



Terraprobe

Consulting Geotechnical & Environmental Engineering
Construction Materials Engineering, Inspection & Testing

**PRELIMINARY HYDROGEOLOGICAL ASSESSMENT
PROPOSED RESIDENTIAL SUBDIVISION
PART OF WEST HALF OF LOT 21,
CONCESSION 9 (ESQUESING)
HAMLET OF GLEN WILLIAMS
REGIONAL MUNICIPALITY OF HALTON**

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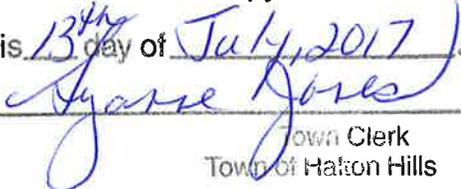
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ABSTRACT

Terraprobe Limited was retained by Wellings Planning Consultants Inc. on behalf of Ms. G. Devins to conduct a preliminary hydrogeological study for a proposed residential development in the Hamlet of Glen Williams (Part of the West Half of Lot 21, Concession 9 (Esquesing), Hamlet of Glen Williams, Regional Municipality of Halton). The purpose of the study was to assess the following:

- (i) The shallow soil and ground water conditions as they relate to the design and construction of septic tank and tile field systems.
- (ii) The potential effect of tile fields on local ground water quality and nearby residential water supplies (wells).

A preliminary terrain analysis of the site and surrounding area was conducted to assess local geologic and hydrogeologic conditions. The analysis consisted of a review of selected geologic and hydrogeologic data for the site. Shallow soil conditions were assessed through 11 test pits excavated on the site. A door-to-door survey was conducted to assess the location and nature of water supplies on adjacent lands.

The results of the preliminary hydrogeologic evaluation indicate the following:

- (i) The site is not situated in a hydrogeologically-sensitive area, based on the Halton Aquifer Management Plan.
- (ii) The site is generally characterized by low permeability glacial till materials. These soils are suitable for the construction of individual septic systems. Fully raised filter beds or shallow buried trench systems will be required. It is understood that tertiary treatment units will be used at each lot.
- (iii) The site will be serviced with municipal piped water. Immediately adjacent properties are currently serviced with municipal piped water.
- (iv) With the use of tertiary treatment units at each lot, the lot size for the development will be governed by the area required to site the building envelope and tile field. This will permit a minimum lot size of about 3,000 sq.m.

The following additional studies must be conducted as part of final approval and design of the development:

- (i) An updated door-to-door survey must be conducted to confirm the presence and nature of any remaining water wells within approximately 500 m of the site.
- (ii) Several monitoring wells must be installed at the site to assess shallow ground water quality, particularly with respect to nitrate concentrations.
- (iii) Test pits must be dug on each lot after site grading to confirm shallow soil conditions.
- (iv) The design and siting of the tile field systems must be conducted by a qualified professional, in accordance with the requirements of the Ontario Building Code.

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1.0 INTRODUCTION

Terraprobe Limited was retained by Wellings Planning Consultants Inc. on behalf of Ms. G. Devins to conduct a preliminary hydrogeological study for a proposed residential development in the Hamlet of Glen Williams (Part of the West Half of Lot 21, Concession 9 (Esquesing), Hamlet of Glen Williams, Regional Municipality of Halton). The purpose of the study was to assess the following:

- (i) The shallow soil and ground water conditions as they relate to the design and construction of septic tank and tile field systems.
- (ii) The potential effect of tile fields on local ground water quality and nearby residential water supplies (wells).

2.0 SITE AND PROJECT DESCRIPTION

The site is located to the northwest of Georgetown on Part of the West Half of Lot 21, Concession 9 (Esquesing), Hamlet of Glen Williams, Regional Municipality of Halton (ref. Figures 1 and 2). The property is situated along the eastern side of the 8th Line to the north of Wildwood Road. It is bounded to the north and west by existing agricultural lands. A residential subdivision is located to the east of the site, and existing residential dwellings abut the property to the south and west (along the 8th Line). An abandoned railway right-of-way is located along the eastern property line.

The property is comprised of some 6.88 hectares (17.2 acres) of primarily fallow agricultural land, with occasional trees along the fence lines. The property itself is subdivided into a number of smaller fields.

The overall topography of the site is gently sloping from the northeast to southwest with a total relief on the order of 3 to 4 m. A drainage swale is situated on the eastern and southern property lines, conveying surface water flow from the north to the south and then to the west towards the 8th Line. Another swale is located at the northwestern portion of the property, and drains to the southwest to the 8th Line.

The proposed development will be serviced by an internal roadway as shown on Figure 2. The development will be serviced with municipal water and storm sewers, and with individual septic tank and tile field systems.

3.0 PROCEDURE

A preliminary terrain analysis of the site and surrounding area was conducted to assess local geologic and hydrogeologic conditions. The analysis consisted of a review of selected geologic and hydrogeologic data for the area. The following documents were reviewed during the preparation of this report:

- Ministry of Environment water well records for wells within approximately 2 km of the site.
- Palaeozoic Geology, Brampton, Southern Ontario, Map 2337; Ontario Division of Mines, 1976. 1:50,000.
- Brampton Area, Southern Ontario, Industrial Mineral Resources Sheet, Map 2176; Ontario Department of Mines, 1969. 1:63,360.
- Brampton Area, Southern Ontario, Drift Thickness Sheet, Map 2179; Ontario Department of Mines, 1969. 1:63,360.
- Physiography of Southern Ontario, Map 2715; Ontario Geological Survey, Ontario Ministry of Natural Resources, 1984. 1:600,000.
- Halton Aquifer Management Plan, Phase 1 Report, February 1996.
- Halton Urban and Rural Servicing Guidelines, Water Supply and Sanitary Sewage Disposal, 2000.
- Glenn Williams Integrated Planning Project; Scoped Subwatershed Plan, January 2003.

A field investigation of the property was conducted on June 19, 1991, as part of an earlier site investigation. No land use changes have occurred at the site since that date. The investigation consisted of the excavation of 11 shallow test pits to depths of between 2.7 and 3.8 m depth.

The test pits were excavated with a rubber tired backhoe. Representative samples of the soil from each test pit were obtained and transported to our laboratory for detailed inspection and testing. The test pits were backfilled to grade once all the pits were excavated to observe seepage conditions. Standpipes were left in all of the test pits to measure water levels at a later date.

The field work was supervised throughout by a member of our staff who located the test pits, directed the digging and sampling operations, and logged the test pit excavations.

Standpipe piezometers were left in each of the test pits to monitor shallow ground water levels. The standpipes were comprised of 12 mm I.D. CPVC tubing, which were saw-slotted near the base and placed to the base of the test pit as shown on the accompanying test pit logs.

The locations of the test pits were determined by our field representative relative to existing physical features and property lines. The elevations of the test pits were estimated from the topographic contours provided on the site plan.

4.0 SUBSURFACE CONDITIONS

4.1 Local Conditions

Based on local geologic mapping, the site is located within a clay/silt till plain. The underlying bedrock consists of red shale of the Queenston Formation. Based on published data, the depth to the bedrock in the immediate vicinity of the site ranges between about 2 and 7 m below grades.

4.2 Local Ground Water Usage and Hydrogeology

The records for wells within about 2 km of the site were reviewed to determine the nature of local ground water resources and use (Concessions 8 to 10, Lots 18 to 24, Town of Halton Hills (Esquesing Township), Regional Municipality of Halton (ref. Table 1). While this information is helpful in assessing local hydrogeologic conditions, it is noted that local wells have generally been abandoned in favour of piped municipal water (see Section 4.4). A summary of the data is presented below:

SUMMARY OF LOCAL WATER WELLS

Total number of wells	260
Number completed in rock	186
Number completed in overburden	74
Depth ranges:	
Less than 15 m	77
15 to 30 m	134
Greater than 30 m	49
Well diameters:	
Less than 400 mm (drilled)	189
Greater than 400 mm (bored/dug)	66
Unknown	5
Water quality:	
Fresh	239*
Mineralized	2 ⁺
Saline	8**
Dry	7
No data	6
Water use:	
Domestic and/or stock	227 [#]
Municipal/Public Supply	8 [#]
Commercial	4
Industrial	1
Irrigation	3
Cooling/Air Conditioning	1
Dry	7
Unknown	10
Range of Reported Pumping Rates	5 to 9,125 lpm
Range of Specific Capacities	0.1 to 3,000 lpm/m

Notes: * 1 well encountered both fresh water and saline water at different depths
 + 1 well encountered both highly mineralized water and saline water at different depths
 # 1 well was used as a source for both public supply and domestic consumption

This indicates that most of the wells (72%) draw water from a bedrock (shale) aquifer, and most are used for domestic/stock supply purposes. The local wells are generally small diameter (100 to 200 mm diameter) drilled wells completed to depths of greater than 30 m.

A summary of the driller's records for these wells is presented in Table 1.

The Halton Aquifer Management Plan was also reviewed to assess local ground water conditions and flow directions. Based on the Halton Aquifer Management Plan, the site is not situated in a hydrogeologically-sensitive area. Ground water flow directions are directed to the south and west toward the Silver Creek. The Halton Aquifer Management Plan also confirms that the major water bearing unit in the area consists of the shale bedrock (ref. Figure 3).

Based on the information contained in the well records, it appears that ground water flow in the shale bedrock aquifer beneath the site is directed to the south and west, towards Silver Creek. Ground water discharge likely occurs into the Silver Creek valley.

4.3 Shallow Subsurface Conditions

Details of the subsurface conditions encountered at the site are summarized below, and are also presented in the accompanying Test Pit Logs. The soil conditions are confirmed at the test pit locations only and may vary at other locations. It is noted that the test pits were excavated in 1991 at the locations shown on Figure 2. A visual inspection of the property was conducted in January 2003. There has been no significant grading or earthworks on the site since 1991, hence the soil conditions encountered in the 1991 study are considered representative of current conditions.

In summary, test pits generally encountered silt till soils which graded into red clayey silt till. A deposit of sandy soil was encountered at the southwest corner of the site. The water table was encountered at depths of between 1.1 and 2.8 m throughout the site.

Topsoil

Topsoil was encountered in each of the test pits, extending from the ground surface to depths of between 0.2 and 0.7 m below grade. The topsoil was generally composed of silt materials with some organic matter.

Sand

Sand was encountered in Test Pit 1 at depths of between 0.3 m and the base of the excavation at 3.7 m. The sand was found to be variable in composition, ranging from a fine to medium sand with a trace of silt and gravel, to a fine to medium sand, with some gravel, and a trace to some silt. The sand deposits were generally brown in colour and damp with measured moisture contents of between 3 and 10 percent.

Sandy Gravel

A deposit of coarse sandy gravel, with traces of silt, and occasional cobbles was encountered at the base of Test Pit 2, from a depth of 2.5 to 3.8 m below existing grades. The sandy gravel was brown in colour, and was found to be damp, with a measured moisture content of 10 percent.

Sandy Silt

Brown to reddish brown sandy silt was encountered immediately beneath the topsoil in three of the test pits (Test Pits 2, 3, and 4). The soil was variable in composition, ranging from a silt, with some fine sand, and a trace of gravel; to a sandy silt, with some clay and a trace of gravel. This soil stratum was found to extend to depths ranging between 1.4 to 2.5 m below existing grades. The sandy silt soil was generally moist with measured moisture contents of between 10 and 24 percent.

Sandy Silt Till

A deposit of sandy silt till was generally encountered beneath the topsoil in five of the test pits (Test Pits 3, 6, 7, 8 and 9), extending to depths of between 1.3 to 3.0 m below grades. The till was encountered beneath the silt soil in Test Pit 3, at a depth of 1.5 m. The material was generally composed of fine sandy silt, with traces of clay and gravel, and occasional cobbles. The soil was generally moist, with measured moisture contents of between 10 and 15 percent (average of 13 percent).

Clayey Silt Till

Reddish brown, hard, clayey silt till was encountered in nine of the test pits (Test Pits 4 through 12). This till was generally encountered beneath the topsoil, or the sandy silt till soil unit, and was found to extend to the base of each of the test pits (to depths of between 2.7 and 3.7 m). The till was found to range in composition from sandy clayey silt, to clayey silt with traces of sand.

The till generally became very hard (blocky) with depth. Given that the red (Queenston) shale bedrock is reported to be close to the ground surface in the immediately vicinity, it is likely that the till soil grades into highly weathered shale bedrock near the base of the test pits. The till was generally moist to damp, becoming drier with depth. The measured moisture contents of the material generally varied between 8 and 12 percent, although one sample had a measured moisture content of 18 percent.

Ground Water

Seepage was encountered in all of the test pits at the time of the investigation, with the exception of Test Pits 1, 3 and 11. The depth to seepage, and the water levels in the test pits, are summarized in the following table. The water levels in the standpipes were measured by our technician on June 24, 1991, when the test pits were originally excavated. The water levels were also measured on January 21, 2003, in those standpipes that could be located.

DEPTHS OF SEEPAGE, WATER LEVELS AND CAVE IN TEST PITS 1 THROUGH 11

<i>Test Pit</i>	<i>Depth of Seepage (June 19/91)</i>	<i>Depth of Cave (June 19/91)</i>	<i>Water Level (June 19/91)</i>	<i>Water Level (June 24/91)</i>	<i>Water Level (Jan.21/03)</i>
1	none	open	dry	dry	dry
2	2.9 m	from 2.5 m	2.9 m	2.8 m	-
3	none	open	dry	dry	-
4	1.7 m	open	3.4 m	2.2 m	-
5	2.4 m	open	3.4 m	2.1 m	-
6	1.8 m	open	3.2 m	1.4 m	2.0 m
7	1.6 m	open	2.6 m	1.4 m	-
8	2.9 m	open	2.9 m	2.0 m	2.6 m
9	1.9 m	open	3.0 m	1.3 m	-
10	-	open	3.3 m	1.9 m	2.2 m
11	none	open	dry	1.5 m	-

It should be noted that ground water levels will be subject to seasonal variations. The water levels noted in 2003 are consistently lower than those in 1991.

4.4 Results of Door-to-Door Survey

A door-to-door survey was conducted on the residences adjacent to the site, along the 8th Line, Wildwood Road, and in the Meagan Meadows subdivision in 1991. There has been no significant development since 1991, hence a door-to-door survey was not conducted as part of the current study. The results of the survey indicated that most of the immediately adjacent lots are serviced with municipal water, and individual septic tank and tile field systems. The residential property immediately to the west and the farm to the north remain serviced by a private well.

4.5 Review of Applicable Guidelines and Policy

The proposed development will be serviced with private on-site sewage disposal systems. The use of on-site sewage disposal systems is subject to a number of regional and provincial guidelines and policies. In addition, a subwatershed study has been conducted in the Glen Williams area which also provides recommendations regarding on-site sewage disposal systems.

The guidelines and policies which were considered in the assessment of the sewage disposal systems for the proposed development are discussed in this section of the report.

4.5.1 Region of Halton

The Region of Halton has prepared guidelines regarding private servicing (*Guidelines for Hydrogeological Studies and Standards for Private Services, June 2000*). With respect to the Halton Guidelines, the following specific information is considered relevant to the proposed development:

- Application of the guidelines. In the introduction to the guidelines, it is noted that “*The information contained in this document, is, for the most part, generic in nature and is not intended to provide detailed methodologies for site-specific studies. These will need to be developed on a case-by-case basis for individual development applications by the proponents and their consultants.*”
- Standard for Evaluation. Section 2.1 of the Halton Guidelines indicates “*This section refers to conventional septic tank and tile field systems, defined in the Ontario Building Code act as a standard for development evaluation.*”, and “*New development approvals on private sewage disposal systems requires a sewage system envelope of 700 m² is maintained of vacant and suitable land be set aside and protected to permit the adequate installation of a conventional septic tank and tile bed*

system.” Similarly, Section 5.1 of the guideline states that, “All proposed development on private services will be reviewed on the basis of being capable of supporting the installation of a conventional septic tank and tile bed system maintaining an area of vacant and suitable land of at least 700 m².”

- Protection of ground water quality. Section 5.1 of the Halton Guideline states that, “*The purpose of the Guideline is to protect the environment and public health by ensuring that development utilizing individual on-site sewage systems proceeds at a density and scale which will not result in, or cause degradation of, ground water resources in exceedance of acceptable limits. Compliance with acceptable limits shall be demonstrated through predictions of the development’s nitrate impact on the ground water at the development boundary and at existing downgradient residences within 500 m from the development.*”

Section 5.2.3 of the Guideline indicates that, “*For the purposes of predicting the potential for ground water impacts, a nitrate loading of at least 40 grams per lot per day per residential dwelling shall normally be used. This is based on expected flows of 1,000 litres per day and a minimum value of 40 mg/litre nitrate/nitrogen in the discharge from domestic/household sewage.*”

Based on the above, the Halton Guidelines establish three fundamental factors with respect to assessing suitable lot sizes and density of development when using on-site sewage systems. These factors are:

- The Guideline is based on the use of conventional septic tank and tile field systems (i.e., without tertiary treatment systems or other systems which may reduce the nitrate/nitrogen loading in the sewage).
- The lot size must be sufficient to accommodate the area required for a conventional septic tank and tile bed system. The Region establishes this as a minimum of 700 m².
- The nitrate/nitrogen concentration in sewage effluent of 40 grams per lot per day “*shall normally be used*”. Again, this is based on the assumption that a septic tank will be used without the use of tertiary treatment.

As noted subsequently in this section of the report, the Halton Guidelines are not in conformance with the policies or recommendations of the Ontario Building Code, the Ministry of Environment, or the Glen Williams Subwatershed Plan.

4.5.2 Ministry of Environment Policy

The Ministry of Environment policy for land development using private on-site services is generally found in “*MOEE Hydrogeological Technical Information Requirements for Land Development Applications, April 1995*”.

The MOE Guidelines provide a similar approach to assessing the nitrate loading in the shallow ground water system as are provided within the Region of Halton Guidelines. Specifically, the Ministry of Environment Guidelines suggest the use of a dilution model which mixes infiltrating precipitation with the volume of sewage generated by the development. The Ministry of Environment policy, however, permits consideration of other approaches to assessing the nitrate loading into the shallow ground water system. These are noted below:

- Application of the Guideline (Section 3.0). It is noted that, “*this guideline may not apply to non-standard individual on-site systems which are specifically designed to reduce nitrate loadings. It should be emphasized that MOEE encourages the development of new technologies for the treatment of domestic sewage wastes. The Ministry will entertain proposals for development which incorporate new technologies.*”
- Monitoring-Based Assessments (Section 5.6.1). The Ministry recognizes that it is possible to monitor the impact of private sewage disposal in nearby developments under similar geologic circumstances, and use this as a tool in assessing actual nitrate loading of the shallow ground water system. Specifically, “*It is also recognized that processes such as absorption, denitrification, filtration, and biodegradation may attenuate contaminants as the effluent passes down through the unsaturated zone and moves into the saturated zone. Since these processes are extremely difficult to quantify with any accuracy, they are usually only considered as a safety factor. However, if the consultant can provide documentation to the satisfaction of MOEE regarding the presence and extent of these processes on site, their impact on nitrate concentrations will be considered.*”, and, “*In some instances there may be nearby on-site sewage system-based development in a similar hydrogeologic environment. If this development has been in place for a lengthy period of time, information on existing ground water quality could be used to demonstrate the combined effect of all available attenuative processes. This empirical information may then be used to help predict the impact of the proposed development.*”

Therefore, the Ministry of Environment permits the use of alternative approaches to assess the impact of the sewage systems on shallow ground water quality. It is noted that both of these alternate

approaches (the use of individual treatment systems to reduce nitrate levels in the sewage effluent, and the use of a monitoring-based approach) were proposed to the Region of Halton in correspondence of October 20, 2003. These were proposed as an alternate method in assessing the appropriate development density for the site.

4.5.3 Ontario Building Code

The Ontario Building Code is the governing authority for the design and installation of on-site sewage systems. The Halton Guidelines (Section 3.2.1 (iii)(d) indicates that the proponent must “*provide preliminary documentation on the leaching bed design and tile bed area requirements for sewage disposal systems conforming to the Ontario Building Code*”). The Ontario Building Code permits the use of secondary or tertiary treatment units provided the units are approved by the Building Materials Evaluation Committee. It is noted that several manufacturers of proprietary treatment systems have obtained approval from the Building Materials Evaluation Committee for the use of these systems in Ontario. The Ontario Building Code also provides provisions for the proper long-term maintenance of the tertiary treatment systems. Section 8.9.2.3(2) of the Building Code indicates, “*No person shall operate a treatment unit other than a septic system unless the person has entered into an agreement whereby servicing and maintenance of treatment unit and its related components by a person who... is authorized by the manufacturer to service and maintain that type of treatment unit.*”

The above ensures that there is a mechanism in place to enforce the proper long-term use of the treatment system. This mechanism is not available for conventional on-site sewage systems. This can be enforced by the local Building Department, under the provisions of the Building Code.

Tertiary treatment systems are commercially available to provide for the reduction of the nitrogen levels in domestic sewage. Depending on the type of system, total nitrogen levels ranging from approximately 5 to 20 mg/litre are readily achievable using affordable and available technology, which is approved under the Ontario Building Code.

In summary, the Building Code (1997) permits the use of treatment systems which will reduce the level of nitrogen in the sewage effluent. The Building Code also provides provisions for the proper on-going maintenance of these systems.

4.5.4 Subwatershed Study

The Glen Williams Integrated Planning Project; Scoped Subwatershed Plan was completed in January, 2003 by Dillon Consulting Limited. The study was endorsed by the Region of Halton through its approval of the Glen Williams Secondary Plan. The document provides recommendations regarding wastewater services for new developments within the subwatershed area. The subject property is identified in the report as "Development Area 2", and is designated as future "Hamlet Residential".

In Section 1.5.1 of their report, Dillon Consulting indicated that the preferred method for wastewater management in new developments should be municipal servicing, but that *"Based on a previous assimilative capacity study conducted for the community of Inglewood (XCG, 1999), and given the limited extent of the anticipated development within the Glen Williams Planning Area (approximately 180 lots) as estimated by the Background Planning Study, the analyses suggests that private septic servicing may be possible without having significant adverse effects on the Credit River."*

Dillon Consulting concluded that *"the primary method for providing wastewater servicing of new development within the Hamlet should be full Regional services, with connection to the Georgetown WPCP. However, in localized areas, where it can be demonstrated that connection to the Georgetown WPCP is not feasible or practical, and subject to Region approval, consideration should be given for development to proceed on individual septic systems, with additional treatment for nitrogen, phosphorus, and bacteria"*. Dillon Consulting further recommended that a site-specific detailed study demonstrating the suitability of private septic systems be prepared prior to subdivision approval.

The subwatershed study supports the use of tertiary treatment systems (additional treatment for nitrogen, phosphorous and bacteria) for private sewage systems within the subwatershed. The subwatershed study also clearly recognizes that private servicing may be possible without having adverse effects on the Credit River.

4.5.5 Summary of Applicable Guidelines and Policy

The current Halton Region Guidelines were first developed in approximately May 1996. There have been few significant changes to the Guidelines since that date. The Guidelines were based, in part, on information contained in the MOE Guidelines of April 1995. Since the date of the original Halton Guidelines, the Ontario Building Code has been developed and has permitted the use of tertiary treatment systems. Similarly, the Glen Williams Subwatershed Study, conducted in 2003, also foresees the use of tertiary treatment systems. The Ministry of Environment Guidelines (1995) encourage the development of new technology for the treatment of domestic sewage. The Ontario Building Code (1997) has provided the vehicle for approval of the

performance criteria for these systems (i.e., ensuring that they perform as expected), and for ensuring their on-going maintenance.

Based on our review, the Halton Guidelines have not been updated recently and do not consider various approaches to development which are encouraged or accepted under the MOE Guidelines, the Ontario Building Code, and the Glen Williams Subwatershed Study.

It is anticipated that tertiary treatment will be required as recommended in the Glen Williams Subwatershed Study and the new Glen Williams Secondary Plan. This requirement could be contained in subdivision agreements and/or zoning bylaws which implement the Glen Williams Secondary Plan.

5.0 RECOMMENDATIONS

The following discussion and recommendations are based on the factual data obtained from this investigation and are presented for planning and feasibility purposes only. Further consultation may be required for final design, construction or approval purposes.

The following recommendations are based on consideration of the applicable guidelines and policy for development of private on-site sewage systems (Halton Guidelines, Ministry of Environment Guidelines, Ontario Building Code, and Glen Williams Subwatershed Study). It is also based on recognition of several other important factors including:

- The development should make efficient use of land, in accordance with Provincial planning policy.
- The lot sizes permitted under the current Glen Williams Secondary Plan is approximately 3,000 m².
- The surrounding areas have been extensively developed with estate residential lots of approximately 2,000 m². There have been no reports of significant impacts to surface or ground water quality arising from the sewage disposal systems associated with these lots. The use of a 3,000 m² minimum lot size is sufficient to allow siting of a house envelope, and a 700 m² tile bed envelope, in accordance with Halton Guidelines.

5.1 On-Site Sewage Systems

The shallow ground water level was found at depths of between 1.4 and 2.8 m below existing grades throughout much of the site. In addition, all of the test pits encountered silt or clayey silt till soils, with the exception of Test Pit 1 (excavated in the extreme southwest corner of the property), which encountered sand soils.

Based on these site conditions, either fully raised septic beds or shallow buried trench systems will be required over much of the site, due to the slow percolation rate of the till soils, and the high water table. Locally, such as near Test Pit 1, where well drained sand materials were found, it may be possible to use in-ground tile fields. Tertiary treatment systems will be used at each lot, such as the Ecoflo ST-650 or the Waterloo Biofilter, to reduce the nitrate levels in the effluent prior to discharge to the beds.

Site grading activities can substantially alter the character of the soils for the tile beds. Therefore, on completion of site grading, test pits should be excavated on each lot to verify the soil conditions and water table for that lot. The test pits should be examined by a qualified professional to confirm the soils and ground

water conditions for the tile field design. In addition, site specific septic designs should be completed by a certified designer, as per the requirements of the Ontario Building Code.

Raised filter beds should consist of a minimum thickness of 1.5 m of approved filter sand. Portions of the sand soils encountered over the site (in the vicinity of Test Pit 1) may be suitable for general grading and filling in the tile bed areas, but not for the filter bed itself. All sand materials for the beds must be inspected and approved by a qualified geotechnical engineer prior to placement in any tile bed areas. Each filter bed will required a 15 m mantle beyond the outer distribution pipe in any direction in which the effluent will move laterally away from the bed.

If shallow buried trench systems are to be installed, the base of each trench will need to be a minimum of 900 mm above the high ground water table. On-site soil may be used as backfill in the trench.

The following setbacks must be observed when siting the septic system components, according to the Ontario Building Code.

Septic tank and tertiary treatment unit not closer than:

- 1.5 m to any structure
- 3 m to the property line
- 15 m to a well or surface water body

Septic bed (either filter bed or shallow buried trench) not closer than:

- 5 m to any structure
- 3 m to the property lines
- 15 m to a surface water body
- 15 m to a well cased to > 6 m depth
- 30 m to a well cased to < 6 m depth

If a raised filter bed is used, the allowable setbacks for the tile field must be increased by 2 m for each 1 m that the bed is elevated above the surrounding grades.

Assuming a sewage flow of 3,500 litres per day for a residential dwelling, a filter bed contact area of about 600 square metres would typically be required. Or, if a shallow buried trench system is installed, a total trench length of about 50 m will be required. Based on this, a typical shallow buried trench septic bed would cover about 130 square metres.

The final design and siting of all septic tile beds must be prepared by a qualified professional, to ensure the intent of the above recommendations is met, and to meet the requirements of the Ontario Building Code.

5.2 Tertiary Treatment System

A variety of tertiary treatment systems are currently approved for use under the Ontario Building Code. Discussions were held with a Southern Ontario manufacturer (Waterloo Biofilter) to confirm the expected level of nitrate removal which can be achieved. Information provided by Waterloo Biofilter is included in Appendix B. In summary, typical domestic sewage contains about 40 mg/L of nitrate. With the use of the Waterloo Biofilter, a reduction of the nitrate level in the treated effluent to about 15 mg/L is considered reasonable. It is noted that for the purposes of impact analysis, a conservative value of 20 mg/L of nitrate has been assumed, as described in Section 5.3 of this report.

The maintenance of the tertiary treatment systems can be regulated under the existing requirements of the Ontario Building Code, as outlined in Section 4.5.3 of this report. As noted, the OBC states that “No person shall operate a treatment unit other than a septic system unless the person has entered into an agreement whereby servicing and maintenance of the treatment unit and its related components by a person who ...is authorized by the manufacturer to service and maintain that type of treatment unit.”

The requirement for a tertiary treatment unit at each lot can be included in the subdivision agreement to further ensure that the systems are installed and maintained correctly. This can include registration on title, so that owners are aware of the requirement to maintain a service contract for the systems. Several developed residential subdivisions in Southern Ontario have this type of agreement in place. Examples of the subdivision agreements from three of these developments are included in Appendix B for reference.

It is concluded that the proposed tertiary treatment systems for the subject site can be maintained through existing regulatory mechanisms, and that little significant municipal involvement would be required to ensure that the proposed 12-lot subdivision does not create any adverse impact to the surrounding surface or ground water systems.

5.3 Impact of Sewage Disposal Systems on Shallow Ground Water Quality

The site will be serviced with individual tile field systems, which will be fitted with tertiary treatment units. Piped municipal water will be provided for water supply. The potential ground water impact of the sewage disposal from the tile fields was calculated assuming that tertiary treatment units were applied which would

allow for treatment of the sewage to a level of 20 mg/litre total nitrogen or less. The potential impact on the shallow ground water quality was then calculated using the Halton Guideline approach (but assuming that the nitrogen content of the sewage was 20 mg/litre as a result of tertiary treatment rather than 40 mg/litre for conventional septic tank systems which are considered in the Halton Guideline).

The Halton Guideline approach is used to assess the nitrate loading to the shallow aquifer based on the assumption that dilution occurs solely by infiltrating water. This approach is simplified and conservative, and over-estimates the actual nitrate loading in the ground water system. In this approach, it is assumed that:

- (i) No denitrification occurs in the ground water.
- (ii) The infiltrating rain water has a negligible nitrate content.
- (iii) There is no ground water flow or recharge from outside of the site which will dilute the sewage.

Based on the topography, soil type, and vegetative cover, an infiltration rate of 180 mm/yr is estimated into the shallow soil zone. This is equivalent to 12,400 m³ of infiltration per year over the approximate 6.88 ha property. An average of about 365 m³/annum of sewage will be produced by each lot, based on a flow of about 1,000 litres per day per dwelling. The sewage is expected to contain about 20 mg/L nitrate after tertiary treatment.

By means of a mass balance approach, the nitrate loading for the proposed development was evaluated based on three scenarios:

- Existing Lot Layout. The currently proposed development will consist of 12 residential lots. The estimated infiltration rate at the site is 180 mm/yr. Under these conditions, it is calculated that the nitrate in the effluent would be diluted to about 5.2 mg/litre.
- Maximum Lot Layout. Using the same variables as above (i.e. infiltration rate of 180 mm/yr, and 365 m³/annum of sewage per lot), the theoretical maximum number of lots was calculated for the development area. A theoretical maximum of 34 lots could be developed without exceeding the 10 mg/litre guideline limit.
- Region of Halton Maximum Lot Layout. The Region of Halton has suggested an infiltration rate of 125 mm/yr for the property. Based on this, the theoretical maximum number of lots for the property would be 23.

The actual lot size must also be governed by the area required to site the house envelope and tile field system. The Halton Guidelines require a minimum sewage system envelope of 700 m². On this basis, the minimum lot size will be approximately 3,000 sq.m. This minimum lot size will govern the development density, rather than the nitrate loading into the shallow ground water.

The above calculation assumes that all of the nitrate will reach the aquifer. This is the worst case scenario. The actual nitrate loading will be considerably lower since low permeability of the clayey silt till will limit the downward migration of nitrate to the lower ground water system.

As noted previously, regional ground water flow in the area is directed towards the south and west. The proposed development and the properties situated to the south are serviced with municipal piped water. Therefore, there are no existing or future users of the ground water resource in this immediate area. This indicates that the tile fields for the proposed development will not adversely affect local ground water supplies.

An updated door-to-door survey of all dwellings within 500 m will be required as part of final development approvals for the site. At that time, the location and nature of any remaining wells within 500 m of the site can be determined. However, based on the available information, there appear to be only two wells remaining downgradient or immediately adjacent to the site.

6.0 REQUIREMENTS FOR FURTHER STUDY

The results of the preliminary hydrogeologic evaluation indicate the following:

- (i) The site is not situated in a hydrogeologically-sensitive area, based on the Halton Aquifer Management Plan.
- (ii) The site is generally characterized by low permeability glacial till materials. These soils are suitable for the construction of septic tank and tile field systems. Fully raised filter beds or shallow buried trench systems will be required. Tertiary treatment units will be used at each lot.
- (iii) The site will be serviced with municipal piped water. Most of the immediately adjacent properties are currently serviced with municipal piped water.

Based on these considerations, it is feasible to develop the property with 12 lots serviced with individual septic systems. The following additional studies must be conducted as part of final approval and design of the development:

- (i) An updated door-to-door survey must be conducted to confirm the presence and nature of any remaining water wells within approximately 500 m of the site.
- (ii) Several monitoring wells must be installed at the site to assess shallow ground water quality, particularly with respect to nitrate concentrations.
- (iii) Test pits must be dug on each lot after site grading to confirm shallow soil conditions.
- (iv) The design and siting of the tile field systems must be conducted by a qualified professional, in accordance with the requirements of the Ontario Building Code. The use of tertiary treatment systems is recommended to achieve a total nitrogen concentration of 20 mg/litre in the sewage effluent. The use of tertiary treatment systems is in accordance with the Ontario Building Code and the Glen Williams Subwatershed Plan.

We trust this description is suitable for your present purposes. Should you have any questions regarding this matter, please do not hesitate to contact this office.

Yours truly,

Terraprobe Limited



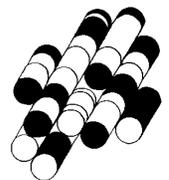
Serena Oyama, B.E.S., C.Tech.
Environmental Technician

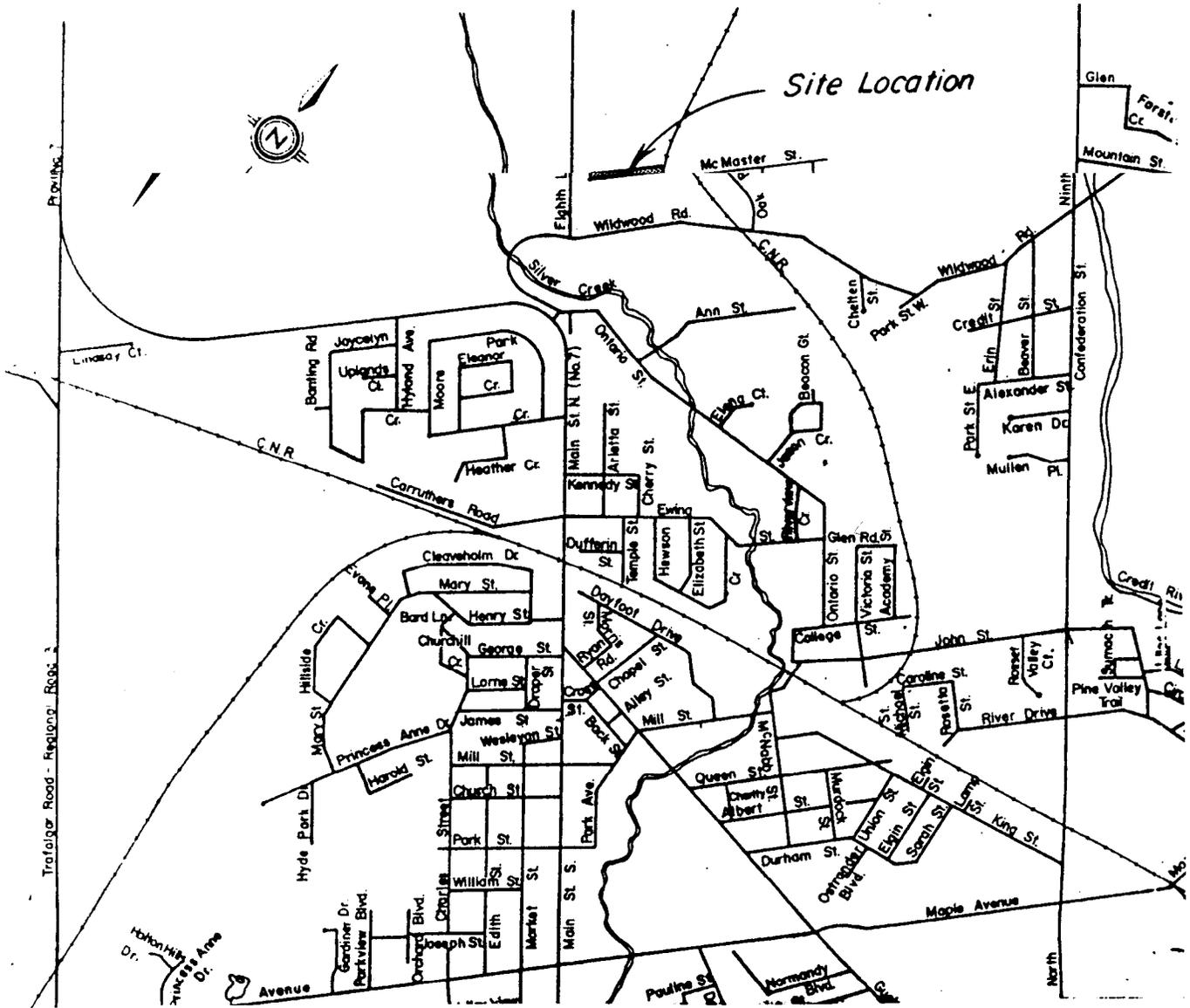


Paul W. Bowen, P.Geo., P.Eng.
Principal

FIGURES

TERRAPROBE LIMITED





SITE LOCATION PLAN



TERRAPROBE LIMITED

Job no. 91198
Scale N.T.S.
Date JULY 1991

FIGURE 1

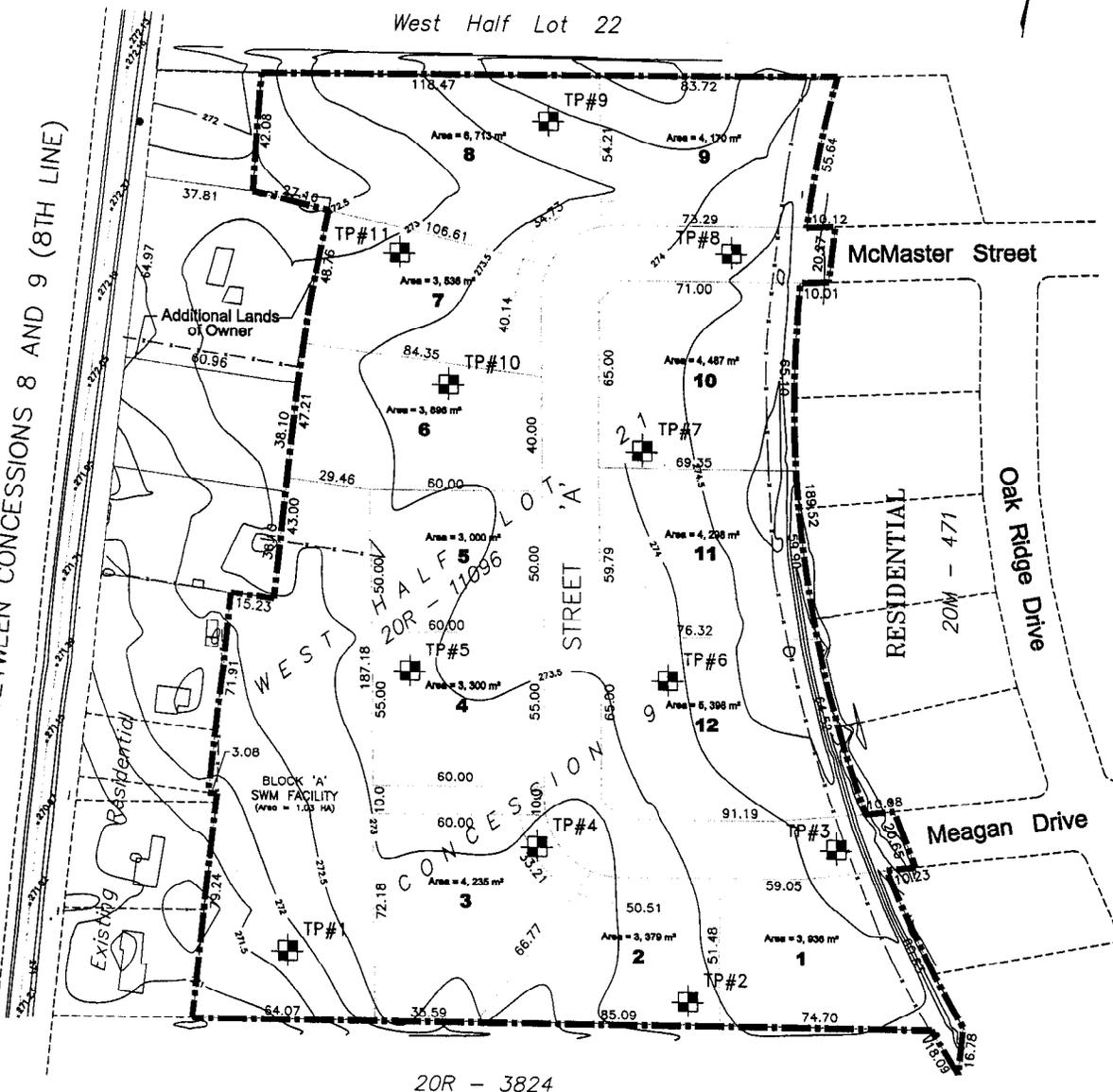
AGRICULTURAL

West Half Lot 22



ROAD ALLOWANCE BETWEEN CONCESSIONS 8 AND 9 (8TH LINE)

RESIDENTIAL



20R - 3824

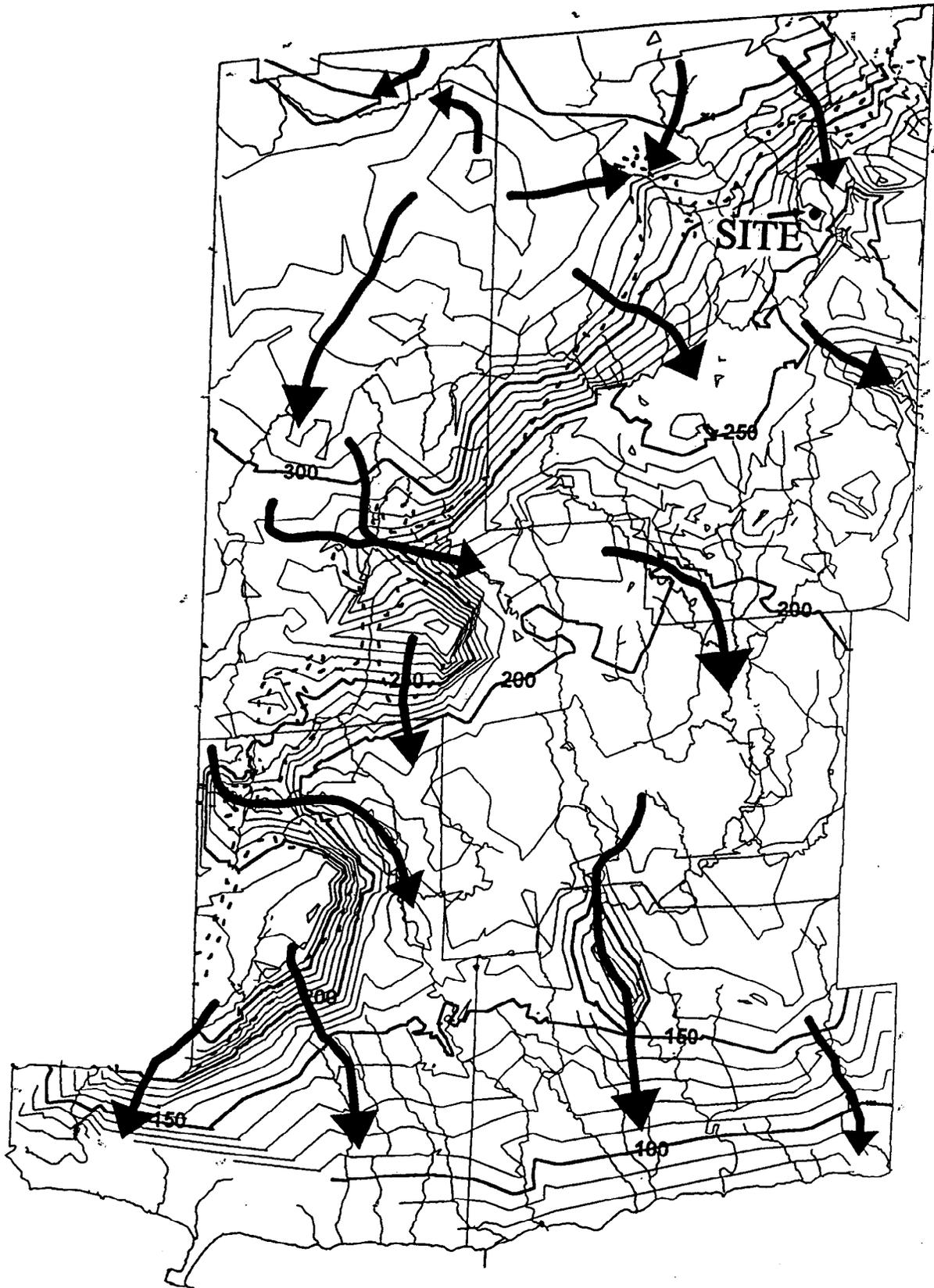
RESIDENTIAL

DRAFT PLAN OF SUBDIVISION
Part of West Half of Lot 21,
Concession 9
Hamlet of Glen Williams
Town of Halton Hills (Esquensing)

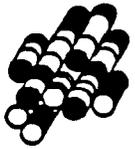
MacNaughton Hermesen Britton Clarkson Planning Limited
REGIONAL & URBAN PLANNING & RESOURCE DEVELOPMENT
DWG NO: H:\Y138\2002\NOVEMBER\181102_DRAFT_PLAN.DWG
DWG DATE: November 8, 2002



TEST PIT LOCATION PLAN



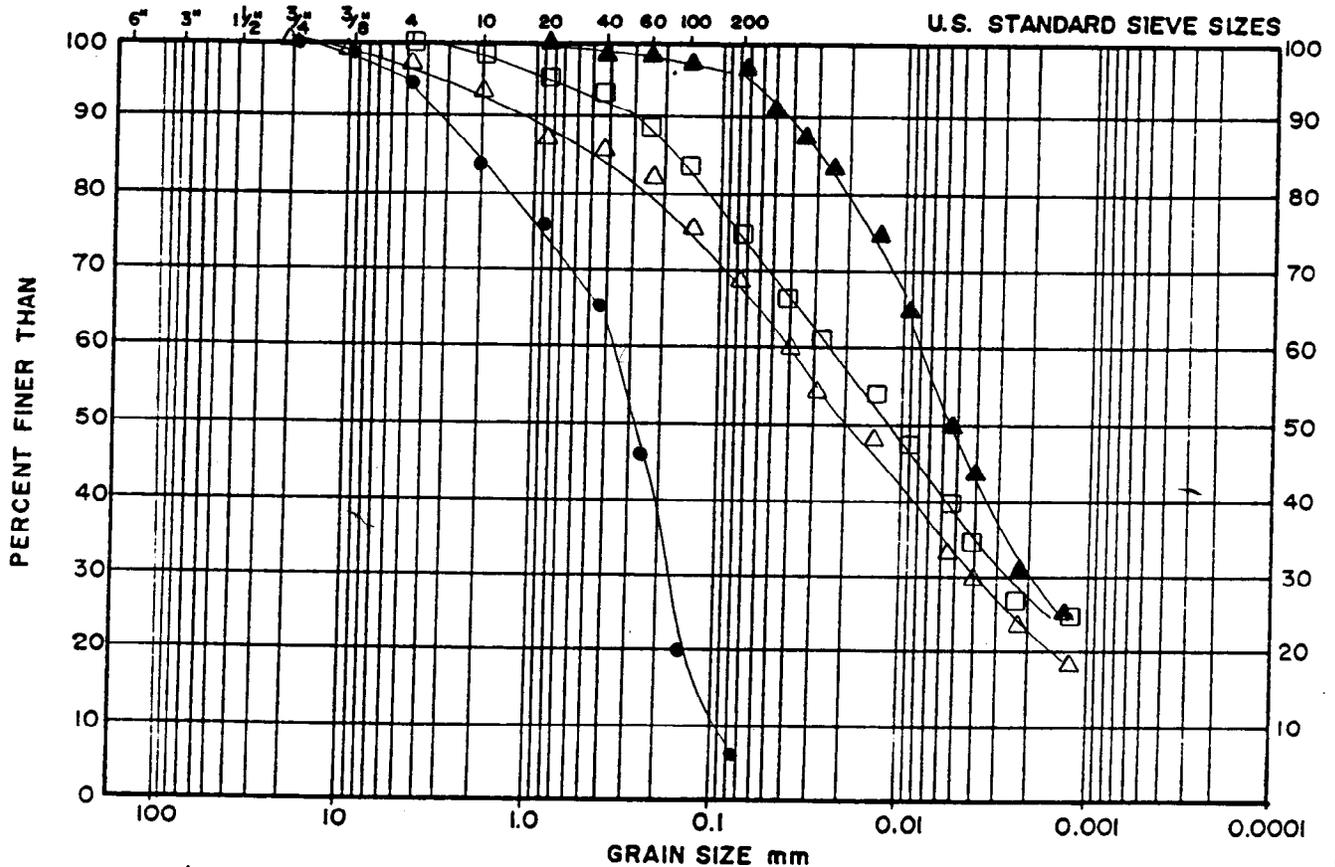
GENERALIZED SHALLOW GROUND WATER FLOW PATTERN
From Halton Aquifer Management Plan - Phase I - 1995



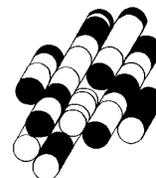
FILE N°: 91198

Fig. N° **4**

- TP 1 SA 2 1.7m Depth **FINE TO MEDIUM SAND**, trace gravel and silt
- △ TP 3 SA 1 1.0m Depth **SANDY SILT**, some clay, trace gravel **(TILL)**
- TP 4 SA 2 2.0m Depth **SANDY CLAYEY SILT** **(TILL)**
- ▲ TP 11 SA 1 1.3m Depth **CLAYEY SILT**, trace sand **(TILL)**



APPENDIX A



TERRAPROBE LIMITED

Table 1

WELL No.	CONCESSION ETC	WATER WELL DATA SYSTEM		UTM		DATE	DRILLER	INS	DIA OF WATER	KIND OF WATER	FOUND LVL FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TIME HR/MN	WATER USE	OWNER/LOG/SCREEN DEPTHS IN FEET TO WHICH FORMATIONS EXTEND	GROUND WATER BULLETIN REPORT
		LOT	WELL NO	EASTING	NORTHING													
20	CON	8	22	28- 584099 1262 4833897	975 11/64	4838	6	FR	11	10	43	6	3/00	ST	D0	LEIBOVICI FRIDA TPSL CLAY 0003 SNDS 0011	RED SHLE 0084	
21	CON	8	22	28- 584484 1263 4834551	900 04/65	1613	5	FR	4	30	5	2/00	D0			OTTEN FRITS TPSL 0001 BLDR CLAY 0020	RED SHLE 0062	
22	CON	8	22	28- 584443 1264 4834541	900 05/65	1613	5	FR	4	55	2	1/00	D0			HOFMAN JOHN TPSL 0002 RED CLAY BLDR 0017	RED SHLE	
23	CON	8	22	28- 584462 1265 4834346	900 06/65	1613	5	FR	63	12	35	5	1/30	D0		BUCKLE BRUCE TPSL 0002 BRWN CLAY 0032	RED SHLE 0065	
24	CON	8	22	28- 584512 1266 4834330	900 09/66	4101	5	FR	28	15	40	14	3/00	D0		SNDY JOE RED CLAY 0025	RED SHLE 0057	
25	CON	8	22	28- 584662 1267 4834239	900 09/66	4101	5	FR	35	8	40	20	4/00	D0		SKOK JONNY RED CLAY 0020	RED SHLE 0058	
26	CON	8	22	28- 584244 1268 4833816	950 08/67	1613	5	FR	61	11	17	5	1/00	D0		SEKULOVICH GEORGE TPSL 0001 RED CLAY 0009	BRWN CLAY BLDR	
27	CON	8	22	28- 584348 1269 4834452	900 09/67	1613	5	FR	32	5	34	5	24/00	D0		0028 RED SHLE 0072 OTTEN FRITS		
28	CON	8	22	28- 584600 2906 4834780	890 11/68	1612	5	FR	75	12	32	5	2/00	D0		TPSL 0001 RED CLAY 0029	RED SHLE 0064	
29	CON	8	22	28- 584550 2921 4834260	915 06/68	1612	5	FR	70	5	12	5	1/00	D0		TPSL 0001 RED BLDR CLAY 0036	RED SHLE	
30	CON	8	22	28- 584550 3251 4834200	915 10/69	3637	30	FR	12	8	12	20	/45	D0		VOROS JOHN PRDG 0005 RED SHLE BLDR 0015	RED SHLE	
31	CON	8	22	28- 584740 3397 4834340	910 04/70	4805	5	FR	45	12	15	3	2/00	D0		BLACK TPSL 0001 RED CLAY 0011	BRWN CLAY	
32	CON	8	22	28- 584633 4250 4834127	915 04/73	3349	5	FR	48	7	40	10	1/00	D0		MSND 0013 BRWN GRVL MSND 0016 HELLER SIDNEY BRWN CLAY BLDR 0019	RED SHLE 0065	
33	CON	8	22	28- 584320 4258 4833690	930 06/73	4805	5	FR	15	10	35	10	1/30	D0		HOGUE LOU BRWN TPSL 0001 RED CLAY BLDR 0028	RED SHLE 0052	
34	CON	8	22	28- 585140 4390 4834560	875 10/73	1660	5	FR	30	15	30	4	1/00	D0		MOORHEAD 6 TPSL 0002 RED SHLE 0081		
35	CON	8	22	28- 584348 4573 4834463	972 07/74	4320	4	FR	60	6	17	10	5/00	D0		TOWNEND P BRWN TPSL 0001 RED CLAY BLDR 0025	RED SHLE 0028	
36	CON	8	22	28- 584328 4574 4833673	940 07/74	4320	6	FR	60	8	75	5	2/00	PS	D0	WILGROVE DEVELOPMENT BRWN CLAY 0030	RED SHLE 0120	
37	CON	8	22	28- 583976 4750 4834010	985 06/75	4320	5	FR	45	5	90	3	1/00	C0		HALTON HILLS CHURCH RED SHLE 0118		
38	CON	8	22	28- 584700 5046 4834700	885 04/77	4820	6	FR	120	15	30	12	2/00	D0		PRINCIPATO ANGELO BRWN TPSL 0001 BRWN CLAY 0009	GREY SNDS	
39	CON	8	23	28- 583950 1270 4834050	980 09/48	4836	5	FR	44	6						0015 BLUE SHLE 0019	RED SHLE 0120	
																KACHMAR JOHN BRWN CLAY 0001	RED SHLE SNDS 0010	
																CLAY SAND 0024	RED SHLE 0095	
																PENSON F CLAY 0013 SNDS 0018	RED SHLE 0044	

Table 1

WATER WELL DATA SYSTEM 24 OCT 86

WELL No.	CONCESSION ETC	LOT	WELL NO	UTM EASTING	ELEV	DATE	DRILLER	INS	DIA OF WATER	CSG KIND	WATER FOUND	STAT LVL	PUMP LVL	TEST RATE	TEST TIME	WATER USE	DEPTH IN FEET TO WHICH FORMATIONS EXTEND	OWNER/LOG/SCREEN
				NORTHING	FEET				INS		FEET	FEET	FEET	GPM	HR/MN			
40	CON	8 23	28- 584147 1271 4834358	950 04/52	4838	5	FR	60	4	22	5	/30	D0				CORBETT R SNDS 0006 RED SHLE 0060	
41	CON	8 23	28- 583975 1272 4834088	975 08/52	4838	6	FR	63	12	30	1		D0				LANE W CLAY 0007 SNDS 0016 RED SHLE 0063	
42	CON	8 23	28- 583950 1273 4834060	980 08/52	4838	6	FR	42	10	10	10		CO				PENSON F CLAY GRVL 0024 RED SHLE 0042	
43	CON	8 23	28- 583650 1274 4834350	980 02/53	4838	5	FR	42	5	45	2		D0				DAVIDSON WILMER CLAY 0014 SNDS 0023 RED SHLE 0045	
44	CON	8 23	28- 583580 1275 4834410	985 07/53	4838	6	FR	20	5	45	2	/30	D0				BARCLAY D CLAY 0009 SNDS 0020 RED SHLE 0045	
45	CON	8 23	28- 583577 1276 4834446	975 11/54	4838	5	FR	42	42	54	3	1/30	D0				WHITTEE O FILL 0002 CLAY 0008 WHIT SNDS 0016 RED SHLE 0054	
46	CON	8 23	28- 583910 1277 4834120	985 03/55	4838	6	FR	42	5	10	5	2/00	D0				BALDWIN J CLAY 0006 SNDS 0011 SHLE 0019 RED SHLE 0055	
47	CON	8 23	28- 583970 1278 4834080	980 03/55	4838	6	FR	48	12	40	7	6/00	D0				KUX WALTER CLAY 0006 SNDS 0014 RED SHLE 0065	
48	CON	8 23	28- 584020 1279 4834010	980 03/55	4838	5	FR	42	12	35	3	2/00	D0				CORBETT H FILL 0005 SNDS 0011 RED SHLE 0065	
49	CON	8 23	28- 583092 1280 4834050	980 07/55	4838	6	FR	30	10	22	6	1/30	D0				FLETCHER BRWN CLAY 0012 RED SHLE 0066	
50	CON	8 23	28- 583970 1281 4834140	980 07/55	4838	6	FR	35	10	22	5	1/30	D0				FLETCHER RED CLAY 0005 RED SHLE 0067	
51	CON	8 23	28- 584090 1282 4834250	975 11/55	4838	6	FR	30	10	20	5	2/00	D0				FLETCHER FRED M BRWN CLAY 0005 RED SHLE 0057	
52	CON	8 23	28- 583610 1283 4834360	985 06/56	1430	4	FR	60	4	20	2		D0				BAILEY CEIL CLAY 0004 RED SHLE 0065	
53	CON	8 23	28- 583970 1284 4834140	980 08/56	4838	6	FR	42	12	21	7	2/00	D0				HOLMES CLARK BRWN CLAY 0006 CLAY STNS 0020 RED SHLE 0055	
54	CON	8 23	28- 583092 1285 4834050	984 06/57	4838	6	FR	54	6	30	5	2/00	D0				GOFTON JOHN BRWN CLAY 0013 SNDS 0022 RED SHLE 0070	
55	CON	8 23	28- 583970 1286 4834130	980 06/57	4838	6	FR	35	8	35	7	4/00	D0				STEINKE WALTER BRWN CLAY 0010 CLAY STNS 0020 SHLE 0031	
56	CON	8 23	28- 584050 1287 4834320	980 08/61	4838	6	FR	61	15	40	4	2/00	D0				PEEL W L BRWN CLAY 0012 RED SHLE 0060	
57	CON	8 23	28- 583810 1288 4834200	987 01/63	4101	6	FR	56	2	45	8	4/00	D0				BALDWIN JAMES BRWN CLAY 0004 RED MSND 0020 RED CLAY 0039 RED SHLE 0064	

GROUND WATER BULLETIN REPORT

Table 1

WATER WELL DATA SYSTEM 24 OCT 86

WELL NO.	CONCESSION ETC	LOT	WELL NO	EASTING	ELEV	DATE	DRILLER	INS	DIA	KIND	WATER FOUND	STAT LVL	PUMP LVL	TEST RATE	TEST TIME	WATER USE	DEPTHS IN FEET TO WHICH FORMATIONS EXTEND	OWNER/LOG/SCREEN	
58	CON	8 23	28- 584100 1289 4834500	945 05/63	1309	7	FR	58	12	70	2	3/00	D0	FOGAL C R	TPSL 0001	RED CLAY 0019	RED SHLE 0080		
59	CON	8 23	28- 584461 1290 4834911	900 06/63	1309	7	FR	23	8	27	5	5/00	CA	IRONSIDE G A	BLACK TPSL 0002	RED CLAY BLDR	GRVL 0019		
60	CON	8 23	28- 583602 1291 4834391	975 01/66	4838	5	FR	17	2	40	4	2/00	D0	VAN LIERE K	TPSL CLAY MSND 0005	CLAY 0007	SNDS 0016		
61	CON	8 23	28- 583736 1292 4834250	975 01/66	3316	5	FR	60	4	45	3	1/00	D0	JEHOVAH KINGDON HALL	MSND GRVL 0010	SNDS 0013	BLUE SHLE 0015		
62	CON	8 23	28- 584202 1293 4834387	975 02/65	4101	6	FR	41	18	50	10	2/30	D0	RED SHLE 0065	RED SHLE 0065				
63	CON	8 23	28- 583737 1294 4834410	950 10/66	4838	5	FR	45	10	40	15	1/30	IR	FINDLAY DOUG	RED CLAY 0018	RED SHLE 0055			
64	CON	8 23	28- 583951 1295 4834158	975 10/66	4838	5	FR	65	20	86	3	2/00	D0	GILS R	CLAY 0020	RED SHLE 0072			
65	C/M	8 23	28- 583930 2907 4834030	980 11/68	1612	6	FR	82	7	10	5	3/00	C0	ZENITH F00 AND DIE	CLAY 0005	SNDS 0013	RED SHLE 0086		
66	CON	8 23	28- 584400 3126 4835350	900 06/69	3413	30	FR	50	40	40	10	24/00	D0	PARK MOTORS	TPSL 0001	BRWN CLAY 0011	RED SHLE 0062		
67	CON	8 23	28- 584500 3154 4835280	900 06/69	1613	5	FR	DRY						CAMILLA DEVELOPMENTS	TPSL 0001	CLAY 0050	CSND 0055		
68	CON	8 23	28- 584300 3840 4835500	840 05/72	1815	6	FR	83	64	73	15	2/00	D0	CAMILLA DEVELOPMENTS	TPSL 0001	MSND GRVL	CLAY 0035		
69	CON	8 23	28- 584375 1317 4836243	975 10/74	4602	6	FR	55	50	69	2	2/00	D0	SENGA CONSTRUCTION	BRWN TPSL 0002	BRWN CLAY	STNS 0017	BLUE SHLE STNS 0047	RED SHLE 0088
70	CON	9 17	28- 587340 5127 4832800	770 06/68	4610	16	FR	45	16	45	900	20/00	MU	EMEN KEN	PRDG 0017	STNS GRVL 0025	LMSN 0062	BLUE SHLE 0072	
71	CON	9 20	28- 586525 1390 4835240	815 12/55	4838	6	FR	42	12	15	6	2/00	D0	TOMN OF GEORGETOWN	SAND GRVL CLAY 0045	SAND GRVL 0082	(S 0051 30)	RED SHLE 0094	
72	CON	9 20	28- 586640 1391 4834860	825 07/58	2904	6	FR	45						BARCLAY D	FILL 0003	GRVL STNS	CLAY 0025	RED SHLE 0047	
73	CON	9 20	28- 586900 1392 4834810	820 03/59	1718	7	FR	40	12	15	15	1/00	D0	VAN ALPHEN ANTHONY	BLUE CLAY 0038	QSNM 0040			
74	CON	9 20	28- 586500 1393 4834930	837 08/60	1307	30	FR	40	40	40	10		D0	MULLIN M	GRVL 0002	YLLW CLAY 0012	FSND 0036	STNS GRVL 0040	
75	CON	9 20	28- 586800 1394 4834650	795 06/61	4838	4	FR	85	40	75	3	2/00	D0	LUCAS J	BRWN TPSL 0005	GRVL 0010	BRWN CLAY	MSND 0040	GRVL 0050
76	CON	9 20	28- 586800 1395 4834880	767 03/62	3513	5	FR	25	8	16	8	4/00	D0	VAN ALPHEN TOM	PRDR 0028	MSND HPAN	GRVL 0077	RED SHLE 0126	
														HOFFER RUDOLF KREPPEN	BRWN CLAY 0001	GRVL STNS	0025		

Table 1

24 OCT 86

WATER WELL DATA SYSTEM

WELL No.	CONCESSION ETC	LOT	WELL NO	EASTING	ELEV	DATE	DRILLER	INS	WATER	CSG DIA	KIND OF	FOUND	STAT	PUMP	TEST	TEST	TEST	DEPTH	FORMATIONS	EXTEND	OWNER/LOG/SCREEN	
				NORTHING	FEET				FEET			FEET	FEET	LVL	RATE	TIME		IN FEET TO WHICH				
									FR			FR	FR	FEET	GPM	HR/MN	USE	TO WHICH				
77	CON	9 20	28- 586370 1396 4834810	812 05/62	4610	5	FR	96	70	134	1	8/00	D0					GOOLET DAVID				
78	CON	9 20	28- 586135 1397 4834660	867 06/62	4101	5	FR	105	70	192	1	8/00	D0					BRWN MSND CLAY BLD R 0031 GRVL MSND HPAN 0094 RED SHLE 0134 ASALEY HAROLD				
79	CON	9 20	28- 586780 1398 4834880	767 04/65	4838	5	FR	65	11	30	7	3/30	D0					BRWN CLAY 0040 HPAN 0078 BRWN MSND 0099 RED SHLE 0192 FOKKENS JACK				
80	CON	9 20	28- 586845 1399 4834800	765 06/67	1307	30	FR	9	9	5	5	D0						MSND 0005 BLD R GRVL 0035 GRVL CLAY 0050 RED SHLE 0078				
81	CON	9 20	28- 586400 2942 4834700	850 03/68	3414	6	FR	105	36	105	3	3/00	D0					GAMBELL T BRWN TPSL 0003 GRVL BLD R 0009 GRVL 0016 WOODWARD D				
82	CON	9 20	28- 586450 3139 4834980	775 08/69	2643	7	FR	70	23	64	3	2/00	D0					BRWN MSND 0018 CLAY 0040 SILT GRVL 0071 GRVL CLAY 0080 RED SHLE 0130				
83	CON	9 20	28- 586690 3149 4834830	775 06/69	1613	5	FR	41	12	18	10	4/30	D0					COOPER R G CLAY MSND BLD R 0044 RED SHLE 0074 STANDRUE INVESTMENTS				
84	CON	9 20	28- 586520 3331 4834920	775 08/69	4919	36	FR	10	5	24/	D0							BLCK TPSL 0002 BRWN CLAY 0017 BRWN CLAY MSND 0040 GRVL 0041				
85	CON	9 20	28- 586680 3499 4834800	800 11/70	1660	5	FR	37	12	25	10	1/00	D0					KIERS R BRWN MSND 0012 GREY MSND STNS 0015 COOPER G				
86	CON	9 20	28- 586630 3522 4834980	770 09/70	3637	30	FR	22	8	D0								BRWN TPSL 0001 CLAY BLD R 0025 BRWN MSND GRVL 0036 GRVL 0037				
87	CON	9 20	28- 586730 3556 4834880	800 06/71	1660	5	FR	30	7	20	6	1/00	D0					KUYF FRANK BRWN STNS MSND CLAY 0006 BRWN MSND 0015 BRWN CLAY STNS 0022 BRWN GRVL MSND 0029 WATSON JIM				
88	CON	9 20	28- 586660 3671 4834950	800 09/71	3349		FR	61	10	20	7	1/00	D0					BLCK TPSL 0001 BRWN CLAY BLD R 0015 GRVL CLAY 0029 GRVL 0030				
89	CON	9 20	28- 586240 3782 4834800	840 03/71	3637	30	FR	52	50	78	D0							LYN-WOOD CONST BRWN TPSL 0001 BRWN CLAY STNS 0046 RED SHLE 0065				
90	CON	9 20	28- 586355 3790 4834750	825 10/71	3349	5	SA	115	93	115	10	1/00						BOMBALL FRED BRWN TPSL 0001 BRWN CLAY 0005 BRWN FSND 0046 BRWN MSND STNS 0052 GREY CSND GRVL 0053 BRWN MSND 0057 GREY CLAY 0081 LYN-WOOD CONST				
91	CON	9 20	28- 586350 3791 4834748	825 11/71	3349	5												BRWN TPSL 0001 BRWN CLAY MSND 0030 BRWN MSND 0065 GREY FSND 0097 RED SHLE GRVL 0117				
92	CON	9 20	28- 586340 3792 4834750	825 12/71	3349	5	FR	90	60	90	6	1/00	D0					LYN-WOOD CONST BRWN TPSL 0001 BRWN CLAY MSND 0025 GREY FSND STNS 0093 RED SHLE GRVL 0120 LYN-WOOD CONST				
93	CON	9 20	28- 586575 3991 4835025	825 12/72	1660	6	FR	33	11	25	8	1/00	D0					BRWN TPSL 0001 BRWN CLAY STNS MSND 0031 GREY FSND 0090 BRWN MSND GRVL 0097 (S 0090 05) SWEDES H				
																		PRDG 0012 CLAY SAND 0030 SHLE 0035				

Table 1

WATER WELL DATA SYSTEM 24 OCT 86

GROUND WATER BULLETIN REPORT

WELL No.	CONCESSION ETC	LOT	WELL NO	EASTING NORTHING	ELEV	DATE	DRILLER	INS	DIA OF WATER	KIND	FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR/MN	USE	DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
94	CON	9 20	28- 3993	586550 4835200	800	12/72	1660	6	FR	36	11	28	8	1/00	D0		SCHTUAB A PRDG 0010 CLAY SAND 0034 SHLE ROCK 0038 LYNWOOD CONSTR BRWN TPSL 0001 BRWN SAND CLAY 0006 BLUE CLAY SILT 0011 BRWN MSND FSND 0012 GREY CLAY STNS 0013 BLCK CSND GRVL 0016 BRWN CLAY SAND 0027 REYNOLDS V BRWN SAND CLAY 0020 BRWN CLAY 0024 BRWN MSND FSND CSND 0063 LYNWOOD CONSTR BLCK TPSL 0001 BRWN CLAY 0004 BRWN SAND 0008 BRWN SAND 0012 BRWN CSND GRVL 0016 BLUE CLAY 0026 LORRIMAN B BRWN TPSL 0001 BRWN CLAY 0016 GREY SAND STNS 0022 GREY SAND 0028 GREY SAND SILT 0034 LORRIMAN B BLCK TPSL 0001 BRWN SAND MUCK 0003 BRWN CLAY 0013 BRWN CSND GRVL 0016 GREY CLAY SAND 0023 DIXON BRIAN BRWN CLAY SILT 0031 GREY CLAY STNS 0098 RED CLAY SHLE 0101 RED SHLE 0150 ALTEO CONST BRWN CLAY FILL 0003 BRWN SAND SILT 0006 BRWN CLAY GRVL 0012 BRWN GRVL 0019 BRWN SAND SILT 0025 RED SHLE 0035 ALDRICK CONST BLCK OBDN 0006 BRWN CSND STNS 0018 BRWN CGVL 0037 RED SHLE STNS 0040 RED SHLE 0090 REYNOLDS VERNE BRWN TPSL 0001 BRWN CLAY 0015 BRWN MSND FSND 0023 BRWN CLAY STNS 0029 BRWN FSND MSND 0041 DIXON B J BRWN TPSL 0001 BRWN CLAY 0019 BRWN MSND FGVL CGVL 0043 ALLEN C BLCK OBDN 0006 BRWN CSND STNS 0018 BRWN CGVL PGVL 0037 RED SHLE STNS 0040 RED SHLE 0090 HAYNES M BLCK OBDN STNS 0002 BRWN CGVL STNS 0015 BRWN CLAY 0045 BRWN CLAY STNS SHLE 0065 RED SHLE 0105 HAYNES M BLCK OBDN STNS 0002 BRWN CLAY 0045 BRWN CLAY STNS SHLE 0065 RED SHLE 0075
95	CON	9 20	28- 3998	586375 4834775	850	03/72	3637	30	FR	13	12	26	8	12/00	D0		
96	CON	9 20	28- 4001	586350 4834875	850	04/72	3637	30	FR	52	51	60			D0		
97	CON	9 20	28- 4055	586275 4834740	850	07/72	3637	30	FR	16	12	26	5	4/00	D0		
98	CON	9 20	28- 4125	586230 4834775	850	02/72	3637	30	FR	33	12	34	14	1/00	D0		
99	CON	9 20	28- 4129	586095 4834725	855	05/72	3637	30	FR	13	8	20	14	1/00	D0		
100	CON	9 20	28- 4571	586187 4834761	850	07/74	4320	4	FR	140	90	150	3	1/00	D0		
101	CON	9 20	28- 4864	586396 4835196	775	05/76	4602	6	FR	12	7	9	12	1/00	D0		
102	CON	9 20	28- 4959	586650 4835000	775	11/76	2332	5	FR	55	9	28	5	1/30	D0		
103	CON	9 20	28- 4988	586050 4834750	860	07/76	3637	30	FR	22	25	41	12	1/00	D0		
104	CON	9 20	28- 4989	586100 4834750	850	07/76	3637	30	FR	25	23	42	30	2/00	D0		
105	CON	9 20	28- 5182	586540 4835080	745	11/77	2332	5	FR	55	9	26	5	1/15	D0		
106	CON	9 20	28- 5183	586500 4834940	770	07/77	2332	5	FR	70	39	43	6	1/30	D0		
107	CON	9 20	28- 5184	586460 4834960	770	07/77	2332	5	FR	70	37	40	10	1/30	D0		

Table 1

WATER WELL DATA SYSTEM 24 OCT 86

WELL No.	CONCESSION ETC	LOT	WELL NO	EASTING	ELEV	DATE	DRILLER	DIA OF INS	KIND OF WATER	FOUND FEET	WATER STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR/MN	WATER USE	DEPTHS IN FEET TO WHICH FORMATIONS EXTEND		OWNER/LOG/SCREEN
																CSG	FORMATIONS EXTEND	
108	CON	9 21	28- 58525	1400 4835235	765 06/52	4838	4	FR	75	30	30	20	2/00	D0				KIRBY V MSND 0030 GRVL CLAY 0061 RED SHLE 0080
109	CON	9 21	28- 585320	1401 4834635	890 07/52	4838	5	FR	65	11	22	5	1/30	D0				MILLER R CLAY 0018 RED SHLE 0065
110	CON	9 21	28- 585695	1402 4834265	850 06/56	4838	6	FR	35	12	53	4	1/30	D0				LORRIMAN BENNY GRVL STNS CLAY 0015 RED SHLE 0053
111	CON	9 21	28- 586120	1403 4835650	830 07/56	4838	4	FR	82	60	87	1	1/30	D0				KIRBY MERVIN MSND 0010 GRVL CLAY 0040 MSND QSND 0070
112	CON	9 21	28- 585700	1404 4834175	855 08/56	4838	6	FR	80	50	105	4	1/30	D0				RED SHLE 0087 LARSON STEVE
113	CON	9 21	28- 585445	1405 4834520	885 10/60	4838	6	FR	42	21	106	2	1/00	D0				TPSL 0002 CLAY GRVL 0020 RED SHLE 0105 MILLER ERNEST
114	CON	9 21	28- 585825	1406 4834525	880 07/61	1325	30	FR	106	20	20							RED CLAY 0005 RED SHLE 0111
115	CON	9 21	28- 585620	1407 4834290	875 10/61	4101	5	DRY										MCKEOWN RALPH BRWN CLAY MSND 0020 GRVL 0027
116	CON	9 21	28- 585645	1408 4834340	880 04/62	4101	5	DRY										CARLTON F RED CLAY 0031 RED SHLE 0157
117	CON	9 21	28- 585640	1409 4834335	880 04/62	4101	5	FR	54	30	58	3	5/00	D0				CARLTON F BRWN CLAY 0020 RED SHLE 0104
118	CON	9 21	28- 585090	1410 4835300	900 09/62	1613	4	DRY										CARLTON J F BRWN CLAY 0030 RED SHLE 0071
119	CON	9 21	28- 585950	1411 4834790	880 05/64	1325	30	FR	31	31	36	1	1/00	D0				HENDERSON J PRDG 0040 RED SHLE 0122
120	CON	9 21	28- 585420	1412 4834700	887 08/67	1325	30	FR	30	15	29	1	1/30	ST D0				INGLIS JEARL BRWN CLAY MSND 0020 BRWN MSND 0037 RED CLAY MSND 0038
121	CON	9 21	28- 585800	2959 4834520	875 10/68	1307	30	FR	45	45	45							DAVISON LLOYD TPSL 0001 BRWN CLAY BLDR 0012 RED SHLE 0032
122	CON	9 21	28- 585700	3357 4834400	860 04/70	3637	30	FR	16	15	40							MURRAY ANDREW BRWN TPSL MSND 0020 GREY CLAY 0045 GRVL 0047 GREY CLAY 0065
123	CON	9 21	28- 586400	3574 4835360	770 02/70	2517	8	FR	4	4	16	2	4/00					GRAHAM GORDON BRWN CLAY MSND STNS 0010 BRWN MSND GRVL 0022 BRWN CLAY STNS 0042
124	CON	9 21	28- 585580	3713 4834300	875 07/71	1660	6	FR	80	38	70	6	1/00	D0				OWRC GLEN WILLIAMS BRWN CLAY STNS 0003 BRWN MSND STNS 0010 BRWN MSND GRVL SILT 0016 (S 0013 04) GRVL SILT 0020 GREY SHLE 0021
125	CON	9 21	28- 586500	3788 4835225	825 03/72	3349	5	FR	44	4	4	8	1/00	D0				D'ENTREPOINT DEL BLCK TPSL 0001 BRWN CLAY STNS 0018 RED SHLE 0084
126	CON	9 21	28- 586525	3789 4835175	825 01/72	3349	5	FR	48	5	30	8	1/00	D0				ALEXANDER A BRWN TPSL 0001 BRWN CLAY BLDR SAND 0025 RED SHLE GRVL 0050 ALEXANDER A BRWN TPSL 0001 BRWN CLAY BLDR 0026 RED SHLE GRVL 0050

Table 1

WATER WELL DATA SYSTEM 24 OCT 86

GROUND WATER BULLETIN REPORT

WELL No.	CONCESSION ETC	LOT	WELL NO	EASTING	ELEV	DATE	DRILLER	DIA OF WATER	KIND	WATER FOUND	STAT LVL	PUMP LVL	TEST RATE	TIME	WATER USE	DEPTH IN FEET	WHICH FORMATIONS EXTEND	OWNER/LOG/SCREEN
144	CON	9 22	28- 585970	2908 4835800	850 08/68	4919	36	FR		18	18				D0			HARTWICK J
145	CON	9 22	28- 585950	3848 4835800	875 09/71	2643	7	FR		102	60	95	6	2/00	D0			TPSL MSND 0004 MSND 0028
146	CON	9 22	28- 586100	4259 4835700	850 04/73	1660	5	FR		66	35	55	7	1/00	D0			REYNOLDS R
147	CON	9 23	28- 585181	1421 4834752	875 05/63	4101	6	SA		84	40	80	4	5/00	D0			QSNL 0063 RED SHLE 0104
148	CON	9 23	28- 585350	2973 4836350	880 07/68	1307	30	FR		24					D0			PRDG 0035 SAND 0065 GRVL 0066
149	CON	9 23	28- 585330	3172 4836440	880 08/69	4919	36	FR		31	10	20	1/30	D0				ARMSTRONG LIOEL
150	CON	9 23	28- 585650	3865 4836100	850 06/72	3349	5	FR		76	34	92	4	1/00	D0			GRVL 0020 BLDR 0030 GRVL 0064 GRVL MSND
151	CON	9 23	28- 584720	5112 4835200	970 09/77	4602	6	FR		34	34	60	1	3/00	D0			0074 RED CLAY 0079 RED SHLE 0084
152	CON	9 23	28- 584600	5222 4835300	900 11/76	4602	6	FR		49	49	62	6	3/00	D0			WAGSTAFF JOHN
153	CON	9 23	28- 585640	5776 4836140	870 03/81	4868	30	FR		16	33	45	1	7/15	D0			BRMN TPSL MSND 0020 RED SHLE 0024
154	CON	9 23	28- 584640	5818 4835380	860 01/82	3637	30	FR		34	34	10	1/00	D0				EVAN OWEN
155	CON	9 24	28- 584797	1422 4835110	900 10/64	4838	6	FR		36	15	55	8	2/00	IR			BRMN TPSL 0003 BRMN CLAY MSND 0031 BRMN
156	CON	9 24	28- 584845	3667 4836790	880 07/71	3349	5	FR		46	FLW	10	7	1/00	D0			CSND 0039
157	CON	9 24	28- 584830	3668 4836830	880 08/71	3349	5	FR		51	5	7	1/00	D0				BELL A
158	CON	9 24	28- 584930	3669 4836800	880 08/71	3349	5	FR		68	18	7	1/00	D0				BLCK TPSL 0001 BRMN CLAY STNS SAND 0028

Table 1

GROUND WATER BULLETIN REPORT

WELL No.	CONCESSION ETC	LOT	WELL NO	UTM EASTING	ELEV	DATE	DRILLER	INS	WATER DIA OF	KIND	WATER FOUND	STAT LVL	PUMP LVL	TEST RATE	TEST TIME	WATER HR/MN	USE	DEPTHS IN FEET TO WHICH FORMATIONS EXTEND	OWNER/LOG/SCREEN FORMATIONS EXTEND
159	CON	9 24	28- 3670	584795 4836830	875	08/71	3349	5	FR		52	12	17	7	1/00	D0		LYN-MOOD CONST BRWN TPSL 0001 BRWN CLAY STNS 0011 SHLE 0055 SAN ANN DEVELOPMENTS BRWN TPSL 0003 BRWN CLAY 0009 0054 CAMPBELL H BRWN TPSL 0001 BRWN CLAY STNS 0008 SAND 0013 RED SAND STNS 0017 CLAY 0028 BLCK MSND 0029 LANG W	RED SHLE BRWN CLAY STNS 0011 RED SHLE BRWN CLAY 0009 RED SHLE BRWN CLAY STNS 0008 RED SAND STNS 0017 RED CLAY 0030 RED CLAY 0030
160	CON	9 24	28- 3889	584900 4836850	900	08/72	1815	6	FR		12	8	51	2	2/00	D0			
161	CON	9 24	28- 4689	584831 4836925	900	12/74	3637	30	FR		28	11	19	7	1/00	D0			
162	CON	9 24	28- 5042	585050 4836700	875	04/77	2918	6	SA		99	15	72	2	2/30	ST D0			
163	CON	10 18	28- 1467	588292 4835195	850	08/66	1307	30	FR		60	30	10	10		D0			
164	CON	10 18	28- 2966	588350 4835200	850	06/68	1307	30	FR		50	15				D0			
165	CON	10 18	28- 2968	588320 4835150	850	06/68	1307	30	FR		54	15				D0			
166	CON	10 18	28- 3389	588400 4835240	825	07/70	1307	30	FR		46	20	42	2	1/00	D0			
167	CON	10 18	28- 3390	588320 4835170	820	07/70	1307	30	FR		55	20	52	2	1/00	D0			
168	CON	10 19	28- 3391	587950 4835740	850	06/70	1307	30	FR		32	12	30	4	1/00	D0			
169	CON	10 19	28- 3839	586350 4835875	825	05/72	1815	6	MN SA		85 100	63	85	1	4/30	D0			
170	CON	10 20	28- 1468	586690 4835179	750	10/64	4838	5	FR		45	10	12	15	1/45	D0			
171	CON	10 20	28- 1469	586814 4835053	750	07/67	2519	30	FR		13 21	13	23	3		D0			
172	CON	10 20	28- 3575	586640 4835320	765	02/70	2517	8	FR		10 18	13				D0			
173	CON	10 20	28- 5006	586900 4835000	750	10/76	1660	6	FR		41	7	32	5	2/00	D0			
174	CON	10 21	28- 1470	586615 4835360	790	09/49	4838	4	FR		17	17	15			PS			
175	CON	10 21	28- 1471	586145 4835715	835	01/50	4830	5	FR		90	35	5			D0			

Table 1

WATER WELL DATA SYSTEM 24 OCT 86

GROUND WATER BULLETIN REPORT

WELL No.	CONCESSION ETC	LOT	WELL NO	UTM EASTING	ELEV	DATE	DRILLER	CSG DIA	KIND OF WATER	INS	WATER FEET	FOUND LVL	STAT LVL	PUMP LVL	TEST RATE	TEST TIME	WATER USE	DEPTH IN FEET TO WHICH FORMATIONS EXTEND	OWNER/LOG/SCREEN
176	CON	10 21	28- 999999 1472 9999999	12/50	4838	FR	68	37	37	10	D0	MINO ANDREW PRDG 0037 MSND 0050	RED SHLE 0068						
177	CON	10 21	28- 586480 1473 4835450	770 04/53	4838	4 MN	63	10	15	5	D0	BEAUMONT ARTHUR MSND 0010 GRVL CLAY 0041	RED SHLE 0065						
178	CON	10 21	28- 586500 1474 4836160	785 03/55	4838	6 FR	72	35	40	7	4/00 D0	HAINES ROLAND BLUE CLAY 0020 MSND CLAY 0050	GRVL CLAY 0058 RED SHLE 0085						
179	CON	10 21	28- 586640 1475 4835585	800 04/55	4838	4 FR	80	55	100	1	2/30 D0	HAYES PHILIP TPSL 0001 MSND 0015 MSND CLAY 0045	QSND 0069 RED SHLE 0100						
180	CON	10 21	28- 586240 1476 4835800	910 07/56	4838	4 FR	72	40	42	10	1/30 D0	COOPER G GRVL CLAY 0030 MSND 0046	GRVL STNS CLAY 0051 RED SHLE 0080						
181	CON	10 21	28- 586165 1477 4835740	830 10/56	4838	4 FR	66	28	40	5	2/30 D0	HAINES TOM MSND 0007 CLAY GRVL 0040	QSND 0058 RED SHLE 0078						
182	CON	10 21	28- 586760 1478 4835800	825 05/57	2904	6 FR	115	58	110	2	8/00 D0	MILLER J L BRWN MSND 0042 HPAN 0044 MSND 0053	HPAN 0058 MSND 0074 HPAN STNS 0078	RED SHLE 0119					
183	CON	10 21	28- 586500 1479 4835580	765 08/60	4838	6 FR	45	15	20	10	5/00 PS	GLEN WILLIAMS SCHOOL CLAY 0010 GRVL CLAY 0020 MSND	GRVL 0030 GRVL 0042 RED SHLE 0062						
184	CON	10 21	28- 586635 1480 4835730	770 07/61	1308	30 FR	12	12		1	8/00 PS	GLEN UNITED CHURCH GRVL 0006 MSND 0009	BLUE CLAY MSND 0021						
185	CON	10 21	28- 586845 1481 4835750	820 03/65	1908	4 SA	160	73	180	1	20/00 D0	SCHIPPER ED MSND 0093	RED SHLE 0190						
186	CON	10 21	28- 586580 1482 4835825	775 05/66	1308	30 FR	6	6	15	2	1/00 D0	ST ALBANS CHURCH TPSL 0001 GRVL BLDL	0017						
187	CON	10 21	28- 586270 1483 4836005	805 05/66	1613	5 FR	88	48	53	1	3/00 D0	HAMMER FRED TPSL 0002 GRVL MSND CLAY 0037	BLUE CLAY 0042 GREY FSND 0045 BRWN CLAY GRVL 0072						
188	CON	10 21	28- 586545 1484 4835935	775 03/67	1613	FR	31	11	24	3	1/00 D0	REDSHLE 0119 IBBOTSON FRED	PRDG 0014 GRVL MSND 0020	RED SHLE 0034					
189	CON	10 21	28- 586540 1485 4836205	790 09/67	1104	6 FR	15	31	65	3	4/00 D0	HAINES ROLAND TPSL 0004 BLDL GRVL 0012 MSND 0015	GRVL 0039 MSND 0073 (S 0069 04)	RED SHLE 0074					
190	CON	10 21	28- 586350 1486 4835790	820 11/67	1613	5 FR	86	49	57	6	2/00 D0	NEUTEL ALBERT GRVL 0046 MSND CLAY 0058	RED SHLE 0090						
191	CON	10 21	28- 586300 2909 4835930	810 04/68	1612	5 FR	91	50	76	5	2/00 D0	EAKINS ORN TPSL 0001 BRWN CLAY MSND	GRVL 0059						
192	CON	10 21	28- 586350 2910 4835900	810 04/68	1612	5 FR	92	49	56	5	3/00 D0	SHLE 0096 CAMPBELL G H	TPSL 0001 CLAY STNS GRVL 0012	GRVL MSND 0034					
193	CON	10 21	28- 586200 2943 4835700	825 08/68	3414	6 FR	63	47	80	3	2/00 D0	WULF G YLLW GRVL CLAY 0009	GRVL CLAY 0041 MSND 0058	RED SHLE 0085					

GROUND WATER BULLETIN REPORT

Table 1

WATER WELL DATA SYSTEM 24 OCT 86

WELL No.	CONCESSION ETC	LOT	UTM WELL EASTING NO	UTM NORTHING	ELEV	DATE	DRILLER	INS	DIA OF WATER	CSG KIND	WATER FOUND FEET	STAT LVL	PUMP LVL	TEST RATE FEET	TEST TIME GPM	OWNER/LOG/SCREEN DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
194	CON	10 21	28- 2969	586500 4835650	770	08/68	1307	30	FR	30	8					COMPTON WAYNE BRWN CLAY MSND 0018 RED SHLE 0030
195	CON	10 21	28- 2997	586250 4835630	800	09/68	1612	5	FR	85	58	80	3	1/30	DO	TOMLINSON GEORGE TPSL 0002 MSND CLAY GRVL 0067 RED SHLE 0090
196	CON	10 21	28- 2998	586130 4835800	835	07/68	1612	5	FR	85	45	54	5	2/00	DO	SQUIRES JOHN TPSL 0001 BRWN MSND GRVL CLAY 0054 RED SHLE 0090
197	CON	10 21	28- 3151	586350 4835710	800	06/69	1613	5	FR	78	48	63	3	3/00	DO	WULF GUNTHER TPSL 0001 BRWN CLAY 0019 BRWN MSND 0048 GRVL MSND 0050 BRWN MSND 0057 RED SHLE 0085
198	CON	10 21	28- 3273	586270 4835880	825	12/69	1613	5	FR	88	42	82	2	1/00	DO	PUCKERING D BRWN CLAY MSND 0027 BRWN MSND STNS 0060 RED SHLE 0092
199	CON	10 21	28- 3298	586250 4835630	775	10/69	1612	5	FR	91	48	85	3	1/00	DO	BRIANT D BRWN TPSL 0001 BRWN GRVL MSND 0033 BRWN MSND STNS 0065 RED SHLE 0091
200	CON	10 21	28- 3405	586260 4835900	835	04/70	1660	5	FR	84	38	76	6	1/00	DO	WULF G BRWN TPSL 0001 BRWN CLAY GRVL 0061 RED SHLE 0087
201	CON	10 21	28- 3572	586580 4836050	775	02/70	2517	8	FR	17	7	17	2	1/00		OMRC GLEN WILLIAMS BRWN CLAY STNS 0003 BRWN CLAY BLDG 0006 MSND BLDG GRVL 0010 GRVL 0013 GRVL FSND 0014 MSND GRVL CLAY 0017 RED CLAY SHLE 0020
202	CON	10 21	28- 3573	586550 4835870	775	02/70	2517	8	FR	22	16					OMRC GLEN WILLIAMS BRWN CLAY STNS 0006 BRWN CLAY MSND STNS 0013 BRWN MSND GRVL SILT 0022 RED CLAY MSND SILT 0025
203	CON	10 21	28- 3714	586230 4835635	800	07/71	1660	5	FR	71	30	63	6	1/00	DO	WULF GUNTHER BRWN TPSL 0001 BRWN CLAY GRVL 0032 GRVL MSND 0069 RED SHLE 0073
204	CON	10 21	28- 4014	586350 4835825	825	09/72	3637	30	FR	36	36	43	4	72/00	DO	PERROTTA N BRWN MSND 0004 BRWN CLAY 0007 BRWN MSND FSND 0038 BLUE CLAY 0040 RED SHLE 0045 HAINES ROLAND
205	CON	10 21	28- 4196	586700 4835740	800	06/73	1570	6	FR	97	72	95	5	2/30	DO	BRWN SAND 0076 HPAN 0096 GRVL 0098
206	CON	10 21	28- 4447	586330 4835958	815	04/73	3637	30	FR	45	44	58	7	1/00	DO	HAINES T GREY FILL 0001 BRWN CLAY SAND 0012 RED SAND 0016 BRWN FSND MSND 0026 BRWN SAND STNS GRVL 0045 GREY SAND MUCK 0048 BRWN SAND CLAY 0050 BRWN MSND FSND CSND 0062 KIRBY T
207	CON	10 21	28- 4466	586207 4835849	830	07/73	3637	30	FR	35	10	35	10	1/00	DO	BRWN TPSL 0001 BRWN SAND STNS GRVL 0042
208	CON	10 21	28- 4781	586408 4835901	800	06/75	4320	5	FR	90	100	8	/10	DO		NORTON LESLIE BRWN CLAY STNS 0016 BRWN GRVL 0031 GREY CLAY STNS 0062 RED SHLE 0105
209	CON	10 21	28- 5192	586340 4835920	790	04/77	4320	6	FR	147	40	10	2/00	DO		SHERIDAN NURSURIES BRWN GRVL 0025 BRWN HPAN SMDY 0055 RED SHLE 0149

GROUND WATER BULLETIN REPORT

Table 1

WATER WELL DATA SYSTEM 24 OCT 86

WELL No.	CONCESSION ETC	LOT	WELL NO	UTM EASTING	ELEV	DATE	DRILLER	INS	DIA OF WATER	KIND	FOUND FEET	STAT FEET	PUMP LVL	TEST RATE GPM	TEST TIME HR/MN	WATER USE	DEPTHS IN FEET TO WHICH FORMATIONS EXTEND	OWNER/LOG/SCREEN
210	CON	10 21	28- 586300 5195 4835780	795 06/77	4320	6	FR	135	40	2	2/00	D0					BRWN FSD 0005 BRWN SAND GRVL STNS 0020 BRWN FSD 0026 BRWN SAND GRVL STNS 0030 BRWN CLAY SAND GRVL 0038 RICCIUTO D GRVL STNS 0010 BRWN CLAY SNDS 0051 CLAY STNS 0066 GRVL 0071 (S 0067 03) TER HUIZEN L	PARKER HELEN STNS CLAY 0054 RED SHLE 0135 FOX F
211	CON	10 21	28- 586150 5284 4835750	825 09/77	4640	30	FR	30	30	6	1/00	D0						
212	CON	10 21	28- 586700 5306 4835650	800 11/78	3317	5		67	50	60	5	5/00	D0					
213	CON	10 21	28- 586550 5384 4836200	800 09/77	4640	30	FR	41	41	2	1/00	D0						
214	CON	10 21	28- 586820 5481 4835720	810 12/79	4868	6	FR	59	42	48	7	1/00	D0					
215	CON	10 21	28- 586260 5609 4835820	800 01/81	1413	5	FR	85	29	58	7	2/30	D0					
216	CON	10 21	28- 586600 5766 4835540	800 06/81	4868		SA	69	7	10	1/00	C0						
217	CON	10 21	28- 586900 5774 4835360	830 03/81	3637		SA	104										
218	CON	10 22	28- 999999	12/50	4838	5												
219	CON	10 22	28- 586125	910 03/52	4838	4	FR	94	30	55	5	1/30	D0					
220	CON	10 22	28- 585935	845 04/53	4838	4	FR	84	30	35	5	D0						
221	CON	10 22	28- 585820	850 04/54	4838	4	FR	72	30	95	1	1/00	D0					
222	CON	10 22	28- 585900	840 05/54	4838	4	SA	63	32	85	1	D0						
223	CON	10 22	28- 586095	840 01/56	1718	6	FR	72	14	45	5	24/00	D0					
224	CON	10 22	28- 586030	837 03/56	1718	6												

FILL 0005 CLAY MSND 0026 BLUE CLAY 0052
RED CLAY MSND STNS 0071 SILT 0075 FSND
0085 RED SHLE 0150

Table 1

WATER WELL DATA SYSTEM 24 OCT 86

GROUND WATER BULLETIN REPORT

WELL No.	CONCESSION ETC	LOT	WELL NO	EASTING	ELEV	DATE	DRILLER	INS	WATER	CSG DIA	KIND OF WATER	FOUND FEET	STAT LVL	PUMP LVL	TEST RATE	TEST TIME	WATER USE	DEPTH IN FEET TO WHICH FORMATIONS EXTEND	OWNER/LOG/SCREEN FORMATIONS EXTEND
				UTM	FEET							FEET	FEET	FEET	GPM	HR/MN	DO		
225	CON	10 22	28- 1494	999999	07/56	4838	4	FR	48	28	28	15	2/00	D0				ROBSON A E	CLAY 0005 MSND 0020 CLAY GRVL 0026 RED SHLE 0063
226	CON	10 22	28- 1495	585725	03/58	4838	6	FR	61	35	50	5	2/00	D0				HAINES THOMAS	GRVL STNS CLAY 0035 MSND 0064 GRVL CLAY 0069 RED SHLE 0097
227	CON	10 22	28- 1496	585925	07/58	1718	6	FR	42	6	24	2	2/00	D0				MULLEN P	TPSL 0001 YLLM CLAY 0015 RED CLAY 0017 RED SHLE 0042
228	CON	10 22	28- 1497	586110	07/60	4101	5	FR	72	30	45	6	8/00	D0				NORTON STAN	BRWN CLAY 0005 GRVL BLDR 0062 FSND 0067 RED SHLE 0096
229	CON	10 22	28- 1498	586110	12/60	2904	5	FR	73	47	104	1	3/00	D0				NORTON BROTHERS	PRDR 0096 RED SHLE 0106 PERCY DANCE L COOMBS
230	CON	10 22	28- 1499	586545	02/62	3514	5	FR	100	35	60	4	3/00	D0				BRWN CLAY 0003 GREY CLAY MSND 0064 RED SHLE 0110	CUTHBERT EARL
231	CON	10 22	28- 1500	585865	09/62	1309	7	FR	38	29	35	2	6/00	D0				TPSL GRVL 0004 CLAY GRVL 0013 BRWN CLAY 0023 CLAY MSND 0034 MSND SILT 0038 MSND GRVL 0041	MCGOWAN W J
232	CON	10 22	28- 1501	585950	10/62	1307	30	FR	40	30		1	D0					BRWN TPSL CLAY 0008 BRWN MSND GRVL 0015 RED CLAY 0040 GRVL 0045	BRANDFORD L
233	CON	10 22	28- 1502	586595	01/65	1307	30	FR	50	45	2		IR					BRWN TPSL 0004 BRWN MSND 0018 BRWN CLAY 0021 BRWN MSND 0058 GRVL 0060	MCGOWAN BILL
234	CON	10 22	28- 1503	586680	01/65	1307	30	FR	39	22	1		D0					BRWN TPSL CLAY 0008 GRVL 0012 BRWN MSND 0022 GREY CLAY 0036 GRVL 0039 RED SHLE 0040	KNITTING BEAUMONT
235	CON	10 22	28- 1504	586365	12/65	1325	42	FR	8	6	14	2	/30	IN				BRWN CLAY BLDR 0006 GRVL 0010 RED SHLE 0016	ZORGE JOHN
236	CON	10 22	28- 1505	586660	05/67	3512	5	FR	148	90	120	5	2/00	D0				TPSL 0005 CLAY MSND 0065 BRWN FSND 0098 RED SHLE 0151	MCGOWAN WILLIAM
237	CON	10 22	28- 1506	585945	10/67	1307	30	FR	38		1		D0					BRWN TPSL CLAY MSND 0020 GREY CLAY MSND 0036 GREY MSND 0038	ZORGE E
238	CON	10 22	28- 3110	586200	01/69	4610	5	FR	87	92	110	2	12/00	D0				CLAY 0087 MSND GRVL CLAY 0093 SHLE 0119 MCLEOD D	BRWN GRVL MSND CLAY 0021 BRWN GRVL MSND 0064 RED SHLE 0100
239	CON	10 22	28- 3269	586180	10/69	1612	5	FR	104	47	91	4	1/30	D0				HARRIS PHIL	BRWN TPSL 0001 BRWN CLAY MSND 0042 BRWN MSND STNS 0057 RED SHLE 0080
240	CON	10 22	28- 3271	586230	10/69	1612	5	FR	75	30	78	5	1/00	D0				BLCK TPSL 0001 BRWN MSND CLAY STNS 0025 GREY CLAY STNS SILT 0040	
241	CON	10 22	28- 3338	585980	04/70	3637	30	FR	25	25	40		D0						

GROUND WATER BULLETIN REPORT

Table 1

24 OCT 86

WATER WELL DATA SYSTEM

WELL NO.	CONCESSION ETC	LOT	WELL NO	EASTING	ELEV	DATE	DRILLER	INS	CSG DIA	KIND OF WATER	FOUND	STAT LVL	PUMP LVL	TEST RATE	TIME	WATER USE	DEPTH IN FEET TO WHICH FORMATIONS EXTEND	OWNER/LOG/SCREEN
242	CON	10 22	28- 586100 4121 4835800	840	12/72	3637	30	FR	30	FR	32	30	34	5	1/00	D0	HANCOCK S	BRWN TPSL 0001 BRWN MSND 0012 BRWN CSND 0013 BRWN GRVL SAND 0016 BRWN MSND 0025 CSND 0031 MSND 0036 GRVL STNS 0037 REID M
243	CON	10 22	28- 586295 4385 4836060	785	05/73	3637	30	FR	30	FR	15	20	36	5	1/00	D0	GREY FILL 0006 BRWN MUCK STNS 0010 BRWN MSND FSND CSND 0016 RED MSND STNS 0025 RED SHLE 0042 SAHDPOGLY FRED	BRWN TPSL 0001 BRWN TPSL 0002 BRWN CLAY 0004 BRWN CSND GRVL STNS 0013 GRN SHLE 0014
244	CON	10 22	28- 586208 4547 4836356	775	07/74	3637	30	FR	30	FR	8	3	7	10	1/10	D0	TERHUZEN	BRWN TPSL 0001 GREY CLAY SAND 0035 BRWN SAND CLAY 0068 BRWN SAND GRVL 0072 BRWN SILT 0082 RED SHLE SOFT 0083 BRWN CLAY GRVL 0084 RED SHLE HARD 0140 SHERIDAN NURSURIES
245	CON	10 22	28- 586400 5055 4836500	815	06/77	2918	5	DRY										BRWN CLAY 0027 GREY CLAY 0072 GRVL CLAY DRY 0098 RED SHLE 0121 KERTON R
246	CON	10 22	28- 586740 5191 4836860	870	04/77	4320	6	FR	6	FR	194	106	6	3/00	D0			BRWN TPSL 0001 BRWN MSND 0015 BRWN SILT SAND 0038 GREY SILT SAND 0049 OTTOWAY G
247	CON	10 22	28- 586680 5194 4837060	870	06/77	4320	6	FR	6	FR	121	70	6	2/00	D0			GRVL CLAY MSND 0066 RED SHLE 0083 BEAM STANLEY
248	CON	10 22	28- 586100 5318 4835950	830	11/78	4640	30	FR	30	FR	36	35	48					CLAY STNS 0010 GRVL MSND CLAY 0040 RED SHLE 0062 BISHOP C G
249	CON	10 23	28- 585675 1507 4836226	825	06/52	4838	4	FR	4	FR	83	35	50	4	2/00	D0		BRWN CLAY MSND 0008 RED CLAY BLDR 0030 RED SHLE 0055 WALSWA WILLIAM
250	CON	10 23	28- 586159 1508 4836814	975	05/61	4838	5	FR	5	FR	45	5	6	25	2/30	D0		BRWN TPSL CLAY 0020 RED CLAY MSND 0054 MSND 0056
251	CON	10 23	28- 585441 1509 4836493	850	06/64	1325	30	FR	30	FR	51	14	54	2	1/00	ST		INGELS GERRY
252	CON	10 23	28- 585565 1510 4836362	850	04/66	1307	30	FR	30	FR	56	35	1					TPSL 0001 BRWN MSND 0007 BRWN CLAY 0012 BLUE CLAY 0020 BLUE MSND 0023 OTTOWAY LESLIE
253	CON	10 23	28- 586222 1511 4837350	975	05/66	1308	30	FR	30	FR	20	14	21	1	/30	D0		BRWN CLAY MSND 0043 CSND 0045 BISHOP G
254	CON	10 23	28- 585680 3078 4836200	850	05/69	1307	30	FR	30	FR	45	25						PRDG 0018 RED SHLE 0055
255	CON	10 23	28- 585580 3328 4836630	840	11/69	3513	5	FR	5	FR	45	21	40	3	2/00	ST		GIEFERT P
256	CON	10 23	28- 585581 4502 4836323	870	05/74	3349	7	FR	7	FR	85	35	90	10	1/00	D0		BRWN CLAY STNS 0046 GREY SAND 0070 RED SHLE 0090 BISHOP C G
257	CON	10 23	28- 585557 4683 4836592	850	09/74	3637	30	FR	30	FR	22	4	5	1/00	D0			BRWN TPSL 0001 BRWN CLAY BLDR STNS 0006 BRWN MSND 0010 BRWN CLAY SAND 0013 GREY SAND CLAY SAND 0024 BRWN MSND 0045

GROUND WATER BULLETIN REPORT

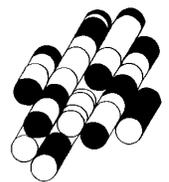
Table 1

WATER WELL DATA SYSTEM 24 OCT 86

WELL No.	CONCESSION ETC	LOT	WELL NO	EASTING	ELEV	DATE	DRILLER	DIA INS	CSG KIND	WATER FOUND	STAT LVL	PUMP LVL	TEST RATE	TIME HR/MN	WATER USE	DEPTHS IN FEET TO WHICH FORMATIONS EXTEND	OWNER/LOG/SCREEN
258	CON	10 24	28- 1512	585133 4836940	875	10/65	1325	30	FR	49	25	50	1	/30	ST	TPSL 0002 GRVL BLDL 0015 HPAN 0022 SHLE	
259	CON	10 24	28- 2936	584800 4837100	900	06/68	4919	36	FR	17	12					0027 RED SHLE 0052	
260	CON	10 24	28- 4017	584750 4837125	900	11/72	3637	30	FR	18	12	18	5	1/00	DO	BROWN PAUL TPSL MSND 0006 CLAY 0020 ROYA CONSTRUCT BRWN TPSL 0001 BRWN CLAY 0012 BLUE CLAY 0015 RED SHLE 0029	

APPENDIX B

TERRAPROBE LIMITED





Waterloo Biofilter Systems Inc.
on-site wastewater treatment

143 Dennis Street, Rockwood ON, N0B 2K0
Tel: 519-856-0757; Fax: 519-856-0759

Serena Oyama
Terraprobe Limited
Consulting Engineers
10 Bram Court
Brampton, Ontario
L6W 3R6

May 8, 2006

Re: Expected Nitrogen Removal using the Waterloo Biofilter for Residential Applications

Dear Serena,

The purpose of this letter is to address the expected effluent criteria leaving the Waterloo Biofilter treatment unit.

I can confirm that the Waterloo Biofilter System has been thoroughly tested by independent third parties such as EPA-ETI and EPA-NSF-ETV, most significantly at the EPA Buzzards Bay test facility. Our individual 3-bedroom and 4-bedroom re-circulating systems were tested for 24 months and 13 months respectively, and lowered the total nitrogen level ($TN = TKN + NO_3-N + NO_2-N$) from 35 mg/L to 14 mg/L, and from 37 mg/L to 13 mg/L, respectively. This removal efficiency of 60% and 65% was attainable on a regular basis in this sewage source which is similar to normal domestic sewage with normal household chemical use.

It is normal that the first 12 months is the most difficult to nitrify and denitrify, and these independent tests are during this period (13 months & 24 months). Simple on-going maintenance programs keep the denitrification process on-going as well. These NSF & EPA tests therefore represent the most difficult period, and most experts agree that, like at any municipal sewage treatment plant with proper operation, the nitrification-denitrification process continues for the lifetime of the system.

Higher-strength sewage experience has been obtained in campgrounds and golf courses, most noteworthy in our ClubLink golf course sites, and a higher percentage of nitrogen is removed due to higher organics, up to 80%. So these test results represent more difficult conditions where water-conservation measures such as low-flow toilets and showers are in place. In these conditions, the sewage will be stronger, and although the nitrogen concentration will be greater, the percentage of nitrogen removed will be higher, and the subsequent mass contribution to the natural environment will be decreased.

In addition to water usage and chemical use, characteristics of the wastewater play a role in the treatment capability of biological systems like the Waterloo Biofilter. Below are some known factors that affect treatment performance:

1. **Alkalinity:** Nitrification depends on the alkalinity of the wastewater. Nitrification reactions are severely hindered if there is not enough alkalinity in the wastewater to buffer pH drops. If the houses are on the Paleozoic carbonate substrate of southern Ontario, there is adequate alkalinity for nitrification-denitrification.
2. **Temperature:** Nitrification is dependent on influent temperature although microbial reactions in the septic tank and Biofilter typically generate enough heat to support nitrification. However, the septic tank can be easily insulated with 2" of styrofoam board, recommended north of Barrie and east of Peterborough.
3. **Disinfectants, medications, and other anti-microbial agents:** This is a major concern with all biological systems. These substances inhibit microorganisms from performing optimally, especially in the case of nitrifying bacteria. Waterloo provides a homeowner's manual of best practice which minimizes problems due to these chemicals.
4. **Ammonium Cleaners:** Use of high ammonium cleaners during the construction stage, and in the spring cleaning rituals does raise the levels of nitrogen coming into the systems to >40 and up to 70-80 mg/L. When this happens, the system typically cannot cope with removing the nitrogen to the desired level. However, this high level is typically short-lived, and Waterloo's manual of practice addresses this.
5. **Operations and maintenance:** Simple O+M of the sewage treatment system is a vital component to the treatment process, and we recommend on-going maintenance contracts. Operators trained by Waterloo Biofilter

have our expertise to help them with potential problems to help maintain the denitrification process.

- 6. Hydraulic loading and residence time:** It is important to correctly design and size the system for optimum denitrification. The residential systems that Waterloo Biofilter provides are mainly pre-engineered and should provide the required treatment performance, with reasonable use by the homeowner.

Given the factors affecting nitrogen removal, based on the removal rates from our third-party testing, and assuming that the median influent TN is 35-40 mg/L (typical TN value of domestic sewage), a median effluent TN of 12-16 mg/L is within our tested limits.

With higher levels of nitrogen and organics due to water-conservation methods, the percentage removal will, in our experience, also increase, and the subsequent contribution of nitrogen to the groundwater resource will be lessened.

I have attached hard copies of our homeowner's manual and the test results for each of the programs, and the data is available on the Internet at:

<http://www.buzzardsbay.org/etistuff/results/waterlooreults.pdf> for the ETI program and

http://www.epa.gov/etv/pdfs/vrvs/09_vr_waterloo.pdf for the ETV program

I trust this meets with your requirements. Let me know if I can be of further service.

Sincerely,

A handwritten signature in black ink, appearing to read 'E. Jowett', written in a cursive style.

E. Craig Jowett, Ph.D., P.Eng.
President

LUCAS & ASSOCIATES
Consultants in Planning and Land Development
24 Debra Crescent
Barrie, Ontario
L4N 3T1
(705) 721-9635 Fax (705) 721-7367

Springwater
(Midhurst)



June 8, 2005

Township of Springwater
1110 Highway 26
Midhurst, Ontario
L0L 1X0

Attention: Mr. Andrew Fyfe, Manager of Planning

Dear Mr. Fyfe,

Re: **CARSON RIDGE ESTATES SUBDIVISION
PART LOT 16, CONCESSION 5**

Further to our last meeting, and our discussions with the MOE and the County, we have prepared the following, which addresses the outstanding issues related to the draft plan approval and rezoning of the Carson Ridge Estates subdivision.

We have identified the following issues to be outstanding:

1. Parkland dedication vs. cash in lieu contribution and the location of the park, if land is the preference.
2. Connecting or not connecting the two subdivisions.
3. Provisions of a pedestrian walkway to Bayfield Street.
4. Upgrading of the municipal water system
5. Use of the Waterloo Biofilter System sewage treatment and disposal systems.

1. Parkland Dedication

Our initial submission proposed a cash in lieu contribution rather than the dedication of a block for parkland purposes. This proposal was based on comments received by planning staff at the time that the existing park in the Glenbrook Heights subdivision is underutilized and of sufficient size to service both the existing residents and the new residents.

We have since heard comments from some member of Council and the public that a park block should be provided in the Carson Ridge Estates subdivision. We prepared a plan that shows a park block that abuts the existing park. This concept was shown at the Public Meeting on February 28, 2005. We have attached a copy of the plan for your reference. Please note that this plan differs slightly from the plan shown at the public meeting, in that we have relocated the pedestrian walkway from between Lots 6 and 7 to between Lots 8 and 9 to address grade concerns.

To date we have not received any direction from the Township with respect to the parkland issue.

2. Connecting The Two Subdivisions

The original approval of the Glenbrook Heights subdivision (OPA 10) required two access roads from Carson Road. This requirement was subsequently waived as the second access, as proposed, was located too close to the Highway 26/Carson Road intersection.

Our application proposes connecting the proposed subdivision with the Glenbrook Heights subdivision to provide emergency vehicles with a way to enter and exit both subdivisions in the event that one of the entrances is blocked.

The existing residents have voiced the opinion that the two subdivisions should not be connected on the basis that it would result in a significant increase in traffic through the Glenbrook Heights Subdivision.

It is our opinion that the impact of non-resident traffic will not increase significantly as this non-resident traffic will pass through the Glenbrook Heights subdivision and not turn around at the existing cul de sac and make a second pass through the subdivision. In addition, it is anticipated that the majority of the new residents will use the proposed Carson Ridge Estates intersection, as the majority of trips will be out to Highway 26 and south to Barrie.

3. Walkway To Bayfield Street

A number of the residents voiced a concern that the proposed subdivision does not include a pedestrian walkway to Highway 26 (Bayfield Street). Apparently a number of the existing residents presently access Bayfield Street through the Carson Ridge lands.

Our plan does not provide a pedestrian walkway, as it is our opinion that such a walkway would encourage pedestrian use of Highway 26, which does not have sidewalks. This section of Highway 26 is a provincial highway and under the jurisdiction of the Ministry of Transportation. We fully anticipate that any proposal to provide a pedestrian walkway to Highway 26 will be opposed by the Ministry out of safety concerns and it is our opinion that such a walkway should not be provided.

4. Upgrading Of Municipal Water System

The Township requested that we undertake a water modeling exercise to determine what impact, if any, the proposed subdivision will have on the existing municipal water system. The exercise was completed to the satisfaction of the Township and revealed that the existing system can handle the domestic demand for water generated by the new subdivision. However, that exercise also revealed that the existing system does not meet MOE guidelines with respect to fire flow and storage. It should be noted that this deficiency exists today.

The existing system will need to be upgraded to meet MOE guidelines and we recognize that a portion of the costs will be attributable to the Carson Ridge Estates subdivision. The owner is prepared to contribute his fair share towards the costs of that upgrade and we are recommending that the following condition be included in the Conditions of Draft Plan Approval:

"Prior to final approval, an Agreement for the upgrading of the existing water system to provide Fire Flow and Storage in accordance with MOE guidelines shall be entered into with the Owner and Township and further, the agreement shall provide for the Owner to contribute his proportionate share to the financial obligation for such works and that these costs shall be shared between the Township, the Owner and future development in a manner consistent with the DC Act, 1997 or by a mechanism mutually agreeable to both parties."

5. Use Of Waterloo Biofilter

During our last meeting, there was considerable discussion about the proposed means of sewage servicing and MOE's comment in this regard.

We contacted the County to see if any further comments had been received from the MOE, and we were advised that there have been no additional comments. The County did indicate, however, that it needed to review the proposal for partial services in light of the Provincial Policy Statement. On May 20, 2005 we received the following e-mail message from Nathan Westendorp at the County:

"This letter is further to a request that the County identify its position with respect to the proposed draft plan of subdivision (SP-T-0401). A primary issue that has been raised is the proposed partial servicing scheme as well as whether the subdivision should proceed prior to the completion of the Midhurst Secondary Plan(s). It should be noted that the County, both through policy and in practice, requires development proposals to examine servicing options to be consistent with the servicing hierarchy stated in the Provincial Policy Statement. However, given the existing Urban Residential designation of the lands; the fact that the lands are proposed to be outside of the Midhurst West Secondary Plan area; and, the existing development policies in place, the County has no objection to proceeding with the application of this proposed subdivision."

We have also contacted the MOE directly and received the following e-mail message from Bill Armstrong on June 3, 2005:

"MOE accepts the County's position as Nathan stated in his email to you of May 20. MOE identified its concerns to MMAH (and thence County Planning) in April 2004 and Oct 2004. County considered them and reached its position as Nathan has stated. I don't believe anything further is "required" from MOE."

With respect to the proposal to use the Waterloo Biofilter system, on January 24, 2005 we provided the Township with copies of two subdivision agreements, one in the City of Sarnia and the other in the Town of Kingsville, where the Waterloo Biofilter System will and/or has been used. This was followed up with a presentation to Planning Committee on January 31, 2005, which included a presentation from representatives from Waterloo Biofilter.

As you are aware, this system is used throughout the province including in the Township of Springwater. The system is MOE approved and permitted under the Ontario Building Code. We are proposing that the entire subdivision be serviced with this system, even though it is not required. We are proposing this because, in our opinion, it makes the annual monitoring program for all the lots easier to administer and this system is far superior to a conventional septic tank and tile field system.

However, we understand that the Township is reluctant to specify a particular manufacturer of this type of system. Therefore, we are proposing a more "generic" Draft Plan Condition as follows:

"That the subdivision shall be serviced by private disposal systems that provide tertiary treatment in accordance with MOE and Ontario Building Code Standards."

In addition, we are proposing that the following also be included as a condition:

"That the Subdivision Agreement between the Owner and the Municipality shall contain the following provisions regarding the installation and maintenance of the private tertiary sewage disposal systems:

- i) The Purchaser/home owner shall be provided with a detailed information package which outlines the nature, operation and maintenance requirements of a tertiary treatment system.*
- ii) The Purchaser/home owner shall be required to retain a professional qualified/certified in tertiary treatment systems to check and maintain the system on an annual basis.*
- iii) The results of the annual maintenance shall be submitted to the Township on _____ of each year (PICK A MONTH).*
- iv) All Offers of Purchase and Sale shall advise purchasers that the subdivision shall be serviced by private sewage disposal systems which provide tertiary treatment and that items i), ii) and iii) preceding shall apply."*

We would note that the size of the lots proposed in the subdivision (a minimum of 2,000 square metres) provides more than enough area to site a conventional system, if a failure of one of the Waterloo Biofilter systems were to occur. We would not be adverse to an additional condition that requires that each lot provide sufficient reserve area to site a conventional system.

In our opinion, the Township now has the information it needs to provide the County with the Township's conditions of draft plan approval. Needless to say, we are eager to see this application move forward as quickly as possible (the initial application was made in February 2004). We would ask that a staff report along with the recommended conditions be brought forward for Planning Committee's consideration at their next meeting on June 27th. By way of this letter, we are also requesting to appear as a deputation at that meeting.

If you require any additional information, please inform us as soon as possible and we will endeavor to provide it to you forthwith.

Yours truly,
Lucas and Associates



Per: Glenn Lucas, B.E.S

cc. Mr. Scott Elliot, The Sarjeant Company Ltd
dd. Ms. Nicola Mitchinson, Mitchinson Planning and Development



PLANNING REPORT

To: Planning Committee
From: Andrew Fyfe, Manager of Planning
Date: June 23rd, 2005
Re: Carson Ridge Subdivision (Glenbrook Heights Phase II)

Recommendations

It is recommended:

- 1) That the Planning Report dated June 23rd, 2005 be received, and
- 2) That the Sarjeant Company be advised that the Township of Springwater preferred option with regard to parkland for the Carson Ridge Subdivision is a cash-in-lieu payment under the Planning Act, and that a copy of the Planning Report be forwarded to the Developer.

Origin

Representatives of the Developer have requested direction through a delegation and follow-up correspondence that the Township consider the dedication of a park site adjacent to the existing park on Glenhuron Drive or in the alternative, a park on Block 54, west of the new road connection to Carson Road, to the rear of the existing homes on Carson Road. Issues related to the connection to the existing subdivision, a walkway to Bayfield Street, the municipal water system and the use of Waterloo Biofilters were also raised and suggestions made as to potential conditions to address these items.

Parkland

Analysis

Planning staff have reviewed the proposals with the Director of Parks and Recreation in light of policies put forward in the Township's new Parks and Recreation Master Plan. The consensus is that due to the topography and ground conditions of both of the proposed park sites, their usefulness is limited and the acquisition of either parcel is not supported by policies put forward in the Master Plan. A small addition of the flatter land at the top of the slope to the north-side of the park would square-off the rear off the park and improve its utility, but the balance of that parcel is steeply sloped and of limited use. Similarly the topography and ground water conditions on the parcel to the rear of the Carson Road homes do not lend themselves to active recreational uses. The cash-in-lieu contribution and/or donations in kind which could be used to add improvements to the existing park, such as a skating pad appears to be appropriate for this development proposal.

Other Matters

Planning staff is in basic agreement with the suggestions put forward by Mr. Lucas. It should be noted that the performance of the Waterloo Biofilter system installed to date appears to surpass standard systems in terms of treatment levels and that properly sited and installed do not appear to have a significant failure rate, but it is a relatively "young" technology and their long-term performance has not been completely established. Therefore the ability of the sites to accommodate alternative systems in the event of failure is important. It appears that a standard septic system can be accommodated on most of the lots, but several may require an alternate "enhanced" system in the event of failure of the original system.

Although the Waterloo system appears to have a technical superiority over other alternatives, appropriate maintenance and monitoring is important and this is reflected in the proposed conditions. There are a number of qualified individuals in this area who can undertake this responsibility and this is not expected to be an issue.

Respectfully Submitted,



Andrew Fyfe
Manager of Planning

— ASK MARIANNE

Sarnia

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THIS AGREEMENT made in quintuplicate the day of _____, 2003.

BETWEEN:

MARLACRES FARMS LIMITED

**(A Company incorporated under the laws of
the Province of Ontario)**

(Hereinafter called the "Subdivider")

OF THE FIRST PART

AND

THE CORPORATION OF THE CITY OF SARNIA

(Hereinafter called the "City")

OF THE SECOND PART

**SUBURBAN RESIDENTIAL SEVERANCE AGREEMENT between MARLACRES FARMS LIMITED
and the Corporation of the City of Samia**

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WHEREAS the Subdivider warrants that it is or will be the sole owner of the Δ Lands ϵ

AND WHEREAS the Committee of Adjustment has imposed as a condition of giving its consent that the Subdivider enter into this Agreement with the City.

AND WHEREAS the Subdivider warrants that the Land will be free from encumbrances except for the mortgages and other encumbrances registered in favour of the Mortgagees named herein as a party of the third part, who by execution hereof, consent to the Subdivider entering into this Agreement insofar as the interest of the Mortgagees in the Lands is concerned and postpones its interest in the Lands to the interest of the City to the extent that this Agreement shall take effect and have priority as if it had been executed and registered before the execution of the document or documents giving to the Mortgagee its interest in the Lands.

AND WHEREAS the Subdivider is required to do certain things and undertake certain financial arrangements with the City.

NOW THEREFORE THIS AGREEMENT WITNESS TO that in consideration of the payment of the sum of One Dollar (\$1.00) of lawful money of Canada, now paid by each of the parties hereto to the other (the receipt of which is hereby acknowledged) and other valuable consideration, the Subdivider hereby covenants, promises and agrees with the City as follows:

1. DEFINITIONS

In this Agreement:

- (i) "Director" means Director of Planning and Building or a Designate.
- (ii) "City Engineer" means the Director of Engineering or a Designate.
- (iii) Δ Lands ϵ means those lands described in Schedule "B" to this Agreement.
- (iv) Δ Plan ϵ means Schedule "A" to this Agreement
- (viii) A Δ Certified Lot Grading Plan ϵ shall show:
 - (A) the proposed finished elevation at the corners of the lot;
 - (B) the proposed finished elevation at the front, rear and sides of the building;
 - (C) the proposed finished top and invert elevations and location of the rear yard catch basin or dry well;
 - (D) the proposed finished elevation of any retaining walls, the proposed location of any walkouts onto these lands and any abrupt changes in the proposed finished elevation of these lands; and

(E) the existing elevations around the perimeter of the lot.

(ix) An Interim Grading Certificate shall bear the signature and seal of either a Registered Ontario Professional Engineer or an Ontario Land Surveyor and shall confirm that the elevation of the top of the foundation wall is set to no less than 150mm above the proposed finished elevation around the building as shown on the Certified Lot Grading Plan.

(x) A Final Grading Certificate shall bear the signature and seal of either a Registered Ontario Professional Engineer or an Ontario Land Surveyor and shall certify that the actual finished elevation and grading of the lot conform to the Certified Lot Grading Plan.

2. SERVICE CHARGES

Development Charges

The Subdivider or any subsequent owner shall pay to the City a development charge in compliance with the City's Development Charges By-law, or any subsequent by-law, before a building permit is issued for such dwelling unit or building. No building permit shall be issued for a dwelling unit or building until after such fee is paid. The said monies shall be a charge on the lands which comprise the site for the dwelling unit or building.

3. SEPTIC SYSTEM REQUIREMENTS

(a) This development is not served by municipal sanitary sewers. Therefore the land subject of this agreement is to be served by a private on-site tertiary sewage system. The Owner is responsible for obtaining all necessary sewage system permit approvals and for maintenance of the system once it is installed. The system to be installed on this lot is subject to the following provisions;

(i) The sewage system requirements for the lands are detailed in the Geotechnical Investigation/On-site Sewage System Design report prepared by BKL Engineering dated December 12, 2002, which forms Schedule "C" to this Agreement. This report is based on a set of assumptions regarding the maximum size of the dwellings in this development. The septic system installed on this lot shall be installed in compliance with the BKL Engineering Report and shall be approved by the County of Lambton under the Ontario Building Code or its successors.

(ii) In addition to operation, maintenance and annual monitoring

requirements contained in the Ontario Building Code (and administered by the County of Lambton), the nitrate levels within the lands are to be monitored annually (using pre-approved protocol) to ensure compliance with the Ministry of the Environment's Reasonable Use Guidelines. The monitoring results must be forwarded to the County of Lambton which will provide administration and manage the records and ensure compliance as required. The costs associated with the nitrate testing must be borne by the Owner of the sewage system and, should it be found that the nitrate levels exceed the MOE's Reasonable Use criteria at any time, the owner of the sewage system will be responsible for taking any actions necessary to remedy the situation and for forwarding evidence of compliance to the County.

(iii) "That the sewage system envelope for this lot is required to contain sufficient area for a "Waterloo Biofilter" tertiary treatment unit **and a contingency area equivalent to the area required for a second treatment unit or 50 square metres, whichever area is greater.** The contingency area is to be available in the event that the first system requires replacement or additional treatment capacity is required. The size and location of the sewage system envelope shall be determined in accordance with Ontario Building Code and the manufacturer's specifications. Under no circumstances shall any buildings or structures (i.e. sheds, pools etc.) be located within the sewage system envelope.

(iv) As part of a building/septic permit application, it is required that plans be submitted showing existing and proposed contours; required drainage facilities (i.e. swales, ditches, infiltration trenches, etc.) complete with elevations and direction of flow; the building envelope, including basement and first floor elevations and municipal setbacks; the rear yard amenities envelope (for pools, patios, sundecks, etc.); the sewage system envelope, including contingency absorption bed area (dimensioned and located relative to property lines), location of the tertiary treatment unit, absorption bed area and sampling points, and final grade elevations; location of the required water supply; and a summary of the sewage system design parameters, including septic tank size, pump specifications (if a pump is required), manufacturer's specifications and any special requirements or equipment including the septic system operation and maintenance agreement, number of bedrooms in the dwelling design (libraries, dens, studies, etc. are considered bedrooms), design fixture unit count and a notation on the plan that the location of the sewage system envelope is to be fixed, and that no buildings, structures, equipment or materials are permitted within the sewage system envelope area, temporarily or permanently, except structures, equipment or materials necessary for the construction of the sewage treatment system.

(b) The Subdivider shall include in all agreements of purchase and sale or lease of the lots offers to purchase the following "Notice of Advisory":

- (i) This development is not served by municipal sanitary sewers. Therefore the land subject of this agreement is to be served by a private on-site tertiary sewage system. The Owner is responsible for obtaining all necessary sewage system permit approvals and for maintenance of the system once it is installed. The system to be installed on this lot is subject to the following provisions;

(A) The sewage system envelope for this lot is required to contain sufficient area for a "Waterloo Biofilter" tertiary treatment unit **and a contingency area equivalent to the area required for a second treatment unit or 50 square metres, whichever area is greater.** The contingency area is to be available in the event that the first system requires replacement or additional treatment capacity is required. The size and location of the sewage system envelope shall be determined in accordance with the Ontario Building Code and the manufacturer's specifications. Under no circumstances shall any buildings or structures (i.e. sheds, pools etc.) be located within the sewage system envelope.

(B) Under the Ontario Building Code, the Operator of the tertiary sewage system required for this lot must enter into a servicing and maintenance agreement with the sewage system manufacturer. In addition to the testing requirements under the Ontario Building Code, the septic system effluent must also be tested annually to determine compliance with the Ministry of the Environment's Reasonable Use Guidelines.

(C) As part of a building/septic permit application, it is required that plans be submitted showing existing and proposed contours; required drainage facilities (i.e. swales, ditches, infiltration trenches, etc.) complete with elevations and direction of flow; the building envelope, including basement and first floor elevations and municipal setbacks; the rear yard amenities envelope (for pools, patios, sundecks, etc.); the sewage system envelope, including contingency absorption bed area (dimensioned and located relative to property lines), location of the tertiary treatment unit, absorption bed area and sampling points, and final grade elevations; location of the required water supply; and a summary of the sewage system design parameters, including septic tank size, pump specifications (if a pump is required), manufacturer's specifications and any special requirements or equipment including the septic system operation and maintenance agreement, number of bedrooms in the dwelling design (libraries, dens, studies, etc. are considered bedrooms), design fixture unit count and a notation on the plan that the location of the sewage system envelope is to be fixed, and that no buildings, structures, equipment or materials are permitted within the sewage system envelope area, temporarily or permanently, except structures, equipment or materials necessary for the construction of the sewage treatment system.

(D) In addition to operation, maintenance and annual monitoring requirements contained in the Ontario Building Code (and administered by the County of Lambton), the nitrate levels within the lands are to be monitored annually (using pre-approved protocol) to ensure compliance with the Ministry of the Environment's Reasonable Use Criteria. The monitoring results must be forwarded to the County of Lambton which will provide administration and manage the records and ensure compliance as required. The costs associated with the nitrate testing must be borne by the Owner of the sewage system and, should it be found that the nitrate levels exceed the MOE's Reasonable Use criteria at any time, the owner of the sewage system will be responsible for taking any actions necessary to remedy the situation and forwarding evidence of compliance to the County.

4. HOUSE NUMBERS

All Lot or building numbers for use within the Plan shall be allocated by the Director. To obtain such allocation the Subdivider shall furnish the Director with a copy of the Plan as registered upon which the Director will designate the proper numbers for the Lot or building. Each owner shall cause the number to be provided and placed and maintained in a conspicuous position in the front of the property.

5. PAVING DRIVEWAYS

Every driveway shall be paved and maintained with hot mix asphalt, paving stone or concrete from the paved portion of the street to the innermost end of the driveway by the owner when constructing the building which any driveway is to serve and any such driveway shall be provided for in the application for the building permit for such building. The construction of such building shall not be considered complete until after such paving has been completed.

6. BUILDING AND SITE ELEVATIONS

(a) Before any building permit is issued there shall be deposited with the Chief Building Official a Certified Lot Grading Plan, which shall be approved by the City Engineer, showing thereon the levels, grades and elevations of the proposed building and its site, and no building permit shall be issued without such plan.

(b) An Interim Grading Certificate shall be provided to the Chief Building Official prior to framing or any above grade work on any proposed building.

(c) No such building shall be occupied until after a Final Grading Certificate is provided to the Chief Building Official and the construction of any rear yard catch basin have been completed.

(d) No person shall, at any time, add fill to a lot or grade a lot in such a manner that it will cause surface water to flow along the surface from that lot to any adjacent lands, except in accordance with the provisions of this Agreement.

7. LANDS FOR MUNICIPAL PURPOSES

(a) The Subdivider shall convey to the City, PART 3 on PLAN 25R8715 for road widening purposes. This represents only a portion of the required road widening and the Subdivider or any subsequent owner shall convey to City, at no cost to the City and free from encumbrances, PART 2 on PLAN 25R8715, should the City determine that these lands are required to widen or reconstruct Blackwell Road or install public services.

(b) Before the execution of this Agreement by the City, the Subdivider shall deposit with the Director the deed or deeds for the aforesaid, duly executed and in a form satisfactory to the City Solicitor.

8. FINANCIAL ARRANGEMENTS

(a) Before the execution of this Agreement the Subdivider shall pay to the City:

(i) an administration fee equal to \$750.00

(iii) a legal fee of \$250.00

9. GENERAL

(a) The approval of the City of this Plan does not relieve the applicant for a building permit from satisfying any other lawful requirements.

(b) The Subdivider on behalf of itself, its successors and assigns in title, hereby covenants to indemnify and save harmless the City from all actions, causes of actions, suits, claims and demands whatsoever which may arise either directly or indirectly by reason of any alteration of the existing grade or level of any street or streets to bring the grade or level into conformity with the grade or level approved by the City Engineer or by reason of any damage to

the lands abutting on any street or streets or to any building erected thereon, arising from or in consequence of, any such alteration of grade or level or by reason of any injuries or damages that may be suffered by any person on any unassumed street within the Plan before the City Council accepts the completed subdivision and assumes all of such streets by by-law.

10. REGISTRATION OF SEVERANCE AGREEMENT

The Subdivider agrees that this Agreement may be registered upon the title to the Land both before and after the registration of the Plan. Such registration shall be at the sole discretion of the City and paid for by the Subdivider, through the legal fee required in Section 8 of this Agreement.

11. NO CITY LIABILITY

(a) This Agreement and the provisions hereof do not give to the Subdivider or any person acquiring any interest in the Land (each hereinafter in this paragraph called "such person"), any rights against the City or the City Engineer with respect to the failure of any such person to perform any obligations under this Agreement or the failure of the City to force any such person to perform any obligations under this Agreement or any negligence of any such person in the performance of the said obligations.

(b) The only duty and responsibility of the City Engineer arising out of this Agreement is to the City and this Agreement and any work or services done or performed by the City Engineer under this Agreement do not in any way create any liability on the part of the City Engineer to the Subdivider or any person acquiring any interest in the Land.

12. CERTIFICATE OF DIRECTOR (Lot Release)

A lot release certificate under the hand of the Director and the seal of the City shall be conclusive evidence to a bonafide purchaser for valuable consideration without notice to the contrary that the land mentioned therein is released from the charge for costs and expenses and the burden imposed by this Agreement to the extent mentioned therein.

13. WAIVER

(a) The Subdivider for itself and its successors and assigns agrees not to call into question directly or indirectly in any proceedings whatsoever whether in law or in equity or before

any administrative tribunal, the right of the City to enter into this Agreement and to enforce each and every item, covenant and condition herein contained including charges imposed, and this Agreement may be pleaded as an estoppel against any such person in any such proceedings.

(b) The Subdivider acknowledges that the City is entering into this Agreement and approving the Plan on the express representation of the Subdivider that it and its successors and assigns will observe and perform all the provisions of this Agreement and that the City is of the opinion that the Plan would not be in the public interest if the Subdivider, its successors and assigns, the owner or owners from time to time of the land in the Plan were not obligated to observe and perform all the provisions hereof except to the extent the City may lawfully change them.

14. SCHEDULES

Schedules "A", "B" and "C" form part of this Agreement.

15. CONDITIONS OF CONSENT APPROVAL

The Subdivider agrees at its own expense to do, perform, construct and complete any and all items of the conditions applying to the consent.

16. BURDEN OF AGREEMENT

For greater certainty it is specifically acknowledged and agreed that the burden of this Agreement shall run with the Land.

17. INTERPRETATION

This Agreement shall be read with any change of gender or number required by the context.

18. CONFLICT

In the event of any conflict, the City Engineer shall decide which provisions shall prevail.

19. AMENDMENT

Without in any way limiting the rights of the City, the Subdivider agrees that the City may,

with the consent of the then registered owner of any land within the Plan, amend this Agreement insofar as it specifically affects such land or any part thereof.

20. CONNECTIONS TO CITY MAINS

No water main lateral shall be connected to a City sewer main or water main until after the consent of the City Engineer for that specific connection has been obtained. The approval of any Schedule to this Agreement or the execution of this Agreement by the City does not constitute a consent required pursuant to this paragraph.

21. ROAD CLEANING

The Subdivider or subsequent owner shall be responsible for cleaning all public streets in the vicinity of the lands to remove all dirt, mud or debris which has been deposited thereon as a result of the construction on the Lands. Such cleaning shall be done at the end of each working day or otherwise as determined by the Director, acting reasonably.

If the Subdivider is unable or unwilling to clean the streets to the satisfaction of the City Engineer, the Subdivider hereby authorizes the City to clean the streets as required by the City Engineer and the Subdivider agrees to pay the City all costs associated with the cleaning operation performed by the City.

22. DWELLING LOCATION

The dwelling proposed to be constructed on the lands must be setback a minimum of 12 metres from the north limit of PART 2, PLAN 25R8715.

AND IT IS DECLARED AND AGREED that this Agreement and the covenants, provisions, conditions and schedules herein contained shall be binding upon the Subdivider and its heirs, executors, administrators, successors and assigns, and the owner or owners from time to time of the Land.

IN WITNESS WHEREOF the Parties hereto have executed this Agreement.

Witness

MARLACRES FARMS LIMITED

Per: Kenneth Albert James - President

I have the authority to bind the Corporation

THE CORPORATION OF THE CITY OF SARNIA

Mayor

Clerk

SCHEDULE "B"
(description of lands)

**Part of Lot 40, Front Concession, Geographic Township of Samia, City of Samia,
County of Lambton, more particularly described as PARTS 1, 2 and 3, PLAN 25R8715.**

Applicant: The Sarjeant Company Ltd.
File No.: SP-T-0401
Municipality: Township of Springwater
Subject Lands: Part of East Half Lot 16, Concession 5
(Geographic Township of Vespra)
Township of Springwater and
Part of Block 51, Registered Plan 51M-630

Date of Decision: January 30, 2006
Date of Notice: February 2, 2006
Last Date of Appeal: February 22, 2006

NOTICE OF DECISION

On Application for Approval of Draft Plan of Subdivision
Subsection 51 (37) of the Planning Act

Draft Approval of the above Plan of Subdivision in respect of the subject lands noted above, was granted subject to conditions by the County of Simcoe. A copy of the notice is attached.

When and How to File An Appeal

Notice to appeal the decision to the Ontario Municipal Board must be filed no later than the last date of appeal as shown above.

The notice of appeal should be sent to the person and address shown below and it must:

- (1) set out the reasons for the appeal, and
- (2) be accompanied by the fee prescribed under the Ontario Municipal Board Act in the amount of \$125.00, payable by certified cheque to the Minister of Finance, Province of Ontario.

Who Can File An Appeal?

Only individuals, corporations or public bodies may appeal the decision of the County of Simcoe to the Ontario Municipal Board. An appeal may not be filed by an unincorporated association or group.

Right of Applicant or Public Body to Appeal Conditions

The applicant or any body may, at any time before the final plan of subdivision/condominium is approved, appeal any of the conditions imposed by the County of Simcoe to the Ontario Board by filing with the Director, or his delegate, a notice of appeal.

How to Receive Notice of Changed Conditions

The conditions of an approval of draft plan of subdivision/condominium may be changed at any time before the final approval is given.

You will be entitled to receive notice of any changes to the conditions of approval of draft plan of subdivision/condominium if you have either:

- (1) made a written request to be notified of the decision to give or refuse to give approval of draft plan of subdivision/condominium, or
- (2) make a written request to be notified of the changes to the conditions of approval of the draft plan of subdivision/condominium.

Getting Additional Information

Additional information about the application is available for public inspection during regular office hours at the County of Simcoe at the address noted below, from the office of the municipality noted above, or by contacting the County of Simcoe Planning Department at (705) 735-6901.

Mailing address for Filing a Notice of Appeal

County Clerk
County of Simcoe
Administration Centre
1110 Highway 26
Midhurst, ON
L0L 1X0

Applicant:	The Sarjeant Company Ltd.	Date of Decision:	January 30, 2006
File No.:	SP-T-0401	Date of Notice:	February 2, 2006
Municipality:	Township of Springwater	Last Date of Appeal:	February 22, 2006
Subject Lands:	Part of East Half Lot 16, Concession 5, (Geographic Township of Vespra) Township of Springwater And Part of Block 51, Registered Plan 51M-630		

The County of Simcoe's conditions to final plan approval for registration of this plan or subdivision are as follows:

No. Conditions

1. That this approval applies to the draft plan of subdivision located at the Part of the East Half of Lot 16, Concession 5 (Geographic Township of Vespra) and Part of Block 51, Registered Plan 51M-630 in the Township of Springwater, prepared by Lucas & Associates Dated July 13, 2005 as certified by the Owner on July 20, 2005 and Alan Worobec, OLS on July 20, 2005 showing the following:
 - a. 50 residential lots (Lots 1-50, inclusive)
 - b. One block for future development (Block 51)
 - c. One block for stormwater management purposes (Block 52)
 - d. Two blocks for environmental protection purposes (Blocks 53 and 54)
 - e. One block for municipal park purposes (Block 55)
 - f. One block for a walkway (Block 56)
2. That Block 52 be deeded to the Township of Springwater for stormwater management purposes, at no cost, free and clear of all charges and encumbrances.
3. That Block 55 be deeded to the Township of Springwater for park purposes, at no cost, free and clear of all charges and encumbrances.
4. That Block 56 be deeded to the Township of Springwater for a public walkway, at no cost, free and clear of all charges and encumbrances.
5. That Blocks 53 and 54 be conveyed to the appropriate public authority as open space, at no cost, free and clear of all charges and encumbrances.
6. That the Owner will agree in the Subdivision Agreement, that such easements as may be required for access, drainage, floodplain management, servicing, stormwater management, utilities, and construction purposes shall be designated to the satisfaction of, and granted to the appropriate agencies and authorities, free and clear of all encumbrances, to the satisfaction of the Township of Springwater.
7. That any required daylighting triangles shall be shown and dedicated as public highways on the final plan.
8. That the streets identified on this Draft Plan of Subdivision as "Glenhuron Drive", "Connor Drive", and "Sarah Court" be dedicated as public highways to the Township of Springwater, at no cost, free and clear of all charges and encumbrances.
9. That prior to final approval, the streets shall be named to the satisfaction of the Township of Springwater in accordance with the Township of Springwater Road Naming Policy with regard to 911 emergency servicing.
10. That in addition to the conveyance of Block 55, the Owner contribute to the Township of Springwater cash-in-lieu of the balance of the 5% parkland dedication.

Applicant:	The Sarjeant Company Ltd.	Date of Decision:	January 30, 2006
File No.:	SP-T-0401	Date of Notice:	February 2, 2006
Municipality:	Township of Springwater	Last Date of Appeal:	February 22, 2006
Subject Lands:	Part of East Half Lot 16, Concession 5, (Geographic Township of Veepra) Township of Springwater And Part of Block 51, Registered Plan 51M-630		

11. That prior to final approval, confirmation of compliance with the applicable provisions of the Zoning By-law be received from the Township of Springwater.
12. That the Owner shall enter into a Subdivision Agreement with the Township of Springwater, agreeing to satisfy all conditions, financial and otherwise of the Township of Springwater concerning the provision of roads, installation of services and drainage.
13. That the Subdivision Agreement between the Owner and the Township of Springwater be registered against the lands to which it applies once the plan has been registered.
14. That prior to final approval or any site alteration, the following shall be prepared to the satisfaction of the Township of Springwater and the Nottawasaga Valley Conservation Authority (NVCA):
 - a) A detailed Stormwater Management Report and Erosion Control Plan detailing how erosion and siltation and their effect will be minimized both during and following construction
 - b) A detailed Grading Plan
 - c) A Landscaping Plan for the stormwater pond
 - d) A Geotechnical Report for the stormwater pond
15. That the Owner shall agree in the Subdivision Agreement, in wording acceptable to the Nottawasaga Valley Conservation Authority, to carry out or cause to be carried out the recommendations and measures contained within the plans and reports set out above.
16. That the Owner shall agree in the Subdivision Agreement to ensure that all stormwater management facilities and sediment and erosion control measures will be in place prior to any site alteration.
17. That prior to final approval, a Tree Preservation Plan shall be prepared to the satisfaction of the Nottawasaga Valley Conservation Authority and Township of Springwater.
18. The Owner shall agree in the Subdivision Agreement to engage a qualified professional to certify in writing that the works were constructed in accordance with the plans, reports and specifications, as approved by the Conservation Authority.
19. That the Subdivision Agreement contain a clause with wording acceptable to the NVCA requiring the owners of lots, as identified by the NVCA, to enter into a Conservation Agreement with the NVCA for the preservation and private stewardship of the remnant woodland areas, as determined by the Tree Preservation Plan. The conservation agreement will include restrictive covenants which will be registered against the title to the Lots in accordance with Section 3 of the Conservation Land Act and shall be in priority to all other claims or encumbrances.
20. That the Owner shall agree in the Subdivision Agreement to include the following notice in the Agreement of Purchase and Sale for those Lots containing remnant woodland areas:
 - a) The owner/purchaser acknowledges that there may be a requirement to enter into a Conservation Agreement with the Nottawasaga Valley Conservation Authority (NVCA)

Applicant:	The Sarjeant Company Ltd.	Date of Decision:	January 30, 2006
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Subject Lands:	Part of East Half Lot 16, Concession 5, (Geographic Township of Vespra) Township of Springwater And Part of Block 51, Registered Plan 51M-630		

for the preservation and private stewardship of remnant woodland area on selected lots, as identified and determined by the NVCA .

- b) The owner/purchaser acknowledges that the rear part of the property is within an environmentally significant area and that the removal of trees and vegetation is prohibited. The owner/purchaser agrees to accept title to the property subject to the restrictive covenants registered for conservation purposes, and that the owner will not seek to have such restrictions removed from title of the property.
21. That the Owner shall agree in the Subdivision Agreement to ensure that the remnant woodland areas will be demarcated using means such as signage, as approved by the NVCA.
22. That prior to any watercourse crossings or site alteration within a regulated area, a permit under the Conservation Authorities Act is required from the Nottawasaga Valley Conservation Authority.
23. That prior to final plan approval, the Owner shall agree to pay all development fees to the Nottawasaga Valley Conservation Authority as required in accordance with the NVCA's fees policy, under the Conservation Authorities Act.
24. That the Subdivision Agreement contain a provision, in wording acceptable to the Nottawasaga Valley Conservation Authority and the Township of Springwater, requiring that the stormwater management and construction mitigation control measures be in place prior to site alteration.
25. That the Subdivision Agreement contain a provision requiring that a qualified professional certify in writing that the stormwater management and construction mitigation measures were constructed in accordance with the plans.
26. That the Subdivision Agreement contain a provision requiring, prior to the issuance of building permits on individual lots, certification by a Professional Engineer that the proposed foundation is suitable for that lot.
27. That the Subdivision Agreement shall contain the following provisions, with wording to the satisfaction of the Township of Springwater and the Ministry of Environment, regarding the installation and maintenance of the private tertiary sewage disposal systems:
- a) That the Agreement of Purchase and Sale provide notice that prior to the issuance of a building permit the Purchaser/lot owner shall provide engineering details for tertiary on-site sewage disposal systems for the review and approval of the Township of Springwater;
 - b) That the design of the pre-treatment units shall be completed by engineers certified by the manufacturer and/or full familiar with such systems;
 - c) That the installation of the of the tertiary sewage disposal system by a contractor certified by the manufacturer of the system;
 - d) The Purchaser/lot owner shall be provided with a detailed information package which outlines the nature, operation and maintenance requirements of a tertiary treatment system;
 - e) The Purchaser/lotowner shall be required to enter into a long term maintenance contract with the installer of the tertiary on-site sewage disposal system;

Applicant: The Sarjeant Company Ltd.
File No.: SP-T-0401
Municipality: Township of Springwater
Subject Lands: Part of East Half Lot 16, Concession 5,
(Geographic Township of Vespra) Township of Springwater
And Part of Block 51, Registered Plan 51M-630

Date of Decision: January 30, 2006
Date of Notice: February 2, 2006
Last Date of Appeal: February 22, 2006

-
- f) The results of the annual maintenance shall be submitted to the Township of Springwater on February 1st of each year;
- g) All offers of Purchase and Sale shall advise purchasers that the subdivision shall be serviced by private sewage disposal systems which provide tertiary treatment and that preceding items a), b), c), d), e), f) and g) shall apply.
28. That the Subdivision Agreement contain a provision requiring that a qualified professional certify in writing that the on-site sewage disposal systems have been constructed in accordance with the recommendations resulting from the completion of Condition 27.
29. That prior final approval, if this plan is not registered within three years of the date of draft approval, the recommendations of the hydrogeological study shall be reconfirmed by a qualified professional to the satisfaction of the Township of Springwater and the Ministry of Environment.
30. That prior to final approval, detailed geotechnical investigations shall be undertaken to ensure that the proposed lots are suitable for individual on-site sewage disposal systems, all to the satisfaction of the Township of Springwater.
31. That prior to final approval, the Owner shall agree in the Subdivision Agreement to include in all Offers of Purchase and Sale, a notice that if full municipal services are extended to the subdivision, homeowners may be required to connect to the municipal services and that extensions of such services may be subject to a financial contribution from individual property owners.
32. That prior to final approval, an agreement for the upgrading of the existing water system to provide Fire Flow and Storage in accordance with MOE guidelines shall be entered into with the Owner and Township and further, the Agreement shall provide for the Owner to contribute his proportionate share of the financial obligation for such works and that these costs shall be shared between the Township, the Owner and future development in a manner consistent with the DC Act, 1997 or by a mechanism mutually agreeable to both parties.
33. That the Owner shall agree in the Subdivision Agreement, in wording satisfactory to the Simcoe County District School Board to insert the following clause:
- a) That the Owner agree to include in all offers of purchase and sale a statement which advises the prospective purchaser that school bus pick up points, will be generally located in through streets convenient to the Board.
34. That the Subdivision Agreement include a provision, in wording satisfactory to the Simcoe County District School Board, that prohibits the development of Lot 17 until such time as substantial completion of the roads in the subdivision occurs to ensure that the existing cul-de-sac on Glenhuron Drive remains free and clear of all construction and can be utilized as a municipal cul-de-sac during the construction of the subdivision.
35. That the Owner shall agree in the Subdivision Agreement, in wording satisfactory to the Simcoe Muskoka Catholic District School Board to insert the following clause:
- a) That the Owner include in all offers of purchase and sale a clause advising prospective purchasers that pupils from this development attending educational facilities operated by

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the Simcoe Muskoka Catholic District School Board may be transported to/accommodated in temporary facilities out of the neighborhood school's area.

36. That the Owner shall agree in the Subdivision Agreement to provide for two concrete pads for the placement of community mailboxes adjacent to Block 54 in accordance with the requirements of Canada Post.
37. That the Subdivision Agreement contain a provision requiring the Owner to coordinate the preparation of an overall utility distribution plan to the satisfaction of all affected utility providers.
38. That if the provision of natural gas servicing to the subdivision is anticipated, that the Subdivision Agreement contain a provision requiring the Owner to grade all streets to final elevation prior to the installation of the gas lines, and provide the necessary field survey information required for the installation of the gas lines, all to the satisfaction of the utility provider.
39. That all of the natural gas distribution system shall be installed within the municipal road allowance.
40. That the utility plan provide for a transfer easement to allow installation of the necessary telephone equipment and associated facilities.
41. The Owner shall agree in the Subdivision Agreement, in words satisfactory to Bell Canada, to grant Bell Canada an 8 metre by 8 metre easement over part of Block 55 to allow for the installation of a Walk-in, Digital Equipment Cabinet and associated facilities, and that all costs associated with the transaction will be the responsibility of the Owner.
42. That prior to final approval, the Owner shall submit to the Ministry of Transportation for their review and approval a copy of a detailed stormwater management report, indicating the intended treatment of the calculated runoff.
43. That prior to final approval the Owner shall carry out an archaeological assessment of the subject property and mitigate, through preservation or resource removal and documental, adverse impacts to any significant archaeological resources found. No grading or other soil disturbances shall take place on the subject property prior to the Township of Springwater and the Ministry of Culture confirming that all archaeological resource concerns have met licensing and resource conservation requirements.
44. That the draft approval of this Plan of Subdivision will lapse on the third anniversary of the date of issuance approving this draft Plan of Subdivision. Provided, however, that this draft approval may be extended pursuant to Subsection 51(33) of the Planning Act, but no extension can be granted once the draft approval has lapsed.
45. That prior to final approval, the Approval Authority is to be advised in writing by the Township of Springwater how Conditions 2 to 14, 17, 24 to 32, 36 to 38, and 43 have been satisfied.
46. That prior to final approval, the Approval Authority is to be advised in writing by the Nottawasaga Valley Conservation Authority how Conditions 14 to 25 have been satisfied.

Applicant:	The Sarjeant Company Ltd.	Date of Decision:	January 30, 2006
File No.:	SP-T-0401	Date of Notice:	February 2, 2006
Municipality:	Township of Springwater	Last Date of Appeal:	February 22, 2006
Subject Lands:	Part of East Half Lot 16, Concession 5, (Geographic Township of Vespra) Township of Springwater And Part of Block 51, Registered Plan 51M-630		

47. That prior to final approval, the Approval Authority is to be advised in writing by the Ministry of Environment how Conditions 27 to 29 have been satisfied.
48. That prior to final approval, the Approval Authority is to be advised in writing by the Simcoe County District School Board how Conditions 33 and 34 have been satisfied.
49. That prior to final approval, the Approval Authority is to be advised in writing by the Simcoe Muskoka Catholic District School Board how Condition 35 has been satisfied.
50. That prior to final approval, the Approval Authority is to be advised in writing by Canada Post how Condition 36 has been satisfied.
51. That prior to final approval, the Approval Authority is to be advised in writing by the utility providers how Conditions 37 to 39 have been satisfied.
52. That prior to final approval, the Approval Authority is to be advised in writing by Bell Canada how Conditions 40 and 41 have been satisfied.
53. That prior to final approval, the Approval Authority is to be advised in writing by the Ministry of Transportation how Condition 42 has been satisfied.
54. That prior to final approval, the Approval Authority is to be advised in writing by the Ministry of Culture how Condition 43 has been satisfied.

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Subject Lands:	Part of East Half Lot 16, Concession 5, (Geographic Township of Vespra) Township of Springwater And Part of Block 51, Registered Plan 51M-630		

Notes to Draft Plan Approval:

1. It is the applicant's responsibility to fulfill the conditions of draft approval and to ensure that the required clearance letters are forwarded by the appropriate agencies to the County of Simcoe, Planning Department, quoting the County file number **SP-T-0401**.
2. We suggest you make yourself aware of:
 - a) Section 143 (1) of the Land Titles Act, which requires all new plans be registered in a land titles system;
 - b) Section 143 (2) – allows certain exceptions.
3. The Nottawasaga Valley Conservation Authority will require a copy of the executed subdivision agreement prior to the clearance of draft plan conditions.
4. The costs of any relocations or revisions to Hydro One facilities which are necessary to accommodate this subdivision will be borne by the developer.
5. Any easement rights of Ontario Hydro are to be respected.
6. The Owner should contact the local Ontario Hydro Area office to verify if any low voltage distribution lines may be affected by the proposal.
7. Bell Canada shall confirm that satisfactory arrangements, financial and otherwise, have been made with Bell Canada for any Bell Canada facilities servicing this draft plan of subdivision.
8. Ministry of Transportation permits are required prior to development of the subdivision. A Land Use permit will be required prior to site grading/servicing/internal road construction, and individual Building & Land Use permits will be required for all lots within a 395 metre radius of the centrepont of the intersection of Highway 26 and Carson road, and within 45 metres of Highway 26 property limits. Sign permits are also required for any proposed signage visible from Highway 26. Permit inquiries should be directed to Ms. Kevin DeVos, Permits Officer, at 416-235-4276.
9. Clearance letters are required from the following agencies:

Mr. A. Fyfe
Manager of Planning
Township of Springwater
County of Simcoe Administration Centre
1110 Highway 26
Midhurst, Ontario L0L 1X0

Ms. Jennifer Sharpe
Planning Officer
Simcoe Muskoka Catholic District School Board
26 Alliance Boulevard
Barrie, Ontario L4M 5K3

Applicant: The Sarjeant Company Ltd. **Date of Decision:** January 30, 2006
File No.: SP-T-0401 **Date of Notice:** February 2, 2006
Municipality: Township of Springwater **Last Date of Appeal:** February 22, 2006
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Ms. Holly Spacek
Planning Officer
Simcoe County District School Board
1170 Highway 27 West
Midhurst, Ontario L0L 1X0

Mr. Charles Burgess
Director of Planning
Nottawasaga Valley Conservation Authority
8195 Concession 8
Utopia, Ontario L0M 1T0

Mr. Patrick Doyle
Canada Post
Delivery Planning
300 Wellington Street
London, Ontario N6B 3P2

Mr Kevin Dinsmore
Right-Of-Way Manager
Bell Canada
Floor 2
136 Bayfield Street
Barrie, Ontario L4M 3B1

Mr. Amel Mangalino
Supervisor, Planning and Design
Enbridge Gas
500 Consumers Road
North York, Ontario M2J 1P8

Mr. William Armstrong
Environmental Planner
Southwestern Region
Ministry of Environment
733 Exeter Road
London, Ontario N6E 1L3

Mr. Peter Dorton
Project Manager
Ministry of Transportation
Central Region Corridor Management Section
7th Floor, Building D
1201 Wilson Avenue
Downsview, Ontario M3M 1J8

Applicant: The Sarjeant Company Ltd.
File No.: SP-T-0401
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Last Date of Appeal: February 22, 2006

Mr. Malcom Home
Ministry of Culture
Heritage Operations/Archaeology
400 University Avenue
4th Floor
Toronto, Ontario
M7A 2R9

10. If an agency condition concerns a matter within the subdivision agreement, a copy of the agreement should be sent to them. This will expedite clearance of the final plan.
11. The Nottawasaga Valley Conservation Authority will require a copy of the executed subdivision agreement prior to the clearance of draft plan conditions.
12. Please be advised that the approval of this draft plan will lapse on January 30, 2009. This approval may be extended pursuant to subsection 51(33) of the Planning Act, but no extension can be granted once the approval has lapsed.

If final approval is not given to this plan within three (3) years of the draft approval date, and no extensions have been granted, draft approval will lapse under subsection 51(32) of the Planning Act, R.S.O. 1990. If the owner wishes to request an extension to draft approval, a written explanation, together with a resolution from Council, must be received by the County of Simcoe sixty (60) days prior to the lapsing date.

13. The Final Plan approved by the County must be registered within 30 days or the County may withdraw its approval under subsection 51(32) of the Planning Act, R.S.O. 1990, as amended.

Subject to the conditions set forth above, this Draft Plan is approved under Section 51 of the Planning Act R.S.O 1990, Chapter 13, as amended.

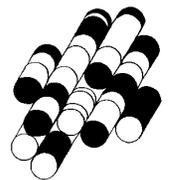
This 30th day of JANUARY, 2006



Director of Planning

TEST PIT LOGS

TERRAPROBE LIMITED



BOREHOLE LOGS

SAMPLING METHOD SS split spoon ST Shelby tube AS auger sample WS wash sample RC rock core WH weight of hammer PH pressure, hydraulic	PENETRATION RESISTANCE Standard Penetration Test (SPT) resistance ('N' values) is defined as the number of blows by a hammer weighing 63.6 kg (140 lb.) falling freely for a distance of 0.76 m (30 in.) required to advance a standard 50 mm (2 in.) diameter split spoon sampler for a distance of 0.3 m (12 in.). Dynamic Cone Test (DCT) resistance is defined as the number of blows by a hammer weighing 63.6 kg (140 lb.) falling freely for a distance of 0.76 m (30 in.) required to advance a conical steel point of 50 mm (2 in.) diameter and with 60° sides on 'A' size drill rods for a distance of 0.3 m (12 in.).																																	
SOIL DESCRIPTION - COHESIONLESS SOILS <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Relative Density</th> <th style="text-align: left;">'N' value</th> </tr> </thead> <tbody> <tr> <td>very loose</td> <td>< 4</td> </tr> <tr> <td>loose</td> <td>4 - 10</td> </tr> <tr> <td>compact</td> <td>10 - 30</td> </tr> <tr> <td>dense</td> <td>30 - 50</td> </tr> <tr> <td>very dense</td> <td>> 50</td> </tr> </tbody> </table>	Relative Density	'N' value	very loose	< 4	loose	4 - 10	compact	10 - 30	dense	30 - 50	very dense	> 50	SOIL DESCRIPTION - COHESIVE SOILS <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Consistency</th> <th style="text-align: left;">Undrained Shear Strength, kPa</th> <th style="text-align: left;">'N' value</th> </tr> </thead> <tbody> <tr> <td>very soft</td> <td>< 12</td> <td>< 2</td> </tr> <tr> <td>soft</td> <td>12 - 25</td> <td>2 - 4</td> </tr> <tr> <td>firm</td> <td>25 - 50</td> <td>4 - 8</td> </tr> <tr> <td>stiff</td> <td>50 - 100</td> <td>8 - 16</td> </tr> <tr> <td>very stiff</td> <td>100 - 200</td> <td>16 - 32</td> </tr> <tr> <td>hard</td> <td>> 200</td> <td>> 32</td> </tr> </tbody> </table>	Consistency	Undrained Shear Strength, kPa	'N' value	very soft	< 12	< 2	soft	12 - 25	2 - 4	firm	25 - 50	4 - 8	stiff	50 - 100	8 - 16	very stiff	100 - 200	16 - 32	hard	> 200	> 32
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SOIL COMPOSITION <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: left;">% by weight</th> </tr> </thead> <tbody> <tr> <td>'trace' (e.g. trace silt)</td> <td>< 10</td> </tr> <tr> <td>'some' (e.g. some gravel)</td> <td>10 - 20</td> </tr> <tr> <td>adjective (e.g. sandy)</td> <td>20 - 35</td> </tr> <tr> <td>'and' (e.g. sand and gravel)</td> <td>35 - 50</td> </tr> </tbody> </table>		% by weight	'trace' (e.g. trace silt)	< 10	'some' (e.g. some gravel)	10 - 20	adjective (e.g. sandy)	20 - 35	'and' (e.g. sand and gravel)	35 - 50	TESTS, SYMBOLS MH mechanical sieve and hydrometer analysis w, w _c water content w _l liquid limit w _p plastic limit I _p plasticity index k coefficient of permeability (soil unit weight, bulk N' angle of internal friction c' cohesion shear strength C _c compression index																							
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GENERAL INFORMATION, LIMITATIONS																																		
<p>The conclusions and recommendations provided in this report are based on the factual information obtained from the boreholes and/or test pits. Subsurface conditions between the test holes may vary.</p> <p>The engineering interpretation and report recommendations are given only for the specific project detailed within, and only for the original client. Any third party decision, reliance, or use of this report is the sole and exclusive responsibility of such third party. The number and siting of boreholes and/or test pits may not be sufficient to determine all factors required for different purposes.</p> <p>It is recommended Terraprobe be retained to review the project final design and to provide construction inspection and testing.</p>																																		



PROJECT: Davison Residential Subdivision
LOCATION: Georgetown, Ontario
CLIENT: R.E. Clipsham Limited

FILE NO: 91198
DATE: June 19, 1991
ELEVATION DATUM: Geodetic

DEPTH, m	STRATIGRAPHY SOIL DESCRIPTION	STRAT. G.W.	SAMPLES		ELEVATION m	WATER CONTENT % BY WEIGHT		
			NO.	DEPTH		10	20	30
271.7	TOPSOIL							
271.5	Reddish Brown Damp		1	0.8	271	⊙		
270.0	FINE TO MEDIUM SAND, trace gravel and silt		2	1.7	270	⊙		
1.7	Brown		3	3.0	269	⊙		
268.0	End of Test Pit				268			

- NOTES:**
1. Test pit dry and open on completion.
 2. Standpipe dry on June 24, 1991.



PROJECT: Davison Residential Subdivision
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DEPTH, m	STRATIGRAPHY SOIL DESCRIPTION	STRAT. G.W.	SAMPLES		ELEVATION m	WATER CONTENT % BY WEIGHT		
			NO.	DEPTH		10	20	30
273.3								
273.0	TOPSOIL							
0.3	Brown Moist				273			
270.8	SILT , some fine sand trace to some clay trace gravel		1	1.0	272			
270.8	Brown Damp		2	2.4	271			
2.5	SANDY GRAVEL , trace silt, occasional cobbles				270			
269.5	End of Test Pit		3	3.8	269			

- NOTES:**
1. Test pit caving from 2.5m depth.
 2. Seepage noted at 2.9m depth.
 3. Water level in test pit at 2.9m depth prior to backfilling.
 4. Water level in standpipe measured at 2.8m depth on June 24, 1991.



Terraprobe

FIELD LOG - TEST PIT NO. 3

PROJECT: Davison Residential Subdivision
LOCATION: Georgetown, Ontario
CLIENT: R.E. Clipsham Limited

FILE NO: 91198
DATE: June 19, 1991
ELEVATION DATUM: Geodetic

DEPTH, m	STRATIGRAPHY		STRAT. G.W.	SAMPLES		ELEVATION m	WATER CONTENT % BY WEIGHT		
	SOIL DESCRIPTION			NO.	DEPTH		10	20	30
274.0	TOPSOIL								
273.8									
0.2	Brown	Moist							
	SANDY SILT, some clay, trace gravel								
				1	1.0	273			
272.0				2	1.9	272			
2.0	Brown	Damp							
	SANDY SILT, trace clay and gravel								
	(TILL)								
271.1				3	2.9				
2.9	End of Test Pit					271			

NOTES:
 1. Test pit dry and open on completion.
 2. Standpipe dry on June 24, 1991.



PROJECT: Davison Residential Subdivision
LOCATION: Georgetown, Ontario
CLIENT: R.E. Clipsham Limited

FILE NO: 91198
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ELEVATION DATUM: Geodetic

DEPTH, m	STRATIGRAPHY SOIL DESCRIPTION		STRAT. G.W.	SAMPLES NO. DEPTH	ELEVATION m	WATER CONTENT % BY WEIGHT		
						10	20	30
272.9	TOPSOIL							
272.6	TOPSOIL							
0.3	Brown	Moist						
	SILT , trace to some clay, trace fine sand and gravel							
271.5				1-1.1	272			
1.4	Reddish Brown	Hard						
		Moist to Damp						
	SANDY CLAYEY SILT (TILL)			2-2.0	271			
269.9								
3.0	Highly Weathered Shale							
				3-3.4	270			
269.2								
3.7	End of Test Pit				269			

- NOTES:**
1. seepage noted at 1.7m depth.
 2. Test pit open on completion.
 3. Water level in test pit at 3.4m depth prior to backfilling.
 4. Water level in standpipe measured at 2.2m depth on June 24, 1991.



PROJECT: Davison Residential Subdivision
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DEPTH, m	STRATIGRAPHY SOIL DESCRIPTION	STRAT. G.W.	SAMPLES		ELEVATION m	WATER CONTENT % BY WEIGHT		
			NO.	DEPTH		10	20	30
273.3								
273.0	TOPSOIL				273			
0.3	Reddish Hard Moist Brown							
	SANDY TO CLAYEY SILT, trace gravel (TILL)		1	1.0	272			
			2	2.0	271			
	very hard							
	Highly Weathered Shale				270			
269.7			3	3.6				
3.6	End of Test Pit				269			

- NOTES:**
1. Test pit open on completion.
 2. Seepage noted at 2.4m depth.
 3. Water level in test pit at 3.4m depth prior to backfilling.
 4. Water level in standpipe measured at 2.1m depth on June 24, 1991.



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DEPTH, m	STRATIGRAPHY SOIL DESCRIPTION	STRAT. G.W.	SAMPLES		ELEVATION m	WATER CONTENT % BY WEIGHT		
			NO.	DEPTH		10	20	30
273.7	TOPSOIL							
273.3	Reddish Brown	Moist			273			
272.4	SANDY SILT , trace clay and gravel (TILL)		1	1.1				
1.3	Reddish Hard Brown	Moist to Damp			272			
271.0	SANDY SILT , some clay trace gravel (TILL)		2	2.0				
271.0	Very Hard				271			
2.7	Highly Weathered Shale							
270.3	End of Test Pit		3	3.4				
3.4					270			

- NOTES:**
1. Test pit open on completion.
 2. Seepage noted at 1.8m depth.
 3. Water level in test pit at 3.2m depth prior to backfilling.
 4. Water level in standpipe measured at 1.4m depth on June 24, 1991.



PROJECT: Davison Residential Subdivision
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DEPTH, m	STRATIGRAPHY SOIL DESCRIPTION	STRAT.	G.W.	SAMPLES		ELEVATION m	WATER CONTENT % BY WEIGHT		
				NO.	DEPTH		10	20	30
274.0	TOPSOIL	~							
273.5		~							
0.5	Brown Moist								
	FINE SANDY SILT , trace clay and gravel (TILL)			1	1.1	273			
272.6									
1.4	Reddish Brown Hard Damp								
	CLAYEY SILT , some sand trace gravel (TILL)			2	1.8				
271.8									
2.2	Grey Layer								
271.6						272			
2.4	Reddish Brown Very Hard Damp								
	Highly weathered Shale								
271.0				3	3.0	271			
3.0	End of Test Pit								
						270			

NOTES:

1. Test pit open on completion.
2. Seepage noted at 1.6m depth.
3. Water level in test pit at 2.6m depth prior to backfilling.
4. Water level in standpipe at 1.4m depth on June 24, 1991



PROJECT: Davison Residential Subdivision
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DEPTH, m	STRATIGRAPHY SOIL DESCRIPTION	STRAT. G.W.	SAMPLES		ELEVATION m	WATER CONTENT % BY WEIGHT		
			NO.	DEPTH		10	20	30
274.3								
	TOPSOIL				274			
273.8								
0.5	Brown Dense Moist							
	SANDY SILT , trace clay and gravel (TILL)							
			1	1.0				
					273			
			2	2.0				
					272			
271.3								
3.0	Reddish Brown Hard to Moist Very Hard							
271.0	CLAYEY SILT TILL TO		3	3.3	271			
3.3	HIGHLY WEATHERED SHALE End of Test Pit							
					270			

- NOTES:**
1. Test pit open on completion.
 2. Seepage noted at 2.9m depth.
 3. Water level in test pit at 2.9m depth prior to backfilling.
 4. Water level in standpipe measured at 2.0m depth on June 24, 1991.



PROJECT: Davison Residential Subdivision
LOCATION: Georgetown, Ontario
CLIENT: R.E. Clipsham Limited

FILE NO: 91198
DATE: June 19, 1991

ELEVATION DATUM: Geodetic

DEPTH, m	STRATIGRAPHY SOIL DESCRIPTION	STRAT. G.W.	SAMPLES NO. DEPTH	ELEVATION m	WATER CONTENT % BY WEIGHT			
					10	20	30	
273.9	TOPSOIL							
273.4								
0.5	Brown Moist SANDY SILT , trace clay and gravel (TILL)		1-1.0	273				
272.6								
1.3	Reddish Hard Damp Brown SILT , some clay and fine sand (TILL)		2-2.0	272				
271.2								
2.7	Highly Weathered Shale			271				
270.6								
3.3	End of Test Pit		3-3.3	270				

NOTES:

1. Test pit open on completion.
2. Seepage noted at 1.9m depth.
3. Water level in test pit at 3.0m depth prior to backfilling.
4. Water level in standpipe measured at 1.3m depth on June 24, 1991.



PROJECT: Davison Residential Subdivision
LOCATION: Georgetown, Ontario
CLIENT: R.E. Clipsham Limited

FILE NO: 91198
DATE: June 19, 1991
ELEVATION DATUM: Geodetic

DEPTH, m	STRATIGRAPHY			STRAT. G.W.	SAMPLES NO. DEPTH	ELEVATION m	WATER CONTENT % BY WEIGHT			
	SOIL DESCRIPTION						10	20	30	
273.6	TOPSOIL									
273.0	0.6	Reddish Brown	Hard	Moist to Damp		1 -1.0	273			
		SILT, some clay, trace to some sand, trace gravel			2 -1.9	272				
		(TILL)				271				
270.3	3.3	End of Test Pit				3 -3.3	270			

- NOTES:
1. Test pit open on completion.
 2. Water level in test pit at 3.3m depth prior to backfilling.
 3. Water level in standpipe measured at 1.9m depth on June 24, 1991.



PROJECT: Davison Residential Subdivision
LOCATION: Georgetown, Ontario
CLIENT: R.E. Clipsham Limited

FILE NO: 91198
DATE: June 19, 1991
ELEVATION DATUM: Geodetic

DEPTH, m	STRATIGRAPHY			STRAT. G.W.	SAMPLES		ELEVATION m	WATER CONTENT % BY WEIGHT		
	SOIL DESCRIPTION				NO.	DEPTH		10	20	30
273.2	TOPSOIL						273			
272.7	0.5	Reddish Brown	Very Hard	Moist						
		CLAYEY SILT, trace sand								
271.8	1.4	(TILL) Grey Layer				1	1.3	272		
	1.5	Reddish Brown	Very Hard	Damp						
		Highly Weathered Shale								
270.0	3.2	End of Test Pit				3	3.2	270		
							269			

NOTES:
 1. Test pit dry and open on completion.
 2. Water level in standpipe measured at 1.5m depth on June 24, 1991.



Terraprobe

FIELD LOG - TEST PIT NO. 1

PROJECT: Davison Residential Subdivision
LOCATION: Georgetown, Ontario
CLIENT: R.E. Clipsham Limited

FILE NO: 91198
DATE: June 19, 1991
ELEVATION DATUM: Geodetic

DEPTH, m 271.7	STRATIGRAPHY SOIL DESCRIPTION	STRAT. G.W.	SAMPLES		ELEVATION m	WATER CONTENT % BY WEIGHT		
			NO.	DEPTH		10	20	30
271.5	TOPSOIL							
0.2	Reddish Brown Damp FINE TO MEDIUM SAND, trace gravel and silt		1	0.8	271	⊙		
270.0								
1.7	Brown		2	1.7	270	⊙		
					269			
			3	3.0		⊙		
268.0								
3.7	End of Test Pit				268			

- NOTES:**
1. Test pit dry and open on completion.
 2. Standpipe dry on June 24, 1991.



PROJECT: Davison Residential Subdivision
LOCATION: Georgetown, Ontario
CLIENT: R.E. Clipsham Limited

FILE NO: 91198
DATE: June 19, 1991
ELEVATION DATUM: Geodetic

DEPTH, m 273.3	STRATIGRAPHY		STRAT. G.W.	SAMPLES		ELEVATION m	WATER CONTENT % BY WEIGHT		
	SOIL DESCRIPTION			NO.	DEPTH		10	20	30
273.0	TOPSOIL					273			
0.3	Brown	Moist		1	1.0	272			
	SILT, some fine sand trace to some clay trace gravel								
270.8	Brown	Damp		2	2.4	271			
2.5	SANDY GRAVEL, trace silt, occasional cobbles					270			
269.5	End of Test Pit			3	3.8	269			
3.8									

- NOTES:**
1. Test pit caving from 2.5m depth.
 2. Seepage noted at 2.9m depth.
 3. Water level in test pit at 2.9m depth prior to backfilling.
 4. Water level in standpipe measured at 2.8m depth on June 24, 1991.



Terraprobe

FIELD LOG - TEST PIT NO. 3

PROJECT: Davison Residential Subdivision
LOCATION: Georgetown, Ontario
CLIENT: R.E. Clipsham Limited

FILE NO: 91198
DATE: June 19, 1991
ELEVATION DATUM: Geodetic

DEPTH, m	STRATIGRAPHY SOIL DESCRIPTION	STRAT. G.W.	SAMPLES		ELEVATION m	WATER CONTENT % BY WEIGHT		
			NO.	DEPTH		10	20	30
274.0								
273.8	TOPSOIL							
0.2	Brown Moist							
	SANDY SILT, some clay, trace gravel		1	1.0	273			
272.0								
2.0	Brown Damp		2	1.9	272			
	SANDY SILT, trace clay and gravel							
271.1	(TILL)		3	2.9				
2.9	End of Test Pit				271			

NOTES:
 1. Test pit dry and open on completion.
 2. Standpipe dry on June 24, 1991.



Terraprobe

FIELD LOG - TEST PIT NO. 4

PROJECT: Davison Residential Subdivision
LOCATION: Georgetown, Ontario
CLIENT: R.E. Clipsham Limited

FILE NO: 91198
DATE: June 19, 1991
ELEVATION DATUM: Geodetic

DEPTH, m	STRATIGRAPHY SOIL DESCRIPTION		STRAT. G.W.	SAMPLES		ELEVATION m	WATER CONTENT % BY WEIGHT		
				NO.	DEPTH		10	20	30
272.9									
272.6	TOPSOIL		~ ~ ~						
0.3	Brown	Moist							
	SILT, trace to some clay, trace fine sand and gravel					272			
				1	1.1				
271.5	Reddish Brown	Hard							
1.4		Moist to Damp				271			
	SANDY CLAYEY SILT (TILL)								
				2	2.0				
269.9						270			
3.0	Highly Weathered Shale								
				3	3.4				
269.2	End of Test Pit					269			
3.7									

- NOTES:**
1. seepage noted at 1.7m depth.
 2. Test pit open on completion.
 3. Water level in test pit at 3.4m depth prior to backfilling.
 4. Water level in standpipe measured at 2.2m depth on June 24, 1991.



PROJECT: Davison Residential Subdivision
LOCATION: Georgetown, Ontario
CLIENT: R.E. Clipsham Limited

FILE NO: 91198
DATE: June 19, 1991
ELEVATION DATUM: Geodetic

DEPTH, m	STRATIGRAPHY SOIL DESCRIPTION	STRAT. G.W.	SAMPLES		ELEVATION m	WATER CONTENT % BY WEIGHT		
			NO.	DEPTH		10	20	30
273.3								
273.0	TOPSOIL				273			
0.3	Reddish Hard Moist Brown							
	SANDY TO CLAYEY SILT, trace gravel (TILL)		1	1.0	272			
			2	2.0	271			
	very hard							
	Highly Weathered Shale				270			
269.7			3	3.6				
3.6	End of Test Pit				269			

- NOTES:**
1. Test pit open on completion.
 2. Seepage noted at 2.4m depth.
 3. Water level in test pit at 3.4m depth prior to backfilling.
 4. Water level in standpipe measured at 2.1m depth on June 24, 1991.



PROJECT: Davison Residential Subdivision
LOCATION: Georgetown, Ontario
CLIENT: R.E. Clipsham Limited

FILE NO: 91198
DATE: June 19, 1991
ELEVATION DATUM: Geodetic

DEPTH, m	STRATIGRAPHY SOIL DESCRIPTION	STRAT. G.W.	SAMPLES NO. DEPTH	ELEVATION m	WATER CONTENT % BY WEIGHT			
					10	20	30	
273.7	TOPSOIL							
273.3	0.4 Reddish Brown Moist			273				
272.4	SANDY SILT , trace clay and gravel (TILL)		1 -1.1					
1.3	Reddish Hard Moist to Damp Brown			272				
271.0	SANDY SILT , some clay trace gravel (TILL)		2 -2.0					
2.7	Very Hard Highly Weathered Shale			271				
270.3	End of Test Pit		3 -3.4		270			

- NOTES:**
1. Test pit open on completion.
 2. Seepage noted at 1.8m depth.
 3. Water level in test pit at 3.2m depth prior to backfilling.
 4. Water level in standpipe measured at 1.4m depth on June 24, 1991.



PROJECT: Davison Residential Subdivision
LOCATION: Georgetown, Ontario
CLIENT: R.E. Clipsham Limited

FILE NO: 91198
DATE: June 19, 1991
ELEVATION DATUM: Geodetic

DEPTH, m	STRATIGRAPHY SOIL DESCRIPTION	STRAT. G.W.	SAMPLES		ELEVATION m	WATER CONTENT % BY WEIGHT		
			NO.	DEPTH		10	20	30
274.0	TOPSOIL							
273.5	Brown Moist							
0.5	FINE SANDY SILT , trace clay and gravel (TILL)		1	1.1	273			
272.6	Reddish Brown Hard Damp							
1.4	CLAYEY SILT , some sand trace gravel (TILL)		2	1.8				
271.8	Grey Layer				272			
2.2	Reddish Brown Very Hard Damp							
271.6	Highly weathered Shale							
2.4	End of Test Pit		3	3.0	271			
271.0								
3.0					270			

- NOTES:**
1. Test pit open on completion.
 2. Seepage noted at 1.6m depth.
 3. Water level in test pit at 2.6m depth prior to backfilling.
 4. Water level in standpipe at 1.4m depth on June 24, 1991



PROJECT: Davison Residential Subdivision
LOCATION: Georgetown, Ontario
CLIENT: R.E. Clipsham Limited

FILE NO: 91198
DATE: June 19, 1991
ELEVATION DATUM: Geodetic

DEPTH, m	STRATIGRAPHY SOIL DESCRIPTION	STRAT. G.W.	SAMPLES NO. DEPTH	ELEVATION m	WATER CONTENT % BY WEIGHT		
					10	20	30
274.3	TOPSOIL			274			
273.8	Brown Dense Moist						
0.5	SANDY SILT , trace clay and gravel (TILL)		1 -1.0	273			
			2 -2.0	272			
271.3	Reddish Brown Hard to very Hard Moist						
3.0	CLAYEY SILT TILL TO		3 -3.3	271			
271.0	HIGHLY WEATHERED SHALE						
3.3	End of Test Pit			270			

- NOTES:**
1. Test pit open on completion.
 2. Seepage noted at 2.9m depth.
 3. Water level in test pit at 2.9m depth prior to backfilling.
 4. Water level in standpipe measured at 2.0m depth on June 24, 1991.



PROJECT: Davison Residential Subdivision
LOCATION: Georgetown, Ontario
CLIENT: R.E. Clipsham Limited

FILE NO: 91198
DATE: June 19, 1991
ELEVATION DATUM: Geodetic

DEPTH, m	STRATIGRAPHY SOIL DESCRIPTION	STRAT. G.W.	SAMPLES		ELEVATION m	WATER CONTENT % BY WEIGHT		
			NO.	DEPTH		10	20	30
273.9	TOPSOIL							
273.4	TOPSOIL							
0.5	Brown Moist SANDY SILT , trace clay and gravel (TILL)		1	1.0	273			
272.6	Reddish Hard Damp Brown SILT , some clay and fine sand (TILL)		2	2.0	272			
271.2	Highly Weathered Shale		3	3.3	271			
2.7								
270.6	End of Test Pit				270			

NOTES:

1. Test pit open on completion.
2. Seepage noted at 1.9m depth.
3. Water level in test pit at 3.0m depth prior to backfilling.
4. Water level in standpipe measured at 1.3m depth on June 24, 1991.



PROJECT: Davison Residential Subdivision
LOCATION: Georgetown, Ontario
CLIENT: R.E. Clipsham Limited

FILE NO: 91198
DATE: June 19, 1991
ELEVATION DATUM: Geodetic

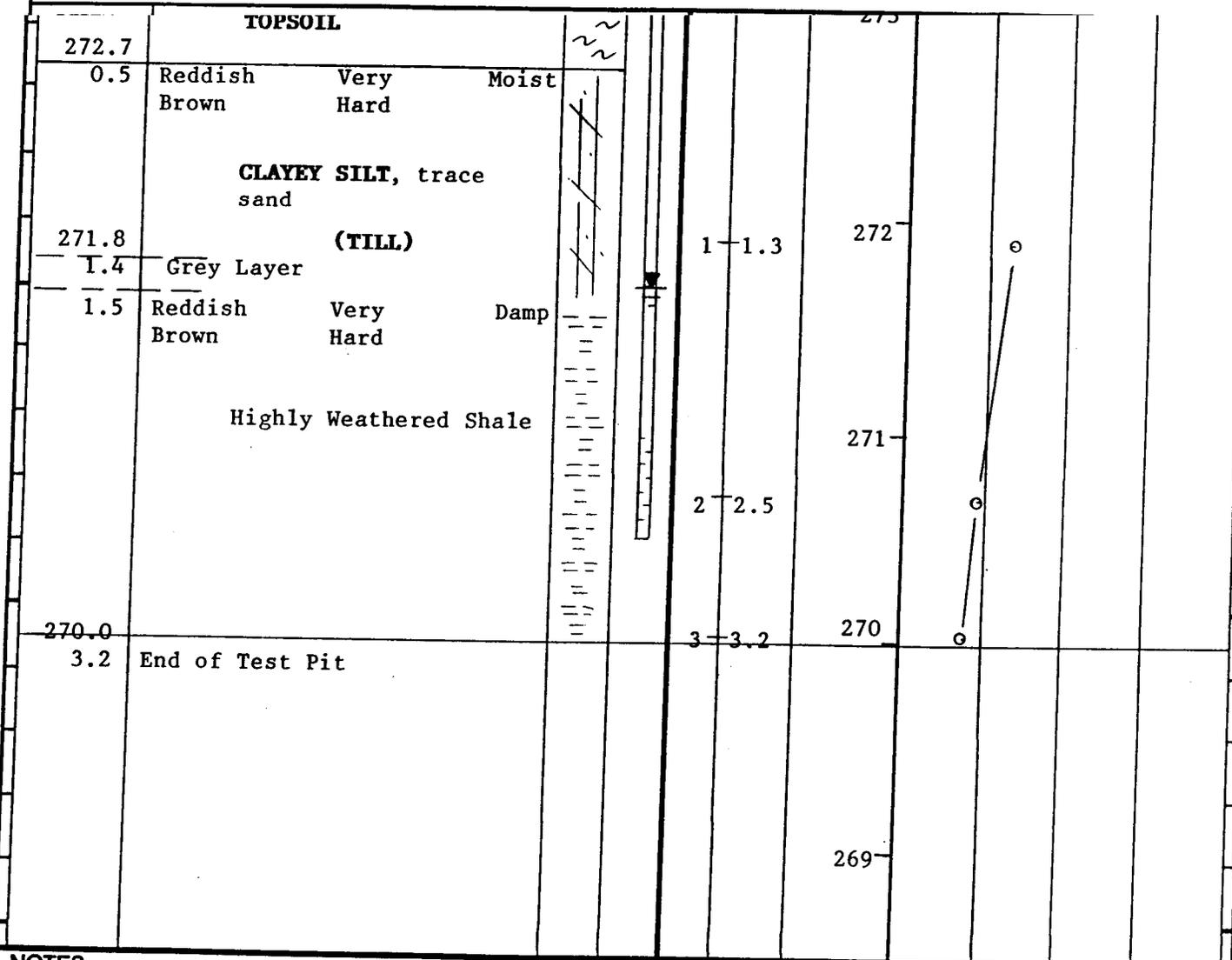
DEPTH, m	STRATIGRAPHY			STRAT. G.W.	SAMPLES NO.	DEPTH	ELEVATION m	WATER CONTENT % BY WEIGHT			
	SOIL DESCRIPTION							10	20	30	
273.6	TOPSOIL										
273.0	0.6	Reddish Brown	Hard	Moist to Damp		1	1.0	273			
		SILT , some clay, trace to some sand, trace gravel				2	1.9	272			
		(TILL)						271			
270.3	3.3	End of Test Pit				3	3.3				
								270			

- NOTES:**
1. Test pit open on completion.
 2. Water level in test pit at 3.3m depth prior to backfilling.
 3. Water level in standpipe measured at 1.9m depth on June 24, 1991.



PROJECT: Davison Residential Subdivision
LOCATION: Georgetown, Ontario
CLIENT: R.E. Clipsham Limited

FILE NO: 91198
DATE: June 19, 1991
ELEVATION DATUM: Geodetic



NOTES:

1. Test pit dry and open on completion.
2. Water level in standpipe measured at 1.5m depth on June 24, 1991.