		Project: North Burleson From W. Center Kyle, Texas	Street to Market Place Avenue		Sampling	g Date	e: 6/2	/14 0°501	20.0-		7050100	25"
		Location: See Boring Loca	ation Plan		Backfill:	ites:	NZ Cu	9 591 ttings	20.87	vv9	/ 52'38	.35
		Soil Descrip	tion	Deptl (ft)	ר SN	wc	PL	LL	ΡΙ	PP	Ν	-200
	FAT CLA reddish t	∖Y (CH) with sand and gra∖ an, moist with limestone fra	vel, stiff, dark brown with agments		Т					1.75 1.5		
	CLAYEY moist wit [CWLS] (moist [AUSTIN	SAND (SC) with gravel, st h limestone fragment and CLAYEY SAND (SC), very] Weathered CHALK, tan a	iff, dark gray with tan, coarse sand dense, tan and light gray	5	SS	17	21	65	44	2.0	50/3"	41
	<u> </u>				ss 📕						50/2"	
LOG SA12-02,ARIASSA12-01.GDT,LIBRARY2013-01.GLB)	Groundwa	ter Data:	Nomenciature Used o	n Boring	-00							
ORING L	First encou	intered during drilling: 6-ft depth ng Data:	Thin-walled tube (T)	Split Spoo	on (SS)		Ţ	Wate	er enco	ountered	during di	rilling
-756.GPJ 6/18/14 (B	Coordinate Logged By: Driller: Aus Equipment	s: Hand-held GPS Unit : R. Russo :tin Geo-Logic : Truck-mounted drill rig t auger: 0 - 9 ft	WC = Water Content (%) PL = Plastic Limit LL = Liquid Limit PI = Plasticity Index PP = Pocket Penetrometer (tsf)	N = SPT -200 = % Pa	Blow Coun Issing #200	Sieve						
2013	- <u>J</u>	<u>.</u>										

SI [C wi	Location: See Boring Loca Soil Description LTY SAND (SM), brown, dry with g	tion Plan on gravel.	Depth (ft)	Backfi	II:	-	Cutti	ngs	-			-
SI [C wi	Soil Description	on gravel.	Depth (ft)	SN								
SI [C wi	LTY SAND (SM), brown, dry with g	gravel.			wc	PL	LL	PI	Ν	-200	REC	RQD
[C wi	WLS] CLAYEY SAND (SC), dense	X	······	Т								
	th limestone fragments.	e to very dense, tan,		85 55	16	21	29	8	35 64/8"	25		
[A wi	ustin] LIMESTONE, tan and light <u>c</u> th clay partings, weathered layers	gray, moderately hard and discontinuities.		RC							78	27
3 SA12-02,ARIASSA12-01.GDT,LIBRARY2013-01.GLB)												
756.GPJ 6/18/14 (BORING L(ield Drilling Data: ield Drilling Data: oordinates: Hand-held GPS Unit ogged By: R. Russo riller: Austin Geo-Logic quipment: Truck-mounted drill rig	Thin-walled tube (T) ■ Thin-walled tube (T) ■ Rock Core (RC) WC = Water Content (%) PL = Plastic Limit LL = Liquid Limit PI = Plasticity Index N = SPT Blow Count	-200 = % Pa RQD = Rock REC = % Ra	LOG on (SS) assing #/ Quality ecovery	200 Sie Desig	eve nation	∑ V	Vater e	encounte	red duri	ng drill	ing

	Project: North Burleson From W. Center Kyle, Texas	Street to Market Pla	ce Ave	nue		S	ampl	ing D)ate:	5/29/14	1'34 28	" \\/C	97°52	'34 7	3"
	Location: See Boring Loc	ation Plan				B	ackfi	II:	J.	Cutting	S			04.7	0
	Soil Description			Depth (ft)	SN	wc	PL	LL	ΡI	N	-200	DD	Uc	REC	RQD
1" As	ohalt over 8" BASE		0000		GB										
FILL:	LEAN CLAY (CL), very stiff, c	lark brown			SS	7	17.	37	20	28	29				
LEAN	CLAY (CL), hard, light tan ar	nd gray			22	11	18	37	10	50/3"	34				
Weat	nered LIMESTONE, light tan a	and gray					2	5	10	00/0	54				
[Austi	n1LIMESTONE, tan, moderat	elv hard with		5		∑∕6				**50/3"					
clay p disco <i>-light</i>	artings, weathered layers and ntinuities. gray from 7 to 8 ft	1			RC							147 (UW) 143	178 111	97	64
SA12-02,ARIASSA12-01.GDT,LIBRARY2013-01.GLB)															
ອິ Groun g During	dwater Data: drilling: Not encountered	Nomena		Used o		ng Lo	g								
	Drilling Data:	Grab Sampl	e (GB) RC)	l	Split S	spoon	(55)								
) + Logge Driller: Equipr	nates: Hand-held GPS Unit d By: W. Persyn Austin Geo-Logic nent: Truck-mounted drill rig	WC = Water Cc PL = Plastic Li LL = Liquid Lin PI = Plasticity	ontent (% mit nit Index)))	** = E F -200 = 9 DD = [Blow C Penetra % Pass Dry Dei	ounts ation sing #2 nsity (j	During 200 Sie pcf)	g Seat eve	tinBgQD = REC = UW =	Rock Qı % Reco Unit We	uality [very ight (p	Design cf)	ation	
Single Rock of	flight auger: 0 - 5 ft ore: 5 - 10 ft	IN = SPT BION	v Count		UC = (Jompre	essive	Stren	gin (te	51)					

	Project: North From	Burleson Street W. Center to Market P Texas	lace Ave	nue			Sam	pling	Date:	6/2/14					
	Location: See E	oring Location Plan					Coor Back	dinat fill:	tes:	N29°59 Cutting	0'40.05 s	" W9)7°52	2'34.4	5"
	Soil Descrip	otion	Depth (ft)	SN	WC	PL	LL	PI	PP	N	-200	DD	Uc	REC	RQD
	FAT CLAY (CH), stiff, dar with organics, scattered o gravel.	k brown, moist coarse sand and		T T	31	22	73	51	2.0 2.25		82				
	SANDY FAT CLAY (CH), light gray, moist with ferro LEAN CLAY with Sand (0 with limestone fragments	stiff, gray to bus staining CL), hard, tan, ☑	5	T T SS		13	26	13	1.5 4.0	50/5"	41				
	LIMESTONE, tan, moder clay partings, weathered discontinuities.	ately hard with layers and	10	RC	8							147 (UW)	133	93	82
SA12-02,ARIASSA12-01.GDT,LIBRARY2013-01.GLB)	Borehole terminated at 1	5 feét													
ING LOC	Groundwater Data: First encountered during drilling:	3.5-ft depth ■ Thin-walle	nclature	Used o	n Bor Solit	ing l	_og)		 ∑ \\/ə	erenco		d duri	na drill	ina –
2013-756.GPJ 6/18/14 (BORI	Field Drilling Data: Coordinates: Hand-held GPS Uni Logged By: R. Russo Driller: Austin Geo-Logic Equipment: Truck-mounted drill ri Single flight auger: 0 - 10 ft Rock core: 10 - 15 ft	g Rock Cord WC = Water PL = Plastic LL = Liquid PI = Plastic PP = Pocket	e (RC) Content (%) Limit Limit ity Index Penetrome) eter (tsf)	N = -200 = DD = Uc = RQD =	SPT % Pa Dry I Com Rock	Blow (assing Density pressiv	/ #200 / (pcf) /e Stre ty Des	Sieve ength (t ignatio	wan REC = UW = sf)	% Reco Unit We	very ight (p	cf)		

	Project: North Burleson From W Center	Street	Sa	mpling	Date	e: 6/2	/14				
	Kyle, Texas		Co	ordina	tes:	N2	9°59'	53.1"	W97	°52'31.7	79''
	Location: See Boring Loca	ation Plan	Ba	ckfill:		Cu	ttings				
	Soil Descrip	tion	Depth (ft)	SN	wc	PL	LL	ΡΙ	PP	Ν	-200
4" Conc.	sidewalk										
brown wi	th tan and gray, with sand	and gravel layers.		Т					2.75		
			×	$\overline{\mathbf{T}}$	30	18	59	41	2.75		62
				\mathbf{X}							
- increas	sed gravel from 4.5 to 5 fet	X	5	J					1.75		
		Ţ.			$\left \right\rangle$						
- abunda	ant gravel at 7 to 8 feet		×	Т					1.75		
[CWLS]	SANDY LEAN CLAY (CL),	stiff, tan, wet		22						50/3"	
Borehole	terminated at 9.5 feet			55						50/5	
			\sim								
	$\langle \rangle$										
1.GLB)											
2013-0											
RARY2											
DT,LIB											
2-01.G											
ASSA1											
72,ARI .											
SA12-(
Groundwa	ter Data: Intered during drilling: 6.5-ft depth	Nomenclature Used on	Boring Log	I							
Field Drilling	ng Data:	Thin-walled tube (T)	Split Spoon (S	SS)		$\overline{\Delta}$	Wate	er enco	ountered	during dı	rilling
Coordinate	s: Hand-held GPS Unit : R. Russo	WC = Water Content (%)	N = SPT RIO	w Count							
Driller: Aus Equipment	tin Geo-Logic : Truck-mounted drill rig	PL = Plastic Limit	200 = % Passir	ng #200	Sieve						
Single fligh	t auger: 0 - 9.5 ft	PI = Plasticity Index PP = Pocket Penetrometer (tsf)									

ſ		Project: North Burleson From W. Center	Street to Market Place Avenue		Sampling	Date:	5/29/	/14				
	- 77	Kyle, Texas			Coordinat	es:	N29°	59'57	7.77"	W9	7°52'27	.99"
		Location: See Boring Loca	ation Plan		Backfill:		Cutti	ngs				
		Soil Desc	ription		Depth (ft)	SN	WC	PL	LL	PI	Ν	-200
	FAT CLA	λΥ (CH), firm, brown and ta	n, wet with sand and grave	el _▼_		SS	16 24	22	48	26	6	45
						SS	26	19	66	47	7	62
						SS GB	38				4	12
		ETE, tan, possible flowable	fill	\searrow		35		ļ			13/3	13
0G SA12-02,ARIASSA12-01.GDT,LIBRARY2013-01.GLB)	Groundurg											
SING LC	First encou After 30 m	nter uata: Intered during drilling: 5-ft depth Inutes: 2-ft depth	Nomenclature Used Split Spoon (SS)	on Boring	Log nple (GB)		V V	Vater	encou	ntered	durina d	rilling
18/14 (BOF	Field Drilli Coordinate Logged By	ng Data: s: Hand-held GPS Unit : W. Persyn	WC = Water Content (%)	** = Blow	v Counts Duri	ng Seal	ل ت ting	Delaye	d wate	er read	ing	5
56.GPJ 6/	Equipment	: Truck-mounted drill rig	PL = Plastic Limit LL = Liquid Limit PI = Plasticity Index	Pene -200 = % P	etration assing #200 \$	Sieve	J					
2013-7	Single fligh	t auger: 0 - 7.3 ft	N = SPT Blow Count									

	Project: North Burleson From W. Center Kyle. Texas	Street to Market Place Avenue		Sam	pling [Date:	6/2/14					
	Location: See Boring Loc	ation Plan		Coor Back	dinate fill:	es:	N30°0 Cutting	'0.49" gs	W97°	52'2	2.31"	
	Soil Descri	otion	D	epth (ff)	SN	WC	PP	N	DD	Uc	REC	RQD
CLAYE	Y SAND (SC), brown to red	dish tan, moist with gravel.			т		2.75					
SANDY limestor	LEAN CLAY (CL), firm, tan ne fragments.	to reddish tan, wet with			ss			6				
[Austin] partings	CHALK, tan to light gray, m , weathered layers and disc	oderately hard with clay continuities.		5	SS			50/1"				
				10	RC	7					88	60
					RC	6			146 (UW)	265	93	83
				<u>15</u> 20	RC	7			150 (UW)	174	100	100
Borehol	e terminated at 20 feet											
SA12-02,ARIASSA12-01.GDT,LIBRARY2013-01.GLB												
Groundw During dri	ater Data: Iling: Not encountered	Nomenclature Used o	on Boring	g Log								
Field Drill Coordinat Logged B Driller: Au	l ing Data: es: Hand-held GPS Unit y: R. Russo stin Geo-Logic	Inin-walled tube (T) Rock Core (RC) WC = Water Content (%) RD = Docket Departments (4-6)	RQD = Ro	oon (SS ock Quali) ty Desig	gnation						
Equipmer Equipmer Single flig Rock core	it: Truck-mounted drill rig ht auger: 0 - 5 ft :: 5 - 20 ft	DD = Dry Density (pcf) Uc = Compressive Strength (tsf)	KEC = % UW = Un)	Recover hit Weigh	y t (pcf)							

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	Project: North Bu From W. Kyle, Tex	rleson Street Center to Marke as	et Place Aver	nue			Sam	pling	Date:	6/5/14	3 12"	∧/07°	52'1	5 2"	
•••	Location: See Borir	ig Location Plar	ı				Back	till:	.03.	Cutting	S.42	vv <i>91</i>	JZ 1	0.2	
	Soil Description	n	Depth (ft)	SN	wc	PL	LL	ΡI	PP	N	-200	DD	Uc	REC	RQD
CLAYE dark bro subroun	✓ GRAVEL (GC), firm wn and tan, with san ded gravel	to hard, d and		SS T	14 17	25 26	48 67	23	4.5+	8	30 24				
[CWLS] tan [Austin] gray, so layers, a layers.	SANDY LEAN CLAY Weathered LIMESTO It to moderately hard and alternating tan an	(CL), hard, DNE, tan to , with marl d gray	5	SS RC	13					50/3"		139 (UW)	38	93	23
G SA12-02,ARIASSA12-01.GDT,LIBRARY2013-01.GLB)															
During dri Field Drill Coordinat Logged B Driller: Au Equipmer	ling: Not encountered ing Data: es: Hand-held GPS Unit /: R. Russo stin Geo-Logic t: Truck-mounted drill rig er: 0 - 1 ft	WC = Wa PL = Pla PI = Pla PP = Por	Spoon (SS) Core (RC) stic Limit uid Limit sticity Index sticity Index sket Penetrome	ter (tsf)	N = -200 = DD = Uc = RQD =	-walle SPT % Pa Dry D Comp Rock	Blow (ssing)ensity pressiv	e (T) Count #200 \$ (pcf) ve Stre ty Des	Sieve ength (te	REC = UW = sf)	% Reco Unit We	very ight (p	cf)		

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		Project: North Burleson From W. Center Kyle, Texas	Street to Market Pla	ace Aven	ue			Sam	pling	Date:	5/29/14		107°	500	07"	
	•••	Location: See Boring Loca	ation Plan					Back	dinat fill:	les:	Cutting	J.05 N S	//9/	5Z 9.	21	
		Soil Description		Depth (ft)	SN	wc	PL	LL	PI	PP	N	-200	DD	Uc	REC	RQD
	FAT CLA	Y (CH), very stiff, dark bro	wn		т	27	21	40	19	13		53				
	LEAN CL	AY (CL), hard, tan				21	21	-0	\rightarrow	1.0						
	Weather	ed LIMESTONE, light tan a	and s		SS	11					50/4"	18				
	light gray			5	55	10	\searrow				50/2					
	[Austin] L hard with and disco	IMESTONE, tan, moderate clay partings, weathered I ontinuities.	ely ayers		RC			>					153 (UW)	595	96	25
				10			\mathbf{i}	>					145 (UW)	124		
	Borehole	terminated at 10 feet			\bigtriangledown	\sim	7			L			(-)			
01.GLB)																
84RY2013-0																
I.GDT,LIBF																
ASSA12-0																
A12-02,ARI																
LOG S	Groundwa	er Data:	Nomen	clature L	Ised o	n Bor	ing L	og								
(BORING	After 30 min Field Drillin Coordinate	nterea auring arilling: 3-ft depth nutes: 3-ft depth ng Data: s: Hand-held GPS Unit	Thin-walled Rock Core	l tube (T) (RC)] Split	Spoo	n (SS)		∑ Wat ⊻ Dela	ter enco ayed wat	untere ter rea	d durii ding	ng drill	ing
6.GPJ 6/18/14	Logged By: Driller: Aus Equipment:	W. Persyn in Geo-Logic Truck-mounted drill rig	WC = Water C PL = Plastic L LL = Liquid Li PI = Plasticity	ontent (%) .imit mit / Index		N = ** = -200 =	SPT Blow Pene % Pa	Blow (Count tration	Count ts Duri 1 #200 1	ing Sea Sieve	Uc = tingQD = REC = UW =	Compre Rock Qu % Reco Unit We	ssive S uality E very ight (n	Streng Desigr cf)	th (tsf) ation)
2013-75	Single fligh Rock core:	: auger: 0 - 5 ft 5 - 10 ft	PP = Pocket F	Penetromet	er (tsf)	DD =	Dry D	ensity	/ (pcf)	5.040	011-	5111 110	.g. (P	5.7		

		Project: North Burleson From W. Center	Street to Market Place Avenue	S	ampling	Date	e: 6/2	/14				
		Location: See Boring Loca	ation Plan	C B	oordina ackfill:	tes:	N3 Cu	0°0'1 ttinas	1.48"	W97	⁰ 52'4.08	3''
Ì		Soil Descrip	tion	Depth (ft)	SN	WC	PL	LL	ΡΙ	PP	Ν	-200
	FAT CLA and smal	Y (CH), stiff, dark brown, r I angular gravel.	noist with coarse sand		т					1.5 2.5		
	FAT CLA coarse sa	Y (CH) with sand, stiff, ligh and and small angular grav	nt gray to tan, moist with vel.	5	T	18	17	50	33			79
	CLAYEY	SAND (SC), tan to light gr	ay, wet		T						50/4"	
LOG SA12-02,ARIASSA12-01.GDT,LIBRARY2013-01.GLB)	Groundwat	rer Data:	Nomenclature Used o	on Boring Lo	9							
JRING L	First encou	ntered during drilling: 4-ft depth	Thin-walled tube (T)	Split Spoon	ษ (SS)		$\bar{\Sigma}$	Wate	r enco	untered	during dı	rilling
756.GPJ 6/18/14 (BC	Coordinates Logged By: Driller: Aus Equipment:	B Data. S: Hand-held GPS Unit R. Russo in Geo-Logic Truck-mounted drill rig	WC = Water Content (%) PL = Plastic Limit LL = Liquid Limit PI = Plasticity Index	N = SPT Bl -200 = % Pass	ow Count ing #200	Sieve						
2013-	Single flight	: auger: 0 - 9 tt	FF = Pocket Penetrometer (tst)									

KEY TO TERMS AND SYMBOLS USED ON BORING LOGS

	MA	JOR I	DIVISIO	NS	GRO SYME	DUP BOLS	DESCRIPTIONS
			action is e size	sravels o Fines)	GW		Well-Graded Gravels, Gravel-Sand Mixtures, Little or no Fines
	Sieve size	/ELS	Coarse fra Io. 4 Sieve	Clean G (little or n	GP		Poorly-Graded Gravels, Gravel-Sand Mixtures, Little or no Fines
OILS	No. 200	GRA	in Half of (ER than N	s with es ciable of Fines)	GM		Silty Gravels, Gravel-Sand-Silt Mixtures
AIND S	GER than		More the LARG	Gravel Fin (Appre amount c	GC		Clayey Gravels, Gravel-Sand-Clay Mixtures
RSE-GR	iterial LAR		action is re size	nds (little Fines)	SW		Well-Graded Sands, Gravelly Sands, Little or no Fines
COAI	half of me	SON	Coarse fra No. 4 Siev	Clean Sa or no I	SP		Poorly-Graded Sands, Gravelly Sands, Little or no Fines
	Aore than	SAN	an half of LER than	ith Fines cciable of Fines)	SM		Silty Sands, Sand-Silt Mixtures
	~		More tha SMALI	Sands w (Appre amount (SC		Clayey Sands, Sand-Clay Mixtures
ILS	MALLER ze	5 g.	YS	imit less 1 50	ML		Inorganic Silts & Very Fine Sands, Rock Flour, Silty or Clayey Fine Sands or Clayey Silts with Slight Plasticity
IND SO	naterial SN) Sieve si:		CL	Liquid Li thar	CL		Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays
IE-GRA	in half of n an No. 200	5 g.	YS	Limit than 50	мн		Inorganic Silts, Micaceous or Diatomaceous Fine Sand or Silty Soils, Elastic Silts
GIN	More tha th		CL	Liquid greater	СН		Inorganic Clays of High Plasticity, Fat Clays
			SA	NDSTONE			Massive Sandstones, Sandstones with Gravel Clasts
	ERIALS		MA	RLSTONE			Indurated Argillaceous Limestones
	LMATE		LII	MESTONE			Massive or Weakly Bedded Limestones
	ATIONA		CLAYSTONE				Mudstone or Massive Claystones
	FORM			CHALK			Massive or Poorly Bedded Chalk Deposits
		MARINE CLAYS					Cretaceous Clay Deposits
			GRO	UNDWATER	1	\mathbf{Y}	Indicates Final Observed Groundwater Level Indicates Initial Observed Groundwater Location

Density of	of Granular Soils
Number of Blows per ft., N	Relative Density
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium
30 - 50	Dense
Over 50	Very Dense

Consistency and Strength of Cohesive Soils			
Number of Blows per ft., N	Consistency	Unconfined Compressive Strength, q _u (tsf)	
Below 2	Very Soft	Less than 0.25	
2 - 4	Soft	0.25 - 0.5	
4 - 8	Medium (Firm)	0.5 - 1.0	
8 - 15	Stiff	1.0 - 2.0	
15 - 30	Very Stiff	2.0 - 4.0	
Over 30	Hard	Over 4.0	

PLASTICITY CHART (ASTM D 2487-11)



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KEY TO TERMS AND SYMBOLS USED ON BORING LOGS

TABLE 1 Soil Classification Chart (ASTM D 2487-11)

Soil Classification

				0	
Criteria of Assigning	g Group Symbols and G	roup Names Using Laborato	ry Tests ⁴	Group Symbol	Group Name ^B
COARSE-GRAIND SOILS	Gravels (More than 50% of	Clean Gravels (Less than 5% fines ^C)	$Cu \ge 4$ and $1 \le Cc \le 3^D$	GW	Well-Graded Gravel ^E
More than 50% retained on No.	coarse fraction retained on No. 4 sieve)		Cu < 4 and/or $[Cc < or Cc > 3]^{D}$	GP	Poorly-Graded Gravel ^E
		Gravels with Fines (More than 12% fines ^C)	Fines classify as ML or MH	GM	Silty Gravel ^{E,F,G}
			Fines classify as CL or CH	GC	Clayey Gravel ^{E,F,G}
200 sieve	Sands	Clean Sands	$Cu \ge 6$ and $1 \le Cc \le 3^D$	SW	Well-Graded Sand
	(50% or more of coarse	(Less than 5% fines ^H)	Cu < 6 and/or	SP	Poorly-Graded Sand [/]
	fraction passes No. 4 sieve)		$[Cc < or Cc > 3]^{D}$		
		Sands with Fines (More than 12% fines ^H)	Fines classify as ML or MH	SM	Silty Sand ^{F,G,I}
			Fines classify as CL or CH	SC	Clayey Sand ^{F,G,I}
FINE-GRAINED SOILS	Silts and Clays	inorganic	PI > 7 and plots on or above "A" line ^J	CL	Lean Clay ^{K,L,M}
	Liquid limit less than 50		PI < 4 or plots below "A" line ^J	ML	Silt ^{K,L,M}
		organic	Liquid limit - oven dried/Liquid & #10	OL	Organic Clay ^{K,L,M,N}
50% or more passes the No. 200 sieve			< 0.75		Organi Silt ^{K,L,M,O}
	Silts and Clays	inorganic	PI plots on or above "A" line	CH	Fat Clay ^{K,L,M}
	Liquid limit 50 or more		PI plots on or above "A" line	MH	Elastic Silt ^{K,L,M}
		organic	Liquid limit - oven dried/Liquid & #10	OH	Organic Clay ^{K,L,M,P}
			< 0.75		Organic Silt ^{K,L,M,Q}
HIGHLY ORGANIC SOLLS	Primarily	raanic matter dark in color an	d organic odor	PT	Peat

^A Based on the material passing the 3-inch (75mm) sieve

^B If field sample contained cobbles or boulders, or both, add "with bcobble sor boulders, or both" to group name

- $^{\rm c}$ Gravels with 5% to 12% fines require dual symbols:
 - GW-GM well-graded gravel with silt
 - GW-GC well-graded gravel with clay
 - GP-GM poorly-graded gravel with silt
 - GP-GC poorly-graded gravel with clay
- D Cu = D₆₀/D₁₀ $(D_{30})^2$ Cc =

D₁₀ x D₆₀

- $^{\scriptscriptstyle E}$ If soil contains \geq 15% sand, add "with sand" to group name
- F If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM
- ^G If fines are organic, add "with organic fines" to group name
- ^H Sand with 5% to 12% fines require dual symbols:
 - SW-SM well-graded sand with silt
 - SW-SC well-graded sand with clay
 - SP-SM poorly-graded sand with silt

 - SP-SC poorly-graded sand with clay
- [/] If soil contains ≥ 15% gravel, add "with gravel" to group name
- ^J If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay
- ^k If soil contains 15% to < 30% plus No. 200, add "with sand" or "with gravel," whichever is predominant
- ^L If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name
- ^M If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name
- ^{*N*} $PI \ge 4$ and plots on or above "A" line
- $^{\circ}\,$ PI < 4 or plots below "A" line
- ^P PI plots on or above "A" line
- ^o PI plots below "A" line

TERMINOLOGY

Boulders	Over 12-inches (300mm)	Parting	Inclusion < 1/8-inch thick extending through samples	
Cobbles	12-inches to 3-inches (300mm to 75mm)	Seam	Inclusion 1/8-inch to 3-inches thick extending through sample	
Gravel	3-inches to No. 4 sieve (75mm to 4.75mm)	Layer	Inclusion > 3-inches thick extending through sample	
Sand	No. 4 sieve to No. 200 sieve (4.75mm to 0.075mm)			
Silt or Clay	Passing No. 200 sieve (0.075mm)			
Calcareous Containing appreciable quantities of calcium carbonate, generally nodular				
Stratified	Alternating layers of varying material or color with layers a	least 6mm thick		
Laminated	Alternating layers of varying material or color with the layer	s less than 6mm t	thick	
Fissured	Breaks along definite planes of fracture with little resistance to fracturing			
Slickensided	Fracture planes appear polished or glossy sometimes striated			
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown			
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay			
Homogeneous	Same color and appearance throughout			

Arias and Associates, Inc.

KEY TO TERMS AND SYMBOLS USED ON BORING LOGS

Class	Hardness	Field Test	Approximate Range of Uniaxial Compression Strength kg/cm ² (tons/ft ²)
I	Extremely hard	Many blows with geologic hammer required to break intact specimen.	> 2,000
11	Very hard	Hand held specimen breaks with hammer end of pick under more than one blow.	2,000 – 1,000
111	Hard	Cannot be scraped or pealed with knife, hand held specimen can be broken with single moderate blow with pick.	1,000 – 500
IV	Soft	Can just be scraped or peeled with knife. Indentations 1mm to 3mm show in specimen with moderate blow with pick.	500 – 250
V	Very soft	Material crumbles under moderate blow with sharp end of pick and can be peeled with a knife, but is too hard to hand-trim for triaxial test specimen.	250 – 10

Hardness Classification of Intact Rock

Rock Weathering Classifications

Grade	Symbol	Diagnostic Features	
Fresh	F	No visible sign of Decomposition or discoloration. Rings under hammer impact.	
Slightly Weathered	WS	Slight discoloration inwards from open fractures, otherwise similar to F.	
Moderately Weathered	WM	Discoloration throughout. Weaker minerals such as feldspar decomposed. Strength somewhat less than fresh rock, but cores cannot be broken by hand or scraped by knife. Texture preserved.	
Highly Weathered	WH	Most minerals somewhat decomposed. Specimens can be broken by hand with effort or shaved with knife. Core stones present in rock mass. Texture becoming indistinct, but fabric preserved.	
Completely Weathered	WC	Minerals decomposed to soil, but fabric and structure preserved (Saprolite). Specimens easily crumbled or penetrated.	
Residual Soil	RS	Advanced state of decomposition resulting in plastic soils. Rock fabric and structure completely destroyed. Large volume change.	

Rock Discontinuity Spacing			
Description for Structural Features: Bedding, Foliation, or Flow Banding	Spacing	Description for Joints, Faults or Other Fractures	
Very thickly (bedded, foliated, or banded)	More than 6 feet	Very widely (fractured or jointed)	
Thickly	2 – 6 feet	Widely	
Medium	8 – 24 inches	Medium	
Thinly	21/2 – 8 inches	Closely	
Very thinly	3/4 – 21/2 inches	Very closely	
Description for Micro-Structural Features: Lamination, Foliation, or Cleavage	Spacing	Descriptions for Joints, Faults, or Other Fractures	
Intensely (laminated, foliated, or cleaved)	1⁄4 – 3⁄4 inch	Extremely close	
Very intensely	Less than 1/4 inch		

Engineering Classification for in Situ Rock Quality

RQD %	Velocity Index	Rock Mass Quality
90 – 100	0.80 - 1.00	Excellent
75 – 90	0.60 - 0.80	Good
50 – 75	0.40 - 0.60	Fair
25 – 50	0.20 - 0.40	Poor
0 – 25	0 – 0.20	Very Poor