March 2, 2020

Cardno
6720 SW Macadam Avenue, Suite 200
Portland, OR 97219

Attention: Russel Montgomery

Report of Pavement Engineering Services
Meadow Park Middle School Pavement Improvements
14100 SW Downing Street
Beaverton, Oregon
GeoDesign Project: BeavSchool-60-01

INTRODUCTION

GeoDesign, Inc. is pleased to submit this report of pavement engineering services for the proposed improvements to the south paved lot at Meadow Park Middle School in Beaverton, Oregon. The scope of our services included subsurface explorations, dynamic cone penetrometer (DCP) testing and evaluation, and pavement rehabilitation recommendations. The approximate location of the project is shown on Figure 1.

SCOPE OF SERVICES

The scope of services for this report included pavement investigation, analysis, and design recommendations for the above-listed parking log according to the AASHTO design procedure.[1] Our specific scope of services for this task included the following:

- Identified and marked coring locations and called in utility locates.
- Provided traffic control plans and traffic control through our subcontractor when required.
- Completed an overview of the existing pavement segments with the design team.
- Explored subsurface conditions by completing four core borings through the asphalt concrete (AC), aggregate base, and into the subgrade to a depth of 4.5 feet below ground surface (BGS).

[1] AASHTO Guide for Design of Pavement Structures, American Association of State Highway and Transportation Officials, 1993.

- Maintained a detailed log of the explorations. Classified the subgrade soil during the field explorations. Collected samples of the pavement, base, and subgrade materials encountered.
- Conducted DCP testing in each exploration. Evaluated DCP results and soil classification results to estimate the resilient modulus of the subgrade soil.
- Estimated traffic equivalent single-axle loads (ESALs) based on our experience and discussions with the design team.
- Provided recommended pavement sections for reconstruction.
- Provided recommendations for materials and construction.
- Provided this report summarizing our field exploration findings and recommendations.

SURFACE AND SITE CONDITIONS

GENERAL

We explored the pavement and base conditions by drilling four core borings (C-1 through C-4) at the locations shown on Figure 2. Photographs of coring locations and cores are presented in the Attachment.

SURFACE CONDITIONS

The project limits are the AC-paved area to the south of the middle school (see Figure 2). Currently, the paved area consists of delineated parking and drive isles with access to the north (off the corner of the building) and to the east along SW 141st Avenue. The pavement is in very poor to poor condition with significant medium to severe fatigue cracking and some potholes. Based on pavement grade changes, the drive isles appear to have been overlain in the past, while the parking areas appear to be approximately 1.5 to 2 inches lower in grade. In addition, we observed evidence of pavement overlay fabric in fatigued areas of the drive isles.

AC CORES

We performed core borings to the bottom of the AC layer at select locations to determine AC thickness. We drilled most of the cores on cracks to determine crack depth penetration. Tables 1 and 2 summarize the findings from these explorations, and photographs of the core locations and cores are presented in the Attachment.

Table 1. Pavement Subsurface Summary – Thickness

Core Number	Layer Thickness (inches)	
	AC	Aggregate Base
C-1	4.8	6.2
C-2	4.5	5.5
C-3	2.3	8.7
C-4	4.5	5.7

Paving fabric was observed at C-1 and C-3, approximately 1.8 inches below the pavement surface.

Table 2. Pavement Subsurface Summary – Distress

Core Number	Cracking Zone (inches)	Stripping Zone (inches)	Other Distress (inches)
C-1	0 to 1.8	None	Delamination 1.8 and 2.7
C-2	0 to 4.5	None	Severe fatigue
C-3	0 to 2.3	None	Severe fatigue
C-4	0 to 4.3	None	Severe fatigue

None: No stripping in core; may still be distress near core location.

In general, the subgrade conditions consist of either medium stiff to stiff silt fill or stiff clay fill. Our explorations did not extend below the fill layer. Specific subsurface conditions are presented on the exploration logs presented in the Attachment. Laboratory tests on samples of the soil collected at depths between 1.0 foot and 3.0 feet BGS indicate in situ moisture contents ranging from 24 to 32 percent at the time of our explorations. Atterberg limits at 3.0 feet in C-2 indicate a liquid limit of 54 percent and a plasticity index of 30 percent. A summary of the laboratory test results is presented in the Attachment.

DCP TESTING

We conducted DCP testing in general accordance with ASTM D6951 to estimate the resilient modulus of the aggregate base and subgrade materials at each test location. We recorded penetration depth of the cone for each blow of the hammer and terminated testing when at refusal of penetration or end of rod length. We plotted depth of penetration versus blow count and visually assessed where the slope of the data plot was relatively constant and at depths where the slope of the data plot changed significantly. We used the first slope of the data plot to estimate the base layer resilient modulus. We used the slope of the data beyond the first change in slope to estimate the resilient modulus of the subgrade. We used least squares regression to determine the slopes and the equation from the ODOT Pavement Design Guide[2] to estimate the moduli using a correction factor $c_f = 0.62$ for estimating the base layer moduli and $c_f = 0.35$ for estimating the subgrade resilient moduli. Table 3 lists our estimates of aggregate base and subgrade resilient modulus at each test location.

[2] ODOT Pavement Design Guide, Pavement Services Unit, Oregon Department of Transportation, August 2011.

Table 3. Base Modulus and Subgrade Modulus Estimated from DCP Testing

Core Number	Estimated Resilient Modulus (psi)	
	Aggregate Base	Subgrade
C-1	19,300	5,600
C-2	17,800	5,700
C-3	18,000	8,200
C-4	21,600	6,700

psi: pounds per square inch

PAVEMENT DESIGN

Properties of existing pavement are based on subsurface explorations and DCP testing. Descriptions of our input parameters and the recommended pavement designs are summarized below.

DESIGN STANDARDS

The standards used for pavement design are listed below:

- AASHTO Guide for Design of Pavement Structures
- ODOT Pavement Design Guide

ESAL CALCULATIONS

Based on discussions with Stephen Yamaski with the school district, we understand that traffic is limited to passenger cars and up to 10 short school buses per day. We estimate a total ESAL load of 40,000 for a 20-year design life.

BASE LAYER AND SUBGRADE RESILIENT MODULI

We used the results obtained from DCP testing listed in Table 3 to determine design resilient moduli for the base layer and subgrade. We calculated the average value for each set of results as recommended by the AASHTO design guide. We recommend an aggregate base modulus of 19,200 psi and a subgrade resilient modulus of 5,600 psi. The lower subgrade resilient modulus was selected due to the significant localized distress at the site and the possibility of larger areas of poor subgrade.

STRUCTURAL LAYER COEFFICIENTS FOR EXISTING PAVEMENT

We used our observations during the site visits to estimate the layer coefficient for the existing AC in conjunction with Table 5.2 in Part III, Section 5.4.5 of the AASHTO design guide. We used the aggregate base layer moduli listed in Table 3 to estimate the layer coefficients for the base layers using Figure 2.6 in Part II, Section 2.3.5 in the AASHTO design guide. We recommend a layer coefficient of 0.15 for the AC and 0.09 for the aggregate base.

REQUIRED STRUCTURAL NUMBER FOR REHABILITATED AC PAVEMENT

We used the procedures in the AASHTO design guide to determine the required structural numbers in developing our rehabilitation strategies based on the ESALs and resilient modulus listed above and the other design parameters discussed next. We recommend a design structural number of 2.12.

OTHER DESIGN PARAMETERS

Other pavement design parameters used in our analysis are summarized below. These input parameters are recommended in the ODOT design guide.

Reliability

We used a reliability of 85 percent based on discussions with the school district.

Serviceability

We used initial and terminal serviceability values of 4.2 and 2.5, respectively.

Overall Standard Deviation

We used an overall standard deviation value of 0.49.

REHABILITATION RECOMMENDATIONS

GENERAL

Based on the results of our subsurface explorations, DCP testing, and analyses, it is our opinion that the existing pavement is in very poor to poor condition and should be reconstructed. We understand, however, that the school district is not interested in reconstruction due to budget constraints and the school district's desire is to grind the existing AC to the top of the aggregate base and pave with 4.0 inches of new AC.

Based on discussions with Mr. Yamasaki, the school district is aware that there are project risks associated with their selected approach and that pavement life will likely be considerably less than 20 years. Below are some recommendations to potentially control some of the construction risks:

- Construction may result in subgrade disturbance be required to complete road repairs.
- The contractor and the school district should review base conditions after grinding and identify areas of soft or disturbed base and/or subgrade.
- Contract provisions should be included for subgrade stabilization if construction results in disturbed subgrade material.
- Grind depths will be variable with a likely range from 2.0 to 5.0 inches. Clear contract language will be required regarding variable grinding to allow contractors to make informed, correct bids.
- We recommend construction during the later parts of the summer when subsurface conditions will be drier, which will reduce (but not remove) the risk of subgrade damage.

- Detailed communication with the contractor, construction sequencing, and careful construction observation will be required to limit subgrade disturbance. We recommend that the contractor prepare a document outlining the construction sequencing for the project.
- Due to the potential for variable subsurface conditions, achieving adequate compaction of the AC layer will be difficult and may not be possible.

If required due to poor subgrade, we recommend the following full-depth repair section:

Full-Depth Repair – Estimate 10 to 20 Percent of Pavement Area

- 3.5-inch-thick, Level 2, ½-inch, dense asphalt concrete pavement (ACP), PG 64-22 wearing course
- 9.0-inch-thick aggregate base
- Stabilization aggregate (if required)
- Subgrade geotextile

PAVEMENT MATERIALS

A submittal should be made for each pavement material prior to the start of paving operations. Each submittal should include the test information necessary to evaluate the degree to which the properties of the material comply with the properties that were recommended or specified. The geotechnical engineer and other appropriate members of the design team should review each submittal.

AC

The AC should be Level 2, ½-inch, dense ACP according to the Oregon Standard Specifications for Construction – 2018 (OSSC) 00744 (Asphalt Concrete Pavement). We recommend lift thicknesses between 2.0 and 3.5 inches. If lift thicknesses outside this range are requested, we recommend additional consultation and communication between the school district and the design team.

Aggregate Base

Imported granular material used as aggregate base should be clean, crushed rock or crushed gravel and sand that are well graded. The aggregate base should meet the gradation defined in OSSC 00640 (Aggregate Base and Shoulders), with the exception that the aggregate should have less than 5 percent by dry weight passing the U.S. Standard No. 200 sieve, a maximum particle size of 1½ inches, and at least two mechanically fractured faces. The aggregate base should be compacted to not less than 95 percent of the maximum dry density, as determined by AASHTO T 99.

Stabilization Aggregate

Stabilization material should consist of pit- or quarry-run rock, crushed rock, or crushed gravel and sand and should meet the requirements set forth in OSSC 00330.14 (Selected Granular Backfill) and OSSC 00330.15 (Selected Stone Backfill), with a maximum particle size of 3 inches for selected granular backfill and 6 inches for selected stone backfill, having less than 5 percent by dry weight passing the U.S. Standard No. 4 sieve, and having at least two mechanically fractured faces. The material should be free of organic material and other deleterious material. Stabilization material should be placed over a geotextile fabric in one lift and compacted to a firm condition.

Subgrade Geotextile

The subgrade geotextile should conform to OSSC 00350 (Geosynthetic Installation). A minimum initial aggregate base lift of 6 inches is required over geotextiles.

OBSERVATION OF CONSTRUCTION

Satisfactory earthwork and pavement performance depend to a large degree on the quality of construction. Sufficient observation of the contractor's activities is a key part of determining that the work is completed in accordance with the construction drawings and specifications. Subsurface conditions observed during construction should be compared with those encountered during the subsurface explorations. Recognition of changed conditions often requires experience; therefore, qualified personnel should visit the site with sufficient frequency to determine if subsurface conditions change significantly from those anticipated.

LIMITATIONS

We have prepared this report for use by the Beaverton School District, Cardno, and the project design and construction teams for the proposed pavement rehabilitation activities. The data and report can be used for bidding or estimating purposes, but our report, conclusions, and interpretations should not be construed as warranty of the subsurface conditions and are not applicable to other sites.

Exploration observations indicate pavement and soil conditions only at specific locations and only to the depths penetrated. They do not necessarily reflect soil strata or water level variations that may exist between exploration locations. If subsurface conditions differing from those described are noted during the course of excavation and construction, re-evaluation will be necessary.

The scope of our services does not include services related to construction safety precautions, and our recommendations are not intended to direct the contractor's methods, techniques, sequences, or procedures, except as specifically described in this report for consideration in design.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in this area at the time this report was prepared. No warranty, express or implied, should be understood.

♦ ♦ ♦

We appreciate the opportunity to be of continued service to you. Please call if you have questions concerning this report or if we can provide additional services.

Sincerely,

GeoDesign, Inc.

Krey D. Younger, P.E., G.E.
Senior Associate Engineer

George Saunders, P.E., G.E.
Principal Engineer

KDY:GPS:kt
Attachments
One copy submitted (via email only)
Document ID: BeavSchool-60-01-030220-geolr.docx

FIGURES

GEODESIGN INC AN NV5 COMPANY	BEAVSCHOOL-60-01	VICINITY MAP	
	MARCH 2020	MEADOW PARK MIDDLE SCHOOL PAVEMENT BEAVERTON, OR	FIGURE 1

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LEGEND:

C-1⦿ PAVEMENT CORE BORING

N

0 60 120
(SCALE IN FEET)

SITE PLAN BASED ON AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH PRO®, MARCH 29, 2019

FIGURE 2

SITE PLAN

MEADOW PARK MIDDLE SCHOOL PAVEMENT
BEAVERTON, OR

BEAVSCHOOL-60-01

MARCH 2020

GEODESIGN™
AN NV5 COMPANY

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ATTACHMENT

ATTACHMENT

FIELD EXPLORATION DATA

GENERAL

We explored the existing pavement conditions at the site by drilling four pavement borings (C-1 through C-4). The locations of the explorations are shown on Figure 2. The borings were completed by Dan J. Fischer Excavating, Inc. of Forest Grove, Oregon, on March 7, 2019. The pavement cores were recovered using a portable core drill with a 5-inch-diameter, diamond core barrel and the borings were advanced with a 4-inch-diameter, solid-stem auger. The borings were filled with polymer-modified cold-patch asphalt. The exploration logs and photographs of the core locations and cores are presented in this attachment.

SOIL SAMPLING

A member of our geology staff observed the explorations. We collected representative samples of the various soils encountered in the borings for geotechnical laboratory testing. Samples were collected from the borings using 1½-inch-inside diameter, split-spoon sampler (SPT). The split-spoon sampling was conducted in general accordance with ASTM D1586. The split-spoon samplers were driven into the soil with a 140-pound hammer free-falling 30 inches. The samplers were driven a total distance of 18 inches. The number of blows required to drive the sampler the final 12 inches is recorded in the exploration logs, unless otherwise noted. Representative grab samples of the soil were collected from the auger cuttings. Sampling methods and intervals are shown on the exploration logs.

The SPTs completed by Dan J. Fischer Excavating, Inc. were conducted using two wraps around the cathead.

SOIL CLASSIFICATION

The soil samples were classified in accordance with the "Exploration Key" (Table A-1) and "Soil Classification System" (Table A-2), which are presented in this attachment. The exploration logs indicate the depths at which the soil or its characteristics change, although the change actually could be gradual. Classifications are shown on the exploration logs.

LABORATORY TESTING

MOISTURE CONTENT

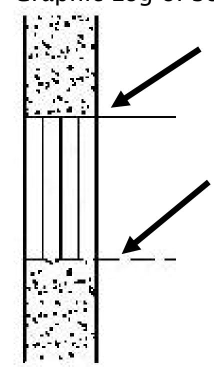
We tested the natural moisture content of select soil samples in general accordance with ASTM D2216. The natural moisture content is a ratio of the weight of the water to soil in a test sample and is expressed as a percentage. The test results are presented in this attachment.

ATTERBERG LIMITS TESTING

Atterberg limits (plastic and liquid limits) testing was performed on a select soil sample in general accordance with ASTM D4318. The plastic limit is defined as the moisture content where the soil becomes brittle. The liquid limit is defined as the moisture content where the soil begins to act similar to a liquid. The plasticity index is the difference between the liquid and plastic limits. The test results are presented in this attachment.

SYMBOL	SAMPLING DESCRIPTION
	Location of sample collected in general accordance with ASTM D1586 using Standard Penetration Test with recovery
	Location of sample collected using thin-wall Shelby tube or Geoprobe® sampler in general accordance with ASTM D1587 with recovery
	Location of sample collected using Dames & Moore sampler and 300-pound hammer or pushed with recovery
	Location of sample collected using Dames & Moore sampler and 140-pound hammer or pushed with recovery
	Location of sample collected using 3-inch-O.D. California split-spoon sampler and 140-pound hammer with recovery
	Location of grab sample
	Rock coring interval
	Water level during drilling
	Water level taken on date shown

Graphic Log of Soil and Rock Types



GEOTECHNICAL TESTING EXPLANATIONS

ATT	Atterberg Limits	P	Pushed Sample
CBR	California Bearing Ratio	PP	Pocket Penetrometer
CON	Consolidation	P200	Percent Passing U.S. Standard No. 200 Sieve
DD	Dry Density		
DS	Direct Shear	RES	Resilient Modulus
HYD	Hydrometer Gradation	SIEV	Sieve Gradation
MC	Moisture Content	TOR	Torvane
MD	Moisture-Density Relationship	UC	Unconfined Compressive Strength
NP	Non-Plastic	VS	Vane Shear
OC	Organic Content	kPa	Kilopascal

ENVIRONMENTAL TESTING EXPLANATIONS

CA	Sample Submitted for Chemical Analysis	ND	Not Detected
P	Pushed Sample	NS	No Visible Sheen
PID	Photoionization Detector Headspace Analysis	SS	Slight Sheen
		MS	Moderate Sheen
ppm	Parts per Million	HS	Heavy Sheen

RELATIVE DENSITY - COARSE-GRAINED SOIL

Relative Density	Standard Penetration Resistance	Dames & Moore Sampler (140-pound hammer)	Dames & Moore Sampler (300-pound hammer)
Very Loose	0 – 4	0 – 11	0 – 4
Loose	4 – 10	11 – 26	4 – 10
Medium Dense	10 – 30	26 – 74	10 – 30
Dense	30 – 50	74 – 120	30 – 47
Very Dense	More than 50	More than 120	More than 47

CONSISTENCY - FINE-GRAINED SOIL

Consistency	Standard Penetration Resistance	Dames & Moore Sampler (140-pound hammer)	Dames & Moore Sampler (300-pound hammer)	Unconfined Compressive Strength (tsf)
Very Soft	Less than 2	Less than 3	Less than 2	Less than 0.25
Soft	2 – 4	3 – 6	2 – 5	0.25 – 0.50
Medium Stiff	4 – 8	6 – 12	5 – 9	0.50 – 1.0
Stiff	8 – 15	12 – 25	9 – 19	1.0 – 2.0
Very Stiff	15 – 30	25 – 65	19 – 31	2.0 – 4.0
Hard	More than 30	More than 65	More than 31	More than 4.0

PRIMARY SOIL DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE-GRAINED SOIL (more than 50% retained on No. 200 sieve)	GRAVEL (more than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (< 5% fines)	GW or GP	GRAVEL
		GRAVEL WITH FINES (≥ 5% and ≤ 12% fines)	GW-GM or GP-GM	GRAVEL with silt
			GW-GC or GP-GC	GRAVEL with clay
		GRAVEL WITH FINES (> 12% fines)	GM	silty GRAVEL
			GC	clayey GRAVEL
			GC-GM	silty, clayey GRAVEL
	SAND (50% or more of coarse fraction passing No. 4 sieve)	CLEAN SAND (<5% fines)	SW or SP	SAND
		SAND WITH FINES (≥ 5% and ≤ 12% fines)	SW-SM or SP-SM	SAND with silt
			SW-SC or SP-SC	SAND with clay
		SAND WITH FINES (> 12% fines)	SM	silty SAND
			SC	clayey SAND
			SC-SM	silty, clayey SAND
FINE-GRAINED SOIL (50% or more passing No. 200 sieve)	SILT AND CLAY	Liquid limit less than 50	ML	SILT
			CL	CLAY
			CL-ML	silty CLAY
			OL	ORGANIC SILT or ORGANIC CLAY
		Liquid limit 50 or greater	MH	SILT
			CH	CLAY
			OH	ORGANIC SILT or ORGANIC CLAY
HIGHLY ORGANIC SOIL			PT	PEAT

MOISTURE CLASSIFICATION

Term	Field Test
dry	very low moisture, dry to touch
moist	damp, without visible moisture
wet	visible free water, usually saturated

ADDITIONAL CONSTITUENTS

Secondary granular components or other materials such as organics, man-made debris, etc.

Percent	Silt and Clay In: Fine-Grained Soil	Silt and Clay In: Coarse-Grained Soil	Percent	Sand and Gravel In: Fine-Grained Soil	Sand and Gravel In: Coarse-Grained Soil
< 5	trace	trace	< 5	trace	trace
5 – 12	minor	with	5 – 15	minor	minor
> 12	some	silty/clayey	15 – 30	with	with
			> 30	sandy/gravelly	Indicate %

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % (0 50 100)	COMMENTS

C-1

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	BLOW COUNT	COMMENTS
0.0	ASPHALT CONCRETE (4.8 inches).				Pavement fabric at 1.8 inches.
	AGGREGATE BASE (6.2 inches).	0.4			
	Medium stiff to stiff, gray to gray-brown SILT (ML), minor clay, trace sand and organics (woody debris, rootlets); moist - **FILL**.	0.9		7	
2.5				13	
5.0	Exploration completed at a depth of 4.5 feet. SPT completed using two wraps with a cathead.	4.5			CORE DETAILS: No patch observed. Cored on severe fatigue crack.
7.5					

C-2

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	BLOW COUNT	COMMENTS
0.0	ASPHALT CONCRETE (4.5 inches).				
	AGGREGATE BASE (5.5 inches).	0.4			
	Medium stiff, light gray SILT (ML), minor clay, trace sand; moist - **FILL**.	0.8		6	
2.5	Stiff, light gray-brown CLAY (CL), trace silt and sand; moist, clay has medium plasticity - **FILL**.	2.5	ATT	9	LL = 54% PL = 24%
5.0	Exploration completed at a depth of 4.5 feet. SPT completed using two wraps with a cathead.	4.5			CORE DETAILS: No patch observed. Cored on severe fatigue crack.
7.5					

DRILLED BY: Dan J. Fischer Excavating, Inc. LOGGED BY: J. Hook COMPLETED: 03/07/19

BORING METHOD: core drill/solid-stem auger (see document text) BORING BIT DIAMETER: 5 inches/4 inches

GEODESIGN INC — AN NV5 COMPANY	BEAVSCHOOL-60-01	BORING	
	MARCH 2020	MEADOW PARK MIDDLE SCHOOL PAVEMENT BEAVERTON, OR	**FIGURE A-1**

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % (0 – 50 – 100)	COMMENTS

C-3

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION / DEPTH	BLOW COUNT	COMMENTS
0.0	ASPHALT CONCRETE (2.3 inches).	0.2		
	AGGREGATE BASE (8.7 inches).	0.9		
	Medium stiff to stiff, light gray to gray-brown SILT (ML), minor clay, trace sand and organics (rootlets, charcoal); moist - **FILL**.		9	
2.5			12	
5.0	Exploration completed at a depth of 4.5 feet. SPT completed using two wraps with a cathead.	4.5		CORE DETAILS: No patch observed. Cored on severe fatigue crack.
7.5				

C-4

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION / DEPTH	BLOW COUNT	COMMENTS
0.0	ASPHALT CONCRETE (4.3 inches).	0.4		Pavement fabric at 1.8 inches.
	AGGREGATE BASE (5.7 inches).	0.8		
	Medium stiff, light gray to gray with brown mottled SILT (ML), some clay, trace sand; moist - **FILL**.		6	
2.5			8	
5.0	Exploration completed at a depth of 4.5 feet. SPT completed using two wraps with a cathead.	4.5		CORE DETAILS: No patch observed. Cored on moderate to severe fatigue crack.
7.5				

DRILLED BY: Dan J. Fischer Excavating, Inc. LOGGED BY: J. Hook COMPLETED: 03/07/19

BORING METHOD: core drill/solid-stem auger (see document text) BORING BIT DIAMETER: 5 inches/4 inches

CORE LOCATION C-1.

CORE C-1.

CORE LOCATION C-2.

CORE C-2.

GEODESIGN INC — AN NV5 COMPANY	BEAVSCHOOL-60-01	CORE LOCATION AND CORE PHOTOGRAPHS	
	MARCH 2020	MEADOW PARK MIDDLE SCHOOL PAVEMENT BEAVERTON, OR	FIGURE A-4

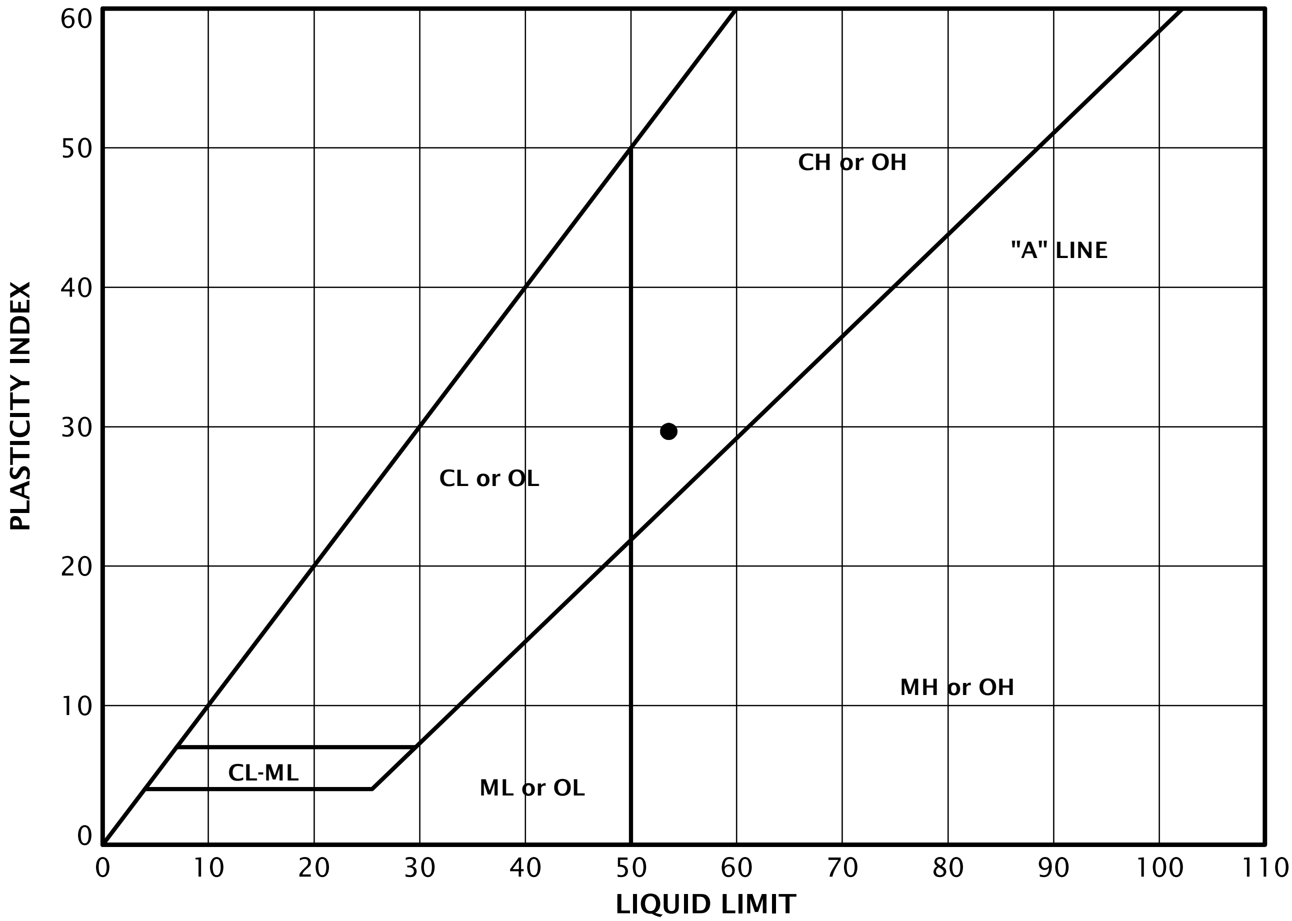
CORE LOCATION C-3.

CORE C-3.

CORE LOCATION C-4.

CORE C-4.

GEODESIGN INC AN NV5 COMPANY	BEAVSCHOOL-60-01	**CORE LOCATION AND CORE PHOTOGRAPHS**	
	MARCH 2020	MEADOW PARK MIDDLE SCHOOL PAVEMENT BEAVERTON, OR	**FIGURE A-6**



KEY	EXPLORATION NUMBER	SAMPLE DEPTH (FEET)	MOISTURE CONTENT (PERCENT)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
●	C-2	3.0	32	54	24	30

GEODESIGN INC
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BEAVSCHOOL-60-01	ATTERBERG LIMITS TEST RESULTS		
MARCH 2020	MEADOW PARK MIDDLE SCHOOL PAVEMENT BEAVERTON, OR	FIGURE A-7	

SAMPLE INFORMATION			MOISTURE CONTENT (PERCENT)	DRY DENSITY (PCF)	SIEVE			ATTERBERG LIMITS		
EXPLORATION NUMBER	SAMPLE DEPTH (FEET)	ELEVATION (FEET)			GRAVEL (PERCENT)	SAND (PERCENT)	P200 (PERCENT)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
C-1	1.0		24							
C-2	3.0		32					54	24	30
C-3	1.0		29							
C-4	1.0		28							