CONSULTING GROUP

Report on Geotechnical Pavement Investigation

Fox Glen Condominium Development
Pavement Rehabilitation
Fox Glen Drive, Bridle Pass, and Santa Fe Trail
Ann Arbor, Washtenaw County, Michigan

Latitude 42.229057° N
Longitude 83.756890° W

Prepared for:

Fox Glen Association
3921 Lohr Road
Ann Arbor, Michigan 48108

G2 Project No. 173225
August 3, 2017

g2consultinggroup.com

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CONSULTING GROUP

August 3, 2017

Mr. John Antos
Fox Glen Association
3921 Lohr Road
Ann Arbor, Michigan 48108

RE: Report of Geotechnical Pavement Investigation
Fox Glen Condominium Development Pavement Rehabilitation
Fox Glen Drive, Bridle Pass, and Santa Fe Trail
Ann Arbor, Washtenaw County, Michigan
G2 Project No. 173225

Dear Mr. Antos:

In accordance with your request, we have completed a pavement investigation for the proposed pavement improvements within the existing Fox Glen Condominium development located in Ann Arbor, Michigan. This report presents the results of our observations and analyses and includes recommendations and construction considerations relative to the proposed pavement rehabilitation/reconstruction.

We appreciate the opportunity to be of service to you and look forward to discussing our findings. In the meantime, if you have any questions regarding this report or any other matter pertaining to the project, please call us.

Sincerely,

G2 Consulting Group, LLC

Jeffrey D. Crow, E.I.T.
Staff Engineer

David L. Wanlass, P.E.
Project Manager

JDC/DLW/ljv

Enclosures

EXECUTIVE SUMMARY

We understand the project consists of rehabilitation/reconstruction of the pavement areas within the existing Fox Glen condominium development located in Ann Arbor, Michigan. The pavements consist of bituminous concrete and are generally in fair to poor condition. Based on Google Earth Historical Aerial Photographs, it appears the pavements were originally constructed sometime between 2000 and 2005. The roads within the development include Fox Glen Drive, Bridle Pass, and Santa Fe Trail.

The bituminous concrete ranges in thickness from 3-1/2 to 4-3/4 inches with an average thickness of 3-3/4 inches. The underlying aggregate base course generally consists of crushed limestone sandy gravel with trace silt and measures 6 to 12 inches in thickness. A grain-size analysis was performed on a select sample of the aggregate base obtained from boring PC-2. Test results indicated the existing aggregate base material does not meet the gradation requirements of MDOT 21AA dense graded material due to an excessive amount of material retained on the 3/4-inch sieve (gravel), however, is close to the required gradation and is suitable for use as aggregate base. Fill soils consisting of medium compact gravelly sand and very stiff sandy clay and silty clay underlie the pavement section of borings PC-1, PC-3, and PC-5, and extends to approximate depths ranging from 2 to 3-1/2 feet below existing grade. Native very stiff to hard silty clay underlies the fill soils within borings PC-1 and PC-3, and below the pavement section of borings PC-2, PC-4, and PC-7, and extends to the explored depths ranging from 4 to 5 feet. Native medium compact sand underlies the pavement section of boring PC-6 and extends to the explored depth of 4-1/2 feet. In general, alternating strata of native very stiff silty clay and medium compact sand underlies the fill soils within boring PC-5 and below the pavement section of boring PC-8 and extends to the explored depth of 5 feet.

Groundwater seepage was encountered at 4-1/2 feet below existing grade within boring PC-2; however, no measurable groundwater was observed upon completion of the borehole. No measurable groundwater was encountered during or upon completion of excavation operations of the remaining borings.

Most of the existing pavements are generally in poor condition with its surface exhibiting moderate to high severity transverse and fatigue cracking. These cracks are full depth and would require a significant amount of full-depth patch if a rehabilitation was performed. In addition, most of the asphalt pavement was observed to be less than 4 inches in thickness, which would be difficult to mill and overlay. Therefore, we recommend the asphalt pavements be reconstructed by completely removing the bituminous concrete, fine grading and compacting the exposed aggregate base to improve surface drainage, proof compact the exposed aggregate base, import 21AA dense graded material as needed to adjust the aggregate base to the required elevation, then construct a new 4-inch bituminous concrete pavement section.

We recommend the existing aggregate be evaluated by proof compacting with a vibratory roller. Any areas that exhibit instability should be undercut to expose stable ground and backfilled with MDOT 21AA aggregate placed in an engineered manner. Once proof compaction is complete, any additional MDOT 21AA aggregate base required to achieve finished grades shall be placed and compacted. All aggregate base should be compacted to a density of at least 95 percent to the maximum dry density as determined by the Modified Proctor (ASTM D 1557) method of testing.

We recommend a minimum pavement design section consisting of 2 inches of MDOT 13A (Tier 1 < 17% RAP) bituminous concrete wearing course, 2 inches of MDOT 3C bituminous concrete leveling course, supported on the existing compacted aggregate base. Given our assumptions for the proposed traffic volume, we estimate the reconstructed pavement section could support passenger vehicles, delivery vehicles, refuse vehicles, and snow removal equipment over a 20-year lifespan.

Do not consider this summary separate from the entire text of this report, with all the conclusions and qualifications mentioned herein. Details of our analysis and recommendations are discussed in the following sections and in the Appendix of this report.

PROJECT DESCRIPTION

We understand the project consists of rehabilitation/reconstruction of the pavement areas within the existing Fox Glen condominium development located in Ann Arbor, Michigan. The pavements consist of bituminous concrete and are generally in fair to poor condition. We anticipate the development generally receives passenger vehicles, delivery vehicles, refuse vehicles, and snow removal equipment. Based on Google Earth Historical Aerial Photographs, it appears the pavements were originally constructed sometime between 2000 and 2005. The roads within the development include Fox Glen Drive, Bridle Pass, and Santa Fe Trail.

The purpose of our investigation is to determine and evaluate the general pavement and subsurface conditions and develop general recommendations for pavement rehabilitation/reconstruction.

SCOPE OF SERVICES

The field operations, laboratory testing, and engineering report preparation were performed under the direction and supervision of a licensed professional engineer. Our services were performed according to generally accepted standards and procedures in the practice of geotechnical engineering in this area. Our scope of services for this project consists of the following specific items:

1. We performed a cursory visual identification of the types and relative magnitudes of observable pavement distress.
2. We drilled a total of eight (8) pavement core/hand auger soil borings within the existing pavement areas extending to depths ranging from 4 to 5 feet. Pavement core/hand auger borings PC-1 and PC-6 were terminated at approximate depths of 4 and 4-1/2 feet, respectively, due to auger refusal. Pavement core/hand auger borings PC-1, PC-7, and PC-8 were performed along Fox Glen Drive, PC-2 through PC-4 were performed along Bridle Pass, and PC-5 and PC-6 were performed along Santa Fe Trail. We measured the existing pavement section materials (bituminous concrete and aggregate base) and identified the type and condition of subgrade soils.
3. We performed laboratory testing on samples obtained from the soil borings. Laboratory testing included visual engineering classification, Atterberg Limits, natural moisture content, grain-size distribution, and unconfined compressive strength determinations.
4. We prepared this engineering report. Our report includes recommendations for existing pavement rehabilitation/reconstruction.

FIELD OPERATIONS

G2 Consulting Group, LLC, selected the number, depth, and location of the soil borings. The soil borings were located in the field by a G2 representative by measuring from existing site features and landmarks using conventional taping methods. The approximate soil boring locations are shown on the individual Soil Boring Location Plan, Plate No. 1. Ground surface elevations were not available at the time of the field investigation.

We used an electrically powered core rig equipped with a 6-inch diameter diamond-tipped core barrel to core the pavement locations. Pavement cores were drilled through the full depth of the existing pavement structure to obtain an accurate determination of the pavement thickness.

Hand-auger borings were performed using a 3-inch diameter hand auger. Within each hand-auger boring, soil samples were obtained at 2-1/2 feet, 5 feet, and at transitions in soil types. The soil samples were placed in sealed containers in the field and brought to the laboratory for testing and classification. A Dynamic Cone Penetrometer (DCP) test was performed within each hand auger boring at depths of 2-1/2 feet and 5 feet to evaluate the consistency of the in-situ soil. DCP testing involves driving a 1-1/2 inch diameter cone with a 45˚ vertex angle into the ground using a 15-pound weight dropped 20 inches after the cone is seated into the bottom of the hand auger borehole. The Dynamic

Cone Penetrometer is driven successive 1-3/4 increments. The blow counts for each 1-3/4 inch increment are presented on the individual hand-auger soil boring logs.

During drilling operations, a G2 field engineer maintained logs of the encountered subsurface conditions, including changes in stratigraphy and observed groundwater levels to be used in conjunction with our analysis of the subsurface conditions. The final hand-auger boring logs are based on the field logs and laboratory soil classification and testing. After completion of boring operations, the boreholes were backfilled with excavated soil and topped with cold patch.

LABORATORY TESTING

Representative soil samples were subjected to laboratory testing to determine soil parameters pertinent to pavement design and site preparation. An experienced geotechnical engineer classified the samples in general conformance with the Unified Soil Classification System.

Laboratory testing included Atterberg Limits, grain-size distribution, natural moisture content, and unconfined compressive strength determinations. Atterberg limits were determined in accordance with ASTM D 4318 "Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils". Grain-size distribution was determined in general conformance with ASTM D 422 method of testing. The unconfined compressive strengths were determined using a spring-loaded hand penetrometer. The hand penetrometer estimates the unconfined compressive strength to a maximum of 4-1/2 tons per square foot (tsf) by measuring the resistance of the soil sample to the penetration of a calibrated spring-loaded cylinder.

The results of the natural moisture content and unconfined compressive strength laboratory tests are indicated on the soil boring logs at depths the samples were obtained. Atterberg limits are shown graphically on Figure No. 9 in the Appendix. The grain-size analysis is presented in the Appendix as Grain-Size Distribution, Figure No. 10. We will hold the soil samples for 60 days from the date of this report. If you would like the samples, please let us know.

EXISTING PAVEMENT CONDITIONS

The existing pavements consist of bituminous concrete and an underlying aggregate base course. The bituminous concrete ranges in thickness from 3-1/2 to 4-3/4 inches with an average thickness of 3-3/4 inches. The underlying aggregate base course generally consists of crushed limestone sandy gravel with trace silt and measures 6 to 12 inches in thickness. A grain-size analysis was performed on a select sample of the aggregate base obtained from boring PC-2. Test results indicated the existing aggregate base material does not meet the gradation requirements of MDOT 21AA dense graded material due to an excessive amount of material retained on the 3/4-inch sieve (gravel), however, is close to the required gradation and is suitable for use as aggregate base.

Moderate to high severity transverse and fatigue cracking is present within a majority of the pavement surface. It appears crack sealing and small areas of bituminous patching have been performed in the past. The pavement is generally crowned at the centerline and sloped to sheet drain to adjacent portland cement concrete shallow gutters and into associated storm drains. No catch basins were observed within the pavements.

SUBSURFACE CONDITIONS

Fill soils consisting of gravelly sand, sandy clay, and silty clay underlie the pavement section of borings PC-1, PC-3, and PC-5, and extends to approximate depths ranging from 2 to 3-1/2 feet below existing grade. Native silty clay underlies the fill soils within borings PC-1 and PC-3, and below the pavement section of borings PC-2, PC-4, and PC-7, and extends to the explored depths ranging from 4 to 5 feet. Native sand underlies the pavement section of boring PC-6 and extends to the explored depth of 4-1/2

feet. In general, alternating strata of native silty clay and sand underlies the fill soils within boring PC-5 and below the pavement section of boring PC-8 and extends to the explored depth of 5 feet.

The gravelly sand fill within the vicinity of boring PC-1 is generally medium compact in relative density with a Dynamic Cone Penetrometer (DCP) Test N-value of 14 blows per 1-3/4 inches driven. The silty clay and sandy clay fill within the vicinity of borings PC-3 and PC-5 is very stiff in consistency with natural moisture contents ranging from 15 to 16 percent, a liquid limit of 30 percent, a plasticity index of 14 percent, and unconfined compressive strengths from 6,000 to 7,000 psf.

The native silty clay is very stiff to hard in consistency with natural moisture contents ranging from 13 to 21 percent and unconfined compressive strengths ranging from 5,000 to 9,000 psf. The native sand is generally medium compact in relative density with a Dynamic Cone Penetrometer (DCP) Test N-values ranging from 15 to 17 blows per 1-3/4 inches driven.

Groundwater seepage was encountered at 4-1/2 feet below existing grade within boring PC-2; however, no measurable groundwater was observed upon completion of the borehole. No measurable groundwater was encountered during or upon completion of excavation operations of the remaining borings. Fluctuations in perched and long-term groundwater levels should be anticipated due to seasonal variations and following periods of prolonged precipitation.

The stratification depths shown on the soil boring logs represent the soil conditions at the boring locations. Variations may occur between borings. Additionally, the stratigraphic lines represent the approximate boundaries between soil types. The transition may be more gradual than what is shown. We have prepared the boring logs on the basis of laboratory classification and testing as well as field logs of the soils encountered. General Notes defining the nomenclature used on the boring logs and elsewhere in this report are presented within the Appendix.

The Soil Boring Location Plan, Plate No. 1, Soil Boring Logs, Figure Nos. 1 through 8, Atterberg Limits Results, Figure No. 9, Grain-Size Distribution, Figure No. 10, and Photographic Documentation, Figure Nos. 11 through 14, are presented in the Appendix. The soil profiles described above are generalized descriptions of the conditions encountered at the boring locations. General Notes defining the nomenclature used on the boring logs and elsewhere in this report are presented on Figure No. 15.

PAVEMENT EVALUATION AND RECOMMENDATIONS

General

Most of the existing pavements are generally in poor condition with its surface exhibiting moderate to high severity transverse and fatigue cracking. These cracks are full depth and would require a significant amount of full-depth patch if a rehabilitation was performed. In addition, most of the asphalt pavement was observed to be less than 4 inches in thickness, which may be difficult to mill and overlay. Therefore, we recommend the asphalt pavements be reconstructed by completely removing the bituminous concrete, fine grading and compacting the exposed aggregate base to improve surface drainage, proof compact the exposed aggregate base, import 21AA dense graded material as needed to adjust the aggregate base to the required elevation, then construct a new 4-inch bituminous concrete pavement section.

The exposed aggregate base should be evaluated for stability. We recommend the existing aggregate be evaluated by proof compacting with a vibratory roller. Any areas that exhibit instability should be undercut to expose stable ground and backfilled with MDOT 21AA aggregate placed in an engineered manner. Once proof compaction is complete, any additional MDOT 21AA aggregate base required to achieve finished grades shall be placed and compacted. All aggregate base should be compacted to a density of at least 95 percent to the maximum dry density as determined by the Modified Proctor (ASTM D 1557) method of testing.

We recommend that undercut excavations, where required, be backfilled with MDOT 21AA dense graded material, and placed in an engineered manner. The fill should be placed in uniform horizontal layers, not more than 9 inches in loose thickness. The engineered fill should be compacted to achieve a density of at least 95 percent of the maximum dry density as determined by the Modified Proctor compaction test (ASTM D 1557). All engineered fill material should be placed and compacted at approximately the optimum moisture content. Frozen material should not be used as fill, nor should fill be placed on a frozen subgrade.

Pavement Design

We performed pavement design analyses in accordance with the "AASHTO Guide for Design of Pavement Structures". The subgrade soils will generally consist of native and fill silty clay soils with moistures contents near or above the plastic limit. Based on the existing subgrade soils, we have provided design pavement sections based on an effective subgrade resilient modulus of 8,000 pounds per square inch (psi).

No information regarding the amount or type of traffic was available upon completion of this report. However, we anticipate the parking lots generally receive passenger vehicles, delivery vehicles, refuse vehicles, and snow removal equipment. Therefore, we have designed the pavement section on an estimated 50,000 18-kip equivalent single-axle loads (ESALs) over a 20-year design life. If any actual traffic volume information becomes available, G2 Consulting Group should be notified so we can reevaluate our recommendations. For the reconstructed pavement section, we recommend a minimum pavement design section consisting of 2 inches of MDOT 13A (Tier 1 < 17% RAP) bituminous concrete wearing course, 2 inches of MDOT 3C bituminous concrete leveling course, supported on the existing compacted aggregate base.

All pavement materials are specified within the 2012 Standard Specifications for Construction from the Michigan Department of Transportation. The bituminous pavement materials are described in Section 501 and can be assigned a structural coefficient number of 0.42. Any existing aggregate base material can be assigned a structural coefficient of 0.11 and imported MDOT 21AA material can be assigned a structural coefficient number of 0.14.

Pavement Drainage and Maintenance

The pavement and subgrade should be properly sloped to promote effective surface and subsurface drainage and prevent water from ponding. We also recommend pavement subbase materials consist of non-frost-susceptible aggregates where possible. Regular timely maintenance should be performed on the bituminous pavement to reduce the potential deterioration associated with moisture infiltration through surface cracks. The owner should be prepared to seal the cracks with a hot-applied elastic crack filler as soon as possible after cracking develops and as often as necessary to block the passage of water to the subgrade soils.

GENERAL COMMENTS

We have formulated the evaluations and recommendations presented in this report relative to site preparation and pavement construction on the basis of data provided to us relating to the general location for the proposed pavement improvements. Any significant change in this data should be brought to our attention for review and evaluation with respect to the prevailing subsurface conditions.

The scope of the present investigation was limited to evaluation of subsurface conditions for the support of the pavements and other related aspects of the development. No chemical, environmental, or hydrogeological testing or analyses were included in the scope of this investigation. If changes occur in the design, location, or concept of the project, the conclusions and recommendations contained in this report are not valid unless G2 Consulting Group, LLC reviews the changes. G2 Consulting Group, LLC will then confirm the recommendations presented herein or make changes in writing.

We have based the analyses and recommendations submitted in this report upon the data from soil borings performed at the approximate locations shown on the Soil Boring Location Plan, Plate No. 1. This report does not reflect variations that may occur between the actual boring locations. The nature and extent of any such variations may not become clear until the time of construction. If significant variations then become evident, it may be necessary for us to re-evaluate our report recommendations.

Soil conditions at the site could vary from those generalized on the basis of soil borings made at specific locations. It is, therefore, recommended that G2 Consulting Group, LLC be retained to provide soil engineering services during the site preparation and pavement construction phases of the proposed project. This is to observe compliance with the design concepts, specifications, and recommendations. Also, this allows design changes to be made in the event that subsurface conditions differ from those anticipated prior to the start of construction.

APPENDIX

Legend

Pavement Cores / Hand-Auger Soil Borings performed by G2 Consulting Group, LLC, on July 26, 2017

Soil Boring Location Plan		
Fox Glen Condominium Development Fox Glen Drive, Bridle Pass, and Santa Fe Trail Ann Arbor, Washtenaw County, Michigan		
G2 CONSULTING GROUP	Project No. 173225	
	Drawn by: JDC	
	Date: 8-1-17	Plate No. 1
	Scale: NTS	

Project Name: Fox Glen Condominium Development

Project Location: Fox Glen Drive, Bridle Pass, Santa Fe Trail
Ann Arbor, Washtenaw County, Michigan

G2 Project No. 173225

Latitude: 42.229057° Longitude: -83.756890°

Soil Boring No. PC-1

G2 CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE/NO.	DCP BLOWS/ 1.75-INCHES	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCOF. COMP. ST. (PSF)
		Bituminous Concrete (3-3/4 inches) 0.3						
		Crushed Limestone Aggregate Base: Gray Sandy Gravel with trace silt (6 inches) 0.8		BS-1				
		Fill: Medium Compact Brown Gravelly Sand with trace silt, frequent clay clods 2.5		BS-2	14			
		Hard Dark Gray Silty Clay with trace sand and gravel, occasional cobbles 4.0		BS-3		14.0		9000*
		End of Boring @ 4 ft, Auger Refusal						
5			5					
10			10					

Total Depth: 4 ft
Drilling Date: July 26, 2017
Inspector: J. Crow, EIT
Contractor: G2 Consulting Group, LLC
Driller: J. Crow, EIT

Drilling Method:
6-inch diameter diamond-tipped core barrel,
3-inch diameter solid-stem auger

Water Level Observation:
Dry during and upon completion of drilling operations

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings and topped with cold patch

Figure No. 1

PAVEMENT CORE DCP 173225.GPJ 20140820 G2 CONSULTING DATA TEMPLATE.GDT 8/3/17

Project Name: Fox Glen Condominium Development

Project Location: Fox Glen Drive, Bridle Pass, Santa Fe Trail
Ann Arbor, Washtenaw County, Michigan

G2 Project No. 173225

Latitude: 42.229433° Longitude: -83.757865°

Soil Boring No. PC-2

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE/NO.	DCP BLOWS/ 1.75-INCHES	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCOF. COMP. ST. (PSF)
		Bituminous Concrete (3-3/4 inches) 0.3						
		Crushed Limestone Aggregate Base: Gray Sandy Gravel with trace silt (10 inches) 1.1		BS-1				
		Hard Brown Silty Clay with trace sand and gravel		BS-2	11	14.9		9000*
		▽ 4.5						
5		Very Stiff Gray Silty Clay with trace sand and gravel, occasional sand seams 5.0	5	BS-3	6	13.1		5000*
		End of Boring @ 5 ft						
10			10					

Total Depth: 5 ft
Drilling Date: July 26, 2017
Inspector: J. Crow, EIT
Contractor: G2 Consulting Group, LLC
Driller: J. Crow, EIT

Drilling Method:
6-inch diameter diamond-tipped core barrel,
3-inch diameter solid-stem auger

Water Level Observation:
Seepage at 4-1/2 feet during drilling operations; dry upon completion

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings and topped with cold patch

Figure No. 2

PAVEMENT CORE DCP 173225.GPJ 20140820 G2 CONSULTING DATA TEMPLATE.GDT 8/3/17

Project Name: Fox Glen Condominium Development

Project Location: Fox Glen Drive, Bridle Pass, Santa Fe Trail
Ann Arbor, Washtenaw County, Michigan

G2 Project No. 173225

Latitude: 42.230038° Longitude: -83.758616°

Soil Boring No. PC-3

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE/NO.	DCP BLOWS/ 1.75-INCHES	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCOF. COMP. ST. (PSF)
		Bituminous Concrete (4-3/4 inches) 0.4						
		Crushed Limestone Aggregate Base: Gray Sandy Gravel with trace silt (8 inches) 1.1		BS-1				
		Fill: Very Stiff Brown Sandy Clay with trace silt, gravel, and concrete debris		BS-2	11	16.1		7000*
		3.5						
5		Hard Mottled Gray and Brown Silty Clay with trace sand and gravel 5.0	5	BS-3	10	20.3		9000*
		End of Boring @ 5 ft						
10			10					

Total Depth: 5 ft
Drilling Date: July 26, 2017
Inspector: J. Crow, EIT
Contractor: G2 Consulting Group, LLC
Driller: J. Crow, EIT

Drilling Method:
6-inch diameter diamond-tipped core barrel,
3-inch diameter solid-stem auger

Water Level Observation:
Dry during and upon completion of drilling operations

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings and topped with cold patch

Figure No. 3

PAVEMENT CORE DCP 173225.GPJ 20140820 G2 CONSULTING DATA TEMPLATE.GDT 8/3/17

Project Name: Fox Glen Condominium Development

Project Location: Fox Glen Drive, Bridle Pass, Santa Fe Trail
Ann Arbor, Washtenaw County, Michigan

G2 Project No. 173225

Latitude: 42.230855° Longitude: -83.758611°

Soil Boring No. PC-4

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE/NO.	DCP BLOWS/ 1.75-INCHES	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCOF. COMP. ST. (PSF)
		Bituminous Concrete (3-3/4 inches) 0.3						
		Crushed Limestone Aggregate Base: Gray Sandy Gravel with trace silt (8 inches) 1.0		BS-1				
		Very Stiff Brown Silty Clay with trace sand and gravel, occasional cobbles		BS-2	9	15.6		7000*
		3.0						
		Hard Brownish Gray Silty Clay with trace sand and gravel						
5		5.0	5	BS-3	11	18.0		9000*
		End of Boring @ 5 ft						
10			10					

Total Depth: 5 ft
Drilling Date: July 26, 2017
Inspector: J. Crow, EIT
Contractor: G2 Consulting Group, LLC
Driller: J. Crow, EIT

Drilling Method:
6-inch diameter diamond-tipped core barrel,
3-inch diameter solid-stem auger

Water Level Observation:
Dry during and upon completion of drilling operations

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings and topped with cold patch

Figure No. 4

PAVEMENT CORE DCP 173225.GPJ 20140820 G2 CONSULTING DATA TEMPLATE.GDT 8/3/17

Project Name: Fox Glen Condominium Development

Project Location: Fox Glen Drive, Bridle Pass, Santa Fe Trail
Ann Arbor, Washtenaw County, Michigan

G2 Project No. 173225

Latitude: 42.231506° Longitude: -83.756823°

Soil Boring No. PC-5

CONSULTING GROUP

SUBSURFACE PROFILE

GROUND SURFACE ELEVATION: N/A

DEPTH (ft)	PRO-FILE		DEPTH (ft)
		Bituminous Concrete (3-1/2 inches) 0.3	
		Crushed Limestone Aggregate Base: Gray Sandy Gravel with trace silt (8 inches) 1.0	
		Fill: Very Stiff Gray Silty Clay with trace sand and gravel 2.0	
		Medium Compact Brown Sand with trace silt and gravel 3.0	
5		Very Stiff Brownish Gray Silty Clay with trace sand and gravel 5.0	5
		End of Boring @ 5 ft	
10			10

SOIL SAMPLE DATA

SAMPLE TYPE/NO.	DCP BLOWS/ 1.75-INCHES	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCOF. COMP. ST. (PSF)
BS-1				
BS-2		15.0		6000*
BS-3	15			
BS-4	8	13.5		5500*

Total Depth: 5 ft
Drilling Date: July 26, 2017
Inspector: J. Crow, EIT
Contractor: G2 Consulting Group, LLC
Driller: J. Crow, EIT

Drilling Method:
6-inch diameter diamond-tipped core barrel,
3-inch diameter solid-stem auger

Water Level Observation:
Dry during and upon completion of drilling operations

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings and topped with cold patch

Figure No. 5

PAVEMENT CORE DCP 173225.GPJ 20140820 G2 CONSULTING DATA TEMPLATE.GDT 8/3/17

Project Name: Fox Glen Condominium Development

Project Location: Fox Glen Drive, Bridle Pass, Santa Fe Trail
Ann Arbor, Washtenaw County, Michigan

G2 Project No. 173225

Latitude: 42.230745° Longitude: -83.757240°

Soil Boring No. PC-6

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE/NO.	DCP BLOWS/ 1.75-INCHES	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCOF. COMP. ST. (PSF)
		Bituminous Concrete (3-1/2 inches) 0.3						
		Crushed Limestone Aggregate Base: Gray Sandy Gravel with trace silt (11 inches) 1.2		BS-1				
		Medium Compact Brown Sand with trace silt and gravel 3.0		BS-2	17			
		Medium Compact Brown Sand with trace silt and gravel, occasional cobbles 4.5		BS-3				
5		End of Boring @ 4.5 ft, Auger Refusal	5					
10			10					

Total Depth: 4.5 ft
Drilling Date: July 26, 2017
Inspector: J. Crow, EIT
Contractor: G2 Consulting Group, LLC
Driller: J. Crow, EIT

Water Level Observation:
Dry during and upon completion of drilling operations

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings and topped with cold patch

Drilling Method:
6-inch diameter diamond-tipped core barrel,
3-inch diameter solid-stem auger

Figure No. 6

PAVEMENT CORE DCP 173225.GPJ 20140820 G2 CONSULTING DATA TEMPLATE.GDT 8/3/17

Project Name: Fox Glen Condominium Development

Project Location: Fox Glen Drive, Bridle Pass, Santa Fe Trail
Ann Arbor, Washtenaw County, Michigan

G2 Project No. 173225

Latitude: 42.230661° Longitude: -83.758045°

Soil Boring No. PC-7

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE/NO.	DCP BLOWS/ 1.75-INCHES	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCOF. COMP. ST. (PSF)
		Bituminous Concrete (3-1/2 inches) 0.3						
		Crushed Limestone Aggregate Base: Gray Sandy Gravel with trace silt (9 inches) 1.0		BS-1				
		Hard Brown Silty Clay with trace sand and gravel		BS-2	14	11.7		9000*
		3.0						
		Hard Gray Silty Clay with trace sand and gravel						
5		5.0	5	BS-3	14	8.3		9000*
		End of Boring @ 5 ft						
10			10					

Total Depth: 5 ft
Drilling Date: July 26, 2017
Inspector: J. Crow, EIT
Contractor: G2 Consulting Group, LLC
Driller: J. Crow, EIT

Drilling Method:
6-inch diameter diamond-tipped core barrel,
3-inch diameter solid-stem auger

Water Level Observation:
Dry during and upon completion of drilling operations

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings and topped with cold patch

Figure No. 7

PAVEMENT CORE DCP 173225.GPJ 20140820 G2 CONSULTING DATA TEMPLATE.GDT 8/3/17

Project Name: Fox Glen Condominium Development

Project Location: Fox Glen Drive, Bridle Pass, Santa Fe Trail
Ann Arbor, Washtenaw County, Michigan

G2 Project No. 173225

Latitude: 42.230019° Longitude: -83.757512°

Soil Boring No. PC-8

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE/NO.	DCP BLOWS/ 1.75-INCHES	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCOF. COMP. ST. (PSF)
		Bituminous Concrete (3-1/2 inches) 0.3						
		Crushed Limestone Aggregate Base: Gray Sandy Gravel with trace silt (12 inches) 1.3		BS-1				
		Hard Brown Silty Clay with trace sand and gravel 3.0		BS-2	7	16.9		6000*
5		Medium Compact Brown Sand with trace silt and gravel 5.0	5	BS-3	16			
		End of Boring @ 5 ft						
10			10					

Total Depth: 5 ft
Drilling Date: July 26, 2017
Inspector: J. Crow, EIT
Contractor: G2 Consulting Group, LLC
Driller: J. Crow, EIT

Drilling Method:
6-inch diameter diamond-tipped core barrel,
3-inch diameter solid-stem auger

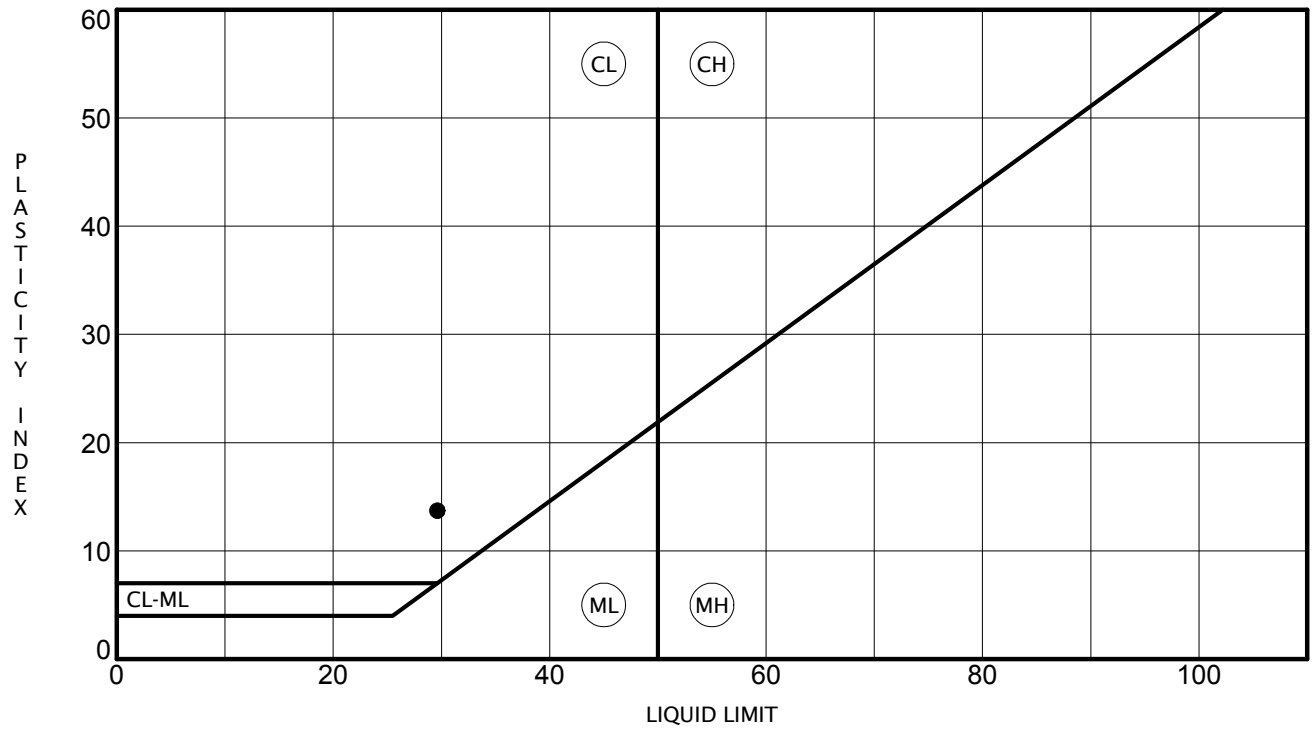
Water Level Observation:
Dry during and upon completion of drilling operations

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings and topped with cold patch

Figure No. 8

PAVEMENT CORE DCP 173225.GPJ 20140820 G2 CONSULTING DATA TEMPLATE.GDT 8/3/17



	Specimen Identification		LL	PL	PI	Fines	M %	Classification
●	PC-5	BS-2	30	16	14		15	Gray Silty Clay

CONSULTING GROUP

ATTERBERG LIMITS RESULTS

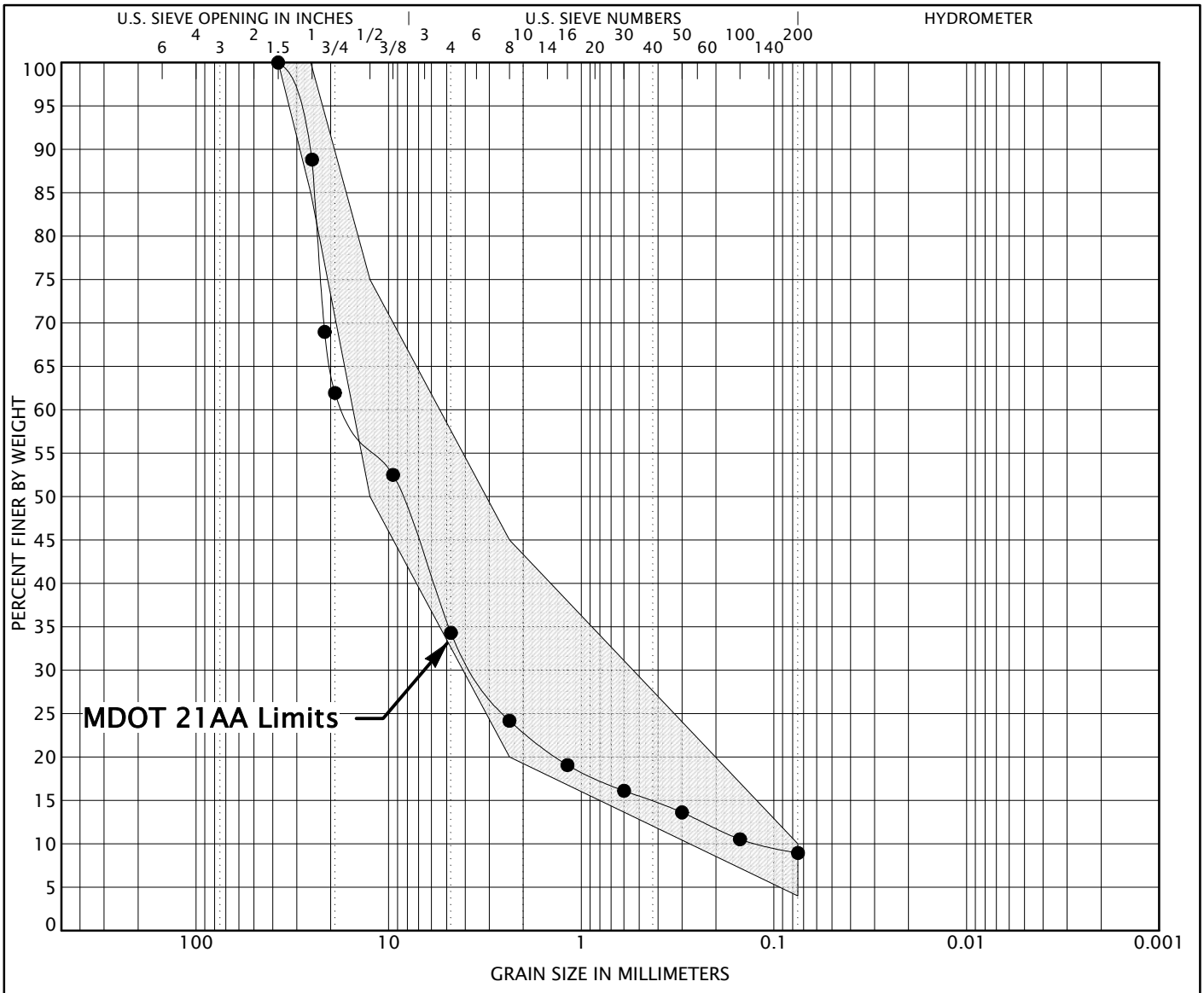
Project Name: Fox Glen Condominium Development

Project Location: Fox Glen Drive, Bridle Pass, Santa Fe Trail
Ann Arbor, Washtenaw County, Michigan

G2 Project No.: 173225

Figure No. 9

US_ATTERBERG_LIMITS 173225.GPJ 20140820 G2 CONSULTING DATA TEMPLATE.GDT 8/3/17



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen ID	Description	LL	PL	PI	Cc	Cu
●	PC-2 BS-1	Gray Sandy Gravel with trace silt				6.34	138.43

	Specimen ID	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	PC-2 BS-1	37.5	16.479	3.528	0.119	65.7	25.4	8.9	

CONSULTING GROUP

GRAIN SIZE DISTRIBUTION

Project Name: Fox Glen Condominium Development

Project Location: Fox Glen Drive, Bridle Pass, Santa Fe Trail
Ann Arbor, Washtenaw County, Michigan

G2 Project No.: 173225

Figure No. 10

US_GRAIN_SIZE_MDOT_21AA 173225.GPJ 20140820 G2 CONSULTING DATA TEMPLATE.GDT 8/3/17

Photographic Documentation
Fox Glen Condominium Development Pavement Rehabilitation
Ann Arbor, Washtenaw County, Michigan
G2 Project No. 173225

Photograph No. 1: Moderate to High severity traverse and fatigue cracking with crack sealing and areas of bituminous patching near boring PC-1. View to the north.

Photograph No. 2: High severity traverse and fatigue cracking with crack sealing And potholes near boring PC-2. View to the east.

Figure No. 11

Photographic Documentation
Fox Glen Condominium Development Pavement Rehabilitation
Ann Arbor, Washtenaw County, Michigan
G2 Project No. 173225

Photograph No. 3: Moderate to high severity traverse and fatigue cracking with crack sealing near boring PC-3. View to the north.

Photograph No. 4: High severity traverse and fatigue cracking with crack sealing near boring PC-4. View to the south.

Photographic Documentation
Fox Glen Condominium Development Pavement Rehabilitation
Ann Arbor, Washtenaw County, Michigan
G2 Project No. 173225

Photograph No. 5: High severity traverse and fatigue cracking with crack sealing near boring PC-5. View to the north.

Photograph No. 6: Moderate to high severity traverse and fatigue cracking with crack sealing near boring PC-6. View to the northeast.

Photographic Documentation
Fox Glen Condominium Development Pavement Rehabilitation
Ann Arbor, Washtenaw County, Michigan
G2 Project No. 173225

Photograph No. 7: High severity traverse and fatigue cracking with crack sealing and areas of bituminous patching near boring PC-7. View to the southeast.

Photograph No. 8: Moderate to high severity traverse and fatigue cracking with crack sealing near boring PC-8. View to the north.

Figure No. 14

GENERAL NOTES TERMINOLOGY

Unless otherwise noted, all terms herein refer to the Standard Definitions presented in ASTM 653.

PARTICLE SIZE

Boulders		- greater than 12 inches
Cobbles		- 3 inches to 12 inches
Gravel	- Coarse	- 3/4 inches to 3 inches
	- Fine	- No. 4 to 3/4 inches
Sand	- Coarse	- No. 10 to No. 4
	- Medium	- No. 40 to No. 10
	- Fine	- No. 200 to No. 40
Silt		- 0.005mm to 0.074mm
Clay		- Less than 0.005mm

CLASSIFICATION

The major soil constituent is the principal noun, i.e. clay, silt, sand, gravel. The second major soil constituent and other minor constituents are reported as follows:

Second Major Constituent (percent by weight)	Minor Constituent (percent by weight)
Trace - 1 to 12%	Trace - 1 to 12%
Adjective - 12 to 35%	Little - 12 to 23%
And - over 35%	Some - 23 to 33%

COHESIVE SOILS

If clay content is sufficient so that clay dominates soil properties, clay becomes the principal noun with the other major soil constituent as modifier, i.e. sandy clay. Other minor soil constituents may be included in accordance with the classification breakdown for cohesionless soils, i.e. silty clay, trace sand, little gravel.

Consistency	Unconfined Compressive Strength (psf)	Approximate Range of (N)
Very Soft	Below 500	0 - 2
Soft	500 - 1,000	3 - 4
Medium	1,000 - 2,000	5 - 8
Stiff	2,000 - 4,000	9 - 15
Very Stiff	4,000 - 8,000	16 - 30
Hard	8,000 - 16,000	31 - 50
Very Hard	Over 16,000	Over 50

Consistency of cohesive soils is based upon an evaluation of the observed resistance to deformation under load and not upon the Standard Penetration Resistance (N).

COHESIONLESS SOILS

Density Classification	Relative Density %	Approximate Range of (N)
Very Loose	0 - 15	0 - 4
Loose	16 - 35	5 - 10
Medium Compact	36 - 65	11 - 30
Compact	66 - 85	31 - 50
Very Compact	86 - 100	Over 50

Relative Density of cohesionless soils is based upon the evaluation of the Standard Penetration Resistance (N), modified as required for depth effects, sampling effects, etc.

SAMPLE DESIGNATIONS

AS - Auger Sample – Cuttings directly from auger flight
BS - Bottle or Bag Samples
S - Split Spoon Sample - ASTM D 1586
LS - Liner Sample with liner insert 3 inches in length
ST - Shelby Tube sample - 3 inch diameter unless otherwise noted
PS - Piston Sample - 3 inch diameter unless otherwise noted
RC - Rock Core - NX core unless otherwise noted

STANDARD PENETRATION TEST (ASTM D 1586) - A 2.0 inch outside-diameter, 1-3/8 inch inside-diameter split barrel sampler is driven into undisturbed soil by means of a 140-pound weight falling freely through a vertical distance of 30 inches. The sampler is normally driven three successive 6-inch increments. The total number of blows required for the final 12 inches of penetration is the Standard Penetration Resistance (N).