

April 10, 2024

Access Engineering Solutions, LLC
1200 Irmscher Blvd.; Suite B
Celina, OH 45822

Attention: Ms. Nancy Tobe, P.E.

Reference: Geotechnical Design Memo
MIA-36 (Broadway); PID 119367
Broadway Street Reconstruction
Covington, Miami County, Ohio
CTL Project No. 23050061WAP

Ms. Tobe:

In preparation of Stage 1 submittals, the attached Test Boring Records and preliminary Subgrade Analysis Spreadsheet is provided.

CTL Engineering (CTL) performed eleven (11) soil test boring along Broadway Street (US Route 36), between the Stillwater River bridge and Larry Avenue. It is understood that the project is being divided into different phases of design and construction. This initial phase includes reconstruction of Broadway Street between the Stillwater River bridge (Sta. 206+00) through the intersection with High Street (SR 48) (near Sta. 217+00).

Three (3) of the eleven (11) borings drilled for the project are located within this first phase of services. Test borings B-001-0-23, B-002-0-23, and B-003-0-23 were each drilled to depths of 6.5 to 7.0 feet below the existing pavement. Borings encountered A-1-a, A-1-b, A-3a, and A-4a soils. Boring B-001-0-23, located closest to the Stillwater River, encountered auger refusal on suspected dolomitic bedrock at a depth of 6.5 feet. Groundwater was not encountered in either of the three borings drilled within this initial phase of the project.

A preliminary subgrade analysis was performed utilizing the subsurface information from the drilled borings, ODOT Geotechnical Design Manual (GDM) Section 600, and ODOT's Subgrade Analysis Spreadsheet. A preliminary copy of the Subgrade Analysis is attached.

The analysis included an assumed new pavement section thickness of 18-inches.

According to ODOT's Subgrade Analysis worksheet, subgrade soils represented by the three test borings drilled for this initial phase are not anticipated to require subgrade improvement due to subgrade soils being unsuitable and/or unstable. Although, during a site reconnaissance of the road surface, isolated areas were observed to be moderately to severely distressed. Distressed areas are suspected to be associated with buried underground utilities and trench backfills. Within these isolated areas, subgrade soils should be field evaluated for subgrade stability.

A design CBR value was calculated using procedures outlined in ODOT's Subgrade Analysis. Group Index values were calculated for the materials encountered below the proposed subgrade at the test boring locations. These Group Index values ranged from 0 to 19 averaging 6; which corresponds to an estimated design CBR value of 7. This analysis includes the preliminary findings of all eleven test borings drilled for the project and not just of the three borings drilled for this initial phase. Subgrade soils encountered in the borings for this initial phase of the project were found to be in better condition than the soils found east of Main Street; hence, the CBR value for this initial phase is likely to be greater than the overall average of 7.

We appreciate the opportunity to work with you on this project. If you have any questions or need further information, please do not hesitate to contact our office.

Respectfully Submitted,

CTL ENGINEERING, INC.



Frederick Schoen, P.E.
Project Engineer

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 24/4/10 19:22 - C:\PROJECT\2023\WAP_0523050061\WAP_MIA-36 BROADWAY ST RECONSTRUCTION- PID\19367_ACCESS ENGINE

PROJECT: <u>BROADWAY ST</u>	DRILLING FIRM / OPERATOR: <u>CTL / C. WARNER</u>	DRILL RIG: <u>CME 55 TRUCK</u>	STATION / OFFSET: <u>207+45, 3' RT.</u>	EXPLORATION ID <u>B-001-0-23</u>
TYPE: <u>SUBGRADE</u>	SAMPLING FIRM / LOGGER: <u>CTL / M. HUGHES</u>	HAMMER: <u>AUTOMATIC HAMMER</u>	ALIGNMENT: <u>US 36</u>	
PID: <u>119367</u> SFN: <u>N/A</u>	DRILLING METHOD: <u>4.0-IN. SFA</u>	CALIBRATION DATE: <u>10/13/22</u>	ELEVATION: <u>908.7 (MSL)</u> EOB: <u>6.5 ft.</u>	PAGE 1 OF 1
START: <u>11/2/23</u> END: <u>11/2/23</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>76.4</u>	LAT / LONG: <u>40.120476, -84.357604</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO ₄ ppm	HOLE SEALED
								GR	CS	FS	SI	CL	LL	PL	PI				
ASPHALT (6")	908.7																		
CONCRETE (12")	908.2	1	12																
MEDIUM DENSE, BROWN, GRAVEL AND/OR STONE FRAGMENTS, SOME SAND, TRACE SILT, TRACE CLAY, DAMP	907.2	2	12 10	28	67	SS-1	-	53	22	12	8	5	NP	NP	NP	7	A-1-a (0)	200	
DENSE, BROWN, GRAVEL AND/OR STONE FRAGMENTS WITH SAND, LITTLE SILT, TRACE CLAY, DAMP	906.2	3	9 15 23	48	78	SS-2	-	46	20	14	12	8	19	16	3	8	A-1-b (0)	-	
VERY DENSE, BROWN AND GRAY, SANDY SILT, LITTLE GRAVEL, TRACE CLAY, DAMP	904.7	4	18 50/4"	-	100	SS-3	-	-	-	-	-	-	-	-	-	4	A-4a (V)	-	
	902.2	5	25 50/1"	-	86	SS-4	-	-	-	-	-	-	-	-	-	8	A-4a (V)	-	
		6																	

ETR3

NOTES: CAVED AT 5.0'. AUGER REFUSAL AT 6.5'
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: BENTONITE/CEMENT GROUT; CONCRETE PATCH

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 24/4/10 19:22 - C:\PROJECT\2023\WAP-0523050061\WAP_MIA-36 BROADWAY ST RECONSTRUCTION- PID\19367_ACCESS ENGINE

PROJECT: <u>BROADWAY ST</u>	DRILLING FIRM / OPERATOR: <u>CTL / C. WARNER</u>	DRILL RIG: <u>CME 55 TRUCK</u>	STATION / OFFSET: <u>210+78, 9' LT.</u>	EXPLORATION ID <u>B-002-0-23</u>
TYPE: <u>SUBGRADE</u>	SAMPLING FIRM / LOGGER: <u>CTL / M. HUGHES</u>	HAMMER: <u>AUTOMATIC HAMMER</u>	ALIGNMENT: <u>US 36</u>	
PID: <u>119367</u> SFN: <u>N/A</u>	DRILLING METHOD: <u>4.0-IN. SFA</u>	CALIBRATION DATE: <u>10/13/22</u>	ELEVATION: <u>910.4 (MSL)</u> EOB: <u>7.0 ft.</u>	PAGE <u>1 OF 1</u>
START: <u>11/3/23</u> END: <u>11/3/23</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>76.4</u>	LAT / LONG: <u>40.120863, -84.356528</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	HOLE SEALED
								GR	CS	FS	SI	CL	LL	PL	PI				
ASPHALT (4")	910.4																		
CONCRETE (12")	910.1																		
MEDIUM DENSE, BROWN, GRAVEL AND/OR STONE FRAGMENTS WITH SAND, TRACE SILT, TRACE CLAY, DAMP	909.1	1	9																
		2	6	19	67	SS-1	-	26	50	14	6	4	NP	NP	NP	4	A-1-b (0)	-	
		3	8	20	78	SS-2	-	29	45	15	7	4	NP	NP	NP	4	A-1-b (0)	-	
		4	8																
		5	10	27	89	SS-3	-	-	-	-	-	-	-	-	-	3	A-1-b (V)	-	
		6	16																
@5.5'; DENSE		6	16	45	100	SS-4	-	-	-	-	-	-	-	-	-	4	A-1-b (V)	-	
	903.4	7	16																
		7	19																
		EOB																	

NOTES: CAVED AT 6.0'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BENTONITE/CEMENT GROUT; CONCRETE PATCH

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 24/4/10 19:22 - C:\PROJECT\2023\WAP-0523050061\WAP-MIA-36 BROADWAY ST RECONSTRUCTION- PID\19367- ACCESS ENGINE

PROJECT: <u>BROADWAY ST</u>	DRILLING FIRM / OPERATOR: <u>CTL / C. WARNER</u>	DRILL RIG: <u>CME 55 TRUCK</u>	STATION / OFFSET: <u>214+78, 3' RT.</u>	EXPLORATION ID <u>B-003-0-23</u>
TYPE: <u>SUBGRADE</u>	SAMPLING FIRM / LOGGER: <u>CTL / M. HUGHES</u>	HAMMER: <u>AUTOMATIC HAMMER</u>	ALIGNMENT: <u>US 36</u>	
PID: <u>119367</u> SFN: <u>N/A</u>	DRILLING METHOD: <u>4.0-IN. SFA</u>	CALIBRATION DATE: <u>10/13/22</u>	ELEVATION: <u>910.7 (MSL)</u> EOB: <u>7.0 ft.</u>	PAGE 1 OF 1
START: <u>11/2/23</u> END: <u>11/2/23</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>76.4</u>	LAT / LONG: <u>40.121213, -84.355169</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO ₄ ppm	HOLE SEALED
								GR	CS	FS	SI	CL	LL	PL	PI				
ASPHALT (4")	910.7																		
CONCRETE (14")	910.4	1	7																
DENSE, BROWN AND GRAY, GRAVEL AND/OR STONE FRAGMENTS, LITTLE SAND, TRACE SILT, TRACE CLAY, DAMP @2.5'; VERY DENSE	909.2	2	12	37	56	SS-1	-	68	13	6	9	4	NP	NP	NP	5	A-1-a (0)	-	
		3	17																
		4	16	52	78	SS-2	-	68	15	6	8	3	NP	NP	NP	4	A-1-a (0)	-	
MEDIUM DENSE, BROWN, SANDY SILT, LITTLE GRAVEL, TRACE CLAY, DAMP	906.7	5	6	2	27	SS-3	-	-	-	-	-	-	-	-	-	11	A-4a (V)	-	
	905.2	6	36																
VERY DENSE, BROWN AND GRAY, COARSE AND FINE SAND, LITTLE GRAVEL, TRACE CLAY, DAMP	903.7	7	30	57	67	SS-4	-	-	-	-	-	-	-	-	-	3	A-3a (V)	-	
		EOB	15																

NOTES: CAVED AT 4.7'
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: BENTONITE/CEMENT GROUT; CONCRETE PATCH

OHIO DEPARTMENT OF TRANSPORTATION**OFFICE OF GEOTECHNICAL ENGINEERING****PLAN SUBGRADES
Geotechnical Bulletin GB1****MIA-US36
119367****Design and full depth reconstruction of approximately 3,750 linear feet of existing US Route 36 (Broadway Street), between Stillwater River bridge and Larry Street.****CTL Engineering, Inc.****Prepared By: Christopher Carey, E.I.
Date prepared: Tuesday, March 12, 2024****CTL Engineering, Inc.
102 Commerce Drive
P.O. Box 44
Wapakoneta, Ohio 45895
41-738-1447
ctlwapak@ctleng.com****NO. OF BORINGS: 11**



#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL.	Cut Fill
1	B-001-0-23	US 36	207+45	3	Right	CME 55 Truck	76	908.7	907.5	1.2 C
2	B-002-0-23	US 36	210+78	9	Left	CME 55 Truck	76	910.4	909.1	1.3 C
3	B-003-0-23	US 36	214+78	3	Right	CME 55 Truck	76	910.7	909.3	1.4 C
4	B-003-1-23	US 36				CME 55 Truck	76	100.0	98.5	1.5 C
5	B-004-0-23	US 36				CME 55 Truck	76	100.0	98.5	1.5 C
6	B-005-0-23	US 36				CME 55 Truck	76	100.0	98.5	1.5 C
7	B-006-0-23	US 36				CME 55 Truck	76	100.0	98.5	1.5 C
8	B-007-0-23	US 36				CME 55 Truck	76	100.0	98.5	1.5 C
9	B-008-0-23	US 36				CME 55 Truck	76	100.0	98.5	1.5 C
10	B-009-0-23	US 36				CME 55 Truck	76	100.0	98.5	1.5 C
11	B-010-0-23	US 36				CME 55 Truck	76	100.0	98.5	1.5 C

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics				Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)		
			From	To	From	To	N ₆₀	N _{60L}		LL	PL	PI	% Silt	% Clay	P200	M _c	M _{OPT}		Class	GI	Unsuitable	Unstable		Unsuitable	Unstable
1	B 001-0 23	SS-1	1.0	2.5	-0.2	1.3	28			NP	NP	NP	8	5	13	7	6	A-1-a	0	200					
		SS-2	2.5	4.0	1.3	2.8	48			19	16	3	12	8	20	8	6	A-1-b	0						
		SS-3	4.0	4.8	2.8	3.6	50									4	10	A-4a	8						
		SS-4	5.5	6.1	4.3	4.9	50	28								8	10	A-4a	8						
2	B 002-0 23	SS-1	1.0	2.5	-0.3	1.2	19			NP	NP	NP	6	4	10	4	6	A-1-b	0						
		SS-2	2.5	4.0	1.2	2.7	20			NP	NP	NP	7	4	11	4	6	A-1-b	0						
		SS-3	4.0	5.5	2.7	4.2	27									3	6	A-1-b	0						
		SS-4	5.5	7.0	4.2	5.7	45	19								4	6	A-1-b	0						
3	B 003-0 23	SS-1	1.0	2.5	-0.4	1.1	37			NP	NP	NP	9	4	13	5	6	A-1-a	0						
		SS-2	2.5	4.0	1.1	2.6	52			NP	NP	NP	8	3	11	4	6	A-1-a	0						
		SS-3	4.0	5.5	2.6	4.1	27									11	10	A-4a	8						
		SS-4	5.5	7.0	4.1	5.6	57	27								3	8	A-3a	0						
4	B 003-1 23	SS-1	1.0	2.5	-0.5	1.0	6			NP	NP	NP	8	4	12	5	6	A-1-b	0						
		SS-2	3.5	3.6	2.0	2.1	50									2	8	A-3a	0						
		SS-3	6.0	7.5	4.5	6.0	18			3	37	20	17	24	18	42	23	16	A-6b	3					
		SS-4	8.5	10.0	7.0	8.5	3	6			1	24	15	9	23	17	40	13	10	A-4a					
5	B 004-0 23	SS-1	1.0	2.5	-0.5	1.0	9			3	19	14	5	26	15	41	9	10	A-4a	1			N ₆₀	12"	
		SS-2	2.5	4.0	1.0	2.5	13			3	25	14	11	16	14	30	11	10	A-2-6	0	99				
		SS-3	4.0	5.5	2.5	4.0	15			1.75							28	16	A-6b	16					
		SS-4	5.5	7.0	4.0	5.5	33	9									4	6	A-1-b	0					
6	B 005-0 23	SS-1	1.0	2.5	-0.5	1.0	34				31	21	10	32	16	48	9	16	A-4a	3	720				
		SS-2	2.5	4.0	1.0	2.5	34			2	NP	NP	NP	26	10	36	9	11	A-4a	0					
		SS-3	4.0	5.5	2.5	4.0	31			4.25							10	10	A-4a	8					
		SS-4	5.5	7.0	4.0	5.5	75	30			2.5						8	10	A-4a	8					
7	B 006-0 23	SS-1	1.0	2.5	-0.5	1.0	10			3.5	31	16	15	23	27	50	19	14	A-6a	5			N ₆₀ & Mc	12"	
		SS-2	2.5	4.0	1.0	2.5	15				NP	NP	NP	21	9	30	12	10	A-2-4	0	99				
		SS-3	4.0	5.5	2.5	4.0	27			1.5							9	10	A-2-4	0					
		SS-4	5.5	6.4	4.0	4.9	50	10									4	8	A-3a	0					
8	B 007-0 23	SS-1	1.0	2.5	-0.5	1.0	14			2	40	16	24	24	36	60	22	16	A-6b	11	99			N ₆₀ & Mc	12"
		SS-2	2.5	4.0	1.0	2.5	15			2	39	17	22	21	29	50	29	16	A-6b	7			Mc		
		SS-3	4.0	5.5	2.5	4.0	13										11	16	A-6b	16					
		SS-4	5.5	7.0	4.0	5.5	59	13									5	10	A-4a	8					
9	B 008-0 23	SS-1	1.0	2.5	-0.5	1.0	11			4.25	46	19	27	28	45	73	24	18	A-7-6	16			N ₆₀ & Mc	12"	
		SS-2	2.5	4.0	1.0	2.5	9			0.5	NP	NP	NP	32	11	43	14	11	A-4a	2	220			HP & Mc	24"
		SS-3	4.0	5.5	2.5	4.0	10			3							14	16	A-6b	16					

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)	
			From	To	From	To	N ₆₀	N _{60L}		LL	PL	PI	% Silt	% Clay	P200	M _c	M _{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable		
		SS-4	5.5	7.0	4.0	5.5	29	9	4.5							12	16	A-6b	16							
10	B 009-0 23	SS-1	1.0	2.5	-0.5	1.0	6	6	1.75	43	17	26	33	38	71	23	18	A-7-6	14	99		HP & Mc		18"	204 Geotextile	
		SS-2	2.5	4.0	1.0	2.5	13		2.5	37	18	19	34	30	64	20	16	A-6b	9			N ₆₀ & Mc		12"		
		SS-3	4.0	5.5	2.5	4.0	20		1.75							12	16	A-6b	16							
		SS-4	5.5	7.0	4.0	5.5	41									8	6	A-1-b	0							
11	B 010-0 23	SS-1	1.0	2.5	-0.5	1.0	11	10	3	53	19	34	36	49	85	25	18	A-7-6	19			N ₆₀ & Mc		12"	204 Geotextile	
		SS-2	2.5	4.0	1.0	2.5	10		2	43	17	26	31	40	71	23	18	A-7-6	14	99		N ₆₀ & Mc		12"		
		SS-3	4.0	5.5	2.5	4.0	10									17	18	A-7-6	16							
		SS-4	5.5	7.0	4.0	5.5	18		3							12	18	A-7-6	16							

PID: 119367

County-Route-Section: MIA-US36

No. of Borings: 11

Geotechnical Consultant: CTL Engineering, Inc.

Prepared By: Christopher Carey, E.I.

Date prepared: 3/12/2024

Chemical Stabilization Options		
320	Rubblize & Roll	Option
206	Cement Stabilization	Option
	Lime Stabilization	Option
206	Depth	12"

Excavate and Replace Stabilization Options	
Global Geotextile Average(N60L): Average(HP):	12" 0"
Global Geogrid Average(N60L): Average(HP):	0" 0"

Design CBR	7
-----------------------	----------

% Samples within 6 feet of subgrade			
N ₆₀ ≤ 5	0%	HP ≤ 0.5	2%
N ₆₀ < 12	23%	0.5 < HP ≤ 1	0%
12 ≤ N ₆₀ < 15	9%	1 < HP ≤ 2	19%
N ₆₀ ≥ 20	54%	HP > 2	28%
M+	21%		
Rock	0%		
Unsuitable	0%		

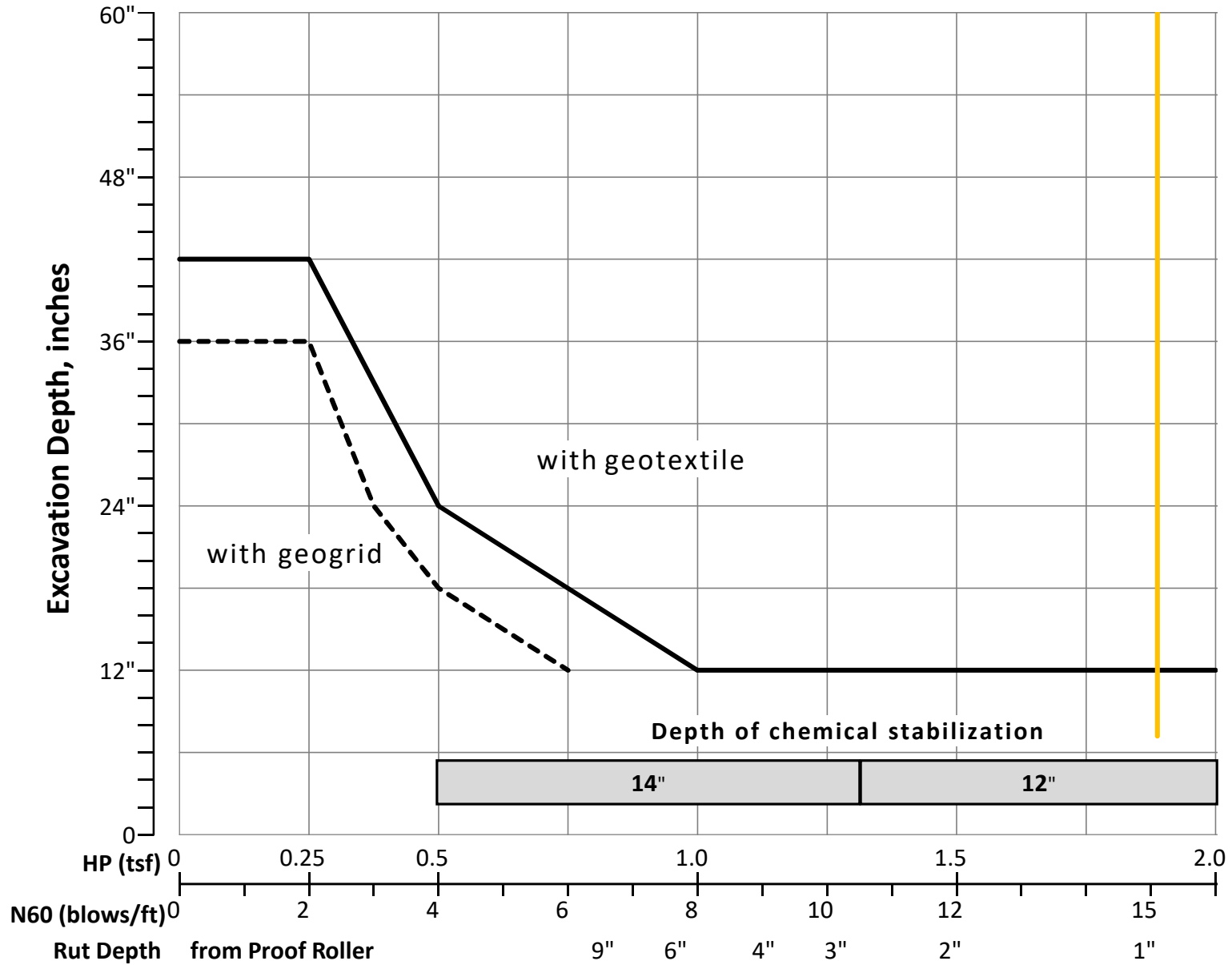
Excavate and Replace at Surface	
Average	7"
Maximum	18"
Minimum	0"

% Proposed Subgrade Surface	
Unstable & Unsuitable	32%
Unstable	32%
Unsuitable	0%

	N ₆₀	N _{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M _C	M _{OPT}	GI
Average	27	15	2.53	35	17	18	21	19	40	12	11	6
Maximum	75	30	4.50	53	21	34	36	49	85	29	18	19
Minimum	3	6	0.50	19	14	3	6	3	10	2	6	0

Classification Counts by Sample																			
ODOT Class	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	0	3	8	2	0	1	0	0	3	11	0	0	1	9	0	6	0	0	44
Percent	0%	7%	18%	5%	0%	2%	0%	0%	7%	25%	0%	0%	2%	20%	0%	14%	0%	0%	100%
% Rock Granular Cohesive	0%	64%										36%						100%	
Surface Class Count	0	3	5	2	0	1	0	0	1	6	0	0	1	7	0	5	0	0	31
Surface Class Percent	0%	10%	16%	6%	0%	3%	0%	0%	3%	19%	0%	0%	3%	23%	0%	16%	0%	0%	100%

GB1 Figure B – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
2.53	1.00	<input type="checkbox"/> HP
15.18	6.00	<input type="checkbox"/> N60L

Average HP —
Average N_{60L} —