



December 9, 1991

C.T. Male Associates, P.C.  
50 Century Hill Drive  
P.O. Box 727  
Latham, N.Y. 12110

Attn: Gary Hoffman, P.E.

Re: Revision of Geotechnical Evaluation  
for Proposed McDonald's Restaurant Sites  
Modena, Port Byron, Warners, Guilderland  
on New York State Thruway  
ESI File No.: ATA-91-192

Dear Mr. Hoffman

As per your direction, we have revised our previous recommendations for allowable soil bearing capacities at the above proposed McDonald's Restaurant sites. According to our discussion, we understand that due to special architectural features of the proposed building design, the column loads will be somewhat higher than anticipated. Therefore, the McDonald's standard allowable bearing pressure of 2000 psf may be too conservative and uneconomical for these foundation designs.

We will assume that the maximum column loads will be 100 kips and that a maximum of one (1) inch of foundation settlement will be tolerable. Based on this criteria, we have re-evaluated the subsurface conditions and determined maximum allowable soil bearing capacities.

The following is a summary of our revised foundation soil bearing recommendations for each site.

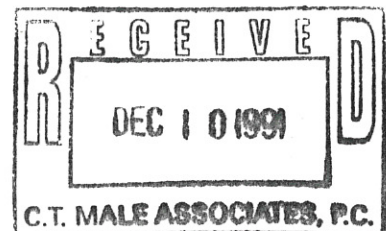
<u>SITE</u>	<u>MAXIMUM ALLOWABLE SOIL BEARING CAPACITY</u>
Modena, N.Y.	4500 psf
Port Byron, N.Y.	2500 psf
Warners, N.Y.	2500 psf
Guilderland, N.Y.	3500 psf

RECEIVED

JAN 17 1992

CLOUGH, HARBOUR  
& ASSOCIATES

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Page 2

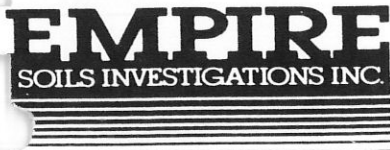
Please call me if you have any questions regarding this letter or if I can be of any further assistance.

Sincerely,

EMPIRE SOILS INVESTIGATIONS, INC.

A handwritten signature in dark ink, appearing to read "Paul DeStefano", is written over the printed name.

Paul DeStefano, P.E.  
Geotechnical Engineering Manager  
Eastern Region



GEOTECHNICAL EVALUATION  
PROPOSED MCDONALD'S RESTAURANT  
MODENA SERVICE AREA  
NEW YORK STATE THRUWAY

Prepared For:  
C.T. MALE ASSOCIATES, P.C.  
50 CENTURY HILL DRIVE  
LATHAM, N.Y. 12110

Prepared By:  
EMPIRE SOILS INVESTIGATIONS, INC.  
BALLSTON SPA, NEW YORK 12020

FILE NO.: ATA-91-192

OCTOBER 1991



October 21, 1991

C.T. Male Associates, P.C.  
50 Century Hill Drive  
P.O. Box 727  
Latham, N.Y. 12110

Attn: Mr. Gary Hoffman, P.E.

Re: Geotechnical Evaluation  
Proposed McDonald's Restaurant  
Modena Service Area  
New York State Thruway  
ESI File No.: ATA-91-192

Dear Mr. Hoffman:

We have completed our investigation and evaluation of the above proposed McDonald's restaurant site according to your directions and authorization. The purpose of our work was to evaluate the existing subsurface conditions and provide recommendations for the design and construction of building and pole foundations, and surrounding pavements. We understand that the existing restaurant building and adjacent pavements located at this site will be demolished and replaced with a new, typical one-story McDonald's restaurant building, with surrounding parking areas, in the same approximate location. The site is relatively flat in the vicinity of the proposed building location. The western portion of the site gradually slopes (approximately 10%) from Northeast to Southwest starting at a distance of approximately 200 feet West of the nearest proposed building foundation. It appears that the western portion of the site

was filled to construct the existing road embankments.

**I. METHOD OF INVESTIGATION**

The site's subsurface conditions were investigated through the advancement of test borings and visual classification of the recovered soil samples. A total of five (5) test borings were advanced from 10 to 15 feet of depth below existing grades to practical refusal in very compact soils. A technician from our staff established their locations in the field through tape measurements from the existing building and structures. The locations of these borings were also established to be in close proximity to the proposed building foundation and adjacent parking areas. Their locations are illustrated on the Subsurface Investigation Plan contained in Appendix A.

Soil samples were recovered on a nearly continuous basis for the first 5 feet of depth and then one sample was recovered at approximately 10 feet of depth. The samples were obtained according to ASTM D-1586, Standard Method for Penetration Test and Split-Barrel Sampling of Soils. A Central Mine Equipment Model 55 drill rig equipped with hollow stem auger casing was used to advance the test borings.

Representative portions of the samples recovered in the field were placed in jars and transported to our office for visual classification by a geotechnical engineer. On the basis of these classifications and the driller's field records

and observations, a log was prepared for each test boring. The logs are presented in Appendix B together with a sheet which explains the terms and symbols used in their preparation.

## II. SUBSURFACE CONDITIONS

After penetrating through the existing pavements, test borings B-3, B-4, and B-5 encountered a very compact glacial till at 2 feet of depth to approximately 11 feet where they were terminated and auger refusal was met. In test borings B-1 and B-2, the samples indicated that the soils were of the same composition as the glacial till found in boring holes B-3 through B-5. However, the consistency of soils found in borings B-1 and B-2 were loose to firm to a depth of 5 feet. Based on these observations, it appears that the site was filled with on-site soils to construct the road embankment on the western portion of the site.

Groundwater was not observed in most of the test borings upon completion. However, groundwater was observed in test boring B-1 at a depth of 6.2 feet after the hole was left open overnight and observed the following morning. Since there was no water observed in the other test borings upon completion of drilling, it appears that surface water runoff may locally percolate through the surficially loose granular soils and becomes perched on the underlying very dense glacial till.

**III. CONCLUSIONS AND RECOMMENDATIONS****A. Site Preparation**

The existing building structure should be demolished and all debris removed to a minimum of two (2) feet below grade level in existing slab areas and to top of existing footing levels. Existing pavements should be broken and removed to below the base course levels at a minimum. The finished floor elevation for the new restaurant should be approximately equal to the existing building's elevation or a minimum of six (6) inches above abutting pavements. A select granular material as specified in paragraph E should be used to complete any grade increases and to backfill areas where foundations were removed. In areas where loose fills are encountered below foundation grade, they should be removed and backfilled with a select granular material according to specifications outlined in paragraph E. In particular, the in-situ foundation subgrades located near test boring B-1 or the Western Portion of the building foundations should be carefully inspected by a geotechnical engineer and reconstructed if necessary.

**B. Foundation Design and Construction**

Conventional spread foundations proportioned according to the McDonald's standard net allowable bearing pressure of 2,000 pounds per square foot may be used to support the structure. All foundations should have a minimum width of eighteen (18) inches even if this results in a bearing pres-

sure less than the recommended allowable. Exterior foundations should be seated at least four (4) feet below final exterior grades to provide frost protection. Interior foundations may bear at two (2) feet below the top of the floor slab is permitted by local building codes. Surface runoff should not be allowed to enter foundation excavation. Water which enters and accumulates in these excavations should be removed through common sump and pump techniques along with any mud or soils surfically softened at bearing grades.

The structural design, sliding and overturning stability of any retaining walls, road sign and utility poles should be analyzed. Assuming adequate drainage provisions and level backfill are included in the design, the following parameters should be used for these analyses together with a factor of safety of at least 1.50.

- o Maximum Allowable Foundation Edge Pressure = 4,000 psf
- o Equivalent Fluid Weight of Level Backfill

Active Pressure = 30 pcf  
Passive Pressure = 250 pcf

- o Coefficient of Sliding Friction

Along Base of Foundation = 0.45

Depth of embedment for pole foundation should be analyzed utilizing the following parameters:

- o Maximum allowable Lateral Soil Bearing Capacity = 300 psf/ft. of depth
- o Allowable Horizontal subgrade reaction constant ( $n_h$ ) = 20

All bearing grades should be excavated to their final elevation and compacted to their undisturbed state. The final grades should be firm and stable, and free of any loose soil, mud, water or frost. Foundation wall backfill should consist of select granular material. Settlements are not expected to exceed one-half (1/2) of an inch. They should occur quickly, that is, as each load increment is applied.

#### **C. Floor Slab Design and Construction**

The building's floor slabs should be constructed over a base course of processed sand and gravel which conforms to the gradation requirements specified for Type 4 material in Section 304-2.02 of the NYSDOT Standard Specifications. The base course layer should be at least six (6) inches in depth and compacted according to the 95 percent ASTM D-1557 density specification.

The slabs may be designed and constructed following the procedures of the American Concrete Institute or Portland Cement Association using 250 pounds per cubic inch as the vertical modulus of subgrade reaction.

#### **D. Pavement Design**

The entrance drive and parking lot for the new restaurant may be constructed as flexible pavements. Assuming any truck traffic is confined to a specific area and will not cross parking lot areas, two pavement sections may be employed; a light section for areas restricted to automobile parking and a heavy section for areas subject to truck traffic.

The following materials and specifications are recommended for each:

<u>COURSE</u>	<u>MATERIAL DESCRIPTION</u>	<u>THICKNESS</u>	<u>NYSDOT SPECS.</u>
<u>Truck Traffic-Entrance Drive</u>			
Top	Asphaltic Concrete	1 1/2"	Section 401 Type 6
Binder	Asphaltic Concrete	3"	Section 401 Type 3
Base	Crusher-Run Stone	6"	Section 304 Type 2
Subbase	Processed Sand & Gravel	12"	Section 304 Type 4
<u>Auto Traffic - Parking Lot</u>			
Top	Asphaltic Concrete	1 1/2"	Section 401 Type 6
Binder	Asphaltic Concrete	2 1/2"	Section 401 Type 3
Base	Processed Sand & Gravel	12"	Section 304 Type 4

Prior to constructing the pavement sections the subgrade should be regraded to remove ruts and any loose soil. The base and subbase courses should be compacted to the 95 percent ASTM D-1557 density specification. Placement and compaction of the asphaltic concrete should be in accordance with the requirements of Section 400 of the NYSDOT Standard Specifications.

**E. Site Fill and Backfill Requirements**

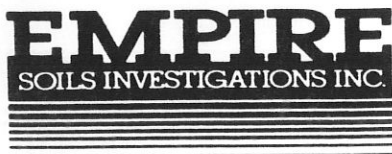
Fill and backfill for the site should meet the following specifications:

<u>TYPE</u>	<u>APPLICATION</u>	<u>COMPACTION REQ.</u>
Select Granular Fill NYSDOT Spec. Section 203-2.02C	Under Foundations, and adjacent to structures	95% ASTM D-1557 6 inch lifts (Max) with plate com- pactor or similar equipment
Select Granular Fill NYSDOT Spec. Section 202-2.02C	Under grassed areas	90% ASTM D-1557 12 inch lifts (Max)
Select Granular Fill NYSDOT Spec. Section 203-2.02C	Under pavements and slabs	95% ASTM D-1557 8 inch lift (Max) with vibratory roller

Existing on-site excavated soils may be used for fill and backfill if they are tested and meet the above specified gradation requirements.

**IV. CLOSURE**

This report has been prepared to assist in the design and construction of a McDonald's Restaurant to be located in the Town of Modena, New York. The recommendations are presented on the basis of our understanding of the project as described herein and through the application of generally accepted soil and foundation engineering practices. No other warranties, expressed or implied, are made. Should there be any modifications in the building location as presented on



the Subsurface Investigation Plan, we should be notified so that we may review the changes and modify our recommendations as required.

Important information concerning the use and interpretation of this report is contained in Appendix D.

Sincerely,

EMPIRE SOILS INVESTIGATIONS, INC.

*Paul D. DeStefano*  
Paul D. DeStefano, P.E.  
Geotechnical Project Engineer



Reviewed by:

*Richard C. Wakeman*  
Richard C. Wakeman, P.E.  
Regional Manager

SUBSURFACE INVESTIGATION PLAN

MODENA SERVICE AREA



TEST BORING  
(TYP.)

B-1

DELIVERIES →

x 570.9

EXIST.  
BLDG.  
FF. ELEV.  
572.0

DRIVER

B-2

x 571.0

B-3

PROPOSED  
BUILDING

B-5

B-4

x 570.8  
SPOT ELEV.  
(TYP.)

EXISTING BLDG.  
ISLAND

PROPOSED BLDG.  
ISLAND

x 570.7

← DRIVE-THRU



SUBSURFACE  
INVESTIGATION PLAN

PROPOSED McDONALD'S RESTAURANT  
NYS THRUWAY  
MODENA SERVICE AREA

BASE MAP PREPARED BY  
C.T. MALE ASSOCIATES, P.C.

DR BY JH

SCALE: 1" = 40'

PROJ. NO. ATA-91-192

CK'D BY

DATE: 10/91

DRWG NO. 2

SUBSURFACE LOGS

APPENDIX B

DATE

STARTED 10/3/91

FINISHED 10/3/91

SHEET 1 OF 1



## SUBSURFACE LOG

HOLE NO. B-1

SURF. ELEV. \_\_\_\_\_

G. W. DEPTH See Note #1

PROJECT Proposed McDonald's Restaurant  
NYS ThruwayLOCATION Modena Service Area  
Orange County, N.Y.

DEPTH-FT.	SAMPLES	SAMPLE NO	BLOWS ON SAMPLER					BLOW ON CASING C	SOIL OR ROCK CLASSIFICATION	NOTES
			0	6	12	18	N			
0		1	4	9			16		POSSIBLE FILL: Brown SAND and SILT, little fine GRAVEL	Note #1: No ground-water observed at completion of boring operation. Ground-water observed @ 6.2 feet depth in boring hole approximately 12 hrs. after completion of drilling.
			7	6						
		2	5	5			9			
			4	4						
5		3	4	1			4		(Damp-Loose)	
			3	17						
10		4	10	24			38		GLACIAL TILL: Brown SAND & SILT, Some Gravel	
			14	12						
15		5	7	30			66		Becomes Brown SAND and GRAVEL, little SILT (Damp - Firm to Very Compact)	
			36	40						
20									End of Boring @ 17.0'	

N = No. blows to drive 2 " spoon 28 " with 140 lb. pin wt. falling 30 " per blow. CLASSIFICATION Visual by Geotechnical

C = No. blows to drive " casing " with lb. weight falling " per blow. Engineer

METHOD OF INVESTIGATION 3 1/2" I.D. Hollow Stem Augers

STARTED 10/3/91  
FINISHED 10/3/91  
SHEET 1 OF 1



HOLE NO. B-2  
SURF. ELEV. \_\_\_\_\_  
G. W. DEPTH See Note #1

PROJECT Proposed McDonald's Restaurant  
NYS Thruway

LOCATION Modena Service Area  
Orange County, N.Y.

[illegible]

N = No. blows to drive 2 " spoon 12 " with 140 lb. pin wt. falling 30 " per blow. CLASSIFICATION Visual by Geotechnical  
C = No. blows to drive \_\_\_\_\_ " casing \_\_\_\_\_ " with \_\_\_\_\_ lb. weight falling \_\_\_\_\_ " per blow Engineer  
METHOD OF INVESTIGATION 3 1/2" I.D. Hollow Stem Augers

STARTED 10/3/91  
FINISHED 10/3/91  
SHEET 1 OF 1



HOLE NO. B-3  
SURF. ELEV. \_\_\_\_\_  
G. W. DEPTH See Note #1

PROJECT Proposed McDonald's Restaurant  
NYS Thruway

LOCATION Modena Service Area  
Orange County, N.Y.

[illegible]

N = No. blows to drive 2 " spoon 12 " with 140 lb. pin wt. falling 30 " per blow. CLASSIFICATION Visual by Geotechnical  
C = No. blows to drive        " casing        " with        lb. weight falling        " per blow.        Engineer  
METHOD OF INVESTIGATION 3 1/2" I.D. Hollow Stem Augers

DATE  
STARTED 10/4/91  
FINISHED 10/4/91  
FEET 1 OF 1



## SUBSURFACE LOG

HOLE NO. B-4  
SURF. ELEV. \_\_\_\_\_  
G.W. DEPTH See Note 31

PROJECT Proposed McDonald's Restaurant  
NYS Thruway

LOCATION Modena Service Area

DEPTH-FT.	SAMPLES	SAMPLE NO.	BLOWS ON SAMPLER					BLOW ON CASING C	SOIL OR ROCK CLASSIFICATION	NOTES
			0	6	12	18	N			
0		1	9				27		±.3 ft. PAVEMENT	Note #1: No observed groundwater completion of boring operation
			18	34						
		2	44	100/.4			100/.4		GLACIAL TILL: Brown SAND, Some GRAVEL Some SILT	
5		3	44	56			100/.9			No recovery (Moist-Very Compact)
			100/.4							
10		4	76	100/.3			100/.3			End of Boring @ 10.1' (Auger refusal at 9.3')

N = No. blows to drive 2 " spoon 12 " with 140 lb. pin wt. falling 30 " per blow. CLASSIFICATION Visual by Geotechnical  
C = No. blows to drive \_\_\_\_\_ " casing \_\_\_\_\_ " with \_\_\_\_\_ lb. weight falling \_\_\_\_\_ " per blow. Engineer  
METHOD OF INVESTIGATION 3 1/2" I.D. Hollow Stem Augers

DATE  
STARTED 10/4/91  
FINISHED 10/4/91  
SHEET 1 OF 1



## SUBSURFACE LOG

HOLE NO. B-5  
SURF. ELEV. \_\_\_\_\_  
G. W. DEPTH See Note #1

PROJECT Proposed McDonald's Restaurant  
NYS Thruway

LOCATION Modena Service Area  
Orange County, N.Y.

DEPTH-FT	SAMPLES	SAMPLE NO	BLOWS ON SAMPLER					BLOW ON CASING C	SOIL OR ROCK CLASSIFICATION	NOTES
			0	6	12	18	N			
0		1	10				22		±.3 ft. PAVEMENT	Note #1: No Groundwater GLACIAL TILL: Brown fine SAND, Some observed at completion coarse SAND, Some GRAVEL, little silt of boring operations
			12	12						
		2	12	24			48			
			24	13						
5		3	14	36			136/.9			(Damp-Firm to Very Compact)
			100/.4							
10		4	45	97			197/.8			End of Boring @ 10.8' (Auger refusal @ 9.3')
			100/.3							
15										

N = No. blows to drive 2 " spoon 12 " with 140 lb. pin wt. falling 30 " per blow. CLASSIFICATION Visual by Geotechnical  
C = No. blows to drive \_\_\_\_\_ " casing \_\_\_\_\_ " with \_\_\_\_\_ lb. weight falling \_\_\_\_\_ " per blow. Engineer  
METHOD OF INVESTIGATION 3½" I.D. Hollow Stem Augers

DATE	<b>EMPIRE</b> BOILERS INVESTIGATIONS INC.	<b>SUBSURFACE LOG</b>
STARTED <u>5-1-86</u>		HOLE NO. <u>B-175</u>
FINISHED <u>5-1-86</u>		SURF. ELEV. <u>325.6</u>
SHEET <u>1</u> OF <u>1</u>		G. W. DEPTH <u>See Note #1</u>

Project \_\_\_\_\_ LOCATION \_\_\_\_\_

DEPTH FT	SAMPLES	SAMPLE NO	BLOWS ON SAMPLER					BLOW ON CASING C	SOIL OR ROCK CLASSIFICATION	NOTES
			0-6	6-12	12-18	18-24	N			
0		1	2	2	3	5	10		TOPSOIL 3"	NOTE #1 G.W. at 2.0' completion G.W. at 2.2' 24 hrs. after completion
							15		Brown SILT, some Sand, trace clay (Moist - Loose)	
							50/5'		Gray SHALE, medium hard weathered, thin bedded some fractures	Run #1, 2.5' - 5.0' 95% Recovery 50% RQD
5										

TABLE I





	Split Spoon Sample
	Shelby Tube Sample
	Auger or Test Pit Sample
	Rock Core

TABLE II

Identification of soil type is made on basis of an estimate of particle sizes, and in the case of fine grained soils also on basis of plasticity.		
Soil Type	Soil Particle Size	
Boulder	> 12"	Coarse Grained (Granular)
Cobble	3" - 12"	
Gravel - Coarse	3" - 3/4"	
- Fine	3/4" - #4	
Sand - Coarse	#4 - #10	Fine Grained
- Medium	#10 - #40	
- Fine	#40 - #200	
Silt-Non Plastic (Granular)	< #200	
Clay-Plastic (Cohesive)		

TABLE III

The following terms are used in classifying soils consisting of mixtures of two or more soil types. The estimate is based on weight of total sample.	
Term	Percent of Total Sample
"and"	35 - 50
"some"	20 - 35
"little"	10 - 20
"trace"	less than 10
(When sampling gravelly soils with a standard split spoon, the true percentage of gravel is often not recovered due to the relatively small sampler diameter.)	

TABLE IV

The relative compactness or consistency is described in accord with the following terms.			
Granular Soils		Cohesive Soils	
Term	Blows per Foot, N	Term	Blows per Foot, N
Loose	< 11	Very Soft	< 3
Firm	11 - 30	Soft	3 - 5
Compact	31 - 50	Medium	6 - 15
Very Compact	> 51	Stiff	16 - 25
		Hard	> 26
(Large particles in the soils will often significantly influence the blows per foot recorded during the Penetration Test.)			

TABLE V

Varved	- Horizontal uniform layers or seams of soil(s).
Layer	- Soil deposit more than 6" thick
Seam	- Soil deposit less than 6" thick
Parting	- Soil deposit less than 1/8" thick
Laminated	- Irregular, horizontal and angled seams and partings of soil(s)

TABLE VI

Rock Classification Terms		Meaning
Term		
Hardness	Soft Medium Hard Hard Very Hard	Scratched by fingernail Scratched easily by penknife Scratched with difficulty by penknife Cannot be scratched by penknife
Weathering	Very Weathered Weathered Sound	Judged from the relative amounts of disintegration iron staining, core recovery, clay seams, etc.
Bedding	Laminated Thin bedded Bedded Thick bedded Massive	Natural breaks in Rock Layers ( < 1" ) ( 1" - 4" ) ( 4" - 12" ) ( 12" - 36" ) ( > 36" )
(Fracturing refers to natural breaks in the rock oriented at some angle to the rock layers.)		

## GENERAL INFORMATION & KEY TO SUBSURFACE LOGS

The Subsurface Logs attached to this report present the observations and mechanical data collected by the driller at the site, supplemented by classification of the material removed from the borings as determined through visual identification by technicians in the laboratory. It is cautioned that the materials removed from the borings represent only a fraction of the total volume of the deposits at the site and may not necessarily be representative of the subsurface conditions between adjacent borings or between the sampled intervals. The data presented on the Subsurface Logs together with the recovered samples will provide a basis for evaluating the character of the subsurface conditions relative to the project. The evaluation must consider all the recorded details and their significance relative to each other. Often analyses of standard boring data indicate the need for additional testing or sampling procedures to more accurately evaluate the subsurface conditions. Any evaluation of the contents of this report and the recovered samples must be performed by Professionals. The information presented in the following defines some of the procedures and terms used on the Subsurface Logs to describe the conditions encountered.

1. The figures in the Depth column defines the scale of the Subsurface Log.
2. The sample column shows, graphically, the depth range from which a sample was recovered. See Table 1 for a description of the symbols used to signify the various types of samples.
3. The Sample No. is used for identification on sample containers and/or Laboratory Test Reports.
4. Blows on Sampler — shows the results of the "Penetration Test", recording the number of blows required to drive a split spoon sampler into the soil. The number of blows required for each six inches of penetration is recorded. The first 6 inches of penetration is considered to be a seating drive. The number of blows required for the second and third 6 inches of penetration is termed the penetration resistance,  $N$ . The outside diameter of the sampler, the hammer weight and the length of drop are noted at the bottom of the Subsurface Log.
5. Blows on Casing — shows the number of blows required to advance the casing a distance of 12 inches. The casing size, the hammer weight and the length of drop are noted at the bottom of the Subsurface Log. If the casing is advanced by means other than driving, the method of advancement will be indicated in the Notes column or under the Method of Investigation at the bottom of the Subsurface Log.
6. All recovered soil samples are reviewed in the laboratory by an engineering technician, geologist or geotechnical engineer, unless note otherwise. The visual descriptions are made on the basis of a combination of the driller's field descriptions and observations and the sample as received in the laboratory. The method of visual classification is based primarily on the Unified Soil Classification (ASTM D 2487-83) with regard to the particle size and plasticity. (See Table No. II) Additionally, the relative portion, by weight, of two or more soil types is described for granular soils in accordance with "Suggested Methods of Test for Identification of Soils" by D. M. Burmister, ASTM Special Technical Publication 479, June 1970. (See Table No. III) The description of the relative soil density or consistency is based upon the penetration records as defined on Table No. IV. The description of the soil moisture is based upon the relative wetness of the soil as recovered and is described as dry, moist, wet and saturated. Water introduced in the boring either naturally or during drilling may have affected the moisture condition of the recovered sample. Special terms are used as required to describe materials in greater detail; several such terms are listed in Table V. When sampling gravelly soils with a standard two inch diameter split spoon, the true percentage of gravel is often not recovered due to the relatively small sampler diameter. The presence of boulders and large gravel is sometimes, but not necessarily, detected by an evaluation of the casing and samplers blows or through the "action" of the drill rig as reported by the driller.
7. The description of the rock shown is based on the recovered rock core and the driller's observations. The terms frequently used in the description are included in Table VI.
8. The stratification lines represent the approximate boundary between soil types and the transition may be gradual. Solid stratification lines are based on the driller's field observations.
9. Miscellaneous observations and procedures noted by the driller are shown in this column, including water level observations. It is important to realize the reliability of the water level observations depends upon the soil type (water does not readily stabilize in a hole through fine grained soils), and that drill water used to advance the boring may have influenced the observations. The ground water level typically will fluctuate seasonally. One or more perched or trapped water levels may exist in the ground seasonally. All the available readings should be evaluated. If definite conclusions cannot be made, it is often prudent to examine the conditions more thoroughly through test pit excavations or water observation wells.
10. The length of core run is defined as the length of penetration of the core barrel. Core recovery is the length of core recovered divided by the core run. The RQD (Rock Quality Designation) is the total pieces of NX core exceeding 4 inches in length divided by the core run. The size core barrel used is also noted.

IMPORTANT INFORMATION CONCERNING  
YOUR GEOTECHNICAL ENGINEERING REPORT

APPENDIX C

# IMPORTANT INFORMATION

## ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT

More construction problems are caused by site subsurface conditions than any other factor. As troublesome as subsurface problems can be, their frequency and extent have been lessened considerably in recent years, due in large measure to programs and publications of ASFE/The Association of Engineering Firms Practicing in the Geosciences.

The following suggestions and observations are offered to help you reduce the geotechnical-related delays, cost-overruns and other costly headaches that can occur during a construction project.

### A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

A geotechnical engineering report is based on a subsurface exploration plan designed to incorporate a unique set of project-specific factors. These typically include: the general nature of the structure involved, its size and configuration; the location of the structure on the site and its orientation; physical concomitants such as access roads, parking lots, and underground utilities, and the level of additional risk which the client assumed by virtue of limitations imposed upon the exploratory program. To help avoid costly problems, consult the geotechnical engineer to determine how any factors which change subsequent to the date of the report may affect its recommendations.

Unless your consulting geotechnical engineer indicates otherwise, *your geotechnical engineering report should not be used:*

- When the nature of the proposed structure is changed, for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one;
- when the size or configuration of the proposed structure is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership, or
- for application to an adjacent site.

*Geotechnical engineers cannot accept responsibility for problems which may develop if they are not consulted after factors considered in their report's development have changed.*

### MOST GEOTECHNICAL "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site exploration identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are extrapolated by geo-

technical engineers who then render an opinion about overall subsurface conditions, their likely reaction to proposed construction activity, and appropriate foundation design. Even under optimal circumstances actual conditions may differ from those inferred to exist, because no geotechnical engineer, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. *Nothing can be done to prevent the unanticipated, but steps can be taken to help minimize their impact.* For this reason, *most experienced owners retain their geotechnical consultants through the construction stage*, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

### SUBSURFACE CONDITIONS CAN CHANGE

Subsurface conditions may be modified by constantly-changing natural forces. Because a geotechnical engineering report is based on conditions which existed at the time of subsurface exploration, *construction decisions should not be based on a geotechnical engineering report whose adequacy may have been affected by time.* Speak with the geotechnical consultant to learn if additional tests are advisable before construction starts.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical report. The geotechnical engineer should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

### GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS

Geotechnical engineers' reports are prepared to meet the specific needs of specific individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor, or even some other consulting civil engineer. Unless indicated otherwise, this report was prepared expressly for the client involved and expressly for purposes indicated by the client. Use by any other persons for any purpose, or by the client for a different purpose, may result in problems. *No individual other than the client should apply this report for its intended purpose without first conferring with the geotechnical engineer. No person should apply this report for any purpose other than that originally contemplated without first conferring with the geotechnical engineer.*

## A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical engineering report. To help avoid these problems, the geotechnical engineer should be retained to work with other appropriate design professionals to explain relevant geotechnical findings and to review the adequacy of their plans and specifications relative to geotechnical issues.

## BORING LOGS SHOULD NOT BE SEPARATED FROM THE ENGINEERING REPORT

Final boring logs are developed by geotechnical engineers based upon their interpretation of field logs (assembled by site personnel) and laboratory evaluation of field samples. Only final boring logs customarily are included in geotechnical engineering reports. *These logs should not under any circumstances be redrawn* for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process. Although photographic reproduction eliminates this problem, it does nothing to minimize the possibility of contractors misinterpreting the logs during bid preparation. When this occurs, delays, disputes and unanticipated costs are the all-too-frequent result.

To minimize the likelihood of boring log misinterpretation, *give contractors ready access to the complete geotechnical engineering report* prepared or authorized for their use. Those who do not provide such access may proceed un-

der the *mistaken* impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes which aggravate them to disproportionate scale.

## READ RESPONSIBILITY CLAUSES CLOSELY

Because geotechnical engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against geotechnical consultants. To help prevent this problem, geotechnical engineers have developed model clauses for use in written transmittals. These are *not* exculpatory clauses designed to foist geotechnical engineers' liabilities onto someone else. Rather, they are definitive clauses which identify where geotechnical engineers' responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your geotechnical engineering report, and you are encouraged to read them closely. Your geotechnical engineer will be pleased to give full and frank answers to your questions.

## OTHER STEPS YOU CAN TAKE TO REDUCE RISK

Your consulting geotechnical engineer will be pleased to discuss other techniques which can be employed to mitigate risk. In addition, ASFE has developed a variety of materials which may be beneficial. Contact ASFE for a complimentary copy of its publications directory.

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