

**Testing Engineers & Consultants, Inc.**

Clarkston Medical Complex  
c/o Landmark Health Care Facilities, LLC  
839 North Jefferson  
Milwaukee, WI 53202

GEOTECHNICAL INVESTIGATION

FOR

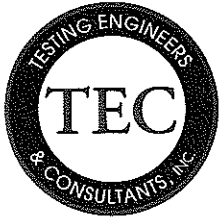
Clarkston Medical Complex  
I-75 & M-15 (Ortonville Road)  
Independence Township, Michigan

TEC Report: 48887-1

By:

Testing Engineers & Consultants, Inc.  
1343 Rochester Road  
P.O. Box 249  
Troy, Michigan 48099-0249  
(248) 588-6200

December 31, 2007



## Testing Engineers & Consultants, Inc.

1343 Rochester Road • PO Box 249 • Troy, Michigan 48099-0249

(248) 588-6200 or (313) T-E-S-T-I-N-G

Fax (248) 588-6232

TEC Report: 48887-1

Date Issued: December 31, 2007

Mr. Kevin Anderson  
Clarkston Medical Complex  
c/o Landmark Health Care Facilities, LLC  
839 North Jefferson  
Milwaukee, WI 53202

Re: Geotechnical Investigation for  
Clarkston Medical Complex  
I-75 & M-15 (Ortonville Road)  
Independence Township, Michigan

Dear :

Please find enclosed the results of a geotechnical investigation performed at the above referenced site. This geotechnical report presents our field and laboratory results; engineering analysis; and our recommendations for design of foundation and slabs, as well as important construction considerations.

As you may know, Testing Engineers & Consultants, Inc. (TEC) has more than forty one years of experience in Quality Control Testing and Construction Inspection. We would be pleased to provide these services on this project.

Should you have any questions regarding this report, please let us know. It has been a pleasure to be of service to you.

Respectfully submitted,  
TESTING ENGINEERS & CONSULTANTS, INC.

Carey J. Suhan, P.E.,  
Vice President, Geotechnical  
& Environmental Services

CJS/ln  
Enclosure

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All services undertaken are subject to the following policy. Reports are submitted for exclusive use of the clients to whom they are addressed. Their significance is subject to the adequacy and representative character of the samples and to the comprehensiveness of the tests, examinations and surveys made. No quotation from reports or use of TEC's name is permitted except as expressly authorized by TEC in writing.

CONSULTING ENGINEERS & FULL-SERVICE PROFESSIONAL TESTING AND INSPECTION  
OFFICES IN ANN ARBOR, DETROIT, AND TROY

FOUNDED IN 1966

2006  
**40<sup>th</sup>**  
ANNIVERSARY

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TEST BORING LOCATION PLAN

LOGS OF TEST BORINGS

SIEVE ANALYSIS RESULTS

GENERAL NOTES FOR SOIL CLASSIFICATION

## Testing Engineers & Consultants, Inc.

Mr. Kevin Anderson  
Clarkston Medical Complex  
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### 1.0 INTRODUCTION

This report presents the results of a geotechnical investigation for the proposed building on the west side of M-15 (Ortonville Road) and the northbound ramp to I-75. Authorization to perform this investigation was given by Mr. Nick Cheota, President of Clarkston Medical Complex, LLC in a signed copy of TEC Proposal 020-07-0155-Rev. 2 dated November 27, 2007.

The purpose of this investigation was to obtain information necessary to determine basic engineering properties of soils at the site through a series of test borings and laboratory tests performed on the soil samples obtained during the field investigation. This information has been evaluated to provide the general recommendations for site development preparations, foundation requirements, floor slab designs and other geotechnical information.

### 2.0 FIELD INVESTIGATION

A total of 16 test borings were drilled on the site at the locations shown on the Test Boring Location Plan. The locations are accurate to within a short distance of the locations shown on the plan. The deep borings in the proposed building area are identified as Nos. A-1 through A-4, the shallow borings in the proposed building areas are identified as B-1 through B-4 and the borings in the proposed pavement areas are identified as C-1 through C-8. The test borings were drilled on December 4 through 6, 2007 with both truck-mounted auger equipment and equipment mounted on an all-terrain vehicle (ATV) to depths ranging from 5 to 40 feet. The ATV was needed to access the wooded areas of the site.

Ground surface elevations at the boring locations have been interpolated from contour and spot elevations shown on a topographical survey drawing provided by Midwestern Consulting. The elevations are shown on the boring logs.

Drilling methods and standard penetration tests were performed in accordance with the current ASTM D-1452 and D-1586 procedures, respectively. These procedures specify that a standard 2-inch O.D. split-barrel sampler be driven by a 140-pound hammer with a free fall of 30 inches. The number of hammer blows required to drive the split-barrel sampler through three successive 6-inch increments is recorded on the Test Boring Log. The first 6-inch increment is used for setting the sampler firmly in the soil and the sum of the hammer blows for the second and third increments is referred to as the "Standard Penetration Index" (N). N values, when using the truck mounted drill rig, were obtained with an automatic trip hammer.

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### 2.0 FIELD INVESTIGATION (Cont'd)

From the standard penetration test a soil sample is recovered in the liner sampler tubes that are located inside the split-barrel sampler. Upon recovery of a soil sample, the liner tubes are removed from the split-barrel sampler and placed in a container which is sealed to prevent moisture losses during transportation to the laboratory. Standard penetration tests are usually made at depths of 2 ½, 5, 7 ½ and 10 feet and at 5-foot depth intervals thereafter. These parameters may vary for a given project depending on the nature of the subsoils and the geotechnical information required.

### 3.0 LABORATORY TESTING

The laboratory testing consisted of determining the unconfined compressive strength, the natural bulk density and the natural moisture content of the soil samples recovered in the liner sampler tubes. In the unconfined compression tests, the compressive strength of the soil is determined by axially loading a soil sample until failure is observed or 15% strain, whichever occurs first. The above referenced test data are recorded on the boring logs. Some test results may deviate from the norm because of variations in texture, imperfect samples, presence of pebbles and/or sand streaks, etc. The results are still reported although they may not be relevant.

In addition to the standard laboratory tests, the particle size distribution of a granular soil sample was determined. The results are shown in the appendix. Also, Atterberg Limits tests were performed on a cohesive sample to obtain estimates of cohesive soil behavior. The results of the tests are shown on Boring No. C-3 in the appendix.

Samples taken in the field are retained in our laboratory for 60 days and are then destroyed unless special disposition is requested by the client. Samples retained over a long period of time are subject to moisture loss and are then no longer representative of the conditions initially encountered.

### 4.0 GENERAL SUBSURFACE CONDITIONS

#### 4.1 Subsoil Conditions

The soil conditions encountered in the borings are presented on the individual boring logs. Each log presents the soil types encountered at that location as well as laboratory test data, ground water data, and other pertinent information. Descriptions of the various soil consistencies, relative densities and particle sizes are given in the Appendix. Definitions of the terms and symbols utilized in this report may be found in ASTM D-653.

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### 4.1 Subsoil Conditions (Cont'd)

Topsoil was encountered in one boring. The sandy topsoil at Boring No. C-1, located at the north end of the site to be developed, was 13 inches thick.

The native soils generally consist of loose to dense sand and loose to compact clayey sand. These soils extend to the terminal depth of the shallow Boring Nos. C-1, C-2, C-5, C-6 and C-8 and to depths ranging from 1 ½ to 12 ½ feet or elevations 1017 to 1042.5 feet in the other borings. Some cobbles and pebbles were encountered in the sand and clayey sand layers at several of the borings. At Boring No. C-3, the ground surface was covered with 6 inches of sand and gravel with some cobbles. The cobbles were generally encountered at shallow depths ranging from ground surface to 2 ½ feet below ground surface or at elevations 1025.5 to 1071 feet. The cobbles extended to depths ranging from 1 ½ to 5 ½ feet or elevations 1022.5 to 1066 feet. The dense sand and dense clayey sand were encountered at Boring Nos. B-2 and B-4 at depths of 8 and 4 ½ feet or elevations 1021 and 1027.5 feet, respectively. The dense sand and dense clayey sand extended to depths of 9.7 and 12 ½ feet or elevation 1019.5 feet.

Underlying the sand and clayey sand was firm to hard clay that extended to depths of 12 to 23 feet or elevations 1009 to 1020 feet in the deep borings and to the terminal depth of the shallow borings. The hard clay was encountered at Boring No. B-4. Pebbles were encountered in the clay layers at several of the borings. At Boring No. C-3, a cobble was encountered at the terminal depth of the boring. A wet sand seam was encountered in Boring No. B-1 at a depth of 4 ½ feet or elevation 1026.5 feet.

Underlying the clay layers in the deep borings was medium compact to dense sand that extended to the terminal depth of the borings. The dense sand was encountered at Boring Nos. A-1, A-3 and B-1 at depths ranging from 19 ½ to 34 ½ feet or elevations 996.5 to 1011.5 feet. The dense sand extended to a depth of 27 feet or elevation 1005 feet at Boring No. A-1 and to the terminal depths of Boring Nos. A-3 and B-1.

Standard penetration values range from 6 blows per foot to 67 blows for a penetration of 6 inches with unconfined compressive strengths of 1810 to 10,130 pounds per square foot (psf). Bulk densities range from 101 to 148 pounds per cubic foot with moisture contents of 3 to 19 percent of the dry weight of the soil.

### 4.2 Ground Water Observations

Water level readings were taken in the bore holes during and after the completion of drilling. These observations are noted on the respective Test Boring Logs. Ground water was encountered during

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### 4.2 Ground Water Observations (Cont'd)

drilling in all of the deep borings and two of the shallow borings at depths ranging from 1 foot to 23 feet below existing grade or at elevations 1009 to 1060 feet. After completion of drilling and removal of the augers, water was noted in seven deep borings and one shallow boring at depths ranging from 1 ½ to 21 feet or at elevations 1011 to 1040.5 feet. After completion of drilling, the boreholes at Boring Nos. A-1 and C-2 caved in at depths of 3 and 1 foot or elevations 1029 and 1060 feet, respectively. No ground water was noted either during drilling or after completion of drilling in Boring Nos. C-1 and C-3 through C-7.

## 5.0 ANALYSIS AND RECOMMENDATIONS

### 5.1 Proposed Development

The proposed development is to consist of the construction of a two story, structural steel framed building with brick veneer. The building will have the slab on grade and will have a T-shaped configuration. Each floor is approximately 36,500 square feet in area. The ground surface within the proposed building footprint is relatively flat with ground surface elevations ranging from 1028 to 1032 feet. The area is relatively clear with some trees. There will be associated parking and drives throughout the 70 acre site. Ground surface elevations vary considerably outside the building area from elevation 1010 feet on the south side of the site to 1085 feet on the north side of the site. The north side of the site is heavily wooded and hilly. A berm runs east to west on the north side of the site. It is surmised that a large part of the site had been mined for sand and gravel during the construction of I-75 creating the bowl effect in the area of the proposed building.

A preliminary grading plan was provided by Spalding DeDecker Associates, Inc. The plan indicates proposed finished floor elevation of 1034 feet and parking lot elevations of about 1030 to 1032 feet.

### 5.2 Ground Water Conditions

The position of water levels found in test borings may vary somewhat depending on seasonal precipitation. At the level encountered in the borings, it will present some problems for design and construction of foundations and utilities. The ground water on the site at greater depths appears to be tied into the ground water in the surrounding areas, possibly from the nearby lakes east of M-15. However, the ground water levels vary considerably since the soils vary from sand to clay layers, and ground water is typically encountered primarily in the sand layers. Dewatering will need to occur during the construction of some of the foundations and some of the underground utilities. Where

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### 5.2 Ground Water Conditions (Cont'd)

foundations or utilities will be more than a foot or so below where the ground water was encountered, well points will need to be constructed. Since the soils are fine-grained the well points will need to be closely spaced to allow dewatering to occur in a timely manner. For shallow excavations any surface water or seepage water is expected to be controllable by direct pumping from the excavations. Dewatering operations should begin prior to any excavating.

### 5.3 Recommended Earthwork Operations

Within the building footprint area and the immediate proposed parking areas around the proposed building, some minor cut and fill operations are expected. Finish floor elevation of the building is expected to be 1034.0 feet. One to five feet of fill will be required in the proposed building area. The final grade elevations of the surrounding parking lot are to range from 1030 to 1032 feet. Because of the large difference in elevation on the north and west side of the site, it is assumed that the proposed entrance drive will follow the existing terrain. However, some localized cut and fill operations are expected. The east quarter of the proposed circular shaped parking lot is expected to be at similar elevations. Much of the ground surface of the southern two thirds of the proposed parking area is currently at elevations 1040 to 1047 feet. The northern one-third of the proposed parking lot cuts across the east-west berm and the ground surface continues to rise to an elevation of 1071 at the northwest corner of the proposed parking lot. Major undercutting, as much as 10 to 40 feet, is expected in this area to achieve final design grade.

Within the limits of areas to be developed, any surface vegetation and topsoil should be removed prior to the site being graded. The site under proposed slab and pavement areas should then be rolled with a vibrating roller to densify any loose sand followed by a proofroll with a heavily loaded rubber tired vehicle to identify any soft or yielding areas. Soft spots can be stabilized with crushed stone or concrete.

The excavations for the foundations and utilities as well as for major undercuts to achieve final grade may require removal of cobbles. Cobbles were first encountered in Boring Nos. A-2, A-4, B-1, C-1, C-3 and C-7 at depths ranging from existing ground surface to 5 feet below existing ground surface. Excavations for shallow foundations as well as utilities will require removal of cobbles and possible boulders. Removal of these materials should be budgeted for much of the site.

Engineered backfill required for construction excavations or fill required to achieve desired grades should preferably consist of clean and well graded granular soils. On-site granular material should be satisfactory for use, particularly for balancing and grading the site. However, the clayey sand should not be used as fill against basement walls or in confined areas such as utility trenches. Since in many



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### 5.3 Recommended Earthwork Operations (Cont'd)

cases, the sands are fine grained, close moisture control will be required to achieve the specified density. Fill should be placed in uniform layers not more than 9 inches in thickness with the soils in each layer compacted to a minimum of 95% of the maximum density as determined by ASTM D-1557. Fill should be at approximately the optimum moisture content during placement and compaction. Furthermore, frozen material must not be used as fill and fill should not be placed on frozen ground.

Since the soils are predominantly loose to medium compact sands and clayey sands, lateral support structure or side sloping with a minimum 1H:1V ratio will be required for the anticipated excavations. Where excavations extend into the firm to stiff clay, a minimum slope of 2/3H:1V should be satisfactory. However, in either case, MIOSHA regulations for worker protection should be followed. Soils exposed in the bases of all satisfactory foundation excavations should be protected against any detrimental change in conditions such as from disturbances, rain or freezing. Surface run-off water should be drained away from the excavations and not be allowed to pond. If possible, all footing concrete should be placed the same day the excavation is made. If this is not possible, the footing excavations should be adequately protected.

### 5.4 Foundation Recommendations

The on-site soils are acceptable for support of the proposed structure on shallow foundations. Local building codes and climatic conditions require that exterior foundations be placed at a minimum depth of 3 ½ feet below finished grade to provide for adequate frost protection. Interior foundations may be below the floor at a lesser depth if not exposed to frost penetration. Final floor elevation is expected to be 1034.0 feet. This will place exterior footings around 1030 feet and interior footings around 1032 feet. At the anticipated foundation depths for the proposed building, the footings will be bearing on medium compact to dense sand and clayey sand. Some interior foundations may be bearing on engineered fill placed to achieve finish floor elevation. At these depths, foundations can be designed for a maximum net allowable bearing pressure of 3000 psf. The recommended design bearing pressure should provide a factor of safety of about 2.5 to 3 against shear failure and limit differential settlements between adjacent columns to less than ¼ inch.

At the foundation invert depths, any loose sand or clayey sand should be thoroughly compacted. Because of the high ground water conditions, some areas, particularly at the northeast end of the flange of the proposed T-shaped building may require placement of 1 to 3 inch size crushed concrete or stone to stabilize the bottom of the footings and to bring the foundation above the ground water elevation. Continuous dewatering will be required to construct the foundations in the dry.

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### 5.4 Foundation Recommendations (Cont'd)

As outlined in the Recommended Earthwork Operations section, the excavation of cobbles and possibly boulders should be budgeted.

From a review of the borings and assumptions made about the lower lying soils a seismic site class of D is recommended for design. It is assumed that the lower lying soils below the bottom of the borings contain soils with an average N value between 15 and 50 and shear strengths between 1000 and 2000 psf. There are not many deep borings in the area since most of the nearby sites are low-rise buildings. This appears to be a reasonable assumption from general geology of the area. This is based off of the 2006 edition of the International Building Code.

### 5.5 Floor Slabs and Pavements

The subgrade resulting from the site preparation, as outlined in the recommended earthwork operations section, will provide a fair to good subgrade for support of pavements and floor slabs. Floor slabs should be placed on a 4 inch leveling course of clean compacted sand. If significant cobbles are encountered in the subgrade, a greater thickness of engineered fill may be required to provide a uniform subgrade and minimize hard spots in the subgrade.

The use of edge drains beneath pavement structures and stub drains at catch basins are recommended due to the primarily clayey fine sand. For drives and parking lots, it is recommended that a 3" asphalt surface be placed on 8" of compacted aggregate base, anticipating minimal heavy truck traffic. A stronger cross section on the order of 4" of asphalt on 10" of aggregate based should be budgeted where truck deliveries and trash dumpster pickups will take place. These areas should be evaluated based upon actual truck traffic and soil conditions. Areas of sustained load, such as dumpster pads and truck loading and unloading areas, should be concrete pavement.

As outlined in the Recommended Earthwork Operations section, the existing ground surface elevation at Boring No. C-3, which is located at the northwest corner of the proposed far west parking lot, is 1071 feet and the existing ground surface elevations at Boring Nos. C-4 through C-6 range from 1042 to 1047 feet, much higher than the expected final grade elevations of 1028 to 1031 feet. The final elevation of the subgrade is expected to be approximately 10 to 40 feet below existing ground elevation. The depth of the pavement borings extended only 5 feet below existing grade. Therefore, once the removal of the soils to achieve final grade is completed, an evaluation of the subgrade should be performed to determine if our recommendations need to be altered.

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### 6.0 DESIGN REVIEW AND FIELD MONITORING

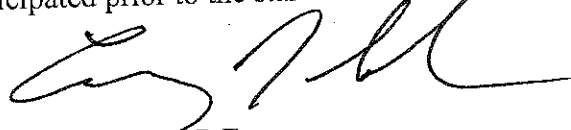
The evaluations and recommendations presented in this report relative to site preparation and building foundations have been formulated on the basis of assumed and provided data relating to the location, type and finished grades for the proposed structure and adjacent areas. Any significant change in this data should be brought to our attention for review and evaluation with respect to the prevailing subsoil conditions.

When the building and foundation plans are finalized, a consultation should be arranged with us for a review to verify that the evaluations and recommendations have been properly interpreted.

Soil conditions at the site could vary from those generalized on the basis of test borings made at specific locations. It is therefore recommended that Testing Engineers & Consultants, Inc. be retained to provide soil engineering services during the site preparation, excavation and foundation phases of the proposed project. This is to observe compliance with the design concepts, specifications and recommendations. Also, this provides opportunity for design changes to be made in the event that subsurface conditions differ from those anticipated prior to the start of construction.



Gary E. Putt, P.E.  
Senior Project Engineer



Carey J. Suhan, P.E.  
Vice President, Geotechnical  
& Environmental Services

GEP/CJS/ln

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**APPENDIX**

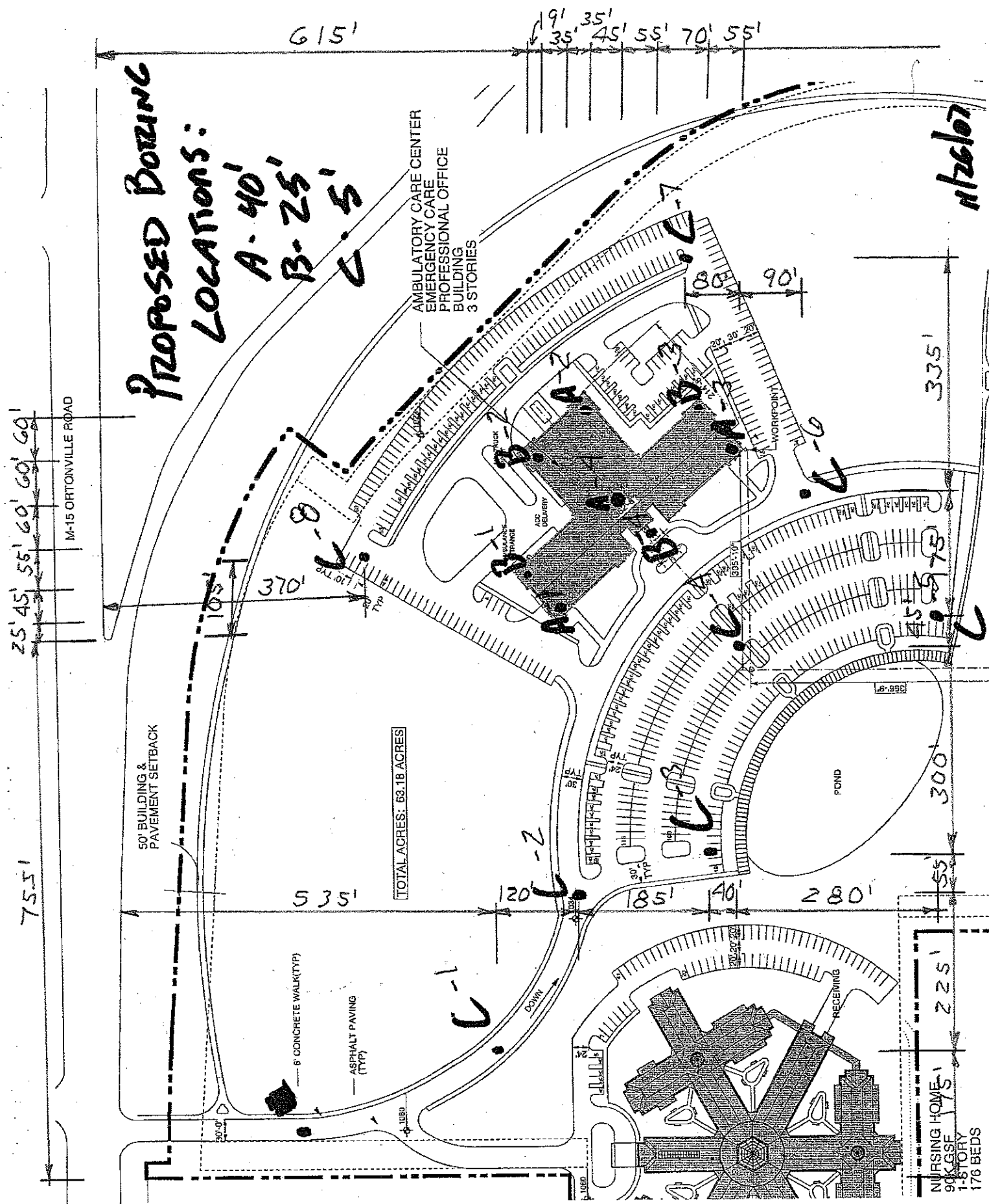
Test Boring Location Plan

Logs Of Test Borings

Sieve Analysis Results

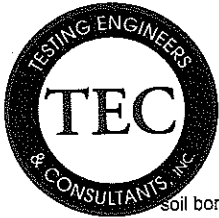
General Notes For Soil Classification

**PROPOSED BORING  
LOCATIONS:  
A-40'  
B-25'  
C-5'**



TEST BORING LOCATION PLAN





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soil borings

soil evaluation

foundation investigation

instrumentation

## SOIL BORING LOG

**BORING NO. A-1**                      **JOB NO.:** 48887                      **PROJECT NAME:** Clarkston Medical Complex  
**CLIENT:** Clarkston Medical Complex c/o Landmark                      I-75 & M-15 (Ortonville Road)  
**Type of Rig:** Truck                      **Location:** Independence Township, Michigan  
**Drilling Method:** Hollow Stem Augers                      **Drilled By:** I. Mickle  
**Ground Surface Elevation:** 1032                      **Started:** December 5, 2007                      **Completed:** December 5, 2007

DEPTH IN FEET	SAMPLE TYPE	N	STRATA CHANGE	SOIL CLASSIFICATION	W	d	qu
2.5	LS	6 13 14		Medium Compact Moist Brown Fine To Medium SAND With Some Gravel	4.4	124	
5	LS	4 10 11	4.7	Medium Compact Wet Brown Medium SAND With Some Gravel	10.8	134	
7.5	LS	6 6 7	6	Medium Compact Wet Brown & Gray Clayey SAND With Trace Of Gravel	14.5	138	
10	LS	6 7 8	9	Firm Moist Gray CLAY With Some Silt, Trace Of Sand & Gravel	14.7	137	1810
12.5			12	Medium Compact Wet Gray SAND With Trace Of Gravel & Pebbles			
15	LS	5 8 8	16	Firm Moist Gray CLAY With Some Silt, Trace Of Sand & Gravel			
17.5							
20	LS	4 5 8			9.2	147	3710
22.5			23				
25	LS	8 21 38		Dense Wet Gray Fine To Medium SAND With Trace Of Gravel			

"N" - Standard Penetration Resistance  
 SS - 2" O.D. Split Spoon Sample  
 LS - Sectional Liner Sample  
 ST - Shelby Tube Sample  
 AS - Auger Sample

w - H<sub>2</sub>O, % of dry weight  
 d - Bulk Density, pcf  
 qu - Unconfined Compression, psf

**WATER ENCOUNTERED 4'7"**

**AT COMPLETION Caved At 3'0"**

**Boring No. A-1**



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soil borings

soil evaluation

foundation investigation

instrumentation

SOIL BORING LOG

**BORING NO. A-1**

**JOB NO.:** 48887

**PROJECT NAME:** Clarkston Medical Complex

**CLIENT:** Clarkston Medical Complex c/o Landmark

I-75 & M-15 (Ortonville Road)

**Type of Rig:** Truck

**Location:** Independence Township, Michigan

**Drilling Method:** Hollow Stem Augers

**Drilled By:** I. Mickle

**Ground Surface Elevation:** 1032

**Started:** December 5, 2007

**Completed:** December 5, 2007

DEPTH IN FEET	SAMPLE TYPE	N	STRATA CHANGE	SOIL CLASSIFICATION	W	d	qu
27.5	LS	8 17 23	27	Dense Wet Gray Fine To Medium SAND With Trace Of Gravel	17.9	124	
30				Compact Wet Gray Fine SAND With Trace Of Gravel			
32.5	LS	5 10 19	32	Medium Compact Wet Gray Fine SAND	19.0	123	
35			36	Compact Wet Gray Fine SAND			
37.5	LS	11 18 31	40	Compact Wet Gray Fine SAND	18.2	125	
40				End of Boring			
42.5							
45							
47.5							
50							

"N" - Standard Penetration Resistance  
 SS - 2" O.D. Split Spoon Sample  
 LS - Sectional Liner Sample  
 ST - Shelby Tube Sample  
 AS - Auger Sample

w - H<sub>2</sub>O, % of dry weight  
 d - Bulk Density, pcf  
 qu - Unconfined Compression, psf

**WATER ENCOUNTERED 4'7"**

**AT COMPLETION Caved At 3'0"**

**Boring No. A-1**



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soil evaluation      foundation investigation      instrumentation  
**SOIL BORING LOG**

**BORING NO. A-2**      **JOB NO.: 48887**      **PROJECT NAME:** Clarkston Medical Complex  
**CLIENT:** Clarkston Medical Complex c/o Landmark      I-75 & M-15 (Ortonville Road)  
**Type of Rig:** Truck      **Location:** Independence Township, Michigan  
**Drilling Method:** Hollow Stem Augers      **Drilled By:** I. Mickle  
**Ground Surface Elevation:** 1028      **Started:** December 5, 2007      **Completed:** December 5, 2007

DEPTH IN FEET	SAMPLE TYPE	N	STRATA CHANGE	SOIL CLASSIFICATION	W	d	qu
2.5	LS	4 11 12	2.5	Medium Compact Moist Brown Fine SAND With Trace Of Gravel	7.5	121	
5	LS	7 25 17	5.5	Compact Moist Brown Fine To Medium SAND With Some Gravel, Pebbles & Cobbles	9.2	137	
7.5	LS	6 7 8		Medium Compact Wet Brown Fine To Medium SAND With Trace Of Gravel & Clayey Seams	12.5	139	
10	LS	11 9 7	11		9.2	115	
12.5							
15	LS	4 5 5	17.5	Firm Moist Gray CLAY With Some Silt, Trace Of Sand & Gravel	8.3	144	10140
17.5							
20	LS	3 5 6	22	Medium Compact Wet Gray Fine SAND With Trace Of Gravel	15.0	125	
22.5							
25	LS	11 17 17		Compact Wet Brown Fine SAND With Trace Of Gravel & Pebbles	15.0	126	

"N" - Standard Penetration Resistance  
 SS - 2" O.D. Split Spoon Sample  
 LS - Sectional Liner Sample  
 ST - Shelby Tube Sample  
 AS - Auger Sample

w - H<sub>2</sub>O, % of dry weight  
 d - Bulk Density, pcf  
 qu - Unconfined Compression, psf

**WATER ENCOUNTERED 5'6"**  
**AT COMPLETION 4'6"**  
**Boring No. A-2**





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**SOIL BORING LOG**

<b>BORING NO. A-2</b>	<b>JOB NO.:</b> 48887	<b>PROJECT NAME:</b> Clarkston Medical Complex
<b>CLIENT:</b> Clarkston Medical Complex c/o Landmark		I-75 & M-15 (Ortonville Road)
<b>Type of Rig:</b> Truck		<b>Location:</b> Independence Township, Michigan
<b>Drilling Method:</b> Hollow Stem Augers		<b>Drilled By:</b> I. Mickle
<b>Ground Surface Elevation:</b> 1028		<b>Started:</b> December 5, 2007 <b>Completed:</b> December 5, 2007

DEPTH IN FEET	SAMPLE TYPE	N	STRATA CHANGE	SOIL CLASSIFICATION	w	d	qu
27.5	LS	11 15 19	27	Compact Wet Brown Fine SAND With Trace Of Gravel & Pebbles	17.1	124	
30				Compact Wet Gray Fine SAND With Trace Of Gravel			
32.5	LS	3 5 9	32	Medium Compact Wet Gray Fine SAND			
35							
37.5			38.5	End of Boring			
40							
42.5							
45							
47.5							
50							

"N" - Standard Penetration Resistance  
 SS - 2" O.D. Split Spoon Sample  
 LS - Sectional Liner Sample  
 ST - Shelby Tube Sample  
 AS - Auger Sample

w - H<sub>2</sub>O, % of dry weight  
 d - Bulk Density, pcf  
 qu - Unconfined Compression, psf

**WATER ENCOUNTERED 5'6"**  
**AT COMPLETION 4'6"**  
**Boring No. A-2**



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## SOIL BORING LOG

<b>BORING NO. A-3</b>	<b>JOB NO.: 48887</b>	<b>PROJECT NAME: Clarkston Medical Complex</b>
<b>CLIENT: Clarkston Medical Complex c/o Landmark</b>		<b>I-75 &amp; M-15 (Ortonville Road)</b>
<b>Type of Rig: Truck</b>		<b>Location: Independence Township, Michigan</b>
<b>Drilling Method: Hollow Stem Augers</b>		<b>Drilled By: I. Mickle</b>
<b>Ground Surface Elevation: 1031</b>		<b>Started: December 6, 2007</b>
		<b>Completed: December 6, 2007</b>

DEPTH IN FEET	SAMPLE TYPE	N	STRATA CHANGE	SOIL CLASSIFICATION	W	d	qu
2.5	LS	5 13 11		Medium Compact Moist Dark Brown Clayey SAND With Trace Of Gravel & Clayey Silt Layers	8.3	143	
5	LS	5 13 15			12.5	142	
7.5	LS	4 10 11	6.5	Medium Compact Very Moist Brown Clayey SILT With Trace Of Gravel & Sand Seams	16.5	145	3460
10	LS	6 13 8	8	Medium Compact Moist Brown & Gray Clayey SAND With Trace Of Gravel & Wet Seams	9.5	146	3300
12.5			12				
15	LS	6 13 14		Stiff Moist Gray CLAY With Some Silt, Trace Of Sand & Gravel	14.0	134	
20	LS	9 11 12			9.5	145	7000
22.5			22				
25	LS	4 17 22		Compact Wet Gray Clayey SAND With Trace Of Gravel	14.4	105	

"N" - Standard Penetration Resistance  
 SS - 2" O.D. Split Spoon Sample  
 LS - Sectional Liner Sample  
 ST - Shelby Tube Sample  
 AS - Auger Sample

w - H<sub>2</sub>O, % of dry weight  
 d - Bulk Density, pcf  
 qu - Unconfined Compression, psf

**WATER ENCOUNTERED 8'0"**

**AT COMPLETION 11'0"**

**Boring No. A-3**



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SOIL BORING LOG

<b>BORING NO. A-3</b>	<b>JOB NO.: 48887</b>	<b>PROJECT NAME: Clarkston Medical Complex</b>
<b>CLIENT: Clarkston Medical Complex c/o Landmark</b>		<b>I-75 &amp; M-15 (Ortonville Road)</b>
<b>Type of Rig: Truck</b>		<b>Location: Independence Township, Michigan</b>
<b>Drilling Method: Hollow Stem Augers</b>		<b>Drilled By: I. Mickle</b>
<b>Ground Surface Elevation: 1031</b>		<b>Started: December 6, 2007      Completed: December 6, 2007</b>

DEPTH IN FEET	SAMPLE TYPE	N	STRATA CHANGE	SOIL CLASSIFICATION	W	d	qu
27.5	LS	5 12 17	27	Compact Wet Gray Clayey SAND With Trace Of Gravel	8.6	112	
30				Medium Compact Wet Gray Fine SAND With Trace Of Gravel			
32.5	LS	6 8 26	34.5	Dense Wet Gray Fine SAND	8.5	135	
35							
37.5			38.5	End of Boring			
40							
42.5							
45							
47.5							
50							

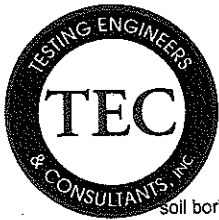
"N" - Standard Penetration Resistance  
 SS - 2" O.D. Split Spoon Sample  
 LS - Sectional Liner Sample  
 ST - Shelby Tube Sample  
 AS - Auger Sample

w - H<sub>2</sub>O, % of dry weight  
 d - Bulk Density, pcf  
 qu - Unconfined Compression, psf

**WATER ENCOUNTERED 8'0"**

**AT COMPLETION 11'0"**

**Boring No. A-3**



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## SOIL BORING LOG

<b>BORING NO. A-4</b>	<b>JOB NO.: 48887</b>	<b>PROJECT NAME: Clarkston Medical Complex</b>
<b>CLIENT: Clarkston Medical Complex c/o Landmark</b>		<b>I-75 &amp; M-15 (Ortonville Road)</b>
<b>Type of Rig: Truck</b>		<b>Location: Independence Township, Michigan</b>
<b>Drilling Method: Hollow Stem Augers</b>		<b>Drilled By: I. Mickle</b>
<b>Ground Surface Elevation: 1030</b>		<b>Started: December 5, 2007</b>
		<b>Completed: December 5, 2007</b>

DEPTH IN FEET	SAMPLE TYPE	N	STRATA CHANGE	SOIL CLASSIFICATION	W	d	qu
2.5	LS	6	1.5	Medium Compact Moist Dark Brown Clayey SAND With Some Gravel	8.0	132	
		25	3	Compact Moist Brown Medium SAND With Some Gravel, Pebbles & Cobble			
5	LS	7		Medium Compact Moist Brown Fine To Medium SAND	5.6	113	
		10					
7.5	LS	6	6.5	Firm Moist Gray CLAY With Some Silt, Trace Of Sand & Gravel	9.9	138	4530
		7					
10	LS	3			8.8	143	2060
		5					
15	LS	4	14.5	Medium Compact Wet Gray Fine To Medium SAND With Trace Of Gravel	7.8	134	
		10					
20	LS	11			14.7		
		7					
25	LS	5			15.4	142	
		10					
		16					

"N" - Standard Penetration Resistance  
 SS - 2" O.D. Split Spoon Sample  
 LS - Sectional Liner Sample  
 ST - Shelby Tube Sample  
 AS - Auger Sample

w - H<sub>2</sub>O, % of dry weight  
 d - Bulk Density, pcf  
 qu - Unconfined Compression, psf

**WATER ENCOUNTERED 14'6"**

**AT COMPLETION 13'0"**

**Boring No. A-4**



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 SOIL BORING LOG

<b>BORING NO. A-4</b>	<b>JOB NO.:</b> 48887	<b>PROJECT NAME:</b> Clarkston Medical Complex
<b>CLIENT:</b> Clarkston Medical Complex c/o Landmark		I-75 & M-15 (Ortonville Road)
<b>Type of Rig:</b> Truck		<b>Location:</b> Independence Township, Michigan
<b>Drilling Method:</b> Hollow Stem Augers		<b>Drilled By:</b> I. Mickle
<b>Ground Surface Elevation:</b> 1030		<b>Started:</b> December 5, 2007 <b>Completed:</b> December 5, 2007

DEPTH IN FEET	SAMPLE TYPE	N	STRATA CHANGE	SOIL CLASSIFICATION	W	d	qu
27.5	LS	3 8 17		Medium Compact Wet Gray Fine To Medium SAND With Trace Of Gravel	18.0	120	
30			32				
32.5	LS	4 5 8		Medium Compact Wet Gray Fine SAND With Trace Of Gravel	8.5	135	
35							
37.5			38.5				
40				End of Boring			
42.5							
45							
47.5							
50							

"N" - Standard Penetration Resistance  
 SS - 2" O.D. Split Spoon Sample  
 LS - Sectional Liner Sample  
 ST - Shelby Tube Sample  
 AS - Auger Sample

w - H<sub>2</sub>O, % of dry weight  
 d - Bulk Density, pcf  
 qu - Unconfined Compression, psf

**WATER ENCOUNTERED 14'6"**  
**AT COMPLETION 13'0"**  
**Boring No. A-4**



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## SOIL BORING LOG

<b>BORING NO. B-1</b>	<b>JOB NO.: 48887</b>	<b>PROJECT NAME: Clarkston Medical Complex</b>
<b>CLIENT: Clarkston Medical Complex c/o Landmark</b>		<b>I-75 &amp; M-15 (Ortonville Road)</b>
<b>Type of Rig: All-Terrain Vehicle</b>		<b>Location: Independence Township, Michigan</b>
<b>Drilling Method: Hollow Stem Augers</b>		<b>Drilled By: I. Mickle</b>
<b>Ground Surface Elevation: 1031</b>		<b>Started: December 4, 2007</b>
		<b>Completed: December 4, 2007</b>

DEPTH IN FEET	SAMPLE TYPE	N	STRATA CHANGE	SOIL CLASSIFICATION	w	d	qu
2.5	LS	5 18 11	3	Medium Compact Moist Brown Fine To Medium SAND With Some Gravel, Cobbles & Pebbles	9.1	129	
5	LS	10 15 10	4.5	Medium Compact Wet Brown Clayey SAND With Some Gravel	11.4	144	6100
7.5	LS	3 6 9		Stiff Moist Gray CLAY With Some Silt, Trace Of Gravel, Sand & Wet Sand Seam At 4'6"	9.1	145	5360
10	LS	5 7 9			18.1	143	5600
15	LS	5 9 12			8.9	148	6350
20	LS	4 7 17	19.5	Dense Wet Gray & Brown SAND With Trace Of Gravel	5.5	143	2880
25	LS	24 67/6"	25		15.6	132	
				End of Boring			

"N" - Standard Penetration Resistance  
 SS - 2" O.D. Split Spoon Sample  
 LS - Sectional Liner Sample  
 ST - Shelby Tube Sample  
 AS - Auger Sample

w - H2O, % of dry weight  
 d - Bulk Density, pcf  
 qu - Unconfined Compression, psf

**WATER ENCOUNTERED 3'0"**  
**AT COMPLETION 18'0"**  
**Boring No. B-1**



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SOIL BORING LOG

**BORING NO. B-2**

**JOB NO.: 48887**

**PROJECT NAME: Clarkston Medical Complex**

**CLIENT: Clarkston Medical Complex c/o Landmark**

**I-75 & M-15 (Ortonville Road)**

**Type of Rig: All-Terrain Vehicle**

**Location: Independence Township, Michigan**

**Drilling Method: Hollow Stem Augers**

**Drilled By: I. Mickle**

**Ground Surface Elevation: 1029**

**Started: December 4, 2007**

**Completed: December 4, 2007**

DEPTH IN FEET	SAMPLE TYPE	N	STRATA CHANGE	SOIL CLASSIFICATION	W	d	qu
2.5	LS	4 8 9		Medium Compact Moist Brown Fine SAND With Some Gravel & Clay	6.3	109	
5	LS	4 8 12	4.5	Medium Compact Wet Brown Medium SAND	12.8	128	
7.5	LS	10 11 12	8	Dense Wet Brown Medium SAND With Trace Of Gravel	11.4	131	
10	LS	23 31 26	9.7	Extremely Stiff Moist Brown CLAY With Some Silt & Trace Of Gravel	13.1	132	
12.5				Stiff Moist Gray CLAY With Some Silt, Trace Of Sand & Gravel			
15	LS	5 8 9			9.5	148	5360
17.5			18	Compact Wet Brown Medium SAND With Trace Of Gravel			
20	LS	19 27 12			9.6	147	
22.5			22	Medium Compact Wet Brown Fine SAND			
25	LS	3 7 14	25		19.0	131	
				End of Boring			

"N" - Standard Penetration Resistance  
 SS - 2" O.D. Split Spoon Sample  
 LS - Sectional Liner Sample  
 ST - Shelby Tube Sample  
 AS - Auger Sample

w - H<sub>2</sub>O, % of dry weight  
 d - Bulk Density, pcf  
 qu - Unconfined Compression, psf

**WATER ENCOUNTERED 4'6"**

**AT COMPLETION 4'6"**

**Boring No. B-2**



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## SOIL BORING LOG

<b>BORING NO. B-3</b>	<b>JOB NO.: 48887</b>	<b>PROJECT NAME: Clarkston Medical Complex</b>
<b>CLIENT: Clarkston Medical Complex c/o Landmark</b>		<b>I-75 &amp; M-15 (Ortonville Road)</b>
<b>Type of Rig: Truck</b>		<b>Location: Independence Township, Michigan</b>
<b>Drilling Method: Hollow Stem Augers</b>		<b>Drilled By: I. Mickle</b>
<b>Ground Surface Elevation: 1030</b>		<b>Started: December 6, 2007</b>
		<b>Completed: December 6, 2007</b>

DEPTH IN FEET	SAMPLE TYPE	N	STRATA CHANGE	SOIL CLASSIFICATION	W	d	qu
2.5	LS	4		Moist Dark Brown SAND With Trace Of Gravel (10")	11.4	128	
		6		Medium Compact Moist Brown Fine SAND With Trace Of Gravel & Clayey Seams			
5	LS	5			14.2	121	
		6					
7.5	LS	4	6.5	Loose Very Moist To Wet Brown Fine SAND With Trace Of Gravel	14.7	130	
		3					
10	LS	3	9	Firm Moist Gray CLAY With Some Silt, Trace Of Sand & Gravel	15.6	136	6180
		6					
15	LS	9			13.4		
		7					
20	LS	12	21				
		7					
22.5	LS	5		Medium Compact Wet Gray Fine SAND			
25	LS	4	25		15.2	117	
		8					
		16		End of Boring			

"N" - Standard Penetration Resistance  
 SS - 2" O.D. Split Spoon Sample  
 LS - Sectional Liner Sample  
 ST - Shelby Tube Sample  
 AS - Auger Sample

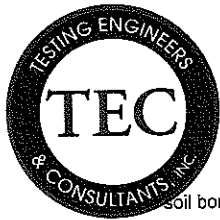
w - H<sub>2</sub>O, % of dry weight  
 d - Bulk Density, pcf  
 qu - Unconfined Compression, psf

**WATER ENCOUNTERED 7'0"**

**AT COMPLETION 7'0"**

**Boring No. B-3**





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**SOIL BORING LOG**

<b>BORING NO. B-4</b>	<b>JOB NO.:</b> 48887	<b>PROJECT NAME:</b> Clarkston Medical Complex
<b>CLIENT:</b> Clarkston Medical Complex c/o Landmark		I-75 & M-15 (Ortonville Road)
<b>Type of Rig:</b> Truck		<b>Location:</b> Independence Township, Michigan
<b>Drilling Method:</b> Hollow Stem Augers		<b>Drilled By:</b> I. Mickle
<b>Ground Surface Elevation:</b> 1032	<b>Started:</b> December 6, 2007	<b>Completed:</b> December 6, 2007

DEPTH IN FEET	SAMPLE TYPE	N	STRATA CHANGE	SOIL CLASSIFICATION	W	d	qu
2.5	LS	2	1.5	Loose Moist Dark Brown Clayey SAND With Trace Of Gravel	11.7	106	
		3		Medium Compact Moist Brown Fine SAND			
5	LS	6	4.5	Dense Moist Brown Clayey SAND With Trace Of Gravel & Pebbles	4.9	112	
		10					
7.5	LS	15	12.5	Hard Moist Gray CLAY With Some Silt & Trace Of Gravel	12.5	133	
		32					
10	LS	40/3"	12.5	Hard Moist Gray CLAY With Some Silt & Trace Of Gravel	5.5	111	
		29					
15	LS	36	12.5	Hard Moist Gray CLAY With Some Silt & Trace Of Gravel	10.5	137	
		50/4"					
20	LS	17	23	Compact Wet Gray Fine SAND With Trace Of Gravel	10.5	126	
		46					
25	LS	71	25	End of Boring			
		13					
		18					

"N" - Standard Penetration Resistance  
 SS - 2" O.D. Split Spoon Sample  
 LS - Sectional Liner Sample  
 ST - Shelby Tube Sample  
 AS - Auger Sample

w - H<sub>2</sub>O, % of dry weight  
 d - Bulk Density, pcf  
 qu - Unconfined Compression, psf

**WATER ENCOUNTERED 23'0"**  
**AT COMPLETION 21'0"**  
**Boring No. B-4**



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## SOIL BORING LOG

<b>BORING NO. C-1</b>	<b>JOB NO.: 48887</b>	<b>PROJECT NAME: Clarkston Medical Complex</b>
<b>CLIENT: Clarkston Medical Complex c/o Landmark</b>		<b>I-75 &amp; M-15 (Ortonville Road)</b>
<b>Type of Rig: All-Terrain Vehicle</b>		<b>Location: Independence Township, Michigan</b>
<b>Drilling Method: Hollow Stem Augers</b>		<b>Drilled By: I. Mickle</b>
<b>Ground Surface Elevation: 1057</b>		<b>Started: December 4, 2007</b> <b>Completed: December 4, 2007</b>

DEPTH IN FEET	SAMPLE TYPE	N	STRATA CHANGE	SOIL CLASSIFICATION	W	d	qu
2.5	LS	3	1.1	Moist Dark Brown Sandy TOPSOIL With Trace Of Gravel	18.8	115	
		7	2	Medium Compact Moist Brown SAND With Some Gravel			
		15		Compact Moist Brown SAND & Gravel With Pebbles & Cobble			
5	LS	24	5	End of Boring	5.0	101	
		23					
25							

"N" - Standard Penetration Resistance SS - 2" O.D. Split Spoon Sample LS - Sectional Liner Sample ST - Shelby Tube Sample AS - Auger Sample	w - H <sub>2</sub> O, % of dry weight d - Bulk Density, pcf qu - Unconfined Compression, psf	<b>WATER ENCOUNTERED None</b>  <b>AT COMPLETION None</b>  <b>Boring No. C-1</b>
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## SOIL BORING LOG

<b>BORING NO. C-2</b>	<b>JOB NO.:</b> 48887	<b>PROJECT NAME:</b> Clarkston Medical Complex
<b>CLIENT:</b> Clarkston Medical Complex c/o Landmark		I-75 & M-15 (Ortonville Road)
<b>Type of Rig:</b> All-Terrain Vehicle		<b>Location:</b> Independence Township, Michigan
<b>Drilling Method:</b> Hollow Stem Augers		<b>Drilled By:</b> I. Mickle
<b>Ground Surface Elevation:</b> 1061		<b>Started:</b> December 4, 2007 <b>Completed:</b> December 4, 2007

DEPTH IN FEET	SAMPLE TYPE	N	STRATA CHANGE	SOIL CLASSIFICATION	W	d	qu
2.5	LS	6 8 10	2	Medium Compact Very Moist To Wet Brown Medium SAND With Some Gravel	8.0	125	
5	LS	6 5 5	5	Medium Compact Wet Clayey SAND With Clay Layers	9.5	140	
7.5				End of Boring			
10							
12.5							
15							
17.5							
20							
22.5							
25							

"N" - Standard Penetration Resistance  
 SS - 2" O.D. Split Spoon Sample  
 LS - Sectional Liner Sample  
 ST - Shelby Tube Sample  
 AS - Auger Sample

w - H<sub>2</sub>O, % of dry weight  
 d - Bulk Density, pcf  
 qu - Unconfined Compression, psf

**WATER ENCOUNTERED 1'0"**

**AT COMPLETION Caved At 1'0"**

**Boring No. C-2**



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SOIL BORING LOG

<b>BORING NO. C-3</b>	<b>JOB NO.:</b> 48887	<b>PROJECT NAME:</b> Clarkston Medical Complex
<b>CLIENT:</b> Clarkston Medical Complex c/o Landmark		I-75 & M-15 (Ortonville Road)
<b>Type of Rig:</b> All-Terrain Vehicle		<b>Location:</b> Independence Township, Michigan
<b>Drilling Method:</b> Hollow Stem Augers		<b>Drilled By:</b> I Mickle
<b>Ground Surface Elevation:</b> 1071		<b>Started:</b> December 4, 2007 <b>Completed:</b> December 4, 2007

DEPTH IN FEET	SAMPLE TYPE	N	STRATA CHANGE	SOIL CLASSIFICATION	W	d	qu
2.5	LS	4		Moist Brown SAND & Gravel With Cobbles (6")	11.6	137	3210
		5		Firm Moist Gray CLAY With Some Silt, Trace Of Sand & Gravel			
5	LS	3			9.9	147	3380
		5 13/1"	5	LL=17 PL=14 PI=3			
7.5				End of Boring			
10							
12.5							
15							
17.5							
20							
22.5							
25							

"N" - Standard Penetration Resistance  
 SS - 2" O.D. Split Spoon Sample  
 LS - Sectional Liner Sample  
 ST - Shelby Tube Sample  
 AS - Auger Sample

w - H<sub>2</sub>O, % of dry weight  
 d - Bulk Density, pcf  
 qu - Unconfined Compression, psf

**WATER ENCOUNTERED None**

**AT COMPLETION None**

**Boring No. C-3**



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## SOIL BORING LOG

<b>BORING NO. C-4</b>	<b>JOB NO.: 48887</b>	<b>PROJECT NAME: Clarkston Medical Complex</b>
<b>CLIENT: Clarkston Medical Complex c/o Landmark</b>		<b>I-75 &amp; M-15 (Ortonville Road)</b>
<b>Type of Rig: All-Terrain Vehicle</b>		<b>Location: Independence Township, Michigan</b>
<b>Drilling Method: Hollow Stem Augers</b>		<b>Drilled By: I. Mickle</b>
<b>Ground Surface Elevation: 1044</b>		<b>Started: December 4, 2007</b>
		<b>Completed: December 4, 2007</b>

DEPTH IN FEET	SAMPLE TYPE	N	STRATA CHANGE	SOIL CLASSIFICATION	W	d	qu
				Medium Compact Moist Brown Clayey SAND With Some Gravel			
	LS	8	1.5				
		13		Stiff Moist Brown CLAY With Some Silt & Trace Of Gravel	7.6	132	2310
2.5		11	2.5				
				Firm Moist Gray CLAY With Some Silt, Trace Of Sand & Gravel			
	LS	4					
		5					
5		8	5		9.6	146	4940
				End of Boring			
7.5							
10							
12.5							
15							
17.5							
20							
22.5							
25							

"N" - Standard Penetration Resistance  
 SS - 2" O.D. Split Spoon Sample  
 LS - Sectional Liner Sample  
 ST - Shelby Tube Sample  
 AS - Auger Sample

w - H<sub>2</sub>O, % of dry weight  
 d - Bulk Density, pcf  
 qu - Unconfined Compression, psf

**WATER ENCOUNTERED None**

**AT COMPLETION None**

**Boring No. C-4**



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soil borings

soil evaluation

foundation investigation

instrumentation

## SOIL BORING LOG

<b>BORING NO. C-5</b>	<b>JOB NO.:</b> 48887	<b>PROJECT NAME:</b> Clarkston Medical Complex
<b>CLIENT:</b> Clarkston Medical Complex c/o Landmark		I-75 & M-15 (Ortonville Road)
<b>Type of Rig:</b> All-Terrain Vehicle		<b>Location:</b> Independence Township, Michigan
<b>Drilling Method:</b> Hollow Stem Augers		<b>Drilled By:</b> I. Mickle
<b>Ground Surface Elevation:</b> 1047		<b>Started:</b> December 4, 2007 <b>Completed:</b> December 4, 2007

DEPTH IN FEET	SAMPLE TYPE	N	STRATA CHANGE	SOIL CLASSIFICATION	W	d	qu
2.5	LS	7 12 16	3	Medium Compact Moist Brown Fine To Medium SAND With Some Gravel & Pebbles	3.3	120	
5	LS	14 18 23	5	Compact Moist Brown Medium SAND With Some Gravel	4.0	141	
7.5				End of Boring			
10							
12.5							
15							
17.5							
20							
22.5							
25							

"N" - Standard Penetration Resistance  
 SS - 2" O.D. Split Spoon Sample  
 LS - Sectional Liner Sample  
 ST - Shelby Tube Sample  
 AS - Auger Sample

w - H<sub>2</sub>O, % of dry weight  
 d - Bulk Density, pcf  
 qu - Unconfined Compression, psf

**WATER ENCOUNTERED None**

**AT COMPLETION None**

**Boring No. C-5**



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instrumentation

## SOIL BORING LOG

<b>BORING NO. C-6</b>	<b>JOB NO.: 48887</b>	<b>PROJECT NAME: Clarkston Medical Complex</b>
<b>CLIENT: Clarkston Medical Complex c/o Landmark</b>		<b>I-75 &amp; M-15 (Ortonville Road)</b>
<b>Type of Rig: Truck</b>		<b>Location: Independence Township, Michigan</b>
<b>Drilling Method: Hollow Stem Augers</b>		<b>Drilled By: I. Mickle</b>
<b>Ground Surface Elevation: 1042</b>		<b>Started: December 5, 2007</b> <b>Completed: December 5, 2007</b>

DEPTH IN FEET	SAMPLE TYPE	N	STRATA CHANGE	SOIL CLASSIFICATION	W	d	qu
2.5	LS	3	1.5	Loose Moist Dark Brown Clayey SAND With Trace Of Gravel	5.0	126	
		7		Medium Compact Moist Brown Fine To Medium SAND With Trace Of Gravel & Pebbles			
5	LS	4	4	Compact Moist Brown Medium SAND	3.2	124	
		19	5				
7.5				End of Boring			
10							
12.5							
15							
17.5							
20							
22.5							
25							

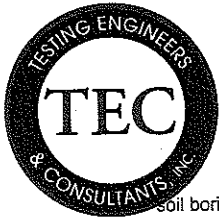
"N" - Standard Penetration Resistance  
 SS - 2" O.D. Split Spoon Sample  
 LS - Sectional Liner Sample  
 ST - Shelby Tube Sample  
 AS - Auger Sample

w - H<sub>2</sub>O, % of dry weight  
 d - Bulk Density, pcf  
 qu - Unconfined Compression, psf

**WATER ENCOUNTERED None**

**AT COMPLETION None**

**Boring No. C-6**



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soil borings

soil evaluation

foundation investigation

instrumentation

## SOIL BORING LOG

<b>BORING NO. C-7</b>	<b>JOB NO.: 48887</b>	<b>PROJECT NAME:</b> Clarkston Medical Complex
<b>CLIENT:</b> Clarkston Medical Complex c/o Landmark		I-75 & M-15 (Ortonville Road)
<b>Type of Rig:</b> All-Terrain Vehicle		<b>Location:</b> Independence Township, Michigan
<b>Drilling Method:</b> Hollow Stem Augers		<b>Drilled By:</b> I Mickle
<b>Ground Surface Elevation:</b> 1029		<b>Started:</b> December 4, 2007 <b>Completed:</b> December 4, 2007

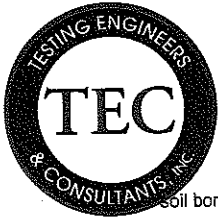
DEPTH IN FEET	SAMPLE TYPE	N	STRATA CHANGE	SOIL CLASSIFICATION	W	d	qu
2.5	LS	4 7 9	1.5	Loose Moist Brown SAND With Some Gravel, Pebbles & Cobbles	14.4	140	2800
				Stiff Moist Gray CLAY With Some Silt, Trace Of Sand, Gravel & Pebbles			
5	LS	5 7 12	5	End of Boring	12.3	124	
7.5							
10							
12.5							
15							
17.5							
20							
22.5							
25							

"N" - Standard Penetration Resistance  
 SS - 2" O.D. Split Spoon Sample  
 LS - Sectional Liner Sample  
 ST - Shelby Tube Sample  
 AS - Auger Sample

w - H<sub>2</sub>O, % of dry weight  
 d - Bulk Density, pcf  
 qu - Unconfined Compression, psf

**WATER ENCOUNTERED None**  
**AT COMPLETION None**  
**Boring No. C-7**





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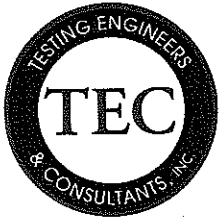
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soil borings      soil evaluation      foundation investigation      instrumentation  
**SOIL BORING LOG**

<b>BORING NO. C-8</b>	<b>JOB NO.: 48887</b>	<b>PROJECT NAME: Clarkston Medical Complex</b>
<b>CLIENT: Clarkston Medical Complex c/o Landmark</b>		<b>1-75 &amp; M-15 (Ortonville Road)</b>
<b>Type of Rig: Truck</b>		<b>Location: Independence Township, Michigan</b>
<b>Drilling Method: Hollow Stem Augers</b>		<b>Drilled By: I. Mickle</b>
<b>Ground Surface Elevation: 1030</b>		<b>Started: December 5, 2007      Completed: December 5, 2007</b>

DEPTH IN FEET	SAMPLE TYPE	N	STRATA CHANGE	SOIL CLASSIFICATION	W	d	qu
2.5	LS	6	1.5	Medium Compact Moist Brown Fine SAND	17.3	130	
		11		Medium Compact Wet Brown Fine SAND With Trace Of Gravel & Pebbles			
5	LS	6	5	End of Boring	13.3	132	
		7					
		8					
7.5							
10							
12.5							
15							
17.5							
20							
22.5							
25							

"N" - Standard Penetration Resistance      w - H<sub>2</sub>O, % of dry weight      **WATER ENCOUNTERED 1'6"**  
 SS - 2" O.D. Split Spoon Sample      d - Bulk Density, pcf      **AT COMPLETION 1'6"**  
 LS - Sectional Liner Sample      qu - Unconfined Compression, psf      **Boring No. C-8**  
 ST - Shelby Tube Sample  
 AS - Auger Sample



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Date: December 12, 2007

TEC Job No. 48887

Project: Clarkston Medical Complex

Client: Clarkston Medical Complex c/o Landmark Health Submitted By: I. Mickle

Source: Boring No. 2 At 2'6"

Tested By: S. Martinez

Use:

Remarks:

Date Sampled: December 4, 2007

## MECHANICAL ANALYSIS FORM

SIEVE SIZE	RETAINED WEIGHT	FRACTIONAL PERCENT	PERCENTS RETAINED	CUMULATIVE PASSING	SPEC.
3"					INITIAL WT. 258.3
2 1/2"					WT. AFT/WASH 232.4
1 1/2"					LBW GMS. 25.9
1"					LBW % 10.0
3/4"					CRUSHED %
1/2"	0	0	0	100	REQ'D CRSH. %
3/8"	15.6	6.0	6.0	94.0	CLAY IRONSTONE %
#4	10.4	4.0	10.0	90.0	SOFT PARTICLES %
#10	11.8	4.6	14.6	85.4	CHERT %
#20	13.3	5.2	19.8	80.2	SOFT & CHERT %
#30	11.5	4.4	24.2	75.8	FN. MODULUS
#40	29.5	11.4	35.6	64.4	MATERIAL DESCRIPTION
#100	123.4	47.9	83.5	16.5	Brown Fine Sand With Some
PAN	16.9	6.5	90		Gravel & Clay
LBW	25.9	10.0		10.0	
TOTAL	258.3	100	100		

## Testing Engineers & Consultants, Inc.

Mr. Kevin Anderson  
Clarkston Medical Complex  
c/o Landmark Health Care Facilities, LLC  
December 31, 2007

TEC Report: 48887-1

### SOIL DESCRIPTIONS

In order to provide uniformity throughout our projects, the following nomenclature has been adopted to describe soil characteristics:

#### CONSISTENCY AND RELATIVE DENSITY

COHESIVE SOILS		GRANULAR SOILS	
<u>"N"</u> <u>VALUES</u>	<u>CONSISTENCY</u>	<u>"N"</u> <u>VALUES</u>	<u>RELATIVE</u> <u>DENSITY</u>
0 - 2	Very Soft	0 - 4	Very Loose
2 - 4	Soft	4 - 10	Loose
4 - 8	Plastic	10 - 30	Med. Compact
8 - 15	Firm	30 - 50	Compact
15 - 30	Stiff	50+	Dense
30 - 60	Ex. Stiff		
60+	Hard		

#### Material Types By Particle Size

BOULDERS

COBBLES

GRAVEL

COARSE SAND

MEDIUM SAND

#### ASTM D2487

Stones Over 12" In Diameter

Stones 3" To 12" In Diameter

#4 To 3" Diameter

#10 To #4 Sieves

#40 To #10 Sieves

## Testing Engineers & Consultants, Inc.

Mr. Kevin Anderson  
Clarkston Medical Complex  
c/o Landmark Health Care Facilities, LLC  
December 31, 2007

TEC Report: 48887-1

### SOIL DESCRIPTIONS (Cont'd)

#### Material Types By Particle Size

FINE SAND

SILT

CLAY

PEAT

MARL

SWAMP BOTTOM DEPOSITS

#### ASTM D2487

#200 To #40 Sieves

Minus #200 Sieve Material,  
Fairly Non-Plastic, Falls Below  
"A"-Line

Minus #200 Sieve Material Plastic  
Material That Has A Tendency To  
Stick Together, Can Be Rolled  
Into Fine Rods When Moistened;  
Falls Above "A"-Line

Black Organic Material  
Containing Partially Decayed  
Vegetable Matter

Fresh Water Deposits Of Calcium  
Carbonate, Often Containing  
Percentages Of Peat, Clay  
& Fine Sand

Mixtures Of Peat, Marl,  
Vegetation & Fine Sand  
Containing Large Amounts Of  
Decayable Organic Material