



# Application for Amendment

Application under the *Agricultural Operation Practices Act* to amend a permit for a confined feeding operation, manure collection area and/or manure storage facility(ies). ("Permit" means an NRCB-issued or grandfathered approval, registration, or authorization, including a grandfathered municipal development permit.)

<b>NRCB USE ONLY</b>	Application number <b>RA18008A</b>	Date Stamp <b>NRCB APPLICATION</b> <b>JAN 17 2020</b>
<input type="checkbox"/> Approval <input type="checkbox"/> Registration <input checked="" type="checkbox"/> Authorization		

**CONTACT INFORMATION**

**RECEIVED**

<b>Applicant Information</b>		
Name: <b>Tim Hofer</b>	Corporate Name (if applicable): <b>Hutterian Brethren of Red Willow</b>	
Address: (Street/P.O. Box) <b>Box 940</b>		
City/Town:	Province: <b>AB</b>	Postal Code: <b>TOC-2L0</b>
<b>Agent Information (if applicable)</b>		
Name:	Corporate Name (if applicable):	
Address: (Street/P.O. Box)		
City/Town:	Province:	Postal Code:

**LOCATION OF DEVELOPMENT**

Which permit do you wish to amend? (List permit number and issuing agency.)	<b>RA18008</b>
Legal Land Description(s)	<b>SE-23-40-18-W4</b> <span style="float: right;">(Qtr-Sec-Twp-Rg-W Mer)</span>

**APPLICATION DISCLOSURE**

This information is collected under the authority of the *Agricultural Operation Practices Act (AOPA)*, and is subject to the provisions of the *Freedom of Information and Protection of Privacy Act*. This information is public unless the NRCB grants a written request that certain sections remain private.

Any construction prior to obtaining an NRCB permit is an offence and is subject to enforcement action, including prosecution.

I, the applicant, or applicant's agent, have read and understand the statements herein and acknowledge that the information provided in this application is true to the best of my knowledge.

Jan 17, 2020  
Date of signing

Red Willow Colony  
Corporate name (if applicable)

Signature

Tim Hofer  
Print name

# Application for Amendment – contd.

## AMENDMENT INFORMATION REQUIREMENTS

### Instructions:

For each part of your permit that you would like amended, please detail what change you would like made and why, and how your proposed change will meet the AOPA requirements. You may attach additional pages to this form to provide this information.

Please note that an approval officer may require a page (or pages) of the Part 2 application forms to be completed as part of this application for amendment, depending on what changes are proposed.

Want to make the Lagoon bigger with the same liner and regulations and the same location.

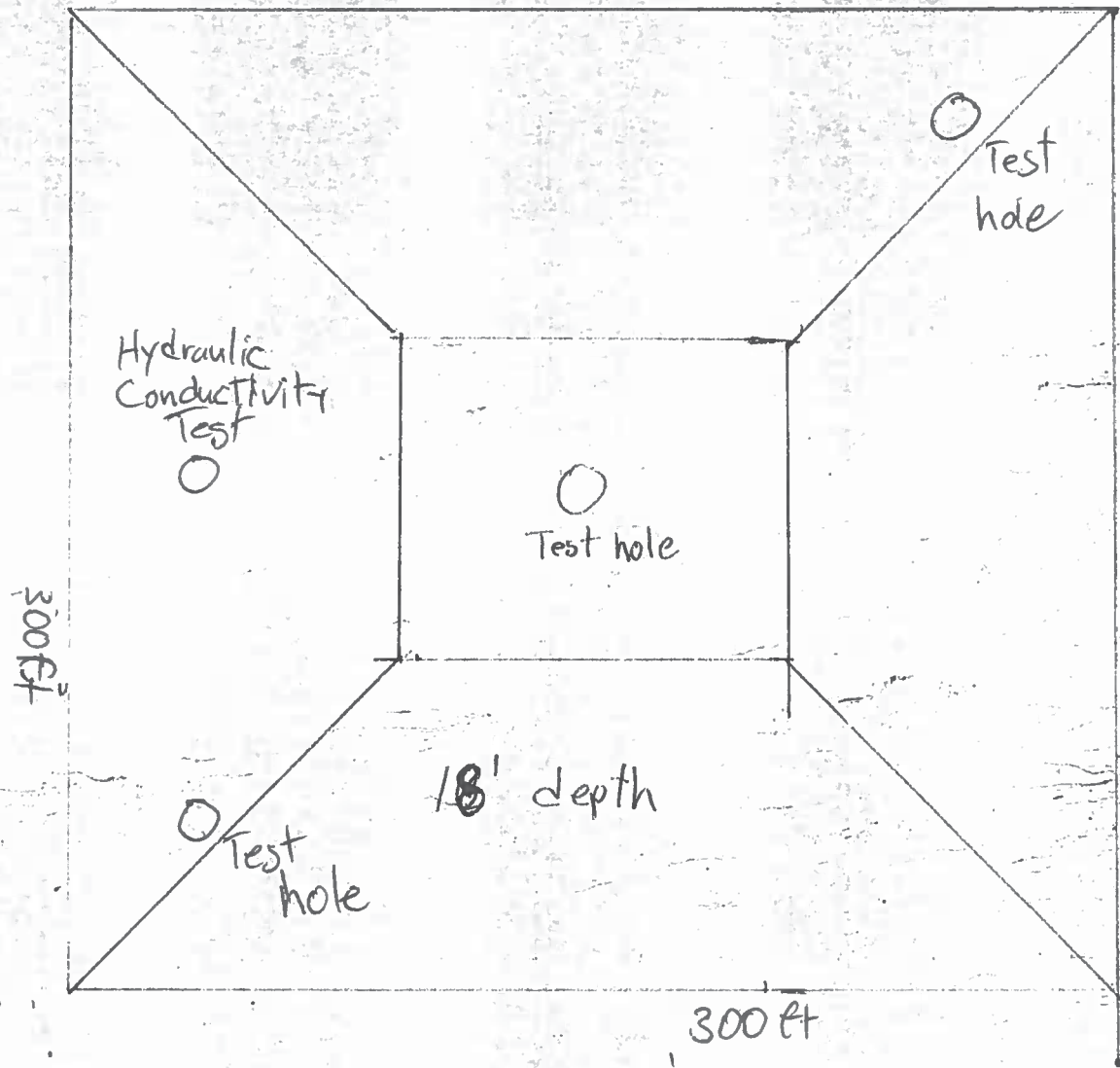
### AO Comments:

The application seeks to modify the dimensions of the permitted earthen liquid manure storage (EMS). The EMS will increase in size from the original dimensions of 61 m x 61 m x 5.5 m deep, to 91.4 m x 91.4 m x 5.5 m deep. The EMS will be located in the same area that was proposed in the original application. The proposal will have a minimal change to its environmental risk, if any. Livestock number, and therefore, annual manure production will not change

RW Colony

# Lagoon for Dairy

30/3



Hydraulic  
Conductivity  
Test

Test  
hole

Test hole

Test  
hole

18' depth

300 ft

300 ft



## ALMOR TESTING SERVICES LTD.

7505 - 40 STREET S.E., CALGARY, AB T2C 2H5    PHONE (403) 236-8880 • FAX (403) 236-1707

2017 12 28

099-133-17

R.W Colony Farming Ltd.  
PO Box 940  
Stettler, Alberta  
T0C 2L0

Attention: Mr. Tim Hofer

Re:   Shallow Subsoil Investigation  
      Liquid Manure Storage Lagoon - Red Willow Colony  
      Red Willow, Alberta

### 1.0 INTRODUCTION

Almor Testing Services Ltd. was requested by Mr. Tim Hofer, on behalf of the Red Willow Hutterite Colony, to conduct a Geotechnical Investigation for the proposed construction of a Liquid Manure Storage Lagoon. The project is located approximately 8km east of Red Willow, Alberta. Figure 1 in Appendix "A" shows the approximate location.

The purpose of the geotechnical investigation was to advance shallow test holes, to evaluate the subsurface soil and groundwater conditions, within the project boundaries. This report summarizes the results of field and laboratory testing programs and presents geotechnical recommendations for the design and construction of the liquid manure storage lagoon to be designed to a depth of some 5.0m below grade.

### 2.0 INVESTIGATION DETAILS

#### 2.1 Field Program

Four (4) test holes, designated as TH1 through TH4, were drilled on the site on October 31, 2017. The test holes were drilled using a truck mounted solid stem auger drill rig operated by Almor Testing Services Ltd. of Calgary, Alberta. The Test Hole Logs are provided in Appendix "B". The test holes were advanced to depths varying between 9.1m and 9.3m, below existing ground surface. The test holes were logged and samples classified in accordance with the Modified Unified Soil Classification System described in Appendix "B". Pocket penetrometer tests were obtained at selected intervals, during drilling. Disturbed soil samples were returned to Almor's Calgary Laboratory for further classification and testing.

.../2

## **2.2 Laboratory Program**

A laboratory testing program meeting applicable ASTM and/or CSA standards was undertaken on selected samples secured in the field. The laboratory testing consisted of the following:

- Determination of the natural moisture content;
- Atterberg limits;
- Grain Size Analysis testing; and
- Hydraulic Conductivity Triaxial Permeability testing.

## **3.0 SUBSURFACE CONDITIONS**

### **3.1 General**

The general stratigraphy of the project site consisted of topsoil/browns, underlain by silty clay till. The following is a general description of the soil units encountered. Detailed descriptions of the soil strata encountered are provided on the Test Hole Logs in Appendix "B".

It should be noted, that the transitions between the classified soil units are gradual, rather than the distinct unit boundaries as shown on the Test Hole Logs.

### **3.2 Topsoil/Browns**

Topsoil/browns were encountered in all test hole locations and varied in thickness between 100mm and 500mm. It is possible, there may be localized areas where the thickness of organic deposits are greater than those observed at the test hole locations.

### **3.3 Clay Till**

The predominant soil encountered was silty clay till and was encountered in all test holes advanced, during the current geotechnical program. It should be noted that clay till is a heterogeneous mixture of soil particles from fine grained to cobble sized material. Oxides, coal fragments and numerous sand partings were also noted. This deposit extended to a maximum depth of 9.3m below existing grade, where drilling was terminated.

The till was described as olive brown in color, in a damp to moist condition and varied between stiff to hard in terms of consistency. Two Atterberg Limit Index Property tests were performed on these soils. TH1 at a 2.0m depth indicated a Liquid Limit of 38 and a Plastic Limit of 14, resulting in a Plasticity Index of 24, TH2 at a 5.0m depth indicated a Liquid Limit of 37 and a Plastic Limit of 13, resulting in a Plasticity Index of 24. The tests classify these soils as medium plastic clay (CI).

No bedrock was encountered, during the current geotechnical investigation program.

### 3.4 Groundwater Conditions

Monitoring of the groundwater conditions was conducted, during drilling operations and two weeks subsequent. After completion of drilling, groundwater seepage was noted in all test holes, at depths varying between 8.1m and 8.4m below existing grade. Groundwater conditions are provided on the Test Hole Logs in Appendix "B". Additionally, groundwater levels fluctuate seasonally and in response to climatic conditions in June to August.

Table 2 summarizes the water level readings recorded, within the standpipes, upon completion and three weeks subsequent:

**Table 1: Groundwater Conditions**

-- Depth Below Existing Ground Surface (m) --

Test Hole No.	Depth of Standpipe	At Completion Oct 31/17	Nov 25/17
1	9.1	8.4	3.71
2	9.1	8.3	3.61
3	9.3	8.2	4.02
4	9.1	8.1	3.14

## 4.0 GEOTECHNICAL RECOMMENDATIONS

### 4.1 General

Development of the facility using balanced cut/fill earth quantities is likely feasible, depending on local variations in soil stratigraphy and topography. Based on selected elevation and subsoil conditions observed in the test holes, the exposed subgrade soils over most cut areas are expected to consist of native clay till soils. In those areas where fill is required, it is anticipated that the local soil will be used.

The majority of the soil in the upper 3.0m of the soil profile is above the optimum moisture content and moisture conditioning, drying of the material may be required. Based on observed groundwater conditions noted, during the geotechnical program, the depth to groundwater within the proposed liquid manure sewage lagoon area ranges from 3.1m to 4.0m below existing grade. Please note perched water conditions are typical in the till soils and will drain to deeper depths, upon excavation and construction.

## 4.2 General Site Grading

The composition and consistency of the soils encountered at the site were such that excavation with conventional earthmoving equipment, and/or hydraulic excavators, is considered feasible.

In general, where the local clay soils are to be used as general engineered fill, moisture conditioning and drying of the material may be required. Extensive fill placement required for general site grading should not be performed during freezing conditions or using frozen soils. The native inorganic soil encountered in the test holes is suitable material for use as general engineered fill. General engineered fill should be compacted to a minimum of 98% of the Standard Proctor Maximum Dry Density (SPMDD) at a moulding moisture of optimum to 3% above Optimum Moisture Content (OMC) for cohesive soils. All fill should be placed in lift thicknesses compatible with the compaction equipment being used, to a maximum lift thickness of 200mm.

## 4.3 Concrete Type

Water soluble sulphate content tests were conducted on the insitu soils encountered within the project boundaries, and indicate the potential degree of sulphate attack may be considered low (as per CSA A23.1-14, Table 3). Accordingly, General Use (Type GU) hydraulic cement may be used for all concrete in contact with these soils. In addition, all concrete must be designed in accordance with the CSA A23.1-14 e.g. air-entraining agents are required in freeze/thaw zones. Should any fine grained soils be imported to the site, it should be tested for the presence of sulphates and the above recommendations modified, if required.

All concrete must be supplied in accordance with the current Alberta and National Building Code requirements. All concrete mix design, and construction, should be carried out in accordance with the CAN/CSA A23.1-14 and A23.2-14 specifications.

## 4.4 Laboratory Testing

### 4.4.1 Soil Texture

A Grain Size Analysis laboratory testing program, meeting applicable ASTM and/or CSA standards was undertaken on the samples secured in the field. The results of the testing are presented in the following table:

**Table 2: Soil Texture**

Test Hole	Depth (m)	Moisture Content (%)	Grain Size Distribution (ASTM D-422)			
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)
1	3.0	19.1	1.0	32.9	38.7	27.4
3	2.0	17.7	0.6	32.1	38.3	29.0

#### **4.5 Sewage Lagoon Liner**

Almor understands, that a well compacted clay backfill is to be used for the clay liner for the liquid manure storage lagoon. The minimum clay liner thickness should be 1000mm (2008 Agricultural Operation Practices Act) and the clay fill should be placed in 200mm thick lifts, with each lift compacted to a minimum of 98% of SPMDD at a moulding moisture of 2% to 3% above OMC. The bottom of the liner must be 1.0m or more above the water table at the site at the time of construction. We recommend that water table should be measured just prior to the construction of the clay liner. Prior to the addition of compacted clay liner material, the in-situ clay till at the base and the sides should be scarified to a depth that can be recompacted utilizing suitable equipment. The scarified surface should be compacted to the specifications noted above. During scarification, attention should be focused on looking for hydraulic defects, such as sand seams, cracks, or fissures, which could compromise the integrity of the liner. If encountered, unsuitable material should be completely removed and replaced with approved soils and compacted to achieve the necessary hydraulic conductivity. The interior and exterior side slopes of the berms should be no steeper than 3H:1V and 4H:1V, respectively.

For the purpose of the liquid storage Lagoon, the 2008 Agricultural Operation Practices Act recommends a coefficient of hydraulic conductivity of  $1 \times 10^{-7}$  cm/sec. Two disturbed soil samples were obtained from within the project boundaries. Hydraulic conductivity testing was performed at Golder Associates laboratory. The results of the Triaxial Permeability testing conducted in accordance to ASTM D5084 were  $5.76 \times 10^{-9}$  cm/sec and  $2.28 \times 10^{-9}$  cm/sec. The test results indicate that the permeability, when reduced by 1 magnitude to compensate for insitu construction are in the order of  $5.76 \times 10^{-8}$  cm/sec and  $2.28 \times 10^{-8}$  cm/sec. The requirement for the maximum permeability of liners for sewage lagoons is  $1 \times 10^{-7}$  cm/sec.

Based on the results of the current laboratory testing program, the local clay till is considered suitable for the construction of the natural clay liners utilized for the liquid manure storage lagoon, when engineered in accordance to the guidelines.

#### **5.0 CLOSURE**

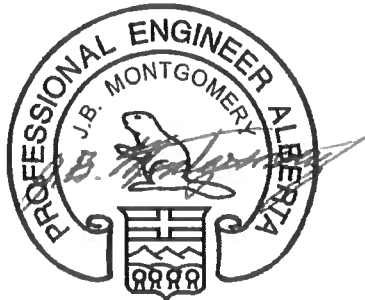
This investigation was performed to evaluate the subsurface soil and groundwater conditions for, review of the development. The geotechnical factors discussed in the report were based on the interpreted subsurface conditions, as found in the four (4) test hole locations investigated. It should be noted that natural conditions can be variable. Should subsurface conditions other than those presented herein be encountered, during subsequent investigations or during construction, our office should be notified in order that our recommendations can be reviewed or revised, if necessary.



This report has been prepared for the exclusive use of R.W. Colony Farming company Ltd. and its agents for specific application to the proposed development described within this report. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Almor accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.

We trust this meets with your present requirements.

Respectfully submitted,  
ALMOR TESTING SERVICES LTD.



J.B. Montgomery, P.Eng.  
AA:ms:A06264  
Attachments


\* APEGA Permit to Practice #P2206


## **APPENDIX A**



Figure 1

## **APPENDIX B**

PROJECT: LIQUID MANURE STORAGE FACILITY RED WILLOW, ALBERTA				PROJECT NO.		HOLE NO. TH1		
CLIENT: RED WILLOW COLONY FARMING COMPANY LTD.				DRILL TYPE SOLID STEM AUGER				
GEODETIC ELEVATION (m)		DATUM		SAMPLE TYPE	WATER CONTENT (%)		COMPRESSION STRENGTH Unconfined ▲ Pocket Pen △	OTHER TESTS
DEPTH (m)	SOIL DESCRIPTION		DEPTH (ft)		MOD UNIFIED SOIL CLASS	PLASTIC LIMIT		
0	TOPSOIL/BROWNS		0					
1	Silty CLAY (TILL) stiff to very stiff, medium plastic, some sand to sandy, trace gravel, trace coaly pieces, trace oxides, mottled olive, moist		4					- Sulphate Content <0.10 %
2	- some sand, olive below 1.8 m		6	CI	14	38		
3			8					
4	- becoming grey		10					November 25, 2017
5	- stiff, some sand to sandy, moist to wet below 4.6 m		12					
6			14					
7	- becoming firm		16					
8	- occasional fine grained, saturated sand lens below 7.6 m		18					
9	- stiff to very stiff, moist below 8.5 m		20					At completion
10	END OF TEST HOLE AT 9.1m - standpipe installed to 9.1m - groundwater level 8.4m at completion - test hole backfilled with soil cuttings - bentonite seal placed, 0.3m		22					
			24					
			26					
			28					
			30					
			32					
			34					
 ALMOR TESTING SERVICES LTD. <b>TEST HOLE LOG</b>				KN/m <sup>2</sup> 16 18 20 22 100 120 140 PCF WET UNIT WEIGHT ○		PENETRATION RESISTANCE ■ □ SPT    ■ Case ■ Cone    ■ BT Pen		GROUNDWATER ▼ Date Measured
COMPLETION DEPTH	9.1 m	DATE DRILLED	October 31, 2017	LOGGED BY	AI Hunter	PLATE NO.	1	

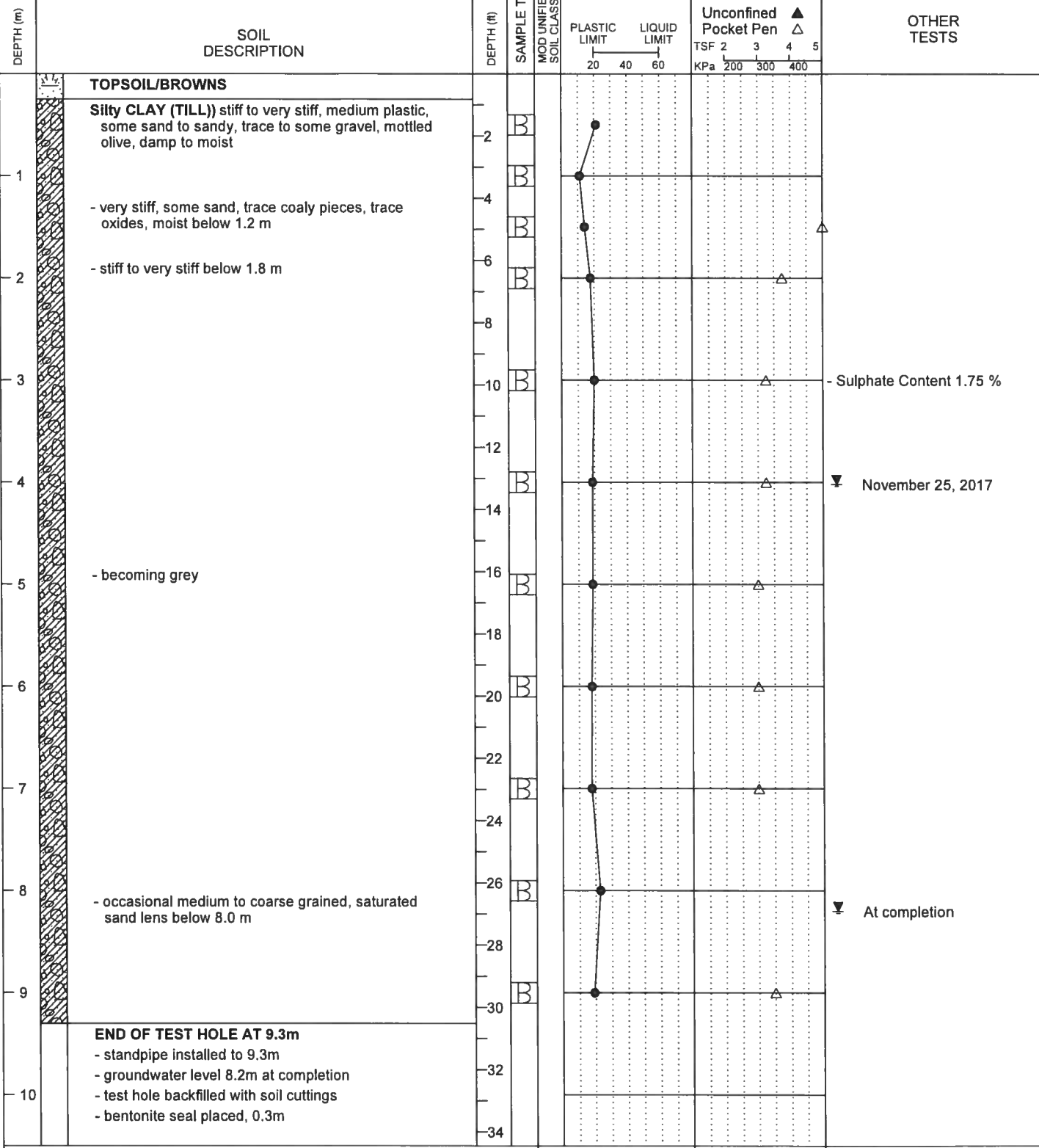
PROJECT: LIQUID MANURE STORAGE FACILITY RED WILLOW, ALBERTA		PROJECT NO.		HOLE NO. TH2			
CLIENT: RED WILLOW COLONY FARMING COMPANY LTD.		DRILL TYPE SOLID STEM AUGER					
GEODETTIC ELEVATION (m)		DATUM					
DEPTH (m)	SOIL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE	WATER CONTENT (%) ●		COMPRESSIVE STRENGTH Unconfined ▲ Pocket Pen △	OTHER TESTS
				PLASTIC LIMIT	LIQUID LIMIT		
1	TOPSOIL/BROWNS Silty CLAY (TILL) stiff to very stiff, medium plastic, some sand, trace gravel, olive/brown, damp to moist - becoming moist	2	B	20	40	200	
2	- stiff, some sand, trace coaly pieces, trace oxides, moist to wet below 1.3 m	4	B	25	45	250	
3	- becoming stiff to very stiff, moist	6	B	25	45	250	
4	- grey below 4.5 m	8	B	25	45	250	
5	- becoming stiff, some sand to sandy, moist to wet	10	B	25	45	250	
6		12	B	25	45	250	November 25, 2017
7		14	B	25	45	250	
8	- firm to stiff below 6.5 m	16	Cl	19	37	250	
9	- occasional fine grained, saturated sand lens below 8.0 m - stiff to very stiff below 8.5 m	18	B	25	45	250	
10	END OF TEST HOLE AT 9.1m - standpipe installed to 9.1m - groundwater level 8.3m at completion - test hole backfilled with soil cuttings - bentonite seal placed, 0.3m	20	B	25	45	250	At completion
		22	B	25	45	250	
		24	B	25	45	250	
		26	B	25	45	250	
		28	B	25	45	250	
		30	B	25	45	250	
		32					
		34					
 ALMOR TESTING SERVICES LTD. TEST HOLE LOG		KN/m <sup>2</sup> 16 18 20 22 PCF 100 120 140 WET UNIT WEIGHT ○		PENETRATION RESISTANCE ■ <input type="checkbox"/> SPT <input checked="" type="checkbox"/> Case <input checked="" type="checkbox"/> Cone <input checked="" type="checkbox"/> BT Pen		GROUNDWATER ▼ Date Measured	
COMPLETION DEPTH	9.1 m	DATE DRILLED	October 31, 2017	LOGGED BY	AI Hunter	PLATE NO.	2

PROJECT: LIQUID MANURE STORAGE FACILITY  
RED WILLOW, ALBERTA

PROJECT NO. HOLE NO. TH3

CLIENT: RED WILLOW COLONY FARMING COMPANY LTD. DRILL TYPE SOLID STEM AUGER

GEODETIC ELEVATION (m) DATUM



**ALMOR** ALMOR TESTING SERVICES LTD. **TEST HOLE LOG**

KN/m<sup>2</sup> 16 18 20 22 PENETRATION RESISTANCE

100 120 140 PCF

WET UNIT WEIGHT

20 40 60

☐ SPT ☑ Case  
■ Cone ■ BT Pen

GROUNDWATER Date Measured

COMPLETION DEPTH 9.3 m DATE DRILLED October 31, 2017 LOGGED BY AI Hunter PLATE NO. 3

PROJECT: LIQUID MANURE STORAGE FACILITY  
RED WILLOW, ALBERTA

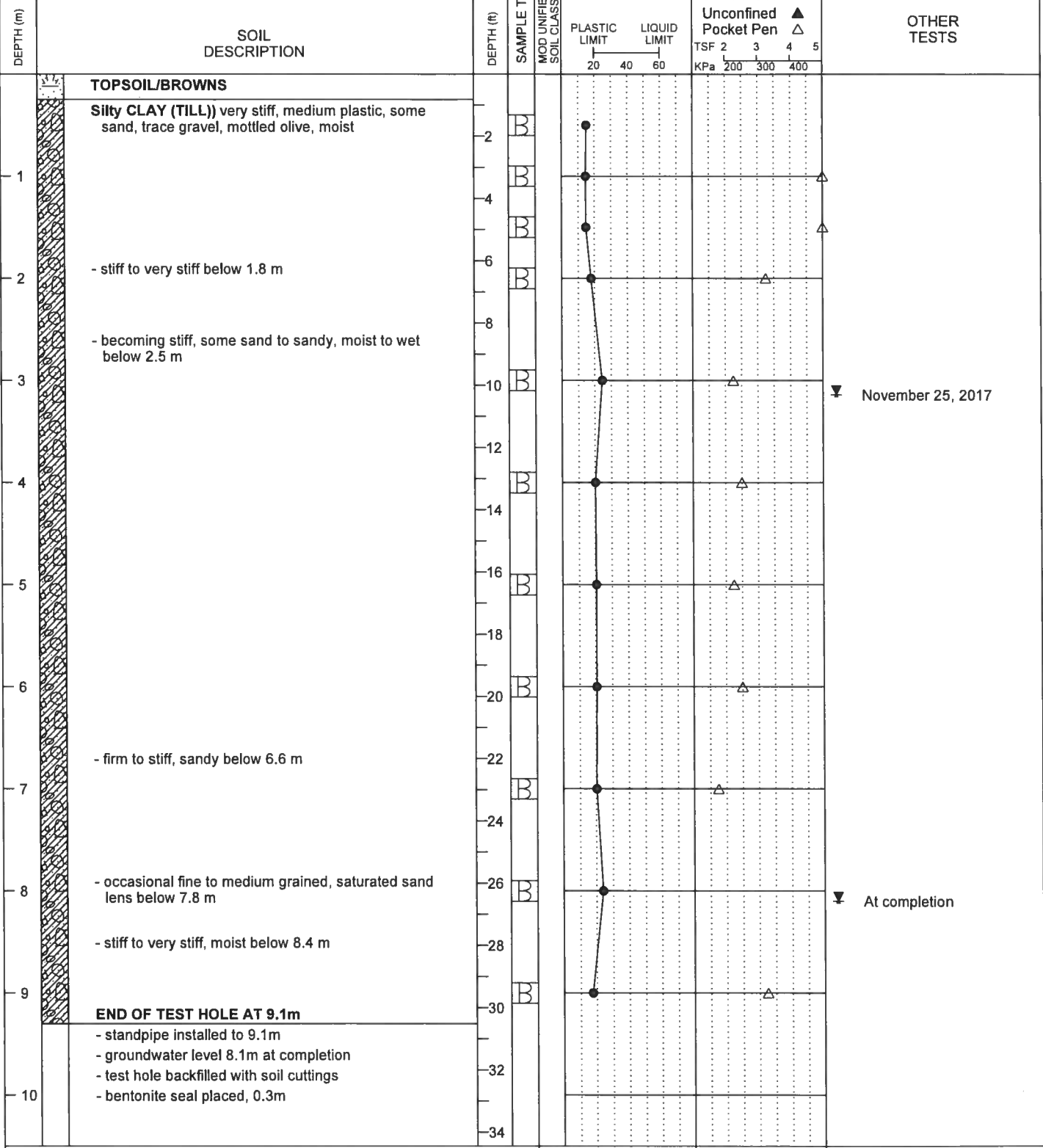
PROJECT NO.

HOLE NO. TH4

CLIENT: RED WILLOW COLONY FARMING COMPANY LTD.

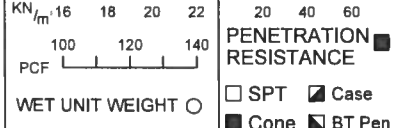
DRILL TYPE SOLID STEM AUGER

GEODETIC ELEVATION (m) DATUM



ALMOR TESTING SERVICES LTD.

TEST HOLE LOG



GROUNDWATER  
Date Measured

COMPLETION DEPTH 9.1 m    DATE DRILLED October 31, 2017    LOGGED BY Al Hunter    PLATE NO. 4



## **APPENDIX C**



7505 - 40 Street SE  
 Calgary, Alberta T2C 2H5  
 Telephone: (403) 236-8880

# Grain Size Distribution

ASTM D-422

**Project** Liquid Manure Storage Lagoon  
**Client** Red Willow Colony  
**Almor Job #** 099-133-17  
**Date Recieved** Oct 31/17  
**Date Tested** Dec 18/17

**Test Hole #** TH1  
**Depth** 3.0m  
**Technician** KC

**Soil Classification**  
 Gravel 1.0%  
 Sand 32.9%  
 Silt 38.7%  
 Clay 27.4%

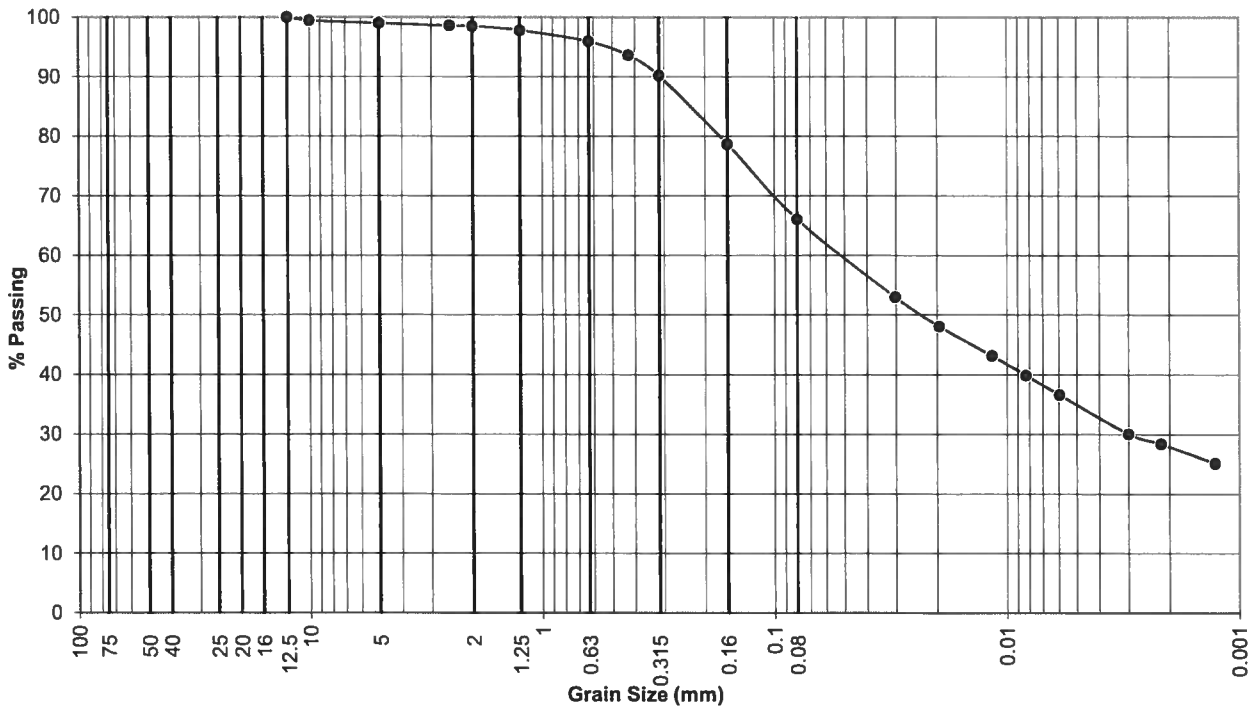
**Soil Description** Sandy Clayey SILT, trace gravel

**Soil Properties**  
 Natural Moisture Content 19.1 %  
 Liquid Limit %  
 Plastic Limit %  
 Plasticity Index %  
 Specific Gravity 2.65

**Comments**

Sieve Size (mm)	% Passing
150	
100	
80	
50	
40	
25	
20	100.0
10	99.5
5	99.0
2	98.5
0.425	93.6
0.080	66.1
0.005	34.5
0.002	27.4

Gravel		Sand			Silt	Clay
Coarse	Fine	Coarse	Medium	Fine		





7505 - 40 Street SE  
 Calgary, Alberta T2C 2H5  
 Telephone: (403) 236-8880

# Grain Size Distribution

ASTM D-422

**Project** Liquid Manure Storage Lagoon  
**Client** Red Willow Colony  
**Almor Job #** 099-133-17  
**Date Received** Oct 31/17  
**Date Tested** Dec 18/17

**Test Hole #** TH3  
**Depth** 2.0m  
**Technician** KC

**Soil Classification**  
 Gravel 0.6%  
 Sand 32.1%  
 Silt 38.3%  
 Clay 29.0%

**Soil Description** Sandy Clayey SILT, trace gravel

**Soil Properties**  
 Natural Moisture Content 17.7 %  
 Liquid Limit %  
 Plastic Limit %  
 Plasticity Index %  
 Specific Gravity 2.65

**Comments**

Sieve Size (mm)	% Passing
150	
100	
80	
50	
40	
25	
20	100.0
10	100.0
5	99.4
2	99.0
0.425	94.4
0.080	67.3
0.005	38.1
0.002	29.0

Gravel		Sand			Silt	Clay
Coarse	Fine	Coarse	Medium	Fine		

