GOVERNMENT OF YUKON- PROPERTY MANAGEMENT AGENCY

WELL COMPLETION REPORT
KLUANE LAKE SCHOOL
BUILDING # 3171
DESTRUCTION BAY
YUKON

EBA FILE: 1260028

February 2007

EBA Engineering Consultants Ltd.
p. 867.668.3068 • f. 867.668.4349
Calcite Business Centre • Unit 6, 151 Industrial Road • Whitehorse, Yukon Y1A 2V3 • CANADA

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1.0 INTRODUCTION

EBA Engineering Consultants Ltd. (EBA) was retained by Government of Yukon (YTG) Property Management Agency (PMA) to co-ordinate the drilling, construction and testing of a new water supply well at Kluane Lake School, Destruction Bay, Yukon (Destruction Bay School). The site location is shown in Figure 1. The Destruction Bay School (Building # 3171) water system is currently supplied by a 31.7 m deep well (Well 3171-A) located in a pit below grade approximately 5 m north of the School. An evaluation of the well and water system completed by EBA in March 2006 titled "Small Water System Assessments- Government of Yukon Maintained Buildings- Western Region" found several high risk deficiencies with the system including poor surface completion of the well, poor water quality and several potential contaminant sources within 30 m of the wellhead. EBA provided several remedial options to mitigate risk associated with these deficiencies. The remedial option selected by PMA was to drill and commission a new well. EBA was authorized to coordinate the well drilling and testing program under the terms of YTG contract GN655651940319 dated October 31, 2006. The intent is to decommission Well 3171-A once the new well, Well 3171-B, is commissioned.

1.1 SCOPE OF WORK

The following tasks were completed as the above mentioned contract and in accordance with EBA's proposal dated September 6, 2006:

- Development of specifications and selection of drilling location;
- Arranging for qualified drilling and pumping test contractors;
- Co-ordinating and supervising drilling, well construction and pumping tests; and
- Preparation of this well completion report.

2.0 FIELD PROGRAM

2.1 SITE RECONNAISSANCE AND WELL LOCATION

A site reconnaissance was completed by Jennifer Kelly of EBA, on October 15, 2006. The purpose of the site visit was to select the optimal drilling location in consideration of the following:

- Potential for encountering sufficient yields and acceptable water quality;
- Proximity to potential contaminant sources and wellhead protection;

- Proximity to existing infrastructure; and
- Future development plans for the area.

The Yukon Department of Health and Social Services has outlined, in the *Draft Guidelines for Part III – Small Public Drinking Water Systems* (Government of Yukon, 2005), appropriate well construction methods for the insurance of wellhead protection. In accordance with the draft guidelines, well construction shall meet or exceed the criteria outlined in the Canadian Groundwater Association's (CGWA) Water Well Construction Guidelines. Well construction location, unless a comprehensive hydrogeological study determines otherwise, must ensure that the drinking water well is located a minimum distance of:

- 15 meters from a septic tank, sewage holding tank or contained privy;
- 30 meters from a soil absorption system, pit privy, or other potential sources of pollution that may pose a health and safety risk;
- 120 meters from a solid waste site or dump, and cemetery; and
- 300 meters from a sewage lagoon or pit.

The location of Well 3171-B shown on Figure 2 was selected based on all of the above criteria.

2.2 WELL DRILLING AND CONSTRUCTION

The well drilling and testing contract was awarded to Double D Drilling of Terrace, BC on September 21, 2006. Drilling of Well 3171-B commenced on October 23, 2006 and completed on October 25, 2006. Testing took place between October 26 and 27, 2006.

Well 3171-B was drilled using the dual air rotary drilling method. Samples were retained continuously during drilling. A summary of soils encountered and observations made during drilling is included on the Well Log 3171-B in Figure 3 and Double D's Drilling Log in Appendix A.

Near surface soils consisted of black silty sand extending to a depth of 4 meters below ground (m-bg). Underlying this unit was brown silty sand, and sand and gravels layers to a depth of 15 m-bg. Below this was an upper confining layer composed of silt and clay to a depth of 21.3 m-bg. A water-bearing sand and gravel aquifer was encountered below the silt and clay unit to a depth of 24.4 m. Below this was a lower confining unit composed of till and extended to the maximum extent of the borehole, at 27.4 m-bg. A screen was designed based on the grain size analysis of the sand and gravel material and installed between 23.2 and 24.4 m-bg. The screen was developed by lifting and surging with air for 8 hours. A summary of relevant well construction details is included on Table 1 on the following page.

TABLE 1: SUMMARY OF WELL 3171-B INFORMATION AND CONSTRUCTION DETAILS	
REQUIRED DETAILS	DETAILS OR REPORT REFERENCE
Date of construction:	From October 23th to 24th, 2006.
Name and address of the owner of the well:	Government of Yukon- Department of Education – Public Schools Branch – Box 2703, Whitehorse, Yukon, Y1A 2C6
Description of the property:	Kluane Lake School, km 1738 Alaska Highway, Beaver Creek, Yukon
UTM Co-ordinates(± 8 m):	UTM Zone 7 E 617989 N 6792823
Location of the well on the property:	See Figure 2.
Method of construction:	Drilled using the dual air rotary drilling method.
Description, depth and thickness of geologic materials encountered during construction:	See Figure 3 Well log 3171-B. Double D Drilling Log is also included in Appendix A.
Depth and diameter of the well:	The well construction details are provided on Well Log 3171-A in Figure 3 and drillers log in Appendix A. Total depth of well completion is 27.4 m-bg.
Type of casing materials and thickness:	Steel Casing – 0.250 inches (6.35 mm) thick.
Static water level:	6.4 m-bg
Type, size, length and location of screen:	Stainless steel V-wire 30 slot (0.030") Johnson screen. Total screen length is 1.2 m., set between 23.2 m and 24.4 m-bg.
Location of major water-bearing zones:	Water bearing sand and gravel zone from 21.3 m to 24.4 m-bg.
Location, type and thickness of grout sealant placed around the well:	Bentonite seal was placed between annulus of the casing and native sand and gravel. Seal is completed from grade to 6.0 m-bg.

2.3 WELL AND AQUIFER TESTING

Well testing was completed on October 26 and 27, 2006 by Double D Drilling. A temporary submersible pump was installed in the well at a depth of 21.3 m–bg. Flow was monitored during the pumping test with a totalizer and flow meter located near the wellhead, and checked using a graduated barrel and stopwatch. Water from the pumping well was conveyed to a location 30.5 m away from the well and disposed of by infiltration.

A step rate test was first conducted to determine the optimal rate at which to perform the constant rate pumping test. The step rate test was initiated on October 26, 2006 at 3:00 PM. Three 60 min steps were completed at rates of 0.38, 0.79 and 1.5 L/s (5, 10 and 20 IGPM, respectively). The final step was reduced to 1.1 L/s (15 IGPM) due to the significant drop

observed at the beginning of the step. It was at this rate of 1.1 L/s (15 IGPM) that the 24 hour constant rate test was conducted. The constant rate test was initiated on October 26, 2007 at 7:00 PM. The water level and flow rate were monitored on specified intervals during the constant rate pumping test. The constant rate pumping test was concluded at 7:00 PM on October 26, 2006, and recovery was monitored for 4 hours following termination of pumping. Data collected during the step test, constant rate test and recovery interval is included as Appendix C.

2.4 WATER QUALITY ANALYSIS

Water samples were collected from a sample port located at the wellhead at the end of the constant rate pumping test. An additional surface water sample was collected from a creek approximately 42 m east of the Destruction Bay School. Samples were collected in laboratory supplied sample containers in accordance with laboratory sampling procedures. Samples were shipped by air cargo to ALS Environmental in Vancouver, B.C. for detailed potability analysis; including the following parameters: physical tests, dissolved anions, nutrients, total metals, and total organic carbon. ALS is an accredited member of the Canadian Association of Environmental Analytical Laboratories (CAEAL).

Analytical results are summarized in Table 4, attached. Laboratory reports and certificates are included as Appendix D.

3.0 HYDRAULIC TESTING RESULTS

3.1 PUMPING TEST

Step Test

A plot of observed drawdown in Well 3171-B during the step rate pumping test is included as the upper graph in Figure 4. The lower graph details specific capacity and drawdown verses pumping rate observed at 60 min into each step. As the flow rate increased from 0.4 to 1.2 L/s, the specific capacity remained constant between 0.2 - 0.1 L/s/m. As expected, drawdown vs. flow rate behaved in a relatively linear fashion.

Constant Rate Test

Drawdown observed in Well 3171-B during the constant rate pumping test is plotted in Figure 5. To facilitate pumping test analysis, the drawdown data has been plotted against elapsed time (log) since the beginning of the constant rate pumping interval. Also included

on Figure 5 is residual drawdown vs. the log of the residual time factor (t/t')[1] as observed during the recovery interval.

The maximum drawdown observed during the constant rate pumping test was 12.7 m. A minor water level fluctuation occurred between 40 min and 200 min, indicative of outside influences or stresses on the aquifer (such as interference from another pumping well, or a rapid change in barometric pressure). A positive boundary condition was observed at approximately 300 min into the constant rate test indicating that some source of recharge was encountered. Recharge can occur through leakage from the confining layer.

The plot of log t/t' vs. residual drawdown intercepts zero at residual drawdown at log t/t' greater than 1, confirming that some recharge occurred during the test. The projected 100 day drawdown is approximately 15.7 m; slightly less than the available drawdown of 16.3 m.

The observed and residual drawdown was analyzed using the Cooper-Jacob straight-line method, which assumes the following:

- The aquifer is infinite in areal extent, and uniform in thickness;
- The aquifer is homogeneous and isotropic;
- The formation receives no recharge from any source;
- The pumping well fully penetrates the aquifer thickness, and pumps at a constant rate;
- The piezometric surface was horizontal prior to pumping;
- The pumping well is 100-percent efficient;
- Water is released instantaneously from storage with a decline in head;
- The well diameter is small such that well storage in negligible; and
- Flow is laminar

The results of the Cooper-Jacob analysis for the constant rate pumping test are included on Figure 5 and summarized in Table 2 below. The straight line approximation was applied separately for the early, mid and late pumping, and early, mid and late recovery intervals. Also included in Table 2 are the conductivity values calculated based on grain size analyses. The Hazen formula was used to determine the hydraulic conductivity from the grain size analysis;

$$K\ (m/s) = d^2_{10} \times 10^{-2}$$

[1] t/t'= (time since pump started)/ (time since pump stopped)

where d_{10} (in mm) represents the grain size at which 10% of the particles have passed through the sieve in the grain size analysis.

TABLE 2: AQUIFER TRANSMISSIVITY AND HYDRAULIC CONDUCTIVITY

CONDUCTIVITY BASED ON PUMPING TEST RESULTS			CONDUCTIVITY BASED ON GRAIN SIZE ANALYSIS	
INTERVAL	T TRANSMISSIVITY	K CONDUCTIVITY	SAMPLE DEPTH	K CONDUCTIVITY
EARLY PUMPING (T_1,K_1)	10 m^2/day	4 x 10^{-5} m/sec	22.8 m	**6 x 10^{-1} m/sec**
MID PUMPING (T_2,K_2)	**16 m^2/day**	**6 x 10^{-5} m/sec**		
LATE PUMPING (T_3,K_3)	**31 m^2/day**	**1 x 10^{-4} m/sec**		
EARLY RECOVERY (T_4,K_4)	6 m^2/day	2 x 10^{-5} m/sec		
MID RECOVERY (T_5,K_5)	**15 m^2/day**	**5 x 10^{-5} m/sec**		
LATE RECOVERY (T_6,K_6)	**20 m^2/day**	**7 x 10^{-5} m/sec**		

Conductivity results shown in bold above (from the mid to late pumping and recovery data) are more representative of aquifer characteristics than earlier interpretations (due to the effects of well loss). The transmissivity values calculated for the mid to late pumping and recovery intervals range from 15 m^2/day to 31 m^2/day. The straight line approximations for pumping and recovery intervals are approximately parallel indicating a reasonable agreement between the two analyses. Using an aquifer thickness of 3.1 m, the hydraulic conductivity (K) values for the aquifer material based on pumping and recovery data range from 7 x 10^{-5} m/s to 1 x 10^{-4} m/s.

The hydraulic conductivity results interpreted from the grain size analysis are much higher than results interpreted from pumping test analysis; one possible explanation is the segregation of fines that may have occurred during air rotary drilling resulting in a coarser sample recovery.

3.2 WELL CAPACITY

To calculate the safe yield of the well, the 100-day specific capacity was multiplied by the safe available drawdown. The 100-day specific capacity of the well (at a given pumping rate) is based on the projection of the constant rate drawdown to 100 days as shown on Figure 5. This conservatively assumes that Well 3171-B would be continuously pumped at the same

rate for 100-days with no recharge to the aquifer. The safe available drawdown of the well is determined from the approximate depth to the bottom of the confining unit (21.3m) after an allowance has been made for seasonal fluctuations in static water level. For a well completed in a confined aquifer (such as Well 3171-B), the water level should never be drawn below the bottom of the confining unit. The safe yield of a well can also be limited by what the well screen is capable of delivering based on the maximum recommended screen entrance velocity. Table 3 below provides the details of the safe yield calculations for Well 3171-B.

TABLE 3: SAFE YIELD CALCULATIONS

WELL PARAMTER	VALUE	UNIT	KEY
Constant Rate Pumping Test Discharge Rate	1.2	L/s	a
Projected 100-Day Drawdown	15.7	m	b
100-Day Specific Capacity	0.1	L/s/m	c
Lowest Expected Seasonal Water Table (1.0 m fluctuation) (m-bg)	7.4	m	d
Depth to bottom of Confining Unit	23.2	m	e
Safe Available Drawdown	13.9	m	f = e - d
Safe Yield Based on Constant Rate Pumping Test			
Safe Estimated Sustainable Yield	1.0	L/s	c x h
Safe Estimated Sustainable Yield	**13**	IGPM	
Check for Maximum Screen Entrance Velocity			
Recommended Maximum Screen Entrance Velocity	0.03	m/s	k
Intake Area (m^2/ m of 0.030" Well Screen)	0.12	m^2/m	l
Maximum Yield per m screen	3.7	L/s	k x l
Maximum Yield for Screen Interval (1.2 m)	4.5	L/s	
Maximum Well Yield	**59**	IGPM	m
Check: Greater than Safe Estimated Sustainable Yield?	**YES**		

Based on specific capacity and available drawdown, the aquifer at Well 3171-B can be safely pumped at a rate of 1.0 L/s (13 IGPM).

3.3 GROUNDWATER UNDER THE DIRECT INFLUENCE OF SURFACE WATER (GUDI) ASSESSMENT

Well water or groundwater under the direct influence of surface water (GUDI) refers to groundwater sources that are hydraulically connected to nearby surface waters and are thus vulnerable to contamination by surface water organisms. The implication of a well being

classified GUDI means that the well water source requires water treatment equivalent to that required for surface water sources.

The Yukon Department of Health and Social Services has prepared a drafted document titled "Assessment Guideline for Well Water or Groundwater Under the Direct Influence of Surface Water" (GUDI) to determine if a well is potentially under the influence of surface water (Government of Yukon, 2005). It is understood that these guidelines are under review and subject to change.

Well 3171-B is completed approximately 30 m cross gradient from a drainage creek located southeast of the school. This distance to the creek is less then a Phase 1 trigger criteria that suggests that wells within 60 m from a surface water body could potentially be GUDI. However, the creek is very shallow, and Well 3171-B is screened within a confined aquifer at a depth of 24.4 m-bg that is bounded by a 6.0 m thick upper confining silt and clay unit. Based on EBA's knowledge of the hydrogeology of the area, the thick silt and clay confining unit is extensive throughout. This confining unit provides a barrier preventing a direct connection between this creek and the underlying confined aquifer, and ensuring that the travel time between surface water from the shallow drainage creek and the groundwater from the confined aquifer would be significantly greater than 90 days. Thus Well 3171-B is considered to be NON-GUDI.

4.0 RESULTS OF LABORATORY ANALYSIS

Groundwater analytical results from Well 3171-A, Well 3171-B and surface water from Destruction Bay Creek are presented in Table 3. Laboratory results and certificates can be found in Appendix D. The following items below have been summarized based on the groundwater analysis conducted on Well 3171-B.

- Water from Well 3171-B met all current Canadian Drinking Water Quality Guidelines (GCDWQ) for health based parameters;
- Water from Well 3171-B is a hard calcium-bicarbonate type water; and
- Bacteriological testing was not conducted due to the time constraints during the drilling and pumping test programs. EBA recommends that a bacteriological analysis be conducted prior to commissioning of the well.

5.0 WELL COMMISSIONING, OPERATION AND MAINTENANCE

It is EBA's understanding that YTG-PMA will be coordinating the commissioning of Well 3171-B in 2007. Proper well commissioning, operation and maintenance are fundamental to ensuring a reliable drinking water source. Recommendations pertinent to the commissioning and operation of Well 3171-B are presented below:

- In accordance with CGWA well construction guidelines the casing of the well should project at least 0.50 m above ground surface upon final completion (it is currently 0.65 m above grade);
- A submersible pump should be installed at the bottom of the confining unit (approx. 15 m below grade) to maximize drawdown and well performance. Pump sizing will be dependant on the required demand, and should account for a pumping water level of up to 15 m-bg.
- After extended periods of non-pumping the well should be allowed to discharge to waste until the water runs clear. Pumping of small amounts of sand or discoloured water is normal after extended periods of non-pumping;
- The pump should not be continuously turned off and on as this can severely decrease the lifetime of the pump, and promote sand build up within the casing thereby increasing the need for re-development of the well;
- The water level and specific capacity in a water supply well should be routinely monitored over time to facilitate evaluation of well performance;
- The well should be "shock chlorinated" (disinfected) prior to commissioning, and bi-annually with a 200 mg/L sodium hypochlorite solution; and,
- Any alterations to Well 3171-B should be in compliance with the Draft Guidelines for Part III – Small Public Drinking Water Systems, or the final document when in effect.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions are based on the information presented in this well completion report:

- In October 2006, a new drinking water well (Well 3171-B) was drilled at the Kluane Lake School in Destruction Bay, Yukon Territory. The well was drilled to a depth of 24.4 m-bg, and a screen was set from 23.2 to 24.4 m-bg within a confined sand and gravel aquifer;

- The new well was constructed in accordance with proposed Government of Yukon Public Drinking Water System Regulations (Government of Yukon, 2005).
- The new well is sited at a location ensuring compliance with current and proposed guidelines for setback distances from existing and potential sources of contamination.
- The maximum drawdown observed during the constant rate pumping test was 12.7 m. A positive boundary condition was observed at approximately 300 min into the constant rate test indicating that some source of recharge was occurring, such as leakage from above or below the aquifer;
- The transmissivity values ranged from 15 m^2/day to 31 m^2/day and the hydraulic conductivity (K) values ranged from 7 x 10^{-5} m/s to 1 x 10^{-4} m/s;
- The safe sustainable yield of Well 3171-B is 1.0 L/s (13 IGPM);
- Based on the hydrogeology of the area, Well 3171-B is considered to not be under the direct influence of surface water and can be considered as a groundwater source (NON-GUDI);
- Water from Well 3171-B met all current Canadian Drinking Water Quality Guidelines (GCDWQ) for health based parameters. Water Quality indicates the water to be a hard calcium-bicarbonate type water;
- To date, well construction and water quality results are in compliance with the Draft Guidelines for Part III – Small Public Drinking Water Systems

Recommendations resulting from this study are:

- Bacteriological testing should be completed prior to commissioning of the new well; and
- Well 3171-A should be decommissioned in accordance with CGWA guidelines for well decommissioning

7.0 CLOSURE

Conclusions and recommendations in this report are based upon the Hydrogeological Investigations as described in the previous sections. This report has been prepared for the use of the Government of Yukon's Property Management Agency. It has been prepared in accordance with generally accepted hydrogeological practices. For further limitations regarding the use of the report, reference should be made to the EBA Environmental Report – General Conditions attached, which form a part of this report.

EBA trusts that this report satisfies your present requirements. Should you have any questions or comments please do not hesitate to contact the undersigned.

Respectfully submitted,

EBA Engineering Consultants Ltd.

Prepared by:

Tammera Kostya, B.Sc.
Junior Hydrogeologist
(Direct Line: (867) 668-2071, ext. 63)
(Email: tkostya@eba.ca)

Reviewed by:

Ryan Martin, M.Sc.(Eng.), P.Eng.
Project Engineer, Hydrogeologist
(Direct Line: (867) 668-2071, ext. 31)
(Email: rmartin@eba.ca)

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ENVIRONMENTAL REPORT – GENERAL CONDITIONS

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

1.0 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.

2.0 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.

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.

3.0 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.

4.0 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.

5.0 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.

6.0 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.

7.0 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.

8.0 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.

9.0 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.

10.0 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.

EBA FILE: 1260028
February 2007

TABLES

TABLE 4
Laboratory Analytic Results for Wells 3171-A and 3171-B
Kluane Lake School, Destruction Bay and Destruction Bay Creek, YT

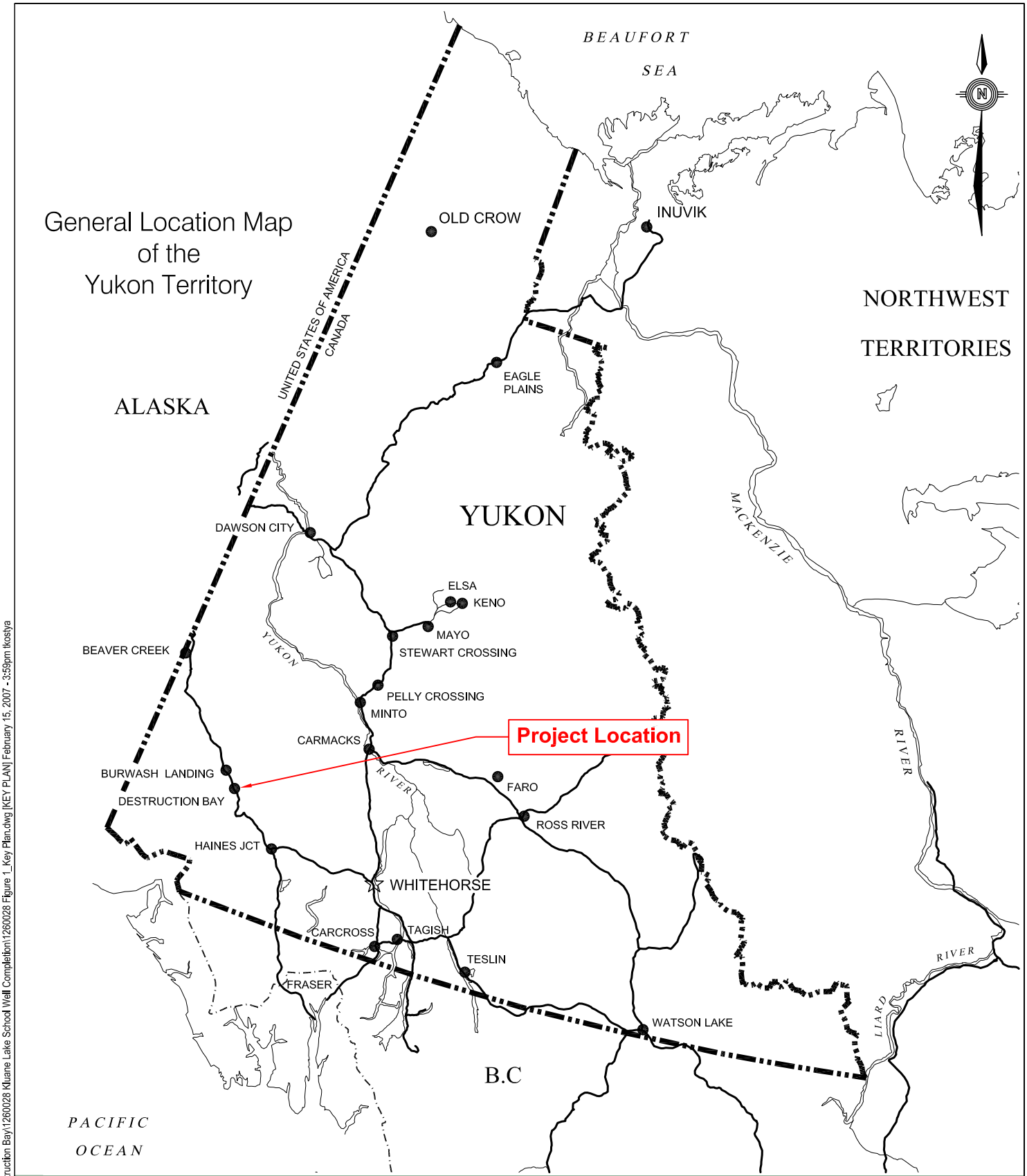
	Well	Kluane Lake School, Destruction Bay (Well 3171-A)			Kluane Lake School, Destruction Bay (Well 3171-B)	Destruction Bay Creek	Canadian Drinking Water Quality Guidelines [1]	
	ALS Report				L450019	L448094		
	Date	21-Sep-04	15-Jun-05	27-Jul-05	27-Oct-06	23-Sep-06		
	Sampled by:				EBA	EBA	MAC [2]	AO [3]
Physical Tests								
Colour	CU	<5.0	<5.0	-	<5.0	8.6	-	15
Conductivity (Field)	uS/cm	-	-	1158	-	-	-	-
Conductivity (Lab)	uS/cm	-	830	-	726	942	-	-
Total Dissolved Solids (Field)	mg/L	-	-	575	-	-	-	-
Total Dissolved Solids (Lab)	mg/L	680	528	-	493	692	-	500
Hardness (CaCO3)	mg/L	1.8	446	-	367	-	-	-
pH (field)	pH units	-	-	8.48	-	-	-	-
pH (lab)	pH units	8.36	8.33	-	8.08	8.2	-	6.5-8.5
Turbidity	NTU	0.3	**1.08**	0.41	0.62	**1.61**	1	5
UV Abosrbance (254 nm)	Abs/cm-1	-	-	-	-	0.0799	-	-
Temperature (Field)	°C	-	-	8.7	-	-	-	-
Free Available Chlorine	mg/L	-	-	0	-	-		
Dissolved Anions								
Alkalinity-Total CaCO3	mg/L	292	295	-	255	319	-	
Chloride	mg/L	1.3	1.06	-	0.83	<0.5	-	250
Fluoride	mg/L	0.18	0.269	-	0.264	0.115	1.5	-
Sulphate	mg/L	165	184	-	168	251	-	500
Nutrients								
Ammonia Nitrogen N	mg/L	-	-	-	-	-	-	-
Nitrate Nitrogen N	mg/L	<0.1	<0.10	-	<0.005	<0.005	10	-
Nitrite Nitrogen N	mg/L	<0.05	<0.10	-	<0.001	<0.001	3.2	-
Total Phosphate	mg/L	-	-	-	-	-	-	-
Total Organic Carbon (TOC)	mg/L	-	-	2.15	3.08	-	-	-
Total Metals								
Aluminum	mg/L	0.034	<0.010	-	<0.01	-	-	-
Antimony	mg/L	<0.0002	<0.00050	-	<0.0005	-	0.006	-
Arsenic	mg/L	0.0043	0.00373	-	0.00812	-	0.01	-
Barium	mg/L	0.002	0.021	-	0.028	-	1	-
Boron	mg/L	1.27	1.04	-	1.22	-	5	-
Cadmium	mg/L	<0.00001	<0.00020	-	<0.0002	-	0.005	-
Calcium	mg/L	-	67.4	-	44.6	-	-	-
Chromium	mg/L	0.0008	<0.0020	-	<0.002	-	0.05	
Copper	mg/L	0.002	<0.0010	-	0.0037	-	-	1
Iron	mg/L	<0.01	0.190	-	0.088	-	-	0.3
Lead	mg/L	0.0002	<0.0010	-	<0.001	-	0.01	-
Magnesium	mg/L	-	67.5	-	62	-	-	-
Manganese	mg/L	<0.005	0.0974	<0.0050	0.0226	-	-	0.05
Mercury	mg/L	-	<0.00020	-	<0.0002	-	0.001	-
Potassium	mg/L	-	5.82	-	5.51	-	-	-
Selenium	mg/L	-	<0.0010	-	<0.001	-	0.01	-
Sodium	mg/L	19.1	27.2	-	28.5	-	-	200
Uranium	mg/L	<0.0005	0.00131	-	0.00138	-	0.02	-
Zinc	mg/L	0.010	<0.050	-	<0.05	-	-	5
Dissolved Metals								
Mangenese	mg/L	-	-	<0.005	-	-	-	0.05

Notes:
"-" indicates not analyzed.
Bold - indicates parameter above proposed CDWQG MAC.
Underline - indicates parameter above CDWQG AO.

[1] CDWQG criteria are taken from the " Canadian Drinking Water Quality Guidelines, April 2004."
[2] MAC refers to the Maximum Acceptable Concentration according to the CDWQG criteria.
[3] AO refers to the Aesthetic Objective according to the CDWQG criteria.

EBA FILE: 1260028
February 2007

FIGURES



0 50 100 200 400

kilometres

CLIENT

Yukon
Property Management Agency

WELL COMPLETION REPORT
KLUANE LAKE SCHOOL - DESTRUCTION BAY, YT

SITE LOCATION MAP

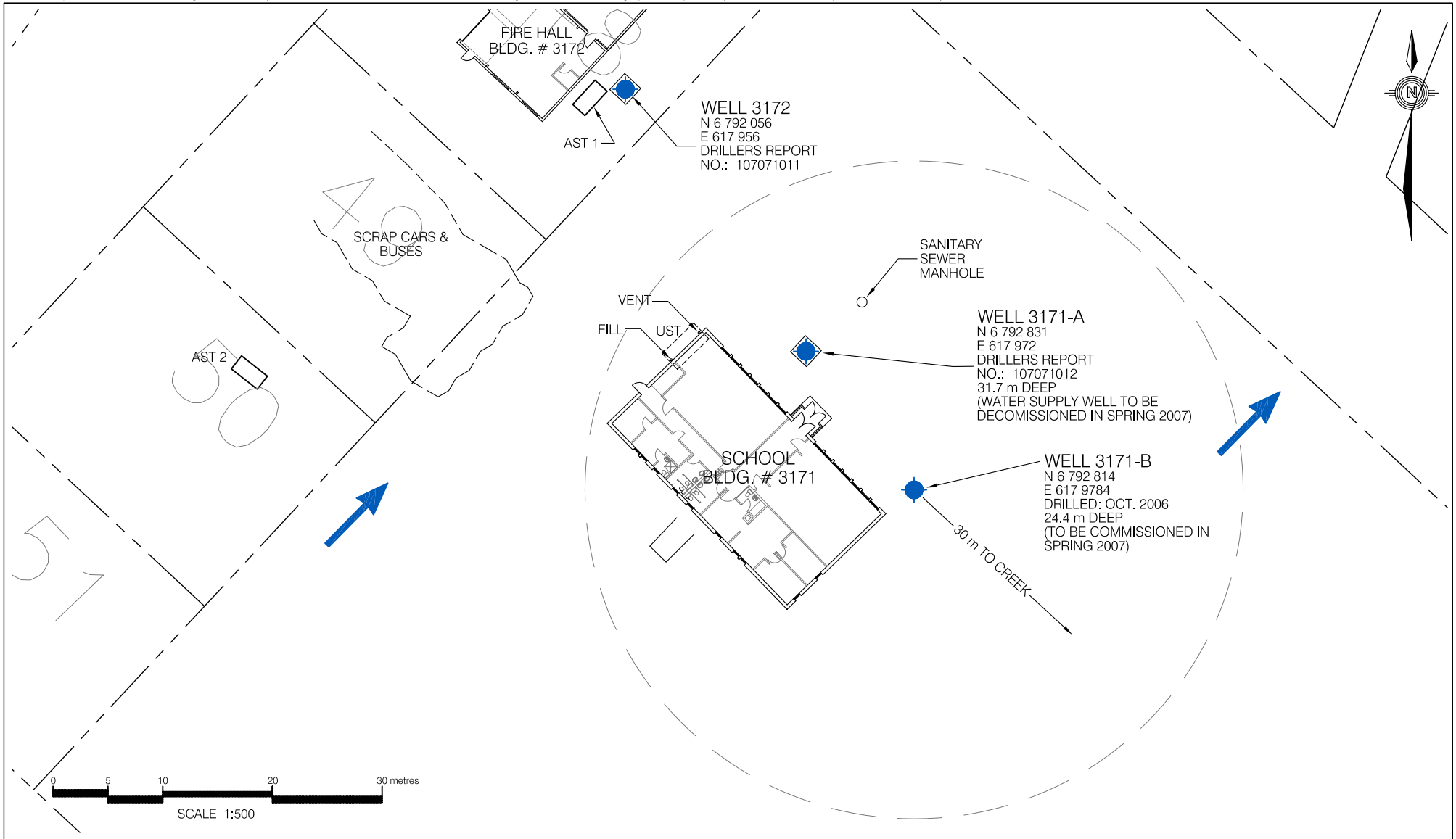
EBA Engineering Consultants Ltd.

PROJECT NO.	DWN	CKD	REV
1260028	JSB	TAK/RMM	0

OFFICE	DATE
EBA-WHSE	January 30, 2007

Figure 1

\\eba.local\corp\Whitehorse\Data\0201drawings\Destruction Bay\1260028 Kluane Lake School Well Completion\1260028 Figure 1_Key Plan.dwg [KEY PLAN] February 15, 2007 - 3:59pm tkostya



LEGEND:

INFERRED GROUNDWATER FLOW DIRECTION

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

NOTES:

1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.
2. BUILDING STRUCTURES RELATIVE TO PROPERTY LINES ARE APPROXIMATE ONLY.

CLIENT

Yukon
Property Management Agency

EBA Engineering Consultants Ltd.

WELL COMPLETION REPORT
KLUANE LAKE SCHOOL - DESTRUCTION BAY, YT

SITE PLAN WITH WELL LOCATION
BUILDING # 3171
WELL ID: 3171-B

PROJECT NO.	DWN	CKD	REV
1260028	JSB	TAK/RMM	0

OFFICE	DATE
EBA-WHSE	January 30, 2007

Figure 2

HYDROGEOLOGIC LOG

PURPOSE OF HOLE: Water Supply Well
DRILLING METHOD: Air Rotary
DRILLING DATE: October 25, 2006
SCREEN INSTALLED: October 26, 2006
CONTRACTOR: Double D Drilling Ltd.

BOREHOLE NO. WELL 3171-B

CASING STICK UP: 1.0 m -agl.
DEPTH TO STATIC: 6.4 m-bgl.
DEPTH TO SCREEN TOP (m): 23.2 m

Depth (m)	Lithology	Comments	Well Installation Summary
0m	SAND - silty, fine grained, black, moist, (TOPSOIL)		Circle Plate - lockable
	4.0 m		10" (250 mm) Bentonite Surface Seal
5m	SAND - some silt, some gravel, fine grained, subangular, brown		6.0 m
	7.6 m	Static Water Level = 6.4 m-bgl Oct. 26/06	
	SAND & GRAVEL - some silt, fine to coarse grained, angular, brown		
	9.1 m		
10m	SILT & SAND - trace of gravel, fine to medium grained, angular, coarsening with depth, brown		6" (152 mm) ID Steel Well Casing
	12.2 m		
	GRAVEL - silty, some sand, angular, brown		
15m	15.2 m		
	SILT & CLAY - some sand, trace of gravel, brown, grey		
20m			
	21.3 m		5" (127 mm) Ø steel riser K-packer top with threaded plug bottom
	SAND & GRAVEL - silty, fine to coarse grained, angular to subangular, grey		Nominal (Telescope) continous 30 slot 0.8 mm (0.030") stainless steel well screen exposed from 23.2 m to 24.4 m-bgl.
	24.4 m		
25m	TILL		
	27.4 m		Backfill/Cuttings
	END OF BOREHOLE - Backfilled with drill cuttings to 24.4 m		
30m			

CLIENT

Yukon Property Management Agency

EBA Engineering Consultants Ltd.

WATER WELL COMPLETION REPORT
KLUANE LAKE SCHOOL - DESTRUCTION BAY, YT

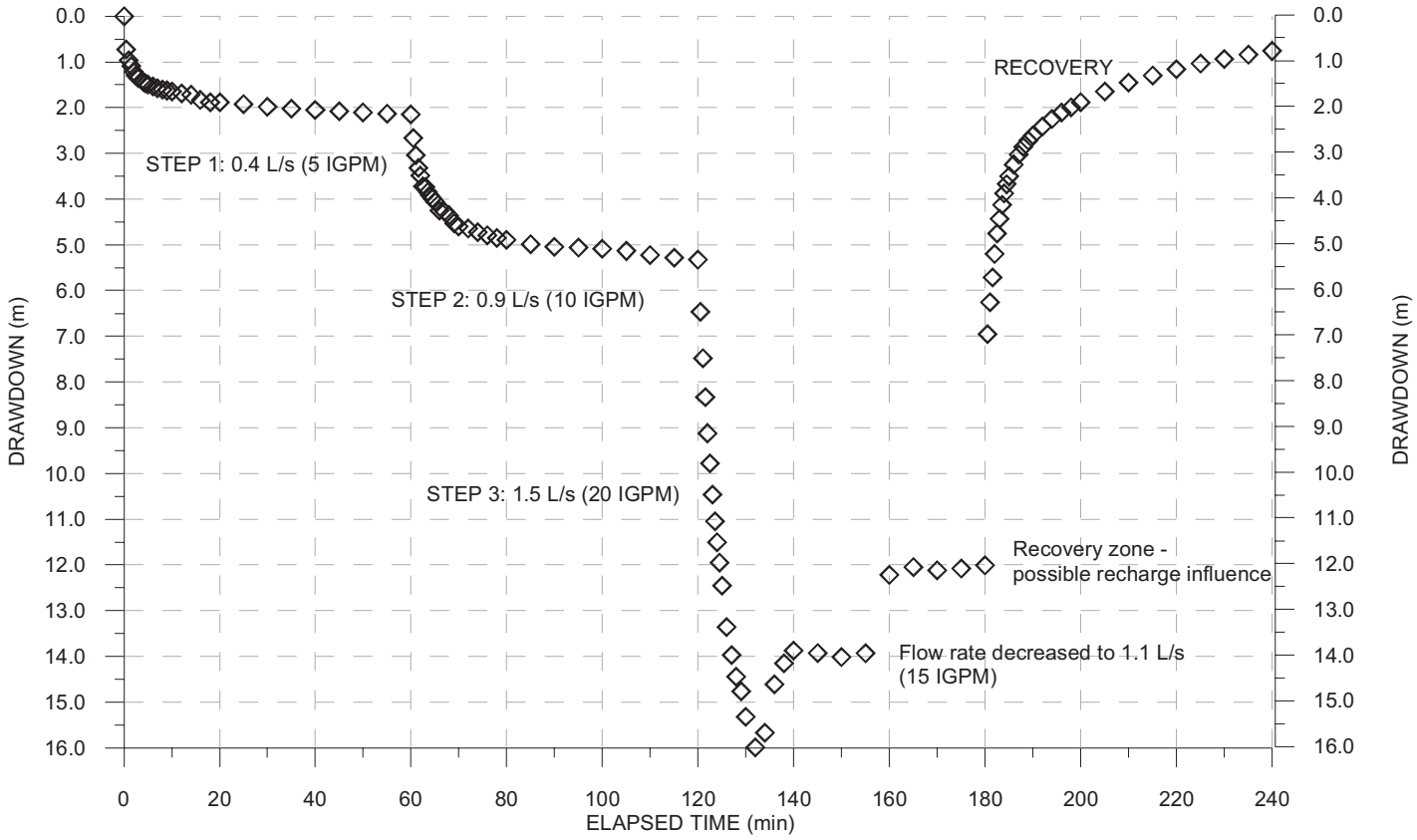
WELL LOG 3171-B

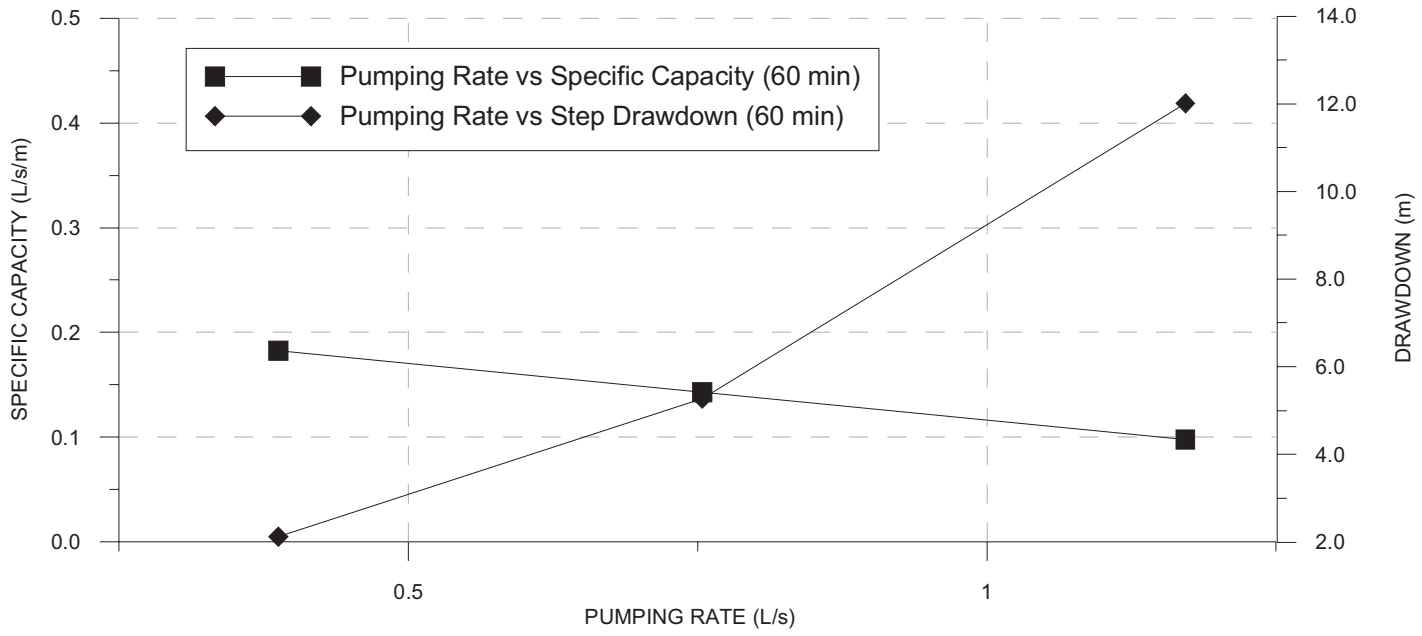
PROJECT NO.	DWN	CKD	REV
1260028	JSB	TAK/RMM	0

OFFICE	DATE
EBA-WHSE	January 30, 2007

Figure 3

\\eba.local\corp\Whitehorse\Data\0201drawings\Destruction Bay\1260028 Kluane Lake School Well Completion\1260028 Figure 1 Well Log_3171B.dwg [WELL 3171-BJ February 15, 2007 - 4:04pm tkostya





CLIENT

Yukon Highways and Public Works Property Management Branch

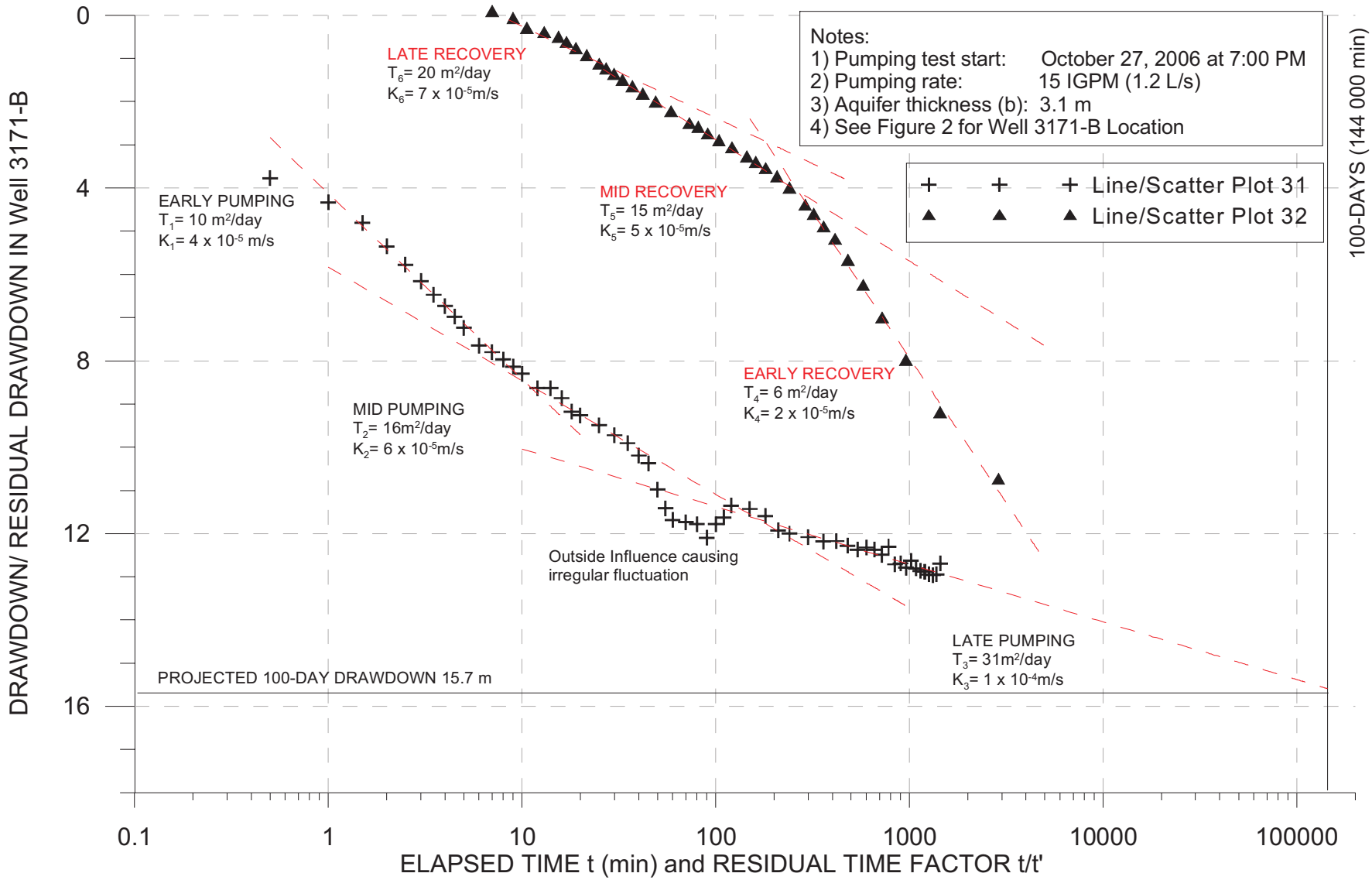
WATER WELL COMPLETION REPORTS, KLUANE LAKE SCHOOL, DESTRUCTION BAY, YUKON

STEP RATE PUMPING TEST

EBA Engineering Consultants Ltd.

PROJECT NO.	DWN	CKD	REV
1260028	TAK	RMM	1
OFFICE: EBA-Whitehorse	DATE: February, 2007		

Figure 4



CLIENT

Yukon Highways and Public Works Property Management Branch

WELL COMPLETION REPORT, KLUANE LAKE SCHOOL, DESTRUCTION BAY, YUKON

CONSTANT RATE PUMPING TEST

EBA Engineering Consultants Ltd.

PROJECT NO.	DWN	CKD	REV
1260028	TAK	RMM	1

OFFICE	DATE
EBA-WHITEHORSE	February 2007

Figure 5

APPENDIX

APPENDIX A DRILLERS WELL LOG

BRITISH COLUMBIA — BC Environment

WATER WELL RECORD

Water Management Branch, Groundwater Section

Date (YR / MO / DY)

BCGS MAP | WELL No. | ELEV | Location Accuracy: GPS

UTM Z | E | N | UTM Date 19__ | Well Type

Owners Name & Address

Legal Description & Address

Descriptive Location: KUANE SCHOOL DISTRICTION ISAK.

1. TYPE OF WORK 1 ☑ New Well 2 ☐ Reconditioned 3 ☐ Deepened 4 ☐ Abandoned

2. WORK METHOD 1 ☐ Cable tool 2 ☐ Bored 3 ☐ Jetted 4 ☑ Rotary a ☐ mud b ☑ air c ☐ reverse ☐ Other

3. WATER WELL USE 1 ☐ Domestic 2 ☐ Municipal 3 ☐ Irrigation 4 ☐ Comm. & Ind. ☐ Other

4. DRILLING ADDITIVES NONE

5. MEASUREMENTS from 1 ☑ ground level 2 ☐ top of casing

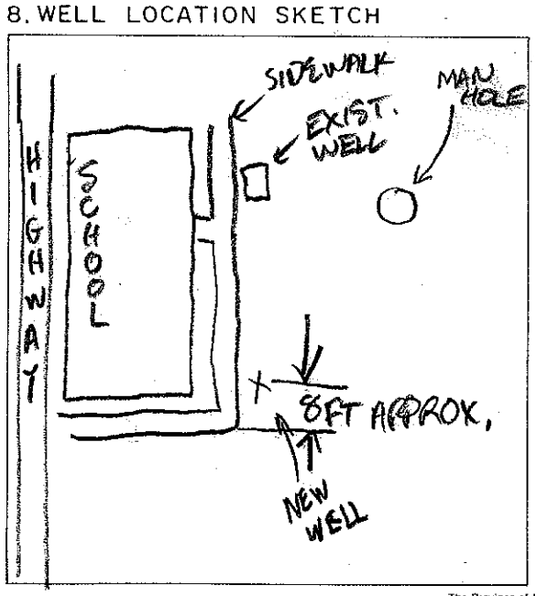
casing height above ground level 3.28 ft.

FROM ft	TO ft	6. WELL LOG DESCRIPTION	SWL ft
0	13	SLT, SAND, TOPSOIL	
13	16	SILT, SAND, TRACES OF GRAVEL	
16	30	BRN, SILT, BRN SAND.	
30	34	SILTY SAND, CLAY MIX	
34	73	(HARD PAN) AND/OR TILL	
73	82	W/B SILTY GREY SAND + FINE - MED, GRAVEL.	
82	85	STICKY SAND + GRAVEL	
		WATER OFF @ 85 FT	
85	90	TILL	
	*	TO SURFACE SEAL TO 20 FT	
	*	GPS READING: 61° 15.109 N 138° 48.046 W ACCURACY 26 FT ELEV, 2627 FT.	

7. CONSULTANT

Address

8. WELL LOCATION SKETCH



9. CASING: Materials 1 ☑ Steel 2 ☐ Galvanized 3 ☐ Wood 4 ☐ Plastic 5 ☐ Concrete ☐ Other

							units
Hole Diameter	6 7/8						ins
Diameter	6						ins
from	0						ft
to	75						ft
Thickness	.280						ins
Weight							lb/ft

Pitless unit ____ ft 1 ☐ above 2 ☐ below ground level

1 ☐ Welded 2 ☐ Cemented 3 ☐ Threaded | 1 ☐ New 2 ☐ Used

Perforations:

Shoe(s): BARBER DRIVE SHOE

Open hole, from ____ to ____ ft Diameter ____ ins

Grout:

10. SCREEN: 1 ☑ Nominal (Telescope) 2 ☐ Pipe Size

Type 1 ☑ Continuous Slot 2 ☐ Perforated 3 ☐ Louvre ☐ Other

Material 1 ☑ Stainless Steel 2 ☐ Plastic ☐ Other

Set from 76 to 80 ft below ground level

RISER, SCREEN & BLANKS							units
Length	2.5		4				ft
Diam. I D	5		5				ins
Slot Size	8		.080				ins
from	73.5		76				ft
to	76		80				ft

Fittings, top K PACKER bottom THREADED PLUG

Gravel Pack

11. DEVELOPED BY: 1 ☑ Surging 2 ☐ Jetting 3 ☑ Air 4 ☐ Bailing 5 ☐ Pumping ☐ Other

12. TEST 1 ☑ Pump 2 ☐ Bail 3 ☐ Air Date (YR / MO / DY) 06 / 10 / 27

Rate 15 ~~Igpm~~ Temp ____ °C SWL before test ____ ft

Water Level ____ ft after test of ____ hrs

☐ DRAWDOWN in ft				☐ RECOVERY in ft			
mins	WL	mins	WL	mins	WL	mins	WL

13.

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING ft	RECOMMENDED PUMPING RATE USgpm

14. WATER TYPE: 1 ☑ fresh 2 ☐ salty 3 ☑ clear 4 ☐ cloudy

colour SLIGHT GREY smell ____; gas 1 ☐ yes 2 ☐ no

15. WATER ANALYSIS: 1 Hardness ____ mg/L 2 Iron ____ mg/L 3 Chloride ____ mg/L 4 pH ____ Field Date ____ Lab Date ____

SITE I D No ____

16. FINAL WELL COMPLETION DATA

Well Depth 80 ft Well Yield 15 ~~Igpm~~

Static Water Level 7.0 ft @ Artesian Flow ____ US gpm Pressure Head ____ ft T.O.C.

Back filled

Well Head Completion 6" LOCKABLE HINGED PLATE

17. DRILLER PLEASE PRINT SURNAME STANUIK FIRST NAME DOUG

Signature

18. CONTRACTOR, DOUBLE D DRILLING LTD.

Address BOX 766 TERRACE B.C. V8G 4R1

(250) 635 7877

Member, B C G W A ☑ yes ☐ no ; DOUG STANUIK

EBA FILE: 1260028
February 2007

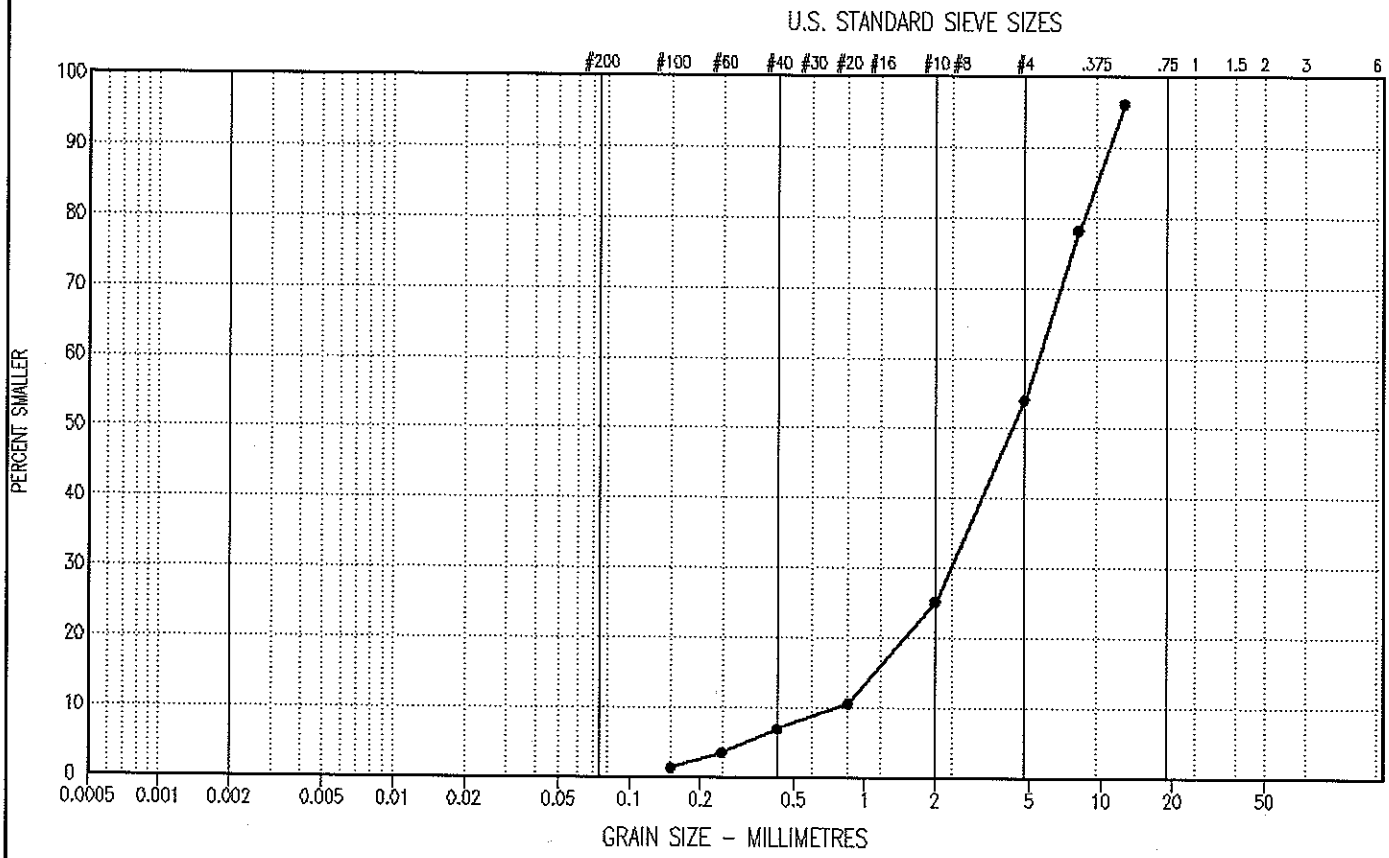
APPENDIX

APPENDIX B WELL 3171-B GRAIN SIZE ANALYSIS

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
●——●	3171-B-75	75.00	---	1 ---	53	46	7.1	1.4	SW

Project: 0201-1260028 Date Tested: 06/10/23 BY: KSJ

Tested in accordance with ASTM D422 unless otherwise noted.

EBA FILE: 1260028
February 2007

APPENDIX

APPENDIX C WELL 3171-B PUMPING TEST DATA

APPENDIX B1: STEP-RATE PUMPING TEST DATA

EBA PROJECT NUMBER:	1260028	PROJECT LOCATION:	Detruction Bay School
WELL NAME:	Kluane School Well 3171-B	PUMP INTAKE DEPTH (m):	23.0 m (75.5 ft)
STATIC WATER LEVEL (m):	6.38 m (24.2 ft)	SCREEN INTERVAL:	23.2 - 24.4 m (76 - 80 ft)
DATUM DESCRIPTION:	Top of Sounding Tube	SLOT SIZE (''):	0.030 in
DATUM STICK-UP(m):	1.12 m above ground level	SAFE AVAILABLE DRAWDOWN(m):	13.9 m (45.6 ft)
WELL DIAMETER:	152 mm (6 in)	SCREEN DIAMETER (mm):	127 mm (5 in)
TOTAL WELL DEPTH:	24.3 m (80 ft)	OBSERVER'S NAME:	Jennifer Kelly

DATE	TIME	ELAPSED TIME (min)	DEPTH TO WATER (m)	DRAWDOWN (m)	METER READING [3] (Total IG)	FLOW RATE (USGPM)	FLOW RATE (IGPM)	FLOW RATE (L/s)	SPECIFIC CAPACITY (L/s/m)	COMMENTS
26-Oct-06	15:00:00	0	6.380	0.000	9	-	-	-	-	START STEP 1
26-Oct-06	15:00:30	0.5	7.110	0.730	-	7.122	5.93	0.449	0.615	
26-Oct-06	15:01:00	1	7.340	0.960	-	-	-	-	-	
26-Oct-06	15:01:30	1.5	7.468	1.088	-	6.869	5.72	0.433	0.398	
26-Oct-06	15:02:00	2	7.597	1.217	-	6.773	5.64	0.427	0.351	
26-Oct-06	15:02:30	2.5	7.680	1.300	-	6.689	5.57	0.422	0.325	
26-Oct-06	15:03:00	3	7.739	1.359	-	-	-	-	-	
26-Oct-06	15:04:00	4	7.815	1.435	-	-	-	-	-	
26-Oct-06	15:04:30	4.5	7.845	1.465	-	-	-	-	-	
26-Oct-06	15:05:00	5	7.870	1.490	-	-	-	-	-	
26-Oct-06	15:06:00	6	7.921	1.541	-	6.341	5.28	0.400	0.260	
26-Oct-06	15:07:00	7	7.955	1.575	-	-	-	-	-	
26-Oct-06	15:08:00	8	7.981	1.601	-	6.329	5.27	0.399	0.249	
26-Oct-06	15:09:00	9	8.005	1.625	-	6.317	5.26	0.399	0.245	
26-Oct-06	15:10:00	10	8.025	1.645	-	6.365	5.3	0.402	0.244	
26-Oct-06	15:12:00	12	8.071	1.691	-	6.305	5.25	0.398	0.235	
26-Oct-06	15:14:00	14	8.103	1.723	-	6.221	5.18	0.392		
26-Oct-06	15:16:00	16	8.215	1.835	-	6.329	5.27	0.399	0.218	
26-Oct-06	15:18:00	18	8.264	1.884	-	-	-	-	-	
26-Oct-06	15:20:00	20	8.265	1.885	-	6.209	5.17	0.392	0.208	
26-Oct-06	15:25:00	25	8.302	1.922	-	-	-	-	-	
26-Oct-06	15:30:00	30	8.364	1.984	-	6.221	5.18	0.392	0.198	
26-Oct-06	15:35:00	35	8.405	2.025	-	6.221	5.18	0.392	0.194	
26-Oct-06	15:40:00	40	8.430	2.050	-	6.197	5.16	0.391	0.191	
26-Oct-06	15:45:00	45	8.456	2.076	-	6.185	5.15	0.390	0.188	
26-Oct-06	15:50:00	50	8.482	2.102	-	6.161	5.13	0.389	0.185	
26-Oct-06	15:55:00	55	8.509	2.129	-	6.149	5.12	0.388	0.182	
26-Oct-06	1:00:00	60	8.529	2.149	867464 ft^3	-	-	-	-	
26-Oct-06	16:00:30	60.5	9.050	2.670	-	12.298	10.24	0.776	0.291	STEP 2
26-Oct-06	16:01:00	61	9.420	3.040	-	12.298	10.24	0.776	0.255	
26-Oct-06	16:01:30	61.5	9.700	3.320	-	12.466	10.38	0.786	0.237	
26-Oct-06	16:02:00	62	9.862	3.482	-	12.118	10.09	0.765	0.220	
26-Oct-06	16:02:30	62.5	10.100	3.720	-	12.106	10.08	0.764	0.205	
26-Oct-06	16:03:00	63	10.121	3.741	-	-	-	-	-	
26-Oct-06	16:03:30	63.5	10.221	3.841	-	12.034	10.02	0.759	0.198	
26-Oct-06	16:04:00	64	10.300	3.920	-	12.070	10.05	0.761	0.194	
26-Oct-06	16:04:30	64.5	10.371	3.991	-	-	-	-	-	
26-Oct-06	16:05:00	65	10.429	4.049	-	11.949	9.95	0.754	0.186	Slight Adjustment
26-Oct-06	16:06:00	66	10.632	4.252	-	11.697	9.74	0.738	0.174	
26-Oct-06	16:07:00	67	10.660	4.280	-	12.274	10.22	0.774	0.181	
26-Oct-06	16:08:00	68	10.734	4.354	-	11.985	9.98	0.756	0.174	
26-Oct-06	16:09:00	69	10.902	4.522	-	-	-	-	-	EC=674 uS/cm, pH=7.34, T=5.6°C
26-Oct-06	16:10:00	70	10.979	4.599	-	12.298	10.24	0.776	0.169	
26-Oct-06	16:12:00	72	11.027	4.647	-	12.382	10.31	0.781	0.168	
26-Oct-06	16:14:00	74	11.101	4.721	-	12.298	10.24	0.776	0.164	
26-Oct-06	16:16:00	76	11.171	4.791	-	12.214	10.17	0.771	0.161	
26-Oct-06	16:18:00	78	11.230	4.850	-	12.154	10.12	0.767	0.158	
26-Oct-06	16:20:00	80	11.270	4.890	-	12.118	10.09	0.765	0.156	
26-Oct-06	16:25:00	85	11.364	4.984	-	12.118	10.09	0.765	0.153	
26-Oct-06	16:30:00	90	11.424	5.044	1380	11.997	9.99	0.757	0.150	
26-Oct-06	16:35:00	95	11.445	5.065	-	11.769	9.8	0.743	0.147	
26-Oct-06	16:40:00	100	11.468	5.088	-	-	-	-	-	
26-Oct-06	16:45:00	105	11.515	5.135	-	11.733	9.77	0.740	0.144	
26-Oct-06	16:50:00	110	11.602	5.222	-	11.805	9.83	0.745	0.143	
26-Oct-06	16:55:00	115	11.660	5.280	-	11.949	9.95	0.754	0.143	
26-Oct-06	17:00:00	120	11.708	5.328	-	-	-	-	-	

APPENDIX B1: STEP-RATE PUMPING TEST DATA

EBA PROJECT NUMBER:	1260028	PROJECT LOCATION:	Detruction Bay School
WELL NAME:	Kluane School Well 3171-B	PUMP INTAKE DEPTH (m):	23.0 m (75.5 ft)
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TOTAL WELL DEPTH:	24.3 m (80 ft)	OBSERVER'S NAME:	Jennifer Kelly

DATE	TIME	ELAPSED TIME (min)	DEPTH TO WATER (m)	DRAWDOWN (m)	METER READING [3] (Total IG)	FLOW RATE (USGPM)	FLOW RATE (IGPM)	FLOW RATE (L/s)	SPECIFIC CAPACITY (L/s/m)	COMMENTS
26-Oct-06	17:00:30	120.5	12.845	6.465	-	25.028	20.84	1.579	0.244	STEP 3
26-Oct-06	17:01:00	121	13.855	7.475	-	24.415	20.33	1.540	0.206	
26-Oct-06	17:01:30	121.5	14.710	8.330	-	-	-	-	-	
26-Oct-06	17:02:00	122	15.500	9.120	-	24.607	20.49	1.552	0.170	
26-Oct-06	17:02:30	122.5	16.162	9.782	-	25.004	20.82	1.577	0.161	
26-Oct-06	17:03:00	123	16.845	10.465	-	24.944	20.77	1.574	0.150	
26-Oct-06	17:03:30	123.5	17.430	11.050	-	-	-	-	-	
26-Oct-06	17:04:00	124	17.880	11.500	-	-	-	-	-	
26-Oct-06	17:04:30	124.5	18.330	11.950	-	-	-	-	-	
26-Oct-06	17:05:00	125	18.830	12.450	-	24.980	20.8	1.576	0.127	
26-Oct-06	17:06:00	126	19.735	13.355	-	24.788	20.64	1.564	0.117	
26-Oct-06	17:07:00	127	20.355	13.975	-	24.199	20.15	1.527	0.109	
26-Oct-06	17:08:00	128	20.823	14.443	-	24.836	20.68	1.567	0.108	
26-Oct-06	17:09:00	129	21.145	14.765	-	24.451	20.36	1.543	0.104	
26-Oct-06	17:10:00	130	21.705	15.325	-	24.523	20.42	1.547	0.101	
26-Oct-06	17:12:00	132	22.370	15.990	-	25.052	20.86	1.581	0.099	
26-Oct-06	17:14:00	134	22.050	15.670	-	18.999	15.82	1.199	0.076	Cut back to 15 IGPM
26-Oct-06	17:16:00	136	20.995	14.615	-	18.771	15.63	1.184	0.081	
26-Oct-06	17:18:00	138	20.532	14.152	-	18.699	15.57	1.180	0.083	
26-Oct-06	17:20:00	140	20.252	13.872	-	18.807	15.66	1.187	0.086	
26-Oct-06	17:25:00	145	20.307	13.927	-	18.675	15.55	1.178	0.085	
26-Oct-06	17:30:00	150	20.400	14.020	-	18.603	15.49	1.174	0.084	
26-Oct-06	17:35:00	155	20.315	13.935	-	18.459	15.37	1.165	0.084	
26-Oct-06	17:40:00	160	18.602	12.222	-	19.119	15.92	1.206	0.099	No adjustment with pumping test
26-Oct-06	17:45:00	165	18.426	12.046	-	19.035	15.85	1.201	0.100	Grey Water
26-Oct-06	17:50:00	170	18.492	12.112	-	18.915	15.75	1.193	0.099	
26-Oct-06	17:55:00	175	18.465	12.085	-	18.939	15.77	1.195	0.099	
26-Oct-06	18:00:00	180	18.394	12.014	1926	18.567	15.46	1.171	0.098	
26-Oct-06	18:00:30	180.5	13.330	6.950	-	-	-	-	-	START RECOVERY
26-Oct-06	18:01:00	181	12.640	6.260	-	-	-	-	-	
26-Oct-06	18:01:30	181.5	12.094	5.714	-	-	-	-	-	
26-Oct-06	18:02:00	182	11.584	5.204	-	-	-	-	-	
26-Oct-06	18:02:30	182.5	11.132	4.752	-	-	-	-	-	
26-Oct-06	18:03:00	183	10.811	4.431	-	-	-	-	-	
26-Oct-06	18:03:30	183.5	10.504	4.124	-	-	-	-	-	
26-Oct-06	18:04:00	184	10.259	3.879	-	-	-	-	-	
26-Oct-06	18:04:30	184.5	10.053	3.673	-	-	-	-	-	
26-Oct-06	18:05:00	185	9.885	3.505	-	-	-	-	-	
26-Oct-06	18:06:00	186	9.620	3.240	-	-	-	-	-	
26-Oct-06	18:07:00	187	9.403	3.023	-	-	-	-	-	
26-Oct-06	18:08:00	188	9.241	2.861	-	-	-	-	-	
26-Oct-06	18:09:00	189	9.102	2.722	-	-	-	-	-	
26-Oct-06	18:10:00	190	8.990	2.610	-	-	-	-	-	
26-Oct-06	18:12:00	192	8.789	2.409	-	-	-	-	-	
26-Oct-06	18:14:00	194	8.629	2.249	-	-	-	-	-	
26-Oct-06	18:16:00	196	8.491	2.111	-	-	-	-	-	
26-Oct-06	18:18:00	198	8.370	1.990	-	-	-	-	-	
26-Oct-06	18:20:00	200	8.259	1.879	-	-	-	-	-	
26-Oct-06	18:25:00	205	8.028	1.648	-	-	-	-	-	
26-Oct-06	18:30:00	210	7.835	1.455	-	-	-	-	-	
26-Oct-06	18:35:00	215	7.674	1.294	-	-	-	-	-	
26-Oct-06	18:40:00	220	7.542	1.162	-	-	-	-	-	
26-Oct-06	18:45:00	225	7.420	1.040	-	-	-	-	-	
26-Oct-06	18:50:00	230	7.316	0.936	-	-	-	-	-	
26-Oct-06	18:55:00	235	7.222	0.842	-	-	-	-	-	
26-Oct-06	19:00:00	240	7.143	0.763	-	-	-	-	-	End Of Test

Notes:
1) Depth to Water below top of sounding tube. Steel casing stick-up approximately 0.90 m.
2) "-" indicates no data or not applicable
3) May be a flow tototalizaer, instantaneous flow meter or other method of flow rate monitoring

APPENDIX B2: CONSTANT RATE PUMPING TEST DATA

EBA PROJECT NUMBER:	1260028	PROJECT LOCATION:	Destruction Bay School
WELL NAME:	Kluane School Well 3171-B	PUMP INTAKE DEPTH (m):	23.0 m (75.5 ft)
STATIC WATER LEVEL (m):	6.38 m (24.2 ft)	SCREEN INTERVAL:	23.2 - 24.4 m (76 - 80 ft)
DATUM DESCRIPTION:	Top of Sounding Tube	SLOT SIZE (''):	0.030 in
DATUM STICK-UP(m):	1.12 m above ground level	SAFE AVAILABLE DRAWDOWN(m):	13.9 m (45.6 ft)
WELL DIAMETER:	152 mm (6 in)	SCREEN DIAMETER (mm):	127 mm (5 in)
TOTAL WELL DEPTH:	24.3 m (80 ft)	OBSERVER'S NAME:	Jennifer Kelly

DATE	TIME	ELAPSED TIME (min)	DEPTH TO WATER (m)	DRAWDOWN (m)	METER READING [3] (Total IG)	FLOW RATE (USGPM)	FLOW RATE (IGPM)	FLOW RATE (L/s)	SPECIFIC CAPACITY (L/s/m)	pH	EC	TEMP	COMMENTS
26-Oct-06	19:00:00	0	7.140	0.000	0		-	-	-	-	-	-	
26-Oct-06	19:00:30	0.5	10.910	3.770	-	18.14	15	1.14	0.30	-	-	-	
26-Oct-06	19:01:00	1	11.471	4.331	-	17.09	14.13	1.07	0.25	-	-	-	
26-Oct-06	19:01:30	1.5	11.945	4.805	-	18.87	15.6	1.18	0.25	-	-	-	
26-Oct-06	19:02:00	2	12.490	5.350	-	18.57	15.35	1.16	0.22	-	-	-	
26-Oct-06	19:02:30	2.5	12.915	5.775	-	18.75	15.5	1.17	0.20	-	-	-	
26-Oct-06	19:03:00	3	13.295	6.155	-	18.64	15.41	1.17	0.19	-	-	-	
26-Oct-06	19:03:30	3.5	13.610	6.470	-	18.49	15.29	1.16	0.18	-	-	-	
26-Oct-06	19:04:00	4	13.870	6.730	-	18.25	15.09	1.14	0.17	-	-	-	
26-Oct-06	19:04:30	4.5	14.115	6.975	-	18.93	15.65	1.19	0.17	-	-	-	
26-Oct-06	19:05:00	5	14.375	7.235	-	18.61	15.39	1.17	0.16	-	-	-	
26-Oct-06	19:06:00	6	14.785	7.645	-	18.46	15.26	1.16	0.15	7.42	686	5.0	
26-Oct-06	19:07:00	7	14.940	7.800	-	18.51	15.3	1.16	0.15	-	-	-	
26-Oct-06	19:08:00	8	15.110	7.970	-	18.43	15.24	1.15	0.14	-	-	-	
26-Oct-06	19:09:00	9	15.275	8.135	-	18.29	15.12	1.15	0.14	-	-	-	
26-Oct-06	19:10:00	10	15.440	8.300	-	18.92	15.64	1.19	0.14	-	-	-	
26-Oct-06	19:12:00	12	15.770	8.630	-	18.78	15.53	1.18	0.14	-	-	-	
26-Oct-06	19:14:00	14	15.770	8.630	-	18.42	15.23	1.15	0.13	-	-	-	
26-Oct-06	19:16:00	16	16.004	8.864	-	18.20	15.05	1.14	0.13	-	-	-	
26-Oct-06	19:18:00	18	16.318	9.178	-	18.71	15.47	1.17	0.13	-	-	-	
26-Oct-06	19:20:00	20	16.400	9.260	-	18.64	15.41	1.17	0.13	-	-	-	
26-Oct-06	19:25:00	25	16.630	9.490	-	18.36	15.18	1.15	0.12	7.5	709	5.0	
26-Oct-06	19:30:00	30	16.865	9.725	-	18.42	15.23	1.15	0.12	-	-	-	
26-Oct-06	19:35:00	35	17.047	9.907	-	18.20	15.05	1.14	0.12	-	-	-	
26-Oct-06	19:40:00	40	17.332	10.192	-	18.19	15.04	1.14	0.11	-	-	-	
26-Oct-06	19:45:00	45	17.514	10.374	-	18.59	15.37	1.16	0.11	7.09	684	5.0	
26-Oct-06	19:50:00	50	18.120	10.980	-	18.29	15.12	1.15	0.10	-	-	-	Sudden increase in
26-Oct-06	19:55:00	55	18.557	11.417	-	18.76	15.51	1.18	0.10	-	-	-	Drawdown.
26-Oct-06	20:00:00	60	18.825	11.685	-	18.67	15.44	1.17	0.10	-	-	-	
26-Oct-06	20:10:00	70	18.875	11.735	-	18.25	15.09	1.14	0.10	-	-	-	
26-Oct-06	20:20:00	80	18.925	11.785	-	19.34	15.99	1.21	0.10	-	-	-	
26-Oct-06	20:30:00	90	19.235	12.095	1380	18.41	15.22	1.15	0.10	-	-	-	
26-Oct-06	20:40:00	100	18.923	11.783	-	18.57	15.35	1.16	0.10	-	-	-	Recovery
26-Oct-06	20:50:00	110	18.767	11.627	1690	18.59	15.37	1.16	0.10	-	-	-	
26-Oct-06	21:00:00	120	18.493	11.353	-	18.61	15.39	1.17	0.10	-	-	-	
26-Oct-06	21:30:00	150	18.569	11.429	2300	18.42	15.23	1.15	0.10	7.35	693	5.5	
26-Oct-06	22:00:00	180	18.736	11.596	2750	18.31	15.14	1.15	0.10	-	-	-	
26-Oct-06	22:30:00	210	19.066	11.926	3220	18.53	15.32	1.16	0.10	7.33	718	5.3	
26-Oct-06	23:00:00	240	19.139	11.999	3680	18.54	15.33	1.16	0.10	7.31	705	5.8	
27-Oct-06	0:00:00	300	19.223	12.083	4600	18.52	15.31	1.16	0.10	7.28	706	5.7	
27-Oct-06	1:00:00	360	19.323	12.183	5516	18.43	15.24	1.15	0.09	7.38	696	5.7	
27-Oct-06	2:00:00	420	19.317	12.177	6431	18.41	15.22	1.15	0.09	7.09	691	5.7	
27-Oct-06	3:00:00	480	19.421	12.281	7348	18.44	15.25	1.16	0.09	7.18	691	4.6	
27-Oct-06	4:00:00	540	19.515	12.375	8261	18.49	15.29	1.16	0.09	7.18	702	4.6	
27-Oct-06	5:00:00	600	19.465	12.325	9214	18.40	15.21	1.15	0.09	7.04	706	4.5	
27-Oct-06	6:00:00	660	19.512	12.372	10080	18.42	15.23	1.15	0.09	7.03	690	4.5	
27-Oct-06	7:00:00	720	19.635	12.495	10999	19.23	15.9	1.20	0.10	6.65	701	4.9	
27-Oct-06	8:00:00	780	19.442	12.302	11909	18.02	14.9	1.13	0.09	6.61	699	4.9	Recovery open to 15.4 IGPM
27-Oct-06	9:00:00	840	19.854	12.714	12829	18.74	15.49	1.17	0.09	6.67	699	4.8	
27-Oct-06	10:00:00	900	19.828	12.688	13761	18.65	15.42	1.17	0.09	6.67	700	4.9	

APPENDIX B2: CONSTANT RATE PUMPING TEST DATA

EBA PROJECT NUMBER:	1260028	PROJECT LOCATION:	Destruction Bay School
WELL NAME:	Kluane School Well 3171-B	PUMP INTAKE DEPTH (m):	23.0 m (75.5 ft)
STATIC WATER LEVEL (m):	6.38 m (24.2 ft)	SCREEN INTERVAL:	23.2 - 24.4 m (76 - 80 ft)
DATUM DESCRIPTION:	Top of Sounding Tube	SLOT SIZE (''):	0.030 in
DATUM STICK-UP(m):	1.12 m above ground level	SAFE AVAILABLE DRAWDOWN(m):	13.9 m (45.6 ft)
WELL DIAMETER:	152 mm (6 in)	SCREEN DIAMETER (mm):	127 mm (5 in)
TOTAL WELL DEPTH:	24.3 m (80 ft)	OBSERVER'S NAME:	Jennifer Kelly

DATE	TIME	ELAPSED TIME (min)	DEPTH TO WATER (m)	DRAWDOWN (m)	METER READING [3] (Total IG)	FLOW RATE (USGPM)	FLOW RATE (IGPM)	FLOW RATE (L/s)	SPECIFIC CAPACITY (L/s/m)	pH	EC	TEMP	COMMENTS
27-Oct-06	11:00:00	960	19.930	12.790	14685	18.74	15.49	1.17	0.09	6.85	698	5.0	
27-Oct-06	12:00:00	1020	19.768	12.628	13608	18.64	15.41	1.17	0.09	6.95	702	4.6	
27-Oct-06	13:00:00	1080	19.946	12.806	16536	18.69	15.45	1.17	0.09	6.98	699	4.8	
27-Oct-06	14:00:00	1140	20.003	12.863	17463	18.72	15.48	1.17	0.09	6.97	698	4.9	
27-Oct-06	15:00:00	1200	20.021	12.881	18389	18.71	15.47	1.17	0.09	6.82	695	5.3	
27-Oct-06	16:00:00	1260	20.082	12.942	19216	18.71	15.47	1.17	0.09	6.79	694	5.0	
27-Oct-06	17:00:00	1320	20.100	12.960	20237	18.47	15.27	1.16	0.09	7.19	672	6.4	
27-Oct-06	18:00:00	1380	20.085	12.945	21157	18.65	15.42	1.17	0.09	6.96	691	5.7	
27-Oct-06	19:00:00	1440	19.833	12.693	22080	18.22	15.06	1.14	0.09	6.72	688	4.9	
27-Oct-06	19:00:30	1440.5	17.911	10.771	-		-	-	-	-	-	-	Start Recovery
27-Oct-06	19:01:00	1441	16.375	9.235	-		-	-	-	-	-	-	
27-Oct-06	19:01:30	1441.5	15.161	8.021	-		-	-	-	-	-	-	
27-Oct-06	19:02:00	1442	14.182	7.042	-		-	-	-	-	-	-	
27-Oct-06	19:02:30	1442.5	13.423	6.283	-		-	-	-	-	-	-	
27-Oct-06	19:03:00	1443	12.848	5.708	-		-	-	-	-	-	-	
27-Oct-06	19:03:30	1443.5	12.362	5.222	-		-	-	-	-	-	-	
27-Oct-06	19:04:00	1444	12.073	4.933	-		-	-	-	-	-	-	
27-Oct-06	19:04:30	1444.5	11.782	4.642	-		-	-	-	-	-	-	
27-Oct-06	19:05:00	1445	11.570	4.430	-		-	-	-	-	-	-	
27-Oct-06	19:06:00	1446	11.171	4.031	-		-	-	-	-	-	-	
27-Oct-06	19:07:00	1447	10.910	3.770	-		-	-	-	-	-	-	
27-Oct-06	19:08:00	1448	10.721	3.581	-		-	-	-	-	-	-	
27-Oct-06	19:09:00	1449	10.579	3.439	-		-	-	-	-	-	-	
27-Oct-06	19:10:00	1450	10.456	3.316	-		-	-	-	-	-	-	
27-Oct-06	19:12:00	1452	10.241	3.101	-		-	-	-	-	-	-	
27-Oct-06	19:14:00	1454	10.074	2.934	-		-	-	-	-	-	-	
27-Oct-06	19:16:00	1456	9.923	2.783	-		-	-	-	-	-	-	
27-Oct-06	19:18:00	1458	9.764	2.624	-		-	-	-	-	-	-	
27-Oct-06	19:20:00	1460	9.679	2.539	-		-	-	-	-	-	-	
27-Oct-06	19:25:00	1465	9.404	2.264	-		-	-	-	-	-	-	
27-Oct-06	19:30:00	1470	9.182	2.042	-		-	-	-	-	-	-	
27-Oct-06	19:35:00	1475	8.999	1.859	-		-	-	-	-	-	-	
27-Oct-06	19:40:00	1480	8.828	1.688	-		-	-	-	-	-	-	
27-Oct-06	19:45:00	1485	8.675	1.535	-		-	-	-	-	-	-	
27-Oct-06	19:50:00	1490	8.539	1.399	-		-	-	-	-	-	-	
27-Oct-06	19:55:00	1495	8.417	1.277	-		-	-	-	-	-	-	
27-Oct-06	20:00:00	1500	8.303	1.163	-		-	-	-	-	-	-	
27-Oct-06	20:10:00	1510	8.104	0.964	-		-	-	-	-	-	-	
27-Oct-06	20:20:00	1520	7.940	0.800	-		-	-	-	-	-	-	
27-Oct-06	20:30:00	1530	7.801	0.661	-		-	-	-	-	-	-	
27-Oct-06	20:40:00	1540	7.679	0.539	-		-	-	-	-	-	-	
27-Oct-06	21:00:00	1560	7.571	0.431	-		-	-	-	-	-	-	
27-Oct-06	21:30:00	1590	7.477	0.337	-		-	-	-	-	-	-	
27-Oct-06	22:00:00	1620	7.245	0.105	-		-	-	-	-	-	-	
27-Oct-06	23:00:00	1680	7.084	-0.056	-		-	-	-	-	-	-	End of Test

Notes:
1) Depth to Water below top of sounding tube. Steel casing stick-up approximately 0.90 m.
2) "-" indicates no data or not applicable
3) May be a flow tototalizer, instantaneous flow meter or other method of flow rate monitoring

APPENDIX

APPENDIX D LABORATORY REPORTS AND CERTIFICATES

ANALYTICAL REPORT

EBA ENGINEERING CONSULTANTS LTD.

ATTN: KATHERINE JOHNSTON

Reported On: 01-DEC-06 08:37 AM

CALCITE BUSINESS CENTRE
UNIT 6 - 151 INDUSTRIAL ROAD
WHITEHORSE YT Y1A 2V3

Lab Work Order #: L450019 **Date Received:** 01-NOV-06

Project P.O. #:
Job Reference: PMA REPLACEMENT WELLS
Legal Site Desc:
CofC Numbers:

Other Information:

Comments:

Joyce Chow
General Manager, Vancouver

For any questions about this report please contact your Account Manager:

CAN DANG

	Sample ID	L450019-1				
	Description					
	Sampled Date	27-OCT-06				
	Sampled Time	18:30				
	Client ID	KLUANE LAKE SCHOOL				
Grouping	**Analyte**					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	367				
	Colour, True (CU)	<5.0				
	Conductivity (uS/cm)	726				
	pH (pH)	8.08				
	Total Dissolved Solids (mg/L)	493				
	Turbidity (NTU)	0.62				
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	255				
	Chloride (Cl) (mg/L)	0.83				
	Fluoride (F) (mg/L)	0.264				
	Sulfate (SO4) (mg/L)	168				
	Nitrate (as N) (mg/L)	<0.0050				
	Nitrite (as N) (mg/L)	<0.0010				
Total Metals	Aluminum (Al)-Total (mg/L)	<0.010				
	Antimony (Sb)-Total (mg/L)	<0.00050				
	Arsenic (As)-Total (mg/L)	0.00812				
	Barium (Ba)-Total (mg/L)	0.028				
	Boron (B)-Total (mg/L)	1.22				
	Cadmium (Cd)-Total (mg/L)	<0.00020				
	Calcium (Ca)-Total (mg/L)	44.6				
	Chromium (Cr)-Total (mg/L)	<0.0020				
	Copper (Cu)-Total (mg/L)	0.0037				
	Iron (Fe)-Total (mg/L)	0.088				
	Lead (Pb)-Total (mg/L)	<0.0010				
	Magnesium (Mg)-Total (mg/L)	62.0				
	Manganese (Mn)-Total (mg/L)	0.0226				
	Mercury (Hg)-Total (mg/L)	<0.00020				
	Potassium (K)-Total (mg/L)	5.51				
	Selenium (Se)-Total (mg/L)	<0.0010				
	Sodium (Na)-Total (mg/L)	28.5				
	Uranium (U)-Total (mg/L)	0.00138				
	Zinc (Zn)-Total (mg/L)	<0.050				
Organic Parameters	Total Organic Carbon (mg/L)	3.08				

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
ALK-COL-VA	Water	Alkalinity by Colourimetric (Automated)	APHA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

ANIONS-CL-IC-VA	Water	Chloride by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions are determined by filtering the sample through a 0.45 micron membrane filter and injecting the filtrate onto a Dionex IonPac AG18 anion exchange column with a hydroxide eluent stream. Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-F-IC-VA	Water	Fluoride by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions are determined by filtering the sample through a 0.45 micron membrane filter and injecting the filtrate onto a Dionex IonPac AG18 anion exchange column with a hydroxide eluent stream. Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-NO2-IC-VA	Water	Nitrite by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions are determined by filtering the sample through a 0.45 micron membrane filter and injecting the filtrate onto a Dionex IonPac AG18 anion exchange column with a hydroxide eluent stream. Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-NO3-IC-VA	Water	Nitrate by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions are determined by filtering the sample through a 0.45 micron membrane filter and injecting the filtrate onto a Dionex IonPac AG18 anion exchange column with a hydroxide eluent stream. Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions are determined by filtering the sample through a 0.45 micron membrane filter and injecting the filtrate onto a Dionex IonPac AG18 anion exchange column with a hydroxide eluent stream. Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310 "TOTAL ORGANIC CARBON (TOC)"

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". All fractions of carbon are determined by the combustion-infrared method. Total carbon includes organic carbon (covalently bonded in organic molecules) and inorganic carbon (carbonate, bicarbonate and dissolved carbon dioxide). Total organic carbon is the calculated difference between the total carbon and the inorganic carbon determination. Dissolved carbon fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	APHA 2120 "Color"

This analysis is carried out using procedures adapted from APHA Method 2120 "Color". Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. Aparent Colour is determined without prior sample filtration. Colour is pH dependent. Unless otherwise indicated, reported colour results pertain to the pH of the sample as received, to within +/- 1 pH unit.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.

HG-TOT-DW-CVAFS-VA	Water	Total Mercury in Water by CVAFS	EPA 245.7

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

Reference Information

MET-TOT-DW-ICP-VA Water Total Metals in Water by ICPAES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-TOT-DW-MS-VA Water Total Metals in Water by ICPMS EPA SW-846 3005A/6020

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020).

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TURB-MET-VA Water Turbidity by Meter APHA 2130 "Turbidity"

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** Laboratory Methods employed follow in-house procedures, which are generally based on nationally or internationally accepted methodologies.
The last two letters of the above ALS Test Code column indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location	Laboratory Definition Code	Laboratory Location
VA	ALS LABORATORY GROUP - VANCOUVER, BC, CANADA		

GLOSSARY OF REPORT TERMS
Surr - A surrogate is an organic compound that is similar to the target analyte(s) in chemical composition and behavior but not normally detected in enviromental samples. Prior to sample processing, samples are fortified with one or more surrogate compounds.
The reported surrogate recovery value provides a measure of method efficiency. The Laboratory control limits are determined under column heading D.L. (Detection Limit)
mg/kg (units) - unit of concentration based on mass, parts per million
mg/L (units) - unit of concentration based on volume, parts per million
N/A - Result not available. Refer to qualifier code and definition for explanation

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
UNLESS OTHERWISE STATED, SAMPLES ARE NOT CORRECTED FOR CLIENT FIELD BLANKS.
Although test results are generated under strict QA/QC protocols, any unsigned test reports, faxes, or emails are considered preliminary.

ALS Laboratory Group has an extensive QA/QC program where all analytical data reported is analyzed using approved referenced procedures followed by checks and reviews by senior managers and quality assurance personnel. However, since the results are obtained from chemical measurements and thus cannot be guaranteed, ALS Laboratory Group assumes no liability for the use or interpretation of the results.

31313

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#2 - 21 Highfield Circle SE, **Calgary**, AB Canada T2G 5N6 Tel: 403-214-5431 Toll Free: 1-866-722-6231 Fax: 403-214-5430
#2 - 8820 100th Street, **Fort St. John**, BC Canada V1J 3W9 Tel: 250-785-8281 Fax: 250-785-8286

CHAIN OF CUSTODY FORM L450019

PAGE _____ OF _____

SEND REPORT TO:

CLIENT: EBA ENGINEERING CONSULTANTS LTD
ADDRESS: 6-151 INDUSTRIAL ROAD
CITY: WHITEHORSE PROV.: YT POSTAL CODE: Y1A 2V3
TELEPHONE: 8676682071 FAX: 8676684349 CONTACT: K Johnston
PROJECT NAME & NO.: PMA Replacment Wells SAMPLER: K Johnston
QUOTE NO.: _____ PO NO.: 1260028 ALS CONTACT: C. Dang
REPORT FORMAT: ☐ HARDCOPY ☒ EMAIL - ADDRESS: ksjohnstone eba.ca
☐ FAX ☐ EXCEL ☐ PDF ☐ OTHER: _____

ANALYSIS REQUESTED:

FOR LAB USE ONLY	SAMPLE IDENTIFICATION	DATE / TIME COLLECTED YYYY-MM-DD	TIME	MATRIX	FULL DW PACKAGE	TOC											NOTES (sample specific comments, due dates, etc.)
	Kluane Lake School	2006-10-27	6:30 pm	H2O	X	X											

TURN AROUND REQUIRED: ☐ ROUTINE ☐ RUSH - SPECIFY DATE: _____ (surcharge may apply)

SEND INVOICE TO: ☐ SAME AS REPORT **INVOICE FORMAT:** ☐ HARDCOPY ☐ PDF ☐ FAX
☐ DIFFERENT FROM REPORT (provide details below)

SPECIAL INSTRUCTIONS:

RELINQUISHED BY:	DATE / TIME	RECEIVED BY:	DATE / TIME
		NR3	Nov 1 2222
RELINQUISHED BY:	DATE / TIME	RECEIVED BY:	DATE / TIME

FOR LAB USE ONLY

COOLER SEAL INTACT?	SAMPLE TEMPERATURE:	COOLING METHOD?
☑ YES ☐ NO ☐ N/A	3 °C FROZEN? ☐ YES ☑ NO	☑ ICEPACKS ☐ ICE ☐ NONE

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SEE WHITEPAPER FOR SOURCE VERSIONR_07

ANALYTICAL REPORT

EBA ENGINEERING CONSULTANTS LTD.

ATTN: KATHERINE JOHNSTON

Reported On: 08-NOV-06 06:55 PM

CALCITE BUSINESS CENTRE
UNIT 6 - 151 INDUSTRIAL ROAD
WHITEHORSE YT Y1A 2V3

Lab Work Order #: L448094 **Date Received:** 26-OCT-06

Project P.O. #:
Job Reference: PMA REPLACEMENT 1260028
Legal Site Desc:
CofC Numbers: 36760

Other Information:

Comments:

Joyce Chow
General Manager, Vancouver

For any questions about this report please contact your Account Manager:

CAN DANG

ALS LABORATORY GROUP ANALYTICAL REPORT

		Sample ID	L448094-1	L448094-2	L448094-3		
		Description					
		Sampled Date	20-OCT-06	22-OCT-06	23-SEP-06		
		Sampled Time	14:30	10:30			
		Client ID	BC AIRPORT	BC SCHOOL	DBAY CREEK		
Grouping	**Analyte**						
WATER							
Physical Tests	Hardness (as CaCO3) (mg/L)		142	163			
	Colour, True (CU)		<5.0	<5.0	8.6		
	Conductivity (uS/cm)		295	333	942		
	pH (pH)		8.05	7.81	8.20		
	Total Dissolved Solids (mg/L)		194	210	692		
	Turbidity (NTU)		1.08	0.43	1.61		
	UV Absorbance (254 nm) (Abs/cm-1)		0.0032	0.0065	0.0799		
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)		129	163	319		
	Chloride (Cl) (mg/L)		0.85	1.68	<0.50		
	Fluoride (F) (mg/L)		0.057	0.082	0.115		
	Sulfate (SO4) (mg/L)		34.2	26.5	251		
	Nitrate (as N) (mg/L)		0.257	0.617	<0.0050		
	Nitrite (as N) (mg/L)		<0.0010	<0.0010	<0.0010		
Total Metals	Aluminum (Al)-Total (mg/L)		<0.010	<0.010			
	Antimony (Sb)-Total (mg/L)		<0.00050	<0.00050			
	Arsenic (As)-Total (mg/L)		0.00073	0.00020			
	Barium (Ba)-Total (mg/L)		<0.020	<0.020			
	Boron (B)-Total (mg/L)		<0.10	<0.10			
	Cadmium (Cd)-Total (mg/L)		<0.00020	<0.00020			
	Calcium (Ca)-Total (mg/L)		46.0	52.2			
	Chromium (Cr)-Total (mg/L)		<0.0020	<0.0020			
	Copper (Cu)-Total (mg/L)		<0.0010	<0.0010			
	Iron (Fe)-Total (mg/L)		<0.030	<0.030			
	Lead (Pb)-Total (mg/L)		<0.0010	<0.0010			
	Magnesium (Mg)-Total (mg/L)		6.54	8.01			
	Manganese (Mn)-Total (mg/L)		<0.0020	<0.0020			
	Mercury (Hg)-Total (mg/L)		<0.00020	<0.00020			
	Potassium (K)-Total (mg/L)		1.12	1.43			
	Selenium (Se)-Total (mg/L)		<0.0010	<0.0010			
	Sodium (Na)-Total (mg/L)		3.9	3.4			
	Uranium (U)-Total (mg/L)		0.00031	0.00040			
	Zinc (Zn)-Total (mg/L)		<0.050	<0.050			
Organic Parameters	Total Organic Carbon (mg/L)		<0.50	0.58			

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
ALK-COL-VA	Water	Alkalinity by Colourimetric (Automated)	APHA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

ANIONS-CL-IC-VA	Water	Chloride by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions are determined by filtering the sample through a 0.45 micron membrane filter and injecting the filtrate onto a Dionex IonPac AG18 anion exchange column with a hydroxide eluent stream. Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-F-IC-VA	Water	Fluoride by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions are determined by filtering the sample through a 0.45 micron membrane filter and injecting the filtrate onto a Dionex IonPac AG18 anion exchange column with a hydroxide eluent stream. Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-NO2-IC-VA	Water	Nitrite by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions are determined by filtering the sample through a 0.45 micron membrane filter and injecting the filtrate onto a Dionex IonPac AG18 anion exchange column with a hydroxide eluent stream. Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-NO3-IC-VA	Water	Nitrate by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions are determined by filtering the sample through a 0.45 micron membrane filter and injecting the filtrate onto a Dionex IonPac AG18 anion exchange column with a hydroxide eluent stream. Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions are determined by filtering the sample through a 0.45 micron membrane filter and injecting the filtrate onto a Dionex IonPac AG18 anion exchange column with a hydroxide eluent stream. Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310 "TOTAL ORGANIC CARBON (TOC)"

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". All fractions of carbon are determined by the combustion-infrared method. Total carbon includes organic carbon (covalently bonded in organic molecules) and inorganic carbon (carbonate, bicarbonate and dissolved carbon dioxide). Total organic carbon is the calculated difference between the total carbon and the inorganic carbon determination. Dissolved carbon fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	APHA 2120 "Color"

This analysis is carried out using procedures adapted from APHA Method 2120 "Color". Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. Aparent Colour is determined without prior sample filtration. Colour is pH dependent. Unless otherwise indicated, reported colour results pertain to the pH of the sample as received, to within +/- 1 pH unit.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

HARDNESS-CALC-VA	Water	Hardness	CALCULATION

HG-TOT-DW-CVAFS-VA	Water	Total Mercury in Water by CVAFS	EPA 245.7

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

Reference Information

MET-TOT-DW-ICP-VA Water Total Metals in Water by ICPAES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-TOT-DW-MS-VA Water Total Metals in Water by ICPMS EPA SW-846 3005A/6020

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020).

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TURB-MET-VA Water Turbidity by Meter APHA 2130 "Turbidity"

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

UV-ABS-VA Water UV Absorbance by Spectrometry APHA 5910B "UV Absorption Method" and EP

This analysis is carried out using procedures adapted from APHA Method 5910B "Ultraviolet Absorption Method" and Method 415.3 "Determination of Total Organic Carbon and Specific UV Absorbance at 254nm in Source Water and Drinking Water", published by the United States Environmental Protection Agency (EPA). The sample is filtered through a 0.45um filter and measured for absorbance in a quartz cell at 254nm and reported as absorbance per cm (i.e. cm-1). The analysis is carried out without pH adjustment. Alternatively, results can be reported as % Transmittance (over one cm) where the absorbance result is converted to % Transmittance by the following calculation: %T = 100(10 to the power of -A).

** Laboratory Methods employed follow in-house procedures, which are generally based on nationally or internationally accepted methodologies.

Chain of Custody numbers:

36760

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location	Laboratory Definition Code	Laboratory Location
VA	ALS LABORATORY GROUP - VANCOUVER, BC, CANADA		

Reference Information

GLOSSARY OF REPORT TERMS
Surr - A surrogate is an organic compound that is similar to the target analyte(s) in chemical composition and behavior but not normally detected in enviromental samples. Prior to sample processing, samples are fortified with one or more surrogate compounds.
The reported surrogate recovery value provides a measure of method efficiency. The Laboratory control limits are determined under column heading D.L.
mg/kg (units) - unit of concentration based on mass, parts per million
mg/L (units) - unit of concentration based on volume, parts per million
< - Less than
D.L. - Detection Limit
N/A - Result not available. Refer to qualifier code and definition for explanation

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
UNLESS OTHERWISE STATED, SAMPLES ARE NOT CORRECTED FOR CLIENT FIELD BLANKS.
Although test results are generated under strict QA/QC protocols, any unsigned test reports, faxes, or emails are considered preliminary.

ALS Laboratory Group has an extensive QA/QC program where all analytical data reported is analyzed using approved referenced procedures followed by checks and reviews by senior managers and quality assurance personnel. However, since the results are obtained from chemical measurements and thus cannot be guaranteed, ALS Laboratory Group assumes no liability for the use or interpretation of the results.

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#2 - 8820 100th Street, **Fort St. John**, BC Canada V1J 3W9 Tel: 250-785-8281 Fax: 250-785-8286

CHAIN OF CUSTODY FORM

PAGE 1 OF 1

SEND REPORT TO:

CLIENT: EBA Engineering Consultants Ltd
ADDRESS: 6-151 Industrial Road
CITY: Whitehorse PROV.: YT POSTAL CODE: Y1A 2V3
TELEPHONE: 8676683068 FAX: 8676684349 CONTACT: K Johnston
PROJECT NAME & NO.: PMA Replacement 1260028 SAMPLER: K Johnston
QUOTE NO.: PO NO.: ALS CONTACT: C. Dang
REPORT FORMAT: ☐ HARDCOPY ☒ EMAIL - ADDRESS: ksjohnston
☐ FAX ☐ EXCEL ☐ PDF ☐ OTHER:

ANALYSIS REQUESTED:

L448094	SAMPLE IDENTIFICATION	DATE / TIME COLLECTED YYYY-MM-DD	TIME	MATRIX	Full DW Package	UV Absorbance	TOC	Physical Tests (from DW Package)		Dissolved Anions (from DW Package)									NOTES (sample specific comments, due dates, etc.)
	BC AIRPORT	2006-10-20	1430	GW	X	X	X												
	BC SCHOOL	2006-10-22	1030	GW	X	X	X												
	DBAM CREEK	2006-07-23	—	GW				X		X									

FOR LAB USE ONLY

TURN AROUND REQUIRED: ☐ ROUTINE ☐ RUSH - SPECIFY DATE: _____ (surcharge may apply)

SEND INVOICE TO: ☐ SAME AS REPORT **INVOICE FORMAT:** ☐ HARDCOPY ☐ PDF ☐ FAX
☐ DIFFERENT FROM REPORT (provide details below)

SPECIAL INSTRUCTIONS:

RELINQUISHED BY:	DATE	RECEIVED BY:	DATE Oct 26
	TIME		TIME 1:18
RELINQUISHED BY:	DATE	RECEIVED BY:	DATE
	TIME		TIME

FOR LAB USE ONLY

COOLER SEAL INTACT?	SAMPLE TEMPERATURE: 6 °C	COOLING METHOD?
☒ YES ☐ NO ☐ N/A	FROZEN? ☐ YES ☒ NO	☒ ICEPACKS ☐ ICE ☐ NONE

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