MEMORANDUM

Missouri Department of Transportation
Construction - Materials
Central Laboratory

TO: Matt Sonner-nw/gs

CC/ATT: Kevin Griep-co/gs

FROM: Kevin Moore, PE
Senior Geotechnical Specialist

DATE: May 21, 2015

SUBJECT: Materials
Geotechnical Section
Foundation Investigation for
King City Maintenance Building
Job No. R35G-FI2297
DeKalb County

Attached are logs of geotechnical borings for the above referenced structure, a proposed new maintenance facility building. Also attached is an aerial photo showing boring locations. See Figure 1: Boring Locations.

Based on information provided with your request, we assume a single-story maintenance building with garage bay doors is proposed to be constructed to the north of the existing maintenance building on the MoDOT maintenance lot at King City, MO. See Figure 1: Boring Locations. The planned building finished grade is at 1104 ft. msl while the building finished floor is at 1104.83 ft. msl. General notes No. 2 on Page 5 of 28 of the project plans states the foundation design is based on an assumed bearing capacity of 2000 psf.

Four borings were drilled at the staked locations as indicated on Figure 1: Boring Locations. Based on observations during drilling and sampling from the borings in the vicinity of the proposed structure, the allowable bearing of the foundation soil was estimated to be 2000 psf and will be adequate for your building. Further construction recommendations are provided below.

Recommendations - The following recommendations are made based upon information provided regarding the proposed building and conditions observed at the site:

- Proof roll the proposed building areas with a tandem axle dump truck loaded with a minimum of 12 tons of material prior to construction or fill placement. Any areas exhibiting pumping or rutting should be excavated to remove the soft material and backfilled with acceptable fill materials and compacted. This recommendation is made because much of the proposed building pad was constructed with lean clay fill materials placed without monitoring of compactions by a qualified construction technician.

- It is recommended that fill materials meet the general requirements of Section 203 of the Missouri Department of Transportation Specifications for Highway Construction. Fill should be compacted to 95% of standard Proctor maximum dry density. Non-granular fill material should be compacted at or within 3% of optimum moisture content. All fill and cut slopes should be constructed to slope and drain away from the proposed building.
- If non-granular fill material is used, at least 10 inches of crushed aggregate base should be placed above the non-granular fill in traffic areas outside the proposed building to bring the surface to final grade.
- One of the boring encountered dark brown lean clay, believed to be topsoil or loam. If this material is encountered in foundation excavations, it should be excavated to remove it and the excavation backfilled with granular fill materials compacted to 95% of its proctor value to re-establish footing bearing surface. Foundation bearing surfaces should be free of loose soil or loose fill materials. Loose materials should be hand tamped into the foundation bearing surface prior to placement of reinforcement and concrete for the foundation.
- Care should be taken to protect soil subgrade from excessive changes in moisture during foundation and floor slab construction. Avoid leaving excavations open for extended periods of time. Protect footing and floor slab bearing surfaces from rain or drying out during construction.

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Attachments

Missouri Department of Transportation
Construction and Materials

BORING NO. O-15-30

Job No.: R35G_Fi2297 **County:** DeKalb **Route:** 169
Design: Fi2297 **Skew:** **Location:** King City
Bent: **Logged By:** Kevin Moore **Operator:** Raymond Murray
Station: **Northing:** 1410043.7 **Date of Work:** 05/12/15-05/12/15
Offset: **Easting:** 2781046.7 **Depth to Water:**
Elevation: 1103.7 **Requested Northing:** **Depth Hole Open:**
Requested Station: **Requested Easting:** **Time Change:**
Requested Offset: **Equipment:** Acker Soil XLS ,Split-Spoon Sampler
Requested Elevation: **Location Note:** New maintenace building.
Drill No.: G-9462 **Hammer Efficiency:** 69% **Drilling Method:** Hollow Stem Auger

Depth (ft)	Graphic	Description	Elevation (ft)	Sample Type	REC % (RQD %)	Blow Counts (N_{60})	Shear Data	Field Tests	Index Tests
0		0-11' Brown and light brown, LEAN CLAY (CL), stiff to medium stiff							
			1100	X	67	3-5-7 (14)		PP = 3.00 tsf	
5				X	100	3-3-4 (8)		PP = 1.00 tsf	
			1095	X	100	2-4-4 (9)		PP = 1.25 tsf	
10				X	100	2-4-5 (10)		PP = 2.00 tsf	
		11-11.5' Brown and light brown, FAT CLAY (CH), very stiff							
		Bottom of borehole at 11.5 feet.							

N_{60} = (Em/60)Nm N_{60} - Corrected N value for standard 60% SPT efficiency; Em - Measured hammer efficiency in percent; Nm - Observed N-value
(1) = Assumed, (2) = Actual

Coordinate System: U.S. State Plane 1983 **Coordinate Zone:** Missouri West **Coordinate Proj. Factor:**
Coordinate Datum: NAD 83 (CONUS) **Coordinate Units:** U.S. Survey Feet

* Persons using this information are cautioned that the materials shown are determined by the equipment noted and accuracy of the "log of materials" is limited thereby and by judgement of the operator. THIS INFORMATION IS FOR DESIGN PURPOSES ONLY.

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Missouri Department of Transportation
Construction and Materials

BORING NO. O-15-31

Job No.: R35G_Fi2297 **County:** DeKalb **Route:** 169
Design: Fi2297 **Skew:** **Location:** King City
Bent: **Logged By:** Kevin Moore **Operator:** Raymond Murray
Station: **Northing:** 1409973.9 **Date of Work:** 05/12/15-05/12/15
Offset: **Easting:** 2781046.7 **Depth to Water:**
Elevation: 1104.1 **Requested Northing:** **Depth Hole Open:**
Requested Station: **Requested Easting:** **Time Change:**
Requested Offset: **Equipment:** Acker Soil XLS ,Split-Spoon Sampler
Requested Elevation: **Location Note:** New maintenace building.
Drill No.: G-9462 **Hammer Efficiency:** 69% **Drilling Method:** Hollow Stem Auger

Depth (ft)	Graphic	Description	Elevation (ft)	Sample Type	REC % (RQD %)	Blow Counts (N_{60})	Shear Data	Field Tests	Index Tests
0		0-8' Brownish gray, LEAN CLAY (CL), stiff to medium stiff, moist							
			1100	X	100	4-4-4 (9)		PP = 2.00 tsf	
5									
				X	100	3-2-3 (6)		PP = 1.00 tsf	
		8-10' Reddish brown, LEAN CLAY (CL), stiff, moist	1095	X	100	2-3-5 (9)		PP = 1.75 tsf	
10									
		10-11.5' Brownish gray, FAT CLAY (CH), very stiff, moist		X	100	2-4-5 (10)		PP = 2.25 tsf	
		Bottom of borehole at 11.5 feet.							

N_{60} = (Em/60)Nm N_{60} - Corrected N value for standard 60% SPT efficiency; Em - Measured hammer efficiency in percent; Nm - Observed N-value
(1) = Assumed, (2) = Actual

Coordinate System: U.S. State Plane 1983 **Coordinate Zone:** Missouri West **Coordinate Proj. Factor:**
Coordinate Datum: NAD 83 (CONUS) **Coordinate Units:** U.S. Survey Feet

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Missouri Department of Transportation
Construction and Materials

BORING NO. O-15-32

Job No.: R35G_Fi2297 **County:** DeKalb **Route:** 169
Design: Fi2297 **Skew:** **Location:** King City
Bent: **Logged By:** Kevin Moore **Operator:** Raymond Murray
Station: **Northing:** 1410044.4 **Date of Work:** 05/12/15-05/12/15
Offset: **Easting:** 2780896.6 **Depth to Water:**
Elevation: 1102.7 **Requested Northing:** **Depth Hole Open:**
Requested Station: **Requested Easting:** **Time Change:**
Requested Offset: **Equipment:** Acker Soil XLS ,Split-Spoon Sampler
Requested Elevation: **Location Note:** New maintenace building.
Drill No.: G-9462 **Hammer Efficiency:** 69% **Drilling Method:** Hollow Stem Auger

Depth (ft)	Graphic	Description	Elevation (ft)	Sample Type	REC % (RQD %)	Blow Counts (N_{60})	Shear Data	Field Tests	Index Tests
0		0-3' Grayish brown, LEAN CLAY (CL), stiff, moist, FILL	1100						
		3-4' Dark brown, LEAN CLAY (CL), stiff, moist, Topsoil.			87	3-5-6 (13)		PP = 2.00 tsf	
5		4-11.5' Brown and dark brown, FAT CLAY (CH), stiff, moist			87	2-3-5 (9)		PP = 1.75 tsf	
			1095		100	2-3-4 (8)		PP = 1.50 tsf	
10					100	2-4-5 (10)		PP = 1.50 tsf	
		Bottom of borehole at 11.5 feet.							

N_{60} = (Em/60)Nm N_{60} - Corrected N value for standard 60% SPT efficiency; Em - Measured hammer efficiency in percent; Nm - Observed N-value
(1) = Assumed, (2) = Actual

Coordinate System: U.S. State Plane 1983 **Coordinate Zone:** Missouri West **Coordinate Proj. Factor:**
Coordinate Datum: NAD 83 (CONUS) **Coordinate Units:** U.S. Survey Feet

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Missouri Department of Transportation
Construction and Materials

BORING NO. O-15-33

Job No.: R35G_Fi2297 **County:** DeKalb **Route:** 169
Design: Fi2297 **Skew:** **Location:** King City
Bent: **Logged By:** Kevin Moore **Operator:** Raymond Murray
Station: **Northing:** 1409984.7 **Date of Work:** 05/12/15-05/12/15
Offset: **Easting:** 2780896.1 **Depth to Water:**
Elevation: 1103.8 **Requested Northing:** **Depth Hole Open:**
Requested Station: **Requested Easting:** **Time Change:**
Requested Offset: **Equipment:** Acker Soil XLS ,Split-Spoon Sampler
Requested Elevation: **Location Note:** New maintenace building.
Drill No.: G-9462 **Hammer Efficiency:** 69% **Drilling Method:** Hollow Stem Auger

Depth (ft)	Graphic	Description	Elevation (ft)	Sample Type	REC % (RQD %)	Blow Counts (N_{60})	Shear Data	Field Tests	Index Tests
0		0-3' Brown, LEAN CLAY with gravel, (CL), stiff, moist, FILL.							
		3-11.5' Light greenish gray, LEAN CLAY (CL), stiff, moist	1100	X	67	7-6-7 (15)			
5				X	67	4-4-6 (12)		PP = 1.75 tsf	
			1095	X	100	3-4-4 (9)		PP = 1.00 tsf	
10				X	100	2-4-4 (9)		PP = 2.00 tsf	
		Bottom of borehole at 11.5 feet.							

N_{60} = (Em/60)Nm N_{60} - Corrected N value for standard 60% SPT efficiency; Em - Measured hammer efficiency in percent; Nm - Observed N-value
(1) = Assumed, (2) = Actual

Coordinate System: U.S. State Plane 1983 **Coordinate Zone:** Missouri West **Coordinate Proj. Factor:**
Coordinate Datum: NAD 83 (CONUS) **Coordinate Units:** U.S. Survey Feet

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KEY TO SYMBOLS

Missouri Department of Transportation
1617 Mo. Blvd.
Jefferson City, Mo. 65109

CLIENT _____ **PROJECT NAME** New maintenance building.

PROJECT NUMBER R35G_Fi2297 **PROJECT LOCATION** King City

LITHOLOGIC SYMBOLS
(Unified Soil Classification System)


CH: USCS High Plasticity Clay


CL: USCS Low Plasticity Clay


FILL: Fill (made ground)


TOPSOIL: Topsoil

SAMPLER SYMBOLS


Split-Spoon Sampler

WELL CONSTRUCTION SYMBOLS

ABBREVIATIONS

LL - LIQUID LIMIT (%)
PI - PLASTIC INDEX (%)
W - MOISTURE CONTENT (%)
DD - DRY DENSITY (PCF)
NP - NON PLASTIC
-200 - PERCENT PASSING NO. 200 SIEVE
PP - POCKET PENETROMETER (TSF)

TV - TORVANE
PID - PHOTOIONIZATION DETECTOR
UC - UNCONFINED COMPRESSION
ppm - PARTS PER MILLION

▽ Water Level at Time of Drilling

▼ Water Level at End of Drilling

▼ Water Level after Drilling

KEY TO SYMBOLS - MISSOURI DOT.GDT - 5/21/15 13:42 - J:\SG\GINT\PROJECT FILES\R35G_FI2297.GPJ

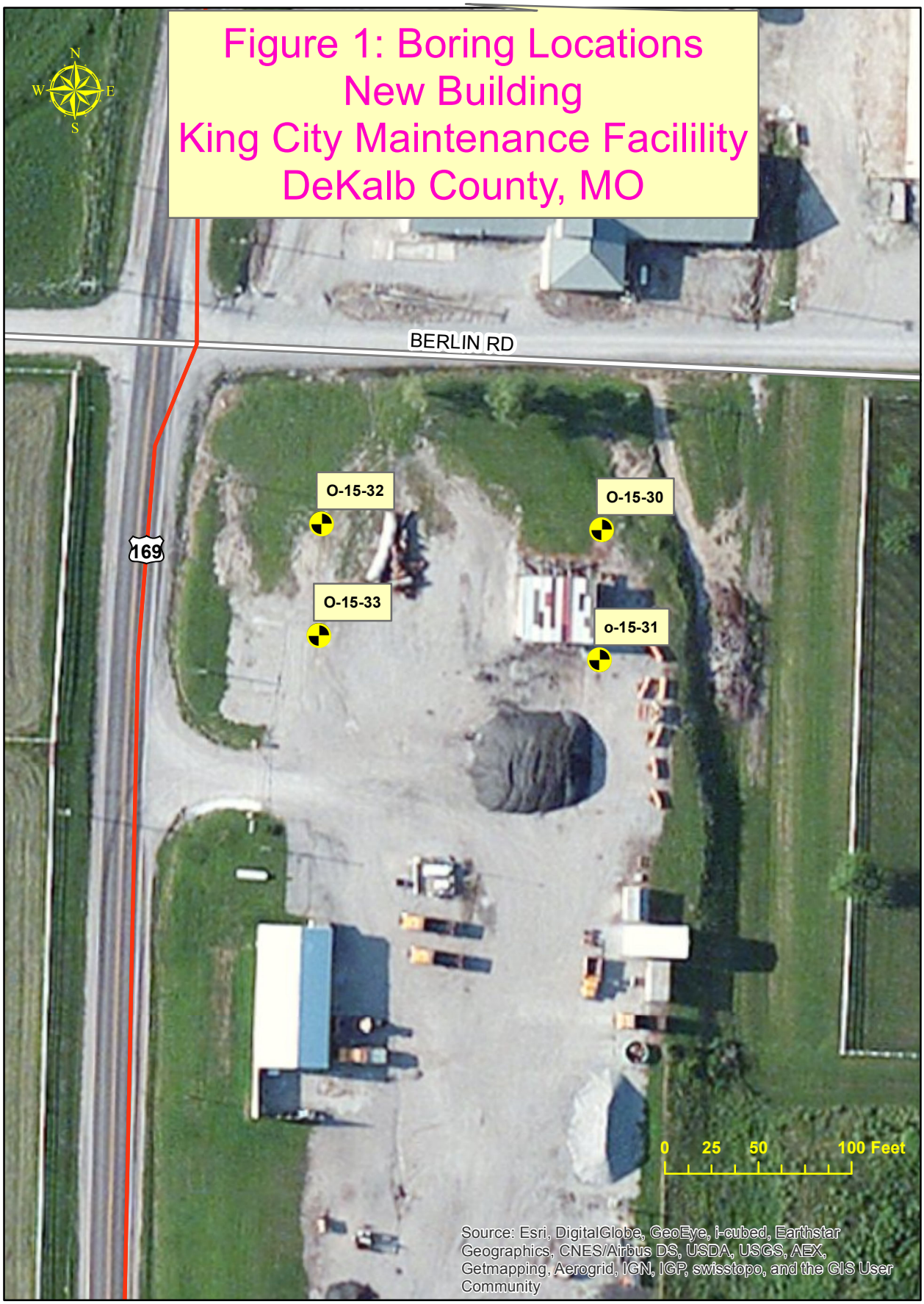
Figure 1: Boring Locations
New Building
King City Maintenance Facilility
DeKalb County, MO
N
W
E
S
BERLIN RD
169
O-15-32
O-15-30
O-15-33
o-15-31
0
25
50
100 Feet
Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community