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June 25, 1995

951-2834-1

Almonte Community Development Corporation Inc.
P.O. Box 3000
Almonte, Ontario
K0A 1A0

Attention: Ms. N. Thompson

RE: GEOTECHNCIAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
375 COUNTRY STREET
ALMONTE, ONTARIO

Dear Sirs:

This report presents the results of a subsurface investigation carried out at the site of a proposed three storey apartment building in Almonte, Ontario. The purpose of the subsurface investigation was to determine the general soil and groundwater conditions across the site by means of a limited number of boreholes and, based on an interpretation of the factual information obtained, to provide engineering guidelines on the geotechnical design aspects of the project, including construction considerations which could influence design decisions.

DESCRIPTION OF PROJECT AND SITE

Plans are being prepared to construct an addition to the existing building at 375 Country Street in Almonte, Ontario (see Key Plan, Figure 1). The addition is to consist of a three storey concrete structure and will be connected to the existing five storey structure with a single storey link. It is understood that the addition will have a walk out basement at the east side of the building provided that substantial blasting of bedrock will not be required.

At the present time, the site of the proposed addition is occupied largely by the parking lot for the existing building. The parking lot is raised above the surrounding terrain. Below the parking lot area, bedrock can be seen to outcrop at ground surface.

The parking lot area appears to have been raised with fill material. Examination of the side slopes indicates the possible presence of concrete or other construction waste in the fill material although this may be material cast over the side slopes.

The existing structure is serviced with municipal water and sanitary sewer services. The parking lot, which occupies the site of the proposed addition, is drained by a series of catch basins which direct storm water to a swale at the southeast corner of the parking lot. Bedrock is exposed on the sides and bottom of the drainage swale. Underground electrical services for the parking lot lighting also exist in the parking lot.

Geologic maps indicate that bedrock in the area generally consists of dolostone of the March or Oxford formations.

PROCEDURE

The field work for this investigation was carried out on June 13, 1995. At that time, seven boreholes (numbered 1 to 5, inclusive, and 7 and 8) were advanced using a track mounted drill rig supplied and operated by Marathon Drilling Company Ltd. of Gloucester, Ontario. The boreholes were advanced in the apparent fill area to auger refusal at depths between about 1.5 and 2.3 metres. A proposed borehole numbered borehole 6 was not drilled because bedrock could be seen to outcrop at ground surface at the borehole location.

Standard penetration tests were carried out in the boreholes at regular intervals of depth, and samples of the soils encountered were recovered using drive open sampling equipment. The field work was supervised throughout by a member of our engineering staff who located the boreholes, directed the drilling operations, logged the boreholes and samples, and carried out the in situ testing.

Samples of the soils encountered in the boreholes were returned to our laboratory for examination by the project engineer

The borehole locations and elevations were determined by Golder Associates personnel. The borehole elevations were referenced to the floor slab of the existing building which was assumed to be at an elevation of 100.00 metres, local datum. The approximate locations of the boreholes are shown on the Site Plan, Figure 2.

SUBSURFACE CONDITIONS

General

The subsurface conditions encountered in the boreholes are shown on the Record of Borehole sheets following the text of this report. The logs indicate the subsurface conditions at the borehole locations only. Boundaries between zones on the logs are often not distinct, but rather are transitional and have been interpreted. The precision with which subsurface conditions are indicated depends on the method of boring, the frequency of sampling, the method of sampling, and the uniformity of the subsurface conditions. Subsurface conditions may vary across the site.

In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties.

The soil descriptions in this report are based on commonly accepted methods of classification employed in geotechnical practice. Classification and identification of soil and bedrock involves judgement and Golder Associates does not guarantee descriptions as exact, but infers accuracy to the extent that is common in current geotechnical practice.

The following presents an overview of the subsurface conditions encountered in the boreholes.

Existing Pavement

Boreholes 1, 2, 3, and 4 were advanced through the pavement of the existing parking lot. The entrance roadway and the north portion of the parking lot have an asphaltic concrete surface. The results of boreholes 1, 2 and 3 indicate that the asphaltic concrete is between approximately 30 and 50 millimetres in thickness. The asphaltic concrete is underlain by between approximately 110 and 170 millimetres of crushed stone. The south portion of the parking lot has a crushed stone surface and discussion with an employee of the existing building indicates that this portion of the parking lot may have been a later addition. In borehole 4, the crushed stone was found to be approximately 100 millimetres thick.

Surficial Topsoil

Boreholes 5, 7, and 8 were advanced in the grassed area surrounding the parking lot pavement surface. The boreholes encountered between approximately 150 to 200 millimetres of sandy topsoil.

Fill Material

All of the boreholes encountered fill material beneath the topsoil and pavement materials. The fill material was generally found to consist of silty sand and sandy silt with some gravel and cobbles. Traces of peat and other organic material were also encountered.

The fill material was found to range between approximately 1.0 and 2.1 metres in thickness.

Standard penetration test N values for this material generally between 4 and 21 blows per 0.3 metres indicate a loose to compact relative density.

Native Soil

A thin veneer of native soil was encountered below the fill material in boreholes 4, 7, and 8. This native soil was found to consist of sandy topsoil overlying glacial till. The glacial till consists of sandy silt with some gravel and trace clay.

Where encountered below the fill material, the native topsoil and glacial till were found to be between approximately 30 and 400 millimetres in thickness.

Auger Refusal and Bedrock

Practical refusal to augering was encountered at depths between approximately 1.5 and 2.3 metres. In borehole 3, it was possible to auger approximately 0.3 metres into the bedrock prior to refusal.

Groundwater

The groundwater conditions were observed in the boreholes during the short time that the boreholes remained open. No groundwater seepage was observed in any of the boreholes.

It should be noted that groundwater levels are expected to fluctuate seasonally and higher groundwater levels are expected during wet periods of the year, such as early spring.

PROPOSED DEVELOPMENT

General

This section of the report provides engineering guidelines on the geotechnical aspects of the project based on our interpretation of the test hole information and project requirements. It is stressed that the information in this portion of the report is provided for the guidance of the designers and is intended for this project only. Contractors bidding on or undertaking the works should examine the factual results of the investigation, satisfy themselves as to the adequacy of the factual information for construction, and make their own interpretation of the factual data as it affects their proposed construction techniques, schedule, safety, and equipment capabilities.

Foundations

The subsurface conditions in the parking lot portion of the site generally consist of fill material overlying shallow bedrock. Outside the parking lot area, a visual inspection indicates that shallow bedrock exists across the remainder of the site. The fill material and native soil should be removed from the area of the proposed addition and the structure should be founded entirely on or within bedrock.

Provided that any weathered bedrock is removed and the structure is founded on competent bedrock, footings for the addition may be sized using an allowable bearing pressure of 1000 kilopascals. Settlement of footings founded on competent bedrock and sized using the above maximum allowable bearing pressure should be negligible, provided that there are no significant soil filled seams in the bedrock beneath founding level. To check for such seams, it is suggested that 50 millimetre diameter rock probe holes be advanced at a 3 metre horizontal spacing along the strip footings and be examined by geotechnical personnel.

It is understood that based on the refusal depths encountered during this investigation, the addition will have a full basement throughout, with the east side being walk out basement apartments and the west side being mechanical, electrical and storage areas. To provide a full basement throughout, the ground floor slab will be approximately 0.6 metres above the ground floor slab of the existing building. The link between the existing building and the addition will be of slab on grade construction for approximately the first 3 metres south of the existing building.

Blasting may be required for a portion of the basement of the addition. Due to the proximity of the existing structure and some existing houses, blasting controls and monitoring measures should be implemented. Blasting for the addition and for the site services should be carried out in a manner which limits peak particle velocities to a maximum of 50 millimetres per second at the location of any existing structure and service. In addition, blasting should not be used for rock removal within 3 metres of existing structures. Additional limits on peak particle velocities may be required where the blasting may have an impact on freshly placed concrete.

The contractor should be required to retain a licensed blasting specialist and to submit his blasting plan to the engineer for review and acceptance prior to any blasting. Trial blasts should be undertaken in an area most removed from existing structures. Monitoring of blasting should be carried out to ensure that the blasting meets the vibration criteria. A preblast survey of nearby residences and buildings should be carried out..

For design purposes, a foundation factor, F, of 1.0 should be used for computing earthquake forces on the structure.

Wall Backfill

Foundation walls for basement and slab on grade areas should be backfilled with free draining, non-frost susceptible granular material such as that conforming to the gradation requirements for Ontario Provincial Standard Specifications (OPSS) Granular B Type I. The granular material should be placed in maximum 300 millimetre thick lifts and should be compacted to at least 95 percent of the standard Proctor dry density. Drainage of the backfill should be provided by means of a geotextile wrapped perforated pipe subdrain in a surround of OPSS Granular A, which leads by gravity drainage to an adjacent storm sewer or to a sump pit. Conventional damp proofing of basement walls is appropriate with the above design approach.

Basement walls backfilled with granular material and effectively drained as described above should be designed to resist lateral earth pressures calculated using a triangular stress distribution, determined using a coefficient of earth pressure at rest, K_o, of 0.5 and a unit weight of 22 kilonewtons per cubic metre for the backfill material.

In areas where pavement or other hard surfacing will abut the building, differential frost heaving could occur between the granular fill and other areas. To reduce this differential frost heaving, the backfill adjacent to the wall should be provided with frost tapers. The frost taper should be brought up to pavement subgrade level from 1.5 metres below finished exterior grade or the top of bedrock, whichever is higher, at a slope of 3 horizontal to 1 vertical away from the footing. The granular fill should be placed in maximum 300 millimetre thick lifts and should be compacted to at least 95 percent of the standard Proctor maximum density using suitable vibratory compaction equipment.

Basement Floor Slabs

Prior to construction of the basement floor slab, all fill material and topsoil should be removed to expose either bedrock or the native, inorganic glacial till. Provision should be made for at least 150 millimetres of OPSS Granular A to form the base for the floor slab. Any bulk fill required to raise the subgrade up to the OPSS Granular A should consist of OPSS Granular B Type I. The granular fill should be placed in maximum 300 millimetre thick lifts and should be compacted to at least 95 percent of the standard Proctor maximum density using suitable vibratory compaction equipment.

Slab on Grade

A portion of the one storey link will be of slab on grade construction. For predictable performance of the floor slab, the existing fill and topsoil should be removed from within the proposed building area. Provision should be made for at least 150 millimetres of OPSS Granular A to form the base of the floor slab. Any bulk fill required to raise the grade up to the underside of the Granular A should consist of OPSS Granular B Type I. The underslab fill should be placed in maximum 300 millimetre thick lifts and should be compacted to at least 95 percent of the standard Proctor maximum dry density using suitable vibratory compaction equipment.

Frost Protection of Foundations

All exterior or isolated footings, footings in unheated areas, or footings for well insulated foundation elements should be provided with a minimum of 1.5 metres of earth cover for frost protection purposes. For footings founded on competent bedrock, the requirement for 1.5 metres of earth cover could be waived where it can be shown that the bedrock below footing level does not contain any joints filled with frost susceptible soil; this decision can only be made in the field at the time of construction based on the results of the rock probe holes.

An alternative to earth cover for frost protection would be to insulate the bearing surfaces with high density insulation. This may be the preferred option for the footings for the walkout basement on the east side of the addition which will likely be founded on bedrock at shallow depth. A typical detail for footing insulation is given in Figure 3. In preparation for the insulation, a levelling mat of lean concrete should be placed on the approved bearing surface, which for this structure will be bedrock. Care must be taken to ensure that the insulation is not damaged during construction. All joints should be carefully overlapped and/or glued where and if possible. Footings may then be placed on the insulation. The allowable bearing pressure should not exceed about 30 percent of the quoted yield strength of the insulation due to the time dependent creep characteristics of the material. For example, the allowable bearing pressure for DOW HI 100 would be 200 kilopascals. Some differential settlement should be expected between portions of the structure founded directly on bedrock and portions of the structure where insulation is placed between the footings and the bedrock. However, this differential settlement should not be significant provided the above maximum allowable bearing pressure for the insulation is used.

Site Servicing

Excavation for the installation of site services will be through fill material and will probably extend into bedrock across most of the site.

No unusual problems are anticipated in trenching in the overburden using hydraulic shovels. Side slopes should be stable in the short term at 1 horizontal to 1 vertical. However, flatter side slopes may be required due to the loose nature of the fill material in some areas of this site. Where space restrictions dictate, the excavation could also be carried out within a fully braced steel trench box, although considering the depth of overburden, this option is not likely to be necessary.

Excavation into bedrock will require drill and blast procedures. Provided that good blasting techniques are used, near vertical trench walls in the bedrock should stand unsupported for the construction period.

Some groundwater inflow into the trenches should be expected. However, it should be possible to handle groundwater inflow into the excavations by pumping from well filtered sumps.

Due to the potential for long term settlement and the effects of this settlement on grade sensitive service lines, the existing fill material at this site are not considered suitable for the support of site services. Where existing fill material exists, site services should be founded on engineered fill consisting of OPSS Granular B Type I or II which extends to native soil or bedrock below the fill. The engineered fill should be placed in maximum 300 millimetre thick lifts and should be compacted to at least 95 percent of the standard Proctor maximum dry density using suitable vibratory compaction equipment. The engineered fill should extend down and out from the bottom of the pipe at a slope of 1 horizontal to 1 vertical, or flatter.

At least 150 millimetres of Ontario Provincial Standard Specification (OPSS) Granular A should be used as pipe bedding. The bedding material should in all cases extend to the spring line of the pipe, and should be compacted to at least 95 percent of the standard Proctor maximum dry density. Cover material, from spring line of the pipe to at least 300 millimetres above the top of pipe, should consist of OPSS Granular A or Granular B Type I compacted to at least 95 percent of the standard Proctor maximum dry density.

It should generally be possible to re-use the fill material as trench backfill. Where the trench will be covered with hard surfaced areas, the type of native material placed in the frost zone (between subgrade level and 2 metres depth) should match the soil exposed on the trench sides for frost heave compatibility. Trench backfill should be placed in maximum 300 millimetre thick lifts and should be compacted to at least 90 percent of the standard Proctor maximum dry density using suitable compaction equipment.

Well fractured or well broken bedrock will be acceptable as backfill for the lower portion of the service trenches in areas where the excavation is in rock. The rock fill, however, should only be placed from at least 300 millimetres above the pipes to minimize damage due to impact or point load. The rock fill should be limited to a maximum of 300 millimetres in size.

Pavement Design

In preparation for the construction of paved areas, all surficial topsoil or other unsuitable, organic material should be excavated from the full width of the entrance roadway and from all parking lot areas. The existing fill material in new pavement areas should be removed to subgrade level and the surface of the fill material proof rolled. Sections requiring raising up to proposed subgrade level should then be filled using acceptable (compactable) earth borrow or OPSS Select Subgrade Material. The fill material under the existing parking lot should generally be suitable for reuse as earth borrow provided that organic material and construction waste are not encountered in the fill material during construction. These materials should be placed in maximum 300 millimetre thick lifts and should be compacted to at least 95 percent of the standard Proctor maximum dry density using suitable compaction equipment. Well broken or recrushed bedrock would also be acceptable as fill material.

The surface of the subgrade or fill should be crowned to promote drainage of the roadway granular structure.

The pavement structure for areas which will not receive significant truck traffic should be:

Pavement Component	Thickness (millimetres)
Asphaltic Concrete	50
OPSS Granular A Base	150
OPSS Granular B Type II Subbase	300

The pavement structure for areas which will receive truck traffic should be:

Pavement Component	Thickness (millimetres)
Asphaltic Concrete	90
OPSS Granular A Base	150
OPSS Granular B Type II Subbase	450

The granular base and subbase materials should be uniformly compacted to at least 100 percent of the standard Proctor maximum dry density using suitable vibratory compaction equipment. The asphaltic concrete should be compacted to at least 97 percent of Marshall density.

In areas of shallow bedrock, the pavement structure could be reduced to 90 millimetres of asphaltic concrete, over 150 millimetres of OPSS Granular A, over 150 millimetres of shattered bedrock or OPSS Granular B Type II, over bedrock.

The composition of the asphaltic concrete pavement in areas which will not receive significant truck traffic should be as follows:

HL3 Surface Course - 50 millimetres

The composition of the asphaltic concrete pavement in areas which will receive significant truck traffic should be as follows:

HL3 Surface Course - 40 millimetres

HL8 Binder Course - 50 millimetres

ADDITIONAL CONSIDERATIONS

The soils at this site are potentially sensitive to disturbance from ponded water, construction traffic and frost.

All footing, subgrade areas, and rock probe holes should be inspected by the geotechnical engineer prior to filling or concreting to ensure that soil or rock having adequate bearing capacity has been reached and that the bearing surfaces have been properly prepared. The placing and compaction of any engineered fill as well as sewer bedding and backfill should be inspected to ensure that the materials used conform to the specifications from both a grading and compaction view point. The placement of insulation under footings should be inspected to ensure that the insulation is placed in a manner consistent with the guidelines in this report.

Preblast surveys should be carried out prior to any blasting operations and continuous monitoring of vibrations should be carried out during blasting operations.

At the time of writing of this report, only conceptual details for the proposed structure were available. Golder Associates should be retained to review final drawings and specifications for this project prior to tendering to ensure that the guidelines in this report have been adequately interpreted.

We hope that this report contains sufficient information for your present requirements. If you have any questions concerning this report, or if we can be of further service to you on this project, please call us.

Yours truly,

GOLDER ASSOCIATES LTD.

M.I. Cunningham, M.Eng.

A.F. Chevrier, P.Eng.
Associate

MIC:AFC:dc
WDC11

Attachments:

- Abbreviations and Symbols
- Record of Borehole Sheets
- Figures 1 to 3

The abbreviation commonly employed on each "Record of Borehole," on the figures and in the text of the report, are as follows:

I. SAMPLE TYPES

AS auger sample
CS chunk sample
DO drive open
DS Denison type sample
FS foil sample
RC rock core
ST slotted tube
TO thin-walled, open
TP thin-walled, piston
WS wash sample

II. PENETRATION RESISTANCES

Dynamic Penetration Resistance:
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 0.3 m (12 in.).

Standard Penetration Resistance, *N*:
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) drive open sampler for a distance of 0.3 m (12 in.).

WH sampler advanced by static weight—weight, hammer

PH sampler advanced by pressure—pressure, hydraulic

PM sampler advanced by pressure—pressure, manual

III. SOIL DESCRIPTION

(a) *Cohesionless Soils*

Relative Density	'N' Blows/0.30m or Blows/ft.
Very loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	over 50

(b) *Cohesive Soils*

Consistency	'Cu' kPa	psf.
Very soft	0 to 12	0 to 250
Soft	12 to 25	250 to 500
Firm	25 to 50	500 to 1000
Stiff	50 to 100	1000 to 2000
Very stiff	100 to 200	2000 to 4000
Hard	over 200	over 4000

IV. SOIL TESTS

C consolidation test
H hydrometer analysis
M sieve analysis
MH combined analysis, sieve and hydrometer[1]
Q undrained triaxial[2]
R consolidated undrained triaxial[2]
S drained triaxial
U unconfined compression
V field vane test

NOTES:
[1]Combined analyses when 5 to 95 per cent of the material passes the No. 200 sieve.
[2]Undrained triaxial tests in which pore pressures are measured are shown as $\bar{Q}$ or $\bar{R}$.

LIST OF SYMBOLS

I. GENERAL

$\pi = 3.1416$

e = base of natural logarithms 2.7183

$\log_e a$ or $\ln a$, natural logarithm of a

$\log_{10} a$ or $\log a$, logarithm of a to base 10

t	time
g	acceleration due to gravity
V	volume
W	weight
M	moment
F	factor of safety

II. STRESS AND STRAIN

u	pore pressure
σ	normal stress
σ'	normal effective stress ($\bar{\sigma}$ is also used)
τ	shear stress
ϵ	linear strain
ϵ_{xy}	shear strain
ν	Poisson's ratio (μ is also used)
E	modulus of linear deformation (Young's modulus)
G	modulus of shear deformation
K	modulus of compressibility
η	coefficient of viscosity

III. SOIL PROPERTIES

(a) *Unit weight*

γ	unit weight of soil (bulk density)
γ_s	unit weight of solid particles
γ_w	unit weight of water
γ_d	unit dry weight of soil (dry density)
γ'	unit weight of submerged soil
G_s	specific gravity of solid particles $G_s = \gamma_s/\gamma_w$
e	void ratio
n	porosity
w	water content
S_r	degree of saturation

(b) *Consistency*

w_L	liquid limit
w_P	plastic limit
I_P	plasticity index
w_S	shrinkage limit
I_L	liquidity index $= (w - w_P)/I_P$
I_C	consistency index $= (w_L - w)/I_P$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
D_r	relative density $= (e_{max} - e)/(e_{max} - e_{min})$

(c) *Permeability*

h	hydraulic head or potential
q	rate of discharge
v	velocity of flow
i	hydraulic gradient
k	coefficient of permeability
j	seepage force per unit volume

(d) *Consolidation (one-dimensional)*

m_v	coefficient of volume change $= -\Delta e/(1+e)\Delta\sigma'$
C_c	compression index $= -\Delta e/\Delta \log_{10} \sigma'$
c_v	coefficient of consolidation
T_v	time factor $= c_v t/d^2$ (d, drainage path)
U	degree of consolidation

(e) *Shear strength*

τ_f	shear strength	
c'	effective cohesion intercept	in terms of effective stress $\tau_f = c' + \sigma' \tan \phi'$
ϕ'	effective angle of shearing resistance, or friction	
c_u	apparent cohesion*	in terms of total stress $\tau_f = c_u + \sigma \tan \phi_u$
ϕ_u	apparent angle of shearing resistance, or friction	
μ	coefficient of friction	
S_t	sensitivity	

*For the case of a saturated cohesive soil, $\phi_u = 0$ and the undrained shear strength $\tau_f = c_u$ is taken as half the undrained compressive strength.

PROJECT: 951-2834

RECORD OF BOREHOLE 1

LOCATION: See Plan

BORING DATE: June 13, 1995

SHEET 1 OF 1

DIP:

DATUM: Local

SAMPLER HAMMER: 63.5kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	LAB. TESTING	COMBUSTIBLE VAPOUR ⊕ ( ) LEL %	HYDRAULIC CONDUCTIVITY, k, cm/s; WATER CONTENT, PERCENT Wp W Wl	INSTALLATIONS A B C
0		Ground Surface										
		ASPHALTIC CONCRETE		99.72 / 0.03								
		Grey CRUSHED STONE		99.51 / 0.21								
1	Power Auger 200mm Diam (Hollow Stem)	Compact brown silty sand and gravel, some crushed stone (FILL)			1	DO	50 / 21					
					2	DO	50 > 100					
				97.92 / 1.80								
2		End of Hole Auger Refusal										
3												
4												
5												

DATA INPUT: S.Leighton

DEPTH SCALE (ALONG HOLE)

1 to 25

Golder Associates

LOGGED: M.I.C

CHECKED: MIC

PROJECT: 951-2834

LOCATION: See Plan

DIP:

RECORD OF BOREHOLE 2

BORING DATE: June 13, 1995

SHEET 1 OF 1

DATUM: Local

SAMPLER HAMMER, 63.5kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	LAB. TESTING	COMBUSTIBLE VAPOUR ( ) LEL %	HYDRAULIC CONDUCTIVITY, K, cm/s / WATER CONTENT, PERCENT Wp W Wl	INSTALLATIONS A B C
0	Power Auger 200mm Diam (Hollow Stem)	Ground Surface		99.55								
		ASPHALTIC CONCRETE		99.49 / 0.06								
		Grey CRUSHED STONE		0.15	1	AS	-					
1		Compact brown silty sand and gravel, with cobbles (FILL)			2	50 DO	61					
					3	50 DO	>100					
				97.78 / 1.77								
2		End of Hole Auger Refusal										
3												
4												
5												

DATA INPUT: S.Leighton

DEPTH SCALE (ALONG HOLE)

1 to 25

Golder Associates

LOGGED: M.I.C

CHECKED: MIC

PROJECT: 951-2834

LOCATION: See Plan

DIP:

RECORD OF BOREHOLE 3

BORING DATE: June 13, 1995

SHEET 1 OF 1

DATUM: Local

SAMPLER HAMMER, 63.5kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	LAB. TESTING	COMBUSTIBLE VAPOUR ⊕ ( ) LEL %	HYDRAULIC CONDUCTIVITY, K, cm/s / WATER CONTENT, PERCENT Wp —W— Wl	INSTALLATIONS A B C
0	Power Auger 200mm Diam (Hollow Stem)	Ground Surface		99.45								
		ASPHALTIC CONCRETE		99.39 0.06								
		Grey CRUSHED STONE		0.21	1	AS						
1		Compact brown silty sand and gravel, with cobbles (FILL)			2	50 DO	13					
		Probably Weathered Bedrock		97.62 1.83	3	50 DO	45					
2		End of Hole Auger Refusal		97.32 2.13								
3												
4												
5												

DATA INPUT: S.Leighton

DEPTH SCALE (ALONG HOLE)

1 to 25

Golder Associates

LOGGED: M.I.C

CHECKED: MIC

PROJECT: 951-2834

LOCATION: See Plan

DIP:

RECORD OF BOREHOLE 4

BORING DATE: June 13, 1995

SHEET 1 OF 1

DATUM: Local

SAMPLER HAMMER, 63.5kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	LAB. TESTING	COMBUSTIBLE VAPOUR ⊕ ( ) LEL %	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT, PERCENT Wp W Wl	INSTALLATIONS A B C
0	Power Auger 200mm Diam (Hollow Stem)	Ground Surface		99.21								
		Grey CRUSHED STONE		99.12 0.09								
1		Loose brown silty sand and gravel, with cobbles (FILL)			1	50 DO	5					
					2	50 DO	3					
2		Dark brown sandy silt (TOPSOIL)		1.83 97.23								
		Brown sandy silt, some gravel (GLACIAL TILL)		1.98 96.98								
		End of Hole Auger Refusal		2.23								
3												
4												
5												

DATA INPUT: S.Leighton

DEPTH SCALE (ALONG HOLE)

1 to 25

Golder Associates

LOGGED: M.I.C

CHECKED: MIC

PROJECT: 951-2834

LOCATION: See Plan

DIP:

RECORD OF BOREHOLE 5

BORING DATE: June 13, 1995

SHEET 1 OF 1

DATUM: Local

SAMPLER HAMMER, 63.5kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	LAB. TESTING	COMBUSTIBLE VAPOUR ( ) LEL %	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT, PERCENT Wp W Wl	INSTALLATIONS A B C
		Ground Surface		99.25								
0		Dark brown fine to medium sand (TOPSOIL)		0.00								
				99.10 / 0.15								
1	Power Auger, 200mm Diam (Hollow Stem)	Loose brown sandy silt, some gravel, trace organics and peat (FILL)			1	50 DO	4					
					2	50 DO	7					
2				96.96 / 2.29								
		End of Hole Auger Refusal										
3												
4												
5												

DATA INPUT: S.Leighton

DEPTH SCALE (ALONG HOLE)

1 to 25

Golder Associates

LOGGED: M.I.C

CHECKED: MIC

RECORD OF BOREHOLE 7

PROJECT: 951-2834
LOCATION: See Plan
DIP:

BORING DATE: June 13, 1995

SHEET 1 OF 1
DATUM: Local
SAMPLER HAMMER, 63.5kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	LAB. TESTING	COMBUSTIBLE VAPOUR ⊕ ( ) LEL %	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT, PERCENT Wp W Wl	INSTALLATIONS A B C
		Ground Surface		99.22								
0	Power Auger 200mm Diam (Hollow Stem)	Dark Brown fine to medium sand (TOPSOIL)		0.00								
		Loose brown sandy silt, some gravel (FILL)		99.07 / 0.15								
1					1	50 DO	4					
					2	50 DO	6					
2		Dark brown sand (TOPSOIL)		97.09 / 2.16								
		End of Hole Auger Refusal										
3												
4												
5												

DATA INPUT: S.Leighton

DEPTH SCALE (ALONG HOLE)
1 to 25

Golder Associates

LOGGED: M.I.C
CHECKED: MIC

RECORD OF BOREHOLE 8

PROJECT: 951-2834
LOCATION: See Plan
DIP:
BORING DATE: June 13, 1995
SHEET 1 OF 1
DATUM: Local
SAMPLER HAMMER, 63.5kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	LAB. TESTING	COMBUSTIBLE VAPOUR ⊕ ( ) LEL % □	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT, PERCENT Wp W Wl	INSTALLATIONS A B C
		Ground Surface		99.65								
0	Power Auger 200mm Diam (Hollow Stem)	Dark brown fine to medium sand (TOPSOIL)		0.00								
		Loose brown sandy silt, some gravel (FILL)		99.44 0.21								
1					1	50 DO	7					
		Dark brown sandy silt (TOPSOIL)		98.43 1.22								
		Brown sandy silt, some gravel (GLACIAL TILL)		98.28 1.37								
		End of Hole Auger Refusal		98.13 1.52								
2												
3												
4												
5												

DATA INPUT: S.Leighton

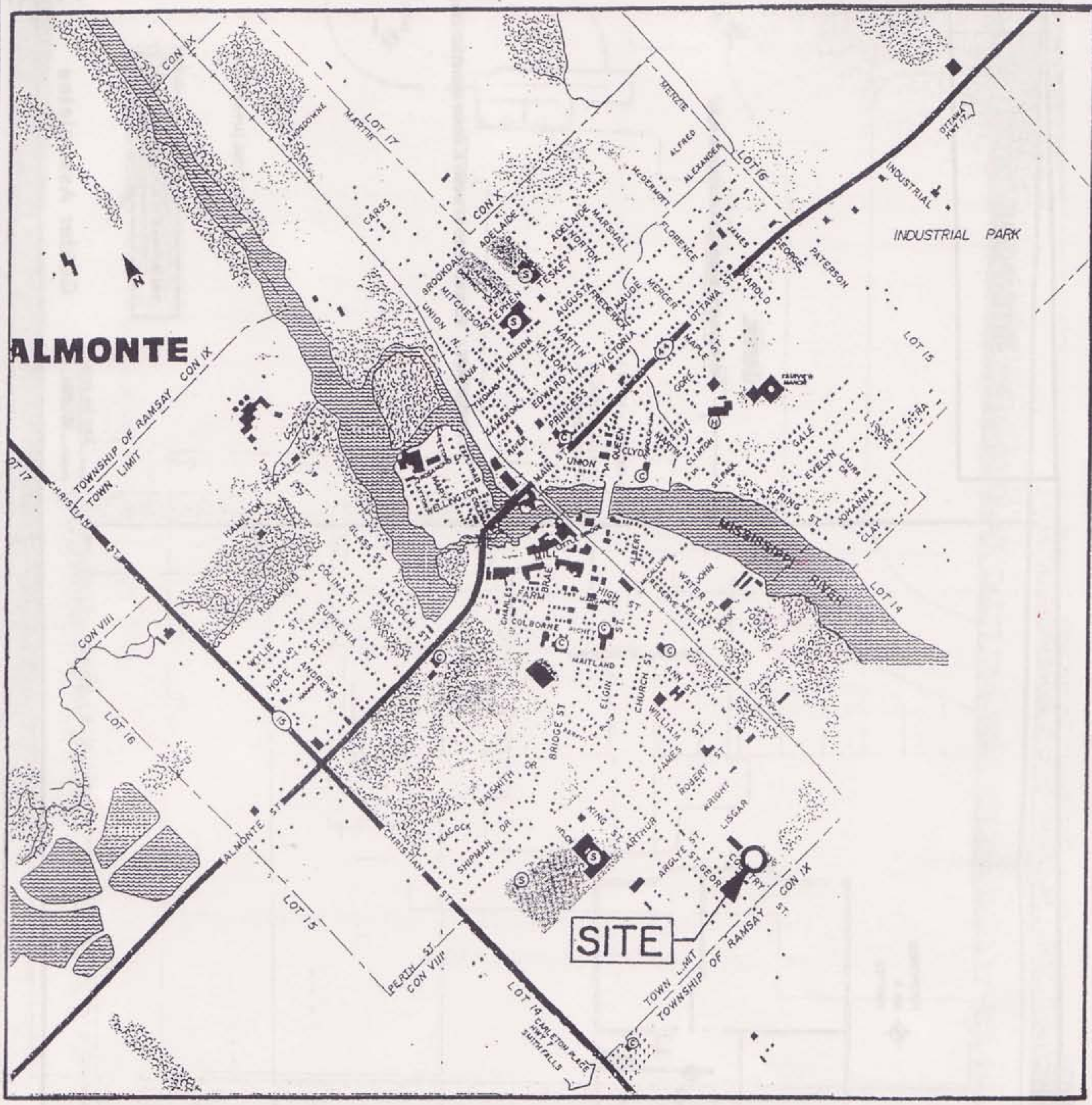
DEPTH SCALE (ALONG HOLE)
1 to 25

Golder Associates

LOGGED: M.I.C
CHECKED: MIC

KEY PLAN

FIGURE I



SCALE I : 20,000

SPECIAL NOTE
THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT

Date JUNE 20, 1995

Project 951-2834

Golder Associates

Drawn SL

Chkd. M/C