

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	ER-15(21)	2010	75	89

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of the material is LARGER than No. 200 sieve size.)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size.)	CLEAN GRAVELS (Little or no fines.)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amt. of fines.)	GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
			GM	Silty gravels, gravel-sand-silt mixtures.
	SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 sieve size.)	CLEAN SANDS (Little or no fines.)	SW	Well graded sands, gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amt. of fines.)	SP	Poorly graded sands or gravelly sands, little or no fines.
			SM	Silty sands, sand-silt mixtures.
FINE GRAINED SOILS (More than 50% of the material is SMALLER than No. 200 sieve size.)	SILTS AND CLAYS (Liquid limit LESS than 50.)	SC	Clayey sands, sand-clay mixtures.	
		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.	
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
	SILTS AND CLAYS (Liquid limit GREATER than 50.)	OL	Organic silts and organic silty clays of low plasticity.	
		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	
		CH	Inorganic clays of high plasticity, fat clays.	
HIGHLY ORGANIC SOILS		OH	Organic clays of medium to high plasticity, organic silts.	
		PT	Peat and other highly organic soils.	
			FRESH TO MODERATELY WEATHERED BASALT	
			VOLCANIC TUFF / HIGHLY TO COMPLETELY WEATHERED BASALT	
			CORAL	

SAMPLE DEFINITION

☒ 2" O.D. Standard Split Spoon Sampler

☒ Shelby Tube

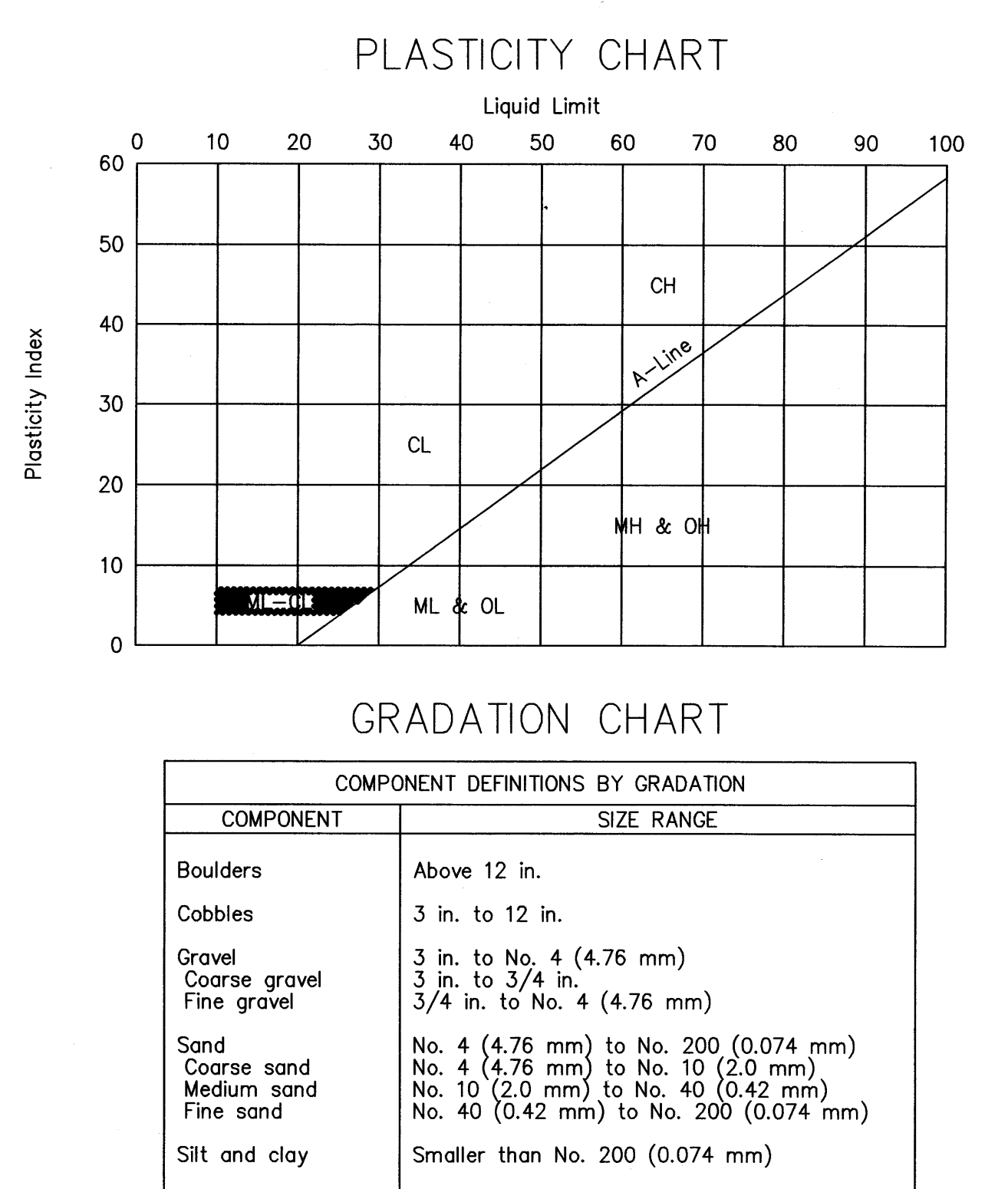
RQD Rock Quality Designation

☐ 3" O.D. Split Tube Sampler

☒ NX / 4" Coring

☒ Water Level

W.O. 09-4729	Earthquake Repairs, Route 19 - Hawaii Belt Road
Hirata & Associates, Inc.	<b>BORING LOG LEGEND</b> Plate A3.1



W.O. 09-4729	Earthquake Repairs, Route 19 - Hawaii Belt Road
Hirata & Associates, Inc.	<b>UNIFIED SOIL CLASSIFICATION SYSTEM</b> Plate A3.2

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

Reference: Soils Mechanics, NAVFAC DM-7.1, Department of the Navy, Naval Facilities Engineering Command, September, 1986.

W.O. 09-4729	Earthquake Repairs, Route 19 - Hawaii Belt Road
Hirata & Associates, Inc.	<b>ROCK WEATHERING CLASSIFICATION SYSTEM</b> Plate A3.3

HIRATA & ASSOCIATES, INC.

BORING LOG						W.O. 09-4729
BORING NO.	B1	DRIVING WT.	140 lb.	START DATE	3/24/09	
SURFACE ELEV.	124±*	DROP	30 in.	END DATE	3/26/09	
DEPTH	GRAPE	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
			74	76	53	Silty SAND (SM) - Brown, moist, dense, with gravel. Covered by 7.5 inches of asphaltic concrete.
5			18	75	37	Clayey SILT (MH) - Mottled brown, moist, medium stiff, with gravel. PP = 3.0 tsf at 4 feet.
10			15	59	55	Firm from 8 to 23 feet. PP = 3.0 tsf, TV = 0.6 tsf at 8 feet.
15			16	61	59	PP = 2.2 tsf at 13 feet.
20			9	73	46	
25			16	59	50	COMPLETELY WEATHERED BASALT (WC) - Mottled brown, moist, medium stiff. PP = 3.7 tsf, TV = 1.7 tsf at 23 feet.
30			14	82	42	PP = 4.0 tsf at 28 feet.

Plate A4.1

HIRATA & ASSOCIATES, INC.

BORING LOG						W.O. 09-4729
BORING NO.	B1 (continued)	DRIVING WT.	140 lb.	START DATE	3/24/09	
SURFACE ELEV.	124±	DROP	30 in.	END DATE	3/26/09	
DEPTH	GRAPE	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
30			11	43	98	PP = 1.5 tsf at 33 feet.
35			18	58	69	PP = 4.0 tsf, TV = 0.7 tsf at 38 feet.
40			50	91	25	HIGHLY WEATHERED BASALT (WH) - Gray, vesicular, highly fractured, medium hard.
45			42	95	27	Begin NX coring at 53 feet. 20% Recovery from 53 to 58 feet. RQD = 10%.
50						End NX coring at 58 feet.

Plate A4.2

HIRATA & ASSOCIATES, INC.

BORING LOG						W.O. 09-4729
BORING NO.	B1 (continued)	DRIVING WT.	140 lb.	START DATE	3/24/09	
SURFACE ELEV.	124±	DROP	30 in.	END DATE	3/26/09	
DEPTH	GRAPE	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
60			50/5"			Lost Recovery
65			10/No Penetration			MODERATELY WEATHERED BASALT (WM) - Gray, vesicular, fractured, hard. Begin NX coring at 68 feet. 93% Recovery from 68 to 73 feet. RQD = 52%.
70						100% Recovery from 73 to 78 feet. RQD = 47%.
75						37% Recovery from 78 to 83 feet. RQD = 0%.
80						Highly fractured from 78 to 88 feet. Void from 80 to 82.5 feet.
85						95% Recovery from 83 to 88 feet. RQD = 0%.
90						100% Recovery from 88 to 93 feet. RQD = 77%.

Plate A4.3

STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION	
<b>BORING LOGS</b>	
<b>EMERGENCY EARTHQUAKE ROCKFALL REPAIRS</b>	
<b>AT VARIOUS LOCATIONS</b>	
<b>F.A. Project No. ER-15(21)</b>	
Scale: As Noted	Date: December, 2009

SHEET No. 1 OF 6 SHEETS

## HIRATA &amp; ASSOCIATES, INC.

## BORING LOG

W.O. 09-4729

BORING NO. B1 (continued) DRIVING WT. 140 lb. START DATE 3/24/09  
SURFACE ELEV. 124± DROP 30 in. END DATE 3/26/09

DEPTH H O	GRA P H	S A M P L E	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
90						100% Recovery from 93 to 98 feet. RQD = 77% Clinker pocket at 93 feet.
95						End NX coring at 98 feet.
100						* Elevations based on Topographic Survey provided by AECOM Pacific, Inc.
110						
115						
120						

Plate A4.4

## HIRATA &amp; ASSOCIATES, INC.

## BORING LOG

W.O. 09-4729

BORING NO. B2 (continued) DRIVING WT. 140 lb. START DATE 3/18/09  
SURFACE ELEV. 123± DROP 30 in. END DATE 3/23/09

DEPTH H O	GRA P H	S A M P L E	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
60						52/6" 74 30
65						75/9" 95 23
70						MODERATELY WEATHERED BASALT (WM) - Gray, vesicular, fractured, hard.  Begin NX coring at 68 feet. 97% Recovery from 70.5 to 75.5 feet. RQD = 88%  Clinker pocket at 75 feet. 100% Recovery from 75.5 to 80 feet. RQD = 84%  100% Recovery from 80.5 to 85.5 feet. RQD = 51% Clinker pocket at 81.5 feet.  95% Recovery from 85.5 to 90 feet. RQD = 28% Clinker pocket at 86 feet.
80						
85						
90						

Plate A4.7

## HIRATA &amp; ASSOCIATES, INC.

## BORING LOG

W.O. 09-4729

BORING NO. B2 DRIVING WT. 140 lb. START DATE 3/18/09  
SURFACE ELEV. 122± DROP 30 in. END DATE 3/23/09

DEPTH H O	GRA P H	S A M P L E	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
			43	102	12	Silty GRAVEL (GM) - Brown, moist, dense, with sand. Covered by 7.75 inches of asphaltic concrete.
5			24	94	21	Clayey SILT (MH) - Mottled brown, moist, medium stiff, with gravel. PP = 1.0 tsf, TV = 0.7 tsf at 5 feet.
			12	70	33	
10			16	71	62	Firm from 9 feet. PP = 1.0 tsf at 9 feet.
15			16	64	62	PP = 1.8 tsf at 14 feet.
20			15	60	54	PP = 1.9 tsf at 24 feet.
25			8	60	59	
30			12	42	110	

Plate A4.5

## HIRATA &amp; ASSOCIATES, INC.

## BORING LOG

W.O. 09-4729

BORING NO. B2 (continued) DRIVING WT. 140 lb. START DATE 3/18/09  
SURFACE ELEV. 122± DROP 30 in. END DATE 3/23/09

DEPTH H O	GRA P H	S A M P L E	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
90						52% Recovery from 90 to 95 feet. RQD = 28%  Void from 93 feet to 97 feet.  60% Recovery from 95 to 100 feet. RQD = 0%
95						End NX coring at 100 feet.
100						
110						
115						
120						

Plate A4.8

## HIRATA &amp; ASSOCIATES, INC.

## BORING LOG

W.O. 09-4729

BORING NO. B2 (continued) DRIVING WT. 140 lb. START DATE 3/18/09  
SURFACE ELEV. 124± DROP 30 in. END DATE 3/23/09

DEPTH H O	GRA P H	S A M P L E	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
30						COMPLETELY WEATHERED BASALT (WC) - Mottled brown, moist, medium stiff.
35			12	65	60	PP = 1.3 tsf at 34 feet.
40			11	66	57	PP = 2.3 tsf, TV = 0.8 tsf at 39 feet.
45			18	60	50	PP = 4.3 tsf at 44 feet.
50			15	62	52	PP = 3.7 tsf at 49 feet.
55			26	56	71	PP = 2.5 tsf, TV = 0.5 tsf at 54 feet.
60			44	59	62	HIGHLY WEATHERED BASALT (WH) - Gray, vesicular, highly fractured, medium hard.

Plate A4.6

## HIRATA &amp; ASSOCIATES, INC.

## BORING LOG

W.O. 09-4729

BORING NO. B4 DRIVING WT. 140 lb. START DATE 4/15/09  
SURFACE ELEV. 414.5± DROP 30 in. END DATE 4/15/09

DEPTH H O	GRA P H	S A M P L E	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty GRAVEL (GM) - Dark brown, moist, dense. Covered by 8.5 inches of AC over 3 inches of base material. Cobble at 2 feet.
5			10/No Penetration			HIGHLY TO COMPLETELY WEATHERED BASALT (WH-WC) - Dark brown, moist, dense. PP = 3.1 tsf at 4 feet.
10			83	93	30	Gray color at 8 feet.
15			52/4" Lost Recovery			PP = 2.5 tsf at 13 feet. Medium dense at 13 feet. Mottled purplish gray color from 13 feet.
20			25	94	16	PP = 2.9 tsf at 18 feet.
25			50	65	44	Medium dense at 23 feet.
30			28	74	30	HIGHLY WEATHERED BASALT (WH) - Mottled purplish brown, moist, dense to medium hard.
			16/3" 10/No Penetration		22	

Plate A4.9

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	ER-15(21)	2010	76	89

ORIGINAL PLAN	DATE
NO.	
DESIGNED BY	
CHECKED BY	
TRACED BY	
SURVEY PLOTTED BY	

P:\PROJECTS\09-4729\09-4729-001\09-4729-001.dwg (A) P:\PROJECTS\09-4729\09-4729-001.dwg (A) PLOT DATE: 04-09-2010 09:04 am  
LAST UPDATE: 04-09-2010 09:04 am

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**BORING LOGS**

**EMERGENCY EARTHQUAKE ROCKFALL REPAIRS**

**AT VARIOUS LOCATIONS**

**F.A. Project No. ER-15(21)**

Scale: As Noted Date: December, 2009

SHEET No. 2 OF 6 SHEETS

HIRATA & ASSOCIATES, INC.

DRAFT  
SUBJECT TO CHANGE

BORING LOG

W.O. 09-4729

BORING NO. B4 (continued) DRIVING WT. 140 lb. START DATE 4/15/09  
SURFACE ELEV. 414.5± DROP 30 in. END DATE 4/15/09

DEPTH H O	GRAVEL P H	SAMPLE P H	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
30						
			54/4"	95	30	
35						
			62/6"	93	22	
40						
			37	75	16	
45						
			50/3"	Lost Recovery		
50						
			60/6"		22	
55						End boring at 53.5 feet.
						Neither groundwater nor seepage water encountered.
60						

Plate A4.10

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 09-4729

BORING NO. B6 DRIVING WT. 140 lb. START DATE 4/14/09  
SURFACE ELEV. 409± DROP 30 in. END DATE 4/15/09

DEPTH H O	GRAVEL P H	SAMPLE P H	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
30						
			79	110	10	Silty GRAVEL (GM) - Gray, moist, dense. Covered by 8 inches of AC over 4 inches of base material.
5			40	100	22	HIGHLY TO COMPLETELY WEATHERED BASALT (WH-WC) - Dark brown, moist, dense to medium hard.
			35	76	25	
10						
			50/4"	93	25	
15						
			10/No Penetration			
20						
			90/8"	87	33	
25						
			77/11"	74	47	
30						

Plate A4.13

HIRATA & ASSOCIATES, INC.

DRAFT  
SUBJECT TO CHANGE

BORING LOG

W.O. 09-4729

BORING NO. B5 DRIVING WT. 140 lb. START DATE 4/16/09  
SURFACE ELEV. 411± DROP 30 in. END DATE 4/16/09

DEPTH H O	GRAVEL P H	SAMPLE P H	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
30						
			50/5"	92	10	Silty GRAVEL (GM) - Mottled brown, moist, dense. Covered by 6.5 inches of AC over 3 inches of base material. Cobble at 1.5 feet.
5			53	112	12	
			16	63	60	Clayey silt at 5 feet.
10						
			50/5"	86	36	HIGHLY TO COMPLETELY WEATHERED BASALT (WH-WC) - Dark brown, moist, dense to medium hard. PP = 3.8 tsf at 9 feet.
15						
			50/3"	92	35	PP = 2.7 tsf at 14.5 feet.
20						
			42	86	17	Dense at 19 feet.
25						
			50/4"	102	22	
30						
			50/4"	77	42	

Plate A4.11

HIRATA & ASSOCIATES, INC.

DRAFT  
SUBJECT TO CHANGE

BORING LOG

W.O. 09-4729

BORING NO. B6 (continued) DRIVING WT. 140 lb. START DATE 4/14/09  
SURFACE ELEV. 411± DROP 30 in. END DATE 4/15/09

DEPTH H O	GRAVEL P H	SAMPLE P H	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
30						
			40	81	25	
35						
			44	85	30	
40						
			25/3"	No Recovery		
45			10/No Penetration			
			10/No Penetration			
50						
			30		21	Begin NX coring at 48 feet. 12% Recovery from 48 to 53 feet. ROD = 12%
55						
						End boring at 55.5 feet.
60						Neither groundwater nor seepage water encountered.

Plate A4.14

HIRATA & ASSOCIATES, INC.

DRAFT  
SUBJECT TO CHANGE

BORING LOG

W.O. 09-4729

BORING NO. B5 (continued) DRIVING WT. 140 lb. START DATE 4/16/09  
SURFACE ELEV. 411± DROP 30 in. END DATE 4/16/09

DEPTH H O	GRAVEL P H	SAMPLE P H	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
30						
			30	59	64	Dense at 34 feet.
35						End boring at 35.5 feet.
						Neither groundwater nor seepage water encountered.
40						
45						
50						
55						
60						

Plate A4.12

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 09-4729

BORING NO. B7 DRIVING WT. 140 lb. START DATE 3/16/09  
SURFACE ELEV. NA DROP 30 in. END DATE 3/16/09

DEPTH H O	GRAVEL P H	SAMPLE P H	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
30						
			10/No Penetration			Silty GRAVEL (GM) - Grayish brown, moist, dense. Covered by 6.5 inches of asphaltic concrete. Cobble at 1 foot.
5			51	107	14	
			53/6"	91	12	
10						End boring at 5.5 feet.
						Neither groundwater nor seepage water encountered.
15						
20						
25						
30						

Plate A4.15

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	ER-15(21)	2010	77	89

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**BORING LOGS**

**EMERGENCY EARTHQUAKE ROCKFALL REPAIRS**

**AT VARIOUS LOCATIONS**

**F.A. Project No. ER-15(21)**

Scale: As Noted      Date: December, 2009

SHEET No. 3 OF 6 SHEETS

DATE	_____
SURVEY PLOTTED BY	_____
TRACED BY	_____
DESIGNED BY	_____
CHECKED BY	_____
NO.	_____

PAW/FILENAME: P:\ET\00035-007 Earthquake Permanent Repairs\04\_PSA\01 Drawings\77 boring logs.dwg      PLOT DATE: 04-06-2010 @ 09:04 am      LAST UPDATE: 07-24-2009 @ 01:57 pm



FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	ER-15(21)	2010	78	89

HIRATA & ASSOCIATES, INC.

BORING LOG						W.O. 09-4729
BORING NO.	B8	DRIVING WT.	140 lb.	START DATE	3/17/09	
SURFACE ELEV.	NA	DROP	30 in.	END DATE	3/17/09	
DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty GRAVEL (GM) - Grayish brown, moist, dense. Covered by 6 inches of asphaltic concrete.
1			10	No Penetration		
2			10	No Penetration		
3						
4						
5						End boring at 5 feet.
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						Neither groundwater nor seepage water encountered.
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						

Plate A4.16

HIRATA & ASSOCIATES, INC.

BORING LOG						W.O. 09-4729
BORING NO.	B11	DRIVING WT.	140 lb.	START DATE	3/17/09	
SURFACE ELEV.	NA	DROP	30 in.	END DATE	3/17/09	
DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty GRAVEL (GM) - Grayish brown, moist, dense. Covered by 5 inches of asphaltic concrete. Cobbles at 1 foot.
1			59	121	13	
2						
3						
4			29	80	37	Clayey SILT (MH) - Brown, moist, medium stiff, with gravel.
5						End boring at 6.5 feet.
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						Neither groundwater nor seepage water encountered.
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						

Plate A4.19

HIRATA & ASSOCIATES, INC.

BORING LOG						W.O. 09-4729
BORING NO.	B9	DRIVING WT.	140 lb.	START DATE	3/17/09	
SURFACE ELEV.	NA	DROP	30 in.	END DATE	3/17/09	
DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty GRAVEL (GM) - Grayish brown, moist, dense. Covered by 6 inches of asphaltic concrete.
1			10	No Penetration		
2			36/5"	82	15	
3			10	No Penetration		Boulder from 4.5 to 5.5 feet.
4						
5						End boring at 5 feet.
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						Neither groundwater nor seepage water encountered.
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						

Plate A4.17

HIRATA & ASSOCIATES, INC.

BORING LOG						W.O. 09-4729
BORING NO.	B12	DRIVING WT.	140 lb.	START DATE	3/17/09	
SURFACE ELEV.	NA	DROP	30 in.	END DATE	3/17/09	
DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty GRAVEL (GM) - Grayish brown, moist, dense. Covered by 6.5 inches of asphaltic concrete.
1			93	112	12	
2						
3			59	87	41	Siltier at 4 feet.
4						
5						End boring at 5.5 feet.
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						Neither groundwater nor seepage water encountered.
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						

Plate A4.20

HIRATA & ASSOCIATES, INC.

BORING LOG						W.O. 09-4729
BORING NO.	B10	DRIVING WT.	140 lb.	START DATE	3/17/09	
SURFACE ELEV.	NA	DROP	30 in.	END DATE	3/17/09	
DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty GRAVEL (GM) - Grayish brown, moist, dense. Covered by 6 inches of asphaltic concrete.
1			10	No Penetration		
2			75/9"	111	9	
3			10	No Penetration		Boulder from 4 to 5 feet.
4			40	110	21	
5						End boring at 6.5 feet.
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						Neither groundwater nor seepage water encountered.
16						
17						
18						
19						
20						
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22						
23						
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28						
29						
30						

Plate A4.18

HIRATA & ASSOCIATES, INC.

BORING LOG						W.O. 09-4729
BORING NO.	B13	DRIVING WT.	140 lb.	START DATE	3/17/09	
SURFACE ELEV.	NA	DROP	30 in.	END DATE	3/17/09	
DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty GRAVEL (GM) - Grayish brown, moist, dense. Covered by 6.5 inches of asphaltic concrete.
1			63	111	13	
2						
3			82	98	16	
4						End boring at 5.5 feet.
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						Neither groundwater nor seepage water encountered.
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						

Plate A4.21

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
**BORING LOGS**  
**EMERGENCY EARTHQUAKE ROCKFALL REPAIRS**  
**AT VARIOUS LOCATIONS**  
**F.A. Project No. ER-15(21)**  
Scale: As Noted      Date: December, 2009

HIRATA & ASSOCIATES, INC.

BORING LOG						W.O. 09-4729
BORING NO.	B14	DRIVING WT.	140 lb.	START DATE	3/17/09	
SURFACE ELEV.	NA	DROP	30 in.	END DATE	3/17/09	
DEPTH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION	
0					Silty GRAVEL (GM) - Grayish brown, moist, dense. Covered by 7.5 inches of asphaltic concrete.	
		30/3"			10/No Penetration	
		46	81	46	Siltier at 3 feet.	
5		12	45	95	Clayey SILT (MH) - Brown, moist, medium stiff, with gravel.	
					End boring at 6.5 feet.	
10					Neither groundwater nor seepage water encountered.	
15						
20						
25						
30						

Plate A4.22

HIRATA & ASSOCIATES, INC.

BORING LOG						W.O. 09-4729
BORING NO.	B17	DRIVING WT.	140 lb.	START DATE	4/29/09	
SURFACE ELEV.	1804±	DROP	30 in.	END DATE	5/14/09	
DEPTH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION	
0					Clayey SILT (MH-OH) - Brown, moist, medium stiff, with gravel.	
		11	22	165		
5		29	54	72	COMPLETELY WEATHERED BASALT (WC) - Mottled brown, moist, stiff. PP = 2.2 tsf at 5 feet.	
10		78	93	25		
15					HIGHLY WEATHERED BASALT (WH) - Gray, vesicular, highly fractured, dense to medium hard. Begin NX coring at 11.5 feet. 65% Recovery from 11.5 to 16.5 feet. RQD = 40%	
					10% Recovery from 16.5 to 21.5 feet. RQD = 0%	
20						
25					End boring at 23.5 feet.	
30					Neither groundwater nor seepage water encountered.	

Plate A4.25

HIRATA & ASSOCIATES, INC.

BORING LOG						W.O. 09-4729
BORING NO.	B15	DRIVING WT.	140 lb.	START DATE	4/27/09	
SURFACE ELEV.	1799±	DROP	30 in.	END DATE	4/28/09	
DEPTH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION	
0					Clayey SILT (MH-OH) - Brown, moist, medium stiff, with gravel.	
		15	37	98	PP = 2.0 tsf at 2 feet.	
5		16	27	167	PP = 0.5 tsf at 4 feet.	
10		5	20	243	Firm from 8 feet. PP = 1.0 tsf at 4 feet.	
15		7	19	264	PP = 1.0 tsf at 13 feet.	
20		4	57	55		
		31	68	50	COMPLETELY WEATHERED BASALT (WC) - Mottled brown, moist, stiff.	
25					End boring at 24.5 feet.	
30					Neither groundwater nor seepage water encountered.	

Plate A4.23

HIRATA & ASSOCIATES, INC.

BORING LOG						W.O. 09-4729
BORING NO.	B18	DRIVING WT.	140 lb.	START DATE	3/31/09	
SURFACE ELEV.	1828.5±	DROP	30 in.	END DATE	4/1/09	
DEPTH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION	
0					Silty SAND (SM) - Grayish brown, moist, dense, with gravel. Covered by 6 inches of asphaltic concrete. Boulder from 1 to 3 feet.	
		10/No Penetration				
		50/5"	89	11		
5		37	95	28	Clayey SILT (MH-OH) - Mottled brown, moist, stiff, with gravel.	
					Boulder from 7 to 9 feet.	
10		23/6"	62	57	PP = 0.7 tsf at 9 feet.	
		10/No Penetration			Boulder from 10 to 11.5 feet.	
15		19	37	125	Boulder from 13 to 14.5 feet.	
					Medium stiff from 14.5 feet. PP = 3.5 tsf at 14.5 feet.	
20		16	37	123		
		10/No Penetration			Boulders from 23 to 28 feet.	
25					Begin NX coring at 27 feet. 0% Recovery from 27 to 32 feet.	
30						

Plate A4.26

HIRATA & ASSOCIATES, INC.

BORING LOG						W.O. 09-4729
BORING NO.	B16	DRIVING WT.	140 lb.	START DATE	3/30/09	
SURFACE ELEV.	1817±	DROP	30 in.	END DATE	3/31/09	
DEPTH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION	
0					Silty SAND (SM) - Grayish brown, moist, dense, with gravel. Covered by 6 inches of asphaltic concrete. Cobble at 2 feet.	
		10/No Penetration				
5		21	66	56	Clayey SILT (MH-OH) - Mottled brown, moist, medium stiff, with gravel.	
					Cobbles from 6 to 8 feet.	
10		11	24	173	PP = 1.5 tsf at 8 feet.	
					Cobble at 10 feet.	
15		9	37	108	Firm at 13 feet.	
20					Medium stiff from 16 feet. Boulders from 17 to 22 feet.	
		10/No Penetration			Begin NX coring at 18.5 feet. 70% Recovery from 18.5 to 23.5 feet.	
25					47% Recovery from 23.5 to 28.5 feet. Boulders from 24.5 to 27 feet.	
		11			Neither groundwater nor seepage water encountered.	
30		10/No Penetration			End boring at 29 feet.	

Plate A4.24

HIRATA & ASSOCIATES, INC.

BORING LOG						W.O. 06-4365
BORING NO.	B18 (continued)	DRIVING WT.	140 lb.	START DATE	3/31/09	
SURFACE ELEV.	1828.5±	DROP	30 in.	END DATE	4/1/09	
DEPTH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION	
30					Firm at 32 feet.	
35		8				
40		10/No Penetration			End boring at 40 feet.	
45					Neither groundwater nor seepage water encountered.	
50						
55						
60						

Plate A4.27

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	ER-15(21)	2010	79	89

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**BORING LOGS**

**EMERGENCY EARTHQUAKE ROCKFALL REPAIRS**

**AT VARIOUS LOCATIONS**

**F.A. Project No. ER-15(21)**

Scale: As Noted      Date: December, 2009

SHEET No. 5 OF 6 SHEETS

HIRATA & ASSOCIATES, INC.

BORING LOG						W.O. 09-4729	
BORING NO. B19		DRIVING WT. 140 lb.		START DATE 4/2/09			
SURFACE ELEV. 1884±		DROP 30 in.		END DATE 4/3/09			
DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION	
0						Silty SAND (SM) - Grayish brown, moist, dense, with gravel. Covered by 6 inches of asphaltic concrete. Boulder from 1.5 to 2.5 feet.	
5			33	100	12	Cobble at 3 feet.	
						Cobble at 5.5 feet.	
						Boulder from 7 to 8 feet.	
10			40/5"	No Recovery		Clayey SILT (MH-OH) - Mottled grayish brown, moist, medium stiff, with gravel. Cobble at 9 feet.	
15			25/3"	10/No Penetration	34	Cobble at 13.5 feet.	
20			10	28	183	PP = 2.0 tsf at 18 feet.	
25			8	22	202	Firm at 23 feet. PP = 0.7 tsf at 23 feet.	
						Neither groundwater nor seepage water encountered.	
30			13	45	93	PP = 3.0 tsf at 28 feet. End boring at 29.5 feet.	

HIRATA & ASSOCIATES, INC.

BORING LOG						W.O. 09-4729	
BORING NO. B22		DRIVING WT. 140 lb.		START DATE 4/2/09			
SURFACE ELEV. 1889±		DROP 30 in.		END DATE 4/2/09			
DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION	
0						Silty SAND (SM) - Grayish brown, moist, medium dense. Covered by 6 inches of asphaltic concrete. Cobbles from 0.5 to 2 feet.	
5			28	94	17	Boulder from 6 to 7 feet.	
10			37/3"	83	32	Clayey SILT (MH-OH) - Mottled brown, moist, medium stiff, with gravel.	
15			42	76	45	Boulder from 13 to 14 feet. Stiff at 14 feet.	
20			14	44	86	Cobble at 18 feet.	
25			14	30	155	Cobble at 21.5 feet.	
						Neither groundwater nor seepage water encountered.	
30			23			End boring at 29.5 feet.	

HIRATA & ASSOCIATES, INC.

BORING LOG						W.O. 09-4729	
BORING NO. B20		DRIVING WT. 140 lb.		START DATE 4/2/09			
SURFACE ELEV. 1886.5±		DROP 30 in.		END DATE 4/2/09			
DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION	
0						Silty SAND (SM) - Grayish brown, moist, dense, with gravel. Covered by 6 inches of asphaltic concrete.	
5			30	104	12		
			42	96	15		
			32	89	25	Cobble at 6.5 feet.	
10			21			Clayey SILT (MH-OH) - Mottled grayish brown, moist, medium stiff, with gravel. Cobble at 8 feet.	
15			50			Cobble at 11 feet. Cobble at 12.5 feet. Stiff from 14 feet.	
20			35	41	135	PP = 2.0 tsf at 19 feet.	
25			18	33	141	Medium stiff from 23 feet.	
						Neither groundwater nor seepage water encountered.	
30			8	24	180	Firm at 29 feet. End boring at 30.5 feet.	

HIRATA & ASSOCIATES, INC.

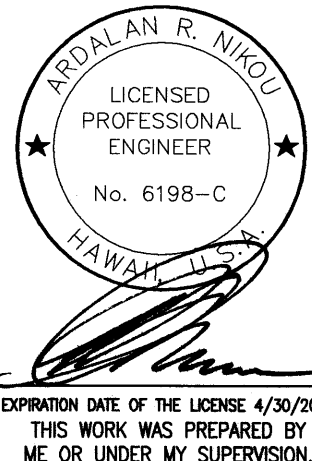
BORING LOG						W.O. 09-4729	
BORING NO. B21		DRIVING WT. 140 lb.		START DATE 5/20/09			
SURFACE ELEV. 1858±		DROP 30 in.		END DATE 5/21/09			
DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION	
0						Clayey SILT (MH-OH) - Grayish brown, moist, firm, with gravel.	
5			7	28	161		
			18/6"	70	38	With highly weathered basalt fragments at 4 feet.	
			50/5"			HIGHLY WEATHERED BASALT (WH) - Gray, vesicular, fractured, medium hard. Begin NX coring at 6.5 feet. 97% Recovery from 6.5 to 11.5 feet. RQD = 62%	
10						60% Recovery from 11.5 to 16.5 feet. RQD = 27%	
15			42		39		
20			50		33		
25						End boring at 24 feet.	
						Neither groundwater nor seepage water encountered.	
30							

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	ER-15(21)	2010	80	89

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	
	TRACED BY	
	DESIGNED BY	
	CHECKED BY	
No.		

PRINT/PLANNER: P:\ET\0803-100 Earthquake Permanent Repair\04 PS&V\01 Drawings\08 boring logs.dwg LAST UPDATE: 05-24-2009 02:05 pm PLOT DATE: 05-06-2010 09:05 am

AECOM



STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**BORING LOGS**  
**EMERGENCY EARTHQUAKE ROCKFALL REPAIRS**  
**AT VARIOUS LOCATIONS**  
**F.A. Project No. ER-15(21)**  
Scale: As Noted Date: December, 2009

SHEET No. 6 OF 6 SHEETS