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Consolidated Terrain Analysis and Hydrogeological Study Reports

Greely Village Centre Subdivision
Part of Lot 73 and Part of Lot 74, Registrar's Compiled Plan 902
Ottawa (Osgoode), Ontario

Prepared For

Sunset Lakes
Development Corporation

October 8, 2008

Report No. PH0145-07

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TABLE OF CONTENTS

APPENDICES

LIST OF TABLES

LIST OF FIGURES (APPENDIX 5)

LIST OF DRAWINGS (APPENDIX 5)

1.0 INTRODUCTION

1.1 Terms of Reference

The firm of Paterson Group Inc. was retained by Mr. Dan Anderson, of Sunset Lakes Development Corporation, to prepare a Terrain Analysis and Hydrogeological Study for a parcel of land forming part of the proposed Greely Village Centre, located within Part of Lots 73 & 74, Registrar's Compiled Plan 902, contained within Part of Lot 6, Concession 5, in the former Township of Osgoode, City of Ottawa, Ontario.

1.2 Background

The subject property is located at the corner of Regional Highway No. 31 and Parkway road in the southeast part of the Village of Greely, Ontario (refer to the Key Plan illustrated in DWG. PH0145-1 located in Appendix 5). The total area in the subdivision application is 30.35 ha (78.21 acres) and will consist of the following land uses on private services:

- Professional Office Park ;
- and a 75 residential lot subdivision .

The purpose of this study has been to ascertain and assess the specific terrain and hydrogeological conditions that currently exist beneath the subject property as they relate to the suitability of the site for development on private services with minimal impact on groundwater resources.

2.0 STUDY METHODOLOGY

2.1 Terrain Analysis

As part of this study, a series of test pits were put down on the subject property to delineate the subsurface soil conditions beneath the site. The field investigation for the residential subdivision was initiated on June 3, 2005. The test pit locations were selected by Paterson Group Inc. personnel to ensure that adequate representation of the subsurface profile was delineated. All test pit locations were selected to accommodate excavation using a standard backhoe. A total of 13 test pits were put down in conjunction with the terrain investigation. The soil profile and test data sheets for each test pit are provided in Appendix 1.

The test pit locations were recorded and the subsurface conditions, including the soil morphology and depth to the groundwater table, were carefully observed and recorded by Paterson Group Inc. personnel as the test pits were advanced. Representative samples of each major soil type were recovered from the test pits. The samples were carefully sealed and returned to our laboratory for further analysis.

2.2 Test Well Installation

Five (5) test wells, denoted as TW1 to TW5 respectively, were constructed at the site by Gilles Bourgeois Well Drilling of St. Albert, Ontario. The test well locations were carefully chosen based on topography and site access considerations. Actual well construction was carried out between April 27, 2005 and May 5, 2005 under the direct supervision of qualified Paterson Group Inc. personnel. The MOE Water Well Record for each test well is provided in Appendix 2.

The casing hole for each test well was advanced at least 1.2 m into the underlying bedrock formation using rotary air drill rig. The annular space was grouted with a neat cement slurry delivered through pressure grouting equipment. Grout was pumped until return to surface in the annular space was observed and a 24 hour set up time was realized prior to continuing drilling.

A 150 mm diameter button bit was used to advance each well to completion through the rock formation. A cross sectional diagram of TW1 is provided in Figure 1 of Appendix 5 and adequately reflects the typical construction of the test wells at the site.

In addition to the field testing component of this study, published MOE Water Well Records were reviewed to assess the general aquifer characteristics of the area. A detailed analysis of these records is presented in Section 5.0.

Test well construction, as well as other site hydrogeology is discussed in Section 6.0.

2.3 Aquifer Analysis

Each test well was pump for a duration of six hours. The pump tests were conducted using a 1.5HP electric submersible pump powered by a portable gasoline generator. The water discharge line was placed downgradient of the well and at a sufficient length in order to minimize the potential for short-circuiting and recharge of the pumped well.

Recovery data was collected for each pump test to assist with aquifer analysis. Several test wells were observed to recover within the first few minutes after pumping had ended and all wells were observed to reach at least 95% recovery within a reasonable period of time.

Pump testing data was analyzed using Waterloo Hydrogeologic's "Aquifer Test" v. 2.5 aquifer analysis software package. The following analytical methods were applied (data permitting):

- Cooper Jacob's Time Drawdown;
- Theis Recovery;
- and Theis (Curve matching).

The results of the aquifer analysis are presented and discussed in Section 7.0.

2.4 Laboratory Testing

Soil

Hydrometer analysis was performed in accordance with ASTM testing methods, on a total of four (4) soil samples recovered as part of the test pit investigation. The grain size distribution curves are provided in Appendix 1 and are discussed in Section 4.1.

All soil samples will be stored in our laboratory for a period of three months after issuance of this report. They will then be discarded unless we are directed otherwise.

Groundwater

Two (2) water samples were collected from each of the five (5) test wells during the course of the pump testing at three (3) hours of pumping and at six (6) hours of pumping, respectively, and were preserved for chemical analyses. The samples were submitted to Accutest Laboratories, of Nepean, Ontario for analysis of a standard "Subdivision Supply Requirement" package which includes a comprehensive suite of health and aesthetic based parameters that are typically used to assess water quality for the purposes of human consumption. The analytical results of each water sample are provided in Appendix C, and are discussed in detail under Section 7.2.

3.0 SITE DESCRIPTION

The primary use of the site has historically been for agricultural use. Specifically, the subject parcel of land has been farmed for various cash crops from a series of fields. Aside from a few trees delineating the field boundaries, the site is generally clear of treed areas.

3.1 Topography and Drainage

The topographical relief of the site is generally flat with near level conditions throughout. Overall relief is towards the north-northeast at a slope of between 0.5 % to 1 %.

The surficial drainage of the site is achieved through a series of drainage ditches located parallel to Parkway Road. The drainage ditches direct surface runoff towards the roadside ditch along Sale barn Road; the eastern boundary of the site.

3.2 Surrounding Land Uses Within 500 m

The lands directly surrounding the site to the north of Highway No. 31 are predominantly active agricultural lands. Existing privately serviced residential dwellings contained in existing plans of subdivision occupy the south side of Highway No. 31 across from the site.

4.0 GEOLOGY

The following sections describe the regional and site specific geology of the study area.

4.1 Surficial Geology

A review of available surficial soils mapping surrounding the subject property contained in Soil Survey Report No. 58 indicates the site in generally located on deposits of low permeable soils of the Manotick association, specifically the Allendale series. The Allendale series is categorized as a poorly drained marine soil having a grayish brown to olive gray colour with reddish brown to dark yellowish brown mottling throughout.

A narrow band of the well draining Grenville soil association encroaches from the south east of the property, however this soil occupies a relatively small area of the subject site.

Based on the results of the test-pit excavation program, overburden thickness across the site and beneath the proposed subdivision, is more than 3 m in all areas encountered in the subject property. Using well recognized techniques for field identification of soils, four (4) specific stratigraphic units were identified in the areas investigated. The soils were classified using the Unified Soil Classification System (USCS) and hydraulic conductivities were estimated based on published data correlating soil types to permeability. The stratigraphic units are summarized below in Table 1:

TABLE 1
SUMMARY OF UNIQUE STRATIGRAPHIC UNITS ENCOUNTERED ON SUBJECT PROPERTY

Stratigraphic Unit	General Description (USCS Classification)	Composition[1] (%sand, silt, clay)	Thicknes s (m)	Estimated Hydraulic Conductivity[2] (cm/s)
1	SM - Silty sand - inorganic silt with fine sand composite	Not Available	0.3 to more than 1.2	10^{-3} to 10^{-5}
2	GM- gravel,.sand silt mixture (glacial till)	Not Available	1.2 to more than 1.5	10^{-2} to 10^{-4}
3	ML-MH– inorganic silts and silty or clayey silts with slight plasticity	0.3-3.7% sand 41.7-51.3 silt 45-58% clay	2.1 to more than 6	10^{-5} to less than 10^{-7}
4	CH–CL- inorganic clay of high plasticity to silty clay	5.5-10% sand 20.5 – 29.7% silt 60 – 74% clay	2.7 to more than 6	10^{-7} to less than 10^{-9}

1. Composition for CH, CL, ML and MHdetermined from grain size and hydrometer analysis.
2. Hydraulic conductivity estimated based on MOE Manual of Guidelines and Policies (1987)

These stratigraphic units are generally consistent with the surficial soil map in the close proximity to the site.

Laboratory hydrometer testing was performed on representative samples of the CH, CL, MH and ML soil units to validate in situ field identification and hydraulic conductivity estimates. The percent composition was easily determined (refer to Table 1) and hydraulic conductivity was validated. The grain size distribution curves are provided in Appendix 1.

Test pit locations and corresponding stratigraphy of the main soil types are summarized on the Test Hole Locations Plan (DWG. PH0145-1 in Appendix 5). The test pit logs are found in Appendix 1.

4.2 Bedrock Geology

Published mapping indicates that the study area is underlain by Paleozoic bedrock of the Oxford Formation. The MOE Water Well Records confirm the presence of limestone bedrock under the site at depths varying from 6.7 m to 7.9 m. Site specific observations indicated that bedrock was not encountered in any of the test pits put down in the subject area.

The primary water supply aquifer is anticipated to consist of fractured zones in the Paleozoic bedrock.

5.0 REGIONAL HYDROGEOLOGY

A total of 76 published MOE Water Well Records for the area immediately surrounding the site were reviewed. The respective water well records for each grouping of surrounding wells are summarized in Appendix 2. Graphical representation of the statistical analysis performed on the Water Well Records is also presented in Appendix 2.

5.1 Overburden Analysis

The statistical analysis of the published records indicates that none of the wells had overburden thicknesses of less than 3 m. Moreover, only 10% of the wells in the published MOE records were reported to have less than 6.1 m of overburden.

The above data confirms that the thickness of overburden observed in the test pits put down for the terrain analysis is, indeed, representative of overburden conditions over the entire site.

5.2 Well Depth

With respect to well depth, the analysis of the published records reveals that all wells were completed in Paleozoic bedrock formations and well depths vary little in the immediate surroundings. 84% of the wells in the published MOE records were completed at depths between 12 m and 43 m; no wells were completed at depths greater than 43 m. This grouping of well depths suggests the presence of several fractured regions within the Paleozoic strata.

5.3 Aquifer Depth

All of the surrounding wells were reported to have encountered water at depths between 6 m and 43 m. Approximately 54% of the surrounding wells encountered water bearing formations at depths of between 12 m and 18 m. Comparative analysis against overburden thickness and well depths suggests the broad presence of water bearing formations at 12 m to 24 m within the Paleozoic bedrock.

5.4 Well Yield

Published well records indicate that 100% of the surrounding wells have well yields of more than 3 IGPM and 5% of these wells are reported to have well yields of more than 50 IGPM.

Comparative analysis of the reported well yields against aquifer depths suggests that the water bearing formations between 12 m and 24 m are capable of providing well yields of between 5 IGPM and 30 IGPM: this is considered to be a water bearing formation with above average yield potential.

5.5 Free Flowing Artesian Wells

Of the surrounding wells reviewed, only one (1) well were reported to be free flowing artesian wells.

6.0 SITE HYDROGEOLOGY

As stated previously, a total of five (5) test wells were constructed throughout the site (refer to Dwg. No. PH0145-1 in Appendix 5). Construction details for each test well, based on MOE Water Well Records and site notes, are summarized below in Table 2. The geodetic elevations of the top of casing for the test wells were provided from a separate survey conducted in conjunction with other related work.

TABLE 2
SUMMARY OF GEOLOGIC CONDITIONS OBSERVED DURING TEST WELL CONSTRUCTION

Test Well No.	GEODETIC ELEVATIONS (metres above Mean Sea Level)				Geologic Description of Rock Formation
	Top of Casing	Existing Grade	Top of Rock	Bottom of Well	
1	92.05	91.5	83.88	61	grey limestone, layered
2	90.9	90.2	82.28	35	grey limestone, white sandstone
3	89.9	89.2	82.19	40	grey limestone, layered
4	86.65	85.9	79.2	49	grey limestone
5	86.3	85.7	77.78	55	grey limestone

A review of Table 2 shows that the hydrogeology of the test wells is generally consistent with the data presented in Section 5. Furthermore, overall well depths were generally consistent, having been completed at approximate depths of between 25 m and 50 m. Reported well yields were consistent with the wells in the surrounding area.

Using the geodetic elevations of the well casings, test well construction data and static water levels were used to analyze groundwater flow through the site.

The supply aquifers were intercepted between 28 m and 53 m below the surface of the ground. The static water levels reported in the test wells indicate piezometric head pressures on the aquifer of between 25.8 m and 51.3 m (i.e. 35 psi and 69.8 psi). The presence of these significant pressures suggests that the aquifer is being acted on by two aquitards, thus creating a confined aquifer. By definintion, "**a confined aquifer is an aquifer that is confined between two aquitards.**" (Freeze & Cherry , 1979) The combination of the low permeable overburden material and the bedrock above the supply aquifer can, therefore, be considered an aquitard.

Piezometric head analysis was conducted using the Surfer (v.8) software package. Dwg. No. PH0145-3 in Appendix 5 clearly illustrates the general delineation of piezometric head across the site as calculated using the software package. The direction of groundwater flow is generally towards the north by northeast and reflects the overall topography across the site. Further analysis of PH0145-3 indicates that the piezometric head contours are evenly spaced across the site from TW1 to TW5 indicating a relatively constant groundwater gradient in the north-northeast direction.

An overburden aquifer exists below the surface of the ground and is anticipated to extend downward to the bedrock. The monitoring wells installed at various locations throughout the site (refer to Drawing No. PH0145-1 for locations) indicate significant variations in static water level elevations between the overburden aquifer and the deeper supply aquifer. This information provides further evidence that the lower aquifer is confined by the overburden and un-jointed bedrock strata above it.

DWG No. PH0145-4 in Appendix 5 is provided to illustrate a cross sectional profile of the general terrain and geologic conditions that exist across the subject site. The depths of the wells, aquifer elevations and overburden water levels have also been visually presented.

7.0 AQUIFER ANALYSIS

The results of the pumping tests performed on the test wells are presented in the following sections.

7.1 Evaluation of Water Quantity

Pump test data and analytical plots for the five pump tests conducted are provided in Appendix 4. Hydraulic properties, including pumping rate, available and maximum drawdown, transmissivity, and storativity for the water supply aquifer for each of the test wells are summarized in Table 3 below.

TABLE 3
AQUIFER TEST RESULTS FROM PUMP TESTING OF FIVE WELLS

ITEM	TW 1	TW 2	TW 3	TW 4	TW 5
Pumping Rate (IGPM)	26.7	26.7	26.7	24	26.7
Depth of Well (Metres Below Existing Grade)	30.48	54.86	48.76	36.57	30.48
Static Water Level (Metres Below Existing Grade)	1.65	1.98	0.7	1.2	0.71
Available Drawdown (m)	28.83	52.88	48.06	35.37	29.77
Maximum Drawdown (Metres Below Existing Grade)	2.17	2.78	1.58	6.25	1.33
Available Drawdown (Expressed as Percentage)	92.5	94.7	96.7	82.3	95.5
Storativity	$3.01\text{x}10^{-4}$	$1.16\text{x}10^{-4}$	$5.5\text{x}10^{-1}$	$3.73\ \text{x}10^{-6}$	$5.33\text{x}10^{-6}$
Transmissivity [1] (m^2/min)	$1.60\text{x}10^{-1}$	$2.1\text{x}10^{-1}$	$1.65\text{x}10^{-1}$	$2.0\text{x}10^{-1}$	$1.31\text{x}10^{-1}$

1.Transmissivity values listed in the table are numerical averages of those values obtained from all analytical methods used.

For TW2, TW3, TW4 and TW5, static water levels were recorded in the nearby monitoring wells to assess any potential for hydraulic response to pumping. Such response would indicate the presence of a hydraulic connection between the receiving aquifer and water supply aquifer. The monitoring well responses for each pump test are included in Appendix 4 with the rest of the pump test data. A static water level drop of 2 cm and 1cm was recorded in MW7 and MW 8, respectively, while pump testing TW4. A static water level drop of 2 cm was recorded in both MW8 and MW9 while pump testing TW5. However, the static water levels in these monitoring piezometers did not continue to fall throughout the duration of the pump test, as observed in the observation well, nor did they recover at the conclusion of the tests. Furthermore, the individual responses of the monitoring piezometers could not be accurately modelled as they did not exhibit behaviour consistent with Neuman or Hantush, the established modelling methods for overburden aquifers and leaky aquifers respectively.

Considering that the receiving aquifer is unconfined, the aquifer is subject to barometric changes. On page 234 of Freeze & Cherry (1979), it states:

> "*It has also been observed that changes in atmospheric pressure can cause small fluctuations in the water table in unconfined aquifers. As the air pressure increases, water tables fall.....Turk (1975) measured diurnal fluctuations of up to 6 cm in a fine grained aquifer with a shallow water table.*"

The Environment Canada Hourly Data Reports (refer to Appendix 4) for the days on which the pump tests took place, indicate that the barometric pressure between June 21, 2005 and June 23, 2005 underwent several significant fluctuations that could easily account for a 1cm to 2 cm water level change in the monitoring piezometers.

7.2 Evaluation of Water Quality

7.2.1 Test Well Analysis

The results of the water quality analyses for the groundwater samples collected from the five test wells during pump testing for health and aesthetic parameters are presented in Table 4 and Tables 5A & 5B, respectively. Laboratory certificates of analysis are included in Appendix 3.

7.2.1.1 Health Related Parameters

The water quality in the test wells, with respect to the prescribed health related objectives of the Ontario Drinking Water Quality Standards (ODWS), is generally satisfactory, and is considered to be relatively typical for the area. Table 4 summarizes the concentration of health related parameters for each test well at the three hour and six hour intervals of the pump test.

Turbidity levels above 1 Nephelometric Turbidity Unit (NTU) were encountered at the end of the pump testing laboratory samples submitted for all of the test wells.

Field turbidity measurements using a turbidity meter, however, confirm that the turbidity was below 1 NTU in all test wells at the completion of the pump testing period, with the exception of TW4. The field turbidity meter malfunctioned during the first pump test, which occurred at TW4, and had to be replaced. As a result field turbidity data was not obtained for TW4. Considering the fact that TW4 and TW5 share similar water chemistry, the field turbidity is likely to be similar to the 0.11 NTU observed in TW5.

The elevated turbidity in the laboratory samples can easily be attributed to precipitation of soluble iron and manganese through oxidation reactions with free oxygen introduced during pumping and sample collection. This is particularly valid considering the concentrations of iron and manganese observed in TW4 and TW5.

Total Coliform (TC) concentrations were present in TW1, TW2, TW4 and TW5 and were observed to fluctuate throughout the pump testing period. Given that the Heterotrophic Plate Count was significantly low in all of the test wells throughout the duration of each pump test and, considering the absence of Faecal Coliform bacteria in each of the samples, it is anticipated that the TC concentrations observed are the direct result of residual soil and organic material left in the well as a direct result of insufficient well development prior to the start of the pump tests. This problem is easily rectified by further well development followed by adequate shock chlorination.

7.2.1.2 Aesthetic Parameter (Non Health Related)

The water quality of the test wells, with respect to aesthetic parameters of the ODWS, is generally satisfactory and is considered to be consistent with the geochemistry of the area and with the supply formation. Tables 5A and 5B below present a summary of the aesthetic parameter concentrations for the water samples taken from each test well.

Based on the detailed review of the analytical results for all test wells, the groundwater is considered to be **very hard**. Elevated hardness is not a health related parameter of the ODWS. It is a common issue in much of Eastern Ontario and, at the observed concentrations, can be easily treated with point of use water treatment equipment.

Total Dissolved Solids (TDS) concentration reported in the test wells varied considerably with values ranging from 787 mg/L to 1790 mg/L. All test wells have TDS concentrations above the ODWO aesthetic objective of 500 mg/L and these concentrations must be factored when sizing point of use water treatment equipment.

Iron (Fe) concentrations were observed to be above the aesthetic objective of 0.3 mg/L in all test wells at the site. Similarly, **manganese (Mn)** concentrations were observed to be above the aesthetic objective of 0.05 mg/L in these same wells. At the measured concentrations for both iron and manganese, standard point of use water treatment devices, such as a potassium permanganate (greensand) filter, will be more than adequate to significantly reduce these concentrations.

Sodium (Na) concentrations in each of the test wells were noted to be generally **elevated** with values varying considerably between 39 mg/L and 383 mg/L. The sodium concentrations in TW1, TW2 and TW3, although quite elevated, were observed to fall by 4%, 27% and 2% respectively over the six hour pump testing period. Continued well development is expected to further reduce these concentrations.

Although sodium is not a chemical parameter of interest in Schedule 2 of the Ontario Regulation 169/03 (Ontario Drinking Water Quality Standards), consistent with the Technical Support Document for Ontario Drinking Water Quality Standards, Guidelines and Objectives, published June 2003 by the MOE, concentrations above 20 mg/L require that the Medical Officer of Health be notified so that this information may be passed on to local physicians for use in treatment of those requiring a sodium-restricted diet.

Hydrogen Sulfide (H_2S) concentrations above the aesthetic objective of 0.05 mg/L were observed in TW4. At the reported concentrations, the signature "rotten egg" odour of this gas will be noticeable, but not overpowering. As H_2S was observed only in TW4, the presence of this gas in future supply wells is expected to be uncommon.

TABLE 4
SUMMARY OF HEALTH RELATED PARAMETERS

PARAMETER	TW1 WS5 (3 Hr)	TW1 WS6 (6 Hr)	TW2 WS7 (3 Hr)	TW2 WS8 (6 Hr)	TW3 WS9 (3 Hr)	TW3 WS10 (6 Hr)	TW4 WS1 (3 Hr)	TW4 WS2 (6 Hr)	TW5 WS3 (3 Hr)	TW5 WS4 (6 Hr)	Ontario Drinking Water Quality Objective
Fluoride	ND	0.15	0.13	0.96	0.18	0.17	0.33	0.50	0.16	0.15	1.5
Ammonia	0.20	0.03	0.10	0.06	0.10	0.10	0.09	0.10	0.02	0.02	-
Nitrite	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Nitrate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Turbidity (NTU)	1.8	1.6	9.3	9.6	2.5	4.5	17.7	62.3	27.6	28.5	1
Field Reading of Turbidity at completion of pump test (NTU)		0.89		0.40		0.62		**N/A**		0.11	1
E. Coli	0	0	0	0	0	0	0	0	0	0	0
Total Coliform[1]	0	0	0	0	0	0	0	0	0	0	0
Faecal Coliform	0	0	0	0	0	0	0	0	0	0	0
Faecal Streptococcus	0	0	0	0	0	0	0	0	0	0	0
HPC	0	1	4	1	0	1	0	2	0	1	500

1. Total Coliform concentrations reported in this table are compiled from retesting after further well development

TABLE 5A
SUMMARY OF AESTHETIC RELATED PARAMETERS

PARAMETER	TW1 WS5 (3 Hr)	TW1 WS6 (6 Hr)	TW2 WS7 (3 Hr)	TW2 WS8 (6 Hr)	TW3 WS9 (3 Hr)	TW3 WS10 (6 Hr)	TW4 WS1 (3 Hr)	TW4 WS2 (6 Hr)	TW5 WS3 (3 Hr)	TW5 WS4 (6 Hr)	Ontario Drinking Water Quality Objective[1]
Conductivity (µS/cm)	2500	2530	2500	2510	2750	2680	1170	1030	1210	1210	-
Colour (TCU)	2	2	ND	3	2	2	2	ND	2	ND	5
Hardness	583	578	529	524	519	519	532	354	603	598	80 - 100
Alkalinity	313	312	289	287	274	268	271	220	307	307	500
Total Dissolved Solids	1630	1640	1630	1630	1790	1740	761	670	787	787	500
pH	7.58	7.63	7.93	7.96	8.03	8.05	7.60	7.80	7.76	7.77	6.5 to 8.5
Chloride	543	538	591	580	698	689	193	177	191	194	250
Sulphate	134	133	114	113	103	104	72	45	65	63	500
Calcium	151	149	131	129	127	127	142	71	164	162	-
Magnesium	50	50	49	49	49	49	43	43	47	47	-
Sodium	292	281	383	301	336	333	56	56	40	39	20

TABLE 5B
SUMMARY OF AESTHETIC RELATED PARAMETERS (CONT'D)

PARAMETER	TW1 WS5 (3 Hr)	TW1 WS6 (6 Hr)	TW2 WS7 (3 Hr)	TW2 WS8 (6 Hr)	TW3 WS9 (3 Hr)	TW3 WS10 (6 Hr)	TW4 WS1 (3 Hr)	TW4 WS2 (6 Hr)	TW5 WS3 (3 Hr)	TW5 WS4 (6 Hr)	Ontario Drinking Water Quality Objective[1]
Potassium	4	4	5	5	7	7	4	4	2	2	-
TKN	0.21	0.25	0.14	0.15	0.15	0.13	0.21	0.21	0.33	0.28	-
Dissolved Organic Carbon	<0.5	0.9	1.1	1.2	1.1	1.8	1.2	1.1	0.5	1.4	5
Iron	0.68	0.69	0.74	0.72	0.65	0.64	1.65	1.71	2.31	2.46	0.3
Manganese	0.10	0.10	0.06	0.06	0.06	0.06	0.22	0.22	0.35	0.35	0.05
Hydrogen Sulphide	ND	ND	ND	ND	ND	ND	0.17	0.15	ND	ND	0.05
Phenols	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
Tannin & Lignin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-

8.0 DEVELOPMENT RECOMMENDATIONS

The following sections outline the recommendations for development which have been formulated from the data collected in this study.

8.1 Site Development

Based on the results of our study, this site is considered to be suitable for the development of the 75 lots as described in the Section 1.0 of this report. The on-site sewage disposal can be handled with fully raised Class 4 septic systems, as per Part 8 of the Ontario Building Code, and an adequate water supply can be obtained with private drilled wells.

8.2 Lot Development Plan

One objective of the hydrogeological study is to enhance development and minimize the effects of sewage systems on the surrounding environment. This is achieved through prevention of accumulation of surface water, by ensuring proper construction of water supply and sewage systems, and by coordinating the overall positioning of the services to maximize separations. A minimum separation of 18 m for fully-raised systems is required between a well and sewage system, whether they are servicing a single lot, or are on neighbouring lots.

The proposed Lot Development Plan, Dwg. No. PH0145-2, in Appendix 5 shows the proposed lot development plans for the site. The purpose of this drawing is to show that a typical home and private services will fit onto the proposed lot, and can meet all pertinent regulations without causing environmental constraints. The typical house shown in this drawing covers a plan area of 120 m^2, assuming a two-storey 240 m^2 (2600 ft^2) home, with a garage of 50 m^2, and is serviced by a sewage system with the capacity of 3000 L/day. In actuality, the daily sewage flows will likely be significantly lower than this value.

It is not the intent of the drawing to restrict placement of the home on each lot. While the position of the home may change, the relative position of the home, sewage system and well should be maintained. In all cases, the separation criteria for the immediate and neighbouring lots should be followed.

The required separation distance from a fully raised leaching bed to surface water is 18 m.

8.3 Nitrate Impact Assessment

Hydrogeolocial Sensitivity

In accordance with Section 5.0 of the MOE publication, entitled, "Procedure D-5-4 Technical Guidelines for Individual On-site Sewage Systems: Water Quality Impact Risk Assessment", the groundwater impacts from on-site sewage systems must be addressed in a step-wise manner. In order to establish the initial step, it is essential to demonstrate whether or not the site is considered hydrogeologically sensitive.

Given the low permeability and moderate thickness of the overburden, and considering the time for vertical seepage, **the subject property is not considered hydrogeologically sensitive**.

Isolation of Supply Aquifer

As established in Section 6.0 of this report, the supply aquifer is considered to be a confined aquifer with the overburden material and bedrock acting as an aquitard. By definition, "..**the term aquitard has been coined to describe the less-permeable beds in a stratigraphic sequence.**" (Freeze & Cherry, 1979) The surficial geology of the site, as detailed in Section 4.1, is predominantly clay to clayey silt soils with very low hydraulic conductivities. Hydrometer analysis on representative samples confirms clay contents of 45% to 74% in these soils; the test well data and published MOE water well records in surrounding wells confirms that the average overburden thickness in the area is more than 6 m. Furthermore, Section 6.0 also established that no hydraulic connection exists between the water supply aquifer and the receiving aquifer in the study area.

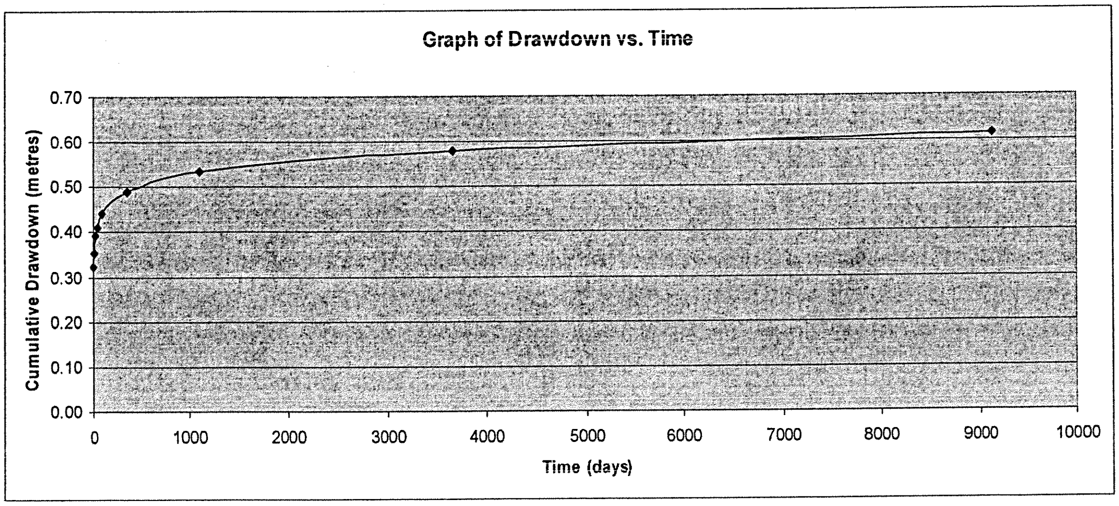
These factors combine to substantiate the claim that the overburden material is, in effect, an aquitard directly above the water supply aquifer. Based on these arguments, the **supply aquifer is sufficiently isolated from the overburden receiving aquifer.**

8.4 Potential Well Interference

During the pump tests, nearby test wells were monitored to determine if there was any well interference taking place. No appreciable drawdown was observed in the observation wells during pumping.

The potential for cumulative drawdown was calculated using the Theis equation and the average of the transmissivities calculated from the pump tests. For the purpose of the analysis, it was assumed that 85 wells (10 more than were proposed) with an average concentric spacing of 15 metres would pump continuously, without interruption, at a rate of 2 m^3/day. The summary of the well functions used for the well interference calculations is provided in Appendix 4. The cumulative drawdown curve is provided below.

It can be seen that over a 30 year period (measured at the centre of the study area), a cumulative drawdown of the order of 0.62 m could occur. In that the average available drawdown is at least 28.8 m, this would result in an approximate drawdown of the order of 2.2 % of the available drawdown. As such it is our opinion that the calculated well interference is considered acceptable for the proposed development.



8.5 Sewage System Design

Sewage systems must be designed according to Part 8 of the Ontario Building Code. The regulations state that 0.9 m of suitable soil above an unacceptable layer (clay or bedrock) and 0.9 m of suitable soil above the high water table are required below absorption trenches.

A large 4 bedroom luxury residence may produce up to 3000 L/day of sewage effluent, although generally, design sewage flows will be less than 2500 L/day. It is anticipated that most of the leaching beds for the subdivision will be fully raised above existing grade. As such, a 250 mm thick imported sand mantle will be required to extend a minimum of 15 m beyond the ends of the absorption trenches in the direction of horizontal flow.

An imported soil with a percolation time (T) of between 6 and 8 min/cm will be required for raised tile bed and mantle construction. A length of absorption trench of 120 metres (i.e. 8 runs of 15 metres) is required for the design sewage flow of 3000 L/day. Given the configuration of most lots, absorption trench systems will be sufficient. Some of the lots, however, will require the installation of a Class 4 filter bed. Based on a daily flow of 3000 L/day, the filter bed will require a minimum stone area of 40 m^2. Due to the low permeability of the underlying clay soils, a minimum extended contact base of filter media sand beneath the stone layer of 177 m^2 is needed. As with the absorption trench leaching bed, the filter bed will also require a 15 m imported sand mantle.

The Lot Development Plans illustrate the size of such tile beds. The sewage system should be placed down gradient of any nearby wells, where feasible.

8.6 Well Design

Drilled wells, completed in the bedrock aquifer, should be used for the water supply in this development. The wells should be drilled by a licensed well contractor experienced in the study area, and should be completed in accordance with Ontario Regulation 903, as amended. A minimum well yield of 3 IGPM is recommended for an average residence.

A rotary drill has been proven to provide satisfactory water supply results in the test wells. Drilling should continue down into the bedrock so that the casing is seated firmly into the bedrock (i.e. 1.0 m into sound bedrock). The annular space between the casing and hole should be cement grouted using a method permitted by Ontario Regulation 903, as amended.

After allowing the cement to set (24 hours for quick-set cement, 72 hours for regular cement), drilling should continue at a 150 mm diameter until the necessary water yield is intercepted. The well should be developed by surging or pumping until the water is developed to a sand free state. Chlorine should be introduced at the completion of well development in sufficient quantity to produce a free chlorine residual of 50 mg/L (ppm). The chlorine should be mixed with the standing water in the casing in such a manner as to ensure thorough vertical mixing of the chlorine over the entire depth of the well.

The well should be completed with a submersible pump, pitless adaptor and vermin proof well cap. The casing should project approximately 0.40 m above the mounded soil around the casing. The grading around the well casing should be slightly elevated to direct surface runoff away from the well.

All work related to the installation of the pump, pitless adapter and other pumping equipment is to be completed by a qualified well contractor possessing a valid Class 4 pump installer's license.

9.0 CONCLUSIONS

A terrain analysis and hydrogeological investigation were completed on a property identified as Part of Lot 73 and Part of Lot 74, Registrar's Compiled Plan 902, City of Ottawa (Osgoode), Ontario. The current proposed development calls for 75 residential lots with a typical lot size of 0.5 acres (1.24 hectares). Based on the data presented in the body of this report, the following conclusions can be drawn:

1. The terrain consists primarily of poorly draining soils with how hydraulic conductivity. This overburden material, combined with the underlying bedrock layers, act as an aquitard that effectively isolates the water supply aquifer from surface activities.
2. There is water of sufficient quantity present in the water supply aquifer beneath the site to support the development. Potential well interference within the subdivision is anticipated to result in a loss of only 2.2% of the available drawdown in the wells (i.e. 0.7 m) over a 25 year period.
3. The quality of the water in the supply aquifer meets all health related parameters of the ODWS for the parameters tested and all tested aesthetic related parameters are treatable.
4. A Class 4 sewage system can be adequately sited on each lot using a combination of fill based absorption trenches and filter media beds.

In summary, this site is suitable for development as a residential subdivision at the proposed density. The hydrogeological recommendations of this report, if followed, will ensure that the development takes place in an effective manner, with a minimal impact on the environment.

10.0 RECOMMENDATIONS

Based on the information presented in the body of this report, the following recommendations can be made:

1. TW2 is located within a proposed road allowance and TW4 and TW5 are located in proposed leaching bed areas. If development is to proceed in a similar manner as proposed on DWG. PH0145-2, both of these wells must be abandoned in strict accordance with Ontario Regulation 903 and abandonment should occur under the direct supervision of a qualified and licensed Professional Engineer of Ontario.

2. Any wells that are not to be used for the purposes of potable water taking in conjunction with lot development must be abandoned. Abandonment must be performed in accordance with Ontario Regulation 903.

3. Wells should be constructed such that the casings are at least 12 m in length and should extend 1.0 m into sound bedrock, whichever is greater. The annular space should be grouted with cement using pressure grouting techniques in accordance with Ontario Regulation 903.

4. Wells must advance to, and terminate in, the water bearing formations of the underlying Paleozoic Bedrock.

5. Fully raised Class 4 leaching beds, can be adequately sited and constructed on each of the proposed lots based on typical design assumptions. The use of tertiary treatment systems in this subdivision will offer greater diversity of house size and location within the lot boundaries.

Report Prepared by:

Robert A. Passmore, B.Eng.

Report Reviewed by:

Stephen J. Walker, P.Eng.

10/06/05
S. J. G. WALKER

APPENDIX 1

TERRAIN ANALYSIS DOCUMENTS

1. Soil Profile & Test Pit Data Sheets
2. Grain Size Distribution and Classification Curves

patersongroup Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic

FILE NO. PH0145

REMARKS

HOLE NO. TP18/MW5

BORINGS BY Backhoe

DATE 3 JUN 05

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	87.71		
TOPSOIL 0.40									
Yellow-brown medium **SAND** 0.80		G	1						
						1	86.71		
Stiff, brown-grey SILTY **CLAY**		G	2						
						2	85.71		⊻
2.50									
End of Test Pit (Water infiltration @ 2.0m depth)									

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic

FILE NO. PH0145

REMARKS

HOLE NO. TP19

BORINGS BY Backhoe

DATE 3 JUN 05

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % (20 40 60 80)	Piezometer Construction
GROUND SURFACE						0	88.00		
TOPSOIL 0.40									
Red-brown fine SAND 1.18		G	3			1	87.00		
Stiff, grey SILTY CLAY 2.90						2	86.00		▽
End of Test Pit (Water infiltration @ 2.6m depth)									

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic

REMARKS

BORINGS BY Backhoe

DATE 3 JUN 05

FILE NO. PH0145

HOLE NO. TP20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	88.51
TOPSOIL 0.30							
Red-brown fine SAND 1.20		G	4			1	87.51
GLACIAL TILL: Compact to dense, grey silty sand with gravel, cobbles and boulders 2.00		G G	5 6			2	86.51
End of Test Pit (Water infiltration @ 1.5m depth)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

Piezometer Construction

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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic

REMARKS

BORINGS BY Backhoe

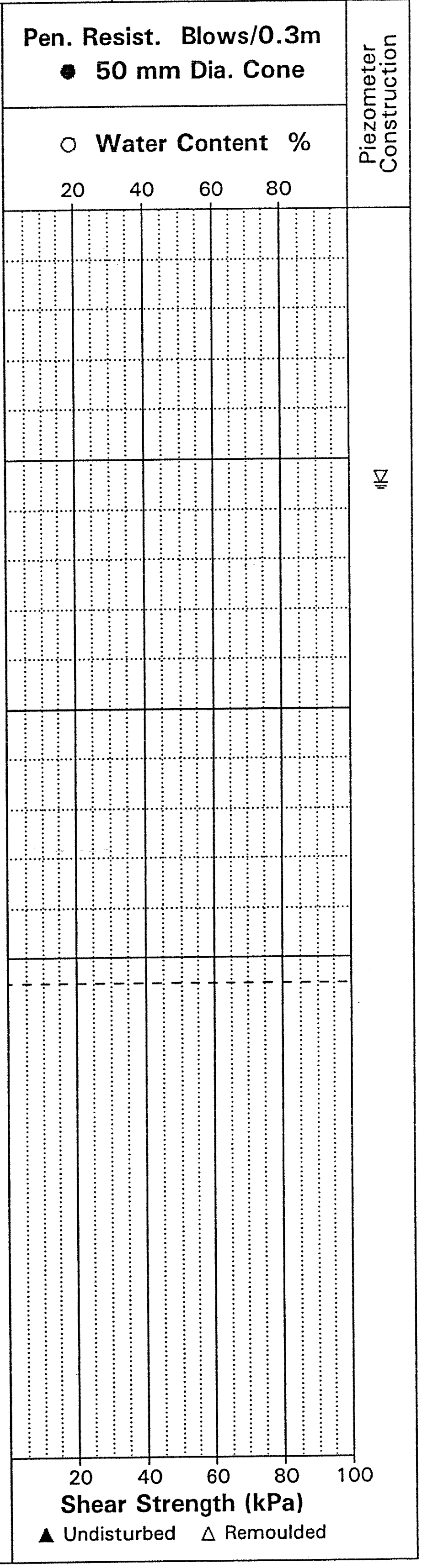
DATE 3 JUN 05

FILE NO. PH0145

HOLE NO. TP21/MW6

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	88.26
TOPSOIL 0.20							
Stiff, grey-brown SILTY CLAY 1.40		G	7			1	87.26
Grey SILT 3.00		G	8			2	86.26
Grey SILTY CLAY 3.10						3	85.26
End of Test Pit							

(Water infiltration @ 1.1m depth)



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SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic

FILE NO. PH0145

REMARKS

HOLE NO. TP22

BORINGS BY Backhoe

DATE 3 JUN 05

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % (20 40 60 80)	Piezometer Construction
GROUND SURFACE						0	87.34		
TOPSOIL 0.30									
Dense, yellow-brown **SILTY SAND** with cobbles		G	9						
						1	86.34		
1.30									
GLACIAL TILL: Dense, grey silty sand with gravel, cobbles		G	10			2	85.34		
3.00						3	84.34		
End of Test Pit (TP dry upon completion)									

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic

REMARKS

BORINGS BY Backhoe

DATE 3 JUN 05

FILE NO. PH0145

HOLE NO. TP23

SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	86.89
TOPSOIL 0.28						
Yellow-brown medium to coarse **SAND** 1.40	G	11			1	85.89
Dense, grey SILT					2	84.89
3.20					3	83.89
End of Test Pit (Water infiltration @ 1.3m depth)						

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

Piezometer Construction

▽

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic

REMARKS

BORINGS BY Backhoe

DATE 3 JUN 05

FILE NO. PH0145

HOLE NO. TP24

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	86.15		
TOPSOIL 0.28									
Red-brown medium SAND 0.60		G	13						
						1	85.15		
									▽
Brown-grey SILTY CLAY 2.30		G	14						
						2	84.15		
End of Test Pit (Water infiltration @ 1.30m depth)									

Water Content %: 20 40 60 80

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic

REMARKS

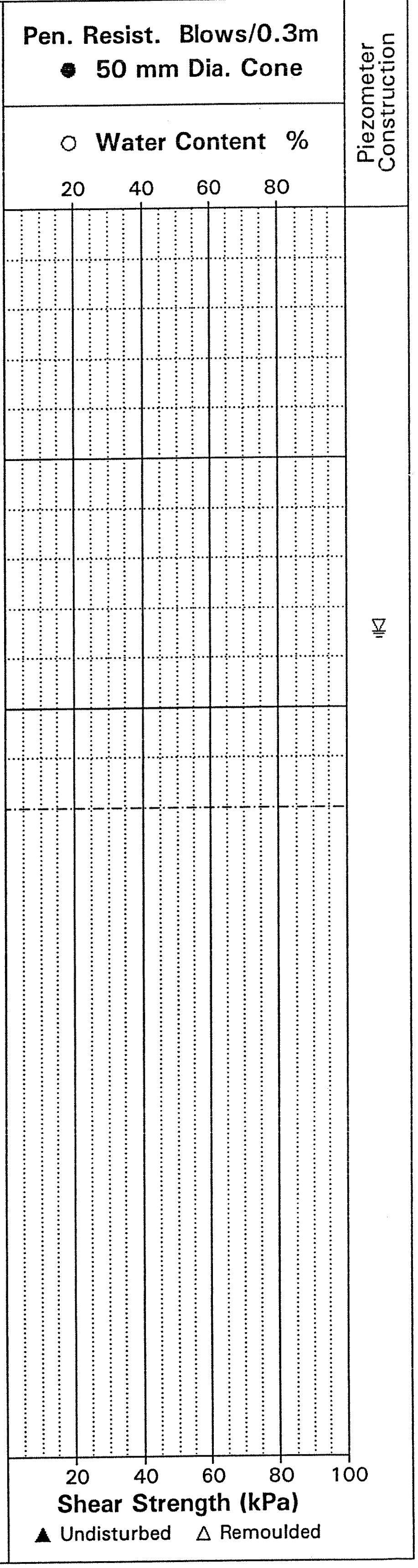
BORINGS BY Backhoe

DATE 3 JUN 05

FILE NO. PH0145

HOLE NO. TP25

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	86.25
TOPSOIL							
0.30							
						1	85.25
Brown SILTY CLAY							
- grey by 1.8m depth							
						2	84.25
2.40							
End of Test Pit							
(Water infiltration @ 1.7m depth)							



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SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic

REMARKS

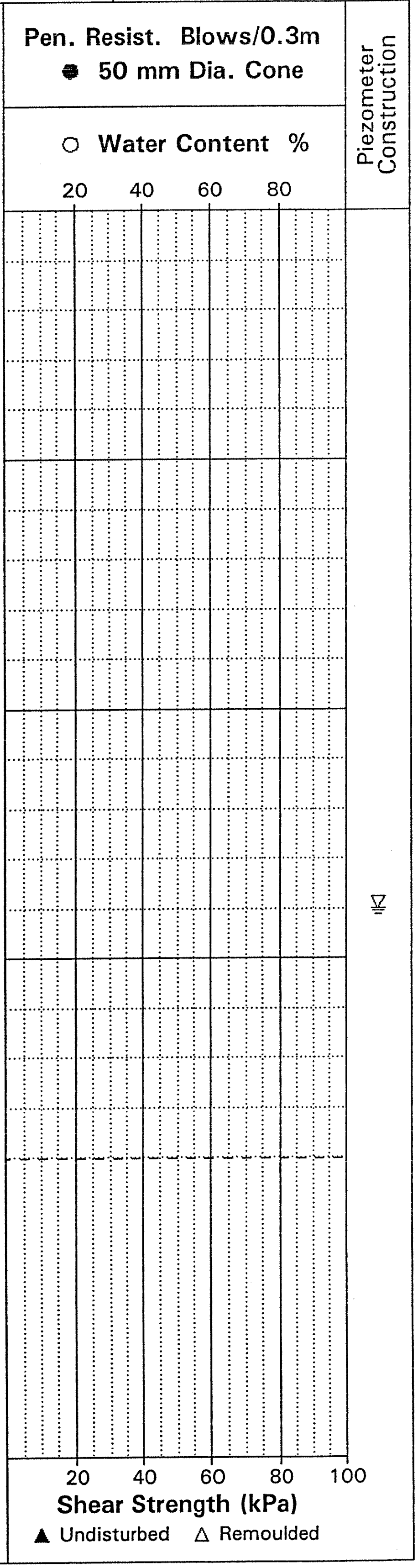
BORINGS BY Backhoe

DATE 3 JUN 05

FILE NO. PH0145

HOLE NO. TP26

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	85.90
TOPSOIL 0.50							
						1	84.90
Brown SILT							
						2	83.90
- grey by 2.9m depth							
		G	15			3	82.90
3.20							
GLACIAL TILL: Grey clayey sandy silt with gravel, cobbles and boulders		G	16				
3.80							
End of Test Pit (Water infiltration @ 2.8m depth)							



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SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic

FILE NO. PH0145

REMARKS

HOLE NO. TP27

BORINGS BY Backhoe

DATE 3 JUN 05

SOIL DESCRIPTION			DEPTH (m)	ELEV. (m)
GROUND SURFACE			0	85.57
TOPSOIL	0.30			
Red-brown fine SAND	0.60			
			1	84.57
Brown SILT			2	83.57
- grey by 2.6m depth				
			3	82.57
			4	81.57
End of Test Pit	4.60			
(Water infiltration @ 2.4m depth)				

STRATA PLOT

SAMPLE: TYPE | NUMBER | % RECOVERY | N VALUE or RQD

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

Piezometer Construction ∇

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic

REMARKS

BORINGS BY Backhoe

DATE 3 JUN 05

FILE NO. PH0145

HOLE NO. TP28/MW7

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Piezometer Construction
GROUND SURFACE						0	85.72	
TOPSOIL 0.28								
Red-brown medium SAND		G	17			1	84.72	
1.20								▽
Grey-brown SILT - grey by 1.8m depth		G	18			2	83.72	
						3	82.72	
3.60								
Grey SILTY CLAY 3.80								
End of Test Pit (Water infiltration @ 1.2m depth)								

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %
20 40 60 80

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic

REMARKS

BORINGS BY Backhoe

DATE 3 JUN 05

FILE NO. PH0145

HOLE NO. TP29/MW8

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	84.55		
TOPSOIL 0.32									
Grey-brown SILT		G	19			1	83.55		▽
- grey by 1.7m depth						2	82.55		
		G	20			3	81.55		
3.50 End of Test Pit (Water infiltration @ 1.5m depth)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic

REMARKS

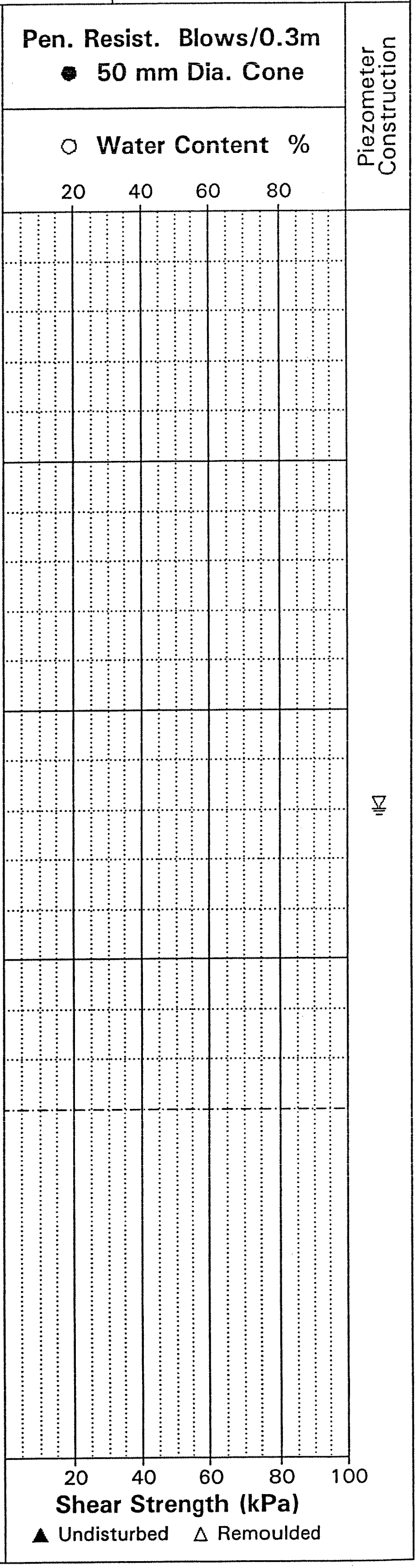
BORINGS BY Backhoe

DATE 3 JUN 05

FILE NO. PH0145

HOLE NO. TP30/MW9

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	85.62
TOPSOIL 0.20							
Red-brown SILTY SAND 0.60							
Grey-brown SILT						1	84.62
- grey by 1.4m depth							
						2	83.62
						3	82.62
3.60							
End of Test Pit (Water infiltration @ 2.4m depth)							



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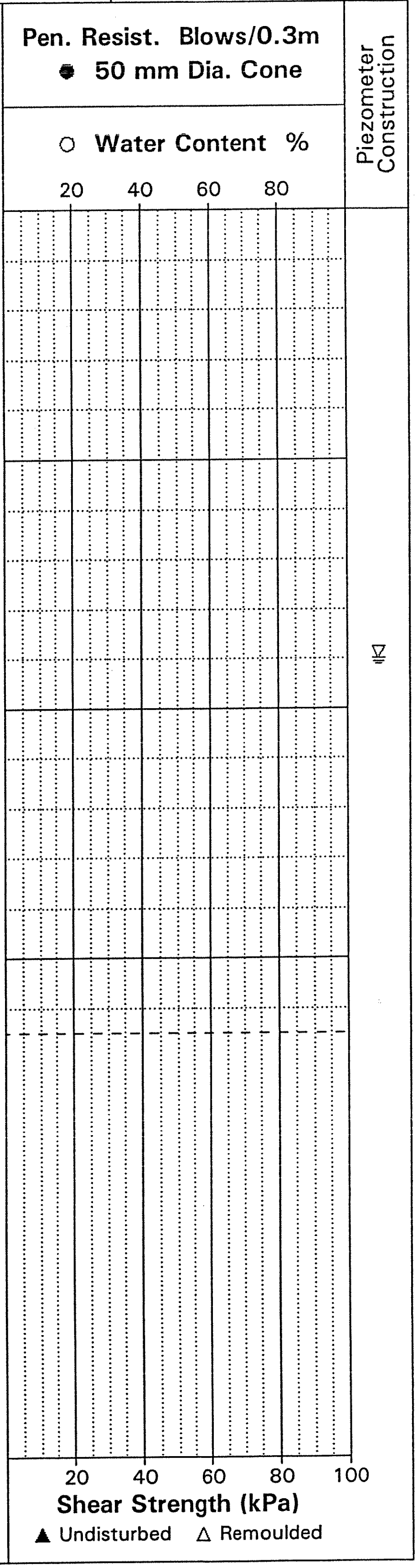
28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

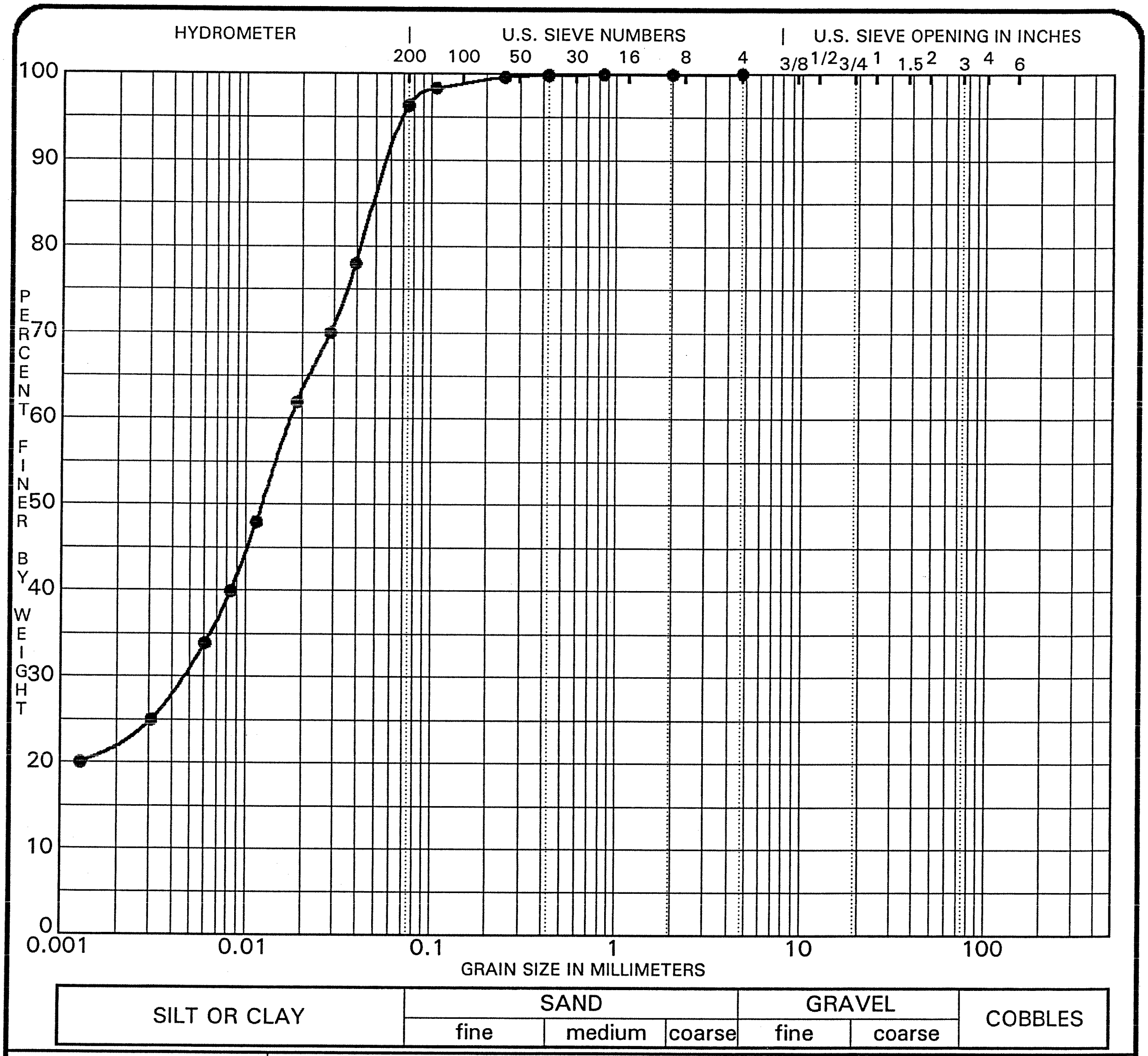
SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic
REMARKS
BORINGS BY Backhoe
DATE 3 JUN 05
FILE NO. PH0145
HOLE NO. TP31

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	85.65
TOPSOIL 0.30							
Red-brown fine SAND 0.60		G	21				
						1	84.65
Brown-grey SILTY CLAY		G	22			2	83.65
3.30						3	82.65
End of Test Pit (Water infiltration @ 1.8m depth)							





Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	TP21/MW6 G7	INORGANIC SILT to CLAYEY SILT (ML)						

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP21/MW6 G7	4.75	0.02	0.005		0.0	3.7		

CLIENT **Sunset Lakes Development Corp.**

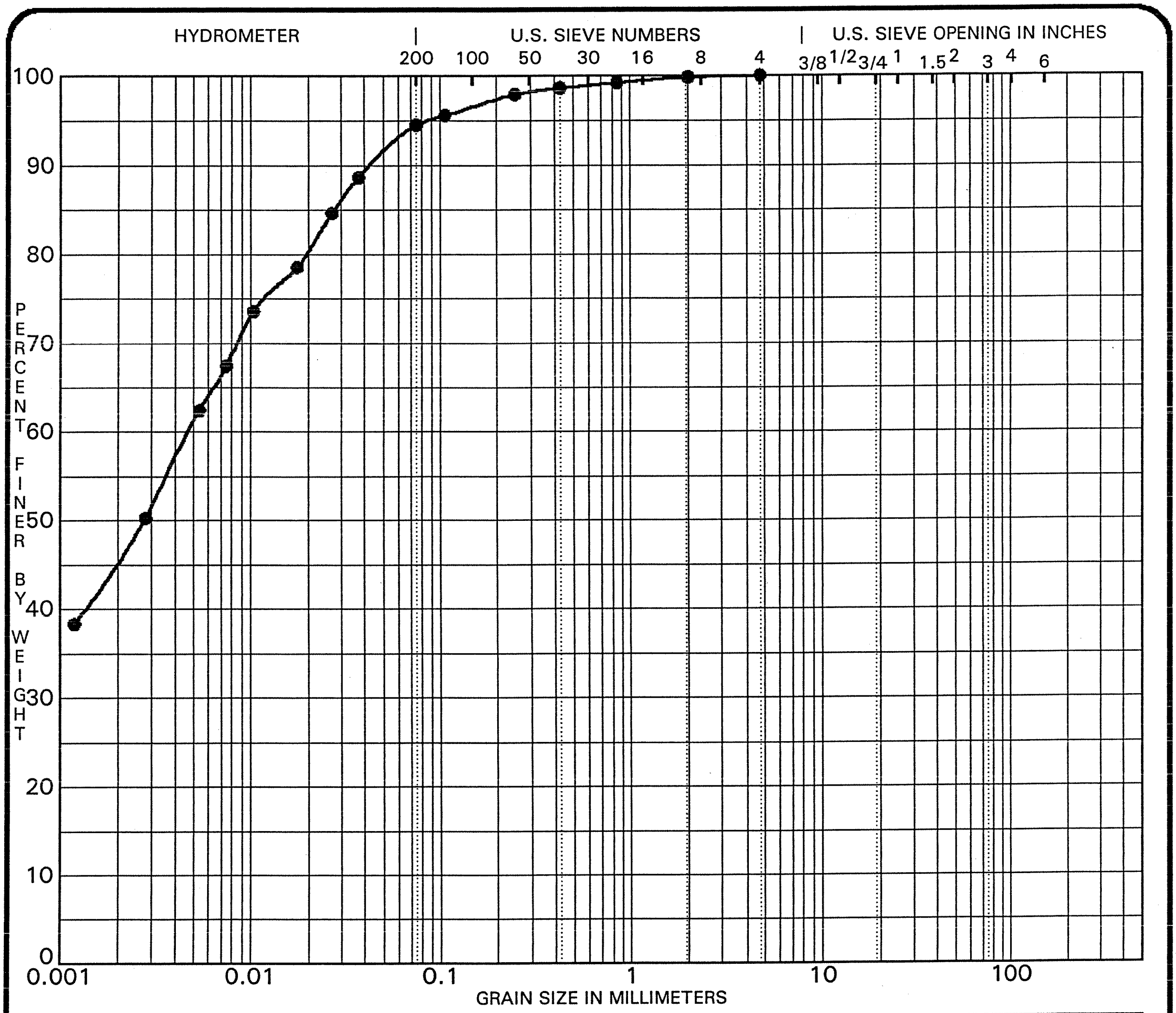
FILE NO. **PH0145**

PROJECT **Hydrogeological Study and Terrain Analysis -**
Greely Village Centre, Parkway Road

DATE **3 JUN 05**

patersongroup Consulting Engineers
28 Concourse Gate, Unit 1, Ottawa, Ontario K2E 7T7

GRAIN SIZE DISTRIBUTION



SILT OR CLAY	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

Specimen Identification			Classification	MC%	LL	PL	PI	Cc	Cu
●	TP24	G14	SILTY CLAY (CL)						

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP24	G14	4.75	0.00			0.0	5.5		

CLIENT **Sunset Lakes Development Corp.**

PROJECT **Hydrogeological Study and Terrain Analysis - Greely Village Centre, Parkway Road**

FILE NO. **PH0145**

DATE **3 JUN 05**

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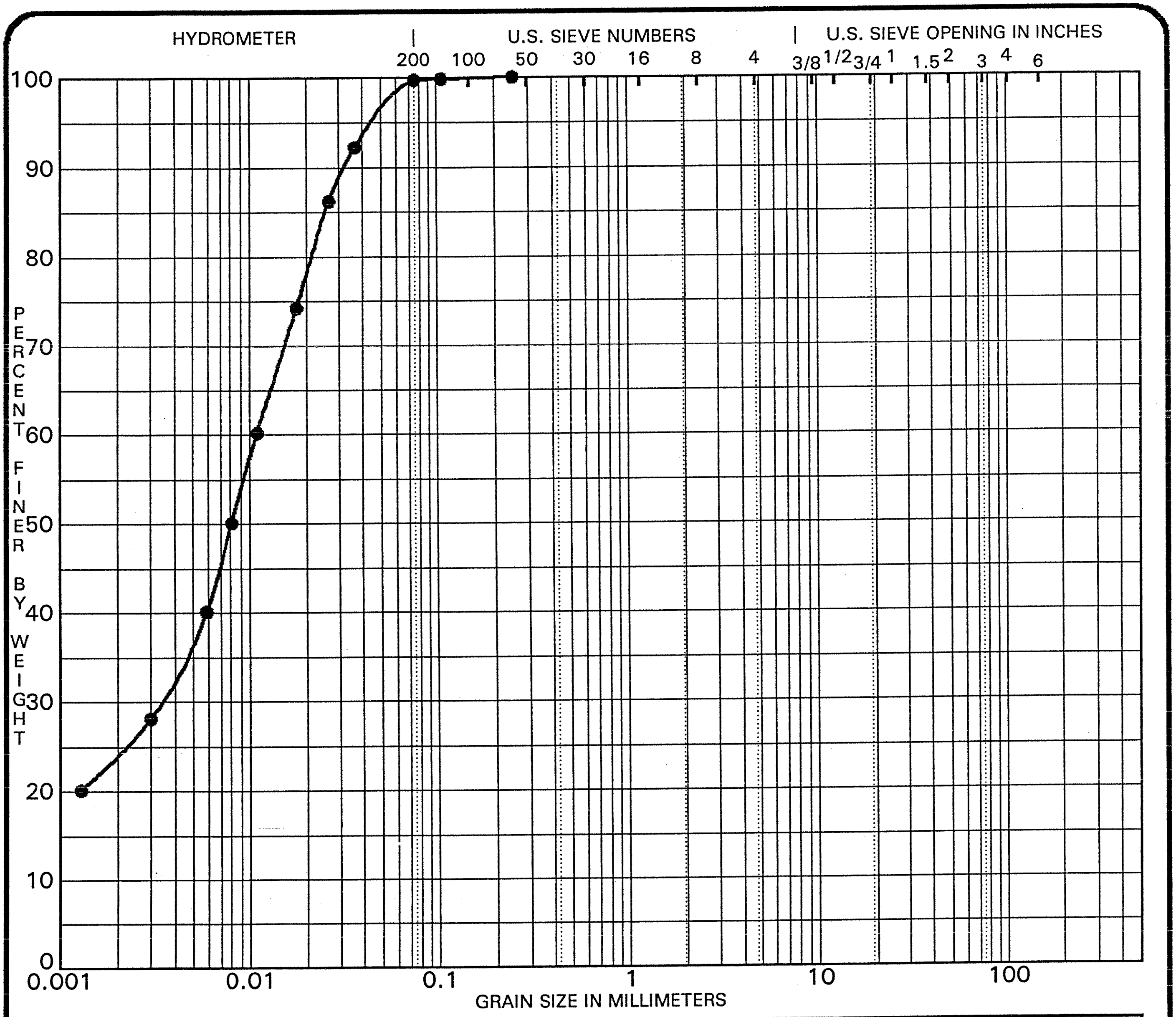
28 Concourse Gate, Unit 1, Ottawa, Ontario K2E 7T7

GRAIN SIZE DISTRIBUTION



SILT OR CLAY	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

	Specimen Identification	Classification	MC%	LL	PL	PI	Cc	Cu
●	**TP28/MW7 G18**	**CLAYEY SILT to SILTY CLAY (MH)**						

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP28/MW7 G18**	**0.25**	**0.01**	**0.003**		**0.0**	**0.3**		

CLIENT **Sunset Lakes Development Corp.**

FILE NO. **PH0145**

PROJECT **Hydrogeological Study and Terrain Analysis -**
Greely Village Centre, Parkway Road

DATE **3 JUN 05**

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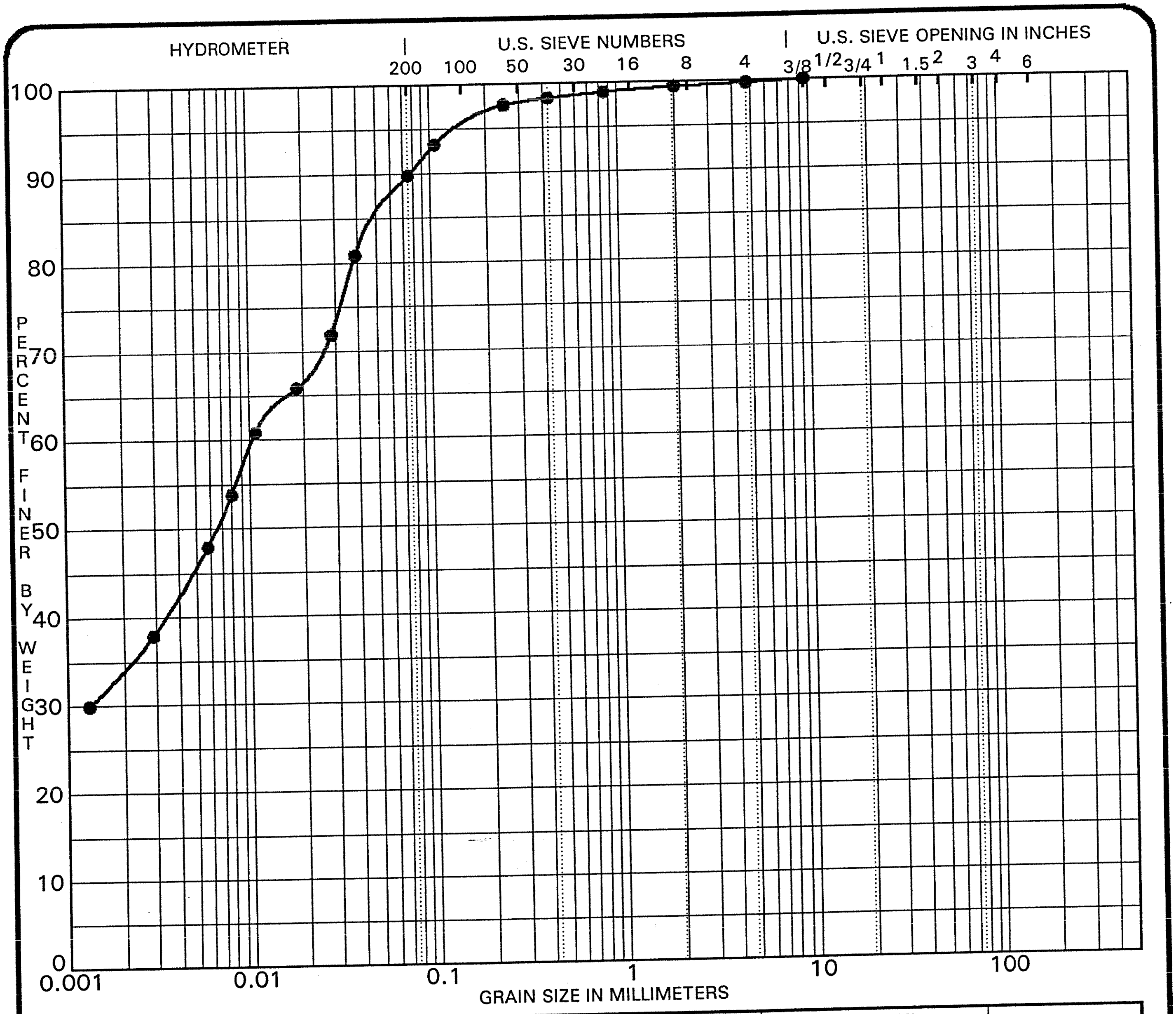
28 Concourse Gate, Unit 1, Ottawa, Ontario K2E 7T7

GRAIN SIZE DISTRIBUTION



SILT OR CLAY	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

Specimen Identification			Classification	MC%	LL	PL	PI	Cc	Cu
●	**TP31**	**G22**	**SILTY CLAY (CH)**						

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP31**	**G22**	**9.50**	**0.01**	**0.001**		**0.3**	**10.0**		

CLIENT **Sunset Lakes Development Corp.**

PROJECT **Hydrogeological Study and Terrain Analysis -**
Greely Village Centre, Parkway Road

FILE NO. **PH0145**

DATE **3 JUN 05**

patersongroup Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, Ontario K2E 7T7

GRAIN SIZE DISTRIBUTION

APPENDIX 2

WATER WELL RECORDS

1. Water Well Records for Test Wells
2. MOE Published Water Well Records for Surrounding Wells
3. Graphical Presentation of Statistical Analysis of Regional Hydrogeology

TWI

Ontario Ministry of the Environment

Well Tag Num A 021474
A021474

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

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- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- 2) **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only
MUN ___ CON ___ LOT ___

Well Owner's Information and Location of Well Information

First Name: Sunset lake
Last Name: Development Corp
Mailing Address (Street Number/Name, RR, Lot Concession): 65 Apple orchard Road
County/District/Municipality: Carleton
Township/City/Town/Village: Greely
Province: Ontario
Postal Code: K4P 1E5
Telephone Number (include area code): 613-860-1100
Address of Well Location (County/District/Municipality): CARleton
Township: City of ottawa
Lot: 73-74
Concession:
RR#/Street Number/Name: Hwy 31
City/Town/Village: Greely
Site/Compartment/Block/Tract etc.: Plan 902
GPS Reading: NAD 83 Zone 18 Easting 5120 4561E Northing 5012386
Unit Make/Model: Magellan
Mode of Operation: UTM ☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify ___

Log of Overburden and Bedrock Materials (see Instructions)

General Colour	Most common material	Other Materials	General Description	Depth Metres From	Depth Metres To
bRown	fill	boulders	Hard	0	2.74
grey	gravel		Hard	2.74	7.62
grey	limestone		layered	7.62	30.48

Hole Diameter

Depth Metres From	Depth Metres To	Diameter Centimetres
0	9.14	21.23
9.14	30.48	15.55

Water Record

Water found at Metres	Kind of Water		
2.8 m	☒ Fresh	☐ Sulphur	
☐ Gas	☐ Salty	☐ Minerals	☐ Other:
___ m	☐ Fresh	☐ Sulphur	
☐ Gas	☐ Salty	☐ Minerals	☐ Other:
___ m	☐ Fresh	☐ Sulphur	
☐ Gas	☐ Salty	☐ Minerals	☐ Other:

After test of well yield, water was
☐ Clear and sediment free
☐ Other, specify ___

Chlorinated ☒ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth Metres From	Depth Metres To
Casing				
15.55	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	0.49	+. 0.60	9.144
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☒ Open hole		9.144	30.48

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___ hrs + ___ min	2		2	
Final water level end of pumping ___ metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___ metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

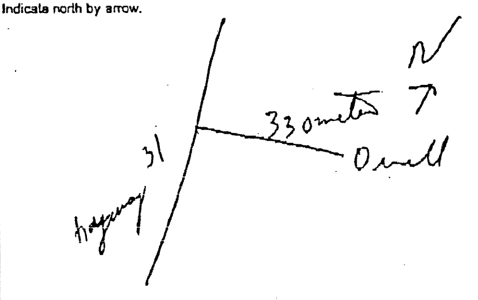
Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	9.14	cement Pressure grout	9bag

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Audit No. Z 21758

Date Well Completed YYYY 05 MM 04 DD 27

Was the well owner's information package delivered? ☐ Yes ☒ No

Date Delivered YYYY 05 MM 04 DD 27

Method of Construction

☐ Cable Tool	☒ Rotary (air)	☐ Diamond	☐ Digging
☐ Rotary (conventional)	☐ Air percussion	☐ Jetting	☐ Other
☐ Rotary (reverse)	☐ Boring	☐ Driving	

Water Use

☒ Domestic	☒ Industrial	☐ Public Supply	☐ Other
☐ Stock	☐ Commercial	☐ Not used	
☐ Irrigation	☐ Municipal	☐ Cooling & air conditioning	

Final Status of Well

☒ Water Supply	☐ Recharge well	☐ Unfinished	☐ Abandoned, (Other)
☐ Observation well	☐ Abandoned, insufficient supply	☐ Dewatering	
☐ Test Hole	☐ Abandoned, poor quality	☐ Replacement well	

Well Contractor/Technician Information

Name of Well Contractor: Gilles BouRgeois
Well Contractor's Licence No.: 1414
Business Address (street name, number, city etc.): 5TA 16at Ont
Name of Well Technician (last name, first name): Alain Bourgeois
Well Technician's Licence No.: 2710
Signature of Technician/Contractor: X Gilles Bourgeois
Date Submitted YYYY 05 MM 04 DD 27

Ministry Use Only

Data Source ___ Contractor ___
Date Received YYYY MM DD ___ Date of Inspection YYYY MM DD ___
Remarks ___ Well Record Number ___

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☐

Cette formule est disponible en français

TW2

Ontario Ministry of the Environment

Well Tag Nu A 021473 …low)

A021473

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

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- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only
MUN ___ CON ___ LOT ___

Well Owner's Information and Location of Well Information

First Name: Sunset lake
Last Name: Development Cop
Mailing Address (Street Number/Name, RR, Lot, Concession): 657 apple orchard Road
County/District/Municipality: Carleton
Township/City/Town/Village: Greely
Province: Ontario
Postal Code: K4P 1E5
Telephone Number (include area code): 613-860-1100
Address of Well Location (County/District/Municipality): Carleton
Township: City of Ottawa
Lot: 73-74
Concession:
RR#/Street Number/Name: Hwy 31
City/Town/Village: Greely
Site/Compartment/Block/Tract etc.: Plan 902
GPS Reading: NAD 83 Zone 18 Easting 456692 E Northing 5012280
Unit Make/Model: Magellan
Mode of Operation: Utm ☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify ___

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth Metres From	Depth Metres To
Brown	till	boulders	Hard	0	2.74
grey	gravel	Sandy	Packed	2.74	7.92
grey	limestone		layered	7.92	36.57
white	Sandstone		Hard	36.57	40.23
grey	limestone		layered	40.28	54.86

Hole Diameter

Depth Metres From	Depth Metres To	Diameter Centimetres
0	9.14	21.23
9.14	54.86	15.55

Water Record

Water found at ___ Metres / Kind of Water

53 m ☒ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other: ___

___ m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other: ___

___ m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other: ___

After test of well yield, water was
☐ Clear and sediment free
☐ Other, specify ___

Chlorinated ☒ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth Metres From	Depth Metres To
Casing				
15.55	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	0.49	+0.60	9.14
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☒ Open hole		9.14	54.86

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___ hrs + ___ min	2		2	
Final water level end of pumping metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___ metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	9.14	Cement Portland grout	10 bag

Method of Construction

☐ Cable Tool ☐ Rotary (conventional) ☐ Rotary (reverse)
☒ Rotary (air) ☐ Air percussion ☐ Boring
☐ Diamond ☐ Jetting ☐ Driving
☐ Digging ☐ Other ___

Water Use

☒ Domestic ☐ Stock ☐ Irrigation
☐ Industrial ☐ Commercial ☐ Municipal
☐ Public Supply ☐ Not used ☐ Cooling & air conditioning
☐ Other ___

Final Status of Well

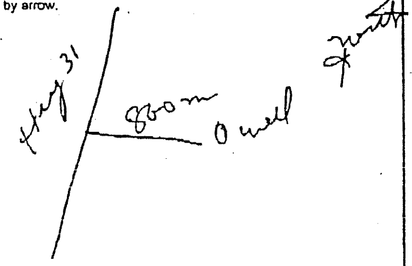
☒ Water Supply ☐ Observation well ☐ Test Hole
☐ Recharge well ☐ Abandoned, insufficient supply ☐ Abandoned, poor quality
☐ Unfinished ☐ Dewatering ☐ Replacement well
☐ Abandoned, (Other) ___

Well Contractor/Technician Information

Name of Well Contractor: Gilles Bourgeois
Well Contractor's Licence No.: 1414
Business Address (street name, number, city etc.): St Albert av
Name of Well Technician (last name, first name): S Arme
Well Technician's Licence No.: 153
Signature of Technician/Contractor: x Gilles Bourgeois
Date Submitted YYYY MM DD: 05 04 28

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Audit No. Z 21760
Date Well Completed YYYY MM DD: 05 04 12
Was the well owner's information package delivered? ☐ Yes ☒ No
Date Delivered YYYY MM DD: 05 04 26

Ministry Use Only

Data Source ___ Contractor ___
Date Received YYYY MM DD ___ Date of Inspection YYYY MM DD ___
Remarks ___ Well Record Number ___

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☐ *Cette formule est disponible en français*

TW3

Ontario Ministry of the Environment

Well Tag N A012199 below)

A012199

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

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- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN ☐☐☐☐☐ CON ☐☐☐☐☐☐☐☐☐☐ LOT ☐☐☐

Well Owner's Information and Location of Well Information

First Name: Sunset lake
Last Name: Development CoRP.
Mailing Address (Street Number/Name, RR, Lot, Concession): 6576 apple oRchard Road
County/District/Municipality: CaRleton
Township/City/Town/Village: CReely
Province: Ontario
Postal Code: K4P 1E5
Telephone Number (include area code): 613-860-1100
Address of Well Location (County/District/Municipality): CaRleton
Township: City of Ottawa
Lot: 23-74
Concession: Hwy 31
RR#/Street Number/Name: Hwy 31
City/Town/Village: CReely
Site/Compartment/Block/Tract etc.: Plan 902
GPS Reading: NAD 83 Zone 18 Easting 456755E Northing 5012191
Unit Make/Model: Magellan
Mode of Operation: ☐ Undifferentiated ☑ Averaged ☐ Differentiated, specify ___ Utm

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth Metres From	To
bRown	fill		Hard	0	2.13
grey	gravel	Sand	Packed	2.13	7.01
grey	limestone		layered	7.01	48.76

Hole Diameter

Depth Metres From	To	Diameter Centimetres
0	8.53	21.23
8.53	48.76	15.55

Water Record

Water found at Metres	Kind of Water	
45 m ☐ Gas ☐ Other:	☑ Fresh ☐ Salty	☐ Sulphur ☐ Minerals
☐ m ☐ Gas ☐ Other:	☐ Fresh ☐ Salty	☐ Sulphur ☐ Minerals
☐ m ☐ Gas ☐ Other:	☐ Fresh ☐ Salty	☐ Sulphur ☐ Minerals

After test of well yield, water was
☐ Clear and sediment free
☐ Other, specify ___

Chlorinated ☑ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth Metres From	To
Casing				
15.55	☑ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	0.48	+.060	8.53
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☑ Open hole		8.53	48.76

Test of Well Yield

Pumping test method	Draw Down Time min	Water Level Metres	Recovery Time min	Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs + ___ min	2		2	
Final water level end of pumping ___ metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___ metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

☐ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	8.53	cement Premix grout	10 bag

Method of Construction

☐ Cable Tool ☐ Rotary (conventional) ☐ Rotary (reverse)
☑ Rotary (air) ☐ Air percussion ☐ Boring
☐ Diamond ☐ Jetting ☐ Driving
☐ Digging ☐ Other

Water Use

☑ Domestic ☐ Stock ☐ Irrigation
☐ Industrial ☐ Commercial ☐ Municipal
☐ Public Supply ☐ Not used ☐ Cooling & air conditioning
☐ Other

Final Status of Well

☐ Water Supply ☐ Observation well ☑ Test Hole
☐ Recharge well ☐ Abandoned, insufficient supply ☐ Abandoned, poor quality
☐ Unfinished ☐ Dewatering ☐ Replacement well
☐ Abandoned, (Other)

Well Contractor/Technician Information

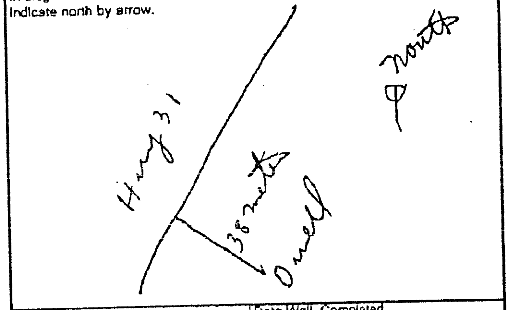
Name of Well Contractor: Gilles BouRgeois
Well Contractor's Licence No.: 1414
Business Address (street name, number, city etc.): 50 A Bergé ave
Name of Well Technician (last name, first name): SA Mac
Well Technician's Licence No.: T-193
Signature of Technician/Contractor: x
Date Submitted YYYY MM DD: 05 05 02

0506E (09/03)

Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☐

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Audit No. Z 21762

Date Well Completed YYYY MM DD: 05 05 02

Date Delivered YYYY MM DD

Was the well owner's information package delivered? ☐ Yes ☑ No

Ministry Use Only

Data Source
Contractor
Date Received YYYY MM DD
Date of Inspection YYYY MM DD
Remarks
Well Record Number

Cette formule est disponible en français

TW4.

Ontario Ministry of the Environment

Well Tag Number A 012198

A01.2198

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

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- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only MUN ___ CON ___ LOT ___

Well Owner's Information and Location of Well Information

First Name: Sunset lake
Last Name: Development Corp
Mailing Address (Street Number/Name, RR, Lot, Concession): 6576 apple ORchard Road
County/District/Municipality: Carleton
Township/City/Town/Village: GReely
Province: Ontario
Postal Code: K4P 1E5
Telephone Number (include area code): 613-860-1100
Address of Well Location (County/District/Municipality): Carleton
Township: City of ottawa
Lot: 10 R 73?4
Concession: St Le Barn Rd
RR#/Street Number/Name: St Le Barn Rd
City/Town/Village: Greely
Site/Compartment/Block/Tract etc.: Plan 902
GPS Reading: NAD 83 Zone 18 Easting 457160E Northing 5012650
Unit Make/Model: Magellan
Mode of Operation: ☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify ______ utm

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth Metres From	Depth Metres To
bRown	fill		Hard	0	1.82
grey	gravel	sand MIX	Packed	1.82	6.70
grey	limestone		layered	6.70	36.57

Hole Diameter

Depth Metres From	Depth Metres To	Diameter Centimetres
0	8.70	21.23
		15.55

Water Record

Water found at Metres	Kind of Water
35 m	☐ Gas ☐ Other: ☒ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
___ m	☐ Gas ☐ Other: ☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
___ m	☐ Gas ☐ Other: ☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals

After test of well yield, water was
☐ Clear and sediment free
☐ Other, specify ______

Chlorinated ☒ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth Metres From	Depth Metres To
Casing				
15.55	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	0.49	+0.60	8.70
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☒ Open hole		8.70	36.57

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___ hrs + ___ min	2		2	
Final water level end of pumping ___ metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___ metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	8.70	cement grout	10 bag

Method of Construction

☐ Cable Tool ☐ Rotary (conventional) ☐ Rotary (reverse)
☒ Rotary (air) ☐ Air percussion ☐ Boring
☐ Diamond ☐ Jetting ☐ Driving
☐ Digging ☐ Other

Water Use

☒ Domestic ☐ Stock ☐ Irrigation
☐ Industrial ☐ Commercial ☐ Municipal
☐ Public Supply ☐ Not used ☐ Cooling & air conditioning
☐ Other

Final Status of Well

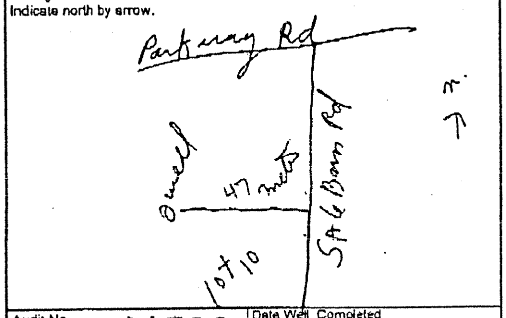
☒ Water Supply ☐ Observation well ☐ Test Hole
☐ Recharge well ☐ Abandoned, insufficient supply ☐ Abandoned, poor quality
☐ Unfinished ☐ Dewatering ☐ Replacement well
☐ Abandoned, (Other)

Well Contractor/Technician Information

Name of Well Contractor: Gilles BOURgeois
Well Contractor's Licence No.: 1414
Business Address (street name, number, city etc.): Same
Name of Well Technician (last name, first name): Same
Well Technician's Licence No.: 0-193
Signature of Technician/Contractor: X
Date Submitted YYYY MM DD: 05 04 30

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Audit No. Z 21780
Date Well Completed YYYY MM DD: 05 04 30
Was the well owner's information package delivered? ☐ Yes ☒ No
Date Delivered YYYY MM DD: 05 04 30

Ministry Use Only
Data Source
Contractor
Date Received YYYY MM DD
Date of Inspection YYYY MM DD
Remarks
Well Record Number

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☐ *Cette formule est disponible en français*

TW5

Ontario Ministry of the Environment

Well T[illegible] A 012197 [illegible]mber below)

A012197

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

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- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | | | | | CON | | | | | | | | | LOT | | |

Well Owner's Information and Location of Well Information

First Name: Sunset Development

Last Name: CORPoRation

Mailing Address (Street Number/Name, RR, Lot, Concession): 6576 apple orchard Road

County/District/Municipality: Carleton

Township/City/Town/Village: GReeLy

Province: Ontario

Postal Code: K4P 1E5

Telephone Number (include area code): 613-860-1100

Address of Well Location (County/District/Municipality): CARleton

Township: City of ottawa

Lot: 16P473-7 Par[illegible] Parkway Rd

Concession:

RR#/Street Number/Name: Parkway Rd

City/Town/Village: GReely

Site/Compartment/Block/Tract etc.: Plan 902

GPS Reading: NAD 83 Zone 18 Easting 456942 E Northing 5012789

Unit Make/Model: Magellan

Mode of Operation: ☐ Undifferentiated ☑ Averaged ☐ Differentiated, specify ______ atm

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth Metres From	Depth Metres To
bRown	fill		Hard	0	2.13
grey	gravel	Sand mix	Packed	2.13	7.92
				7.92	30.48

Hole Diameter

Depth Metres From	Depth Metres To	Diameter Centimetres
0	9.144	21.23
9.144	30.48	15.55

Water Record

Water found at Metres	Kind of Water		
29 m	☑ Fresh	☐ Sulphur	
	☐ Gas	☐ Salty	☐ Minerals
	☐ Other:		
___ m	☐ Fresh	☐ Sulphur	
	☐ Gas	☐ Salty	☐ Minerals
	☐ Other:		
___ m	☐ Fresh	☐ Sulphur	
	☐ Gas	☐ Salty	☐ Minerals
	☐ Other:		

After test of well yield, water was
☐ Clear and sediment free
☐ Other, specify ______

Chlorinated ☑ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth Metres From	Depth Metres To
Casing				
15.55	☑ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	0.48	+0.60	9.144
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☐ Open hole		9.144	30.48

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___ hrs + ___ min	2		2	
Final water level end of pumping metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___ metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

☐ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	9.144	Cement Pressure grout	9 bag

Method of Construction

☐ Cable Tool	☑ Rotary (air)	☐ Diamond	☐ Digging
☐ Rotary (conventional)	☐ Air percussion	☐ Jetting	☐ Other
☐ Rotary (reverse)	☐ Boring	☐ Driving	

Water Use

☑ Domestic	☐ Industrial	☐ Public Supply	☐ Other
☐ Stock	☐ Commercial	☐ Not used	
☐ Irrigation	☐ Municipal	☐ Cooling & air conditioning	

Final Status of Well

☐ Water Supply	☐ Recharge well	☐ Unfinished	☐ Abandoned, (Other)
☐ Observation well	☐ Abandoned, insufficient supply	☐ Dewatering	
☑ Test Hole	☐ Abandoned, poor quality	☐ Replacement well	

Well Contractor/Technician Information

Name of Well Contractor: Gilles BOURgeois

Well Contractor's Licence No.: 1414

Business Address (street name, number, city etc.): ST Albert ont

Name of Well Technician (last name, first name): ST [illegible]

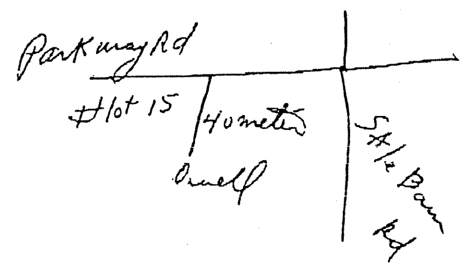
Well Technician's Licence No.: 0-193

Signature of Technician/Contractor: X

Date Submitted YYYY MM DD: 05 05 02

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Audit No. Z 21761

Date Well Completed YYYY MM DD: 05 05 2

Was the well owner's information package delivered? ☐ Yes ☑ No

Date Delivered YYYY MM DD: 05 05 2

Ministry Use Only

Data Source:

Contractor:

Date Received YYYY MM DD:

Date of Inspection YYYY MM DD:

Remarks:

Well Record Number:

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☐ *Cette formule est disponible en français*

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MUNICIPALITY              UTM                             CSG KIND  WATER STAT PUMP TEST TEST              SCREEN         OWNER
CONCESSION           WELL EASTING  ELEV                   DIA  OF   FOUND LVL  LVL  RATE TIME  WATER DEPTH LENGTH DEPTHS IN FEET TO WHICH
   ETC         LOT    NO  NORTHING FEET DATE    DRILLER  INS WATER FEET  FEET FEET GPM  HR:MN USE    FEET   FEET      FORMATIONS EXTEND

CONTINUING... OSGOODE TOWNSHIP

CON      05  005  15-    455900   310  1968/10 1517  04  FR   0043  2    15   20   1 :0  DO                  TAILLEFER D
                  09572 5012330                                                                              LOAM MSND 0004 MSND 0038 LMSN 0044
CON      05  005  15-    456080   305  1970/10 1558  06  FR   0075  26   27   18   2 :0  DO                  LEE J
                  10991 5012220                                                                              BRWN GRVL STNS 0075
CON      05  005  15-    455635   328  1972/11 3504  06  FR   0065  5    40   10   1 :0  DO                  JOHNSTON S
                  12362 5011950                                                                              GRVL SAND 0040 LMSN 0065
CON      05  006  15-    999999        1993/09 3749  06  FR   0046  7    27   10   1 :0  DO                  BYLES
                  27613 9999999                                                                              GREY GRVL HPAN PCKD 0019 GREY LMSN 0055
CON      05  006  15-    999999        1997/08 2348  06  FR   0090  15   125  5    1 :0  DO                  RACINE, CLAIR
                  29644 9999999                                                                              HPAN 0020 GRVL 0027 LMSN 0130
CON      05  006  15-    999999        1989/07 3701  06  FR   0078  15   20   15   1 :0  DO                  PILARMAC DEV LTD
                  24283 9999999                                                                              BRWN LOAM 0001 BRWN CLAY BLDR DNSE 0038 GREY ROCK
                                                                                                             LMSN 0078
CON      05  006  15-    999999        1991/10 1558  06  UK   0096  12   20   10   1 :0  DO                  MCEVOY, PHILIP
                  26013 9999999                                                                              BRWN SAND BLDR 0014 GREY SAND BLDR 0027 GREY LMSN
                                                                                                             0100
CON      05  006  15-    999999        1991/07 1517  06  FR   0048  8    20   20   1 :0  DO                  MR CONSELMAN
                  25595 9999999                                                                              BRWN SAND 0018 BRWN SAND GRVL 0048 GREY LMSN ROCK
                                                                                                             0049
CON      05  006  15-    999999        1988/06 2348  06  FR   0070  15   75   7    1 :0                      STRABY, SHELDON
                  22931 9999999                                                                              SAND GRVL 0022 LMSN 0075
CON      05  006  15-    999999        1987/10 4875  06  FR   0056  12   45   40   0 :30 DO                  MCGILLNARY, MR F X
                  21970 9999999                                                                              BRWN SAND 0008 GREY GRVL BLDR 0040 GREY LMSN SHLE
                                                                                                             0063
CON      05  006  15-    999999        1987/07 4875  06  FR   0088  8    90   12   1 :30 PS                  GREEZY RE. ASSOC.
                  21526 9999999                                                                              BRWN CLAY FILL 0004 GREY SAND 0016 GREY SAND GRVL
                                                                                                             BLDR 0035 GREY LMSN SHLE 0102
CON      05  006  15-    999999        1988/08 4875  06  FR   0056  9    40   20   0 :45 AC                  GREELY LIONS CLUB
                  22551 9999999                                                                              BRWN SAND 0009 GREY TILL 0035 GREY GRVL BLDR 0048
                                                                                                             GREY LMSN SHLE 0065
CON      05  006  15-    999999        1988/03 1558  06  UK   0070  12   25   30   1 :0  DO                  VANDERYDT, JOHN
                  22290 9999999                                                                              BRWN SAND BLDR 0004 BRWN SAND GRVL 0030 GREY SAND
                                                                                                             GRVL BLDR 0047 GREY LMSN 0075
CON      05  006  15-    999999        1988/08 4875  06  FR   0056  8    40   20   0 :45 DO                  GREELY LIONS CLUB
                  22552 9999999                                                                              BRWN SAND 0008 GREY TILL 0032 GREY GRVL SAND BLDR
                                                                                                             0048 GREN LMSN SHLE 0065
CON      05  006  15-    456100   308  1974/11 3644  06  FR   0050  5    25   50   1 :0  DO                  HAMMOND GORD
                  14561 5012040                                                                              GREY CLAY STNS 0040 GREY HPAN GRVL 0050
CON      05  006  15-    456200   310  1976/07 3644  06  FR   0038  6    25   20   1 :0  DO                  GEEBAN CONSTRUCTION
                  15660 5011860                                                                              GREY SAND 0020 GREY SAND STNS 0032 GREY LMSN 0040
CON      05  006  15-    455698   322  1975/09 3644  06  FR   0073  15   50   20   1 :0  DO                  NORMAYLE CONST
                  15135 5011839                                                                              GREY HPAN STNS 0025 GREY SAND 0047 GREY LMSN 0075
CON      05  006  15-    455910   318  1976/06 1517  06  FR   0048  20   35   15   1 :0  DO                  JET B G
                  15532 5011970                                                                              BRWN SAND 0040 BLCK GRVL 0043 GREY SNDS 0049
CON      05  006  15-    456238   312  1975/06 1558  06  FR   0108  5    15   75   1 :0  DO                  ZERANSKY HELMUT
                  14763 5011967                                                                              BRWN SAND 0002 GREY SAND 0013 GREY LMSN BLDR 0016
                                                                                                             GREY SAND 0018 GREY LMSN 0080 GREY SNDS 0100 GREY
                                                                                                             LMSN 0110
CON      05  006  15-    455520   325  1976/07 1517  06  FR   0053  20   50   20   1 :30 MN                  STASION FEUE
                  15531 5011760                                                                              BRWN GRVL 0027 GREY HPAN 0050 GREY SNDS 0051 UNKN
                                                                                                             0055
CON      05  006  15-    455883   320  1975/10 3644  06  FR   0051  15   30   100  1 :0  DO                  GEEBAU CONSTRUCTION
                  15172 5011955                                                                              GREY HPAN SAND STNS 0050 GREY LMSN 0053
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MUNICIPALITY             UTM                         CSG KIND  WATER STAT PUMP TEST TEST          SCREEN         OWNER
CONCESSION          WELL EASTING  ELEV               DIA  OF   FOUND LVL  LVL  RATE TIME  WATER DEPTH LENGTH DEPTHS IN FEET TO WHICH
  ETC        LOT     NO  NORTHING FEET DATE  DRILLER INS WATER FEET  FEET FEET GPM  HR:MN USE   FEET   FEET      FORMATIONS EXTEND

CONTINUING... OSGOODE TOWNSHIP

CON      05  006  15-   455922   318  1975/11 3644  06  FR    0052  6    25   50   1 :0   DO                  CABA BILL
                  15170 5011939                                                                              GREY SAND STNS 0049 GREY LMSN 0054
CON      05  006  15-   455990   315  1976/08 3658  06  FR    0064  3    25   75   2 :0   DO                  GORE BRIAN
                  15791 5011990                                                                              GREY GRVL 0010 GREY CLAY 0040 GREY HPAN 0055 GREY
                                                                                                             LMSN 0065
CON      05  006  15-   456540   297  1976/07 1558  06  FR    0044  6    20   60   1 :0   DO                  PROULX ARMAN
                  15514 5011990                                                                              BRWN CLAY STNS FILL 0003 BRWN SAND LOOS 0041 BLCK
                                                                                                             LMSN FCRD 0045
CON      05  006  15-   455939   316  1975/08 3644  06  FR    0045  8    30   40   1 :0   DO                  GEEBAU CONSTRUCTION
                  15150 5011885                                                                              GREY SAND STNS 0042 GREY GRVL 0045
CON      05  006  15-   456126   300  1975/06 1558  06  FR    0121  20   75   7    1 :0   DO                  GARRARD ROY
                  14749 5012111                                                                              GRVL BLDR 0046 BLCK LMSN 0123
CON      05  006  15-   455883   325  1975/08 3644  06  FR    0048  8    40   20   1 :0   DO                  CROFT
                  14844 5011924                                                                              GREY SAND 0045 GREY LMSN 0048 GREY GRVL 0050
CON      05  006  15-   455921   316  1975/11 3644  06  FR    0073  15   50   10   1 :0   DO                  DOWNEY
                  15168 5011872                                                                              GREY SAND GRVL 0048 GREY LMSN 0075
CON      05  006  15-   455817   325  1975/07 3644  06  FR    0053  10   25   20   1 :0   DO                  HAARSMA J
                  14853 5011864                                                                              BRWN SAND GRVL 0039 GREY LMSN 0055
CON      05  006  15-   455810   320  1975/08 3644  06  FR    0034  5    25   50   1 :0   DO                  LARICCIA MIKE
                  14855 5011881                                                                              GREY SAND 0026 GREY HPAN STNS 0028 GREY LMSN 0033
                                                                                                             GREY GRVL 0035
CON      05  006  15-   455940   315  1976/04 1517  06  FR    0055  18   25   20   1 :10  DO                  B G JET CO LTD
                  15390 5011920                                                                              BRWN SAND GRVL BLDR 0040 BRWN SAND GRVL 0049 GREY
                                                                                                             LMSN 0056
CON      05  006  15-   455977   316  1975/09 1517  06  FR    0048  8    25   15   1 :20  DO                  VEZINA CHARLES
                  15094 5011952                                                                              BRWN SAND 0041 BLCK SHLE 0050
CON      05  006  15-   455910   316  1976/04 1517  06  FR    0058  15   30   15   1 :10  DO                  B G JET CO LTD
                  15391 5011910                                                                              BRWN GRVL SAND BLDR 0050 BRWN GRVL 0052 UNKN 0059
CON      05  006  15-   455935   316  1975/11 1558  06  FR    0058  10   30   20   1 :0   DO                  ROMBOUGH JAMES
                  15081 5011890                                                                              BRWN SAND PCKD 0025 BRWN GRVL BLDR PCKD 0046 GREY
                                                                                                             LMSN 0060
CON      05  006  15-   456240   311  1976/11 3644  06  FR    0051  8    25   50   1 :0   DO                  ROCK GARY
                  15828 5011760                                                                              GREY SAND STNS 0040 GREY LMSN 0055
CON      05  006  15-   456180   310  1976/11 3644  06  FR    0061  10   40   50   1 :0   DO                  BERT JERRY
                  15829 5011950                                                                              GREY SAND 0045 GREY LMSN 0064
CON      05  006  15-   455905   322  1975/09 3644  06  FR    0062  15   30   30   1 :0   DO                  GULIK JOHN VAN
                  15139 5011859                                                                              GREY HPAN STNS 0018 BRWN SAND 0040 GREY HPAN 0051
                                                                                                             GREY LMSN 0065
CON      05  006  15-   456234   310  1975/07 1558  06  FR    0070  15   20   25   1 :0   DO                  ENGELS ALEXANDER
                  14789 5012021                                                                              BRWN GRVL BLDR 0046 GREY LMSN 0073
CON      05  006  15-   455880   320  1976/04 4788  06  FR    0060  20   30   6    1 :0   DO                  MACEACHERN J
                  15342 5011920                                                                              BRWN SAND BLDR SOFT 0025 YLLW SAND SOFT 0046 GREY
                                                                                                             LMSN HARD 0065
CON      05  006  15-   456600   280  1976/09 1517  05  FR    0025  6    18   25   1 :20  DO                  MCEVOYS PHILLIP
                  15603 5011960                                                                              YLLW SAND 0021 BLCK SHLE 0028
CON      05  006  15-   455840   322  1976/05 4788  06  FR    0060  20   35   6    1 :15  DO                  PLOSENSKI PETER
                  15340 5011920                                                                              BRWN SAND BLDR SOFT 0017 YLLW SAND SOFT 0048 GREY
                                                                                                             LMSN HARD 0065
CON      05  006  15-   455599   325  1981/07 1414  06  FR    0040  12   25   30   1 :0   DO                  FRANZ H
                  17638 5011799                                                                              YLLW CLAY SNDY SOFT 0031 BLCK SHLE SOFT 0041
CON      05  006  15-   455499   325  1979/07 1517  06  FR    0049  18   28   25   1 :30  DO                  KELSEY B
                  17152 5011999                                                                              YLLW SAND 0035 BRWN HPAN SAND 0040 GREY LMSN 0051
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MUNICIPALITY              UTM                           CSG KIND  WATER STAT PUMP TEST TEST          SCREEN          OWNER
CONCESSION           WELL EASTING  ELEV                 DIA  OF   FOUND LVL  LVL  RATE TIME  WATER DEPTH LENGTH DEPTHS IN FEET TO WHICH
  ETC        LOT      NO  NORTHING FEET DATE   DRILLER INS WATER FEET  FEET FEET GPM  HR:MN USE   FEET   FEET      FORMATIONS EXTEND

CONTINUING... OSGOODE TOWNSHIP
CON      05  006  15-    455499   325  1979/08 1517   06  FR    0049  20   30   18   1 :30  DO                  MCDONALD G
                  17154 5011999                                                                                 YLLW SAND 0043 GREY LMSN 0053
CON      05  006  15-    455799   320  1981/06 1414   06  FR    0046  7    20   30   1 :0   DO                  LEVESQUE C
                  17585 5011999                                                                                  RED CLAY SOFT 0012 GREY TILL BLDR HARD 0040 GREY
                                                                                                                LMSN HARD 0048
CON      05  006  15-    456080   310  1976/03 1505   06  FR    0055  20   35   8    1 :0   DO                  DESCHAMPS D
                  16450 5011680                                                                                 BRWN FILL 0002 BRWN SAND GRVL BLDR 0030 BRWN SAND
                                                                                                                GRVL PCKD 0046 GREY LMSN HARD 0065
CON      05  006  15-    455499   325  1979/06 1517   06  FR    0048  20   26   20   1 :30  DO                  KINSELLA L
                  17024 5011999                                                                                 BRWN HPAN 0016 YLLW SAND 0045 BLCK GRVL 0047 GREY
                                                                                                                LMSN 0051
CON      05  006  15-    455799   320  1981/07 1414   06  FR    0046  12   25   30   1 :0   DO                  MANNARINO R
                  17581 5011899                                                                                  RED CLAY SOFT 0003 GREY TILL BLDR HARD 0040 GREY
                                                                                                                STNS HARD 0048
CON      05  006  15-    455899   320  1981/08 1558   06  FR    0058  5    20   50   1 :0   DO                  GARRETT M
                  17755 5011999                                                                                 BRWN SAND BLDR 0005 BRWN SAND 0047 BRWN SAND GRVL
                                                                                                                0048 GREY LMSN 0060
CON      05  006  15-    457099   280  1983/04 4006   08  FR    0056  0    7    8    1 :0   DO                  STOKELY C
                  18216 5012599                                                                                 BRWN SAND CLAY STNS 0004 GREY SAND GRVL CLAY 0018
                                                                                                                GREY LMSN HARD 0064
CON      05  006  15-    455899   320  1982/05 1558   06  FR    0050  20   25   30   1 :0   DO                  JOHN VANDERYDT LTD
                  17964 5011899                                                                                 BRWN SAND BLDR 0014 GREY HPAN GRVL 0030 GREY GRVL
                                                                                                                SAND 0043 GREY LMSN 0055
CON      05  006  15-    456099   320  1982/10 1517   06  FR    0043  12   20   20   1 :30  DO                  MILLER J
                  18002 5011699                                                                                 BRWN SAND 0006 GREY QSND STNS MGRD 0042 GREY LMSN
                                                                                                                STNS HARD 0045
CON      05  006  15-    455599   320  1983/05 1414   06  FR    0047  12   35   10   1 :0   PS DO               GREELY COM CTRE
                  18291 5011699                                                                                  RED SILT SOFT 0012 GREY TILL BLDR HARD 0039 BLCK
                                                                                                                STNS HARD 0048
CON      05  006  15-    455799   320  1982/06 2348   06  FR    0037  14   20   18   1 :0   DO                  SOHNSTON D
                  17878 5011599                                                                                 SAND 0020 GRVL 0034 LMSN 0039
CON      05  006  15-    455699   325  1983/05 1414   06  FR    0051  6    25   10   1 :0   DO                  LARABIE R
                  18289 5011899                                                                                  RED CLAY SOFT 0012 BLUE CLAY SNDY SOFT 0041 BLUE
                                                                                                                GRVL HARD 0048 BLUE STNS HARD 0053
CON      05  006  15-    455799   320  1984/09 1517   06  FR    0046  12   16   20   1 :0   DO                  BALISLE M
                  19360 5011599                                                                                 BRWN SAND 0004 GREY SAND GRVL 0021 GREY QSND 0040
                                                                                                                GREY CSND GRVL 0045 GREY LMSN STNS 0048
CON      05  006  15-    455799   320  1982/06 2348   06  FR    0047  10   20   30   1 :0   DO                  BELANGER T
                  17879 5011599                                                                                 SAND 0033 GRVL 0042 LMSN 0049
CON      05  006  15-    999999        1998/05 2348   06  FR    0050  10   50   6    1 :0   DO                  RACIRE, CLAIRE
                  30108 9999999                                                                                 HPAN 0020 GRVL 0021 LMSN 0055
CON      05  006  15-    999999        1985/06 2307   06  FR    0063  21   63   10   4 :0   DO                  DONWELL CONST.
                  19914 9999999                                                                                 BRWN FILL LOOS STNS 0003 WHIT SAND 0031 GRVL LOOS
                                                                                                                0049 GREY SHLE SOFT 0063
CON      05  006  15-    999999        1985/06 2307   06  FR    0078  20   70   10   1 :0   DO                  DONWEL CONST.
                  19915 9999999                                                                                 WHIT SAND STNS LOOS 0013 GREY SHLE SOFT 0085
CON      05  006  15-    999999                2348   06  FR    0060  20   60   7    1 :0   DO
                  20499 9999999                                                                                 SAND GRVL LMSN 0064
CON      05  006  15-    456840   288  1958/02 1530   04  FR    0060  15   20   50   1 :0   DO                  SCHARFF B
                  07302 5012510                                                                                 LOAM MSND 0015 HPAN 0048 GRVL 0051 LMSN 0060
CON      05  006  15-    455510   325  1966/10 3504   05  FR    0050  20   50   6    1 :0   DO                  KAUFMAN H
                  07313 5011720                                                                                 GRVL BLDR 0018 LMSN 0060
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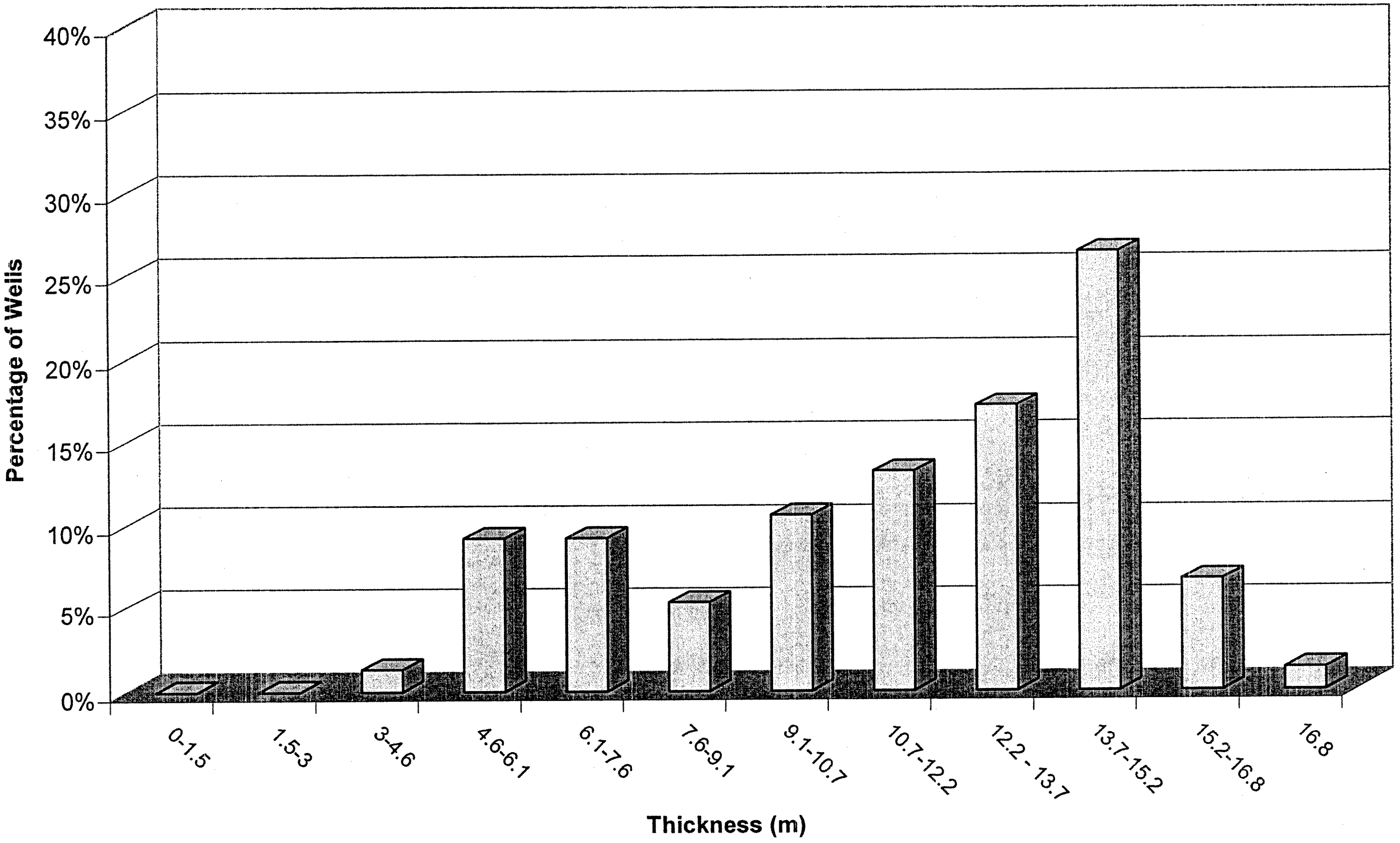
MUNICIPALITY             UTM                                CSG KIND  WATER STAT PUMP TEST TEST            SCREEN          OWNER
CONCESSION         WELL EASTING  ELEV                       DIA  OF   FOUND LVL  LVL  RATE TIME  WATER DEPTH LENGTH DEPTHS IN FEET TO WHICH
   ETC      LOT     NO  NORTHING FEET DATE    DRILLER INS WATER FEET  FEET FEET GPM  HR:MN USE   FEET   FEET       FORMATIONS EXTEND

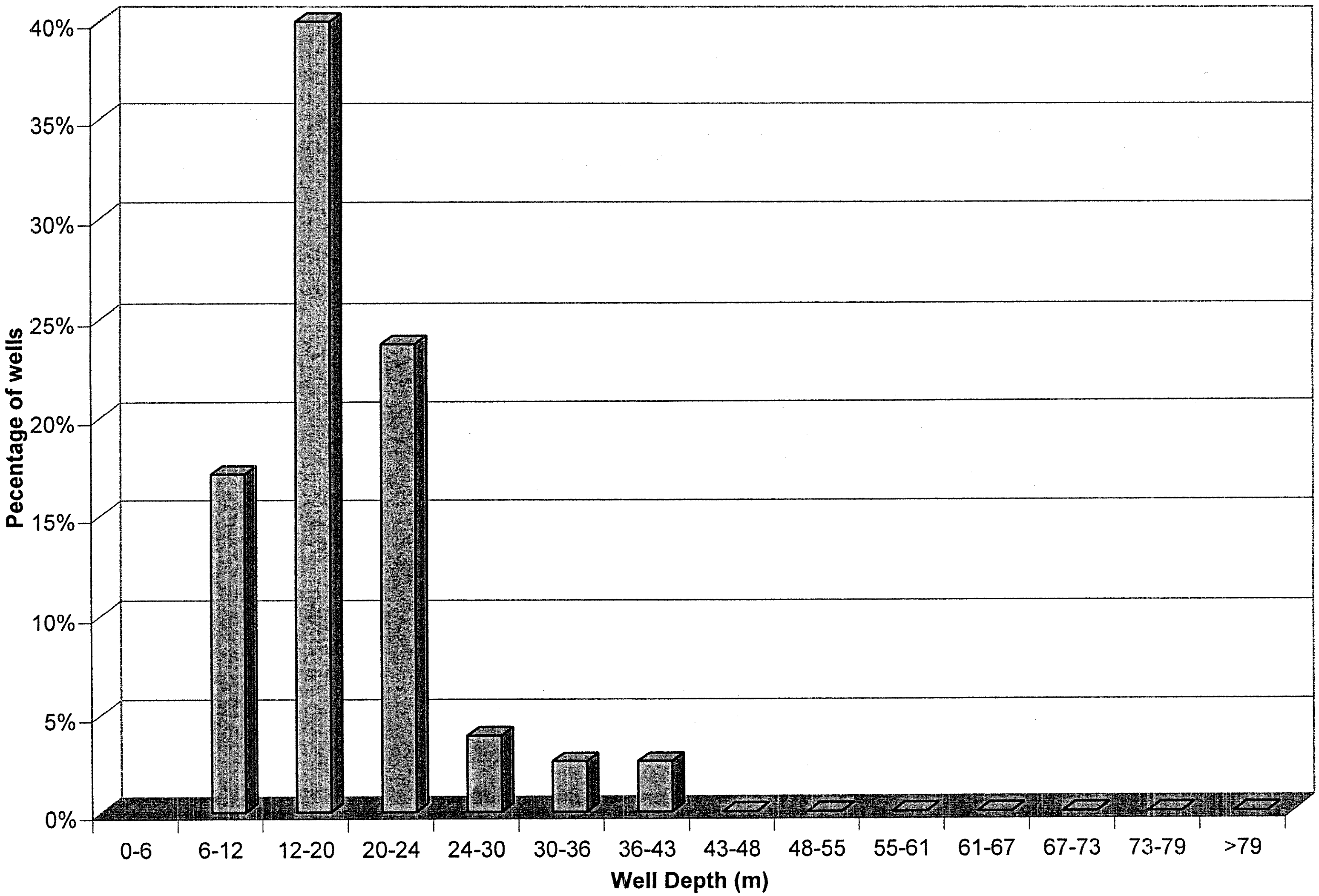
CONTINUING... OSGOODE TOWNSHIP

CON     05  006  15-    456160   305  1966/03 1503  05  SU    0056  19   40   10    1 :0   DO                     MORROW G
                 07312 5012020                                                                                  CLAY MSND 0020 HPAN BLDR 0034 LMSN 0057
CON     05  006  15-    456230   305  1965/01 3601  05  FR    0035  8    10   10    1 :0   DO                     HERBERT C
                 07311 5012160                                                                                  GRVL MSND 0024 LMSN 0035
CON     05  006  15-    456310   310  1962/10 4825  04  FR    0024  5    8    6     0 :30  DO                     SKRABS A
                 07310 5011980                                                                                  CLAY 0016 LMSN 0025
CON     05  006  15-    456300   305  1962/09 4825  05  FR    0026  2    6    6     0 :30  DO                     WOUTERS A
                 07308 5012130                                                                                  MSND 0021 LMSN 0027
CON     05  006  15-    456490   300  1961/08 1530  04  FR    0023  7    10   10    2 :0   DO                     MCEVOY P
                 07307 5012020                                                                                  LOAM MSND 0012 QSND 0015 MSND GRVL 0017 GREY LMSN
                                                                                                                0023
CON     05  006  15-    456020   315  1961/05 1530  04  FR    0040  5    15   12    2 :0   DO                     WADELEK S
                 07306 5012050                                                                                  LOAM MSND 0020 QSND 0030 MSND 0038 LMSN 0042
CON     05  006  15-    456960   282  1958/02 1530  04  FR    0035  20   25   17    2 :0   DO                     MCEVOY P
                 07304 5012600                                                                                  HPAN 0031 GREY LMSN 0036
CON     05  006  15-    456940   285  1958/02 1530  05  FR    0040  10   25   17    1 :0   ST DO                  SHIELD A
                 07303 5012520                                                                                  HPAN 0031 LMSN 0042
CON     05  006  15-    455980   320  1960/04 1530  04  FR    0060  12   15   15    1 :0   DO                     SCHARFF A
                 07305 5012020                                                                                  LOAM MSND 0020 QSND 0030 MSND STNS 0049 ROCK 0060
CON     05  006  15-    455810   320  1962/09 1503  05  FR    0075  23   26   10    1 :0   DO                     CAIN D
                 07309 5011910                                                                                  GRVL 0020 MSND 0043 BLUE LMSN 0077
CON     05  006  15-    456390   308  1968/10 1517  04  FR    0024  2    10   10    0 :30  DO                     MCEVOY PHILIP
                 09571 5012020                                                                                  LOAM MSND 0003 QSND 0021 BLCK LMSN 0026
CON     05  006  15-    456294   311  1972/10 1517  06  FR    0043  FLW  28   10    1 :0   DO                     JOHN LANDRIGAN
                 12259 5012045                                                                                  GREY HPAN 0026 GREY LMSN ROCK 0045
CON     05  006  15-    456580   300  1970/10 1517  05  FR    0030  10   18   20    0 :30  DO                     MC EVOY P
                 10889 5011980                                                                                  BRWN MSND 0015 GREY GRVL 0024 GREY MSND 0032
CON     05  006  15-    456458   300  1970/06 1517  05  FR    0086  25   38   10    1 :0   DO                     LLOYD TIERNEY
                 10768 5012100                                                                                  BRWN MSND STNS 0040 GREY MSND 0080 GREY MSND GRVL
                                                                                                                0084 GREY LMSN 0087
CON     05  006  15-    455573   325  1972/11 1558  06  FR    0046  12   30   20    1 :0   DO                     GEO ASTMA CONSTR
                 12221 5011795                                                                                  BRWN SAND GRVL BLDR 0009 GREY SAND GRVL BLDR 0040
                                                                                                                BLCK LMSN 0048
CON     05  006  15-    456160   309  1973/09 1517  05  FR    0025  4    10   25    1 :0   DO                     MCEVEALY PHILIPE
                 13425 5012040                                                                                  BRWN LOAM 0003 GREY QSND 0016 UNKN 0026
CON     05  006  15-    455525   325  1973/08 1517  05  FR    0043  18   35   15    1 :10  DO                     SHIELD R
                 13421 5011750                                                                                  BRWN HPAN BLDR 0043
CON     05  006  15-    455492   318  1973/08 1517  05  FR    0032  19   30   8     1 :57  DO                     DIFRANCESCO VAN
                 13408 5011409                                                                                  BRWN HPAN BLDR 0025 GREY LMSN 0035
CON     05  007  15-    999999        1990/11 3323  06  FR    0202  12   175  15    1 :0   DO                     KRUCLELL DON CONST.
                 26911 9999999                                                                                  BRWN SAND FILL 0005 BLCK LOAM 0030 GREY HPAN CLAY
                                                                                                                0049 GREY LMSN 0207
CON     05  007  15-    999999        1996/11 6455  04  DRY                            :                        KAUFERT, HARRY
                 29267 9999999                                                                                  PRDG 0032
CON     05  007  15-    999999        1989/09 4875  06  UK    0169  23   150  10    2 :0        NU                DONWEL, CONSTRUCTION
                 23996 9999999                                                                                  BRWN CLAY FILL 0003 GREY SAND FGRD 0042 GREY SAND
                                                                                                                CGVL 0049 GREY LMSN SHLE HARD 0179
CON     05  007  15-    999999        1989/07 1558  06  FR    0037  20   30   30    1 :0   DO                     DONWELL, CONSTRUCTIO
                 23613 9999999                                                                                  BRWN SAND 0010 GREY SAND GRVL BLDR 0026 GREY LMSN
                                                                                                                0060
CON     05  007  15-    999999        1989/03 4875  06  UK    0232  26   200  20    1 :0   DO                     OHARA, MR WELDON
                 23298 9999999                                                                                  BRWN SAND 0015 GREY GRVL SAND BLDR 0055 GREY LMSN
                                                                                                                SHLE 0215 GREY SNDS 0245
```

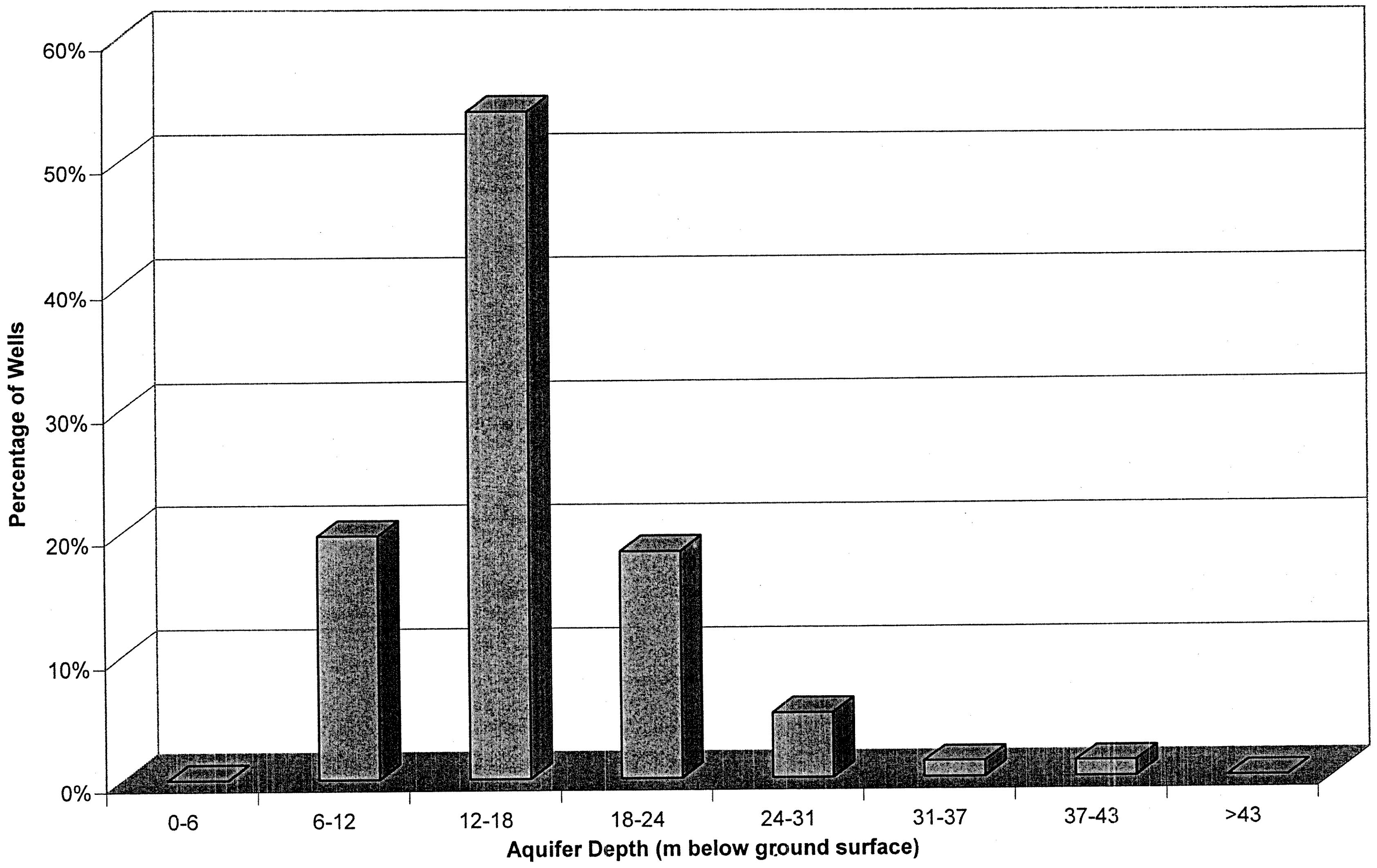
Summary of Overburden Thickness Reported in Surrounding Water Wells



Summary of Well Depths Reported in Surrounding Water Wells

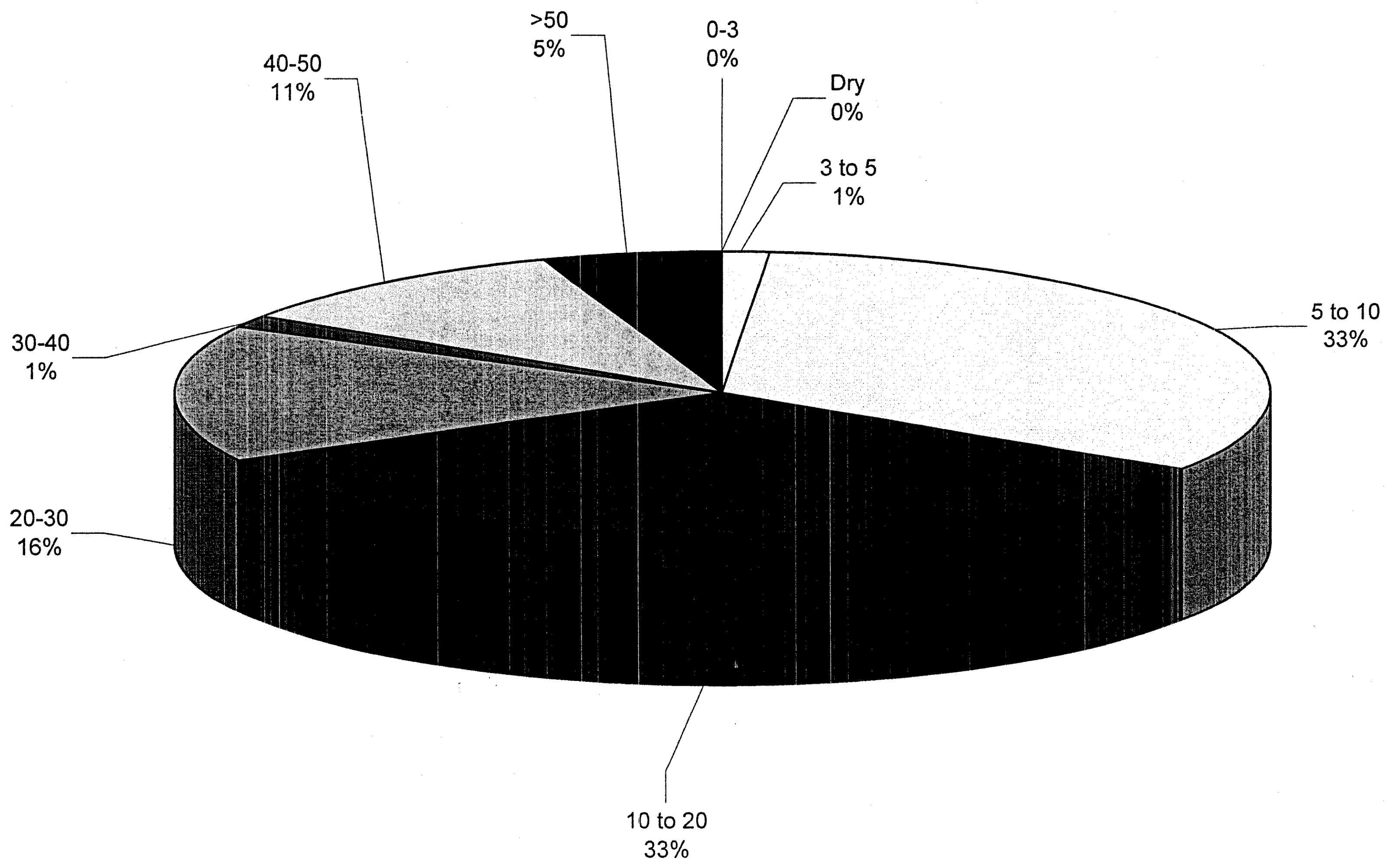


Summary of Reported Aquifer Depths In Surrounding Water Wells



Summary of Well Yields Reported for Surrounding Water Wells

(Range of Well Yields in Imperial Gallons per Minute)



APPENDIX 3

LABORATORY TEST DATA

1. Reports of Analysis For Water Samples Collected During Pump Testing
2. Reports of Analysis For Water Samples Collected During Extended Well Development

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **Paterson Group**
1-28 Concourse Gate
Ottawa, Ont.
K1V 1T6
Attention: **Robert Passmore**

Report Number: 2512050
Date: 2005-06-27
Date Submitted: 2005-06-23

Project: PH0145

P.O. Number: PO# 2552
Matrix: Water

Chain of Custody Number: **29556**

		LAB ID:	394207	394208				**GUIDELINE**		
		Sample Date:	2005-06-23	2005-06-23				MOE REG. 170/03		
		Sample ID:	TW1, WS5	TW1, WS6						
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0	1				MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0	0				MAC	0	ct/100mL
Heterotrophic Plate Count	ct/1mL		0	1				MAC	500	ct/1mL
Faecal Coliforms	ct/100mL		0	0				MAC	0	ct/100mL
Faecal Streptococcus	ct/100mL		0	0						ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL:
Tim McCooeye
QC Manager

Results relate only to the parameters tested on the samples submitted for analysis.

Client: **Paterson Group**
1-28 Concourse Gate
Ottawa, Ont.
K1V 1T6
Attention: **Robert Passmore**

Report Number: 2512053
Date: 2005-07-06
Date Submitted: 2005-06-23

Project: PH0145

P.O. Number: PO# 2552
Matrix: Water

Chain of Custody Number: 29556

		LAB ID:	394213	394214				**GUIDELINE**		
		Sample Date:	2005-06-23	2005-06-23				MOE REG. 170/03		
		Sample ID:	TW1, WS5	TW1, WS6						
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Alkalinity as CaCO3	mg/L	5	313	312				OG	500	mg/L
Chloride	mg/L	1	543	538				AO	250	mg/L
Colour	TCU	2	2	2				AO	5	TCU
Conductivity	uS/cm	5	2500	2530						TCU
Dissolved Organic Carbon	mg/L	0.5	<0.5	0.9				AO	5	mg/L
Fluoride	mg/L	0.10	<0.10	0.15				MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01	<0.01				AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.20	0.03						mg/L
N-NO2 (Nitrite)	mg/L	0.10	<0.10	<0.10				MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.10	<0.10	<0.10				MAC	10.0	mg/L
pH			7.58	7.63				AO	6.5-8.5	
Phenols	mg/L	0.001	<0.001	<0.001						
Sulphate	mg/L	1	134	133				AO	500	mg/L
Tannin & Lignin	mg/L	0.1	<0.1	<0.1						mg/L
TDS (COND - CALC)	mg/L	5	1630	1640				AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.05	0.21	0.25						mg/L
Turbidity	NTU	0.1	1.8	1.6				AO	1.0	NTU
Hardness as CaCO3	mg/L	1	583	578				OG	100	mg/L
Ion Balance		0.01	1.00	0.99						mg/L
Calcium	mg/L	1	151	149						mg/L
Magnesium	mg/L	1	50	50						mg/L
Potassium	mg/L	1	4	4						mg/L
Sodium	mg/L	2	292	281				AO	20	mg/L
Iron	mg/L	0.03	0.68	0.69				AO	0.3	mg/L
Manganese	mg/L	0.01	0.10	0.10				AO	0.05	mg/L

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **Paterson Group**
1-28 Concourse Gate
Ottawa, Ont.
K1V 1T6
Attention: **Robert Passmore**

Report Number: 2512305
Date: 2005-06-30
Date Submitted: 2005-06-27

Project: PG0145

P.O. Number: PO# 2348
Matrix: Water

Chain of Custody Number: 29934

		LAB ID:	394847	394848				**GUIDELINE**		
		Sample Date:	2005-06-27	2005-06-27				MOE REG. 170/03		
		Sample ID:	TW2, WS7	TW2, WS8						
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0	2				MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0	0				MAC	0	ct/100mL
Heterotrophic Plate Count	ct/1mL		4	1				MAC	500	ct/1mL
Faecal Coliforms	ct/100mL		0	0				MAC	0	ct/100mL
Faecal Streptococcus	ct/100mL		0	0						ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: K Quantrill
Krista Quantrill
Microbiology Analyst

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD **REPORT OF ANALYSIS**

Client: **Paterson Group**
1-28 Concourse Gate
Ottawa, Ont.
K1V 1T6
Attention: **Robert Passmore**

Report Number: 2512307
Date: 2005-07-14
Date Submitted: 2005-06-27

Project: PG0145

P.O. Number: PO# 2348
Matrix: Water

Chain of Custody Number: **29934**

		LAB ID:	394850	394851				**GUIDELINE**		
		Sample Date:	2005-06-27	2005-06-27				MOE REG. 170/03		
		Sample ID:	TW2, WS7	TW2, WS8						
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Alkalinity as CaCO3	mg/L	5	289	287				OG	500	mg/L
Chloride	mg/L	1	591	580				AO	250	mg/L
Colour	TCU	2	<2	3				AO	5	TCU
Conductivity	uS/cm	5	2500	2510						TCU
Dissolved Organic Carbon	mg/L	0.5	1.1	1.2				AO	5	mg/L
Fluoride	mg/L	0.10	0.13	0.13				MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01	<0.01				AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.10	0.12						mg/L
N-NO2 (Nitrite)	mg/L	0.10	<0.10	<0.10				MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.10	<0.10	<0.10				MAC	10.0	mg/L
pH			7.93	7.96				AO	6.5-8.5	
Phenols	mg/L	0.001	<0.001	<0.001						
Sulphate	mg/L	1	114	113				AO	500	mg/L
Tannin & Lignin	mg/L	0.1	<0.1	<0.1						mg/L
TDS (COND - CALC)	mg/L	5	1630	1630				AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.05	0.14	0.15						mg/L
Turbidity	NTU	0.1	9.3	9.6				AO	1.0	NTU
Hardness as CaCO3	mg/L	1	529	524				OG	100	mg/L
Ion Balance		0.01	1.10	0.97						mg/L
Calcium	mg/L	1	131	129						mg/L
Magnesium	mg/L	1	49	49						mg/L
Potassium	mg/L	1	5	5						mg/L
Sodium	mg/L	2	383	301				AO	20	mg/L
Iron	mg/L	0.03	0.74	0.72				AO	0.3	mg/L
Manganese	mg/L	0.01	0.06	0.06				AO	0.05	mg/L

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **Paterson Group**
1-28 Concourse Gate
Ottawa, Ont.
K1V 1T6
Attention: **Robert Passmore**

Report Number: 2512439
Date: 2005-07-08
Date Submitted: 2005-06-28

Project: PH0145

P.O. Number: PO# 2554
Matrix: Water

Chain of Custody Number: **29935**

LAB ID:			395159	395160				GUIDELINE		
Sample Date:			2005-06-28	2005-06-28				MOE REG. 170/03		
Sample ID:			TW3, WS9	TW3, WS10						
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Alkalinity as CaCO3	mg/L	5	274	268				OG	500	mg/L
Chloride	mg/L	1	698	689				AO	250	mg/L
Colour	TCU	2	2	2				AO	5	TCU
Conductivity	uS/cm	5	2750	2680						TCU
Dissolved Organic Carbon	mg/L	0.5	1.1	1.8				AO	5	mg/L
Fluoride	mg/L	0.10	0.18	0.17				MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01	<0.01				AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.10	0.12						mg/L
N-NO2 (Nitrite)	mg/L	0.10	<0.10	<0.10				MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.10	<0.10	<0.10				MAC	10.0	mg/L
pH			8.03	8.05				AO	6.5-8.5	
Phenols	mg/L	0.001	<0.001	<0.001						
Sulphate	mg/L	1	103	104				AO	500	mg/L
Tannin & Lignin	mg/L	0.1	<0.1	<0.1						mg/L
TDS (COND - CALC)	mg/L	5	1790	1740				AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.05	0.15	0.13						mg/L
Turbidity	NTU	0.1	2.5	4.5				AO	1.0	NTU
Hardness as CaCO3	mg/L	1	519	519				OG	100	mg/L
Ion Balance		0.01	0.92	0.93						mg/L
Calcium	mg/L	1	127	127						mg/L
Magnesium	mg/L	1	49	49						mg/L
Potassium	mg/L	1	7	7						mg/L
Sodium	mg/L	2	336	333				AO	20	mg/L
Iron	mg/L	0.03	0.65	0.64				AO	0.3	mg/L
Manganese	mg/L	0.01	0.06	0.06				AO	0.05	mg/L

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **Paterson Group**
1-28 Concourse Gate
Ottawa, Ont.
K1V 1T6
Attention: **Robert Passmore**

Report Number: 2512441
Date: 2005-07-04
Date Submitted: 2005-06-28

Project: PH0145

P.O. Number: PO# 2554
Matrix: Water

Chain of Custody Number: **29935**

		LAB ID:	395162	395163				**GUIDELINE**		
		Sample Date:	2005-06-28	2005-06-28				MOE REG. 170/03		
		Sample ID:	TW3, WS9	TW3, WS10						
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0	0				MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0	0				MAC	0	ct/100mL
Heterotrophic Plate Count	ct/1mL		0	1				MAC	500	ct/1mL
Faecal Coliforms	ct/100mL		0	0				MAC	0	ct/100mL
Faecal Streptococcus	ct/100mL		0	0						ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL:
Peter Haulena
Analytical Services Manager

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD **REPORT OF ANALYSIS**

Client: **Paterson Group**
1-28 Concourse Gate
Ottawa, Ont.
K1V 1T6
Attention: **Robert Passmore**

Report Number: 2511732
Date: 2005-06-24
Date Submitted: 2005-06-21

Project: PH0145

P.O. Number: PO# 2550
Matrix: Water

Chain of Custody Number: **29548**

		LAB ID:	393561	393562				**GUIDELINE**		
		Sample Date:	2005-06-21	2005-06-21				MOE REG. 170/03		
		Sample ID:	TW4, WS1	TW4, WS2						
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0	9				MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0	0				MAC	0	ct/100mL
Heterotrophic Plate Count	ct/1mL		0	2				MAC	500	ct/1mL
Faecal Coliforms	ct/100mL		0	0				MAC	0	ct/100mL
Faecal Streptococcus	ct/100mL		0	0						ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL:
Krista Quantrill
Microbiology Analyst

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **Paterson Group**
1-28 Concourse Gate
Ottawa, Ont.
K1V 1T6
Attention: **Robert Passmore**

Report Number: 2511735
Date: 2005-06-28
Date Submitted: 2005-06-21

Project: PH0145

P.O. Number: PO# 2550
Matrix: Water

Chain of Custody Number: **29548**

		LAB ID:	393567	393568				**GUIDELINE**		
		Sample Date:	2005-06-21	2005-06-21				MOE REG. 170/03		
		Sample ID:	TW4, WS1	TW4, WS2						
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Alkalinity as CaCO3	mg/L	5	271	220				OG	500	mg/L
Chloride	mg/L	1	193	177				AO	250	mg/L
Colour	TCU	2	2	<2				AO	5	TCU
Conductivity	uS/cm	5	1170	1030						TCU
Dissolved Organic Carbon	mg/L	0.5	1.2	1.1				AO	5	mg/L
Fluoride	mg/L	0.10	0.33	0.50				MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	0.17	0.15				AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.09	0.10						mg/L
N-NO2 (Nitrite)	mg/L	0.10	<0.10	<0.10				MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.10	<0.10	<0.10				MAC	10.0	mg/L
pH			7.60	7.80				AO	6.5-8.5	
Phenols	mg/L	0.001	<0.001	<0.001						
Sulphate	mg/L	1	72	45				AO	500	mg/L
Tannin & Lignin	mg/L	0.1	<0.1	<0.1						mg/L
TDS (COND - CALC)	mg/L	5	761	670				AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.05	0.21	0.21						mg/L
Turbidity	NTU	0.1	17.7	62.3				AO	1.0	NTU
Hardness as CaCO3	mg/L	1	532	354				OG	100	mg/L
Ion Balance		0.01	1.06	0.93						mg/L
Calcium	mg/L	1	142	71						mg/L
Magnesium	mg/L	1	43	43						mg/L
Potassium	mg/L	1	4	4						mg/L
Sodium	mg/L	2	56	56				AO	20	mg/L
Iron	mg/L	0.03	1.65	1.71				AO	0.3	mg/L
Manganese	mg/L	0.01	0.22	0.22				AO	0.05	mg/L

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

Results relate only to the parameters tested on the samples submitted for analysis.

Client: **Paterson Group**
1-28 Concourse Gate
Ottawa, Ont.
K1V 1T6
Attention: **Robert Passmore**

Report Number: 2511886
Date: 2005-06-27
Date Submitted: 2005-06-22

Project: PH0145

P.O. Number: PO# 2551
Matrix: Water

Chain of Custody Number: **28540**

		LAB ID:	393928	393929				**GUIDELINE**		
		Sample Date:	2005-06-22	2005-06-22				MOE REG. 170/03		
		Sample ID:	TW5, WS3	TW5, WS4						
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		24	7				MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0	0				MAC	0	ct/100mL
Heterotrophic Plate Count	ct/1mL		0	1				MAC	500	ct/1mL
Faecal Coliforms	ct/100mL		0	0				MAC	0	ct/100mL
Faecal Streptococcus	ct/100mL		0	0						ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: ____________
Tim McCooeye
QC Manager

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **Paterson Group**
1-28 Concourse Gate
Ottawa, Ont.
K1V 1T6
Attention: **Robert Passmore**

Report Number: 2511889
Date: 2005-06-29
Date Submitted: 2005-06-22

Project: PH0145

P.O. Number:
Matrix: Water

Chain of Custody Number: 28548

		LAB ID:	393937	393938				**GUIDELINE**		
		Sample Date:	2005-06-22	2005-06-22				MOE REG. 170/03		
		Sample ID:	TW5, WS3	TW5, WS4						
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Alkalinity as CaCO3	mg/L	5	307	307				OG	500	mg/L
Chloride	mg/L	1	191	194				AO	250	mg/L
Colour	TCU	2	2	<2				AO	5	TCU
Conductivity	uS/cm	5	1210	1210						TCU
Dissolved Organic Carbon	mg/L	0.5	0.5	1.4				AO	5	mg/L
Fluoride	mg/L	0.10	0.16	0.15				MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01	<0.01				AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.02	0.02						mg/L
N-NO2 (Nitrite)	mg/L	0.10	<0.10	<0.10				MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.10	<0.10	<0.10				MAC	10.0	mg/L
pH			7.76	7.77				AO	6.5-8.5	
Phenols	mg/L	0.001	<0.001	<0.001						
Sulphate	mg/L	1	65	63				AO	500	mg/L
Tannin & Lignin	mg/L	0.1	<0.1	<0.1						mg/L
TDS (COND - CALC)	mg/L	5	787	787				AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.05	0.33	0.28						mg/L
Turbidity	NTU	0.1	27.6	28.5				AO	1.0	NTU
Hardness as CaCO3	mg/L	1	603	598				OG	100	mg/L
Ion Balance		0.01	1.07	1.06						mg/L
Calcium	mg/L	1	164	162						mg/L
Magnesium	mg/L	1	47	47						mg/L
Potassium	mg/L	1	2	2						mg/L
Sodium	mg/L	2	40	39				AO	20	mg/L
Iron	mg/L	0.03	2.31	2.46				AO	0.3	mg/L
Manganese	mg/L	0.01	0.35	0.35				AO	0.05	mg/L

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **Paterson Group**
1-28 Concourse Gate
Ottawa, Ont.
K1V 1T6
Attention: **Robert Passmore**

Report Number: 2517679
Date: 2005-09-06
Date Submitted: 2005-09-02

Project: PH0145

P.O. Number: PO# 2587
Matrix: Water

Chain of Custody Number: **23283**

		LAB ID:	409025	409026	409027	409028		**GUIDELINE**		
		Sample Date:	2005-09-02	2005-09-02	2005-09-02	2005-09-02		MOE REG. 170/03		
		Sample ID:	TW1, WS R1	TW2, WS R1	TW4, WS R1	TW5, WS R1				
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		1	82	7	0		MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0	0	0	0		MAC	0	ct/100mL
Heterotrophic Plate Count	ct/1mL		1	3	3	0		MAC	500	ct/1mL
Faecal Coliforms	ct/100mL		0	0	0	0		MAC	0	ct/100mL
Faecal Streptococcus	ct/100mL		0	0	0	0				

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: ____________________
Peter Haulena
Analytical Services Manager

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD **REPORT OF ANALYSIS**

Client: **Paterson Group**
1-28 Concourse Gate
Ottawa, Ont.
K1V 1T6
Attention: **Robert Passmore**

Report Number: 2518550
Date: 2005-09-16
Date Submitted: 2005-09-14

Project: PH0145

P.O. Number: PO# 2591
Matrix: Water

Chain of Custody Number: **21891**

		LAB ID:	411404	411405	411406			**GUIDELINE**		
		Sample Date:	2005-09-14	2005-09-14	2005-09-14			MOE REG. 170/03		
		Sample ID:	TW4 W5R2	TW2 W5R2	TW1 W5R2					
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0	0	0			MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0	0	0			MAC	0	ct/100mL
Heterotrophic Plate Count	ct/1mL		4	0	36			MAC	500	ct/1mL
Faecal Coliforms	ct/100mL		0	0	0			MAC	0	ct/100mL
Faecal Streptococcus	ct/100mL		0	0	0					

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL: ____________
Krista Quantrill
Microbiology Analyst

APPENDIX 4

AQUIFER ANALYSIS DATA

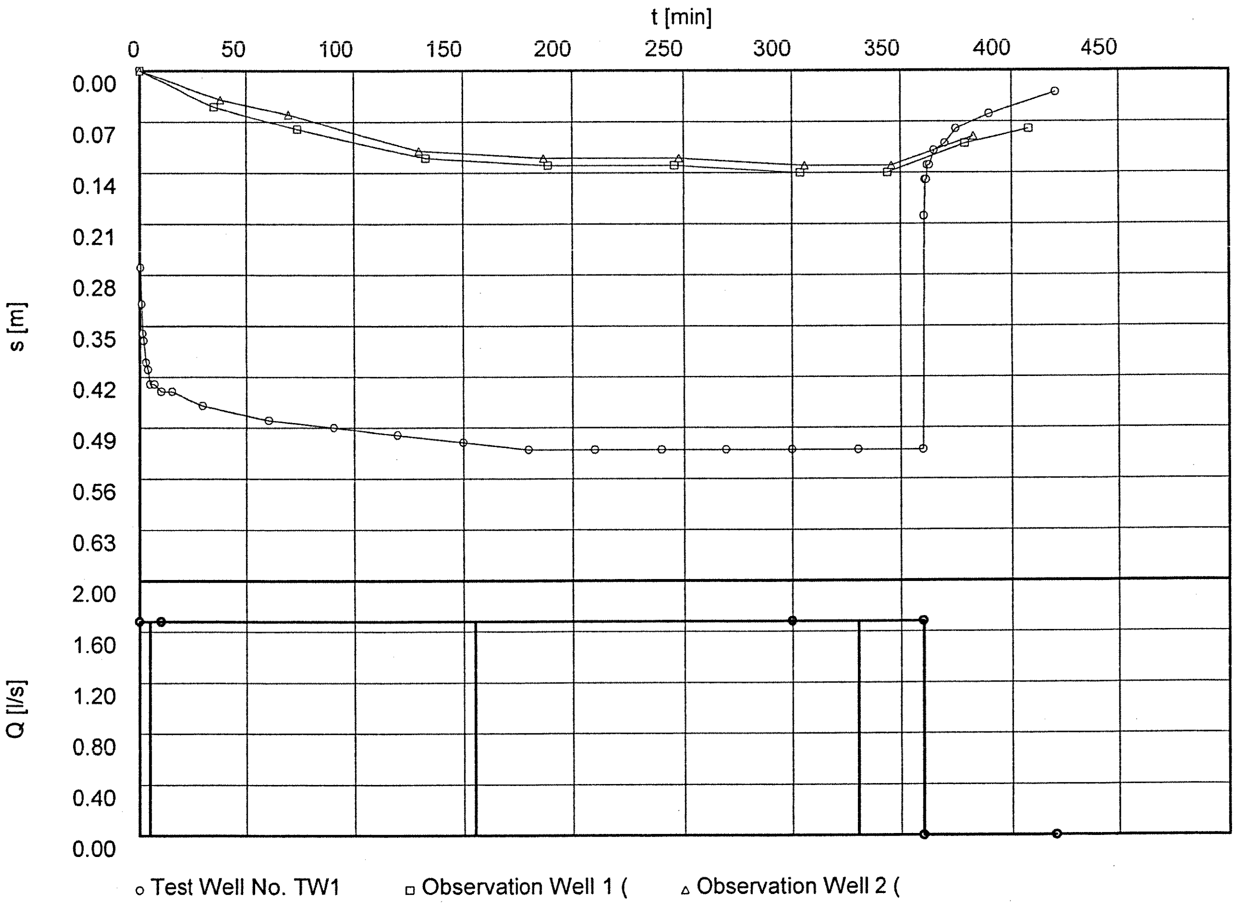
1. Pump Test Data & Aquifer Analysis Curves for Test Wells
2. Cumulative Drawdown Curve for Potential Well Interference
3. Environment Canada Hourly Data Reports for June 21 to June 23, 2005

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot
with discharge

Date: 25.07.2005	none, Page 1
Project: Sunset Lakes	
Evaluated by: RAP	

Pumping Test No. 1	Test conducted on: June 23, 2005
TW1	
Discharge 1.44 l/s	



Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot
with discharge

Date: 25.07.2005
none, Page 2
Project: Sunset Lakes
Evaluated by: RAP

Pumping Test No. 1
Test conducted on: June 23, 2005

TW1
Test Well No. TW1

Discharge 1.44 l/s
Distance from the pumping well 0.100 m

Static water level: 1.650 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.650	0.000	
2	0.50	1.920	0.270	
3	1.00	1.970	0.320	
4	1.50	2.010	0.360	
5	2.00	2.020	0.370	
6	3.00	2.050	0.400	
7	4.00	2.060	0.410	
8	5.00	2.080	0.430	
9	7.00	2.080	0.430	
10	10.00	2.090	0.440	
11	15.00	2.090	0.440	
12	30.00	2.110	0.460	
13	60.00	2.130	0.480	
14	90.00	2.140	0.490	
15	120.00	2.150	0.500	
16	150.00	2.160	0.510	
17	180.00	2.170	0.520	
18	210.00	2.170	0.520	
19	240.00	2.170	0.520	
20	270.00	2.170	0.520	
21	300.00	2.170	0.520	
22	330.00	2.170	0.520	
23	360.00	2.170	0.520	
24	360.50	1.850	0.200	
25	361.00	1.800	0.150	
26	361.50	1.800	0.150	
27	362.00	1.780	0.130	
28	363.00	1.780	0.130	
29	365.00	1.760	0.110	
30	370.00	1.750	0.100	
31	375.00	1.730	0.080	
32	390.00	1.710	0.060	
33	420.00	1.680	0.030	

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot
with discharge

Date: 25.07.2005

none, Page 3

Project: Sunset Lakes

Evaluated by: RAP

Pumping Test No. 1

Test conducted on: June 23, 2005

TW1

Constant rate pump test

Discharge 1.44 l/s

	Pumping test duration [min]	Discharge [l/s]		
1	0.00	1.68		
2	10.00	1.68		
3	300.00	1.68		
4	360.00	1.68		
5	360.10	0.00		
6	420.00	0.00		

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot
with discharge

Date: 25.07.2005

Project: Sunset Lakes
Evaluated by: RAP

Pumping Test No. 1
Test conducted on: June 23, 2005
TW1
Observation Well 1 (TW2)
Discharge 1.44 l/s
Distance from the pumping well 100.000 m

Static water level: 1.650 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.650	0.000	
2	35.00	1.700	0.050	
3	73.00	1.730	0.080	
4	133.00	1.770	0.120	
5	189.00	1.780	0.130	
6	246.00	1.780	0.130	
7	304.00	1.790	0.140	
8	344.00	1.790	0.140	
9	379.00	1.750	0.100	
10	408.00	1.730	0.080	

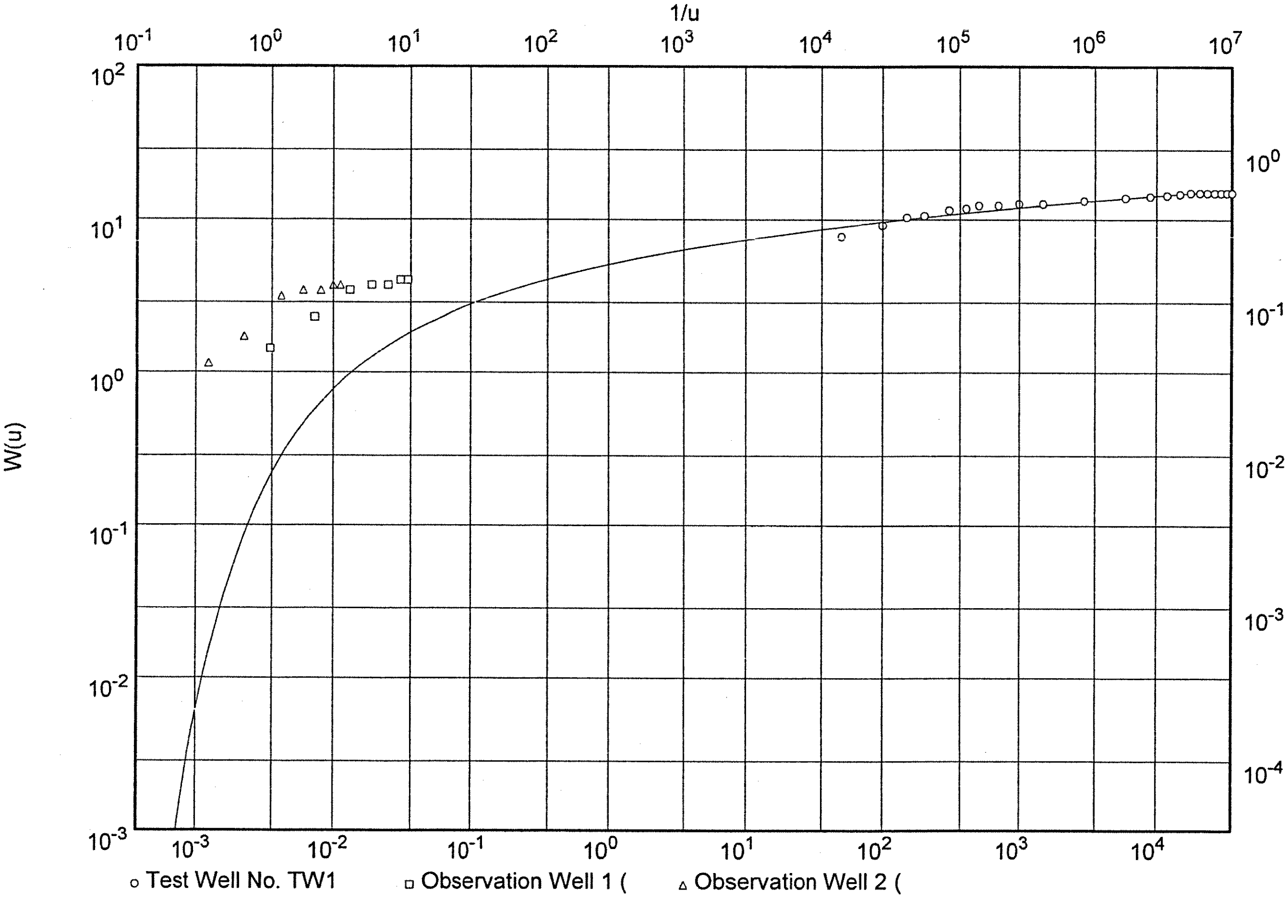
Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot with discharge	Date: 25.07.2005	none, Page 5
		Project: Sunset Lakes	
		Evaluated by: RAP	

Pumping Test No. 1	Test conducted on: June 23, 2005
TW1	Observation Well 2 (TW3)
Discharge 1.44 l/s	Distance from the pumping well 175.000 m
Static water level: 0.360 m below datum	

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	0.360	0.000	
2	38.00	0.400	0.040	
3	69.00	0.420	0.060	
4	130.00	0.470	0.110	
5	187.00	0.480	0.120	
6	248.00	0.480	0.120	
7	306.00	0.490	0.130	
8	346.00	0.490	0.130	
9	383.00	0.450	0.090	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Theis analysis method Confined aquifer	Date: 25.07.2005	none, Page 6
		Project: Sunset Lakes	
		Evaluated by: RAP	

Pumping Test No. 1	Test conducted on: June 23, 2005
TW1	
Discharge 1.44 l/s	

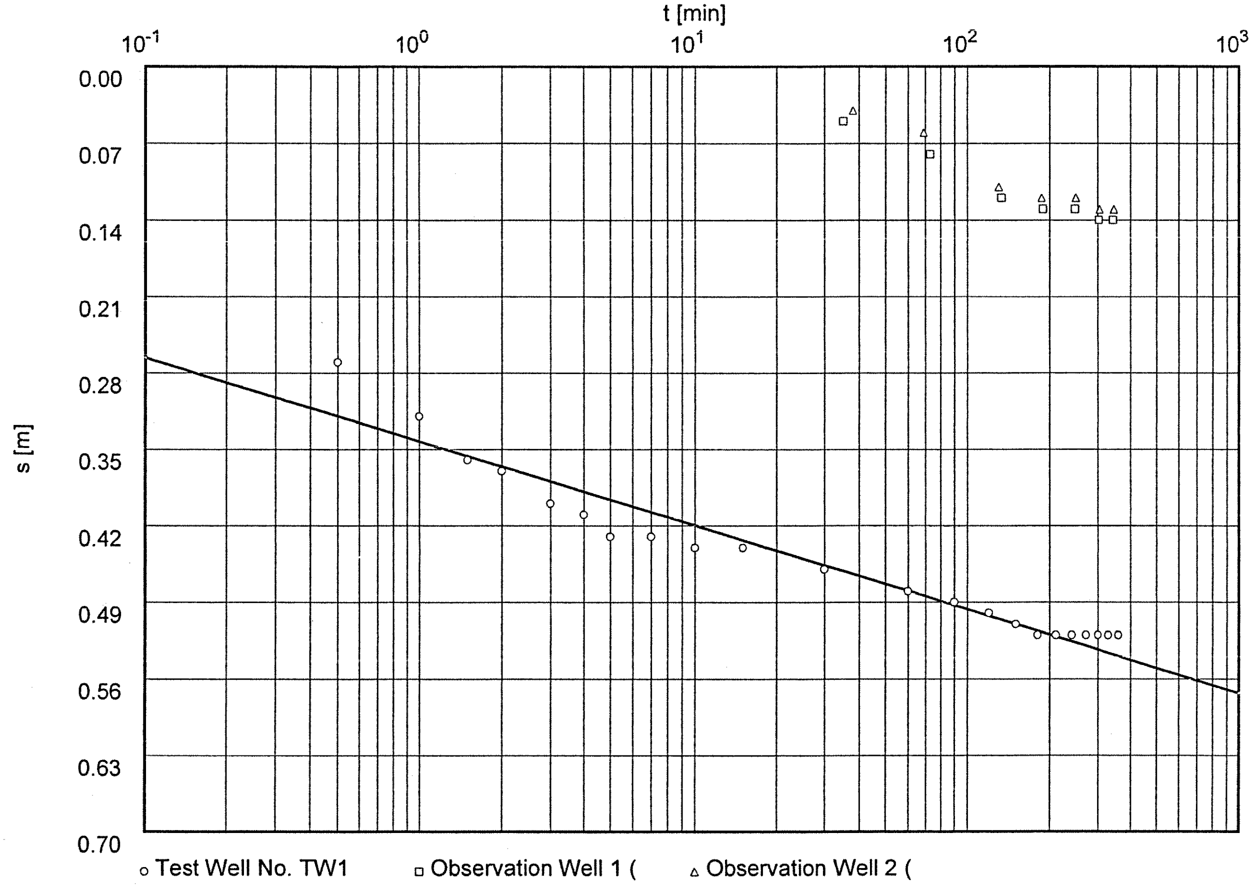


Transmissivity [m²/min]: 1.96×10^{-1}

Storativity: 2.82×10^{-3}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Date: 25.07.2005	none, Page 7
		Project: Sunset Lakes	
		Evaluated by: RAP	

Pumping Test No. 1	Test conducted on: June 23, 2005
TW1	
Discharge 1.44 l/s	

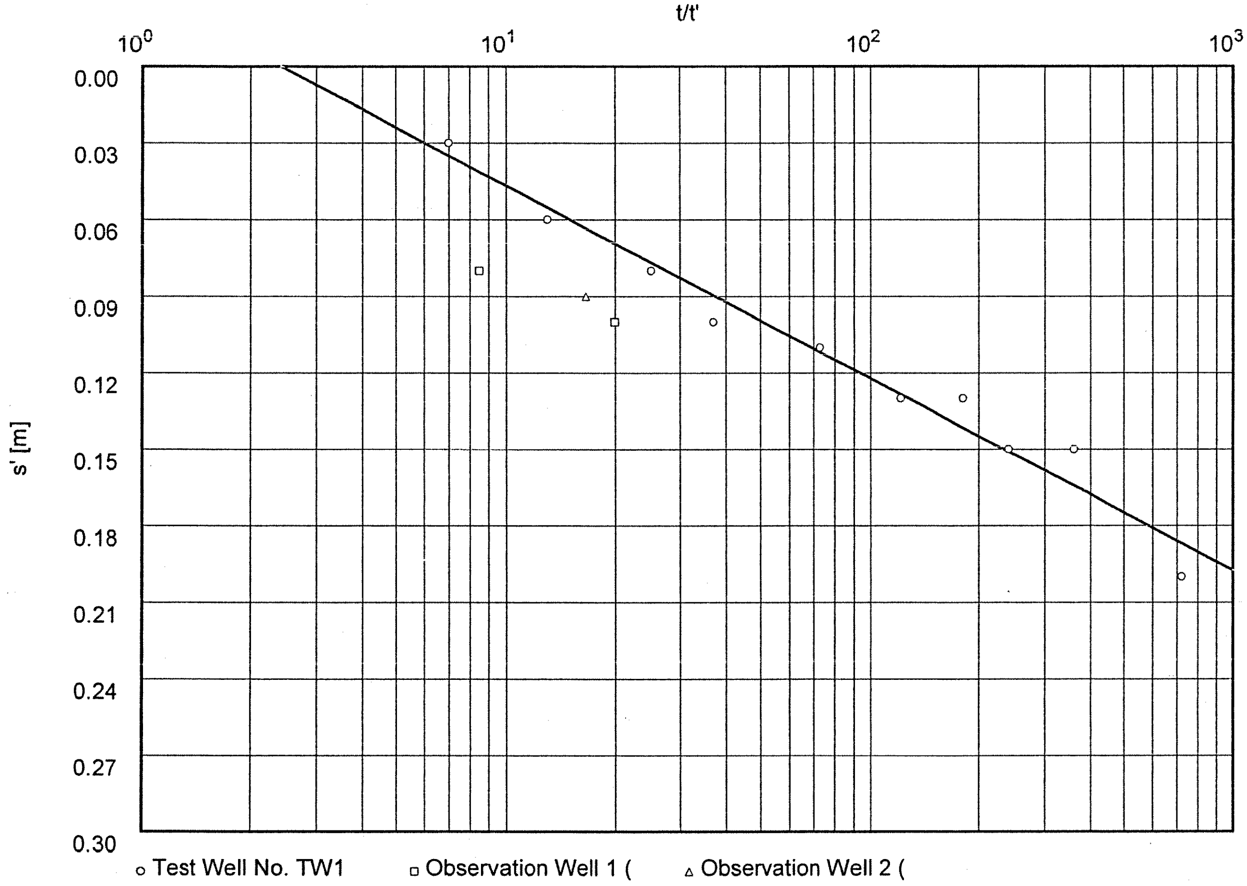


Transmissivity [m²/min]: 2.05×10^{-1}

Storativity: 1.61×10^{-3}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Date: 25.07.2005	none, Page 8
		Project: Sunset Lakes	
		Evaluated by: RAP	

Pumping Test No. 1	Test conducted on: June 23, 2005
TW1	
Discharge 1.44 l/s	
	Pumping test duration: 360.00 min



Transmissivity [m²/min]: 2.09×10^{-1}

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot
with discharge

Date: 25.07.2005
none, Page 9

Project: Sunset Lakes

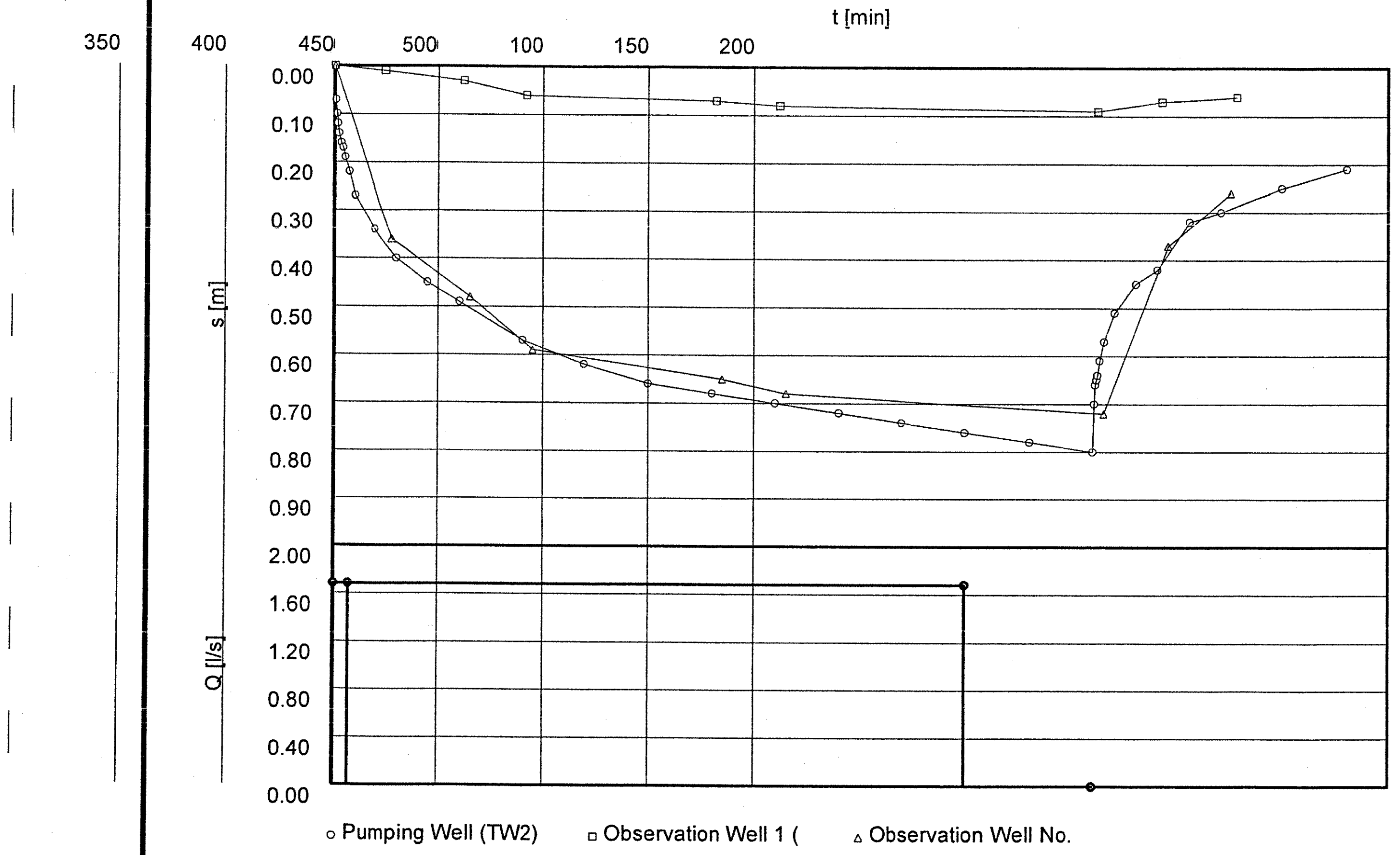
Evaluated by: RAP

Pumping Test No. 2

Test conducted on: June 27, 2005

TW2

Discharge 1.40 l/s



Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot
with discharge

Date: 25.07.2005
none, Page 10
Project: Sunset Lakes
Evaluated by: RAP

Pumping Test No. 2
Test conducted on: June 27, 2005
TW2
Constant Rate Pump Test
Discharge 1.40 l/s

	Pumping test duration [min]	Discharge [l/s]		
1	0.00	1.68		
2	7.00	1.68		
3	300.00	1.68		
4	360.00	0.00		

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot
with discharge

Date: 25.07.2005
none, Page 11
Project: Sunset Lakes
Evaluated by: RAP

Pumping Test No. 2
Test conducted on: June 27, 2005
TW2
Pumping Well (TW2)
Discharge 1.40 l/s
Distance from the pumping well 0.100 m

Static water level: 1.980 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]
1	0.00	1.980	0.000
2	0.50	2.050	0.070
3	1.00	2.080	0.100
4	1.50	2.100	0.120
5	2.00	2.120	0.140
6	3.00	2.140	0.160
7	4.00	2.150	0.170
8	5.00	2.170	0.190
9	7.00	2.200	0.220
10	10.00	2.250	0.270
11	20.00	2.320	0.340
12	30.00	2.380	0.400
13	45.00	2.430	0.450
14	60.00	2.470	0.490
15	90.00	2.550	0.570
16	120.00	2.600	0.620
17	150.00	2.640	0.660
18	180.00	2.660	0.680
19	210.00	2.680	0.700
20	240.00	2.700	0.720
21	270.00	2.720	0.740
22	300.00	2.740	0.760
23	330.00	2.760	0.780
24	360.00	2.780	0.800
25	360.50	2.680	0.700
26	361.00	2.640	0.660
27	361.50	2.630	0.650
28	362.00	2.620	0.640
29	363.00	2.590	0.610
30	365.00	2.550	0.570
31	370.00	2.490	0.510
32	380.00	2.430	0.450
33	390.00	2.400	0.420
34	405.00	2.300	0.320
35	420.00	2.280	0.300
36	450.00	2.230	0.250
37	480.00	2.190	0.210

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot with discharge	Date: 25.07.2005 none, Page 12 Project: Sunset Lakes Evaluated by: RAP

Pumping Test No. 2	Test conducted on: June 27, 2005
TW2	Observation Well 1 (TW1)
Discharge 1.40 l/s	Distance from the pumping well 100.000 m

Static water level: 1.810 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.810	0.000	
2	25.00	1.820	0.010	
3	62.00	1.840	0.030	
4	92.00	1.870	0.060	
5	182.00	1.880	0.070	
6	212.00	1.890	0.080	
7	362.00	1.900	0.090	
8	392.00	1.880	0.070	
9	428.00	1.870	0.060	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot with discharge	Date: 25.07.2005	none, Page 13
		Project: Sunset Lakes	
		Evaluated by: RAP	

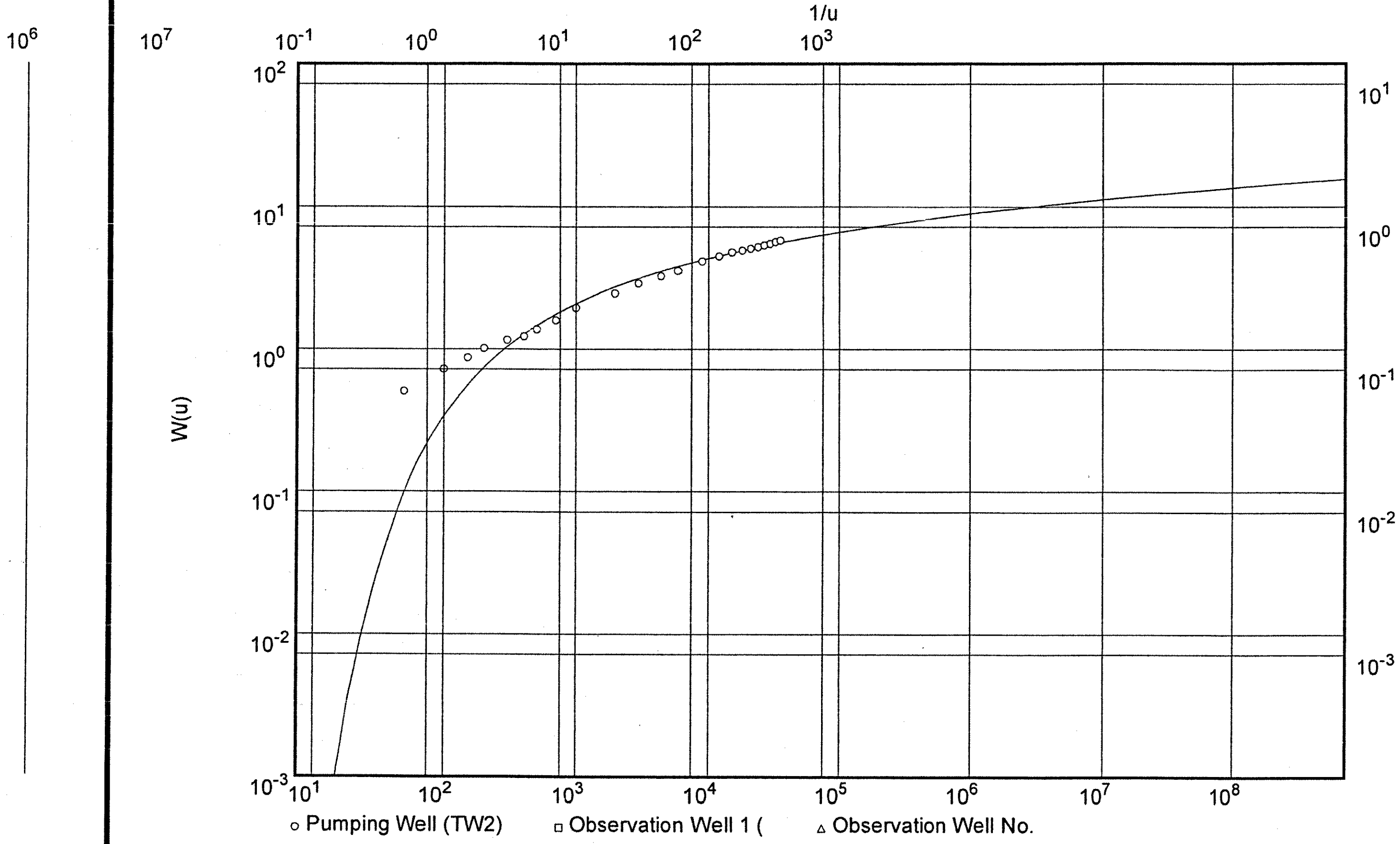
Pumping Test No. 2	Test conducted on: June 27, 2005
TW2	Observation Well No. 2 (TW3)
Discharge 1.40 l/s	Distance from the pumping well 50.000 m

Static water level: 0.690 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	0.690	0.000	
2	28.00	1.050	0.360	
3	65.00	1.170	0.480	
4	95.00	1.280	0.590	
5	185.00	1.340	0.650	
6	215.00	1.370	0.680	
7	365.00	1.410	0.720	
8	395.00	1.060	0.370	
9	425.00	0.950	0.260	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Theis analysis method Confined aquifer	Date: 25.07.2005	none, Page 15
		Project: Sunset Lakes	
		Evaluated by: RAP	

Pumping Test No. 2	Test conducted on: June 27, 2005
TW2	
Discharge 1.40 l/s	

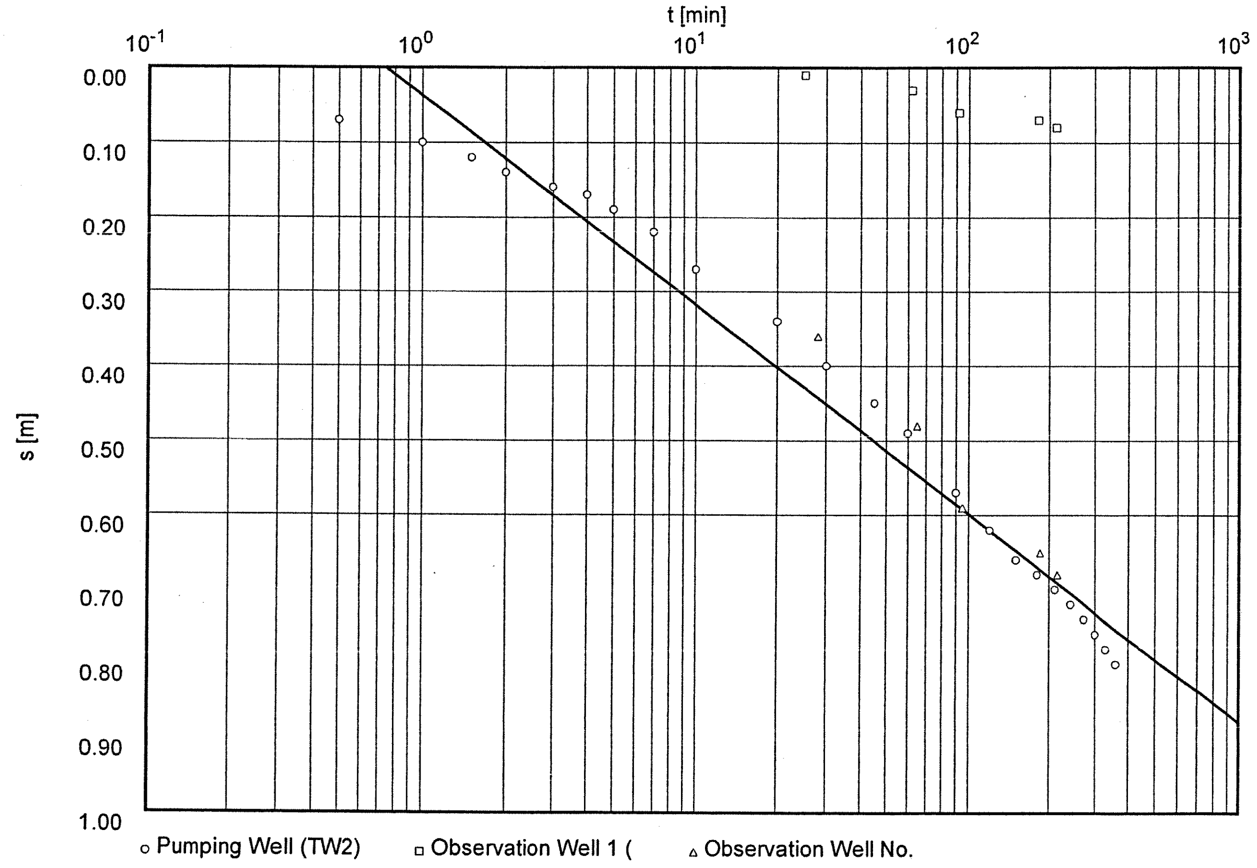


Transmissivity [m²/min]: 4.83×10^{-2}

Storativity: 1.45×10^{1}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Date: 25.07.2005	none, Page 16
		Project: Sunset Lakes	
		Evaluated by: RAP	

Pumping Test No. 2	Test conducted on: June 27, 2005
TW2	
Discharge 1.40 l/s	



Transmissivity [m²/min]: 5.47×10^{-2}

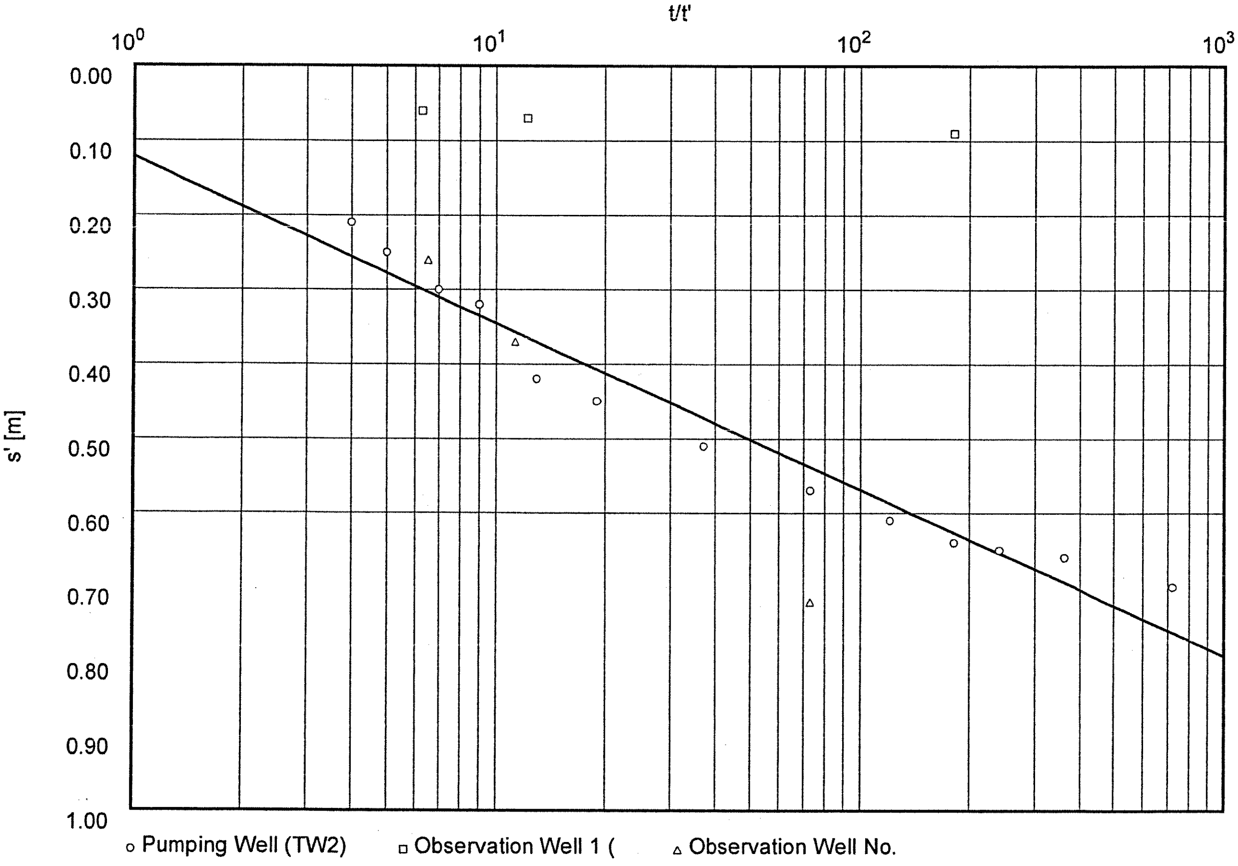
Storativity: 9.11×10^{0}

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Recovery method after
THEIS & JACOB
Confined aquifer

Date: 25.07.2005
none, Page 17
Project: Sunset Lakes
Evaluated by: RAP

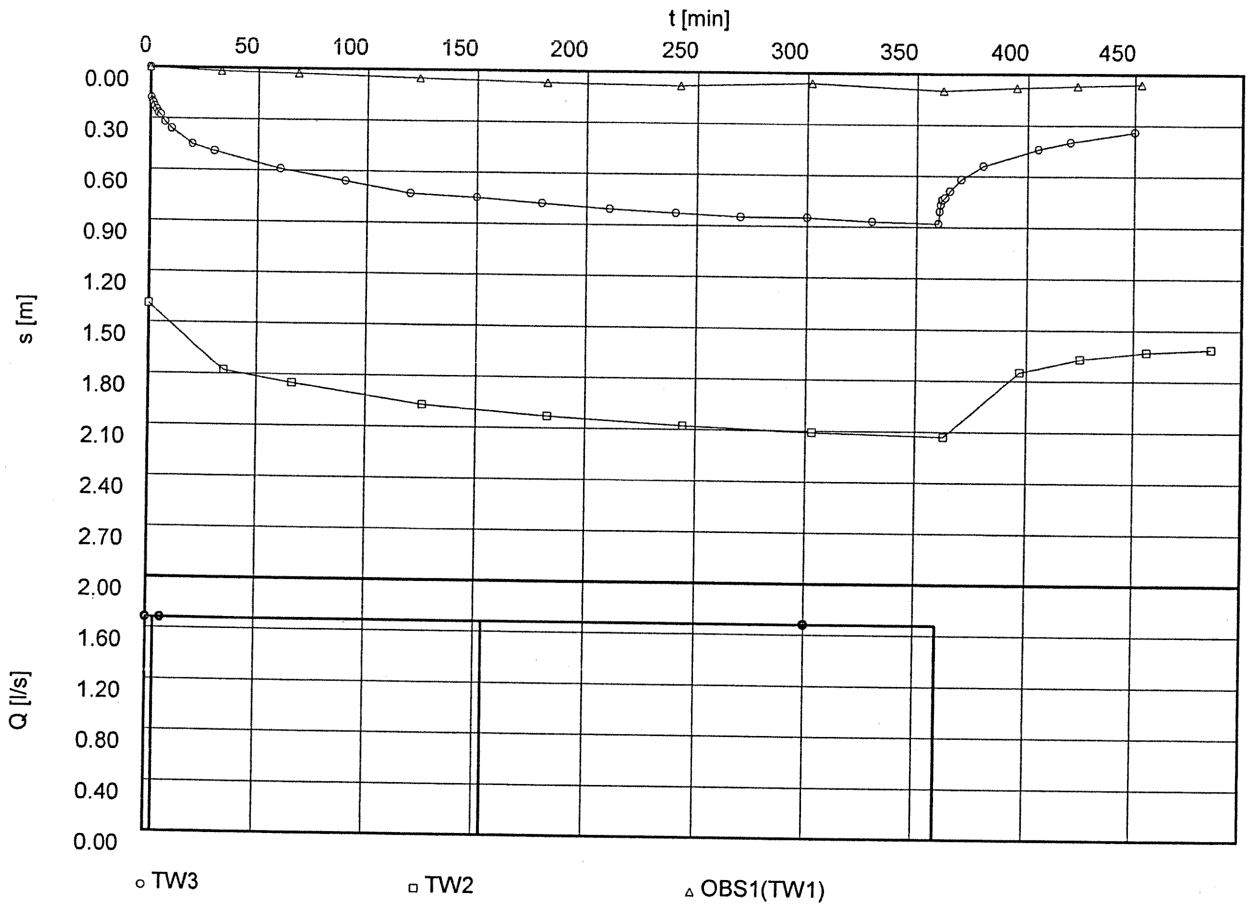
Pumping Test No. 2
Test conducted on: June 27, 2005
TW2
Discharge 1.40 l/s
Pumping test duration: 360.00 min



Transmissivity [m²/min]: 6.87 x 10^{-2}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot with discharge	Date: 27.07.2005	none, Page 18
		Project: Sunset Lakes	
		Evaluated by: RAp	

Pumping Test No. 3	Test conducted on: June 28, 2005
TW 3	
Discharge 1.68 l/s	



Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot with discharge	Date: 27.07.2005 none, Page 19 Project: Sunset Lakes Evaluated by: RAp

Pumping Test No. 3	Test conducted on: June 28, 2005
TW 3	TW3
Discharge 1.68 l/s	Distance from the pumping well 0.100 m

Static water level: 0.700 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	0.700	0.000	
2	0.50	0.880	0.180	
3	1.00	0.900	0.200	
4	1.50	0.910	0.210	
5	2.00	0.930	0.230	
6	3.00	0.950	0.250	
7	4.00	0.970	0.270	
8	5.00	0.980	0.280	
9	7.00	1.020	0.320	
10	10.00	1.060	0.360	
11	20.00	1.150	0.450	
12	30.00	1.190	0.490	
13	60.00	1.290	0.590	
14	90.00	1.360	0.660	
15	120.00	1.430	0.730	
16	150.00	1.450	0.750	
17	180.00	1.480	0.780	
18	210.00	1.510	0.810	
19	240.00	1.530	0.830	
20	270.00	1.550	0.850	
21	300.00	1.550	0.850	
22	330.00	1.570	0.870	
23	360.00	1.580	0.880	
24	360.50	1.510	0.810	
25	361.00	1.470	0.770	
26	361.50	1.440	0.740	
27	362.00	1.440	0.740	
28	363.00	1.430	0.730	
29	365.00	1.390	0.690	
30	370.00	1.320	0.620	
31	380.00	1.240	0.540	
32	405.00	1.140	0.440	
33	420.00	1.100	0.400	
34	450.00	1.040	0.340	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot with discharge	Date: 27.07.2005	none, Page 20
		Project: Sunset Lakes	
		Evaluated by: RAp	

Pumping Test No. 3	Test conducted on: June 28, 2005
TW 3	Constant rate test
Discharge 1.68 l/s	

	Pumping test duration [min]	Discharge [l/s]		
1	0.00	1.68		
2	7.00	1.68		
3	300.00	1.68		

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot with discharge	Date: 27.07.2005	none, Page 21
		Project: Sunset Lakes	
		Evaluated by: RAp	

Pumping Test No. 3	Test conducted on: June 28, 2005
TW 3	TW2
Discharge 1.68 l/s	Distance from the pumping well 0.100 m

Static water level: 0.700 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	2.090	1.390	
2	35.00	2.480	1.780	
3	66.00	2.550	1.850	
4	126.00	2.670	1.970	
5	183.00	2.730	2.030	
6	244.00	2.780	2.080	
7	303.00	2.810	2.110	
8	363.00	2.830	2.130	
9	397.00	2.450	1.750	
10	425.00	2.370	1.670	
11	456.00	2.330	1.630	
12	485.00	2.310	1.610	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot with discharge	Date: 27.07.2005	none, Page 22
		Project: Sunset Lakes	
		Evaluated by: RAp	

Pumping Test No. 3	Test conducted on: June 28, 2005
TW 3	OBS1(TW1)
Discharge 1.68 l/s	Distance from the pumping well 3.500 m
Static water level: 1.860 m below datum	

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.860	0.000	
2	33.00	1.880	0.020	
3	68.00	1.890	0.030	
4	124.00	1.910	0.050	
5	182.00	1.930	0.070	
6	242.00	1.940	0.080	
7	302.00	1.920	0.060	
8	362.00	1.960	0.100	
9	395.00	1.940	0.080	
10	423.00	1.930	0.070	
11	453.00	1.920	0.060	

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

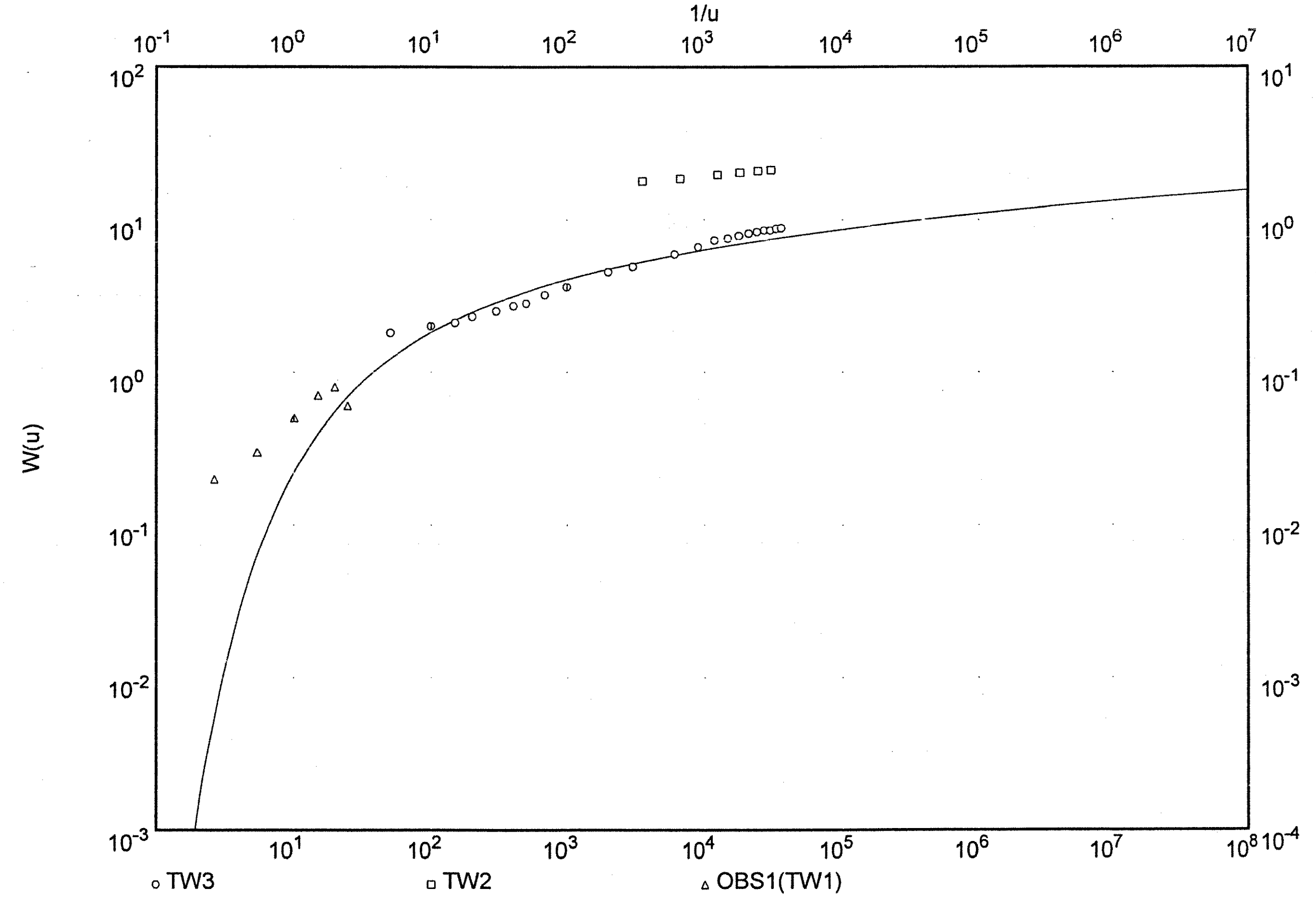
Pumping test analysis
Theis analysis method
Confined aquifer

Date: 27.07.2005
none, Page 23
Project: Sunset Lakes
Evaluated by: RAp

Pumping Test No. 3
Test conducted on: June 28, 2005

TW 3

Discharge 1.68 l/s



Transmissivity [m²/min]: 8.02×10^{-2}

Storativity: 3.20×10^{0}

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown-method after
COOPER & JACOB
Confined aquifer

Date: 27.07.2005

none, Page 24

Project: Sunset Lakes

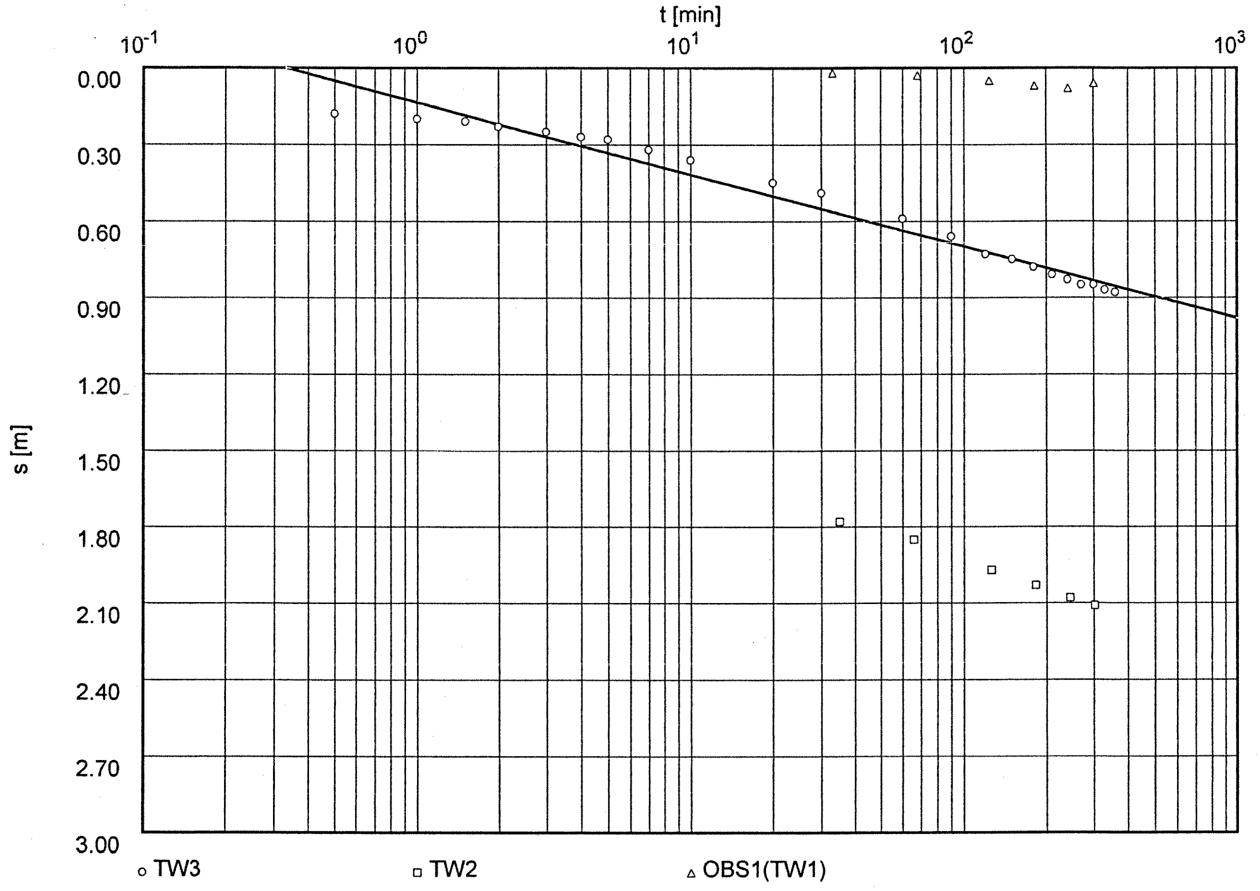
Evaluated by: RAp

Pumping Test No. 3

Test conducted on: June 28, 2005

TW 3

Discharge 1.68 l/s



Transmissivity [m²/min]: 6.55×10^{-2}

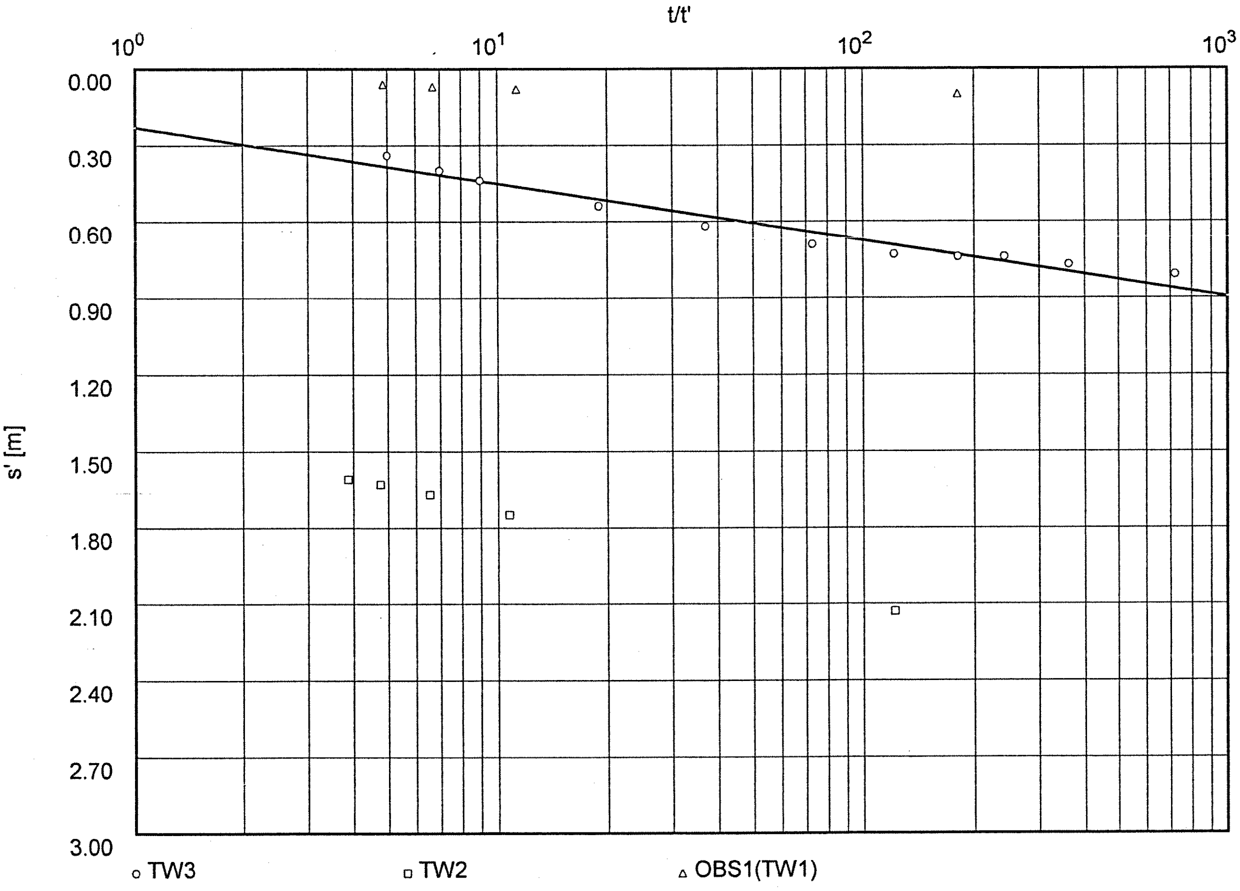
Storativity: 4.88×10^{0}

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Recovery method after
THEIS & JACOB
Confined aquifer

Date: 27.07.2005
none, Page 25
Project: Sunset Lakes
Evaluated by: RAp

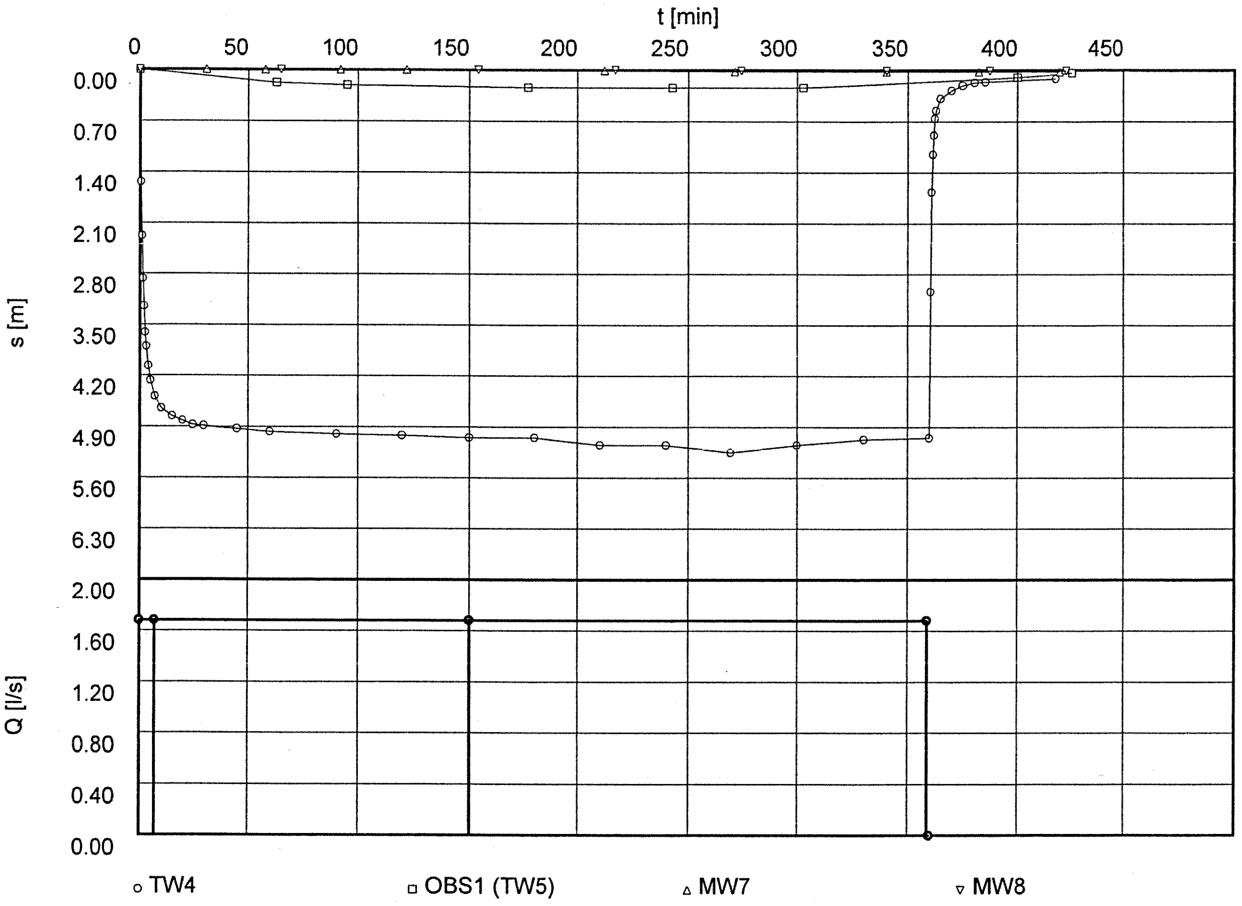
Pumping Test No. 3
Test conducted on: June 28, 2005
TW 3
Discharge 1.68 l/s
Pumping test duration: 360.00 min



Transmissivity [m²/min]: 8.30 x 10^{-2}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot with discharge	Date: 09.08.2005	none, Page 26
		Project: Sunset Lakes	
		Evaluated by: RAP	

Pumping Test No. 1	Test conducted on: June 21, 2005
TW4	
Discharge 1.68 l/s	



Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot with discharge	Date: 09.08.2005	none, Page 27
		Project: Sunset Lakes	
		Evaluated by: RAP	

Pumping Test No. 1	Test conducted on: June 21, 2005
TW4	Constant Rate Test
Discharge 1.68 l/s	

	Pumping test duration [min]	Discharge [l/s]		
1	0.00	1.68		
2	7.00	1.68		
3	150.00	1.68		
4	359.00	1.68		
5	360.00	0.00		

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot
with discharge

Date: 09.08.2005
none, Page 28
Project: Sunset Lakes
Evaluated by: RAP

Pumping Test No. 1
Test conducted on: June 21, 2005
TW4
TW4
Discharge 1.68 l/s
Distance from the pumping well 0.100 m

Static water level: 1.200 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.200	0.000	
2	0.50	2.740	1.540	
3	1.00	3.480	2.280	
4	1.50	4.070	2.870	
5	2.00	4.450	3.250	
6	2.50	4.810	3.610	
7	3.00	5.000	3.800	
8	4.00	5.270	4.070	
9	5.00	5.470	4.270	
10	7.00	5.690	4.490	
11	10.00	5.850	4.650	
12	15.00	5.960	4.760	
13	20.00	6.020	4.820	
14	25.00	6.080	4.880	
15	30.00	6.090	4.890	
16	45.00	6.130	4.930	
17	60.00	6.170	4.970	
18	90.00	6.200	5.000	
19	120.00	6.220	5.020	
20	150.00	6.250	5.050	
21	180.00	6.250	5.050	
22	210.00	6.350	5.150	
23	240.00	6.350	5.150	
24	270.00	6.450	5.250	
25	300.00	6.350	5.150	
26	330.00	6.270	5.070	
27	360.00	6.250	5.050	
28	360.50	4.240	3.040	
29	361.00	2.870	1.670	
30	361.50	2.350	1.150	
31	362.00	2.090	0.890	
32	362.50	1.860	0.660	
33	363.00	1.750	0.550	
34	365.00	1.590	0.390	
35	370.00	1.480	0.280	
36	375.00	1.410	0.210	
37	380.00	1.370	0.170	
38	385.00	1.360	0.160	
39	417.00	1.320	0.120	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot with discharge	Date: 09.08.2005	none, Page 29
		Project: Sunset Lakes	
		Evaluated by: RAP	

Pumping Test No. 1	Test conducted on: June 21, 2005
TW4	OBS1 (TW5)
Discharge 1.68 l/s	Distance from the pumping well 273.000 m

Static water level: 0.750 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	0.750	0.000	
2	63.00	0.930	0.180	
3	95.00	0.960	0.210	
4	177.00	0.990	0.240	
5	243.00	0.990	0.240	
6	303.00	0.990	0.240	
7	400.00	0.850	0.100	
8	425.00	0.790	0.040	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot with discharge	Date: 09.08.2005	none, Page 30
		Project: Sunset Lakes	
		Evaluated by: RAP	

Pumping Test No. 1	Test conducted on: June 21, 2005
TW4	MW7
Discharge 1.68 l/s	Distance from the pumping well 140.000 m

Static water level: 0.720 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	0.720	0.000	
2	31.00	0.720	0.000	
3	58.00	0.720	0.000	
4	92.00	0.720	0.000	
5	122.00	0.720	0.000	
6	212.00	0.730	0.010	
7	272.00	0.740	0.020	
8	340.00	0.740	0.020	
9	382.00	0.740	0.020	
10	419.00	0.740	0.020	

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot
with discharge

Date: 09.08.2005
none, Page 31
Project: Sunset Lakes
Evaluated by: RAP

Pumping Test No. 1
Test conducted on: June 21, 2005
TW4
MW8
Discharge 1.68 l/s
Distance from the pumping well 100.000 m
Static water level: 0.140 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	0.140	0.000	
2	65.00	0.140	0.000	
3	154.00	0.140	0.000	
4	217.00	0.140	0.000	
5	275.00	0.150	0.010	
6	340.00	0.150	0.010	
7	387.00	0.150	0.010	
8	422.00	0.150	0.010	

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

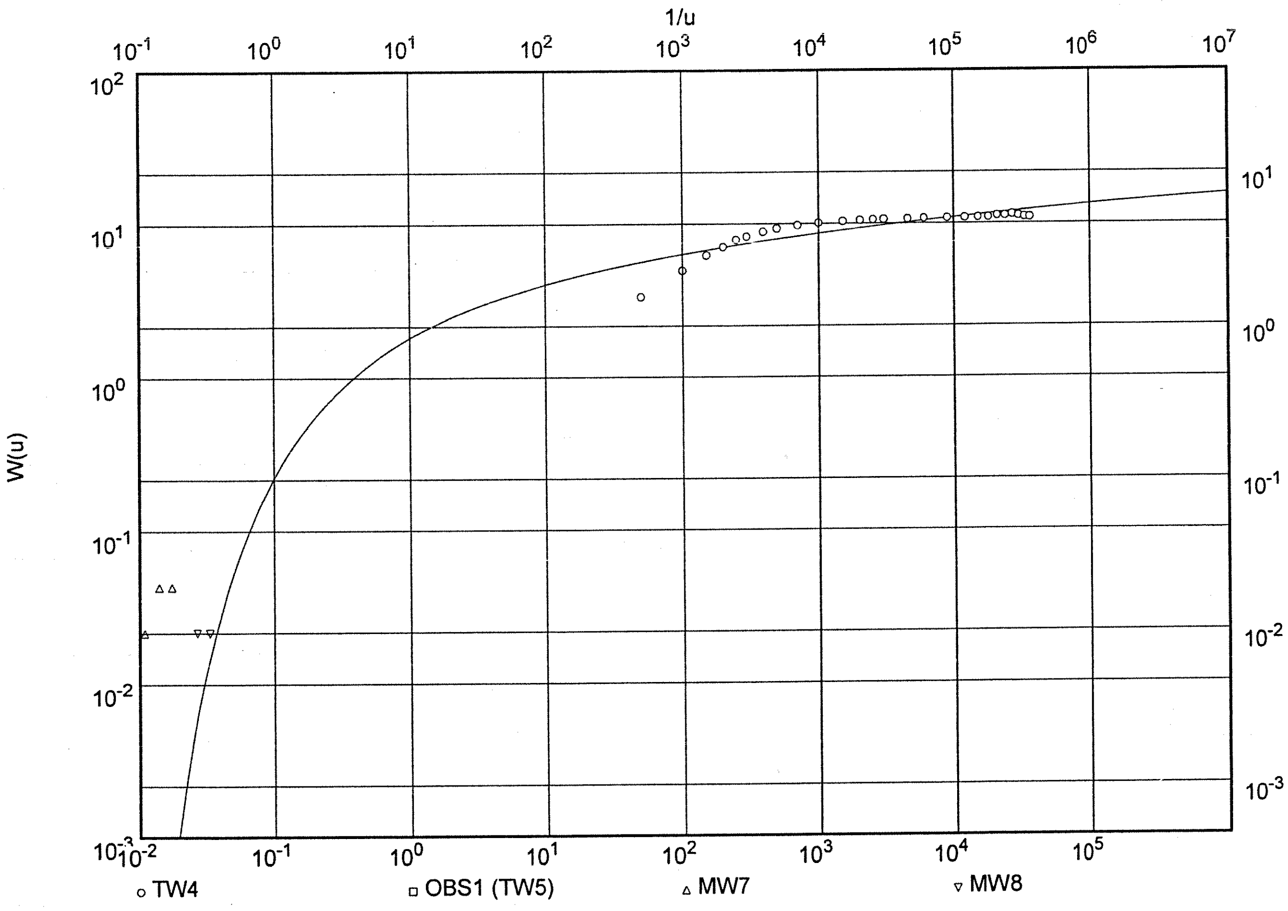
Pumping test analysis
Theis analysis method
Confined aquifer

Date: 09.08.2005
none, Page 31
Project: Sunset Lakes
Evaluated by: RAP

Pumping Test No. 1
Test conducted on: June 21, 2005

TW4

Discharge 1.68 l/s

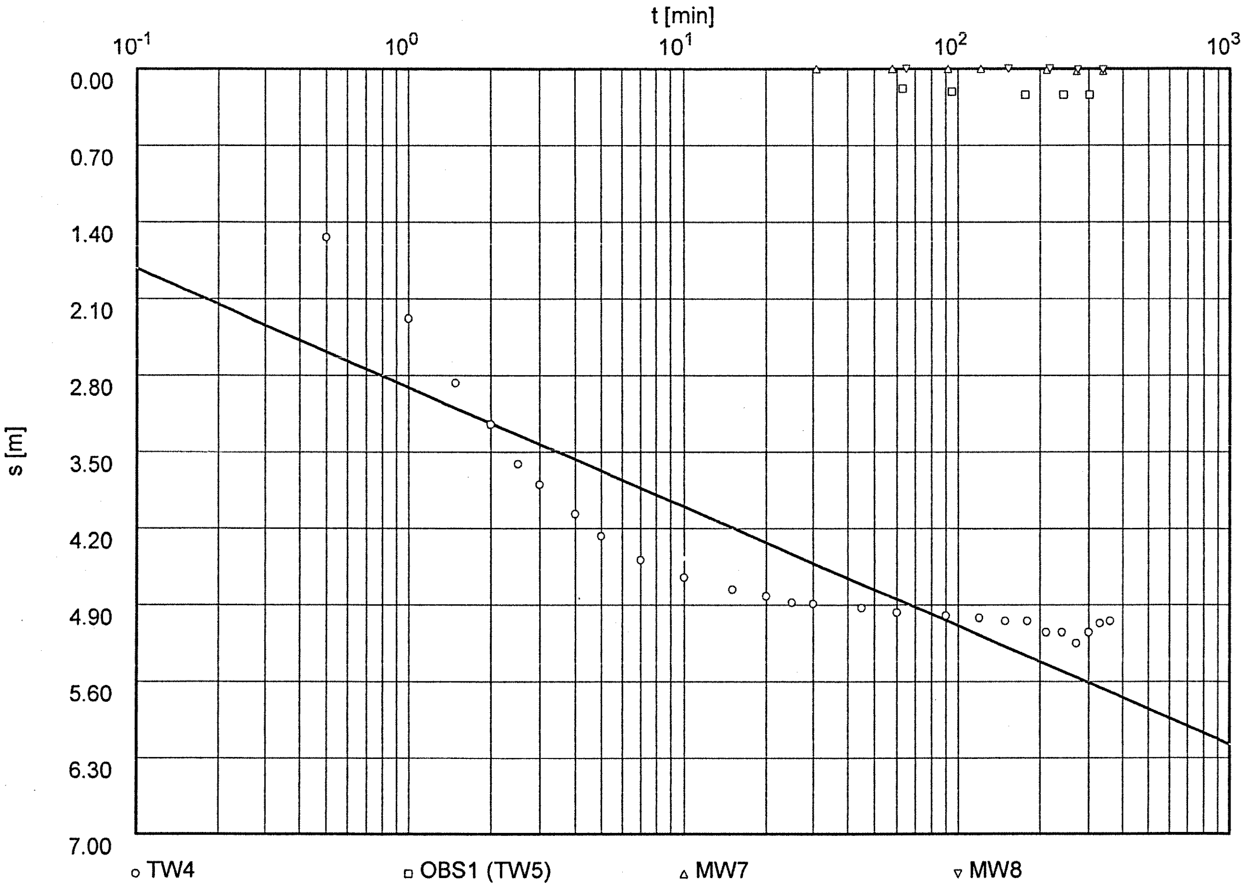


Transmissivity [m²/min]: 1.73×10^{-2}

Storativity: 6.86×10^{-3}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Date: 09.08.2005	none, Page 32
		Project: Sunset Lakes	
		Evaluated by: RAP	

Pumping Test No. 1	Test conducted on: June 21, 2005
TW4	
Discharge 1.68 l/s	

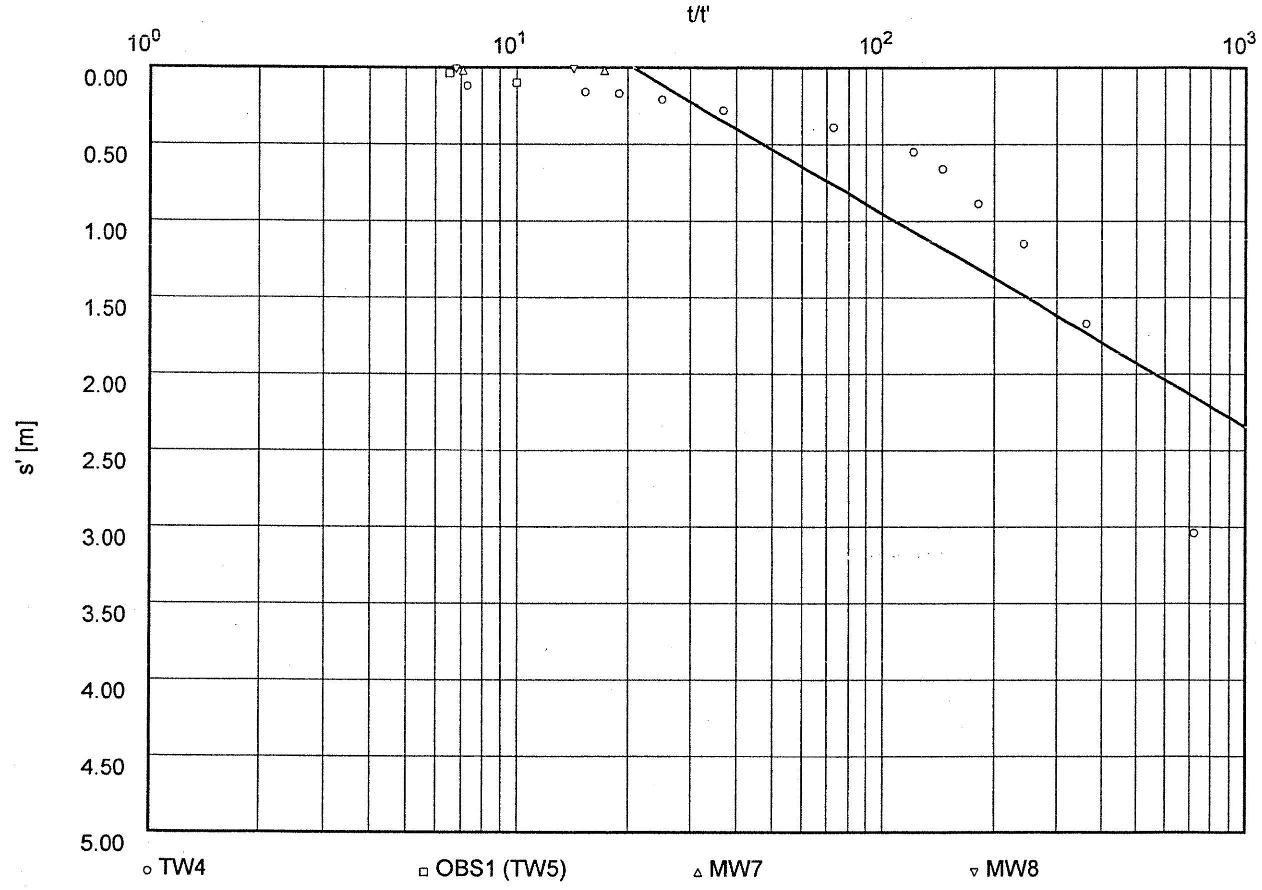


Transmissivity [m²/min]: 1.68×10^{-2}

Storativity: 8.11×10^{-3}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Date: 09.08.2005	none, Page 33
		Project: Sunset Lakes	
		Evaluated by: RAP	

Pumping Test No. 1	Test conducted on: June 21, 2005
TW4	
Discharge 1.68 l/s	
	Pumping test duration: 360.00 min



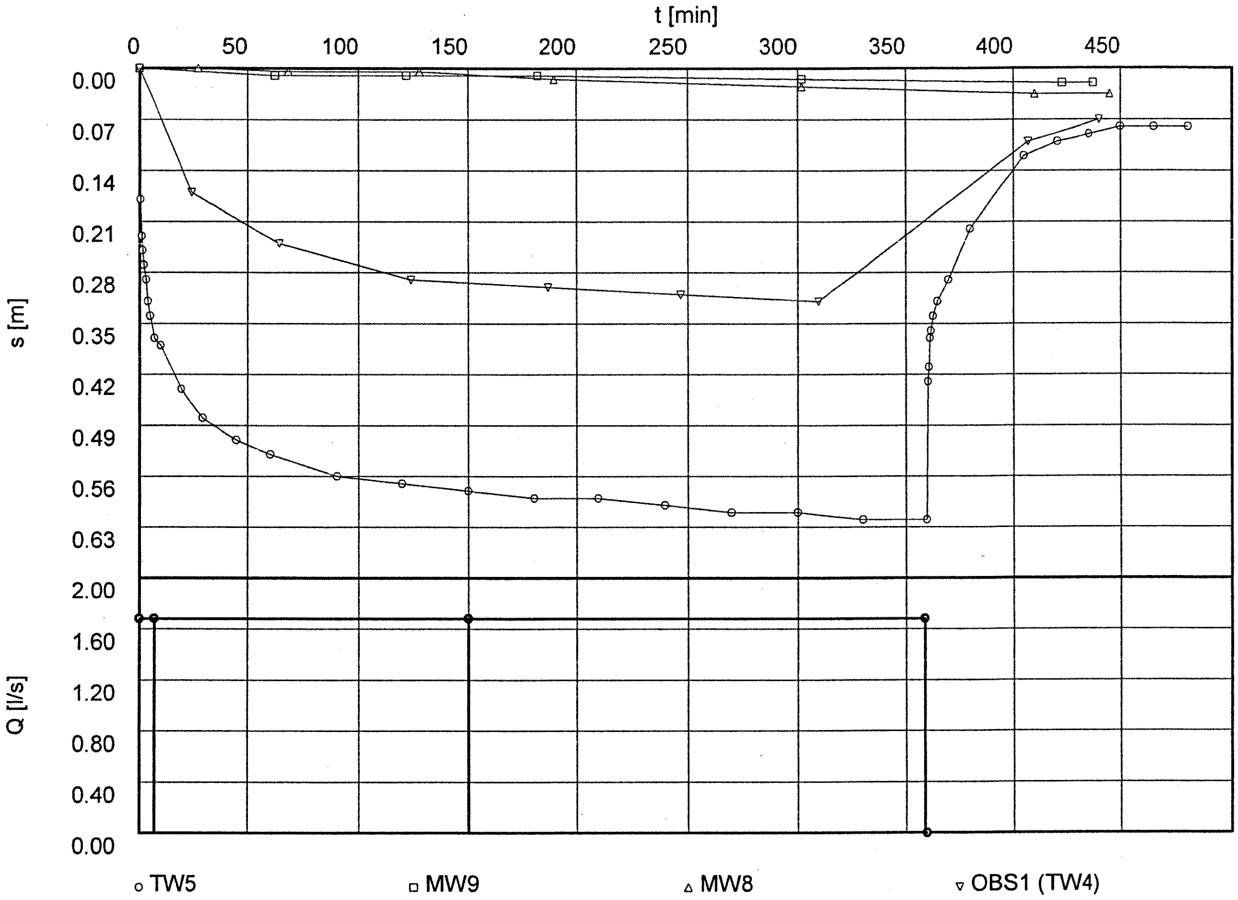
Transmissivity [m²/min]: 1.31×10^{-2}

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot
with discharge

Date: 09.08.2005
none, Page 34
Project: Sunset Lakes
Evaluated by: RAP

Pumping Test No. 2	Test conducted on: June 22, 2005
TW5	
Discharge 1.68 l/s	



Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot
with discharge

Date: 09.08.2005
none, Page 35
Project: Sunset Lakes
Evaluated by: RAP

Pumping Test No. 2	Test conducted on: June 22, 2005
TW5	Constant Rate Test
Discharge 1.68 l/s	

	Pumping test duration [min]	Discharge [l/s]		
1	0.00	1.68		
2	7.00	1.68		
3	150.00	1.68		
4	359.00	1.68		
5	360.00	0.00		

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot
with discharge

Date: 09.08.2005
none, Page 36
Project: Sunset Lakes
Evaluated by: RAP

Pumping Test No. 2
Test conducted on: June 22, 2005

TW5
TW5

Discharge 1.68 l/s
Distance from the pumping well 0.100 m

Static water level: 0.710 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	0.710	0.000	
2	0.50	0.890	0.180	
3	1.00	0.940	0.230	
4	1.50	0.960	0.250	
5	2.00	0.980	0.270	
6	3.00	1.000	0.290	
7	4.00	1.030	0.320	
8	5.00	1.050	0.340	
9	7.00	1.080	0.370	
10	10.00	1.090	0.380	
11	20.00	1.150	0.440	
12	30.00	1.190	0.480	
13	45.00	1.220	0.510	
14	60.00	1.240	0.530	
15	90.00	1.270	0.560	
16	120.00	1.280	0.570	
17	150.00	1.290	0.580	
18	180.00	1.300	0.590	
19	210.00	1.300	0.590	
20	240.00	1.310	0.600	
21	270.00	1.320	0.610	
22	300.00	1.320	0.610	
23	330.00	1.330	0.620	
24	360.00	1.330	0.620	
25	360.50	1.140	0.430	
26	361.00	1.120	0.410	
27	361.50	1.080	0.370	
28	362.00	1.070	0.360	
29	363.00	1.050	0.340	
30	365.00	1.030	0.320	
31	370.00	1.000	0.290	
32	380.00	0.930	0.220	
33	405.00	0.830	0.120	
34	420.00	0.810	0.100	
35	435.00	0.800	0.090	
36	450.00	0.790	0.080	
37	465.00	0.790	0.080	
38	480.00	0.790	0.080	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot with discharge	Date: 09.08.2005	none, Page 37
		Project: Sunset Lakes	
		Evaluated by: RAP	

Pumping Test No. 2	Test conducted on: June 22, 2005
TW5	MW9
Discharge 1.68 l/s	Distance from the pumping well 40.000 m
Static water level: 0.720 m below datum	

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	0.720	0.000	
2	62.00	0.730	0.010	
3	122.00	0.730	0.010	
4	182.00	0.730	0.010	
5	302.00	0.735	0.015	
6	422.00	0.740	0.020	
7	437.00	0.740	0.020	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot with discharge	Date: 09.08.2005 · none, Page 38 Project: Sunset Lakes Evaluated by: RAP

Pumping Test No. 2	Test conducted on: June 22, 2005
TW5	MW8
Discharge 1.68 l/s	Distance from the pumping well 190.000 m

Static water level: 0.125 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	0.125	0.000	
2	28.00	0.125	0.000	
3	68.00	0.130	0.005	
4	128.00	0.130	0.005	
5	190.00	0.140	0.015	
6	302.00	0.150	0.025	
7	410.00	0.160	0.035	
8	445.00	0.160	0.035	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot with discharge	Date: 09.08.2005 | none, Page 39 Project: Sunset Lakes Evaluated by: RAP

Pumping Test No. 2	Test conducted on: June 22, 2005
TW5	OBS1 (TW4)
Discharge 1.68 l/s	Distance from the pumping well 273.000 m

Static water level: 1.170 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.170	0.000	
2	25.00	1.340	0.170	
3	64.00	1.410	0.240	
4	124.00	1.460	0.290	
5	187.00	1.470	0.300	
6	247.00	1.480	0.310	
7	310.00	1.490	0.320	
8	407.00	1.270	0.100	
9	440.00	1.240	0.070	

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

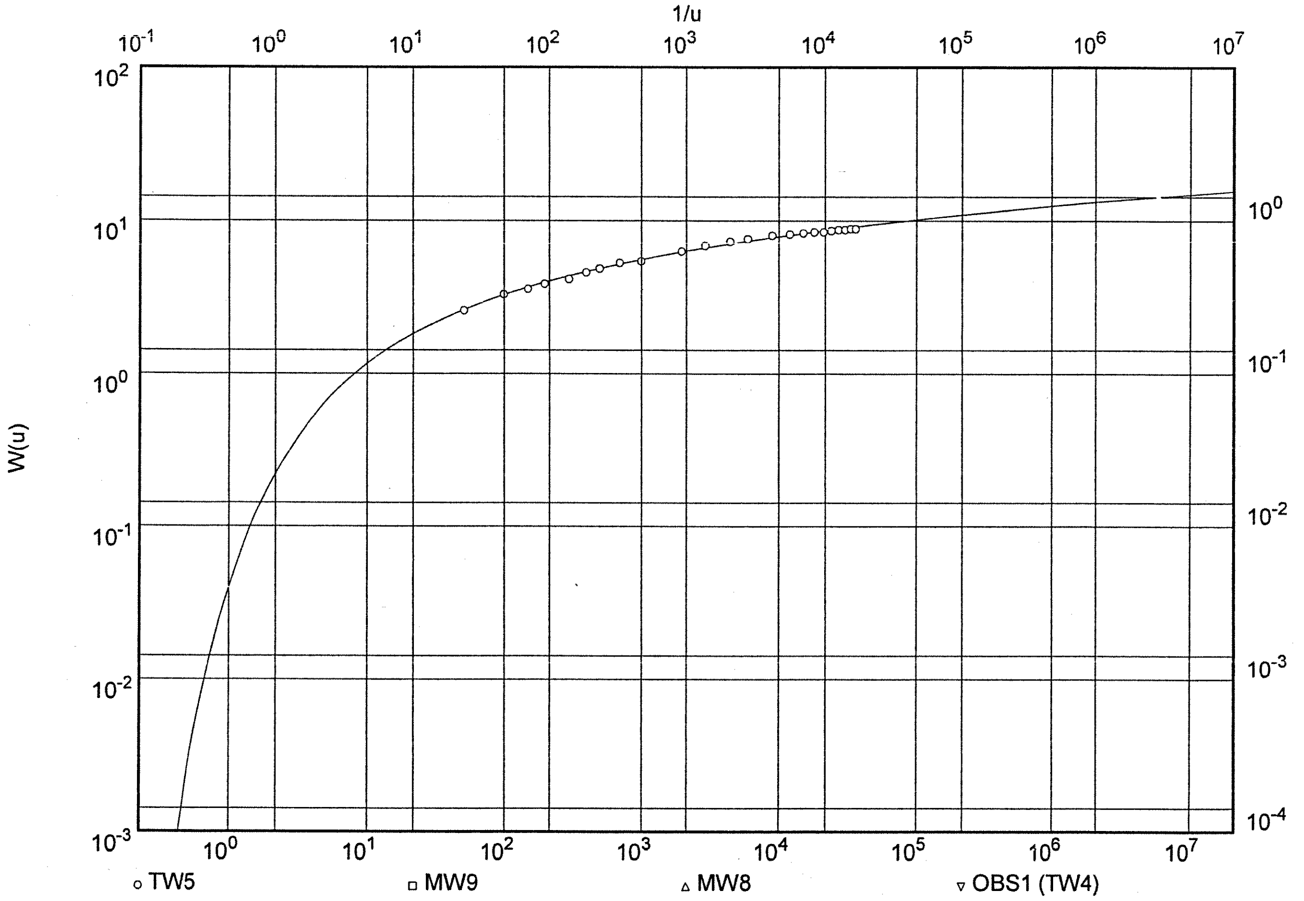
Pumping test analysis
Theis analysis method
Confined aquifer

Date: 09.08.2005
none, Page 39

Project: Sunset Lakes

Evaluated by: RAP

Pumping Test No. 2	Test conducted on: June 22, 2005
TW5	
Discharge 1.68 l/s	

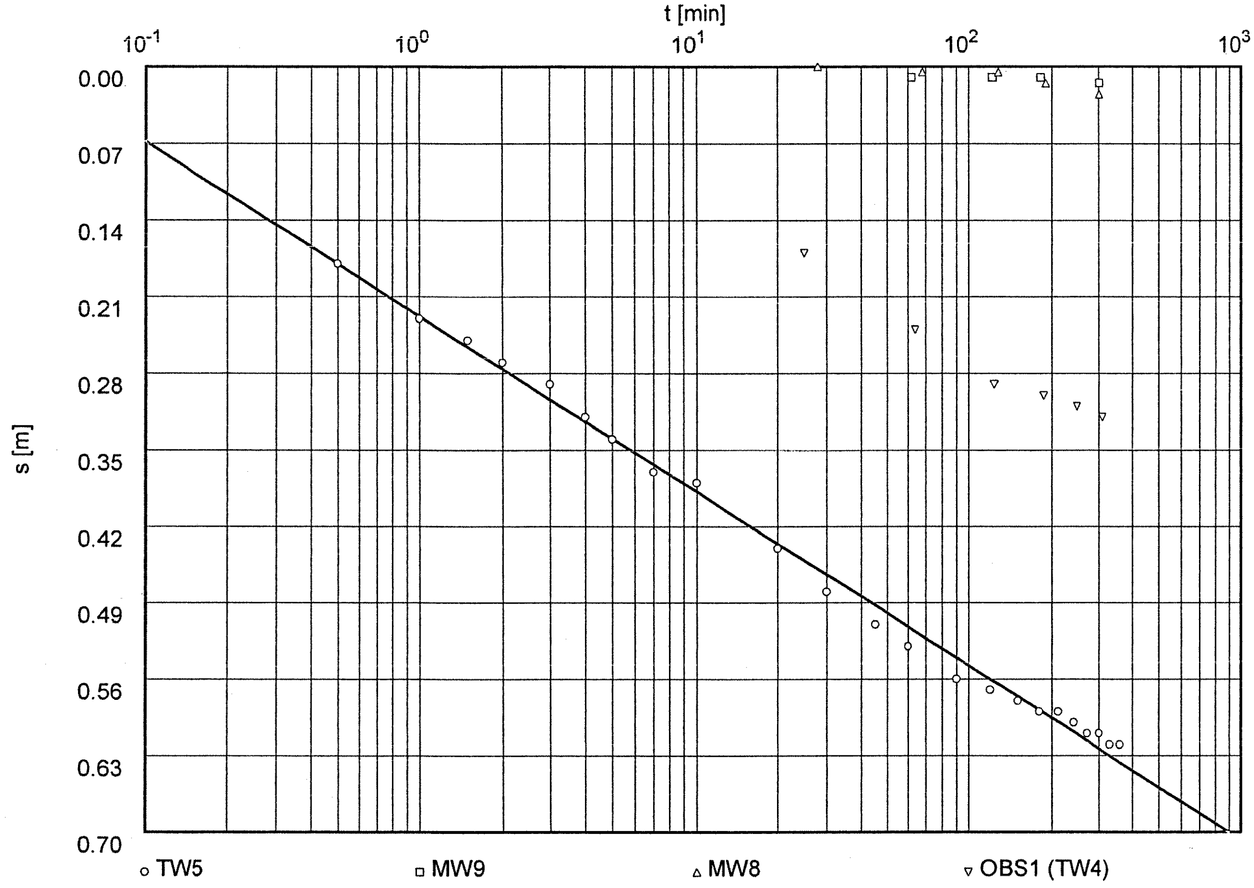


Transmissivity [m²/min]: 1.14×10^{-1}

Storativity: 9.83×10^{-1}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Date: 09.08.2005	none, Page 40
		Project: Sunset Lakes	
		Evaluated by: RAP	

Pumping Test No. 2	Test conducted on: June 22, 2005
TW5	
Discharge 1.68 l/s	

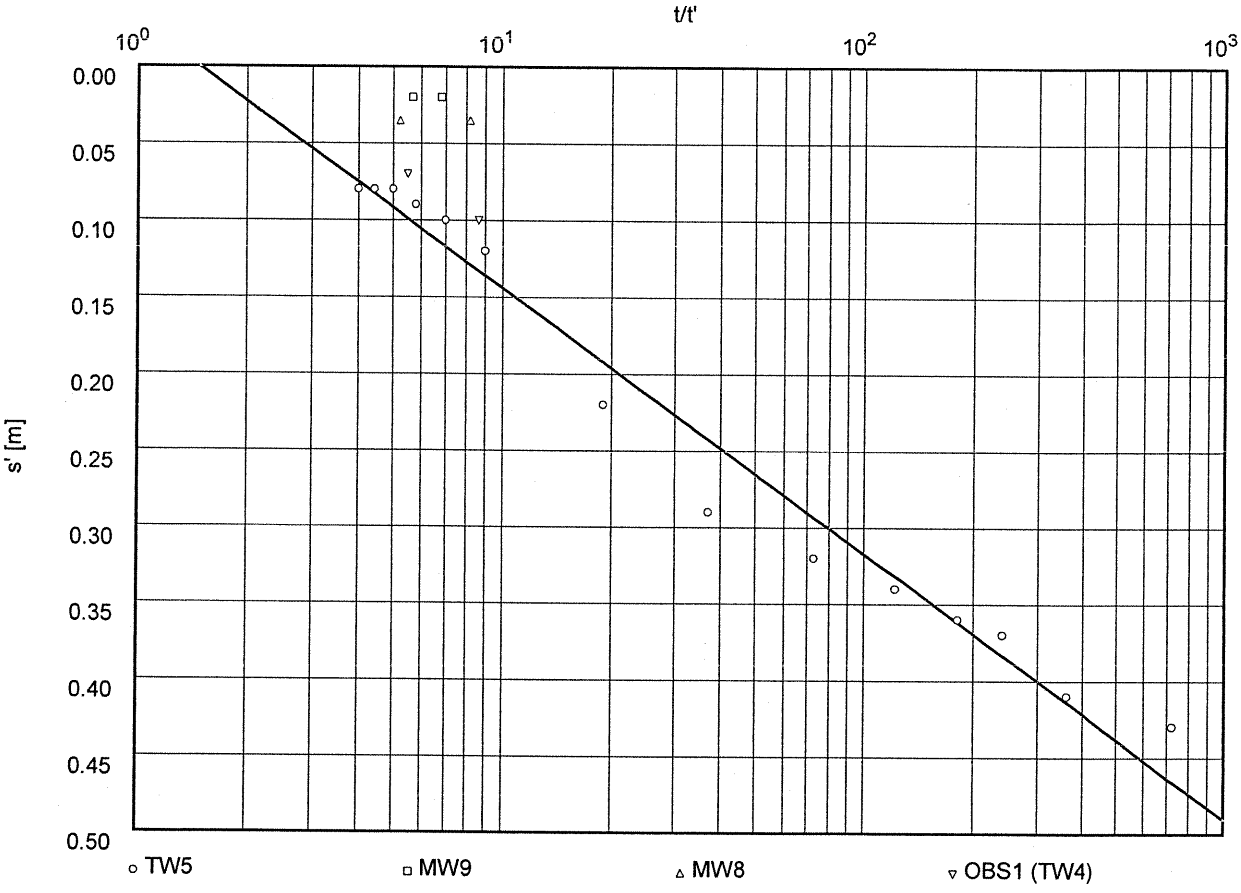


Transmissivity [m²/min]: 1.15 x 10^{-1}

Storativity: 9.71 x 10^{-1}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Date: 09.08.2005	none, Page 41
		Project: Sunset Lakes	
		Evaluated by: RAP	

Pumping Test No. 2	Test conducted on: June 22, 2005
TW5	
Discharge 1.68 l/s	
	Pumping test duration: 360.00 min



Transmissivity [m²/min]: 1.06×10^{-1}

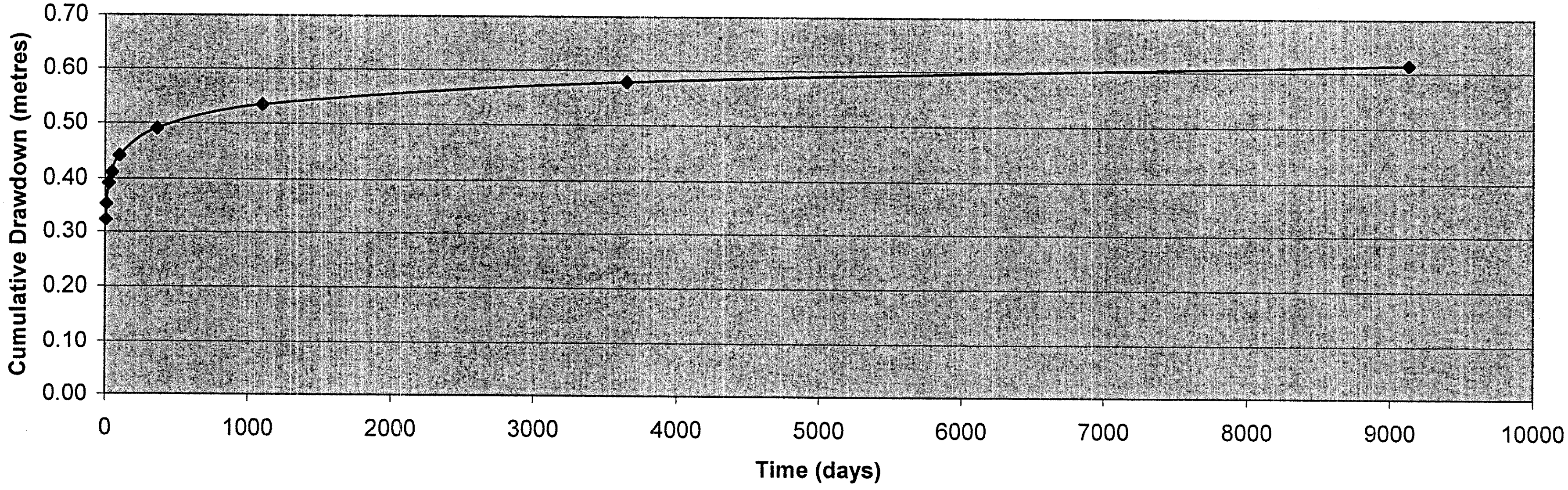
Determination of Potential Well Interference

Pumping Rate (Q) m3/day	2
Transmissivity (T) m2/day	249
Average Well Spacing (m) r	15
Coefficient of Storage S	0.001

Notes: Analysis Assumes Continuous Pumping of 85 Wells

Time (days)	1st Well Grouping		2nd Well Grouping		3rd Well Grouping		4th Well Grouping		Drawdown
	u	W(u)	u	W(u)	u	W(u)	u	W(u)	
5	2E-05	10.24	7E-05	8.99	1E-04	8.63	2E-04	7.94	0.32
10	1E-05	10.94	3E-05	9.84	6E-05	9.14	8E-05	8.86	0.35
25	5E-06	11.63	1E-05	10.94	2E-05	10.24	3E-05	9.84	0.39
50	2E-06	12.55	7E-06	11.29	1E-05	10.94	2E-05	10.24	0.41
100	1E-06	13.24	3E-06	12.14	6E-06	11.45	8E-06	11.16	0.44
365	3E-07	14.44	9E-07	13.34	2E-06	12.55	2E-06	12.55	0.49
1100	1E-07	15.54	3E-07	14.44	5E-07	13.93	7E-07	13.60	0.53
3650	3E-08	16.74	9E-08	15.65	2E-07	14.85	2E-07	14.85	0.58
9125	1E-08	17.84	4E-08	16.46	6E-08	16.05	9E-08	15.65	0.61

Graph of Drawdown vs. Time



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[français] [Back]

Hourly Data Report for June 22, 2005

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Notes on Data Quality.

OTTAWA MACDONALD-CARTIER INT'L A ONTARIO

Latitude: 45° 19' N **Longitude:** 75° 40' W **Elevation:** 114.00 m

Climate ID: 6106000 **WMO ID:** 71628 **TC ID:** YOW

Hourly Data Report for June 22, 2005

Time	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
00:00	18.7	17.9	95		0	12.9	99.83			Rain Showers
01:00	18.0	17.6	98		0	16.1	99.87			Cloudy
02:00	18.4	17.0	92	3	15	25.0	99.94			Mostly Cloudy
03:00	16.7	11.1	70	4	17	25.0	100.02			Mainly Clear
04:00	15.7	9.6	67	2	19	24.1	100.09			Mainly Clear
05:00	14.9	8.2	64	1	22	24.1	100.17			Mainly Clear
06:00	14.4	6.4	59	36	26	24.1	100.26			Clear
07:00	15.0	5.4	53	36	19	24.1	100.36			Clear
08:00	15.4	5.1	50	36	19	24.1	100.42			Clear
09:00	16.6	5.8	49	1	15	24.1	100.43			Clear
10:00	17.4	7.0	50	31	11	24.1	100.45			Clear
11:00	18.6	7.4	48	33	19	24.1	100.46			Clear
12:00	19.6	8.7	49	31	19	24.1	100.45			Clear
13:00	20.0	5.2	38	1	24	24.1	100.44			Clear
14:00	20.9	6.1	38	1	17	24.1	100.44			Clear
15:00	20.6	5.1	36	34	20	24.1	100.42			Clear
16:00	20.6	4.6	35	36	19	24.1	100.43			Clear
17:00	20.4	4.9	36	35	15	24.1	100.43			Clear
18:00	19.9	5.3	38	34	17	32.2	100.47			Mainly Clear
19:00	18.7	5.7	42	34	15	32.2	100.51			Mainly Clear
20:00	16.2	5.6	49	34	11	32.2	100.55			Mainly Clear
21:00	15.7	5.7	51	32	7	25.0	100.58			Mainly Clear
22:00	15.8	6.1	52	31	6	25.0	100.62			Clear
23:00	15.1	6.1	55	35	4	25.0	100.64			Clear

▲

Important Notices and Disclaimers

Created : 2002-06-21
Modified : 2004-01-21
Reviewed : 2004-01-21
Url of this page : http://www.climate.weatheroffice.ec.gc.ca/climateData/hourlydata_e.html

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The Green Lane™, Canada

Hourly Data Report for June 21, 2005

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Notes on Data Quality.

OTTAWA MACDONALD-CARTIER INT'L A
ONTARIO

Latitude: 45° 19' N **Longitude:** 75° 40' W **Elevation:** 114.00 m

Climate ID: 6106000 **WMO ID:** 71628 **TC ID:** YOW

Hourly Data Report for June 21, 2005

Time	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
00:00	17.1	13.5	79	22	11	24.1	100.29			Clear
01:00	16.4	13.2	81	22	13	24.1	100.31			Clear
02:00	15.6	13.0	85	23	13	24.1	100.28			Clear
03:00	15.0	13.0	88	23	9	24.1	100.23			Clear
04:00	14.2	12.8	91	22	11	24.1	100.18			Clear
05:00	14.5	13.0	91	20	11	24.1	100.17			Clear
06:00	15.6	13.9	90	21	11	24.1	100.14			Mainly Clear
07:00	18.0	14.7	81	22	15	24.1	100.14			Mainly Clear
08:00	19.7	15.0	74	22	13	24.1	100.09			Cloudy
09:00	20.2	14.9	72	22	13	24.1	100.04			Cloudy
10:00	22.0	15.6	67	23	15	24.1	99.99			Cloudy
11:00	23.6	16.4	64	24	17	24.1	99.95	28		Mostly Cloudy
12:00	25.8	17.7	61	27	15	24.1	99.86	32		Cloudy
13:00	25.8	17.7	61	22	17	24.1	99.80	32		Cloudy
14:00	26.6	18.5	61	23	13	24.1	99.74	33		Cloudy
15:00	25.2	17.2	61	24	20	24.1	99.72	31		Cloudy
16:00	21.0	18.4	85	27	19	19.3	99.71			Rain Showers
17:00	20.6	19.0	91	23	19	19.3	99.67			Rain Showers
18:00	20.0	18.5	91	24	15	8.0	99.71			Rain Showers, Fog
19:00	19.5	18.6	95	23	13	8.0	99.71			Rain, Fog
20:00	19.5	18.6	95	24	13	9.7	99.71			Fog
21:00	19.2	18.1	93	25	11	12.9	99.75			Cloudy
22:00	19.0	18.0	94	26	9	16.1	99.78			Mostly Cloudy
23:00	18.8	17.9	95	26	4	12.9	99.82			Cloudy

Environment Canada Environnement Canada

[français] [Back]

Hourly Data Report for June 28, 2005

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Notes on Data Quality.

OTTAWA MACDONALD-CARTIER INT'L A ONTARIO

Latitude: 45° 19' N **Longitude:** 75° 40' W **Elevation:** 114.00 m
Climate ID: 6106000 **WMO ID:** 71628 **TC ID:** YOW

Hourly Data Report for June 28, 2005

Time	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
00:00	24.9	16.8	61	19	7	19.3	100.40	30		Mainly Clear
01:00	23.5	17.0	67	18	9	19.3	100.43	29		Mainly Clear
02:00	23.1	16.8	68	20	6	19.3	100.40	28		Mainly Clear
03:00	21.7	17.1	75	27	9	19.3	100.43			Mainly Clear
04:00	21.7	17.1	75	18	9	19.3	100.46			Mainly Clear
05:00	21.2	16.7	76	18	7	19.3	100.44			Mainly Clear
06:00	22.5	18.0	76	20	9	19.3	100.43			Mainly Clear
07:00	24.3	20.0	77	21	11	16.1	100.43	32		Mainly Clear
08:00	26.0	21.1	74	21	9	16.1	100.40	34		Mainly Clear
09:00	27.3	22.2	74	18	11	16.1	100.31	37		Mainly Clear
10:00	29.1	22.8	69	18	11	16.1	100.27	39		Mainly Clear
11:00	30.4	23.3	66	18	11	19.3	100.23	41		Mostly Cloudy
12:00	30.8	23.0	63	18	13	19.3	100.15	41		Mostly Cloudy
13:00	31.9	23.0	59	17	17	19.3	100.10	42		Mostly Cloudy
14:00	32.1	23.1	59	20	15	19.3	100.01	42		Mostly Cloudy
15:00	31.2	22.4	60	20	11	19.3	99.92	41		Mostly Cloudy
16:00	31.0	22.5	61	20	17	19.3	99.87	41		Mainly Clear
17:00	30.6	21.8	59	22	13	16.1	99.78	40		Mainly Clear
18:00	29.6	21.4	61	22	9	9.7	99.80	38		Haze
19:00	28.2	21.7	68	21	7	8.0	99.85	37		Haze
20:00	27.2	21.4	71	21	7	8.0	99.84	36		Haze
21:00	26.5	21.2	73	20	7	12.9	99.87	35		Cloudy
22:00	25.2	20.8	77	19	6	12.9	99.84	33		Cloudy
23:00	24.8	20.9	79	21	7	11.3	99.80	33		Cloudy

▲

Created : 2002-06-21
Modified : 2004-01-21
Reviewed : 2004-01-21
Url of this page : http://www.climate.weatheroffice.ec.gc.ca/climateData/hourlydata_e.html

The Green Lane™, Canada

APPENDIX 5

DRAWINGS & SPECIFICATIONS

1. PH0145-1:	TEST HOLE LOCATION PLAN
2. PH0145-2:	LOT DEVELOPMENT PLAN
3. PH0145-3:	PIEZOMETRIC HEAD DELINATION
4. PH0145-4:	STRATIGRAPHIC CROSS SECTION A-A
5. FIGURE 1:	TYPICAL TEST WELL CONSTRUCTION DRAWING

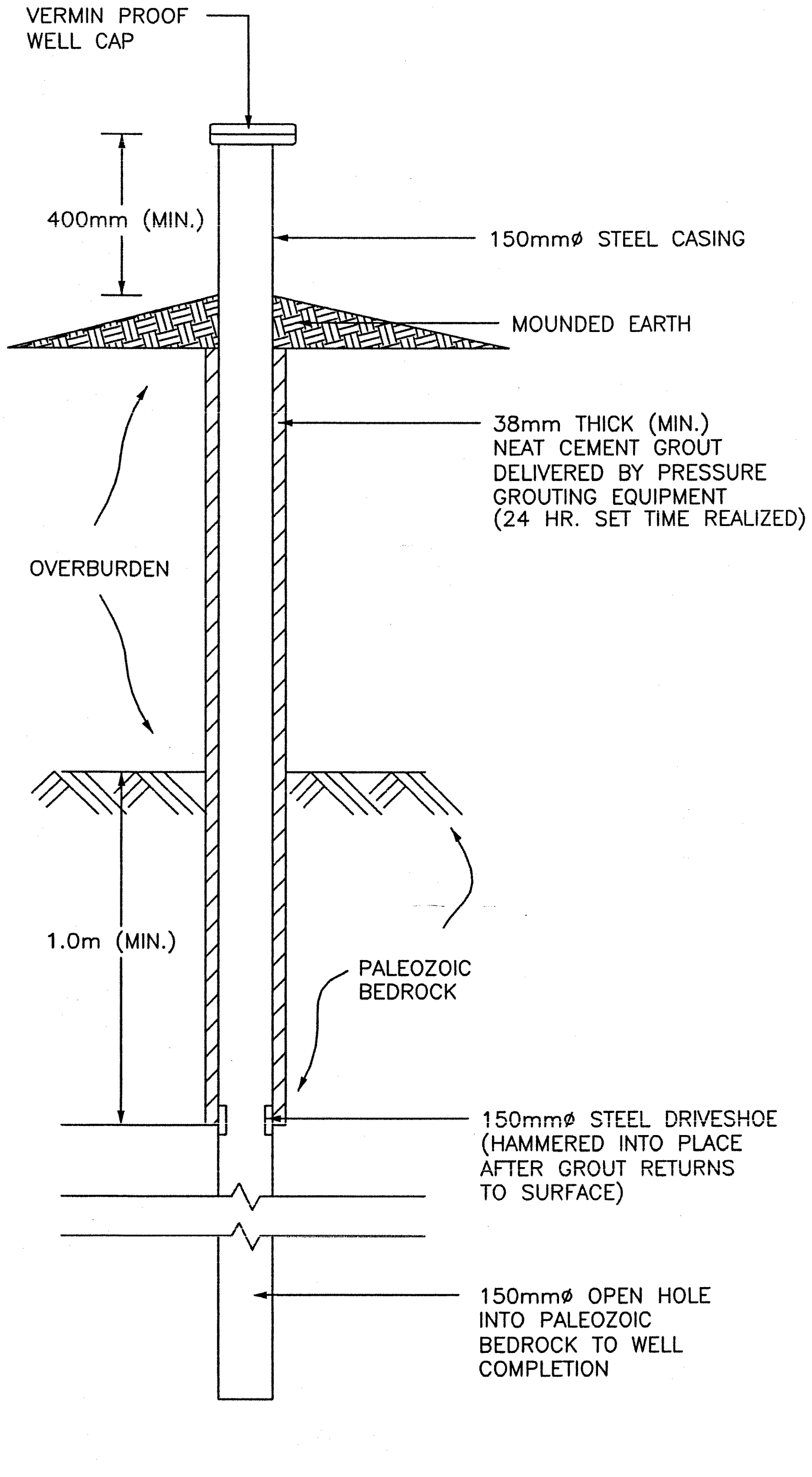

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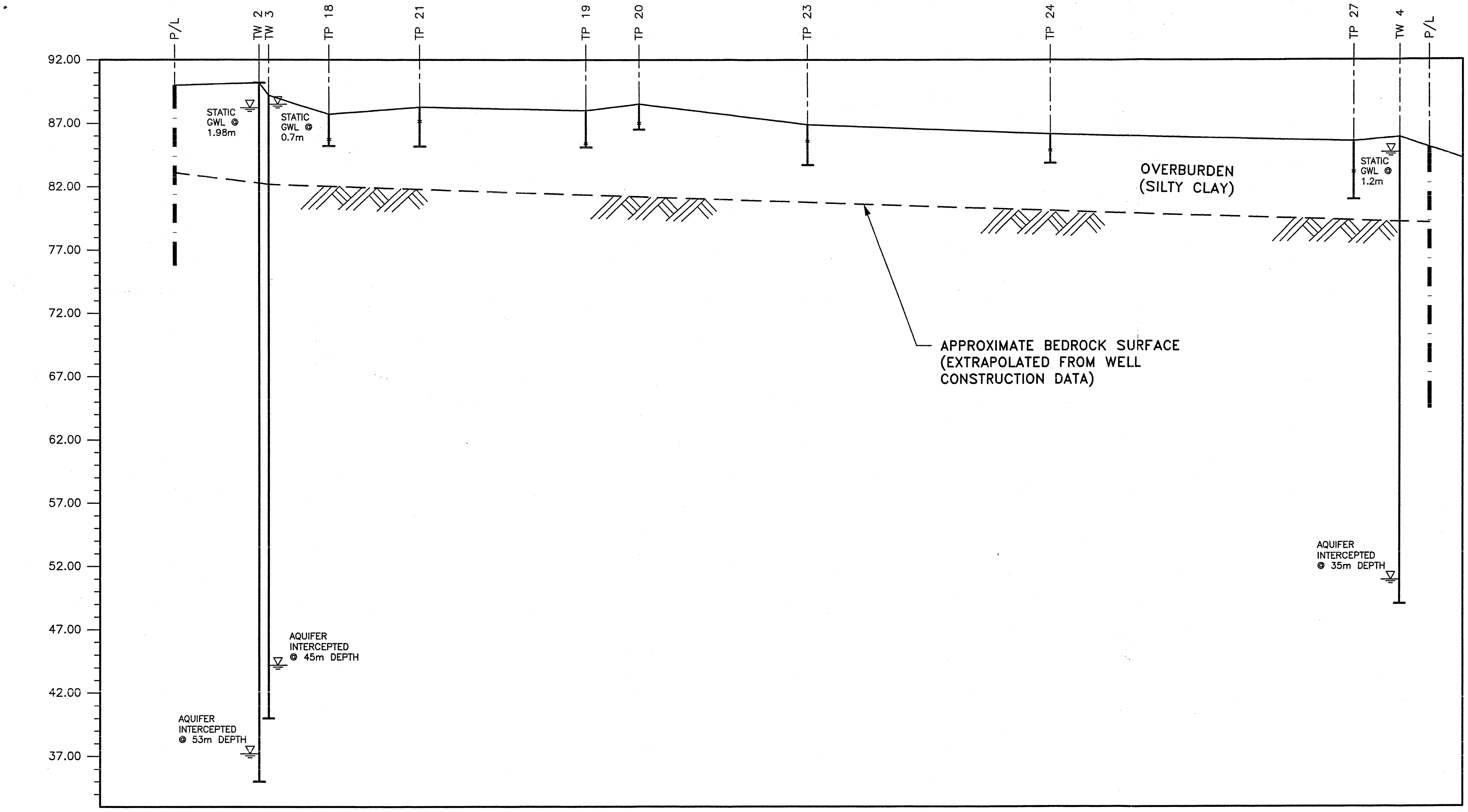
FIGURE 1:
AS–BUILT CONSTRUCTION DETAIL
FOR TEST WELL NO. 1

Report No.:		Scale:
PH0145–5		N.T.S.
Date:	Drawn:	Approved:
09/2005	RAP	RAP



paterson group
consulting engineers
28 Concourse Gate, Unit 1, Ottawa, Ontario K2E 7T7

Scale: 1:300 V 1:2000 H
Des.: RAP
Dwn: MPG
Chkd: RAP

SUNSET LAKES DEVELOPMENT CORP.
PROPOSED VILLAGE CENTRE SUBDIVISION
SALES BARN ROAD
OTTAWA, ONTARIO

CROSS–SECTION A–A (GENERAL SITE STRATIGRAPHY)

Dwg. No. PH0145–4
Report No.: PH0145–01
Date: 09/2005

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

patersongroup

Terrain Analysis and Hydrogeological Study
Addendum No. 1

Greely Village Centre Subdivision
Part of Lot 73 and Part of Lot 74,
Registrar's Compiled Plan 902
Ottawa (Osgoode), Ontario

Prepared For

Sunset Lakes
Development Corporation

June 19, 2006

Report No. PH0145-REP.02

Paterson Group Inc.
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TABLE OF CONTENTS

1.0 INTRODUCTION

The following documentation is provided in response to the comments received from:

1. A peer review conducted by Golder Associates Ltd. (Golder), submitted to the City of Ottawa in a letter dated December 29, 2005; and

2. A technical review performed by the South Nation Conservation (SNC) submitted to the City of Ottawa in a letter dated February 2, 2006.

These comments relate to the terrain analysis and hydrogeological study performed by this firm in support of the subdivision development (Paterson Report No. PH0145-REP.01). The following addendum addresses issues related to each comment received from Golder and SNC with the intent to alleviate any outstanding issues or concerns.

The original report identified the proposed use of the site as containing a 75 lot residential subdivision and a 6 unit professional office park, where applicable for analysis. Accordingly, we have divided the site into two sectors: residential sector and office park sector. The ODWS health parameters of the well water samples were not on a communal site. The aesthetic parameters are addressed herein. The health parameters and aesthetic parameters were met on the residential site.

2.0 RESPONSE TO COMMENTS

2.1 Comments Received by Golder Associates Ltd.

2.1.1 "Total coliform bacteria were detected in 4 of the 5 test wells and confirmed in the second sampling in 3 of the 5 test wells. Chlorine residual measurements at the time of the sampling of the test wells were not reported and there is no indication provided in the report that chlorine residual testing was conducted. Procedure D-5-5 states that, "chlorine residual must be zero before any bacteriological sample can be taken".

In light of the total coliform bacteria detected in 4 of the 5 test wells and confirmed in the second sampling in 3 of the 5 wells, measurement and reporting of chlorine residuals is crucial in order to have confidence that the data reflects natural conditions

unaffected by chlorine. Considering the comment in the report that the coliform concentrations "fluctuate", we recommend additional testing to confirm the report conclusion that the presence of bacteria is associated with well construction and insufficient well development. Additional bacteriological results must be supported with chlorine residual data."

Response

It is established practice by this firm to confirm the absence of free chlorine residual at the well head prior to collecting water samples for analysis. Free chlorine residual is measured either by a chlorine meter or test strips. Test strips were used to check for the absence of free chlorine residual in the test wells. Although not reported in the body of the report, all test wells did not contain free chlorine residual at the time of collection of the water samples at both the three (3) hour and six (6) hour time intervals. Furthermore, the same methodology was utilized during the collection of subsequent water samples collected from the well that required additional disinfection due to poor well development.

With respect to the statements made concerning total coliform concentrations in the test wells, the report clearly indicates that total coliform concentrations fluctuated during pump testing of the five(5) test wells. The laboratory data contained within Appendix 3 of the report clearly indicates that total coliform concentrations increased slightly between the three and six hour sampling intervals for TW1, TW2, and TW4. The actual increase was only 1, 2 and 9 counts per 100 mL, respectively. While TW3 had no detectable total coliform concentrations, the samples received from TW5 were noted to decline from 24 to 7 counts per 100 mL. Subsequent diligent disinfection and flushing of the wells by Paterson resulted in a complete absence of total coliform from all test wells. This, combined with the absence of other pathogenic indicators, confirms the statement in the report that poor well development was the initial cause of the presence of total coliform bacteria.

In carrying out follow-up work on the site, additional water samples were collected by Paterson, using established water sampling protocols, for all of the original test wells and one new test well, referred to hereafter as TW6.(Laboratory test data reports are provided in Appendix 1). A chlorine residual of approximately 50 mg/L was established in the test wells and maintained for a duration of not less than 12 hours. The test wells were pumped at rates upwards of 30 IGPM until free chlorine residual was not detected in the discharge water (i.e. one to two hours). The laboratory reports for the bacteriological parameters indicate that original test wells (i.e. TW1 to TW5) are free of all pathogenic bacteriological parameters after more than six (6) months without use.

Furthermore, TW6 exhibited the exact response as TW1, TW2 and TW4 with respect to an increase in total coliform concentrations in the absence of other pathogenic indicators. This evidence confirms the theory, originally presented in the report, that poor well development was responsible for the fluctuations of total coliform bacteria as surface debris (i.e. soil and organic matter) was not adequately removed from the wells.

Based on the evidence provided above, it is clear that the test wells and water supply aquifer are clear of all bacteriological indicators.

2.1.2 "Laboratory measured turbidity samples exceeded 1 NTU in all wells and 5 NTU in three of the five wells. The turbidity increased over time for four of the five pump tests, with results as high as 62 NTU. Levels above 1 NTU can be considered a health concern, and levels above 5 NTU are not considered reasonably treatable, according to D-5-5.

The report indicates that field measurements using a turbidity meter confirm that results were below 1 NTU in all wells except TW4 (no field data from TW4 due to equipment problems), however, none of the field data was provided in the report. This data should be provided for review. The report attributes the elevated turbidity in the laboratory samples to oxidation of iron and manganese. The aesthetic objectives for iron and manganese outlined in D-5-5 are 0.3 mg/L and 0.05 mg/L, respectively. The concentrations measured in all of the five wells exceeded these limits. The report indicates that these parameters can be treated by potassium permanganate (greensand) filters.

Based on the assumption presented in the report that turbidity increased due to oxidation reactions, turbidity could increase in the water supply with some treatment processes (i.e. chlorination) or at fixtures (i.e. aerators), which could create health and aesthetic concerns. As such, the higher turbidity measured after oxidation would be relevant. Procedure D-5-5 indicates that the levels of turbidity measured in the laboratory are not reasonably treatable."

Response

Field measurements for turbidity were recorded over the duration of each pump test (with the exception of TW4 due to equipment malfunction). It is widely accepted that the most relevant data is the field turbidity readings at the time of sample collection for water quality analysis. The reason for the importance of measurements made at these specific instances comes from the fact that the sampled water at the point of discharge of the pump testing piping represents the point of discharge of the distribution system in a residence. The other data points only identify potential trending of turbidity and this data is only useful if there are significant fluctuations in turbidity during pumping. In the monitored test wells, there were no significant fluctuations and, hence, there is no rationale to include the data in the body of the report. As required from the peer review, the field turbidity data recorded during each pumping test of the original five (5) test wells is provided in Appendix 2.

We now address the conjecture related to the potential increase in turbidity in the water supply with some treatment processes and at fixtures. The importance of the field test data, as established in the previous section, is such that it reasonably reflects the condition of the water at the point of discharge or consumption. The oxidation of concentrations of soluble iron and manganese at the point of discharge is too slow to result in the formation of precipitates visible to the naked eye during normal water use that would lead to a negative aesthetic impact. However, water that is drawn from the point of discharge and allowed to sit for a moderate period of time, will likely contain metal precipitates in the bottom of the container. Again this does not negatively impact the aesthetic pleasure of the water for consumption, but will result in staining of porcelain, etc. Although the levels of laboratory turbidity reported in the test wells is not reasonably treatable under the constraints of Table 3 of Procedure D-5-5, the concentrations of iron and manganese are. Since the iron and manganese are contributing to the turbidity, and both of these parameters are readily treatable, the turbidity is also reasonably treatable as is the theoretical problem with it.

Further to the argument presented in the previous paragraph, the turbidity poses no apparent health issues related to either water treatment processes or point of use consumption. Once the test wells were adequately disinfected and flushed, there were no further reports of the presence of bacteriological parameters in the water supply aquifer. As such there is no requirement to utilize chlorine for disinfection. If chlorination is to be chosen to be used in conjunction with iron and manganese removal, then the sand filter positioned after the chlorine contact chamber will remove the iron, manganese and residual turbidity. Accordingly, the ODWS for turbidity have been met.

2.1.3 "Total dissolved solids (TDS) concentrations were above the aesthetic objectives in five of the test wells and sodium and chloride were above the aesthetic objective in three of the five test wells (TW1, TW2 and TW3). Hardness was measured in excess of 500 mg/L in all of the test wells. As stated in Procedure D-5-5, hardness in excess of 500 mg/L is unacceptable for most domestic purposes. The elevated chloride concentrations were not addressed in the report. The report suggests that sodium would be expected to decline with well development, the technical basis for this assumption should be provided. It is our opinion that the source of the elevated sodium is likely anthropogenic. TDS concentrations were measured in TW1, TW2 and TW3 at more than three times the aesthetic limit and chloride concentrations were more than two times the aesthetic limit. According to Procedure D-5-5, the sodium and chloride concentrations measured in test wells TW1, TW2 and TW3 are not reasonably treatable. Further, with elevated TDS, hardness, chloride and sodium, issues of mineral deposition, and corrosion are a concern."

Response

As indicated in the Section 1.0 of this report, the residential and commercial areas will be dealt with separately in addressing this comment.

Residential Area

The residential area consists of 75 lots located on the eastern part of the subject property. TW4 and TW5 are contained within the residential area while the newly constructed TW6 is located along the western edge (refer to the revised Lot Development Plan contained in Drawing No. PH0145-2).

The water quality in the residential area of the subject site, as defined by the water quality results from TW4 and TW5 in the original report, exceeds the Ontario Drinking Water Standards only for the following aesthetic parameters: iron, manganese, hardness and total dissolved solids (TDS). As well, sodium is present in concentrations in excess of 20 mg/L and, as such, require notification of the medical officer of health. The concentrations of sodium and chloride in the water from TW4 and TW5 does not indicate anthropogenic sources.

Additional analysis of water quality of the aquifer intercepted by these wells was conducted during additional field work at the subject site. The laboratory analyses are provided in Appendix 1. The following is a discussion of the outstanding aesthetic water quality issues and Table 2.1.3 summarizes the reasonable treatable limits, possible treatment technologies and associated capital cost to install and operate.:

Iron and Manganese

The concentrations of iron and manganese, which are anticipated to be causing the post field test turbidity, are both present in concentrations that are considered to be reasonably treatable even under the antiquated values presented in Table 3 of Procedure D-5-5. Removal of these parameters can easily be accomplished through the use of water treatment technologies employing ion exchange (softener) or absorption/oxidation (greensand filters) technologies.

Hardness

The water contained within the water supply aquifer intercepted by TW4 and TW5 is considered to be very hard. As there are no maximum treatable limits set for hardness, the degree of hardness removal is ultimately a function of the capacity of the water softener. It is anticipated, based on average hardness concentrations of approximate 473 mg/L that reduction to the ODWS Operation Guideline (OG) of hardness of 100 mg/L is easily achievable. Given that water softeners operate based on the ion exchange principle, if sodium chloride is used to charge the resin, sodium concentrations in the treated water will increase. Individuals requiring control of sodium intake can easily substitute potassium chloride to recharge the resin. As there is no discharge of sodium into the treated water when potassium chloride is used, sodium concentrations will not increase.

TDS

The total dissolved solids (TDS) of the water supply aquifer intercepted by TW4 and TW5 is present at a concentration of between 670 and 825 mg/L. The water is slightly alkaline with moderate buffering potential with a pH of between 7.6 and 7.98 and the alkalinity between 220 and 300 mg/L. Based on this information, corrosion of the distribution piping is not likely, even in cases where the water is softened.. Encrustation is only anticipated where unsoftened water is heated. In heating the water, calcium carbonate will be precipitated. Typically the precipitate, noted as a dense white scale, forms on heating elements in kettles, electric fired hot water tanks, etc.

Table 2.1.3 below presents a summary of the aesthetic parameters and the recognized concentrations that the water treatment industry acknowledges as being treatable as well as the associated standard treatment technology available to achieve the necessary level of treatment.

Chloride and Sodium

There are no concerns with either chloride or sodium in the test wells located within the residential area of the proposed development given that both of these parameters are well below the aesthetic objectives. With respect to sodium, the concentrations in the TW4 and TW5 are above 20 mg/L. As a result, it is required, under Procedure D-5-5, that the Medical Officer of Health be notified to allow the information to be disseminated to local physicians.

Table 2.1.3-
SUMMARY OF MAXIMUM TREATABLE LIMTS AND COMMON TREATMENT TECHNOLOGIES FOR RELEVENT AESTHETIC PARAMETERS

Parameter	ODWS Aesthetic Objective (mg/L)	D-5-5[1] Maximum Reasonable Treatable Limit (mg/L)	WQA[2] Maximum Reasonable Treatable Limit (mg/L)	Most Commonly Available Treatment Technologies[2]
Iron	0.30	10	30	Water softeners, air oxidation combined with filtration
Manganese	0.05	1.0	2.0	Water softeners, air oxidation combined with filtration
Hardness (as $CaCO_3$)	500	N/A	1105	Water softeners
TDS[3]	500	N/A	5000	Point of Use Reverse Osmosis

1. From Table 3 of MOE Procedure D-5-5.
2. Information based on summary letter by Water Quality Association certified water treatment professional (TechnaLinks Letter Dated June 7, 2006 –refer to Appendix 3)
3. TDS = total dissolved solids. TDS is largely based on dissolved ions, namely sodium and chloride. Removal of these ions will reduce TDS.

Office Park

TW1, TW2, TW3 are all located in the proposed office park portions of the subject site. TW6, a well constructed April 21, 2006, is located at the edge of the office park area, immediately adjacent to the residential area.

Based on the most recent water quality data from these wells (refer to laboratory analysis records in Appendix 1) that, like the residential part of the development, the water has elevated concentrations of sodium, hardness, and TDS. Unlike the residential portion of the site, the water supply aquifer intercepted by these test wells also has elevated chloride concentrations. Please note, there is no sodium or chloride issue with the residential portion. The six (6) units abutting the highway proposed for office use are affected.

Sodium

Sodium concentrations are higher in TW1, TW2, TW3 and TW6 than in TW4 and TW5 with values ranging from 270 to 318 mg/L. Sodium, as noted in the discussion in the residential portion of the site, will require notification of the Medical Officer of Health. Furthermore, as explained in the Technical Support Document for Ontario Drinking Water-Standards, Objectives and Guidelines (June 2003);

> "The aesthetic objective for sodium in drinking water is 200 mg/L at which it can be detected by a salty taste. Sodium is not toxic. Consumption of sodium in excess of 10 grams per day by normal adults does not result in any apparent adverse health effects. In addition, the average intake of sodium from water is only a small fraction of that consumed in a normal diet. A maximum acceptable concentration for sodium in drinking water has, therefore, not been specified."

It has been suggested that the source of the sodium is anthropogenic in nature. The water supply aquifer(s) beneath the site, as detailed in the original report, and supplemented with the work summarized in Section 2.1.10 of this addendum, are hydraulically isolated from the surface. As such, the source of the sodium must be offsite and hydraulically up-gradient of the subject property. It should be noted that in the final report by Jacques Whitford Ltd., entitled *Final Draft Groundwater Study Interim Report #1 (City of Ottawa-Shields Creek Subwatershed Study)*, dated 2002, concluded that chloride "appears to tend higher along major roadways", which supports the offsite sources of sodium and chloride.

Sodium can be easily removed using membrane technology (i.e. reverse osmosis) for drinking water need in the office park areas. As the buffering potential of the water is moderate, corrosion of the distribution system is not anticipated, even with the elevated TDS values and, hence, total water treatment (i.e. all incoming water) will not be required.

Chloride

The chloride concentrations in TW1, TW2, TW3 and TW6, all located within the office park portion of the development, are above the aesthetic objective of 250 mg/L with values ranging between 527 and 650 mg/L. As detailed in the section above concerning sodium, the subject site is hydraulically isolated from the water supply aquifer. As such, the source of the chlorides is offsite and hydraulically up-gradient of the subject site. Furthermore, as chlorides are generally unattenuated in the natural environment, the chloride concentration would be expected to increase with depth in the water supply aquifer. This would also provide a natural explanation for the concentrations of chloride and sodium reported in TW2, TW3 and TW6.

The concentrations of chloride in the office park portion of the development, although generally elevated, are within the range of values observed from samples collected in neighbouring wells located close to the western and northern portions of the development. Refer to Table 2.1.4.1 in section 2.1.4 for the summary of neighbouring water quality analysis and Drawing No. PH0145-5 for the sample locations.

By conducting comparative analysis on the neighbouring sample locations, it is apparent that a source of contamination exists beyond the site to the north and west. Given the pressures placed on the City of Ottawa to reduce salt application to Regional Roads, it is anticipated that chloride (and sodium) concentrations will fall in the future as new de-icing technologies (such as liquid brine application) become mainstream.

Like sodium, chloride can be easily removed with membrane technology for the drinking water supplies in the office park portions of the site. There is no need for treatment in the residential portion.

Hardness

As the concentrations of hardness in the commercial portions of the site are similar to those of the residential, the same treatment options as those used for the residential part of the site can be utilized.

TDS

As the concentrations of TDS and levels of pH and alkalinity are similar to those of the residential portion of the subject site, encrustation may occur on heating elements. When using membrane treatment technologies, the units should be sized to accommodate the TDS concentrations to increase the time between membrane maintenance intervals.

Summary

Based on the water quality information, especially with respect to the information obtained from the new TW6 located in the commercial area, adjacent to the residential development, well construction in the residential portion of the site should be revised to target the upper part of the water supply aquifer. It is clearly apparent, when comparing the water quality from TW4 and TW5 to the other four (4) test wells, that TW4 and TW5 have lower concentrations of aesthetic parameters. As such, it would appear prudent to recommend the depth of the wells in the residential and commercial areas, where possible, to no more than approximately 37 m below the surface of the ground.

With respect to maximum treatable limits, as imposed by the antiquated values contained within Procedure D-5-5, current technologies are such that the maximum treatable limits no longer accurately reflect available treatment technologies. As such, based on the information presented in this section, the aesthetic parameters can be easily treated to meet the ODWS. As there are no health related issues with the water supply aquifer in the office park portion of the site and the indicated aesthetic parameters can be easily treated, if required, there is no scientific basis to prevent the development of the office park.

2.1.4 "Results of groundwater sampling from existing developments were not provided. Section 4.4.1 in Procedure D-5-5 indicates that sampling from the existing developments should be obtained and analysed."

Response

Samples were collected from six (6) neighbouring developments under the supervision of Paterson. The samples were collected on May 4, 2005 and submitted for analysis to Accutest Laboratories Ltd. (Accutest). The laboratory records of analysis are provided in Appendix 1. The geographical locations relative to the subject site are depicted in Drawing No. PH0145-5 in Appendix 5.

TABLE 2.1.4.1 –
SUMMARY OF NEIGHBOURING WATER QUALITY ANALYSIS

Parameter	Units	ODWS	1508	7164	7200	7281	7377	Sale Barn
Microbiological Parameters								
Total Coliforms	ct/100mL	0	0	0	0	0	0	0
E.Coli	ct/100mL	0	0	0	0	0	0	0
HPC	ct/1mL	500	1	2	12	185	16	0
Faecal Coliforms	ct/100mL	0	0	0	0	0	0	0
Faecal Streptocuccus	ct/100mL	0	0	0	0	0	0	0
Chemical Parameters (Health Related)								
Fluoride	mg/L	2.4	0.17	0.11	0.11	0.17	0.59	0.51
Nitrite	mg/L	1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Nitrate	mg/L	10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Turbidity	NTU	1	10.4	6.8				
Chemical Parameters with Aesthetic Objectives/ Operational Guidelines								
Alkalinity	mg/L	500	340	316	307	0.17	218	299
Chloride	mg/L	250	136	175	228	1536	316	399
Colour	TCU	5	<2	<2	<2	<2	<2	<2
DOC	mg/L	5	1.1	<0.5	<0.5	<0.5	<0.5	<0.5
Hydrogen Sulfide	mg/L	0.05	0.13	<0.01	<0.01	<0.01	1.40	1.10
pH		6.5-8.5	8.01	7.88	7.88	7.89	7.99	8.07
Sulphate	mg/L	500	81	91	98	87	47	69
Hardness	mg/L	100	466	463	486	617	342	5
Sodium	mg/L	20	56	82	105	807	159	418
Iron	mg/L	0.3	1.24	0.57	0.32	0.26	0.41	<0.03
Manganese	mg/L	0.05	0.05	0.10	0.06	0.06	0.03	<0.01

2.1.5 "Under Procedure D-5-5 section 4.3.1, recovery measurements following pump testing must continue until 95 % recovery, or for 24 hours, whichever is less. Data from three of the pump tests indicate that recovery monitoring data provided stops at approximately 60 to 80% recovery even though the study methodology section indicates that 95% recovery was observed in all wells. All recovery data should be provided for review."

Response

A 120 minute recover period of constant recording of water levels was performed on all wells as a standard monitoring protocol. Where 95% recover has not been achieved in a particular well at the completion of the 120 minute period, additional measurements are taken either at 18 hours or 24 hours after completion of pumping. Three test wells, TW2, TW3 and TW5 had slower recovery rates during pump testing resulting in water levels not recovering to at least 95% within the allotted time period. As such, Paterson recorded drawdown measurements for these wells within 24 hours of completion of pumping. The recovery data for these wells is provided below, as the data points were omitted from the water level data used to conduct the aquifer analysis since they were irrelevant to the analysis of the aquifer parameters.

In conjunction with supplemental field work carried out to address other comments contained within this report, TW4, TW5, and a newly constructed well, TW6, were pump tested. The drawdown data for these pump tests appear in Appendix 1. Analysis of the drawdown and recovery data indicates full recovery in less than a 24 hour period and confirms that no mining of the water supply aquifers has occurred.

2.1.6 "As per Procedure D-5-5 Section 4.3, hydraulic gradients were provided for the water supply aquifer. Hydraulic gradients for the receiving aquifer should also be provided."

Response

The receiving aquifer exists in the silty sand layer overlying the silty clay to clayey silt soils present above the bedrock. This is confirmed by water infiltrating downward through the sand being held up on the underlying low-permeable soils resulting in a perched water table. As the water exists in a perched condition, the slope of the low permeable soils and drainage network generally governs the hydraulic gradient of the receiving aquifer. Most of the drainage ditches, which form the primary drainage network, are incised into the underlying low permeable soils. This provides an outlet of water trapped within the sand layer above the low permeable soils. The hydraulic gradients for the receiving aquifer have been added to Drawing No. PH0145-3 and reflect the general trending of the perched water in the sand layer.

2.1.7 "The report does not discuss the water or sewage requirements for the proposed commercial "Professional Office Park" or the associated potential impacts. An estimate of water demand, yield and interference potential as per D-5-5, leaching bed space requirements, and sewage system impacts as per D-5-4 Section 5.6.3 should be provided."

Response

With respect to the anticipated water demand for the Professional Office Park, each building to be located on each business lot is proposed to have a gross floor area of approximately 200 m^2 (2000-2100 ft^2). The proposed use of these building is intended for office space as indicated in the application for zoning amendment. As such, using total daily design sanitary sewage flow values contained within Table 8.2.1.b of the Ontario Building Code (OBC) a value of 75 L/day/9.3 m^2 of office area is applicable. Using this value, each office building is anticipated to have a total daily design sanitary sewage flow of approximately 1650 L/day. The daily water demand for each office building will be approximately 1650 L/day; this value is one half of the quantities of water anticipated for each of the proposed dwellings within the residential subdivision. As such, for the purpose of analysis, two lots within the office park can be considered to behave as a residential lot with respect to sewage system sizing and potential well interference. Since peak water use in an office building is generally two hours in the morning followed by two hours at lunch, water demand and well interference will also be similar to a residential dwelling, however, much residential usage (nights, weekends) will differ from office use (day time).

With respect to leaching bed sizing, given that the daily design sanitary sewage flows expected from the proposed office buildings are similar to residential flows, similar leaching bed sizes to those in the residential subdivision, are expected. The lot development plan (Drawing No. PH0145-2) has been revised to reflect the proposed building footprint, well and sewage system locations for the professional office park.

2.1.8 "It is commonly accepted practice that new subdivisions have sufficient space to accommodate at least one Class 4 leaching bed (largest system area) such that the lot owner has space for a complete range of sewage system options when developing the property, or for replacement space in the event of a problem with the installed system. The proposed plan includes six lots with filter beds proposed. We recommend that the lots be revised to accommodate Class 4 leaching beds for the above noted reasons. Further, loading rates as defined by the Code and Guide for Sewage Systems, 1997, should be based on Percolation Time (T) > 50 min/cm associated with the presence of silty clays on the site. These calculations should be provided.

In addition to the above, the narrow mantles proposed may not be able to accommodate the horizontal flow into and through the mantle, based on the proposed system layout and design parameters provided for flow, percolation rate (permeability) and mantle dimensions. The layout of the sewage system and the mantle design should address potential mounding based on the assumption that negligible flow will enter the native subsurface soils to ensure the systems will function properly. The rationale and calculations should be provided."

Response

1. The six lots referred to are able to accommodate a Class 4 absorption trench leaching bed and a full range of sewage system options. The Lot Development Plan (Drawing PH0145-2) has been revised to reflect absorption trench installations.

2. Under the OBC, R.S.O. 1997, a filter bed is considered to be a Class 4 sewage system; this is the same category as an absorption trench leaching bed. When leaching bed fill is used to raise the distribution piping above high ground water table, bedrock or soils having a T>50 min/cm, it becomes a fill based leaching bed. The OBC prescribes that the leaching bed fill occupy an area of sufficient size to achieve a specific effluent loading rate for a particular range of T-times of the receiving soil. From Table 8..7.4.1.A, the maximum loading rate for a soil having a T >50 min/cm. is 4 L/m^2/day. Based on a flow of 3000 L/day, the minimum contact area of leaching bed fill required to meet the maximum loading rate of 4 L/m^2/day is 750 m^2. The absorption trench leaching beds shown on Drawing No. PH0145-2 have a contact area of approximately 761 m^2 and a loading rate of 3.9 L/m^2/day.

It is likely that all of the sewage systems will be installed onto the silty sand overlying the low permeable soils due to the perched water table condition. As such, the leaching bed areas shown on Drawing No. PH0145-2 reflect the absolute maximum contact area requirements. More room is also available by moving the house back on the lot. Proposed zoning for the rear yard set back is 10.5m.

With respect to the mantle configuration, the mantles are not considered to be narrow. The width of the leaching bed and mantle areas provide sufficient lateral dispersal of effluent beneath an artificially constructed subgrade to prevent significant mounding beneath the distribution pipes. Furthermore, the OBC considers only hydraulic loading rates onto the soils and not mounding beneath the leaching bed. Given this fact, the design of the sewage systems is considered to be in total compliance with OBC requirements.

It is expected that, where low permeable soils are encountered in the preparation of the subgrade for the leaching bed, that the subgrade surface will be suitably sloped and scarified. The subgrade slope, ideally at a minimum of 2%, is expected to extend from upper edge of the bed (header end) and slope through the bed and mantle. The toe of the mantle must be free draining into permeable native soils, or imported topsoil. Given that all of the sewage systems are designated for the front yard and will slope towards to the road side ditches, effluent mounding will be minimal and should not impede the flow of oxygen into the leaching bed fill beneath the clear stone layer. As always, care must be taken to ensure that the mantles are kept free from compaction and the surface of the leaching beds shaped to shed surface water away from the bed area.

2.1.9 "Some of the proposed sewage systems are shown with the mantle direction extending up slope or side slope and not in the direction of flow, based on the existing topography. Additional details on how these systems will be constructed regarding site topography should be provided."

Response

This comment has been addressed in response to Comment No. 8.

It is imperative to note that, in accordance with the City of Ottawa policies regarding subdivision planning, that it is preferred to maintain consistency with respect to the positioning of leaching beds relative to the wells on each lot. This is to avoid a "flip-flop" scenario where leaching beds alternate from front to rear of the lot depending on site topography. It is considered to be a superior design solution where road side ditches and rear yard swales can be utilized to achieve consistent leaching bed positioning regardless of site topography. The post development drainage patterns have been taken into account and the overall subdivision design is good and is expected to function successfully in a manner similar to other Greely developments.

2.1.10 "Potential hydraulic connections between the receiving overburden and the water supply aquifer were investigated in the report. Monitoring wells (MW) were installed in five test pits. TP18/MW5 and TP21/MW6 were installed in relatively close proximity to TW2 and TW3. No data was provided from these monitoring wells during any of the pump tests. TP28/MW7, TP28/MW8 and TP30/MW9 were installed in relatively close proximity to TW4 and TW5. Data from these MW's collected during pumping of TW4 and TW5 was provided. In summary, water levels dropped between 1 to 3.5 cm in those MW's during TW4 and TW5 pumping tests.

The report indicates that the decline in water levels could be associated with barometric fluctuations and not due to interconnection between aquifers. Barometric pressure data from Environment Canada was provided in the report. The hourly barometric pressure data corresponding with the pumping of TW4 (June 21, 2005) indicates that pressure was falling continuously

> **throughout the day. A drop in pressure would be expected to cause a rise in water levels. Therefore, due to barometric influences, the hydraulic interconnection may be more significant than the water level data suggests. The hourly barometric pressure data that corresponds with the pumping of TW5 (June 22, 2005) indicates that pressure was stable throughout the day. This may suggest that barometric pressure would not have significantly affected the water level data.**
>
> **The report also concludes that the aquifer is a confined aquifer due to significant pressure on the aquifer; however, examining the data provided indicates no significant pressure differential between the water supply aquifer and the overburden wells (approximately 0.10 to 0.30 metres difference). As such, the conclusion that the water supply aquifer is hydraulically isolated, or that the supply aquifer is confined is not well supported by the data provided.**
>
> **Without sufficient evidence of hydrogeological isolation, an impact assessment based on dilution methodology is recommended for the residential and commercial portions of the proposed development. Given that the silty clay unit is discontinuous across the site and that the elevated sodium and chloride in test wells TW1, TW2, and TW3 indicates anthropogenic impacts to the bedrock groundwater, it is our opinion that hydrogeological isolation has not been adequately demonstrated for this site."**

Response

Additional field work has been carried out on the site in order to demonstrate that the water supply aquifer is isolated from the receiving aquifer via an aquitard consisting of low permeable soils and unfractured bedrock above the water supply aquifers located deep beneath the site. The methodology utilized to conduct this additional work was first utilized in the determination of isolation for the South Village and Woodstream (JDPA Report NO. G8105-12). The methodology data, results and conclusion were confirmed to be valid and accepted by the Ontario Municipal Board Order No. 1725 dated November 1, 2004.

The methodology is summarized below and Drawing No. PH0145-1 has been updated to reflect the new monitoring well and borehole information:

Three monitoring wells, consisting of 38 mm diameter PVC piping with end caps and a slotted 3 m section, were installed within 5 m of each of TW4, TW5 and

TW6. The nomenclature of each monitoring well was established relative to the test well it surrounded. For example, for TW4, the monitoring wells were numbered MW4-1, MW4-2 and MW4-3.

All of the monitoring wells, with the exception of MW6-3, were installed into the silty clay to clayey silt soils underlying the silty sand layer. The average depth of these monitoring wells were 2.5 m below ground surface. In the case of MW6-3, the well was advanced to the bedrock. The casing above the screened portion was sealed with clay and the casing extended above the ground surface. The depth of MW6-3 is approximately 8.5 m below ground surface.

A constant rate pump test was conducted for each of TW4, TW5 and TW6. The duration of the pumping was for six (6) hours. The pumping rate was set at between 1.88 and 2.14 L/s corresponding to between 40,600 L and 46,200 L pumped from the aquifer during each test. The drawdown was periodically monitored in the surrounding test wells, monitoring wells adjacent to the pumped well and in the monitoring wells surrounding the other test wells.

Water levels in each test well and monitoring well were recorded for several days before, during, and after, the pump testing to establish a baseline of water level fluctuations on the site. This data is summarized in Figure A-1-1 (refer to Appendix 1).

Analysis of Figure A-1-1 illustrates the behaviour of the water levels in the monitoring wells was independent of the pump testing.

The discharge from each pumped well was carefully directed to functional drainage ditches located on the subject site. The minimum discharge distance was 50 m from the pumping well with no water being allowed to discharge onto the surface of the ground.

Table 2.1.10.1 below summarizes the results of each pump test with respect to pumping rates, volumes pumped and drawdown in pumping and monitoring wells.

TABLE 2.1.10.1-
SUMMARY OF HYDRAULIC INTERFERENCE TESTS

Pumping Well	Pump Rate (L/min)	Quantity Pumped (L)	Total Drawdown Measured in Pumped Well (m)	Overburden Monitoring Well Drawdown (m)
TW4	112.5	40,500	7.03	0.01 m in MW4-1 0 m in MW4-2 0 m in MW4-3 0 m in MW6-1 0 m in MW6-2 0 m in MW6-3
TW5	115.2	41, 472	0.46	0 m in MW5-1 0 m in MW5-2 0.01 m in MW5-3 0 m in MW4-1 0 m in MW4-2 0.01 m in MW4-3
TW6	128.4	46,224	0.78	-0.02 m in MW6-1 -0.04 m MW6-2 0 m in MW6-3 -0.01 m in MW4-1 -0.01 m in MW4-2 0 m in MW4-3

Analysis of Table 2.1.10.1 reveals that there was no drawdown observed in the monitoring wells surrounding the pumped well and the surrounding monitoring wells. Furthermore, as supported by Figure A-1-1, the water levels in the monitoring wells behaved in a manner independent of pumping.

Drawdown was observed, however, in most of the test wells during each pump test. As the test wells were located over 200 m apart, the cone of influence easily extended this distance considering over 40,000 L was removed during each pump test. As such, the monitoring wells located within 5 m of the test well being pumped, the monitoring wells, especially MW6-3 located on the face of the bedrock, should have recorded some appreciable drawdown if a hydraulic interconnection exists between the overburden and the water supply aquifer.

The lack of drawdown in any of the monitoring wells during pumping, combined with the absence of nitrates and other indicators of surface water influence on the water supply aquifer provides sufficient evidence to the isolation argument established in the original report.

In addition to the monitoring well installation and pump testing works performed at the site, a series of test pits were put down in the proposed residential and office park areas. The test pits put down in the residential area, denoted on Drawing No. PH0145-1 as TP32 and TP33 (refer to Appendix 1 for Soil Profile Records), encountered similar deposits as had been ascertained in the terrain analysis in the original report. Specifically, the presence of a thick deposit of low permeable silty clay soil was encountered and confirms the lateral extent of the layer.

Based on the results of the testing performed in the original report (refer to Appendix 1 for grain size and hydrometer analyses), the silty clay soils, are "practically impervious". This based on cross-referencing the estimated hydraulic conductivity from Table 1 of Report No. PH0145-REP.01 with the Casagrande and Fadum classification system.

An additional test pit, TP34 was put down in the office park area (refer to Appendix 1 for Soil Profile Report and Drawing PH0145-1 in Appendix 5 for location). The purpose of constructing this test pit was to determine the exact nature of the glacial till deposits in this portion of the subject site. Based on field observations, supported by the grain size distribution curve created from samples of the glacial till (refer to Appendix 1 for grain size distribution curve), the glacial till deposit increases in density with depth and has a predominant matrix of fine grained sandy clay soils. Based on the degree of compaction present in the layer, and considering the dominant sandy clay matrix, the hydraulic conductivity of the glacial till layer tends closer to that of sandy clay, at between 1×10^{-4} to less than 1×10^{-6} cm/sec. Based on these hydraulic conductivities, and considering the very dense soil structure, the till is considered to be "practically impervious" according to the Casagrande and Fadum classification system.

2.2 Comments Received from South Nation Conservation

2.2.1 "The impacts on the watershed environment occurring due to the septic effluent migration have not been evaluated. Report has also not commented on the presence of any hydrogeological sensitive features around the site that may be impacted by this development."

Response

In reviewing the requirements of Procedure D-5-5, there is no reference to impacts on the watershed environment. The migration of septic effluent, as it pertains to Procedure D-5-5 only, can be addressed. As detailed in the response to comments made by Golder in Section 2.1.10, it has been established that the water supply aquifer is hydraulically isolated from the proposed development. As such, septic effluent migration is limited to the receiving aquifer which exists as a perched water table condition within the silty sand layer overlying the low permeable soils present over bedrock. Since the design of the septic systems is based on subsurface dispersal of the treated effluent, the effluent will move downward until it encounters the perched groundwater. There, the effluent will move with the hydraulic gradient as established in the response to the comment by Golder detailed in Section 2.1.6. The post treatment flows will benefit from additional dilution with the stormwater management systems employed by this developer. The receiving aquifer moves in a gradual direction easterly and all post treatment flows are cut off from any offsite impact by the existence of a hydraulic barrier in the form of Shields Municipal Drain, along the entire eastern boundary of the site. The deep ditch located perpendicular to the hydraulic gradient of the receiving aquifer and stretching across the width of the development, will act as a hydraulic barrier to offsite migration of septic system effluent. This coupled with the fact that there are no hydrogeologically sensitive features within 500 m in the down-gradient direction of the site, the requirements of Procedure D-5-5 have been met.

2.2.2 "The groundwater flow directions in the aquifer receiving the septic effluent have not been established. This information is necessary to determine the direction of septic effluent migration and whether the impacts are expected on the down-gradient land uses."

Response

This comment has been previously addressed in responses detailed in Section 2.1.6 and 2.2.1 of this addendum report.

2.2.3 "The submission has commented on the potential well interference and has calculated maximum drawdown within the development resulting from the pumping of on-site wells. However, report does not make it clear as to how far the drawdown influence is expected to extend from pumping in the on-site wells and if this will be impacting the neighbouring wells in the surrounding developments. The underlying assumptions and rationales for use of parameters values in the calculations for max drawdown are also not very clearly discussed in the report."

Response

Analysis of the constant rate pump test data for test wells located along the perimeter of the residential and commercial areas, using the Cooper-Jacobs graphical analysis of Distance-Drawdown, indicates that the water supply aquifer has high transmissivity and moderate storativity values. The cones of influence created at the pumping rates used for the pumping tests (1.4 to 1.88 L/s) are not representative of actual pumping rates and durations of pumping at the site. Interpretation of the Distance-Drawdown data for pumping of the test wells at rates of 0.035 L/s (3000 L/day), combined with the rates of recharge observed during recovery, and potential well interference calculations contained within the original report, suggest the cone of influence will not extend more than 10 to 20 m under extended pumping events of any single well. As such, neighbouring offsite wells will remain unaffected by pumping of the wells along the perimeter of the development.

2.2.4 "The hydrogeological study report has not provided any information on the recharge areas for the on-site wells. This information is [a] critical part of site hydrogeological characterization and is necessary for establishing vulnerability of the aquifer."

Response

As established in the original report, and substantiated with additional testing, as summarized in Section 2.1.10 of this addendum, the site is hydraulically isolated from the water supply aquifers beneath. The overburden soils act as an aquitard preventing contaminant migration to the water supply aquifer. This, combined with the Theis-like response to pumping, and the established confining pressures acting on the water supply aquifer, confirms that the water supply aquifer is confined. As such, the location of the recharge area must be offsite. In any event, following a review of the Jacques Whitford well sampling study and the modeling study, there is no area in and around the Village of Greely which represents a problem with respect to recharge for the subject site.

2.2.5 "The estimates of conductivities for soils are based on the grain size/hydrometer analysis in lab and in-situ hydraulic conductivity tests were not conducted to support the isolation theory and to establish the characteristics of the designated isolating layer. Also, the lab reports for hydrometer analysis are not attached with the report."

The grain size distribution curves for the silty clay and silt soils were provided in the original report. These curves are provided, again, in Appendix 1.

With respect to in-situ hydraulic conductivity tests, it is our experience that estimates of hydraulic conductivity are more accurate when grain size analysis is used. Although the argument that fissures, wormholes, etc. can exist in the soil that cause short circuiting from the surface to the bedrock, this is seldom evidenced where the depth of overburden is thicker than a few metres. The subject site is covered with approximately 7 m of very low permeable soil overlying competent bedrock.

The lower 4 to 6 m of silty clay overburden was visually inspected by a qualified Paterson engineer during installation of MW6-3 and during the construction of numerous exploratory test pits and excavations in the till areas and in the vicinity of the proposed surface water ponds. Based on these observations, the silty clay to clayey silt soil is very stiff and generally exhibits homogeneous structure at depths 2 m into the low permeable soils with no apparent fissures. The borehole logs for these holes are provided in Appendix 1.

With respect to the south west portion of the site noted to contain deposits of fluvioglacial till deposits, the till exists as a silty clay till with cobbles and boulders held tightly into a very dense structure. Hydrometer analysis was performed on samples of the till and the results of the analysis appear in Appendix 1.

An estimate of the residence time required for infiltrating effluent to migrate through the overburden to the top of the bedrock can be estimated. However, it must be noted that the permeability of the sand layer overlying the low permeable soils is at least four (4) magnitudes greater than the most permeable estimates of the hydraulic conductivity of the low permeable soils, and as a result, will direct infiltrating surface water and septic effluent along the surface with minimal deep infiltration. That having been stated, based on a hydraulic conductivity of 10^{-6} cm/s, and given a vertical distance of travel of 6.5 m, the time required for effluent to migrate to the face of the bedrock will be approximately 75 years. Moreover, it is much more likely that, based on the stiffness and homogeneity of the low permeable soils present over the rock, the hydraulic conductivity is less than 10^{-6} cm/s making the residence time somewhere from 75 to much more than 750 years.

2.2.6 "Information provided on the depths of the various soil layers especially the silty clay layer was not confirmed by drilling deeper test pits or boreholes. The only soil information available [from] deeper depths is from the test well records which do not indicate encountering any silty clay layer. Establishing the depth and extent of the isolation layer is an important part of the site investigations and is necessary to determine if indeed the isolation deposits are massive and of sufficient depth to prevent downward migration of the septic effluent to the water supply aquifers. Report has also not provided any information whether the isolation is deemed as extending beyond the site boundaries to at least 500m in all directions."

Response

The issues related to the extent, hydraulic conductivity and homogeneity of the isolative layers existing on this site have been detailed in Section 2.2.5 of this addendum.

We do not rely on the observations of well drillers as an accurate or reliable source of information with respect to subsurface soil conditions. These observations are personal, anecdotal and not based upon grain size analysis. The simple fact is that, to the well driller, silty clay, silt and clayey till having low residual moisture contents, will often appear as silt to fine sand with the only discernable material being the portions of pulverized gravel and boulders in the case of till. As TW1 TW2 and TW3 were the first wells constructed, and these wells intercepted the glacial till layers, it is likely that the well driller did not take careful notes while drilling through the overburden material (largely unimportant to the driller) and went by memory to complete the well records.

That is why it is important for the hydrogeologist to conduct his own collection of research data, observations, laboratory tests and reach accurate conclusions. According to Procedure D-5-5, the hydrogeological consultant, "must clearly define those portions of the subsurface which will be affected by the effluent." Clearly, in this case, the portions of the subsurface that could, potentially, be affected would be down-gradient from the site. However, there is a deep ditch stretching along Salebarn Road to the east of the site, which acts as a hydraulic barrier to the movement of surface water and shallow groundwater (i.e. water moving through the sand above the low permeable soils). Since it has been established that the subsurface dispersal of effluent will take place within the silty sand layer, the effluent cannot move into lands to the east of the site. Therefore, the site is isolated both vertically from infiltration into the water supply aquifer and horizontally from down-gradient migration into lands to the east of the site. As such, it is conclusively established that there will be no offsite impacts.

2.2.7 "Hydraulic response monitoring was conducted to determine if interconnection is present between the water supply aquifer and overlying deposits. Based on the observations [from] 6 hours pump test and monitors installed close to the surface, the report has concluded that no interconnection is present. However, accounting for depth of the pumping wells and the surficial monitors, the 6 hour monitoring/pumping period is considered very small for any significant changes to show up in the monitors. Normally for a hydraulic interconnectivity study involving multiple aquifers, the multilevel piezom[e]ters are installed at the minimum in all geological formations present above the aquifer being pumped.

Since the overburden was not explored to the full extent (up to bedrock), it is not clear if any other significant aquifer or formations are present on the site which might need to be monitored to establish the extent of the hydraulic response.

Also, for hydraulic response study, the pumping is continued for far longer time then [than] was done in this case; followed by an even longer time of monitoring to observe the changes in vertical hydraulic gradients. Due to the mentioned shortcomings, the results of the hydraulic response monitoring are considered inconclusive."

Response

This comment has been previously addressed in Sections 2.1.10 and 2.2.5 of this Addendum report.

2.2.8 "The report documents that during the monitoring for the hydraulic response to pumping in water supply aquifer, the water level fluctuations were observed in the monitoring wells installed close to the surface. Although [the] report has attributed these changes to the barometric pressure changes in the atmosphere and provided raw data from Environment Canada, however, due to the non-availability of observed barometric pressures vs drawdown graphs during pumping and non-pumping events, it is not entirely clear if the water table fluctuations were indeed corresponding to the barometric changes."

Response

The retesting of to confirm hydraulic isolation has been summarized in Section 2.1.10 of this Addendum.

2.2.9 "The drawdown vs time graphs shown in the appendix 4 are missing identifiers for observation wells which were used for watertable monitoring during pumping of test wells. Observation wells/monitoring wells No. 1-5 are not mentioned in [the] report nor marked on figure PH0145-1."

Response

The revised original aquifer analysis information, as well as the aquifer analysis conducted on repeat pumping of TW4 and TW5 and the pumping of TW6, are all provided in Appendix 1. Furthermore, Drawing No. PH0145-1 has been revised to reflect all of the test well and monitoring well locations used in the confirmation testing for hydraulic isolation.

2.2.10 "The test wells 1, 4, and 5 (and corresponding monitored test wells) showing signs of recharge indicating that even for a single well, the 6 hour pumping duration has resulted in the hydraulic head changes to initiate recharge contributions into [the] aquifer being pumped (and also in aquifer for corresponding monitored test wells). Therefore, the statement made in the report that supply aquifer is sufficiently isolated from the overburden receiving aquifer is not considered to be holding for protecting the water supply aquifer from septic effluent as implied by the report especially during pumping events. Once the sub-division is fully built and all wells are pumping (even more frequently), far more hydraulic gradient changes will occur in the aquifer being pumped resulting in more leakage into the water supply aquifer.

Report has not commented on this behaviour noted during the pump tests and neither installed multilevel piezom[e]ters at strategic elevations in the geologic formations to see the extent of the hydraulic head changes. This info is necessary to characterize the aquitard response and to establish if post development changes are of such a degree in the overlying aquifers/aquitards that contamination released in the aquifer receiving the septic effluent will start migrating towards the water supply aquifer. The multilevel piezometer installation would have also helped to clarify as to which

formation is contributing to the aquifer and what is the extent of isolation."

Response

To further the explanation and findings detailed in Section 2.1.10 of this Addendum, the original "recharge" noted in TW1, TW4 and TW5 was not from the overburden. Rather, given the high transmissivity of the aquifer, the pumping rate was insufficient to reduce pressure in the aquifer over the duration of the pump test. As a result, the effect of recharge can actually be attributed to the movement of water into the cone of depression as the test wells were being pumped. This is known as stabilization. Often as wells begin to stabilize as they are pumped the water level will exhibit signs of recovery as an equilibrium is established.

The findings of the follow-up testing, performed under very controlled conditions, confirms that the recharge in the original testing was related to the pressure differential and not vertical movement. Furthermore, graphical analysis using Hantush modeling for aquifer analysis in the follow up testing, confirmed that the TW4, TW5 and TW6 exhibit Theis-like response with no significant deviation that would indicate leaky aquifer conditions.

2.2.11 "Water chemistry analysis shows the presence of Dissolved Organic Carbon (DOC), Ammonia, Sodium and Organic Nitrogen. Report has not commented on the sources of these parameters neither established if this is an indication of surficial impacts."

Response

The neighbouring water quality analysis, detailed in Section 2.1.4 of this Addendum, indicates similar levels of these parameters in the surrounding wells. The presence of minimal traces of DOC, ammonia and organic nitrogen are typically found in anaerobic groundwater. This lends further evidence to hydraulic isolation as surface water infiltrating directly from the surface above the water supply aquifers at the site would be aerobic if it moved quickly downward. Rather, it is likely that, given the neighbouring analyses, these parameters are merely indicative of the water bearing formations and signify isolated groundwater. The absence of other indicators of surface water influence, such as nitrates and bacteria, in the water supply aquifer further evidences this .

2.2.12 "Exceedances in Hydrogen Sulphide (TW4), Iron, Manganes[e], Hardness, Turbidity and Total Dissolved Solids were noted in water chemistry analysis and report has concluded that this is consistent with the geo-chemistry of the are[a] and with supply formation. The basis of this conclusion is not entirely supportable by report as no additional area wide geo-chemistry data or regional study references have been presented to support this conclusion.

The report also did not analyse sufficient water samples from surrounding wells and neither any interviews were conducted with well owners to [establish] if any incidences of adverse water quality have happened in the past. In any case, due to the exceedances in the already mentioned parameters above the Ontario Drinking Water Standards, the raw water is not considered to be meeting the required potability criteria."

Response

The updated water quality analyses for the test wells, and neighbouring wells have been provided in Appendix 1 and the analysis was summarized in Section 2.1.4 of this report.

Interviews were conducted with the residents where the water samples were collected, with copies of these interviews provided in Appendix 1. A review of the interviews confirms the absence of adverse water quality. Furthermore, most residents indicate the water is plentiful, but quite hard. This appears indicative of the water quality results for the area.

The water quality from both the surrounding wells and the test wells put down on the subject site meet all health related parameters in the ODWS. The only issues related to exceedances of the ODWS is in aesthetic parameters. The aesthetic parameters have been demonstrated to be easily treatable to achieve the aesthetic objectives as the concentrations of these parameters do not exceed current treatable limits, as confirmed by the Water Quality Association.

2.1.13 "The water quality analysis did not include the pesticides and herbicides parameters to determine if any impacts from the historic agricultural practices on-site and in surrounding, as indicated in the report, have occurred on the water supply aquifer. Surrounding well owners were not interviewed for adverse water quantity shortages and/or to determine if cases of septic malfunction have occurred in

the past. Report has not indicated if Chlorine measurements were taken during the well sampling."

Response

It is noted that there is no scientific justification for this comment. The half life of the herbicides is sufficiently brief to pose no known risk at this location. The consultant is not aware of any precedent for such testing in any subdivision in the Greely area. Furthermore, it is noted that in the JWEL well sampling study conducted in 2002, a single well sample was tested for a range of contaminants. No contamination was detected even though the sample was located in an active agricultural area, immediately east of the subject site. There is no recommendation for this type of testing in the JWEL sampling or modeling studies nor any historical practices which would indicate a need for such testing.

Notwithstanding the foregoing, through a series of interviews, it was ascertained that the property has, in the past, had herbicides applied to the land. Specifically, an Atrazine derivative was used. A water sample was collected from TW4, located at the down-gradient end of the site, which is most reflective of possible water supply aquifer contamination. The laboratory analysis report is provided in Appendix 2.

The analysis did not reveal any presence of Atrazine in the water supply aquifer intercepted by TW4.

With respect to interviews with surrounding well owners, this issue was addressed in Section 2.1.12 of this Addendum.

With respect to the issues surrounding chlorine measurements, the clarification of the sampling methodology has been provided in Section 2.1.1. of this Addendum.

2.1.14 "Site cross-section in appendix 5 has grouped all the overburden above the bedrock as silty clay. This cross-section is not considered representative of site conditions as test pit logs show the presence of other soil types and the confirmatory information on soils below 4.6m was not carried out. In addition, central and northern portions of the site do not have sufficient test pit to establish the soil conditions. The same portions of the site do not have test wells or other deep boreholes to establish the site conditions in those parts and to support the impermeable layer presence."

Response

This comment has been addressed in several different sections of this Addendum. No further comment is required in this matter.

The cross-section of the site, as depicted in Drawing PH0145-4 has been revised to reflect the additional test well, monitoring well and test pit information obtained from the central and northern portions of the site.

2.1.15 "Lot development plan showing progression of phases and lot sizes is not available. The report has not outlined a monitoring program [t]hat will be implemented for recommendation of the subsequent phase of development."

Response

The phasing of the lots has been established as follows:1-17, 34-47,64,65, and 69-75. Phase 2 would be the balance of the lots.

The monitoring program for the release of Phase 2 will be the same established for Sunset Lakes and according to written correspondence with former MOE director, Kirk Hansen indicating the need for 20% of the wells to be completed and sampled in Phase 1. Certificates of Completion for the sewage systems for a total of eight (8) lots will be provided as well as observations made from field inspection by a qualified engineer. Furthermore, well compliance certificates will be provided as part of the report. Two (2) original test wells will be tested for the usual parameters, if available. Six (6) wells will be tested for Total Coliform, E.coli, and nitrates only.

Prepared by:

Robert A. Passmore, B.Eng.

Stephen J. Walker, P.Eng.

APPENDIX 1

SUPPORTING DOCUMENTATION
TERRAIN ANALYSIS DOCUMENTS

1. Soil Profile & Test Pit Data Sheets
2. Grain Size Distribution and Classification Curves

patersongroup Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic

REMARKS

BORINGS BY Backhoe

DATE 26 APR 06

FILE NO. PH0145

HOLE NO. TP32

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	86.15		
TOPSOIL 0.25	■								
Brown medium SAND, trace silt 1.60	⁘					1	85.15		
SILTY CLAY	▨					2	84.15		
	▨					3	83.15		▽
4.20	▨					4	82.15		
End of Test Pit (Water infiltration @ 2.8m depth)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic

REMARKS

BORINGS BY Backhoe

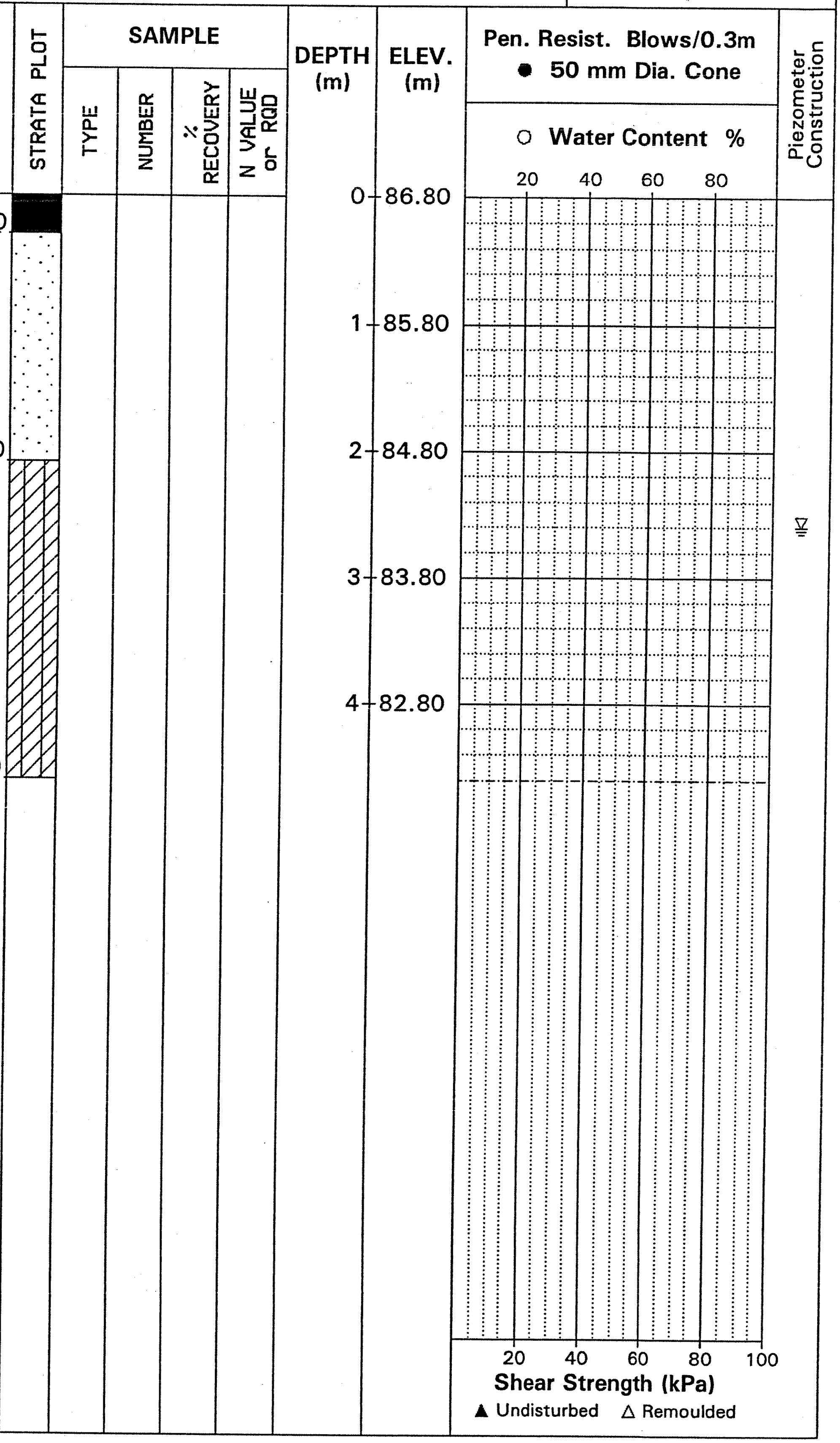
DATE 26 APR 06

FILE NO. PH0145

HOLE NO. TP33

SOIL DESCRIPTION	
GROUND SURFACE	
TOPSOIL	0.30
Brown medium SAND, trace silt	2.10
SILTY CLAY to SILT	4.60
End of Test Pit	

(Water infiltration @ 2.6m depth)



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SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic

REMARKS

BORINGS BY Backhoe

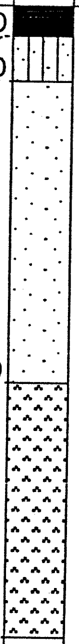
DATE 26 APR 06

FILE NO. PH0145

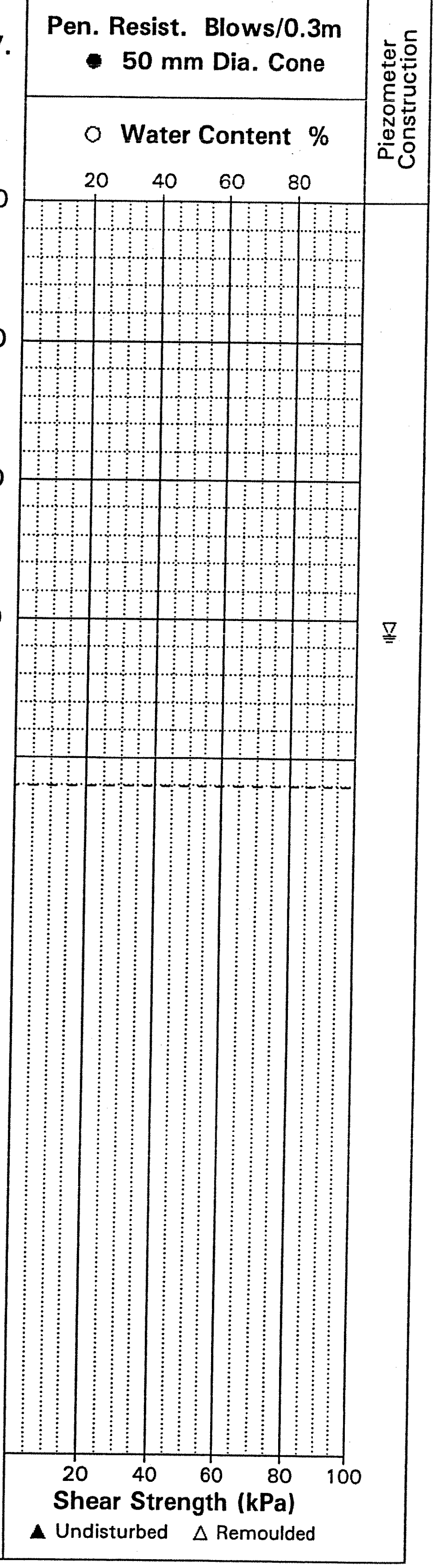
HOLE NO. TP34

SOIL DESCRIPTION	Depth to base (m)
GROUND SURFACE	
TOPSOIL	0.20
Brown SILTY SAND	0.50
Brown SAND, trace silt	2.50
GLACIAL TILL	4.20
End of Test Pit	

(Water infiltration @ 3.1m depth)



SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
				0	89.80
				1	88.80
				2	87.80
				3	86.80
				4	85.80



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SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic

REMARKS

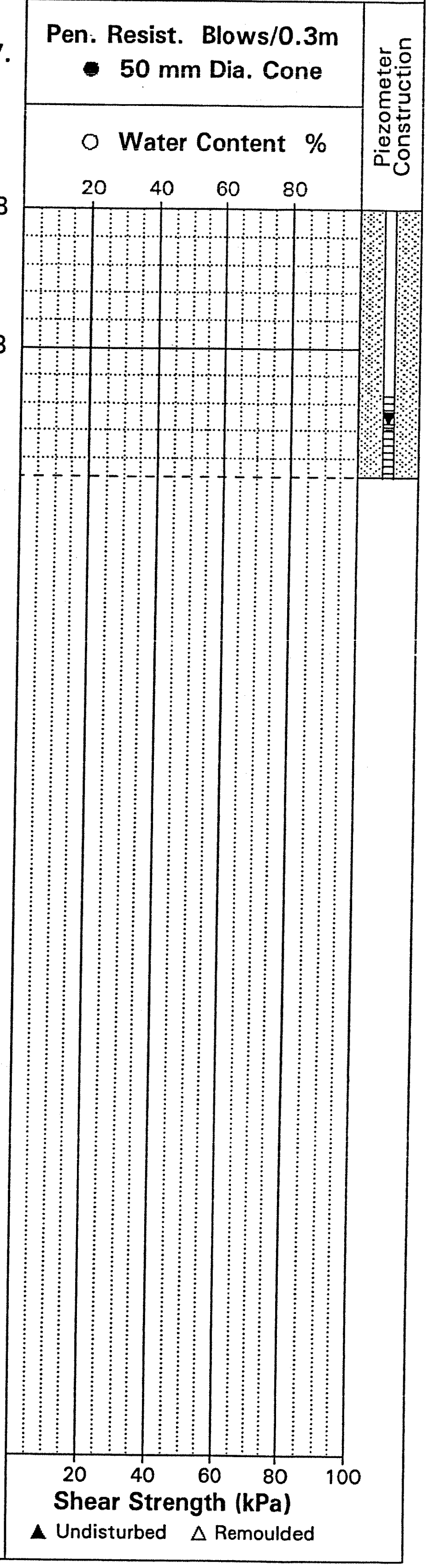
BORINGS BY Backhoe

DATE 25 APR 06

FILE NO. PH0145

HOLE NO. MW 4-1

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	85.88
TOPSOIL 0.25							
Brown medium SAND, trace silt 1.94						1	84.88
End of Monitoring Well Monitoring well terminated on silty clay @ 1.94m depth (GWL @ 1.55m-May 5/06)							



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SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic

FILE NO. PH0145

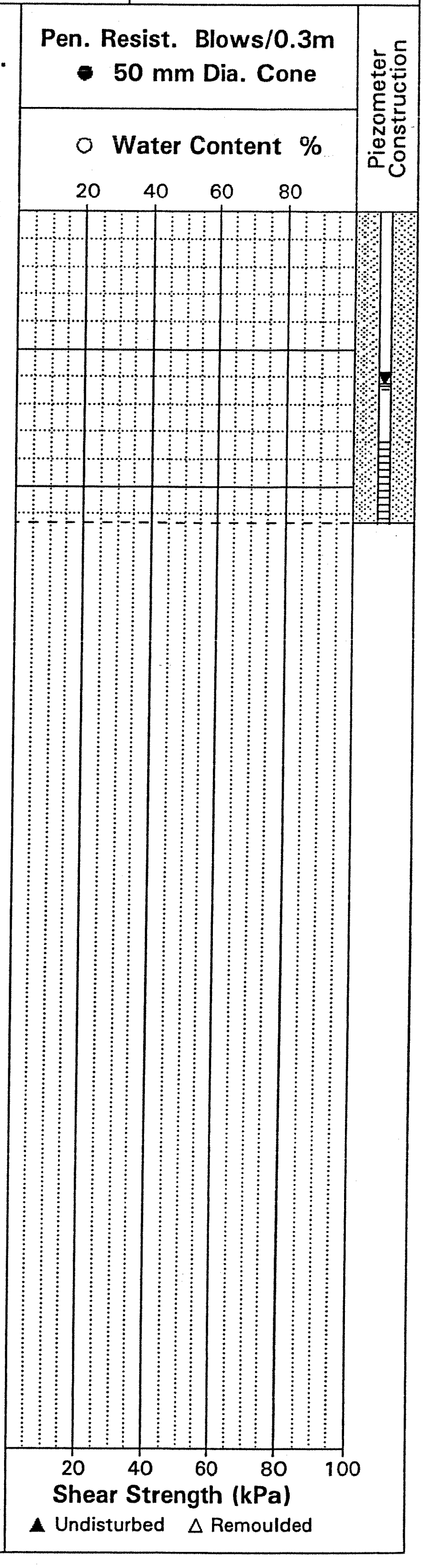
REMARKS

HOLE NO. MW 4-2

BORINGS BY Backhoe

DATE 25 APR 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	85.91
TOPSOIL 0.25	▇						
Brown medium SAND, trace silt 2.27	⁘					1	84.91
						2	83.91
End of Monitoring Well Monitoring well terminated on silty clay @ 2.27m depth (GWL @ 1.25m-May 5/06)							



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SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic

REMARKS

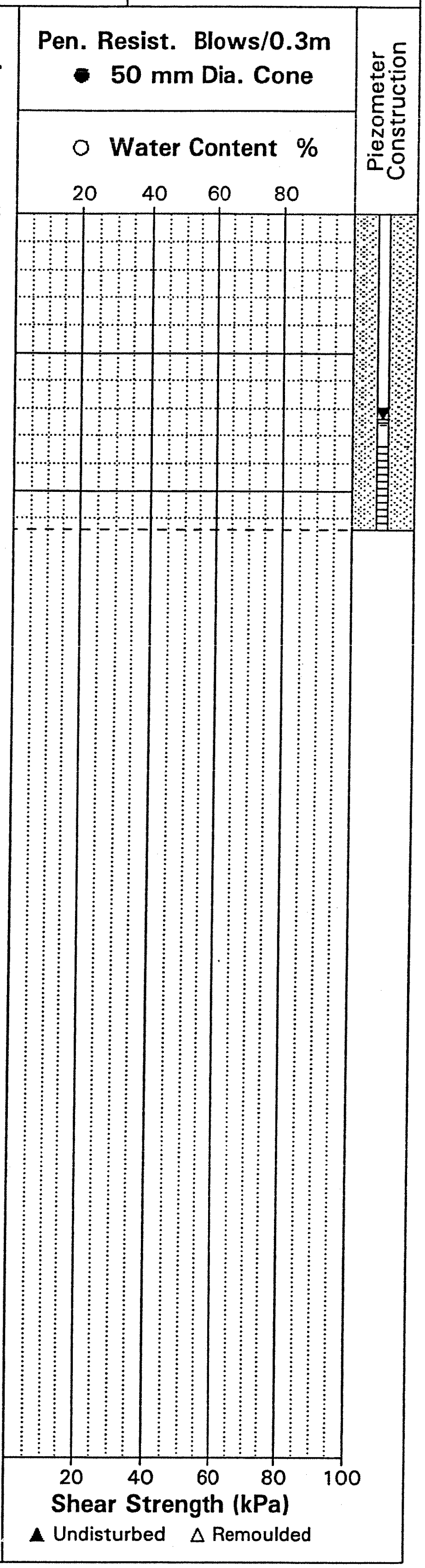
BORINGS BY Backhoe

DATE 25 APR 06

FILE NO. PH0145

HOLE NO. MW 4-3

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
TOPSOIL 0.22						0	85.86
Brown medium SAND, trace silt 2.28						1	84.86
						2	83.86
End of Monitoring Well Monitoring well terminated on silty clay @ 2.28m depth (GWL @ 1.48m-May 5/06)							



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SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic

REMARKS

BORINGS BY Backhoe

DATE 26 APR 06

FILE NO. PH0145

HOLE NO. MW 5-1

SOIL DESCRIPTION

GROUND SURFACE

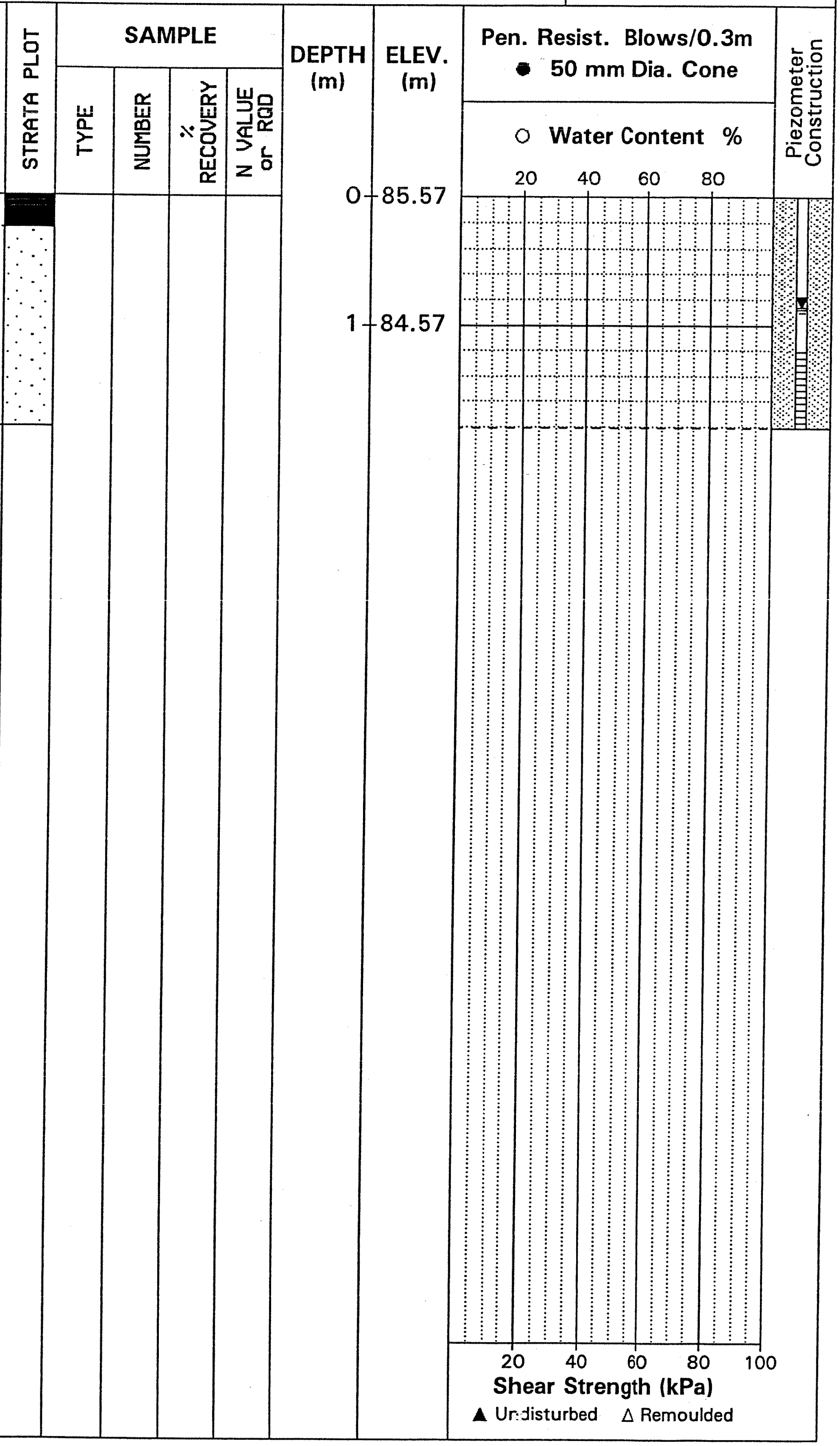
TOPSOIL 0.25

Brown medium SAND, trace silt 1.81

End of Monitoring Well

Monitoring well terminated on silty clay @ 1.81m depth

(GWL @ 0.86m-May 5/06)



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SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic

REMARKS

BORINGS BY Backhoe

DATE 26 APR 06

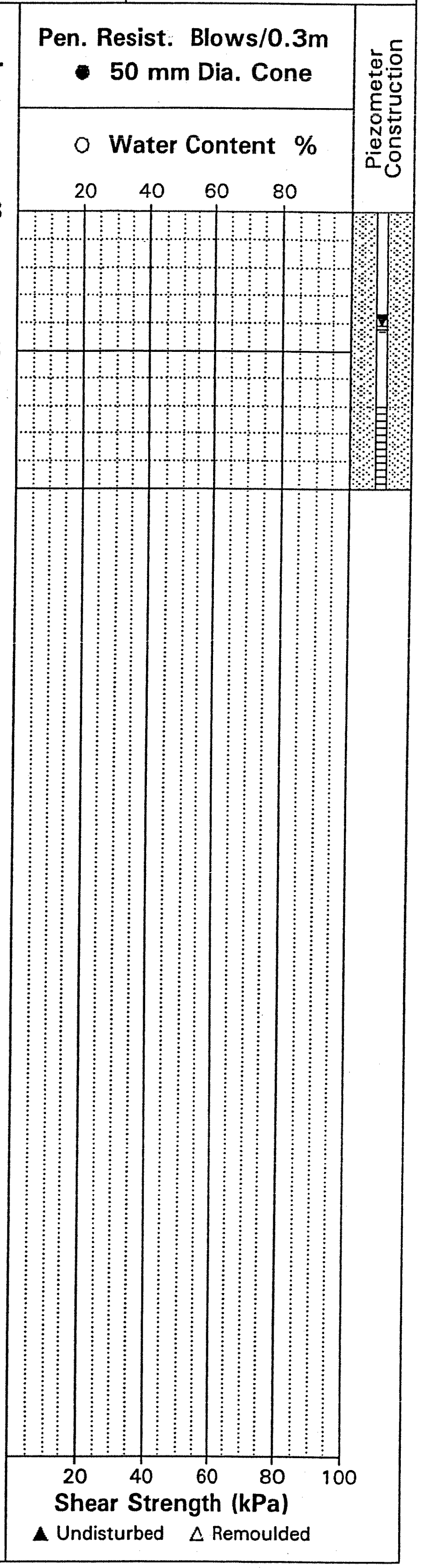
FILE NO. PH0145

HOLE NO. MW 5-2

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	85.58
TOPSOIL 0.30	■						
Brown medium SAND, trace silt 2.00	⁘					1	84.58
End of Monitoring Well						2	83.58

Monitoring well terminated on silty clay @ 2.00m depth

(GWL @ 0.82m-May 5/06)



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SOIL PROFILE & TEST DATA

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Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic

REMARKS

BORINGS BY Backhoe

DATE 26 APR 06

FILE NO. PH0145

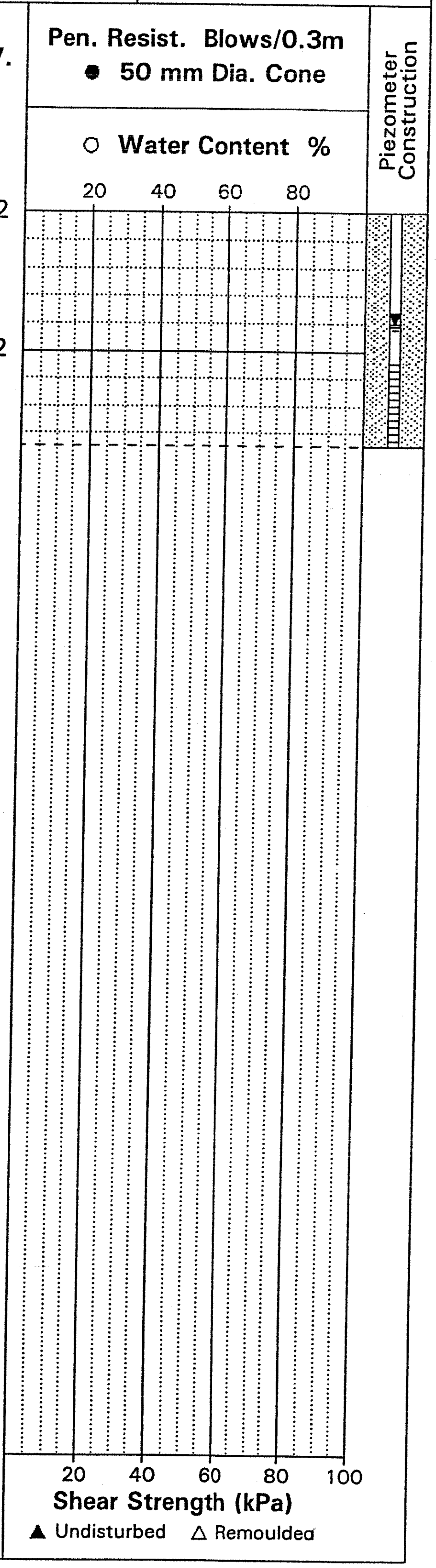
HOLE NO. MW 5-3

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
TOPSOIL 0.25						0	85.52
Brown medium SAND, trace silt 1.69						1	84.52

End of Monitoring Well

Monitoring well terminated on silty clay @ 1.69m depth

(GWL @ 0.80m-May 5/06)



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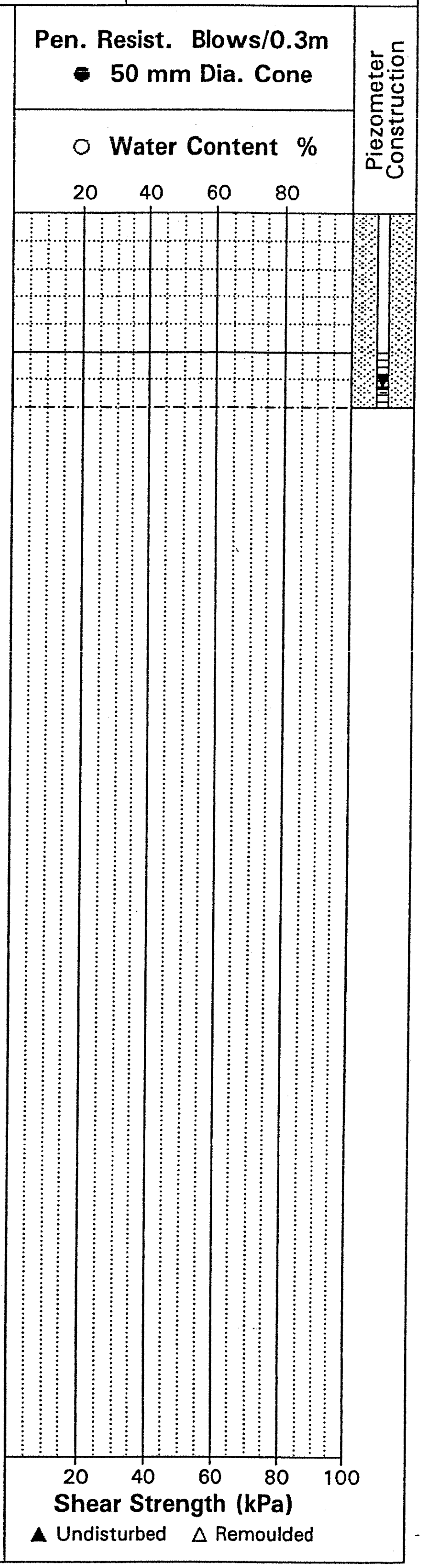
SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM	Approximate geodetic
REMARKS	
BORINGS BY	Backhoe
DATE	25 APR 06
FILE NO.	PH0145
HOLE NO.	MW 6-1

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.50
TOPSOIL 0.20	■						
Brown medium SAND, trace silt 1.40	⁘					1	86.50
End of Monitoring Well Monitoring well terminated on silty clay @ 1.40m depth (GWL @ 1.25-May 5/06)							



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SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic

REMARKS

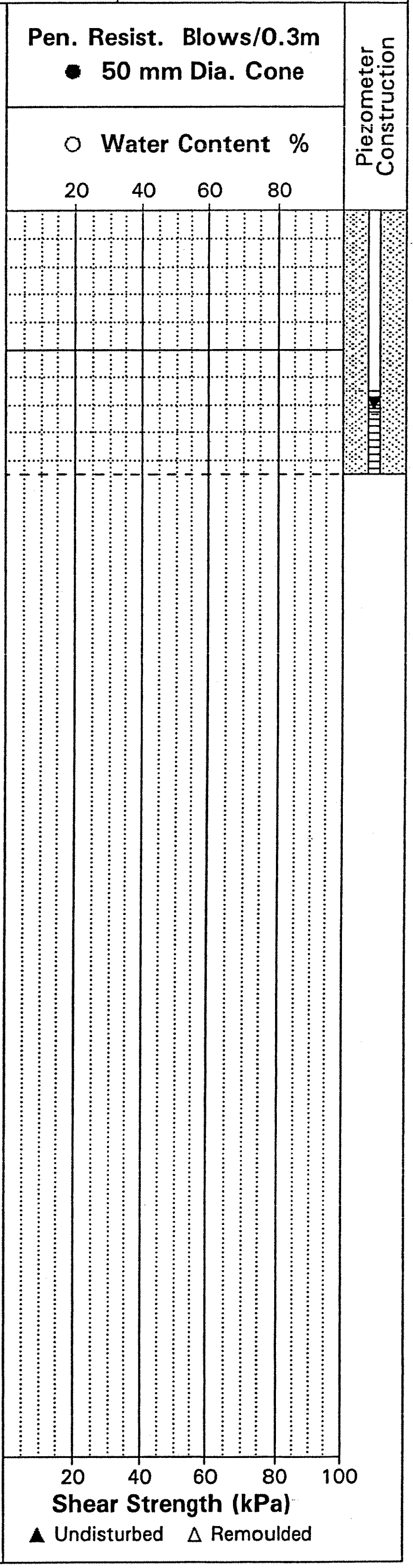
BORINGS BY Backhoe

DATE 25 APR 06

FILE NO. PH0145

HOLE NO. MW 6-2

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.57
TOPSOIL 0.20							
Brown medium SAND, trace silt						1	86.57
1.90							
End of Monitoring Well Monitoring well terminated on silty clay @ 1.90m depth (GWL @ 1.43m-May 5/06)							



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Engineers

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Hydrogeological Study and Terrain Analysis
Greely Village Centre, Parkway Road
Ottawa (Greely), Ontario

DATUM Approximate geodetic

FILE NO. PH0145

REMARKS

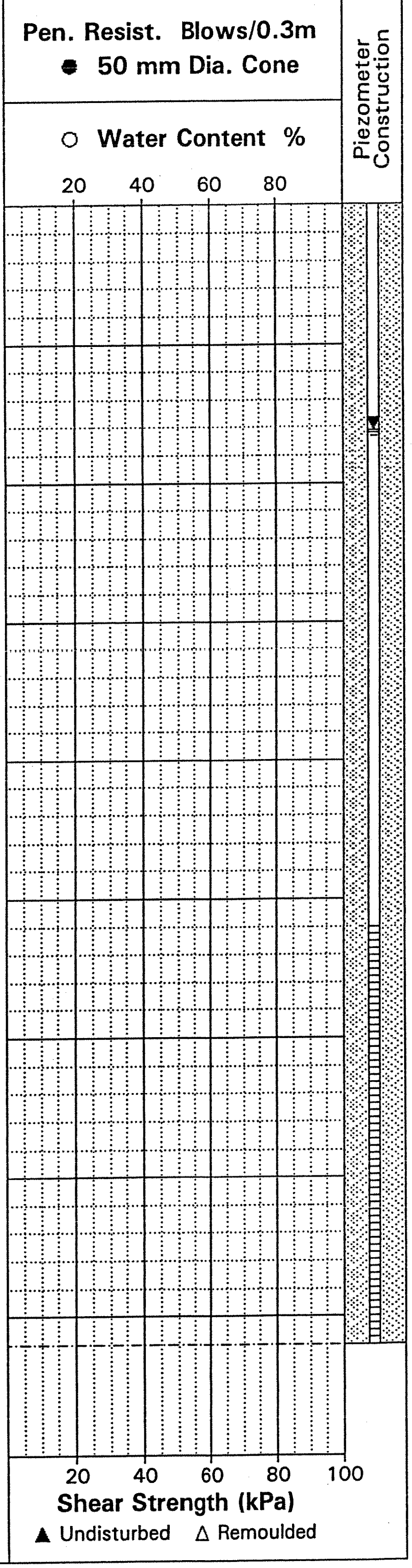
HOLE NO. MW 6-3

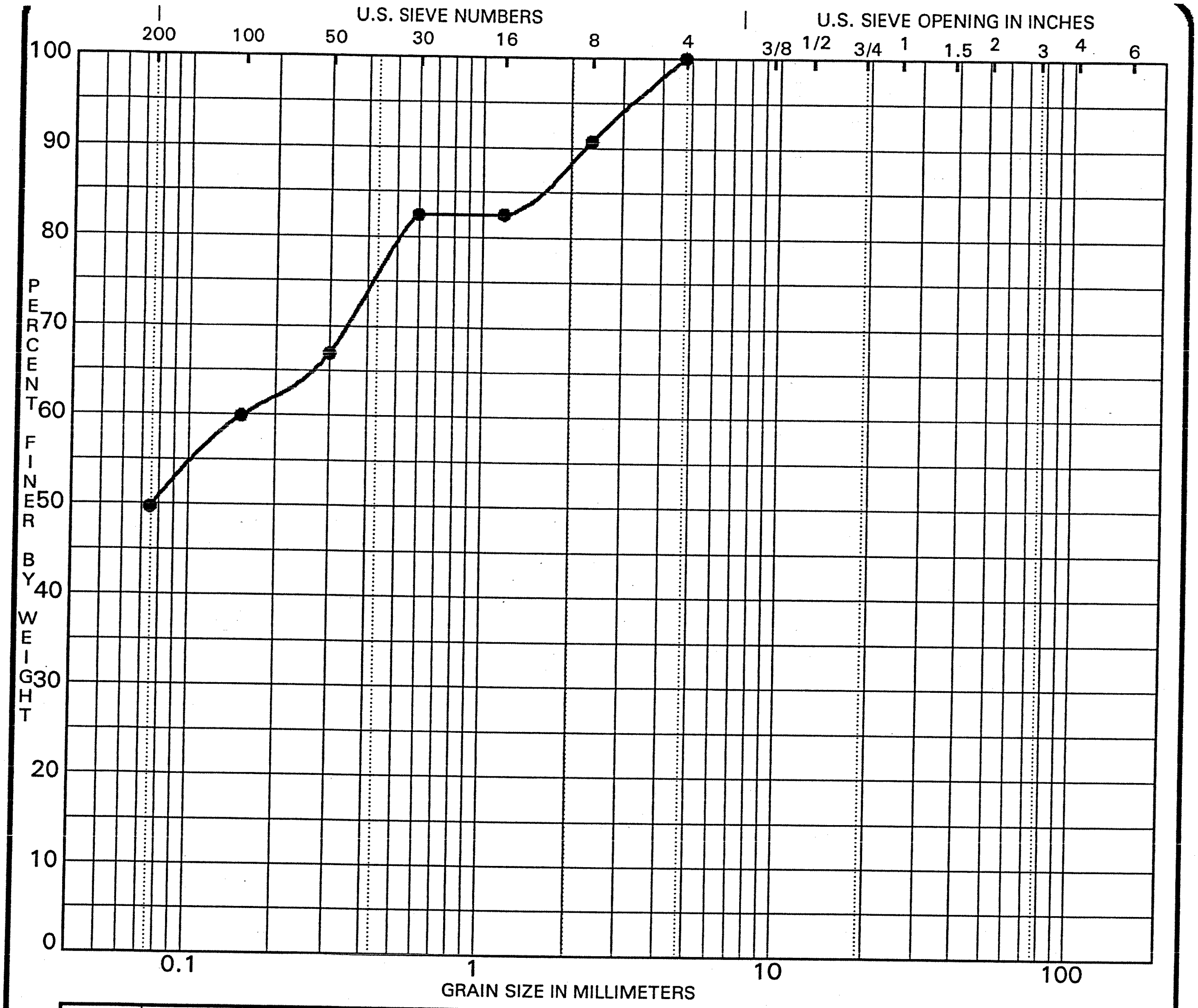
BORINGS BY Backhoe

DATE 25 APR 06

SOIL DESCRIPTION	Depth (m)	TYPE	NUMBER	% RECOVERY	N VALUE or RQD
GROUND SURFACE					
TOPSOIL	0.20				
Brown medium SAND, trace silt	1.78				
SILTY CLAY	4.00				
CLAYEY SILT	8.20				
End of Monitoring Well					
(GWL @ 1.62m-May 5/06)					

DEPTH (m)	ELEV. (m)
0	87.66
1	86.66
2	85.66
3	84.66
4	83.66
5	82.66
6	81.66
7	80.66
8	79.66





SILT	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

Specimen Identification	Classification	MC%	LL	PL	PI	Cc	Cu
● TP34	GLACIAL TILL						
NOTE: Sample screened for material coarser than the No. 4 Sieve to isolate the matrix of the till layer							
	Based on ASTM D 2487						

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● TP34	4.75	0.15			0.0	50.3	49.7	

CLIENT	Sunset Lakes Development Corp.	FILE NO.	PH0145
PROJECT	Hydrogeological Study and Terrain Analysis - Greely Village Centre, Parkway Road	DATE	26 APR 06

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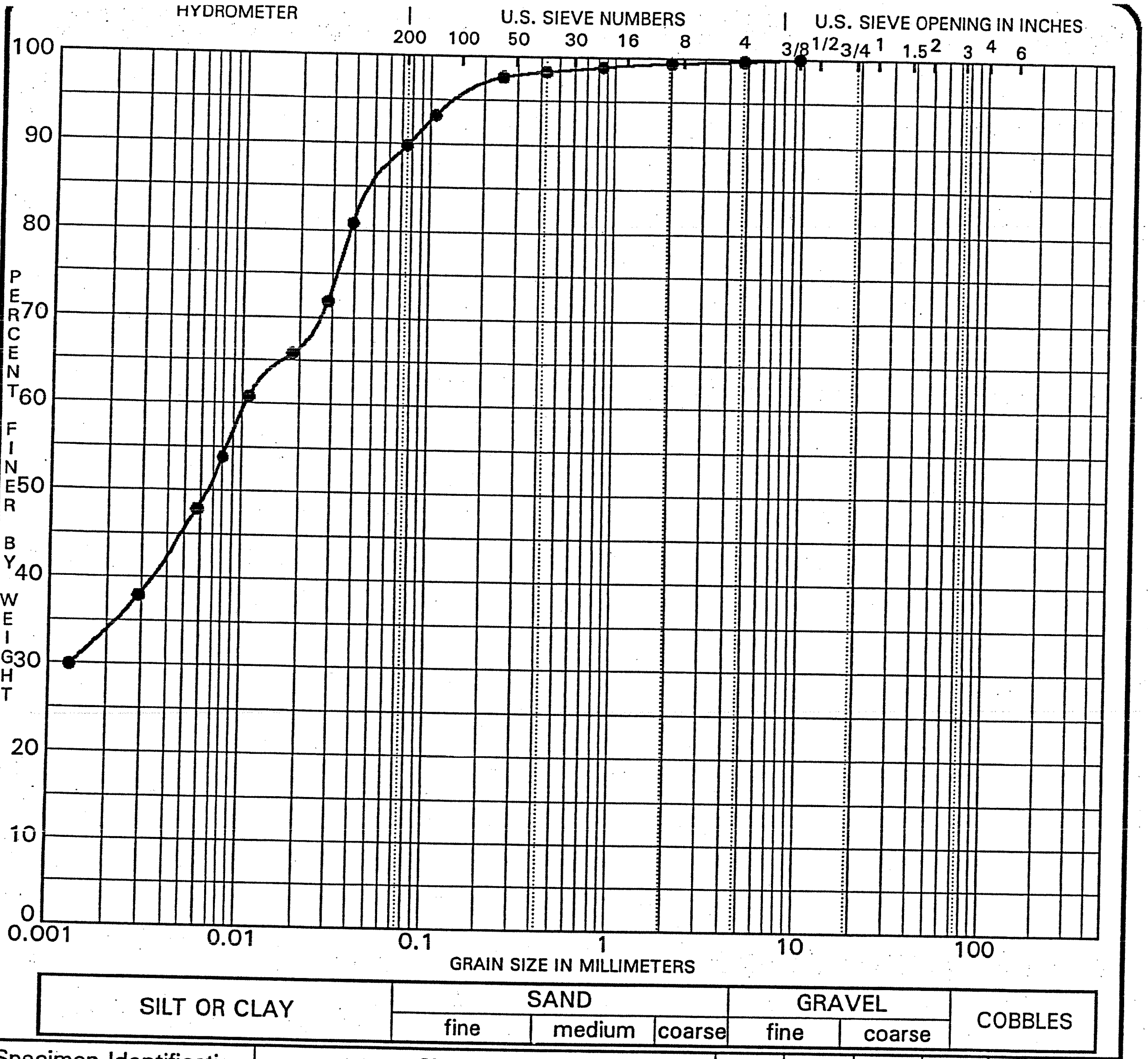
28 Concourse Gate, Unit 1, Ottawa, Ontario K2E 7T7

GRAIN SIZE DISTRIBUTION



Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
● TP31	G22	SILTY CLAY (CH)						

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● TP31	G22	9.50	0.01	0.001		0.3	10.0		

CLIENT **Sunset Lakes Development Corp.**
PROJECT **Hydrogeological Study and Terrain Analysis - Greely Village Centre, Parkway Road**

FILE NO. **PH0145**
DATE **3 JUN 05**

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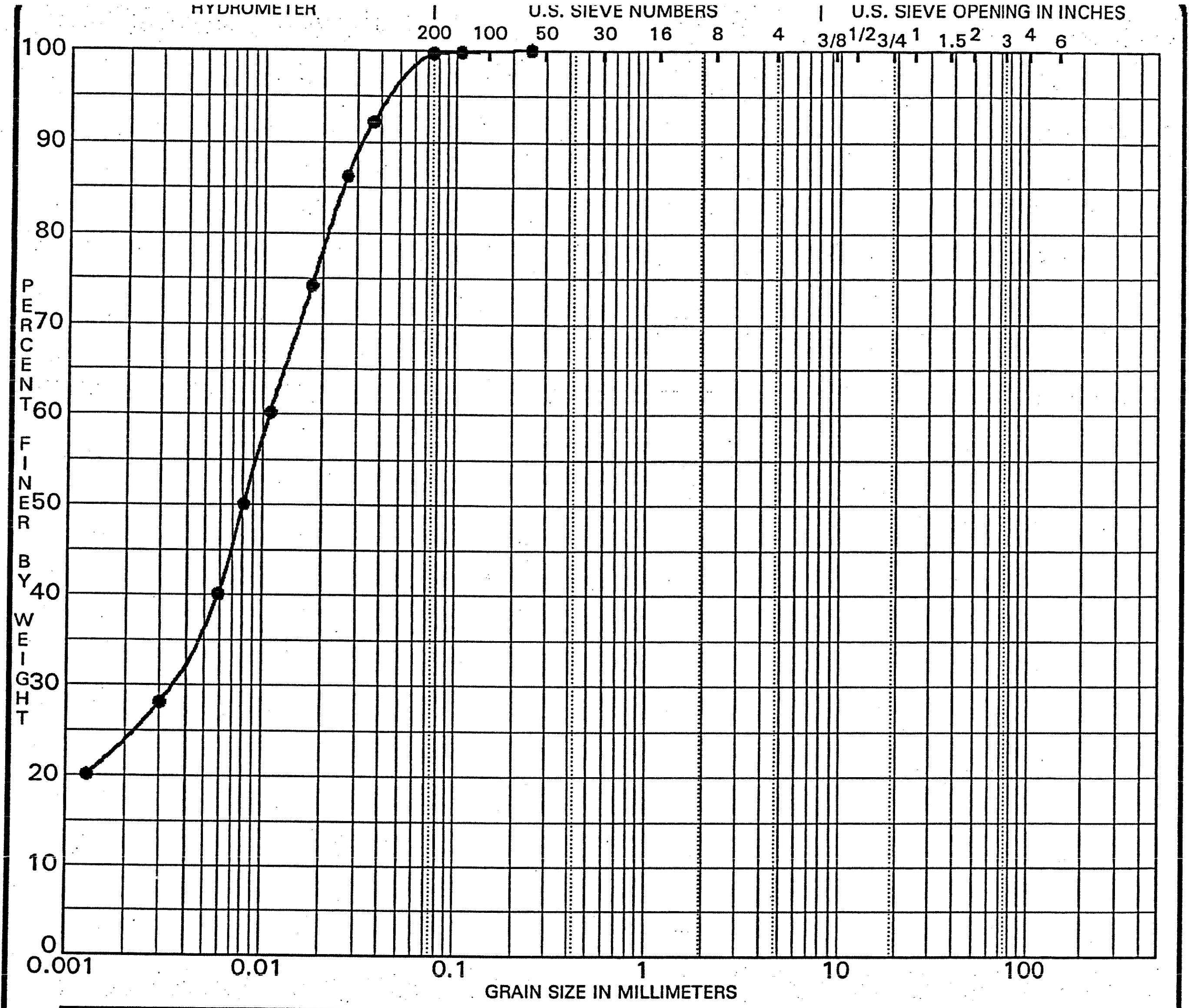
GRAIN SIZE DISTRIBUTION



<table>
<tr><td rowspan="2">SILT OR CLAY</td><td colspan="3">SAND</td><td colspan="2">GRAVEL</td><td rowspan="2">COBBLES</td></tr>
<tr><td>fine</td><td>medium</td><td>coarse</td><td>fine</td><td>coarse</td></tr>
</table>

	Specimen Identification	Classification	MC%	LL	PL	PI	Cc	Cu
●	**TP28/MW7 G18**	**CLAYEY SILT to SILTY CLAY (MH)**						

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP28/MW7 G18**	**0.25**	**0.01**	**0.003**		**0.0**	**0.3**		

CLIENT **Sunset Lakes Development Corp.**
PROJECT **Hydrogeological Study and Terrain Analysis -**
Greely Village Centre, Parkway Road

FILE NO. **PH0145**
DATE **3 JUN 05**

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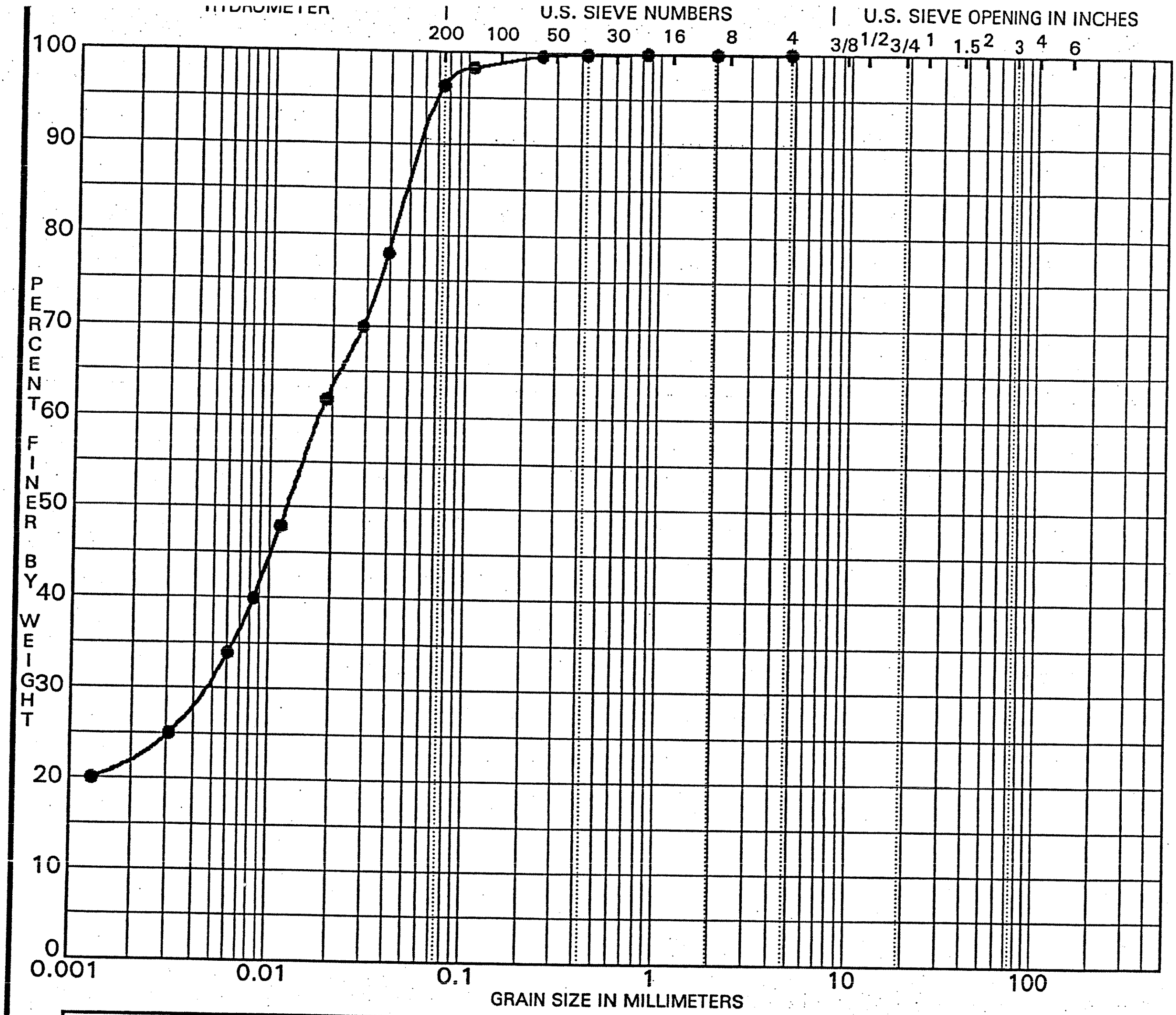
GRAIN SIZE DISTRIBUTION



SILT OR CLAY	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

Specimen Identification	Classification	MC%	LL	PL	PI	Cc	Cu
● TP21/MW6 G7	INORGANIC SILT to CLAYEY SILT (ML)						

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● TP21/MW6 G7	4.75	0.02	0.005		0.0	3.7		

CLIENT Sunset Lakes Development Corp.
PROJECT Hydrogeological Study and Terrain Analysis - Greely Village Centre, Parkway Road

FILE NO. PH0145
DATE 3 JUN 05

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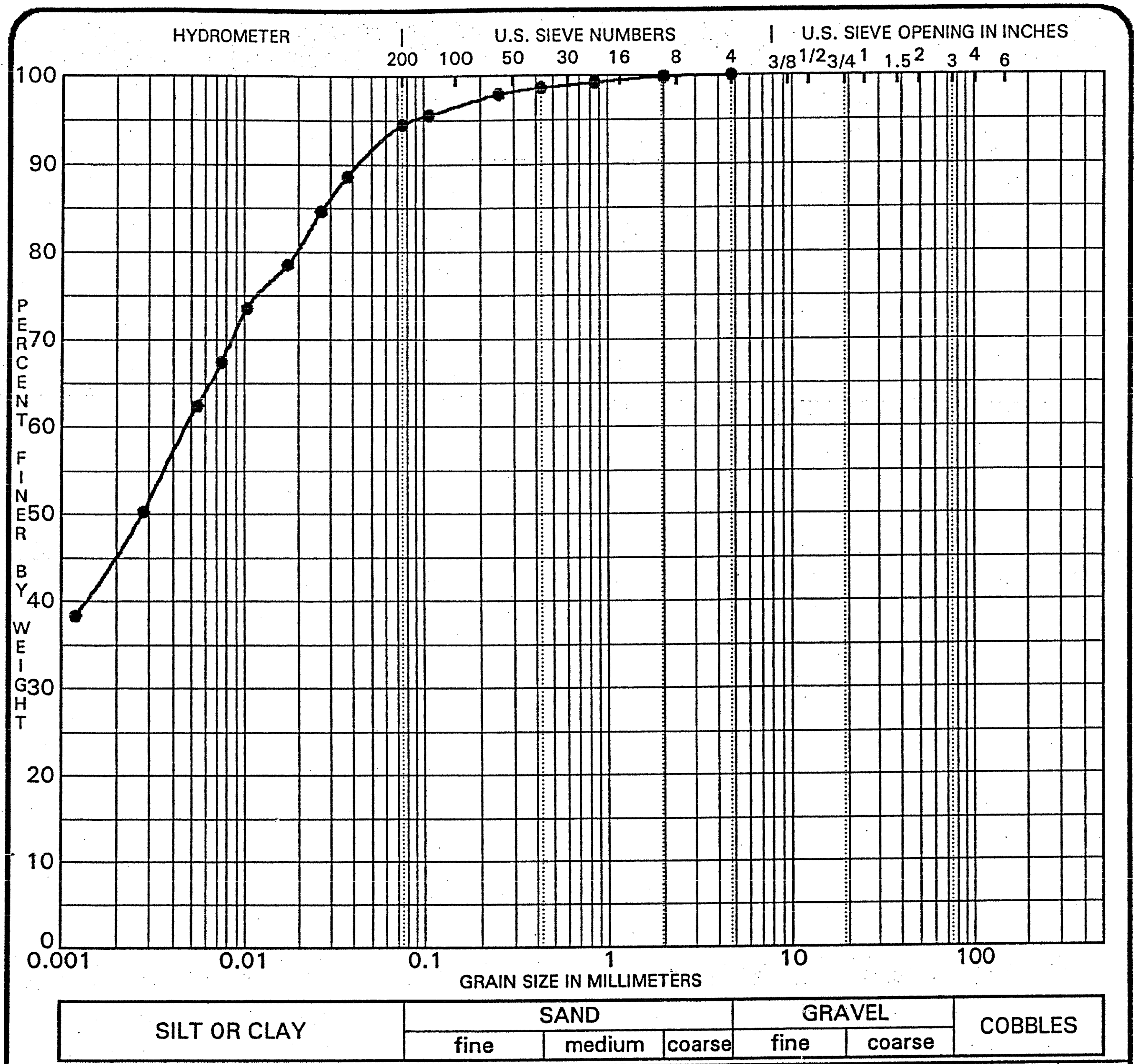
28 Concourse Gate, Unit 1, Ottawa, Ontario K2E 7T7

GRAIN SIZE DISTRIBUTION



Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
● TP24	G14	SILTY CLAY (CL)						

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● TP24	G14	4.75	0.00			0.0	5.5		

CLIENT Sunset Lakes Development Corp.

PROJECT Hydrogeological Study and Terrain Analysis -
Greely Village Centre, Parkway Road

FILE NO. PH0145

DATE 3 JUN 05

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28 Concourse Gate, Unit 1, Ottawa, Ontario K2E 7T7

GRAIN SIZE DISTRIBUTION

APPENDIX 2

SUPPORTING DOCUMENTATION
WATER WELLS

1. Water Well Record for Test Well No. 6
2. Completed Well Interview forms from Neighbouring Residences

Ontario Ministry of the Environment

Well T umber below)
A 036169
A036169

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

ıstructions for Completing Form

- For use in the **Province of Ontario** only. This document is a permanent **legal** document. Please retain for future reference.
- All Sections must be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only
MUN ☐☐☐☐☐ CON ☐☐☐☐☐☐☐☐☐☐ LOT ☐☐☐☐

Vell Owner's Information and Location of Well Information

irst Name: Sunset
Last Name: Lakes
Mailing Address (Street Number/Name, RR,Lot,Concession): 6576 Apple Orchard Road
:ounty/District/Municipality:
Township/City/Town/Village: Greely
Province: Ontario
Postal Code: K4P 1E5
Telephone Number (include area code):
ıddress of Well Location (County/District/Municipality): Ottawa-Carleton
Township: Osgoode
Lot: 6
Concession: 5
RR#/Street Number/Name: 6045+6055 Bank Street
City/Town/Village: Greely
Site/Compartment/Block/Tract etc.: Plan 902 P/L73+74
GPS Reading: NAD 83 Zone 18 Easting 432044 Northing 5003136
Unit Make/Model: Magellan
Mode of Operation: ☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth Metres From	Depth Metres To
	Sand boulders			0	8.23
	Grey Limestone			8.23	36.57
	Grey Sandstone			36.57	49.98

Hole Diameter

Depth Metres From	Depth Metres To	Diameter Centimetres
0	49.98	15.23

Water Record

Water found at Metres / Kind of Water
13.11 m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other: NOT TESTED
48.16 m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:
☐ m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:
After test of well yield, water was ☐ Clear and sediment free CLOUDY NOT TESTED ☐ Other, specify
Chlorinated ☒ Yes ☐ No

Construction Record

Casing

Inside diam centimetres	Material	Wall thickness centimetres	Depth Metres From	Depth Metres To
15.88	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.48	0	10.97
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			

Screen

Outside diam	Material	Slot No.	Depth Metres From	Depth Metres To
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			

No Casing or Screen

	From	To
☒ Open hole	10.36	49.98

Test of Well Yield

Pumping test method: Sub Pump
Pump intake set at (metres): 42.67
Pumping rate - (litres/min): 91
Duration of pumping ___ hrs + 0 min
Final water level end of pumping: 2.04 metres
Recommended pump type. ☐ Shallow ☒ Deep
Recommended pump depth: 42.6 metres
Recommended pump rate. (litres/min): 91
If flowing give rate - (litres/min):
If pumping discontinued, give reason.

Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level	1.30		2.04
1	1.59	1	1.72
2	1.59	2	1.65
3	1.62	3	1.56
4	1.62	4	1.45
5	1.62	5	1.38
10	1.68	10	1.30
15	1.74	15	
20	1.76	20	
25	1.79	25	
30	1.81	30	
40	1.85	40	
50	1.87	50	
60	2.04	60	

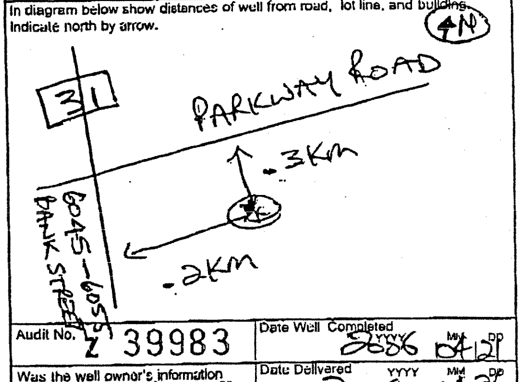
Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
10.36	7.31	Neat Cement Slurry	.227
7.31	0	Bentonite Slurry	.613

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Method of Construction

☐ Cable Tool ☐ Rotary (air) ☐ Diamond ☐ Digging
☐ Rotary (conventional) ☒ Air percussion ☐ Jetting ☐ Other
☐ Rotary (reverse) ☐ Boring ☐ Driving

Water Use

☒ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

☒ Water Supply ☐ Recharge well ☐ Unfinished ☐ Abandoned, (Other)
☐ Observation well ☐ Abandoned, insufficient supply ☐ Dewatering
☐ Test Hole ☐ Abandoned, poor quality ☐ Replacement well

Well Contractor/Technician Information

Name of Well Contractor: AIR ROCK DRILLING Co LTD
Well Contractor's Licence No.: 1119
Business Address (street name, number, city etc.): RR#1 RICHMOND ONT K0A2Z0
Name of Well Technician (last name, first name): HOGAN DAN
Well Technician's Licence No.: T3058
Signature of Technician/Contractor: X
Date Submitted YYYY MM DD

Audit No. Z 39983
Date Well Completed YYYY MM DD: 2006 04 21
Was the well owner's information package delivered? ☒ Yes ☐ No
Date Delivered YYYY MM DD: 2006 04 06

Ministry Use Only
Data Source
Contractor
Date Received YYYY MM DD
Date of Inspection YYYY MM DD
Remarks
Well Record Number

0506E (09/03)
Contractor's Copy ☒ Ministry's Copy ☐ Well Owner's Copy ☐
Cette formule est disponible en français

05/08/2006 15:08 16138383277 AIR ROCK DRILLING PAGE 01/01

patersongroup
Consulting Engineers
28 Concourse Gate, Unit 1, Nepean, Ontario, K2E 7T7
Tel: (613) 226-7381 Fax: (613) 226-6344

Well Inspection

Client:
Project: PH0145
Location

Address: 1508 MEADOW DR
Homeowner Interviewed? [✓ Y] / N
Well Inspected? [✓ Y] N

Field Supervisor: DBM
Date: MAY 3, 06

Quality Comments:
Taste: GOOD
Odour: NO
Colour: GOOD
Hardness: VERY HARD
Bacteria Testing: NO

Quantity Comments:
Flow Rate: LOTS OF WATER
Pump:
Pump Depth:
Problems:

Well Details:
Type of Well: DRILLED
Depth of Well:
Age of Well:
Driller:
Well Record Available: N/A

Environmental Concerns:
Surface Water:
Septic System:
Land Use:
Neighbouring Properties:

Sketch:

RENTAL

patersongroup
Consulting Engineers
28 Concourse Gate, Unit 1, Nepean, Ontario, K2E 7T7
Tel: (613) 226-7381 Fax: (613) 226-6344

Well Inspection

Client: Greely Animal Hospital.
Project:
Location

Address: 7200 Parkway Road
Homeowner Interviewed? [✓ Y] / N
Well Inspected? ~~Y/N~~ N/A

Field Supervisor: CHRISTOPHER FISCHER
Date: 3rd May 06.

Quality Comments:
Taste: N/A
Odour: N/A
Colour: N/A
Hardness: YES, SOME RUST.
Bacteria Testing: ≈ every 1-2 years

Quantity Comments:
Flow Rate: –
Pump: –
Pump Depth: –
Problems: –

Well Details:
Type of Well: drilled
Depth of Well: ?
Age of Well: 18 years
Driller:
Well Record Available: –

Environmental Concerns:
Surface Water:
Septic System:
Land Use:
Neighbouring Properties:

Sketch:

patersongroup
Consulting Engineers
28 Concourse Gate, Unit 1, Nepean, Ontario, K2E 7T7
Tel: (613) 226-7381 Fax: (613) 226-6344

Well Inspection

Client: Stephen Quinn
Project:
Location 7164 Parkway Rd.

Address:
Homeowner Interviewed? [✓ Y] / N
Well Inspected? Y / N N/A

Field Supervisor: Christopher Fischer
Date: 3rd May 06

Quality Comments:
Taste: NA
Odour: NA
Colour: NA
Hardness: Water Softener
Bacteria Testing:

Quantity Comments:
Flow Rate:
Pump:
Pump Depth:
Problems:

Well Details: (unknown).
Type of Well:
Depth of Well:
Age of Well:
Driller:
Well Record Available:

Environmental Concerns:
Surface Water:
Septic System:
Land Use:
Neighbouring Properties:

Sketch:

patersongroup
Consulting Engineers
28 Concourse Gate, Unit 1, Nepean, Ontario, K2E 7T7
Tel: (613) 226-7381 Fax: (613) 226-6344

Well Inspection

Client: Nina Jencz
Project:
Location

Address: 7377 Parkway Road
Homeowner Interviewed? [✓ Y] / N
Well Inspected? [✓ Y] / N

Field Supervisor: Christopher Fischer
Date: 3rd May 06

Quality Comments:
Taste: Yes
Odour: Yes
Colour: No
Hardness: NO
Bacteria Testing: 1 year ago

Quantity Comments:
Flow Rate:
Pump:
Pump Depth:
Problems:

Well Details:
Type of Well: Drilled Well
Depth of Well:
Age of Well:
Driller:
Well Record Available:

Environmental Concerns:
Surface Water:
Septic System:
Land Use:
Neighbouring Properties:

Sketch:

patersongroup
Consulting Engineers
28 Concourse Gate, Unit 1, Nepean, Ontario, K2E 7T7
Tel: (613) 226-7381 Fax: (613) 226-6344

Well Inspection

↗ use same well as Petacostal church

Client: Joyce Bicker
Project:
Location

Address: 7281 Parkway Rd.
Homeowner Interviewed? Y / N
Well Inspected? Y / N

Field Supervisor: Christopher Fischer
Date: 3rd May 06.

Quality Comments:
Taste: Hardwater.
Odour: Sulfer.
Colour:
Hardness: ✓
Bacteria Testing:

Quantity Comments:
Flow Rate:
Pump:
Pump Depth:
Problems:

Well Details:
Type of Well:
Depth of Well:
Age of Well:
Driller:
Well Record Available:

Environmental Concerns:
Surface Water:
Septic System:
Land Use:
Neighbouring Properties:

Sketch:

APPENDIX 3

SUPPORTING DOCUMENTATION LABORATORY TEST DATA

1. Reports of Analysis For Water Samples Collected During Pump Testing of TW4, TW5 and TW6
2. Reports of Analysis For Water Samples Collected During Flushing of TW1, TW2, and TW3
3. Reports of Analysis For Water Samples Collected From Neighbouring Residences
4. Report of Analysis for Atrazine in TW4
5. Letter From TechnaLinks Concerning Maximum Treatable Limits for Aesthetic Parameters in Ground Water

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: Paterson Group
1-28 Concourse Gate
Ottawa, Ont.
K1V 1T6
Attention: Robert Passmore

Report Number:	2608758
Date:	2006-05-05
Date Submitted:	2006-05-02
Project:	PH0145
P.O. Number:	4241
Matrix:	Water

Chain of Custody Number: 22517

		LAB ID:	459818	459819	459820	459821		GUIDELINE		
		Sample Date:	2006-05-02	2006-05-02	2006-05-02	2006-05-02		ODWSOG		
		Sample ID:	TW1, WS-05/06	TW2, WS05/06	TW3, WS 05/06	TW5, WS 05/06				
PARAMETER	UNITS	MDL						TYPE	LIMIT	UNITS
Total Coliforms	ct/100mL		0	0	0	0		MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0	0	0	0		MAC	0	ct/100mL
Heterotrophic Plate Count	ct/1mL		0	1	0	0		MAC	500	ct/1mL
Faecal Coliforms	ct/100mL		0	0	0	0		MAC	0	ct/100mL
Faecal Streptococcus	ct/100mL		0	0	0	0				

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: KQuantrill
Krista Quantrill
Microbiology Analyst

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: Paterson Group
1-28 Concourse Gate
Ottawa, Ont.
K1V 1T6
Attention: Robert Passmore

Report Number: 2608757
Date: 2006-05-05
Date Submitted: 2006-05-02

Project: PH0145

P.O. Number: 4241
Matrix: Water

Chain of Custody Number: 22517

		LAB ID:	459814	459815	459816	459817		**GUIDELINE**		
		Sample Date:	2006-05-02	2006-05-02	2006-05-02	2006-05-02		ODWSOG		
		Sample ID:	TW1, WS-05/06	TW2, WS 05/06	TW3, WS 05/06	TW5, WS 05.06				
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Alkalinity as CaCO3	mg/L	5	327	289	288	301		OG	500	mg/L
Chloride	mg/L	1	527	625	650	156		AO	250	mg/L
Colour	TCU	2	3	<2	<2	3		AO	5	TCU
Conductivity	uS/cm	5	2370	2640	2720	1120				
Dissolved Organic Carbon	mg/L	0.5	<0.5	2.1	<0.5	1.9		AO	5	mg/L
Fluoride	mg/L	0.10	0.11	0.17	0.18	0.16		MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01	<0.01	<0.01	<0.01		AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.09	0.09	0.13	0.07				
N-NO2 (Nitrite)	mg/L	0.10	<0.10	<0.10	<0.10	<0.10		MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.10	<0.10	<0.10	<0.10	<0.10		MAC	10.0	mg/L
pH			7.75	7.78	7.80	7.74		AO	6.5-8.5	pH Units
Phenols	mg/L	0.001	<0.001	<0.001	<0.001	<0.001				
Sulphate	mg/L	1	115	98	97	64		AO	500	mg/L
Tannin & Lignin	mg/L	0.1	<0.1	<0.1	<0.1	<0.1				
TDS (COND - CALC)	mg/L	5	1540	1720	1770	728		AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.05	<0.05	<0.05	0.09	<0.05				
Turbidity	NTU	0.1	1.9	2.7	6.1	17.7		AO	1.0	NTU
Hardness as CaCO3	mg/L	1	511	536	536	474		OG	100	mg/L
Ion Balance		0.01	0.93	0.96	0.95	0.96				
Calcium	mg/L	1	132	134	134	124				
Magnesium	mg/L	1	44	49	49	40				
Potassium	mg/L	1	4	5	5	2				
Sodium	mg/L	2	270	311	318	40		AO	20	mg/L
Iron	mg/L	0.01	0.63	0.63	0.64	1.92		AO	0.3	mg/L
Manganese	mg/L	0.01	0.08	0.05	0.06	0.27		AO	0.05	mg/L

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: Paterson Group
1-28 Concourse Gate
Ottawa, Ont.
K1V 1T6
Attention: Robert Passmore

Report Number: 2608628
Date: 2006-05-04
Date Submitted: 2006-05-02

Project: PH0145

P.O. Number:
Matrix: Water

Chain of Custody Number: 43328

		LAB ID:	459572					**GUIDELINE**		
		Sample Date:	2006-05-01							
		Sample ID:	TW4, W51-06							
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0							
Escherichia Coli	ct/100mL		0							
Heterotrophic Plate Count	ct/1mL		1							
Faecal Coliforms	ct/100mL		0							
Faecal Streptococcus	ct/100mL		0							

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL: KQuantrill
Krista Quantrill
Microbiology Analyst

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: Paterson Group
1-28 Concourse Gate
Ottawa, Ont.
K1V 1T6
Attention: Robert Passmore

Report Number: 2608662
Date: 2006-05-05
Date Submitted: 2006-05-02

Project: PH0145

P.O. Number: 4241
Matrix: Water

Chain of Custody Number: 43328

		LAB ID:	459635					GUIDELINE		
		Sample Date:	2006-05-01							
		Sample ID:	TW4 WS1-06							
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Alkalinity as CaCO3	mg/L	5	274							
Chloride	mg/L	1	227							
Colour	TCU	2	3							
Conductivity	uS/cm	5	1270							
Dissolved Organic Carbon	mg/L	0.5	1.5							
Fluoride	mg/L	0.10	0.29							
Hydrogen Sulphide	mg/L	0.01	0.15							
N-NH3 (Ammonia)	mg/L	0.02	0.12							
N-NO2 (Nitrite)	mg/L	0.10	<0.10							
N-NO3 (Nitrate)	mg/L	0.10	<0.10							
pH			7.79							
Phenols	mg/L	0.001	<0.001							
Sulphate	mg/L	1	62							
Tannin & Lignin	mg/L	0.1	<0.1							
TDS (COND - CALC)	mg/L	5	825							
Total Kjeldahl Nitrogen	mg/L	0.05	0.44							
Turbidity	NTU	0.1	17.9							
Hardness as CaCO3	mg/L	1	472							
Ion Balance		0.01	0.97							
Calcium	mg/L	1	118							
Magnesium	mg/L	1	43							
Potassium	mg/L	1	4							
Sodium	mg/L	2	74							
Iron	mg/L	0.03	1.41							
Manganese	mg/L	0.01	0.20							

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: Paterson Group
1-28 Concourse Gate
Ottawa, Ont.
K1V 1T6
Attention: Robert Passmore

Report Number: 2608509
Date: 2006-05-02
Date Submitted: 2006-04-28

Project: PH0145

P.O. Number:
Matrix: Water

Chain of Custody Number: 41093

		LAB ID:	459177	459178				GUIDELINE		
		Sample Date:	2006-04-28	2006-04-28				ODWSOG		
		Sample ID:	TW6, WS1	TW6, WS2						
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0	2				MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0	0				MAC	0	ct/100mL
Heterotrophic Plate Count	ct/1mL		2	1				MAC	500	ct/1mL
Faecal Coliforms	ct/100mL		0	0				MAC	0	ct/100mL
Faecal Streptococcus	ct/100mL		0	0						

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: KQuantrill
Krista Quantrill
Microbiology Analyst

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: Paterson Group
1-28 Concourse Gate
Ottawa, Ont.
K1V 1T6
Attention: Robert Passmore

Report Number: 2608513
Date: 2006-05-05
Date Submitted: 2006-04-28

Project: PH0145

P.O. Number: 2860
Matrix: Water

Chain of Custody Number: 41093

		LAB ID:	459190	459191				GUIDELINE		
		Sample Date:	2006-04-28	2006-04-28				ODWSOG		
		Sample ID:	TW6, WS1	TW6, WS2						
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Alkalinity as CaCO3	mg/L	5	279	278				OG	500	mg/L
Chloride	mg/L	1	613	617				AO	250	mg/L
Colour	TCU	2	<2	<2				AO	5	TCU
Conductivity	uS/cm	5	2580	2560						
Dissolved Organic Carbon	mg/L	0.5	<0.5	<0.5				AO	5	mg/L
Fluoride	mg/L	0.10	0.27	0.26				MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	0.11	0.08				AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.27	0.21						
N-NO2 (Nitrite)	mg/L	0.10	<0.10	<0.10				MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.10	<0.10	<0.10				MAC	10.0	mg/L
pH			8.00	7.98				AO	6.5-8.5	pH Units
Phenols	mg/L	0.001	<0.001	<0.001						
Sulphate	mg/L	1	110	108				AO	500	mg/L
Tannin & Lignin	mg/L	0.1	<0.1	<0.1						
TDS (COND - CALC)	mg/L	5	1680	1660				AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.05	0.52	0.29						
Turbidity	NTU	0.1	2.0	0.9				AO	1.0	NTU
Hardness as CaCO3	mg/L	1	616	640				OG	100	mg/L
Ion Balance		0.01	0.91	0.94						
Calcium	mg/L	1	141	149						
Magnesium	mg/L	1	64	65						
Potassium	mg/L	1	10	10						
Sodium	mg/L	2	240	246				AO	20	mg/L
Iron	mg/L	0.03	0.04	<0.03				AO	0.3	mg/L
Manganese	mg/L	0.01	0.05	0.05				AO	0.05	mg/L

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: Paterson Group
1-28 Concourse Gate
Ottawa, Ont.
K1V 1T6
Attention: Robert Passmore

Report Number: 2608926
Date: 2006-05-05
Date Submitted: 2006-05-03

Project: PH0145

P.O. Number:
Matrix: Water

Chain of Custody Number: 22840

		LAB ID:	460241					**GUIDELINE**		
		Sample Date:	2006-05-03							
		Sample ID:	TW4-ORG							
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Atrazine	mg/L	0.002	<0.002							

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL:
Steven Blais
Organic Lab Coordinator

ACCUTEST LABORATORIES LTD **REPORT OF ANALYSIS**

Client: **Sunset Lakes Development Corporation**
6576 Apple Orchard Road
Greely, ON
K4P 1E5
Attention: **Dave Meikle**

Report Number: 2608987
Date: 2006-05-08
Date Submitted: 2006-05-04

Project: PH0145

P.O. Number:
Matrix: Water

Chain of Custody Number: **22827**

								GUIDELINE		
		LAB ID:	460377							
		Sample Date:	2006-05-03							
		Sample ID:	1508							
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0							
Escherichia Coli	ct/100mL		0							
Heterotrophic Plate Count	ct/1mL		1							
Faecal Coliforms	ct/100mL		0							
Faecal Streptococcus	ct/100mL		0							

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: ____________________
Tim McCooeye
QC Manager

Client: **Sunset Lakes Development Corporation**
6576 Apple Orchard Road
Greely, ON
K4P 1E5
Attention: **Dave Meikle**

Report Number: 2608975
Date: 2006-05-10
Date Submitted: 2006-05-04

Project: PH0145

P.O. Number:
Matrix: Water

Chain of Custody Number: **22827**

		LAB ID:	460361					**GUIDELINE**		
		Sample Date:	2006-05-03							
		Sample ID:	1508							
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Alkalinity as CaCO3	mg/L	5	340							
Chloride	mg/L	1	136							
Colour	TCU	2	<2							
Conductivity	uS/cm	5	1130							
Dissolved Organic Carbon	mg/L	0.5	1.1							
Fluoride	mg/L	0.10	0.17							
Hydrogen Sulphide	mg/L	0.01	0.13							
N-NH3 (Ammonia)	mg/L	0.02	0.07							
N-NO2 (Nitrite)	mg/L	0.10	<0.10							
N-NO3 (Nitrate)	mg/L	0.10	<0.10							
pH			8.01							
Phenols	mg/L	0.001	<0.001							
Sulphate	mg/L	1	81							
Tannin & Lignin	mg/L	0.1	<0.1							
TDS (COND - CALC)	mg/L	5	735							
Total Kjeldahl Nitrogen	mg/L	0.05	0.18							
Turbidity	NTU	0.1	10.4							
Hardness as CaCO3	mg/L	1	466							
Ion Balance		0.01	0.96							
Calcium	mg/L	1	114							
Magnesium	mg/L	1	44							
Potassium	mg/L	1	5							
Sodium	mg/L	2	56							
Iron	mg/L	0.03	1.24							
Manganese	mg/L	0.01	0.05							

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: ________________
Ewan McRobbie
Inorganic Lab Supervisor

ACCUTEST LABORATORIES LTD **REPORT OF ANALYSIS**

Client: **Sunset Lakes Development Corporation**
6576 Apple Orchard Road
Greely, ON
K4P 1E5
Attention: **Dave Meikle**

Report Number: 2608988
Date: 2006-05-08
Date Submitted: 2006-05-04

Project: PH0145

P.O. Number:
Matrix: Water

Chain of Custody Number: **22826**

		LAB ID:	460378					**GUIDELINE**		
		Sample Date:	2006-05-03							
		Sample ID:	7164							
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0							
Escherichia Coli	ct/100mL		0							
Heterotrophic Plate Count	ct/1mL		2							
Faecal Coliforms	ct/100mL		0							
Faecal Streptococcus	ct/100mL		0							

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL: ____________
Tim McCooeye
QC Manager

Results relate only to the parameters tested on the samples submitted for analysis.

REPORT OF ANALYSIS

Client: **Sunset Lakes Development Corporation**
6576 Apple Orchard Road
Greely, ON
K4P 1E5
Attention: **Dave Meikle**

Report Number: 2608976
Date: 2006-05-10
Date Submitted: 2006-05-04

Project: PH0145

P.O. Number:
Matrix: Water

Chain of Custody Number: **22826**

		LAB ID:	460362					**GUIDELINE**		
		Sample Date:	2006-05-03					ODWSOG		
		Sample ID:	716A							
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Alkalinity as CaCO3	mg/L	5	316					OG	500	mg/L
Chloride	mg/L	1	175					AO	250	mg/L
Colour	TCU	2	<2					AO	5	TCU
Conductivity	uS/cm	5	1260							
Dissolved Organic Carbon	mg/L	0.5	<0.5					AO	5	mg/L
Fluoride	mg/L	0.10	0.11					MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01					AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	<0.02							
N-NO2 (Nitrite)	mg/L	0.10	<0.10					MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.10	<0.10					MAC	10.0	mg/L
pH			7.88					AO	6.5-8.5	pH Units
Phenols	mg/L	0.001	<0.001							
Sulphate	mg/L	1	91					AO	500	mg/L
Tannin & Lignin	mg/L	0.1	<0.1							
TDS (COND - CALC)	mg/L	5	819					AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.05	0.17							
Turbidity	NTU	0.1	6.8					AO	1.0	NTU
Hardness as CaCO3	mg/L	1	463					OG	100	mg/L
Ion Balance		0.01	0.98							
Calcium	mg/L	1	126							
Magnesium	mg/L	1	36							
Potassium	mg/L	1	3							
Sodium	mg/L	2	82					AO	20	mg/L
Iron	mg/L	0.03	0.57					AO	0.3	mg/L
Manganese	mg/L	0.01	0.10					AO	0.05	mg/L

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: ________________
Ewan McRobbie
Inorganic Lab Supervisor

ACCUTEST LABORATORIES LTD **REPORT OF ANALYSIS**

Client: **Sunset Lakes Development Corporation**
6576 Apple Orchard Road
Greely, ON
K4P 1E5
Attention: **Dave Meikle**

Report Number: 2608990
Date: 2006-05-08
Date Submitted: 2006-05-04

Project: PH0145

P.O. Number:
Matrix: Water

Chain of Custody Number: 22826

		LAB ID:	460380					**GUIDELINE**		
		Sample Date:	2006-05-03							
		Sample ID:	7200							
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0							
Escherichia Coli	ct/100mL		0							
Heterotrophic Plate Count	ct/1mL		12							
Faecal Coliforms	ct/100mL		0							
Faecal Streptococcus	ct/100mL		0							

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL: ____________
Tim McCooeye
QC Manager

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **Sunset Lakes Development Corporation**
6576 Apple Orchard Road
Greely, ON
K4P 1E5
Attention: **Dave Meikle**

Report Number: 2608978
Date: 2006-05-10
Date Submitted: 2006-05-04

Project: PH0145

P.O. Number:
Matrix: Water

Chain of Custody Number: **22825**

								GUIDELINE		
		LAB ID:	460364							
		Sample Date:	2006-05-03							
		Sample ID:	7200							
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Alkalinity as CaCO3	mg/L	5	307							
Chloride	mg/L	1	228							
Colour	TCU	2	<2							
Conductivity	uS/cm	5	1390							
Dissolved Organic Carbon	mg/L	0.5	<0.5							
Fluoride	mg/L	0.10	0.11							
Hydrogen Sulphide	mg/L	0.01	<0.01							
N-NH3 (Ammonia)	mg/L	0.02	<0.02							
N-NO2 (Nitrite)	mg/L	0.10	<0.10							
N-NO3 (Nitrate)	mg/L	0.10	<0.10							
pH			7.88							
Phenols	mg/L	0.001	<0.001							
Sulphate	mg/L	1	98							
Tannin & Lignin	mg/L	0.1	<0.1							
TDS (COND - CALC)	mg/L	5	904							
Total Kjeldahl Nitrogen	mg/L	0.05	0.10							
Turbidity	NTU	0.1	2.4							
Hardness as CaCO3	mg/L	1	486							
Ion Balance		0.01	0.98							
Calcium	mg/L	1	132							
Magnesium	mg/L	1	38							
Potassium	mg/L	1	3							
Sodium	mg/L	2	105							
Iron	mg/L	0.03	0.32							
Manganese	mg/L	0.01	0.06							

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: ________________
Ewan McRobbie
Inorganic Lab Supervisor

Results relate only to the parameters tested on the samples submitted for analysis.

Client: **Sunset Lakes Development Corporation**
6576 Apple Orchard Road
Greely, ON
K4P 1E5
Attention: **Dave Meikle**

Report Number: 2608989
Date: 2006-05-08
Date Submitted: 2006-05-04

Project: PH0145

P.O. Number:
Matrix: Water

Chain of Custody Number: **22824**

		LAB ID:	460379					**GUIDELINE**		
		Sample Date:	2006-05-03							
		Sample ID:	7281							
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0							
Escherichia Coli	ct/100mL		0							
Heterotrophic Plate Count	ct/1mL		185							
Faecal Coliforms	ct/100mL		0							
Faecal Streptococcus	ct/100mL		0							

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL:
Tim McCooeye
QC Manager

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **Sunset Lakes Development Corporation**
6576 Apple Orchard Road
Greely, ON
K4P 1E5
Attention: **Dave Meikle**

Report Number: 2608977
Date: 2006-05-10
Date Submitted: 2006-05-04

Project: PH0145

P.O. Number:
Matrix: Water

Chain of Custody Number: **22824**

		LAB ID:	460363					**GUIDELINE**		
		Sample Date:	2006-05-03							
		Sample ID:	7281							
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Alkalinity as CaCO3	mg/L	5	247							
Chloride	mg/L	1	1536							
Colour	TCU	2	<2							
Conductivity	uS/cm	5	5030							
Dissolved Organic Carbon	mg/L	0.5	<0.5							
Fluoride	mg/L	0.10	0.17							
Hydrogen Sulphide	mg/L	0.01	<0.01							
N-NH3 (Ammonia)	mg/L	0.02	0.14							
N-NO2 (Nitrite)	mg/L	0.10	<0.10							
N-NO3 (Nitrate)	mg/L	0.10	<0.10							
pH			7.89							
Phenols	mg/L	0.001	<0.001							
Sulphate	mg/L	1	87							
Tannin & Lignin	mg/L	0.1	<0.1							
TDS (COND - CALC)	mg/L	5	3270							
Total Kjeldahl Nitrogen	mg/L	0.05	0.29							
Turbidity	NTU	0.1	2.1							
Hardness as CaCO3	mg/L	1	617							
Ion Balance		0.01	0.95							
Calcium	mg/L	1	158							
Magnesium	mg/L	1	54							
Potassium	mg/L	1	10							
Sodium	mg/L	2	807							
Iron	mg/L	0.03	0.26							
Manganese	mg/L	0.01	0.06							

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: ____________________
Ewan McRobbie
Inorganic Lab Supervisor

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD **REPORT OF ANALYSIS**

Client: **Sunset Lakes Development Corporation**
6576 Apple Orchard Road
Greely, ON
K4P 1E5
Attention: **Dave Meikle**

Report Number: 2608991
Date: 2006-05-08
Date Submitted: 2006-05-04

Project: PH0145

P.O. Number:
Matrix: Water

Chain of Custody Number: 22829

		LAB ID:	460381					**GUIDELINE**		
		Sample Date:	2006-05-03							
		Sample ID:	7377							
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0							
Escherichia Coli	ct/100mL		0							
Heterotrophic Plate Count	ct/1mL		19							
Faecal Coliforms	ct/100mL		0							
Faecal Streptococcus	ct/100mL		0							

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL: ________________
Tim McCooeye
QC Manager

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD **REPORT OF ANALYSIS**

Client: **Sunset Lakes Development Corporation**
6576 Apple Orchard Road
Greely, ON
K4P 1E5
Attention: **Dave Meikle**

Report Number: 2608979
Date: 2006-05-10
Date Submitted: 2006-05-04

Project: PH0145

P.O. Number:
Matrix: Water

Chain of Custody Number: **22825**

		LAB ID:	460365					**GUIDELINE**		
		Sample Date:	2006-05-03							
		Sample ID:	7377							
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Alkalinity as CaCO3	mg/L	5	218							
Chloride	mg/L	1	316							
Colour	TCU	2	<2							
Conductivity	uS/cm	5	1460							
Dissolved Organic Carbon	mg/L	0.5	<0.5							
Fluoride	mg/L	0.10	0.59							
Hydrogen Sulphide	mg/L	0.01	1.40							
N-NH3 (Ammonia)	mg/L	0.02	0.39							
N-NO2 (Nitrite)	mg/L	0.10	<0.10							
N-NO3 (Nitrate)	mg/L	0.10	<0.10							
pH			7.99							
Phenols	mg/L	0.001	<0.001							
Sulphate	mg/L	1	47							
Tannin & Lignin	mg/L	0.1	<0.1							
TDS (COND - CALC)	mg/L	5	949							
Total Kjeldahl Nitrogen	mg/L	0.05	0.46							
Turbidity	NTU	0.1	3.5							
Hardness as CaCO3	mg/L	1	342							
Ion Balance		0.01	0.98							
Calcium	mg/L	1	71							
Magnesium	mg/L	1	40							
Potassium	mg/L	1	11							
Sodium	mg/L	2	159							
Iron	mg/L	0.03	0.41							
Manganese	mg/L	0.01	0.03							

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **Sunset Lakes Development Corporation**
6576 Apple Orchard Road
Greely, ON
K4P 1E5
Attention: **Dave Meikle**

Report Number: 2608992
Date: 2006-05-08
Date Submitted: 2006-05-04

Project: PH0145

P.O. Number:
Matrix: Water

Chain of Custody Number: **22828**

		LAB ID:	460382					**GUIDELINE**		
		Sample Date:	2006-05-03							
		Sample ID:	Sale Barn							
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0							
Escherichia Coli	ct/100mL		0							
Heterotrophic Plate Count	ct/1mL		0							
Faecal Coliforms	ct/100mL		0							
Faecal Streptococcus	ct/100mL		0							

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: ________________
Tim McCooeye
QC Manager

Results relate only to the parameters tested on the samples submitted for analysis.

[illegible] [illegible]

Client: **Sunset Lakes Development Corporation**
6576 Apple Orchard Road
Greely, ON
K4P 1E5
Attention: **Dave Meikle**

Report Number: 2608980
Date: 2006-05-10
Date Submitted: 2006-05-04
Project: PH0145
P.O. Number:
Matrix: Water

Chain of Custody Number: **22825**

		LAB ID:	460366					**GUIDELINE**		
		Sample Date:	2006-05-03							
		Sample ID:	Sale Barn							
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Alkalinity as CaCO3	mg/L	5	299							
Chloride	mg/L	1	399							
Colour	TCU	2	<2							
Conductivity	uS/cm	5	1930							
Dissolved Organic Carbon	mg/L	0.5	<0.5							
Fluoride	mg/L	0.10	0.51							
Hydrogen Sulphide	mg/L	0.01	1.10							
N-NH3 (Ammonia)	mg/L	0.02	<0.02							
N-NO2 (Nitrite)	mg/L	0.10	<0.10							
N-NO3 (Nitrate)	mg/L	0.10	<0.10							
pH			8.07							
Phenols	mg/L	0.001	<0.001							
Sulphate	mg/L	1	69							
Tannin & Lignin	mg/L	0.1	1.0							
TDS (COND - CALC)	mg/L	5	1250							
Total Kjeldahl Nitrogen	mg/L	0.05	0.22							
Turbidity	NTU	0.1	0.2							
Hardness as CaCO3	mg/L	1	5							
Ion Balance		0.01	0.98							
Calcium	mg/L	1	2							
Magnesium	mg/L	1	<1							
Potassium	mg/L	1	<1							
Sodium	mg/L	2	418							
Iron	mg/L	0.03	<0.03							
Manganese	mg/L	0.01	<0.01							

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL: ________________
Ewan McRobbie
Inorganic Lab Supervisor

Results relate only to the parameters tested on the samples submitted for analysis.

TechnaLinks
1294 Leeds Ave., Ottawa, Ontario K1B 3W3
Phone: (877) 805-1220 Fax: (613) 842-5100

International Pump
Technology Inc.
Distributor of Goulds Pumps
Fergus, Ontario Phone. (800) 265-9355
ASM Industries
of Canada
Manufacturer of the "Ground Hog" Grouter Pump Puller & the Ultimate Vermin Proof Well Cap
Fergus, Ontario Phone: (800) 265-9355

June 7, 2006

Paterson Group
28 Concourse Gate, Unit 1
Ottawa, Ontario K2E 7T7

Attention: Robert Passmore

Re: Maximum treatable limits for Aesthetic Parameters in Ground Water

Dear Robert,

Based on my experience in the industry selling, sizing and designing water treatment systems for the last 10 years, using knowledge gathered through education as a certified member of The Water Quality Association of America, I am providing a reference as to the maximum reasonable treatable limits for the most common (nuisance) parameters of a Secondary nature. Please keep in mind that no consideration is given to cost of these recommendations as it is usually at the discretion of the end user whether or not the system is implemented.

I will denote the MOE aesthetic objective (AO) or operational guideline (OG) first followed by the reasonable maximum treatable limit derived from past experience using various field proven and industry accepted methods of treatment.

1. Hardness OG: 80 – 100 ppm. Maximum reasonable treatable limit 1105 ppm by ion exchange cation method. Other factors which influence the success of this method is presence of iron, sodium, or sodium chloride in the water
2. Iron AO: 0.30 ppm. Maximum reasonable treatable limit can be up to 30 ppm by method of oxidization by either air or chemical injection followed by depth filtration by a backwashing filter. PH can affect success of this method
3. PH OG: 6.5 – 8.5 Maximum reasonable treatable limits can be from 5 to 10. Method of treatment is either acid injection for high PH or calcite injection for low PH.
4. Manganese AO: 0.05 ppm. Maximum treatable limit 2 ppm. Effective methods of treatment are chlorination, manganese greensand filters or air injection. The presence of iron and sulfur in the water will affect the success of the treatment.
5. Tannins (organics) AO: 5.0 Maximum reasonable treatable limit 3 ppm. Having the characteristics of, or derived from, plant, living organism or animal, usually comprised of a carbon-hydrogen structure, the preferred method of treatment is organic specific anion resin. System works on the same principle as hardness removal and uses sodium as a regenerant. Chlorination can also be used but care must exercised when treating this symptom by chlorination as THM's (trihalomethanes) are a by-product of oxidizing the organics.
6. T.D.S. (total dissolved solids) AO: 500 ppm Maximum reasonable treatable limit is 5000 ppm. In order to treat TDS effectively a Reverse Osmosis system would be necessary. This type of membrane filtration requires that the water be relatively soft and free of minerals such as iron, manganese and sulfur. Whole house systems can be quite costly, as a repressurization system would be required as well as storage tanks and plastic piping throughout the house for a distribution system would be a consideration. Point of use systems for drinking and cooking are much more economical but would not eliminate some of the harmful effects of TDS on appliances and fixtures
7. Hydrogen Sulfide AO detectable as low as .1 ppm Maximum reasonable treatable limit 10 ppm. Various methods such as full line chlorination or aeration are effective as long as sufficient contact time is allowed. Many times if an aeration system is required for iron a bonus is that it will act on the sulfur as well.

All of the above parameters are very common in the RMOC and outlying areas. When good practices combined with accurate water analysis and proper treatment are applied, these nuisances can be controlled.

Sincerely

Peter Misner CWS III
GM TechnaLinks

APPENDIX 4

SUPPORTING DOCUMENTATION AQUIFER ANALYSIS DATA

1. New Pump Test Data & Aquifer Analysis Curves for TW4, TW5 and TW6
2. Original Pump Test Data & Aquifer Analysis Curves for TW1, TW2 and TW3

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 10.05.2006 | none, Page 2

Project: PH0145

Evaluated by: RAP

Pumping Test No. 06-2 | Test conducted on: May 1, 2006

TW4 | TW4

Discharge 1.88 l/s | Distance from the pumping well 0.150 m

Static water level: 1.400 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.400	0.000	
2	0.50	3.010	1.610	
3	1.00	3.660	2.260	
4	1.50	4.350	2.950	
5	2.00	4.920	3.520	
6	3.00	5.300	3.900	
7	4.00	5.630	4.230	
8	5.00	5.820	4.420	
9	7.00	6.050	4.650	
10	10.00	6.200	4.800	
11	15.00	6.470	5.070	
12	30.00	6.700	5.300	
13	45.00	6.780	5.380	
14	60.00	6.820	5.420	
15	90.00	6.880	5.480	
16	120.00	6.920	5.520	
17	150.00	6.970	5.570	
18	180.00	6.970	5.570	
19	210.00	6.970	5.570	
20	240.00	6.980	5.580	
21	270.00	7.010	5.610	
22	300.00	7.020	5.620	
23	330.00	7.020	5.620	
24	360.00	7.030	5.630	
25	360.50	3.920	2.520	
26	361.50	3.040	1.640	
27	362.00	2.500	1.100	
28	363.00	2.090	0.690	
29	364.00	1.670	0.270	
30	365.00	1.810	0.410	
31	367.00	1.730	0.330	
32	370.00	1.680	0.280	
33	375.00	1.640	0.240	
34	390.00	1.520	0.120	
35	405.00	1.470	0.070	
36	420.00	1.440	0.040	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 10.05.2006	none, Page 3
		Project: PH0145	
		Evaluated by: RAP	

Pumping Test No. 06-2	Test conducted on: May 1, 2006
TW4	MW4-1
Discharge 1.88 l/s	Distance from the pumping well 5.000 m
Static water level: 1.550 m below datum	

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.550	0.000	
2	60.00	1.550	0.000	
3	90.00	1.550	0.000	
4	120.00	1.550	0.000	
5	150.00	1.560	0.010	
6	180.00	1.550	0.000	
7	210.00	1.560	0.010	
8	240.00	1.560	0.010	
9	270.00	1.560	0.010	
10	300.00	1.560	0.010	
11	330.00	1.560	0.010	
12	360.00	1.560	0.010	
13	390.00	1.560	0.010	
14	420.00	1.560	0.010	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 10.05.2006 | none, Page 4 Project: PH0145 Evaluated by: RAP

Pumping Test No. 06-2	Test conducted on: May 1, 2006
TW4	MW4-2
Discharge 1.88 l/s	Distance from the pumping well 5.000 m

Static water level: 1.250 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.250	0.000	
2	60.00	1.250	0.000	
3	90.00	1.260	0.010	
4	120.00	1.260	0.010	
5	150.00	1.260	0.010	
6	180.00	1.250	0.000	
7	210.00	1.250	0.000	
8	240.00	1.250	0.000	
9	270.00	1.260	0.010	
10	300.00	1.260	0.010	
11	330.00	1.250	0.000	
12	360.00	1.250	0.000	
13	390.00	1.250	0.000	
14	420.00	1.250	0.000	

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 10.05.2006
none, Page 5
Project: PH0145
Evaluated by: RAP

Pumping Test No. 06-2
Test conducted on: May 1, 2006
TW4
MW4-3
Discharge 1.88 l/s
Distance from the pumping well 5.000 m

Static water level: 1.390 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.390	0.000	
2	60.00	1.390	0.000	
3	90.00	1.390	0.000	
4	120.00	1.390	0.000	
5	150.00	1.390	0.000	
6	180.00	1.390	0.000	
7	210.00	1.390	0.000	
8	240.00	1.390	0.000	
9	270.00	1.390	0.000	
10	300.00	1.390	0.000	
11	330.00	1.390	0.000	
12	360.00	1.390	0.000	
13	390.00	1.390	0.000	
14	420.00	1.390	0.000	

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 10.05.2006
none, Page 6
Project: PH0145
Evaluated by: RAP

Pumping Test No. 06-2
Test conducted on: May 1, 2006
TW4
TW5
Discharge 1.88 l/s
Distance from the pumping well 277.000 m
Static water level: 1.060 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.060	0.000	
2	35.00	1.060	0.000	
3	170.00	1.160	0.100	
4	290.00	1.180	0.120	
5	420.00	0.920	-0.140	

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 10.05.2006
none, Page 7
Project: PH0145
Evaluated by: RAP

Pumping Test No. 06-2
Test conducted on: May 1, 2006
TW4
TW6
Discharge 1.88 l/s
Distance from the pumping well 353.000 m
Static water level: 0.650 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	0.650	0.000	
2	160.00	0.660	0.010	
3	280.00	0.660	0.010	
4	400.00	0.660	0.010	

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 10.05.2006 | none, Page 8
Project: PH0145
Evaluated by: RAP

Pumping Test No. 06-2	Test conducted on: May 1, 2006
TW4	MW6-1
Discharge 1.88 l/s	Distance from the pumping well 359.000 m

Static water level: 1.270 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.270	0.000	
2	160.00	1.270	0.000	
3	280.00	1.270	0.000	

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 10.05.2006
none, Page 9
Project: PH0145
Evaluated by: RAP

Pumping Test No. 06-2
Test conducted on: May 1, 2006
TW4
MW6-2
Discharge 1.88 l/s
Distance from the pumping well 364.000 m
Static water level: 1.400 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.400	0.000	
2	160.00	1.400	0.000	
3	280.00	1.400	0.000	
4	360.00	1.400	0.000	

Pumping test analysis
Time-Drawdown plot

Date: 10.05.2006

Project: PH0145

Evaluated by: RAP

Pumping Test No. 06-2

Test conducted on: May 1, 2006

TW4

MW6-3

Discharge 1.88 l/s

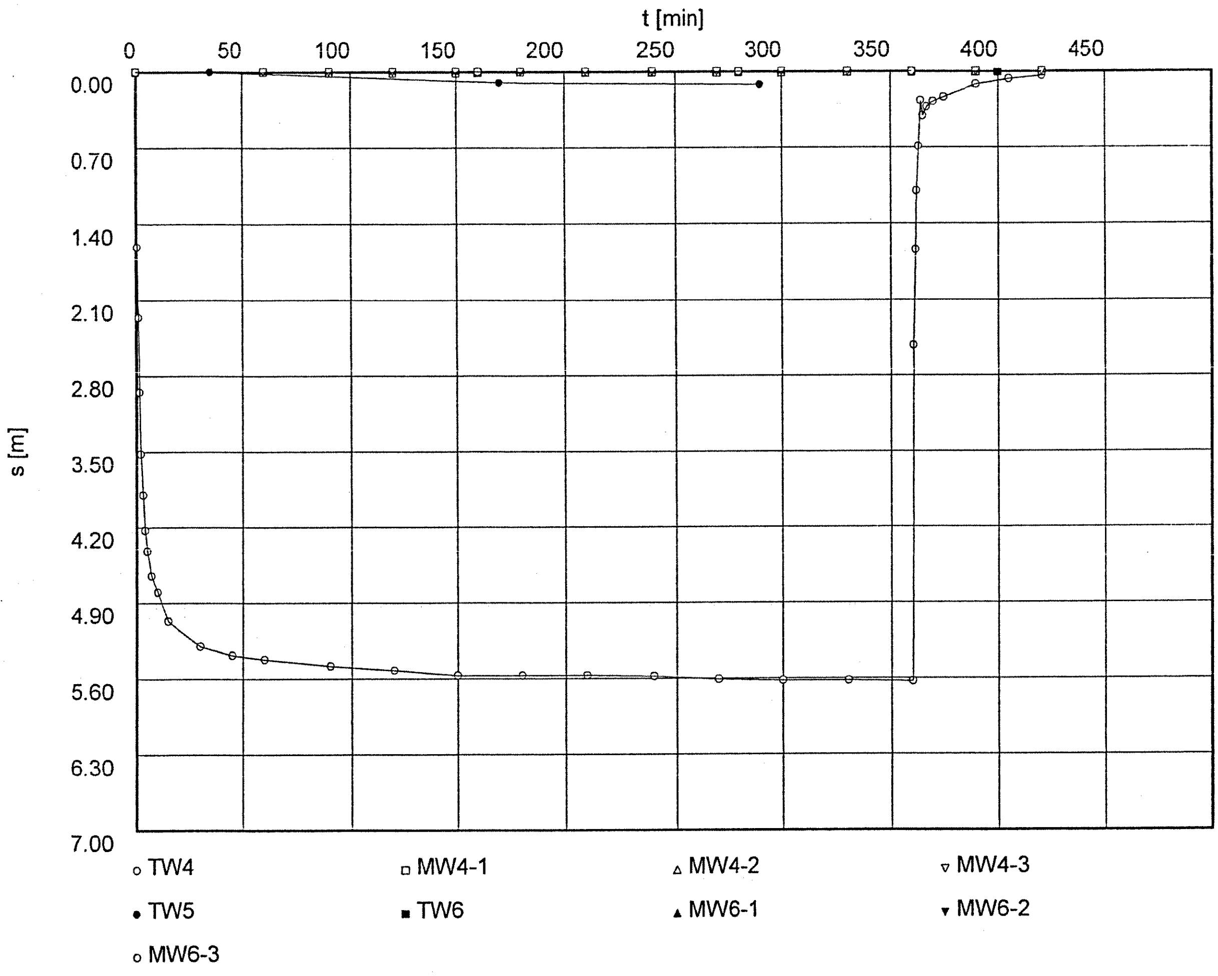
Distance from the pumping well 349.000 m

Static water level: 1.650 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.650	0.000	
2	160.00	1.650	0.000	
3	280.00	1.650	0.000	
4	360.00	1.650	0.000	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 10.05.2006	none, Page 1
		Project: PH0145	
		Evaluated by: RAP	

Pumping Test No. 06-2	Test conducted on: May 1, 2006
TW4	
Discharge 1.88 l/s	



Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

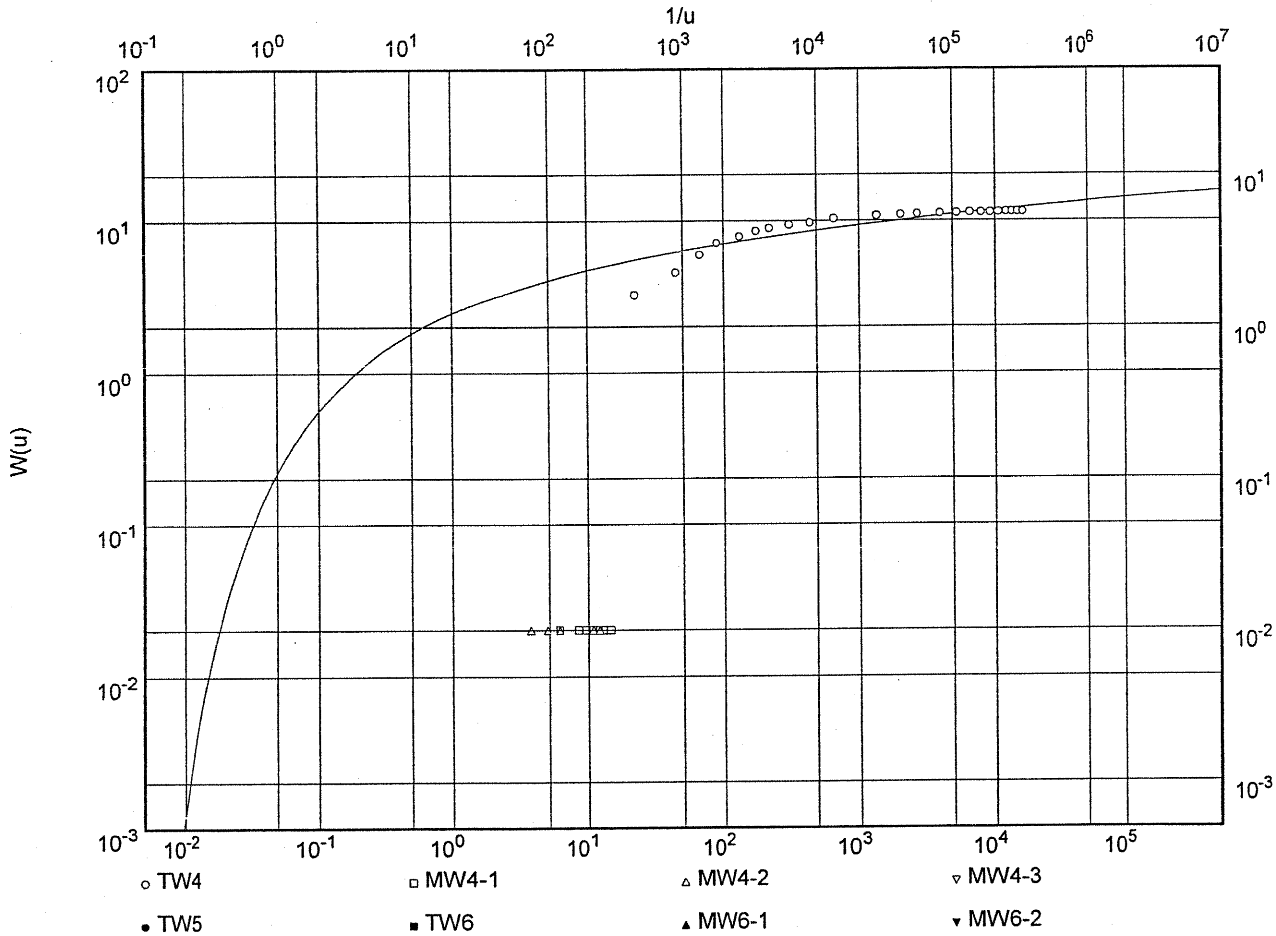
Pumping test analysis
Theis analysis method
Confined aquifer

Date: 10.05.2006
none, Page 1
Project: PH0145
Evaluated by: RAP

Pumping Test No. 06-2
Test conducted on: May 1, 2006

TW4

Discharge 1.88 l/s

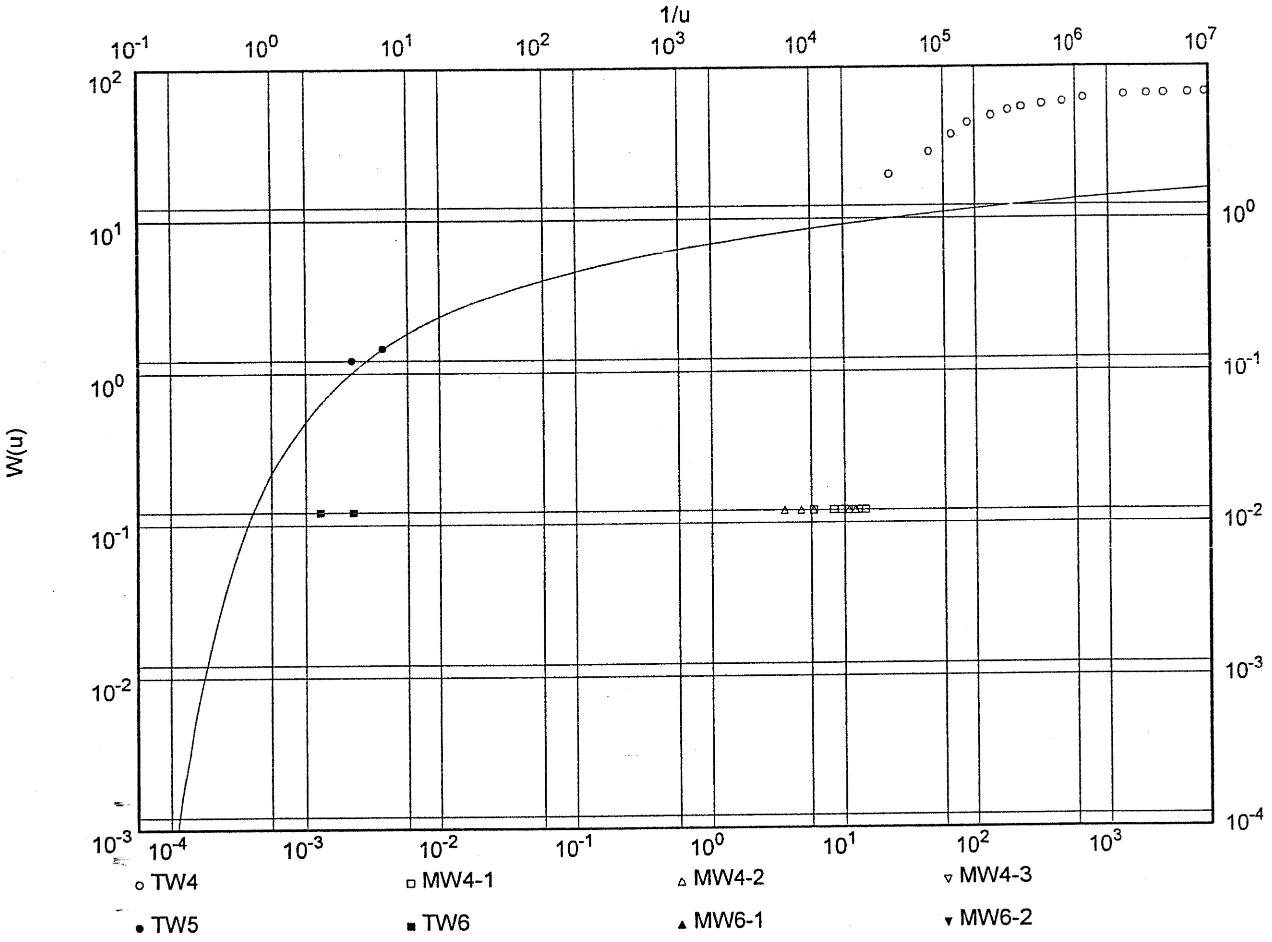


Transmissivity [m²/min]: 1.80×10^{-2}

Storativity: 3.59×10^{-3}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Theis analysis method Confined aquifer	Date: 10.05.2006 none, Page 1 Project: PH0145 Evaluated by: RAP

Pumping Test No. 06-2	Test conducted on: May 1, 2006
TW4	
Discharge 1.88 l/s	



Transmissivity [m²/min]: 1.08 x 10^{-1}

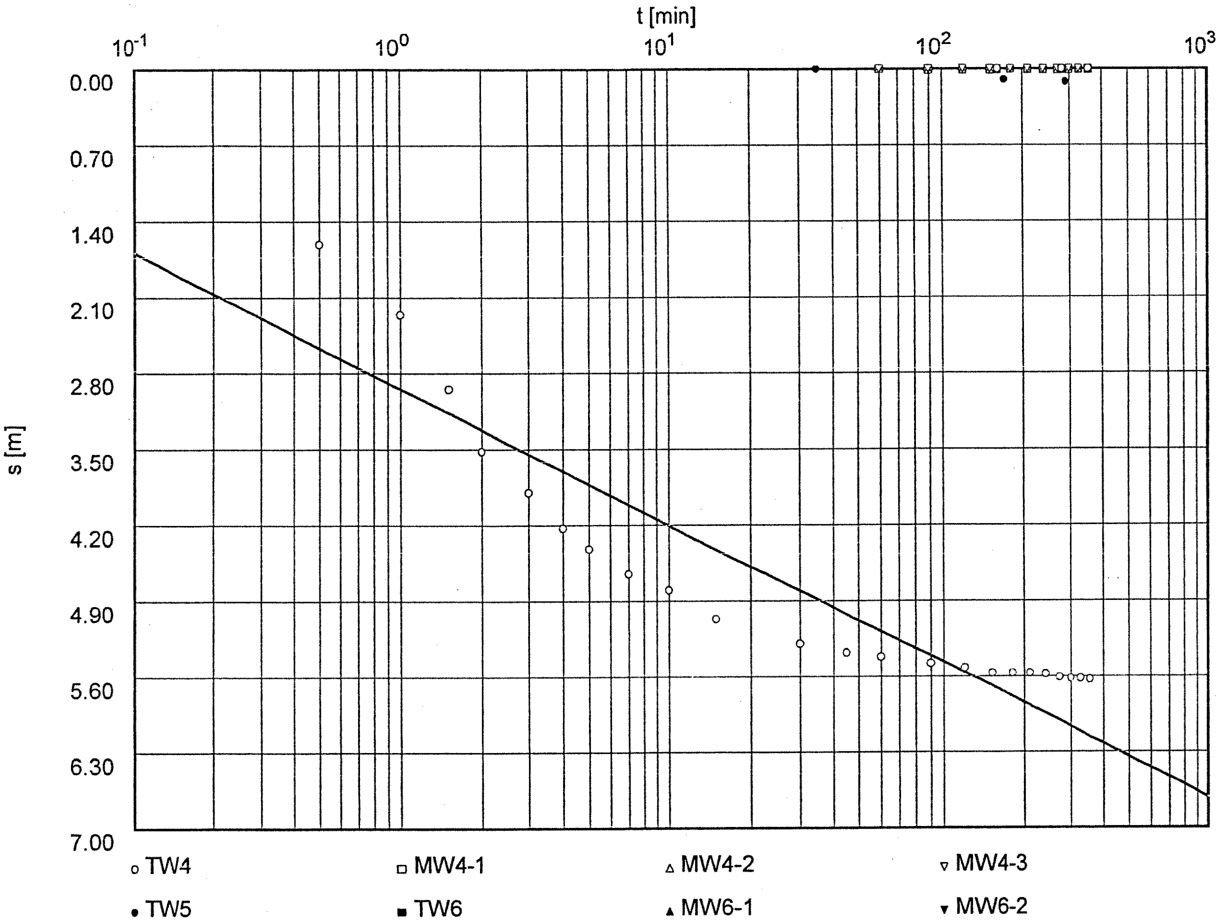
Storativity: 2.49 x 10^{-4}

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown-method after
COOPER & JACOB
Confined aquifer

Date: 10.05.2006
none, Page 1
Project: PH0145
Evaluated by: RAP

Pumping Test No. 06-2
Test conducted on: May 1, 2006
TW4
Discharge 1.88 l/s



Transmissivity [m²/min]: 1.64×10^{-2}

Storativity: 7.51×10^{-3}

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 16.05.2006
none, Page 2
Project: PH0145
Evaluated by: RAP

Pumping Test No. 3
Test conducted on: May 2, 2006
TW5
TW5
Discharge 1.92 l/s
Distance from the pumping well 0.150 m

Static water level: 1.070 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.070	0.000	
2	3.00	1.200	0.130	
3	4.00	1.230	0.160	
4	5.00	1.250	0.180	
5	6.00	1.260	0.190	
6	7.00	1.280	0.210	
7	8.00	1.290	0.220	
8	10.00	1.310	0.240	
9	12.00	1.320	0.250	
10	14.00	1.340	0.270	
11	16.00	1.350	0.280	
12	18.00	1.360	0.290	
13	20.00	1.370	0.300	
14	25.00	1.390	0.320	
15	30.00	1.400	0.330	
16	35.00	1.420	0.350	
17	40.00	1.430	0.360	
18	45.00	1.440	0.370	
19	55.00	1.460	0.390	
20	60.00	1.460	0.390	
21	70.00	1.480	0.410	
22	80.00	1.480	0.410	
23	90.00	1.490	0.420	
24	100.00	1.500	0.430	
25	110.00	1.500	0.430	
26	120.00	1.510	0.440	
27	140.00	1.510	0.440	
28	160.00	1.510	0.440	
29	180.00	1.520	0.450	
30	210.00	1.520	0.450	
31	240.00	1.520	0.450	
32	293.00	1.530	0.460	
33	330.00	1.530	0.460	
34	361.00	1.270	0.200	
35	362.00	1.240	0.170	
36	363.00	1.220	0.150	
37	365.00	1.160	0.090	
38	370.00	1.120	0.050	
39	376.00	1.070	0.000	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 16.05.2006 none, Page 3 Project: PH0145 Evaluated by: RAP

Pumping Test No. 3	Test conducted on: May 2, 2006
TW5	TW4
Discharge 1.92 l/s	Distance from the pumping well 277.000 m
Static water level: 1.320 m below datum	

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.320	0.000	
2	50.00	1.560	0.240	
3	85.00	1.600	0.280	
4	146.00	1.630	0.310	
5	210.00	1.640	0.320	
6	256.00	1.640	0.320	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 16.05.2006	none, Page 4
		Project: PH0145	
		Evaluated by: RAP	

Pumping Test No. 3	Test conducted on: May 2, 2006
TW5	MW5-1
Discharge 1.92 l/s	Distance from the pumping well 5.000 m
Static water level: 0.860 m below datum	

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	0.860	0.000	
2	14.00	0.860	0.000	
3	25.00	0.860	0.000	
4	40.00	0.860	0.000	
5	55.00	0.860	0.000	
6	80.00	0.860	0.000	
7	90.00	0.860	0.000	
8	110.00	0.860	0.000	
9	140.00	0.860	0.000	
10	210.00	0.860	0.000	
11	293.00	0.860	0.000	
12	330.00	0.860	0.000	
13	360.00	0.860	0.000	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 16.05.2006 none, Page 5 Project: PH0145 Evaluated by: RAP

Pumping Test No. 3	Test conducted on: May 2, 2006
TW5	MW5-2
Discharge 1.92 l/s	Distance from the pumping well 5.000 m

Static water level: 0.820 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	0.820	0.000	
2	14.00	0.820	0.000	
3	25.00	0.820	0.000	
4	40.00	0.820	0.000	
5	55.00	0.820	0.000	
6	80.00	0.820	0.000	
7	90.00	0.820	0.000	
8	110.00	0.820	0.000	
9	140.00	0.820	0.000	
10	210.00	0.820	0.000	
11	293.00	0.820	0.000	
12	330.00	0.820	0.000	
13	360.00	0.820	0.000	

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 16.05.2006
none, Page 6
Project: PH0145
Evaluated by: RAP

Pumping Test No. 3
Test conducted on: May 2, 2006

TW5
MW5-3

Discharge 1.92 l/s
Distance from the pumping well 5.000 m

Static water level: 0.800 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	0.800	0.000	
2	14.00	0.800	0.000	
3	25.00	0.800	0.000	
4	40.00	0.800	0.000	
5	55.00	0.800	0.000	
6	80.00	0.800	0.000	
7	90.00	0.800	0.000	
8	110.00	0.800	0.000	
9	140.00	0.800	0.000	
10	210.00	0.800	0.000	
11	293.00	0.800	0.000	
12	330.00	0.800	0.000	
13	360.00	0.800	0.000	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 16.05.2006	none, Page 7
		Project: PH0145	
		Evaluated by: RAP	

Pumping Test No. 3	Test conducted on: May 2, 2006
TW5	MW4-1
Discharge 1.92 l/s	Distance from the pumping well 267.000 m

Static water level: 1.460 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.460	0.000	
2	21.00	1.460	0.000	
3	50.00	1.460	0.000	
4	85.00	1.460	0.000	
5	143.00	1.460	0.000	
6	306.00	1.460	0.000	
7	400.00	1.460	0.000	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 16.05.2006 none, Page 8 Project: PH0145 Evaluated by: RAP

Pumping Test No. 3	Test conducted on: May 2, 2006
TW5	MW4-2
Discharge 1.92 l/s	Distance from the pumping well 277.000 m

Static water level: 1.240 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.240	0.000	
2	50.00	1.240	0.000	
3	85.00	1.240	0.000	
4	143.00	1.240	0.000	
5	211.00	1.240	0.000	
6	306.00	1.240	0.000	
7	400.00	1.240	0.000	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 16.05.2006 none, Page 9 Project: PH0145 Evaluated by: RAP

Pumping Test No. 3

Test conducted on: May 2, 2006

TW5

MW4-3

Discharge 1.92 l/s

Distance from the pumping well 289.000 m

Static water level: 1.480 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.480	0.000	
2	50.00	1.480	0.000	
3	85.00	1.480	0.000	
4	143.00	1.480	0.000	
5	211.00	1.480	0.000	
6	306.00	1.480	0.000	
7	400.00	1.480	0.000	

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 16.05.2006
none, Page 1

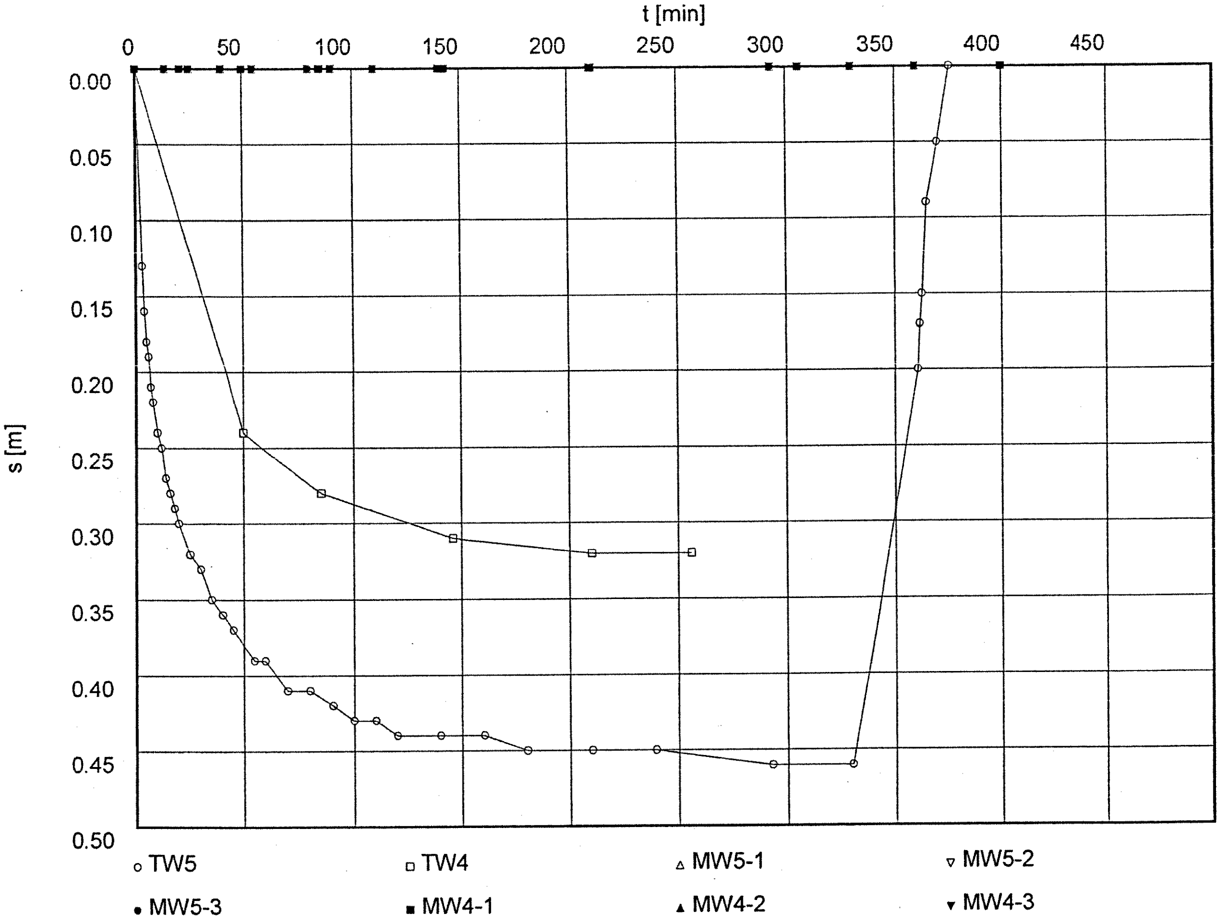
Project: PH0145

Evaluated by: RAP

Pumping Test No. 3
Test conducted on: May 2, 2006

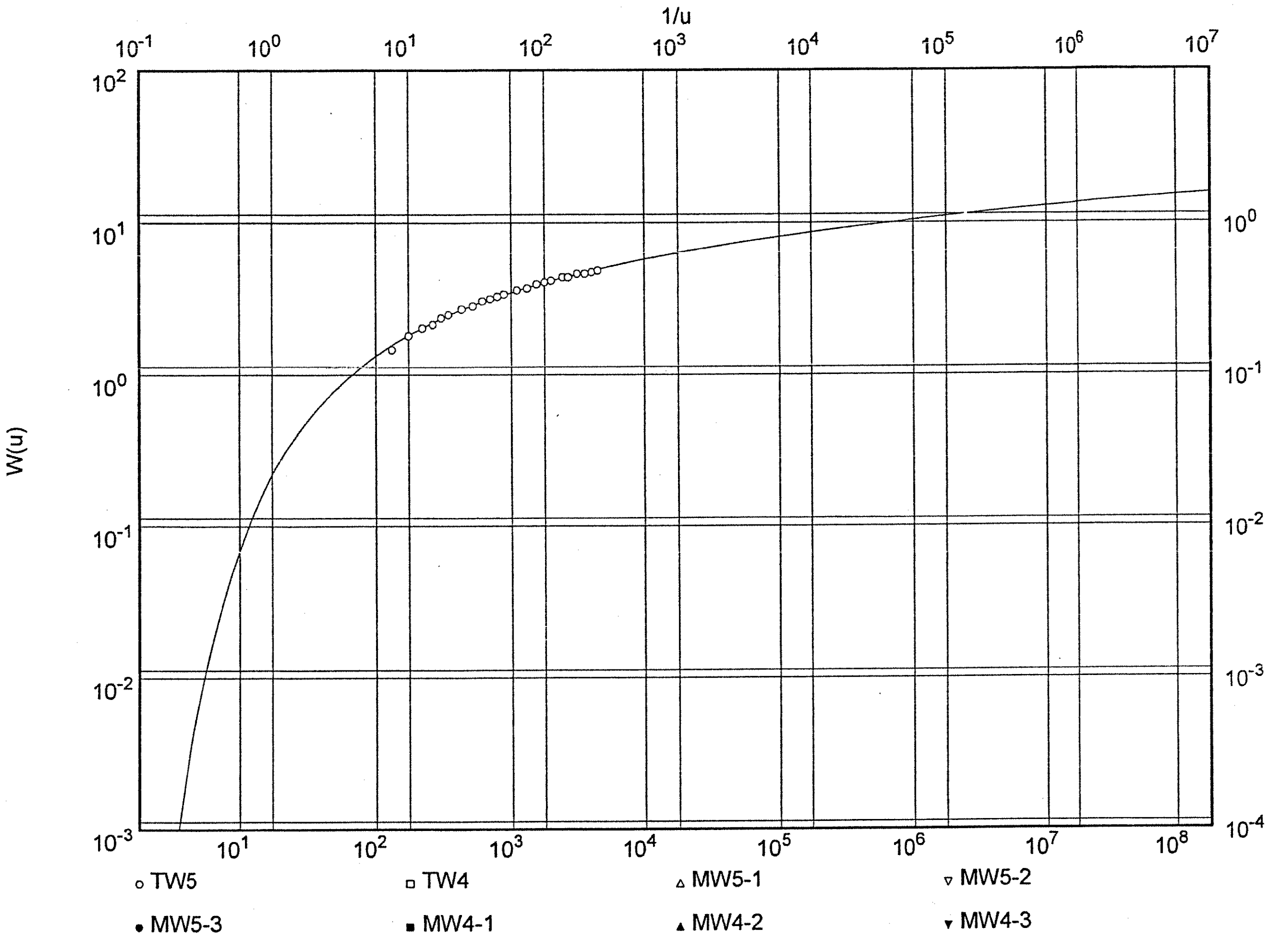
TW5

Discharge 1.92 l/s



Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Theis analysis method Confined aquifer	Date: 16.05.2006	none, Page 1
		Project: PH0145	
		Evaluated by: RAP	

Pumping Test No. 3	Test conducted on: May 2, 2006
TW5	
Discharge 1.92 l/s	



Transmissivity [m²/min]: 1.03×10^{-1}

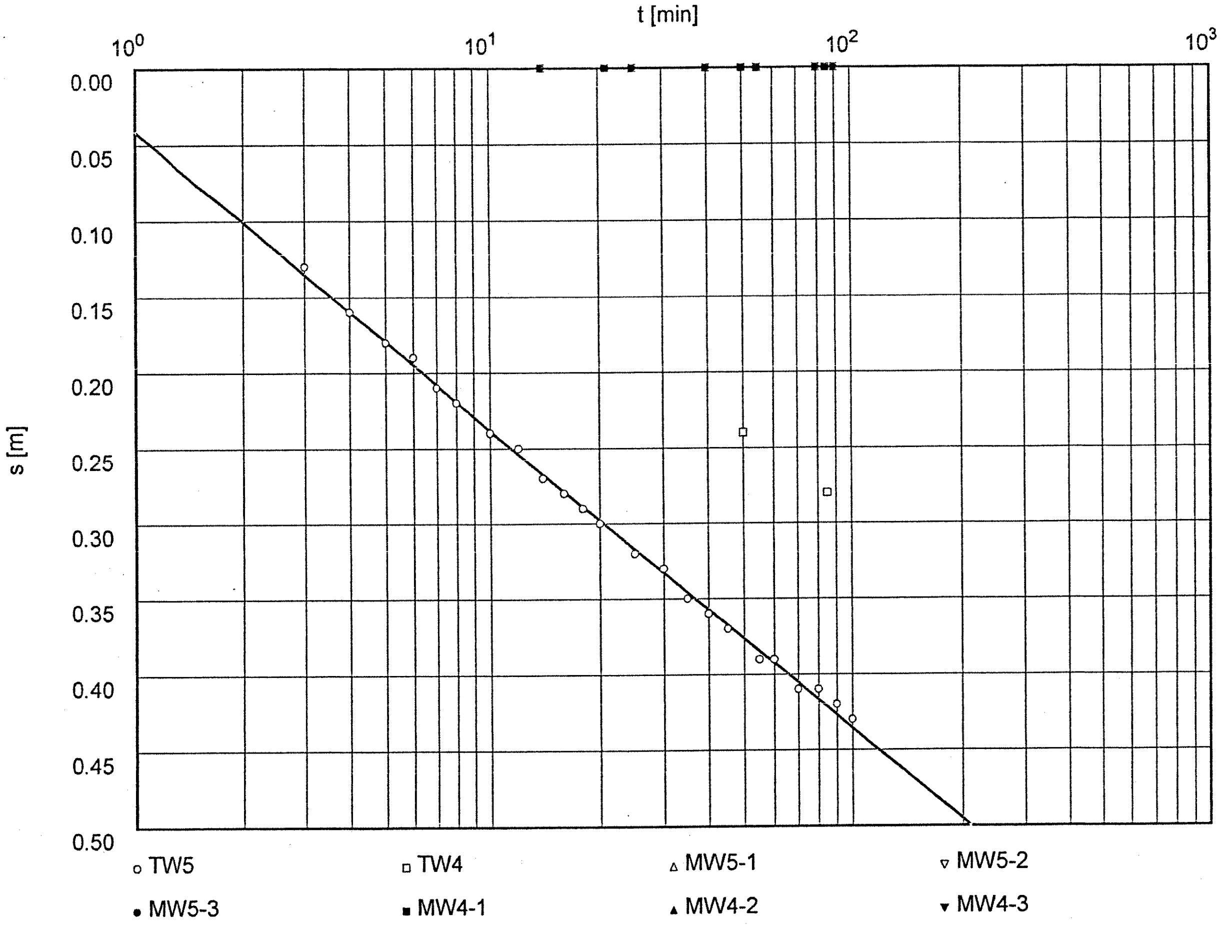
Storativity: 7.27×10^{0}

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown-method after
COOPER & JACOB
Confined aquifer

Date: 16.05.2006
none, Page 1
Project: PH0145
Evaluated by: RAP

Pumping Test No. 3
Test conducted on: May 2, 2006
TW5
Discharge 1.92 l/s

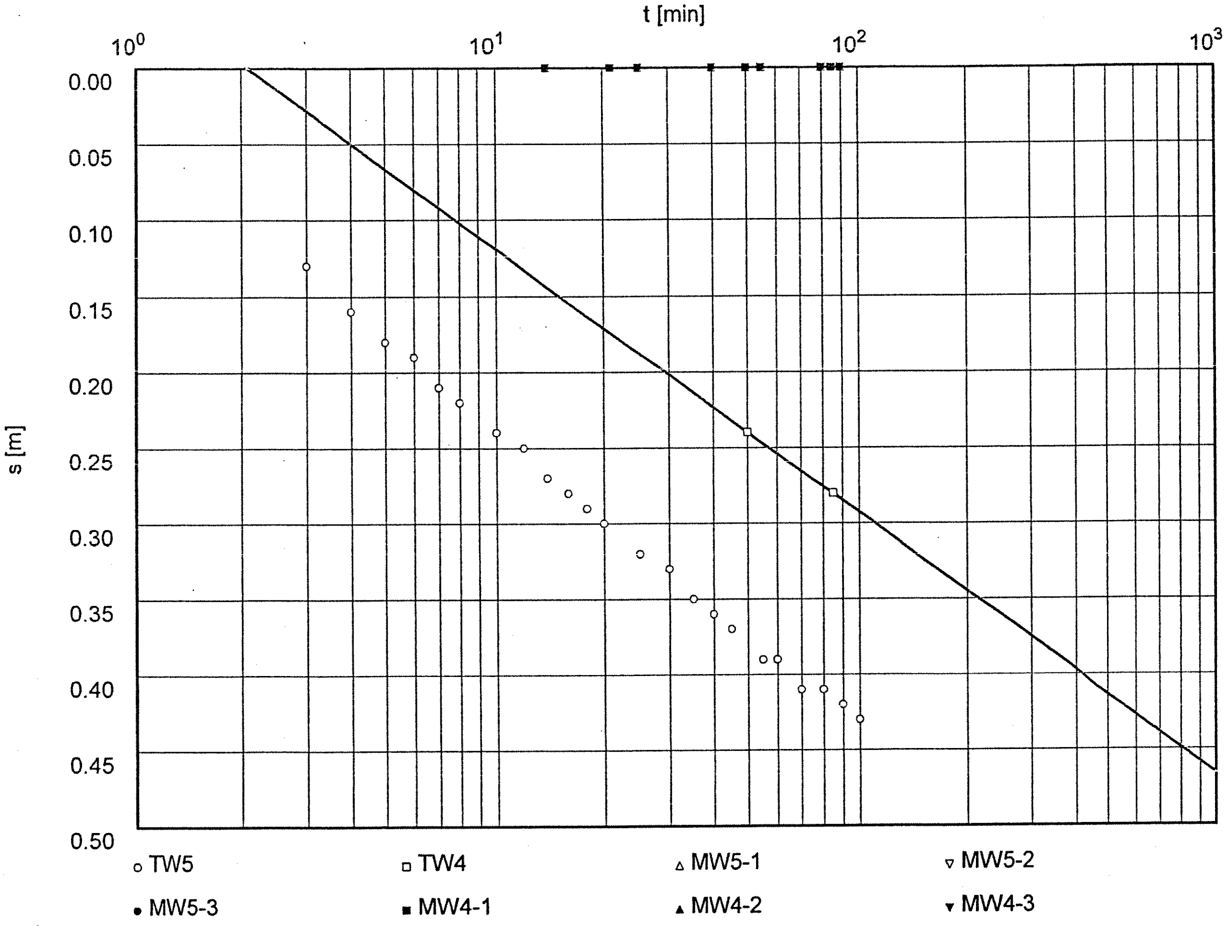


Transmissivity [m²/min]: 1.06 x 10^{-1}

Storativity: 6.61 x 10^{0}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Date: 16.05.2006	none, Page 1
		Project: PH0145	
		Evaluated by: RAP	

Pumping Test No. 3	Test conducted on: May 2, 2006
TW5	
Discharge 1.92 l/s	

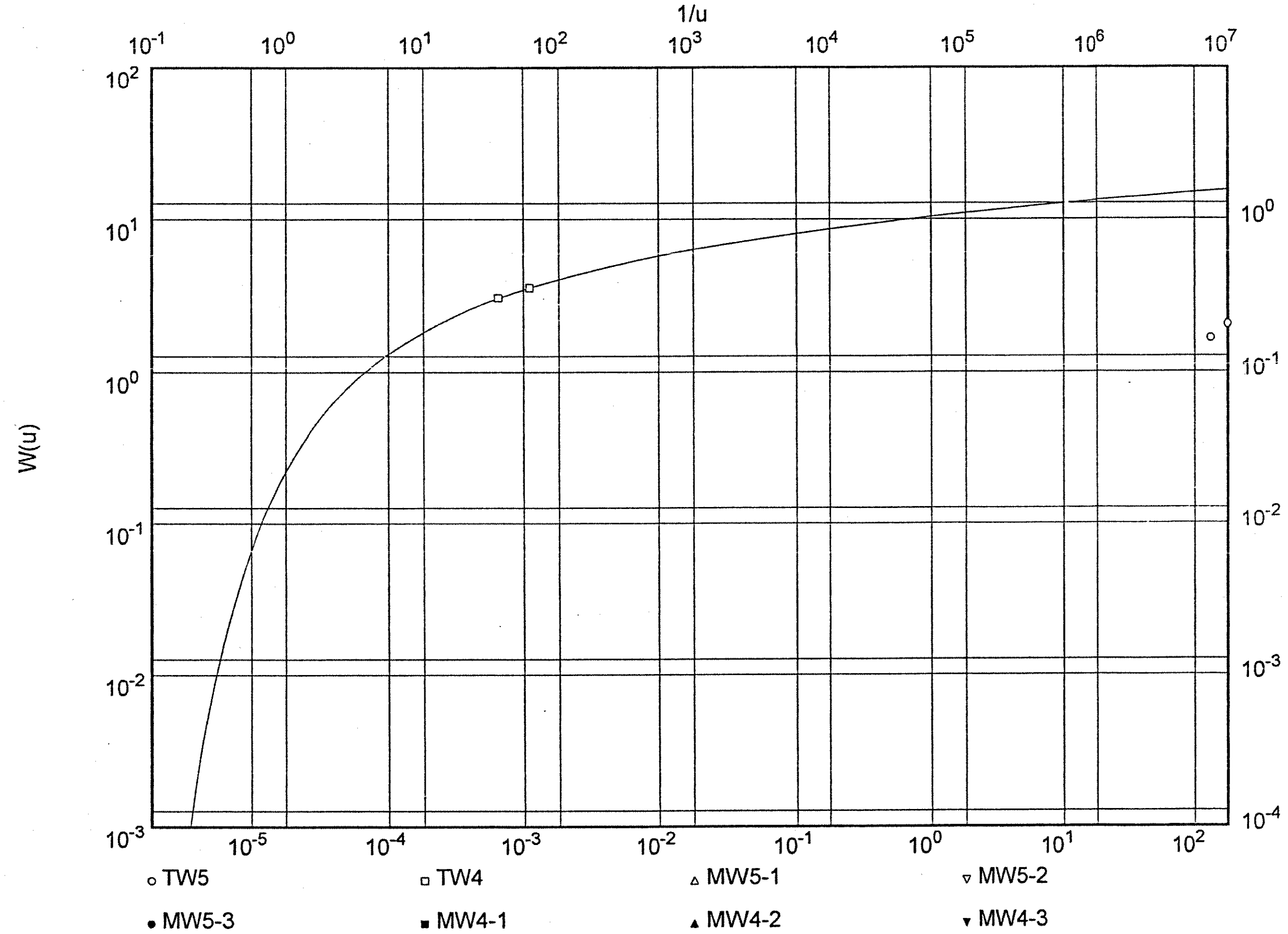


Transmissivity [m²/min]: 1.21×10^{-1}

Storativity: 7.37×10^{-6}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Theis analysis method Confined aquifer	Date: 16.05.2006	none, Page 1
		Project: PH0145	
		Evaluated by: RAP	

Pumping Test No. 3	Test conducted on: May 2, 2006
TW5	
Discharge 1.92 l/s	



Transmissivity [m²/min]: 1.16×10^{-1}

Storativity: 8.34×10^{-6}

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 05.05.2006

none, Page 2

Project: PHO145

Evaluated by: RAP

Pumping Test No. O6/01

Test conducted on: April 28, 2006

TW6

Test Well 6

Discharge 2.14 l/s

Distance from the pumping well 0.150 m

Static water level: 0.870 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	0.870	0.000	
2	0.50	0.970	0.100	
3	1.00	1.120	0.250	
4	1.50	1.150	0.280	
5	2.00	1.180	0.310	
6	2.50	1.190	0.320	
7	3.00	1.200	0.330	
8	4.00	1.220	0.350	
9	5.00	1.250	0.380	
10	7.00	1.270	0.400	
11	10.00	1.320	0.450	
12	15.00	1.360	0.490	
13	30.00	1.440	0.570	
14	45.00	1.500	0.630	
15	60.00	1.550	0.680	
16	90.00	1.610	0.740	
17	120.00	1.640	0.770	
18	150.00	1.670	0.800	
19	180.00	1.680	0.810	
20	210.00	1.690	0.820	
21	240.00	1.690	0.820	
22	270.00	1.690	0.820	
23	300.00	1.690	0.820	
24	330.00	1.700	0.830	
25	360.00	1.710	0.840	
26	360.50	1.380	0.510	
27	361.00	1.350	0.480	
28	361.50	1.340	0.470	
29	362.00	1.320	0.450	
30	363.00	1.320	0.450	
31	364.00	1.270	0.400	
32	366.00	1.240	0.370	
33	370.00	1.200	0.330	
34	375.00	1.150	0.280	
35	380.00	1.100	0.230	
36	390.00	1.040	0.170	
37	405.00	0.980	0.110	
38	420.00	0.930	0.060	
39	435.00	0.890	0.020	

Pumping test analysis
Time-Drawdown plot

Date: 05.05.2006

Project: PHO145

Evaluated by: RAP

Pumping Test No. O6/01

Test conducted on: April 28, 2006

TW6

TW4

Discharge 2.14 l/s

Distance from the pumping well 353.000 m

Static water level: 1.400 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.400	0.000	
2	180.00	1.280	-0.120	
3	330.00	1.280	-0.120	
4	428.00	1.420	0.020	

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 05.05.2006
none, Page 4
Project: PHO145
Evaluated by: RAP

Pumping Test No. O6/01
Test conducted on: April 28, 2006
TW6
TW2
Discharge 2.14 l/s
Distance from the pumping well 260.000 m

Static water level: 1.848 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.848	0.000	
2	150.00	1.890	0.042	
3	300.00	1.900	0.052	
4	385.00	1.890	0.042	
5	456.00	1.860	0.012	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 05.05.2006	none, Page 5
		Project: PHO145	
		Evaluated by: RAP	

Pumping Test No. 06/01	Test conducted on: April 28, 2006
TW6	TW3
Discharge 2.14 l/s	Distance from the pumping well 280.000 m

Static water level: 0.550 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	0.550	0.000	
2	150.00	0.590	0.040	
3	300.00	0.600	0.050	
4	385.00	0.590	0.040	
5	456.00	0.560	0.010	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 05.05.2006	none, Page 6
		Project: PHO145	
		Evaluated by: RAP	

Pumping Test No. O6/01	Test conducted on: April 28, 2006
TW6	MW6-1
Discharge 2.14 l/s	Distance from the pumping well 5.000 m

Static water level: 1.250 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.250	0.000	
2	60.00	1.240	-0.010	
3	90.00	1.240	-0.010	
4	120.00	1.240	-0.010	
5	150.00	1.240	-0.010	
6	180.00	1.230	-0.020	
7	210.00	1.230	-0.020	
8	240.00	1.230	-0.020	
9	270.00	1.230	-0.020	
10	300.00	1.230	-0.020	
11	330.00	1.230	-0.020	
12	360.00	1.230	-0.020	
13	365.00	1.230	-0.020	
14	440.00	1.230	-0.020	

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 05.05.2006
none, Page 7
Project: PHO145
Evaluated by: RAP

Pumping Test No. O6/01
Test conducted on: April 28, 2006
TW6
MW6-2
Discharge 2.14 l/s
Distance from the pumping well 5.000 m

Static water level: 1.430 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.430	0.000	
2	60.00	1.430	0.000	
3	90.00	1.430	0.000	
4	120.00	1.410	-0.020	
5	150.00	1.410	-0.020	
6	180.00	1.410	-0.020	
7	210.00	1.410	-0.020	
8	240.00	1.400	-0.030	
9	270.00	1.400	-0.030	
10	300.00	1.410	-0.020	
11	330.00	1.410	-0.020	
12	360.00	1.400	-0.030	
13	365.00	1.390	-0.040	
14	440.00	1.390	-0.040	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 05.05.2006	none, Page 8
		Project: PHO145	
		Evaluated by: RAP	

Pumping Test No. O6/01	Test conducted on: April 28, 2006
TW6	MW6-3
Discharge 2.14 l/s	Distance from the pumping well 5.000 m
Static water level: 1.620 m below datum	

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.620	0.000	
2	60.00	1.620	0.000	
3	90.00	1.620	0.000	
4	120.00	1.620	0.000	
5	150.00	1.620	0.000	
6	180.00	1.620	0.000	
7	240.00	1.610	-0.010	
8	270.00	1.610	-0.010	
9	300.00	1.620	0.000	
10	330.00	1.620	0.000	
11	360.00	1.620	0.000	
12	365.00	1.620	0.000	
13	440.00	1.620	0.000	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 05.05.2006	none, Page 9
		Project: PHO145	
		Evaluated by: RAP	

Pumping Test No. O6/01

Test conducted on: April 28, 2006

TW6

MW4-1

Discharge 2.14 l/s

Distance from the pumping well 358.000 m

Static water level: 1.430 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.440	0.010	
2	180.00	1.440	0.010	
3	330.00	1.440	0.010	
4	470.00	1.440	0.010	

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 05.05.2006
none, Page 10
Project: PHO145
Evaluated by: RAP

Pumping Test No. 06/01

Test conducted on: April 28, 2006

TW6

MW4-2

Discharge 2.14 l/s

Distance from the pumping well 353.000 m

Static water level: 1.250 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.250	0.000	
2	180.00	1.250	0.000	
3	330.00	1.240	-0.010	
4	470.00	1.240	-0.010	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 05.05.2006	none, Page 11
		Project: PHO145	
		Evaluated by: RAP	

Pumping Test No. O6/01	Test conducted on: April 28, 2006
TW6	MW4-3
Discharge 2.14 l/s	Distance from the pumping well 362.000 m
Static water level: 1.440 m below datum	

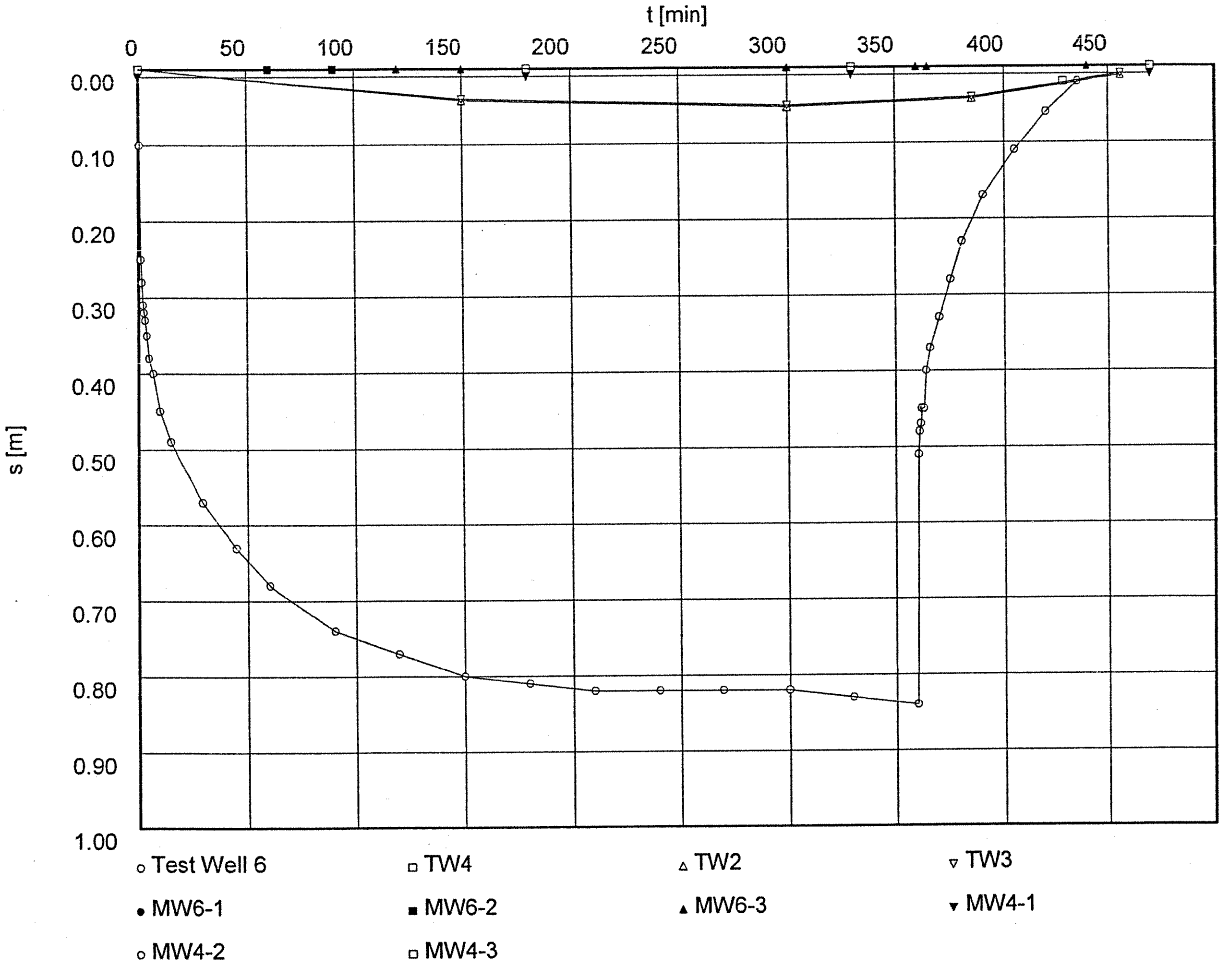
	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.440	0.000	
2	180.00	1.440	0.000	
3	330.00	1.440	0.000	
4	470.00	1.440	0.000	

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 05.05.2006
none, Page 1
Project: PHO145
Evaluated by: RAP

Pumping Test No. O6/01
Test conducted on: April 28, 2006
TW6
Discharge 2.14 l/s



Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Theis analysis method
Confined aquifer

Date: 05.05.2006

none, Page 1

Project: PHO145

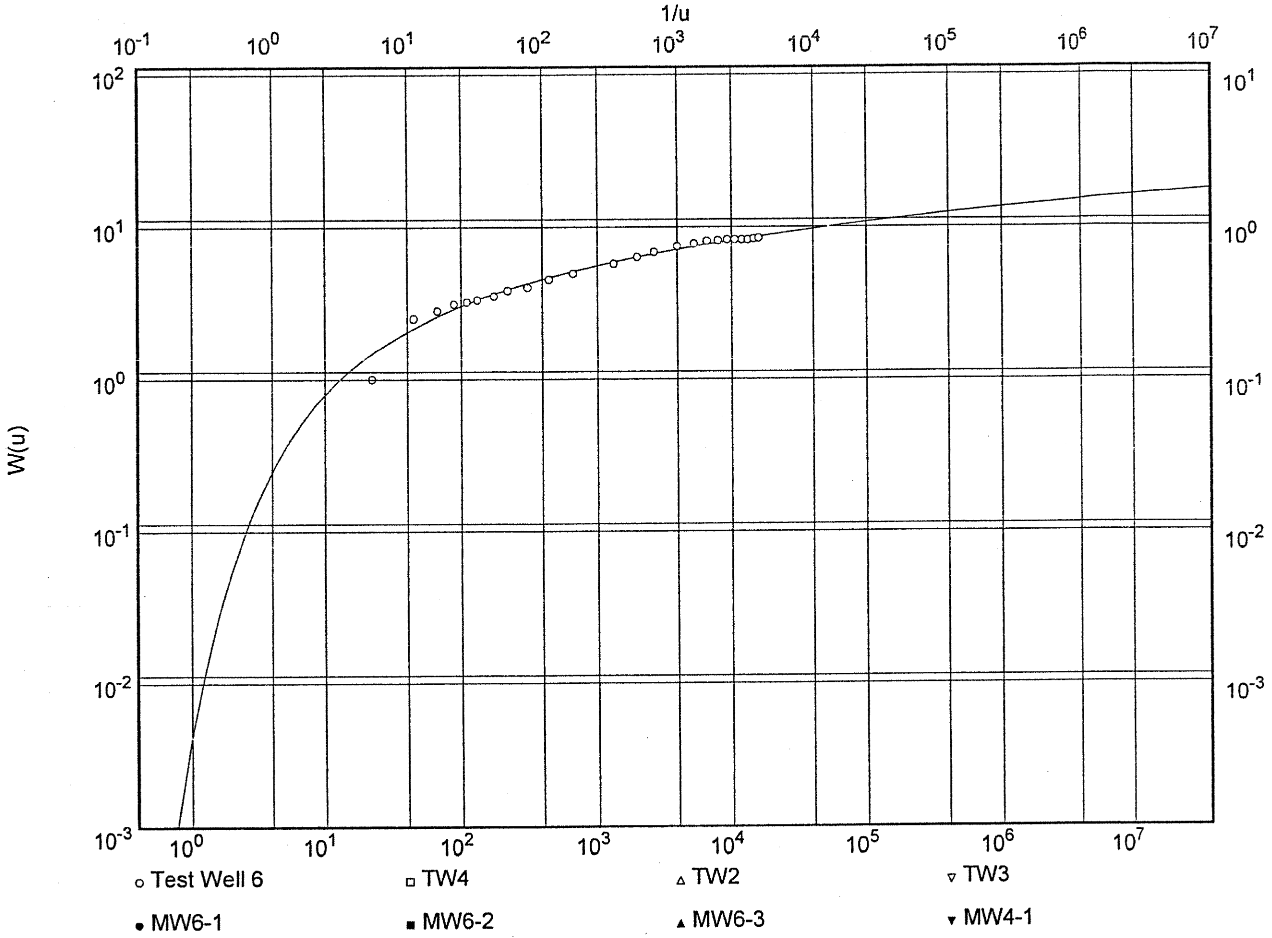
Evaluated by: RAP

Pumping Test No. O6/01

Test conducted on: April 28, 2006

TW6

Discharge 2.14 l/s

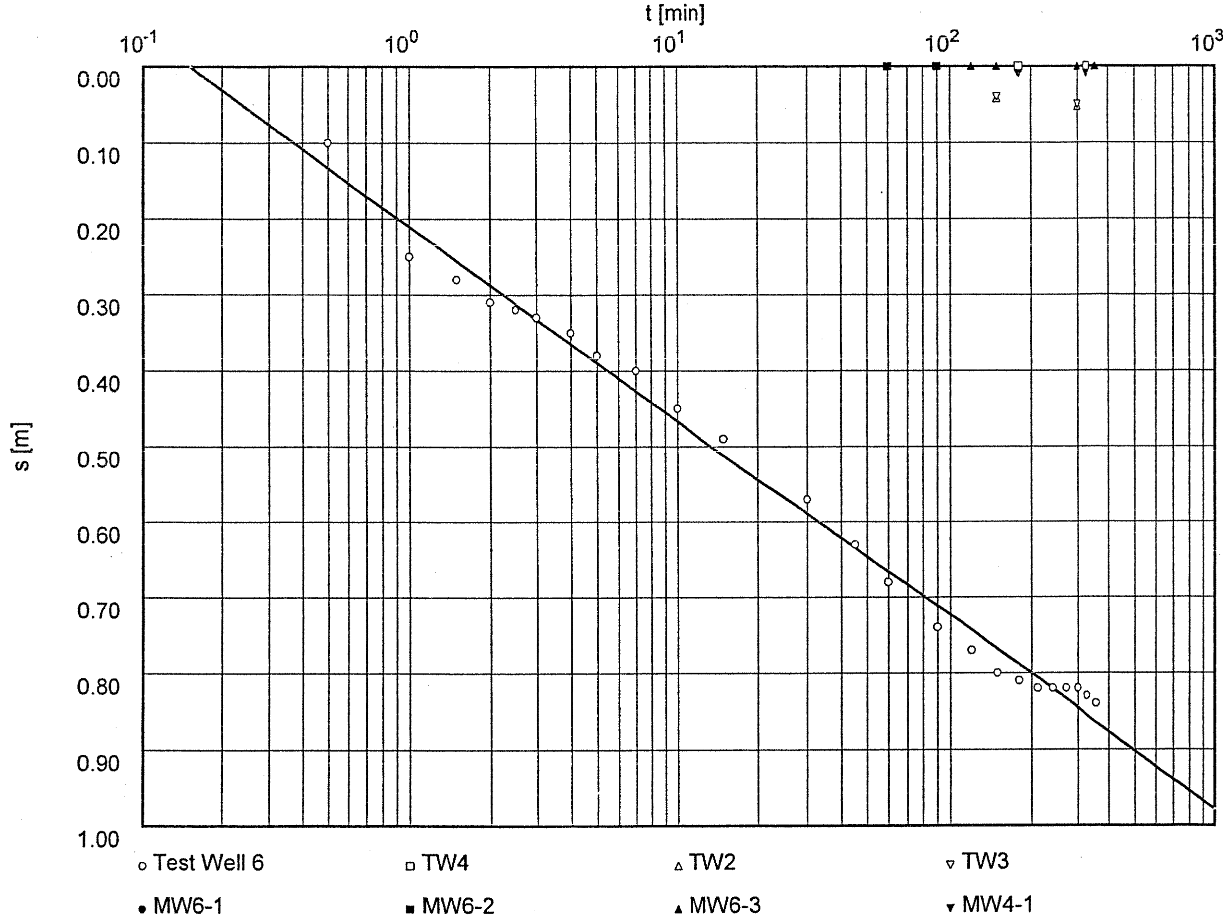


Transmissivity [m²/min]: 9.12×10^{-2}

Storativity: 1.44×10^{0}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Date: 05.05.2006	none, Page 1
		Project: PHO145	
		Evaluated by: RAP	

Pumping Test No. O6/01	Test conducted on: April 28, 2006
TW6	
Discharge 2.14 l/s	



Transmissivity [m²/min]: 9.16×10^{-2}

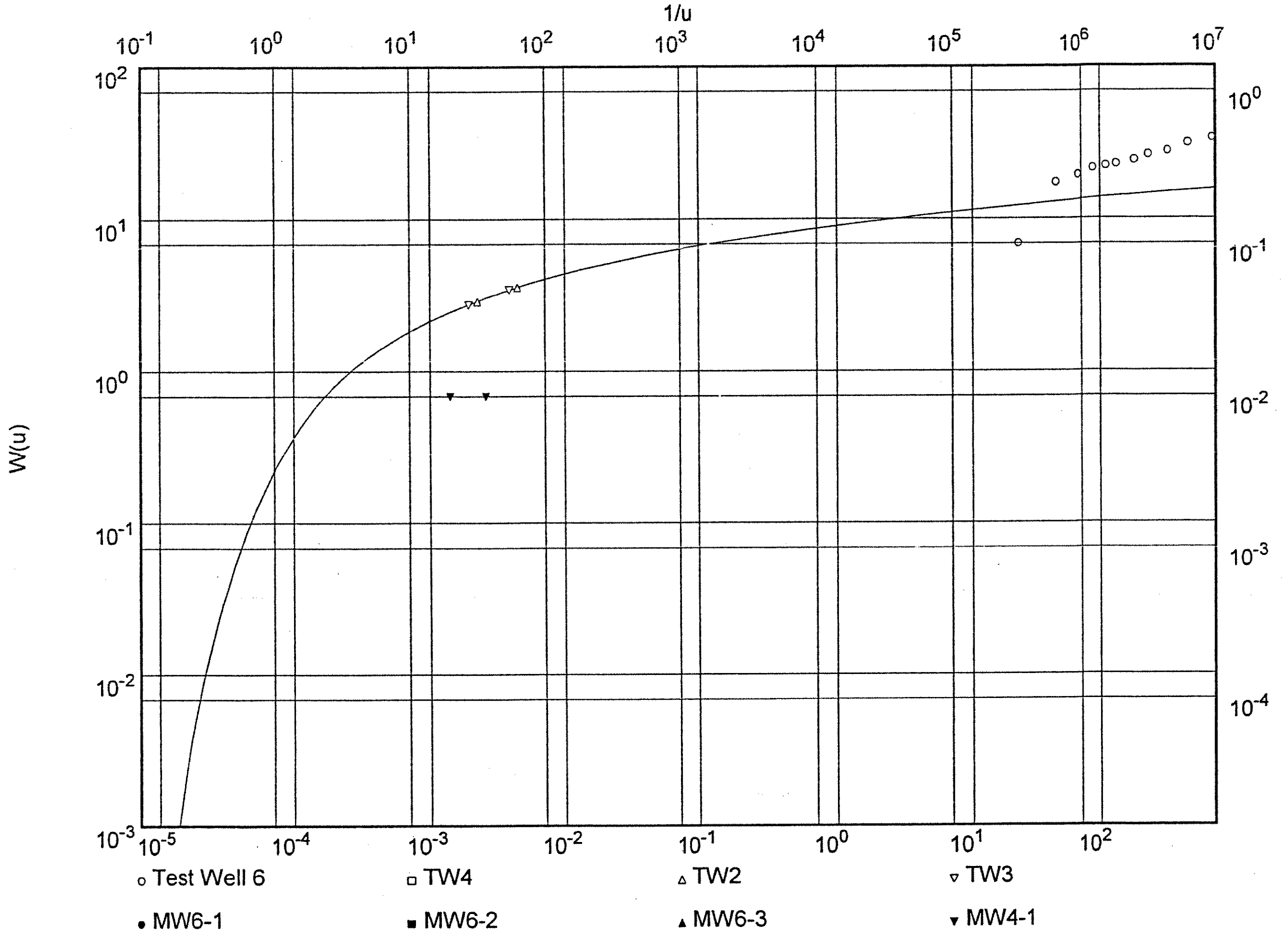
Storativity: 1.39×10^{0}

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Theis analysis method
Confined aquifer

Date: 05.05.2006
none, Page 1
Project: PHO145
Evaluated by: RAP

Pumping Test No. O6/01
Test conducted on: April 28, 2006
TW6
Discharge 2.14 l/s



Transmissivity [m²/min]: 6.99 x 10^{-1}_{-3}

Storativity: 1.99 x 10^{-4}

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown-method after
COOPER & JACOB
Confined aquifer

Date: 05.05.2006
none, Page 1

Project: PHO145

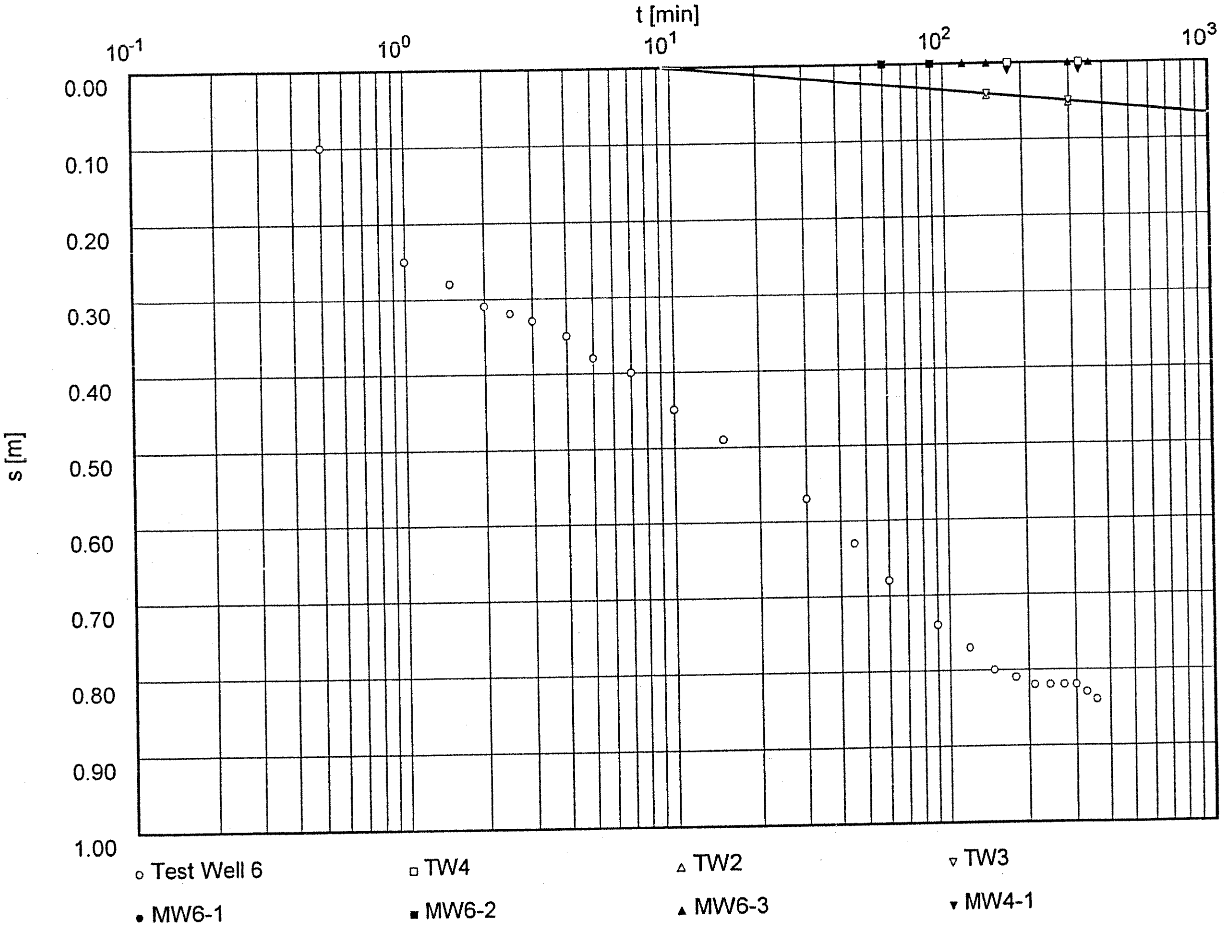
Evaluated by: RAP

Pumping Test No. O6/01

Test conducted on: April 28, 2006

TW6

Discharge 2.14 l/s



Transmissivity [m²/min]: 7.07 x 10^{-1}

Storativity: 1.90 x 10^{-4}

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 25.07.2005

none, Page 1

Project: Sunset Lakes

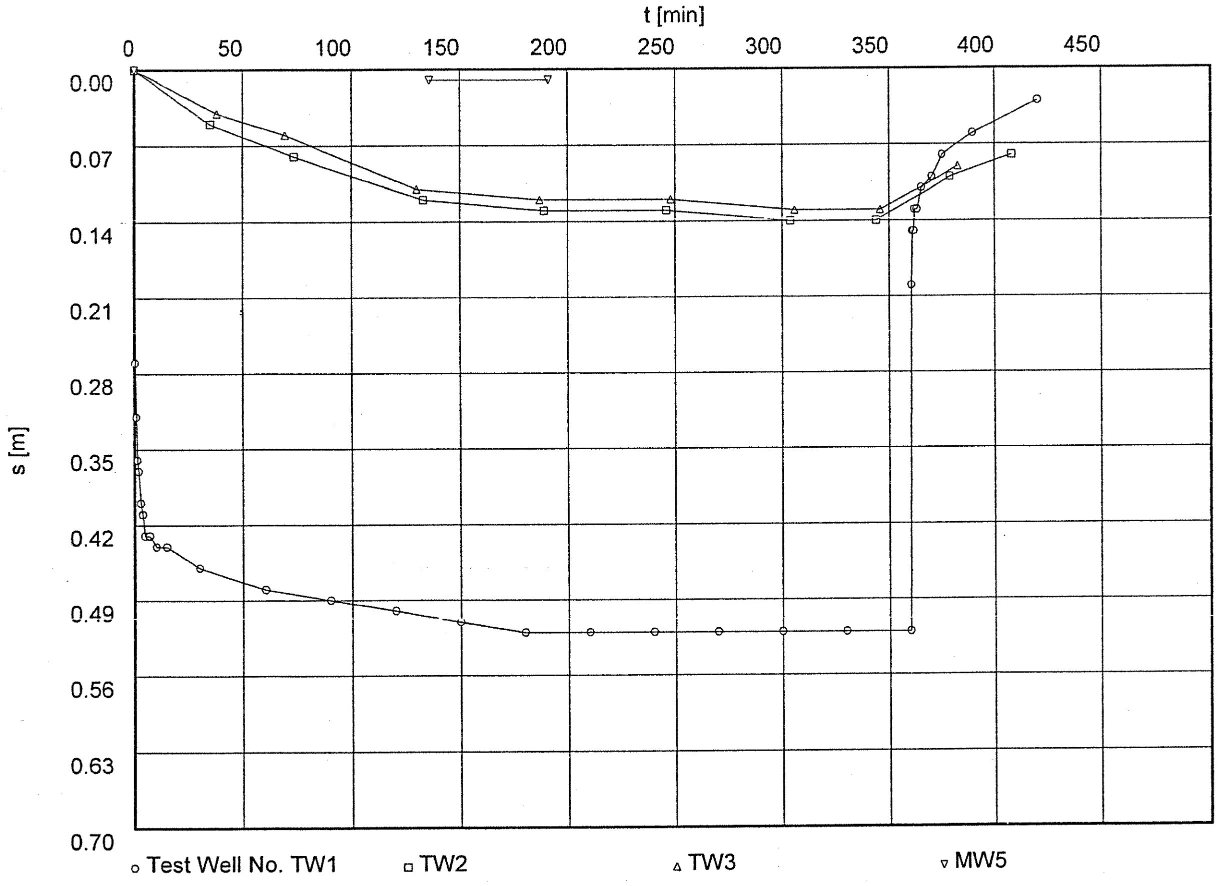
Evaluated by: RAP

Pumping Test No. 1

Test conducted on: June 23, 2005

TW1

Discharge 1.44 l/s



Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 25.07.2005
none, Page 2

Project: Sunset Lakes

Evaluated by: RAP

Pumping Test No. 1

Test conducted on: June 23, 2005

TW1

Test Well No. TW1

Discharge 1.44 l/s

Distance from the pumping well 0.100 m

Static water level: 1.650 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.650	0.000	
2	0.50	1.920	0.270	
3	1.00	1.970	0.320	
4	1.50	2.010	0.360	
5	2.00	2.020	0.370	
6	3.00	2.050	0.400	
7	4.00	2.060	0.410	
8	5.00	2.080	0.430	
9	7.00	2.080	0.430	
10	10.00	2.090	0.440	
11	15.00	2.090	0.440	
12	30.00	2.110	0.460	
13	60.00	2.130	0.480	
14	90.00	2.140	0.490	
15	120.00	2.150	0.500	
16	150.00	2.160	0.510	
17	180.00	2.170	0.520	
18	210.00	2.170	0.520	
19	240.00	2.170	0.520	
20	270.00	2.170	0.520	
21	300.00	2.170	0.520	
22	330.00	2.170	0.520	
23	360.00	2.170	0.520	
24	360.50	1.850	0.200	
25	361.00	1.800	0.150	
26	361.50	1.800	0.150	
27	362.00	1.780	0.130	
28	363.00	1.780	0.130	
29	365.00	1.760	0.110	
30	370.00	1.750	0.100	
31	375.00	1.730	0.080	
32	390.00	1.710	0.060	
33	420.00	1.680	0.030	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 25.07.2005	none, Page 3
		Project: Sunset Lakes	
		Evaluated by: RAP	

Pumping Test No. 1	Test conducted on: June 23, 2005
TW1	Constant rate pump test
Discharge 1.44 l/s	

	Pumping test duration [min]	Discharge [l/s]		
1	0.00	1.68		
2	10.00	1.68		
3	300.00	1.68		
4	360.00	1.68		
5	360.10	0.00		
6	420.00	0.00		

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 25.07.2005 | none, Page 4 Project: Sunset Lakes Evaluated by: RAP

Pumping Test No. 1	Test conducted on: June 23, 2005
TW1	TW2
Discharge 1.44 l/s	Distance from the pumping well 100.000 m

Static water level: 1.650 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.650	0.000	
2	35.00	1.700	0.050	
3	73.00	1.730	0.080	
4	133.00	1.770	0.120	
5	189.00	1.780	0.130	
6	246.00	1.780	0.130	
7	304.00	1.790	0.140	
8	344.00	1.790	0.140	
9	379.00	1.750	0.100	
10	408.00	1.730	0.080	

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 25.07.2005
none, Page 5
Project: Sunset Lakes
Evaluated by: RAP

Pumping Test No. 1
Test conducted on: June 23, 2005
TW1
TW3
Discharge 1.44 l/s
Distance from the pumping well 175.000 m
Static water level: 0.360 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	0.360	0.000	
2	38.00	0.400	0.040	
3	69.00	0.420	0.060	
4	130.00	0.470	0.110	
5	187.00	0.480	0.120	
6	248.00	0.480	0.120	
7	306.00	0.490	0.130	
8	346.00	0.490	0.130	
9	383.00	0.450	0.090	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 25.07.2005	none, Page 6
		Project: Sunset Lakes	
		Evaluated by: RAP	

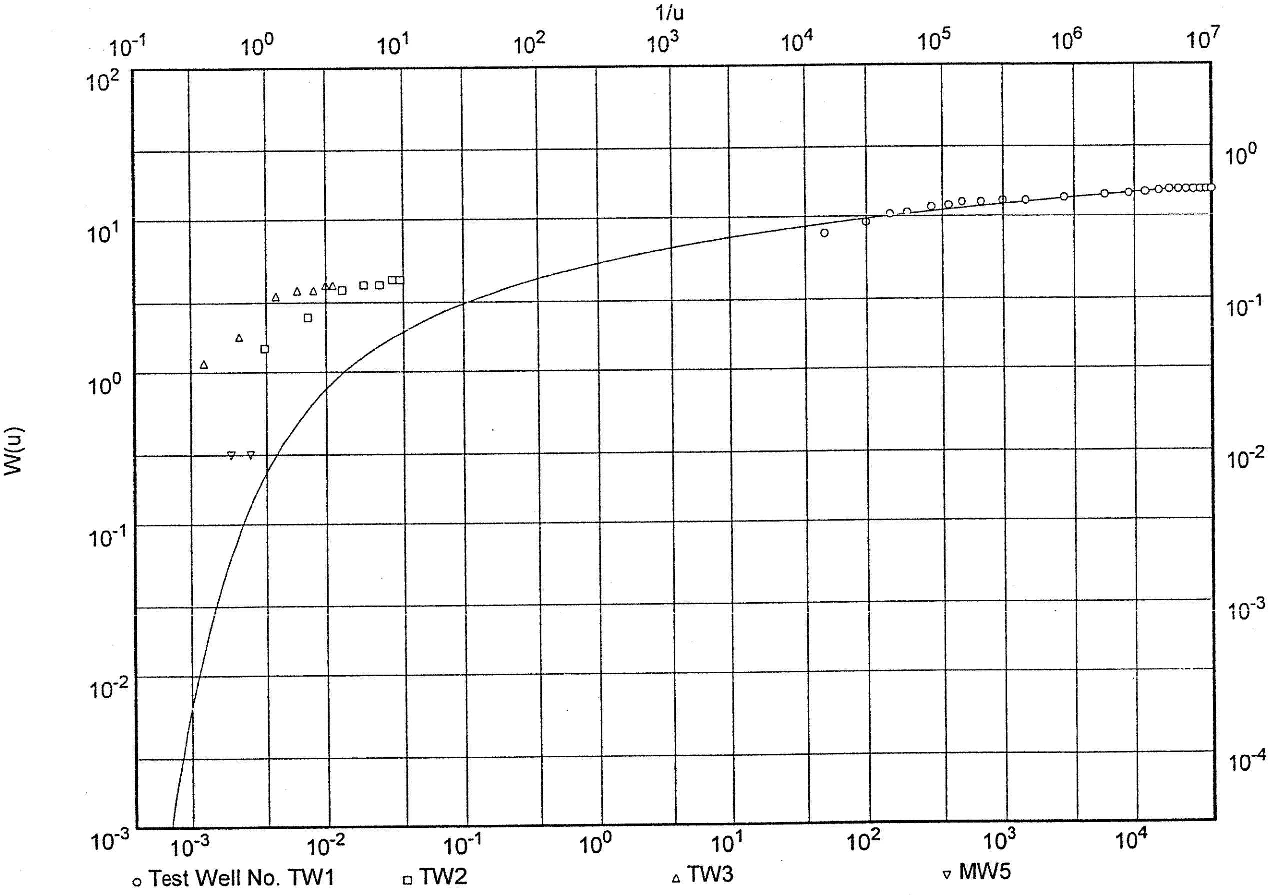
Pumping Test No. 1	Test conducted on: June 23, 2005
TW1	MW5
Discharge 1.44 l/s	Distance from the pumping well 264.000 m

Static water level: 0.970 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	0.970	0.000	
2	76.00	0.960	-0.010	
3	136.00	0.980	0.010	
4	191.00	0.980	0.010	
5	308.00	0.960	-0.010	
6	348.00	0.960	-0.010	
7	399.00	0.960	-0.010	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Theis analysis method Confined aquifer	Date: 25.07.2005	none, Page 1
		Project: Sunset Lakes	
		Evaluated by: RAP	

Pumping Test No. 1	Test conducted on: June 23, 2005
TW1	
Discharge 1.44 l/s	



Transmissivity [m²/min]: 1.96×10^{-1}

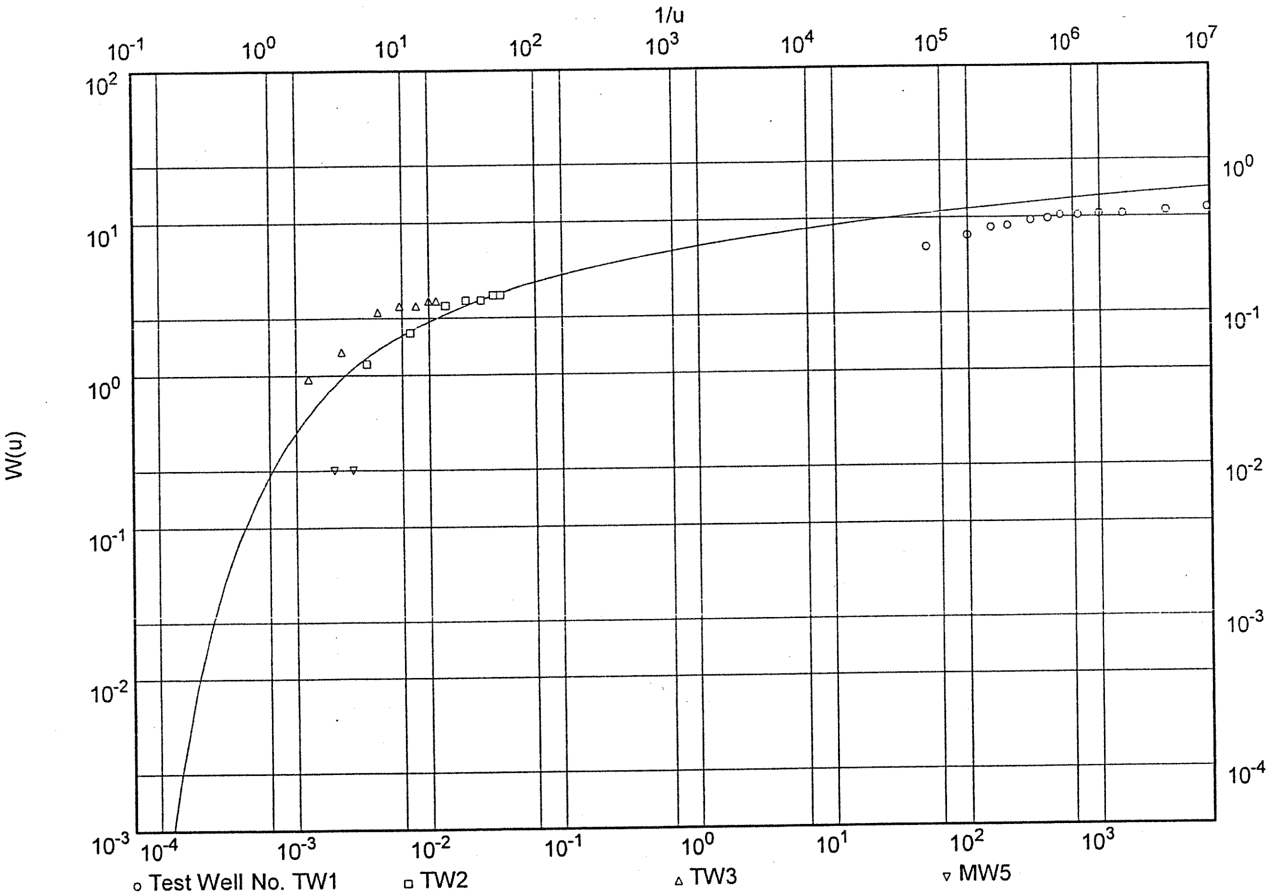
Storativity: 2.82×10^{-3}

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Theis analysis method
Confined aquifer

Date: 25.07.2005
none, Page 1
Project: Sunset Lakes
Evaluated by: RAP

Pumping Test No. 1
Test conducted on: June 23, 2005
TW1
Discharge 1.44 l/s



Transmissivity [m²/min]: 1.62×10^{-1}

Storativity: 4.13×10^{-4}

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

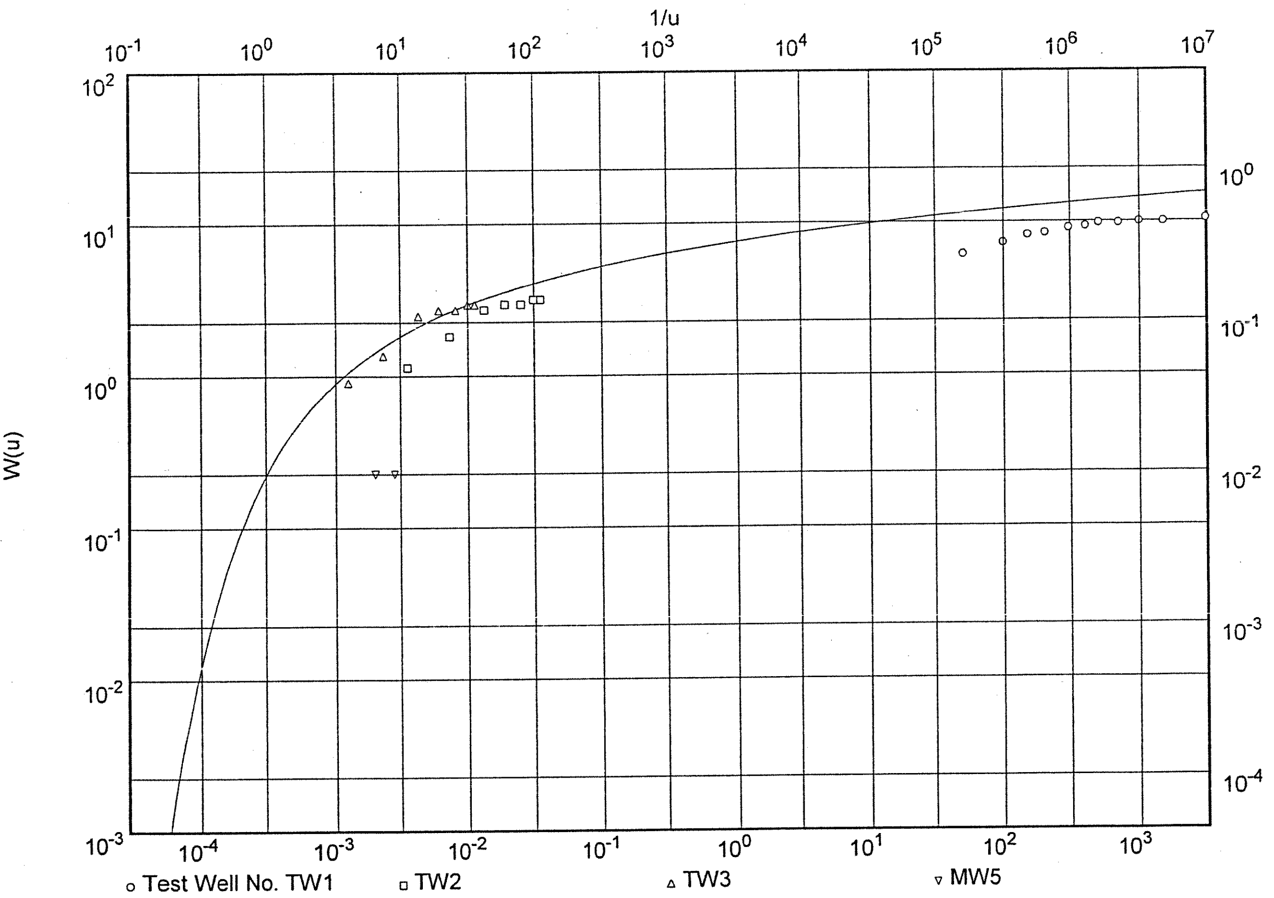
Pumping test analysis
Theis analysis method
Confined aquifer

Date: 25.07.2005
none, Page 1
Project: Sunset Lakes
Evaluated by: RAP

Pumping Test No. 1
Test conducted on: June 23, 2005

TW1

Discharge 1.44 l/s

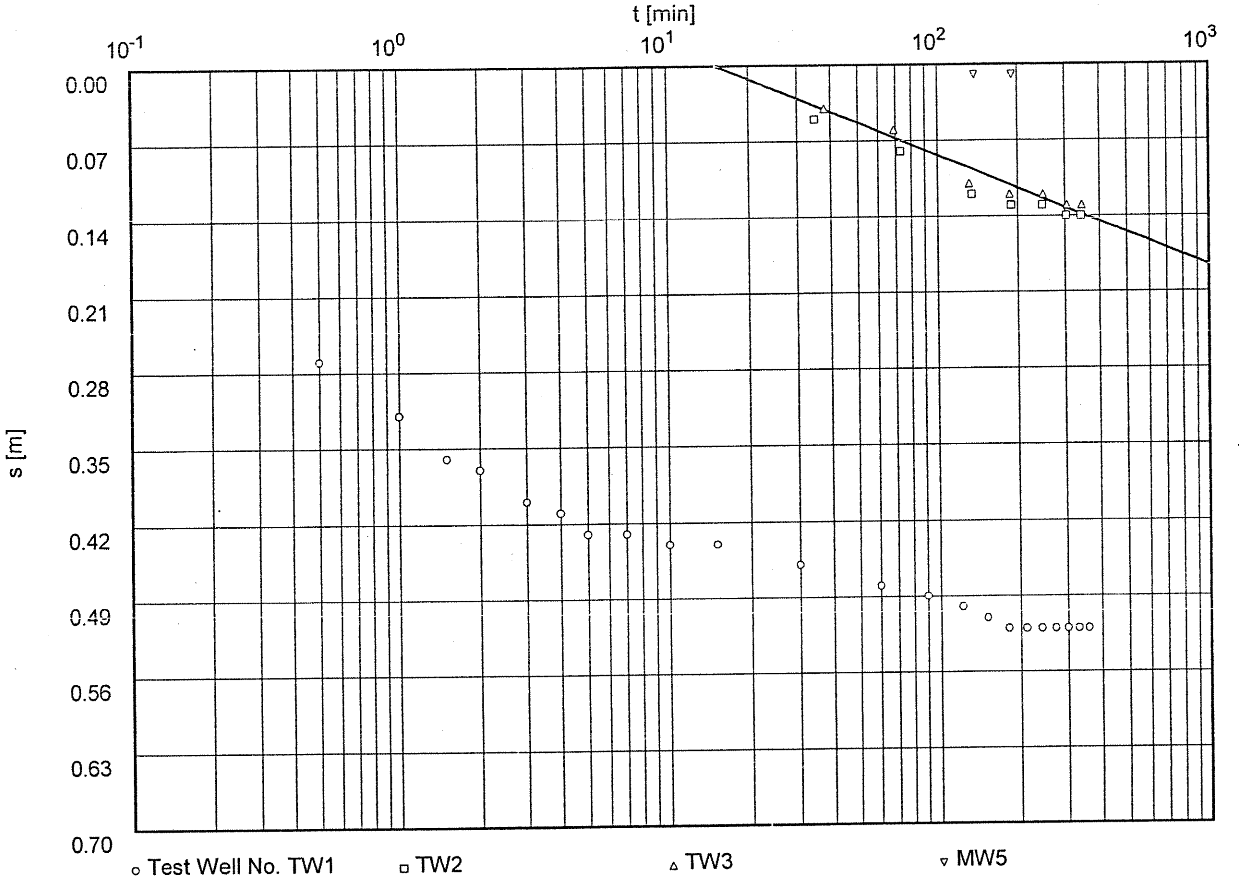


Transmissivity [m²/min]: 1.55 x 10^{-1}

Storativity: 1.89 x 10^{-4}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Date: 25.07.2005	none, Page 1
		Project: Sunset Lakes	
		Evaluated by: RAP	

Pumping Test No. 1	Test conducted on: June 23, 2005
TW1	
Discharge 1.44 l/s	

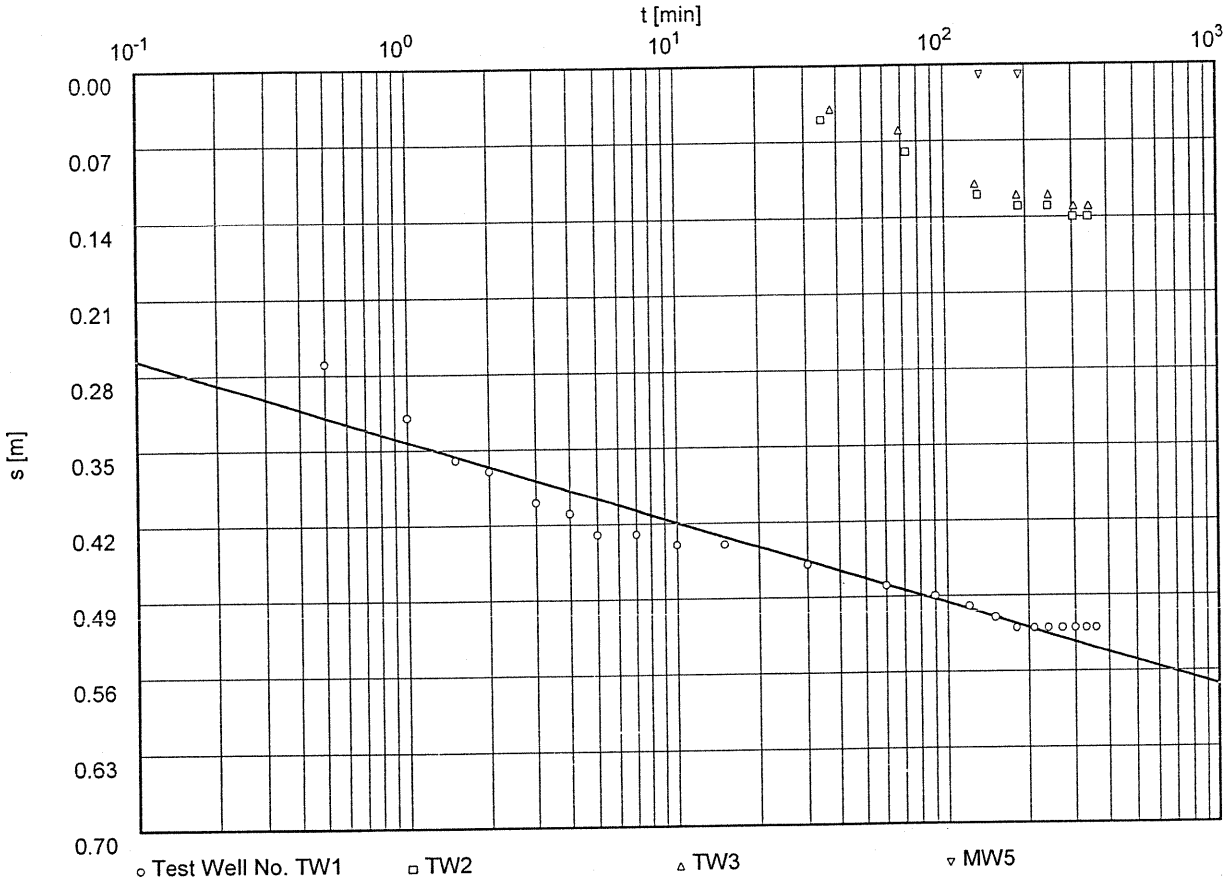


Transmissivity [m²/min]: 1.55×10^{-1}

Storativity: 1.72×10^{-4}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Date: 25.07.2005	none, Page 1
		Project: Sunset Lakes	
		Evaluated by: RAP	

Pumping Test No. 1	Test conducted on: June 23, 2005
TW1	
Discharge 1.44 l/s	

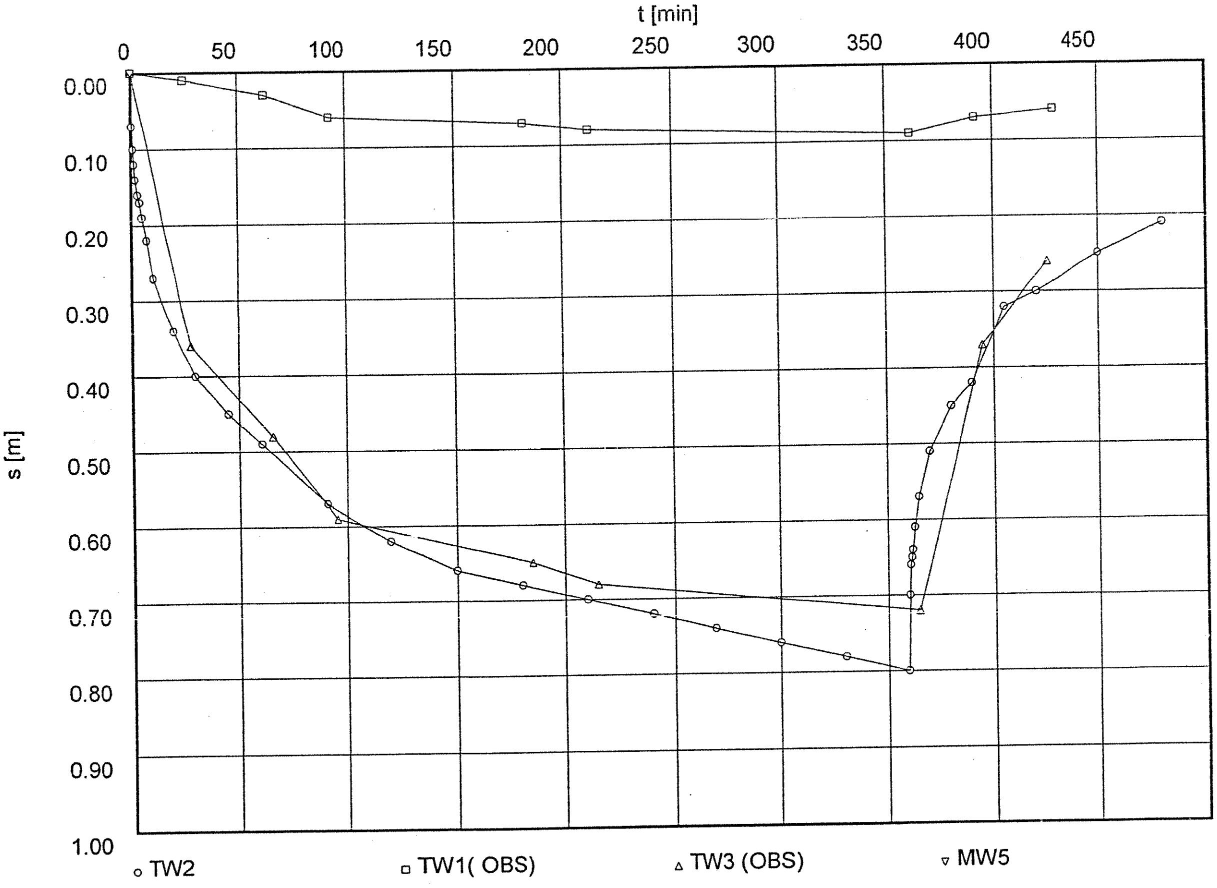


Transmissivity [m²/min]: 2.05×10^{-1}

Storativity: 1.61×10^{-3}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 25.07.2005	none, Page 1
		Project: Sunset Lakes	
		Evaluated by: RAP	

Pumping Test No. 2	Test conducted on: June 27, 2005
TW2	
Discharge 1.40 l/s	



Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 25.07.2005 | none, Page 2

Project: Sunset Lakes

Evaluated by: RAP

Pumping Test No. 2

Test conducted on: June 27, 2005

TW2

Constant Rate Pump Test

Discharge 1.40 l/s

	Pumping test duration [min]	Discharge [l/s]		
1	0.00	1.68		
2	7.00	1.68		
3	300.00	1.68		
4	360.00	0.00		

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 25.07.2005
none, Page 3

Project: Sunset Lakes

Evaluated by: RAP

Pumping Test No. 2

Test conducted on: June 27, 2005

TW2

TW2

Discharge 1.40 l/s

Distance from the pumping well 0.100 m

Static water level: 1.980 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.980	0.000	
2	0.50	2.050	0.070	
3	1.00	2.080	0.100	
4	1.50	2.100	0.120	
5	2.00	2.120	0.140	
6	3.00	2.140	0.160	
7	4.00	2.150	0.170	
8	5.00	2.170	0.190	
9	7.00	2.200	0.220	
10	10.00	2.250	0.270	
11	20.00	2.320	0.340	
12	30.00	2.380	0.400	
13	45.00	2.430	0.450	
14	60.00	2.470	0.490	
15	90.00	2.550	0.570	
16	120.00	2.600	0.620	
17	150.00	2.640	0.660	
18	180.00	2.660	0.680	
19	210.00	2.680	0.700	
20	240.00	2.700	0.720	
21	270.00	2.720	0.740	
22	300.00	2.740	0.760	
23	330.00	2.760	0.780	
24	360.00	2.780	0.800	
25	360.50	2.680	0.700	
26	361.00	2.640	0.660	
27	361.50	2.630	0.650	
28	362.00	2.620	0.640	
29	363.00	2.590	0.610	
30	365.00	2.550	0.570	
31	370.00	2.490	0.510	
32	380.00	2.430	0.450	
33	390.00	2.400	0.420	
34	405.00	2.300	0.320	
35	420.00	2.280	0.300	
36	450.00	2.230	0.250	
37	480.00	2.190	0.210	

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 25.07.2005

Project: Sunset Lakes

Evaluated by: RAP

Pumping Test No. 2

Test conducted on: June 27, 2005

TW2

TW1(OBS)

Discharge 1.40 l/s

Distance from the pumping well 100.000 m

Static water level: 1.810 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.810	0.000	
2	25.00	1.820	0.010	
3	62.00	1.840	0.030	
4	92.00	1.870	0.060	
5	182.00	1.880	0.070	
6	212.00	1.890	0.080	
7	362.00	1.900	0.090	
8	392.00	1.880	0.070	
9	428.00	1.870	0.060	

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 25.07.2005

Project: Sunset Lakes
Evaluated by: RAP

Pumping Test No. 2
Test conducted on: June 27, 2005
TW2
TW3 (OBS)
Discharge 1.40 l/s
Distance from the pumping well 50.000 m

Static water level: 0.690 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	0.690	0.000	
2	28.00	1.050	0.360	
3	65.00	1.170	0.480	
4	95.00	1.280	0.590	
5	185.00	1.340	0.650	
6	215.00	1.370	0.680	
7	365.00	1.410	0.720	
8	395.00	1.060	0.370	
9	425.00	0.950	0.260	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 25.07.2005	none, Page 6
		Project: Sunset Lakes	
		Evaluated by: RAP	

Pumping Test No. 2

Test conducted on: June 27, 2005

TW2

MW5

Discharge 1.40 l/s

Distance from the pumping well 70.000 m

Static water level: 1.030 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.030	0.000	
2	67.00	1.020	-0.010	
3	97.00	1.020	-0.010	
4	187.00	1.020	-0.010	
5	217.00	1.020	-0.010	
6	367.00	1.020	-0.010	

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

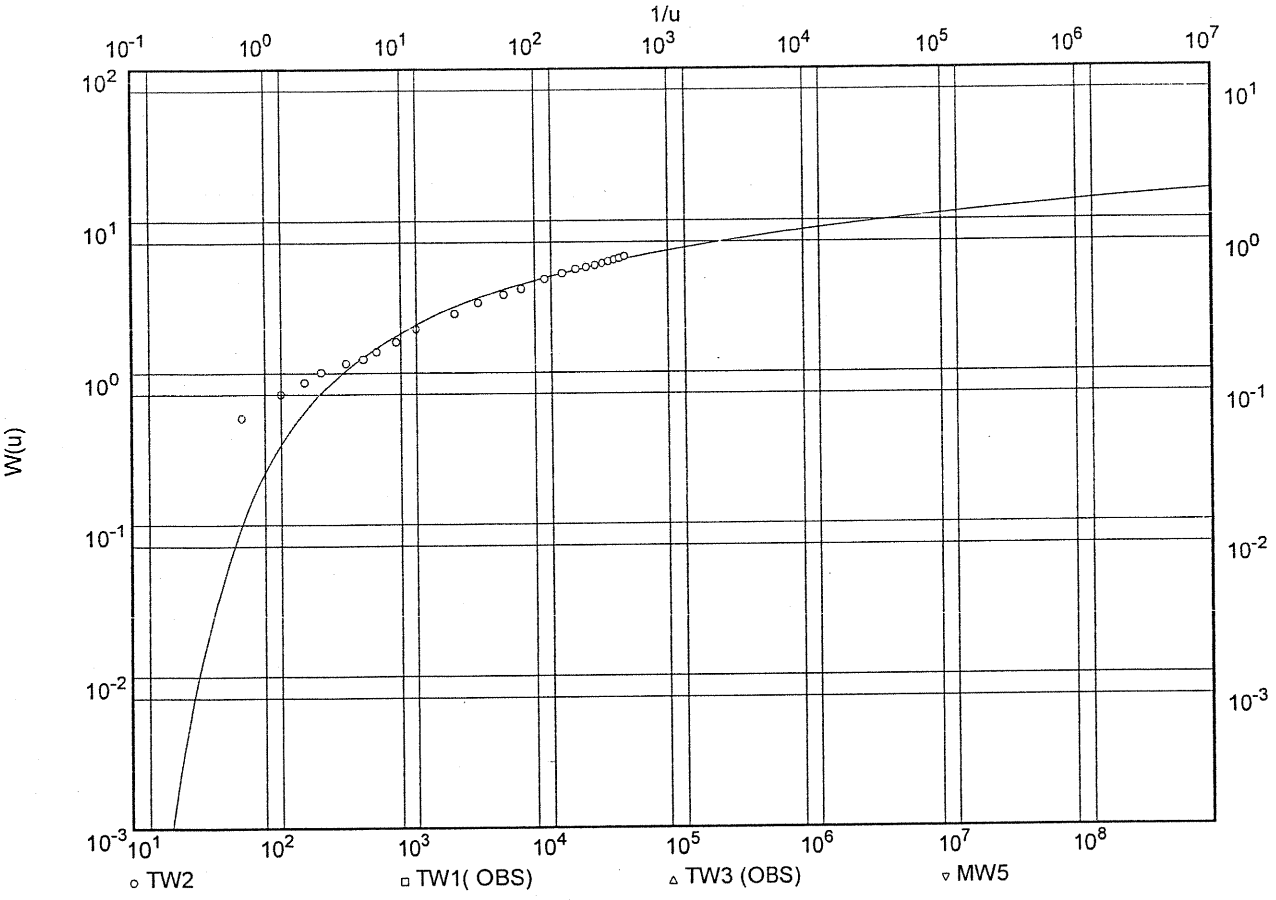
Pumping test analysis
Theis analysis method
Confined aquifer

Date: 25.07.2005
none, Page 1
Project: Sunset Lakes
Evaluated by: RAP

Pumping Test No. 2
Test conducted on: June 27, 2005

TW2

Discharge 1.40 l/s

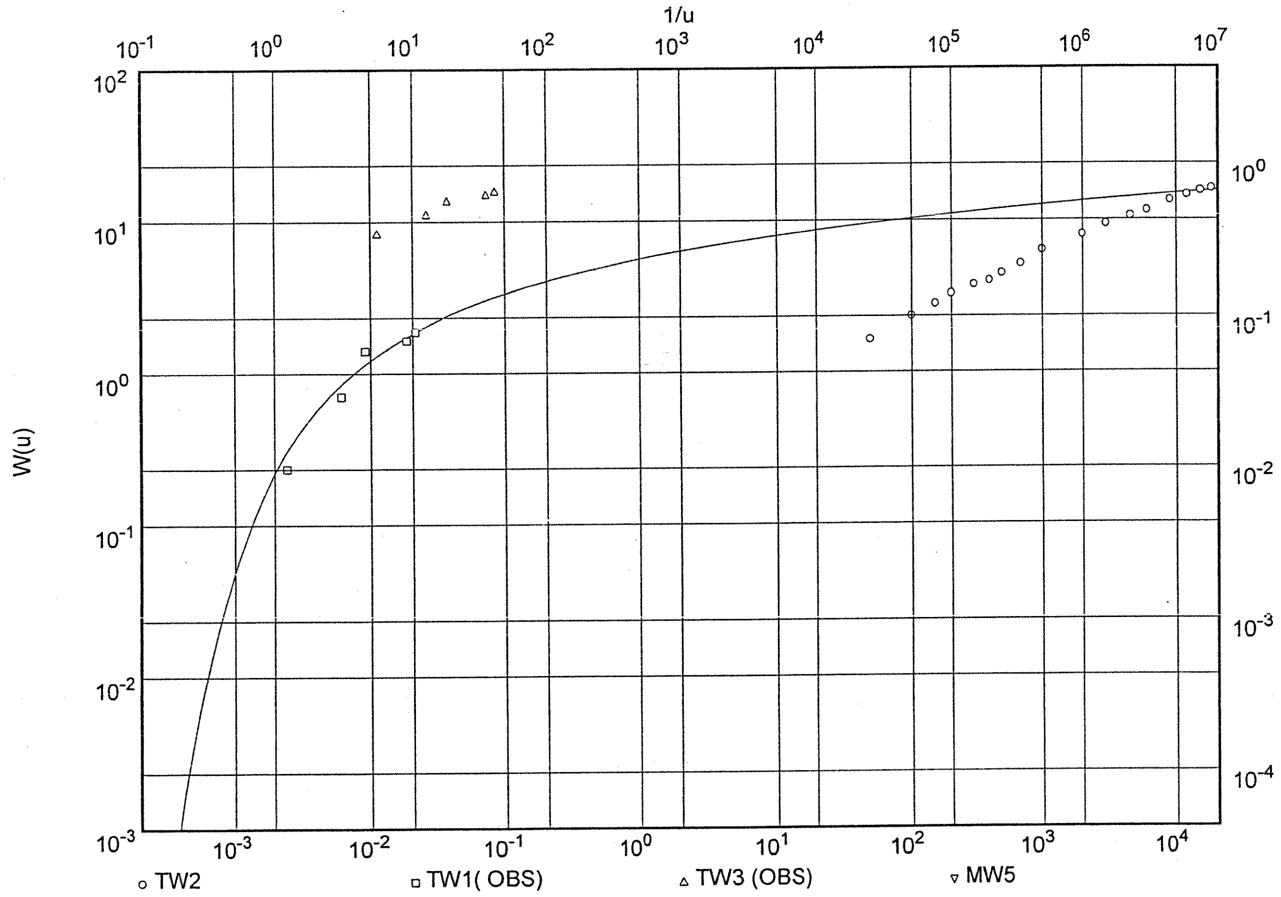


Transmissivity [m²/min]: 4.83×10^{-2}

Storativity: 1.45×10^{1}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Theis analysis method Confined aquifer	Date: 25.07.2005	none, Page 1
		Project: Sunset Lakes	
		Evaluated by: RAP	

Pumping Test No. 2	Test conducted on: June 27, 2005
TW2	
Discharge 1.40 l/s	



Transmissivity [m²/min]: 1.56×10^{-1}

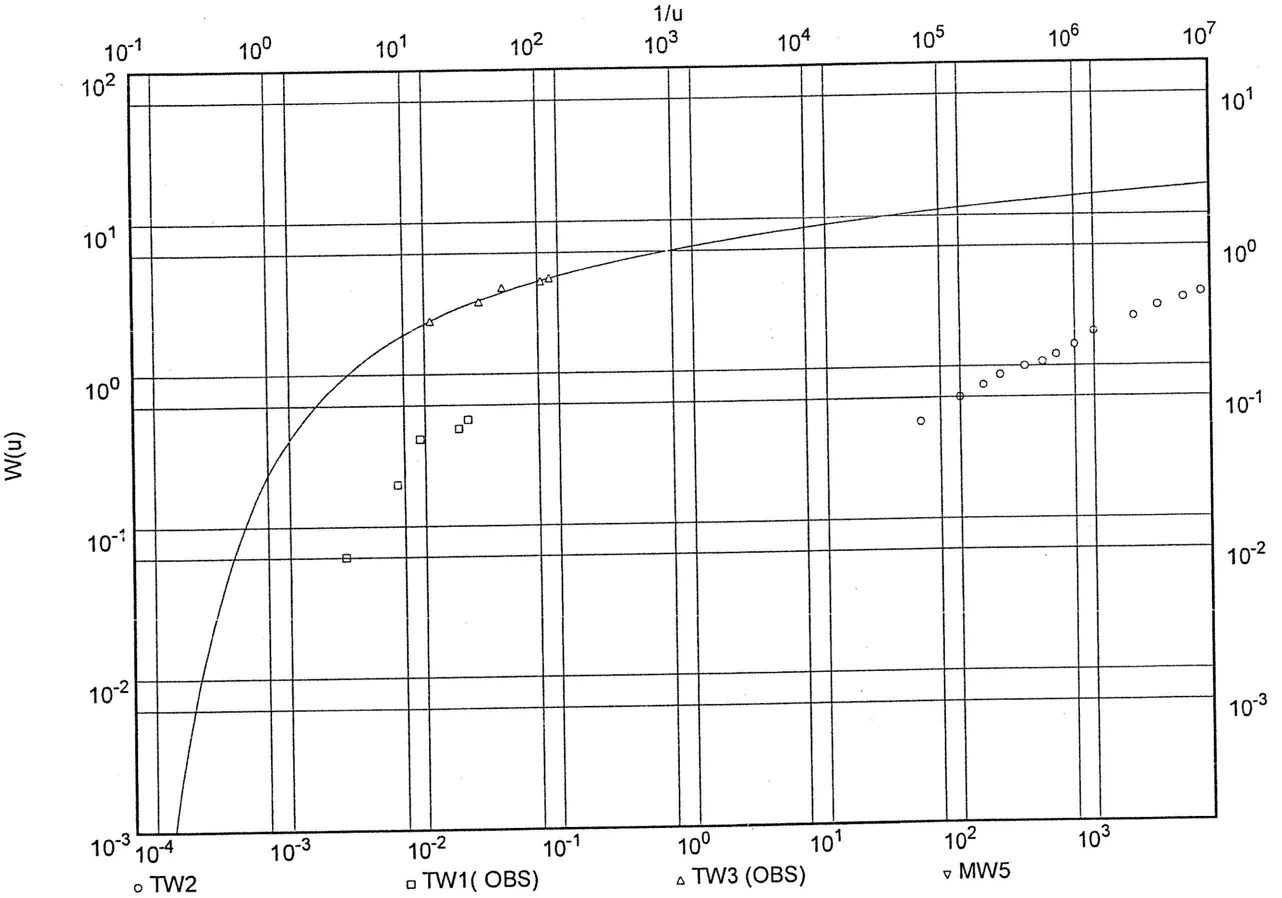
Storativity: 1.25×10^{-3}

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Theis analysis method
Confined aquifer

Date: 25.07.2005
none, Page 1
Project: Sunset Lakes
Evaluated by: RAP

Pumping Test No. 2
Test conducted on: June 27, 2005
TW2
Discharge 1.40 l/s

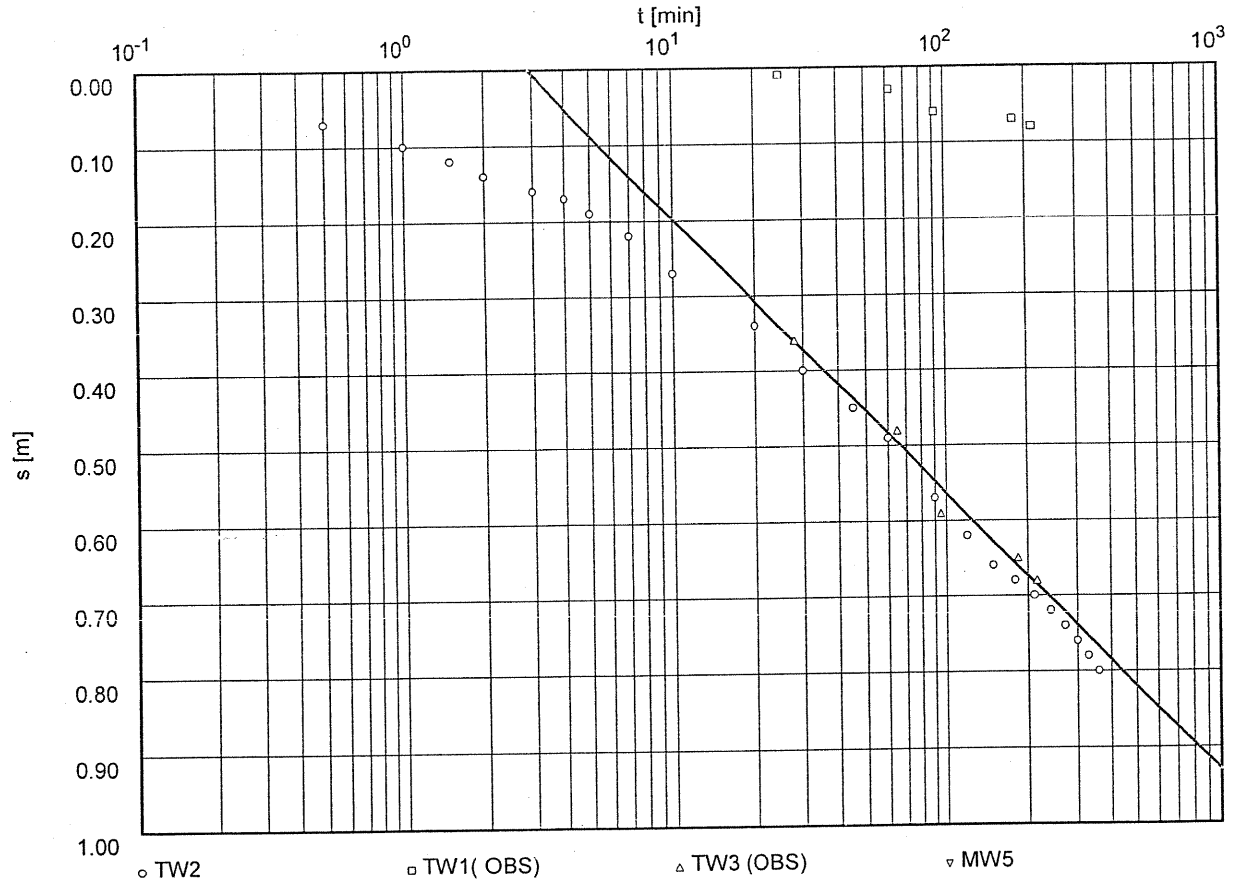


Transmissivity [m²/min]: 4.16×10^{-2}

Storativity: 1.16×10^{-4}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Date: 25.07.2005	none, Page 1
		Project: Sunset Lakes	
		Evaluated by: RAP	

Pumping Test No. 2	Test conducted on: June 27, 2005
TW2	
Discharge 1.40 l/s	

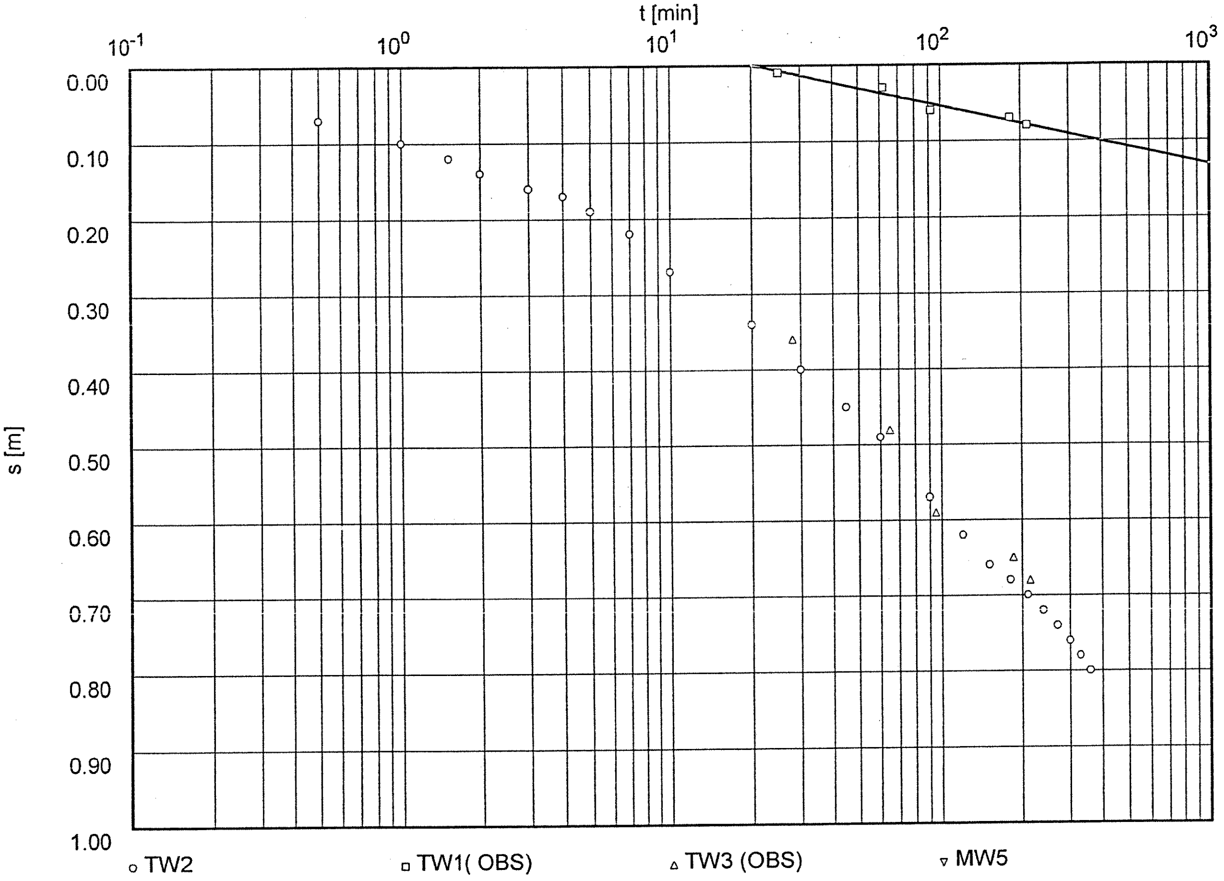


Transmissivity [m²/min]: 4.19×10^{-2}

Storativity: 1.09×10^{-4}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Date: 25.07.2005	none, Page 1
		Project: Sunset Lakes	
		Evaluated by: RAP	

Pumping Test No. 2	Test conducted on: June 27, 2005
TW2	
Discharge 1.40 l/s	



Transmissivity [m²/min]: 1.98×10^{-1}

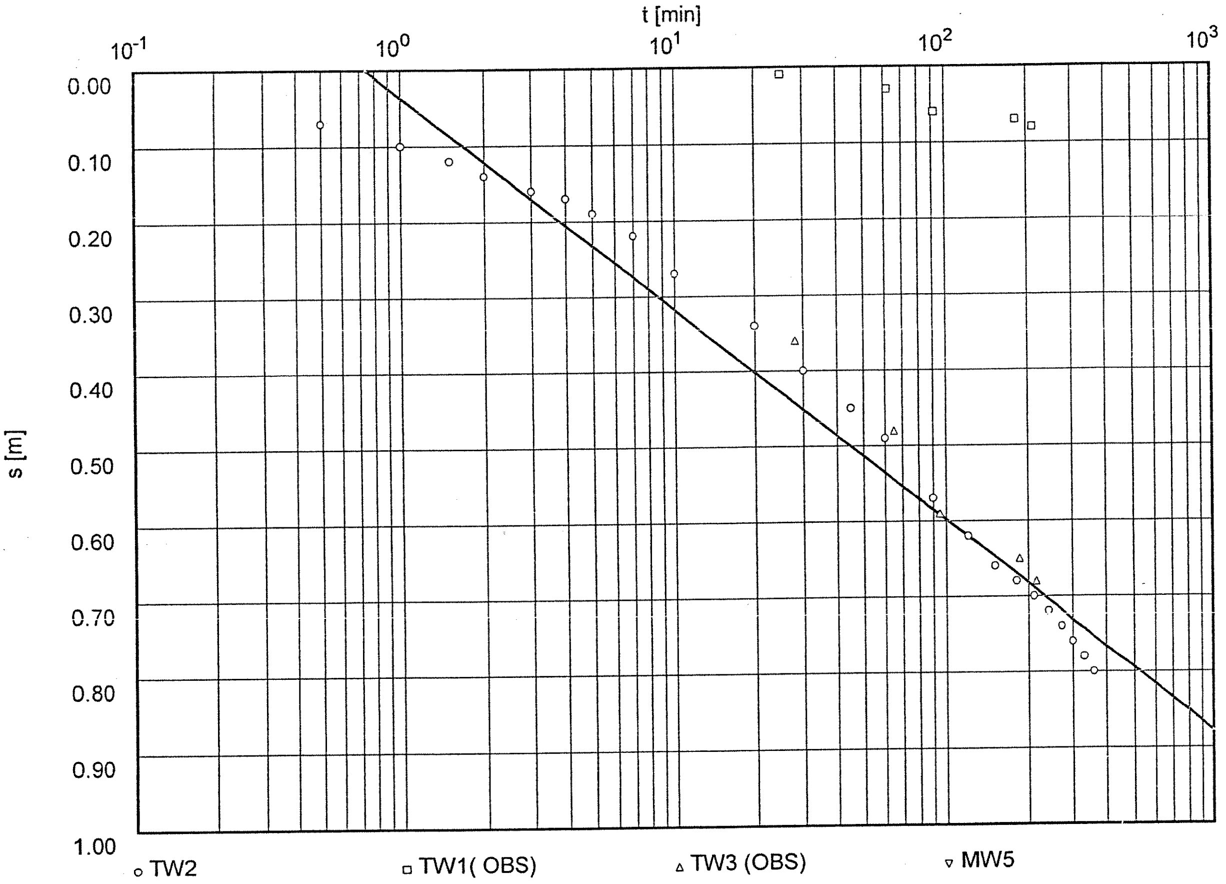
Storativity: 8.96×10^{-4}

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown-method after
COOPER & JACOB
Confined aquifer

Date: 25.07.2005
none, Page 1
Project: Sunset Lakes
Evaluated by: RAP

Pumping Test No. 2
Test conducted on: June 27, 2005
TW2
Discharge 1.40 l/s



Transmissivity [m²/min]: 5.47×10^{-2}

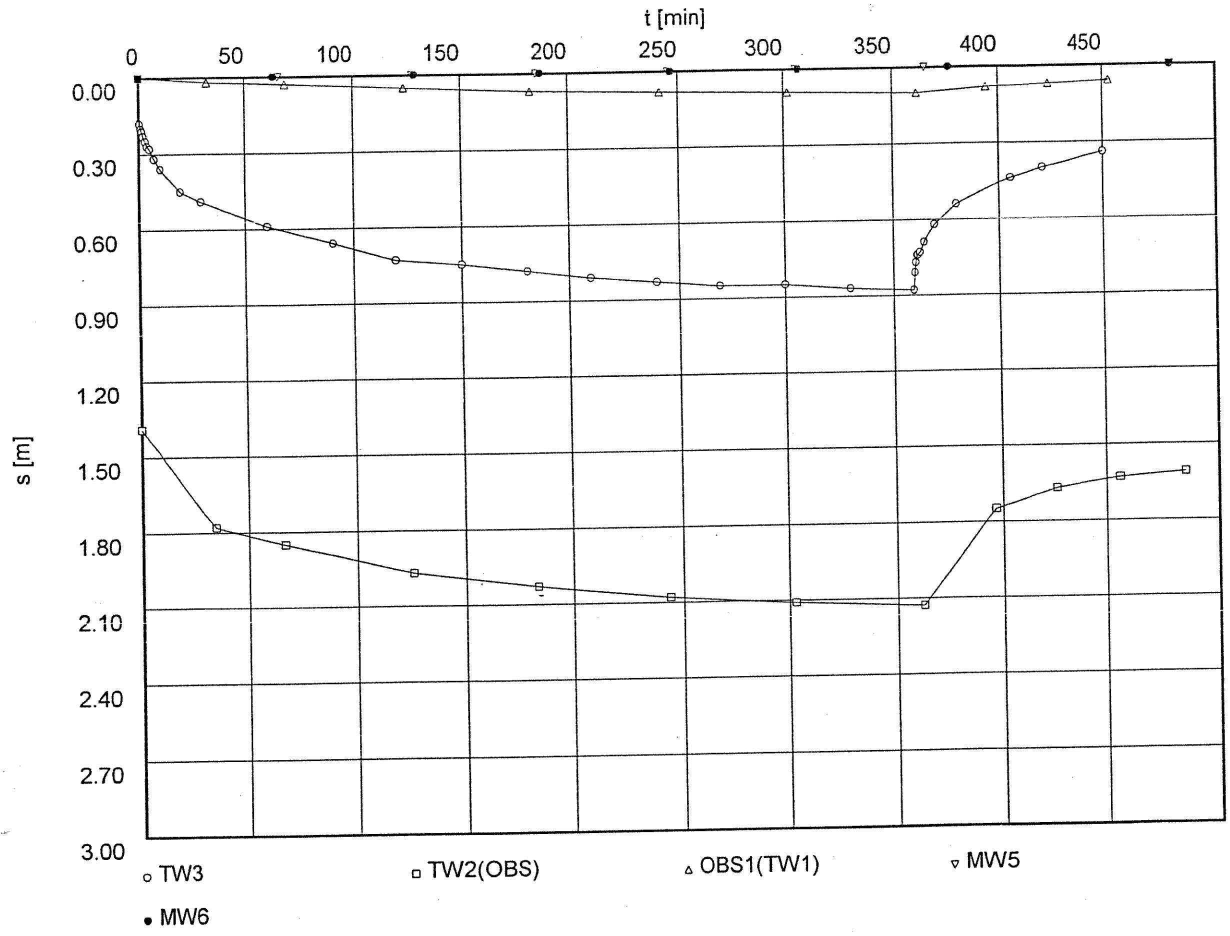
Storativity: 9.11×10^{0}

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 27.07.2005
none, Page 1
Project: Sunset Lakes
Evaluated by: RAp

Pumping Test No. 3
Test conducted on: June 28, 2005
TW 3
Discharge 1.68 l/s



Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 27.07.2005
none, Page 2

Project: Sunset Lakes

Evaluated by: RAp

Pumping Test No. 3

Test conducted on: June 28, 2005

TW 3

TW3

Discharge 1.68 l/s

Distance from the pumping well 0.100 m

Static water level: 0.700 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	0.700	0.000	
2	0.50	0.880	0.180	
3	1.00	0.900	0.200	
4	1.50	0.910	0.210	
5	2.00	0.930	0.230	
6	3.00	0.950	0.250	
7	4.00	0.970	0.270	
8	5.00	0.980	0.280	
9	7.00	1.020	0.320	
10	10.00	1.060	0.360	
11	20.00	1.150	0.450	
12	30.00	1.190	0.490	
13	60.00	1.290	0.590	
14	90.00	1.360	0.660	
15	120.00	1.430	0.730	
16	150.00	1.450	0.750	
17	180.00	1.480	0.780	
18	210.00	1.510	0.810	
19	240.00	1.530	0.830	
20	270.00	1.550	0.850	
21	300.00	1.550	0.850	
22	330.00	1.570	0.870	
23	360.00	1.580	0.880	
24	360.50	1.510	0.810	
25	361.00	1.470	0.770	
26	361.50	1.440	0.740	
27	362.00	1.440	0.740	
28	363.00	1.430	0.730	
29	365.00	1.390	0.690	
30	370.00	1.320	0.620	
31	380.00	1.240	0.540	
32	405.00	1.140	0.440	
33	420.00	1.100	0.400	
34	450.00	1.040	0.340	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 27.07.2005	none, Page 3
		Project: Sunset Lakes	
		Evaluated by: RAp	

Pumping Test No. 3	Test conducted on: June 28, 2005
TW 3	Constant rate test
Discharge 1.68 l/s	

	Pumping test duration [min]	Discharge [l/s]		
1	0.00	1.68		
2	7.00	1.68		
3	300.00	1.68		

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 27.07.2005 none, Page 4 Project: Sunset Lakes Evaluated by: RAp

Pumping Test No. 3	Test conducted on: June 28, 2005
TW 3	TW2(OBS)
Discharge 1.68 l/s	Distance from the pumping well 122.000 m

Static water level: 0.700 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	2.090	1.390	
2	35.00	2.480	1.780	
3	66.00	2.550	1.850	
4	126.00	2.670	1.970	
5	183.00	2.730	2.030	
6	244.00	2.780	2.080	
7	303.00	2.810	2.110	
8	363.00	2.830	2.130	
9	397.00	2.450	1.750	
10	425.00	2.370	1.670	
11	456.00	2.330	1.630	
12	485.00	2.310	1.610	

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 27.07.2005
none, Page 5
Project: Sunset Lakes
Evaluated by: RAp

Pumping Test No. 3
Test conducted on: June 28, 2005
TW 3
OBS1(TW1)
Discharge 1.68 l/s
Distance from the pumping well 3.500 m

Static water level: 1.860 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.860	0.000	
2	33.00	1.880	0.020	
3	68.00	1.890	0.030	
4	124.00	1.910	0.050	
5	182.00	1.930	0.070	
6	242.00	1.940	0.080	
7	302.00	1.950	0.090	
8	362.00	1.960	0.100	
9	395.00	1.940	0.080	
10	423.00	1.930	0.070	
11	453.00	1.920	0.060	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 27.07.2005	none, Page 6
		Project: Sunset Lakes	
		Evaluated by: RAp	

Pumping Test No. 3	Test conducted on: June 28, 2005
TW 3	MW5
Discharge 1.68 l/s	Distance from the pumping well 72.000 m

Static water level: 1.040 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	1.040	0.000	
2	65.00	1.040	0.000	
3	128.00	1.040	0.000	
4	185.00	1.040	0.000	
5	246.00	1.040	0.000	
6	306.00	1.040	0.000	
7	366.00	1.040	0.000	
8	480.00	1.040	0.000	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 27.07.2005	none, Page 7
		Project: Sunset Lakes	
		Evaluated by: RAp	

Pumping Test No. 3	Test conducted on: June 28, 2005
TW 3	MW6
Discharge 1.68 l/s	Distance from the pumping well 82.000 m

Static water level: 0.680 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	0.680	0.000	
2	63.00	0.680	0.000	
3	129.00	0.680	0.000	
4	187.00	0.680	0.000	
5	247.00	0.680	0.000	
6	307.00	0.680	0.000	
7	377.00	0.680	0.000	
8	480.00	0.680	0.000	

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Theis analysis method
Confined aquifer

Date: 27.07.2005
none, Page 1

Project: Sunset Lakes

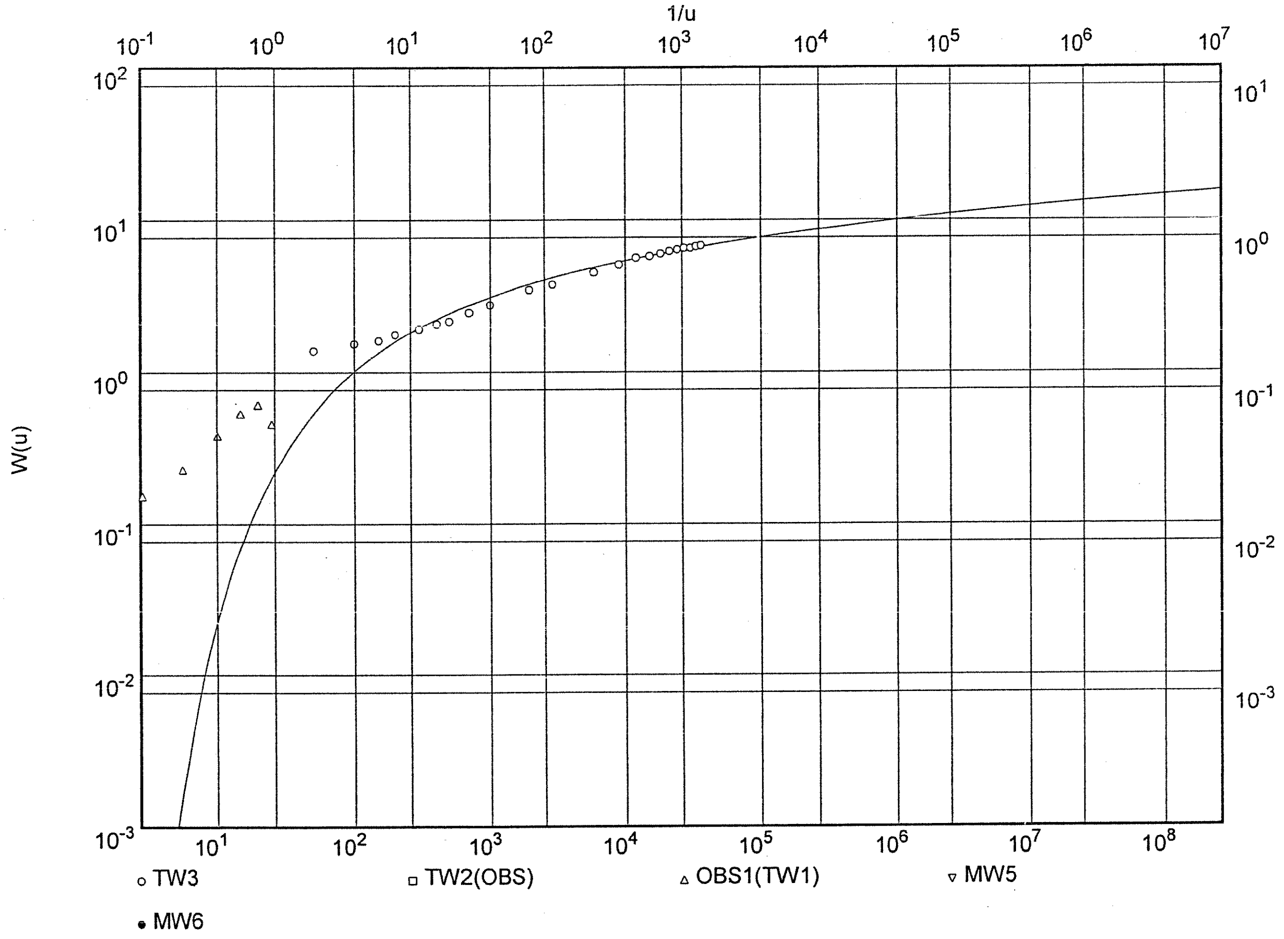
Evaluated by: RAp

Pumping Test No. 3

Test conducted on: June 28, 2005

TW 3

Discharge 1.68 l/s



Transmissivity [m²/min]: 6.13×10^{-2}

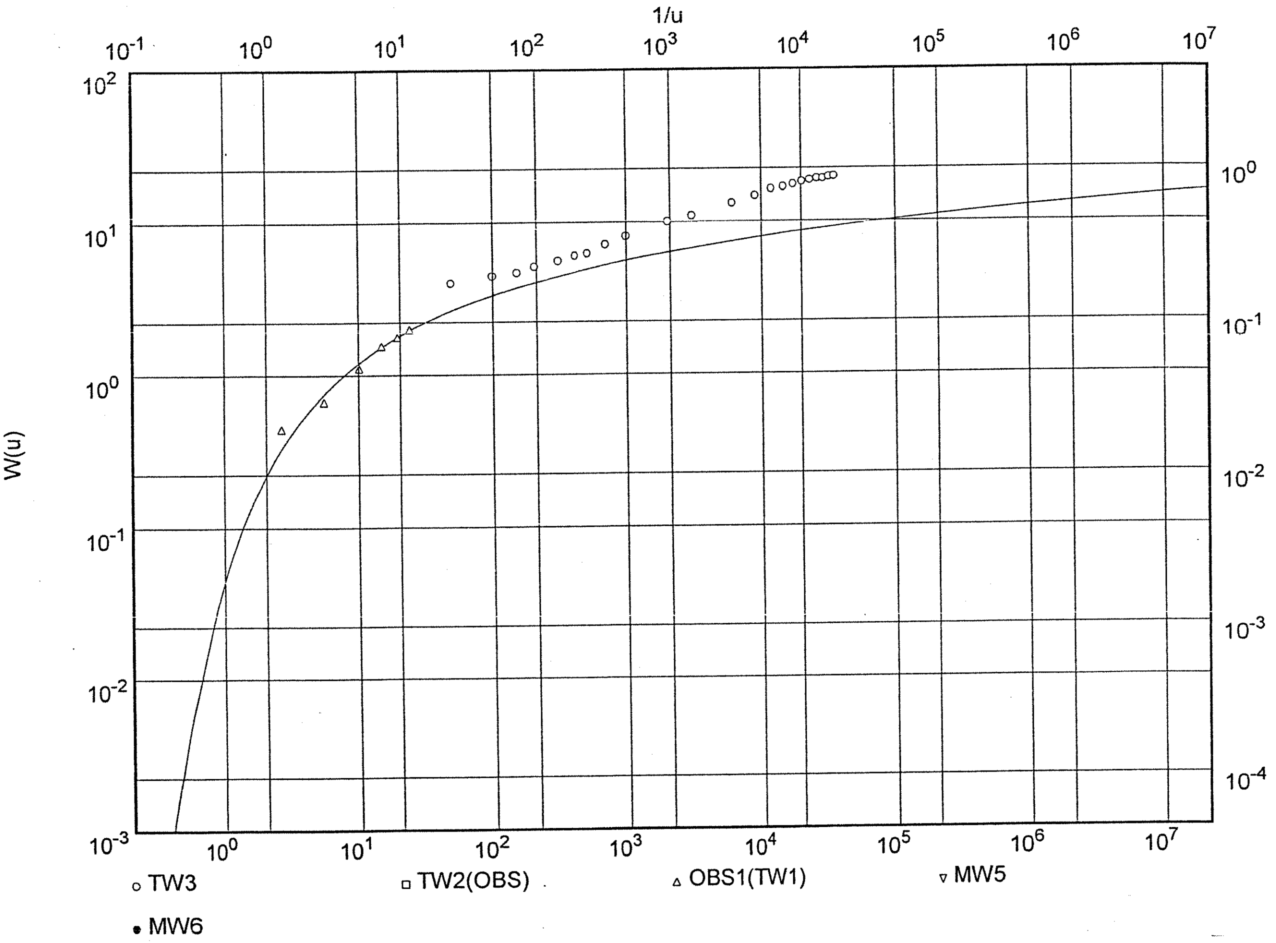
Storativity: 6.35×10^{0}

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Theis analysis method
Confined aquifer

Date: 27.07.2005
none, Page 1
Project: Sunset Lakes
Evaluated by: RAp

Pumping Test No. 3
Test conducted on: June 28, 2005
TW 3
Discharge 1.68 l/s



Transmissivity [m²/min]: 1.78×10^{-1}

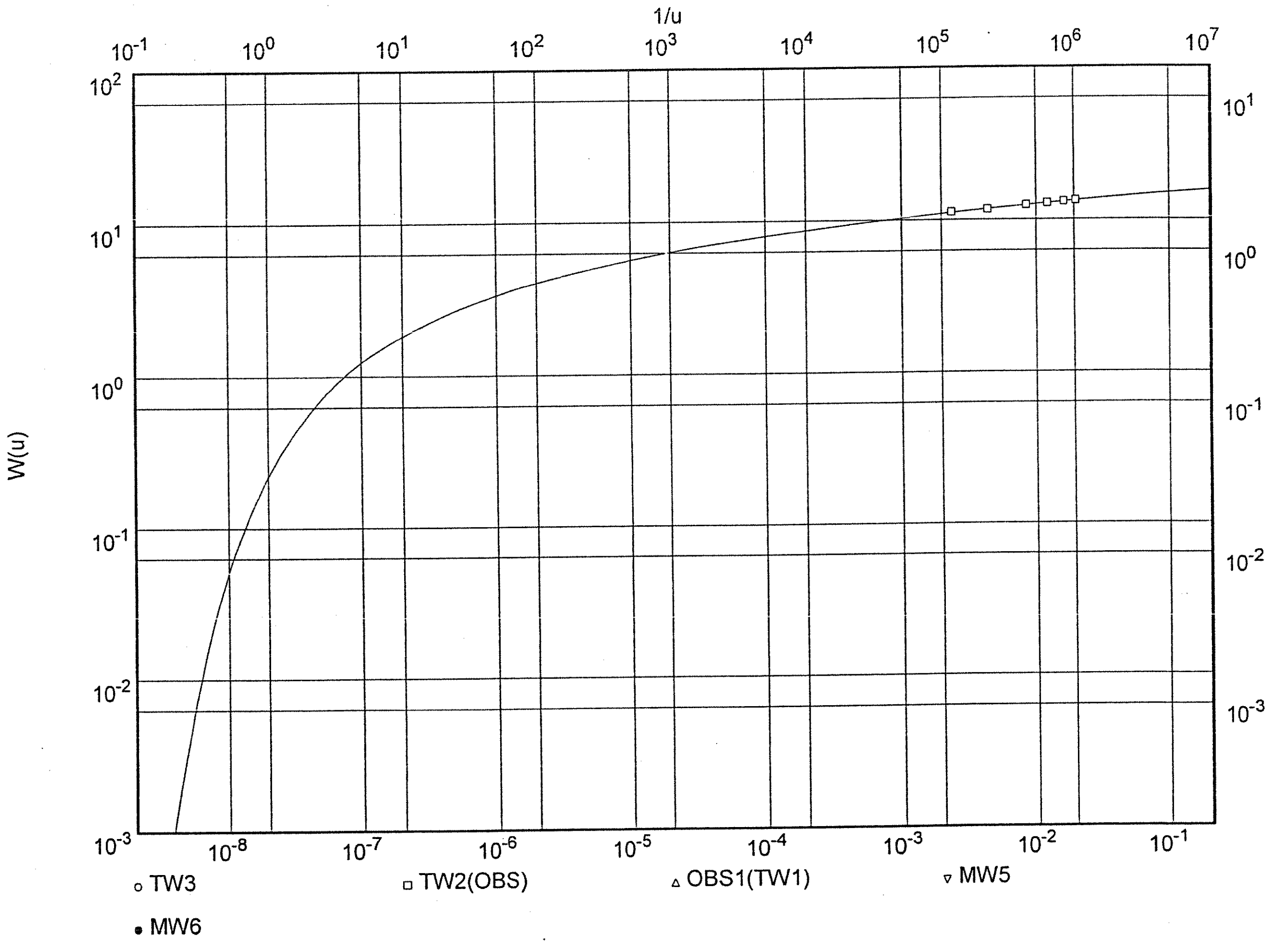
Storativity: 1.47×10^{0}

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Theis analysis method
Confined aquifer

Date: 27.07.2005
none, Page 1
Project: Sunset Lakes
Evaluated by: RAp

Pumping Test No. 3
Test conducted on: June 28, 2005
TW 3
Discharge 1.68 l/s



Transmissivity [m²/min]: 5.04×10^{-2}

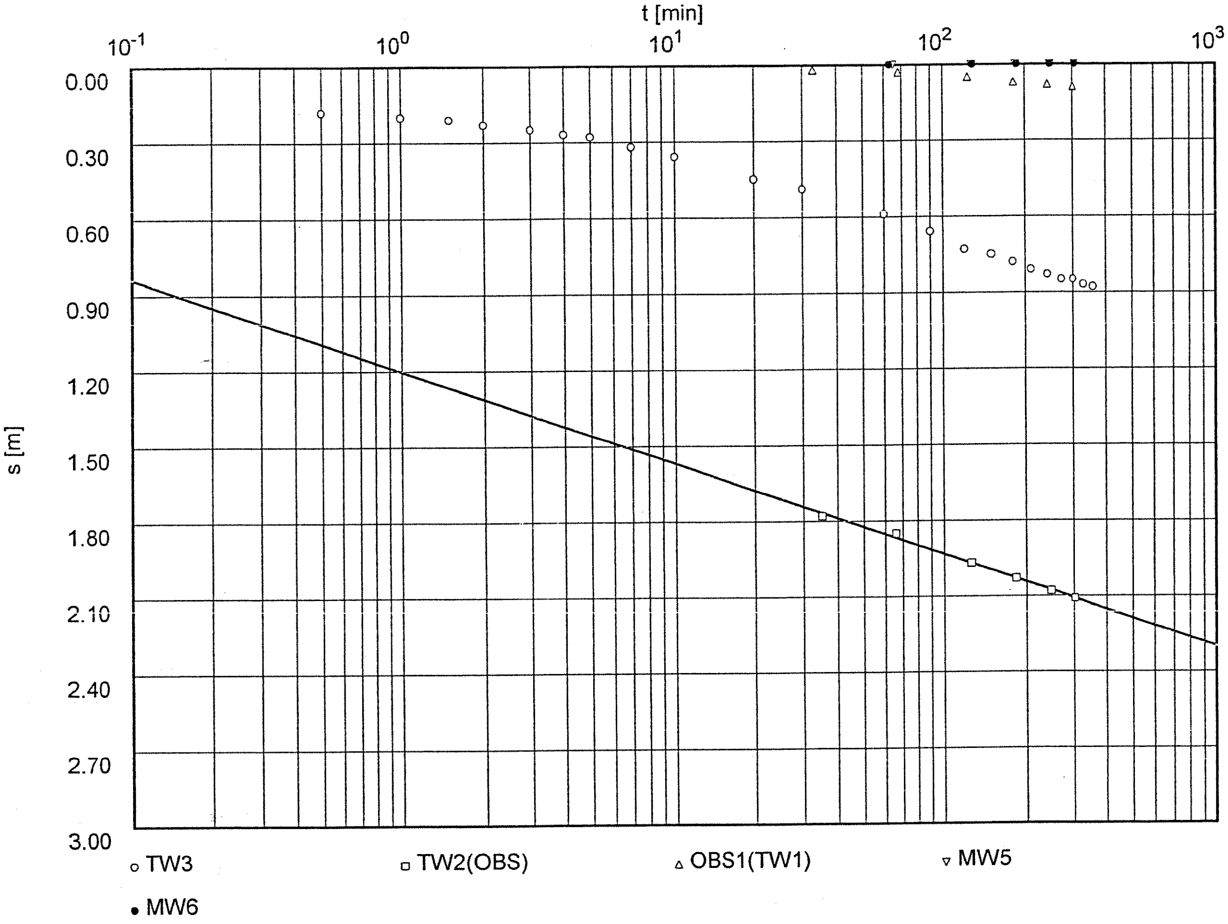
Storativity: 3.98×10^{-9}

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown-method after
COOPER & JACOB
Confined aquifer

Date: 27.07.2005
none, Page 1
Project: Sunset Lakes
Evaluated by: RAp

Pumping Test No. 3
Test conducted on: June 28, 2005
TW 3
Discharge 1.68 l/s



Transmissivity [m²/min]: 5.04×10^{-2}

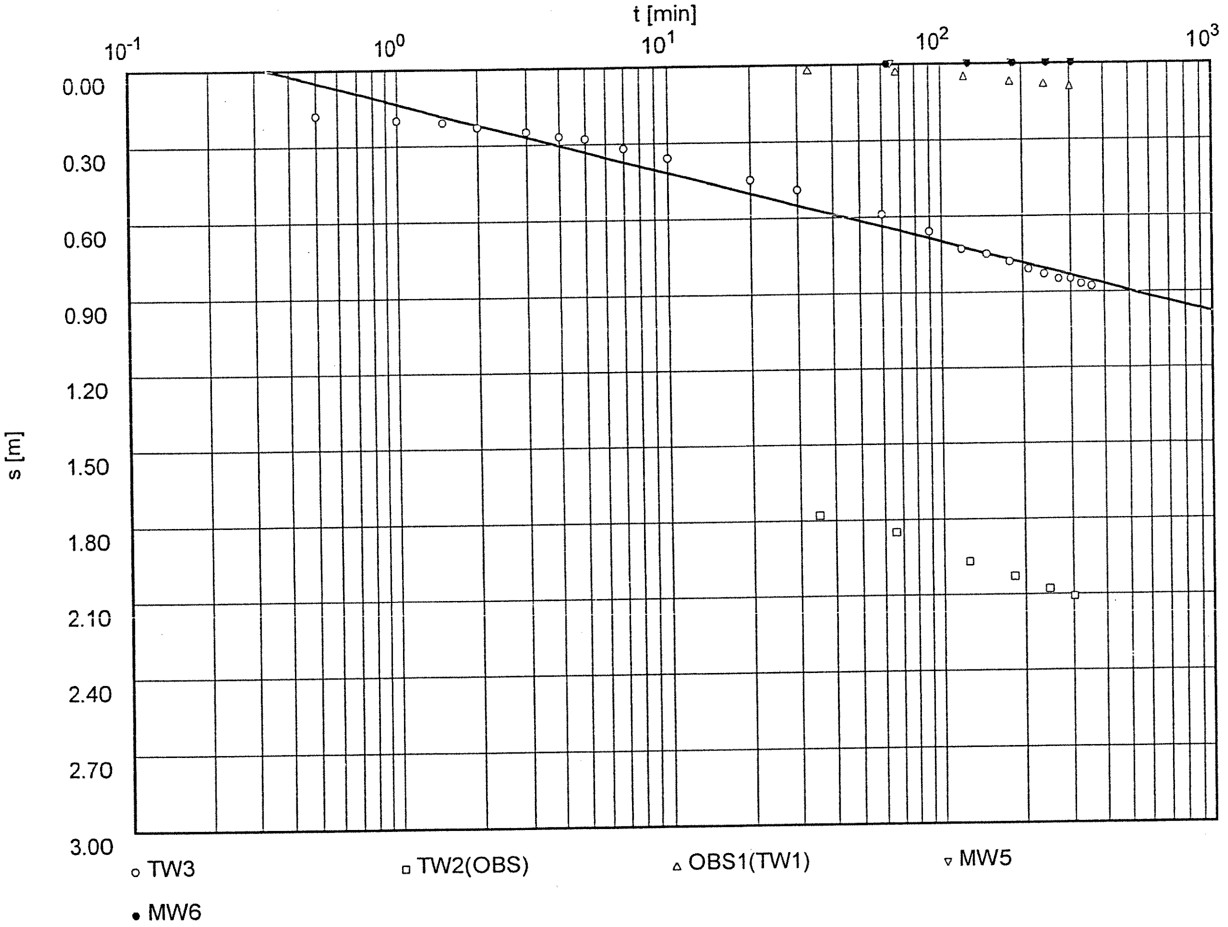
Storativity: 3.90×10^{-9}

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown-method after
COOPER & JACOB
Confined aquifer

Date: 27.07.2005
none, Page 1
Project: Sunset Lakes
Evaluated by: RAp

Pumping Test No. 3	Test conducted on: June 28, 2005
TW 3	
Discharge 1.68 l/s	

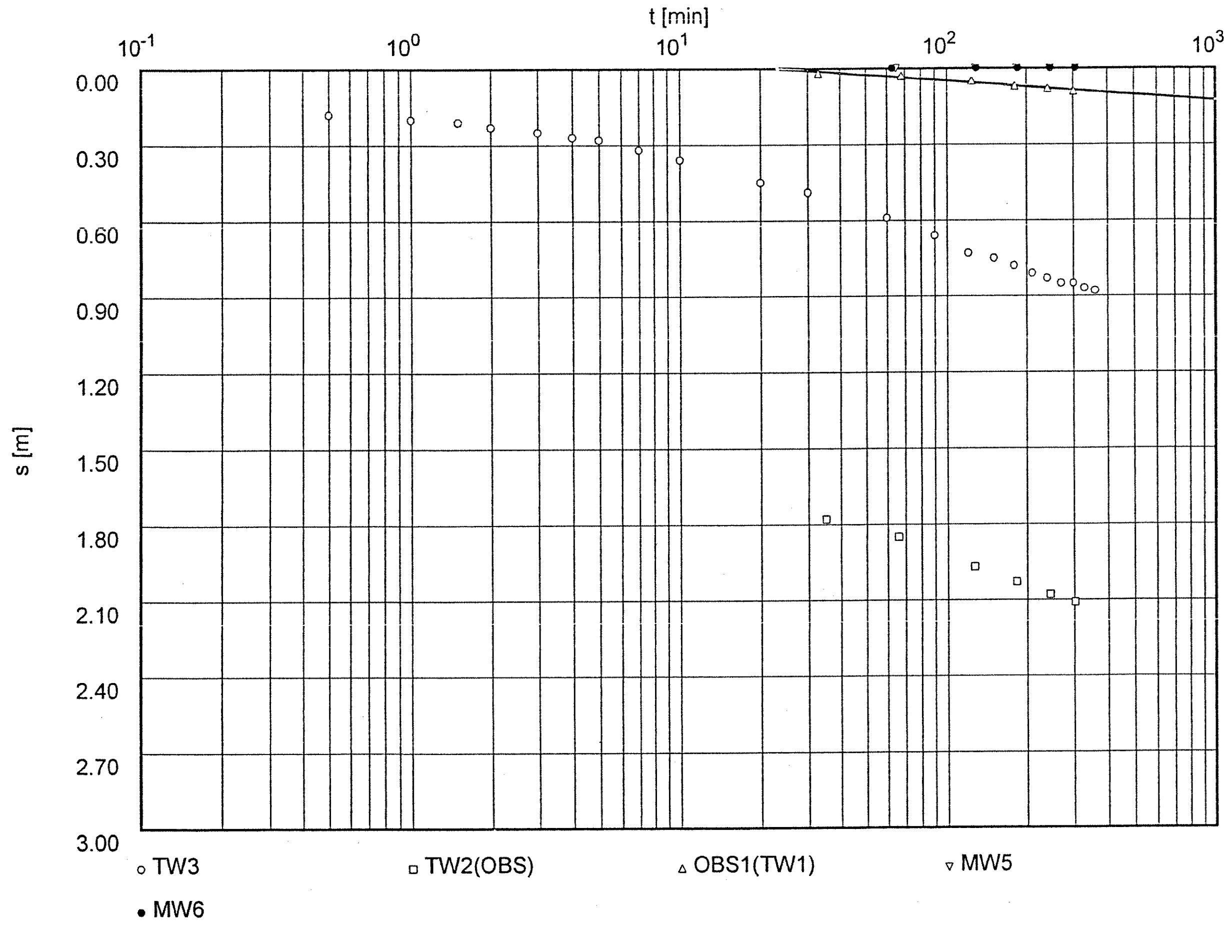


Transmissivity [m²/min]: 6.55 x 10^{-2}

Storativity: 4.88 x 10^{0}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Date: 27.07.2005	none, Page 1
		Project: Sunset Lakes	
		Evaluated by: RAp	

Pumping Test No. 3	Test conducted on: June 28, 2005
TW 3	
Discharge 1.68 l/s	



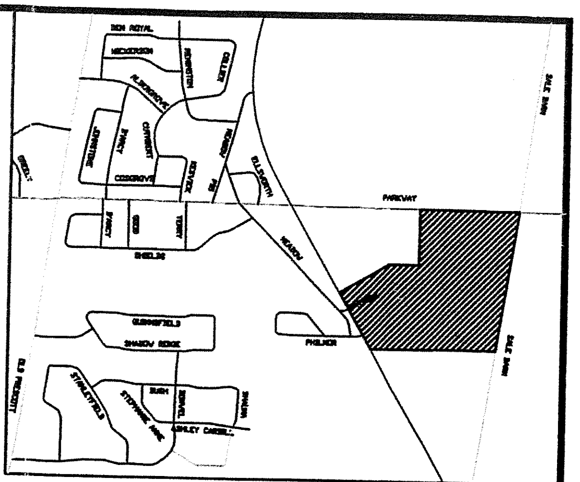
Transmissivity [m²/min]: 2.39×10^{-1}

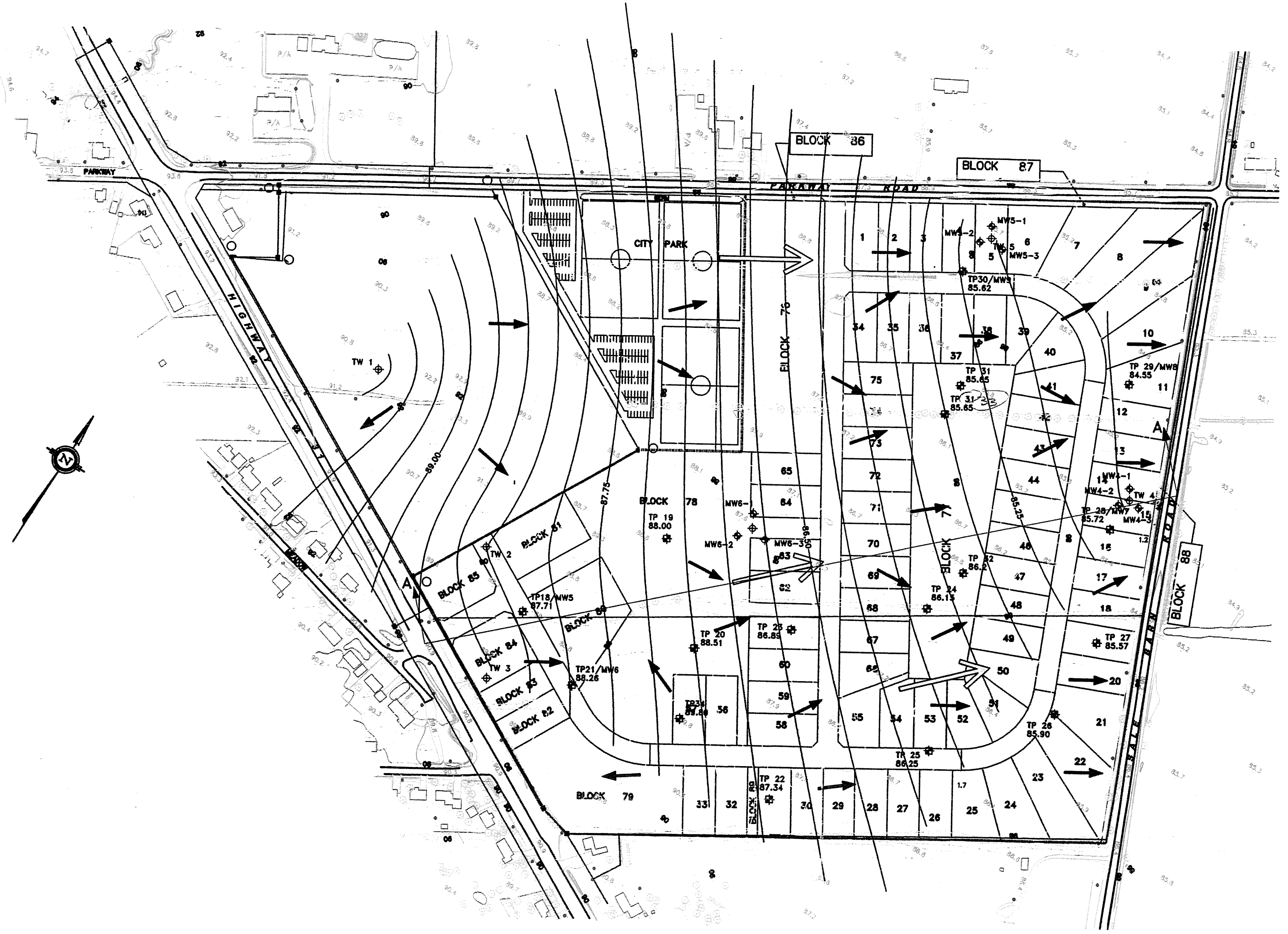
Storativity: 1.00×10^{0}

APPENDIX 5

SUPPORTING DOCUMENTATION REVISED DRAWINGS & SPECIFICATIONS

1. PH0145-1:	TEST HOLE LOCATION PLAN
2. PH0145-2:	LOT DEVELOPMENT PLAN
3. PH0145-3:	PIEZOMETRIC HEAD DELINATION
4. PH0145-4:	STRATIGRAPHIC CROSS SECTION A-A
5. FIGURE 1:	LOCATION PLAN OF NEIGHBOURING SAMPLING
6. FIGURE 2:	GRAPHICAL ANALYSIS OF MONITORING WELL DATA





LEGEND:

⊕	TEST PIT LOCATION
⊕	TEST WELL LOCATION
◈	MONITORING WELL LOCATION
90.70	GROUND SURFACE ELEVATION (m)
⌒ 85.25	POTENTIOMETRIC HEAD CONTOUR ELEVATION (m)
⇗	DIRECTION OF FLOW OF WATER SUPPLY AQUIFER
➡	DIRECTION OF FLOW OF RECEIVING AQUIFER

NOTE: REFER TO DRAWING NO. PH0145-4 FOR SECTION DETAIL OF CUT LINE A-A

1	OVERBURDEN FLOW DIRECTIONS ADDED	19/06/06	RAP
NO.	REVISIONS	DATE	INITIAL

patersongroup
consulting engineers
28 Concourse Gate, Unit 1, Ottawa, Ontario K2E 7T7

SCALE: 1:2000
DESIGN: RAP
DRAWN: MPG
CHECKED: RAP
DATE: 09/2005

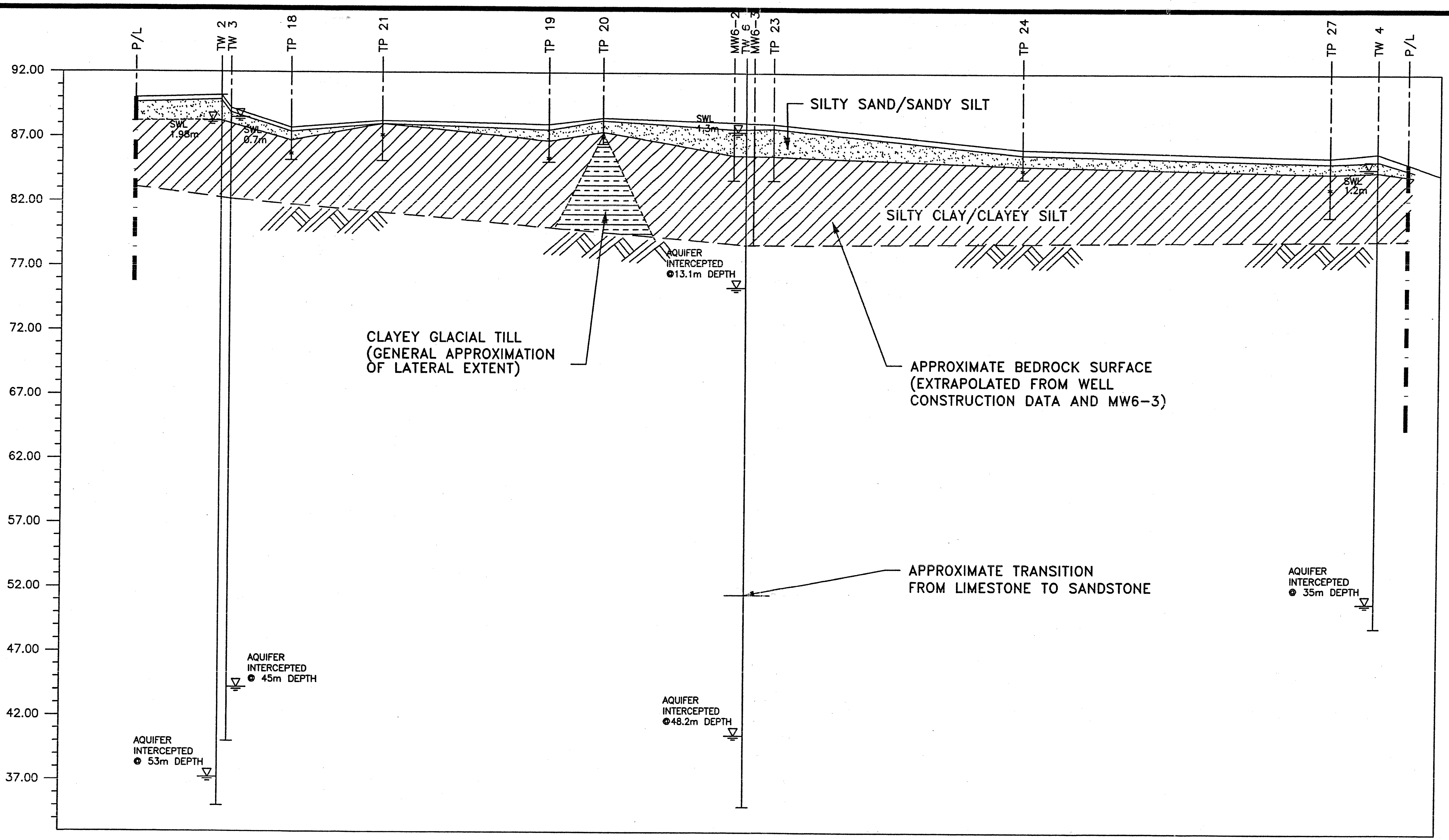
PROPOSED VILLAGE CENTRE SUBDIVISION
SALE BARN ROAD
OTTAWA, ONTARIO

DWG. NO. PH0145-3

SUNSET LAKES DEVELOPMENT CORP.

POTENTIOMETRIC HEAD DELINEATION

A1



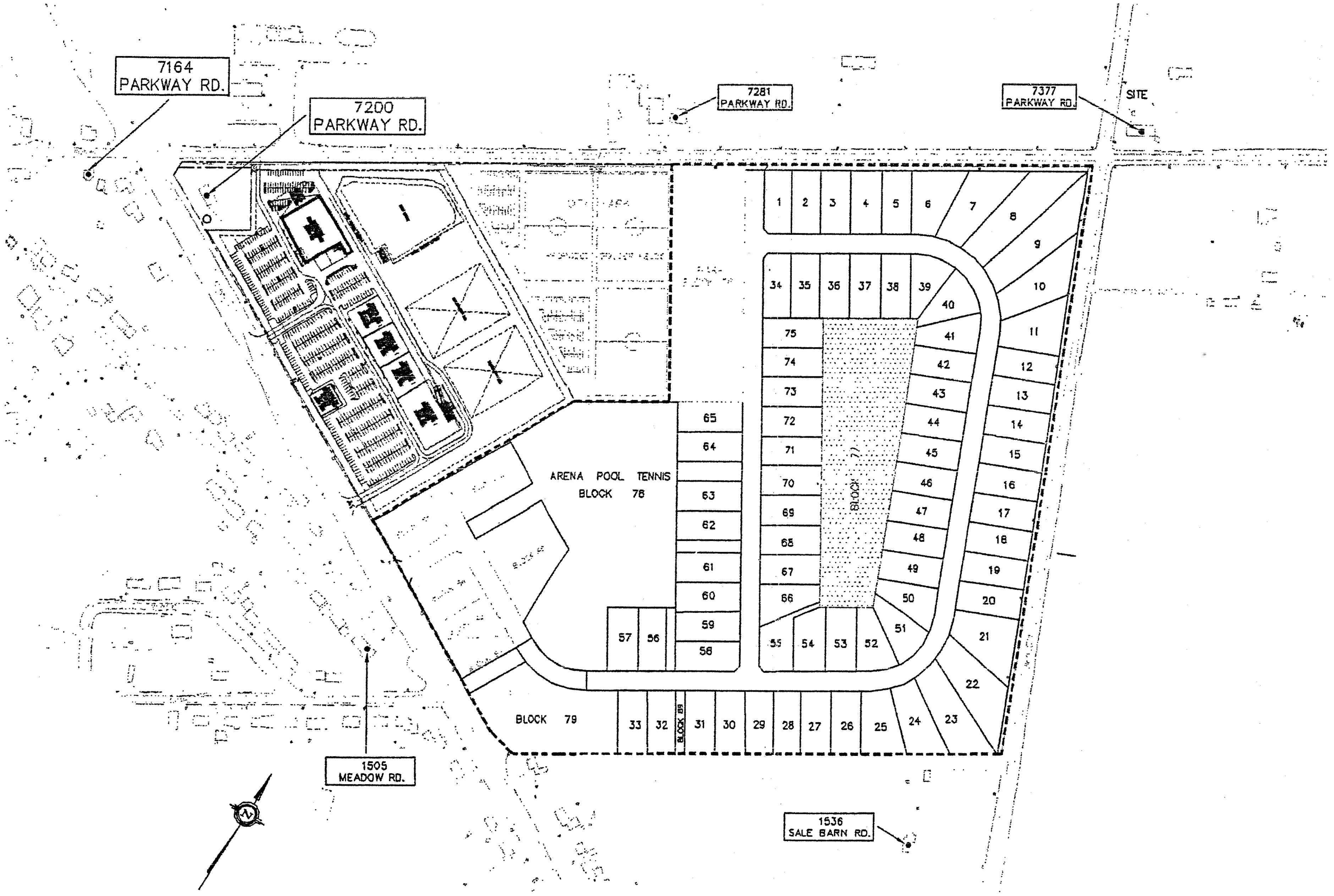
patersongroup
consulting engineers
28 Concourse Gate, Unit 1, Ottawa, Ontario K2E 7T7

Scale:	1:300 V 1:2000 H
Des.:	RAP
Dwn:	MPG
Chkd:	RAP

SUNSET LAKES DEVELOPMENT CORP.
PROPOSED VILLAGE CENTRE SUBDIVISION
SALES BARN ROAD
OTTAWA, ONTARIO

CROSS-SECTION A-A
(GENERAL SITE STRATIGRAPHY)

Dwg. No. PH0145-4
Report No.: PH0145-01
Date: 09/2005



paterson group
consulting engineers
28 Concourse Gate, Unit 1, Ottawa, Ontario K2E 7T7

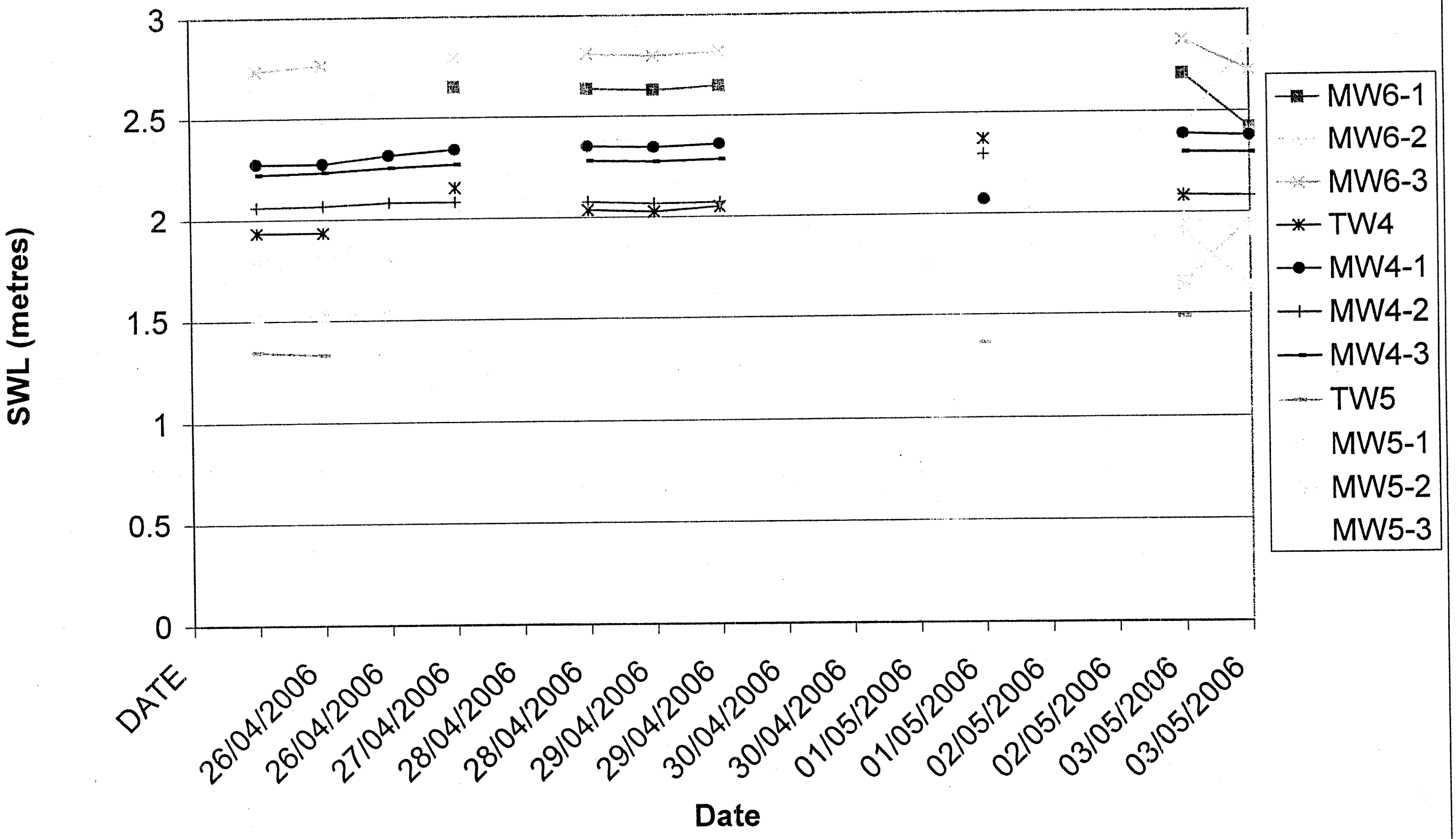
Scale:	NTS
Des.:	RAP
Dwn:	MPG
Chkd:	RAP

SUNSET LAKES DEVELOPMENT CORP.
PROPOSED VILLAGE CENTRE SUBDIVISION
SALES BARN ROAD
OTTAWA, ONTARIO

LOCATION OF NEIGHBOURING
WATER SAMPLE COLLECTION

Dwg. No.
FIGURE 1
Report No.: PH0145-02
Date: 06/2006

Figure 2: Plot of Static Water Levels over 7 day Period



patersongroup

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Geotechnical Engineering
Environmental Engineering
Hydrogeology
Geological Engineering
Materials Testing
Building Science

www.patersongroup.ca

September 28, 2006
Report No. PH0145-03.Let

South Nation River Conservation Authority
15 Union Street
Berwick, Ontario
K0C 1G0

Attention: **Ms. Jennifer L. Boyer**
Environmental Planner

Subject: **Response to Conservation Partners Comments of August 3rd, 2006**
Greely Centre Subdivision
Sunset Lakes Development Corporation

Dear Sir:

In response to the comments provided to by the Conservation Partners, we offer the following comments. It is understood by your response that the previous comments have been addressed, and the more recent comments are as a result of the subsequent addendum submitted by this firm.

The Conservation Partners identify the water as not being potable, which in itself states that the water is unsafe for consumption. This is not scientifically valid, in that this comment is being made on the basis of an exceedance of an aesthetic parameter. By definition, ***potable is defined as water that is safe for human consumption.*** Our studies indicate that the water is safe in this regard, and that the chemical parameters are within the Ontario Drinking Water Objectives for health related parameters. Also, by definition, ***aesthetic objectives apply to the characteristics of drinking water that can affect consumer acceptance (i.e. - appearance and palatability), and can vary from person to person***. For instance, some people find the City of Ottawa municipal water supply to be offensive, and provide treatment of the water, yet that does not mean that the municipal water supply is unsafe. Furthermore, the aesthetic objective for sodium in Saskatchewan is 300 mg/L compared to 200 mg/L in Ontario, which in itself would suggest that there is no hard and fast limit at which sodium is unacceptable.. It is simply a matter of personal choice, and the sodium exceedences for this development are simply aesthetic and do not pose a health risk. It is important that the Conservation Partners separate a Maximum Allowable Concentration (MAC) from an Aesthetic Objective (AO), which is the intent of the standards.

Section 2.2.1

With respect to the issue of watercourses or wetlands on the site, accept this as confirmation that the site is free of these features. However, there is a ditch immediately adjacent to, and downgradient of the site along Sale Barn Road, and whether or not this is indeed considered a watercourse is debatable, in that it only serves to control stormwater, and does not contain water year round. This is typical of the rural environment where ditches always exist along significant roadways. We do not believe that it is the intent of the guidelines to consider a ditch to be a watercourse.

In any event, all septic systems in this development are located at least 30 metres from this ditch, which provides a more than adequate buffer for in-ground treatment of effluent, and ensures that effluent does not discharge directly into the ditch. In that there is no discharge of effluent into the ditch, there is no need for phosphorus impact modeling.

Based on our review of available MOE Water Well Records, we are not aware of any shallow overburden wells within 500 metres downgradient of the site. Comments regarding the ditch being a hydraulic barrier are based on the fact that the base of the ditch terminates in clay soils, and any subsurface drainage within the strata above the clay is perched, and would be intercepted by the Sale Barn Road ditch. This situation is quite common throughout the Greely area, where typically coarser grained soils overly silt/clay soils that serve as an aquitard. Given the above, even if shallow overburden wells did exist downgradient, the deep ditch along Sale Barn Road provides the necessary protection.

Section 2.2.4

The designation of off-site groundwater recharge studies can only be determined through large scale regional groundwater studies, which would involve extensive field investigations on private lands that are not owned by the proponent. In the studies produced by the City of Ottawa to date, we are not aware of these studies identifying significant recharge areas that would specifically impact the proposed development. Also, we are not aware of any Permit to Take Water Permits that would impact the proposed development. If indeed there is information to suggest otherwise, it would be a little more pro-active on the part of the Conservation Partners to identify the specific risks so that the specifics can be constructively dealt with.

Section 2.2.5

The purpose of the hydrogeological study is not to conduct research into the variability and precision of various test methods, but rather to use accepted procedures for analysis, and to take that data to arrive at a professional opinion. In your comments, you provide an "opinion that grain size analyses and hydraulic conductive (?) should have been supplemented by in-situ permeability tests." What is the rationale for this? This is a new concept being thrown out by the Conservation Partners, and we would caution that the new draft City of Ottawa guidelines have not been adopted, and the Conservation Partners should not be conducting the review based on the proposed guidelines.

In a recent Ontario Municipal Board Decision for the South Village / Woodstream subdivisions in Greely, the City's expert testified that isolation could be proven by laboratory grain size testing **or** pump testing of the water supply wells with overburden monitoring (but not both), and was accepted by all of the experts. For this project, we have done both, and it is our opinion that in situ hydraulic testing is not required, nor would it change the conclusions, based on the testing that has been completed to date. With respect to the estimate of time for the effluent to reach the top of the bedrock layer, the entire overburden soil layer was considered, so that no additional analyses are required.

Section 2.2.6

To date, the Conservation Partners have never defined the acceptable criteria for thicknesses of an overburden isolating layer. As part of this study, a series of test holes was put down to delineate the stratigraphy, and a clay layer was delineated. In situ testing confirmed that isolation existed. As a rule of thumb, from an engineering perspective, for surficial structures that could impact the groundwater aquifer,(i.e. stormwater ponds, sewage lagoons, etc.), the use of a clay liner is the most common means of providing the necessary protection. Typically, 450 to 600 mm of clay is specified in this regard (where there is a significant potential for contamination), and that would be more than acceptable in the natural environment. In addition, the RVCA Ottawa Septics Approvals Office typically recommends 100 mm of clay seal over fractured bedrock be used immediately below septic systems to prevent sewage migration directly into fractured bedrock. Based on my review of all the test pit logs, laboratory analyses, site data and knowledge of the area, it is my opinion that a more than adequate thickness of low permeability exists across the site to protect the drinking water supply.

The clarification of the Sale Barn Road ditch acting as a hydraulic barrier is provided in 2.2.1 above.

Section 2.2.7

To provide clarification with respect to the numbering of the figures, we hereby confirm that Figure 2 is indeed the item pertaining the reference of Figure A-1-1 in the report. This matter was previously clarified in response to Mr. Rizvi's email request for clarification of July 18, 2006. The purpose of that graph was to demonstrate that natural fluctuations exist prior to and during the pumping process. To assist you in your interpretation, Table 2.1.10.1 is a summary of observations during pumping. The maximum fluctuation of 4 cm occurred in MW6-2 during the pumping of where the water level rose 4 cm. (For clarification, a -0.04m drawdown indicates a rise in the water level). The observed maximum drawdown at any single point was no greater than 1 cm, which is well within the natural variations that occurred when no pumping was taking place. The fact that increases in the water level occurred (as opposed to drawdown) is a clear indication that there is no interconnection of the two aquifers.

Section 2.2.13

We acknowledge your acceptance that the site has not been impacted by the use of herbicides.

With respect to the JWEL comments, it could be surmised that they saw fit that a single sample would suffice for the entire village of Greely as part of their study, in that no further testing was conducted.

Section 2.2.15

The Conservation Partners are quite familiar with the nature of the content for performance reports, that are submitted prior to the releasing of additional phases. The RVCA has been very inconsistent over the last couple of years in what the requirements are, and for the record there are no established criteria in this regard, other than previous guidelines being provided by the MOE for development in the Greely area, which we have referred to in the Addendum report, which recommends a 20% buildout. If the RVCA has technical evidence to support any defined number, we would request that we be copied with these studies. We are reluctant to rely solely upon RVCA's opinion.

We will point out that both Mr. Rizvi and myself gave evidence under oath on phased buildouts in December of 2005, before an arbitration panel of three lawyers, including a retired judge. In the written decision, Mr. Rizvi's evidence was not accepted, and the evidence of Mr. Walker was unanimously accepted in this regard. I believe that you can derive some comfort from a professional perspective and now one that has been judicially accepted that the professional opinion on what is required for a phased release is acceptable. The recommendations made by this firm under similar hydrogeological conditions are consistent with what is normally considered acceptable in the Ottawa area.

Summary

The Conservation Partners comments go on to discuss the City of Ottawa Official Plan, and the Provincial Policy Statement. From our studies, it is evident that the water in the residential portion of the site meets both the aesthetic and health related objectives, and in the business park portion, the health related objectives are met. As discussed earlier, the definition of an aesthetic objective(AO) can vary from person to person, and based on further investigation, the provincial objectives for aesthetics can also significantly vary. For example, the AO in Ontario for sodium is 200 mg/L, and in Saskatchewan, the AO is 300 mg/L, which is 50% higher. This is a clear indication that aesthetic objectives represent nothing more than a threshold at which an individual may find the water unpleasing. It is not suggested that people in Saskatchewan may have a higher tolerance, rather that these aesthetic guidelines are subjective. It should also be noted that throughout the City of Ottawa, people may find the municipal water supply to be offensive, and choose to treat the water with in-house water treatment systems. This is in no way an indication that the water is unsafe to drink. This is emphasized on the City of Ottawa web site where it speaks to problems that could occur with appearance, taste and odour, and assures residents that this is not a health concern. It also goes on to recommend the use of treatment (carbon filters) for dealing with offensive taste and odour issues. The concept of treatment for sodium (or any other parameter) on the Greely Village site would be merely a personal choice.

Please find attached information on portable (and inexpensive) reverse osmosis systems that are readily available, along with the applicable contamination rejection rates for the same equipment. In addition, we have attached the Saskatchewan aesthetic objectives for water quality.

It should also be noted that we do not see the relevance of your comments regarding Small Water and Wastewater Works, in that such systems have not been proposed for this project.

We trust this addresses the comments contained in your letter of August 3, 2006. If you have any questions, please call.

Sincerely,
Paterson Group Inc.

Stephen J. Walker, P.Eng.

cc: City of Ottawa (Charles Warnock)
Rideau Valley Conservation Authority (Asher Rizvi)
Sunset Lakes Development Corporation (Dan Anderson)

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

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Supplemental Hydrogeological Assessment

Greely Village Centre Subdivision
Part of Lot 73 and Part of Lot 74,
Registrar's Compiled Plan 902
Ottawa (Osgoode), Ontario

Prepared For

Sunset Lakes
Development Corporation

February 28, 2007

Report No. PH0145-REP.05

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TABLE OF CONTENTS

APPENDICES

Appendix 1	Ontario Ministry of the Environment Water Well Records for Test Wells
Appendix 2	Laboratory Test Data for Water Quality Analysis
Appendix 3	Aquifer Analysis Data for Additional Test Wells
Appendix 4	Revised Lot Development Plan

1.0 INTRODUCTION

This report summarizes the supplemental hydrogeolgical assessment undertaken by this firm for the proposed development, referred to hereafter as Greely Village Centre, and located on the property forming Part of Lot 73 and Part of Lot 74, Concession 5, former Township of Osgoode, now in the City of Ottawa, Ontario (subject property).

Specifically, the purpose of these works is to present, to the Ontario Municipal Board Chair, water quantity and quality data obtained from a deeper bedrock aquifer present beneath the subject property in order to demonstrate the aquifer is a viable water supply aquifer for the proposed Greely Village Centre development.

1.1 Background

Paterson Group Inc. (Paterson) produced a Terrain Analysis and Hydrogeological Study (Report No. PH0145-REP.01) in September 2005. Two additional addendum reports, entitled Addendum No. 1 and Addendum No.2 were prepared by Paterson in June 2006 and December 2006, respectively. Both addendum reports addressed relevant outstanding issues related to the technical review of the original report.

During the execution of a portion of the additional fieldwork in preparation of Addendum No.2, carried out to address issues related to the investigation of the presence of a deeper potential water supply aquifer located beneath the subject site, a deep well (TW7) was constructed at the site. This well encountered an aquifer located in the Nepean Sandstone formation, several metres below the base of the overlying limestone. Analysis of the pumping test and water quality data for TW7 concluded that the sandstone aquifer has excellent water quality and quantity characteristics making it a potential water supply aquifer for the development.

As part of this Supplemental Hydrogeological Assessment, Paterson undertook additional fieldwork, under the authorization of Sunset Lakes Development Corporation (Sunset Lakes), in order to assess the certainty of intercepting the sandstone aquifer at all points throughout the subject site.

1.2 Methodology

In order to demonstrate that future wells can adequately intercept and utilize the sandstone aquifer, an additional four (4) wells were constructed at locations such that the five (5) wells into the sandstone layer would be distributed throughout the site. The locations of these additional test wells, denoted hereafter as TW8, TW9, TW10 and TW11, are shown on Drawing No. PH0145-1, REV. 3.

Each well was developed for a period of one (1) hour after completion of construction of the well andin advance of the pumping tests. Each well was pumping tested for a period of at least six (6) hours at a constant rate and raw water samples were recovered at three (3) hour and six (6) hour milestones. In addition, field measurements of temperature, pH, Total Dissolved Solids (TDS), turbidity and free chlorine residual were recorded for each test well during the pumping test.

Aquifer analysis was performed on the pumping test data obtained from the pumping of each test well using Aquifer Test for Windows v. 2.57, by Waterloo Hydrogeologic Inc. Transmissivity and storativity values for the aquifer were obtained using the Theis and Cooper-Jacobs methods for aquifer analysis.

2.0 ADDITIONAL TEST WELL CONSTRUCTION

2.1 General Discussion of Test Well Construction

The general construction of TW8, TW9, TW10 and TW11 was closely modelled after the construction of TW7. The construction of the additional test wells took place between February 1, 2007 and February 7, 2007 and the locations of the wells are shown on the appended Test Hole Location Plan, Drawing No. PH0145-1, REV.3. The Ministry of the Environment (MOE) Water Well Records are provided in Appendix 2.

The following are the relevant observations of the general construction of each test well:

1. A 300 mm diameter tricone bit was used to advance a working casing hole approximately 600 mm into the surface of the limestone bedrock. The depth of the overburden varied at the well locations from between 4.9 m and 8.78m.

2. A 250 mm diameter steel working casing was installed into the casing hole to stabilize the overburden.

3. A 220 mm diameter casing hole was advanced through the base of the limestone layer and through a transitional layer consisting of interbedded layers of limestone and sandstone. The sandstone in the transitional layer was noted to be relatively soft and fractured. The casing hole was advanced through the transitional layer and terminated approximately 4 m into hard to very hard white sandstone. Casing hole depths varied somewhat between the test wells with hole depths varying between 56.4 m and 61.7 m below ground surface (bgs).

4. A casing, consisting of 150 mm diameter new steel, was installed in the casing hole. The casing was fitted with a drive shoe and each 6 m length of casing was welded together in a satisfactory manner creating a single watertight casing column.

5. Grouting of the annular space was conducted using a tremie pipe placed down the inside of the 150 mm diameter casing, and pumped through the annulus to the surface using a reverse-pressure grouting method. The grout was visually verfied by Paterson to consist of approximately 20% bentonite solids slurry, consistent with the mixing ratio specified by Bariod Industrial Drilling Products. Prior to termination of grouting, a batch of high early cement grout was prepared and delivered to the annulus at the bottom of the grout

column. Pumping of the grout to the ground surface was visually verified by Paterson.

6. The casing was lightly hammered against the bedrock face, in order to seat the drive shoe prior to initiating a standby period of at least 18 hours while the cement grout set up.

7. A 150 mm diameter open borehole was advanced from the bottom of the casing to the point of interception of a water supply aquifer within the Nepean sandstone formation. The sandstone aquifer was intercepted at between 10 m and 13 m below the underside of casing, which corresponds to depths of between 64 m and 73 m bgs.

3.0 AQUIFER ANALYSIS

3.1 Test Well 8

3.1.1 Water Quantity

The aquifer characteristics for TW8 are summarized, below, in Table 1.

Table 1:
Summary of Sandstone Aquifer Characteristics Resulting from Analysis of Pumping Test Data for TW 8

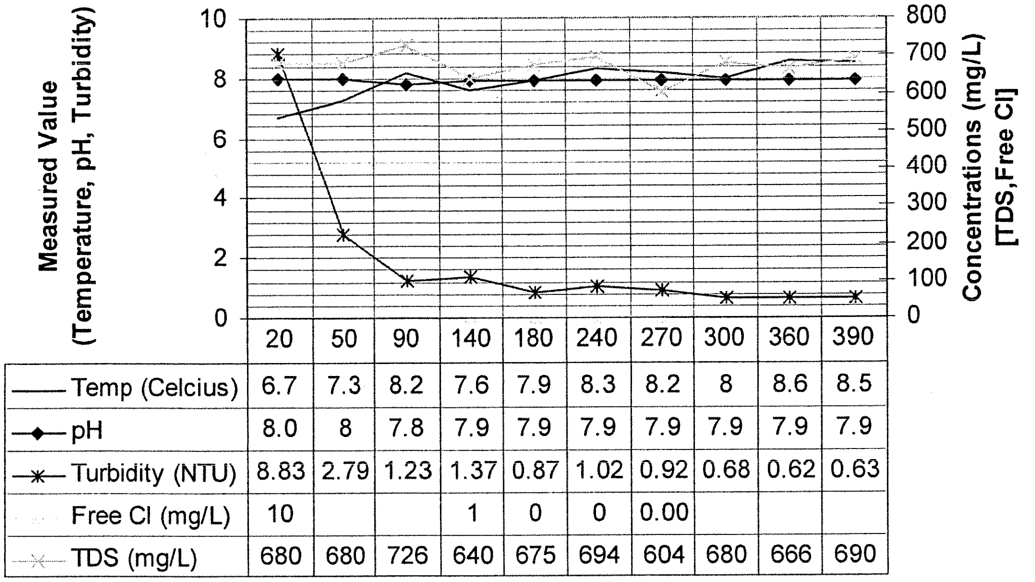
Aquifer Parameter	Result of Analysis
Storativity	1.20×10^{-1}
Transmissivity (m^2/min)	9.42×10^{-3}
Transmissivity (T) (m^2/day)	13.56
Available Drawdown (s) (m)	60
Specific Capacity (L/min/m drawdown)	15.9
20 year safe yield (m^3/day)	553

3.1.2 Water Quality

3.1.2.1 Field Water Quality Analysis

Figure 1, below summarizes the field measurements taken during the pumping test for TW8.

Figure 1:
Field Measurements During Pumping of TW8



	20	50	90	140	180	240	270	300	360	390
—— Temp (Celcius)	6.7	7.3	8.2	7.6	7.9	8.3	8.2	8	8.6	8.5
—◆— pH	8.0	8	7.8	7.9	7.9	7.9	7.9	7.9	7.9	7.9
—✱— Turbidity (NTU)	8.83	2.79	1.23	1.37	0.87	1.02	0.92	0.68	0.62	0.63
Free Cl (mg/L)	10			1	0	0	0.00			
—✕— TDS (mg/L)	680	680	726	640	675	694	604	680	666	690

Time Since Pumping Started (min)

A review of the field water quality data recorded during the pumping test indicates that the temperature, pH and Total Dissolved Solids (TDS) stabilized after approximately 300 minutes of pumping. This corresponds to a reduction of turbidity to below 1 NTU. Free chlorine residual was also recorded to be non-detectable after 180 minutes of pumping.

3.1.2.2 Laboratory Water Quality Analysis

The water quality data for TW8 is summarized in Tables 2 and 3 below.

Table2:
Summary of Health and Aesthetic/Operation Objective Parameters for TW8

Parameter	Units	TW No. 8		Ontario Drinking Water Standards [1]	
		3 Hour	6 Hour	Type	Limit
Microbiological Parameters[2]					
Escherichia Coli	ct/100 mL	0	0	MAC	0
Faecal Coliforms	ct/100 mL	0	0	-	-
Faecal Streptococcus	ct/100 mL	0	0	-	-
Heterotrophic Plate Count	ct/1 mL	0	0	-	-
Total Coliforms	ct/100 mL	0	0	MAC	0
Chemical Parameters (Health Related)					
Fluoride	mg/L	0.25	0.25	MAC	2.4
Nitrite	mg/L	<0.10	<0.10	MAC	1
Nitrate	mg/L	<0.10	<0.10	MAC	10
Chemical Parameters with Aesthetic Objectives/ Operational Guidelines					
Alkalinity	mg/L	210	207	OG	500
Chloride	mg/L	205	204	AO	250
Colour	TCU	<2	2	AO	5
DOC	mg/L	0.9	0.9	AO	5
Hydrogen Sulfide	mg/L	<0.01	<0.01	AO	0.05
pH		8.04	8.06	AO	6.5-8.5
Sulphate	mg/L	55	53	AO	500
Hardness	mg/L	404	381	OG	100
Sodium	mg/L	54	53	AO	20(200)
Iron	mg/L	0.22	0.23	AO	0.30
Manganese	mg/L	0.04	0.04	AO	0.05
Total Dissolved Solids	mg/L	748	728	AO	500
Turbidity (Laboratory)	NTU	2.5	0.2	AO	1
Turbidity (Field)	NTU	0.68	0.63	AO	1

1. Ontario Drinking Water Standards identifies the following types of parameters: MAC= Maximum Allowable Concentration; AO=Aesthetic Objective; OG=Operational Guideline.
2. Free chlorine residuals verified to be non-detectable prior to collection of water samples.

Table 3:
Summary of General Chemical Parameters for TW8

Parameter	Units	TW No. 8	
		3 Hour	6 Hour
General Chemical Parameters			
Conductivity	uS/cm	1150	1120
N-NH_3 (Ammonia)	mg/L	0.09	0.09
Phenols	mg/L	<0.001	<0.001
Tannin & Lignin	mg/L	<0.1	<0.1
Total Kjeldahl Nitrogen	mg/L	0.16	0.09
Ion Balance	Unitless	0.95	0.92
Calcium	mg/L	96	90
Magnesium	mg/L	40	38
Potassium	mg/L	7	6

A review of the water quality analysis data for TW8 indicates that the raw water meets all health related parameters of the Ontario Drinking Water Standards (ODWS). With respect to aesthetic objectives and operational guidelines, the water contains modestly elevated concentrations of hardness and total dissolved solids. Observations made during the construction of TW8 note that the source of water in TW8 originates from a layer of limestone sandwiched between sandstone layers. It is believed that the casing for TW8 was not advanced past the base of the transition layer and is not indicative of the water quality of the sandstone aquifer.

Although acceptable quality of water was available from TW8, it was observed in subsequent drilling that improved water quality could be obtained with consistent penetration to the sandstone aquifer.

Hardness, an operational guideline, does not appear in the ODWS. Rather it appears in the Technical Support Documents for Drinking Water Standards, Objectives and Guidelines (Technical Support Documents) as a parameter with an operational guideline of 100 mg/L. At the measured concentrations, the water is considered to be very hard, however it is below the reasonable treatable limit of 500 mg/L specified in Table 3 of the guidance document, entitled, "Procedure D-5-5: Technical Guideline for Private Wells: Water Supply Assessment", published by the MOE in 1995.

With respect to Total Dissolved Solids (TDS), the Technical Support Documents state an aesthetic objective of 500 mg/L. Based on the fundamentals of groundwater chemistry, it is typical that ions of calcium, chloride, magnesium, sodium and sulphate, and hardness account for more than 90% of the TDS concentration measured in groundwater. TDS is a gross measurement of dissolved material and the aesthetic objective set out in the Technical Support Documents reflects both the tendency to have balanced water and the minimization of ionic concentrations that could affect the palatability of the water.

Although the aquifer that TW8 intercepts contains a TDS concentration of 728 mg/L, the water does not have any individual concentrations of ions that result in an adverse impact on the palatability of the water. In fact, the water appears to be generally balanced between chloride and hardness resulting in aesthetically pleasing water.

In accordance with Procedure D-5-5, Table 3 does not reflect a maximum concentration considered reasonably treatable. Rather, Procedure D-5-5 requires written rationale that corrosion, encrustation, or taste problems will not occur. The Langelier Saturation Index (LSI) indicates the corrosivity of water. The LSI is explained in the Table 4 below:

Table 4:
Summary of Explanation of Langelier Saturation Index Values

LSI Value	Explanation
less than -0.5	Water is corrosive
between -0.5 and +0.5	Water is in equilibrium
higher than +0.5	Water has high scale potential

The LSI value for the water in the aquifer intercepted by TW8 is **+0.27** based on the field measured pH and temperature, and the laboratory analyses for calcium, alkalinity and TDS. Based on the calculated LSI, the water is in equilibrium with minimal potential for creation of scale and is non-corrosive. The taste of the water, as such, is anticipated to be balanced and aesthetically pleasing and palatable.

3.2 Test Well 9

3.2.1 Water Quantity

The aquifer characteristics for TW9 are summarized, below, in Table 5.

Table 5:
Summary of Sandstone Aquifer Characteristics Resulting from Analysis of Pumping Test Data for TW 9

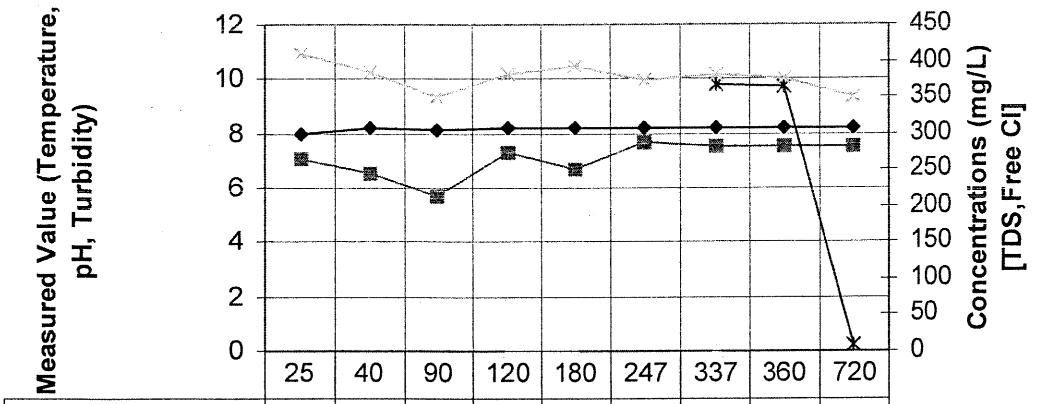
Aquifer Parameter	Result of Analysis
Storativity	1.19×10^{-1}
Transmissivity (m^2/min)	1.12×10^{-3}
Transmissivity (T) (m^2/day)	1.61
Available Drawdown (s) (m)	73.2
Specific Capacity (L/min/m drawdown)	2.44
20 year safe yield (m^3/day)	78.5

3.2.2 Water Quality

3.2.2.1 Field Water Quality Analysis

Figure 2, below summarizes the field measurements taken during the pumping test for TW9.

Figure 2:
Field Measurements During Pumping of TW9



	25	40	90	120	180	247	337	360	720
—■— Temp (Celcius)	7.1	6.5	5.7	7.3	6.7	7.7	7.5	7.5	7.5
—◆— pH	8	8.2	8.1	8.2	8.2	8.2	8.2	8.2	8.2
—✱— Turbidity (NTU)							9.78	9.7	0.25
Free Cl (mg/L)				0.1	0		0.00		
—×— TDS (mg/L)	410	384	350	383	392	373	382	375	350

Time Since Pumping Started (min)

A review of the field measurements for TW9 indicates that the measured values for temperature, pH, and TDS appeared to stabilize within the six hour pumping period. Field turbidity remained high during the pumping test period as excess rust on the casing was observed to be present throughout testing. TW9 was pumped for an extended period in order to clean the casing of any residual rust. The field turbidity measurement after six hours of extended pumping was recorded to be 0.25 NTU. A sample of the water from TW9, obtained at the end of the extended pumping, was submitted for analysis for parameters comprise the "subdivision" package from Accutest Laboratories. The data appears in Table 6 in Section 3.2.2.2. and the laboratory analysis report is provided in Appendix 3.

3.2.2.2 Laboratory Water Quality Analysis

The water quality data for TW9 is summarized in Tables 6 and 7 below.

Table 6:
Summary of Health and Aesthetic/Operation Objective Parameters for TW9

Parameter	Units	TW No. 9		Ontario Drinking Water Standards [1]	
		3 Hour	6 hour[3]	Type	Limit
Microbiological Parameters[2]					
Escherichia Coli	ct/100 mL	0	0	MAC	0
Faecal Coliforms	ct/100 mL	0	0	-	-
Faecal Streptococcus	ct/100 mL	0	0	-	-
Heterotrophic Plate Count	ct/1 mL	1	0	-	-
Total Coliforms	ct/100 mL	0	0	MAC	0
Chemical Parameters (Health Related)					
Fluoride	mg/L	0.42	0.36	MAC	2.4
Nitrite	mg/L	<0.10	<0.10	MAC	1
Nitrate	mg/L	<0.10	<0.10	MAC	10
Chemical Parameters with Aesthetic Objectives/ Operational Guidelines					
Alkalinity	mg/L	207	207	OG	500
Chloride	mg/L	61	60	AO	250
Colour	TCU	<2	<2	AO	5
DOC	mg/L	1.0	1.3	AO	5
Hydrogen Sulfide	mg/L	<0.01	<0.01	AO	0.05
pH		8.23	7.96	AO	6.5-8.5
Sulphate	mg/L	45	41	AO	500
Hardness	mg/L	217	226	OG	100
Sodium	mg/L	44	45	AO	20(200)
Iron	mg/L	2.25	0.15	AO	0.30
Manganese	mg/L	0.05	0.03	AO	0.05
Total Dissolved Solids	mg/L	435	435	AO	500
Turbidity (Laboratory)	NTU	16.5	1.1	AO	1
Turbidity (Field)	NTU	9.7	0.25	AO	1

1. Ontario Drinking Water Standards identifies the following types of parameters: MAC= Maximum Allowable Concentration; AO=Aesthetic Objective; OG=Operational Guideline.
2. Free chlorine residuals verified to be non-detectable prior to collection of water samples.
3. Water quality analysis of water collected after an additional six hours of extended pumping.

Table 7: Summary of General Chemical Parameters for TW9			
Parameter	Units	TW No. 9	
		3 Hour	6 Hour [1]
General Chemical Parameters			
Conductivity	uS/cm	670	677
N-NH_3 (Ammonia)	mg/L	0.10	0.09
Phenols	mg/L	<0.001	<0.001
Tannin & Lignin	mg/L	0.1	0.2
Total Kjeldahl Nitrogen	mg/L	0.16	0.18
Ion Balance	Unitless	0.94	0.92
Calcium	mg/L	49	48
Magnesium	mg/L	23	22
Potassium	mg/L	6	6

1. Water quality analysis of water collected after an additional six hours of extended pumping.

Analysis of the water quality data obtained from TW9, after the additional six hours of pumping, reveals water meeting all of the ODWS health parameters and all aesthetic parameters with the exception of turbidity and hardness.

Laboratory turbidity was reported to be 1.1 NTU, however field turbidity readings noted consistent turbidity data below 1 NTU during the extended pumping period. It is likely that oxidation of the iron within the sample, during collection, is likely the reason for the difference. Oxidation of iron and manganese are common during sample collection as air is often introduced to the water during sample recovery.

Hardness was reported at a concentration of 226 mg/L after six hours of pumping. The operational guideline for hardness, in the ODWS is 100 mg/L. At the reported concentration, the water is considered to be hard, however it is considered reasonably treatable based on Table 3 of Procedure D-5-5.

3.3 Test Well 10

3.3.1 Water Quantity

The aquifer characteristics for TW10 are summarized, below, in Table 8.

Table 8:
Summary of Sandstone Aquifer Characteristics Resulting from Analysis of Pumping Test Data for TW 10

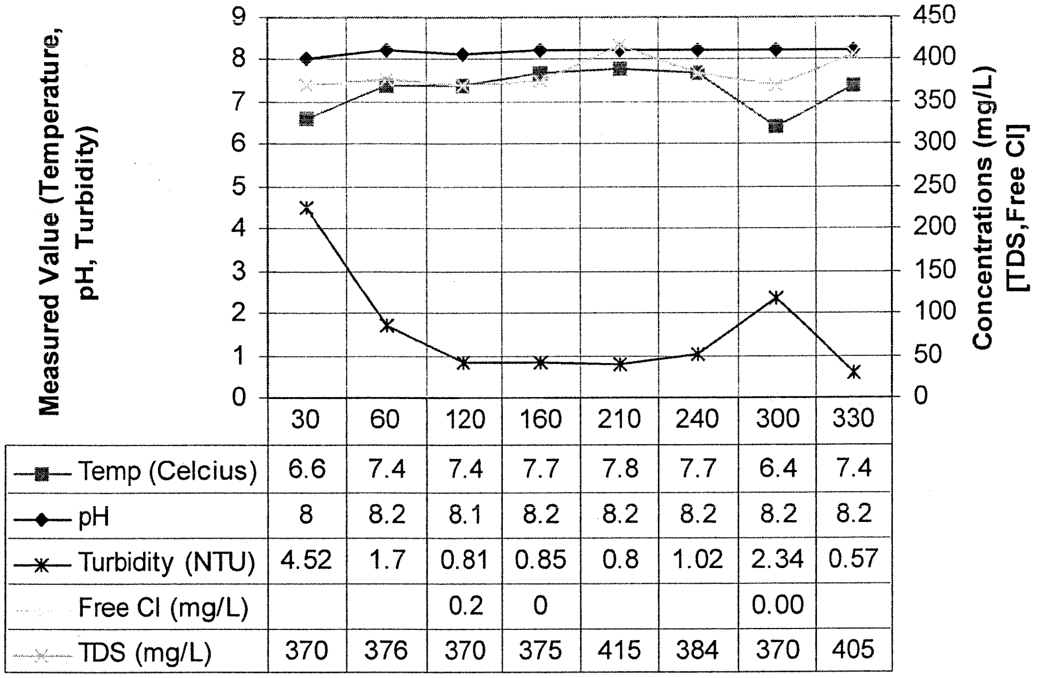
Aquifer Parameter	Result of Analysis
Storativity	7.24×10^{-2}
Transmissivity (m^2/min)	1.77×10^{-3}
Transmissivity (T) (m^2/day)	2.55
Available Drawdown (s) (m)	70
Specific Capacity (L/min/m drawdown)	3.7
20 year safe yield (m^3/day)	121

3.3.2 Water Quality

3.3.2.1 Field Water Quality Analysis

Figure 3, below summarizes the field measurements taken during the pumping test for TW10.

Figure 3:
Field Measurements During Pumping of TW10



	30	60	120	160	210	240	300	330
■ Temp (Celcius)	6.6	7.4	7.4	7.7	7.8	7.7	6.4	7.4
◆ pH	8	8.2	8.1	8.2	8.2	8.2	8.2	8.2
✱ Turbidity (NTU)	4.52	1.7	0.81	0.85	0.8	1.02	2.34	0.57
Free Cl (mg/L)			0.2	0			0.00	
× TDS (mg/L)	370	376	370	375	415	384	370	405

Time Since Pumping Started (min)

A review of the field water quality data recorded during the pumping test suggests that the water from the aquifer intercepted by TW10 was stable at the completion of the six hour pumping test period. Free chlorine residual was recorded to be non detectable after 160 minutes of pumping.

3.3.2.2 Laboratory Water Quality Analysis

The water quality data for TW10 is summarized in Tables 9 and 10 below.

Table 9:
Summary of Health and Aesthetic/Operation Objective Parameters for TW10

Parameter	Units	TW No. 10		Ontario Drinking Water Standards [1]	
		3 Hour	6 Hour	Type	Limit
Microbiological Parameters[2]					
Escherichia Coli	ct/100 mL	0	0	MAC	0
Faecal Coliforms	ct/100 mL	0	0	-	-
Faecal Streptococcus	ct/100 mL	0	0	-	-
Heterotrophic Plate Count	ct/1 mL	0	0	-	-
Total Coliforms	ct/100 mL	0	0	MAC	0
Chemical Parameters (Health Related)					
Fluoride	mg/L	0.36	0.38	MAC	2.4
Nitrite	mg/L	<0.10	<0.10	MAC	1
Nitrate	mg/L	<0.10	<0.10	MAC	10
Chemical Parameters with Aesthetic Objectives/ Operational Guidelines					
Alkalinity	mg/L	208	207	OG	500
Chloride	mg/L	65	65	AO	250
Colour	TCU	3	2	AO	5
DOC	mg/L	1.1	1.1	AO	5
Hydrogen Sulfide	mg/L	<0.01	<0.01	AO	0.05
pH		8.14	8.09	AO	6.5-8.5
Sulphate	mg/L	48	48	AO	500
Hardness	mg/L	231	252	OG	100
Sodium	mg/L	36	37	AO	20(200)
Iron	mg/L	0.09	0.09	AO	0.30
Manganese	mg/L	0.03	0.03	AO	0.05
Total Dissolved Solids	mg/L	439	442	AO	500
Turbidity (Laboratory)	NTU	1.0	0.7	AO	1
Turbidity (Field)	NTU	0.85	0.57	AO	1

1. Ontario Drinking Water Standards identifies the following types of parameters: MAC= Maximum Allowable Concentration; AO=Aesthetic Objective; OG=Operational Guideline.
2. Free chlorine residuals verified to be non-detectable prior to collection of water samples.

Table 10:
Summary of General Chemical Parameters for TW10

Parameter	Units	TW No. 10	
		3 Hour	6 Hour
General Chemical Parameters			
Conductivity	uS/cm	676	680
N-NH_3 (Ammonia)	mg/L	0.09	0.09
Phenols	mg/L	<0.001	<0.001
Tannin & Lignin	mg/L	0.2	0.2
Total Kjeldahl Nitrogen	mg/L	0.13	0.12
Ion Balance	Unitless	0.90	0.97
Calcium	mg/L	54	58
Magnesium	mg/L	25	26
Potassium	mg/L	5	6

TW10 was noted to be a free flowing artesian well. As such, the water chemistry is very much stable, as noted in the water quality analysis, due to the natural development process resulting from the constant flow of water.

The water from TW10 is noted to meet all health and aesthetic related parameters of the ODWS with the exception of hardness. The hardness, reported to be between 231 and 252 mg/L, is consistent with the values noted from pumping of TW9 and is considered to be reasonably treatable according to Table 3 of Procedure D-5-5.

3.4 Test Well 11

3.4.1 Water Quantity

The aquifer characteristics for TW11 are summarized, below, in Table 11.

**Table 11:
Summary of Sandstone Aquifer Characteristics Resulting from Analysis of Pumping Test Data for TW 11**

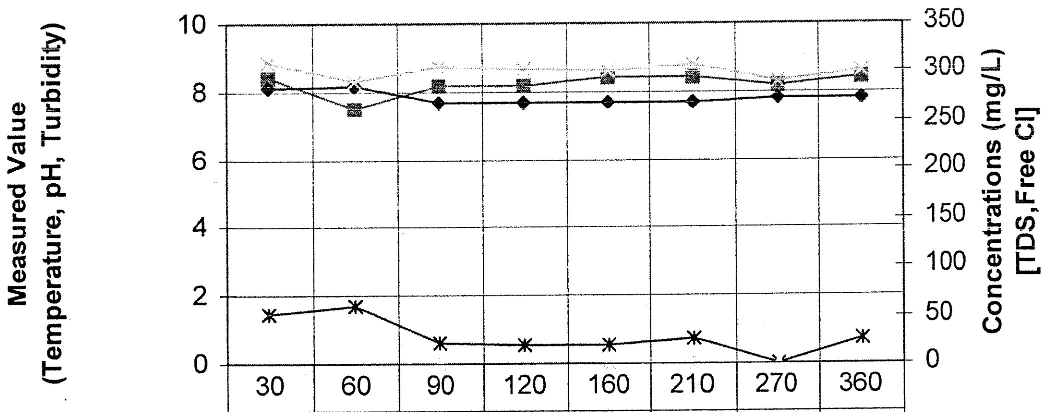
Aquifer Parameter	Result of Analysis
Storativity	7.15×10^{-4}
Transmissivity (m^2/min)	2.32×10^{-1}
Transmissivity (T) (m^2/day)	33.4
Available Drawdown (s) (m)	57
Specific Capacity (L/min/m drawdown)	181.1
20 year safe yield (m^3/day)	1295

3.4.2 Water Quality

3.4.2.1 Field Water Quality Analysis

Figure 4, below summarizes the field measurements taken during the pumping test for TW8.

Figure 4:
Field Measurements During Pumping of TW11



	30	60	90	120	160	210	270	360
■ Temp (Celcius)	8.4	7.5	8.2	8.2	8.4	8.4	8.2	8.4
◆ pH	8.1	8.2	7.7	7.7	7.7	7.7	7.8	7.8
✳ Turbidity (NTU)	1.45	1.7	0.64	0.55	0.57	0.73	0	0.72
Free Cl (mg/L)			0.5		0	0	0.00	
✳ TDS (mg/L)	310	291	305	302	300	308	290	301

Time Since Pumping Started (min)

A review of the field water quality data recorded during the pumping test indicates that the water chemistry stabilized after approximately 160 minutes of pumping. Free residual was measured to be non detectable at this point in the pumping test also.

3.4.2.2 Laboratory Water Quality Analysis

The water quality data for TW11 is summarized in Tables 12 and 13 below.

Table 12:
Summary of Health and Aesthetic/Operation Objective Parameters for TW11

Parameter	Units	TW No. 11		Ontario Drinking Water Standards [1]	
		3 Hour	6 Hour	Type	Limit
Microbiological Parameters[2]					
Escherichia Coli	ct/100 mL	0	0	MAC	0
Faecal Coliforms	ct/100 mL	0	0	-	-
Faecal Streptococcus	ct/100 mL	0	0	-	-
Heterotrophic Plate Count	ct/1 mL	0	1	-	-
Total Coliforms	ct/100 mL	0	0	MAC	0
Chemical Parameters (Health Related)					
Fluoride	mg/L	0.4	0.4	MAC	2.4
Nitrite	mg/L	<0.10	<0.10	MAC	1
Nitrate	mg/L	<0.10	<0.10	MAC	10
Chemical Parameters with Aesthetic Objectives/ Operational Guidelines					
Alkalinity	mg/L	203	205	OG	500
Chloride	mg/L	43	42	AO	250
Colour	TCU	<2	<2	AO	5
DOC	mg/L	1.0	0.9	AO	5
Hydrogen Sulfide	mg/L	<0.01	<0.01	AO	0.05
pH		8.09	8.13	AO	6.5-8.5
Sulphate	mg/L	39	39	AO	500
Hardness	mg/L	203	203	OG	100
Sodium	mg/L	37	37	AO	20(200)
Iron	mg/L	0.23	0.4	AO	0.30
Manganese	mg/L	0.03	0.03	AO	0.05
Total Dissolved Solids	mg/L	384	384	AO	500
Turbidity (Laboratory)	NTU	1.9	4.2	AO	1
Turbidity (Field)	NTU	0.57	0.72	AO	1

1. Ontario Drinking Water Standards identifies the following types of parameters: MAC= Maximum Allowable Concentration; AO=Aesthetic Objective; OG=Operational Guideline.
2. Free chlorine residuals verified to be non-detectable prior to collection of water samples.

Table 14:
Summary of General Chemical Parameters for TW11

Parameter	Units	TW No. 11	
		3 Hour	6 Hour
General Chemical Parameters			
Conductivity	uS/cm	590	591
N-NH_3 (Ammonia)	mg/L	0.09	0.09
Phenols	mg/L	<0.001	<0.001
Tannin & Lignin	mg/L	<0.1	0.1
Total Kjeldahl Nitrogen	mg/L	0.12	0.13
Ion Balance	Unitless	0.95	0.95
Calcium	mg/L	45	45
Magnesium	mg/L	22	22
Potassium	mg/L	6	6

Water quality analysis of the water recovered from TW11 reveals that the water meets all health related parameters of the ODWS. Furthermore, the water meets all aesthetic related parameters with the exception of hardness, laboratory turbidity, and iron.

The concentration of hardness in the water from TW11 is noted to be 203 mg/L. This concentration is consistent with the values reported in both TW9 and TW10. Like the hardness reported in TW9 and TW10, the reported hardness is considered reasonably treatable according to Procedure D-5-5.

The laboratory turbidity and concentration of iron are above ODWS values. The field turbidity data indicates consistent turbidity levels of less than 1 NTU. As previously detailed on Section 3.2.2.2 of this report, oxidation of iron during sample recover is likely responsible for the difference between turbidity readings. Given that the concentration of iron was reported to be 0.4 mg/L after six hours of pumping, there is ample iron present to form iron oxide precipitate in the sample bottle. Although the concentration of iron is above the ODWS aesthetic objective of 0.3 mg/L, the water is considered reasonably treatable according to Table 3 of Procedure D-5-5.

3.5 Well Interference Calculations

The original well interference calculations have been updated to reflect the utilization of the sandstone aquifer. Figure 5, below, summarizes the anticipated cumulative drawdown within the centre of the site resulting from continuous pumping of residential and commercial wells.

Based on an analysis of the revised well interference calculations, it is evident that there is an ample supply of water available to the proposed developments from the sandstone aquifer.

4.0 DISCUSSION

With respect to the water quality analysis for TW9, TW10, and TW11, these test wells are noted to have intercepted the same water supply aquifer located within the sandstone of the Nepean formation. The quantity of water is considered to be more than adequate for residential and commercial uses. Moreover, this water supply aquifer is of excellent water quality with only minor elevations in hardness, and iron reported. These aesthetic parameters are reported at concentrations that are considered reasonably treatable as per Table 3 of Procedure D-5-5.

It must be noted that the sodium concentration in the sandstone aquifer is quite low at values between 36 and 53 mg/L. Although the ODWS aesthetic objective is 200 mg/L, any concentrations of sodium above 20 mg/L requires that the water quality data be made available to the local Medical Officer of Health. This is in order to allow for the dissemination of this information to local physicians for treatment of persons with sodium restricted dietary needs.

Based on the locations of the additional test wells, the site has comprehensive coverage of deep test wells with TW7, TW9, TW10 and TW11 easily intercepting the sandstone aquifer at approximately 61 to 73 m bgs within the residential areas. The sandstone aquifer can be easily intercepted by advancing the casing a additional 6 to 10 m into the sandstone formation in the commercial areas.

Static water levels reported in the additional test wells reveal a significant upwards gradient exists within the sandstone aquifer. The updated well interference calculations confirm acceptable anticipated drawdown values within the site and also confirm that the upwards gradient will be maintained even during the worst case scenario of maximum water taking from the aquifer for the proposed development. As such, the sandstone aquifer, considered to be hydraulically isolated, is a excellent water supply for this site.

5.0 CONCLUSIONS

Based on the information presented in the body of this supplemental hydrogeological assessment, the following conclusions can be drawn:

1. A suitable water supply aquifer exists within the sandstone formation underlying the limestone formation at the subject site.
2. The sandstone water supply aquifer has an aeral extent such that all portions of the site can access it.
3. The sandstone water supply aquifer has ample quantities of water available for utilization by both the proposed residential and commercial portions of the site and has excellent water quality.
4. The sandstone water supply aquifer possesses a significant upwards gradient that remains largely unaffected by maximum water taking estimates at the site and, as agreed to by experts at the Ontario Municipal Board Hearing, is hydrogeologically isolated from surface activity.
5. The sandstone aquifer is considered to be an excellent aquifer for this development.

6.0 RECOMMENDATIONS

The following recommendations are presented, based on the information contained within the body of this report:

1. Wells intended to utilize the sandstone aquifer in the residential portion of the site should be cased and properly grouted, in accordance with Ontario Regulation 903, through the limestone formation, and transition zone, and should extend to a depth of not less than 60 m bgs or at least a minimum of 4 m into the sandstone layer.

2. Wells intended to utilize the sandstone aquifer in the commercial portion of the site, should be cased and properly grouted, in accordance with Ontario Regulation 903, through the limestone formation and transition zone, and should extend to a depth of not less than 70 m bgs or at least a minimum of 10 m into the sandstone layer.

3. The sodium concentrations require the usual warning clause in the subdivision agreement for persons with sodium restricted dietary needs.

Paterson Group Inc.

Robert A. Passmore, B.Eng.

Stephen J. Walker, P.Eng.

Report Distribution:

☐ Sunset Lakes Development Corporation (3 copies)
☐ Paterson Group (1 copy)

APPENDIX 1

Ontario Ministry of the Environment Water Well Records for Additional Test Wells

Ontario Ministry of the Environment

Well Tag Number (place sticker and print number below) A 052444

A052444

Well Record

Regulation 903 Ontario Water Resources Act

page __ of __

Instructions for Completing Form

- For use in the **Province of Ontario** only. This document is a permanent **legal** document. Please retain for future reference.
- All Sections **must** be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Help Desk (Toll Free) at 1-888-396-9355.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN __ CON __ LOT __

Well Owner's Information and Location of Well Information

First Name: (c/o Sunset Lakes) Last Name: Greely Family Farm Inc
Mailing Address (Street Number/Name, RR, Lot, Concession): 6576 Apple Orchard Road
County/District/Municipality:
Township/City/Town/Village: Greely
Province: Ontario
Postal Code: K4P 1E5
Telephone Number (include area code):

Address of Well Location (County/District/Municipality): Ottawa-Carleton
Township: Osgoode
Lot: 6
Concession: 5
RR#/Street Number/Name: #7268 Parkway
City/Town/Village: Greely
Site/Compartment/Block/Tract etc.: Plan 902 Pt L 73 + 74
GPS Reading: NAD 83 Zone 18 Easting 456740 Northing 5012337
Unit Make/Model: Magellan
Mode of Operation: ☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth Metres From	Depth Metres To
	Sand & Boulders			0	8.69
	Limestone			8.69	40.54
	Sandstone			40.54	52.42
	White Sandstone			52.42	64.00

Hole Diameter

Depth Metres From	Depth Metres To	Diameter Centimetres
0	64.00	15.23

Water Record

Water found at Metres: 61.87 m — Kind of Water: ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other: NOT TESTED

__ m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

__ m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

After test of well yield, water was ☐ Clear and sediment free ☐ Other, specify NOT TESTED

Chlorinated ☒ Yes ☐ No

Construction Record

Casing

Inside diam centimetres	Material	Wall thickness centimetres	Depth Metres From	Depth Metres To
15.88	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.48	0	56.39
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			

Screen

Outside diam	Material	Slot No.	Depth Metres From	Depth Metres To
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			

No Casing or Screen

		From	To
☒ Open hole		55.78	64.00

Test of Well Yield

Pumping test method: Sub Pump
Pump intake set at (metres): 54.56
Pumping rate (litres/min): 91
Duration of pumping: 1 hrs + 0 min
Final water level end of pumping: 7.98 metres
Recommended pump type: ☐ Shallow ☒ Deep
Recommended pump depth: 54.56 metres
Recommended pump rate (litres/min): 91
If flowing give rate (litres/min):
If pumping discontinued, give reason:

Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level	2.56		9.78
1	3.98	1	5.37
2	5.48	2	4.27
3	6.45	3	3.87
4	7.05	4	3.72
5	7.5	5	3.63
10	8.57	10	3.42
15	7.00	15	3.34
20	7.25	20	3.32
25	7.40	25	3.29
30	7.52	30	3.26
40	7.70	40	3.26
50	7.85	50	3.26
60	7.98	60	3.26

Plugging and Sealing Record ☒ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
55.78	52.73	Neat Cement Slurry	.1816
52.73	0	Bentonite Slurry	1.47

Method of Construction

☐ Cable Tool ☐ Rotary (conventional) ☐ Rotary (reverse) ☐ Rotary (air) ☒ Air percussion ☐ Boring ☐ Diamond ☐ Jetting ☐ Driving ☐ Digging ☐ Other

Water Use

☒ Domestic ☐ Stock ☐ Irrigation ☐ Industrial ☐ Commercial ☐ Municipal ☐ Public Supply ☐ Not used ☐ Cooling & air conditioning ☐ Other

Final Status of Well

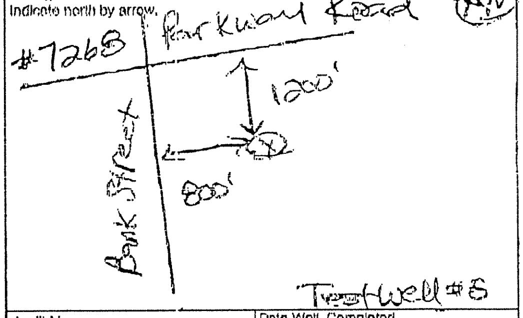
☐ Water Supply ☐ Observation well ☒ Test Hole ☐ Recharge well ☐ Abandoned, insufficient supply ☐ Abandoned, poor quality ☐ Unfinished ☐ Dewatering ☐ Replacement well ☐ Abandoned, (Other)

Well Contractor/Technician Information

Name of Well Contractor: Air Rock Drilling Co Ltd
Well Contractor's Licence No.: 1119
Business Address (street name, number, city etc.): RR#1 Richmond Ont K0A 2Z0
Name of Well Technician (last name, first name): Purcell Shannon
Well Technician's Licence No.: T 2122
Signature of Technician/Contractor: X
Date Submitted: YYYY MM DD

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Audit No. Z 64733
Date Well Completed: 2007 02 01
Was the well owner's information package delivered? ☒ Yes ☐ No
Date Delivered: 2007 02 03

Ministry Use Only

Data Source: Contractor:
Date Received: YYYY MM DD
Date of Inspection: YYYY MM DD
Remarks: Well Record Number:

0506E (09/2000) **Ministry's Copy** *Cette formule est disponible en français*

Ontario Ministry of the Environment

Well Tag A 052445 (number below)

A052445

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

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- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN ___ CON ___ LOT ___

Well Owner's Information and Location of Well Information

First Name: (Sunset Lakes)
Last Name: Greely Family of Farm Inc
Mailing Address (Street Number/Name, RR, Lot, Concession): 6576 Apple Orchard Road
County/District/Municipality:
Township/City/Town/Village: Greely
Province: Ontario
Postal Code: K4P 1E5
Telephone Number (include area code):

Address of Well Location (County/District/Municipality): Ottawa - Carleton
Township: Osgoode
Lot: 6
Concession: 5
RR#/Street Number/Name: #7268 Parkway Road
City/Town/Village: Greely
Site/Compartment/Block/Tract etc.: Plan 902 P/L 73+74
GPS Reading: NAD 83 Zone 18 Easting 456894 Northing 5012637
Unit Make/Model: Magellan
Mode of Operation: ☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth Metres From	Depth Metres To
	Sandy Clay			0	8.53
	Sand, Gravel Lime stone			8.53	40.54
	Grey Sandstone			40.54	73.15

Hole Diameter

Depth Metres From	Depth Metres To	Diameter Centimetres
0	73.15	15.23

Water Record

Water found at Metres / Kind of Water
57.71 m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other: NOT
63.70 m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other: TESTED
___ m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

After test of well yield, water was ☐ Clear and sediment free: CLOUDY NOT
☐ Other, specify: TESTED
Chlorinated ☒ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth Metres From	Depth Metres To
Casing				
15.88	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.48	0	58.82
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☒ Open hole		58.21	73.15

Test of Well Yield

Pumping test method: Sub Pump
Pump intake set at (metres): 60.76
Pumping rate (litres/min): 45.72
Duration of pumping: 1 hrs + 0 min
Final water level end of pumping: 30.64 metres
Recommended pump type: ☐ Shallow ☒ Deep
Recommended pump depth: 60.76 metres
Recommended pump rate (litres/min): 45.72
If flowing give rate (litres/min):
If pumping discontinued, give reason:

Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level	1.00		20.64
1	3.12	1	17.63
2	4.44	2	14.80
3	5.53	3	13.00
4	6.50	4	11.33
5	7.32	5	7.83
10	10.20	10	5.27
15	11.57	15	3.15
20	14.20	20	1.23
25	15.78	25	1.11
30	16.76	30	1.11
40	18.43	40	
50	19.63	50	
60	30.64	60	

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
58.21	55.17	Neat Cement Slurry	.1816
55.17	0	Bentonite Slurry	1.84

Method of Construction

☐ Cable Tool ☐ Rotary (conventional) ☐ Rotary (reverse) ☐ Rotary (air) ☒ Air percussion ☐ Boring ☐ Diamond ☐ Jetting ☐ Driving ☐ Digging ☐ Other

Water Use

☒ Domestic ☐ Stock ☐ Irrigation ☐ Industrial ☐ Commercial ☐ Municipal ☐ Public Supply ☐ Not used ☐ Cooling & air conditioning ☐ Other

Final Status of Well

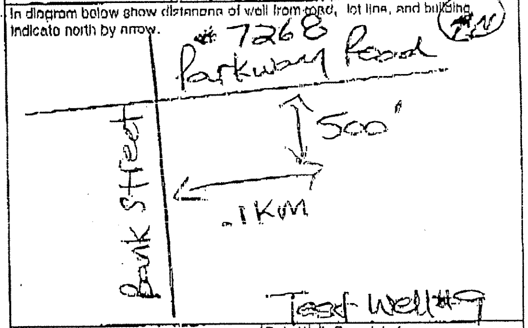
☐ Water Supply ☐ Observation well ☒ Test Hole ☐ Recharge well ☐ Abandoned, insufficient supply ☐ Abandoned, poor quality ☐ Unfinished ☐ Dewatering ☐ Replacement well ☐ Abandoned, (Other)

Well Contractor/Technician Information

Name of Well Contractor: Air Rock Drilling Co Ltd
Well Contractor's Licence No.: 1119
Business Address (street name, number, city etc.): RR#1 Richmond ONT K0A2Z0
Name of Well Technician (last name, first name): Purcell Shannon
Well Technician's Licence No.:
Signature of Technician/Contractor: X
Date Submitted YYYY MM DD

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Audit No. Z 64734
Date Well Completed: 2007 02 04
Was the well owner's information package delivered? ☒ Yes ☐ No
Date Delivered YYYY MM DD: 2007 02 06

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Data Source
Contractor
Date Received YYYY MM DD
Date of Inspection YYYY MM DD
Remarks
Well Record Number

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Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below)
A 052446
A052446

Well Record

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- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only
MUN ___ CON ___ LOT ___

Well Owner's Information and Location of Well Information

First Name: Sunset Lakes
Last Name: Greely Family Farm Inc
Mailing Address (Street Number/Name, RR, Lot, Concession): 6576 Apple Orchard Rd
County/District/Municipality:
Township/City/Town/Village: Greely
Province: Ontario
Postal Code: K4P 1E5
Telephone Number (include area code):
Address of Well Location (County/District/Municipality): Ottawa-Carleton
Township: Osgoode
Lot: 6
Concession: 5
RR#/Street Number/Name: #7268 Parkway
City/Town/Village: Greely
Site/Compartment/Block/Tract etc.: Plan 902 P/L 73 + 74
GPS Reading: NAD 83 Zone 18 Easting 457115 Northing 5012789
Unit Make/Model: Magellan
Mode of Operation: ☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify ___

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth Metres From	Depth Metres To
	Sand, gravel, Boulders w/	Blue Clay		0	7.62
	Limestone			7.62	42.97
	Sandstone			42.97	73.15

Hole Diameter

Depth Metres From	Depth Metres To	Diameter Centimetres
0	73.15	15.23

Water Record

Water found at Metres	Kind of Water
66.75 m	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☒ Minerals ☐ Other: NOT TESTED
70.10 m	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other: NOT TESTED
___ m	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

After test of well yield, water was: CLOUDY NOT ☐ Clear and sediment free ☐ Other, specify TESTED
Chlorinated ☒ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth Metres From	Depth Metres To
Casing				
15.88	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.48	0	61.57
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☒ Open hole		60.96	73.15

Test of Well Yield

Pumping test method: Sub Pump
Pump intake set at (metres): 60.96
Pumping rate (litres/min): 56.78
Duration of pumping: 1 hrs + 0 min
Final water level end of pumping: 16.80 metres
Recommended pump type: ☐ Shallow ☒ Deep
Recommended pump depth: 60.96 metres
Recommended pump rate (litres/min): 56.78
If flowing give rate (litres/min): 45.5
If pumping discontinued, give reason:

Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level	Flow		16.80
1	.48	1	13.10
2	1.98	2	11.00
3	3.14	3	9.40
4	4.30	4	7.30
5	5.50	5	6.40
10	8.38	10	1.72
15	10.21	15	0.12
20	11.72	20	
25	12.70	25	
30	13.30	30	
40	15.30	40	
50	16.05	50	
60	16.80	60	

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
60.96	57.91	Neat Cement Slurry	.1316
57.91	0	Bentonite Slurry	2.21

Method of Construction

☐ Cable Tool ☐ Rotary (conventional) ☐ Rotary (reverse) ☐ Rotary (air) ☒ Air percussion ☐ Boring ☐ Diamond ☐ Jetting ☐ Driving ☐ Digging ☐ Other

Water Use

☒ Domestic ☐ Stock ☐ Irrigation ☐ Industrial ☐ Commercial ☐ Municipal ☐ Public Supply ☐ Not used ☐ Cooling & air conditioning ☐ Other

Final Status of Well

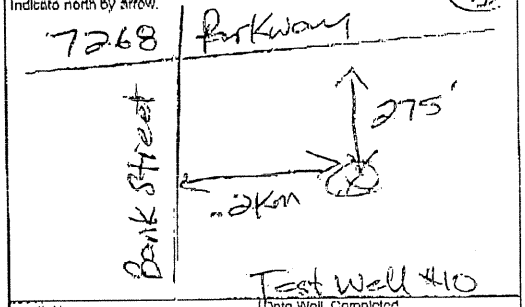
☐ Water Supply ☐ Observation well ☒ Test Hole ☐ Recharge well ☐ Abandoned, insufficient supply ☐ Abandoned, poor quality ☐ Unfinished ☐ Dewatering ☐ Replacement well ☐ Abandoned, (Other)

Well Contractor/Technician Information

Name of Well Contractor: AIR ROCK DRILLING Co LTD
Well Contractor's Licence No.: 1119
Business Address (street name, number, city etc.): RR#1 Richmond ONT K0A 2Z0
Name of Well Technician (last name, first name): PURCELL SHANNON
Well Technician's Licence No.: T2122
Signature of Technician/Contractor: X
Date Submitted YYYY MM DD

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Audit No. Z 64735
Date Well Completed YYYY MM DD: 2007 02 06
Was the well owner's information package delivered? ☒ Yes ☐ No
Date Delivered YYYY MM DD: 2007 02 07

Ministry Use Only

Data Source
Contractor
Date Received YYYY MM DD
Date of Inspection YYYY MM DD
Remarks
Well Record Number

0506E (09/2000) Ministry's Copy Cette formule est disponible en français

Ontario Ministry of the Environment

Well Tag A 052506 (or below)

A 052506

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

- For use in the **Province of Ontario** only. This document is a permanent **legal** document. Please retain for future reference.
- All Sections **must** be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Help Desk (Toll Free) at 1-888-396-9355.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only: MUN ☐ CON ☐ LOT ☐

Well Owner's Information and Location of Well Information

First Name: (Sunset Lakes) 2) to
Last Name: Greely Family Farm Inc
Mailing Address (Street Number/Name, RR, Lot, Concession): 6576 Apple Orchard Road
County/District/Municipality:
Township/City/Town/Village: Greely
Province: Ontario
Postal Code: K4P1E5
Telephone Number (include area code):
Address of Well Location (County/District/Municipality): Ottawa-Carleton
Township: Osgoode
Lot: 6
Concession: 5
RR#/Street Number/Name: #7268 Parkway
City/Town/Village: Greely
Site/Compartment/Block/Tract etc.: Plan 902 PL 73+74
GPS Reading: NAD 83 Zone 18 Easting 457284 Northing 5012352
Unit Make/Model: Magellan
Mode of Operation: ☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify ______

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth Metres From	Depth Metres To
	Clay, gravel, boulders			0	4.88
	Limestone			4.88	38.71
	Limestone & Sandstone			38.71	50.59
	Sandstone			50.59	60.96

Hole Diameter

Depth Metres From	Depth Metres To	Diameter Centimetres
0	60.96	15.23

Water Record

Water found at Metres / Kind of Water
40.97 m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other: NOT
56.39 m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other: TESTED
___ m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

After test of well yield, water was ☐ Clear and sediment free ☐ Other, specify CLOUDY NOT TESTED

Chlorinated ☒ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth Metres From	Depth Metres To
Casing				
15.23	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.48	0	54.86
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☒ Open hole		54.25	60.96

Test of Well Yield

Pumping test method: Sub Pump
Pump intake set at (metres): 54.86
Pumping rate (litres/min): 91
Duration of pumping: ___ hrs + 0 min
Final water level end of pumping: 1.24 metres
Recommended pump type. ☐ Shallow ☒ Deep
Recommended pump depth: 54.86 metres
Recommended pump rate. (litres/min): 91
If flowing give rate - (litres/min):
If pumping discontinued, give reason.

Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level	.74		1.24
1	1.10	1	.74
2	1.13	2	
3	1.15	3	
4	1.17	4	
5	1.18	5	
10	1.19	10	
15	1.21	15	
20	1.23	20	
25	1.23	25	
30	1.24	30	
40	1.24	40	
50	1.24	50	
60	1.24	60	

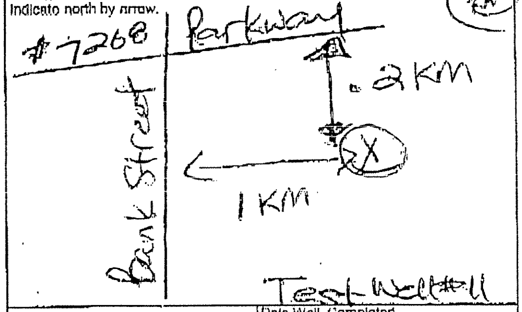
Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
54.25	51.20	Neat Cement Slurry	.227
51.20	0	Bentonite Slurry	1.10.

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Audit No. Z 64736
Date Well Completed (YYYY MM DD): 2007 02 07
Was the well owner's information package delivered? ☒ Yes ☐ No
Date Delivered (YYYY MM DD): 2007 02 10

Method of Construction

☐ Cable Tool ☐ Rotary (air) ☐ Diamond ☐ Digging
☐ Rotary (conventional) ☒ Air percussion ☐ Jetting ☐ Other
☐ Rotary (reverse) ☐ Boring ☐ Driving

Water Use

☒ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

☐ Water Supply ☐ Recharge well ☐ Unfinished ☐ Abandoned, (Other)
☐ Observation well ☐ Abandoned, insufficient supply ☐ Dewatering
☒ Test Hole ☐ Abandoned, poor quality ☐ Replacement well

Well Contractor/Technician Information

Name of Well Contractor: Air Rock Drilling Co Ltd
Well Contractor's Licence No.: 1119
Business Address (street name, number, city etc.): RR#1 Richmond Ont K0A 2Z0.
Name of Well Technician (last name, first name): Purcell Shannon
Well Technician's Licence No.: T2122
Signature of Technician/Contractor: x
Date Submitted (YYYY MM DD):

Ministry Use Only

Data Source:
Contractor:
Date Received (YYYY MM DD):
Date of Inspection (YYYY MM DD):
Remarks:
Well Record Number:

0506E (08/2006)

Ministry's Copy

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APPENDIX 2

Laboratory Test Data Reports of Water Quality Analyses

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: Paterson Group
1-28 Concourse Gate
Ottawa, Ont.
K1V 1T6
Attention: Robert Passmore

Report Number: 2702286
Date: 2007-02-05
Date Submitted: 2007-02-02

Project: PH0145

P.O. Number:
Matrix: Water

Chain of Custody Number: 53647

		LAB ID:	522033					**GUIDELINE**		
		Sample Date:	2007-02-02					ODWSOG		
		Sample ID:	TW8 WS01							
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Chloride	mg/L	1	191					AO	250	mg/L
Conductivity	uS/cm	5	1090							
TDS (COND - CALC)	mg/L	5	708					AO	500	mg/L
Sodium	mg/L	2	52					AO	20	mg/L

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

Results relate only to the parameters tested on the samples submitted for analysis.

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REPORT OF ANALYSIS

Client: **Paterson Group**
28 Concourse Gate, Unit 1
Nepean, ON
K2E 7T7
Attention: **Mr. Robert Passmore**

INVOICE: Paterson Group Inc.
Chain of Custody Number: 53219

Report Number:	2702746
Date:	2007-02-12
Date Submitted:	2007-02-09
Project:	PH0145
P.O. Number:	
Matrix:	Water

		LAB ID:	523363	523364				**GUIDELINE**		
		Sample Date:	2007-02-09	2007-02-09				ODWSOG		
		Sample ID:	TW 8 WS 2	TW 8 WS 3						
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0	0				MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0	0				MAC	0	ct/100mL
Heterotrophic Plate Count	ct/1mL		0	0						
Faecal Coliforms	ct/100mL		0	0						
Faecal Streptococcus	ct/100mL		0	0						

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL: Kquantrill
Krista Quantrill
Microbiology Analyst

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **Paterson Group**
28 Concourse Gate, Unit 1
Nepean, ON
K2E 7T7
Attention: **Mr. Robert Passmore**

INVOICE: Paterson Group Inc.
Chain of Custody Number: 53219

Report Number:	2702749
Date:	2007-02-14
Date Submitted:	2007-02-09
Project:	PHO 145
P.O. Number:	
Matrix:	Water

									GUIDELINE	
		LAB ID:	523367	523368					ODWSOG	
		Sample Date:	2007-02-09	2007-02-09						
		Sample ID:	TW 8 WS2	TW 8 WS 3						
PARAMETER	UNITS	MDL						TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5	210	207				OG	500	mg/L
Chloride	mg/L	1	205	204				AO	250	mg/L
Colour	TCU	2	<2	2				AO	5	TCU
Conductivity	uS/cm	5	1150	1120						
Dissolved Organic Carbon	mg/L	0.5	0.9	0.9				AO	5	mg/L
Fluoride	mg/L	0.10	0.25	0.25				MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01	<0.01				AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.09	0.09						
N-NO2 (Nitrite)	mg/L	0.10	<0.10	<0.10				MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.10	<0.10	<0.10				MAC	10.0	mg/L
pH			8.04	8.06				AO	6.5-8.5	
Phenols	mg/L	0.001	<0.001	<0.001						
Sulphate	mg/L	1	55	53				AO	500	mg/L
Tannin & Lignin	mg/L	0.1	<0.1	<0.1						
TDS (COND - CALC)	mg/L	5	748	728				AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.05	0.16	0.09						
Turbidity	NTU	0.1	2.5	0.2				AO	1.0	NTU
Hardness as CaCO3	mg/L	1	404	381				OG	100	mg/L
Ion Balance		0.01	0.95	0.92						
Calcium	mg/L	1	96	90						
Magnesium	mg/L	1	40	38						
Potassium	mg/L	1	7	6						
Sodium	mg/L	2	54	53				AO	20	mg/L
Iron	mg/L	0.03	0.22	0.23				AO	0.3	mg/L
Manganese	mg/L	0.01	0.04	0.04				AO	0.05	mg/L

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

ACCUTEST LABORATORIES LTD

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Client: **Paterson Group**
28 Concourse Gate, Unit 1
Nepean, ON
K2E 7T7
Attention: **Mr. Robert Passmore**

INVOICE: Paterson Group Inc.
Chain of Custody Number: 53990

Report Number: 2702685
Date: 2007-02-12
Date Submitted: 2007-02-08

Project: PH0145

P.O. Number:
Matrix: Water

		LAB ID:	523230	523231				**GUIDELINE**		
		Sample Date:	2007-02-08	2007-02-08				ODWSOG		
		Sample ID:	TW9 WS2	TW9 WS3						
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0	0				MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0	0				MAC	0	ct/100mL
Heterotrophic Plate Count	ct/1mL		1	0						
Faecal Coliforms	ct/100mL		0	0						
Faecal Streptococcus	ct/100mL		0	0						

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: KQuantrill
Krista Quantrill
Microbiology Analyst

Results relate only to the parameters tested on the samples submitted for analysis.

..CC..EST LABORATORIES LTD

REPORT OF ANALYSIS

Client: Paterson Group
1-28 Concourse Gate
Ottawa, Ont.
K1V 1T6
Attention: Robert Passmore

Report Number: 2702502
Date: 2007-02-07
Date Submitted: 2007-02-06

Project: PH0145

P.O. Number:
Matrix: Water

Chain of Custody Number: 53938

		LAB ID:	522629					**GUIDELINE**		
		Sample Date:	2007-02-06							
		Sample ID:	TW9 WS1							
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Hardness as CaCO3	mg/L	1	208							
Calcium	mg/L	1	47							
Magnesium	mg/L	1	22							
Sodium	mg/L	2	43							

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

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Client: **Paterson Group**
1-28 Concourse Gate
Ottawa, Ont.
K1V 1T6
Attention: **Robert Passmore**

Report Number: 2702503
Date: 2007-02-13
Date Submitted: 2007-02-06
Project: PH0145
P.O. Number:
Matrix: Water

Chain of Custody Number: 53938

		LAB ID:	522630					**GUIDELINE**		
		Sample Date:	2007-02-06							
		Sample ID:	TW9 WS1							
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Chloride	mg/L	1	60							
Conductivity	uS/cm	5	657							
TDS (COND - CALC)	mg/L	5	427							

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: Paterson Group
28 Concourse Gate, Unit 1
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore

INVOICE: Paterson Group Inc.
Chain of Custody Number: 53990

Report Number: 2702686
Date: 2007-02-14
Date Submitted: 2007-02-08

Project: PH0145

P.O. Number:
Matrix: Water

		LAB ID:	523232	523233				GUIDELINE		
		Sample Date:	2007-02-08	2007-02-08				ODWSOG		
		Sample ID:	TW9 WS2	TW9 WS3						
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Alkalinity as CaCO3	mg/L	5	207	208				OG	500	mg/L
Chloride	mg/L	1	61	63				AO	250	mg/L
Colour	TCU	2	<2	<2				AO	5	TCU
Conductivity	uS/cm	5	670	677						
Dissolved Organic Carbon	mg/L	0.5	1.0	1.5				AO	5	mg/L
Fluoride	mg/L	0.10	0.42	0.42				MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01	<0.01				AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.10	0.09						
N-NO2 (Nitrite)	mg/L	0.10	<0.10	<0.10				MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.10	<0.10	<0.10				MAC	10.0	mg/L
pH			8.23	8.24				AO	6.5-8.5	
Phenols	mg/L	0.001	<0.001	<0.001						
Sulphate	mg/L	1	45	46				AO	500	mg/L
Tannin & Lignin	mg/L	0.1	0.1	0.2						
TDS (COND - CALC)	mg/L	5	435	440				AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.05	0.16	0.18						
Turbidity	NTU	0.1	16.5	26.8				AO	1.0	NTU
Hardness as CaCO3	mg/L	1	217	210				OG	100	mg/L
Ion Balance		0.01	0.94	0.92						
Calcium	mg/L	1	49	48						
Magnesium	mg/L	1	23	22						
Potassium	mg/L	1	6	6						
Sodium	mg/L	2	44	46				AO	20	mg/L
Iron	mg/L	0.03	2.25	3.96				AO	0.3	mg/L
Manganese	mg/L	0.01	0.05	0.07				AO	0.05	mg/L

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **Paterson Group**
28 Concourse Gate, Unit 1
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore

INVOICE: Paterson Group Inc.
Chain of Custody Number: 53221

Report Number: 2703210
Date: 2007-02-19
Date Submitted: 2007-02-15

Project: PH0145

P.O. Number:
Matrix: Water

		LAB ID:	524762					**GUIDELINE**		
		Sample Date:	2007-02-15					ODWSOG		
		Sample ID:	TW9 WS4							
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Alkalinity as CaCO3	mg/L	5	207					OG	500	mg/L
Chloride	mg/L	1	60					AO	250	mg/L
Colour	TCU	2	<2					AO	5	TCU
Conductivity	uS/cm	5	670							
Dissolved Organic Carbon	mg/L	0.5	1.3					AO	5	mg/L
Fluoride	mg/L	0.10	0.36					MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01					AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.09							
N-NO2 (Nitrite)	mg/L	0.10	<0.10					MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.10	<0.10					MAC	10.0	mg/L
pH			7.96					AO	6.5-8.5	
Phenols	mg/L	0.001	<0.001							
Sulphate	mg/L	1	41					AO	500	mg/L
Tannin & Lignin	mg/L	0.1	0.1							
TDS (COND - CALC)	mg/L	5	435					AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.05	0.11							
Turbidity	NTU	0.1	1.1					AO	1.0	NTU
Hardness as CaCO3	mg/L	1	226					OG	100	mg/L
Ion Balance		0.01	0.99							
Calcium	mg/L	1	51							
Magnesium	mg/L	1	24							
Potassium	mg/L	1	6							
Sodium	mg/L	2	45					AO	20	mg/L
Iron	mg/L	0.03	0.15					AO	0.3	mg/L
Manganese	mg/L	0.01	0.03					AO	0.05	mg/L

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

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REPORT OF ANALYSIS

Client: **Paterson Group**
28 Concourse Gate, Unit 1
Nepean, ON
K2E 7T7
Attention: **Mr. Robert Passmore**

INVOICE: Paterson Group Inc.
Chain of Custody Number: 58471

Report Number: 2702802
Date: 2007-02-14
Date Submitted: 2007-02-12

Project:

P.O. Number:
Matrix: Water

		LAB ID:	523515					GUIDELINE		
		Sample Date:	2007-02-12					ODWSOG		
		Sample ID:	TW10 WS1							
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0					MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0					MAC	0	ct/100mL
Heterotrophic Plate Count	ct/1mL		0							
Faecal Coliforms	ct/100mL		0							
Faecal Streptococcus	ct/100mL		0							

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: K Quantrill
Krista Quantrill
Microbiology Analyst

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **Paterson Group**
28 Concourse Gate, Unit 1
Nepean, ON
K2E 7T7
Attention: **Mr. Robert Passmore**

INVOICE: Paterson Group Inc.
Chain of Custody Number: **58356**

Report Number: 2702834
Date: 2007-02-14
Date Submitted: 2007-02-12

Project: PH 0145

P.O. Number:
Matrix: Water

		LAB ID:	523572					**GUIDELINE**		
		Sample Date:	2007-02-12					ODWSOG		
		Sample ID:	TW 10WS2							
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0					MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0					MAC	0	ct/100mL
Heterotrophic Plate Count	ct/1mL		0							
Faecal Coliforms	ct/100mL		0							
Faecal Streptococcus	ct/100mL		0							

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: K Quantrill
Krista Quantrill
Microbiology Analyst

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: Paterson Group
1-28 Concourse Gate
Ottawa, Ont.
K1V 1T6
Attention: Robert Passmore

Report Number: 2702812
Date: 2007-02-16
Date Submitted: 2007-02-12

Project:

P.O. Number:
Matrix: Water

Chain of Custody Number: 58471

		LAB ID:	523535					**GUIDELINE**		
		Sample Date:	2007-02-12					ODWSOG		
		Sample ID:	TW10 WS1							
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Alkalinity as CaCO3	mg/L	5	208					OG	500	mg/L
Chloride	mg/L	1	65					AO	250	mg/L
Colour	TCU	2	3					AO	5	TCU
Conductivity	uS/cm	5	676							
Dissolved Organic Carbon	mg/L	0.5	1.1					AO	5	mg/L
Fluoride	mg/L	0.10	0.36					MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01					AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.09							
N-NO2 (Nitrite)	mg/L	0.10	<0.10					MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.10	<0.10					MAC	10.0	mg/L
pH			8.14					AO	6.5-8.5	
Phenols	mg/L	0.001	<0.001							
Sulphate	mg/L	1	48					AO	500	mg/L
Tannin & Lignin	mg/L	0.1	0.2							
TDS (COND - CALC)	mg/L	5	439					AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.05	0.13							
Turbidity	NTU	0.1	1.0					AO	1.0	NTU
Hardness as CaCO3	mg/L	1	231					OG	100	mg/L
Ion Balance		0.01	0.90							
Calcium	mg/L	1	54							
Magnesium	mg/L	1	25							
Potassium	mg/L	1	5							
Sodium	mg/L	2	36					AO	20	mg/L
Iron	mg/L	0.03	0.09					AO	0.3	mg/L
Manganese	mg/L	0.01	0.03					AO	0.05	mg/L

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **Paterson Group**
28 Concourse Gate, Unit 1
Nepean, ON
K2E 7T7
Attention: **Mr. Robert Passmore**

INVOICE: Paterson Group Inc.
Chain of Custody Number: 58356

Report Number: 2702831
Date: 2007-02-16
Date Submitted: 2007-02-12

Project: PH 0145

P.O. Number:
Matrix: Water

		LAB ID:	523566					**GUIDELINE**		
		Sample Date:	2007-02-12					ODWSOG		
		Sample ID:	TW 10WS2							
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Alkalinity as CaCO3	mg/L	5	207					OG	500	mg/L
Chloride	mg/L	1	65					AO	250	mg/L
Colour	TCU	2	2					AO	5	TCU
Conductivity	uS/cm	5	680							
Dissolved Organic Carbon	mg/L	0.5	1.1					AO	5	mg/L
Fluoride	mg/L	0.10	0.38					MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01					AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.09							
N-NO2 (Nitrite)	mg/L	0.10	<0.10					MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.10	<0.10					MAC	10.0	mg/L
pH			8.09					AO	6.5-8.5	
Phenols	mg/L	0.001	<0.001							
Sulphate	mg/L	1	48					AO	500	mg/L
Tannin & Lignin	mg/L	0.1	0.2							
TDS (COND - CALC)	mg/L	5	442					AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.05	0.12							
Turbidity	NTU	0.1	0.7					AO	1.0	NTU
Hardness as CaCO3	mg/L	1	252					OG	100	mg/L
Ion Balance		0.01	0.97							
Calcium	mg/L	1	58							
Magnesium	mg/L	1	26							
Potassium	mg/L	1	6							
Sodium	mg/L	2	37					AO	20	mg/L
Iron	mg/L	0.03	0.09					AO	0.3	mg/L
Manganese	mg/L	0.01	0.03					AO	0.05	mg/L

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **Paterson Group**
28 Concourse Gate, Unit 1
Nepean, ON
K2E 7T7
Attention: **Mr. Robert Passmore**

INVOICE: Paterson Group Inc.
Chain of Custody Number: 49794

Report Number:	2702985
Date:	2007-02-16
Date Submitted:	2007-02-13
Project:	PHO145
P.O. Number:	
Matrix:	Water

		LAB ID:	524055	524056				GUIDELINE		
		Sample Date:	2007-02-13	2007-02-13				ODWSOG		
		Sample ID:	TW11 WS1	TW11 WS2						
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0	0				MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0	0				MAC	0	ct/100mL
Heterotrophic Plate Count	ct/1mL		0	1						
Faecal Coliforms	ct/100mL		0	0						
Faecal Streptococcus	ct/100mL		0	0						

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL: K Quantrill
Krista Quantrill
Microbiology Analyst

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **Paterson Group**
28 Concourse Gate, Unit 1
Nepean, ON
K2E 7T7
Attention: **Mr. Robert Passmore**

INVOICE: Paterson Group Inc.
Chain of Custody Number: 49794

Report Number: 2702988
Date: 2007-02-16
Date Submitted: 2007-02-13

Project: PHO145

P.O. Number:
Matrix: Water

		LAB ID:	524059	524060				**GUIDELINE**		
		Sample Date:	2007-02-13	2007-02-13				ODWSOG		
		Sample ID:	TW11 WS1	TW11 WS2						
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Alkalinity as CaCO3	mg/L	5	203	205				OG	500	mg/L
Chloride	mg/L	1	43	42				AO	250	mg/L
Colour	TCU	2	<2	<2				AO	5	TCU
Conductivity	uS/cm	5	590	591						
Dissolved Organic Carbon	mg/L	0.5	1.0	0.9				AO	5	mg/L
Fluoride	mg/L	0.10	0.40	0.40				MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01	<0.01				AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.09	0.09						
N-NO2 (Nitrite)	mg/L	0.10	<0.10	<0.10				MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.10	<0.10	<0.10				MAC	10.0	mg/L
pH			8.09	8.13				AO	6.5-8.5	
Phenols	mg/L	0.001	<0.001	<0.001						
Sulphate	mg/L	1	39	39				AO	500	mg/L
Tannin & Lignin	mg/L	0.1	<0.1	0.1						
TDS (COND - CALC)	mg/L	5	384	384				AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.05	0.12	0.13						
Turbidity	NTU	0.1	1.9	4.2				AO	1.0	NTU
Hardness as CaCO3	mg/L	1	203	203				OG	100	mg/L
Ion Balance		0.01	0.95	0.95						
Calcium	mg/L	1	45	45						
Magnesium	mg/L	1	22	22						
Potassium	mg/L	1	6	6						
Sodium	mg/L	2	37	37				AO	20	mg/L
Iron	mg/L	0.03	0.23	0.40				AO	0.3	mg/L
Manganese	mg/L	0.01	0.03	0.03				AO	0.05	mg/L

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

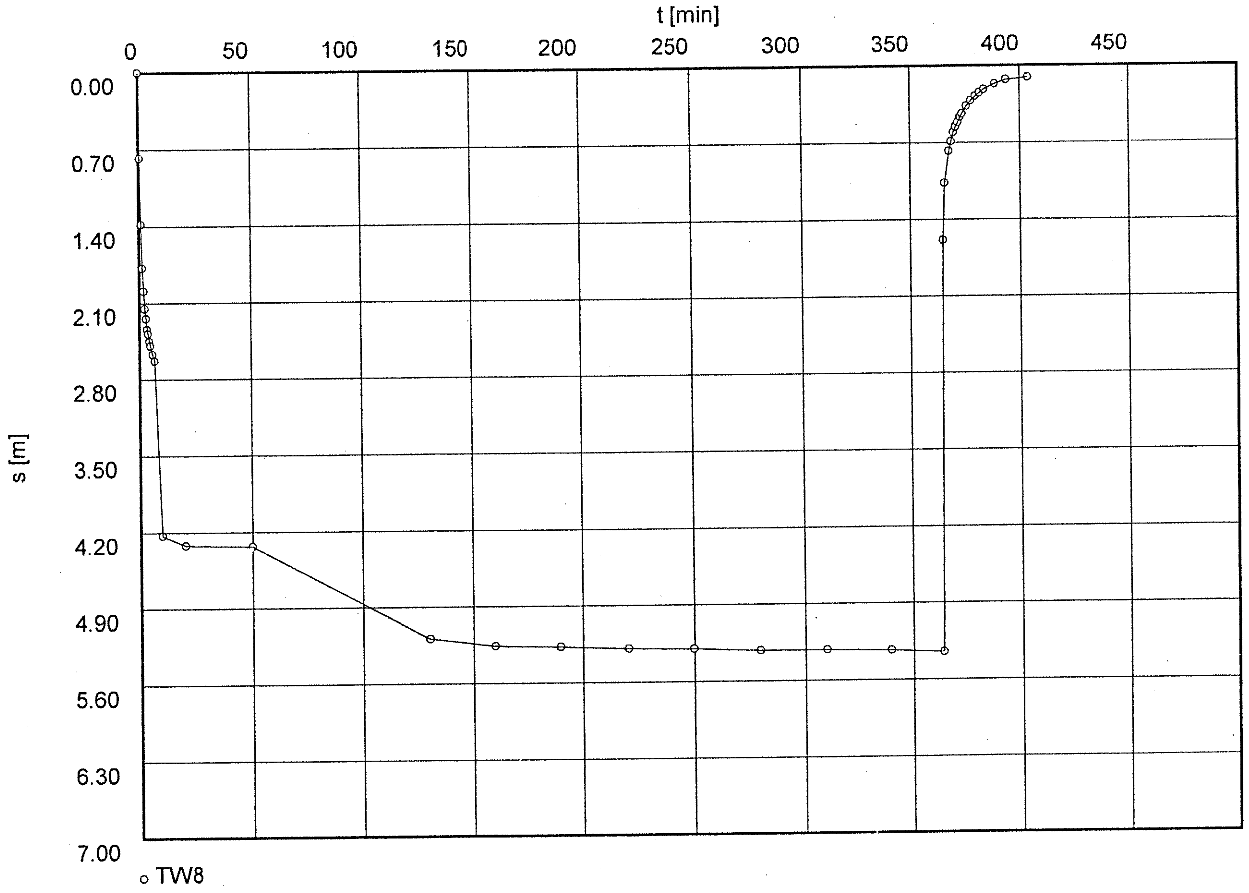
APPROVAL: Ewan McRobbie
Inorganic Lab Supervisor

APPENDIX 3

Aquifer Analysis Data for Additional Test Wells

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 23.02.2007	none, Page 1
		Project: PH0145	
		Evaluated by: RAP	

Pumping Test No. 2	Test conducted on: Feb. 9, 2007
TW8	
Discharge 1.42 l/s	



Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 23.02.2007
none, Page 2
Project: PH0145
Evaluated by: RAP

Pumping Test No. 2
Test conducted on: Feb. 9, 2007

TW8
TW8

Discharge 1.42 l/s
Distance from the pumping well 0.150 m

Static water level: 2.820 m below datum

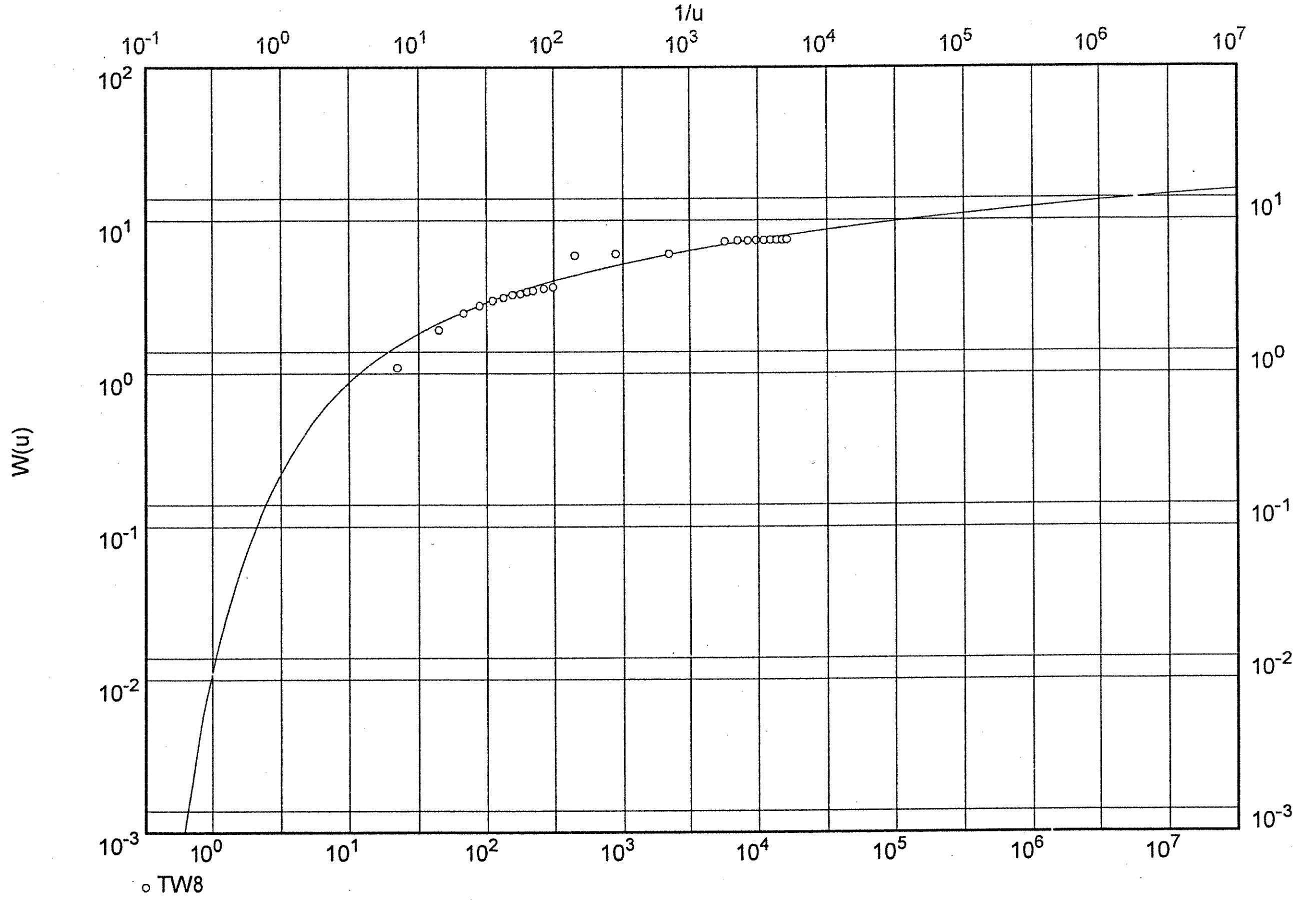
	Pumping test duration [min]	Water level [m]	Drawdown [m]
1	0.00	2.820	0.000
2	0.50	3.600	0.780
3	1.00	4.200	1.380
4	1.50	4.600	1.780
5	2.00	4.810	1.990
6	2.50	4.970	2.150
7	3.00	5.060	2.240
8	3.50	5.160	2.340
9	4.00	5.200	2.380
10	4.50	5.270	2.450
11	5.00	5.310	2.490
12	6.00	5.390	2.570
13	7.00	5.450	2.630
14	10.00	7.050	4.230
15	20.00	7.140	4.320
16	50.00	7.150	4.330
17	130.00	8.010	5.190
18	160.00	8.080	5.260
19	190.00	8.090	5.270
20	220.00	8.110	5.290
21	250.00	8.120	5.300
22	280.00	8.140	5.320
23	310.00	8.140	5.320
24	340.00	8.150	5.330
25	364.00	8.170	5.350
26	365.00	4.410	1.590
27	366.00	3.890	1.070
28	368.00	3.600	0.780
29	369.00	3.510	0.690
30	370.00	3.430	0.610
31	371.00	3.380	0.560
32	372.00	3.340	0.520
33	373.00	3.290	0.470
34	374.00	3.260	0.440
35	376.00	3.190	0.370
36	378.00	3.140	0.320
37	380.00	3.100	0.280
38	382.00	3.070	0.250
39	384.00	3.040	0.220
40	389.00	2.990	0.170
41	394.00	2.950	0.130
42	404.00	2.930	0.110

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Theis analysis method
Confined aquifer

Date: 23.02.2007
none, Page 1
Project: PH0145
Evaluated by: RAP

Pumping Test No. 2
Test conducted on: Feb. 9, 2007
TW8
Discharge 1.42 l/s



Transmissivity [m²/min]: 9.41×10^{-3}

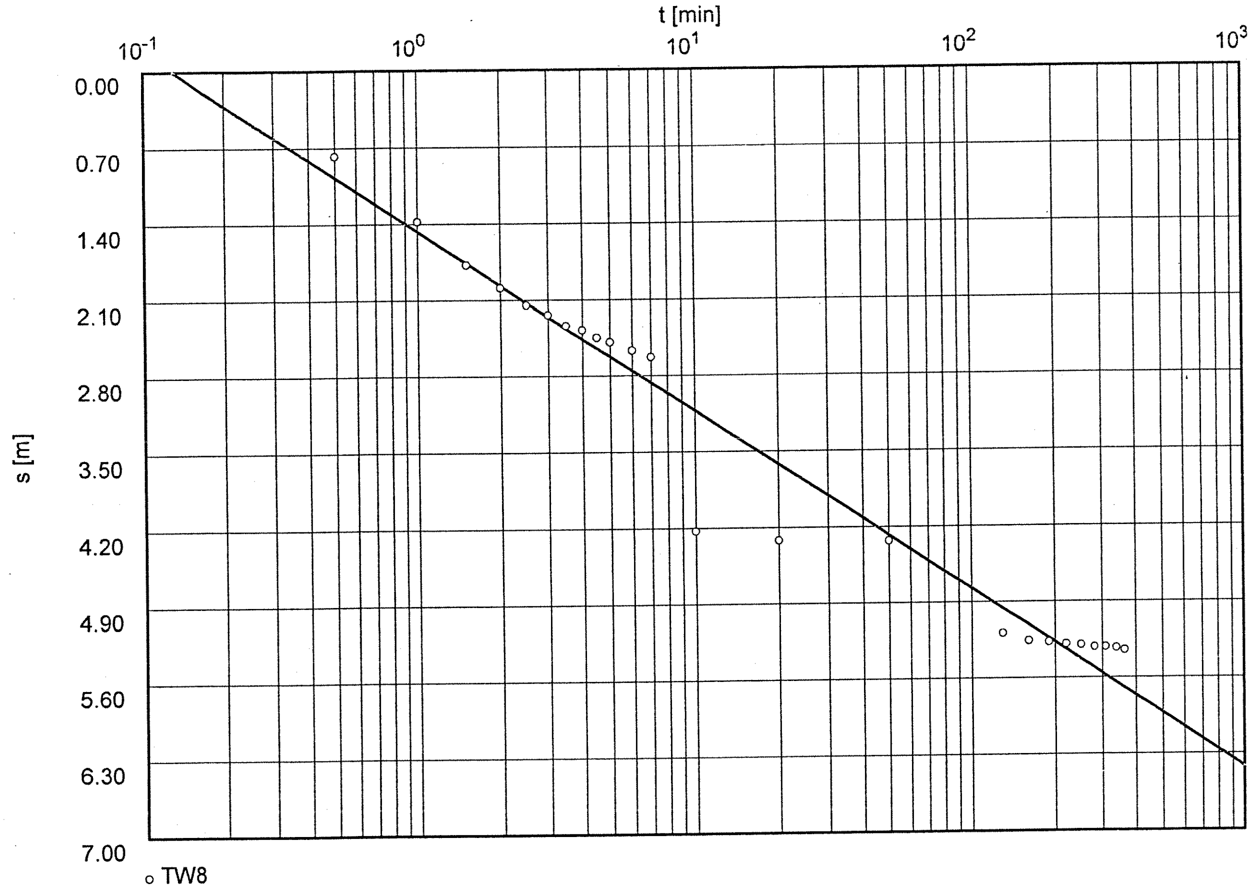
Storativity: 1.18×10^{-1}

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown-method after
COOPER & JACOB
Confined aquifer

Date: 23.02.2007
none, Page 1
Project: PH0145
Evaluated by: RAP

Pumping Test No. 2
Test conducted on: Feb. 9, 2007
TW8
Discharge 1.42 l/s

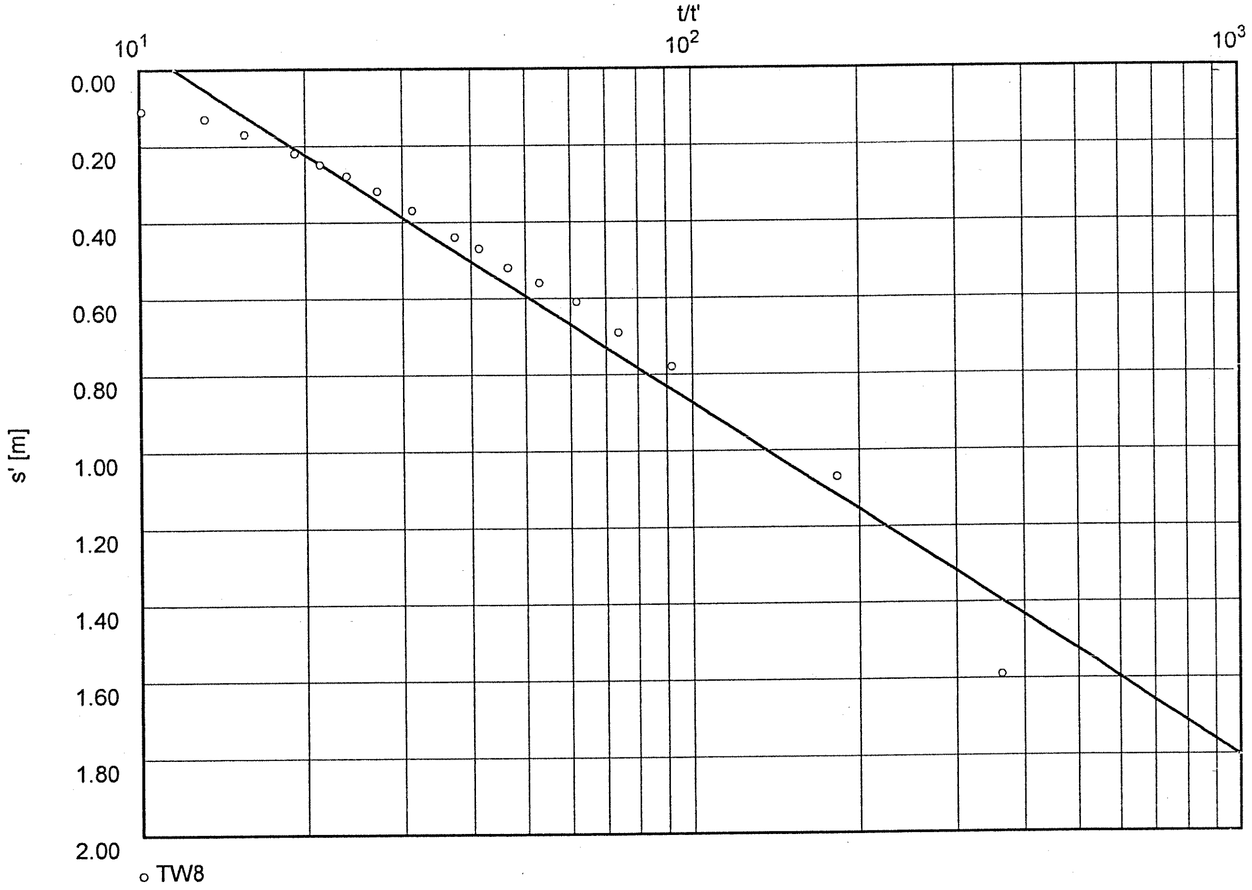


Transmissivity [m²/min]: 9.44 x 10^{-3}

Storativity: 1.21 x 10^{-1}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Date: 23.02.2007	none, Page 1
		Project: PH0145	
		Evaluated by: RAP	

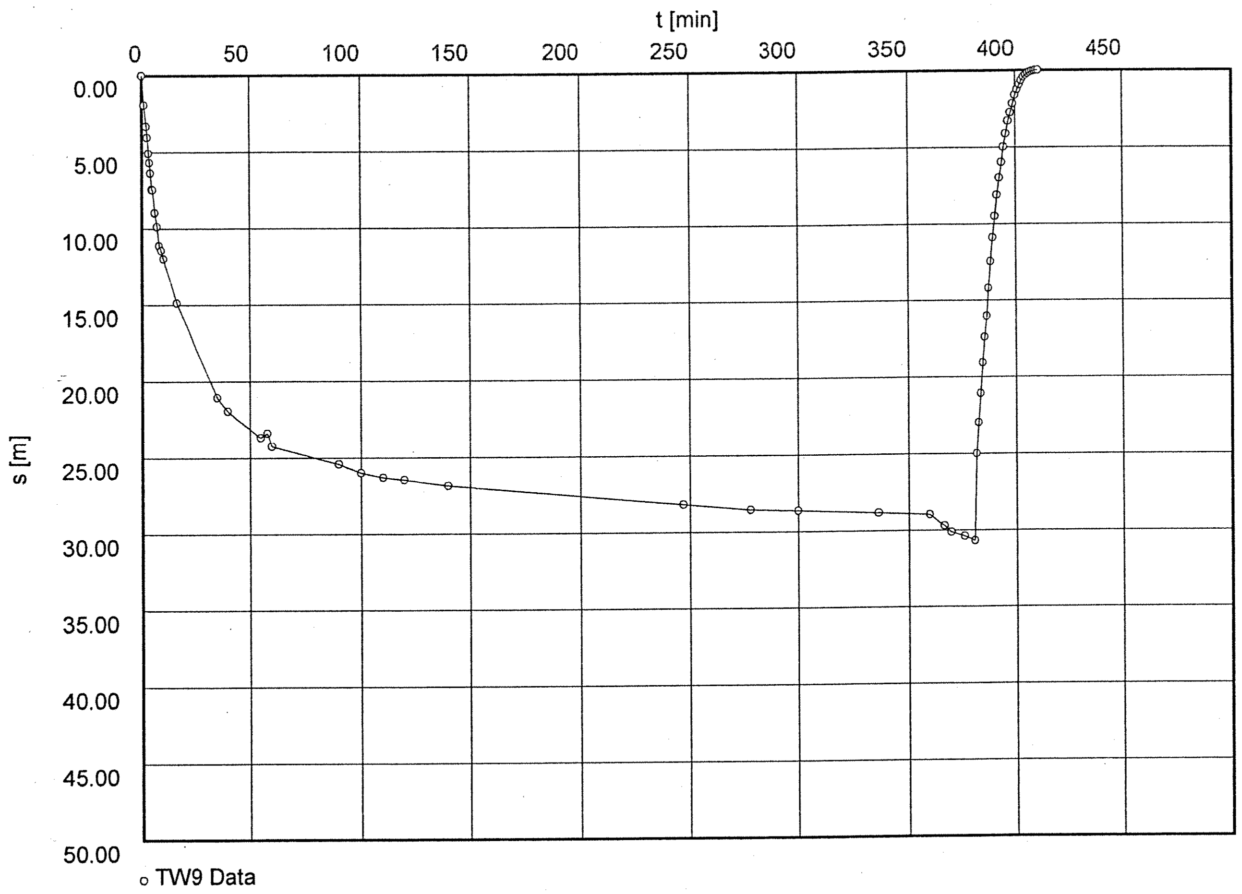
Pumping Test No. 2	Test conducted on: Feb. 9, 2007
TW8	
Discharge 1.42 l/s	
	Pumping test duration: 364.00 min



Transmissivity [m²/min]: 1.67 x 10^{-2}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 22.02.2007	none, Page 1
		Project: PH0145	
		Evaluated by: RAP	

Pumping Test No. 1	Test conducted on: February 8, 2007
TW9	
Discharge 1.50 l/s	



Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 22.02.2007

Project: PH0145
Evaluated by: RAP

Pumping Test No. 1

Test conducted on: February 8, 2007

TW9

TW9 Data

Discharge 1.50 l/s

Distance from the pumping well 0.150 m

Static water level: 0.970 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	0.970	0.000	
2	1.00	2.880	1.910	
3	2.00	4.280	3.310	
4	2.50	5.020	4.050	
5	3.00	6.050	5.080	
6	3.50	6.650	5.680	
7	4.00	7.340	6.370	
8	4.50	8.400	7.430	
9	5.00	8.440	7.470	
10	6.00	9.920	8.950	
11	7.00	10.840	9.870	
12	8.00	12.100	11.130	
13	9.00	12.400	11.430	
14	10.00	12.950	11.980	
15	16.00	15.850	14.880	
16	35.00	22.030	21.060	
17	40.00	22.930	21.960	
18	55.00	24.660	23.690	
19	58.00	24.370	23.400	
20	60.00	25.200	24.230	
21	90.00	26.380	25.410	
22	100.00	26.960	25.990	
23	110.00	27.280	26.310	
24	120.00	27.420	26.450	
25	140.00	27.830	26.860	
26	247.00	29.160	28.190	
27	278.00	29.540	28.570	
28	300.00	29.620	28.650	
29	337.00	29.810	28.840	
30	360.00	29.950	28.980	
31	367.00	30.670	29.700	
32	370.00	31.100	30.130	
33	376.00	31.360	30.390	
34	381.00	31.660	30.690	
35	382.00	25.960	24.990	
36	383.00	23.940	22.970	
37	384.00	22.060	21.090	
38	385.00	20.050	19.080	
39	386.00	18.360	17.390	
40	387.00	17.000	16.030	
41	388.00	15.170	14.200	
42	389.00	13.420	12.450	
43	390.00	11.870	10.900	
44	391.00	10.460	9.490	
45	392.00	9.090	8.120	
46	393.00	7.960	6.990	
47	394.00	6.950	5.980	
48	395.00	5.950	4.980	
49	396.00	5.100	4.130	
50	397.00	4.270	3.300	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 22.02.2007	none, Page 3
		Project: PH0145	
		Evaluated by: RAP	

Pumping Test No. 1	Test conducted on: February 8, 2007
TW9	TW9 Data
Discharge 1.50 l/s	Distance from the pumping well 0.150 m
Static water level: 0.970 m below datum	

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
51	398.00	3.720	2.750	
52	399.00	3.130	2.160	
53	400.00	2.580	1.610	
54	401.00	2.230	1.260	
55	402.00	1.900	0.930	
56	403.00	1.640	0.670	
57	404.00	1.400	0.430	
58	405.00	1.290	0.320	
59	406.00	1.170	0.200	
60	407.00	1.100	0.130	
61	408.00	1.040	0.070	
62	409.00	1.010	0.040	
63	410.00	0.980	0.010	
64	411.00	0.970	0.000	

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

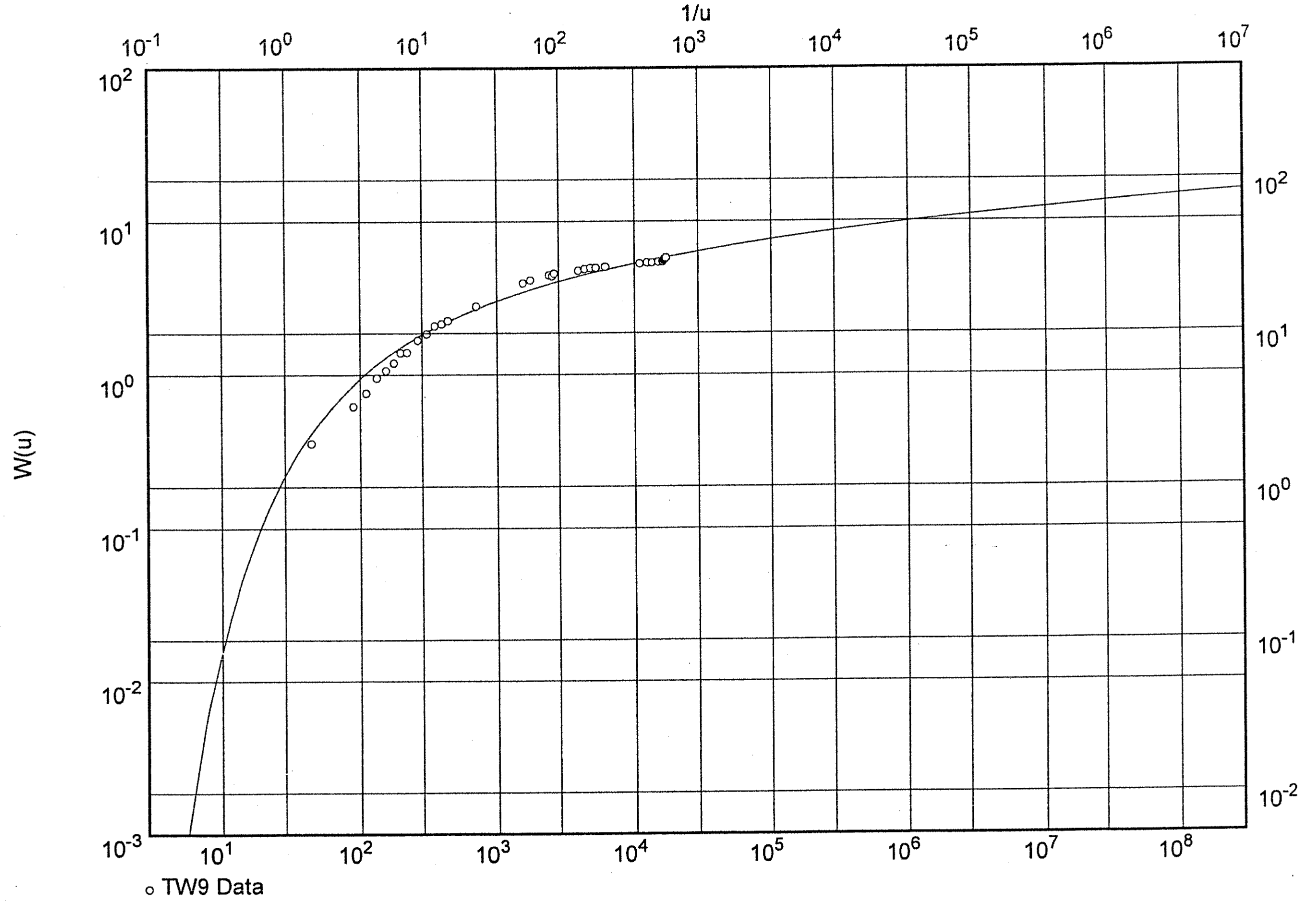
Pumping test analysis
Theis analysis method
Confined aquifer

Date: 22.02.2007
none, Page 1
Project: PH0145
Evaluated by: RAP

Pumping Test No. 1
Test conducted on: February 8, 2007

TW9

Discharge 1.50 l/s

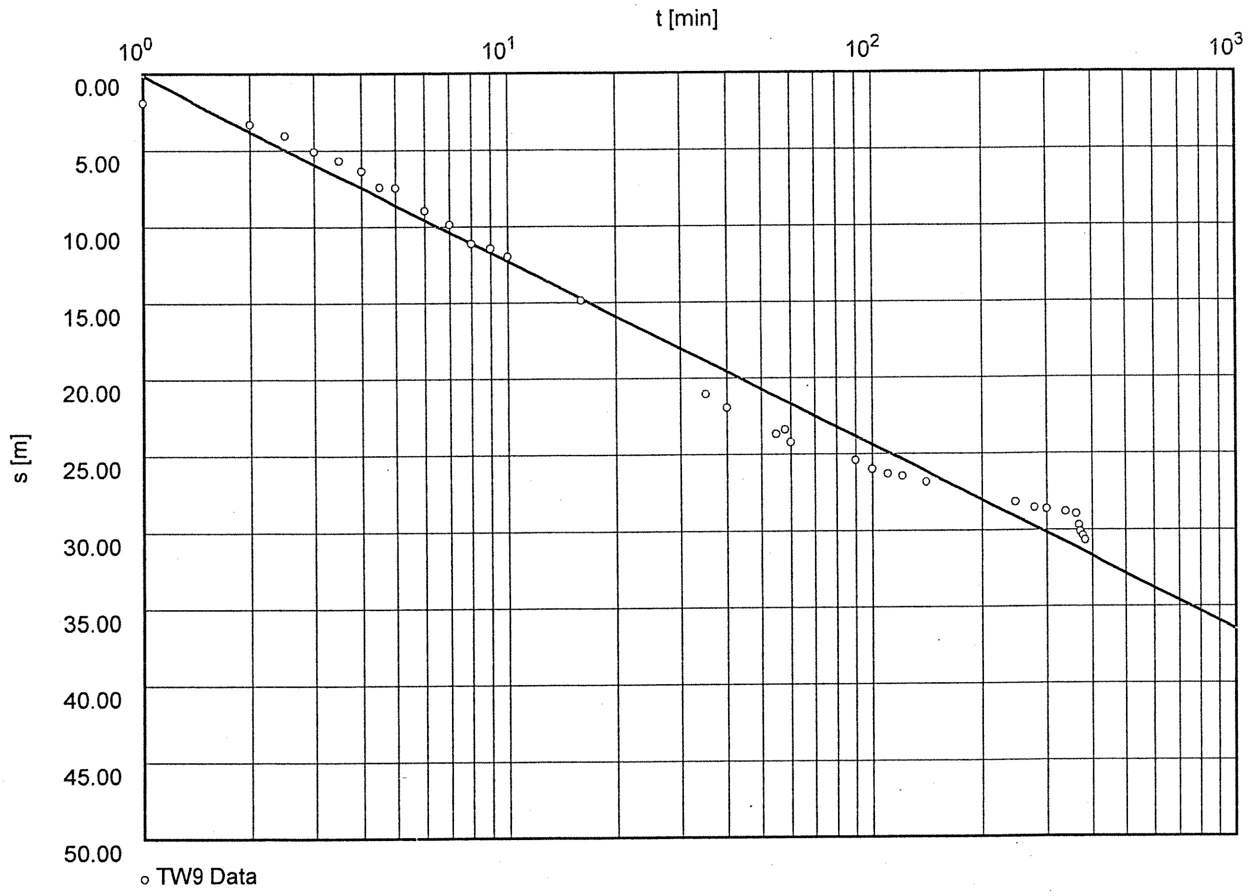


Transmissivity [m²/min]: 1.33×10^{-3}

Storativity: 1.52×10^{-1}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Date: 22.02.2007	none, Page 1
		Project: PH0145	
		Evaluated by: RAP	

Pumping Test No. 1	Test conducted on: February 8, 2007
TW9	
Discharge 1.50 l/s	



Transmissivity [m²/min]: 1.35 x 10^{-3}

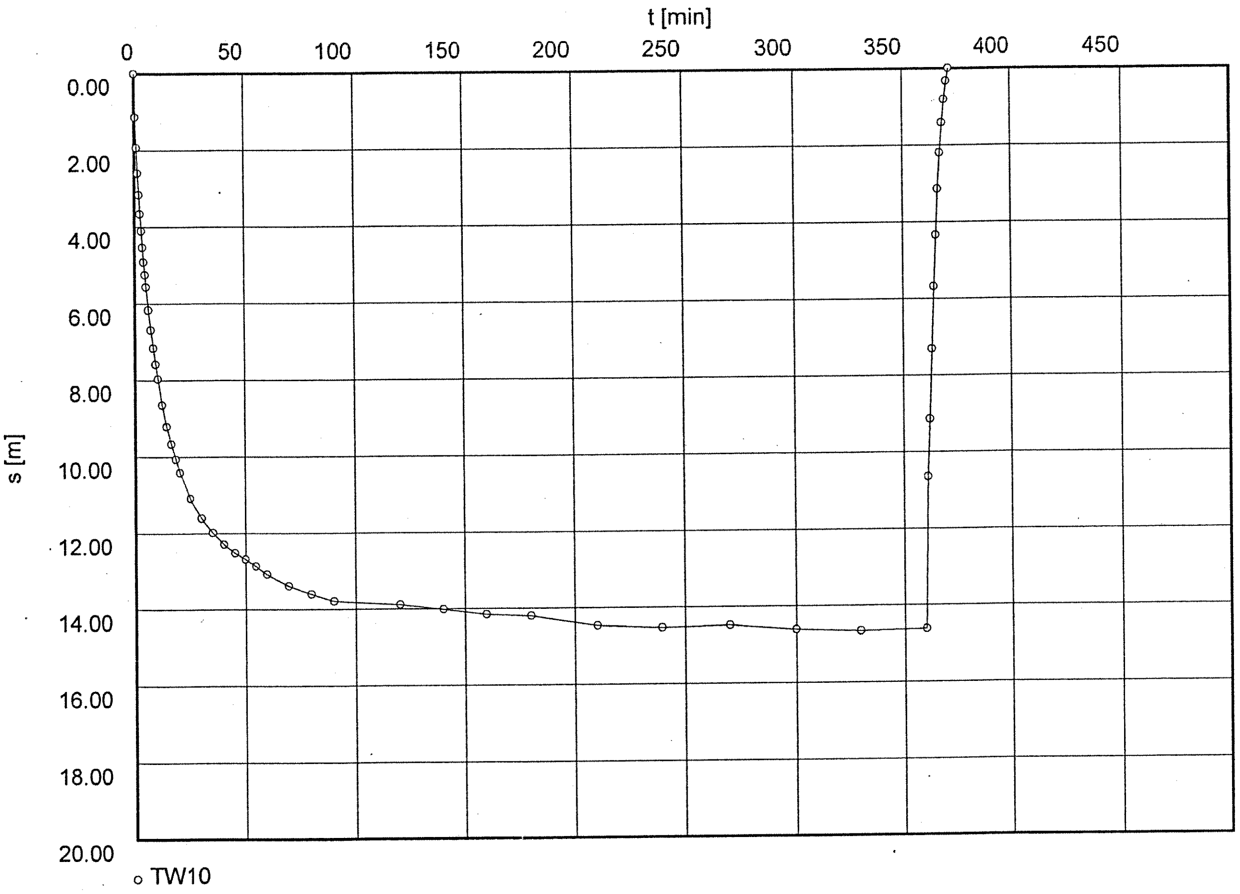
Storativity: 1.32 x 10^{-1}

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 23.02.2007
none, Page 1
Project: PH0145
Evaluated by: RAP

Pumping Test No. 3
Test conducted on: Feb. 12, 2007
TW10
Discharge 0.90 l/s



Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 23.02.2007
none, Page 2
Project: PH0145
Evaluated by: RAP

Pumping Test No. 3
Test conducted on: Feb. 12, 2007
TW10
TW10
Discharge 0.90 l/s
Distance from the pumping well 0.150 m

Static water level: 0.000 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	0.000	0.000	
2	0.50	1.130	1.130	
3	1.00	1.930	1.930	
4	1.50	2.600	2.600	
5	2.00	3.170	3.170	
6	2.50	3.660	3.660	
7	3.00	4.110	4.110	
8	3.50	4.530	4.530	
9	4.00	4.920	4.920	
10	4.50	5.250	5.250	
11	5.00	5.570	5.570	
12	6.00	6.170	6.170	
13	7.00	6.680	6.680	
14	8.00	7.160	7.160	
15	9.00	7.580	7.580	
16	10.00	7.970	7.970	
17	12.00	8.650	8.650	
18	14.00	9.210	9.210	
19	16.00	9.670	9.670	
20	18.00	10.070	10.070	
21	20.00	10.420	10.420	
22	25.00	11.090	11.090	
23	30.00	11.610	11.610	
24	35.00	11.980	11.980	
25	40.00	12.290	12.290	
26	45.00	12.520	12.520	
27	50.00	12.680	12.680	
28	55.00	12.870	12.870	
29	60.00	13.080	13.080	
30	70.00	13.390	13.390	
31	80.00	13.610	13.610	
32	90.00	13.790	13.790	
33	120.00	13.890	13.890	
34	140.00	14.020	14.020	
35	160.00	14.160	14.160	
36	180.00	14.200	14.200	
37	210.00	14.470	14.470	
38	240.00	14.530	14.530	
39	270.00	14.480	14.480	
40	300.00	14.610	14.610	
41	330.00	14.660	14.660	
42	360.00	14.620	14.620	
43	361.00	10.650	10.650	
44	362.00	9.140	9.140	
45	363.00	7.310	7.310	
46	364.00	5.680	5.680	
47	365.00	4.340	4.340	
48	366.00	3.150	3.150	
49	367.00	2.200	2.200	
50	368.00	1.420	1.420	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 23.02.2007	none, Page 3
		Project: PH0145	
		Evaluated by: RAP	

Pumping Test No. 3	Test conducted on: Feb. 12, 2007
TW10	TW10
Discharge 0.90 l/s	Distance from the pumping well 0.150 m

Static water level: 0.000 m below datum

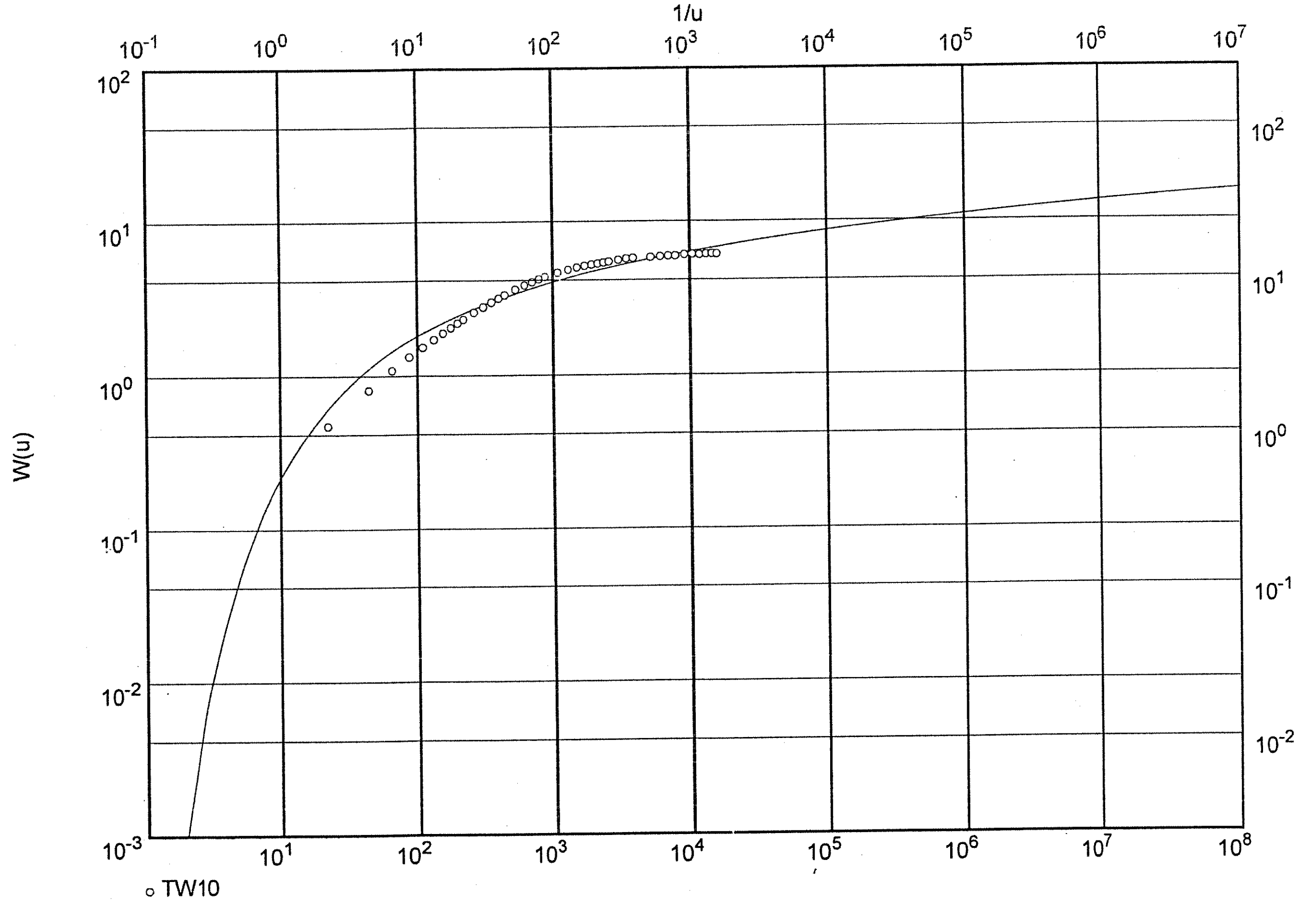
	Pumping test duration [min]	Water level [m]	Drawdown [m]	
51	369.00	0.810	0.810	
52	370.00	0.330	0.330	
53	371.00	0.000	0.000	

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Theis analysis method
Confined aquifer

Date: 23.02.2007
none, Page 1
Project: PH0145
Evaluated by: RAP

Pumping Test No. 3
Test conducted on: Feb. 12, 2007
TW10
Discharge 0.90 l/s



Transmissivity [m²/min]: 1.78×10^{-3}

Storativity: 7.31×10^{-2}

Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

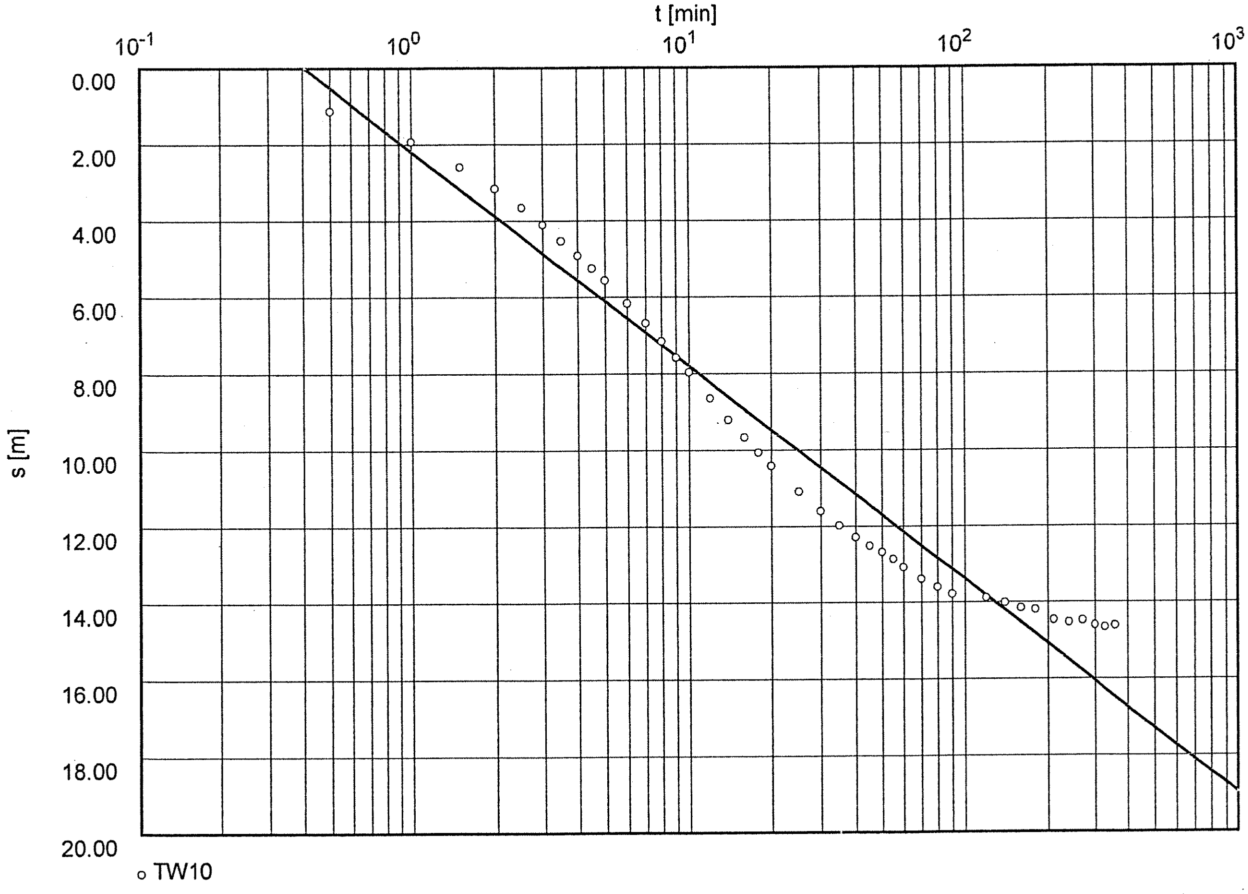
Pumping test analysis
Time-Drawdown-method after
COOPER & JACOB
Confined aquifer

Date: 23.02.2007
none, Page 1
Project: PH0145
Evaluated by: RAP

Pumping Test No. 3
Test conducted on: Feb. 12, 2007

TW10

Discharge 0.90 l/s

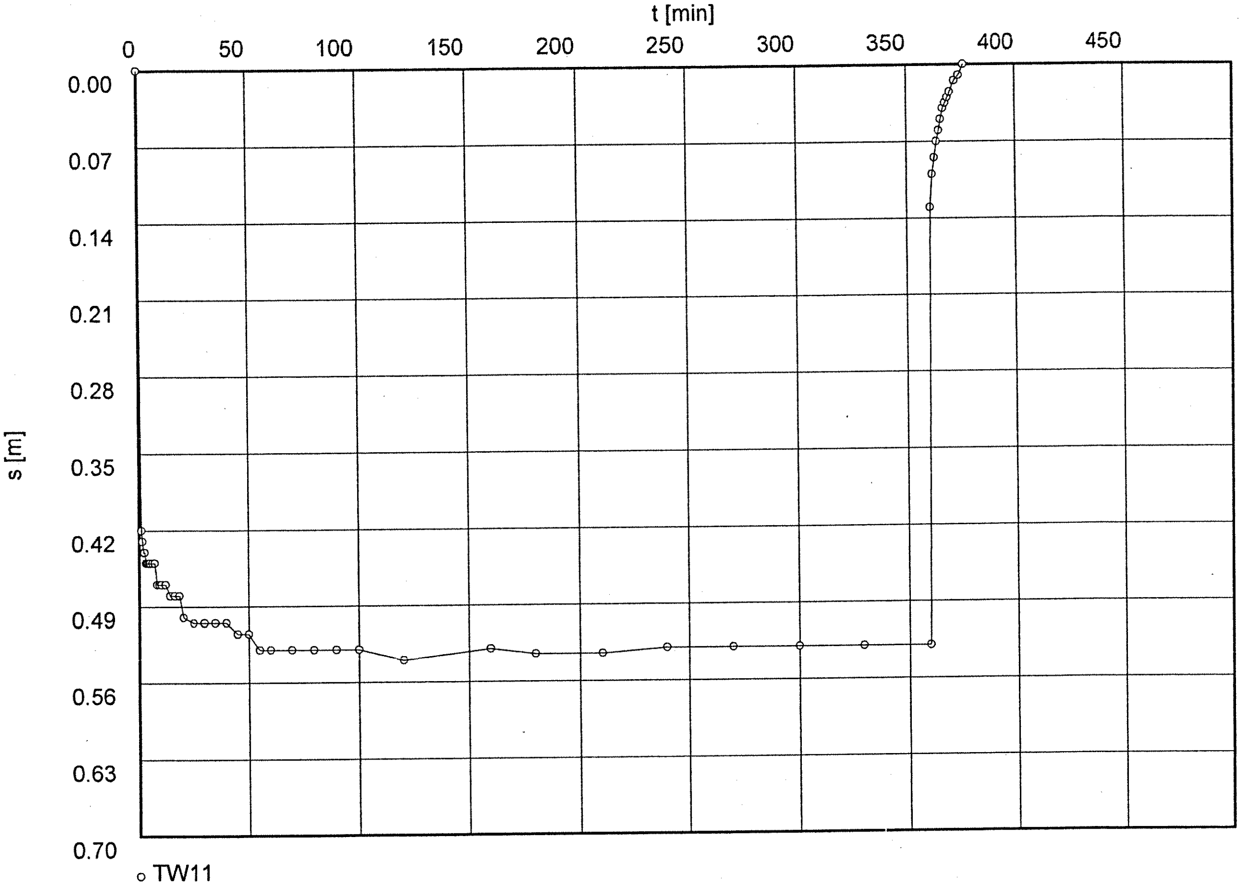


Transmissivity [m²/min]: 1.76×10^{-3}

Storativity: 7.16×10^{-2}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 23.02.2007	none, Page 1
		Project: PH0145	
		Evaluated by: RAP	

Pumping Test No. 4	Test conducted on: Feb.13, 2007
TW11	
Discharge 1.60 l/s	



Paterson Group Ltd.
1-28 Concourse Gate
Nepean, ON K2E 7T7

Pumping test analysis
Time-Drawdown plot

Date: 23.02.2007
none, Page 2
Project: PH0145
Evaluated by: RAP

Pumping Test No. 4
Test conducted on: Feb.13, 2007
TW11
TW11
Discharge 1.60 l/s
Distance from the pumping well 0.150 m
Static water level: 0.800 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
1	0.00	0.800	0.000	
2	1.00	1.220	0.420	
3	1.50	1.230	0.430	
4	2.00	1.240	0.440	
5	2.50	1.240	0.440	
6	3.00	1.250	0.450	
7	3.50	1.250	0.450	
8	4.00	1.250	0.450	
9	4.50	1.250	0.450	
10	5.00	1.250	0.450	
11	6.00	1.250	0.450	
12	7.00	1.250	0.450	
13	8.00	1.270	0.470	
14	9.00	1.270	0.470	
15	10.00	1.270	0.470	
16	12.00	1.270	0.470	
17	14.00	1.280	0.480	
18	16.00	1.280	0.480	
19	18.00	1.280	0.480	
20	20.00	1.300	0.500	
21	25.00	1.305	0.505	
22	30.00	1.305	0.505	
23	35.00	1.305	0.505	
24	40.00	1.305	0.505	
25	45.00	1.315	0.515	
26	50.00	1.315	0.515	
27	55.00	1.330	0.530	
28	60.00	1.330	0.530	
29	70.00	1.330	0.530	
30	80.00	1.330	0.530	
31	90.00	1.330	0.530	
32	100.00	1.330	0.530	
33	120.00	1.340	0.540	
34	160.00	1.330	0.530	
35	180.00	1.335	0.535	
36	210.00	1.335	0.535	
37	240.00	1.330	0.530	
38	270.00	1.330	0.530	
39	300.00	1.330	0.530	
40	330.00	1.330	0.530	
41	360.00	1.330	0.530	
42	361.00	0.930	0.130	
43	362.00	0.900	0.100	
44	363.00	0.885	0.085	
45	364.00	0.870	0.070	
46	365.00	0.860	0.060	
47	366.00	0.850	0.050	
48	367.00	0.840	0.040	
49	368.00	0.835	0.035	
50	369.00	0.830	0.030	

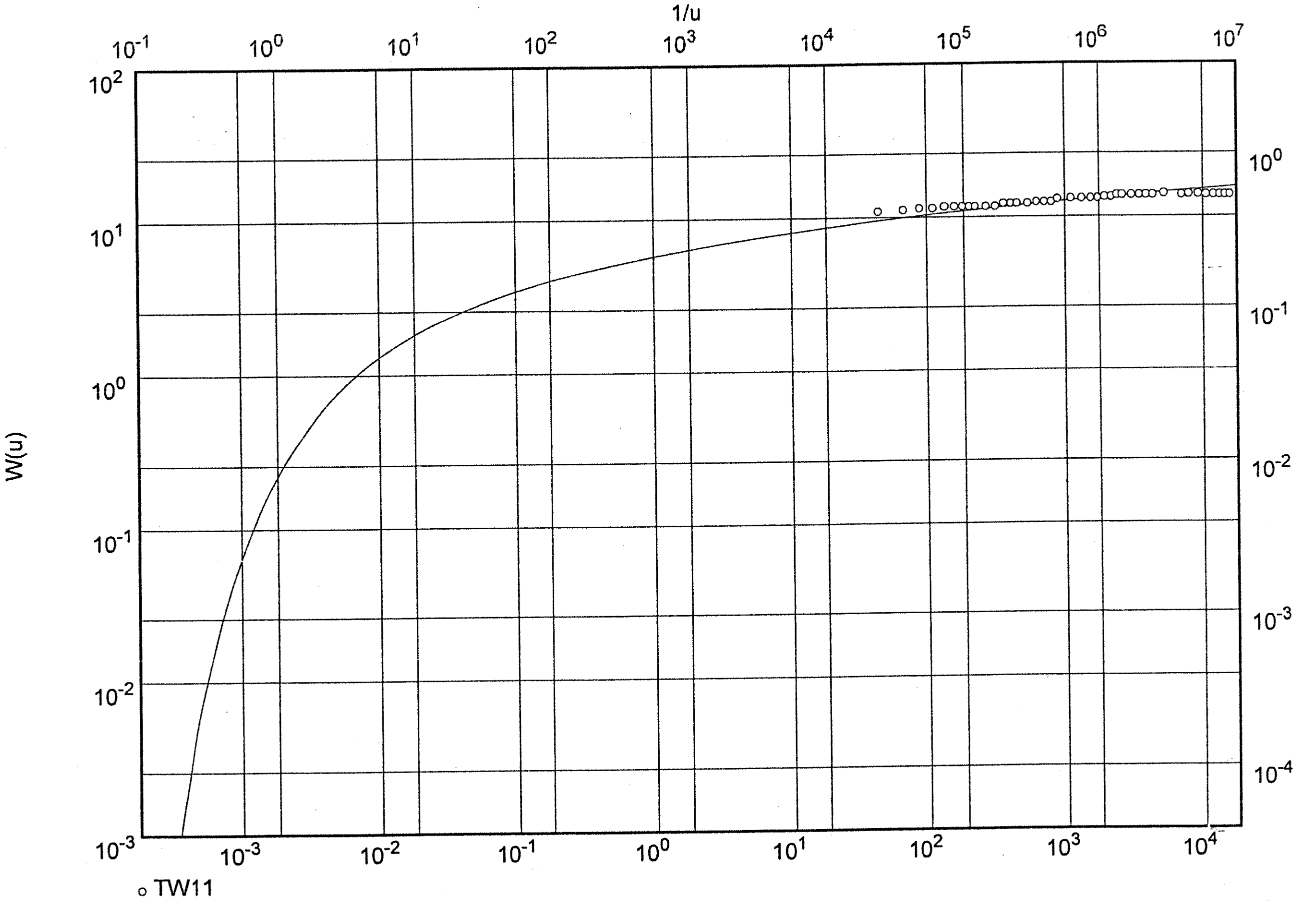
Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 23.02.2007	none, Page 3
		Project: PH0145	
		Evaluated by: RAP	

Pumping Test No. 4	Test conducted on: Feb.13, 2007
TW11	TW11
Discharge 1.60 l/s	Distance from the pumping well 0.150 m
Static water level: 0.800 m below datum	

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
51	370.00	0.825	0.025	
52	372.00	0.815	0.015	
53	374.00	0.810	0.010	
54	376.00	0.800	0.000	

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Theis analysis method Confined aquifer	Date: 23.02.2007	none, Page 1
		Project: PH0145	
		Evaluated by: RAP	

Pumping Test No. 4	Test conducted on: Feb.13, 2007
TW11	
Discharge 1.60 l/s	

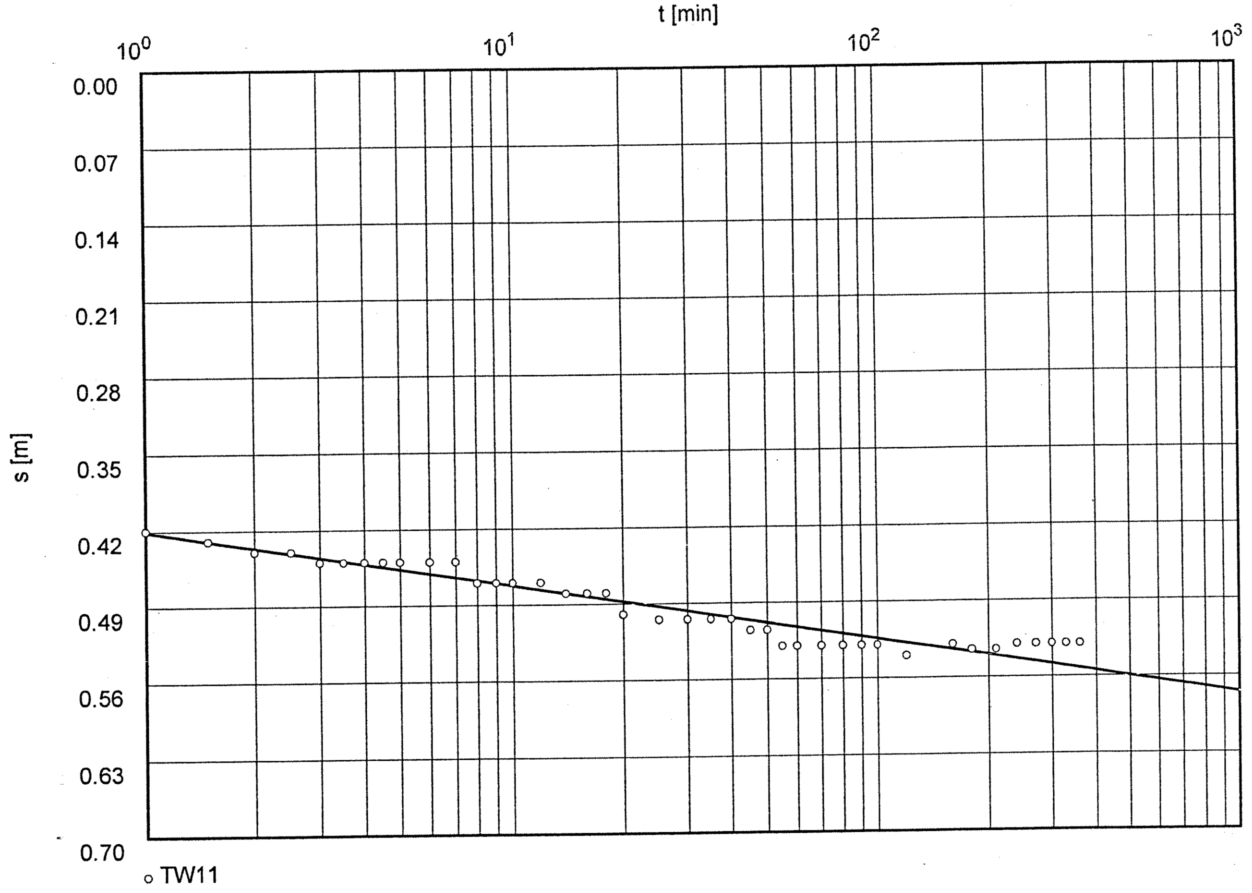


Transmissivity [m²/min]: 1.97×10^{-1}

Storativity: 1.43×10^{-3}

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Date: 23.02.2007	none, Page 1
		Project: PH0145	
		Evaluated by: RAP	

Pumping Test No. 4	Test conducted on: Feb.13, 2007
TW11	
Discharge 1.60 l/s	



Transmissivity [m²/min]: 3.41×10^{-1}

Storativity: 2.20×10^{-7}

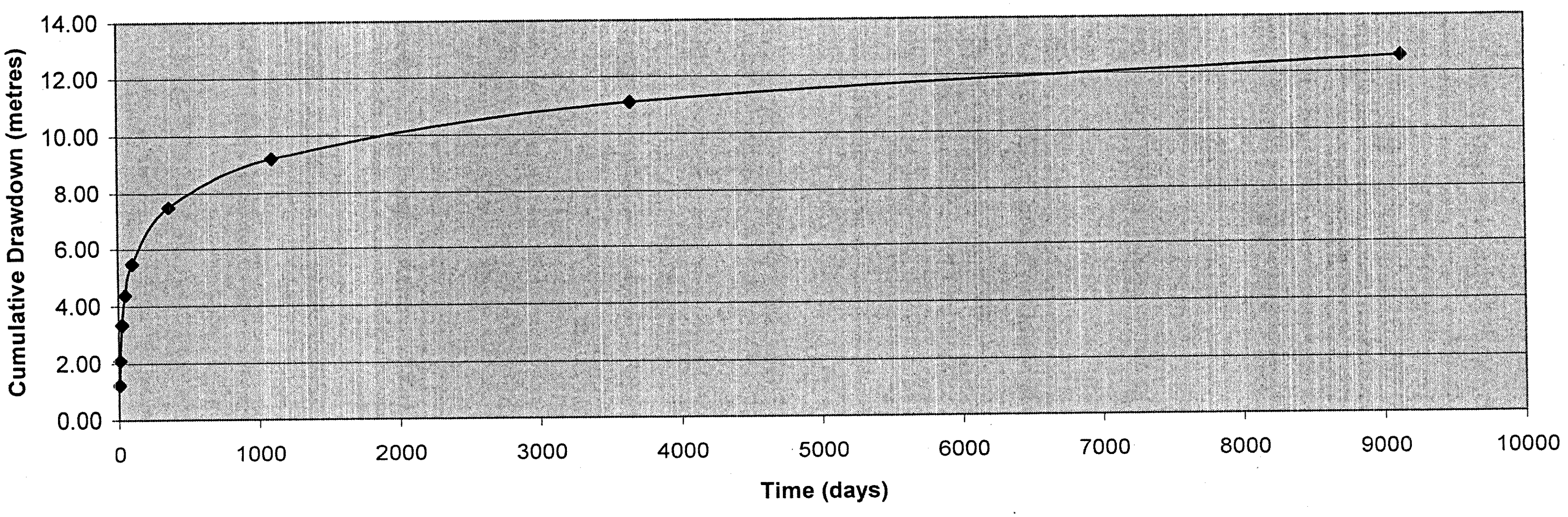
Determination of Potential Well Interference

Pumping Rate (Q) m3/day	2
Transmissivity (T) m2/day	12.52
Average Well Spacing (m)	25
Coefficient of Storage S	0.0423

Notes: Analysis Assumes Continuous Pumping of 252 Wells

	1st Well Grouping		2nd Well Grouping		3rd Well Grouping		4th Well Grouping		5th Well Grouping		Drawdown
Time (days)	u	W(u)	u	W(u)	u	W(u)	u	W(u)	u	W(u)	m
5	5.3E-02	2.4126	1.6E-01	1.4092	2.6E-01	1.0139	3.7E-01	0.7554	4.8E-01	0.5848	1.26
10	2.6E-02	3.0983	7.9E-02	2.0386	1.3E-01	1.5889	1.8E-01	1.3098	2.4E-01	1.0762	2.10
25	1.1E-02	3.9436	3.2E-02	2.8965	5.3E-02	2.4126	7.4E-02	2.0991	9.5E-02	1.8695	3.36
50	5.3E-03	4.6681	1.6E-02	3.5739	2.6E-02	3.0983	3.7E-02	2.7563	4.8E-02	2.5068	4.39
100	2.6E-03	5.3776	7.9E-03	4.2716	1.3E-02	3.7785	1.8E-02	3.4581	2.4E-02	3.1763	5.47
365	7.2E-04	6.6598	2.2E-03	5.5443	3.6E-03	5.0532	5.1E-03	4.7064	6.5E-03	4.4652	7.48
1100	2.4E-04	7.7579	7.2E-04	6.6598	1.2E-03	6.1494	1.7E-03	5.8016	2.2E-03	5.5443	9.19
3650	7.2E-05	8.9617	2.2E-04	7.8449	3.6E-04	7.3526	5.1E-04	7.0044	6.5E-04	6.7620	11.10
9125	2.9E-05	9.8710	8.7E-05	8.7725	1.4E-04	8.2968	2.0E-04	7.9402	2.6E-04	7.6779	12.56

Graph of Drawdown vs. Time



APPENDIX 4

Revised Lot Development Plan

patersongroup

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July 4, 2008
File No. PH0145-05.Let

Sunset Lakes Development Corporation
6576 Apple Orchard Road
Greely, ON
K4P 1E5

Attention: **Mr. Dan Anderson**

Subject: **Nitrate Impact Calculations**
Greely Village, Ottawa, ON

Dear Sir:

As requested, please find below our revised nitrate impact calculations for the above referenced site. It is our understanding that the most recent development proposal calls for 71 residential lots and 6 office blocks.

Design Flows

The design flows used for sizing residential leaching beds are typically in the range of 3000 to 3500 L/day, depending on the size of house. As per MOE Guideline D-5-4, a corresponding figure of 1000 L/day per residential unit is used as representing the portion of flows containing nitrates at a concentration of 40 mg/L. The design flows for office buildings are covered under the Ontario Building Code, with a specified design flow of 75 L / 9.3 m2 of office space. Based on our understanding that the typical office building will be of the order of 186 m2, this would equate to a design flow of 1500 L/day, which would be approximately half that of a typical house. As such, for purposes of nitrate impact assessment, it would be taken that 2 office blocks would be equivalent to one house, and as such a total site loading of 74,000 L/day would be used in the analysis for the site (71 houses x 1000 l/day plus 6 offices x 0.5x1000 l/day).

Site Topography Factor

The sewage loadings will be reduced through dilution using precipitation. The amount of infiltration is reduced by factors such as evapotranspiration, and runoff, with the remaining portion being identified as surplus moisture. This portion is available for dilution.

It is important to note that dilution modelling must consider the post development condition, to provide a reasonable assessment of how the subdivision will perform in the long term. As would be expected, site grading, stormwater management, and an understanding of how hard surfaces contribute to the overall groundwater recharge to the site are important in predictive assessments.

In arriving at a reasonable value for a site topography factor, it is important to base it on the actual conditions that will exist when development takes place. Regrading of the site is required as part of the overall stormwater management, to ensure that stormwater is directed to the ponds on the interior of the site. On Page 4.55 of the <u>*MOEE Hydrogeological Technical Information Requirements for Land Development Applications*"</u> it states that:

> *"Another crucial consideration is the potential to a site's soil cover which can occur from grading and regrading activities which are part of the site's development."*

This provides a clear indication that the actual post development condition should be considered.

On the same page of the above referenced document, it states that:

> *"Stormwater management facilities may also contribute to infiltration. However, they may also detract from infiltration by directing water away from the tile bed area. These facilities should be considered as part of determination of available infiltration."*

This is a further indication that the predictive assessment should consider the post development conditions. It is our opinion that the proposed ponds will contribute to infiltration in that they are dug to intercept the overburden aquifer, and are not lined with an impervious material to prevent infiltration.

In conducting our analysis, the following assumptions are made:

Infiltration Factors

As part of the overall site development, significant regrading will occur as part of the stormwater management design. It is assumed that 75 % of the stormwater runoff will be contained within the site boundaries by directing the runoff to stormwater management ponds. It is also recognized that although the available infiltration area is reduced by the presence of hard or impervious surfaces, a portion of the runoff from these surfaces is available for infiltration. This can be ensured by connecting roof down-spouts into the subsurface soils. In our analysis, this available water is reduced by a factor of 20% to provide for losses.

Topography	Flat Land (controlled through stormwater management)	0.30
Soil Type	Open Sandy Loam (weighted for anomolous areas)	0.35
Cover	Cultivated Lands (Grass Covered)	0.1
Total		0.75

What this implies is that 25% of the surplus water leaves the site. In actuality, approximately 75% of this runoff water (for calculation purposes) is retained on site and available for dilution. The approach of using retained runoff in the analysis has been used in numerous subdivisions throughout the Greely area, and has been accepted by the authorities, including MOE, as part of the review process. Specifically, this approach was accepted by the MOE for the original Sunset Lakes Subdivision (which is of the order of 15+/- years old), and the recent Jacques Whitford studies show that no nitrate impacts have been detected in this area.

We have conducted our predictions using the following:

Site Area	32 hectares
Total Site Sewage Flow	74,000 L/day
Surplus Water	372.2 mm / year

With the above parameters, the cumulative nitrate impact has been calculated to be 8.1 mg/L, which is considered to be acceptable.

Accepting that retained stormwater runoff on site is a contributor, the selection of infiltration factors is not a major contributing factor. By way of example, if we assume steeper average slopes for the site, more runoff occurs which is available for dilution, and results in only a slight change in the predicted cumulative nitrate concentration. As such, we have repeated the calculation using a topography factor of 0.2 and a soil cover factor of 0.3, and the resulting cumulative nitrate impact has been calculated to be 8.5 mg/L., which is only a 5% increase over the originally predicted value of 8.1 mg/L.

The other contributing factor to be considered is the availability of additional lands for dilution. Approximately 4.14 hectares of land has been conveyed to the City for use as sports fields. If these lands are included in the dilution area, the nitrate impact is reduced to 7.3 mg/L.

Our experience throughout the recent development of the Greely area is that as a general rule of thumb, development can safely occur at a density of one lot / 0.4 hectares. This site is proposing a density of 77 lots (74 equivalent lots based on sewage flow considerations) on 32 hectares, which is a reduced density from this general guideline. Studies by Jacques Whitford Limited (JWL), on behalf of the City of Ottawa, indicate that nitrate impacts throughout Greely are significantly below what these simplistic models would predict, and the Jacques Whitford study indicates that at full buildout of Greely, acceptable impacts will exist. It should also be noted that in the early stages of this development proposal, the City of Ottawa had retained Jacques Whitford Limited to update their study, with particular emphasis on this development. In their analysis of this specific site, they predict average nitrate concentrations of 2 mg/L and peak concentrations of 4.5 mg/L.

As an additional comfort level, the existing development across Highway 31 has been in place for what we believe to be over 30 years, and lot sizes appear to be smaller, or at least comparable to the proposed development. The proposed development is downgradient from this existing development, and in all of our test wells, we have not detected any nitrates, which is an indication of satisfactory performance. Also, in all six off-site wells that were tested, two of which are in the older development, the nitrates were also non-detectable. This provides a further reassurance that the risks associated with development in the area are acceptable.

In summary, it is our opinion that the proposed development comprising 71 residential lots and 6 office blocks will have an acceptable impact on the underlying groundwater aquifer.

We trust this is to your satisfaction. If we can be of further assistance in this matter, please call.

Yours truly,
Paterson Group Inc.

Stephen J. Walker, P.Eng.

Nitrate Impact Assessment

Project: Greely Village Centre
File: PH0145
Condition: 71 Village Lots with 6 Office Blocks - 75 % of Runoff retained on site

Groundwater Flow Calculation

Background Nitrate Concentration (C_b) =	0	mg/L
Hydraulic Conductivity (k) =	0	m/s
Horizontal Gradient (i) =	0	
Length (L) =	0	m
Aquifer Thickness (t) =	0	m
Groundwater Flow (Q_b) =	0	m3/day

Infiltration Calculation

Nitrate Concentration in Precipitation (C_i) =	0	mg/L
Surplus Water (Environment Canada)	372.2	mm/yr
Factored Water Surplus =	279.15	mm/yr
Additional Surplus from Landscape Runoff =	69.79	mm/yr
Infiltration Flow Entering the System (Q_i) =	291.50	m^3/day

Mass Balance Model (MOEE 1995)

$C_T = (Q_bC_b+Q_eC_e+Q_iC_i)/(Q_b+Q_e+Q_i)$ = Cumulative Nitrate Concentration

where:

Q_b = flow entering the system across the upgradient area =	0	m^3/day
C_b = background nitrate concentration =	0	mg/L
Q_e = flow entering the system from the septic drainfield =	74	m^3/day
C_e = concentration of nitrates in the septic effluent =	40	mg/L
Q_i = flow entering the system from infiltration =	291.50	m^3/day
C_i = Concentration of nitrates in the infiltrate =	0	mg/L

Therefore: **C_T = 8.1 mg/L**

Weighted Infiltration Factors

Topography	0.3
Soil	0.35
Cover	0.1
Total	**0.75**

Septic Effluent

Concentration of Effluent (Cs) =	40	mg/L
Number of Lots:	74	
Daily Sewage Flow (Qs)=	74	m^3

Site Characteristics

Area of Site :	320000	m^2
Roof Areas:	15400	m^2
Length of Roadways:	1850	m
Driveways:	15400	m^2
Impervious Area	41900	m^2
Percent Impervious Area =	13.09	%
Infiltration Area =	278100	m^2

Nitrate Impact Assessment

Project: Greely Village Centre
File: PH0145
Condition: 71 Village Lots with 6 Office Blocks - 75 % of Runoff retained on site

Groundwater Flow Calculation

Background Nitrate Concentration (C_b) =	0	mg/L
Hydraulic Conductivity (k) =	0	m/s
Horizontal Gradient (i) =	0	
Length (L) =	0	m
Aquifer Thickness (t) =	0	m
Groundwater Flow (Q_b) =	0	m3/day

Infiltration Calculation

Nitrate Concentration in Precipitation (C_i) =	0	mg/L
Surplus Water (Environment Canada)	372.2	mm/yr
Factored Water Surplus =	223.32	mm/yr
Additional Surplus from Landscape Runoff =	111.66	mm/yr
Infiltration Flow Entering the System (Q_i) =	275.74	m^3/day

Mass Balance Model (MOEE 1995)

$C_T = (Q_bC_b+Q_eC_e+Q_iC_i)/(Q_b+Q_e+Q_i)$ = Cumulative Nitrate Concentration

where:

Q_b = flow entering the system across the upgradient area =	0	m^3/day
C_b = background nitrate concentration =	0	mg/L
Q_e = flow entering the system from the septic drainfield =	74	m^3/day
C_e = concentration of nitrates in the septic effluent =	40	mg/L
Q_i = flow entering the system from infiltration =	275.74	m^3/day
C_i = Concentration of nitrates in the infiltrate =	0	mg/L

Therefore: C_T = **8.5 mg/L**

Weighted Infiltration Factors

Topography	0.2
Soil	0.3
Cover	0.1
Total	**0.6**

Septic Effluent

Concentration of Effluent (Cs) =	40	mg/L
Number of Lots:	74	
Daily Sewage Flow (Qs)=	74	m^3

Site Characteristics

Area of Site :	320000	m^2
Roof Areas:	15400	m^2
Length of Roadways:	1850	m
Driveways:	15400	m^2
Impervious Area	41900	m^2
Percent Impervious Area =	13.09	%
Infiltration Area =	278100	m^2

Nitrate Impact Assessment

Project: Greely Village Centre
File: PH0145
Condition: 71 Village Lots with 6 Office Blocks - 75 % of Runoff retained on site and using sports fields

Groundwater Flow Calculation

Background Nitrate Concentration (C_b) =	0	mg/L
Hydraulic Conductivity (k) =	0	m/s
Horizontal Gradient (i) =	0	
Length (L) =	0	m
Aquifer Thickness (t) =	0	m
Groundwater Flow (Q_b) =	0	m3/day

Infiltration Calculation

Nitrate Concentration in Precipitation (C_i) =	0	mg/L
Surplus Water (Environment Canada)	372.2	mm/yr
Factored Water Surplus =	279.15	mm/yr
Additional Surplus from Landscape Runoff =	69.79	mm/yr
Infiltration Flow Entering the System (Q_i) =	331.08	m^3/day

Mass Balance Model (MOEE 1995)

$C_T = (Q_bC_b+Q_eC_e+Q_iC_i)/(Q_b+Q_e+Q_i)$ = Cumulative Nitrate Concentration

where:

Q_b = flow entering the system across the upgradient area =	0	m^3/day
C_b = background nitrate concentration =	0	mg/L
Q_e = flow entering the system from the septic drainfield =	74	m^3/day
C_e = concentration of nitrates in the septic effluent =	40	mg/L
Q_i = flow entering the system from infiltration =	331.08	m^3/day
C_i = Concentration of nitrates in the infiltrate =	0	mg/L

Therefore: C_T = **7.3 mg/L**

Weighted Infiltration Factors

Topography	0.3
Soil	0.35
Cover	0.1
Total	**0.75**

Septic Effluent

Concentration of Effluent (Cs) =	40	mg/L
Number of Lots:	74	
Daily Sewage Flow (Qs)=	74	m^3

Site Characteristics

Area of Site :	361400	m^2
Roof Areas:	15400	m^2
Length of Roadways:	1850	m
Driveways:	15400	m^2
Impervious Area	41900	m^2
Percent Impervious Area =	11.59	%
Infiltration Area =	319500	m^2