

**APPENDIX A**  
**DRAFT INTERIM REPORT - PAVEMENT ENGINEERING**  
**DETROIT RIVER INTERNATIONAL CROSSING**

**APPENDIX A**

**DRAFT INTERIM REPORT ON**

**PAVEMENTS ENGINEERING  
DETROIT RIVER INTERNATIONAL CROSSING  
WINDSOR, ONTARIO**

**DRAFT**

Submitted to:

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August 2005

05-1140-003

## **INTRODUCTION**

This report summarizes the background information on the subsurface conditions pertaining to pavement engineering in the Windsor area in support of the Environmental Assessment being undertaken for the proposed Detroit River International Crossing transportation corridors. A group of consulting firms, lead by URS Corporation, is completing the study under contract to the Ministry of Transportation, Ontario. The Ministry of Transportation, Ontario is one of the four principal members of an international partnership organized to study potential transportation corridors to permit more efficient transit of travelers and goods between the highway systems in the Windsor and Detroit metropolitan areas. Other members of the partnership include Transport Canada (TC), the United States Federal Highway Administration (US FHWA), and the State of Michigan Department of Transportation (MDOT).

### **Proposed Project**

It is understood that current and projected cross-border traffic conditions in the greater Detroit and Windsor areas are such that a new river crossing is needed. The project will generally consist of either upgrading of existing transportation routes or building of new roadways to connect Provincial Highway 401 in Ontario with the interstate highway system surrounding Detroit. This connection will require either a bridge or tunnel crossing of the Detroit River and has the potential to include multiple overpass or underpass bridge structures associated with interchanges or grade separations along the connecting routes. Consideration may also be given to roadway sections lowered between retaining structures to achieve grade separations and which may minimize the effects of the corridor on surrounding areas. At this time, the details of the crossing facilities, locations, and corridors to and from the regional highways have not been established.

The general study area is illustrated on Figure 1.

### **Scope of Report**

The scope of this report is to compile, review and provide a summary of the background information related to the subsurface conditions in the context of feasibility evaluation, route selection, and environmental assessment for the pavement engineering component of the proposed project. No subsurface investigations were conducted for this report and all subsurface data has been gathered from existing internal and published sources.

## **SUBSURFACE DATA REVIEW**

Existing subsurface data was compiled and used to develop the soil classification maps described in this report. Information was gathered from Ministry of Transportation Ontario files (through the GEOCREs system), Golder Associates project files, Ontario Ministry of Natural Resources (MNR), and published papers and books. These data were used to assist in building an electronic database of subsurface information, and map the soil classification throughout the Windsor area at the following approximate intervals of depth: 0.3, 1.5, 3.0, and 6.0 metres below existing ground surface at the borehole locations.

Subsurface data existing in Golder Associates and the Ministry of Transportation Ontario (MTO) GEOCREs library files for projects completed in Windsor and surrounding areas over the last 40 years were reviewed for this project using the following criteria:

- Available boreholes and test pits drilled or excavated from ground surface to a minimum depth of 3 metres, and
- One representative borehole or test pit per minimum area of 0.25 square kilometres, where available, within the City of Windsor and Towns of LaSalle and Tecumseh.

The resultant data base is provided in Appendix A-I.

## **GEOLOGY OF THE WINDSOR AREA**

The subsurface conditions in the Windsor area are characterized by regionally extensive, flat-lying soil including:

- Surface layers of miscellaneous fill materials at localized areas, associated with industrial and urban growth,
- Native deposits of sand and silt present at or near the surface in some locations, particularly in the west end of the City of Windsor and Town of LaSalle,
- Beneath the sand, where present, extensive deposits of clayey silt to silty clay,
- Bedrock throughout the study area is generally encountered at depths of 20 to 35 metres.

Figure 2 illustrates the general surficial sedimentary geology of the study area based on geologic interpretation of widely-spaced sample locations and an understanding of geomorphologic

processes. When reviewing this figure, it should be noted that only the natural sediments encountered closest to the surface are identified, and that other sediments will exist beneath these.

## **Sedimentary Geology**

The study area is located in the physiographic region of Southwestern Ontario known as the St. Clair Clay Plains<sup>1</sup>. Within this region, Essex County and the southwestern part of Kent County are normally discussed as a subregion known as the Essex Clay Plain. The clay plain was deposited during the retreat of the ice sheets (late Pleisocene Era) when a series of glacial lakes inundated the area. In general, the ice sheets deposited till in the area of Windsor and Detroit. Depending on the locations of the glacial ice sheets and depths of water in the ice-contact glacial lakes, the till may have been directly deposited at the contact between the ice sheet and the bedrock or, as the lake levels rose and the ice sheets retreated and floated, the soil and rock debris within and at the base of the ice may have been deposited through the lake water (lacustrine). Glacial till, in its common usage, often indicates a very dense or hard composition resulting from consolidation and densification under the weight of the ice sheet. The mineral soil particles typically have a distribution of grain sizes ranging from cobbles to clay. However, in many areas of Windsor and Detroit, the soils described as “glacial till” were deposited through water and have a softer consistency as a result. A large end moraine of glacial till is mapped in the area of Windsor-Detroit, generally trending northwest to southeast near the outlet of Lake St. Clair as illustrated throughout Essex County near the terminus of Provincial Highway 401. In other areas, the lacustrine deposits overlie the hard glacial till. The major clay stratum, typically ranging in thickness from about 20 metres to 30 metres, exhibits a till-like structure exemplified by a random distribution of coarser particles within the primarily fine-grained silt and clay deposit (this type of deposit is also called “diamict”).

Surficial layers or pockets of more typical layered lacustrine (lake deposited) silty clay, silt, or sand may be encountered overlying the extensive stratum of “till-like” silty clay. Silt and sand deposits, on the order of 2 to 4 metres thick, are often found near the ground surface in areas near the western side of Windsor and the southwestern limits of the study area.

## **General Subsurface Conditions**

The following section describes the general subsurface conditions in the Windsor and surrounding areas, at intervals of depths of approximately 0.3, 1.5, 3.0 and 6.0 metres below existing ground surface. The information was gathered from previous geotechnical investigations by Golder Associates and others, using the criteria defined in Section 2.0. The following descriptions of the subsurface conditions are generalized and should not be interpreted to be

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<sup>1</sup> Chapman, L. J., The Physiography of Southern Ontario, 1984.

exact, nor used in the design of the pavement structure of a proposed corridor. Further detailed site specific geotechnical investigation is required once a corridor has been selected.

Beneath the topsoil and/or surficial fill materials in west Windsor and LaSalle, at a depth of approximately 0.3 metres below existing ground surface, the subsurface conditions consists of fine grained granular material, such as sand, silty sand and sandy silt. In central and east Windsor, and Tecumseh, the subsurface conditions at a depth of approximately 0.3 metres below existing ground surface generally consist of a silty clay to clayey silt, with localized areas of surficial granular soil. Figure 3 illustrates the subsurface soil conditions at an approximate depth of 0.3 metres below existing ground surface.

In general, in west Windsor and LaSalle, at a depth of approximately 1.2 to 1.5 metres below the existing ground surface, the subsurface conditions consists of a clayey silt to silty clay, with areas of granular deposits, consisting of sand, silty sand and sandy silt. In central and east Windsor and Tecumseh, the subsurface conditions at a depth of approximately 1.5 metres below existing ground surface generally consist of a clayey silt to a silty clay. Figure 4 illustrates the subsurface soil conditions at a depth of approximately 1.5 metres below existing ground surface.

At an approximate depth of 3.0 metres below existing ground surface, the subsurface conditions in the Windsor and surrounding areas generally consist of clayey silt to silty clay. However, localized areas of granular soil exist at a depth of approximately 3.0 metres below existing ground surface. Figure 5 illustrates the subsurface soil conditions at a depth of approximately 3.0 metres below existing ground surface.

At an approximate depth of 6.0 metres below existing ground surface, the subsurface conditions in the Windsor and surrounding areas generally consist of clayey silt to silty clay. Fine-grained granular material was encountered in previous investigations at a depth of about 6.0 metres below existing ground surface in the northeast corner of the study area. Figure 6 illustrates the subsurface soil conditions at a depth of approximately 6.0 metres below existing ground surface.

## **SOIL CHARACTERISTICS INFLUENCING PAVEMENT DESIGN**

The subsurface conditions as described in this report have an important influence on the design of the pavement structure for the proposed transportation corridor. Two main factors affecting roadway pavement design are:

- i) frost susceptibility of the subgrade soil which influences the design of the pavement structure component thicknesses, and
- ii) soil erodibility which influences the design of embankment surfacing and drainage ditches that may be proposed in the design of a proposed corridor.

The following comments are general and should not be used for actual design of the roadway cross-section along a proposed corridor.

### **Frost Susceptibility**

The generalized subsurface conditions at a depth of approximately 1.2 to 1.5 metres below existing ground surface, typical subgrade depths, have been categorized into categories of frost susceptibility, low, medium and high. At a depth of about 1.2 to 1.5 metres below existing ground surface, the subsurface conditions generally consist of clayey silt in the west end of Windsor, which is considered to have medium frost susceptibility. The west end of Windsor has areas of silty clay, which are considered to have low susceptibility to frost. Figure 7 illustrates the frost susceptibility of the soils at a depth of approximately 1.2 to 1.5 metres below existing ground surface in the Windsor and surrounding area.

### **Soil Erodibility**

It is anticipated that drainage ditches and embankments may be incorporated in the design of the proposed corridor. As previously indicated, the subsurface conditions in Windsor and surrounding area mainly consist of a silty clay at an approximate depth of 1.2 to 1.5 metres below existing ground surface. The areas of silty clay and localized areas of sand and silty sand are considered to be slightly erodible. However, some localized areas of clayey silt and sandy silt exist, and these are considered to be moderately erodible. Figure 8 illustrates the soil erodibility of the Windsor and surrounding area at a depth of approximately 1.2 to 1.5 metres below existing ground surface.

## **ADDITIONAL GEOTECHNICAL WORK**

This interim report has been prepared on the basis of existing background information available through a limited number of resources. The work completed for this report is not sufficient to permit preliminary or final design and must be considered within the context of feasibility study and environmental assessment. Preliminary and final design, once a preferred route or routes have been selected, will require site-specific subsurface explorations, testing, analysis, and reporting.

### **GOLDER ASSOCIATES LTD.**

André Bom, M.A.Sc., EIT

Philip R. Bedell, P.Eng.  
Principal

#### Attachments

Figures A-1 to A-8

Appendix A-1

N:\ACTIVE\PROJECTS - OTHER OFFICES\WINDSOR\2005\05-1140-003 URS - PAVEMENTS\REPORTS\05-1140-003-1\UPDATED DRAFT - DEC 17 07\APPENDIX A - INTERIM RPT\RPT-DRAFT-050711-INTERIM PAVEMENT REPORT-AB.DOC



G:\Projects\2005\05-1140-003\_DRIC\_Pavements\GIS\MXDs\Draft\July2005\_Edits\FIG1\_LOCATION\_MAP.mxd



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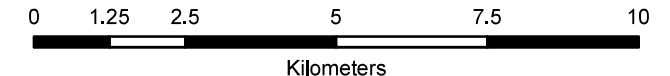
- Expressway
- Major Road
- Local Road
- Water
- ▭ Municipal Boundary

NOTE: Figure to be read in conjunction with accompanying report.

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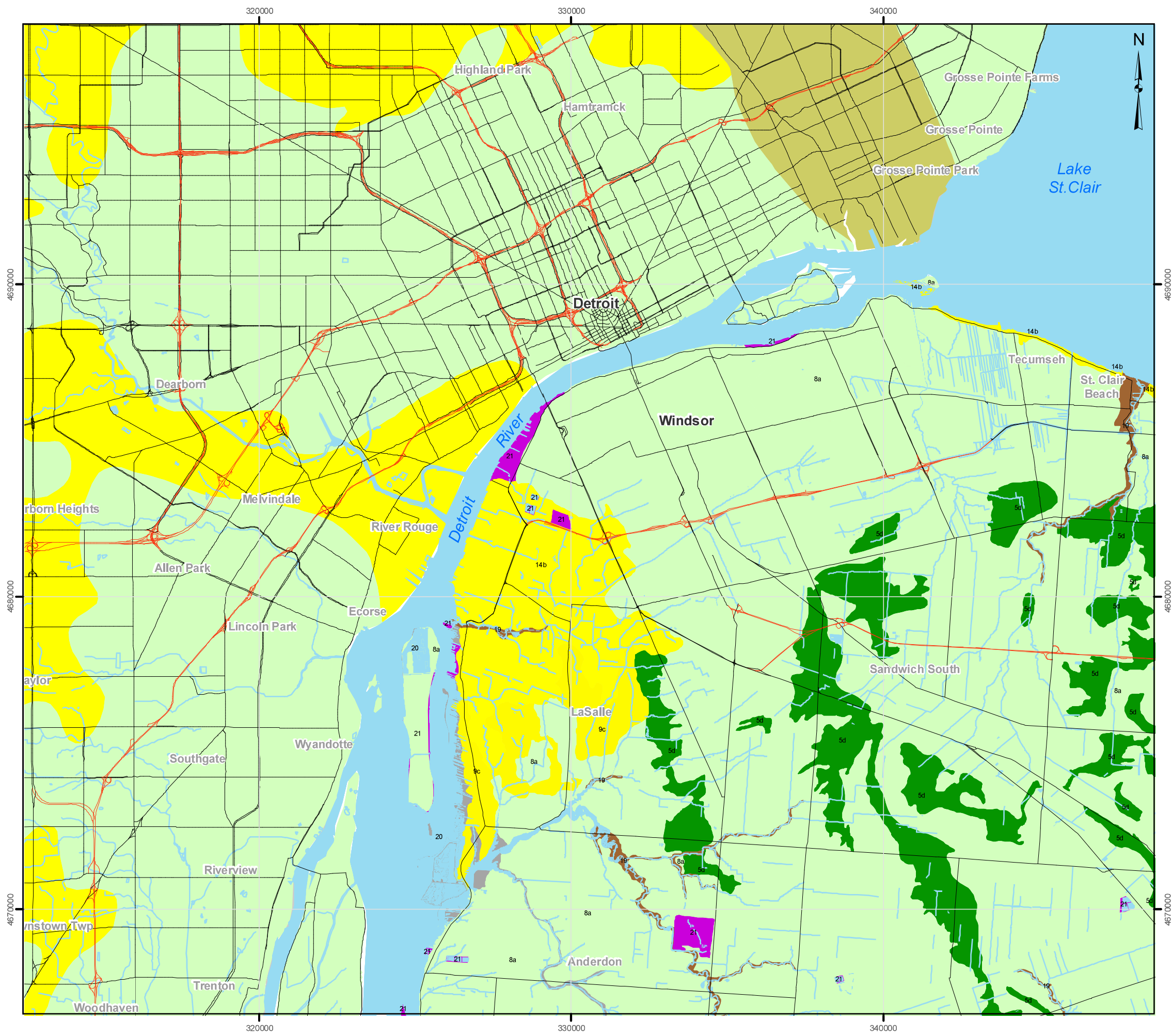


**REFERENCE**  
 Base Data - MNR NRVIS, obtained 2004, CANMAP v7.3 2003  
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 Datum: NAD 83 Projection: UTM Zone 17N



PROJECT	ROUTE PLANNING DETROIT RIVER INTERNATIONAL CROSSING CANADIAN SIDE		
TITLE	SITE LOCATION PLAN		
 Mississauga, Ontario	PROJECT No.	05-1140-003	SCALE 1:125,000
	DESIGN	AW 16 Feb. 2005	REV. 0
	GIS	CC 13 Jul. 2005	<b>FIGURE: 1</b>
	CHECK	AB 14 Jul. 2005	
	REVIEW		

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**LEGEND**

**Quaternary Geology - Ontario**

- 5d: Glaciolacustrine-derived silty to clayey till
- 8a: Massive to well laminated clayey silt to silty clay diamict
- 9c: Foreshore-basinal deposits of silty sand to sandy silt
- 14b: Littoral-foreshore deposits of silty sand to sandy silt
- 19: Modern alluvial deposits
- 20: Organic deposits
- 21: Man-made deposits

**Quaternary Geology - Michigan**

- End moraines of fine-textured till
- Lacustrine clay and silt
- Lacustrine sand and gravel

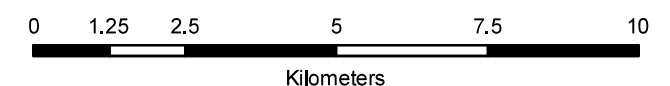
NOTE: Figure to be read in conjunction with accompanying report.


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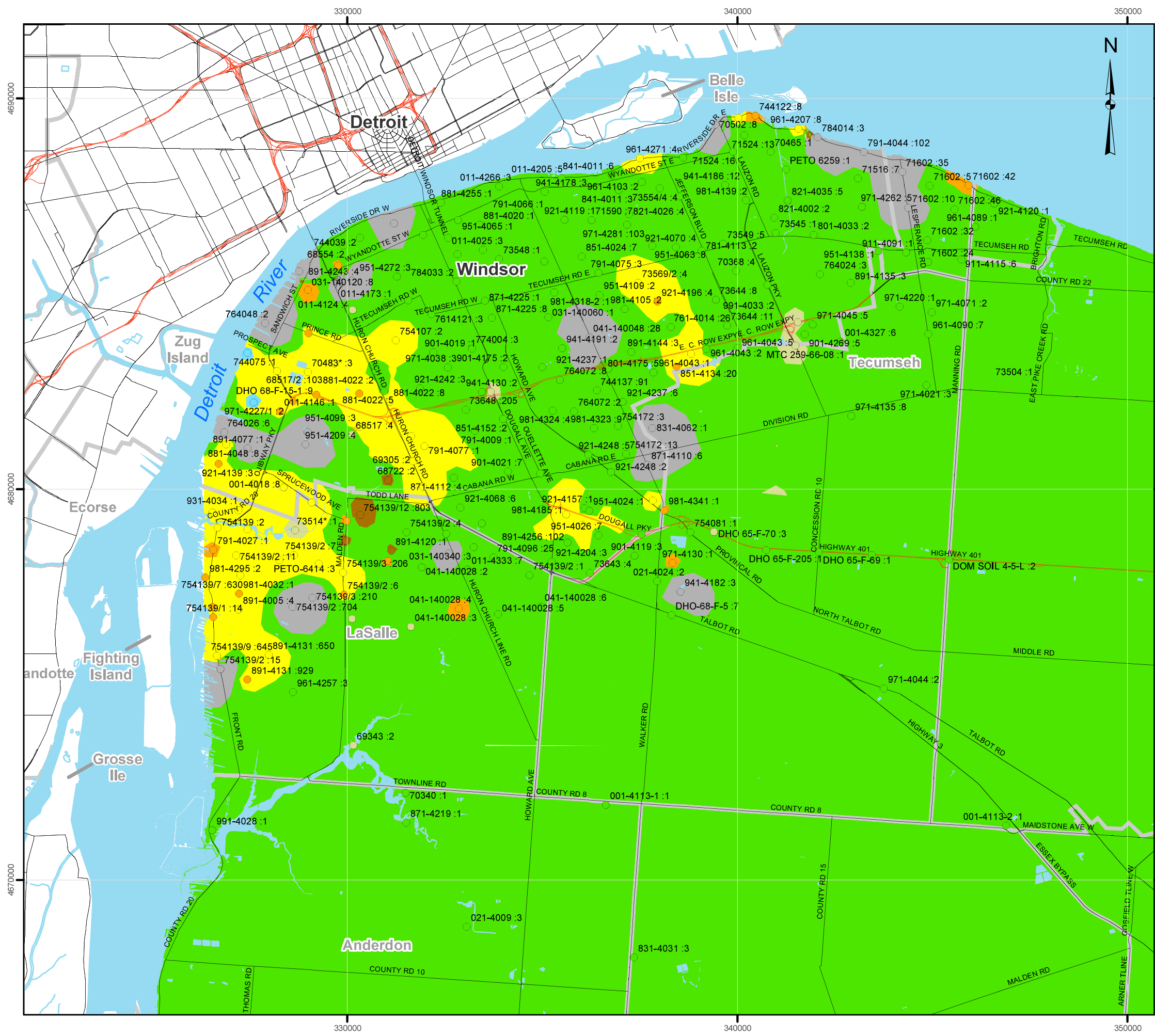
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Base Data - MNR NRVIS, obtained 2004 and CANMAP v7.3 obtained 2003, Ontario Geology - OGS digital 1:50 000, obtained 2003, Michigan Geology - downloaded from MI Geographic Data Library - 1:500000, obtained Feb. 2004. Produced by Golder Associates Ltd under licence from Ontario Ministry of Natural Resources, © Queens Printer 2005  
 Datum: NAD 83 Projection: UTM Zone 17N



PROJECT	ROUTE PLANNING DETROIT RIVER INTERNATIONAL CROSSING CANADIAN SIDE		
TITLE	QUATERNARY GEOLOGY		
 Golder Associates Mississauga, Ontario	PROJECT No.	05-1140-003	SCALE 1:125,000
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	CHECK	AB 14 Jul. 2005	<b>FIGURE: 2</b>
	REVIEW		

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**LEGEND**

- Expressway
- Major Road
- Fill
- Silt/Sandy Silt
- Silty Clay
- Clayey Silt
- Silty Sand
- Sand
- Sand and Gravel
- Water
- Municipal Boundary

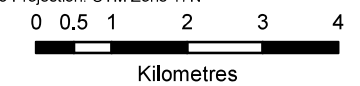
Borehole Labels: Job Number:Borehole Number

NOTE: Figure to be read in conjunction with accompanying report.

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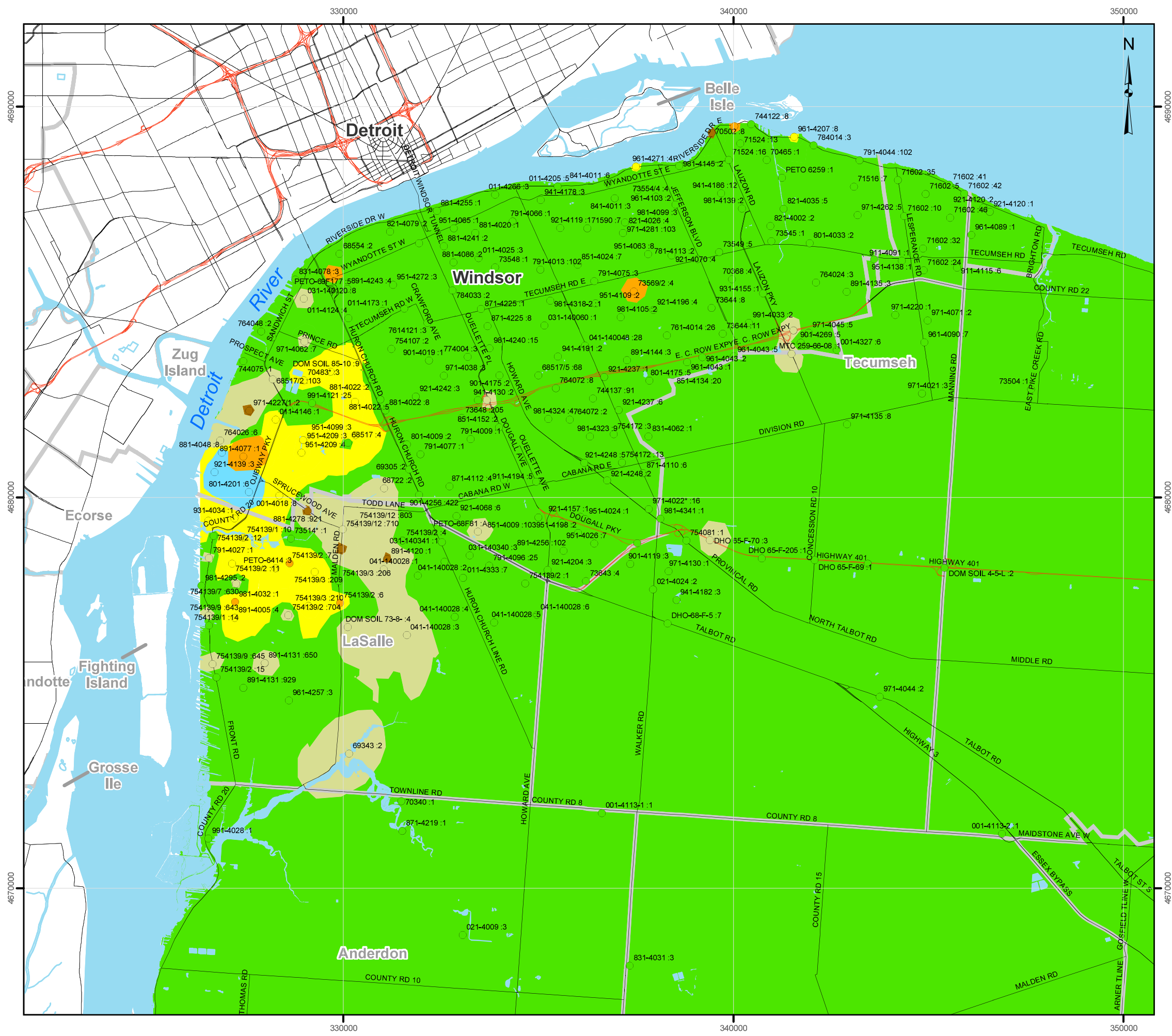


**REFERENCE**  
 Base Data - MNR NRVIS, obtained 2004, CANMAP v7.3 2003  
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 Datum: NAD 83 Projection: UTM Zone 17N



<b>PROJECT</b>	<b>ROUTE PLANNING DETROIT RIVER INTERNATIONAL CROSSING CANADIAN SIDE</b>		
<b>TITLE</b>	<b>SOIL CLASSIFICATION 0.3 M DEPTH</b>		
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	DESIGN CC 06 Jun. 2005		
	CHECK CC 17 Aug. 2005		
	REVIEW		
<b>FIGURE: 3</b>			

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**LEGEND**

- Expressway
- Major Road
- Clayey Silt
- Silty Clay
- Silt/Sandy Silt
- Silty Sand
- Sand
- Sand and Gravel
- Water
- Municipal Boundary

Borehole Labels: Job Number:Borehole Number

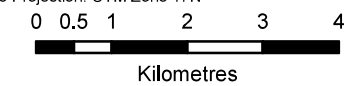
NOTE: Figure to be read in conjunction with accompanying report.

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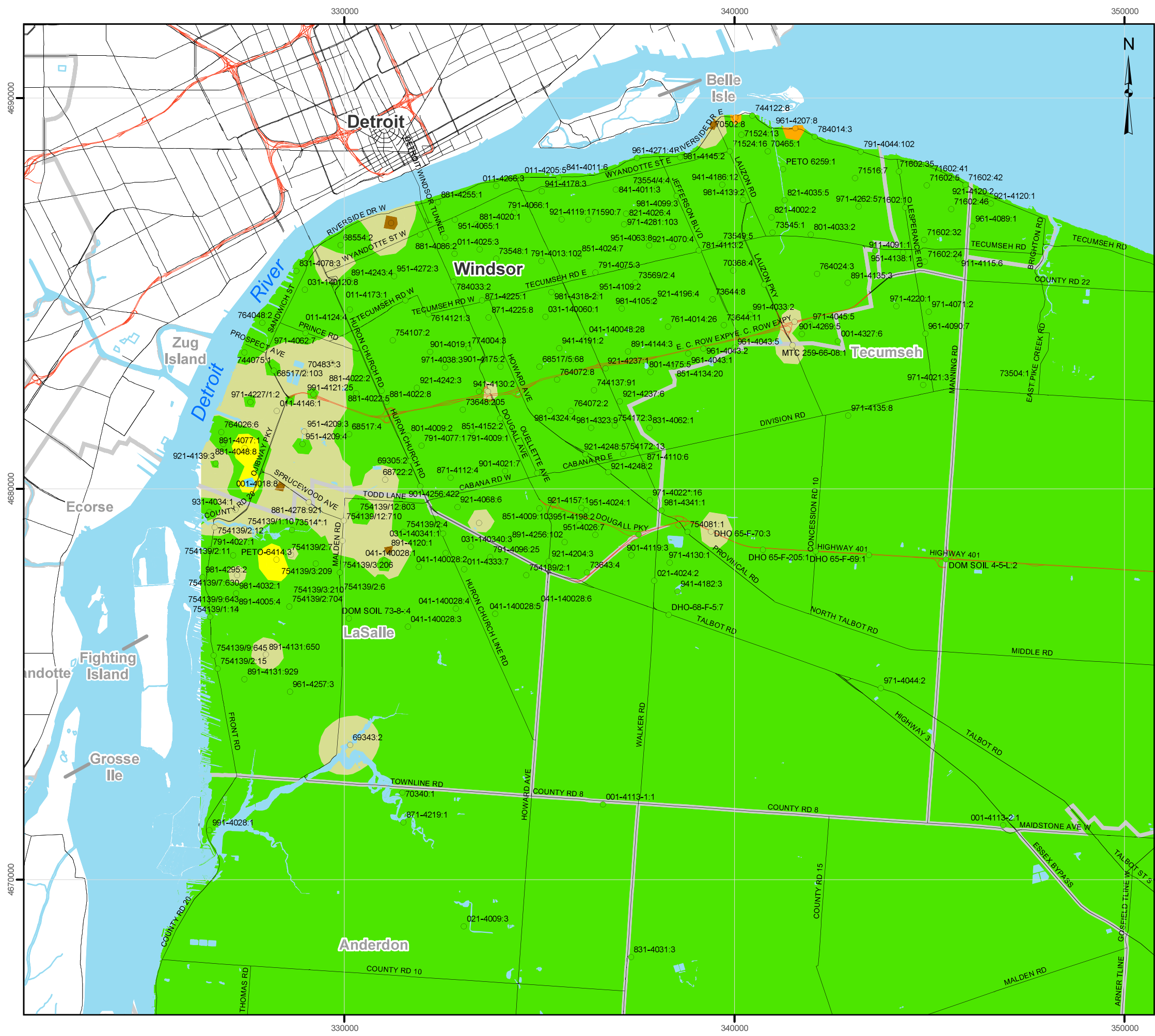
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Base Data - MNR NRVIS, obtained 2004, CANMAP v7.3 2003  
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<b>PROJECT</b>	<b>ROUTE PLANNING DETROIT RIVER INTERNATIONAL CROSSING CANADIAN SIDE</b>		
<b>TITLE</b>	<b>SOIL CLASSIFICATION 1.2 TO 1.5 M DEPTH</b>		
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	DESIGN CC 06 Jun. 2005		
	CHECK CC 17 Aug. 2005		
	REVIEW		
FIGURE: 4			

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**LEGEND**

- Expressway
- Major Road
- Clayey Silt
- Silty Clay
- Silt/Sandy Silt
- Silty Sand
- Sand
- Sand & Gravel

Borehole Labels: Job Number:Borehole Number

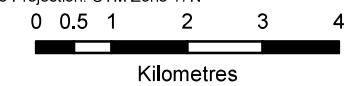
NOTE: Figure to be read in conjunction with accompanying report.

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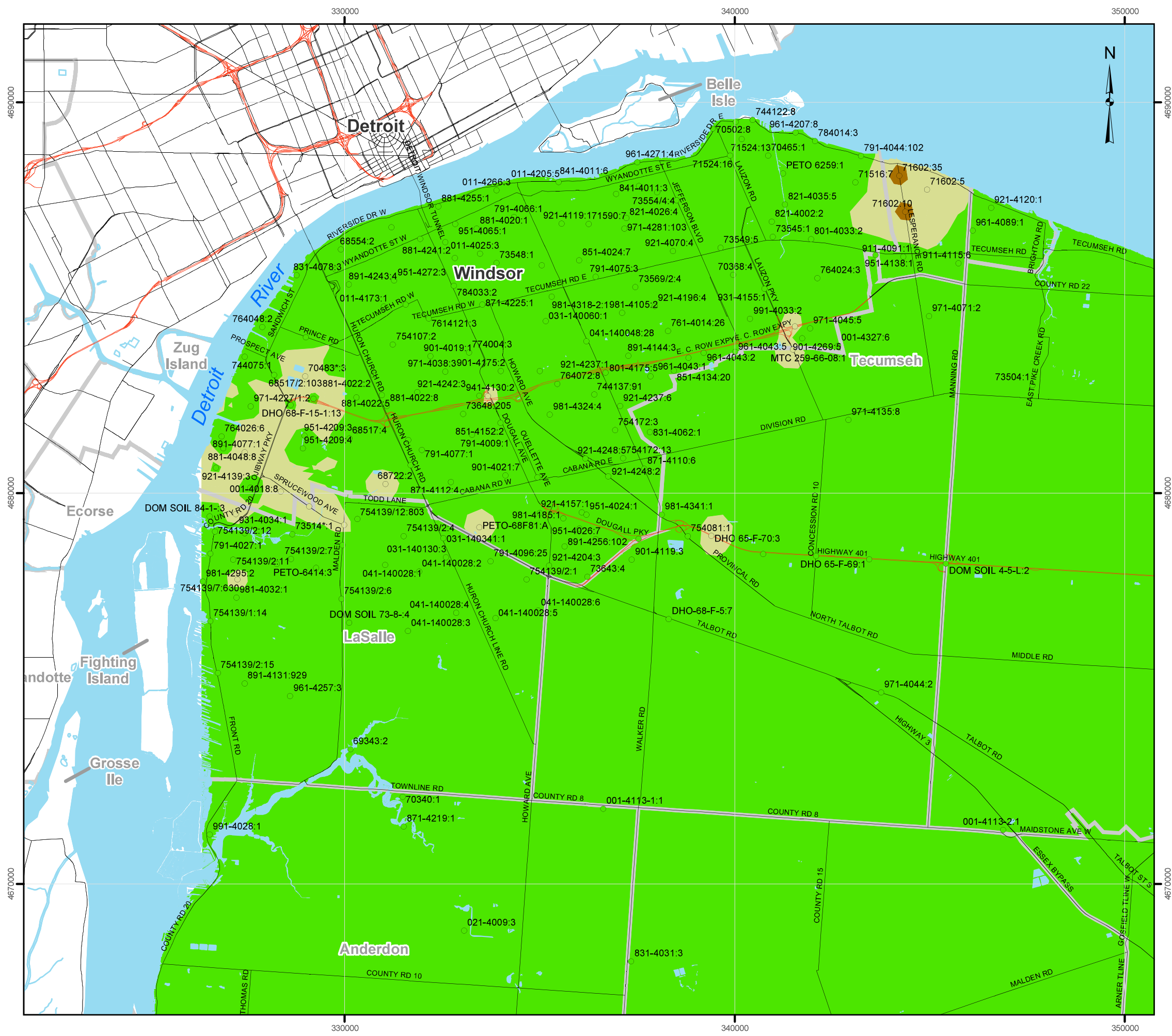
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<b>PROJECT</b>	<b>ROUTE PLANNING DETROIT RIVER INTERNATIONAL CROSSING CANADIAN SIDE</b>		
<b>TITLE</b>	<b>SOIL CLASSIFICATION 3 M DEPTH</b>		
 Golder Associates Mississauga, Ontario	PROJECT No. 05-1140-003	SCALE 1:100,000	REV. 0
	DESIGN CC 06 Jun. 2005		
	GIS CC 17 Aug. 2005		
	CHECK REVIEW		
			<b>FIGURE: 5</b>

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**LEGEND**

- Expressway
- Major Road
- Clayey Silt
- Silt/Sandy Silt
- Silty Clay
- Water
- Municipal Boundary

Borehole Labels: Job Number:Borehole Number

NOTE: Figure to be read in conjunction with accompanying report.

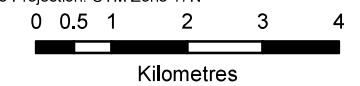
Borehole Labels: Job Number:Borehole Number

NOTE: Figure to be read in conjunction with accompanying report.



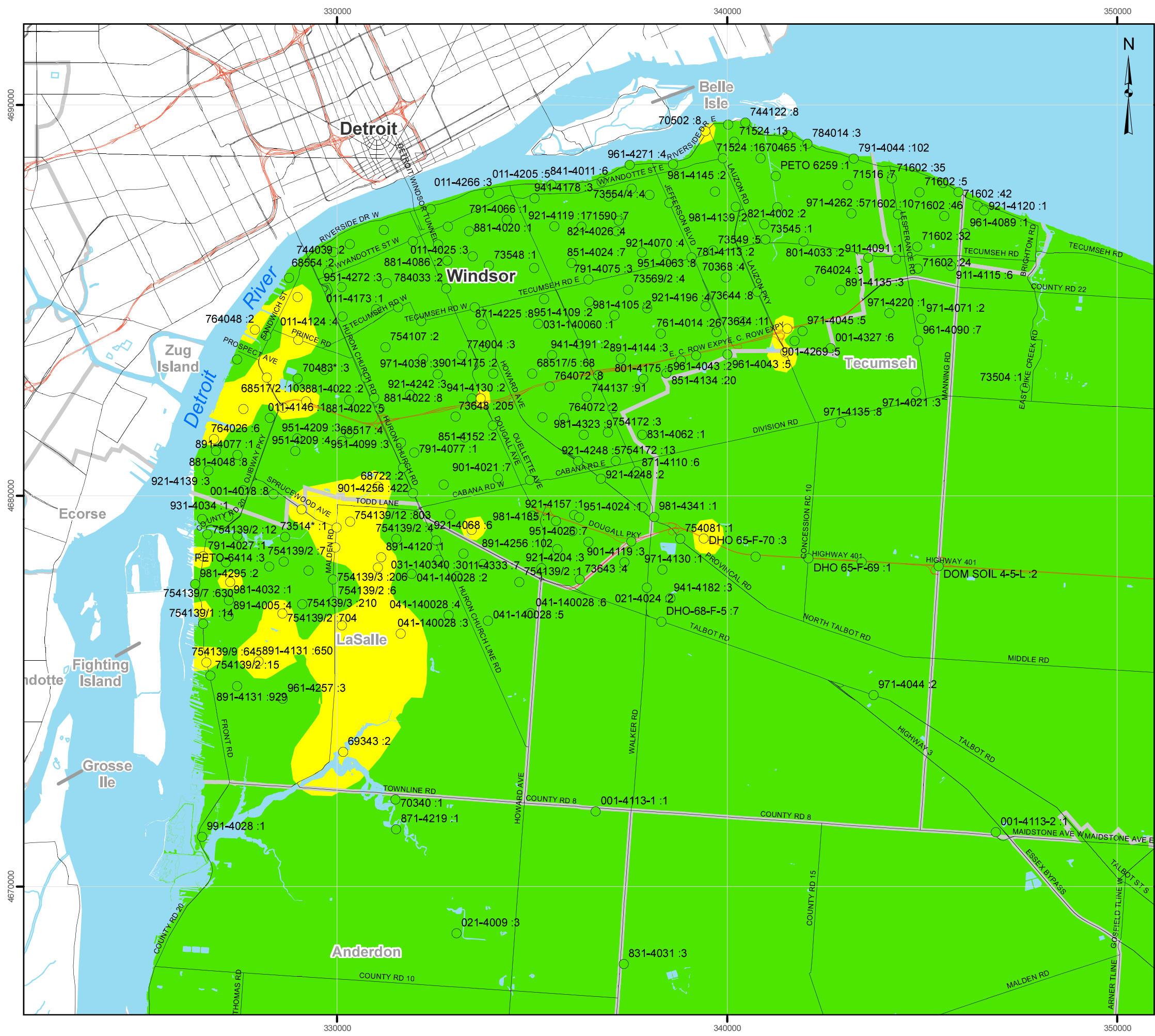
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<b>PROJECT</b>	<b>ROUTE PLANNING DETROIT RIVER INTERNATIONAL CROSSING CANADIAN SIDE</b>		
<b>TITLE</b>	<b>SOIL CLASSIFICATION 6 M DEPTH</b>		
 Golder Associates Mississauga, Ontario	PROJECT No. 05-1140-003	SCALE 1:100,000	REV. 0
	DESIGN CC 06 Jun. 2005		
	GIS CC 17 Aug. 2005		
	CHECK REVIEW		
			<b>FIGURE: 6</b>

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**LEGEND**

- Expressway
- Major Road

**Susceptibility**

- Medium
- Low
- Water
- Municipal Boundary

Borehole Labels: Job Number:Borehole Number

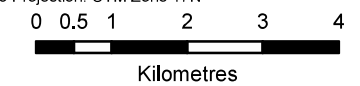
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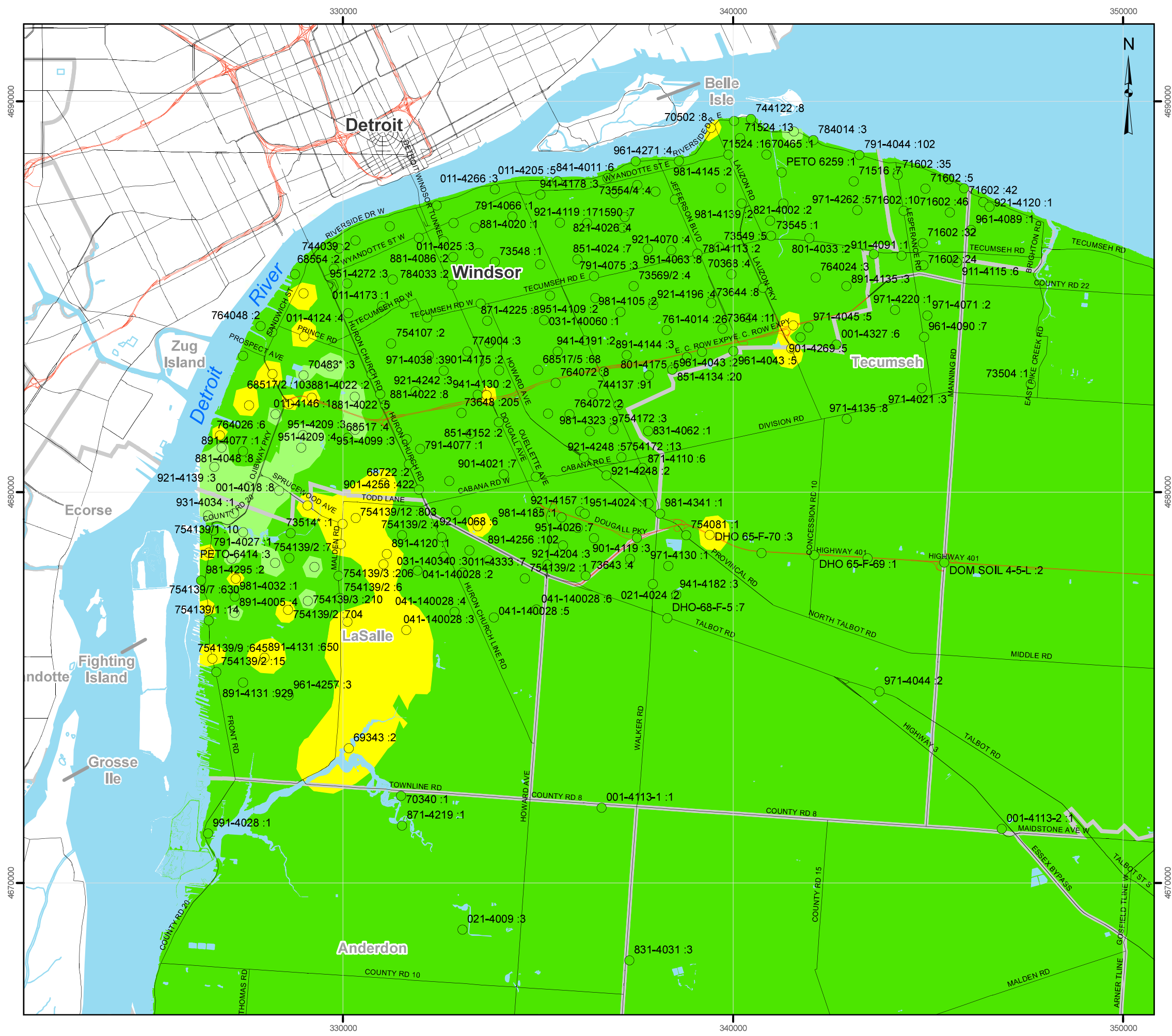
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 Datum: NAD 83 Projection: UTM Zone 17N



PROJECT	ROUTE PLANNING DETROIT RIVER INTERNATIONAL CROSSING CANADIAN SIDE		
TITLE	FROST SUSCEPTIBILITY 1.2 TO 1.5 M DEPTH		
 Golder Associates Mississauga, Ontario	PROJECT No. 05-1140-003	SCALE 1:100,000	REV. 0
	DESIGN CC 06 Jun. 2005		
	GIS CC 17 Aug. 2005		
	CHECK		
REVIEW			
			<b>FIGURE: 7</b>

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**LEGEND**

- Expressway
- Major Road

**Erodibility**

- Moderate
- Slight
- Very Slight
- Water
- Municipal Boundary

Borehole Labels: Job Number:Borehole Number

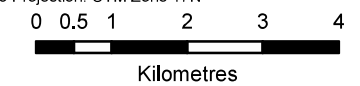
NOTE: Figure to be read in conjunction with accompanying report.

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<b>PROJECT</b>	<b>ROUTE PLANNING DETROIT RIVER INTERNATIONAL CROSSING CANADIAN SIDE</b>		
<b>TITLE</b>	<b>SOIL ERODIBILITY 1.2 TO 1.5 M DEPTH</b>		
 Golder Associates Mississauga, Ontario	PROJECT No. 05-1140-003	SCALE 1:100,000	REV. 1
	DESIGN CC 06 Jun. 2005		
	CHECK CC 17 Aug. 2005		
	REVIEW		
		<b>FIGURE: 8</b>	



**APPENDIX A-I**  
**SUBSURFACE DATABASE**

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**APPENDIX A-I**  
SUBSURFACE DATABASE

				Soil	Soil	Soil	Soil				
Job	BH # /			Classification	Classification	Classification	Classification	Frost			
#	TP #	Northing	Easting	0.3 m (1')	1.5 m (5')	3 m (10')	6 m (20')	Susceptibility	Erodibility		
				depth	depth	depth	depth	at 1.5 m depth	at 1.5 m depth		
<i>Note: bold soil classification indicates GSD carried out on a sample at about this depth</i>											
											<b>Frost</b>
											<b>Susceptibility:</b>
981-4032	1	4677335	327219	SiSa	SiSa	SiCl	SiCl	L	S		- H - High
981-4295	2	4677750	326357	SiSa	SiCl	SiCl	SiCl	L	S		- M - Medium
791-4027	1	4678463	326556	SiSa	<b>CISi</b>	SiCl	SiCl	M	M		- L - Low
754139/1	14	4676731	326555	SiSa	<b>SiCl</b>	<b>SiCl</b>	SiCl	L	S		
754139/9	643	4676989	326542	SiSa	CISi	SiCl	--	M	M		<b>Erodibility:</b>
754139/9	645	4675742	326647	Sa	CISi	SiCl	--	M	M		- VS - Very Slightly
754139/2	15	4675406	326746	Fill	SiCl	SiCl	SiCl	L	S		- S - Slightly
891-4131	929	4675134	327434	SiSa	SiCl	SiCl	SiCl	L	S		- M - Moderately
764026	6	4681463	326840	Fill	<b>CISi</b>	<b>SiCl</b>	SiCl	M	M		- H - Highly
921-4139	3	4680654	326696	SiSa	<b>Sa&amp;Gr</b>	SiCl to CISi	SiCl to CISi	L	VS		
881-4048	8	4681152	326887	Sa	<b>Sa&amp;Gr</b>	SiCl	SiCl	L	VS		
931-4034	1	4679475	327205	Sa	Sa	CISi	CISi	L	VS		
OM SOIL 84-1-W	3	4679417	326536	Sa	Sa	SiCl	SiCl	L	VS		
754139/2	12	4679032	326671	Sa	SiCl	<b>CISi</b>	<b>SiCl</b>	L	S		
754139/1	10	4678988	327437	Sa	Sa	<b>CISi</b>	<b>SiCl</b>	L	VS		
754139/2	11	4678313	327142	Sa	Sa	SiCl	SiCl	L	VS		
754139/7	630	4677798	327249	Sa	<b>CISi</b>	<b>CISi</b>	<b>CISi</b>	M	M		
891-4005	4	4676925	327211	<b>Sa</b>	<b>Sa</b>	SiCl	--	L	VS		
754139/2	704	4676996	328588	Fill	CISi	SiCl	--	M	M		
891-4131	650	4675768	327983	Sa	CISi	CISi	--	M	M		
961-4257	3	4674809	328599	SiCl	SiCl	SiCl	SiCl	L	S		
--	--	--	--	--	--	--	--				
744075	1	4683499	327434	<b>Sa &amp; Gr</b>	SiCl	SiCl	SiCl	L	S		
971-4227/1	2	4682232	327588	Sa & Gr	SaSi	SiCl to CISi	SiCl	M	M		
891-4077	1	4681051	327438	Fill	SiSa	Sa	CISi	L	S		
011-4146	1	4682001	328266	SiSa	Sa	CISi	--	L	VS		
PETO-6414	3	4678200	328252	Sa	Sa	Sa	SiCl	L	VS		
801-4201	6	4680147	327581	Sa	Sa&Gr	Sa&Gr	SiCl	L	VS		
001-4018	8	4680049	328361	Sa	Sa	Si	CISi	L	VS		
73514	1	4678963	328656	CISi	SiCl	SiCl	SiCl	L	S		
881-4278	921	4679662	329082	Sa	SaSi	CISi	CISi	M	M		
754139/2	7	4678329	328623	<b>Sa</b>	SiSa	<b>CISi</b>	SiCl	L	S		
754139/3	209	4678101	329262	Sa	Sa	SiCl	SiCl	L	VS		
754139/3	210	4677230	329098	Fill	Sa	SiCl	--	L	VS		
754139/2	6	4677306	329912	SiSa	SiSa	SiCl	SiCl	L	S		
OM SOIL 73-8-W	4	4676694	330112	CISi	CISi	SiCl	SiCl	M	M		

**APPENDIX A-I**  
SUBSURFACE DATABASE

Job #	BH # / TP #	Northing	Easting	Soil	Soil	Soil	Soil	Frost	Erodibility at 1.5 m depth		
				Classification	Classification	Classification	Classification	Susceptibility			
				0.3 m (1') depth	1.5 m (5') depth	3 m (10') depth	6 m (20') depth	at 1.5 m depth			
031-140089	3	4676323	330286	CISi	CISi	SiCl	SiCl	M	M		
--	--	--	--	--	--	--	--				
69343	2	4673459	330146	CISi	CISi	CISi	SiCl	M	M		
764048	2	4684264	327887	Fill	Alluvium (SiCl)	SiCl	SiCl	M	S		
981-4046	9	4684109	328176	Fill	SiCl	SiCl	SiCl	L	S		
70483	3	4683005	328984	Sa	Sa	CISi to SiCl	CISi to SiCl	L	VS		
68517/2	103	4683037	328189	Sa	CISi	SiCl	SiCl	M	M		
DHO 68-F-15-1	13	4682267	328609	SiSa	SiCl to CISi	SiCl to CISi	SiCl to CISi	M	M		
DHO 68-F-15-1	9	4682427	329199	SiSa	SiCl to CISi	SiCl to CISi	SiCl to CISi	M	M		
951-4209	3	4681474	328969	Fill	Sa	CISi	SiCl	L	VS		
951-4209	4	4681151	328923	Fill	Sa	SiCl	SiCl	L	VS		
68517	4	4681405	330118	CISi	SiCl	SiCl	SiCl	L	S		
754139/12	710	4679198	329980	SiSa	CISi	CISi	CISi	H	H		
754139/12	709	4678686	329944	SaSi	SaSi	CISi	SiCl	M	M		
754139/12	803	4679354	330326	Si	CISi	SiCl	SiCl	M	M		
891-4120	1	4678433	331130	SaSi	SaSi	SaSi	--	M	M		
041-140028	1	4678170	331043	SiSa	CISi	SiCl	SiCl	M	M		
754139/3	206	4677872	329883	Sa	SiCl	SiCl	--	L	S		
041-140028	3	4676484	331630	CISi	CISi	SiCl	SiCl	M	M		
PETO-69F177	5	4685730	329761	SiSa	SiSa	CISi to SiCl	SiCl	L	S		
831-4078	3	4685585	328762	Fill	SiCl	SiCl	SiCl	L	S		
031-140120	8	4685104	328981	SiSa	CISi	SiCl	--	M	M		
DM SOIL 85-10-V	9	4683231	329670	Sa	Sa	CISi	SiCl	L	VS		
011-4124	4	4684598	330131	CISi	SiCl	SiCl	--	L	S		
971-4062	7	4684003	329001	SiSa	CISi to SiCl	SiCl	SiCl	M	M		
881-4022	2	4683032	330734	SiCl	SiCl	SiCl	SiCl	L	S		
881-4022	5	4682520	330954	SiCl	SiCl	SiCl	SiCl	L	S		
991-4121	25	4682456	330299	SiSa	Sa	SiCl	SiCl	L	VS		
881-4022	8	4682242	331085	Sa	SiCl	SiCl	SiCl	L	S		
951-4099	3	4681603	330303	Sa	Sa	SiCl	SiCl	L	VS		
801-4009	2	4681369	331638	Sa	SiCl	SiCl	SiCl	L	S		
69305	2	4680724	331693	Sa	SiCl	SiCl	SiCl	L	S		
68722	2	4680242	331049	SaSi to SiSa	CISi	CISi	CISi	M	M		
901-4256	422	4680070	331948	Sa	SiCl	SiCl	SiCl	L	S		
031-140130	3	4678366	332597	Fill	SiCl	SiCl	SiCl	L	S		
031-140341	1	4678864	332535	SiCl	SiCl	SiCl	SiCl	L	S		
754139/2	4	4678911	331517	SiCl	SiCl	SiCl	SiCl	L	S		
011-4333	7	4677953	333077	SiCl	SiCl	SiCl	--	L	S		

**APPENDIX A-I**  
SUBSURFACE DATABASE

Job #	BH # / TP #	Northing	Easting	Soil	Soil	Soil	Soil	Frost	Erodibility			
				Classification	Classification	Classification	Classification	Susceptibility	at 1.5 m depth	at 1.5 m depth		
				0.3 m (1') depth	1.5 m (5') depth	3 m (10') depth	6 m (20') depth					
041-140028	2	4678009	331912	SiCl	SiCl	SiCl	SiCl	L	S			
041-140028	4	4676950	332860	SiSa	SiCl	SiCl	SiCl	L	S			
041-140028	5	4676808	333869	SiCl	SiCl	SiCl	SiCl	L	S			
744039	2	4686446	330317	SiCl	SiCl	SiCl	SiCl	L	S			
68554	2	4686244	329895	SiCl	SiCl	SiCl	SiCl	L	S			
891-4243	4	4685347	330105	Fill	SiCl	SiCl	SiCl	L	S			
951-4272	3	4685446	331275	SiCl	SiCl	SiCl	SiCl	L	S			
011-4173	1	4684784	331005	SiCl	SiCl	SiCl	SiCl	L	S			
851-4126	2	4684842	331563	SiCl	SiCl	SiCl	SiCl	L	S			
754107	2	4683817	331240	Sa	SiCl	SiCl	SiCl	L	S			
901-4019	1	4683515	332203	SiCl	SiCl	SiCl	SiCl	L	S			
971-4038	3	4683123	332583	SiCl	SiCl	SiCl	SiCl	L	S			
921-4242	3	4682597	331864	SiCl to ClSi	SiCl	SiCl	SiCl	L	S			
73648	205	4682039	333040	SiCl	SiCl	SiCl	SiCl	L	S			
791-4077	1	4681115	331978	Sa	SiCl	SiCl	SiCl	L	S			
791-4009	1	4681500	333270	SiCl	SiCl	SiCl	SiCl	L	S			
871-4112	4	4680294	332728	SiCl	SiCl	SiCl	SiCl	L	S			
PETO-68F81	A	4679141	333452	SiCl	ClSi	ClSi	ClSi	M	M			
031-140340	3	4678526	333241	SiCl	SiCl	SiCl	--	L	S			
921-4068	6	4679537	332901	SiCl	SiCl	SiCl	--	L	S			
754139/2	1	4677805	334667	SiCl	SiCl	SiCl	SiCl	L	S			
791-4096	25	4678266	333746	SiCl	SiCl	SiCl	SiCl	L	S			
041-140028	6	4677007	334961	SiCl	SiCl	SiCl	SiCl	L	S			
821-4079	2	4686814	331199	Fill	SiCl	SaSi	SiCl	L	S			
881-4241	2	4686435	332584	SiCl	SiCl	SiCl	SiCl	L	S			
011-4079	2	4686515	331944	SiCl	SiCl	SiCl	SiCl	L	S			
7614121	3	4684486	332157	SiCl	SiCl	SiCl	SiCl	L	S			
881-4086	2	4686026	332828	SiCl	SiCl	SiCl	SiCl	L	S			
784033	2	4685316	332802	SiCl	SiCl	SiCl	SiCl	L	S			
774004	3	4683612	333194	SiCl	SiCl	SiCl	SiCl	L	S			
871-4225	1	4684839	333530	SiCl	SiCl	SiCl	SiCl	L	S			
981-4240	15	4683826	333755	SiCl	SiCl	SiCl	SiCl	L	S			
901-4175	2	4683134	334004	SiCl	SiCl	SiCl	SiCl	L	S			
941-4130	2	4682501	333455	SiCl	SiCl	SiCl	SiCl	L	S			
DHO-68-F-15-2	4	4682497	333680	ClSi	ClSi	ClSi	ClSi	M	M			
851-4152	2	4681803	333997	SiCl	SiCl	SiCl	SiCl	L	S			
901-4021	7	4680461	334123	SiCl	SiCl	SiCl	SiCl	L	S			
911-4194	5	4680406	334943	SiCl	SiCl	SiCl	SiCl	L	S			

**APPENDIX A-I**  
SUBSURFACE DATABASE

Job #	BH # / TP #	Northing	Easting	Soil	Soil	Soil	Soil	Frost	Erodibility			
				Classification	Classification	Classification	Classification	Susceptibility	at 1.5 m depth	at 1.5 m depth		
				0.3 m (1') depth	1.5 m (5') depth	3 m (10') depth	6 m (20') depth					
851-4009	103	4679506	335005	SiCl	SiCl	SiCl	SiCl	L	S			
981-4185	1	4679368	335609	Sa	SiCl	SiCl	SiCl	L	S			
951-4198	2	4679102	336022	Sa	SiCl	SiCl	SiCl	L	S			
891-4256	102	4678649	335644	SiCl	SiCl	SiCl	SiCl	L	S			
921-4204	3	4678157	335239	SiCl	SiCl	SiCl	SiCl	L	S			
73643	4	4677869	336224	SiCl	SiCl	SiCl	SiCl	L	S			
881-4255	1	4687346	332404	SiCl	SiCl	SiCl	SiCl	L	S			
951-4065	1	4686899	332838	SiCl	SiCl	SiCl	SiCl	L	S			
881-4020	1	4686779	333388	SiCl	SiCl	SiCl	SiCl	L	S			
73548	1	4685896	333892	SiCl	SiCl	SiCl	SiCl	L	S			
011-4025	3	4686131	333475	SiCl	SiCl	SiCl	SiCl	L	S			
871-4225	8	4684401	333703	SiCl	SiCl	SiCl	--	L	S			
031-140060	1	4684414	335154	SiCl	SiCl	SiCl	SiCl	L	S			
941-4191	2	4683614	335508	SiCl	SiCl	SiCl	--	L	S			
68517/5	68	4683135	335004	SiCl	SiCl	SiCl	SiCl	L	S			
764072	8	4682805	335453	SiCl	SiCl	SiCl	SiCl	L	S			
981-4324	4	4682019	335262	SiCl	SiCl	SiCl	SiCl	L	S			
981-4323	9	4681568	336322	SiCl	SiCl	SiCl	--	L	S			
764072	2	4682002	335811	SiCl	SiCl	SiCl	--	L	S			
921-4248	5	4680892	336178	SiCl	SiCl	SiCl	SiCl	L	S			
921-4248	2	4680439	336762	SiCl	SiCl	SiCl	SiCl	L	S			
921-4157	1	4679521	336078	SiCl	SiCl	SiCl	SiCl	L	S			
951-4024	1	4679460	336200	SiCl	SiCl	SiCl	SiCl	L	S			
PETO-01TF072A	71-4	4678846	337540	SiCl	SiCl	SiCl	SiCl	L	S			
951-4026	7	4678835	336437	SiCl	SiCl	SiCl	SiCl	L	S			
901-4119	3	4678306	337362	SiCl	SiCl	SiCl	SiCl	L	S			
021-4024	2	4677655	337942	SiCl	SiCl	SiCl	--	L	S			
DHO-68-F-5	7	4676785	338312	SiCl	SiCl	SiCl	SiCl	L	S			
011-4266	3	4687762	333893	SiCl	SiCl	SiCl	SiCl	L	S			
941-4178	3	4687623	335062	SiCl	SiCl	SiCl	--	L	S			
791-4066	1	4687071	334348	SiCl	SiCl	SiCl	SiCl	L	S			
921-4119	1	4686907	335567	SiCl	SiCl	SiCl	SiCl	L	S			
791-4013	102	4685836	335052	SiCl	SiCl	SiCl	SiCl	L	S			
981-4318-2	1	4685046	335309	SiCl	SiCl	SiCl	SiCl	L	S			
951-4109	2	4684982	336466	SiCl	SiCl	SiCl	--	L	S			
851-4024	7	4685965	336013	SiCl	SiCl	SiCl	SiCl	L	S			
041-140048	28	4683896	336202	Fill	SiCl	SiCl	SiCl	L	S			
921-4237	1	4683093	336694	SiCl	SiCl	SiCl	SiCl	L	S			

**APPENDIX A-I**  
SUBSURFACE DATABASE

Job #	BH # / TP #	Northing	Easting	Soil	Soil	Soil	Soil	Frost	Erodibility			
				Classification	Classification	Classification	Classification	Susceptibility	at 1.5 m depth	at 1.5 m depth		
				0.3 m (1') depth	1.5 m (5') depth	3 m (10') depth	6 m (20') depth					
891-4144	3	4683522	337275	SiCl	SiCl	SiCl	SiCl	L	S			
921-4237	6	4682243	337062	SiCl	SiCl	SiCl	SiCl	L	S			
754172	3	4681625	336937	SiCl	SiCl	SiCl	SiCl	L	S			
744137	91	4682539	336402	SiCl	SiCl	SiCl	SiCl	L	S			
831-4062	1	4681571	337825	Fill	SiCl	SiCl	SiCl	L	S			
754172	13	4680904	337143	SiCl	SiCl	SiCl	SiCl	L	S			
871-4110	6	4680629	337683	Fill	SiCl	SiCl	SiCl	L	S			
754081	1	4678913	338795	SiCl	SiCl	SiCl	SiCl	L	S			
981-4341	1	4679465	338126	SiSa	SiCl	SiCl	SiCl	L	S			
971-4022	16	4679713	337831	Sa	SiCl	SiCl	--	L	S			
971-4130	1	4678122	338341	SiSa	SiCl	SiCl	--	L	S			
941-4182	3	4677387	338543	Fill	SiCl	SiCl	--	L	S			
011-4205	5	4687972	335492	SiCl	SiCl	SiCl	SiCl	L	S			
841-4011	6	4688049	336780	SiCl	SiCl	SiCl	SiCl	L	S			
841-4011	3	4687664	336960	SiCl	SiCl	SiCl	SiCl	L	S			
71590	7	4686899	336259	SiCl	SiCl	SiCl	SiCl	L	S			
821-4026	4	4687049	337221	SiCl	SiCl	SiCl	SiCl	L	S			
791-4075	3	4685539	336437	SiCl	SiCl	SiCl	SiCl	L	S			
971-4281	103	4686775	337172	SiCl	SiCl	SiCl	SiCl	L	S			
73569/2	4	4685283	337456	Sa	SiSa	SiCl	SiCl	L	S			
981-4105	2	4684629	337113	SiCl	SiCl	SiCl	SiCl	L	S			
921-4196	4	4684809	337952	SiSa	SiCl	SiCl	SiCl	L	S			
761-4014	26	4684160	338295	SiCl	SiCl	SiCl	SiCl	L	S			
801-4175	5	4683003	337846	SiCl	SiCl	SiCl	SiCl	L	S			
851-4134	20	4683146	338443	SiSa	SiCl	SiCl	SiCl	L	S			
961-4043	1	4683472	338814	Sa	SiCl	SiCl	SiCl	L	S			
DHO 65-F-70	3	4678919	339400	CiSi	CiSi	CiSi	CiSi	M	M			
DHO 65-F-205	1	4678453	340730	SiCl	SiCl	SiCl	SiCl	L	S			
961-4271	4	4688482	337500	Sa	Sa	SiCl	SiCl	L	S			
961-4103	2	4687870	337548	SiCl	SiCl	SiCl	SiCl	L	S			
73554/4	4	4687706	338008	SiCl	SiCl	SiCl	SiCl	L	S			
981-4099	3	4687503	338515	SiCl	SiCl	SiCl	SiCl	L	S			
951-4063	8	4686237	337817	SiCl	SiCl	SiCl	--	L	S			
921-4070	4	4686204	338420	SiCl	SiCl	SiCl	SiCl	L	S			
781-4113	2	4686111	339086	SiCl	SiCl	SiCl	--	L	S			
73644	8	4684860	339444	SiCl	SiCl	SiCl	--	L	S			
73644	11	4684200	339731	SiCl	SiCl	SiCl	--	L	S			
961-4043	2	4683603	339202	SiCl	SiCl	SiCl	SiCl	L	S			

**APPENDIX A-I**  
SUBSURFACE DATABASE

Job #	BH # / TP #	Northing	Easting	Soil	Soil	Soil	Soil	Frost	Erodibility			
				Classification	Classification	Classification	Classification	Susceptibility	at 1.5 m depth	at 1.5 m depth		
				0.3 m (1') depth	1.5 m (5') depth	3 m (10') depth	6 m (20') depth					
961-4043	5	4683624	340006	SiCl	SiCl	SiCl	SiCl	L	S			
DHO 65-F-69	1	4678407	342084	SiCl	SiCl	SiCl	SiCl	L	S			
971-4044	2	4674907	343750	SiCl	SiCl	SiCl	SiCl	L	S			
70502	8	4689341	339438	Fill	SaSi	SaSi	SiCl	M	M			
981-4145	2	4688493	338611	SiCl	SiCl	SiCl	--	L	S			
71524	16	4688648	339885	SiCl	SiCl	SiCl	SiCl	L	S			
941-4186	12	4687794	339685	SiCl	SiCl	SiCl	--	L	S			
981-4139	2	4687402	340218	SiCl	SiCl	SiCl	--	L	S			
73549	5	4686285	339635	SiCl	SiCl	<b>SiCl</b>	SiCl	L	S			
73545	1	4686565	340976	SiCl	SiCl	SiCl	SiCl	L	S			
70368	4	4685589	339963	SiCl	SiCl	SiCl	SiCl	L	S			
931-4155	1	4685238	340766	SiCl	SiCl	SiCl	SiCl	L	S			
MTC 259-66-08	1	4683685	341491	CISi	CISi	CISi	CISi	M	M			
MTC 259-66-04	106	4684284	341543	CISi	CISi	CISi	CISi	M	M			
991-4033	2	4684478	340395	SiCl	SiCl	SiCl	SiCl	L	S			
901-4269	5	4683973	341728	SiCl	SiCl	SiCl	SiCl	L	S			
971-4135	8	4681882	342915	SiCl	SiCl	SiCl	SiCl	L	S			
DOM SOIL 5-3-7	1	4678321	343445	SiCl	SiCl	SiCl	SiCl	L	S			
744122	1	4689513	340025	Sa	<b>SiSa</b>	<b>SiSa</b>	SiCl	L	S			
744122	8	4689567	340460	<b>SiSa</b>	SiCl	SiCl	SiCl	L	S			
70465	1	4688648	340854	<b>SiCl</b>	SiCl	SiCl	<b>SiCl</b>	L	S			
71524	13	4689072	340179	SiCl	SiCl	SiCl	SiCl	L	S			
PETO 6259	1	4688192	341242	SiCl	SiCl	SiCl	SiCl	L	S			
821-4035	5	4687394	341285	SiCl	SiCl	SiCl	SiCl	L	S			
821-4002	2	4686956	340948	SiCl	SiCl	SiCl	SiCl	L	S			
801-4033	2	4686511	341957	<b>SiCl</b>	SiCl	SiCl	SiCl	L	S			
764024	3	4685505	342115	SiCl	SiCl	SiCl	SiCl	L	S			
891-4135	3	4685282	342904	SiCl	SiCl	SiCl	--	L	S			
971-4045	5	4684227	341930	SiCl	SiCl	SiCl	SiCl	L	S			
001-4327	6	4683788	342651	SiCl	SiCl	SiCl	SiCl	L	S			
DOM SOIL 4-5-L	2	4678207	345416	SiCl	SiCl	SiCl	SiCl	L	S			
961-4207	8	4689240	341560	Sa	Sa	SiSa	SiCl	L	VS			
784014	3	4689020	342058	Fill	SiCl	<b>SiCl</b>	SiCl	L	S			
791-4044	102	4688642	343237	Fill	SiCl	<b>SiCl</b>	SiCl	L	S			
71516	7	4687965	343090	SiCl	SiCl	SiCl	SiCl	L	S			
971-4262	5	4687231	343186	SiCl	SiCl	SiCl	--	L	S			
951-4138	1	4686102	343610	SiCl	SiCl	SiCl	SiCl	L	S			
911-4091	1	4686062	344321	SiCl	SiCl	SiCl	SiCl	L	S			

**APPENDIX A-I**  
SUBSURFACE DATABASE

Job #	BH # / TP #	Northing	Easting	Soil	Soil	Soil	Soil	Frost	Erodibility			
				Classification	Classification	Classification	Classification	Susceptibility	at 1.5 m depth	at 1.5 m depth		
				0.3 m (1')	1.5 m (5')	3 m (10')	6 m (20')					
				depth	depth	depth	depth					
971-4220	1	4684682	344153	SiCl	SiCl	SiCl	--	L	S			
971-4071	2	4684539	344979	SiCl	SiCl	SiCl	SiCl	L	S			
961-4090	7	4683983	344892	SiCl	SiCl	SiCl	--	L	S			
971-4021	3	4682670	344838	SiCl	SiCl	SiCl	--	L	S			
71602	35	4688132	344219	Fill	SiCl	SiCl	SaSi	L	S			
71602	10	4687212	344375	Fill	SiCl	SiCl	SaSi	L	S			
71602	5	4687777	344929	SiCl	SiCl	SiCl	ClSi	L	S			
71602	46	4687167	345558	SiCl	SiCl	SiCl	--	L	S			
71602	32	4686380	344863	SiCl	SiCl	SiCl	--	L	S			
71602	24	4685818	344881	SiCl	SiCl	SiCl	--	L	S			
911-4115	6	4685888	345735	SiCl	SiCl	SiCl	SiCl	L	S			
71602	41	4688017	345528	SiSa	SiCl	SiCl	--	L	S			
71602	42	4687784	345923	SiSa	SiCl	SiCl	--	L	S			
921-4120	2	4687430	346415	SiCl	SiCl	SiCl	--	L	S			
961-4089	1	4686724	346097	SiCl	SiCl	SiCl	SiCl	L	S			
county Road 8 and East of Manning Road												
70340	1	46722391	331493	SiCl	SiCl	SiCl	SiCl	L	S			
991-4028	1	4671276	326536	SiCl	SiCl	SiCl	SiCl	L	S			
871-4219	1	4671475	331513	SiCl	SiCl	SiCl	SiCl	L	S			
831-4031	3	4668031	337346	SiCl	SiCl	SiCl	SiCl	L	S			
001-4113-1	1	4671933	336630	SiCl	SiCl	SiCl	SiCl	L	S			
001-4113-2	1	4671395	346882	SiCl	SiCl	SiCl	SiCl	L	S			
021-4009	3	4668807	333066	SiCl	SiCl	SiCl	SiCl	L	S			
921-4120	1	4687315	346575	SiCl	SiCl	SiCl	SiCl	L	S			
73504	1	4682776	347631	SiCl	SiCl	SiCl	SiCl	L	S			



**APPENDIX B**  
**SUBSURFACE DATABASE**  
**DETROIT RIVER INTERNATIONAL CROSSING**

SUBSURFACE DATABASE

REFERENCE	BOREHOLE OR TEST PIT	NORTHING (m)	EASTING (m)	SOIL CLASSIFICATION				FROST SUSCEPTIBILITY	ERODIBILITY
				0.3 m Depth	1.5 m Depth	3 m Depth	6 m Depth	1.5 m depth	1.5 m depth
744075	1	4,683,499	327,434	<b>Sa &amp; Gr</b>	Si Cl	Si Cl	Si Cl	L	S
971-4227/1	2	4,682,232	327,588	Sa & Gr	SaSi	Si Cl to Cl Si	Si Cl	M	M
011-4146	1	4,682,001	328,266	Si Sa	Sa	Cl Si	--	L	VS
70483	3	4,683,005	328,984	Sa	Sa	Cl Si to Si Cl	Cl Si to Si Cl	L	VS
68517/2	103	4,683,037	328,189	Sa	Cl Si	Si Cl	Si Cl	M	M
DHO 68-F-15-1	13	4,682,267	328,609	Si Sa	Si Cl to Cl Si	Si Cl to Cl Si	Si Cl to Cl Si	M	M
DHO 68-F-15-1	9	4,682,427	329,199	Si Sa	Si Cl to Cl Si	Si Cl to Cl Si	Si Cl to Cl Si	M	M
951-4209	3	4,681,474	328,969	Fill	Sa	Cl Si	Si Cl	L	VS
68517	4	4,681,405	330,118	Cl Si	Si Cl	Si Cl	Si Cl	L	S
881-4022	5	4,682,520	330,954	Si Cl	Si Cl	Si Cl	Si Cl	L	S
881-4022	8	4,682,242	331,085	Sa	Si Cl	Si Cl	Si Cl	L	S
951-4099	3	4,681,603	330,303	Sa	Sa	Si Cl	Si Cl	L	VS
69305	2	4,680,724	331,693	Sa	Si Cl	Si Cl	Si Cl	L	S
68722	2	4,680,242	331,049	Sa Si to Si Sa	Cl Si	Cl Si	Cl Si	M	M
754139/2	4	4,678,911	331,517	Si Cl	Si Cl	Si Cl	Si Cl	L	S
011-4333	7	4,677,953	333,077	Si Cl	Si Cl	Si Cl	--	L	S
041-140028	2	4,678,009	331,912	Si Cl	Si Cl	Si Cl	Si Cl	L	S
791-4077	1	4,681,115	331,978	Sa	Si Cl	Si Cl	Si Cl	L	S
871-4112	4	4,680,294	332,728	Si Cl	Si Cl	Si Cl	Si Cl	L	S
921-4068	6	4,679,537	332,901	Si Cl	Si Cl	Si Cl	--	L	S
754139/2	1	4,677,805	334,667	Si Cl	Si Cl	Si Cl	Si Cl	L	S
791-4096	25	4,678,266	333,746	Si Cl	Si Cl	Si Cl	Si Cl	L	S
041-140028	6	4,677,007	334,961	Si Cl	Si Cl	Si Cl	Si Cl	L	S
921-4204	3	4,678,157	335,239	Si Cl	Si Cl	Si Cl	Si Cl	L	S
73643	4	4,677,869	336,224	Si Cl	Si Cl	Si Cl	Si Cl	L	S
901-4119	3	4,678,306	337,362	Si Cl	Si Cl	Si Cl	Si Cl	L	S
04-111-060	1	4,677,738	335,500	Si Cl	Si Cl	Si Cl	Cl Si	L	S
04-111-060	7	4,678,848	333,325	Cl Si	Cl Si	Cl Si	Cl Si	L	S
04-111-060	14	4,680,648	331,648	Fill	Cl Si	Cl Si	Cl Si	L	S
04-111-060	23	4,682,323	328,529	Fill and Topsoil	Sa Si	Cl Si	Cl Si	M	M

**Frost Susceptibility:**  
 - M - Moderate  
 - L - Low

**Erodibility:**  
 - VS - Very Slight  
 - S - Slight  
 - M - Moderate

- NOTES:
1. **Bold** soil classification indicates grain size analysis carried out on a sample at about this depth.
  2. Table to be read in conjunction with accompanying report.

**APPENDIX C**  
**RECORDS OF BOREHOLES**  
**(GOLDER ASSOCIATES LTD. PROJECT NO. 04-1111-060)**  
**DETROIT RIVER INTERNATIONAL CROSSING**

PROJECT 04-1111-060 **RECORD OF BOREHOLE No 1** 1 OF 4 **METRIC**  
 G.W.P. \_\_\_\_\_ LOCATION 335500E, 4677738N ORIGINATED BY C.C.  
 DIST SW Region HWY 401 / 3 BOREHOLE TYPE POWER AUGER, HOLLOW STEM COMPILED BY T.M.  
 DATUM Geodetic DATE November 2, 2006 - November 5, 2006 CHECKED BY SJS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB VANE						
186.70	GROUND SURFACE													
0.00	TOPSOIL, clayey Firm Black		1	SS	5									
0.27	SILTY CLAY, some sand, trace gravel, fissured, oxidized along fissures Firm Brown													
185.18														
1.52	SILTY CLAY, some sand, trace gravel, fissured and oxidized along fissures Very stiff Brown		2	SS	28									
182.80														
3.90	CLAYEY SILT, some sand, trace gravel Stiff Grey		3	SS	15									
			4	SS	14									
			5	TO	PH			1.2					21.1	9 30 36 25 CICU, Oedometer
			6	SS	9			7.5						
			7	TO	PH			1.0						
			8	SS	11			1.7						
			9	TO	PH									
			10	TO	PH								20.5	2 28 41 29 CICU, Oedometer
			11	SS	10									

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Continued Next Page

+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

**RECORD OF BOREHOLE No 7**

1 OF 4

**METRIC**

PROJECT 04-1111-060

G.W.P. LOCATION 333325E, 4678848N

ORIGINATED BY C.C.

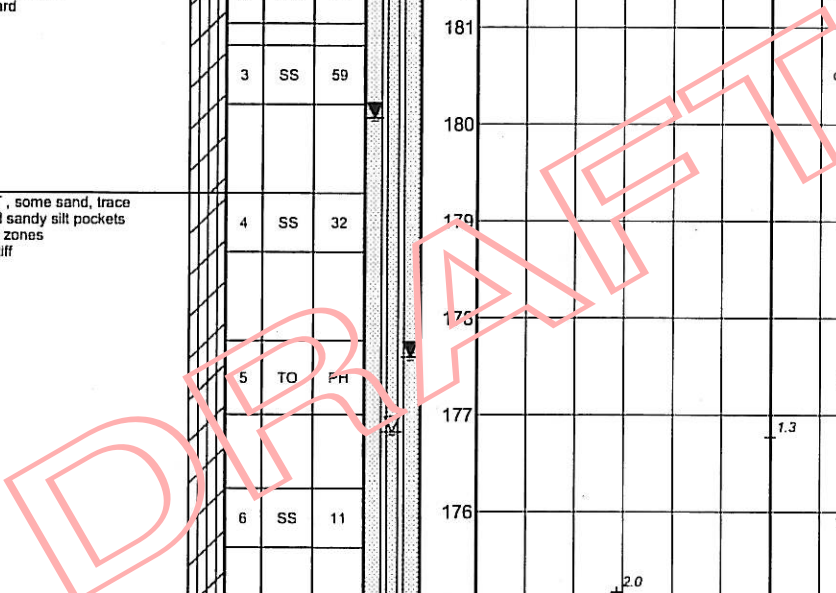
DIST SW Region HWY 401/3 BOREHOLE TYPE POWER AUGER, HOLLOW STEM

COMPILED BY T.M.

DATUM Geodetic DATE November 10, 2006 - November 16, 2006

CHECKED BY SJB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
						20	40	60	80	100	10	20	30	GR SA SI CL
183.17	GROUND SURFACE													
0.00	TOPSOIL, clayey													
0.25	Firm Black CLAYEY SILT, some sand, trace gravel Stiff Mottled brown and grey		1	SS	10									
181.65														
1.52	CLAYEY SILT, some sand, trace gravel, oxidized fissures Very stiff to hard Brown		2	SS	23									
			3	SS	59									
179.28														
3.89	CLAYEY SILT, some sand, trace gravel, silt and sandy silt pockets and laminated zones Firm to very stiff Grey		4	SS	32									
			5	TO	PH									
			6	SS	11									
			7	TO	PH									
			8	SS	12									
			9	TO	PH									
			10	SS	8									
			11	TO	PH									



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+<sup>3</sup>, X<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE



**RECORD OF BOREHOLE No 23**

1 OF 3

**METRIC**

PROJECT 04-1111-060

G.W.P. \_\_\_\_\_ LOCATION 32B529E, 46B2323N

ORIGINATED BY C.C.

DIST SW Region HWY 401/3 BOREHOLE TYPE POWER AUGER, HOLLOW STEM

COMPILED BY T.M.

DATUM Geodetic DATE November 24, 2006 - November 26, 2006

CHECKED BY *SJB*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									WATER CONTENT (%)			
						20	40	60	80	100	20	40	60	80	100	10	20	30	kN/m <sup>3</sup>	GR SA SI CL
178.92	GROUND SURFACE																			
0.00	FILL, silty sand, with gravel and silt pockets		1	AS	-															
178.92	Brown																			
0.30	TOPSOIL, silty sand																			
178.31	Black																			
0.61	SANDY SILT, Compact																			
177.24	Brown to grey,																			
1.68	CLAYEY SILT, laminated, some sand, numerous silt and sandy silt partings		2	SS	15															
	Silt to very stiff																			
	Grey		3	SS	6															
			4	TO	PH															
174.50	CLAYEY SILT, some sand, trace gravel, silty sand pockets																			
4.42	Soft to very stiff																			
	Grey		5	SS	4															
			6	SS	5															
			7	TO	PH															
			8	SS	1															
			9	TO	PH															
			10	SS	3															
			11	TO	PH															

DRAFT

1 23 37 39  
CICU  
Oedameter

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Continued Next Page

+<sup>3</sup>, X<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

**APPENDIX D**  
**SITE PHOTOGRAPHS**  
**DETROIT RIVER INTERNATIONAL CROSSING**



## SITE PHOTOGRAPHS

### Detroit River International Crossing Windsor, Ontario

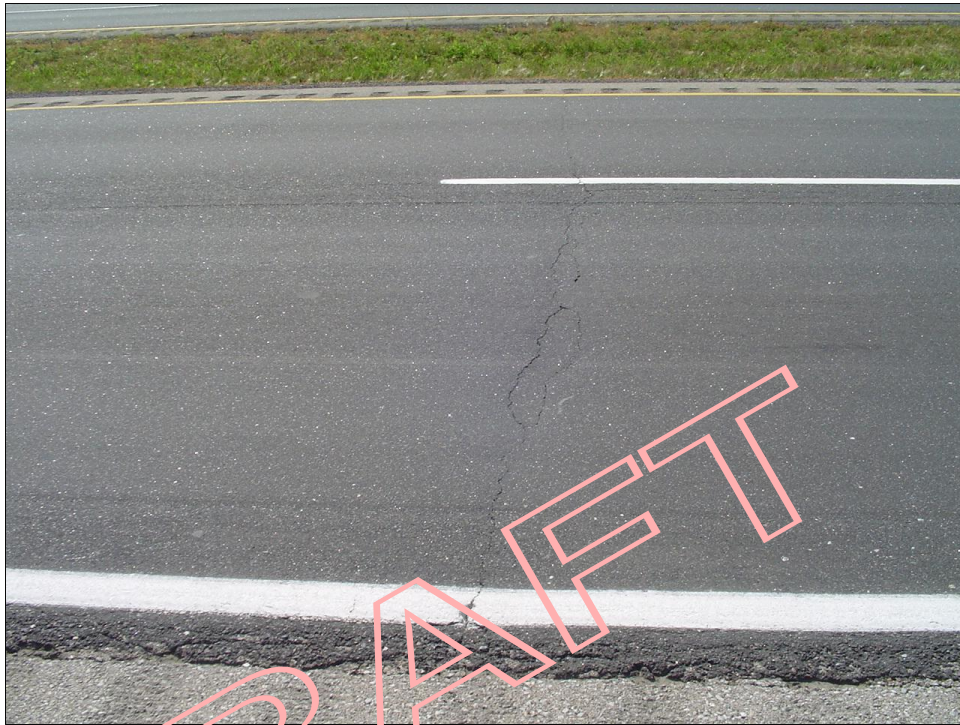


Photo 1 – Highway 401 westbound lanes between North Talbot Road and Huron Church Line. Typical transverse crack.



Photo 2 – Highway 401 westbound lanes just west of Talbot Road east. Note rutting and cracking at inner edge of pavement.

## SITE PHOTOGRAPHS

### Detroit River International Crossing Windsor, Ontario



Photo 3 – Howard Avenue - south of Talbot Line - looking south.



Photo 4 – Howard Avenue - south of Talbot Line - looking north.

## SITE PHOTOGRAPHS

### Detroit River International Crossing Windsor, Ontario



Photo 5 – Howard Avenue - north of Talbot Line - looking north.



Photo 6 – Howard Avenue - north of Talbot Line - looking south.

## SITE PHOTOGRAPHS

### Detroit River International Crossing Windsor, Ontario



Photo 7 – Cousineau Road - looking south.



Photo 8 – Sandwich Parkway - looking north.

## SITE PHOTOGRAPHS

### Detroit River International Crossing Windsor, Ontario



Photo 9 – Sandwich Parkway - looking south



Photo 10 – Cabana Road - looking north.

## SITE PHOTOGRAPHS

### Detroit River International Crossing Windsor, Ontario



Photo 11 – Cabana Road - looking south

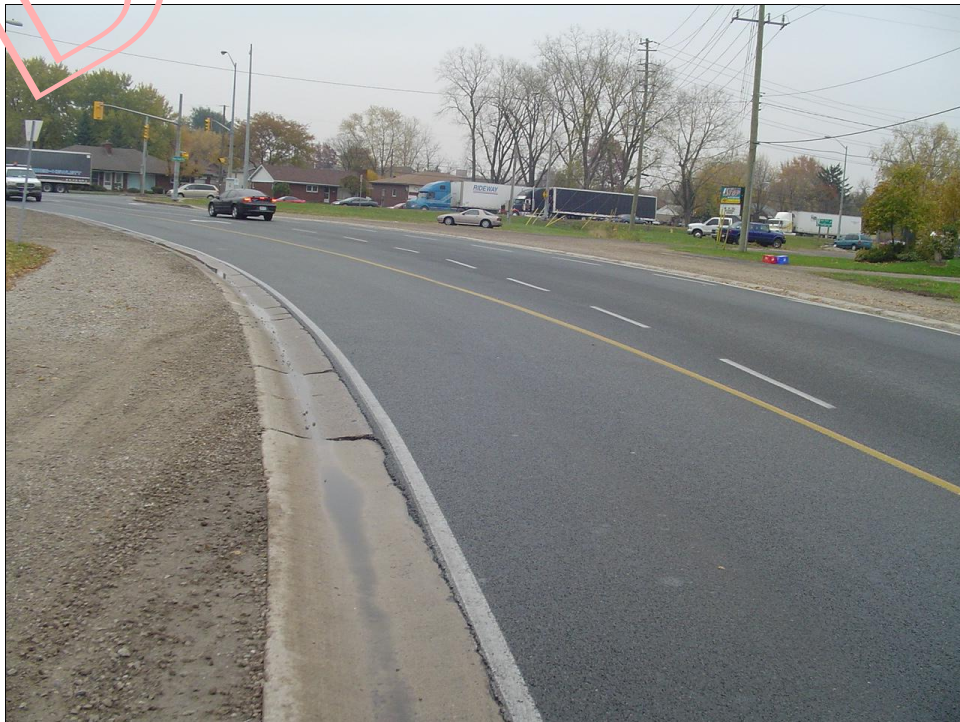


Photo 12 – Todd Lane - looking north

## SITE PHOTOGRAPHS

### Detroit River International Crossing Windsor, Ontario



Photo 13 – Todd Lane - looking south



Photo 14 – Pulford Street - looking west.

## SITE PHOTOGRAPHS

### Detroit River International Crossing Windsor, Ontario



Photo 15 – Pulford Street - looking east.



Photo 16 – Pulford Street – concrete distress about 50 m south of Northway Ave.



## SITE PHOTOGRAPHS

### Detroit River International Crossing Windsor, Ontario



Photo 17 – Pulford Street - concrete distress about 20 m south of Northway Ave.



Photo 18 – Grand Marais Road West - looking east.

## SITE PHOTOGRAPHS

### Detroit River International Crossing Windsor, Ontario



Photo 19 – Grand Marais Road West - looking west.



Photo 20 – Lambton Street - looking east.

## SITE PHOTOGRAPHS

### Detroit River International Crossing Windsor, Ontario



Photo 21 – Lambton Street - looking west



Photo 22 – Spring Garden Road - looking east

## SITE PHOTOGRAPHS

### Detroit River International Crossing Windsor, Ontario



Photo 23 – Spring Garden Road - looking west



Photo 24 – Spring Garden Road – slight joint spalling

## SITE PHOTOGRAPHS

### Detroit River International Crossing Windsor, Ontario



Photo 25 – Labelle Street - looking west



Photo 26 – Malden Road - south of E.C. Row Expressway - looking south

## SITE PHOTOGRAPHS

### Detroit River International Crossing Windsor, Ontario



Photo 27 – Malden Road - north of E.C. Row Expressway - looking north



Photo 28– Malden Road - north of E.C. Row Expressway - looking south

## SITE PHOTOGRAPHS

### Detroit River International Crossing Windsor, Ontario



Photo 29 – Malden Road – very severe transverse crack



Photo 30 – Malden Road – very severe longitudinal/meander crack

## SITE PHOTOGRAPHS

### Detroit River International Crossing Windsor, Ontario



Photo 31 – Matchette Road - north of E.C. Row Expressway - looking south

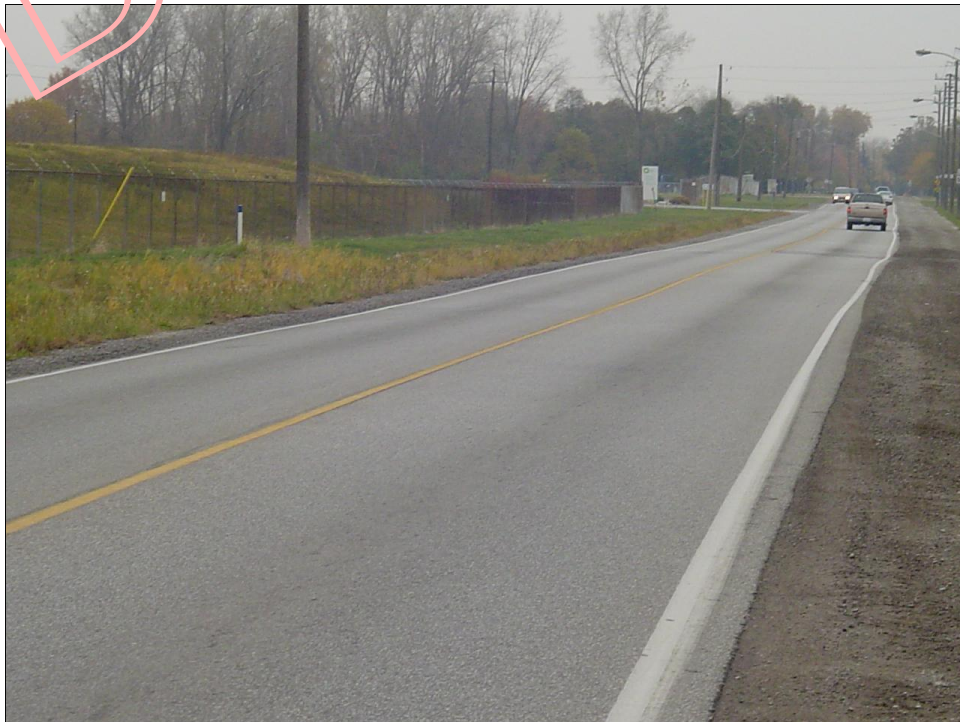


Photo 32 – Matchette Road – north of E.C. Row Expressway – looking north



## SITE PHOTOGRAPHS

### Detroit River International Crossing Windsor, Ontario



Photo 33 – Matchette Road – north of E.C. Row Expressway – alligator wheel path cracks



Photo 34 – Matchette Road – south of E.C. Row Expressway – looking north

## SITE PHOTOGRAPHS

### Detroit River International Crossing Windsor, Ontario



Photo 35 – Matchette Road – south of E.C. Row Expressway – looking south



Photo 36 – Matchette Road – moderate longitudinal cracks

## SITE PHOTOGRAPHS

### Detroit River International Crossing Windsor, Ontario



Photo 37 – Ojibway Parkway - north of E.C. Row Expressway



Photo 38 – Ojibway Parkway - north of E.C. Row Expressway