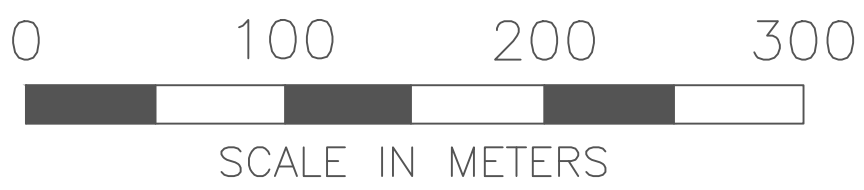




Borehole	UTM N (m)	UTM E (m)	Elevation (m)	Depth (m)
BH-06	5679028	460028	1124.4	15.1
BH-07	5678943	459919	1106.1	5.7
BH-08	5678803	459400	1104.4	23.8
BH-09	5678792	459321	1107.9	23.9
BH-10	5678659	459035	1106.6	17.7



BORING LOCATIONS
Cougar Corners
Phase 4 Avalanche Mitigation
Investigation
Glacier National Park, BC

LEGEND

-  BORING
-  km HWAY 1 STATIONS

The stratification lines represent approximate boundaries. The transition may be gradual.



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LOG OF BORING BH06

Sheet 2 of 2

Project: Geotechnical Investigation for Cougar Corner Avalanche Pathways				Location: Glacier National Park, BC				Client: Highway Engineering Services - Parks Canada Agency													
Elevation, meters	Depth, meters	Barr Project Number: 61021018		Graphic Log	Sample Type & Rec.	STANDARD PENETRATION TEST DATA		WATER CONTENT %		SIEVE ANALYSIS		Physical Properties									
		MATERIAL DESCRIPTION (ASTM D2488)				N in blows/0.3m		PL LL		GRAVEL SAND SILT CLAY FINES		WC %	γ kNm ³	φ °	Q _u kPa	Q _p kPa	Gs	RQD %			
1120	10	SILTY, CLAYEY SAND WITH GRAVEL (SC-SM): fine to coarse; light brown - brown; moist; medium dense to very dense; angular to subangular; strong HCl reaction; colluvium deposit. (Continued) Boulder from 10.2m-11.1m.			X	50/5"							4								
1119	11																				
1118	12																				
1117	13																				
1116	14																				
	15	Saturated. Bottom of Boring at 15.13 meters Suspected Bedrock Encountered			X	50/1"															
	16				X	50/0"															
	17																				
	18																				
	19																				
Completion Depth:		15.1		Remarks:																	
Date Boring Started:		27/9/17																			
Date Boring Completed:		28/9/17		SAMPLE TYPES																	
Logged By:		MGP3																		WATER LEVELS (m)	
Drilling Contractor:		Earth Drilling		LEGEND																	
Drilling Method:		ODEX																		MC Moisture Content Q _u Unconfined Compression	
Ground Surface Elevation:		1131.0		γ Dry Unit Weight Q _p Hand Penetrometer UC																	
Coordinates:		UTM 11 N:5679028m, E:460028m																		φ Friction Angle Gs Specific Gravity	
Datum:				RQD Rock Quality Designation																	

The stratification lines represent approximate boundaries. The transition may be gradual.



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LOG OF BORING BH07

Sheet 1 of 1

Project: Geotechnical Investigation for Cougar Corner Avalanche Pathways				Location: Glacier National Park, BC				Client: Highway Engineering Services - Parks Canada Agency																							
Elevation, meters	Depth, meters	Barr Project Number: 61021018		Graphic Log	Sample Type & Rec.	STANDARD PENETRATION TEST DATA		WATER CONTENT %		SIEVE ANALYSIS		Physical Properties																			
		MATERIAL DESCRIPTION (ASTM D2488)				N in blows/0.3m		PL ———— X ———— LL		<div>GRAVEL SAND SILT CLAY</div> <div>FINES</div>		WC %	γ kNm ³	φ °	Q _u kPa	Q _p kPa	Gs	RQD %													
	0	Surface Elev.: 1106.00 m				10	20	30	40	20	40	60	20	40	60	80															
1105	1	POORLY GRADED GRAVEL WITH SILTY CLAY AND SAND (GP-GC): fine to coarse; greyish brown - brown; moist; medium dense; angular to subangular; strong HCl reaction; colluvium deposit.					23			X				60.4		91.9	6														
1104	2																														
1103	3	SILTY, CLAYEY SAND WITH GRAVEL (SC-SM): medium to coarse; brown; moist; medium dense; angular to subangular; colluvium deposit.		2.23m			26			X				40.6		84.1	5.6														
1102	4	SILTY, CLAYEY GRAVEL WITH SAND (GC-GM): fine to coarse; brown; moist; medium dense; subangular to subrounded; colluvium deposit.		3.75m			25							42		82.9															
1101	5									X																					
	6	SILTY, CLAYEY SAND WITH GRAVEL (SC-SM): fine to coarse; brown; moist; very dense; angular; colluvium deposit.		5.27m										12.7		81	97.1	0.2													
	6	Bottom of Boring at 5.74 meters Suspected Bedrock Encountered		5.74m						X																					
	7																														
	8																														
	9																														
Completion Depth:		5.7		Remarks:																											
Date Boring Started:		29/9/17																													
Date Boring Completed:		29/9/17		SAMPLE TYPES																				WATER LEVELS (m)		LEGEND					
Logged By:		MGP3																													
Drilling Contractor:		Earth Drilling		At Time of Drilling Dry																				MC Moisture Content				Q _u Unconfined Compression			
Drilling Method:		ODEX																													
Ground Surface Elevation:		1106.0		Split Spoon																				γ Dry Unit Weight		Q _p Hand Penetrometer UC					
Coordinates:		UTM 11 N:5678943m, E:459919m																													
Datum:				Grab Sample																				φ Friction Angle		Gs Specific Gravity					
				RQD Rock Quality Designation																											

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LOG OF BORING BH08

Sheet 2 of 3

Project: Geotechnical Investigation for Cougar Corner Avalanche Pathways			Location: Glacier National Park, BC			Client: Highway Engineering Services - Parks Canada Agency											
Elevation, meters	Depth, meters	Barr Project Number: 61021018	Graphic Log	Sample Type & Rec.	STANDARD PENETRATION TEST DATA N in blows/0.3m <div><div>10203040</div></div>	WATER CONTENT % PL ——— X ——— LL <div><div>204060</div></div>	SIEVE ANALYSIS <div><div>GRAVELSANDSILTCLAY</div><div>FINES</div></div>	Physical Properties									
		WC %						γ kNm ³	ϕ °	Q _u kPa	Q _p kPa	Gs	RQD %				
	10	SILTY, CLAYEY SAND WITH GRAVEL (SC-SM): fine to coarse; light greyish brown; moist; medium dense to very dense; subangular to subrounded; colluvium deposit. <i>(Continued)</i>															
1093	11																
1092	12			<div><div>>></div><div>⊕</div><div>50/5"</div></div>													
1091	13																
1090	14																
1089	15			<div><div>>></div><div>⊕</div><div>50/3"</div></div>													
1088	16																
1087	17																
1086	18		<div><div>>></div><div>⊕</div><div>51</div></div>					<div><div>28.5</div><div>77.1</div></div>	1.5								
1085	19																
			Continued Next Page														
Completion Depth: 23.8			Remarks:														
Date Boring Started: 29/9/17																	
Date Boring Completed: 30/9/17																	
Logged By: MGP3																	
Drilling Contractor: Earth Drilling																	
Drilling Method: ODEX																	
Ground Surface Elevation: 1104.0																	
Coordinates: UTM 11 N:5678803m, E:459400m																	
Datum:																	
SAMPLE TYPES					WATER LEVELS (m)					LEGEND							
<div><div>⊗</div> Split Spoon</div> <div><div>👉</div> Grab Sample</div>					<div><div>▽</div> At Time of Drilling</div> <div>Dry</div>					<div><div>MC</div> Moisture Content</div> <div><div>γ</div> Dry Unit Weight</div> <div><div>ϕ</div> Friction Angle</div> <div><div>Q_u</div> Unconfined Compression</div> <div><div>Q_p</div> Hand Penetrometer UC</div> <div><div>Gs</div> Specific Gravity</div> <div>RQD Rock Quality Designation</div>							

The stratification lines represent approximate boundaries. The transition may be gradual.

P:\CALGARY\61 CANADA\02161021018 PARKS CANADA GEOTECHNICAL SERVICE\FILES\003.6 NEW SITES\DESIGN\GINT LOGS\61021018.GPJ BARR\LIBRARY_JFB.GLB HORIZONTAL LOG REPORT 1



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LOG OF BORING BH08

Sheet 3 of 3

Project: Geotechnical Investigation for Cougar Corner Avalanche Pathways		Location: Glacier National Park, BC		Client: Highway Engineering Services - Parks Canada Agency														
Elevation, meters	Depth, meters	Barr Project Number: 61021018		Graphic Log Sample Type & Rec.	STANDARD PENETRATION TEST DATA N in blows/0.3m 10 20 30 40	WATER CONTENT % PL LL 20 40 60	SIEVE ANALYSIS GRAVEL SAND SILT CLAY 20 40 60 80 FINES	Physical Properties										
		WC %	γ kNm ³					φ °	Q _u kPa	Q _p kPa	G _s	RQD %						
1084	20	SILTY, CLAYEY SAND WITH GRAVEL (SC-SM): fine to coarse; light greyish brown; moist; medium dense to very dense; subangular to subrounded; colluvium deposit. (Continued)																
1083	21																	
1082	22																	
1081	23	Boulder or bedrock from 22.8m-23.8m; strong HCl reaction.																
	24	Bottom of Boring at 23.80 meters 23.80m																
	25																	
	26																	
	27																	
	28																	
	29																	
Completion Depth: 23.8		Remarks:																
Date Boring Started: 29/9/17																		
Date Boring Completed: 30/9/17		SAMPLE TYPES WATER LEVELS (m) LEGEND																
Logged By: MGP3																		
Drilling Contractor: Earth Drilling		Split Spoon Grab Sample At Time of Drilling Dry MC Moisture Content Q _u Unconfined Compression																
Drilling Method: ODEX																		
Ground Surface Elevation: 1104.0		γ Dry Unit Weight Q _p Hand Penetrometer UC																
Coordinates: UTM 11 N:5678803m, E:459400m																		
Datum:		φ Friction Angle G _s Specific Gravity RQD Rock Quality Designation																

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Project: Geotechnical Investigation for Cougar
Corner Avalanche Pathways

Location: Glacier National Park, BC

Client: Highway Engineering Services - Parks
Canada Agency






Elevation, meters	Depth, meters	Barr Project Number: 61021018	Graphic Log Sample Type & Rec.	STANDARD PENETRATION TEST DATA N in blows/0.3m	WATER CONTENT % PL LL	SIEVE ANALYSIS GRAVEL SAND SILT CLAY FINES	Physical Properties									
		MATERIAL DESCRIPTION (ASTM D2488)					WC %	γ kNm ³	ϕ °	Q _u kPa	Q _p kPa	Gs	RQI %			
	0	Surface Elev.: 1108.00 m		10 20 30 40	20 40 60	20 40 60 80										
	1	ORGANIC SILT (OL): medium; black and brown; moist; medium dense; subangular; colluvium deposit.	0.76m	13	X											
1107	1	SILTY, CLAYEY SAND WITH GRAVEL (SC-SM): fine to coarse; light brown; moist; medium dense to very dense; subangular to subrounded; strong HCl reaction; colluvium deposit.		25			34.8	80.4-96.9								
1106	2	SILTY, CLAYEY GRAVEL WITH SAND (GC-GM): fine to coarse; light brown; moist; medium dense to very dense; subangular to subrounded; strong HCl reaction; colluvium deposit.	1.74m		X		45	85.3	4	3						
1105	3			13	X				4.5							
1104	4			25												
1103	5															
1102	6	Boulder from 5.9m-6.5m.		50/3"					3.7							
1101	7			13												
1100	8															
1099	9			22												

Continued Next Page

Continued Next Page

Completion Depth:	23.9
Date Boring Started:	1/10/17
Date Boring Completed:	1/10/17
Logged By:	MGP3
Drilling Contractor:	Earth Drilling
Drilling Method:	ODEX
Ground Surface Elevation:	1108.0
Coordinates:	UTM 11 N:5678792m, E:459321m
Datum:	

Remarks:

SAMPLE TYPES		WATER LEVELS (m)	LEGEND	
 Split Spoon	 Grab Sample	 At Time of Drilling Dry	MC Moisture Content	Q _u Unconfined Compression
			 Dry Unit Weight	Q _p Hand Penetrometer UC
			 Friction Angle	G _s Specific Gravity
				RQD Rock Quality Designation

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LOG OF BORING BH09

Sheet 2 of 3

Project: Geotechnical Investigation for Cougar Corner Avalanche Pathways			Location: Glacier National Park, BC			Client: Highway Engineering Services - Parks Canada Agency								
Elevation, meters	Depth, meters	Barr Project Number: 61021018	Graphic Log	Sample Type & Rec.	STANDARD PENETRATION TEST DATA N in blows/0.3m 10 20 30 40	WATER CONTENT % PL ——— X ——— LL 20 40 60	SIEVE ANALYSIS GRAVEL SAND SILT CLAY FINES 20 40 60 80	Physical Properties						
		WC %						γ kNm ³	φ °	Q _u kPa	Q _p kPa	G _s	RQD %	
	10	SILTY, CLAYEY GRAVEL WITH SAND (GC-GM): fine to coarse; light brown; moist; medium dense to very dense; subangular to subrounded; strong HCl reaction; colluvium deposit. (Continued)						2.6						
1097	11													
1096	12													
1095	13													
1094	14													
1093	15													
1092	16													
1091	17													
1090	18													
1089	19													
Continued Next Page														
Completion Depth: 23.9			Remarks:											
Date Boring Started: 1/10/17														
Date Boring Completed: 1/10/17			SAMPLE TYPES											
Logged By: MGP3														
Drilling Contractor: Earth Drilling			WATER LEVELS (m)											
Drilling Method: ODEX														
Ground Surface Elevation: 1108.0			LEGEND											
Coordinates: UTM 11 N:5678792m, E:459321m														
Datum:			MC Moisture Content Q _u Unconfined Compression											
			γ Dry Unit Weight Q _p Hand Penetrometer UC											
			φ Friction Angle G _s Specific Gravity											
			RQD Rock Quality Designation											

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LOG OF BORING BH09

Sheet 3 of 3

Project: Geotechnical Investigation for Cougar Corner Avalanche Pathways		Location: Glacier National Park, BC		Client: Highway Engineering Services - Parks Canada Agency												
Elevation, meters	Depth, meters	Barr Project Number: 61021018		Graphic Log Sample Type & Rec.	STANDARD PENETRATION TEST DATA N in blows/0.3m 10 20 30 40	WATER CONTENT % PL LL 20 40 60	SIEVE ANALYSIS GRAVEL SAND SILT CLAY FINES	Physical Properties								
		WC %	γ kNm ³					φ °	Q _u kPa	Q _p kPa	G _s	RQD %				
1088	20	SILTY, CLAYEY GRAVEL WITH SAND (GC-GM): fine to coarse; light brown; moist; medium dense to very dense; subangular to subrounded; strong HCl reaction; colluvium deposit. (Continued)			50/2"				4.3							
1087	21															
1086	22															
1085	23															
	24															
	25															
	26	Bottom of Boring at 23.90 meters 23.90m			50/3"											
	27															
	28															
	29															
Completion Depth: 23.9		Remarks:														
Date Boring Started: 1/10/17																
Date Boring Completed: 1/10/17																
Logged By: MGP3																
Drilling Contractor: Earth Drilling																
Drilling Method: ODEX																
Ground Surface Elevation: 1108.0																
Coordinates: UTM 11 N:5678792m, E:459321m																
Datum:																
SAMPLE TYPES					WATER LEVELS (m)			LEGEND								
Split Spoon Grab Sample					At Time of Drilling Dry			MC Moisture Content Q _u Unconfined Compression γ Dry Unit Weight Q _p Hand Penetrometer UC φ Friction Angle G _s Specific Gravity RQD Rock Quality Designation								

The stratification lines represent approximate boundaries. The transition may be gradual.

LOG OF BORING BH10

Sheet 1 of 2

Project: Geotechnical Investigation for Cougar Corner Avalanche Pathways				Location: Glacier National Park, BC				Client: Highway Engineering Services - Parks Canada Agency															
Elevation, meters	Depth, meters	Barr Project Number: 61021018		Graphic Log	Sample Type & Rec.	STANDARD PENETRATION TEST DATA N in blows/0.3m	WATER CONTENT % PL ——— X ——— LL	SIEVE ANALYSIS GRAVEL SAND SILT CLAY FINES	Physical Properties														
		MATERIAL DESCRIPTION (ASTM D2488)							WC %	γ kNm ³	ϕ °	Q _u kPa	Q _p kPa	Gs	RQD %								
	0	Surface Elev.: 1107.00 m				10	20	30	40	20	40	60	20	40	60	80	24.8						
1106	1	ORGANIC SOIL (OL/OH): coarse; black; moist; loose; subangular; with sand and gravel; colluvium deposit.		0.76m	SP	10				X				48.9	91.8	55.5		33.2					
1105	2	POORLY GRADED GRAVEL WITH SILTY CLAY AND SAND (GP-GC): fine to coarse; greyish brown; moist; dense; angular to subangular; with organics; colluvium deposit.		1.74m	GP	32				X				47.7	91.1	19	2.8	3					
1104	3	WELL GRADED GRAVEL WITH SILTY CLAY AND SAND (GW-GC): fine to coarse; greyish brown - brown; moist; medium dense to very dense; subangular to subrounded; trace organics; colluvium deposit.			GP	21				X							1.9						
1103	4				GP	24																	
1102	5				GP																		
1101	6				GP																		
1100	7				GP	23				X							9						
1099	8	Boulder from 7.7m-8.3m.			GP																		
1098	9	Evidence of oxidation.			GP																		
		Continued Next Page																					
Completion Depth:		17.7		Remarks:																			
Date Boring Started:		1/10/17																					
Date Boring Completed:		2/10/17																					
Logged By:		MGP3																					
Drilling Contractor:		Earth Drilling																					
Drilling Method:		ODEX																					
Ground Surface Elevation:		1107.0																					
Coordinates:		UTM 11 N:5678659m, E:459035m																					
Datum:																							
				SAMPLE TYPES				WATER LEVELS (m)				LEGEND											
				Split Spoon Grab Sample				At Time of Drilling Dry				MC Moisture Content γ Dry Unit Weight ϕ Friction Angle Q _u Unconfined Compression Q _p Hand Penetrometer UC Gs Specific Gravity RQD Rock Quality Designation											

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