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May 9, 2008
File # RD1755

Original by Mail

**Frontier Energy Inc.**
**#8, 10th Street**
**Sylvan Lake Alberta**
**T4S 2P3**

**Attention: Mr. Frank Wilson**

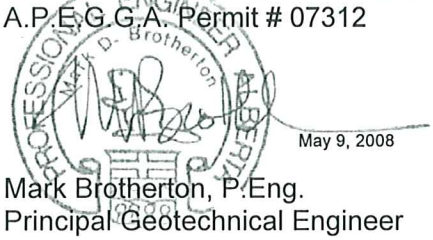
Re: Sylvan Lake Property NE 34-39-2-W5M
Lacombe County, AB

Dear Sir,

In November 2005, Parkland Geotechnical Consulting Ltd. (ParklandGEO) prepared a geotechnical report for the property referred to above. We have reviewed the report and the March 25,2 008 e-mail query from Lacombe County. The findings and recommendations given in this report are still valid and are applicable to your development based on understanding of your present development proposal.

We trust this information meets with your present requirements. If you have any questions or comments please contact our office.

Respectfully submitted,
**PARKLAND GEOTECHNICAL CONSULTING LTD.**
A.P.E.G.G.A. Permit # 07312




May 9, 2008

Mark Brotherton, P.Eng.
Principal Geotechnical Engineer

cc Jolene Tekjl - jtejkl@lacombecounty.com

The ParklandGEO Consulting Group

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November 22, 2005
Project No. RD1480

Email: fwilson@frontierenergy.com
Original by mail

**Frank Wilson**
**#8 10 St.**
**Sylvan Lake, Alberta**
**T4S 2P3**

**Attention: Mr. Frank Wilson**

Re: Sylvan Lake Property NE 34-39-2-W5M
Lacombe County, AB

Parkland Geotechnical Consulting Ltd. (Parkland) was commissioned to conduct groundwater table measurements and a preliminary geotechnical assessment for a proposed rural residential development at the site noted above. The following report summarizes available site information, percolation rates and groundwater measurements. This report includes information presented in our preliminary report memo dated January 14, 2005

## 1.0 SITE DESCRIPTION

The proposed development is located in the NE 34-39-2-W5M, Lacombe County. The site is located about 200 m north of the northwest corner of Sylvan Lake. The development area is bordered to the north by the local county road (Rainy Creek Road). The area of the proposed subdivision is mostly open farmland with a few trees along the fence lines. The topography is gently rolling with an overall slope to the south towards Sylvan Lake.

## 2.0 FIELD PROGRAM

On December 22, 2004, Parkland drilled five boreholes at the site using a truck mounted auger drill. Ms. Tina Cole, E.I.T., of Parkland supervised drilling and logged the soil profile encountered. Borehole logs describing the soil profile are attached. For each of the selected sites, a 3.0 m deep borehole was drilled to measure depth to groundwater. Groundwater measurements were taken upon drilling completion and on January 14, 2004.

On October 4, 2005, a second hole was drilled at the test hole locations for percolation testing. These percolation test holes were drilled to depths of 0.9 m at a distance of approximately 3 m from each of the original 2004 boreholes. On October 5, 2005, ParklandGEO undertook percolation tests in accordance with "Interim Guidelines for the Evaluation of Water Table and Soil Percolation Rate for Unserviced Residential Subdivisions" prepared by the Groundwater Protection Branch, Waste and Chemicals Division, and the Land Use Branch, Environmental Assessment Division, of Alberta Environmental Protection Services, Alberta

Environment. The procedure for percolation rate testing consisted of auguring a 150 mm diameter test hole to a depth of 0.9 m at each location. The sides of each hole were carefully scarified to expose a natural soil interface and each hole was pre-soaked for a minimum of twenty four hours prior to testing. The 'Fixed Time Interval and Refill Method' was employed.

## 3.0 SOIL CONDITIONS

The soil profile at the subject site consists of topsoil and/or a thin layer of silty lacustrine clay overlying clay till. The 100 mm thick layer of surficial topsoil encountered at each site and is moderately organic, black and damp. The silty clay found in Boreholes 1 to 4 was low plastic, firm to stiff, brown and damp. The very stiff clay till found below the silty clay in Boreholes 1 to 4 and below the topsoil in Borehole 5 was a mixture of silt, sand and clay with inclusions of coal and gravel up to cobble sizes. The depth to the clay till varied from 0.1 to 0.5 m at the test hole sites.

Borehole logs are attached to this letter along with explanation sheets showing the terms and symbols used on the logs.

## 4.0 GROUNDWATER AND PERCOLATION TESTING

The boreholes were noted to be dry in December 2004 and January 2005. Boreholes 1 and 4 were still present on October 4, 2005 and both holes remained dry (the other three holes were collapsed and the pipes were missing). Therefore, groundwater depths at the test locations were considered to be greater than the minimum depth required for conventional septic field systems and house basements.

The percolation test results varied between the five test sites as summarized below in Table 1. The detailed summary of the percolation data is attached to this letter.

**TABLE 1**
**WATER LEVELS PERCOLATION RATES**

| Borehole Location | Borehole Depth (m) | Water Level Completion (m) | Water Level Jan. 14/05 (m) | Water Level Oct. 5/05 (m) | Percolation Rate (min/cm) |
|---|---|---|---|---|---|
| 1 | 3.0 | dry | dry | dry | 35.0 |
| 2 | 3.0 | dry | dry | - | 26.5 |
| 3 | 3.0 | dry | dry | - | No drop |
| 4 | 3.0 | dry | dry | dry | 17.5 |
| 5 | 3.0 | dry | dry | - | 6.0 |

The favourable range of percolation rate for soils is between 2.0 and 23.6 min/cm as shown in the table of Section 2.2 in the "Soil Testing and Groundwater Supply Evaluation Guidelines for Residential Subdivisions". Two of the five tested locations were within the range. The other three tests had slow percolation rates indicative of low permeable soils.

## 5.0 PRIVATE SEWAGE DISPOSAL

Based on the test results above and on previous studies in the area, the local lacustrine soils usually have favourable grain size and percolation characteristics and are often suitable for conventional septic field construction. The local clay till is usually low permeable and is not expected to meet the required percolation rates for placement of a conventional septic field system. The suitability of selected sites for conventional septic fields will be dependent on the depth of silty lacustrine clay overlying the clay till.

In areas of shallow till, practical options for private sewage disposal will include modifying the existing subgrade by mixing in silt and sand to achieve an acceptable low to moderate permeability; construction of septic mounds; use of an engineered sewage disposal/treatment systems or installation of septic pump out tanks. Septic disposal systems should be constructed in accordance with applicable regulations and should be properly sized and installed by a licensed contractor based on testing and verification of actual field conditions.

## 6.0 ROAD DEVELOPMENT

The thin layer of silty clay encountered below the topsoil was firm to stiff, with an estimated soil moisture content at or slightly above the Optimum Moisture Content. When wet, these silty deposits are considered to be frost susceptible and sensitive to disturbance when wet. These soils will provide a low level of subgrade support for local pavements and may require relatively thick pavement sections in order to support construction traffic, depending on actual conditions at the time of construction. These sensitive subgrade conditions are considered to be typical in Central Alberta.

The local clay till is considered to be stiffer and generally more stable than the lacustrine clay. However, the till will be prone to possible softening if subjected to disturbance when wet.

## 7.0 RESIDENTIAL FOUNDATIONS

Standard house basement foundations using strip and spread footings will be acceptable at this site. Footings based on native clay or clay till deposits may be designed based on a maximum allowable bearing pressure of 100 ka for footings placed on undisturbed inorganic soil free from loosened material. The design and construction of residential foundations should conform to Alberta Building Code - Section 9. In general, excavations should be protected against surface water; footing bases should not be allowed to dry out excessively during construction; and the bearing soil should be protected against freezing during and after construction.

The groundwater table is more than 3 m below grade at this site. Regardless, a standard weeping tile drain is recommended around the outside perimeter of basement areas to control potential surface infiltration into the backfill around the perimeter of the basement. Groundwater infiltration flows can be significantly increased by poor site drainage around houses, improperly directed roof leaders and poorly graded or compacted backfill.

## 8.0 CLOSURE

This report is based on the findings at 5 test hole locations. If different subsoil and groundwater conditions are encountered, this office must be notified and recommendations submitted herein will be reviewed and revised as required. This report has been prepared for the exclusive use of Frank Wilson and his approved agents for the specified application to the proposed subdivision development within NE 34-39-2-W5M, near Sylvan Lake, Alberta. It has been prepared in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

We trust the information presented in this report meets with your present requirements. If you have any questions or concerns about the information provided in this report, please do not hesitate to contact this office.

Respectfully submitted,
**Parkland Geotechnical Consulting Ltd.**
A.P.E.G.G.A. Permit # 07312

M.D. Brotherton, P.Eng.
Principal Geotechnical Engineer

attach/ perc test results, site plan,
borehole logs, explanation sheets

## TABLE 2
## PERCOLATION TEST RESULTS

**PERCOLATION TEST HOLE 1:**

| Time (min) | Drop (cm) | Rate (min/cm) |
|---|---|---|
| 56 | 1.5 | 37.3 |
| 57 | 1.5 | 34.7 |

**PERCOLATION TEST HOLE 2:**

| Time (min) | Drop (cm) | Rate (min/cm) |
|---|---|---|
| 17 | 0.47 | 36.5 |
| 54 | 2.0 | 26.5 |

**PERCOLATION TEST HOLE 3:**

| Time (min) | Drop (cm) | Rate (min/cm) |
|---|---|---|
| 60 | 0 | +23.6 |

**PERCOLATION TEST HOLE 4:**

| Time (min) | Drop (cm) | Rate (min/cm) |
|---|---|---|
| 60 | 3.3 | 18.2 |
| 55 | 3.2 | 17.2 |
| 47 | 2.7 | 17.4 |

**PERCOLATION TEST HOLE 5:**

| Time (min) | Drop (cm) | Rate (min/cm) |
|---|---|---|
| 57 | 9.6 | 5.9 |
| 49 | 8.3 | 5.9 |
| 53 | 8.5 | 6.2 |