FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	360AB-02-98	2008	10	16

Boring Log Legend

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISIONS			USCS		TYPICAL DESCRIPTIONS
COARSE-GRAINED SOILS	GRAVELS	CLEAN GRAVELS LESS THAN 5% FINES		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES MORE THAN 12% FINES		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
MORE THAN 50% OF MATERIAL RETAINED ON NO. 200 SIEVE	SANDS	CLEAN SANDS LESS THAN 5% FINES		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	50% OR MORE OF COARSE FRACTION PASSING THROUGH NO. 4 SIEVE	SANDS WITH FINES MORE THAN 12% FINES		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE-GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		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
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
50% OR MORE OF MATERIAL PASSING THROUGH NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT 50 OR MORE		MH	INORGANIC SILT, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

LEGEND

	2-INCH O.D. STANDARD PENETRATION TEST	LL	LIQUID LIMIT
	3-INCH O.D. MODIFIED CALIFORNIA SAMPLE	PI	PLASTICITY INDEX
S	SHELBY TUBE SAMPLE	TV	TORVANE SHEAR (tsf)
G	GRAB SAMPLE	PEN	POCKET PENETROMETER (tsf)
	CORE SAMPLE	UC	UNCONFINED COMPRESSION (psi)
		▽	WATER LEVEL OBSERVED IN BORING

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HANA HIGHWAY ROCKFALL MITIGATION
MILE POST 19.18 TO 19.52
HANA, MAUI, HAWAII

Log of Boring 6

Approximate Ground Surface Elevation :

Other Tests	Moisture Content (%)	Dry Unit Weight (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample Graphic	USCS	Description
					25/.3' Ref.				GM	4-inch ASPHALTIC CONCRETE
									GW	Grayish brown SILTY BASALTIC GRAVEL with sand, medium dense, moist (base course)
										Gray BASALTIC GRAVEL with sand, very dense, moist
			71	17			5			Gray slightly vesicular to massive BASALT, highly fractured, moderately weathered, medium hard to hard (basalt formation)
			98	45			10			grades to moderately fractured
			97	63			15			grades with olivine phenocrysts
			100	87						grades to massive, slightly to moderately fractured
			95	37			20			Gray massive BASALT with olivine phenocrysts, moderately fractured, slightly to moderately weathered, hard (basalt formation)
			50	37			25			
			37	0			30			Gray BASALT, highly fractured, moderately weathered, medium hard (basalt formation)
							35			

Date Started:	August 13, 2002	Water Level: ▽	Not Encountered
Date Completed:	August 13, 2002		
Logged By:	N. Mitchell	Drill Rig:	MOBILE B-53
Total Depth:	37 feet	Drilling Method:	4" Solid-Stem Auger & HQ Coring
Work Order:	4898-00(A)	Driving Energy:	140 lb. wt., 30 in. drop

GEOLABS, INC. Geotechnical Engineering

HANA HIGHWAY ROCKFALL MITIGATION
MILE POST 19.18 TO 19.52
HANA, MAUI, HAWAII

Log of Boring 6

(Continued from previous plate)

Other Tests	Moisture Content (%)	Dry Unit Weight (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample Graphic	USCS	Description
					50/.0' Ref.		40			Boring terminated at 37 feet
							45			
							50			
							55			
							60			
							65			
							70			

Date Started:	August 13, 2002	Water Level: ▽	Not Encountered
Date Completed:	August 13, 2002		
Logged By:	N. Mitchell	Drill Rig:	MOBILE B-53
Total Depth:	37 feet	Drilling Method:	4" Solid-Stem Auger & HQ Coring
Work Order:	4898-00(A)	Driving Energy:	140 lb. wt., 30 in. drop

GEOTECHNICAL NOTES

1. A geotechnical engineering report entitled "Geotechnical Engineering Exploration, Route 360 Hana Highway, Rockfall Mitigation, Phase-2, Mile Post 19.18 to 19.52, Hana, Maui, Hawaii" dated April 21, 2008 has been prepared by Geolabs, Inc. A copy of the report is on file at the office of the Engineer for review by the Contractor.
2. For boring locations, see Sheets 7 & 8.
3. The information presented in the logs of borings depict the subsurface conditions encountered at that specified location and at the time of the field exploration only. Variations of subsoil conditions from those depicted in the logs of borings may occur between and beyond the borings.

GEOTECHNICAL NOTES CONT.

4. The penetration resistance shown on the logs of borings indicate the number of blows required for the specific sampler type used. The blow counts may need to be factored to obtain the Standard Penetration Test (SPT) blow counts.
5. The data given is for general information only. Bidders shall examine the site and the boring data and draw their own conclusions therefrom as to the character of materials to be encountered. The Engineer will not assume responsibility for variations of subsoil quality or conditions other than at the boring locations shown and at the time the borings were taken.

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

TEDDY S. T. KWOK LICENSED PROFESSIONAL ENGINEER No. 7951-C HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

Teddy S T Kwok 04/30/10
SIGNATURE EXPIRATION DATE OF THE LICENSE
GEOLABS, INC.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS AND NOTES

ROUTE 360 HANA HIGHWAY
ROCKFALL MITIGATION, PHASE 2
MILE POST 19.18 TO 19.52
Project No. 360AB-02-98

Scale: None Date: June 2008

SHEET No. 1 OF 7 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	360AB-02-98	2008	11	16

GEOLABS, INC. Geotechnical Engineering

HANA HIGHWAY ROCKFALL MITIGATION
MILE POST 19.18 TO 19.52
HANA, MAUI, HAWAII

Log of Boring 7

Other Tests	Moisture Content (%)	Dry Unit Weight (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS	Approximate Ground Surface Elevation : Description
							0				6-inch ASPHALTIC CONCRETE
										GM GC	6-inch grayish brown SILTY GRAVEL with sand, medium dense to dense, moist (base course)
					36/.5' +20/.2' 50/.0'						Red-gray-brown CLAYEY GRAVEL with some sand, very dense, moist (fill)
										ML	Gray with reddish brown mottling SANDY SILT with some gravel, stiff, moist (extremely weathered basalt)
					17		5				
			50	0	50/.1'		10				Gray slightly vesicular BASALT, highly fractured, highly weathered, medium hard (basalt formation)
			70	18							
							15				grades to moderately weathered
			100	47							
							20				
			95	67	50/.3' Ref.					SM	Gray-brown SILTY SAND with gravel, dense, moist (extremely weathered basalt)
							25				Gray massive BASALT, moderately fractured, slightly to moderately weathered, hard (basalt formation)
			100	97							grades to slightly fractured, slightly weathered, very hard
							30				
			95	47							grades to moderately fractured, moderately weathered, hard
							35				

Date Started:	August 19, 2002	Water Level: ⧗	Not Encountered
Date Completed:	August 21, 2002		
Logged By:	N. Mitchell	Drill Rig:	MOBILE B-53
Total Depth:	42 feet	Drilling Method:	4" Solid-Stem Auger & HQ Coring
Work Order:	4898-00(A)	Driving Energy:	140 lb. wt., 30 in. drop

GEOLABS, INC. Geotechnical Engineering

HANA HIGHWAY ROCKFALL MITIGATION
MILE POST 19.18 TO 19.52
HANA, MAUI, HAWAII

Log of Boring 7

Other Tests	Moisture Content (%)	Dry Unit Weight (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS	(Continued from previous plate) Description
			100	63			40				
											Boring terminated at 42 feet
							45				
							50				
							55				
							60				
							65				
							70				

Date Started:	August 19, 2002	Water Level: ⧗	Not Encountered
Date Completed:	August 21, 2002		
Logged By:	N. Mitchell	Drill Rig:	MOBILE B-53
Total Depth:	42 feet	Drilling Method:	4" Solid-Stem Auger & HQ Coring
Work Order:	4898-00(A)	Driving Energy:	140 lb. wt., 30 in. drop

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

TEDDY S. T. KWOK
LICENSED PROFESSIONAL ENGINEER
No. 7951-C
HAWAII U.S.A.

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DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS AND NOTES

ROUTE 360 HANA HIGHWAY
ROCKFALL MITIGATION, PHASE 2
MILE POST 19.18 TO 19.52
Project No. 360AB-02-98

Scale: None Date: June 2008

SHEET No. 2 OF 7 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	360AB-02-98	2008	12	16

GEOLABS, INC. — Geotechnical Engineering

HANA HIGHWAY ROCKFALL MITIGATION
MILE POST 19.18 TO 19.52
HANA, MAUI, HAWAII

Log of Boring 8

Other Tests	Moisture Content (%)	Dry Unit Weight (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS	Approximate Ground Surface Elevation : / Description
					41		0			GM	6-inch ASPHALTIC CONCRETE
										GW	6-inch grayish brown SILTY BASALTIC GRAVEL with sand, medium dense, moist (base course)
										SM	Gray BASALTIC GRAVEL with sand, dense, moist (fill)
											Grayish brown SILTY SAND with gravel, very dense, moist (extremely weathered basalt)
			83	83	50/.3'		5				Gray slightly vesicular to massive BASALT, slightly fractured, slightly to moderately weathered, hard (basalt formation)
			100	70							
							10				grades to moderately fractured, very hard
			100	93							grades to slightly fractured
			100	90			15				
							20				
			100	97							Gray massive BASALT, slightly fractured, slightly weathered, very hard (basalt formation)
			60	37			25				CLINKER
			62	28			30				grades to medium hard
							35				CLINKER

Date Started:	August 21, 2002	Water Level: ⧗	Not Encountered
Date Completed:	August 22, 2002		
Logged By:	N. Mitchell	Drill Rig:	MOBILE B-53
Total Depth:	42 feet	Drilling Method:	4" Solid-Stem Auger & HQ Coring
Work Order:	4898-00(A)	Driving Energy:	140 lb. wt., 30 in. drop

GEOLABS, INC. — Geotechnical Engineering

HANA HIGHWAY ROCKFALL MITIGATION
MILE POST 19.18 TO 19.52
HANA, MAUI, HAWAII

Log of Boring 8

Other Tests	Moisture Content (%)	Dry Unit Weight (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS	(Continued from previous plate) / Description
			88	42			40				
							45				Boring terminated at 42 feet
							50				
							55				
							60				
							65				
							70				

Date Started:	August 21, 2002	Water Level: ⧗	Not Encountered
Date Completed:	August 22, 2002		
Logged By:	N. Mitchell	Drill Rig:	MOBILE B-53
Total Depth:	42 feet	Drilling Method:	4" Solid-Stem Auger & HQ Coring
Work Order:	4898-00(A)	Driving Energy:	140 lb. wt., 30 in. drop

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

TEDDY S. T. KWOK
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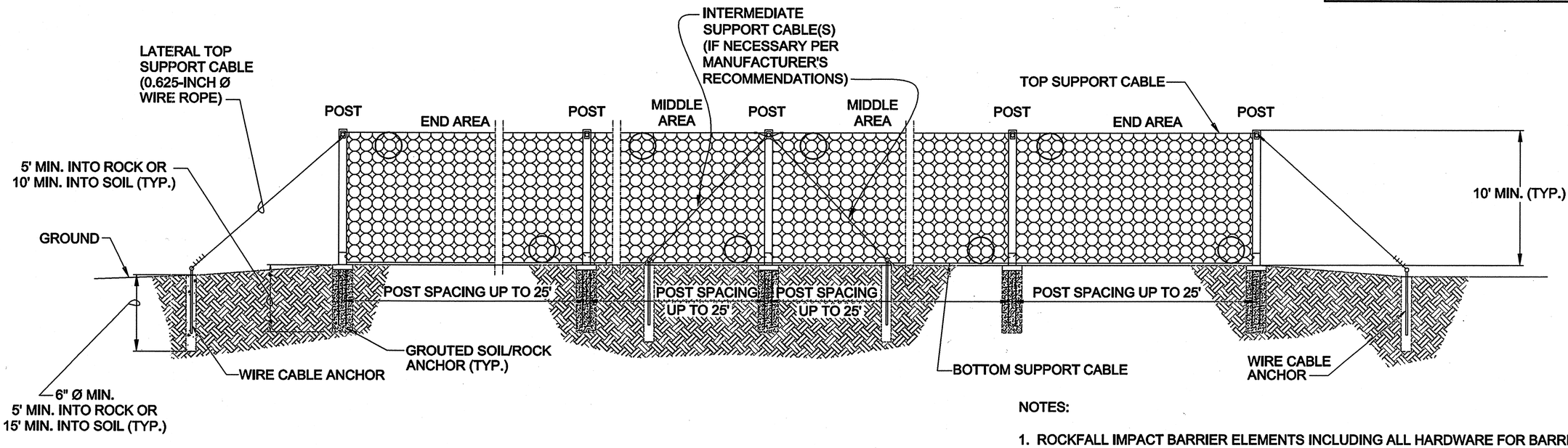
BORING LOGS AND NOTES

ROUTE 360 HANA HIGHWAY
ROCKFALL MITIGATION, PHASE 2
MILE POST 19.18 TO 19.52
Project No. 360AB-02-98

Scale: None Date: June 2008

SHEET No. 3 OF 7 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	360AB-02-98	2008	13	16

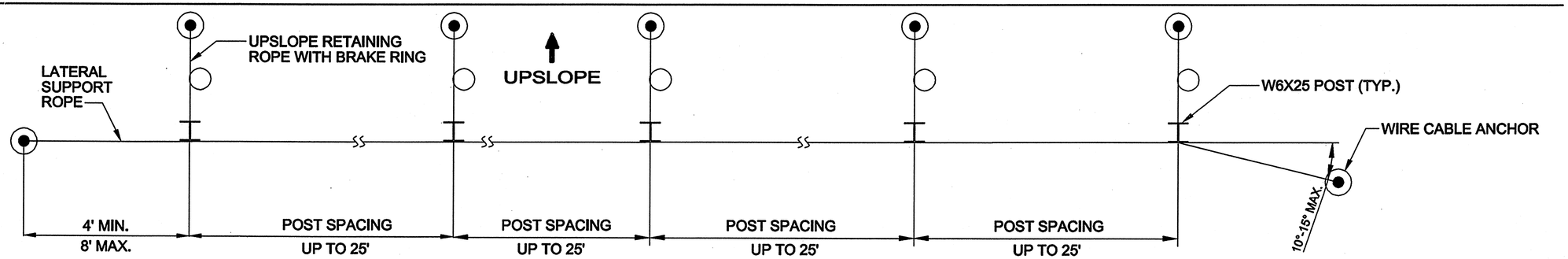


TYPICAL LAYOUT OF POSTS AND WIRE CABLE ANCHOR

NOT TO SCALE

NOTES:

1. ROCKFALL IMPACT BARRIER ELEMENTS INCLUDING ALL HARDWARE FOR BARRIER SHALL BE POWDER COATED BLACK.
2. ROCKFALL IMPACT BARRIER SYSTEM SHALL HAVE A MINIMUM RATED ENERGY ABSORPTION CAPACITY OF 74 FOOT-TONS WITH AN ADEQUATE FACTOR OF SAFETY.
3. REFER TO SHEET 15 FOR FOUNDATION DETAILS.
4. VERTICAL SAG OF RING NET SHALL BE MAX. 3% OF POST SPACING.



TYPICAL LAYOUT OF ANCHOR POINTS

NOT TO SCALE

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

TEDDY S. T. KWOK
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HIGHWAYS DIVISION

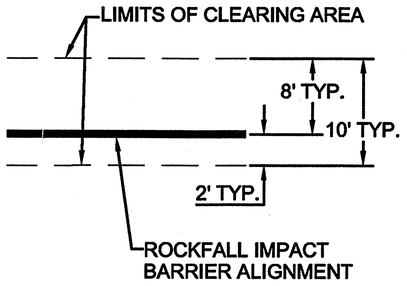
ROCKFALL IMPACT BARRIER

ROUTE 360 HANA HIGHWAY
ROCKFALL MITIGATION, PHASE 2
MILE POST 19.18 TO 19.52
Project No. 360AB-02-98

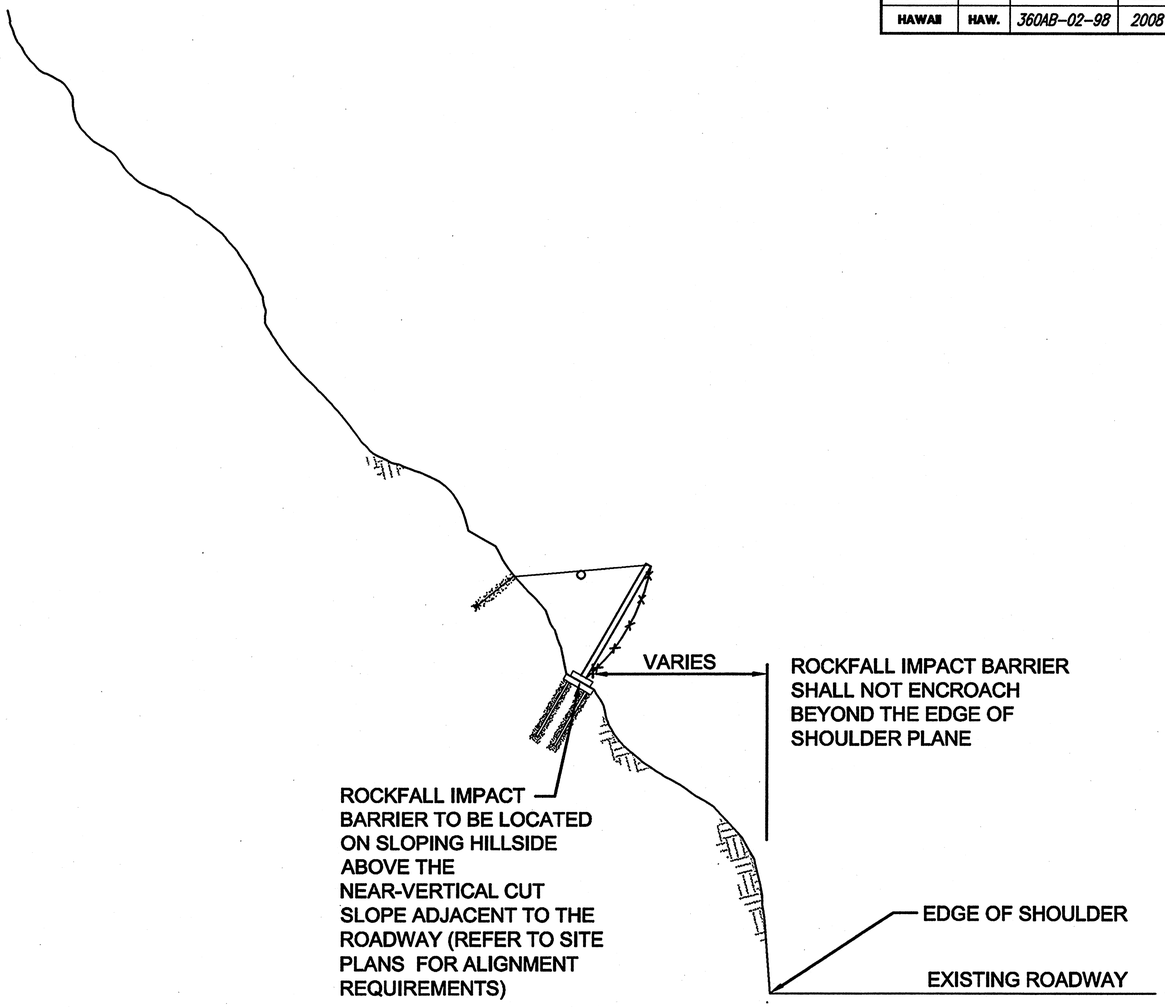
Scale: Not to Scale Date: June 2008

SHEET No. 4 OF 7 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	360AB-02-98	2008	14	16



TYPICAL CLEARING PLAN
NOT TO SCALE



ROCKFALL IMPACT BARRIER TYPICAL SECTION
NOT TO SCALE

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

TEDDY S. T. KWOK
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HIGHWAYS DIVISION

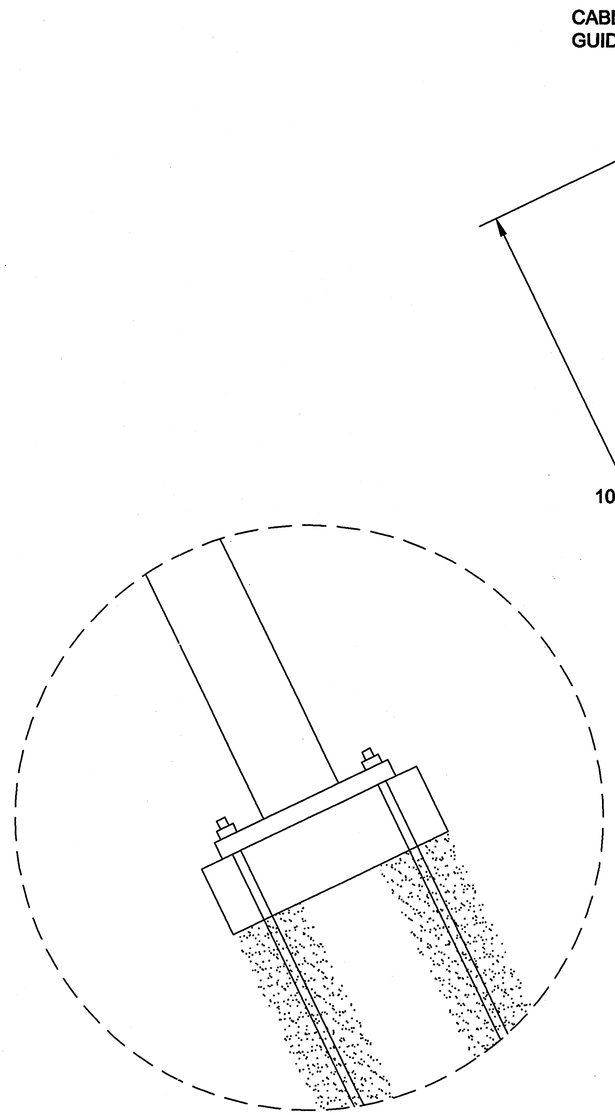
TYPICAL SECTIONS

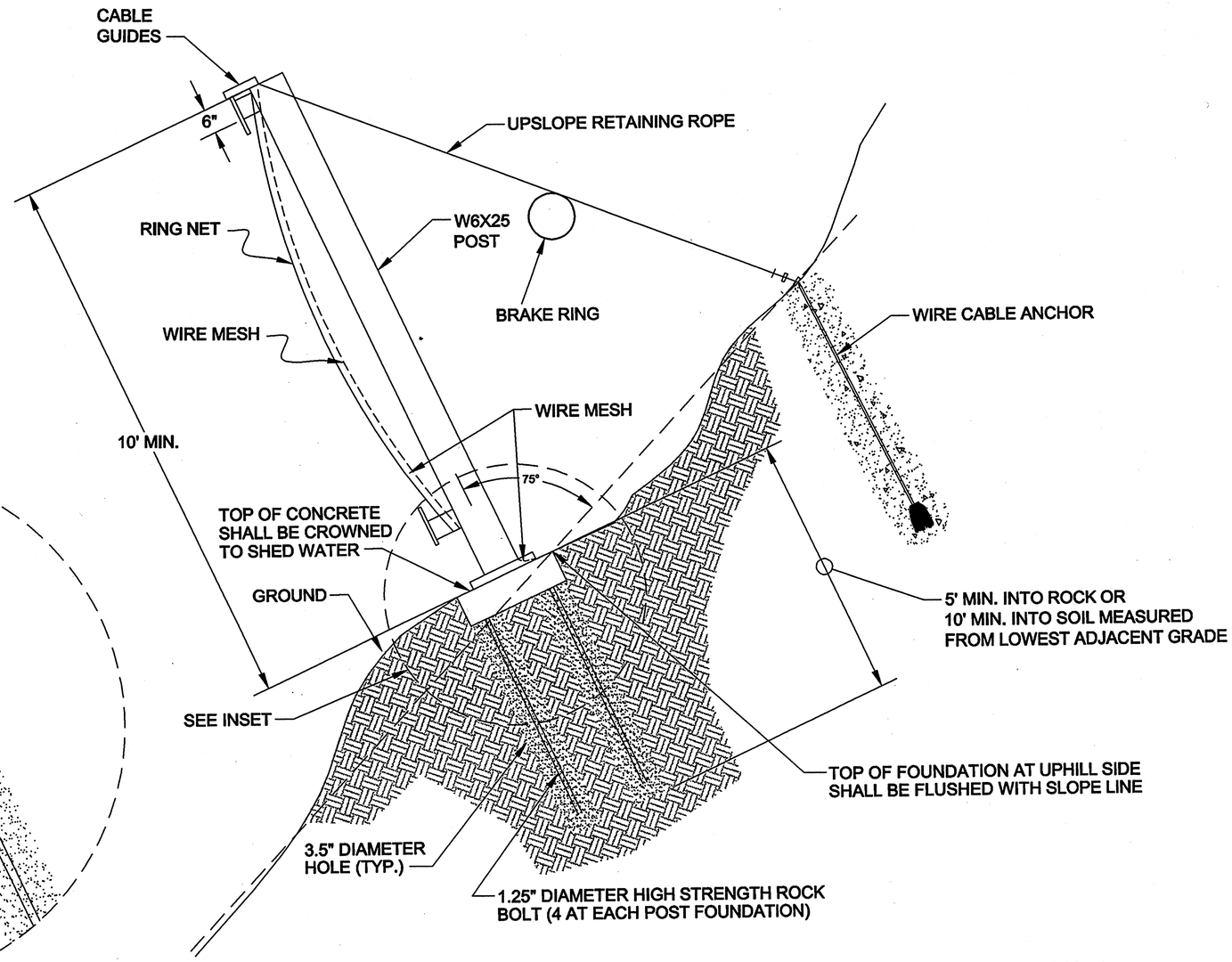
ROUTE 360 HANA HIGHWAY
ROCKFALL MITIGATION, PHASE 2
MILE POST 19.18 TO 19.52
Project No. 360AB-02-98

Scale: Not to Scale Date: June 2008

SHEET No. 5 OF 7 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	360AB-02-98	2008	15	16





GROUTED SOIL/ROCK ANCHOR FOUNDATION FOR ROCKFALL IMPACT BARRIER

NOT TO SCALE

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

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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

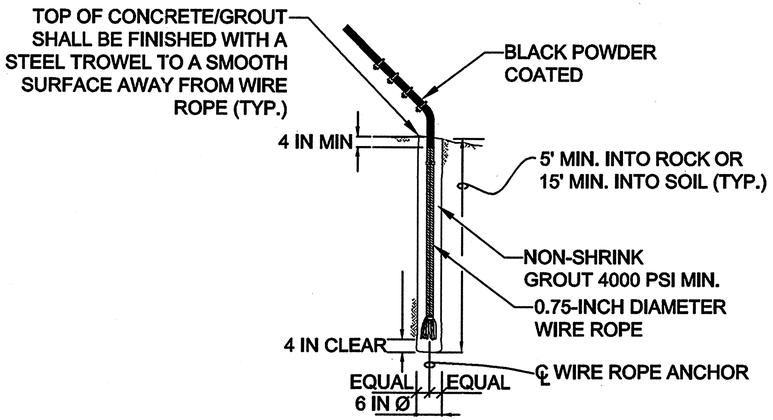
FOUNDATION DETAILS

ROUTE 360 HANA HIGHWAY
ROCKFALL MITIGATION, PHASE 2
MILE POST 19.18 TO 19.52
Project No. 360AB-02-98

Scale: Not to Scale Date: June 2008

SHEET No. 6 OF 7 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	360AB-02-98	2008	16	16



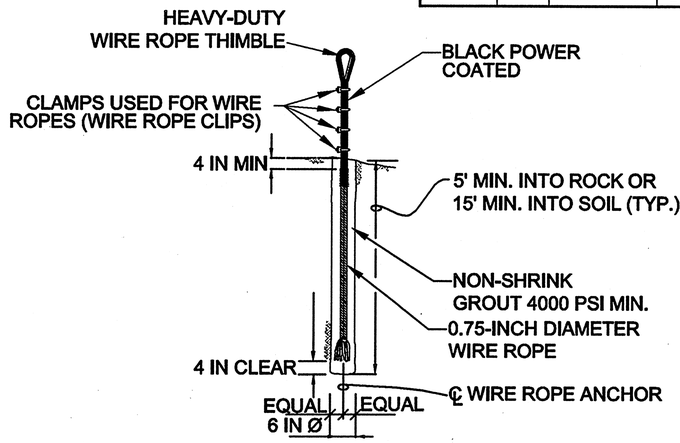
WIRE CABLE ANCHOR (SIDE VIEW)
NOT TO SCALE

NOTES:

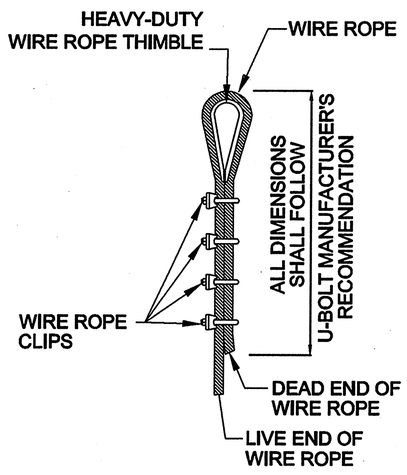
1. DRILL 6" MIN. DIA. ANCHOR HOLES TO A MINIMUM DEPTH OF 5' INTO ROCK OR 15' INTO SOIL FOR WIRE CABLE ANCHOR.

2. WIRE ROPE ANCHOR ENDS TO BE SPLAYED BEFORE SETTING IN CONCRETE.

3. ANCHORS SHALL HAVE A PULLOUT CAPACITY OF 15 TONS (30 KIPS).



WIRE CABLE ANCHOR (FRONT VIEW)
NOT TO SCALE



WIRE ROPE CLIP LOOP
NOT TO SCALE

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

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No. 7951-C
HAWAII, U.S.A.

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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

MISCELLANEOUS DETAILS

ROUTE 360 HANA HIGHWAY
ROCKFALL MITIGATION, PHASE 2
MILE POST 19.18 TO 19.52
Project No. 360AB-02-98

Scale: Not to Scale Date: June 2008

SHEET No. 7 OF 7 SHEETS