GEOLABS, INC.

Geotechnical Engineering

SEISMIC RETROFIT OF KAHOLO BRIDGE
HAWAII BELT ROAD, PROJECT NO. BR-019-2(072)
DISTRICT OF HAMAKUA, ISLAND OF HAWAII

Log of Boring 1

Laboratory			Field							
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS

Approximate Ground Surface Elevation (feet): 737 *

Description

Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	USCS	Description
								8-inch **ASPHALTIC CONCRETE**
							GM	Gray with some brown **SILTY GRAVEL (BASALTIC)**, medium dense, moist (fill)
	52				14		ML	Orangish brown with gray mottling **CLAYEY SILT** with some sand (basaltic) and a little decomposed gravel, stiff to very stiff, moist (saprolite)
LL=43 PI=10					85	3.5		grades with cobble sized basalt corestones locally
TXUU S_u=1.7 ksf	54	68			41	1.0		grades to medium stiff and very moist locally
Direct Shear	65	62			17	0.8		
Sieve - #200 = 31.2%	32	77	29		51		GM	Gray and brown **SILTY GRAVEL (BASALTIC)** with some sand, medium dense, moist (weathered basalt)
	44		33	0	23		ML	Brown with gray mottling **CLAYEY SILT** with some sand (basaltic) and traces of gravel, very stiff, moist (saprolite)
	39		47	0	15/6" +25/3"			Brownish gray to gray vesicular **BASALT**, severely fractured, moderately to highly weathered, soft to medium hard (pahoehoe basalt)
							ML	

5 10 15 20 25 30 35

Date Started:	May 13, 2021	Water Level: ▼ Not Encountered	Plate
Date Completed:	May 14, 2021		
Logged By:	S. Latronic	Drill Rig: MOBILE B-53.1 *(Energy Transfer Ratio = 42.9%)*	A - 1.1
Total Depth:	80.5 feet	Drilling Method: 4" Solid-Stem Auger & HQ Coring	
Work Order:	8063-00	Driving Energy: 140 lb. wt., 30 in. drop	

BORING_LOG 8063-00.GPJ GEOLABS.GDT 12/13/23

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SEISMIC RETROFIT OF KAHOLO BRIDGE
HAWAII BELT ROAD, PROJECT NO. BR-019-2(072)
DISTRICT OF HAMAKUA, ISLAND OF HAWAII

Log of Boring 1

Laboratory			Field							
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS

(Continued from previous plate)

Description

Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	USCS	Description
	35				42			ML	Brown with gray mottling **CLAYEY SILT** with some sand (basaltic) and traces of gravel, hard, moist (saprolite)
			14						
	30				25/2"		40		
UC= 660 psi			72	10					Brownish gray to gray vesicular **BASALT**, closely fractured, moderately to highly weathered, medium hard (pahoehoe basalt)
			55	13			45		
									grades to hard locally
			57	0			50		grades with small voids
									Brownish gray to gray vugular **BASALT**, closely to severely fractured, moderately weathered, medium hard to hard (a'a basalt)
			35	0			55	GW	Brownish gray subangular **SANDY GRAVEL (BASALTIC)** with a little silt and cobbles, medium dense, moist (clinker)
							60		Gray vugular **BASALT**, closely to severely fractured, slightly weathered, hard (a'a basalt)
			92	10					Brownish gray to gray vesicular **BASALT**, moderately to closely fractured, slightly to moderately weathered, medium hard to hard (pahoehoe basalt)
							65		grades with highly weathered soft zones locally
UC= 4300 psi			100	50					
			100	60			70		

Date Started:	May 13, 2021	Water Level: ▼ Not Encountered	Plate
Date Completed:	May 14, 2021		
Logged By:	S. Latronic	Drill Rig: MOBILE B-53.1 *(Energy Transfer Ratio = 42.9%)*	A - 1.2
Total Depth:	80.5 feet	Drilling Method: 4" Solid-Stem Auger & HQ Coring	
Work Order:	8063-00	Driving Energy: 140 lb. wt., 30 in. drop	

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SEISMIC RETROFIT OF KAHOLO BRIDGE
HAWAII BELT ROAD, PROJECT NO. BR-019-2(072)
DISTRICT OF HAMAKUA, ISLAND OF HAWAII

Log of Boring 1

Laboratory			Field							
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS

(Continued from previous plate)

Description

			83	25			75				
			93	52							grades to very hard
							80				Boring terminated at 80.5 feet
											* Elevations estimated from Topographic Survey Map provided by KSF, Inc. on September 30, 2021.
							85				
							90				
							95				
							100				
							105				

Date Started:	May 13, 2021	Water Level: ▼	Not Encountered	Plate
Date Completed:	May 14, 2021			
Logged By:	S. Latronic	Drill Rig:	MOBILE B-53.1 *(Energy Transfer Ratio = 42.9%)*	
Total Depth:	80.5 feet	Drilling Method:	4" Solid-Stem Auger & HQ Coring	A - 1.3
Work Order:	8063-00	Driving Energy:	140 lb. wt., 30 in. drop	

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SEISMIC RETROFIT OF KAHOLO BRIDGE
HAWAII BELT ROAD, PROJECT NO. BR-019-2(072)
DISTRICT OF HAMAKUA, ISLAND OF HAWAII

Log of Boring 2

Laboratory			Field							
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS
	18	100			24					GP
										GP
	43				8					MH
TXUU S_u=1.3 ksf	55	66			11		5			
	66				6		10			
Direct Shear	71	60	0		13		15			
	18		0		31		20			
	21				45		25			
			43	0			30			
			0	0	30/1"		35			

Approximate Ground Surface Elevation (feet): 737 *

Description

9-inch **ASPHALTIC CONCRETE**

Brownish gray **GRAVEL (BASALTIC)** with some sand, medium dense, moist (fill)

Dark gray **GRAVELLY SAND** with some silt, medium dense to loose, moist (fill)

Brown **CLAYEY SILT** with some sand, medium stiff, wet (residual soil)

grades with white mottling

grades with some gravel, hard

Gray with orangish mottling vesicular **BASALT**, severely fractured, highly to moderately weathered, medium hard to hard (basalt formation)

Date Started:	May 4, 2021	Water Level: ▽	Not Encountered
Date Completed:	May 6, 2021		
Logged By:	D. Gremminger	Drill Rig:	MOBILE B-53.1 *(Energy Transfer Ratio = 42.9%)*
Total Depth:	102.5 feet	Drilling Method:	4" Solid-Stem Auger & HQ Coring
Work Order:	8063-00	Driving Energy:	140 lb. wt., 30 in. drop

Plate A - 2.1

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GEOLABS, INC.

Geotechnical Engineering

SEISMIC RETROFIT OF KAHOLO BRIDGE
HAWAII BELT ROAD, PROJECT NO. BR-019-2(072)
DISTRICT OF HAMAKUA, ISLAND OF HAWAII

Log of Boring

2

Laboratory			Field							
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS	(Continued from previous plate) Description
	28				31						breaks down to a sandy gravel (basaltic), hard
			14	0			40			ML	Brownish gray **GRAVELLY SILT** with some sand, hard, wet (saprolite)
Sieve - #200 = 52.5%	43				32						
			0	0			45				
	26				77						
			26	0			50				Gray vesicular **BASALT**, severely fractured, highly to moderately weathered, medium hard to hard (basalt formation)
			22	0	45/2"						
							55				
			7	0	25/1"						
							60				
			88	64	50/4"						Gray **BASALT**, severely to moderately fractured, moderately weathered, hard (basalt formation)
							65				
			80	42							
							70				

Date Started:	May 4, 2021	Water Level: ▽	Not Encountered	Plate
Date Completed:	May 6, 2021			
Logged By:	D. Gremminger	Drill Rig:	MOBILE B-53.1 *(Energy Transfer Ratio = 42.9%)*	
Total Depth:	102.5 feet	Drilling Method:	4" Solid-Stem Auger & HQ Coring	A - 2.2
Work Order:	8063-00	Driving Energy:	140 lb. wt., 30 in. drop	

BORING_LOG 8063-00.GPJ GEOLABS.GDT 12/13/23

GEOLABS, INC.

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SEISMIC RETROFIT OF KAHOLO BRIDGE
HAWAII BELT ROAD, PROJECT NO. BR-019-2(072)
DISTRICT OF HAMAKUA, ISLAND OF HAWAII

Log of Boring

2

Laboratory			Field							
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS

(Continued from previous plate)

Description

Other Tests	Core Recovery (%)	RQD (%)	Depth (feet)	USCS	Description
	100	62	75		
UC= 1230 psi	100	85			grades to closely to slightly fractured
			80		
	62	22			grades to severely to closely fractured
			85		
	52	23			
			90	GM	Reddish brown **SANDY GRAVEL (BASALTIC)**, dense, wet (clinker)
	70	33			
			95		Gray **BASALT**, severely to moderately fractured, highly to moderately weathered, medium hard to hard (basalt formation)
UC= 9080 psi	62	22			
			100		
					Boring terminated at 102.5 feet
			105		

Date Started:	May 4, 2021	Water Level: ▽	Not Encountered	Plate
Date Completed:	May 6, 2021			
Logged By:	D. Gremminger	Drill Rig:	MOBILE B-53.1 *(Energy Transfer Ratio = 42.9%)*	
Total Depth:	102.5 feet	Drilling Method:	4" Solid-Stem Auger & HQ Coring	A - 2.3
Work Order:	8063-00	Driving Energy:	140 lb. wt., 30 in. drop	

BORING_LOG 8063-00.GPJ GEOLABS.GDT 12/13/23

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SEISMIC RETROFIT OF KAHOLO BRIDGE
HAWAII BELT ROAD, PROJECT NO. BR-019-2(072)
DISTRICT OF HAMAKUA, ISLAND OF HAWAII

Log of Boring

3

Laboratory			Field							
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS

Approximate Ground Surface Elevation (feet): 758 *

Description

Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	USCS	Description
								8-inch **ASPHALTIC CONCRETE**
							GM	Gray and brown **SILTY GRAVEL (BASALTIC)**,
	46				57		MH	medium dense, moist (fill)
								Dark brown **CLAYEY SILT** with a little gravel
							MH	(basaltic), hard, moist (fill)
	37	74			41	2.0		Orangish brown with gray mottling **CLAYEY SILT** with some sand (basaltic) and a little decomposed gravel, very stiff, moist (saprolite)
LL=77 PI=27 TXUU S_u=2.1 ksf Sieve - #200 = 9.0%	29	80			35	3.0		grades with gravel
TXUU S_u=2.2 ksf	67	56			13	0.8		grades to medium stiff and very moist locally
Direct Shear Sieve - #200 = 93.9%	68	57	43		31	2.5		grades with a little sand, very stiff
LL=60 PI=12	83		36		20			grades to reddish brown locally
	43		0		7			grades to medium stiff

Date Started:	May 12, 2021	Water Level: ▼	Not Encountered		Plate
Date Completed:	May 13, 2021				
Logged By:	S. Latronic	Drill Rig:	MOBILE B-53.1	*(Energy Transfer Ratio = 42.9%)*	A - 3.1
Total Depth:	91 feet	Drilling Method:	4" Solid-Stem Auger & HQ Coring		
Work Order:	8063-00	Driving Energy:	140 lb. wt., 30 in. drop		

BORING_LOG 8063-00.GPJ GEOLABS.GDT 12/13/23

GEOLABS, INC.

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SEISMIC RETROFIT OF KAHOLO BRIDGE
HAWAII BELT ROAD, PROJECT NO. BR-019-2(072)
DISTRICT OF HAMAKUA, ISLAND OF HAWAII

Log of Boring 3

Laboratory			Field							
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS

(Continued from previous plate)

Description

Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	USCS	Description
	64				23		MH	grades to very stiff
			14					
	40				52			grades to brownish gray, hard
			42	0				Gray vugular **BASALT**, closely to severely fractured, slightly to moderately weathered, medium hard to hard (a'a basalt)
	72				16		ML	Brownish gray **CLAYEY SILT** with some sand (basaltic), very stiff, moist (saprolite)
			72	28				Gray vesicular **BASALT**, moderately fractured, slightly to moderately weathered, medium hard to hard (pahoehoe basalt)
UC= 600 psi			92	12				
								Brownish gray vesicular **BASALT**, closely to severely fractured, highly weathered, soft (pahoehoe basalt)
			93	37				Gray vugular **BASALT**, closely fractured, slightly to moderately weathered, medium hard to hard (a'a basalt)
							ML	Brownish gray **SANDY SILT** with some decomposed gravel, stiff, moist (saprolite)
								Brownish gray vesicular **BASALT**, moderately fractured, slightly to moderately weathered, medium hard to hard (pahoehoe basalt)
UC= 3040 psi			88	35				
			57	23				grades with severely fractured, highly weathered soft zones locally

40 45 50 55 60 65 70

Date Started:	May 12, 2021	Water Level: ▼ Not Encountered	Plate
Date Completed:	May 13, 2021		
Logged By:	S. Latronic	Drill Rig: MOBILE B-53.1 *(Energy Transfer Ratio = 42.9%)*	A - 3.2
Total Depth:	91 feet	Drilling Method: 4" Solid-Stem Auger & HQ Coring	
Work Order:	8063-00	Driving Energy: 140 lb. wt., 30 in. drop	

BORING_LOG 8063-00.GPJ GEOLABS.GDT 12/13/23

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SEISMIC RETROFIT OF KAHOLO BRIDGE
HAWAII BELT ROAD, PROJECT NO. BR-019-2(072)
DISTRICT OF HAMAKUA, ISLAND OF HAWAII

Log of Boring 3

Laboratory			Field						
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS	(Continued from previous plate) Description
			72	28							
							75				Gray vugular **BASALT**, moderately fractured, slightly weathered, hard to very hard (a'a basalt)
			75	42						GM	Grayish brown **SILTY GRAVEL (BASALTIC)**, medium dense, moist (clinker)
											Gray vugular **BASALT**, moderately fractured, slightly weathered, very hard (a'a basalt)
			72	33			80			GM	Grayish brown **SILTY GRAVEL (BASALTIC)**, medium dense, moist (clinker)
											Gray vugular **BASALT**, moderately fractured, slightly weathered, very hard (a'a basalt)
			93	67			85				grades to vesicular locally
							90				Boring terminated at 91 feet
							95				
							100				
							105				

Date Started:	May 12, 2021	Water Level: ▼	Not Encountered	Plate
Date Completed:	May 13, 2021			
Logged By:	S. Latronic	Drill Rig:	MOBILE B-53.1 *(Energy Transfer Ratio = 42.9%)*	
Total Depth:	91 feet	Drilling Method:	4" Solid-Stem Auger & HQ Coring	A - 3.3
Work Order:	8063-00	Driving Energy:	140 lb. wt., 30 in. drop	

BORING_LOG 8063-00.GPJ GEOLABS.GDT 12/13/23

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HAWAII BELT ROAD, PROJECT NO. BR-019-2(072)
DISTRICT OF HAMAKUA, ISLAND OF HAWAII

Log of Boring

4

Laboratory			Field							
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS

Approximate Ground Surface Elevation (feet): 758 *

Description

Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	USCS	Description
							GM	4-inch **ASPHALTIC CONCRETE**
							MH	Gray and brown **SILTY GRAVEL (BASALTIC)**, medium dense, moist (fill)
	25				15			Dark brown **CLAYEY SILT** with a little gravel (basaltic), stiff to very stiff, moist (fill)
LL=176 PI=91	76	48			26	1.8	MH	Brown with orange mottling **CLAYEY SILT** with some sand (basaltic) and traces of decomposed gravel, stiff, moist (saprolite)
TXUU S_u=1.3 ksf	69	56			11	0.8		grades to medium stiff and very moist locally
LL=32 PI=NP	40				46		ML	Brown with orange mottling **CLAYEY SILT** with some sand and decomposed cobble corestones locally, hard, very moist
Direct Shear	46	83	8		50/5"			grades with gravel
Sieve - #200 = 41.4%	39		25		58		GM	Brown with orange mottling **SILTY GRAVEL** with some sand, very dense to dense, very moist (basalt formation)
	36		0	0	31			

5 10 15 20 25 30 35

Date Started:	May 10, 2021	Water Level: ▼	Not Encountered
Date Completed:	May 11, 2021		
Logged By:	S. Latronic	Drill Rig:	MOBILE B-53.1 *(Energy Transfer Ratio = 42.9%)*
Total Depth:	76 feet	Drilling Method:	4" Solid-Stem Auger & HQ Coring
Work Order:	8063-00	Driving Energy:	140 lb. wt., 30 in. drop

Plate

A - 4.1

BORING_LOG 8063-00.GPJ GEOLABS.GDT 12/13/23

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SEISMIC RETROFIT OF KAHOLO BRIDGE
HAWAII BELT ROAD, PROJECT NO. BR-019-2(072)
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Log of Boring

4

Laboratory			Field							
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS	Description
											(Continued from previous plate)
										GM	grades to highly weathered basalt
	15		57	7	50/2"						Brownish gray vesicular **BASALT**, severely fractured, moderately to highly weathered, soft to medium hard (pahoehoe basalt)
											Gray dense **BASALT**, moderately fractured, slightly to moderately weathered, hard to very hard (a'a basalt)
							40			GM	
			52	13							Brownish gray **SILTY GRAVEL (BASALTIC)**, medium dense, moist (clinker)
											Grayish brown vesicular **BASALT**, severely fractured, moderately to highly weathered, soft to medium hard (pahoehoe basalt)
							45				Brownish gray vugular **BASALT**, closely fractured, slightly to moderately weathered, medium hard to hard (a'a basalt)
UC= 420 psi	29		76	33	50/2"						Grayish brown vesicular **BASALT**, moderately fractured, moderately to highly weathered, medium hard (pahoehoe basalt)
							50				
			95	20							Gray vugular **BASALT**, moderately fractured, slightly weathered, hard (a'a basalt)
							55			ML	Reddish brown with gray mottling **SANDY SILT** with a little gravel (basaltic), stiff, moist (saprolite)
			95	50							Gray vugular **BASALT**, moderately fractured, slightly weathered, hard (a'a basalt)
UC= 2230 psi							60				
			95	58							Brownish gray vesicular **BASALT**, moderately fractured, slightly to moderately weathered, medium hard to hard (pahoehoe basalt)
							65				
			57	35							grades to dense
											VOID
							70				

Date Started:	May 10, 2021	Water Level: ▼	Not Encountered	Plate
Date Completed:	May 11, 2021			
Logged By:	S. Latronic	Drill Rig:	MOBILE B-53.1 *(Energy Transfer Ratio = 42.9%)*	
Total Depth:	76 feet	Drilling Method:	4" Solid-Stem Auger & HQ Coring	A - 4.2
Work Order:	8063-00	Driving Energy:	140 lb. wt., 30 in. drop	

BORING_LOG 8063-00.GPJ GEOLABS.GDT 12/13/23

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Log of Boring

4

Laboratory			Field						
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS	(Continued from previous plate) Description
			63	0							Gray vugular **BASALT**, moderately fractured, slightly weathered, hard (a'a basalt)
							75			SM	Brown with some gray **SILTY SAND (BASALTIC)** with some gravel, medium dense, moist (saprolite)
											Boring terminated at 76 feet
							80				
							85				
							90				
							95				
							100				
							105				

Date Started:	May 10, 2021	Water Level: ▼	Not Encountered	Plate
Date Completed:	May 11, 2021			
Logged By:	S. Latronic	Drill Rig:	MOBILE B-53.1 *(Energy Transfer Ratio = 42.9%)*	A - 4.3
Total Depth:	76 feet	Drilling Method:	4" Solid-Stem Auger & HQ Coring	
Work Order:	8063-00	Driving Energy:	140 lb. wt., 30 in. drop	

BORING_LOG 8063-00.GPJ GEOLABS.GDT 12/13/23