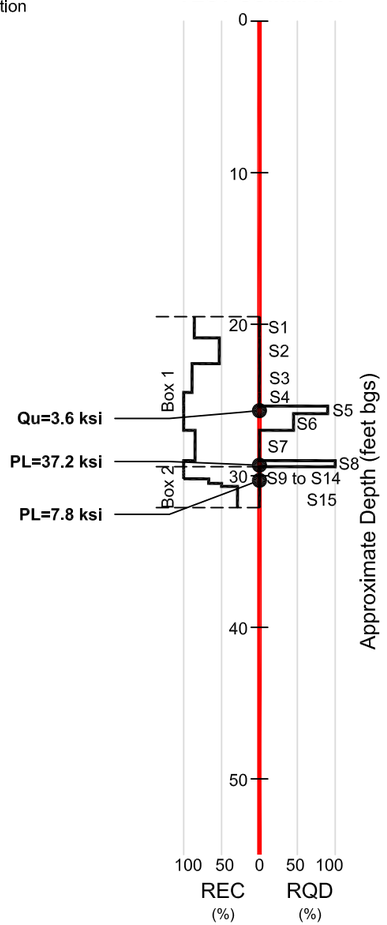
ROCK CORE PHOTOGRAPHS
Boring B-3

Coring runs S9 through S15 experienced frequent blocking off and slow penetration rates during drilling.

Box 1: 19.5 to 29.4 feet bgs

Box 2: 29.4 to 32.1 feet bgs

CORE RUN AND LAB TEST SUMMARY



SUMMARY OF DISCONTINUITIES AND PHYSICAL PROPERTIES

DESCRIPTION	***Rock Type:*** *gray to black, SHALE occasionally interbedded with gray, fine-grained, SANDSTONE*
Average Joint spacing	1/4 to 3 inches
Dominant Joint Angles	30 to 40°, 50 to 70°, 80 to 90°
Bedding/Foliation	Laminated to very thinly bedded
Bedding/Foliation Angles	60 to 70°
Joint Smoothness[1]	Smooth to Rough
Joint Filling	Iron staining, calcite, and unknown mineral coatings
Relative Hardness[2]	Easy to Medium
Effervescence[3]	None, High from 25.4 to 32.1 feet in filled fractures
Degree of Weathering[4]	Fresh to Slight; Moderate from 22.6 to 24.5 feet
Comments	Contains occasional calcite-filled microfractures

NOTES

1. Visual classification of smoothness of joint surfaces (sl-slickensided, s-smooth, r-rough).
2. Indicates effort required to scratch core surface with Hardness 5 stylus (e-easy, m-moderate, h-hard).
3. Visual classification of effervescence when 10:1 HCL is applied to core (l-low, m-moderate, h-high).
4. Visual classification of apparent weathering of core (fr-fresh, sw-slightly weathered, mw-moderately weathered, hw-highly weathered, cw-completely weathered, r-residual soil).
5. See Figure A-2 for rock classification system and other terminology.
6. See Appendix B for full laboratory reports.

ACRONYMS

BGS - Below Ground Surface
REC - Recovery
RQD - Rock Quality Designation
Qu - Estimated Uniaxial Compressive Strength
PL - Estimated Compressive Strength from Point Load Index Testing
KSI - Kips per Square Inch

Rock Quality Description	
RQD Value	Description of Rock Quality
0% - 25%	Very Poor
26% - 50%	Poor
51% - 75%	Fair
76% - 90%	Good
91% - 100%	Excellent

Shotgun Cove Road Extension
Whittier, Alaska

ROCK CORE DATA:
BORING B-3

January 2022 102528-003

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FIG. A-13

APPENDIX B: LABORATORY TEST RESULTS

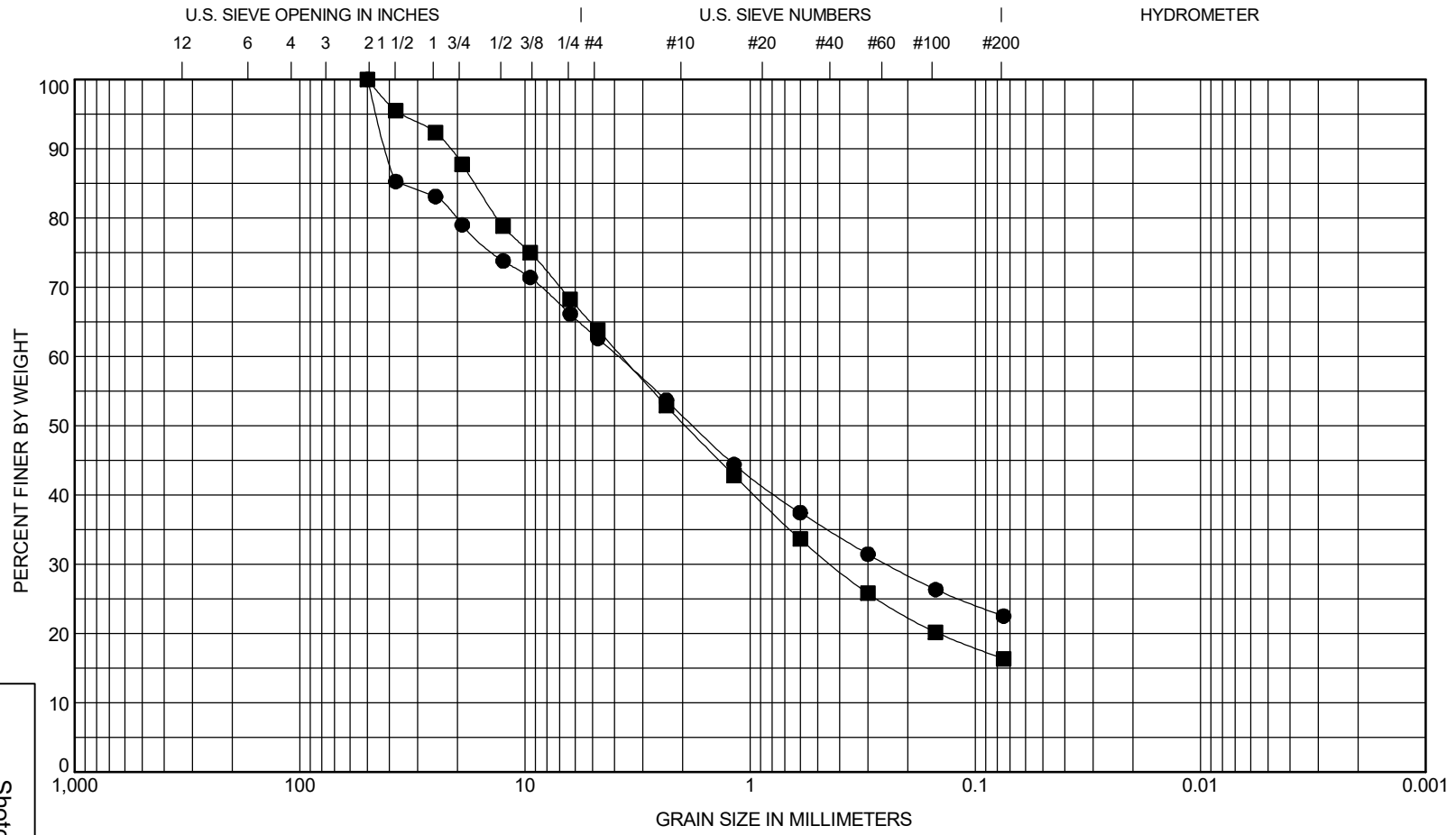
Appendix B

Laboratory Test Results

Table B-1 - Rock Durability Results Summary

		Stockpile Borings							Surface Grab Samples (Structure Mapping Locations)				Alignment Boring	
Sample ID and Depth in Feet:		SCG1 SPB-1 0-20' bgs		SPB-1 0-25' bgs		SPB-2 0-27' bgs		SPB-2 + SPB-3	SCST01 Grab		SCST12 Grab		Boring B-1 21-41.6' bgs	
Test	Method													
Apparent Specific Gravity	ASTM C127	2.76		2.78		2.77		-	2.73		2.75		2.76	
L.A. Abrasion*	ASTM C131	Grading	% Loss	Grading	% Loss	Grading	% Loss	-	Grading	% Loss	Grading	% Loss	Grading	% Loss
		A	18	A	18	A	20	-	A	29	A	33	A	18
Magnesium Sulfate Soundness	ASTM C88													
	Test Fraction:	3/4" to 3/8"	3/8" to #4	3/4" to 3/8"	3/8" to #4	3/4" to 3/8"	3/8" to #4	-	1.5" to 3/4"	-	1.5" to 3/4"	-	3/4" to 3/8"	3/8" to #4
	% Passing Designated Sieve After Test:	8.7	2.1	3.7	4.5	1.8	9.2	-	0.0	-	0.1	-	0.5	0.6
	Weighted % Loss:	6.7	0.5	2.9	1.0	1.4	1.9	-	0.0	-	0.1	-	0.4	0.1
	Total % Loss:	7		4		3		-	0		0		1	
Degradation	ATM T313	84		91		78		-	85		67		79	
Nordic Abrasion	ATM 312	-		-		-		20.8	19.8**		-		-	

NOTES:
* Resistance to Degradation of Small-Size Coarse Aggregate
** Sample collected from the SCST01 location with Field Designation SCNA-1
ASTM ASTM International, Inc.
ATM Alaska Test Method
% Percent
Samples submitted for Nordic Abrasion testing did not meet the flat and elongated requirement for testing.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample		Depth, Ft	USCS Classification	LL	PL	PI	Cc	Cu
●	B-3 S2	7.5 - 9.0	**Silty Sand with Gravel (SM)**		**16**			
■	B-3 S5	15.0 - 16.5	**Silty Sand with Gravel (SM)**					

Sample		Depth, Ft	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-3 S2	7.5 - 9.0	**50**	**3.87**	**0.25**		**37**	**40**	**23**	
■	B-3 S5	15.0 - 16.5	**50**	**3.72**	**0.44**		**36**	**47**	**16**	

GRAIN SIZE CLASSIFICATION

Shotgun Cove Road Extension
Whittier, Alaska

January 2022

102528-003

FIG. B-1

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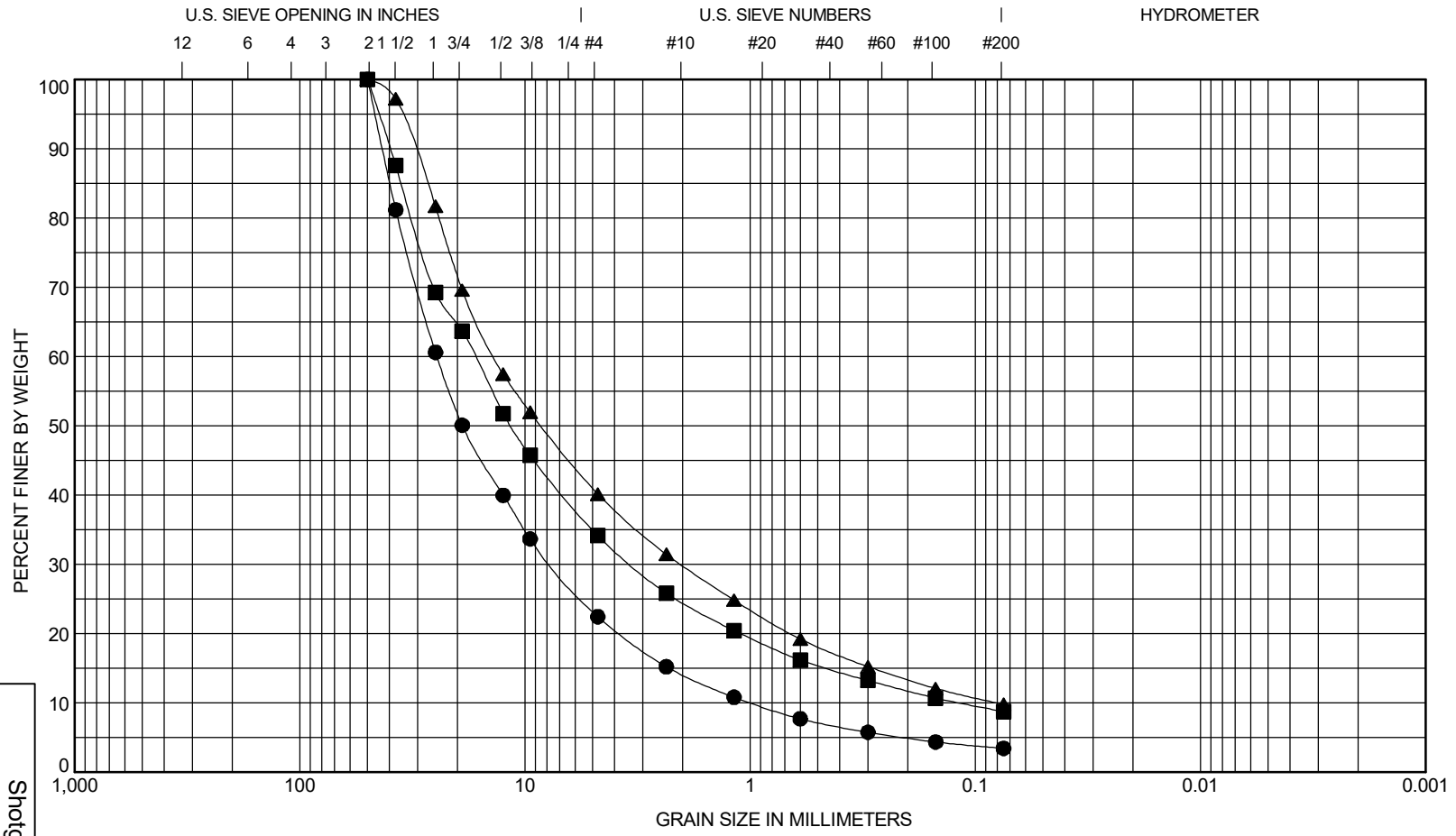

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample		Depth, Ft	USCS Classification	LL	PL	PI	Cc	Cu
●	SPB-1 S5	20.0 - 21.5	**Well-Graded Gravel with Sand**				**2.4**	**24.9**
■	SPB-2 S2	5.0 - 6.5	**Poorly Graded Gravel with Silt and Sand**				**5.7**	**142.4**
▲	SPB-3 S1	0.0 - 1.5	**Poorly Graded Gravel with Silt and Sand**				**3.8**	**170.3**

Sample		Depth, Ft	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	SPB-1 S5	20.0 - 21.5	**50**	**24.61**	**7.58**	**0.99**	**78**	**19**	**3**	
■	SPB-2 S2	5.0 - 6.5	**50**	**16.69**	**3.35**	**0.12**	**66**	**25**	**9**	
▲	SPB-3 S1	0.0 - 1.5	**50**	**13.65**	**2.03**	**0.08**	**60**	**30**	**10**	

GRAIN SIZE CLASSIFICATION

Shotgun Cove Road Extension
Stockpile Borings
Whittier, Alaska

SHANNON & WILSON, INC.
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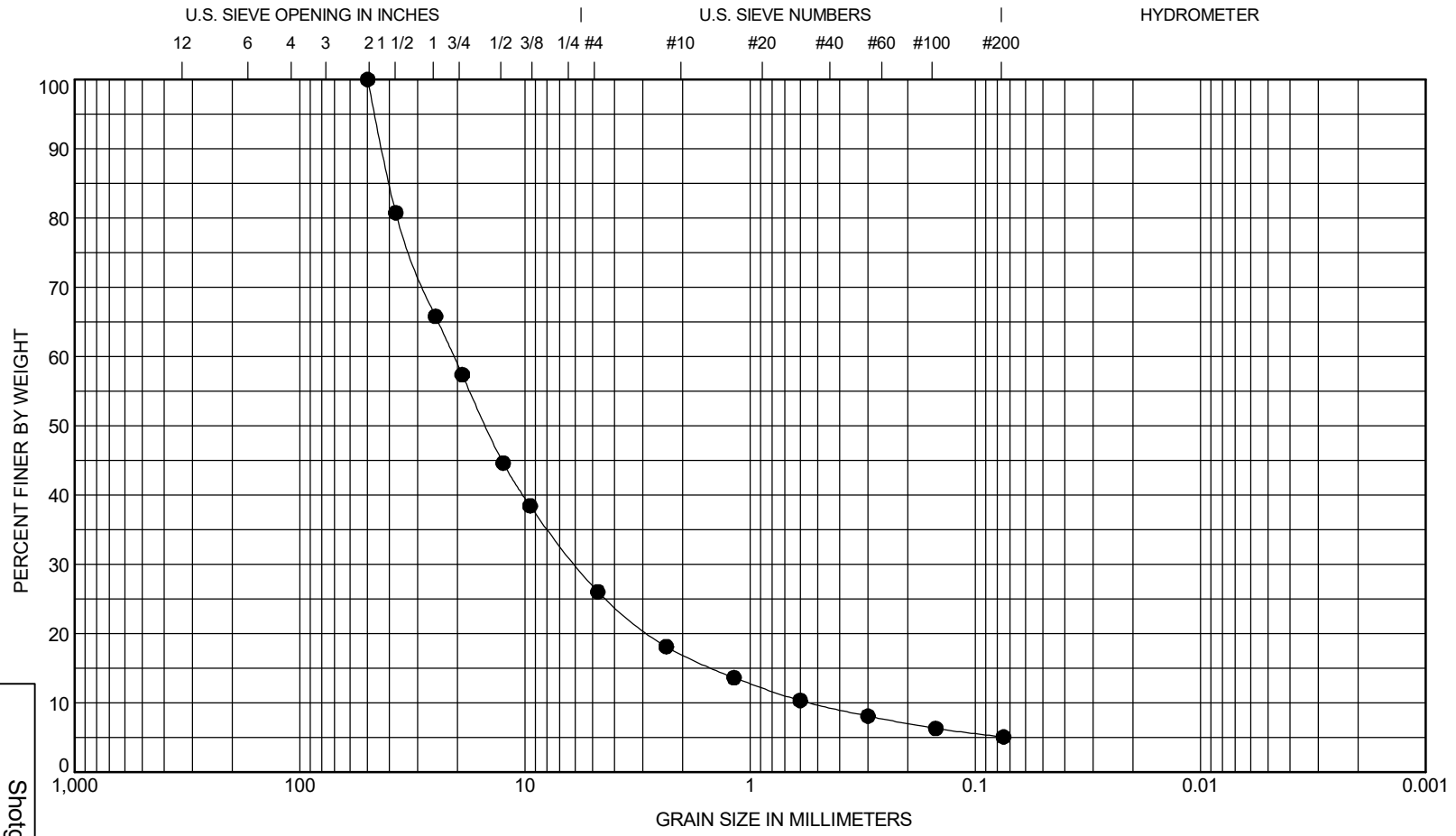
January 2022

102528-003

FIG. B-2
Sheet 1 of 2



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample	Depth, Ft	USCS Classification	LL	PL	PI	Cc	Cu
● SPB-4 S4	15.0 - 16.5	**Poorly Graded Gravel with Silt and Sand**				**3.1**	**38.3**

Sample	Depth, Ft	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● SPB-4 S4	15.0 - 16.5	**50**	**20.7**	**5.93**	**0.54**	**74**	**21**	**5**	

Shotgun Cove Road Extension
Stockpile Borings
Whittier, Alaska

GRAIN SIZE CLASSIFICATION

January 2022

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FIG. B-2
Sheet 2 of 2

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SPECIFIC GRAVITY WORKSHEET

PROJECT NO.	102528-004
START/END DATE	9-25-2020/9-28-2020
WORK ORDER	4281
TEST METHOD	*ASTM* C127 *AASHTO* T85

PROJECT NAME/LOCATION	Shotgun Cove Road

CLIENT INFORMATION		S&W LAB TECHNICIANS		EQUIPMENT USED	
Contact		Mass tare	PMW	Balance (tare)	270
Client	Anchorage Office	Mass wet soil	PMW	Balance (wet)	270
Address		Mass dry soil	PMW	Balance (dry)	270
Email		Calculations	PMW	Oven	333
Phone		Data entry	JKR		

SAMPLE IDENTIFICATION	SCG-1 SPB-1 (1/2")

SOAKING TIME	
BEGINNING OF SOAK TIME	2:00pm
END OF SOAK TIME	11:00am
TOTAL SOAK TIME (HOURS)	21 Hours

SATURATED SURFACE DRY (SSD) SAMPLE MASS	
MASS OF TARE (g)	1624.2
MASS OF TARE AND SSD SAMPLE (g)	3723.4
MASS OF SSD SAMPLE (g)	2099.2

SAMPLE MASS IN WATER	
TEMPERATURE OF WATER (˚C)	23.0
MASS OF CONTAINER IN WATER (g)	TARED
MASS OF CONTAINER AND SAMPLE IN WATER (g)	TARED
MASS OF SAMPLE IN WATER (g)	1334.0

DRY SAMPLE MASS	
MASS OF TARE (g)	1624.2
MASS OF TARE AND DRY SAMPLE (1) (g)	3714.1
MASS OF TARE AND DRY SAMPLE (2) (g)	3714.1
MASS OF DRY SAMPLE (g)	2089.9

COARSE AGGREGATE	
COARSE AGGREGATE IN SAMPLE (%)	100.0
SPECIFIC GRAVITY (OVEN-DRY)	2.73
SPECIFIC GRAVITY (SSD)	2.74
APPARENT SPECIFIC GRAVITY	2.76
DENSITY (OVEN-DRY) (pcf)	170.06
DENSITY (SSD) (pcf)	170.81
APPARENT DENSITY (pcf)	172.18
ABSORPTION (%)	0.4

FINE AGGREGATE (IF APPLICABLE)	
FINE AGGREGATE IN SAMPLE (%)	N/A
SPECIFIC GRAVITY OF FINE AGGREGATE	N/A
ABSORPTION OF FINE AGGREGATE (%)	N/A

AVERAGE VALUES (IF APPLICABLE)	
AVERAGE BULK SPECIFIC GRAVITY	N/A
AVERAGE DENSITY (pcf)	N/A
AVERAGE ABSORPTION (%)	N/A

NOTES: Specific gravity (OD) = (mass of dry sample) / [(mass of SSD sample in air) – (mass of SSD sample in water)]
Specific gravity (SSD) = (mass of SSD sample in air) / [(mass of SSD sample in air) – (mass of SSD sample in water)]
Apparent specific gravity = (mass of dry sample) / [(mass of dry sample) – (mass of SSD sample in water)]
*Density (OD) = [62.27 * (mass of dry sample)] / [(mass of SSD sample in air) – (mass of SSD sample in water)]*
*Density (SSD) = [62.27 * (mass of SSD sample in air)] / [(mass of SSD sample in air) – (mass of SSD sample in water)]*
*Absorption = {[(mass of SSD sample in air) – (mass of dry sample)] / (mass of dry sample)} * 100*
FOR AVERAGE SPECIFIC GRAVITY, AVERAGE DENSITY, AND AVERAGE ABSORPTION SEE TEST METHOD

REVIEW BY (initial/date)

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L.A. ABRASION WORKSHEET

PROJECT NO.	102528-004
START/END DATE	9-26-2020/9-29-2020
WORK ORDER	4281
TEST METHOD	*ASTM* C131/C535 *AASHTO* T96

PROJECT NAME/LOCATION	Shotgun Cove Road Aggregate Quality

CLIENT INFORMATION		S&W LAB TECHNICIANS		EQUIPMENT USED	
Contact		Sample wash	PMW	Balance(s)	270
Client	Anchorage Office	Gradation	PMW	LA Abrasion	656
Address		LA Abrasion	PMW	Oven(s)	333
Email		Calculations	PMW	Sieve(s)	1000
Phone		Data entry	IRD		

SAMPLE IDENTIFICATION	SPB-1 SCG-1

SIZE FRACTION		GRADING							SAMPLE MASS
PASSING	RETAINED	A	B	C	D	1	2	3	
3"	2 ½"					2500 ± 50			
2 ½"	2"					2500 ± 50			
2"	1 ½"					5000 ± 50	5000 ± 50		
1 ½"	1"	1250 ± 25					5000 ± 50	5000 ± 50	1257.6g
1"	¾"	1250 ± 25						5000 ± 50	1257.0g
¾"	½"	1250 ± 10	2500 ± 10						1242.6g
½"	⅜"	1250 ± 10	2500 ± 10						1249.0g
⅜"	¼"			2500 ± 10					
¼"	NO. 4			2500 ± 10					
NO. 4	NO. 8				5000 ± 10				
TOTAL MASS (g)		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10	10,000 ± 100	10,000 ± 100	10,000 ± 100	5006.2g
NUMBER OF SPHERES		12	11	8	6	12	12	12	12g
MASS OF SPHERES (g)		5000 ± 25	4584 ± 25	3330 ± 20	2500 ± 15	5000 ± 25	5000 ± 25	5000 ± 25	5015.6g

SPHERE MASS (g)			
416.3g	429.4g	416.8g	416.9g
394.1g	417.3g	433.9g	417.2g
424.1g	418.2g	416.4g	415.0g
TOTAL MASS (g)	5015.6g		

MASS RETAINED ON THE NO. 12 SIEVE (g)	4111.1g
LOSS (g)	895.1g
PERCENT LOSS	17.9%

NOTES: Sphere masses must be between 390g and 445g each
Sample must be washed before gradation
Sample must be washed after shaking over the No. 12 sieve
Loss = (total mass of sample) – (mass of sample retained on the No. 12 sieve)
Percent loss = (loss) / (total mass of sample)

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VERSION 2, FEBRUARY 2010

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SULFATE SOUNDNESS WORKSHEET

PROJECT NO.	102528-004
START/END DATE	10-2-2020
WORK ORDER	4281
TEST METHOD	*ASTM* C88 *AASHTO* T104

PROJECT NAME/LOCATION	Shotgun Cove Road

CLIENT INFORMATION		S&W LAB TECHNICIANS		EQUIPMENT USED	
Contact		Sample prep	PMW	Balance(s)	270
Client	Anchorage Office	Sample cycle	PMW	Oven(s)	333
Address		Sieving	PMW	Sieve(s)	131
Email		Calculations	PMW		160
Phone		Data entry	SLD		

SAMPLE IDENTIFICATION	SCG-1 SPB-1
SULFATE SOLUTION	Magnesium Sulfate

SIEVE SIZE	GRADING OF ORIGINAL SAMPLE (%)	MASS OF TEST FRACTIONS BEFORE TEST (g)		MASS AFTER TEST (g)	PERCENT PASSING DESIGNATED SIEVE AFTER TEST	WEIGHTED PERCENT LOSS
MINUS NO. 100						
NO. 100 TO NO. 50						
NO. 50 TO NO. 30						
NO. 30 TO NO. 16						
NO. 16 TO NO. 8						
NO. 4 TO NO. 8						
3/8" TO NO. 4						
TOTALS						
4" TO 3.5"						
3½" TO 3 "						
3" TO 2 ½"						
2 ½" TO 2"						
2" TO 1½"						
1½" TO 1 "						
1" TO ¾"						
¾" TO ½"		669.5g	1000.5g	913.1g	8.7%	8.7%
½" TO 3/8"		331.0g				
NO. 3/8" TO 4"		301.7g		295.4g	2.1%	2.1%

Total Percent Loss = 7%

NOTES: Cycle sample for five days
Dry during the day at 230F

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DEGRADATION WORKSHEET

PROJECT NO.	102528-004
START/END DATE	9-30-2020/10-1-2020
WORK ORDER	4281
TEST METHOD	*ATM* T313

PROJECT NAME/LOCATION	Shotgun Cove Road

CLIENT INFORMATION		S&W LAB TECHNICIANS		EQUIPMENT USED	
Contact		Aggregate crushing	PMW/IRD	Balance(s)	270
Client	Anchorage Office	Sample weights	PMW	Oven(s)	333
Address		Degradation	SLD	Sieve(s)	199
Email		Calculations	PMW		115
Phone		Data entry	SLD		

SAMPLE IDENTIFICATION	SCG-1 SPB-1

SIEVE SIZE	REQUIRED MASS (g)	SAMPLE MASS (g)
1/2" TO ¼ "	500 ± 1	500.5
¼" TO No.10	500 ± 1	500.0

HEIGHT OF SEDIMENT IN CYLINDER	1"
DEGRADATION VALUE	84
REQUIRED DEGRADATION VALUE	N/A

NOTES: Aggregate must be crushed prior to testing
Aggregate must be washed and oven dried prior to testing

REVIEW BY (initial/date)

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SPECIFIC GRAVITY WORKSHEET

PROJECT NO.	102528-004
START/END DATE	9-25-2020/9-28-2020
WORK ORDER	4281
TEST METHOD	*ASTM* C127 *AASHTO* T85

PROJECT NAME/LOCATION	Shotgun Cove Road

CLIENT INFORMATION		S&W LAB TECHNICIANS		EQUIPMENT USED	
Contact		Mass tare	PMW	Balance (tare)	270
Client	Anchorage Office	Mass wet soil	PMW	Balance (wet)	270
Address		Mass dry soil	PMW	Balance (dry)	270
Email		Calculations	PMW	Oven	333
Phone		Data entry	JKR		

SAMPLE IDENTIFICATION	SPB-1 (1/2")

SOAKING TIME	
BEGINNING OF SOAK TIME	10:00am
END OF SOAK TIME	12:00pm
TOTAL SOAK TIME (HOURS)	26 Hours

SATURATED SURFACE DRY (SSD) SAMPLE MASS	
MASS OF TARE (g)	1617.6
MASS OF TARE AND SSD SAMPLE (g)	3632.6
MASS OF SSD SAMPLE (g)	2015.0

SAMPLE MASS IN WATER	
TEMPERATURE OF WATER (°C)	23.4
MASS OF CONTAINER IN WATER (g)	TARED
MASS OF CONTAINER AND SAMPLE IN WATER (g)	TARED
MASS OF SAMPLE IN WATER (g)	1283.0

DRY SAMPLE MASS	
MASS OF TARE (g)	1617.6
MASS OF TARE AND DRY SAMPLE (1) (g)	3622.7
MASS OF TARE AND DRY SAMPLE (2) (g)	3622.7
MASS OF DRY SAMPLE (g)	2005.1

COARSE AGGREGATE	
COARSE AGGREGATE IN SAMPLE (%)	100.0
SPECIFIC GRAVITY (OVEN-DRY)	2.74
SPECIFIC GRAVITY (SSD)	2.75
APPARENT SPECIFIC GRAVITY	2.78
DENSITY (OVEN-DRY) (pcf)	170.56
DENSITY (SSD) (pcf)	171.43
APPARENT DENSITY (pcf)	172.92
ABSORPTION (%)	0.5

FINE AGGREGATE (IF APPLICABLE)	
FINE AGGREGATE IN SAMPLE (%)	N/A
SPECIFIC GRAVITY OF FINE AGGREGATE	N/A
ABSORPTION OF FINE AGGREGATE (%)	N/A

AVERAGE VALUES (IF APPLICABLE)	
AVERAGE BULK SPECIFIC GRAVITY	N/A
AVERAGE DENSITY (pcf)	N/A
AVERAGE ABSORPTION (%)	N/A

NOTES: Specific gravity (OD) = (mass of dry sample) / [(mass of SSD sample in air) – (mass of SSD sample in water)]
Specific gravity (SSD) = (mass of SSD sample in air) / [(mass of SSD sample in air) – (mass of SSD sample in water)]
Apparent specific gravity = (mass of dry sample) / [(mass of dry sample) – (mass of SSD sample in water)]
*Density (OD) = [62.27 * (mass of dry sample)] / [(mass of SSD sample in air) – (mass of SSD sample in water)]*
*Density (SSD) = [62.27 * (mass of SSD sample in air)] / [(mass of SSD sample in air) – (mass of SSD sample in water)]*
*Absorption = {[(mass of SSD sample in air) – (mass of dry sample)] / (mass of dry sample)} * 100*
FOR AVERAGE SPECIFIC GRAVITY, AVERAGE DENSITY, AND AVERAGE ABSORPTION SEE TEST METHOD

REVIEW BY (initial/date)

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L.A. ABRASION WORKSHEET

PROJECT NO.	102528-004
START/END DATE	9-26-2020/9-29-2020
WORK ORDER	4281
TEST METHOD	*ASTM* C131/C535 *AASHTO* T96

PROJECT NAME/LOCATION	Shotgun Cove Road Aggregate Quality

CLIENT INFORMATION		S&W LAB TECHNICIANS		EQUIPMENT USED	
Contact		Sample wash	PMW	Balance(s)	270
Client	Anchorage Office	Gradation	PMW	LA Abrasion	656
Address		LA Abrasion	PMW	Oven(s)	333
Email		Calculations	PMW	Sieve(s)	1000
Phone		Data entry	IRD		

SAMPLE IDENTIFICATION	SPB-1

SIZE FRACTION		GRADING							SAMPLE MASS
PASSING	RETAINED	A	B	C	D	1	2	3	
3"	2 ½"					2500 ± 50			
2 ½"	2"					2500 ± 50			
2"	1 ½"					5000 ± 50	5000 ± 50		
1 ½"	1"	1250 ± 25					5000 ± 50	5000 ± 50	1251.4g
1"	¾"	1250 ± 25						5000 ± 50	1253.4g
¾"	½"	1250 ± 10	2500 ± 10						1250.3g
½"	⅜"	1250 ± 10	2500 ± 10						1251.7g
⅜"	¼"			2500 ± 10					
¼"	NO. 4			2500 ± 10					
NO. 4	NO. 8				5000 ± 10				
TOTAL MASS (g)		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10	10,000 ± 100	10,000 ± 100	10,000 ± 100	5006.8g
NUMBER OF SPHERES		12	11	8	6	12	12	12	12g
MASS OF SPHERES (g)		5000 ± 25	4584 ± 25	3330 ± 20	2500 ± 15	5000 ± 25	5000 ± 25	5000 ± 25	5015.6g

SPHERE MASS (g)			
416.3g	429.4g	416.8g	416.9g
394.1g	417.3g	433.9g	417.2g
424.1g	418.2g	416.4g	415.0g
TOTAL MASS (g)	5015.6g		

MASS RETAINED ON THE NO. 12 SIEVE (g)	4088.9g
LOSS (g)	917.9g
PERCENT LOSS	18.3%

NOTES: Sphere masses must be between 390g and 445g each
Sample must be washed before gradation
Sample must be washed after shaking over the No. 12 sieve
Loss = (total mass of sample) – (mass of sample retained on the No. 12 sieve)
Percent loss = (loss) / (total mass of sample)

REVIEW BY (initial/date)

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SULFATE SOUNDNESS WORKSHEET

PROJECT NO.	102528-004
END DATE	10-2-2020
WORK ORDER	4281
TEST METHOD	*ASTM* C88 *AASHTO* T104

PROJECT NAME/LOCATION	Shotgun Cove Road

CLIENT INFORMATION		S&W LAB TECHNICIANS		EQUIPMENT USED	
Contact		Sample prep	PMW	Balance(s)	270
Client	Anchorage Office	Sample cycle	PMW/SLD	Oven(s)	333
Address		Sieving	PMW	Sieve(s)	234
Email		Calculations	PMW		
Phone		Data entry	SLD		

SAMPLE IDENTIFICATION	SPB-1
SULFATE SOLUTION	Magnesium Sulfate

SIEVE SIZE	GRADING OF ORIGINAL SAMPLE (%)	MASS OF TEST FRACTIONS BEFORE TEST (g)		MASS AFTER TEST (g)	PERCENT PASSING DESIGNATED SIEVE AFTER TEST	WEIGHTED PERCENT LOSS
MINUS NO. 100						
NO. 100 TO NO. 50						
NO. 50 TO NO. 30						
NO. 30 TO NO. 16						
NO. 16 TO NO. 8						
NO. 4 TO NO. 8						
3/8" TO NO. 4						
TOTALS						
4" TO 3.5"						
3½" TO 3 "						
3" TO 2 ½"						
2 ½" TO 2"						
2" TO 1½"						
1½" TO 1 "						
1" TO ¾"						
¾" TO ½"		674.7g	1006.3g	968.6g	3.7%	3.7%
½" TO 3/8"		331.6g				
NO. 3/8" TO 4"		300.0g		286.4g	4.5%	4.5%

Total Percent Loss = 4%

NOTES: Cycle sample for five days
Dry during the day at 230F

REVIEW BY (initial/date)

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GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
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DEGRADATION WORKSHEET

PROJECT NO.	102528-004
START/END DATE	9-30-2020/10-1-2020
WORK ORDER	4281
TEST METHOD	*ATM* T313

PROJECT NAME/LOCATION	Shotgun Cove Road

CLIENT INFORMATION		S&W LAB TECHNICIANS		EQUIPMENT USED	
Contact		Aggregate crushing	PMW	Balance(s)	270
Client	Anchorage Office	Sample weights	PMW	Oven(s)	333
Address		Degradation	SLD	Sieve(s)	199
Email		Calculations	PMW		115
Phone		Data entry	SLD		

SAMPLE IDENTIFICATION	SPB-1

SIEVE SIZE	REQUIRED MASS (g)	SAMPLE MASS (g)
1/2" TO ¼ "	500 ± 1	500.4
¼" TO No.10	500 ± 1	500.1

HEIGHT OF SEDIMENT IN CYLINDER	.5"
DEGRADATION VALUE	91
REQUIRED DEGRADATION VALUE	N/A

NOTES: Aggregate must be crushed prior to testing
Aggregate must be washed and oven dried prior to testing

REVIEW BY (initial/date)

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SPECIFIC GRAVITY WORKSHEET

PROJECT NO.	102528-004
START/END DATE	9-25-2020/9-28-2020
WORK ORDER	4281
TEST METHOD	*ASTM* C127 *AASHTO* T85

PROJECT NAME/LOCATION	Shotgun Cove Road

CLIENT INFORMATION		S&W LAB TECHNICIANS		EQUIPMENT USED	
Contact		Mass tare	PMW	Balance (tare)	270
Client	Anchorage Office	Mass wet soil	PMW	Balance (wet)	270
Address		Mass dry soil	PMW	Balance (dry)	270
Email		Calculations	PMW	Oven	333
Phone		Data entry	JKR		

SAMPLE IDENTIFICATION	SPB-2 (1/2")

SOAKING TIME	
BEGINNING OF SOAK TIME	3:00pm
END OF SOAK TIME	2:50pm
TOTAL SOAK TIME (HOURS)	23.8 Hours

SATURATED SURFACE DRY (SSD) SAMPLE MASS	
MASS OF TARE (g)	1611.0
MASS OF TARE AND SSD SAMPLE (g)	3663.9
MASS OF SSD SAMPLE (g)	2052.9

SAMPLE MASS IN WATER	
TEMPERATURE OF WATER (°C)	22.6
MASS OF CONTAINER IN WATER (g)	TARED
MASS OF CONTAINER AND SAMPLE IN WATER (g)	TARED
MASS OF SAMPLE IN WATER (g)	1305.0

DRY SAMPLE MASS	
MASS OF TARE (g)	1611.0
MASS OF TARE AND DRY SAMPLE (1) (g)	3653.3
MASS OF TARE AND DRY SAMPLE (2) (g)	3653.3
MASS OF DRY SAMPLE (g)	2042.3

COARSE AGGREGATE	
COARSE AGGREGATE IN SAMPLE (%)	100.0
SPECIFIC GRAVITY (OVEN-DRY)	2.73
SPECIFIC GRAVITY (SSD)	2.75
APPARENT SPECIFIC GRAVITY	2.77
DENSITY (OVEN-DRY) (pcf)	170.04
DENSITY (SSD) (pcf)	170.92
APPARENT DENSITY (pcf)	172.49
ABSORPTION (%)	0.5

FINE AGGREGATE (IF APPLICABLE)	
FINE AGGREGATE IN SAMPLE (%)	N/A
SPECIFIC GRAVITY OF FINE AGGREGATE	N/A
ABSORPTION OF FINE AGGREGATE (%)	N/A

AVERAGE VALUES (IF APPLICABLE)	
AVERAGE BULK SPECIFIC GRAVITY	N/A
AVERAGE DENSITY (pcf)	N/A
AVERAGE ABSORPTION (%)	N/A

NOTES: Specific gravity (OD) = (mass of dry sample) / [(mass of SSD sample in air) – (mass of SSD sample in water)]
Specific gravity (SSD) = (mass of SSD sample in air) / [(mass of SSD sample in air) – (mass of SSD sample in water)]
Apparent specific gravity = (mass of dry sample) / [(mass of dry sample) – (mass of SSD sample in water)]
*Density (OD) = [62.27 * (mass of dry sample)] / [(mass of SSD sample in air) – (mass of SSD sample in water)]*
*Density (SSD) = [62.27 * (mass of SSD sample in air)] / [(mass of SSD sample in air) – (mass of SSD sample in water)]*
*Absorption = {[(mass of SSD sample in air) – (mass of dry sample)] / (mass of dry sample)} * 100*
FOR AVERAGE SPECIFIC GRAVITY, AVERAGE DENSITY, AND AVERAGE ABSORPTION SEE TEST METHOD

REVIEW BY (initial/date)

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L.A. ABRASION WORKSHEET

PROJECT NO.	102528-004
START/END DATE	9-26-2020/9-29-2020
WORK ORDER	4281
TEST METHOD	*ASTM* C131/C535 *AASHTO* T96

PROJECT NAME/LOCATION	Shotgun Cove Road Aggregate Quality

CLIENT INFORMATION		S&W LAB TECHNICIANS		EQUIPMENT USED	
Contact		Sample wash	PMW	Balance(s)	270
Client	Anchorage Office	Gradation	PMW	LA Abrasion	656
Address		LA Abrasion	PMW	Oven(s)	333
Email		Calculations	PMW	Sieve(s)	1000
Phone		Data entry	IRD		

SAMPLE IDENTIFICATION	SPB-2

SIZE FRACTION		GRADING							SAMPLE MASS
PASSING	RETAINED	A	B	C	D	1	2	3	
3"	2 ½"					2500 ± 50			
2 ½"	2"					2500 ± 50			
2"	1 ½"					5000 ± 50	5000 ± 50		
1 ½"	1"	1250 ± 25					5000 ± 50	5000 ± 50	1253.0g
1"	¾"	1250 ± 25						5000 ± 50	1248.1g
¾"	½"	1250 ± 10	2500 ± 10						1251.3g
½"	⅜"	1250 ± 10	2500 ± 10						1251.3g
⅜"	¼"			2500 ± 10					
¼"	NO. 4			2500 ± 10					
NO. 4	NO. 8				5000 ± 10				
TOTAL MASS (g)		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10	10,000 ± 100	10,000 ± 100	10,000 ± 100	5003.7g
NUMBER OF SPHERES		12	11	8	6	12	12	12	12g
MASS OF SPHERES (g)		5000 ± 25	4584 ± 25	3330 ± 20	2500 ± 15	5000 ± 25	5000 ± 25	5000 ± 25	5015.6g

SPHERE MASS (g)			
416.3g	429.4g	416.8g	416.9g
394.1g	417.3g	433.9g	417.2g
424.1g	418.2g	416.4g	415.0g
TOTAL MASS (g)	5015.6g		

MASS RETAINED ON THE NO. 12 SIEVE (g)	4003.6g
LOSS (g)	1000.1g
PERCENT LOSS	20.0%

NOTES: Sphere masses must be between 390g and 445g each
Sample must be washed before gradation
Sample must be washed after shaking over the No. 12 sieve
Loss = (total mass of sample) – (mass of sample retained on the No. 12 sieve)
Percent loss = (loss) / (total mass of sample)

REVIEW BY (initial/date)

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SULFATE SOUNDNESS WORKSHEET

PROJECT NO.	102528-004
END DATE	10-2-2020
WORK ORDER	4281
TEST METHOD	*ASTM* C88 *AASHTO* T104

PROJECT NAME/LOCATION	Shotgun Cove Road

CLIENT INFORMATION		S&W LAB TECHNICIANS		EQUIPMENT USED	
Contact		Sample prep	PMW	Balance(s)	270
Client	Anchorage Office	Sample cycle	PMW/SLD	Oven(s)	333
Address		Sieving	PMW	Sieve(s)	234
Email		Calculations	PMW		
Phone		Data entry	SLD		

SAMPLE IDENTIFICATION	SPB-2
SULFATE SOLUTION	Magnesium Sulfate

SIEVE SIZE	GRADING OF ORIGINAL SAMPLE (%)	MASS OF TEST FRACTIONS BEFORE TEST (g)		MASS AFTER TEST (g)	PERCENT PASSING DESIGNATED SIEVE AFTER TEST	WEIGHTED PERCENT LOSS
MINUS NO. 100						
NO. 100 TO NO. 50						
NO. 50 TO NO. 30						
NO. 30 TO NO. 16						
NO. 16 TO NO. 8						
NO. 4 TO NO. 8						
3/8" TO NO. 4						
TOTALS						
4" TO 3.5"						
3½" TO 3 "						
3" TO 2 ½"						
2 ½" TO 2"						
2" TO 1½"						
1½" TO 1 "						
1" TO ¾"						
¾" TO ½"		673.7g	1007.4	989.4g	1.8%	1.8%
½" TO 3/8"		333.7g				
NO. 3/8" TO 4"		300.5g		272.9g	9.2%	9.2%

Total Percent Loss = 3%

NOTES: Cycle sample for five days
Dry during the day at 230F

REVIEW BY (initial/date)

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DEGRADATION WORKSHEET

PROJECT NO.	102528-004
START/END DATE	10-1-2020/10-2-2020
WORK ORDER	4281
TEST METHOD	*ATM* T313

PROJECT NAME/LOCATION	Shotgun Cove Road

CLIENT INFORMATION		S&W LAB TECHNICIANS		EQUIPMENT USED	
Contact		Aggregate crushing	IRD	Balance(s)	270
Client	Anchorage Office	Sample weights	PMW	Oven(s)	333
Address		Degradation	SLD	Sieve(s)	115
Email		Calculations	SLD		199
Phone		Data entry	PMW		

SAMPLE IDENTIFICATION	SPB-2

SIEVE SIZE	REQUIRED MASS (g)	SAMPLE MASS (g)
1/2" TO ¼ "	500 ± 1	500.2
¼" TO No.10	500 ± 1	500.2

HEIGHT OF SEDIMENT IN CYLINDER	1.4
DEGRADATION VALUE	78
REQUIRED DEGRADATION VALUE	N/A

NOTES: Aggregate must be crushed prior to testing
Aggregate must be washed and oven dried prior to testing

REVIEW BY (initial/date)

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SPECIFIC GRAVITY WORKSHEET

PROJECT NO.	102528
START/END DATE	9-25-2019/9-26-2019
WORK ORDER	4164
TEST METHOD	*ASTM* C127 *AASHTO* T85

PROJECT NAME/LOCATION	Shotgun Cove Road

CLIENT INFORMATION		S&W LAB TECHNICIANS		EQUIPMENT USED	
Contact	Anchorage Office	Mass tare	PW	Balance (tare)	270
Client		Mass wet soil	PW	Balance (wet)	270
Address		Mass dry soil	PW	Balance (dry)	270
Email		Calculations	PW	Oven	564
Phone		Data entry	PW		

SAMPLE IDENTIFICATION	SCST01

SOAKING TIME	
BEGINNING OF SOAK TIME	8:00 9-25
END OF SOAK TIME	8:23 9-26
TOTAL SOAK TIME (HOURS)	24.4

SATURATED SURFACE DRY (SSD) SAMPLE MASS	
MASS OF TARE (g)	1424.5
MASS OF TARE AND SSD SAMPLE (g)	3441.8
MASS OF SSD SAMPLE (g)	2017.3

SAMPLE MASS IN WATER	
TEMPERATURE OF WATER (°C)	23.0
MASS OF CONTAINER IN WATER (g)	Zeroed
MASS OF CONTAINER AND SAMPLE IN WATER (g)	Zeroed
MASS OF SAMPLE IN WATER (g)	1271.0

DRY SAMPLE MASS	
MASS OF TARE (g)	1615.4
MASS OF TARE AND DRY SAMPLE (1) (g)	3621.9
MASS OF TARE AND DRY SAMPLE (2) (g)	3621.9
MASS OF DRY SAMPLE (g)	2006.5

COARSE AGGREGATE	
COARSE AGGREGATE IN SAMPLE (%)	100
SPECIFIC GRAVITY (OVEN-DRY)	2.69
SPECIFIC GRAVITY (SSD)	2.70
APPARENT SPECIFIC GRAVITY	2.73
DENSITY (OVEN-DRY) (pcf)	167.4
DENSITY (SSD) (pcf)	168.3
APPARENT DENSITY (pcf)	170.0
ABSORPTION (%)	0.54

FINE AGGREGATE (IF APPLICABLE)	
FINE AGGREGATE IN SAMPLE (%)	NA
SPECIFIC GRAVITY OF FINE AGGREGATE	NA
ABSORPTION OF FINE AGGREGATE (%)	NA

AVERAGE VALUES (IF APPLICABLE)	
AVERAGE BULK SPECIFIC GRAVITY	NA
AVERAGE DENSITY (pcf)	NA
AVERAGE ABSORPTION (%)	NA

NOTES: Specific gravity (OD) = (mass of dry sample) / [(mass of SSD sample in air) – (mass of SSD sample in water)]
Specific gravity (SSD) = (mass of SSD sample in air) / [(mass of SSD sample in air) – (mass of SSD sample in water)]
Apparent specific gravity = (mass of dry sample) / [(mass of dry sample) – (mass of SSD sample in water)]
*Density (OD) = [62.27 * (mass of dry sample)] / [(mass of SSD sample in air) – (mass of SSD sample in water)]*
*Density (SSD) = [62.27 * (mass of SSD sample in air)] / [(mass of SSD sample in air) – (mass of SSD sample in water)]*
*Absorption = {[(mass of SSD sample in air) – (mass of dry sample)] / (mass of dry sample)} * 100*
FOR AVERAGE SPECIFIC GRAVITY, AVERAGE DENSITY, AND AVERAGE ABSORPTION SEE TEST METHOD

REVIEW BY (initial/date)
9-26-2019

VERSION 1, JANUARY 2010

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L.A. ABRASION WORKSHEET

PROJECT NO.	102528
START/END DATE	9-21-19/
WORK ORDER	4164
TEST METHOD	*ASTM* C131/C535 *AASHTO* T96

PROJECT NAME/LOCATION	Shotgun Cove Road

CLIENT INFORMATION		S&W LAB TECHNICIANS		EQUIPMENT USED	
Contact	Anchorage Office	Sample wash	SD	Balance(s)	270
Client		Gradation	PW/AW	LA Abrasion	
Address		LA Abrasion	SD	Oven(s)	333/564
Email		Calculations	PW	Sieve(s)	233
Phone		Data entry	PW		

SAMPLE IDENTIFICATION	SCST01

SIZE FRACTION		GRADING							SAMPLE MASS
PASSING	RETAINED	A	B	C	D	1	2	3	
3"	2 ½"					2500 ± 50			
2 ½"	2"					2500 ± 50			
2"	1 ½"					5000 ± 50	5000 ± 50		
1 ½"	1"	1250 ± 25					5000 ± 50	5000 ± 50	1249.6
1"	¾"	1250 ± 25						5000 ± 50	1250.5
¾"	½"	1250 ± 10	2500 ± 10						1250.4
½"	⅜"	1250 ± 10	2500 ± 10						1246.8
⅜"	¼"			2500 ± 10					
¼"	NO. 4			2500 ± 10					
NO. 4	NO. 8				5000 ± 10				
TOTAL MASS (g)		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10	10,000 ± 100	10,000 ± 100	10,000 ± 100	4997.3
NUMBER OF SPHERES		12	11	8	6	12	12	12	12
MASS OF SPHERES (g)		5000 ± 25	4584 ± 25	3330 ± 20	2500 ± 15	5000 ± 25	5000 ± 25	5000 ± 25	4987.6

SPHERE MASS (g)			
434.6	433.8	416.7	416.2
417.1	429.4	423.9	416.3
395.2	417.0	393.2	394.5
TOTAL MASS (g)	4987.6		

MASS RETAINED ON THE NO. 12 SIEVE (g)	3539.9
LOSS (g)	1457.4
PERCENT LOSS	29%

NOTES: Sphere masses must be between 390g and 445g each
Sample must be washed before gradation
Sample must be washed after shaking over the No. 12 sieve
Loss = (total mass of sample) – (mass of sample retained on the No. 12 sieve)
Percent loss = (loss) / (total mass of sample)

REVIEW BY (initial/date)
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SULFATE SOUNDNESS WORKSHEET

PROJECT NO.	102528
START/END DATE	9-12-19
WORK ORDER	4164
TEST METHOD	*ASTM* C88 *AASHTO* T104

PROJECT NAME/LOCATION	Shotgun Cove Road

CLIENT INFORMATION		S&W LAB TECHNICIANS		EQUIPMENT USED	
Contact	Anchorage Office	Sample prep	PW	Balance(s)	270
Client		Sample cycle	PW/SD	Oven(s)	564
Address		Sieving	SD	Sieve(s)	233
Email		Calculations	PW		
Phone		Data entry	PW		

SAMPLE IDENTIFICATION	SCST01
SULFATE SOLUTION	Magnesium

SIEVE SIZE	GRADING OF ORIGINAL SAMPLE (%)	MASS OF TEST FRACTIONS BEFORE TEST (g)	MASS AFTER TEST (g)	PERCENT PASSING DESIGNATED SIEVE AFTER TEST	WEIGHTED PERCENT LOSS
MINUS NO. 100					
NO. 100 TO NO. 50					
NO. 50 TO NO. 30					
NO. 30 TO NO. 16					
NO. 16 TO NO. 8					
NO. 4 TO NO. 8					
3/8" TO NO. 4					
TOTALS					

4" TO 3.5"						
3½" TO 3 "						
3" TO 2 ½"						
2 ½" TO 2"						
2" TO 1½"						
1½" TO 1 "		1002.8		1503.0	0.0	0.0
1" TO ¾"		500.6				
¾" TO ½"						
½" TO 3/8"						
NO. 3/8" TO 4"						

Total Percent Loss = 0%

SIEVE SIZE	PARTICLES EXHIBITING DISTRESS								TOTAL NO. OF PARTICLES BEFORE TEST
	SPLITTING		CRUMBLING		CRACKING		FLAKING		
	NO.	%	NO.	%	NO.	%	NO.	%	
4" TO 3.5"									
3½" TO 3 "									
3" TO 2 ½"									
2 ½" TO 1 ½"									
1 ½"TO ¾"	70	0.0	70	0.0	70	0.0	70	0.0	70

NOTES: Cycle sample for five days
Dry during the day at 230F

REVIEW BY (initial/date)
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DEGRADATION WORKSHEET

PROJECT NO.	102528
START/END DATE	9-23-19/
WORK ORDER	4164
TEST METHOD	*ATM* T313

PROJECT NAME/LOCATION	Shotgun Cove Road

CLIENT INFORMATION		S&W LAB TECHNICIANS		EQUIPMENT USED	
Contact	Anchorage Office	Aggregate crushing	PW/SD/AW	Balance(s)	270
Client		Sample weights	PW/AW	Oven(s)	564
Address		Degradation	SD	Sieve(s)	233
Email		Calculations	PW		
Phone		Data entry	PW		

SAMPLE IDENTIFICATION	SCST01

SIEVE SIZE	REQUIRED MASS (g)	SAMPLE MASS (g)
1/2" TO ¼ "	500 ± 1	500.2
¼" TO No.10	500 ± 1	500.7

HEIGHT OF SEDIMENT IN CYLINDER	0.9
DEGRADATION VALUE	85
REQUIRED DEGRADATION VALUE	

NOTES: Aggregate must be crushed prior to testing
Aggregate must be washed and oven dried prior to testing

REVIEW BY (initial/date)

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SPECIFIC GRAVITY WORKSHEET

PROJECT NO.	102528
START/END DATE	9-25-2019/9-26-2019
WORK ORDER	4164
TEST METHOD	*ASTM* C127 *AASHTO* T85

PROJECT NAME/LOCATION	Shotgun Cove Road

CLIENT INFORMATION		S&W LAB TECHNICIANS		EQUIPMENT USED	
Contact	Anchorage Office	Mass tare	PW	Balance (tare)	270
Client		Mass wet soil	PW	Balance (wet)	270
Address		Mass dry soil	PW	Balance (dry)	270
Email		Calculations	PW	Oven	564
Phone		Data entry	PW		

SAMPLE IDENTIFICATION	SCST12

SOAKING TIME	
BEGINNING OF SOAK TIME	8:00 9-25
END OF SOAK TIME	8:00 9-26
TOTAL SOAK TIME (HOURS)	24.0

SATURATED SURFACE DRY (SSD) SAMPLE MASS	
MASS OF TARE (g)	1543.2
MASS OF TARE AND SSD SAMPLE (g)	3596.2
MASS OF SSD SAMPLE (g)	2053.0

SAMPLE MASS IN WATER	
TEMPERATURE OF WATER (°C)	23.0
MASS OF CONTAINER IN WATER (g)	Zeroed
MASS OF CONTAINER AND SAMPLE IN WATER (g)	Zeroed
MASS OF SAMPLE IN WATER (g)	1299.0

DRY SAMPLE MASS	
MASS OF TARE (g)	1612.6
MASS OF TARE AND DRY SAMPLE (1) (g)	3652.2
MASS OF TARE AND DRY SAMPLE (2) (g)	3652.2
MASS OF DRY SAMPLE (g)	2039.6

COARSE AGGREGATE	
COARSE AGGREGATE IN SAMPLE (%)	100
SPECIFIC GRAVITY (OVEN-DRY)	2.71
SPECIFIC GRAVITY (SSD)	2.72
APPARENT SPECIFIC GRAVITY	2.75
DENSITY (OVEN-DRY) (pcf)	168.4
DENSITY (SSD) (pcf)	169.6
APPARENT DENSITY (pcf)	171.2
ABSORPTION (%)	0.66

FINE AGGREGATE (IF APPLICABLE)	
FINE AGGREGATE IN SAMPLE (%)	NA
SPECIFIC GRAVITY OF FINE AGGREGATE	NA
ABSORPTION OF FINE AGGREGATE (%)	NA

AVERAGE VALUES (IF APPLICABLE)	
AVERAGE BULK SPECIFIC GRAVITY	NA
AVERAGE DENSITY (pcf)	NA
AVERAGE ABSORPTION (%)	NA

NOTES: Specific gravity (OD) = (mass of dry sample) / [(mass of SSD sample in air) – (mass of SSD sample in water)]
Specific gravity (SSD) = (mass of SSD sample in air) / [(mass of SSD sample in air) – (mass of SSD sample in water)]
Apparent specific gravity = (mass of dry sample) / [(mass of dry sample) – (mass of SSD sample in water)]
*Density (OD) = [62.27 * (mass of dry sample)] / [(mass of SSD sample in air) – (mass of SSD sample in water)]*
*Density (SSD) = [62.27 * (mass of SSD sample in air)] / [(mass of SSD sample in air) – (mass of SSD sample in water)]*
*Absorption = {[(mass of SSD sample in air) – (mass of dry sample)] / (mass of dry sample)} * 100*
FOR AVERAGE SPECIFIC GRAVITY, AVERAGE DENSITY, AND AVERAGE ABSORPTION SEE TEST METHOD

REVIEW BY (initial/date)

9-26-2019

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L.A. ABRASION WORKSHEET

PROJECT NO.	102528
START/END DATE	9-21-19/
WORK ORDER	4164
TEST METHOD	*ASTM* C131/C535 *AASHTO* T96

PROJECT NAME/LOCATION	Shotgun Cove Road

CLIENT INFORMATION		S&W LAB TECHNICIANS		EQUIPMENT USED	
Contact		Sample wash	SD	Balance(s)	270
Client	Anchorage Office	Gradation	PW/AW	LA Abrasion	
Address		LA Abrasion	SD	Oven(s)	333/564
Email		Calculations	PW	Sieve(s)	233
Phone		Data entry	PW		

SAMPLE IDENTIFICATION	SCST12

SIZE FRACTION		GRADING							SAMPLE MASS
PASSING	RETAINED	A	B	C	D	1	2	3	
3"	2 ½"					2500 ± 50			
2 ½"	2"					2500 ± 50			
2"	1 ½"					5000 ± 50	5000 ± 50		
1 ½"	1"	1250 ± 25					5000 ± 50	5000 ± 50	1251.6
1"	¾"	1250 ± 25						5000 ± 50	1251.6
¾"	½"	1250 ± 10	2500 ± 10						1251.6
½"	⅜"	1250 ± 10	2500 ± 10						1253.7
⅜"	¼"			2500 ± 10					
¼"	NO. 4			2500 ± 10					
NO. 4	NO. 8				5000 ± 10				
TOTAL MASS (g)		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10	10,000 ± 100	10,000 ± 100	10,000 ± 100	5008.6
NUMBER OF SPHERES		12	11	8	6	12	12	12	12
MASS OF SPHERES (g)		5000 ± 25	4584 ± 25	3330 ± 20	2500 ± 15	5000 ± 25	5000 ± 25	5000 ± 25	4987.6

SPHERE MASS (g)			
434.6	433.8	416.7	416.2
417.1	429.4	423.9	416.3
395.2	417.0	393.2	394.5
TOTAL MASS (g)	4987.6		

MASS RETAINED ON THE NO. 12 SIEVE (g)	3356.3
LOSS (g)	1652.3
PERCENT LOSS	33%

NOTES: Sphere masses must be between 390g and 445g each
Sample must be washed before gradation
Sample must be washed after shaking over the No. 12 sieve
Loss = (total mass of sample) – (mass of sample retained on the No. 12 sieve)
Percent loss = (loss) / (total mass of sample)

REVIEW BY (initial/date)
9-26-2019

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
2355 HILL ROAD, FAIRBANKS, ALASKA 99709 (907) 479-0600

SULFATE SOUNDNESS WORKSHEET

PROJECT NO.	102528
START/END DATE	9-12-19
WORK ORDER	4164
TEST METHOD	*ASTM* C88 *AASHTO* T104

PROJECT NAME/LOCATION	Shotgun Cove Road

CLIENT INFORMATION		S&W LAB TECHNICIANS		EQUIPMENT USED	
Contact	Anchorage Office	Sample prep	PW	Balance(s)	270
Client		Sample cycle	PW/SD	Oven(s)	564
Address		Sieving	SD	Sieve(s)	233
Email		Calculations	PW		
Phone		Data entry	PW		

SAMPLE IDENTIFICATION	SCST02
SULFATE SOLUTION	Magnesium

SIEVE SIZE	GRADING OF ORIGINAL SAMPLE (%)	MASS OF TEST FRACTIONS BEFORE TEST (g)	MASS AFTER TEST (g)	PERCENT PASSING DESIGNATED SIEVE AFTER TEST	WEIGHTED PERCENT LOSS
MINUS NO. 100					
NO. 100 TO NO. 50					
NO. 50 TO NO. 30					
NO. 30 TO NO. 16					
NO. 16 TO NO. 8					
NO. 4 TO NO. 8					
3/8" TO NO. 4					
TOTALS					

4" TO 3.5"						
3½" TO 3 "						
3" TO 2 ½"						
2 ½" TO 2"						
2" TO 1½"						
1½" TO 1 "		1003.0	1504.6	1503.5	0.0	0.0
1" TO ¾"		501.6				
¾" TO ½"					Total Percent Loss = 0%	
½" TO 3/8"						
NO. 3/8" TO 4"						

SIEVE SIZE	PARTICLES EXHIBITING DISTRESS								TOTAL NO. OF PARTICLES BEFORE TEST
	SPLITTING		CRUMBLING		CRACKING		FLAKING		
	NO.	%	NO.	%	NO.	%	NO.	%	
4" TO 3.5"									
3½" TO 3 "									
3" TO 2 ½"									
2 ½" TO 1 ½"									
1 ½"TO ¾"	74	0.0	74	0.0	74	0.0	74	0.0	74

NOTES: Cycle sample for five days
Dry during the day at 230F

REVIEW BY (initial/date)

9-26-2019

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
2355 HILL ROAD, FAIRBANKS, ALASKA 99709 (907) 479-0600

DEGRADATION WORKSHEET

PROJECT NO.	102528
START/END DATE	9-23-19/
WORK ORDER	4164
TEST METHOD	*ATM* T313

PROJECT NAME/LOCATION	Shotgun Cove Road

CLIENT INFORMATION		S&W LAB TECHNICIANS		EQUIPMENT USED	
Contact	Anchorage Office	Aggregate crushing	PW/SD/AW	Balance(s)	270
Client		Sample weights	PW/AW	Oven(s)	564
Address		Degradation	SD	Sieve(s)	233
Email		Calculations	PW		
Phone		Data entry	PW		

SAMPLE IDENTIFICATION	SCST12

SIEVE SIZE	REQUIRED MASS (g)	SAMPLE MASS (g)
1/2" TO ¼ "	500 ± 1	500.3
¼" TO No.10	500 ± 1	500.4

HEIGHT OF SEDIMENT IN CYLINDER	2.3
DEGRADATION VALUE	67
REQUIRED DEGRADATION VALUE	

NOTES: Aggregate must be crushed prior to testing
Aggregate must be washed and oven dried prior to testing

REVIEW BY (initial/date)

9-26-2019

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
2355 HILL ROAD, FAIRBANKS, ALASKA 99709 (907) 479-0600

SPECIFIC GRAVITY WORKSHEET

PROJECT NO.	102528-001
START/END DATE	2-25-2021/3-2-2021
WORK ORDER	4304
TEST METHOD	*ASTM* C127 *AASHTO* T85

PROJECT NAME/LOCATION	Shotgun Cove Road

CLIENT INFORMATION		S&W LAB TECHNICIANS		EQUIPMENT USED	
Contact	Katra Wedeking	Mass tare	PMW	Balance (tare)	270
Client	Shannon & Wilson, Inc.- Anc.	Mass wet soil	PMW	Balance (wet)	699
Address		Mass dry soil	PMW	Balance (dry)	270
Email		Calculations	PMW	Oven	564
		Data entry	PMW		

SAMPLE IDENTIFICATION	Boring B-1 (Box 3, 4, 5)- ½" Crushed Rock

SOAKING TIME	
BEGINNING OF SOAK TIME	8:15am
END OF SOAK TIME	9:00am
TOTAL SOAK TIME (HOURS)	23.75

SATURATED SURFACE DRY (SSD) SAMPLE MASS	
MASS OF TARE (g)	1632.5
MASS OF TARE AND SSD SAMPLE (g)	3688.1
MASS OF SSD SAMPLE (g)	2055.6

SAMPLE MASS IN WATER	
TEMPERATURE OF WATER (C)	22.8
MASS OF CONTAINER IN WATER (g)	1255.0
MASS OF CONTAINER AND SAMPLE IN WATER (g)	2557.0
MASS OF SAMPLE IN WATER (g)	1302.0

DRY SAMPLE MASS	
MASS OF TARE (g)	1632.5
MASS OF TARE AND DRY SAMPLE (1) (g)	3675.5
MASS OF TARE AND DRY SAMPLE (2) (g)	3675.5
MASS OF DRY SAMPLE (g)	2043.0

COARSE AGGREGATE	
COARSE AGGREGATE IN SAMPLE (%)	100.0
SPECIFIC GRAVITY (OVEN-DRY)	2.71
SPECIFIC GRAVITY (SSD)	2.73
APPARENT SPECIFIC GRAVITY	2.76
DENSITY (OVEN-DRY) (pcf)	168.81
DENSITY (SSD) (pcf)	169.87
APPARENT DENSITY (pcf)	171.67
ABSORPTION (%)	0.6

FINE AGGREGATE (IF APPLICABLE)	
FINE AGGREGATE IN SAMPLE (%)	N/A
SPECIFIC GRAVITY OF FINE AGGREGATE	N/A
ABSORPTION OF FINE AGGREGATE (%)	N/A

AVERAGE VALUES (IF APPLICABLE)	
AVERAGE BULK SPECIFIC GRAVITY	N/A
AVERAGE DENSITY (pcf)	N/A
AVERAGE ABSORPTION (%)	N/A

NOTES: Specific gravity (OD) = (mass of dry sample) / [(mass of SSD sample in air) – (mass of SSD sample in water)]
Specific gravity (SSD) = (mass of SSD sample in air) / [(mass of SSD sample in air) – (mass of SSD sample in water)]
Apparent specific gravity = (mass of dry sample) / [(mass of dry sample) – (mass of SSD sample in water)]
*Density (OD) = [62.27 * (mass of dry sample)] / [(mass of SSD sample in air) – (mass of SSD sample in water)]*
*Density (SSD) = [62.27 * (mass of SSD sample in air)] / [(mass of SSD sample in air) – (mass of SSD sample in water)]*
*Absorption = {[(mass of SSD sample in air) – (mass of dry sample)] / (mass of dry sample)} * 100*
FOR AVERAGE SPECIFIC GRAVITY, AVERAGE DENSITY, AND AVERAGE ABSORPTION SEE TEST METHOD

REVIEW BY (initial/date)

VERSION 1, JANUARY 2010

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
2355 HILL ROAD, FAIRBANKS, ALASKA 99709 (907) 479-0600

L.A. ABRASION WORKSHEET

PROJECT NO.	102528-002
START/END DATE	2-27-2021/3-3-2021
WORK ORDER	4304
TEST METHOD	*ASTM* C131/C535 *AASHTO* T96

PROJECT NAME/LOCATION	Shotgun Cove Road

CLIENT INFORMATION		S&W LAB TECHNICIANS		EQUIPMENT USED	
Contact	Katra Wedeking	Sample wash	PMW	Balance(s)	270
Client	Shannon & Wilson- Anchorage	Gradation	PMW	LA Abrasion	656
Address		LA Abrasion	PMW	Oven(s)	33
Email		Calculations	PMW	Sieve(s)	1000
Phone		Data entry	PMW		

SAMPLE IDENTIFICATION	Boring B-1, Boxes 3,4,5

SIZE FRACTION		GRADING							SAMPLE MASS
PASSING	RETAINED	A	B	C	D	1	2	3	
3"	2 ½"					2500 ± 50			
2 ½"	2"					2500 ± 50			
2"	1 ½"					5000 ± 50	5000 ± 50		
1 ½"	1"	1250 ± 25					5000 ± 50	5000 ± 50	1251.6
1"	¾"	1250 ± 25						5000 ± 50	1251.5
¾"	½"	1250 ± 10	2500 ± 10						1247.1
½"	⅜"	1250 ± 10	2500 ± 10						1250.1
⅜"	¼"			2500 ± 10					
¼"	NO. 4			2500 ± 10					
NO. 4	NO. 8				5000 ± 10				
TOTAL MASS (g)		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10	10,000 ± 100	10,000 ± 100	10,000 ± 100	5000.3
NUMBER OF SPHERES		12	11	8	6	12	12	12	12
MASS OF SPHERES (g)		5000 ± 25	4584 ± 25	3330 ± 20	2500 ± 15	5000 ± 25	5000 ± 25	5000 ± 25	4992.6

SPHERE MASS (g)			
429.2	433.5	416.9	393.5
416.1	416.5	416.8	423.6
418.0	394.5	418.1	415.9
TOTAL MASS (g)	4992.6		

MASS RETAINED ON THE NO. 12 SIEVE (g)	4090.2
LOSS (g)	910.1
PERCENT LOSS	18.2%

NOTES: Sphere masses must be between 390g and 445g each
Sample must be washed before gradation
Sample must be washed after shaking over the No. 12 sieve
Loss = (total mass of sample) – (mass of sample retained on the No. 12 sieve)
Percent loss = (loss) / (total mass of sample)

REVIEW BY (initial/date)

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
2355 HILL ROAD, FAIRBANKS, ALASKA 99709 (907) 479-0600

SULFATE SOUNDNESS WORKSHEET

PROJECT NO.	102528-002
START/END DATE	2-23-2021/3-3-2021
WORK ORDER	4304
TEST METHOD	*ASTM* C88 *AASHTO* T104

PROJECT NAME/LOCATION	Shotgun Cove Road

CLIENT INFORMATION		S&W LAB TECHNICIANS		EQUIPMENT USED	
Contact	Katra Wedeking	Sample prep	PMW	Balance(s)	270
Client	Shannon & Wilson, Inc.-Anchorage	Sample cycle	PMW	Oven(s)	564
Address		Sieving	PMW	Sieve(s)	1000
Email		Calculations	PMW		
Phone		Data entry	PMW		

SAMPLE IDENTIFICATION	Boring B-1 Boxes 3,4,5
SULFATE SOLUTION	Magnesium Sulfate (MgSO4)

SIEVE SIZE	GRADING OF ORIGINAL SAMPLE (%)	MASS OF TEST FRACTIONS BEFORE TEST (g)		MASS AFTER TEST (g)	PERCENT PASSING DESIGNATED SIEVE AFTER TEST	WEIGHTED PERCENT LOSS
MINUS NO. 100						
NO. 100 TO NO. 50						
NO. 50 TO NO. 30						
NO. 30 TO NO. 16						
NO. 16 TO NO. 8						
NO. 4 TO NO. 8						
3/8" TO NO. 4						
TOTALS						
4" TO 3.5"						
3½" TO 3 "						
3" TO 2 ½"						
2 ½" TO 2"						
2" TO 1½"						
1½" TO 1 "						
1" TO ¾"						
¾" TO ½"		669.6	999.6	668.1 / 326.2= 994.3	0.5%	
½" TO 3/8"		330.0				
NO. 3/8" TO 4"		300.3		298.5	0.6%	

Total Percent Loss = 1%

NOTES: Cycle sample for five days
Dry during the day at 230F

REVIEW BY (initial/date)

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
2355 HILL ROAD, FAIRBANKS, ALASKA 99709 (907) 479-0600

DEGRADATION WORKSHEET

PROJECT NO.	102528-002
START/END DATE	3-3-2021/3-4-2021
WORK ORDER	4304
TEST METHOD	*ATM* T313

PROJECT NAME/LOCATION	Shotgun Cove Road

CLIENT INFORMATION		S&W LAB TECHNICIANS		EQUIPMENT USED	
Contact	Katra Wedeking	Aggregate crushing	PMW	Balance(s)	270
Client	Shannon & Wilson, Inc.-Anc.	Sample weights	PMW	Oven(s)	564
Address		Degradation	PMW	Sieve(s)	1000
Email		Calculations	PMW		
Phone		Data entry	PMW		

SAMPLE IDENTIFICATION	Boring B-1 Boxes 3, 4, 5

SIEVE SIZE	REQUIRED MASS (g)	SAMPLE MASS (g)
1/2" TO ¼ "	500 ± 1	500.0
¼" TO No.10	500 ± 1	500.0

HEIGHT OF SEDIMENT IN CYLINDER	1.3"
DEGRADATION VALUE	79
REQUIRED DEGRADATION VALUE	N/A

NOTES: Aggregate must be crushed prior to testing
Aggregate must be washed and oven dried prior to testing

REVIEW BY (initial/date)

9101 Vanguard Drive
Anchorage, AK 99507
T: 907.522.1707
F: 907.522.3403
www.rmconsult.com

Material Test Report

Report No: MAT:ANC-W1692-S1
Issue No: 1
This report replaces all previous issues of report no 'MAT:ANC-W1692-S1'.

Client: Shannon & Wilson, Inc. **CC:**

5430 Fairbanks Street, Suite #3
Anchorage AK 99518

Project: S&W Shotgun Cove Road

AASHTO R18

Reviewed By: Ryan McCormick (Supervising Laboratory Technician)
Date of Issue: 9/23/2020

Sample Details

Sample ID	ANC-W1692-S1
Field Sample ID	SPB-2 & SPB-3
Date Sampled	9/18/2020
Source	Client Provided
Material	Client Provided Aggregate
Specification	Project Specific
Sampling Method	Client Provided Material
Sampling Location	Client provided material for Nordic Abrasion testing
Bore Hole	n/a
Depth	n/a

Other Test Results

Description	Method	Result	Limits
Abrasion Value 1	ATM 312	20.7	
Abrasion Value 2		20.8	
Abrasion Value 3		20.8	
Average Abrasion		20.8	

Particle Size Distribution

Chart

Comments

N/A

Laboratory Test Results Lab # 248-2020

R & M Consultants, Inc.
9101 Vanguard Dr., Anchorage, AK 99507, (907) 522-1707, Fax (907) 533-3403

AMRL Lab #793

Client & Sample Information

Field #: SCNA-1

Client: Shannon & Wilson
Client Address: Anchorage, AK
Project: Shotgun Cove Road
Material/Use: Nordic Abration Testing
Test Location: n/a
Sampled From: n/a
Sampled By: Client
Date Sampled: n/a
Source: n/a
Depth: n/a
Quantity Rep: n/a
PO Number:

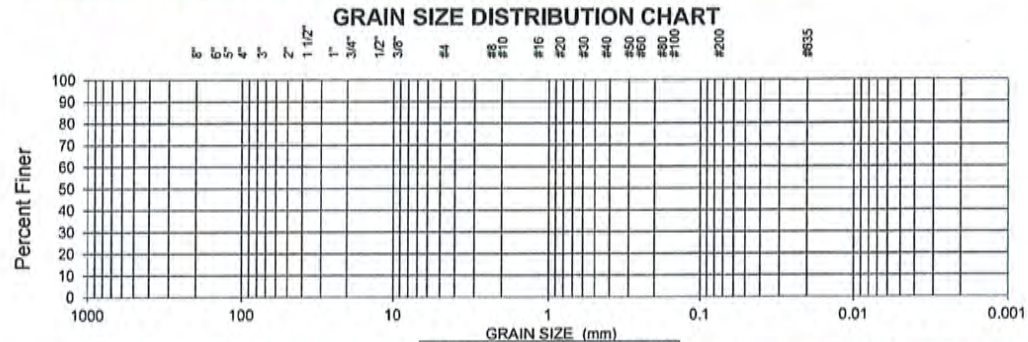
Laboratory Sample Data

Received By: RJM
Date Received: Oct-2020
Tech Assigned: Lab Staff
R&M Project No: 2867.01
Lab No: 248-2020
Date Completed: 11/3/2020

Aggregate & Soils Classification, Atterberg, SpG, etc.

Grain Size Distribution			
Sieve	Indv. % Ret.	Cum. % Pass	Spec.
6"			
5"			
4"			
3"			
2 1/2"			
2"			
1 1/2"			
1 1/4"			
1"			
3/4"			
5/8"			
1/2"			
3/8"			
5/16"			
1/4"			
#4			
#5			
#6			
#8			
#10			
#12			
#16			
#20			
#30			
#40			
#50			
#60			
#70			
#80			
#100			
#140			
#200			
.02mm			
.005mm			
.002mm			
.001mm			
Fineness Modulus:			

R&M performs sieve analyses using one or more of the following test methods (whichever apply): **P200 Wash:** ASTM-C117 or D1140 or AASHTO-T11; **Standard Gradation Only:** ASTM-C136 or AASHTO-T27 or T88; **Gradation w/ Hydrometer:** ASTM-D422 or ATM T-1; **Sieve Analysis of Mineral filler for Asphalt:** ASTM-D546 or AASHTO-T37; **Sieve Analysis of Extracted Aggregate:** ASTM-D5444 or AASHTO-T30



ASTM-USCS Classification

Boulders	Cobbles	Gravel		Sand			Silt Clay		
		Coarse	Fine	Coarse	Medium	Fine	Silt Clay	Silt Size[1]	C.S.[2]

[1]ASTM D653 defines "Silt Size" as soil finer than .02mm and coarser than .002mm; [2]ASTM D653 defines "Clay Size" as soil finer than .002mm

USCS % Boulders & Cobbles	USCS % Gravel	USCS % Sand	USCS % Silt Clay	USCS Classification	AASHTO % Boulders & Cobbles	AASHTO % Gravel	AASHTO % Sand	AASHTO % Silt Clay	AASHTO Classification

Note: The USCS (ASTM) and AASHTO classifications were determined using the following test methods, respectively: ASTM-D2487 and AASHTO-M145.
For both USCS and AASHTO: % boulders & cobbles is based on the original field sample; % gravel, sand and silt clay are based on only minus 3 inch material.

Test Methods used are as follows:
D_{100}, D_{60}, D_{30}, D_{10}, C_C, C_U- ASTM D2487
Atterberg Limits- ASTM D421, D2217, D4318 or AASHTO T87, T89, T90, T146;
Specific Gravity- ASTM C127, C128, D854 or AASHTO T84, T85, or T100;
Fineness Modulus - ASTM C136 or AASHTO T27

Chart for Coefficients of Curvature and Uniformity					
D_{100}	D_{60}	D_{30}	D_{10}	C_C	C_U

Note: D100 = particle diameter (mm) corresponding to 100% finer on the particle-size distribution curve. Similarly, D60, D30 and D10 = particle diameter (mm) corresponding to 60, 30 or 10% finer on the particle-size distribution curve, respectively. These values may have been obtained through interpolation or extrapolation. These values are based on only the minus 3-inch material.

Atterberg Limits			
Prep:	Wet	Dry	Spec.
LL			
PL			
PI			

Specific Gravity					
Coarse			Fine		
	Actual	Spec.		Actual	Spec.
Bulk:			Bulk:		
Bulk SSD:			Bulk SSD:		
Apparent:			Apparent:		
Absorption:			Absorption:		

More Test Results on the Following Page →

Laboratory Test Results Lab # 248-2020

R&M Consultants, Inc.
9101 Vanguard Dr., Anchorage, AK 99507, (907) 522-1707, Fax (907) 533-3403

Density, Moisture, Unit Weight, etc.

Field #: SCNA-1

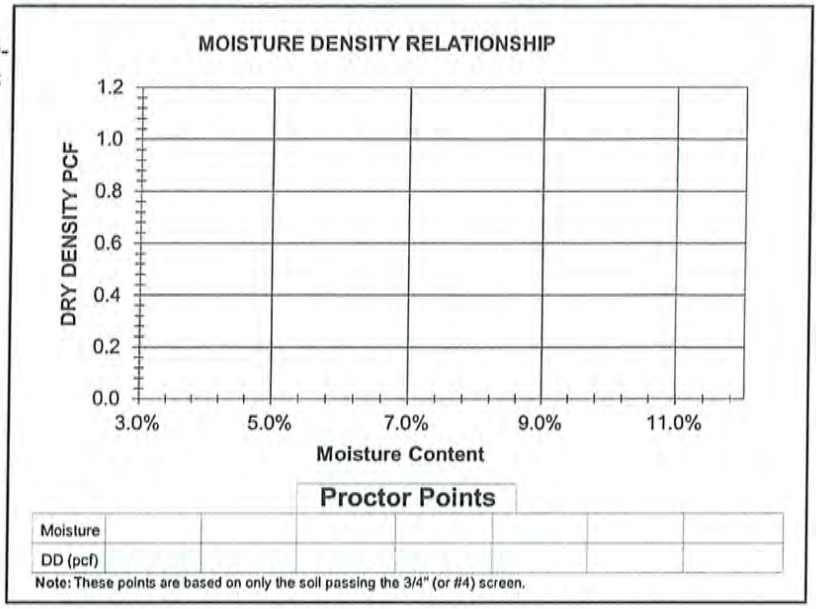
R&M uses the following methods for these tests: **Proctor:** ASTM-D698 or D1557 or D4718 or AASHTO-T99 or T180 or T224 or T272; **Moisture:** ASTM-C566 or D2216 or AASHTO-T217 or T255 or T265; **Unit Weight of Aggregate:** ASTM-C29 or AASHTO-T19; **Brass Liner Dry Density:** ASTM-D2937

Density (BLDD/Proctor)
Natural Density(BLDD)
Max Dry Density
Corr. Max Density

Moisture
Natural Moisture
Optimum Moisture
Corr. Opt. Moisture

Density - Vibratory Table (D4253)	
Maximum Index Density:	

Unit Weight			
Weight Loose:		Weight Rodded:	



Proctor Points

Moisture							
DD (pcf)							

Note: These points are based on only the soil passing the 3/4" (or #4) screen.

Aggregate Quality (Degradation, LA Abrasion, Sodium Sulfate)

R&M performs aggregate quality tests using the following methods (whichever apply): **Degradation:** ATM-T13; **LA Abrasion:** ASTM-C131 or C535 or AASHTO-T96; **Sodium Sulfate:** ASTM-C88 or AASHTO-T104

	Reading	D-Value	Spec.
ATM Deg.			

	Grading	% Loss	Spec.
LA Abrasion			

	Fine	Spec.	Coarse	Spec.
Sodium Sulfate				

Fracture, SE, Organic, pH, Friable Particles, etc.

Test Methods Used are as follows: **Sand Equivalent:** ASTM-D2419 or AASHTO T176; **Organic Content:** ASTM-D2974 or AASHTO-T267; **pH Level:** ASTM-D4972 or AASHTO T-289 or ATM-T29; **Friable Particles:** ASTM-C142 or AASHTO-T112; **Uncompacted Voids:** ASTM-C1252 or AASHTO-T304; **Permeability:** ASTM-D2434 or AASHTO-T215

	Actual	Spec.
Sand Equivalent Value:		
Organic Content:		
pH in H_2O:		
pH in $CaCl_2$:		
Friable Particles:		
Uncompacted Voids:		
Nordic Abrasion	See	Remarks

Fracture Count				
Size	1 Face	Spec.	2 Face	Spec.
+ 1"				
1" - 3/4"				
3/4" - 3/8"				
3/8" - #4				
#4 - #10				
Combined				

ASTM DESCRIPTION:

REMARKS: ATM 312 Nordic Abrasion Resutls = Sample #1 =19.0, Sample #2 = 18.2, Sample #3 = 22.3, Ave. Value = 19.8

Checked By:

Signed By: Ryan J. McCormick

Ryan J. McCormick, Laboratory Supervisor - Materials Lab

More Test Results on the Previous Page

Unconfined Compression Testing - Results Summary
For Axial Tests - US Units

Project	Shotgun Cove Road Extension	Tested by/date	RTH	2/3/2020
Location	Whittier, Alaska	Calculated by/date	SKD	2/3/2020
Job No.	102528-002	Checked by/date	SKD	2/3/2020
File	102528-002 D7012	Procedure	ASTM D7012-14	

Boring Number	Run Number	Depth (feet)	Diameter (in)	Failure Load (pounds)	Qu (psi)	Bulk Unit Weight (pcf)
B-1	10	12.9-13.6	1.769	9990	4065	171.3
B-1	13	25.0-25.7	1.772	35890	14553	169.4
B-1	16	33.5-35.4	1.774	68250	27612	170.9
B-2	5	14.5-15.1	1.762	1150	471.6	172.0
B-2	8	22.0-23.1	1.766	15640	6385	172.3
B-2	13	33.3-34.2	1.766	50210	20498	171.0
B-2	15	43.1-44.4	1.767	44100	17984	170.4
B-3	5	25.5-25.9	1.771	8940	3629	171.7

Moisture Content Of Samples At Testing = Laboratory Air Dry

Qu Test Photographs

Project Shotgun Cove Road Extension
Location Whittier, Alaska
Job No. 102528-002

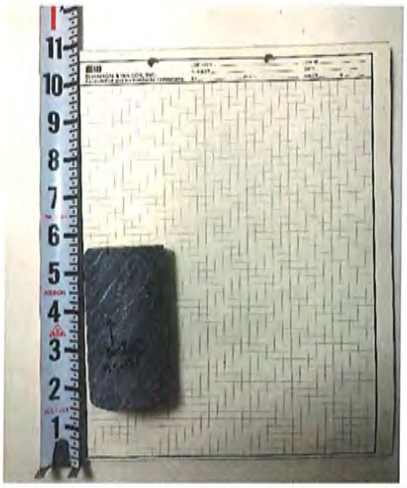
Boring Number	B-1
Run Number	10
Depth (feet)	12.9-13.6

Boring Number	B-1
Run Number	13
Depth (feet)	25.0-25.7

Qu Test Photographs

Project	Shotgun Cove Road Extension
Location	Whittier, Alaska
Job No.	102528-002

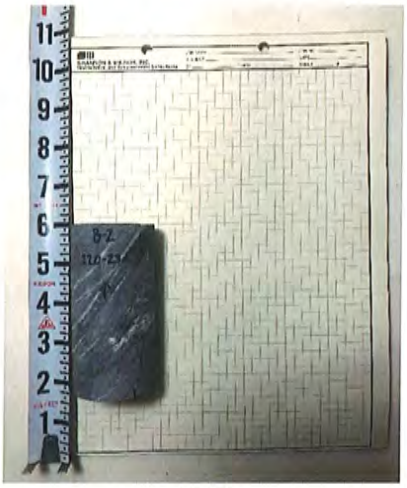
Boring Number	B-1
Run Number	16
Depth (feet)	33.5-35.4



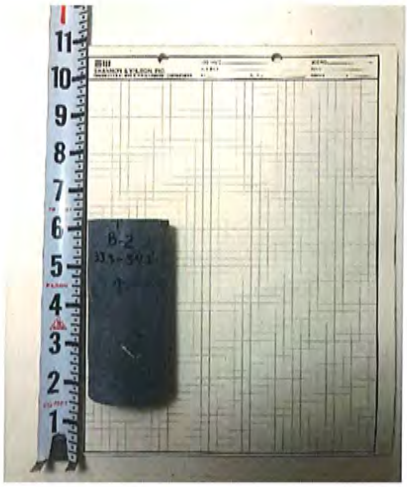
Boring Number	B-2
Run Number	5
Depth (feet)	14.5-15.1

Qu Test Photographs

Project Shotgun Cove Road Extension
Location Whittier, Alaska
Job No. 102528-002



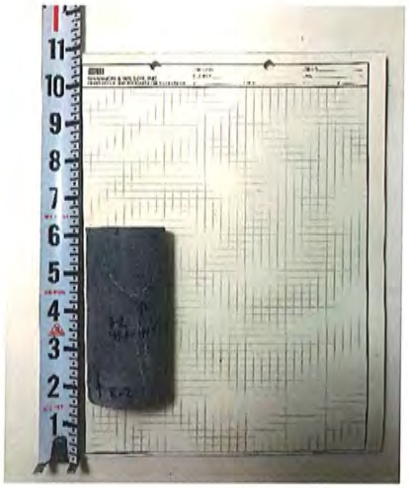
Boring Number	B-2
Run Number	8
Depth (feet)	22.0-23.1



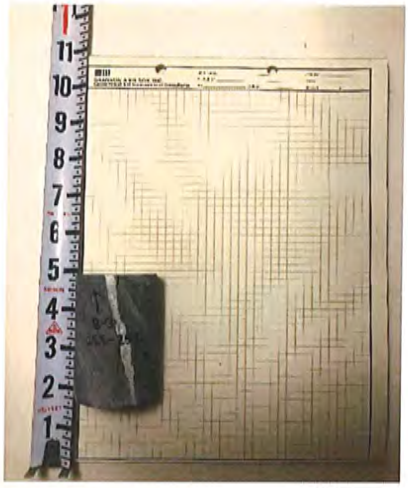
Boring Number	B-2
Run Number	13
Depth (feet)	33.3-34.2

Qu Test Photographs

Project	Shotgun Cove Road Extension
Location	Whittier, Alaska
Job No.	102528-002



Boring Number	B-2
Run Number	15
Depth (feet)	43.1-44.4



Boring Number	B-3
Run Number	5
Depth (feet)	25.5-25.9

Point Load Test Results Summary - US Units

Project	Shotgun Cove Road Extension
Location	Whittier, Alaska
Job No.	102528-002
File	102528-002 D5731

Tested By / Date:	LNL	12/28/20
Calculated By / Date:	CMB	12/28/20
Checked By / Date:	CMB	12/28/20
Procedure	ASTM D5731	

Boring Number	Run Number	Depth (feet)	Test Type	Diameter (D), in	Corr. Dia. (D'), in	D_e^2, in^2	Load (P), lbs.	I_s, psi	$I_{s(50)}$, psi	S_c, psi*	Penetration Data, in		
											Starting	Ending	Total
B-1	--	4.6	d //	1.81	1.65	2.99	2571	859	810	12127	1.81	1.65	0.16
B-1	--	12.5	d //	1.81	1.42	2.57	4975	1938	1767	27291	1.81	1.42	0.39
B-1	--	20.0	d //	1.81	1.65	2.99	1957	653	617	9227	1.81	1.65	0.16
B-1	--	22.6	d //	1.81	1.69	3.07	3019	985	934	13912	1.81	1.69	0.12
B-1	--	35.3	d //	1.81	1.69	3.07	3354	1094	1038	15458	1.81	1.69	0.12
B-1	--	39.0	d //	1.81	1.46	2.64	7155	2712	2487	38208	1.81	1.46	0.35
B-2	--	10.7	d //	1.81	1.69	3.07	2795	912	865	12881	1.81	1.69	0.12
B-2	--	15.6	d //	1.81	1.50	2.71	3130	1155	1066	16284	1.81	1.50	0.31
B-2	--	20.4	d //	1.81	1.73	3.14	839	267	255	3779	1.81	1.73	0.08
B-2	--	27.0	d //	1.81	1.65	2.99	4025	1344	1268	18981	1.81	1.65	0.16
B-2	--	29.3	d //	1.81	1.69	3.07	5478	1787	1695	25248	1.81	1.69	0.12
B-2	--	35.9	d //	1.81	1.65	2.99	3969	1325	1251	18718	1.81	1.65	0.16
B-2	--	44.9	d //	1.81	1.65	2.99	4416	1475	1392	20827	1.81	1.65	0.16
B-3	--	29.3	d //	1.81	1.38	2.50	6596	2643	2394	37198	1.81	1.38	0.43
B-3	--	30.3	d //	1.81	1.73	3.14	1733	552	527	7809	1.81	1.73	0.08

d = diametral

// = parallel to rock core

* = Uniaxial Compressive Strength calculated using an extrapolated K value from TABLE 1 in test method.

Moisture Content Of Samples At Testing = Laboratory Air Dry

Statistics	
Mean $I_{s(2)\,//}$	1224
$I_{a(2)}$	10

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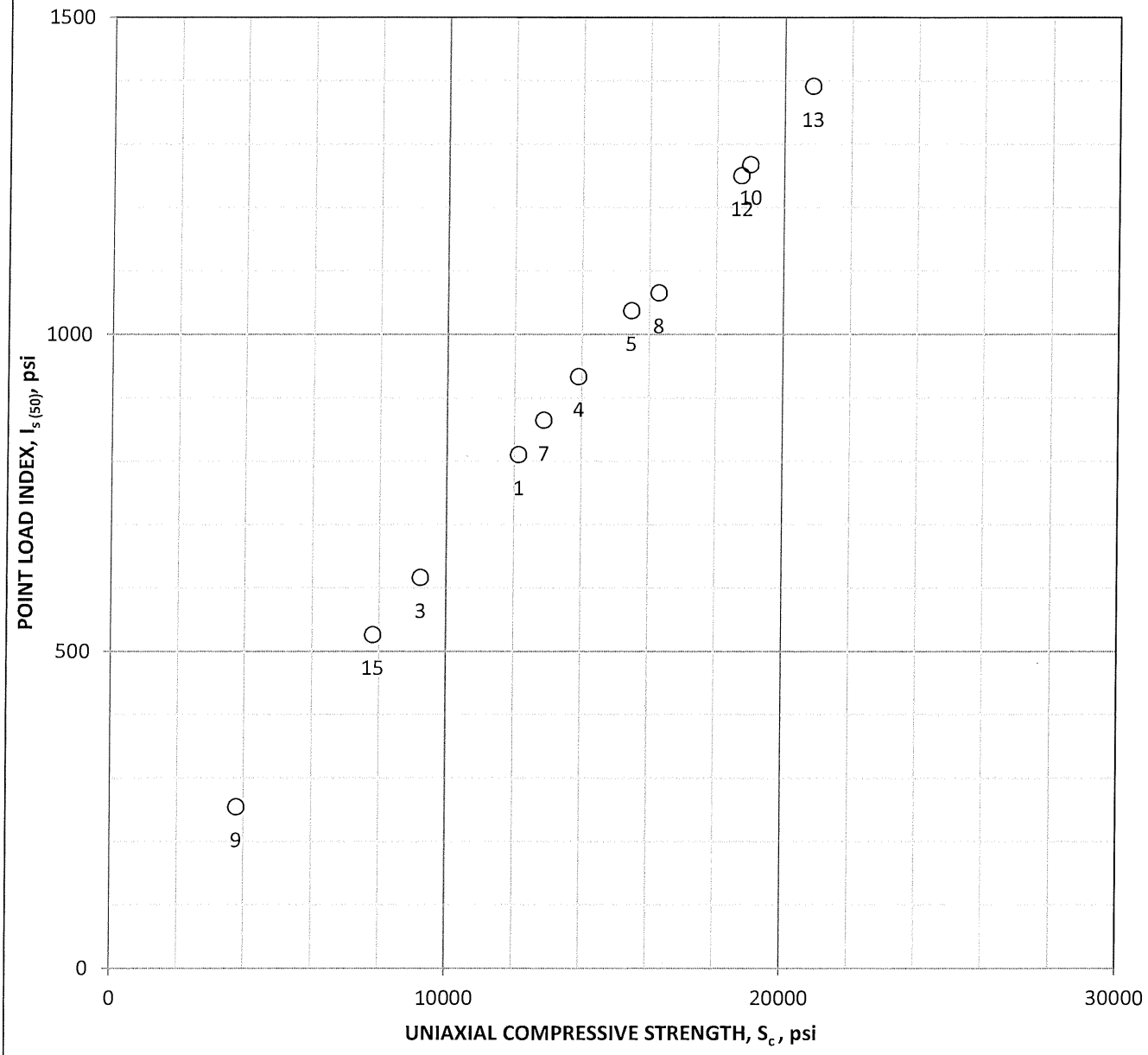
St. Louis, MO 63146

Point Load Index vs. Uniaxial Strength



Test	Run	S_c, psi	$I_{s(50)}$, psi	Test	Run	S_c, psi	$I_{s(50)}$, psi
1	--	12127	810	10	--	18981	1268
2	--	27291	1767	11	--	25248	1695
3	--	9227	617	12	--	18718	1251
4	--	13912	934	13	--	20827	1392
5	--	15458	1038	14	--	37198	2394
6	--	38208	2487	15	--	7809	527
7	--	12881	865				
8	--	16284	1066				
9	--	3779	255				

Shotgun Cove Road Extension
Whittier, Alaska

Point Load Test Results
Borings B-1, B-2, B-3

March 2021 102528-003

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. B-3

Point Load Test Photographs

Project Shotgun Cove Road Extension
Location Whittier, Alaska
Job No. 102528-002

Boring Number B-1
Run Number --
Depth (ft.) 4.6

Boring Number B-1
Run Number --
Depth (ft.) 12.5

Boring Number B-1
Run Number --
Depth (ft.) 20

Boring Number B-1
Run Number --
Depth (ft.) 22.6

Point Load Test Photographs

Project Shotgun Cove Road Extension
Location Whittier, Alaska
Job No. 102528-002

Boring Number B-1
Run Number --
Depth (ft.) 35.3

Boring Number B-1
Run Number --
Depth (ft.) 39

Boring Number B-2
Run Number --
Depth (ft.) 10.7

Boring Number B-2
Run Number --
Depth (ft.) 15.6

Point Load Test Photographs

Project Shotgun Cove Road Extension
Location Whittier, Alaska
Job No. 102528-002

Boring Number B-2
Run Number --
Depth (ft.) 20.4

Boring Number B-2
Run Number --
Depth (ft.) 27

Boring Number B-2
Run Number --
Depth (ft.) 29.3

Boring Number B-2
Run Number --
Depth (ft.) 35.9

Point Load Test Photographs

Project Shotgun Cove Road Extension
Location Whittier, Alaska
Job No. 102528-002

Boring Number B-2
Run Number --
Depth (ft.) 44.9

Boring Number B-3
Run Number --
Depth (ft.) 29.3

Boring Number B-3
Run Number --
Depth (ft.) 30.3

APPENDIX C: KINEMATIC ANALYSIS RESULTS

Appendix C

Kinematic Analysis Results

Table C-1 : Bedrock Structure Measurements

Cell ID	Discontinuity	Avg Dip (degrees)*	Min Dip (degrees)*	Dip Direction (degrees)**	Persistence					Spacing			Max Length (feet)	Aperature (inches)	Joint Filling	Joint Roughness	Water	Remarks
					L1 (feet)	L2 (feet)	Nt	Nc	Ψ	Min (feet)	Max (feet)	Avg (feet)						
SCST1	Slope Face	78		272														defined by foliation, 1.5 to 2 feet overburden
	JS	69	54	165	10	12	0	5	74	1	4	2	9	0-1/16	None	S	D	
	JS	15	10	89	18	6	0	8	0	6	12	8	15	0	None	S	D	
	JS	78	77	168	3	10	0	7	80	0.08	1	0.5	6.5	0-1/16	None	S	D	
	SJ		76	212				1	85				5	0	Calcite	S	D	
SCST2	Slope Face	79		218														2 to 3 feet overburden
	FO	72	70	146	12	6	>50	0	72	tiny	0.2	tiny	6	0	None	S	D	
	JS	80	69	154	12	6	0	32	85	0.0	0.8	0.3	4	1/8-1	Quartz	S	D	crosscutting Quartz veins
	JS	78	77	152	12	6	3	1	-	0.3	1.3	0.7	6	0-1/4	None	S/M	D	defines face
SCST3	Slope Face	63		284														foliation variable, not as strong here; 2-2.5 feet overburden
	JS	81	80	202	50	18	2	18	85	1	3	2	18	0-1/16	None	S	D	
	JS	28	25	71	50	18	0	8	20	1.5	3	2.5	25	0-2	None	S	W	2 inch aperture anomaly, erosion?
	JS	46	46	125	35	15	0	6	18	0.3	4	2	20	1/16	Quartz/Calcite	S	D	
	JS	36	36	164	12	12	0	5	31	0.3	2	1.5	10	1/16	Quartz/Calcite	S	D	
	SJ	58	-	161	6	6	0	1	40	-	-	-	8	1/16	Quartz/Calcite	S	D	
SCST4	Slope Face	30		296														Isolated outcrop at approx Station 310+30
	BJ	67		274						0.2	0.7							
SCST5	Slope Face	50		285														small outcrop
	BJ		70	279						0.3	1							surface
SCST6	Slope Face	70		274														waterfall below Station 323+00
	JS		12	270	10	10	4	0	4	2	3	5	10	-	None	S	S	
	JS		70	274	10	10	4	0	-	1	4	2	10	-	None	S	S	defines face
SCST7	Slope Face	76		279														2 feet overburden
	BJ	72	70	283	20	40	all	0	face	<0.08	1.5	0.2	40	0	None	S	D	defines rockface
	JS	61	60	236	16	40	4	0	58	2.5	4	3	40	0	None	S	D	
	JS	76	74	158	10	40	1	4	55	1	2	1.5	40	0	None	S	D	
	SJ	84	-	21	1	40	1	-	78	-	-	-	40	0	None	S	D	could be tight group of several, could be repeated outside cell ~20 feet apart
	JS	70	70	94	20	30	0	6	25	1	3	2	16	0	None	S	D	dipping into face, break joint for bedding slabs
SCST8	Slope Face	67		280														
	BJ	67	65	280	30	30	lots	0	face	<0.08	0.1	<0.08	30	0	Calcite or Quartz	S	D	defines face
	JS	87	87	188	15	15	0	4	75	1.5	3	2	15	0	-	S	D	
	JS	62	55	9	30	30	1	20	47	0.2	3.5	2.5	30	0	-	S	D	
	SJ	15	3	274	20	4	-	1	5	-	-	-	20	<1/16	Oxidized Quartz	S	D	
	JS	36	26	278	10	12	0	2	10	10	10	10	6	<1/16	Caltcite, Oxidized	S	D	

Table C-1 : Bedrock Structure Measurements

Cell ID	Discontinuity	Avg Dip (degrees)*	Min Dip (degrees)*	Dip Direction (degrees)**	Persistence					Spacing			Max Length (feet)	Aperature (inches)	Joint Filling	Joint Roughness	Water	Remarks
					L1 (feet)	L2 (feet)	Nt	Nc	Ψ	Min (feet)	Max (feet)	Avg (feet)						
SCST9	Slope Face	69		276														2- 2.5 feet overburden
	BJ	70	65	276	20	6	all	-	face	0.0	0.0	0.2	20	0	None	S	D	defines face
	JS	75	70	165	10	4	0	6	70	0.1	2	1.5	4	0	None	S	D	
	JS	62	60	0	10	6	0	18	56	0.0	1	0.5	3.5	0	None	S	D	
	SJ	0	0	74	3	2	0	1	0	-	-	-	3	0	None	S	D	perfectly flat
	JS	65	62	182	8	6	3	7	65	0.1	2	1	6	0	None	S	D	
SCST10	Face	71		279														0.5 feet overburden
	BJ	70	68	279	12	5	all	-	face	0.0	0.2	0.0	12	0	None	S	D	defines face
	JS	62	60	58	8	5	4	0	51	1	3	2	4	0	None	S	D	
	JS	80	80	109	12	5	1	3	12	0.7	2.5	1.5	12	0	None	S	D	break joint for bedding plane
SCST11	Slope Face	64		276														2 feet overburden
	BJ	65	63	271	30	15	-	-	face	0.0	0.5	0.2	30	0	None	S	D	defines rockface
	JS	52	50	182	20	15	2	2	58	2.1	4.3	2.5	15	0	None	S	D	
	JS	45	40	16	30	12	0	6	35	1	5	2.5	8	0	None	S	D	
	JS	2	0	107	20	12	0	4	0	0.3	5	1.5	4	0	None	S	D	
	SJ	86	82	351	0	1	0	88	-	-	-	15	0	-	None	R	D	
SCST12	Slope Face	70		279														2.5 feet overburden
	BJ	70	63	279	-	-	-	-	-	0.1	0.3	0.3	35	0	None	S	D	defines face
	JS	46	45	39	35	10	7	4	48	0.1	3.5	2	13	0	None	S	D	
	JS	9	2	284	30	8	0	12	1	0.1	2.5	0.7	4	0	None	S	D	
	JS	84	82	35	35	10	1	8	89.7	0.3	5.5	2	10	0	None	S	D	

NOTES:
* Dip angle reported relative to horizontal
** All structure orientations reported relative to true north

Discontinuity
- SJ = Single Joint
- JS = Joint Set
- BJ = Bedding Joint
- FO = Foliation

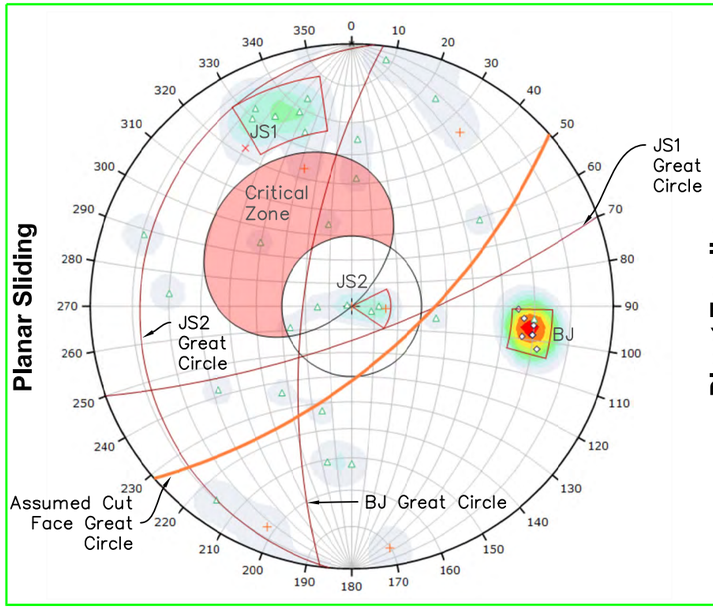
L1 = Cell Height
L2 = Cell Width
Nt = Number of occurrences transecting the cell
Nc = Number of occurences fully contained in the cell
Y = Dip of the feature within the cell

Joint Roughness
- S = Smooth
- W = Wavy
- R = Rough

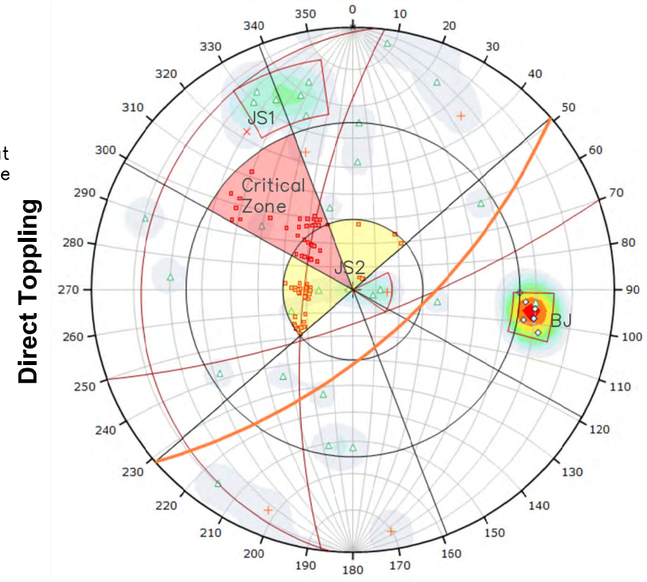
Water = Presence of water in mapped discontinuity
- D = Dry
- S = Squirting
- W = Wet

DOWNSLOPE SIDE

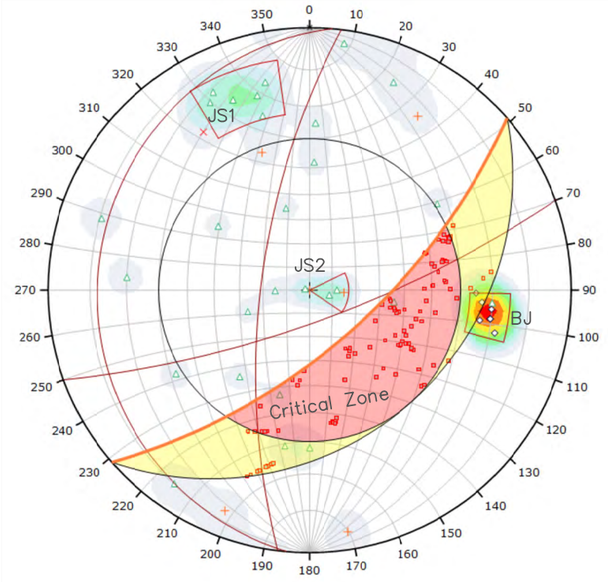
Planar Sliding



Direct Toppling

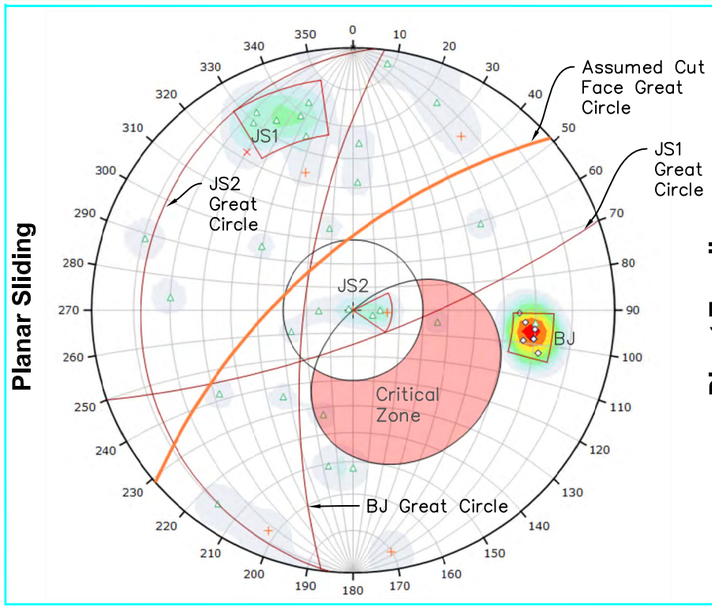


Wedge Sliding

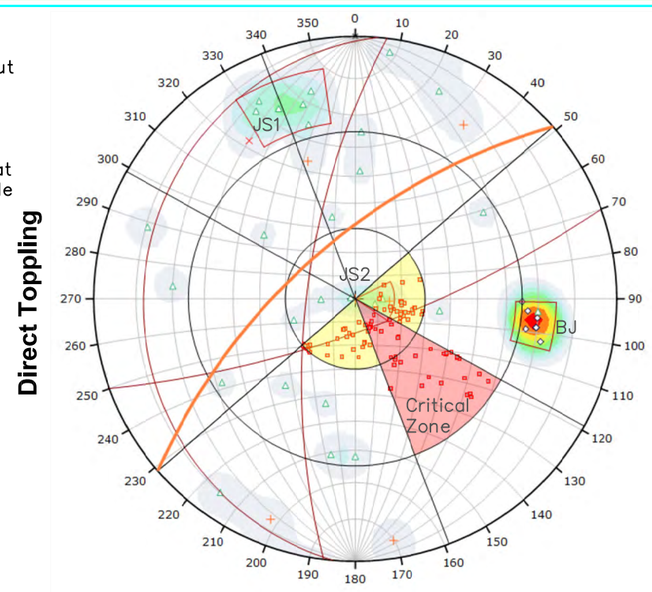


UPSLOPE SIDE

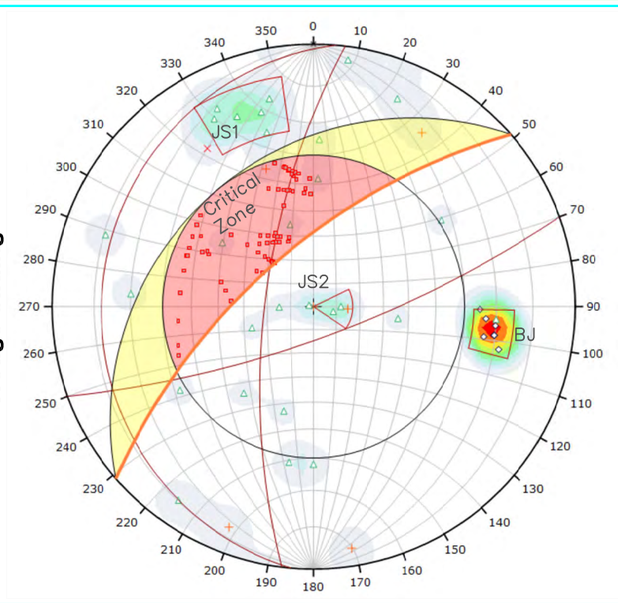
Planar Sliding



Direct Toppling



Wedge Sliding

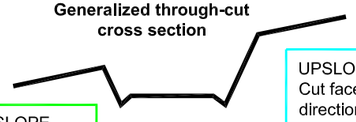


LEGEND

Measured Discontinuity Poles for measured joints, joint sets, bedding planes, and foliation.

Intersection of two discontinuity Great Circles represents potentially admissible kinematic failure

Generalized through-cut cross section



DOWNSLOPE
Cut face dip/dip direction: 065°/139°

UPSLOPE
Cut face dip/dip direction: 065°/319°

NOTES

1. Assumed friction angle: 30°
2. BJ Dip/dip direction: 069°/277°
   JS1 Dip/dip direction: 076°/160°
   JS2 Dip/dip direction: 012°/275°
3. Structure data measured by Shannon & Wilson in June and July 2019. Data from all stations plotted. See Figure 2 for station locations and Table 2 for orientation measurement data.
4. Orientations relative to true north.

Shotgun Cove Road Extension
Whittier, Alaska

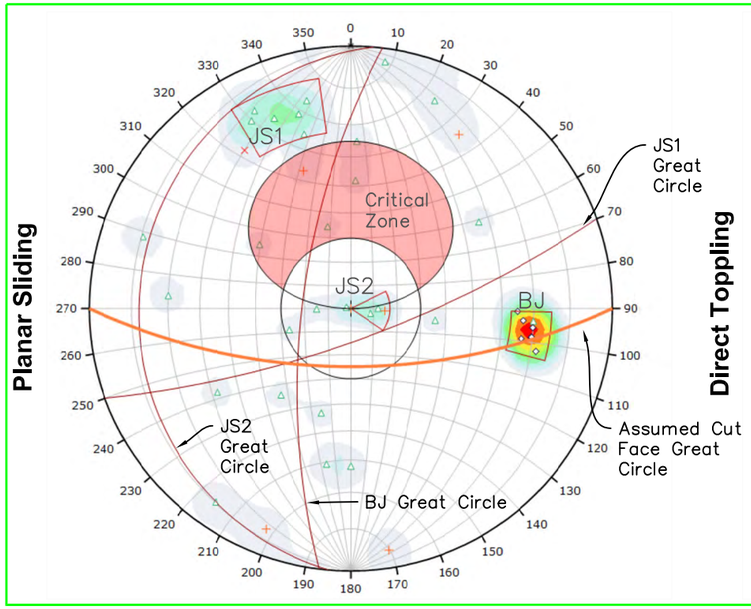
KINEMATIC ANALYSIS - AVERAGE ALIGNMENT ORIENTATION

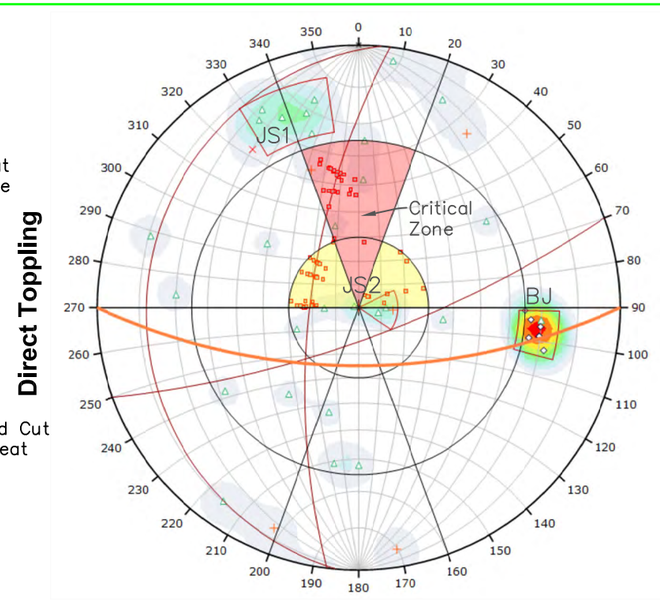
January 2022 102528-003

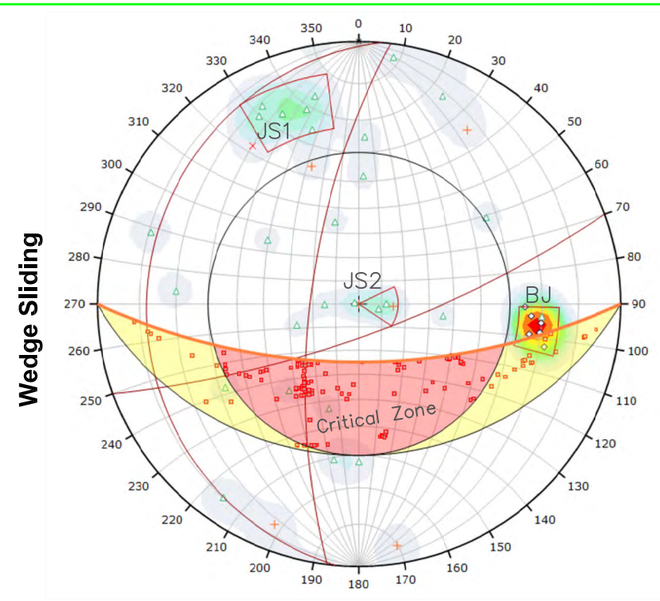
SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. C-1

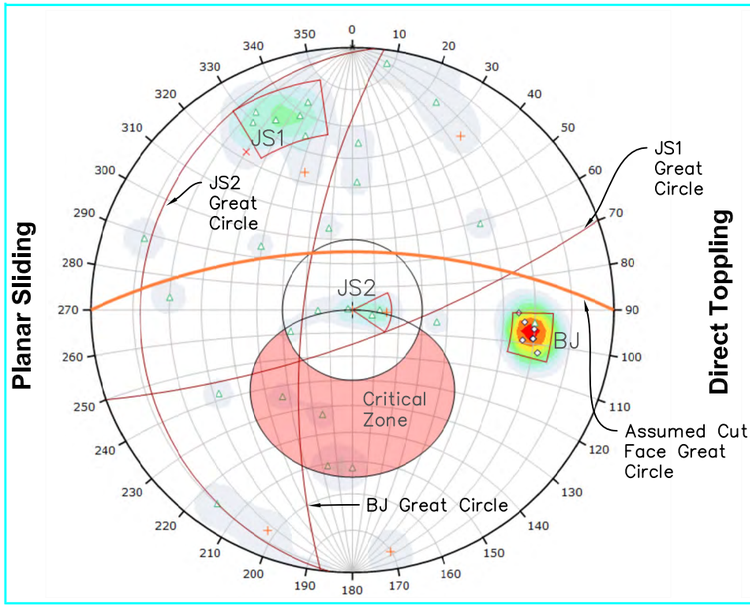
DOWNSLOPE SIDE

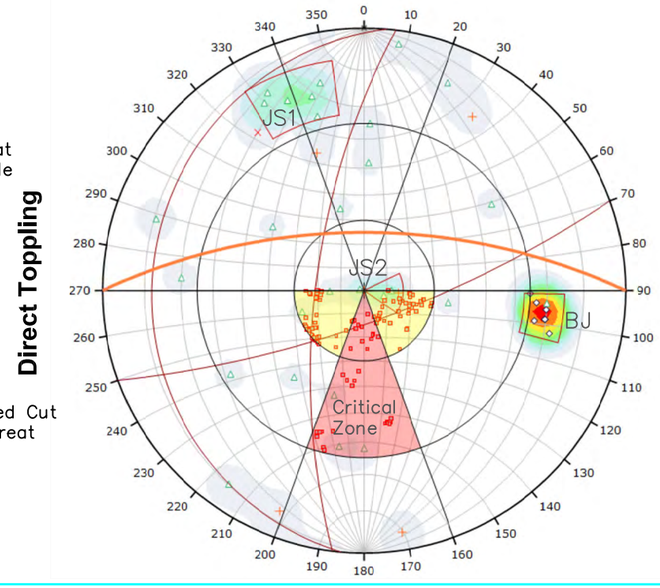


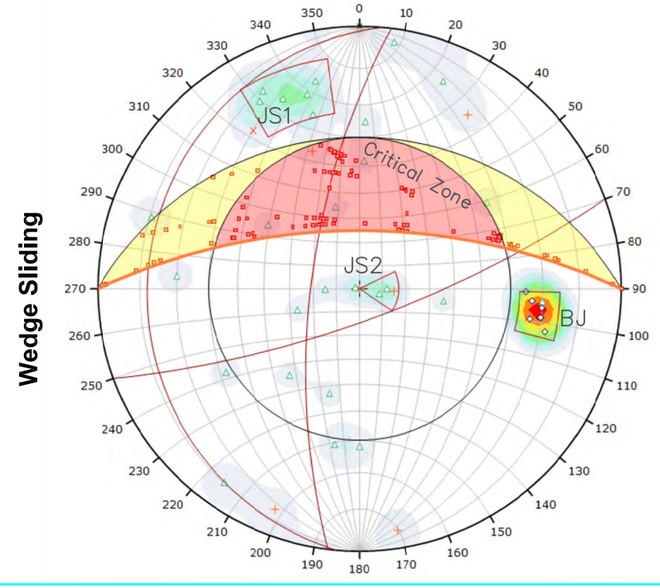




UPSLOPE SIDE





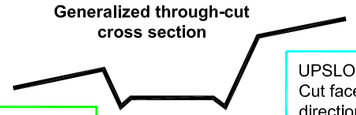


LEGEND

Measured Discontinuity Poles for measured joints, joint sets, bedding planes, and foliation.

Intersection of two discontinuity Great Circles represents potentially admissible kinematic failure

Generalized through-cut cross section



DOWNSLOPE
Cut face dip/dip direction: 065°/180°

UPSLOPE
Cut face dip/dip direction: 065°/000°

NOTES

1. Assumed friction angle: 30°
2. BJ Dip/dip direction: 069°/277°
   JS1 Dip/dip direction: 076°/160°
   JS2 Dip/dip direction: 012°/275°
3. Structure data measured by Shannon & Wilson in June and July 2019. Data from all stations plotted. See Figure 2 for station locations and Table 2 for orientation measurement data.
4. Orientations relative to true north.

Shotgun Cove Road Extension
Whittier, Alaska

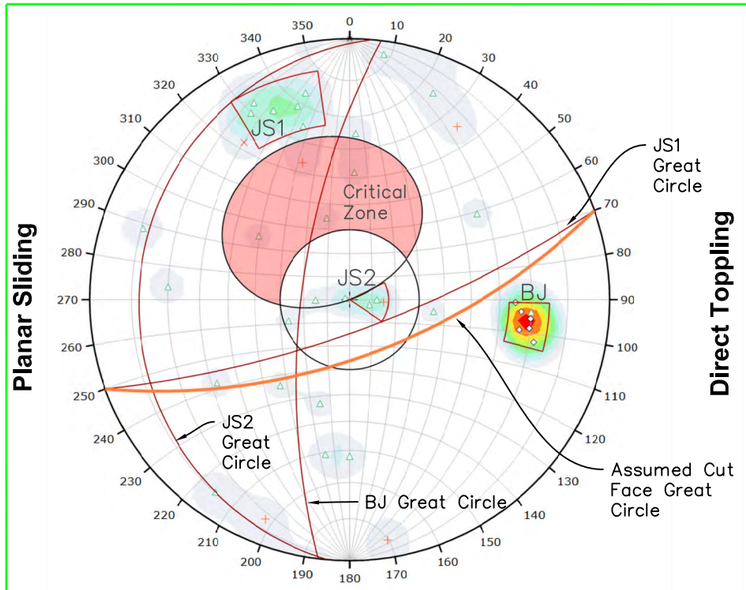
KINEMATIC ANALYSIS - EASTERLY ALIGNMENT ORIENTATION

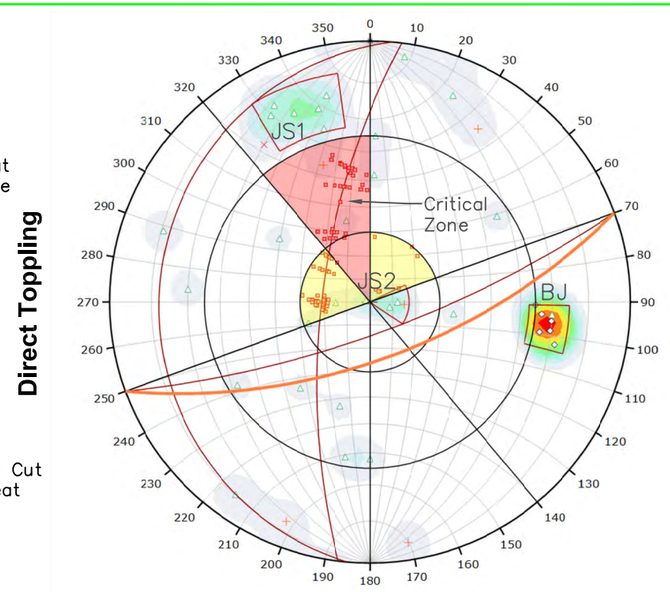
January 2022 102528-003

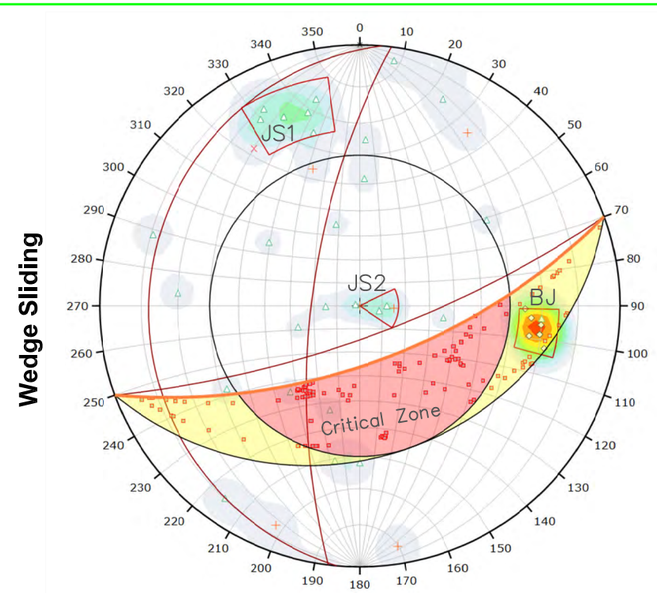
SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. C-2

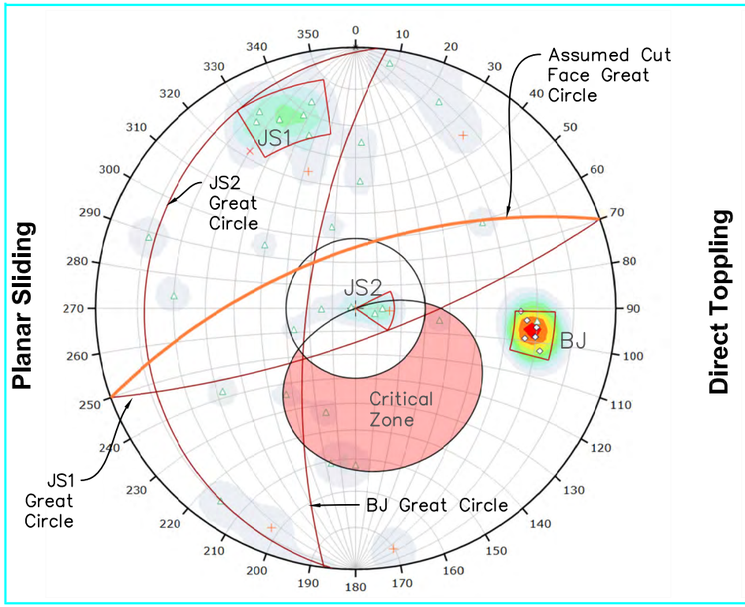
DOWNSLOPE SIDE

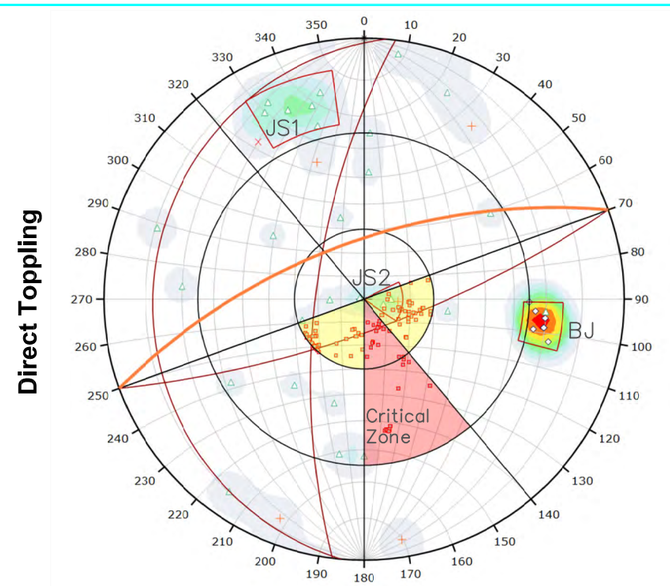


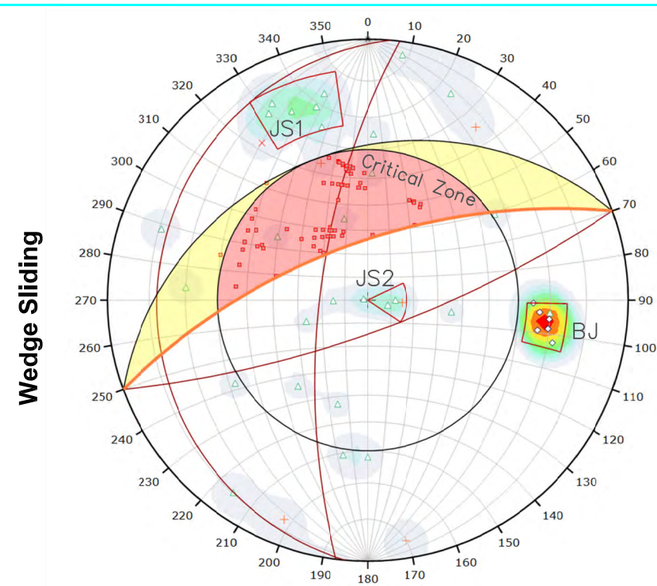




UPSLOPE SIDE





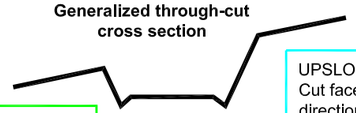


LEGEND

Measured Discontinuity Poles for measured joints, joint sets, bedding planes, and foliation.

Intersection of two discontinuity Great Circles represents potentially admissible kinematic failure

Generalized through-cut cross section



DOWNSLOPE
Cut face dip/dip direction: 065°/160°

UPSLOPE
Cut face dip/dip direction: 065°/340°

NOTES

1. Assumed friction angle: 30°
2. BJ Dip/dip direction: 069°/277°
   JS1 Dip/dip direction: 076°/160°
   JS2 Dip/dip direction: 012°/275°
3. Structure data measured by Shannon & Wilson in June and July 2019. Data from all stations plotted. See Figure 2 for station locations and Table 2 for orientation measurement data.
4. Orientations relative to true north.

Shotgun Cove Road Extension
Whittier, Alaska

KINEMATIC ANALYSIS - ENE ALIGNMENT ORIENTATION

January 2022 102528-003

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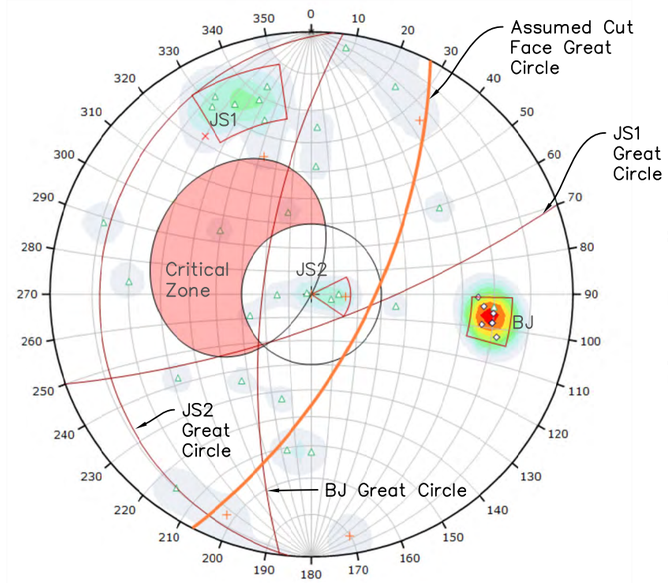
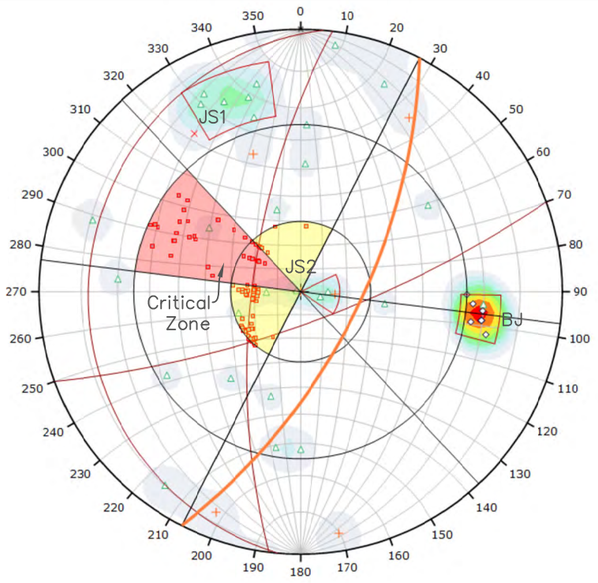
FIG. C-3

DOWNSLOPE SIDE

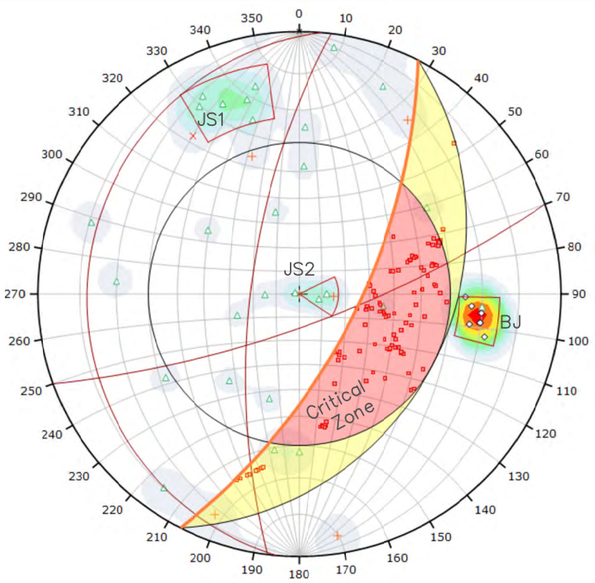
Planar Sliding



Direct Toppling

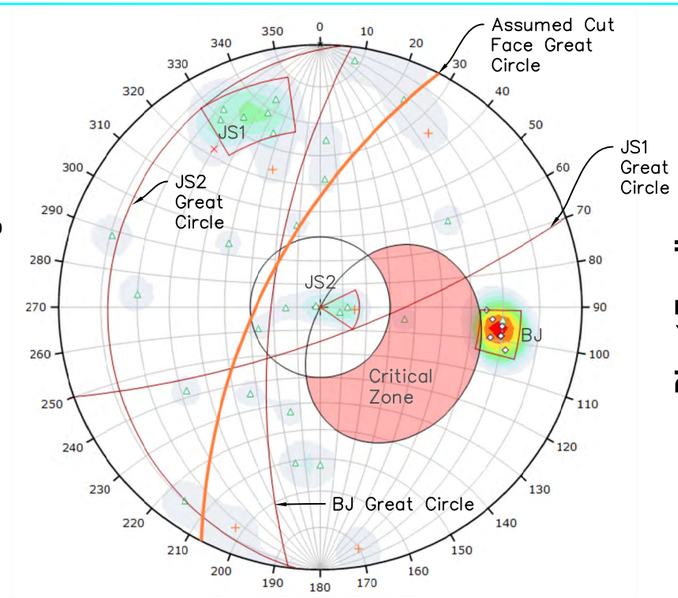


Wedge Sliding

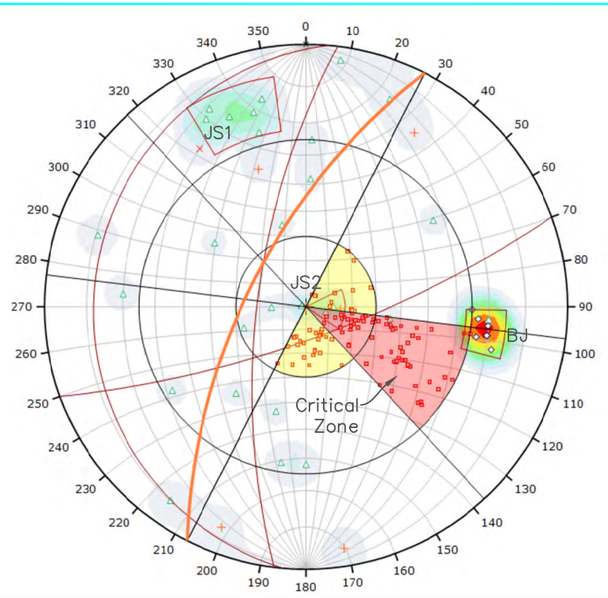


UPSLOPE SIDE

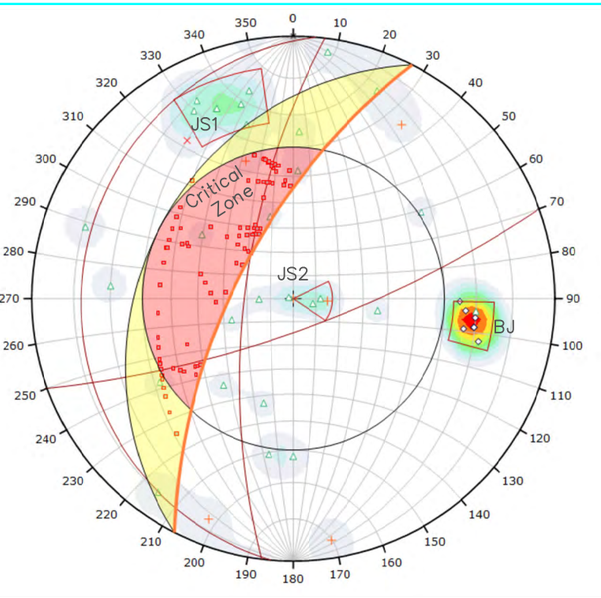
Planar Sliding



Direct Toppling



Wedge Sliding

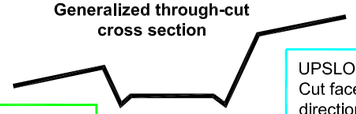


LEGEND

Measured Discontinuity Poles for measured joints, joint sets, bedding planes, and foliation.

Intersection of two discontinuity Great Circles represents potentially admissible kinematic failure

Generalized through-cut cross section



DOWNSLOPE
Cut face dip/dip direction: 065°/117°

UPSLOPE
Cut face dip/dip direction: 065°/297°

NOTES

1. Assumed friction angle: 30°
2. BJ Dip/dip direction: 069°/277°
   JS1 Dip/dip direction: 076°/160°
   JS2 Dip/dip direction: 012°/275°
3. Structure data measured by Shannon & Wilson in June and July 2019. Data from all stations plotted. See Figure 2 for station locations and Table 2 for orientation measurement data.
4. Orientations relative to true north.

Shotgun Cove Road Extension
Whittier, Alaska

KINEMATIC ANALYSIS - NNE ALIGNMENT ORIENTATION

January 2022 102528-003

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FIG. C-4

Photo 1: SCST1 Face

See Structure Table C-1 for measurement details and Site Plan, Figure 2 for location

Photo 2: SCST2 Face

See Structure Table C-1 for measurement details and Site Plan, Figure 2 for location

Photo 3: SCST3 Face

See Structure Table C-1 for measurement details and Site Plan, Figure 2 for location

Photo 4: SCST4 Outcrop

See Structure Table C-1 for measurement details and Site Plan, Figure 2 for location

Photo 5: SCST5 Outcrop

See Structure Table C-1 for measurement details and Site Plan, Figure 2 for location

Photo 6: SCST6 Face Adjacent to Waterfall

See Structure Table C-1 for measurement details and Site Plan, Figure 2 for location

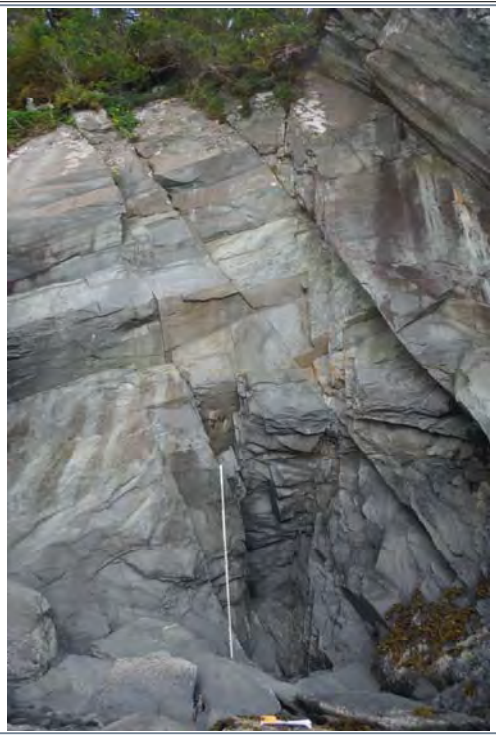

Photo 7: SCST7 Face

See Structure Table C-1 for measurement details and Site Plan, Figure 2 for location

Photo 8: SCST8 Face

See Structure Table C-1 for measurement details and Site Plan, Figure 2 for location

Photo 9: SCST9 Face

See Structure Table C-1 for measurement details and Site Plan, Figure 2 for location

Photo 10: SCST10 Face

See Structure Table C-1 for measurement details and Site Plan, Figure 2 for location

Photo 11: SCST11 Face

See Structure Table C-1 for measurement details and Site Plan, Figure 2 for location

Photo 12: SCST12 Face

See Structure Table C-1 for measurement details and Site Plan, Figure 2 for location

IMPORTANT INFORMATION

Important Information

About Your Geotechnical Report

IMPORTANT INFORMATION

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include: the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used: (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors which were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining

your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims

being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports, and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland