APPENDIX E

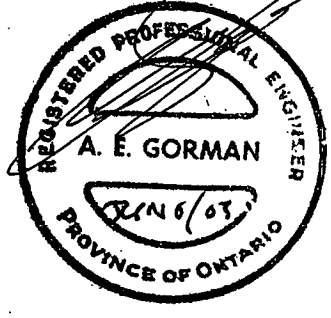
Preliminary Geotechnical Investigation
Mayfield Road Widening, June 2003

PRELIMINARY GEOTECHNICAL INVESTIGATION
MAYFIELD ROAD WIDENING – CLASS EA STUDY
HEART LAKE ROAD TO AIRPORT ROAD
REGION OF PEEL, ONTARIO

Report

to

Stantec Consulting Ltd.



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THURBER

1. INTRODUCTION

This report presents the results of a preliminary geotechnical investigation carried out by Thurber Engineering Ltd. (Thurber) for the widening of Mayfield Road between Heart Lake Road and Airport Road in the Region of Peel, Ontario. A Class EA Study is being conducted for the widening of Mayfield Road in this area. The purpose of this investigation was to obtain subsurface soil and groundwater information within the project limits and to provide preliminary geotechnical recommendations related to the design of the project. Additional geotechnical investigation should be conducted in selected areas prior to the detailed design of the project.

The contents of this report are subject to the Statement of General Conditions attached at the end of the text. The reader's attention is specifically drawn to these conditions as it is considered essential that they be followed for the proper use and interpretation of this report.

2. SITE AND PROJECT DESCRIPTION

2.1 Site Description

This section of Mayfield Road between Heart Lake Road and Airport Road is approximately 5.5 km long and intersects with Dixie Road, Bramalea Road, and Torbram Road. Mayfield Road is a two-lane roadway through a rural area consisting of mainly residential properties and farmland. The existing shoulders are primarily gravel and open ditching exists on both sides of the roadway. Mayfield Secondary School is located at the intersection with Bramalea Road. There is also a gas station located at the intersection with Airport Road.

There are about 18 culverts along Mayfield Road between the project limits. There are 2 open concrete box culverts located at approximately 240 m west of Bramalea Road and at 320 m west of Airport Road. These culverts are 3600 mm x 2100 mm and 3000 mm x 1800 mm in size. In both cases, a 9 m long, 1015 mm diameter steel casing (tunnel) carrying the 750 mm Bolton feeder main exists about 1 m below the culvert footings. There is also an 1800 mm x 2400 mm elliptical CSP culvert at approximately 380 m west of Torbram Road and a large

4500 mm x 8500 mm pipe arch culvert at approximately 500 m east of Torbram Road. The remaining 14 culverts consist of corrugated steel pipes of varying diameters.

There are two wetlands within the project limits. At approximately 600 m east of Heart Lake Road, a marshy area on the south side of Mayfield Road consisting of tall grasses and bullrushes extends for approximately 150 m to the east. At approximately 300 m west of Airport Road, there is a 30 m long wetland on both sides of the road at the concrete box culvert.

2.2 Project Description

As indicated earlier, a Class Environmental Assessment is being conducted for the widening of Mayfield Road from a 2-lane to a 4-lane roadway from Heart Lake Road to Airport Road. The widening would involve placing fill on both sides of the existing roadway and culverts would have to be extended as required.

3. INVESTIGATION PROCEDURE

3.1 Field Investigation

A visual pavement survey was conducted on December 5, 2002 to evaluate the condition of the existing pavement. The field investigation was conducted on December 17 and 18, 2002 in which a total of 24 boreholes were drilled. The boreholes were drilled to depths of approximately 1.4 m to 8.2 m on the existing road and shoulders at approximate intervals of 250 m along Mayfield Road to investigate the subsurface conditions under the existing pavement and the shoulders and subgrade conditions for widening of the road. The borehole locations and elevations were surveyed by AGM Surveying. Plans showing the approximate locations of the boreholes are included as Drawing 17-308-321-1. The borehole intervals were adjusted to allow deeper boreholes to be drilled at the major culvert locations to provide preliminary foundation design information for culvert extensions. The depth of these culvert boreholes ranged from 5.1 m to 8.2 m. Borehole 02-9 was located at the box culvert at 240 m west of Bramalea Road and Borehole 02-17 was located at the pipe arch culvert at 500 m east of Torbram Road. The borehole 02-19 proposed at the box culvert at 320 m west of Airport

Road was not drilled since a previous geotechnical investigation report by AMEC Earth & Environmental Ltd. (AMEC) for a 750 mm diameter watermain included a borehole (BH 11A) in the vicinity. Borehole 02-26 was drilled near the elliptical culvert at 380 m west of Torbram Road. Borehole 02-21 proposed at the wetland west of Airport Road was not drilled since the area was not accessible to the drill rig. Boreholes 02-22 to 02-25 were drilled on the shoulders of the four intersecting roads (Dixie, Bramalea, Torbram, and Airport Road). These boreholes were drilled at 65 m to 75 m north or south of Mayfield Road to provide preliminary information on design of possible turning lanes or widening of the intersecting roads in the vicinity of Mayfield Road. Standpipe piezometers were installed in Boreholes 02-9, 02-17 and 02-26 (culvert boreholes) for future monitoring of the groundwater level.

All borehole locations were cleared of underground utilities and traffic control was employed during the field investigation. The boreholes were drilled using a truck-mounted, continuous flight auger drill rig supplied and operated by Geo-Environmental Drilling Inc. of Milton, Ontario. The boreholes were advanced using 100 mm diameter solid stem augers with Standard Penetration Tests (SPT) carried out at selected intervals. The drilling and sampling operations were supervised on a full time basis by Thurber's field inspector. Soil samples were collected and transported back to Thurber's laboratory for routine geotechnical testing. The thickness of the asphalt and granular layers, where discernible, was measured at each borehole. All boreholes were backfilled with drill cuttings upon completion, and those on the roadway were finished with asphalt patch.

Hand-dug pits were excavated in the ditch adjacent to eight of the boreholes to measure the thickness of topsoil where the roadway may potentially be widened. At the two wetland areas, the surface soil close to the existing roadway was probed with a rod to a depth of 1 m.

The results of the drilling and sampling are summarized on the borehole logs in Appendix A.

3.2 Laboratory Testing

Visual classification and natural moisture content determinations were conducted

on all soil samples collected. Selected samples of the road base granular and subgrade soils were also subjected to grain size analysis tests. The results of the laboratory tests are shown on the borehole logs and in Appendix B.

Selected soil samples were also submitted to PSC Analytical Services for environmental analytical testing. Borehole 02-25 was located adjacent to the gas station at Airport Road, and therefore, two samples from this borehole were submitted for BTEX/TPH testing to investigate for the presence of hydrocarbon impact. One of these samples was also subjected to TCLP Leachate testing (Ontario Regulation 558) to determine the disposal option for any impacted soil. One sample from each of Boreholes 02-3 and 02-16 was also submitted to the laboratory to test for the inorganic parameters of the Ministry of Environment and Energy of Ontario (MOEE) Guidelines for Use at Contaminated Sites in Ontario. The environmental laboratory test results are enclosed in Appendix C.

4. PAVEMENT CONDITION

Based on the visual pavement condition survey, the ride comfort of Mayfield Road from Heart Lake Road to Airport Road is considered to be fair to good. There is some evidence of deterioration of the asphalt mainly in the form of cracking. There is extensive evidence of severe centre line and transverse cracks. There is also frequent to extensive evidence of longitudinal wheel track, pavement edge and alligator cracking, as well as ravelling and coarse aggregate loss. The majority of the cracks have been treated by patching, routing and sealing. The shoulders of the roadway are primarily gravel. The flexible pavement condition evaluation form is attached at the end of the text.

5. SUBSURFACE CONDITIONS

Detailed subsurface conditions at each borehole are presented in the Record of Borehole sheets in Appendix A. A table of pavement asphalt thickness and topsoil thickness in the ditch adjacent to selected borehole locations is also enclosed in Appendix A. The general subsurface stratigraphy is described below.

5.1 Pavement Structure (Travelled Lanes)

The boreholes drilled through the travelled lanes indicate that the thickness of asphalt at the borehole locations varies from 100 mm to 355 mm with an average thickness of about 200 mm. The asphalt is underlain by 0.33 m to 1.22 m of granular fill in the form of sand fill or sand and gravel fill.

The granular fill below the asphalt was noted to be in a loose to very dense state (SPT N values ranging from 8 to 68 blows/0.3 m). The moisture content of the granular base ranged from 4% to 12%.

Gradation analysis conducted on samples of the granular base (Figure B-1, Appendix B) indicate that the materials have too high a fines content to meet the Ontario Provincial Standards Specifications (OPSS) for Granular A or B.

5.2 Shoulders

The gravel shoulders consisted of 0.38 m to 3.05 m of granular fill in the form of sand or sand and gravel fill. The material is in a loose to dense state (SPT N values ranging from 4 to 50 blows/0.3 m) and the moisture content ranged from 4% to 11%. The granular material has too high a fines content to meet the OPSS Granular A or B specifications.

5.3 Fill

Below the roadbase granular fill material, in the majority of the boreholes there was typically a silty clay fill with some sand and trace gravel to the end of the 1.4 to 1.8 m deep boreholes. In the deeper boreholes drilled near the major culverts (02-9, 02-17 and 02-26), the silty clay fill was encountered to a depth of approximately 4.5 m below the ground surface. This was also indicated in the AMEC borehole log 11A near the culvert 300 m west of Airport Road. The silty clay fill is stiff to very stiff with SPT N values of 8 to 17 blows/0.3 m. The moisture contents ranged from 11% to 33%.

5.4 Topsoil and Wetland Condition

The topsoil thickness in the ditches adjacent to the roadway ranges from 75 mm to 450 mm at the locations probed.

While no boreholes were drilled in the two wetland areas, probing with a rod indicated that there is at least 750 mm to 1000 mm of soft soils in the wetland areas which will be crossed by fills placed to widen the roadway. Additional drilling investigation is recommended in the wetland areas to define the subsoil conditions for detailed design.

5.5 Native Subgrade

In Boreholes 02-4, 02-8, 02-15, 02-16, 02-18 and 02-20, firm to stiff native silty clay with some sand and trace gravel was encountered directly below the granular base. The SPT N values in the native subgrade ranged from 7 to 20 blows/0.3 m and the moisture content ranges from 11% to 22%. Native glacial clayey silt till was encountered in the deeper boreholes. Although not encountered in the boreholes, cobbles and boulders are known to exist in the glacial till.

5.6 Culvert Boreholes (02-9, 02-17, 02-26 and AMEC BH 11A)

5.6.1 Box Culvert at 240 m West of Bramalea Road (Borehole 02-9)

Borehole 02-9 drilled in the vicinity of this box culvert encountered 280 mm of asphalt over 480 mm of granular fill over 3.5 m of stiff clay fill over very stiff to hard native silty clay till. The stratigraphy is similar to the soil conditions noted in the AMEC log of BH 4 drilled nearby. Both boreholes were dry at the completion of drilling.

5.6.2 Elliptical Culvert at 380 m West of Torbram Road (Borehole 02-26)

Borehole 02-26 drilled near this culvert encountered about 3 m of dense to loose sand and gravel fill (SPT blow count, N: 38 to 4 blows/300mm) over 1.4 m of stiff silty clay fill over very stiff native clayey silt till. Water content in the granular fill is about 5%. Water content in the clay fill and the underlying till ranges from 19 to 10%. A standpipe piezometer installed in Borehole 02-26 indicated a water level

at 1.5 m below the ground surface at the borehole location. The stratigraphic conditions are similar to those encountered in the AMEC log of BH 8 drilled nearby.

5.6.3 Pipe Arch Culvert at 500 m East of Torbram Road (Borehole 02-17)

Borehole 02-17 drilled near this culvert encountered 125 mm of asphalt over 1.1 m of compact granular fill (N=29 to 16 blows) over 3.4 m of stiff to very stiff silty clay fill. Below the fill a 1.2 m thick layer of firm silty clay till was noted which was underlain by very dense sandy silt till (N=50 blows for 125mm). Water content in the upper granular fill ranged from 5 to 12%. In the clay fill and clay till, water content ranged from 15 to 20%. Water content in the dense sandy silt was about 5%.

5.6.4 Box Culvert at 320 m West of Airport Road (AMEC BH 11A)

AMEC BH 11A drilled near this culvert encountered 0.7 m of granular fill over 3.7 m of silty clay fill. Below the fill, hard to stiff silty clay and hard clayey silt till were encountered to about 8.2 m depth. Grey weathered shale bedrock was encountered at 8.2 m depth. The water level in the borehole was 1.8 m below ground surface.

5.7 Groundwater Conditions

All of the shallow boreholes were dry upon completion. The groundwater level in the piezometer at Borehole 02-26 (which was not located in the roadway) was measured at 1.51 m below ground surface on January 2, 2003. The AMEC borehole logs indicated the water level to be at 2.7 m to 4.7 m depth. These are short-term observations and the groundwater table could fluctuate seasonally and in response to weather events. Perched water may also be encountered in granular fills.

6. PRELIMINARY GEOTECHNICAL EVALUATION AND RECOMMENDATIONS

6.1 Rehabilitation of Existing Pavement

The visual pavement survey indicates that the existing Mayfield Road pavement between Heart Lake Road and Airport Road is in fair to good condition. The pavement should be periodically inspected and any distresses observed should be repaired by routing, patching and sealing any cracks that may develop over the next 5 years. Based on periodic inspections of the pavement, timing for rehabilitation or reconstruction of the existing pavement may be decided within the next 5 years. The need for rehabilitation or reconstruction of the existing pavement should be reassessed just prior to the widening of the roadway so that the necessary improvement to the existing pavement may be tied into construction of the road widening.

6.2 Roadway Widening (Non-Wetland Areas)

The roadway widening will involve pavement construction on the existing shoulders and placement of fill on each side of the roadway to widen the roadway platform. In the areas of road widening, all topsoil, organics, soft and deleterious materials should be stripped from the subgrade areas. The exposed subgrade is expected to consist of granular fill in the shoulder areas or stiff clayey silt/silty clay glacial till on either side of the existing road embankments except in the wetlands and near the watercourses.

The exposed subgrade should be compacted and then proofrolled by 2 passes of a loaded gravel truck. The subgrade should be inspected for signs of rutting or displacement. Areas with rutting or displacement should be recompacted and retested or excavated and replaced with well-compacted fill, free of organics or other deleterious material.

Once the subgrade is prepared, embankment fill may be placed for road widening. The embankment fill may consist of either granular fill or local inorganic glacial till materials as long as the placement moisture content is within 2% of the Optimum Moisture Content (OMC). The fill should be placed and compacted in accordance with Ontario Provincial Standards Specifications (OPSS) 501. The final 300 mm of the road subgrade should be compacted to 98% of Standard Proctor Maximum Dry Density (SPMDD) at ± 2% of OMC. Subgrade preparation and fill construction

should not be done in winter. The final subgrade surface should be sloped at least 3% to drain towards the side ditches.

Bonding between existing embankment fill and new fill should be achieved as per OPSD 208.010. Topsoil should be stripped from existing fill slopes prior to commencing widening. Ditches providing effective drainage should be re-established on either side of the widened roadway.

Fill and cut slopes should be no steeper than 2 Horizontal : 1 Vertical (2H:1V). Permanent cut and fill slopes and ditch slopes should be vegetated immediately after construction to minimize the likelihood of erosion.

6.3 Roadway Widening (Wetland Areas)

In this preliminary stage of the investigation, boreholes were not drilled in the two wetland areas (approximately 600 m east of Heart Lake Road and approximately 300 m west of Airport Road) since they were not easily accessible to the drill rig. The wetland areas were however probed with a steel rod and it is estimated that there is at least 0.75 m to 1.0 m of soft soils adjacent to the existing roadway.

There are two options of embankment construction in the wetland areas:

- Complete or partial removal of organic and soft soils from the footprint of the widening;
- Construct the embankment widening directly on the wetland by bridging the organic deposits with geogrid and granular fill.

The choice of appropriate design will depend upon the actual thickness of soft and organic soils under the areas of widening.

In either case, some advance fill construction and surcharging may be required to achieve sufficient consolidation of the wetland areas in advance of construction.

As indicated earlier, additional boreholes should be drilled in the wetland areas during the detailed design phase so that an appropriate design may be chosen for crossing the wetlands.

6.4 Pavement Design

The projected traffic volumes for the year 2027 were provided by Stantec to Thurber on April 11, 2003. This information indicates that the AADT values in 2027 will range from 44,000 to 51,500 for a 6-lane roadway (3 through lanes in each direction).

Provided the subgrade is uniformly prepared as indicated in Section 6.2, the recommended pavement section for the Mayfield Road Widening is provided below:

Material		Thickness (mm)
Asphalt	HL-1	40
	Heavy Duty Binder Course - HDBC	100
OPSS Granular A Base Course		200
OPSS Granular B Subbase Course		450

At the major intersections, it is recommended that the pavement section be strengthened as indicated below:

Material		Thickness (mm)
Asphalt	HL-1	50
	HDBC	100
OPSS Granular A Base Course		150
OPSS Granular B Subbase Course		550

The strengthened pavement structure should extend at least 15 m in each direction from the intersection from the outside property line of the intersecting road.

All granular base and subbase materials should be placed in 150 mm lifts and compacted to 100% of SPMDD at ± 2% of OMC. Asphalt materials should be placed in 40 to 50 mm lifts and compacted in accordance with the appropriate

OPSS or Region of Peel specifications.

At the limits of construction, appropriate tapering of pavement thickness to match existing pavement structures should be implemented in accordance with OPSS or applicable Region of Peel practice. The finished pavement surface should be adequately sloped (normally 2%) towards the sides to provide positive drainage. Continuity of drainage through the granular road base and subbase layers should be maintained between existing and new pavement structures. In this regard, the granular thickness for any new pavement structure for the road widening may have to be increased from the above recommended thickness in some areas to match the thicker existing granular fill under the existing pavement.

6.5 Culvert Extensions

Boreholes 02-9, 02-17, 02-26 and AMEC BH 11A were drilled at the major box culverts, elliptical and arch culverts. The Bolton Feeder Main Drawings supplied by Stantec Consulting Ltd. show that the footings for the box culverts and the elliptical and arch culverts are all founded in stiff to very stiff clayey silt/silty clay till or silty clay. It should be noted that a 9 m long steel casing (tunnel), approximately 1.02 m diameter carrying the Bolton feeder main exists approximately 1 m below the culvert footings at the two box culverts.

These culverts will need to be extended as part of the roadway widening. The footing bases for the culvert extensions should be at the same elevation as the existing culvert footings. It is assumed that the footing bases for the existing culverts are below the scour depth and the depth of frost penetration. This should be confirmed. If the new footings for the culvert extensions are founded on native undisturbed stiff to very stiff glacial till, the following preliminary bearing resistance may be used for the design of the new footings:

Factored Ultimate Limit State:	375 kPa
Serviceability Limit State:	250 kPa

The serviceability limits are based on a maximum allowable settlement of 25 mm. The footings for the culvert extensions should not be narrower than the existing culvert footings.

The sliding resistance of the footings must be checked using the following factors for a concrete/soil interface:

Foundation Material	Ultimate Friction Factor
Granular A	0.55
Native Till	0.45

The construction of new footings for culvert extensions will likely occur below water level. It is anticipated that seepage will be encountered in the footing excavations requiring control of water. Successful dewatering of footing excavations in these areas may require temporary diversion of the water courses during construction and construction of a sheet pile enclosure and control of water within the footing excavation. During footing construction, it will be important to keep the water table at least 1 m below the design footing base elevation so that the base does not boil and reduce the bearing capacity of the foundation soils.

The current Ontario Occupational Health and Safety Regulations (OHSA) should be adhered to for temporary excavations. Any excavation deeper than 1.2 m will require an open cut with safe side slopes (as per OHSA), or temporary shoring designed by an experienced Professional Engineer.

Excavation for footing lengthening must not undermine the existing footings. The backfilling of the culvert extensions should follow the manufacturer's specifications or appropriate Ontario Provincial Standards Specifications. The backfill should be brought up simultaneously to the same elevation on both sides of the culvert. Appropriate inlet/outlet treatment, seepage and erosion control should be employed for each culvert.

For extension of the remaining corrugated steel pipe culverts, the native stiff clayey silt till should be a good subgrade for culvert extensions provided the subgrade is not allowed to soften. No organics, topsoil, ice, snow, or soft soils should be allowed to remain in the subgrade. The bedding and backfilling of culverts should follow the relevant Region of Peel specifications or OPSS.

Additional boreholes should be drilled at each major culvert location during the detailed design stage to confirm the above preliminary recommendations.

6.6 Sewer Installation

Sewers may be installed as part of the proposed works. Based on the boreholes drilled, excavations for sewers are likely to encounter predominantly silty clay fill, silty clay and silty clay/clayey silt till with occasional boulders. Perched water or groundwater may also be encountered, depending on the final grades and alignment of sewers. Pumping from properly filtered sumps should be able to keep the excavation dry for sewer installation.

The current OHSA should be adhered to for temporary excavation for sewer installation. Any excavation deeper than 1.2 m will require an open cut with safe side slopes (as per OHSA), or temporary shoring designed by an experienced Professional Engineer. In accordance with OHSA, the following soil types would apply to the stratigraphy at this site:

Fills	Type 3 Soil
Silty Clay Till	Type 2 Soil

Sewer bedding and backfill and compaction of these materials should follow the appropriate OPSS or Region of Peel specifications. For sewers or other utilities located below the pavement or shoulder areas, granular backfill should be used to backfill the entire trench and all backfill should be compacted to 98% of SPMDD at ± 2% of OMC to minimize the potential of pavement settlement.

Additional boreholes should be drilled along the sewer alignment during the detailed design stage to confirm the above preliminary recommendations.

6.7 Soil Disposal

The environmental analytical test data was compared to the MOEE Table A guidelines for Agricultural Land Use and for a potable groundwater condition.

The MOEE Guidelines for Use at Contaminated Sites in Ontario tests (inorganic

parameters) on Borehole 02-3, Sample #2 (clay fill) and Borehole 02-16, Sample #2 (Native clay till) indicate that none of the parameters tested exceed the MOEE Table A guidelines except Electrical Conductivity and Sodium Absorption Ratio which likely reflects the impact of road salting operations. The limited test data does indicate that the materials tested may be classified as non-subject waste material.

The limited hydrocarbon testing conducted on two samples (Sample #1, granular fill and Sample #2, clay fill) from Borehole 02-25 located near a gas station at Airport Road does indicate the presence of heavy oil and diesel in Sample #2 (see Appendix C). The heavy oil concentration of 520 µg/g is below the MOEE Table A guideline of 1000 µg/g. However, the diesel concentration of 110 µg/g exceeds the MOEE Table A guideline of 100 µg/g. The diesel concentration is however lower than the MOEE Table B guideline concentration of 1000 µg/g for a nonpotable groundwater condition. A TCLP Leachate test (inorganic parameters) was also conducted on Sample #2 from Borehole 02-25, which shows that the parameters tested were below the Ontario Regulation 558 Schedule 4 Leachate Quality Criteria indicating that the material in not a subject waste. Additional drilling investigation and analytical testing are recommended to confirm the extent and level of hydrocarbon impact in the area of Borehole 02-25 and to assess the source of the impact.

6.8 Construction Inspection

It is recommended that geotechnical inspection by qualified personnel be provided during the road widening construction. It is critical that the final subgrade be inspected prior to fill placement.

Placement and compaction of fill for grade raising or road widening, pavement construction/sewer backfilling and culvert installation and extension should be inspected and tested.

Footing base inspection and compaction testing of backfilling behind culverts should be carried out.

Ministry of Transportation
Ontario

FLEXIBLE PAVEMENT CONDITION EVALUATION FORM

Location From: Mayfield Road from Heart Lake Road **To:** Airport Road

LHRS [ ] BEGINS [ ] OFFSET km **Section Length** [ ] LENGTH km **District** [ ]

Survey Date [0][2] YEAR [12] MONTH **PCR** [ ] **RCR** [ ] **Traffic Direction** [B] (B : BOTH DIRECTIONS; N : NORTH BOUND; S : SOUTH BOUND; E : EAST BOUND; W : WEST BOUND) **Highway** [ ]

Contract No. [ ] – [ ] **WP No.** [ ] – [ ] – [ ] **Facility** [ ] (A : ALL LANES; C : COLLECTOR; E : EXPRESS; O : OTHERS (Additional Lanes)) **Class** [ ] (F : FREEWAY; A : ARTERIAL; C : COLLECTOR; L : LOCAL; S : SECONDARY)

Ride Condition Rating (at 80 km/h)

- 10 EXCELLENT — Smooth and pleasant
- 8 GOOD — Comfortable
- (6)
- 4 FAIR — Uncomfortable
- 2 POOR — Very rough and bumpy
- 0 VERY POOR — Dangerous at 80 km/h

Pavement			SEVERITY OF DISTRESS: Very Slight 1	Slight 2	Moderate 3	Severe 4	Very Severe 5	DENSITY OF DISTRESS (Extent of Occurrence,%): Few <10 1	Intermittent 10-20 2	Frequent 20-50 3	Extensive 50-80 4	Throughout 80-100 5
SURFACE DEFECTS		Ravelling & C. Agg. Loss 1			X					X		
		Flushing 2	X					X				
SURFACE DEFORMATIONS		Rippling and Shoving 3	X					X				
		Wheel Track Rutting 4		X						X		
		Distortion 5	X					X				
CRACKING	Longitudinal Wheel Track	Single and Multiple 6			X					X		
		Alligator 7			X					X		
	Centre Line	Single and Multiple 8				X					X	
		Alligator 9			X					X		
	Pavement Edge	Single and Multiple 10			X						X	
		Alligator 11			X						X	
	Transverse	Half, Full and Multiple 12				X					X	
		Alligator 13			X					X		
	Longitudinal Meander and Midlane	14			X					X		
	Random	15			X				X			

Shoulders			SEVERITY OF DISTRESS: RIGHT Mod 1	RIGHT Severe 2	LEFT Mod 1	LEFT Severe 2	DENSITY OF DISTRESS (Extent of Occurrence,%): RIGHT 10-30 1	RIGHT >30 2	LEFT 10-30 1	LEFT >30 2
DOMINANT TYPE	ONE	DISTRESS								
PAVED FULL		Cracking								
		Pavement Edge/ Curb Separation								
PAVED PARTIAL		Distortion								
SURFACE TREATED		Breakup/Separation								
		Edge Break								
PRIMED		Breakup								
GRAVEL	✓									

Maintenance Treatment		EXTENT OF OCCURRENCE, %: <10 1	10-20 2	20-50 3	50-80 4	>80 5
PAVEMENT	Manual Patching	X				
	Machine Patching		X			
	Spray Patching		X	X	X	
	Rout and Seal Cracks			X	X	
	Chip Seal		X			
SHOULDERS	Manual Patching					
	Machine Patching					
	Rout and Seal Cracks					
	Chip Seal					

Distress Comments (Items not covered above) _____

Other Comments (e.g. subsections, additional contracts) _____

Evaluated by _____

PH-D-584 86-01

Figure A-1. Pavement Condition Rating Form

STATEMENT OF GENERAL CONDITIONS

1. STANDARD OF CARE

This study and Report have been prepared in accordance with generally accepted engineering or environmental consulting practices in this area. No other warranty, expressed or implied, is 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 us by the Client, communications between us and the Client, and to any other reports, writings, proposals or documents prepared by us for the Client relative to the specific site described herein, all of which 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. WE CANNOT BE 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 purpose that were described to us by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document are only valid to the extent that there has been no material alteration to or variation from any of the said descriptions provided to us unless we are 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 OUR WRITTEN CONSENT. WE WILL CONSENT TO ANY REASONABLE REQUEST BY THE CLIENT TO APPROVE THE USE OF THIS REPORT BY OTHER PARTIES AS "APPROVED USERS". The contents of the Report remain our copyright property and we authorize only the Client and Approved Users to make copies of the Report only in such quantities as are reasonably necessary for the use of the Report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make the Report, or any portion thereof, available to any party without our written permission. Any use which a third party makes of the Report, or any portion of the Report, are the sole responsibility of such third parties. We accept no responsibility for damages suffered by any third party resulting from unauthorized use of the Report.

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 judgemental in nature and even 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 all persons making use of such documents or records should be aware of, and accept, this risk. 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. Where 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.

(see over...)

INTERPRETATION OF THE REPORT *(continued)*

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 us. We have relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of persons providing information.

6. RISK LIMITATION

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause an accidental release of those substances. In consideration of the provision of the services by us, which are for the Client's benefit, the Client agrees to hold harmless and to indemnify and defend us and our directors, officers, servants, agents, employees, workmen and contractors (hereinafter referred to as the "Company") from and against any and all claims, losses, damages, demands, disputes, liability and legal investigative costs of defence, whether for personal injury including death, or any other loss whatsoever, regardless of any action or omission on the part of the Company, that result from an accidental release of pollutants or hazardous substances occurring as a result of carrying out this Project. This indemnification shall extend to all Claims brought or threatened against the Company under any federal or provincial statute as a result of conducting work on this Project. In addition to the above indemnification, the Client further agrees not to bring any claims against the Company in connection with any of the aforementioned causes.

7. SERVICES OF SUBCONSULTANTS AND CONTRACTORS

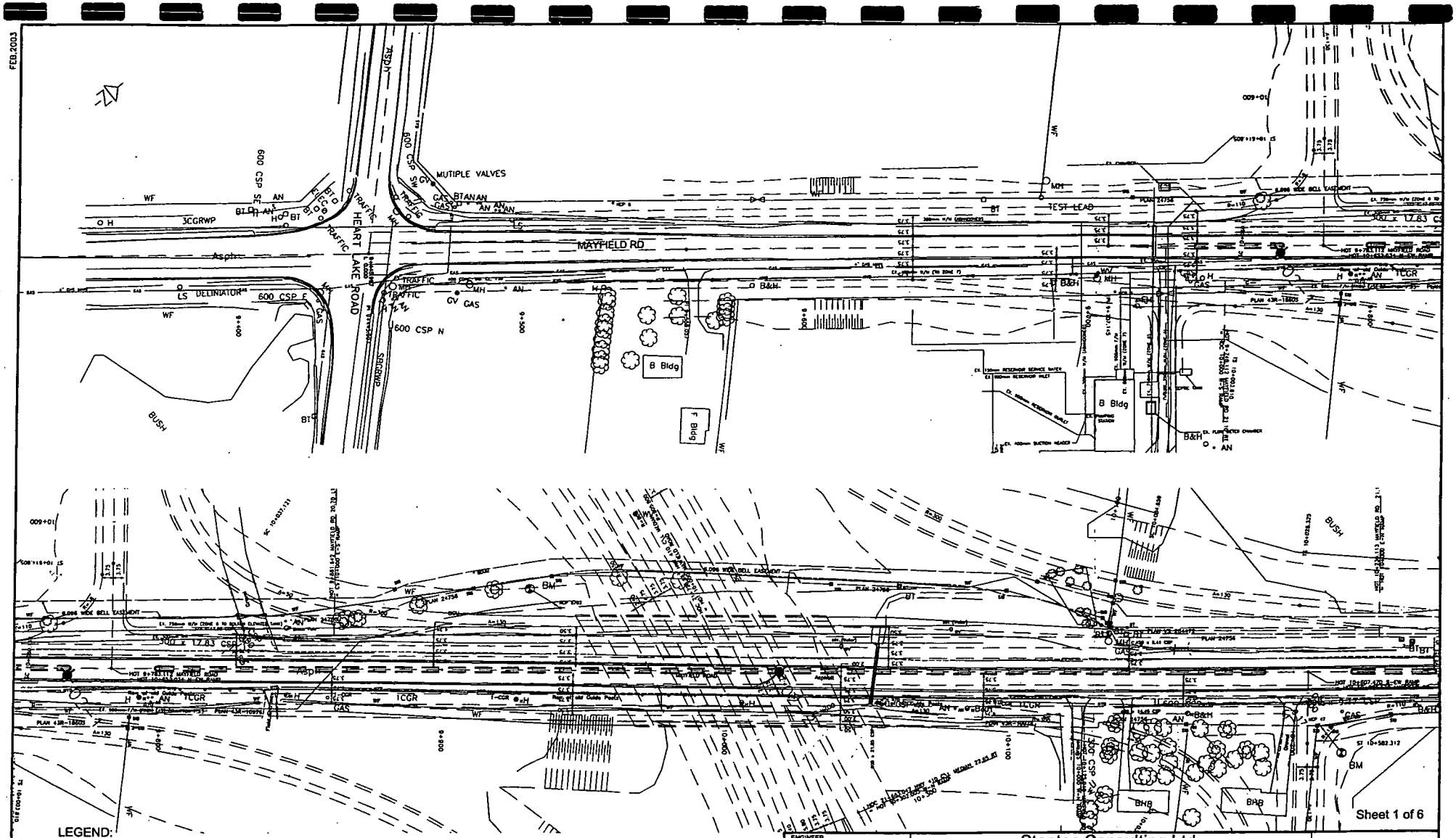
The conduct of engineering and environmental studies frequently requires hiring the services of individuals and companies with special expertise and/or services which we do not provide. We may arrange the hiring of these services as a convenience to our Clients. As these services are for the Clients' benefit, the Client agrees to hold the Company harmless and to indemnify and defend us from and against all claims arising through such hirings to the extent that the Client would incur had he hired those services directly. This includes responsibility for payment for services rendered and pursuit of damages for errors, omissions or negligence by those parties in carrying out their work. In particular, these conditions apply to the use of drilling, excavation and laboratory testing services.

8. CONTROL OF WORK AND JOBSITE SAFETY

We are responsible only for the activities of our employees on the jobsite. The presence of our personnel on the site shall not be construed in any way to relieve the Client or any contractors on site from their responsibilities for site safety. The Client acknowledges that he, his representatives, contractors or others retain control of the site and that we never occupy a position of control of the site. The Client undertakes to inform us of all hazardous conditions, or other relevant conditions of which the Client is aware. The Client also recognizes that our activities may uncover previously unknown hazardous conditions or materials and that such a discovery may result in the necessity to undertake emergency procedures to protect our employees as well as the public at large and the environment in general. These procedures may well involve additional costs outside of any budgets previously agreed to. The Client agrees to pay us for any expenses incurred as the result of such discoveries and to compensate us through payment of additional fees and expenses for time spent by us to deal with the consequences of such discoveries. The Client also acknowledges that in some cases the discovery of hazardous conditions and materials will require that certain regulatory bodies be informed and the Client agrees that notification to such bodies by us will not be a cause of action or dispute.

9. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on our interpretation of conditions revealed through limited investigation conducted within a defined scope of services. We cannot 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 decisions made to either purchase or sell land.



LEGEND:

- Thurber Borehole (Approximate location)
- AMEC Borehole (Approximate location)
- Thurber Borehole Not Drilled Due to Difficult Access for the Drill Rig

ENGINEER	MEF
DRAWN	SS
DATE	FEB 13,2003
APPROVED	PKC
SCALE	1:1250

Stantec Consulting Ltd.

Preliminary Geotechnical Investigation
Mayfield Road Widening: Heart Lake to Airport Road
Region of Peel , Ontario

BOREHOLE LOCATION PLAN

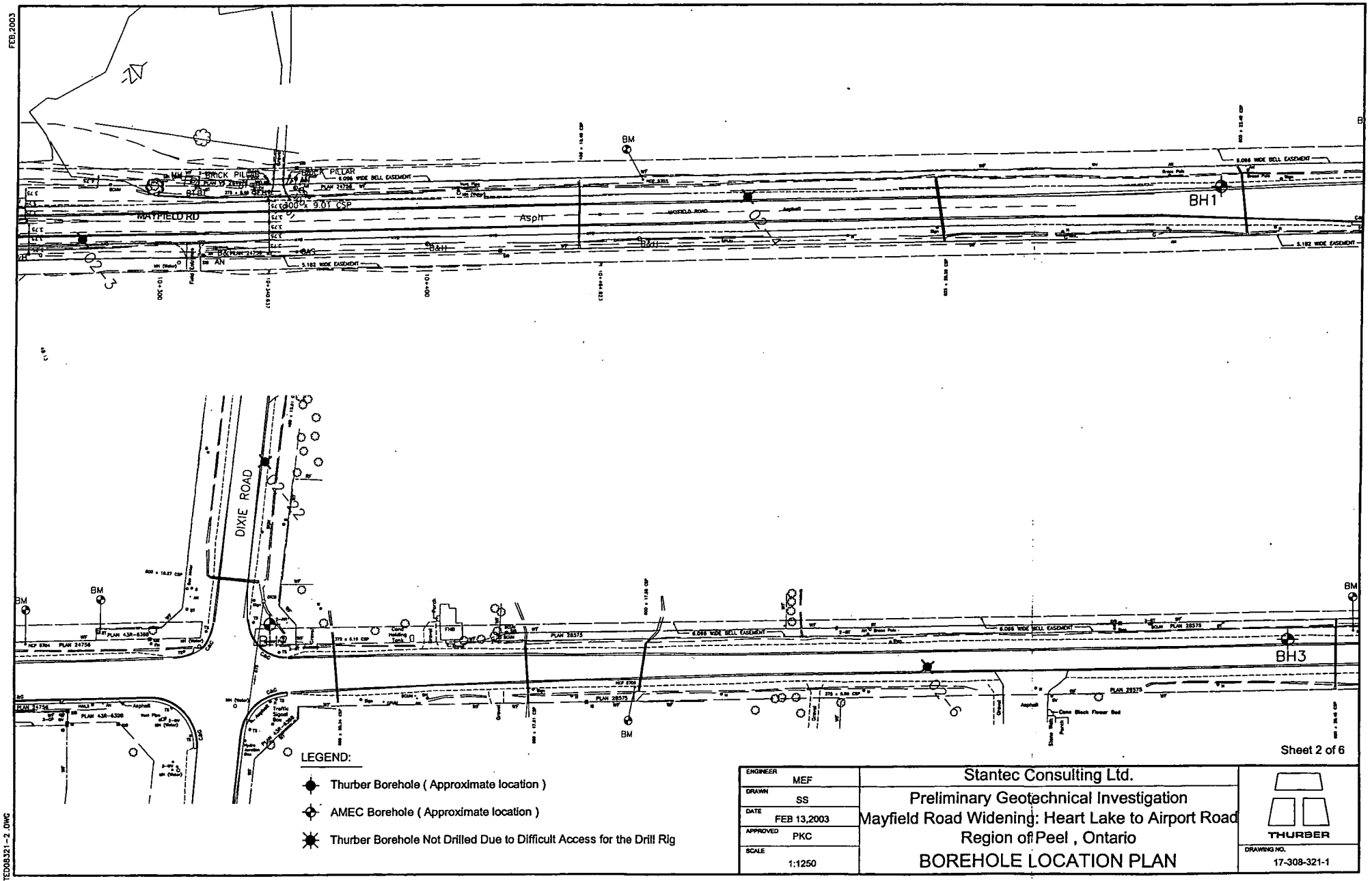
THURBER

DRAWING NO. 17-308-321-1

DO NOT SCALE

FEB.2003

TED08321-2.DWG



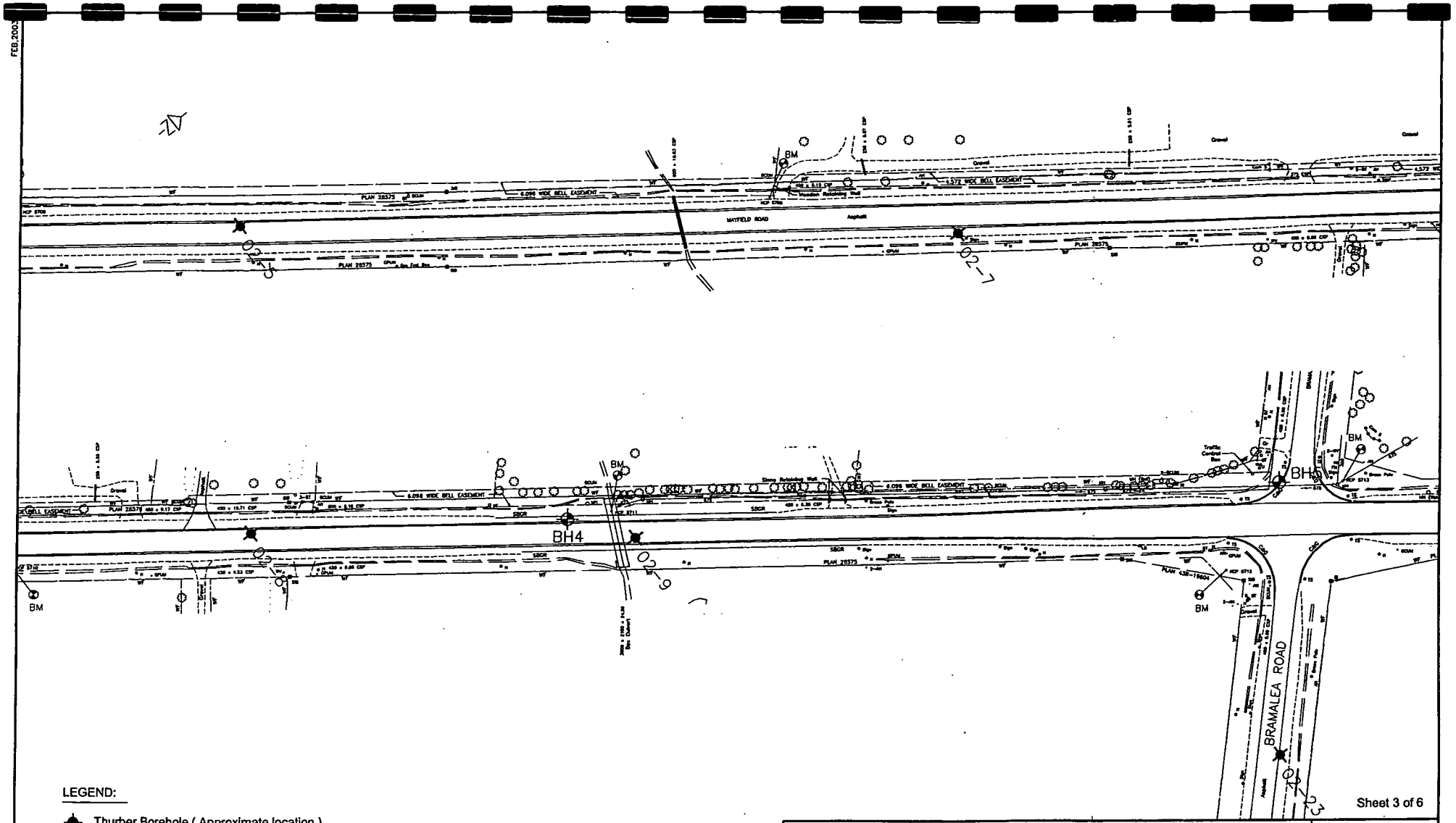
Sheet 2 of 6

ENGINEER MEF	Stantec Consulting Ltd.	THURBER
DRAWN SS	Preliminary Geotechnical Investigation	
DATE FEB 13,2003	Mayfield Road Widening: Heart Lake to Airport Road	
APPROVED PKC	Region of Peel , Ontario	DRAWING NO. 17-308-321-1
SCALE 1:1250	BOREHOLE LOCATION PLAN	

DO NOT SCALE

FEB.2003

TE0308321-2.DWG



LEGEND:

- Thurber Borehole (Approximate location)
- AMEC Borehole (Approximate location)
- Thurber Borehole Not Drilled Due to Difficult Access for the Drill Rig

ENGINEER	MEF
DRAWN	SS
DATE	FEB 13,2003
APPROVED	PKC
SCALE	1:1250

Stantec Consulting Ltd.

Preliminary Geotechnical Investigation
Mayfield Road Widening: Heart Lake to Airport Road
Region of Peel , Ontario

BOREHOLE LOCATION PLAN

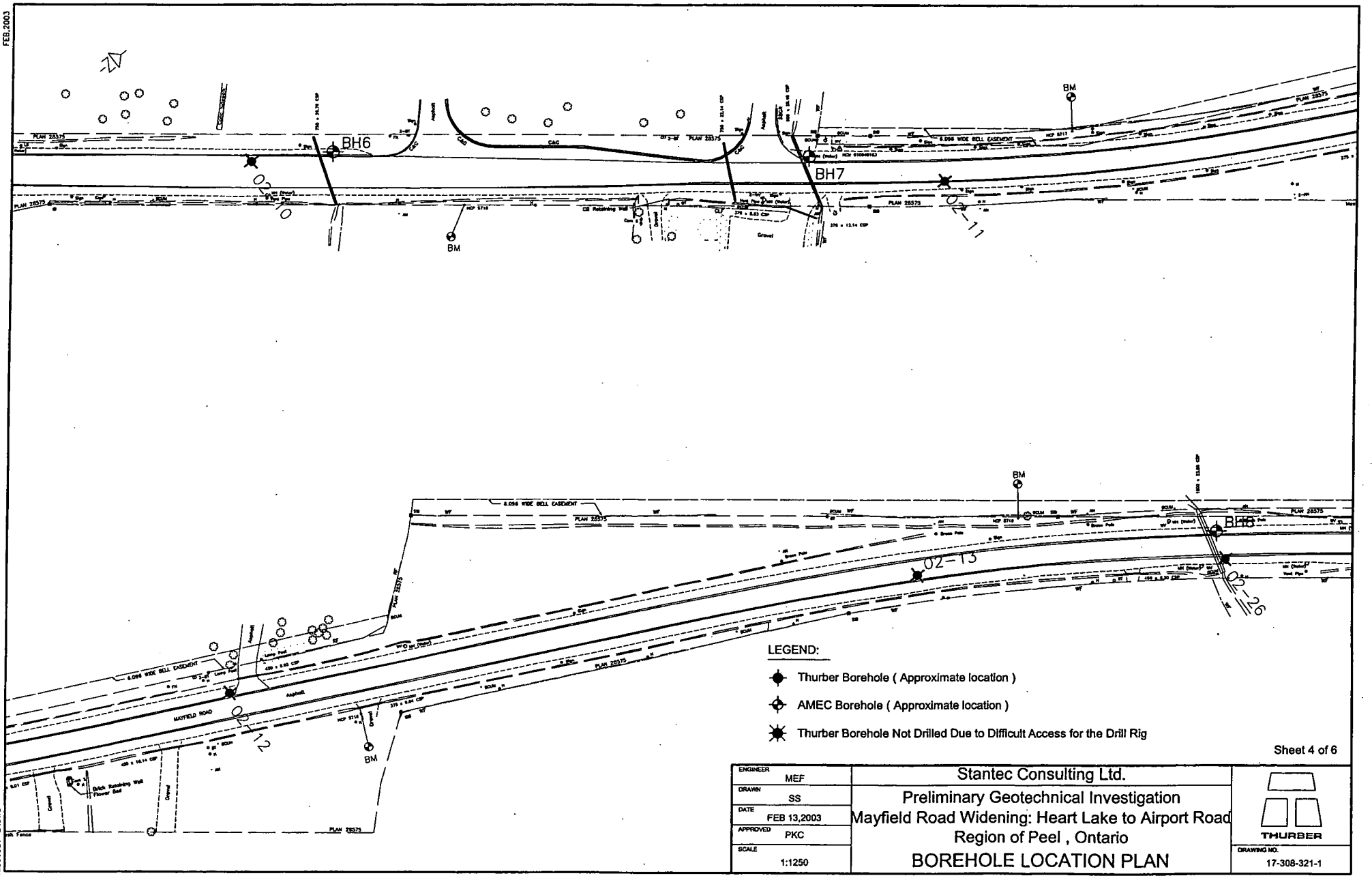
THURBER

DRAWING NO. 17-308-321-1

DO NOT SCALE

FEB.2003

TE008321-2.DWG



LEGEND:

- Thurber Borehole (Approximate location)
- AMEC Borehole (Approximate location)
- Thurber Borehole Not Drilled Due to Difficult Access for the Drill Rig

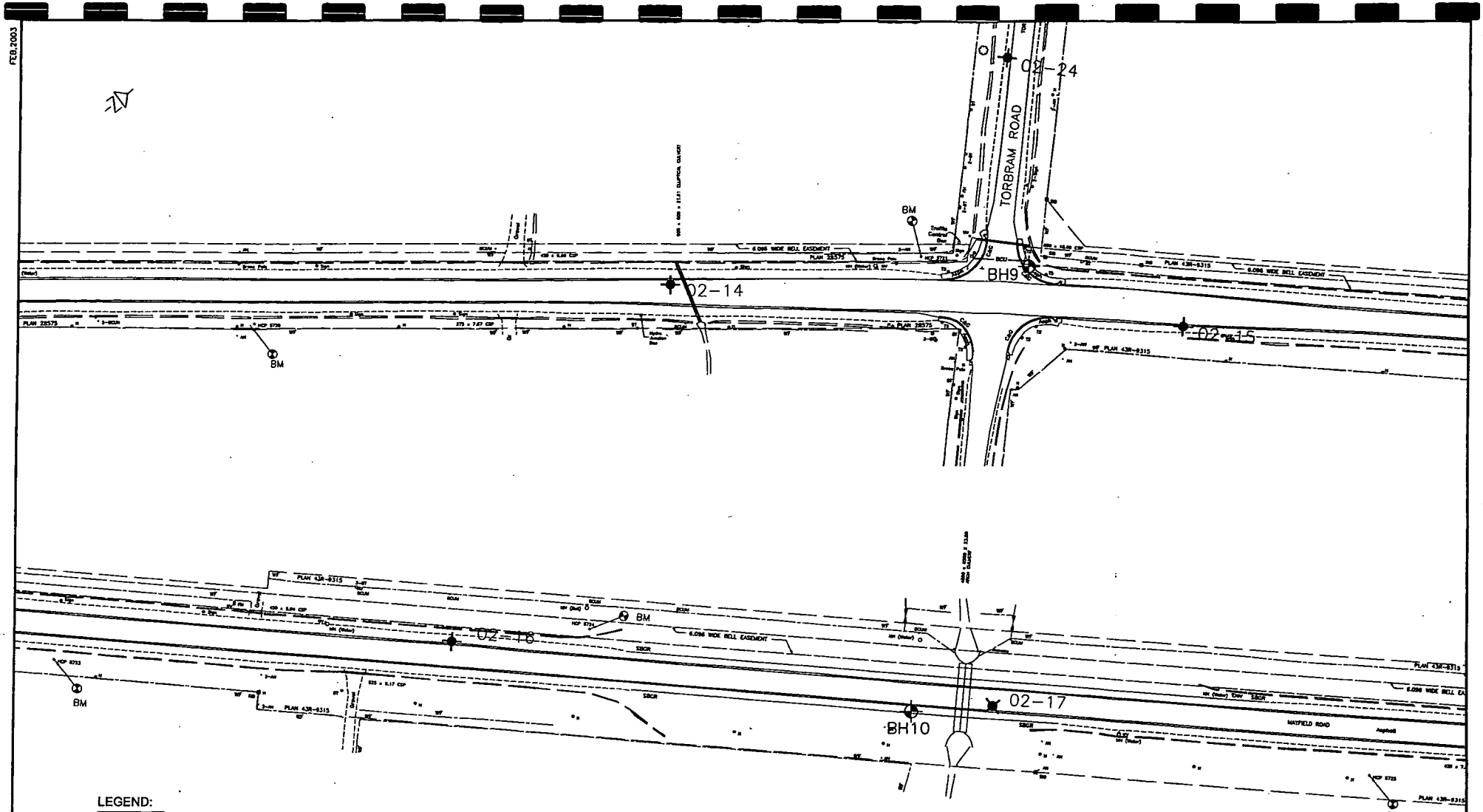
Sheet 4 of 6

ENGINEER: MEF	Stantec Consulting Ltd.	THURBER
DRAWN: SS	Preliminary Geotechnical Investigation Mayfield Road Widening: Heart Lake to Airport Road Region of Peel , Ontario	
DATE: FEB 13,2003		
APPROVED: PKC		
SCALE: 1:1250	BOREHOLE LOCATION PLAN	DRAWING NO.: 17-308-321-1

DO NOT SCALE

FEB.2003

TE00B321-2.DWG



LEGEND:

- Thurber Borehole (Approximate location)
- AMEC Borehole (Approximate location)
- Thurber Borehole Not Drilled Due to Difficult Access for the Drill Rig

Sheet 5 of 6

ENGINEER	MEF
DRAWN	SS
DATE	FEB 13,2003
APPROVED	PKC
SCALE	1:1250

Stantec Consulting Ltd.

Preliminary Geotechnical Investigation
Mayfield Road Widening: Heart Lake to Airport Road
Region of Peel , Ontario

BOREHOLE LOCATION PLAN

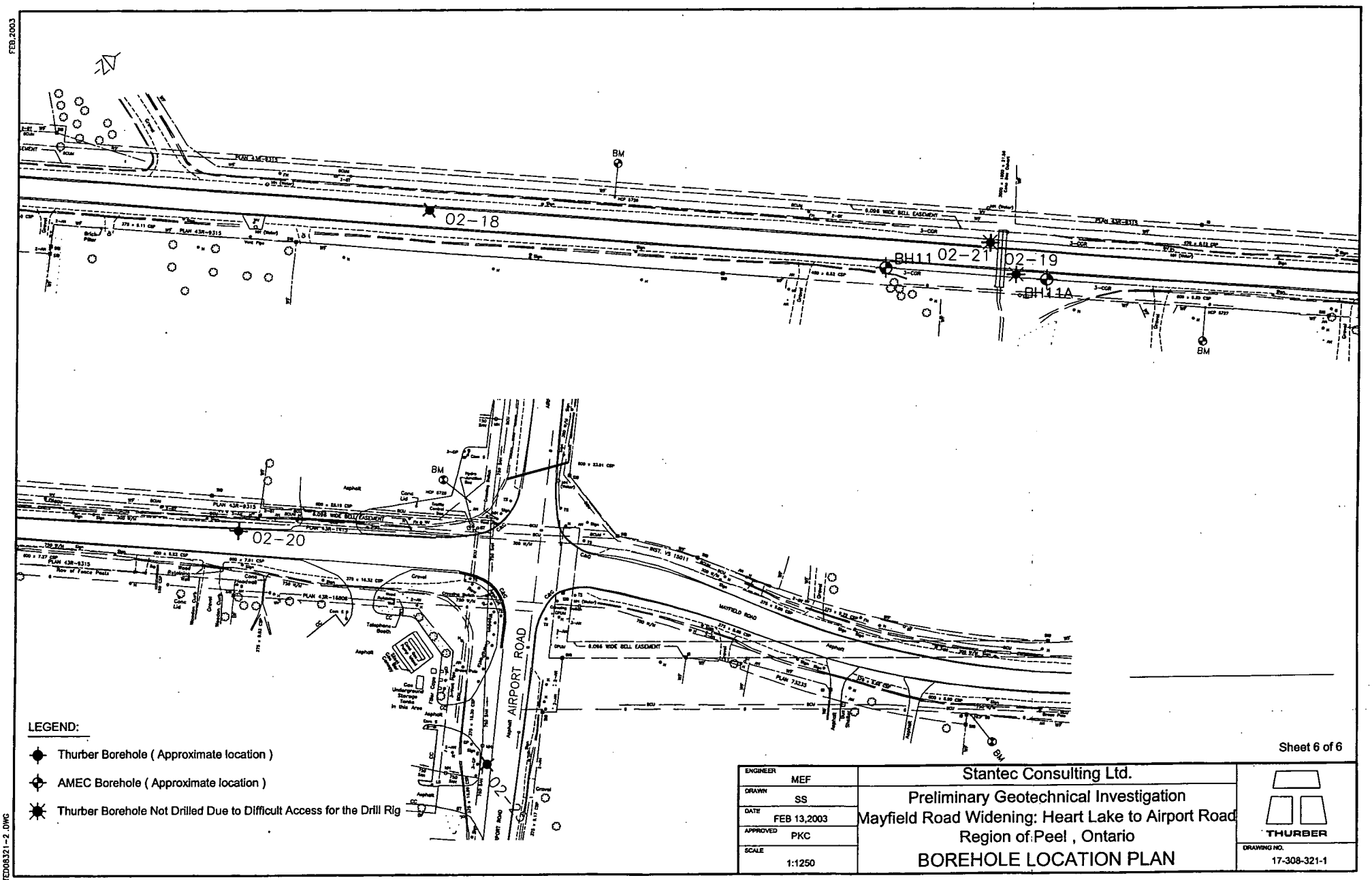
THURBER

DRAWING NO. 17-308-321-1

FEB.2003

TED08321-2.DWG

DO NOT SCALE



Sheet 6 of 6

ENGINEER: MEF	Stantec Consulting Ltd.
DRAWN: SS	Preliminary Geotechnical Investigation
DATE: FEB 13,2003	Mayfield Road Widening: Heart Lake to Airport Road
APPROVED: PKC	Region of Peel , Ontario
SCALE: 1:1250	BOREHOLE LOCATION PLAN
	THURBER
	DRAWING NO. 17-308-321-1

DO NOT SCALE

FEB.2003

TED08321-2.DWG

APPENDIX A

BOREHOLE LOGS

THURBER BOREHOLES

TABLE A-1: TABLE OF ASPHALT AND TOPSOIL THICKNESS
Mayfield Road Widening: Heart Lake to Airport Road

Borehole Number	Asphalt Thickness (mm)	Topsoil Thickness (mm) (measured in ditch)
02-1	300 (measured from borehole)	-
02-2	150 (measured from borehole)	-
02-3	N/A	150
02-4	N/A	-
02-5	150 (measured from borehole)	125
02-6	267 (measured from borehole)	-
02-7	N/A	-
02-8	150 (measured from borehole)	-
02-9	280 (measured from core sample)	200
02-10	178 (measured from borehole)	-
02-11	125 (measured from borehole)	-
02-12	N/A	75
02-13	300 (measured from borehole)	-
02-14	178 (measured from borehole)	-
02-15	N/A	75
02-16	N/A	75
02-17	125 (measured from borehole)	-
02-18	355 (measured from borehole)	-
02-20	190 (measured from borehole)	150
02-22	N/A	-
02-23	N/A	-
02-24	N/A	-
02-25	100 (measured from borehole)	-
02-26	N/A	450

SYMBOLS AND TERMS USED ON TEST HOLE LOGS

1. TEXTURAL CLASSIFICATION OF SOILS

CLASSIFICATION	PARTICLE SIZE	VISUAL IDENTIFICATION
Boulders	Greater than 200mm	same
Cobbles	75 to 200mm	same
Gravel	4.75 to 75mm	5 to 75mm
Sand	0.075 to 4.75mm	Not visible particles to 5mm
Silt	0.002 to 0.075mm	Non-plastic particles, not visible to the naked eye
Clay	Less than 0.002mm	Plastic particles, not visible to the naked eye

2. COARSE GRAIN SOIL DESCRIPTION (50% greater than 0.075mm)

TERMINOLOGY	PROPORTION
Trace or Occasional	Less than 10%
Some	10 to 20%
Adjective (e.g. silty or sandy)	20 to 35%
And (e.g. sand and gravel)	35 to 50%

3. TERMS DESCRIBING CONSISTENCY (COHESIVE SOILS ONLY)

DESCRIPTIVE TERM	UNDRAINED SHEAR STRENGTH (kPa)	APPROXIMATE SPT[(1)] "N" VALUE
Very Soft	Less than 10	Less than 2
Soft	10 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	Greater than 200	Greater than 30

NOTE: Hierarchy of Soil Strength Prediction

1) Laboratory Triaxial Testing
2) Field Insitu Vane Testing
3) Laboratory Vane Testing
4) SPT value
5) Pocket Penetrometer

4. TERMS DESCRIBING DENSITY (COHESIONLESS SOILS ONLY)

DESCRIPTIVE TERM	SPT "N" VALUE
Very Loose	Less than 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	Greater than 50

5. LEGEND FOR TEST HOLE LOGS

SYMBOLS FOR SAMPLE TYPE

- Shelby Tube
- SPT
- No Recovery
- A - Casing
- Grab/Auger sample
- Core

- MC – Moisture Content (% by Weight) as determined by sample

Water Level

C_{vane} Shear Strength Determination by Field Insitu Vane

C_{pen} Shear Strength Determination by Pocket Penetrometer

C_{lab} Shear Strength Determination using a Laboratory Vane Apparatus

C_U Undrained Shear Strength determined by Unconfined Compression Test

(1) SPT Standard Penetration Test – refers to the number of blows from a 63.5kg hammer falling through 0.76m to advance a 60 degree truncated cone 0.3m.

UNIFIED SOILS CLASSIFICATION

MAJOR DIVISIONS		GROUP SYMBOL	TYPICAL DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	Well-graded gravels or gravel-sand mixtures, little or no fines.
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines.
		GM	Silty gravels, gravel-sand-silt mixtures.
		GC	Clayey gravels, gravel-sand-clay mixtures.
	SAND AND SANDY SOILS	SW	Well-graded sands or gravelly sands, little or no fines.
		SP	Poorly-graded sands or gravelly sands, little or no fines.
		SM	Silty sands, sand-silt mixtures.
		SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS	SILTS AND CLAYS $W_L < 50\%$	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. ($W_L < 30\%$).
		CI	Inorganic clays of medium plasticity, silty clays. ($30\% < W_L < 50\%$).
		OL	Organic silts and organic silty-clays of low plasticity.
	SILTS AND CLAYS $W_L > 50\%$	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		CH	Inorganic clays of high plasticity, fat clays.
		OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils.
CLAY SHALE			
SANDSTONE			
SILTSTONE			
CLAYSTONE			
COAL			

RECORD OF BOREHOLE 02-1

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 17 December 2002
COMPLETED : 17 December 2002

SHEET 1 OF 1
DATUM

THURBER

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✤, rem V - ●, Q - ✖, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT wp W wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		258.18							
	100 mm SOLID STEM SUGERS	**ASPHALT** (300mm)		0.00 257.88							
1		**SAND**, some gravel, some silt, dense, brown: (FILL)		0.30	1	SS	44	Grain Size Analysis: 12% Gr/ 70% Sa/ 18% Fines	o		
		CLAY, silty, some sand, some gravel, occasional iron oxide staining, stiff, brown: (CL)(POSSIBLE FILL)		256.81 1.37 256.36	2	SS	12		o		
2		END OF BOREHOLE AT 1.83m. BOREHOLE OPEN TO 1.83m. BOREHOLE DRY ON COMPLETION. BOREHOLE BACKFILLED WITH DRILL CUTTINGS.		1.83							
3											
4											
5											
6											

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : MF
CHECKED : PKC

THURBER

THURBER2 3821.GPJ 14/05/03

RECORD OF BOREHOLE 02-2

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 18 December 2002
COMPLETED : 18 December 2002

THURBER

SHEET 1 OF 1
DATUM

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲; 40 80 120 160) / WATER CONTENT, PERCENT (wp — w — wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		251.29							
	100 mm SOLID STEM AUGERS	**ASPHALT** (150mm)		0.00 251.14							
		SAND and GRAVEL, trace silt, compact, brown: (FILL)		0.15	1	SS	17		○		
				250.53							
1		**SAND**, some gravel, trace silt, loose, brown: (FILL)		0.76	2	SS	8		○		
				249.92							
		END OF BOREHOLE AT 1.37m. BOREHOLE OPEN TO 1.37m. BOREHOLE DRY ON COMPLETION. BOREHOLE BACKFILLED WITH DRILL CUTTINGS.		1.37							
2											
3											
4											
5											
6											

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : GA
CHECKED : PKC

THURBER

THURBER2 3821.GPJ 14/05/03

RECORD OF BOREHOLE 02-3

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 17 December 2002
COMPLETED : 17 December 2002

THURBER

SHEET 1 OF 1
DATUM

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✤, rem V - ●, Q - ✖, Cpen ▲; 40 80 120 160) / WATER CONTENT, PERCENT (wp ⊢ ○w ⊣ wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		257.57							
	100 mm SOLID STEM AUGERS	**SAND and GRAVEL**, trace silt, compact, brown: (FILL)		0.00	1	SS	20		○		
				256.96							
1		**CLAY**, silty, some sand, trace gravel, firm, brown: (CL) (POSSIBLE FILL)		0.61	2	SS	8		○ ◢		
				256.20							
		END OF BOREHOLE AT 1.37m. BOREHOLE OPEN TO 1.37m. BOREHOLE DRY ON COMPLETION. BOREHOLE BACKFILLED WITH DRILL CUTTINGS.		1.37							
2											
3											
4											
5											
6											

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : MF
CHECKED : PKC

THURBER

RECORD OF BOREHOLE 02-4

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 17 December 2002
COMPLETED : 17 December 2002

THURBER

SHEET 1 OF 1
DATUM

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✤, rem V - ●, Q - ✖, Cpen ▲; 40 80 120 160) / WATER CONTENT, PERCENT (wp, w, wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		257.49							
1	100 mm SOLID STEM AUGERS	**SAND and GRAVEL**, trace silt, very dense, brown: (FILL)		0.00	1	SS	50				
		SAND, trace silt, trace gravel, loose, brown: (FILL)(SP)		256.88 0.61							
		CLAY, silty, some sand, trace gravel, firm, brown: (POSSIBLE FILL)(CL)		256.42 1.07	2	SS	7				
		END OF BOREHOLE AT 1.37m. BOREHOLE OPEN TO 1.37m. BOREHOLE DRY ON COMPLETION. BOREHOLE BACKFILLED WITH DRILL CUTTINGS.		256.12 1.37							

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : MF
CHECKED : PKC

THURBER

THURBER2 3821.GPJ 14/05/03

RECORD OF BOREHOLE 02-5

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 18 December 2002
COMPLETED : 18 December 2002

THURBER

SHEET 1 OF 1
DATUM

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✤, rem V - ●, Q - ✖, Cpen ▲; 40 80 120 160) / WATER CONTENT, PERCENT (wp, w, wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		255.03							
	100 mm SOLID STEM AUGERS	**ASPHALT** (150mm)		0.00 254.88							
		SAND, some gravel, some silt, compact, brown: (FILL)		0.15	1	SS	14	Grain Size Analysis: 10% Gr/ 78% Sa/ 12% Fines	○		
				254.42							
		SILT, sandy, gravelly, some clay, compact, mottled grey-brown: (FILL)(CL-ML)		0.61							
1					2	SS	26		●		
				253.66							
		END OF BOREHOLE AT 1.37m. BOREHOLE OPEN TO 1.37m. BOREHOLE DRY ON COMPLETION. BOREHOLE BACKFILLED WITH DRILL CUTTINGS.		1.37							
2											
3											
4											
5											
6											

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : GA
CHECKED : PKC

THURBER

RECORD OF BOREHOLE 02-6

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 17 December 2002
COMPLETED : 17 December 2002

SHEET 1 OF 1
DATUM

THURBER

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✤, rem V - ●, Q - ✖, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT wp w wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		255.72							
	100 mm SOLID STEM AUGERS	**ASPHALT** (267mm)		0.00							
				255.45							
		SAND and GRAVEL, trace silt, very dense to compact, brown: (FILL)		0.27	1	SS	68		o		
1					2	SS	22		o		
				254.34							
		END OF BOREHOLE AT 1.37m. BOREHOLE OPEN TO 1.37m. BOREHOLE DRY ON COMPLETION. BOREHOLE BACKFILLED WITH DRILL CUTTINGS.		1.37							
2											
3											
4											
5											
6											

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : MF
CHECKED : PKC

THURBER

THURBER2 3821.GPJ 14/05/03

RECORD OF BOREHOLE 02-8

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 18 December 2002
COMPLETED : 18 December 2002

THURBER

SHEET 1 OF 1
DATUM

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✤, rem V - ●, Q - ✕, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT wp w wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		253.30							
		ASPHALT (150mm)		0.00 253.15							
	100 mm SOLID STEM AUGERS	**SAND and GRAVEL**, trace silt, trace asphalt fragments, brown: (FILL)		0.15	1	SS	50/.075				
				252.69							
1		**CLAY**, silty, some sand, trace gravel, occasional iron oxide staining, very stiff, brown: (TILL)(CL)		0.61	2	SS	16	Hydrometer Test: 7% Gr/ 32% Sa/ 40% Si/ 21% Cl			
				251.93							
		END OF BOREHOLE AT 1.37m. BOREHOLE OPEN TO 1.37m. BOREHOLE BACKFILLED WITH DRILL CUTTINGS.		1.37							
2											
3											
4											
5											
6											

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : GA
CHECKED : PKC

THURBER

THURBER2 382-1.GPJ 14/05/03

RECORD OF BOREHOLE 02-7

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 17 December 2002
COMPLETED : 17 December 2002

THURBER

SHEET 1 OF 1
DATUM

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲; 40 80 120 160) / WATER CONTENT, PERCENT (wp, w, wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		254.67							
	100 mm SOLID STEM AUGERS	**SAND and GRAVEL**, trace silt, compact, brown: (FILL)		0.00							
					1	SS	20		○		
				254.06							
		CLAY, silty, some sand, trace gravel, stiff, mottled grey-brown: (FILL)(CL)		0.61					○		
1					2	SS	8		○	225 ▲	
				253.30							
		END OF BOREHOLE AT 1.37m. BOREHOLE OPEN TO 1.37m. BOREHOLE DRY ON COMPLETION. BOREHOLE BACKFILLED WITH DRILL CUTTINGS.		1.37							
2											
3											
4											
5											
6											

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : MF
CHECKED : PKC

THURBER

THURBER2 3821.GPJ 14/05/03

RECORD OF BOREHOLE 02-9

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 18 December 2002
COMPLETED : 18 December 2002

THURBER

SHEET 1 OF 2
DATUM

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✤, rem V - ●, Q - ✖, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT wp w wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		250.15							
		ASPHALT (280mm)		0.00 249.87							19mm Piezometer 249.85
		SAND, trace gravel, very dense, brown: (FILL)		0.28	1	SS	45		○		Bentonite Seal
				249.39							249.24
1		**CLAY**, silty, some sand, trace gravel, occasional rootlets, stiff, mottled grey-brown: (FILL)(CL)		0.76	2	SS	12		○ ▲		
					3	SS	10		◔		
2											Drill Cuttings
3											
					4	SS	11		○ ▲		
4	100 mm SOLID STEM AUGERS			245.89							
		SILT, clayey, some sand, trace gravel, occasional iron oxide staining, hard to very stiff, brown to grey: (TILL)(CL-ML)		4.27							
					5	SS	34		○	215 ▲	
5											
											244.36
6											Bentonite Seal
					6	SS	19		○	▲	243.75
											Filter Sand 243.45

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : GA
CHECKED : PKC

THURBER

THURBER2 382.1.GPJ 14/05/03

RECORD OF BOREHOLE 02-9

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 18 December 2002
COMPLETED : 18 December 2002

DATUM

THURBER

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲; 40 80 120 160) / WATER CONTENT, PERCENT (wp, w, wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
8		**SILT**, clayey, some sand, trace gravel, occasional iron oxide staining, hard to very stiff, brown to grey: (TILL)(CL-ML)		241.92	7	SS	19		○ ▲		Slotted Screen
		END OF BOREHOLE AT 8.23m. BOREHOLE OPEN TO 8.23m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.		8.23							241.92
9											
10											
11											
12											
13											

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : GA
CHECKED : PKC

THURBER

RECORD OF BOREHOLE 02-10

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 18 December 2002
COMPLETED : 18 December 2002

SHEET 1 OF 1
DATUM

THURBER

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ♣, rem V - ●, Q - ✕, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT wp w wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		252.28							
	100 mm SOLID STEM AUGERS	**ASPHALT** (178mm)		0.00 252.11							
		SAND, trace gravel, trace silt, compact, brown: (FILL)		0.18	1	SS	25		O		
				251.52							
1		**CLAY**, silty, trace to some gravel, occasional iron oxide staining, stiff, brown to dark brown: (FILL)		0.76	2	SS	9		O▲		
				250.91							
		END OF BOREHOLE AT 1.37m. BOREHOLE OPEN TO 1.37m. BOREHOLE DRY ON COMPLETION. BOREHOLE BACKFILLED WITH DRILL CUTTINGS.		1.37							
2											
3											
4											
5											
6											

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : GA
CHECKED : PKC

THURBER

RECORD OF BOREHOLE 02-11

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 17 December 2002
COMPLETED : 17 December 2002

THURBER

SHEET 1 OF 1
DATUM

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✤, rem V - ●, Q - ✕, Cpen ▲; 40 80 120 160) / WATER CONTENT, PERCENT (wp, w, wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		251.50							
		ASPHALT (125mm)		0.00 / 251.37							
	100 mm SOLID STEM AUGERS	**SAND and GRAVEL**, trace silt, dense, brown: (FILL)		0.13	1	SS	42		○ ○		
1		**CLAY**, silty, some sand, trace gravel, occasional wood fragments, stiff, greenish grey: (FILL)(CL)		250.66 / 0.84	2	SS	13	Hydrometer Test: 1% Gr/ 24% Sa/ 45% Si/ 30% Cl	○ ▲		
		END OF BOREHOLE AT 1.37m. BOREHOLE OPEN TO 1.37m. BOREHOLE DRY ON COMPLETION. BOREHOLE BACKFILLED WITH DRILL CUTTINGS.		250.13 / 1.37							
2											
3											
4											
5											
6											

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : MF
CHECKED : PKC

THURBER

THURBER2 3821.GPJ 14/05/03

RECORD OF BOREHOLE 02-12

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 17 December 2002
COMPLETED : 17 December 2002

THURBER

SHEET 1 OF 1
DATUM

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✕, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT (wp ⊢—o^w—⊣ wl) 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE	248.49							
	100 mm SOLID STEM AUGERS	**SAND and GRAVEL**, trace silt, compact, brown: (FILL)	0.00	1	SS	23				
1		**CLAY**, silty, some sand, trace gravel, occasional iron oxide staining, occasional black staining, stiff, mottled grey-brown: (CL)	247.58 / 0.91	2	SS	10				
		END OF BOREHOLE AT 1.37m. BOREHOLE OPEN TO 1.37m. BOREHOLE DRY ON COMPLETION. BOREHOLE BACKFILLED WITH DRILL CUTTINGS.	247.12 / 1.37							
2										
3										
4										
5										
6										

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : MF
CHECKED : PKC

THURBER

RECORD OF BOREHOLE 02-13

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 17 December 2002
COMPLETED : 17 December 2002

THURBER

SHEET 1 OF 1
DATUM

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✤, rem V - ●, Q - ✕, Cpen ▲; 40 80 120 160) / WATER CONTENT, PERCENT (wp, w, wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		245.49							
	100 mm SOLID STEM AUGERS	**ASPHALT** (300mm)		0.00 245.19							
		SAND, some gravel, some silt, dense, brown: (FILL)		0.30	1	SS	41	Grain Size Analysis: 16% Gr/ 68% Sa/ 16% Fines	○		
1		**CLAY**, silty, some sand, trace gravel, occasional black staining, stiff, mottled greenish grey to grey-brown: (FILL) (CL)		244.58 0.91	2	SS	12		○ ▲		
		END OF BOREHOLE AT 1.37m. BOREHOLE OPEN TO 1.37m. BOREHOLE DRY ON COMPLETION. BOREHOLE BACKFILLED WITH DRILL CUTTINGS.		244.12 1.37							
2											
3											
4											
5											
6											

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : MF
CHECKED : PKC

THURBER

THURBER2 3821.GPJ 14/05/03

RECORD OF BOREHOLE 02-14

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 17 December 2002
COMPLETED : 17 December 2002

THURBER

SHEET 1 OF 1
DATUM

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✤, rem V - ●, Q - ✖, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT wp W wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		243.56							
	100 mm SOLID STEM AUGERS	**ASPHALT** (178mm)		0.00 / 243.38							
		SAND and GRAVEL, trace silt, compact, brown: (FILL)		0.18	1	SS	20		○		
1		**CLAY**, silty, some sand, trace gravel, occasional cobbles, occasional black staining, stiff, brown to dark grey: (FILL)(CL)		242.64 / 0.91	2	SS	13		○ ▲		
		END OF BOREHOLE AT 1.37m. BOREHOLE OPEN TO 1.37m. BOREHOLE DRY ON COMPLETION. BOREHOLE BACKFILLED WITH DRILL CUTTINGS.		242.18 / 1.37							
2											
3											
4											
5											
6											

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : MF
CHECKED : PKC

THURBER

RECORD OF BOREHOLE 02-15

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 17 December 2002
COMPLETED : 17 December 2002

SHEET 1 OF 1
DATUM

THURBER

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲; 40 80 120 160) / WATER CONTENT, PERCENT (wp w wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		241.73							
0	100 mm SOLID STEM AUGERS	**SAND and GRAVEL**, trace silt, compact, brown: (FILL)		0.00	1	SS	20		○		
				241.12							
		CLAY, silty, some sand, trace gravel, stiff, mottled grey-brown: (CL)		0.61							
1					2	SS	13	Hydrometer Analysis: 1% Gr/ 23% Sa/ 46% Si/ 30% Cl	○ ○ ▲		
				240.36							
		END OF BOREHOLE AT 1.37m. BOREHOLE OPEN TO 1.37m. BOREHOLE DRY ON COMPLETION. BOREHOLE BACKFILLED WITH DRILL CUTTINGS.		1.37							
2											
3											
4											
5											
6											

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : MF
CHECKED : PKC

THURBER

THURBER2 3821.GPJ 14/05/03

RECORD OF BOREHOLE 02-16

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 17 December 2002
COMPLETED : 17 December 2002

THURBER

SHEET 1 OF 1
DATUM

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT wp w wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		236.14							
1	100 mm SOLID STEM AUGERS	**SAND and GRAVEL**, trace silt, compact, brown: (FILL)		0.00	1	SS	16		○		
		CLAY, silty, some sand, trace gravel, occasional iron oxide staining, stiff, brown: (TILL)(CL)		235.53 0.61	2	SS	14		○ ○ 225 ▲		
		END OF BOREHOLE AT 1.37m. BOREHOLE OPEN TO 1.37m. BOREHOLE DRY ON COMPLETION. BOREHOLE BACKFILLED WITH DRILL CUTTINGS.		234.77 1.37							

2
3
4
5
6

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : MF
CHECKED : PKC

THURBER

THURBER2 3821.GPJ 14/05/03

RECORD OF BOREHOLE 02-17

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 18 December 2002
COMPLETED : 18 December 2002

THURBER

SHEET 1 OF 2
DATUM

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✤, rem V - ●, Q - ✕, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT wp w wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		231.61							
		ASPHALT (125mm)		0.00 / 231.48							
		SAND and GRAVEL, trace silt, compact, brown: (FILL)		0.13							
				231.15	1	SS	29				
		SAND, trace gravel, compact, brown: (FILL)		0.46							
1					2	SS	16				
				230.39							
		CLAY, silty, some sand, trace gravel, occasional iron oxide staining, stiff to very stiff, greenish grey to brown: (FILL)		1.22							
					3	SS	9				
2											
					4	SS	17	Hydrometer Test: 2% Gr/ 20% Sa/ 38% Si/ 40% Cl			
3											
4											
				227.04							
		CLAY, silty, some sand, trace to some gravel, occasional iron oxide staining, firm, brown: (TILL)(CL)		4.57							
					5	SS	7				
5											
				225.82							
		SILT, sandy, trace gravel, occasional iron oxide staining, very dense, grey: (TILL)(ML-NONPLASTIC)		5.79							
6					6	SS	50/ .125				
				224.90							
		END OF BOREHOLE AT 6.71m.		6.71							

100mm SOLID STEM AUGERS

19mm Piezometer 231.30
Bentonite Seal 230.69
Drill Cuttings
227.34
Bentonite Seal 226.73
Filter Sand 226.43
Slotted Screen
224.90

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : GA
CHECKED : PKC

THURBER

THURBER2 3821.GPJ 14/05/03

RECORD OF BOREHOLE 02-17

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 18 December 2002
COMPLETED : 18 December 2002

DATUM

THURBER

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	SOIL PROFILE: STRATA PLOT	SOIL PROFILE: ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✤, rem V - ●, Q - ✖, Cpen ▲; 40 80 120 160) / WATER CONTENT, PERCENT (wp, w, wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.									
8											
9											
10											
11											
12											
13											

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : GA
CHECKED : PKC

THURBER

RECORD OF BOREHOLE 02-18

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 17 December 2002
COMPLETED : 17 December 2002

THURBER

SHEET 1 OF 1
DATUM

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✤, rem V - ●, Q - ✖, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT wp w wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		235.50							
	100 mm SOLID STEM AUGERS	**ASPHALT** (355mm)		0.00							
				235.15							
		SAND, silty, trace gravel, compact, brown: (FILL)		0.36	1	SS	24	Grain Size Analysis: 3% Gr/ 69% Sa/ 28% Fines			
				234.82							
1		**CLAY**, silty, some sand, trace gravel, stiff, dark grey to brown: (CL)		0.69	2	SS	11				
				234.13							
		END OF BOREHOLE AT 1.37m. BOREHOLE OPEN TO 1.37m. BOREHOLE DRY ON COMPLETION. BOREHOLE BACKFILLED WITH DRILL CUTTINGS.		1.37							
2											
3											
4											
5											
6											

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : MF
CHECKED : PKC

THURBER

THURBER2 3821.GPJ 14/05/03

RECORD OF BOREHOLE 02-20

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 17 December 2002
COMPLETED : 17 December 2002

THURBER

SHEET 1 OF 1
DATUM

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✤, rem V - ●, Q - ✖, Cpen ▲; 40 80 120 160) / WATER CONTENT, PERCENT (wp, w, wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		234.65							
		ASPHALT (190mm)		0.00 234.46							
	100 mm SOLID STEM AUGERS	**SAND and GRAVEL**, trace silt, compact, brown: (FILL)		0.19	1	SS	29		○		
1		**CLAY**, silty, trace sand, trace gravel, very stiff, brown: (CI-CH)		233.43 1.22 233.12	2	SS	20	Hydrometer Test: 0% Gr/ 4% Sa/ 34% Si/ 62% Cl	○	225 ▲	
		END OF BOREHOLE AT 1.52m. BOREHOLE OPEN TO 1.52m. BOREHOLE DRY ON COMPLETION. BOREHOLE BACKFILLED WITH DRILL CUTTINGS.		1.52							
2											
3											
4											
5											
6											

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : MF
CHECKED : PKC

THURBER

THURBER 2 382 ROP 14/05/03

RECORD OF BOREHOLE 02-22

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 18 December 2002
COMPLETED : 18 December 2002

THURBER

SHEET 1 OF 1
DATUM

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✤, rem V - ●, Q - ✕, Cpen ▲; 40 80 120 160) / WATER CONTENT, PERCENT (wp, w, wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		257.24							
	100 mm SOLID STEM AUGERS	**SAND and GRAVEL**, trace silt, dense, brown: (FILL)		0.00	1	SS	33		○		
				256.48							
1		**CLAY**, silty, some sand, trace gravel, occasional rootlets, occasional iron oxide staining, stiff, mottled grey-brown: (FILL)(CL)		0.76	2	SS	11		○ ▲		
				255.87							
		END OF BOREHOLE AT 1.37m. BOREHOLE OPEN TO 1.37m. BOREHOLE DRY ON COMPLETION. BOREHOLE BACKFILLED WITH DRILL CUTTINGS.		1.37							
2											
3											
4											
5											
6											

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : GA
CHECKED : PKC

THURBER

THURBER2 3821.GPJ 14/05/03

RECORD OF BOREHOLE 02-23

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 18 December 2002
COMPLETED : 18 December 2002

THURBER

SHEET 1 OF 1
DATUM

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✤, rem V - ●, Q - ✖, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT wp w wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		250.71							
	100 mm SOLID STEM AUGERS	**SAND**, some gravel, some silt, compact, brown: (FILL)		0.00	1	SS	18	Grain Size Analysis: 16% Gr/ 65% Sa/ 19% Fines	○		
1		**CLAY**, silty, some sand, trace gravel, occasional rootlets, occasional black oxide staining, stiff, brown: (FILL)(CL)		249.95 0.76	2	SS	12		○	225 ▲	
		END OF BOREHOLE AT 1.37m. BOREHOLE OPEN TO 1.37m. BOREHOLE DRY ON COMPLETION. BOREHOLE BACKFILLED WITH DRILL CUTTINGS.		249.34 1.37							
2											
3											
4											
5											
6											

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : GA
CHECKED : PKC

THURBER

THURBER2 3821.GPJ 14/05/03

RECORD OF BOREHOLE 02-24

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 18 December 2002
COMPLETED : 18 December 2002

THURBER

SHEET 1 OF 1
DATUM

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✤, rem V - ●, Q - ✖, Cpen ▲; 40 80 120 160) / WATER CONTENT, PERCENT (wp, w, wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		243.46							
	100 mm SOLID STEM AUGERS	**SAND and GRAVEL**, trace silt, brown: (FILL)		0.00							
		SILT, clayey, trace sand, occasional gravel, black organics staining, occasional rootlets: (FILL)(CL-ML)		243.07 0.38	1	SS	15		○		
1		**CLAY**, silty, trace to some sand, trace gravel, occasional iron oxide staining, occasional rootlets, very stiff to stiff, brown-grey: (FILL)		242.85 0.61	2	SS	13		○		
		END OF BOREHOLE AT 1.37m. BOREHOLE OPEN TO 1.37m. BOREHOLE DRY ON COMPLETION. BOREHOLE BACKFILLED WITH DRILL CUTTINGS.		242.08 1.37							
2											
3											
4											
5											
6											

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : GA
CHECKED : PKC

THURBER

THURBER2 3821.GPJ 14/05/03

RECORD OF BOREHOLE 02-25

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 17 December 2002
COMPLETED : 17 December 2002

DATUM

THURBER

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT (wp, w, wl) 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		234.59							
	100 mm SOLID STEM AUGERS	**ASPHALT** (100mm)		234.49 / 0.00							
		SAND and GRAVEL, trace silt, very dense, brown: (FILL)		0.10	1	SS	52		w ≈ 5		
1		**CLAY**, silty, with organics, some sand, possible hydrocarbon odour, stiff, dark grey: (FILL)(CL)		233.67 / 0.91	2	SS	10		w ≈ 33		
		END OF BOREHOLE AT 1.37m. BOREHOLE OPEN TO 1.37m. BOREHOLE DRY ON COMPLETION. BOREHOLE BACKFILLED WITH DRILL CUTTINGS.		233.21 / 1.37							
2											
3											
4											
5											
6											

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : MF
CHECKED : PKC

THURBER

RECORD OF BOREHOLE 02-26

PROJECT : Mayfield Road Widening
LOCATION : Heart Lake Road to Airport Road
STARTED : 18 December 2002
COMPLETED : 18 December 2002

THURBER

SHEET 1 OF 1
DATUM

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✤, rem V - ●, Q - ✖, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT wp w wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		244.76							
	100 mm SOLID STEM AUGERS	**SAND and GRAVEL**, trace silt, dense to loose, brown: (FILL)		0.00	1	SS	38				19mm Piezometer 244.46
1					2	SS	7				Bentonite Seal 243.85
											▽ Drill Cuttings
2					3	SS	4				242.63
											Bentonite Seal 242.02
3				241.72							Filter Sand 241.72
		CLAY, silty, some sand, trace gravel, occasional black staining, occasional sand pockets, stiff, greenish grey: (FILL)		3.05	4	SS	12				
4											Slotted Screen
				240.34							
		SILT, clayey, trace to some sand, trace gravel, occasional iron oxide staining, very stiff, grey: (TILL)(CL-ML)		4.42	5	SS	26				240.19
5				239.58							239.58
		END OF BOREHOLE AT 5.18m. BOREHOLE OPEN TO 4.57m. WATER LEVEL AT 4.57m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.		5.18							
6		WATER LEVEL READINGS: DATE — DEPTH (m) 18/12/02 — 4.57 02/01/03 — 1.51									

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date) 01/02/03

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : GA
CHECKED : PKC

THURBER

THURBER2 3821.GPJ 14/05/03

AMEC BOREHOLES FOR
750 MM WATERMAIN ALONG MAYFIELD ROAD

LOG OF BOREHOLE 1

ENCL. No.

REF. No.:	TT20845	*DRILLING DATA*	
CLIENT:	KMK Consultants Limited		
PROJECT NAME:	Proposed Watermain	Method:	SolSt Augering
LOCATION	Region of Peel, Ontario	Diameter:	150 mm
DATUM:	Geodetic	Date:	July 31st, 2000

LABORATORY DATA						*SAMPLES*				MATERIAL DESCRIPTION	ELEV.	DEPTH	WATER DATA	REMAR
PL %	W %	LL %	UNIT WT kN/m3	UNDR STRNG Field Vane kPa	UNDR STRNG Lab Compr kPa	No.	TYPE	N-Value	SYMBOL		m	m		
										SURFACE EL. 256.6 m				
	4					1	SS	19		0.15m Sandy Gravel FILL brown Sand FILL trace gravel, silt damp	256			GROUNDWAT IN OPEN BOR on completion: none
	12					2	SS	4				1		
	19									brown to grey Silty Clay FILL with sand, trace gravel damp	255			
	24					3	SS	6				2		
	5					4	AS	-		brown Sand FILL with gravel damp				Auger Refusal 2.5m. Boreho moved 2.0m w and advanced.
	10					5	SS	24			254			
										brown CLAYEY SILT TILL trace gravel v.stiff damp		3		
	9					6	SS	28			253			
												4		<-- Proposed invert
										End of Borehole				

Vertical Scale: 1:40

AMEC

Checked: AD

SHEET 1 OF 1 BH No. 1

LOG OF BOREHOLE 2

ENCL. No.: 2

REF. No.:	TT20845	*DRILLING DATA*	
CLIENT:	KMK Consultants Limited		
PROJECT NAME:	Proposed Watermain	Method:	SolSt Augering
LOCATION	Region of Peel, Ontario	Diameter:	150 mm
DATUM:	Geodetic	Date:	July 31st, 2000

LABORATORY DATA						*SAMPLES*				**MATERIAL DESCRIPTION**	ELEV. m	DEPTH m	WATER DATA	**REMARKS**
PL %	W %	LL %	UNIT WT kN/m3	ROCKCORING RQD %	ROCKCORING REC %	No.	TYPE	N-Value	SYMBOL					
										SURFACE EL. 256.2 m				
	13					1	SS	5		0.23m TOPSOIL brown Silty Sand FILL trace clay, rootlets — damp	256			GROUNDWATER IN OPEN BORE on completion: none
	4					2	SS	17				1		
										brown, Sand FILL, with gravel — damp	255			
	12					3	SS	22						Auger Refusal at 1.5m. Borehole moved 4.0m northwest.
										brown CLAYEY SILT TILL trace gravel v.stiff — damp	254	2		
	14					4	SS	22			253	3		
	10					5	SS	25						<-- Proposed invert
										End of Borehole		4		

Vertical Scale: 1:40

AGRA

Checked: AD

SHEET 1 OF 1 BH No. 2

LOG OF BOREHOLE 3

ENCL. No.:

REF. No.:	TT20845	*DRILLING DATA*	
CLIENT:	KMK Consultants Limited		
PROJECT NAME:	Proposed Watermain	Method:	SolSt Augering
LOCATION	Region of Peel, Ontario	Diameter:	150 mm
DATUM:	Geodetic	Date:	July 31st, 2000

LABORATORY DATA						*SAMPLES*						
PL %	W %	LL %	UNIT WT kN/m3	ROCKCORING RQD %	ROCKCORING REC %	No.	TYPE	N-Value	SYMBOL	MATERIAL DESCRIPTION	ELEV. m	DEPTH m	WATER DATA	REMARKS
										SURFACE EL. 255.1 m				
	3					1	SS	20		brown Sand FILL with gravel, trace silt — damp	255			GROUNDWATER IN OPEN BOREHOLE on completion: none
	7									brown Silty Sand FILL trace gravel — damp				
	27					2	SS	4		grey Silty Clay FILL trace sand, gravel, rootlets	254	1		
	25					3	SS	5		some topsoil — damp				
	12					4	SS	13		stiff	253	2		
	10					5	SS	25		brown CLAYEY SILT TILL trace gravel — damp; v.stiff	252	3		<-- Proposed invert
						6	SS	27				4		
										End of Borehole				

Vertical Scale: 1:40

AGRA

Checked: AD

SHEET 1 OF 1 BH No. 3

LOG OF BOREHOLE 4

ENCL. No.: 4

REF. No.:	TT20845	*DRILLING DATA*	
CLIENT:	KMK Consultants Limited		
PROJECT NAME:	Proposed Watermain	Method:	SolSt Augering
LOCATION	Region of Peel, Ontario	Diameter:	150 mm
DATUM:	Geodetic	Date:	July 31st, 2000

LABORATORY DATA						*SAMPLES*				MATERIAL DESCRIPTION	ELEV.	DEPTH	WATER DATA	REMARKS
PL %	W %	LL %	UNIT WT kN/m3	UNDR STRNG Field Vane kPa	UNDR STRNG Lab Compr kPa	No.	TYPE	N-Value	SYMBOL		m	m		
										SURFACE EL. 250.6 m				
	4					1	SS	16		brown Sand FILL with gravel, trace silt — damp	250			GROUNDWATER IN OPEN BORE on completion: July 31:none Oct 13:none
	14					2	SS	5		grey Clayey Silt FILL trace sand, gravel — damp		1		
	31					3	SS	5		grey Silty Sand FILL trace clay, topsoil — damp	249			On July 31: Borehole drilled from surface to 4.6m depth & backfilled.
	14									firm		2		
	11					4	SS	26		v.stiff	248			On Oct 13: Borehole drilled from 4.6m to 9.6m depth.
	11					5	SS	31		hard — CLAYEY SILT TILL trace gravel — damp		3		
	11					6	SS	28		v.stiff — brown / grey	247	4		<-- Proposed invert
	8					7	SS	33		hard	246	5		
	10					8	SS	36			245	6		
	10					9	SS	28		v.stiff	244			
	8					10	SS	25				7		

Vertical Scale: 1:40

AMEC

Checked: AD

LOG OF BOREHOLE 4

ENCL. No.:

REF. No.:	TT20845	*DRILLING DATA*	
CLIENT:	KMK Consultants Limited		
PROJECT NAME:	Proposed Watermain	Method:	SolSt Augering
LOCATION	Region of Peel, Ontario	Diameter:	150 mm
DATUM:	Geodetic	Date:	July 31st, 2000

LABORATORY DATA						*SAMPLES*				MATERIAL DESCRIPTION	ELEV.	DEPTH	WATER DATA	REMARI
PL %	W %	LL %	UNIT WT kN/m3	UNDR STRNG Field Vane kPa	UNDR STRNG Lab Compr kPa	No.	TYPE	N-Value	SYMBOL		m	m		
										SURFACE EL. 250.6 m				
										hard	243	8		
	8					11	SS	35						
	8					12	SS	65			242	9		
	7					13	SS	41						
										End of Borehole	241			

Vertical Scale: 1:40

AMEC

Checked: AD

SHEET 2 OF 2 BH No. 4

LOG OF BOREHOLE 5

ENCL. No.: 6

REF. No.:	TT20845	*DRILLING DATA*	
CLIENT:	KMK Consultants Limited		
PROJECT NAME:	Proposed Watermain	Method:	SolSt Augering
LOCATION	Region of Peel, Ontario	Diameter:	150 mm
DATUM:	Geodetic	Date:	July 31st, 2000

LABORATORY DATA						*SAMPLES*				MATERIAL DESCRIPTION	ELEV. m	DEPTH m	WATER DATA	REMARKS
PL %	W %	LL %	UNIT WT kN/m3	UNDR STRNG Field Vane kPa	UNDR STRNG Lab Compr kPa	No.	TYPE	N-Value	SYMBOL					
										SURFACE EL. 252.0 m				
	12					1	SS	12		0.15m TOPSOIL brown Silty Sand FILL trace gravel — damp				GROUNDWATER IN OPEN BORE on completion: 4.7m
	5													
	13					2	SS	6		brown Clayey Silt FILL trace sand, gravel — damp	251	1		In piezometer, August 4, 2000: 3.6m October 13, 2000: 3.7m
	14					3	SS	5		SILTY CLAY TILL trace gravel	250	2		
				>110						firm				
	12					4	SS	4		moist to wet	249	3		SS4: sampler pushed a stone.
				>176						brown / grey stiff	248	4		
	21					5	SS	9						
	10					6	SS	52/15		hard				
										End of Borehole				<-- Proposed invert

Vertical Scale: 1:40

AMEC

Checked: AD

SHEET 1 OF 1 BH No. 5

LOG OF BOREHOLE 6

ENCL. No

REF. No.:	TT20845	*DRILLING DATA*	
CLIENT:	KMK Consultants Limited		
PROJECT NAME:	Proposed Watermain	Method:	SolSt Augering
LOCATION	Region of Peel, Ontario	Diameter:	150 mm
DATUM:	Geodetic	Date:	July 31st, 2000

LABORATORY DATA						*SAMPLES*				MATERIAL DESCRIPTION	ELEV.	DEPTH	WATER DATA	REMAR
PL %	W %	LL %	UNIT WT kN/m3	UNDR STRNG Field Vane kPa	UNDR STRNG Lab Compn kPa	No.	TYPE	N-Value	SYMBOL		m	m		
										SURFACE EL. 252.1 m				
	3					1	SS	22		0.3m Sand FILL with gravel brown Crusher Run Limestone FILL — damp	252			GROUNDWA IN OPEN BO on completion none
	3													
	7					2	SS	21				1		
											251			
	27					3	SS	5		grey Silty Clay FILL trace sand, topsoil — damp				
												2		
											250			
	12					4	SS	15		stiff				
	11					5	SS	20		CLAYEY SILT TILL trace gravel		3		
											249			
										v.stiff — damp				
	10					6	SS	23				4		
											248			
	9					7	SS	34		hard				
										brown		5		
	11					8	SS	34		grey	247			<-- Proposed invert
										End of Borehole				

Vertical Scale: 1:40

AMEC

Checked: AD

SHEET 1 OF 1 BH No. 6

LOG OF BOREHOLE 7

ENCL. No.: 8

REF. No.:	TT20845	*DRILLING DATA*	
CLIENT:	KMK Consultants Limited		
PROJECT NAME:	Proposed Watermain	Method:	SolSt Augering
LOCATION	Region of Peel, Ontario	Diameter:	150 mm
DATUM:	Geodetic	Date:	July 31st, 2000

LABORATORY DATA						*SAMPLES*							
PL %	W %	LL %	UNIT WT kN/m3	UNDR STRNG Field Vane kPa	UNDR STRNG Lab Compr kPa	No.	TYPE	N-Value	SYMBOL	MATERIAL DESCRIPTION	ELEV. m	DEPTH m	WATER DATA	REMARKS
										SURFACE EL. 251.7 m				
	4					1	SS	21		brown Sand FILL with gravel — damp				GROUNDWATER IN OPEN BORE on completion: none
											251			
	23					2	SS	7		grey Silty Clay FILL trace sand, topsoil — damp		1		
										stiff				
	10					3	SS	19			250			
										v.stiff — damp		2		
										brown CLAYEY SILT TILL trace gravel				
											249			
	12					4	SS	26				3		
	12					5	SS	24			248			
										End of Borehole		4		<-- Proposed invert

Vertical Scale: 1:40

AMEC

Checked: AD

SHEET 1 OF 1 BH No. 7

LOG OF BOREHOLE 8

ENCL. No.:

REF. No.:	TT20845	*DRILLING DATA*	
CLIENT:	KMK Consultants Limited		
PROJECT NAME:	Proposed Watermain	Method:	SolSt Augering
LOCATION	Region of Peel, Ontario	Diameter:	150 mm
DATUM:	Geodetic	Date:	July 31st, 2000

LABORATORY DATA						*SAMPLES*				MATERIAL DESCRIPTION	ELEV.	DEPTH	WATER DATA	REMARK
PL %	W %	LL %	UNIT WT kN/m3	UNDR STRNG Field Vane kPa	UNDR STRNG Lab Compr kPa	No.	TYPE	N-Value	SYMBOL		m	m		
										SURFACE EL. 245.2 m				
	3					1	SS	18		brown Sand FILL with gravel — damp	245			GROUNDWTER IN OPEN BORE on completion: none
	25					2	SS	8				1		
											244			
	20					3	SS	3		brown Silty Clay FILL trace sand, gravel, topsoil — moist				
												2		
											243			
	27					4	SS	8				3		
											242			
										stiff				
						5	SS	17		v.stiff — grey SILTY CLAY TILL trace gravel — damp				
												4		
										End of Borehole				

<-- Proposed invert

Vertical Scale: 1:40

AMEC

Checked: AD

SHEET 1 OF 1 BH No. 8

LOG OF BOREHOLE 9

ENCL. No.: 10

REF. No.:	TT20845	*DRILLING DATA*	
CLIENT:	KMK Consultants Limited		
PROJECT NAME:	Proposed Watermain	Method:	SolSt Augering
LOCATION	Region of Peel, Ontario	Diameter:	150 mm
DATUM:	Geodetic	Date:	July 31st, 2000

LABORATORY DATA						*SAMPLES*				**MATERIAL DESCRIPTION**	ELEV. m	DEPTH m	WATER DATA	**REMARKS**
PL %	w %	LL %	UNIT WT kN/m3	UNDR STRNG Field Vane kPa	UNDR STRNG Lab Compr kPa	No.	TYPE	N-Value	SYMBOL					
										SURFACE EL. 242.8 m				
										60mm ASPHALTIC CONCRETE				GROUNDWTER IN OPEN BORE on completion: none
						1	SS	15		brown Gravelly Sand FILL damp				
	4					2	SS	8		asphalt coated	242	1		
	12													
	11					3	SS	14		stiff	241	2		
										CLAYEY SILT TILL trace gravel				
	12					4	SS	22		damp	240	3		
	12					5	SS	26		v.stiff				<-- Proposed invert
	11					6	SS	24		brown	239	4		
	10					7	SS	19		grey	238	5		
										End of Borehole				

Vertical Scale: 1:40

AMEC

Checked: AD

SHEET 1 OF 1 BH No. 9

LOG OF BOREHOLE 10

ENCL. No.:

REF. No.:	TT20845	*DRILLING DATA*	
CLIENT:	KMK Consultants Limited		
PROJECT NAME:	Proposed Watermain	Method:	SolSt Augering
LOCATION	Region of Peel, Ontario	Diameter:	150 mm
DATUM:	Geodetic	Date:	July 31st, 2000

LABORATORY DATA						*SAMPLES*				MATERIAL DESCRIPTION	ELEV.	DEPTH	WATER DATA	REMARK
PL %	W %	LL %	UNIT WT kN/m3	UNDR STRNG Field Vane kPa	UNDR STRNG Lab Compr kPa	No.	TYPE	N-Value	SYMBOL					
										SURFACE EL. 231.5 m				
	3					1	SS	16		brown Sand FILL with gravel	231			GROUNDWATE IN OPEN BORE on completion: none
	21					2	SS	10		trace topsoil		1		
										brown				
	23					3	SS	4		grey Silty Clay FILL some sand, trace gravel	230	2		
										damp	229			
	22					4	SS	14				3		<-- Proposed invert
											228			
	20					5	SS	8				4		
										End of Borehole				

Vertical Scale: 1:40

AMEC

Checked: AD

SHEET 1 OF 1 BH No. 10

LOG OF BOREHOLE 11

ENCL. No.: 12

REF. No.:	TT20845	*DRILLING DATA*	
CLIENT:	KMK Consultants Limited		
PROJECT NAME:	Proposed Watermain	Method:	SolSt Augering
LOCATION	Region of Peel, Ontario	Diameter:	150 mm
DATUM:	Geodetic	Date:	July 31st, 2000

LABORATORY DATA						*SAMPLES*				MATERIAL DESCRIPTION	ELEV.	DEPTH	WATER DATA	REMARKS
PL %	W %	LL %	UNIT WT kN/m3	UNDR STRNG Field Vane kPa	UNDR STRNG Lab Compr kPa	No.	TYPE	N-Value	SYMBOL		m	m		
										SURFACE EL. 231.7 m				
	3					1	SS	13		brown Sand FILL with gravel — damp				GROUNDWATER IN OPEN BORE on completion: none
	25					2	SS	6		grey Silty Clay FILL trace sand, gravel, rootlets — damp	231	1		
	22					3	SS	13		stiff	230	2		
										brown				
	23					4	SS	18		grey — v.stiff — damp	229	3		<-- Proposed invert
	17					5	SS	20		SILTY CLAY TILL trace gravel				
										occasional sand seams	228	4		
	14					6	SS	23						
	14					7	SS	16			227	5		
										End of Borehole				

Vertical Scale: 1:40

AMEC

Checked: AD

SHEET 1 OF 1 BH No. 11

LOG OF BOREHOLE 11A

ENCL. No.

REF. No.:	TT20845	*DRILLING DATA*	
CLIENT:	KMK Consultants Limited		
PROJECT NAME:	Proposed Watermain	Method:	SolSt Augering
LOCATION	Region of Peel, Ontario	Diameter:	100 mm
DATUM:	Geodetic	Date:	October 23rd, 2000

LABORATORY DATA						*SAMPLES*							
PL %	W %	LL %	UNIT WT kN/m3	UNDR STRNG Field Vane kPa	UNDR STRNG Lab Compr kPa	No.	TYPE	N-Value	SYMBOL	MATERIAL DESCRIPTION	ELEV. m	DEPTH m	WATER DATA	REMAR
										SURFACE EL. 230.5 m				
	7				PP	1	SS	50		grey-brown Gravelly Sand FILL damp	230	0		GROUND WATER IN OP BORE on completion: 3m
	17					2	SS	18		grey Silty Clay FILL damp		1		6hrs later: 1.8m
	23					3	SS	9		trace gravel trace rootlets	229	2	▽	
	21					4	SS	15		trace rootlets	228			SS4:sampler wet
	13					5	SS	16		trace gravel trace sand lense	227	3		
	20					6	SS	17				4		
	21				>215	7	SS	50		hard brown-grey SILTY CLAY damp	226	5		
	23				140	8	SS	32			225			
	9				72	9	SS	14		stiff moist	224	6		<--Proposed invert
	13				>215	10	SS	48		hard grey CLAYEY SILT TILL trace gravel trace sand damp		7		

Vertical Scale: 1:40

AMEC

Checked: AD

SHEET 1 OF 2 BH No. 11A

LOG OF BOREHOLE 11A

ENCL. No.: 14

REF. No.:	TT20845	*DRILLING DATA*	
CLIENT:	KMK Consultants Limited		
PROJECT NAME:	Proposed Watermain	Method:	SolSt Augering
LOCATION	Region of Peel, Ontario	Diameter:	100 mm
DATUM:	Geodetic	Date:	October 23rd, 2000

LABORATORY DATA						*SAMPLES*							
PL %	w %	LL %	UNIT WT kN/m3	UNDR STRNG Field Vane kPa	UNDR STRNG Lab Compr kPa	No.	TYPE	N-Value	SYMBOL	MATERIAL DESCRIPTION	ELEV. m	DEPTH m	WATER DATA	REMARKS
										SURFACE EL. 230.5 m				
	11					11	SS	50/15			223	8		
						12	SS	70/10		grey weathered SHALE with clay layers/seams	222	9		
						13	SS	70/5		End of Borehole				

Vertical Scale: 1:40

AMEC

Checked: AD

SHEET 2 OF 2 BH No. 11A

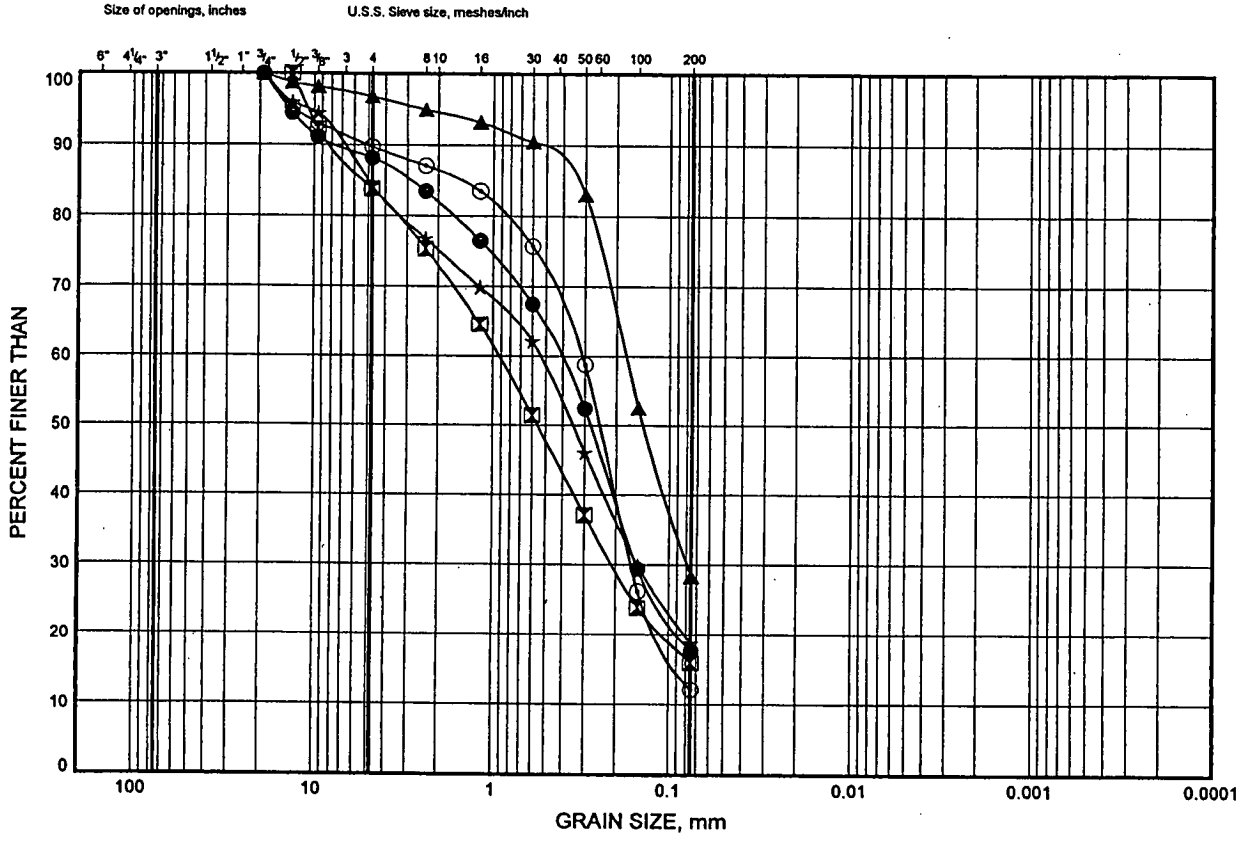
APPENDIX B

GEOTECHNICAL LABORATORY TEST RESULTS

Mayfield Road Widening

GRAIN SIZE DISTRIBUTION

FIGURE B1



COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT and CLAY
	GRAVEL		SAND			FINE GRAINED

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	02-1	0.91	
⊠	02-13	0.53	
▲	02-18	0.46	
★	02-23	0.46	
⊙	02-5	0.46	

Date January 2003

Project 17-308-321

THURBER

Prep'd WM

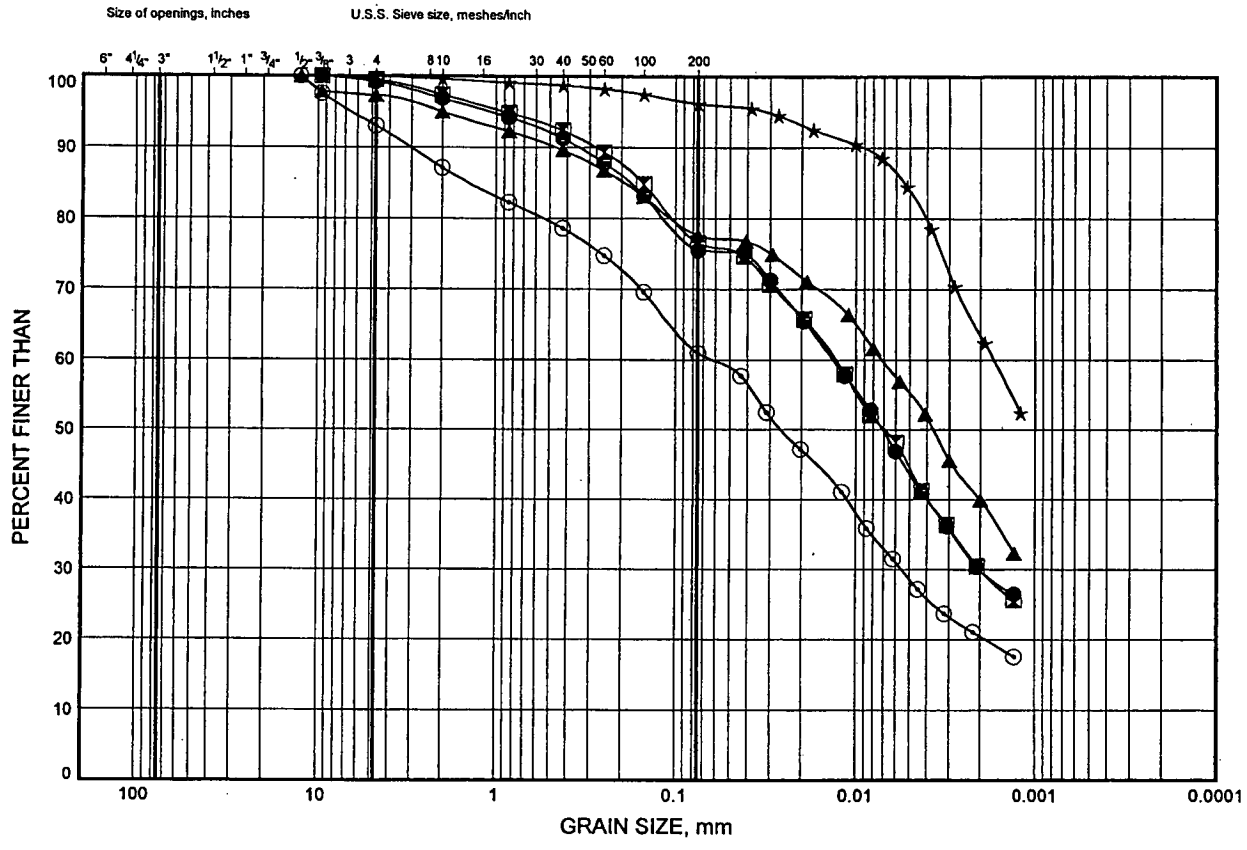
Chkd. PKC

THURBGSD 3821.GPJ 13/01/03

Mayfield Road Widening

GRAIN SIZE DISTRIBUTION

FIGURE B2



COBBLE SIZE	GRAVEL		SAND			SILT and CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	FINE GRAINED

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	02-11	1.07	
⊠	02-15	1.07	
▲	02-17	3.35	
★	02-20	1.22	
⊙	02-8	1.07	

Date January 2003

Project 17-308-321

THURBER

Prep'd WM

Chkd. PKC

THURBGSD 3821.GPJ 14/01/03

APPENDIX C

ENVIRONMENTAL LABORATORY TEST RESULTS

16-Jan-2003

THURBER ENGINEERING LTD.
2010 Winston Park Drive, Suite 103
Oakville, ON
L6H 5R7

Attn: Mark Farrant
Project: 17-308-321

PO #:

Received: 7-Jan-2003 17:26

Job: 2350105

Status: Final

Parameter			MOEE Table A Criteria (AGR)	02-3 SS#2 Clay Till soil	02-16 SS#2 Clay Till soil	Blank	Standard (found)	Standard (expected)	Repeat 02-3 SS#2
Antimony	SW 6020 mod.	ug/g	13	<0.2	<0.2	<0.2	0.5	0.7	<0.2
Arsenic	SW 6020 mod.	ug/g	20	3.5	3.3	<0.2	22.8	23.0	3.5
Barium	SW 6020 mod.	ug/g	750	52	92	<5	167	171	56
Beryllium	SW 6020 mod.	ug/g	1.2	0.5	0.5	<0.2	0.5	0.7	0.5
Cadmium	SW 6020 mod.	ug/g	3.0	<0.5	<0.5	<0.5	0.6	0.5	<0.5
Chromium	SW 6020 mod.	ug/g	750	16	20	<1	45	51	17
Chromium (6+)	SW 7196	ug/g	8.0	<1	<1	<1	3	3	<1
Cobalt	SW 6020 mod.	ug/g	40	9	12	<2	27	28	9
Copper	SW 6020 mod.	ug/g	150	25	25	<1	32	33	26
Free Cyanide	SM 4500I	ug/g	100	<0.02	<0.02	<0.02	0.05	0.05	<0.02
Lead	SW 6020 mod.	ug/g	200	12	10	<5	24	25	13
Mercury	SW 7470	ug/g	10	0.03	0.02	<0.01	0.28	0.29	0.03
Molybdenum	SW 6020 mod.	ug/g	5.0	<3	<3	<3	<3	<3	<3
Nickel	SW 6020 mod.	ug/g	150	17	25	<2	45	46	17
Selenium	SW 7741	ug/g	2.0	0.2	<0.2	<0.2	0.6	0.5	0.2
Silver	SW 6020 mod.	ug/g	20	<1	<1	<1	2	1	<1
Vanadium	SW 6020 mod.	ug/g	200	22	22	<1	43	50	22
Zinc	SW 6020 mod.	ug/g	600	50	64	<5	128	133	51
pH	SM 4500B	pH Units	5-9	8.28	7.70 +	1.00	7.48	7.73	8.29
EC	SM 2510B	mS/cm	0.70	5.980 +	2.900 +	0.001	1.000	1.027	5.700
S.A.R.	Calculation	None	5.0	58.0 +	9.67 +	0.24	0.80	0.78	57.0
Thallium	SW 6020 mod.	ug/g	4.1	0.11	0.16	<0.05	0.28	0.28	0.12
Boron (HWS)	SW 6010 mod.	ug/g	1.5	0.2	<0.2	<0.2	5.0	5.0	<0.2

+ EXCEEDANCE

16-Jan-2003

THURBER ENGINEERING LTD.
2010 Winston Park Drive, Suite 103
Oakville, ON
L6H 5R7

Attn: Mark Farrant
Project: 17-308-321 PO #:

Received: 7-Jan-2003 17:26

Job: 2350105 Status: Final

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done unless otherwise agreed upon by contractual arrangement. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

Job approved by:

Signed: .....

Ralph Siebert, B.Sc.
Section Supervisor, Metals

THURBER ENGINEERING LTD.
2010 Winston Park Drive, Suite 103
Oakville, ON
L6H 5R7

13-Jan-2003

Attn: Mark Farrant
Project: 17-308-321

PO #:

Received: 7-Jan-2003 17:26

Job: 2350105

Status: Final

Soil Samples

Sample Id	TPH-Heavy Oils SM 5520F ug/g	TPH-Gas+Diesel Calc. ug/g	TPH-Gas HS-GC/FID ug/g	TPH-Diesel GC/FID ug/g	Benzene HS-GC/PID ug/g	Toluene HS-GC/PID ug/g
			+ exceedance			
02-25 SS#2	520	110	<10	110	<0.02	<0.02
02-25 SS#1	<100	<10	<10	<10	<0.02	<0.02
Spiked 02-25 SS#2	91%	---	79%	---	73.0%	77.0%
Blank	<100	<10	<10	<10	<0.02	<0.02
QC Standard (found)	90%	---	104%	100%	99.0%	105. %
QC Standard (expected)	100%	---	100%	100%	100. %	100. %
Repeat 02-25 SS#2	470	120	<10	120	<0.02	<0.02
MOEE Table A Criteria (ALR)	1000	100		100	0.24	2.1
Table B (Res/Park)		1000				

Sample Id	Ethylbenzene HS-GC/PID ug/g	m-&p-Xylenes HS-GC/PID ug/g	o-Xylene HS-GC/PID ug/g
02-25 SS#2	<0.02	<0.04	<0.02
02-25 SS#1	<0.02	<0.04	<0.02
Spiked 02-25 SS#2	78.0%	76.0%	73.0%
Blank	<0.02	<0.04	<0.02
QC Standard (found)	102. %	102. %	101. %
QC Standard (expected)	100. %	100. %	100. %
Repeat 02-25 SS#2	<0.02	<0.04	<0.02
MOEE Table A Criteria	0.28	25	

13-Jan-2003

THURBER ENGINEERING LTD.
2010 Winston Park Drive, Suite 103
Oakville, ON
L6H 5R7

Attn: Mark Farrant
Project: 17-308-321 PO #:

Received: 7-Jan-2003 17:26

Job: 2350105 Status: Final

- TPH-Gas represents total purgeable hydrocarbons (less than C10) based on gasoline calibration, using Headspace/GC/FID.
- TPH-Diesel represents total extractable hydrocarbons (C10-C24) based on diesel calibration, using GC/FID.
- TPH-Gas+Diesel is the summation of TPH-Gas and TPH-Diesel.
- The TPH-Diesel detected in sample 02-25 SS#2 is mainly due to an oil contamination ranging from C16 to C50 rather than a true diesel.

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done unless otherwise agreed upon by contractual arrangement. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

Job approved by:

Signed: .....

Medhat Riskallah, Ph.D., C.Chem.
Manager, Gas Chromatography Section

16-Jan-2003

THURBER ENGINEERING LTD.
2010 Winston Park Drive, Suite 103
Oakville, ON
L6H 5R7

Attn: Mark Farrant
Project: 17-308-321

PO #:

Received: 7-Jan-2003 17:26

Job: 2350105

Status: Final

TCLP Leach

Sample Id	F- SM 4500F mg/L	NO2+NO3-N COBAS mg/L	Free CN- SM 4500I mg/L	Hg ICP/MS mg/L	As ICP/MS mg/L	Se ICP/MS mg/L	B ICP/MS mg/L	Ba ICP/MS mg/L
02-25 SS#2	0.2	<0.2	<0.01	<0.01	<0.2	<0.1	0.2	1.2
Blank	<0.1	<0.2	<0.01	<0.01	<0.2	<0.1	<0.1	<0.2
QC Standard (found)	5.0	1.3	0.06	0.17	1.0	1.0	0.5	1.0
QC Standard (expected)	5.0	1.4	0.06	0.20	1.0	1.0	0.5	1.0
Repeat 02-25 SS#2	0.2	<0.2	<0.01	<0.01	<0.2	<0.1	0.2	1.4
O. Reg 558 Criteria (mg/L)	150.0	1000.0	20.0	0.1	2.5	1.0	500.0	100.0

Sample Id	Cd ICP/MS mg/L	Cr ICP/MS mg/L	Pb ICP/MS mg/L	Ag ICP/MS mg/L	U ICP/MS mg/L
02-25 SS#2	<0.05	<0.1	0.6	<0.01	<0.01
Blank	<0.05	<0.1	<0.1	<0.01	<0.01
QC Standard (found)	0.50	0.5	0.5	0.03	0.04
QC Standard (expected)	0.50	0.5	0.5	0.03	0.04
Repeat 02-25 SS#2	<0.05	<0.1	0.7	<0.01	<0.01
O. Reg 558 Criteria (mg/L)	0.5	5.0	5.0	5.0	10.0