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MIDLAND STANDARD ENGINEERING & TESTING, INC.

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November 27, 2018

Mr. Todd Wheeland
McHenry County College
8900 US Highway 14
Crystal Lake, Illinois 60012

Re: Pavement Coring and Subgrade Evaluation
McHenry County College – Parking Lot E
Crystal Lake, Illinois
MSET File No. 18599

Dear Mr. Wheeland:

We have completed the field exploration work and analysis of the pavement conditions for the referenced parking lot. This report was prepared for use in the preparation of the project design plans.

Purpose

The purpose of this exploration was to determine the existing pavement section materials for Parking Lot E. To determine the types of soil encountered at the proposed subgrade elevation and to determine the presence of problem subgrade materials that may require special treatments.

Scope

The scope of this exploration and analysis included review of available information from previous work conducted in the area, field and laboratory testing, analysis of the data obtained, formulation of our recommendations and preparation of this report. The field exploration included making six (6) pavement cores with shallow subgrade soil probes located across parking lot.

FIELD EXPLORATION

General

A field engineer from Midland Standard Engineering & Testing, Inc supervised the pavement cores. The specimens obtained were transported to our laboratory for testing and analysis. Our project engineer has directed all phases of this investigation.

Pavement Sampling Procedures

Pavement cores were made with a 4-inch diameter core barrel/electric drill setup to sample all pavement components. A sample of the subgrade soil was obtained with hand auguring equipment and tested for strength using a dynamic cone penetrometer.

Laboratory Testing

A supplemental testing program was conducted to ascertain additional pertinent engineering characteristics of the subgrade materials. The soils laboratory work was performed in accordance with applicable ASTM standards. The laboratory-testing program included: visual classification and moisture content determination on each subgrade sample obtained. The results of testing are presented on the attached Pavement Core Measurement Logs.

EXISTING PAVEMENT AND SUBGRADE

Existing Pavement Materials

Pavement cores performed in the existing pavement encountered 2-1/2 to 4 inches of Bituminous Concrete (HMA) overlying 7-1/2 to 13 inches of Crushed Stone Granular Base Course. The total pavement section thickness ranges from 10 to 17 inches and the existing structural number has been determined to range from 1.43 (C-5) to 2.36 (C-1).

Details of materials encountered and laboratory test results are presented on the attached Pavement Core Logs.

Subgrade Soil Conditions

Subgrade soils encountered beneath the pavement materials consisted primarily of dark grey to brown and grey CLAY, A-7-6 to Clay LOAM, A-6 with moisture contents between 17 and 25 percent. Strengths of the subgrade soils were determined in the field with a dynamic cone penetrometer. Soils were found to have a cone penetration value of 2 to 10 blows per 6 inches, which translates to an unconfined compressive strength of 0.6 to 4.2 tons per square foot.

TABLE 1 - Summary of Findings

Core Location	Thickness, inches			Subgrade Soil	
	HMA	GBC	Total	Moisture, Mc%	Strength, Qu tsf
C-1	4	13	17	25	0.9
C-2	2-1/2	8-1/2	11	24	0.6
C-3	3	8	11	21	1.3
C-4	3	9	12	20	2.2
C-5	2-1/2	7-1/2	10	25	0.6
C-6	2-3/4	9-1/4	12	17	2.7

PROJECT DESCRIPTION

Project Description

The project consists of the rehabilitation of Parking Lot E on the east side of campus. Proposed improvements to the lot are to include rehabilitation or replacement of the existing pavement materials. The parking lot consists of two north sections, a middle circular drive, and an I-shaped south section, reference the boring location map.

DISCUSSION & RECOMMENDATIONS

Parking Lot Findings and Recommendations

The bituminous concrete section is relatively thin and can not be partially removed for resurfacing. The existing base material is a well graded competent material and can be reused. The subgrade soil conditions are marginal at best. Because of these conditions the pavement can be rehabilitated in several ways depending on budget and planning.

1. The pavement can be resurfaced by removing the existing bituminous concrete in its entirety and replacing with new HMA surface and binder course. The exposed base course should be inspected by proof rolling and repaired with a full depth under cut as necessary prior to paving.
2. The strength of the pavement can be improved, and therefore the pavement life extended by addressing the subgrade soil. This would involve removing the bituminous section, removing and stock piling the base stone, addressing the subgrade soil by drying and recompaction or by lime stabilizing, then replacement of the base stone and paving with new HMA.

After the existing granular base course is stockpiled, the subgrade soils should be thoroughly disced, dried and compacted, then cut or filled to grade, and proof-rolled with a loaded 6-wheel dump truck. However, weather conditions and frequent construction traffic may cause unstable areas in the subgrade, which will need to be treated by removing the unstable material and replacing with stone.

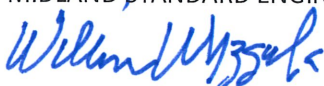
Recycled bituminous concrete material generated during the milling process may be stockpiled and used to backfill undercuts in the subgrade soils and may be used to increase base thickness as lower granular base course. Recycled asphalt (RAP) should be stockpiled separate from other base course stone. If recycled asphalt is used as a base course material, it should be capped with a minimum of 6 inches of the crushed limestone or sand and gravel, IDOT CA-6 gradation.

The thickness of the bituminous material should be determined based on anticipated traffic loading and using an estimated Illinois Bearing Ratio of 2.0.

Closure

The report is based on the information available at this time and as the design progresses, we would be happy to review the soil conditions relevant to the proposed pavement construction. Thank you for the opportunity to offer our services. If you should have any questions regarding this report, please feel free to call.

Sincerely,
MIDLAND STANDARD ENGINEERING & TESTING, INC.



William J. Wyzgala, P. E.
Principal

Attachments: Core Location Diagram, Pavement Core Logs (C-1 to C-6) & Core Pictures

Core Location Map

MCC Parking Lot E Rehabilitation
Crystal Lake, IL
MSET Project 18599

C-1

C-2

C-3

C-5

C-4

C-6

Legend

● Pavement Core

Google Earth

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200 ft

PAVEMENT CORE MEASUREMENT LOG
McHENRY COUNTY COLLEGE PARKING LOT E
CRYSTAL LAKE, ILLINOIS

Core No. C-1						
Location	See Location Map					
Material	Depth (in.)		Thickness (in.)		Remarks/Condition	coeff sn
Bituminous Surface	0	to 2	2			0.30 0.60
Bituminous Binder	2	to 4	2			0.23 0.46
Granular Base Course	4	to 17	13		Crushed Stone	0.10 1.30
Subgrade	17				Dark Grey CLAY, A-7-6 Mc=25%, Qu=0.9 to 1.3 tsf	<u>2.36</u>
Core No. C-2						
Location	See Location Map					
Material	Depth (in.)		Thickness (in.)		Remarks/Condition	coeff sn
Bituminous Surface	0	to 1	1			0.30 0.30
Bituminous Binder	1	to 2- 1/2	1- 1/2			0.23 0.35
Granular Base Course	2- 1/2	to 11	8- 1/2		Crushed Stone	0.10 0.85
Subgrade	11				Dark Grey CLAY, A-7-6 Mc=24%, Qu=0.6 to 0.9 tsf	<u>1.50</u>
Core No. C-3						
Location	See Location Map					
Material	Depth (in.)		Thickness (in.)		Remarks/Condition	coeff sn
Bituminous Surface	0	to 1	1			0.30 0.30
Bituminous Binder	1	to 3	2			0.23 0.46
Granular Base Course	3	to 11	8		Crushed Stone	0.10 0.80
Subgrade	11				Dark Grey CLAY, A-7-6 Mc=21%, Qu=1.3 to 2.2 tsf	<u>1.56</u>
Core No. C-4						
Location	See Location Map					
Material	Depth (in.)		Thickness (in.)		Remarks/Condition	coeff sn
Bituminous Surface	0	to 1	1			0.30 0.30
Bituminous Binder	1	to 3	2			0.23 0.46
Granular Base Course	3	to 12	9		Crushed Stone	0.10 0.90
Subgrade	12				Dark Grey CLAY, A-7-6 Mc=20%, Qu=2.2 to 3.7 tsf	<u>1.66</u>

PAVEMENT CORE MEASUREMENT LOG
McHENRY COUNTY COLLEGE PARKING LOT E
CRYSTAL LAKE, ILLINOIS

Core No. C-5						
Location	See Location Map					
Material	Depth (in.)		Thickness (in.)	Remarks/Condition	coeff	sn
Bituminous Surface	0	to 1- 1/2	1- 1/2		0.30	0.45
Bituminous Binder	1- 1/2	to 2- 1/2	1		0.23	0.23
Granular Base Course	2- 1/2	to 10	7- 1/2	Crushed Stone	0.10	0.75
Subgrade	10			Dark Brown and Dark Grey CLAY, A-7-6 Mc=25%, Qu=0.6 to 2.2 tsf		1.43
Core No. C-6						
Location	See Location Map					
Material	Depth (in.)		Thickness (in.)	Remarks/Condition	coeff	sn
Bituminous Surface	0	to 1	1		0.30	0.30
Bituminous Binder	1	to 2- 3/4	1- 3/4		0.23	0.40
Granular Base Course	2- 3/4	to 12	9- 1/4	Crushed Stone	0.10	0.93
Subgrade	12			Brown and Grey Clay LOAM, A-6 Mc=17%, Qu=2.7 to 4.2 tsf		1.63

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558 PLATE DRIVE, UNIT 6, EAST DUNDEE, IL 60118

DYNAMIC CONE PENETRATION TEST

MSET NO. 18599 DATE TESTED 11/9/18
 PROJ. NAME MCC Parking Lot E WEATHER Partly Cloudy
 PROJ. LOC Crystal Lake, Illinois
 CLIENT McHenry County College INSPECTOR D. Villanova/J. Donovan

TEST LOCATION AND REMARKS	INITIAL DEPTH	SUBGRADE <input checked="" type="checkbox"/> FOUNDATION <input type="checkbox"/>					
C-1	17"	DEPTH	17	23			
		BLOWS	3	4			
		RATE	2.0	1.5			
		IBV	2.9	4.2			
		QU	0.9	1.3			
C-2	11"	DEPTH	11	17	23		
		BLOWS	3	2	9		
		RATE	2.0	3.0	0.7		
		IBV	2.9	1.7	11.5		
		QU	0.9	0.6	3.7		
C-3	11"	DEPTH	11	17			
		BLOWS	6	4			
		RATE	1.0	1.5			
		IBV	6.9	4.2			
		QU	2.2	1.3			
C-4	12"	DEPTH	12	18	24		
		BLOWS	9	6	6		
		RATE	0.7	1.0	1.0		
		IBV	11.5	6.9	6.9		
		QU	3.7	2.2	2.2		
C-5	10"	DEPTH	10	16	22		
		BLOWS	2	4	6		
		RATE	3.0	1.5	1.0		
		IBV	1.7	4.2	6.9		
		QU	0.6	1.3	2.2		

NOTE: Rate is inches of penetration per blow.

CALCULATIONS

$$IBV = 10^{[0.84 - 1.26 \times \log(RATE)]}$$

$$QU(tsf) = 0.32 \times IBV$$

RATE	IBV	QU	RATE	IBV	QU
0.5	17	5.4	1.3	5	1.6
0.6	13	4.2	1.5	4	1.3
0.7	11	3.5	2.0	3	1.0
0.8	9	2.9	2.6	2	0.6
0.9	8	2.6	3.0	1.7	0.5
1.0	7	2.2	3.3	1.5	0.5
1.1	6	1.9	4.6	1	0.3
1.2	5.5	1.8	>4.6	<1	<0.3

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558 PLATE DRIVE, UNIT 6, EAST DUNDEE, IL 60118

DYNAMIC CONE PENETRATION TEST

MSET NO. 18599

DATE TESTED 11/9/18

PROJ. NAME MCC Parking Lot E

WEATHER Partly Cloudy

PROJ. LOC Crystal Lake, Illinois

CLIENT McHenry County College

INSPECTOR D. Villanova/J. Donovan

TEST LOCATION AND REMARKS	INITIAL DEPTH	SUBGRADE <input checked="" type="checkbox"/> FOUNDATION <input type="checkbox"/>					
C-6	12"	DEPTH	12	18			
		BLOWS	10	7			
		RATE	0.6	0.9			
		IBV	13.2	8.4			
		QU	4.2	2.7			
		DEPTH					
		BLOWS					
		RATE					
		IBV					
		QU					
		DEPTH					
		BLOWS					
		RATE					
		IBV					
		QU					
		DEPTH					
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		QU					
		DEPTH					
		BLOWS					
		RATE					
		IBV					
		QU					

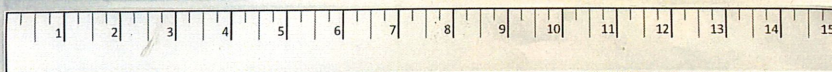
NOTE: Rate is inches of penetration per blow.

CALCULATIONS

$$IBV = 10^{[0.84 - 1.26 \times \log(RATE)]}$$

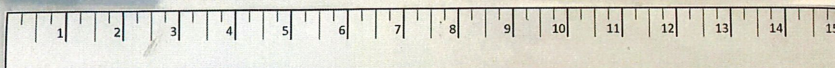
$$QU(tsf) = 0.32 \times IBV$$

RATE	IBV	QU	RATE	IBV	QU
0.5	17	5.4	1.3	5	1.6
0.6	13	4.2	1.5	4	1.3
0.7	11	3.5	2.0	3	1.0
0.8	9	2.9	2.6	2	0.6
0.9	8	2.6	3.0	1.7	0.5
1.0	7	2.2	3.3	1.5	0.5
1.1	6	1.9	4.6	1	0.3
1.2	5.5	1.8	>4.6	<1	<0.3



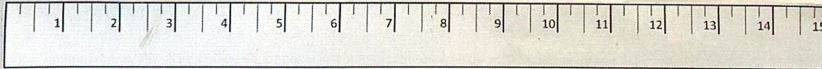
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CRYSTAL LAKE, ILLINOIS
MSET File No. 18599 NOVEMBER 2018

C-1



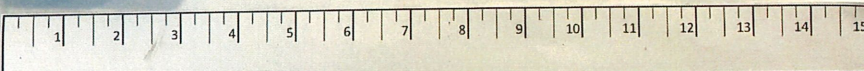
McHENRY COUNTY COLLEGE PARKING LOT E
CRYSTAL LAKE, ILLINOIS
MSET File No. 18599 NOVEMBER 2018

C-2



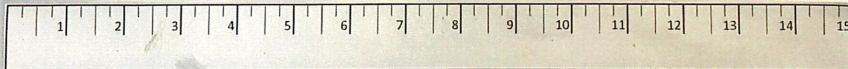
McHENRY COUNTY COLLEGE PARKING LOT E
CRYSTAL LAKE, ILLINOIS
MSET File No. 18599 NOVEMBER 2018

C-3



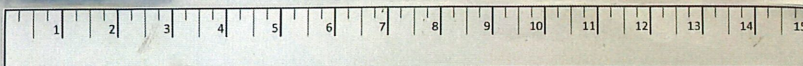
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CRYSTAL LAKE, ILLINOIS
MSET File No. 18599 NOVEMBER 2018

C-4



McHENRY COUNTY COLLEGE PARKING LOT E
CRYSTAL LAKE, ILLINOIS
MSET File No. 18599 NOVEMBER 2018

C-5



McHENRY COUNTY COLLEGE PARKING LOT E
CRYSTAL LAKE, ILLINOIS
MSET File No. 18599 NOVEMBER 2018

C-6