GORGE 2ND TUNNEL - BOREHOLE LOG SUMMARY KEY

Discontinuity Types

- **J**=Joint (discordant with foliation or of unknown relationship with foliation)
- **FJ**=Joint along foliation
- **S**=Shear (slickensided joint)
- **F**=Fault (sheared or fractured zone where offset is likely)
- **HJ**=Healed Joint (joint healed with mineral infilling)
- **HS**=Healed Shear (shear healed with mineral infilling)
- **HF**=Healed Fault (fault healed with mineral infilling)
- **MB**=Mechanical Break

Discontinuity Angle: Measured from perpendicular to core axis

Aperture

- **W**=Wide (0.5 to 2.0 inches)
- **MW**=Moderately Wide (0.1 to 0.5 inches)
- **N**=Narrow (0.05 to 0.1 inch)
- **VN**=Very Narrow (<0.05 inch)
- **T**=Tight (0)

Type of Infilling

- **Cl**=Clay
- **Ch**=Chlorite
- **Fe**=Iron Oxide
- **H**=Healed
- **My**=Mylonite
- **Py**=Pyrite
- **Sd**=Sand
- **Si**=Silt
- **Bi**=Biotite
- **Ca**=Calcite
- **Ep**=Epidote
- **Gr**=Gravel
- **Mn**=Manganese
- **No**=None
- **Qz**=Quartz
- **Se**=Serpentinite
- **Uk**=Unknown

Roughness of Surfaces

- **Slk**=Slickensided (surface has smooth, glassy finish with visual evidence of striations)
- **S**=Smooth (surface appears smooth and feels so to the touch)
- **SR**=Slightly Rough (asperities on discontinuity surfaces are distinguishable and can be felt)
- **R**=Rough (ridges and side-angle steps are evident; asperities are clearly visible; surface feels very abrasive)
- **VR**=Very Rough (near-vertical steps and ridges occur on discontinuity surface)

Rock Fracturing

- **Intensely Fractured**=Fractures spaced less than 2 inches apart
- **Highly Fractured**=Fractures spaced 2 inches to 1 foot apart
- **Moderately Fractured**=Fractures spaced 1 foot to 3 feet apart
- **Slightly Fractured**=Fractures spaced 3 feet to 10 feet apart
- **Massive**=Fracture spacing greater than 10 feet

Discontinuity Shape

- **Pl**=Planar
- **C**=Curved
- **U**=Undulating
- **St**=Stepped
- **I**=Irregular

Intrusions

- **Vein** <1-foot-thick
- **Dike**=>1-foot-thick

Fractures per foot: Discludes healed joints and mechanical breaks

Grain Size

- **Fine grained**= <1 mm
- **Medium grained**= 1 to 5 mm
- **Coarse grained**= 5 to 20 mm
- **Very coarse grained**= >20 mm

Foliation

- **Uniform**= No preferential alignment of minerals or banding is apparent
- **Weakly Foliated**= Minerals are preferentially aligned but no banding is apparent
- **Moderately Foliated**= Minerals preferentially aligned and faintly banded
- **Strongly Foliated**= Minerals distinctly banded and preferentially aligned

Rock Weathering

- **RS**=Residual Soil (original minerals of rock have been entirely decomposed to secondary minerals, and original rock fabric is not apparent; material can be easily broken by hand)
- **CW**=Completely Weathered (original minerals of rock have been almost entirely decomposed to secondary minerals, although original fabric may be intact; material can be granulated by hand)
- **HW**=Highly Weathered (more than half of the rock is decomposed; rock is weakened so that a minimum 2-inch-diameter sample can be broken readily by hand across rock fabric)
- **MW**=Moderately Weathered (rock is discolored and noticeably weakened, but less than half is decomposed; a minimum 2-inch-diameter sample cannot be broken readily by hand across rock fabric)
- **SW**=Slightly Weathered (rock is slightly discolored, but not noticeably lower in strength than fresh rock)
- **F**=Fresh (rock shows no discoloration, loss of strength, or other effect of weathering)

Rock Strength

- **EW**=Extremely Weak (Can be indented by thumbnail); UCS= 35 to 150 psi
- **VW**=Very Weak (Can be peeled by pocket knife); UCS= 150 to 700 psi
- **W**=Weak (Can be peeled by difficulty by pocket knife); UCS= 700 to 3,600 psi
- **MS**=Moderately Strong (Can be indented 5 mm with sharp end of pick); UCS= 3,600 to 7,200 psi
- **S**=Strong (Requires one hammer blow to fracture); UCS= 7,200 to 14,500 psi
- **VS**=Very Strong (Requires many hammer blows to fracture); 14,500 to 36,000 psi
- **ES**=Extremely Strong (Can only be chipped with hammer blows); >36,000 psi

Tests

- **UCS**= Unconfined Compressive Strength (psi)
- **PL**= Point Load test value adjusted to approximate correlative unconfined compressive strength (psi)
- **Min**= Mineral percentages from petrographic analysis
- **Packer**= Packer test interval

Core Recovery Calculation (%): *(Sum of length of recovered core pieces/Total length of core run) x 100*
(NOTE: *100** = Recovery length was field-adjusted to 100% to account for variations in run lengths)
Rock Quality Designation (RQD) Calculation (%): *(Sum of length of intact core pieces > 4 inches/Total length of core run) x 100*

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Gorge 2nd Tunnel Core Borehole Log

Project Number	Sheet	Borehole Number
A080138/JA4087	1 of 16	**B-1**

Prepared for	Seattle City Light, Newhalem, WA	Elevation	542.4 ft (NAVD88)
Driller / Equipment	Crux Subsurface Burley 5500-3	Drilling dates	7/30/2009 to 8/12/2009
Coring Method	HQ wireline	Azimuth/Inclination	55° / -1.5°
Location	Tunnel portal	Hole Diam/Core Diam	3.8 in/ 2.4 in
Coordinates	48.67669° N, -121.24074° E	Logged by/Approved by	AAE / DHM

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	1–5	1	1	43	29	N/A, N/A, 6, 3, 0	NR, NR	0-60°, J, Fe, VR, Pl-I.		No recovery.		NOTE: Refer to laboratory and packer test results for details.	
										BOULDER. BIOTITE QUARTZ PLAGIOCLASE GNEISS, very strong, slightly weathered.	~30		
	6–10		2	75	66	1, 2, 1, 1, 2	NR, NR	5-60°, J, VN, SR-R, Pl-I.		No recovery.			
										BIOTITE QUARTZ PLAGIOCLASE GNEISS. Medium- to fine-grained, moderately strong to very strong, generally weakly to moderately foliated, gray, fresh to slightly weathered. Becomes medium-grained, weakly foliated to uniform (6.8 to 26 ft).	~40		
	10–11		3	73	68	0					15		
	11–13		4	100	88	4, 0, 0, 1		45°, J, VN, Fe, SR, Pl. 30°, J, T, SR, Pl.			22		
542	13–20		5	100	87	0, 0, 10, 3, 0		30-45°, J, VN, No-Fe, SR, Pl. 70°, J, VN, No-Fe, SR, Pl.		Zone contains iron oxide staining (18 to 18.7 ft).	35		
	20–21					0							

NOTE: See Borehole Log Summary Key for explanation of symbols and abbreviations.

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

Sheet: 2 of 16

Borehole Number: **B-1**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	22					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to very strong, generally weakly to moderately foliated, gray, fresh to slightly weathered.			
	23		6	97	83	1					35		
	24					1		45°, J, T-VN, Cl-Sd, SR, Pl.					
	25					7		20-55°, J, T-VN, Cl-Sd, SR, Pl.					
	26	2				2							
	27					0							
	28		7	97	95	4		45°, J, SR, Pl. 60°, J, Cl-Sd, SR, Pl.			15		Lost drill water circulation. Cased borehole with HWT casing to 15.6 ft.
	29					0							
	30					0							
	31					0							
	32					0							
	33		8	100*	100	0					22		
	34					0							
	35					0							
	36		9	100	100	3		55-60°, J/S?, VN, Ch, Slk-SR, Pl.			10		
	37	3				1		45°, J, T, Ch, SR, Pl. 80°, HJ, T, H, SR, I.					
	38		10	100	96	0					60		
	39					0							
	40					0							
	41		11	100*	79	0		45°, J, T, SR, Pl. 45°, J, VN, Cl, SR, Pl.			36		
	42					2							
	43					3		45°, J, VN, Cl, SR, Pl.					
	44		12	100*	93	0					40		

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

Sheet: 3 of 16

Borehole Number: **B-1**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	45					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to very strong, generally weakly to moderately foliated, gray, fresh to slightly weathered.			
	46		13	100*	82	4		60°, S, Ch, Cl, Slk. 50°, J, VN, SR, C. 60°, S, T, Cl, Slk.			22		
	47					3		NA°, S, Unk, Sd-Cl, R-Slk. 35°, S, VN, Cl, SR-Slk.					
	48					3		30°, S, VN, Sd-Cl, R-Slk. 5°, J, VN, SR. 55°, S, VN, Cl, SR-Slk.		Includes thin chlorite and quartz veins (possible healed fractures; 48.4 to 49.1 ft).			
	49	4				0		50°, FJ, T, No-Cl, SR.					
	50					2							
	51		14	100*	93	0					35	PL = 10461, 6353 psi.	
541	52					0							
	53					4		70°, J, VN, Cl, SR.					
	54					0							
	55					0							
	56		15	100	100	0		45°, HJ, T, Ch, Slk.			42		
	57					0		HJ.					
	58					0							
	59					0							
	60					0							
	61		16	100*	100	0					50		
	62					0							
	63	5				0							
	64					0							
	65					0							
	66		17	100	100	0					30		
	67					0							

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

Borehole Number: **B-1**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	68		18	100	100	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to very strong, generally weakly to moderately foliated, gray, fresh to slightly weathered.	18		
	69					0							
	70					0							
	71		19	100	100	0				Includes strongly foliated bands (72.5 to 90.5 ft).	22		
	72					0							
	73					0		10°, FJ, T, SR.					
	74					0							
	75					0							
	76	6	20	100	100	0					18		
	77					0							
	78					0							
	79					1		0°, FJ, SR.					
	80					0							
	81		21	100	100	0					17		
	82					0							
	83					0							
	84					0							
	85					0							
	86		22	100	100	0					22		
	87					0							
	88					0							
	89					0							
	90					0							
	91					0							

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

Borehole Number: **B-1**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	92	7	23	100	82	0		45°, J, T, SR, Pl. 45°, J, VN, Sd-Cl, SR, Pl. 45°, HJ, T, SR, Pl. 45°, J, VN, SR, Pl. 55°, HJ, H-VN, Qz-Bi, Pl. 45°, J, VN, Sd, SR, Pl. 45°, J, VN, Sd-Cl, SR, Pl.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to very strong, generally weakly to moderately foliated, gray, fresh to slightly weathered. Contains healed joints and 1/4 to 2-inch-thick quartz veins (91.4 to 94 ft). Healed fault shows 1/4 to 1-inch of offset.	20		
	93					>10							
	94					0							
	95					1							
	96		24	100*	97	0					36		
	97					0		30°, HJ, Qz.					
	98					0							
	99					0		30°, HJ, Qz -Bi.					
	100					0		5°, J, T, No, SR, Pl.					
	101	8	25	100*	100	2					30	UCS = 14570 psi.	
	102					0							
	103					0							
	104					0							
	105					0							
	106		26	100*	97	0					28		
	107					1		60°, J, T, No-Cl, SR, Pl.					
	108					0							
	109					0							
	110					1		60°, J, T, No-Sd, SR, Pl.					
	111		27	100*	100	0					9		
	112		28	100*	100	0					17		
	113					0							
	114					0							

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

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Borehole Number: **B-1**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	115					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to very strong, generally weakly to moderately foliated, gray, fresh to slightly weathered.			
	116					0							
	117	9				0							
	118		29	100*	100	0					29		
	119					0							
	120					0							
	121					0							
	122		30	100*	100	0					22		
	123					0		0°, J, SR, Pl.					
	124		31	100*	92	0		5°, J, VN, No-Sd, SR-S.			56	PL = 9267, 8309 (in gneiss) psi.	
	125					0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to coarse-grained, moderately strong to strong, fresh, mostly pegmatitic in composition.			
	126					0		5°, J, Cl-Sd, SR.					
	127					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong to very strong, weakly to moderately foliated, gray, fresh to slightly weathered.			
539	128		32	100*	100	0					26		
	129					0							
	130	10				0							
	131					0							
	132					0							
	133		33	100*	100	0					22		
	134					0							
	135					0							
	136					0							
	137					0							
	138												

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-1**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	139		34	100*	90	1		60°, FJ, T, Sd, SR, Pl. 50°, HJ, H, Bi-, Slk.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong to very strong, weakly to moderately foliated, gray, fresh to slightly weathered.	22		
						4		60°, FJ/S?, Sd-Cl, SR-Slk?.					
	140					1		30°, J, T, SR, I-Pl.		**PEGMATITE**. Medium- to very coarse-grained, moderately strong to strong, white, fresh.			
	141					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong to very strong, weakly to moderately foliated, gray, fresh to slightly weathered.			
	142					0							
	143	11	35	100*	100	0					23		
	144					0							
	145					0							
	146					0							
	147		36	100*	100	0					23		
	148					0		60°, S, VN, Bi-Ch, Slk-SR.					
	149					3		65°, J, VN, SR.					
	150					1		70°, FJ, T, SR, St-I.					
	151					4				**PEGMATITE**. Medium- to very coarse-grained, moderately strong, white, slightly weathered.			
	152					2		45°, FJ, T, SR. 35°, FJ, T, SR.				PL = 6650 psi.	
	153		37	100*	100	1				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong to very strong, weakly to moderately foliated, gray, fresh to slightly weathered.	34		
	154					2							
	155					0							
	156					0							
	157					0							
	158	12	38	100*	100	0					36		
	159					0							
	160					0							
	161					0							

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

Borehole Number: **B-1**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	162					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong to very strong, weakly to moderately foliated, gray, fresh to slightly weathered.			
	163		39	100*	100	0					56		
	164					0							
	165					0							
	166					0							
538	167					0							
	168		40	100*	100	0					22		
	169					1		45°, J, T, SR, Pl.					
	170					1		55°, S, T, Ch, Slk.					
	171					0		55°, S, Ch, Slk.					
	172					0							
	173	13	41	100	100	0					27		
	174					2							
	175					0							
	176					0		60°, J, T, SR.					
	177					1		60°, S, Ch, Slk.					
	178		42	100	96	0		60°, J, T, SR, Pl-C.			24		
	179					1		5°, J, T, R, Pl.					
	180					2		5°, J, T, R, I.		**PEGMATITE**. Medium- to very coarse-grained, moderately strong, white with black, fresh, migmatitc texture.			
	181					0							
	182					0							
	183		43	100*	100	1		10°, J, T, SR, Pl-I.			24	PL = 6650 psi.	
	184					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong to very strong, weakly to moderately foliated, gray, fresh to slightly weathered.			
						0							

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

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Borehole Number: **B-1**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	185							10°, J, T, SR, Pl.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong to very strong, weakly to moderately foliated, gray, fresh to slightly weathered.			
	186					2		35°, J, T, SR, Pl.					
						1		35°, FJ, T, R, Pl.					
	187					0							
	188	14	44	100*	96						32		
						1		15°, J, T, SR, Pl.					
	189												
						3		15°, J, VN, Sd, SR, Pl.					
	190							5°, FJ-J, Cl-Sd, SR, Pl.					
						>10				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Moderately strong, black and white, fresh to slightly weathered, possible fault (190.3) - no obvious offset but joint contains 2 inches of fine to coarse sand and gravel-sized fragments.			
	191					0							
	192												
						1							
	193		45	100	88						20		
						>10		5-35°, S-J, MW, Fe-Cl, Slk-SR.					
	194							15°, HJ, T, Fe, NA.					
								60°, HJ, T, Qz, NA.				PL = 6016 psi.	
						>10							
	195							20°, HJ, T, Qz, NA.					
								55°, F, W, Cl-Sd, SR, Pl.					
						1		10°, J, Qz, SR-S, Pl.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong to very strong, weakly to moderately foliated, gray, fresh to slightly weathered.			
	196					0							
	197					0							
	198		46	100*	100						34		
						0							
	199												
						1		50°, J, T, SR, Pl.					
	200												
		15				0							
	201					0							
	202												
						>10		5°, Qz-Ch, R, I.					
	203		47	100*	85			SR, Pl.			22		
						4		5°, J/S?, VN, SR/Slk?, Pl.					
	204							55°, J/S?, T, Cl-Ch-Fe, S-SR/Slk?, Pl.					
						7		80°, HJ, T, Fe-Qz, S-SR, Pl.					
	205							0°, J, T, Fe, S-SR, Pl.					
						3							
	206							45°, FJ, T, Qz-Ch-Fe, SR.					
						0							
	207												
						1							
	208		48	100*	100			0°, J, VN, SR, Pl.			20		

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

Sheet: 10 of 16

Borehole Number: **B-1**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	209					1		60°, J, T, SR, I.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong to very strong, weakly to moderately foliated, gray, fresh to slightly weathered.			
	210					0							
	211					0							
	212					0							
	213	16	49	100	100	1		45°, S, T, Ch, Slk, St.			18		
	214					0							
	215					0							
	216					0							
	217					1		55°, S, N, Ch-Fe, Slk.					
	218		50	100*	90	2		45°, J, VN, Fe, S-SR. 45°, S, VN, Ch-Fe, Slk.			20		
	219					2		35°, J/S?, N, S-SR. 35°, J/S?, MW, S-SR.					
	220					2		35°, J, VN, Fe, SR.					
	221					0							
	222					>10							
	223		51	100*	93	2		25°, J, VN, Fe, SR, Pl-I.			25		
	224					0		20-85°, HJ, Fe-Ch.		**PEGMATITE**. Medium- to very coarse-grained, moderately strong to strong, white, slightly weathered.			
	225					6		60°, S, VN, Ch-Fe, Slk, Pl. 5°, J, T, SR. 10°, J, VN, SR, I.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong to very strong, weakly to moderately foliated, gray, fresh to slightly weathered.			
	226					3		20°, J, Fe, SR, Pl.					
	227					>10		5-45°, J, T-Unk, Fe-Cl-Ch-No, SR, Pl.					
	228	17	52	100*	40	>10		30°, S, T, Ch-Cl, Slk.			37		
	229					7							
	230					3		J, T, Ch-Cl, SR.					
	231					5							
						4							

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

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Borehole Number: **B-1**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	232							70°, S, T, Ch-Fe, Slk.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong to very strong, weakly to moderately foliated, gray, fresh to slightly weathered.			
						0		50°, FJ, T-N, Cl, SR, Pl-I.					
	233		53	100*	82			60°, HS, VN, Ch, Slk.			68		
						1		40°, J, VN, Fe, SR, Pl.					
	234												
						2							
	235							20-40°, J, T-VN, Fe-Cl, SR, Pl.					
						>10		5-15°, J, T-N, Cl-Fe, SR, Pl-I.		Becomes strong (235.3 to 241.1 ft).			
	236									3.5-inch-wide intensely weathered zone containing fine to coarse subrounded gravel-sized fragments with iron oxide staining.			
						>10		20°, S, VN, Fe-Cl, Slk, Pl.					
	237							45°, S, T, Fe-Cl, Slk, Pl.					
						4		45°, J, VN, Fe-Cl, SR, Pl.					
	238		54	100*	37						26		
						>10		5-80°, J, T-VN, N-Fe, SR, Pl-I-St.					
	239									**PEGMATITE**. Medium- to very coarse-grained, moderately strong to strong, white, generally slightly weathered.			
						>10		10-80°, J, T, N-Fe, SR-S, Pl.					
	240							35°, J, Fe, SR, I.					
						>10				Becomes moderately weathered zone, stained with iron oxide (240 to 241.1).			
	241							45°, J, VN, Cl, SR, U.					
						>10		10°, J, VN, Cl, S, Pl.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong, weakly to moderately foliated, gray, fresh to slightly weathered, slightly migmatitic texture.			
	242							5-45°, J, T-VN, N-Cl-Fe, SR-R, Pl-I-St.					
536						>10		5°, S, VN, Cl-Fe-Ch, Slk-SR.					
	243	18	55	100	47			10°, J/S?, VN, Cl, S-SR-Slk?.			19	PL = 4519 psi.	
						2							
	244							55°, S, VN, Ch, Slk, Pl.					
						6		20°.					
	245											PL = 6832, 6340 psi.	
						>10							
	246		56	100	64			5°, J, SR, I.			24		
								10°, J, VN, S-SR, Pl.					
						1				**PEGMATITE**. Medium- to very coarse-grained, moderately strong to strong, white, slightly weathered.			
	247												
						0		10°, HJ.					
	248												
			57	100*	100	1		70°, FJ, N, Cl, SR, U-Pl.			54		
	249												
						0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to coarse-grained, moderately strong to strong, black and white, slightly weathered.			
	250												
						0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, weakly to moderately foliated, gray, fresh to slightly weathered, contains <5% hornblende (250 to 256 ft), rock mass is streaky in appearance.			
	251												
						1		HJ, VN, SR, Pl.					
	252							J, VN, SR, Pl.					
						1							
	253		58	100*	98						22	PL = 9915, 10164, 11877 psi.	
								15°, J, VN, SR, Pl.					
						8		15°, J, Cl, SR, Pl-I.					
	254												
						1		45°, J, VN, Cl, SR, Pl.					
	255												

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-1**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	256					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, weakly to moderately foliated, gray, fresh to slightly weathered, contains <5% hornblende (250 to 256 ft), rock mass is streaky in appearance.			
	257					4		45°, J, VN, Cl, SR, Pl. 45°, HJ.					
	258	19	59	100	52	7		35-50°, J, VN-N, Fe-Cl, SR, Pl.		Contains approximately 50% greenish white quartz veins with chlorite (257.8 to 261 ft).	34		
	259					7							
	260					>10		J.					
	261					6		20°, J, T, SR, St.					~0.75 gpm flowing from hole start of day 8/6/09 (260.3 ft).
	262					>10		20°, S, VN, Cl, Slk, Pl.					
	263		60	98	52	>10		15-60°, J, T-VN, N-Cl-Fe, SR.			26		
	264					>10				**PEGMATITE**. Medium- to very coarse-grained, moderately strong to strong, white, moderately weathered.			
	265					>10		10-80°, J, T-VN, SR, Pl-I.		Intact but easily broken along hairline fractures (263.8 to 265.1 ft).			
	266					>10		10°, J.		**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to very coarse-grained, moderately strong to strong, black and white, slightly weathered.			
	267					2		40°, S, VN, Cl-Bi, Slk, Pl.					
	268		61	100*	85	6		0-30°, J, VN, SR, Pl-St-I.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, weakly to moderately foliated, generally gray, fresh to slightly weathered.	24		
	269					0							
	270					>10		30-60°, J, T-VN, Sd-Fe, SR, I-P.					
	271					2		55°, J, SR.					
	272					1		15°, J, T, Cl, SR. HJ.					
	273	20	62	100*	69	0					26		
	274					7		50°, J, T-VN, Fe, SR.					
	275					6		75-80°, J, T-VN, Cl-Fe (+muscovite?), S, Pl.		Becomes greenish white, slightly weathered, altered with chlorite (274.3 to 276.7).			
	276					11		5-55°, J, T-VN, Fe, SR, Pl-I. 50°, J, SR, Pl. J.					
	277					1							
	278		63	100	87	6		75°, J, VN, N-Fe, S, Pl. 10-75°, J, T-VN, N-Fe, SR, Pl-I.			23		

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-1**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	279					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, weakly to moderately foliated, generally gray, fresh to slightly weathered.			
	280					0							
535	281					0							
	282					0							
	283		64	100	100	0					27		
	284					0							
	285					0							
	286					0						Packer = 285 to 305 ft, fracture system does not accept water. UCS = 5000 psi, PL = 8471 psi, UCS value low.	
	287					0							
	288	21	65	100*	100	0					32		
	289					1		45°, J, N, Cl-Fe, R.					
	290					0							
	291					0							
	292					0							
	293		66	100*	100	0					59		
	294					0							
	295					0				4-inch-thick pegmatite vein.			
	296					4		45-85°, J, VN, Fe-Cl, SR, Pl.					
	297					4		45°, S, VN, Fe, Slk, Pl.					
	298		67	94	82	8		40-50°, J, VN, Fe, SR, Pl-I. 40°, S, VN, Ch, Slk, Pl.			43		
	299					1							
	300					5		80°, J, N, Cl, SR, St. 5-85°, J, VN, SR, Pl.					
	301					5		80°, J, T, Cl, SR, I.					
						1							

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-1**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	303	22	68	100*	100	2, 6, >10		20°, J, T, Fe, SR, Pl-I.; 5-45°, J, VN, Fe, SR, Pl.; 45°, HJ, Qz.; 5-10°, J, VN, Cl-Sd-Fe, SR, Pl.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, weakly to moderately foliated, generally gray, fresh to slightly weathered.	28		
	304												
	305												
	306		69	100	87	1, 2, 6, 2, 1		10°, VN, Fe, SR.; 5-15°, J, N, Cl, R.; 5-15°, J, VN, Fe, SR.		**PEGMATITE**. Medium- to very coarse-grained, moderately strong, white, highly iron oxide stained dike, contains ~1.5-inch hard green mineral at 306.7 ft.	18	PL = 6340 psi.	
	307									Contains many healed fractures (307.3 to 309.8 ft).			
	308									**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, weakly to moderately foliated, gray, fresh to slightly weathered.			
	309												
	310												
	311		70	100*	100	2, 0, 0, 1, 0		55°, J, Fe, SR.; 55°, J, VN, Cl, SR, Pl.; 45°, J, VN, Cl, SR, Pl.		Contains <5% hornblende (311 to 314 ft).	23	UCS = 8880 psi.	
	312												
	313												
	314												
	315												
	316	23	71	90	63	0, 0, 10, >10		45-60°, J, T-W, Sd-Cl, SR, Pl.; 20-70°, J, T-MW, Cl, SR, Pl.			17		Sand and silt from joint filled up core barrel (~317 ft).
	317												
	318									Possible void or wide fracture zone (318 to 318.6 ft).			
534	319									**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, weakly to moderately foliated, generally gray, fresh to slightly weathered.			
	320					6		30-45°, J, T-MW, Cl, SR, Pl.					
	321		72	92	80	3, 2, 2, 1, 1		0-45°, J, VN, SR-S, Pl-I.; 0-35°, J, VN-MW, Cl-Sd-Ch, SR-S, Pl-I.			26	PL = 13064, 11695 psi.	Turbid water flowing from boring at ~10 gpm (320.3 ft).
	322												
	323												
	324												
	325												

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

Borehole Number: **B-1**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	326		73	100	77	1				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, weakly to moderately foliated, generally gray, fresh to slightly weathered.	15		Turbid water flowing at 20 gpm; driller notes high head (80 psi) (325.3 ft). Tube filled with sand and clay from fracture zone above. Water flowing at ~15+ gpm (326.5 ft).
	327					1		50°, HJ, Ch. 5°, J, VN, SR-S, Pl.					
	328					0							
	329		74	100	83	0					24		
	330					0							
	331	24				3				Dark greenish gray, quartz rich, altered, with chlorite (330.5 to 334.8). Contains pyrite (<1%).			
	332					2		5-75°, J, T, Fe-Py, SR, Pl-I.					Water flowing from boring at 55 gpm (331.5).
	333					2							
	334		75	100*	90	0		5-55°, J, T-VN, SR, Pl.			34		
	335					1							
	336					0							Clean water flowing from boring at 50 to 60 gpm (335.8).
	337					0		75°, HJ, Qz-Ch.					
	338		76	100*	100	0					36		
	339					1							
	340					0							
	341					0							
	342					0							
	343	25	77	100*	100	0					37		
	344					0							
	345					1							
	346					0							
	347					0							
	348		78	100*	100	0					34		

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-1**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	349					0		45°, HJ, Qz-Bi-Ch.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, weakly to moderately foliated, generally gray, fresh to slightly weathered.			
	350					3		60°, J, VN, Cl-Sd, SR, Pl.		Contains iron oxide staining and trace pyrite (350.3 to 360.8 ft).			
	351					0							
	352					2		55-75°, HJ, Qz-Fe-Ch-Py.					
	353		79	100*	85	7					35		
	354					0		35-90°, J, VN-N, Cl, Sd, Fe, SR-S, Pl-S.					
	355					4							
	356	26				1				Strongly foliated (356 to 357).			
533	357					1		40-50°, FJ, N-MW, Sd-Bi-No, SR, Pl.					
	358		80	100*	100	0					35		
	359					0		70-75°, HJ, Qz-Ch.					Water flow from boring ~30 to 50 gpm until grouted 9/17/09.
	360					0				Bottom of boring at 360.8 ft. Backfilled with cement and bentonite grout.			

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Gorge 2nd Tunnel Core Borehole Log

Project Number	Sheet	Borehole Number
A080138/JA4087	1 of 35	**B-2**

Prepared for	Seattle City Light, Newhalem, WA	Elevation	1228.0 ft (NAVD88)
Driller / Equipment	Crux Subsurface Burley 5500-1	Drilling dates	8/17/2009 to 9/12/2009
Coring Method	HQ wireline	Azimuth/Inclination	34° / -60°
Location	Above surge tank	Hole Diam/Core Diam	3.8 in/ 2.4 in
Coordinates	48.679582° N, -121.23478° E	Logged by/Approved by	AAE/SM/SB / DHM

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	1	1	1	100*	0	11		J-FJ, VN-MW, Cl-Fe-No, SR, Pl-I.		**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Moderately strong to strong, generally strongly foliated to strongly folded, black and gray, slightly weathered to fresh, moderately iron oxide stained, highly iron oxide stained on joint surfaces (0 to 17.1 ft).	12	NOTE: Refer to laboratory and packer test results for details.	
1227													
	2					0							
1226						1				Highly iron oxide stained (1.7 to 3.2 ft) around 3-inch-thick PEGMATITE zone at ~2.5 ft.			
	3												
1225			2	100*	72	1		5-35°, J-FJ, T-VN-N, Cl-Fe-No, SR, Pl-I.		Contains ~5% pink garnet (<1/2-inch) within dark greenish gray, fine-grained matrix (2.9 to 3.5 ft).	18		
	4												
1224						2							
	5												
						7							
1223	6		3	66	66						3		
						4		45°, J, VN-?, Cl-No, SR, I.					
1222	7												
						0							
1221	8	1											
			4	100*	81	1					25		
	9												
1220						6		J-FJ, T, Fe, SR, Pl.					
	10												
1219						0							
	11												
1218						1							
	12												
						10							
1217	13												
			5	100	55	5					20		
1216	14							0-65°, J-FJ, T-N, Cl-Fe, SR, Pl-I.					
						7							
1215	15												
						5							
	16												
1214						3				3/4-inch-thick intensely fractured zone with bright orange iron oxide staining (15.9 ft).			Lost drill water circulation.
	17												
1213						2		0-15°, J, T-VN, Cl-Fe-No, SR, Pl.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong to very strong, weakly to moderately foliated, gray, fresh.			
	18												
1212			6	100	93	1					32		
	19												
1211						0		60°, S, T, Cl-Fe, Pl.					
	20												
						5							
1210	21												

NOTE: See Borehole Log Summary Key for explanation of symbols and abbreviations.

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

Borehole Number: **B-2**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
1209	22	2	7	100	68	6		5-25°, FJ, VN-N, Cl-Fe-No, SR, Pl.		**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong, gray and white, fresh, strongly foliated at 0° (~21.1 to 24 ft).	21	PL = 5261 psi.	
1208	23					3		10°, S, Py, Slk, Pl.					
						1		15°, FJ, VN-N, Cl-Fe-No, SR, Pl.					
1207	24		8	100	100	0					16		
1206	25					0							
	26												
1205	27	3	9	100*	95	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong to very strong, weakly to moderately foliated, gray, fresh.	25		
1204	28					0							
1203	29					0							
1202	30					2		15°, J, VN, SR, Pl.					
	31					0							
1201	32		10	100*	100	0					23		
1200	33		11	98	96	0				Contains pyrite (<1%) (32.3 ft).	18		
1199	34					3				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, weakly to strongly foliated, gray and white, fresh.			
1198	35					0		5-25°, FJ-HJ-J, T, Cl-No, SR-R, I.					
1197	36					4							Drill water circulation returns.
1196	37		12	100	96	1		0°, FJ/S?, VN, Bi, Slk?, Pl.			24		
1195	38					1		5°, FJ, VN, Cl-Py, SR, C-Pl.		Trace weathered pyrite exposed in joint (<1%) (37.8 ft).			
1194	39					0							
1193	40					0				~1% pink garnet in 1-inch-thick biotite rich zone (39.7 ft).			
	41					1		40°, FJ, VN, Cl-Py, SR, C-Pl.					
1192	42		13	100	100	0					24		
1191	43					0							
1190	44					0							

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-2**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
1189	45	4				1		50°, FJ, T, Cl, SR, I-Pl.		**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, weakly to strongly foliated, gray and white, fresh.			
						0							
1188	46												
			14	100	94	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong to very strong, weakly to moderately foliated, gray, fresh, contains <1% garnet (<1/8-inch).	37	
1187	47					0							
1186	48					1		10°, J, VN, SR, U.		**PEGMATITE**. Coarse-grained, moderately strong to strong, white, fresh.			
1185	49					0							
			15	100	100						12		
1184	50					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong to very strong, weakly to moderately foliated, gray, fresh.			
1183	51					0				<1% dark brownish red garnet (<1/2-inch) (50.4 to 51.2 ft).			
			16	100	100						16		
1182	52					0				**PEGMATITE**. Coarse-grained, moderately strong to strong, white, fresh.			
	53	5				0							
1181	54		17	100	100	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong to very strong, weakly to moderately foliated, gray, fresh.	15		
1180	55					0							
	56												
1179						0							
	57												
1178	58					0							
			18	99	99						26		
1177	59					0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, weakly to strongly foliated, dark gray, gray, and white, fresh, includes sparse, small, brownish red garnet.			
1176	60					0							
	61												
1175						0							
	62												
1174			19	100*	93	5		15-30°, FJ, VN, Cl-No, SR, Pl-St.			28		
	63									**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to fine-grained, strong to very strong, weakly to moderately foliated, generally dark gray, fresh, streaky appearance.			
1173						2		0-15°, J/S, VN, Ch-No, SR/Slk, Pl.					
	64												
1172			20	100	85	0				Healed shear partially reactivated (63.7 ft).	16		
	65												
1171						3		30-40°, FJ/S, T-VN, No-Py, Slk, Pl.		Becomes fine-grained.			
	66												
						3							
1170	67					>10							

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Gorge 2nd Tunnel Core Borehole Log

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
1169	68	6	21	98	28	>10		5-45°, J/S?, T, Cl-No, SR/Slk?, Pl-I.		Joint infilled with light greenish gray clay with micaceous structure preserved (67.4 ft).	21		
1168	69					>10				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to fine-grained, strong to very strong, weakly to moderately foliated, generally dark gray, fresh, streaky appearance.			
1167	70					9				Intensely fractured zone (68.6 to 68.9 ft).			
	71												
1166	72		22	100*	58	5		S, T, Cl-Ch-Sd-Si, Slk, Pl-I.		Partially migmatitic structure (69.9 to 73.8 ft).	20		
1165	73					10				Multiple small slivers within fracture zones (70.1 to 70.3 ft).			
1164	74					6		5-90°, J, T, Cl-Ch-Sd-Si, SR, Pl-I.		Dark brownish gray (71.1 to 81.6 ft).			
1163	75					2				Moderately foliated (73.8 to 81.5 ft).			
	76					2							
1162	77		23	100	88	6					19		
1161	78					0		5-75°, J, T, Sd-Si-Py, SR, Pl-I.					
1160	79					1							
1159	80					3							
1158	81					0		40°, FJ, SR, I.					
1157	82	7	24	98	96	1				**PEGMATITE**. Coarse-grained, moderately strong to strong, white, fresh.	32		
1156	83					0							
1155	84					0							
1154	85					3		FJ-J, SR, I.		**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine-grained, moderately strong to strong, weakly to moderately foliated, dark gray, fresh, biotite-rich.			
	86					0							
1153	87		25	100*	100	0					20		
1152	88					0				Contains <5% garnet in zones (87.3 to 94.7 ft).			
1151	89					0							
1150	90					0							
	91					0							

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
1148	92					0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine-grained, moderately strong to strong, weakly to moderately foliated, dark gray, fresh, biotite-rich.			
	93					0							
1147	94		26	98	98	0					25		
1146	95					0				**PEGMATITE**. Coarse-grained, moderately strong to strong, white, fresh.			
1145	96					1							
1144	97					0		0°, j, T, SR, I.		**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, weakly to moderately foliated, dark gray, fresh, biotite-rich with quartz-rich zones.			
1143	98					0				**PEGMATITE**. Coarse-grained, moderately strong, white, fresh.		PL = 9065 psi.	
1142	99		27	100*	100	1		5-10°, J-FJ, T-N, Py-Sd-Si, SR, I.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine-grained, strong to very strong, strongly foliated, dark gray, fresh, partially migmatitc texture.	45		
1141	100					1							
1140	101					0							
1139	102					0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, weakly to moderately foliated, black and white, fresh.			
1138	103	8	28	97	97	1		5-50°, J-FJ, T, Py-No, SR, I.			23		
1137	104					1							
1136	105					1		5-50°, J-FJ/S?, T, Py-No, Slk?, I. 45°, FJ/S?, T, SR-Slk?, I.					
1135	106					1							
1134	107					0							
1133	108					4		45°, FJ/S?, T, SR-Slk?, I.					
1132	109		29	100*	98	0					22		
1131	110					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine-grained, strong, weakly to moderately foliated, generally dark gray, generally fresh.		PL = 11075, 7824 psi.	
1130	111					1							
	112					0		HJ, H, Ca-Ch-Qz, Pl.		Becomes medium- to fine-grained, gray, contains ~1% garnet.			
	113					0				Rock mass altered to chlorite within ~1 inch around healed joint (111.6 ft).			
	114		30	100	100	0		HJ, H, Ca-Ch-Qz, Pl.			30		
1129						1							

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
1128	115	9				0		5°, HJ-J, T, Red Cu sulfide?, SR, Pl.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine-grained, strong, weakly to moderately foliated, generally dark gray, generally fresh.			
	116									Becomes greenish gray, chlorite-rich, contains ~1% garnet.			
1127	117		31	98	98	1				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, weakly to moderately foliated, gray to black and white, fresh, contains up to 1% dark pink to reddish brown garnet in zones, contains greenish chlorite-rich layers.	33		
1126	118					0							
1125	119					0							
1124	120					0				Bright red coppery pyrite coating on joint (116.1 ft).			
	121					0							
1123	122		32	100*	100	0					32		
1122	123					1		50-90°, HJ-J, T, Ca-Sd-Si, SR, I.					
1121	124					1							
1120	125		33	100	100	2					11		
1119	126					0							
1118	127	10	34	93	60	>10		35°, FJ/F?, W, Ca-Cl, SR, Pl.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to fine-grained, strong to very strong, weakly to moderately foliated, generally gray, fresh.	19		
	128					>10				Intensely fractured zone (126.9 to 127.4 ft), contains ~100 fine to coarse gravel-sized fragments.			
1117	129					>10				Becomes fine-grained, dark gray, contains quartz-rich veins.			
1116	130					>10		5°, J, N-VN, Py, SR, Pl.					
1115	131					0							
1114	132		35	100*	100	0				No recovery.	18	UCS = 8740 psi.	
1113	133					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine-grained, strong to very strong, weakly to strongly foliated, dark gray, fresh.			
1112	134					0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, weakly to moderately foliated, black and white, fresh.			
1111	135					1							
	136					0		0-10°, J, T, SR, I.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine-grained, strong to very strong, generally weakly to strongly foliated, generally dark gray, fresh, partially migmatitic texture; contains quartz-rich bands.			
1110	137					1		10°, FJ, T, SR, I.					
1109	138					0							

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
1108	139		36	100*	100	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine-grained, strong to very strong, generally weakly to strongly foliated, generally dark gray, fresh, partially migmatitic texture; contains quartz-rich bands.	21	UCS = 16610 psi, PL = 7284 psi.	
1107	140					1		0°, HJ-J, T, Cl, SR, I.					
1106	141					0							
1105	142	11	37	100*	100	0				Contains ~5% garnet (141.3 to 142.1 ft).	19	PL = 6785 (low value), 7979 psi.	
						1		30°, FJ, T, SR, I.					
1104	143					0							
1103	144					1		20°, FJ, T, Py-Sd, SR, I.					
1102	145					0							
1101	146		38	100	98	0					20		
1100	147					1		10-35°, FJ, N-VN, SR, Pl.		Generally contains ~1% garnet, contains up to 5% garnet locally (147.8 to 180.3 ft).			
1099	148					2							
1098	149					10		45°, HJ-J, Cl-Fe-Py-Sd, SR, Pl.		Trace pyrite exposed in joints (149.6 to 150 ft).			
1097	150					0				Moderately foliated (150 to 165.4 ft).			
1096	151		39	96	79	0					18		
1095	152					1							
1094	153					7		45-55°, J, VN, Ca-Cl-Fe, S, Pl. 10-20°, J, MW, Gr-Sd, SR, Pl-I. 15°, FJ, VN, SR, Pl.		Black and bright orange iron oxide streaks, and orange iron oxide clay in and near joints (153 to 153.9 ft). Joints are also coated with calcite.			
1093	154					0							
1092	155					0							
1091	156		40	100*	100	0					20		
1090	157					0							
1089	158					0		45°, HJ, Ch-Qz, Pl.					
	159					0							
	160					0							
	161					0				Chlorite-rich zones (160.7 to 165.4 ft).			

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
1088	162	12	41	100	98	0, 2, 0, 2, 3		10°, FJ-J, VN-MW, Ch-Cl-No, SR, I-St.; 10-60°, FJ-HJ-J, VN-MW, Ch-Cl-No, SR, I-St.		~1-inch-diameter mass of pinkish garnets (161.1 ft). **BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine-grained, strong to very strong, generally weakly to strongly foliated, generally dark gray, fresh, partially migmatitic texture; contains quartz-rich bands. Includes 1/8- to 3-inch-thick bands of up to 50% garnet (162.2 to 164.4 ft). Becomes medium- to fine-grained, weakly to moderately foliated, light gray, quartz-rich.	19		
1087	163												
1086	164												
1085	165												
1084	166		42	81	65	3, 1		7°, J, MW, Cl-Py-No, ST, Pl-I.			27		
1083	167												
1082	168		43	100*	100	0, 0, 0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, weakly to moderately foliated, light gray, fresh, quartz-rich, <1% garnet.	14	UCS = 9830 psi, PL = 8040 psi.	
1081	169												
1080	170												
1079	171	13	44	12	97	2, 1, 5, 1, 1		30°, J, MW, Fe, SR, St.; 45-90°, J, T, Ch-Fe, ST, Pl-U.; 15°, J, MW, Sd, SR, I.; 55-90°, FJ, T, SR, C-I.		Chlorite-rich (173.7 to 174.5 ft). Thick orange iron oxide past coating joint (174.3 ft).	20		
1078	172												
1077	173												
1076	174												
1075	175		45	100	96	0, 3, 0, 2, 4		5-55°, J, T-VN, Cl-Fe-Py, SR, Pl-St-U.; 5°, J, T-VN, Cl-Fe-Py, SR, Pl-St-U.; 5°, J, T-VN, Cl-Fe-Py, SR, Pl-St-U.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine-grained, strong to very strong, weakly to strongly foliated, dark gray, fresh, contains ~1 to 2% garnet. Partially migmatitic texture (180.3 to 181.2 ft), contains quartz-rich veins and ~2 to 5% purplish pink garnet.	23		
1074	176												
1073	177												
1072	178												
1071	179												
1070	180		46	98	96	8, 0, 0, 0		15-45°, J, VN-MW?, Fe-Py-Si, SR, U-I.			23		
1069	181												
	182												
	183												
	184												

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
1067	185–186					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine-grained, strong to very strong, weakly to strongly foliated, dark gray, fresh, contains ~1 to 2% garnet.			
1066–1065–1064	187–189	14	47	100	100	0, 0, 0, 0					26		
1063	190–191					0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, weakly to moderately foliated, white, gray, and black, fresh.			
1062–1061–1060	192–194		48	100	35	2, 10, >10, >10		0-60°, J, T-MW, Fe, SR, Pl-C-U-I.			23		
1059	195–196					4		30-50°, J, VN, Fe-No, SR, Pl.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to fine-grained, strong to very strong, generally weakly to moderately foliated, generally gray, fresh.			
1058–1057–1056	197–199		49	100*	56	10, >10, 8		5-55°, J, N-VN, Fe-No, SR, Pl.			20		
1055	200					4		0-30°, F, VN, Cl-Fe-Gr-Sd, SR, Pl.		Becomes fine-grained, weakly to strongly foliated, dark gray, contains up to 5% garnet.			
1054	201					0				Highly oxidized, moderately to highly weathered, and weak to very weak around fault (198.7 to 199.3 ft).			
1053–1052–1051–1050	202–206		50	100	100	0, 0, 1, 0, 0		0°, FJ, N, SR, U-I.		**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, weakly to moderately foliated, white, gray, and black, fresh, generally contains ~1 to 5% garnet. Foliated at 0°.	27		
1049–1048	207–208					1, >10		5-20°, J, VN-MW?, Fe-No, SR, Pl-U-I.		Moderately weathered around fracture zone (207.4 to 207.6 ft).			

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
1047	209	15	51	100	88	>10		5-20°, HJ, VN-MW?, Ch, SR, Pl-U-I.		Fracture zone is slightly weathered and contains rounded, washed, angular gravel-sized clasts (208 to 208.4 ft).	23		
						4		2-20°, J, VN-MW?, Cl-Fe-Sd, SR, Pl-U-I.		**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, weakly to moderately foliated, white, gray, and black, fresh, generally contains ~1 to 5% garnet.			
1046	210					0							
	211												
1045						0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine-grained, strong, weakly to strongly foliated, dark gray, fresh, partially migmatitic texture, contains up to 10% garnet.		UCS = 9830 psi, PL = 8485, 8235 psi.	
	212												
1044						0							
	213												
1043			52	100	87	>10		0-60°, S, T-VN, Ch-Cl-Fe, Slk, Pl-I-U.			24		
	214												
1042						2							
	215							0-60°, J, T-VN, Ch-Cl-Fe, SR, Pl-I-U.					
						2							
1041	216									**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, weakly to moderately foliated, white, gray, and black, fresh, generally tightly banded and folded, with few quartz or biotite-rich layers up to 6-inches-thick, contains ~1% garnet, with up to 5% garnet in biotite-rich, fine-grained zones.			
						0							
1040	217												
						4		15-75°, J, VN-MW, Cl-Fe, S-SR, C-U.					
1039	218												
			53	100	90	0					27		
	219							20°, J, VN-MW, Cl-Fe, S-SR, C-U.					
1038						1							
	220												
1037						3							
	221							20°, J, VN-MW, Cl-Fe, S-SR, C-U.					
		16				0							
1036	222												
						4							
1035	223							5-60°, J, VN, Fe-No, SR, Pl-I.					
			54	100*	89	0					23		
1034	224												
						1							
	225												
1033						>10		5-60°, J, VN, Fe-No, SR, Pl-I.		Rock mass is chlorite-rich (224.8 to 225.7 ft).			
	226												
1032			55	100*	100	0					7		
	227												
1031						1							
	228												
						2		10-55°, J, VN, SR, Pl-I.					
1030	229												
			56	100	100	0					16		
1029	230												
						1							
1028	231							10-55°, J, VN, SR, Pl-I.					
						0							

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
1027	232					0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, weakly to moderately foliated, white, gray, and black, fresh, generally tightly banded and folded, with few quartz or biotite-rich layers up to 6-inches-thick, contains ~1% garnet, with up to 5% garnet in biotite-rich, fine-grained zones.			
1026	233					0							
1025	234	17	57	100*	100	2		45°, J, VN, SR, Pl.		Rock mass is pinkish gray and contains ~15% garnet (234.3 to 235.2 ft).	15		
1024	235					0							
1023	236					0							
1022	237					1		5°, FJ-J, T, SR, Pl-I.		Foliated at 5 to 30° (247 to 256 ft).		UCS = 7910 psi, PL = 4458 psi.	
1021	238					0							
1020	239		58	100*	100	0					17		
1019	240					1		30°, FJ-J, T, SR, Pl-I.					
1018	241					0							
1017	242					0							
1016	243					0							
1015	244		59	100*	100	0					16		
1014	245					1		30°, FJ, T, Py, SR, I.					
1013	246					0							
1012	247					0							
1011	248					0							
1010	249	18	60	100*	100	0					15		
1009	250					0							
1008	251					0							
	252					0							
	253					0							
	254		61	100*	100	0					15		
	255												

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
1007	256					0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, weakly to moderately foliated, white, gray, and black, fresh, generally tightly banded and folded, with few quartz or biotite-rich layers up to 6-inches-thick, contains ~1% garnet, with up to 5% garnet in biotite-rich, fine-grained zones.			
1006	257					0							
1005	258		62	100*	80	10		5-90°, J, VN-W, Cl-Fe-Py, S-SR, Pl-I.			23		
1004	259					3							
1003	260					2		15-90°, J, T, Py, SR, Pl-I.					
1002	261					3							
1001	262					0							
1000	263					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine-grained, strong to very strong, weakly to strongly foliated, dark gray, fresh, partially migmatitic texture.			
999	264					2		15-35°, FJ, T, SR, Pl-I.					
998	265	19	63	100	100	1					21		
997	266					0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, weakly to moderately foliated, white, gray, and black, fresh, generally tightly banded and folded.			
996	267					0		HJ, T, Ca.					
995	268					0							
994	269					1		0°, J, T, SR, Pl.					
993	270		64	100*	100	0					24		
992	271					0							
991	272					0							
990	273					0							
989	274					0							
988	275		65	100*	100	0					21		
987	276					0							
	277					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, weakly to moderately foliated, gray, fresh, partially migmatitic texture, contains quartz-rich bands up to 1-inch-thick, contains up to 1% garnet.			
	278					0							

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
986	279	20	66	93	93	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, weakly to moderately foliated, gray, fresh, partially migmatitic texture, contains quartz-rich bands up to 1-inch-thick, contains up to 1% garnet.	32		
985	280					0							
984	281					0							
983	282		67	100*	100	0					30	PL = 9416, 7817 psi.	
982	283					0							
981	284		68	100*	100	0					13	Packer = 285 to 305 ft, localized closed system.	
980	285					0							
979	286					0							
978	287		69	100*	100	0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, weakly to moderately foliated, white, gray, and black, fresh, strongly foliated at ~45°.	21		
977	288					0							
976	289					0		0-5°, J, T, SR, I.					
975	290					1							
974	291					0							
973	292		70	100	100	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong to very strong, weakly to moderately foliated, gray, fresh, partially migmatitic texture, contains biotite-rich and quartz-rich bands up to 1/2-inch-thick.	23		
972	293					0							
971	294					0							
970	295					0							
969	296					1							
968	297		71	100	100	0		60°, J, Bi-Ch, S, Pl.			26		Water depth ATD start of day 9/9/09 (borehole depth 661.9 ft bgs).
967	298					0							
	299					0							
	300					0							
	301					0							

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

Borehole Number: **B-2**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
966	303					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong to very strong, weakly to moderately foliated, gray, fresh, partially migmatitic texture, contains biotite-rich and quartz-rich bands up to 1/2-inch-thick.			
965	304					0							
964	305		72	100	100	0					30		
963	306					0							
	307					0							
962						0							
	308												
961						0							
	309									**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, weakly to moderately foliated, white, gray, and black, fresh, weak migmatitic texture, no garnet apparent.			
960		22	73	100	100	0					31		
	310												
959						0							
	311												
958						0							
	312												
						0							
957	313												
						0							
956	314												
			74	100*	100	0					67		
	315												
955						0		70°, HJ, Ca, Pl.					
	316												
954						0							
	317												
						0							
953	318												
						0							
952	319												
			75	100	100	0					25		
951	320												
						0							
950	321												
						1							
	322							0-15°, J, N, ST, I-Pl.					
949						0							
	323												
948						0							
	324												
947		23	76	100*	98	0					29		
	325												

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

Borehole Number: **B-2**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
946	326					0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, weakly to moderately foliated, white, gray, and black, fresh, weak migmatitic texture, no garnet apparent.			
						1		60°, HS-J, H-T, Ca, Slk, Pl.					
945	327												
						0							
944	328		77	100*	100						27		
						0							
943	329												
						>10		5-90°, J, VN, SR, Pl-I.		Medium- to fine-grained, white, fresh, granular, quartz-rich felsic vein (329.5 to 330.4 ft), contains no biotite and ~1% chlorite.			
942	330							40-90°, HJ, H, Qz, Pl-I.				PL = 9442 psi, PL test in quartz vein.	
			78	100*	77	1					16		
941	331												
						1							
	332												
940	333					0							
						0							
939	334												
			79	100	100	0					23		
938	335												
						0							
937	336											PL = 11000, 11891 psi.	
						0							
	337												
936						0							
	338												
935						0							
	339												
934		24	80	100	100	0					35		
	340												
933						0							
	341							80°, HJ, H, Ch-Qz, Pl-I.					
						0							
932	342												
						0						PL = 7217, 9955 psi.	
931	343												
						0							
930	344							40°, S-F, VN, Ca, Slk, Pl.					
			81	100*	100	1					43		
929	345												
						0							
928	346												
						0							
	347												
927						0							
	348												
						0							

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-2**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
926	349									**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, weakly to moderately foliated, white, gray, and black, fresh, weak migmatitic texture, no garnet apparent.			
			82	100*	100	0					26		
925	350												
						0							Water depth ATD start of day 9/8/09 (borehole depth 631 ft bgs).
924	351												
						0							
	352												
923						0							
	353												
922						0							
	354												
921		25	83	100*	100	0					63		
	355												
920						0							
	356												
						0							
919	357												
						0							
918	358												
						0							
917	359												
			84	100*	100	0					26		
	360												
916						0							
	361												
915						0							
	362												
914						0							
	363												
						0				~1% garnet, mostly in biotite-rich bands (363.2 to 365.3 ft).			
913	364												
			85	100*	100	0					23		
912	365												
						0							
911	366												
						0							
	367												
910						0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, ranges from weakly to strongly foliated, gray, fresh to slightly weathered, includes quartz-rich and biotite-rich bands up to 1-inch-thick.			
	368												
909						0				Weakly to moderately foliated.			
	369												
908		26	86	100	100	0					22		
	370												
907						0							
	371												
						0							
906	372												

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-2**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
905	373					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, ranges from weakly to strongly foliated, gray, fresh to slightly weathered, includes quartz-rich and biotite-rich bands up to 1-inch-thick.			
						0							
904	374									<1% purplish pink garnet (<1/16-inch) (373.9 to 374.9 ft).			
			87	100	100	0					29		
903	375												
						0							
902	376					1		20°, FJ, T, SR, Pl.		Becomes moderately to strongly foliated, slightly migmatitic texture (376 to 394.5 ft).			
	377												
901						0				Partially migmatitic texture (376.1 to 394.5 ft).			
	378												
900	379					0							
			88	100	100	0					57		
899	380												
						0							
898	381												
						0							
	382												
897						0							
	383												
896						0							
	384												
895		27	89	93	87	0					28		
	385												
894						0							
	386							0°, FJ, N-MW, SR-S, C-Pl.					
						2		0°, FJ, Sd-Si, SR, Pl.					
893	387												
						0							
892	388												
						0							
	389												
891			90	100*	100	0					24		
	390												
890						0							
	391												
889						0							
	392												
888						0							
	393							0-90°, J, T, SR, I.					
						>10		70°, HJ, H, Ca-Ch, Pl.					
887	394												
			91	100	93	0					28		
886	395									Moderately to weakly foliated.			

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-2**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
885	396					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, ranges from weakly to strongly foliated, gray, fresh to slightly weathered, includes quartz-rich and biotite-rich bands up to 1-inch-thick.			
						0							
884	397					0							
883	398					0							
882	399	28	92	100*	100	0					30		
881	400					0							Water depth ATD start of day 9/12/09 (borehole depth 791.9 ft bgs).
880	401					0							
879	402					0						PL = 7689, 7149 psi.	
878	403					0							
877	404		93	100*	100	0					26		Water depth ATD start of day 9/10/09 (borehole depth 696.9 ft bgs).
876	405					0							
	406					0							
875	407					0							
874	408					2		0°, J, VN, Sd, SR, I.					
873	409		94	100*	100	0					24		
872	410					0							
871	411					0							
870	412					0							
869	413	29	95	100*	100	0					25		
868	414					0							
867	415					1		0-20°, S-F, VN-N, Bi, SR-S-Slk, U.		Abrupt change in foliation angle at joint.			
866	416					0							
	417					0							
	418					0							

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Borehole Number: **B-2**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
865			96	100	100	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, ranges from weakly to strongly foliated, gray, fresh to slightly weathered, includes quartz-rich and biotite-rich bands up to 1-inch-thick.	25		
	420												
864						0							
	421												
863						0						UCS = 11750 psi, PL = 7567 psi.	
	422												
862						0							
	423												
861						0							
	424		97	100*	100						24		
860						0							
	425												
859						0							
	426							40°, HF, N, Qz, Pl-I.					
	427					0							
858						0							
	428												
857						0				Weakly to strongly foliated, partially migmatitic texture (428 to 469.5 ft).			
	429												
856		30	98	100*	100	0					29		
	430												
855						0							
	431												
						0							
854	432												
						0							
853	433		99	100*	100						22		
						0		55°, HJ, N, Ch-Qz, Pl.					
	434												
852						0							
	435												
851			100	100*	100	0					13		
	436												
850						0							
	437												
849						0							
	438							60°, HJ, H, Ch-Qz, SR, Pl.					
848						0							
	439												
			101	100*	100	0					26		
847	440												
						0							
846	441												
						0							
	442												

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
844	443	31	102	100*	100	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, ranges from weakly to strongly foliated, gray, fresh to slightly weathered, includes quartz-rich and biotite-rich bands up to 1-inch-thick.	31		
	444					0							
843						0							
	445												
842	446					0							
841	447					0							
	448		103	100*	100	0					25		
840						0							
839	449					0							
	450												
838						0							
837	451					0							
	452	32	104	100*	100	0					49		
836						0							
	453												
835						0							
	454												
834	455					0							
						1		10°, J, VN, Pl-I.					
833	456					0							
	457		105	100*	100						37		
832						0							
	458												
831						0		10-70°, HJ, H, Ca-Ch-Qz, Pl-I.					
	459												
830						1		0°, J, VN-N, SR, Pl-U. 30-90°, HJ, H.					
	460												
829	461					0							
						0							
828	462												
			106	100*	100	0		45°, HF, H, Bi-Qz, SR, Pl.			36		
827	463												
						0							
826	464												
						0							
825	465					0							

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
824	466					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, ranges from weakly to strongly foliated, gray, fresh to slightly weathered, includes quartz-rich and biotite-rich bands up to 1-inch-thick.			
	467												
823	468					0							
822	469					0							
821	470		107	100*	100	0				Weakly to moderately foliated.	45		
820	471					0							
	472	33				0							
819			108	100*	100	0					11		
	473												
818						0							
	474												
817						0							
	475		109	100*	94						27		
816						0							
	476												
						0							
815	477												
						0							
814	478					0							
813	479		110	100	100	0					34		
	480												
812						0							
	481												
811						0		25°, HS-HJ, N-H, Bi, Pl.					
	482												
810						0							
	483												
809	484					0							
		34	111	100	100	0					28		
808	485												
						0							
807	486												
						0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, weakly to moderately foliated, gray, fresh.			
	487												
806						0							
	488												
805						0							
	489												

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Borehole Number: **B-2**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
804	490		112	100	100	0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, weakly to moderately foliated, gray, fresh.	41		
803	491					0							
						0						PL = 7419, 9152 psi.	
802	492									**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, weakly to moderately foliated, gray, fresh to slightly weathered.			
801	493					0							
						0							
800	494		113	100	100	0					56		
799	495					0							
798	496					0							
797	497					0							
796	498					0							
795	499	35	114	100	100	0					22		
794	500					0							
793	501					0							
792	502					0							
791	503		115	100	100	0					20		
790	504					0							
789	505					0							
788	506					0							
787	507		116	100*	100	0					22		
786	508					0							
785	509					0							
	510					0							
	511					0							
	512												

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
784	513	36	117	100	100	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong, weakly to moderately foliated, gray, fresh to slightly weathered.	25		
783	514					0							
						1		0-10°, FJ-J, VN, SR, I.					
782	515					0							
781	516					0							
	517					0							
780			118	100*	100	0					22		
	518					0							
779	519					0							
778	520					0							
777	521					0							
776	522					0						PL = 9173, 9577 psi.	
775	523	37	119	100*	99	0					24		
	524					0							
774						0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, moderately to strongly foliated, gray, fresh to slightly weathered.			
773	525					0							
	526					3		55°, S, VN, Slk, Pl. 5°, J, T, SR, I.					
772	527					0							
771	528		120	100	95	3		40°, S, N, Slk, Pl.			23		
770	529					0							
769	530					0							
768	531					0							
	532					0				<1% purplish pink garnet (<1/16-inch) in some zones, mostly in fine-grained, biotite-rich layers (~532 to 538 ft).			
767						0							
	533					0							
766	534		121	100*	74	0					22		
765	535					5							

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
763	537	38	122	100*	96		S, VN-MW, Ca-Ch-Cl-Fe-Py-Sd Slk, Pl-I-U.		**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, moderately to strongly foliated, gray, fresh to slightly weathered.	23		
762	538						15°, S, VN-MW, Fe-Py-Qz, Slk-S, U.					
761	539											
760	540						45°, HJ, H, Ch-Qz, Pl.					
759	541						15°, S, N-VN, Sd, Slk, Pl.					
758	542		123	100	98					26		
757	543						70°, HJ, H.					
756	544						0-60°, J, MW-W, Ch-Fe, S, Pl-I.					
755	545											
754	546						50°, J-HJ, SR, Pl.					
753	547		124	100*	97		60°, HJ, N, Ch-Qz, Pl.			25		
752	548											
751	549								Foliated at 0 to 35° (~550 to 619 ft).			
750	550						5-35°, FJ, N-MW, Ch-Py-Sd, SR, I-St.					
749	551											
748	552		125	98	73				Contains 0 to 2% garnet (553.3 to 596.5 ft).	23		
747	553						0-10°, FJ, T-W, Cl-Fe-Py-Sd, SR, Pl-I-St.		Quartz-rich zone contains 5 to 15% garnet, including 1-inch-diameter cluster (553.7 to 554.2 ft).			
746	554						0-10°, J/F?, VN-N, Sd, SR, Pl.		Slightly to moderately weathered and strong to very weak around fracture (556.2 to 556.9 ft).			
745	555						15°, FJ, N-MW, SR, Pl-I.					
744	556						0-90°, FJ, N, Cl-Py-Sd, SR, Pl-I.					
	557											
	558											
	559											

Fractures/ft: 5, 0, 0, 0, 1, 3, 0, 0, 1, 0, 0, 0, >10, 0, 1, 0, 0, 0, 2, 5, 0, 1, 8, 3, >10, 1, >10

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Borehole Number: **B-2**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
743	560	39	126	98	90	0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, moderately to strongly foliated, gray, fresh to slightly weathered.	22		
						0							
742	561					1		FJ, VN-MW, SR, Pl-I.					
	562												
741						0							
	563												
740						0							
	564												
739			127	100*	100	0				Contains elongated pyrite, ~1/8-inch by 1-inch, within quartz-rich band (564.3 to 564.5 ft).	25		
	565												
						0							
738	566									Mostly dark gray, fine-grained, and biotite-rich (566 to 596.5 ft).			
						0							
737	567												
						0							
736	568									Contains ~7 to 10% garnet (<1/16-inch) within dark gray, fine-grained, biotite-rich layers (567.6 to 570.9 ft).			
						0		20-35°, FJ, VN-N, Ca, SR-S, Pl-I.					
	569												
735			128	100*	100	0					23		
	570												
734						0							
	571												
733						0							
	572									Contains 1 to 7% garnet (571.9 to 573.5 ft).			
						7		0-90°, J-FJ, VN, SR, Pl-St-U.					
732	573												
						0							
731	574												
		40	129	100*	90	1		5°, FJ, T, SR, I.			24		
730	575												
						0							
	576												
729						4		0°, J, T-VN, SR, Pl-I.					
	577							20°, HJ, Ca, Pl.					
728						0							
	578												
727						0		40°, HJ-S?, N, Cl-Py, SR-Slk?, Pl.					
	579												
			130	100	100	1		20°, FJ, N-MW, SR, Pl.			34		
726	580												
						0							
725	581												
						0							
724	582												
						0							

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

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Borehole Number: **B-2**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
723	583	41	131	100	98	5				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, moderately to strongly foliated, gray, fresh to slightly weathered.	26		
722	584					0							
721	585					0							
720	586					1		15°, FJ, VN, SR, Pl.					
719	587		132	93	93	2					32	UCS = 5530 psi, UCS value low.	
718	588					1		0-25°, J, VN-MW, Ch, SR, Pl.		Contains ~5% garnet (up to 3/16-inch) overall and up to 30% garnet locally, ~1% pyrite, and ~10% chlorite (587.7 to 588.1 ft).			
717	589					0				Contains trace elongate sulfide nodules up to 3/4-inch-long and 1/8-inch-wide (589.2 to 592.6 ft).			
716	590					0							
715	591					>10		20-35°, F, VN-W, Ch-Cl, SR, I.					
714	592		133	100*	95	3		5°, J, VN-MW, Cl, S-SR, Pl.			23		
713	593					0							
712	594					0							
711	595					2		5°, S, VN-MW, Ch-Sd, Slk, Pl.					
710	596					0							
709	597	42	134	91	91	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to fine-grained, moderately strong to very strong to strong, generally weakly to moderately foliated, generally gray to dark gray, generally fresh to slightly weathered, partially migmatitic texture, contains quartz-rich veins, generally contains <1% garnet (up to 1/8-inch) (596.5 to 722.2 ft).	30		
708	598					0							
707	599					0							
706	600					0							
705	601					0							
704	602		135	98	98	0					26		
	603					0							
	604					0							
	605					0							
	606					0							

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

Borehole Number: **B-2**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
703						0		20°, FJ, VN, S-SR, Pl-I.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to fine-grained, moderately strong to very strong to strong, generally weakly to moderately foliated, generally gray to dark gray, generally fresh to slightly weathered, partially migmatitic texture, contains quartz-rich veins, generally contains <1% garnet (up to 1/8-inch) (596.5 to 722.2 ft).			
	607												
702						0							
	608												
701						0							
	609												
			136	100*	98	0					25		
700													
	610												
						>10		10°, FJ, VN-W, Gr-Sd-Si, SR, Pl.				PL = 5531, 5976 psi.	
699	611												
						8							
698	612												
						1							
	613												
697						1		0-5°, FJ, VN-MW, S-SR, Pl.					
	614												
696		43	137	100*	88	1					27		
	615												
695						0							
	616												
						>10		0-5°, J-F, N-W, SR, I.					
694	617												
						0							
693	618												
						1							
692	619							5°, FJ, VN, Sd, SR, Pl.					
			138	100*	100	0					25		
691	620												
						0							
690	621												
						0							
	622												
689						0							
	623												
688						0							
	624												
			139	100*	100	0					28		
687	625												
						0							
686	626												
						0				No garnet (626 to 666).			
685	627												
						0							
	628												
684						1				Foliated at 80°.			
	629												
683													

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-2**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	630	44	140	100*	100	2		0-80°, J-FJ, VN, SR, I.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to fine-grained, moderately strong to very strong to strong, generally weakly to moderately foliated, generally gray to dark gray, generally fresh to slightly weathered, partially migmatitic texture, contains quartz-rich veins, generally contains <1% garnet (up to 1/8-inch) (596.5 to 722.2 ft).	25		
682						1							
	631												
681						0							
	632												
						0							
680	633												
						0							
679	634												
			141	100	100	0					48		
	635												
678						0							
	636												
677						0							
	637												
676						0				Foliated at 0°.			
	638												
						0							
675	639												
			142	98	100	0					18		
674	640												
						0							
673	641												
						0							
672	642												
						0							
	643												
671						0							
	644												
670		45	143	98	100	0					23		
	645												
669						0							
	646												
668						0							
	647												
						0							
667	648												
						0							
666	649												
			144	98	100	0					22		
665	650												
						0							
664	651												
						0							
	652												
663						0							

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-2**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
662	654					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to fine-grained, moderately strong to very strong to strong, generally weakly to moderately foliated, generally gray to dark gray, generally fresh to slightly weathered, partially migmatitic texture, contains quartz-rich veins, generally contains <1% garnet (up to 1/8-inch) (596.5 to 722.2 ft).			
661	655		145	98	100	0					16		
660	656					0							
659	657					0							
658	658					0							
657	659	46	146	100	82	0					27		
656	660					0							
655	661					7		15-40°, FJ/F?, VN-W, Si, S, Pl.		Becomes fine-grained, strongly foliated, dark gray, fresh, rock mass contains hornblende (~661 to 667 ft).			
654	662					6		20-50°, F, W, Si, S, Pl.		Foliated at 40°.			
653	663					1		J, MW, S, Pl.					
652	664		147	98	86	0					12		
651	665					0				Foliated at 50°.			
	666					0						UCS = 3020 psi, UCS value low.	
650	667					1		40°, FJ, VN, S, Pl.		Becomes medium- to fine-grained, weakly to moderately foliated, gray to dark gray, fresh to slightly weathered, partially migmatitic texture, contains quartz-rich veins, generally contains <1% garnet.			
649	668					0		40°, HJ, W, Qz, I.					
648	669		148	100	101	0				Contains ~10% garnet (669 to 675.9 ft).	29		
647	670					0				Foliated at 30°.			
646	671					0							
645	672					0							
644	673					0							
643	674	47	149	100	100	0					26		
	675					0							
	676												

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

Borehole Number: **B-2**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
642	677					0				Contains ~30% garnet (675.9 to 676.3 ft).			
						0				Contains ~15% garnet (676.3 to 682 ft).			
641	678									**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to fine-grained, moderately strong to very strong to strong, generally weakly to moderately foliated, generally gray to dark gray, generally fresh to slightly weathered, partially migmatitic texture, contains quartz-rich veins, generally contains <1% garnet (up to 1/8-inch) (596.5 to 722.2 ft).			
						0							
640	679												
			150	98	98	0					29		
	680												
639						0							
	681												
638						0							
	682									Contains <1% garnet (682 to 690 ft).			
637						0							
	683												
636						0							
	684												Driller indicates drill water return is about 75% (off and on throughout day).
			151	100	100	0					18		
635	685												
						0							
634	686												
						0							
633	687												
						0							
	688												
632						0							
	689												
631		48	152	98	98	0					30		
	690												
630						0				Contains ~10% garnet (690 to 690.3 ft).			
	691									Contains <1% garnet (690.3 to 694 ft).			
629						1		30°, J, T, Py (15% coated), SR, I.					
	692												
						0							
628	693												
						0							
627	694												
			153	100	100	1		30°, FJ, VN, SR, Pl.		No garnet (694 ft to BOB at 800 ft).	34		
	695												
626						0							
	696												
625						0							
	697												
624						0							
	698												
623						0							
	699												
			154	100	100	0					78		

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-2**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	700							10°, HJ, VN, Qz, P.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to fine-grained, moderately strong to very strong to strong, generally weakly to moderately foliated, generally gray to dark gray, generally fresh to slightly weathered, partially migmatitic texture, contains quartz-rich veins, generally contains <1% garnet (up to 1/8-inch) (596.5 to 722.2 ft).		Packer = 701 to 800 ft, conductivity exceeds capacity of test.	
621	701					0							
						0							
620	702												
						0							
619	703												
						0							
	704												
618		49	155	100	100	0					28		
	705												
617						0							
	706												
						0							
616	707												
						0							
615	708												
						0							
614	709												
			156	100	100	0					32		
	710												
613						0							
	711									Foliated at 20°.			
612						0							
	712												
611						0							
	713												
						0							
610	714												
			157	100*	100	0					33		
609	715												
						0							
608	716												
						1		75°, S, Py, Slk?.					
607	717												
						1							
	718												
606						1		60-70°, J.					
	719												
605		50	158	100	100	0					37		
	720												
						0		75°, HJ, VN.					
604	721												
						4		70°, J, Ch-Se.					
603	722												
						3							
602	723												

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

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Borehole Number: **B-2**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
601	724		159	100*	64	3, 5		0-20°, J, VN-MW, Si, SR, Pl-I.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to fine-grained, moderately strong to very strong to strong, generally weakly to moderately foliated, generally gray to dark gray, generally fresh to slightly weathered, partially migmatitic texture, contains quartz-rich veins, generally contains <1% garnet (up to 1/8-inch) (596.5 to 722.2 ft).	29		Lost drill water circulation.
600	725												
599	726					3, 2		0-30°, J, VN-W, Si, SR, C-I-Pl.					
598	727												
597	728					3, 1							
596	729		160	100*	85	2					30		
595	730					3, 2		0-30°, J, VN, SR, I.					~50% drill water circulation returns. Lost drill water circulation.
594	731												
593	732					1, 0		20-70°, HJ, N, S, Pl. 0°, J, N, S, Pl.		Becomes fine-grained, strong to very strong, weakly foliated, dark, slightly purplish gray, fresh, contains many healed fractures infilled with chlorite, rock mass possibly silicified.			
592	733												
591	734	51	161	100*	98	0, 2		20-70°, HJ, N, S, Pl. 10°, J, VN, SR, Pl.			30		
590	735												
589	736					2, 1		40°, J, VN, Ch, S, Pl.					
588	737												
587	738					3, 0		0-30°, J, N, S, Pl.			30		
586	739		162	100*	80								
585	740					1, 3							
584	741												
583	742					2, 1		0-30°, J, N, SR, Pl-I.		Becomes medium- to fine-grained, weakly to moderately foliated, gray to dark gray, fresh to slightly weathered, sharp lithology change (743 ft), contains sparse quartz-rich and biotite-rich bands (743 to 778.5 ft).		PL = 13354 psi.	
582	743		163	100*	84	1, 0					26		
	744												
	745												
	746							60°, J, N, Py-Fe, S,					

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Borehole Number: **B-2**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
581	747	52	164	100*	87	>10		Pl. 0-20°, J, N, SR, Pl-I.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to fine-grained, moderately strong to very strong to strong, generally weakly to moderately foliated, generally gray to dark gray, generally fresh to slightly weathered, partially migmatitic texture, contains quartz-rich veins, generally contains <1% garnet (up to 1/8-inch) (596.5 to 722.2 ft).	31		
						5		30°, J, VN, SR, Pl.					
580	748							0-30°, J, MW, Si-Fe, SR, I.					
						3							
	749							50°, FJ, N, Si, S, Pl.		Foliated at 50°.			
579						2		30°, MW, SR, I.					
	750												
578						0							
	751							30°, J, T, SR, Pl.					
						1							
577	752		165	100*	82	>10		30°, J, N-MW, SR, I.			26		
576	753												
						0							
575	754												
						5		30°, J, N, Fe, S-SR, Pl-I.					
574	755												
						6							
	756												
573						0							
	757	53	166	100	58	5		0-60°, J, T-N, No-Fe, S-SR, Pl-I.			29		
572													
	758					5							
571													
	759					3							Drill water circulation returns.
570	760												
						>10							
569	761												
						3							
568	762												
						0							
	763												Lost drill water circulation.
567						5							
	764												
566			167	100*	64	8					20		
	765												
565						>10		0°, J, N-W, S, Pl. 0-70°, J, MW-W, No-Fe, S-SR, Pl-I.					
	766												
						1		0°, J, VN, Si, SR, Pl-I.					
564	767												
						4							
563	768												
						3		0°, J, MW, Py, S, Pl.					
562	769												
			168	100*	88	2		0-30°, J-FJ, VN-N, SR, Pl-I.		Foliated at 30°.	30		

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

Borehole Number: **B-2**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
561						0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to fine-grained, moderately strong to very strong to strong, generally weakly to moderately foliated, generally gray to dark gray, generally fresh to slightly weathered, partially migmatitic texture, contains quartz-rich veins, generally contains <1% garnet (up to 1/8-inch) (596.5 to 722.2 ft).			
	771												
560						0							
	772												
559						0							
	773												
558						0				Partially migmatitic texture (773.5 to 778.5 ft).			
	774												
			169	100	100	0					26		
557	775												
						1		40°, HJ, MW, Qz.					
556	776							40°, S, VN, Py-Ch, Slk, Pl.					
						0							
	777												
555						0							
	778												
554						1				**ANDESITE**. Fine-grained, weak to very strong, dark gray, fresh.			
	779							0°, J, N, S-SR, Pl.					
553		54	170	100	100	1					37		
	780												
552						0							
	781												
						4		20°, J, T-VN, Ch, S, Pl-I.					
551	782												
						>10							
550	783												
						5							
549	784												
			171	100*	97	5		40°, J, VN, S-SR, Pl-I.			~40		
	785												
548						5							
	786												
547						1							
	787											UCS = 6900 psi.	
546						0							
	788							10°, J, VN, SR, I.					
545						2							
	789												
			172	100	100	0					~40		
544	790												
						1							
543	791							0°, J, VN, SR, Pl.					
						0							
542	792												
						0							
	793												

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Borehole Number: **B-2**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	794	55				0				**ANDESITE**. Fine-grained, weak to very strong, dark gray, fresh.			
540			173	91	91	1		15°, J, VN, S, Pl.			42		
	795												
539						0							
	796					2		20°, J, VN, S-SR, Pl-St.				PL = 5989, 17394, 2361, 10373 psi.	
538	797												
						3							
537	798							30°, J, VN, Ca-Py-Ch, S-SR, Pl.					
			174	100	85	2					20		
536	799									**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, strong to very strong, weakly to moderately foliated, gray to dark gray, fresh to slightly weathered.			
						3		60°, J, VN, Ch, S, U.					
	800							10°, J, R, I.					

VWP grouted in place at bottom of boring at 800.0 ft.

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Gorge 2nd Tunnel Core Borehole Log

Project Number	Sheet	Borehole Number
A080138/JA4087	1 of 18	**B-3**

Prepared for	Seattle City Light, Newhalem, WA	Elevation	712.7 ft (NAVD88)
Driller / Equipment	Crux Subsurface Burley 5500-3	Drilling dates	9/2/2009 to 9/16/2009
Coring Method	HQ wireline	Azimuth/Inclination	233° / -5°
Location	Adit	Hole Diam/Core Diam	3.8 in/ 2.4 in
Coordinates	48.68678° N, -121.22321° E	Logged by/Approved by	DFR/AAE / DHM

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	1–2	1	1	100	92	1, 1		70°, HJ, VN, R, U.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine- to medium-grained, moderately strong, generally weakly to moderately foliated, ranges from dark gray to gray, fresh, partially migmatitic texture, contains healed joints.	10	NOTE: Refer to laboratory and packer test results for details.	
	2–7	1	2	100	100	0, 0, 0, 0, 1		10°, J, VN, R, Pl.		Fine-grained, dark gray, contains ~7% garnet (up to 1/8-inch, from 0 to 8 ft).	20		
712	7–12	1	3	100	100	0, 0, 1, 0, 1		0°, J, N, R, Pl.; 80-90°, HJ, Py, Qz, Ch.; 8°, J, VN, R, Pl.		Contains ~3% garnet (up to 1/3-inch) (8 to 16 ft).	20		
	12–16	2	4	100	100	0, 0, 0, 0, 0				Becomes medium-grained, gray, contains many healed joints and ~1% garnet (16 to 17.9 ft).	35		
	16–17	2	5	100	100	0					10		
	17–21	2	6	100	100	0, 0, 3, 0		0-5°, J, N, R, Pl.		No garnet (17.9 to 24 ft). Rock mass altered to greenish white (19.1 to 20.1 ft).	36		

NOTE: See Borehole Log Summary Key for explanation of symbols and abbreviations.

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

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Borehole Number: **B-3**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	22					1		0°, J, VN, R, Pl.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine- to medium-grained, moderately strong, generally weakly to moderately foliated, ranges from dark gray to gray, fresh, partially migmatitic texture, contains healed joints.			
	23					0							
	24		7	100	100	0				Contains ~5% garnet (up to 1/8-inch) (23 to 28 ft).	34		
	25					0							
	26					0		50-70°, HJ, Ch.					
	27					0		30-50°, HJ, Ch.					
	28		8	100	100	0				Contains 0 to 1% garnet (up to 1/8-inch) (23 to 33 ft).	38		
	29					0							
	30	3				0							
	31					0		20-30°, HJ, Ch.					
710	32					0		35°, HJ, Ch.					
	33					0				Becomes fine-grained, dark gray, contains healed joints, no garnet.			
	34					0				Becomes medium- to fine-grained, gray.			
	35		9	100	100	0					40		
	36					0				Becomes fine-grained, dark gray.		PL = 13422, 12140 psi.	
	37					0							
	38		10	100	100	0				Becomes medium- to fine-grained, gray, contains many healed joints and up to 1% garnet (up to 1/4-inch) (38.2 to 63 ft).	30		
	39					0							
	40					0							
	41		11	100	100	0					20		
	42					0							
	43					0							
	44							10°, J, VN, R, Pl.					

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Borehole Number: **B-3**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	45–48	4	12	100	100	0, 1, 1, 0		10°, J, VN, R, Pl.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine- to medium-grained, moderately strong, generally weakly to moderately foliated, ranges from dark gray to gray, fresh, partially migmatitic texture, contains healed joints.	30		
	48–53	4	13	100	100	0, 0, 0, 0, 0				Partially migmatitic texture (49 to 67 ft).	26		
708	53–58	5	14	100	100	0, 0, 0, 0, 0					25		
	58–63	5	15	100	100	1, 1, 1, 0, 1		0°, J, MW, R, Pl.; 5°, J, N, R, Pl.; 5°, J, N, R, Pl.; 5°, J, VN, R, Pl.			35		
707	63–67	5	16	100	100	0, 0, 1, 0, 1		20°, HJ, Ch.; 5°, J, VN, R, Pl.; 5°, J, VN, R, Pl.		No garnet (63 to 93 ft). Non-migmatitic texture, contains sparse quartz and biotite-rich bands (67 to 137.9 ft).	22		

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Borehole Number: **B-3**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	68									**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine- to medium-grained, moderately strong, generally weakly to moderately foliated, ranges from dark gray to gray, fresh, partially migmatitic texture, contains healed joints.			
	69					0							
	70					0							
	71		17	100	100	0					35		
	72					0							
	73					0							
	74					0							
	75					0							
	76	6	18	100	100	0					30		
	77					0							
706	78					0							
	79					0							
	80					0							
	81		19	100	100	0					35		
	82					0							
	83					0							
	84					0							
	85					0							
	86		20	100	100	0					38		
	87					0							
	88					0							
705	89					0							
	90					0							
	91	7	21	100	100	0					28		

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Borehole Number: **B-3**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	92					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine- to medium-grained, moderately strong, generally weakly to moderately foliated, ranges from dark gray to gray, fresh, partially migmatitic texture, contains healed joints.			
						0							
	93												
			22	100	100	0				Contains <1% garnet (up to 1/8-inch) (93 to 127.3 ft).	28	UCS = 13800 psi, PL = 4654, 7588 psi.	
	94					0							
	95					0							
	96					0							
	97					0							
	98					0							
	99					0							
	100					0							
704						0							
	101		23	100	100	0		60°, HJ, Qz.			30		
	102					0		50°, HJ, Qz.					
	103					0							
	104					0							
	105					0							
	106	8	24	100	100	0					25		
	107					0							
	108					0							
	109					0							
	110					0							
	111		25	100	100	0					35		
703	112					0							
	113					0							
	114					0							

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Borehole Number: **B-3**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	115–118	9	26	100	100	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine- to medium-grained, moderately strong, generally weakly to moderately foliated, ranges from dark gray to gray, fresh, partially migmatitic texture, contains healed joints.	60		
	118–123	9	27	100	100	0				Foliated at 20°.	37		
702	123–128	9	28	100	100	0				Becomes fine-grained, moderately foliated, dark gray, no garnet.	40		
	128–133	10	29	100	100	0		5°, HJ, Qz. 50-60°, HJ, Ch.		Becomes medium-grained, weakly to moderately foliated, gray, garnet (up to 10%) only in sparse, thin (~1-inch-thick) biotite-rich bands. Foliated at 10°.	54		
701	133–138	10	30	100	100	0		30°, HJ, Qz.			20		

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Borehole Number: **B-3**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	139		31	100	100	0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, weakly to strongly foliated, generally very dark gray, fresh, biotite-rich (~70%) (137.9 to 150 ft), no garnet.	25		
	140					0							
	141					0							
	142					0							
	143					0							
	144	11	32	100	100	0				Up to 7% garnet (up to 1/8-inch) in biotite-rich layers.	25	PL = 7284, 5665 psi.	
	145					0							
	146					0							
700	147					0							
	148					0							
	149		33	100	100	0				Variable foliation, predominantly 20°.	17		
	150					0							
	151					0				Becomes dark gray, contains less biotite.			
	152					0							
	153					0							
	154		34	100	100	0					34		
	155					0							
	156					0							
	157					0							
699	158					0							
	159		35	100	100	0		40°, J, VN, SR, Pl.		Weakly foliated predominantly at 70°, contains 0 to 15% garnet (<1/8-inch), mostly contained within biotite-rich matrix (158.5 to 179.9 ft).	35		
	160					0							
	161					0							

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Borehole Number: **B-3**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	162					0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, weakly to strongly foliated, generally very dark gray, fresh, biotite-rich (~70%) (137.9 to 150 ft), no garnet.			
	163					0							
	164					0							
	165					0				Weakly foliated at 30°.			
	166	12	36	100	100	0					25		
	167					0							
	168					0							
	169					0							
698						1		20°, FJ, N, Ch, R, Pl.					
	170		37	100	100	0					30		
	171					0				Weakly foliated at 20 to 30°.			
	172					0							
	173					0							
	174					0							
	175					0							
	176		38	100	100	0					18		
	177					0							
	178					0							
	179					0							
	180					0							
697	181	13	39	100	100	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine-grained, strong to very strong, ranges from weakly to strongly foliated, generally dark gray, fresh, contains 3 to 5% garnet.	18		
	182					0							
	183					0							
	184					0							

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Borehole Number: **B-3**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	185					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine-grained, strong to very strong, ranges from weakly to strongly foliated, generally dark gray, fresh, contains 3 to 5% garnet.			
	186		40	100	100						19		
			71	100*	87	0					31		
	187												
						0							
	188												
						0				Strongly foliated at 70°.			
	189												
						0							
	190												
						0							
	191		41	100	100						16		
			72	100*	99	0					33		
696	192												
						0							
	193												
						0				Strongly foliated at 20°.			
	194												
						0							
	195												
						0							
	196	14	42	100	100						14		
		24				0							
	197												
						0							
	198												
						0				Strongly foliated at 60°.			
	199												
						0							
	200												
						0							
	201		43	100	100						20		
						0							
	202												
						0							
	203												
						0				Becomes medium-grained, weakly to moderately foliated, gray, partially migmatitic texture, poor foliation at 70°, contains <1% garnet.			
695	204												
						0							
	205												
						0							
	206		44	100	100						40		
						0							
	207												
						0		10-70°, J, VN, Ch.		Becomes fine-grained, moderately foliated, dark gray, strongly foliated at 80°, 0 to 10% garnet.			
	208												

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Borehole Number: **B-3**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	209	15	45	100	97	0		50-80°, J, N, MW, Ch, R, Pl.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine-grained, strong to very strong, ranges from weakly to strongly foliated, generally dark gray, fresh, contains 3 to 5% garnet.	48		
	210					0		40-70°, J, MW, Qz, R, Pl.					
	211					0		30-50°, HJ.					
	212					0							
	213					0							
	214					1		20°, J, N, R, Pl.					
694	215		46	100	100	0					32		
	216					0		20-50°, HJ.					
	217					1		10°, J.					
	218					0				Becomes medium-grained, weakly to moderately foliated, gray, partially migmatitic texture, no garnet.			
	219	16	47	100	100	0					24		
	220					1		10°, J, VN, R, Pl.					
	221					0				Becomes fine-grained, moderately foliated, dark gray, partially migmatitic texture, up to 7% garnet.			
	222					1		60°, J, VN, R, I.					
	223					0							
	224		48	100	100	0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, weakly to strongly foliated, gray, fresh, contains ~1% garnet.	31	PL = 12140, 8114 psi.	
	225					0		70°, HJ, Qz.					
	226					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to medium-grained, strong to very strong, moderately to weakly foliated, dark gray to gray, fresh, partially migmatitic texture, ~3% garnet.			
693	227					0				Fine-grained, moderately foliated, dark gray.			
	228					0				Becomes medium-grained, weakly to moderately foliated, gray, partially migmatitic texture, ~3% garnet.			
	229		49	100	100	0					30		
	230					0							
	231					0							

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Borehole Number: **B-3**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	232					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to medium-grained, strong to very strong, moderately to weakly foliated, dark gray to gray, fresh, partially migmatitic texture, ~3% garnet.			
	233					0							
	234					0							
	235					0							
	236		50	100	100	0				Becomes fine-grained, weakly foliated, dark gray, contains many healed joints, no garnet.	32		
	237					0							
692	238					0							
	239					0							
	240					0		70°, HJ, Qz.					
	241	17	51	100	100	0					46		
	242					0							
	243					0							
	244					0							
	245					1							
	246		52	100	100	0		40°, J, VN, SR, Pl.			23		
	247					0							
	248					0							
	249					0							
691	250					0							
	251		53	100	100	0					29		
	252					0							
	253					0							
	254					0							
	255												

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Borehole Number: **B-3**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	256, 257, 258	18	54	100	100	0, 0, 0, 0		50°, HJ, T, Qz.; 40°, HJ, VN, Ch.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to medium-grained, strong to very strong, moderately to weakly foliated, dark gray to gray, fresh, partially migmatitic texture, ~3% garnet.	40		
	259, 260, 261, 262, 263		55	100	97	0, 1, 1, 0, 0		HJ, Ch, Qz.; 30°, J, N, SR, Pl.		**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, weakly to strongly foliated, dark gray, fresh, weakly foliated at 30°, no garnet.	44		
690	264, 265, 266, 267, 268	19	56	100	100	0, 0, 0, 0, 0		40°, HJ, Ch.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium-grained, strong, generally weakly to moderately foliated, generally gray, fresh, contains biotite-rich and quartz-rich bands and many healed joints, 0 to 1% garnet.	28		
	269, 270, 271, 272, 273		57	100	100	0, 0, 0, 0, 2		30°, J, VN, Ca, R, Pl.			41	Packer = 270 to 290 ft, fracture system does not accept water.	
689	274, 275, 276, 277, 278		58	100	97	0, 3, 2, 0		40°, HJ, Ch.; 20-60°, J, N, VN, Ca, SR, Pl.; 30°, HJ, Ca.		Rock mass is highly altered and slightly weathered, whitish green (275.7 to 276.7 ft).	45		

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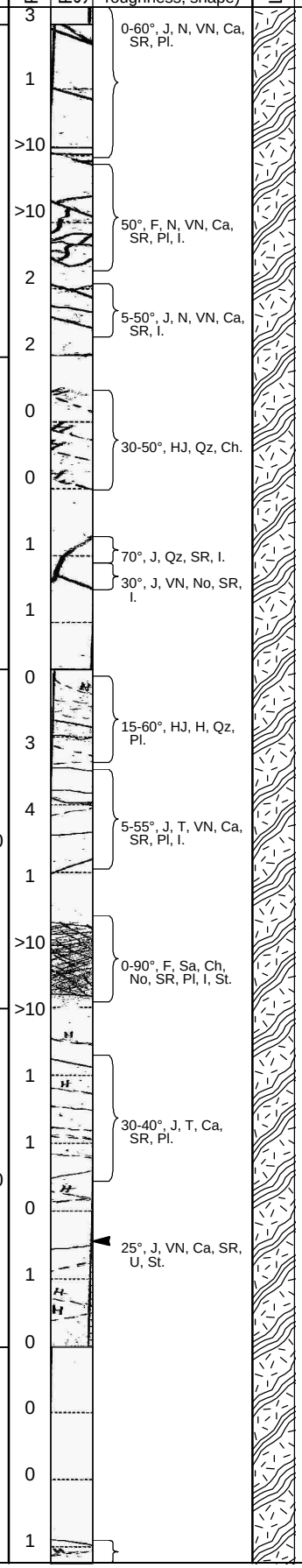
Borehole Number: **B-3**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Drill Time (min/run)	TESTS	FIELD NOTES
	279–283	20	59	100	64	28	UCS = 7960 psi.	
688	284–288	20	60	100	62	40		
	289–293	20	61	100*	100	55	PL = 13071, 7487 (low value) psi.	
687	294–298	21	62	100*	100	22	UCS = 12330 psi, PL = 11668 psi. PL = 36 psi.	
	299–301	21	63	100	98	31		



DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)

- 0-60°, J, N, VN, Ca, SR, Pl.
- 50°, F, N, VN, Ca, SR, Pl, I.
- 5-50°, J, N, VN, Ca, SR, I.
- 30-50°, HJ, Qz, Ch.
- 70°, J, Qz, SR, I.
- 30°, J, VN, No, SR, I.
- 15-60°, HJ, H, Qz, Pl.
- 5-55°, J, T, VN, Ca, SR, Pl, I.
- 0-90°, F, Sa, Ch, No, SR, Pl, I, St.
- 30-40°, J, T, Ca, SR, Pl.
- 25°, J, VN, Ca, SR, U, St.

MATERIAL DESCRIPTION

Matrix is highly altered and slightly to highly weathered, greenish white (278.1 to 283.5 ft).

BIOTITE QUARTZ PLAGIOCLASE GNEISS. Generally medium-grained, strong, generally weakly to moderately foliated, generally gray, fresh, contains biotite-rich and quartz-rich bands and many healed joints, 0 to 1% garnet.

Contains many healed joints, no garnet, gray.

Rock mass partially altered in zones up to 1-inch-wide around healed joints.

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Borehole Number: **B-3**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	303					1		10-30°, J, VN, Cl, Ca, Sa, SR, Pl, I.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium-grained, strong, generally weakly to moderately foliated, generally gray, fresh, contains biotite-rich and quartz-rich bands and many healed joints, 0 to 1% garnet.			
						3							
	304					1		10°, J, N, VN, Ca, Ch, S, SR.					
	305					0							
	306		64	100	98	0		70°, HF, H, Qz, Ch, Pl.			32		
686	307					0							
	308					0							
						0							
	309					0							
	310					0							
	311		65	100	100	0		10°, J, VN, N, Ch, SR, Pl.		Becomes fine-grained, weakly foliated, dark gray.	34		
	312					1				Becomes medium-grained, weakly to moderately foliated, gray, contains up to 20% garnet (up to 1/8-inch) in biotite-rich zones.			
	313					1							
	314					3		5-80°, J, N, VN, Ca, Ch, SR, Pl, C.					
	315					1							
	316		66	100*	100	1		60°, HF, H, Qz, Ch, Pl, I. 5°, HJ, Ca.			35		
	317					0							
	318					1		5°, J, N, VN, Cl, Ca, SR, I.					
685	319	22				2				Becomes fine-grained, weakly foliated, dark gray, contains 1 to 2% garnet.			
	320		67	100*	84	5					21		
	321					3		5-20°, J, T-VN, Py, Ca, Cl, S, SR, Pl, St.		Becomes medium-grained, weakly to moderately foliated, gray, contains 1 to 2% garnet.			
	322					0		HJ, VN, H.		**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, weakly to strongly foliated, gray to dark gray, fresh, contains up to 10% garnet (up to 1/8-inch) in biotite-rich zones, <1% garnet overall.			
	323												
	324					0							
	325		68	100	100						21		

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Borehole Number: **B-3**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	326					0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, weakly to strongly foliated, gray to dark gray, fresh, contains up to 10% garnet (up to 1/8-inch) in biotite-rich zones, <1% garnet overall.			
	327					0							
	328					5		15°, J, T, SR, Pl, C.					
	329					1							
684	330					>10		20-50°, S-F, VN, W, Cl, Ca, Sd, Gr, Mn, Mg, S, Slk, Pl.					
	331		69	100*	100	>10					30		
	332					>10		5-90°, J, T, N, Cl.					
	333					0							
	334	23				1				Contains trace pyrite (<1/8-inch) (333.6 to 335.1 ft).			
	335					3		10-60°, HJ, H, Ca, Pl, I.					
	336		70	100	72	>10		50°, J, T, N, Ca, Fe, Ch, Cl, Pl, I.		Rock mass is altered to greenish gray and is iron oxide stained.	40		
	337					>10		55°, S-F, VN, N, Ca, Ch, Slk. 10-60°, J, T, N, Ca, Fe, Ch, Cl, Pl, I. HF, Ca, Ch.					
	338					0							
	339					0							
	340					1		20-90°, J, VN, Cl, SR, Pl.		Contains ~5% garnet and up to 2% pyrite in biotite-rich bands.			
683	341					0							
	342					0							
	343					4		F, N, Fe, VR, I. 20-90°, J, VN, Cl, SR, Pl.					
	344					0							
	345					0							
	346					0							
	347					0							
	348					0							

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

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Borehole Number: **B-3**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	349					0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, weakly to strongly foliated, gray to dark gray, fresh, contains up to 10% garnet (up to 1/8-inch) in biotite-rich zones, <1% garnet overall.			
	350					0							
	351		73	100*	100	0					33		
	352					2		5-40°, J, T, VN, Cl, SR, Pl, U.					
682	353					1							
	354					3							
	355					2				**PEGMATITE**. Moderately strong to strong, white, fresh, no garnet.			
	356		74	100	100	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to coarse-grained, strong to very strong, weakly to moderately foliated, gray, fresh, partially migmatitic texture, contains <1% garnet.	37	Packer = 356 to 376 ft, low permeability with partial clogging of fractures over time.	
	357					0		20-40°, J, VN, SR, Pl.					
	358					0							
	359					2							
	360					4							
	361		75	100	95	3					45		
	362					1		30°, J, N, VN, Fe, Py, Sd, SR, Pl, U.					
	363					1							
	364					2							
681	365	25						10-40°, J, VN, SR, Pl.					
	366		76	100	70	0				**PEGMATITE**. Coarse-grained, moderately strong to strong, white, fresh.	47		
	367					0		80-90°, HJ, Qz.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to coarse-grained, moderately strong to strong, weakly foliated, generally light greenish gray, generally fresh.			
	368					0				Rock mass is altered partially to chlorite and is light greenish gray, contains no garnet (367.2 to 375 ft).			
	369		77	100	74	4		10-30°, J, N, VN, SR, Pl, I.		Rock mass is unaltered and gray, foliated at 30°.	50		
	370					0							
	371					3							
	372		78	100	27	>10					19		

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

Borehole Number: **B-3**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Drill Time (min/run)	TESTS
	373–375	26	79	100	62	42	
680	376–379	26	80	100	33	28	
	380–383	26	81	100	100	22	UCS = 15490 psi.
	384	27	82	100	80	33	
679	385–389	27	83	100	92	30	PL = 6947, 9530 psi.
	390–394	27	84	100	53	40	
	395						

Fractures/ft: >10, 5, >10, 3, 1, 1, 1, 1, 2, 1, 1, 1, 0, 0, 0, 0, 4, 0, 9, 3, >10, 8, 0

Fracture Sketch

DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)

- 0-20°, J, N, VN, No, Fe, SR, R, Pl, I.
- 50°, J, T, SR, I.
- 30°, J, VN, Ca, SR, Pl.
- 0-10°, J, VN, SR, Pl.
- 10-40°, J, VN, N, No, Py, SR, Pl.
- HJ, Qz, Fe.
- 10-50°, J, N, VN, Fe, SR, R, Pl, I.
- 10-50°, J, N, VN, Fe, SR, Pl.

Lithology

MATERIAL DESCRIPTION

BIOTITE QUARTZ PLAGIOCLASE GNEISS. Medium- to coarse-grained, moderately strong to strong, weakly foliated, generally light greenish gray, generally fresh.

Contains 0 to 1% garnet (375 ft to bottom of boring at 399.2 ft).

Rock mass is altered partially to muscovite and is light greenish gray, foliated at 40°.

Rock mass is unaltered and gray.

Rock mass is altered partially to muscovite and is light greenish gray, foliated at 30°.

Rock mass is unaltered and gray.

Rock mass is altered partially to muscovite and is light greenish gray.

Rock mass is unaltered and gray.

Rock mass is altered partially to muscovite and is light greenish gray.

Rock mass is unaltered and gray, foliated at 30°.

Rock mass is altered partially to muscovite and is light greenish gray.

FIELD NOTES

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

Sheet: 18 of 18

Borehole Number: **B-3**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	396	28	85	100	43	3		HJ, Ch.		Rock mass is unaltered and gray.	52		
	397					1		J, VN, SR, Pl.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to coarse-grained, moderately strong to strong, weakly foliated, generally light greenish gray, generally fresh.			
	398					0		HJ, T, Ch.					
678	399					2		J, VN, SR, Pl.		Bottom of boring at 399.2 ft. VWP grouted in place at 398 ft.			

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Gorge 2nd Tunnel Core Borehole Log

Project Number	Sheet	Borehole Number
A080138/JA4087	1 of 18	**B-4**

Prepared for	Seattle City Light, Newhalem, WA	Elevation	712.2 ft (NAVD88)
Driller / Equipment	Crux Subsurface Burley 5500-3	Drilling dates	8/18/2009 to 9/2/2009
Coring Method	HQ wireline	Azimuth/Inclination	43° / -5°
Location	Adit	Hole Diam/Core Diam	3.8 in/ 2.4 in
Coordinates	48.686809° N, -121.22316° E	Logged by/Approved by	DFR/SM / DHM

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	1											
	2		1	100	50		20-60°, J, MW, SR, R.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium-grained, strong to very strong, weakly to moderately foliated, generally gray, fresh to slightly weathered, foliated at 30°.	13	NOTE: Refer to laboratory and packer test results for details.	
712							0°, J, MW, SR, R.		Altered to chlorite and greenish gray (0 to 0.7 ft).			
	3											
	4		2	100	100				**PEGMATITE**. Coarse- to medium-grained, moderately strong to strong, white and gray, fresh, contains up to 30% muscovite and biotite.	29		
	5											
	6											
	7	1	3	100	100					17		
	8								**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to medium-grained, moderately strong to strong, weakly to moderately foliated, light gray to dark gray, fresh, contains ~5 to 60% biotite (7 to 14.5 ft), with ~10% garnet in biotite-rich zones.			
	9						0°, J, N, SR, R, Pl.		Medium-grained.			
	10		4	88	88					30		
	11											
	12		5	100	100		10-30°, FJ, MW, SR, Pl.			22		
	13											
711	14						60°, HJ, Qz, Pl.					
	15		6	78	78				Becomes fine- to medium-grained, dark gray, slightly migmatitic texture, contains up to 15% garnet (<1/8-inch), contains quartz-rich bands up to 4-inches-thick.	33		
	16											
	17											
	18						0°, J, MW, R.					
	19											
	20	2	7	100	100					21		
	21											

Fractures/ft: 4, 2, 2, 0, 0, 0, 0, 0, 1, 0, 0, 20, 1, 1, 0, 0, 1, 1, 0, 0, 1

NOTE: See Borehole Log Summary Key for explanation of symbols and abbreviations.

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

Borehole Number: **B-4**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	22					1				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to medium-grained, moderately strong to strong, weakly to moderately foliated, light gray to dark gray, fresh, contains ~5 to 60% biotite (7 to 14.5 ft), with ~10% garnet in biotite-rich zones.			
						0							
	23					1							
	24					1							
	25		8	100	100	0					34		
710	26					1		20°, FJ, R, I.					
	27					0							
	28					0							
	29					0							
	30		9	100	100			20°, J, R, U.			28		
	31					1							
	32					0							
	33					0							
	34					1		20°, J, N, R, Pl. 80°, HJ, N, Qz, Pl.					
	35	3	10	100*	98	1					34		
	36					0							
709	37					0							
	38					0						PL = 6812, 7284 psi.	
	39					1		10-20°, J, N, SR, Pl.					
	40		11	100	96	1					20		
	41					1				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to coarse-grained, strong, moderately foliated to uniform, dark gray with white, fresh, contains up to 15% muscovite bordering quartz-rich bands, contains up to 10% garnet in biotite-rich bands.			
	42					0							
	43					0							
	44												

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

Borehole Number: **B-4**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	45		12	100	100	0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to coarse-grained, strong, moderately foliated to uniform, dark gray with white, fresh, contains up to 15% muscovite bordering quartz-rich bands, contains up to 10% garnet in biotite-rich bands.	13		
	46					0							
	47					0							
	48					0						UCS = 8430 psi.	
708													
	49					0							
	50					0							
	51	4	13	100	100	0					17		
	52					0							
	53					0							
	54					0				Contains ~15% garnet (<1/4-inch) (54 to 54.7 ft).			
	55					0							
	56		14	100	100	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine- to medium-grained, strong, generally weakly to moderately foliated, generally dark gray, fresh, partially migmatitic texture, contains ~10% garnet (1/20- to 1/4-inch), ~30% mica, and quartz-rich bands <1 foot.	20	PL = 10589, 10974 psi.	
	57					1							
	58					0							
	59					0							
707	60		15	100*	100	0					31		
	61					0							
	62					0							
	63					0							
	64					0							
	65					0							
	66	5	16	100*	100	0					33		
	67					0							

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

Sheet: 4 of 18

Borehole Number: **B-4**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	68					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine- to medium-grained, strong, generally weakly to moderately foliated, generally dark gray, fresh, partially migmatitic texture, contains ~10% garnet (1/20- to 1/4-inch), ~30% mica, and quartz-rich bands <1 foot.			
	69					0							
	70		17	100*	100	0					16		
706	71					0							
	72					0							
	73					0							
	74					0							
	75		18	100*	100	0					15		
	76					0							
	77					0							
	78					0							
	79					0							
	80	6	19	100	100	1		20°, J, N, SR, S, Pl.			23		
	81					0							
	82					0							
705	83					0							
	84					0							
	85		20	100*	100	0					24		
	86					0							
	87					0							
	88					0							
	89					0							
	90		21	100*	100	1		30°, FJ, VN, SR, U.			16		
	91												

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

Borehole Number: **B-4**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	92					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine- to medium-grained, strong, generally weakly to moderately foliated, generally dark gray, fresh, partially migmatitic texture, contains ~10% garnet (1/20- to 1/4-inch), ~30% mica, and quartz-rich bands <1 foot.			
						0							
	93												
						0							
	94												
704						0							
	95												
		7	22	100*	100	0					7		
	96												
						0							
	97												
						0							
	98												
						0							
	99												
						0							
	100												
			23	100*	100	0					17		
	101												
						0							
	102												
						0							
	103												
						0							
	104												
						0							
	105												
			24	100*	97	0				Becomes medium-grained, weakly foliated, gray, contains ~5% garnet.	13		
703	106							80°, HJ, VN, Qz, SR. 30°, J, VN, SR, Pl.					
						1							
	107							35°, J, N, SR, Pl.					
						2							
	108									Becomes fine-grained, weakly to moderately foliated, dark gray, contains ~7 to 10% garnet.			
						3		20°, J, MW, S, SR, Pl.					
	109												
						0							
	110												
		8	25	100*	90	1		20°, J, VN, SR, Pl.		Becomes medium- to coarse-grained, gray, contains ~7% garnet.	19		
	111												
						0							
	112												
						0							
	113												
						0							
	114												
						0							

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

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Borehole Number: **B-4**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	115		26	100*	100	0		35°, HJ, N, Qz, SR, Pl.		Becomes fine-grained, dark gray, contains ~7% garnet (<1/4-inch).	19		
	116					1		20°, J, VN, SR, Pl.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine- to medium-grained, strong, generally weakly to moderately foliated, generally dark gray, fresh, partially migmatitic texture, contains ~10% garnet (1/20- to 1/4-inch), ~30% mica, and quartz-rich bands <1 foot.			
702	117					0							
	118					1				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to coarse-grained, moderately strong, moderately foliated to uniform, dark gray with white, fresh, contains ~3 to 10% garnet.			
	119							20-30°, J, N, SR, Pl.				PL = 6846, 6144 psi.	
	120		27	87	51	2					22		
	121					>10							
	122					>10							
	123					>10							
	124					0							
	125	9	28	100*	99	0					29		
	126					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine-grained, strong, weakly to moderately foliated, dark gray, fresh, contains 10 to 15% garnet (<1/8-inch).			
	127					0							
	128					0							
701	129					0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, moderately foliated to uniform, dark gray with white, fresh, contains ~5 to 10% garnet up to 3/8-inch.			
	130		29	100*	100	0					20		
	131					0							
	132					2		20°, J, VN, SR, Pl.					
	133					0							
	134					0							
	135		30	100*	100	0					22		
	136					0							
	137					0							
	138												

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

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Borehole Number: **B-4**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
700	139, 140, 141, 142, 143	10	31	100*	100	0, 0, 0, 0, 0		70°, HJ, VN, Qz, SR, Pl.; 80°, HJ, VN, Qz, SR, Pl.		**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to fine-grained, moderately strong to strong, moderately foliated to uniform, dark gray with white, fresh, contains ~5 to 10% garnet up to 3/8-inch.	28		
	143, 144, 145, 146, 147		32	100*	100	0, 0, 0, 0, 0					29		
	147, 148, 149, 150, 151		33	100*	100	0, 0, 0, 0, 0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to coarse-grained, strong, weakly to moderately foliated, dark gray to gray, fresh, contains ~15% garnet up to 1/4-inch. Fine- to medium-grained, dark gray.	22		
699	151, 152, 153, 154, 155, 156, 157	11	34	100*	100	0, 0, 0, 0, 0					25		
	157, 158, 159, 160, 161		35	100	100	0, 0, 0, 0		80°, HJ, VN, Qz, SR, Pl.			28		

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-4**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	162					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to coarse-grained, strong, weakly to moderately foliated, dark gray to gray, fresh, contains ~15% garnet up to 1/4-inch.			
698	163					0							
	164					0				Becomes medium- to coarse-grained, gray, contains ~7% garnet.			
	165		36	100*	100	0		0°, J, MW, SR, Pl, I.			42		
	166					1				Becomes fine- to coarse-grained, dark gray, contains quartz-rich veins, zones of migmatitic texture, and ~5 to 10% garnet.			
	167					0							
	168					0							
	169					0							
	170	12	37	100	100	0					26		
	171					0							
	172					0							
	173					0							
	174					0							
697	175		38	100*	100	1					21		
	176					0		0°, J, MW, SR, S, Pl, I.		Becomes medium- to coarse-grained, gray, quartz-rich, contains ~1% garnet.			
	177					0		0°, J, N, SR, S, Pl, I.					
	178					0				Becomes fine- to coarse-grained, dark gray, partially migmatitic texture, contains ~2% garnet and zones of PEGMATITE <1 foot.			
	179					0							
	180		39	100*	100	0					20		
	181					0							
	182					0				Becomes medium- to coarse-grained, gray, contains 0 to 3% garnet.			
	183					0							
	184					0							

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-4**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	185	13	40	100	100	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to coarse-grained, strong, weakly to moderately foliated, dark gray to gray, fresh, contains ~15% garnet up to 1/4-inch.	28		
696	186					0							
	187					0							
	188		41	100*	100	0					37		
	189					0							
	190					0							
	191					0							
	192					0						PL = 9442, 9105 psi.	
	193	14	42	100*	100	0				Becomes medium-grained, dark gray, partially migmatitic texture, contains ~3 to 7% purplish red garnet (< 3/4-inch) and quartz-rich bands, foliation variable at 30 to 45°.	44		
	194					0							
	195					0							
	196					0							
	197					0							
695	198		43	100	100	0					20		
	199					0							
	200					0							
	201					0						UCS = 7900 psi, PL = 8701, 2900 (low value) psi.	
	202					0							
	203		44	100	100	0					25		
	204					0							
	205					0							
	206					0							
	207					0							
	208					0							

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

Borehole Number: **B-4**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
694	209					0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to coarse-grained, strong, weakly to strongly foliated, dark gray with white, fresh, 1 to 5% garnet <1/2-inch (generally less than 1/4-inch), generally banded, with variable foliation at 5 to 60°.			
	210		45	100	100	0					20		
	211					0							
	212					0							
	213					0				Foliated at 10°.			
	214					0							
	215	15	46	100	100	0					30	UCS = 16160 psi, PL = 5665, 6023 psi.	
	216					0							
	217					0							
	218					0							
	219					0							
	220		47	100	100	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to coarse-grained, strong to very strong, weakly foliated, gray to dark gray, fresh, contains 1 to 2% garnet, foliated at 0°.	30		
693	221					0				Medium- to coarse-grained, gray.			
	222					0		20°, J, VN, R, I.					
	223					1				Becomes fine- to coarse-grained, strongly foliated, dark gray to gray, foliated at 40°.			
	224					0							
	225		48	100	98	0					32		
	226					2		30°, S, VN, Fe, R, Pl.		Moderately weathered around shear zone (~225.5 to 226 ft).			
	227					1		30°, J, VN, Fe, R, Pl.		Weakly foliated below shear zone.			
	228					0				No garnet, foliated at 5°.			
	229					0		10°, J, T, SR.					
	230	16	49	100	100	1					35		
	231					0							
						0							

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-4**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
692	232					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to coarse-grained, strong to very strong, weakly foliated, gray to dark gray, fresh, contains 1 to 2% garnet, foliated at 0°.			
	233					0							
	234					1		0°, J, N, SR, U.		**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to coarse-grained, moderately strong to strong, weakly to strongly foliated, gray to white, fresh, no garnet.			
	235		50	100	97	0					30		
	236					0							
	237					1		0-20°, J, T, SR, Pl.					
	238					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine-grained, strong to very strong, strongly foliated, dark gray, fresh, 0 to 1% garnet (<1/8-inch), foliated at 0°.			
	239					0							
	240		51	100	100	0					20		
	241					0				No garnet.			
	242					0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to coarse-grained, moderately strong to strong, weakly foliated, white with gray, fresh, predominately PEGMATITE in composition, foliated at 0°.			
	243					1		0°, J, VN, SR, Pl.					
691	244		52	100	100	0					25		
	245					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to medium-grained, strong, weakly foliated, gray, fresh, no garnet.		PL = 8148, 10555 psi.	
	246		53	100	100	0					20		
	247					1		10°, J, VN, SR, Pl.					
	248	17				0							
	249					0							
	250		54	100	97	0		0°, J, W, SR, Pl.			50		
	251					0				**PEGMATITE**. Coarse-grained, moderately strong to strong, white and gray, fresh, no garnet.			
	252					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to medium-grained, moderately strong to strong, weakly to moderately foliated, gray, fresh, with quartz and biotite-rich bands, no garnet.		PL = 5396 psi.	
	253					0							
	254					0							
	255												

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Borehole Number: **B-4**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	256		55	100	100	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to medium-grained, moderately strong to strong, weakly to moderately foliated, gray, fresh, with quartz and biotite-rich bands, no garnet.	40		
	257					0							
	258					0				Contains <1% garnet (<1/16-inch) (257.6 to 262 ft).			
	259					0							
	260		56	100	100	0					25		
	261					0							
	262					0				Foliated at 50°.			
	263					0							
	264	18				0							
	265		57	100	100	0					42		
	266					0							
689	267					0							
	268					0							
	269		58	100	100	0					48		
	270					0							
	271		59	100	100	0					16		
	272					0							
	273					0							
	274					0				Contains ~3% garnet (274 to 274.4 ft).			
	275		60	100	100	0					41		
	276					0							
	277					0		70°, HJ, Py.					
	278												

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Borehole Number: **B-4**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	279	19	61	100	100	0				Contains <1% garnet (278 to 282 ft). **BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to medium-grained, moderately strong to strong, weakly to moderately foliated, gray, fresh, with quartz and biotite-rich bands, no garnet.	42		
	280					0							
	281					0							
	282					0							
	283		62	100	100	1		0°, J, N, SR, Pl. 45°, HJ, Ch.			35		
	284					0							
	285					0		HJ, Qz.					
	286					0							
	287					0							
	288	20	63	100	100	0				Thin quartz-rich vein contains ~7% garnet.	37		
687	289					0							
	290					0							
	291					0							
	292					0							
	293		64	100	100	0				Contains trace garnet <1/16-inch (293 to 297.5 ft).	45		
	294					0							
	295					0							
	296					0							
	297					0							
	298		65	100	100	0				**PEGMATITE**. Coarse-grained, moderately strong to strong, white and gray, fresh, no garnet.	65		
	299					0							
	300					0							
	301					0							

UCS = 10460

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Borehole Number: **B-4**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
						0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to medium-grained, strong, moderately foliated, gray, fresh, no garnet.		psi.	
	303					0							
	304					0							
	305		66	100	100	0				**PEGMATITE**. Coarse-grained, strong, white and gray, fresh, no garnet.	90	PL = 9969 psi.	
	306					0							
	307					0							
	308					0							
	309					0							
	310	21	67	100	100	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to medium-grained, strong, weakly foliated, gray, fresh, contains quartz and biotite-rich layers, no garnet.	54		
	311					0							
685	312					0							
	313					0							
	314					0							
	315		68	100	100	0				Contains <1% garnet (314.5 to 315.5 ft).	47		
	316					0							
	317					0							
	318					0							
	319					3		0°, J, N, R, Pl.					
	320		69	100	95	0					66		
	321					0				Contains ~1% garnet <1/4-inch (321 to 331.8 ft).			
	322					0							
	323	22	70	100	100	0					28		
	324					0							
	325												

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Borehole Number: **B-4**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	326		71	100	100	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to medium-grained, strong, weakly foliated, gray, fresh, contains quartz and biotite-rich layers, no garnet.	37		
	327					0							
	328					0							
	329					0							
	330		72	100	100	0					43		
	331					0							
	332					0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to coarse-grained, strong, white and gray, fresh, composed of PEGMATITE and BIOTITE QUARTZ PLAGIOCLASE GNEISS, no garnet.			
	333					0							
	334					0				**PEGMATITE**. Coarse-grained, strong, white and gray, fresh, no garnet.			
683	335	23	73	100	100	0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to coarse-grained, strong, white and gray, fresh, composed of PEGMATITE and BIOTITE QUARTZ PLAGIOCLASE GNEISS, no garnet.	43		
	336					0							
	337					0				**PEGMATITE**. Coarse-grained, strong, white and gray, fresh, no garnet.		PL = 11257 psi.	
	338					0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to coarse-grained, strong, white and gray, fresh, composed of PEGMATITE and BIOTITE QUARTZ PLAGIOCLASE GNEISS, no garnet.			
	339		74	100	100	0					49		
	340					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to medium-grained, strong, weakly to strongly foliated, gray, fresh, contains quartz and biotite-rich bands and zones of migmatitic texture (approximately 30% overall rock mass), no garnet.			
	341					0							
	342		75	100	100	0					18		
	343					0							
	344					0							
	345		76	100*	100	0					27		
	346					0							
682	347					0							
	348					0							

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Borehole Number: **B-4**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	349	24	77	100	100	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to medium-grained, strong, weakly to strongly foliated, gray, fresh, contains quartz and biotite-rich bands and zones of migmatitic texture (approximately 30% overall rock mass), no garnet.	46		
	350					0				Contains <1% garnet (350 to 355 ft).			
	351		78	100	100	0					8		
	352					0							
	353		79	100	100	0					65		
	354					0							
	355					0							
	356					0				**PEGMATITE**. Coarse-grained, strong, white and gray, fresh, no garnet.			
	357					0							
681	358	25	80	100	100	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to medium-grained, strong, weakly foliated, gray, fresh, contains 0 to 1% garnet (<1/4-inch).	70		
	359					0							
	360					0							
	361		81	100	100	0					20		
	362					0							
	363					0							
	364		82	100	100	0					29		
	365					0							
	366					0							
	367					0							
	368					0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Strong, weakly foliated, gray to dark gray, fresh, no garnet.			
	369		83	100	100	0					59		
680	370					0							
	371					0							
	372					0							

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-4**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	373					0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Strong, weakly foliated, gray to dark gray, fresh, no garnet.			
	374					0							
	375					0							
	376	26	84	100	100	0					30		
	377					0		30°, HJ, MW, Qz, Pl.					
	378					0							
	379					0							
	380					0							
	381		85	100	100	0					50		
679													
	382					0							
	383					0							
	384					0							
	385		86	100	100	0				Foliation variable and irregular at 80°.	40		
	386					0							
	387					0		40°, HJ, MW, Qz.					
	388	27				0							
	389					0							
	390		87	100	100	0				Foliated at 20°.	30		
	391					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to medium-grained, strong, weakly foliated, gray, fresh, contains 0 to 1% garnet up to 1/8-inch.			
	392					1		5°, J, VN, R, Pl.				UCS = 9080 psi, PL = 11641 psi.	
678						0							
	393					0							
	394					0							
	395	28	88	100	100						52		

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-4**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	396					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to medium-grained, strong, weakly foliated, gray, fresh, contains 0 to 1% garnet up to 1/8-inch.			
						0							
	397					0				Bottom of boring at 397.6 ft. Backfilled with cement and bentonite grout.			

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Gorge 2nd Tunnel Core Borehole Log

Project Number	Sheet	Borehole Number
A080138/JA4087	1 of 20	**B-5**

Prepared for	Seattle City Light, Newhalem, WA	Elevation	793.2 ft (NAVD88)
Driller / Equipment	Crux Subsurface Burley 5500-3	Drilling dates	9/26/2009 to 10/14/2009
Coring Method	HQ wireline	Azimuth/Inclination	91° / -3°
Location	Adit access road	Hole Diam/Core Diam	3.8 in/ 2.4 in
Coordinates	48.693522° N, -121.21695° E	Logged by/Approved by	AAE/SM / DHM

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
793	1, 2, 3, 4	1	1	100	91	2, 8, 0, 1, 1		10-80°, J-HJ, Fe, SR, C. 10-60°, J-HJ, N-VN, Cl-Fe-Ch, SR, Pl.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to coarse-grained, strong, generally weakly foliated, generally gray, fresh to slightly weathered, includes thin quartz and biotite-rich bands (up to 1-inch-thick) and bands of fine-grained BIOTITE QUARTZ PLAGIOCLASE GNEISS (2- to 8-inches-thick), contains <1% pink garnet (<1/16-inch). Weakly to moderately foliated.	30	NOTE: Refer to laboratory and packer test results for details.	
	5, 6, 7, 8, 9		2	100*	100	2, 4, 3, 3, 1		5-50°, J-HJ, VN, N-Fe, SR, Pl. J, VN, SR, Pl. 10-60°, HJ, VN-MW, Ch-Qz.		Becomes fine-grained, dark greenish gray, rock mass altered with chlorite.	26		
	10, 11, 12, 13, 14		3	100*	82	2, 2, >10, 2, 1		40°, J, VN, Ch, SR, Pl. 40°, J, VN, Ch, SR, Pl. 5-70°, J, VN-MW, Fe, SR, Pl-St. HJ.		Becomes medium- to coarse-grained, weakly foliated, gray, contains <1% garnet (up to 1/8-inch). Rock mass is moderately strong to weak with iron oxide staining around fracture zone (~12.3 to 12.7 ft). Partially migmatitic texture (14 to 18.5 ft).	31		Lost drill water circulation. Regained 75% drill water circulation.
	15, 16, 17, 18, 19		4	100*	100	1, 0, 0, 0, 0		0°, J, VN-MW, SR-S.			~35		Regained full drill water circulation.
	20		5	100	100	>10				Approximately 50% of rock mass is strong and altered to greenish gray with chlorite (19.6 to 23.3 ft).	16		
	21												

NOTE: See Borehole Log Summary Key for explanation of symbols and abbreviations.

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

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Borehole Number: **B-5**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	22	2				1		J, N-W, Fe, SR, Pl-St.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to coarse-grained, strong, generally weakly foliated, generally gray, fresh to slightly weathered, includes thin quartz and biotite-rich bands (up to 1-inch-thick) and bands of fine-grained BIOTITE QUARTZ PLAGIOCLASE GNEISS (2- to 8-inches-thick), contains <1% pink garnet (<1/16-inch).			
792	23		6	100	82	1		10-60°, HJ, Ch.			?		
	24					0							
	25					0							Driller notes slow drilling here despite using a new, sharp bit.
	26		7	100*	100	0					15		
	27					0							
	28					0							
	29	3	8	100*	100	1		0-10°, J-HJ, VN, SR, Pl.			15		
	30					3							
	31					0							
	32		9	100*	85	1		HJ, Ch-Qz. 45°, J, N-VN, SR, Pl-I.			39		
	33					0							
	34					0							
	35					2		35°, J, N-VN, SR, Pl-I.					
	36					1		HJ, Ch-Ca.					
	37		10	98	95	0					28		
	38					0							
	39					0							
	40					0				Gray to greenish gray (40 to 59.5 ft).			
	41					0		40°, HJ, Ch.					
	42		11	100*	100	0					39		
	43					0							
	44					0		40°, HJ, Ch-Ca.					

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-5**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	45					1		30°, J, T, SR, Pl-C.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to coarse-grained, strong, generally weakly foliated, generally gray, fresh to slightly weathered, includes thin quartz and biotite-rich bands (up to 1-inch-thick) and bands of fine-grained BIOTITE QUARTZ PLAGIOCLASE GNEISS (2- to 8-inches-thick), contains <1% pink garnet (<1/16-inch).			
	46					0							
	47	4	12	100*	98	0		10-90°, J, VN-MW, Fe-Si-Sd, SR, Pl-I.			~34		Lost drill water circulation.
	48					10							
	49					2		3-80°, J, H-VN, Ca-Cl. 0-90°, HJ.					
	50					0		50°, J, VN, SR, Pl.					
	51					1							
	52		13	100	100	0		HS.			~30		
	53					0							
	54					0							
	55					0							
	56					0							
	57		14	100	100	0		40°, HJ, Ch.			~40		
	58					1		50°, J, VN, Fe-Cl-Ch-Ca, SR, Pl.					
	59					0							
	60	5	15	100	100	0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to coarse-grained, moderately strong to strong, white and black to greenish gray, fresh to slightly weathered, mostly quartz-rich, contains chlorite and biotite.	28		
790	61					0							
	62					2		10°, HJ, Ch. 30°, J, VN-MW, Cl-Sd, SR-S, Pl.					
	63		16	100	97	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to medium-grained, strong, generally weakly to moderately foliated, generally gray, fresh to slightly weathered, partially migmatitic texture, contains <1% garnet.	26		
	64					0							
	65					0				Weakly foliated.			
	66					0							
	67					0							

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-5**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	68									**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to medium-grained, strong, generally weakly to moderately foliated, generally gray, fresh to slightly weathered, partially migmatitic texture, contains <1% garnet.			
			17	100	100	0					36		
	69					0							
	70					1		10°, HJ, Ch. 30°, J, T, SR, Pl.					
	71									Becomes greenish gray.			
						0		30°, HJ.					
	72					0							
	73	6				0							
			18	100	100						43		
	74					1		20°, J, SR-Pl, VN. HJ, Ch.					
	75					0							
	76												
						0		HJ.					
	77					1							
	78												
			19	100	97	0					30		
	79					0		15-40°, J, VN-N, SR, Pl.					
789	80					3							
	81					7				Becomes fine-grained, uniform, dark greenish gray, includes thin (<1/8-inch-thick) quartz veins.			
	82					0		HJ, Cl.					
	83					>10		HJ, Ch. 0-80°, J, T-VN, Cl, SR, Pl-St-I.			23		
			20	100	95								
	84					>10				Becomes fine- to medium-grained, weakly to moderately foliated, gray, approximately 50% of rock mass is altered to greenish gray with chlorite (19.6 to 23.3 ft), rock mass is iron oxide-stained.			
	85					1							
	86					0							
	87					0							
	88	7	21	100	100	2		0°, HJ, Ch-Qz.			~25		
	89							5-80°, J, T, Sr, Pl-I.					
	90					0							
	91					0							

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-5**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Drill Time (min/run)	TESTS	FIELD NOTES
	92–95		22	100*	70	~25		Driller indicates possible void (93 ft).
	96–99	8	23	100*	46	19		
788	99–100							
	101–103		24	100	87	~57		
	106–108		25	100	94	33	UCS = 11480 psi, PL = 10859, 11412 psi.	
	111–114		26	100	98	~25		

Fracture Sketch

Fractures/ft	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)
0	
>10	HJ.
	5-85°, J, VN-N, Si, SR, Pl.I.
4	
>10	
	5°, F, VN, Si-Sd-Fe, SR-S, Pl.
>10	
	J, VN, Fe-Sd, SR-S, Pl.
>10	
	J, VN-W, Fe-Cl, SR, Pl.
>10	
	20-70°, J, VN-W, Fe-Si-Sd, Cl, Gr, SR, Pl.
>10	
	0-80°, J, VN-W, SR, Pl-St.
5	
	15-40°, J, VN-N, Cl, SR, Pl.
5	
	HJ, Ch-Ca-Qz-Py.
>10	
2	
	20-70°, J, VN-N, Cl, SR, Pl.
8	
0	
0	
1	
	5-65°, J, VN-N, No-Fe, SR, Pl.
>10	
0	
0	
0	
1	
2	
3	

Lithology

MATERIAL DESCRIPTION

BIOTITE QUARTZ PLAGIOCLASE GNEISS. Fine- to medium-grained, strong, generally weakly to moderately foliated, generally gray, fresh to slightly weathered, partially migmatitic texture, contains <1% garnet.

Rock mass altered to greenish white (92.5 to 97.5 ft).

Becomes fine-grained, dark greenish gray.

Approximately 10 to 25% of rock mass is altered to greenish gray with chlorite, mostly around healed joints (97.5 to 121.4 ft).

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Borehole Number: **B-5**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	115									**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to medium-grained, strong, generally weakly to moderately foliated, generally gray, fresh to slightly weathered, partially migmatitic texture, contains <1% garnet.			
	116					>10		5-70°, J, VN-MW, No-Si, SR, Pl-C-. HJ, HJ, Fe-Ch-Qz.					
	117					2							
	118	9	27	100*	88	1					~25		
787	119					1		0-50°, J, VN-MW, No-Fe-Si-, SR, Pl-St-C.					
	120					0							
	121					4							
	122					>10				Rock mass is intensely fracured, moderately weathered, and highly altered. Iron oxide-stained to reddish brown (121.4 to 122 ft), altered to greenish gray and greenish brown (122 to 138.4 ft).			
	123		28	95	47	>10				Weathered to clay (122.5 to 122.6 ft).	27		
	124					>10		5-50°, J, VN-N, Fe-Cl-Sd-Gr, SR, Pl-C.					
	125					>10							
	126					>10							
	127					>10							
	128		29	100	6	>10					34		
	129					>10							
	130					>10		15-70°, J, T-W, Sd-Cl-No, SR, Pl-I.					
	131					2							
	132					>10							
	133	10	30	100*	42	>10		HJ, Ca-Ch-Fe.			~35		
	134					>10							
	135					>10							
	136					>10							
	137					>10							
	138		31	100	58	>10					~35		

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Borehole Number: **B-5**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	139					3				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to medium-grained, strong, generally weakly to moderately foliated, generally gray, fresh to slightly weathered, partially migmatitic texture, contains <1% garnet.			
	140					1				Rock mass is dark gray with greenish chlorite alteration around healed joints (138.4 to 144.4 ft).			
	141					>10		HJ, HS, T-W, Ca-Cl-Fe-Sd, SR.					
	142					0							
	143		32	100*	97	0					~60		
	144					0							
	145					1		40°, J, VN-N, SR, Pl-I.		Becomes medium- to fine-grained, gray, contains quartz and bioitite-rich bands and sparse orange iron oxide staining in places, contains <1% pink garnet (<1/8-inch) (144.4 to 190 ft).			
	146					0						UCS = 9490 psi, PL = 14420 psi.	
	147					>10		15-35°, J, N-W, Qz-Ca-No, S-Slk-SR, Pl.					
	148	11	33	100*	100	0					130		
	149					1		15-35°, J, N-W, Qz-Ca-No, S-Slk-SR, Pl.					
	150					0							
	151					0							
	152		34	95	88	0		HJ, Ca-Ch-Qz.			~30		
	153					1		5°, J, N-VN, Ca, SR, Pl.					
	154					1							
	155		35	100*	100	0					~30		
	156					0		HJ, Ch.					
785	157					0							
	158		36	100	100	0					~30		
	159					0							
	160	12				0							
	161					0							

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	162					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to medium-grained, strong, generally weakly to moderately foliated, generally gray, fresh to slightly weathered, partially migmatitic texture, contains <1% garnet.			
	163		37	100*	97	0					~120		
	164					1							
	165					0		40°, J, N-MW, Ca-Ch, S-SR, Pl. HJ, Ch.					
	166					>10							
	167					3		25°, S, VN-N, Fe-Cl-Ch, Slk, Pl. HJ, Ch. 25-75°, J-S, VN-MW, Fe-Ch-Qz, Slk-SR, Pl-C.					
	168		38	100*	97	0					~55		
	169					0							
	170					0							
	171					0				Moderately strong to strong.		PL = 7338, 7136 psi.	
	172					0							
	173	13	39	100*	97	0					~64		
	174					0							
	175					0							
784	176					0							Sample burned and discolored during drilling (175 to 178 ft).
	177					0		HJ, Ch.					
	178		40	83	83	0					~80		Sample mechanically broken during repeated attempts to retrieve core (178 to 180.7 ft).
	179					0							
	180					0							
	181					0							
	182					0							
	183		41	100*	100	0					56		
	184					0							

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	185					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to medium-grained, strong, generally weakly to moderately foliated, generally gray, fresh to slightly weathered, partially migmatitic texture, contains <1% garnet.			
	186					0							
	187					0		40°, HJ, VN, Ch, S.					
	188	14	42	100	100	0					~55		
	189					0							
	190					0				No garnet (~190 to 283 ft).			
	191					0							
	192					0							
	193		43	100*	98	0					19		
	194					0							
783	195					0							
	196					0		30-40°, HJ, N, Qz, SR, Pl.					
	197					0							
	198		44	100*	100	0					29		
	199					0							
	200					0							
	201					0							
	202					0							
	203	15	45	100*	98	0					39		
	204					1							
	205					1		40°, J, T, Fe, S, Pl.		**PEGMATITE**. Coarse- to fine-grained, strong, white, fresh to slightly weathered, 70° inclined vein, contains biotite and chlorite.		PL = 9699 psi.	
	206					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to coarse-grained, strong, generally weakly to moderately foliated, generally gray, fresh to slightly weathered, contains quartz and biotite-rich bands.			
	207					1							
	208												

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Drill Time (min/run)	TESTS	FIELD NOTES
	209–210		46	100*	100	53	PL = 10603, 11419 psi.	
	211–215	16	47	100	100	45		
	216–220	16	48	100	88	67		
	221–225	16	49	100	91	70	Packer = 221.7 to 245.7 ft, fracture system does not accept water.	
	226–231	16	50	98	100	32		

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MATERIAL DESCRIPTION

BIOTITE QUARTZ PLAGIOCLASE GNEISS. Generally medium- to coarse-grained, strong, generally weakly to moderately foliated, generally gray, fresh to slightly weathered, contains quartz and biotite-rich bands.

DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)

Fracture Sketch	Fractures/ft	Discontinuity description
	1	0°, J, N-MW, S, C.
	0	
	0	
	0	
	0	HJ, Ch.
	0	
	0	
	0	
	2	30°, J, VN-T, SR, Pl.
	1	
	0	HJ, Ch.
	0	
	0	
	0	
	0	
	0	
	1	40°, J, N, S, U.
	2	
	4	0-35°, J, N, Fe, S-SR, Pl-St-C.
	0	
	0	
	0	
	1	
	2	30-50°, J, N, SR, Pl.
	1	50°, J, N-MW, SR, Pl.
	0	

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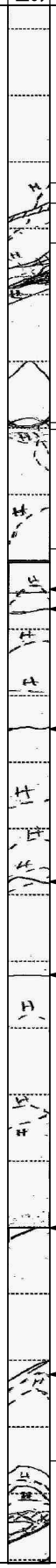
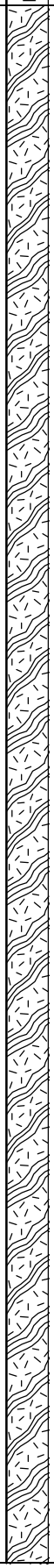
Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
781	232–235	17	51	100	100	0, 0, 1, 3		HJ.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to coarse-grained, strong, generally weakly to moderately foliated, generally gray, fresh to slightly weathered, contains quartz and biotite-rich bands.	80		
	236–240		52	92	92	1, 2, 0, 0, 2		40-60°, J, N-MW-VN, S, Pl.; HJ, T.; 0°, J, MW, S, Pl.; 0°, J, MW, SR, I.			33		
	241–245	18	53	100*	100	0, 1, 0, 1, 0		0°, J, N, Fe, SR, I-Pl.; 40°, J, MW, SR, I-Pl.			95		
	246–250		54	100*	93	1, 0, 0, 0, 1		0°, J, N, SR.; 50°, J, S, Pl.			33		
780	251–255		55	88	55	0, 1, 2, 2		60°, J, VN, SR, Pl.; 50-60°, J, T-VN, SR-R, Pl-I.			7		

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Borehole Number: **B-5**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	256	19	56	100*	100	0, 1, 0, 0, 0, 0		J, VN, S, Pl.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to coarse-grained, strong, generally weakly to moderately foliated, generally gray, fresh to slightly weathered, contains quartz and biotite-rich bands.	37		
	261		57	100*	95	0, 1, 0, 2, 2		10-30°, HJ, N, Ch, SR.; 60°, J, SR, Pl.; 50°, HJ, Ch.; 30-60°, J, N, SR, Pl.			80		
	266		58	100*	100	0, 0, 1, 0, 1		60°, HJ.; 60°, J, VN, S, Pl.			81		
779	271		59	100*	100	0, 0, 0, 0, 0		0-50°, HJ, VN, Ch.			39		
	276		60	100*	89	1, 0		40°, J, N, SR, Pl-I.			70		

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	279	20				1		0°, J, MW, SR, I.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to coarse-grained, strong, generally weakly to moderately foliated, generally gray, fresh to slightly weathered, contains quartz and biotite-rich bands.			
	280					4		0-70°, J, N, S, I-Pl.					
						1							
	281					0							
	282					2		70°, HJ, VN, Fe.					
	283		61	100	98	0		0°, J, MW, S, Pl-I.		Contains ~3% garnet (283 to 285 ft).	60		
	284					0							
	285					0		30°, HJ, VN-MW, Ch-Qz.					
	286	21				0							
	287					0							
	288		62	100	100	0		HJ, VN, Ch.			50		
	289					0							
778	290					0							
	291					1		60°, J, N, Fe-Ch, S, Pl.					
	292					0							
	293		63	100	100	0					35		
	294					2		0°, J, N, Ch, S, Pl.					
	295					1		HJ, Ch. 60°, J, T, Ch, S, Pl.					
	296					0				Becomes fine-grained, weakly foliated, dark gray, greenish and chlorite-rich around many healed joints.			
	297					0							
	298		64	100	100	0		HJ, Ch.			35		
	299					3		30°, J, T, Ch, S, Pl.					
	300					0							
	301					0							

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	303		65	100	100	1		40°, J, Ch, S, Pl. HJ, Ch.		**ANDESITE**. Fine-grained, strong, uniform, dark gray, fresh to slightly weathered.	27		
	304					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to coarse-grained, strong, weakly to moderately foliated, gray, fresh to slightly weathered.			
	305					0				**ANDESITE**. Fine-grained, strong, uniform, dark gray, fresh to slightly weathered.			
	306					0		HJ, Ch.				Packer = 305.7 to 325.7 ft, conductivity exceeds capacity of test. PL = 11466 psi.	
	307					0							
	308	22	66	100	100	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to coarse-grained, strong, weakly to moderately foliated, gray, fresh to slightly weathered, contains 0 to 1% garnet.	44		
777	309					0							
	310					0				**PEGMATITE**. Coarse- to medium-grained, weak to moderately strong, moderately foliated, white, fresh to slightly weathered.			
	311					1						UCS = 5380 psi, PL = 2152 psi.	
	312					1		60°, J, T, SR, Pl.					
	313		67	100	92	0		0°, J, T, SR, Pl.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to coarse-grained, strong, weakly to moderately foliated, gray, fresh to slightly weathered.	48		
	314					2		30-60°, J, T-N-VN, Si-Cl, S-SR, Pl.		**PEGMATITE**. Strong, white, fresh to slightly weathered.		PL = 10117, 10097 psi.	
	315					2		60°, HJ, T, Si-Cl, SR, Pl.					
	316					3				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to coarse-grained, strong, weakly foliated, generally gray, fresh to slightly weathered, contains cross-cutting quartz and biotite-rich bands.			
	317					>10		30-60°, J, T-VN-MW, No-Gr, SR, Pl.					
	318		68	90	90	1					16		Partial loss of drill water circulation. Drill water circulation lost.
	319					1							
	320					2		0-30°, J, T-W, S-SR, Pl.					
	321					0							
	322					1		30°, J, VN, SR, Pl-I.					
	323	23	69	100*	100	3		30-40°, J, VN-T, S, Pl.			65		
	324					1				Becomes fine-grained, dark gray.			
	325												

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
776	326		70	100*	100	1		40°, J, VN, SR, Pl.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to coarse-grained, strong, weakly foliated, generally gray, fresh to slightly weathered, contains cross-cutting quartz and biotite-rich bands.	37		
	327					1		40°, J, T, S, Pl.					
	328					0							
	329					1		40°, J, T, SR, Pl.		Becomes medium- to coarse-grained, gray.			
	330					0							
	331		71	100*	100	0					42		
	332					0		HJ, Ch.					
	333					0							
	334					0							
	335					1							
	336		72	100*	100	2		20-30°, J, N, Ch, S, Pl.			30		
	337					0							
	338	24				0							
	339					0							
	340					0							
	341		73	100	100	0		HJ, Ch.			35		
	342					1		40°, J, VN, SR, Pl.					
	343					0							
	344					0							
	345					0							
	346		74	100*	92	1		HJ, Ch. J, VN, S, Pl.			62		
	347					0							
	348					0							

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	349					1				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to coarse-grained, strong, weakly foliated, generally gray, fresh to slightly weathered, contains cross-cutting quartz and biotite-rich bands.			
	350					4		30°, J-HJ, VN, CH, S, Pl.					
	351					0							
	352					0							
	353	25	75	100	100	0					60		
	354					0		30°, HJ, VN, Ch.					
	355					0							
	356					0							
	357					0							
	358		76	100*	100	0					48		
	359					0		HJ, Ch.					
	360					1		0°, J, N, S, Pl.					
	361					5				Partially altered, light gray.			
	362					>10							
	363		77	100	37	>10		40°, J, Gr, S, Pl.			40		
	364					3		0°, J, MW, S, Pl.					
	365					6		30°, J, N, S, Pl.					
	366					7		30-60°, J, N-MW, No-Fe, S, Pl.					
774	367					>10		MW, S, Pl.		**PEGMATITE**. Coarse-grained, moderately strong to strong, white, fresh to slightly weathered, partially altered, light greenish gray, contains quartz and biotite-rich bands.			
	368	26	78	100	57	6		30-50°, J, N, Fe, S, Pl-I.			26		
	369					>10		40°, J, MW, Cl-Gr, S, I.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Strong, weakly foliated, gray, fresh to slightly weathered, rock mass partially altered.		PL = 2293 (low value), 12295 psi.	
	370					>10		30°, J, VN, Ch, S, Pl.					
	371					2		0-30°, J, S, Pl. HJ, MW, Qz.					
	372					0							

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

Sheet: 17 of 20

Borehole Number: **B-5**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	373		79	100*	100	0				Unaltered. **BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Strong, weakly foliated, gray, fresh to slightly weathered, rock mass partially altered.	22		Drill water circulation returns.
	374					0							
	375					0							
	376					0							
	377					0							
	378		80	100*	100	0		HJ, Ch.			30		
	379					1		20°, J, VN, SR, Pl.					
	380					1		20°, J, VN, SR, Pl.					
	381					2		40°, J, T-VN, SR, I-Pl.					
	382					1		50°, J, VN, S, Pl.					
	383	27	81	100	100	0					35		
	384					0							
	385					0		45°, FJ, T, SR, Pl.					
773	386					0						UCS = 8770 psi, PL = 6151 psi, PL value low.	
	387					0							
	388		82	100	100	0					46		
	389					0		HJ, Ch.					
	390					0							
	391					0							
	392					0				**ANDESITE**. Fine-grained, strong, uniform, dark gray, fresh to slightly weathered.			
	393		83	100	100	0					37		
	394					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to coarse-grained, strong, generally weakly foliated, generally gray, fresh to slightly weathered.			
	395												

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

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Borehole Number: **B-5**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	396					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to coarse-grained, strong, generally weakly foliated, generally gray, fresh to slightly weathered.			
	397					0							
	398	28	84	100	100	1		40°, J, N, S, Pl.			50		
	399					0							
	400					0							
	401					0							
	402					0							
	403		85	100	100	1		70°, J, T, SR, Pl.			33		
	404					1		40°, J, T, Fe, S, Pl.					
772	405					0						PL = 12005 psi.	
	406					0							
	407					0							
	408		86	100	100	1		70°, T, SR, Pl.		Becomes fine- to medium-grained, dark gray, cross-cutting through ~25% medium- to coarse-grained BIOTITE QUARTZ PLAGIOCLASE GNEISS, no garnet.	34	PL = 10549 psi.	
	409					0							
	410					0							
	411					0						UCS = 11210 psi, PL = 9874, 9105 psi.	
	412					0							
	413	29	87	100	100	0					31		
	414					0							
	415					0				Becomes medium- to coarse-grained, gray, contains quartz and biotite-rich veins, no garnet.			
	416					0							
	417					0							
	418		88	100	100	0					40		

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-5**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	420					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to coarse-grained, strong, generally weakly foliated, generally gray, fresh to slightly weathered.			
						0							
	421					0							
	422					0							
	423		89	100	100	0					53		
771	424					0				Becomes fine- to medium-grained, uniform, dark gray.			
	425					0							
	426					0				Becomes medium- to coarse-grained, weakly foliated, gray, contains ~50% porphyritic ANDESITE.			
	427					0							
	428	30	90	100	100	0					75		
	429					0							
	430					0							
	431					0							
	432					0		HJ, Ch.					
	433		91	100	100	0				Becomes fine- to medium-grained, uniform, dark gray.	32		
	434					0				Becomes medium- to coarse-grained, weakly foliated, gray, no dike rock, contains quartz and biotite-rich veins.			
	435					0							
	436					0							
	437					0							
	438		92	100	100	0					28		
	439					0							
	440					0							
	441					6		60°, J, N, S, Pl.					
	442												

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-5**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
770	443	31	93	100	100	>10		60°, S, W, Sd, Slk, Pl.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally medium- to coarse-grained, strong, generally weakly foliated, generally gray, fresh to slightly weathered.	27		
	444					0							
	445					0							
	446					0							
	447					0							
	448					0							
	449		94	100	100	0					34		
	450					0							
						0				VWP grouted in place at bottom of boring at 450.7 ft.			

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Gorge 2nd Tunnel Core Borehole Log

Project Number	Sheet	Borehole Number
A080138/JA4087	1 of 17	**B-6**

Prepared for	Seattle City Light, Newhalem, WA	Elevation	784.2 ft (NAVD88)
Driller / Equipment	Crux Subsurface Burley 5500-1	Drilling dates	9/22/2009 to 10/13/2009
Coring Method	HQ wireline	Azimuth/Inclination	90° / 0°
Location	Adit road near Gorge dam	Hole Diam/Core Diam	3.8 in/ 2.4 in
Coordinates	48.695887° N, -121.21334° E	Logged by/Approved by	AAE/SM / DHM

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
			1	100	100						5		
	1		2	100*	100	6 / 0		30-50°, J, VN, Fe, SR, Pl.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to coarse-grained, strong, weakly foliated, light gray, slightly weathered, includes thin (<1/8-inch-thick) quartz veins and nodules.	11	NOTE: Refer to laboratory and packer test results for details.	
	2					0							
	3					0							
	4		3	100	93	0					26		
	5					1		60°, J, MW-VN, Cl, SR, Pl-I.					
	6	1				0							
						9		50-70°, J, T-VN, No-Fe-Cl, S, Pl.		**ANDESITE**. Fine-grained, strong, uniform, dark gray, slightly weathered.			
	7					7							
	8					5				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to coarse-grained, strong, weakly to moderately foliated, gray, slightly weathered.			
	9		4	95	63	3					50		
	10					6		0-90°, J, VN-MW, No-Cl, S, Pl-C.					
	11					>10							
	12					0							
	13					0							
	14		5	100*	100	>10					27		
	15							35-55°, J, VN-Unk, Fe-Sd-Cl, SR, Pl.					Drill water circulation begins to decrease.
	16					0							
	17					0				Contains <1% pink garnet (<1/16-inch).			
	18					1		45°, FJ, VN-MW, Fe, SR, Pl-I.					Drill water circulation continues to decrease.
	19	2	6	100*	98	0					61		
	20					0							
	21												

NOTE: See Borehole Log Summary Key for explanation of symbols and abbreviations.

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

Borehole Number: **B-6**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	22					1		45°, FJ, VN-MW, Fe, SR, Pl-I.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Medium- to coarse-grained, strong, weakly to moderately foliated, gray, slightly weathered.			
	23					0							
						0		5-40°, J, VN-MW, No-Si, SR, Pl-I.					
	24		7	100	84	2					54		Driller notes soft drilling (23.7 to 24.2 ft)
	25					0							
	26												
	27					1		0°, J, MW-VN, SR-S, C.					
	28					0							
	29		8	100	100	0					70		
	30					0							
	31					6		30-90°, J, T-VN, SR, Pl.					
	32		9	82	82	0					18		
	33					0							
	34		10	71	37	4					~40		
	35					>10							
	36	3				>10							
	37					>10		20-70°, J, VN-W, Fe-Cl-Sd, SR, Pl.					
	38					>10							
	39		11	58	58	>10					~40		Driller notes a void (39 to 39.8 ft).
	40					>10				**ANDESITE**. Fine-grained, strong, slightly greenish gray, slightly to moderately weathered, broken clasts are stained orange with iron staining.		PL = 10144 psi.	
	41					>10				Moderately weathered in fracture zone (40.4 to 40.6 ft).			
	42					3				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Strong, weakly foliated, gray, rock mass is slightly altered.			
	43					>10		0-90°, J, VN-W, Fe-Cl, SR, Pl-I.					
	44		12	59	34	>10				**ANDESITE**. Fine- to medium-grained, strong, uniform, greenish gray, slightly weathered.	~40		

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Gorge 2nd Tunnel Core Borehole Log

Project Number: A080138/JA4087

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Borehole Number: **B-6**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	45					2, >10				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine- to coarse-grained, strong, generally weakly to strongly foliated, generally slightly weathered, includes quartz and biotite-rich bands up to 2-inches-thick, rock mass is sparsely iron oxide-stained (<1%).			
	46												
	47		13	90	78	3, 2, 1, >10, 6		5-60°, J, VN-N-W, Fe-Sd-Cl, SR, Pl-St.		Becomes. Becomes.	~40		
	48												
	49												
	50												
	51												Drill rod vibration from loss of circulation.
	52		14	90	70	1, 0, 0					28		
	53	4											Drill rod vibration from loss of water circulation; stop drilling and case to 49.5 ft; circulation returns.
	54												
	55					0, 0							
	56							50°, J, N, Si-Ca, SR, Pl. 50°, HJ, Ch.					
	57		15	88	88	1, 0, 0					70		
	58												
	59												
	60					0, 1							
	61							0°, J, VN-MW, N, S-SR.					
	62		16	98	83	1, 2, >10		0°, J, T-N, Fe-No, SR, Pl.			45		
	63												
	64												
	65					1, 0							
	66												
	67	5	17	100*	72	2, >10					45		

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-6**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	68					>10		5-65°, J, VN, Cl-Fe-No, SR, Pl.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine- to coarse-grained, strong, generally weakly to strongly foliated, generally slightly weathered, includes quartz and biotite-rich bands up to 2-inches-thick, rock mass is sparsely iron oxide-stained (<1%).			
	69					>10							
	70		18	100	75	5					~45		
	71					3							
	72					2							
	73					2							
	74					0		5-60°, J-HJ, VN, Fe-Ch, SR, Pl.					
	75					>10				Moderately to completely weathered, strong to extremely weak, and iron oxide-stained to reddish brown (75.1 to 76.8 ft).			
	76		19	100*	66	>10		5-60°, J, VN-?, Fe-Cl-Sd, SR, Pl.		Weathered to residual soil (75.9 to 80 ft).	~45		
	77					0							
	78					0							
	79		20	100*	100	0				Medium- to fine-grained, uniform, white, granular, quartz-rich felsic vein with quartzite-like texture (78.6 to 79.2 ft).	~20		Hard drilling (78.6 to 79.2 ft).
	80					2		HJ, Ch.					
	81					0							
	82	6	21	100	97	0					105		
	83					4		0-65°, J, T-N, SR, Pl.					
	84					1							
	85					0							
	86					0							
	87		22	100	99	2		50°, J, VN, SR, Pl.			105		
	88					0							
	89					0							
	90		23	100	100	0					~55		
	91												

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-6**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	92		24	100	100	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine- to coarse-grained, strong, generally weakly to strongly foliated, generally slightly weathered, includes quartz and biotite-rich bands up to 2-inches-thick, rock mass is sparsely iron oxide-stained (<1%).	~40		
	93					0		HJ, Ca-Bi.					
	94					1		40°, J, T-VN, SR, Pl.					
	95		25	100	85	1		40°, J, T-VN, SR, Pl.		Moderately weathered, strong, and greenish orange (95.5 to 96.1 ft).	61		
	96					>10		40-45°, J, T-W, Fe-No, SR, Pl.					
	97	7				0							
	98					0							
	99					1		40-45°, J, T-W, Fe-No, SR, Pl.					
	100		26	95	95	1		0°, J, N-MW, SR, C.		Becomes fresh to slightly weathered.	60		Joint contains possible alluvial gravel (rounded, 1/2-inch).
						0		HJ, Ch.					
	101					0							
	102					0							
	103					0							
	104					0							
	105		27	97	97	0					~90		
	106					0							
	107					0							
	108					0							
	109					0							
	110		28	100*	93	0					~120		
	111					0							
	112	8				0							
	113					8		0-50°, J, N-MW, No-Cl, S-SR, Pl.					
	114					2							
						0							

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-6**

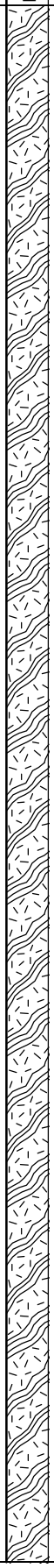
Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Drill Time (min/run)	TESTS	FIELD NOTES
	115–119	9	29	100	100	30		
	117–119	9	30	100*	98	~95		
	120–124	9	31	100	93	~60		
	124–125	9	32	100	100	8		
	125–129	9	33	96	74	60+		
	129–134	9	34	100*	88		PL = 12066, 9598 psi.	
	134–138	9	35	100*	98	60+		

Fracture Sketch

DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)

Depth (ft)	Fractures/ft	Discontinuity description
115	0	
116	1	
117	0	
118	2	
119	1	
120	1	10-35°, J, VN-N, SR, Pl.
121	1	
122	0	
123	2	
124	2	20-30°, FJ, N, Cl-No-Fe, SR, Pl. HJ, Ca-Fe-Ch.
125	0	
126	>10	0°, J, MW, Gr-Sd-Si, SR, C-I.
127		60°, J, N, Sd-Si, SR, Pl-I. 30°, FJ, N-MW, Sd, SR, U.
128	0	
129	0	
130	0	
131	0	
132	5	HJ, Fe-Cl-Ca.
133	2	30-50°, J, N-MW, No-Cl, SR, Pl.
134	1	20°, S, N-NW, Fe, Slk, Pl.
135	>10	40°, S, N-MW, Fe, S-SR, Pl-U.
136	0	
137	0	
138	0	

Lithology



MATERIAL DESCRIPTION

BIOTITE QUARTZ PLAGIOCLASE GNEISS. Generally fine- to coarse-grained, strong, generally weakly to strongly foliated, generally slightly weathered, includes quartz and biotite-rich bands up to 2-inches-thick, rock mass is sparsely iron oxide-stained (<1%).

Increased iron oxide staining (132.8 to 134.3 ft).

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	139					0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine- to coarse-grained, strong, generally weakly to strongly foliated, generally slightly weathered, includes quartz and biotite-rich bands up to 2-inches-thick, rock mass is sparsely iron oxide-stained (<1%).			
	140					0							
	141					0							
	142	10	36	100	95	0					~30		
	143					8		50°, J, MW-T, Si, S, Pl. FJ, MW-T, Si, S, Pl.		Quartz-rich (~20% biotite) (142.5 to 144.3 ft).			
	144					0							
	145					0							
	146					0							
	147		37	100	100	0					35		
	148					0							
	149					0							
	150					0						UCS = 10350 psi.	
	151					1		0°, J, N, S, C.					
	152		38	100*	100	5		60°, J, MW, Fe, S, Pl.			36		
	153					0							
	154					0							
	155					0							
	156					0		60°, HJ, VN, Cl. 30°, HJ, VN, Qz.					
	157	11	39	100*	100	0					47		
	158					0							
	159					1		50°, J, MW, Fe, SR-S, Pl.					
	160					0							
	161					0							

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Borehole Number: **B-6**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	162		40	100*	100	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine- to coarse-grained, strong, generally weakly to strongly foliated, generally slightly weathered, includes quartz and biotite-rich bands up to 2-inches-thick, rock mass is sparsely iron oxide-stained (<1%).	96		
	163					0							
	164					0							
	165					1		50°, J, VN, S, Pl.					
	166					0							
	167		41	100	98	0					42		
	168					0							
	169					0							
	170					0							
	171					0							
	172	12	42	100*	98	1		65°, J, N, S, Pl.			90		
	173					0							
	174					0							
	175					0		HJ, Qz.					
	176					1		0°, J, N, S, C-Pl.					
	177		43	100	100	0					50		
	178					0							
	179					1		60°, S, VN, Fe, Slk, Pl.					
	180					0							
	181					0		60°, HJ, VN-W, Ch.					
	182		44	100*	100	0					32		
	183					0							
	184					0							
						0							

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-6**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	185									**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine- to coarse-grained, strong, generally weakly to strongly foliated, generally slightly weathered, includes quartz and biotite-rich bands up to 2-inches-thick, rock mass is sparsely iron oxide-stained (<1%).			
	186					0							
	187	13	45	100*	100	0		60°, HJ, VN, Ch.			53		
	188					0		40°, HJ, VN, Ch, S, Pl.					
	189					0							
	190					1		0°, J, MW, S, Pl.				PL = 7655, 8761 psi.	Drilling without water to attempt to sharpen bit.
	191					0							
	192		46	100*	84	0					94		
	193					0							
	194					0							
	195					0		60°, J, VN, SR, Pl.					
	196					1							
	197		47	100*	100	0					70		
	198					0							
	199					0							
	200					1		0°, J, N, SR, Pl.					
	201					1		J, VN-T, Fe, SR, Pl. 50°, J, T, Fe, S, Pl.					
	202	14	48	100	100	1		30°, J, N, Qz, SR, I-Pl.			60		
	203					0							
	204					2		60°, J, T, SR, Pl.					
	205					1							
	206					3		60°, J, VN, S-SR, Pl.					
	207		49	100	100	0					50		
	208					1							

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Gorge 2nd Tunnel Core Borehole Log

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Borehole Number: **B-6**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	209					2		60°, J, T-VN, SR, Pl-I.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine- to coarse-grained, strong, generally weakly to strongly foliated, generally slightly weathered, includes quartz and biotite-rich bands up to 2-inches-thick, rock mass is sparsely iron oxide-stained (<1%).			
	210					1				1/4-inch-thick band of coarse biotite crystals.			
	211					0							
	212		50	100*	100	0					45		
	213					1		30°, J, VN, Ch, S.					
	214					0							
	215					0							
	216					0							
	217	15	51	100	100	0					60		
	218					0							
	219					1		50°, FJ, N, SR, Pl-I.					
	220					3		40-50°, J, N, SR, Pl-I.					
	221					0							
	222		52	100	92	0					58		
	223					0							
	224					0							
	225					0							
	226					0							
	227		53	100	97	0					76		
	228					0							
	229					1		HJ, VN, Ch. 40°, J, VN, Ch.					
	230					0							
	231					0							
						0							

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	232	16	54	100	100	0				**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Generally fine- to coarse-grained, strong, generally weakly to strongly foliated, generally slightly weathered, includes quartz and biotite-rich bands up to 2-inches-thick, rock mass is sparsely iron oxide-stained (<1%).	91		
	233					0							
	234												
	235					0							
	236					0							
	237		55	100	100	0		30°, HJ, VN, Qz.			30		
	238					0		30°, J, VN, S, Pl.					
	239					1							
	240	17				0				**MIGMATITIC BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Weak to strong, gray, black, and white, fresh, white, black, and greenish gray swirled bands.		PL = 2718 (in migmatite) psi. UCS = 4070 psi.	
	241					0							
	242		56	100	100	0					41	PL = 8889 psi.	
	243					1		40°, J, T, SR, Pl.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to coarse-grained, strong, weakly to strongly foliated, gray, fresh, slightly migmatitic texture, contains quartz and biotite-rich bands and with bands of uniformly fine-grained material up to 1 foot.			
	244					0							
	245					1		50°, FJ, VN, Fe, S, Pl.				Packer = 244.3 to 273.3 ft, conductivity exceeds capacity of test.	
	246					2		0°, J, N, S, Pl.					
	247		57	100	85	0		40-50°, J, N, S, Pl.			35		
	248					3		40-50°, J-FJ, N, S, Pl.					
	249					3							
	250					4							
	251					3		30°, J, T-VN, Ch, S, Pl.				PL = 9355, 10407 psi.	
	252		58	100	100	1					43		
	253					1							
	254					0							
	255					1							Drill water circulation decreases.

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	256					1		40-60°, J, T-VN, SR, Pl.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to coarse-grained, strong, weakly to strongly foliated, gray, fresh, slightly migmatitic texture, contains quartz and biotite-rich bands and with bands of uniformly fine-grained material up to 1 foot.			
	257		59	100	100	0					29		
	258					0							
	259					1		30°, J, VN, S, Pl.					
	260					0							Lost drill water circulation.
	261					0		30°, HJ, N, Ch.					
	262	18	60	100	100	1		30°, J, Ch, S, I-Pl.			63		
	263					1		60°, FJ, N, S, Pl.					
	264					0							
	265					0							Drill water circulation returns.
	266					0							
	267		61	100	97	1		30°, FJ, N, S, Pl.			97		
	268					6							
	269					3		0-75°, J, N, S, Pl.					
	270					0							
	271					2		40°, FJ, N, S, Pl.					Drill rod vibration from loss of circulation.
	272		62	100	100	1		70°, J, N, S, Pl.			90		
	273					0							
	274					0							
	275					0							Drillers greased rods to seal fractures; water circulation returns.
	276					0							
	277	19	63	100	100	0					22		
	278					0							

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Borehole Number: **B-6**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	279					1		60°, J, VN, S, Pl.		**BIOTITE QUARTZ PLAGIOCLASE GNEISS**. Fine- to coarse-grained, strong, weakly to strongly foliated, gray, fresh, slightly migmatitic texture, contains quartz and biotite-rich bands and with bands of uniformly fine-grained material up to 1 foot.			
	280					1		10°, J, VN, Ch, S, Pl.				Packer = 279.3 to 299.3 ft, conductivity exceeds capacity of test.	
	281					0				Becomes mostly fine-grained (280.3 to 283.6 ft).			
	282		64	100	100	1					30	UCS = 7760 psi.	
	283					0							
	284					0							
	285					2		0-50°, J, N, S-SR, Pl-I.					
	286					2							
	287		65	23	10	N/A	NR			No recovery.	13		
	288					N/A							
	289					N/A	NR						
	290					N/A				**ALLUVIAL GRAVEL**. Orange to gray, coarse sub-angular gravel, mixed gneiss and dike lithology, iron oxide-stained.			Maintaining drill water circulation due to return flow from voids.
	291					N/A							
	292	20	66	100	20	N/A		0-90°, Fe.			15		
	293					N/A							
	294					N/A				**BOULDER**. Medium-grained, BIOTITE QUARTZ PLAGIOCLASE GNEISS, gray, very strong, slightly weathered, weakly foliated.			
	295					0							
	296					1	NR			No recovery.			
	297		67	23	23	N/A					8		
	298					N/A							
	299					N/A	NR						
	300					N/A				**ALLUVIAL GRAVELLY SAND**. Brownish gray, gravelly fine sand, contains coarse gravel and cobbles of mixed gneiss and dike lithology of up to 4 inches, iron oxide-stained.			Water flowing from boring at ~5 gpm 15 minutes after sample (R67) pulled.
	301					N/A							
						N/A							

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Borehole Number: **B-6**

Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	303, 304	21	68	50	6	N/A, N/A				**ALLUVIAL GRAVELLY SAND**. Brownish gray, gravelly fine sand, contains coarse gravel and cobbles of mixed gneiss and dike lithology of up to 4 inches, iron oxide-stained.	15		
	305, 306, 307, 308, 309		69	0	0	N/A, N/A, N/A, N/A, N/A	NR, NR, NR, NR			No recovery.	3		
	310, 311, 312, 313, 314		70	36	0	N/A, N/A, N/A, N/A, N/A	NR, NR			**ALLUVIAL GRAVEL**. Medium-grained, brown, sub-angular gravel of mixed gneiss and dike lithology up to 2 inches, iron oxide-stained.	10		
	315, 316, 317, 318, 319		71	70	70	N/A, N/A, N/A, N/A, N/A				**ALLUVIAL SILTY SAND**. Brown, fine sand.	10		
	320, 321, 322, 323, 324		72	43	20	N/A, N/A, N/A, N/A, N/A	NR, NR, NR, NR	30°, HJ, N, Fe-Ch, S, Pl.		No recovery.	10		
	325					N/A		60°, S, Fe.		**ALLUVIAL SILTY SAND**. Brown, fine sand.			
										BOULDER. Medium-grained, BIOTITE QUARTZ PLAGIOCLASE GNEISS, gray, very strong, slightly weathered, weakly foliated.			
										ANDESITE. Fine-grained, strong, uniform, dark gray.			

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	326					2		30°, J, VN, Ch, S, Pl.		**ANDESITE**. Fine-grained, strong, uniform, dark gray.			
								HJ, Ch.					
	327		73	96	100	1		90°, J, VN, Ch, S, Pl-I.		**BOULDER**. Medium-grained, BIOTITE QUARTZ PLAGIOCLASE GNEISS, gray, very strong, slightly weathered, weakly foliated.	42		
	328					N/A		40-70°, J, VN, Ch, S, Pl.					
	329					N/A		80°, J, Fe, S, Pl.					
	330					N/A							
	331					N/A							
	332	22	74	100*	96	N/A		30°, J, T, Fe, S, Pl.			63		
	333					N/A		HJ, Ch.					
	334					N/A		50°, J, S, Pl.					
	335					N/A							
	336					N/A							
	337		75	100*	97	N/A		45°, J, T, Ch, S, Pl.			56		
	338					N/A		20°, J, T, Ch, S, Pl.					
	339					N/A		60°, J, T, Fe, S, Pl.		**ANDESITE**. Fine-grained, strong, uniform, dark gray.			
	340					1							
	341					N/A							
	342		76	60	43	7		50-80°, J, N-W, S, Pl-I.		**BOULDER**. Medium- to coarse-grained, BIOTITE QUARTZ PLAGIOCLASE GNEISS, gray, very strong, slightly weathered, weakly foliated.	38		
	343					N/A							
	344					N/A		50°, J, Fe, S, Pl.		No recovery.			
	345					N/A				**ALLUVIAL SILTY SAND**. Brown, wet.			
	346					N/A							
	347		77	100	0	N/A					8		
	348					N/A							

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	349									**ALLUVIAL SILTY SAND**. Brown, wet.			
	350					N/A				**ALLUVIAL GRAVEL**. Coarse sub-angular gravel of mixed gneiss and dike lithology, iron oxide-stained.			Driller notes boulder (350.3 to 351.8 ft)
	351					N/A				**ALLUVIAL SILTY SAND**. Wet.			
	352	23	78	80	0	N/A					~3		
	353					N/A							
	354					N/A							
	355					N/A				No recovery.			
	356					N/A	NR						
	357		79	10	0	N/A					3		
	358					N/A							
	359					N/A	NR						
	360					N/A				**ALLUVIAL SILTY SAND**.			
	361					N/A	NR			No recovery.			
	362		80	10	0	N/A					1		
	363					N/A							
	364					N/A	NR						
	365					N/A				**ALLUVIAL SILTY SAND**.			
	366					N/A	NR			No recovery.			
	367		81	10	0	N/A	NR				2		
	368					N/A	NR						
	369					N/A							
	370					N/A				**ALLUVIAL SILTY SAND**.			
	371					N/A							
	372	24	82	100	0	N/A					2		

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Approx Elev (ft)	Drill Depth (ft)	Box #	Run #	%Recovery	% RQD	Fractures/ft	Fracture Sketch	DISCONTINUITY DESCRIPTION (Angle, type, aperture, infilling, roughness, shape)	Lithology	MATERIAL DESCRIPTION	Drill Time (min/run)	TESTS	FIELD NOTES
	373					N/A				**ALLUVIAL SILTY SAND**.			
						N/A							
	374												
						N/A							
	375									**ALLUVIAL GRAVEL**. Coarse sub-angular gravel of mixed gneiss and dike lithology, iron oxide-stained.			
						N/A							
	376									**BOULDER**. BIOTITE QUARTZ PLAGIOCLASE GNEISS.			
						N/A							
	377		83	50	30						~10		
						N/A	NR			No recovery.			
	378												
						N/A	NR						
	379									Bottom of boring at 379.3 ft. Backfilled with cement and bentonite grout.			