Golder Associates Ltd.

2465 McDougall Street, Suite 100
Windsor, Ontario, Canada N8X 3N9
Telephone 519-250-3733
Fax 519-250-6452

REPORT ON

GEOTECHNICAL INVESTIGATION
MANNING ROAD RECONSTRUCTION
LANOUE STREET TO SYLVESTRE DRIVE
TECUMSEH, ONTARIO

Submitted to:

R. Lucente Engineering Inc.
3514 Walker Road, Unit 1
Windsor, Ontario
N8W 3S4

DISTRIBUTION:

4 Copies - R. Lucente Engineering Inc.
2 Copies - Golder Associates Ltd.

July 5, 2004

041-140008-1

Golder Associates Ltd.

2465 McDougall Street, Suite 100
Windsor, Ontario, Canada N8X 3N9
Telephone 519-250-3733
Fax 519-250-6452

July 5, 2004

041-140008-1

R. Lucente Engineering Inc.
3514 Walker Road, Unit 1
Windsor, Ontario
N8W 3S4

Attention: Mr. R. Lucente, P. Eng.

RE: GEOTECHNICAL INVESTIGATION
MANNING ROAD RECONSTRUCTION
LANOUE STREET TO SYLVESTRE DRIVE
TECUMSEH, ONTARIO

Dear Sirs:

This report presents the results of a geotechnical investigation carried out for the proposed reconstruction of Manning Road between Lanoue Street and Sylvestre Drive in the Town of Tecumseh, Ontario. The approximate location of the site is shown on the Key Plan, Figure 1.

1.0 TERMS OF REFERENCE

The purpose of the investigation was to determine the existing pavement structure and subgrade conditions along the roadway and based on our interpretation of the data obtained, to provide geotechnical engineering recommendations for the design of the reconstruction works.

The investigation was carried out, and this report prepared, in general accordance with Golder Associates Ltd. proposal letter P14-2917 dated April 17, 2003.

Authorization to proceed with the investigation was received from Mr. R. Lucente, P. Eng., of R. Lucente Engineering Inc.

2.0 PROJECT DESCRIPTION

It is understood that consideration is being given to the reconstruction of Manning Road between St. Gregory's Road and Sylvestre Drive in the Town of Tecumseh, Ontario. The overall length of road under investigation is approximately 1.94 kilometres.

Golder Associates Ltd. carried out a geotechnical investigation and prepared a report addressing the northmost 0.668 kilometres of the roadway between St. Gregory's Road and Lanoue Street in the Winter of 2004 with the report being issued in March 2004. This current investigation and report addresses the southmost 2.38 kilometres of the road between Lanoue Street and Sylvestre Drive.

The travelled portion of Manning Road currently being investigated presently comprises basically two asphalt surfaced lanes with additional turning lane(s) at approaching intersections and at existing driveways leading to commercial properties. From Lanoue Street to Sylvestre Drive, an existing ditch, approximately 2 to 3 metres deep is located along the west side of the roadway. From Lanoue Street to County Road 22, an existing ditch, approximately 1.5 to 2 metres deep is located along the east side of the roadway. This ditch continues with a depth of approximately 2 to 3 metres from about the halfway between the County Road 22 and Sylvestre Drive to beyond Sylvestre Drive going south. The roadside drainage ditches are separated from the pavement surface by a gravel surfaced shoulder which varies in width. It is understood that portions of the ditch may be enclosed to accommodate widening of the pavement.

Based on preliminary traffic and lane configuration details provided to us, it appears that Manning Road is to be widened to create basically four lanes of through traffic (i.e. two lanes northbound and two lanes southbound). In addition, it is proposed to add the necessary turning lanes at the intersections.

3.0 INVESTIGATION PROCEDURE

The field work for the current investigation was carried out from April 27 to April 29, 2004 during which time nineteen (19) boreholes were advanced at the site. The approximate locations of the boreholes are shown on the Location Plan, Figure 2. A portable power auger was used to drill the boreholes.

During the investigation, the boreholes were advanced to depths of between 1.2 and 1.5 metres. Standard penetration testing and soil sampling was carried out in the boreholes using conventional 38 millimetre, inside diameter, split spoon sampling equipment. All of the soil samples obtained were placed in individually labelled containers and brought to our Windsor office for further examination and laboratory testing.

The pavement structure and soil stratigraphy encountered in the boreholes as well as the results of field and laboratory testing are shown in detail in Table I, Record of Boreholes following the text of this report.

An experienced member of our engineering staff located the boreholes in the field, cleared these locations of buried utilities, supervised the drilling operations, logged the boreholes and cared for the soil samples obtained.

4.0 SUBSURFACE CONDITIONS

The pavement structure, soil and groundwater conditions encountered in the boreholes drilled for this investigation are presented in Table I, Records of Boreholes. The boundaries typically represent transitions from one soil type to another and are not necessarily intended to define exact planes of geological change. The subsurface conditions are established only at the borehole locations and may vary between and beyond the boreholes.

The subsurface conditions encountered in the boreholes generally consisted of the existing pavement structure overlying silty sand or silty clay fill and/or mottled brown/grey silty clay till.

In boreholes 11, 12, 15, 16, 19, 20, 22, 23, 24, 25 and 27, asphaltic concrete, varying in thickness from 75 to 230 millimetres was encountered from the road surface. Underlying the asphalt in these boreholes and from the ground surface in boreholes 10, 13, 14, 17, 18, 21, 26 and 28, crushed granular base material was encountered. The granular base material varied in thickness from 150 millimetres to greater than 1080 millimetres at the borehole locations. The granular base material was generally compact to very dense in relative density with 'N' values, as determined from standard penetration testing carried out within the granular base material varying from 14 to greater than 100 blows per 0.3 metres. The water content of samples of the granular base material was typically about 3.5 per cent.

Underlying the granular base material in borehole 11 and 23 and the silty sand and gravel fill in borehole 27, black clayey topsoil about 250 millimetres to 310 millimetres in thickness was encountered. The water content of samples of the topsoil was typically about 18 per cent.

Underlying the granular base materials in boreholes 10, 13, 15, 17, 20, 21, 27 and 28, fill materials about 150 to 610 millimetres in thickness were encountered. The fill materials varied in composition from silty sand to fine sand to silty clay fill. Measured 'N' values in the fill material ranged from 9 to 49 blows per 0.3 metres with corresponding water contents of about 4 to 22 per cent.

Blue/Green organic silty clay was encountered underlying the granular base in borehole 18 on the fine sand fill in boreholes 19 and 20. Measured 'N' values in the organic silty clay varied from 10 to 49 blows per 0.3 metres with water contents of between 9 and 25 per cent.

With the exception of boreholes 18, 19, 20 and 24, the boreholes were terminated in mottled brown and grey silty clay till. Standard penetration test 'N' values, measured in the silty clay till varied from 11 to 52 blows per 0.3 metres with corresponding water contents of 15 to 21 per cent.

The boreholes remained dry and open during the drilling operations.

5.0 DISCUSSION

5.1 General

The following section of the report presents our interpretation of the factual information obtained from the investigation and is intended only for use by the design engineers. Where comments are made on construction, they are provided only in order to highlight aspects of construction which could potentially affect the design of the project. Contractors bidding on or undertaking any work at the site should examine the factual results of the investigation, satisfy themselves as to the adequacy of the information for construction and make their own interpretation of the factual data as it affects their proposed construction techniques, schedule, equipment capabilities, costs, sequencing and the like.

Our professional services for this assignment address only the geotechnical (physical) aspects of the subsurface conditions at the site. The geo-environmental (chemical) aspects, including the consequences of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off site sources are outside the terms of reference of this report and have not been investigated or addressed.

As indicated, it is proposed to reconstruct Manning Road, from Lanoue Street to Sylvestre Drive from the present two lane roadway with turning lanes into a four lane roadway with additional turning lanes at intersections. In addition to the roadway reconstruction, the existing drainage ditches on the east side and west side of Manning Road from Lanoue Street to Sylvestre Drive will likely be enclosed to accommodate the road widening.

5.2 Pavement Reconstruction

Prior to pavement reconstruction, the existing asphalt should be removed. The underlying granular materials may be carefully reclaimed but should not be used in the pavement reconstruction works. The existing topsoil, deleterious fill materials, softened and/or loosened native soils should be removed from within the limits of the proposed roadway. The exposed subgrade should be heavily proof-rolled with a non-vibratory steel wheel roller under the direction of the geotechnical engineer. Any excessively softened areas identified during this operation should be subexcavated and backfilled with an approved granular material such as OPSS Granular 'A' or Granular 'B', Type II placed in maximum 300 millimetre thick loose lifts uniformly compacted to at least 100 per cent of standard Proctor maximum dry density.

For design purposes, Manning Road may be classified as a major collector roadway, having a corresponding maximum Benkelman beam design limiting rebound of 1.2 millimetres. The design limiting rebound can probably be achieved using a pavement structure consisting of 125 millimetres of asphalt and 500 millimetres of Granular 'A'.

The Granular 'A' base material should be placed in loose lifts not exceeding 250 millimetres and should be uniformly compacted to 100 per cent of standard Proctor maximum dry density. The asphaltic materials should be produced and placed in accordance with OPSS specifications and be comprised of Medium Duty Binder Course (MDBC) and HL 1 surface course asphalts.

It is recommended that continuous subdrains be installed along the edges of the roadway. The subdrains should be keyed into the subgrade, bedded in properly graded granular material and sloped to promote drainage to the catch basins.

5.3 Enclosing Existing Ditches

It is understood that the existing drainage ditches on each side of Manning Road might potentially be replaced with precast concrete culverts to allow widening of the road. Prior to construction of the culverts, all organic, loosened and/or softened material should be removed from the base and sides of the ditch. A levelling pad of granular material about 200 millimetres thick should be placed on the base of the excavation and should be compacted to at least 95 per cent of standard Proctor maximum dry density.

Backfill of the culvert may utilize Granular 'A' or 'B' materials placed in 250 millimetre thick loose lifts and uniformly compacted to 95 per cent of standard Proctor maximum dry density. Fill material placed on top of the culvert or within 1 metre of the road surface should be compacted to at least 98 per cent of standard Proctor maximum dry density.

5.4 Construction Inspection and Testing

To ensure that construction is carried out in a manner consistent with the intent of and the recommendations set forth in this report, a program of geotechnical inspection and testing should be developed and implemented throughout construction. In addition, related laboratory testing should be carried out in conjunction with the field work to monitor compliance with the various material and project specifications.

We trust this report is sufficient for your present purpose. If you have any questions or if we may be of any assistance during the construction stage, do not hesitate to contact this office.

GOLDER ASSOCIATES LTD.

Brent Gusba, P. Eng.

James D. Rodger, P. Eng.
Principal

Attachments
Table I, Record of Boreholes
Figures 1 and 2

BG/JDR:bg/se
N:\ACTIVE\2004\140000\041-140008 MANNING ROAD WIDENING\RPT-040520-GEOTECHNICAL INVESTIGATION-BG.DOC

TABLE I
RECORD OF BOREHOLES
MANNING ROAD RECONSTRUCTION
LANOUE STREET TO SYLVESTRE DRIVE TECUMSEH, ONTARIO

BOREHOLE	DEPTH (mm)	STRATIGRAPHY	WATER CONTENT (%)	'N' (Blows per 0.3 m)	REMARKS
10	0 - 150	Crushed Granular Base **(FILL)**			Borehole remained dry during drilling.
	150 - 300	Brown/Black Silty Sand, trace Sand and Gravel **(FILL)**			
	300 - 460	Loose Crushed Granular Base **(FILL)**			
	460- 760	Stiff Mottled Brown and Grey Silty Clay, some Sand, and Pockets of Topsoil **(FILL)**		8	
	760 - 1520	Stiff Mottled Brown/Grey **SILTY CLAY**, trace Sand and Gravel **(TILL)**		11	
11	0 - 110	Asphalt			Borehole remained dry during drilling.
	110 - 510	Crushed Granular Base **(FILL)**			
	510 - 760	Black **CLAYEY TOPSOIL**			
	760 - 1220	Very Stiff Mottled Brown/Grey **SILTY CLAY**, trace Sand and Gravel **(TILL)**		15	
12	0 - 170	Asphalt			Borehole remained dry during drilling.
	170 - 910	Compact Crushed Granular Base **(FILL)**	4.2, 5.7	15	
	910 - 1520	Stiff Mottled Brown/Grey **SILTY CLAY**, trace Sand and Gravel, with trace Organics **(TILL)**	16.4	13	
13	0 - 300	Crushed Granular Base **(FILL)**			Borehole remained dry during drilling.
	300 - 910	Stiff Mottled Brown and Grey Silty Clay, trace Sand and Gravel, and Organic Pockets **(FILL)**		14	
	910 - 1520	Very Stiff Mottled Brown/Grey **SILTY CLAY**, trace Sand and Gravel **(TILL)**		18	

TABLE I
RECORD OF BOREHOLES
MANNING ROAD RECONSTRUCTION
LANOUE STREET TO SYLVESTRE DRIVE TECUMSEH, ONTARIO

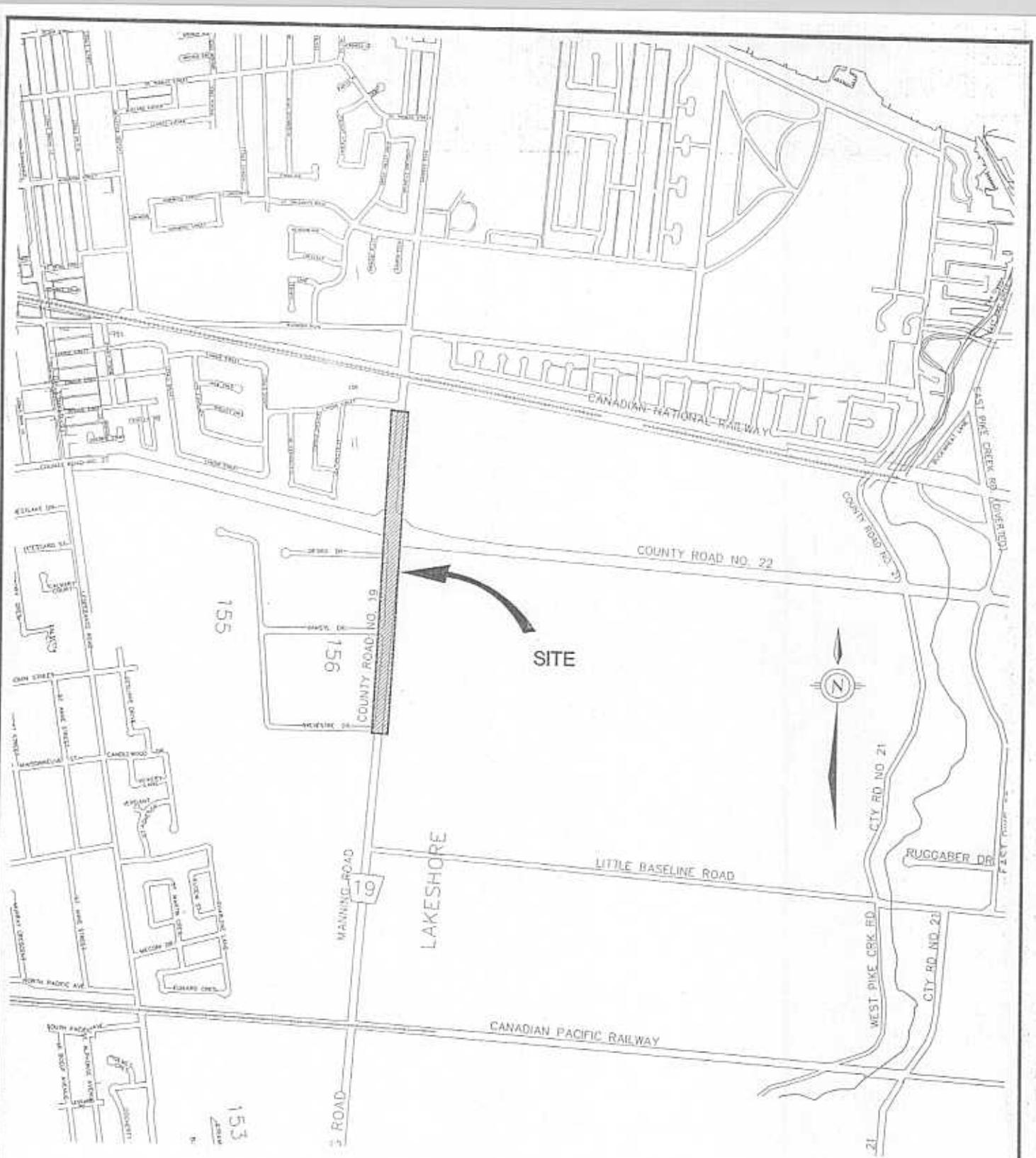
BOREHOLE	DEPTH (mm)	STRATIGRAPHY	WATER CONTENT (%)	'N' (Blows per 0.3 m)	REMARKS
14	0 - 300	Crushed Granular Base **(FILL)**	3.5		Borehole remained dry during drilling.
	300 - 1520	Stiff to Very Stiff Mottled Brown/Grey **SILTY CLAY**, trace Sand and Gravel, with trace Organics **(TILL)**	19.6, 18.4	10 to 21	
15	0 - 100	Asphalt			Borehole remained dry during drilling.
	100 - 760	Compact Crushed Granular Base **(FILL)**		19	
	760 - 910	Very Stiff Silty Clay, trace Sand and Gravel, some Organic Material **(FILL)**			
	910 - 1520	Very Stiff Mottled Brown/Grey **SILTY CLAY**, trace Sand and Gravel **(TILL)**		22	
16	0 - 150	Asphalt			Borehole remained dry during drilling.
	150 - 660	Compact Crushed Granular Base **(FILL)**	5.3		
	660 - 1220	Stiff Mottled Brown/Grey **SILTY CLAY**, trace Sand and Gravel **(TILL)**	14.7	13	
17	0 - 300	Crushed Granular Base **(FILL)**			Borehole remained dry during drilling.
	300 - 790	Loose Brown Silty Sand and Gravel with thin Silty Clay Layers **(FILL)**	18.2, 22.3	9	
	790 - 1520	Stiff to Very Stiff Mottled Brown/Grey **SILTY CLAY**, trace Sand and Gravel **(TILL)**	20.0	17	
18	0 - 610	Compact Brown Sand and Gravel (FILL)	7.6		Borehole remained dry during drilling.
	610 - 910	Compact Crushed Granular Base **(FILL)**	3.6	22	
	910 - 1520	Stiff Mottled Blue/Green **SILTY CLAY**, trace Sand and Gravel, with trace Organics	24.9	10	

TABLE I
RECORD OF BOREHOLES
MANNING ROAD RECONSTRUCTION
LANOUE STREET TO SYLVESTRE DRIVE TECUMSEH, ONTARIO

BOREHOLE	DEPTH (mm)	STRATIGRAPHY	WATER CONTENT (%)	'N' (Blows per 0.3 m)	REMARKS
19	0 - 150	Asphalt			Borehole remained dry during drilling.
	150 - 760	Very Dense Crushed Granular Base (FILL)	2.9	65	
	760 - 1220	Dense to Very Dense Brown Fine Sand, trace Gravel (FILL)	11.0	49	
	1220 - 1520	Hard Blue/Green Silty Clay, some Sand (FILL)	9.2	49	
20	0 - 150	Asphalt			Borehole remained dry during drilling.
	150 - 710	Compact Crushed Granular Base (FILL)	3.0, 11.1		
	710 - 910	Compact Brown Fine Sand, trace Gravel (FILL)		28	
	910 - 1220	Very Stiff Blue/Green Silty Clay, trace Sand and Gravel, Granular and Organic Pockets (FILL)	22.0	28	
21	0 - 910	Compact Crushed Granular Base (FILL)	2.4, 3.3	17	Borehole remained dry during drilling.
	910 - 1220	Very Stiff Brown Silty Clay, trace Sand and Gravel (FILL)	13.0	20	
	1220 - 1520	Very Stiff Mottled Brown/Grey SILTY CLAY, trace Sand and Gravel (TILL)	21.5	20	
22	0 - 230	Asphalt	1.6		Borehole remained dry during drilling.
	230 - 910	Very Dense Crushed Granular Base (FILL)	2.3		
	910 - 1220	Hard Mottled Brown/Grey SILTY CLAY, trace Sand and Gravel, with trace Organics (TILL)	15.7	52	
23	0 - 190	Asphalt	2.3		Borehole remained dry during drilling.
	190 - 910	Very Dense Crushed Granular Base (FILL)	3.8	119	
	910 - 1220	Hard Black Clayey TOPSOIL	18.3	37	
	1220 - 1520	Hard Mottled Brown/Grey SILTY CLAY, trace Sand and Gravel (TILL)		37	

TABLE I
RECORD OF BOREHOLES
MANNING ROAD RECONSTRUCTION
LANOUE STREET TO SYLVESTRE DRIVE TECUMSEH, ONTARIO

BOREHOLE	DEPTH (mm)	STRATIGRAPHY	WATER CONTENT (%)	'N' (Blows per 0.3 m)	REMARKS
24	0 - 140	Asphalt	4.9		Borehole remained dry during drilling.
	140 - 1220	Dense Crushed Granular Base **(FILL)**	6.1, 6.7	36	
25	0 - 220	Asphalt			Borehole remained dry during drilling.
	220 - 1070	Crushed Granular Base **(FILL)**	5.1		
	1070 - 1370	Mottled Brown/Grey **SILTY CLAY**, trace sand and Gravel **(TILL)**	17.8		
26	0 - 1070	Crushed Granular Base **(FILL)**		14	Borehole remained dry during drilling.
	1070 - 1220	Very Stiff Mottled Brown/Grey **SILTY CLAY**, trace Sand and Gravel **(TILL)**			
27	0 - 75	Asphalt			Borehole remained dry during drilling.
	75 - 300	Crushed Granular Base **(FILL)**	3.5		
	300 - 610	Compact Brown Silty Sand and Gravel, mixed with crushed Granular **(FILL)**	4.3	23	
	610 - 910	Black Clayey **TOPSOIL**	16.7	23	
	910 - 1520	Very Stiff Mottled Brown/Grey **SILTY CLAY**, trace Sand and Gravel **(TILL)**	18.4	28	
28	0 - 300	Crushed Granular Base **(FILL)**	3.2		Borehole remained dry during drilling.
	300 - 760	Stiff Brown Silty Clay, trace Sand and Gravel **(FILL)**	12.4	9	
	760 - 1520	Very Stiff Mottled Brown/Grey **SILTY CLAY**, trace Sand and Gravel **(TILL)**	20.8, 20.6	22	



PROJECT

R. LUCENTE ENGINEERING INC.
PROPOSED MANNING RD. WIDENING FROM
LANOUE ST TO SYLVESTRE DR., TECUMSEH, ONTARIO

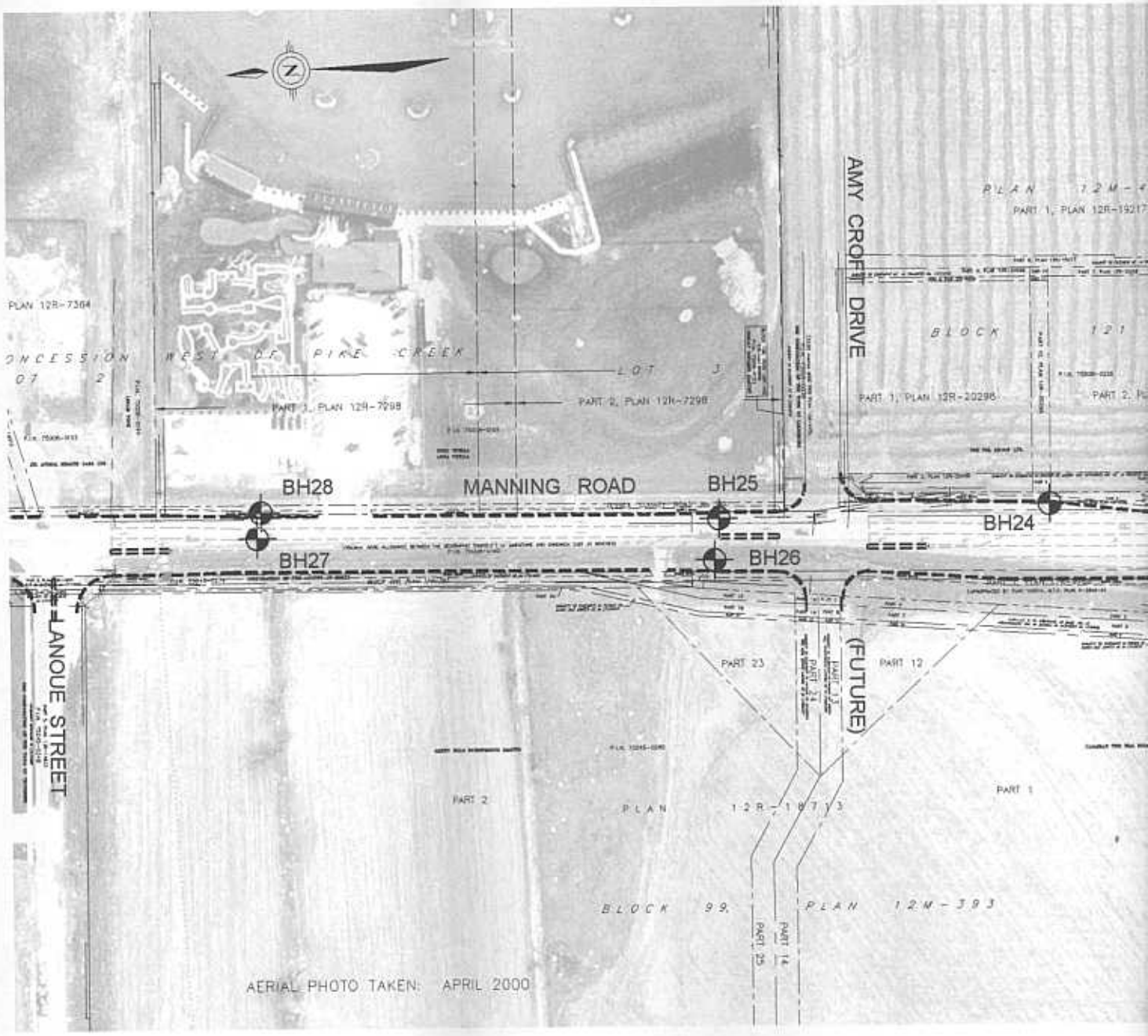
TITLE

KEY PLAN

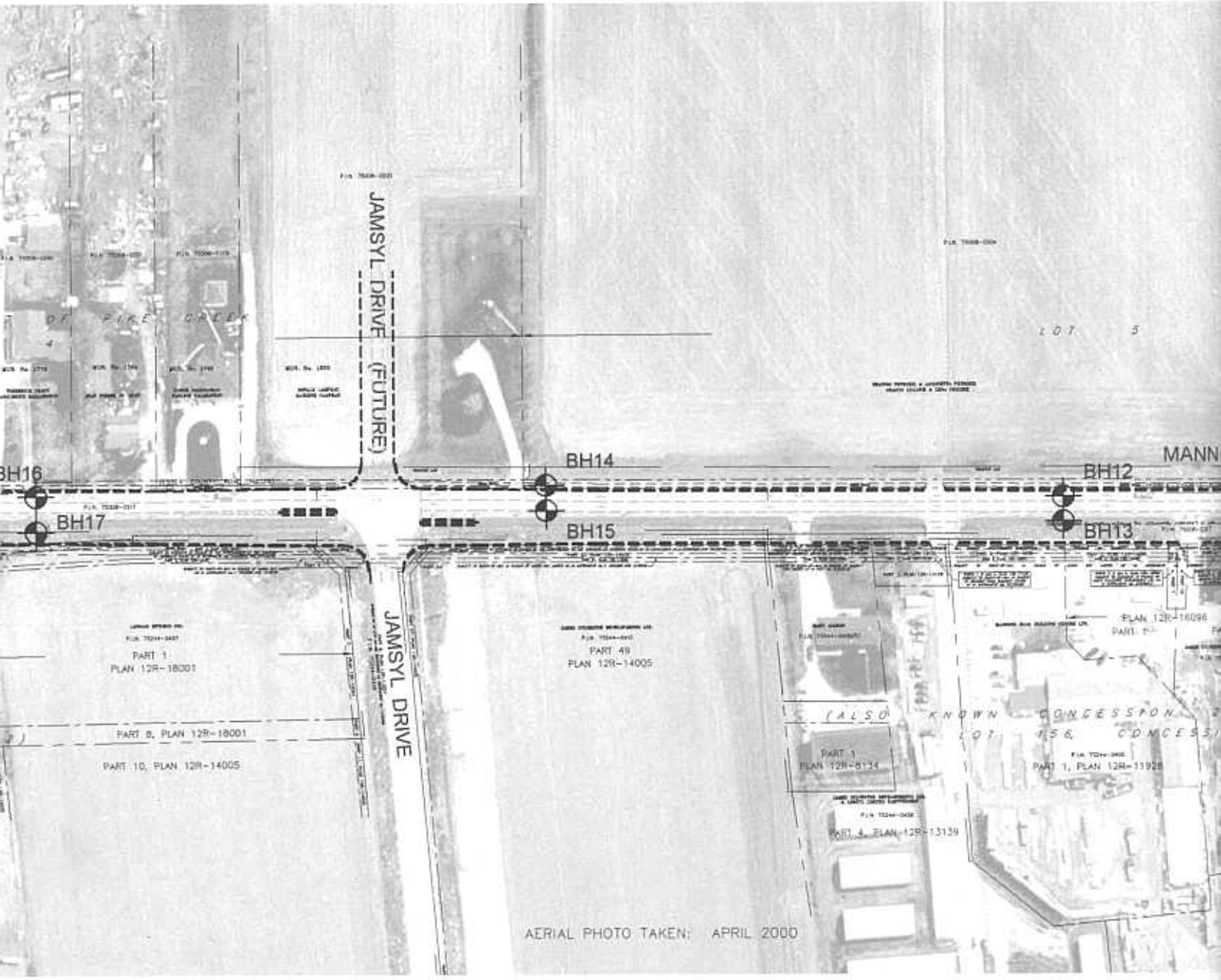
Golder Associates
Windsor, Ontario

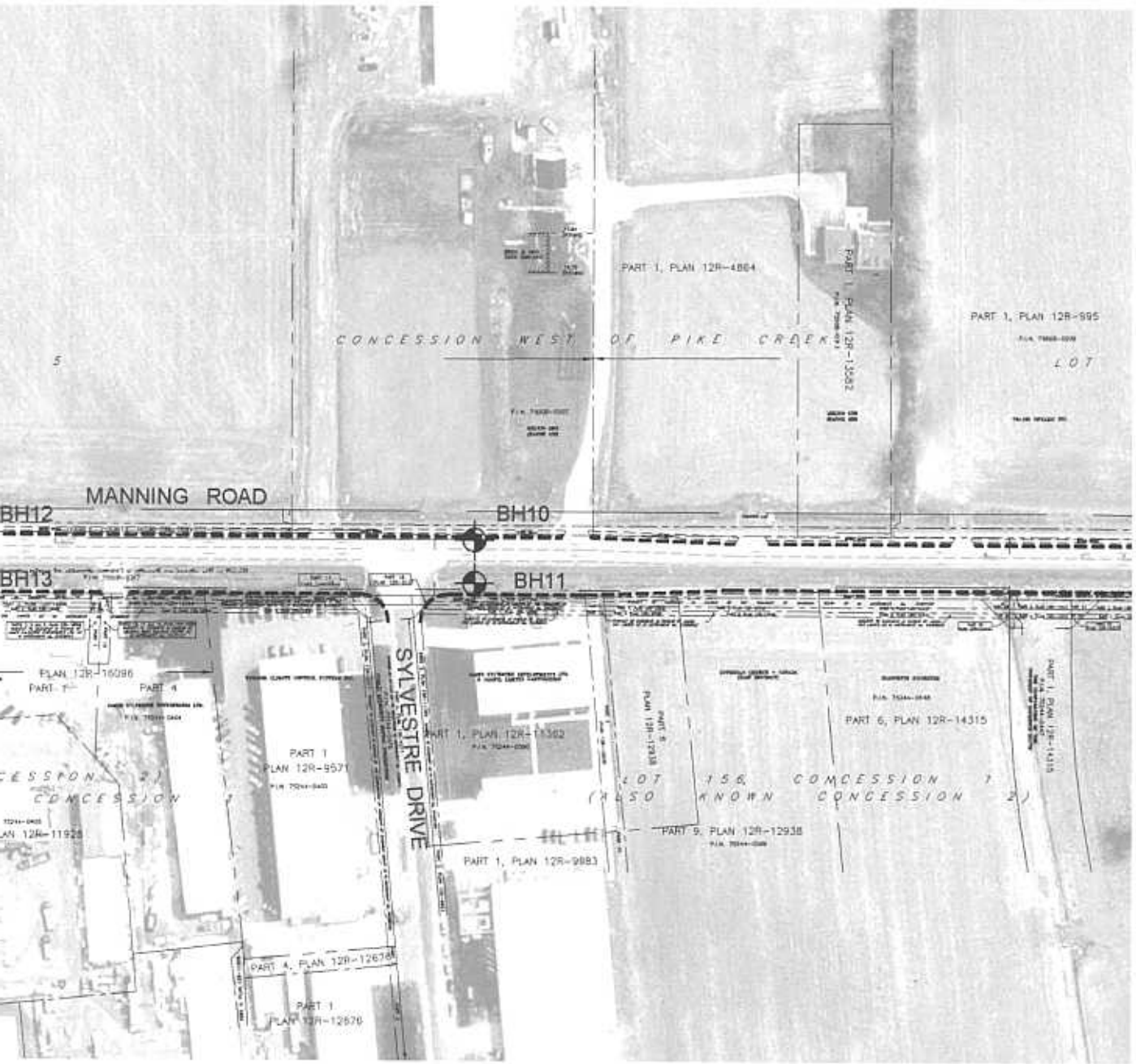
PROJECT No.	041-140005	FILE No.	041140005D002.dwg
DESIGN		SCALE	N.T.S. REV. 0
CADD	T.M. APR/30/04		
CHECK			FIGURE 1
REVIEW			

Drawing file: 041140005D002.dwg Apr 30, 2004 - 11:17am




ESSEX COUNTY ROAD 22
MANNING ROAD
BH21
BH22
BH23
BH18
BH19
BH20
BH16
BH17
DESRO DRIVE
PART 2, PLAN 12R-20298
PART 1
PLAN 12R-9749
PART 4
PLAN 12R-10047
PART 2
PLAN 12R-9267
PART 3
PLAN 12R-10047
PART 7
PLAN 12R-10051
PART 21
CONCESSION WEST OF
LOT 4
(ALSO KNOWN CONCESSION
LOT 156 CONDESSION


JAMSYL DRIVE (FUTURE)
BH16
BH17
BH14
BH15
BH12
BH13
MANN
JAMSYL DRIVE
PART 1
PLAN 12R-18001
PART 8, PLAN 12R-18001
PART 10, PLAN 12R-14005
PART 49
PLAN 12R-14005
PART 1
PLAN 12R-8134
PART 4, PLAN 12R-13139
PLAN 12R-16096
PART 1, PLAN 12R-11928
AERIAL PHOTO TAKEN: APRIL 2000



LEG

NOT

THIS D
ACCOM

ALL LO

REF

CAD F
R. LU
RECEV

PROJECT

LAN

TITLE

LEGEND

BOREHOLE LOCATION

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT.

ALL LOCATIONS APPROXIMATE.

REFERENCES

CAD PLAN SUPPLIED BY:
R. LUCENTE ENGINEERING INC.
RECEVIED: APRIL 14, 2004

40 0 40
SCALE: 1:2000 METRES

PROJECT
R. LUCENTE ENGINEERING INC.
PROPOSED MANNING RD. WIDENING FROM
LANOUE ST. TO SYLVESTRE DR., TECUMSEH, ONTARIO

TITLE
LOCATION PLAN

Golder Associates
Windsor, Ontario

PROJECT No.	041-140006	File No.	04114000B0001.dwg
DESIGN		SCALE	AS SHOWN REV. 0
CADD	T.M. APR/30/04		
CHECK			FIGURE 2
REVIEW			