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Final Environmental Assessment

KOLEKOLE BRIDGE SEISMIC RETROFIT

Pepe'ekeo, Hawaii
Adjacent to TMK: 2-9-03:3,39,44 and 2-8-15:1,5,15

Proposing Agency:

DEPARTMENT OF TRANSPORTATION
STATE OF HAWAII
601 Kamokila Boulevard, Room 688
Kapolei, Hawaii 96707

Prepared by:

ENGINEERING CONCEPTS, INC.
1150 South King Street, Suite 700
Honolulu, Hawaii 96814

SEPTEMBER 1999

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This environmental document has been prepared pursuant to Chapter 343, Hawaii Revised Statutes

Proposing Agency:

DEPARTMENT OF TRANSPORTATION
STATE OF HAWAII
601 Kamokila Boulevard, Room 688
Kapolei, Hawaii 96707

Responsible Official:

Kazu Hayashida, Director

9/24/99
Date

Prepared by:

ENGINEERING CONCEPTS, INC.
1150 South King Street, Suite 700
Honolulu, Hawaii 96814

SEPTEMBER 1999

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DEVELOPMENT SUMMARY

PROPOSING AGENCY:	Department of Transportation State of Hawaii 601 Kamokila Boulevard, Room 688 Kapolei, Hawaii 96707	
Responsible Official:	Kazu Hayashida, Director *Department of Transportation*	
Contact Person: Phone: Fax:	Emilio Barroga, Jr. 692-7546 692-7555	
PROJECT NAME:	Kolekole Bridge Seismic Retrofit Project No. BR-0100(57)	
PROPOSED ACTION:	Retrofit the existing Kolekole Bridge for seismic stability	
PROJECT LOCATION:	Hawaii Belt Road (Route 19) Pepe'ekeo, Hawaii	
TAX MAP KEY:	Adjacent to: TMK: 2-9-03: 3, 39, 44 TMK: 2-8-15: 1, 5, 15	
LAND OWNER:	State of Hawaii	
STATE LAND USE DESIGNATION:	Conservation and Agricultural	
FACILITY USE:	Primary Arterial	
HAWAII COUNTY GENERAL PLAN LAND USE:	Extensive Agricultural	
HAWAII COUNTY ZONING:	2-9-03: 3, 39, 44 2-8-15: 1, 5 2-8-15: 15	A-20a (Agricultural) A-20a (Agricultural) Open
EXISTING USE:	Bridge along the Hawaii Belt Road (Route 19), between Hilo and Laupahoehoe.	

CHAPTER 1
INTRODUCTION

1.1 PURPOSE OF THIS DOCUMENT

The purpose of this Draft Environmental Assessment (EA) is to present potential environmental impacts associated with the seismic retrofit of the Kolekole Bridge on Hawaii Belt Road in the County of Hawaii.

This Draft EA has been prepared in accordance with Chapter 343, Hawaii Revised Statutes (HRS). The State of Hawaii Department of Transportation (DOT) is the proposing agency for this document. Mr. Emilio Barroga, Jr. is the point of contact at DOT for the project.

This Draft EA will also be submitted in support of Special Management Area and Conservation District Use permit applications.

1.2 BACKGROUND

The State of Hawaii Department of Transportation retained KSF, Inc. (KSF), structural engineers, to analyze the Kolekole Bridge for seismic stability. It was determined by a seismic stability analysis that the Kolekole Bridge was inadequate to resist seismic forces. As a result of this finding, several design alternatives were identified to stabilize the bridge structure. Of these alternatives, the cable and anchor block system was chosen as the preferred retrofit alternative.

1.3 OBJECTIVES

The State of Hawaii Department of Transportation proposes to retrofit the existing Kolekole Bridge to comply with the American Association of State Highway and Transportation Officials (AASHTO) specifications for highway bridges. Specifically, the current bridge does not comply with the seismic stability criteria which compromises the safety of the general public. Currently, AASHTO specifications for highway bridges designate the island of Hawaii in seismic performance category D, a region where seismic forces with maximum ground acceleration can occur. The seismic analysis for the bridge was performed using a 0.42 acceleration coefficient to simulate seismic forces imposed on the bridge structure.

1.4 PROJECT LOCATION

The Kolekole Bridge (adjacent to TMK:2-9-03:3, 39, 44, TMK:2-8-15:1, 5, 15) is located on the Hawaii Belt Road (Route 19) in the South Hilo district on the island of Hawaii (see **Figure 1.1**). The bridge is located about 14 miles north of the Hilo Airport, one mile north of Honomu, and about 100 feet from the mouth of Kolekole Stream at the Pacific Ocean. Hawaii Belt Road is the only direct major access road between Hilo and the communities to the north. The bridge spans the Kolekole Stream which flows toward the east from the slopes of Mauna Kea to the Hamakua coast.

1.5 ALTERNATIVES CONSIDERED

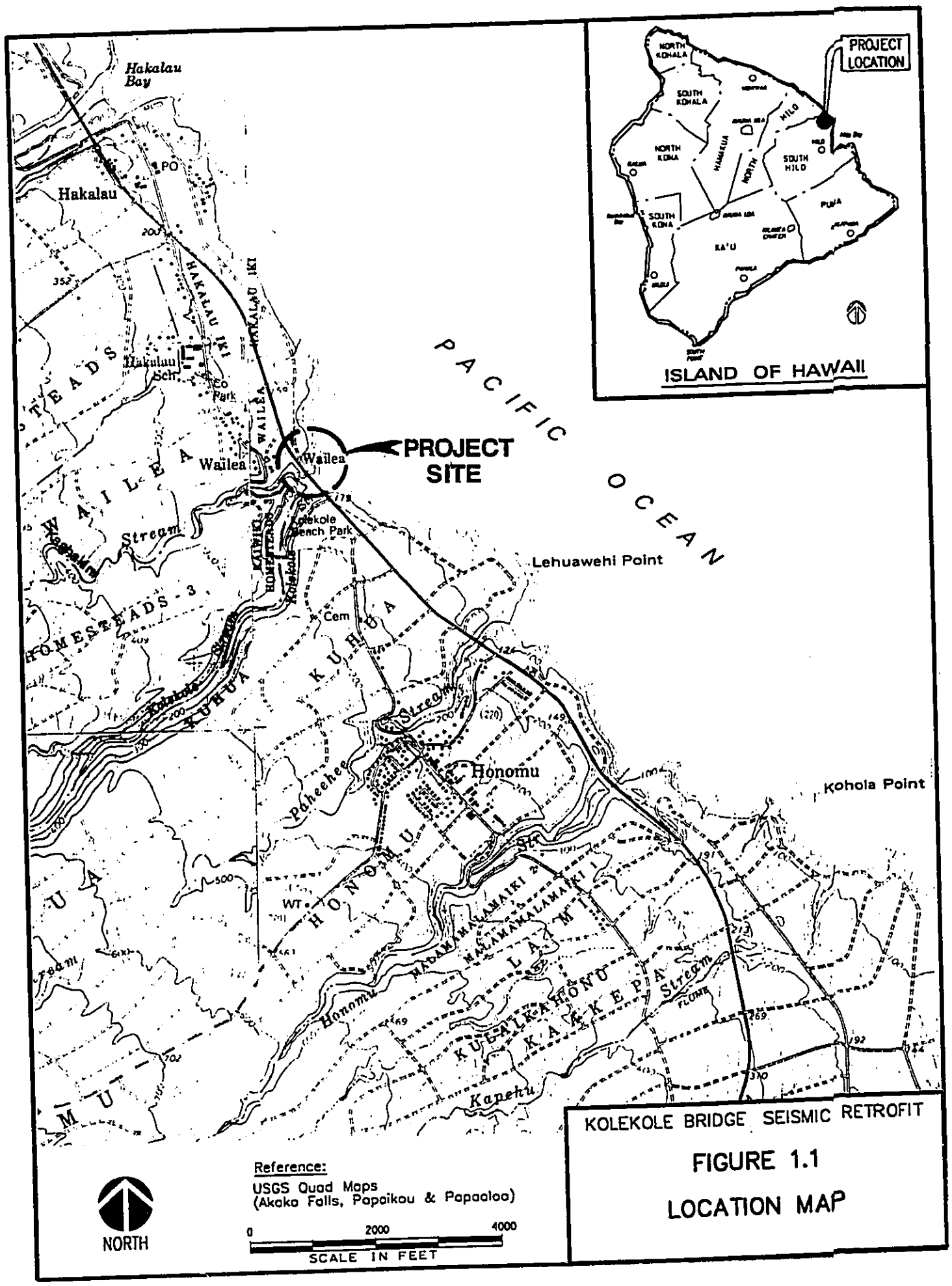
Three alternatives to the proposed action were considered.

No Action. In the "no action" scenario, use of the existing bridge would continue, despite structural inadequacy to resist seismic forces. Should the bridge fail during and earthquake, loss of life or injury may result. This alternative is not acceptable because of the potential impacts to public safety and welfare.

Runner Truss. The runner truss alternative involves construction of a new truss, attachment to the piers, and connection to the gulch beneath the abutments. This system functions similarly to the proposed cable and anchor block system in tension, and also provides strength in compression. Although this alternative also provides compressive strength, it requires much more material (added weight) and labor to construct. Truss construction is more difficult compared to the cable system, and the total cost is far more expensive. In addition, this alternative may require construction equipment to be placed in or near the stream in order to provide safe and ready access to the underside of the bridge. This alternative is undesirable due to cost and additional environmental impacts.

Strengthening of Footings and Columns. The footing and column retrofit will require dewatering and result in other water-related problems due to the proximity of the bridge piers to the stream and ocean. This alternative is undesirable due to additional environmental impacts.

In addition, an alternate method of construction was considered. Lowering equipment and workers from the bridge to the construction areas beneath the bridge abutments was deemed a less desirable construction method due to safety concerns, increased construction time, and more traffic disruption.


Hakalau Bay
Hakalau
PO
HAKALAU IKI
Hakalau Sch
Park
WAILEA
Wailea
Wailea
PROJECT SITE
Kolekole Beach Park
Kolekole
Stream
Cem
KUHUA
Stream
Honomu
Honomu
Stream
Lehuawehi Point
Kohola Point
PACIFIC OCEAN
PROJECT LOCATION
NORTH KOHALA
SOUTH KOHALA
HILO
NORTH KONA
HAMAKUA
SOUTH HILO
SOUTH KONA
KA'U
PUNA
ISLAND OF HAWAII
Reference:
USGS Quad Maps
(Akaka Falls, Papaikou & Papaaloa)
NORTH
0
2000
4000
SCALE IN FEET
KOLEKOLE BRIDGE SEISMIC RETROFIT
FIGURE 1.1
LOCATION MAP

1.6 SUMMARY OF POTENTIAL IMPACTS AND MITIGATION MEASURES

Regional Impacts. The project will not stimulate development or result in social or economic changes. Short-term, construction-related impacts include generation of dust, noise and traffic disturbances. Construction time can be minimized by use of temporary access roads to reach areas beneath the bridge.

Soil Erosion. No long-term soil erosion problems will result from seismic retrofit of the bridge. Use of erosion control measures during construction will minimize the short-term impact of soil erosion.

Water Quality. Construction activities will take place near Kolekole Stream. The contractor will be required to implement best management practices to prevent soil and debris from entering the stream as a result of construction activities No long-term impacts are anticipated.

Flood and Tsunami Hazards. The proposed action should not be adversely affected by flood or tsunami waters. No long term impacts are anticipated as a result of the proposed action.

Flora. Approximately 0.25 to 0.5 acre of vegetation will be removed in order to access the areas in which concrete anchor blocks will be installed. The acreage includes the alignment of the temporary construction access roads. Upon completion of construction, all areas cleared for the project shall be hydromulched to reestablish existing vegetation.

Fauna. Construction activities will not have a significant impact on native or federally protected avian or mammalian species.

Air Quality. Generation of fugitive dust and exhaust emissions during construction will be mitigated by implementation of appropriate best management practices and compliance with DOH regulations. The project will have no long-term impact on air quality.

Archaeological and Historic Resources. No archaeological sites were identified in the project area and therefore, no significant impacts are anticipated. The proposed action will not affect the historic character of the bridge.

Noise. Short-term impacts may result from construction activities. The contractor will be required to comply with all applicable State and County noise regulations. No long-term impacts are anticipated.

Traffic. Traffic impacts may result in the short-term, due to construction vehicles entering and exiting the project site and construction staging areas, possibly along the bridge itself. Closure of one lane on the bridge may be required. Temporary construction access roads may be required for the contractor to gain access to the abutments. No long-term traffic impacts are anticipated.

Visual Resources. The appearance of the existing bridge will not be significantly altered. Temporary access roads may be visible during construction activities. The roads will be revegetated upon completion of construction. No long term visual impacts area anticipated.

Lead Paint Removal. Work will be coordinated with DLNR Division of Aquatic Resources to minimize impact to natural resources in the stream.

Neighboring Lands. Construction of temporary access roads will impact neighboring land owners. The Department of Transportation will compensate land owners for use of there property during construction.

Utility Infrastructure. Overhead electrical power, cable TV and telephone lines will be avoided during construction. The affected utility company will be contacted to coordinate relocation of their line, if needed.

1.7 PERMITS AND APPROVALS REQUIRED

Permits and approvals which may be required for construction of the proposed project are listed in **Table 1.1**. Permit applications will be prepared as planning and design of the project proceeds.

TABLE 1.1
PERMITS AND APPROVALS

AGENCY	PERMIT/APPROVAL
Hawaii County Building Department	Building Permit
Hawaii County Department of Public Works	Construction Plan Approval Grubbing/Grading Permit
Hawaii County Planning Department	Special Management Area Use Permit[1]
State Department of Land and Natural Resources	Conservation District Use Permit[2]
Commission on Water Resource Management	Stream Channel Alteration Permit

1 SMA assessment exemption granted for seismic retrofit work. A SMA assessment application will be prepared for construction of temporary access roads.

2 DLNR determined that the seismic retrofit work constitutes repair of an existing, nonconforming structure and does not require a permit. A CDUA will be prepared for construction of temporary access roads.

The applicability of other environmental permits has been coordinated with various agencies:

Dept. of the Army Permit. Based on review of the Draft EA, the Army Corps of Engineers has determined that a permit from the Department of the Army (e.g. Section 404, Section 10) will not be required for the project.

U.S. Coast Guard Bridge Permit. The U.S.C.G. Aids to Navigation Branch determined that Kolekole Stream is a navigable waterway that meets the criteria for advance approval, and that a bridge permit will not be required.

National Pollutant Discharge Elimination System (NPDES) Permits. The proposed action will not involve a discharge that is subject to a NPDES permit.

Refer to **Appendix A** for applicable correspondence.

CHAPTER 2
PROJECT DESCRIPTION

2.1 NEED FOR THE PROJECT

The State of Hawaii Department of Transportation retained KSF, Inc. (KSF), structural engineers to analyze the Kolekole Bridge for seismic stability. By performing a dynamic analysis using a "lollipop model", KSF determined that the ability of the bridge to resist seismic forces along its longitudinal axis was inadequate. Due to this finding, corrective action is required.

Use of the existing bridge continues despite its structural inadequacy to resist seismic forces. Should the bridge fail or be deemed unsafe after a seismic event, the potential for loss of life and/or injury exists. Bridge failure would also sever the only direct ground transportation link between Hilo and communities to the north. Such occurrence would prevent or at least severely restrict transport of goods and emergency services to those northern communities, and hence directly impact public safety and welfare. For this reason, the proposed action is retrofit of the bridge to withstand seismic forces and remain serviceable.

2.2 DESCRIPTION OF THE PROPOSED ACTION

Elements of this project include the cable and anchor block system, seat extenders and cable restrainers, beam and column reinforcement, construction access roads, and lead paint removal. The first three components will improve the seismic stability of the bridge. The last two will enable the seismic retrofit work to be implemented. The primary elements of this project are described below.

2.2.1 Cable and Anchor Block System

The retrofit design selected to rectify the structural inadequacy of the bridge consists of a cable system with anchor blocks (see **Figures 2.1, 2.2, and 2.3**). This system will be designed to prevent excessive longitudinal displacements by restraining the piers at the truss support.

The design will incorporate high strength threaded bars extending longitudinally beneath the bottom chord of the truss and plate girders connecting each pier, and fastened to concrete anchor or connection blocks located on the slopes below the abutments. Rock anchors will fasten the concrete connection blocks to the ground. This design will relegate the existing structural system to carry the dead loads and daily vehicular traffic, while the cable system would resist the seismic forces in the longitudinal direction.

Four 1-3/8-inch diameter high strength threaded bars encased in a 4-inch high-density

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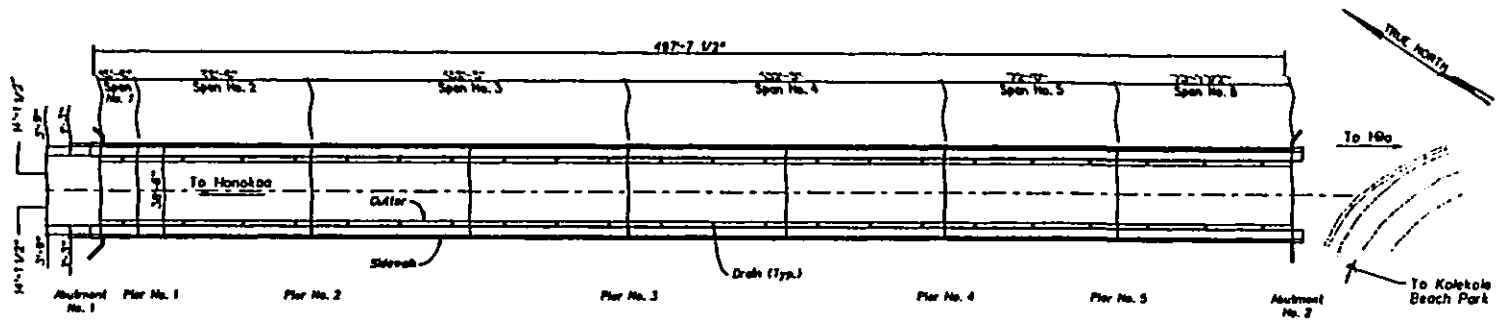
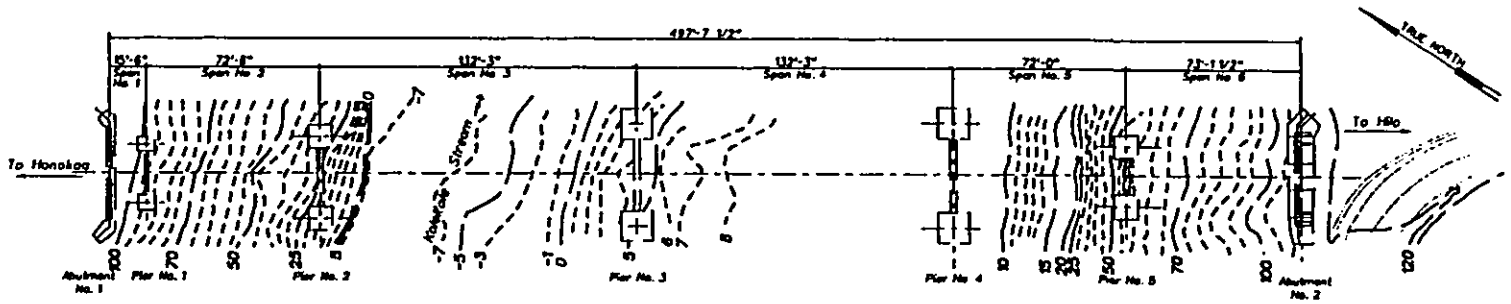


DECK FRAMING PLAN



FOUNDATION PLAN

KOLEKOLE BRIDGE SEISMIC RETROFIT

FIGURE 2.1

BRIDGE PLAN

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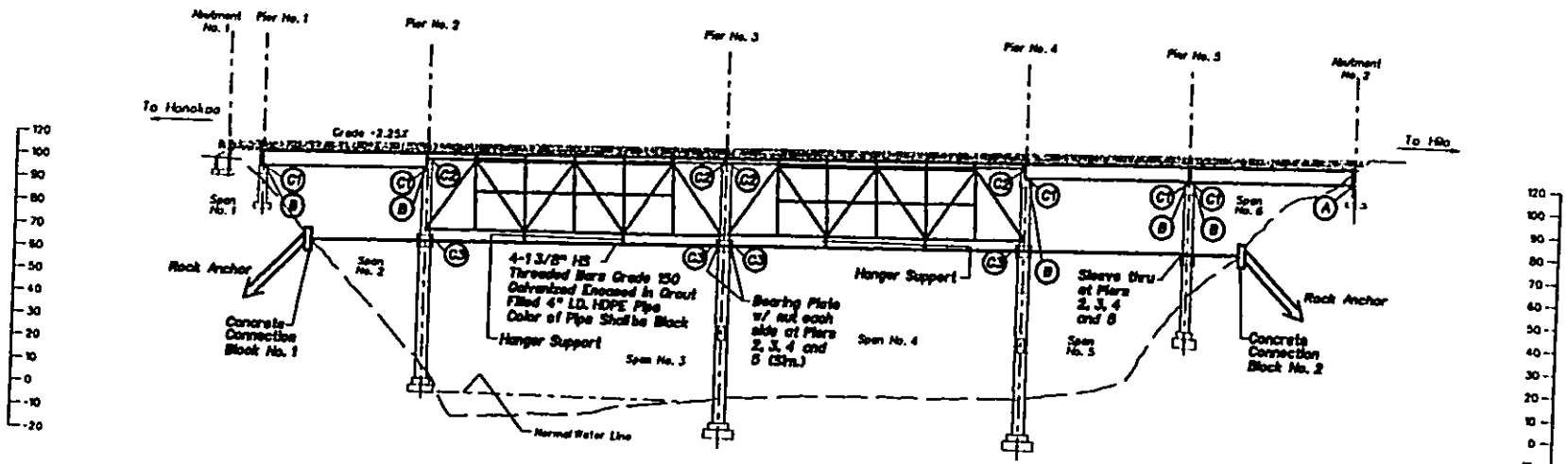


ELEVATION

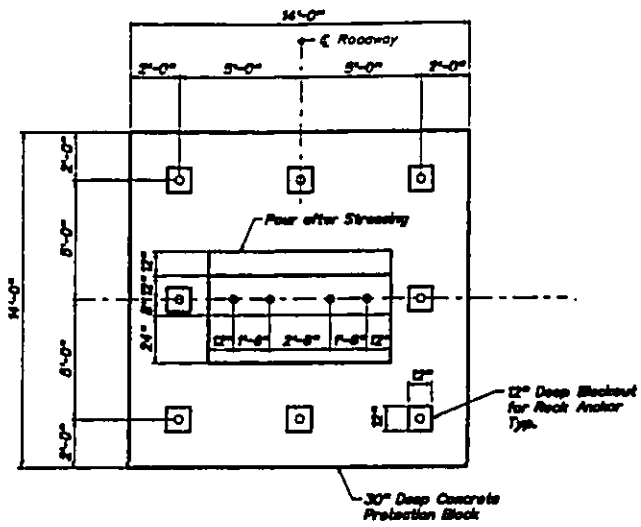
LEGEND

- (A) Seat Extender
- (B) Concrete Facia on each side of Pier Cap
- (C1) Seat Extender with Longitudinal Cable Restrainer - Condition 1
- (C2) Seat Extender with Longitudinal Cable Restrainer - Condition 2
- (C3) Seat Extender
- (D) High Strength Threaded Bar encased in grout-filled High Density Polyethelene Pipe to Qty Superstructure.

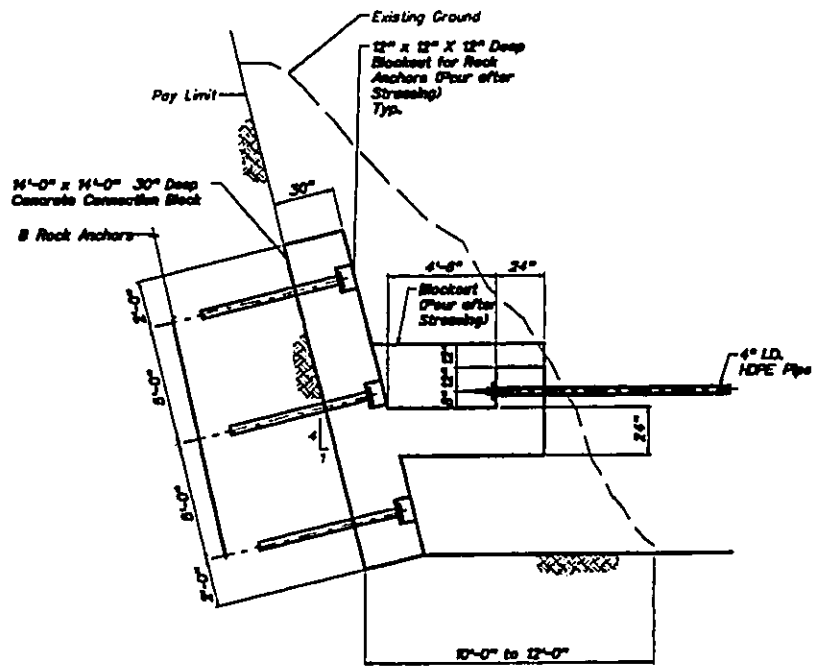
KOLEKOLE BRIDGE SEISMIC RETROFIT

FIGURE 2.2

BRIDGE ELEVATION



CONCRETE CONNECTION BLOCK ELEVATION
NOT TO SCALE



SECTION
NOT TO SCALE

KOLEKOLE BRIDGE SEISMIC RETROFIT

FIGURE 2.3

CONCRETE CONNECTION BLOCK

polyethylene pipe were selected as the lateral force-resisting system. This encasement system will be grout-filled and designed to retard corrosion of the threaded bar.

2.2.2 Seat Extenders and Cable Restrainers

Other seismic upgrades to the structure consist of seat extenders and cable restrainers (see **Figures 2.4, 2.5, and 2.6**). Concrete bearing seat extenders will be designed to accommodate the large anticipated longitudinal displacements at the abutments. These seat extenders will be designed to permit longitudinal translation and also should prevent the steel girders from falling free from the supports. Similar bearing seat extenders will be designed for the pier caps to accommodate longitudinal and transverse displacements. Cable restrainers will be installed to prevent plate girders from being displaced from the pier cap supports.

2.2.3 Beam and Column Reinforcement

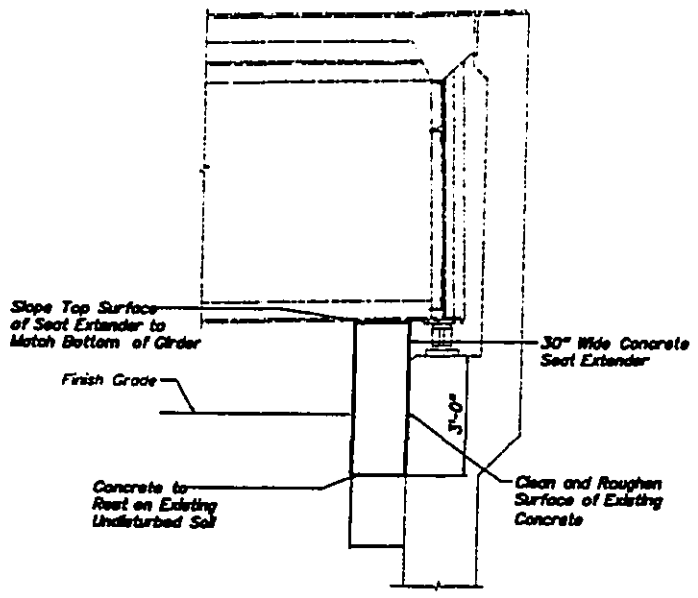
The dynamic analysis showed that large shears occurred in sections of the beams and columns. Externally applied bonded carbon fiber reinforced polymer (CFRP) sheets will be utilized to increase the shear capacity of these beams and columns. Advantages of using CFRP sheets are their light weight, high tensile strength, ease of application, low installation costs, and non-corrosive properties. They are also visually inconspicuous, thus minimizing the aesthetic impact of the retrofit work.

2.2.4 Construction Access Roads

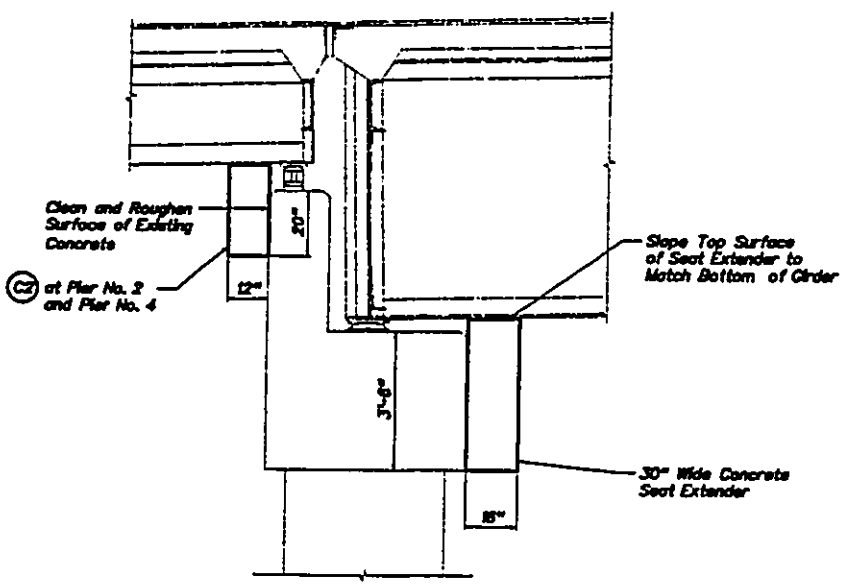
The proposed construction method will require construction of temporary access roads from the Hawaii Belt Road to beneath the bridge abutments. The construction access roads will allow excavation equipment, workers and construction materials to be driven to work areas beneath the bridge. The access roads are likely to be built on the makai side of both ends of the bridge where there is adequate space to accommodate such roads. These roads will be outside the highway right-of-way, and will encroach into private property. Vegetation will be cleared to construct the access roads. The access roads are likely to be about 12 feet wide, and approximately 300 feet in length. Actual road lengths will vary depending on terrain and other site conditions. The proposed access road alignment is illustrated on **Figure 2.7**. Typical sections of the proposed roads beneath the bridge are illustrated on **Figure 2.8**. Additional discussion on the use of temporary access roads in included in **Chapter 5**.

2.2.5 Lead Paint Removal

The steel girders and beams of the existing bridge are coated with a lead-based paint. Removal and containment of the lead paint will be the responsibility of the contractor. Paint will be removed only where required for the retrofit work. Several alternatives for lead paint removal are being considered. One such alternative involves the application of a glue-like coating to the lead paint. Once the coating has adhered to the paint, it is scraped off carrying the lead paint with it.



PIER SEAT EXTENDER (A)
NOT TO SCALE

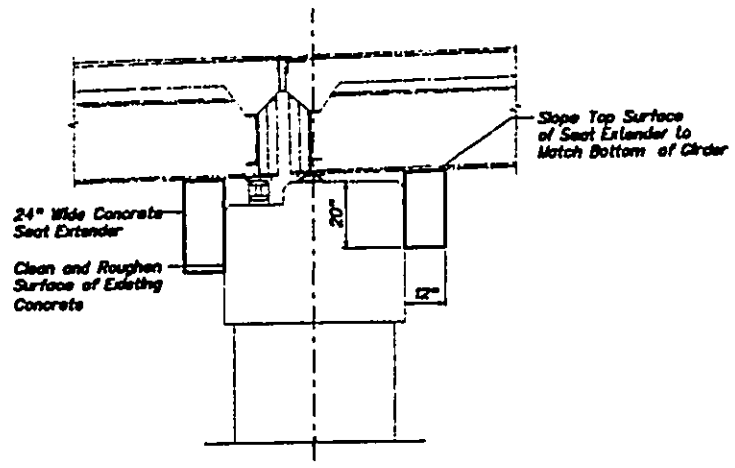


PIER SEAT EXTENDER (C1)
NOT TO SCALE

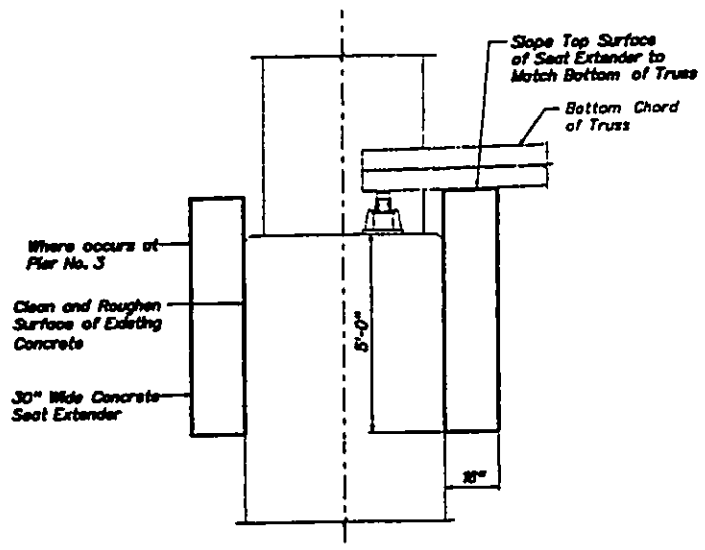
KOLEKOLE BRIDGE SEISMIC RETROFIT

FIGURE 2.4

SEAT EXTENDERS



PIER SEAT EXTENDER (C2)

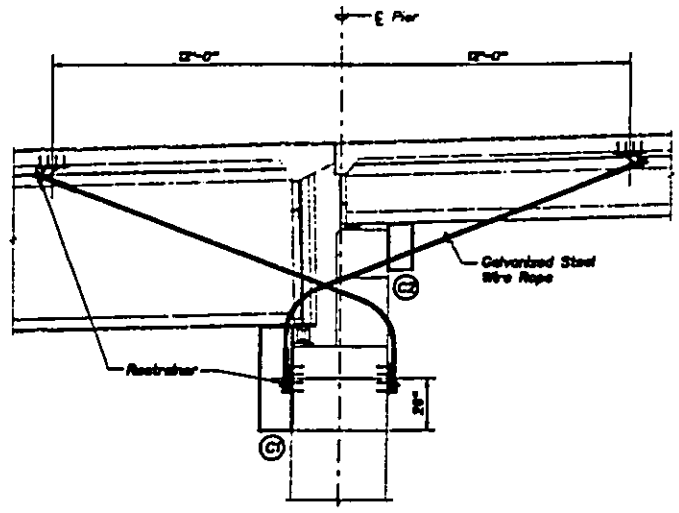


PIER SEAT EXTENDER (C3)

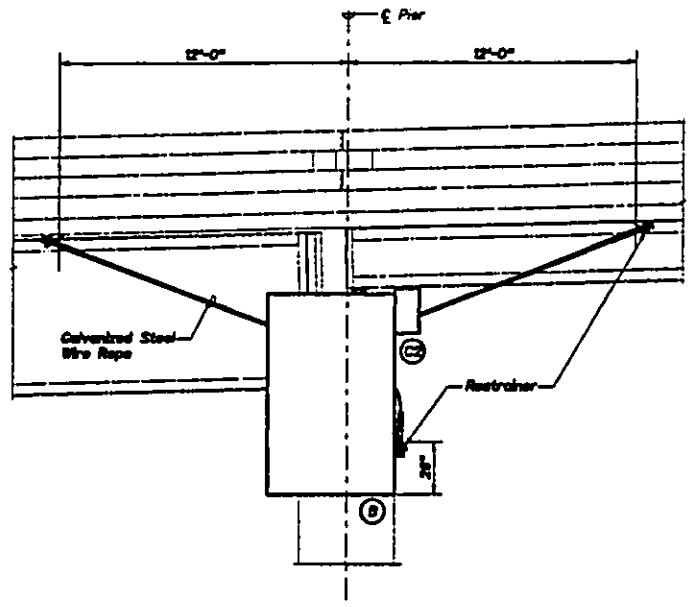
KOLEKOLE BRIDGE SEISMIC RETROFIT

FIGURE 2.5

SEAT EXTENDERS



SECTION

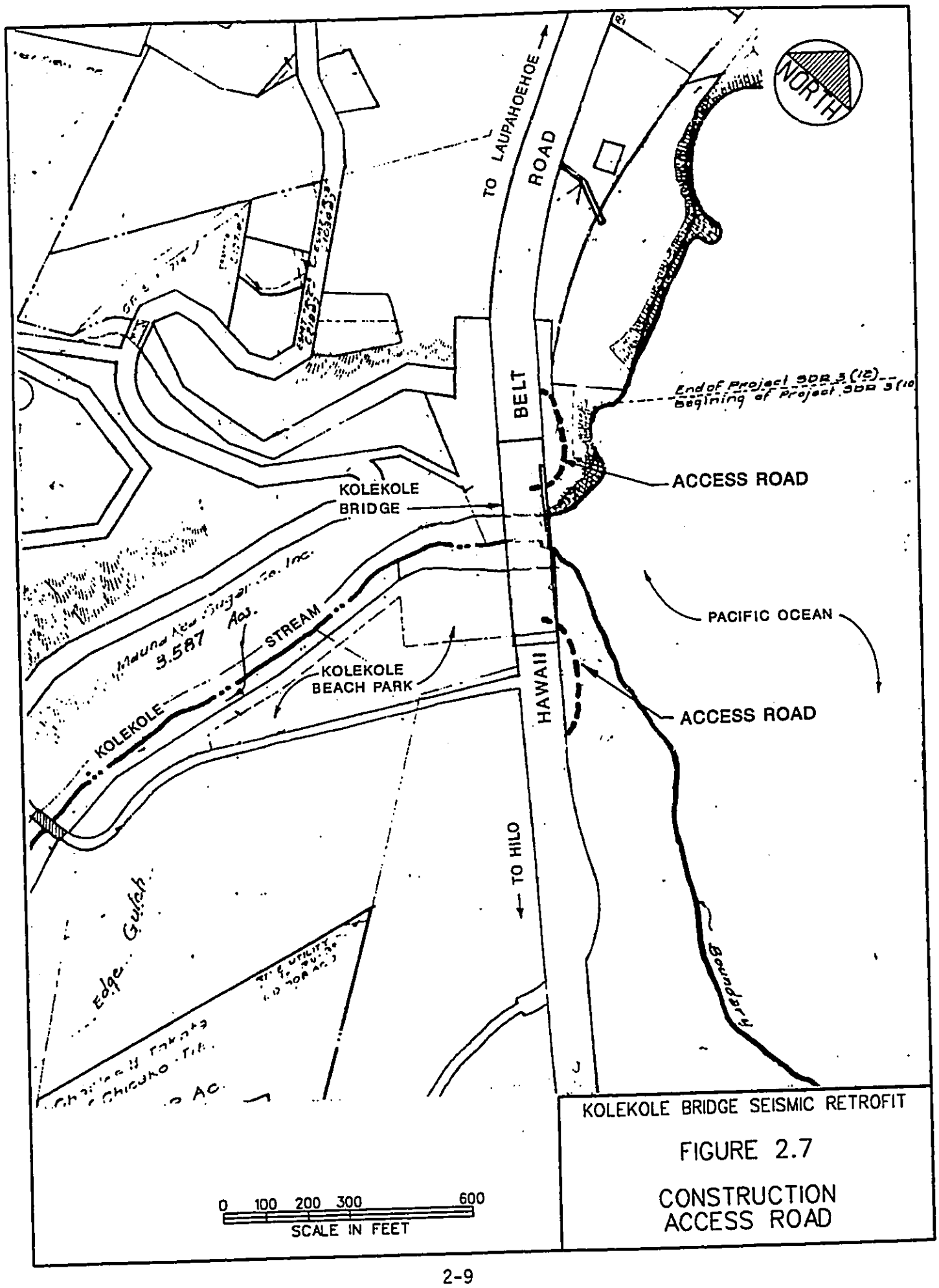


SECTION

KOLEKOLE BRIDGE SEISMIC RETROFIT

FIGURE 2.6

CABLE RESTRAINERS


TO LAUPAHOEHOE
ROAD
BELT
NORTH
End of Project SDB 3 (12)
Beginning of Project SDB 3 (10
ACCESS ROAD
KOLEKOLE
BRIDGE
STREAM
KOLEKOLE
BEACH PARK
KOLEKOLE
HAWAII
PACIFIC OCEAN
ACCESS ROAD
TO HILO
Edge
Gulch
Boundary
0 100 200 300 600
SCALE IN FEET
KOLEKOLE BRIDGE SEISMIC RETROFIT
FIGURE 2.7
CONSTRUCTION
ACCESS ROAD

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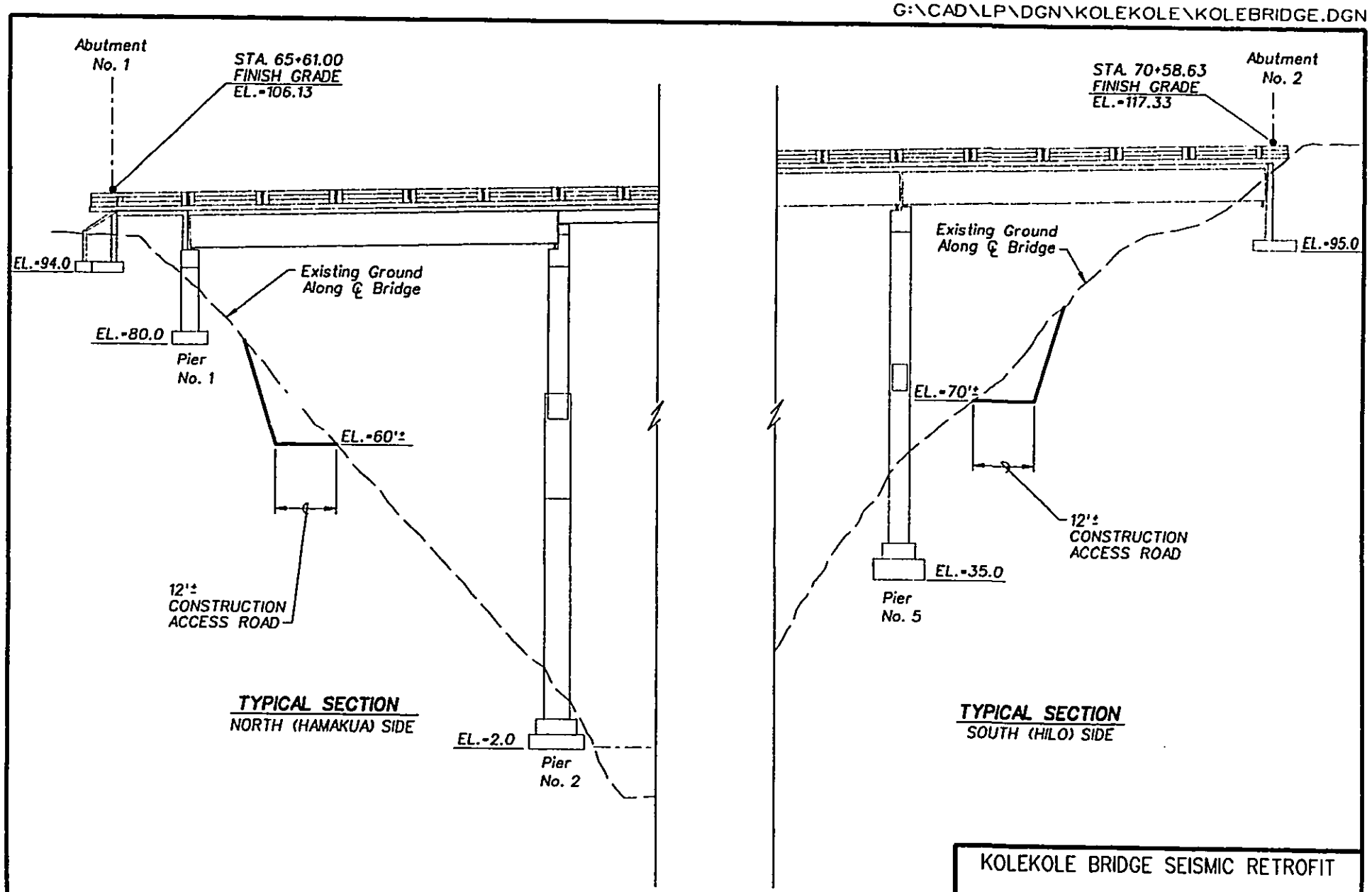


NO SCALE

KOLEKOLE BRIDGE SEISMIC RETROFIT

FIGURE 2.8

CONSTRUCTION ACCESS ROAD
TYPICAL SECTIONS

2.3 PROJECT SCHEDULE AND CONSTRUCTION COST

Construction is anticipated to begin in mid to late 2000, upon receipt of the required permits and approvals. Construction is estimated to last approximately 12 months. The cost of the project is estimated to be about $4 million, funded by the federal government and the State of Hawaii.

CHAPTER 3
DESCRIPTION OF THE AFFECTED ENVIRONMENT

The intent of this chapter is to describe the existing physical and social environment which is affected by the proposed action. Potential impacts which may result from the proposed action, and mitigative measures to be employed to minimize negative impacts, are described in **Chapter 4.**

3.1 PHYSICAL ENVIRONMENT

3.1.1 Regional Context

The Kolekole Bridge is located on the Hawaii Belt Road (Route 19) about 14 miles north of the Hilo Airport, and one mile north of Honomu (see **Figure 1.1**). The County of Hawaii's Kolekole Beach Park is located directly mauka of the bridge. Access to the park is provided by an asphalt road from the Hawaii Belt Road on the southern side of the Kolekole Stream gulch. The elevation drop from the highway to the beach park is about 110 feet. Amenities at the park include a pavilion, restrooms, picnic tables and a shower.

The beach park is surrounded by heavily forested, steep terrain which continues mauka via the Kolekole Stream gulch for about 18 miles toward Mauna Kea. The Kolekole Stream gulch traverses through the Hilo and Mauna Kea forest reserves. Mauna Kea lies about 24 miles west of the Kolekole Bridge.

Kolekole Stream runs perpendicular to and under the bridge, and discharges to the Pacific Ocean immediately makai of the bridge. Kaahakini Stream discharges to Kolekole Stream immediately mauka of the bridge, from the north bank.

3.1.2 Climate

Hawaii is located in the tropics, with relatively little seasonal variations. There are only two seasons: summer and winter. The prevailing winds are northeasterly trades, averaging about seven miles per hour, which are stronger in the afternoon and summer and weaker in the evenings and winter.

Average monthly temperatures recorded at the Hilo Airport range from 66 to 82 degrees Fahrenheit, with an average annual temperature of 74 degrees. Extreme temperatures of 53 degrees to 94 degrees have been recorded.

The average annual rainfall recorded at the Hilo Airport gage is about 129 inches, with most of the rainfall occurring during the winter months (November to April). In the past ten years, the lowest annual rainfall was about 86 inches in 1995, and the highest annual rainfall was about 211 inches in 1990.

3.1.3 Topography and Soils

Topography

Volcanic activity has shaped the topography of the island. Where volcanic flows have not recently occurred, such as at the project site, the terrain has been eroded by rivers and streams. Wave action has formed the high sea cliffs bordered by narrow strips of land that are found along the Hamakua Coast.

The base of the Kolekole Bridge site is relatively flat with a small park, (Kolekole Beach Park) located mauka of the bridge. From the relatively flat base, the side slopes of the gulch rise steeply toward the abutments of the bridge.

Elevations along the gulch wall at the north end of the bridge range from sea level to approximately 100 feet above mean sea level (MSL), resulting in a slope of about 110 percent. At the south end of the bridge, elevations range from 10 to 120 feet MSL, resulting in a slope of about 80 percent.

Geology

Geologically, the island of Hawaii is the youngest island in the Hawaiian group. The island was formed by the outpouring of lava from five volcanoes: Mauna Kea, Mauna Loa, Kilauea, Hualalai, and Kohala. The project site has been formed by lava flows from Mauna Kea, resulting in a layered accumulation of olivine basalt and volcanic ash.

Soils

Soil type and classification of the area are reported in *Soil Survey of Island of Hawaii, State of Hawaii* compiled by the U.S. Department of Agriculture Soil Conservation Service (1973). The project site soils are of the Hilo and Rough Broken Land Series.

The Hilo Series soils at the site are Hilo silty clay loam, zero to 10 percent slopes (HoC), and Hilo silty clay loam, 10 to 20 percent slopes (HoD). This series consists of well-drained silty clay loams located on gentle to steep slopes. Permeability is rapid, runoff is slow to medium, and the erosion hazard is slight to moderate. This soil is characterized as having low bearing capacity, high compressibility, low shear strength, high shrinkage, and a high organic matter content. These soils are located at both ends of the bridge, away from the gulch walls.

The Rough Broken Land (RB) soil is a miscellaneous land type that consists of very steep land broken by many intermittent drainage channels. It occurs primarily in gulches, where the slope is predominantly 35 to 70 percent. The soil material ranges from very shallow to deep, and stone and rock outcrops are common in some areas. This type of soil is located within the gulch.

3.1.4 Kolekole Stream

Kolekole Stream flows toward the east to the Hamakua coast from the slopes of Mauna Kea. The headwater is located about 18 miles inland on the slope of Mauna Kea at an elevation of about 4,600 feet MSL. This results in a stream slope of about eight percent. The discharge rate of the stream during a December 1998 field survey was estimated at 50 cubic feet per second.

Water quality within Kolekole Stream was described as excellent by AECOS, Inc. (see **Appendix B**). Nutrient concentrations were described as unusually low even for Hamakua Coast streams. Turbidity was found to be slight and cloudiness low.

AECOS, Inc. also measured concentrations of lead (Pb) in the stream to assess if lead paint on the bridge might be impacting the stream water quality. Lead was undetected in water samples collected upstream of the bridge, and barely detected underneath. The source could be from the bridge (paint), the highway, or ocean salts.

3.1.5 Flood and Tsunami Hazards

The Federal Emergency Management Agency Flood Insurance Rate Map (FIRM), Map Index and Street Index, in the vicinity of the project site is illustrated on **Figure 3.1**. According to the FIRM, the Kolekole Bridge is located in a "minimal tsunami inundation" area. The Kolekole Bridge is adjacent to a region designated as flood hazard Zone X, an area determined to be outside the 500-year flood plain.

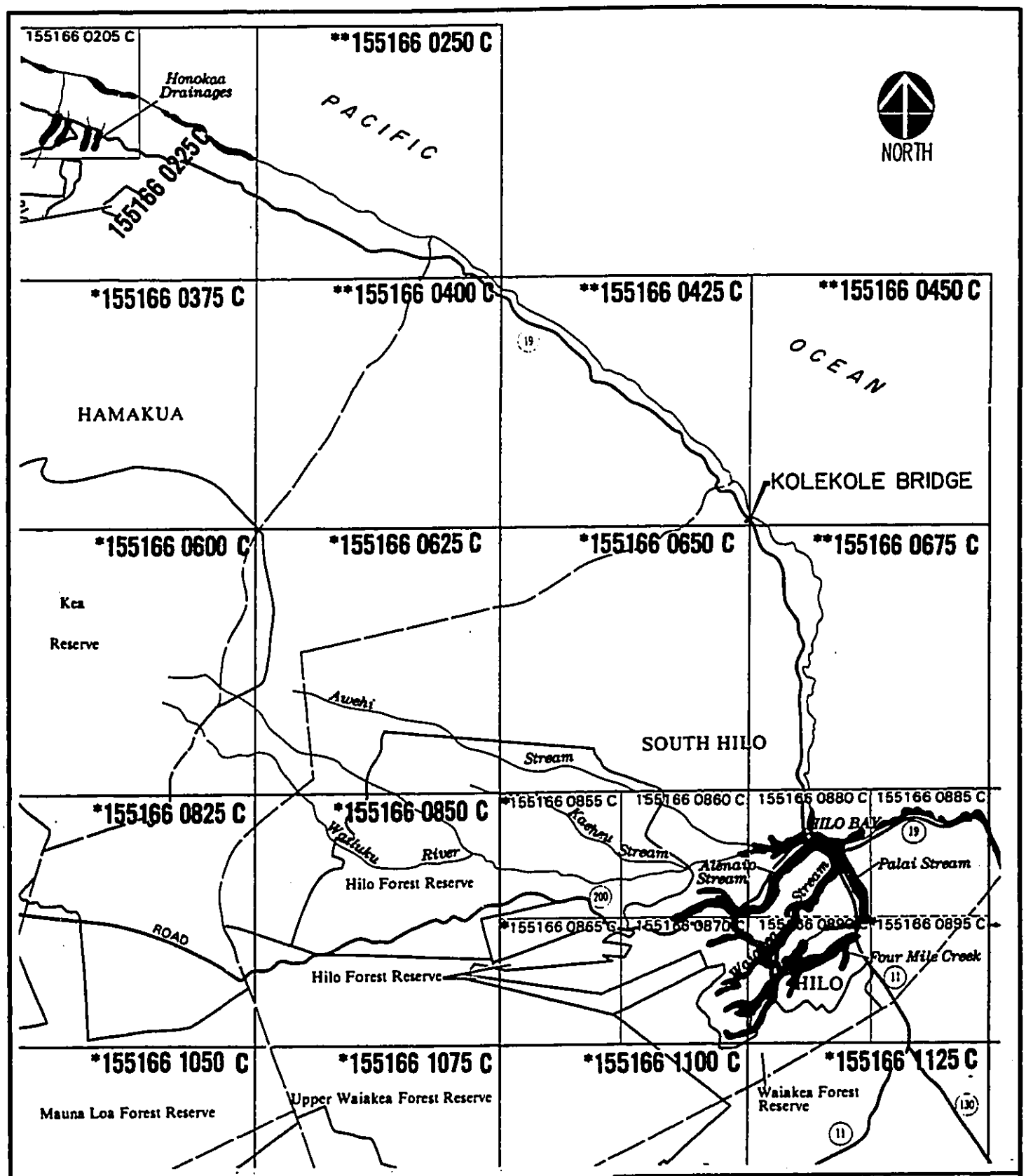
Civil Defense Tsunami Evacuation Map 15 (GTE, June 1996-1997) identifies Kolekole Beach Park as being located within a tsunami evacuation area. This evacuation area extends from the shoreline to an undetermined distance upstream of Kolekole Beach Park.

A tsunami runup map (Atlas of Hawaii, 1998) is illustrated on **Figure 3.2**. Runup is defined as the "sloshing" action of the wave (Atlas of Hawaii, 1998). The 1946 tsunami that originated from the Aleutian Islands resulted in a tsunami runup of 37 feet above the mean lower low water datum at the coast. Later tsunamis resulted in runup of 11 feet (from the Aleutians, 1957), 12 feet (from Chile, 1960), and three feet (from Alaska, 1964).

3.1.6 Flora

A botanical survey was conducted by Char & Associates in December 1998. See **Appendix C** for the complete report.

On the level gulch bottom, the bridge crosses over the seaward portion of the beach park. In this area the vegetation consists of low mats of wedelia (*Wedelia trilobata*), a commonly used ground cover plant, and the grassy lawn areas are dominated by Hilo grass (*Paspalum conjugatum*). Scattered about are clumps of crape ginger or spiral flag (*Costus speciosus*), young ironwood



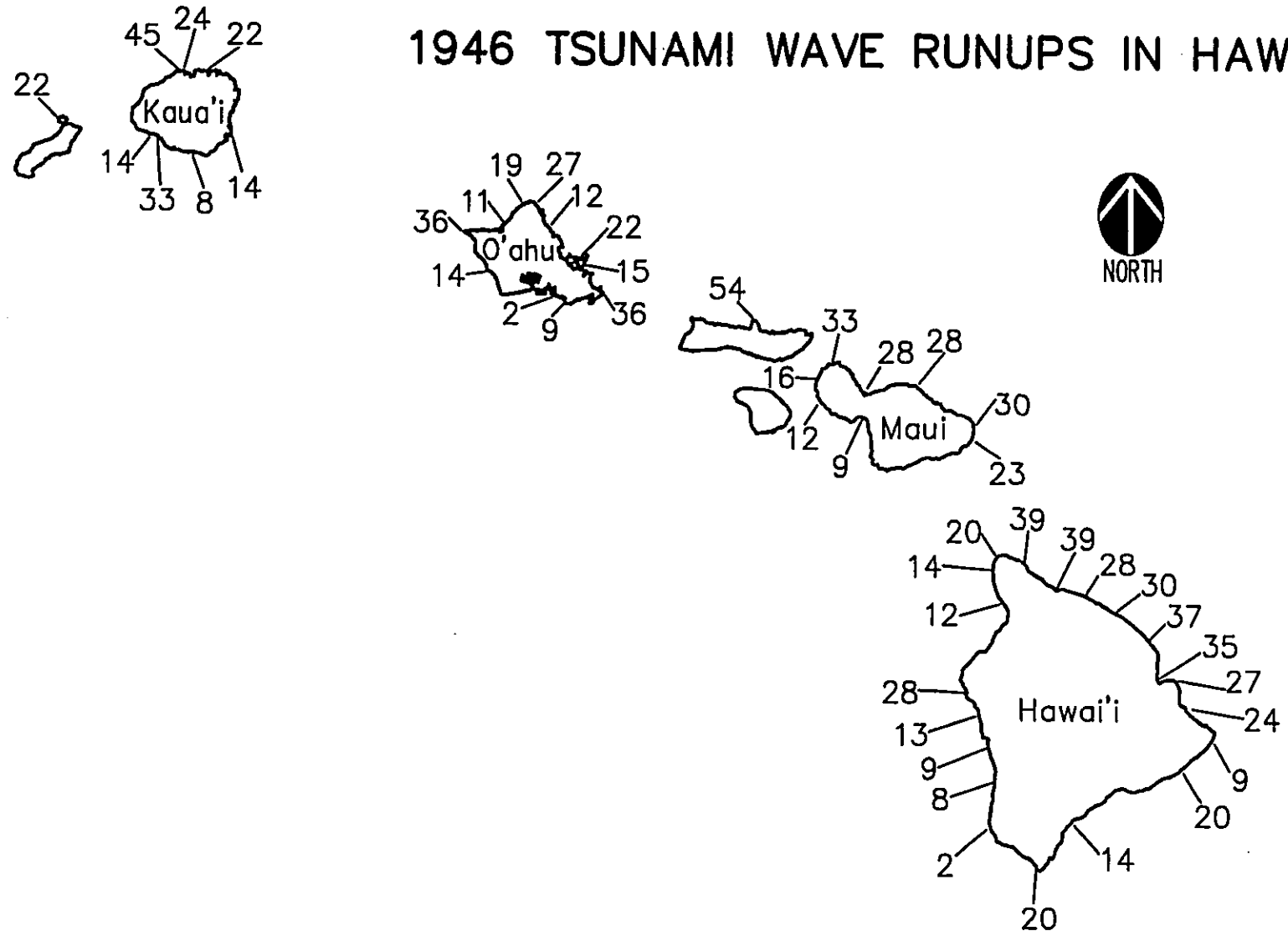
*PANEL NOT PRINTED–AREA IN ZONE X
**PANEL NOT PRINTED–MINIMAL TSUNAMI INUNDATION

KOLEKOLE BRIDGE SEISMIC RETROFIT

FIGURE 3.1

FEMA
FLOOD INSURANCE RATE MAP
(FIRM)

1946 TSUNAMI WAVE RUNUPS IN HAWAI'I



LEGEND:

9 RUNUP HEIGHT (FEET) FOR APRIL 1, 1946 TSUNAMI

KOLEKOLE BRIDGE SEISMIC RETROFIT

FIGURE 3.2

1946 TSUNAMI RUNUP HEIGHTS MAP

trees (*Casuarina equisetifolia*), and a few coconut (*Cocos nucifera*) and hala (*Pandanus tectorius*) trees. Near the rocky, boulder-strewn beach, the vegetation is composed of seashore paspalum (*Paspalum vaginatum*) and wedelia.

At the base of the gulch slopes on the Hilo (south) side under the bridge, there is a large thicket of hau (*Hibiscus tilaceus*) which also extends upslope. In this area, there are plants of shampoo ginger (*Zingiber zerumbet*), 'ape (*Alocasia macrorrhiza*), lobster claw (*Heliconia* sp.), maiden hair fern (*Adiantum raddianum*), ti leaf (*Cordyline fruticosa*), *Philodendron* sp., and other ornamental species. On the Honoka'a (north) side under the bridge, the upper to middle slopes support dense patches of white shrimp plant (*Justicia betonica*) and crape ginger. The slopes adjacent to the bridge support a forest of mixed introduced species which include ironwood, avocado (*Persea americana*), Chinese banyan (*Ficus microcarpa*), Java plum (*Syzygium cumini*), gunpowder tree (*Trema orientalis*), African tulip (*Spathodea campanulata*), and rose apple (*Syzygium jambos*). Shrubs of guava (*Psidium guajava*) and strawberry guava (*Psidium cattleianum*) are locally common.

In the areas around the bridge abutments, the vegetation is more open and grassy. California grass (*Brachiaria mutica*) is abundant near the Hilo side abutment, while Guinea grass (*Panicum maximum*) and palm grass (*Setaria palmifolia*) are common by the Honoka'a side abutment.

On the makai side of the bridge, the steep gulch slopes and the more or less level areas abutting the gulch are covered by a forest composed largely of various introduced species. There are large stands of ironwood trees, and scattered thickets of hau. Other trees found include the king or Alexandra palm (*Archontophoenix alexandrae*), gunpowder tree, African tulip, mango (*Mangifera indica*), bingabing (*Macaranga mappa*), Java plum, and hala. Ground cover is sparse because of the heavy shade and consists of the more shade-tolerant species such as palm grass, Spanish clover, Hilo grass, white shrimp plant, maiden hair fern, and woodfern.

The vegetation in the area under and around the Kolekole Stream Bridge is dominated by introduced species such as guava, Java plum, ironwood, Hilo grass, etc. Most coastal and lowland zones of the Hawaiian Islands have been disturbed by humans and there are few remnants of native vegetation left. Introduced species are all those plants which were brought to the islands by humans.

None of the plants is a threatened or endangered species; nor is any plant a species of concern. All of the plants can be found in similar environmental habitats throughout the islands. Nine native species were found during the field studies, eight of which are indigenous. These are: hau, hala, pakahakaha fern (*Pleopeltis thunbergiana*), *Pycreus polystachyos*, *Macrothelypteris torresiana*, naupaka (*Scaevola sericea*), water hyssop (*Bacopa monnieri*), and *Lysimachia mauritiana*. One species, the neleau or neneleau (*Rhus sandwicensis*), is endemic.

3.1.7 Fauna

A terrestrial and vertebrate species survey was conducted by Rana Productions, Ltd. in November 1998. See **Appendix B** for the complete report.

Mammals
During a field survey, at least four Hawaiian hoary bats (*Lasiurus cinereus semotus*) were observed and 13 bat passes were recorded electronically. The only other mammalian species detected was a dog (*Canis f. familiaris*). While not observed, it is probable that the house mouse, and all three species of rats (roof, Norway, Polynesian) are also present within the project area. It is also likely that the small Indian mongoose, cat, and feral pig are in the general area. All of the introduced mammalian species present on the island are deleterious to both the native habitats and species.

Due to the close proximity of the project site to the city of Hilo and numerous homes and farms, it can be expected that most of the introduced feral mammalian species found in the lowlands of the island utilize the area below the bridge structure on occasion.

Birds
During the field survey, a total of 10 bird species representing nine separate families were detected (see **Table 3.1**). No avian species listed as proposed, threatened or endangered by either the U.S. Fish and Wildlife Service (USFWS) or the State of Hawaii Department of Land and Natural Resources (DLNR) were recorded during the course of the survey.

With the exception of a single White-tailed Tropicbird, and a migratory Spotted Sandpiper, all of the avian species detected during the field survey were alien. This is typical of the coastal area of the windward side of the island, where the avifauna is dominated by alien species.

Three endemic bird species could potentially be impacted by construction activity. These are the threatened Newell's Shearwater (*Puffinus newelli*), the endangered Dark-rumped Petrel (*Pterodroma phaeopygia sandwichsis*), and the endangered Hawaiian Hawk (*Buteo solitarius*). There is no suitable nesting habitat within the project area for either the Newell's Shearwater or the Dark-rumped Petrel. However, both species may overfly the bridge on their way to and from their nesting colonies between late April and late October. Although no Hawaiian Hawks were recorded during the survey, it is probable that there is at least occasional usage of habitat within the Kolekole Stream gulch by this species. The project area is well within the normal range of this bird. This species is currently under review by the USFWS for down listing from endangered to threatened status.

Aquatic Biota
Aquatic biota were reported by AECOS, Inc. (see **Appendix B**). Immediately upstream of the Kolekole Bridge, the Kolekole Stream enters a deep estuary adjacent to the beach park parking lot. Within the estuary, there were o'opu akupa (*Eleotris sandwicensis*), aholehole (*Kuhlia*

TABLE 3.1
AVIAN SPECIES DETECTED DURING THE FAUNAL SURVEY

COMMON NAME	SCIENTIFIC NAME
TROPICBIRDS - Phaethontidae White-tailed Tropicbird	*Phaethon lepturus dorothea*
SANDPIPERS & ALLIES - Scolopacidae Spotted Sandpiper	*Actitus macularis*
PIGEONS & DOVES - Columbidae Spotted Dove Zebra Dove	*Streptopeia chinensis* *Geopelia striata*
STARLINGS - Sturnidae Common Myna	*Acridotheres tristis*
SILVEREYES - Zosteropidae Japanese White-Eye	*Zosterops japonica*
BABBLERS - Timaliidae Melodius Laughing Thrush	*Garulax canorous*
WAXBILLS & ALLIES - Estrilididae Nutmeg Manikin (Scaly-breasted Munia)	*Lonchura punctulata topela*
FRINGILLIDS - Fringillidae House Finch	*Carpodacus mexicanus mexicanus*
EMBERIZIDS - Emberizadae Northern Cardinal	*Cardinalis cardinalis*

Reference: Rana Productions, Ltd. (November 1998)

sandvicensis), and hapawai (*Neritinia vespertinus*). There was also some blue-green alga (*Phormidium* sp.).

3.1.8 Archaeological and Historic Resources

A field survey was conducted in October and November of 1998 by Cultural Surveys Hawaii. See **Appendix E** for the complete report. The survey consisted of a 100 percent ground survey of all accessible areas underneath and surrounding the bridge. Portions of the slopes on both sides of the bridge were inaccessible to pedestrian traffic due to steepness. Photographic documentation of the bridge and surrounding area was also conducted. The survey was conducted to determine the presence or absence of cultural remains that could possibly be impacted by the proposed project.

The areas surveyed at the top of the gulch have been completely altered either by construction of the existing bridge or from sugar cane cultivation. The sides of the gulch within the project area also seem to have been impacted by the construction of the existing bridge, and are prohibitively steep and inaccessible. No archaeological sites were found.

On the floor of the gulch within the project area, the stream bed covers approximately 30 percent of the flood plain. No archaeological sites were found. On the gully floor outside of the project area, the footings of the old railroad bridge were observed. A total of four square footings were observed, two on either side of the stream bed. A cylindrical cement footing was also observed in the center of Kolekole Stream. No other remnants of the old railway bridge were observed.

3.1.9 Air Quality

There is no known air quality data in the immediate area. The State Department of Health reduced its neighbor island air quality monitoring network in 1985. Consequently, there has been no permanent air monitoring of regulated pollutants in East or West Hawaii after 1985. The latest available data from stations in Hilo and Honokaa indicate that total suspended particulate matter and sulfur dioxide standards in the area are below the standards established by the State Department of Health.

An air quality study was conducted by J.W. Morrow in August 1994 on the Kealakaha Stream Bridge, about 16 miles north of the Kolekole Bridge. Results from the Morrow study are presented due to the similarities between the Kealakaha and Kolekole bridges. Both are located on the east side of the island exposed to the northeasterly tradewinds and located in a rural area.

The investigator concluded that air quality probably continues to be good most of the time based on the historical monitoring data (1972-1985) and given the rural, undeveloped nature of the project site. The results of the modeling suggest that current carbon monoxide levels are well below the federal and state standards and there should only be a slight increase in the future.

3.1.10 Noise

The Kolekole Bridge, on the Hawaii Belt Road about one mile north of Honomu, is situated in a rural environment. Existing ambient noise consists of local and distant traffic and background sources including birds, dogs, wind and foliage, and the ocean.

3.1.11 Visual Resources

The Kolekole Bridge spans the width of the Kolekole Stream gulch with a length of almost 500 feet, and consists of two abutments and five piers. The piers are of reinforced concrete construction, and are connected to each other via a steel truss. The end piers are connected to the abutments via steel girders. The longest span between piers is about 132 feet, and the shortest about 72 feet. None of the piers actually contact the stream.

The bridge is 38 feet 6 inches wide, with a pavement width of about 24 feet. The deck contains a gutter and sidewalk on each side of the travel way, with a guardrail bordering the sidewalk. The Kolekole Stream gulch is listed in the Hawaii County General Plan as a site of natural beauty. Akaka Falls, located upstream along Kolekole Stream (off Route 220 from Honomu) is also listed.

3.2 SOCIOECONOMIC ENVIRONMENT

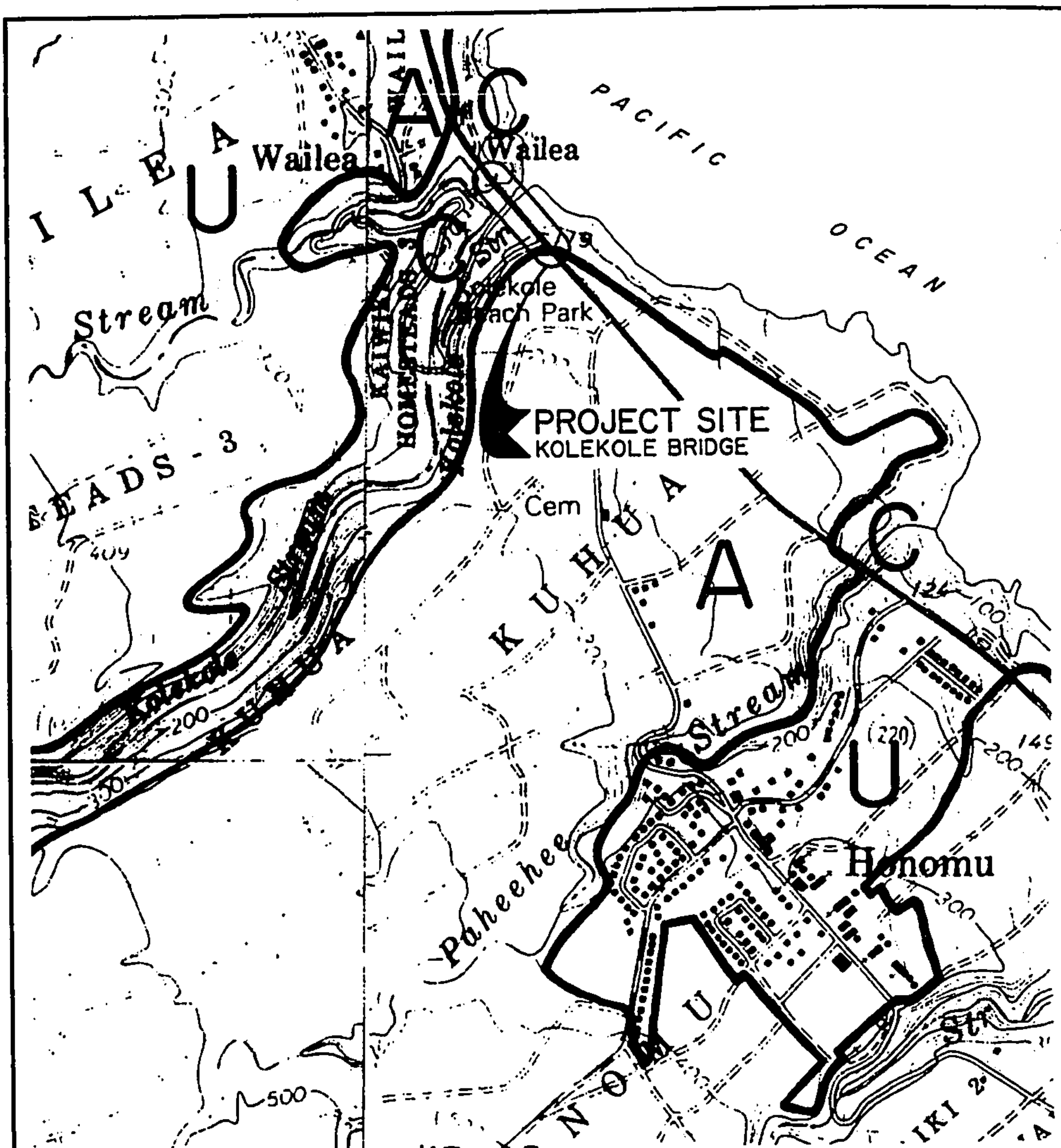
3.2.1 State and County Land Use Designation

The Kolekole Bridge is located within state land use Conservation and Agricultural districts (**Figure 3.3**). According to Hawaii County Planning Department maps, the bridge is also located within the state Special Management Area (see **Figure 3.4**). According to the Hawaii County Planning Department, the project site is zoned A-20a (Agricultural) and Open. The corresponding Hawaii County General Plan Land Use Designation is Extensive Agricultural. The proposed project is pursuant to and consistent with the Hawaii County Zoning Code.

3.2.2 Population and Economy

The Kolekole Bridge is located about 14 miles north of Hilo, the population center of the island of Hawaii. In 1990, Hilo had a population of about 38,000, while the entire island had a population of about 120,000. From 1990 to 1997, the island population had grown to about 141,000. The 1990 population of selected towns from Hilo to Honokaa was reported to be:

Town	Population
Papaikou	1,634
Honomu	532
Laupahoehoe	508
Honokaa	2,186



LEGEND:

U	URBAN DISTRICT
C	CONSERVATION DISTRICT
A	AGRICULTURAL DISTRICT

NORTH

1000' 0 1000' 2000'

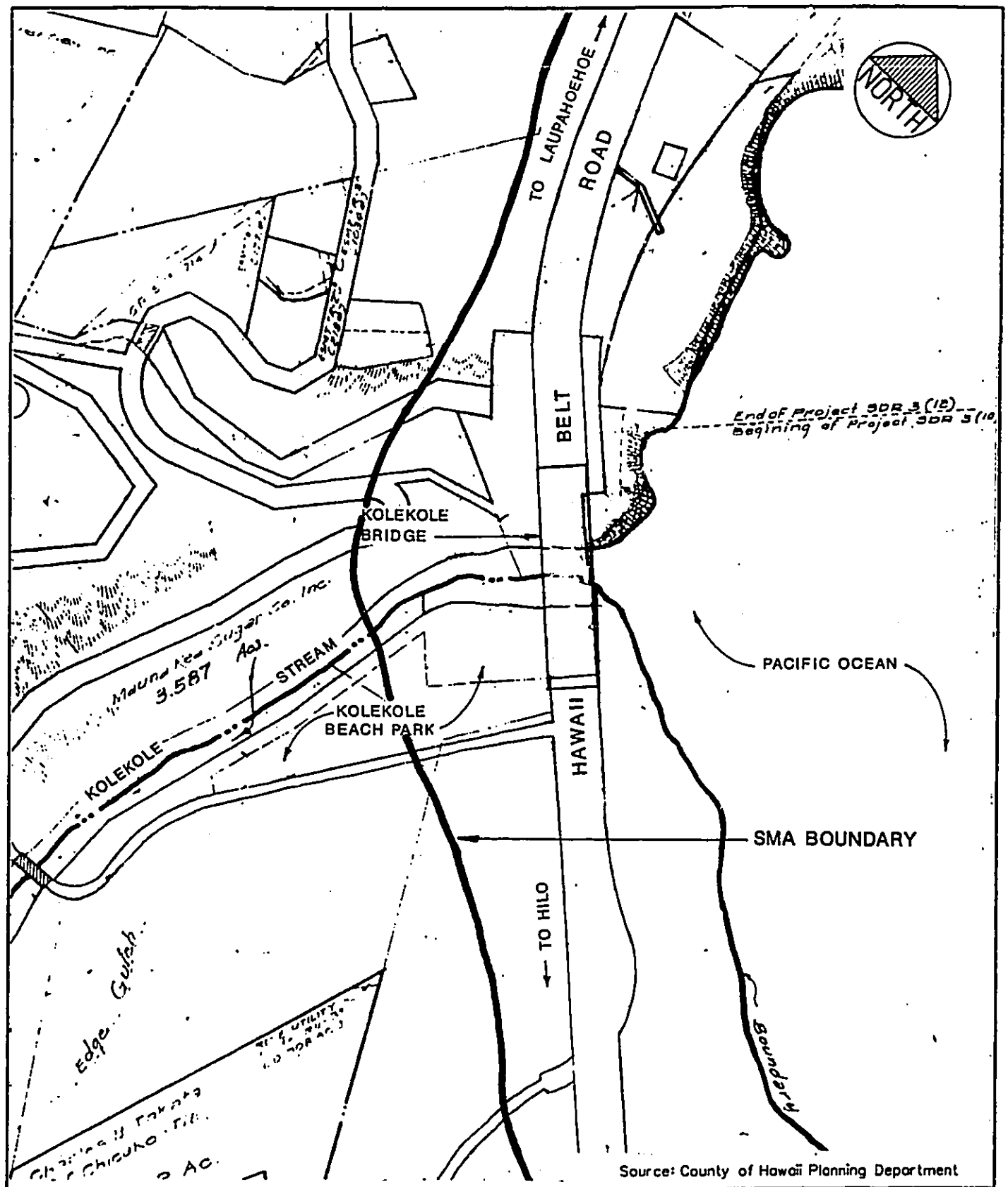
SCALE IN FEET

REFERENCE
USGS QUAD MAPS
(AKAKA FALLS, PAPAIKOU, & PAPAALOA)

KOLEKOLE BRIDGE SEISMIC RETROFIT

FIGURE 3.3

STATE LAND USE MAP



KOLEKOLE BRIDGE SEISMIC RETROFIT

FIGURE 3.4

SMA MAP

The local economy is influenced by tourism, commercial fishing, forestry (Ohia-Lehua, Koa), construction, the retail industry, farming (cattle, pigs, foul), and agriculture (flowers, vegetables, nuts, etc.).

3.2.3 Neighboring Lands

Neighboring land owners are listed in **Table 3.2**. Refer to **Figure 3.5** for location of these parcels in relationship to the project site.

3.3 INFRASTRUCTURE

3.3.1 Roads

The Hawaii Belt Road is a two lane divided highway that is the primary traffic artery connecting Hilo with outlying districts. The Kolekole Bridge portion of the Hawaii Belt Road (Route 19) has a pavement width of 24 feet, and spans the width of the Kolekole Stream gulch for a length of about 500 feet (see **Figure 2.1**). The bridge deck is about 110 feet above the bottom of the gulch.

Kolekole Beach Park is accessed via a two lane asphalt roadway on the mauka side of the Hawaii Belt Road, on the Hilo end. There is no vehicular access to the beach in the immediate area or from the beach park.

3.3.2 Electrical Power, Telephone and Cable TV Service

Electrical Power

Power lines span the width of the gulch on the mauka side of the bridge. The lines are suspended from three-pole frames, each located near the ends of the bridge.

Telephone Service

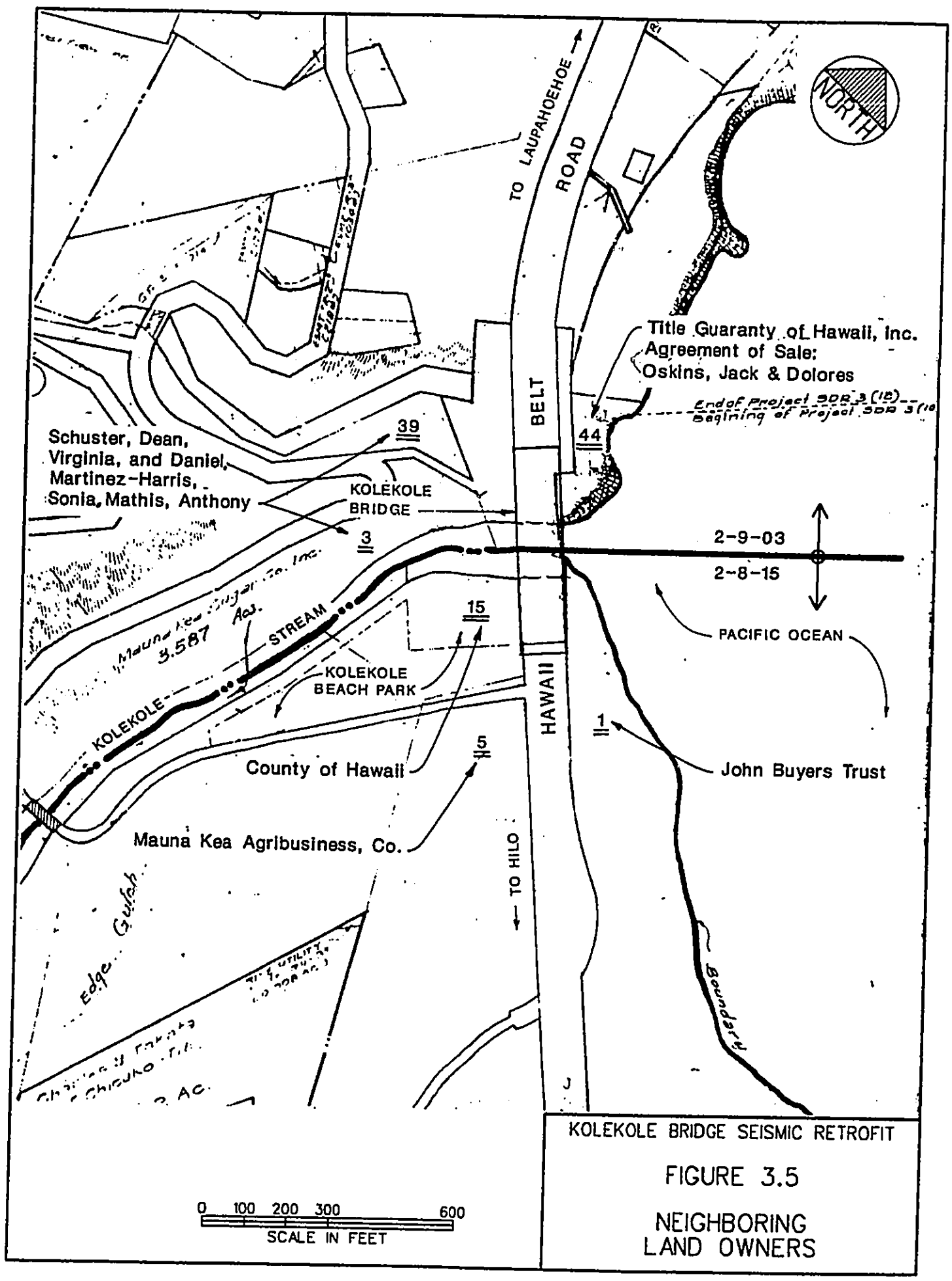
Telephone lines span the width of the gulch on the makai side of the bridge. The lines are suspended from single poles and, like the electric three-pole frames, are located near the ends of the bridge.

Cable TV Service

Hawaiian CableVision of Hilo has a fiber optic line on the power poles located on the mauka side of the bridge. The cable sags low due to the long span between poles.

TABLE 3.2
NEIGHBORING LAND OWNERS

TMK	LAND OWNER	PROPERTY LOCATION
2-9-03: 3, 39	Schuster, Dean, Virginia and Daniel Martinez-Harris, Sonia Mathis, Anthony	North of gulch, west and northwest of bridge
2-9-03: 44	Title Guaranty of Hawaii, Inc. Agreement of Sale: Oskins, Jack & Delores	North of gulch, east of bridge
2-8-15: 1	John Buyers Trust	South of gulch
2-8-15: 5	Mauna Kea Agribusiness Co., Inc.	South of gulch
2-8-15: 15	County of Hawaii (Kolekole Beach Park)	South of stream, west and under bridge in gulch



KOLEKOLE BRIDGE SEISMIC RETROFIT

FIGURE 3.5

NEIGHBORING
LAND OWNERS

3.3.3 Miscellaneous

There are three conduits strapped to the makai side of the bridge, near the base of the concrete guardrail. These conduits are located above the steel girders, away from the proposed seismic retrofit work. The County Department of Water Supply has confirmed that there are no municipal water mains strapped to the bridge. It is possible that one of the conduits is a cable T.V. or telephone conduit.

CHAPTER 4
POTENTIAL IMPACTS AND PROPOSED MITIGATION MEASURES

This chapter identifies the major impacts attributable to the proposed project. Impacts are categorized as short-term impacts (normally of short duration and confined to the length of the construction period) and long-term impacts (resulting from operational activities).

4.1 IMPACTS ON THE PHYSICAL ENVIRONMENT

4.1.1 Regional Impacts

Short-term Impacts
Short-term impacts during the construction period will include generation of dust, air pollutant emissions, noise, vibration, and traffic disruptions from construction activities and construction vehicles.

Construction-related impacts will be mitigated by compliance with federal, state, and county laws and the contract documents. More detailed mitigation for specific impacts is described in the sections that follow.

A positive short-term impact would be the creation of jobs in construction and related fields, including suppliers of construction materials.

Long-term Impacts
A major long-term impact of the project is a safer and more earthquake-resistant bridge on Hawaii Belt Road, which is a major artery connecting Hilo with towns to the north.

4.1.2 Soil Erosion

During construction, the following practices and control measures may be employed to minimize impacts associated with soil erosion:

- Conduct grubbing and grading activities during periods with low rainfall to minimize erosion potential.
- Clear only areas essential for construction.
- Protect natural vegetation with fencing, tree armoring, retaining walls or tree wells.
- Cover or stabilize stockpiles of soil or other construction materials.

- Intercept runoff for conveyance around the construction area.
- Establish streamside buffers to protect water bodies and natural drainage systems.
- Properly dispose of sediment and debris from construction activities.
- Replant bare areas as soon as grading or construction is completed, using soil amendments, fertilizers and temporary irrigation as required to establish growth.
- Minimize transport of sediment and associated pollutants in storm runoff by installing fabric filter fences or straw bale barriers and maintaining vegetative strips.

The contractor shall comply with the requirements of Section 639, "Temporary Project Water Pollution Control (Soil Erosion)," of the *Standard Specifications for Road and Bridge Construction*, State of Hawaii.

All earthwork and grading shall be in conformance with Chapter 10, "Erosion and Sediment Control", of the Hawaii County Code.

4.1.3 Water Quality

If practical, construction will be scheduled during the drier months of the year in order to reduce adverse water quality impacts resulting from soil erosion and runoff. No construction activity will be conducted in the stream.

According to the aquatic biota consultant, AECOS, Inc., the proposed project should have minimal short-term and no long-term impacts on the Kolekole Stream. The contractor will be responsible for removal of any construction debris which inadvertently falls into the stream, park, or estuary.

An application for a Stream Channel Alteration Permit (SCAP) will be prepared due to the proposed concrete connection block construction on the north side. The Commission on Water Resource Management considers the northern gully wall to be the stream bank. Hence, construction of the concrete connection block on the north side is considered alteration of the stream bank. The contractor will be responsible for compliance with conditions of the SCAP during construction activities.

4.1.4 Flood and Tsunami Hazards

The proposed action should not be adversely affected by flood or tsunami waters. The high strength threaded bars, suspended under the bridge's steel frame, should be at a sufficient height to avoid adding drag on the bridge structure. The highest recorded tsunami run-up to date is 37 feet (1946), whereas the lowest threaded bars elevation is about 66 feet.

4.1.5 Flora

Disturbance and/or removal of vegetation in the gulch will be kept to a minimum. Areas cleared of vegetation will be hydromulched as soon as possible to prevent soil erosion and the discharge of sediment into Kolekole Stream.

Approximately 0.25 to 0.5 acre of vegetation will be removed in order to access the areas in which concrete connection blocks will be installed. The alignment of the temporary construction access roads has been included in this estimate. The following mitigation measures will be incorporated into the project to minimize impacts to the botanical resources:

- All project-related materials shall be placed or stored in ways to avoid or minimize disturbance to the environment.
- All project-related materials shall be free of pollutants.
- No contamination of the aquatic environment (e.g. trash and debris disposal) shall result from project activities.
- A contingency plan to control accidental spills of petroleum products shall be developed. Absorbent pads and containment booms shall be stored onsite to facilitate cleanup of petroleum spills.
- Turbidity and siltation from excavation activities shall be minimized and contained to the immediate vicinity of excavation through the use of effective silt containment devices and the curtailment of excavation during adverse weather conditions.
- Upon completion of the project, all areas cleared for the project shall be hydromulched to cover exposed earth and to minimize soil erosion.

4.1.6 Fauna

Construction activities will not have a significant impact on native or federally protected avian or mammalian species. The proposed seismic retrofit of the bridge will not have a deleterious impact on the Hawaiian hoary bat as a species. However, the potential exists for individual bats to be disturbed by the construction activity if conducted at twilight. Although none were observed at the project site, the threatened Newell's Shearwater and the endangered Dark-rumped Petrel may fly over the bridge on the way to and from their nesting colonies. As a precautionary measure, any unshielded construction or equipment maintenance lighting will be kept to a minimum to avoid disorienting these birds. The actual need for lighting is not foreseen due to construction during daylight hours.

4.1.7 Archaeological and Historic Resources

The State Historic Preservation Division (SHPD) has determined that the bridge is a historic resource. However, SHPD has also determined that the proposed seismic retrofit work will not impact the historic character of the bridge. No archaeological sites were identified in the project area during the reconnaissance survey, and therefore, no significant impacts to archaeological resources are anticipated.

4.1.8 Air Quality

Air quality degradation can be expected in the immediate vicinity of construction activity and is primarily attributable to fugitive dust and exhaust emissions from construction equipment and vehicles. To minimize air quality degradation, the contractor will be required to implement measures such as inspecting construction vehicles for exhaust emissions, watering to retard airborne dust and erecting dust screens. Erosion control measures will be employed as soon as possible.

Dust and air pollution control will be governed by Chapter 60.1, "Air Pollution Control", of Title 11, *Hawaii Administrative Rules*, State Department of Health.

4.1.9 Noise

While it is not possible to mitigate noise generated by earthwork and other construction activities to inaudible levels, the contractor will be required to install mufflers on construction equipment and onsite vehicles. Allowable hours of operation for normal construction noise levels (less than or equal to 95 decibels) and for above normal construction noise levels exceeding 95 decibels are indicated on **Figure 4.1**. The contractor shall obtain a noise waiver if noise levels from construction activities are expected to exceed the allowable levels. Typical levels of noise from construction activities are shown on **Figure 4.2**.

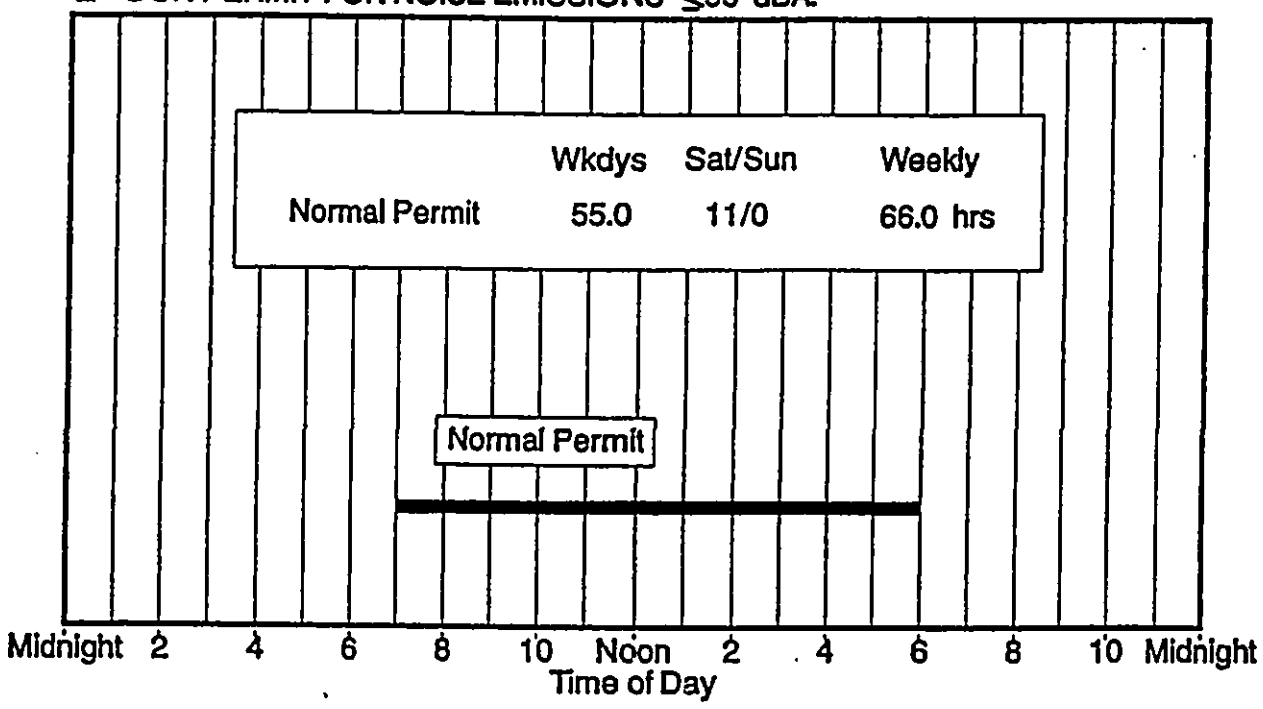
Noise will be governed by the applicable Hawaii County and State Department of Health regulations, including Chapter 11-42, "Vehicular Noise Control for Oahu" and Chapter 11-46, "Community Noise Control" of Title 11, *Hawaii Administrative Rules*, State Department of Health.

With regard to long-term impacts, the alignment and design speed along the Hawaii Belt Road will not change as a result of the seismic retrofit work. Therefore, the traffic noise level should not increase.

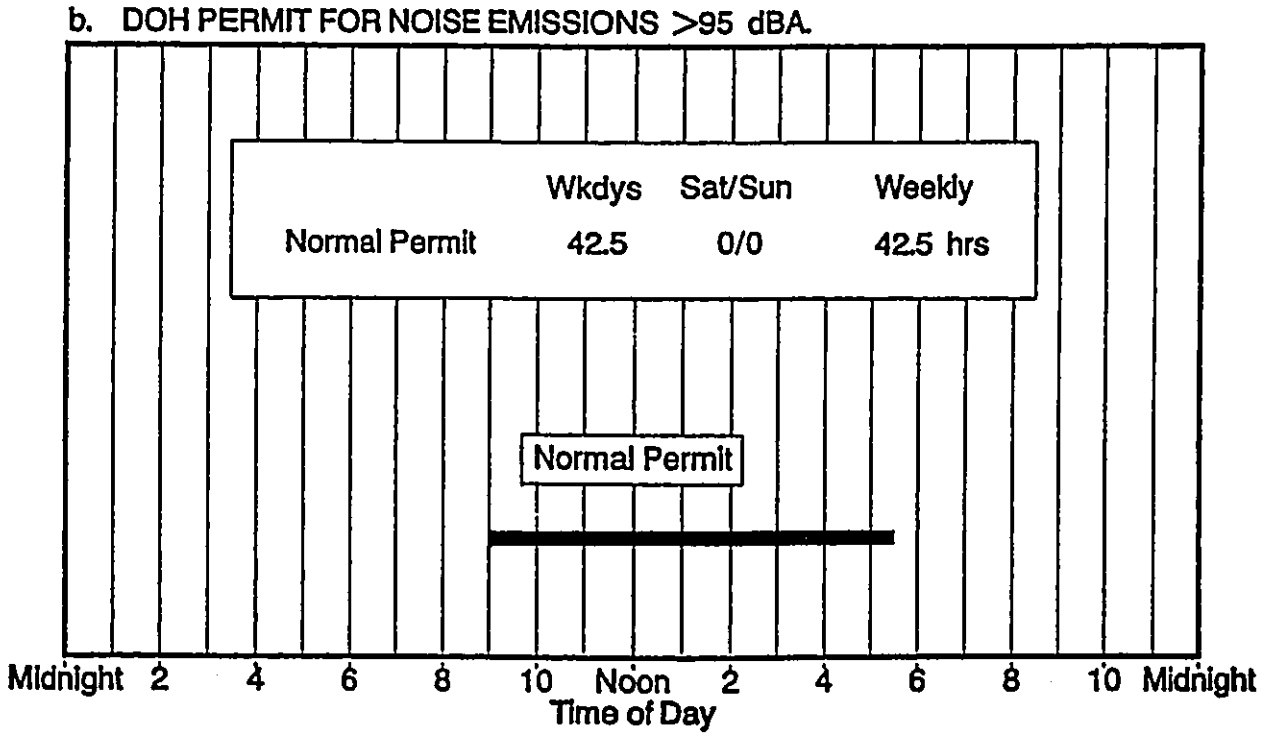
4.1.10 Traffic

During construction of the proposed action, motorists using Hawaii Belt Road in the vicinity of the site will experience traffic inconveniences. Traffic will be interrupted periodically by trucks hauling construction material to and from the site. Through traffic may also be limited to one lane

a. DOH PERMIT FOR NOISE EMISSIONS ≤95 dBA.



b. DOH PERMIT FOR NOISE EMISSIONS >95 dBA.



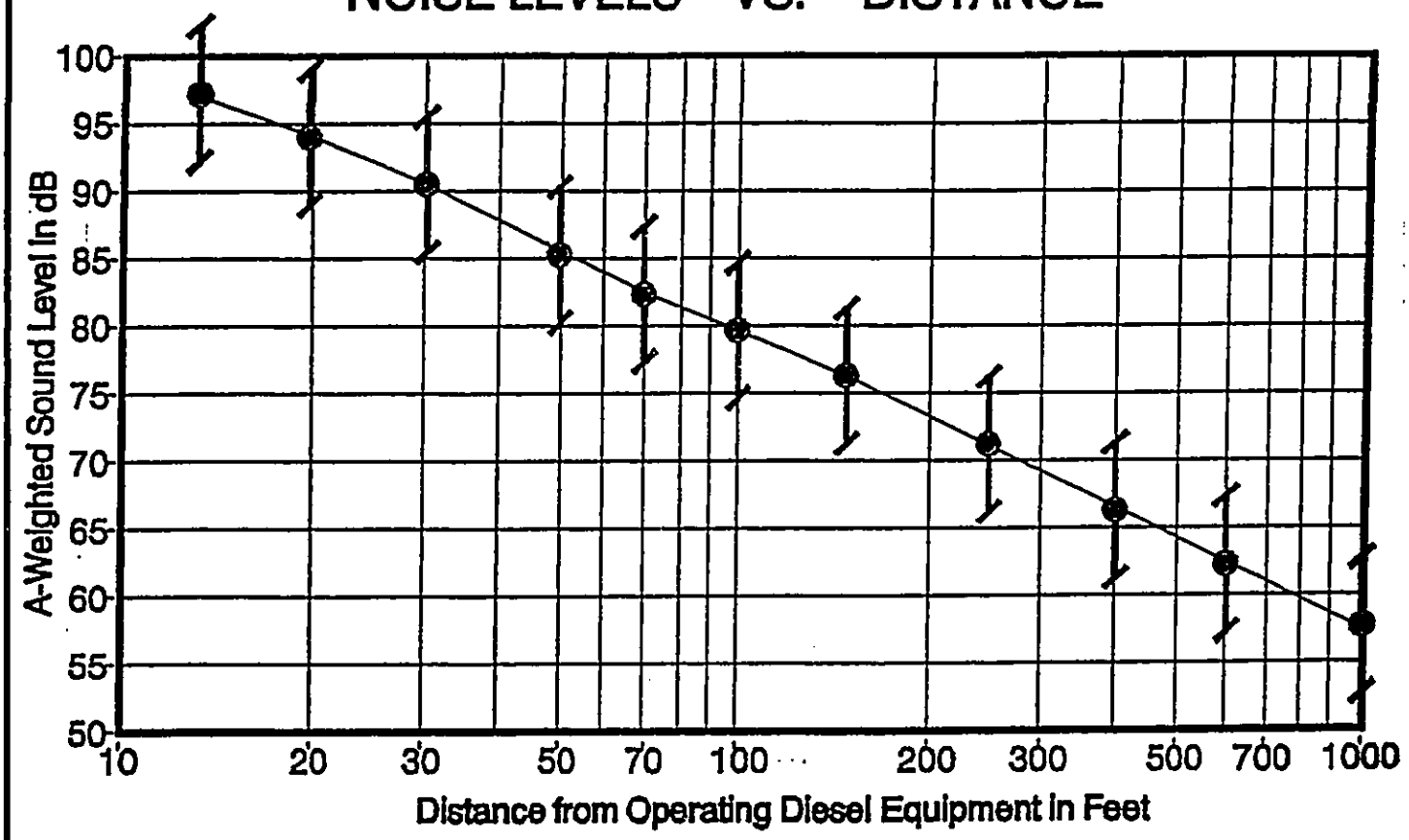
Source: Y. Ebisu & Assoc., Acoustic study for the Kealakaha Stream Bridge Replacement, August 1995

KOLEKOLE BRIDGE SEISMIC RETROFIT

FIGURE 4.1

AVAILABLE WORK HOURS UNDER DOH PERMIT PROCEDURES FOR CONSTRUCTION NOISE

ANTICIPATED RANGE OF CONSTRUCTION NOISE LEVELS VS. DISTANCE



Source: Y. Ebisu & Assoc., Acoustic study for the Kealakaha Stream Bridge Replacement, August 1995

KOLEKOLE BRIDGE SEISMIC RETROFIT

FIGURE 4.2

CONSTRUCTION NOISE v. DISTANCE

on Hawaii Belt Road in the immediate vicinity of construction due to equipment staging. The contractor shall comply with Federal and State highway standards for traffic control. The contractor shall conform to the requirements of the Federal Highway Administration, *Manual on Uniform Traffic Control Devices for Streets and Highways, Part VI*, "Traffic Controls for Highway Construction and Maintenance Operations" and the "Rules and Regulations Governing the Use of Traffic Control Devices at Work Sites on or Adjacent to Public Streets and Highways," of the Highway Safety Coordinator.

Other conditions that may be imposed on the contractor to minimize traffic disruptions include:

- Opening all lanes to traffic during non-working hours.
- Hiring special duty police officers to direct the flow of traffic.
- Maintaining all accesses to and from driveways and public streets in passable condition.

4.1.11 Visual Resources

The appearance of the existing bridge will not be significantly altered. High strength threaded bars will span the length of the bridge, suspended from the steel frame structure located beneath the bridge deck. These threaded bars will be attached to concrete connection blocks located beneath each end of the bridge. The footings, piers, and bridge deck will not be altered, so the overall appearance of the bridge will remain the same.

4.1.12 Lead Paint Removal

Removal of lead paint from steel girders and beams will be necessary at designated areas to prepare the steel for the retrofit work. To prevent paint from entering the environment and creating an impact, several alternatives are being considered. One alternative involves the application of a glue-like coating to the lead paint. Once the glue coating has adhered to the paint, it will be scraped off, carrying the lead paint with it. By utilizing this procedure, scraped paint will not impact the surrounding environment. The contractor will be required to coordinate lead paint removal with Dr. Robert Nishimoto at DLNR Division of Aquatic Resources in Hilo to identify specific means for averting or minimizing adverse effects and provide mitigation for unavoidable damage to natural resource values.

4.2 IMPACTS ON THE SOCIOECONOMIC ENVIRONMENT

The proposed project is not expected to have any adverse social or economic impacts. The proposed action will retrofit an existing bridge to resist earthquake forces. The retrofit work will have a positive impact on public safety. The bridge alignment, deck width, and travel lanes will not be altered and, therefore, its carrying capacity will not increase.

Temporary use of land may be required on both sides of the bridge to enable the construction of access roads beneath the abutments for construction of the concrete connection blocks. Currently, the land on both sides of the bridge is unused. Construction of the temporary access roads will impact neighboring land owners. The State Department of Transportation will compensate land owners for use of their property during the construction period.

Construction staging areas for storage of construction equipment and materials will be located within the state highway right-of-way.

Due to location of the temporary access roads alignments within the Special Management Area and Conservation District, construction of the temporary access roads will be subject to conditions of the Special Management Area Use Permit and Conservation District Use Permit. Applications for these permits will be prepared.

4.3 IMPACT ON UTILITY INFRASTRUCTURE

4.3.1 Roads

Temporary access roads may be constructed at both ends of the bridge to enable access to the area beneath the abutments. These roads would ease access and aid in the installation of the two concrete connection blocks. Driveways for these access roads would intersect Hawaii Belt Road. Ingress and egress of construction vehicles from these driveways may possibly cause deterioration of the highway asphalt pavement At the completion of the project, the pavement will be restored to its original condition.

4.3.2 Electrical Power, Telephone and Cable TV Service

Currently, power lines and a cable TV fiber optic line span the width of the gulch on the mauka side of the bridge. These lines are suspended from three-pole frames at both ends. Telephone lines span the gulch on the makai side of the bridge. These lines are suspended from single poles at both ends. Construction activities will avoid these utilities to mitigate any impact. In the event that these overhead lines require relocation, the affected utility company will be contacted to coordinate relocation. The contractor will be liable for any damage to utility lines due to construction operations.

CHAPTER 5
ALTERNATIVES TO THE PROPOSED ACTION

This chapter discusses the alternatives against which the proposed action was evaluated. The alternatives were rejected due to their inability to meet the project objectives, or attainment of the objectives to a less desirable degree. Three alternatives to the proposed action were considered. Each alternative is described in the sections that follow.

5.1 NO ACTION

In the "no action" scenario, use of the existing bridge would continue, despite its structural inadequacy to resist seismic forces. Should the bridge fail during an earthquake, loss of life or injury may result. If the bridge is deemed unsafe after a seismic event, the only direct ground transportation link between Hilo and communities to the north would be severed. This would prevent, or severely restrict, the transportation of goods and emergency services to those communities.

This alternative is not acceptable because of the potential impacts to public health and welfare.

5.2 RUNNER TRUSS

The runner truss alternative involves construction of a new truss, attachment to the piers, and connection to the gulch beneath the abutments. This system functions similarly to the proposed cable and anchor block system in tension, and also provides strength in compression. Although this alternative also provides compressive strength, it requires much more material (added weight) and labor to construct. Truss construction is more difficult compared to the cable system, and the total cost is far more expensive. In addition, this alternative may require construction equipment to be placed in or near the stream in order to provide safe and ready access to the underside of the bridge. This alternative is undesirable due to cost and additional environmental impacts.

5.3 STRENGTHENING OF FOOTINGS AND COLUMNS

The footing and column retrofit will require dewatering and result in other water-related problems due to the proximity of the bridge piers to the stream and ocean. This alternative is also undesirable due to additional environmental impacts.

5.4 ALTERNATE CONSTRUCTION METHODS

There are two primary construction methods proposed for construction of the concrete connection blocks to be located beneath the bridge abutments. Each alternative is discussed below. Selection of the construction method to be utilized will be a decision left to the contractor.

5.4.1 Temporary Construction Access Road

The preferred method is to construct a temporary access road which would allow workers, equipment and construction materials to be driven to the work area beneath the bridge. The proposed access road would need to be approximately 12 feet wide, excavated into the stream gully wall, approximately 60 to 70 feet above the water surface. Cut slopes of 1:4 (horizontal to vertical) are anticipated based on preliminary soils investigations. Two roads would be required, one constructed at each end of the bridge. Both roads would descend from the makai side of the Hawaii Belt Road. Each road would need to be approximately 300 feet in length, at a grade of 15 to 20 percent, to reach the work area located about 50 feet below the bridge deck. The actual access road alignment and design will be determined by the contractor, based on his assessment of terrain and construction requirements.

The major advantage of this alternative is that the time required for construction of the concrete connection blocks will be minimized. The access road will be constructed by use of a hopto or possibly a backhoe. Vegetation and excavated material may be loaded into a small truck and hauled away for disposal at an approved site. When the road is completed, the excavation equipment will be used to prepare the site for construction of the concrete connection blocks. The ability to drive to utilize excavation equipment and haul trucks will minimize construction time. It is anticipated that excavation for the concrete connector blocks can be completed in six weeks with this method. Upon completion of the site excavation, construction equipment and materials can be delivered directly to the site by trucks, which will further minimize construction time.

Disadvantages of this alternative are the need to utilize neighboring properties and the need for additional environmental permits:

Use of private lands. Construction of temporary access roads will encroach into privately-owned lands. The State Department of Transportation will compensate land owners for use of their property. Agreements will be worked out with land owners should the contractor decide to utilize this construction method.

Permits. Construction of temporary access roads will be subject to both Special Management Area and Conservation District permits since the roads will extend beyond the state highway right-of-way. The roads will not extend into the shoreline setback area.

Upon completion of construction, the access roads will be hydromulched to encourage regrowth of natural vegetation. A vehicle barrier will be erected near the start of the road at the Hawaii Belt Road to prevent further use of the road by others.

5.4.2 Lowering Workers and Materials from Bridge Deck

An alternate construction method is lowering workers, materials and equipment (including a drilling rig) down to the work area from the bridge deck. The vertical distance is approximately 50 feet from the bridge deck to the concrete connection block sites. Use of a crane or boom truck would be required to transport workers, tools and building materials; and to retrieve vegetation and excavated materials from the site. The debris would be loaded on a truck and hauled to an approved disposal site. Daily use of the crane or boom truck would be required until completion of the concrete connection blocks. The contractor would be responsible for staging the crane or boom truck within the state highway right-of-way during use, and storing the equipment out of the travel lanes after hours.

There are several advantages in utilizing this alternative. First, all work could be contained within the existing Department of Transportation highway right-of-way. It would not be necessary to obtain any easements for the proposed construction. Also, both the Hawaii County Planning Department and the Department of Land and Natural Resources have determined that work contained within the existing right-of-way would not be subject to the respective Special Management Area and Conservation District permits.

There are three major disadvantages in utilizing this construction method: increased construction time, traffic disruption and safety concerns.

Construction time. Construction time would increase due to the need to excavate by hand. Based on the soils investigation, rock is anticipated at the concrete connector block sites. Due to the need to lower workers and materials to the work area, use of excavation equipment would be prohibitive. Excavation would need to be accomplished with use of hand tools. All excavated material, including trees, would need to be lifted out by boom truck or crane. Over 400 cubic yards of excavated material will need to be removed. Similarly, all construction materials would need to be lowered to the site. It is estimated that excavation alone would take four months. The time to construct the concrete connection blocks would also increase due to the inability to drive to the site.

Secondary impacts associated with increased construction time are higher construction cost and a longer time period for construction-related impacts such as noise and fugitive dust to occur.

Traffic disruption. Certain large pieces of equipment (e.g. drilling rig) will need to be lowered to the work area by crane. Use of a crane will essentially halt traffic over the bridge. The space required for the outriggers which stabilize the crane while in operation

will extend over the two traffic lanes. Once lifting is completed, the outriggers can be retracted and one traffic lane can be reopened.

Alternatively, use of a boom truck will only require closure of one traffic lane during lifting operations. The disadvantage of using a boom truck is its limited capacity. Workers and tools can be accommodated; however, the drilling rig and other large and/or heavy loads may exceed the boom truck capacity. For example, removal of excavated material would likely be limited to 0.3 cubic yard per lift (requiring over 1,200 lifts to remove all the material by boom truck).

Safety. Workers would need to be lowered 50 feet to the concrete connection block sites daily. Initially, work at the site would be precarious due to the steep slope of the gully wall and the need to clear an area for the proposed construction. The presence of overhead utility lines on both the mauka and makai sides of the bridge also pose safety concerns which may prohibit or at least restrict use of a crane or boom truck.

CHAPTER 6
RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES AND CONTROLS FOR THE AFFECTED AREA

This chapter examines conformance of the proposed project with selected state and local laws and regulations which have been developed to guide physical, social and economic development and to encourage protection of natural and manmade resources.

6.1 CONSERVATION DISTRICT

The State Land Use Law (Chapter 205, Hawaii Revised Statutes), adopted in 1961, establishes the framework of land use management in Hawaii. All lands in the state are classified into one of four land use districts: Urban, Rural, Agricultural or Conservation. The project site is situated on land classified as Agricultural (A) and Conservation (C).

The Conservation classification primarily includes lands in existing forests and water reserve zones. It also includes areas necessary for the protection of watersheds and water sources; scenic and historic areas; parks; wilderness; open space; recreational areas; habitats of endemic plants, fish and wildlife; and all submerged lands seaward of the shoreline. Lands subject to flooding and soil erosion are also included. The Conservation District is controlled by the State Board of Land and Natural Resources, and its uses are governed by the rules of the Department of Land and Natural Resources. The Conservation District serves to conserve, protect and preserve the important natural resources of the state through appropriate management and use to promote long-term sustainability and public health, safety and welfare.

Seismic retrofit of the bridge is considered repair of an existing, nonconforming structure that does not require a Conservation District Use Permit (CDUP). However, a Conservation District Use Application (CDUA) will need to be obtained if the contractor decides to construct temporary access roads to facilitate construction of the concrete connection blocks beneath the bridge abutments. Construction and use of temporary access roads will be carefully managed to be consistent with the purpose of the Conservation District. The roads will be utilized for several months during the construction period. They will not be paved or permanently maintained. Once construction is completed, vehicle access will be blocked and the graded area will be revegetated.

The project site is located in the Resource (R) subzone of the Conservation District. The objective of this subzone is to develop, with proper management, areas to ensure sustained use of the natural resources of those areas. Land uses in the R subzone also include those land uses

permitted in the Protective and Limited subzones. Development of temporary construction access roads would fall under the following permitted uses:

- Landscaping, defined as alteration (including clearing) of plant cover.
- Land uses undertaken by the State of Hawaii to fulfill a mandated governmental function, activity or service for public benefit and in accordance with public policy and the purpose of the Conservation District.
- Demolition, grading, removal or alteration of topographic features.

6.2 COASTAL ZONE MANAGEMENT

The objectives of the Hawaii Coastal Zone Management Program (HRS Chapter 205A, Part I) are to protect the valuable and vulnerable coastal resources such as coastal ecosystems, special scenic and cultural values, and recreational opportunities. The objectives of the program are also to reduce coastal hazards and to improve the review process for activities proposed within the coastal zone.

The relationship of the proposed project, and specifically the temporary construction access roads, to the program objectives and policies is summarized below.

§205A-2(b)(1) Recreational resources

Objective: *Provide coastal recreational opportunities accessible to the public.*
Discussion: N/A

§205A-2(b)(2) Historic resources

Objective: *Protect, preserve, and where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.*
Discussion: No archaeological sites were found during a field survey of the project site, including areas considered for temporary access road construction. The State Historic Preservation Division has determined that the proposed seismic retrofit work will not impact the historic character of the bridge.

§205A-2(b)(3) Scenic and open space resources

Objective: *Protect, preserve, and where desirable, restore or improve the quality of coastal scenic and open space resources.*
Discussion: Upon completion of construction, seismic retrofit of the bridge should have no impact on the existing coastal scenic and open space resources. During

the construction period, the presence of equipment and vehicles will temporarily detract from coastal views. Similarly, grading of temporary construction access roads may detract from views of the stream gulch due to removal of vegetation. However, vegetation will be reestablished and no long term visual impact is anticipated to result from the access roads.

§205A-2(b)(4) Coastal ecosystems

Objective: *Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.*

Discussion: Erosion and sediment controls will be implemented during construction to protect water quality and coastal ecosystems. The project will also require a Stream Channel Alteration Permit and will be subject to conditions of the permit.

§205A-2(b)(5) Economic uses

Objective: *Provide public or private facilities and improvements important to the State's economy in suitable locations.*

Discussion: The project is not a coastal dependent development. However, it involves repair of an existing bridge which happens to be located in a coastal area. Seismic retrofit of the bridge is a necessary improvement that is vital to the economy by insuring continued operation of an important transportation route. Adverse environmental impacts associated with construction activities will be minimized. Construction of temporary access roads will aid in implementation of the project and minimize the overall construction period.

§205A-2(b)(6) Coastal hazards

Objective: *Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.*

Discussion: Control measures will be employed to minimize erosion and sediment transport to the stream and coastal waters during construction activities.

§205A-2(b)(7) Managing development

Objective: *Improve the development review process, communication, and public participation in the management of coastal resources and hazards.*

Discussion: N/A

§205A-2(b)(8) Public participation

Objection: *Stimulate public awareness, education, and participation in coastal management.*
Discussion: N/A

§205A-2(b)(9) Beach protection

Objection: *Protect beaches for public use and recreation.*
Discussion: The project site is located inland from the shoreline setback area. In addition, the proposed temporary construction access roads will be located inland from the shoreline setback area. Along the coastline, the access roads will be no closer than 60 feet from the top of the cliff.

§205A-2(b)(10) Marine resources

Objection: *Implement the State's ocean resources management plan.*
Discussion: N/A

6.3 SPECIAL MANAGEMENT AREA

The purpose of the Special Management Area (SMA) is defined in HRS Chapter 205A, Part II. Special controls on developments within an area along the shoreline were found by the state legislature to be necessary to avoid permanent losses of valuable resources and the foreclosure of management options, and to ensure that adequate access to public owned or used beaches, recreation areas, and natural reserves is provided. It is state policy to preserve, protect, and where possible, to restore the natural resources of the coastal zone.

Within the County of Hawaii, the Special Management Area is governed by rules and regulations under the authority of the Hawaii County Planning Commission SMA Rule 9. All development within the SMA is administered through the Hawaii County Planning Department under Rule 9, pursuant to the objectives and policies of Chapter 205A, HRS.

CHAPTER 7
FINDINGS AND DETERMINATION

7.1 DETERMINATION

The State of Hawaii Department of Transportation has concluded that the proposed project does not have the potential to generate significant environmental impacts, and the need to prepare an environmental impact statement is not evident. This Final Environmental Assessment is submitted with a Finding of No Significant Impact (FONSI) determination.

7.2 FINDINGS AND REASONS SUPPORTING DETERMINATION

The overall and cumulative effects of the proposed action were evaluated with respect to Hawaii Administrative Rules (HAR) Title 11, Department of Health, Chapter 200, Environmental Impact Statement Rules, Section 11-200-12 "Significant Criteria". The following findings and conclusions can be made in support of the FONSI determination.

(1) *The proposed action will not involve an irrevocable commitment to loss or destruction of any natural or cultural resource.*

The State Historic Preservation Division (SHPD) believes that the Kolekole Bridge is eligible for listing on the Hawaii and National Registers of Historic Places. However, SHPD has stated that the utilization of seat extenders at the abutments and piers, and installation of steel bars under the bridge and anchoring them into the slope will have "no effect" on the historic character of the bridge (see **Appendix A**).

(2) *The proposed action will not curtail the range of beneficial uses of the environment.*

The proposed action will strengthen the existing Kolekole Bridge against earthquake forces. This work will take place beneath the abutments and within the bridge structure itself. The footings, piers, and bridge deck will not be altered, and there will be no permanent encroachment upon previously undeveloped areas. Temporary construction roads may be required to access the abutments during construction. These roads will be revegetated when their use is no longer required.

(3) *The proposed action will not conflict with the state's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders.*

Development of the proposed action will comply with the environmental policies, goals and guidelines expressed in Chapter 344, HRS.

(4) *The proposed action will not have a substantial negative effect on the economic or social welfare of the community or state.*

The proposed project is not expected to have any adverse social or economic impacts. Rather, seismic retrofit of the existing bridge which is presently inadequate to resist earthquake forces will have a positive impact on social welfare and public safety. The bridge alignment, deck width, and travel lanes will not be altered and, therefore, its carrying capacity will not increase.

(5) *The proposed action will not have a substantial negative effect on public health.*

Construction activities may result in temporary generation of noise and dust. However, these impacts will subside upon completion of construction and there should be no long term effect on public health.

(6) *The proposed action will not involve substantial secondary impacts, such as population changes or effects on public facilities.*

The proposed action will not have a significant effect on population. The bridge will have a positive impact on transportation facilities with regard to public welfare and safety.

(7) *The proposed action does not involve substantial degradation of environmental quality.*

The proposed action may require the construction of temporary access roads through previously undeveloped lands. After completion of the seismic retrofit work, the access roads will be revegetated. According to the botanical, faunal, and archaeological consultants, there are no threatened or endangered flora or fauna, or historic sites in the vicinity that would be impacted by the proposed project.

(8) *The proposed action will not have a considerable cumulative effect upon the environment or involve a commitment for larger actions.*

The proposed action is directed at mitigating a public safety issue. Specifically, the proposed action is to retrofit an existing bridge deemed inadequate to resist earthquake forces. The bridge alignment and width will not be altered.

(9) *The proposed action will not substantially affect a rare, threatened, or endangered species or its habitat.*

According to the botanical consultant, Char & Associates, the proposed seismic retrofit work is not expected to have a significant negative impact on the botanical resources.

None of the plants found during the field survey is a threatened or endangered species; nor is any plant a species of concern.

According to the faunal consultant, Rana Productions Ltd., the construction activity conducted on the bridge structure will not have a significant impact on native or federally protected avian or mammalian species. During the field survey, no avian species listed as proposed, threatened or endangered by either the U.S. Fish and Wildlife Service or the State Department of Land and Natural Resources were recorded.

According to the aquatic biota consultant, AECOS, Inc., the project should have minimal short-term and no long-term impacts on the Kolekole Stream. While the aquatic environment in the project area is dominated by native species, none are listed as threatened or endangered.

(10) *The proposed action will not detrimentally affect air or water quality or ambient noise levels.*

Air quality and ambient noise levels may be temporarily impacted during construction activities. However, these impacts will terminate upon completion of construction.

The project should have minimal short-term and no long-term impacts on the Kolekole Stream.

(11) *The proposed action will not affect, nor is it likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal water.*

The project site is located about 100 feet inland from the shoreline, where the Kolekole Stream discharges to the Pacific Ocean. None of the seismic retrofit work will take place in or impact the stream or ocean. Although located in a tsunami evacuation area, the lowest part of the bridge structure is 66 feet above the normal water level. The highest recorded tsunami run-up to date is 37 feet (1946).

(12) *The proposed action will not substantially affect scenic vistas or viewplanes identified in county or state plans or studies.*

The appearance of the existing bridge will not be significantly altered. The footings, piers, and bridge deck will not be altered, so the overall appearance of the bridge will remain the same.

(13) *The proposed action will not require substantial energy consumption.*

No substantial changes in energy consumption are anticipated.

CHAPTER 8
CONSULTATION

8.1 LIST OF PREPARERS

This Final Environmental Assessment (EA) was prepared for the State of Hawaii Department of Transportation (DOT) by Engineering Concepts, Inc. The following organizations were also involved in the preparation of this document.

Organization	Area of Expertise
AECOS, Inc.	Water Quality and Aquatic Biota
Rana Productions, Ltd.	Fauna
Char & Associates	Botanical Resources
Cultural Surveys Hawaii	Archaeology, Cultural/Historical Significance
Geolabs Hawaii	Geotechnical Engineer
KSF, Inc.	Structural Engineer

8.2 PARTIES CONSULTED DURING PREPARATION OF THE DRAFT EA

The following agencies were contacted for pre-assessment consultation during the preparation of the Draft EA.

8.2.1 State Government

Department of Land and Natural Resources:
- State Historic Preservation Division
- Land Division

8.2.2 County of Hawaii

Planning Department

8.3 PARTIES CONSULTED DURING PREPARATION OF THE FINAL EA

Thirty three (33) copies of the Draft EA were mailed to agencies, organizations and other interested parties. A complete listing of these consulted parties is included in **Sections 8.3.1** through **8.3.5**.

Availability of the Draft EA was published in the April 23, 1999 edition of *The Environmental*

Notice by the Office of Environmental Quality Control. A total of six comment letters and one telephone call were received as of June 14, 1999 (the public review period ended on May 24, 1999). Agencies, organizations and interested parties responding to the request for comments are marked with an asterisk (*) on the lists which follow. Those parties responding with "no comments" are marked with a plus (+).

8.3.1 Federal Government

U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service

8.3.2 State Government

State Legislature:
- Senator Lorraine Inouye, District 1
- Representative Dwight Takamine, District 1

Department of Business, Economic Development and Tourism:
- \+ Land Use Commission
- \+ Office of Planning
- Energy, Resources and Technology Division

* Department of Health, Environmental Planning Office
* Department of Land and Natural Resources:
- * State Historic Preservation Division
- Commission on Water Resource Management
- Land Division

Office of Environmental Quality Control

8.3.3 County of Hawaii

Council Member Dominic Yagong
* Planning Department
Department of Parks and Recreation
Department of Public Works
Department of Water Supply

8.3.4 Other Interested Parties

Office of Hawaiian Affairs
American Lung Association
Schuster, Dean, Virginia, and Daniel
Martinez-Harris, Sonia
Mathis, Anthony
Title Guaranty of Hawaii, Inc.
- Agreement of Sale: Oskins, Jack & Dolores

John Buyers Trust
Mauna Kea Agribusiness Co., Inc.
Hawaii Electric Light Company, Inc.
GTE Hawaiian Telephone Company
Oceanic Cablevision
* Hawaiian CableVision of Hilo

8.3.5 Libraries

Hawaii State Library
University of Hawaii, Hilo
Hilo Public Library
Laupahoehoe Public and School Library

8.4 COMMENTS ON THE DRAFT EA

Comment letters received during public review of the Draft EA and responses prepared by the applicant have been included in **Appendix A.**

REFERENCES

Hawaii County, Land Use Pattern Allocation Guide Map, *County of Hawaii General Plan*, November 1989.

Hawaii County, Facilities Map, *County of Hawaii General Plan*, November 1989.

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Hawaii State, Department of Health, *Hawaii Administrative Rules*, "Chapter 60.1: Air Pollution Control", October 29, 1993.

Hawaii State, Department of Health, *Hawaii Administrative Rules*, "Chapter 200: Environmental Impact Statement Rules", August 20, 1996.

Morrow, J.W., Environmental Management Consultant, *Air Quality Impact Report (AQIR), Kealakaha Stream Bridge Replacement*, August 1994.

U.S. Dept. of Agriculture Soil Conservation Service, *Soil Survey of Island of Hawaii, State of Hawaii*, December 1973.

U.S. Federal Emergency Management Agency, National Flood Insurance Program, "Flood Insurance Rate Map, Hawaii County, Hawaii", July 16, 1990.

University of Hawaii, Dept. of Geography, *Atlas of Hawaii, third edition*, 1998.

Appendix A

CORRESPONDENCE

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF

February 2, 1999

Operations Branch

Mr. Kenneth T. Ishizaki, P.E.
Engineering Concepts, Inc.
250 Ward Avenue, Suite 206
Honolulu, Hawaii 96814

Dear Mr. Ishizaki:

This letter responds to your request for a determination concerning Department of the Army (DA) permit requirements for the Kolekole Bridge seismic retrofit. Based on the information provided in the draft environmental assessment for the project I have determined that a DA permit will not be required. I suggest that you also coordinate this project with the U. S. Coast Guard, since they also have permitting authority for bridges.

If you have any questions concerning this determination, please contact Mr. Alan Everson or William Lennan of my staff at 438-9258, and reference File No. 990000143.

Sincerely,

George P. Young, P.E.
Chief, Operations Branch

U.S. Department of Transportation
United States Coast Guard

Commander
Fourteenth Coast Guard

300 Ala Moana Blvd
Honolulu, HI 96850-4982
Staff Symbol: (oan)
Phone: (808)541-2315
FAX: (808)541-2309

16590
Serial 32021
28 JUL 1999

RECEIVED
JUL 30 1999
ENGINEERING CONCEPTS

Mr. Kenneth Ishizaki, P.E.
Engineering Concepts, Inc.
1150 South King Street, Suite 700
Honolulu, HI 96814

Dear Mr. Ishizaki:

Thank you for submitting the proposal for the Kolekole Bridge project. The Kolekole Stream is considered to be a navigable waterway of the United States, but it meets the criteria for advance approval of bridges as set forth in the following paragraph.

> Title 33, Code of Federal Regulations, section 115.70, as amended, gives the advance approval of the Commandant, U. S. Coast Guard, to the location and plans of bridges to be constructed across navigable waterways or waterways navigable-in-law but not actually navigated other than by logs, log rafts, rowboats, canoes, and small motorboats. In such cases, the clearances provided for high water stages will be considered adequate to meet the reasonable needs of navigation.

In view of the above, a bridge permit will not be required and the Coast Guard offers no objection to the proposed bridge retrofit provided that full consideration is given to the laws and regulations in enclosure (1). If you have any further questions on this matter, please contact my bridge administrator, LTJG Dan Stulack, at (808) 541-2319.

Sincerely,

T. D. Hooper

T. D. HOOPER
Commander, U. S. Coast Guard
Chief, Aids to Navigation Branch
By direction of the District Commander

Encl: (1) Categorical Exclusion Checklist

CATEGORICAL EXCLUSION CHECKLIST
FOR
ADVANCE APPROVAL BRIDGE PROJECTS

Categorically excluded bridge projects are subject to the following orders, regulations and laws:

a. Section 303 (formerly 4(f)) of the Department of Transportation Act (P.L. 89-670).

b. Executive Order 11990 - Protection of Wetlands.

c. Executive Order 11988 - Floodplain Management.

d. Section 106 of the National Historic Preservation Act (P.L. 89-665) and Executive Order 11593.

e. Section 401 of the Federal Water Pollution Control Act as amended (P.L. 92-500).

f. Fish and Wildlife Coordination Act (P.L. 85-624).

g. Endangered Species Act (P.L. 93-205).

h. Coastal Zone Management Act (P.L. 92-583).

i. Section 309 of the Clean Air Act (P.L. 90-148).

j. Noise Control Act (P.L. 92-574).

k. Wild and Scenic Rivers Act of 1968 (P.L. 90-532).

l. Prime and Unique Farmlands (Council on Environmental Quality Policy dated 16 January 1980).

m. Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646).

n. Magnuson-Stevens Fishery Conservation and Management Act Provisions.

BENJAMIN J. CAYETANO
GOVERNOR

RECEIVED
MAY 3 1999
ENGINEERING CONCEPTS

ESTHER UEDA
EXECUTIVE OFFICER

STATE OF HAWAII
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM
LAND USE COMMISSION
P.O. Box 2359
Honolulu, HI 96804-2359
Telephone: 808-587-3822
Fax: 808-587-3827

April 29, 1999

Mr. Emilio Barroga, Jr.
Department of Transportation
State of Hawaii
601 Kamokila Boulevard, Room 688
Kapolei, Hawaii 96707

Dear Mr. Barroga:

Subject: Draft Environmental Assessment (DEA) for Kolekole Bridge Seismic Retrofit, Pepeekeo, South Hilo, Hawaii, Adjacent to TMK 2-9-03: 3, 39, 44 and 2-8-15: 1, 5, 15

We have reviewed the DEA for the subject project and confirm that the project site, as represented on Figure 3.3, is designated within the State Land Use Agricultural and Conservation Districts.

We have no further comments to offer at this time. We appreciate the opportunity to comment on the subject DEA.

Should you have any questions, please feel free to call me or Bert Saruwatari of our office at 587-3822.

Sincerely,

ESTHER UEDA
Executive Officer

EU:th

cc: OEQC
Kenneth Ishizaki

BENJAMIN J CAYETANO
GOVERNOR

HIGHWAY DESIGN BRANCH, ROOM 688A
BRIDGE DESIGN SECTION, ROOM 611
CADASTRAL DESIGN SECTION, ROOM 600
HIGHWAY DESIGN SECTION, ROOM 609
HYDRAULIC DESIGN SECTION, ROOM 636
TECHNICAL DESIGN SERVICE, 688
RIGHT-OF-WAY BRANCH, ROOM 691
TRAFFIC BRANCH, ROOM 602
MOTOR VEHICLE SAFETY OFFICE, ROOM 511

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION AT KAPOLEI
601 KAMOKILA BOULEVARD
KAPOLEI, HAWAII 96707

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
GLENN M. OKIMOTO
FRANK S. MINAU

IN REPLY REFER TO
HWY-DS
2.4196

June 17, 1999

TO: ESTHER UEDA, EXECUTIVE OFFICER
LAND USE COMMISSION
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT AND TOURISM

FROM: KAZU HAYASHIDA
DIRECTOR OF TRANSPORTATION

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA) FOR KOLEKOLE BRIDGE SEISMIC RETROFIT OF VARIOUS BRIDGES, VICINITY OF PEPEEKEO, FEDERAL-AID PROJECT NO. BR-0100(57) DISTRICT OF SOUTH HILO, ISLAND OF HAWAII ADJACENT TO TMK 2-9-03:3, 39, 44 AND 2-8-15:1,5,15

Thank you for your letter dated April 29, 1999, regarding the Draft EA for the proposed project. We appreciate your effort in reviewing the document and acknowledge your confirmation that the project site is located within the State Land Use Agricultural and Conservation Districts.

A copy of your comment and this response will be included in the Final EA. Should you have any questions, please direct them to the attention of Emilio Barroga, Jr. of our Highways Division, or contact him at 692-7546.

c: Kenneth Ishizaki - Engineering Concepts, Inc. ✓
Les Segundo - Office of Environmental Quality Control

ENGINEERING CONCEPTS, INC.
Consulting Engineers

MEMORANDUM

Date: April 28, 1999

To: Mr. Calvin Miyahara
KSF, Inc.

From: Kenneth Ishizaki

Subject: Kolekole Bridge Seismic Retrofit Draft EA

ECI received a telephone call from Ms. Christina Miller of the Office of Planning (587-2845) on April 28, 1999. The Office of Planning had no comments on the Draft EA.

250 Ward Avenue, Suite 206 Honolulu, Hawaii 96814
Tel: (808) 591-8820 Fax: (808) 591-9010 E-Mail Address: eci@aol.gte.net

BENJAMIN J CAYETANO
GOVERNOR

HIGHWAY DESIGN BRANCH, ROOM 6654
BRIDGE DESIGN SECTION, ROOM 611
CADASTRAL DESIGN SECTION, ROOM 510
HIGHWAY DESIGN SECTION, ROOM 609
HYDRAULIC DESIGN SECTION, ROOM 536
TECHNICAL DESIGN SERVICE, 666

RIGHT-OF-WAY BRANCH, ROOM 691

TRAFFIC BRANCH, ROOM 602

MOTOR VEHICLE SAFETY OFFICE, ROOM 311

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION AT KAPOLEI
601 KAMOKILA BOULEVARD
KAPOLEI, HAWAII 96707

RECEIVED
JUN 2 9 1999
ENGINEERING CONCEPTS

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
GLENN M. OKIMOTO
BRIAN H. MINAAI

IN REPLY REFER TO
HWY-DS
2.4195

June 17, 1999

TO: DAVID BLANE, DIRECTOR
OFFICE OF PLANNING
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT AND TOURISM

FROM: KAZU HAYASHIDA
DIRECTOR OF TRANSPORTATION

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA) FOR KOLEKOLE BRIDGE SEISMIC RETROFIT OF VARIOUS BRIDGES, VICINITY OF PEPEEKEO, FEDERAL-AID PROJECT NO. BR-0100(57) DISTRICT OF SOUTH HILO, ISLAND OF HAWAII ADJACENT TO TMK 2-9-03:3, 39, 44 AND 2-8-15:1,5,15

Thank you for your telephone call to Kenneth Ishizaki of Engineering Concepts, Inc. on April 28, 1999, regarding the Draft EA for the proposed project. We appreciate your effort in reviewing the document and acknowledge that you have no comments at this time.

A copy of the memorandum documenting your telephone conversation and this response will be included in the Final EA. Should you have any questions, please direct them to the attention of Emilio Barroga, Jr. of our Highways Division, or contact him at 692-7546.

c: Kenneth Ishizaki - Engineering Concepts, Inc.
Les Segundo - Office of Environmental Quality Control

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

RECEIVED
MAY 27 1999
[illegible] CONCEPTS

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801

BRUCE S. ANDERSON, Ph.D., M.P.H.
DIRECTOR OF HEALTH

In reply, please refer to:
File:

May 19, 1999

99-081/epo

Mr. Emilio Barroga, Jr.
State of Hawaii
Department of Transportation
601 Kamokila Boulevard, Room 688
Kapolei, Hawaii 96707

Dear Mr. Barroga:

Subject: Draft Environmental Assessment (DEA)
Kolekole Bridge Seismic Retrofit
Pepe`ekeo, South Hilo, Hawaii
Adjacent to TMK: 2-9-03: 3, 39

Thank you for allowing us to review and comment on the subject document. We have the following comments to offer:

Water Pollution

1. The applicant should contact the Army Corps of Engineers to identify whether a federal permit (including a Department of Army permit) is required for this project. If a federal permit is required, then a Section 401 Water Quality Certification is required from the State Department of Health, Clean Water Branch.

2. A National Pollutant Discharge Elimination System (NPDES) general permit is required for the following discharges to waters of the State:

   a. Storm water discharges relating to construction activities, such as clearing, grading, and excavation, for projects equal to or greater than five acres;

   b. Storm water discharges from industrial activities;

   c. Construction dewatering activities;

   d. Noncontact cooling water discharges less than one million gallons per day;

   e. Treated groundwater from underground storage tank remedial activities;

   f. Hydrotesting water;

   g. Treated effluent from petroleum bulk stations and terminals; and

   h. Treated effluent from well drilling activities.

   Any person requesting to be covered by a NPDES general permit for any of the above activities should file a Notice of Intent with the Department's Clean Water Branch at least 30 days prior to commencement of any discharge to waters of the State.

Any questions regarding these comments should be directed to Mr. Denis Lau, Branch Chief, Clean Water Branch at 586-4309.

Polluted Runoff Control

Proper planning, design and use of erosion control measures and management practices will substantially reduce the total volume of runoff and limit the potential impact to the coastal waters from polluted runoff. Please refer to the *Hawaii's Coastal Nonpoint Source Control Plan*, pages III-117 to III-119 for guidance on these management measures and practices for specific project activities. To inquire about receiving a copy of this plan, please call the Coastal Zone Management Program in the Planning Office of the Department of Business and Economic Development and Tourism at 587-2877.

The following practices are suggested to minimize erosion during construction activities:

1. Conduct grubbing and grading activities during the low rainfall months (minimum erosion potential).

2. Clear only areas essential for construction.

3. Locate potential nonpoint pollutant sources away from steep slopes, water bodies, and critical areas.

4. Protect natural vegetation with fencing, tree armoring, and retaining walls or tree wells.

5. Cover or stabilize topsoil stockpiles.

6. Intercept runoff above disturbed slopes and convey it to a permanent channel or storm drain.

7. On long or steep slopes, construct benches, terraces, or ditches at regular intervals to intercept runoff.

8. Protect areas that provide important water quality benefits and/or are environmentally sensitive ecosystems.

9. Protect water bodies and natural drainage systems by establishing streamside buffers.

10. Minimize the amount of construction time spent in any stream bed.

11. Properly dispose of sediment and debris from construction activities.

12. Replant or cover bare areas as soon as grading or construction is completed. New plantings will require soil amendments, fertilizers and temporary irrigation to become established. Use high planting and/or seeding rates to ensure rapid stand establishment. Use seeding and mulch/mats. Sodding is an alternative.

The following practices are suggested to remove solids and associated pollutants in runoff during and after heavy rains and/or wind:

1. Sediment basins.

2. Sediment traps.

3. Fabric filter fences.

4. Straw bale barriers.

5. Vegetative filter strips.

Any questions regarding these matters should be directed to the Polluted Runoff Control Program in the Clean Water Branch at 586-4309.

Sincerely,

GARY GILL
Deputy Director for
Environmental Health

c: CWB
OEQC
Engineering Concepts, Inc.

BENJAMIN J. CAYETANO
GOVERNOR

HIGHWAY DESIGN BRANCH, ROOM 4483
BRIDGE DESIGN SECTION, ROOM 611
CADASTRAL DESIGN SECTION, ROOM 630
HIGHWAY DESIGN SECTION, ROOM 607
HYDRAULIC DESIGN SECTION, ROOM 676
TECHNICAL DESIGN SERVICE, 5489

RIGHT-OF-WAY BRANCH, ROOM 601

TRAFFIC BRANCH, ROOM 802

MOTOR VEHICLE SAFETY OFFICE, ROOM 511

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION AT KAPOLEI
601 KAMOKILA BOULEVARD
KAPOLEI, HAWAII 96707

June 22, 1999

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
GLENN M. OKIMOTO
BRIAN K. MINAAI

IN REPLY REFER TO

HWY-DS
2.4194

TO: GARY GILL
DEPUTY DIRECTOR FOR ENVIRONMENTAL HEALTH
DEPARTMENT OF HEALTH

FROM: KAZU HAYASHIDA
DIRECTOR OF TRANSPORTATION

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA) FOR KOLEKOLE BRIDGE SEISMIC RETROFIT OF VARIOUS BRIDGES, VICINITY OF PEPEEKEO, FEDERAL-AID PROJECT NO. BR-0100(57) DISTRICT OF SOUTH HILO, ISLAND OF HAWAII ADJACENT TO TMK 2-9-03:3, 39, 44 AND 2-8-15:1, 5, 15

Thank you for your letter dated May 19, 1999 (99-081/epo) regarding the Draft EA for the proposed project. We appreciate your effort in reviewing the document and offer the following response to your comments.

1. Water Pollution

a) Our consultant has discussed the need for permits with the Army Corps of Engineers. The Corps has determined that the proposed construction will not require a Department of the Army Permit.

b) The proposed project will not involve a discharge which is subject to a NPDES permit.

2. Polluted Runoff Control

The final EA will identify practices that may be employed to minimize erosion during construction. These practices include:

a) Conduct grubbing and grading activities during periods with low rainfall to minimize erosion potential.

b) Clear only areas essential for construction.

c) Protect natural vegetation with fencing, tree armoring, retaining walls or tree wells.

d) Cover or stabilize stockpiles of soil or other construction materials.

e) Intercept runoff for conveyance around the construction area.

f) Establish streamside buffers to protect water bodies and natural drainage systems.

g) Properly dispose of sediment and debris from construction activities.

h) Replant bare areas as soon as grading or construction is completed, using soil amendments, fertilizers and temporary irrigation as required to establish growth.

The final EA will also state that fabric filter fences, straw bale barriers or vegetative filter strips may be used to minimize solids and associated pollutants in storm runoff.

A copy of your letter and this response will be included in the Final EA. Should you have any questions, please direct them to the attention of Emilio Barroga, Jr. of our Highways Division, or contact him at 692-7546.

c: Kenneth Ishizaki - Engineering Concepts, Inc.
Les Segundo - Office of Environmental Quality Control

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P.O. BOX 621
HONOLULU, HAWAII 96809

MAY 20 1993

Ref:PS:EM

Mr. Emilio Barroga Jr.
Department of Transportation
State of Hawaii
601 Kamokila Boulevard, Room 688
Kapolei, Hawaii 96707

Dear Mr. Barroga:

Subject: Draft Environmental Assessment (DEA)
For the Kolekole Bridge Seismic Retrofit
Pepe'ekeo, South Hilo, Hawaii
Adjacent to TMK: 2-9-03:3,39&49, and 2-8-15:1,5&15

We have reviewed the subject DEA document and have the following comments to offer for your consideration.

Division of Aquatic Resources:

Our Big Island biologist has concerns about the potential short term impacts to aquatic resources during the lead paint removal. We suggest that he be consulted before the project begins to identify specific means for averting or minimizing adverse effects, and provide possible mitigation for unavoidable damage to natural resources values.

Copies of the DEA have been sent to the Big Island for his review and additional comments will be forthcoming.

Contact: Dr. Robert Nishimoto
Division of Aquatic Resources, DLNR
Hilo, Hawaii
Phone: (808) 974-6201

Commission on Water Resource Management:

The proposed Kolekole Bridge modifications include construction of concrete connector blocks in the upper channel. Therefore, a stream alteration permit (HRS Section 174-71) will be required.

Land Division, Engineering Branch:

Our current projects are not effected by the proposed project.

We confirm that the proposed project is located in an area of minimal tsunami inundation (according to FEMA Community Panel Map Nos. 155166 0425 C and 155166 0450). Also the project site is adjacent to a region designated as flood hazard Zone X (according to FEMA Community Panel Map No. 155166 0450 C). This is an area determined to be outside the 500-year flood plain.

Land Division: Planning Section:

We note that the proposed project may include development of a temporary access road outside the existing roadway right-of way. Please provide more detailed information regarding this aspect of the proposed project so that a determination can be made regarding potential Conservation district Use Permit requirements.

Thank you for the opportunity to review this document. Should you have any questions or require further assistance, please contact staff planner Ed Henry at 587-0380.

Very truly yours,

TIMOTHY E. JOHNS
Chairperson

c.c. OEQC
Engineering Concepts, Inc.
Attn: Mr. Kenneth Ishizaki
DAR
CWRM
Engineering Branch
HDLO

BENJAMIN J. CAYETANO
GOVERNOR

HIGHWAY DESIGN BRANCH, ROOM 6664
BRIDGE DESIGN SECTION, ROOM 611
CADASTRAL DESIGN SECTION, ROOM 602
HIGHWAY DESIGN SECTION, ROOM 609
HYDRAULIC DESIGN SECTION, ROOM 638
TECHNICAL DESIGN SERVICE, 666

RIGHT-OF-WAY BRANCH, ROOM 691

TRAFFIC BRANCH, ROOM 652

MOTOR VEHICLE SAFETY OFFICE, ROOM 511

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION AT KAPOLEI
601 KAMOKILA BOULEVARD
KAPOLEI, HAWAII 96707

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
GLENN M. OKIMOTO
BRIAN K. MINAAI

IN REPLY REFER TO:

HWY-DS
2.4193

TO: TIMOTHY E. JOHNS, CHAIRPERSON
DEPARTMENT OF LAND AND NATURAL RESOURCES

FROM: KAZU HAYASHIDA
DIRECTOR OF TRANSPORTATION

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA) FOR KOLEKOLE BRIDGE SEISMIC RETROFIT OF VARIOUS BRIDGES, VICINITY OF PEPEEKEO, FEDERAL-AID PROJECT NO. BR-0100(57) DISTRICT OF SOUTH HILO, ISLAND OF HAWAII ADJACENT TO TMK 2-9-03:3, 39, 44 AND 2-8-15:1,5,15

Thank you for your letter dated May 20, 1999, regarding the Draft EA for the proposed project. We appreciate your effort in reviewing the document and offer the following response to your comments.

1. Aquatic Resources Division
The final EA will include a statement that the contractor will be required to coordinate lead paint removal with Dr. Robert Nishimoto of the Division of Aquatic Resources, DLNR in Hilo to identify specific means for averting or minimizing adverse effects, and provide possible mitigation for unavoidable damage to natural resources.

2. Commission on Water Resource Management
We understand that a Stream Channel Alteration Permit will be required for this project. Correspondence with Mr. David Higa has been initiated regarding the permit application.

3. Land Division, Engineering Branch
We acknowledge confirmation of the flood and tsunami hazard information presented in the Draft EA.

4. Land Division, Planning Section
We have initiated correspondence directly with Mr. Tom Eisen regarding the need for a Conservation District Use Application for the project. It is our understanding that while the proposed seismic retrofit work does not require a permit, a construction access road outside of the existing road right-of-way and within the Conservation District may be subject to one.

A copy of your comments and this response will be included in the Final EA. Should you have additional comments, please direct them to the attention of Emilio Barroga, Jr. of our Highways Division, or contact him at 692-7546.

c: Kenneth Ishizaki - Engineering Concepts, Inc.
Les Segundo - Office of Environmental Quality Control

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

TIMOTHY E. JOHNS
CHAIRPERSON

BRUCE S. ANDERSON
RICHARD N. COX
ROBERT G. GIRALD
DAVID A. MORIOKA
HERBERT M. RICHARDS, JR.

EDWIN T. SAKODA
Acting Deputy Director

MAR -9 1999

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MAR 1 1 1999
ENGINEERING CONCEPTS

Mr. Ken Ishizaki, Vice President
Engineering Concepts
250 Ward Avenue, Suite 208
Honolulu, Hawaii 96814

Dear Mr. Ishizaki:

Request for Determination of Paheehee and Kolekole Streams

This is in response to your request for a determination as to whether stream channel alteration permits are required for modification of bridge structures at Paheehee and Kolekole Streams.

Based on the plans you submitted, the Kolekole Stream modification includes construction of concrete connector blocks within the upper bed and banks of the stream channel. Therefore, a stream channel alteration permit will be required for the proposed bridge modification.

The Paheehee Stream bridge modification includes tieing the existing bridge footing with a concrete cap. If the concrete ties can be installed without modifying the bed of Paheehee Stream channel, a stream channel alteration permit will not be required. Otherwise, if the stream channel must be modified to install the concrete caps, a stream channel alteration permit will be required.

Thank you for your inquiry. We apologize for not responding to you sooner. If you have any questions, please call David Higa at 587-0249.

Sincerely,

Ed Sakoda

EDWIN T. SAKODA
Acting Deputy Director

DH:ss

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
P O BOX 621
HONOLULU, HAWAII 96809

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND DIVISION
STATE PARKS
WATER RESOURCE MANAGEMENT

MAR 2 2 1999

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MAR 2 6 1999
ENGINEERING CONCEPTS

Ref:PB:TNE

File: Cor98.202

Mr. Kenneth Ishizaki, P.E.
Engineering Concepts, Inc.
250 Ward Avenue, Suite 206
Honolulu, Hawaii 96809

Dear Mr. Ishizaki,

SUBJECT: Conservation District Use Permit (CDUP) Requirements for Proposed Seismic Retrofit of Kolekole and Paheehee Bridges, South Hilo, Hawaii

We received your correspondence inquiring on the CDUP requirements for the subject projects, and we have the following comments. We apologize for the lateness of our response.

We understand the two existing bridges over streams on the Hawaii Belt Highway are approximately 50 years old, and DOT plans to retrofit them to meet current seismic design criteria. The Kolekole Bridge is located completely within the Conservation District (Resource subzone), while the Paheehee Bridge appears to be located on the boundary of the Conservation District. All lands makai of the Paheehee Bridge and the highway in this area are designated as Conservation District (Resource subzone). The State Land Use Commission (LUC) has the authority to determine whether this bridge is actually located within or outside of the Conservation District. The LUC can be contacted at 587-3822.

Chapter 13-5, Hawaii Administrative Rules provides for the regulation of land uses within the Conservation District through the issuance of discretionary permits. However, Sections 13-5-37 and 13-5-22(b) "Existing Structures" indicate that the repair of existing, nonconforming structures, such as the two bridges, do not require permits.

Construction of "temporary access roads" may require permits, pursuant to Section 13-5-22(b) "Public Purpose Uses." Therefore, should these roads be required and should they be located within the Conservation District, then we suggest that a Conservation District Use Application (CDUA) be submitted. We have enclosed a copy of the rules and two CDUA forms for your use.

Please contact Tom Eisen of our Planning Branch at 587-0439 if you have any questions regarding this matter.

Sincerely,

DEAN UCHIDA, Administrator
Land Division

Enclosures

cc: Hawaii Board member
HDLO

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION

May 5, 1999

MEMORANDUM

LOG NO: 23310
DOC NO: 9905tm03
Architecture

TO: Mr. Emilio Barroga, Jr.
Department of Transportation

FROM: Don Hibbard, Administrator
Historic Preservation Division

SUBJECT: Draft Environmental Assessment for
Kolekole Bridge Seismic Retrofit
Adjacent to TMK: 2-9-03:03,39,44 and 2-8-15:01,05,15,
Pepeekeo, South Hilo, Island of Hawaii

Thank you for submitting the Draft Environmental Assessment (DEA) for the Kolekole Bridge Seismic Retrofit project. As noted in the DEA, this office has already concurred to the project to retrofit the bridge utilizing a system of seat extenders and the abutments and piers and installing steel bars under the bridge. The current plan remains similar and will have little visual impact on the historic character of the Kolekole Bridge. It should be noted under Section 3.1.8 Archaeological and Historic Resources, that the bridge is an historic resource.

Thank you for the opportunity to comment. Should you have further questions, please call Tonia Moy at 692-8030.

TM:jk

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

September 2, 1997

MEMORANDUM

LOG NO: 22045
DOC NO: 9709tm15
Architecture

TO: Mr. Hugh Y. Uno, Administrator
Highways Division
Department of Transportation

FROM: Don Hibbard, Deputy
State Historic Preservation Officer

SUBJECT: Section 106 Compliance
Federal Aid Project RR-0100(57).
Proposed Seismic Retrofit of Kolekole Bridge
Vicinity of Pepeekeo, Island of Hawaii

Thank you for transmitting the proposal to retrofit Kolekole Bridge, which we believe is eligible for listing on the Hawaii and National Registers of Historic Places, to withstand the effects of seismic activity. We concur that the utilization of seat extenders at the abutments and piers and installation of steel bars under the bridge and anchoring them into the slope as shown in the plans submitted will have "no effect" on the historic character of the bridge.

Thank you for the opportunity to comment. Should you have any further questions, please call Tonia Moy at 587-0005.

TM:jk

c Jamie Ho, Design Branch, Highways Division, DOT

BENJAMIN J. CAYETANO
GOVERNOR

HIGHWAY DESIGN BRANCH, ROOM 686A
BRIDGE DESIGN SECTION, ROOM 611
CADASTRAL DESIGN SECTION, ROOM 609
HIGHWAY DESIGN SECTION, ROOM 608
HYDRAULIC DESIGN SECTION, ROOM 606
TECHNICAL DESIGN SERVICE, 686

RIGHT-OF-WAY BRANCH, ROOM 691

TRAFFIC BRANCH, ROOM 607

MOTOR VEHICLE SAFETY OFFICE, ROOM 611

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION AT KAPOLEI
601 KAMOKILA BOULEVARD
KAPOLEI, HAWAII 96707

June 16, 1999

RECEIVED
JUN 21 1999
ENGINEERING CONCEPTS

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
GLENN M. OKIMOTO
BRIAN H. MINAAI

IN REPLY REFER TO:

HWY-DS
2.4189

TO: DON HIBBARD, ADMINISTRATOR
HISTORIC PRESERVATION DIVISION
DEPARTMENT OF LAND AND NATURAL RESOURCES

FROM: KAZU HAYASHIDA
DIRECTOR OF TRANSPORTATION

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA) FOR KOLEKOLE BRIDGE SEISMIC RETROFIT OF VARIOUS BRIDGES, VICINITY OF PEPEEKEO, FEDERAL-AID PROJECT NO. BR-0100(57) DISTRICT OF SOUTH HILO, ISLAND OF HAWAII ADJACENT TO TMK 2-9-03:3, 39, 44 AND 2-8-15:1,5,15

Thank you for your memorandum dated May 5, 1999, regarding the Draft EA for the proposed project. We appreciate your effort in reviewing the document and acknowledge your comment that the proposed seismic retrofit work will have little visual impact on the historic character of the bridge. The Archeological and Historic Resources section of the Final EA will disclose that the bridge is a historic resource.

A copy of your comment and this response will be included in the Final EA. Should you have additional comments, please direct them to the attention of Emilio Barroga, Jr. of our Highways Division, or contact him at 692-7546.

c: Kenneth Ishizaki - Engineering Concepts, Inc. ✓
Les Segundo - Office of Environmental Quality Control

Stephen K. Yamashiro
Mayor

Virginia Goldstein
Director

Russell Kokubun
Deputy Director

RECEIVED
JUN 14 1999
ENGINEERING CONCEPTS

County of Hawaii
PLANNING DEPARTMENT
25 Aupuni Street, Room 109 • Hilo, Hawaii 96720-4252
(808) 961-8288 • Fax (808) 961-8742

June 7, 1999

Mr. Emilio Barroga, Jr.
State of Hawaii
Department of Transportation
601 Kamokila Blvd., Rm. 688
Kapolei, HI 96707

Dear Mr. Barroga:

(Draft Environmental Assessment) of Kolekole Bridge Seismic Retrofit
Special Management Area Use Permit Assessment
Application (SMAA 99-17)
Applicant: State of Hawaii - Department of Transportation
TMK: 2-9-03: Kolekole Bridge (adjacent to parcels 03, 39, & 44)
TMK: 2-8-15: Kolekole Bridge (adjacent to parcels 01, 05, & 15)

Discussed below, this letter contains two actions by the Planning Director: first, it states our comments on the above DEA pursuant to Hawaii Administrative Rule 11-200-9(a)(1) as *"...the county agency responsible for implementing the [Hawaii County] [G]eneral [P]lan...."* (Emphasis added). And secondly, an SMA assessment exemption is granted for this project.

Discussion of Zoning & Land Use Requirements. For your convenience, the enclosed memorandum lists the land use laws that pertain to the six parcels adjacent to the project site. The significance of these land use regulations apply to both actions; and therefore, *the discussions below on a state or county land use law is our findings that determine the project's consistency with the criteria of the respective land use regulation.*

Findings: Declaration of Exemption from SMA (Special Management Area) Rules. Because the project site and the surrounding parcels are within the SMA zone it is subject to the requirements of the Hawaii County Planning Commission SMA Rule 9. Pursuant to Rule 9-4(10)C, the Planning Director has determined that the proposed seismic retrofitting and the accessory or related improvements to the Kolekole Bridge are exempt from the SMA definition

of "development". The retrofit project is consistent with the repair or maintenance of roads or highways within an existing right-of-way and the repair or maintenance to existing structures or uses, and these are exempt actions pursuant to Rule 9-4(10)B(ii) & (vi). Therefore, in accordance with Rule 9-10G, the Planning Director declares that the proposed retrofit project of Kolekole Bridge are exempt from the SMA rules. A SMA (major) Use Permit is not required for this project.

Shoreline Setback Rules. The Kolekole Bridge project is not subject to the county's shoreline setback requirements because the site is not a parcel of land, building site or lot consistent with Zoning Code definitions sec. 25-1-5(b)(18) & (68). SMA Rule 9-10B8 only requires a shoreline survey *"...when the parcel abuts the shoreline..."* (emphasis added). Rather, consistent with Zoning Code definition sec. 25-1-5(b)(97), this is a bridge within an existing road right-of-way that provides access to building sites.

SLU: "C" ("Conservation") District. The project site and the adjacent areas of the six surrounding parcels are within the SLU: "C" district. Regulation of "C" land use is under the jurisdiction of the state DLNR (Department of Land & Natural Resources). Haw. Rev. Stat. sec. 205-5.

Hawaii County Zoning Code Requirements: A-20a, Parcels 01, 05, 03, 39, & 44. Pursuant to and consistent with county Zoning Code secs. 25-4-11(c), -1-5(b)(86), and -5-72(a)(17) or (c)(13), the proposed seismic retrofit of this bridge qualifies as a public use or structure and is therefore "...a permitted use in any county zone district....".

Hawaii County Zoning Code Requirements: Open, Parcel 15. This project is also a permitted public use or structure and is consistent with the county's Open district, pursuant to sec. 25-5-162(a)(12) and -4-11(c).

County GP (General Plan) Land Use Designation: Extensive Agricultural. The project site and the adjacent parcels are designated extensive agricultural, according to the LUPAG (Land Use Pattern Allocation Guide) Map - HI County GP, Ordinance No. 89-142 (effective: November 4, 1989).

Thank you for including our participation to comment on this proposal. Any follow-up on these comments may be made with Earl Lucero at 961-8288.

Sincerely,

VIRGINIA GOLDSTEIN
Planning Director

EML:gp
f:\wp60\emf\letters\video4.eml

c: Office of Environmental Quality Control
235 S. Beretania Street, Suite 702, Honolulu 96813

Mr. Kenneth Ishizaki
Engineering Concepts, Inc.
250 Ward Ave., Suite 206, Honolulu 96814

c: SMA Section
Mr. Jiro Sumada, Deputy Chief Engineer
Department of Public Works

June 7, 1999

FR: Hawaii County Planning Department
RE: Land Use Designations & Zoning:

TMK: 2-9-03: 03, 39, & 44
TMK: 2-8-15: 01, 05, & 15

TMK: 2-8-15: 01 & TMK: 2-9-03: 44
- County Zoning: A-20a (Agricultural)
- SLU (State Land Use): "C" ("Conservation") & "A" ("Agricultural"): parcel 01
- SLU: "C": parcel 44
- SMA: Yes, parcels are in the Special Management Area
- Shoreline Setback: Yes, parcels abut the shoreline
- County GP (General Plan) Land Use Designation: Extensive Agricultural

TMK: 2-8-15: 05 (mauka); TMK: 2-9-03: 03, 39 (mauka)
- County Zoning: A-20a
- SLU: "Conservation"
- SMA: Yes, the parcel or a portion of it is in the SMA Zone
- County GP (General Plan) Land Use Designation: Extensive Agricultural

TMK: 2-8-15: 15 (mauka)
- County Zoning: Open
- SLU: "C"
- SMA: Yes, this parcel is in the SMA zone
- County GP Land Use Designation: Extensive Agricultural

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ENGINEERING CONCEPTS

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO
HWY-DS
2.5241

September 7, 1999

Ms. Virginia Goldstein, Director
Planning Department
County of Hawaii
25 Aupuni Street, Room 109
Hilo, Hawaii 96720-4252

Dear Ms. Goldstein:

Subject: Draft Environmental Assessment (EA) for Kolekole Bridge
Seismic Retrofit of Various Bridges, Vicinity of Pepeekeo
Federal-Aid Project No. BR-0100(57)
District of South Hilo, Island of Hawaii
Adjacent to TMK 2-9-03:3, 39, 44 and 2-8-15:1, 5, 15

Thank you for your letter dated June 7, 1999, regarding the Draft EA for the proposed project. We appreciate your effort in reviewing the document and your comments relating to the applicable land use laws that are within the Planning Department's jurisdiction.

The final EA will include the Hawaii County Zoning and General Plan Land Use Designations for the parcels as described in your letter.

We understand that the draft EA was also reviewed as a Special Management Area Use Permit Assessment Application (99-17) and that a SMA assessment exemption has been granted for the proposed retrofit work within the existing right-of-way.

For your information, we are coordinating with the Department of Land and Natural Resources on the CDUA requirements for the project.

A copy of your comments and this response will be included in the final EA. Should you have any questions, please direct them to the attention of Emilio Barroga, Jr. of our Highways Division, or contact him at 692-7546.

Very truly yours,

KAZU HAYASHIDA
Director of Transportation

c: Kenneth Ishizaki - Engineering Concepts, Inc. ✓
Les Segundo - Office of Environmental Quality Control

RECEIVED
MAY 7 1999
ENGINEERING CONCEPTS

HAWAIIAN CableVision
HAWAIIAN CABLEVISION OF HILO
a TIME WARNER Company

May 4, 1999

Mr. Emilio Barroga, Jr.
Dept. of Transportation
State of Hawaii
601 Kamokila Blvd., Rm 688
Kapolei, HI 96707

RE: EAs for Paheehee Bridge and Kolekole Bridge Seismic Retrofits
Pepeekeo, Hilo, Hawaii

Dear Mr. Barroga:

Our review of the Environmental Assessments dated April 23, 1999, for Paheehee Bridge and Kolekole Bridge has brought forth a major concern. The construction staging area (chapter 2-2.2.5 page 2 – 4 and page 2-9 figure 2.7) will take place on the mauka side of the road and the Hamakua side of Paheehee Bridge. Please be advised that we have fiber optic line on the power poles that service the Hamakua coast. Due to the long power line spans the cable sags low.

Our concern from past experience is that equipment moving in and out of the staging area may damage our fiber lines. The down time and repair costs to splice these lines in the event of damage is extremely high. Hawaiian CableVision of Hilo would require assurance that we would be compensated for all losses suffered due to damage to our system.

If you wish to discuss, please contact me.

Sincerely,

Lorene Hough
General Manager

Cc: Marilyn Yoza
Office of Environmental Quality Control
Kenneth Ishizaki

C:\corp\99\EA_bridges 1257 Kilauea Avenue • Hilo, Hawaii 96720 • (808) 961-0443 • Fax (808) 935-0148

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BENJAMIN J. CAYETANO
GOVERNOR

HIGHWAY DESIGN BRANCH, ROOM 688A
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CADASTRAL DESIGN SECTION, ROOM 609
HIGHWAY DESIGN SECTION, ROOM 608
HYDRAULIC DESIGN SECTION, ROOM 636
TECHNICAL DESIGN SERVICE, 688

RIGHT-OF-WAY BRANCH, ROOM 691

TRAFFIC BRANCH, ROOM 602

MOTOR VEHICLE SAFETY OFFICE, ROOM 511

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION AT KAPOLEI
601 KAMOKILA BOULEVARD
KAPOLEI, HAWAII 96707

June 16, 1999

RECEIVED
JUN 21 1999
ENGINEERING CONCEPTS

KAZU HAYASHIDA
DEPUTY DIRECTOR
GLENN M. OKIMOTO
DEPUTY DIRECTOR

IN REPLY REFER TO
HWY-DS
2.4190

Ms. Lorene Hough, General Manager
Hawaiian CableVision of Hilo
1257 Kilauea Avenue
Hilo, Hawaii 96720

Dear Ms. Hough:

Subject: Draft Environmental Assessment (EA) for Kolekole Bridge
Seismic Retrofit of Various Bridges, Vicinity of Pepeekeo
Federal-Aid Project No. BR-0100(57)
District of South Hilo, Island of Hawaii
Adjacent to TMK 2-9-03:3, 39, 44 and 2-8-15:1, 5, 15

Thank you for your letter dated May 4, 1999, regarding the Draft EA for the proposed project. We appreciate your effort in reviewing the document and note your comment regarding the location of a fiber optic cable on power poles on the mauka side of Hawaii Belt Road. The location of the fiber optic cable will be disclosed in the Final EA. In addition, the location of the cable will be included in the construction documents and the contractor will be liable for any damage to the cable due to construction operations.

A copy of your comment and this response will be included in the Final EA. Should you have additional comments, please direct them to the attention of Emilio Barroga, Jr. of our Highways Division, or contact him at 692-7546.

Very truly yours,

KAZU HAYASHIDA
Director of Transportation

c: Kenneth Ishizaki - Engineering Concepts, Inc.
Les Segundo - Office of Environmental Quality Control

Appendix B

BIOLOGICAL RECONNAISSANCE SURVEY OF KOLEKOLE STREAM

By AECOS, Inc.

Biological reconnaissance survey of Kolekole Stream at and above Hawaii Belt Road on the Island of Hawai'i[1]

August 5, 1999 *AECOS* No. 912A

Eric B. Guinther
AECOS, Inc. 970 N. Kalaheo Ave., Suite C311
Kailua, Hawai'i 96734
Phone: (808) 254-5884 Fax: (808) 254-3029 Email: guinther@aecos.com

Introduction

This report provides a description Kolekole Stream at Hawaii Belt Road (State Rte 19), approximately 19 km (12 mi) north of Hilo on the Island of Hawai'i. The purpose of the report is to assess biological and water quality impacts of a proposed bridge repair across Kolekole Gulch. A reconnaissance survey of the bridge site was made by *AECOS* biologists Eric Guinther and Rodger Douglas on December 14, 1998. In addition, two areas upstream of the bridge crossing were visited. Water quality samples were collected and biological observations made at each location. Representative specimens of aquatic biota that could not be readily identified in the field were collected.

Stream Description

Kolekole Gulch is one of a number of the large gulches that are conspicuous features on the landscape along the Hāmākua Coast of the Big Island north of Hilo. Kolekole Stream empties into the Pacific Ocean about 17 km (10.8 mi) north-northwest of Hilo, draining the lower slopes of Mauna Kea from about the 1400 m (4600 ft) elevation (Figure 1). This stream is shown on the USGS topographic maps (7.5-Minute Series, Pua Akala, Akaka Falls, Papaaloa, and Papaikou quadrangles, 1980-81) as continuous flowing at all elevations. Kolekole Stream is well known for its 'Akaka Falls (wailele o 'Akaka) – at 135 m (442 ft) in height (DLNR, 1998) being one of the State's most spectacular. A large plunge pool at the base of the waterfall is around the 240 m (800 ft) elevation. From this point to the ocean, Kolekole gulch is very steep-sided and some mostly 75 to 100 m (250 to 300 ft) deep relative to the interfluvial surface. At the Hawaii Belt Road crossing

[1] Report prepared for Engineering Concepts, Inc. for their project: "Seismic Retrofit of Various Bridges, Vicinity of Pepeekeo." This report will become part of the public record.

(project area), essentially at the mouth of Kolekole Gulch, the road surface of the bridge is approximately 35 m (120 ft) above the estuary.

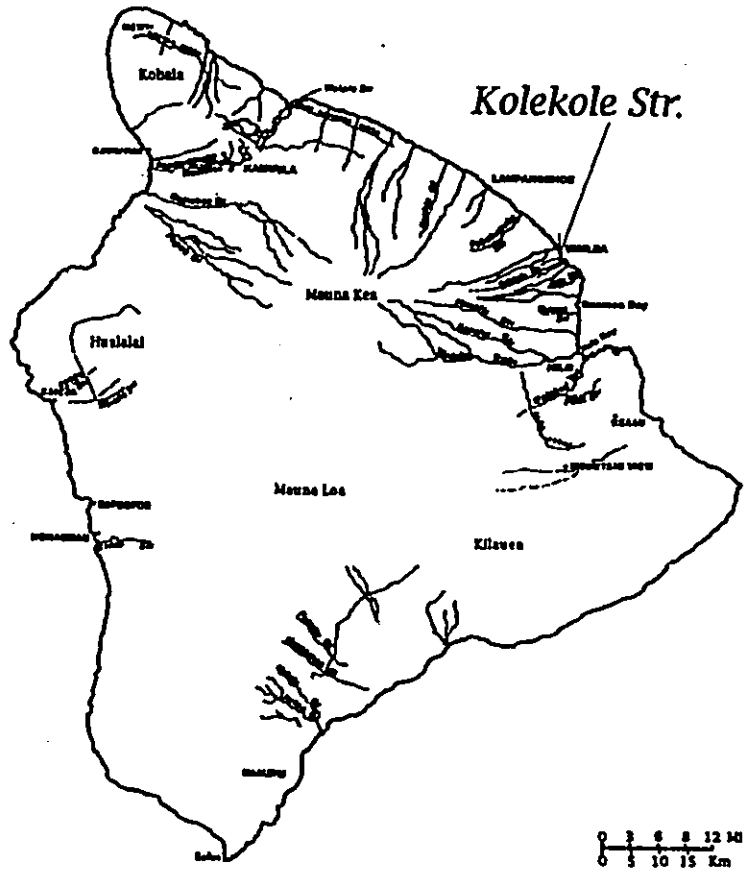

Figure 1. Location of bridge project across Kolekole Gulch indicated on a map of the Big Island (Hawai'i) showing distribution of most larger streams and diversion ditches.

Table 1 lists the streams and gulches for a section of the Hilo/Hāmākua Coast (South Hilo District) as an inventory of aquatic features in the project vicinity. For this table, every stream and gulch that appears as a blue line (solid or dashed) on the USGS, 7.5 minute series topographic maps (Papaikou, Papaaloa, Akaka Falls, and Pua Akala quadrangles, USGS, 1980-81) between Hakalau Stream and Makea Stream (inclusive) is listed. In this area of the Big Island, however, many branch streams exist which are not indicated on these maps. In the first column of the table, streams appear in italics and gulches appear in regular type (a style adapted from USGS topographic maps). Although gulches and ravines are generally considered dry much of the time, whereas streams might be flowing much or all of the time, the distinction here is simply one established by USGS in mapping and is not meant to imply a particular class (see Column 4). A sans serif font (TrueType® "Arial") is used to indicate non-aquatic features, such as towns and place names. The listing of aquatic and non-aquatic features is from west to east (clockwise around the island). The letters "*l*" or "*r*" appear in Column 2 to indicate a branch entering on the left or right bank[2], respectively. Segments representing the confluence of two branches account for stream or gulch names being repeated (different segments represented).

Column 2 provides vertical and horizontal bars that show the relationships between tributaries. A vertical double line identifies the root stream that discharging into the sea. Tributaries are then joined by a solid or dotted vertical line. A dotted line indicates that more tributaries of a particular branch or segment are listed further down in the table. Column 3 (State Code) lists the State code for perennial streams. Codes have been assigned by DLNR only to perennial streams and not to intermittent streams.

Column 4 (Stream Class) presents the type of stream feature: "P" for perennial stream and "I" for intermittent stream. A lower case "I" (as in PI) indicates an interrupted stream, usually one which is perennial at higher elevations but intermittent at lower elevations. A lower case "c" (as in Pc) indicates a stream continuous flowing to the sea. Class designation comes from the Hawaii Stream Assessment (Hawaii Cooperative Park Service Unit, 1990) or field observation in most cases (see Table 1 footnotes).

Column 5 gives the elevation of headwaters in feet above sea level. The value is estimated by examination of the topographic map, and represents an attempt to determine the highest elevation at which a distinct channel for the stream is probably present. Where this value is particularly difficult to determine from the map, the value is preceded by a "~" meaning "about." A number in parentheses indicates the upper elevation of the particular segment, the stream continuing as two or more branches to headwaters at a higher elevation.

[2] The left or right bank of a stream is determined by facing downstream (in the direction of flow). The left bank is then the shore on the left, the right bank is on the right.

Table 1. Summary of stream relationships, characteristics, and other aquatic features for a portion of the Hilo coast, Island of Hawai`i

Stream / Gulch Umauma Stream to Laupāhoehoe		State Code	Stream Class[1]	"Headwaters" Elevation[2] or feature name	F[3]	F elev.	RANK[4]	Survey Data[5]
Hakalau		8-2-32	P	(470)			0	1980
Kamae`e	*l*		*P*	(1185)				
unnamed	*r*		*I*	1360				
unnamed	*n*		*P*	~1720				
unnamed	*s*		*P*	(1205)				
unnamed	*n*		*P*	~2300				
unnamed (2)	*s*		*P*	~2000				
unnamed	*l*		*I*	1200				
Wa`awa`a	*n*		*P*	(1435)				
unnamed	*n*		*P*	~2800				
Wa`awa`a	*s*		*P*	~3160				
Hakalau			*P*	(2150)				
"	*s*			flume	Do	815		
unnamed	*n*		*P*	~3100				
Hakalau	*s*		*P*	(4520)				
"			*P*	*Kalakao`o*	Do	3035		
Hakalau	*n*		*P*	~8000				
Puu Kahinahina	*s*		*P*	~8000				
HAKALAU								
unnamed			*I*	360				
unnamed			*I*	525				
WAILEA								
Kolekole		8-2-33	P				0	1979
Ka`ahakini	*l*		*P*	1600				
unnamed	*l*		*I*	1380				
unnamed	*l*		*P*	(1530)				
"				*Kahuna*	WI	1018		
unnamed	*n*		*PI*	~2840				
unnamed	*s*		*P*	~1800				
Kolekole			*P*	(1650)				DLNR 1967a
"				*Akaka*	WI	1200		
Kalako`o	*n*		*P*	3035				
"				*Hakalau*	DI	3035		
Kolekole	*s*		*P*	4560				

(Kolekole continues)

Table 1 (continued).

Stream / Gulch	State Code	Stream Class[1]	"Headwaters" Elevation[2] or feature name	F[3]	F elev.	RANK[4]	Survey Data[5]
(Kolekole)	(8-2-33)						
unnamed		*I*	(2270)				
unnamed		*I*	3640				
unnamed		*I*	~2800				
unnamed		*I*	335				
Pāhe`ehe`e	8-2-34	P	~2300			O	DLNR 1967b
unnamed		*I*	1160				
unnamed		*I*	640				
HONOMŪ							
Honomū	8-2-35	P	~2860			O	1980
unnamed		*I*	340				
La`imi	8-2-36	P(I)	~1700				
Kapehu	8-2-37	P	~1200			O	1980
unnamed		*I*	570				
Kapehu			flume	Do	340		
unnamed		*I*	(490)				
unnamed		*I*	~670				
unnamed		*I*	~780				
unnamed		*I*	~800				
unnamed		*I*	320				
Makea	8-2-38	*P*	~1120				
"			flume	Do	170		
unnamed		*I*	550			O	

to Hilo Alia Str.

FOOTNOTES:

1 - P= perennial; I = intermittent; c = continuous; i = interrupted. Where given in *italics*, the class is inferred from topographic sheet by solid, dash-dotted, or no blue line. Otherwise, class is inferred from observation or as indicated in the Hawaii Stream Assessment. P,I indicates a stream segment that is intermittent above a perennial part.

2 - In feet, estimated (from topographic maps) upper elevation of stream channel; generally somewhat higher than headwaters shown on topographic map, but may be lower than drainage basin boundary. Elevation in () indicates top of stream segment and point of significant branch or name change to tributary in next row.

3 - F: Natural or man-made aquatic features, such as wetlands, reservoirs, and irrigation ditch systems, which capture flow from the natural stream or feed water into the natural stream. The following codes are used: DI - diversion in; discharge into stream from a ditch, auwai, or other stream (includes overflow from ditch system or stream); Do - diversion out, from a stream into an auwai, flume, or other stream; Gc - USGS crest-stage gaging station; Gp - USGS partial-record gaging station; R - reservoir; RD - reservoir with diversion to a ditch; WT - waterfall. The actual or estimated elevation (in feet) of the feature is provided in Column 7. Multiple features are listed from lowest to highest on branch. The feature name (if known) or type is given in Column 5.

Table 1 (continued).

4 - Summary from the Hawaii Stream Assessment (Hawaii Cooperative Park Service Unit, 1990); aquatic rankings: M = moderate; O = outstanding; S = substantial; U = unknown. If blank, then stream was not ranked.

5 - Lists any references which provide biological or water quality data for the indicated stream or stream segment. Dates alone represent last DLNR survey years as listed in Hawaii Cooperative Park Service Unit (1990) and not referenced further in our report.

Natural or man-made aquatic features (Column 5, 6, and 7), such as wetlands, reservoirs, and irrigation ditch systems, which capture flow from, or feed water into, the natural stream are each given a line under the associated stream branch. Multiple features are listed from lowest to highest on a branch. The feature name (if known) is given in Column 5 and the feature type in Column 6 (see Table 1 footnotes). Column 7 gives the approximate elevation (usually on the stream branch) of the feature .

Column 8 provides ranking information (see Table 1 footnote). Column 9 gives references to other studies on each stream, stream segment, or branches. Complete references are given in the bibliography at the end of the report. Water quality station locations and other information about a particular branch may also appear in this column. Horizontal, dashed lines divide watersheds.

From Table 1 it is evident, in terms of drainage or hydrographic relationship, that Kolekole is the largest drainage between Hakalau and Kapue, draining slopes extending to about 1500 m (5000 ft), whereas the Hakalau and Kapue extend well into the dry zone above about 1800 m (6000 ft) on the east slope of 4205 m (13796 ft) Mauna Kea. These latter two streams are intermittent[3] at higher elevations. Watershed boundaries are shown in Geographic Decision Systems International and E. P. Dashiell (1994) extending to the summit of Mauna Kea in the case of Kolekole (8-2-33), but not Hakalau (8-2-32) or Kapue (8-2-53) and the watershed areas for these three drainage systems are given as 5430, 2568, and 2913 ha (13417, 6346, 7199 ac) respectively. This discrepancy of the Hakalau drainage being much smaller than Kolekole can be explained by the fact that Hakalau, at an elevation of 925 m (3035 ft), feeds into Kalakao'o Stream (a tributary of Kolekole; see Table 1) at least some of the time. Since both Hakalau and Kolekole gulches are fairly equally incised into the mountain slope, both must have received inputs from upper Hakalau drainage over geological time. We are unfamiliar with the current situation, but this process of "stream piracy" is perhaps incomplete, with neither stream monopolizing drainage during flood stage.

[3] An interrupted stream is one that flows all of the time at higher elevation, but is intermittent close to the coast according to Timbol and Maciolek (1978). All streams of any length on the north, west, and south slopes of Mauna Kea are intermittent at elevations above 1200 m because of the low rainfall (less than 30 inches annually). On the east facing slope, the 30-inch isohyet is generally above 2400 m.

To this point, Macdonald and Abbott (1970, p. 304) make the following statement describing this part of the Big Island:

> Between the occasional large gulches, the northeastern flank of Mauna Kea is barely beginning to show scars of erosion... Even the largest gulches extend inland only 3 or 4 miles. The streams plunge into them over high waterfalls, the erosive action of which is gradually extending the canyons headward.... The large number of small streams are consequent [follow the steepest slope] on the original [lava] slopes, and integration of the drainage is just beginning. Excellent examples of near capture of one stream by another can be seen from the air...

At some point in the far distant future, the upper drainage of Hakalau Nui will be completely captured by either Hakalau Stream or Kalakao'o Stream — in the latter case flowing to the sea through Kolekole Gulch.

The Hawaii Stream Assessment (Hawaii Cooperative Park Service Unit, 1990) provides some information on Kolekole Stream, indicating it is a perennial stream of substantial resource value and is listed in that document as a candidate stream for protection. Kolekole is listed as outstanding with respect to both aquatic resources and recreational resources, as well as being listed as a "blue ribbon stream" for recreational resource value. In the latter case, Kolekole was one of 18 streams selected by the Recreational Resources Committee as representing the very best in the State of Hawai'i for recreational use and potential (encompassing camping, fishing, boating, nature study, parks, hiking, swimming, and scenic view).

The elevation in the project area is just above sea level. An existing steel bridge presently carries Hawaii Belt Road (State Rte. 19) over Kolekole Gulch at the mouth of the gulch. In fact, the support structures for the bridge are located at the makai edge of the developed portion of Kolekole Park at this location. The gulch here is some 160 m (520 ft) across at the top and the estuary of Kolekole is 25+ m (80+ ft) across beneath the bridge. During the field visit on December 14, large waves were breaking on the cobble beach just makai (seaward) of the bridge, and a strong flow of fresh water was moving seaward from Kolekole Stream.

The stream was also visited at two places upstream of the project area: at the old highway bridge and on a tributary within Akaka Falls Park. The old highway bridge is located 0.45 km (0.3 mi) upstream from the mouth. The elevation at this station (Sta. 2) is about 10 m (30 ft). Akaka Falls is located 5.52 km (3.4 mi) upstream from the mouth. Akaka Falls Park, located at the top of the gulch, provides ready viewing of Akaka Falls,

but not access to Kolekole Stream below the falls[4]. For this reason, a smaller stream within the park at an elevation of 350 m (1140 ft) was sampled (Station 1) as representative of aquatic environments well upstream of the project area. The stream at these surveyed locations is described in somewhat greater detail under Biota below

Water Quality

At each of the three survey sites, water samples were collected in appropriate containers and taken to the *AECOS* Laboratory on O'ahu for analyses. Table 2 lists the instruments and analytical methods used on these samples. Due to an oversight during mobilization, a meter to measure temperature and dissolved oxygen (DO) in the field was not available to the field team. It is felt that DO values would have been at saturation at all three stations given the high flow of water in Kolekole Stream.

Table 2. Analytical methods and instruments used for the December 14, 1998 water quality sampling in Kolekole Stream, South Hilo District, Hawai'i.

Analyses List	Method	Reference	Instrument
Ammonia	alkaline phenol	Koroleff in Grasshoff et al. (1986)	Technicon AutoAnalyzer II
Conductivity	Method 2510B (EPA 120.1)	Standard Methods 18th Edition (1992); EPA (1979)	Hydach pH/conductivity meter
Nitrate + Nitrite	EPA 353.2	EPA (1993)	Technicon AutoAnalyzer II
pH	EPA 150.1	EPA (1979)	Orion SA 250 pH meter / Ross combination electrode
Total Nitrogen	persulfate digestion /EPA 353.2	D'Elia et al. (1977) / EPA (1993)	Technicon AutoAnalyzer II
Total Phosphorus	persulfate digestion /EPA 365.1	Koroleff in Grasshoff et al. (1986) / EPA (1993)	Technicon AutoAnalyzer II
Turbidity	Method 2130B (EPA 180.1)	Standard Methods 18th Edition (1992); EPA (1993)	Hach 2100P Turbidimeter

D'Elia, C.F., P.A. Stendler, & N. Corwin. 1977. *Limnol. Oceanogr.* 22(4): 760-764.
EPA. 1979. Methods for Chemical Analysis of Water and Wastes. U.S. Environmental Protection Agency, EPA 600/4-79-020.
EPA. 1993. Methods for the Determination of Inorganic Substances in Environmental Samples. EPA 600/R-93/100.
EPA. 1994. Methods for Determination of Metals in Environmental Samples, Supplement 1. EPA/600/R-94/111. May 1994.
Grasshoff, K., M. Ehrhardt, & K. Kremling (eds). 1986. Methods of Seawater Analysis (2nd ed). Verlag Chemie, GmbH, Weinheim.
Standard Methods. 1992. Standard Methods for the Examination of Water and Wastewater. 18th Edition. 1992. (Greenberg, Clescert, and Eaton, eds.). APHA, AWWA, & WEF. 1100 p.

[4] Apparently there is an old ditch trail from Akaka Falls Park to the vicinity of the top of Aklaka Falls (DLNR, 1967a), but the trail head was not found.

Results of the laboratory analyses on samples collected from Kolekole Stream on December 14 do not reveal any water quality problems (Table 3). Indeed, water quality, as indicated by these measurements, is excellent. Nutrient values as low as measured here are seldom if ever seen in streams on O'ahu, and are unusually low even for Hāmākua Coast streams (see *AECOS*, 1998a,b). Total nitrogen (total N) values indicate almost no organic nitrogen (all of the total N is present as inorganic nitrates). Total phosphorus values (4 - 7 µg P/l) are also very low.

Table 3. Water quality characteristics of Kolekole Stream below Akaka Falls on December 14, 1998. Note Sta. 1 sample is from a tributary in Akaka Falls Park, North Hilo District, Island of Hawai`i.

	Time sampled	Cond. (µmhos/cm)	pH (pH units)	Turbidity (ntu)	TSS (mg/l)	Ammonia (µg N/l)
12-14-98						
Sta. 1	0840	78.3	7.72	1.08	0.4	< 1
Sta. 2	1050	48.0	7.64	1.30	0.6	< 1
Sta. 3a	~1300	51.1	--	--	--	--
Sta. 3b	1250	1100	7.60	1.35	0.7	2

		Nitrate + nitrite (µg N/l)	Total N (µg N/l)	Total P (µg P/l)	Total Lead (µg Pb/l)
12-14-98					
Sta. 1	0840	50	50	4	< 2
Sta. 2	1050	94	94	6	< 2
Sta. 3a	~1300	--	--	--	--
Sta. 3b	1250	117	119	7	2

Values recorded for conductivity, turbidity, and TSS are generally good and within expected values based upon criteria established for stream water quality by State Department of Health (DOH, 1991). Although pH is slightly on the high side, the values (7.6 to 7.7) are within the 5.5 to 8.0 pH range established as a State water quality criterion.

Stations 3a and 3b were located in the Kolekole estuary near its upper and lower ends, respectively. Water at Sta. 3a is (by conductivity) stream water. Water at Sta. 3b, located just under the highway bridge, shows some admixture of salt water, but remains essentially fresh water with a salinity of around 1 ppt (compared with ocean water at around 34 ppt).

While there is slight turbidity to these waters, the cloudiness is low. State of Hawaii, Water Quality Criteria (DOH, 1992) for streams includes a geometric mean (average) value not to be exceeded of 2.0 ntu for the dry season and 5.0 ntu for the wet season (applicable to December samples). All three samples are below the dry season mean criterion.

Measurements were also made of lead (Pb) in the stream to assess if suspected lead paint on the existing highway bridge might be impacting stream water quality. The results (Table 3) show lead as undetected in both water samples collected upstream of all road bridges and just detected (0.002 mg Pb/l) beneath the Hawaii Belt Road bridge structure. Because of the close proximity of the ocean, it was not really possible to collect a "downstream" sample for Kolekole Stream relative to this bridge. Perhaps under low or no surf conditions a meaningful sample could be obtained from off the beach, but such occasions are rare along this coast which lacks protective reef development. The results from under the bridge show lead to be just detectable. However, values for metals at the detection limit are somewhat questionable. It is interesting that the sample closest to the bridge was the only one with detectable lead, but the source could be from the bridge (paint), the highway, or ocean salts (present in small amount in this sample and not in the others).

Biota

Kolekole Stream below Akaka Falls flows along the bottom of a deep gulch which is everywhere heavily forested, providing a high quality riparian zone within this large ravine. Dominant vegetation on the ravine slopes in the vicinity of the existing bridge on old Mamalahoa Highway includes yellow ginger (*Hedychium flavescens*), gunpowder tree (*Trema orientalis*), albizia (*Paraserianthes falcataria*), Alexander palm (*Archontophoenix alexandrae*), African tulip (*Spathodea campanulata*), rose apple (*Syzigium jambos*), common guava (*Psidium guajava*), kukui (*Aleurites moluccana*), avacado (*Persea americana*), wood rose (*Merremia tuberosa*), indet. Convolvulacea. Other species noted from this area (Fosberg, 1972) include: banana (*Musa*), breadfruit (*Artocarpus altilis*), ironwood (*Casuarina*). native sumac (*Rhus javanica*), sword fern (*Nephrolepis*) and (*Eupatorium riparium*).

The following from Fosberg (1972) describes the vegetation along the loop trail at Akaka Falls park, providing a listing of many plant species common to the area generally:

> A paved loop trail a few hundred meters long leads down from the parking lot, through the plantings, to a magnificent view of the Falls. The left fork leads along the slope past a clump of giant *Heliconia* sp. and *Nicolaia elatior*. The bank on the left is covered by *Selaginella* sp. and a *Coffee arabica* (coffee) tree is on the right

below a small bridge. Up the small stream is *Bambusa* cf. *vulgaris*. Azaleas, *Ardisia* sp., banyans and other planted ornamentals are abundant. Almost nothing native can be seen along this part of the trail. The trail turns left along the edge of the gorge below the Falls, providing views of the sheer drop of the stream and of groves of *Aleurites moluccana* on the cliff opposite below the Falls. *Cecropia* sp. is below on the cliff in front of the Falls. Along the trail to the right and up the stairway may be seen *Sanchezia nobilis*, *Dieffenbachia* sp., *Philodendron* sp., *Fittonia argyroneuron*, *Solandra grandiflora* (cope de ccv), *Costus* sp., *Monstera deliciosa*, *Cordyline fruticosa* (ti), *Melastoma malobathricum*, *Eupatorium riparium*, *Polyscias guilfoylei*, *Brassaia actinophylla*, *Impatiens sultan*, *Alpina nutans*, and *Eugenia* sp.

Along this trail on the top of the first hill and on the ridge leading to Kahuna are *Metrosideros* (lehua) groves, persisting from the original forest of the area. In the second of these groves are a number of epiphytes including *Astelia menziesiana*, *Psilotum* sp., *Polypodium tamariscinum*, *Grammitis* sp., *Elaphoglossum reticulatum* and *Lycopodium phyllanthum*. The latter is on an arched root at the branch trail to the toilet above Kahuna Falls. *Pteris vittata* is on the steps by the pavilion overlooking Kahuna Falls. This cataract is only slightly less spectacular than Akaka itself. Opposite it, a small *Cyanea* grows on the base of a tree. *Rhus javanica* can be seen to advantage on the edge of the cliff just below the Kahuna Falls overlook. *Pteris cretica* is common along the wall of the walk nearer the parking lot. Along this trail also are *Coix lachryma-jobi*, giant clumps of *Bambusa* and, on a lehua trunk at the end of the railing above the small bridge, *Ophioglossum pendulum* var. *falcatum* and *Lycopodium phyllanthum*. On the cut bank is *Adiantum cuneatum*. Above here the trail rejoins itself just below the parking lot.

Station 1 on Kolekole Stream was actually a smaller stream within Akaka Falls Park accessed along the lower (right) branch of the park loop trail. Despite the fact that this stream is not even indicated on USGS Quad sheet, the stream is of good size and strong flow at the time of sampling. Particularly abundant here are native atyid shrimp, or ʻopae kalaʻole (*Atyoida bisulcata*). Survey notes from DLNR (1967a) relate the observation "Atyids very abundant" in Kolekole Stream.

Station 2 was located just upstream of the old highway bridge, accessed along the road to Kolekole Park by continuing on to Hakalau (village) instead of turning right at the bottom of the gulch. The stream is some 20+ meters wide here, tumbling over small to moderate size boulders. Hihiwai (*Neritinia granosa*) are fairly common here. Native gobies are perhaps abundant, but difficult to sample or even observe in the rushing water. The DLNR report (1967a) notes that ʻoʻopu nopili (*Sicyopterus stimpsoni*) was dominant and ʻoʻopu nakea (*Awaous stamineus*) present at their survey station located 1 mile upstream of the old bridge. We netted one juvenile ʻoʻopu at Station 2.

Table 4. Checklist of aquatic biota observed or reported from Kolekole Stream.

Species	Common name	Status	CC Code	Abundance
ALGAE				
CYANOPHYTA, HORMOGONALES	(blue green algae)			
OSCILLATORIACEAE				
Phormidium sp.		?ind	20	C
RHODOPHYTA	(red algae)			
Audouinella sp.		?ind.	20	P
INVERTEBRATES				
ANNELIDA, OLIGOCHAETA				
Indet.	meiofaunal worm		20	P
MOLLUSCA, MESOGASTROPODA				
NERITIDAE				
Neritinia vespertinus Sowerby	*hapawai*	end	10	R
Neritinia granosa Sowerby	*hihiwai*	end	10	C
ARTHROPODA, CRUSTACEA				
ATYIDAE				
Atyoida bisulcata Randall	*ʻopae kala ʻole*	end	21	A
PALAEMONIDAE				
Microbrachium lar (Fabricius)	Pacific island prawn	nat	21	A
ARTHROPODA, INSECTA				
DIPTERA, CHIRONOMIDAE				
Indet.	midge, larva		01	
DIPTERA, CULICIDAE				
Aedes albopictus.(Skuse)	forest day mosquito, adult	nat	21	A
DIPTERA, TIPULIDAE				
Indet.	crane fly, adult		21	C
ODONATA				
Indet.	damselfly, nymph		01	
ODONATA, AESCHNIDAE				
Anax junius (Drury)	green darner, adult	ind	10	P
ODONATA, LIBULELLIDAE				
Pantala flavescens (Fabr.)	globe skimmer, adult	nat	10	P
VERTEBRATA, PICES				
ELEOTRIDAE				
Eleotris sandwicensis (Vaill. & Soul.)	*ʻoʻopu akupa*	end	10	U
GOBIIDAE				
Awaous stamineus (Eyd. & Soul.)	*ʻoʻopu nakea*	end	10	C
Sicyopterus stimpsoni (Gill)	*ʻoʻopu nopili*	end	01	
KUHLIIDAE				
Kuhlia sandvicencis (Steindachner)	*aholehole*	end	10	C

POECILIIDAE			
Poecilia reticulata Peters	guppy	nat	01

Table 4 (continued)

KEY TO SYMBOLS USED:

Status:
- nat. - naturalized. An introduced or exotic species.
- ind. - indigenous. A native species also found elsewhere in the Pacific.
- end. - endemic - A native species found only in the Hawaiian Islands.

QC Code:
- 01 - Reported in unpublished reports (DLNR, 1967).
- 10 - Observed and identified in the field on December 14, 1998.
- 20 - Collected; identified in the laboratory; specimen(s) not saved.
- 21 - Collected; identified in the laboratory; voucher specimen(s) saved.

Abundance at survey locations:
- P - present; not common, but unable to assess abundance.
- R - rare; only one or two individuals seen.
- U - uncommon; several individuals seen, in some habitat places visited.
- C - common; numerous individuals seen, or seen in most habitat places visited.
- A - abundant; numerous in most habitat places visited

Kolekole Stream tumbles over boulders and enters the deeper estuary adjacent to the parking lot at Kolekole Beach Park. The estuary is a large pool, perhaps 125 m (410 ft) long and 15 to 25 m (50 to 85 ft) across. Currents are swift and variable, alternating between outflow generated by the stream, and wave wash flushing into the estuary at the seaward end. Water depths are mostly on the order of 1 to 2 m (3 to 6 ft), increasing towards the left bank in the area where Ka`ahakini Stream enters as a waterfall. Directly downstream from this point, the estuary is spanned by the Hawaii Belt Road bridge (project site). Within the estuary, the bottom is a mixture of large boulders and pockets of relatively coarse sand. Along the right shore, and towards the seaward end, rounded cobble, deposited by ocean waves, predominates. The left (north) shore is mostly a basalt cliff. Vegetation in this area is pretty much as described above (gunpowder tree, African tulip tree, Alexander palm, etc.) for the mauka end of the park, but becomes more sparse, windblown, and dominated by species more resistant to salt air at the makai end. Common here are ironwood (*Casuarina equisetifolia*), wedelia (*Wedelia trilobа*), bingabing (*Macaranga mappa*), hala (*Pandanus tectorus*), and various grasses.

Within the estuary, `o`opu akupa (*Eleotris sandwicensis*) was observed. Most plentiful was aholehole (*Kuhlia sandvicensis*), a wide variety of sizes of which were seen during a snorkeling dive within the estuary. Several fishermen at the beach park at the time of our survey were surf casting from the ocean beach, but at least one individual was casting for aholehole within the estuary. In this area, hapawai (*Neritinia vespertinus*), a more salt tolerant relative of the hihiwai observed upstream, was common. A blue-

green alga, *Phormidium* sp., was present, but not overly abundant, on rocks of the stream and estuary, appearing to increase in coverage towards the mouth.

Assessment

Kolekole Stream is a large drainage feature on the landscape of the Hāmākua Coast in the South Hilo District. The stream can be traced upslope to around the 1500 m (5,000 ft) elevation on Mauna Kea. Over most of the length of the stream, water flow is strong (estimated at >50 cfs in DLNR, 1967), increasing substantially during freshets (high flows during rainy periods) which are frequent in this wet region. The project site is a large steel bridge structure crossing just inside (mauka) of the mouth of Kolekole Stream. This structure is tall (nearly 35 m or 120 ft) and supported on massive concrete footings. It is proposed to strengthen the bridge against seismic activity by creating rock anchors high up on the margins of the gulch beneath the bridge and securing the bridge structure to these, as well as making other structural improvements to the bridge's existing steel framework. These activities do not require work within Kolekole Stream or its estuary, although much of the proposed work will take place above the estuarine waters. Presumably some clearing and grading will occur on the margins of the gulch under and adjacent to the bridge.

Kolekole is an exceptional stream in terms of both biological diversity and recreational resource value. Vegetation comprising the riparian zone within the project area is dominated by non-native species. However, the aquatic environment is dominated by native species. While none of these aquatic species is listed as a threatened or endangered species (USFWS, 1994), streams dominated by native species and showing a paucity of introduced species are increasingly uncommon in Hawai`i. Kolekole has managed to avoid much of the damage from agricultural runoff, loss of forest cover, and use as a dumping place that characterizes many Hāmākua Coast streams (see *AECOS*, 1998a,b). For this stream to remain outstanding will require that all parts of it be conserved, not just the upper reaches located in the Hilo Forest Reserve. Many native stream species are diadromous.[5] Populations in the upper, pristine areas are dependent upon there being a healthy aquatic environment in the lower reaches of the stream. Consequently, activities near the coast can impact on aquatic animal populations upslope.

The resource significance of Kolekole Stream cannot be overemphasized. This having been said, the proposed project should have minimal short-term and no long-term impacts on Kolekole. The bridge spans the short estuary of the Stream, where mixing

[5] Diadromous – aquatic species that regularly migrate between the ocean and freshwater streams. In Hawai`i, native aquatic species, including in Hawai`i native `o`opu (fishes), hihiwai (snail), and `opae (prawns), develop as larvae in the ocean, then migrate as juveniles into streams.

by strong outward flow[6] and wave action at the mouth will promote flushing of any pollutants generated by construction. Nontheless, all precautions should be implemented to minimize particulates and pollutants in runoff from construction areas. While all but larger debris items would be removed naturally and quickly from the estuary, they will end up in the nearshore environment. The close proximity of the project to Kolekole Park and substantial recreational value of the area demand that debris of any kind falling onto the park, the cobble beach, or the estuary be removed before completion of the project. This should be accomplished by the contractor or the State Department of Transportation (utilizing divers in the estuary) to insure that neither aesthetic value nor safety of recreational users is compromised by construction debris.

The proposed improvements to the structural integrity of the existing Hawaii Belt Road bridge over Kolekole Gulch should produce no long-term alterations in the existing relationships between human activities on this watershed and the ecology of Kolekole Stream. The proposed improvements are designed to strengthen the bridge against seismic activity (earthquakes) for safer transit across the gulch, but do not change local land use patterns or traffic flow, while lessening the chance that the entire structure could end up in Kolekole Stream.

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[6] In addition to strong flow in Kolekole, Ka'ahakini Stream enters the estuary just upstream of the bridge.

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Appendix C

BOTANICAL RESOURCES ASSESSMENT
By Char & Associates

BOTANICAL RESOURCES ASSESSMENT
KOLEKOLE STREAM BRIDGE
SOUTH HILO DISTRICT, HAWAI'I

by

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Prepared for: ENGINEERING CONCEPTS, INC.

December 1998

BOTANICAL RESOURCES ASSESSMENT
KOLEKOLE STREAM BRIDGE
SOUTH HILO DISTRICT, HAWAI'I

INTRODUCTION

Kolekole Stream Bridge is located along the Hawai'i Belt Road (Route 19) between the towns of Honomu and Hakalau. The bridge crosses over Kolekole Stream which runs along the bottom of a fairly large and wide gulch. Kolekole Beach Park is found near the mouth of the stream and the bridge also crosses over a portion of the park.

The bridge was constructed in the early 1950's and is roughly 500 feet in length; the bridge elevation is approximately 120 feet. Seismic retrofit work is proposed to bring the bridge up to Federal safety standards.

Field studies to assess the vegetation under and immediately adjacent to the bridge were conducted on 10 December 1998 by two botanists. It is also anticipated that construction access roads will be built on the makai side of bridge, on both bnaks, thus the field work also included these areas. The primary objectives of the field studies were to:

1) provide a general description of the vegetation on the study area;
2) search for threatened and endangered plants as well as species of concern; and
3) identify areas of potential environmental problems or concerns and propose appropriate mitigation measures.

SURVEY METHODS

Prior to undertaking the field studies, topographic maps and the bridge plans were examined to determine terrain characteristics, access, boundaries, and reference points.

Access to the bridge footings on the gulch bottom (Pier Nos. 2, 3, and 4) was from Kolekole Beach Park. For the abutments and Pier Nos. 1 and 5, the highway/bridge maintenance personnel have established foot trails which access these areas and the plank walkway under the bridge. The foot trails begin in the area around each of the abutments by the highway and then follow under the bridge.

DESCRIPTION OF THE VEGETATION

The flowering plant names used in this discussion follow Wagner et al. (1990) and Evenhuis and Miller (1995-1998) for the naturalized species, and St. John (1973) for the ornamental plants. The fern names are in accordance with Lamoureux (1988).

Bridge Area

On the level gulch bottom, the bridge crosses over the seaward portion of the beach park. In this area, the vegetation consists of low mats of wedelia (Wedelia trilobata), a commonly used ground cover plant. Grassy lawn areas are dominated by Hilo grass (Paspalum conjugatum). Scattered about are clumps of crape ginger or spiral flag (Costus speciosus), young ironwood trees (Casuarina equisetifolia), and a few coconut (Cocos nucifera) and hala (Pandanus tectorius) trees. Near the rocky, boulder-strewn beach, the vegetation is composed of seashore paspalum (Paspalum vaginatum) and wedelia.

At the base of the gulch slopes on the Hilo side under the bridge, there is a large thicket of hau (Hibiscus tilaceus) which also extends upslope. In this area, there are plants of shampoo ginger (Zingiber zerumbet), 'ape (Alocasia macrorrhiza), lobster claw (Heliconia sp.), maiden hair fern (Adiantum raddianum), ti leaf (Cordyline fruticosa), Philodendron sp., and other ornamental species. On the Honoka'a side under the bridge, the upper to middle slopes support dense patches of white shrimp plant (Justicia betonica) and crape ginger. The slopes adjacent to the bridge support a forest of mixed introduced species which include ironwood, avocado (Persea americana), Chinese banyan (Ficus microcarpa), Java plum (Syzygium cumini), gunpowder tree (Trema orientalis), African tulip (Spathodea campanulata), and rose apple (Syzygium jambos). Shrubs of guava (Psidium guajava) and strawberry guava (Psidium cattleianum) are locally common.

In the areas around the bridge abutments, the vegetation is more open and grassy. California grass (Brachiaria mutica) is abundant near the Hilo side abutment, while Guinea grass (Panicum maximum) and palm grass (Setaria palmifolia) are common by the Honoka'a side abutment.

Proposed Access Roads' Area

On the makai side of the bridge, the steep gulch slopes and the more or less level areas abutting the gulch are covered by a forest composed largely of various introduced species. There are large stands of ironwood trees, 20 to 80 feet tall, and scattered thickets of hau, a native species. Other trees found here include the king or Alexandra palm (Archontophoenix alexandrae), gunpowder tree, African tulip, mango (Mangifera indica), bingabing (Macaranga mappa), Java plum, and hala.

Young saplings of the trees mentioned above and shrubs of guava

and strawberry guava are common to abundant. Ground cover is usually sparse because of the heavy shade and consists of the more shade-tolerant species such as palm grass, Spanish clover (Desmodium incanum), Hilo grass, white shrimp plant, maiden hair fern, and woodfern (Christella parasitica).

A few plants of the native Lysimachia mauritiana, a member of the primrose family, are found on the steep coastal cliffs on the Hilo side. The Lysimachia is an indigenous species, that is, it is native to the Hawaiian Islands (where it is rare) and also elsewhere. It would not be affected by the project since it is on the coastal cliff area, outside of the project site.

DISCUSSION AND RECOMMENDATIONS

The vegetation in the area under and around Kolekole Stream Bridge is dominated by introduced species such as guava, Java plum, ironwood, Hilo grass, etc. The bridge also crosses over a portion of Kolekole Beach Park. This is not surprising as most coastal and lowland zones of the Hawaiian Islands have been disturbed by humans and there are few remnants of native vegetation left (Cuddihy and Stone 1990). Introduced species are all those plants which were brought to the islands by humans, intentionally or accidentally, after Western contact, that is, Cook's discovery of the islands in 1778.

None of the plants found during the field studies is a threatened and endangered species; nor is any plant a species of concern (U.S. Fish and Wildlife Service 1997). All of the plants can be found in similar environmental habitats throughout the islands. Nine native species were found during the field studies. Eight are indigenous, that is, they are native to the islands and also elsewhere; these are: hau, hala, pakahakaha fern (Pleopeltis thunbergiana), Pycreus polystachyos, Macrothelypteris torresiana,

naupaka (Scaevola sericea), water hyssop (Bacopa monnieri), and Lysimachia mauritiana. The Lysimachia and water hyssop occur on the steep coastal cliffs outside of the project site. One species, the neleau or neneleau (Rhus sandwicensis), is endemic, that is, it is native only to the Hawaiian Islands. It can be found scattered in relatively wet to dry, disturbed areas, especially along roadsides and in pastures, from 450 feet to about 2,300 feet elevation, on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i, especially in the area from Hilo to Waimea (Wagner et al. 1990).

Given the findings above, the proposed seismic retrofit work is not expected to have a significant negative impact on the botanical resources. The construction of the access roads may cause soil erosion problems. It is recommended that areas cleared of vegetation be grassed over as soon as possible to prevent soil loss and discharge of sediments into the stream. Hilo grass (for shaded areas) and California grass (for open, sunny areas) already occur on the project site and are recommended for the revegetation effort.

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Appendix D

RECONNAISSANCE SURVEY OF TERRESTRIAL VERTEBRATE SPECIES

By Rana Productions, Ltd.

A RECONNAISSANCE SURVEY OF TERRESTRIAL VERTEBRATE SPECIES FOR THE KOLEKOLE BRIDGE SEISMIC RETROFIT PROJECT, NORTH HILO, ISLAND OF HAWAI'I.

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November 14, 1998

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Introduction:

This report summarizes the findings of a one and a half day ornithological and mammalian reconnaissance survey of the Kolekole Bridge and its environs. The project is located in the District of North Hilo, Island of Hawai'i. The proposed project is to perform a seismic retrofit to the existing bridge structure. Additionally, it may be necessary to build construction access roads on both banks of the gulch east of the existing structure. The field work was conducted on November the 12th and 13th, 1998.

The primary purpose of the survey was to determine what bird and mammal species occur within the proposed project area, or are likely to occur given the type of habitat available, and to determine the presence of any native species; particularly, any federally listed endangered, threatened, or proposed avian or mammalian species on, or in the immediate vicinity of the proposed project area. Additionally we were asked to assess the potential impacts to the existing habitat in the event that construction access roads are built to the east of the bridge.

General Site Description:

The Kolekole Bridge is located on the Hawaii Island Beltway, Highway 190, approximately 12 miles north of the town of Hilo. The bridge spans the Kolekole gulch and Kolekole stream which passes under the bridge some 100 feet below. The sides of the river wall are extremely steep. There is a waterfall on the northeast wall immediately adjacent to the structure. The Pacific Ocean is directly east of the project site. The County of Hawai'i's Kolekole Beach Park is located directly below and to the west of the bridge structure.

The vegetation within the immediate vicinity of the project site is dominated by a diverse mix of alien species as are most of the lowland areas on the windward side of the Island. Many of the ornamentals plants present within the County Beach Park have clearly been planted, and are maintained by the Department of Parks and Recreation. Co-dominate trees include Ironwood (*Casuarina equisetifolia*), African Tulip (*Spathodea campanulata*), Monkeypod (*Samanea saman*), Mango (*Mangifera indica*), Coconut (*Cocos nusifera*), *Archontophoenix alexandrae*, and Siris tree (*Albizia lebbeck*) mixed in with stands of guava (*Psidium sp.*) Java plum (*Syzygium cumini*), Christmas berry (*Schinus terebinthifolius*), pandanus (Pandanus tectorius) and Banana (*Musa x parasiiaca*). There are at least three species of Ginger Lilly (*Hedychium sp.*), Shampoo Ginger (*Zingiber zerumbet*) as well other ornamentals such as impatience (*Impatiens sp.*) and numerous alien graminoid species.

Previous Surveys:

The first systematic surveys of the avifauna of Hawai'i were not undertaken until 1976. Starting in

that year and continuing until 1983 the U.S. Fish & Wildlife Service (USFWS) conducted a state wide survey of the avifauna of Hawai'i (Scott et al. 1986). During the course of the Hawai'i Forest Bird Surveys (HFBS) no survey transects were counted within or close to the Kolekole Bridge (Scott et al. 1986). I am not aware of any other recent faunal surveys of the immediate area other than the Jacobs bat survey discussed below.

Only four comprehensive bat surveys have been conducted on the Island of Hawai'i (Jacobs 1994, Cooper et al. 1995, Cooper and David 1995, David 1997). One of these surveys addressed sites close to the project site. David Jacobs conducted an island wide survey between 1990-1993 which attempted to ascertain the distribution and abundance of Hawaiian hoary bats by sampling along paved principal roadways around the Island of Hawai'i (Jacobs 1994). The bulk of the remaining published literature relies heavily on anecdotal and incidental information on bat distribution and abundance on the Island (Baldwin 1950, Bryan 1955, Tomich 1986).

Mammalian Survey Methods:

Two stationary remote bat census stations were deployed below the bridge structure on the night of November 12th 1998. Broadband AnaBat II ultrasonic bat detectors, coupled to voice activated cassette recorders and remote timing devices were used to detect bat vocalizations. The use of voice activated tape recorders and remote timing devices allowed the usage of multiple units simultaneously sampling at separate locations. Electronic counts were conducted between 1800 and 0800 hours. Following techniques developed by Krusic et al. (1996), units were calibrated using a pet ultrasonic flea collar. The tapes were reviewed and the number of bat passes, which were defined as ≥ 2 echolocation calls were counted. In addition visual scans were made from the bridge structure for bats between 1800 and 2000 hours on the same night.

The survey of feral mammals was limited to visual and auditory detection, as well as observation of scat, tracks and road kills. No trapping study was conducted in an attempt to quantify the usage of the site by alien mammalian species.

Avian Survey Methods:

Six count stations were sited within the vegetated areas surrounding the bridge. Eight minute unlimited distance circular plot counts were made at each of the count stations (Reynolds et al. 1980). Stations were counted once. Counts were concentrated during the early morning hours (between 0600 hr. and 1100 hr.), the peak bird activity time. Field observations were made with the aid of Leitz 10 X 42 binoculars and by listening for vocalizations. A running tally was kept of all bird species observed and heard while walking within the project area. An additional 2 hours were spent on site between 1800 hrs. and 2000 hrs. on the evening of November the 12th 1998.

in an attempt to detect the threatened Newell's Shearwater (*Puffinus newelli*) , and the endangered Dark-rumped Petrel (*Pterodroma phaeopygia sandwichensis*) over-flying the site.

Avian phylogenetic order used in this report follows *Birds Of The World: A Checklist 4th Edition* (Clements 1991), and the *1st and 2nd Supplements to Birds Of The World: A Checklist 4th Edition* (Clements and Principe, Jr. 1992, Clements 1997); scientific nomenclature follows *The AOU Checklist of North American Birds. 7th Edition* (AOU 1998), Mammal scientific names follow *Mammals in Hawaii* (Tomich 1986), plant names follow *Manual of the Flowering Plants of Hawai'i* (Wagner et al. 1990). Place names follow *Place Names of Hawaii* (Pukui et al, 1976)

Results:

During the course of this survey we saw at least four Hawaiian hoary bats (*Lasiurus cinereus semotus*) or 'Ope'ape'a, and recorded 13 sets of bat passes electronically. The only other mammalian species detected was a lone dog (*Canis f. familiaris*) seen in the Kolekole Beach Park. Although no *muridae* were seen it is probable that the house mouse (*Mus musculus*), as well as all three species of naturalized rats found on Hawai'i ; roof (*Rattus rattus*), Norway (*Rattus norvegicus*), and Polynesian (*Rattus exulans hawaiiensis*) are also present within the vegetated areas of the project area. It is also likely that there is some usage of the general area by small Indian mongoose (*Herpestes a. auropunctatus*), cat (*Felis catus*) and feral pig (*Sus s. scrofa*). Without conducting a trapping program, it is difficult to assess the population densities of these often hard-to-see mammals. All of the introduced mammalian species present on the Island are deleterious to both native habitats and species.

A total of 10 bird species representing 9 separate families were detected during the course of this survey (Table 1). Two of the species deteted are worthy of comment. One White-tailed Tropicbird (*Phaethon lepterus dorothea*) was seen flying to the east of the bridge. This is a native breeding seabird (Pyle 1997). The other bird of note was a Spotted Sandpiper (*Actitus macularis*) which is an uncommon migratory species (David 1991). The remaining eight species recorded are considered to be alien (introduced to Hawai'i by man). No avian species listed as proposed, threatened or endangered by either the USFWS or the State of Hawaii Department of land and Natural Resources (DLNR) were recorded during the course of this survey (USFWS 1996, DLNR 1986).

Discussion:

That we detected Hawaiian hoary bats within the project area is not surprising, they are relatively abundant in the lowland areas of the windward side of the Island (David 1997). There has been very little scientific work attempted on this species, in no small part due to the fact that this bat is usually a solitary arboreal rooster and therefor difficult to study. The existing scientific evidence is

conflicting as to what effect alien species, plant or otherwise, may have had on this species (Jacobs, 1994, Kepler et al. 1990, Tomich 1986). It should be borne in mind that little is known about the possible changes in this species range, population density or habitat preferences since the advent of humans and their impacts on the native Hawaiian ecosystems. The implementation of the proposed seismic retrofit of bridge will not have a deleterious impact on this species. Individual bats potentially may be disturbed by construction activity if conducted during crepuscular hours. Though, given that this species readily forages above and close to the existing roadway it is unlikely that construction activity will disturb foraging bats.

Given the close proximity of both the town of Hilo and numerous houses, farms and the like it is to be expected that most of the introduced feral mammalian species found in the lowlands of the Island utilize the area below the bridge structure upon occasion.

Had it not been for one fly-over by a single White-tailed Tropicbird, and the uncommon presence of a migratory Spotted Sandpiper along the stream, all of the avian species detected were alien. This is not surprising given that the avifauna of the coastal area of the windward side of the Island is dominated by alien species. The limited number of avian species detected is due in no small part to the almost constant noise of heavy traffic moving over the bridge structure. It is likely that all of the established alien species found along the windward coast utilize areas below and around the structure.

There are three listed endemic bird species which potentially could be impacted by construction activity. These are the threatened Newell's Shearwater (*Puffinus newelli*) , the endangered Dark-rumped Petrel (*Pterodroma phaeopygia sandwichensis*), and the endangered Hawaiian Hawk (*Buteo solitarius*). The first two species are pelagic seabirds which return to their nesting colonies on the upper slopes of Mauna Loa and possibly Mauna Kea during crepuscular and night time hours between April and October. There are numerous records of Newell's Shearwater being seen, heard or collected close Hilo (Kepler et al. 1979, Banko 1980a, Conant 1980). Sheila Conant recovered a dead bird on Kaumana drive in 1978 (Conant 1980). Newell's Shearwater have been heard along the Wailuku river (Kepler et al 1979), and numerous downed birds have been recovered from different locations in and around Hilo (Kepler et al. 1979, Banko 1980 b, R. David pers. obs.,). Dark-rumped Petrels nest much higher and in lower numbers than do Newell's Shearwater. Several downed birds have been recovered from various locations around Hilo (R. David, pers. obs. , J. Jeffrey, pers. comm.). There is no suitable nesting habitat within the project area for either the Newell's Shearwater or the Dark-rumped Petrel. Both species may over-fly the bridge on their way to and from their nesting colonies between late April and late October. Both species of seabirds, especially fledging birds, can become disoriented by exterior lighting on their way to sea in the fall. When disoriented, seabirds often collide with manmade structures and, if not killed outright, the dazed or injured birds are easy targets of opportunity for feral mammals. Construction lighting could therefore pose a potential threat to these seabird species especially in

the fall months between August and October.

Table 1

Avian Species Detected During the Kolekole Bridge Faunal Survey	
Common Name	***Scientific Name***
TROPICBIRDS - Phaethontidae	
White-tailed Tropicbird.	*Phaethon lepturus dorothea.*
SANDPIPERS & ALLIES - Scolopacidae	
Spotted Sandpiper	*Actitus macularis*
PIGEONS & DOVES - Columbidae	
Spotted Dove.	*Streptopelia chinensis.*
Zebra Dove.	*Geopelia striata.*
STARLINGS - Sturnidae	
Common Myna.	*Acridotheres tristis.*
SILVEREYES - Zosteropidae	
Japanese White-Eye.	*Zosterops japonica.*
BABBLERS - Timaliidae	
Melodius Laughing Thrush.	*Garulax canorous.*
WAXBILLS & ALLIES - Estrildidae	
Nutmeg Manikin (Scaly-breasted Munia)	*Lonchura punctulata topela*
FRINGILLIDS - Fringillidae	
House Finch.	*Carpodacus mexicanus mexicanus.*
EMBERIZIDS - Emberizidae	
Northern Cardinal	*Cardinalis cardinalis.*

Although no Hawaiian Hawks were recorded during the course of the survey, it is probable that there is a least occasional usage of habitat within the Kolekole Gulch by this species. The project area is well within the normal range of this Hawaii Island endemic. This species has seemingly adapted better than any other endemic avian species to the alien dominated lowland areas of the Island. Hawaiian Hawks occupy a wide variety of habitats, they are found in almost all habitats not lacking trees. They are all but absent from treeless or close to treeless grasslands and lava fields. The current population is estimated to be between 1230 and 1600 birds (Klavitter and Marzluff 1998, Morrison et al. 1994). It is generally thought that the population as a whole is

healthy and maintaining itself, unlike many other endemic species. This species is currently under review by the USFWS for down listing from endangered to threatened status (USFWS 1993).

The construction activity conducted on the bridge structure will not have a significant impact on native or federally protected avian or mammalian species. In an attempt to minimize the downing of Newell's Shearwater and Dark-rumped Petrels by their interaction with external construction lighting, no unshielded construction or equipment maintenance lighting should be permitted after dark between the months of April and October.

Should construction access roads be built to the east of the bridge, care should be taken to avoid runoff and siltation of the Kolekole stream and near shore areas immediately adjacent to the project site. Given the steepness of the gulch sides and the generally high rainfall associated with the Hilo area the control of runoff and siltation is a real issue.

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Appendix E

ARCHAEOLOGICAL ASSESSMENT
By Cultural Surveys Hawaii

Archaeological Assessment For Seismic Retrofitting for the Kolekole Stream Bridge Wailea, South Hilo District, Hawaii Island

by

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and

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Prepared for

ENGINEERING CONCEPTS, INC.

Cultural Surveys Hawaii, Inc.
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ABSTRACT

At the request of Engineering Concepts, Inc., Cultural Surveys Hawaii Inc. conducted an archaeological assessment of the proposed seismic retrofitting of the Kolekole Bridge site in the vicinity of Pepeekeo, South Hilo District, Hawaii. The assessment consisted of a ground survey of all accessible areas and compilation of historical documentation and previous archaeological research.

The project area consisted of the slopes of Kolekole Gulch under and surrounding the Kolekole Bridge and approximately 100.0 feet of the slopes *mauka* and *makai* of the bridge. The bridge is located along the Mamalahoa Highway (Hawaii Belt Road) approximately 11 miles northwest of Hilo and just south of the town of Wailea. The project area lies almost entirely within the Kolekole Stream Gulch and traverses the Kolekole Beach Park. The present bridge is an iron and concrete structure that is planned to be reinforced to meet seismic standards.

No archaeological sites were found within the project area.

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Project Area Description

The project area is located underneath and adjacent to the Kolekole Stream Bridge on Route 19. It lies approximately 11 miles northwest of Hilo (See Figure 1). The project area is located in the South Hilo District of east Hawaii within the *ahupua'a* of Wailea and Kuhua. The bridge is located along the Hawaii Belt ~~Hawaii~~ Road between the towns of Hakalau and Honomu.

The terrain of the *ahupua'a* is characterized by sea cliffs bordering a narrow marine bench on the coast, with gradually ascending uplands above (average 13% grade above the 300 ft. interval). The uplands are broken by the steep and relatively narrow Kolekole Stream Gulch which lies along the western boundary of *Kuhua ahupua'a*. The upland slopes are *'ohi'a* forests.

Kolekole gulch slopes steeply, descending approximately 120 feet to a relatively wide stream bed at the bottom. The stream bed is boulder and cobble lined with level alluvial deposits along the sides. Annual rainfall is between 100 and 125 inches per year and it is expected that this gulch is prone to frequent flooding. Average temperatures are between 62 and 82 degrees Fahrenheit (Armstrong 1973:57).

Scope of Work

The following scope of work was utilized during the project. The scope is based on a September 2, 1997 letter from Don Hibbard stating that the proposed modifications will have no effect on the bridges historic character. Based on this information the assessment focused on the areas around and under the bridge.

1. A brief historical background search including examinations of historic maps, previous archaeological reports and other historic documents to determine if there are actual or potential archaeological sites in the area.

2. A one-day field survey of the bridge and its surroundings, including the bottom and sides of the gulch and any access route to the gulch or other areas which would be used during construction of the bridge improvements. This survey will identify and briefly describe any archaeological sites which may be present.

3. Preparation of a report on the results of the historic background research and the field survey. This report will contain recommendations for protection and avoidance of archaeological or any further studies that are appropriate, if any archaeological sites are encountered. If no sites are encountered within the vicinity of the bridge, which would be impacted by the proposed bridge improvements, no further action will be recommended.

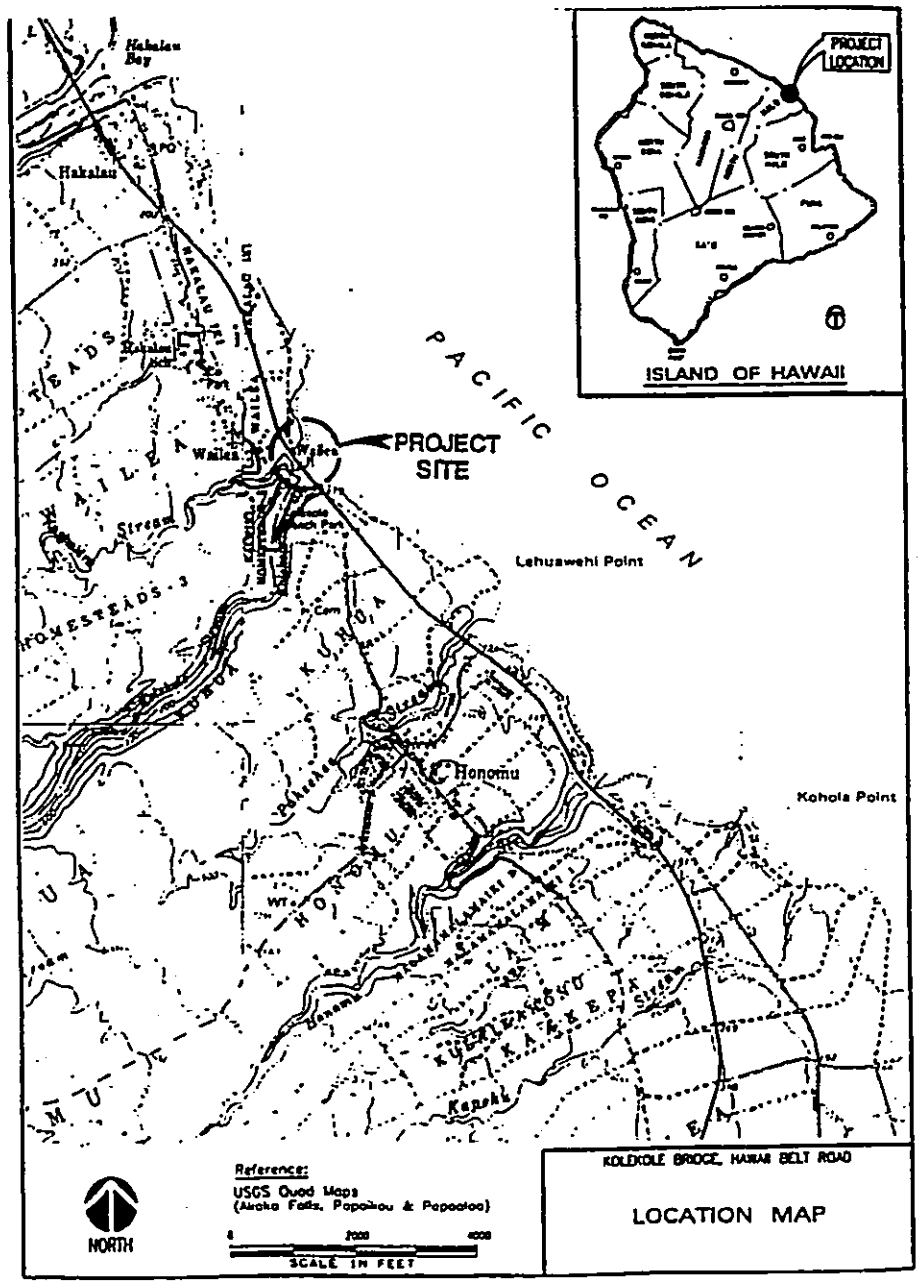

Figure 1 Portion of USGS 7.5 Minute Series Topographic Map Portions of the Papaikou and the Papaaloa Quads received from Engineering Concepts, Inc. Showing the Project Area Location

Methods

Field work was conducted on October 23, 1998 by Brian Colin and Anthony Bush and on November 11, 1998 by Tracy Tam Sing and Tyler Campbell. Field work consisted of a 100% ground survey, on foot, of all accessible areas underneath and surrounding the bridge up to 30.0 m. (98.4 ft.) along all sides of the bridge. Portions of the slopes on both sides of the sides of the bridge were unaccessible to pedestrian traffic due to being very steep. Photographic documentation of the bridge and surrounding area was also conducted. The first day of the survey consisted of an evaluation of bridge and accessibility to the structure and surrounding area. The second day consisted of actual ground survey. The survey was conducted to determine the presence or absence of cultural remains that could possibly be impacted by the modifications to the bridge.

HISTORIC BACKGROUND

The Kolekole Bridge was constructed in the 1950s. "William R. Bartels, longtime bridge engineer for the Territorial Highway Department, made imaginative use of two trusses from the Wailuku Railroad Bridge . . . which he designed in the 1950s" (Alvarez 1987:88-89). Therefore based on the above information it appears that the Kolekole Bridge was constructed with materials from the former Wailuku Railroad Bridge during the 1950s.

PREVIOUS ARCHAEOLOGICAL RESEARCH

Previous archaeology within the entire Mauna Kea Windward Slopes subregion is limited to three reconnaissance surveys conducted between 1908 and 1932, two inventory surveys by Paul H. Rosendahl, Inc. (PHRI), conducted in 1990 and 1992 and a regional synthesis of Hamakua by Ross Cordy (1992).

The three early surveys include Stokes (1919), Hudson (1932), and Handy and Handy (1930s). These surveys area characterized by Ross Cordy as, "extremely limited reconnaissances" which took place, "before the advent of modern archaeology and after the major development of the sugar cane industry in this region" (1992:150). "In sum," Cordy continues, "only three archaeological sites appear to have been identified in this subregion. One [the Ka Loa *heiau* identified by Stokes] was destroyed by 1930-1932, and one [a cliff cave at Kukuihaele in which a wooden religious image was found] is unlocated" (1991:150-151). The other site is an irrigated agricultural site located by Handy and Handy in Waiko'eko'e *ahupua'a*.

The more recent inventory surveys within the Mauna Kea Windward Slopes subregion were both within sugar cane lands, one on the western end of the Hamakua coast, near Waipi'o Valley, and one near the town of Paauilo, located approximately five miles to the northwest of the present project area. In the latter survey (Head and Rosendahl 1992), three sites were identified and all were historic, transportation-related and "probably associated with Hamakua Sugar Company agricultural activities" (1992:6). The remainder of the project area was either cane fields which had been extensively plowed, or gulches which contained no evidence of agriculture or habitation-related use. Although there were no LCA's within this PHRI project area, the authors concluded that it was probable there were houses scattered along the *alanui aupuni*, with other trails running *mauka* to the *'ohi'a-koa* forest zone, similar to the land-use

pattern of this subregion discussed by Cordy (1992).

FINDINGS AND ARCHAEOLOGICAL INTERPRETATIONS

The project area terrain consisted of three distinct parts, the relatively level area on both sides of the bridge on the top of the gulch; the steep sides of the gulch beneath the bridge; and the floor of the gulch beneath the bridge which consisted of the gently sloping stream bed and adjacent meander bars.

The areas surveyed on the top of the gulch have been completely altered either by the construction of the current bridge or from the cultivation of sugar cane.

The sides of the gulch within the project area also seem to have been impacted in the construction of the current bridge, and were prohibitively steep and largely inaccessible. No archaeological sites were found.

On the floor of the gully within the project area (beneath the bridge) the stream bed covers approximately 30% of the flood plain surface. The stream bed was exposed bedrock with scattered soil and gravel pockets. The meander bars consisted of undulating soil and scattered cobbles and boulders overlying bedrock. No archaeological sites were found.

On the floor of the gully outside of the project area, the footings of the old railroad bridge were observed. A total of four square footings were observed, two on either side of the streambed. A cylindrical cement footing was also observed in the center of the ~~center of~~ Kolekole Stream. No other remnants of the old railway bridge were observed.

Based on the negative findings the proposed seismic retrofitting will have no effect on historic sites.

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