



**APPENDIX**  
Geotechnical Study

F



**THURBER** ENGINEERING LTD.

November 6, 2018

File: 18907

ISL Engineering and Land Services Ltd.  
7909 – 51 Avenue  
Edmonton, AB  
T6E 5L9

Attention: Ms. Shelly Moulds, P.Eng.

**RANGE ROAD 231 AND 232 FUNCTIONAL PLANNING STUDY  
FROM HIGHWAY 628 TO WYE ROAD  
GEOTECHNICAL DESKTOP STUDY**

Dear Ms. Moulds:

This report presents the results of a geotechnical desktop assessment carried out by Thurber Engineering Ltd. (Thurber) for a functional planning study (FPS) between Range Road 231 and 232 and between Highway 628 and Wye Road in Sherwood Park, Alberta.

The desktop study was carried out in general accordance with our proposal to ISL dated May 17, 2017.

It is a condition of this letter report that Thurber's performance of its professional services will be subject to the attached Statement of Limitations and Conditions.

**1. PROJECT DESCRIPTION**

Strathcona County is planning to upgrade Range Roads 231 and 232 between Highway 628 and Wye Road to enhance the traffic flow due to the increasing developments south of Sherwood Park. An existing functional planning study was conducted by Tetra Tech in 2004 but an update is required.

The study area is shown on Drawing No. 18907-1, in Appendix A.

The purpose of the geotechnical assessment is to provide preliminary information on the expected geotechnical conditions in the FPS area including site geology and topography, to identify any geotechnical constraints that may affect the proposed development, and to provide preliminary geotechnical input to assist in developing design options for the proposed intersection improvements and roadway upgrading.

**2. METHODOLOGY**

The desktop study consisted of the following tasks:

- A review of available geotechnical information from Thurber's in-house reports in the vicinity of the study area was carried out. A total of 47 test holes were available within the general site area from previous geotechnical and environmental investigations



as shown on Drawing No. 18907-1 in Appendix A. Five water well records were also available in the general site area. A list of the reference material used is provided at the end of the text of this report and test hole information pertinent to this report is included in Appendix C.

- A review of available LiDAR and satellite images of the area and a review of available surficial and bedrock geology maps were carried out to provide supplementary information on the expected soil and groundwater conditions.
- A site reconnaissance was carried out by Mr. Niels Rasmussen, P.Geo., of Thurber, on October 31, 2018. The site reconnaissance was limited to inspection of the areas adjacent to the public roadways. The purpose of the reconnaissance was to identify potential geotechnical issues within the study area and to confirm the topographic features identified in the satellite imagery. Selected photographs from the site reconnaissance are included in Appendix B.
- A geotechnical report was prepared that summarizes the existing geotechnical conditions in the study area and identifies any significant geotechnical constraints to the proposed development.

### **3. SITE TOPOGRAPHY AND GEOLOGY**

#### **3.1 Review of LiDAR**

LiDAR data provided by ISL was used as a base for the geomorphology review of the site. Bare earth LiDAR was used to prepare the major contour lines presented on Drawing No. 18907-2, Appendix A. The ground elevation within the study area ranges from about 740 m to 760 m.

#### **3.2 Surficial Geology**

Drawing No. 18907-3, Appendix A, shows the surficial geology of the study area with the major surficial geological units. The geological units are named as per the reference map created by Kathol and McPherson (1975).

Hummocky glacial till consisting of mixed clay, silt, and sand with pebbles and boulders covers the majority of the study area. The glacial till varies from 8 m to more than 25 m thick and becomes thinner towards the southeast.

Glaciolacustrine deposits consisting of bedded silt, sand and clay with pebbles are located in the northeast corner of the study area.

Lake and slough deposits consisting of silt, clay, and organics are scattered throughout the study area. The organic material has generally developed in poorly drained low-lying areas. The approximate locations of the organic deposits based on a review of satellite imagery are shown on Drawing No. 18907-3, Appendix A. Some of the poorly drained areas become temporarily filled by water during rainy periods.



### **3.3 Bedrock Geology**

The study area is underlain by Upper Cretaceous bedrock of the Horseshow Canyon Formation, which consists of sandstone, carbonaceous and bentonitic clay shale with occasional coal layers.

The bedrock surface is generally between 8 m and more than 25 m below ground surface in the study area.

## **4. SITE CONDITIONS**

### **4.1 Surface Conditions**

The proposed roadway upgrades are located along the existing Range Road 231 and 232 roadways. The roadway embankments are generally 0.9 to 1.5 m in height above existing grade.

Proposed intersection improvement and/or roundabouts at the main access points to the subdivisions, Wye Road and Highway 628 would be located within existing grassed ditches and/or treed private property.

Sloughs/dugouts are located adjacent to the roadway rights-of-way at several locations (see Drawing No. 18907-3, Appendix A and Photos 1 and 2 in Appendix B).

The majority of the ditches were dry at the time of the site reconnaissance. Some exceptions include the southwest and southeast quadrants of the intersection of Range Road 231 and Wye Road (see Photos 3 and 4 in Appendix B) where standing water and cattails were present and the southwest quadrant of the intersection of Range Road 232 and Wye Road.

CSP culverts are located at all the existing access points. A retaining wall is located on the west side of Range Road 232 between the access to Scot Haven and West Whitecroft (see Photo 5 in Appendix B).

### **4.2 Subsurface Soil and Bedrock Conditions**

The generalized subsurface stratigraphy at this site, based on the available water well records and test hole logs, consists of a thin layer of topsoil or fill overlying deposits of clay and sand, over clay till or bedrock. In general, the bedrock was encountered at depths between about 3.3 m and 30.5 m. However, the depth to bedrock appears highly variable and may also contain ice-raftered bedrock, which was noted in one test hole.

Detailed descriptions of the subsurface conditions are presented on the water well records and test hole logs in Appendix C. Drawing 18907-1 shows the approximate locations of the water wells and test holes. Following is a summary of the available test hole information:





### **Reference 1 – Alberta Environment Water Well Database**

Five water wells (1795235, 75829, 76311, 79018, and 79019) indicated clay and clay till over coal, siltstone, clay shale and sandstone bedrock. Bedrock was encountered at depths between 6.4 m to 30.5 m below ground surface. Water was encountered in TH12-46 at a depth of 2.8 m below ground surface. Water well 75829 indicated the presence of rafted bedrock over glacial till.

### **Reference 2 – New Esso Station Wye Road and Nottingham Way (TH00-1 to TH00-6)**

Test holes TH00-1 to TH00-6 completed at the Esso site are located northwest of the intersection of Wye Road and Range Road 231. The test holes indicated clay till fill over clay or clay till. Bedrock was not encountered at the maximum termination depth of 11.9 m. A standpipe piezometer installed in TH00-3 in the clay till indicated groundwater at 0.5 m below ground surface.

### **Reference 3 – Proposed Satellite Dish Compound 500 Wye Road (TH15-1)**

Test hole TH15-1 completed north of Wye Road between Range Road 231 and 232 indicated 0.5 m of fill (concrete, gravel and clay) over clay till. Bedrock was not encountered at the termination depth of 7.3 m below ground surface. A standpipe piezometer installed within the clay till indicated groundwater at 1.8 m below ground surface.

### **Reference 4 – Strathcona County Wye Road Yard (H1 to H23)**

Test holes H1 to H23 drilled in 1995 for the Strathcona County Yard located southwest of the intersection of Wye Road and Range Road 231 indicated sand or gravel fill over clay and/or sand. Hydrocarbon staining and odour and staining were noted in the sand and clay. Additional reports were not reviewed during this study for any remediation completed for the site. Bedrock was not encountered at the termination depth of 6.0 m below ground surface.

### **Reference 5 – Carr Residence 37 Windsor Estate (TH06-1 to TH06-4)**

Test holes drilled along west of Range Road 231 at 37 Windsor Estate indicated clay till with sand layers over clay shale bedrock. Bedrock was encountered at depths between 3.3 and 4.0 m below ground surface. A standpipe piezometer installed within the clay till indicated dry conditions 13 days following installation.

### **Reference 6 – HWY 628:04 Twinning (TH07-12 to TH07-15, TH07-19 to TH07-22, TH07-30, TH07-31, TH07-33, and TH07-35)**

Test holes drilled at the intersections of HWY 628 and Range Road 231 and 232 indicated asphalt, sand and gravel fill over clay fill over clay till. Fill was encountered to depths ranging from 0.4 m to 2.7 m depth below ground surface. Peat was encountered below the fill in TH07-21 and TH07-31 from 1.8 to 2.5 m and 1.5 to 3.2 m, respectively, below ground surface. Bedrock was not encountered at the test hole termination depths of 3.0 to 4.9 m below ground surface.



### 4.3 Groundwater Conditions

The available groundwater information from standpipe piezometers and water wells is summarized in Table 4.1 below.

**TABLE 4.1  
SUMMARY OF GROUNDWATER LEVELS**

TEST HOLE	TEST HOLE DEPTH (mBGS)	GROUNDWATER LEVEL AT END OF DRILLING (mBGS)	SLOTTED SCREEN DEPTH (mBGS)	LATEST WATER LEVEL READING (mBGS)
Reference 1				
1795235	80.8	N/A	61.0 to 79.2 (Bedrock)	6.8 (November 28, 2008)
Reference 2				
TH00-3	11.9	3.1	5.7 to 11.8 (Clay Till)	0.5 (August 1, 2000)
Reference 3				
TH15-1	7.3	None	3.8 to 6.8 (Clay Till)	1.8 (October 28, 2015)
Reference 4				
H1	3.4	1.2 (May 16, 1995)	N/A	N/A
H12	4.5	0.6 (June 21, 1995)	N/A	N/A
H21	6.0	1.5 (June 30, 1995)	N/A	N/A
Reference 5				
TH06-1	4.3	None	1.3 to 4.3 (Clay Till with Sand Layer)	Dry (July 24, 2008)

Note: BGS = below ground surface

It should be noted that groundwater levels are expected to vary seasonally and may be higher after prolonged heavy rainfall. Therefore, the actual groundwater conditions at the time of construction may vary from those recorded during these investigations.

## 5. PRELIMINARY GEOTECHNICAL EVALUATION AND RECOMMENDATIONS

Details on the proposed roadway upgrades and intersection improvements were not available at the time of this report; however, we understand that both roadway corridors will be two lanes, with either signalized intersections or roundabouts at problem intersections. There will be minimal changes to the profile, and rural drainage will be maintained.



Results of the desktop review indicate that the construction of the proposed intersection improvement and roadway upgrades are feasible from a geotechnical point of view.

The roadway corridors along Range Road 231 and 232 are expected to be underlain by clay and clay till deposits with sand layers overlying competent clay shale and sandstone bedrock at relatively shallow depth. Peat may be encountered below the existing roadway fill as shown in TH07-21 and TH07-31 (Reference 6) drilled for the Highway 628 twinning.

The site is located within hummocky glacial terrain and the permeability of the silty clay is low. Hence, the natural drainage condition is poor. Sloughs are present near the roadway corridors. Suitable drainage structures or facilities are required to promote drainage in this area. It will also be important to provide good drainage to the intersection subgrades. This can be achieved by providing a suitable cross-fall on the subgrade draining to side ditches of at least 1 m in depth.

The glaciolacustrine clay and clay till soils along the corridor alignments have low potential for erosion. Permanent cut and fill slopes should be topsoiled and revegetated as soon as possible to reduce potential slope erosion. In deep cuts, installation of erosion mats or other appropriate erosion control measures should be provided to limit erosion. In addition, water flow in roadway ditches should be evaluated and appropriate ditch erosion protection measures should be provided, where required.

When possible, the construction of approach roads, intersection upgrades and roundabouts should avoid any bogs or sloughs. From an available satellite image, organic materials and water bodies (slough and dugout) were identified and outlined on Drawing No. 18907-3, Appendix A. Where it is not feasible to avoid these features, the organic materials and any underlying soft soil should be sub-excavated prior to embankment fill construction. Note that these areas with organic materials could be in a wet condition in the spring time or during heavy rainfall events.

## **6. FURTHER WORK**

A detailed geotechnical investigation including test holes should be undertaken during future stages of the project. These should include investigations of the intersection upgrades and roundabouts to provide specific construction recommendations.


Standpipes should be installed to assess the groundwater levels. These should be read on a periodic basis throughout the year to provide information on the potential variations in groundwater levels.

## **7. CLOSURE**

This desktop study is based on widely spaced existing information and a general knowledge of subsurface conditions in the general area. Hence, the evaluations and recommendations presented within are preliminary in nature and only intended to guide ISL in developing their preliminary design options. Further investigation and recommendations will be required once a design option has been selected.



We trust that the above meets your present requirements, please do not hesitate to contact us should you have any questions.

Yours very truly,  
Thurber Engineering Ltd.  
R.W. Tweedie, P.Eng.   
Review Principal



Niels Rasmussen, P.Geo.  
Geologist  
/lg

Attachments:

- Statement of Limitations and Conditions
- Appendix A – Drawings
- Appendix B – Select Photographs from Site Reconnaissance
- Appendix C – Select Information from References

## **STATEMENT OF LIMITATIONS AND CONDITIONS**

### **1. STANDARD OF CARE**

This Report has been prepared in accordance with generally accepted engineering or environmental consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made.

### **2. COMPLETE REPORT**

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

### **3. BASIS OF REPORT**

The Report has been prepared for the specific site, development, design objectives and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

### **4. USE OF THE REPORT**

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT THURBER'S WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS THURBER MAY EXPRESSLY APPROVE. Ownership in and copyright for the contents of the Report belong to Thurber. Any use which a third party makes of the Report, is the sole responsibility of such third party. Thurber accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without Thurber's express written permission.

### **5. INTERPRETATION OF THE REPORT**

- a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.
- b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.
- c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.
- d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

### **6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES**

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

### **7. INDEPENDENT JUDGEMENTS OF CLIENT**

The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.



## **LIST OF PUBLISHED GEOLOGY REFERENCES**

- Kathol, C.P. and McPherson, R.A. (1975): Surficial Geology of the Edmonton Area. Alberta Research Council, Figure 23, Bulletin 32, scale 1:50,000.
- Kathol, C.P. and McPherson, R.A. (1975): Thickness of Surficial Deposits in the Edmonton Area. Alberta Research Council, Figure 24, Bulletin 32, scale 1:50,000.
- Kathol, C.P. and McPherson, R.A. (1975): Thickness of Glacial Till in the Edmonton Area. Alberta Research Council, Figure 28, Bulletin 32, scale 1:50,000.
- Kathol, C.P. and McPherson, R.A. (1975): Thickness of Glaciolacustrine Sediments in the Edmonton Area. Alberta Research Council, Figure 29, Bulletin 32, scale 1:50,000.
- Prior, G.J., Hathway, B., Glombick, P.M., Pana, D.I., Banks, C.J., Hay, D.C., Schneider, C.L., Grobe, M., Elgr, R. and Weiss, J.A. (2013): Bedrock geology of Alberta; Energy Resources Conservation Board, ERCB/AGS Map 600, scale 1:1,000,000.

## **REFERENCE LIST FOR AVAILABLE PREVIOUS INFORMATION**

1. Alberta Environment Water Well Database
2. Thurber Engineering Ltd. Report (2000). "New Esso Station Wye Road and Nottingham Way Sherwood Park, Alberta Geotechnical Investigation" (File: 19-553-90).
3. Thurber Engineering Ltd. Report (2015). "Proposed Satellite Dish Compound 500 Wye Road Sherwood Park, Alberta Geotechnical Investigation" (File: 19-7017-0).
4. Bel-MK Engineering Ltd. Report (1995). "Phase I/Preliminary Phase II Environmental Site Assessment Strathcona County Wye Road Yard Sherwood Park, Alberta" (File: 95-2635).  
  
Bel-MK Engineering Ltd. Report (1995). "Phase II Environmental Site Assessment Wye Road Yard Sherwood Park, Alberta" (File: 95-2635.1).
5. Thurber Engineering Ltd. Report (2006). "Carr Residence 37 Windsor Estate Strathcona County, Alberta Geotechnical Investigation" (File: 19-4927-0).
6. Thurber Engineering Ltd. Letter (2012). "HWY 628:04 Twinning – HWY 216 to HWY 21 Preliminary Geotechnical Soil Information" (File: 17-308-495).

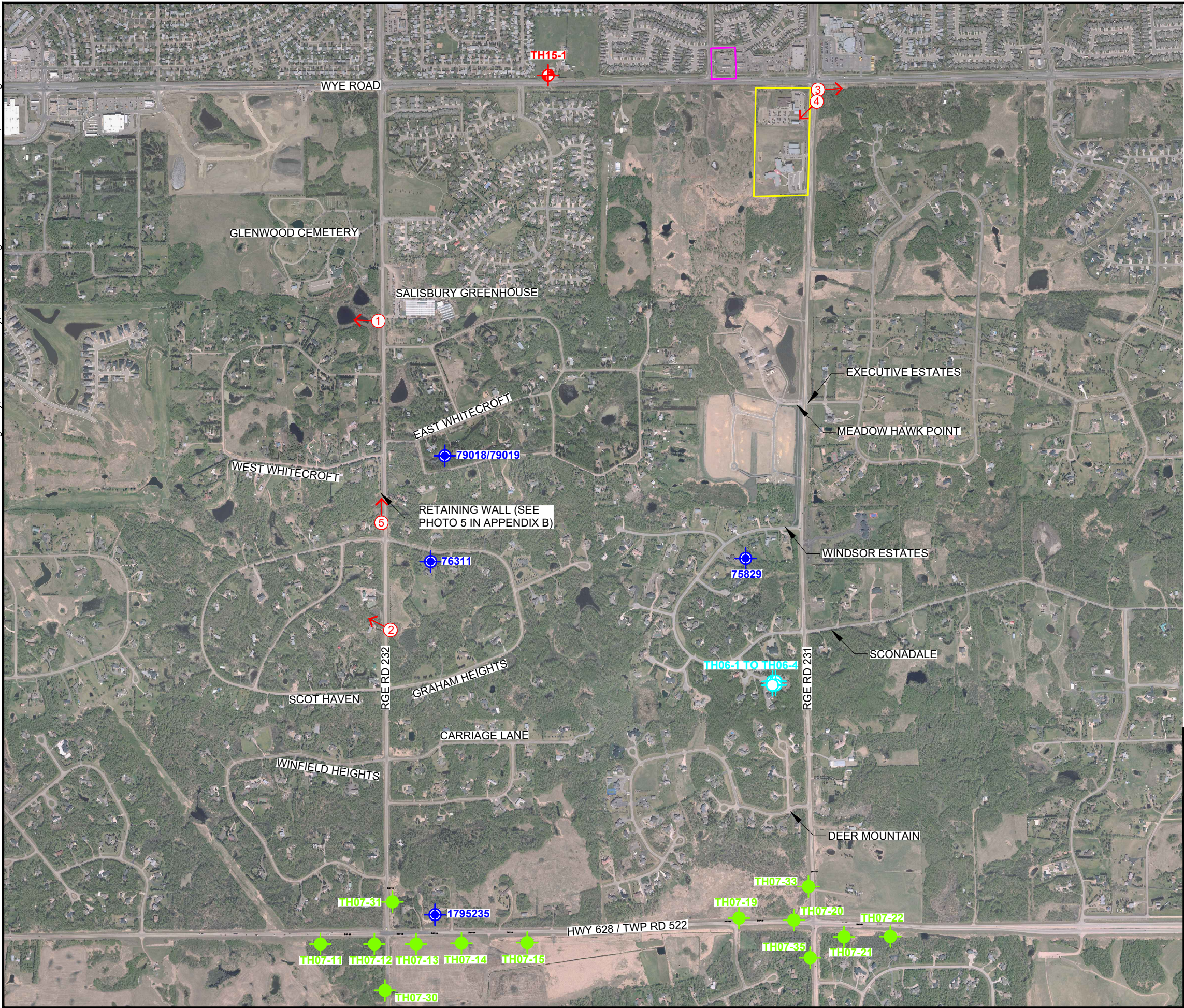


## **APPENDIX A**

Drawing Nos. 18907-1 to 18907-3



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**LEGEND**

- REFERENCE 1
- REFERENCE 2
- REFERENCE 3
- REFERENCE 4
- REFERENCE 5
- REFERENCE 6
- PHOTOGRAPH NUMBER, AND APPROXIMATE DIRECTION AND LOCATION

REFERENCE		No. OF TEST HOLES
NUMBER	NAME	
1	Alberta Environment Groundwater Well Database	5
2	New Esso Station Wye Road and Nottingham Way Sherwood Park, Alberta - Geotechnical Investigation	6
3	Proposed Satellite Dish Compound 500 Wye Road Sherwood Park, Alberta - Geotechnical Investigation	1
4	Phase I/Preliminary Phase II Environmental Site Assessment Strathcona County Wye Road Yard Sherwood Park, Alberta Phase II Environmental Site Assessment Wye Road Yard Sherwood Park, Alberta	23
5	Carr Residence 37 Windsor Estate Strathcona County, Alberta - Geotechnical Investigation	4
6	HWY 628:04 Twinning - HWY 216 to HWY 21 Preliminary Geotechnical Soil Information	13

0 200 400 600 800m

SCALE 1:15000

BASE PLAN PROVIDED BY ISL

**ISL Engineering and Land Services**

**RANGE ROAD 231 & 232 FUNCTIONAL PLANNING STUDY FROM HIGHWAY 628 TO WYE ROAD GEOTECHNICAL DESKTOP STUDY**

**SITE PLAN**

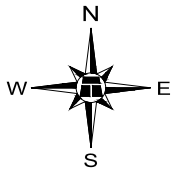
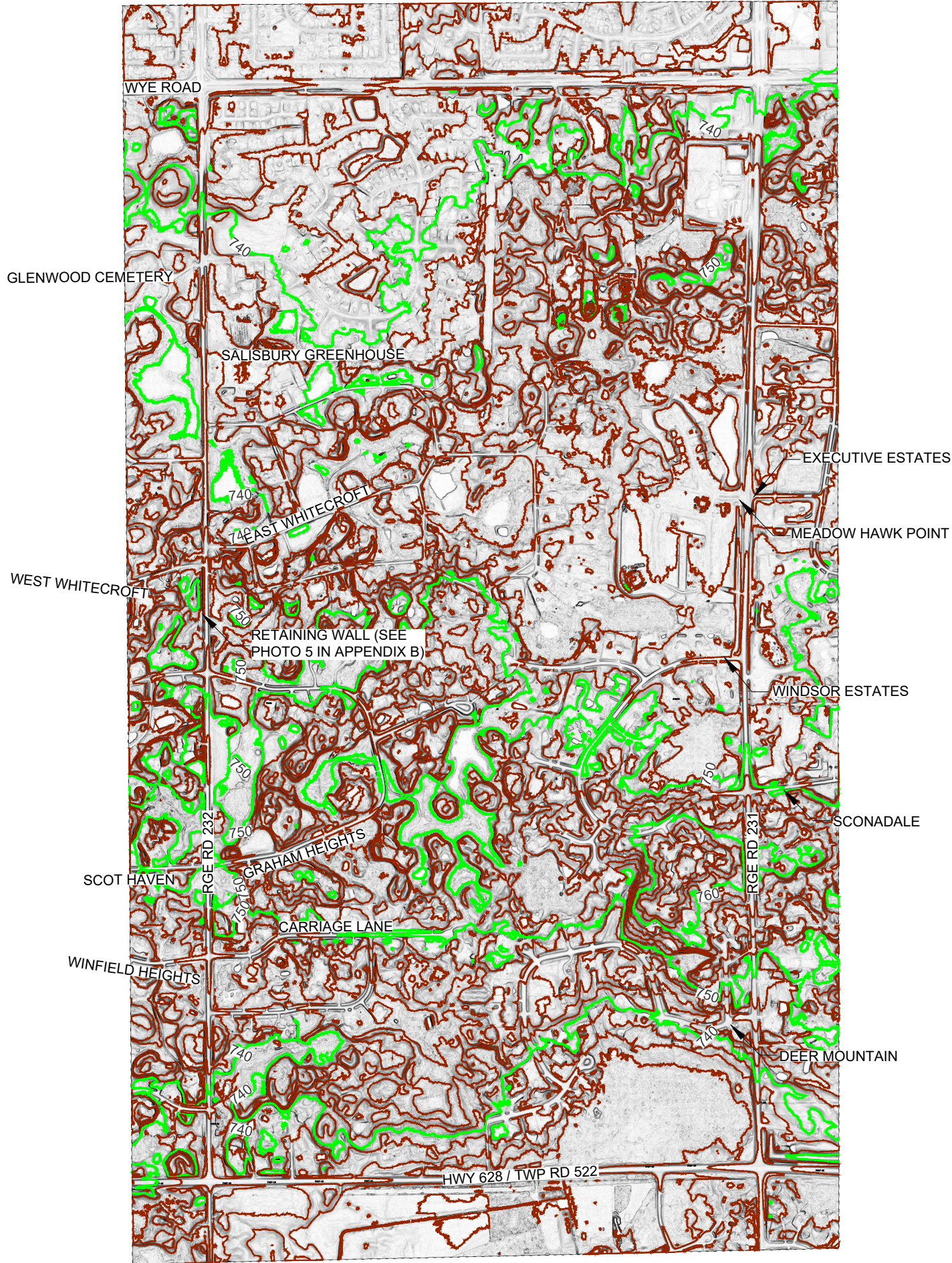
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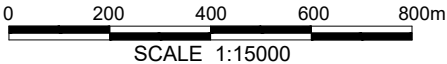
**THURBER ENGINEERING LTD.**



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LEGEND  
GROUND SURFACE CONTOUR (m)



BASE PLAN PROVIDED BY ISL



RANGE ROAD 231 & 232 FUNCTIONAL PLANNING  
STUDY FROM HIGHWAY 628 TO WYE ROAD  
GEOTECHNICAL DESKTOP STUDY

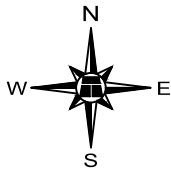
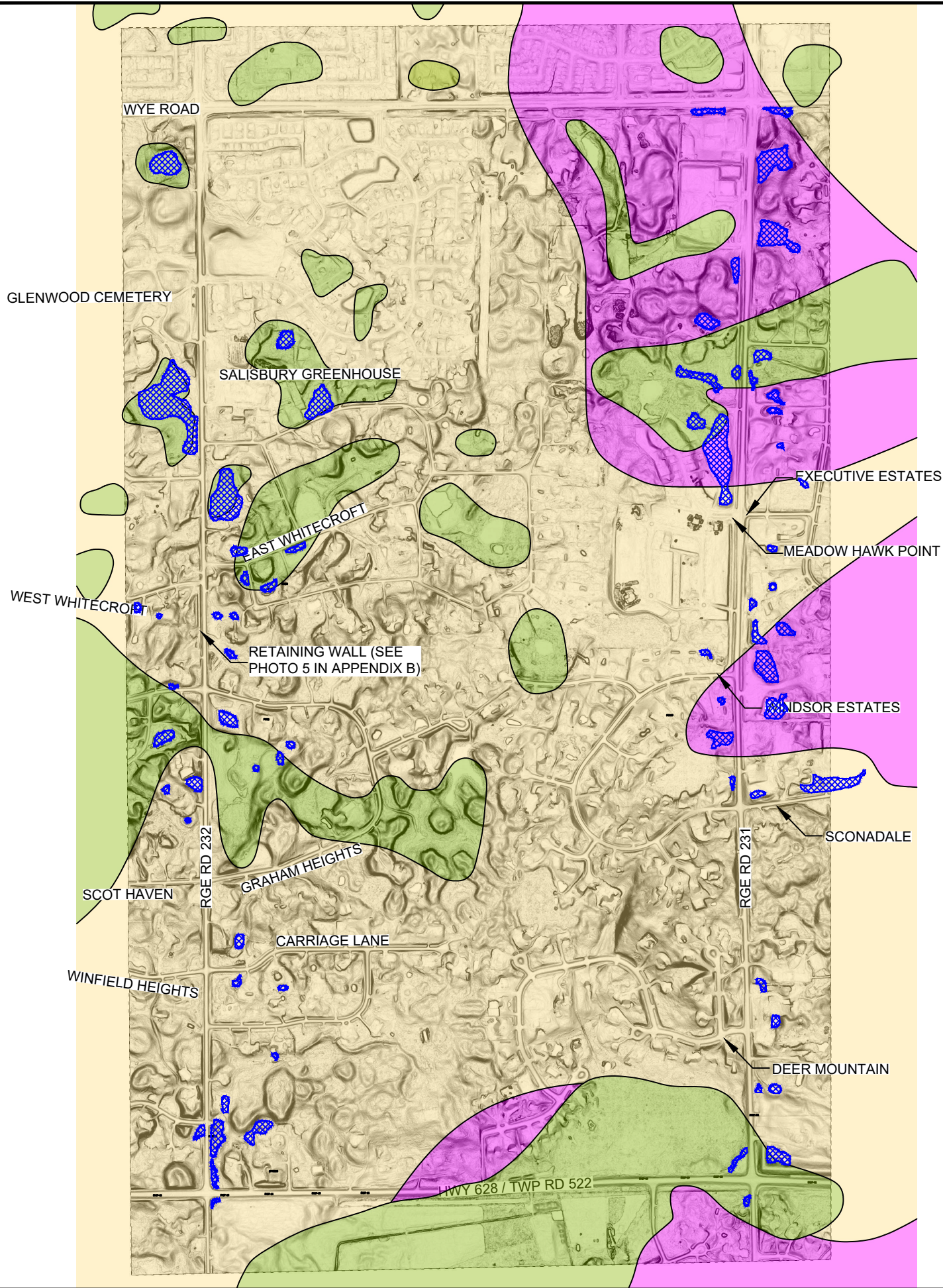
SITE PLAN SHOWING GROUND  
SURFACE CONTOURS

DWG No. 18907-2

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DATE	NOVEMBER 2018
FILE No.	18907



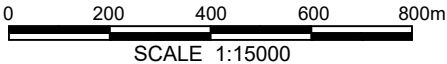




LEGEND

- HUMMOCKY GLACIAL TILL
- GLACIOLACUSTRINE
- LAKE AND SLOUGH DEPOSITS
- ORGANIC DEPOSITS  
(FROM SATELLITE IMAGERY REVIEW)

REFERENCE:  
KATHOL, C.P. AND MCPHERSON, R.A. (1975): SURFICIAL  
GEOLOGY OF THE EDMONTON AREA. ALBERTA RESEARCH  
COUNCIL, FIGURE 23, BULLETIN 32, SCALE 1:50,000.



BASE PLAN PROVIDED BY ISL



RANGE ROAD 231 & 232 FUNCTIONAL PLANNING  
STUDY FROM HIGHWAY 628 TO WYE ROAD  
GEOTECHNICAL DESKTOP STUDY

SURFICIAL GEOLOGY

DWG No. 18907-3

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DESIGNED BY	NFR
APPROVED BY	RWT
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DATE	NOVEMBER 2018
FILE No.	18907





## **APPENDIX B**

Photographs from Site Reconnaissance  
(October 31, 2018)





PHOTO 1 - VIEW LOOKING WEST AT SLOUGH LOCATED WEST OF RANGE ROAD 232 AND THE SALISBURY GREENHOUSE.



PHOTO 2 - VIEW OF SLOUGH LOCATED WEST OF RANGE ROAD 232 AND SOUTH OF 52264.

**RANGE ROAD 231 & 232 FUNCTIONAL PLANNING  
STUDY FROM HIGHWAY 628 TO WYE ROAD  
GEOTECHNICAL DESKTOP STUDY**

**SELECTED SITE PHOTOGRAPHS**

**PLATE 1**



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DATE	NOVEMBER 2018
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PHOTO 3 - VIEW OF CATTAILS IN SOUTHEAST QUADRANT OF INTERSECTION OF RANGE ROAD 231 AND WYE ROAD.



PHOTO 4 - VIEW OF STANDING WATER ADJACENT TO TURNING LANE IN SOUTHEAST QUADRANT OF INTERSECTION OF RANGE ROAD 231 AND WYE ROAD.

**RANGE ROAD 231 & 232 FUNCTIONAL PLANNING  
STUDY FROM HIGHWAY 628 TO WYE ROAD  
GEOTECHNICAL DESKTOP STUDY**

**SELECTED SITE PHOTOGRAPHS**

**PLATE 2**



DRAWN BY	ML
DESIGNED BY	NFR
APPROVED BY	RWT
SCALE	N.T.S.
DATE	NOVEMBER 2018
FILE No.	18907







PHOTO 5 - VIEW LOOKING NORTH AT RETAINING WALL LOCATED ON THE WEST SIDE OF RANGE ROAD 232 BETWEEN SCOT HAVEN AND WEST WHITECROFT.

**RANGE ROAD 231 & 232 FUNCTIONAL PLANNING  
STUDY FROM HIGHWAY 628 TO WYE ROAD  
GEOTECHNICAL DESKTOP STUDY**

**SELECTED SITE PHOTOGRAPHS**

**PLATE 3**



DRAWN BY	ML
DESIGNED BY	NFR
APPROVED BY	RWT
SCALE	N.T.S.
DATE	NOVEMBER 2018
FILE No.	18907



**THURBER ENGINEERING LTD.**



## **APPENDIX C**

Select Information from References



**Reference 1:** Alberta Environment Water Well Database





# Water Well Drilling Report

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

[View in Metric](#) [Export to Excel](#)

GIC Well ID 1795235  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received 2009/02/05

GOWN ID

Well Identification and Location										Measurement in Imperial	
<b>Owner Name</b>		<b>Address</b>		<b>Town</b>		<b>Province</b>		<b>Country</b>		<b>Postal Code</b>	
JACKSON, DOUG & NANCY		2 - 23166 TWP 522		SHERWOOD PARK		ALBERTA		CA			
<b>Location</b>	<b>1/4 or LSD</b>	<b>SEC</b>	<b>TWP</b>	<b>RGE</b>	<b>W of MER</b>	<b>Lot</b>	<b>Block</b>	<b>Plan</b>	<b>Additional Description</b>		
	4	14	52	23	4	1C		9721994			
<b>Measured from Boundary of</b>					<b>GPS Coordinates in Decimal Degrees (NAD 83)</b>						
_____ ft from _____					Latitude <u>53.483448</u> Longitude <u>-113.292875</u>					Elevation <u>2421.26</u> ft	
_____ ft from _____					How Location Obtained					How Elevation Obtained	
					Lat/Long calculated to centre of lot					Estimated	

Drilling Information	
<b>Method of Drilling</b>	<b>Type of Work</b>
Rotary	New Well
<b>Proposed Well Use</b>	
Domestic	

Formation Log			Measurement in Imperial		
Depth from ground level (ft)	Water Bearing	Lithology Description			
46.00		Clay			
48.00		Coal			
50.00		Sand			
55.00		Clay			
58.00		Shale			
66.00		Sandy Clay			
68.00		Coal			
75.00		Shale			
78.00		Sandstone			
80.00		Shale			
81.00		Coal			
106.00		Limestone			
107.00		Shale			
130.00		Shale			
131.00		Limestone			
142.00		Shale			
161.00		Sandstone			
168.00		Shale			
172.00		Sandstone			
182.00		Shale			
190.00		Sandstone			
195.00		Shale			
196.00		Coal			
210.00		Shale			
211.00		Limestone			
223.00		Shale			
235.00		Sandstone			
237.00		Shale			
238.00		Coal			
250.00		Shale			
253.00		Sandstone			
265.00		Shale			

Yield Test Summary			Measurement in Imperial		
Recommended Pump Rate <u>2.50</u> igpm					
Test Date	Water Removal Rate (igpm)	Static Water Level (ft)			
2008/11/28	3.00	22.42			

Well Completion				Measurement in Imperial			
Total Depth Drilled	Finished Well Depth	Start Date	End Date				
265.00 ft	265.00 ft	2008/11/26	2008/11/26				
<b>Borehole</b>							
Diameter (in)	From (ft)	To (ft)					
7.88	0.00	265.00					
<b>Surface Casing (if applicable)</b>				<b>Well Casing/Liner</b>			
Plastic				Plastic			
Size OD : <u>6.00</u> in		Size OD : <u>4.50</u> in					
Wall Thickness : <u>0.432</u> in		Wall Thickness : <u>0.237</u> in					
Bottom at : _____ ft		Top at : _____ ft					
		Bottom at : _____ ft					
<b>Perforations</b>							
From (ft)	To (ft)	Diameter or Slot Width(in)	Slot Length (in)	Hole or Slot Interval(in)			
200.00	260.00	0.020		2.00			
Perforated by Machine							
<b>Annular Seal</b>							
Placed from _____ ft to _____ ft							
Amount _____							
Other Seals							
Type				At (ft)			
<b>Screen Type</b>							
Size OD : _____ in							
From (ft)	To (ft)	Slot Size (in)					
Attachment _____							
Top Fittings _____				Bottom Fittings _____			
<b>Pack</b>							
Type Unknown				Grain Size _____			
Amount Unknown							

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well	Certification No
SHAUN YURKISH	77758A
Company Name	Copy of Well report provided to owner
WESTAR WATER WELL DRILLING LTD.	Yes
	Date approval holder signed
	2008/12/20



# Water Well Drilling Report

[View in Metric](#) [Export to Excel](#)

GIC Well ID 1795235  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received 2009/02/05

GOWN ID

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

Well Identification and Location										Measurement in Imperial	
Owner Name		Address			Town		Province		Country	Postal Code	
JACKSON, DOUG & NANCY		2 - 23166 TWP 522			SHERWOOD PARK		ALBERTA		CA		
Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description		
	4	14	52	23	4	1C		9721994			
Measured from Boundary of					GPS Coordinates in Decimal Degrees (NAD 83)						
ft from					Latitude 53.483448 Longitude -113.292875					Elevation 2421.26 ft	
ft from					How Location Obtained					How Elevation Obtained	
					Lat/Long calculated to centre of lot					Estimated	

Additional Information										Measurement in Imperial	
Distance From Top of Casing to Ground Level										in	
Is Artesian Flow										Is Flow Control Installed	
Rate										igpm	
Describe											
Recommended Pump Rate										2.50 igpm	
Pump Installed										Yes	
Recommended Pump Intake Depth (From TOC)										180.00 ft	
Type										Submersible	
Make										230 V	
H.P.											
Model (Output Rating)											
Did you Encounter Saline Water (>4000 ppm TDS)										Depth	
Gas										Depth	
Well Disinfected Upon Completion											
Geophysical Log Taken											
Submitted to ESRD											
Sample Collected for Potability										Submitted to ESRD	
Additional Comments on Well											
BOREHOLE DIAMETER 7.875" CASING & 5.125" LINER. BOTTOM AND TOP OF CASING AND LINER INFORMATION NOT PROVIDED IN DRILLERS REPORT. REPORT DATA AS SUPPLIED BY DRILLER. MISSING INFORMATION WAS REQUESTED FROM DRILLER BUT HAS NOT BEEN PROVIDED											

Yield Test			Taken From Top of Casing		Measurement in Imperial	
			Depth to water level			
Test Date	Start Time	Static Water Level	Drawdown (ft)	Elapsed Time	Recovery (ft)	
2008/11/28	9:00 AM	22.42 ft		Minutes:Sec		
Method of Water Removal			22.42	0:00	180.00	
Type Pump			31.17	1:00	175.00	
Removal Rate			40.50	2:00	172.00	
Depth Withdrawn From			45.50	3:00	169.00	
			51.00	4:00	167.00	
			56.17	5:00	165.00	
			62.42	6:00	162.42	
			67.42	7:00	160.00	
			72.17	8:00	157.00	
			77.67	9:00	155.17	
			85.67	10:00	153.17	
			94.00	12:00	149.00	
			103.00	14:00	145.00	
			111.67	16:00	141.17	
			126.50	20:00	132.33	
			145.50	25:00	123.33	
			163.58	30:00	114.75	
			179.00	35:00	105.50	
			180.00	40:00	98.25	
				50:00	82.17	
				60:00	66.42	
				75:00	51.17	
				90:00	43.08	
				105:00	36.50	
			180.00	120:00	30.67	

Water Diverted for Drilling		
Water Source	Amount Taken	Diversion Date & Time
WESTSTAR SHOP WELL	1250.00 ig	2008/11/26 6:00 AM

Contractor Certification		
Name of Journeyman responsible for drilling/construction of well	Certification No	
SHAUN YURKISH	77758A	
Company Name	Copy of Well report provided to owner	Date approval holder signed
WESTAR WATER WELL DRILLING LTD.	Yes	2008/12/20



# Water Well Drilling Report

[View in Metric](#) [Export to Excel](#)

GIC Well ID 75829  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received

GOWN ID

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

Well Identification and Location										Measurement in Imperial	
Owner Name		Address		Town		Province		Country		Postal Code	
R.C.A.#TH 79											
Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description		
16		14	52	23	4						
Measured from Boundary of					GPS Coordinates in Decimal Degrees (NAD 83)						
ft from					Latitude 53.495611 Longitude -113.274734					Elevation 2453.00 ft	
ft from					How Location Obtained					How Elevation Obtained	
					Not Verified					Survey-Transit	

Drilling Information	
Method of Drilling	Type of Work
Drilled	Test Hole
Proposed Well Use	
Investigation	

Formation Log			Measurement in Imperial
Depth from ground level (ft)	Water Bearing	Lithology Description	
16.00		Light Yellow Till	
18.00		Carbonaceous Clay & Shale	
21.00		Glacial Hard Ledges	
30.00		Gray Shaly Sandstone	

Yield Test Summary			Measurement in Imperial
Recommended Pump Rate			igpm
Test Date	Water Removal Rate (igpm)	Static Water Level (ft)	

Well Completion			Measurement in Imperial
Total Depth Drilled	Finished Well Depth	Start Date	End Date
30.00 ft		1971/08/01	1971/08/01
Borehole			
Diameter (in)	From (ft)	To (ft)	
0.00	0.00	30.00	
Surface Casing (if applicable)		Well Casing/Liner	
Size OD : 0.00 in		Size OD : 0.00 in	
Wall Thickness : 0.000 in		Wall Thickness : 0.000 in	
Bottom at : 0.00 ft		Top at : 0.00 ft	
		Bottom at : 0.00 ft	
Perforations			
From (ft)	To (ft)	Diameter or Slot Width(in)	Slot Length (in)
			Hole or Slot Interval(in)
Perforated by			
Annular Seal			
Placed from 0.00 ft to 0.00 ft			
Amount			
Other Seals			
Type		At (ft)	
Screen Type			
Size OD : 0.00 in			
From (ft)	To (ft)	Slot Size (in)	
Attachment			
Top Fittings		Bottom Fittings	
Pack			
Type		Grain Size	
Amount			

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well	Certification No
UNKNOWN NA DRILLER	1
Company Name	Copy of Well report provided to owner
UNKNOWN DRILLER	Date approval holder signed



# Water Well Drilling Report

[View in Metric](#) [Export to Excel](#)

GIC Well ID 75829  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Imperial	
Owner Name		Address		Town		Province		Country		Postal Code	
R.C.A.#TH 79											
Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description		
16		14	52	23	4						
Measured from Boundary of					GPS Coordinates in Decimal Degrees (NAD 83)						
ft from					Latitude 53.495611 Longitude -113.274734					Elevation 2453.00 ft	
ft from					How Location Obtained					How Elevation Obtained	
					Not Verified					Survey-Transit	

Additional Information										Measurement in Imperial
Distance From Top of Casing to Ground Level										in
Is Artesian Flow										
Rate										igpm
Is Flow Control Installed										
Describe										
Recommended Pump Rate										igpm
Recommended Pump Intake Depth (From TOC)										ft
Pump Installed										Depth ft
Type										Make H.P.
										Model (Output Rating)
Did you Encounter Saline Water (>4000 ppm TDS)										Depth ft
Gas										Depth ft
Well Disinfected Upon Completion										
Geophysical Log Taken										
Submitted to ESRD										
Sample Collected for Potability										Submitted to ESRD
Additional Comments on Well										

Yield Test			Taken From Ground Level	Measurement in Imperial
Test Date	Start Time	Static Water Level		
		ft		
Method of Water Removal				
Type				
Removal Rate				
igpm				
Depth Withdrawn From				
ft				
If water removal period was < 2 hours, explain why				

Water Diverted for Drilling		
Water Source	Amount Taken	Diversion Date & Time
	ig	

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well	Certification No
UNKNOWN NA DRILLER	1
Company Name	Copy of Well report provided to owner Date approval holder signed
UNKNOWN DRILLER	



# Water Well Drilling Report

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GIC Well ID 76311  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received

GOWN ID

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

Well Identification and Location										Measurement in Imperial	
Owner Name		Address		Town		Province		Country		Postal Code	
R.C.A.#TH 67		EDMONTON									
Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description		
	13	14	52	23	4						
Measured from Boundary of					GPS Coordinates in Decimal Degrees (NAD 83)						
ft from					Latitude 53.495611 Longitude -113.292927					Elevation 2418.00 ft	
ft from					How Location Obtained					How Elevation Obtained	
					Not Verified					Survey-Transit	

Drilling Information	
Method of Drilling	Type of Work
Drilled	Test Hole
Proposed Well Use	
Investigation	

Formation Log			Measurement in Imperial
Depth from ground level (ft)	Water Bearing	Lithology Description	
12.00		Light Yellow Till	
41.00		Gray Hard Till	
53.00		Brownish Gray Shale	
55.00		Blue Gray Bentonitic Sandstone	

Yield Test Summary			Measurement in Imperial
Recommended Pump Rate			igpm
Test Date	Water Removal Rate (igpm)	Static Water Level (ft)	

Well Completion			Measurement in Imperial
Total Depth Drilled	Finished Well Depth	Start Date	End Date
55.00 ft		1971/08/01	1971/08/01
Borehole			
Diameter (in)	From (ft)	To (ft)	
0.00	0.00	55.00	
Surface Casing (if applicable)		Well Casing/Liner	
Size OD : 0.00 in		Size OD : 0.00 in	
Wall Thickness : 0.000 in		Wall Thickness : 0.000 in	
Bottom at : 0.00 ft		Top at : 0.00 ft	
		Bottom at : 0.00 ft	
Perforations			
From (ft)	To (ft)	Diameter or Slot Width(in)	Slot Length (in)
			Hole or Slot Interval(in)
Perforated by			
Annular Seal			
Placed from 0.00 ft to 0.00 ft			
Amount			
Other Seals			
Type		At (ft)	
Screen Type			
Size OD : 0.00 in			
From (ft)	To (ft)	Slot Size (in)	
Attachment			
Top Fittings		Bottom Fittings	
Pack			
Type		Grain Size	
Amount			

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well	Certification No
UNKNOWN NA DRILLER	1
Company Name	Copy of Well report provided to owner
UNKNOWN DRILLER	Date approval holder signed



# Water Well Drilling Report

[View in Metric](#) [Export to Excel](#)

GIC Well ID 76311  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received

GOWN ID

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

Well Identification and Location										Measurement in Imperial	
Owner Name		Address		Town		Province		Country		Postal Code	
R.C.A.#TH 67		EDMONTON									
Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description		
	13	14	52	23	4						
Measured from Boundary of					GPS Coordinates in Decimal Degrees (NAD 83)						
ft from					Latitude 53.495611 Longitude -113.292927					Elevation 2418.00 ft	
ft from					How Location Obtained					How Elevation Obtained	
					Not Verified					Survey-Transit	

Additional Information										Measurement in Imperial
Distance From Top of Casing to Ground Level in										
Is Artesian Flow										
Rate igpm										
Is Flow Control Installed										
Describe										
Recommended Pump Rate igpm										
Pump Installed										
Depth ft										
Recommended Pump Intake Depth (From TOC) ft										
Type										
Make										
H.P.										
Model (Output Rating)										
Did you Encounter Saline Water (>4000 ppm TDS)										
Depth ft										
Well Disinfected Upon Completion										
Gas										
Depth ft										
Geophysical Log Taken										
Submitted to ESRD										
Sample Collected for Potability										
Submitted to ESRD										
Additional Comments on Well										
SOME WATER IN SANDSTONE										

Yield Test			Taken From Ground Level	Measurement in Imperial
Test Date	Start Time	Static Water Level		
		ft		
Method of Water Removal				
Type				
Removal Rate igpm				
Depth Withdrawn From ft				
If water removal period was < 2 hours, explain why				

Water Diverted for Drilling		
Water Source	Amount Taken	Diversion Date & Time
	ig	

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well	Certification No
UNKNOWN NA DRILLER	1
Company Name	Copy of Well report provided to owner
UNKNOWN DRILLER	Date approval holder signed



# Water Well Drilling Report

[View in Metric](#) [Export to Excel](#)

GIC Well ID 79018  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received 1964/11/23

GOWN ID

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

Well Identification and Location										Measurement in Imperial	
Owner Name JOB #441		Address W. WHITECROFT			Town		Province		Country	Postal Code	
Location	1/4 or LSD 4	SEC 23	TWP 52	RGE 23	W of MER 4	Lot	Block	Plan	Additional Description		
Measured from Boundary of ft from ft from					GPS Coordinates in Decimal Degrees (NAD 83) Latitude 53.499250 Longitude -113.292047 How Location Obtained Not Verified					Elevation 2425.00 ft How Elevation Obtained Estimated	

Drilling Information	
Method of Drilling Drilled	Type of Work New Well
Proposed Well Use Unknown	

Formation Log			Measurement in Imperial	
Depth from ground level (ft)	Water Bearing	Lithology Description		
20.00		Brown Clay		
35.00		Brown Fine Grained Sand & Silt		
92.00		Gray Sandy Clay		
93.00		Coal		
100.00		Gray Soft Shale		
104.00		Gray Silty Sandstone		
125.00		Brownish Gray Shale		
132.00		Gray Bentonitic Sandstone		
143.00		Green Shale		
148.00		Gray Shale		
156.00		Gray Soft Sandstone		
182.00		Brown Shale & Coal		
183.00		Brown Shaly Hard Ledges		
188.00		Brown Shale & Coal		
192.00		Gray Shale		
206.00		Brown Shale		
209.00		Gray Soft Sandstone		
211.00		Gray Hard Shale		

Yield Test Summary			Measurement in Imperial	
Recommended Pump Rate			igpm	
Test Date	Water Removal Rate (igpm)	Static Water Level (ft)		

Well Completion			Measurement in Imperial	
Total Depth Drilled	Finished Well Depth	Start Date	End Date	
211.00 ft		1964/05/27	1964/06/02	
Borehole				
Diameter (in)	From (ft)	To (ft)		
0.00	0.00	211.00		
Surface Casing (if applicable)		Well Casing/Liner		
		Unknown		
Size OD :	0.00 in	Size OD :	4.50 in	
Wall Thickness :	0.000 in	Wall Thickness :	0.000 in	
Bottom at :	0.00 ft	Top at :	0.00 ft	
		Bottom at :	185.00 ft	
Perforations				
From (ft)	To (ft)	Diameter or Slot Width(in)	Slot Length (in)	Hole or Slot Interval(in)
125.00	130.00	0.000		0.00
148.00	156.00	0.000		0.00
Perforated by				
Annular Seal Cement/Grout				
Placed from	0.00 ft	to	186.00 ft	
Amount				
Other Seals				
Type		At (ft)		
Screen Type				
Size OD :	0.00 in			
From (ft)	To (ft)	Slot Size (in)		
Attachment				
Top Fittings		Bottom Fittings		
Pack				
Type	Grain Size			
Amount				

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER	Certification No 1
Company Name MCAULEY DRILLING CO. LTD.	Copy of Well report provided to owner Date approval holder signed



# Water Well Drilling Report

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GIC Well ID 79018  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received 1964/11/23

GOWN ID

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

Well Identification and Location										Measurement in Imperial
Owner Name JOB #441		Address W. WHITECROFT			Town		Province		Country	Postal Code
Location	1/4 or LSD 4	SEC 23	TWP 52	RGE 23	W of MER 4	Lot	Block	Plan	Additional Description	
Measured from Boundary of _____ ft from _____ ft from					GPS Coordinates in Decimal Degrees (NAD 83) Latitude 53.499250 Longitude -113.292047 How Location Obtained Not Verified			Elevation 2425.00 ft How Elevation Obtained Estimated		

Additional Information										Measurement in Imperial
Distance From Top of Casing to Ground Level _____ in										
Is Artesian Flow _____ Rate _____ igpm					Is Flow Control Installed _____ Describe _____					
Recommended Pump Rate _____ igpm			Pump Installed _____			Depth _____ ft				
Recommended Pump Intake Depth (From TOC) _____ ft			Type _____		Make _____		H.P. _____		Model (Output Rating) _____	
Did you Encounter Saline Water (>4000 ppm TDS) _____ Gas _____					Depth _____ ft Depth _____ ft		Well Disinfected Upon Completion _____ Geophysical Log Taken _____ Submitted to ESRD _____ Sample Collected for Potability _____ Submitted to ESRD _____			
Additional Comments on Well S.W.L. = 38', RATE = 1 gpm.										

Yield Test			Taken From Ground Level	Measurement in Imperial
Test Date	Start Time	Static Water Level ft		
Method of Water Removal				
Type _____				
Removal Rate _____ igpm				
Depth Withdrawn From _____ ft				
If water removal period was < 2 hours, explain why _____				

Water Diverted for Drilling		
Water Source	Amount Taken ig	Diversion Date & Time

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER	Certification No 1
Company Name MCAULEY DRILLING CO. LTD.	Copy of Well report provided to owner Date approval holder signed





# Water Well Drilling Report

[View in Metric](#) [Export to Excel](#)

GIC Well ID 79019  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received 1964/01/01

GOWN ID

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

Well Identification and Location										Measurement in Imperial		
Owner Name		Address			Town		Province		Country		Postal Code	
MURFITT, BOB		WHITCROFT										
Location		1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description		
4		23	52	23	4							
Measured from Boundary of					GPS Coordinates in Decimal Degrees (NAD 83)					Elevation		
ft from					Latitude 53.499250 Longitude -113.292047					2440.00 ft		
ft from					How Location Obtained					How Elevation Obtained		
					Not Verified					Estimated		

Drilling Information	
Method of Drilling	Type of Work
Drilled	New Well
Proposed Well Use	
Domestic	

Formation Log			Measurement in Imperial		
Depth from ground level (ft)	Water Bearing	Lithology Description			
100.00		Clay			
120.00		Sandstone			
180.00		Coal			
200.00		Clay			
220.00		Sandstone			
240.00		Coal			
265.00		Soapstone			

Yield Test Summary			Measurement in Imperial		
Recommended Pump Rate			2.00 igpm		
Test Date	Water Removal Rate (igpm)	Static Water Level (ft)			
1963/07/26	2.00	80.00			

Well Completion			Measurement in Imperial		
Total Depth Drilled	Finished Well Depth	Start Date	End Date		
265.00 ft		1963/07/26	1963/07/26		
Borehole					
Diameter (in)	From (ft)	To (ft)			
0.00	0.00	265.00			
Surface Casing (if applicable)			Well Casing/Liner		
Size OD : 0.00 in			Size OD : 0.00 in		
Wall Thickness : 0.000 in			Wall Thickness : 0.000 in		
Bottom at : 0.00 ft			Top at : 0.00 ft		
			Bottom at : 0.00 ft		
Perforations					
From (ft)	To (ft)	Diameter or Slot Width(in)	Slot Length (in)	Hole or Slot Interval(in)	
Perforated by					
Annular Seal Packer & Bentonite					
Placed from 0.00 ft to 0.00 ft					
Amount					
Other Seals					
Type			At (ft)		
Screen Type					
Size OD : 0.00 in					
From (ft)	To (ft)	Slot Size (in)			
Attachment					
Top Fittings			Bottom Fittings		
Pack					
Type Natural			Grain Size		
Amount 0.00					

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well	Certification No
UNKNOWN NA DRILLER	1
Company Name	Copy of Well report provided to owner
KIELBAUCH DRLG	Date approval holder signed



GIC Well ID	79019
GoA Well Tag No.	
Drilling Company Well ID	
Date Report Received	1964/01/01

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

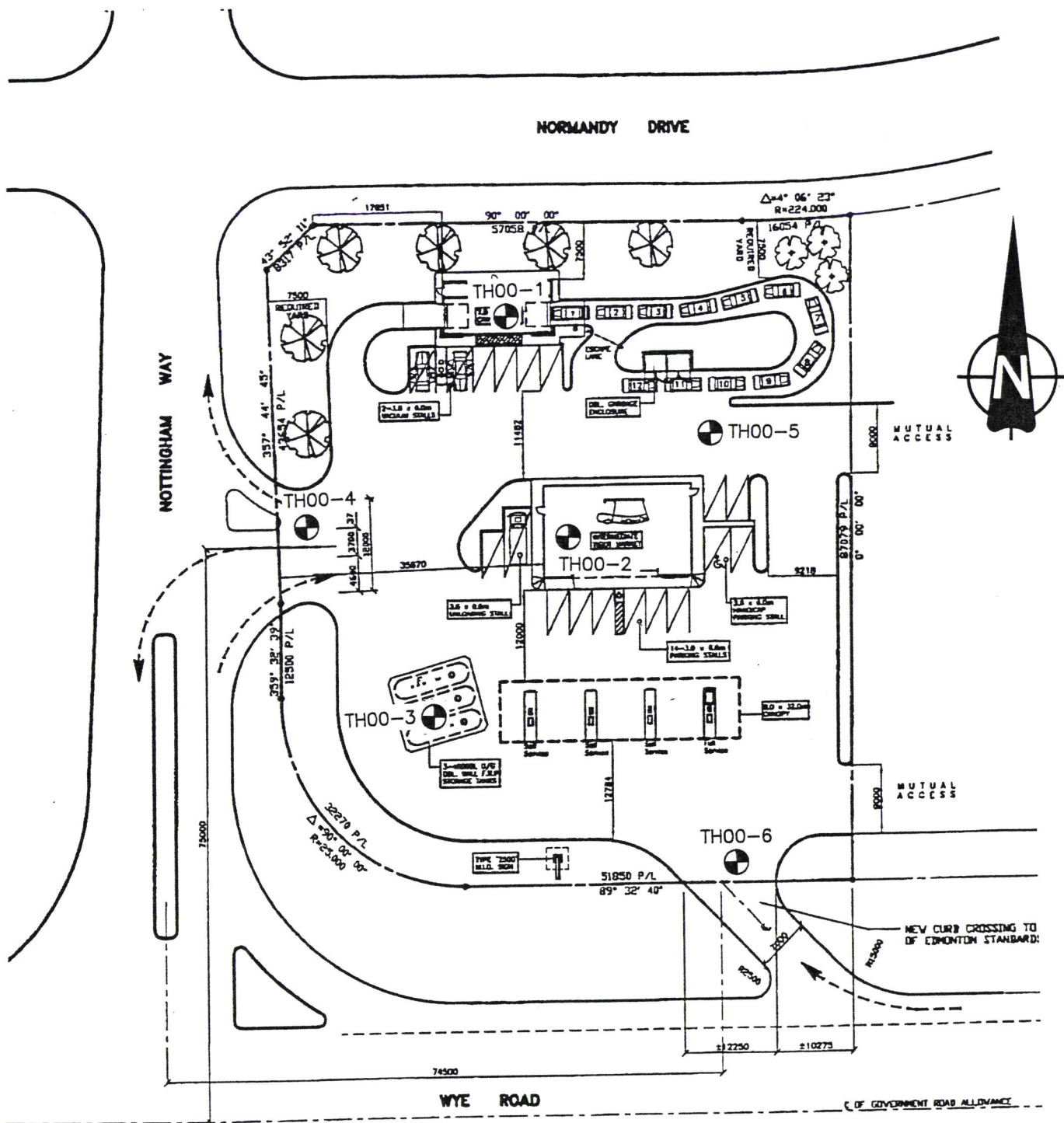
Additional Information			Measurement in Imperial		
Distance From Top of Casing to Ground Level _____ in			Is Flow Control Installed _____		
Is Artesian Flow _____			Describe _____		
Rate _____ igpm					
Recommended Pump Rate _____ 2.00 igpm			Pump Installed Yes _____	Depth _____ ft	
Recommended Pump Intake Depth (From TOC) _____ 0.00 ft			Type SUB _____	Make _____	H.P. _____
			Model (Output Rating) _____		
Did you Encounter Saline Water (>4000 ppm TDS) _____	Depth _____ ft	Well Disinfected Upon Completion _____			
Gas _____	Depth _____ ft	Geophysical Log Taken _____			
			Submitted to ESRD _____		
			Sample Collected for Potability _____	Submitted to ESRD _____	
Additional Comments on Well _____					
DRILLER REPORTS WATER SOFT.					

Water Diverted for Drilling		
Water Source	Amount Taken	Diversion Date & Time
	ig	

Printed on 8/21/2017 2:50:42 PM



**Reference 2:** Thurber Engineering Ltd. Report (2000). "New Esso Station Wye Road and Nottingham Way Sherwood Park, Alberta Geotechnical Investigation" (File: 19-553-90)



# LEGEND



APPROXIMATE TESTHOLE LOCATION

THURBER PROJECT NO. 19-553-90

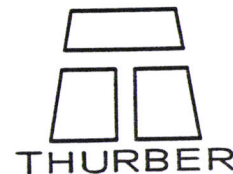
ENGINEER	GSB
DRAWN	VH
DATE	AUG 2000
APPROVED	
SCALE	N T S

COLT ENGINEERING CORPORATION

## SITE PLAN SHOWING TEST HOLE LOCATIONS

WYE RD & NOTTINGHAM WAY  
ESSO GAS STATION

SHERWOOD PARK, AB



DRAWING No.  
19-553-90-1



CLIENT: COLT ENGINEERING		PROJECT: NOTTINGHAM WAY ESSO, SHERWOOD PK		HOLE NO: TH00-1	
DRILLING CO.: SUN-ALTA DRILLING		DATE DRILLED: 25 JULY 2000		PROJECT NO: 19-553-90	
DRILL METHOD: B61/SOLID STEM AUGER		LOCATION: SEE DRAWING 19-553-90-1		ELEVATION:	
SAMPLE TYPE		<input checked="" type="checkbox"/> SHELBY TUBE <input type="checkbox"/> SPT <input type="checkbox"/> NO RECOVERY <input type="checkbox"/> A-CASING <input type="checkbox"/> GRAB SAMPLE <input type="checkbox"/> CORE SAMPLE			

DEPTH(m)	SAMPLE TYPE	SPT(N)	▲ C <sub>pen</sub> (kPa) ▲ 50   100   150   200 ■ SPT (N) Blows/300 mm ■ 10   20   30   40 PLASTIC   M.C.   LIQUID 10   20   30   40	Remarks	USC	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH(m)
0.0							CLAY TILL (FILL)	0.0
				SO4 = No Reaction		CI-CH	very stiff, brown, silty, sandy, some coal and oxides, occasional pebbles to 30mm diameter, occasional silt pockets	
1.0		13				CI		1.0
						CI	- possible calcareous deposit	
2.0								2.0
						CI		
3.0		18						3.0
						CI	CLAY TILL	
4.0							very stiff, dark brown, silty, some sand, occasional pebbles, trace oxides, trace coal, silt pockets	
						CI	- becomes grey, sandy, trace brown silt pockets, some pebbles	
5.0		22						5.0
						CI		
6.0								6.0
						CI	- some sand, trace pebbles	
7.0		16						7.0
						CI	- siltstone nodules	
8.0		14						8.0
				Seepage		CI		
9.0								9.0
						CI	- sand seams	
10.0		13						10.0
				END OF TEST HOLE AT 9.9m UPON COMPLETION: - Slough at 4.1m - Dry BACKFILLED WITH CUTTINGS		CI		

Thurber Engineering Ltd. Edmonton, Alberta.		LOGGED BY: GSB / DNR	COMPLETION DEPTH: 9.9 m
		REVIEWED BY: GSB	COMPLETE: 25/07/00
		Fig. No:	Page 1 of 1

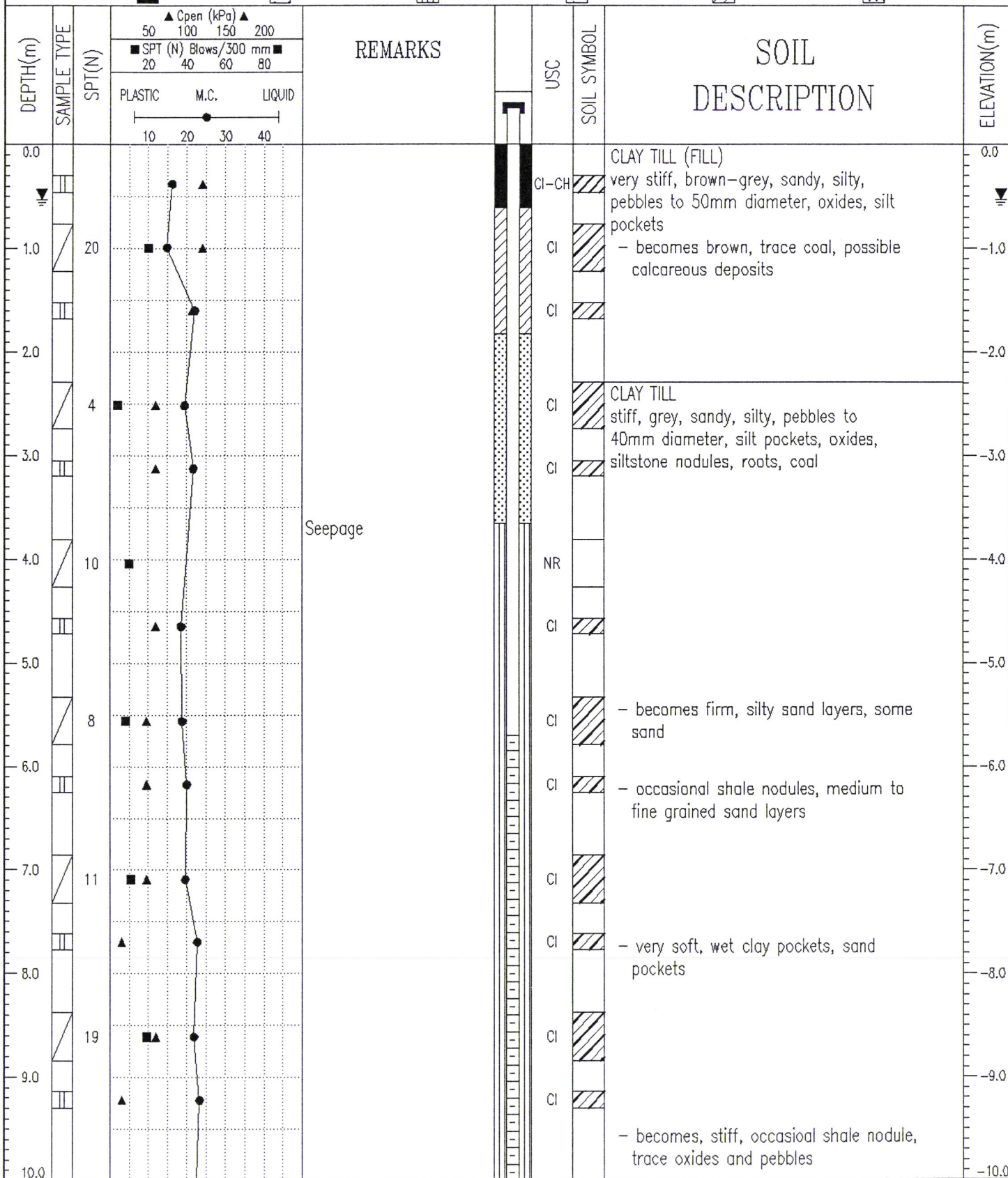
CLIENT: COLT ENGINEERING		PROJECT: NOTTINGHAM WAY ESSO, SHERWOOD PK		HOLE NO:	TH00-2
DRILLING CO.: SUN-ALTA DRILLING		DATE DRILLED: 25 JULY 2000		PROJECT NO:	19-553-90
DRILL METHOD: B61/SOLID STEM AUGER		LOCATION: SEE DRAWING 19-553-90-1		ELEVATION:	
SAMPLE TYPE	<input checked="" type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPT	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> A-CASING	<input checked="" type="checkbox"/> GRAB SAMPLE	<input checked="" type="checkbox"/> CORE SAMPLE
DEPTH(m)	SAMPLE TYPE SPT(N)	REMARKS	USC SOIL SYMBOL	SOIL DESCRIPTION	DEPTH(m)
0.0				CLAY TILL (FILL) very stiff, brown, sandy, silty, pebbles, oxides, silt and sand pockets, coal, occasional wood	0.0
1.0	19		CI		1.0
2.0		Liquid Limit = 53.8% SO4 = No Reaction	CH	CLAY very stiff, brown-grey, oxides, some sand, silt pockets, occasional pebble, trace wood - becomes grey, sandy, silty, gypsum crystals, possible siltstone nodules	2.0
3.0	15		CH		3.0
4.0			CI	CLAY TILL stiff, dark brown, rocks up to 50 mm diameter, silty, trace to some sand, some oxides, some coal	4.0
5.0	11		NR		5.0
6.0			CI	- becomes grey, very silty, occasional pebble	6.0
7.0	10		CI	- becomes firm	7.0
8.0		Seepage	CI	- trace sand, silt layers, water bearing sand layers, trace oxides	8.0
9.0	11		CI	- no sand layers	9.0
10.0		END OF TEST HOLE AT 9.9m UPON COMPLETION: - Slough at 5.3m - Dry BACKFILLED WITH CUTTINGS	CI		10.0

**Thurber Engineering Ltd.**  
Edmonton, Alberta

LOGGED BY: GSB / DNR	COMPLETION DEPTH: 9.9 m
REVIEWED BY: GSB	COMPLETE: 25/07/00
Fig. No:	Page 1 of 1



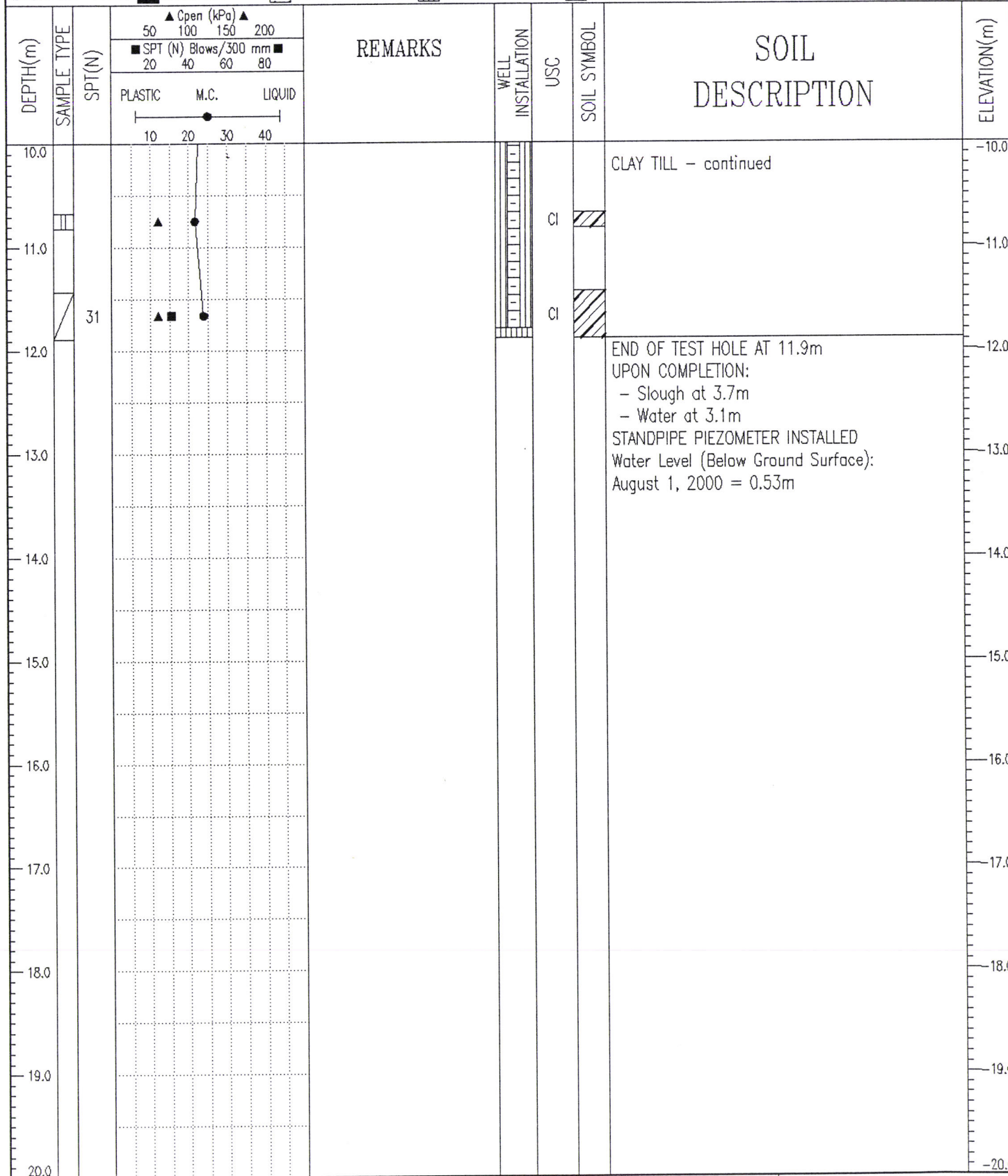
CLIENT: COLT ENGINEERING		PROJECT: NOTTINGHAM WAY ESSO, SHERWOOD PK		HOLE NO: TH00-3	
DRILLING CO.: SUN-ALTA DRILLING		DATE DRILLED: 25 JULY 2000		PROJECT NO: 19-553-90	
DRILL METHOD: B61/SOLID STEM AUGER		LOCATION: SEE DRAWING 19-553-90-1		ELEVATION:	
SAMPLE TYPE	<input checked="" type="checkbox"/> SHELBY TUBE	<input checked="" type="checkbox"/> SPT	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> A-CASING	<input checked="" type="checkbox"/> GRAB SAMPLE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input checked="" type="checkbox"/> PEA GRAVEL	<input checked="" type="checkbox"/> SLOUGH	<input checked="" type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS
					<input checked="" type="checkbox"/> CORE SAMPLE



Thurber Engineering Ltd.  
Edmonton, Alberta.

LOGGED BY: GBS / DNR	COMPLETION DEPTH: 11.9 m
REVIEWED BY: GSB	COMPLETE: 25/07/00
Fig. No:	Page 1 of 2

CLIENT: COLT ENGINEERING	PROJECT: NOTTINGHAM WAY ESSO, SHERWOOD PK	HOLE NO: TH00-3
DRILLING CO.: SUN-ALTA DRILLING	DATE DRILLED: 25 JULY 2000	PROJECT NO: 19-553-90
DRILL METHOD: B61/SOLID STEM AUGER	LOCATION: SEE DRAWING 19-553-90-1	ELEVATION:
SAMPLE TYPE	<input checked="" type="checkbox"/> SHELBY TUBE <input type="checkbox"/> SPT <input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> A-CASING <input type="checkbox"/> GRAB SAMPLE <input type="checkbox"/> CORE SAMPLE	
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE <input type="checkbox"/> PEA GRAVEL <input type="checkbox"/> SLOUGH <input type="checkbox"/> GROUT <input type="checkbox"/> DRILL CUTTINGS <input type="checkbox"/> SAND	



Thurber Engineering Ltd.  
Edmonton, Alberta.

LOGGED BY: GBS / DNR  
REVIEWED BY: GSB  
Fig. No:

COMPLETION DEPTH: 11.9 m  
COMPLETE: 25/07/00



CLIENT: COLT ENGINEERING		PROJECT: NOTTINGHAM WAY ESSO, SHERWOOD PK		HOLE NO: TH00-4	
DRILLING CO.: SUN-ALTA DRILLING		DATE DRILLED: 25 JULY 2000		PROJECT NO: 19-553-90	
DRILL METHOD: B61/SOLID STEM AUGER		LOCATION: SEE DRAWING 19-553-90-1		ELEVATION:	
SAMPLE TYPE <input checked="" type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPT		<input checked="" type="checkbox"/> NO RECOVERY		<input type="checkbox"/> A-CASING <input type="checkbox"/> GRAB SAMPLE <input type="checkbox"/> CORE SAMPLE	

DEPTH(m)	SAMPLE TYPE	SPT(N)	<div style="text-align: center;">           ▲ C<sub>pen</sub> (kPa) ▲            50    100    150    200            ■ SPT (N) Blows/300 mm ■            10    20    30    40         </div>	Remarks	USC	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH(m)
0.0							GRAVEL (FILL)	0.0
						CI-CH	CLAY TILL (FILL) very stiff, brown, silty, some sand, trace oxide, coal, pebbles, shale nodules	
1.0						CI-CH	- silt stringers, some coal, some oxides, high plastic clay layers	1.0
2.0						CI		2.0
2.3							END OF TEST HOLE AT 2.3m UPON COMPLETION: - No slough - No water BACKFILLED WITH CUTTINGS	2.3
3.0								3.0
4.0								4.0
5.0								5.0
6.0								6.0
7.0								7.0
8.0								8.0
9.0								9.0
10.0								10.0

Thurber Engineering Ltd. Edmonton, Alberta.		LOGGED BY: GSB / DNR REVIEWED BY: GSB Fig. No:	COMPLETION DEPTH: 2.3 m COMPLETE: 25/07/00 Page 1 of 1
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CLIENT: COLT ENGINEERING		PROJECT: NOTTINGHAM WAY ESSO, SHERWOOD PK		HOLE NO: TH00-5	
DRILLING CO.: SUN-ALTA DRILLING		DATE DRILLED: 25 JULY 2000		PROJECT NO: 19-553-90	
DRILL METHOD: B61/SOLID STEM AUGER		LOCATION: SEE DRAWING 19-553-90-1		ELEVATION:	
SAMPLE TYPE		<input checked="" type="checkbox"/> SHELBY TUBE <input type="checkbox"/> SPT <input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> A-CASING <input type="checkbox"/> GRAB SAMPLE <input type="checkbox"/> CORE SAMPLE			

DEPTH(m)	SAMPLE TYPE	SPT(N)	▲ C <sub>pen</sub> (kPa) ▲ 50    100    150    200 ■ SPT (N) Blows/300 mm ■ 10    20    30    40 PLASTIC    M.C.    LIQUID 10    20    30    40	Remarks	USC	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH(m)
0.0						CI-CH	CLAY TILL (FILL) very stiff, brown, silty, sandy, oxide, staining, pebbles, silt pocket, coal	0.0
1.0						CI	- topsoil staining, occasional roots	1.0
2.0						CI	- stiff, occasional grey high plastic clay layers, trace white sand pockets	2.0
3.0							END OF TEST HOLE AT 2.3m UPON COMPLETION: - No slough - No water BACKFILLED WITH CUTTINGS	3.0
4.0								4.0
5.0								5.0
6.0								6.0
7.0								7.0
8.0								8.0
9.0								9.0
10.0								10.0

Thurber Engineering Ltd. Edmonton, Alberta.		LOGGED BY: GSB / DNR	COMPLETION DEPTH: 2.3 m
		REVIEWED BY: GSB	COMPLETE: 25/07/00
		Fig. No:	Page 1 of 1



CLIENT: COLT ENGINEERING		PROJECT: NOTTINGHAM WAY ESSO, SHERWOOD PK		HOLE NO: TH00-6	
DRILLING CO.: SUN-ALTA DRILLING		DATE DRILLED: 25 JULY 2000		PROJECT NO: 19-553-90	
DRILL METHOD: B61/SOLID STEM AUGER		LOCATION: SEE DRAWING 19-553-90-1		ELEVATION:	
SAMPLE TYPE <input checked="" type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPT <input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> A-CASING <input type="checkbox"/> GRAB SAMPLE <input type="checkbox"/> CORE SAMPLE					

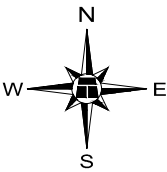
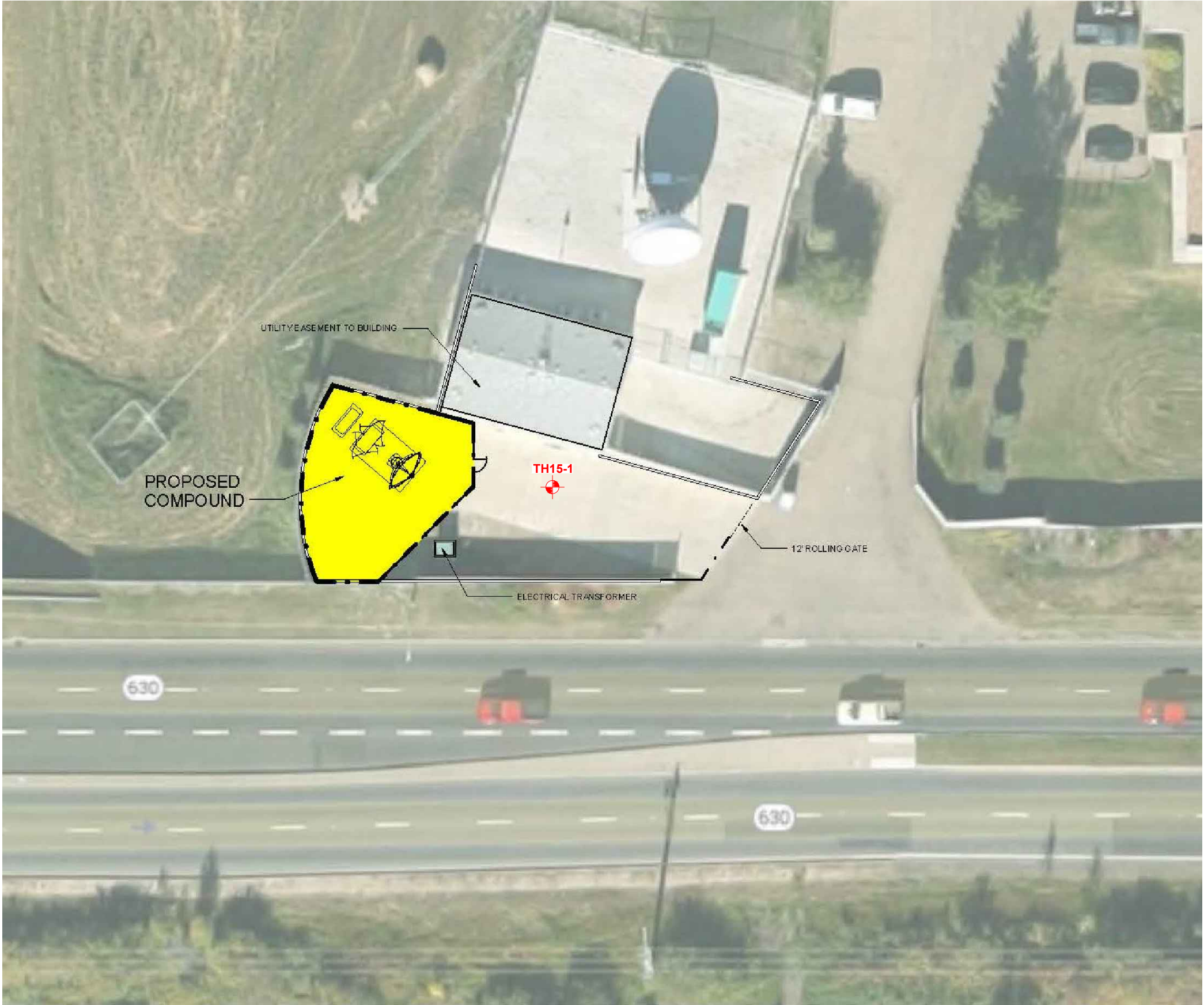
DEPTH(m)	SAMPLE TYPE	SPT(N)	<div style="text-align: center;"> ▲ C<sub>pen</sub> (kPa) ▲  50   100   150   200  ■ SPT (N) Blows/300 mm ■  10   20   30   40  PLASTIC   M.C.   LIQUID  10   20   30   40 </div>	Remarks	USC	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH(m)
0.0						CI-CH	CLAY TILL (FILL) very stiff, brown and black, silty, sandy, pebbles, trace coal and oxides	0.0
1.0						CI	- trace wood, high plastic clay layers	1.0
2.0						CI		2.0
3.0							END OF TEST HOLE AT 2.3m UPON COMPLETION: - No slough - No water BACKFILLED WITH CUTTINGS	3.0
4.0								4.0
5.0								5.0
6.0								6.0
7.0								7.0
8.0								8.0
9.0								9.0
10.0								10.0

Thurber Engineering Ltd. Edmonton, Alberta.		LOGGED BY: GSB / DNR	COMPLETION DEPTH: 2.3 m
		REVIEWED BY: GSB	COMPLETE: 25/07/00
		Fig. No:	Page 1 of 1



**Reference 3:** Thurber Engineering Ltd. Report (2015). "Proposed Satellite Dish Compound  
500 Wye Road Sherwood Park, Alberta Geotechnical Investigation" (File: 19-7017-0)



LEGEND

 APPROXIMATE TEST HOLE LOCATION



BASE PLAN PROVIDED BY TERRACON



TERRACON - 500 WYE ROAD SHERWOOD PARK SITE

SITE PLAN SHOWING APPROXIMATE  
TEST HOLE LOCATION

DWG No. 19-7017-0-1

DRAWN BY	KLW
DESIGNED BY	PSS
APPROVED BY	RVC
SCALE	APPROX. 1:400
DATE	OCTOBER 2015
FILE No.	19-7017-0




THURBER ENGINEERING LTD.

CLIENT: TERRACON CONSULTANTS INC.		PROJECT: TERRACON - 500 WYE ROAD SHERWOOD PARK SITE		BOREHOLE NO: <b>TH15-1</b>	
DRILLING COMPANY: Mobile Augers & Research Ltd.		DATE DRILLED: October 14, 2015		PROJECT NO: 19-7017-0	
DRILL/METHOD: M10 Truck, 6" Solid Stem Auger		LOCATION: See Drawing No. 19-7017-0-1		ELEVATION:	
SAMPLE TYPE		<input type="checkbox"/> GRAB SAMPLE <input checked="" type="checkbox"/> SPT <input checked="" type="checkbox"/> SHELBY TUBE			
BACKFILL TYPE		<input checked="" type="checkbox"/> DRILL CUTTINGS <input checked="" type="checkbox"/> BENTONITE <input type="checkbox"/> SLOUGH			

DEPTH (m)	SAMPLE TYPE	SPT (N)	▲ CPEN (kPa) ▲ 50   100   150   200 ■ SPT Blows/300 mm ■ 10   20   30   40 PLASTIC   M.C.   LIQUID 10   20   30   40	REMARKS	SLOTTED PIEZOMETER	USC	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)
0								CONCRETE	0
								GRAVEL	
								CLAY (FILL) brown, silty, sandy, trace gravel and organic stain	
1		5						CLAY (TILL) firm, brown, silty, sandy, trace gravel, oxide, coal, clay lense and calcareous deposits	1
2				-Resistivity = 9.9ohm-m pH = 8.4 Chloride = 2.25meq/L -SO <sub>4</sub> = 0.02%					2
		14						-stiff	
3				-Cobbles = 0.0% Gravel = 0.1% Sand = 36.9% Silt = 42.0% Clay = 21.0%					3
								-dark grey	
4		14							4
5									5
		8							
6									6
7		8							7
								END OF TEST HOLE AT 7.3m UPON COMPLETION: (Below ground surface) -Slough at 6.8m -No water Standpipe piezometer installed WATER LEVEL BELOW GROUND SURFACE: -October 14, 2015 = Dry -October 28, 2015 = 1.8m	
8									8
9									9
10									10

 <b>THURBER ENGINEERING LTD.</b>	FIELD LOGGED BY: NNM	COMPLETION DEPTH: 7.3 m
	PREPARED BY: PSS	COMPLETION DATE: 10/14/15
	REVIEWED BY: RVC	

BOREHOLE LOG 19-7017-0.GPJ THRB AB.GDT 11/12/15- LIBRARY-NEW LOGO.GLB





**Reference 4:** Bel-MK Engineering Ltd. Report (1995). "Phase I/Preliminary Phase II Environmental Site Assessment Strathcona County Wye Road Yard Sherwood Park, Alberta" (File: 95-2635)  
Bel-MK Engineering Ltd. Report (1995). "Phase II Environmental Site Assessment Wye Road Yard Sherwood Park, Alberta" (File: 95-2635.1)





Sirathcona County	Drill : Norwest Labs	TEST HOLE NO: H1
Wye Road Yard	Drill Type : Geoprobe 5400	PROJECT NO: 95-2635
Preliminary Phase II ESA	Testhole Location : Gate #3 UST	ELEVATION: 745 (m)

SAMPLE TYPE ☒ Geoprobe Sample ☐ No Recovery

DEPTH(m)	USC	SOIL SYMBOL	Soil Description	SAMPLE TYPE	SAMPLE NO	Organic Vapour (ppm)	Hydrocarbons (ug/gm)	DEPTH(ft)
0.0	ASPH		Asphalt					0.0
	CL		CLAY - sandy, medium brown to yellow brown medium plasticity, slightly moist, medium grey clay micro-fractures, minor hydrocarbon odour, no staining		1	1800		1.0
1.0	CL		CLAY - sandy, medium brown, medium plasticity, moist to saturated at 2.1 m, hydrocarbon odour and staining		2	9999	304	3.0
2.0	SW		SAND - medium grey brown, well graded, compacted, hydrocarbon odour		3	400		5.0
3.0	CL		CLAY - sandy, medium grey, medium plasticity, moist, minor hydrocarbon smell					7.0
			End of Hole					9.0
4.0								11.0
5.0								13.0
								15.0
								16.0

BEL-MK ENGINEERING  
Edmonton, Alberta

LOGGED BY: DKM  
REVIEWED BY: DKM  
Fig. No: 2635-1-1

COMPLETION DEPTH: 3.4 m  
COMPLETE: 16/05/95

Page 1 of 1

Strathcona County	Drill : Norwest Labs	TEST HOLE NO: H2
Wye Road Yard	Drill Type : Geoprobe 5400	PROJECT NO: 95-2635
Preliminary Phase II ESA	Testhole Location : Gate # 3 UST	ELEVATION: 745 (m)

SAMPLE TYPE ☒ Geoprobe Sample ☐ No Recovery

DEPTH(m)	USC	SOIL SYMBOL	Soil Description	SAMPLE TYPE	SAMPLE NO	Organic Vapour (ppm)	Hydrocarbons (ug/gm)	DEPTH(ft)
0.0	GP	4.4.1	GRAVEL - minor sand asphalt, no odour or staining					0.0
	CL		CLAY - sandy, medium brown to yellow brown medium plasticity, slightly moist, medium grey clay micro-fractures, minor organics, no hydrocarbon odour or staining		1	70		1.0
1.0			CLAY - sandy, medium brown, medium plasticity, moist, no hydrocarbon odour or staining		2	28		2.0
2.0	CL							3.0
			CLAY - sandy medium grey brown, medium plasticity, moist no hydrocarbon odour		3	23		4.0
3.0	CL							5.0
			End of Hole					6.0
4.0								7.0
								8.0
5.0								9.0
								10.0
								11.0
								12.0
								13.0
								14.0
								15.0
								16.0

BEL-MK ENGINEERING  
Edmonton, Alberta

LOGGED BY: DKM  
REVIEWED BY: DKM  
Fig. No: 2635-1-2

COMPLETION DEPTH: 3.1 m  
COMPLETE: 16/05/95

Page 1 of 1

Strathcona County	Drill : Norwest Labs	TEST HOLE NO: H3
Wye Road Yard	Drill Type : Geoprobe 5400	PROJECT NO: 95-2635
Preliminary Phase II ESA	Testhole Location : Gate # 3 UST	ELEVATION: 745 (m)

SAMPLE TYPE ☒ Geoprobe Sample ☐ No Recovery

DEPTH(m)	USC	SOIL SYMBOL	Soil Description	SAMPLE TYPE	SAMPLE NO	Organic Vapour (ppm)	Hydrocarbons (ug/gm)	DEPTH(ft)
0.0								0.0
	GP		GRAVEL - poorly graded, dk brown, hydrocarbon odour and staining					1.0
	CL		CLAY - sandy, dk brown, medium plasticity slightly moist, minor cavities (ice lenses?), hydrocarbon odour and staining		1	60		2.0
1.0	CL		CLAY - sandy, dk grey-brown, medium plasticity, moist, hydrocarbon odour and minor staining		2	1500		3.0
	CL				3	9999		4.0
2.0	CL							5.0
	SP		SAND - minor clay, dk grey brown, poorly graded, hydrocarbon odour, minor staining		4	9999	1170	6.0
	SP				5	9999		7.0
3.0	SC		SAND - clayey, dk grey-brown, hydrocarbon odour, minor staining		6	9999		8.0
			End of Hole					9.0
								10.0
								11.0
								12.0
4.0								13.0
								14.0
								15.0
5.0								16.0

BEL-MK ENGINEERING  
Edmonton, Alberta

LOGGED BY: DKM  
REVIEWED BY: DKM  
Fig. No: 2635-1-3

COMPLETION DEPTH: 3.5 m  
COMPLETE: 16/05/95

Strathcona County	Drill : Norwest Labs	TEST HOLE NO: H4
Wye Road Yard	Drill Type : Geoprobe 5400	PROJECT NO: 95-2635
Preliminary Phase II ESA	Testhole Location : Gate # 3 UST	ELEVATION: 745 (m)

SAMPLE TYPE ☒ Geoprobe Sample ☐ No Recovery

DEPTH(m)	USC	SOIL SYMBOL	Soil Description	SAMPLE TYPE	SAMPLE NO	Organic Vapour (ppm)	Hydrocarbons (ug/gm)	DEPTH(ft)
0.0	GP		GRAVEL - poorly graded, dk brown, minor hydrocarbon odour and staining		1	70	710	0.0
								1.0
	CL		CLAY - sandy, dk brown-grey, medium plasticity, slightly moist, hydrocarbon odour and minor staining		2	9999		2.0
1.0					CLAY - sandy, dk grey-brown, minor plasticity, moist, hydrocarbon odour and minor staining white and yellow sand lenses, medium	3		3700
	CL				4	58		4.0
2.0					CLAY - sandy, dk grey, medium plasticity, moist, minor hydrocarbon odour and no staining			
	SC		SAND - clayey, dk brown, minor hydrocarbon odour, no staining			6.0		
3.0							7.0	
			End of Hole				8.0	
							9.0	
							10.0	
							11.0	
							12.0	
4.0							13.0	
							14.0	
							15.0	
5.0							16.0	

BEL-MK ENGINEERING  
Edmonton, Alberta

LOGGED BY: DKM  
REVIEWED BY: DKM  
Fig. No: 2635-1-4

COMPLETION DEPTH: 3.4 m  
COMPLETE: 16/05/95

Page 1 of 1



Srathcona County	Drill :Norwest Labs	TEST HOLE NO: H5
Wye Road Yard	Drill Type : Geoprobe 5400	PROJECT NO: 95-2635
Preliminary Phase II ESA	Testhole Location : School Bus UST	ELEVATION: 741 (m)

SAMPLE TYPE ☒ Geoprobe Sample ☐ No Recovery

DEPTH(m)	USC	SOIL SYMBOL	Soil Description	SAMPLE TYPE	SAMPLE NO	Organic Vapour (ppm)	Hydrocarbons (ug/gm)	DEPTH(ft)
0.0			GRAVEL - poorly graded, dk brown, no hydrocarbon odour or staining					0.0
	GP							1.0
								2.0
	CL		CLAY - sandy, dk grey-brown, medium plasticity, slightly moist, no hydrocarbon odour or staining		1	24		3.0
1.0			CLAY - sandy, medium brown, medium plasticity, barely moist, no hydrocarbon odour or staining					4.0
	CL				2	40		5.0
								6.0
2.0								7.0
			CLAY - sandy, dk brown-grey, medium plasticity, barely moist, no hydrocarbon odour or staining					8.0
	CL				3	15		9.0
3.0								10.0
			End of Hole					11.0
								12.0
4.0								13.0
								14.0
								15.0
5.0								16.0

BEL-MK ENGINEERING  
Edmonton, Alberta

LOGGED BY: DKM  
REVIEWED BY: DKM  
Fig. No: 2635-1-5

COMPLETION DEPTH: 3.4 m  
COMPLETE: 16/05/95

Page 1 of 1

Strathcona County	Drill : Norwest Labs	TEST HOLE NO: H6
Wye Road Yard	Drill Type : Geoprobe 5400	PROJECT NO: 95-2635
Preliminary Phase II ESA	Testhole Location : Oil Spill Pit	ELEVATION: 744.5 (m)

SAMPLE TYPE ☒ Geoprobe Sample ☐ No Recovery

DEPTH(m)	USC	SOIL SYMBOL	Soil Description	SAMPLE TYPE	SAMPLE NO	Organic Vapour (ppm)	Hydrocarbons (ug/gm)	DEPTH(ft)
0.0	GP		GRAVEL - poorly graded, dk brown, no hydrocarbon odour or staining			38		0.0
	GP		GRAVEL - poorly graded, black, minor hydrocarbon odour and staining		1	78		1.0
	CL		CLAY - sandy, dk grey, medium plasticity, slightly moist, minor hydrocarbon odour and staining			28		2.0
1.0								3.0
	CL		CLAY - sandy, dk grey, medium plasticity, moist, no hydrocarbon odour or staining		2	45		4.0
2.0								5.0
			End of Hole					6.0
								7.0
								8.0
								9.0
3.0								10.0
								11.0
								12.0
								13.0
4.0								14.0
								15.0
5.0								16.0

BEL-MK ENGINEERING  
Edmonton, Alberta

LOGGED BY: DKM  
REVIEWED BY: DKM  
Fig. No: 2635-1-6

COMPLETION DEPTH: 2.1 m  
COMPLETE: 16/05/95

Page 1 of 1

Strathcona County	Drill : Norwest Labs	TEST HOLE NO: H7
Wye Road Yard	Drill Type : Geoprobe 5400	PROJECT NO: 95-2635
Preliminary Phase II ESA	Testhole Location : Waste Oil Pit	ELEVATION: 745.5 (m)

SAMPLE TYPE ☒ Geoprobe Sample ☐ No Recovery

DEPTH(m)	USC	SOIL SYMBOL	Soil Description	SAMPLE TYPE	SAMPLE NO	Organic Vapour (ppm)	Hydrocarbons (ug/gm)	DEPTH(ft)
0.0			SAND - well graded, dk to medium brown, no hydrocarbon odour or staining					0.0
	SW					18		1.0
	CL		CLAY - compacted, grey, medium plasticity, slightly moist, hydrocarbon odour, minor staining		1	360		2.0
1.0			CLAY - sandy, dk grey-green, minor dk plasticity, slightly moist, hydrocarbon odour and minor staining decreasing down the hole					3.0
	CL		brown lenses (<2 cm), minor organics, low		2	1800	32500	5.0
2.0								6.0
	CL				3	290		9.0
3.0								10.0
			End of Hole					11.0
								12.0
4.0								13.0
								14.0
								15.0
5.0								16.0

BEL-MK ENGINEERING  
Edmonton, Alberta






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REVIEWED BY: DKM  
Flg. No: 2635-1-7

COMPLETION DEPTH: 3.4 m  
COMPLETE: 16/05/95

Page 1 of 1

Sutherland County	Drill : Norwest Labs	TEST HOLE NO: H8
Wye Road Yard	Drill Type : Geoprobe 5400	PROJECT NO: 95-2635
Preliminary Phase II ESA	Testhole Location : Salt Shed	ELEVATION: 744.5 (m)

SAMPLE TYPE ☒ Geoprobe Sample ☐ No Recovery

DEPTH(m)	USC	SOIL SYMBOL	Soil Description	SAMPLE TYPE	SAMPLE NO	Organic Vapour (ppm)	Hydrocarbons (ug/gm)	DEPTH(ft)
0.0	ASPH		ASPHALT - concrete(?), black-grey fill (gravel/sand), no odours		1			0.0
	GP		GRAVEL - poorly graded gravels and sand, minor tar material, no odours					1.0
	SP		SAND - poorly sorted, dk brown, minor tar, (backfill?), barely moist, no hydrocarbon odour or staining					2.0
1.0	CL		CLAY - sandy, dk. grey-brown, minor black clay laminations, low plasticity, barely moist, no odour or staining					3.0
2.0			End of Hole					4.0
								5.0
								6.0
								7.0
								8.0
								9.0
								10.0
								11.0
								12.0
								13.0
								14.0
								15.0
								16.0
5.0								

BEL-MK ENGINEERING  
Edmonton, Alberta

LOGGED BY: DKM

REVIEWED BY: DKM

Fig. No: 2635-1-8

COMPLETION DEPTH: 2.0 m

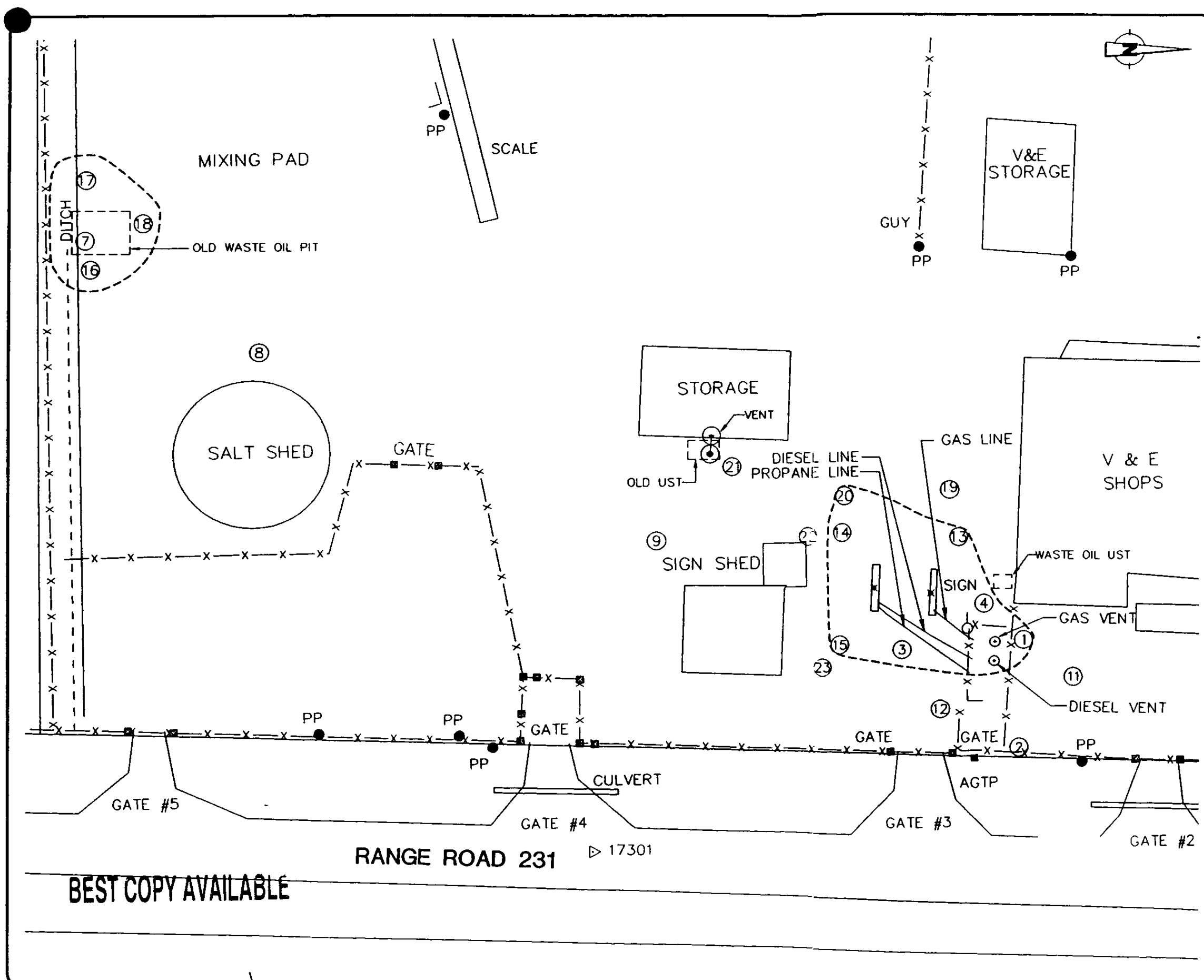
COMPLETE: 16/05/95

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Strathcona County		Drill : Norwest Labs		TEST HOLE NO: H9				
Wye Road Yard		Drill Type : Geoprobe 5400		PROJECT NO: 95-2635				
Preliminary Phase II ESA		Testhole Location : Pesticide Facility		ELEVATION: 744 (m)				
SAMPLE TYPE <input checked="" type="checkbox"/> Geoprobe Sample <input type="checkbox"/> No Recovery								
DEPTH(m)	USC	SOIL SYMBOL	Soil Description	SAMPLE TYPE	SAMPLE NO	Organic Vapour (ppm)	Hydrocarbons (ug/gm)	DEPTH(ft)
0.0	GP		GRAVEL - poorly sorted, dk brown, minor sand, yellow powder material, no odours		1			0.0
	CL		CLAY - sandy, minor gravel, dk grey, low plasticity, barely moist, no odours or staining					1.0
1.0			End of Hole					2.0
								3.0
								4.0
								5.0
								6.0
								7.0
								8.0
								9.0
								10.0
								11.0
								12.0
								13.0
								14.0
								15.0
								16.0
5.0								

Strathcona County		Drill : Norwest Labs		TEST HOLE NO: H10				
Wye Road Yard		Drill Type : Geoprobe 5400		PROJECT NO: 95-2635				
Preliminary Phase II ESA		Testhole Location : School Bus UST		ELEVATION: 741 (m)				
SAMPLE TYPE <input checked="" type="checkbox"/> Geoprobe Sample <input type="checkbox"/> No Recovery								
DEPTH(m)	USC	SOIL SYMBOL	Soil Description	SAMPLE TYPE	SAMPLE NO	Organic Vapour (ppm)	Hydrocarbons (ug/gm)	DEPTH(ft)
0.0	SC		SAND - clayey, dk brown, poorly sorted, no hydrocarbon odour or staining			16		0.0
			CLAY - sandy, dk grey-brown, medium plasticity, slightly moist, no hydrocarbon odour or staining					1.0
	CL			1	57			2.0
1.0								3.0
	CL		CLAY - sandy, medium brown, medium plasticity, barely moist, no hydrocarbon odour or staining, minor orange-brown Fe-rich sand lenses (<2cm)	2	47			4.0
2.0								5.0
	CL		CLAY - sandy, medium brown, medium plasticity, barely moist, no hydrocarbon odour or staining, minor orange brown Fe-rich sand lenses (<2cm)	3	14			6.0
3.0								7.0
			End of Hole					8.0
								9.0
								10.0
								11.0
								12.0
								13.0
								14.0
								15.0
5.0								16.0
BEL-MK ENGINEERING Edmonton, Alberta			LOGGED BY: DKM REVIEWED BY: DKM Fig. No: 2635-1-10		COMPLETION DEPTH: 3.4 m COMPLETE: 16/05/95 Page 1 of 1			



STRATHCONA COUNTY

WYE ROAD YARD  
PHASE II ENVIRONMENTAL  
SITE ASSESSMENT

- ESTIMATED LIMIT OF HYDROCARBON CONTAMINATED SOIL
- ⑨ TESTHOLE LOCATION/ NUMBER
- ▷ 17301 BENCHMARK LOCATION/NUMBER

NOTE: EXTENTS OF CONTAMINATION  
LIMITS BASED ON REMEDIATION  
GUIDELINES FOR PETROLEUM  
STORAGE TANK SITES, DRAFT 1994

SCALE 1:1000

ESTIMATED HYDROCARBON  
CONTAMINATED SOIL  
PLUMES

**Bel-MK**  
**Engineering Ltd.**  
EDMONTON CALGARY BANFF

FIGURE 3

95/08/09  
2635-01C

Strathcona County			Drill : Mobile Augers and Research			TEST HOLE NO: H11		
Wye Road Yard			Drill Type : Unit 73 auger			PROJECT NO: 95-2635.1		
Detailed Phase II ESA			Testhole Location : Gate 3 UST			ELEVATION: 744.5 (m)		
SAMPLE TYPE			<input checked="" type="checkbox"/> Grab Sample <input type="checkbox"/> No Recovery					

DEPTH(m)	USC	SOIL SYMBOL	Soil Description	SAMPLE TYPE	SAMPLE NO	Organic Vapour (ppm)	Hydrocarbons (ug/gm)	DEPTH(ft)
0.0	GR	▲▲▲	GRAVEL - poorly sorted, blk to med brn, no hydrocarbon odour or staining	Core	1	44		0.0
0.5	CL	□	CLAY - sandy, med grey-brown, medium plasticity, slightly moist, no hydrocarbon odour or staining		2	24		1.0
1.0	CL	□			3	84		2.0
1.5	CL	□			4	60		3.0
2.0	CL	□			5	160		4.0
2.5	CL	□			6	320		5.0
3.0	CL	□	CLAY - dk grey to brn, medium plasticity, minor dk brn sandy lenses, moderately moist, no hydrocarbon odour or staining					6.0
3.5	CL	□						7.0
4.0	CL	□						8.0
4.5	CL	□						9.0
5.0			End of Hole					10.0
5.5								11.0
6.0								12.0
6.5								13.0
7.0								14.0
7.5								15.0
8.0								16.0
8.5								17.0
9.0								18.0
9.5								19.0
10.0								20.0
10.5								21.0
11.0								22.0
11.5								23.0
12.0								24.0

BEL-MK ENGINEERING Edmonton, Alberta		LOGGED BY: DKM REVIEWED BY: DKM Fig. No: 2635-2-1	COMPLETION DEPTH: 4.5 m COMPLETE: 21/06/95 Page 1 of 1
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Strathcona County		Drill : Mobile Augers and Research		TEST HOLE NO: H12					
Wye Road Yard		Drill Type : Unit 73 auger		PROJECT NO: 95-2635.1					
Detail Phase II ESA		Testhole Location : Gate 3 UST		ELEVATION: 744.5 (m)					
SAMPLE TYPE		<input checked="" type="checkbox"/> Grab Sample <input type="checkbox"/> No Recovery							
BACKFILL TYPE		<input checked="" type="checkbox"/> BENTONITE <input type="checkbox"/> PEA GRAVEL <input type="checkbox"/> SLOUGH <input type="checkbox"/> GROUT <input checked="" type="checkbox"/> DRILL CUTTINGS <input type="checkbox"/> SAND							
DEPTH(m)	SLOTTED PIEZOMETER	USC	SOIL SYMBOL	Soil Description	SAMPLE TYPE	SAMPLE NO	Organic Vapour (ppm)	Hydrocarbons (ug/gm)	DEPTH(ft)
0.0				GRAVEL - poorly sorted, blk to med brn, no hydrocarbon odour or staining, compacted					0.0
0.5				CLAY - sandy, med grey-brown, medium plasticity, slightly moist, minor pebbles		1	22		0.5
1.0				no hydrocarbon odour or staining		2	30		1.0
1.5						3	48		1.5
2.0						4	120		2.0
2.5						5	68		2.5
3.0				CLAY - dk grey to brn, medium plasticity, minor dk brn sandy lenses, moderately moist, no hydrocarbon odour or staining		6	600		3.0
3.5									3.5
4.0									4.0
4.5									4.5
5.0				End of Hole					5.0
5.5									5.5
6.0									6.0
6.5									6.5
7.0									7.0
7.5									7.5
8.0									8.0
8.5									8.5
9.0									9.0
9.5									9.5
10.0									10.0
10.5									10.5
11.0									11.0
11.5									11.5
12.0									12.0
12.5									12.5
13.0									13.0
13.5									13.5
14.0									14.0
14.5									14.5
15.0									15.0
15.5									15.5
16.0									16.0
16.5									16.5
17.0									17.0
17.5									17.5
18.0									18.0
18.5									18.5
19.0									19.0
19.5									19.5
20.0									20.0
20.5									20.5
21.0									21.0
21.5									21.5
22.0									22.0
22.5									22.5
23.0									23.0
23.5									23.5
24.0									24.0

BEL-MK ENGINEERING Edmonton, Alberta		LOGGED BY: DKM REVIEWED BY: DKM Flg. No: 2635-2-2	COMPLETION DEPTH: 4.5 m COMPLETE: 21/06/95 Page 1 of 1
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Sroathcona County		Drill : Mobile Augers and Research		TEST HOLE NO: H13																																																																																																																																																																																																																																											
Wye Road Yard		Drill Type : Unit 73 auger		PROJECT NO: 95-2635.1																																																																																																																																																																																																																																											
Detailed Phase II ESA		Testhole Location : Gate 3 UST		ELEVATION: 744.5 (m)																																																																																																																																																																																																																																											
SAMPLE TYPE <input checked="" type="checkbox"/> Grab Sample <input type="checkbox"/> No Recovery																																																																																																																																																																																																																																															
<table border="1"> <thead> <tr> <th>DEPTH(m)</th> <th>USC</th> <th>SOIL SYMBOL</th> <th>Soil Description</th> <th>SAMPLE TYPE</th> <th>SAMPLE NO</th> <th>Organic Vapour (ppm)</th> <th>Hydrocarbons (ug/gm)</th> <th>DEPTH(ft)</th> </tr> </thead> <tbody> <tr> <td>0.0</td> <td>GP</td> <td>▲▲▲</td> <td>GRAVEL – poorly sorted, med brn, minor hydrocarbon odour</td> <td></td> <td></td> <td></td> <td></td> <td>0.0</td> </tr> <tr> <td>0.5</td> <td>CL</td> <td>▨</td> <td>CLAY – sandy, med brn, minor pebbles, medium plasticity, slightly moist, hydrocarbon odours and staining</td> <td></td> <td>1</td> <td>86</td> <td></td> <td>1.0</td> </tr> <tr> <td>1.0</td> <td>CL</td> <td>▨</td> <td></td> <td></td> <td>2</td> <td>520</td> <td></td> <td>2.0</td> </tr> <tr> <td>1.5</td> <td>CL</td> <td>▨</td> <td></td> <td></td> <td>3</td> <td>1300</td> <td></td> <td>3.0</td> </tr> <tr> <td>2.0</td> <td>CL</td> <td>▨</td> <td></td> <td></td> <td>4</td> <td>4600</td> <td></td> <td>4.0</td> </tr> <tr> <td>2.5</td> <td>CL</td> <td>▨</td> <td></td> <td></td> <td>5</td> <td>820</td> <td></td> <td>5.0</td> </tr> <tr> <td>3.0</td> <td>CL</td> <td>▨</td> <td>CLAY – dk grey to brn, medium plasticity, minor pebbles, moderately moist, hydrocarbon odour and staining</td> <td></td> <td>6</td> <td>2200</td> <td></td> <td>6.0</td> </tr> <tr> <td>3.5</td> <td>CL</td> <td>▨</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>7.0</td> </tr> <tr> <td>4.0</td> <td>CL</td> <td>▨</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>8.0</td> </tr> <tr> <td>4.5</td> <td></td> <td></td> <td>End of Hole</td> <td></td> <td></td> <td></td> <td></td> <td>9.0</td> </tr> <tr> <td>5.0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>10.0</td> </tr> <tr> <td>5.5</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>11.0</td> </tr> <tr> <td>6.0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>12.0</td> </tr> <tr> <td>6.5</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>13.0</td> </tr> <tr> <td>7.0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>14.0</td> </tr> <tr> <td>7.5</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>15.0</td> </tr> <tr> <td>8.0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>16.0</td> </tr> <tr> <td>8.5</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>17.0</td> </tr> <tr> <td>9.0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>18.0</td> </tr> <tr> <td>9.5</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>19.0</td> </tr> <tr> <td>10.0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>20.0</td> </tr> <tr> <td>10.5</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>21.0</td> </tr> <tr> <td>11.0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>22.0</td> </tr> <tr> <td>11.5</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>23.0</td> </tr> <tr> <td>12.0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>24.0</td> </tr> </tbody> </table>						DEPTH(m)	USC	SOIL SYMBOL	Soil Description	SAMPLE TYPE	SAMPLE NO	Organic Vapour (ppm)	Hydrocarbons (ug/gm)	DEPTH(ft)	0.0	GP	▲▲▲	GRAVEL – poorly sorted, med brn, minor hydrocarbon odour					0.0	0.5	CL	▨	CLAY – sandy, med brn, minor pebbles, medium plasticity, slightly moist, hydrocarbon odours and staining		1	86		1.0	1.0	CL	▨			2	520		2.0	1.5	CL	▨			3	1300		3.0	2.0	CL	▨			4	4600		4.0	2.5	CL	▨			5	820		5.0	3.0	CL	▨	CLAY – dk grey to brn, medium plasticity, minor pebbles, moderately moist, hydrocarbon odour and staining		6	2200		6.0	3.5	CL	▨						7.0	4.0	CL	▨						8.0	4.5			End of Hole					9.0	5.0								10.0	5.5								11.0	6.0								12.0	6.5								13.0	7.0								14.0	7.5								15.0	8.0								16.0	8.5								17.0	9.0								18.0	9.5								19.0	10.0								20.0	10.5								21.0	11.0								22.0	11.5								23.0	12.0								24.0
DEPTH(m)	USC	SOIL SYMBOL	Soil Description	SAMPLE TYPE	SAMPLE NO	Organic Vapour (ppm)	Hydrocarbons (ug/gm)	DEPTH(ft)																																																																																																																																																																																																																																							
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12.0								24.0																																																																																																																																																																																																																																							
BEL-MK ENGINEERING Edmonton, Alberta			LOGGED BY: DKM REVIEWED BY: DKM Flg. No: 2635-2-3																																																																																																																																																																																																																																												
			COMPLETION DEPTH: 4.5 m COMPLETE: 21/06/95																																																																																																																																																																																																																																												
			Page 1 of 1																																																																																																																																																																																																																																												

Strathcona County		Drill : Mobile Augers and Research		TEST HOLE NO: H14				
Wye Road Yard		Drill Type : Unit 73 auger		PROJECT NO: 95-2635.1				
Detail Phase II ESA		Testhole Location : Gate 3 UST		ELEVATION: 744.5 (m)				
SAMPLE TYPE <input checked="" type="checkbox"/> Grab Sample <input type="checkbox"/> No Recovery								
DEPTH(m)	USC	SOIL SYMBOL	Soil Description	SAMPLE TYPE	SAMPLE NO	Organic Vapour (ppm)	Hydrocarbons (ug/gm)	DEPTH(ft)
0.0	Gr	▲▲▲	GRAVEL - poorly sorted, med brn, hydrocarbon odour					0.0
1.0	Cl	▨	CLAY - sandy, med brn, minor pebbles, minor black (organic ?) mottled texture below 1.50 meters, watertable not distinct medium plasticity, very moist, major hydrocarbon odours, staining, minor sheen on water		1	9999		1.0
2.0	Cl	▨			2	9999		2.0
3.0	Cl	▨			3	9999		3.0
4.0	Cl	▨			4	9999		4.0
5.0	Cl	▨	CLAY - dk grey to blk, medium plasticity, minor pebbles, saturated soil, major hydrocarbon odour and staining to 4.50 m.		5	9999		5.0
6.0	Cl	▨			6	6300	673	6.0
7.0	Cl	▨			7	3400		7.0
			End of Hole Note : 9999 ppm organic vapour readings indicate the vapour in the sample was above the analytical range of the GasTech.					

BEL-MK ENGINEERING Edmonton, Alberta		LOGGED BY: DKM REVIEWED BY: DKM Flg. No: 2635-2-4	COMPLETION DEPTH: 5.3 m COMPLETE: 21/06/95 Page 1 of 1
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Strathcona County		Drill : Mobile Augers and Research		TEST HOLE NO: H15				
Wye Road Yard		Drill Type : Unit 73 auger		PROJECT NO: 95-2635.1				
Detail Phase II ESA		Testhole Location : Gate 3 UST		ELEVATION: 744.5 (m)				
SAMPLE TYPE <input checked="" type="checkbox"/> Grab Sample <input checked="" type="checkbox"/> No Recovery								
DEPTH(m)	USC	SOIL SYMBOL	Soil Description	SAMPLE TYPE	SAMPLE NO	Organic Vapour (ppm)	Hydrocarbons (ug/gm)	DEPTH(ft)
0.0	GP	▲▲▲	GRAVEL - poorly sorted, med brn, minor hydrocarbon odour					0.0
1.0	CL	▨	CLAY - sandy, med brn, minor pebbles, minor black mottled texture (organic?) below 1.00 meters, medium plasticity, moist, major hydrocarbon odours and minor staining		1	260		1.0
2.0	CL	▨			2	9999		2.0
3.0	CL	▨			3	9999		3.0
4.0	CL	▨			4	8600		4.0
5.0	CL	▨	CLAY - dk grey, medium plasticity, saturated soil, minor pebbles, major hydrocarbon odour and staining		5	9999		5.0
6.0	CL	▨			6	2600	89	6.0
7.0			End of Hole Note : 9999 ppm organic vapour readings indicate the vapour in the sample was above the analytical range of the GasTech.					7.0
BEL-MK ENGINEERING Edmonton, Alberta				LOGGED BY: DKM REVIEWED BY: DKM Fig. No: 2635-2-5		COMPLETION DEPTH: 4.5 m COMPLETE: 21/06/95 Page 1 of 1		

Strathcona County		Drill : Mobile Augers and Research		TEST HOLE NO: H16				
Wye Road Yard		Drill Type : Unit 73 auger		PROJECT NO: 95-2635.1				
Detail Phase II ESA		Testhole Location : Old Waste Oil Pit		ELEVATION: 745 (m)				
SAMPLE TYPE <input checked="" type="checkbox"/> Grab Sample <input type="checkbox"/> No Recovery								
DEPTH(m)	USC	SOIL SYMBOL	Soil Description	SAMPLE TYPE	SAMPLE NO	Organic Vapour (ppm)	Hydrocarbons (ug/gm)	DEPTH(ft)
0.0			ASPHALT - blk, minor hydrocarbon odour					0.0
	GP		GRAVEL - med. brn, poorly sorted, no hydrocarbon odour or staining.					1.0
	CL-OL		CLAY - sandy, dk green-grey, minor pebbles		1	120		2.0
			minor organic material, low plasticity,					3.0
1.0	CL-OL		moderately moist, hydrocarbon odours (oily/solvent smell) and staining		2	180		4.0
								5.0
	CL-OL				3	300		6.0
2.0								7.0
	CL		CLAY - sandy, dk green-grey, medium plasticity, saturated soil below 3.00 m.,		4	180		8.0
			minor hydrocarbon odour (oily/solvent smell), minor staining.					9.0
3.0	CL				5	180		10.0
								11.0
	CL				6	70		12.0
4.0								13.0
	CL							14.0
			End of Hole					15.0
5.0								16.0
								17.0
								18.0
6.0								19.0
								20.0
								21.0
7.0								22.0
								23.0
								24.0
BEL-MK ENGINEERING			LOGGED BY: DKM		COMPLETION DEPTH: 4.5 m			
Edmonton, Alberta			REVIEWED BY: DKM		COMPLETE: 21/06/95			
			Fig. No: 2635-2-6		Page 1 of 1			

Strathcona County		Drill : Mobile Augers and Research		TEST HOLE NO: H17				
Wye Road Yard		Drill Type : Unit 73 auger		PROJECT NO: 95-2635.1				
Detail Phase II ESA		Testhole Location : Old Waste Oil Pit		ELEVATION: 745 (m)				
SAMPLE TYPE <input checked="" type="checkbox"/> Grab Sample <input checked="" type="checkbox"/> No Recovery								
DEPTH(m)	USC	SOIL SYMBOL	Soil Description	SAMPLE TYPE	SAMPLE NO	Organic Vapour (ppm)	Hydrocarbons (ug/gm)	DEPTH(ft)
0.0	GW		GRAVEL - med brn, well sorted, minor asphalt material, no hydrocarbon odour					0.0
1.0	CL		CLAY - sandy, dk green-grey, minor pebbles low plasticity, slightly moist, hydrocarbon odours (oily/solvent smell) and minor staining		1	20		1.0
2.0	CL				2	400		2.0
3.0	CL				3	420		3.0
4.0	CL		CLAY - sandy, dk green-grey, minor white nodules, minor pebbles, medium plasticity saturated soil below 3.00 m., hydrocarbon odour (oily/solvent smell) and minor staining.		4	110		4.0
5.0	CL				5	105		5.0
6.0	CH		CLAY - dk green-grey, minor med brn sand lenses, saturated, high plasticity, minor pebbles, minor hydrocarbon odour.		6	32		6.0
7.0			End of Hole					7.0
								8.0
								9.0
								10.0
								11.0
								12.0
								13.0
								14.0
								15.0
								16.0
								17.0
								18.0
								19.0
								20.0
								21.0
								22.0
								23.0
								24.0
BEL-MK ENGINEERING Edmonton, Alberta				LOGGED BY: DKM REVIEWED BY: DKM Flg. No: 2635-2-7		COMPLETION DEPTH: 4.5 m COMPLETE: 21/06/95		Page 1 of 1



Strathcona County		Drill : Mobile Augers and Research		TEST HOLE NO: H18				
Wye Road Yard		Drill Type : Unit 73 auger		PROJECT NO: 95-2635.1				
Detailed Phase II ESA		Testhole Location : Old Waste Oil Pit		ELEVATION: 745 (m)				
SAMPLE TYPE <input checked="" type="checkbox"/> Grab Sample <input type="checkbox"/> No Recovery								
DEPTH(m)	USC	SOIL SYMBOL	Soil Description	SAMPLE TYPE	SAMPLE NO	Organic Vapour (ppm)	Hydrocarbons (ug/gm)	DEPTH(ft)
0.0			ASPHALT - blk, minor hydrocarbon odour					0.0
	GP		GRAVEL - med. brn, poorly sorted, no hydrocarbon odour or staining.					1.0
	CL-OL		CLAY - sandy, dk green-grey, minor pebbles organic material, low plasticity, moderately moist, hydrocarbon odours (oily/solvent smell) and staining		1	180		2.0
1.0	CL-OL				2	380		3.0
	CL-OL							4.0
	CL-OL				3	610	16042	5.0
2.0	CL		CLAY - sandy, dk green-grey, medium plasticity, saturated soil below 3.00 m., minor hydrocarbon odour (oily/solvent smell), minor staining.		4	270		6.0
	CL							7.0
3.0	CL				5	310		8.0
	CL							9.0
4.0	CL				6	60		10.0
	CL							11.0
			End of Hole					12.0
								13.0
5.0								14.0
								15.0
								16.0
								17.0
								18.0
6.0								19.0
								20.0
								21.0
								22.0
7.0								23.0
								24.0
BEL-MK ENGINEERING Edmonton, Alberta				LOGGED BY: DKM REVIEWED BY: DKM Fig. No: 2635-2-8		COMPLETION DEPTH: 4.5 m COMPLETE: 21/06/95		Page 1 of 1

Strathcona County		Drill : Mobile Augers and Research		TEST HOLE NO: H19				
Wye Road Yard		Drill Type : Unit 04 auger		PROJECT NO: 95-2635.1				
Detail Phase IIA ESA		Testhole Location : Gate 3 UST		ELEVATION: 744.5 (m)				
SAMPLE TYPE <input checked="" type="checkbox"/> Grab Sample <input type="checkbox"/> No Recovery								
DEPTH(m)	USC	SOIL SYMBOL	Soil Description	SAMPLE TYPE	SAMPLE NO	Organic Vapour (ppm)	Hydrocarbons (ug/gm)	DEPTH(ft)
0.0			GRAVEL - med. brn-grey, poorly sorted, no hydrocarbon odour or staining.		1	34		0.0
1.0			CLAY - sandy, med brn-grey, minor pebbles blk organic material, low plasticity, slightly moist, no hydrocarbon odours or staining		2	28		1.0
2.0					3	30		2.0
3.0					4	46		3.0
4.0			CLAY - sandy, dk grey, slightly moist, low plasticity, minor med brn sand lenses (3.75-4.50), no hydrocarbon odour or staining.		5	94		4.0
5.0					6	130		5.0
6.0					7	120		6.0
7.0					8	56		7.0
8.0			End of Hole					8.0
9.0								9.0
10.0								10.0
11.0								11.0
12.0								12.0
13.0								13.0
14.0								14.0
15.0								15.0
16.0								16.0
17.0								17.0
18.0								18.0
19.0								19.0
20.0								20.0
21.0								21.0
22.0								22.0
23.0								23.0
24.0								24.0
BEL-MK ENGINEERING			LOGGED BY: DKM	COMPLETION DEPTH: 6.0 m				
Edmonton, Alberta			REVIEWED BY: DKM	COMPLETE: 30/06/95				
			Flg. No: 2635-3-1	Page 1 of 1				

Strathcona County		Drill : Mobile Augers and Research		TEST HOLE NO: H20				
Wye Road Yard		Drill Type : Unit 04 auger		PROJECT NO: 95-2635.1				
Delta Phase Ila ESA		Testhole Location : Gate 3 UST		ELEVATION: 744.5 (m)				
SAMPLE TYPE <input checked="" type="checkbox"/> Grab Sample <input type="checkbox"/> No Recovery								
DEPTH(m)	USC	SOIL SYMBOL	Soil Description	SAMPLE TYPE	SAMPLE NO	Organic Vapour (ppm)	Hydrocarbons (ug/gm)	DEPTH(ft)
0.0		▲▲▲	GRAVEL - dk. brn-grey, poorly sorted, minor hydrocarbon odour or staining.		1	500		0.0
1.0		▨	CLAY - sandy, med brn-grey, minor pebbles blk organic material, low plasticity, slightly moist, hydrocarbon odours and staining (1.50-2.75m)		2	680		1.0
2.0		▨			3	1600		2.0
3.0		▨	CLAY - sandy, dk grey, slightly moist, low plasticity, minor med brn sand lenses (2.75-3.50), hydrocarbon odour and minor staining (2.75-3.75m)		4	8400		3.0
4.0		▨			5	2000		4.0
5.0		▨			6	150		5.0
6.0		▨			7	90		6.0
7.0		▨			8	140		7.0
6.0			End of Hole					19.0
								20.0
								21.0
								22.0
								23.0
								24.0
BEL-MK ENGINEERING				LOGGED BY: DKM		COMPLETION DEPTH: 6.0 m		
Edmonton, Alberta				REVIEWED BY: DKM		COMPLETE: 30/06/95		
				Fig. No: 2635-3-2		Page 1 of 1		

Strathcona County		Drill : Mobile Augers and Research		TEST HOLE NO: H21				
Wye Road Yard		Drill Type : Unit 04 auger		PROJECT NO: 95-2635.1				
Detail Phase IIa ESA		Testhole Location : Storage Quonset UST		ELEVATION: 744.5 (m)				
SAMPLE TYPE <input checked="" type="checkbox"/> Grab Sample <input type="checkbox"/> No Recovery								
DEPTH(m)	USC	SOIL SYMBOL	Soil Description	SAMPLE TYPE	SAMPLE NO	Organic Vapour (ppm)	Hydrocarbons (ug/gm)	DEPTH(ft)
0.0			GRAVEL - dk. grey-blk, poorly sorted, minor asphalt, no hydrocarbon odour or staining.		1	38		0.0
1.0			SAND - clay, med brn-grey, minor gravel, poorly sorted, slightly moist, no hydrocarbon odour or staining.		2	120		1.0
2.0			blk organic material, low plasticity, slightly moist, hydrocarbon odours and staining (1.50-2.75m).		3	28		2.0
3.0			SAND - clay, med brn, very moist, medium plasticity, gravel and silt, poorly sorted, no hydrocarbon odour or staining.		4	38		3.0
4.0			CLAY - sandy, med brn, moist, medium plasticity, minor blk organic lenses, minor pebbles, no hydrocarbon odour or staining.		5	30		4.0
5.0			CLAY - sandy, med to dk grey, slightly moist, medium plasticity, minor med brn sandy lenses, no hydrocarbon odour or staining.		6	180		5.0
6.0			CLAY - sandy, dk grey, slightly moist, medium plasticity, no hydrocarbon odour or staining.		7	90		6.0
7.0			CLAY - sandy, dk grey, slightly moist, medium plasticity, no hydrocarbon odour or staining.		8	180		7.0
8.0			End of Hole					8.0
9.0								9.0
10.0								10.0
11.0								11.0
12.0								12.0
13.0								13.0
14.0								14.0
15.0								15.0
16.0								16.0
17.0								17.0
18.0								18.0
19.0								19.0
20.0								20.0
21.0								21.0
22.0								22.0
23.0								23.0
24.0								24.0
BEL-MK ENGINEERING				LOGGED BY: DKM		COMPLETION DEPTH: 6.0 m		
Edmonton, Alberta				REVIEWED BY: DKM		COMPLETE: 30/06/95		
				Fig. No: 2635-3-3		Page 1 of 1		

Strathcona County		Drill : Mobile Augers and Research		TEST HOLE NO: H22				
Wye Road Yard		Drill Type : Unit 04 auger		PROJECT NO: 95-2635.1				
Delta Phase Ila ESA		Testhole Location : Gate 3 UST		ELEVATION: 744.5 (m)				
SAMPLE TYPE <input checked="" type="checkbox"/> Grab Sample <input type="checkbox"/> No Recovery								
DEPTH(m)	USC	SOIL SYMBOL	Soil Description	SAMPLE TYPE	SAMPLE NO	Organic Vapour (ppm)	Hydrocarbons (ug/gm)	DEPTH(ft)
0.0			GRAVEL - dk grey-brn to blk, poorly sorted minor asphalt, minor hydrocarbon odour and staining.		1	900		0.0
1.0			CLAY - sandy, med brn-grey, minor pebbles minor blk organic material, minor med brn sand lenses, low plasticity, slightly moist, minor hydrocarbon odours and staining.		2	470		1.0
2.0					3	200		2.0
3.0					4	370		3.0
4.0			CLAY - sandy, med to dk grey, minor med brn sand lenses (3.00-3.75m), slightly moist, low plasticity, no hydrocarbon odour or staining.		5	460		4.0
5.0					6	310		5.0
6.0					7	210		6.0
7.0					8	260		7.0
			End of Hole					
BEL-MK ENGINEERING Edmonton, Alberta				LOGGED BY: DKM REVIEWED BY: DKM Fig. No: 2635-3-4		COMPLETION DEPTH: 6.0 m COMPLETE: 30/06/95		Page 1 of 1



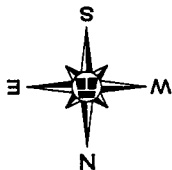
Strathcona County		Drill : Mobile Augers and Research		TEST HOLE NO: H23				
Wye Road Yard		Drill Type : Unit 04 auger		PROJECT NO: 95-2635.1				
Detail Phase I/II ESA		Testhole Location : Gate 3 UST		ELEVATION: 744.5 (m)				
SAMPLE TYPE <input checked="" type="checkbox"/> Grab Sample <input type="checkbox"/> No Recovery								
DEPTH(m)	USC	SOIL SYMBOL	Soil Description	SAMPLE TYPE	SAMPLE NO	Organic Vapour (ppm)	Hydrocarbons (ug/gm)	DEPTH(ft)
0.0	GP		GRAVEL - dk grey-brn to blk, poorly sorted minor asphalt, minor hydrocarbon odour and staining.		1	270		0.0
1.0					2	400		1.0
2.0	CL		CLAY - sandy, med brn-grey, minor pebbles minor blk organic material, minor yellow brn sand lenses, medium plasticity, slightly moist, minor hydrocarbon odours and staining.		3	880		2.0
3.0					4	900		3.0
4.0	CL		CLAY - sandy, med grey, minor gypsum xls and med brn sand lenses (3.00-3.75m), slightly moist, medium plasticity, no hydrocarbon odour or staining.		5	610		4.0
5.0					6	160		5.0
6.0	CL				7	88		6.0
7.0					8	320		7.0
8.0			End of Hole					8.0
9.0								9.0
10.0								10.0
11.0								11.0
12.0								12.0
13.0								13.0
14.0								14.0
15.0								15.0
16.0								16.0
17.0								17.0
18.0								18.0
19.0								19.0
20.0								20.0
21.0								21.0
22.0								22.0
23.0								23.0
24.0								24.0

BEL-MK ENGINEERING		LOGGED BY: DKM	COMPLETION DEPTH: 6.0 m
Edmonton, Alberta		REVIEWED BY: DKM	COMPLETE: 30/06/95
		Fig. No: 2635-3-5	Page 1 of 1



**Reference 5:** Thurber Engineering Ltd. Report (2006). "Carr Residence 37 Windsor Estate Strathcona County, Alberta Geotechnical Investigation" (File: 19-4927-0)

GOVERNMENT ROAD ALLOWANCE



LOT 42

LOT 39A

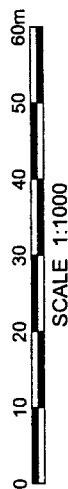
PLAN 932 1631

ASPHALT

LOT 41

LOT 40

FENCE  
LOT 37A



**LEGEND**

- APPROXIMATE TEST HOLE LOCATIONS
- SP STANDPIPE PIEZOMETER

WINDSOR DRIVE

THURBER PROJECT #19-4927-0

**WILMAX CONSTRUCTION LTD.**

**SITE PLAN SHOWING  
APPROXIMATE TEST HOLE LOCATIONS**



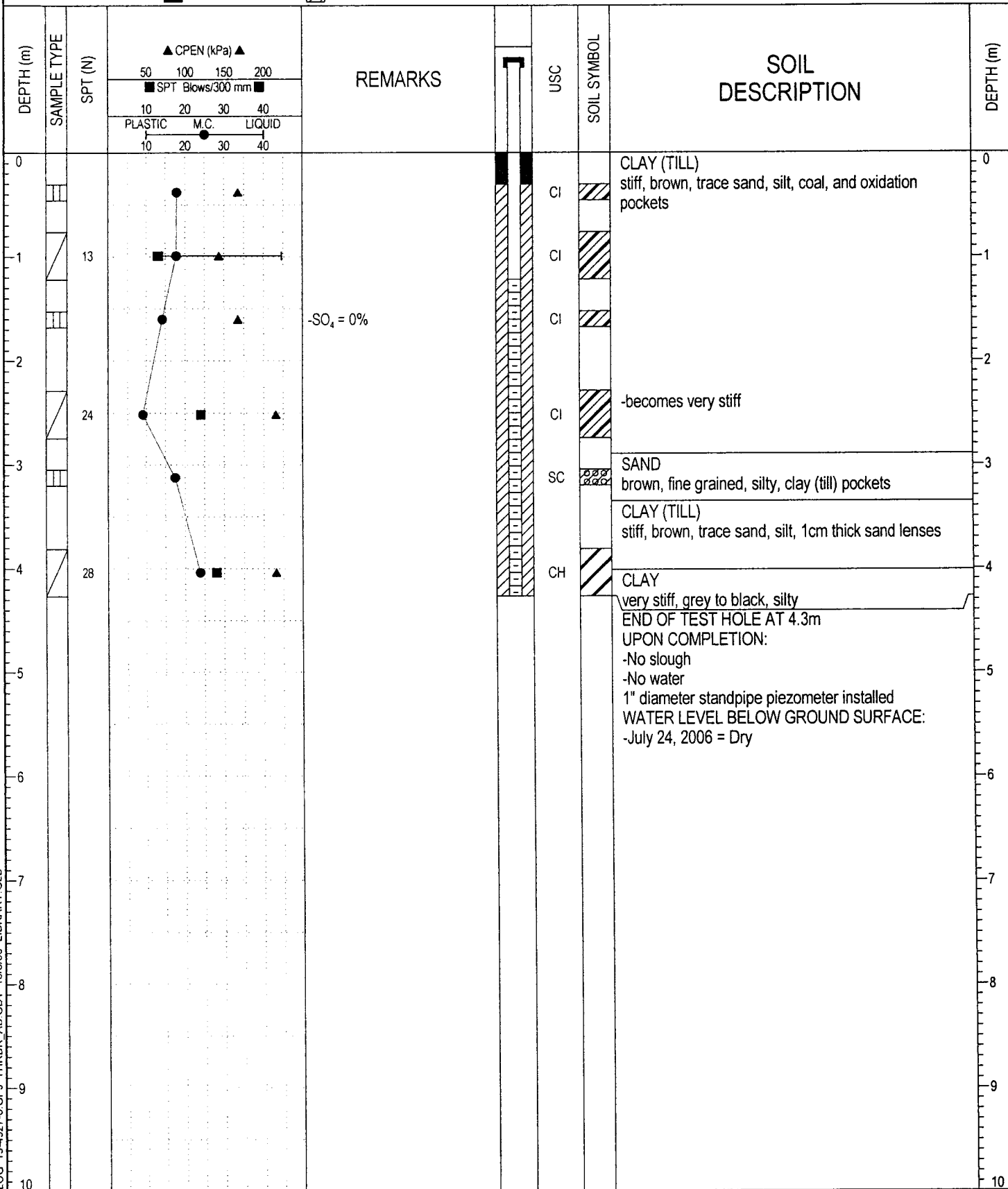
**THURBER ENGINEERING LTD.**  
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS

ENGINEER: TF	DRAWN: HH	APPROVED:
DATE: AUGUST 2006	SCALE: 1:1,000	DRAWING No. 19-4927-0-1

Carr Residence Geotechnical Investigation

EDMONTON, AB

CLIENT: Wilmax Construction	PROJECT: Carr Residence Geotechnical Investigation	BOREHOLE NO: TH06-1
DRILLING COMPANY: Mobile Augers & Research Ltd.	DATE DRILLED: July 11, 2006	PROJECT NO: 19-4927-0
DRILL/METHOD:	LOCATION: See Drawing #19-4927-0-1	ELEVATION:
SAMPLE TYPE	<input type="checkbox"/> GRAB SAMPLE <input checked="" type="checkbox"/> SPT	
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE <input type="checkbox"/> DRILL CUTTINGS	



BOREHOLE LOG 19-4927-0.GPJ THURBER AB GDT 10/8/06 - LIBRARY GLB



**THURBER ENGINEERING LTD.**  
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS

FIELD LOGGED BY: TF	COMPLETION DEPTH: 4.3 m
PREPARED BY: TF	COMPLETION DATE: 11/7/06
REVIEWED BY:	

CLIENT: Wilmax Construction		PROJECT: Carr Residence Geotechnical Investigation		BOREHOLE NO: TH06-2			
DRILLING COMPANY: Mobile Augers & Research Ltd.		DATE DRILLED: July 11, 2006		PROJECT NO: 19-4927-0			
DRILL/METHOD:		LOCATION: See Drawing #19-4927-0-1		ELEVATION:			
SAMPLE TYPE <input type="checkbox"/> GRAB SAMPLE <input checked="" type="checkbox"/> SPT							
DEPTH (m)	SAMPLE TYPE	SPT (N)	REMARKS	USC	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)
0						CLAY (TILL) stiff, brown, trace silt and sand, occasional rootlets	0
1		8	-SO <sub>4</sub> = 0%		CI		1
2					CI		2
3		18			CI	-becomes very stiff -occasional gravel and wood pieces	3
4		26			SC	SAND yellowish brown, fine grained, silty, clay pockets	4
5					CH	CLAY SHALE very stiff, grey, silty	5
6						END OF TEST HOLE AT 4.3m UPON COMPLETION: (Below ground surface) -Slough at 3.5m -No water Backfilled with drill cuttings	6
7							7
8							8
9							9
10							10



**THURBER ENGINEERING LTD.**  
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS

FIELD LOGGED BY: TF

PREPARED BY: TF

REVIEWED BY:

COMPLETION DEPTH: 4.3 m

COMPLETION DATE: 11/7/06

Page 1 of 1

BOREHOLE LOG 19-4927-0.GPJ THRB AB GDI 10/8/06- LIBRARY GLB



CLIENT: Wilmax Construction		PROJECT: Carr Residence Geotechnical Investigation		BOREHOLE NO: TH06-3	
DRILLING COMPANY: Mobile Augers & Research Ltd.		DATE DRILLED: July 11, 2006		PROJECT NO: 19-4927-0	
DRILL/METHOD:		LOCATION: See Drawing #19-4927-0-1		ELEVATION:	
SAMPLE TYPE <input type="checkbox"/> GRAB SAMPLE <input checked="" type="checkbox"/> SPT					

DEPTH (m)	SAMPLE TYPE	SPT (N)	REMARKS	USC	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)
0						CLAY (TILL) stiff, brown, trace sand, silt, rootlets, and wood	0
1		12		CI			1
2				CI		-occasional gravel (up to 2cm)	2
3		22		CI		-becomes very stiff	3
4		28		CH		CLAY SHALE very stiff, light grey, silty, calcareous lenses	4
5						END OF TEST HOLE AT 4.3m UPON COMPLETION: -No slough -No water Backfilled with drill cuttings	5
6							6
7							7
8							8
9							9
10							10

	<b>THURBER ENGINEERING LTD.</b>	FIELD LOGGED BY: TF	COMPLETION DEPTH: 4.3 m
	GEOTECHNICAL • ENVIRONMENTAL • MATERIALS	PREPARED BY: TF	COMPLETION DATE: 11/7/06
		REVIEWED BY:	

BOREHOLE LOG: 19-4927-0.GPJ THRB, AB GDT 10/8/06, LIBRARY GLB

CLIENT: Wilmax Construction		PROJECT: Carr Residence Geotechnical Investigation		BOREHOLE NO: TH06-4			
DRILLING COMPANY: Mobile Augers & Research Ltd.		DATE DRILLED: July 11, 2006		PROJECT NO: 19-4927-0			
DRILL/METHOD:		LOCATION: See Drawing #19-4927-0-1		ELEVATION:			
SAMPLE TYPE <input type="checkbox"/> GRAB SAMPLE <input checked="" type="checkbox"/> SPT							
DEPTH (m)	SAMPLE TYPE	SPT (N)	REMARKS	USC	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)
0						CLAY (TILL) very stiff, brown, trace sand and silt	0
1		18			CH		1
2					CI		2
3		12			CI	-occasional gravel (up to 1cm) -becomes stiff	3
4		19			CH	-coal pockets and white calcareous lenses	4
5						CLAY SHALE very stiff, grey, silty	5
6						END OF TEST HOLE AT 4.3m UPON COMPLETION: (Below ground surface) -Slough at 3.7m -No water Backfilled with drill cuttings	6
7							7
8							8
9							9
10							10

BOREHOLE LOG 19-4927-0.GPJ THRRR-AB GDT 10/8/06- LIBRARY GLB



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FIELD LOGGED BY: TF

PREPARED BY: TF

REVIEWED BY:

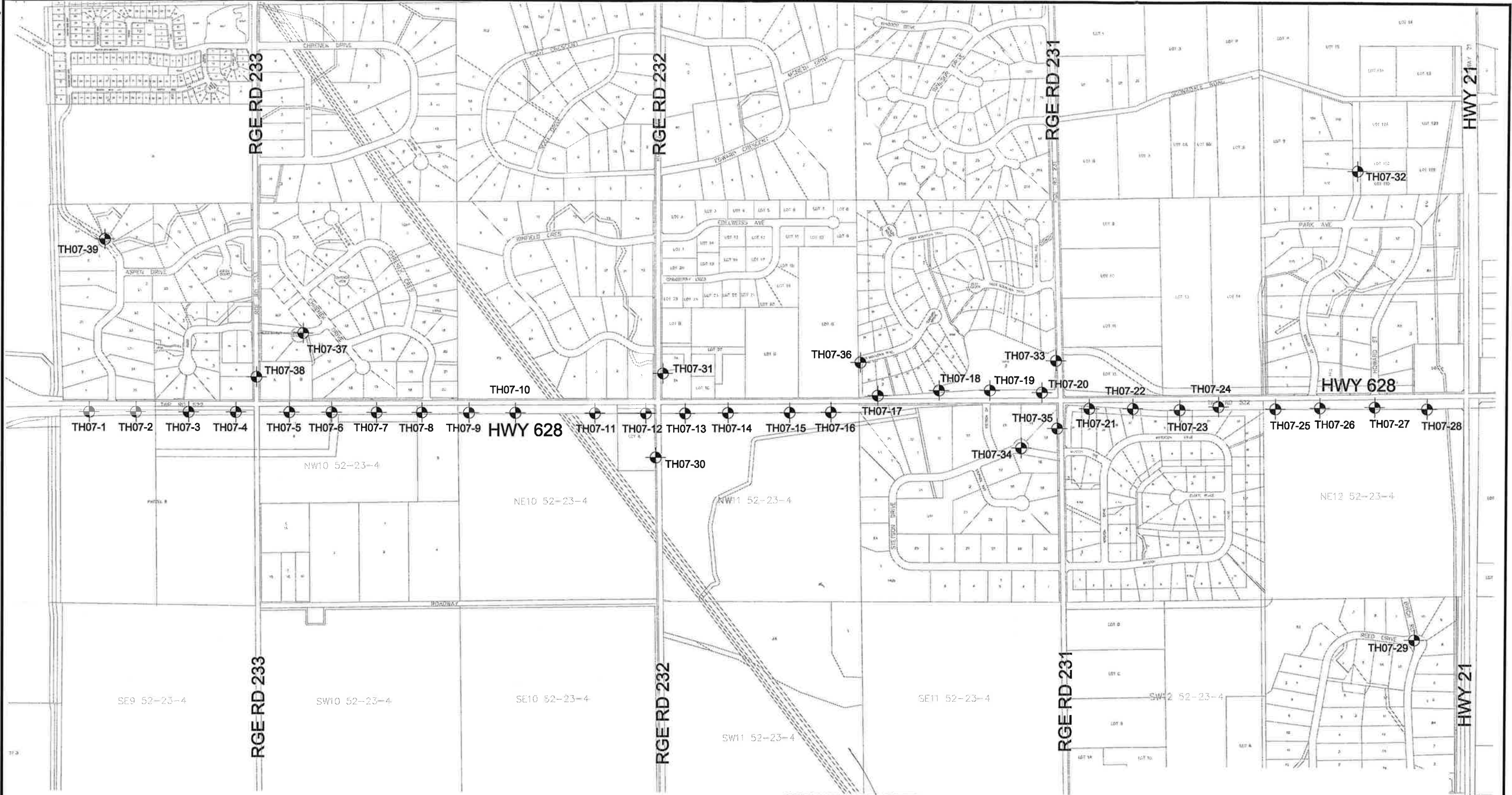
COMPLETION DEPTH: 4.3 m

COMPLETION DATE: 11/7/06

Page 1 of 1

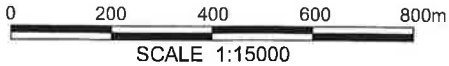


**Reference 6:** Thurber Engineering Ltd. Letter (2012). "HWY 628:04 Twinning – HWY 216 to HWY 21 Preliminary Geotechnical Soil Information" (File: 17-308-495)




LEGEND

● APPROXIMATE TEST HOLE LOCATIONS



BASE PLAN PROVIDED BY: STANTEC

STANTEC CONSULTING LTD.				<b>THURBER ENGINEERING LTD.</b> GEOTECHNICAL • ENVIRONMENTAL • MATERIALS			
SITE PLAN SHOWING APPROXIMATE TEST HOLE LOCATIONS							
HWY 628:04 (HWY 216 TO HWY 210 GEOTECHNICAL INVESTIGATION		ENGINEER	ASZ	DRAWN	CMH	APPROVED	DAP
		DATE	FEB. 2007	SCALE	AS SHOWN	DRAWING No	17-308-495-1
SHERWOOD PARK, AB							

CLIENT: STANTEC CONSULTING LTD.	PROJECT: HWY 628.04 (HWY 216 TO HWY 21)	BOREHOLE NO: TH07-12
DRILLING COMPANY: Mobile Augers & Research Ltd.	DATE DRILLED: January 2, 2007	PROJECT NO: 17-308-495
DRILL METHOD: M10 Truck / Solid Stem Auger	LOCATION: N5927991.53, E46589.72	ELEVATION: 740.17 m
SAMPLE TYPE	<input checked="" type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> CORE SAMPLE <input checked="" type="checkbox"/> SPT SAMPLE <input checked="" type="checkbox"/> GRAB SAMPLE <input type="checkbox"/> NO RECOVERY	

Depth (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	BLOWS /150 mm	TEST DATA				OTHER DATA
						UNSATURATED				
						SATURATED				
						OTHER				
0		ASPHALT								
		SAND, GRAVEL, AND CLAY		1						
		CLAY (FILL)								
		very stiff, brown, silty, sandy, trace gravel		2						
1										
				3						
2										
				4						
3		CLAY (TILL)		5						
		stiff, brown, silty, sandy, trace gravel								
		END OF TEST HOLE AT 3.0m								
		Backfilled with drill cuttings and cold mix at surface								
4										
5										
6										
7										
8										
9										
10										



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 REVIEWED BY: CC

COMPLETION DEPTH: 3.0 m  
 COMPLETION DATE: 2/1/07



CLIENT: STANTEC CONSULTING LTD.	PROJECT: HWY 628:04 (HWY 216 TO HWY 21)	BOREHOLE NO: TH07-13
DRILLING COMPANY: Mobile Augers & Research Ltd.	DATE DRILLED: January 2, 2007	PROJECT NO: 17-308-495
DRILL METHOD: M10 Truck / Solid Stem Auger	LOCATION: N5927992.26, E46791.34	ELEVATION: 736.39 m
SAMPLE TYPE	<input checked="" type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> CORE SAMPLE <input checked="" type="checkbox"/> SPT SAMPLE <input checked="" type="checkbox"/> GRAB SAMPLE <input type="checkbox"/> NO RECOVERY	

Depth (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	BLOWS /150 mm	<div> <div> ▲ VANE SHEAR ▲ 2 4 6 8  ■ BLOW COUNT ■ 20 40 60 80  ◆ UNCONF. SHEAR STR. (kPa) ◆ 100 200 300 400  ● 0.5 x POCKETPEN. (kPa) ● 100 200 300 400 </div> <div> PLASTIC    M.C.    LIQUID 20 40 60 80 </div> </div>	OTHER DATA
0		ASPHALT					
		MIXTURE OF SAND, GRAVEL, AND CLAY brown		1			
1		CLAY (FILL) very stiff, brown, silty, sandy, occasional gravel		2			
		-becomes stiff		3			
2		CLAY (TILL) stiff, brown, silty, sandy, trace gravel, coal, and oxide stains		4			
3		END OF TEST HOLE AT 3.0m Backfilled with drill cuttings and cold mix at surface		5			
4							
5							
6							
7							
8							
9							
10							

AB TRANS BOREHOLE LOG 17-308-495.GPJ ALBERTA-TRANSPORTATION-TEMPLATE.GDT 22/2/07



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REVIEWED BY: CC

COMPLETION DEPTH: 3.0 m  
COMPLETION DATE: 2/1/07

CLIENT: STANTEC CONSULTING LTD.	PROJECT: HWY 628:04 (HWY 216 TO HWY 21)	BOREHOLE NO: <b>TH07-14</b>
DRILLING COMPANY: Mobile Augers & Research Ltd.	DATE DRILLED: January 2, 2007	PROJECT NO: 17-308-495
DRILL METHOD: M10 Truck / Solid Stem Auger	LOCATION: N5927995.14, E46924.0	ELEVATION: 737.37 m

SAMPLE TYPE ☒ SHELBY TUBE ☐ CORE SAMPLE ☒ SPT SAMPLE ☐ GRAB SAMPLE ☐ NO RECOVERY

Depth (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	BLOWS /150 mm	PLASTIC M.C. LIQUID	▲ VANE SHEAR ▲ 2 4 6 8 ■ BLOW COUNT ■ 20 40 60 80 ◆ UNCONF. SHEAR STR. (kPa) ◆ 100 200 300 400 ● 0.5 x POCKETPEN. (kPa) ● 100 200 300 400	OTHER DATA
0		ASPHALT						
		MIXTURE OF SAND, GRAVEL, AND CLAY brown		1				
1		CLAY (TILL) very stiff, brown, silty, sandy, trace gravel and coal		2				
		-iron pockets		3				
2				4				
3				5				
		END OF TEST HOLE AT 3.0m Backfilled with drill cuttings and cold mix at surface						
4								
5								
6								
7								
8								
9								
10								

AB TRANS BOREHOLE LOG 17-308-495.GPJ ALBERTA-TRANSPORTATION-TEMPLATE.GDT 22/2/07



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COMPLETION DEPTH: 3.0 m

COMPLETION DATE: 2/1/07

Page 1 of 1

CLIENT: STANTEC CONSULTING LTD.	PROJECT: HWY 628:04 (HWY 216 TO HWY 21)	BOREHOLE NO: TH07-15
DRILLING COMPANY: Mobile Augers & Research Ltd.	DATE DRILLED: January 2, 2007	PROJECT NO: 17-308-495
DRILL METHOD: M10 Truck / Solid Stem Auger	LOCATION: N5927997.64, E47065.41	ELEVATION: 224.691 m

SAMPLE TYPE ☒ SHELBY TUBE ☐ CORE SAMPLE ☒ SPT SAMPLE ☐ GRAB SAMPLE ☐ NO RECOVERY

Depth (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	BLOWS /150 mm	<div> <div>PLASTIC</div> <div>M.C.</div> <div>LIQUID</div> </div>	<div>▲ VANE SHEAR ▲</div> <div>2 4 6 8</div>	OTHER DATA
							<div>■ BLOW COUNT ■</div> <div>20 40 60 80</div>	
							<div>◆ UNCONF. SHEAR STR. (kPa) ◆</div> <div>100 200 300 400</div>	
							<div>● 0.5 x POCKETPEN. (kPa) ●</div> <div>100 200 300 400</div>	
0		ASPHALT						
		SAND AND GRAVEL		1				
		brown						
		CLAY (TILL)		2				
1		stiff to hard, brown, silty, sandy, trace coal, iron stain, and gravel						
				3				
2								
				4				
3								
				5				
4		END OF TEST HOLE AT 3.8m						
		Backfilled with drill cuttings and cold mix at surface						
5								
6								
7								
8								
9								
10								

AB TRANS BOREHOLE LOG 17-308-495 GPJ ALBERTA-TRANSPORTATION-TEMPLATE GDT 22/2/07



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LOGGED BY: SGR	COMPLETION DEPTH: 3.8 m
PREPARED BY: ASZ	COMPLETION DATE: 2/1/07
REVIEWED BY: CC	Page 1 of 1

AB TRANS BOREHOLE LOG 17-308-495.GPJ ALBERTA-TRANSPORTATION-TEMPLATE.GDT 22/2/07

CLIENT: STANTEC CONSULTING LTD.		PROJECT: HWY 628:04 (HWY 216 TO HWY 21)		BOREHOLE NO: TH07-19				
DRILLING COMPANY: Mobile Augers & Research Ltd.		DATE DRILLED: January 3, 2007		PROJECT NO: 17-308-495				
DRILL METHOD: M10 Truck / Solid Stem Auger		LOCATION: N5928044.32, E48170.87		ELEVATION: 735.62 m				
SAMPLE TYPE <input checked="" type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> CORE SAMPLE <input checked="" type="checkbox"/> SPT SAMPLE <input checked="" type="checkbox"/> GRAB SAMPLE <input type="checkbox"/> NO RECOVERY								
Depth (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	BLOWS /150 mm	VANE SHEAR	BLOW COUNT	OTHER DATA
						2    4    6    8	20    40    60    80	
						UNCONF. SHEAR STR. (kPa)	0.5 x POCKETPEN. (kPa)	
						100    200    300    400	100    200    300    400	
0		ASPHALT						-Frozen to 0.4m
		MIXTURE OF SAND, GRAVEL, AND CLAY brown		1				
		CLAY (FILL) very stiff, silty, sandy		2				
-1								
				3				
-2		CLAY (TILL) firm to stiff, brown, silty, sandy, trace gravel and coal						
				4				
-3		-trace roots						
		END OF TEST HOLE AT 3.0m Backfilled with drill cuttings and cold mix at surface		5				
-4								
-5								
-6								
-7								
-8								
-9								
-10								



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COMPLETION DEPTH: 3.0 m  
COMPLETION DATE: 3/1/07

CLIENT: STANTEC CONSULTING LTD.	PROJECT: HWY 628:04 (HWY 216 TO HWY 21)	BOREHOLE NO: <b>TH07-20</b>
DRILLING COMPANY: Mobile Augers & Research Ltd.	DATE DRILLED: January 3, 2007	PROJECT NO: 17-308-495
DRILL METHOD: M10 Truck / Solid Stem Auger	LOCATION: N5928046.77, E48269.58	ELEVATION: 736.11 m
SAMPLE TYPE	<input checked="" type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> CORE SAMPLE <input checked="" type="checkbox"/> SPT SAMPLE <input checked="" type="checkbox"/> GRAB SAMPLE <input type="checkbox"/> NO RECOVERY	

Depth (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	BLOWS /150 mm	PLASTIC M.C. LIQUID			2 4 6 8				OTHER DATA
									▲ VANE SHEAR ▲				
									■ BLOW COUNT ■				
									◆ UNCONF. SHEAR STR. (kPa) ◆				
						20 40 60 80				20 40 60 80			

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COMPLETION DEPTH: 3.0 m  
COMPLETION DATE: 3/1/07



CLIENT: STANTEC CONSULTING LTD.	PROJECT: HWY 628:04 (HWY 216 TO HWY 21)	BOREHOLE NO: TH07-21
DRILLING COMPANY: Mobile Augers & Research Ltd.	DATE DRILLED: January 2, 2007	PROJECT NO: 17-308-495
DRILL METHOD: M10 Truck / Solid Stem Auger	LOCATION: N5928030.12, E48551.59	ELEVATION: 738.7 m

SAMPLE TYPE	<input checked="" type="checkbox"/> SHELBY TUBE	<input checked="" type="checkbox"/> CORE SAMPLE	<input checked="" type="checkbox"/> SPT SAMPLE	<input type="checkbox"/> GRAB SAMPLE	<input type="checkbox"/> NO RECOVERY
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Depth (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	BLOWS /150 mm	<div> <div> <div>▲ VANE SHEAR ▲</div> <div>2 4 6 8</div> </div> <div> <div>■ BLOW COUNT ■</div> <div>20 40 60 80</div> </div> <div> <div>◆ UNCONF. SHEAR STR. (kPa) ◆</div> <div>100 200 300 400</div> </div> <div> <div>● 0.5 x POCKETPEN (kPa) ●</div> <div>100 200 300 400</div> </div> </div> <div> <div>PLASTIC</div> <div>M.C.</div> <div>LIQUID</div> </div>	OTHER DATA
0		ASPHALT					
		MIXTURE OF SAND, GRAVEL, AND CLAY brown - dark grey		1			
		CLAY (FILL) stiff, brown, silty, sandy, trace gravel, coal, and silt lenses		2			
				3			
		PEAT dark brown, sandy		4			
		CLAY firm, dark grey, silty, trace sand		5			
3		END OF TEST HOLE AT 3.0m Backfilled with drill cuttings and cold mix at surface					
4							
5							
6							
7							
8							
9							
10							

AB TRANS BOREHOLE LOG 17-308-495.GPJ ALBERTA-TRANSPORTATION-TEMPLATE.GDT 22/2/07



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COMPLETION DEPTH: 3.0 m

COMPLETION DATE: 2/1/07

Page 1 of 1

CLIENT: STANTEC CONSULTING LTD.	PROJECT: HWY 628:04 (HWY 216 TO HWY 21)	BOREHOLE NO: <b>TH07-22</b>
DRILLING COMPANY: Mobile Augers & Research Ltd.	DATE DRILLED: January 2, 2007	PROJECT NO: 17-308-495
DRILL METHOD: M10 Truck / Solid Stem Auger	LOCATION: N5928022.46, E48719.25	ELEVATION: 741.24 m

SAMPLE TYPE ☒ SHELBY TUBE ☐ CORE SAMPLE ☒ SPT SAMPLE ☐ GRAB SAMPLE ☐ NO RECOVERY

Depth (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	BLOWS /150 mm	PLASTIC M.C. LIQUID	▲ VANE SHEAR ▲ 2 4 6 8 ■ BLOW COUNT ■ 20 40 60 80 ◆ UNCONF. SHEAR STR. (kPa) ◆ 100 200 300 400 ● 0.5 x POCKETPEN (kPa) ● 100 200 300 400	OTHER DATA
0		ASPHALT						
		MIXTURE OF SAND, GRAVEL, AND CLAY brown - dark grey		1				
		CLAY (FILL) very stiff, silty, sandy, occasional gravel		2				
1								
				3				
2								
		-trace silt pockets		4				
3		CLAY (TILL) stiff, brown, silty, sandy, some sand pockets, trace gravel and coal		5				
		END OF TEST HOLE AT 3.0m Backfilled with drill cuttings and cold mix at surface						
4								
5								
6								
7								
8								
9								
10								

-Frozen to 0.4m

-Seepage

AB TRANS BOREHOLE LOG 17-308-495 GPJ ALBERTA-TRANSPORTATION-TEMPLATE GDT 22/2/07

CLIENT: STANTEC CONSULTING LTD.	PROJECT: HWY 628:04 (HWY 216 TO HWY 21)	BOREHOLE NO: TH07-30
DRILLING COMPANY: Mobile Augers & Research Ltd.	DATE DRILLED: January 2, 2007	PROJECT NO: 17-308-495
DRILL METHOD: M10 Truck / Solid Stem Auger	LOCATION: N5927822.84, E46754.07	ELEVATION: 734.35 m

SAMPLE TYPE ☒ SHELBY TUBE ☐ CORE SAMPLE ☒ SPT SAMPLE ☐ GRAB SAMPLE ☐ NO RECOVERY

Depth (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	BLOWS /150 mm				OTHER DATA
0		ASPHALT							-Frozen to 0.4m
		MIXTURE OF SAND, GRAVEL, AND CLAY		1					
		brown							
		CLAY (FILL)							
1		very stiff, brown, silty, sandy, trace gravel		2					
		CLAY (TILL)		3					
2		very stiff, dark grey - brown, silty, sandy, trace gravel and coal							
				4					
3		END OF TEST HOLE AT 3.0m		5					
		Backfilled with drill cuttings and cold mix at surface							
4									
5									
6									
7									
8									
9									
10									

AB TRANS BOREHOLE LOG 17-308-495 GPJ ALBERTA-TRANSPORTATION-TEMPLATE GDT 22/2/07



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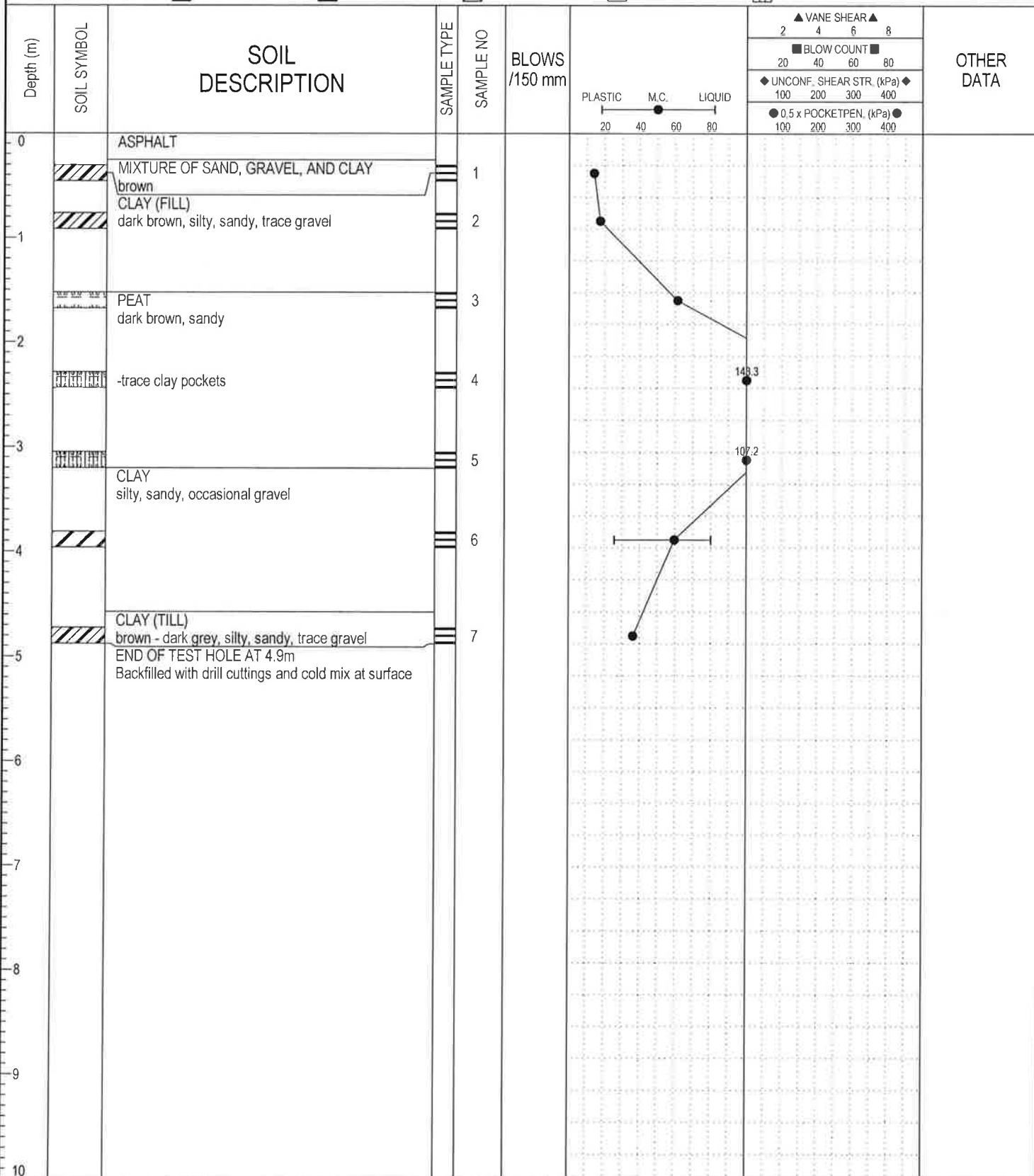
COMPLETION DEPTH: 3.0 m

COMPLETION DATE: 2/1/07

Page 1 of 1

CLIENT: STANTEC CONSULTING LTD.	PROJECT: HWY 628:04 (HWY 216 TO HWY 21)	BOREHOLE NO: TH07-31
DRILLING COMPANY: Mobile Augers & Research Ltd.	DATE DRILLED: January 3, 2007	PROJECT NO: 17-308-495
DRILL METHOD: M10 Truck / Solid Stem Auger	LOCATION: N5928168.46, E46755.61	ELEVATION: 737.68 m

SAMPLE TYPE	<input checked="" type="checkbox"/> SHELBY TUBE	<input checked="" type="checkbox"/> CORE SAMPLE	<input checked="" type="checkbox"/> SPT SAMPLE	<input type="checkbox"/> GRAB SAMPLE	<input type="checkbox"/> NO RECOVERY
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AB TRANS BOREHOLE LOG 17-308-495 GPJ ALBERTA-TRANSPORTATION-TEMPLATE.GDT 22/2/07



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COMPLETION DEPTH: 4.9 m  
COMPLETION DATE: 3/1/07

CLIENT: STANTEC CONSULTING LTD.	PROJECT: HWY 628:04 (HWY 216 TO HWY 21)	BOREHOLE NO: <b>TH07-33</b>
DRILLING COMPANY: Mobile Augers & Research Ltd.	DATE DRILLED: January 3, 2007	PROJECT NO: 17-308-495
DRILL METHOD: M10 Truck / Solid Stem Auger	LOCATION: N5928231.78, E48376.96	ELEVATION: 737.98 m

SAMPLE TYPE    ☒ SHELBY TUBE    ☒ CORE SAMPLE    ☒ SPT SAMPLE    ☒ GRAB SAMPLE    ☐ NO RECOVERY

Depth (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	BLOWS /150 mm	<div> <div>PLASTIC      M.C.      LIQUID</div> <div>20      40      60      80</div> </div>	<div>▲ VANE SHEAR ▲</div> <div>2      4      6      8</div>	OTHER DATA
							<div>■ BLOW COUNT ■</div> <div>20      40      60      80</div>	
							<div>◆ UNCONF. SHEAR STR. (kPa) ◆</div> <div>100      200      300      400</div>	
							<div>● 0.5 x POCKETPEN. (kPa) ●</div> <div>100      200      300      400</div>	
0		ASPHALT						-Frozen to 0.4m
		MIXTURE OF SAND, GRAVEL, AND CLAY brown		1				
		CLAY (FILL) stiff, grey - brown, silty, sandy, trace gravel		2				
1								
				3				
2		CLAY (TILL) stiff, brown, silty, sandy, trace gravel						
				4				
				5				
3		END OF TEST HOLE AT 3.0m Backfilled with drill cuttings and cold mix at surface						
4								
5								
6								
7								
8								
9								
10								

AB TRANS BOREHOLE LOG 17-308-495.GPJ ALBERTA-TRANSPORTATION-TEMPLATE.GDT 22/2/07



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PREPARED BY: ASZ  
REVIEWED BY: CC

COMPLETION DEPTH: 3.0 m  
COMPLETION DATE: 3/1/07



CLIENT: STANTEC CONSULTING LTD.	PROJECT: HWY 628:04 (HWY 216 TO HWY 21)	BOREHOLE NO: TH07-35
DRILLING COMPANY: Mobile Augers & Research Ltd.	DATE DRILLED: January 3, 2007	PROJECT NO: 17-308-495
DRILL METHOD: M10 Truck / Solid Stem Auger	LOCATION: N5927868.13, E48387.43	ELEVATION: 736.77 m
SAMPLE TYPE	<input checked="" type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> CORE SAMPLE <input checked="" type="checkbox"/> SPT SAMPLE <input checked="" type="checkbox"/> GRAB SAMPLE <input type="checkbox"/> NO RECOVERY	

Depth (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	BLOWS /150 mm	2 4 6 8				OTHER DATA
						BLOW COUNT				
						20 40 60 80				
						UNCONF. SHEAR STR. (kPa)				
						PLASTIC	M.C.	LIQUID		
						20	40	60	80	
				</						

AB TRANS BOREHOLE LOG 17-308-495.GPJ ALBERTA-TRANSPORTATION-TEMPLATE.GDT 22/2/07



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PREPARED BY: ASZ  
REVIEWED BY: CC

COMPLETION DEPTH: 3.0 m  
COMPLETION DATE: 3/1/07