Underwater Bridge Inspection
for
Hakalau Stream Bridge
(Bridge No. 001290001100003)

Prepared for
County of Hawaii
Department of Public Works

March 2016

Hawaii Engineering Group, Inc.
Consulting Civil Engineers, Structural Engineers & Land Surveyors

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Honolulu, Hawaii 96813

www.hawaiiengineering.net

UNDERWATER BRIDGE INSPECTION FOR HAKALAU STREAM BRIDGE (Bridge No. 001290001100003)

for

DEPARTMENT OF PUBLIC WORKS
COUNTY OF HAWAI'I

by

Hawaii Engineering Group, Inc.
1088 Bishop Street, Suite 2506
Honolulu, Hawaii 96813

This Work Has Been Prepared By Me or Under My Supervision Under NHI Requirements

TABLE OF CONTENTS

APPENDICES

UNDERWATER BRIDGE INSPECTION FOR HAKALAU STREAM BRIDGE

SECTION 1.0 – INTRODUCTION

1.1 Scope of Work

1.1.1 Conduct on-site underwater inspection for the Hakalau Stream Bridge in conformance with the following:

- Federal Highway Administration (FHWA) Bridge Inspector's Reference Manual, revised December 2012.
- AASHTO Manual for Bridge Evaluation, Second Edition 2011, 2013.
- State of Hawaii Department of Transportation Highways Division Bridge Inspection Program, revised March 27, 2013, and 2014 Interim Revisions.
- FHWA Underwater Bridge Inspection, Publication No. FHWA-NHI-10-027, April 2010.
- Contract No.: C.005541 dated February 9, 2016. Professional and Technical Services related to performing Underwater Bridge Inspections for the Keawe-Wailuku Bridge (#23-1) and the Hakalau Stream Bridge (#29-3), Federal Aid Project No. BR-NBIS (055).

1.1.2 Prepare Underwater Bridge Inspection Report.

1.1.3 Measure the streambed depth by using a measuring line and weighted anchor at the end. Measurements to be taken from the bridge railing top edge down to the streambed at equal spacing along bridge length to the streambed below. Measurements to be taken at both the upstream and downstream faces of the bridge. The assumed reference is pre-marked with a survey square and an x marking determining the reference point as elevation 100.00 on the sidewalk downstream northeast corner. See Bridge Plan.

1.2 Inspection Period

1.2.1 An on-site underwater inspection was conducted on February 3, 2016. Sea Engineering, Inc. (SEI) assisted Hawaii Engineering Group Inc. (HEG) in performing the underwater probing.

SECTION 2.0 – BRIDGE DESCRIPTION

2.1 Location

Hakalau Stream Bridge is located in South Hilo, County of Hawaii, Hawai'i. Bridge No. 29 is on Old Mamalahoa Highway and crosses over Hakalau Stream. The bridge is a reinforced concrete structure with closed spandrel arches, with concrete abutment and

was built in 1930. It measures approximately 22'-6" wide out-to-out and 68 feet in length. See photos in Appendix B.

SECTION 3.0 – INSPECTION PROCEDURES (PLAN OF ACTION)

3.1 Timetable for Conducting the Inspection

There are no records on underwater inspection for this bridge. This inspection is the first underwater inspection done to meet the 5-year cycle mandated by Federal law.

3.2 Personnel Requirements for Each Portion of the Inspection

3.2.1 Inspection Team

The inspection team consisted of Team Leader, Ather Dar, with assistance from Kenneth Lai. Both have completed FHWA/NHI Course No. 130055, Safety Inspection of In-Service Bridges, and received certification. The Team Leader is responsible for overseeing the conducting the inspection. The Assistant Inspector is responsible for measurements, taking notes, taking photographs and report-writing during field inspection.

3.2.2 Underwater Team

SEI conducted all the underwater investigation and probing. HEG conducted the horizontal survey and stream-bed elevation in conjunction with divers. Scouring underwater conditions were investigated and probed to determine the degree of degradation. The SEI underwater inspection team was headed by Paul Roberts, a licensed Civil Engineer and commercial diver with NBIS underwater bridge inspection certification. SEI commercial divers, Tyler Borge and Wyatt Rodongo, both with recent underwater bridge inspection experience, made up the remainder of the 3-man dive team.

3.3 Inspection Requirements

3.3.1 A scoping meeting and site visit conducted with Hawaii County engineers on July 13, 2015. The scoping meeting was held to determine the extent of the work and latest underwater requirements from the County. The purpose of the site visit was to determine potential staging area for equipment and field personnel access points. It was determined that no traffic control will be required.

3.3.2 Any defects and possible undermining or scouring were investigated. Survey work included using a drop measuring line at various points along the upstream and downstream bridge faces for the stream bed cross section. Horizontal survey and topography were needed around the bridge embankments to map out the erosion and scour below water. The divers measured depth of scour and

established baseline for future use. SEI also determined the velocity of the stream flow at the center by dropping a floating object into the water on the upstream side of the bridge. A measuring tape was laid out on one of the embankments under the bridge. SEI measured the time it took for the floating object to travel from the upstream end of the measuring tape to the downstream end of the measuring tape. Stream velocity was estimated using calculations from this method.

This report will establish degree of degradation and if the condition warrants mitigation measure. It will also establish if the bridge is scour critical and how it may impact structural integrity of the bridge.

3.4 Access Equipment Requirements

3.4.1 SEI was equipped a dive ladder for diver ingress/egress. Ropes were used (when necessary) to raise and lower equipment from the top of the embankment and bridge to the inspection area at the bottom. A secure rope was used for personnel as a hand-grip to safely access to the embankment area. The divers accessed the waterway from the channel embankment using a dive ladder.

3.5 Traffic Control

3.5.1 Traffic control was not required. The dive team parked their equipment van in the holding area near the site. The holding area location was off the shoulder of the road and did not interfere with local traffic. No traffic control was required for HEG during the inspection.

3.6 Type and Level of NDT Requirements

3.6.1 Diving Inspection Intensity Level 1 inspection performed on all submerged substructure elements. See Federal Highway Administration Bridge Inspector's Manual Section 2.1 for definition of underwater inspection levels. An investigation of scour and undermining of abutment footings was done using probe sticks and measuring tape to determine the dimension of the hole.

3.7 Pre-Dive and Post-Dive Checklists

See Appendix E.

SECTION 4.0 – FIELD OBSERVATION

4.1 The south end ledger below the abutment is in general satisfactory condition. Water visibility at time was about 15 feet to allow an inspection of concrete defects by visual assessment. There are some signs of minor erosion along the left edge of the rock ledge below the abutment water line (see Photos B7 and B15).

4.2 The north end ledger supporting the abutment and bridge foundation is undermined and is considered to be scour critical since the scour depth is 17 to 25 feet deep horizontally and 5.5 to 8 feet vertically and under the bridge foundation.

4.3 The upstream is littered with boulders and small rocks, which impede flow and narrow the water flow to the right side of the stream (see photos B8 and B12).

SECTION 5.0 – GENERAL CONDITION ASSESSMENT AND RECOMMENDATIONS

5.1 Assessment

The upstream side is littered with boulders and rocks which restrict water flow and direct flow more toward the north end of the bridge abutment. Because of the restricted flow, the water pressure is increased and is causing scouring of the rock ledge below the abutment at the north end of the bridge.

An engineering evaluation of the observed scour condition is recommended, otherwise the bridge could collapse during a heavy hurricane or storm or heavy traffic load (see photos B8 through B11, & B13). See also North Abutment Plan (page 26), sections A through C (pages 27 to 29).

5.2 Maintenance List

Items include the following:

5.2.1 Remove the boulders and small rocks at the upstream left side.

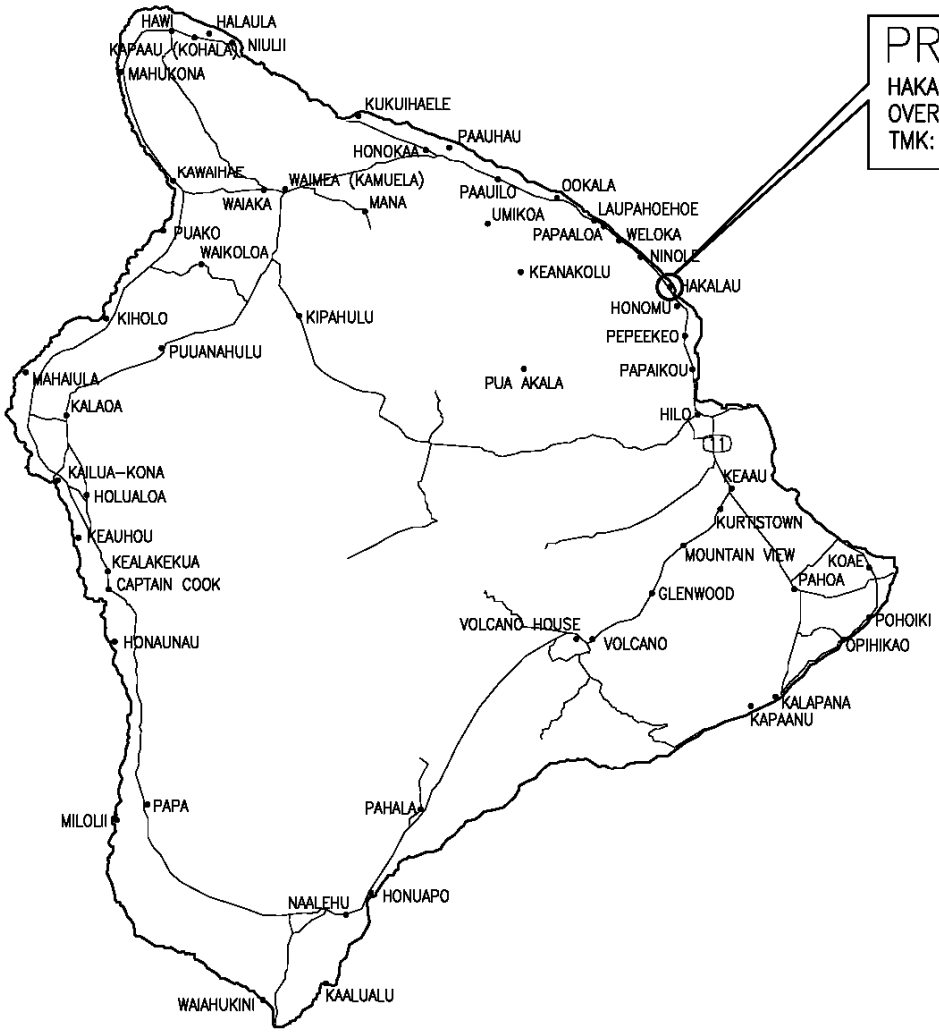
5.3 Repair List

Items include the following:

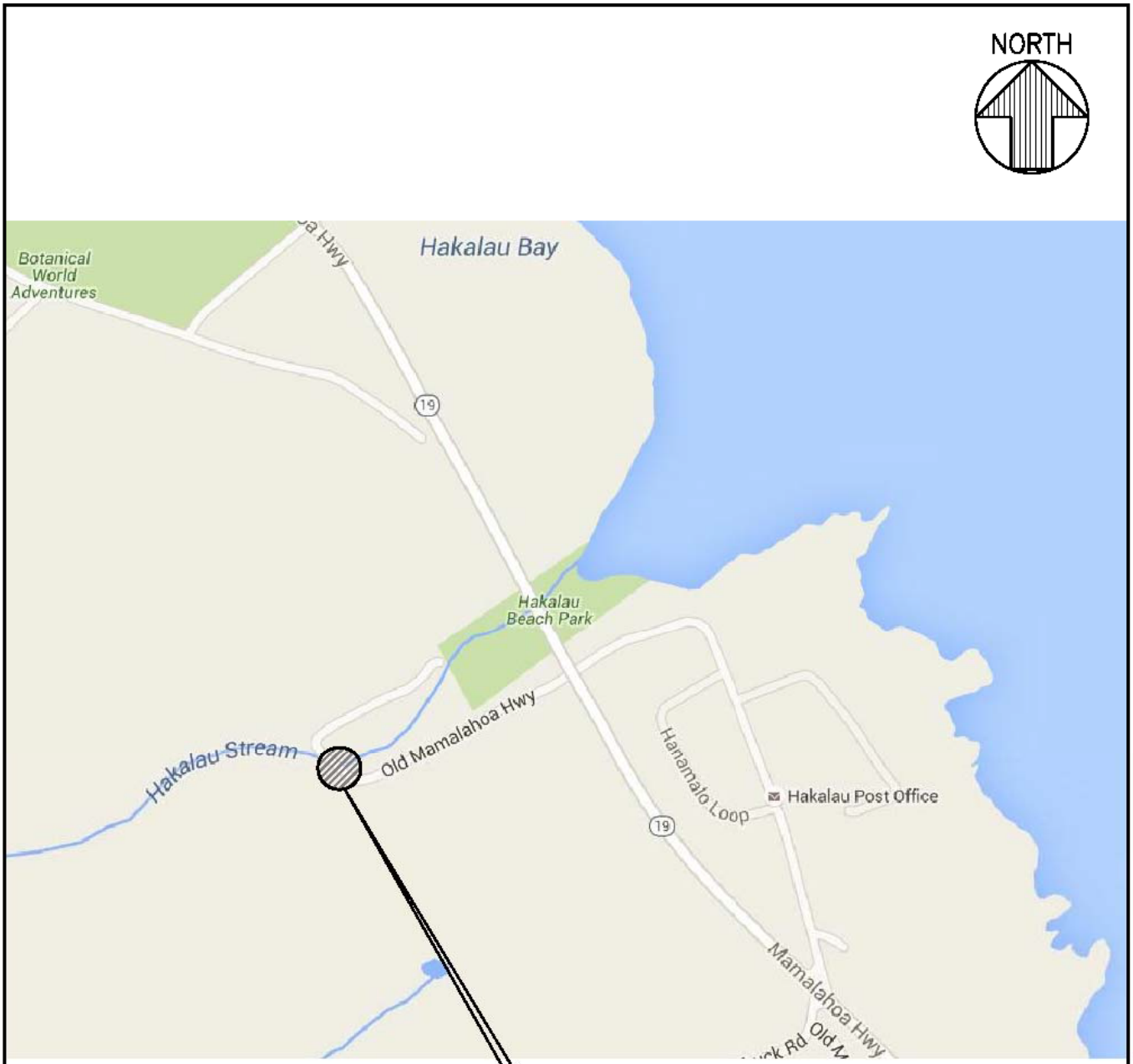
5.3.1 Repair foundation undermining due to flow at the north end abutment. Recommended construction of a cutoff or protective wall around the rock ledge. Drill holes from the top through the rock ledge and pump shortcrete or other acceptable material to ensure bridge abutment will not collapse and fail.

5.3.2 At the north abutment upstream face, construct cutoff wall to extend ledge out a few feet to prevent further erosion of abutment rock ledge.

APPENDIX A
LOCATION AND VICINITY MAP



LOCATION MAP
NTS



VICINITY MAP
NTS

APPENDIX B
PHOTOGRAPHS

B1: View of the Hakalau Bridge from the roadway from north approach.

B2: Upstream bridge profile.

B3: Downstream bridge profile.

B4: Upstream flow condition.

B5: Downstream flow condition.

B6: North end abutment & rock ledger.

B7: South end abutment & rock ledger.

B8: Scour/undermined on the inlet side at the upstream end.

B9: Water flowing beneath the north end rock ledger at the upstream side.

B10: Scour/undermined condition below the rock ledger inlet side at north end of bridge.

B11: Close up of the scour/undermined condition inlet side at north abutment upstream.

B12: Boulders and smaller rock debris cause restriction on water flow upstream.

B13: Scour/undermined condition on the outlet side downstream end at the north abutment.

B14: Fractured cracks and erosion on upstream rock ledge north end. See North Abutment Plan on page 28 for location.

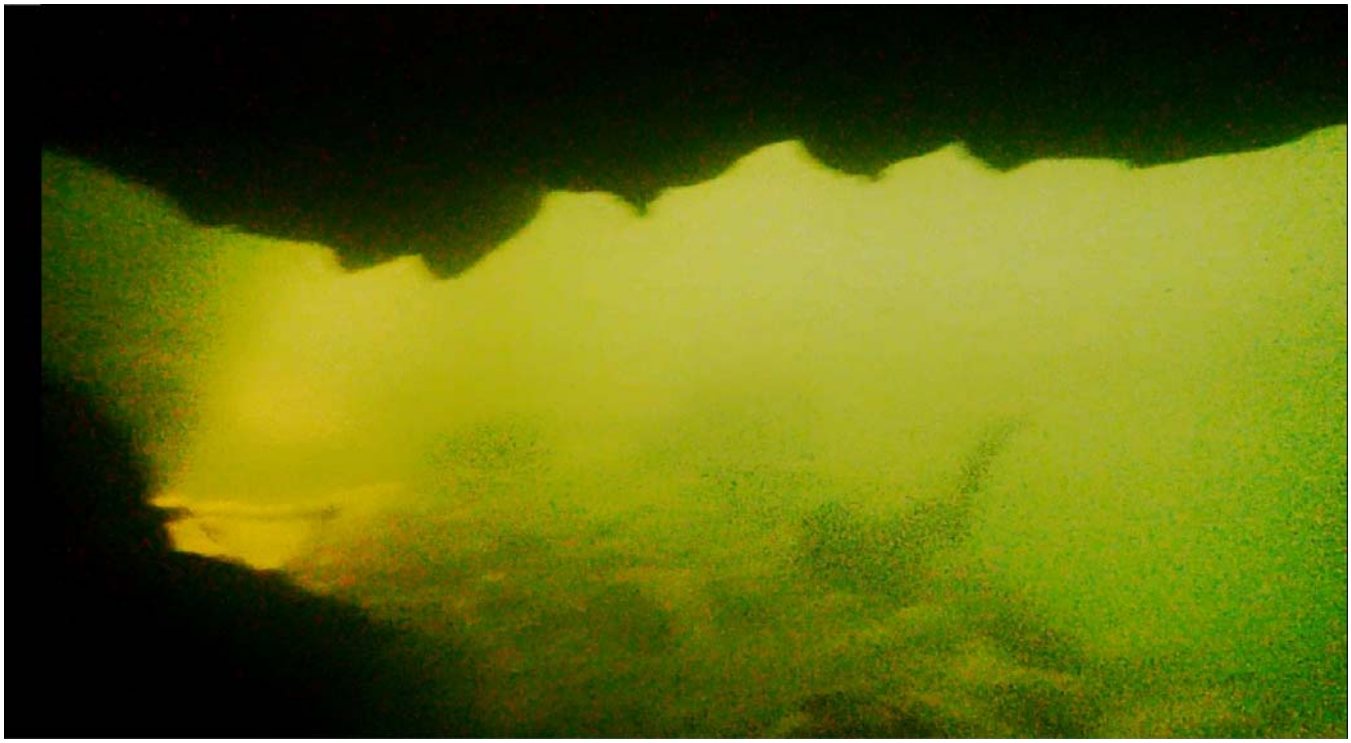
B15: Signs of minor scouring/erosion at the downstream side on the south rock ledge.

B16: **SOUTH ABUTMENT (UNDERWATER)** Underwater photo below the rock at the upstream side (Refer to photo B7).

B17: **SOUTH ABUTMENT (UNDERWATER)** Underwater photo below the rock of the upstream side (Refer to photo B7).

B18: **NORTH ABUTMENT (UNDERWATER)** Upstream entrance.

B19: **NORTH ABUTMENT (UNDERWATER)** Near the center of undermining upstream-side of north abutment.



B20: **NORTH ABUTMENT (UNDERWATER)** Center of undermining toward downstream-side.

B21: **NORTH ABUTMENT (UNDERWATER)** Near downstream-side entrance.

APPENDIX C
UNDERWATER BRIDGE INSPECTION REPORT

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

UNDERWATER BRIDGE INSPECTION REPORT

Date of Inspection		2/3/2016			
Bridge Number		29	Bridge Name	Hakalau Stream Bridge	
Location:	Island	Hawaii	Route No.	Highway	Highway
Body of Water		Hakalau Stream		Milepost	
Number of Spans		1	Number of Piers in the Waterway		0
Structure Type		Arch Bridge	Substructure Type		Concrete
Foundation Type		Spread Footing			

Diving Conditions:			Dive Mode	Surface Supplied Air
	Air Temp.	75 F	Ave. Visibility	15 ft.
	Water Temp.	65 F	Bot. Material	Basalt Rock
	Max. Depth	17.5 ft		
	Water Velocity	1 fps		

[Condition ratings for these items shall be in accordance with applicable NBI items 60, 61 or 62.]

	Items of Inspection	Condition Rating	Remarks
1.	Pilings/Shafts	N	5. The abutments are in satisfactory condition;
2.	Footings/caissons/Pedestals	N	however, the area under the northern end
3.	Columns/Wall Piers	N	Abutment support rock ledge is undermined and
4.	Bracings/Struts/Web Walls	N	is considered to be critical scour per NBI Coding
5.	Abutments/End Bents	7	Guide #113. It would be a assigned a rating of
6.	Retaining Walls/Wing Walls	7	2.
7.	Fender System/Pier Protection	N	
8.	Embankments/Slopes/Bulkheads	7	
9.	Degradation/Aggradation	N	
10.	Obstruction/Flow	6	
11.	Culvert Barrels	N	
12.	Culvert Headwalls	N	

Inspected by: Name (printed): Kenneth Lai Title: PE, Inspector

Signature:

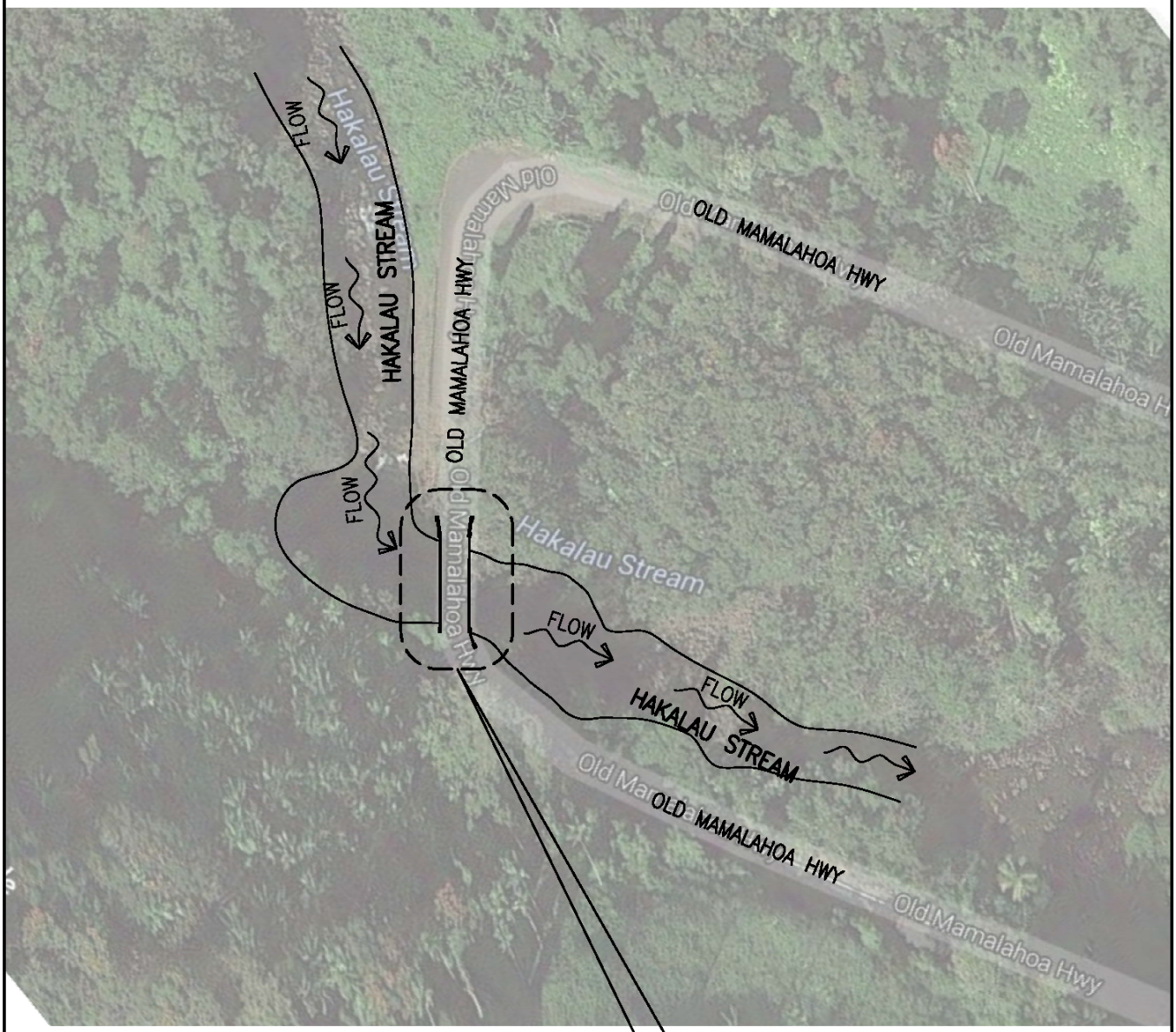
Phone Number: 808.533.2092

Supervised by: Name (printed): Ather Dar Title: PE, Team Leader

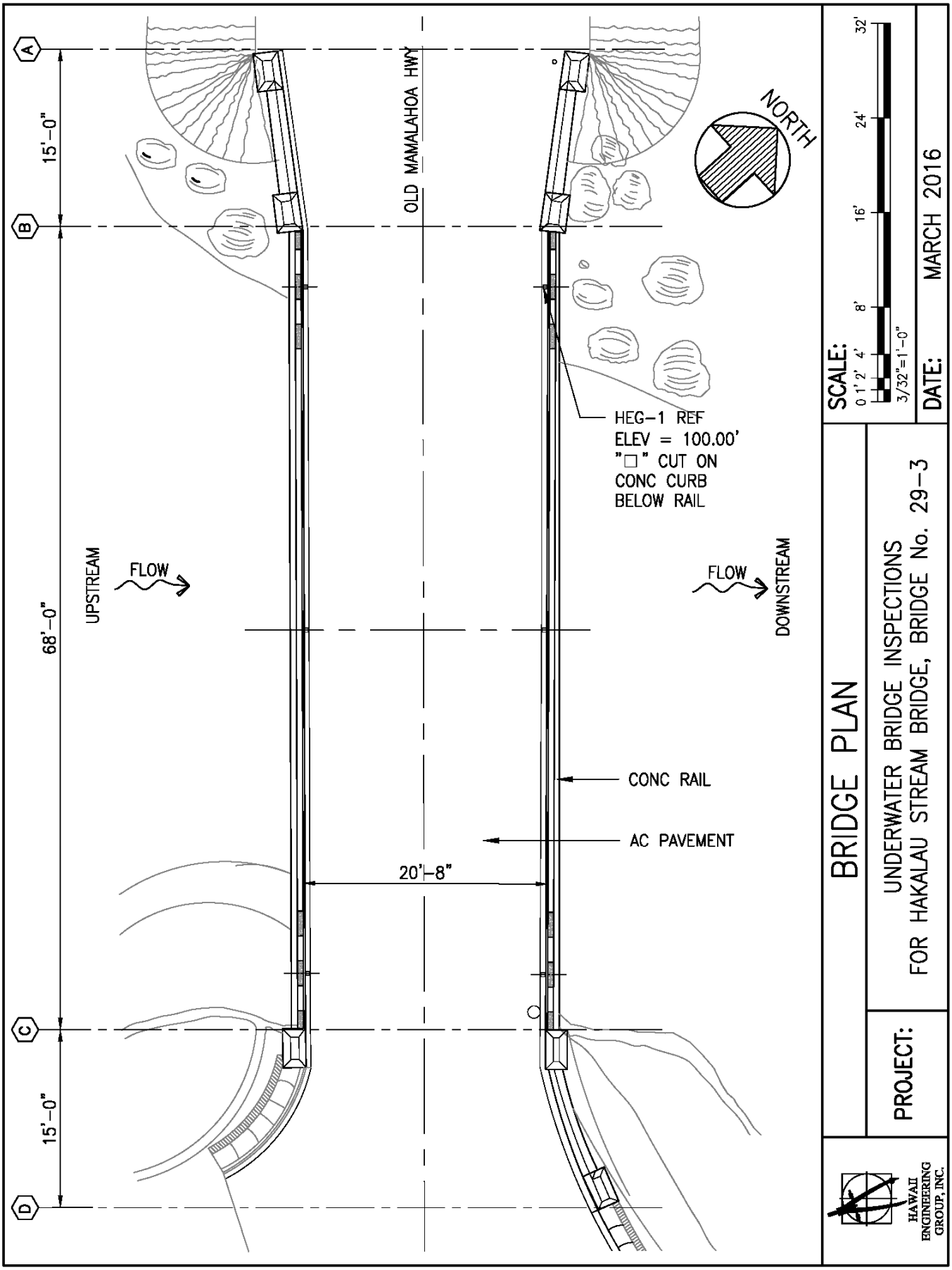
Signature:

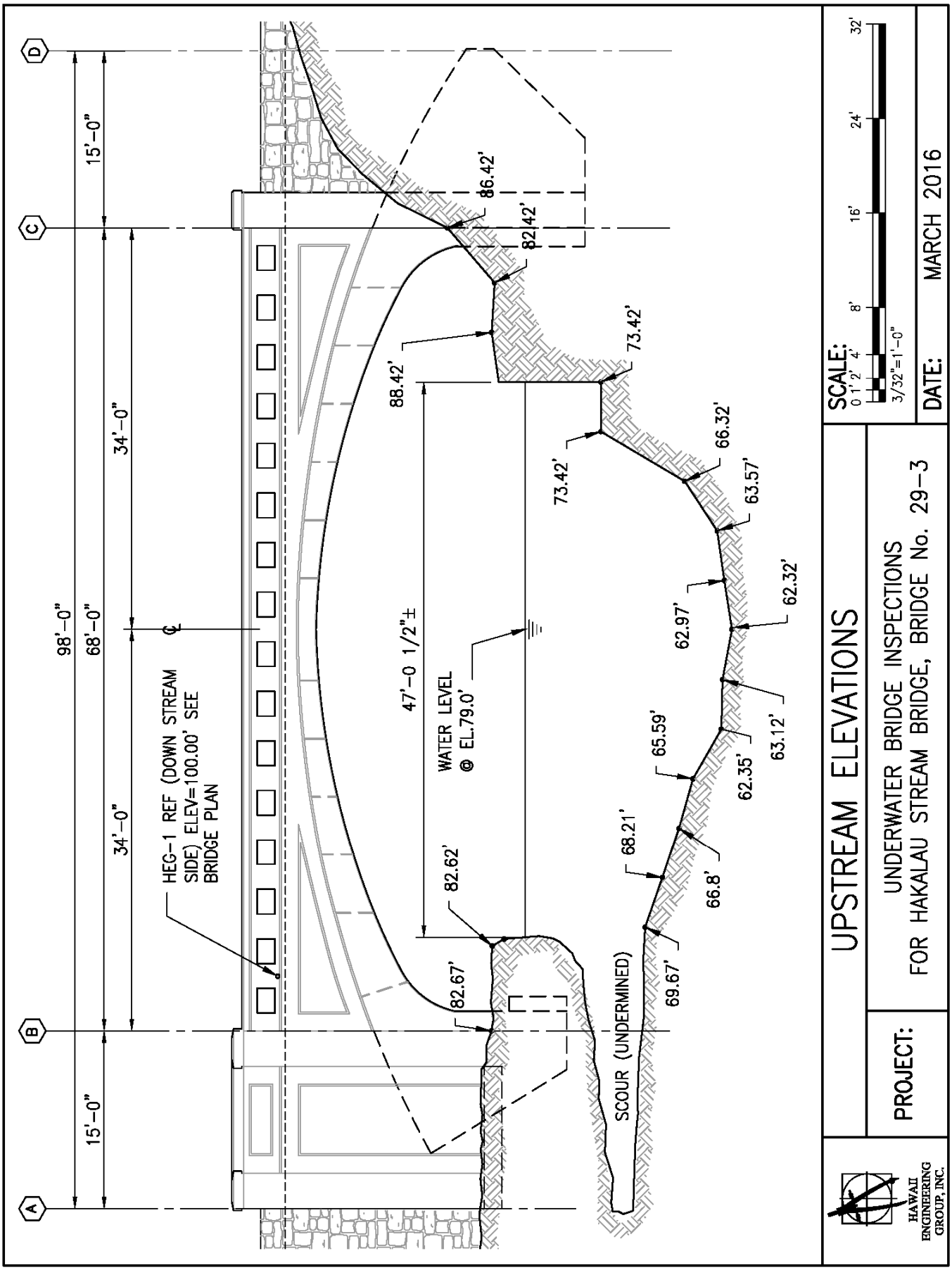
Phone Number: 808.533.2092

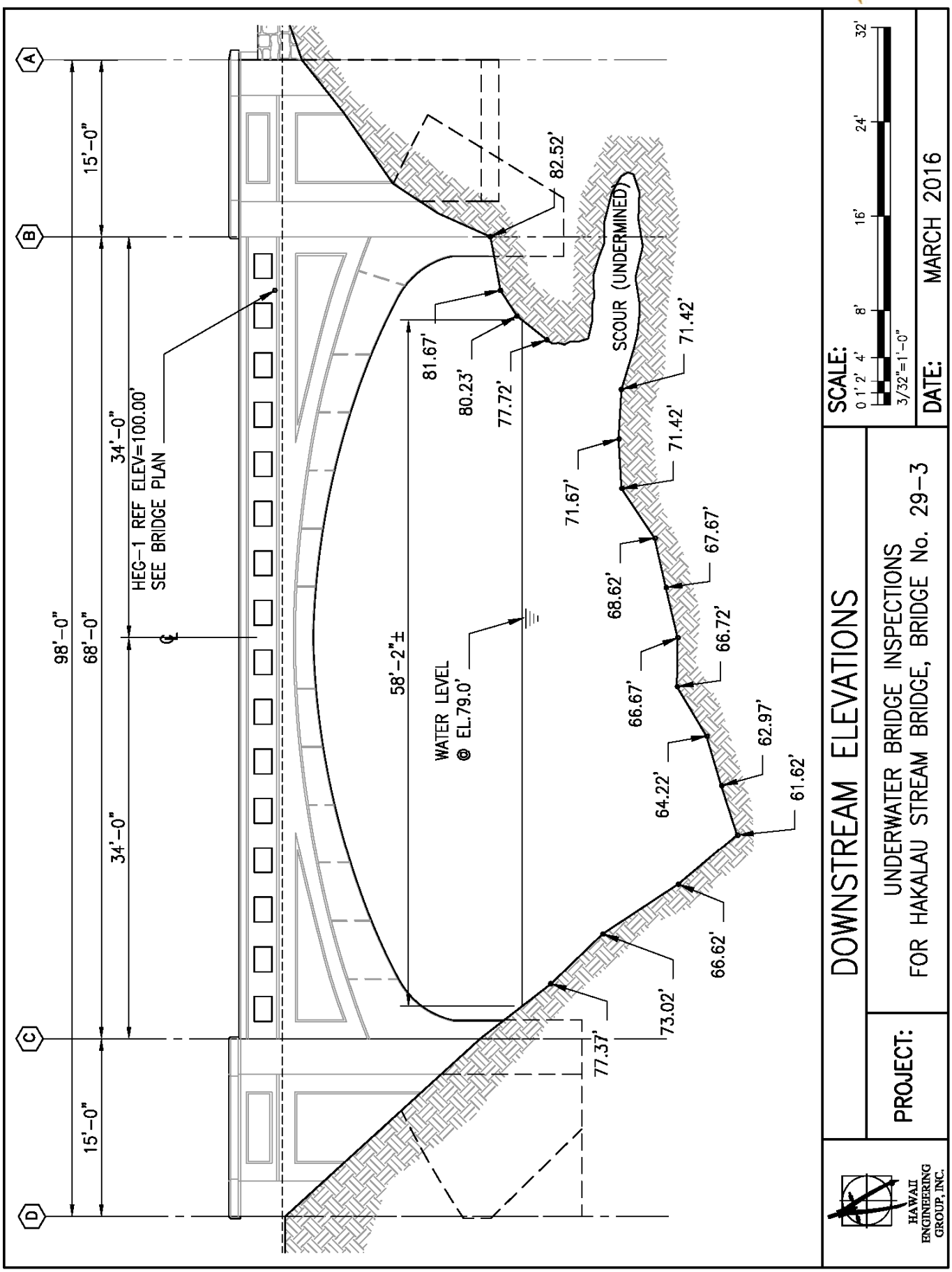
APPENDIX D
FIGURES

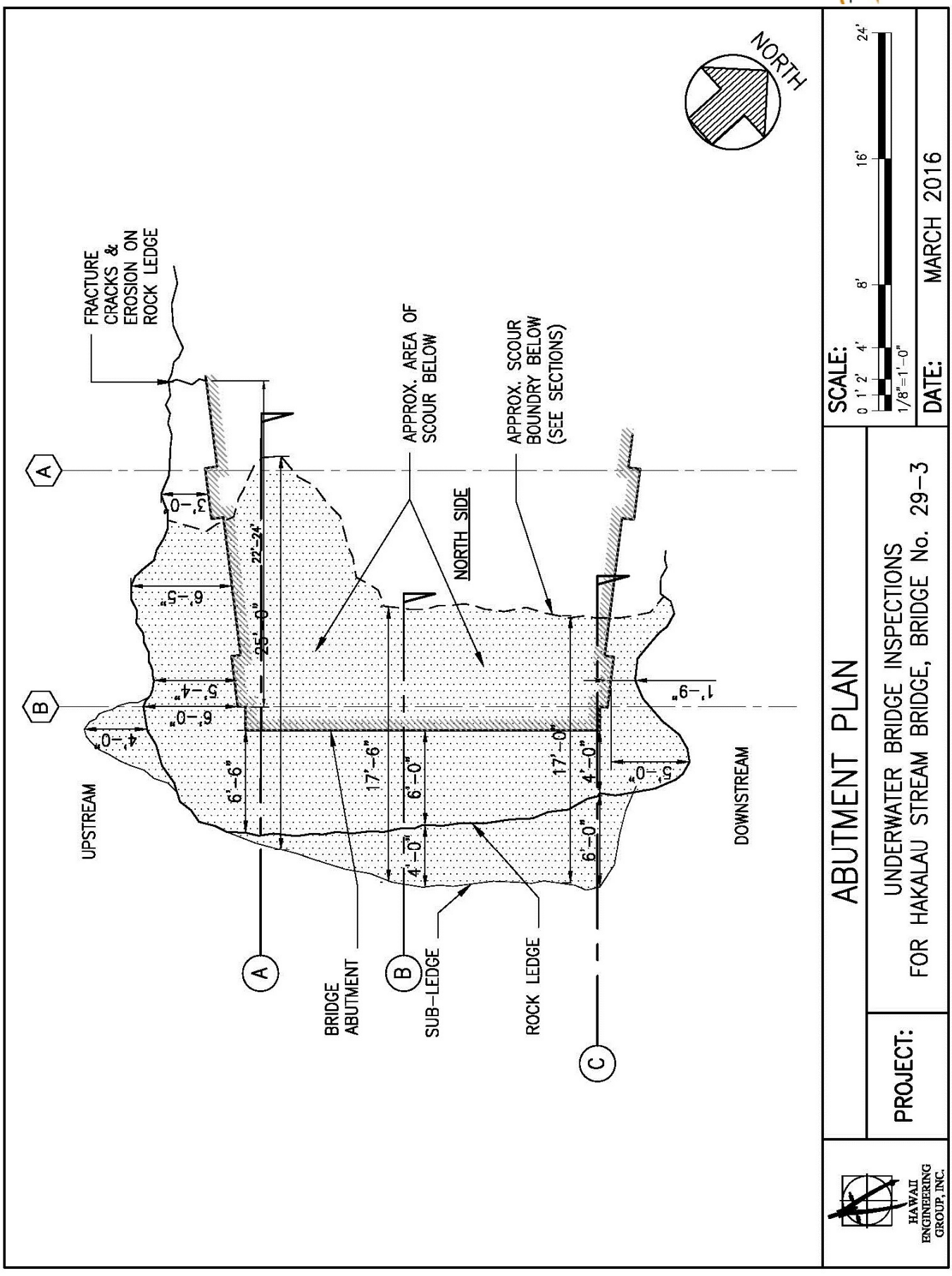

NORTH
FLOW
HAKALAU STREAM
FLOW
FLOW
OLD MAMALAHOA HWY
OLD MAMALAHOA HWY
Hakalau Stream
FLOW
FLOW
HAKALAU STREAM
OLD MAMALAHOA HWY
PROJECT SITE
HAKALAU STREAM BRIDGE
OVER HAKALAU GULCH
TMK: 2-9-002:025

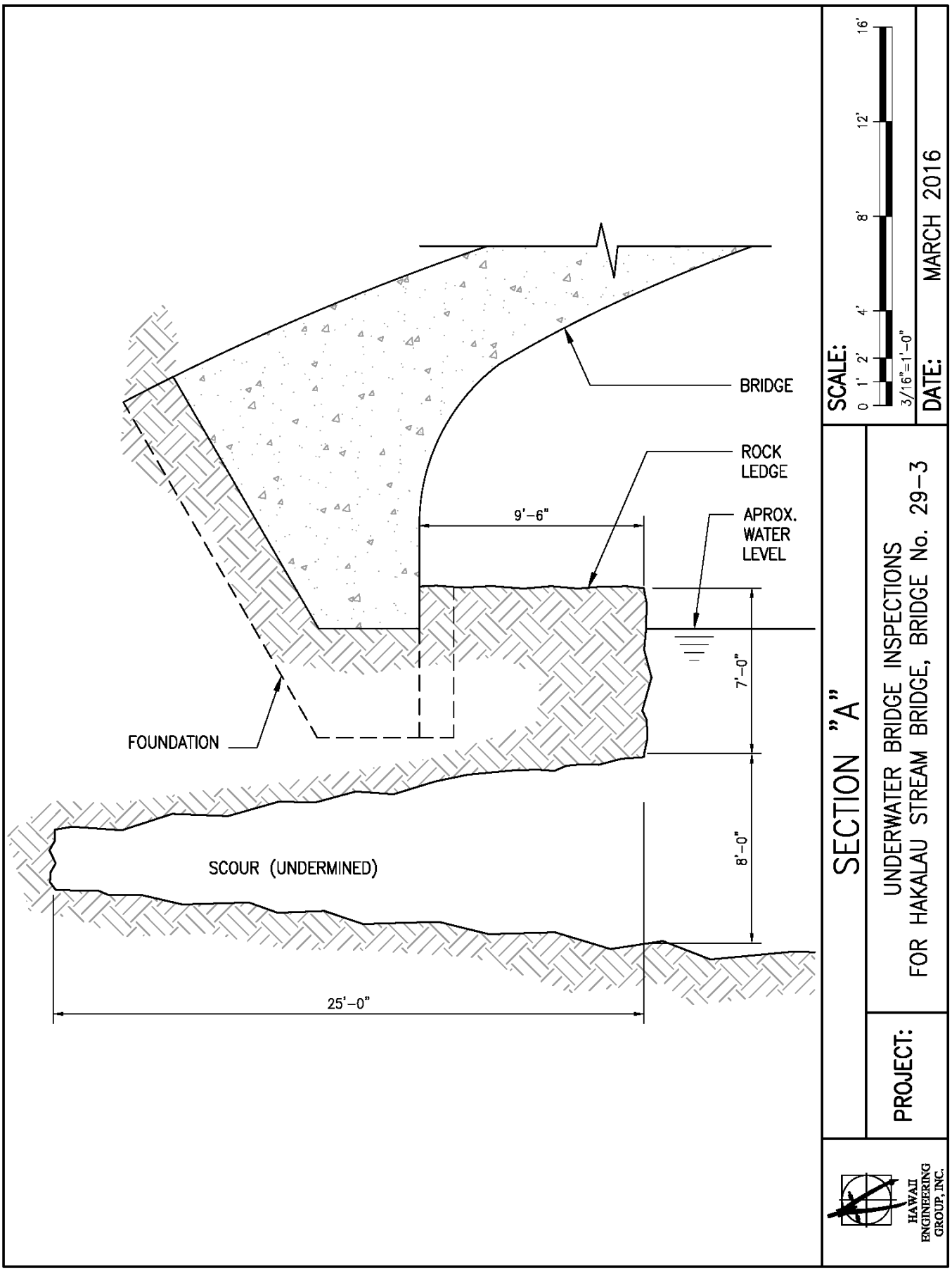
SITE MAP
NTS

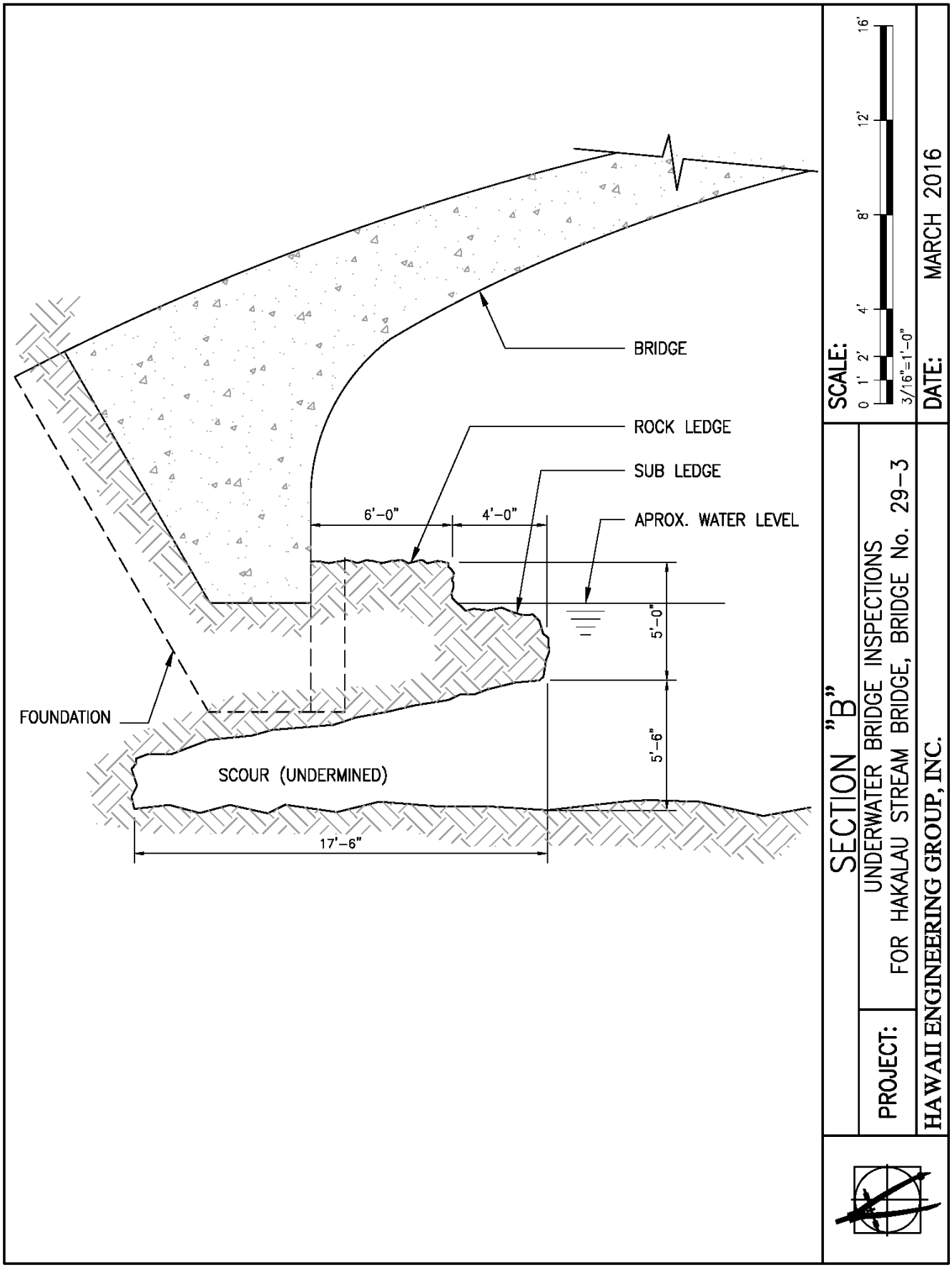

A
B
C
D
15'-0"
68'-0"
15'-0"
OLD MAMALAHOA HWY
NORTH
HEG-1 REF
ELEV = 100.00'
"□" CUT ON
CONC CURB
BELOW RAIL
UPSTREAM
FLOW
FLOW
DOWNSTREAM
CONC RAIL
AC PAVEMENT
20'-8"
SCALE:
0 1' 2' 4' 8' 16' 24' 32'
3/32"=1'-0"
DATE: MARCH 2016
BRIDGE PLAN
PROJECT:
UNDERWATER BRIDGE INSPECTIONS
FOR HAKALAU STREAM BRIDGE, BRIDGE No. 29-3
HAWAII ENGINEERING GROUP, INC.

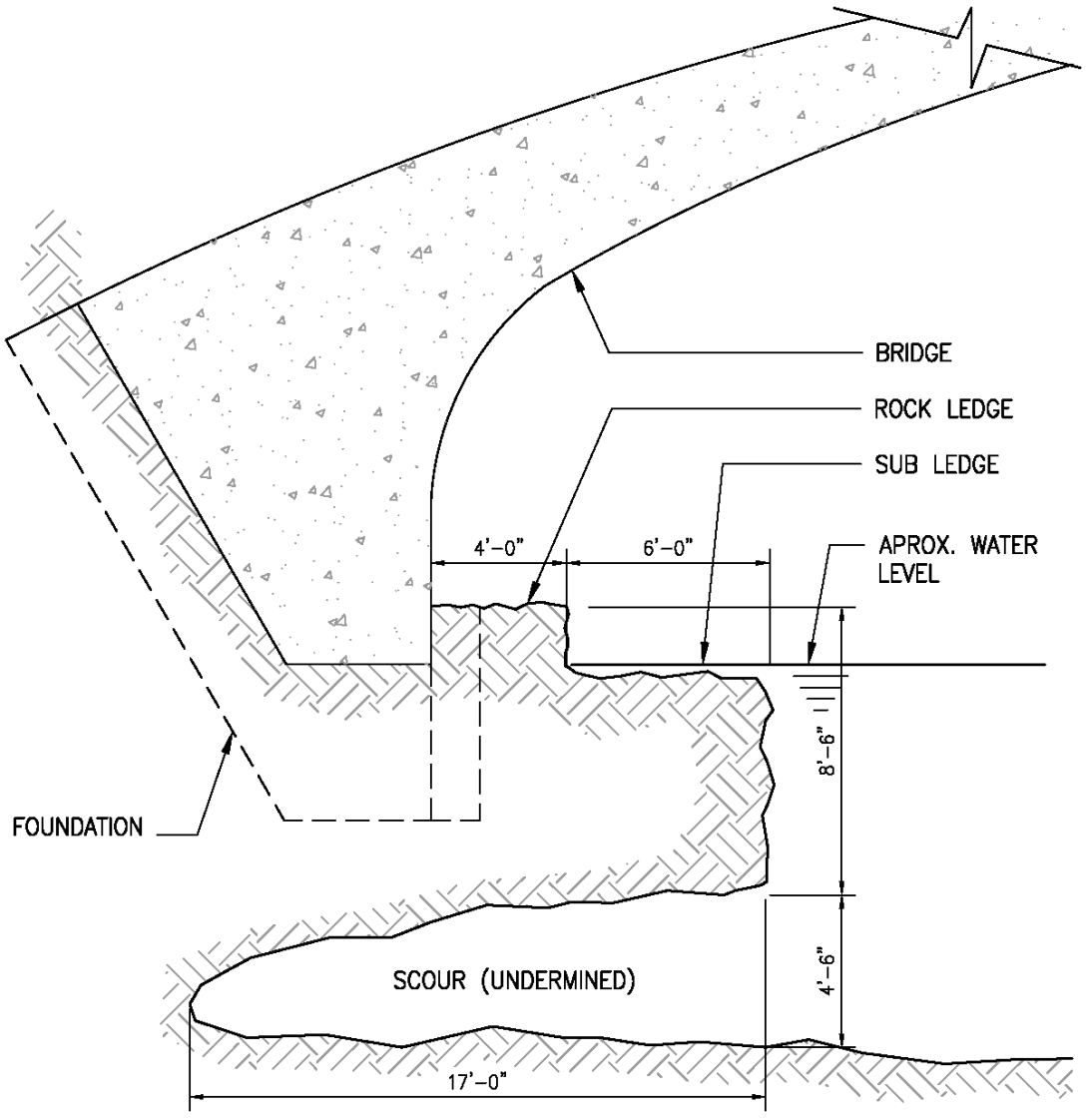

UPSTREAM ELEVATIONS
UNDERWATER BRIDGE INSPECTIONS
FOR HAKALAU STREAM BRIDGE, BRIDGE No. 29-3
PROJECT:
HAWAII ENGINEERING GROUP, INC.
SCALE: 3/32"=1'-0"
DATE: MARCH 2016
98'-0"
68'-0"
34'-0"
34'-0"
15'-0"
15'-0"
HEG-1 REF (DOWN STREAM SIDE) ELEV=100.00' SEE BRIDGE PLAN
WATER LEVEL @ EL.79.0'
47'-0 1/2"±
88.42'
86.42'
82.42'
82.62'
82.67'
73.42'
73.42'
66.32'
63.57'
62.32'
62.97'
63.12'
62.35'
65.59'
68.21'
66.8'
69.67'
SCOUR (UNDERMINED)


A
B
C
D
15'-0"
34'-0"
98'-0"
68'-0"
34'-0"
15'-0"
HEG-1 REF ELEV=100.00'
SEE BRIDGE PLAN
82.52'
81.67'
80.23'
77.72'
SCOUR (UNDERMINED)
71.42'
71.42'
71.67'
68.62'
67.67'
66.72'
66.67'
64.22'
62.97'
61.62'
66.62'
73.02'
77.37'
58'-2"±
WATER LEVEL
@ EL.79.0'
SCALE:
0 1' 2' 4' 8' 16' 24' 32'
3/32"=1'-0"
DATE: MARCH 2016
DOWNSTREAM ELEVATIONS
UNDERWATER BRIDGE INSPECTIONS
FOR HAKALAU STREAM BRIDGE, BRIDGE No. 29-3
PROJECT:
HAWAII ENGINEERING GROUP, INC.


NORTH
FRACTURE CRACKS & EROSION ON ROCK LEDGE
APPROX. AREA OF SCOUR BELOW
APPROX. SCOUR BOUNDRY BELOW (SEE SECTIONS)
NORTH SIDE
UPSTREAM
DOWNSTREAM
BRIDGE ABUTMENT
SUB-LEDGE
ROCK LEDGE
A
B
C
3'-0"
6'-5"
5'-4"
6'-0"
4'-0"
6'-6"
25'-0"
22'-24'
17'-6"
6'-0"
4'-0"
17'-0"
4'-0"
6'-0"
5'-0"
1'-9"
SCALE:
0 1' 2' 4' 8' 16' 24'
1/8"=1'-0"
DATE: MARCH 2016
ABUTMENT PLAN
UNDERWATER BRIDGE INSPECTIONS
FOR HAKALAU STREAM BRIDGE, BRIDGE No. 29-3
PROJECT:
HAWAII ENGINEERING GROUP, INC.


BRIDGE
ROCK LEDGE
APROX. WATER LEVEL
9'-6"
7'-0"
8'-0"
FOUNDATION
SCOUR (UNDERMINED)
25'-0"
SECTION "A"
UNDERWATER BRIDGE INSPECTIONS
FOR HAKALAU STREAM BRIDGE, BRIDGE No. 29-3
PROJECT:
SCALE:
0 1' 2' 4' 8' 12' 16'
3/16"=1'-0"
DATE:
MARCH 2016
HAWAII ENGINEERING GROUP, INC.


BRIDGE
ROCK LEDGE
SUB LEDGE
APROX. WATER LEVEL
6'-0"
4'-0"
5'-0"
5'-6"
FOUNDATION
SCOUR (UNDERMINED)
17'-6"
SCALE:
0 1' 2' 4' 8' 12' 16'
3/16"=1'-0"
DATE: MARCH 2016
SECTION "B"
PROJECT: UNDERWATER BRIDGE INSPECTIONS
FOR HAKALAU STREAM BRIDGE, BRIDGE No. 29-3
HAWAII ENGINEERING GROUP, INC.



SCALE: 0 1' 2' 4' 8' 12' 16' 3/16"=1'-0"

DATE: MARCH 2016

SECTION "C"

PROJECT: UNDERWATER BRIDGE INSPECTIONS FOR HAKALAU STREAM BRIDGE, BRIDGE No. 29-3

HAWAII ENGINEERING GROUP, INC.

APPENDIX E
PRE-DIVE AND POST-DIVE CHECKLISTS

General Pre-Dive Operations Checklist

Project Name: BIG ISLAND B MOLE IMSP. Project No. 35216

Location: HAKALAU, HI Date 2/3/16

1. **Paperwork / Reporting**
   - [✓] Diving Safe Practices Manual
   - [✓] U.S. Navy Dive Manual
   - [✓] Dive Logs
   - [✓] Pre-Dive Equipment Checklist
   - [✓] Post-Dive Checklist

2. **First Aid / Emergency**
   - [✓] Stokes Litter
   - [✓] First Aid Kit
   - [✓] First Aid Manual
   - [✓] DAN approved O2 resuscitation system

3. **Safety**
   - [✓] Conduct pre-dive safety meeting and dive briefing
   - [✓] Display proper signals indicating underwater operations: International Code flag "Alpha" and recreational SCUBA flag.

2/3/16

Diving Supervisor Date

B. Checklist for Equipment and Procedures

1. Basic Preparation:

[✓] 1. Verify that proper signals indicating underwater operations being conducted are displayed correctly.

[✓] 2. Ensure that all personnel concerned, or in the vicinity, are informed of diving operations.

[✓] 3. Determine that all valves, switches, controls, and equipment components affecting diving operation are tagged-out to prevent accidental shut-down or activation.

2. Equipment Protection:

[✓] 1. Assemble all members of the diving team and support personnel (if applicable) for a pre-dive briefing.

[✓] 2. Assemble and lay out all dive equipment, both primary equipment and standby spares for diver (or standby diver), including all accessory equipment and tools.

[✓] 3. Check all equipment for superficial wear, tears, dents, distortion, or other discrepancies.

[✓] 4. Check all masks, helmets, view ports, faceplates, seals, and visors for damage.

[✓] 5. Check all harnesses, laces, strain reliefs, and lanyards for wear; renew as needed.

3. General Equipment:

[✓] 1. Check that all accessory equipment – tools, lights, special systems, spares, etc., – are on site and in working order.

[✓] 2. Erect diving stage or attach diving ladder. If using contractor-supplied ladder or stage, inspect for condition and safety.

4. Preparing the Diving System:

[✓] 1. Check that a primary and suitable back-up air supply is available with a capacity to completely service all divers including decompression, recompressions and accessory equipment throughout all phases of the planned operation.

2. ~~**COMPRESSORS:**~~ N/A - USED HP AIR

~~[ ] a.~~ Determine that sufficient fuel, coolant and lubricants are available to service all components throughout the operation. All compressors should be fully fueled, lubricated, and serviced.

~~[ ] b.~~ Check maintenance and repair logs to ensure the suitability of the compressor (both primary and back-up) to support the operation.

~~[ ] c.~~ Verify that all compressor controls are properly marked and any remote valving is tagged with "Divers Air Supply - Do Not Touch" signs.

~~[ ] d.~~ Verify that oil in the compressor is an approved type. Check that the compressor oil does not overflow Fill mark; contamination of air supply could result from fumes or oil mist.

[ ] e. Check that compressor exhaust is vented away from work areas and, specifically, does not foul the compressor intake

[ ] f. Check that compressor intake is obtaining a free and pure suction without contamination. Use pipe to lead intake to a clear suction if necessary.

[ ] g. Check all filters, cleaners and oil separators for cleanliness.

[ ] h. Bleed off all condensed moisture from filters and from the bottom of volume tanks. Check all manifold drain plugs, and that all petcocks are closed.

[ ] i. Check that all belt-guards are properly in place on drive units.

[ ] j. Check all pressure-release valves, check valves and automatic unloaders

[ ] k. Verify that all supply hoses running to and from compressor have proper leads, do not pass near high-heat areas such as steam lines, are free of kinks and bends, and are not exposed on deck in such a way that they could be rolled over, damaged, or severed by machinery or other means.

[ ] l. Verify that all pressure supply hoses have safety lines and strain reliefs properly attached.

5. Activate the Air Supply in accordance with approved Operating Procedures.

1. **Compressors:** N/A

[ ] a. Ensure that all warm-up procedures are completely followed.

[ ] b. Check all petcocks, filler valves, filler caps, overflow points, bleed valves, and drain plugs for leakage or malfunction of any kind.

[ ] c. Verify that there is a properly functioning pressure gauge on the air receiver and that the compressor is meeting its delivery requirements.

2. **Cylinders:**

[✓] a. Gauge all cylinders for proper pressure.

[✓] b. Verify availability and suitability of reserve cylinders.

[✓] c. Check all manifolds and valves for operation.

[✓] d. Activate and check delivery.

For all supply systems, double check "Do Not Touch" tags (tags outs).

6. Diving Hoses:

[✓] 1. Ensure all hoses have a clear lead and are protected from excessive heating and damage.

[✓] 2. Check that hoses are free of moisture, packing material, or chalk.

[✓] 3. Soap test hose connections after connection to air supply and pressurization.

[✓] 4. Ensure umbilical boots are in good condition

7. Test Equipment with Activated Air Supply

[✓] 1. Hook up all air hoses to helmets, masks and chamber; make connections between back-up supply and primary supply manifold

[✓] 2. Verify flow to helmets and masks.

[✓] 3. Check all exhaust and non-return valves.

[✓] 4. Hook up and test all communications

[✓] 5. Check air flow from both primary and back-up supplies to chamber.

8. **~~Recompression Chamber Checkout (Predive only):~~** N/A - No "D" DIVING

- [ ] ~~1.~~ Check that chamber is completely free and clear of all combustible materials.
- [ ] ~~2.~~ Check primary and back-up air supply to chamber and all pressure gauges.
- [ ] ~~3.~~ Check that chamber is free of all odors or other contaminants.
- [ ] ~~4.~~ Hook up and test all communications.
- [ ] ~~5.~~ Check air flow from both primary and back-up supplies to chamber

9. **Final Preparations:**

- [✓] 1. Verify that all necessary records, logs, and timesheets are on the diving station.
- [✓] 2. Check that appropriate decompression tables are readily at hand.
- [✓] 3. Place the dressing bench in position, reasonably close to the diving ladder or stage, to minimize diver travel.

2/3/16
Tender Date

2/3/16
Diving Supervisor Date

C. Activity Hazard Analysis

Project Name: BIG ISLAND BRIDGE INSP.		Project No. 35216
Location: HAKALAU, HI		Date 2/3/16
DIVING ASSIGNMENTS *(Provide Names)*	Diver 1: PAUL ROBERTS	Standby Diver: WYATT REDONDO
	Diver 2: —	Dive Supervisor: TYLER BORLEE

1. Assemble and Lay Out Dive Equipment:

[✓] Primary air tanks, check for proper pressure.
[✓] Backup air tanks, check for proper pressure.
[✓] Erect diver access ladder.
[✓] Check that all accessory equipment – tools, lights – are on-site and in working order.
[✓] Verify availability of spare cylinder.

2. Personal Diving Gear:

Diver 1	Diver 2	Standby Diver	Gear
[✓]	[ ]	[✓]	~~Mask~~ DIVE HELMET
[✓]	[ ]	[✓]	Fins with Booties or Boots
~~[ ]~~	[ ]	~~[ ]~~	~~BCD~~ N/A
[✓]	[ ]	[✓]	Wet Suit
[✓]	[ ]	[✓]	Gloves
[✓]	[ ]	[✓]	Knife
~~[ ]~~	[ ]	~~[ ]~~	~~Weight Belt~~ N/A
[✓]	[ ]	[✓]	Depth Gage
[✓]	[ ]	[✓]	Primary Air Cylinder ~~& Regulator~~ OK
[✓]	[ ]	[✓]	Backup Air Cylinder ~~& Regulator~~ OK
1,800		1800	Check Primary Cylinder (psi) K-BOTTLE
3,000		3,000	Check Backup Cylinder (psi) 30 CU. FT BAILOUT
[ ]	[ ]	[ ]	
[ ]	[ ]	[ ]	

3. Equipment Found Defective: N/A

Diving Supervisor — Date 2/3/16

ACTIVITY HAZARD ANALYSIS
(Daily Hazard Analysis / Control Report)

Project No. 35216 Project Name: B26 ISLAND BRIDGE INSP.

Activity Date: 2/3/16 Submitted by Contractor: **Sea Engineering Inc.** Contractor's Repr: _____ Signature and Title

Accepted by Govt. Repr. _____ Signature and Title Comments by Govt. Repr: _____

Work Location and Description: UW INSP. OF HAKALAU STREAM BRIDGE

PHASE NO.	ACTIVITY	POTENTIAL HAZARDS	PRECAUTIONARY ACTION & CONTROL TO BE TAKEN
1	SETUP	SLIPS, TRIPS, FALLS	PROPER KNOTS FOR DIVE
			LADDER / ACCESS LADDER
			ATTACHMENT, WEAR PPE,
			ORGANIZED DIVE STATION
2	DIVING	ENTRAPPED DIVER	DIVER - ENSURE BODY & EQUIP
			CAN FIT IN ANY AREA
			NEAR APPURTENANTS PRIOR
			TO DIVING OPERATIONS.
			KEEP INSPECTION TOOLS
			CLOSE TO BODY WHEN
			TRAVELLING. TENDER -
			LINE TEND DIVER, GOOD
			COMMS w/ DIVE SUP.

Site Conditions:

Air Temp.	Winds	Sea State	Surf	Current	Visibility	Water Temp.
☐ Cold	☑ Slack	☑ Calm	☑ < 1 ft	☑ Slack	☐ > 1 ft	☐ Cold
☐ Moderate	☐ Moderate	☐ Moderate	☐ 1 – 2 ft	☐ Moderate	☐ 1 – 3 ft	☑ Moderate
☑ Warm	☐ Heavy	☐ Rough	☐ 2 – 3 ft	☐ Heavy	☐ 3 – 10 ft	☐ Warm
☐ _____	☐ _____	☐ _____	☐ > 3 ft	☐ _____	☑ > 10 ft	☐ _____

Anticipated Changes in Site Conditions: _____ Sheet 1 of 1 Sheets

SEA ENGINEERING, INC. DIVING LOG

Project Name: BI ISLAND BRIDGE INSP Date: 2/3/16

Location: HAKALAU, HI (HAKALAU STREAM BRIDGE) Project No.: 35216

Diver: PAUL ROBERTS Dive Tender: TYLER BORGE

Standby Diver: WYATT REDONGO Diver Supervisor: TYLER BORGE

Last Previous Dive (date, time) 72+ HRS

DIVING CONDITIONS:

AIR TEMP	WINDS	SEA STATE	SURF	CURRENT	VISIBILITY	WATER TEMP
☐ Cold	☑ Slack	☑ Calm	☑ < 1 ft.	☑ Slack	☐ < 1 ft.	☐ Cold
☐ Moderate	☐ Moderate	☐ Moderate	☐ 1 – 2 ft.	☐ Moderate	☐ 1 – 3 ft.	☑ Moderate
☑ Warm	☐ Heavy	☐ Rough	☐ 2 – 3 ft.	☐ Heavy	☐ 3 – 10 ft.	☐ Warm
☐	☐	☐	☐ > 3 ft.	☐	☑ > 10 ft.	☐

BREATHING MEDIUM:
☑ AIR
☐
OTHER:

EQUIPMENT USED:
☑ SURFACE SUPPLIED
☐ OTHER:

DIVE PROFILE:	DIVE NO. 1	DIVE NO. 2	DIVE NO. 3	DIVE NO. 4	DIVE NO. 5
MAXIMUM DEPTH	15'				
REPET. GROUP AT START	–				
RESIDUAL NITROGEN TIME	–				
NO DECOMPRESSION TIME	449 min				
FREE TIME THIS DIVE	"				
OUT OF FREE TIME (HH:MM)	–				
TOTAL PLANNED BOTTOM TIME	90 min				
OUT OF BOTTOM TIME (HH:MM)	07:29				
LEAVE SURFACE	0800				
LEAVE BOTTOM	0915				
BOTTOM TIME	475 min				
RESIDUAL NITROGEN TIME	–				
TOTAL BOTTOM TIME	75 min				
REPET. GROUP AFTER DIVE	C				
SURFACE INTERVAL	–				
REPET. GROUP AFTER S.I.	–				

WORK ACCOMPLISHED:

UW INSPECTION OF NORTH & SOUTH ABUTMENTS

Diving Supervisor — 2/3/16 Date

E. **Post Dive Checklist**			Project No. 35216	
Location: HAKALAU, HI			Date 2/3/16	
Diver Name	Physical Condition	No Fly Time Notification	Hyperbaric Notification	Emergency Phone
N/A		12 hrs	Kuakini Medical Center Oahu (808) 5387-3425	911
		12 hrs	Kuakini Medical Center Oahu (808) 5387-3425	911
		12 hrs	Kuakini Medical Center Oahu (808) 5387-3425	911
		12 hrs	Kuakini Medical Center Oahu (808) 5387-3425	911

EQUIPMENT

- ☑ Breathing Cylinders secured
- ☑ Dive Flags/Markers secured
- ☑ Oxygen Resuscitation secured
- ☑ Emergency Equipment secured
- ☑ Diving Equipment secured
- ☐ Other: _____
- ☐ Other: _____
- ☑ Jobsite secured

REPORTING

- ☑ Diving Logs complete
- ☐ Authorities notified, if any N/A
- ☑ Client Notified, when on site

SAFETY

YES	NO	
☐	☑	Any unmarked hazards to navigation remain?
☐	☑	Any defective equipment identified today?
☐	☑	Any lost time or reportable accidents today?
☐	☑	Any procedures or conditions determined unsafe today?

List Precautions Taken: SAFE DIVING PRACTICES

Diving Supervisor — Date 2/3/16