

OHIO DEPARTMENT OF TRANSPORTATION**OFFICE OF GEOTECHNICAL ENGINEERING****PLAN SUBGRADES
Geotechnical Bulletin GB1****SUM-77-9.77****102329****Pavement replacement over SUM - I.R. 77 from 9.77 to 11.54. Includes rehabilitation of several structures in the City of Akron, Summit County, Ohio.****ELR****Prepared By:** Kevin Mihalcea
Date prepared: Tuesday, February 19, 2019**E.L. Robinson Engineering
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Cleveland, Ohio 44113****kmihalcea@elrobinson.com
(216) 452-1890****NO. OF BORINGS:** **52**

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
1	B-021-0-18	I.R. 77 - NB	520+31	32	RT	CME45 RENTAL	72	1056.6	1055.0	1.6 C
2	B-022-0-18	I.R. 77 - SB	524+33	28	LT	CME45 RENTAL	72	1070.4	1068.8	1.6 C
3	B-023-0-18	I.R. 77	526+65	44	LT	18 CME 55 404185	87	1075.5	1073.9	1.6 C
4	B-024-0-18	I.R. 77	325+90	56	RT	CME45 RENTAL	72	1078.5	1076.9	1.6 C
5	B-025-0-18	I.R. 77	329+90	63	RT	CME45 RENTAL	72	1088.1	1086.5	1.6 C
6	B-026-0-18	I.R. 77	333+90	63	LT	CME45 RENTAL	72	1097.8	1096.2	1.6 C
7	B-027-0-18	I.R. 77	337+80	7	RT	CME45 RENTAL	72	1106.9	1105.3	1.6 C
8	B-028-0-18	I.R. 77	342+68	8	LT	CME45 RENTAL	72	1112.1	1110.5	1.6 C
9	B-029-0-18	I.R. 77	346+84	49	RT	CME45 RENTAL	72	1110.5	1108.9	1.6 C
10	B-030-0-18	I.R. 77	350+86	52	LT	18 CME 55 404185	87	1104.2	1102.6	1.6 C
11	B-031-0-18	I.R. 77	354+95	7	RT	CME45 RENTAL	72	1103.9	1102.3	1.6 C
12	B-032-0-18	I.R. 77	358+81	7	LT	CME45 RENTAL	72	1109.6	1108.0	1.6 C
13	B-033-0-18	I.R. 77	362+81	68	RT	CME45 RENTAL	72	1115.8	1114.2	1.6 C
14	B-034-0-18	I.R. 77	367+64	64	LT	18 CME 55 404185	87	1124.8	1123.2	1.6 C
15	B-035-0-18	I.R. 77	374+73	6	RT	CME45 RENTAL	72	1131.0	1129.4	1.6 C
16	B-036-0-18	I.R. 77	381+04	6	LT	CME45 RENTAL	72	1124.1	1122.5	1.6 C
17	B-037-0-18	I.R. 77	382+88	49	RT	CME45 RENTAL	72	1120.4	1118.8	1.6 C
18	B-038-0-18	I.R. 77	386+88	48	LT	18 CME 55 404185	87	1111.6	1110.0	1.6 C
19	B-039-0-18	I.R. 77	391+90	7	RT	CME45 RENTAL	72	1100.4	1098.8	1.6 C
20	B-040-0-18	I.R. 77	394+85	75	LT	18 CME 55 404185	87	1093.8	1092.2	1.6 C
21	B-041-0-18	I.R. 77	398+62	64	RT	CME45 RENTAL	72	1088.1	1086.5	1.6 C
22	B-042-0-18	I.R. 77	401+90	63	LT	18 CME 55 404185	87	1085.4	1083.8	1.6 C
23	B-043-0-18	I.R. 77	406+10	8	RT	CME45 RENTAL	72	1083.9	1082.3	1.6 C
24	P-001-0-20	S.R. 8	4310+13	7	LT	19 CME 75 079797	84	0.0	-1.0	1.0 C
25	P-002-0-20	S.R. 8	4310+81	38	RT	19 CME 75 079797	84	0.0	-1.0	1.0 C
26	P-003-0-20	S.R. 8	4314+12	30	LT	19 CME 75 079797	84	0.0	-1.0	1.0 C
27	P-004-0-20	S.R. 8	4314+81	25	RT	19 CME 75 079797	84	0.0	-1.0	1.0 C
28	P-005-0-20	S.R. 8	4317+93	14	RT	19 CME 75 079797	84	0.0	-1.0	1.0 C
29	P-006-0-20	S.R. 8	4318+13	40	LT	19 CME 75 079797	84	0.0	-1.0	1.0 C
30	P-007-0-20	S.R. 8	4321+13	5	RT	19 CME 75 079797	84	0.0	-1.0	1.0 C
31	P-008-0-20	S.R. 8	4322+19	7	LT	19 CME 75 079797	84	0.0	-1.0	1.0 C
32	P-009-0-20	RAMP S	6339+71	9	RT	19 CME 75 079797	84	0.0	-1.0	1.0 C
33	P-010-0-20	S.R. 8	4325+18	35	RT	19 CME 75 079797	84	0.0	-1.0	1.0 C
34	P-011-0-20	S.R. 8	4326+20	15	LT	19 CME 75 079797	84	0.0	-1.0	1.0 C
35	P-012-0-20	RAMP S	6335+64	5	RT	19 CME 75 079797	84	0.0	-1.0	1.0 C
36	P-013-0-20	S.R. 8	4327+93	44	LT	19 CME 75 079797	84	0.0	-1.0	1.0 C
37	P-014-0-20	S.R. 8	4329+20	28	RT	19 CME 75 079797	84	0.0	-1.0	1.0 C
38	P-015-0-20	S.R. 8	327+44	14	RT	19 CME 75 079797	84	0.0	-1.0	1.0 C
39	P-016-0-20	S.R. 8	328+48	47	LT	19 CME 75 079797	84	0.0	-1.0	1.0 C
40	P-017-0-20	S.R. 8	331+44	6	RT	19 CME 75 079797	84	0.0	-1.0	1.0 C
41	P-018-0-20	S.R. 8	332+50	8	LT	19 CME 75 079797	84	0.0	-1.0	1.0 C
42	P-019-0-20	S.R. 8	334+68	62	RT	19 CME 75 079797	84	0.0	-1.0	1.0 C
43	P-020-0-20	S.R. 8	336+51	54	LT	19 CME 75 079797	84	0.0	-1.0	1.0 C
44	P-022-0-20	S.R. 8	340+02	41	LT	19 CME 75 079797	84	0.0	-1.0	1.0 C
45	P-024-0-20	S.R. 8	344+03	59	LT	19 CME 75 079797	84	0.0	-1.0	1.0 C

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
46	P-025-0-20	CARROLL RAMP	2+04	2	LT	19 CME 75 079797	84	0.0	-1.0	1.0 C
47	P-027-0-20	CARROLL RAMP	6+04	1	RT	19 CME 75 079797	84	0.0	-1.0	1.0 C
48	P-028-0-20	S.R. 8	352+04	79	LT	19 CME 75 079797	84	0.0	-1.0	1.0 C
49	P-029-0-20	RAMP T	51+83	4	LT	19 CME 75 079797	84	0.0	-1.0	1.0 C
50	P-030-0-20	CARROLL RAMP	9+50	17	RT	19 CME 75 079797	84	0.0	-1.0	1.0 C
51	P-032-0-20	S.R. 8	360+03	55	LT	19 CME 75 079797	84	0.0	-1.0	1.0 C
52	P-033-0-20	CARROLL RAMP	14+67	3	RT	19 CME 75 079797	84	0.0	-1.0	1.0 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 021-0 18	SS-1	1.0	2.5	-0.6	0.9	18	14		23	15	8	35	23	58	16	10	A-4a	5	660		Mc				
		SS-2	2.5	4.0	0.9	2.4	14			23	15	8	34	20	54	13	10	A-4a	4			N ₆₀ & Mc		12"		
		SS-3	4.0	5.5	2.4	3.9	26		4.5							17	10	A-4a	8							
		SS-4	5.5	7.0	3.9	5.4	29		3.25							16	16	A-6b	16							
2	B 022-0 18	SS-1	1.0	1.8	-0.6	0.2	50	30		25	21	4	15	7	22	20	6	A-1-b	0							
		SS-2	2.5	2.8	0.9	1.2	50									19	6	A-1-b	0							
3	B 023-0 18	SS-1	1.3	2.5	-0.3	0.9	15	7		28	18	10	28	17	45	12	13	A-4a	2	420						
		SS-2	2.5	4.0	0.9	2.4	10			27	18	9	27	14	41	10	13	A-4a	1			N ₆₀		12"		
		SS-3	4.0	5.5	2.4	3.9	7		0.5							11	10	A-4a	8							
		SS-4	5.5	7.0	3.9	5.4										16	10	A-4a	8							
4	B 024-0 18	SS-1	1.0	2.5	-0.6	0.9	11	11		NP	NP	NP	0			6	6	A-1-a	0	170						
		SS-2	2.5	4.0	0.9	2.4	36			22	15	7	29	15	44	13	10	A-4a	2			Mc				
		SS-3	4.0	5.5	2.4	3.9	17									15	16	A-6b	16							
		SS-4	5.5	7.0	3.9	5.4	11		1							13	16	A-6b	16							
5	B 025-0 18	SS-1	1.0	2.5	-0.6	0.9	10	4		NP	NP	NP	5		5	11	6	A-1-a	0	1900						
		SS-2	2.5	4.0	0.9	2.4	8			21	13	8	21	16	37	12	10	A-4a	0			N ₆₀		12"		
		SS-3	4.0	5.5	2.4	3.9	4									12	10	A-4a	8							
		SS-4	5.5	7.0	3.9	5.4	18									16	16	A-6b	16							
6	B 026-0 18	SS-1	1.1	2.5	-0.5	0.9	4	2		NP	NP	NP	4		4	9	6	A-1-a	0	200						
		SS-2	2.5	4.0	0.9	2.4	73			NP	NP	NP	8	3	11	12	6	A-1-b	0							
		SS-3	4.0	5.5	2.4	3.9	2									7	6	A-1-a	0							
		SS-4	5.5	6.0	3.9	4.4			2.5							5	0	Rock	0							
7	B 027-0 18	SS-1	1.0	2.5	-0.6	0.9	29	29								13	6	A-1-b	0	100						
		SS-2	2.5	4.0	0.9	2.4	32									12	8	A-3a	0							
		SS-3	4.0	4.8	2.4	3.2	50									9	8	A-3a	0							
		SS-4	5.5	5.8	3.9	4.2	50									10	8	A-3a	0							
8	B 028-0 18	SS-1	1.2	2.5	-0.4	0.9	71	30		NP	NP	NP	4	4	8	7	6	A-1-a	0	100						
		SS-2	2.5	3.2	0.9	1.6	50			NP	NP	NP	15		15	11	8	A-3a	0							
		SS-3	4.0	4.3	2.4	2.7	50									15	8	A-3a	0							
		SS-4	5.5	5.7	3.9	4.1										14	0	Rock	0							
9	B 029-0 18	SS-1	1.0	2.5	-0.6	0.9	28	28		NP	NP	NP	5		5	17	6	A-1-b	0	2100						
		SS-2	2.5	4.0	0.9	2.4				28	20	8	38	21	59	10	0	Rock	0		Rock	N ₆₀ & Mc	29"	0"		
		SS-3	4.0	4.8	2.4	3.2										6	0	Rock	0			N ₆₀ & Mc				
		SS-4	5.5	6.3	3.9	4.7										8	0	Rock	0							

#	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
10	B 030-0 18	SS-1	1.0	2.5	-0.6	0.9	19	19		31	21	10	44	20	64	8	0	Rock	0	680	Rock	Mc			
		SS-2	2.5	3.5	0.9	1.9	134			30	19	11	36	18	54	5	0	Rock	0		Rock	Mc	23"		
		SS-3	4.0	4.7	2.4	3.1										6	0	Rock	0			N ₆₀ & Mc			
11	B 031-0 18	SS-1	1.0	2.5	-0.6	0.9	12	10		28	23	5	17	9	26	10	10	A-2-4	0	100					
		SS-2	2.5	4.0	0.9	2.4	10			28	16	12	28	19	47	11	14	A-6a	3			N ₆₀		12"	
		SS-3	4.0	5.3	2.4	3.7	80									8	0	Rock	0						
		SS-4	5.5	6.3	3.9	4.7										6	0	Rock	0						
12	B 032-0 18	SS-1	1.0	2.5	-0.6	0.9	14	14		27	19	8	40	18	58	11	14	A-4a	5	240					
		SS-2	2.5	3.8	0.9	2.2	106			NP	NP	NP	12		12	8	6	A-1-b	0						
		SS-3	4.0	4.7	2.4	3.1										15	0	Rock	0			N ₆₀ & Mc			
		SS-4	5.5	5.8	3.9	4.2										4	0	Rock	0						
13	B 033-0 18	SS-1	1.1	2.5	-0.5	0.9	10	10		24	16	8	36	19	55	12	11	A-4a	4	260		N ₆₀		12"	
		SS-2	2.5	4.0	0.9	2.4	12			25	18	7	56	22	78	6	13	A-4b	8		A-4b		29"		
		SS-3	4.0	5.5	2.4	3.9	11									15	16	A-6b	16						
		SS-4	5.5	7.0	3.9	5.4	55		1.75							16	16	A-6b	16						
14	B 034-0 18	SS-1	1.0	2.5	-0.6	0.9	22	17		NP	NP	NP	6		6	5	6	A-1-b	0	100					
		SS-2	2.5	4.0	0.9	2.4	19			17	8	9	18	14	32	11	10	A-2-4	0						
		SS-3	4.0	5.5	2.4	3.9	17		2.25							17	10	A-4a	8						
		SS-4	5.5	7.0	3.9	5.4	32									11	10	A-4a	8						
15	B 035-0 18	SS-1	1.1	2.5	-0.5	0.9	7	7		27	15	12	22	18	40	12	14	A-6a	2	170		N ₆₀		15"	
		SS-2	2.5	4.0	0.9	2.4	10			24	14	10	41	23	64	13	10	A-4a	6			N ₆₀ & Mc		12"	
		SS-3	4.0	5.5	2.4	3.9	22		4.5							13	10	A-4a	8						
		SS-4	5.5	7.0	3.9	5.4	32		4.5							11	10	A-4a	8						
16	B 036-0 18	SS-1	1.0	1.3	-0.6	-0.3	50	8		NP	NP	NP	8		8	9	6	A-1-b	0	140					
		SS-2	2.5	4.0	0.9	2.4	8			NP	NP	NP	6		6	9	6	A-1-a	0						
		SS-3	4.0	5.5	2.4	3.9	29		4.5							14	14	A-6a	10						
		SS-4	5.5	7.0	3.9	5.4	30		4.5							12	14	A-6a	10						
17	B 037-0 18	SS-1	1.0	2.5	-0.6	0.9	12	2		NP	NP	NP	5		5	10	6	A-1-b	0	190					
		SS-2	2.5	4.0	0.9	2.4	5			NP	NP	NP	9		9	10	6	A-1-b	0						
		SS-3	4.0	5.5	2.4	3.9	7		4							11	14	A-6a	10						
		SS-4	5.5	7.0	3.9	5.4	2									16	8	A-3a	0						
18	B 038-0 18	SS-1	1.3	2.5	-0.3	0.9	13	10		18	12	6	20	11	31	12	8	A-3a	0	350					
		SS-2	2.5	4.0	0.9	2.4	10			27	18	9	56	30	86	19	13	A-4b	8		A-4b	N ₆₀ & Mc	29"	12"	
		SS-3	4.0	5.5	2.4	3.9	16		4.25							14	10	A-4b	8						
		SS-4	5.5	7.0	3.9	5.4	25		4.25							14	10	A-4b	8						

PID: 102329

County-Route-Section: SUM-77-9.77

No. of Borings: 52

Geotechnical Consultant: DLZ

Prepared By: Kevin Mihalcea

Date prepared: 2/19/2019

Chemical Stabilization Options		
320	Rubblize & Roll	Option
206	Cement Stabilization	Option
	Lime Stabilization	No
206	Depth	12"

Excavate and Replace Stabilization Options	
Global Geotextile Override(N60L): Average(HP):	15" 0"
Global Geogrid Override(N60L): Average(HP):	0" 0"

Design CBR	9
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% Samples within 6 feet of subgrade			
$N_{60} \leq 5$	6%	$HP \leq 0.5$	1%
$N_{60} < 12$	24%	$0.5 < HP \leq 1$	1%
$12 \leq N_{60} < 15$	9%	$1 < HP \leq 2$	1%
$N_{60} \geq 20$	44%	$HP > 2$	13%
M+	20%		
Rock	21%		
Unsuitable	29%		

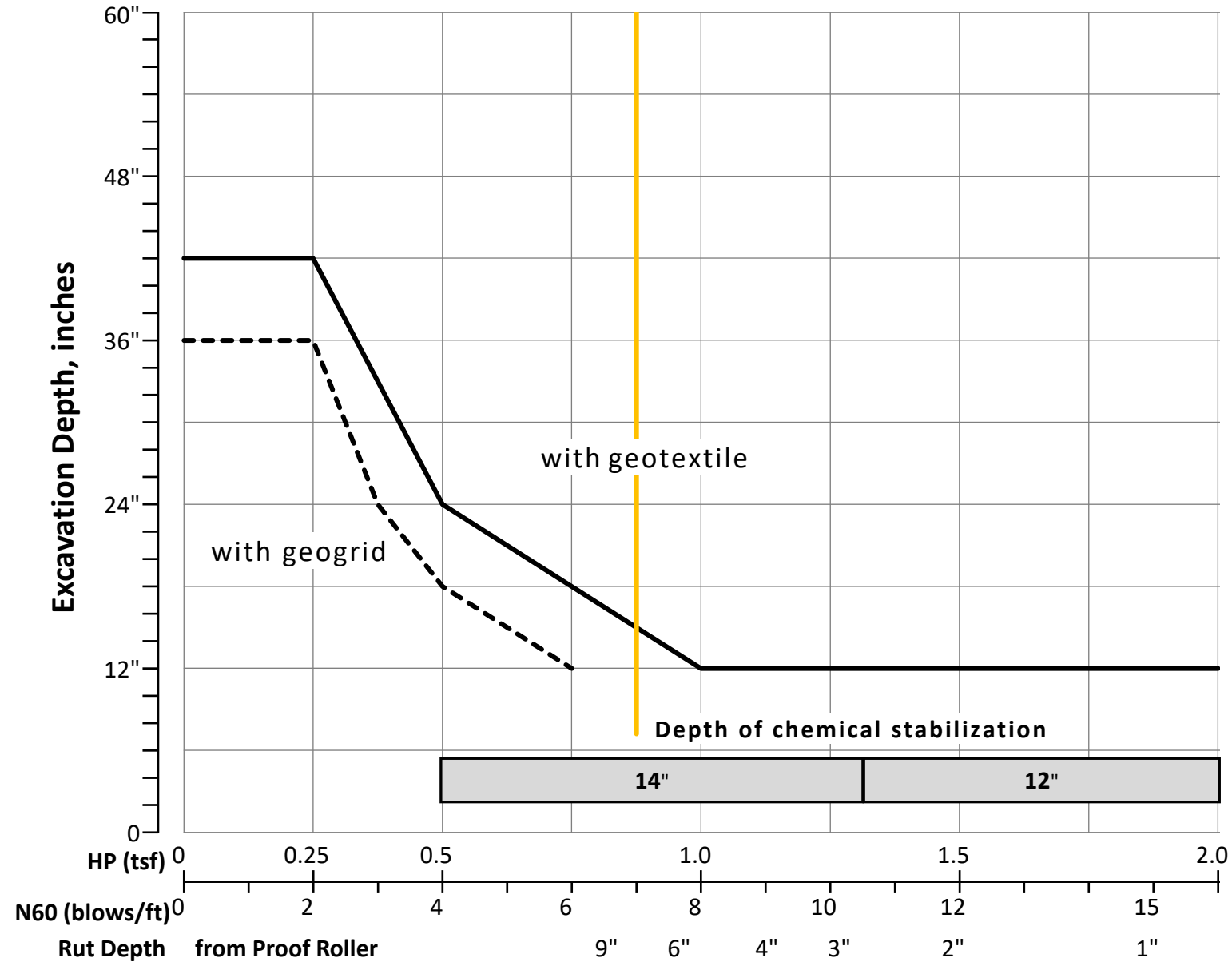
Excavate and Replace at Surface	
Average	0"
Maximum	0"
Minimum	0"

% Proposed Subgrade Surface	
Unstable & Unsuitable	44%
Unstable	32%
Unsuitable	12%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	30	15	3.30	25	17	8	21	16	33	11	7	3
Maximum	134	30	4.50	31	23	12	56	30	86	20	16	16
Minimum	2	2	0.50	17	8	4	0	3	4	4	0	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	21	10	11	3	0	0	0	0	7	18	4	0	5	6	0	0	0	0	85
Percent	25%	12%	13%	4%	0%	0%	0%	0%	8%	21%	5%	0%	6%	7%	0%	0%	0%	0%	100%
% Rock Granular Cohesive	25%	58%										18%							100%
Surface Class Count	14	10	12	3	0	0	0	0	5	15	3	0	4	2	0	0	0	0	68
Surface Class Percent	21%	15%	18%	4%	0%	0%	0%	0%	7%	22%	4%	0%	6%	3%	0%	0%	0%	0%	100%

GB1 Figure B – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
3.30	0.50	<input type="checkbox"/> HP
14.61	7.00	<input checked="" type="checkbox"/> N60L

Average HP —
 Average N₆₀L —