



Fracflow Consultants Inc.

Environmental, Hydrogeological and
Geotechnical Engineering Consultants



TECHNICAL MEMORANDUM

TO: Cold Ocean Salmon Ltd. FFC-NL-500-003
% Cooke Aquaculture Inc.
874 Main Street
Black's Harbour, NB E5H 1E6

FROM: Fracflow Consultants Inc.

DATE: September 8, 2009

SUBJECT: Results of Drilling and Aquifer Testing, St. Alban's, Newfoundland

Summary

This report presents a summary of the aquifer tests that were completed by and under the supervision of Fracflow Consultants Inc. in St. Alban's, NL between June 30 and July 25, 2009 to investigate a potential water supply for a proposed fish hatchery in St. Alban's, NL.

Aquifer tests were carried out to determine the capacity of two individual bedrock wells (Church Well, Sea Farm Well) and the properties of the underlying bedrock aquifer. In addition, the interaction or connection between the two production bedrock wells and the overlying overburden aquifer from which the Town of St. Alban's draws its water supply was monitored using the new and existing piezometers and observation wells. The well performance and aquifer characteristics were determined by carrying out a step-drawdown test, followed by a 48-hour and/or 72-hour aquifer test followed by monitoring of the recovery of the water levels in each of the two wells. The well interference was assessed by pumping both production wells, simultaneously, at or close to their maximum pumping rate with the installed pumps and overlapping this combined pumping with the aquifer test that was conducted on the new well that was installed in the Town's well field. Water samples were collected and field geochemical parameters were measured periodically through out the aquifer test program.

Based on the specific capacity of approximately 73 L/min/m the Church well, assuming a moderate well efficiency, would have a short term capacity in excess of 600 L/min. Based on the specific capacity that was computed for the Sea Farm well, 17.6 L/min/m, the short term well yield would be in excess of 500 Lpm, assuming a low to moderate well efficiency.

The aquifer tests that were completed during this hydrogeological investigation, demonstrated that the bedrock wells have the capacity to meet the short term requirements of the proposed fish hatchery. The extended aquifer tests demonstrated that the bedrock aquifer, or the aquifer that the wells produce from when they are cased through the overburden and drilled into bedrock, contains high permeability zones and that the three bedrock wells (Church Well, Sea Farm Well and the DFA well) are all well connected.

The proposed average daily water usage for each month for the proposed fish hatchery has been compared to the average daily water usage by the Town of St. Alban's for the period of August to November, 2008, including the fish plant, and to the maximum exploitable daily water volume or available water from the overburden aquifer (2,160 m³/day) as estimated by Morrison Beatty and Associates Ltd. (1990). In addition, the average daily water volume that would be required by a town with a population of 1,250 persons was calculated.

Based on this comparison, the volume of water that is available to other users, the difference between the Town's average water usage and the Morrison Beatty and Associates Ltd. (1990) estimate of 2,160 m³/day of available water, exceeds that which would be withdrawn by the proposed fish hatchery since the fish hatchery's water demands would be buffered through storage in the overburden aquifer. It is important to note that Morrison Beatty and Associates Ltd. (1990) did not consider any contribution from the bedrock aquifer.

It is Fracflow's opinion that the additional water needed to service the proposed fish hatchery exists in the overburden even with the current Town water demands or usage. However, the proposed fish hatchery proposes to draw its water from the bedrock aquifer and part of this water will be obtained by leakage through and from the overburden aquifer. It is clear that the Town's water needs are much less than the current water usage due to leaks in the Town's water pipelines. If the leaks are fixed or reduced an additional volume of potable water, up to 1,000 m³/day, would become available to the stakeholders.

Introduction

This report presents a summary of the field work and the aquifer tests that were completed by and under the supervision of Fracflow Consultants Inc. in St. Alban's, NL between June 30 and July 25, 2009 to investigate a potential water supply for a proposed fish hatchery in St. Alban's, NL. Figure 1 is an aerial photograph of part of St. Alban's showing the well locations and other points that are relevant to the proposed fish hatchery.

Scope of Work

A 150 mm diameter casing was driven on July 1 - 2, 2009 approximately 14.63 m east of the existing Church Well (Figure 1) and three piezometers P1, P2, P3 were installed at selected vertical depths to serve as observation wells for the aquifer tests on the Church Well(CW on

Figure 1). On July 5, 2009 static water levels for P1, P2 and P3 were 7.3 m, 6.8 m, and 5.4 m, respectively, measured from the top of each casing. Key elevation data for each production well are tabulated in Figure 1.

During the period of July 2 - 9, 2009, a 150 mm diameter casing was also driven 16.8 m west of the Sea Farm or Incubation (SFW or IW on Figure 1) well and piezometer P1 was installed at or close to the overburden-bedrock contact. On July 15, 2009, piezometer P2 was installed approximately 20.42 m west of the Sea Farm/Incubation pumping well. On July 15, 2009 static water levels for P1, P2 and the DFA well respectively were 14.9 m, 13.7 m and 14.7 m below the top of each casing. Refer to Table 1.1 for well details. These piezometers and observation wells, along with the Department of Fisheries and Aquaculture (DFA) well, were used as observation wells during the aquifer tests on the Sea Farm well.

Table 1.1 Well construction data obtained during drilling and/or borehole camera viewing.

Location	Depth (m)	Casing Depth (m)	Drill Date	Screen Depth (m)	Geologic Depth (m)	Geology
Church Well	47.5	45.7	1995 ?	No screen	0 - 45.7 45.7 - 47.5	n/a bedrock
Church Well 2009 - P1	49.1	9.8	July 1, 2009	46.0 - 49.1	0 - 6.1	Brown, moist, med-coarse grained sand
Church Well 2009 - P2	34.4	9.8	July 1, 2009	31.4 - 34.4	6.1 - 13.7	Light brown fine grained sand
Church Well 2009 - P3	18	9.8	July 1, 2009	14.9 - 18.0	13.7 - 49.1 49.1 - 49.7	Grey fine grained silty sand Bedrock - black
Sea Farm Well	122.5	73.8	1995 ?	No screen	0 - 73.8 Bedrock	n/a Bedrock
Sea Farm Well 2009 - P1	73.8	7	July 7, 2009	70.4 - 73.5	0 - 4.6 4.6 - 24.4 24.4 - 30.5 30.5 - 73.2 73.2 - 73.8	Brown, coarse grained sand and gravel Brown, coarse grained sand Grey fine grained sand Grey fine grained silty sand Bedrock - Grey shale
Sea Farm Well 2009 - P2	17.7	0.9	July 15, 2009	14.6 - 17.8	0 - 4.6 4.6 - 18.3	Brown, coarse grained sand and gravel Brown, coarse grained sand
Salt Water Well	75.3	55.5	1995 ?	No screen	0 - 55.5 55.5 - 75.3	No information Bedrock - fractured dark rock w/ quartz veins

On July 10, 2009, a 48-hour aquifer test was conducted on the Church well with a flowrate of 329 L/min. The pumping rate remained steady at 329 L/min and the drawdown stabilized at approximately 4.5 m. The three observation wells were monitored during the aquifer test and drawdowns within P1, P2 and P3 were 1.3 m, 0.13 m and 0.14 m, respectively.

On July 15, 2009, a 72-hour aquifer test was conducted on the Sea Farm well with a flowrate of 225 L/min producing a total drawdown of 12.8 m at the end of the 72-hour test period. Drawdowns in SFW-P1, SFW-P2 and the DFA well during this 72-hour period were 1.7 m, 0.04 m and 1.4 m, respectively.

Water samples were collected from each well after 24 hours, 48 hours, 72 hours (Sea Farm Well) and again on July 23, 2009. Selected water samples have been analyzed and the laboratory data are provided in Appendix A.

The Town of St. Alban's constructed Well PW#8 in the well field area on approximately July 21, 2009, to a depth of 18.3 m. A 48-hour pumping test was completed on well PW#8 at a production rate of 379 L/min. The PW#8 pumping well and two observation wells in the Town's well field were monitored during this aquifer test, while the other two wells, the Church and the Sea Farm wells were also pumping at 329 L/min and 225 L/min, respectively.

A Borehole TV Camera was used to examine the well bores in both the Church Well, the Sea Farm Well and the Salt-Water Well, to determine well depth and casing depth in each well.

The results from the drilling of observation wells and analysis of aquifer tests carried out on two bedrock water wells are described below.

Aquifer Test Results

The aquifer tests were carried out to determine the capacity of the individual wells and the properties of the underlying aquifer. In addition, the interaction or connection between the two production wells and the overlying overburden aquifer from which the Town of St. Alban's draws its water supply was monitored using the new and existing piezometers and observation wells. The well performance and aquifer characteristics were determined by carrying out a step-drawdown test, followed by a 48-hour and/or 72-hour aquifer test followed by monitoring of the recovery of the water levels in each of the two wells. The well interference was assessed by pumping both production wells, simultaneously, at or close to their maximum pumping rate with the installed pumps and overlapping this combined pumping with the aquifer test that was conducted on the new well that was installed in the Town's well field. The well testing and water sampling were carried out according to guidelines set out by the Water Resources Management Division of the Newfoundland Department of Environment and Conservation (Robinson, 1986). A brief description and performance of each well are summarized below.

Church Well

There is one water supply well (Church Well) and three observation wells within an adjacent well (nested piezometers P1, P2, P3) at this location (Figure 1). The Church Well is located in the northwest corner of a large exposed sandy area adjacent the Church and was drilled sometime around 1995. This Church Well is 47.6 m deep and the end of the casing or the casing shoe was located at 45.8 m using the borehole TV camera.

The observation wells are located approximately 14.63 m (48 feet) east of the Church Well. This second well, containing the three observation wells (P1, P2, P3), was drilled on July 1, 2009 by Northeast Drilling Ltd. under the supervision of Fracflow. The well was drilled to 49.7 m (163 feet). The first observation well screen (P1) was installed from 46.03 m to 47.07 m (151 feet to 161 feet), within or at the top of the bedrock. The second observation well screen (P2) was installed from 31.4 m to 34.4 m (103 feet to 113 feet) within a grey fine-grained silty sand layer. The third observation well screen (P3) was installed 14.9 to 18.0 m (49 feet to 59 feet) in the upper portion of the aquifer within a grey fine-grained silty sand layer. These nested piezometers were then used as observation wells during the Church Well aquifer test to monitor how hydraulic heads were affected within the overburden aquifer at different depths during the aquifer tests. The geological cross-section for this well location is provided in Figure 2.

Three steps were completed on this well for the step-drawdown test using rates of 202 L/min, 264 L/min and the highest setting of 329 L/min, which was the full capacity of the pump. The first three steps in the step-drawdown test reached a quasi steady-state within the 30-minute period of the step. Drawdowns within the Church pumping well during the three steps were 2.4 m, 3.4 m and 4.5 m, respectively.

The pumping rate for the 48-hour aquifer test for the Church well was set at 329 L/min. The pumping rate remained steady at 329 L/min and the drawdown stabilized at approximately 4.5 m of drawdown. The three observation wells were monitored during the pumping test and drawdowns within P1, P2 and P3 were 1.3 m, 0.13 m and 0.14 m, respectively. The available drawdown in this well was approximately 32 m (water table is at approximately 7 m below ground surface and the producing zone is at approximately 47 m, assuming that the pump is placed at the bottom of the well and that the water level is maintained at approximately 6 m above the top of the pump). Based on the specific capacity of approximately 73 L/min/m this well, assuming a moderate well efficiency, would have a short term capacity in excess of 600 L/min

The aquifer test data for the Church Well are provided in Figures 3 and 4. Additional aquifer test figures for the Church Well are provided in Appendix B. The storativity that was calculated from the observation well data indicates that the producing aquifer is a leaky confined aquifer. The observation well data gave a transmissivity of $2.67 \times 10^{-3} \text{ m}^2/\text{s}$ if we assume that the aquifer is 50 m thick. However note that, at this well location, the producing well was only open approximately 3 m into bedrock.

Water samples were collected during this test at the 5-hour, 24-hour and 48-hour mark, and again on July 23, 2009. Water chemistry data are provided in Appendix A.

Sea Farm Well

At the Sea Farm well location, two new observation wells were installed to support aquifer testing of the existing production water well. The drill date for the existing production well was assumed to be sometime in 1995 but this could not be confirmed. The well is 122.5 m deep (401.9 ft) and the casing depth is at 73.7 m (242 ft). The bottom of the casing was confirmed using a borehole TV camera after the aquifer tests had been completed. The geological cross-section for this location, based on the overburden samples that were collected during the piezometer construction is provided in Figure 5.

One observation well, SFW-P1, is located approximately 16.8 m (55 feet) west of the Sea Farm pumping well and was drilled on July 7, 2009, by Northeast Drilling Ltd. to a depth of 73.7 m (242 feet). A screen was installed from 70.41 m to 73.4 m (231 to 241 feet) within a grey fine grained silty sand, at the top of the bedrock or the bottom of the overburden unit. A second piezometer (observation SFW-P2) is located approximately 20.42 m (67 feet) west of the Sea Farm pumping well and was augered on July 15, 2009 by Formation Drilling Ltd. to a depth of 18.29 m (60 feet). A screen was installed from 14.63 m to 17.68 m (48 to 58 feet) within a brown, coarse grained sand unit. These two piezometers were used as observation wells during the Sea Farm Well aquifer test to monitor how hydraulic heads were affected within the overburden aquifer at different depths during the aquifer test on the Sea Farm well. In addition to these two wells, a third well drilled to bedrock by the Department of Fisheries and Aquaculture (DFA) in January 2008, located approximately 61 m from the Sea Farm pumping well, was used as an observation well.

Three steps were completed for the step-drawdown test using flow rates of 113 L/min, 144 L/min and 225 L/min. The three steps in the step-drawdown test reached a quasi steady-state within the 30-minute period of each step. Drawdowns during the three steps within the Sea Farm pumping well were 7.1 m, 9.4 m and 13.3 m, respectively.

The pumping rate for the 72-hour aquifer test on the Sea Farm well was set at 225 L/min and a total drawdown of 12.8 m was recorded at the end of the 72-hour test period. Drawdowns in SFW-P1, SFW-P2 and the DFA well during this 72-hour period were 1.7 m, 0.04 m and 1.4 m, respectively. The Sea Farm well has total available drawdown of approximately 48 m. Based on the preliminary specific capacity that was computed for this well, 17.6 L/min/m, the short term well yield would be in excess of 500 Lpm, assuming a low to moderate well efficiency.

The aquifer test data for the Sea Farm well are presented in Figures 6 and 7 with additional aquifer test data being provided in Appendix B. The storativity that was calculated from the observation well data indicates that the producing aquifer is a leaky confined aquifer. The

observation well data and the producing well data gave a transmissivity of $8.09 \times 10^{-4} \text{ m}^2/\text{s}$ if we assume that the aquifer is 50 m thick.

Water samples were collected during this test at the 24-hour, 48-hour and 72-hour mark, and again on July 23, 2009. The water chemistry data are presented in Appendix A and compared to the freshwater aquatic life guidelines with highlights indicating when those guideline values are exceeded.

The pumping rate, drawdown, and specific capacity for each step in the step-drawdown tests are given in Table 1.2.

Table 1.2 Data from step-drawdown tests on Church and SFW well.

Well 1 - Church Well			
Step	Flowrate, Q (L/min)	Drawdown, dd (m)	Specific Capacity (L/min/m)
1	202	2.4	84.2
2	264	3.47	76
3	329	4.5	73.1
Well 2 - Sea Farm Well (SFW)			
Step	Flowrate, Q (L/min)	Drawdown, dd (m)	Specific Capacity (L/min/m)
1	113	7.1	15.9
2	144	9.4	15.3
3	225	13.3	16.9

Well Inteference Tests

During the period of this hydrogeological investigation of the bedrock aquifer, the Town of St. Alban's constructed an additional water production well, PW#8. This well is located in the immediate area of the town's well field. There are seven water supply wells at this location although only three are currently being used. This new production well, PW#8 was drilled in July 2009 to a depth of 18.3 m (60 feet) and a 48-hour pumping test was completed at a pumping rate of 379 L/min by the town's contractor. Fracflow monitored this pumping well and two observation wells in the Town's well field during this test, while the other two wells, the Church Well and the SFW were also pumping at 329 L/min and 225 L/min respectively. These three aquifer tests were conducted at the same time as this was accepted as a realistic stress condition of the aquifer since the hatchery proposes to use approximately 300 L/min in addition to the average 1,400 L/min that is currently being pumped from the overburden aquifer for the Town's residential and commercial/industrial usage. Unfortunately, the water from PW#8 was discharged to the ground within 30 m of the well and the drawdown data from the pumping well suggest that

the discharge water was most likely recharged back to the overburden aquifer within a few minutes. However, the normal withdrawals from the overburden aquifer by the Town continued during this extended period of aquifer testing.

Conclusions

The aquifer tests that were completed during this hydrogeological investigation, demonstrated that the bedrock wells have the capacity to meet the short term requirements of the proposed fish hatchery. The extended aquifer tests (Figure 8) demonstrated that the bedrock aquifer, or the aquifer that the wells produce from when they are cased through the overburden and drilled into bedrock, contains high permeability zones and that the three bedrock wells (Church Well, Sea Farm Well and the DFA well) are all well connected. The water level in each bedrock well responds rapidly to pumping in the individual wells. The piezometers that were constructed in the overburden showed hydraulic responses to water withdrawal from the bedrock aquifer. These responses confirm that the overburden and bedrock aquifers are interconnected to some degree.

Figure 9 shows the proposed average daily water usage for each month for the proposed fish hatchery. Figure 10 shows the average daily water usage by the Town of St. Alban's for the period of August to November, 2008, including the fish plant, the maximum exploitable daily water volume or available water from the overburden aquifer (2,160 m³/day) as estimated by Morrison Beatty and Associates Ltd. (1990), the average daily water volume that would be required by a town with a population of 1,250 persons, along with the average daily water usage for each month for the proposed fish hatchery.

For the August to November 2008 time period, the Town's usage varied from about 550 to 2,400 m³/day while the actual volume of water needed by the Town based on population statistics is about 500 m³/day. The fish plant requirements have been estimated at 300 to 600 m³/day producing a total Town need for water of approximately 1,100 m³/day. Obviously, fire flows have to be provided from storage (tank and cistern) and overall well capacity. Note that this water is being produced from the overburden aquifer with significant induced infiltration from the Swanger Cove River.

Based on these records, Figure 10 shows that the volume of water that is available, the difference between the Town's average water usage and the Morrison Beatty and Associates Ltd. (1990) estimate of 2,160 m³/day of available water, exceeds that which would be withdrawn by the proposed fish hatchery. It is important to note that Morrison Beatty and Associates Ltd. (1990) did not consider any contribution from the bedrock aquifer. Based on the short term aquifer tests that were completed for this investigation, the bedrock wells can produce in excess of 600 L/min in the short term. Since the bedrock aquifer is a leaky confined aquifer the potential long term yield from bedrock wells is estimated to range from 100 to 600 m³/day. In addition, it is estimated that Swanger Cove area, which is considered to be down gradient of the existing Town well field, is estimated to yield about 15 to 50 m³/day of fresh to brackish water. Finally, it

should be noted that the proposed fish hatchery demand is expected to peak in April of each year, during spring snow melt or run-off.

There are a number of stakeholders that have a vested interest in the potable water that can be developed from the overburden and bedrock aquifers in the Swanger Cove River valley and adjacent areas. These include the town of St. Alban's, the existing fish plant, DFA to service the proposed aquaculture research/service facility, DMA and DOEC with a mandate to protect the existing Town water supply, the proposed fish Hatchery, FFO with a need to ensure that the Swanger Cove River low flows are not reduced, and future industrial developments that might be attracted to establish in the Town of St. Alban's.

It is Fracflow's opinion that the additional water needed to service the proposed fish hatchery exists in the overburden even with the current Town water demands or usage. However, the proposed fish hatchery proposes to draw its water from the bedrock aquifer and part of this water will be obtained by leakage through and from the overburden aquifer. It is clear that the Town's water needs are much less than the current water usage due to leaks in Town's water pipelines. If the leaks are fixed or reduced, an additional volume of potable water, up to 1,000 m³/day, would become available to the stakeholders.

Cold Ocean Salmon Inc. has collected a significant set of data on the bedrock aquifer that can be used to calibrate a future 3D flow and transport model to estimate the long term contribution that the bedrock aquifer can make to the potable water supplies of the area.

References

- Morrison Beatty and Associates Limited, 1990. *Hydrogeological Study of the St. Alban's Well Field Area, St. Alban's, Newfoundland*, Water Resources Report 3-3, Department of Environment and Lands, Water Resources Division, Groundwater Section, Government of Newfoundland and Labrador, 99 p.
- Robinson, J.W., 1986. *Guidelines for Aquifer Pumping Tests*, Water Resources Management Division, Groundwater Section, Department of Environment, Government of Newfoundland and Labrador, 27 p.

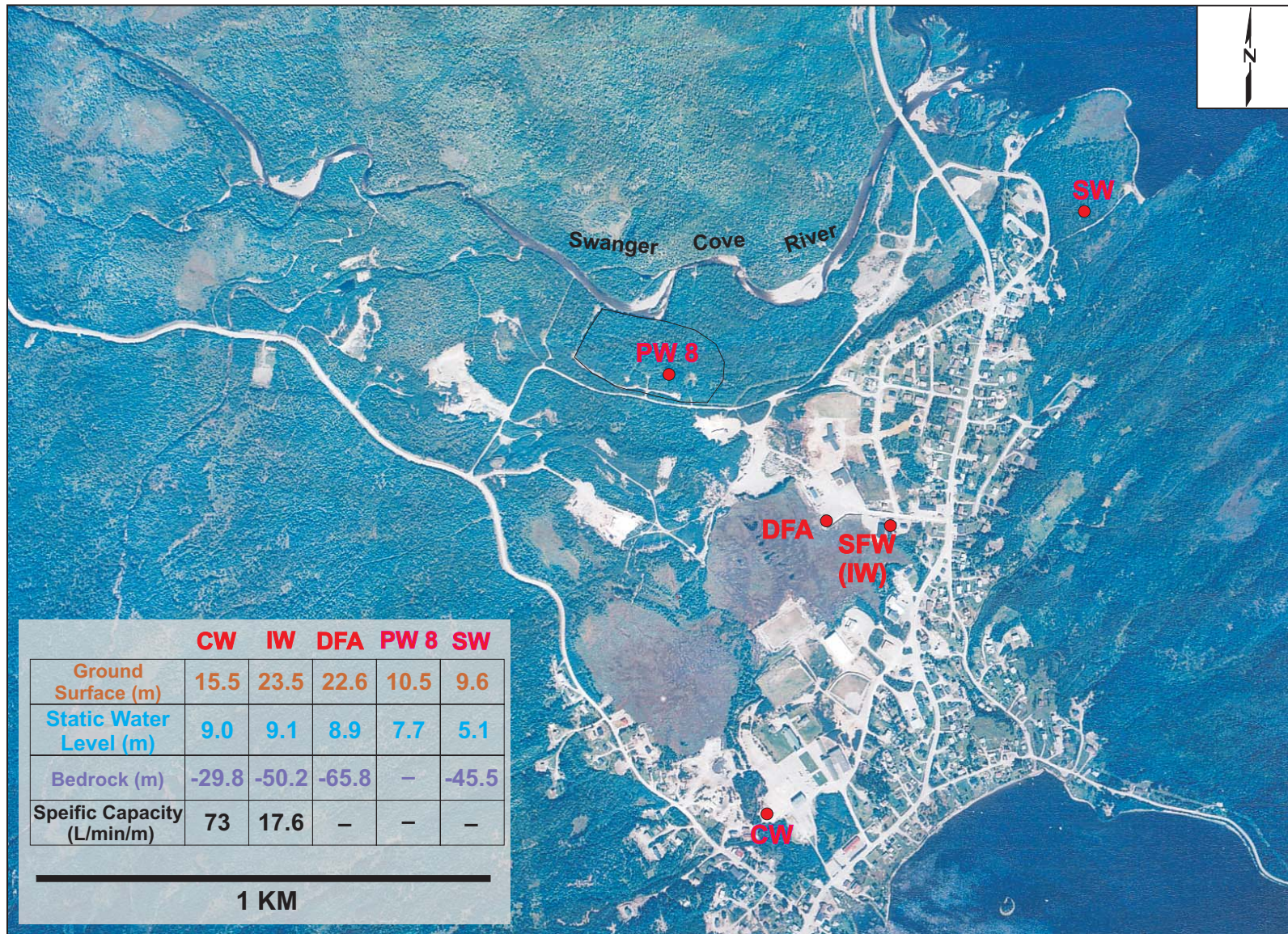



Figure 1 Aerial photograph of part of St. Alban's, NL, showing location of and elevation data for Church Well (CW), Incubator Well (IW) or Sea Farm Well (SFW), DFA well, PW8, and Salt Water Well (SW).

Project No. 500	Scale As Shown	
Location St. Alban's, NL	Date August 2009	

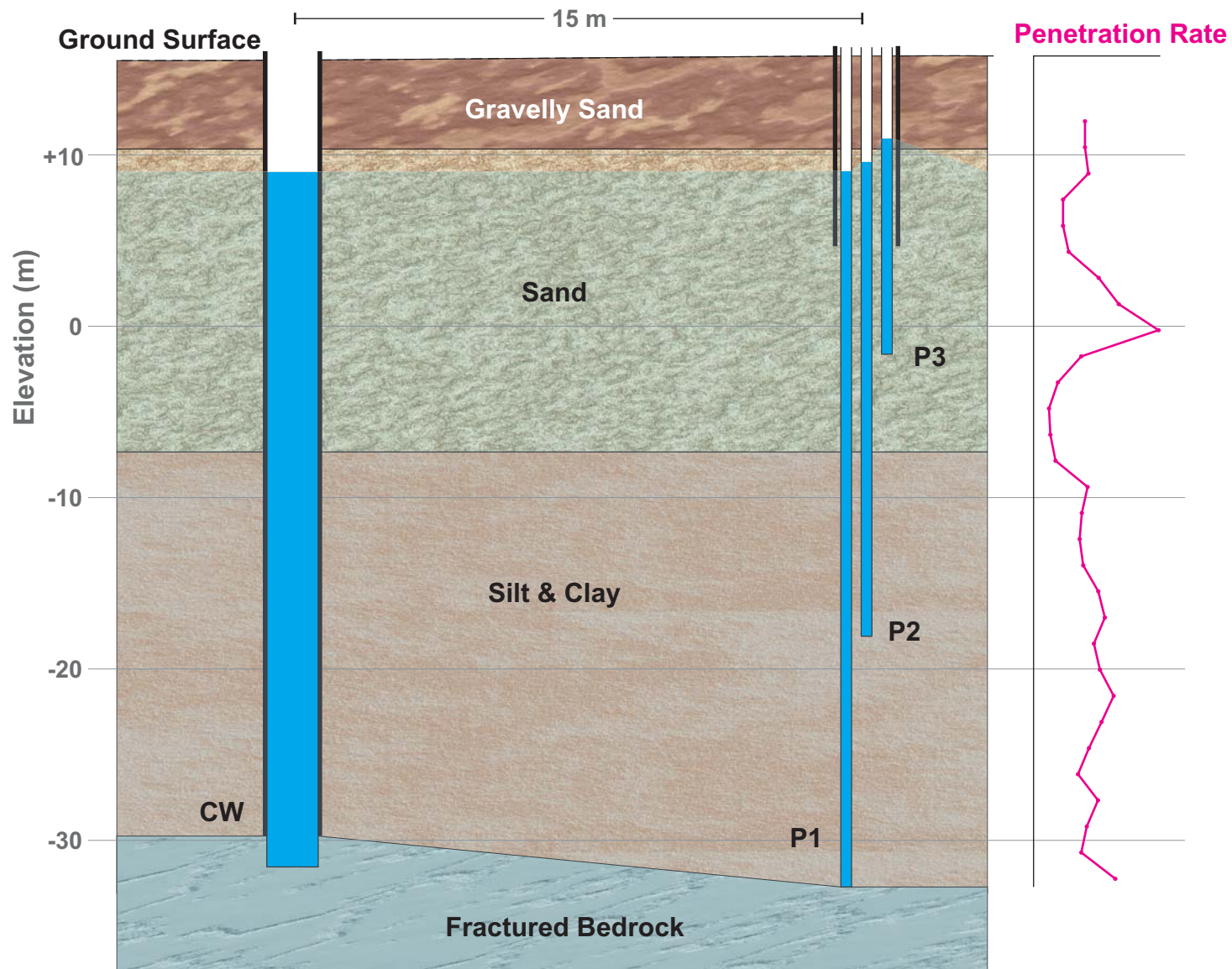



Figure 2 Geological cross-section for the Church Well aquifer.

Project No. 500	Scale As Shown	
Location St. Alban's, NL	Date August 2009	

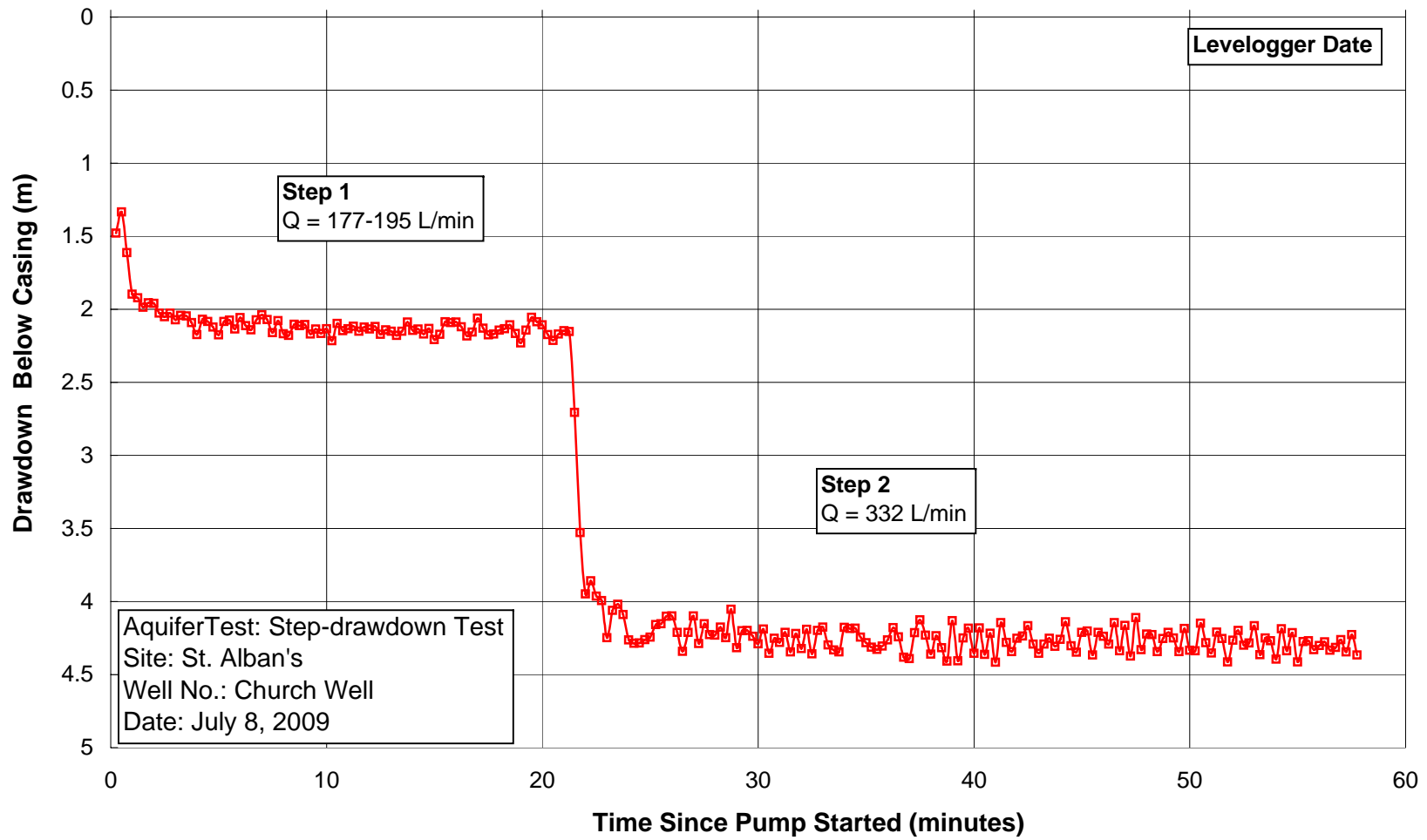


Figure 3 Plot of drawdown versus time for the step drawdown test on Church Well.

Project No. 500	Scale Not To Scale
Location St. Alban's, NL	Date August 2009



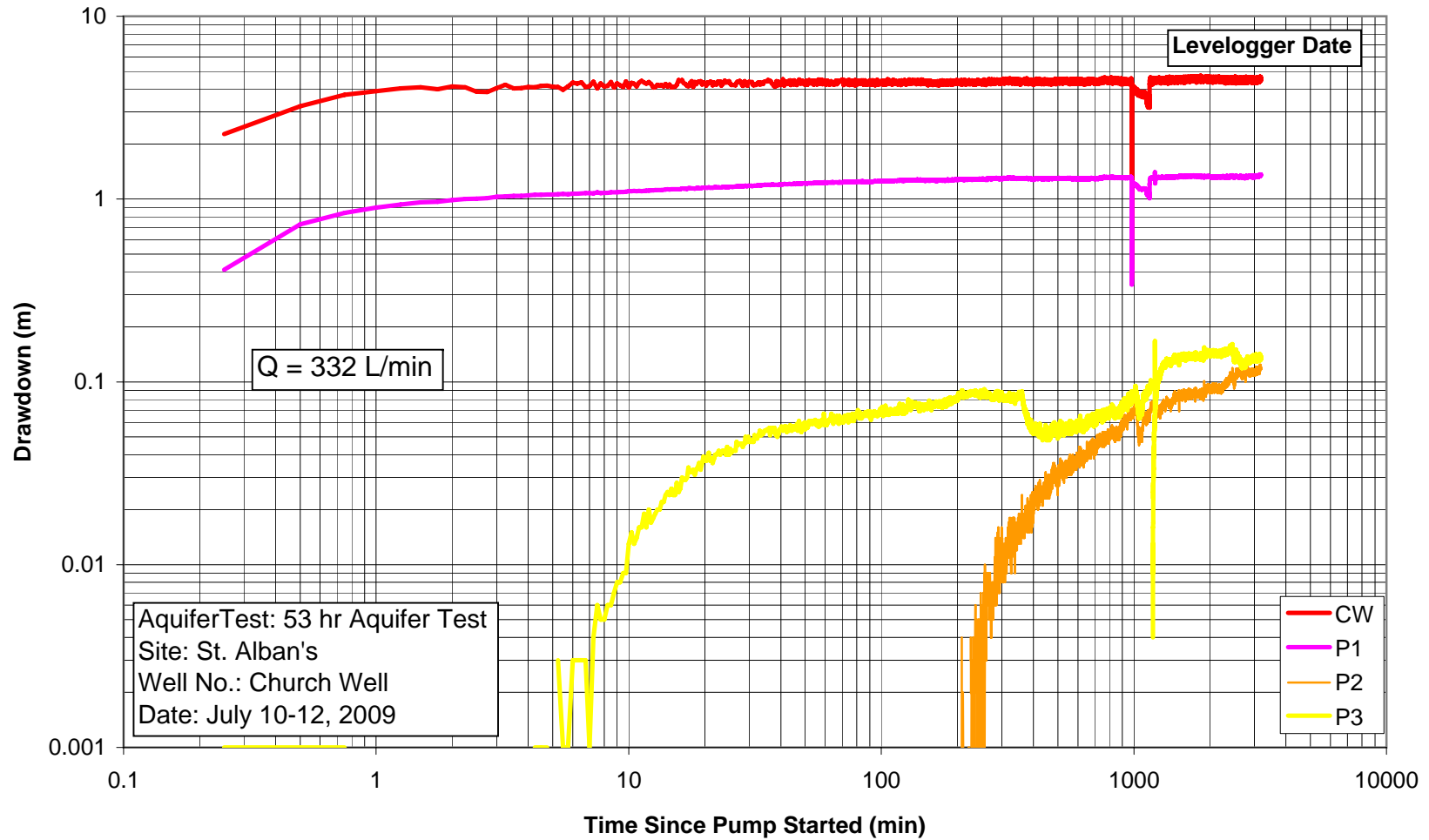


Figure 4 Log-log plot of drawdown versus time for Church Well (CW), CW-P1, CW-P2, and CW-P3 during the 53 hour aquifer test on Church Well (332 L/min).

Project No.
500

Scale
Not To Scale

Location
St. Alban's, NL

Date
August 2009



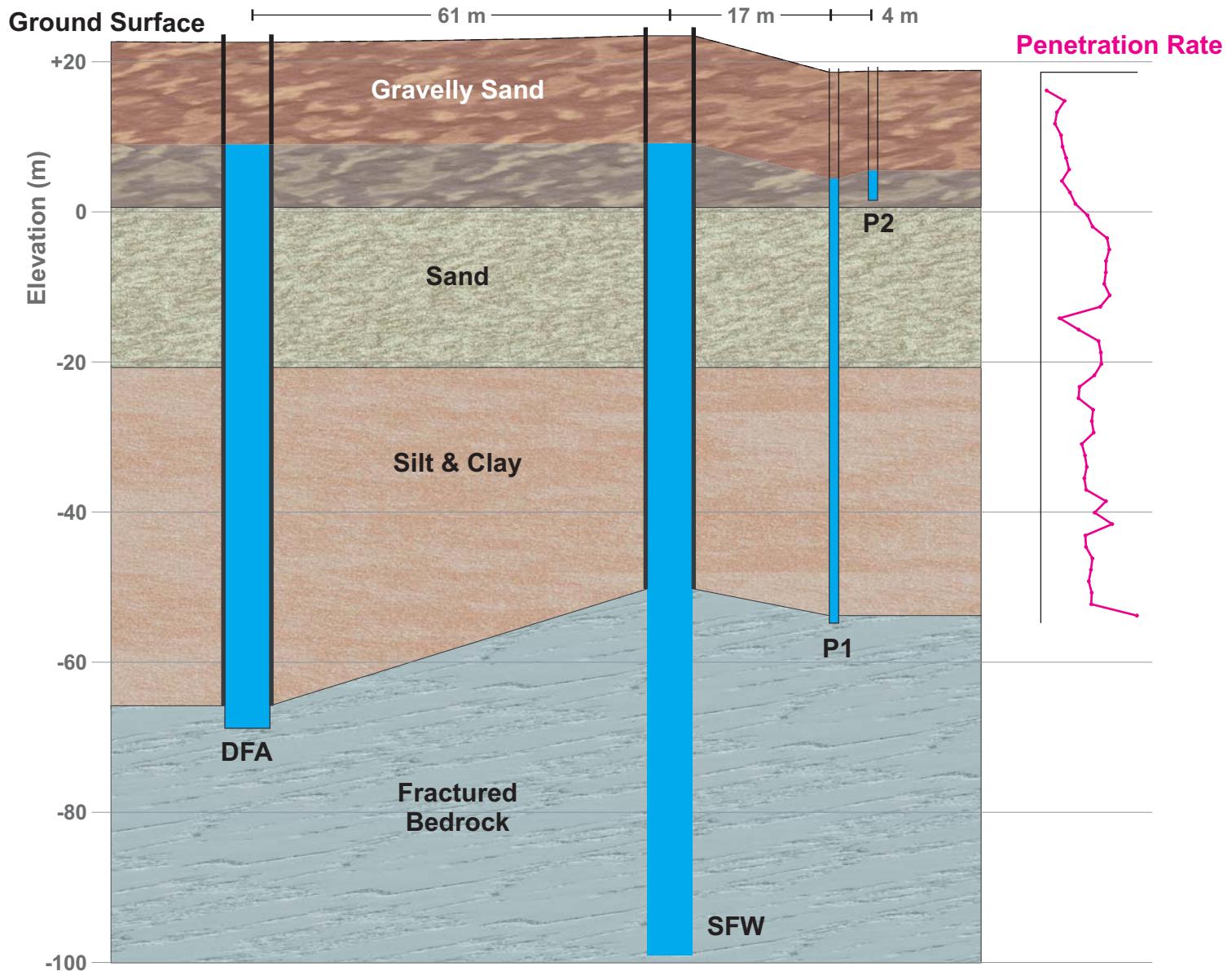



Figure 5 Geological cross-section for the Sea Farm Well aquifer.

Project No. 500	Scale As Shown	
Location St. Alban's, NL	Date August 2009	

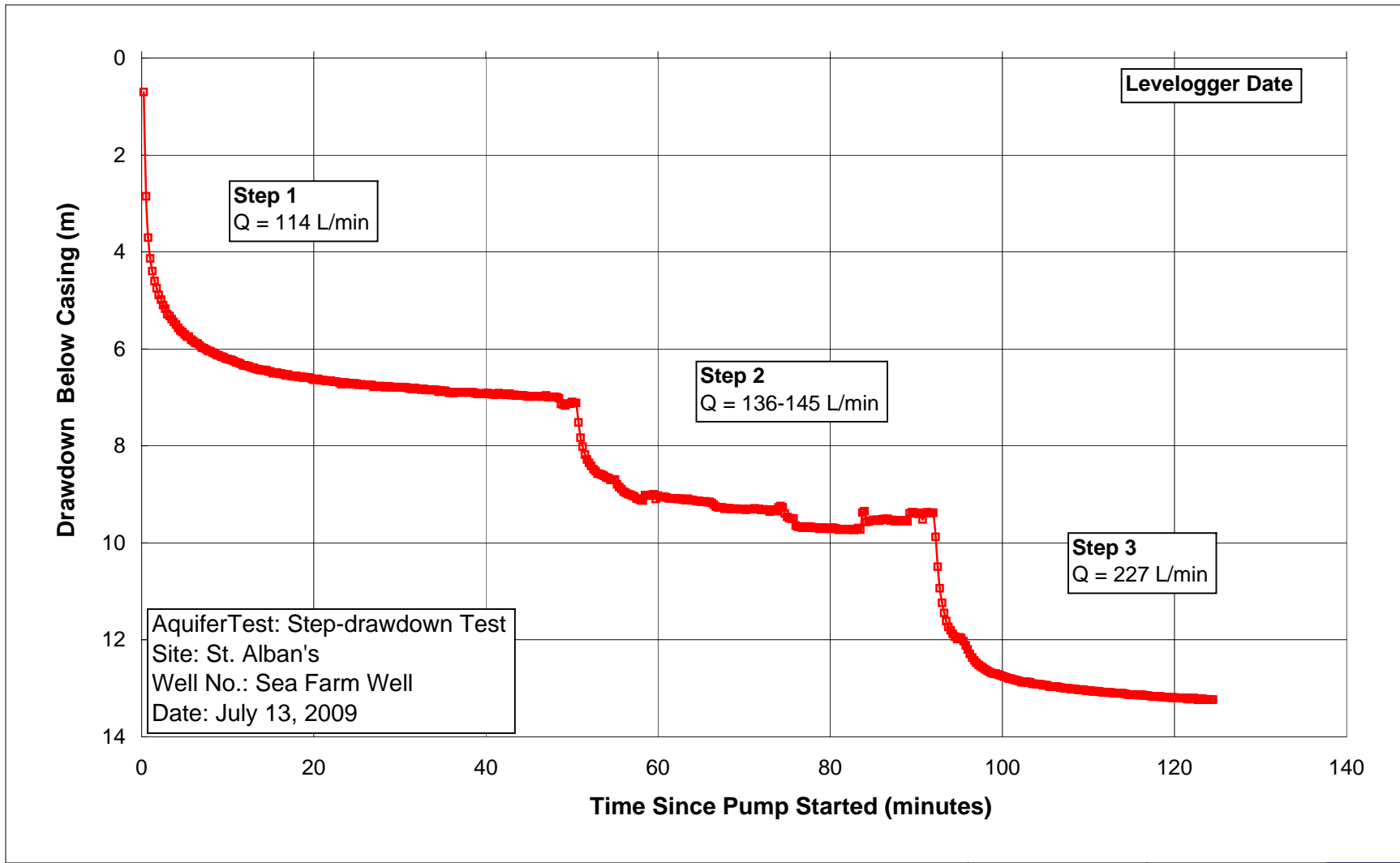


Figure 6 Plot of drawdown versus time for the step drawdown test on Sea Farm Well.

Project No. 500	Scale Not To Scale
Location St. Alban's, NL	Date August 2009



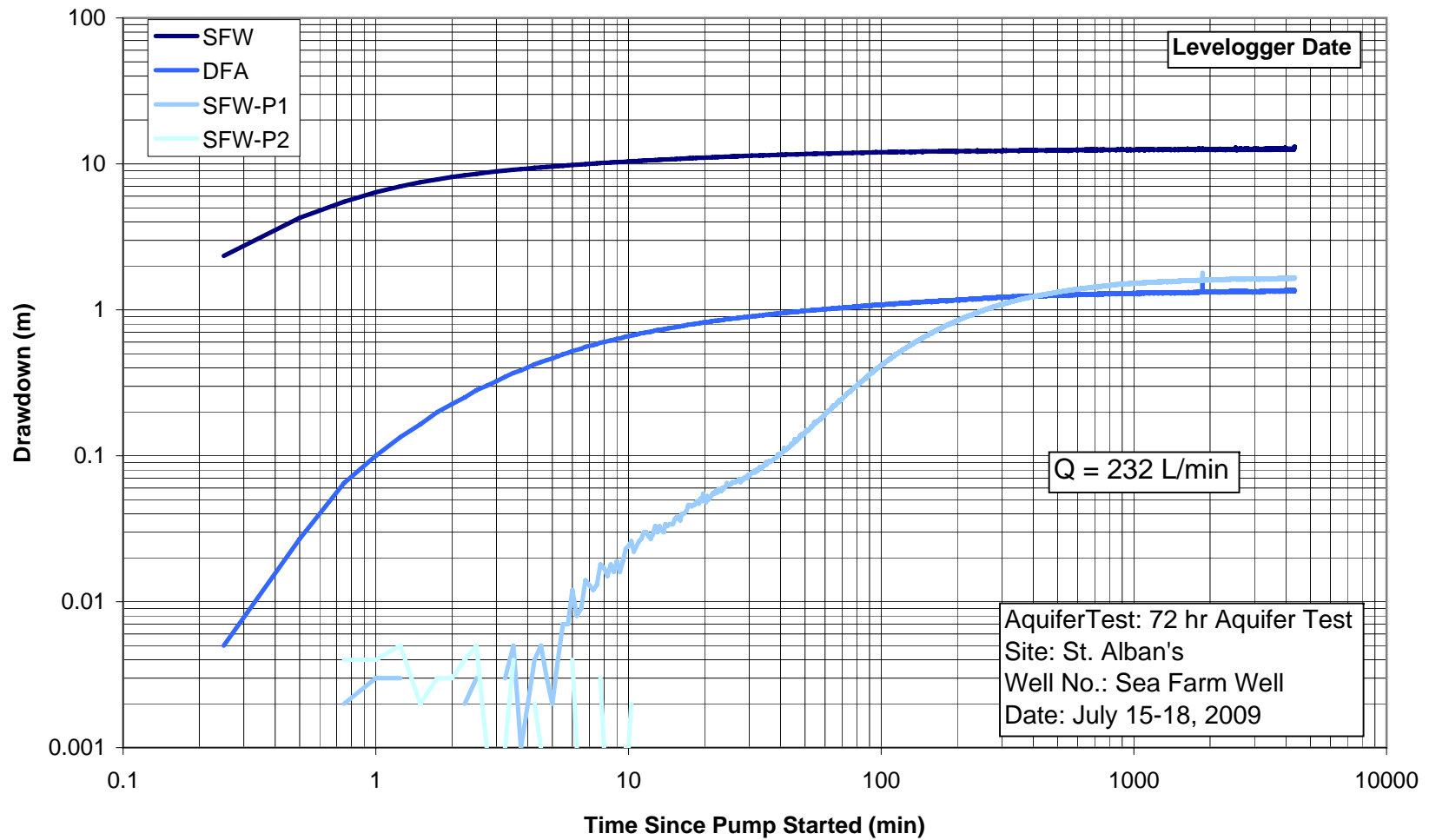
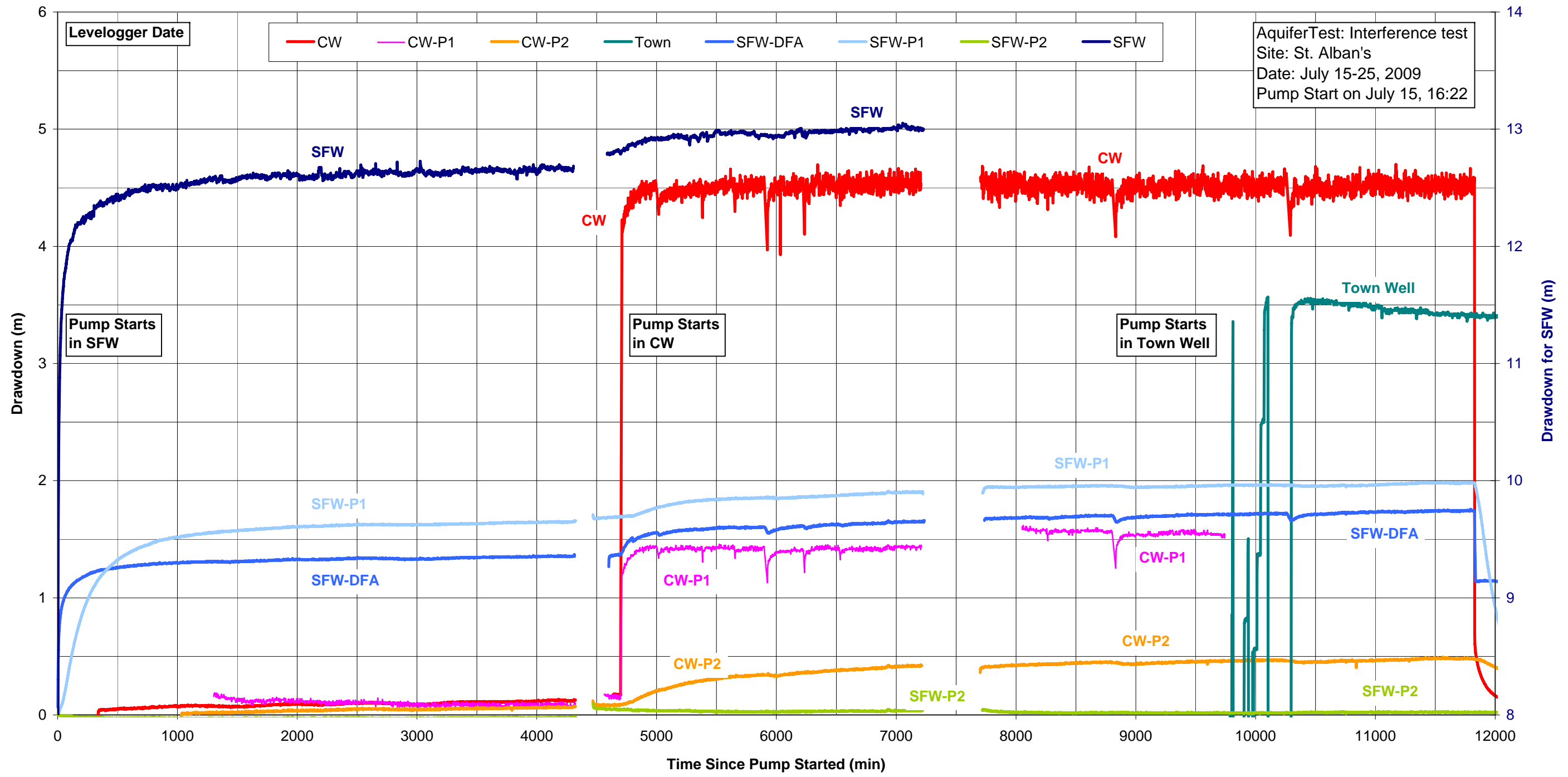


Figure 7 Log-log plot of drawdown versus time for Sea Farm Well (SFW), DFA, SFW-P1, and SFW-P2 during the 72 hour aquifer test on Sea Farm Well (232 L/min).

Project No. 500	Scale Not To Scale
Location St. Alban's, NL	Date August 2009





AquiferTest: Interference test
 Site: St. Alban's
 Date: July 15-25, 2009
 Pump Start on July 15, 16:22

Figure 8 Summary drawdown data for main aquifer tests and interference tests that were completed for this hydrogeological investigation.

Project No. 500	Scale Not To Scale	
Location St. Alban's, NL	Date August 2009	

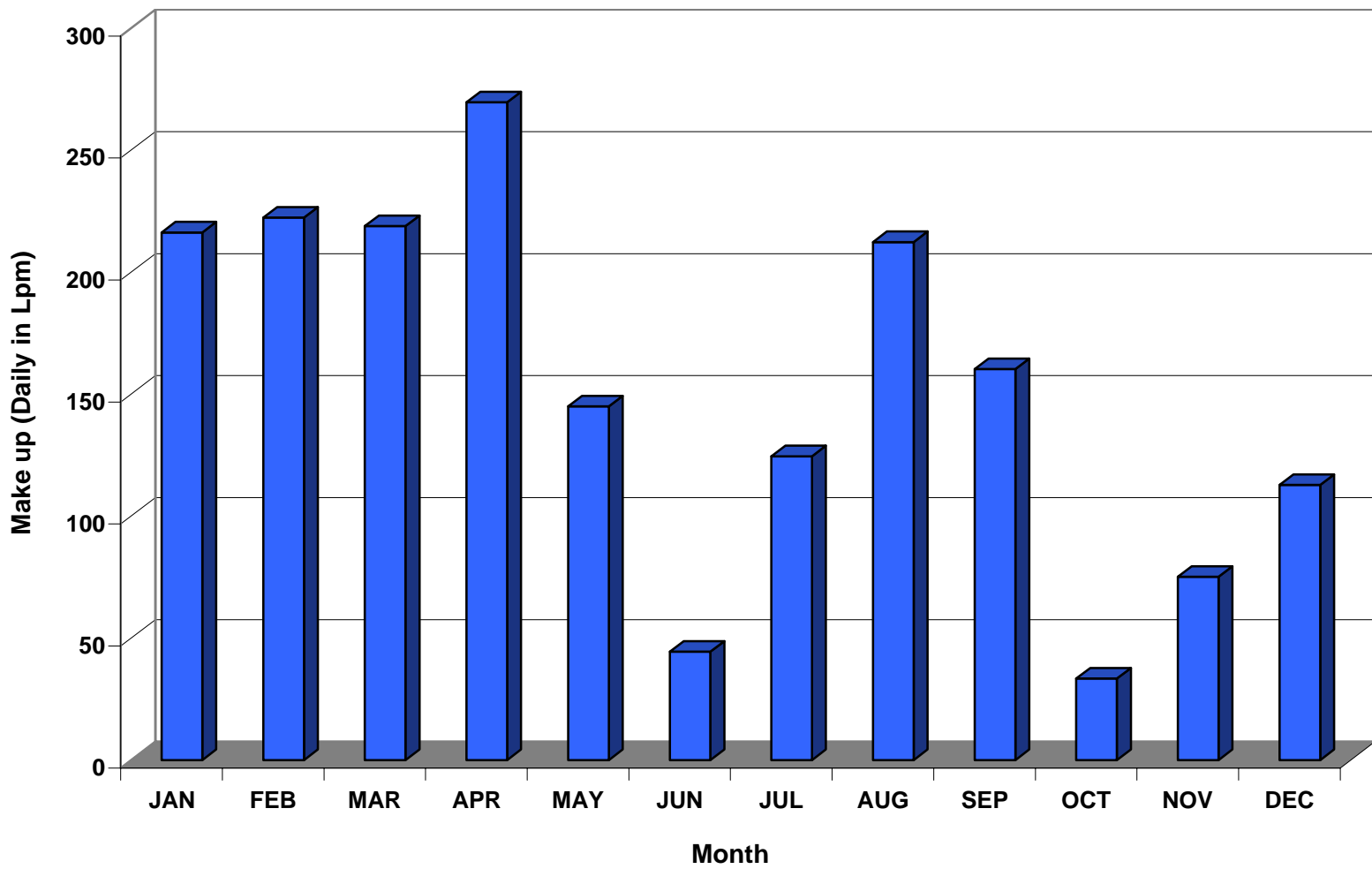


Figure 9 Proposed water usage for new fish hatchery facility, St. Alban's, NL (J. Elliott, personal communication, 2009).

Project No. 500	Scale Not To Scale
Location St. Alban's, NL	Date August 2009



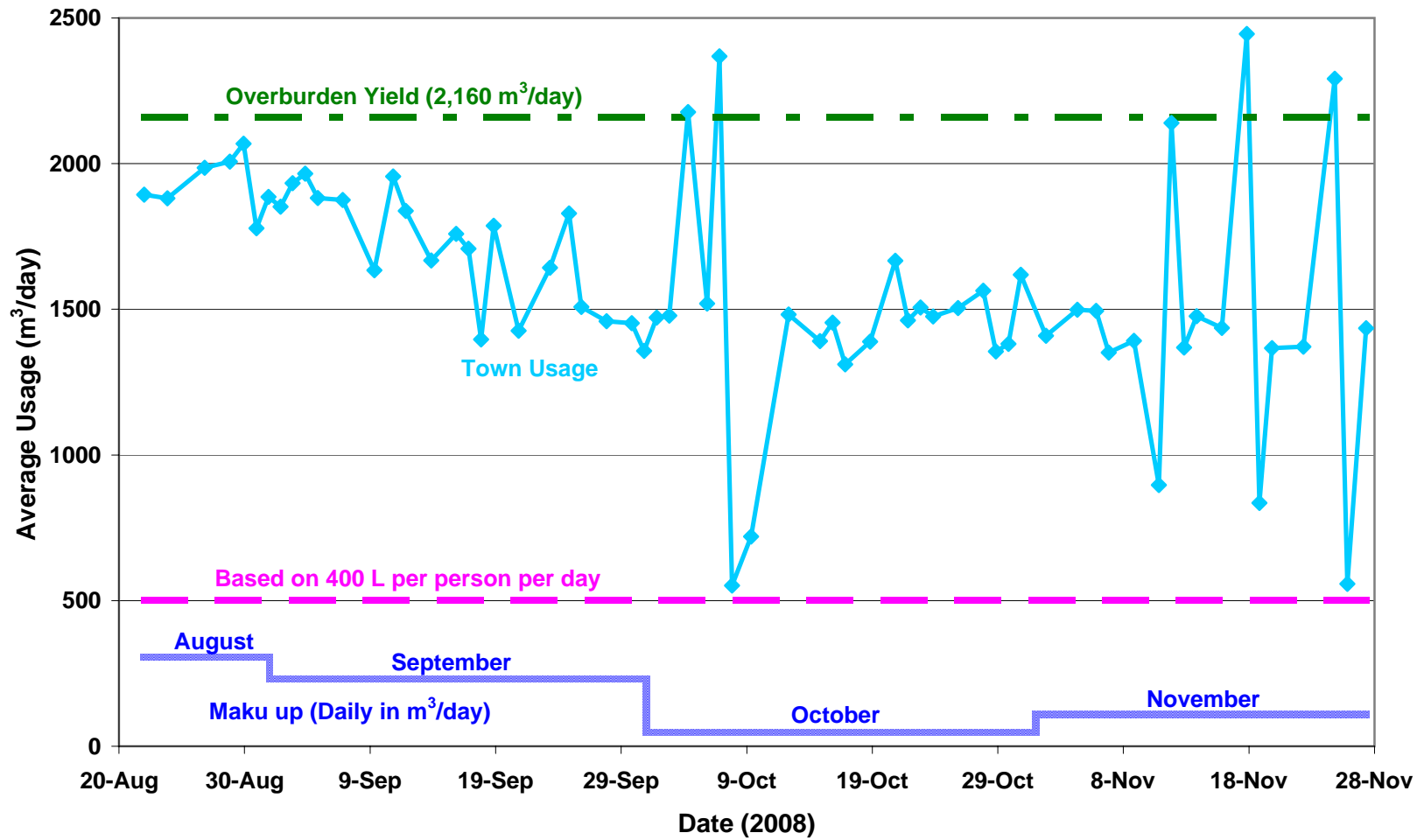


Figure 10 Average town daily water usage, fish hatchery make up water and reference water usage.

Project No. 500	Scale Not To Scale
Location St. Alban's, NL	Date August 2009



APPENDIX A

Water Chemistry

Your P.O. #: 2897
 Your Project #: 500
 Site: ST. ALBAN'S NL
 Your C.O.C. #: 30133

Attention: John Gale
 Fracflow Consultants Inc
 154 Major's Path
 St. John's, NL
 A1A 5A1

Report Date: 2009/08/21

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: A9A4219
Received: 2009/08/12, 10:19

Sample Matrix: Water
 # Samples Received: 7

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Carbonate, Bicarbonate and Hydroxide	2	N/A	2009/08/18		
Alkalinity	2	N/A	2009/08/18	ATL SOP 00013 R4	Based on EPA310.2
Chloride	2	N/A	2009/08/18	ATL SOP 00014 R6	Based on SM4500-Cl-
Colour	2	N/A	2009/08/18	ATL SOP 00020 R3.	Based on SM2120C
Conductance - water	2	N/A	2009/08/18	ATL SOP 00004 R4/00006 R4	Based on SM2510B
Hardness (calculated as CaCO3)	2	N/A	2009/08/18	ATL SOP 00048	Based on SM2340B
Metals Water Total OES - Partial Scan	2	N/A	2009/08/18	ATL SOP 00025 R4	Based on EPA200.7
Metals Water Diss. MS - Low Level	5	N/A	2009/08/20	ATL SOP 00024 R4	Based on EPA6020A
Metals Water Total MS - Low Level	5	N/A	2009/08/21	ATL SOP 00024 R4	Based on EPA6020A
Ion Balance (% Difference)	2	N/A	2009/08/20		
Anion and Cation Sum	2	N/A	2009/08/20		
Nitrogen Ammonia - water	2	N/A	2009/08/19	ATL SOP 00015 R5	Based on USEPA 350.1
Nitrogen - Nitrate + Nitrite	2	N/A	2009/08/18	ATL SOP 00016 R4	Based on USGS - Enz.
pH	2	N/A	2009/08/18	ATL SOP 00003 R5/00005 R6	Based on EPA150.1
Phosphorus - ortho	2	N/A	2009/08/18	ATL SOP 00021 R3	Based on USEPA 365.1
Sat. pH and Langelier Index (@ 20C)	2	N/A	2009/08/20		
Sat. pH and Langelier Index (@ 4C)	2	N/A	2009/08/20		
Reactive Silica	2	N/A	2009/08/18	ATL SOP 00022 R3	Based on EPA 366.0
Sulphate	2	N/A	2009/08/18	ATL SOP 00023 R3	Based on EPA 375.4
Total Dissolved Solids (TDS calc)	2	N/A	2009/08/20		
Organic carbon - Total (TOC)	2	N/A	2009/08/25	ATL SOP 00037 R3	Based on SM5310C
Turbidity	2	N/A	2009/08/19	ATL SOP 00011 R4	based on EPA 180.1

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Your P.O. #: 2897
Your Project #: 500
Site: ST. ALBAN'S NL
Your C.O.C. #: 30133

Attention: John Gale
Fracflow Consultants Inc
154 Major's Path
St. John's, NL
A1A 5A1

Report Date: 2009/08/21

CERTIFICATE OF ANALYSIS

-2-

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

STACY JOSEPH, Project Manager
Email: Stacy.Joseph.Reports@maxxamanalytics.com
Phone# (902) 420-0203

=====
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. SCC and CALA have approved this reporting process and electronic report format.

Total cover pages: 2

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Maxxam Job #: A9A4219
 Report Date: 2009/08/21

Fracflow Consultants Inc
 Client Project #: 500
 Project name: ST. ALBAN'S NL
 Your P.O. #: 2897

RESULTS OF ANALYSES OF WATER

Maxxam ID			DJ3860		
Sampling Date			2009/07/23		
COC Number			30133		
Registration #					
	Units	Criteria A	500-CHURCH WELL-JULY23-09	RDL	QC Batch

Calculated Parameters					
Anion Sum	me/L	-	2.44	N/A	1907060
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	-	94	1	1907056
Calculated TDS	mg/L	-	138	1	1907063
Carb. Alkalinity (calc. as CaCO3)	mg/L	-	ND	1	1907056
Cation Sum	me/L	-	2.33	N/A	1907060
Hardness (CaCO3)	mg/L	-	100	1	1907146
Ion Balance (% Difference)	%	-	2.31	N/A	1907059
Langelier Index (@ 20C)	N/A	-	-0.0270		1907061
Langelier Index (@ 4C)	N/A	-	-0.278		1907062
Saturation pH (@ 20C)	N/A	-	7.88		1907061
Saturation pH (@ 4C)	N/A	-	8.13		1907062
Inorganics					
Total Alkalinity (Total as CaCO3)	mg/L	-	94	5	1909489
Dissolved Chloride (Cl)	mg/L	-	5	1	1909492
Colour	TCU	-	ND	5	1909508
Nitrate + Nitrite	mg/L	-	ND	0.05	1909510
Nitrogen (Ammonia Nitrogen)	mg/L	-	ND	0.05	1911655
Total Organic Carbon (C)	mg/L	-	ND	0.5	1910518
Orthophosphate (P)	mg/L	-	ND	0.01	1909509
pH	pH	6.5 : 9.0	7.85	N/A	1910419
Reactive Silica (SiO2)	mg/L	-	10	0.5	1909503
Dissolved Sulphate (SO4)	mg/L	-	20	2	1909499
Turbidity	NTU	-	0.2	0.1	1911841
Conductivity	uS/cm	-	220	1	1910422

ND = Not detected
 RDL = Reportable Detection Limit
 QC Batch = Quality Control Batch
 Criteria A: Water - CCME Freshwater Aquatic Life
 Canadian Council of ministers of the Environment, "Canadian Water Quality Guidelines for the Protection of Aquatic Life", 2005 (Freshwater Aquatic Life).
 Note: Confirm Criteria B exceedence versus guideline, when Criteria A is not an exceedence, as the guideline is also dependent on other criteria such as Calcium level.

Maxxam Job #: A9A4219
 Report Date: 2009/08/21

Fracflow Consultants Inc
 Client Project #: 500
 Project name: ST. ALBAN'S NL
 Your P.O. #: 2897

RESULTS OF ANALYSES OF WATER

Maxxam ID			DJ3866		
Sampling Date			2009/07/23		
COC Number			30133		
Registration #					
	Units	Criteria A	500-SFW-JULY23-09	RDL	QC Batch

Calculated Parameters					
Anion Sum	me/L	-	2.49	N/A	1907060
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	-	93	1	1907056
Calculated TDS	mg/L	-	143	1	1907063
Carb. Alkalinity (calc. as CaCO3)	mg/L	-	ND	1	1907056
Cation Sum	me/L	-	2.49	N/A	1907060
Hardness (CaCO3)	mg/L	-	98	1	1907146
Ion Balance (% Difference)	%	-	0.00	N/A	1907059
Langelier Index (@ 20C)	N/A	-	0.0790		1907061
Langelier Index (@ 4C)	N/A	-	-0.171		1907062
Saturation pH (@ 20C)	N/A	-	7.91		1907061
Saturation pH (@ 4C)	N/A	-	8.16		1907062
Inorganics					
Total Alkalinity (Total as CaCO3)	mg/L	-	94	5	1909489
Dissolved Chloride (Cl)	mg/L	-	8	1	1909492
Colour	TCU	-	ND	5	1909508
Nitrate + Nitrite	mg/L	-	ND	0.05	1909510
Nitrogen (Ammonia Nitrogen)	mg/L	-	ND	0.05	1911655
Total Organic Carbon (C)	mg/L	-	ND	0.5	1910518
Orthophosphate (P)	mg/L	-	ND	0.01	1909509
pH	pH	6.5 : 9.0	7.99	N/A	1910419
Reactive Silica (SiO2)	mg/L	-	10	0.5	1909503
Dissolved Sulphate (SO4)	mg/L	-	18	2	1909499
Turbidity	NTU	-	0.2	0.1	1911841
Conductivity	uS/cm	-	230	1	1910422

ND = Not detected
 RDL = Reportable Detection Limit
 QC Batch = Quality Control Batch
 Criteria A: Water - CCME Freshwater Aquatic Life
 Canadian Council of ministers of the Environment, "Canadian Water Quality Guidelines for the Protection of Aquatic Life", 2005 (Freshwater Aquatic Life).
 Note: Confirm Criteria B exceedence versus guideline, when Criteria A is not an exceedence, as the guideline is also dependent on other criteria such as Calcium level.

Maxxam Job #: A9A4219
 Report Date: 2009/08/21

Fracflow Consultants Inc
 Client Project #: 500
 Project name: ST. ALBAN'S NL
 Your P.O. #: 2897

ELEMENTS BY ICP-AES (WATER)

Maxxam ID				DJ3860		
Sampling Date				2009/07/23		
COC Number				30133		
Registration #						
	Units	Criteria A	Criteria B	500-CHURCH WELL-JULY23-09	RDL	QC Batch

Metals						
Total Calcium (Ca)	mg/L	-	-	33	0.1	1911362
Total Copper (Cu)	mg/L	0.004	.002 -.004	ND	0.01	1911362
Total Iron (Fe)	mg/L	0.3	-	0.09	0.02	1911362
Total Magnesium (Mg)	mg/L	-	-	5.2	0.1	1911362
Total Manganese (Mn)	mg/L	-	-	0.09	0.01	1911362
Total Potassium (K)	mg/L	-	-	3.3	0.1	1911362
Total Sodium (Na)	mg/L	-	-	5.7	0.1	1911362
Total Zinc (Zn)	mg/L	0.03	-	ND	0.05	1911362

ND = Not detected
 RDL = Reportable Detection Limit
 QC Batch = Quality Control Batch
 Criteria A,Criteria B: Water - CCME Freshwater Aquatic Life
 Canadian Council of ministers of the Environment, "Canadian Water Quality Guidelines for the Protection of Aquatic Life", 2005 (Freshwater Aquatic Life).
 Note: Confirm Criteria B exceedence versus guideline, when Criteria A is not an exceedence, as the guideline is also dependent on other criteria such as Calcium level.

Maxxam Job #: A9A4219
 Report Date: 2009/08/21

Fracflow Consultants Inc
 Client Project #: 500
 Project name: ST. ALBAN'S NL
 Your P.O. #: 2897

ELEMENTS BY ICP-AES (WATER)

Maxxam ID				DJ3866		
Sampling Date				2009/07/23		
COC Number				30133		
Registration #						
	Units	Criteria A	Criteria B	500-SFW-JULY23-09	RDL	QC Batch

Metals						
Total Calcium (Ca)	mg/L	-	-	30	0.1	1911362
Total Copper (Cu)	mg/L	0.004	.002 -.004	ND	0.01	1911362
Total Iron (Fe)	mg/L	0.3	-	0.07	0.02	1911362
Total Magnesium (Mg)	mg/L	-	-	4.3	0.1	1911362
Total Manganese (Mn)	mg/L	-	-	0.04	0.01	1911362
Total Potassium (K)	mg/L	-	-	3.3	0.1	1911362
Total Sodium (Na)	mg/L	-	-	12	0.1	1911362
Total Zinc (Zn)	mg/L	0.03	-	ND	0.05	1911362

ND = Not detected
 RDL = Reportable Detection Limit
 QC Batch = Quality Control Batch
 Criteria A,Criteria B: Water - CCME Freshwater Aquatic Life
 Canadian Council of ministers of the Environment, "Canadian Water Quality Guidelines for the Protection of Aquatic Life", 2005 (Freshwater Aquatic Life).
 Note: Confirm Criteria B exceedence versus guideline, when Criteria A is not an exceedence, as the guideline is also dependent on other criteria such as Calcium level.

Maxxam Job #: A9A4219
 Report Date: 2009/08/21

 Fracflow Consultants Inc
 Client Project #: 500
 Project name: ST. ALBAN'S NL
 Your P.O. #: 2897

ELEMENTS BY ICP/MS (WATER)

Maxxam ID				DJ3831		
Sampling Date				2009/07/11		
COC Number				30133		
Registration #						
	Units	Criteria A	Criteria B	500-CHURCH WELL-24H	RDL	QC Batch

Metals						
Dissolved Aluminum (Al)	ug/L	100	5	ND	5.0	1914377
Total Aluminum (Al)	ug/L	100	5	5.9	5.0	1914385
Dissolved Antimony (Sb)	ug/L	-	-	ND	2.0	1914377
Total Antimony (Sb)	ug/L	-	-	ND	2.0	1914385
Dissolved Arsenic (As)	ug/L	5	-	4.9	2.0	1914377
Total Arsenic (As)	ug/L	5	-	4.7	2.0	1914385
Dissolved Barium (Ba)	ug/L	-	-	ND	5.0	1914377
Total Barium (Ba)	ug/L	-	-	ND	5.0	1914385
Dissolved Beryllium (Be)	ug/L	-	-	ND	2.0	1914377
Total Beryllium (Be)	ug/L	-	-	ND	2.0	1914385
Dissolved Bismuth (Bi)	ug/L	-	-	ND	2.0	1914377
Total Bismuth (Bi)	ug/L	-	-	ND	2.0	1914385
Dissolved Boron (B)	ug/L	-	-	5.1	5.0	1914377
Total Boron (B)	ug/L	-	-	5.8	5.0	1914385
Dissolved Cadmium (Cd)	ug/L	0.017	-	ND	0.017	1914377
Total Cadmium (Cd)	ug/L	0.017	-	ND	0.017	1914385
Dissolved Chromium (Cr)	ug/L	8.9	-	ND	1.0	1914377
Total Chromium (Cr)	ug/L	8.9	-	ND	1.0	1914385
Dissolved Cobalt (Co)	ug/L	-	-	ND	0.40	1914377
Total Cobalt (Co)	ug/L	-	-	ND	0.40	1914385
Dissolved Copper (Cu)	ug/L	4	2	ND	2.0	1914377
Total Copper (Cu)	ug/L	4	2	ND	2.0	1914385
Dissolved Iron (Fe)	ug/L	300	-	67	50	1914377
Total Iron (Fe)	ug/L	300	-	67	50	1914385
Dissolved Lead (Pb)	ug/L	7	1	ND	0.50	1914377
Total Lead (Pb)	ug/L	7	1	ND	0.50	1914385

ND = Not detected

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Criteria A,Criteria B: Water - CCME Freshwater Aquatic Life

Canadian Council of ministers of the Environment, "Canadian Water Quality Guidelines for the Protection of Aquatic Life", 2005 (Freshwater Aquatic Life).

Note: Confirm Criteria B exceedence versus guideline, when Criteria A is not an exceedence, as the guideline is also dependent on other criteria such as Calcium level.

Maxxam Job #: A9A4219
 Report Date: 2009/08/21

Fracflow Consultants Inc
 Client Project #: 500
 Project name: ST. ALBAN'S NL
 Your P.O. #: 2897

ELEMENTS BY ICP/MS (WATER)

Maxxam ID				DJ3831		
Sampling Date				2009/07/11		
COC Number				30133		
Registration #						
	Units	Criteria A	Criteria B	500-CHURCH WELL-24H	RDL	QC Batch

Dissolved Manganese (Mn)	ug/L	-	-	87.3	2.0	1914377
Total Manganese (Mn)	ug/L	-	-	86.6	2.0	1914385
Dissolved Molybdenum (Mo)	ug/L	73	-	ND	2.0	1914377
Total Molybdenum (Mo)	ug/L	73	-	ND	2.0	1914385
Dissolved Nickel (Ni)	ug/L	25	25	ND	2.0	1914377
Total Nickel (Ni)	ug/L	25	25	ND	2.0	1914385
Dissolved Selenium (Se)	ug/L	1	-	ND	1.0	1914377
Total Selenium (Se)	ug/L	1	-	ND	1.0	1914385
Dissolved Silver (Ag)	ug/L	0.1	-	ND	0.10	1914377
Total Silver (Ag)	ug/L	0.1	-	ND	0.10	1914385
Dissolved Strontium (Sr)	ug/L	-	-	138	5.0	1914377
Total Strontium (Sr)	ug/L	-	-	141	5.0	1914385
Dissolved Thallium (Tl)	ug/L	0.8	-	ND	0.10	1914377
Total Thallium (Tl)	ug/L	0.8	-	ND	0.10	1914385
Dissolved Tin (Sn)	ug/L	-	-	ND	2.0	1914377
Total Tin (Sn)	ug/L	-	-	ND	2.0	1914385
Dissolved Titanium (Ti)	ug/L	-	-	ND	2.0	1914377
Total Titanium (Ti)	ug/L	-	-	ND	2.0	1914385
Dissolved Uranium (U)	ug/L	-	-	0.41	0.10	1914377
Total Uranium (U)	ug/L	-	-	0.48	0.10	1914385
Dissolved Vanadium (V)	ug/L	-	-	ND	2.0	1914377
Total Vanadium (V)	ug/L	-	-	ND	2.0	1914385
Dissolved Zinc (Zn)	ug/L	30	-	ND	5.0	1914377
Total Zinc (Zn)	ug/L	30	-	ND	5.0	1914385

ND = Not detected
 RDL = Reportable Detection Limit
 QC Batch = Quality Control Batch
 Criteria A,Criteria B: Water - CCME Freshwater Aquatic Life
 Canadian Council of ministers of the Environment, "Canadian Water Quality Guidelines for the Protection of Aquatic Life", 2005 (Freshwater Aquatic Life).
 Note: Confirm Criteria B exceedence versus guideline, when Criteria A is not an exceedence, as the guideline is also dependent on other criteria such as Calcium level.

Maxxam Job #: A9A4219
 Report Date: 2009/08/21

 Fracflow Consultants Inc
 Client Project #: 500
 Project name: ST. ALBAN'S NL
 Your P.O. #: 2897

ELEMENTS BY ICP/MS (WATER)

Maxxam ID				DJ3841	DJ3842		
Sampling Date				2009/07/12	2009/07/16		
COC Number				30133	30133		
Registration #							
	Units	Criteria A	Criteria B	500-CHURCH WELL-48H	500-SFW-24H	RDL	QC Batch

Metals							
Dissolved Aluminum (Al)	ug/L	100	5	132	6.3	5.0	1914377
Total Aluminum (Al)	ug/L	100	5	7.9	10.8	5.0	1914385
Dissolved Antimony (Sb)	ug/L	-	-	ND	ND	2.0	1914377
Total Antimony (Sb)	ug/L	-	-	ND	ND	2.0	1914385
Dissolved Arsenic (As)	ug/L	5	-	5.1	2.9	2.0	1914377
Total Arsenic (As)	ug/L	5	-	4.7	ND	2.0	1914385
Dissolved Barium (Ba)	ug/L	-	-	ND	ND	5.0	1914377
Total Barium (Ba)	ug/L	-	-	ND	ND	5.0	1914385
Dissolved Beryllium (Be)	ug/L	-	-	ND	ND	2.0	1914377
Total Beryllium (Be)	ug/L	-	-	ND	ND	2.0	1914385
Dissolved Bismuth (Bi)	ug/L	-	-	ND	ND	2.0	1914377
Total Bismuth (Bi)	ug/L	-	-	ND	ND	2.0	1914385
Dissolved Boron (B)	ug/L	-	-	5.2	7.0	5.0	1914377
Total Boron (B)	ug/L	-	-	5.4	6.8	5.0	1914385
Dissolved Cadmium (Cd)	ug/L	0.017	-	ND	ND	0.017	1914377
Total Cadmium (Cd)	ug/L	0.017	-	ND	ND	0.017	1914385
Dissolved Chromium (Cr)	ug/L	8.9	-	ND	ND	1.0	1914377
Total Chromium (Cr)	ug/L	8.9	-	ND	ND	1.0	1914385
Dissolved Cobalt (Co)	ug/L	-	-	ND	ND	0.40	1914377
Total Cobalt (Co)	ug/L	-	-	ND	ND	0.40	1914385
Dissolved Copper (Cu)	ug/L	4	2	ND	ND	2.0	1914377
Total Copper (Cu)	ug/L	4	2	ND	2.1	2.0	1914385
Dissolved Iron (Fe)	ug/L	300	-	102	ND	50	1914377
Total Iron (Fe)	ug/L	300	-	70	ND	50	1914385
Dissolved Lead (Pb)	ug/L	7	1	ND	ND	0.50	1914377
Total Lead (Pb)	ug/L	7	1	ND	ND	0.50	1914385

ND = Not detected
 RDL = Reportable Detection Limit
 QC Batch = Quality Control Batch
 Criteria A, Criteria B: Water - CCME Freshwater Aquatic Life
 Canadian Council of ministers of the Environment, "Canadian Water Quality Guidelines for the Protection of Aquatic Life", 2005 (Freshwater Aquatic Life).
 Note: Confirm Criteria B exceedence versus guideline, when Criteria A is not an exceedence, as the guideline is also dependent on other criteria such as Calcium level.

Maxxam Job #: A9A4219
 Report Date: 2009/08/21

Fracflow Consultants Inc
 Client Project #: 500
 Project name: ST. ALBAN'S NL
 Your P.O. #: 2897

ELEMENTS BY ICP/MS (WATER)

Maxxam ID				DJ3841	DJ3842		
Sampling Date				2009/07/12	2009/07/16		
COC Number				30133	30133		
Registration #							
	Units	Criteria A	Criteria B	500-CHURCH WELL-48H	500-SFW-24H	RDL	QC Batch

Dissolved Manganese (Mn)	ug/L	-	-	88.7	34.4	2.0	1914377
Total Manganese (Mn)	ug/L	-	-	90.4	27.3	2.0	1914385
Dissolved Molybdenum (Mo)	ug/L	73	-	ND	ND	2.0	1914377
Total Molybdenum (Mo)	ug/L	73	-	ND	ND	2.0	1914385
Dissolved Nickel (Ni)	ug/L	25	25	ND	ND	2.0	1914377
Total Nickel (Ni)	ug/L	25	25	ND	ND	2.0	1914385
Dissolved Selenium (Se)	ug/L	1	-	ND	ND	1.0	1914377
Total Selenium (Se)	ug/L	1	-	ND	ND	1.0	1914385
Dissolved Silver (Ag)	ug/L	0.1	-	ND	ND	0.10	1914377
Total Silver (Ag)	ug/L	0.1	-	ND	ND	0.10	1914385
Dissolved Strontium (Sr)	ug/L	-	-	140	124	5.0	1914377
Total Strontium (Sr)	ug/L	-	-	146	126	5.0	1914385
Dissolved Thallium (Tl)	ug/L	0.8	-	ND	ND	0.10	1914377
Total Thallium (Tl)	ug/L	0.8	-	ND	ND	0.10	1914385
Dissolved Tin (Sn)	ug/L	-	-	ND	ND	2.0	1914377
Total Tin (Sn)	ug/L	-	-	ND	ND	2.0	1914385
Dissolved Titanium (Ti)	ug/L	-	-	ND	ND	2.0	1914377
Total Titanium (Ti)	ug/L	-	-	ND	ND	2.0	1914385
Dissolved Uranium (U)	ug/L	-	-	0.49	0.26	0.10	1914377
Total Uranium (U)	ug/L	-	-	0.48	0.32	0.10	1914385
Dissolved Vanadium (V)	ug/L	-	-	ND	ND	2.0	1914377
Total Vanadium (V)	ug/L	-	-	ND	ND	2.0	1914385
Dissolved Zinc (Zn)	ug/L	30	-	ND	7.3	5.0	1914377
Total Zinc (Zn)	ug/L	30	-	ND	5.4	5.0	1914385

ND = Not detected
 RDL = Reportable Detection Limit
 QC Batch = Quality Control Batch
 Criteria A,Criteria B: Water - CCME Freshwater Aquatic Life
 Canadian Council of ministers of the Environment, "Canadian Water Quality Guidelines for the Protection of Aquatic Life", 2005 (Freshwater Aquatic Life).
 Note: Confirm Criteria B exceedence versus guideline, when Criteria A is not an exceedence, as the guideline is also dependent on other criteria such as Calcium level.

Maxxam Job #: A9A4219
 Report Date: 2009/08/21

 Fracflow Consultants Inc
 Client Project #: 500
 Project name: ST. ALBAN'S NL
 Your P.O. #: 2897

ELEMENTS BY ICP/MS (WATER)

Maxxam ID				DJ3843	DJ3844		
Sampling Date				2009/07/17	2009/07/18		
COC Number				30133	30133		
Registration #							
	Units	Criteria A	Criteria B	500-SFW-48H	500-SFW-72H	RDL	QC Batch

Metals							
Dissolved Aluminum (Al)	ug/L	100	5	ND	9.6	5.0	1914377
Total Aluminum (Al)	ug/L	100	5	5.8	ND	5.0	1914385
Dissolved Antimony (Sb)	ug/L	-	-	ND	ND	2.0	1914377
Total Antimony (Sb)	ug/L	-	-	ND	ND	2.0	1914385
Dissolved Arsenic (As)	ug/L	5	-	3.1	3.3	2.0	1914377
Total Arsenic (As)	ug/L	5	-	3.1	2.9	2.0	1914385
Dissolved Barium (Ba)	ug/L	-	-	ND	ND	5.0	1914377
Total Barium (Ba)	ug/L	-	-	ND	ND	5.0	1914385
Dissolved Beryllium (Be)	ug/L	-	-	ND	ND	2.0	1914377
Total Beryllium (Be)	ug/L	-	-	ND	ND	2.0	1914385
Dissolved Bismuth (Bi)	ug/L	-	-	ND	ND	2.0	1914377
Total Bismuth (Bi)	ug/L	-	-	ND	ND	2.0	1914385
Dissolved Boron (B)	ug/L	-	-	6.9	6.6	5.0	1914377
Total Boron (B)	ug/L	-	-	8.0	7.7	5.0	1914385
Dissolved Cadmium (Cd)	ug/L	0.017	-	ND	ND	0.017	1914377
Total Cadmium (Cd)	ug/L	0.017	-	ND	ND	0.017	1914385
Dissolved Chromium (Cr)	ug/L	8.9	-	ND	ND	1.0	1914377
Total Chromium (Cr)	ug/L	8.9	-	ND	ND	1.0	1914385
Dissolved Cobalt (Co)	ug/L	-	-	ND	ND	0.40	1914377
Total Cobalt (Co)	ug/L	-	-	ND	ND	0.40	1914385
Dissolved Copper (Cu)	ug/L	4	2	ND	ND	2.0	1914377
Total Copper (Cu)	ug/L	4	2	ND	ND	2.0	1914385
Dissolved Iron (Fe)	ug/L	300	-	ND	ND	50	1914377
Total Iron (Fe)	ug/L	300	-	ND	ND	50	1914385
Dissolved Lead (Pb)	ug/L	7	1	ND	ND	0.50	1914377
Total Lead (Pb)	ug/L	7	1	ND	ND	0.50	1914385
Dissolved Manganese (Mn)	ug/L	-	-	34.2	34.6	2.0	1914377

ND = Not detected
 RDL = Reportable Detection Limit
 QC Batch = Quality Control Batch
 Criteria A, Criteria B: Water - CCME Freshwater Aquatic Life
 Canadian Council of ministers of the Environment, "Canadian Water Quality Guidelines for the Protection of Aquatic Life", 2005 (Freshwater Aquatic Life).
 Note: Confirm Criteria B exceedence versus guideline, when Criteria A is not an exceedence, as the guideline is also dependent on other criteria such as Calcium level.

Maxxam Job #: A9A4219
 Report Date: 2009/08/21

Fracflow Consultants Inc
 Client Project #: 500
 Project name: ST. ALBAN'S NL
 Your P.O. #: 2897

ELEMENTS BY ICP/MS (WATER)

Maxxam ID				DJ3843	DJ3844		
Sampling Date				2009/07/17	2009/07/18		
COC Number				30133	30133		
Registration #							
	Units	Criteria A	Criteria B	500-SFW-48H	500-SFW-72H	RDL	QC Batch

Total Manganese (Mn)	ug/L	-	-	34.6	33.3	2.0	1914385
Dissolved Molybdenum (Mo)	ug/L	73	-	ND	ND	2.0	1914377
Total Molybdenum (Mo)	ug/L	73	-	ND	ND	2.0	1914385
Dissolved Nickel (Ni)	ug/L	25	25	ND	ND	2.0	1914377
Total Nickel (Ni)	ug/L	25	25	ND	ND	2.0	1914385
Dissolved Selenium (Se)	ug/L	1	-	ND	ND	1.0	1914377
Total Selenium (Se)	ug/L	1	-	ND	ND	1.0	1914385
Dissolved Silver (Ag)	ug/L	0.1	-	ND	ND	0.10	1914377
Total Silver (Ag)	ug/L	0.1	-	ND	ND	0.10	1914385
Dissolved Strontium (Sr)	ug/L	-	-	121	124	5.0	1914377
Total Strontium (Sr)	ug/L	-	-	132	127	5.0	1914385
Dissolved Thallium (Tl)	ug/L	0.8	-	ND	ND	0.10	1914377
Total Thallium (Tl)	ug/L	0.8	-	ND	ND	0.10	1914385
Dissolved Tin (Sn)	ug/L	-	-	ND	ND	2.0	1914377
Total Tin (Sn)	ug/L	-	-	ND	ND	2.0	1914385
Dissolved Titanium (Ti)	ug/L	-	-	ND	ND	2.0	1914377
Total Titanium (Ti)	ug/L	-	-	ND	ND	2.0	1914385
Dissolved Uranium (U)	ug/L	-	-	0.25	0.26	0.10	1914377
Total Uranium (U)	ug/L	-	-	0.28	0.27	0.10	1914385
Dissolved Vanadium (V)	ug/L	-	-	ND	ND	2.0	1914377
Total Vanadium (V)	ug/L	-	-	ND	ND	2.0	1914385
Dissolved Zinc (Zn)	ug/L	30	-	ND	20.2	5.0	1914377
Total Zinc (Zn)	ug/L	30	-	ND	ND	5.0	1914385

ND = Not detected
 RDL = Reportable Detection Limit
 QC Batch = Quality Control Batch
 Criteria A,Criteria B: Water - CCME Freshwater Aquatic Life
 Canadian Council of ministers of the Environment, "Canadian Water Quality Guidelines for the Protection of Aquatic Life", 2005 (Freshwater Aquatic Life).
 Note: Confirm Criteria B exceedence versus guideline, when Criteria A is not an exceedence, as the guideline is also dependent on other criteria such as Calcium level.

Maxxam Job #: A9A4219
Report Date: 2009/08/21

Fracflow Consultants Inc
Client Project #: 500
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GENERAL COMMENTS

Sample DJ3841-01: Poor Total vs Dissolved agreement for Aluminum verified by repeat analysis.

Results relate only to the items tested.

Fracflow Consultants Inc
 Attention: John Gale
 Client Project #: 500
 P.O. #: 2897
 Project name: ST. ALBAN'S NL

Quality Assurance Report
 Maxxam Job Number: DA9A4219

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
1909489 MCN	Matrix Spike	Total Alkalinity (Total as CaCO3)	2009/08/18		NC	%	80 - 120
	QC Standard	Total Alkalinity (Total as CaCO3)	2009/08/18		106	%	80 - 120
	Spiked Blank	Total Alkalinity (Total as CaCO3)	2009/08/18		109	%	80 - 120
	Method Blank	Total Alkalinity (Total as CaCO3)	2009/08/18	ND, RDL=5		mg/L	
	RPD	Total Alkalinity (Total as CaCO3)	2009/08/18	NC		%	25
1909492 JOA	Matrix Spike	Dissolved Chloride (Cl)	2009/08/18		104	%	80 - 120
	QC Standard	Dissolved Chloride (Cl)	2009/08/18		102	%	80 - 120
	Spiked Blank	Dissolved Chloride (Cl)	2009/08/18		105	%	80 - 120
	Method Blank	Dissolved Chloride (Cl)	2009/08/18	ND, RDL=1		mg/L	
	RPD	Dissolved Chloride (Cl)	2009/08/18	NC		%	25
1909499 SMT	Matrix Spike	Dissolved Sulphate (SO4)	2009/08/18		109	%	80 - 120
	QC Standard	Dissolved Sulphate (SO4)	2009/08/18		109	%	80 - 120
	Spiked Blank	Dissolved Sulphate (SO4)	2009/08/18		108	%	80 - 120
	Method Blank	Dissolved Sulphate (SO4)	2009/08/18	ND, RDL=2		mg/L	
	RPD	Dissolved Sulphate (SO4)	2009/08/18	NC		%	25
1909503 MCN	Matrix Spike	Reactive Silica (SiO2)	2009/08/18		NC	%	80 - 120
	QC Standard	Reactive Silica (SiO2)	2009/08/18		99	%	75 - 125
	Spiked Blank	Reactive Silica (SiO2)	2009/08/18		98	%	80 - 120
	Method Blank	Reactive Silica (SiO2)	2009/08/18	ND, RDL=0.5		mg/L	
	RPD	Reactive Silica (SiO2)	2009/08/18	0.5		%	25
1909508 MCN	QC Standard	Colour	2009/08/18		104	%	80 - 120
	Method Blank	Colour	2009/08/18	ND, RDL=5		TCU	
	RPD	Colour	2009/08/18	NC		%	25
1909509 JOA	Matrix Spike	Orthophosphate (P)	2009/08/18		NC	%	80 - 120
	QC Standard	Orthophosphate (P)	2009/08/18		96	%	80 - 120
	Spiked Blank	Orthophosphate (P)	2009/08/18		95	%	80 - 120
	Method Blank	Orthophosphate (P)	2009/08/18	ND, RDL=0.01		mg/L	
	RPD	Orthophosphate (P)	2009/08/18	1.6		%	25
1909510 SMT	Matrix Spike	Nitrate + Nitrite	2009/08/18		101	%	80 - 120
	QC Standard	Nitrate + Nitrite	2009/08/18		101	%	80 - 120
	Spiked Blank	Nitrate + Nitrite	2009/08/18		102	%	80 - 120
	Method Blank	Nitrate + Nitrite	2009/08/18	ND, RDL=0.05		mg/L	
	RPD	Nitrate + Nitrite	2009/08/18	NC		%	25
1910419 ARS	QC Standard	pH	2009/08/18		100	%	80 - 120
	Method Blank	pH	2009/08/18	6.23, RDL=0		pH	
	RPD	pH	2009/08/18	1.4		%	25
1910422 ARS	QC Standard	Conductivity	2009/08/18		102	%	80 - 120
	Method Blank	Conductivity	2009/08/18	ND, RDL=1		uS/cm	
	RPD	Conductivity	2009/08/18	5.4		%	25
1910518 BMM	Matrix Spike	Total Organic Carbon (C)	2009/08/25		97	%	75 - 125
	QC Standard	Total Organic Carbon (C)	2009/08/18		104	%	80 - 120
	Spiked Blank	Total Organic Carbon (C)	2009/08/25		102	%	75 - 125
	RPD	Total Organic Carbon (C)	2009/08/25	NC		%	25
1911362 SSI	Matrix Spike	Total Calcium (Ca)	2009/08/18		92	%	80 - 120
		Total Copper (Cu)	2009/08/18		96	%	80 - 120
		Total Iron (Fe)	2009/08/18		93	%	80 - 120
		Total Magnesium (Mg)	2009/08/18		92	%	80 - 120
		Total Manganese (Mn)	2009/08/18		95	%	80 - 120
		Total Potassium (K)	2009/08/18		101	%	80 - 120
		Total Sodium (Na)	2009/08/18		101	%	80 - 120
		Total Zinc (Zn)	2009/08/18		94	%	80 - 120
	QC Standard	Total Calcium (Ca)	2009/08/18		99	%	80 - 120
		Total Copper (Cu)	2009/08/18		106	%	80 - 120
		Total Iron (Fe)	2009/08/18		99	%	80 - 120
		Total Magnesium (Mg)	2009/08/18		96	%	80 - 120

Fracflow Consultants Inc
 Attention: John Gale
 Client Project #: 500
 P.O. #: 2897
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Quality Assurance Report (Continued)

Maxxam Job Number: DA9A4219

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits	
1911362 SSI	QC Standard	Total Manganese (Mn)	2009/08/18		99	%	80 - 120	
		Total Potassium (K)	2009/08/18		103	%	80 - 120	
		Total Sodium (Na)	2009/08/18		102	%	80 - 120	
		Total Zinc (Zn)	2009/08/18		96	%	80 - 120	
	Spiked Blank	Total Calcium (Ca)	2009/08/18		92	%	80 - 120	
		Total Copper (Cu)	2009/08/18		94	%	80 - 120	
		Total Iron (Fe)	2009/08/18		92	%	80 - 120	
		Total Magnesium (Mg)	2009/08/18		94	%	80 - 120	
		Total Manganese (Mn)	2009/08/18		94	%	80 - 120	
		Total Potassium (K)	2009/08/18		100	%	80 - 120	
	Method Blank	Total Sodium (Na)	2009/08/18		99	%	80 - 120	
		Total Zinc (Zn)	2009/08/18		93	%	80 - 120	
		Total Calcium (Ca)	2009/08/18	ND, RDL=0.1		mg/L		
		Total Copper (Cu)	2009/08/18	ND, RDL=0.01		mg/L		
		Total Iron (Fe)	2009/08/18	ND, RDL=0.02		mg/L		
		Total Magnesium (Mg)	2009/08/18	ND, RDL=0.1		mg/L		
		Total Manganese (Mn)	2009/08/18	ND, RDL=0.01		mg/L		
		Total Potassium (K)	2009/08/18	ND, RDL=0.1		mg/L		
	RPD	Total Sodium (Na)	2009/08/18	ND, RDL=0.1		mg/L		
		Total Zinc (Zn)	2009/08/18	ND, RDL=0.05		mg/L		
Total Calcium (Ca)		2009/08/18	0.8		%	25		
Total Magnesium (Mg)		2009/08/18	1.3		%	25		
Total Potassium (K)		2009/08/18	0.9		%	25		
Total Sodium (Na)		2009/08/18	0.6		%	25		
1911655 JOA	Matrix Spike	Nitrogen (Ammonia Nitrogen)	2009/08/19		95	%	80 - 120	
	QC Standard	Nitrogen (Ammonia Nitrogen)	2009/08/19		100	%	80 - 120	
	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2009/08/19		97	%	80 - 120	
	Method Blank	Nitrogen (Ammonia Nitrogen)	2009/08/19	ND, RDL=0.05		mg/L		
	RPD	Nitrogen (Ammonia Nitrogen)	2009/08/19	NC		%	25	
1911841 JRC	QC Standard	Turbidity	2009/08/19		100	%	80 - 120	
	Method Blank	Turbidity	2009/08/19	ND, RDL=0.1		NTU		
	RPD	Turbidity	2009/08/19	8.5		%	25	
1914377 KGU	QC Standard	Dissolved Aluminum (Al)	2009/08/20		99	%	80 - 120	
		Dissolved Antimony (Sb)	2009/08/20		129 (1)	%	80 - 120	
		Dissolved Arsenic (As)	2009/08/20		92	%	80 - 120	
		Dissolved Barium (Ba)	2009/08/20		99	%	80 - 120	
		Dissolved Beryllium (Be)	2009/08/20		93	%	80 - 120	
		Dissolved Bismuth (Bi)	2009/08/20		108	%	80 - 120	
		Dissolved Boron (B)	2009/08/20		94	%	80 - 120	
		Dissolved Cadmium (Cd)	2009/08/20		102	%	80 - 120	
		Dissolved Chromium (Cr)	2009/08/20		101	%	80 - 120	
		Dissolved Cobalt (Co)	2009/08/20		98	%	80 - 120	
		Dissolved Copper (Cu)	2009/08/20		90	%	80 - 120	
		Dissolved Iron (Fe)	2009/08/20		96	%	80 - 120	
		Dissolved Lead (Pb)	2009/08/20		96	%	80 - 120	
		Dissolved Manganese (Mn)	2009/08/20		93	%	80 - 120	
		Dissolved Molybdenum (Mo)	2009/08/20		110	%	80 - 120	
		Dissolved Nickel (Ni)	2009/08/20		95	%	80 - 120	
		Dissolved Selenium (Se)	2009/08/20		91	%	80 - 120	
		Dissolved Silver (Ag)	2009/08/20		90	%	80 - 120	
		Dissolved Strontium (Sr)	2009/08/20		99	%	80 - 120	
		Dissolved Thallium (Tl)	2009/08/20		92	%	80 - 120	
		Dissolved Vanadium (V)	2009/08/20		100	%	80 - 120	
		Dissolved Zinc (Zn)	2009/08/20		83	%	80 - 120	
		Spiked Blank	Dissolved Aluminum (Al)	2009/08/20		109	%	80 - 120

Fracflow Consultants Inc
 Attention: John Gale
 Client Project #: 500
 P.O. #: 2897
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Quality Assurance Report (Continued)

Maxxam Job Number: DA9A4219

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits	
1914377 KGU	Spiked Blank	Dissolved Antimony (Sb)	2009/08/20		100	%	80 - 120	
		Dissolved Arsenic (As)	2009/08/20		103	%	80 - 120	
		Dissolved Barium (Ba)	2009/08/20		103	%	80 - 120	
		Dissolved Beryllium (Be)	2009/08/20		107	%	80 - 120	
		Dissolved Bismuth (Bi)	2009/08/20		112	%	80 - 120	
		Dissolved Boron (B)	2009/08/20		102	%	80 - 120	
		Dissolved Cadmium (Cd)	2009/08/20		103	%	80 - 120	
		Dissolved Chromium (Cr)	2009/08/20		108	%	80 - 120	
		Dissolved Cobalt (Co)	2009/08/20		107	%	80 - 120	
		Dissolved Copper (Cu)	2009/08/20		111	%	80 - 120	
		Dissolved Lead (Pb)	2009/08/20		107	%	80 - 120	
		Dissolved Manganese (Mn)	2009/08/20		106	%	80 - 120	
		Dissolved Molybdenum (Mo)	2009/08/20		106	%	80 - 120	
		Dissolved Nickel (Ni)	2009/08/20		108	%	80 - 120	
		Dissolved Selenium (Se)	2009/08/20		98	%	80 - 120	
		Dissolved Silver (Ag)	2009/08/20		98	%	80 - 120	
		Dissolved Strontium (Sr)	2009/08/20		106	%	80 - 120	
		Dissolved Thallium (Tl)	2009/08/20		111	%	80 - 120	
		Dissolved Tin (Sn)	2009/08/20		109	%	80 - 120	
		Dissolved Titanium (Ti)	2009/08/20		106	%	80 - 120	
	Dissolved Uranium (U)	2009/08/20		112	%	80 - 120		
	Dissolved Vanadium (V)	2009/08/20		110	%	80 - 120		
	Dissolved Zinc (Zn)	2009/08/20		109	%	80 - 120		
	Method Blank	Dissolved Aluminum (Al)	2009/08/20		ND, RDL=5.0		ug/L	
		Dissolved Antimony (Sb)	2009/08/20		ND, RDL=2.0		ug/L	
		Dissolved Arsenic (As)	2009/08/20		ND, RDL=2.0		ug/L	
		Dissolved Barium (Ba)	2009/08/20		ND, RDL=5.0		ug/L	
		Dissolved Beryllium (Be)	2009/08/20		ND, RDL=2.0		ug/L	
		Dissolved Bismuth (Bi)	2009/08/20		ND, RDL=2.0		ug/L	
		Dissolved Boron (B)	2009/08/20		ND, RDL=5.0		ug/L	
		Dissolved Cadmium (Cd)	2009/08/20		ND, RDL=0.017		ug/L	
		Dissolved Chromium (Cr)	2009/08/20		ND, RDL=1.0		ug/L	
		Dissolved Cobalt (Co)	2009/08/20		ND, RDL=0.40		ug/L	
Dissolved Copper (Cu)		2009/08/20		ND, RDL=2.0		ug/L		
Dissolved Iron (Fe)		2009/08/20		ND, RDL=50		ug/L		
Dissolved Lead (Pb)		2009/08/20		ND, RDL=0.50		ug/L		
Dissolved Manganese (Mn)	2009/08/20		ND, RDL=2.0		ug/L			
Dissolved Molybdenum (Mo)	2009/08/20		ND, RDL=2.0		ug/L			
Dissolved Nickel (Ni)	2009/08/20		ND, RDL=2.0		ug/L			
Dissolved Selenium (Se)	2009/08/20		ND, RDL=1.0		ug/L			
Dissolved Silver (Ag)	2009/08/20		ND, RDL=0.10		ug/L			
Dissolved Strontium (Sr)	2009/08/20		ND, RDL=5.0		ug/L			
Dissolved Thallium (Tl)	2009/08/20		ND, RDL=0.10		ug/L			
Dissolved Tin (Sn)	2009/08/20		ND, RDL=2.0		ug/L			
Dissolved Titanium (Ti)	2009/08/20		ND, RDL=2.0		ug/L			
Dissolved Uranium (U)	2009/08/20		ND, RDL=0.10		ug/L			
Dissolved Vanadium (V)	2009/08/20		ND, RDL=2.0		ug/L			
Dissolved Zinc (Zn)	2009/08/20		ND, RDL=5.0		ug/L			
1914385 MPT	QC Standard	Total Aluminum (Al)	2009/08/21		100	%	80 - 120	
		Total Antimony (Sb)	2009/08/21		134 (2)	%	80 - 120	
		Total Arsenic (As)	2009/08/21		99	%	80 - 120	
		Total Barium (Ba)	2009/08/21		98	%	80 - 120	
		Total Beryllium (Be)	2009/08/21		95	%	80 - 120	
		Total Boron (B)	2009/08/21		87	%	80 - 120	
		Total Cadmium (Cd)	2009/08/21		99	%	80 - 120	

Fracflow Consultants Inc
 Attention: John Gale
 Client Project #: 500
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Quality Assurance Report (Continued)

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QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits		
1914385 MPT	QC Standard	Total Chromium (Cr)	2009/08/21		98	%	80 - 120		
		Total Cobalt (Co)	2009/08/21		103	%	80 - 120		
		Total Copper (Cu)	2009/08/21		102	%	80 - 120		
		Total Iron (Fe)	2009/08/21		108	%	80 - 120		
		Total Lead (Pb)	2009/08/21		100	%	80 - 120		
		Total Manganese (Mn)	2009/08/21		100	%	80 - 120		
		Total Molybdenum (Mo)	2009/08/21		111	%	80 - 120		
		Total Nickel (Ni)	2009/08/21		103	%	80 - 120		
		Total Selenium (Se)	2009/08/21		105	%	80 - 120		
		Total Strontium (Sr)	2009/08/21		103	%	80 - 120		
		Total Thallium (Tl)	2009/08/21		121 (t)	%	80 - 120		
		Total Uranium (U)	2009/08/21		91	%	80 - 120		
		Total Vanadium (V)	2009/08/21		102	%	80 - 120		
		Total Zinc (Zn)	2009/08/21		98	%	80 - 120		
		Spiked Blank	Spiked Blank	Total Aluminum (Al)	2009/08/21		104	%	80 - 120
				Total Antimony (Sb)	2009/08/21		103	%	80 - 120
				Total Arsenic (As)	2009/08/21		96	%	80 - 120
				Total Barium (Ba)	2009/08/21		99	%	80 - 120
				Total Beryllium (Be)	2009/08/21		95	%	80 - 120
				Total Bismuth (Bi)	2009/08/21		105	%	80 - 120
				Total Boron (B)	2009/08/21		94	%	80 - 120
				Total Cadmium (Cd)	2009/08/21		98	%	80 - 120
				Total Chromium (Cr)	2009/08/21		97	%	80 - 120
				Total Cobalt (Co)	2009/08/21		98	%	80 - 120
				Total Copper (Cu)	2009/08/21		98	%	80 - 120
				Total Lead (Pb)	2009/08/21		96	%	80 - 120
				Total Manganese (Mn)	2009/08/21		102	%	80 - 120
				Total Molybdenum (Mo)	2009/08/21		103	%	80 - 120
				Total Nickel (Ni)	2009/08/21		97	%	80 - 120
				Total Selenium (Se)	2009/08/21		97	%	80 - 120
				Total Silver (Ag)	2009/08/21		102	%	80 - 120
				Total Strontium (Sr)	2009/08/21		99	%	80 - 120
				Total Thallium (Tl)	2009/08/21		101	%	80 - 120
Total Tin (Sn)	2009/08/21				108	%	80 - 120		
Total Titanium (Ti)	2009/08/21				101	%	80 - 120		
Total Uranium (U)	2009/08/21				104	%	80 - 120		
Total Vanadium (V)	2009/08/21				99	%	80 - 120		
Total Zinc (Zn)	2009/08/21				97	%	80 - 120		
Method Blank	Method Blank			Total Aluminum (Al)	2009/08/21	ND, RDL=5.0		ug/L	
				Total Antimony (Sb)	2009/08/21	ND, RDL=2.0		ug/L	
				Total Arsenic (As)	2009/08/21	ND, RDL=2.0		ug/L	
				Total Barium (Ba)	2009/08/21	ND, RDL=5.0		ug/L	
				Total Beryllium (Be)	2009/08/21	ND, RDL=2.0		ug/L	
				Total Bismuth (Bi)	2009/08/21	ND, RDL=2.0		ug/L	
				Total Boron (B)	2009/08/21	ND, RDL=5.0		ug/L	
				Total Cadmium (Cd)	2009/08/21	ND, RDL=0.017		ug/L	
				Total Chromium (Cr)	2009/08/21	ND, RDL=1.0		ug/L	
		Total Cobalt (Co)	2009/08/21	ND, RDL=0.40		ug/L			
		Total Copper (Cu)	2009/08/21	ND, RDL=2.0		ug/L			
		Total Iron (Fe)	2009/08/21	ND, RDL=50		ug/L			
		Total Lead (Pb)	2009/08/21	ND, RDL=0.50		ug/L			
		Total Manganese (Mn)	2009/08/21	ND, RDL=2.0		ug/L			
		Total Molybdenum (Mo)	2009/08/21	ND, RDL=2.0		ug/L			
Total Nickel (Ni)	2009/08/21	ND, RDL=2.0		ug/L					
Total Selenium (Se)	2009/08/21	ND, RDL=1.0		ug/L					

Fracflow Consultants Inc
 Attention: John Gale
 Client Project #: 500
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Quality Assurance Report (Continued)

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QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
1914385 MPT	Method Blank	Total Silver (Ag)	2009/08/21	ND, RDL=0.10		ug/L	
		Total Strontium (Sr)	2009/08/21	ND, RDL=5.0		ug/L	
		Total Thallium (Tl)	2009/08/21	ND, RDL=0.10		ug/L	
		Total Tin (Sn)	2009/08/21	ND, RDL=2.0		ug/L	
		Total Titanium (Ti)	2009/08/21	ND, RDL=2.0		ug/L	
		Total Uranium (U)	2009/08/21	ND, RDL=0.10		ug/L	
		Total Vanadium (V)	2009/08/21	ND, RDL=2.0		ug/L	
		Total Zinc (Zn)	2009/08/21	ND, RDL=5.0		ug/L	

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
 Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
 QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
 Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
 Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
 NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
 NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
 (1) Secondary RM is acceptable.
 (2) Suspect problem with RM. Minimal impact on data quality.

Sample Integrity Form

Invoice To:

Fracflow Consultants Inc
ATTN: John Gale
154 Major's Path
St. John's, NL
A1A 5A1
Client Contact:
John Gale

Maxxam Job #: A9A4219
Date Received: 2009/08/12
Your C.O.C. #: 30133
Your Project #: 500
Your P.O. #: 2897
Maxxam Project Manager: STACY JOSEPH
Quote #: A90807

No discrepancies noted.

Report Comments

Received Date: 2009/08/12 Time: 10:19 By: _____

Inspected Date: _____ Time: _____ By: _____

SIF Created Date: _____ Time: 00:00 By: _____



Rep 806

CHAIN OF CUSTODY RECORD

30133

INVOICE INFORMATION:
 Company Name: FRAEFLOW
 Contact Name: John Gale
 Address: 154 Major's Path
St. John's, NL, A1A 5A1
 Email: ffc-nf
 Ph: 739 7270 Fax: 753 5101

REPORT INFORMATION (if differs from invoice):
 Company Name: _____
 Contact Name: _____
 Address: _____
 Email: _____
 Ph: _____ Fax: _____

PO #: 2897
 Project #: 500
 Proj. Name: _____
 Location: St. Alban's, NL
 Quotation#: Standing offer
 Submitted By: _____
 Site Task #: _____

MAXXAM JOB NUMBER:
A9A4219
 ENTERED BY, Init: JG
 Client Code: 11664

Specify Guideline Requirements:
FWAL - fresh water aquatic life
 *Specify Matrix: Surface/Salt/Ground/Tapwater/Sewage/Effluent/Seawater
 Potable/NonPotable/Tissue/Soil/Sludge/Metal

Field Filtered & Preserved	Lab Filtration Required	RCAp-30 Choose Total or Diss Metals	RCAp-MS Choose Total or Diss Metals	Total Digest (Default Method)	Dissolved	Mercury	Available Metals Digest	Total Digest - for sediments	Tin	Selenium	Hot Water Soluble Boron	TPH MUST	TPH Fractionation	PAH's	PCB's	VOC's EPA 624-8260	
						Mercury is not included in soil or water metals scan	Default Method [HNO ₃ /H ₂ O]	[HNO ₃ /HF/HClO ₄]	(required for CCME soils)	(low level) Req'd for CCME Residential, Parkland, Agricultural	(required for CCME Agricultural)	(BTEX, C ₆ -C ₁₀)	Soil (Potable), TPH MUST, NS Fuel Oil Spill Policy Low Level BTEX & C ₆ -C ₁₀	TPH Fractionation	PAH's	PCB's	VOC's EPA 624-8260

DUE DATE:
 STANDARD:
 RUSH Due Date: _____
 For extra cost rush, specify Due Date. Rush analysis must be scheduled prior to sample submission.
 Client will be contacted if Rush date cannot be met.
 Other Analysis or Comments/Hazards

Sample Identification	Matrix*	Date/Time Sampled	# & type of bottles	Field Filtered & Preserved	Lab Filtration Required	RCAp-30	RCAp-MS	Total Digest	Dissolved	Mercury	Metals Water	Metals Soil	TPH MUST	TPH Fractionation	PAH's	PCB's	VOC's EPA 624-8260	Other Analysis or Comments/Hazards
500 Church Well Sh	H2O	July 9/09	(2) vial (1) 250ml	X	X	X	X	X	X	X	X	DJ3831-09						
500-Church Well-24 h	"	July 11/09	"	X	X	X	X	X	X	X	X	DJ3831-09						Total and Dissolved
500-Church Well-48 h	"	July 12/09	"	X	X	X	X	X	X	X	X	DJ3841-09						"
500-SFW-24 h	"	July 16/09	"	X	X	X	X	X	X	X	X	DJ3842-09						"
500-SFW - 48 h	"	July 17/09	"	X	X	X	X	X	X	X	X	DJ3843-09						"
500-SFW - 92 h	"	July 18/09	"	X	X	X	X	X	X	X	X	DJ3844-09						"
500-Church Well-July 23/09	"	July 23/09	(3) vial (1) 250ml	X	X	X	X	X	X	X	X	DJ3845-09						General chemistry
500-SFW-July 23-09	"	July 23/09	(2) vial (1) 250ml	X	X	X	X	X	X	X	X	DJ3846-09						General chemistry

RELINQUISHED BY: (Signature/Print)	RECEIVED BY: (Signature/Print)	DATE / TIME	PURPOSE OF CHANGE / REMARKS	TEMP @ Maxxam Receipt
	<u>[Signature]</u>	<u>2009/09/10</u>	<u>Y: 55</u>	<u>8 727</u>
				INTEGRITY Init: <u>[Signature]</u>
				Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>

1x200

cart 10

CLIENT: Fracflow Consultants Inc
 PROJECT #: 500 , MAXXAM JOB : A9A4219
 INORGANIC PARAMETERS
 MATRIX: GROUND WATER

Select Guideline Values from the Dropdown List Below. Exceedences (& "ND") will turn BOLD with Yellow Background.

3. CWQG Aquatic Life - Freshwater, Coarse Grained

Bold with Blue Background indicates non-detected but DL > Guideline (due to dilution etc)

** Guideline flagging is correct only when result units correspond with guideline units on spreadsheet. Every effort has been made to ensure report and guideline units are aligned.

Note: Window zoom values other than 75% may cause unstable perform

***Programmers' Note: Do not insert or delete Parameter rows unless Guidelines, DropDownConstants & BaseTables are also adjusted.

Sample ID	Guideline	Detection	Units	500-CHURCH WELL-24H	500-CHURCH WELL-48H	500-SFW-24H	500-SFW-48H	500-SFW-72H	CHURCH WELL-JULY23	500-SFW-JULY23-09
Laboratory ID	3. CWQG Aquatic Life	Limit		DJ3831	DJ3841	DJ3842	DJ3843	DJ3844	DJ3860	DJ3866
Maxxam Job #	Freshwater			A9A4219	A9A4219	A9A4219	A9A4219	A9A4219	A9A4219	A9A4219
Sampling Date	Coarse Grained			11-July-2009	12-July-2009	16-July-2009	17-July-2009	18-July-2009	23-July-2009	23-July-2009
Aluminium (mg/L) ^{3,4}	0.005	-	-							
Aluminium (ug/L) ^{3,4}	5	5.0	ug/L	ND	132	6.3	ND	9.6		
Ammonia (total)	NV	0.05	mg/L						ND	ND
Ammonia (un-ionized)	0.019	-	-							
Antimony	NV	2.0	ug/L	ND	ND	ND	ND	ND		
Arsenic	5	2.0	ug/L	4.9	5.1	2.9	3.1	3.3		
Barium	NV	5.0	ug/L	ND	ND	ND	ND	ND		
Boron	NV	5.0	ug/L	5.1	5.2	7	6.9	6.6		
Bromate	NV	-	-							
Cadmium	0.017	0.017	ug/L	ND	ND	ND	ND	ND		
Chloramines—total	NV	-	-							
Chlorate	NV	-	-							
Chloride	NV	1	mg/L						5	8
Chlorite	NV	-	-							
Chromium (mg/L)	NV	-	-							
Chromium (ug/L)	NV	1.0	ug/L	ND	ND	ND	ND	ND		
Hexavalent chromium (Cr(VI))	0.001	-	-							
Trivalent chromium (Cr(III))	0.0089	-	-							
Colour	NV	5	TCU						ND	ND
Copper (mg/L) ⁵	0.002	0.01	mg/L						ND	ND
Copper (ug/L) ⁵	2	2.0	ug/L	ND	ND	ND	ND	ND		
Cyanide	NV	-	-							
Cyanide (as free CN)	5	-	-							
Dissolved oxygen ^{6,7}	5.5	-	-							
Fluoride	0.12	-	-							
Iron (mg/L)	0.3	0.02	mg/L						0.09	0.07
Iron (ug/L)	300	50	ug/L	67	102	ND	ND	ND		
Lead (mg/L) ⁸	0.001	-	-							
Lead (ug/L) ⁸	1	0.50	ug/L	ND	ND	ND	ND	ND		
Manganese (mg/L)	NV	0.01	mg/L						0.09	0.04
Manganese (ug/L)	NV	2.0	ug/L	87.3	88.7	34.4	34.2	34.6		
Mercury	0.026	-	-							
Methylmercury	0.004	-	-							
Molybdenum	73	2.0	ug/L	ND	ND	ND	ND	ND		
Nickel ⁹	25	2.0	ug/L	ND	ND	ND	ND	ND		
Nitrate (as N)	2.9	-	-							
Nitriiotriacetic acid (NTA)	NV	-	-							
Nitrite (as N)	0.06	-	-							
Odour ¹⁰	NV	-	-							
pH ^{12,12}	NV	0	pH						7.85	7.99
Phosphorus (total)	NV	-	-							
Reactive chlorine species (hypochlorous)	0.5	-	-							
Salinity ¹³	NV	-	-							
Selenium	1	1.0	ug/L	ND	ND	ND	ND	ND		
Silver	0.1	0.10	ug/L	ND	ND	ND	ND	ND		
Sodium (mg/L)	NV	0.1	mg/L						5.7	12
Sodium (ug/L)	NV	-	-							
Sulphate	NV	2	mg/L						20	18
Sulphide (as H2S)	NV	-	-							
Taste ¹⁴	NV	-	-							
Temperature ¹⁵	NV	-	-							
Thallium	0.8	0.10	ug/L	ND	ND	ND	ND	ND		
Total dissolved solids (TDS-Measured)	NV	-	-							
Total dissolved solids (TDS-Calculated)	NV	1	mg/L						138	143

Tributyltin	0.008	-	-							
Triphenyltin	0.022	-	-							
Turbidity	NV	0.1	NTU					0.2		0.2
Uranium	NV	0.10	ug/L	0.41	0.49	0.26	0.25	0.26		
Zinc (mg/L)	0.03	0.05	mg/L						ND	ND
Zinc (ug/L)	30	5.0	ug/L	ND	ND	7.3	ND	20.2		

NOTES:

NV = no value

CDWQ DW Guidelines: May 2008, CDWQ Aquatic Life Guidelines Update 7.0: Sep 2007

Coarse/Fine Designation only applies to Atlantic RBCA (PIRI) Water Guidelines, for all other guidelines this designation may be ignored.

1. This table represents a summary of the data presented in the Laboratory Certificate of Analysis for convenience purposes only
2. This summary is to be used in conjunction with, not as a replacement of the Laboratory Certificate of Analysis which contains all QA/QC information
3. Aluminum Aesthetic Objective (CDWQ - AO): Conventional Treatment Plants = 0.1 mg/L (100 ug/L), Other Treatment Systems = 0.2 mg/L (200 ug/L)
4. Aluminum Guideline (CWQG Aquatic Life - Freshwater): if pH < 6.5 then 0.005 mg/L (5 ug/L), else if pH >= 6.5 then 0.1 mg/L (100 ug/L)
5. Copper Guideline (CWQG Aquatic Life - Freshwater): if CaCO₃ < 120 mg/L then 0.002 mg/L (2 ug/L), if CaCO₃ = 120-180 mg/L then 0.003 mg/L (3 ug/L), if CaCO₃ > 180 mg/L then 0.004 mg/L (4 ug/L),
6. Dissolved Oxygen Guideline (CWQG Aquatic Life - Freshwater): Warm-water biota (WWB) early life stages 6000 ug/L, WWB other life stages 5500 ug/L, Cold-water biota (CWB) early life stages 9500 ug/L, other life stages 6500 ug/L
7. Dissolved Oxygen Guideline (CWQG Aquatic Life - Marinewater): > 8000 ug/L
8. Lead Guideline (CWQG Aquatic Life - Freshwater): if CaCO₃ < 60 mg/L then 0.001 mg/L (1 ug/L), if CaCO₃ = 60-120 mg/L then 0.002 mg/L (2 ug/L), if CaCO₃ = 120-180 mg/L then 0.004 mg/L (4 ug/L), if CaCO₃ > 180 mg/L then 0.007 mg/L (7 ug/L),
9. Nickel Guideline (CWQG Aquatic Life - Freshwater): if CaCO₃ < 60 mg/L then 0.025 mg/L (25 ug/L), if CaCO₃ = 60-120 mg/L then 0.065 mg/L (65 ug/L), if CaCO₃ = 120-180 mg/L then 0.110 mg/L (110 ug/L), if CaCO₃ > 180 mg/L then 0.150 mg/L (150 ug/L),
10. Odour Aesthetic Objective (CDWQ): "Inoffensive"
11. pH Objective (CDWQ): 6.5 - 8.5
12. pH Guideline (CWQG Aquatic Life): Freshwater 6.5 - 9, Marine 7.0 - 8.7
13. Salinity Guideline (CWQG Aquatic Life - Marinewater): < 10% fluctuation.
14. Taste Aesthetic Objective (CDWQ): "Inoffensive"
15. Temperature Aesthetic Objective (CDWQ): <= 15 °C
16. Calculated result only includes measured parameters. Actual TDS may be higher.

Maxxam Job #: A9A4219
 Report Date: 2009/08/21

Fracflow Consultants Inc
 Client Project #: 500
 Project name: ST. ALBAN'S NL
 Your P.O. #: 2897
 Sampler Initials:

RESULTS OF ANALYSES OF WATER

Maxxam ID			DJ3860	DJ3866		
Sampling Date			7/23/2009	7/23/2009		
COC Number			30133	30133		
Registration #						
	Units	Criteria A	500-CHURCH WELL-JULY23-09	500-SFW- JULY23-09	RDL	QC Batch
Calculated Parameters						
Anion Sum	me/L	-	2.44	2.49	N/A	1907060
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	-	94	93	1	1907056
Calculated TDS	mg/L	-	138	143	1	1907063
Carb. Alkalinity (calc. as CaCO3)	mg/L	-	ND	ND	1	1907056
Cation Sum	me/L	-	2.33	2.49	N/A	1907060
Hardness (CaCO3)	mg/L	-	100	98	1	1907146
Ion Balance (% Difference)	%	-	2.31	0	N/A	1907059
Langelier Index (@ 20C)	N/A	-	-0.0270	0.0790		1907061
Langelier Index (@ 4C)	N/A	-	-0.278	-0.171		1907062
Saturation pH (@ 20C)	N/A	-	7.88	7.91		1907061
Saturation pH (@ 4C)	N/A	-	8.13	8.16		1907062
Inorganics						
Total Alkalinity (Total as CaCO3)	mg/L	-	94	94	5	1909489
Dissolved Chloride (Cl)	mg/L	-	5	8	1	1909492
Colour	TCU	-	ND	ND	5	1909508
Nitrate + Nitrite	mg/L	-	ND	ND	0.05	1909510
Nitrogen (Ammonia Nitrogen)	mg/L	-	ND	ND	0.05	1911655
Total Organic Carbon (C)	mg/L	-	ND	ND	0.5	1910518
Orthophosphate (P)	mg/L	-	ND	ND	0.01	1909509
pH	pH	6.5 : 9.0	7.85	7.99	N/A	1910419
Reactive Silica (SiO2)	mg/L	-	10	10	0.5	1909503
Dissolved Sulphate (SO4)	mg/L	-	20	18	2	1909499
Turbidity	NTU	-	0.2	0.2	0.1	1911841
Conductivity	uS/cm	-	220	230	1	1910422

ND = Not detected

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Criteria A: Water - CCME Freshwater Aquatic Life

Canadian Council of ministers of the Environment, "Canadian Water Quality Guidelines for the Protection of Aquatic Life", 2005 (Freshwater Aquatic Life).

Note: Confirm Criteria B exceedence versus guideline, when Criteria A is not an exceedence, as the guideline is also dependent on other criteria such as Calcium level.

Maxxam Job #: A9A4219
 Report Date: 2009/08/21

Fracflow Consultants Inc
 Client Project #: 500
 Project name: ST. ALBAN'S NL
 Your P.O. #: 2897
 Sampler Initials:

ELEMENTS BY ICP-AES (WATER)

Maxxam ID				DJ3860	DJ3866		
Sampling Date				7/23/2009	7/23/2009		
COC Number				30133	30133		
Registration #							
	Units	Criteria A	Criteria B	500-CHURCH WELL-JULY23-09	500-SFW- JULY23-09	RDL	QC Batch
Metals							
Total Calcium (Ca)	mg/L	-	-	33	30	0.1	1911362
Total Copper (Cu)	mg/L	0.004	.002 -.004	ND	ND	0.01	1911362
Total Iron (Fe)	mg/L	0.3	-	0.09	0.07	0.02	1911362
Total Magnesium (Mg)	mg/L	-	-	5.2	4.3	0.1	1911362
Total Manganese (Mn)	mg/L	-	-	0.09	0.04	0.01	1911362
Total Potassium (K)	mg/L	-	-	3.3	3.3	0.1	1911362
Total Sodium (Na)	mg/L	-	-	5.7	12	0.1	1911362
Total Zinc (Zn)	mg/L	0.03	-	ND	ND	0.05	1911362

ND = Not detected

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Criteria A, Criteria B: Water - CCME Freshwater Aquatic Life

Canadian Council of ministers of the Environment, "Canadian Water Quality Guidelines for the Protection of Aquatic Life", 2005 (Freshwater Aquatic Life).

Note: Confirm Criteria B exceedence versus guideline, when Criteria A is not an exceedence, as the guideline is also dependent on other criteria such as Calcium level.

Maxxam Job #: A9A4219
 Report Date: 2009/08/21

Fracflow Consultants Inc
 Client Project #: 500
 Project name: ST. ALBAN'S NL
 Your P.O. #: 2897
 Sampler Initials:

ELEMENTS BY ICP/MS (WATER)

Maxxam ID				DJ3831	DJ3841	DJ3842	DJ3843	DJ3844		
Sampling Date				7/11/2009	7/12/2009	7/16/2009	7/17/2009	7/18/2009		
COC Number				30133	30133	30133	30133	30133		
Registration #										
	Units	Criteria A	Criteria B	500-CHURCH WELL-24H	500-CHURCH WELL-48H	500-SFW-24H	500-SFW-48H	500-SFW-72H	RDL	QC Batch
Metals										
Dissolved Aluminum (Al)	ug/L	100	5	ND	132	6.3	ND	9.6	5.0	1914377
Total Aluminum (Al)	ug/L	100	5	5.9	7.9	10.8	5.8	ND	5.0	1914385
Dissolved Antimony (Sb)	ug/L	-	-	ND	ND	ND	ND	ND	2.0	1914377
Total Antimony (Sb)	ug/L	-	-	ND	ND	ND	ND	ND	2.0	1914385
Dissolved Arsenic (As)	ug/L	5	-	4.9	5.1	2.9	3.1	3.3	2.0	1914377
Total Arsenic (As)	ug/L	5	-	4.7	4.7	ND	3.1	2.9	2.0	1914385
Dissolved Barium (Ba)	ug/L	-	-	ND	ND	ND	ND	ND	5.0	1914377
Total Barium (Ba)	ug/L	-	-	ND	ND	ND	ND	ND	5.0	1914385
Dissolved Beryllium (Be)	ug/L	-	-	ND	ND	ND	ND	ND	2.0	1914377
Total Beryllium (Be)	ug/L	-	-	ND	ND	ND	ND	ND	2.0	1914385
Dissolved Bismuth (Bi)	ug/L	-	-	ND	ND	ND	ND	ND	2.0	1914377
Total Bismuth (Bi)	ug/L	-	-	ND	ND	ND	ND	ND	2.0	1914385
Dissolved Boron (B)	ug/L	-	-	5.1	5.2	7.0	6.9	6.6	5.0	1914377
Total Boron (B)	ug/L	-	-	5.8	5.4	6.8	8.0	7.7	5.0	1914385
Dissolved Cadmium (Cd)	ug/L	0.017	-	ND	ND	ND	ND	ND	0.017	1914377
Total Cadmium (Cd)	ug/L	0.017	-	ND	ND	ND	ND	ND	0.017	1914385
Dissolved Chromium (Cr)	ug/L	8.9	-	ND	ND	ND	ND	ND	1.0	1914377
Total Chromium (Cr)	ug/L	8.9	-	ND	ND	ND	ND	ND	1.0	1914385
Dissolved Cobalt (Co)	ug/L	-	-	ND	ND	ND	ND	ND	0.40	1914377
Total Cobalt (Co)	ug/L	-	-	ND	ND	ND	ND	ND	0.40	1914385
Dissolved Copper (Cu)	ug/L	4	2	ND	ND	ND	ND	ND	2.0	1914377
Total Copper (Cu)	ug/L	4	2	ND	ND	2.1	ND	ND	2.0	1914385
Dissolved Iron (Fe)	ug/L	300	-	67	102	ND	ND	ND	50	1914377
Total Iron (Fe)	ug/L	300	-	67	70	ND	ND	ND	50	1914385
Dissolved Lead (Pb)	ug/L	7	1	ND	ND	ND	ND	ND	0.50	1914377
Total Lead (Pb)	ug/L	7	1	ND	ND	ND	ND	ND	0.50	1914385
Dissolved Manganese (Mn)	ug/L	-	-	87.3	88.7	34.4	34.2	34.6	2.0	1914377

Maxxam ID				DJ3831	DJ3841	DJ3842	DJ3843	DJ3844		
Sampling Date				7/11/2009	7/12/2009	7/16/2009	7/17/2009	7/18/2009		
COC Number				30133	30133	30133	30133	30133		
Registration #										
	Units	Criteria A	Criteria B	500-CHURCH WELL-24H	500-CHURCH WELL-48H	500-SFW-24H	500-SFW-48H	500-SFW-72H	RDL	QC Batch
Total Manganese (Mn)	ug/L	-	-	86.6	90.4	27.3	34.6	33.3	2.0	1914385
Dissolved Molybdenum (Mo)	ug/L	73	-	ND	ND	ND	ND	ND	2.0	1914377
Total Molybdenum (Mo)	ug/L	73	-	ND	ND	ND	ND	ND	2.0	1914385
Dissolved Nickel (Ni)	ug/L	25	25	ND	ND	ND	ND	ND	2.0	1914377
Total Nickel (Ni)	ug/L	25	25	ND	ND	ND	ND	ND	2.0	1914385
Dissolved Selenium (Se)	ug/L	1	-	ND	ND	ND	ND	ND	1.0	1914377
Total Selenium (Se)	ug/L	1	-	ND	ND	ND	ND	ND	1.0	1914385
Dissolved Silver (Ag)	ug/L	0.1	-	ND	ND	ND	ND	ND	0.10	1914377
Total Silver (Ag)	ug/L	0.1	-	ND	ND	ND	ND	ND	0.10	1914385
Dissolved Strontium (Sr)	ug/L	-	-	138	140	124	121	124	5.0	1914377
Total Strontium (Sr)	ug/L	-	-	141	146	126	132	127	5.0	1914385
Dissolved Thallium (Tl)	ug/L	0.8	-	ND	ND	ND	ND	ND	0.10	1914377
Total Thallium (Tl)	ug/L	0.8	-	ND	ND	ND	ND	ND	0.10	1914385
Dissolved Tin (Sn)	ug/L	-	-	ND	ND	ND	ND	ND	2.0	1914377
Total Tin (Sn)	ug/L	-	-	ND	ND	ND	ND	ND	2.0	1914385
Dissolved Titanium (Ti)	ug/L	-	-	ND	ND	ND	ND	ND	2.0	1914377
Total Titanium (Ti)	ug/L	-	-	ND	ND	ND	ND	ND	2.0	1914385
Dissolved Uranium (U)	ug/L	-	-	0.41	0.49	0.26	0.25	0.26	0.10	1914377
Total Uranium (U)	ug/L	-	-	0.48	0.48	0.32	0.28	0.27	0.10	1914385
Dissolved Vanadium (V)	ug/L	-	-	ND	ND	ND	ND	ND	2.0	1914377
Total Vanadium (V)	ug/L	-	-	ND	ND	ND	ND	ND	2.0	1914385
Dissolved Zinc (Zn)	ug/L	30	-	ND	ND	7.3	ND	20.2	5.0	1914377
Total Zinc (Zn)	ug/L	30	-	ND	ND	5.4	ND	ND	5.0	1914385

ND = Not detected

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Criteria A, Criteria B: Water - CCME Freshwater Aquatic Life

Canadian Council of ministers of the Environment, "Canadian Water Quality Guidelines for the Protection of Aquatic Life", 2005 (Freshwater Aquatic Life).

Note: Confirm Criteria B exceedence versus guideline, when Criteria A is not an exceedence, as the guideline is also dependent on other criteria such as Calcium level.

GENERAL COMMENTS

Sample DJ3841-01: Poor Total vs Dissolved agreement for Aluminum verified by repeat analysis.

Results relate only to the items tested.

Fracflow Consultants Inc
 Attention: John Gale
 Client Project #: 500
 P.O. #: 2897
 Project name: ST. ALBAN'S NL

Quality Assurance Report
 Maxxam Job Number: DA9A4219

QA/QC Batch	QC Type	Date Analyzed	Parameter	Value	Recovery	Units	QC Limits
Num	Init	yyyy/mm/dd					
1909489	MCN	Matrix Spike	Total Alkalinity (Total as CaCO3)	8/18/2009	NC	%	80 - 120
		QC Standard	Total Alkalinity (Total as CaCO3)	8/18/2009	106	%	80 - 120
		Spiked Blank	Total Alkalinity (Total as CaCO3)	8/18/2009	109	%	80 - 120
		Method Blank	Total Alkalinity (Total as CaCO3)	8/18/2009	ND	RDL=5 mg/L	
		RPD	Total Alkalinity (Total as CaCO3)	8/18/2009	NC	%	25
1909492	JOA	Matrix Spike	Dissolved Chloride (Cl)	8/18/2009	104	%	80 - 120
		QC Standard	Dissolved Chloride (Cl)	8/18/2009	102	%	80 - 120
		Spiked Blank	Dissolved Chloride (Cl)	8/18/2009	105	%	80 - 120
		Method Blank	Dissolved Chloride (Cl)	8/18/2009	ND	RDL=1 mg/L	
		RPD	Dissolved Chloride (Cl)	8/18/2009	NC	%	25
1909499	SMT	Matrix Spike	Dissolved Sulphate (SO4)	8/18/2009	109	%	80 - 120
		QC Standard	Dissolved Sulphate (SO4)	8/18/2009	109	%	80 - 120
		Spiked Blank	Dissolved Sulphate (SO4)	8/18/2009	108	%	80 - 120
		Method Blank	Dissolved Sulphate (SO4)	8/18/2009	ND	RDL=2 mg/L	
		RPD	Dissolved Sulphate (SO4)	8/18/2009	NC	%	25
1909503	MCN	Matrix Spike	Reactive Silica (SiO2)	8/18/2009	NC	%	80 - 120
		QC Standard	Reactive Silica (SiO2)	8/18/2009	99	%	75 - 125
		Spiked Blank	Reactive Silica (SiO2)	8/18/2009	98	%	80 - 120
		Method Blank	Reactive Silica (SiO2)	8/18/2009	ND	RDL=0.5 mg/L	
		RPD	Reactive Silica (SiO2)	8/18/2009	0.5	%	25
1909508	MCN	QC Standard	Colour	8/18/2009	104	%	80 - 120
		Method Blank	Colour	8/18/2009	ND	RDL=5 TCU	
		RPD	Colour	8/18/2009	NC	%	25
1909509	JOA	Matrix Spike	Orthophosphate (P)	8/18/2009	NC	%	80 - 120
		QC Standard	Orthophosphate (P)	8/18/2009	96	%	80 - 120
		Spiked Blank	Orthophosphate (P)	8/18/2009	95	%	80 - 120
		Method Blank	Orthophosphate (P)	8/18/2009	ND	RDL=0.01 mg/L	
		RPD	Orthophosphate (P)	8/18/2009	1.6	%	25
1909510	SMT	Matrix Spike	Nitrate + Nitrite	8/18/2009	101	%	80 - 120
		QC Standard	Nitrate + Nitrite	8/18/2009	101	%	80 - 120
		Spiked Blank	Nitrate + Nitrite	8/18/2009	102	%	80 - 120
		Method Blank	Nitrate + Nitrite	8/18/2009	ND	RDL=0.05 mg/L	
		RPD	Nitrate + Nitrite	8/18/2009	NC	%	25
1910419	ARS	QC Standard	pH	8/18/2009	100	%	80 - 120
		Method Blank	pH	8/18/2009	6.23	RDL=0 pH	
		RPD	pH	8/18/2009	1.4	%	25
1910422	ARS	QC Standard	Conductivity	8/18/2009	102	%	80 - 120
		Method Blank	Conductivity	8/18/2009	ND	RDL=1 uS/cm	
		RPD	Conductivity	8/18/2009	5.4	%	25
1910518	BMM	Matrix Spike	Total Organic Carbon (C)	8/25/2009	97	%	75 - 125
		QC Standard	Total Organic Carbon (C)	8/18/2009	104	%	80 - 120
		Spiked Blank	Total Organic Carbon (C)	8/25/2009	102	%	75 - 125

QA/QC Batch Num	Init	QC Type	Date Analyzed Parameter	yyyy/mm/dd	Value	Recovery	Units	QC Limits
1911362	SSI	RPD	Total Organic Carbon (C)	8/25/2009	NC		%	25
		Matrix Spike	Total Calcium (Ca)	8/18/2009		92	%	80 - 120
		Matrix Spike	Total Copper (Cu)	8/18/2009		96	%	80 - 120
		Matrix Spike	Total Iron (Fe)	8/18/2009		93	%	80 - 120
		Matrix Spike	Total Magnesium (Mg)	8/18/2009		92	%	80 - 120
		Matrix Spike	Total Manganese (Mn)	8/18/2009		95	%	80 - 120
		Matrix Spike	Total Potassium (K)	8/18/2009		101	%	80 - 120
		Matrix Spike	Total Sodium (Na)	8/18/2009		101	%	80 - 120
		Matrix Spike	Total Zinc (Zn)	8/18/2009		94	%	80 - 120
		QC Standard	Total Calcium (Ca)	8/18/2009		99	%	80 - 120
		QC Standard	Total Copper (Cu)	8/18/2009		106	%	80 - 120
		QC Standard	Total Iron (Fe)	8/18/2009		99	%	80 - 120
		QC Standard	Total Magnesium (Mg)	8/18/2009		96	%	80 - 120
		QC Standard	Total Manganese (Mn)	8/18/2009		99	%	80 - 120
		QC Standard	Total Potassium (K)	8/18/2009		103	%	80 - 120
	QC Standard	Total Sodium (Na)	8/18/2009		102	%	80 - 120	
	QC Standard	Total Zinc (Zn)	8/18/2009		96	%	80 - 120	
	Spiked Blank	Total Calcium (Ca)	8/18/2009		92	%	80 - 120	
	Spiked Blank	Total Copper (Cu)	8/18/2009		94	%	80 - 120	
	Spiked Blank	Total Iron (Fe)	8/18/2009		92	%	80 - 120	
	Spiked Blank	Total Magnesium (Mg)	8/18/2009		94	%	80 - 120	
	Spiked Blank	Total Manganese (Mn)	8/18/2009		94	%	80 - 120	
	Spiked Blank	Total Potassium (K)	8/18/2009		100	%	80 - 120	
	Spiked Blank	Total Sodium (Na)	8/18/2009		99	%	80 - 120	
	Spiked Blank	Total Zinc (Zn)	8/18/2009		93	%	80 - 120	
	Method Blank	Total Calcium (Ca)	8/18/2009	ND	RDL=0.1	mg/L		
	Method Blank	Total Copper (Cu)	8/18/2009	ND	RDL=0.01	mg/L		
	Method Blank	Total Iron (Fe)	8/18/2009	ND	RDL=0.02	mg/L		
	Method Blank	Total Magnesium (Mg)	8/18/2009	ND	RDL=0.1	mg/L		
	Method Blank	Total Manganese (Mn)	8/18/2009	ND	RDL=0.01	mg/L		
	Method Blank	Total Potassium (K)	8/18/2009	ND	RDL=0.1	mg/L		
	Method Blank	Total Sodium (Na)	8/18/2009	ND	RDL=0.1	mg/L		
	Method Blank	Total Zinc (Zn)	8/18/2009	ND	RDL=0.05	mg/L		
RPD	Total Calcium (Ca)	8/18/2009	0.8		%	25		
RPD	Total Magnesium (Mg)	8/18/2009	1.3		%	25		
RPD	Total Potassium (K)	8/18/2009	0.9		%	25		
RPD	Total Sodium (Na)	8/18/2009	0.6		%	25		
1911655	JOA	Matrix Spike	Nitrogen (Ammonia Nitrogen)	8/19/2009		95	%	80 - 120
		QC Standard	Nitrogen (Ammonia Nitrogen)	8/19/2009		100	%	80 - 120
		Spiked Blank	Nitrogen (Ammonia Nitrogen)	8/19/2009		97	%	80 - 120
		Method Blank	Nitrogen (Ammonia Nitrogen)	8/19/2009	ND	RDL=0.05	mg/L	
		RPD	Nitrogen (Ammonia Nitrogen)	8/19/2009	NC		%	25
1911841	JRC	QC Standard	Turbidity	8/19/2009		100	%	80 - 120
		Method Blank	Turbidity	8/19/2009	ND	RDL=0.1	NTU	
		RPD	Turbidity	8/19/2009	8.5		%	25
1914377	KGU	QC Standard	Dissolved Aluminum (Al)	8/20/2009		99	%	80 - 120
		QC Standard	Dissolved Antimony (Sb)	8/20/2009		129 (1)	%	80 - 120
		QC Standard	Dissolved Arsenic (As)	8/20/2009		92	%	80 - 120
		QC Standard	Dissolved Barium (Ba)	8/20/2009		99	%	80 - 120
		QC Standard	Dissolved Beryllium (Be)	8/20/2009		93	%	80 - 120
		QC Standard	Dissolved Bismuth (Bi)	8/20/2009		108	%	80 - 120
		QC Standard	Dissolved Boron (B)	8/20/2009		94	%	80 - 120

QA/QC Batch Num	Init	QC Type	Date Analyzed Parameter	yyyy/mm/dd	Value	Recovery	Units	QC Limits
			Dissolved Cadmium (Cd)	8/20/2009		102	%	80 - 120
			Dissolved Chromium (Cr)	8/20/2009		101	%	80 - 120
			Dissolved Cobalt (Co)	8/20/2009		98	%	80 - 120
			Dissolved Copper (Cu)	8/20/2009		90	%	80 - 120
			Dissolved Iron (Fe)	8/20/2009		96	%	80 - 120
			Dissolved Lead (Pb)	8/20/2009		96	%	80 - 120
			Dissolved Manganese (Mn)	8/20/2009		93	%	80 - 120
			Dissolved Molybdenum (Mo)	8/20/2009		110	%	80 - 120
			Dissolved Nickel (Ni)	8/20/2009		95	%	80 - 120
			Dissolved Selenium (Se)	8/20/2009		91	%	80 - 120
			Dissolved Silver (Ag)	8/20/2009		90	%	80 - 120
			Dissolved Strontium (Sr)	8/20/2009		99	%	80 - 120
			Dissolved Thallium (Tl)	8/20/2009		92	%	80 - 120
			Dissolved Vanadium (V)	8/20/2009		100	%	80 - 120
			Dissolved Zinc (Zn)	8/20/2009		83	%	80 - 120
		Spiked Blank	Dissolved Aluminum (Al)	8/20/2009		109	%	80 - 120
			Dissolved Antimony (Sb)	8/20/2009		100	%	80 - 120
			Dissolved Arsenic (As)	8/20/2009		103	%	80 - 120
			Dissolved Barium (Ba)	8/20/2009		103	%	80 - 120
			Dissolved Beryllium (Be)	8/20/2009		107	%	80 - 120
			Dissolved Bismuth (Bi)	8/20/2009		112	%	80 - 120
			Dissolved Boron (B)	8/20/2009		102	%	80 - 120
			Dissolved Cadmium (Cd)	8/20/2009		103	%	80 - 120
			Dissolved Chromium (Cr)	8/20/2009		108	%	80 - 120
			Dissolved Cobalt (Co)	8/20/2009		107	%	80 - 120
			Dissolved Copper (Cu)	8/20/2009		111	%	80 - 120
			Dissolved Lead (Pb)	8/20/2009		107	%	80 - 120
			Dissolved Manganese (Mn)	8/20/2009		106	%	80 - 120
			Dissolved Molybdenum (Mo)	8/20/2009		106	%	80 - 120
			Dissolved Nickel (Ni)	8/20/2009		108	%	80 - 120
			Dissolved Selenium (Se)	8/20/2009		98	%	80 - 120
			Dissolved Silver (Ag)	8/20/2009		98	%	80 - 120
			Dissolved Strontium (Sr)	8/20/2009		106	%	80 - 120
			Dissolved Thallium (Tl)	8/20/2009		111	%	80 - 120
			Dissolved Tin (Sn)	8/20/2009		109	%	80 - 120
			Dissolved Titanium (Ti)	8/20/2009		106	%	80 - 120
			Dissolved Uranium (U)	8/20/2009		112	%	80 - 120
			Dissolved Vanadium (V)	8/20/2009		110	%	80 - 120
			Dissolved Zinc (Zn)	8/20/2009		109	%	80 - 120
		Method Blank	Dissolved Aluminum (Al)	8/20/2009	ND	RDL=5.0	ug/L	
			Dissolved Antimony (Sb)	8/20/2009	ND	RDL=2.0	ug/L	
			Dissolved Arsenic (As)	8/20/2009	ND	RDL=2.0	ug/L	
			Dissolved Barium (Ba)	8/20/2009	ND	RDL=5.0	ug/L	
			Dissolved Beryllium (Be)	8/20/2009	ND	RDL=2.0	ug/L	
			Dissolved Bismuth (Bi)	8/20/2009	ND	RDL=2.0	ug/L	
			Dissolved Boron (B)	8/20/2009	ND	RDL=5.0	ug/L	
			Dissolved Cadmium (Cd)	8/20/2009	ND	RDL=0.017	ug/L	
			Dissolved Chromium (Cr)	8/20/2009	ND	RDL=1.0	ug/L	
			Dissolved Cobalt (Co)	8/20/2009	ND	RDL=0.40	ug/L	
			Dissolved Copper (Cu)	8/20/2009	ND	RDL=2.0	ug/L	
			Dissolved Iron (Fe)	8/20/2009	ND	RDL=50	ug/L	
			Dissolved Lead (Pb)	8/20/2009	ND	RDL=0.50	ug/L	

QA/QC	Date								
Batch	Analized								
Num	Init	QC Type	Parameter	yyyy/mm/dd	Value	Recovery	Units	QC Limits	
			Dissolved Manganese (Mn)	8/20/2009	ND	RDL=2.0	ug/L		
			Dissolved Molybdenum (Mo)	8/20/2009	ND	RDL=2.0	ug/L		
			Dissolved Nickel (Ni)	8/20/2009	ND	RDL=2.0	ug/L		
			Dissolved Selenium (Se)	8/20/2009	ND	RDL=1.0	ug/L		
			Dissolved Silver (Ag)	8/20/2009	ND	RDL=0.10	ug/L		
			Dissolved Strontium (Sr)	8/20/2009	ND	RDL=5.0	ug/L		
			Dissolved Thallium (Tl)	8/20/2009	ND	RDL=0.10	ug/L		
			Dissolved Tin (Sn)	8/20/2009	ND	RDL=2.0	ug/L		
			Dissolved Titanium (Ti)	8/20/2009	ND	RDL=2.0	ug/L		
			Dissolved Uranium (U)	8/20/2009	ND	RDL=0.10	ug/L		
			Dissolved Vanadium (V)	8/20/2009	ND	RDL=2.0	ug/L		
			Dissolved Zinc (Zn)	8/20/2009	ND	RDL=5.0	ug/L		
1914385	MPT	QC Standard	Total Aluminum (Al)	8/21/2009		100	%	80 - 120	
			Total Antimony (Sb)	8/21/2009		134 (2)	%	80 - 120	
			Total Arsenic (As)	8/21/2009		99	%	80 - 120	
			Total Barium (Ba)	8/21/2009		98	%	80 - 120	
			Total Beryllium (Be)	8/21/2009		95	%	80 - 120	
			Total Boron (B)	8/21/2009		87	%	80 - 120	
			Total Cadmium (Cd)	8/21/2009		99	%	80 - 120	
			Total Chromium (Cr)	8/21/2009		98	%	80 - 120	
			Total Cobalt (Co)	8/21/2009		103	%	80 - 120	
			Total Copper (Cu)	8/21/2009		102	%	80 - 120	
			Total Iron (Fe)	8/21/2009		108	%	80 - 120	
			Total Lead (Pb)	8/21/2009		100	%	80 - 120	
			Total Manganese (Mn)	8/21/2009		100	%	80 - 120	
			Total Molybdenum (Mo)	8/21/2009		111	%	80 - 120	
			Total Nickel (Ni)	8/21/2009		103	%	80 - 120	
			Total Selenium (Se)	8/21/2009		105	%	80 - 120	
			Total Strontium (Sr)	8/21/2009		103	%	80 - 120	
			Total Thallium (Tl)	8/21/2009		121 (1)	%	80 - 120	
			Total Uranium (U)	8/21/2009		91	%	80 - 120	
			Total Vanadium (V)	8/21/2009		102	%	80 - 120	
			Total Zinc (Zn)	8/21/2009		98	%	80 - 120	
		Spiked Blank	Total Aluminum (Al)	8/21/2009		104	%	80 - 120	
			Total Antimony (Sb)	8/21/2009		103	%	80 - 120	
			Total Arsenic (As)	8/21/2009		96	%	80 - 120	
			Total Barium (Ba)	8/21/2009		99	%	80 - 120	
			Total Beryllium (Be)	8/21/2009		95	%	80 - 120	
			Total Bismuth (Bi)	8/21/2009		105	%	80 - 120	
			Total Boron (B)	8/21/2009		94	%	80 - 120	
			Total Cadmium (Cd)	8/21/2009		98	%	80 - 120	
			Total Chromium (Cr)	8/21/2009		97	%	80 - 120	
			Total Cobalt (Co)	8/21/2009		98	%	80 - 120	
			Total Copper (Cu)	8/21/2009		98	%	80 - 120	
			Total Lead (Pb)	8/21/2009		96	%	80 - 120	
			Total Manganese (Mn)	8/21/2009		102	%	80 - 120	
			Total Molybdenum (Mo)	8/21/2009		103	%	80 - 120	
			Total Nickel (Ni)	8/21/2009		97	%	80 - 120	
			Total Selenium (Se)	8/21/2009		97	%	80 - 120	
			Total Silver (Ag)	8/21/2009		102	%	80 - 120	
			Total Strontium (Sr)	8/21/2009		99	%	80 - 120	
			Total Thallium (Tl)	8/21/2009		101	%	80 - 120	

QA/QC Batch Num	Init	QC Type	Date Analyzed Parameter	Value	Recovery	Units	QC Limits
			Total Tin (Sn)	8/21/2009	108	%	80 - 120
			Total Titanium (Ti)	8/21/2009	101	%	80 - 120
			Total Uranium (U)	8/21/2009	104	%	80 - 120
			Total Vanadium (V)	8/21/2009	99	%	80 - 120
			Total Zinc (Zn)	8/21/2009	97	%	80 - 120
		Method Blank	Total Aluminum (Al)	8/21/2009	ND	RDL=5.0	ug/L
			Total Antimony (Sb)	8/21/2009	ND	RDL=2.0	ug/L
			Total Arsenic (As)	8/21/2009	ND	RDL=2.0	ug/L
			Total Barium (Ba)	8/21/2009	ND	RDL=5.0	ug/L
			Total Beryllium (Be)	8/21/2009	ND	RDL=2.0	ug/L
			Total Bismuth (Bi)	8/21/2009	ND	RDL=2.0	ug/L
			Total Boron (B)	8/21/2009	ND	RDL=5.0	ug/L
			Total Cadmium (Cd)	8/21/2009	ND	RDL=0.017	ug/L
			Total Chromium (Cr)	8/21/2009	ND	RDL=1.0	ug/L
			Total Cobalt (Co)	8/21/2009	ND	RDL=0.40	ug/L
			Total Copper (Cu)	8/21/2009	ND	RDL=2.0	ug/L
			Total Iron (Fe)	8/21/2009	ND	RDL=50	ug/L
			Total Lead (Pb)	8/21/2009	ND	RDL=0.50	ug/L
			Total Manganese (Mn)	8/21/2009	ND	RDL=2.0	ug/L
			Total Molybdenum (Mo)	8/21/2009	ND	RDL=2.0	ug/L
			Total Nickel (Ni)	8/21/2009	ND	RDL=2.0	ug/L
			Total Selenium (Se)	8/21/2009	ND	RDL=1.0	ug/L
			Total Silver (Ag)	8/21/2009	ND	RDL=0.10	ug/L
			Total Strontium (Sr)	8/21/2009	ND	RDL=5.0	ug/L
			Total Thallium (Tl)	8/21/2009	ND	RDL=0.10	ug/L
			Total Tin (Sn)	8/21/2009	ND	RDL=2.0	ug/L
			Total Titanium (Ti)	8/21/2009	ND	RDL=2.0	ug/L
			Total Uranium (U)	8/21/2009	ND	RDL=0.10	ug/L
			Total Vanadium (V)	8/21/2009	ND	RDL=2.0	ug/L
			Total Zinc (Zn)	8/21/2009	ND	RDL=5.0	ug/L

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.

Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.

NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

(1) Secondary RM is acceptable.

(2) Suspect problem with RM. Minimal impact on data quality.

APPENDIX B

Additional Aquifer Test Figures

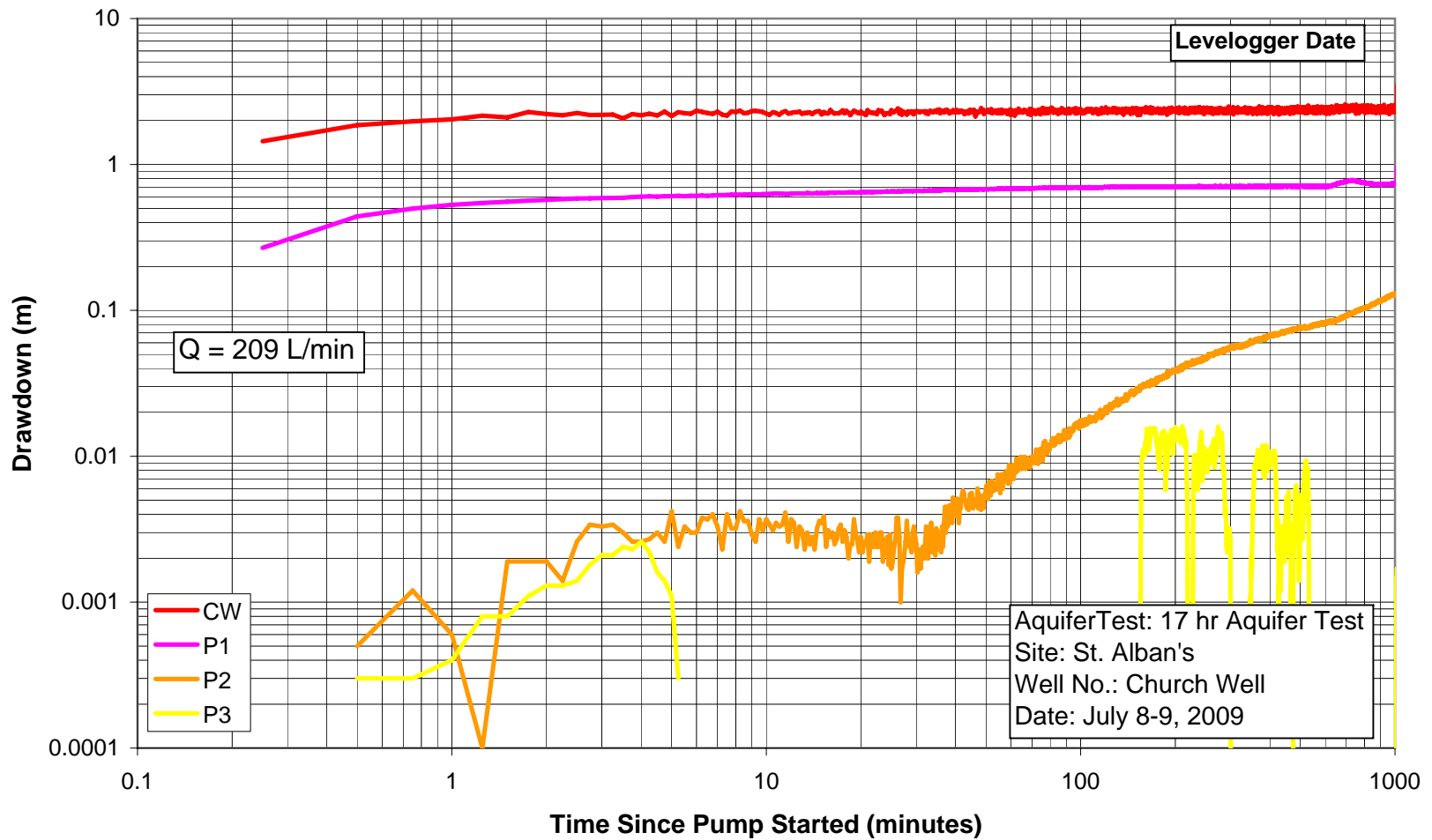


Figure B1 Log-log plot of drawdown versus time for Church Well (CW), CW-P1, CW-P2, and CW-P3 during the 17 hour aquifer test on Church Well (209 L/min).

Project No.

500

Scale

Not To Scale

Location

St. Alban's, NL

Date

August 2009



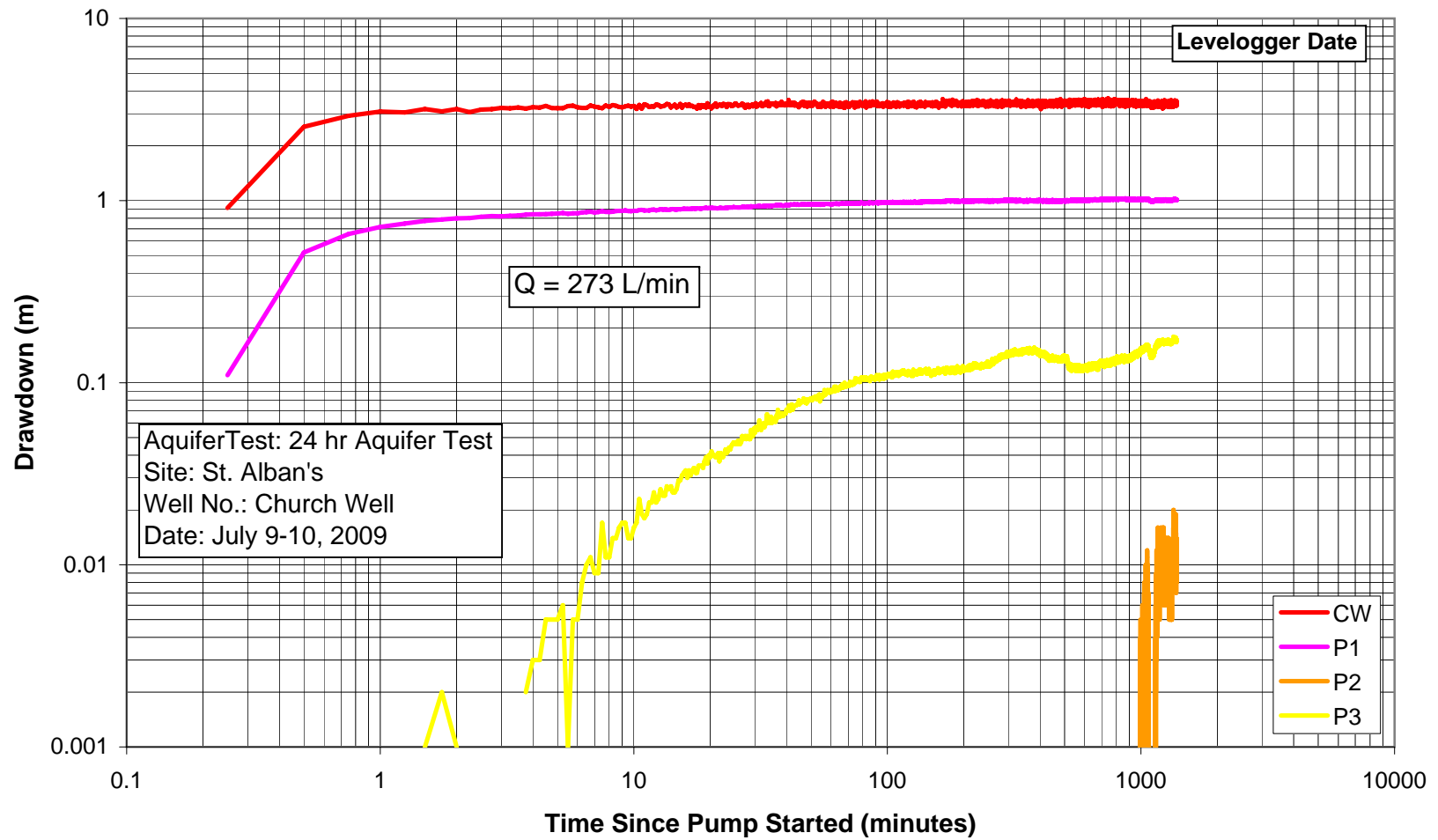


Figure B2 Log-log plot of drawdown versus time for Church Well (CW), CW-P1, CW-P2, and CW-P3 during the 24 hour aquifer test on Church Well (273 L/min).

Project No.

500

Scale

Not To Scale

Location

St. Alban's, NL

Date

August 2009



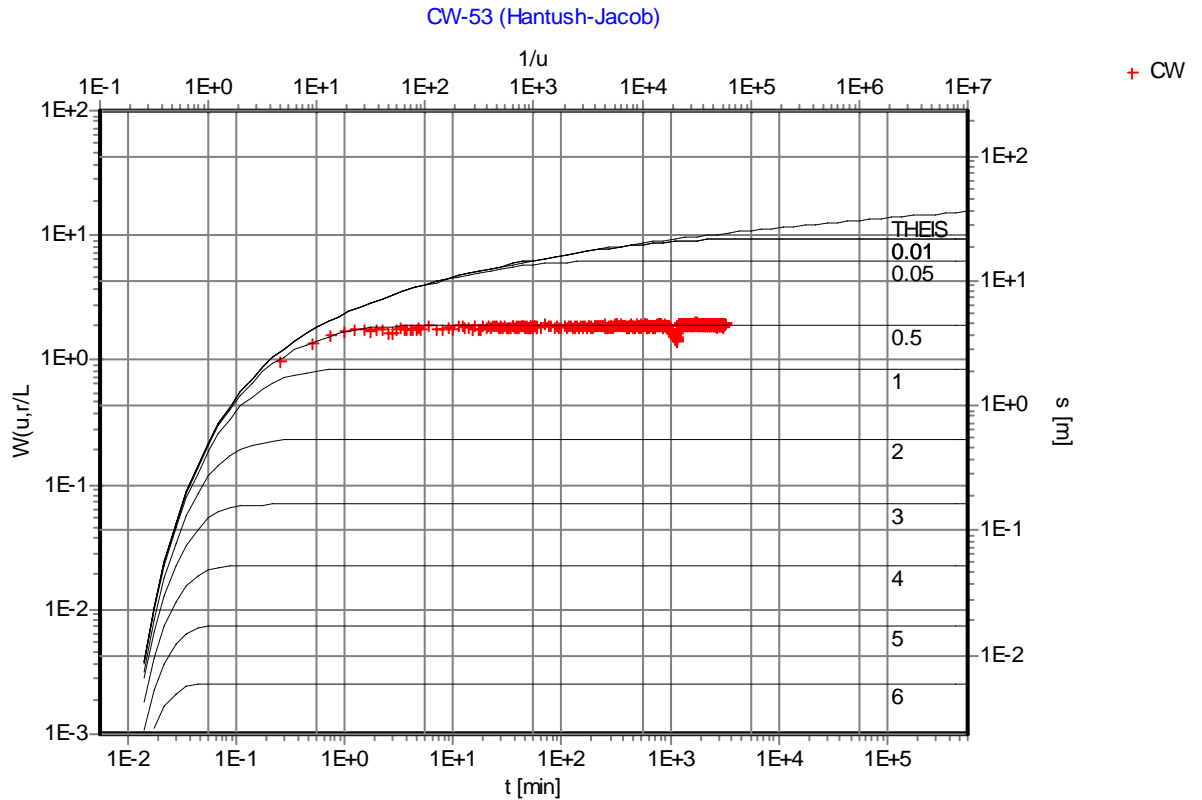


Fracflow Consultants Inc.

154 Major's Path
 St. John's, NL
 (709) 739-7270

Pumping Test Analysis Report

Project: 500_Aquifer Test
 No: 500
 Client: Cold Ocean Salmon Inc.



Test name: **CW-53**

Analysis method: **Hantush-Jacob**

Analysis results: Conductivity: 3.80E-6 [m/s]

Test parameters:

Pumping well:	CW	Aquifer thickness:	50 [m]
Casing radius	0.0762 [m]		
Screen length:	3 [m]		
Screen radius:	0.0762 [m]		
Discharge rate:	5.5311 [l/s]		

Figure B3 Analysis of 53 hour aquifer test on Church Well using the Hantush-Jacob method on a log-log plot.

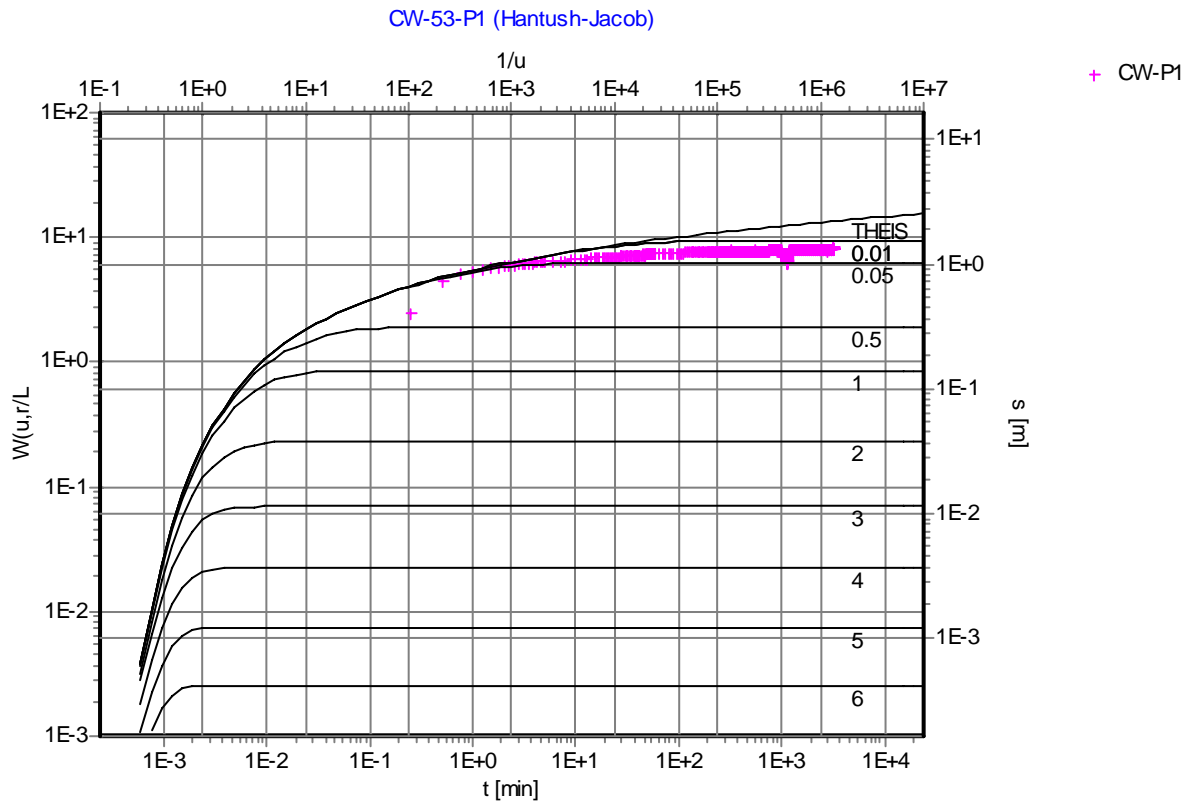


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154 Major's Path
 St. John's, NL
 (709) 739-7270

Pumping Test Analysis Report

Project: 500_Aquifer Test
 No: 500
 Client: Cold Ocean Salmon Inc.



Test name: **CW-53-P1**
Analysis method: **Hantush-Jacob**

<u>Analysis results:</u>	Transmissivity:	2.67E-3 [m ² /s]	Conductivity:	5.34E-5 [m/s]
	Storativity:	7.15E-6	c:	1.34E+7 [min]

<u>Test parameters:</u>	Pumping well:	CW	Aquifer thickness:	50 [m]
	Casing radius	0.0762 [m]	r/L:	0.01
	Screen length:	3 [m]		
	Screen radius:	0.0762 [m]		
	Discharge rate:	5.5311 [l/s]		

Figure B4 Analysis of aquifer test on CW-P1 (observation well) using the Hantush-Jacob method on a log-log plot during 53 hour aquifer test on Church Well (pumping well).

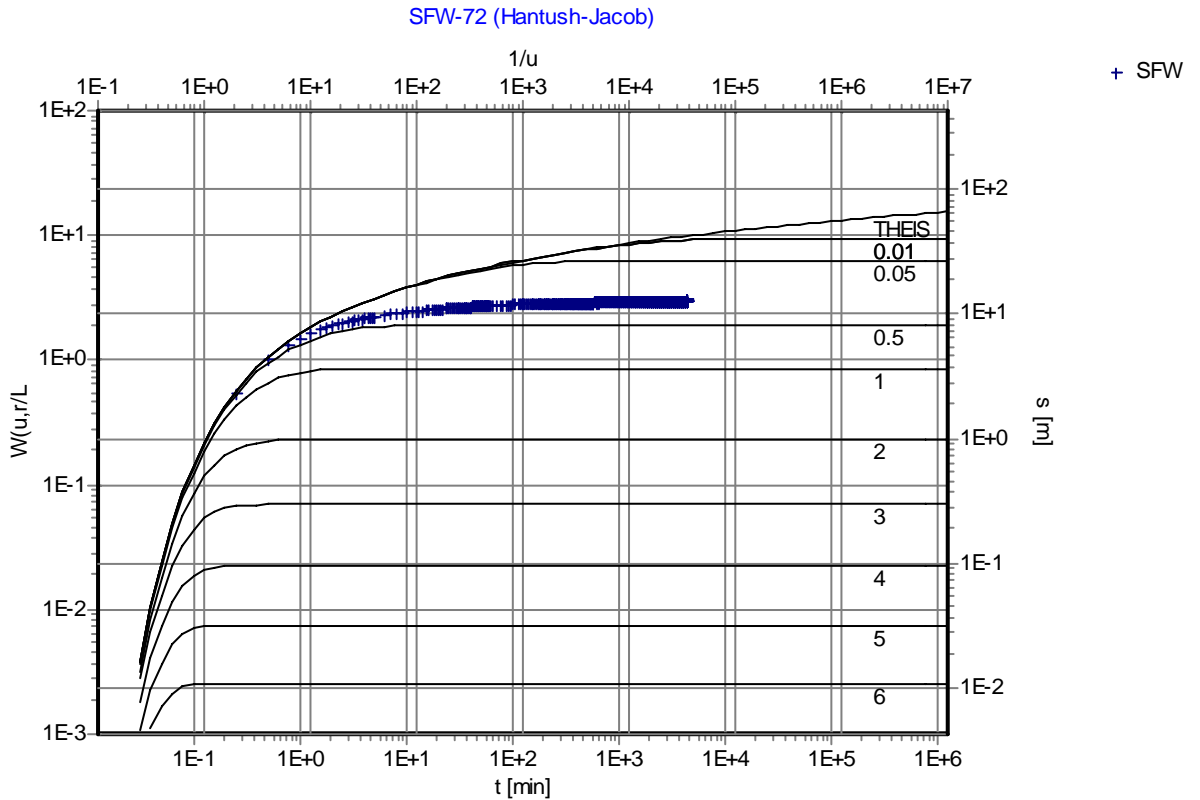


Fracflow Consultants Inc.

154 Major's Path
 St. John's, NL
 (709) 739-7270

Pumping Test Analysis Report

Project: 500_Aquifer Test
 No: 500
 Client: Cold Ocean Salmon Inc.



Test name: **SFW-72**
Analysis method: **Hantush-Jacob**

Analysis results: Conductivity: 1.44E-6 [m/s]

Test parameters:

Pumping well:	SFW	Aquifer thickness:	50 [m]
Casing radius:	0.0762 [m]		
Screen length:	50 [m]		
Screen radius:	0.0762 [m]		
Discharge rate:	3.8642 [l/s]		

Figure B5 Analysis of 72 hour aquifer test on Sea Farm Well using the Hantush-Jacob method on a log-log plot.



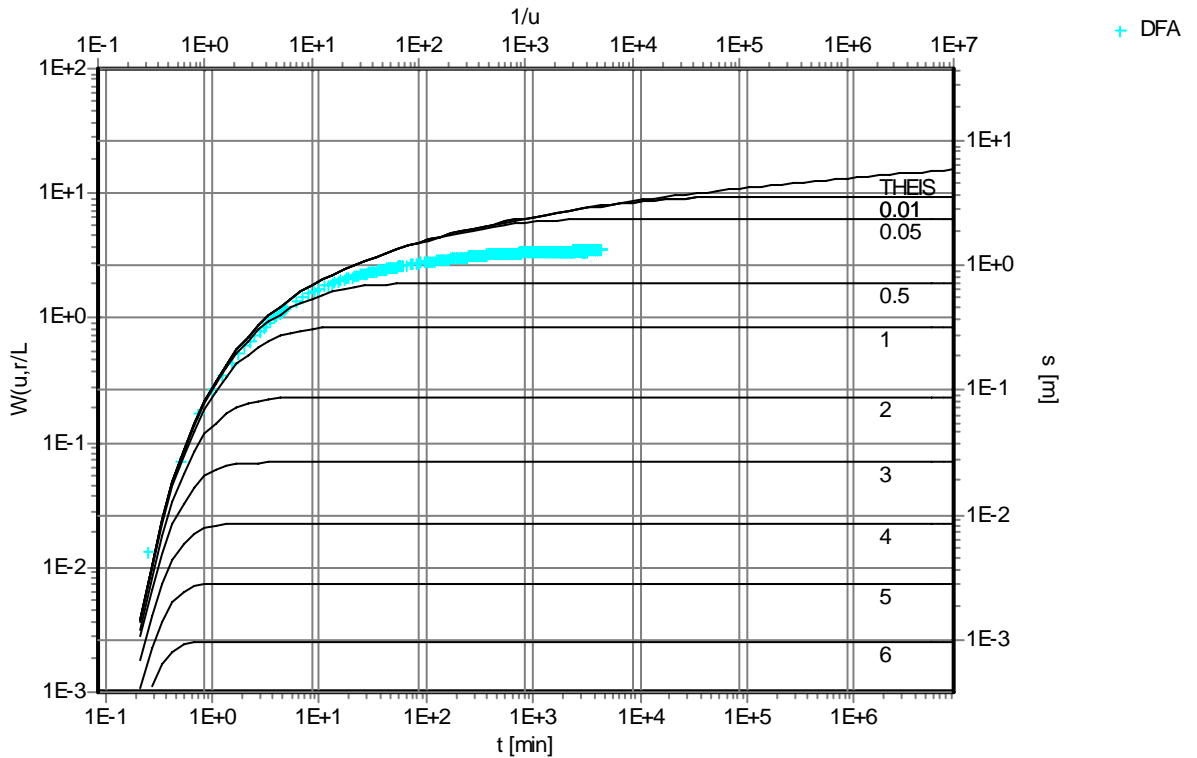
Fracflow Consultants Inc.

154 Major's Path
 St. John's, NL
 (709) 739-7270

Pumping Test Analysis Report

Project: 500_Aquifer Test
 No: 500
 Client: Cold Ocean Salmon Inc.

SFW-72-DFA (Hantush-Jacob)



Test name: **SFW-72-DFA**
Analysis method: **Hantush-Jacob**

<u>Analysis results:</u>	Transmissivity:	8.09E-4 [m ² /s]	Conductivity:	1.62E-5 [m/s]
	Storativity:	4.44E-5	c:	7.67E+8 [min]

<u>Test parameters:</u>	Pumping well:	SFW	Aquifer thickness:	50 [m]
	Casing radius	0.0762 [m]	r/L:	0.01
	Screen length:	50 [m]		
	Screen radius:	0.0762 [m]		
	Discharge rate:	3.8642 [l/s]		

Figure B6 Analysis of aquifer test on DFA Well (observation well) using the Hantush-Jacob method on a log-log plot during 72 hour aquifer test on Sea Farm Well (pumping well).

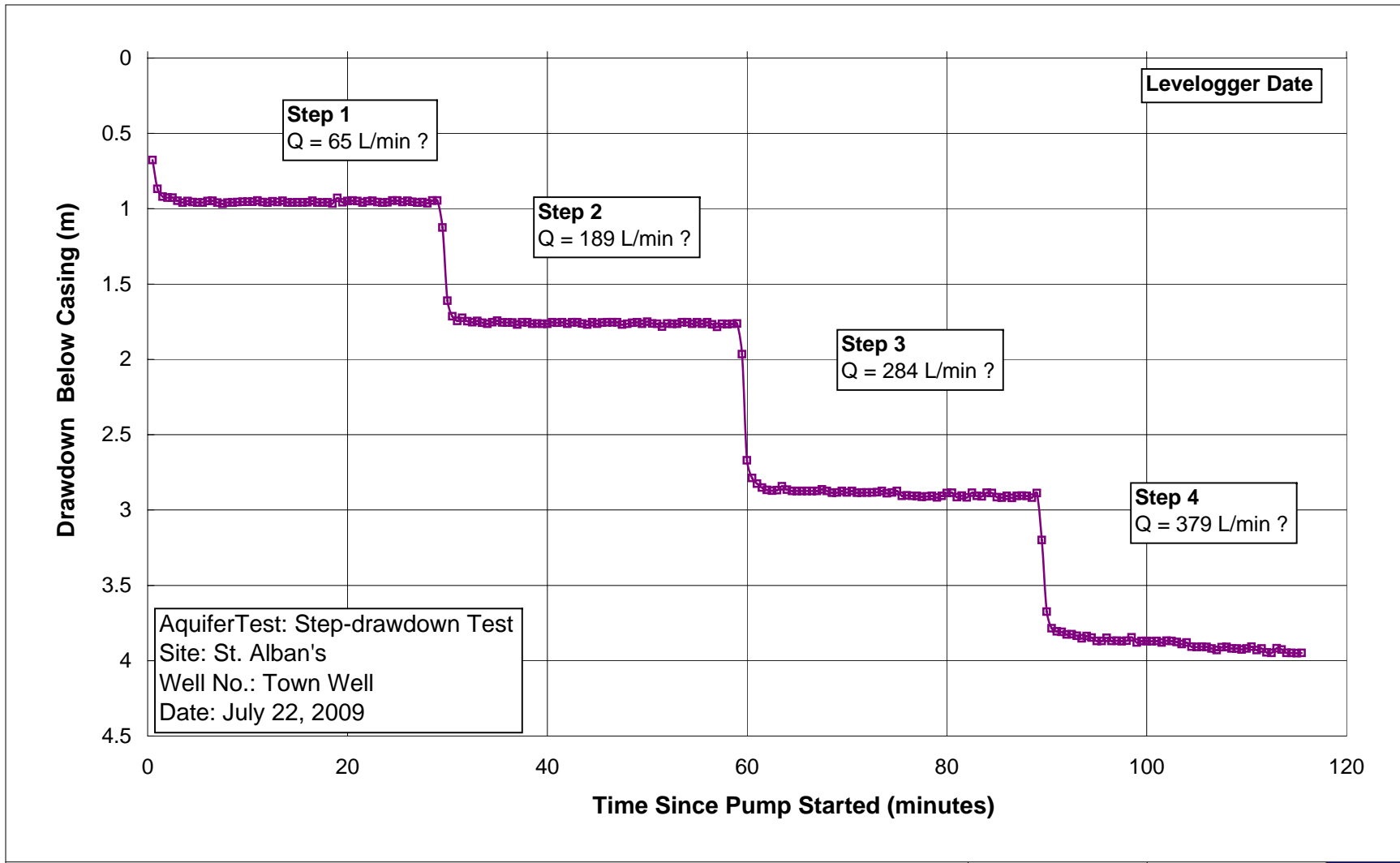


Figure B7 Plot of drawdown versus time for the step drawdown test on Town Well #8.

Project No. 500	Scale Not To Scale
Location St. Alban's NL	Date August 2009



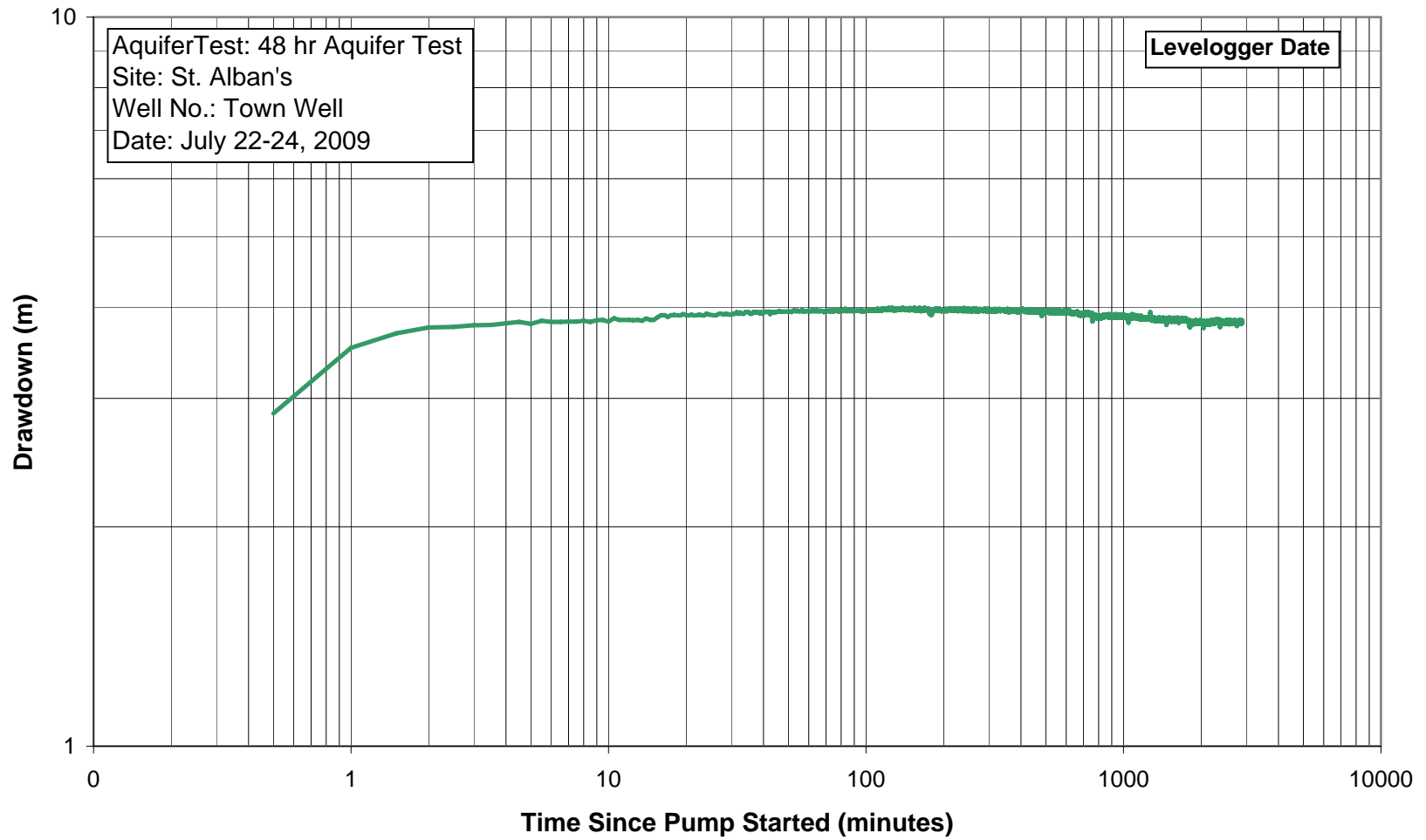


Figure B8 Log-log plot of drawdown versus time for Town Well #8 for aquifer test.

Project No. 500	Scale Not To Scale
Location St. Alban's NL	Date August 2009

