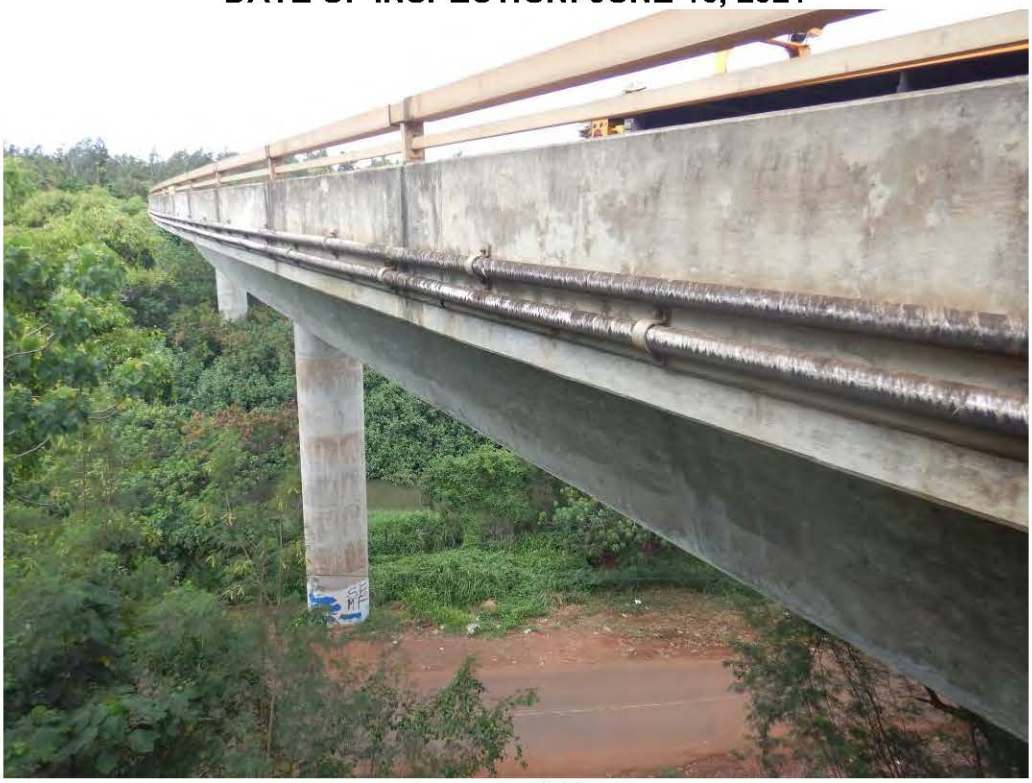
ROUTINE (PERIODIC) BRIDGE INSPECTION REPORT

HANAMAULU RIVER (VIADUCT) BRIDGE
BRIDGE NO. 007000510200281
KAUAI, HAWAII

DATE OF INSPECTION: JUNE 10, 2021



Prepared For:

State of Hawaii
Department of Transportation
Kauai District
Contract No. DOT-2020-024

Prepared By:

Team Leader:
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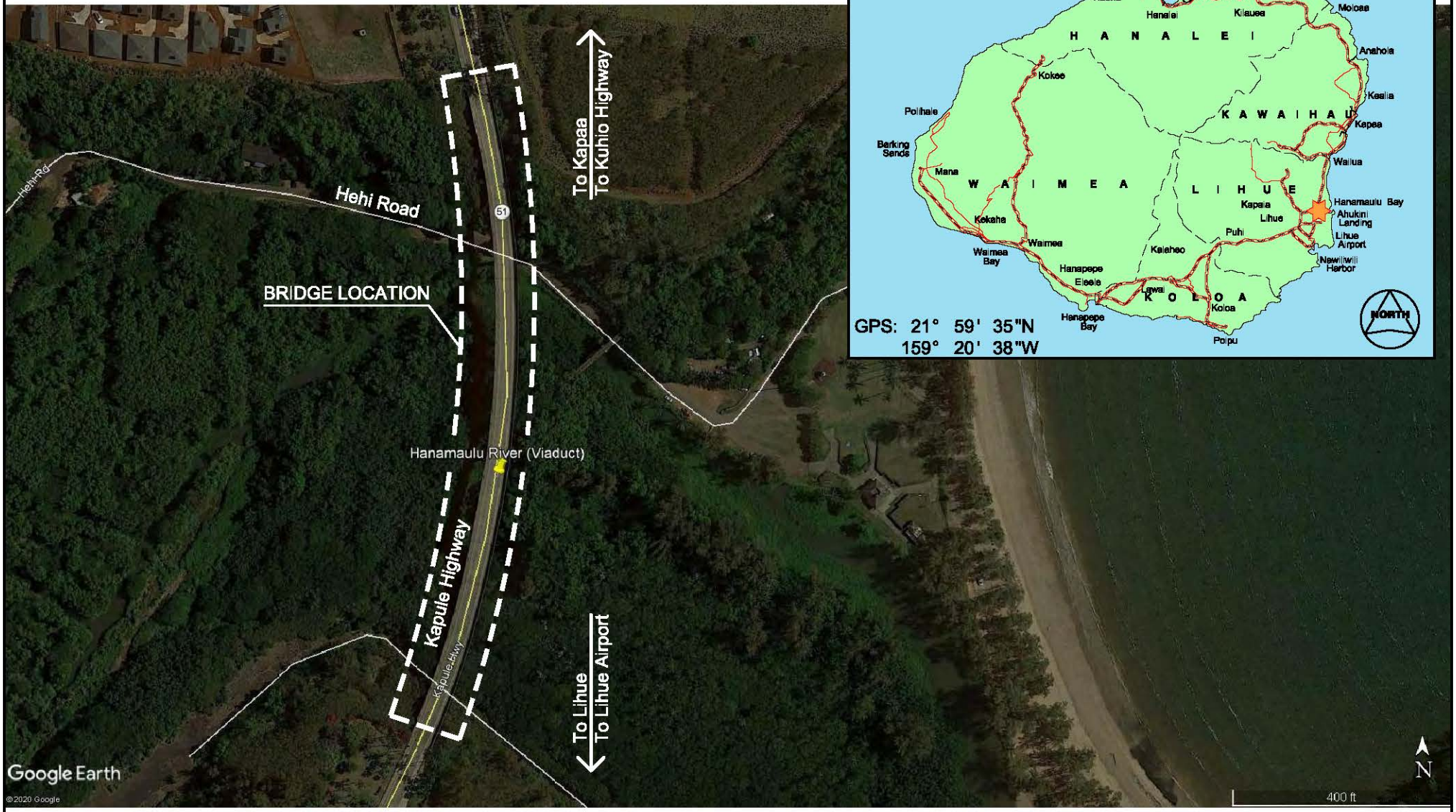

NAGAMINE OKAWA ENGINEERS INC.
1003 Bishop Street, SUITE 2025
Honolulu, Hawaii 96813

LOCATION AND VICINITY MAPS

Bridge Name: HANAMAULU RIVER (VIADUCT) BRIDGE

Structure No. : 007000510200281	Route No: 00051	Mile Post: 2.810	
Date of Inspection: 6/10/2021	Scale: AS NOTED		

State of Hawaii
Department of Transportation
Highways Division,
Kauai District

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APPENDICES

SECTION 1.0 – INSPECTION SUMMARY

1.1 BRIDGE DESCRIPTION

Year Built	1987
Lanes on bridge	2
No. of Spans	7
Bridge Posting Sign(s)	None
Approach Slab Material and Location	Reinforced concrete at each approach
Deck Wearing Surface	Reinforced concrete
Culvert Material and Type	N/A
Deck Material and Type	Reinforced concrete
Superstructure Material and Type	Prestressed concrete multi-box girders
Substructure Material and Type	Reinforced concrete abutments
Bearing Type	Sliding bearings at abutments
Bridge Railing Material	Aluminum rails on concrete parapets
Bridge Railing Height	4'-7", Aluminum rails = 1'-5" and Concrete parapets 3'-2"

Span count starts from the Lihue end of the bridge.

Pier count starts from the Lihue end of the bridge.

Girder count for the bridge starts from the upstream side of the bridge.

1.2 PARKING, BRIDGE ACCESS, AND SAFETY HAZARDS

Parking to perform bridge inspection	Upstream Lihue/Kapaa shoulders
Access to underside of bridge	Upstream/Downstream Lihue/Kapaa from abutments)
Equipment used to access underside of bridge	Snooper
Traffic Controls	Provided by Traffic Safety Consultant (Snooper inspection)

1.3 OVERALL CONDITION

The bridge structure is generally in satisfactory to good condition. Periodic bridge inspections are recommended not to exceed 24-month intervals as specified in the NBIS.

	NBI RATINGS
#36 Traffic Safety Features (Bridge Railings, Transitions, Approach Guardrail, Approach Guardrail Ends)	1, 1, 1, 1
#58 Deck	6
#59 Superstructure	6
#60 Substructure	7
#61 Channel & Channel Protection	7
#62 Culvert and Retaining Walls	N
#67 Structural Condition	6
#71 Waterway Adequacy	9
#113 Scour	8

1.4 SCOUR CONDITION

- No scour observed at the time of inspection.

SECTION 2.0 – LOAD RATING SUMMARY

Calculations for the load rating were performed by MKE Associates on June 29, 2020:

The load ratings for this bridge are as follows:

Inventory Rating: RF = 2.91

Operating Rating: RF = 3.77

Note: RF = Rating Factor

The bridge is currently not posted. Based on the inspector's visual observations at the time of inspection there appears to be no visual signs of overstress since the last inspection dated June 5, 2019 performed by Nagamine Okawa Engineers. Inc.

SECTION 3.0 – BrM ELEMENT AND SI&A REPORTS

BrM Element and SI&A Reports for this inspection cycle and are provided on the following pages.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
BRIDGE INSPECTION REPORT

Inspection Date: June 10, 2021

Bridge Number: 007000510200281 Bridge Name: HANAMAULU RIVER

District Kauai Route No: 00051 Milepost: 3 Facility: KAPULE HWY

NBI ITEM 36 - TRAFFIC SAFETY FEATURES		List any maintenance work required: (ie: defects, missing bolts, collision damage, etc.)
36A	Bridge Railings	(36A) Bridge parapets and railings are in satisfactory condition. (36B) Guardrail transitions are in satisfactory condition. (36C) Guardrails are in satisfactory condition. (36D) There are no guardrail ends. Guardrails terminate into hillsides.
36B	Transitions	
36C	Approach Guardrail	
36D	Approach Guardrail Ends	

ELEMENT INSPECTION

ELEM NO. / DEFECT	ELEMENT / DEFECT DESCRIPTION	ENV.	TOTAL QUANTITY	UNIT	CS 1 (Good)	CS 2 (Fair)	CS 3 (Poor)	CS 4 (Severe)
15	Pre Concrete Top Flange	1	49,665	sq.ft	48,963	670	32	0
1080	Delamination/Spall/Patched		220	sq.ft	0	220	0	0
1090	Exposed Rebar		32	sq.ft	0	0	32	0
1110	Cracking (PSC)		450	sq.ft	0	450	0	0

Defect No. 1080:
-5'x40' (CS2) patches in bridge deck along transverse compression joint between pier 2 and pier 3 near pier 2 (Photo 27).
-2'-6"x2'-6" (CS2) and 3'x2'-6" (CS2) patches in bridge deck above span 3 near pier 2 (Photo 28).
-(2) 4"x4" (CS2) patches in upstream lane of bridge deck above span 7 (Photo 36).

Defect No. 1090:
-2"x4"x¼" (CS3) spall with exposed rebar with section loss in upstream bicycle lane of bridge deck above Lihue end of span 1 (Photo 24).
-2"x4"x¼" (CS3) spall with exposed rebar with section loss in upstream bicycle lane of bridge deck above Lihue end of span 1 (Photo 25).
-(4) 2"x4"x¼" (CS3) spall with exposed rebar with section loss in upstream bicycle lane of bridge deck above Lihue end of span 1 (Photo 26).
-2"x9"x¼" (CS3) spall with exposed rebar with section loss in bridge deck above span 4 at pier 3 (Photo 30).
-(2) 2"x9"x¼" (CS3) spalls with exposed rebar with section loss in bridge deck above span 5 near pier 4 (Photo 32).
-2"x10"x¼" (CS3) spall with exposed rebar with section loss in upstream lane of bridge deck above span 7 (Photo 33).
-7'-6"x1'-2"x¼" (CS3) and 2"x3"x¼" spalls with exposed rebar with section loss in upstream lane of bridge deck above span 7 (Photo 34).
-3"x4"x¼" (CS3) spall with exposed rebar with section loss in upstream lane of bridge deck above span 7 (Photo 35).
-4"x2"x¼" (CS3) spall with exposed rebar with section loss and (2) 4"x4" (CS2) patches in upstream lane of bridge deck above span 7 (Photo 36).
-3"x5"x¼" (CS3) spall with exposed rebar with section loss in downstream lane of bridge deck above span 7 (Photo 37).
-2"x4"x1/8" (CS3) and (3) 2"x1'-2"x1/8" (CS3) spalls with exposed rebar with section loss in downstream lane of bridge deck above span 7 (Photo 38).
-(2) 2"x6"x¼" (CS3) spalls with exposed rebar with section loss in downstream lane of bridge deck above span 7 (Photo 39).
-2"x8"x¼" (CS3) spall with exposed rebar with section loss in downstream lane of bridge deck above span 7 (Photo 40).

Defect No. 1110:
-Typical 0.030" wide (CS2) longitudinal and map cracks in bridge deck (Photo 29).

104	Pre Clsd Box Girder	1	4,560	ft	4,305	220	35	0
1080	Delamination/Spall/Patched		130	ft	0	95	35	0
1090	Exposed Rebar		25	ft	20	5	0	0
1110	Cracking (PSC)		120	ft	0	120	0	0

Defect No. 1080:
-8'x4' patches (CS2) in soffit of box girders in span 1 (Photo 44).
-4"x8"x1" (CS3) spall and 2'-3"x1'-2" (CS3) delamination (CS3) in downstream side of box girders in span 1 (Photo 45).
-3'x8" (CS2) delamination/spall of cement plaster on downstream side of box girders in span 1 (typical in various spans and on upstream side of box girders) (Photo 47).
-20'x1' patches (CS2) and 5"x4"x1" (CS2) spall along upstream edge of soffit of box girders near pier 3 in span 3 (Photo 51).
-30'x1' patch (CS2) along upstream edge of soffit of box girders in span 4 (Photo 53).
-2'x2', 3'x2', (2) 2'x1' patches (CS2) in soffit of box girders at joint near pier 5 in span 5. 6"x6"x1" spall (CS2) in cantilevered deck soffit near deck drain (Photo 55).
-1'x1'x1" (CS3) spall and honeycombing in upstream edge of soffit of box girders in span 6 (Photo 59).

Defect No. 1090:
-2"x6"x1" spall with exposed rebar (CS2) in soffit of box girders in span 1 (Photo 44).
-1'-6"x10" (CS2) honeycombing with exposed rebar in upstream edge of soffit of box girders in span 6 (Photo 57).
-1'-2"x8" (CS2) honeycombing with exposed rebar in upstream edge of soffit of box girders in span 6 (Photo 58).

Defect No. 1110:
-0.006 to 0.009" wide (CS2) horizontal and vertical cracks in downstream side of box girders in span 1 (Typical in all spans) (Photo 46).

-Active ground termites on soffit of box girders near at joint near pier 2 in span 3 (Photo 50).
-2"x2"x¼" and 5"x4"x½" spalls with exposed rebar in downstream cantilevered deck soffit above downstream Kapaa wingwall (Photo 61).

205	Re Conc Column	1	6	each	6	0	0	0
1130	Cracking (RC and Other)		1	each	1	0	0	0

Defect No. 1130:
-0.004" wide (CS1) horizontal and vertical crack in Kapaa side of pier 1 (Photo 70).

-Graffiti on column at pier 5 (Photo 78).

215	Re Conc Abutment	1	86	ft	82	2	2	0
1080	Delamination/Spall/Patched		2	ft	0	0	2	0
1130	Cracking (RC and Other)		2	ft	0	2	0	0

Defect No. 1080:
-1'-4"x1'x6" (CS3) and 1'-3"x10"x3" (CS3) spalls in Lihue abutment on downstream side of 2nd bearing from upstream side of bridge (Photo 65).

Defect No. 1130:
-0.012" wide (CS2) vertical crack in Lihue abutment (Typical of 2) (Photo 66).

-Water stains on Lihue abutment (Photo 63).

227	Re Conc Pile	1	64	(EA)	64	0	0	0

Elem No. 227: Piles are below grade. 64 piles at Lihue (32 piles) and Kapaa (32 piles) abutments. Number of piles under piers 2, 3, 4, and 5 are unknown due to insufficient as-builts. Spread footings under piers 1 and 6.

301	Pourable Joint Seal	1	86	ft	86	0	0	0

Defect No. 2350:
-Transverse compression joint between pier 2 and pier 3 near pier 2 impacted with dirt (CS2) (Photo 27).
-Transverse compression joint between pier 4 and pier 5 near pier 5 impacted with dirt (CS2) (Photo 31).

302	Compressn Joint Seal	1	86	ft	0	86	0	0
2350	Debris Impaction		86	ft	0	86	0	0

Defect No. 2350:
-Transverse compression joint between pier 2 and pier 3 near pier 2 impacted with dirt (Photo 27).
-Transverse compression joint between pier 4 and pier 5 near pier 5 impacted with dirt (Photo 31).

311	Moveable Bearing	1	8	each	8	0	0	0
-Photos 64 and 83.								
321	Re Conc Approach Slab	1	204	sq.ft	204	0	0	0
-Photos 22 and 41.								
330	Metal Bridge Railing	1	2,329	ft	2,328	0	1	0
1010	Cracking		1	ft	0	0	1	0
1020	Connection		1	ft	1	0	0	0

Defect No. 1010:
-Crack in weld at 1st railing post from Lihue end of bridge at upstream bridge railing (Photo 7).

Defect No. 1020:
-Nut not fully engaged at downstream bridge railing anchor plate at midspan above span 5 (Photo 15).

331	Re Conc Bridge Railing	1	2,329	ft	2,210	117	2	0
1090	Exposed Rebar		2	ft	0	0	2	0
1130	Cracking (RC and Other)		117	ft	0	117	0	0

Defect No. 1090:
-3"x1'-6"x4" (CS3) spall with exposed rebar in upstream bridge parapet at joint between pier 4 and pier 5 near pier 5 (Photo 9).
-4"x4"x½" (CS3) spall with exposed rebar with section loss in downstream bridge parapet above Kapaa end of span 2 (Photo 14).

Defect No. 1130:
-0.012" wide (CS2) vertical cracks continuing into top of upstream bridge parapet (Photo 8).
-0.012" wide (CS2) vertical crack continuing into top of downstream bridge parapet (Photo 16).

-4"x2'x4" spall in downstream side of downstream Kapaa end post (Photo 12).
-6"x8" spall with exposed rebar and delamination in downstream Lihue end post (Photo 18).
-9"x8"x1" spall in downstream Lihue end post (Photo 19).

NBI ITEM CONDITION RATINGS			Describe defects noted during bridge inspection. Provide sketches, diagrams, and photographs where possible.
58	Deck	6	(58) -2"x2"x¼" and 5"x4"x½" spalls with exposed rebar in downstream cantilevered deck soffit above downstream Kapaa wingwall (Photo 61).
59	Superstructure	6	
60	Substructure	7	
61	Channel and Channel Protection	7	
62	Culvert	N	
71	Waterway Adequacy	9	

NBI ITEM 93 - CRITICAL FEATURE INSPECTION		REQUIRED	FREQUENCY	CURRENT	NEXT
93A	Fracture Critical Details	N			1/1/01
93B	Underwater Inspection	N			1/1/01

OTHER FEATURES			REMARKS
Posted Status (NBI Item 41)	A - Open, no restriction		Governing EV Rating Factor = 9.46; no posting for EV.
Posted Weight Limit	(Posted limit (Tons) or 'N' if not applicable)	N	
Signing for Posting Legible/Visible? (Provide 2 pictures of signs. 1 on each end of bridge)	(Y or N)	N	
Riding Surface (Roughness) Rating	(3 - smooth, 2 - Avg, 1 - Poor)	2	

REPAIRS, IMPROVEMENTS AND RECOMMENDATIONS

List all work done to this bridge since last inspection (ie: structural repair work, cleaning, maintenance work, etc.)

a. Utility conduit has been repaired at downstream Kapaa wingwall.

List proposed and/or recommended work for this bridge including estimated cost (ie: structural repair work, cleaning, maintenance, etc.)

a. Repair spalls in bridge deck (Est. Cost = $20,000).
b. Repair unsound patches, delaminations, and spalls in box girder (Est. Cost = $50,000).
c. Repair spall in Lihue abutment (Est. Cost = $5,000).
d. Clear debris from deck joints (Maintenance Item).
e. Repair broken weld in aluminum railing post and fully engage anchor bolt nut in railing base plate (Maintenance Item).
f. Remove graffiti from pier 5 column (Maintenance Item).
g. Repair spalls and seal cracks in Lihue abutment (Est. Cost = $3000).

Other comments or observations.

None.

Inspector: **Signature:** Eric House **Phone:** 8085362626

Eric House

Inspector: **Signature:** C. Tam **Phone:** 8085362626

Charles Tam

Team Leader: **Signature:** Robin Matsubayashi **Phone:** 808-536-2626

Office: NOEI **Certification Date:** 01/17/2017

BIP Leader: **Signature:** Jeff Aguinaldo **QC Date:** 08/09/2021

Office: HDOT HWY-K

Attachments:

Structural Inventory & Appraisal (SI&A) Sheet

Photos

State of Hawaii
Department of Transportation
Structure Inventory and Appraisal Sheet (English Units)

Name: **HANAMAULU RIVER** Bridge No: **007000510200281** Inspection Date: 06/10/2021

IDENTIFICATION

Rte.(On/Under)	5A:	Route On Structure	State	1:	15 Hawaii
Rte. Signing Prefix	5B:	2 U.S. Numbered Hwy	Facility Carried	7:	KAPULE HWY
Level of Service	5C:	1 Mainline	Place Code	4:	
Route Number	5D:	00051	SHD District	2:	15 Kauai
Directional Suffix	5E:	0 N/A (NBI)	Feature Intersected	6:	HANAMAULU RIVER
Border Bridge Code	98:	Unknown (P)	County Code	3:	Kauai
Border Bridge Number	99:	NA	Location	9:	.83 MI N OF AHUKINI RD
Mile Post	11:	2.810 mi	Latitude	16:	21° 59' 35"
Struc Num	8:	007000510200281	Longitude	17:	159° 20' 38"

INSPECTION

Inspection Date	90:	6/10/2021	Frequency	91:	24 months	Next Inspection:	6/10/2023
FC Inspection Date	93A:	NA	FC Frequency	92A:		Next FC Inspection:	NA
UW Inspection Date	93B:	NA	UW Frequency	92B:		Next UW Inspection:	NA

CONDITION

Deck	58:	6 Satisfactory	Super	59:	6 Satisfactory	Sub 60: 7 Good	SD/FO: ND
Culvert	62:	N N/A (NBI)	Channel/Channel Protection			61: 7 Minor Damage	SUFF RATE: 99.0

LOAD RATING AND POSTING

Inventory Rating Method	65:	8 LRFR (HL93)	Operating Rating Method	63:	8 LRFR (HL93)
Inventory Rating	66:	2.91	Operating Rating	64:	3.77
Design Load	31:	5 MS 18 (HS 20)	Posting	70:	5 At/Above Legal Loads
Posting Status	41:	A - Open, no restriction			

GEOMETRIC DATA

Length Max Span	48:	182.09 ft	Structure Length	49:	1,154.86 ft
Width Curb to Curb	51:	40.03 ft	Curb/Sdwlk Width L	50A:	0.00 ft
Approach Roadway width (w/ shoulders)	32:	40.03 ft	Curb/Sidewalk Width R	50B:	0.00 ft
			Width Out to Out	52:	42.98 ft
Deck Area:		49,632.39 sq. ft	Median	33:	0 No median
Skew	34:	10.00°	Structure Flared	35:	0 No flare
Vertical Clearance	10:	99.99 ft	Horizontal Clearance	47:	40.03 ft
Min. Vert. Cl. Over Bridge	53:	99.99 ft	Min. Lat. Undercl. Ref. R	55A:	N Feature not hwy or RR
Min. Vert. Undercl. Ref.	54A:	N Feature not hwy	Min. Lat. Undercl. R	55:	0.00 ft
Min. Vert. Undercl.	54B:	0.00 ft	Min. Lat. Undercl. L	56:	0.00 ft

AGE AND SERVICE

Year Built	27:	1987	ADT	29:	22,400
Type of Service on	42A:	1 Highway	Year Reconstructed	106:	-1
Type of Service under	42B:	9 Relief for waterway	Detour Length	19:	0.0 mi
Lanes on	28A:	2	Truck ADT	109:	3%
Lanes under	28B:	0	Year of ADT	30:	2017

STRUCTURE TYPE AND MATERIALS

Deck Type	107:	1 Concrete-Cast-in-Place	Number of Spans Main Unit	45:	7
Wearing Surface	108A:	1 Monolithic Concrete	Main Span Material Design	43A:	2 Concrete Continuous
Membrane	108B:	0 None	Main Span Material Design	43B:	05 Multiple Box Beam
Deck protection	108C:	None	Number of Approach Spans	46:	0

State of Hawaii

Department of Transportation

Structure Inventory and Appraisal Sheet (English Units)

APPRAISAL					
Bridge Rail	**36A:**	1 Meets Standards	**Approach Rail**	**36C:**	1 Meets Standards
Transition	**36B:**	1 Meets Standards	**Approach Rail Ends**	**36D:**	1 Meets Standards
Str Evaluation	**67:**	6 Equal Min Criteria	**Deck Geometry**	**68:**	5 Above Tolerable
Waterway Adequacy	**71:**	9 Above Desirable	**Approach Alignment**	**72:**	8 Equal Desirable Crit
Scour Critical	**113:**	8 Stable Above Footing	**Vert. & Horiz. Undercl.**	**69:**	N Not applicable (NBI)
CLASSIFICATION					
Defense Highway	**100:**	0 Not a STRAHNET hwy	**Parallel Structure**	**101:**	No || bridge exists
Direction of Traffic	**102:**	2 2-way traffic	**Temporary Structure**	**103:**	Unknown (NBI)
Highway System	**104:**	3 On free road	**NBIS Length**	**112:**	Long Enough
Defense Hwy	**110:**	1 On the NHS	**Functional Class**	**26:**	11 Urban Interstate
Toll Facility	**20:**	0 Not a STRAHNET hwy	**Historical Significance**	**37:**	5 Not eligible for NRHP
Owner	**22:**	State Highway Agency	**Custodian**	**21:**	State Highway Agency
PROPOSED IMPROVEMENTS					
Bridge Cost	**94:**	$0	**Type of Work**	**75:**	38 Other Structural
Roadway Cost	**95:**	$0	**Length of Improvement**	**76:**	0.0 ft
Total Cost	**96:**	$0	**Future ADT**	**114:**	21,480
Year of Cost Estimate	**97:**	Unknown	**Year of Future ADT**	**115:**	2025
NAVIGATION DATA					
Navigation Control	**38:**	Permit Not Required	**Horizontal Clearance**	**40:**	0.0 ft
Vertical Clearance	**39:**	0.0 ft	**Lift Bridge Vert. Cl.**	**116:**	
Pier Protection	**111:**	1 Not Required			