Department of Public Works

February 9, 2017

Hakalau Stream Bridge
Old Māmalahoa Highway
Bridge No. 001290001100003, 29-3

HAKALAU BRIDGE NO. 29 SHEET 1 OF 4 SHEETS

Rubble Masonry Guard Wall

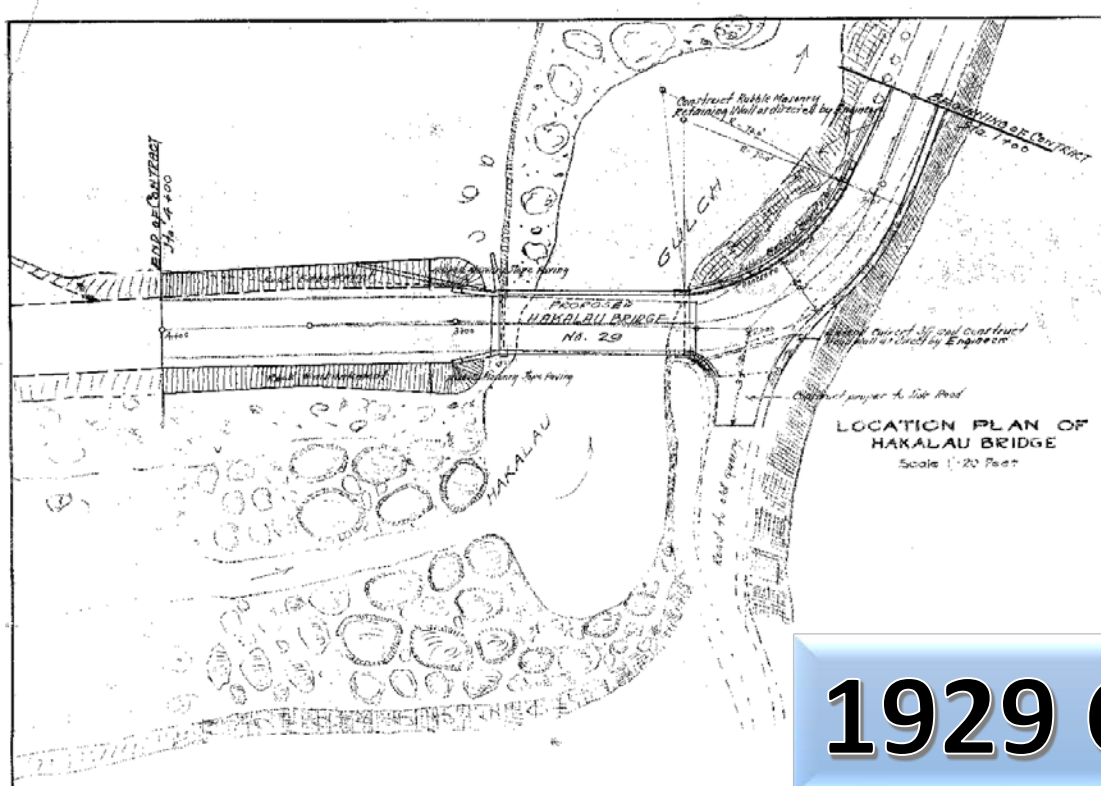
1929

APPROVED Oct. 2, 1929

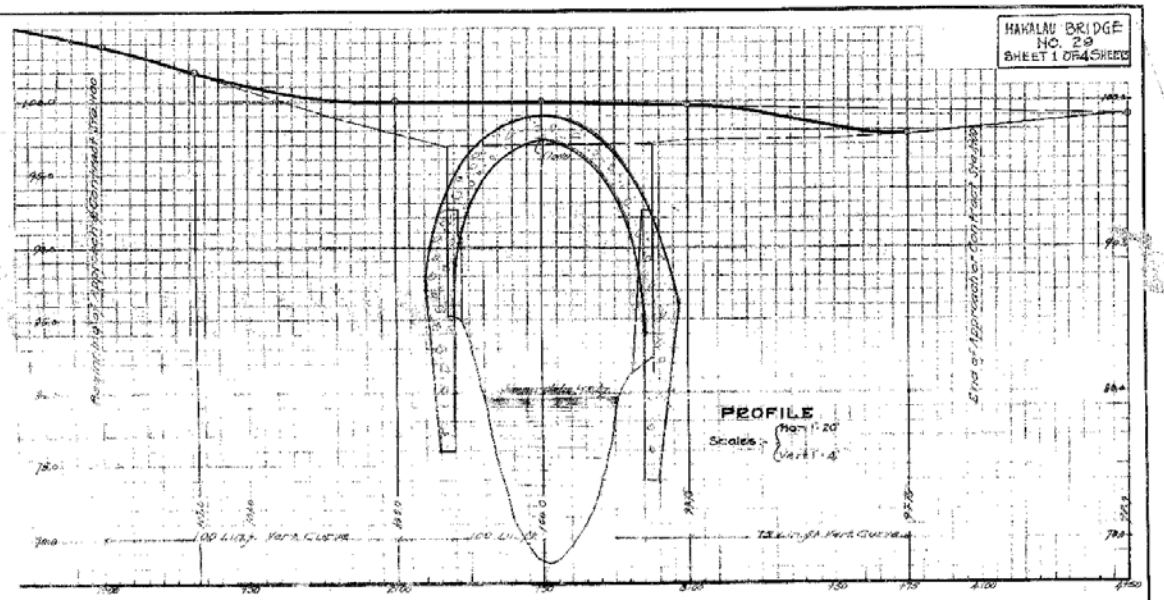
MAKAI ELEVATION

Scale: 1"=4'

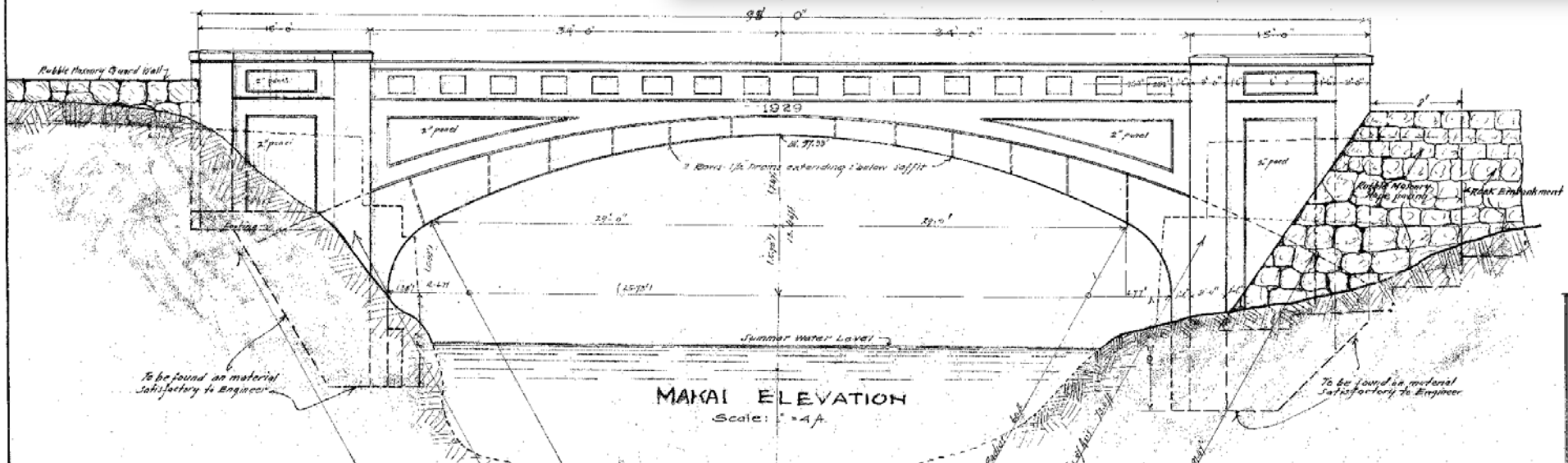
The Hakalau Stream Bridge is located in South Hilo, County of Hawai'i, Hawai'i. Bride No. 29 is on the Old Māmalahoa Highway and crosses over the Hakalau Stream. The bridge is a reinforced concrete structure with closed spandrel arches, with concrete abutment and was built in 1930. It measures approximately 22' -6" wide out-to-out and 68' in length.



LOCATION PLAN OF HAKALAU BRIDGE
Scale 1:20 Feet



1929 CONSTRUCTION PLANS



MAKAI ELEVATION
Scale: 1"=4'

APPROVED Oct. 2, 1929
Supt. of Public Works

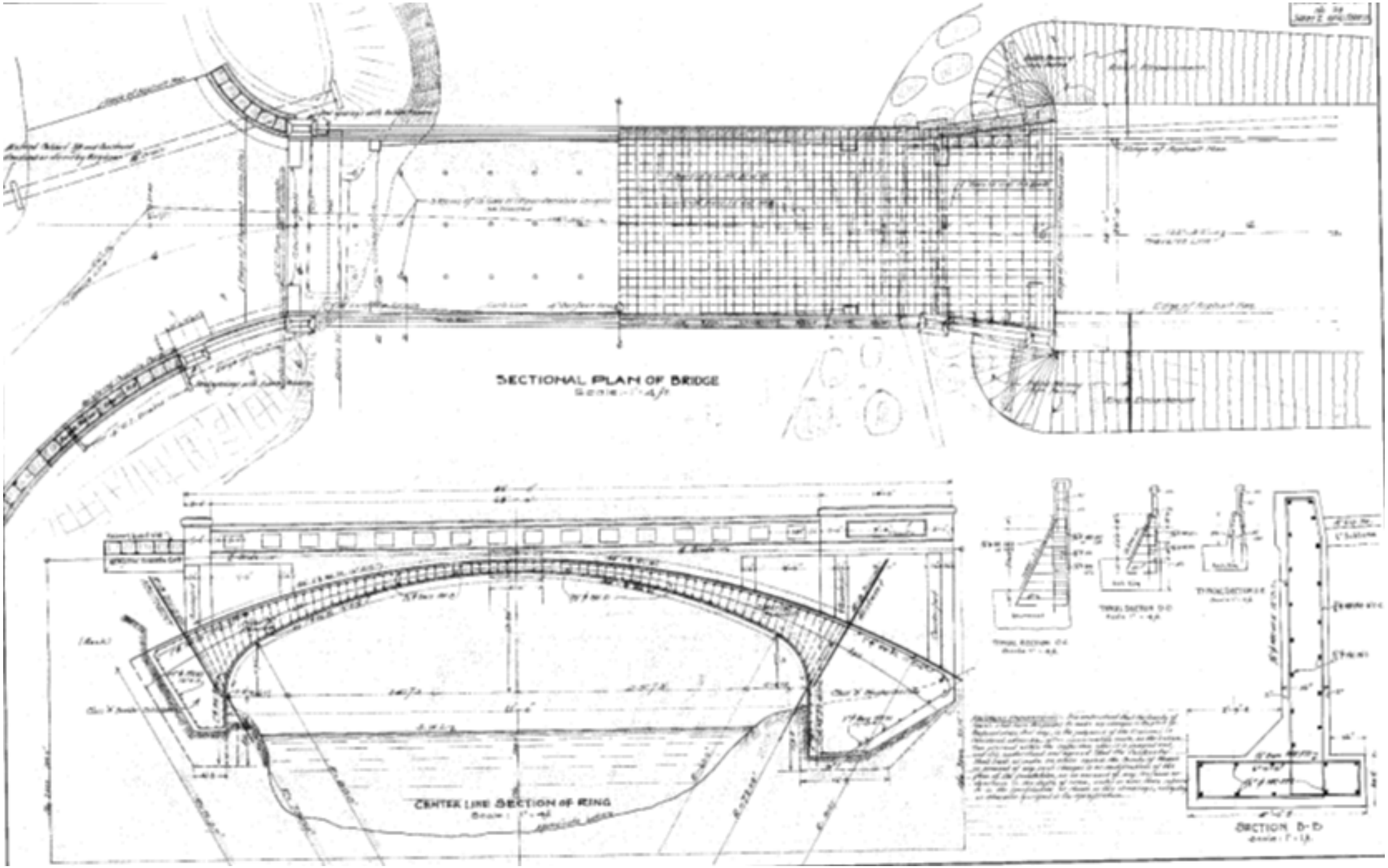
APPROVED October 8th 1929
Chairman & Executive Officer

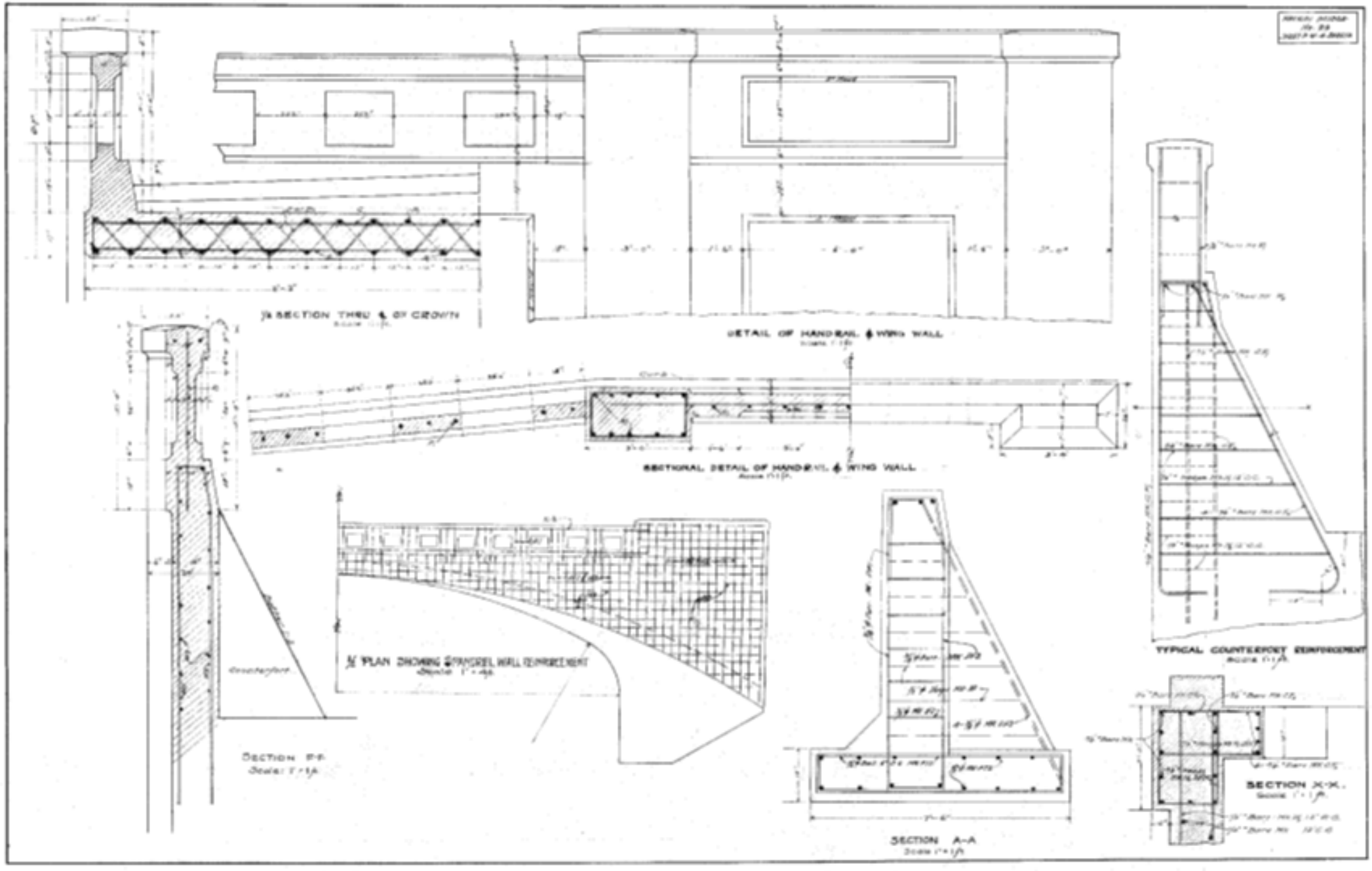
OFFICE OF CITY & COUNTY ENGINEER
NO.- HAKALAU BRIDGE - 29
DISTRICT OF SOUTH HILO, HAWAII.
JOB NO. 688
ITEM 38 ACT 27; SESSION LAWS, 1927,
AS AMENDED BY ACT 254, ITEM 37, S.L. 1929.

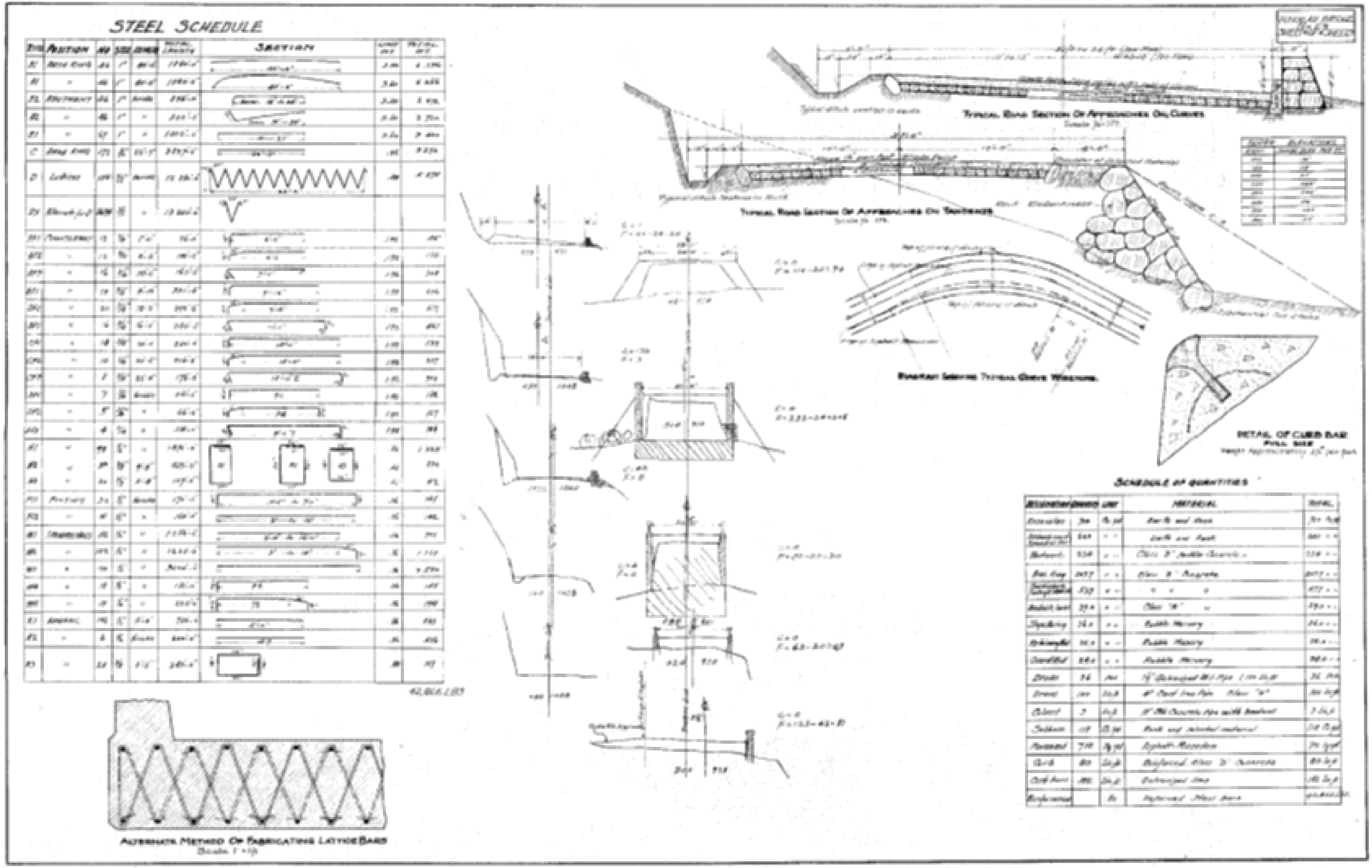
BY: E.L.W. L.W.H.C.
PLANS BY: W.H.C.
TRACED BY: W.H.C. A.H.C.
SPECIFICATIONS: W.H.C.

CHECKED BY:-
SCALES AS NOTED.
SEPTEMBER - 1929

APPROVED:

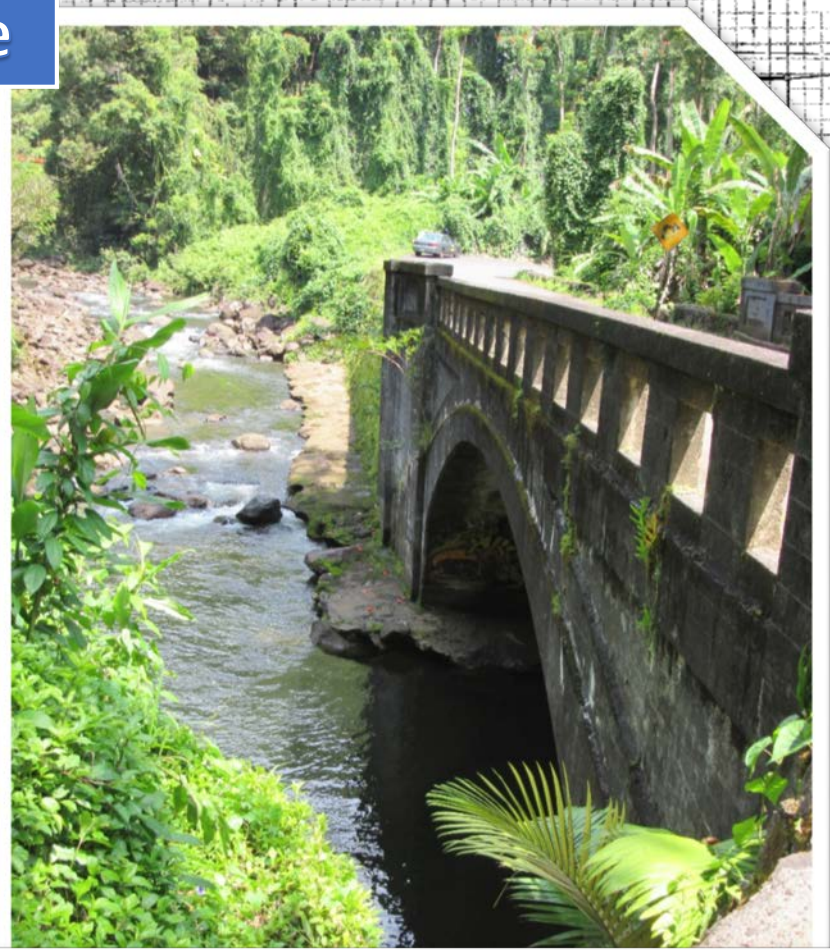

SECTIONAL PLAN OF BRIDGE
CENTER LINE SECTION OF RING
SECTION B-B


½ SECTION THRU ℄ OF CROWN
DETAIL OF HANDRAIL & WING WALL
SECTIONAL DETAIL OF HANDRAIL & WING WALL
½ PLAN SHOWING SPANDREL WALL REINFORCEMENT
SECTION F-F
SECTION A-A
TYPICAL COUNTERFORT REINFORCEMENT
SECTION K-K.



STEEL SCHEDULE
SECTION
TYPICAL ROAD SECTION OF APPROACHES ON CURVES
TYPICAL ROAD SECTION OF APPROACHES ON TANGENTS
SKETCH SHOWING TYPICAL CURVE WIDENING
DETAIL OF CURB BAR
FULL SIZE
SCHEDULE OF QUANTITIES
MATERIAL
TOTAL
ALTERNATE METHOD OF FABRICATING LATTICE BARS

2015 Photos of Bridge



2015 Photos of Bridge

PROFILE

MAKAI ELEVATION
Scale: 1"=4'

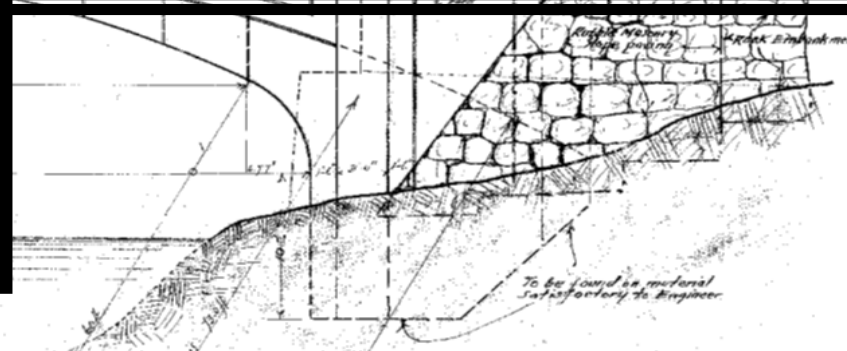
APPROVED Oct. 2, 1929
Supt. of Public Works

APPROVED October 8th, 1929
Chairman & Executive Officer

OFFICE OF CITY & COUNTY ENGINEER
NO.- HAKALAU BRIDGE - 29
DISTRICT OF SOUTH HILO, HAWAII.
JOB NO. 688
ITEM 38 ACT 221 SESSION LAWS, 1927.
AS AMENDED BY ACT 254, ITEM 37, S.L. 1929.
BY: E.L.W. & W.H.C. CHECKED BY:-
PLANS BY: W.H.C. SCALES AS NOTED.
TRACED BY: W.H.C. & H.C.
SPECIFICATIONS:- W.H.C. SEPTEMBER - 1929
APPROVED: CITY & COUNTY ENGINEER

2015 Photos of Bridge

2015 Photos of Bridge



APPROVED October 8th 1929
Chairman & Executive Officer

OFFICE OF CITY & COUNTY ENGINEER
NO.- HAKALAU BRIDGE - 29
DISTRICT OF SOUTH HILO, HAWAII.
JOB NO. 688
ITEM 38 ACT 271 SESSION LAWS, 1927.
AS AMENDED BY ACT 254, ITEM 37, S.L. 1929.
BY: E.L.W. & W.H.C. CHECKED BY:-
PLANS BY: W.H.C. SCALES AS NOTED.
TRACED BY: W.H.C. & R.C.
SPECIFICATIONS:- W.H.C. SEPTEMBER - 1929
APPROVED: CITY & COUNTY ENGINEER

MAKAI ELEVATION
Scale: 1" = 4'

Hakalau Stream Bridge
Underwater Inspection Report

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

Prepared for
County of Hawaii
Department of Public Works

March 2016

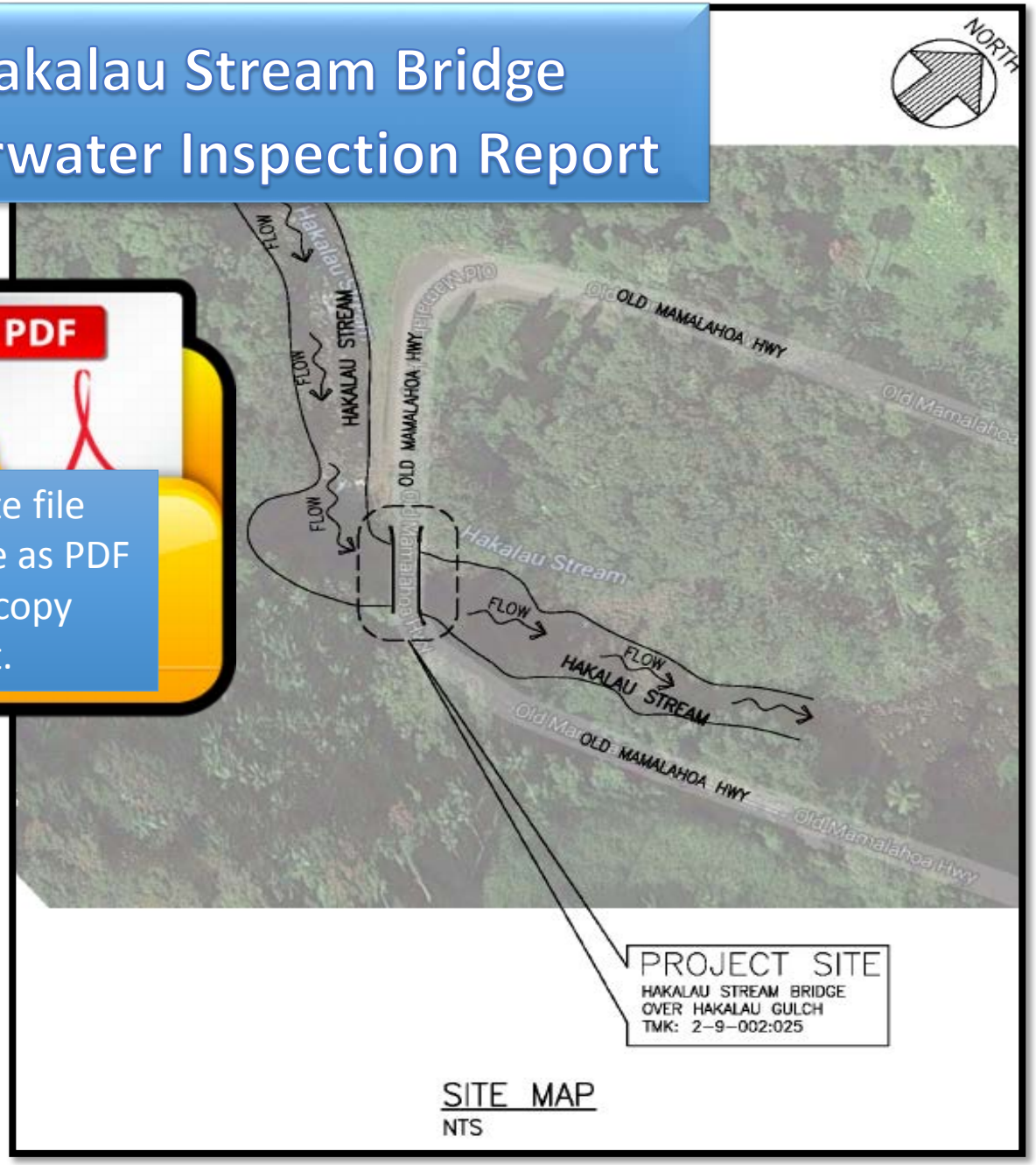
Hawaii Engineering Group, Inc.
Consulting Civil Engineers, Structural Engineers & Land Surveyors

1088 Bishop Street, Suite 2506
Honolulu, Hawaii 96813

www.hawaiiengineering.net

PDF

Complete file available as PDF or hard copy handout.



SITE MAP
NTS

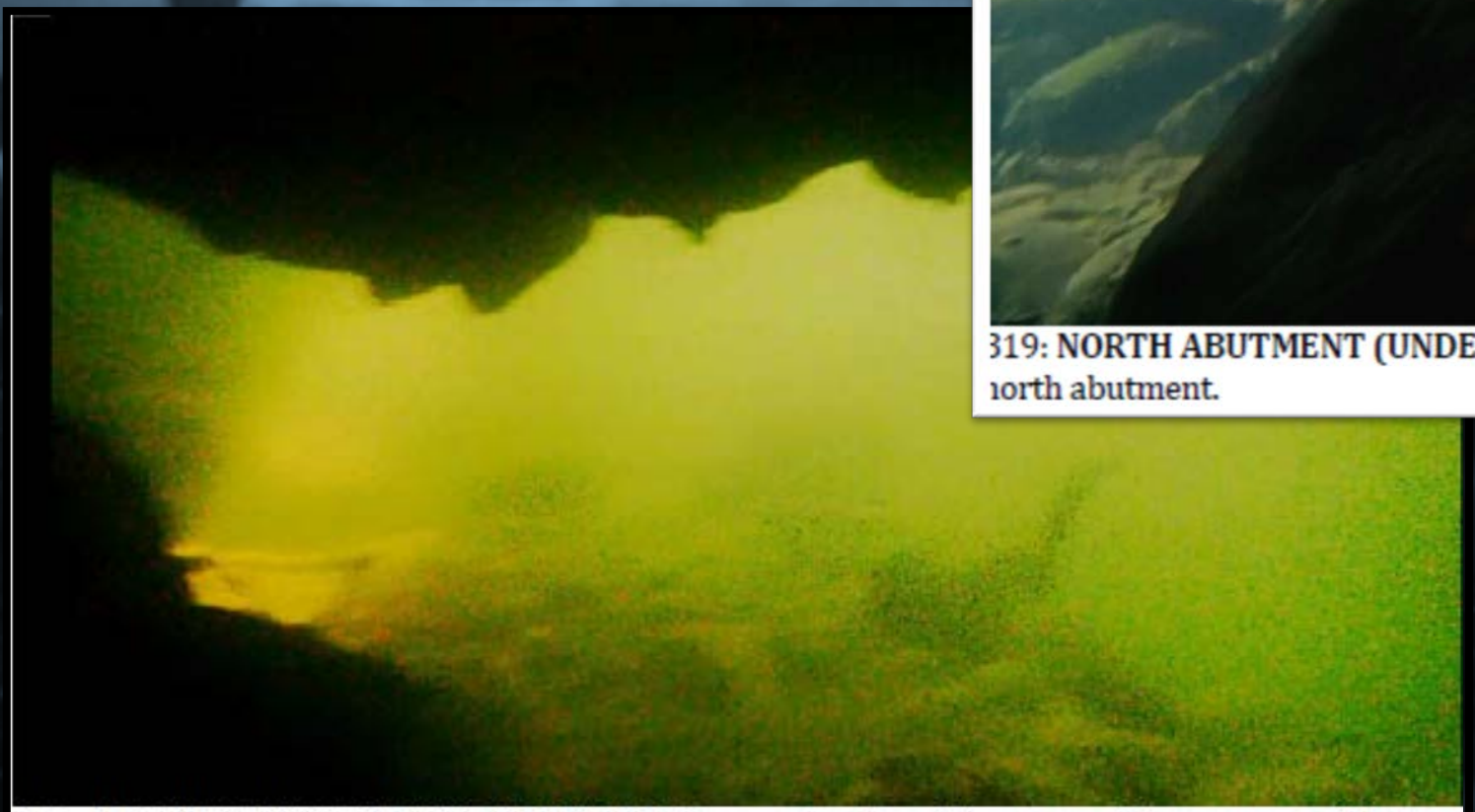
Underwater Bridge Inspection Photos

Underwater Bridge Inspection Photos

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

Underwater Bridge Inspection Photos

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



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

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

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:

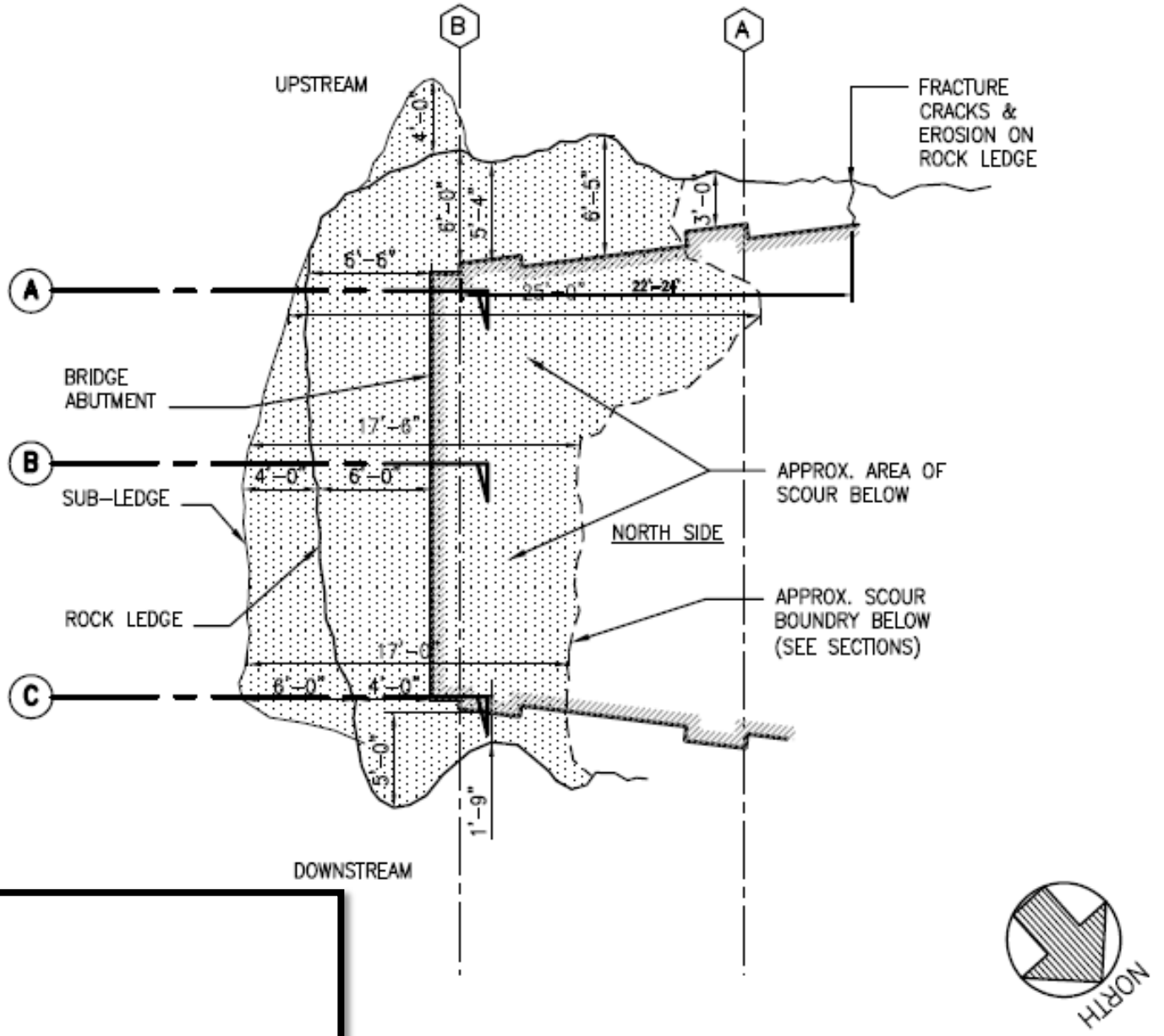
Phone Number: 808.533.2092

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

Signature:

Phone Number: 808.533.2092

Critical Damages Sketches



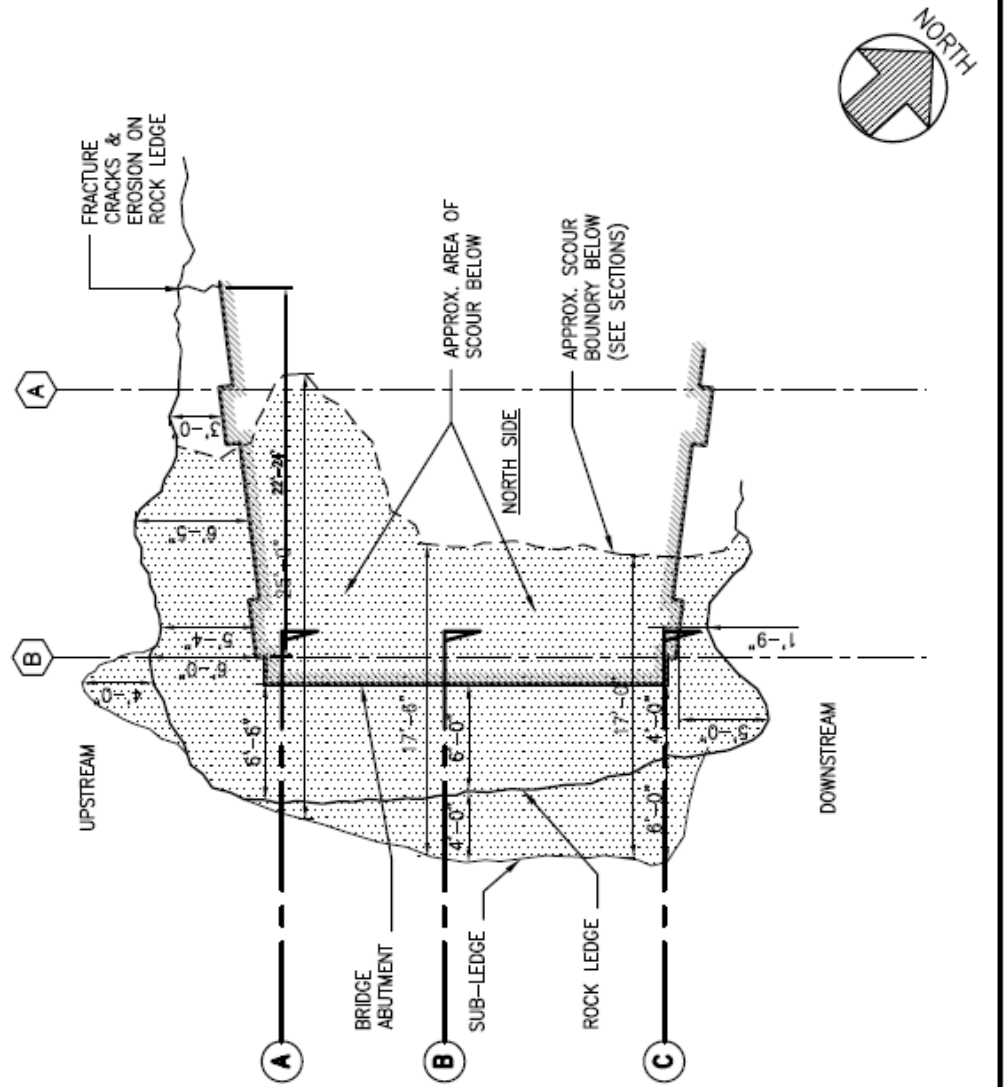
ABUTMENT PLAN

SCALE: 1/8"=1'–0"

0 1' 2' 4' 8' 16' 24'

1/8"=1'–0"

HAKALAU STREAM BRIDGE
OVER HAKALAU GULCH
BRIDGE No. 29–3



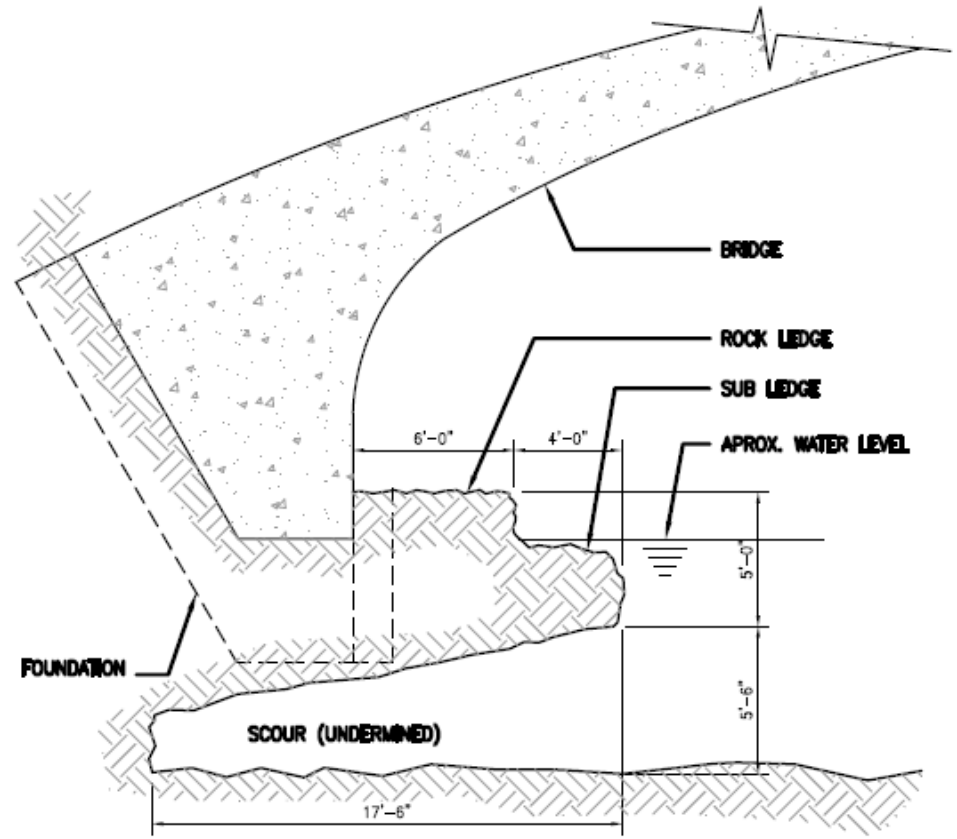
ABUTMENT PLAN

SCALE: 1/8"=1'-0"

0 1' 2' 4' 8' 16' 24'

1/8"=1'-0"

HAKALAU STREAM BRIDGE
OVER HAKALAU GULCH
BRIDGE No. 29-3



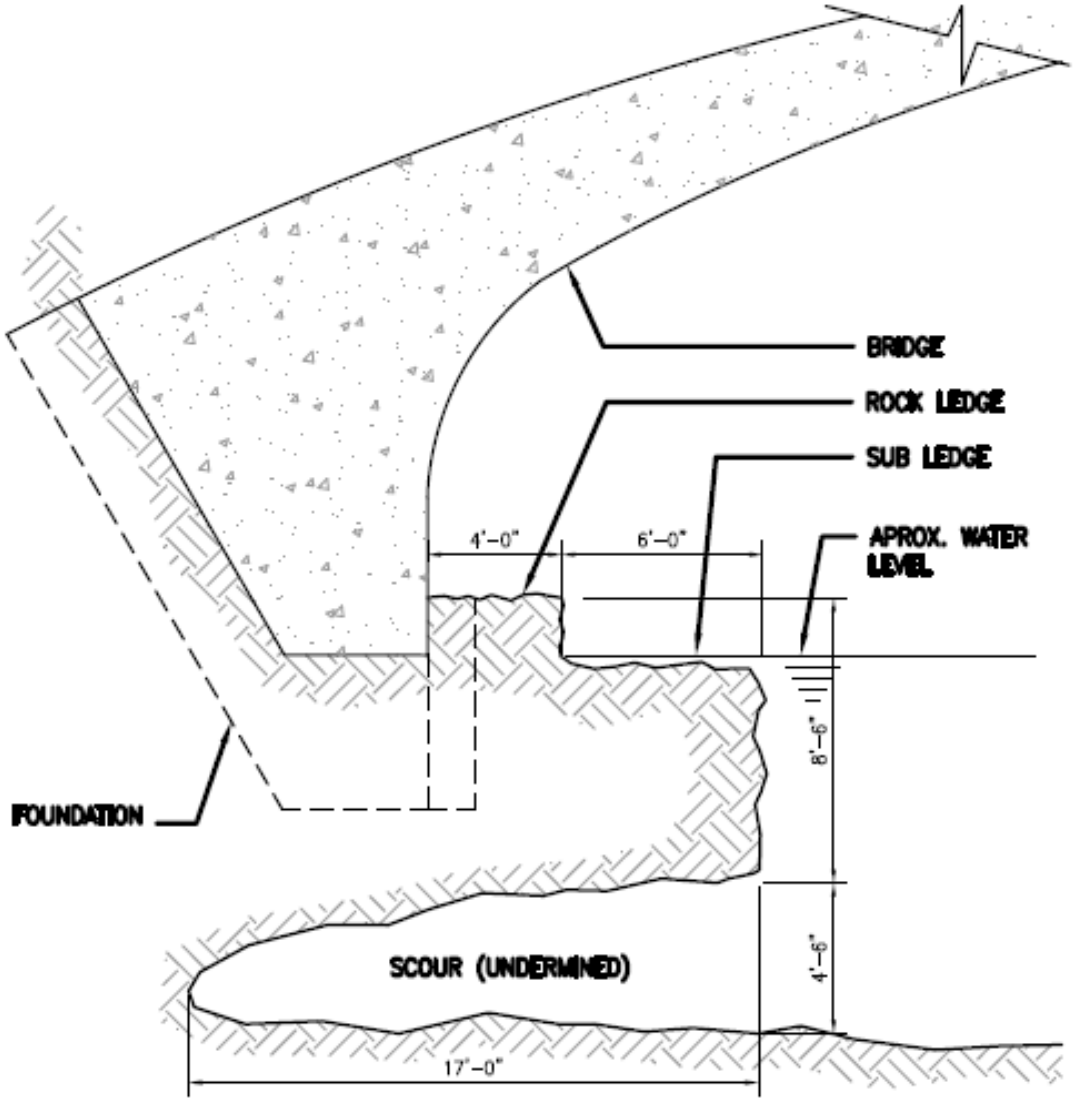
SECTION "B"

SCALE: 3/16"=1'-0"

0 1' 2' 4' 8' 12' 16'

3/16"=1'-0"

HAKALAU STREAM BRIDGE
OVER HAKALAU GULCH
BRIDGE No. 29-3



0 1' 2' 4' 8' 12' 16'

3/16"=1'-0"

SECTION "C"

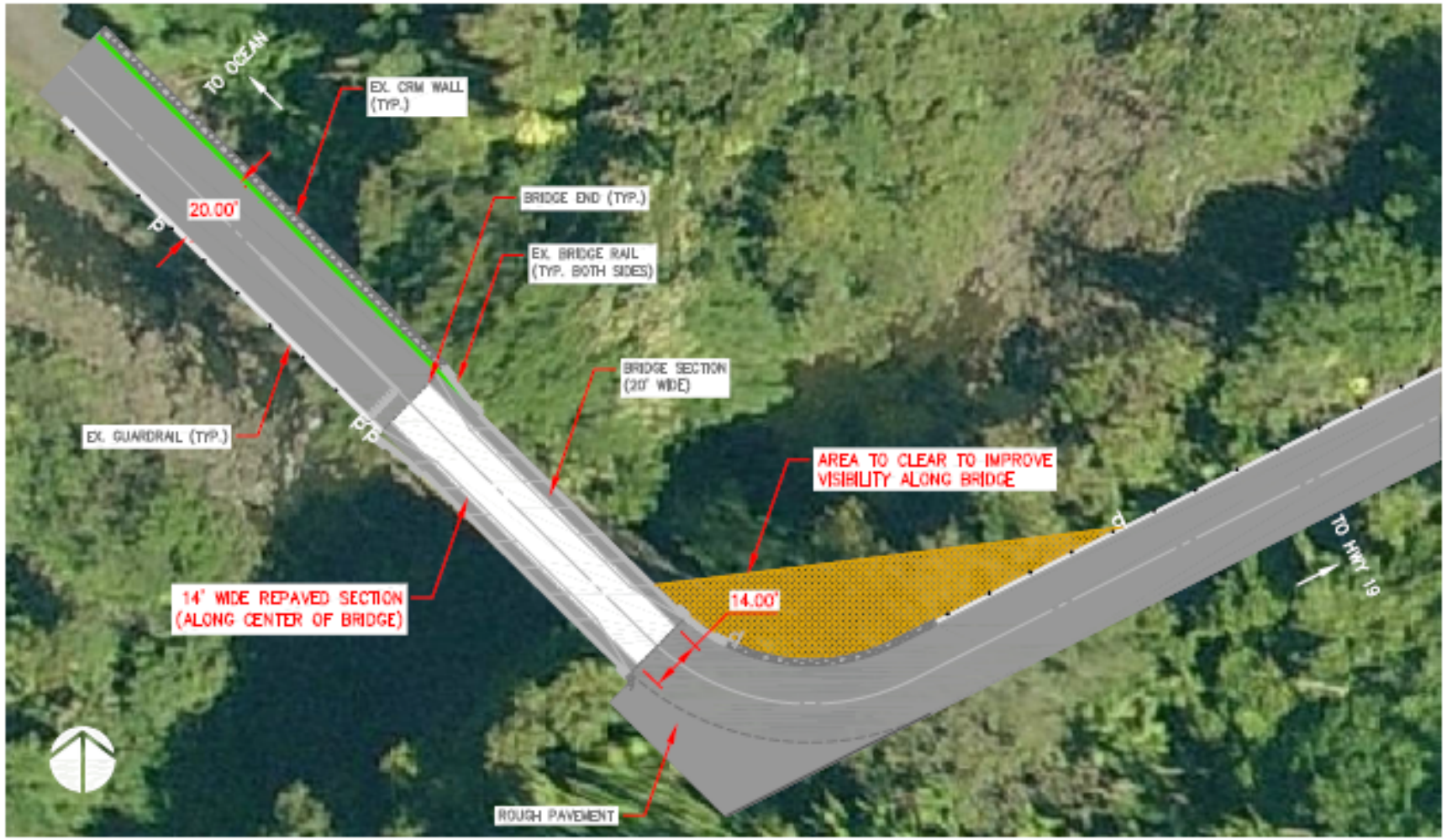
SCALE: 3/16"=1'-0"

0 1' 2' 4' 8' 12' 16'

3/16"=1'-0"

HAIKALAU STREAM BRIDGE
OVER HAIKALAU GULCH
BRIDGE No. 29-3

Precautionary Measures



PAVING AND CLEARING FOR YIELD CONDITION
OLD MAMALAHOA HWY, BRIDGE 29-3
SCALE: 1"=30'

0 30' 60'
SCALE: 1"=30'

NOTES

1. DIMENSIONS ARE MEASURED ALONG OLD MAMALAHOA HWY CENTERLINE.
2. ALL DIMENSIONS AND LINES ARE APPROXIMATE.
3. FIELD ADJUST AS REQUIRED.
4. CENTERLINE STRIPING SPACING AND SIGN SYMBOLS ARE EXAGGERATED FOR CLARITY.

PAVING AND CLEARING FOR YIELD CONDITION
OLD MAMALAHOA HWY, BRIDGE 29-3
TRAFFIC DIVISION, Department of Public Works

COUNTY OF HAWAII

IR No: 16-029
WO No:
Date: 4/7/16
Scale: 1"=30'

Drawn by: ATT
Page 3 of 3

Yogi Kwong Engineers, LLC. (YKE)
Preliminary Geotech Consultation Letter

January 23, 2017

Mr. Robert Yanabu
County of Hawaii
Department of Public Works
101 Pauahi Street, Suite 7
Hilo, Hawaii 96720

Subject: Preliminary Geotechnical Consultation Letter
North Abutment Scouring Geotechnical Issues
Hakalau Stream Bridge (No. 29-3)
Hilo, County of Hawaii, Hawaii

Dear Mr. Yanabu:

At the request of Department of Public Works, County of Hawaii, Yogi Kwong Engineers, LLC (YKE) is pleased to submit this preliminary geotechnical consultation letter summarizing our preliminary geotechnical review comments and opinions pertaining to the foundation subgrade of the north bridge abutment of Hakalau Stream Bridge. Our service was performed in accordance with the Contract with the County of Hawaii (County), dated November 14, 2016.

A. List of Information Reviewed

A list of the information provided by the County and reviewed is presented below:

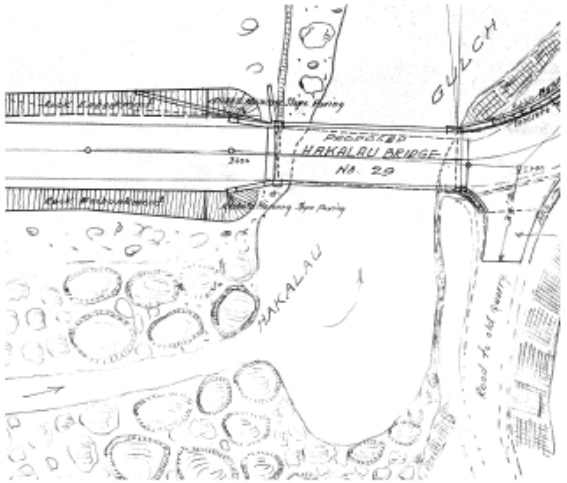
a. Report on Underwater Bridge Inspection for Hakalau Stream Bridge (Bridge no. 001290001100003) by Hawaii Engineering Group, Inc., dated March 2016.
b. Record drawings, Office of City & County Engineer, No.-Hakalau Bridge-29, District of South Hilo, Hawaii, Job No. 688, 4 sheets, dated September 1929.
c. Biennial Bridge Inspection Report, Hakalau Stream Bridge, Old Mamalahoa Highway, Bridge No. 001290001100003, 29-3, Island of Hawaii, prepared for State of Hawaii Department of Transportation, Highways Division, by County of Hawaii, Department of Public Works., dated June 2, 2015.
d. John Williams (HWY-CM) email, dated August 3, 2016.
e. Domingo Galicinao (FHWA Regional Bridge Engineer) email, dated August 4, 2016.
f. Underwater bridge inspection check list, Hakalaau Stream Bridge, NBI Bridge Number 001290001100003, dated March 2016.
g. Wesley R. Segawa & Associates, Inc. draft structural engineering consultation letter to County, undated.

Yogi Kwong Engineers, LLC
677 Ala Moana Boulevard, Suite 711
Honolulu, Hawaii 96813
Tel: 808.942.0001
Fax: 808.942.0004

Complete file available as PDF or hard copy handout.

c. The asphalt concrete road surface appeared recently repaved and cracks on the bridge concrete railings were repaired or patched.
d. The stream level was above the "rubble masonry slope paving" (Insert 4) fringing the base of the north abutment, and therefore the rubble masonry paving and undermining of the north abutment cannot be observed during the field visit (Insert 3).

Insert 3. View of "Rock Embankment" north of north abutment, looking south.



Insert 4. "Rubble Masonry Slope Paving" and "Rock Embankment" call out on 1929 record plans. North abutment is the left abutment on plan shown.

Wesley R. Segawa & Associates (WRSA) Draft Report

DRAFT 1 – 2/1/17: For review and comment. Hopefully I have incorporated all of the elements in your draft letter in spite of all the revisions I've made. I ended up mentioning the cracks in the bridge railings because they are mentioned in the YKE report.

January 31, 2017

Mr. Frank DeMarco P.E.
Director of Public Works
County of Hawaii
Department of Public Works
101 Pauahi Street, Suite 7
Hilo, HI 96720

Complete file available as PDF or hard copy handout.

Subject: Hakalau Stream Bridge (#29-3)
Structural Condition Survey Report

Wesley R. Segawa & Associates (WRSA), conducted a field visit on January 13, 2017 to observe the condition of observable portions of the Hakalau Stream Bridge for the purpose of rendering a professional opinion regarding the structural condition of the bridge at the time of our visit.

This field visit was conducted after review of the following documents provided by the County of Hawaii (COH):

1. Original construction drawings, specifications and miscellaneous contract documents (circa 1929).
2. Biennial Bridge Inspection Report, dated June 3, 2015.
3. Underwater Inspection Report by Hawaii Engineering Group (HEG), dated March 2016.
4. FHWA e-mail by Mr. Domingo Galiciano, P.E. (FWHA), dated August 4, 2016.
5. Draft Preliminary Geotechnical Consultation Letter by Yogi Kwong Engineers (YKE), dated November 15, 2016.

General Description

1. The Hakalau Stream Bridge is a reinforced concrete arch bridge spanning over Hakalau Stream.
2. The project specifications indicate the bridge was designed and constructed as an arched structure based on prescribed construction sequencing and monitoring while placing concrete for the Arch Ring Abutments and Arch Ring.
3. A recent underwater inspection of the bridge's Arch Ring Abutments discovered severe scouring beneath the full width of the North Arch Ring Abutment (North Abutment) that measured 17 to 25 feet in horizontal depth measured from the face of the Sub-Ledge and vertical opening measuring 5.5 to 8 feet from the stream bed, as identified in the HEG report.

Conclusions and Recommendations

1. Structural Opinion: We believe the arched design and construction of this bridge causes the majority of the foundation's resultant forces to be applied at an angle that is more tangent with the arch and not directly over the scoured cavity. Based on this assumption, it is our professional opinion that the structural integrity of this bridge will remain intact provided the bridge foundation bears upon stable and structurally sound subgrade material. Notwithstanding the risks associated with the scouring beneath the North Abutment, it is WRSA's considered opinion that the subject bridge is capable of supporting a single passenger vehicle not exceeding 6 Tons at any given time. WRSA's opinion that the bridge is safe for limited usage is influenced somewhat by its projected low ADT, lightweight vehicles and YKE's opinion that a significant portion of the foundation loads placed upon the subgrade are beyond the surveyed scoured zone.

2. If adverse physical changes in the bridge are reported in the immediate future or if the COH discovers or acquires new information about this bridge, the COH shall be sole responsible for delivering this information to WRSA for review and appropriate response, including rescinding our Structural Opinion. In any event, we recommend conducting another condition survey within the next 6 months to give WRSA an opportunity to determine whether our Structural Opinion should be revised.

3. To insure public safety, WRSA recommends continued monitoring and frequent inspections of the bridge by qualified and experienced bridge inspectors employed by or hired by the COH. Any changes in the physical condition of the bridge should then be brought to the COH's attention for appropriate action. In addition, WRSA should be notified if movement is observed or suspected. For example, monitoring of the patched cracks on the bridge rails should be check regularly for any signs of movement such as separation of the patching material from the cracked surfaces.

4. WRSA concurs with FWHA's concerns, recommendations and urgency for the COH to take immediate action to reduce or eliminate the risk to the traveling public.

5. WRSA supports YKE's recommendation to conduct site specific in-water reconnaissance and geotechnical investigations as necessary for preparing recommendations to reestablish and protect the subgrade integrity beneath the North Abutment.