

GOVERNMENT OF YUKON- PROPERTY MANAGEMENT AGENCY

WELL COMPLETION REPORT
BEAVER CREEK AIRPORT TERMINAL BUILDING
BUILDING # 3125
BEAVER CREEK
YUKON

EBA FILE: 1260028

February 2007





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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 the Beaver Creek Airport Terminal Building (ATB). The site location is shown in Figure 1. The Beaver Creek ATB (Building # 3125) water system is currently supplied by a well of unknown depth (Well 3125-A) located in a pit below grade approximately 2 m east of the terminal building. 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 3125-A once the new well, Well 3215-B, is commissioned.

1.1 SCOPE OF WORK

The following tasks were completed as part of 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 3125-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 3125-B commenced on October 15, 2006 and was completed on October 16, 2006. Testing took place between October 19 and 20, 2006.

Well 3125-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 3125-B in Figure 3 and Double D's Drilling Log in Appendix A.

Near surface soils consisted of a sandy silt unit to a depth of 1.5 meters below ground (m-bg). Underlying this unit was a gravel layer to a depth of 4.5 m-bg. A water-bearing sand and gravel aquifer was encountered below the gravel unit to the maximum extent of the borehole, at 28.9 m-bg. A screen was designed based on the grain size analysis of the material from this zone and installed between 27.7 and 28.9 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 3125-B INFORMATION AND CONSTRUCTION DETAILS

REQUIRED DETAILS	DETAILS OR REPORT REFERENCE
Date of construction:	From October 15 th to 16 th , 2006.
Name and address of the owner of the well:	Government of Yukon- Department of Highways and Public Works - Aviation and Marine Branch Box 2129, Whitehorse, Yukon, Y0B 1L0
Description of the property:	Beaver Creek Airport Terminal Building, km 1933 Alaska Highway, Beaver Creek, Yukon
UTM Co-ordinates(± 8 m):	UTM Zone 7 E 567075 N 6919606
Location of the well on the property:	See Figure 2.
Method of construction:	Dual air rotary drilling method.
Description, depth and thickness of geologic materials encountered during construction:	See Figure 3 Well log 3125-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 3125-B in Figure 3 and drillers log in Appendix A. Total depth of well completion is 28.9 m-bg.
Type of casing materials and thickness:	Steel Casing – 0.25 inches (6.35 mm) thick.
Static water level:	9.8 m-bg (October 20, 2006)
Type, size, length and location of screen:	Stainless steel V-wire 40 slot (0.040”) Johnson screen. Total screen length is 1.2 m., set between 27.7 and 28.9 m-bg.
Location of major water-bearing zones:	Water bearing sand and gravel zone from 4.5 to 28.9 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 19 and 20, 2006 by Double D Drilling. A temporary submersible pump was installed in the well at a depth of 27.7 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 19, 2006 at 12:00 PM. Three 60 min steps were completed at rates of 1.5, 3.0 and 6.0 L/s (20, 40 and

80 IGPM, respectively). Due to the minimal drawdown observed, the final step of 6.0 L/s (80 IGPM) was extended for 24 hours as the constant rate test. A plot of drawdown versus elapsed time is included as the upper portion of Figure 2.

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 3:00 PM on October 20, 2006, and recovery was monitored for 2.5 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. 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 3 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 3125-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 1.5 to 6.0 L/s (20 to 80 IGPM), the specific capacity increased from 153.9 to 203.1 L/s/m, indicating that the efficiency of the well increased during the step test. As expected, drawdown vs. flow rate behaved in a relatively linear fashion.

Constant Rate Test

Drawdown observed in Well 3125-B during the constant rate pumping test is plotted on 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 0.03 m. Evidence of recharge is indicated by a stabilized horizontal line on the drawdown vs. log time plot in the constant rate pumping test.

Recovery occurred very rapidly and the log plot of t/t' vs. residual drawdown intercepts zero at residual drawdown when $\log t/t'$ is much greater than 1. This may indicate aquifer recharge; however, the total drawdown was very small which makes the recovery data difficult to interpret. The projected 100 day drawdown is approximately 0.03 m; which is significantly less than the available drawdown of 17.9 m.

The Cooper-Jacob analysis, a tool to determine hydraulic conductivity and transmissivity, could not be applied to the constant rate pumping test data since a slope can not be calculated from a horizontal (flat) line. The small amount of drawdown and flat line observed in the well even when pumping at relatively high rates (>80 IGPM) confirms that the transmissivity and hydraulic conductivity of the aquifer is very high. A hydraulic conductivity value was calculated based on grain size analyses of the sand and gravel aquifer unit. The Hazen formula was used to determine the hydraulic conductivity from the grain size analysis and is presented below for reference:

$$K \text{ (m/s)} = d_{10}^2$$

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.

The aquifer conductivity interpreted from the grain size analyses for the sample collected at 28.9 m-bg was 6×10^{-2} m/s. The value is generally consistent with the observed data indicating a highly productive aquifer system.

A longer term pumping test with a screen that can supply at a much higher rate would be necessary to sufficiently stress the aquifer for the analysis of more accurate hydraulic properties. However, given the anticipated demand for each well (10 IGPM), testing at much higher rates is not warranted at this time. Hence, the pumping test results are considered sufficient for the purpose of estimating the safe sustainable yield.

¹ $t/t' = (\text{time since pump started}) / (\text{time since pump stopped})$

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 3125-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 by applying a safety factor of 70% of the physical available drawdown after an allowance has been made for seasonal fluctuations in static water level. For a well completed in an unconfined aquifer (such as Well 3125-B), the water level should never be drawn below the top of the screen. The safe yield of a well can be limited by what the well screen is capable of delivering based on the maximum recommended screen entrance velocity. Table 2 below provides the details of the safe yield calculations for Well 3125-B.

TABLE 2: SAFE YIELD CALCULATIONS				
WELL PARAMTER	VALUE	UNIT	KEY	
Constant Rate Pumping Test Discharge Rate	6	L/s	a	
Projected 100-Day Drawdown	0.03	m	b	
100-Day Specific Capacity	193.5	L/s/m	c	
Lowest Expected Seasonal Water Table (1.0 m fluctuation) (m-bg)	10.8	m	d	
Depth to top of Screen Interval	27.7	m	e	
Available Drawdown	16.9	m	f = e-d	
Safety Factor	70	%	g	
Safe Available Drawdown	11.8	m	h = f x g	
Safe Yield Based on Constant Rate Pumping Test				
Safe Estimated Sustainable Yield	2289.7	L/s	c x h	
Safe Estimated Sustainable Yield	30220	IGPM		
Check for Maximum Screen Entrance Velocity				
Recommended Maximum Screen Entrance Velocity	0.03	m/s	k	
Intake Area (m ² / m of 0.040" Well Screen)	0.15	m ² /m	l	
Maximum Yield per m screen	4.6	L/s	k x l	
Maximum Yield for Screen Interval (1.2 m)	5.5	L/s		
Maximum Well Yield	72	IGPM	m	
Check: Greater than Safe Estimated Sustainable Yield?	NO – Limits Well Capacity			

The capacity of Well 3125-B is limited by the well screen entrance velocity of 5.5 L/s (72 IGPM). Therefore, the estimated long term well capacity is 5.5 L/s.

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 supply sources that are hydraulically connected to nearby surface 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 draft 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.

The screen interval for Well 3125-B is completed within an unconfined aquifer production zone and therefore, based on the Yukon GUDI Screening (Phase 1), it meets one of the four criteria for being potentially GUDI, thus requiring a Phase 2 assessment as presented below:

The regional groundwater flow regime is interpreted to consist of groundwater recharge occurring in the upland areas to the west of Beaver Creek Airport, and discharge occurring to the Beaver Creek drainage. Regional aquifer parameters have been established previously by EBA in a study completed for the White River First Nation community (EBA, 2007). A travel time assessment has been completed on the following page:

$$v = (K \times i) / n$$

where: v = Groundwater Flow Velocity based on Darcy's Equation

K = Hydraulic conductivity of aquifer (6×10^{-2} m/s)

i = Hydraulic gradient (0.0008 m/m)

n = Porosity of aquifer (typically about 0.3)

Based on the groundwater velocity, calculated to be 14.5 m/day, and the nearest upgradient surface water body, approximately 3000 m from the well, a conservative estimate of the travel time between the surface water body and the well would be in the order of 200 days. The general rule of thumb is that travel times greater than 90 days would provide sufficient

removal of potential surface water organisms. Therefore, Well 3125-B can be considered NON-GUDI.

4.0 RESULTS OF LABORATORY ANALYSIS

Groundwater analytical results from Well 3125-A and Well 3125-B are presented in Table 3, attached. Laboratory results and certificates can be found in Appendix D. Key observations regarding the groundwater analysis conducted on Well 3125-B are:

- Turbidity was detected slightly above Guidelines for Canadian Drinking Water Quality (GCDWQ), 1.08 NTU, however this concentration is within analytical error and is considered to meet the GCDWQ health based criteria;
- All other parameters tested for met current GCDWQ for health based and aesthetic parameters on the date sampled;
- Water from Well 3125-B is a hard calcium-bicarbonate type with a pH of approximately 8; 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 the well.

5.0 WELL COMMISSIONING, OPERATION AND MAINTENANCE

It is EBA's understanding that YTG-PMA will be coordinating the commissioning of Well 3125-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 3125-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 approximately 1.5 m above the top of screen (approx. 26 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 12 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 3125-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 well (Well 3125-B) was drilled at the Beaver Creek Airport Terminal Building (# 3125). The well was drilled to a depth of 28.9 m-bg, and a screen was set from 27.7 to 28.9 m-bg within an unconfined sand and gravel aquifer;
- The new well was constructed in accordance with the 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 potential sources of contamination;
- The small amount of drawdown and horizontal trend line observed in the well when pumping at relatively high rates (>80 IGPM) confirms that the transmissivity of the aquifer is very high;
- Grain size analysis of the aquifer bearing unit indicates a hydraulic conductivity of approximately 6×10^{-3} m/s;
- Well 3125-B is limited by the well screen entrance velocity and can be rated at 5.5 L/s (72 IGPM). This will be more than sufficient to meet the current demands of the airport facility;
- Based on the YTG draft GUDI assessment guidelines, the well is not considered to be under the direct influence of surface water and can be considered as a groundwater source (NON-GUDI);
- Water from Well 3125-B met all GCDWQ health based and aesthetic objectives for the parameters analyzed;

- 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 3125-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.

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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.



TABLES

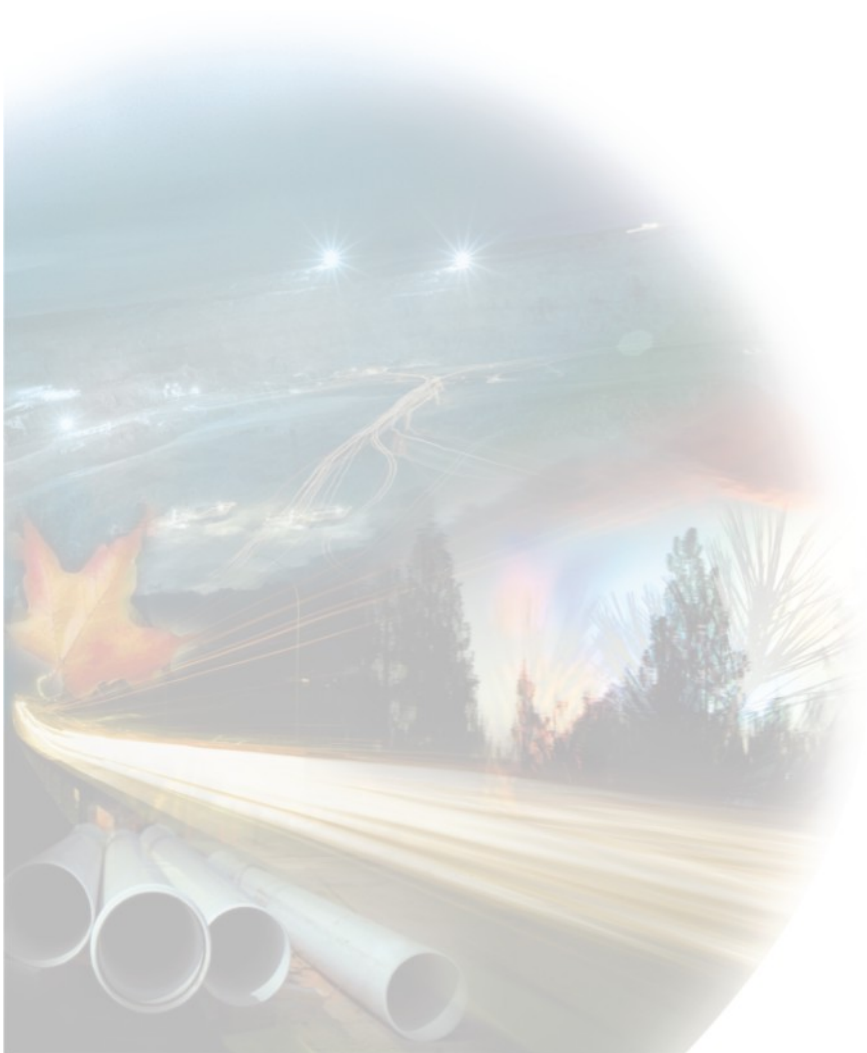


TABLE 3
Laboratory Analytic Results for Wells 3125-A and 3125-B
Beaver Creek Airport Terminal Building

	Well	Beaver Creek Airport Terminal Building (Well 3125-A)			Beaver Creek Airport Terminal Building (Well 3125-B)	Canadian Drinking Water Quality Guidelines ¹	
	ALS Report				L448094-1		
	Date	21-Sep-04	15-Jun-05	27-Jul-05	20-Oct-06		
	Sampled by:				EBA	MAC ²	AO ³
Physical Tests							
Colour	CU	7	<5.0	-	<5.0	-	15
Conductivity (Field)	uS/cm	-	-	251	-	-	-
Conductivity (Lab)	uS/cm	-	290	-	295	-	-
Total Dissolved Solids (Field)	mg/L	-	-	127	-	-	-
Total Dissolved Solids (Lab)	mg/L	156	171	-	194	-	500
Hardness (CaCO ₃)	mg/L	137	126	-	142	-	-
pH (field)	pH units	-	-	8.31	-	-	-
pH (lab)	pH units	8.29	8.16	-	8.05	-	6.5-8.5
Turbidity	NTU	4.1	3.29	11.7	1.08	1	5
UV Absorbance (254 nm)	Abs/cm-1	-	-	98.6	0.0032	-	-
Temperature (Field)	°C	-	-	17.5	-	-	-
Dissolved Anions							
Alkalinity-Total CaCO ₃	mg/L	120	118	-	129	-	-
Chloride	mg/L	<0.5	0.62	-	0.85	-	250
Fluoride	mg/L	<0.05	0.059	-	0.057	1.5	-
Sulphate	mg/L	-	-	-	34.2	-	500
Nutrients							
Ammonia Nitrogen N	mg/L	-	-	-	-	-	-
Nitrate Nitrogen N	mg/L	0.2	0.22	-	0.257	10	-
Nitrite Nitrogen N	mg/L	<0.05	<0.1	-	<0.0010	3.2	-
Total Phosphate	mg/L	-	-	-	-	-	-
Total Organic Carbon (TOC)	mg/L	-	-	0.9	<0.5	-	-
Total Metals							
Aluminum	mg/L	<0.005	<0.01	-	<0.01	-	-
Antimony	mg/L	<0.0002	<0.0005	-	<0.0005	0.006	-
Arsenic	mg/L	0.0006	0.00041	-	0.0007	0.01	-
Barium	mg/L	0.011	<0.02	-	<0.02	1	-
Boron	mg/L	0.026	<0.1	-	<0.1	5	-
Cadmium	mg/L	<0.00001	<0.0002	-	<0.0002	0.005	-
Calcium	mg/L	-	39.3	-	46	-	-
Chromium	mg/L	0.0005	<0.002	-	<0.002	0.05	-
Copper	mg/L	0.059	0.102	-	<0.001	-	1
Iron	mg/L	0.27	0.209	-	<0.03	-	0.3
Lead	mg/L	0.0014	0.001	-	<0.001	0.01	-
Magnesium	mg/L	-	6.67	-	6.54	-	-
Manganese	mg/L	0.014	0.009	-	<0.002	-	0.05
Mercury	mg/L	-	<0.0002	-	<0.0002	0.001	-
Potassium	mg/L	-	1.08	-	1.12	-	-
Selenium	mg/L	-	<0.001	-	<0.001	0.01	-
Sodium	mg/L	3	2.5	-	3.9	-	200
Uranium	mg/L	<0.0005	0.0003	-	0.00031	0.02	-
Zinc	mg/L	1.47	1.02	-	<0.05	-	5
Extractable Hydrocarbons							
EPH ₁₀₋₁₉	mg/L	-	-	<0.3	-	-	-
EPH ₁₉₋₃₂	mg/L	-	-	<1.0	-	-	-
LEPH	mg/L	-	-	-	-	-	-
HEPH	mg/L	-	-	-	-	-	-

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.

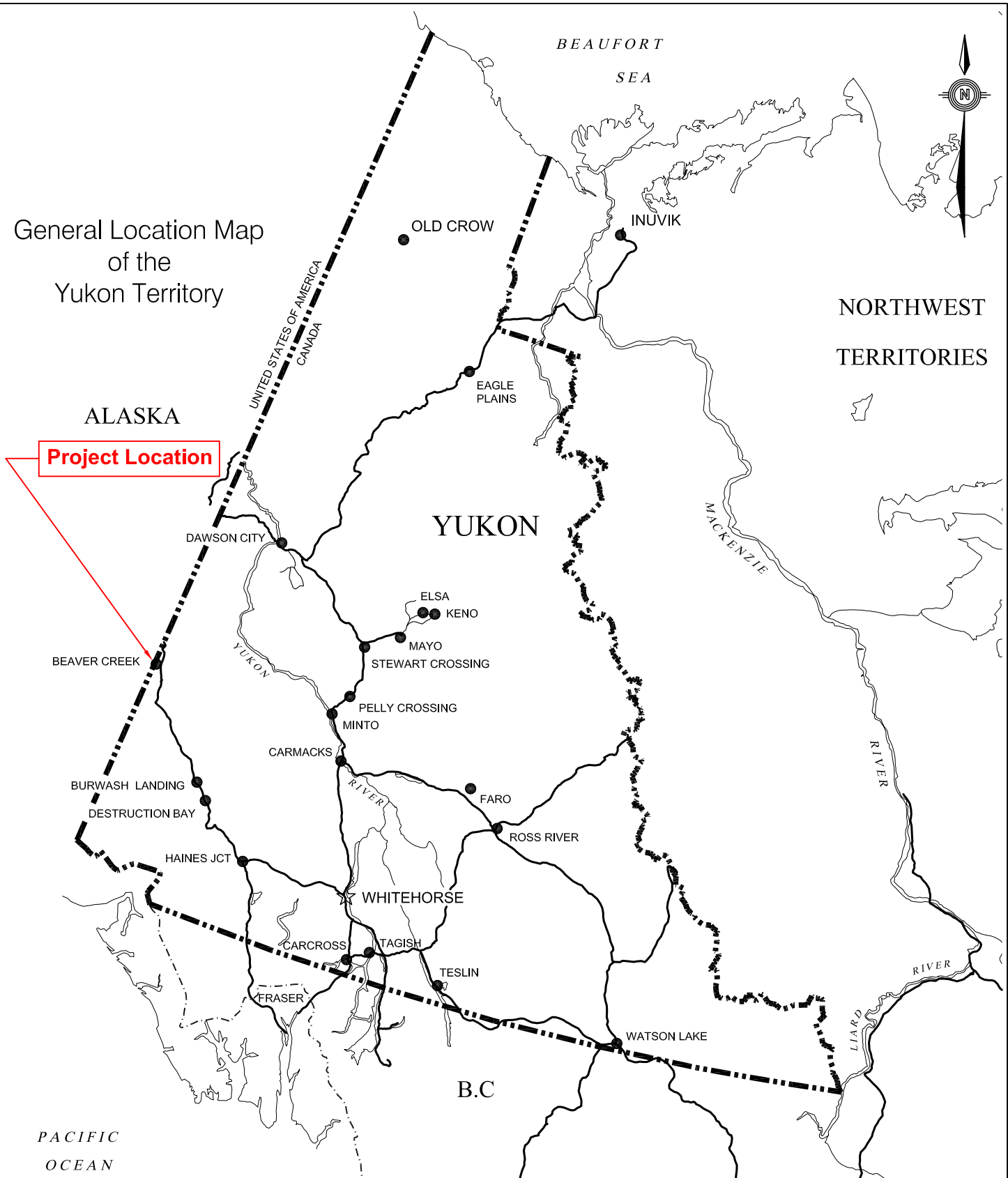




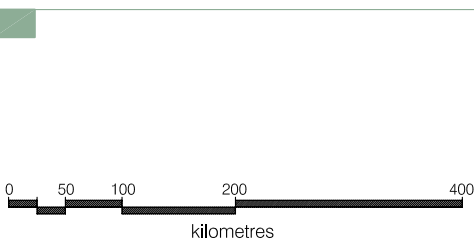
FIGURES



General Location Map of the Yukon Territory



C:\Whitehorse\Data\0201\Drawings\Beaver Creek\1260028 ATB\Figure 1_Key Plan.dwg [KEY PLAN] February 15, 2007 - 3:23pm jbuyc



CLIENT

Yukon
Property Management Agency

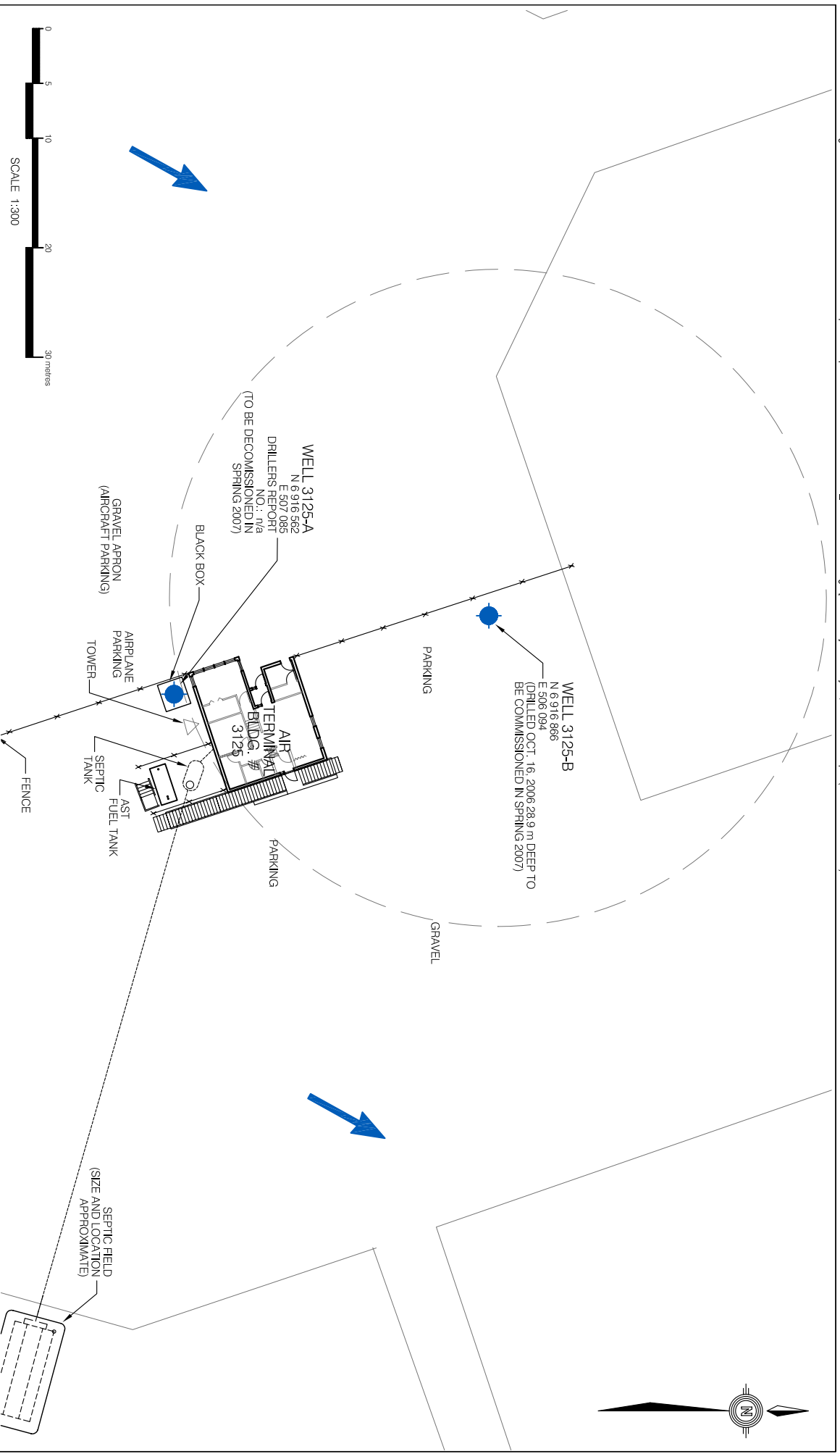
**WELL COMPLETION REPORT
AIR TERMINAL BUILDING - BEAVER CREEK, YT.**

SITE LOCATION MAP

EBA Engineering Consultants Ltd.

PROJECT NO. 1260028	DWN JSB	CKD TAK/RMM	REV 0
OFFICE EBA-WHSE	DATE January 30, 2007		

Figure 1



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.



EBA Engineering Consultants Ltd.

WELL COMPLETION REPORT
AIR TERMINAL BUILDING - BEAVER CREEK, YT.
SITE PLAN WITH WELL LOCATIONS
BUILDING # 3125
WELL ID: 3125-B

PROJECT NO.	DWN	CKD	REV
1260028	JSB	TAK/RMM	0
OFFICE	DATE		
EBA-WHSE	January 9, 2007		

Figure 2

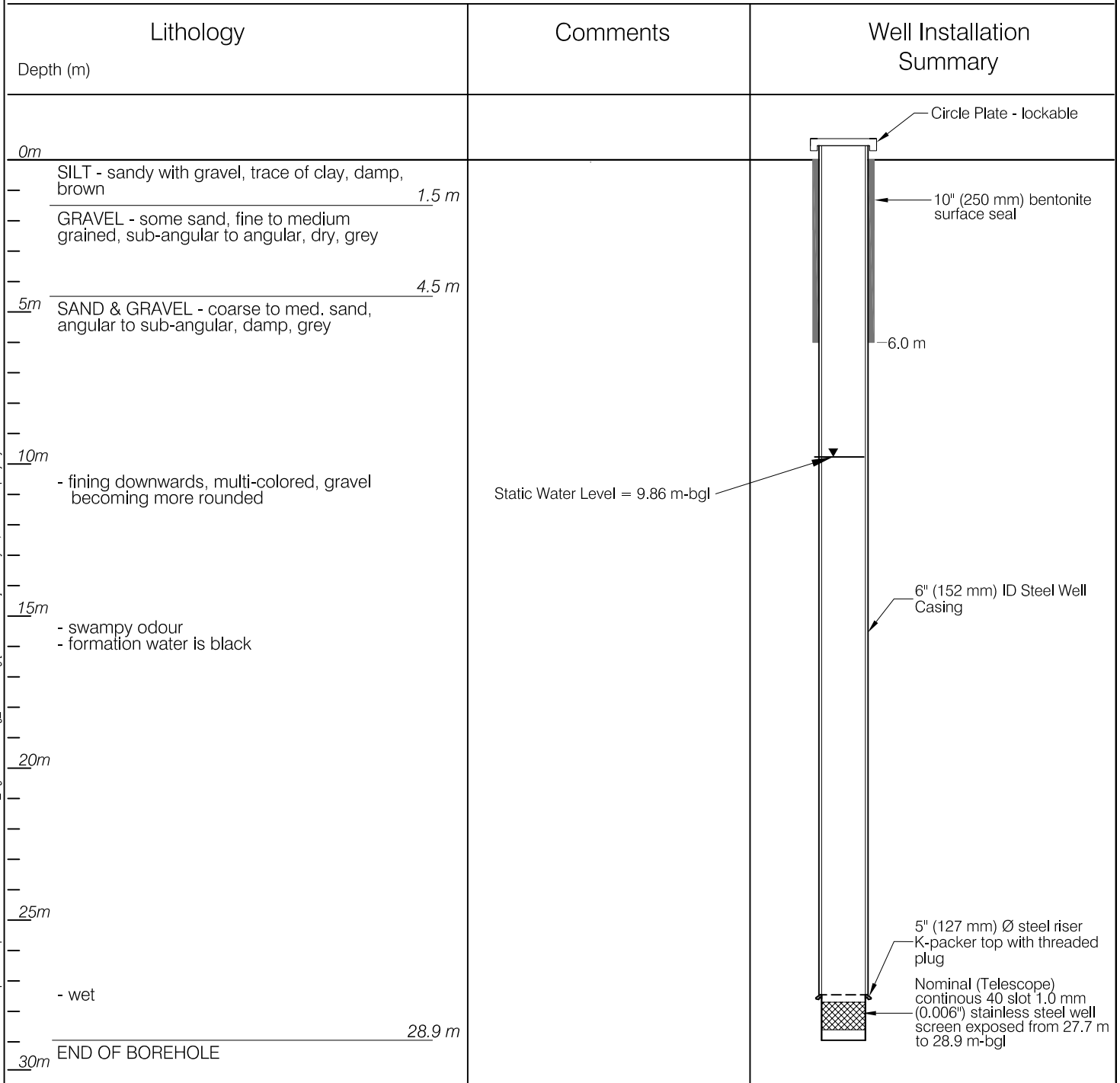
HYDROGEOLOGIC LOG

BOREHOLE NO.

WELL 3125-B

PURPOSE OF HOLE: Water Supply Well
 DRILLING METHOD: Air Rotary
 DRILLING DATE: October 15, 2006
 SCREEN INSTALLED: October 16, 2006
 CONTRACTOR: Double D Drilling Ltd.

CASING STICK UP: 1.0 m -agl.
 DEPTH TO STATIC: 9.86 m-bgl.
 DEPTH TO SCREEN (m): 27.13 m



C:\Whitehorse\Data\0201\Drawings\Beaver Creek\1260028 Water Well Completion Report\1260028 ATB\Figure 1 Well Log_3125-B.dwg [WELL 3125-B] February 15, 2007 - 3:21pm jbuycck

CLIENT



WELL COMPLETION REPORT
AIRPORT TERMINAL BUILDING - BEAVER CREEK, YT.

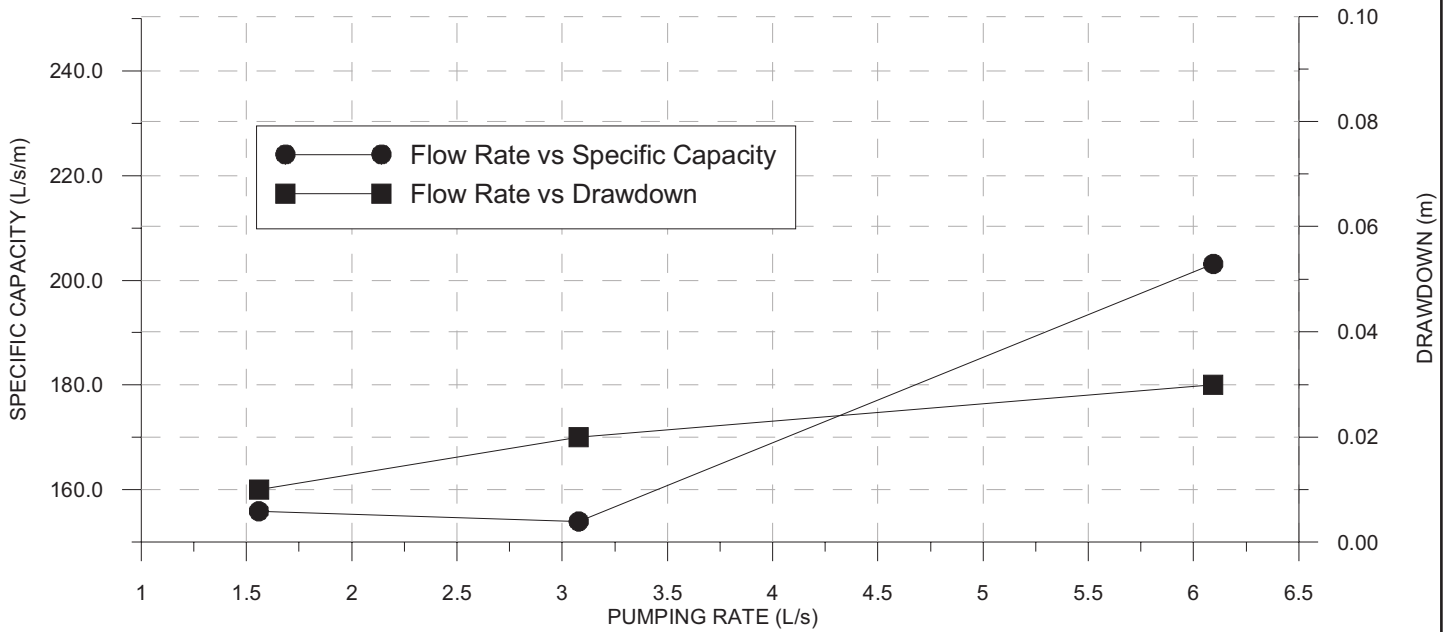
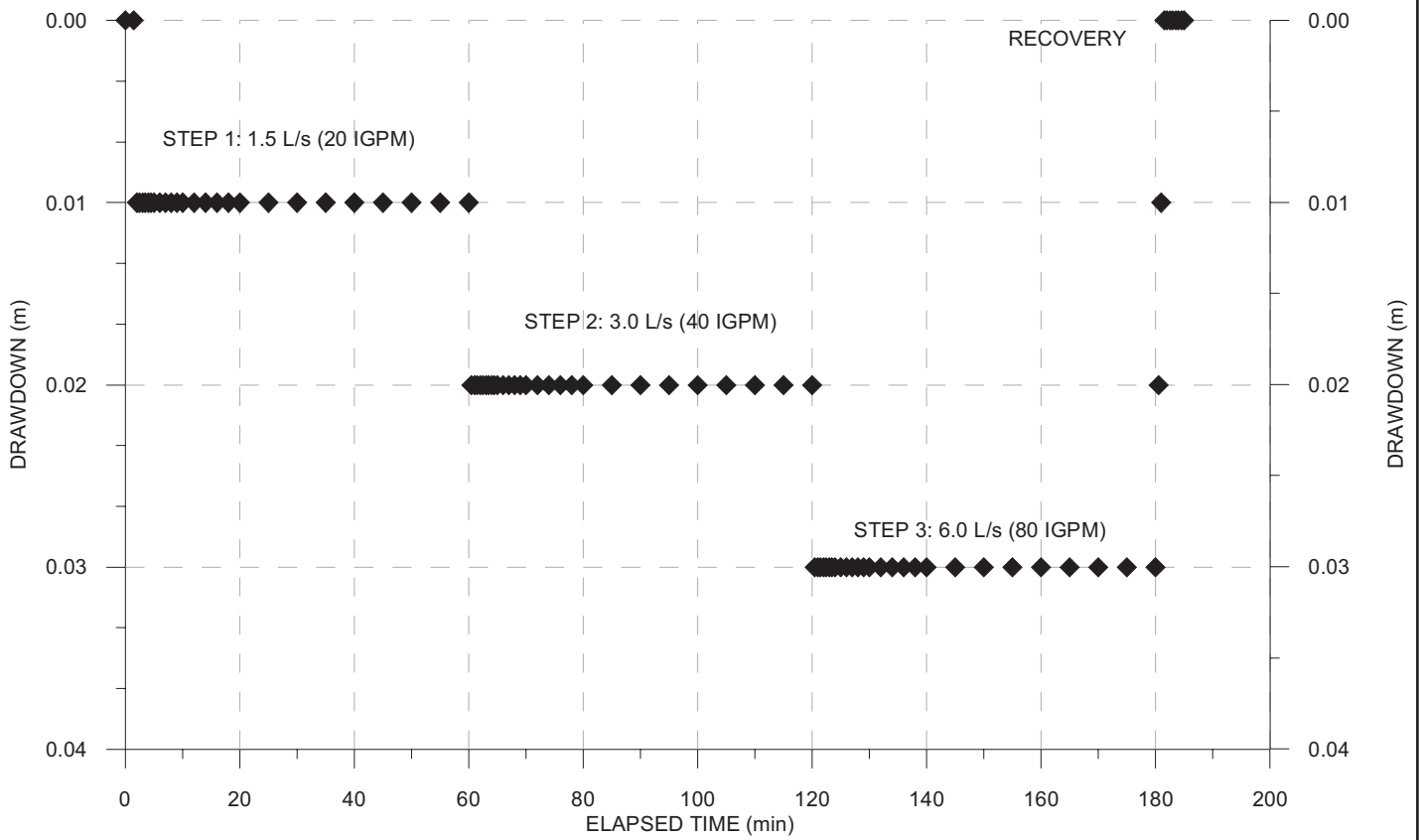
WELL LOG 3125-B

EBA Engineering Consultants Ltd.



PROJECT NO. 1260028	DWN JSB	CKD TK/BEP	REV 0
OFFICE EBA-WHSE	DATE January 9, 2007		

Figure 3



CLIENT



**WATER WELL COMPLETION REPORT,
BEAVER CREEK AIRPORT, YUKON**

STEP RATE PUMPING TEST

EBA Engineering
Consultants Ltd.



PROJECT NO.
1260028

DWN
TAK

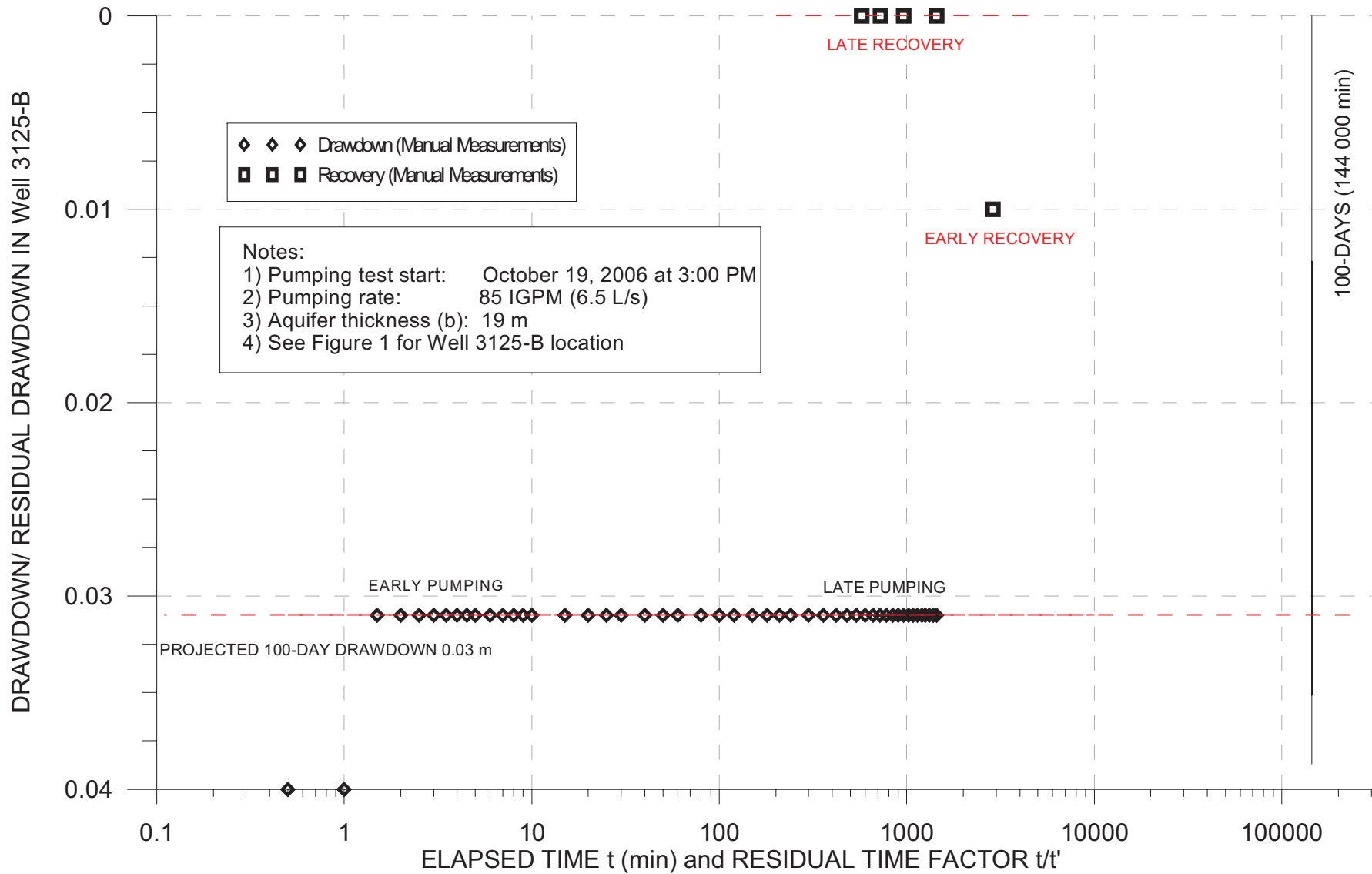
CKD
RMM

REV
1

OFFICE
EBA-Whitehorse

DATE
February, 2007

Figure 4



CLIENT



**WELL COMPLETION REPORT,
BEAVER CREEK AIRPORT, YUKON**

CONSTANT RATE PUMPING TEST

EBA Engineering
Consultants Ltd.



PROJECT NO.
1260028

OFFICE
EBA-WHITEHORSE

DWN
TAK

DATE
February 2007

CKD
RMM

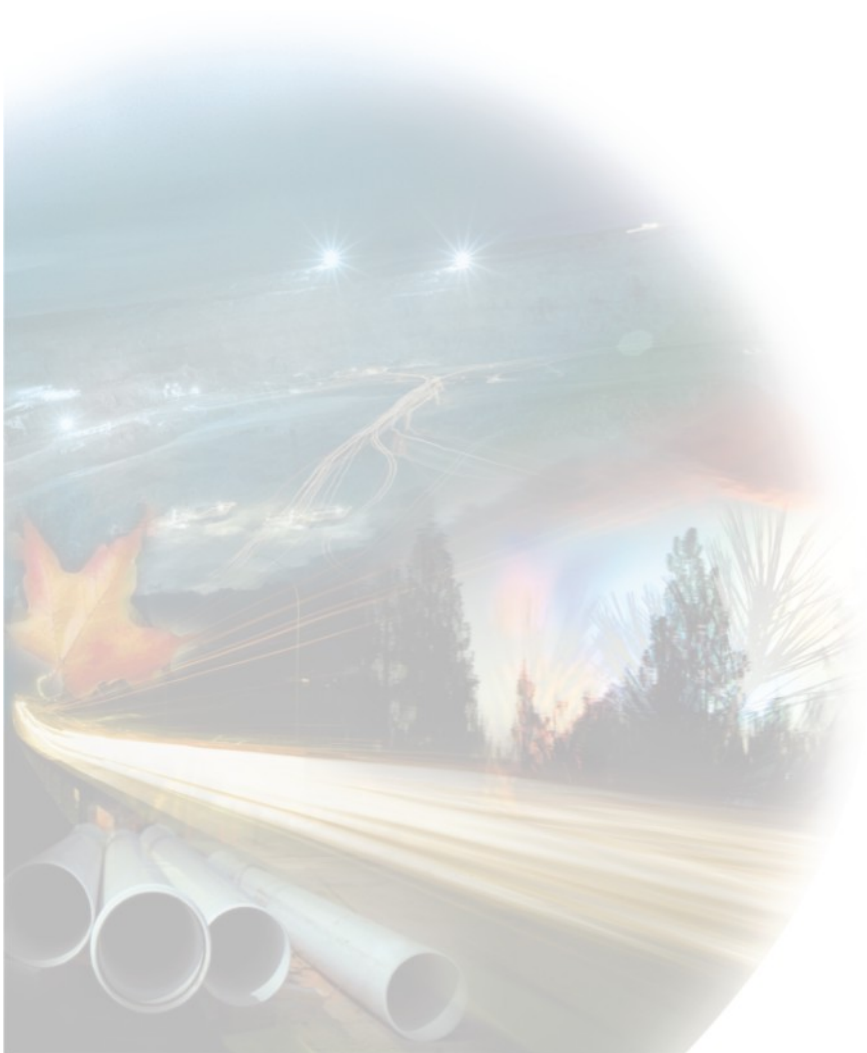
REV
1

Figure 5



APPENDIX

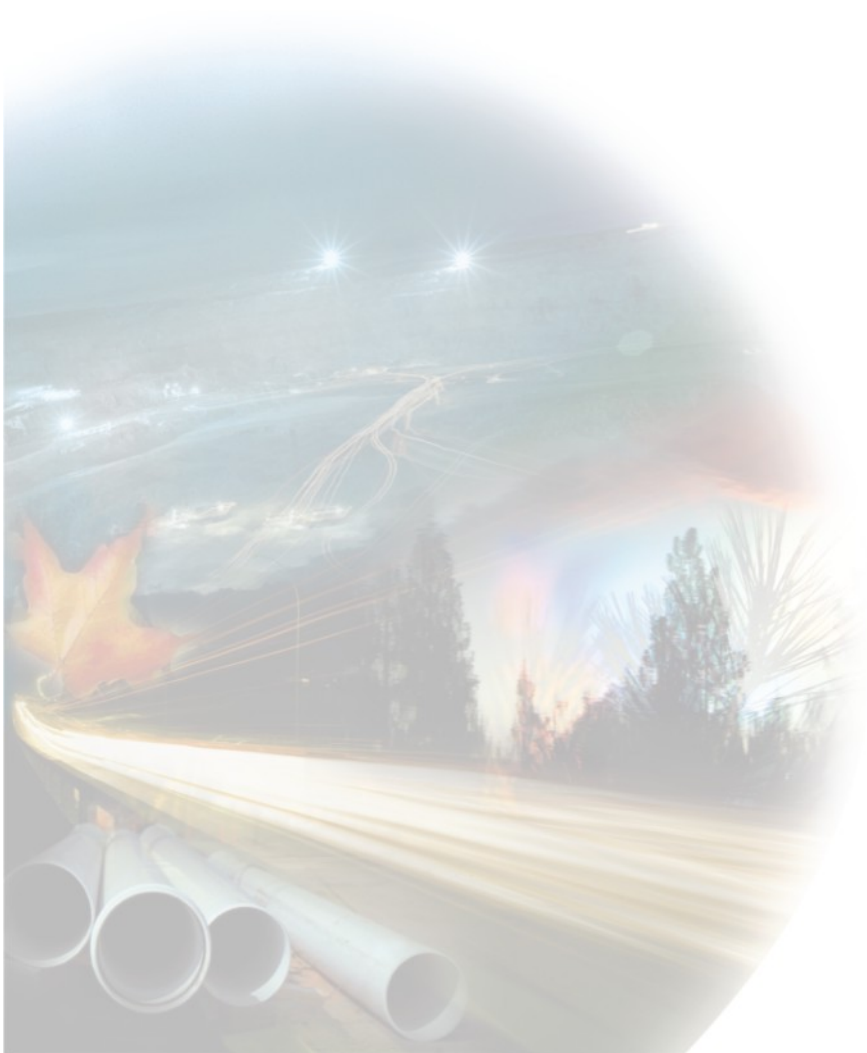
APPENDIX A DRILLERS WELL LOG



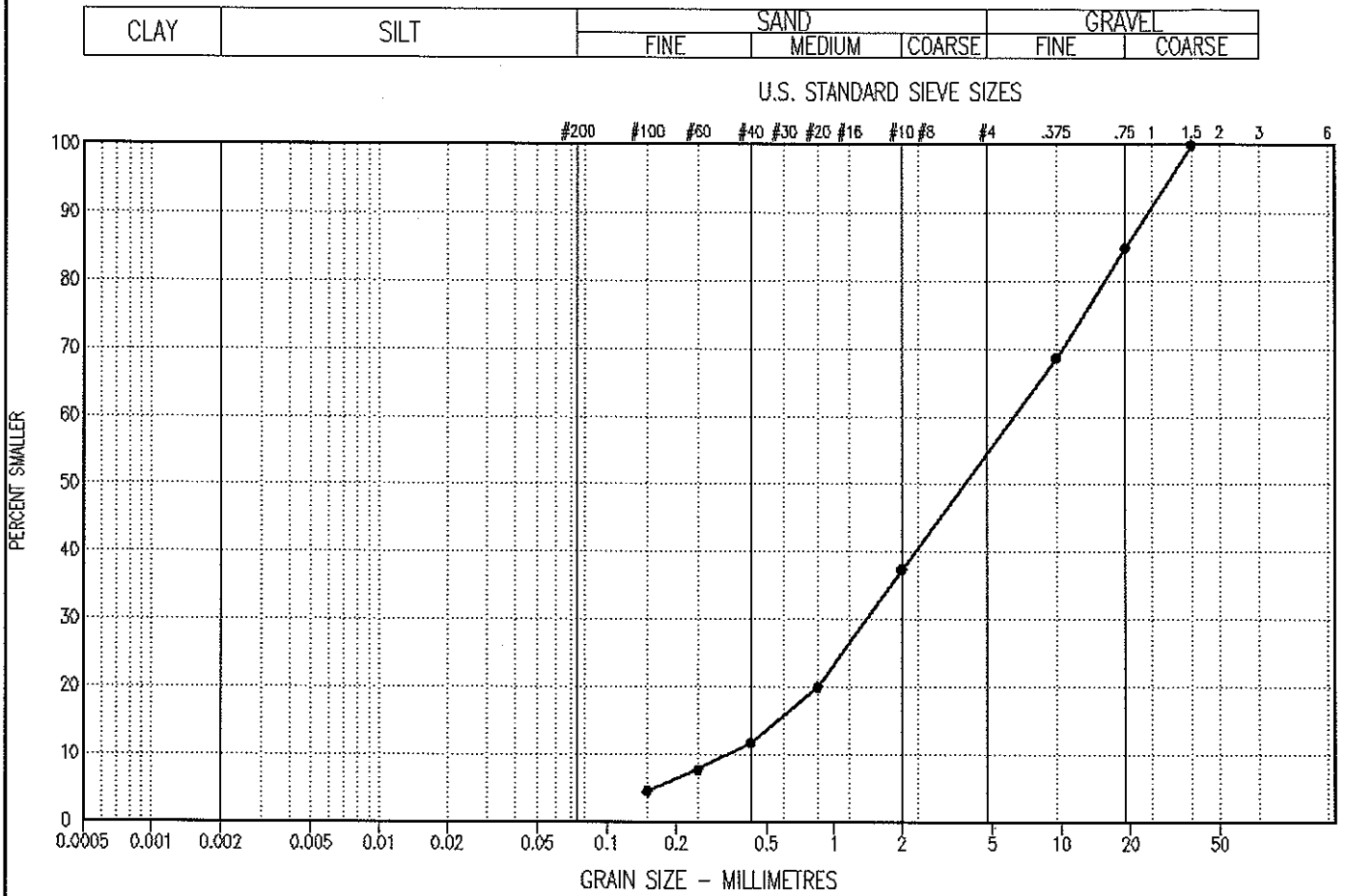


APPENDIX

APPENDIX B WELL 3125-B GRAIN SIZE ANALYSIS



PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
●—●	3125-B-95	95.00	---	4	44	52	21.0	0.9	GP

Project: 0201-1260028

Date Tested: 06/10/15

BY: JK

Tested in accordance with ASTM D422 unless otherwise noted.

Data presented hereon is for the sole use of the stipulated client. EBA is not responsible, nor can be held liable, for use made of this report by any other party, with or without the knowledge of EBA

The testing services reported herein have been performed by an EBA technician to recognized industry standards, unless otherwise noted. No other warranty is made. These data do not include or represent any interpretation or opinion of specification compliance or material suitability. Should engineering interpretation be required, EBA will provide it upon written request.





APPENDIX

APPENDIX C WELL 3125-B PUMPING TEST DATA



APPENDIX B1: STEP-RATE PUMPING TEST DATA

EBA PROJECT NUMBER: 1260028

PROJECT LOCATION: Beaver Creek Airport

WELL NAME: Beaver Creek Airport (# 3125)

PUMP INTAKE DEPTH (m): 23.0 m (75.5 ft)

STATIC WATER LEVEL (m): 9.86 m (35.6 ft)

SCREEN INTERVAL: 27.7 - 28.9 m (91 - 95 ft)

DATUM DESCRIPTION: Top of Sounding Tube

SLOT SIZE ("): 0.040 in

DATUM STICK-UP(m): 1.2 m above ground level

SAFE AVAILABLE DRAWDOWN(m): 11.8 m (38.7 ft)

WELL DIAMETER: 152 mm (6 in)

SCREEN DIAMETER (mm): 127 mm (5 in)

TOTAL WELL DEPTH: 28.9 m (95 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
19-Oct-06	12:00:00	0	9.860	0.000	-	-	-	-	-	START STEP 1
19-Oct-06	12:00:30	0.5	9.820	-0.040	-	28.82	24	1.818	-	
19-Oct-06	12:01:00	1	9.850	-0.010	-	27.62	23	1.743	-	
19-Oct-06	12:01:30	1.5	9.860	0.000	-	23.67	19.71	1.493	-	
19-Oct-06	12:02:00	2	9.870	0.010	-	-	-	-	-	
19-Oct-06	12:02:30	2.5	9.870	0.010	-	24.21	20.16	1.527	152.749	
19-Oct-06	12:03:00	3	9.870	0.010	-	24.03	20.01	1.516	151.612	
19-Oct-06	12:03:30	3.5	9.870	0.010	-	-	-	-	-	
19-Oct-06	12:04:00	4	9.870	0.010	-	-	-	-	-	
19-Oct-06	12:04:30	4.5	9.870	0.010	-	24.01	19.99	1.515	151.461	
19-Oct-06	12:05:00	5	9.870	0.010	-	-	-	-	-	
19-Oct-06	12:06:00	6	9.870	0.010	-	24.16	20.12	1.524	152.446	
19-Oct-06	12:07:00	7	9.870	0.010	-	-	-	-	-	
19-Oct-06	12:08:00	8	9.870	0.010	-	24.69	20.56	1.558	155.779	
19-Oct-06	12:09:00	9	9.870	0.010	-	-	-	-	-	
19-Oct-06	12:10:00	10	9.870	0.010	-	24.78	20.63	1.563	156.310	
19-Oct-06	12:12:00	12	9.870	0.010	-	-	-	-	-	
19-Oct-06	12:14:00	14	9.870	0.010	-	24.76	20.62	1.562	156.234	
19-Oct-06	12:16:00	16	9.870	0.010	319	-	-	-	-	
19-Oct-06	12:18:00	18	9.870	0.010	-	-	-	-	-	
19-Oct-06	12:20:00	20	9.870	0.010	-	24.51	20.41	1.546	154.643	
19-Oct-06	12:25:00	25	9.870	0.010	-	24.73	20.59	1.560	156.007	
19-Oct-06	12:30:00	30	9.870	0.010	-	-	-	-	-	
19-Oct-06	12:35:00	35	9.870	0.010	-	-	-	-	-	
19-Oct-06	12:40:00	40	9.870	0.010	-	24.63	20.51	1.554	155.401	EC=281 uS/cm, pH=7.14,
19-Oct-06	12:45:00	45	9.870	0.010	-	-	-	-	-	T=5.6 degrees Celcius
19-Oct-06	12:50:00	50	9.870	0.010	-	-	-	-	-	
19-Oct-06	12:55:00	55	9.870	0.010	-	-	-	-	-	
19-Oct-06	1:00:00	60	9.870	0.010	1222	24.70	20.57	1.559	155.855	
19-Oct-06	13:00:30	60.5	9.880	0.020	-	47.08	39.2	2.970	148.506	STEP 2
19-Oct-06	13:01:00	61	9.880	0.020	-	47.32	39.4	2.985	149.263	
19-Oct-06	13:01:30	61.5	9.880	0.020	-	49.06	40.85	3.095	154.756	
19-Oct-06	13:02:00	62	9.880	0.020	-	-	-	-	-	
19-Oct-06	13:02:30	62.5	9.880	0.020	-	-	-	-	-	
19-Oct-06	13:03:00	63	9.880	0.020	-	-	-	-	-	
19-Oct-06	13:03:30	63.5	9.880	0.020	-	-	-	-	-	
19-Oct-06	13:04:00	64	9.880	0.020	-	-	-	-	-	
19-Oct-06	13:04:30	64.5	9.880	0.020	-	-	-	-	-	
19-Oct-06	13:05:00	65	9.880	0.020	-	-	-	-	-	
19-Oct-06	13:06:00	66	9.880	0.020	-	-	-	-	-	
19-Oct-06	13:07:00	67	9.880	0.020	-	-	-	-	-	
19-Oct-06	13:08:00	68	9.880	0.020	-	-	-	-	-	
19-Oct-06	13:09:00	69	9.880	0.020	-	-	-	-	-	
19-Oct-06	13:10:00	70	9.880	0.020	-	-	-	-	-	

APPENDIX B1: STEP-RATE PUMPING TEST DATA

EBA PROJECT NUMBER: 1260028

PROJECT LOCATION: Beaver Creek Airport

WELL NAME: Beaver Creek Airport (# 3125)

PUMP INTAKE DEPTH (m): 23.0 m (75.5 ft)

STATIC WATER LEVEL (m): 9.86 m (35.6 ft)

SCREEN INTERVAL: 27.7 - 28.9 m (91 - 95 ft)

DATUM DESCRIPTION: Top of Sounding Tube

SLOT SIZE ("): 0.040 in

DATUM STICK-UP(m): 1.2 m above ground level

SAFE AVAILABLE DRAWDOWN(m): 11.8 m (38.7 ft)

WELL DIAMETER: 152 mm (6 in)

SCREEN DIAMETER (mm): 127 mm (5 in)

TOTAL WELL DEPTH: 28.9 m (95 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
19-Oct-06	13:12:00	72	9.880	0.020	-	-	-	-	-	
19-Oct-06	13:14:00	74	9.880	0.020	-	-	-	-	-	
19-Oct-06	13:16:00	76	9.880	0.020	-	-	-	-	-	
19-Oct-06	13:18:00	78	9.880	0.020	-	-	-	-	-	
19-Oct-06	13:20:00	80	9.880	0.020	2036	48.94	40.75	3.088	154.378	
19-Oct-06	13:25:00	85	9.880	0.020	-	48.96	40.77	3.089	154.453	
19-Oct-06	13:30:00	90	9.880	0.020	-	-	-	-	-	
19-Oct-06	13:35:00	95	9.880	0.020	-	-	-	-	-	
19-Oct-06	13:40:00	100	9.880	0.020	-	-	-	-	-	
19-Oct-06	13:45:00	105	9.880	0.020	-	-	-	-	-	
19-Oct-06	13:50:00	110	9.880	0.020	-	-	-	-	-	
19-Oct-06	13:55:00	115	9.880	0.020	-	-	-	-	-	
19-Oct-06	14:00:00	120	9.880	0.020	3654	48.79	40.63	3.078	153.923	
19-Oct-06	14:00:30	120.5	9.890	0.030	-	114.75	95.55	7.240	241.322	STEP 3
19-Oct-06	14:01:00	121	9.890	0.030	-	97.11	80.86	6.127	204.220	
19-Oct-06	14:01:30	121.5	9.890	0.030	-	96.94	80.72	6.116	203.867	
19-Oct-06	14:02:00	122	9.890	0.030	-	-	-	-	-	
19-Oct-06	14:02:30	122.5	9.890	0.030	-	97.18	80.92	6.131	204.372	
19-Oct-06	14:03:00	123	9.890	0.030	-	-	-	-	-	
19-Oct-06	14:03:30	123.5	9.890	0.030	-	96.69	80.51	6.100	203.337	
19-Oct-06	14:04:00	124	9.890	0.030	-	-	-	-	-	
19-Oct-06	14:04:30	124.5	9.890	0.030	-	-	-	-	-	
19-Oct-06	14:05:00	125	9.890	0.030	-	-	-	-	-	
19-Oct-06	14:06:00	126	9.890	0.030	-	-	-	-	-	
19-Oct-06	14:07:00	127	9.890	0.030	-	-	-	-	-	
19-Oct-06	14:08:00	128	9.890	0.030	-	-	-	-	-	
19-Oct-06	14:09:00	129	9.890	0.030	-	-	-	-	-	
19-Oct-06	14:10:00	130	9.890	0.030	-	96.59	80.43	6.094	203.134	EC=288 uS/cm, pH=7.2
19-Oct-06	14:12:00	132	9.890	0.030	-	-	-	-	-	T=6.5 degrees Celcius
19-Oct-06	14:14:00	134	9.890	0.030	-	-	-	-	-	
19-Oct-06	14:16:00	136	9.890	0.030	-	-	-	-	-	
19-Oct-06	14:18:00	138	9.890	0.030	-	-	-	-	-	
19-Oct-06	14:20:00	140	9.890	0.030	-	-	-	-	-	
19-Oct-06	14:25:00	145	9.890	0.030	-	-	-	-	-	
19-Oct-06	14:30:00	150	9.890	0.030	6092	-	-	-	-	
19-Oct-06	14:35:00	155	9.890	0.030	-	-	-	-	-	
19-Oct-06	14:40:00	160	9.890	0.030	-	-	-	-	-	
19-Oct-06	14:45:00	165	9.890	0.030	-	-	-	-	-	
19-Oct-06	14:50:00	170	9.890	0.030	-	-	-	-	-	
19-Oct-06	14:55:00	175	9.890	0.030	-	-	-	-	-	
19-Oct-06	15:00:00	180	9.890	0.030	-	-	-	-	-	
19-Oct-06	15:00:30	180.5	9.880	0.020	-	-	-	-	-	START RECOVERY
19-Oct-06	15:01:00	181	9.870	0.010	-	-	-	-	-	
19-Oct-06	15:01:30	181.5	9.860	0.000	-	-	-	-	-	

APPENDIX B1: STEP-RATE PUMPING TEST DATA

EBA PROJECT NUMBER: <u>1260028</u>	PROJECT LOCATION: <u>Beaver Creek Airport</u>
WELL NAME: <u>Beaver Creek Airport (# 3125)</u>	PUMP INTAKE DEPTH (m): <u>23.0 m (75.5 ft)</u>
STATIC WATER LEVEL (m): <u>9.86 m (35.6 ft)</u>	SCREEN INTERVAL: <u>27.7 - 28.9 m (91 - 95 ft)</u>
DATUM DESCRIPTION: <u>Top of Sounding Tube</u>	SLOT SIZE ("): <u>0.040 in</u>
DATUM STICK-UP(m): <u>1.2 m above ground level</u>	SAFE AVAILABLE DRAWDOWN(m): <u>11.8 m (38.7 ft)</u>
WELL DIAMETER: <u>152 mm (6 in)</u>	SCREEN DIAMETER (mm): <u>127 mm (5 in)</u>
TOTAL WELL DEPTH: <u>28.9 m (95 ft)</u>	OBSERVER'S NAME: <u>Jennifer Kelly</u>

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
19-Oct-06	15:02:00	182	9.860	0.000	-	-	-	-	-	
19-Oct-06	15:02:30	182.5	9.860	0.000	-	-	-	-	-	
19-Oct-06	15:03:00	183	9.860	0.000	-	-	-	-	-	
19-Oct-06	15:03:30	183.5	9.860	0.000	-	-	-	-	-	
19-Oct-06	15:04:00	184	9.860	0.000	-	-	-	-	-	
19-Oct-06	15:04:30	184.5	9.860	0.000	-	-	-	-	-	
19-Oct-06	15:05:00	185	9.860	0.000	-	-	-	-	-	End Of Test

Notes:

- 1) Depth to Water below top of sounding tube. Steel casing stick-up approximately 1.2 m.
- 2) "-" indicates no data or not applicable
- 3) May be a flow totalizer, instantaneous flow meter or other method of flow rate monitoring



APPENDIX B2: CONSTANT RATE PUMPING TEST DATA

EBA PROJECT NUMBER: <u>1260028</u>	PROJECT LOCATION: <u>Beaver Creek Airport</u>
WELL NAME: <u>Beaver Creek Airport (# 3125)</u>	PUMP INTAKE DEPTH (m): <u>23.0 m (75.5 ft)</u>
STATIC WATER LEVEL (m): <u>9.86 m (35.6 ft)</u>	SCREEN INTERVAL: <u>27.7 - 28.9 m (91 - 95 ft)</u>
DATUM DESCRIPTION: <u>Top of Sounding Tube</u>	SLOT SIZE ("): <u>0.040 in</u>
DATUM STICK-UP(m): <u>1.2 m above ground level</u>	SAFE AVAILABLE DRAWDOWN(m): <u>11.8 m (38.7 ft)</u>
WELL DIAMETER: <u>152 mm (6 in)</u>	SCREEN DIAMETER (mm): <u>127 mm (5 in)</u>
TOTAL WELL DEPTH: <u>28.9 m (95 ft)</u>	OBSERVER'S NAME: <u>Jennifer Kelly</u>

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
19-Oct-06	15:00:00	0	9.860	0.000	-	102.93	85.71	6.49	-	-	-	-	
19-Oct-06	15:00:30	0.5	9.900	0.040	-	-	-	-	-	-	-	-	
19-Oct-06	15:01:00	1	9.900	0.040	-	102.84	85.63	6.49	162.20	-	-	-	
19-Oct-06	15:01:30	1.5	9.891	0.031	-	-	-	-	-	-	-	-	
19-Oct-06	15:02:00	2	9.891	0.031	-	-	-	-	-	-	-	-	
19-Oct-06	15:02:30	2.5	9.891	0.031	-	102.92	85.7	6.49	209.46	-	-	-	
19-Oct-06	15:03:00	3	9.891	0.031	-	-	-	-	-	-	-	-	
19-Oct-06	15:03:30	3.5	9.891	0.031	-	-	-	-	-	-	-	-	
19-Oct-06	15:04:00	4	9.891	0.031	-	-	-	-	-	-	-	-	
19-Oct-06	15:04:30	4.5	9.891	0.031	-	-	-	-	-	-	-	-	
19-Oct-06	15:05:00	5	9.891	0.031	-	-	-	-	-	-	-	-	
19-Oct-06	15:06:00	6	9.891	0.031	-	-	-	-	-	-	-	-	
19-Oct-06	15:07:00	7	9.891	0.031	-	102.83	85.62	6.49	209.27	-	-	-	
19-Oct-06	15:08:00	8	9.891	0.031	-	-	-	-	-	-	-	-	
19-Oct-06	15:09:00	9	9.891	0.031	-	-	-	-	-	-	-	-	
19-Oct-06	15:10:00	10	9.891	0.031	849	102.95	85.72	6.49	209.51	-	-	-	
19-Oct-06	15:15:00	15	9.891	0.031	-	102.49	85.34	6.47	208.58	-	-	-	
19-Oct-06	15:20:00	20	9.891	0.031	1840	-	-	-	-	-	-	-	
19-Oct-06	15:25:00	25	9.891	0.031	-	-	-	-	-	-	-	-	
19-Oct-06	15:30:00	30	9.891	0.031	-	102.86	85.65	6.49	209.34	-	-	-	
19-Oct-06	15:40:00	40	9.891	0.031	3417	-	-	-	-	7.05	280	7.1	
19-Oct-06	15:50:00	50	9.891	0.031	-	-	-	-	-	-	-	-	
19-Oct-06	16:00:00	60	9.891	0.031	-	-	-	-	-	-	-	-	
19-Oct-06	16:20:00	80	9.891	0.031	-	-	-	-	-	-	-	-	
19-Oct-06	16:40:00	100	9.891	0.031	-	-	-	-	-	6.97	283	5.5	
19-Oct-06	17:00:00	120	9.891	0.031	-	102.77	85.57	6.48	209.14	-	-	-	
19-Oct-06	17:30:00	150	9.891	0.031	12838	102.74	85.55	6.48	209.10	-	-	-	
19-Oct-06	18:00:00	180	9.891	0.031	15319	102.95	85.72	6.49	209.51	6.92	278	6.4	
19-Oct-06	18:30:00	210	9.891	0.031	17922	102.79	85.59	6.48	209.19	-	-	-	
19-Oct-06	19:00:00	240	9.891	0.031	-	102.54	85.38	6.47	208.68	-	-	-	
19-Oct-06	20:00:00	300	9.891	0.031	25663	103.11	85.86	6.51	209.85	7.21	276	7.6	
19-Oct-06	21:00:00	360	9.891	0.031	30800	102.93	85.71	6.49	209.49	-	-	-	
19-Oct-06	22:00:00	420	9.891	0.031	35933	102.79	85.59	6.48	209.19	6.37	286	8.0	
19-Oct-06	23:00:00	480	9.891	0.031	41071	103.10	85.85	6.50	209.83	-	-	-	
19-Oct-06	0:00:00	540	9.891	0.031	46216	102.92	85.7	6.49	209.46	6.18	285	7.4	
19-Oct-06	1:00:00	600	9.891	0.031	51366	103.33	86.04	6.52	210.29	-	-	-	
19-Oct-06	2:00:00	660	9.891	0.031	56516	102.97	85.74	6.50	209.56	6.07	278	7.8	
19-Oct-06	3:00:00	720	9.891	0.031	61661	103.10	85.85	6.50	209.83	6.53	271	7.6	
19-Oct-06	4:00:00	780	9.891	0.031	66815	103.25	85.97	6.51	210.12	-	-	-	
19-Oct-06	5:00:00	840	9.891	0.031	71961	103.31	86.02	6.52	210.24	-	-	-	
19-Oct-06	6:00:00	900	9.891	0.031	77112	103.21	85.94	6.51	210.05	6.47	264	7.8	
19-Oct-06	7:00:00	960	9.891	0.031	82764	103.10	85.85	6.50	209.83	6.31	291	3.4	
19-Oct-06	8:00:00	1020	9.891	0.031	87442	103.28	86	6.52	210.20	-	-	-	

APPENDIX B2: CONSTANT RATE PUMPING TEST DATA

EBA PROJECT NUMBER: <u>1260028</u>	PROJECT LOCATION: <u>Beaver Creek Airport</u>
WELL NAME: <u>Beaver Creek Airport (# 3125)</u>	PUMP INTAKE DEPTH (m): <u>23.0 m (75.5 ft)</u>
STATIC WATER LEVEL (m): <u>9.86 m (35.6 ft)</u>	SCREEN INTERVAL: <u>27.7 - 28.9 m (91 - 95 ft)</u>
DATUM DESCRIPTION: <u>Top of Sounding Tube</u>	SLOT SIZE ("): <u>0.040 in</u>
DATUM STICK-UP(m): <u>1.2 m above ground level</u>	SAFE AVAILABLE DRAWDOWN(m): <u>11.8 m (38.7 ft)</u>
WELL DIAMETER: <u>152 mm (6 in)</u>	SCREEN DIAMETER (mm): <u>127 mm (5 in)</u>
TOTAL WELL DEPTH: <u>28.9 m (95 ft)</u>	OBSERVER'S NAME: <u>Jennifer Kelly</u>

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
19-Oct-06	9:00:00	1080	9.891	0.031	92622	103.57	86.24	6.53	210.78	6.70	267	3.3	
19-Oct-06	10:00:00	1140	9.891	0.031	-	102.99	85.76	6.50	209.61	-	-	-	
19-Oct-06	11:00:00	1200	9.891	0.031	-	103.15	85.89	6.51	209.93	6.48	286	6.7	
19-Oct-06	12:00:00	1260	9.891	0.031	108041	102.95	85.72	6.49	209.51	-	-	-	
19-Oct-06	13:00:00	1320	9.891	0.031	-	102.74	85.55	6.48	209.10	-	-	-	
19-Oct-06	14:00:00	1380	9.891	0.031	118325	102.93	85.71	6.49	209.49	-	-	-	
19-Oct-06	15:00:00	1440	9.891	0.031	123470	103.10	85.85	6.50	209.83	6.86	292	5.2	
19-Oct-06	15:00:30	1440.5	9.870	0.010	-		-	-	-	-	-	-	Start Recovery
19-Oct-06	15:01:00	1441	9.860	0.000	-		-	-	-	-	-	-	
19-Oct-06	15:01:30	1441.5	9.860	0.000	-		-	-	-	-	-	-	
19-Oct-06	15:02:00	1442	9.860	0.000	-		-	-	-	-	-	-	
19-Oct-06	15:02:30	1442.5	9.860	0.000	-		-	-	-	-	-	-	

Notes:

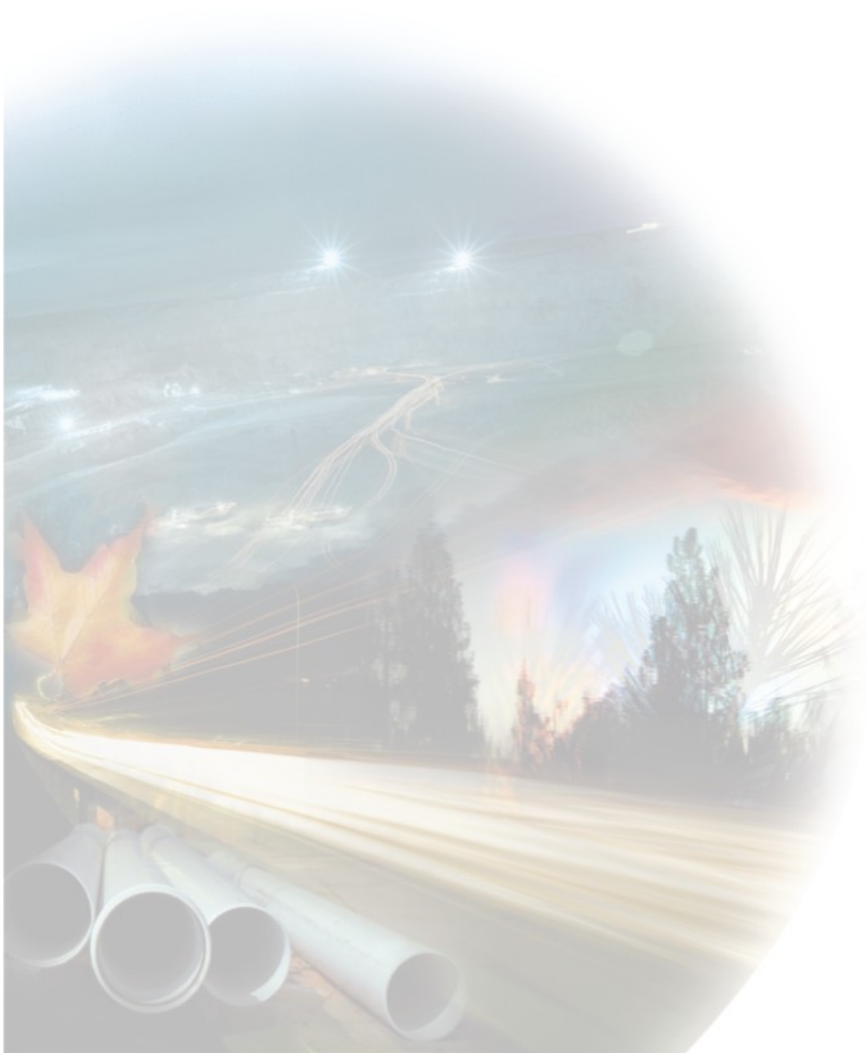
- 1) Depth to Water below top of sounding tube. Steel casing stick-up approximately 1.2 m.
- 2) "-" indicates no data or not applicable
- 3) May be a flow totalizer, instantaneous flow meter or other method of flow rate monitoring





APPENDIX

APPENDIX D LABORATORY REPORTS AND CERTIFICATES





Environmental Division

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

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN AUTHORITY OF THE LABORATORY.
ALL SAMPLES WILL BE DISPOSED OF AFTER 30 DAYS FOLLOWING ANALYSIS. PLEASE CONTACT THE LAB IF YOU
REQUIRE ADDITIONAL SAMPLE STORAGE TIME.

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
<p>This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.</p>			
ANIONS-CL-IC-VA	Water	Chloride by Ion Chromatography	APHA 4110 "Determination of Anions by IC
<p>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.</p>			
ANIONS-F-IC-VA	Water	Fluoride by Ion Chromatography	APHA 4110 "Determination of Anions by IC
<p>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.</p>			
ANIONS-NO2-IC-VA	Water	Nitrite by Ion Chromatography	APHA 4110 "Determination of Anions by IC
<p>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.</p>			
ANIONS-NO3-IC-VA	Water	Nitrate by Ion Chromatography	APHA 4110 "Determination of Anions by IC
<p>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.</p>			
ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 "Determination of Anions by IC
<p>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.</p>			
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310 "TOTAL ORGANIC CARBON (TOC)"
<p>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.</p>			
COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	APHA 2120 "Color"
<p>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. Apparent 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.</p>			
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
<p>This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.</p>			
HARDNESS-CALC-VA	Water	Hardness	CALCULATION
HG-TOT-DW-CVAFS-VA	Water	Total Mercury in Water by CVAFS	EPA 245.7
<p>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).</p>			

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 environmental 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.

