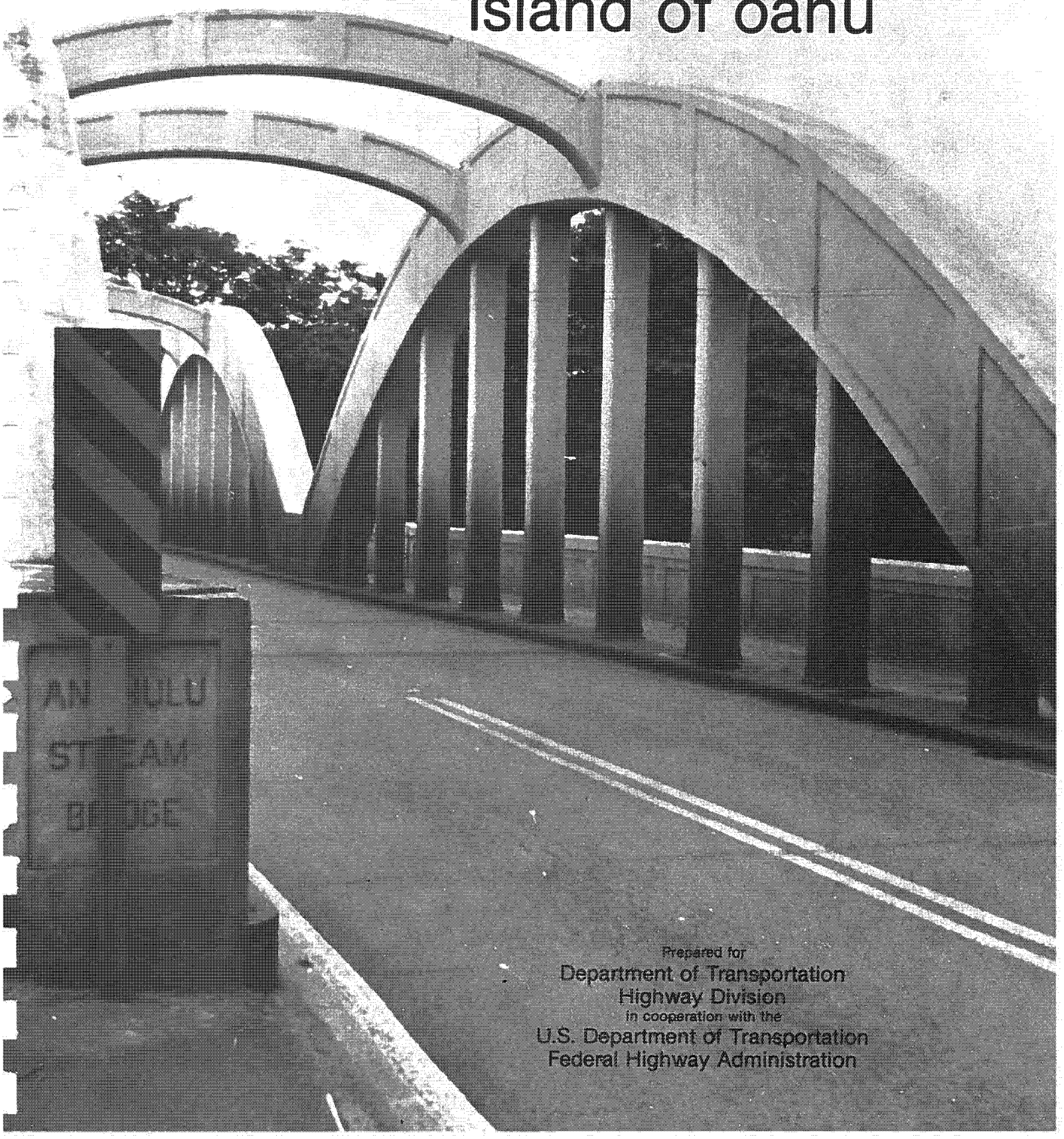
HISTORIC BRIDGE INVENTORY

island of oahu



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HISTORIC BRIDGE INVENTORY

ISLAND OF OAHU

by

Bethany Thompson

Historical Consultant

PREPARED FOR THE
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
IN COOPERATION WITH THE
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F O R E W O R D

Pursuant to Act 243 Session Laws of Hawaii 1978 and Section 106 of the National Historic Preservation Act of 1966, the State conducted a historic bridge inventory for the island of Oahu to identify those bridges that may qualify for nomination to the National Register of Historic Places.

This inventory was performed during the summer of 1980 by Ms. Bethany Thompson. Ms. Thompson is a local historian who has lived in Hawaii for over twenty years. As a full time history instructor at Leeward Community College since 1968, she worked upon a variety of history projects in the community. She is interested in the problems of historical preservation and their relationship to environmental impact questions. Ms. Thompson has double Master's degrees in History and American Studies. She is presently a Ph.D. candidate at the University of Hawaii.

All photographs contained in this report were personally taken by Ms. Thompson.

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SUMMARY AND RECOMMENDATIONS

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There are a total of 127 bridges on Oahu built before 1940. They are divided into five general types for classification and historic preservation purposes.

The deck girder type has a total of 70 bridges with the following four being recommended for inclusion in Category One for historic preservation purposes; Heeia Viaduct, Kipapa or F.D.R. bridge, Puowaina Drive bridge and Waimea bridge.

The flat slab type has a total of 37 bridges with none being recommended for inclusion in Category One.

The reinforced concrete arch type has a total of 10 bridges with 3 being recommended for inclusion in Category One; Anahulu bridge, Kalakaua Avenue bridge, and Nuuanu Arch bridge.

The steel type has a total of 3 bridges with only one being recommended for inclusion in Category One; the Karsten Thot bridge.

The wooden bridge type has a total of 7 bridges with none being recommended for inclusion in Category One.

In total, of the 127 bridges on Oahu built before 1940, eight are recommended for inclusion in Category One for historic preservation purposes.

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Criteria for Evaluation of Oahu's Bridges

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Oahu's 127 historic bridges are composed of five different types: reinforced concrete arch bridges, steel bridges, timber bridges, reinforced concrete deck girder bridges and reinforced flat slab bridges. The historic steel bridges are further divided into three separate types; warren truss, steel girder and metal flume.

A bridge is considered historic if built before 1940 and is associated with people and events that have made a significant contribution to the broad patterns of Hawaii's history. This historic classification includes bridges that are associated with the lives of persons significant in our past, or if it embodies distinctive characteristics of a type, period or method of construction. It is also considered to be historic if it represents the work of a master, or if it possesses high artistic value. Further it is considered to be historic if it represents a significant and distinguishable entity whose components may lack individual distinction. Finally, it is considered historic if it has contributed significantly as a transportation link to the growth of an area by fostering residential, commercial, or industrial development. [1]

The majority of Oahu's bridges built before 1940, are of the common type, i.e., concrete slabs, I-Beam girders, concrete deck girders, concrete T-Beams, and concrete continuous slabs. They are of limited historical value

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if erected after 1910, when these types became common. It should also be noted that regarding the selection of materials for the building of bridges on Oahu, the corrosion capability of the salt air from the Pacific Ocean makes the maintenance of steel and wooden bridges less practical over here than on the continental United States thus explaining their relative scarcity. Very few of Oahu's bridges are of dramatic heights or lengths due to our topography.

The criteria for evaluation of Oahu's bridges is primarily modeled after that of the State of Virginia's (for steel truss bridges), while making allowances for Hawaii's unique topography, climate, history and variety of common bridge types.

The eight major islands which make up the archipelago are of recent volcanic origin, geologically speaking, having emerged from their primal subterranean depths in the Pacific Ocean only ten million years ago.[2] The mountain ranges of the Hawaiian chain reach 4000 feet above sea level on Oahu, giving the island a rugged sheer-cliffed appearance with lush green tropical vegetation covering their slopes. The rugged escarpments abruptly give way to spreading plains and flat lands stretching to the ocean shore with vegetation

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reaching almost to the shoreline.

Lying near the margin of the tropics, the islands are in the path of NE trade winds, producing a wet windward side and a dry leeward one. Rainfall increases with altitude, subsequently picturesque waterfalls with their fresh mountain streams, often become swift freshets making bridge durability a chief factor in their construction on the more densely populated flat lowlands. The most prevalent construction material of Oahu's bridges is reinforced concrete and stone. In that the population centers on Oahu are located in the flat lowlands, bridge construction is practical rather than dramatic, pursuing utilitarian designs.

Hawaii's political history may be divided into four general divisions, of which the last one need only to concern us, as no public historic bridges remain on Oahu with a construction date earlier than 1905. The four basic divisions of Hawaiian history are:

1. Polynesian (Pre-European contact; 500 A.D. to 1778).
2. European Discovery (Capt. Cook 1778).
3. Monarch (King Kamehameha 1810 to Queen Liliuokalani 1893).
4. Provisional Government - Territorial Status - Statehood (1893 to present).

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Considering the dramatic social and political upheavals of Hawaiian history, it is fortunate that any records about bridge building were kept, however careful examination of archival materials and government documents from one transition period to the next, reveal only sparse information. In most cases, no written documentation exists, thus the techniques of the oral historian were employed in an attempt to reconstruct lost data on bridges suspected of being historically significant but with no existing tabulation up to this study. Those structures with no written record and of the predominant common type were placed in Category III of the criteria, to be explained.

The initial Oahu bridge inventory concerns only this island's structures. It may be expanded to include bridges inventoried on the outside islands, making adjustments and modifications in the criteria's point system for any new type of structures found.

It was decided to place Oahu's bridges into three categories for historic evaluation purposes. The points for each category are awarded according to the Criteria hereby included. Category I is for bridges with a total point accumulation of 19 or more points. Category II includes bridges with a total point range of 15 to 18 points. Category III is for bridges with 14 points and less.

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It is assumed that all bridges built on Oahu before 1940, are of some historical interest, however an attempt was made to classify the structures according to an objective numerical classification that would be useful in making decisions regarding their ultimate disposition or preservation. Category I contains those bridges with the most claim for historic significance. Category II contains those bridges that have considerable historic significance but not enough at this time to warrant being placed in Category I. Category III contains those bridges with the least historic significance. No attempt was made to determine the ultimate disposition of the bridges in any of the categories, as that goes beyond the scope of this initial inventory.

All bridges on the Oahu inventory were placed in their respective categories because of available documentation, technological and environmental considerations. The creation of a Category II in Oahu's case was done to provide a managerial classification for bridges about which little may be known at present, but has more suspected historic significance and otherwise high scores in the criteria's rating system. This Category II is necessary because of endemic conditions on the island, where ancient

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Hawaiian folklore and history often blur together in complex oral traditions regarding a crossing or a ford where other structures now gone, once existed. It is recognized that once construction on such a bridge site commences, certain community minded folklorists may come forth with 'new' information regarding the overall significance of a bridge site. At that time, the 'new' data or information may possibly change the number of points originally given to a bridge for classification purposes.

All classifications were devised as a result of the following:

- multiple on-site visits by the consultant
- photographing of all bridges inventoried
- archival research
- examination of histories of sites and builders whenever available
- assessment of technological significance
- judgement of site and bridge integrity
- consideration of environment and aesthetic values
- studying photo's, drawings of all bridges
- reading and writing summary reports of bridge sites
- historic consultant working with an Inter-agency advisory committee for support, review, suggestion and selection of bridges for categorization and criteria considerations
- developing a rational numerical rating system
- inventoried bridges by type

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- mapping on charts
- filling out HAER cards on historically significant structures
- including an endemic factor for historic considerations.

The attempt to classify the bridges according to an objective numerical classification has its recognized limits in terms of using numbers to quantify a subjective analysis, i.e., the aesthetic beauty of a bridge site. One person may find the view particularly pleasing while another sees it as being common and unrewarding. However it is recognized that regardless the background of any particular individual, whether in the humanities or more technical disciplines, it is possible to gather certain general impressions of a site that make value judgements possible and which fall into certain basic divisions. After considering the various factors that enter into making such subjective evaluations, the characteristics of Oahu's bridges were identified then placed under three basic headings, as follows:

1) DOCUMENTATION (Chronological age and builder)
   26% - 7 points maximum

2) TECHNOLOGICAL SIGNIFICANCE (Technology and geometrics)
   33% - 9 points maximum

3) ENVIRONMENTAL (Aesthetics, history and integrity)
   41% - 11 points maximum

Each of these divisions includes specific features

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which will be defined later. Among these features are age, technological innovation, length and number of spans, uniqueness in relation to bridge building design trends, as well as history and aesthetics in terms of ambience and the visual integrity of the bridge. Each bridge type was compared with others of its type on a local (island) level as inventories from the outer islands are not yet available. The percentages and point system for Oahu's bridges are the same as those comprising the "Virginia Criteria for Steel Bridges," but have been modified and adjusted to accommodate the variety of Oahu's bridge types.[3]

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TABLE II

Factors comprising the "Criteria for Historical Significance of Oahu's Reinforced Concrete Arch Bridges"

DOCUMENTATION (26%)			
1.	Builder		
	a. Unknown	0	
	b. Known	1	
	c. Known, prolific	2	
	d. Known, unusual	3	
2.	Construction dates		
	a. post 1940	0	
	b. 1936 - 1940	1	
	c. 1926 - 1935	2	
	d. 1911 - 1925	3	
	e. pre - 1910	4	Maximum 7 pts.
TECHNOLOGY (33%)			
1.	Technical		
	a. Spans (more than one)	1	
	b. Span lengths (varying)	1	
	c. Height	1	
	d. Materials	1	
	e. Integrity	1	
	f. Special feature	1	
2.	Geometric Configuration		
	a. Unique	3	
	b. Unusual	2	
	c. Typical	0	Maximum 9 pts.
ENVIRONMENTAL (41%)			
1.	Aesthetics		
	a. Poor	0	
	b. Average	2	
	c. Excellent	3	
2.	History		
	a. Poor	2	
	b. Average	4	
	c. Excellent	6	
3.	Integrity		
	a. Vantage point	1	
	b. Visual +	1	Maximum 11 pts.

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TABLE III

Factors comprising the "Criteria for Historic Significance of Oahu's Timber Bridges"

DOCUMENTATION (26%)			
1.	Builder		
	a. Unknown	0	
	b. Known	1	
	c. Known, prolific	2	
	d. Known, unusual	3	
2.	Construction dates		
	a. post 1940	0	
	b. 1936 - 1940	1	
	c. 1926 - 1935	2	
	d. 1911 - 1925	3	
	e. pre - 1910	4	Maximum 7 pts.
TECHNOLOGY (33%)			
1.	Technical		
	a. Spans (more than one)	1	
	b. Span lengths (varying)	1	
	c. Height (over 10')	1	
	d. Materials	1	
	e. Integrity	1	
	f. Special feature	1	
2.	Geometric Configuration		
	a. Unique	3	
	b. Unusual	2	
	c. Typical	0	Maximum 9 pts.
ENVIRONMENTAL			
1.	Aesthetics	0	
	a. Poor	2	
	b. Average	3	
	c. Excellent		
2.	History		
	a. Poor	2	
	b. Average	4	
	c. Excellent	6	
3.	Integrity		
	a. Vantage point	1	
	b. Visual +	1	Maximum 11 pts.

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TABLE IV

Factors comprising the "Criteria for Historic Significance of Oahu's Reinforced Concrete Flat Slab Bridges"

DOCUMENTATION (26%)			
1.	Builder		
	a. Unknown	0	
	b. Known	1	
	c. Known, prolific	2	
	d. Known, unusual	3	
2.	Construction dates		
	a. post 1940	0	
	b. 1936 - 1940	1	
	c. 1926 - 1935	2	
	d. 1911 - 1925	3	
	e. pre - 1910	4	Maximum 7 pts.
TECHNOLOGY (33%)			
1.	Technical		
	a. Spans (more than one)	1	
	b. Span lengths	1	
	c. Height	1	
	d. Materials	1	
	e. Integrity	1	
	f. Special feature	1	
2.	Geometric Configuration		
	a. Unique	3	
	b. Unusual	2	
	c. Excellent	0	Maximum 9 pts.
ENVIRONMENTAL			
1.	Aesthetics		
	a. Poor	0	
	b. Average	2	
	c. Excellent	3	
2.	History		
	a. Poor	2	
	b. Average	4	
	c. Excellent	6	
3.	Integrity		
	a. Vantage point	1	
	b. Visual +	1	Maximum 11 pts.

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TABLE V

Factors comrpising the "Criteria for Historic Significance of Oahu's Reinforced Concrete Deck Girder Bridges"

DOCUMENTATION (26%)			
1.	Builder		
	a. Unknown	0	
	b. Known	1	
	c. Known, prolific	2	
	d. Known, unusual	3	
2.	Construction dates		
	a. post 1940	0	
	b. 1936 - 1940	1	
	c. 1926 - 1935	2	
	d. 1911 - 1925	3	
	e. pre - 1910	4	Maximum 7 pts.
TECHNOLOGY (33%)			
1.	Technical		
	a. Spans	1	
	b. Span lengths	1	
	c. Height	1	
	d. Materials	1	
	e. Integrity	1	
	f. Special feature	1	
2.	Geometric Configuration		
	a. Unique	3	
	b. Unusual	2	
	c. Typical	0	Maximum 9 pts.
ENVIRONMENTAL			
1.	Aesthetics	0	
	a. Poor	2	
	b. Average	3	
	c. Excellent		
2.	History		
	a. Poor	2	
	b. Average	4	
	c. Excellent	6	
3.	Integrity		
	a. Vantage point	1	
	b. Visual +	1	Maximum 11 pts.

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DOCUMENTATION

The important elements included for documentation are the names of the builder and/or designer and the age of the bridge.

The designation "known prolific builder" is used to describe owners and companies such as the McCandless brothers, E. E. Black, E. J. Lord, and Hawaiian Dredging Company. These owners and companies constructed large numbers of bridges and roads throughout Oahu but for the most part utilized standard materials and basic engineer designs, constructing only common bridges.

The designation "unusual designer" is applied to men like Guy Rothwell and R. E. Woolley who were engineers and architects of considerable local prominence, who built other more famous structures in Honolulu, but who contracted to build an occasional bridge or serve as a design consultant, constructing rare or unique bridges.

The designation "known" applies to bridges where the builder or company's name is available, but recognized only for one contract or belt-road project with a common type bridge or so included in the contract, i.e.,Moses Akiona and E. K. Sugihara.

Where the builder is unknown, no points are given.

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AGE

Points are given for increasing age in four groupings: Pre 1910 = 4 pts; 1911 - 1925 = 3 pts.; 1926 - 1935 = 2 pts.; 1936 - 1940 = 1 pt. The date of pre 1910 was taken as a limit based upon the fact the oldest known public bridge in existence on Oahu has a construction date of 1905. The data from the outer islands is not yet available, but 1910 is a good place to start in terms of Hawaii's political history in that the shift from monarchy to a provisional government to U. S. Territorial status was accomplished between 1893 and 1900. The organization and consolidation of governmental responsibility was clearly allocated by 1910, subsequently, bridge and road building records were at least attempted and some archival data is available. Before 1910, there is no information on existing structures. There are a few bridges in existence on Oahu built between the dates 1911-1925, and were thought to merit a substantial historical score as they are not uniform or standardized types. After 1925, when Hawaii realized she was eligible for federal assistance in terms of funding for the building of bridges and roads, a standardization of bridge types becomes apparent. From 1926 - 1935 a considerable number of now existing bridges were built during the Depression with the assistance of WPA and NRA monies that peaked during the 1936 - 1940 period and were

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phased out with the advent of World War II. These bridges are mostly of a common type.

Points are given when the date can be definitely established from date plates, plans, newspapers or government documents. Where such information is not available, no points are given.

TECHNOLOGICAL SIGNIFICANCE

The second broad division of characteristics recognizes the technological features of the various bridge types on Oahu. Within this division the general geometric configuration is considered. Technical features were modified for each of the different bridge types on Oahu. (See Tables).

Patented Technology

Items of significance would include patented innovations or forms in the evolution of steel bridges and applies only to this type of structure. One point is awarded whenever a patent is found. (None were found to exist on Oahu).

Number of Spans

Most of Oahu's historic bridges consist of a single span. A point was given for bridges with multiple spans.

Length of Spans

Bridges with varying span lengths were given a point.

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Height

Most of Oahu's historic bridges are not very impressive structures in this regard. One point was given for any structure over 10' in height regardless of type.

Materials

Oahu's steel bridges are not dominated by wrought iron fixtures although both metals were used for structural members and necessary parts during this period of bridge building throughout America (1920' to 1940's). It is not easy to differentiate between the two metals without extensive testing thus Oahu's steel bridges (3) were awarded a point for using steel over wrought iron.

One point was awarded for reinforced concrete bridges on Oahu because they are all of a common type.

Timber bridges were awarded a point because of their rarity.

Integrity

A point is awarded if the structure has not been moved from its original location.

Special Feature

Most historic bridges on Oahu are relatively free of any ornamentation or a special characteristic, i.e., portal bracing, finials or other details. A few have a distinctive

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characteristic not always visible to the average observer. Where these occur, a point is awarded.

Geometric Configuration

Common bridge types were included in the scoring under the classification "Typical" and not awarded any points. Curves, skews or peculiar terrain were taken into consideration and bridges rating an "Unusual" classification based on that were awarded 2 points. A "Unique" rating was applied when it was determined that this configuration was not found anywhere else among Oahu's bridges, or is the only one of its type on the island, and awarded 3 pts. (This classification of unusual or unique may change when comparing a structure to a broader sample, i.e., statewide).

ENVIRONMENTAL

In addition to the technical or engineering aspects of bridges that are listed under Documentation and Technological Significance, non-technical characteristics such as Aesthetics and historical factors are considered under the term "Environment." Environmental and historical factors are irreplaceable. Once destroyed, the site is lost. The sense of place is important, especially in view of Hawaii's rapid population growth and rush toward urbanization. It is probable that in the absence of quantitative criteria, these factors have been the major influence on National Register

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nominations of structures. Hence a significant number of total points is warranted in this category. The proper evaluation of environmental factors also provides information important for the type of preservation effort to be pursued once a bridge is determined to be in one of the three Categories mentioned earlier. For example, if a bridge receives high marks in the first two classifications, documentation and technological significance, but low marks in the environmental classification, then relocation of the structure would be warranted. If, on the other hand, the environmental characteristics are significant, then special efforts to preserve or adaptively use the structure at its current location would be indicated. Those bridges placed in Category I with the highest marks for a preservation score warrant every effort made to preserve them in tact. Whereas bridges placed in Category II need be only properly recorded for historic preservation purposes. And finally, those bridges in Category III merely noted then eliminated from historic preservation considerations.

Environmental factors are judged in three areas: aesthetics, history and integrity. Bridges judged to possess these characteristics are given the indicated number of points.

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Aesthetics

Aesthetics are judged on the basis that the bridge is an integral part of its setting to the point that its removal or relocation would be detrimental to the bridge and the ambiance of the setting. While judging aesthetics is a subjective experience, it is realized that people with either a technical or humanities background and training can usually come together in agreement regarding the visual impressions of a structure and the detrimental impact of the removal. The points awarded are given for one of three divisions; poor 0 pt.; average 2 pts.; excellent 3 pts.

History

The term "history" embraces a variety of meanings that go beyond mere Documentation (date and builder). The historic value of a structure is determined according to a self-explanatory division of poor, average or excellent, depending upon the following definitions:

(1) The bridge may be associated with a historical property or area, or it may have fostered residential, commercial or industrial development.

(2) The bridge may be associated with significant events circumstances, or a person or a group of individuals, for whom the bridge may or may not be named after.

(3) Bridges in communities that have formed important

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transportation links with other settlements or towns so as to have contributed significantly to local development.

If none of the above descriptions applies to a bridge the structure's rating is generally given 0 points; if one or two of the above descriptions apply, 2 to 4 points; and if all three apply, 6 points.

Integrity

One point is awarded if the vantage point is accessible to the public. Another point is given if the visual scene is pleasing.

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Footnotes

[1]Howard Newlon, Jr., "A Trial Rating System for Truss Bridges." Interim Report No. 1. (Charlottesville, Va.: Virginia Highway and Transportation Research Council, 1980), Appendix 1, p.17.

[2]T. F. Kennedy, A Descriptive Atlas of the Pacific (Sydney, Austrailia: Reed Education, 1974), p.41.

[3]Dan Diebler, Virginia Criteria for Steel Truss Bridges: Interim Report No. 1 (Charlottesville, Va.: Virginia Highway and Transportation Research Council, 1980), Appendix 1, p.12.

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REINFORCED CONCRETE

ARCH BRIDGES

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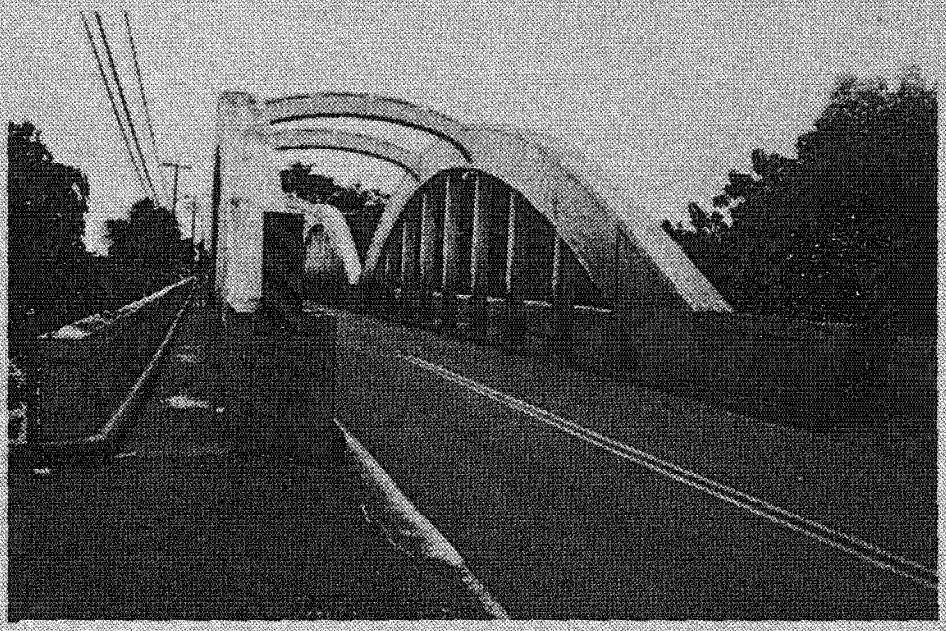

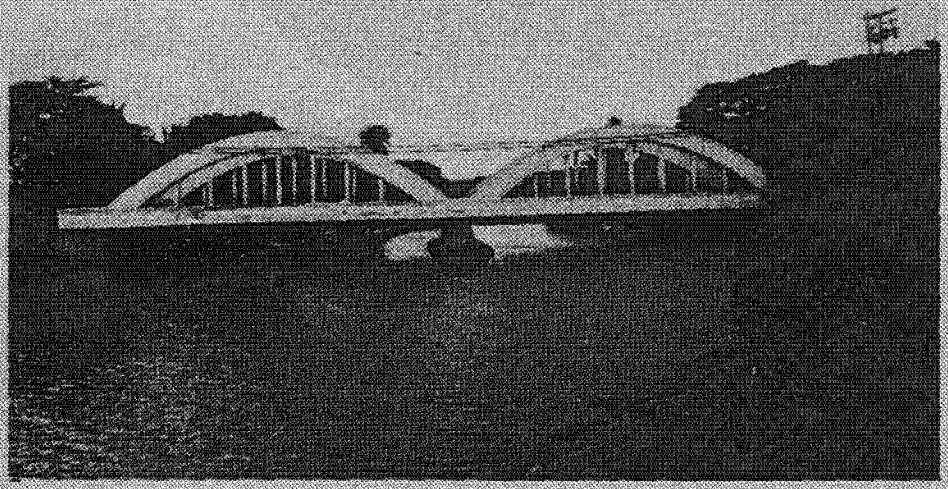

Anahulu Bridge

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The Anahulu bridge located on Kamehameha Highway in Haleiwa is 172' long, with a double through deck arch approximately 17'6" in height. It is 31.8' wide with a 3.6' pedestrian walkway on either side. It is made of reinforced concrete poured over steel molds and joiners. The load capacity is H-10. It has a vertical clearance of 16'8".

The bridge was designed and built in 1921, by Fred Ohrt who was the City and County Design Engineer. One of the consulting engineers was Guy Rothwell who was a prolific builder in Honolulu responsible for the design of the New Palama Settlement, Harris Memorial Church and other bridges on Oahu. [5,10]

The Anahulu bridge is representative of a type and style of architecture that was popular on the mainland after 1875, when it was discovered that reinforced concrete was a relatively cheap building material and gave structural strength in tension and compression by combining the elements of stone masonry in compression with the tensile strength of steel. [8] The Anahulu bridge does not use concrete to its fullest elasticity like the structures of Francois Hennebique of France and Robert Maillert of Switzerland, who were successful in creating structural shapes eloquent in terms of the unique powers and properties of reinforced concrete. [9] Only modern bridge architecture in Honolulu reflects the good spare construction possible with sensitive engineering design and supervision. However, situated in the plantation town of Haleiwa on the north shore of Oahu, the Anahulu bridge has a

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unique aesthetic charm of its own, set against the Pacific Ocean on one side and the winding river landscape of surrounding sugarcane fields on the other. It is the only bridge of its particular design in existence on Oahu, therefore is unique in terms of its geometric configuration. The design integrity of the structure is intact.

The structure is too narrow for all types of modern two-way traffic loads and in 1968 the Waialua Community Association urged the City Council to replace it with a new structure. [6,7] However by 1970, it became apparent that some concerned citizens wanted to keep the "quaint, chunky" bridge, while at the same time realizing that a more modern crossing was necessary in tying together two sides of the north shore community. The alternative reached was to realign Kamehameha Highway building a new four-lane bridge upstream. But now there are some business interests along the present route who fear the new highway will leave the sleepy waterfront town even quieter.

The bridge is an important transportation link between the North Shore communities and is associated with the famous Honolulu designer engineer Guy Rothwell. It also contributed to the commercial growth of the area.

There are many vantage points accessible to the public and the view is good.

Aesthetically the scene is rated excellent.

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[7] Star Bulletin, January 31, 1970, "Anahulu Bridge."

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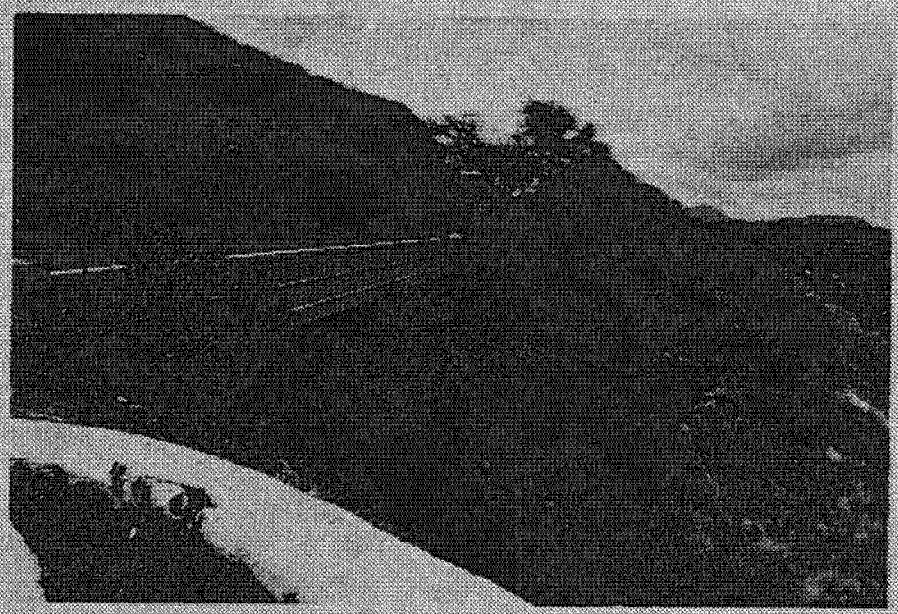

Diamond Head Road Bridge

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The Diamond Head Road bridge is located 950' west of the intersection with Poka Street and Diamond Head Road. It is a single span reinforced concrete arch structure, built in 1930. The design integrity is intact. It is 50' in length and 28' wide with a maximum load of H-20. It was built by the City and County of Honolulu. The contractor is unknown.

The bridge is built across a ravine which is approximately 15' deep. On the mountain side there are no abutments or parapets as the roadway is carved out of the side of Diamond Head crater. The bridge is located directly behind a national landmark, the Amelia Earhart memorial, but has little historical significance as a transportation link except for traffic commuting between Waialae-Kahala and Waikiki.

The structure has no outstanding architectural characteristics. It is a common type built on the mainland and Oahu in the early twentieth century following the pattern of earlier stone bridge architecture.

The view is poor and suffers in comparison with the nearby scenic lookout of the Pacific Ocean. There is a public vantage point from which to view the bridge but the scene is poor.

Aesthetically it is rated poor.

AR00042269

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AR00042270

The Ihihilauakea bridge is located .594 miles southwest of Blowhole on Kalanianaole highway. It was built in 1931 by E. E. Black, a prolific builder and prominent Honolulu businessman.[9]

The road widening project known as FAP-6D was awarded to E. E. Black for building two miles of road stretching from Ko-Ko Head Park to Blowhole for $209,801.00. The bridge was to be built for the cost of $10,999.86. When the entire project was completed, the Superintendent of Public Works wrote in his annual report, "This is one of the most expensive pieces of road in the territory."[5]

The bridge is a reinforced concrete single span open spandrel arch girder, 70' in length, with a 30' wide roadway. It has a design load capacity of H-2-. The structure stretches across a ravine some 22' above the stream bed below. There are stone masonry abutments with concrete and pipe railings. The railings do not detract from the design integrity.

The bridge is a common type but it is unique on Oahu because of the open spandrel arch in terms of geometric configuration.

The bridge was and is an important transportation link for around-the-island traffic and is associated with the famous builder E. E. Black. It also contributed to the economic growth of the area by allowing Waimanalo to be linked commercially to Waikiki thus to the tourist trade.

There are no public access vantage points and the view from the road is poor.

Aesthetically it is given a rating of excellent.

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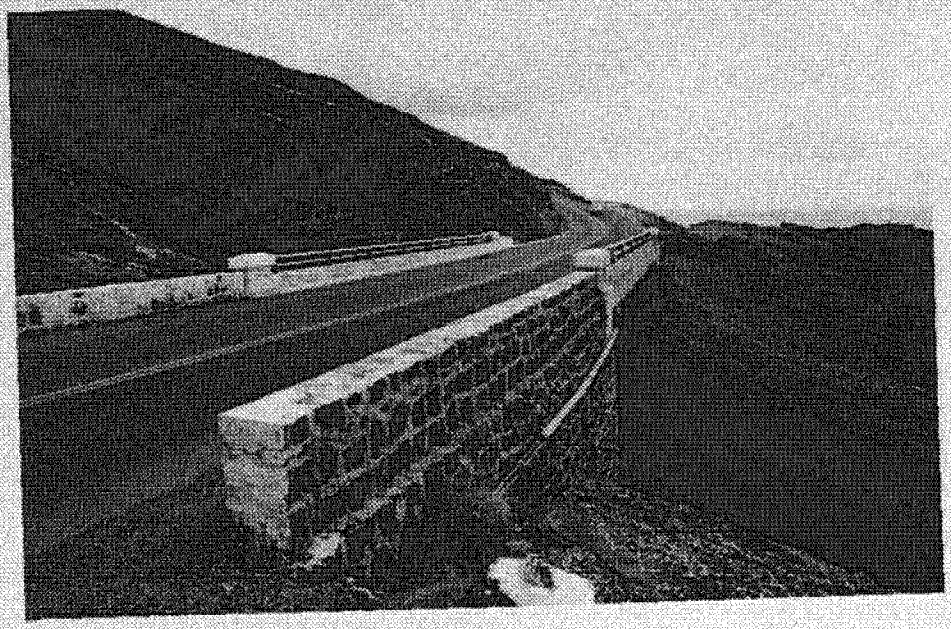

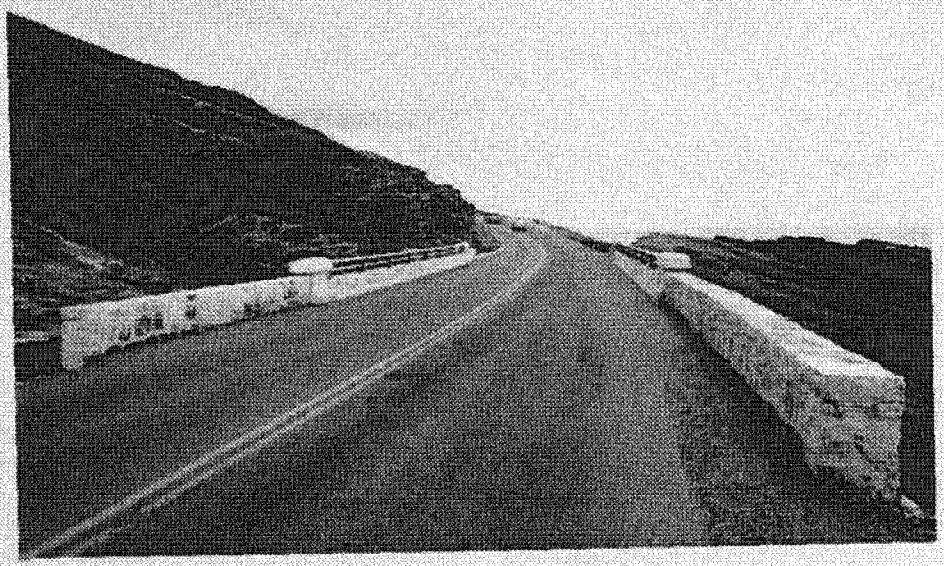

Ihiihilauakea Bridge

AR00042272

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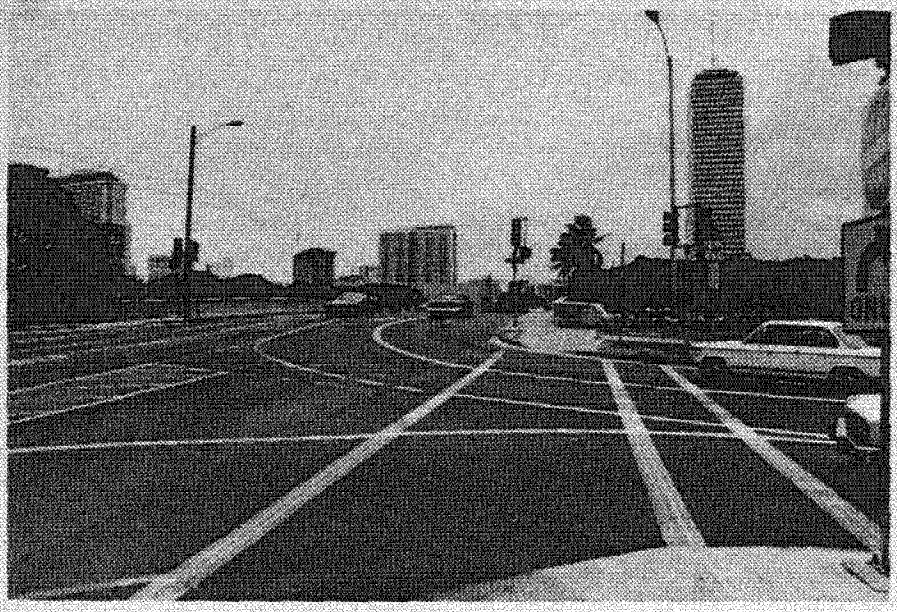
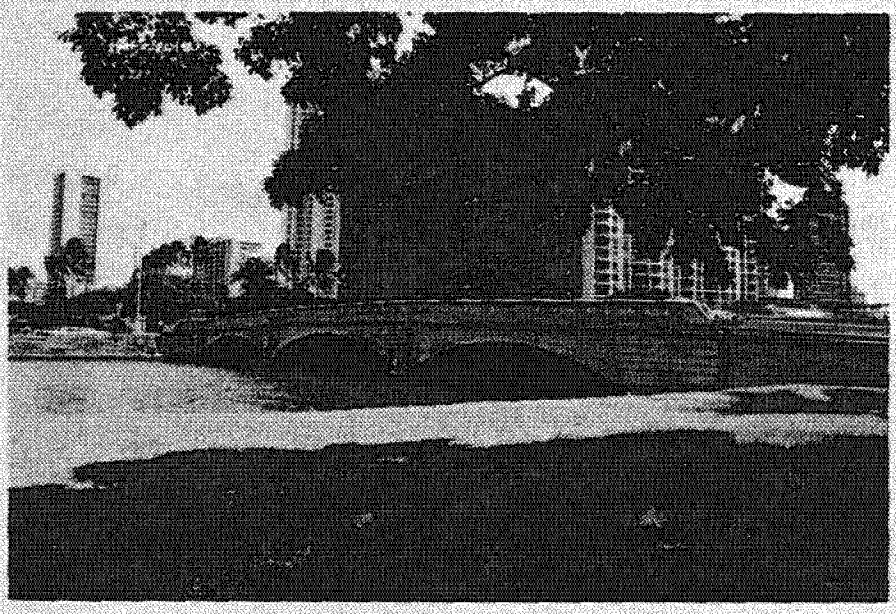
AR00042273





Kalakaua Avenue Bridge

AR00042274

The Kalakaua Ave. bridge across the Ala Wai canal was built in 1929 by the contractor and design engineer, R. E. Woolley, who was a prolific builder in Honolulu. Temporary wooden bridges had been constructed while the Ala Wai canal was being dredged for the ongoing and politically controversial Waikiki Reclamation Project.

The Waikiki Reclamation Project began in concept as early as 1904, when Lucius E. Pinkham was head of the Board of Health and saw the odiferous duck-ponds and swamps of Waikiki as a health hazard. Once he was made Governor of the Territory he pursued the Waikiki Reclamation Project with zeal. However actual work on the Ala Wai canal did not begin until 1922, when Hawaiian Dredging Company, owned by Walter F. Dillingham, was given the contract to dredge a canal 150' wide, 25' deep and about two miles in length. The original concept included a cut from Kapiolani Park to the Pacific Ocean in the vicinity of Kuhio Beach but this unit was never completed.[11] Hawaiian Dredging Co. was allowed to keep, at a nominal price, the dredged material which in turn was sold as land-fill for what became McKinley High School grounds, Ala Moana shopping center, Ala Moana Park, Piers 16 and 17. This escalated property values in Waikiki, adding to the controversy, as original owners of the duck ponds were forced to sell their properties at comparatively reduced prices hence the antagonism raged on.[7]

The building of the bridge itself was a needed improvement over the inadequate wooden structure therefore experienced

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no adverse public reaction when Woolley was awarded the contract for the sum of $103,900.00 to build it.[5]

Originally the massive arch dimensions for the bridge were: two end arches each with a span of 41' and a center span of 50'. At high tide there was to be a 6' clearance under the center arch which was thought ample to permit the passage of all boats that used the canal. There was an 8' sidewalk on each side. However to accommodate modern traffic loads the original structure has been expanded to the following dimensions without altering the design integrity: total length including the approaches is 169', the width is 56' and the sidewalks are 8' and 6'8" with pipeducts running under them. The end arches are 44' and 47' with a 54' middle arch. It has a load capacity of H-20. It is the only multiple span marine arch reinforced concrete structure of its kind on Oahu therefore is given an unusual rating in terms of geometric configuration.

The structure is typical of the architecture used in the United States after 1875 when the secrets of reinforced concrete were widely known.[8] Aesthetically the structure feels the limits imposed upon its design by the unimaginative use of tons of concrete so as to make it look like a stone bridge.[9]

The bridge is an important transportation link between Waikiki and downtown Honolulu. It is also associated with the famous design engineer R. E. Woolley, and the structure contributed greatly to the growth and development of Waikiki.[10]

AR00042276

The bridge was regarded as an attractive structure when first built but is still pleasing to view. The public has many vantage points and the visual scene is good.

Aesthetically the scene is given an excellent rating.

AR00042277

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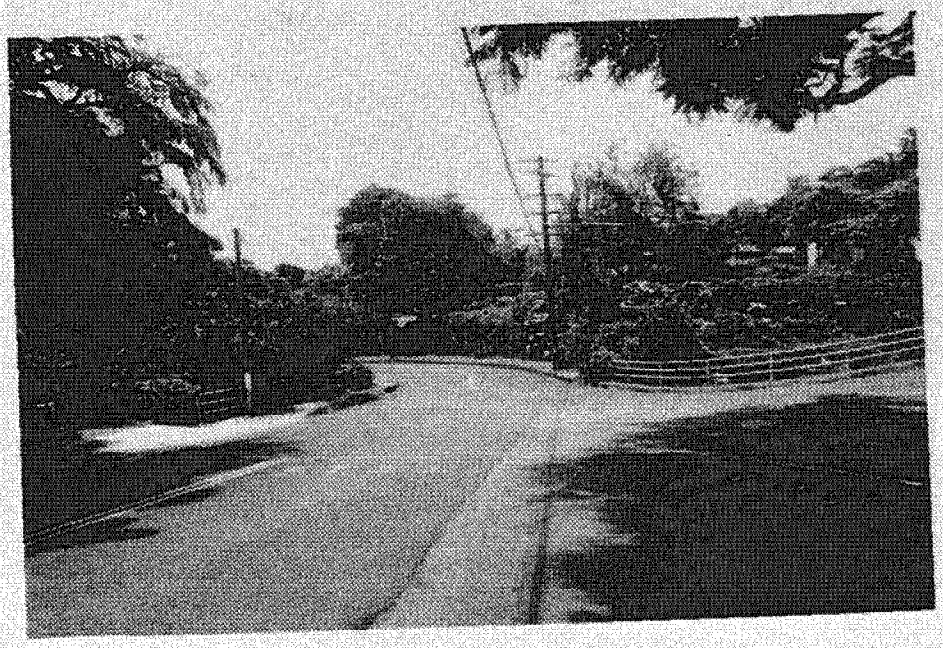

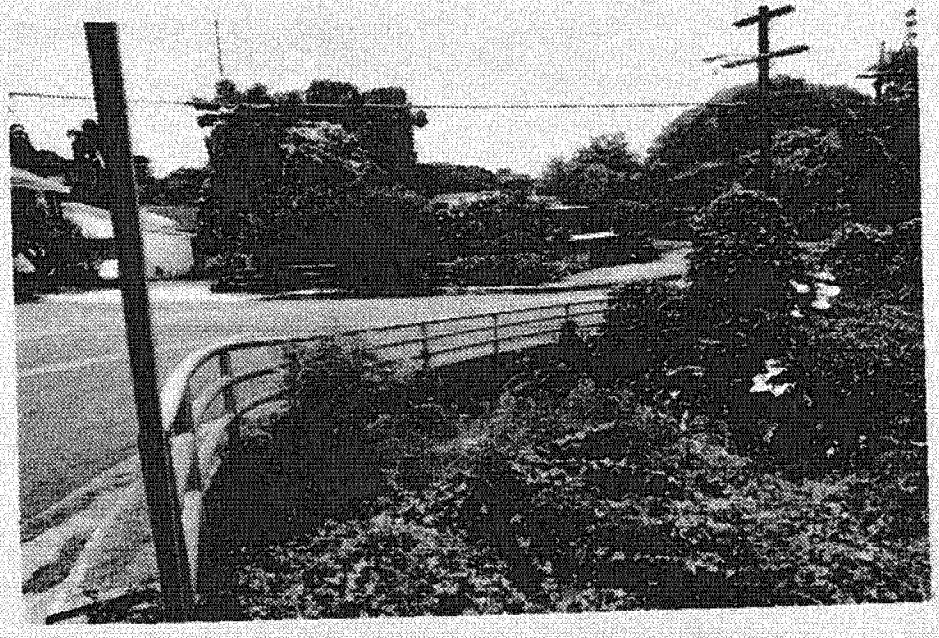

Makiki Street Bridge

AR00042279

The Makiki Bridge over Makiki Stream was built by the City and County of Honolulu in 1912 and rebuilt in 1953. The builders are unknown.

The bridge is a single span reinforced concrete arch structure 22' in length, 36' wide, approximately 10' in height. Its load capacity is H-10. The design integrity is not intact.

The structure is an important transportation link for Makiki residents and downtown Honolulu.

There are no good vantage points for public access and the view is poor.

Aesthetically the scene is given an average rating.

AR00042280

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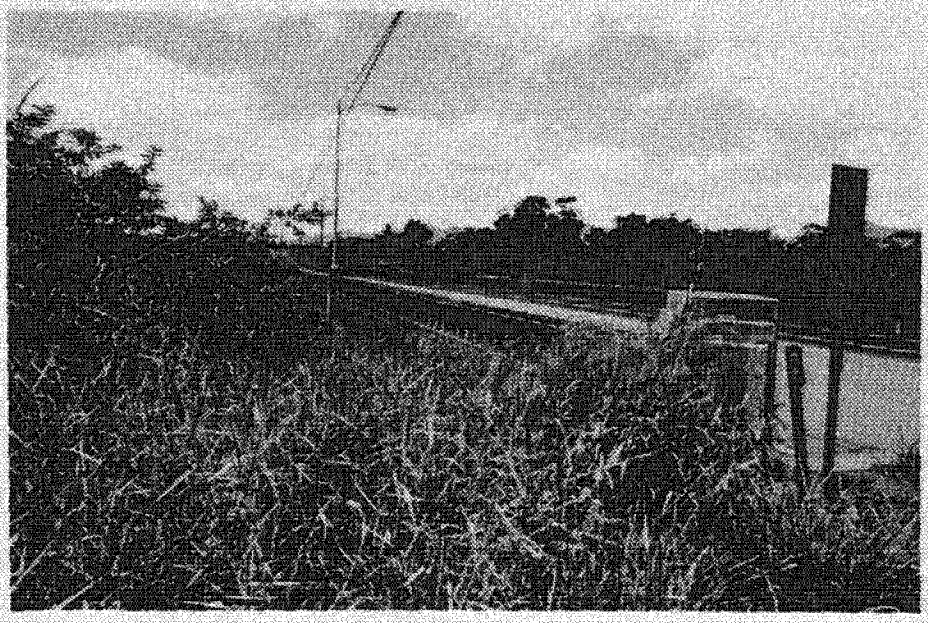

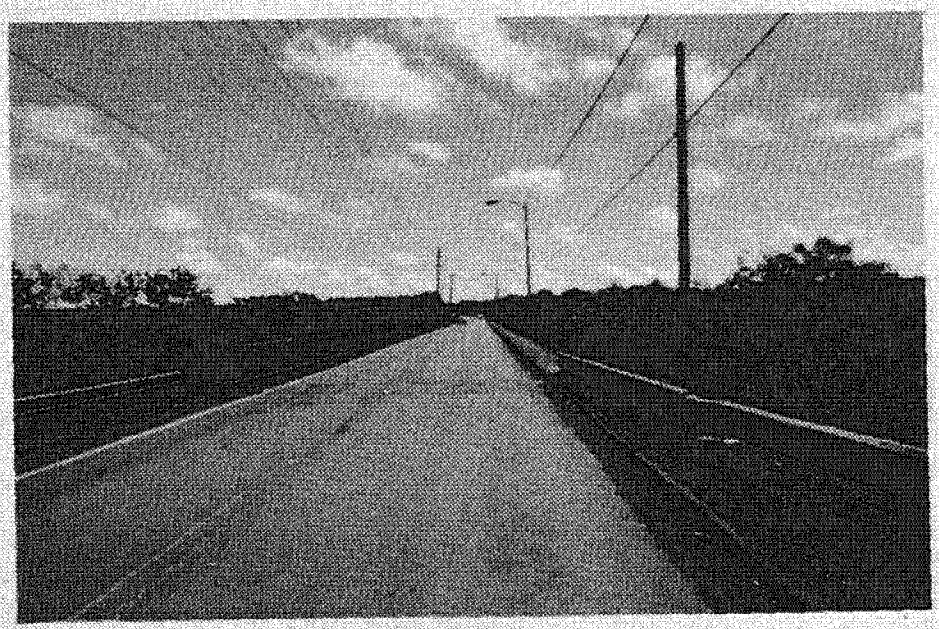

North Poamoho Bridge

AR00042282

North Poamoho bridge is also known as Lower Poamoho bridge. It crosses the North Poamoho stream on Farrington Highway .220 miles south of the intersection with Hukilau Loop. It was built in 1934 by E. E. Black, a prolific builder in Honolulu. [5,9]

The bridge has three spans, two 48' and one 62' for a total length of 164' including approaches. It has a width of 24.1' and a height of approximately 20', with a load capacity of H-15. It is a reinforced concrete arch girder bridge on piers resting on iron bearings. The design integrity is intact.

The architecture is typical of bridges built in the mainland after 1875 when reinforced concrete was popular and relatively cheap for building material. It follows the heavy design of early stone mason bridges. [6,8]

The bridge is an important transportation link between North Shore communities and is associated with the famous builder, E. E. Black.

The structure does not have a public vantage point and the view is poor.

Aesthetically it is rated poor.

AR00042283

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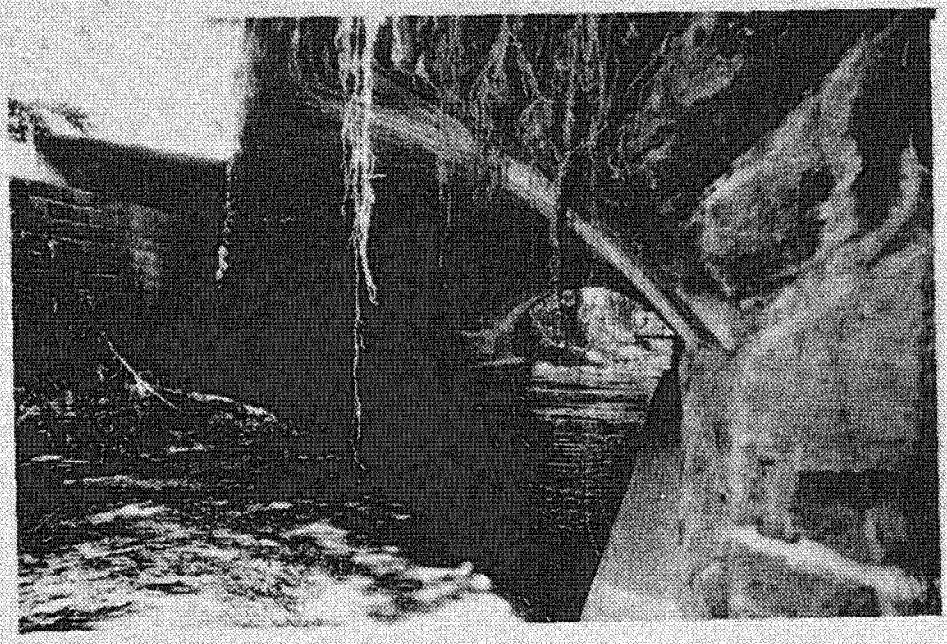

Nuuanu Arch Bridge

AR00042285

The Nuuanu arch bridge is located 200' east of the Pauoa Road and Nuuanu Avenue intersection. It is one massive arch of reinforced concrete with a false front of stone masonry. It was built in 1933 by the City and County of Honolulu. The Chief Engineer was B. F. Rush and the building contractor, D. W. Whitehouse.[5]

The bridge is 32' in length, 62' in width and approximately 19' in height. The structure has a maximum load capacity of H-20. The design integrity of the structure is intact.

The structure is architecturally common in the mainland after 1875 with the invention of reinforced concrete.[6] There are others of its type on Oahu. It limits the use of reinforced concrete to the confines of stone masonry and even has a false masonry front to imitate stone.[7] However the Nuuanu bridge is probably the best example of this building style in existence on the island in terms of natural setting. It has maintained an aesthetically pleasing view blending well with the natural landscape and has excellent vantage points for public access from which the view is good.

The bridge is an important transportation link between Nuuanu and downtown Honolulu and is associated with the prominent builder, D. W. Whitehouse.[8]

Aesthetically it is given an excellent rating.

AR00042286

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Upper Poamoho Bridge

AR00042288

Upper Poamoho bridge located on Kamehameha highway just .202 miles north of the intersection with Poamoho road was built in 1936 by E. J. Lord Construction Company. E. J. Lord was a prolific Honolulu builder. Louis Cain was the design engineer for the Territory of Hawaii at this time.

The bridge has four spans for a total length of 405'. The length of the maximum spant length is 116'. The height of the structure is approximately 75' over the river bed. The width of the structure is 31.9' with a 5' sidewalk on the left side. The load capacity is H-15. The design integrity is intact.

The Poamoho structure is a reinforced concrete arch girder birdge typical of the style built in the mainland after 1875 copying the design of stone. [5,7]

The bridge is an important transportation link between North Shore and Leeward Oahu and is associated with the prominent builder, E. J. Lord. [6,8]

There are no public access vantage points and the visual scene is poor.

Aesthetically it is given a poor rating.

AR00042289

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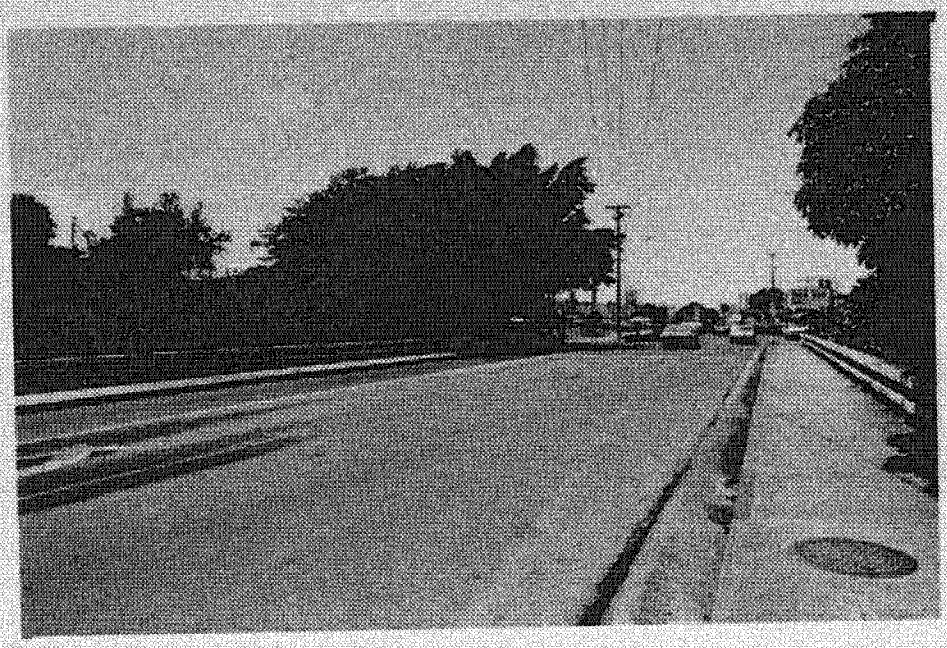

St. Louis Drive Bridge

AR00042291

The St. Louis Drive bridge crossing Palolo stream 100' north of the intersection of Waialae Avenue and St. Louis Drive was originally built in 1929 but has since been reconstructed thus its engineering design integrity belongs to a more modern period. It was built by the City and County of Honolulu. The contractor is unknown.

The bridge is 122' in length, 60' wide, with two sidewalks on either side that are 8' in width. It is a single span structure and the design integrity of the original structure is not intact.

The structure is an important transportation link between St. Louis Heights and Kaimuki.

The structure has no public access vantage points and the view is poor.

Aesthetically it is given a poor rating.

AR00042292

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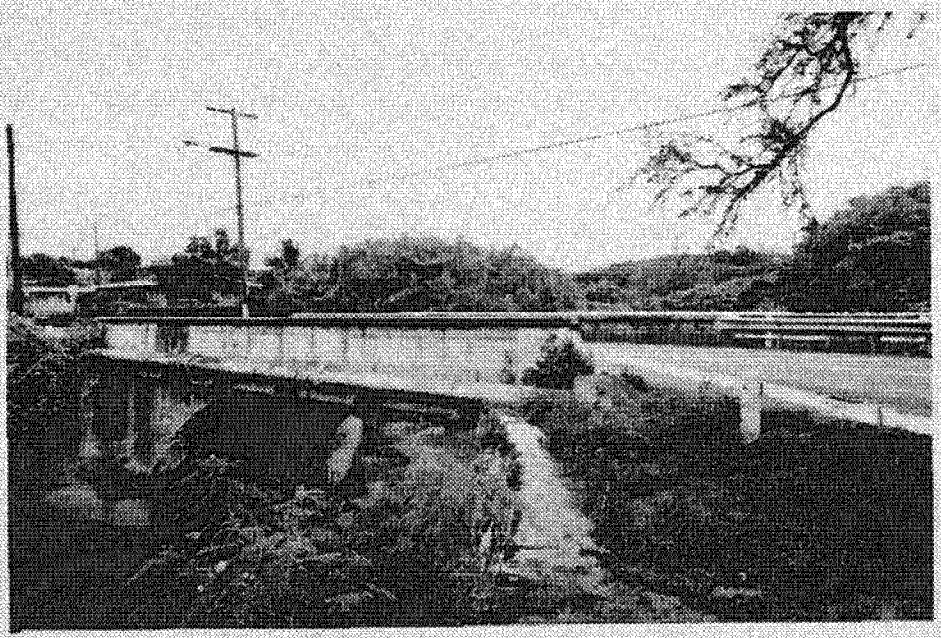

Waipahu Street Arch Bridge

AR00042294

The Waipahu Street arch bridge located on Waipahu St. crossing Waikele stream is the oldest structure of its type on Oahu built in 1905. It is a reinforced concrete girder or slab. According to sources at Oahu Sugar Company it was designed by the City and County of Honolulu and probably built by Costa and Silva Contracting Company.[6,9]

The bridge is a single span reinforced concrete structure, 54' in length and 27.5' in width. It is approximately 18.5' in height. It has a load capacity of H-10. The original design integrity is intact.

The structure is located on the Waipahu flood basin at end of the Waipahu Cultural Garden Park acreage. Architecturally the bridge is a common type built in the mainland after 1875 when the use of reinforced concrete became popular as a cheap building material.[7] It is limited in design to follow the principles of stone mason bridges.[8]

The bridge is an important transportation link between Waipahu and Waianae and/or Kunia Road.

There are many vantage points for public access and the view is good.

Aesthetically it is rated average.

AR00042295

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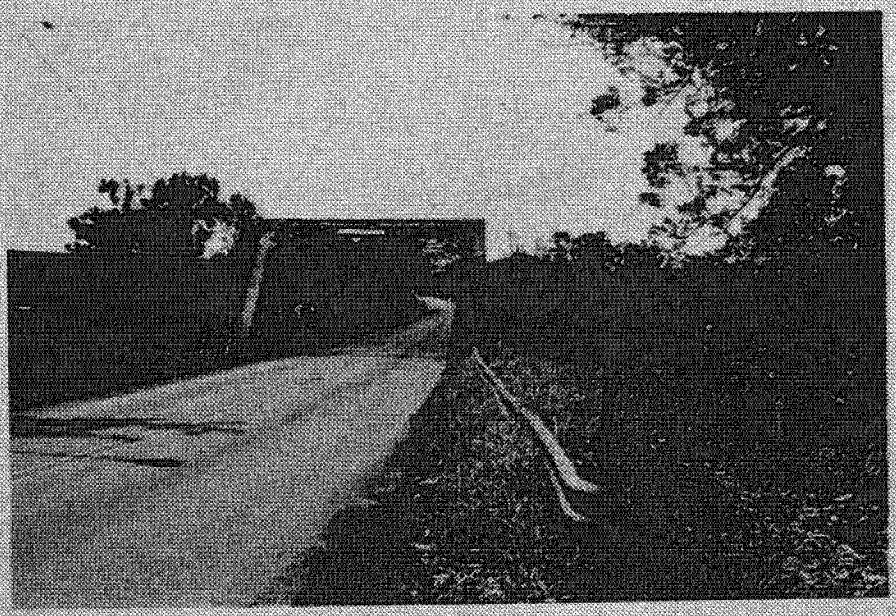
STEEL BRIDGES

AR00042297



Karsten Thot Bridge

AR00042298

The Karsten Thot bridge in Wahiawa over the north fork of the Kaukonahua stream was built in 1934, by the John L. Young Construction and Engineering Company for a price of $65,555.91.[4] The company merged with another construction company and upon completion of the bridge called itself the Hawaiian-American Construction Co.[10]

The design engineer for the structure was G. K. Dawson. The Chief Engineer of Public Works at the time was H. R. Austin and the Territorial Highway Engineer was L. H. Bigelow, all prominent men of Honolulu.

The structure is a through deck Warren steel truss, with a single span 210' in length. The structure is 40' wide with two 8' sidewalks on either side. It has a load capacity of H-20. The vertical clearance of the bridge is 13'5".

The design integrity of the structure is intact.

In that it is the only structure of its type in existence on Oahu today it is given a unique rating for geometric configuration. The bridge is built in the mode of steel railway bridges throughout the continental United States. Due to salt water erosion problems steel bridges were phased out on Oahu. The Karsten Thot bridge is located over the fresh water Wahiawa reservoir.

The bridge is an important transportation link between north shore, Waiawa and Honolulu. The structure contributed to growth of Wahiawa. The bridge is named after Karsten Thot, who was a prominent community-minded citizen and it was built by a prominent Honolulu businessman who was a prolific builder.[12,13

AR00042299

Mr. Thot was born in Schleswig-Holstein, Germany on 12 February 1889, but came to Wahiawa, Hawaii in 1904. He was a resident of Hawaii for twenty-seven years, working as a field supervisor for the Hawaiian Pineapple Co. until his death in 1932. He was survived by a wife and three children.

Karsten Thot was very active in community affairs when the Honolulu Board of Supervisors under Charles Crane asked if they could name the bridge after him. This was not carried out until Fred Wright became mayor in 1937. In 1974 a memorial plaque was placed on the bridge by the family.

The bridge has vantage points for public access and the view is good.

Aesthetically the scene is rated excellent.

AR00042300

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[11] Tom Able, Jr.
Family member.
Private conversation. 1 February 1981.

AR00042301

[12] Ted Remaly.
Neighbor and member of Wahiawa Rotary Club.
Historical Consultant.
Private conversation. 1 February 1981.

[13] Gerda Rutherford.
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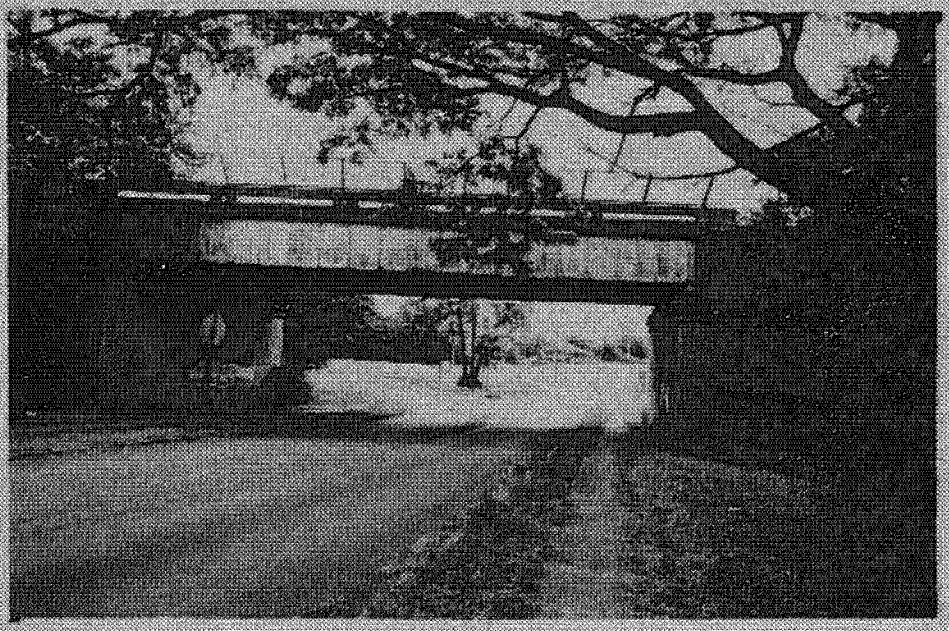

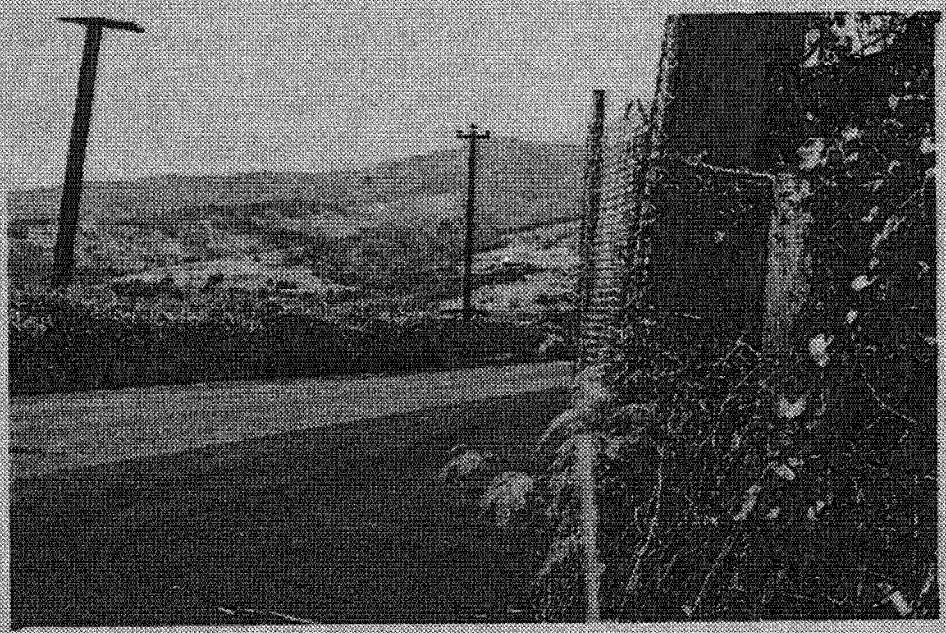

Waialua Plantation Road Overpass

AR00042303

The Waialua Plantation Road overpass is privately owned by the Waialua Sugar Company. It shows a date of having been built in 1940 but according to the engineering department at Waialua Sugar Company the bridge was an old railway trestle originally constructed in the 1890s. [5] The 1940 date is a reconstruction date, when the trestle was refurbished for modern loads. In 1953 the plantation switched to trucks as their main mode of transportation in the fields, so the bridge went into a period of disuse from then on. It is totally fenced off from public access.

The structure is located one block south of Waialua High School on Farrington Highway. It is a steel girder 62' in length, and 33.1' in width. It has an under clearance of 16'1" and an unlimited load capacity.

The bridge is unique in that it is the only structure of its kind on Oahu but the design is common to railway bridges built in the mainland in the nineteenth and twentieth centuries. [4] The design integrity is intact.

The sugarcane fields aided the commercial growth and expansion of the area.

The public access to a vantage point is limited to the highway level beneath the girder. The view is poor.

Aesthetically the scene is rated average.

AR00042304

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[4] David Plowden.
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AR00042305

Fort Weaver Road Metal Flume Overpass

AR00042306

The Fort Weaver Road metal flume overpass is a multiple wooden truss structure, located on Fort Weaver Road, .026 of mile northwest of the intersection with Kumuhahi St. It was built by the Ewa Sugar Company when George Renton was the plantation manager.[3] The engineer was T. Tsuzuki. It was built in 1934.

The structure is on private land leased by the Oahu Sugar Company from Campbell Estate. The length of the structure across the public road is 42' and it is 6' wide. There is a vertical clearance of 20'9". The design integrity is intact.

The structure is unique being the only one of its kind on Oahu. The metal overpass section is constructed of steel barrels sawed in half. The trusses are made of creosoted lumber. The entire structure is in a delapidated condition scheduled for removal when the Fort Weaver Road widening project commences.

The flume was built for irrigation purposes to remedy the practical economic problem of moving tons of water from a higher elevated field to a lower one for better cane production. The design is simple following the architecture of the old Roman aqueduct, using the flow of the water's gravity as its propellant.[4] It has a certain historic and aesthetic appeal but is in a delapidated state.

The sugarcane fields the flume services aided the commercial growth and expansion of the area.

AR00042307

There are public access vantage points and the view is good.

Aesthetically the scene is rated average.

AR00042308

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AR00042309

TIMBER BRIDGES

AR00042310

The timber bridge with creosoted and chemically treated beams is common to the style of structures built on the mainland throughout U.S. bridge building history. Timber bridges were seen as an economical way to build temporary structures with an average life span of 20 to 30 years, as there was an abundance of timber and left-over railroad trestles for construction materials.[6] Farrington Highway follows the old railway bed of Oahu Sugar Company trains.[8] Although the trend in the western U.S. has been to continue building some wooden bridges, on Oahu the trend has been to replace them with concrete or steel, probably due to saltwater erosion problems.

Wood lost its reputation as a suitable building material around 1900, as it seemed inferior to Machine Age products.[7] However, as Machine Age costs multiply, wood is enjoying a popularity on the mainland for the building and replacement of bridges.[10] Wood can be used in the engineering sense, like iron or steel, in that wood is generally suited to the same types of construction that are propitious in metal, thus explaining the longevity of the Makaha structures.[9]

AR00042311

The Makaha #2 bridge located on Farrington Highway .146 of a mile west of the intersection with Maiuu Road was built in 1937. W. D. Bartel was the Chief Engineer for the Territorial Highway Department.

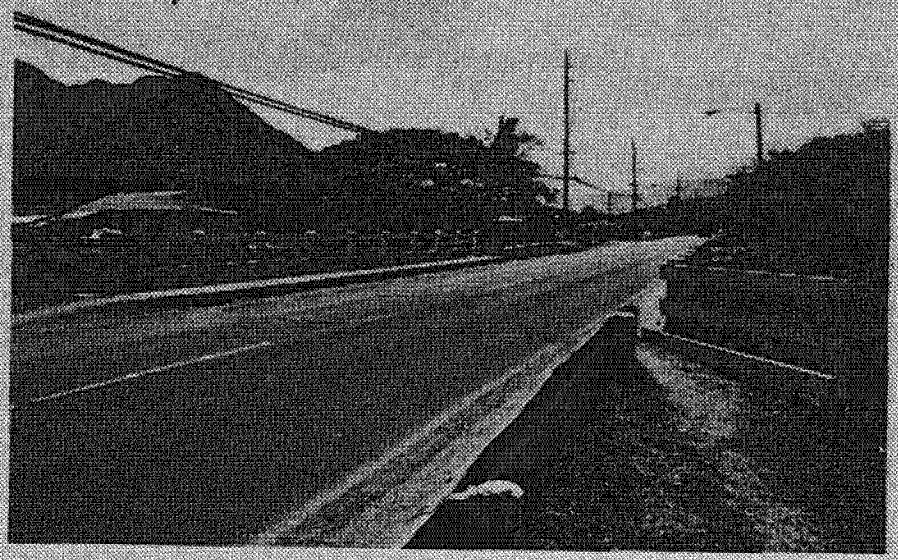
The bridge is a timber girder and floor beam, three span structure, with a total length of 60', 29.1' wide. It has a load capacity of H-15. There is a narrow sidewalk with two wooden railings on each side. The design integrity is intact.

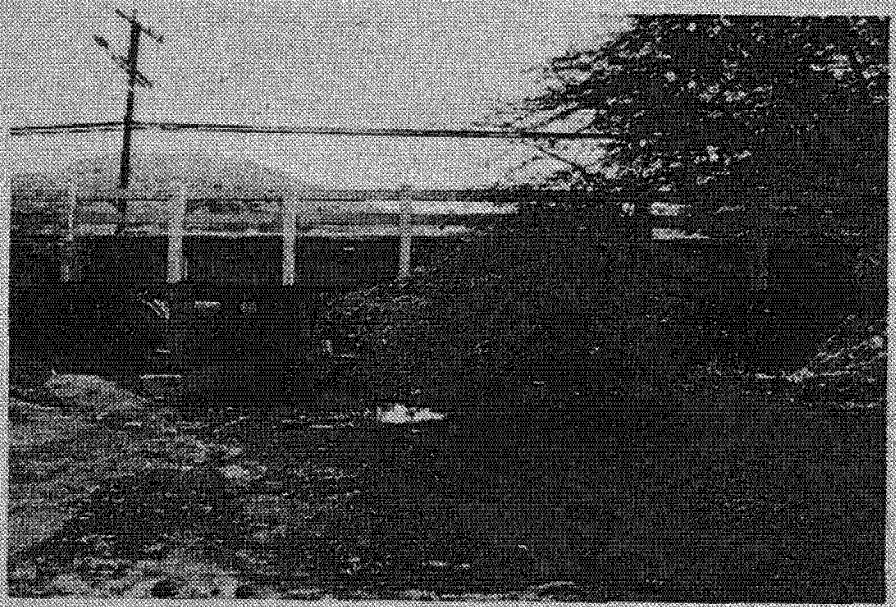
The painted white railings with their creosoted sub-structure blend aesthetically with the rural scene of the Waianae coast.

This bridge is an important transportation link between the Waianae coast and Honolulu. This bridge is located next to a beach park thus has many good vantage points for public access. The view is good.

Aesthetically it is given an average rating.

AR00042312





Makaha No. 2 Bridge

AR00042313

The Makaha #3 bridge across Makaha stream located on Farrington Highway .124 miles west of the intersection with Upena St. is a timber girder floor beam structure built in 1937. W. D. Bartel was the Chief Engineer for the Territorial Highway Department.

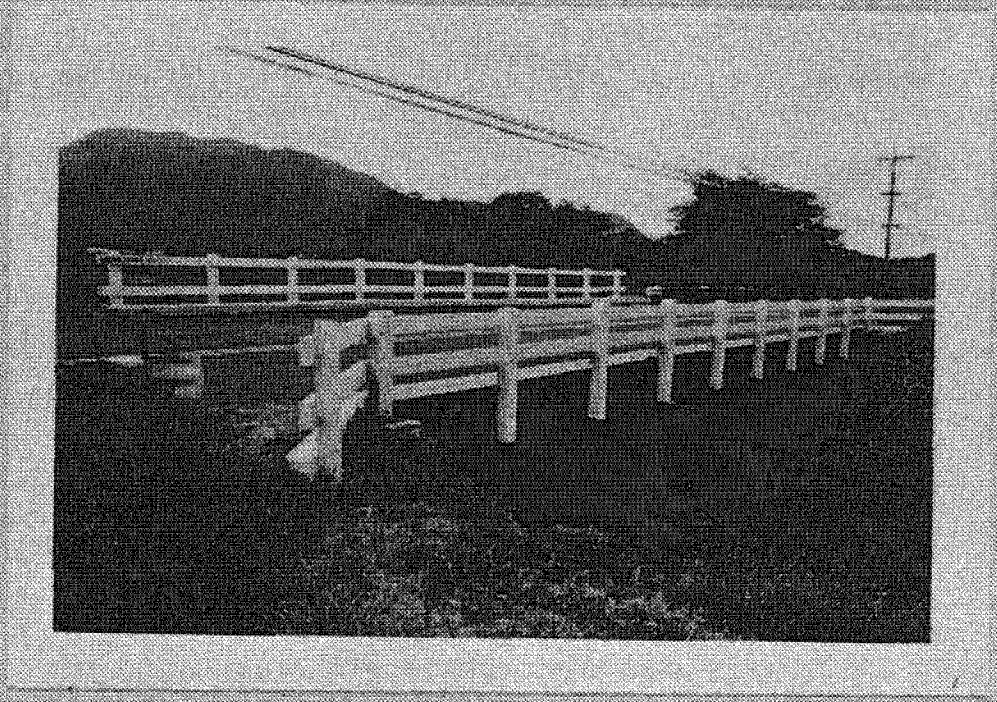
The structure is 60' in total length, with three spans. It is 29.2' wide and 12' in height. The load capacity is H-15. There is a 4' sidewalk on the right side. The abutments are constructed of cement rubble masonry with two wooden rails on each side. The design integrity is intact.

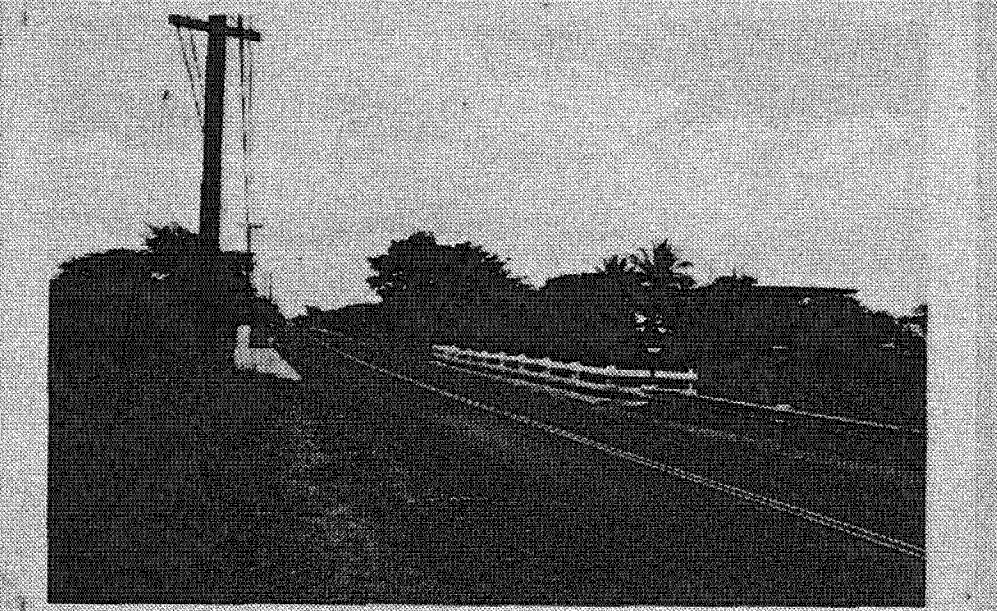
The painted white railings with their creosoted sub-structures and cement rubble masonry abutments blend aesthetically with the rural ranch scenes of the Waianae coast. The bridge is an important transportation link between the Waianae coast and Honolulu.

The only vantage point for viewing this bridge is from the beach. The view is good.

Aesthetically, the scene is rated average.

AR00042314





Makaha No. 3 Bridge

AR00042315

The Makaha #3A bridge located on Farrington Highway .200 of a mile west of the intersection with Upena Street is a timber girder floor beam structure built in 1937. W. D. Bartel was the Chief Engineer for the Territorial Highway Department.

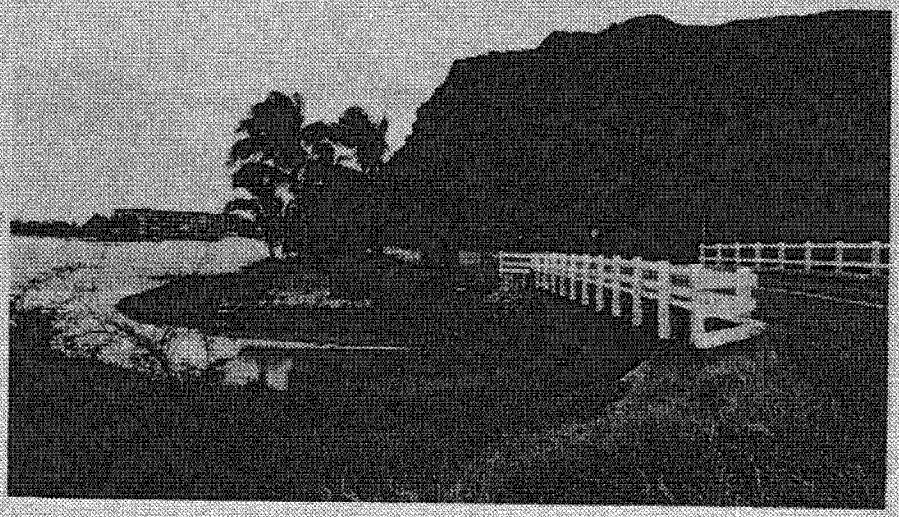
The bridge is a 4 span structure with a total length of 78' with a width of 29.3' and a length of 11'. It has a load capacity of H-15. The abutments are constructed of cement rubble masonry. There are two wooden railings on both sides of the structure. The design integrity is intact.

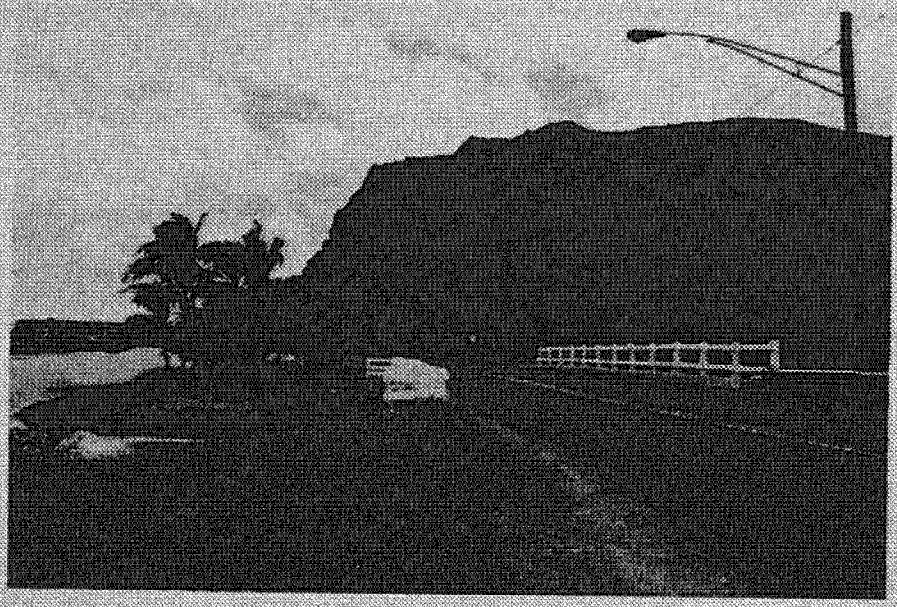
The painted white railings with their creosoted sub-structure and cement rubble masonry abutments blend aesthetically with the rural ranch scenes of the Waianae coast. The bridge is an important transportation link between the Waianae coast and Honolulu.

There are vantage points for public viewing of the bridge. The view is good.

The aesthetics are rated average.

AR00042316





Makaha No. 3A Bridge

AR00042317

The Makaha #3B bridge is located on Farrington Highway .100 of a mile north of the beginning of the route. It is a timber beam on a bent timber pile, built in 1937. W. D. Bartel was the Chief Engineer for the Territorial Highway Department.

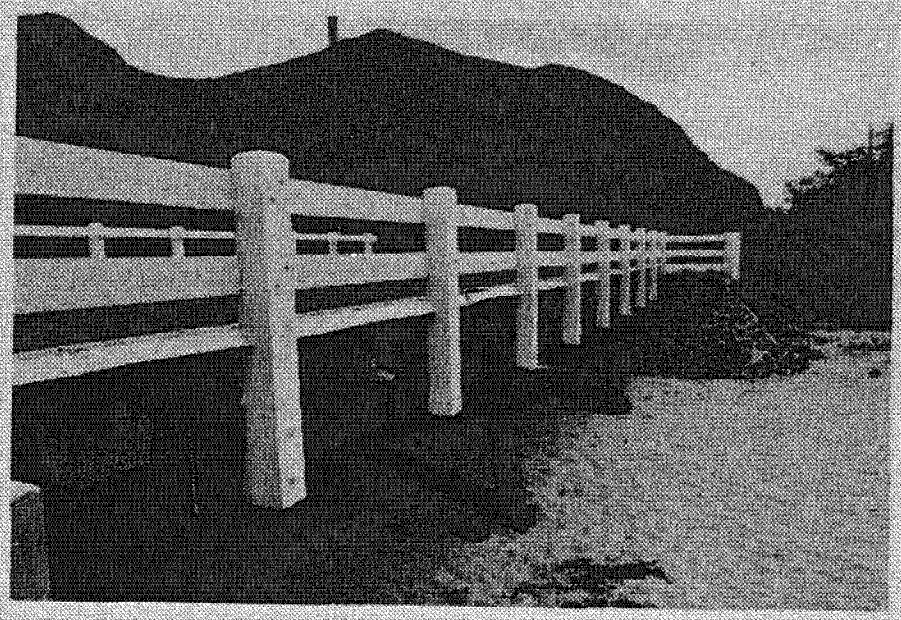
The bridge is a three span structure, 60' in length, 29.2' wide, and only 9' in height. It has a load capacity of H-15. The abutments are constructed of cement rubble masonry. There are two wooden railings on each side and one 4' sidewalk on the left. The design integrity is intact.

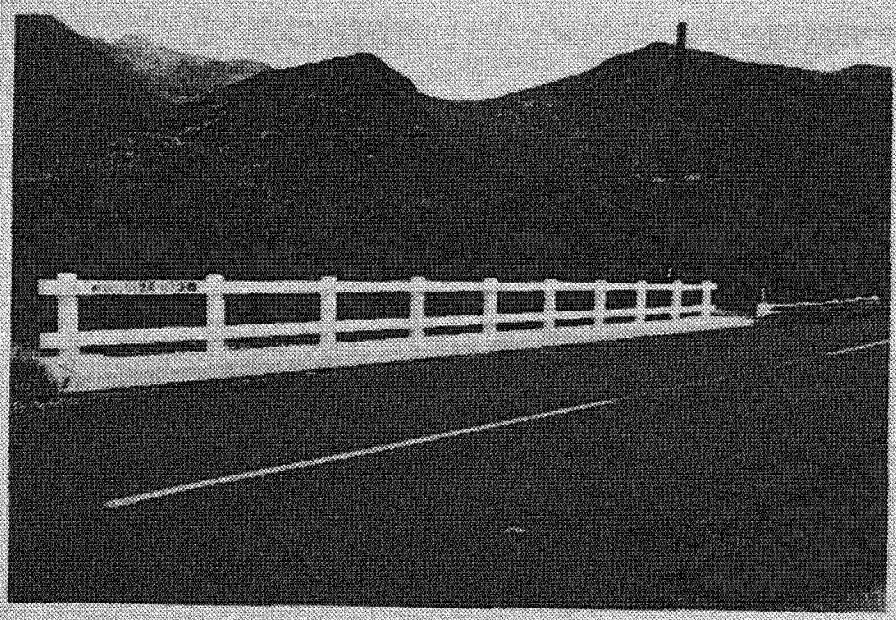
The painted white railings with their creosoted sub-structure and cement rubble masonry abutments blend aesthetically with the rural ranch scenes of the Waianae coast. The bridge is an important transportation link between the Waianae coast and Honolulu.

There are several good vantage points for viewing the bridge. The view is good.

The aesthetics are given an average rating.

AR00042318





Makaha No. 3B Bridge

AR00042319

The Makaha #4 bridge located on Farrington Highway .600 of a mile north of Makaha #3 bridge was built in 1937. W. D. Bartel was the Chief Engineer for the Territorial Highway Department.

The structure is a seven span bent timber frame with a total length of 135'. The width is 29.3', with a height of 12'. The load capacity is H-15. The abutments are constructed of cement rubble masonry and there are two wooden rails on each side. The design integrity is intact.

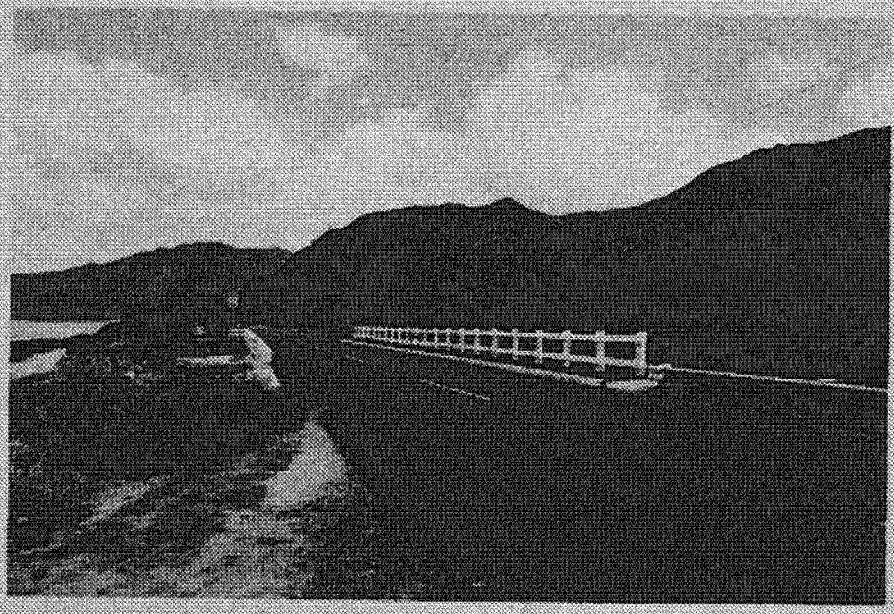
The painted white railings with their creosoted substructure and cement rubble masonry abutments blend aesthetically with the rural ranch scenes of the Waianae coast.

The bridge is an important link between the Waianae coast and Honolulu.

There are several good vantage points for viewing the bridge and the view is good.

The aesthetics are given an average rating.

AR00042320



Makaha No. 4 Bridge

AR00042321

The Makaha #5 bridge located on Farrington Highway .180 of a mile north of the intersection with Makaha bridge #4 is a timber beam bent frame, built in 1937. W. D. Bartel was the Chief Engineer for the Territorial Highway Department.

The bridge is a two span structure, 40' in total length, 28.9' wide, and 7' in height. It has a load capacity of H-15. The abutments are cement rubble masonry. There are two wooden railings on each side and one 4' wide sidewalk on the left. The design integrity is intact.

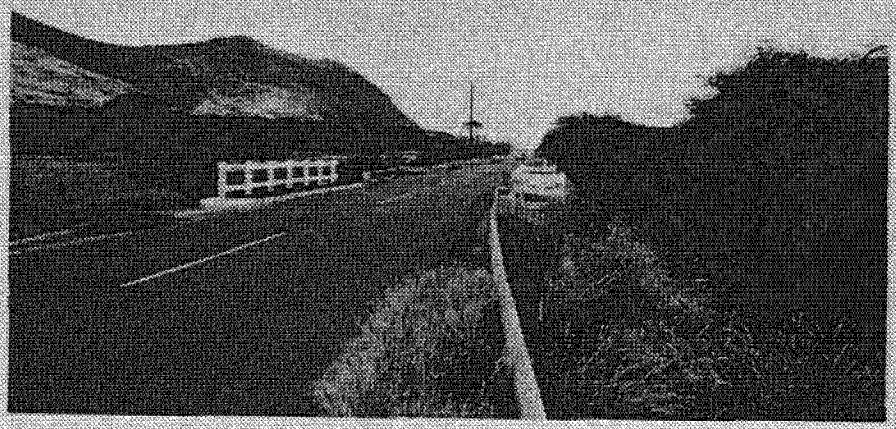
The painted white railings with their creosoted sub-structures and cement rubble masonry abutments blend well with the rural ranch scenes of the Waianae coast.

The bridge is an important transportation link between the Waianae coast and Honolulu.

There are no vantage points of the bridge except from private property and the view is poor.

The aesthetics are given a poor rating.

AR00042322



Makaha No. 5 Bridge

AR00042323

The Makaha #5A bridge located on Farrington Highway .500 of a mile north of the intersection with Makaha bridge #5 is a timber beam bent frame structure that was built in 1937. W. D. Bartel was the Chief Territorial Highway Engineer.

The structure is a one span bridge 22' in total length and 29' wide. It has a load capacity of H-15. The abutments are cement rubble masonry and there is one 4' wide sidewalk on the left. There are two wooden railings on each side of the structure. The design integrity is intact.

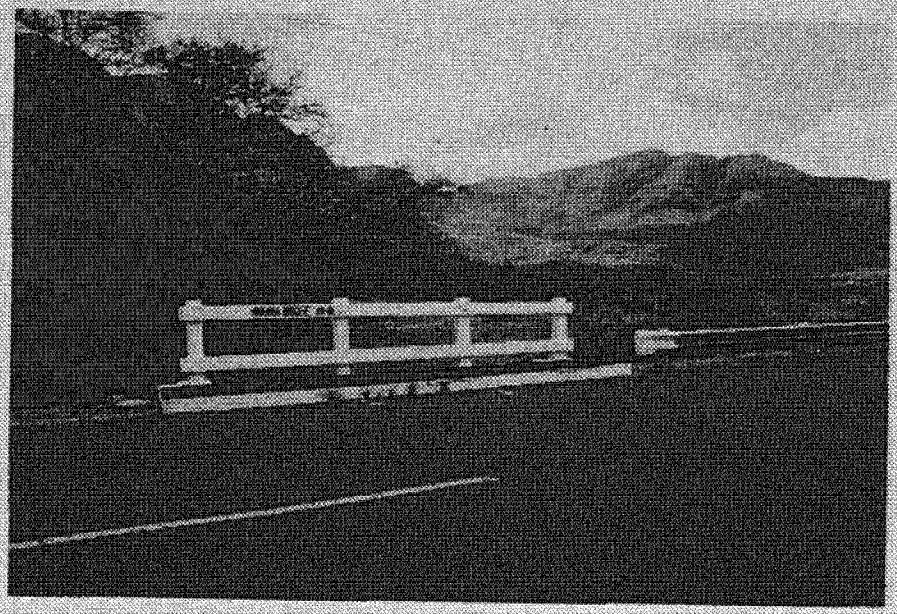
The painted white railings with their creosoted sub-structures and cement rubble masonry abutments blend aesthetically well with the rural ranch scenes of the Waianae coast.

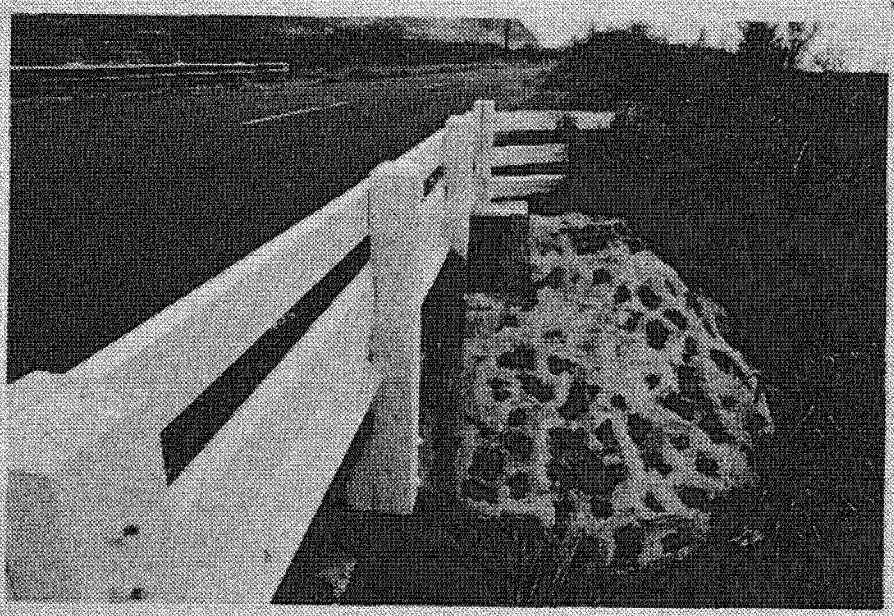
The bridge is an important transportation link between the Waianae coast and Honolulu.

There are no good vantage points of the structure, except from private property and the view is poor.

The aesthetics are given a poor rating.

AR00042324





Makaha No. 5A Bridge

AR00042325

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AR00042326

REINFORCED CONCRETE

DECK GIRDER

AR00042327

Today reinforced concrete is one of America's most important structural materials, as it is economical and can be molded into virtually any shape. The full plasticity of the material has never been fully utilized by American design engineers, so when it comes to bridge building, men like Francoise Hennebique, Robert Maillart and Eugene Freyssinet took the lead in creating beautiful concrete structures throughout Europe, free from the traditions of stone masonry. Their contributions liberated concrete bridge design from total dependence on the arch, and today the concrete girder has become the standard American bridge. However the new forms from Europe did not necessarily produce superior American designs; only occasionally have creative structures resulted. [10]

In American bridge building history the concrete girder bridge goes back to 1898, when F. W. Patterson developed a form of concrete girder. In essence, it was no more than a steel beam covered in concrete. Other engineers such as Ernest Ransome realized other forms of bar reinforcing and by 1910, the basic form of the concrete girder bridge had evolved. [10]

Architecturally, straight beams are reasonable and economical in reinforced concrete girder bridges and attempts at slight arches or curved under edges are usually done to achieve a form of light elegance, as concrete is a relatively bulky material. Reinforced concrete is not particularly

AR00042328

visually pleasing in rectilinear forms but dullness can be avoided through the welcoming of every opportunity to introduce lightness and fineness as contrast to the dominant mass. [12]

AR00042329

Aiea Stream Bridge

AR00042330

The Aiea stream bridge located on Kamehameha Highway .247 of a mile east of the intersection with Honomanu Street was built in 1938 then reconstructed in 1945 and 1965. The Chief Territorial Engineer in 1938 was W. D. Bartel. The contractor is unknown.

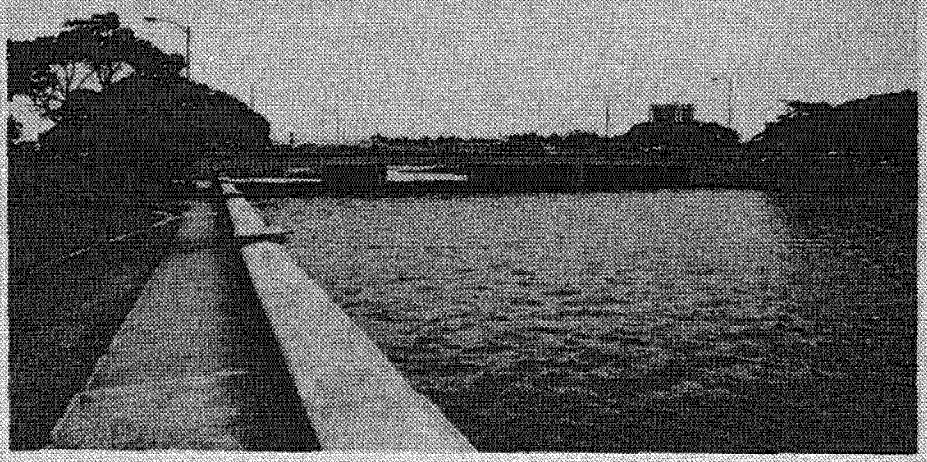
The structure is a one span reinforced concrete deck girder and a pre-stressed tee girder, 49' in length, 91.4' wide, and approximately 10' in height. It has a design load capacity of H-20. There is a 4' sidewalk on both sides. The abutment is curved and constructed of reinforced concrete and pipes. Thus the design integrity of the older structure is not intact.

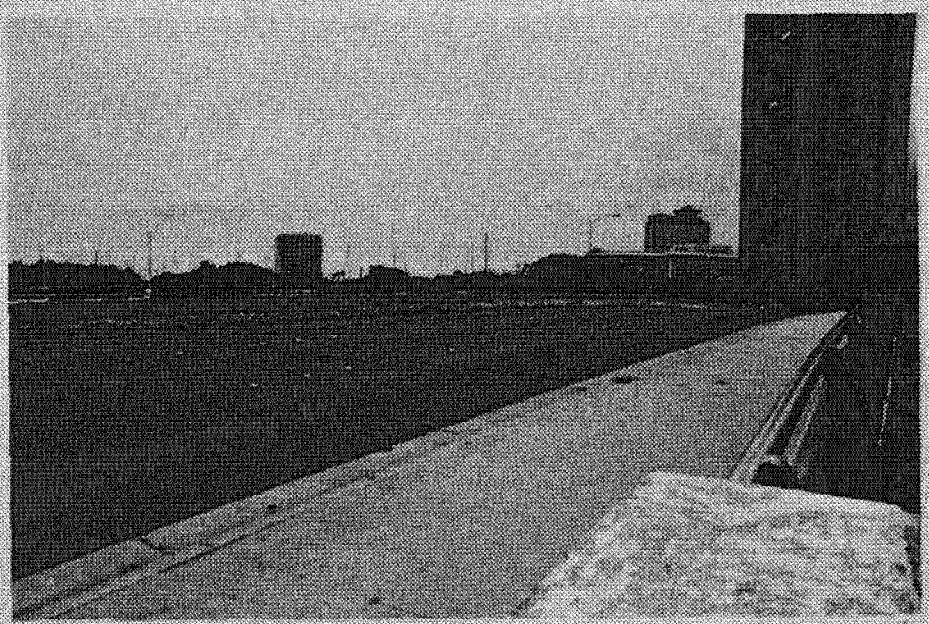
This bridge is a transportation link between Moanalua Road and Kahemameha Highway.

There are no public access vantage points and the view is poor.

The aesthetics of the scene are poor.

AR00042331





Ala Wai Canal Bridge

AR00042332

The Ala Wai Canal bridge at Ala Moana Boulevard was built in 1939. The Territorial Public Works Director was Louis B. Cain. The designer and builder was R. E. Woolley, a prominent Honolulu businessman and prolific builder. [19]

The bridge was constructed after a storm of controversy that had its beginnings in the earlier Waikiki Reclamation Project which in turn began in concept as early as 1904, when Lucius E. Pinkham was head of the Board of Health and saw the odiferous duck-ponds and swamps of Waikiki as a health hazard. Once he was appointed Governor of the Territory in 1913, he pursued the Waikiki Reclamation Project with zeal. [16] However, actual work on the Ala Wai canal did not begin until 1922, when Hawaiian Dredging Company, owned by Walter F. Dillingham, was given the contract to dredge a canal 150' wide, 25' deep and about two miles in length. [5] The original concept included a cut from Kapiolani Park to the Pacific Ocean in the vicinity of Kuhio Beach but this unit was never completed. [20] Hawaiian Dredging Co. was allowed to keep, at a nominal price, the dredged material, which in turn was sold as land-fill for what became McKinley High School grounds, Ala Moana shopping center, Ala Moana Park, Piers 16 and 17. This escalated property values in Waikiki, adding to the controversy, as original owners were forced to sell their properties at comparatively reduced prices, hence the antagonism raged on. [16]

AR00042333

In 1939 the federal Public Works Administration granted $75,000.00 at the request of Louis Cain to build a $200,000.00 bridge across the Ala Wai. The remaining sum of money to be supplied by the Territory. Cain immediately solicited for bids then the controversy regarding the bridge specifically broke out.[8]

The Waikiki Park Board issued a sharp protest in the form of a public letter against the construction of any bridge over the Ala Wai canal at Ala Moana stating that ". . . The principal of sound civic development had been violated." They called in none other than the urban architectural genius of international repute, Lewis Mumford, as their consultant who asserted that the design, ". . . created an unnecessary traffic hazard . . ." and he discussed ". . . a number of features which he determined to be dangerous as well as unsightly."[13] They were never elaborated upon. The Park Board further asserted Louis B. Cain was afraid of losing the $75,000.00 grant therefore rushed into the plans without due consideration.[7]

It is interesting to note, the Park Board was not above criticism, not because of its Chairman, Lester McCoy, but because its members were wealthy property owners; Phillip Spaulding, Louise Dillingham, wife of W. F. Dillingham who owned Hawaiian Dredging and Hawaiian Contracting Co. and who came out second in the bidding for the building of the bridge, Herman von Holt and Francis Sylva. In summation, the Park

AR00042334

Board wanted a bridge low enough so as not to cut off the view of the ocean from certain Waikiki properties. Then the Waikiki Jubilee committee requested a bridge high enough to float barges under it for a water-borne version of the Aloha Day parade.[11] Most yacht owners wanted a bridge high enough to sail under. Thus the design of the bridge was changed three times.[14] Finally, the police chief, Wm. A. Gabrielson, threw his ideas into the public arena, requesting that no bridge be built on the premise if one was built it would necessitate the erection of a new traffic signal.[10] Louis Cain refused comment, taking a trip to the outer islands. When he returned it was announced that R. E. Woolley won the contract with the low bid of $109,996.90 so the affair was apparently ended.

In the meantime R. E. Woolley noted an error in the addition of his total bid, so promptly withdrew it.[6] Hawaiian Dredging Co. then sued for the contract as they were second in the original bidding. A Washington, D.C. spokesman was contacted, a Major Bernel, who suggested the fairest solution was to re-submit all the bids. This was done and R. E. Woolley was again awarded the contract in September 1938, thus ending all controversy. The total cost of the structure was $132,175.00. It was reconstructed for road widening purposes in 1970.

The bridge is a three span reinforced concrete deck arch girder structure, 166' in total length and 100' wide.

AR00042335

It has a design load capacity of H-20. There are 8.8' sidewalks on both sides. The abutments and railings are constructed of concrete and pipe. There is a 10' clearance between the structure and the water at high tide.

The engineering design is typical of the concrete deck girder type of structure built in the U. S. after 1898. It is the most commonly built type of bridge in the U. S. [17] Architecturally, arch beams are reasonable and economical in reinforced concrete, though inexpressive of its special character. The reconstruction of the abutments and the addition of pipe railings has compromised the original design integrity so that it is not intact.

There are many public access vantage points from which to view the structure and the view is good.

The aesthetics of the scene are poor.

The structure is an important transportation link between Waikiki and downtown Honolulu. It is also associated with many prominent Honolulu men and builders. In the course of its construction it was linked to the historic Waikiki Reclamation Project which contributed extensively to the commercial growth of the area.

AR00042336

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AR00042337

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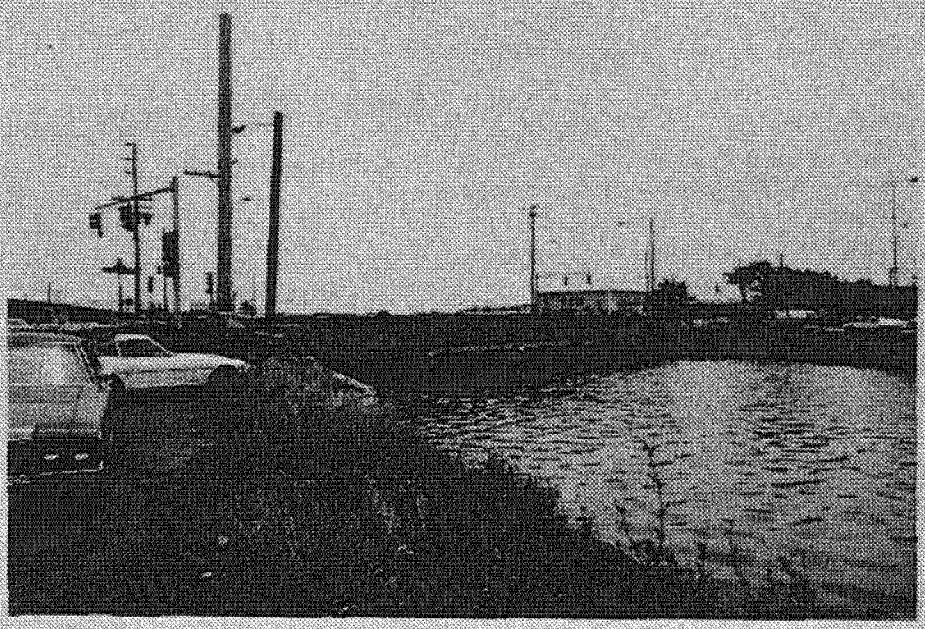
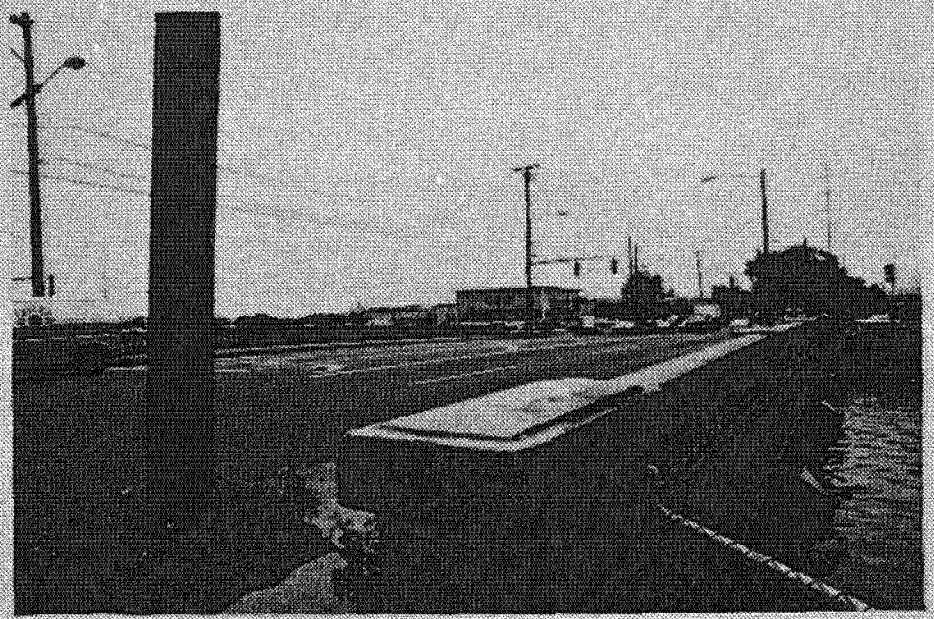
AR00042338





Dillingham Boulevard Bridge

AR00042339

The Dillingham Boulevard bridge, also known as the Kapalama Canal bridge, located between Kohou Street and Kokea Street across the Kapalama Canal was built in 1930. The Bureau Engineer for the City and County of Honolulu was D. Balch. The design engineer was George Dawson. The builder is unknown.

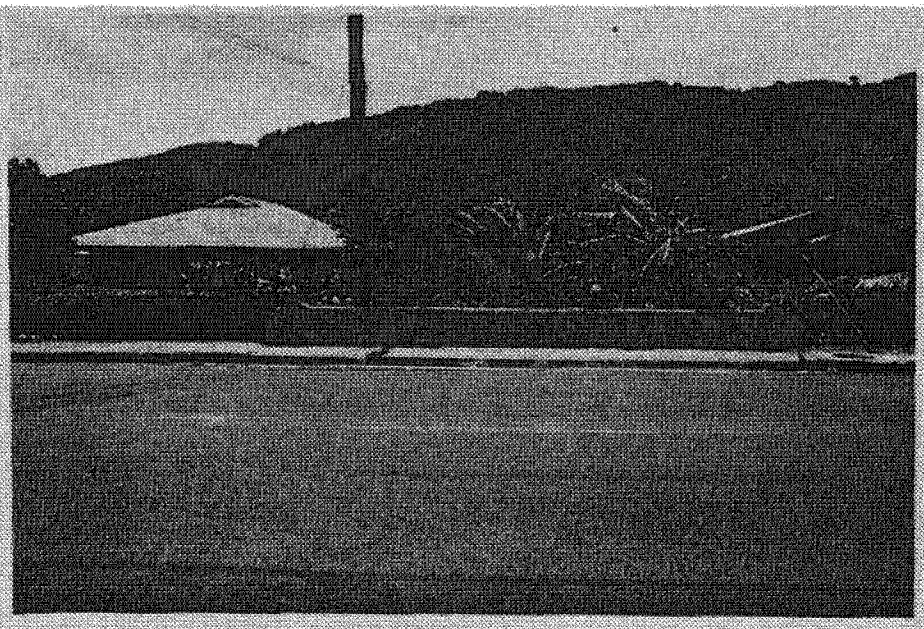
The bridge is a five span reinforced concrete tee beam deck girder structure, 113.4' in length, 78' wide, and 10.5' in height. The sidewalks are 10' on both sides. The abutments and parapets are constructed of reinforced concrete. The geometric configuration of the structure is typical. The design integrity is intact.

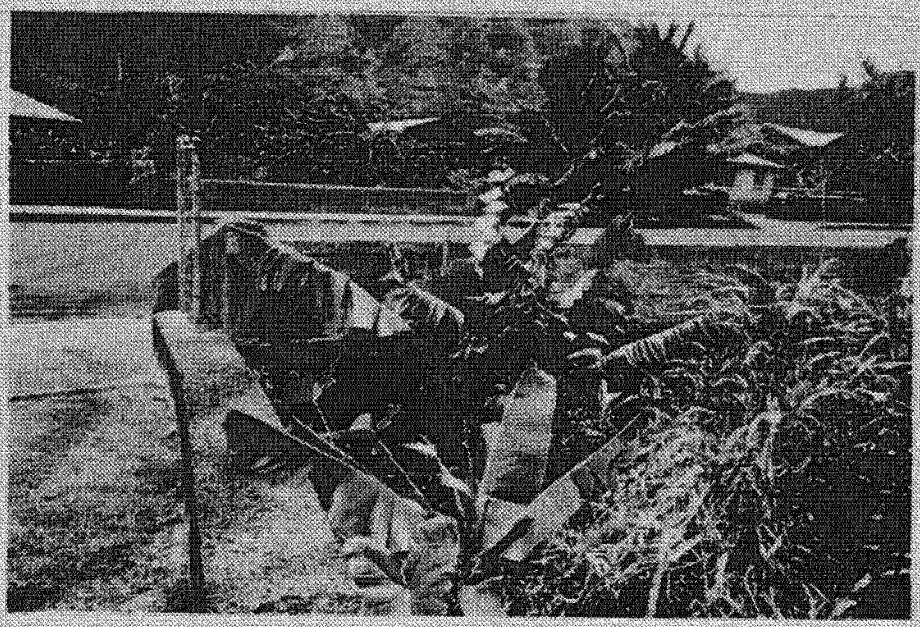
The bridge is an important transportation link between Kalihi and downtown Honolulu.

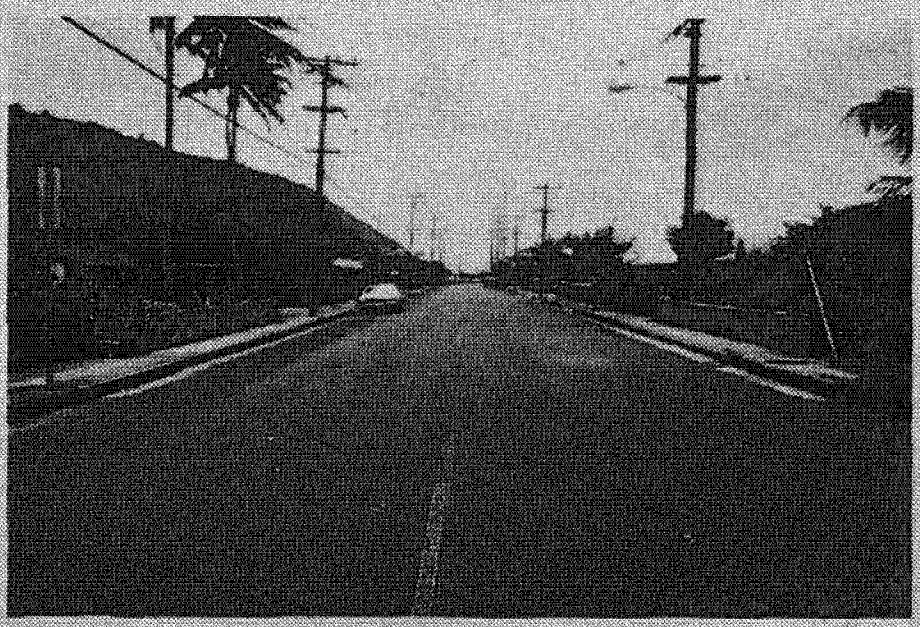
There are many vantage points for public access and the view is good.

The aesthetics of the scene are poor.

AR00042340







East Manoa Road Bridge

AR00042341

The East Manoa Road bridge located across the Manoa Park ditch was built in 1938. It was a City and County Project. R. S. Mowry was the Bureau Engineer. The design engineer was S. Dodo. The builder is unknown.

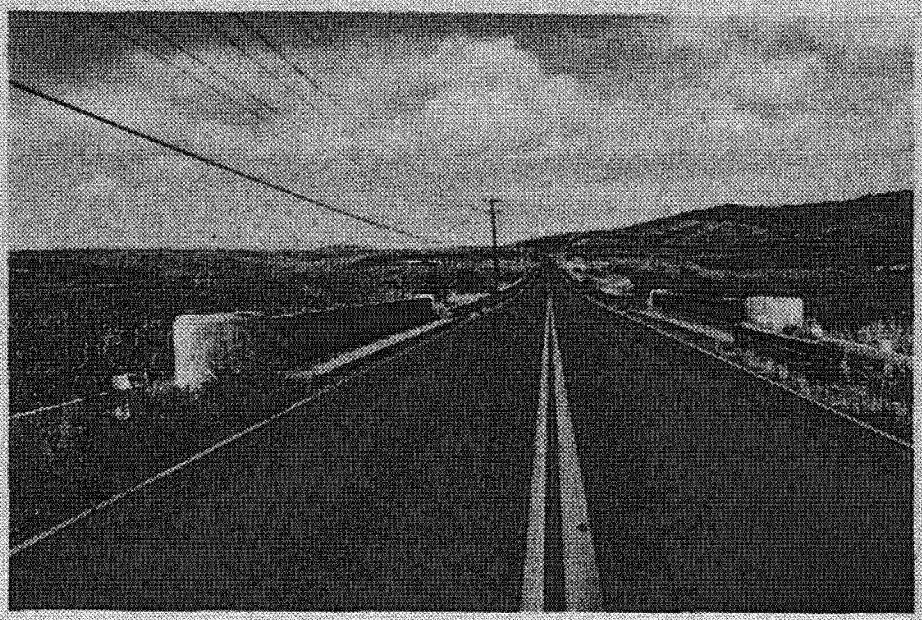
The bridge is a one span reinforced concrete tee beam structure, 33' in total length, 46' wide. The design load capacity is H-20. The abutments are adorned with slanted approaches. There are sidewalks on each side. The design integrity is intact.

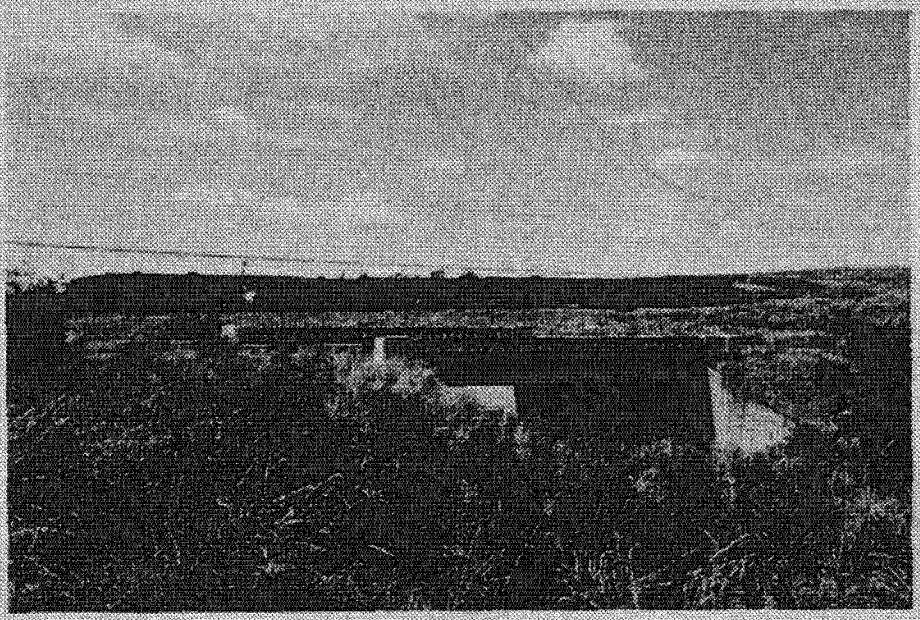
The bridge is an important transportation link between East Manoa and Manoa.

The only vantage points are from private property. The view is poor.

The aesthetics of the scene are poor.

AR00042342





Farrington Highway Bridge - Honouliuli Stream

AR00042343

The Farrington Highway bridge over Honouliuli stream was built in 1939 by the City and County of Honolulu. F. Ohrt was the City and County engineer. The builder is unknown.

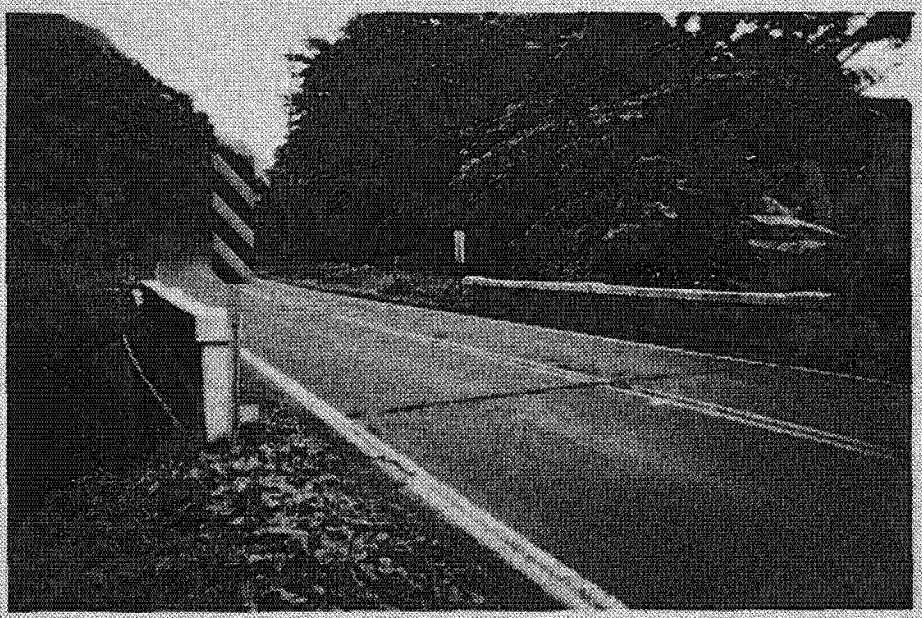
The bridge is a one span reinforced concrete tee beam structure, 54' in total length and 32' wide. The height is approximately 10'. It has a design load capacity of H-15. The abutments and parapets are constructed of reinforced concrete. The design integrity is intact.

At one time this structure was an important transportation link between Waianae and Ewa but it is now used primarily by cane-haul trucks.

The only vantage points are from private property and the view is poor.

The aesthetics of the scene are rated poor.

AR00042344



Hakipuu Bridge

AR00042345

The Hakipuu bridge on Kamehameha Highway .097 of a mile south of the intersection with Johnson Road was built in 1922. It was a City and County project. F. Ohrt was the City and County Engineer and the design engineer was R. W. Hendry. The builder is unknown.

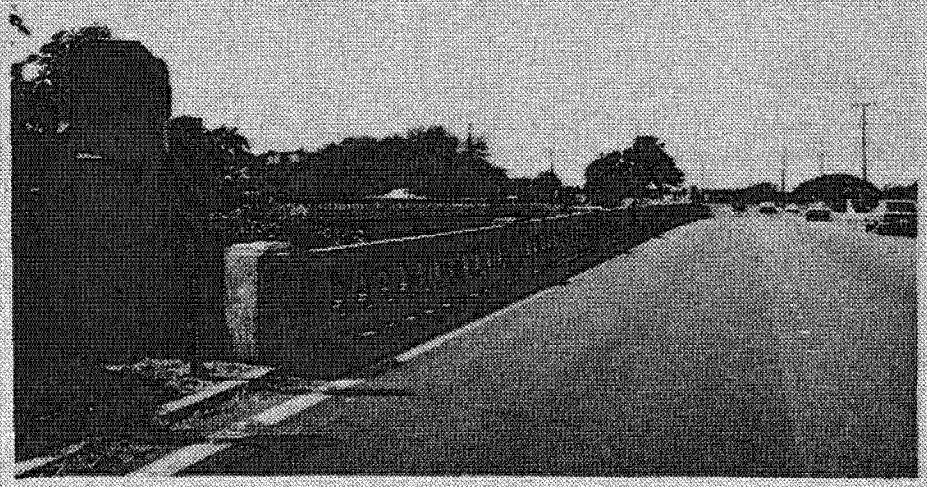
The structure is a one span reinforced concrete deck girder bridge, 32' in total length and 26.3' wide. It has a design load capacity of H-15. The abutments and parapets are constructed of reinforced concrete. The design integrity is intact.

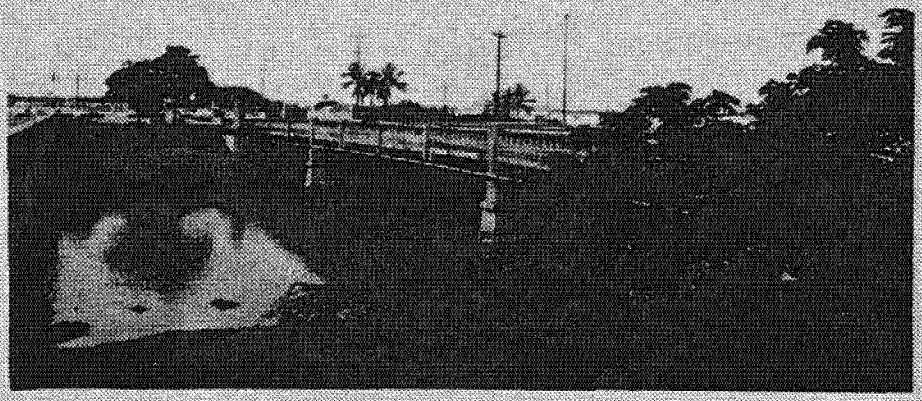
The bridge is an important transportation link for the Windward island communities.

There are no public access vantage points but the view is good.

The aesthetics of the scene are rated poor.

AR00042346





Halawa (East) Bridge

AR00042347

The Halawa (East) bridge located on Kamehameha Highway .057 of a mile south of the intersection with Kalaloa Street was built in 1937 then reconstructed in 1970. W. D. Bartel was the Chief Engineer for the Territorial Department of Transportation. The builder is unknown.

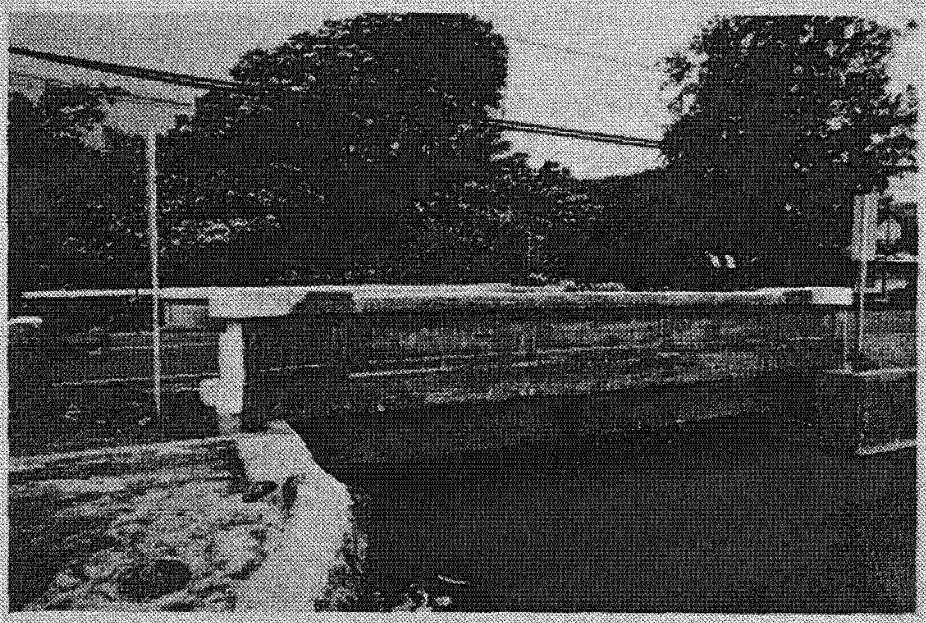
The bridge is a three span reinforced concrete deck girder and prestressed reinforced concrete girder structure, 200' in total length, 44' wide, and 14' in height. There is a 4' sidewalk on the right side. The abutments and parapets on the left are constructed of reinforced concrete. The abutments on the right are constructed of reinforced concrete and aluminum rails. The design integrity is not intact.

The bridge is an important transportation link between Leeward communities, i.e., Aiea and Pearl Harbor.

There are vantage points for public access but the view is poor.

The aesthetics of the scene are rated average.

AR00042348



Hauula Bridge

AR00042349

The Hauula bridge located on Kamehameha Highway southeast of the intersection with Kukuna Road was built in 1932. The contractor was L. L. McCandless, a prominent Honolulu businessman and prolific builder.[13] A contract was awarded to L. L. McCandless for the total sum of $190,117.51 to build five miles of road and 7 concrete bridges.*

The structure is a one span reinforced concrete deck girder bridge, 26' in total length and 27.4' wide. It has a design load capacity of H-15. The abutments and parapets are constructed of reinforced concrete. The design integrity is intact.

The bridge is an important transportation link between Windward communities.

There are vantage points for public access and the view is good.

The aesthetics of the scene are excellent.

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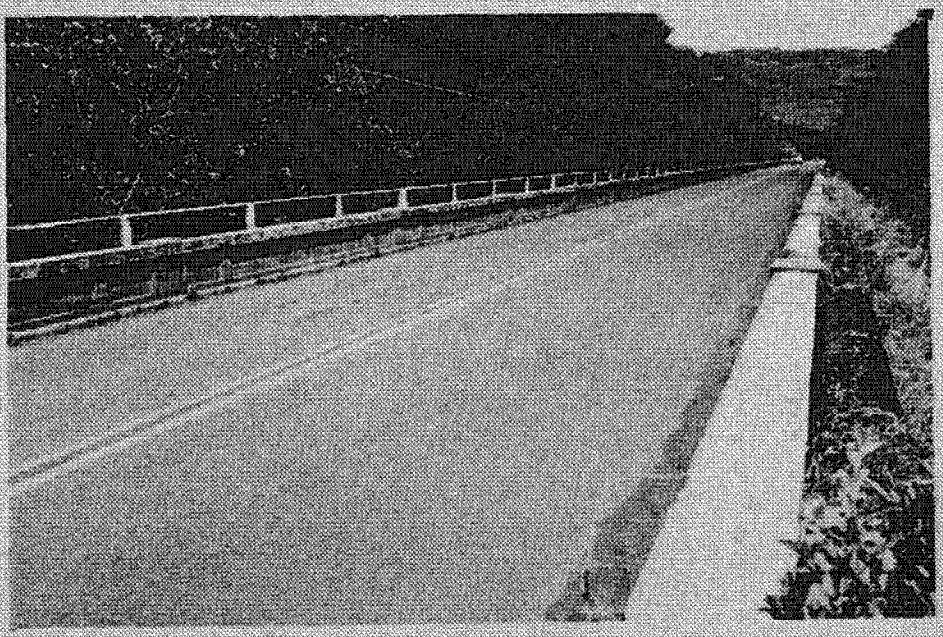
*Laiewai, Laiemaloo, Kaipapau, Waipilopilo, Muliwai, Hauula and Waipuhi bridges are included in this five mile belt-road.[5]

AR00042350



Heeia Viaduct

AR00042351

The Heeia Viaduct located on Kamehameha Highway over Heeia stream .173 of a mile north of the intersection with Ihiiki Street was built in 1922. It was a City and County project under F. Ohrt. L. H. Bigelow was the Superintendent of Public Works. The design engineer was J. T. Taylor and the contractor, E. J. Lord, one of Honolulu's prolific builders.[13]

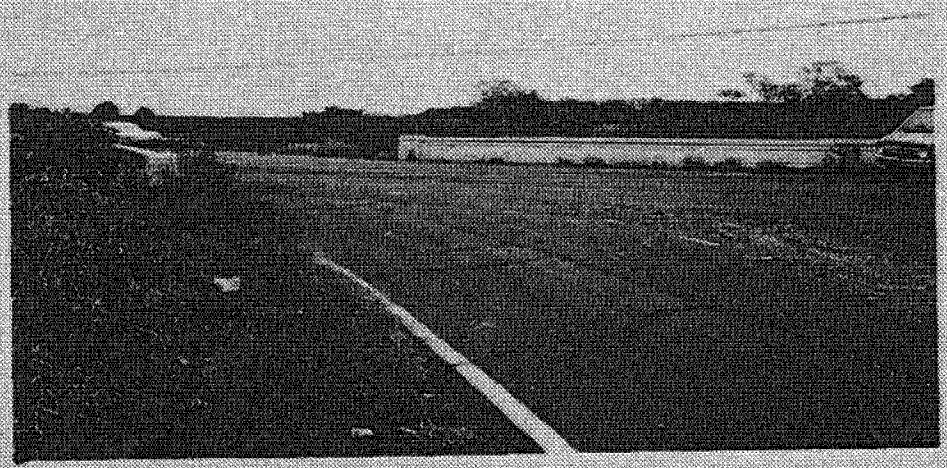
The bridge is a reinforced concrete deck girder structure with fifty-two spans. It has a total length of 896', with a total width of 24.6', and is 10' in height. The design load capacity is H-10. There is a 4' wooden sidewalk on the right. The design integrity is intact. This is the longest bridge of this type on Oahu.[5,6]

This structure is an important transportation link for Windward communities. It is associated with a famous Honolulu builder and aided in the commercial growth of the area.

There are no safe vantage points for public access. The view of the bridge is obscured by dense foilage giving it a poor visual rating.

The aesthetics of the scene are excellent.

AR00042352



Honouliuli Bridge - Fort Weaver Road

AR00042353

The Honouliuli bridge located on Fort Weaver Road .832 of a mile northwest of the intersection with the old Tongg Ranch Company Road, was built in 1927. It was a City and County project under F. Ohrt. The contractor was L. L. McCandless, a prominent Honolulu businessman and prolific builder.[13] He was awarded a contract of $23,150.75 to construct the bridge.[5,6]

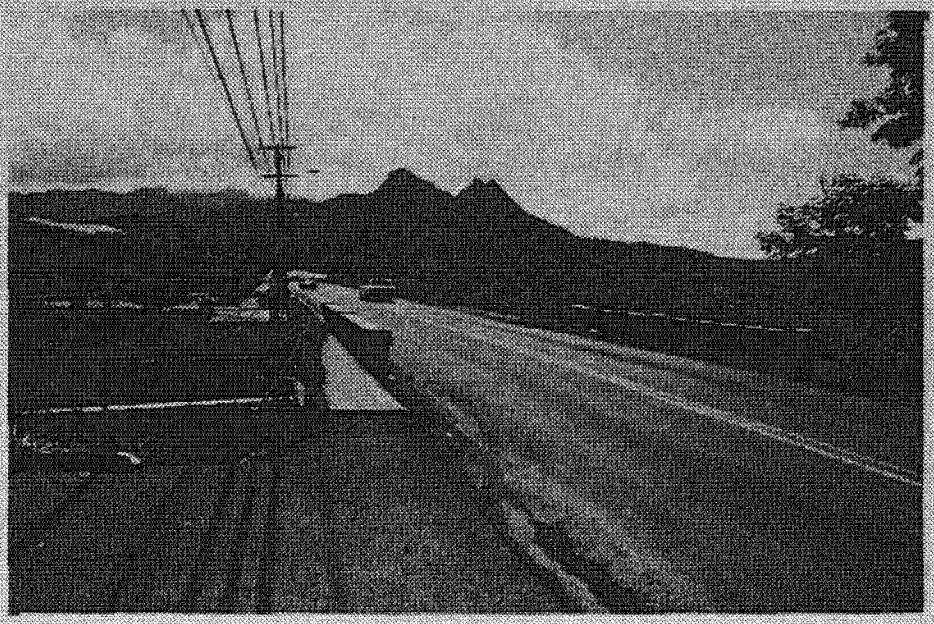
The bridge is a one span reinforced concrete deck girder structure, 42' in total length and 32.9' wide. The design load capacity is H-10. The bridge is built around a wide curve. The abutments and parapets are constructed of reinforced concrete. The design integrity is intact.

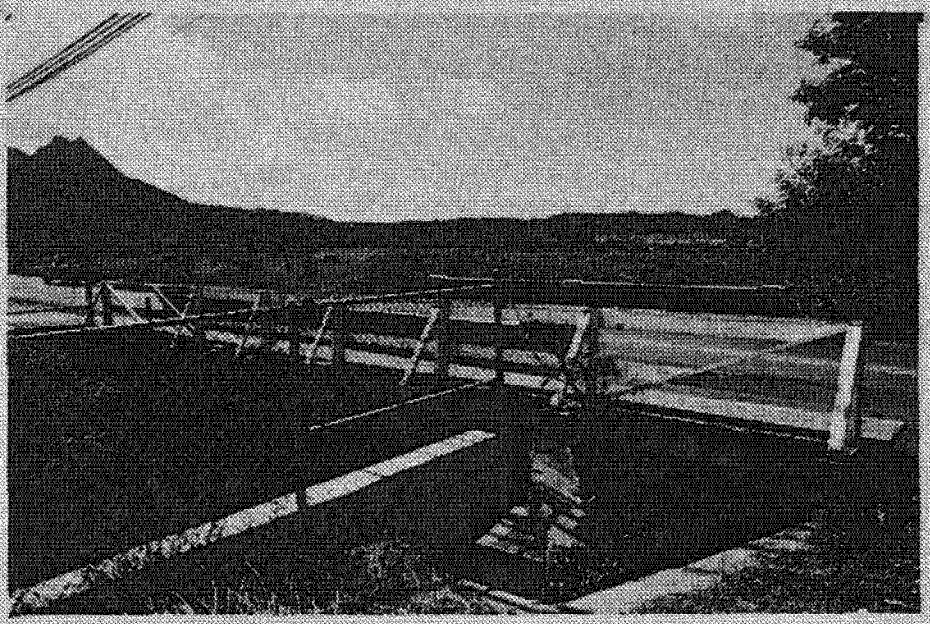
The bridge is an important transportation link between Ewa and other Leeward communities. It stimulated the economic growth of the area and was once located near the site of the railroad depot for Oahu Sugar Co., linking Ewa with Waianae and Waipahu.[14]

There are no public access vantage points and the view is poor.

The aesthetics are poor.

AR00042354





Kahawai Bridge (East)

AR00042355

The Kahawai bridge (East) located on Kalanianaole Highway .055 of a mile northwest of the intersection with Flamingo Street was built in 1924. It is also known as the Waimanalo bridge. John H. Wilson was the design engineer. Fred Ohrt was the 1st Assistant engineer for the City and County of Honolulu. The builder is unknown.

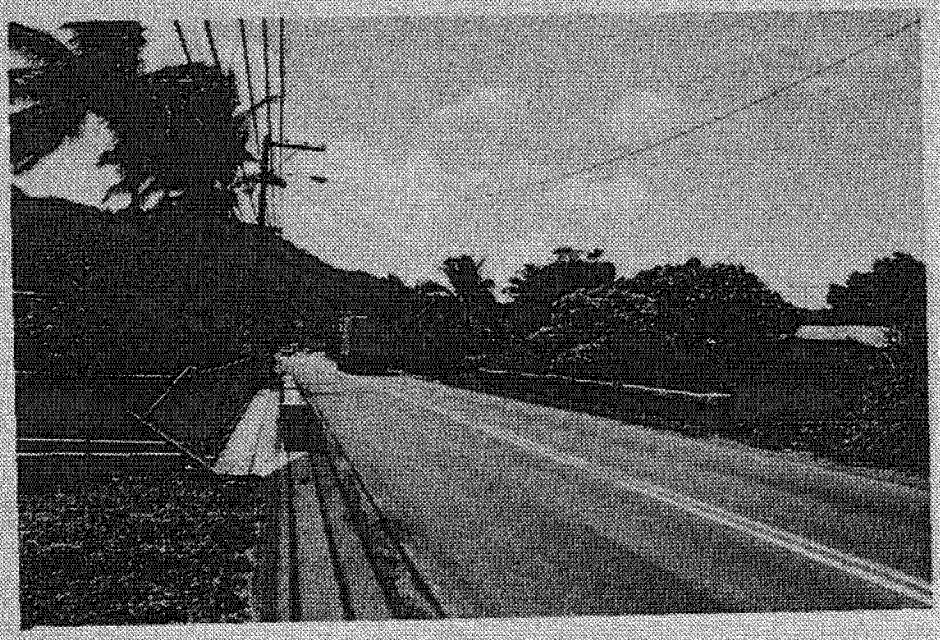
The bridge is a two span reinforced concrete deck girder structure, 53' in total length and 23.5' wide. It has a design load capacity of H-10. The abutments and parapets are constructed of reinforced concrete. The design integrity is not intact.

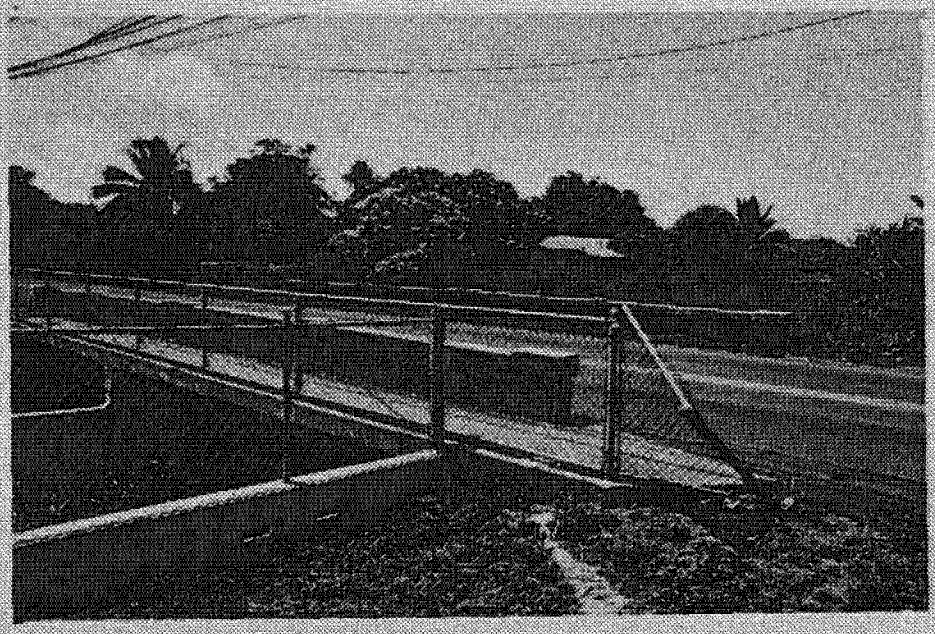
The structure is an important transportation link for Waimanalo and other Windward communities.

There are no public access vantage points except from private property and the view is poor.

The aesthetics are poor.

AR00042356





Kahawai Bridge (West)

AR00042357

The Kahawai bridge (West) located on Kalanianaole Highway .062 of a mile northeast of the intersection with Humuniki Street was built in 1924. John H. Wilson was the design engineer. Fred Ohrt was the 1st Assistant Engineer for the City and County of Honolulu. The builder is unknown.

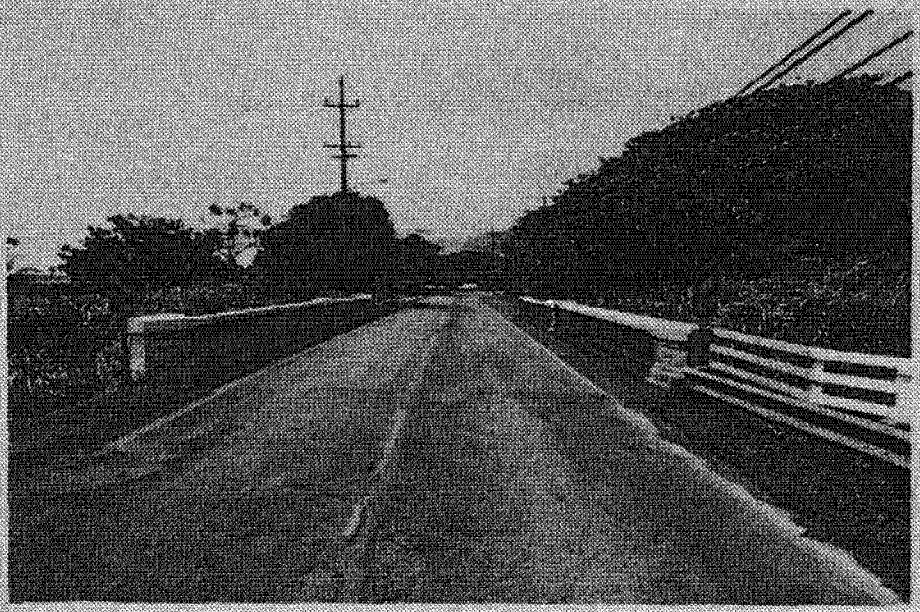
The bridge is a one span reinforced concrete deck girder structure, 33' in total length and 23.4' wide. It has a design load capacity of H-10. The abutments and parapets are constructed of reinforced concrete. The design integrity is not intact.

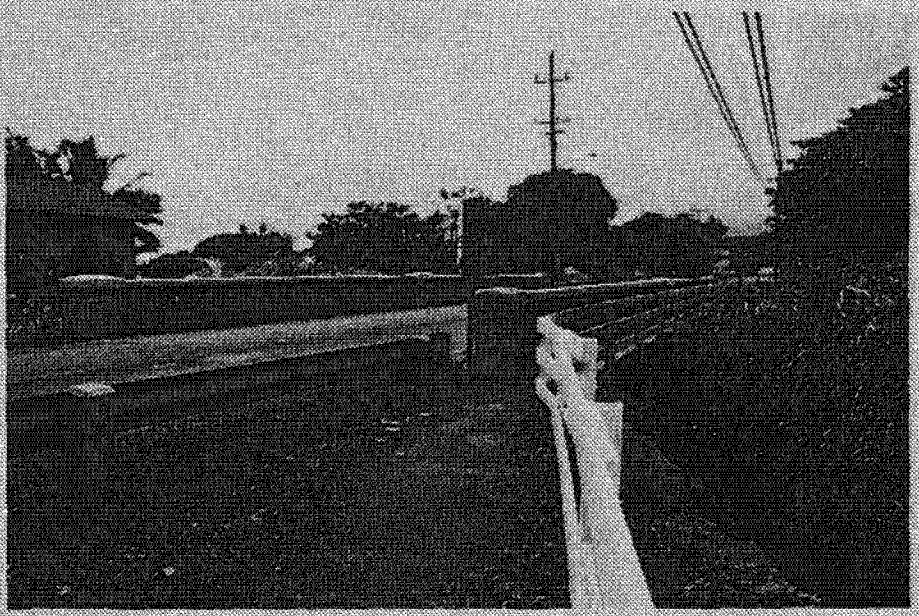
The structure is an important transportation link for Waimanalo and other Windward communities.

There are public access vantage points but the view is poor.

The aesthetics are poor.

AR00042358





Kaipapau Bridge

AR00042359

The Kaipapau bridge located on Kamehameha Highway .014 of a mile southeast of the intersection with Pipilani Place was built in 1932.[5,6] The contractor was L. L. McCandless, a prominent Honolulu businessman and prolific builder.[13] He was awarded a contract of $190,117.51 for the construction of five miles of road and seven bridges, from Hauula to Kahuku.*

The bridge is a two span reinforced concrete deck girder structure, 82' in total length, 28.4' wide, and 12' in height. It has a design load capacity of H-15. The abutments and parapets are constructed of reinforced concrete. There is a wooden railing and walkway on the right. The design integrity is not intact.

The bridge is an important transportation link for Windward communities and it is associated with one of Honolulu's prominent builders.

There is no good vantage point and the view is poor.

The aesthetics are poor.

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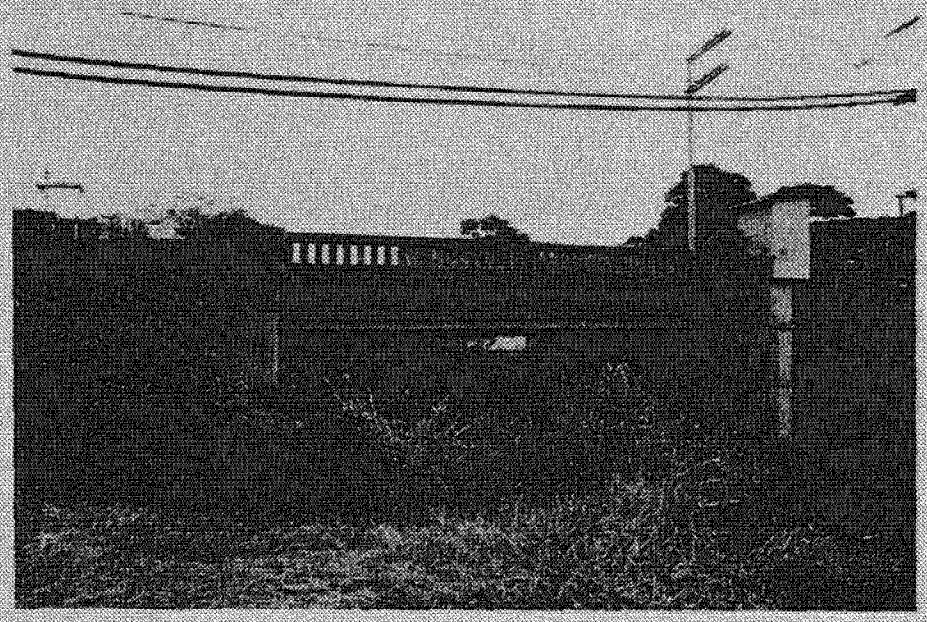
*Laiewai, Laiemaloo, Kaipapau, Waipilopilo, Muliwai, Hauula and Waipuhi bridges are included on this belt-road.

AR00042360



Kalauao Bridge

AR00042361

The Kalauao bridge across Kalauao stream on Moanalua Road 150' west of the intersection of Hale Momi Place, was built in 1935. The original designer was George Dawson and B. F. Rush was the City and County engineer. R. S. Mowry was the Bureau Engineer of Roads. The builder is unknown.

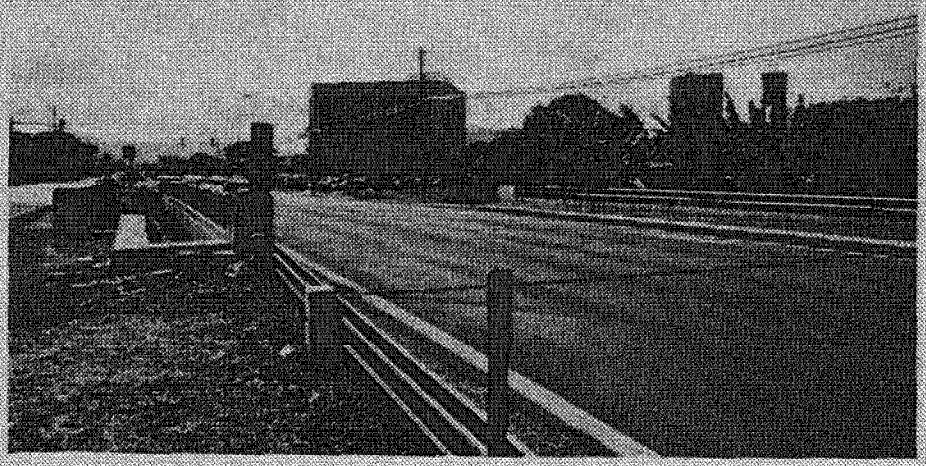
The bridge is a one span reinforced concrete deck girder structure 41' in total length, 24' wide, and 17' in height. It has a design load capacity of H-20. The abutments and parapets are made of reinforced concrete and stone masonry. There is a 3.8' sidewalk on each side. The design integrity is intact.

The bridge is an important transportation link between Aiea and Pearl City.

There are public access vantage points and the view is good.

The aesthetics are judged average.

AR00042362



Kalauao Springs Bridge (East)

AR00042363

The Kalauao Springs bridge (East) located on Kamehameha Highway .056 of a mile west of the intersection with Aiea Kai Place was originally built in 1936 then reconstructed in 1966. The builder is unknown.

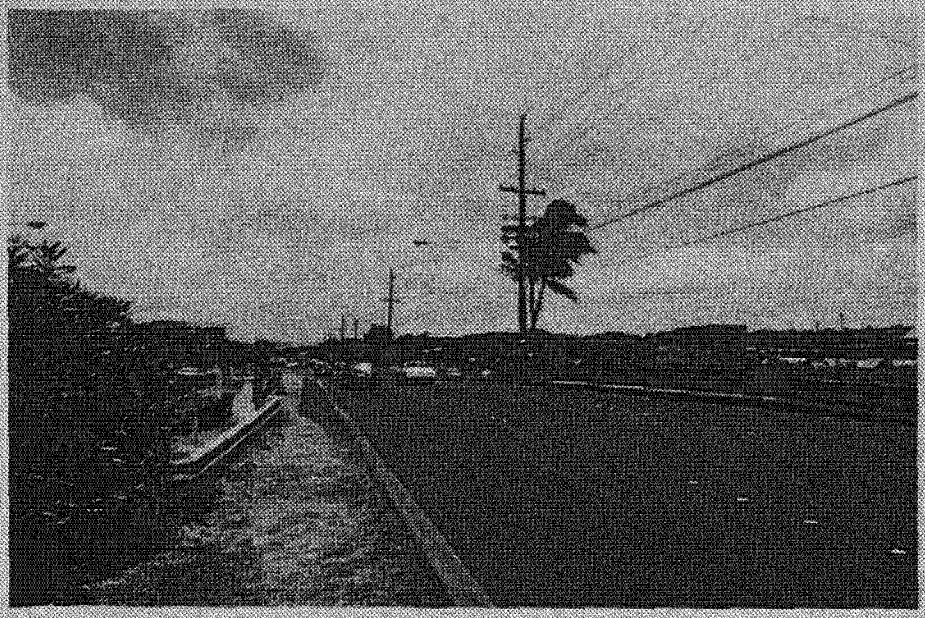
The bridge is a one span reinforced concrete deck girder with a pre-stressed girder structure, 60' in total length and 48.3' wide. The design load is H-20. The abutments and parapets are constructed of reinforced concrete, pipe and aluminum rail. There are 4' sidewalks on both sides. The original design integrity is not intact.

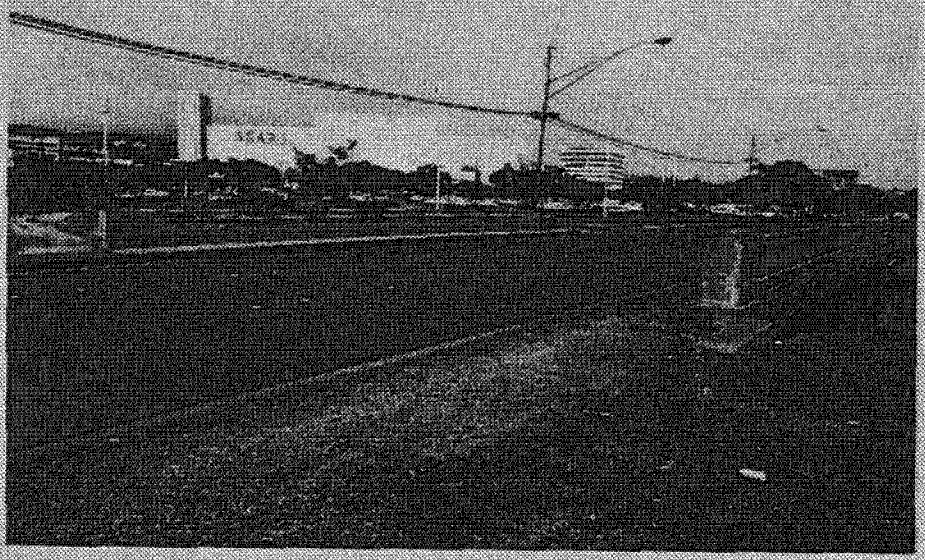
The bridge is an important transportation link between Leeward communities and its construction aided in the economic growth of the area.

There are no vantage points for public access and the view is poor.

The aesthetics are rated poor.

AR00042364





Kalauao Springs Bridge (Eastbound)

AR00042365

The Kalauao Springs bridge (Eastbound) located on Kamehameha Highway .107 of a mile east of the intersection with Lipoa Place was originally built in 1936 then reconstructed in 1966. The builder is unknown.

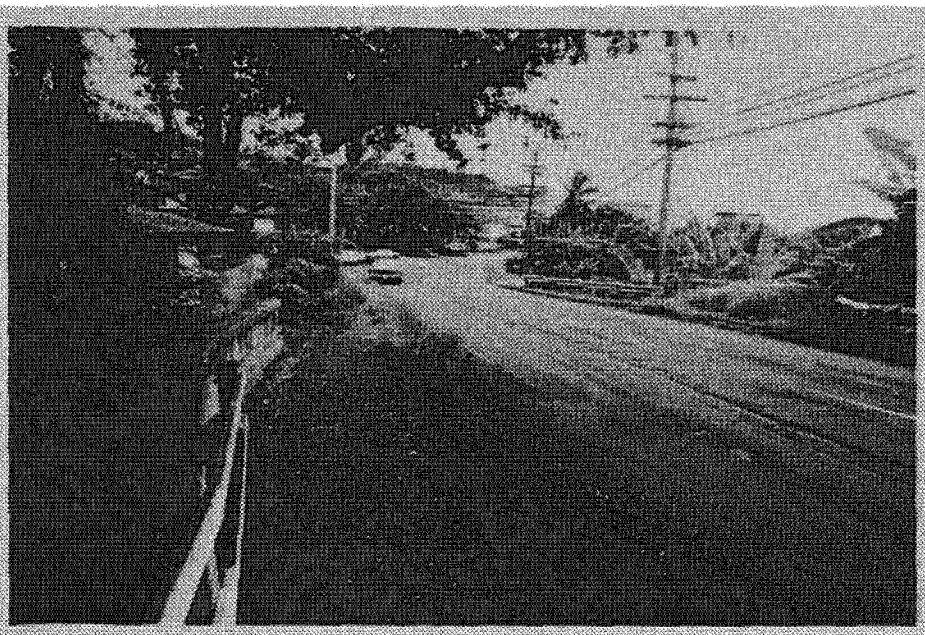
The bridge is a one span reinforced concrete deck girder with a pre-stressed girder structure, 45' in total length, 48.1' wide. The design load is H-20. The abutments and parapets are constructed of reinforced concrete, pipe and aluminum rail. There are 4' sidewalks on each side. The design integrity is not intact.

The bridge is an important transportation link between Leeward communities. It aided in the commercial growth and expansion of the area.

There are no public access vantage points and the view is poor.

The aesthetics are rated poor.

AR00042366



Kalihi Bridge

AR00042367

The Kalihi bridge #1 located on Kalihi Street at the intersection of Monte Street was built in 1938. It is also known as the Kamanaike [Kamanaiki] bridge as it is across the Kamanaiki stream. The design engineer was L. Perry-Fiske. The City and County Engineer was B. F. Rush. The builder is unknown.

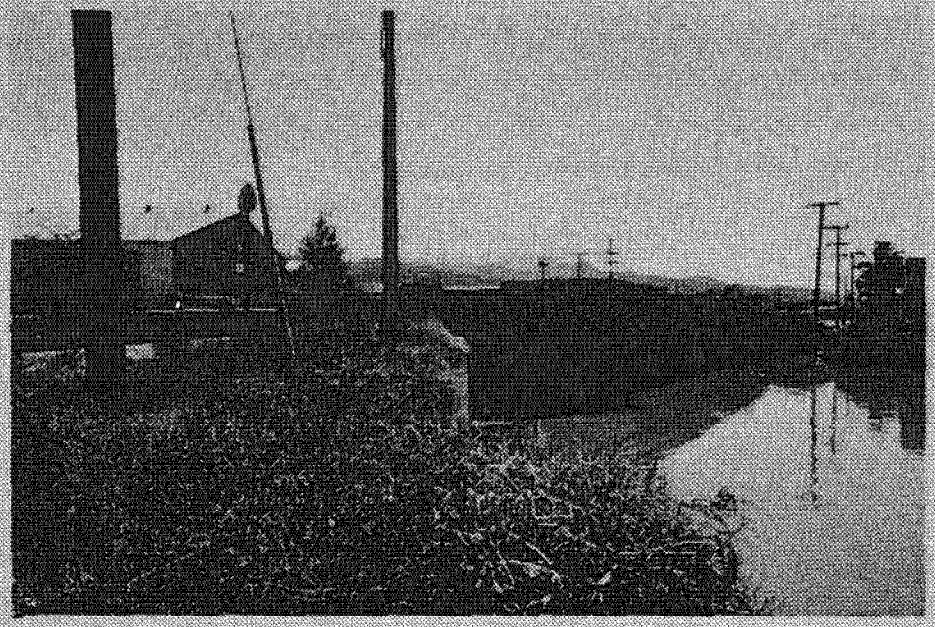
The bridge is a one span reinforced concrete deck girder structure, 29' in total length, 49.2' wide, and 18.6' in height. It has a design load capacity of H-10. The abutments and parapets are constructed of reinforced concrete. There are 7' sidewalks on both sides. The design integrity is still intact.

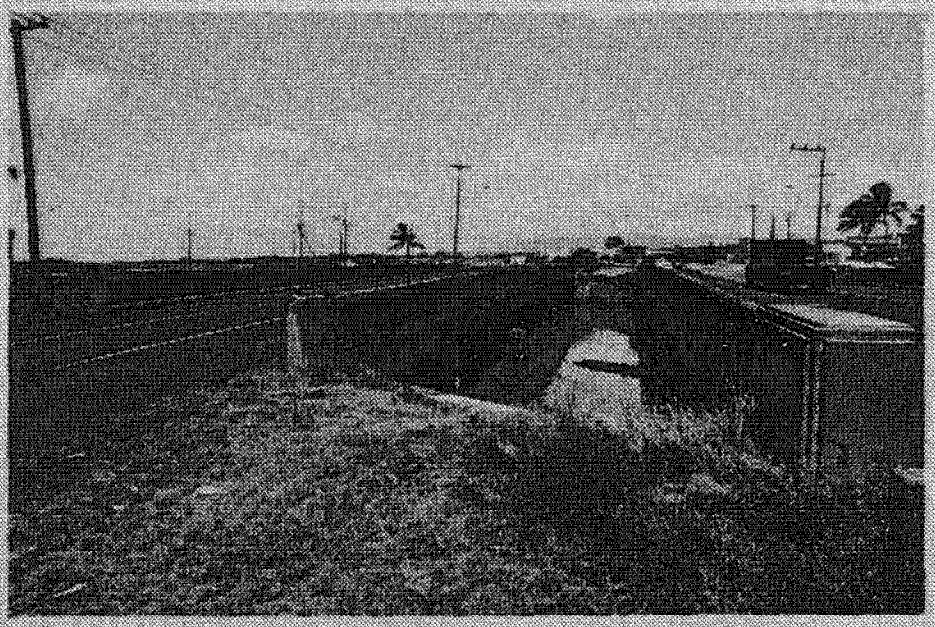
The bridge is an important transportation link between upper and lower Kalihi.

There are no vantage points except from private property and the view is poor.

The aesthetics are rated poor.

AR00042368





Kamehameha Highway Bridge No. 1

AR00042369

The Kamehameha Highway bridge #1 located 500' east of the intersection with Middle Street was originally built in 1926 then reconstructed in 1938. Louis B. Cain was the City and County Engineer. The builder is unknown.

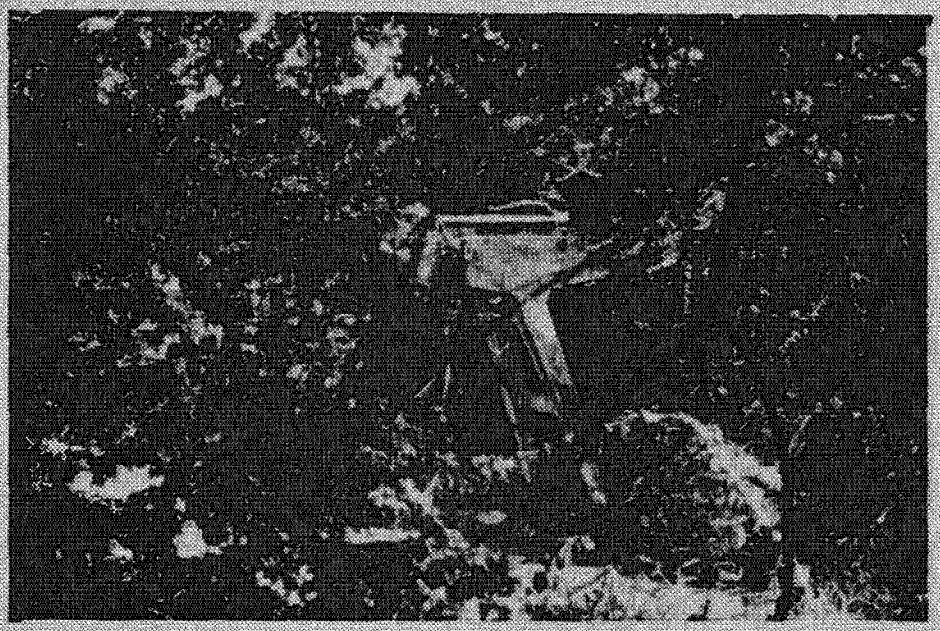
The bridge is a six span reinforced concrete deck girder structure, 162' in total length, 43' wide. It has an estimated design load capacity of H-20. The abutments and parapets are constructed of reinforced concrete. There is a narrow sidewalk on both sides. The design integrity is intact.

The structure is an important transportation link between Kalihi and Pearl Harbor.

There are no public access vantage points and the view is poor.

The aesthetics are rated poor.

AR00042370



Kamehameha Highway Flume Overpass

AR00042371

The Kamehameha Highway flume overpass located .078 of a mile north of the intersection with Mililani Memorial Park Road was built in 1933 and is privately owned by the Waialua Sugar and Pineapple Agricultural Company. The builder is unknown.

The bridge is a reinforced concrete continuous beam slant-leg structure that is 69' in total length and 4.8' wide. It is approximately 16' in height. The design integrity is intact. The geometric configuration with the slant leg beams of this structure is unique on the island of Oahu.

The pineapple fields the flume services aided the commercial growth and expansion of the area.

There are public access vantage points and the view is good.

The aesthetics are rated average.

AR00042372

Kamocalii Bridge (Outbound)

AR00042373

The Kamooalii bridge (Outbound) located on Kamehameha Highway .130 of a mile south of the intersection with Kahiko Street was built in 1933. The design engineer was F. E. Harvey. The City and County engineer was A. S. Canton. The builder is unknown.

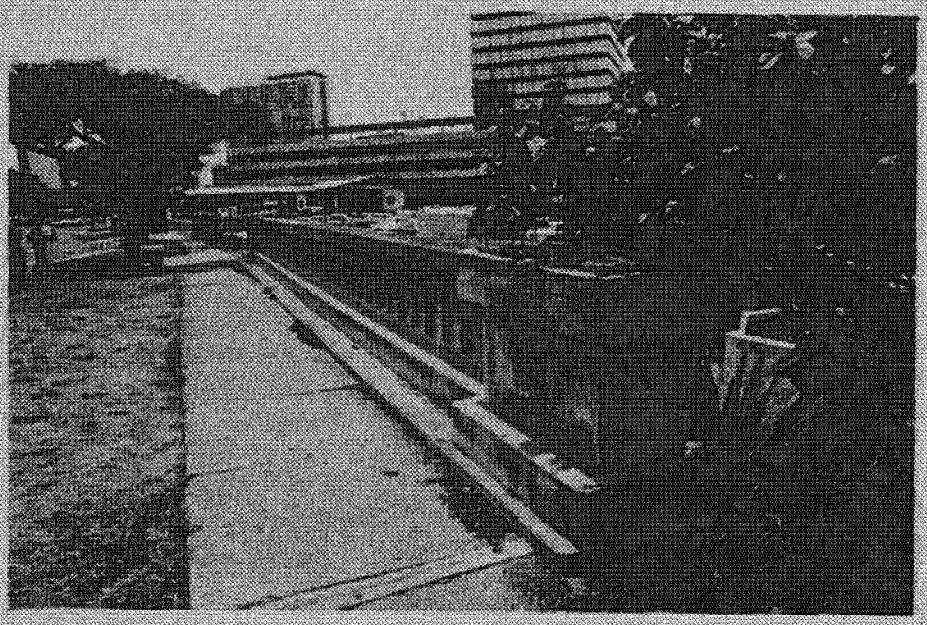
The bridge is a one span reinforced concrete deck girder structure, 42' in total length, 28.1' wide, and 13' in height. It has a design load capacity of H-15. The abutments and parapets are of reinforced concrete. The design integrity is not intact.

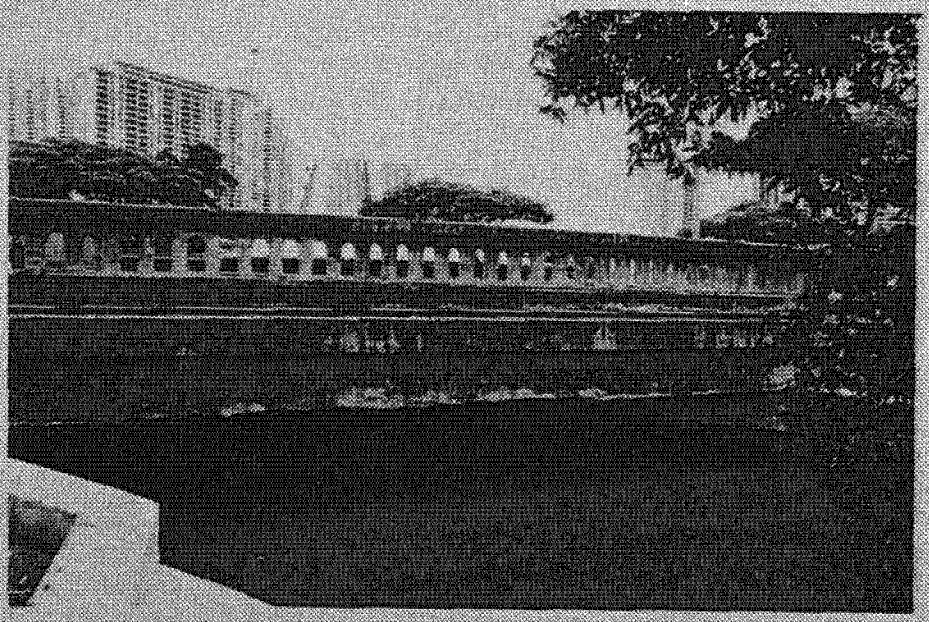
The structure is an important transportation link between Windward communities.

There is a public access vantage point and the view is good.

The aesthetics are rated excellent.

AR00042374





Kapiolani Boulevard Bridge No. 1

AR00042375

The Kapiolani Boulevard Bridge #1 located 320' east of the intersection with Kalakaua Avenue was built in 1931. The design engineer was G. K. Dawson. The City and County Engineer was D. Balch. The builder is unknown.

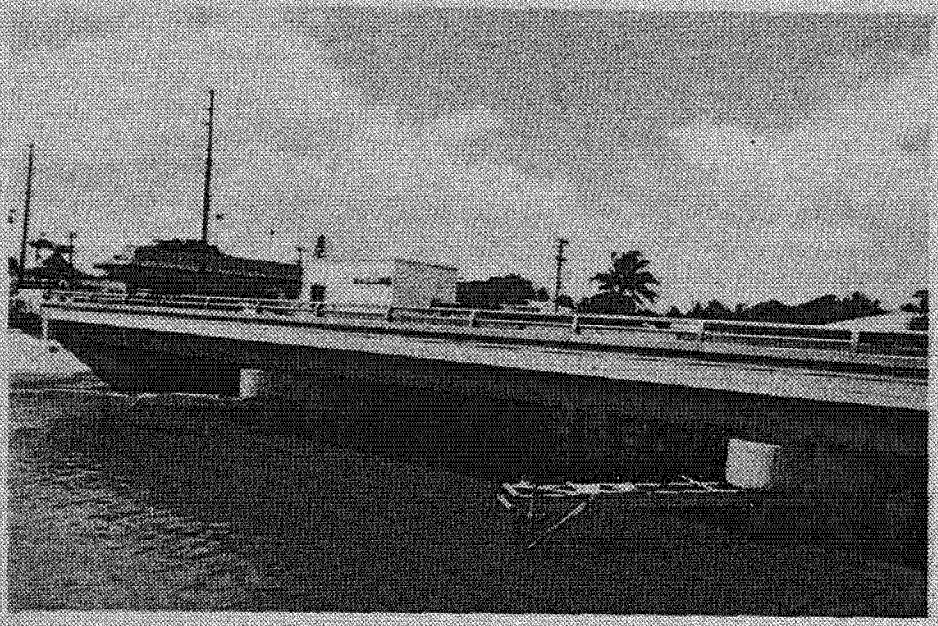
The bridge is a one span reinforced concrete tee beam deck girder structure, 40' in total length, 100' wide. It has a design load capacity of H-20. The abutments and parapets are constructed of reinforced concrete. There are 2' sidewalks on each side. The design integrity is intact.

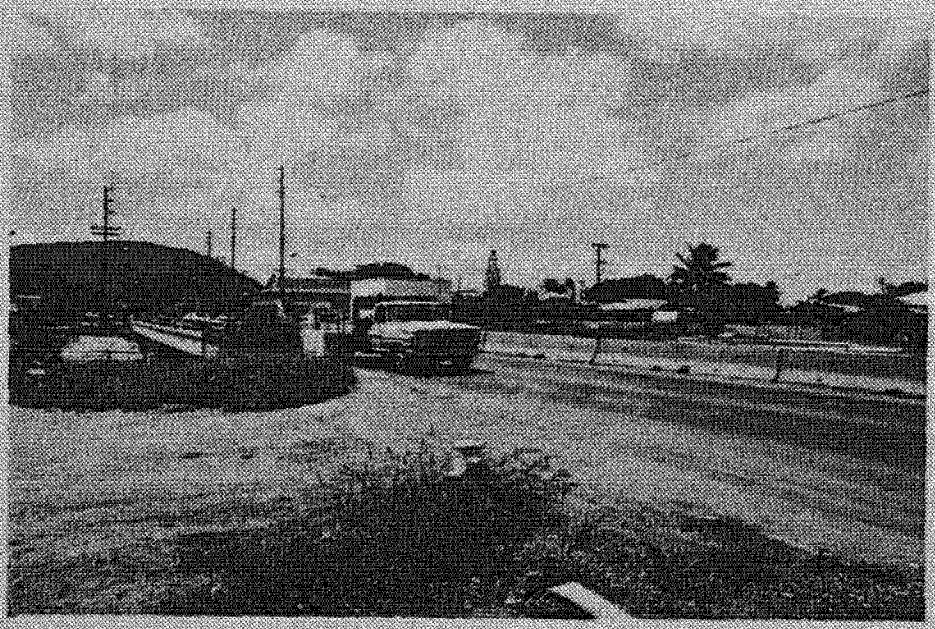
The structure aided in the commercial growth of the area.

There is a good vantage point and the view is good.

The aesthetics are judged poor.

AR00042376





Kapuni Bridge

AR00042377

The Kapuni bridge located on Farrington Highway .039 of a mile west of the intersection with Kapuni Street was built in 1937. The design engineer was W. D. Bartel. The builder is unknown.

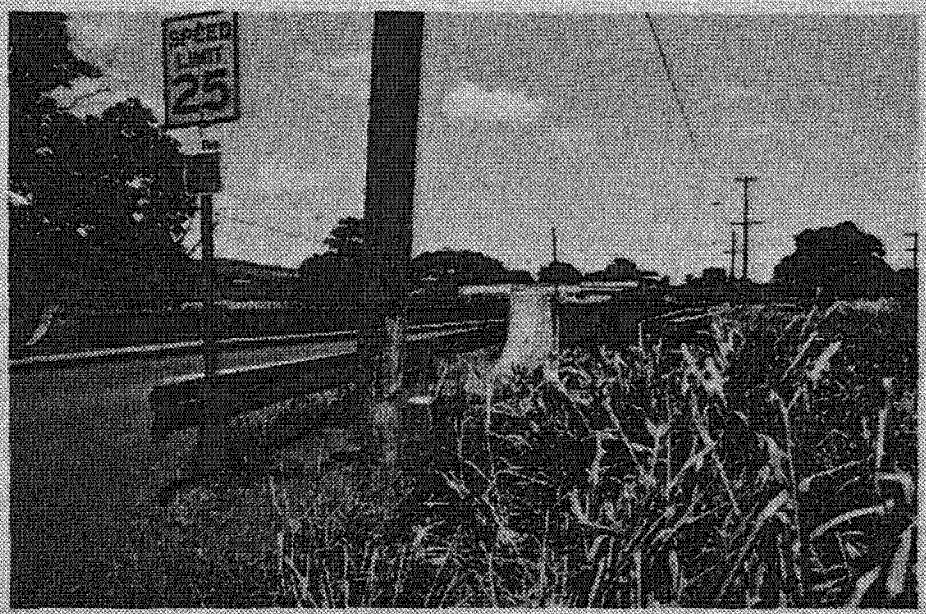
The bridge is a three span pre-stressed tee girder structure 148' in length, 38.2' wide, and only 8' in height. It has a design load capacity of H-15. The abutments and parapets are made of reinforced concrete and pipes. There is a 4' sidewalk on both sides. The original design integrity is not intact.

The structure is an important transportation link between Windward communities and aided in the commercial growth of the area.

There are public access vantage points and the view is good.

The aesthetics are rated poor.

AR00042378



Kaukonahua Bridge

AR00042379

The Kaukonahua bridge located on Farrington Highway .020 of a mile south of the intersection with Naluahi Street was built in 1940. The builder is unknown.

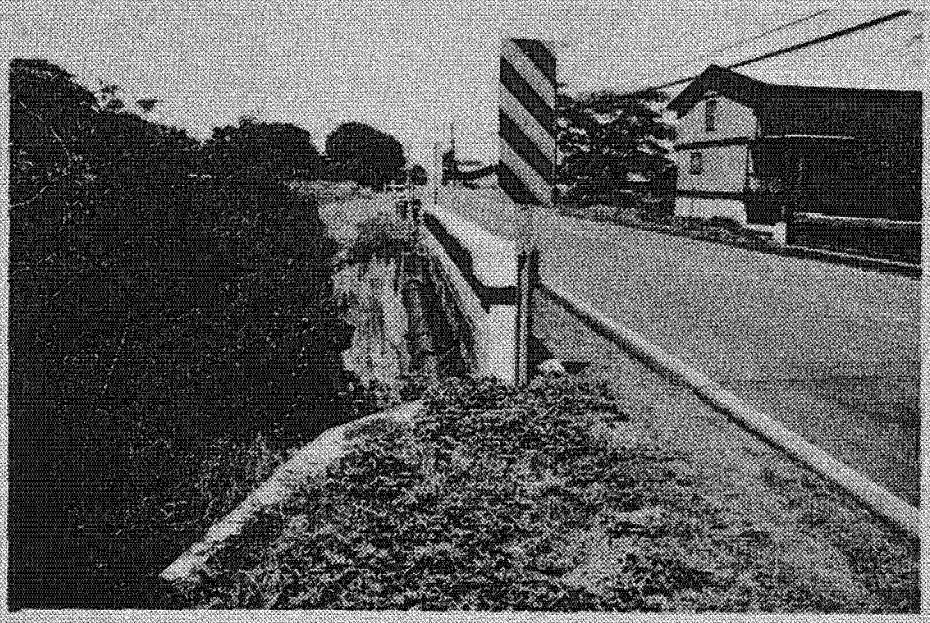
The bridge is a two span reinforced concrete deck girder structure 148' in total length, 37.3' wide, and 16' in height. It has a design load capacity of H-15. The abutments and parapets are made of reinforced concrete. There is a 5' sidewalk on each side. The design integrity is intact.

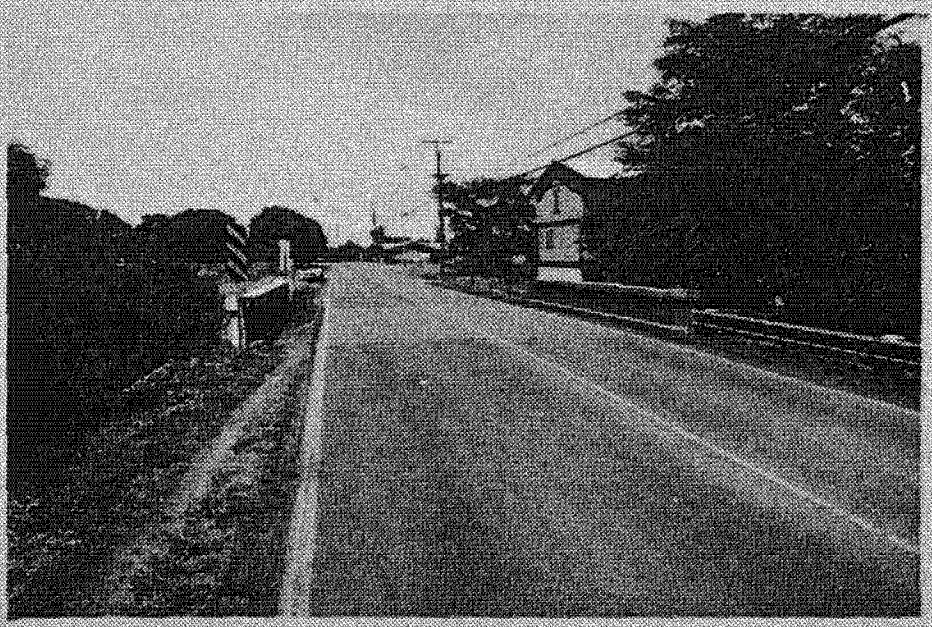
The bridge is an important transportation link for around-the-island traffic and Windward and North Shore communities.

There are no public access vantage points and the view is poor.

The aesthetics are rated poor.

AR00042380





Kaunala Bridge

AR00042381

The Kaunala bridge located on Kamehameha Highway .107 of a mile northeast of the intersection with Wehiwa Street was built in 1929. The design engineer was R. W. Hendry. The builder is unknown.

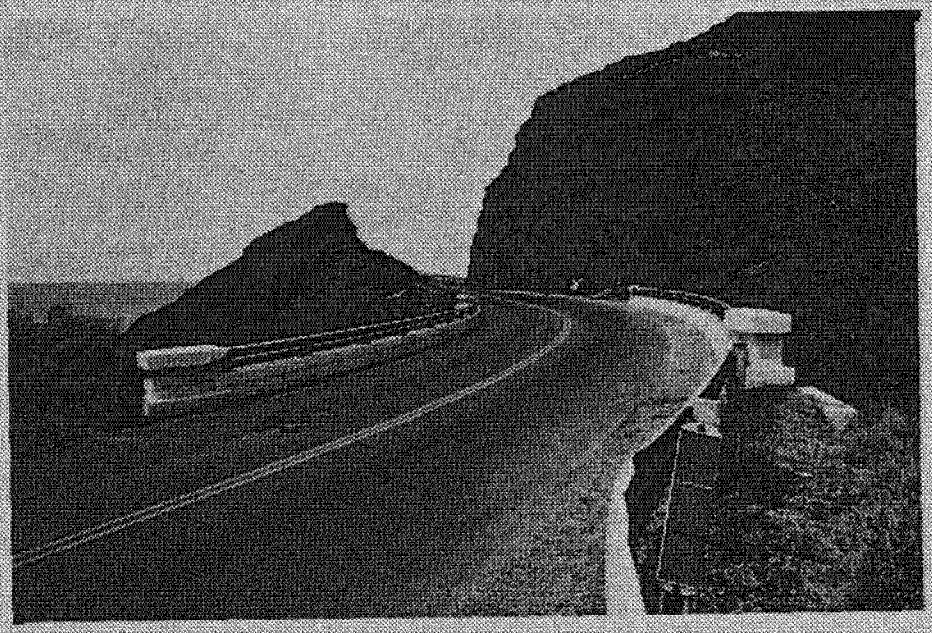
The bridge is a one span reinforced concrete deck girder structure 32' in total length, 27.4' wide, 14' in height. It has a design load capacity of H-15. The abutments and parapets are constructed of reinforced concrete. The design integrity is intact.

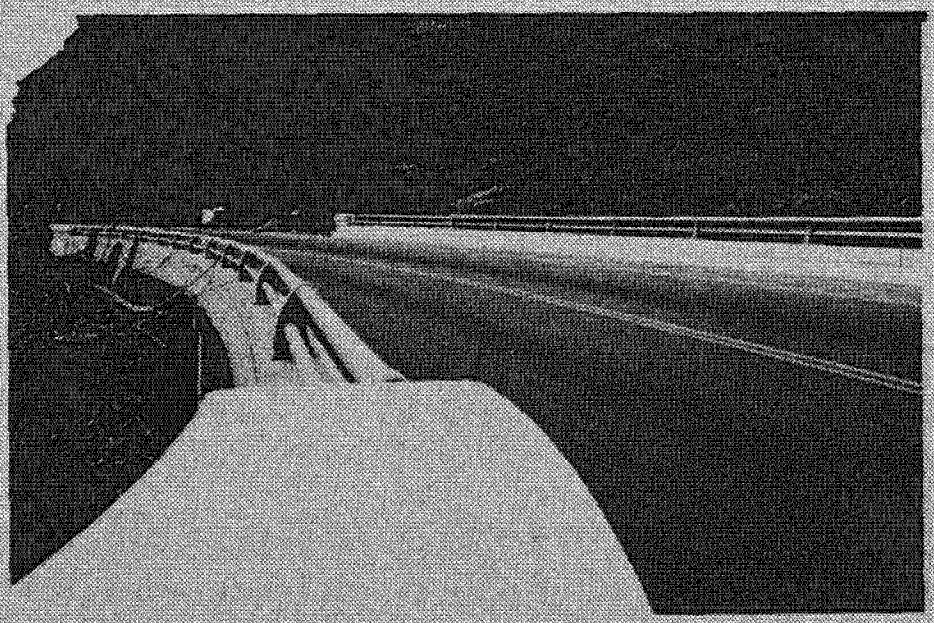
The bridge is an important transportation link between North Shore and Windward communities.

There are no vantage points and the view is poor.

The aesthetics are rated poor.

AR00042382





Kawaiakaiea Bridge

AR00042383

The Kawaiakaiea bridge located .500 of a mile southwest of Blowhole on Kalanianaole Highway across Kawaiaakaiea stream was built in 1931 by E. J. Lord, a prominent Honolulu businessman and prolific builder.[13] He was awarded the contract originally in 1928, for the construction of a road from Waiamanalo over the Pali by Makapuu 1.3 miles known as FAP-6A. Then a lawsuit was filed due to the course of the road being altered. The city auditor refused to release the necessary funding. By 1929 a new contract was awarded to E. J. Lord Ltd., for the sum of $107,220, legalized and confirmed by the Territorial Legislature (Act 108). E. J. Lord won the court suit against the city auditor.[5,6]

The bridge is a three span reinforced concrete deck girder structure on columns 100' in length, 27' in width, and 19' in height. It has a design load capacity of H-15. The railings are constructed of concrete and pipe. The geometric configuration is unique on Oahu as it is built on a skew curve. The design integrity is not intact.

The engineering design is difficult if not impossible to appreciate as the structure is built on a blind curve with no sidewalks or safe vantage points from which to view the bridge. It belongs to the type of bridges in Honolulu that are our most dramatic structures but so little can be seen of it that the aesthetics must be judged dull and uninspiring and the view poor.

AR00042384

The bridge is an important transportation link for Waimanalo and Waikiki. It contributed to the commercial growth of Waimanalo and is linked with a prominent Honolulu builder.

The aesthetics are rated poor.

AR00042385

Kawailoa Bridge

AR00042386

The Kawailoa bridge located on Kamehameha highway .613 of a mile northeast of the intersection with Ashley Road was built in 1929. The design engineer was R. W. Hendry. W. D. Bartel was the Territorial Engineer. The builder is unknown.

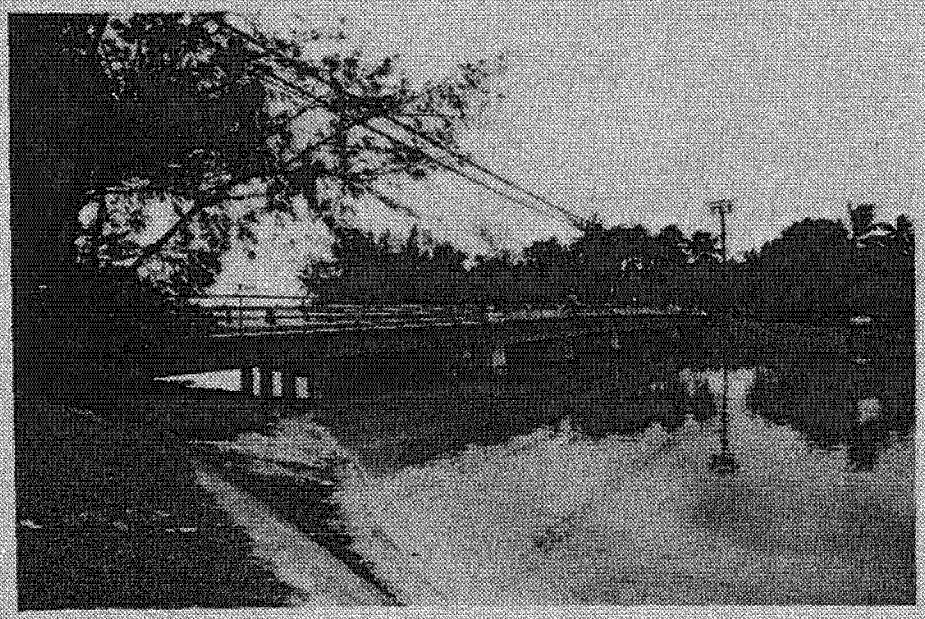
The bridge is a one span reinforced concrete deck girder structure 25' in total length 27.5' wide. It has a design load capacity of H-15. The abutments and parapets are made of reinforced concrete. The design integrity is intact.

The bridge is an important transportation link for around-the-island traffic linking the North Shore and Windward communities.

There are no vantage points of easy public access and the view is poor.

The aesthetics are judged poor.

AR00042387



Kawailoa Road Bridge

AR00042388

The Kawailoa Road bridge located across Kaelepulu stream was originally built in 1925 then reconstructed in 1960. The builder is unknown.

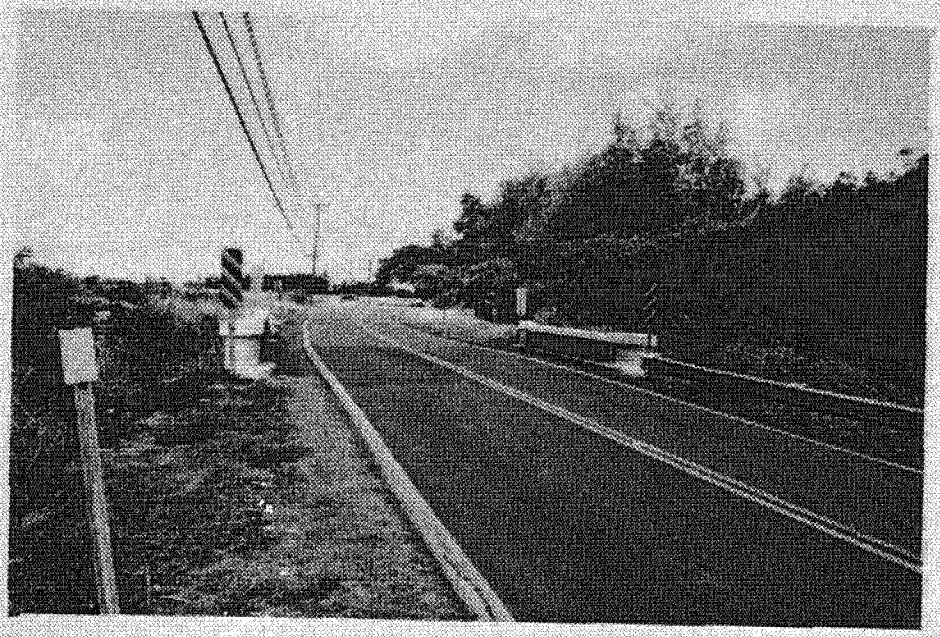
The bridge is a reinforced concrete tee beam girder 7 span structure, 212' in length, 26.3' wide. It has a design load capacity of H-15. The railings are constructed of reinforced concrete and pipes. There are sidewalks on both sides. The design integrity is intact.

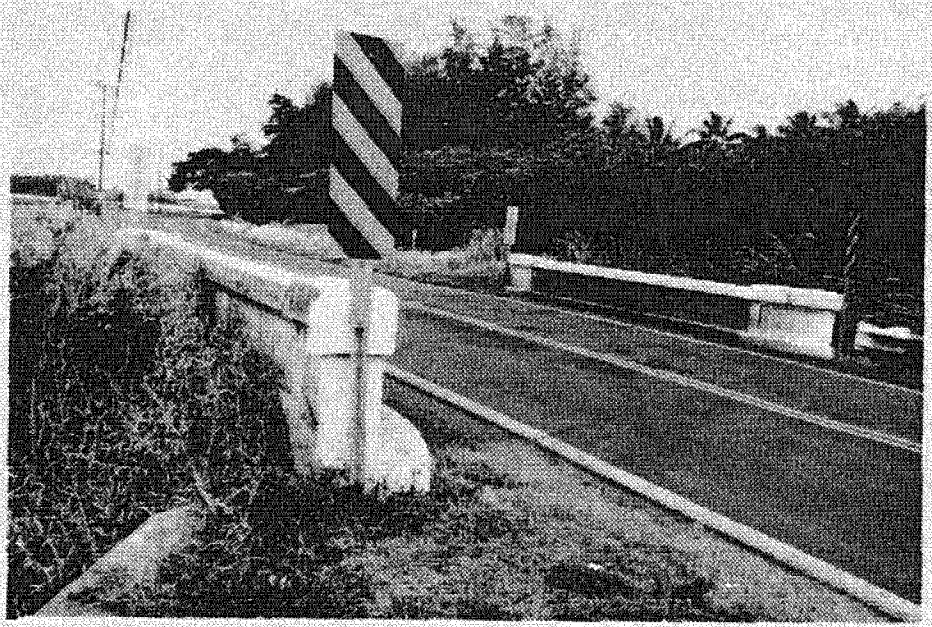
The structure is an important transportation link for around-the-island traffic and Windward and North Shore communities.

There are vantage points for public access and the view is good.

The aesthetics are judged average.

AR00042389





Kawela Bridge

AR00042390

The Kawela bridge located on Kamehameha Highway .134 of a mile west of the intersection with Hanopu Street was built in 1931. The contractor was E. K. Sugihara of Kalihi Construction Company, who built a total of four bridges and the Waialee belt-road for the sum of $189,940.80.* [5]

The bridge is a one span reinforced concrete deck girder structure, 24' in length and 27.4' wide. It has a design load capacity of H-15. The abutments and parapets are made of reinforced concrete. The design integrity is intact.

The structure is an important transportation link between North Shore and Windward communities.

There are no vantage points for public access and the view is poor.

The aesthetics are rated poor.

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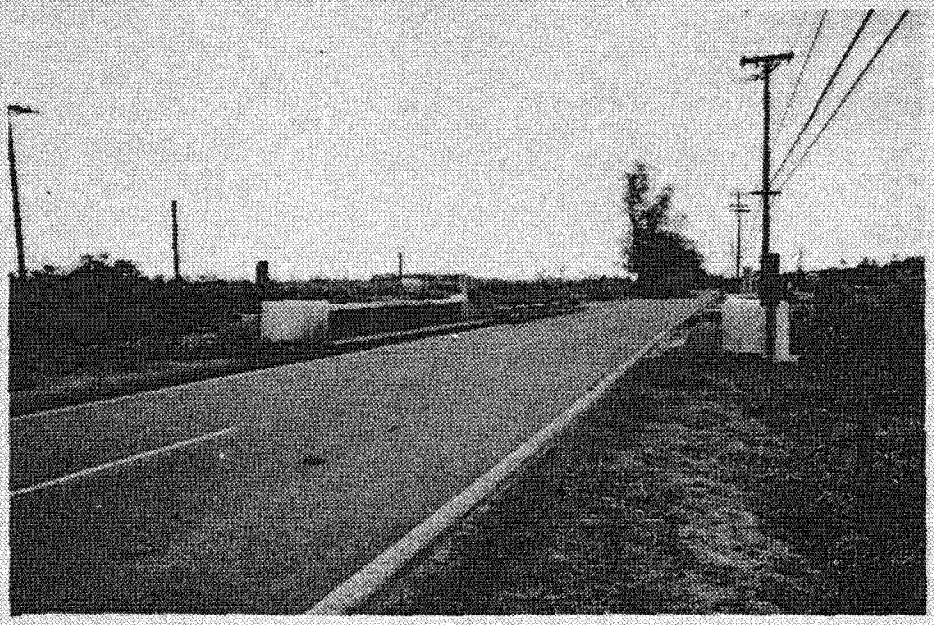
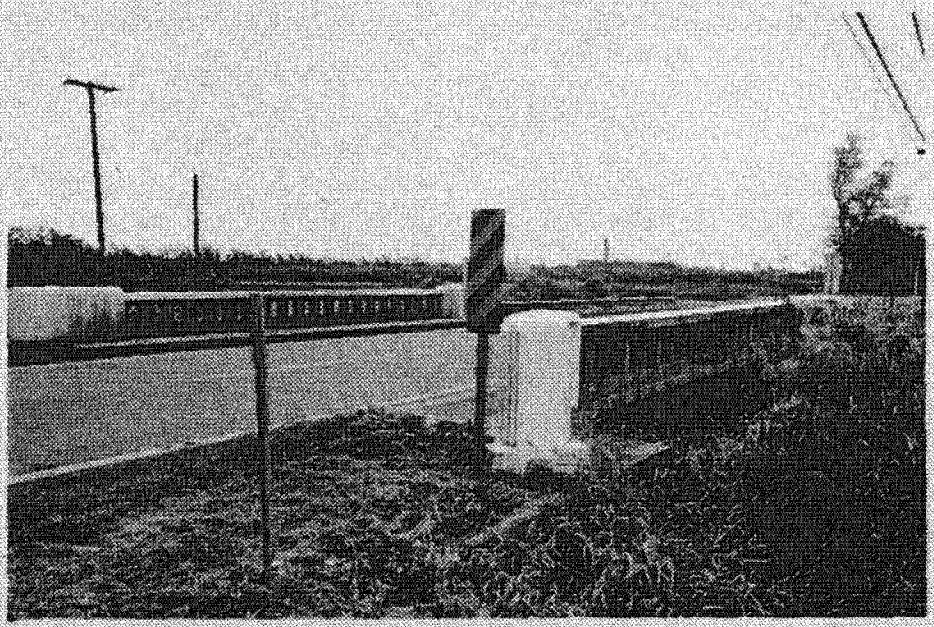
*Kuilima, Waialee, Kawela, Nanahu bridges are part of this Waialee belt-road.

AR00042391





Kii Bridge

AR00042392

The Kii bridge located on Kamehameha Highway .369 of a mile west of the intersection with Hospital Road was built in 1937. The builder is unknown.

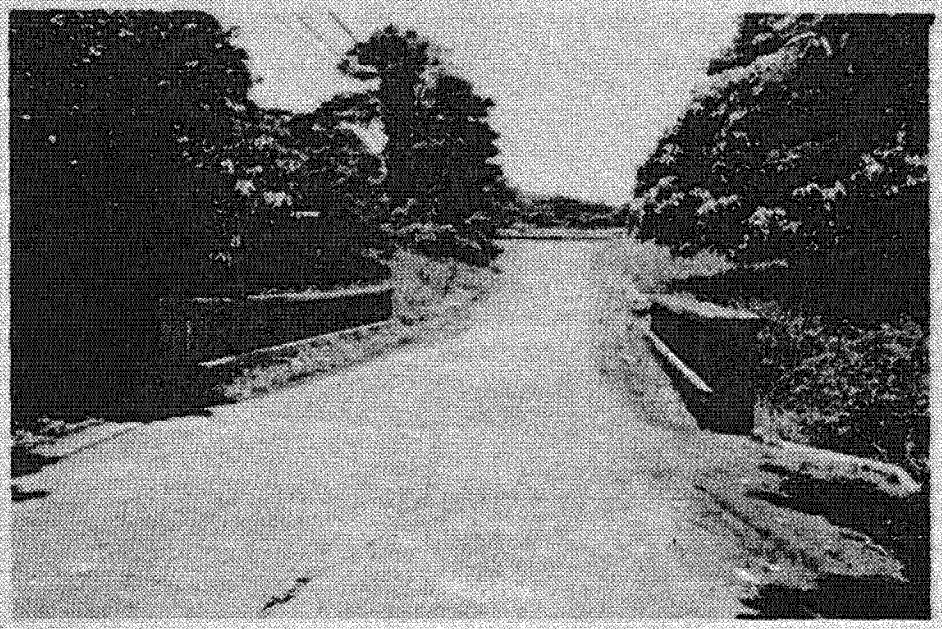
The bridge is a one span reinforced concrete deck girder 38' in length 32.4' wide. The design load capacity is H-20. The abutments and parapets are constructed of reinforced concrete. The design integrity is intact.

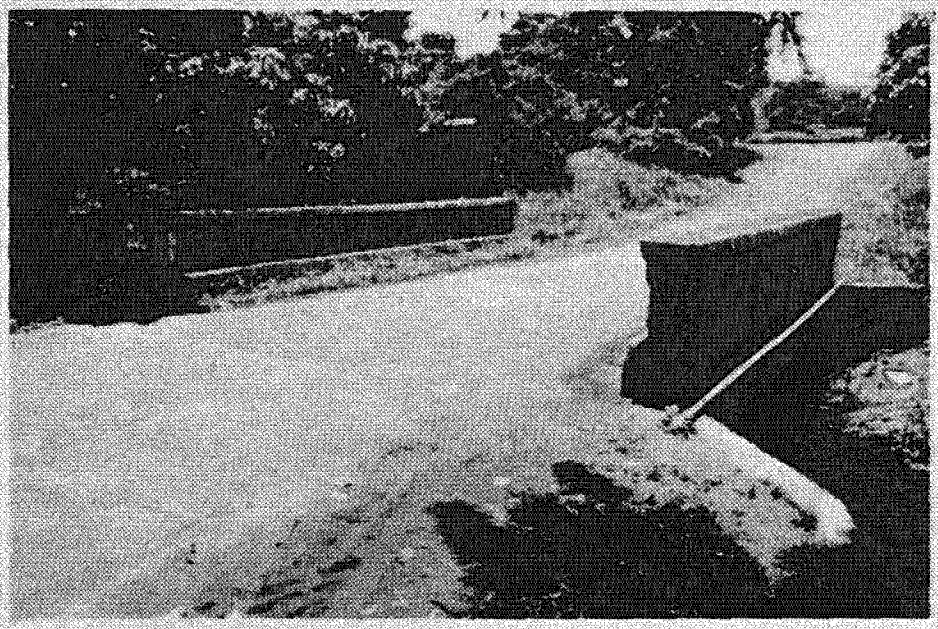
The structure is an important transportation link between North Shore and Windward communities.

There are no public access vantage points and the view is poor.

The aesthetics are rated poor.

AR00042393





Kionaole Road Bridge

AR00042394

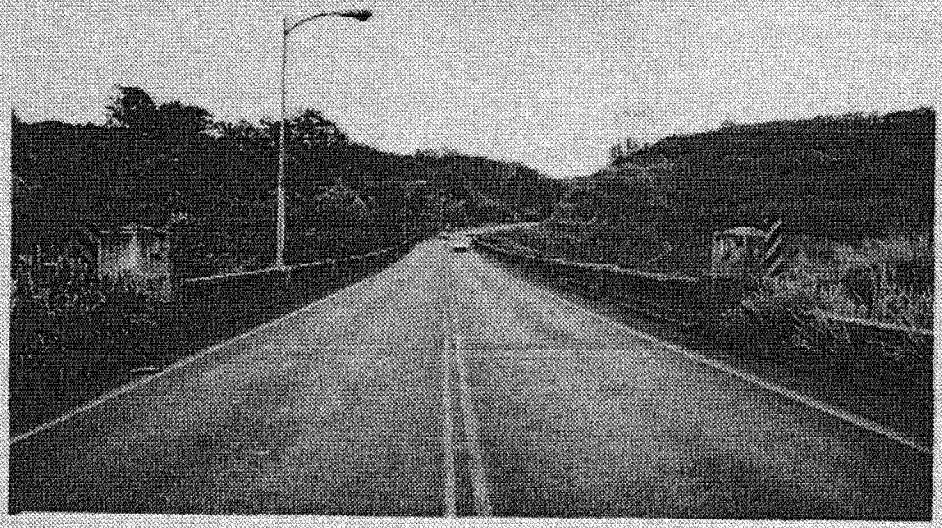
The Kionaole Road bridge across Kamooalii stream was built in 1918. It was a City and County project. The design engineer was F. E. Harvey. The builder is unknown.

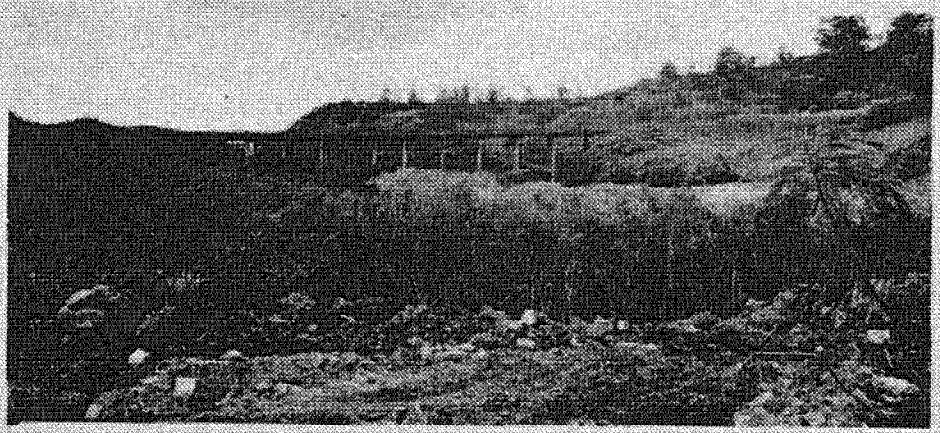
The bridge is a one span reinforced concrete tee beam structure 24' in length, 18' wide. It has a design load capacity of H-10. The abutments and parapets are constructed of reinforced concrete. The design integrity is intact.

The structure has vantage points for public access and the view is good.

The aesthetics are excellent.

AR00042395





Kipapa Bridge

AR00042396

The Kipapa bridge located on Kamehameha Highway .029 of a mile south of the intersection with Diary Road was built in 1933. The original name was the Franklin Delano Roosevelt or the F.D.R. bridge.

There was a gala celebration for the official opening ceremony on April 18, 1934. The Army donated truckloads of beer and the public was invited. Raymond C. Brown was Acting Governor for Joseph Poindexter. He made a speech that was boradcast on local radio stations. Also present and making speeches over the radio was Rear Admiral Yarnell of the 14th Naval District, and Major-General Bryant Wells, Commandant at Schofield.[7]

The military Corps of Engineers did not have anything to do with the actual construction of the bridge but as early as 1922 both the Army and Navy assisted in the road widening by lending equipment and material to the City and County for use on the construction of the Kipapa Gulch Road because the Army had an airfield located nearby so was interested in the construction of the bridge. The Territorial Highway Engineer at the time of the construction of the bridge was W. D. Bartel. The builder was W. F. Dillingham, a prolific Honolulu builder and owner of the Hawaiian Contracting Company. The total cost of the structure was $275,654.10.[5]

The bridge is a reinforced concrete continuous beam type built on reinforced concrete trestles. There are 16 spans for a total length of 491.5'. It is 33.3' in width and

AR00042397

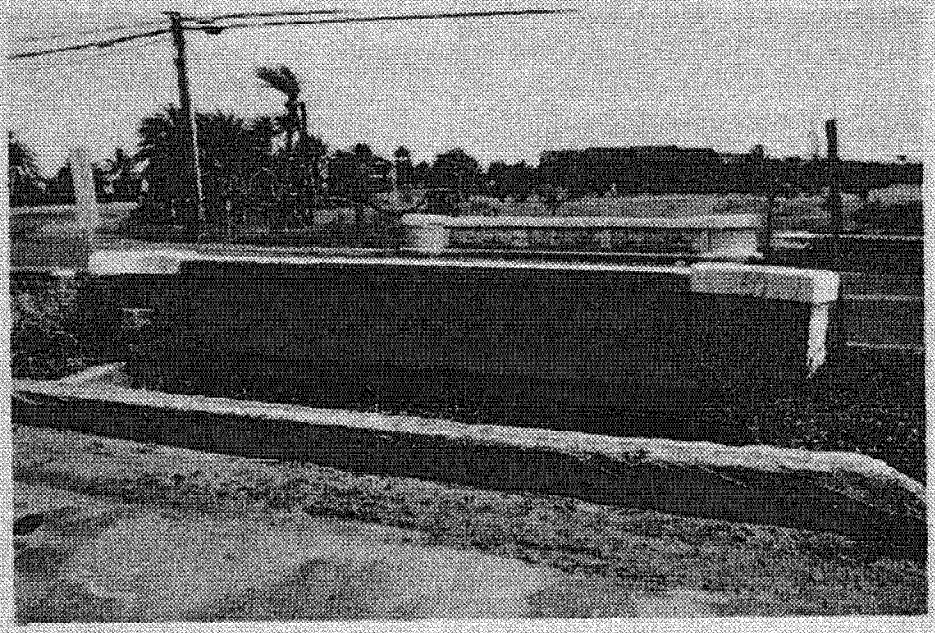
is 70' high. It has a design load capacity of H-15. The abutments and parapets are constructed of reinforced concrete. The design integrity is intact. The engineering design is impressive because it is a continuous slab structure and because of its height.

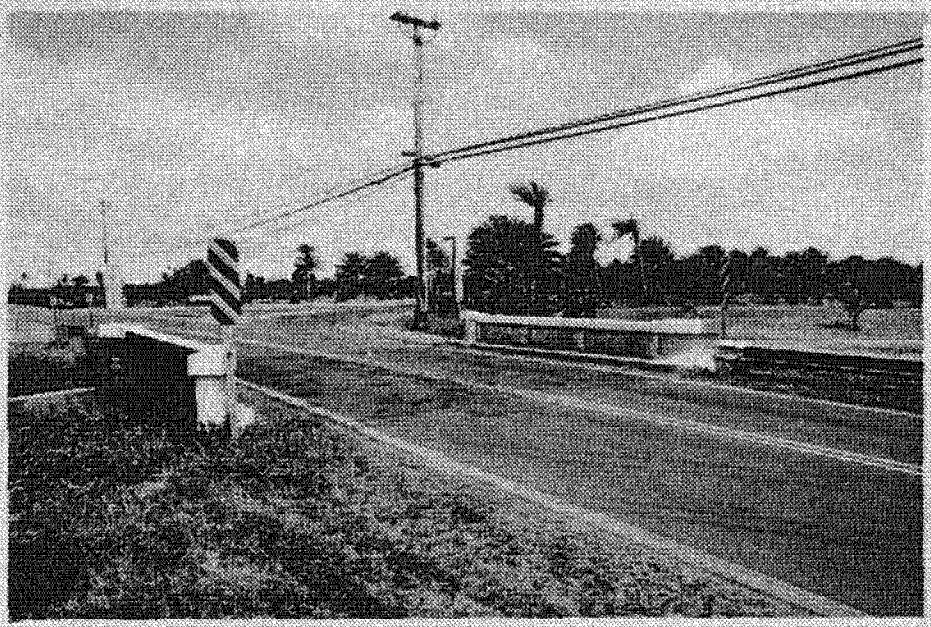
The structure is an important transportation link between Leeward and No. Shore communities. It aided in the commercial growth of the area and its building is associated with many prominent military and civilian men of Honolulu being named after our 31st President.

There are public access vantage points and the view is good.

The aesthetics are average.

AR00042398





Kuilima Bridge

AR00042399

The Kuilima bridge located on Kamehameha Highway over Oio stream .030 of a mile east of the intersection with Kuilima Hotel Road was built in 1931. The contractor was E. K. Sugihara who built four bridges and the Waialee Road section for a total sum of $189,940.80.* [5]

The bridge is a one span reinforced concrete deck girder structure 25' in length, 27.6' wide. The design load capacity is H-15. The abutments and parapets are made of reinforced concrete. The design integrity is intact.

The bridge is an important transportation link between North Shore and Windward communities.

There are public access vantage points and the view is good.

The aesthetics are judged poor.

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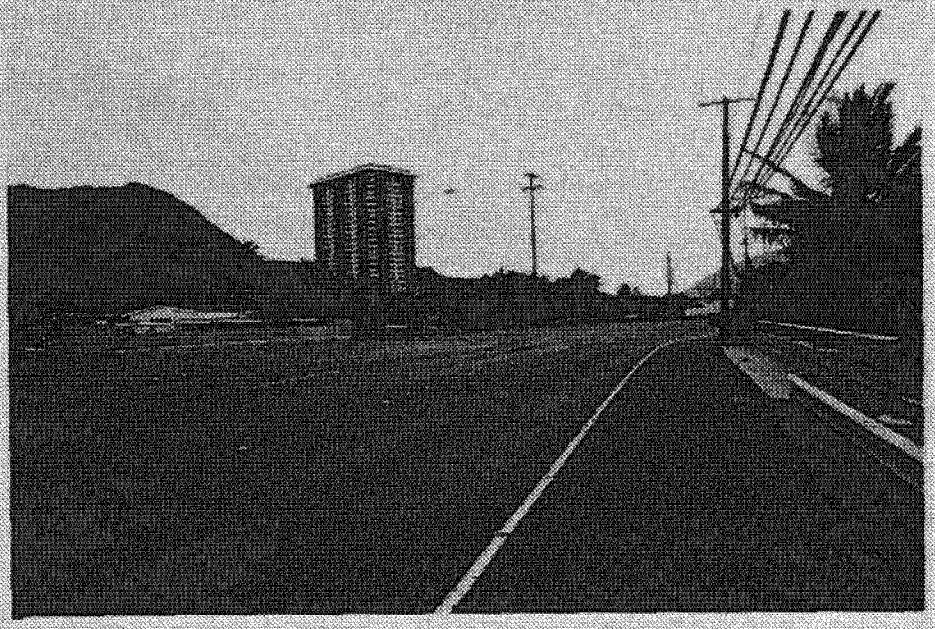
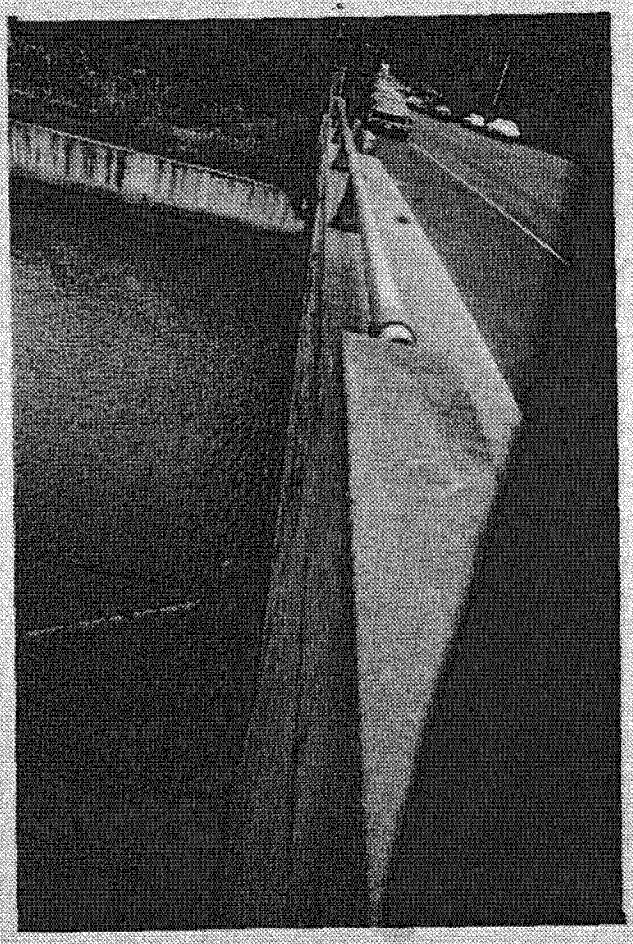
*Kawela, Nanahu and Waialee bridges are the other structures noted in this contract for the Waialee belt-road.

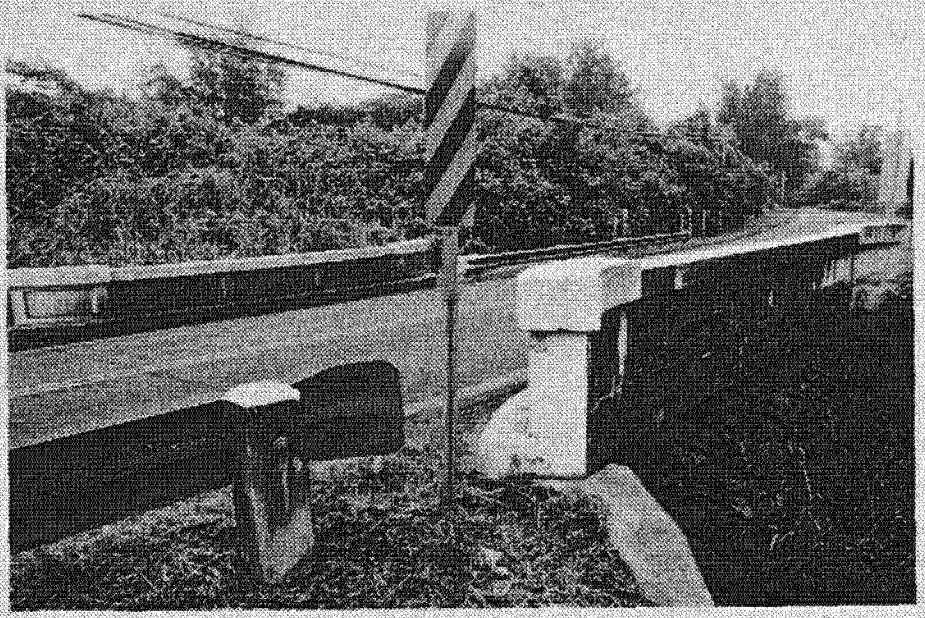
AR00042400





Kuliouou Bridge

AR00042401



Laie Bridge

AR00042402

The Laie bridge located across Kokolono stream on Kamehameha Highway .416 of a mile northwest of Kahikola Place was built in 1932. The contract was awarded to Moses Akiona who built three bridges between Hauula and Kahuku.* [5]

The bridge is a one span reinforced concrete deck girder structure 24' in total length, 27.4' wide. It has a design load capacity of H-15. The abutments and parapets are made of reinforced concrete. The design integrity is intact.

The structure is an important transportation link between Windward communities and around-the-island traffic.

There are no vantage points for public access and the view is poor.

The aesthetics are judged poor.

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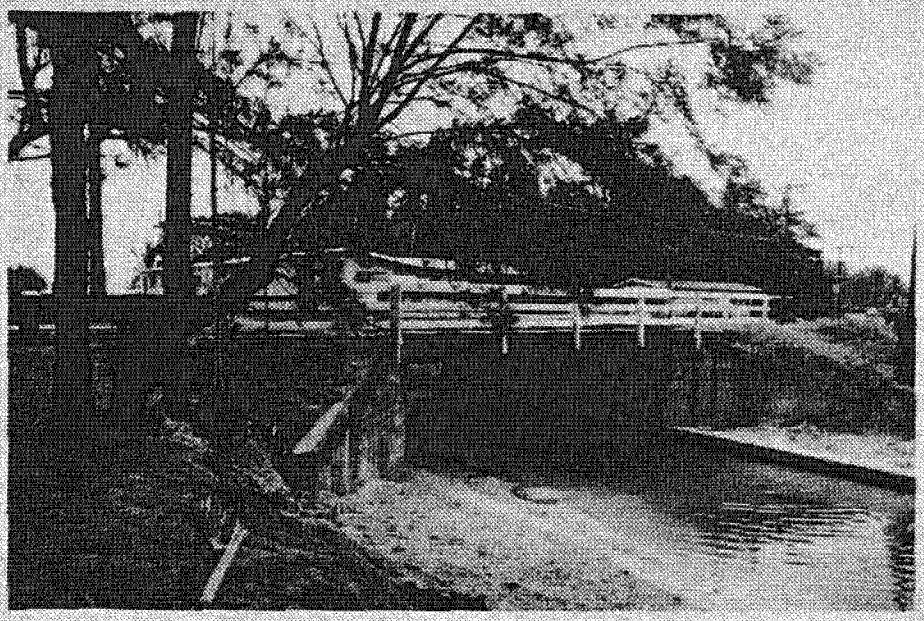
*Laieloa and Malaekahana bridges are the other two structures mentioned on this contract.

AR00042403



Laieloa Bridge

AR00042404

The Laieloa bridge located on Kamehameha Highway .084 of a mile southeast of the intersection with Halelaa Boulevard was built in 1932. The contract was awarded to Moses Akiona who built three bridges between Hauula and Kahuku.*

The bridge is a one span reinforced concrete deck girder structure 26' in length, 27.4' wide. It has a design load capacity of H-15. The abutments and parapets are made of reinforced concrete. There is an additional wooden railing on the right side with a narrow walkway. The design integrity is not intact.

The structure is an important transportation link between Windward and North Shore communities.

There are no public access vantage points and the view is poor.

The aesthetics are judged average.

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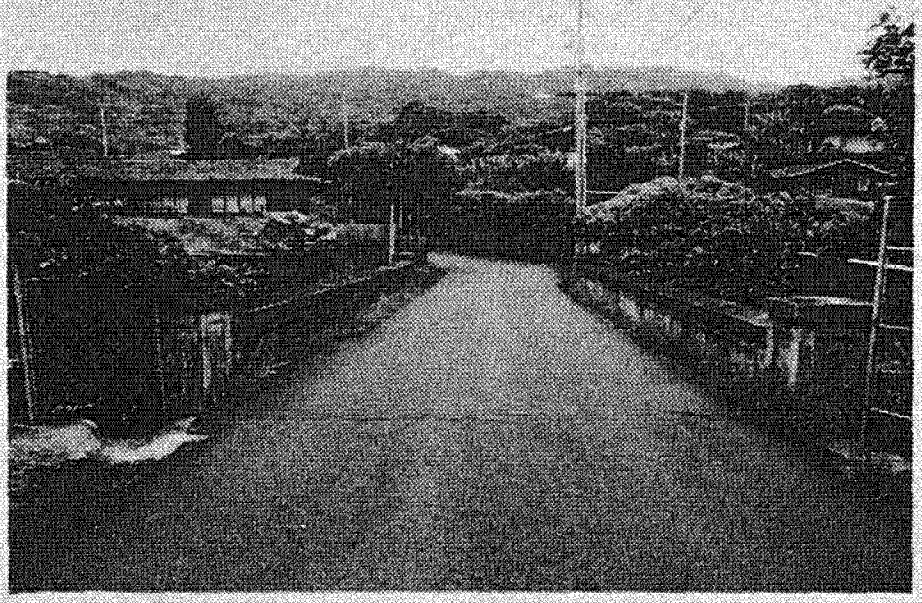
*Laie and Malaekahana bridges are the other two structures included on this contract.

AR00042405



Laimi Bridge

AR00042406

The Laimi Road bridge located across Nuuanu stream was built in 1920. The City and County engineer was John Wilson. The builder is unknown.

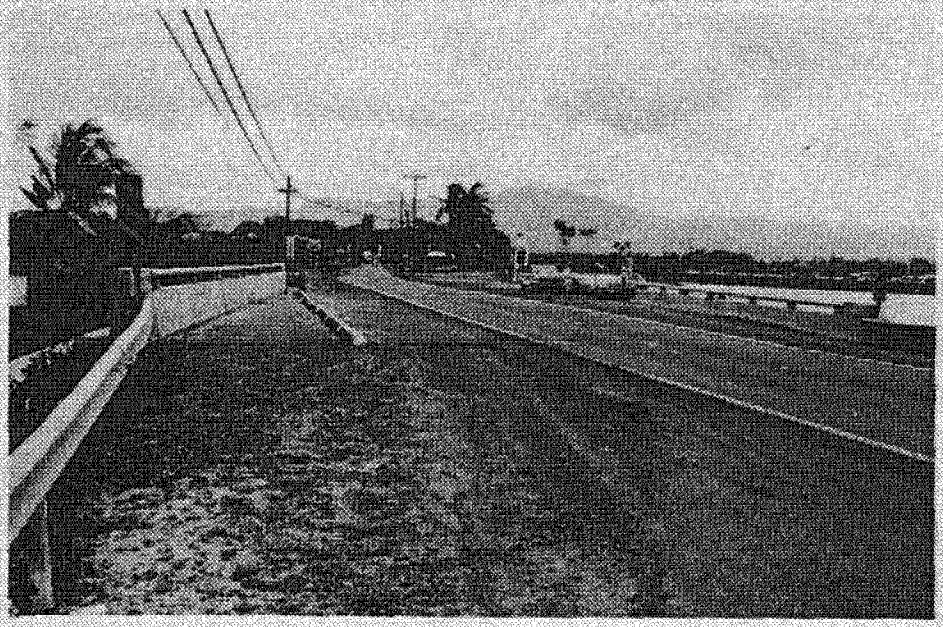
The bridge is a one span concrete girder and floorbeam structure 53' in total length and 22' wide. The design load capacity is one 15 ton steamroller. The abutments and parapets are constructed of reinforced concrete. The design integrity is intact.

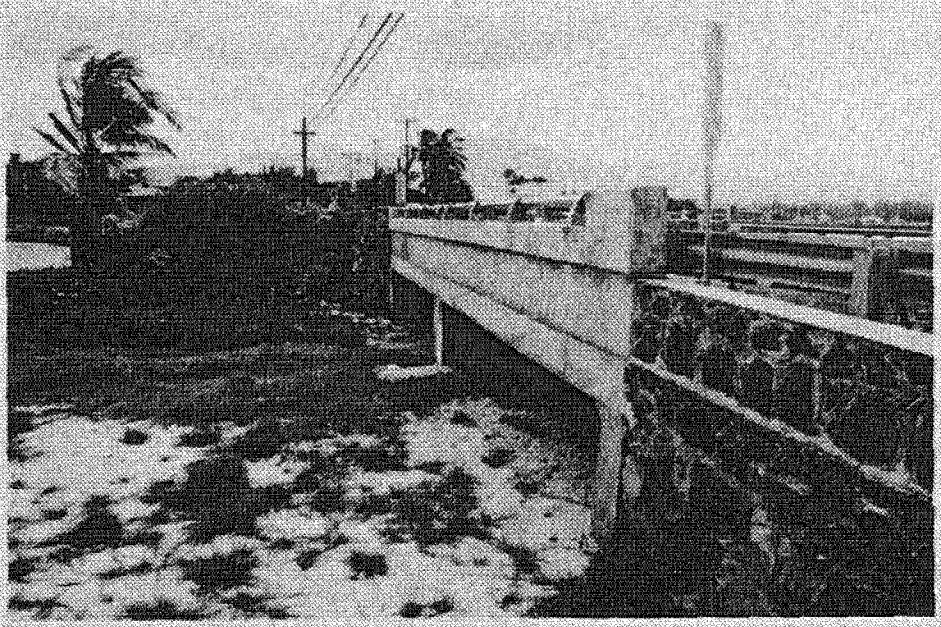
The structure aided in the commercial growth of the area.

It has no public access vantage points but the view is good.

The aesthetics are rated average.

AR00042407





Loko'ea Bridge

AR00042408

The Loko'ea bridge, also known as the Sunken County Bridge, is located on Kamehameha Highway .07 of a mile from North Loko'ea Road. It was originally built in 1923 then reconstructed in 1948 and again in 1977.[9] The builder is unknown.

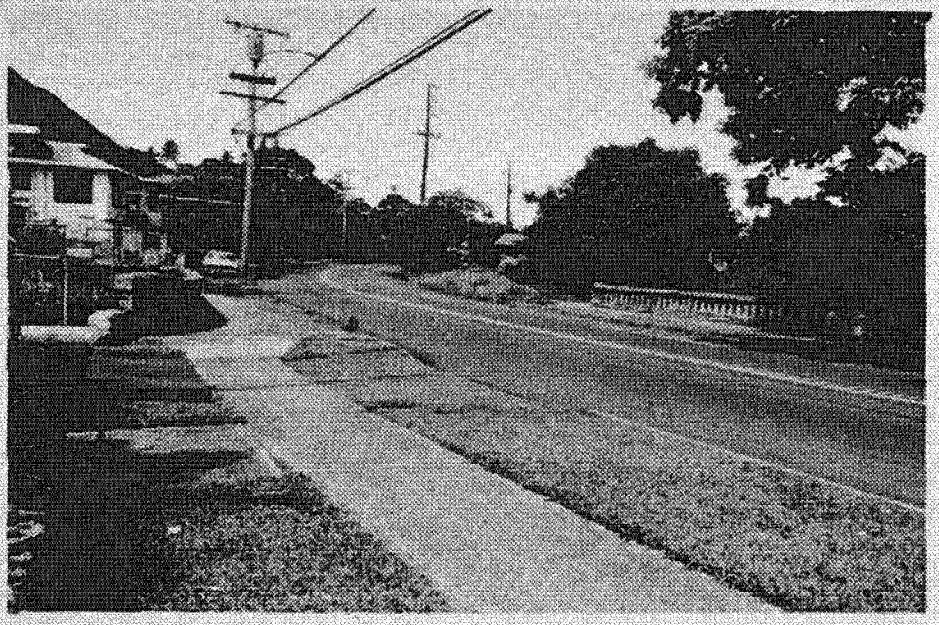
The bridge is a two span reinforced concrete deck girder T-beam structure 31' in length, 32' wide. It has a design load capacity of H-15. The abutments and railings are made of reinforced concrete, stone masonry and pipe. There are 5.5' sidewalks on both sides. The design integrity is not intact.

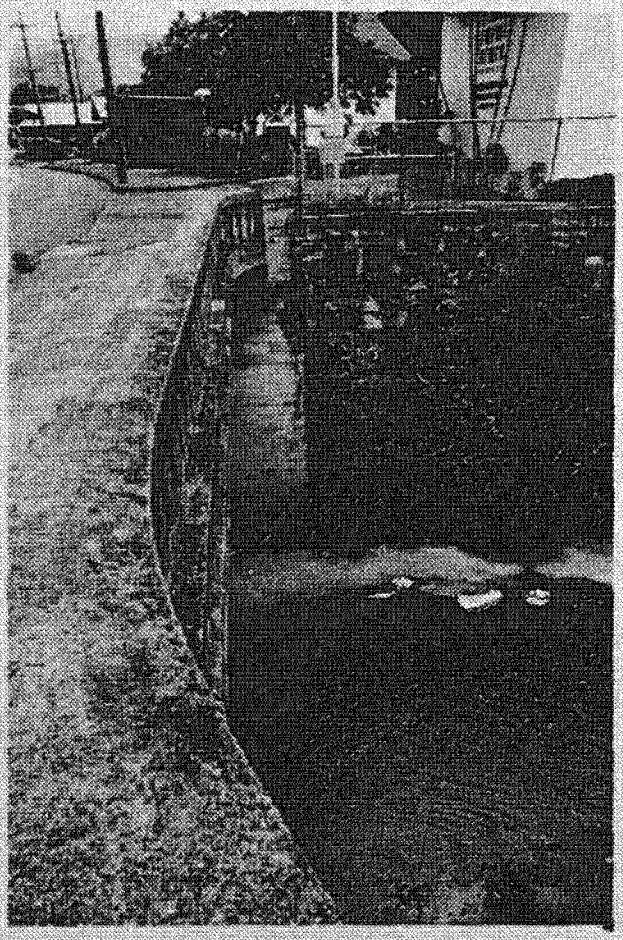
The structure is an important transportation link between North Shore communities and aided in the commerical development of the area.

There are vantage points for public access and the view is good.

The aesthetics are rated average.

AR00042409





Lusitana Street Bridge

AR00042410

The Lusitana Street bridge located .350' north of the intersection with Auwaiolimu Street across Pauoa stream was built in 1932.[5] The design engineer was R. S. Mowry. F. J. Lord was the contractor, a prolific builder and prominent Honolulu businessman.[13]

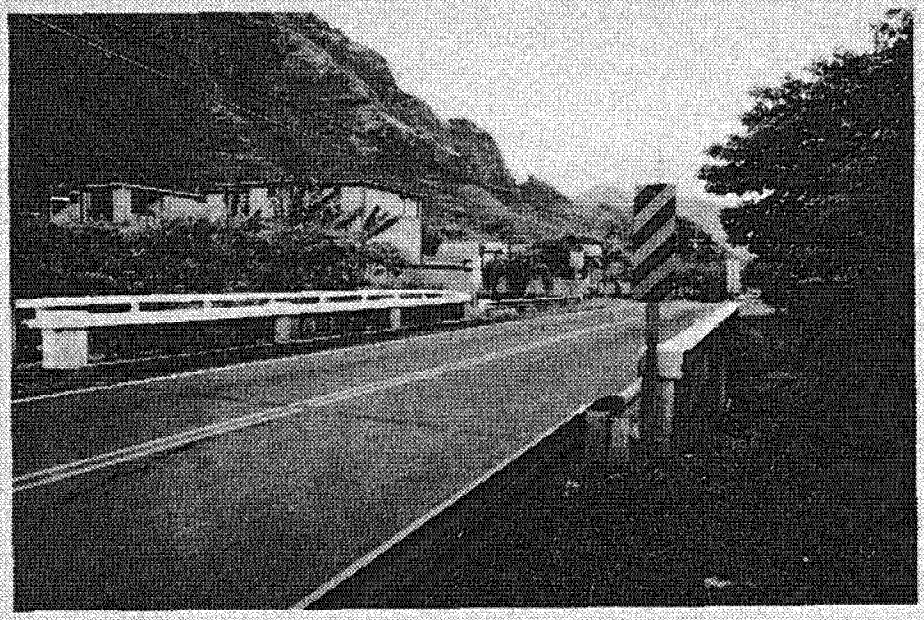
The bridge is a reinforced concrete tee beam deck girder structure, 38' in total length, 52' wide, and approximately 10' in height. The design load capacity is H-10. The abutments and parapets are made of reinforced concrete. The railings are curved. There are 9' sidewalks on each side. The design integrity is intact.

The structure is an important transportation link between Nuuanu and downtown Honolulu.

There are public access vantage points. The view is good.

The aesthetics are rated average.

AR00042411



Makaua Bridge

AR00042412

The Makaua bridge located on Kamehameha Highway .220 of a mile west of the intersection with Hiaka Road was built in 1927. The builder is unknown.

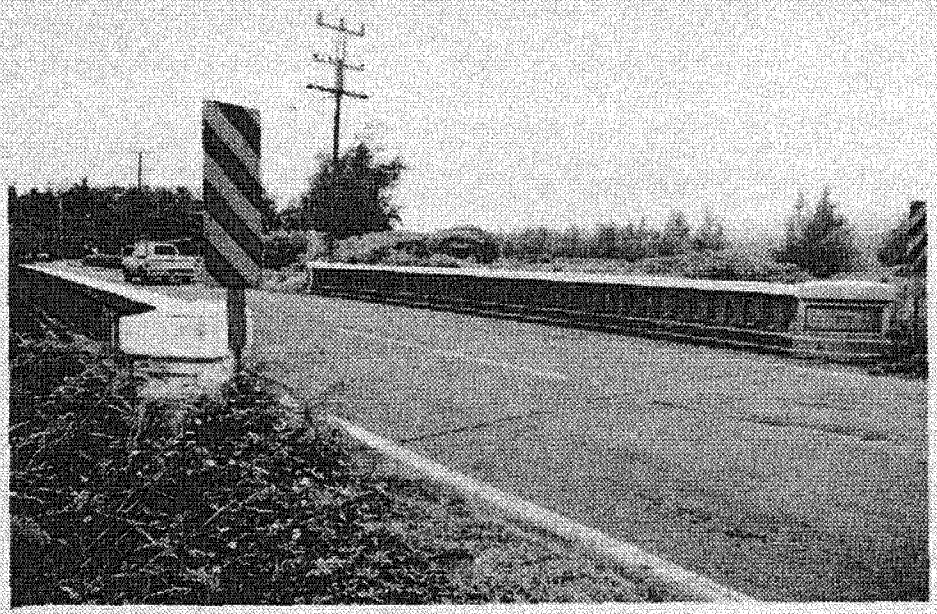
The bridge is a one span reinforced concrete deck girder 44' in total length and 26.5' wide. It has a design load capacity of H-15. The abutments and parapets are made of reinforced concrete. The design integrity is intact.

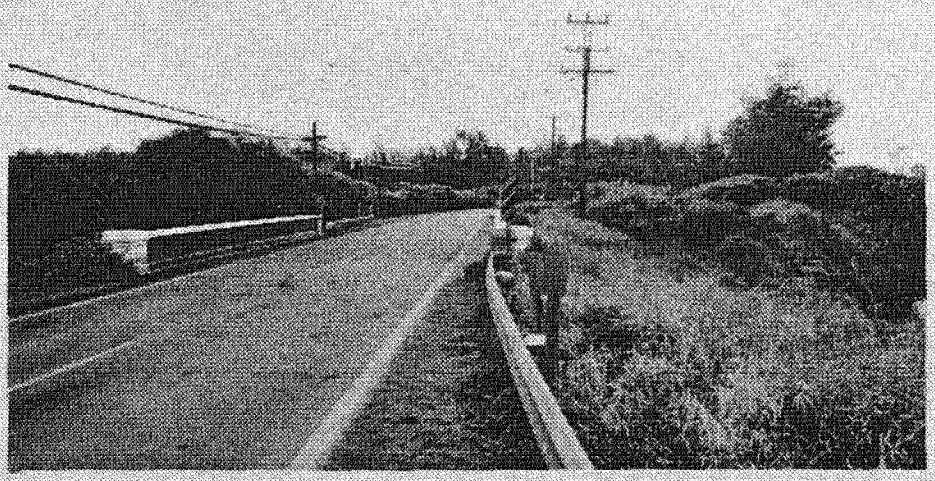
The structure is an important transportation link between Windward communities and for around-the-island traffic.

There are no public access vantage points and the view is poor.

The esthetics are rated poor.

AR00042413





Malaekahana Bridge

AR00042414

The Malaekahana bridge located on Kamehameha Highway .501 of a mile east of the intersection with Kahuku High School Road was built in 1932. The contract was awarded to Moses Akiona for the sum of $107,049.70 for the construction of three bridges to be built between Hauula and Kahuku.*

The bridge is a one span reinforced concrete deck girder structure 57' in length and 27.5' wide. The design load capacity is H-15. The abutments and parapets are made of reinforced concrete. The design integrity is intact.

The structure is an important transportation link for around-the-island traffic and Windward communities.

There are no public access vantage points and the view is poor.

The aesthetics are rated poor.

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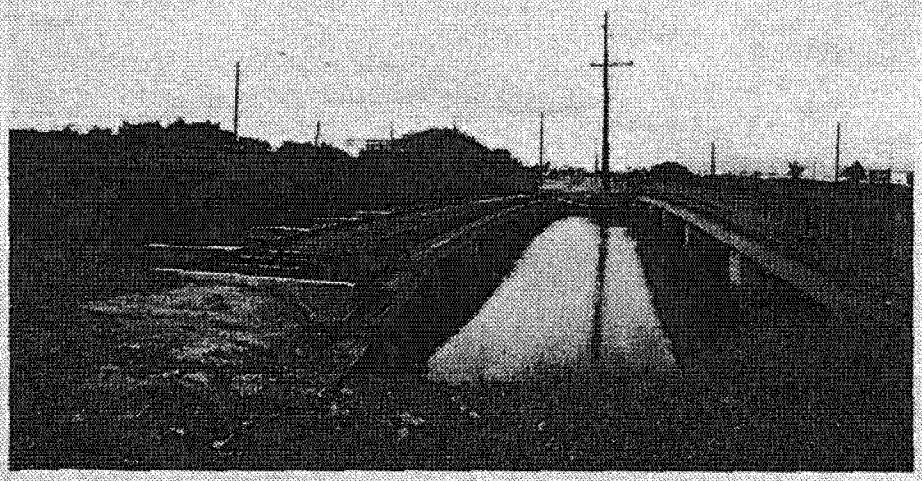
*Laie and Laieloa are the other two structures included on this contract.

AR00042415



Moanalua Bridge (Inbound)

AR00042416

The Moanalua bridge (Inbound) located on Kamehameha Highway .338 of a mile east of the intersection with Ahua Street was built in 1938. The builder is unknown.

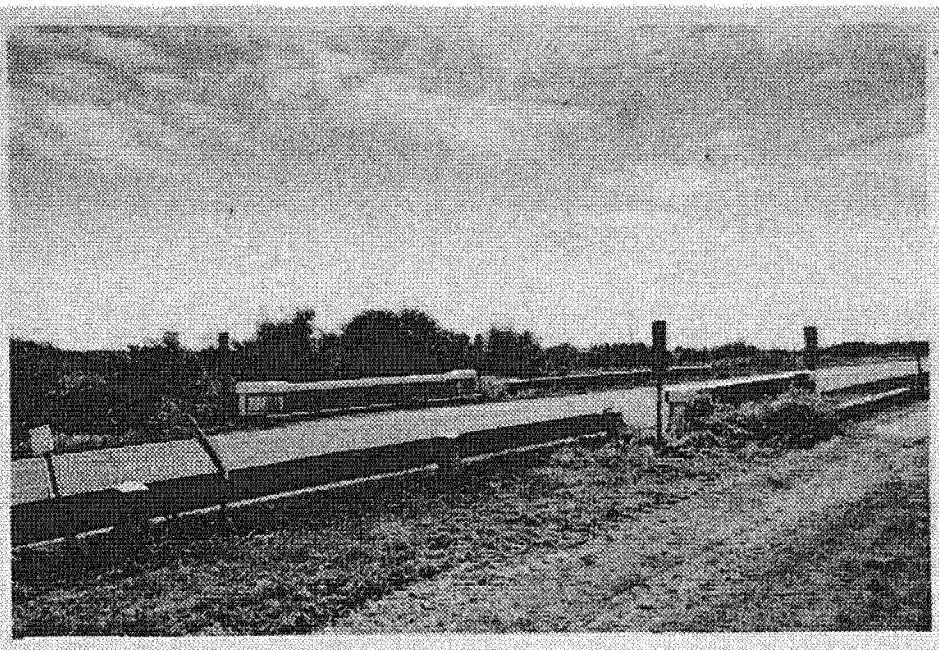
The bridge is a six span reinforced concrete deck girder structure, 164' in total length and 40.2' wide. It has a design load capacity of H-10. The abutments and parapets are made of reinforced concrete. There are 3.3' sidewalks on both sides. The design integrity is not intact.

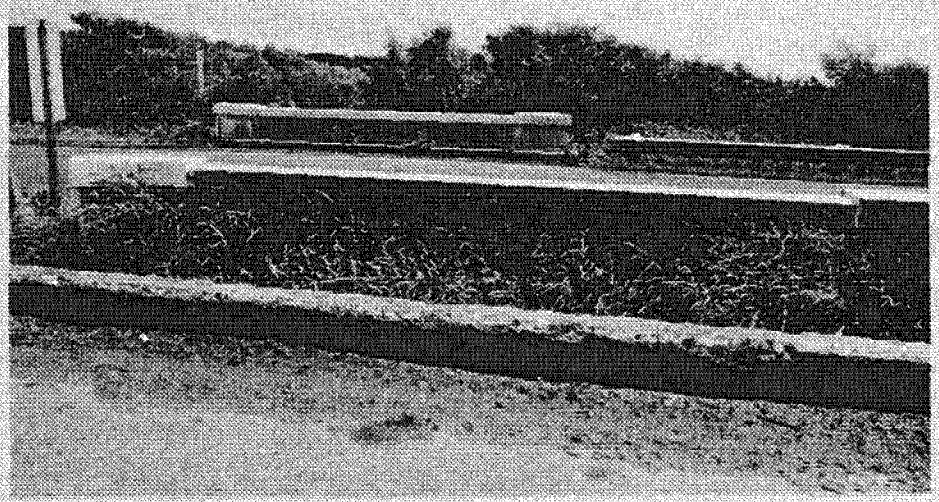
The structure is an important transportation link between Honolulu and Pearl Harbor. It aided in the commercial growth of the district.

There are no public access vantage points and the view is poor.

The aesthetics are rated poor.

AR00042417





Nanahu Bridge

AR00042418

The Nanahu bridge located on Kamehameha Highway .097 of a mile west of the intersection with the road to RCA Communication Center, across Hoolapa stream, was built in 1931. E. K. Sugihara of Kalihi Construction Company was the contractor. He was awarded a contract of $189,940.80 for building the four bridges from Waialee to Kahuku on the Waialee belt-road.* [5]

The bridge is a reinforced concrete deck girder structure 26' in total length and 27.7' wide. It has a design load capacity of H-15. The abutments and parapets are made of reinforced concrete. The design integrity is intact.

The bridge is an important transportation link between North Shore and Windward communities.

There are public access vantage points and the view is good.

The aesthetics are rated poor.

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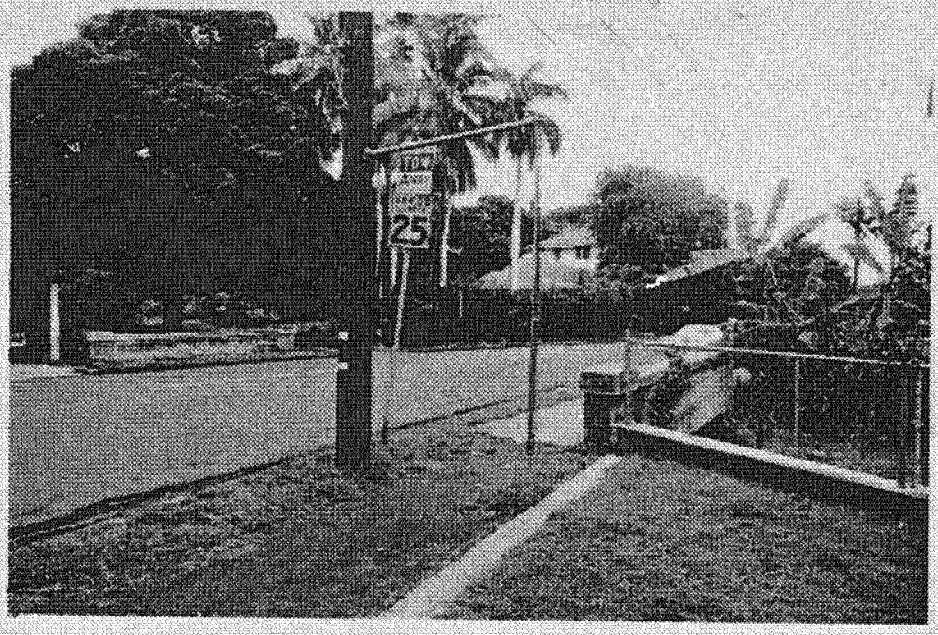
*The other three bridges on this contract were Kuilima, Waialee and Kawela.

AR00042419



Nehoa Street Bridge

AR00042420

The Nehoa Street bridge located at the intersection with Makiki Street across Makiki stream was built in 1920. The builder is unknown.

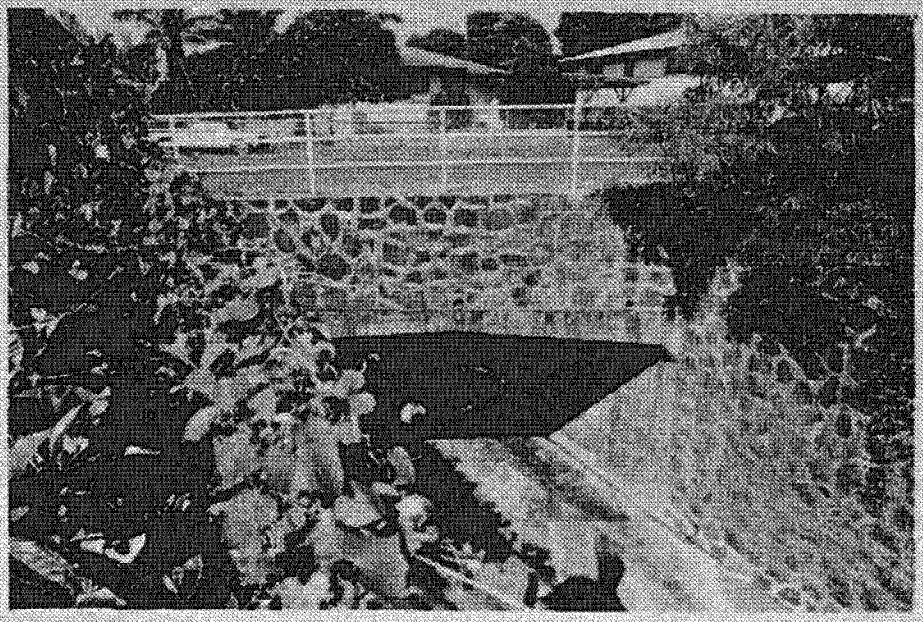
The bridge is a one span reinforced concrete tee beam deck girder structure, 24' in length and 48.4' wide. The abutments and parapets are made of reinforced concrete. There are 6' sidewalks on each side. The design integrity is intact.

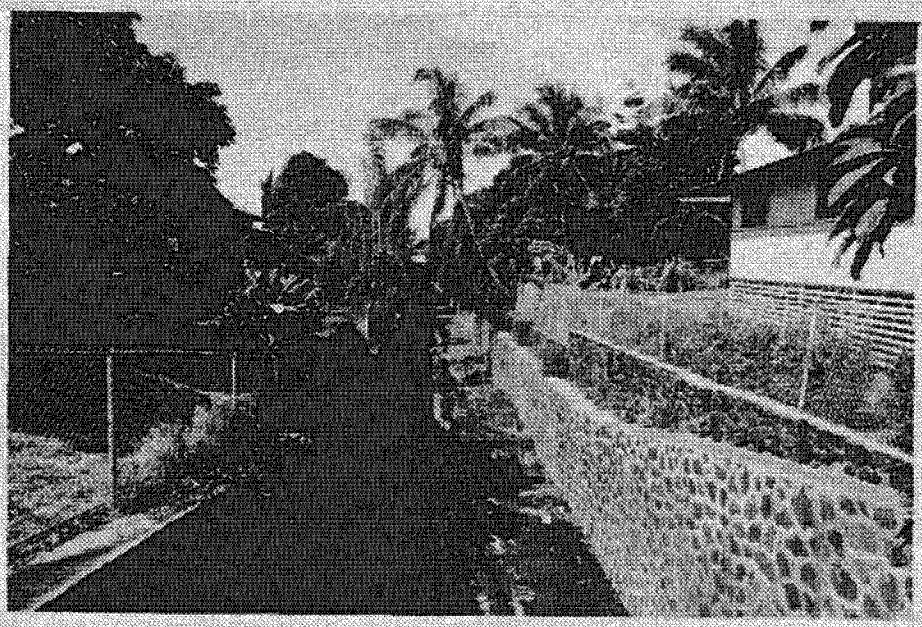
The bridge aided in the commercial development of the area.

There are public access vantage points. The view is good.

The aesthetics are rated average.

AR00042421





Noelani Street Bridge

The Noelani Street bridge located across the Pearl City drainage ditch was built originally in 1936, then reconstructed in 1956. The builder is unknown.

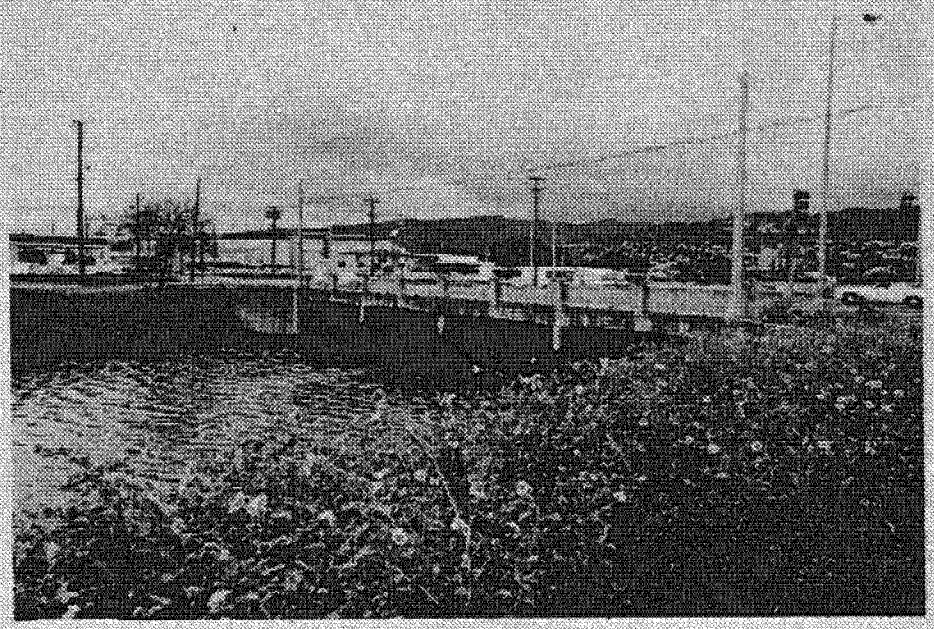
The bridge is a reinforced concrete deck girder structure 20' in length, 59.5' wide, and approximately 10' in height. It has a design load capacity of H-20. The abutments are of reinforced concrete stone masonry with pipe and a chain link fence. The design integrity is not intact.

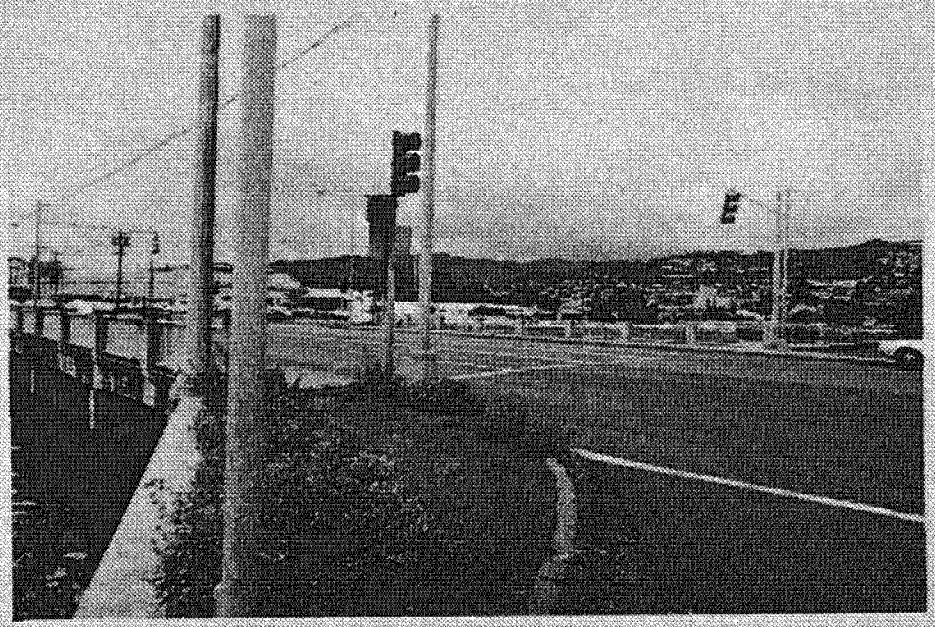
The structure contributed to the growth of the area.

There are no public access vantage points. The view is good.

The aesthetics are rated average.

AR00042423





North King Street Bridge

AR00042424

The North King Street bridge located at the intersection with Kokea Street across the Kapalama canal was built in 1938. The builder is unknown.

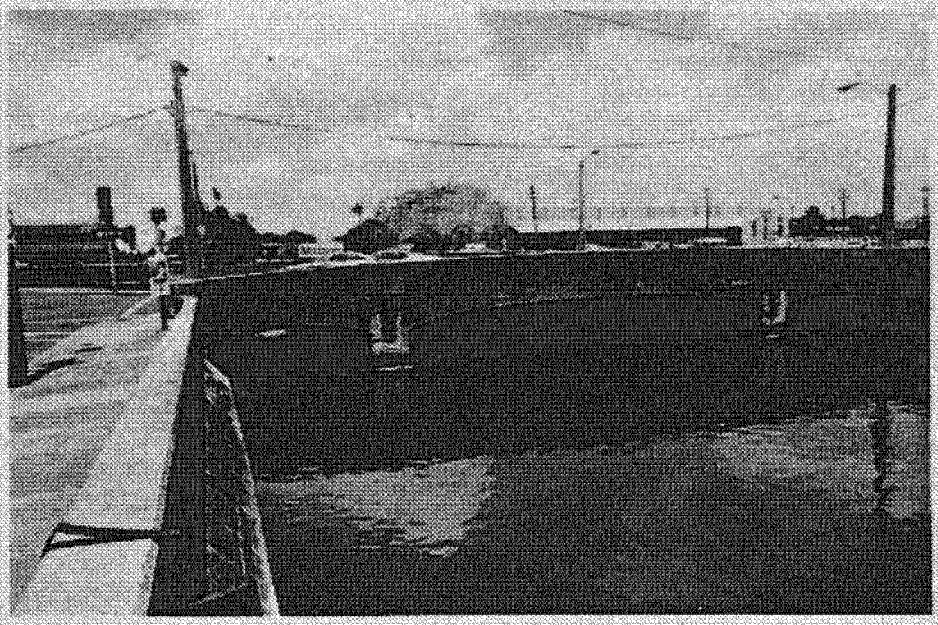
The bridge is a four span reinforced concrete tee beam deck girder structure 101' in length, 86.7' wide, and 14' in height. The design load capacity is H-20. The abutments and parapets are made of reinforced concrete. There are sidewalks 9.2' on both sides. The design integrity is intact.

The structure is an important transportation link between Kalihi and downtown Honolulu.

The public has access to many vantage points. The view is good.

The aesthetics are rated average.

AR00042425



North King Street Bridge No. 1

AR00042426

The North King Street bridge #1, also known as the Nuuanu Bridge, located over Nuuanu stream at the intersection of River Street was built in 1922. The City and County Engineer was Fred Ohrt; the Acting Engineer H. A. Austin. The builder is unknown.

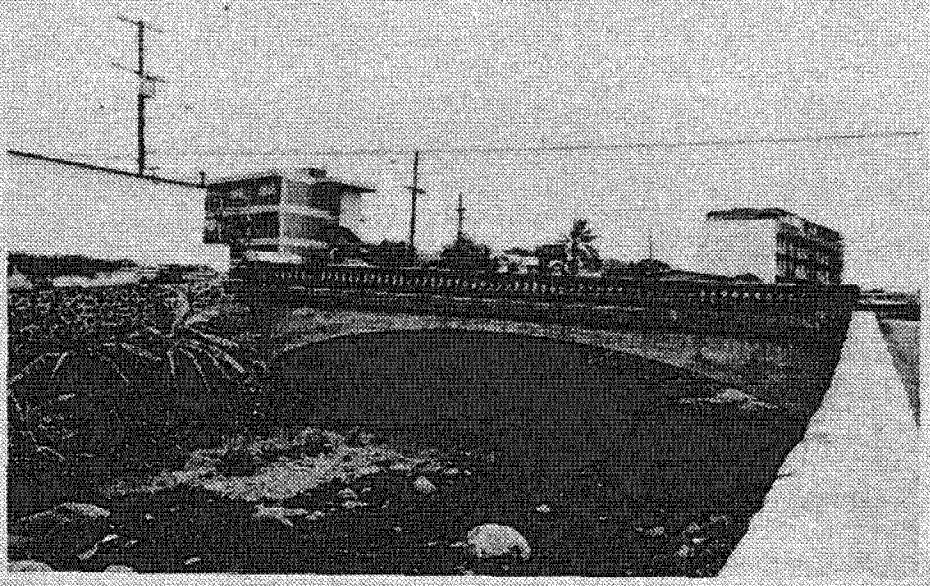
The bridge is a four span reinforced concrete tee beam continuous girder structure. It has a total length of 92', a width of 56.5', and a height of 19'. The design load capacity is H-30. There are 10' sidewalks on both sides. The abutments and parapets are constructed of reinforced concrete. The beams are decorated with baroque urn-like carvings. The design integrity is intact.

The structure is an important transportation link for downtown Honolulu traffic and Nuuanu. It aided in the commercial development of the area.

There are public access vantage points and the view is good.

The aesthetics of the scene are average.

AR00042427



North King Street Bridge No. 3 (Kalihi Bridge)

AR00042428

The North King Street bridge #3 located over Kalihi stream 300' west of the intersection with Gulick Avenue was built in 1933. It is also known as the Kalihi bridge by the State Department of Transportation. It was a City and County project. The Chief Engineer was B. F. Rush. The Bureau Engineer was R. H. Whitehouse. The builder is unknown.

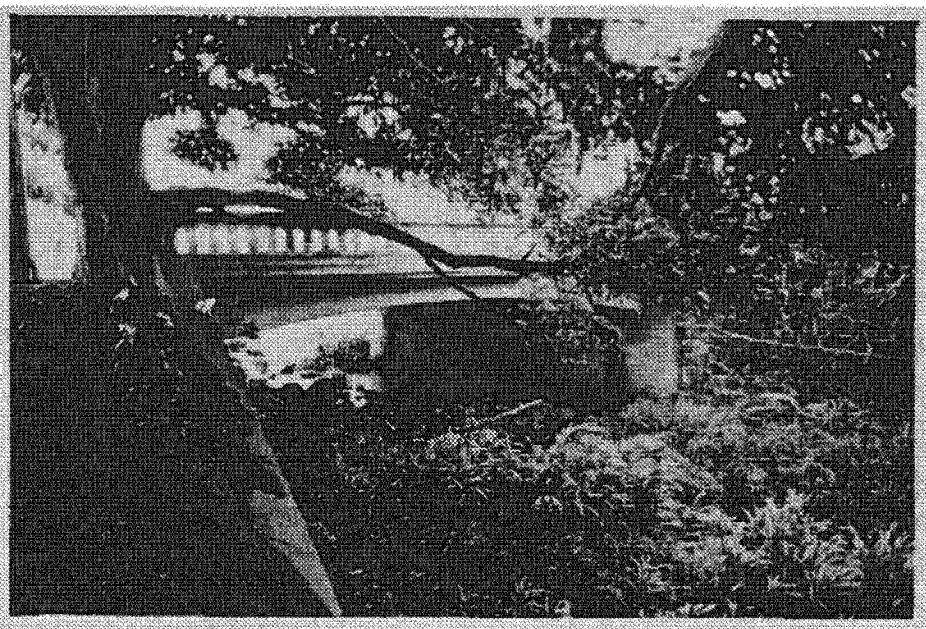
The bridge is a one span reinforced concrete tee beam girder 65' in length, 86' wide, and 16' in height. It has a design load capacity of H-20. The abutments and parapets are constructed of reinforced concrete. The design integrity is intact.

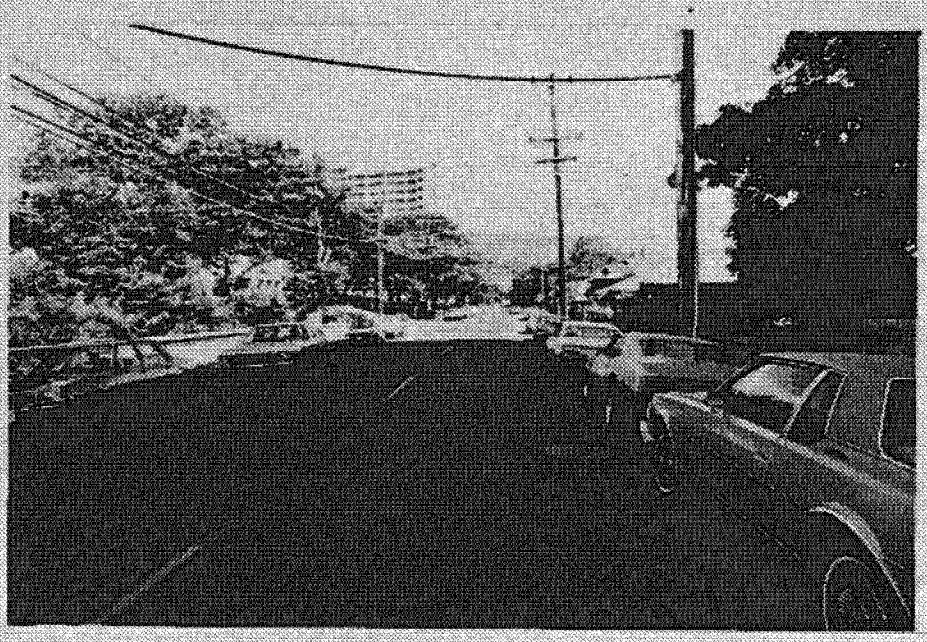
The bridge is an important transportation link between Honolulu and Ft. Shafter.

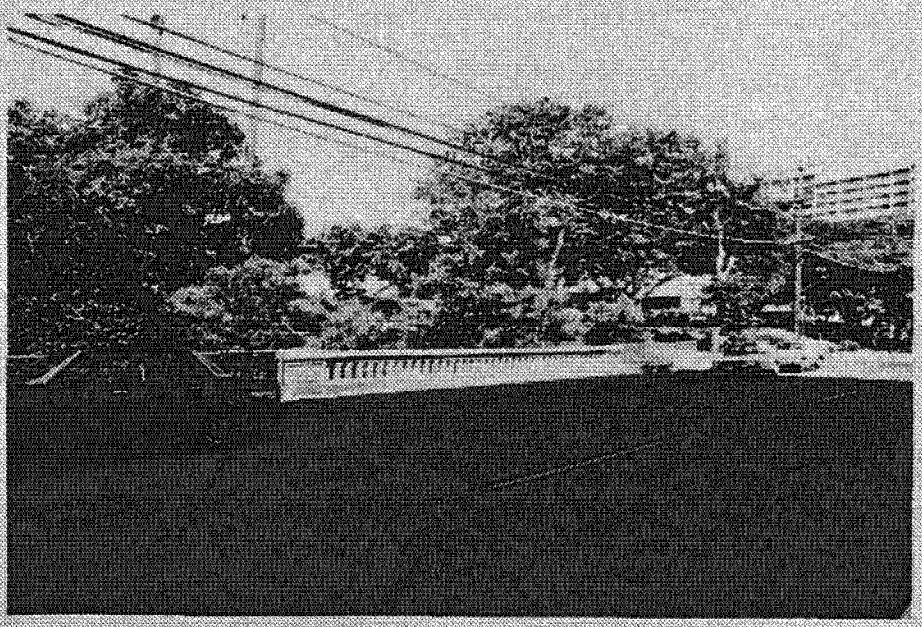
There are public access vantage points and the view is good.

The aesthetics of the scene are rated average.

AR00042429







North Kuakini Bridge No. 2 (Waiolani Bridge)

AR00042430

The North Kuakini Bridge #2, located on North Kuikini Street 100' north of the intersection with Huna Street was built in 1934. It is also known as the Waiolani bridge by the State Department of Transportation but is situated over the Puehuehu Pool according to the chiseled inscription on the structure. It was a City and County project. The design engineer was G. K. Dawson. The Chief Engineer was B. F. Rush. The builder is unknown.

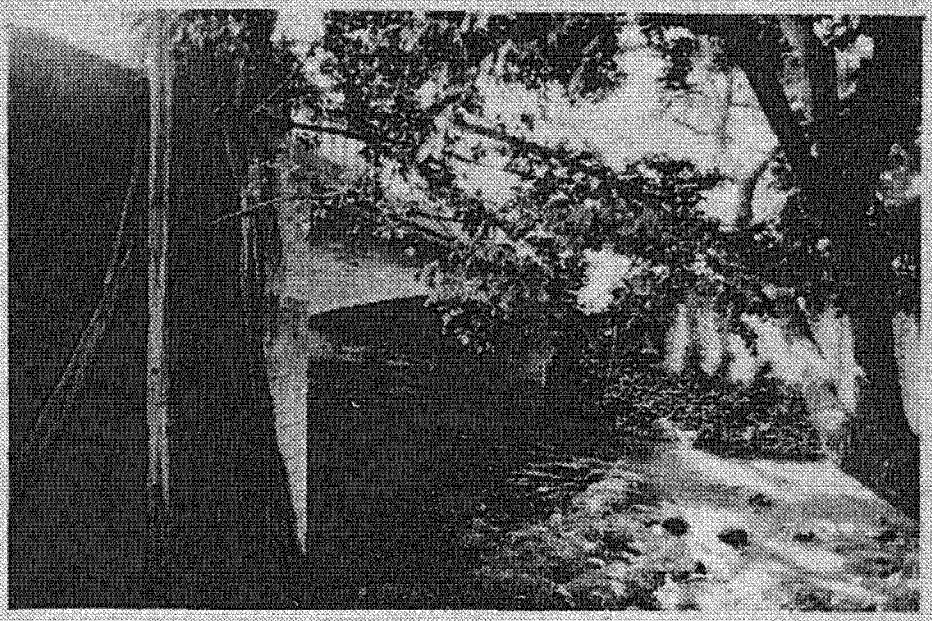
The bridge is a one span reinforced concrete tee beam girder structure, 44' in total length, 52.7' wide, and is 15' in height. It has a design load capacity of H-10. The abutments and parapets are made of reinforced concrete. There are 7' sidewalks on both sides. The design integrity is intact.

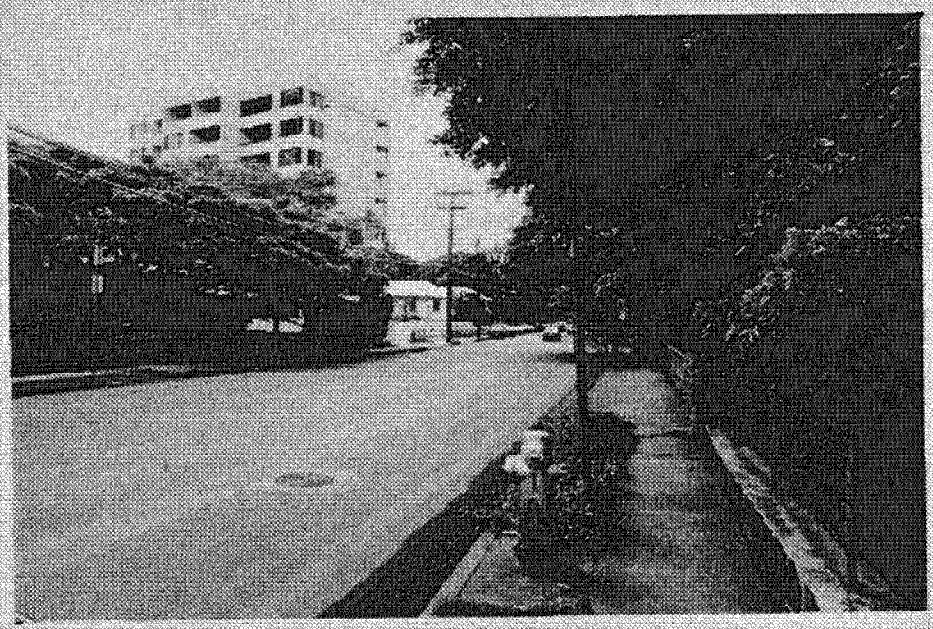
The bridge is an important transportation link for Nuuanu traffic and downtown Honolulu.

There are no public access vantage points but the view is good from private property sites.

The aesthetics are rated excellent.

AR00042431





Nuuanu Bridge No. 1 (North Kuakini Street Bridge No. 1)

AR00042432

The Nuuanu bridge #1, as it is known by the City and County of Honolulu, is referred to as the North Kuakini Street bridge #1 by the State Department of Transportation. It is located across Nuuanu stream 450' north of the intersection of Nuuanu Avenue and North Kuakini Street. It was built in 1934. The City and County Engineer was B. F. Rush and the Bureau Engineer, L. W. Whitehouse. The contractor was Hawaiian Dredging Co., owned by W. F. Dillingham, one of Honolulu's prolific builders and prominent businessmen.

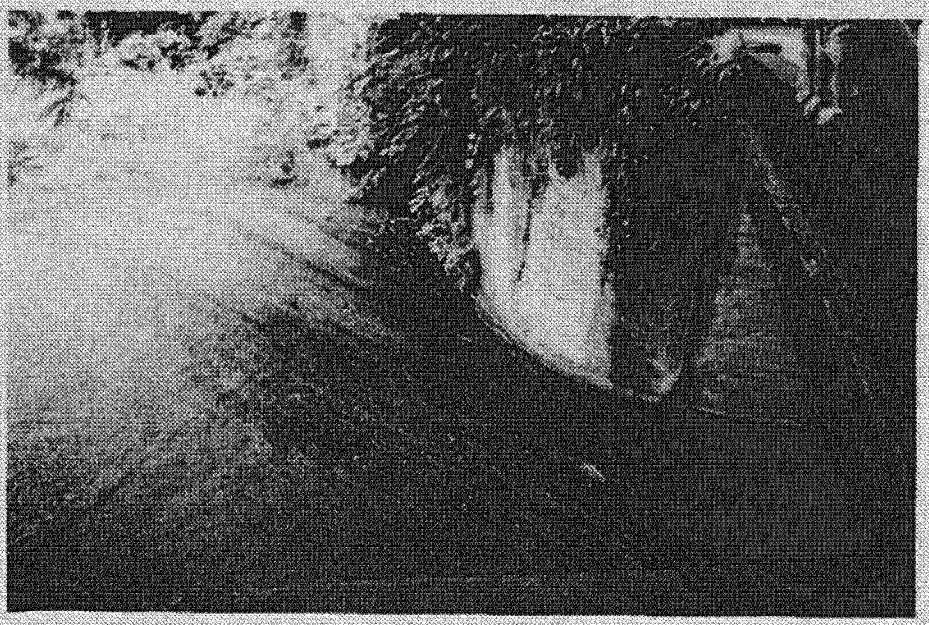
The bridge is a one span concrete tee beam deck girder structure, 64' in length, 52.7' wide, and 15.5' in height. It has a design load capacity of H-20. There are 7' sidewalks on both sides. It has a stone masonry railing with a chain link fence on top. The substructure has a false brick facing. The design integrity is intact.

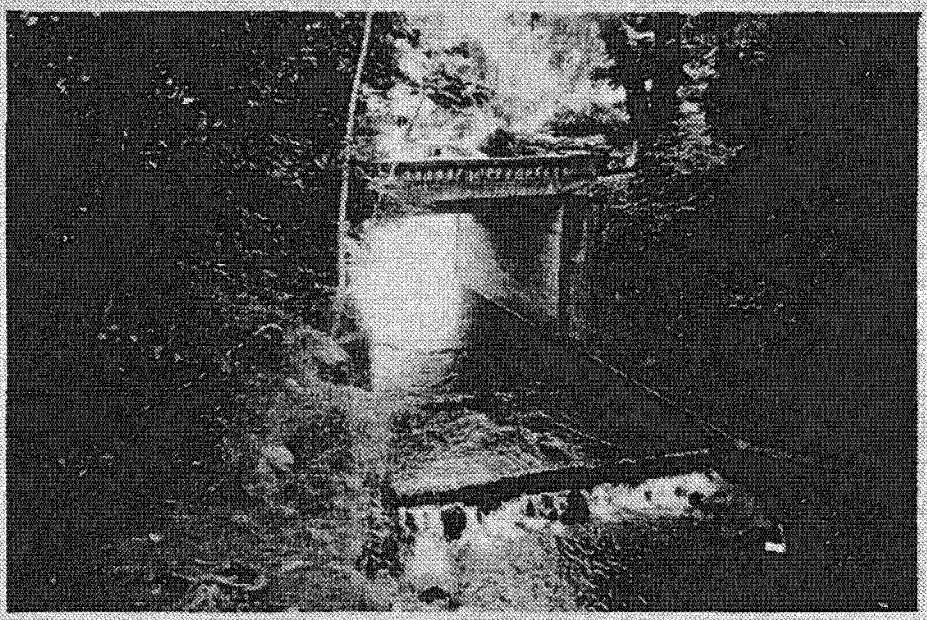
The structure is an important transportation link between Nuuanu and downtown Honolulu. It is associated with a famous Honolulu businessman.

The public has access to vantage points and the view is good.

The aesthetics are excellent.

AR00042433





Nuuanu Pali Drive Bridge

VII-108

The Nuuanu Pali Drive bridge across Nuuanu stream located over the dam spillway was built in 1931. The City and County Engineer was F. Ohrt. The builder is unknown.

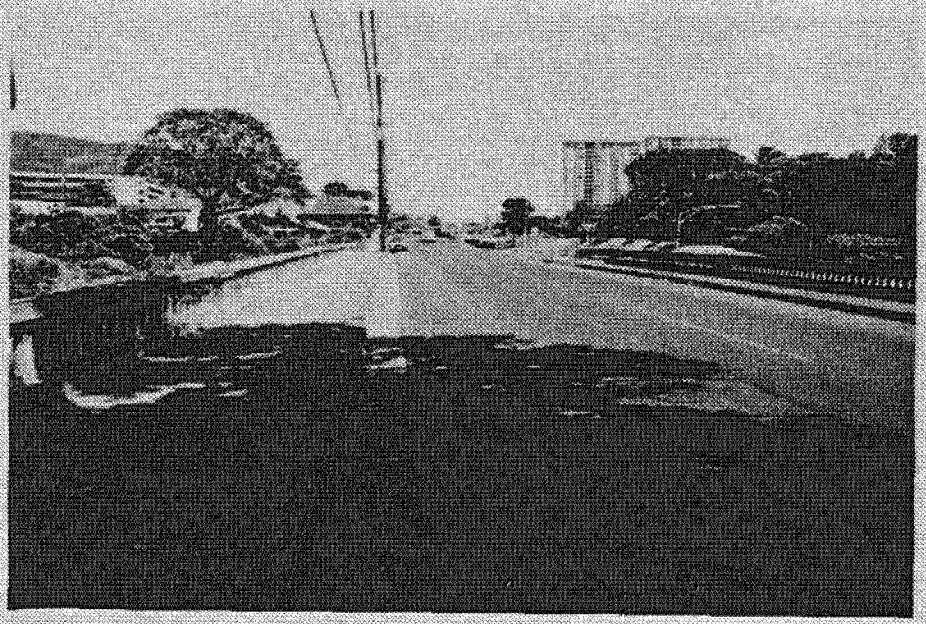
The bridge is a one span reinforced concrete tee beam structure 26' in total length and 28' in total width. It has a design load capacity of H-10. The abutments and parapets are constructed of reinforced concrete. The design integrity is intact.

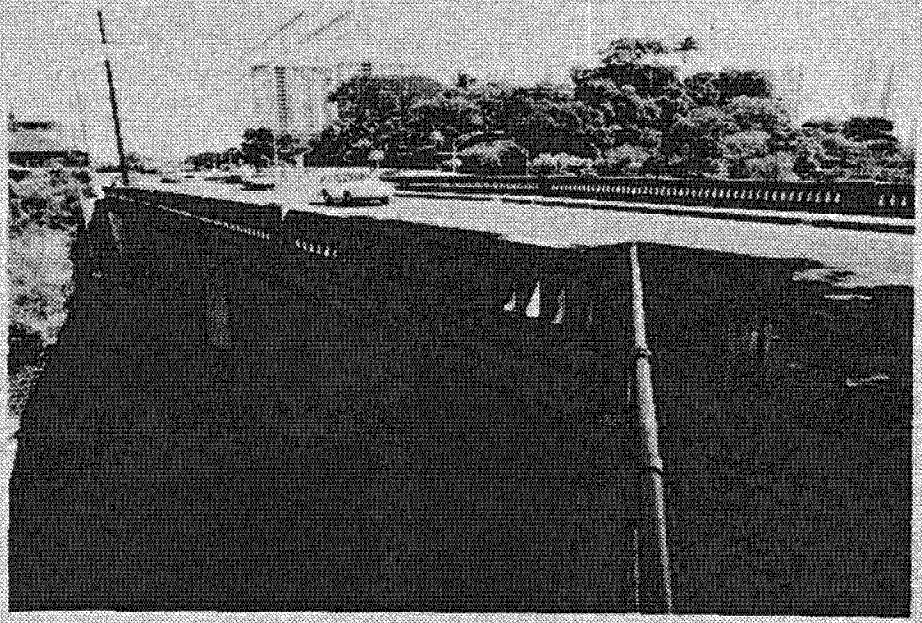
The structure connects the Nuuanu rain forest scenic drive to Nuuanu.

There are vantage points for public access. The view is good.

The aesthetics are excellent.

AR00042435





North School Street Bridge No. 1

AR00042436

The North School Street Bridge #1, located across Nuuanu stream .225 of a mile south of the intersection with Stillman Lane was built in 1932. It was a City and County project. The design engineer was G. K. Dawson. The City and County Engineer was R. S. Mowrey. The builder is unknown.

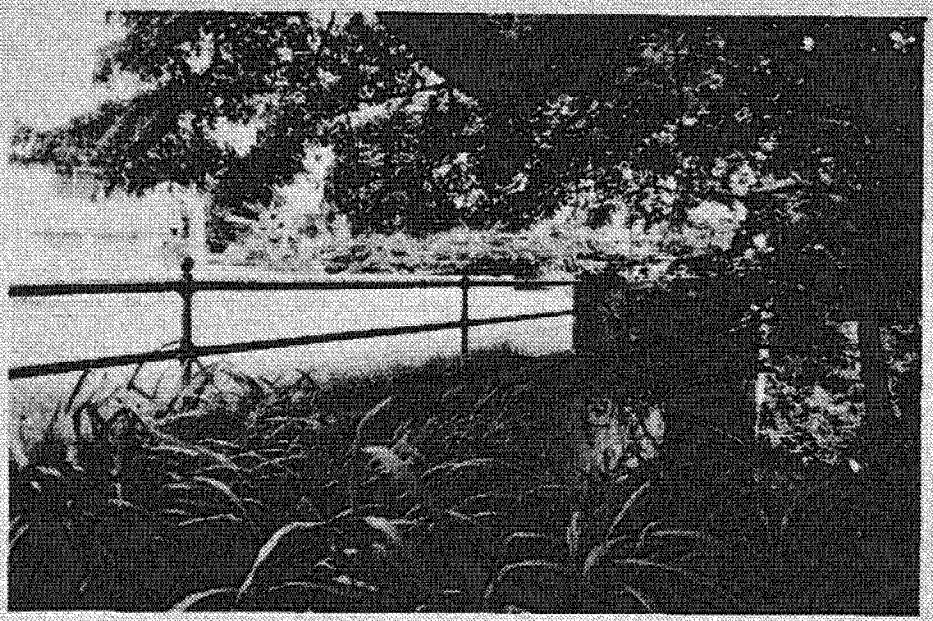
The bridge is a reinforced concrete three span tee beam deck girder structure, 129' in length, 60' wide, and 31' in height. It has a design load capacity of H-20. There are 8.3' sidewalks on both sides. The abutments and parapets are constructed of reinforced concrete. The design integrity is intact.

The structure is an important transportation link for downtown Honolulu traffic.

There are vantage points of easy public access. The view is good.

The aesthetics are excellent.

AR00042437



North School Street Bridge No. 2

AR00042438

The North School Street Bridge #2, located 550' north of the intersection with Gulick Avenue, across Kalihi stream, was built in 1927. The design engineer was J. D. Yapp. The City and County Engineer was Louis Cain. The builder is unknown.

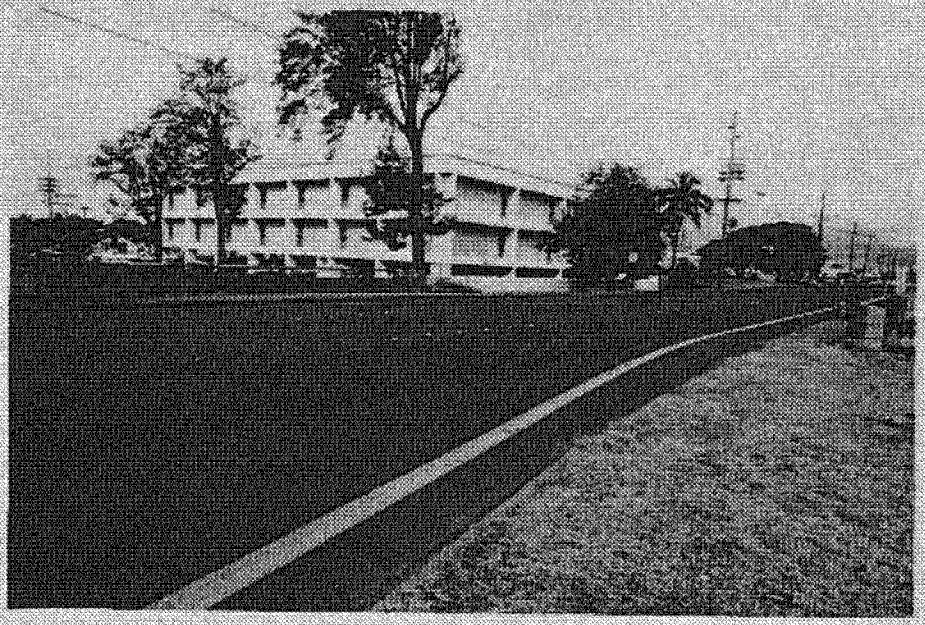
The bridge is a one span reinforced concrete tee beam deck girder structure 41' in length and 60' wide. It has a design load capacity of H-20. The abutments and parapets are made of reinforced concrete and there are some pipe and chain link railings. The design integrity is not intact.

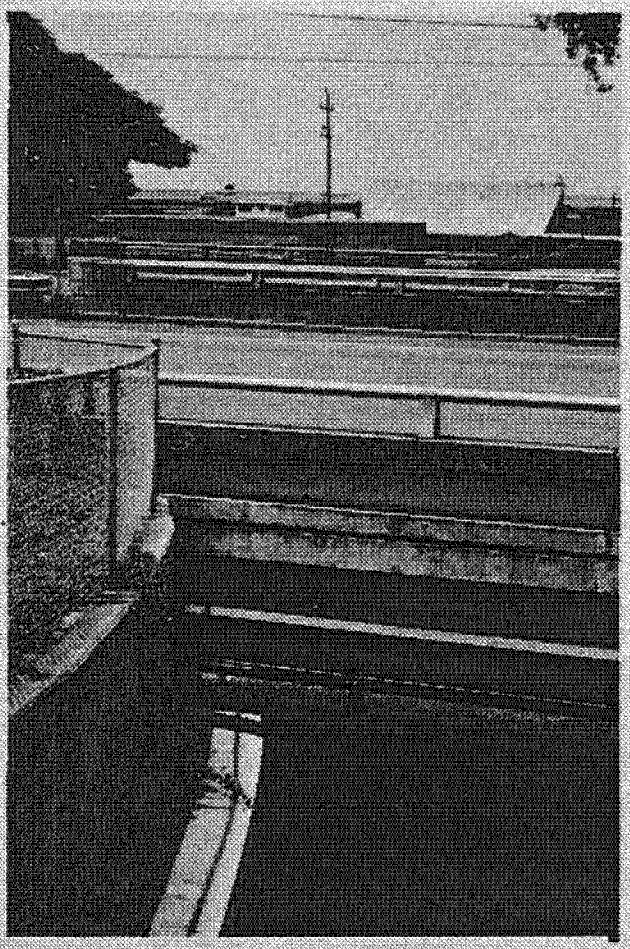
The structure is an important transportation link.

There are no public access vantage points and the view is poor.

The aesthetics are poor.

AR00042439





Pearl City Bridge (East)

AR00042440

The Pearl City bridge (East) located on Kamehameha Highway .100 of a mile east of the intersection with Lehua Avenue was originally built in 1936 then reconstructed in 1962. W. D. Bartel was the design engineer for the State of Hawaii Department of Transportation during the reconstruction. The builders are unknown.

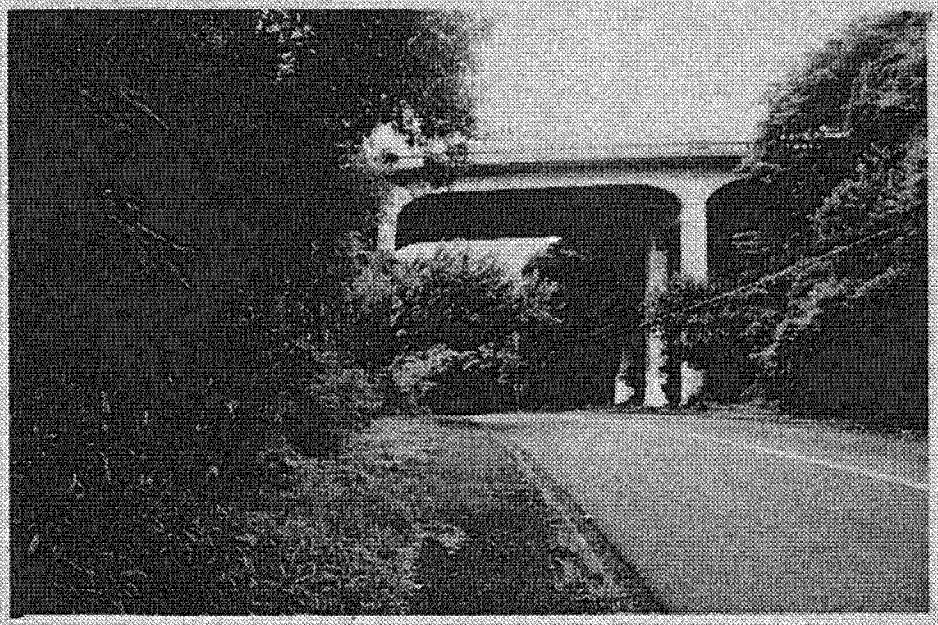
The bridge is a one span reinforced concrete deck girder and a pre-stressed concrete girder structure, 38' in total length and 54' wide. The design load capacity is H-20. The abutments are made of reinforced concrete and pipe. There is a 5' sidewalk on the right side. The design integrity is not intact.

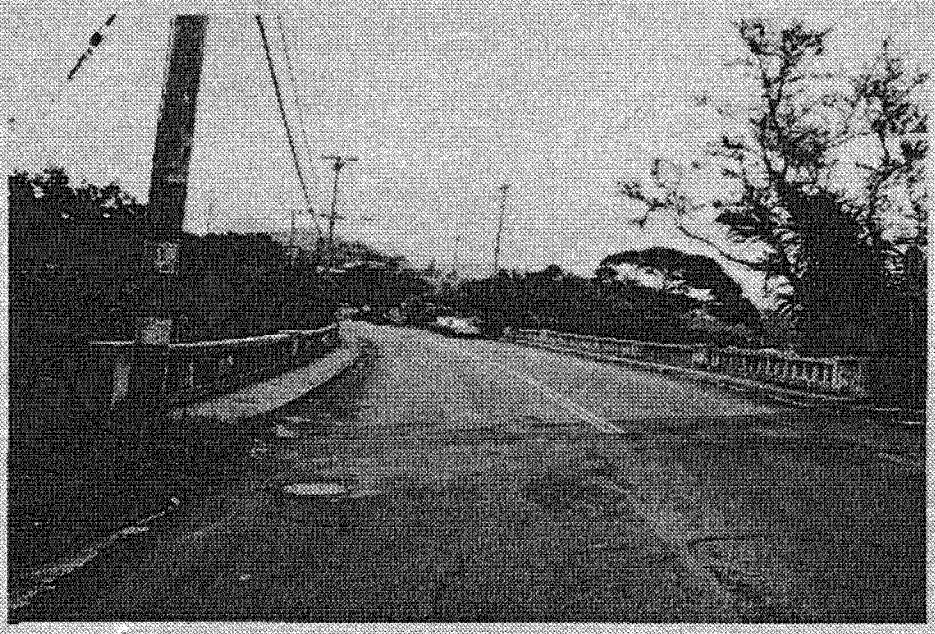
The structure is an important transportation link between Pearl City and Honolulu.

There are no public access vantage points and the view is poor.

The aesthetics are given a rating of poor.

AR00042441





Puowainia Drive Bridge

AR00042442

The Puowainia Drive bridge located on Auwaiolimu Street was built in 1936. The design engineer was W. F. Way. The City and County Engineer was B. F. Rush. The builder is unknown.

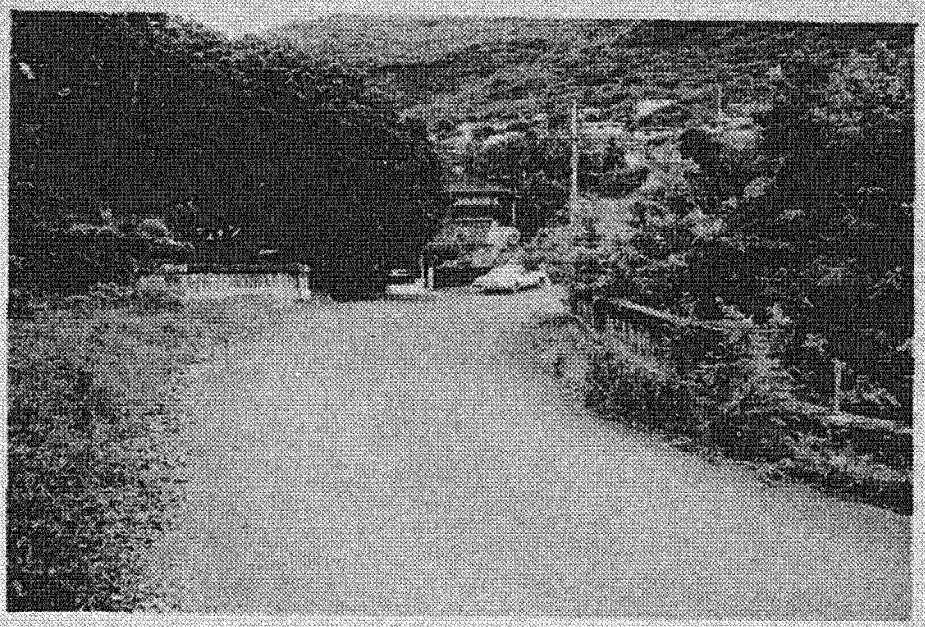
The bridge is a three span reinforced concrete tee beam deck girder structure, 122' in total length and 44' wide. It is 59.3' in height, from the road to the roadway. It has a design load capacity of H-20. The abutments and parapets are constructed of reinforced concrete. The design integrity is intact. The height is unique for downtown Honolulu.

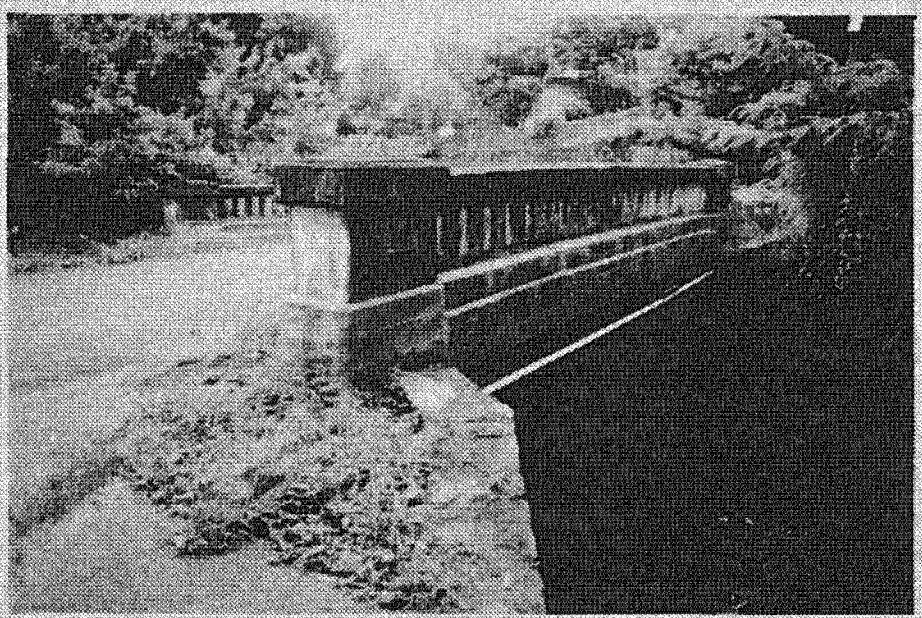
The bridge is an important transportation link between Punchbowl and downtown Honolulu. Its construction aided the economic growth of the area.

It has public access vantage points and the view is good.

The aesthetics of the structure are excellent.

AR00042443





Tenth Avenue Place Bridge

AR00042444

The Tenth Avenue Place bridge located across Waiomao stream was built in 1930. The builder is unknown.

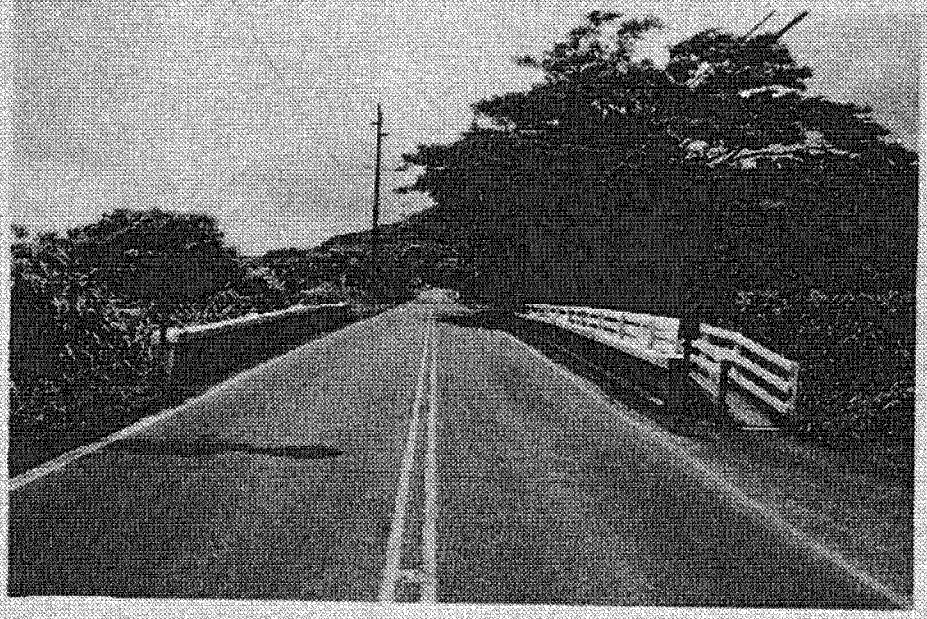
The bridge is a one span reinforced concrete tee beam deck girder structure 25' in total length, 27.3' wide, and 14.5' in height. The design load capacity is H-20. The abutments and parapets are made of reinforced concrete. The design integrity is intact.

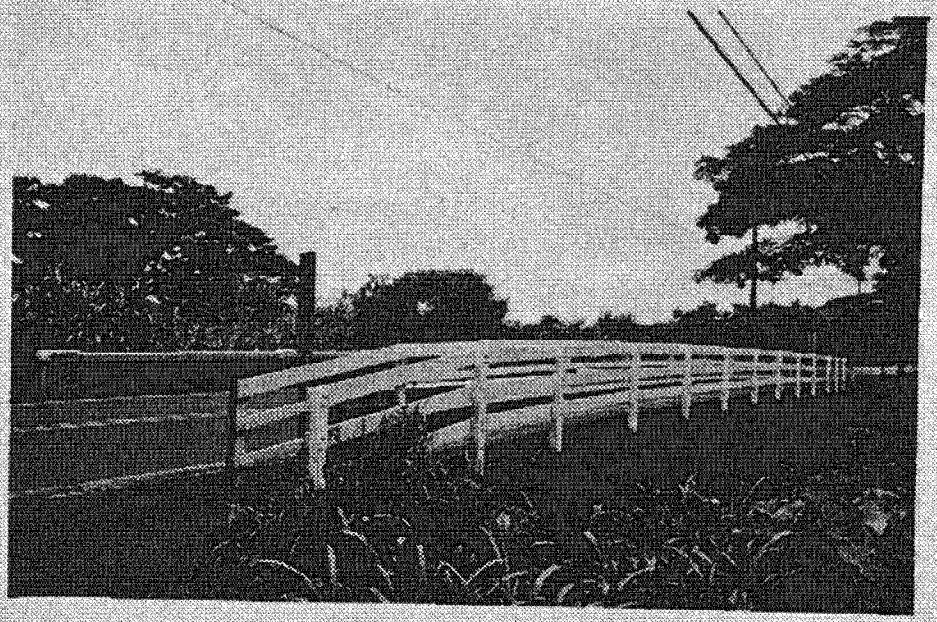
The structure is a transportation link between Palolo residential districts.

There are no public access vantage points but the view is good from private property locations.

The aesthetics are given a rating of average.

AR00042445





Waiahole County Bridge

AR00042446

The Waiahole County bridge located on Kamehameha Highway 1.044 of a mile south of the intersection with Waiahole Valley Road was built in 1922. The design engineer was R. W. Mowry and Fred Ohrt was the City and County Engineer. The builder is unknown.

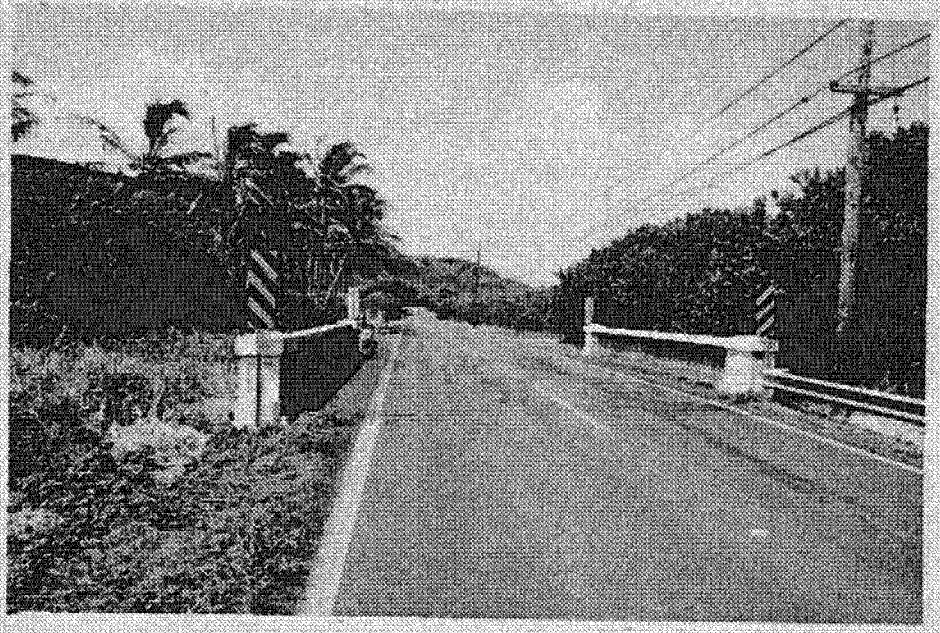
The bridge is a two span reinforced concrete deck girder structure 66' in length and 26.2' wide. The design load capacity is H-10. The abutments and parapets are made of reinforced concrete. There is a woodenwalkway with railings on the right side. The design integrity is not intact.

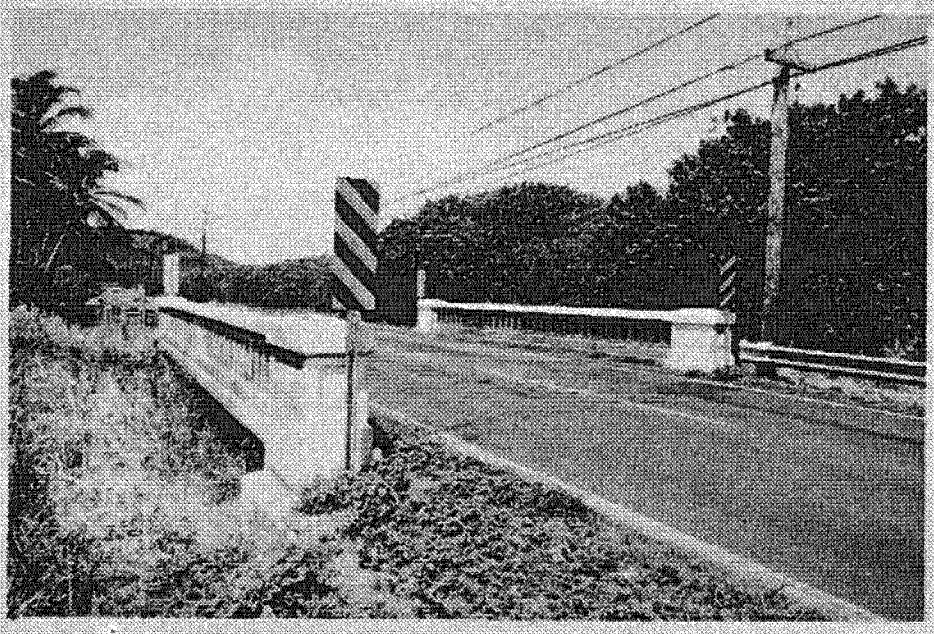
The structure is an important transportation link between Windward communities.

There are no public access vantage points and the view is poor.

The aesthetics are given a poor rating.

AR00042447





Waialee Bridge

AR00042448

The Waialee bridge located on Kamehameha Highway 1.061 of a mile northeast of the intersection with Kaunala Street was built in 1931. The contractor was E. K. Sugihara who was awarded a contract for $189,940.80 to build four bridges and a road from Waialee to Kahuku.* [5]

The bridge is a one span reinforced concrete deck girder structure 39' in length and 27.5' wide. It has a design load capacity of H-15. The abutments and parapets are made of reinforced concrete. The design integrity is intact.

The structure is an important transportation link between Windward communities.

There are no vantage points for public access. The view is good.

The aesthetics are given a rating of poor.

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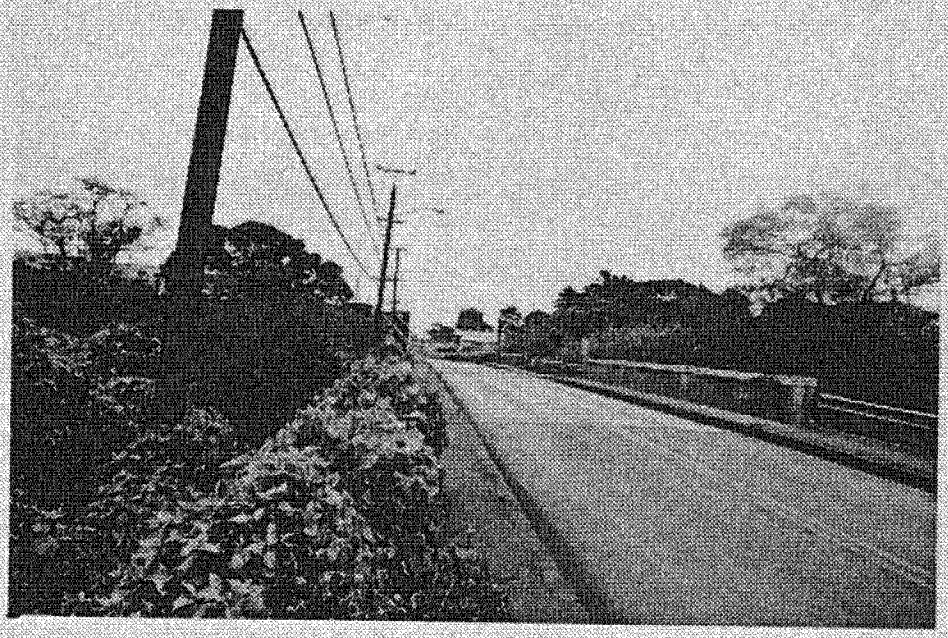
*Kuilima, Kawela and Nanahu bridges are the other structures included in this contract for the Waialee belt-road.

AR00042449



Waialua Twin Bridge

AR00042450

The Waialua Twin bridge located on Kamehameha Highway over Halemano stream .343 of a mile north of the intersection with Waialua Beach Road was built in 1928. The contractor was John K. McCandless, one of Honolulu's prolific builders and prominent businessmen. He constructed both of the bridges for a sum of $64,615.93. [5]

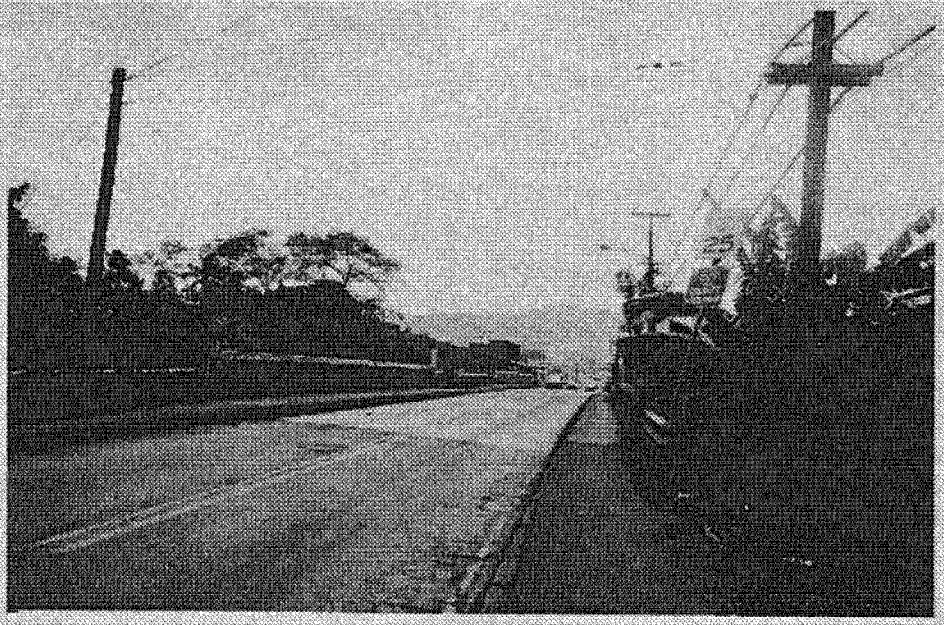
The bridge is a one span reinforced concrete deck girder, 65' in length, 30.1' wide, and 20' in height. It has a design load capacity of H-15. The abutments and parapets are constructed of reinforced concrete and stone masonry. There is a 4' sidewalk on each side. The design integrity is intact.

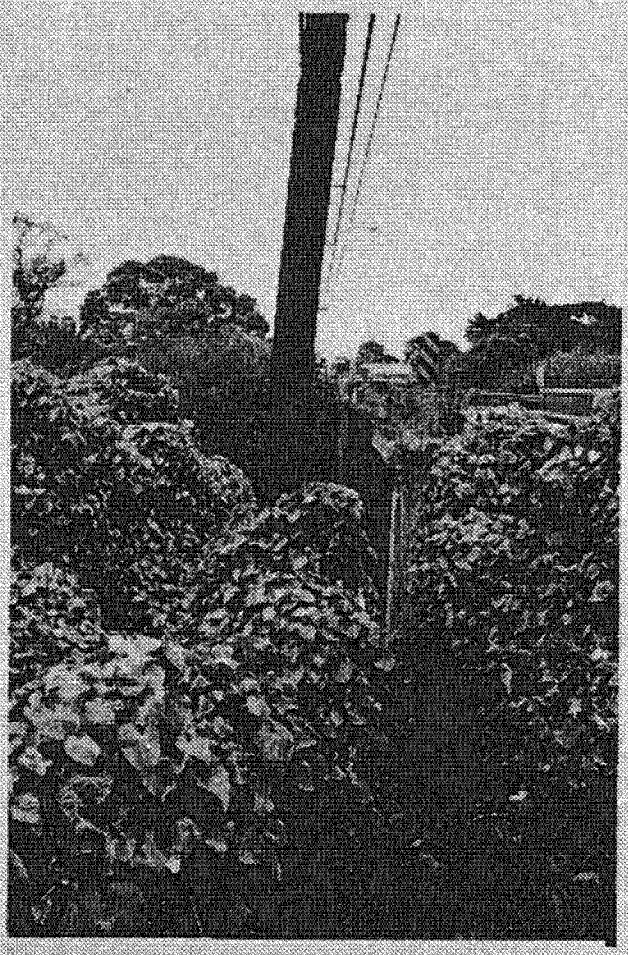
The bridge is an important transportation link between Haleiwa and Leeward. It aided in the commercial growth of the area and is associated with a famous builder.

There are no public access vantage points but the view is good from private property.

The aesthetics are rated excellent.

AR00042451





Waialua Twin "B" Bridge

AR00042452

The Waialua Twin "B" bridge located on Kamehameha Highway across Opaeula stream .356 of a mile north of the intersection with Waialua Beach Road, was built in 1928. The contractor was John K. McCandless, one of Honolulu's prolific builders and prominent businessmen. He constructed both of the Twin bridges for a sum of $64,615.93. [5]

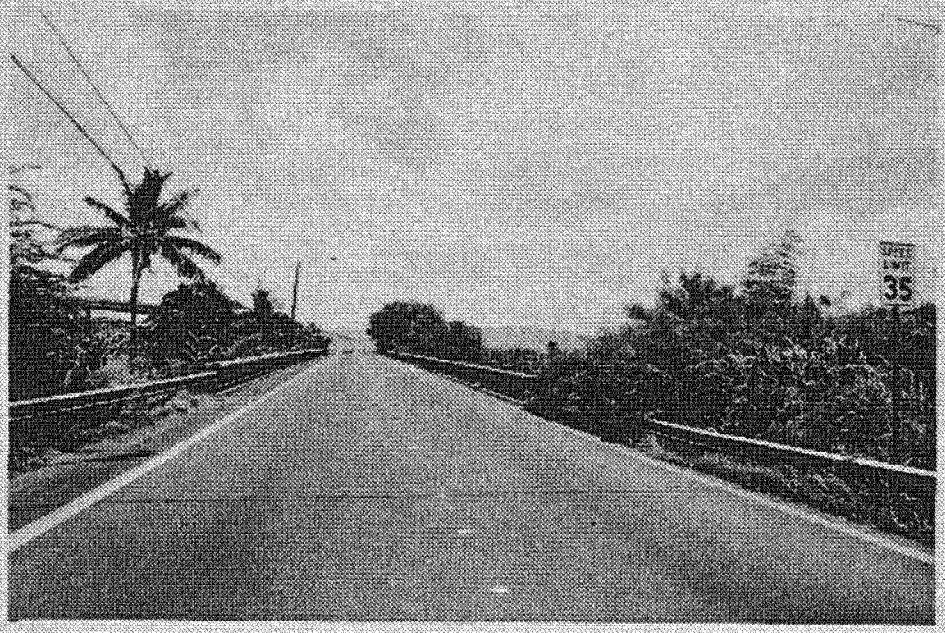
The bridge is a one span reinforced concrete deck girder structure, 65' in length, 30' in width, and 20' in height. The design load capacity is H-15. The abutments and parapets are constructed of reinforced concrete. There are 4' sidewalks on both sides. The design integrity is intact.

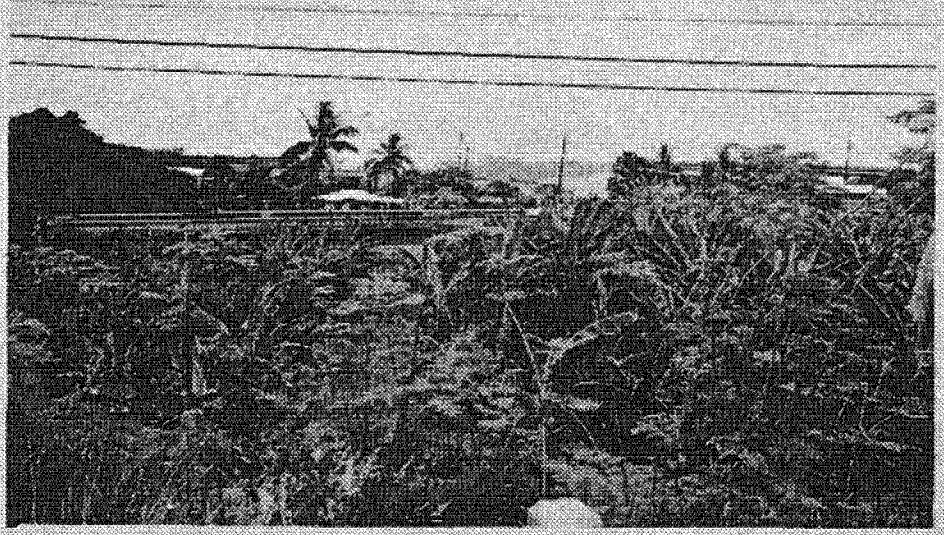
The structure is an important transportation link between Haleiwa and Leeward. It aided in the commercial growth of the area and is associated with a famous builder.

There are no vantage points available for easy public access but the view is good from private property sites.

The aesthetics are excellent.

AR00042453





Waiawa Bridge (Westbound)

AR00042454

The Waiawa bridge (Westbound) located on Farrington Highway .138 of a mile east of the intersection with the Leeward Community College access road was built in 1938. The contractor was John L. Young, a prolific builder and prominent Honolulu businessman. The John L. Young Contracting Company was awarded a contract of $89,466.02. The design engineer was Merritt A. Trease.

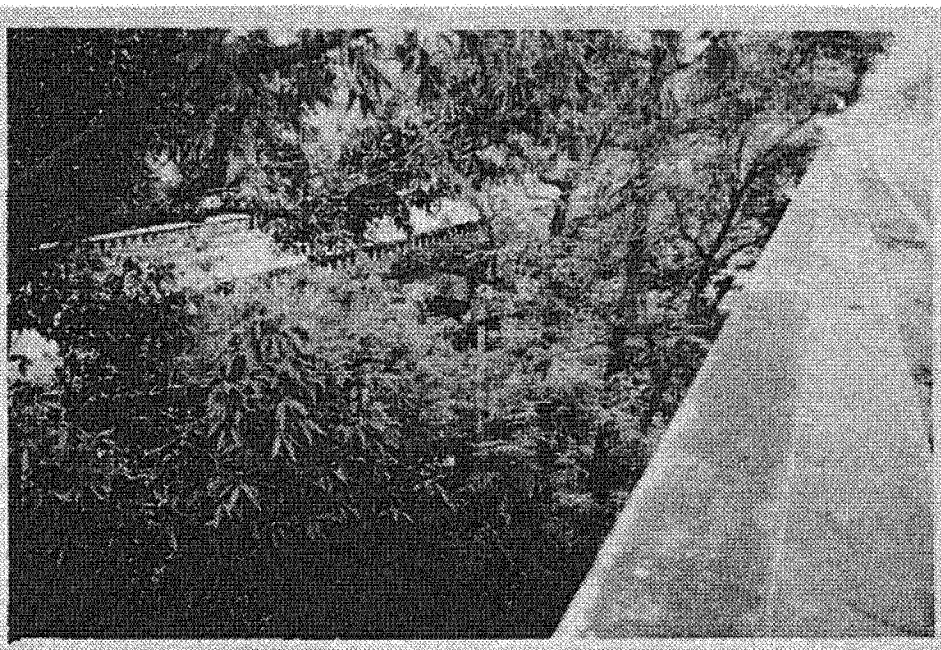
The bridge is a six span reinforced concrete continuous deck girder structure 332' in length, 33.7' wide, and 30' in height. It has a design load capacity of H-20. The abutments and parapets are made of reinforced concrete. The design integrity is intact.

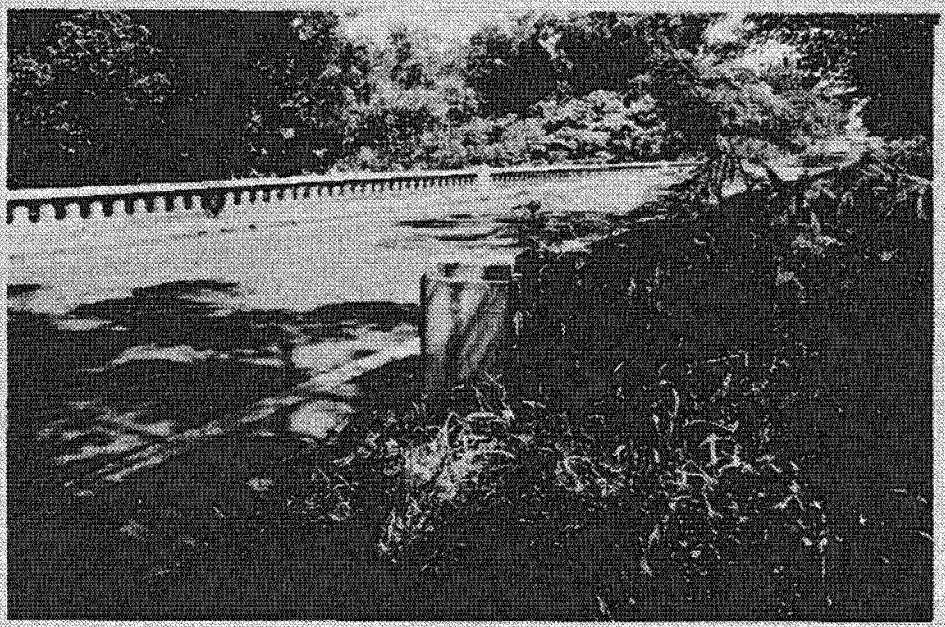
The structure is an important transportation link between Waipahu and Pearl City and associated with a prolific builder.

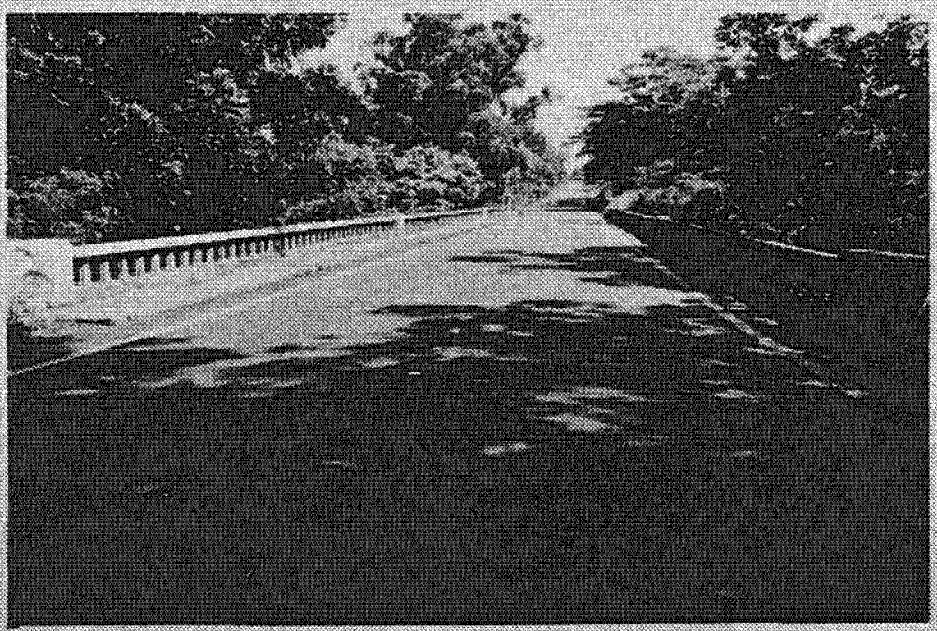
There are no vantage points for public access and the view is poor.

The aesthetics of the scene are average.

AR00042455







Waiakakalaua Bridge

AR00042456

The Waikakalaua bridge located on Kamehameha Highway .712 of a mile south of the intersection with Lehua Avenue was built in 1936. The builder is unknown.

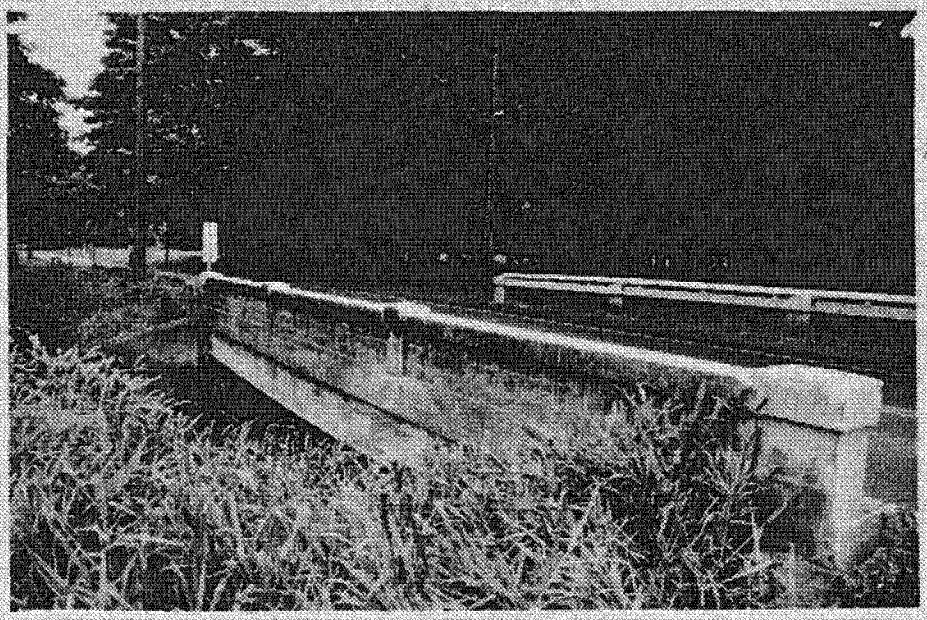
The bridge is a three span reinforced concrete continuous beam structure, 225' in length, 37.9' wide, and 38' in height. The design load capacity is H-15. The abutments and parapets are made of reinforced concrete. The design integrity is intact.

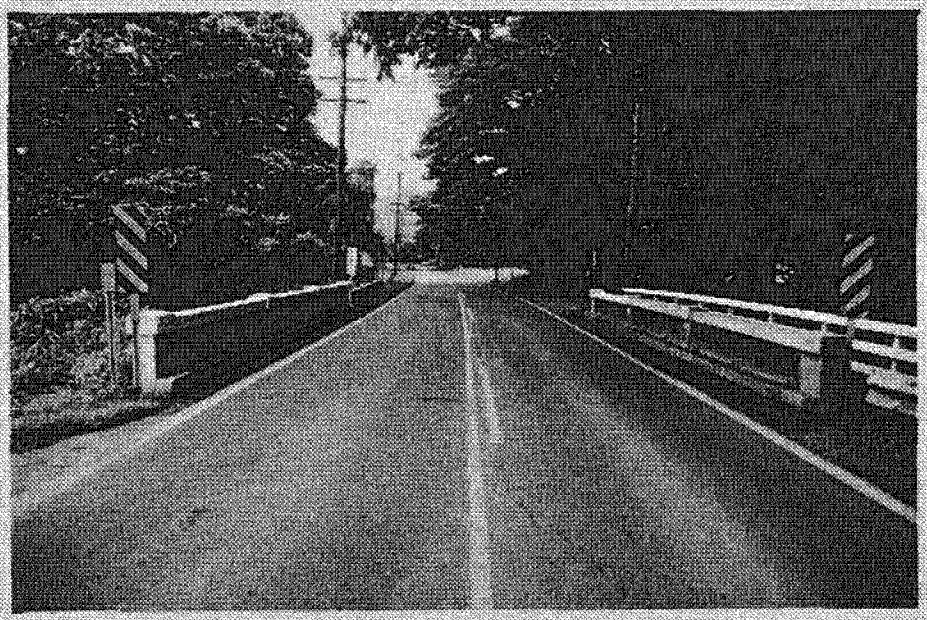
The structure is an important transportation link between North Shore and Leeward.

There are no easily accessible vantage points for public access and the view is poor.

The aesthetics are given a rating of average.

AR00042457





Waikane Bridge

AR00042458

The Waikane bridge located on Kamehameha Highway .342 of a mile south of the intersection with Johnson Road was built in 1928. The builder is unknown.

The bridge is a one span reinforced concrete deck girder structure 44' in length and 27' wide. It has a design load capacity of H-15. The abutments and parapets are made of reinforced concrete. There is a wooden walkway on the right side. The design integrity is not intact.

The structure is an important transportation link between Windward communities.

There are no public access vantage points but the view is good.

The aesthetics are given a rating of poor.

AR00042459

Waikele Bridge (Eastbound)

AR00042460

The Waikele bridge (Eastbound) (Inbound) located on Farrington Highway .220 of a mile east of the intersection with Waikele Road, was built in 1939. The builder is unknown.

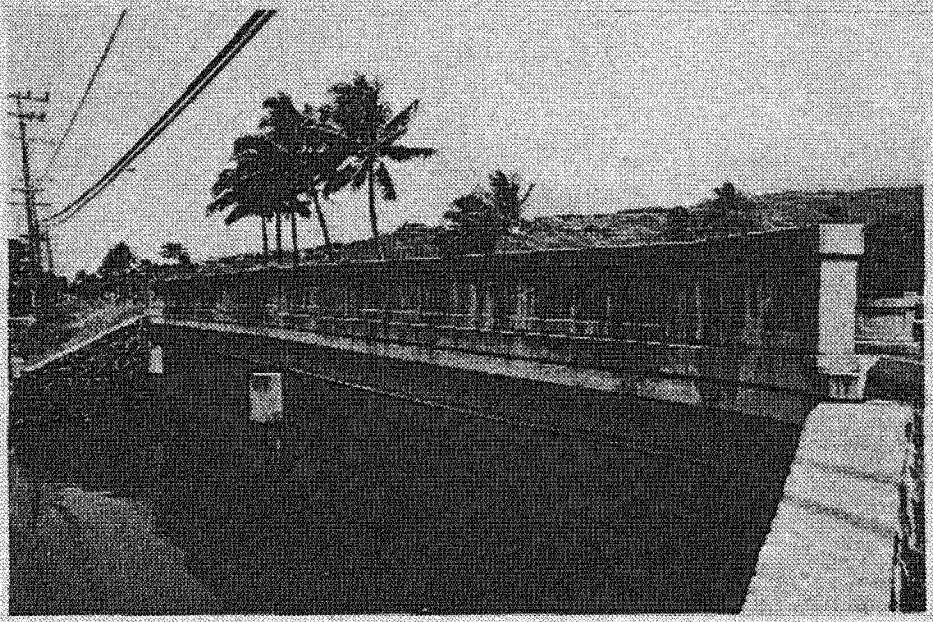
The structure is a three span reinforced concrete deck girder, 130' in length, 32' wide, and 48' in height. The design load capacity is H-15. The abutments and parapets are constructed of reinforced concrete and there are 3' sidewalks on both sides. The sparse use of concrete on the columns is unusual for this time in terms of geometric configuration. The design integrity is intact.

The structure is an important transportation link between Leeward communities.

The public has access to vantage points and the view is good.

The aesthetics of the scene are given an average rating.

AR00042461



Wailupe Bridge (Inbound)

The Wailupe bridge (Inbound) located on Kamehameha Highway .081 of a mile west of the intersection with East Hind Drive was built in 1930. The contractor was L. L. McCandless, a prolific builder and one of Honolulu's prominent businessmen.[13] The total cost of the original structure was $22,602.64.[5] It was reconstructed in 1964. The original design engineer was G. K. Dawson and the Territorial Highway Engineer Lyman Bigelow.

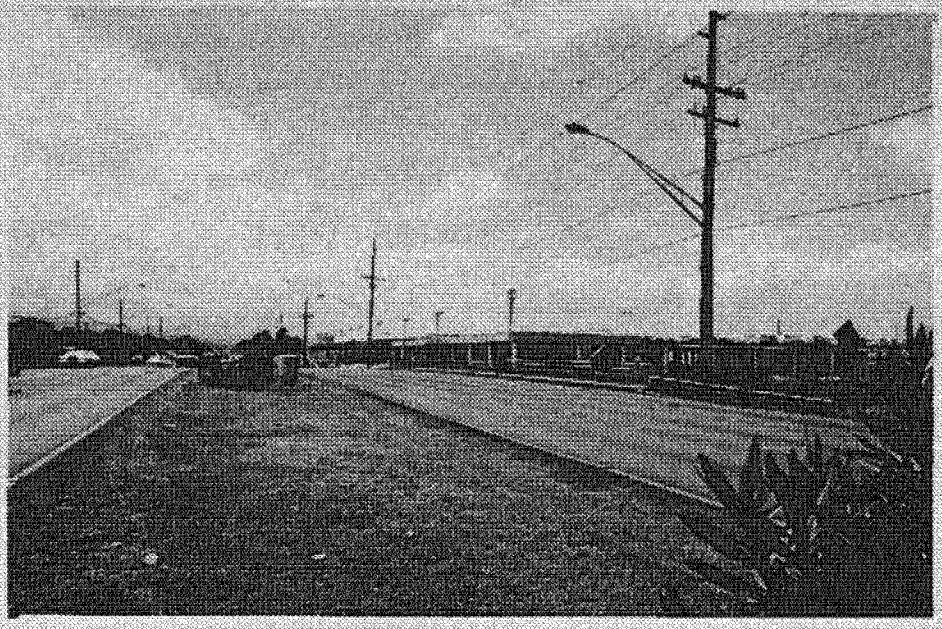
The bridge is a two span reinforced concrete deck girder structure 60' in total length and 47.9' wide. The design load capacity is H-15. The abutments and parapets are made of reinforced concrete. The design integrity is intact.

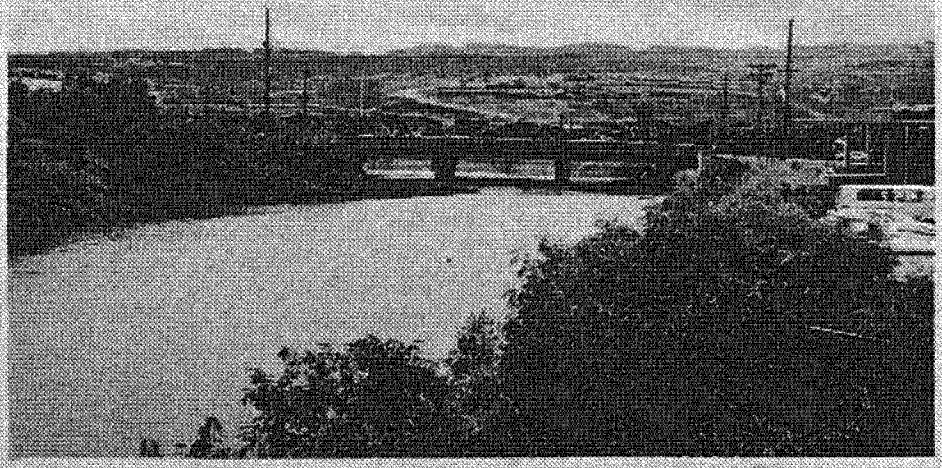
The structure is an important transportation link between Hawaii Kai residents and downtown Honolulu.

There are no vantage points for public access but the view is good from private property.

Aesthetically the scene is given a poor rating.

AR00042463





Waimalu (East) Bridge

VII-138

AR00042464

The Waimalu (East) bridge located on Kamehameha Highway .135 of a mile east of the intersection with Pearl Harbor Park Road was originally built in 1936 then reconstructed in 1966. W. D. Bartel was the Chief Engineer for the State of Hawaii Stransportation Department for the reconstruction. The builders are unknown.

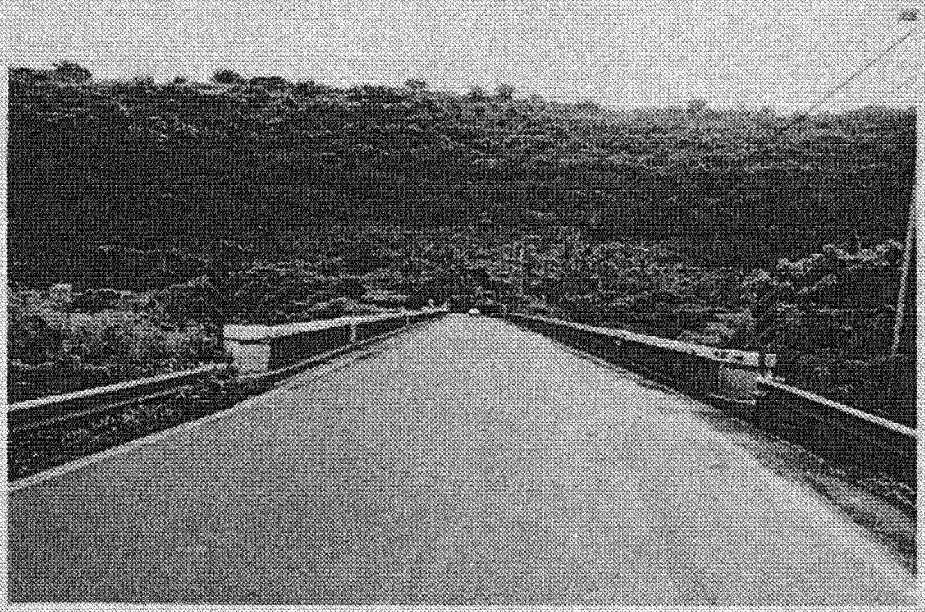
The bridge is a three span reinforced concrete deck girder with a pre-stressed concrete girder structure. It is 145' in length, 48.1' wide, and 17' in height. It has a design load capacity of H-20. The abutments and parapets are made of reinforced concrete. There is a 4' sidewalk on the right and a 3' sidewalk on the left. There are pipe railings. The design integrity is not intact.

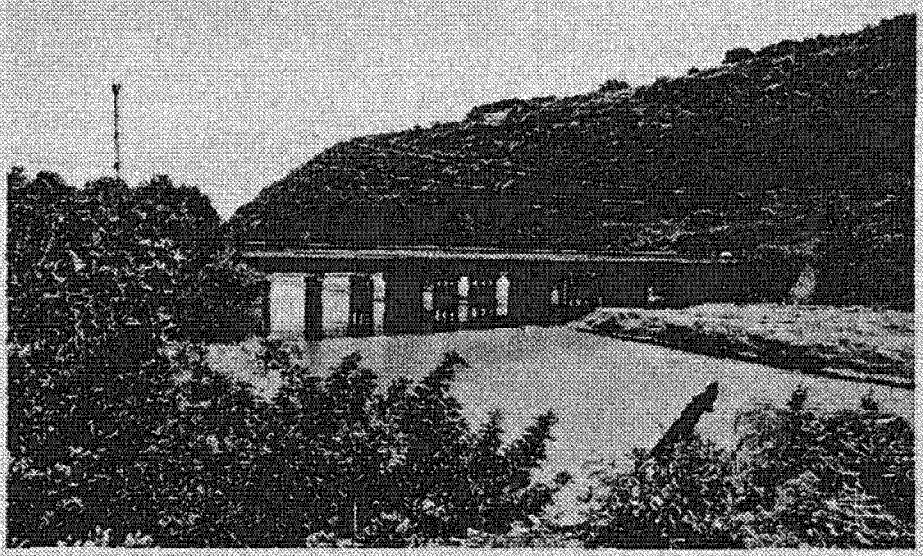
The structure is an important transportation link between Leeward and downtown Honolulu.

There are public access vantage points and the view is good.

The aesthetics are given a poor rating.

AR00042465





Waimea Bridge

AR00042466

The Waimea bridge located on Kamehameha Highway .039 of a mile northeast of the intersection with Waimea Beach Road, was built in 1930. The design engineer was R. W. Hendry. The contractor was the National Construction Company owned by John L. Young, who was awarded a contract of $279,689.92 to build the bridge in 1929. The National Construction Co. proved to be very unsatisfactory, claiming bankruptcy as the creditors foreclosed. A construction superintendent was then hired by the Territorial Department of Public Works and the Waimea bridge completed. [5,6]

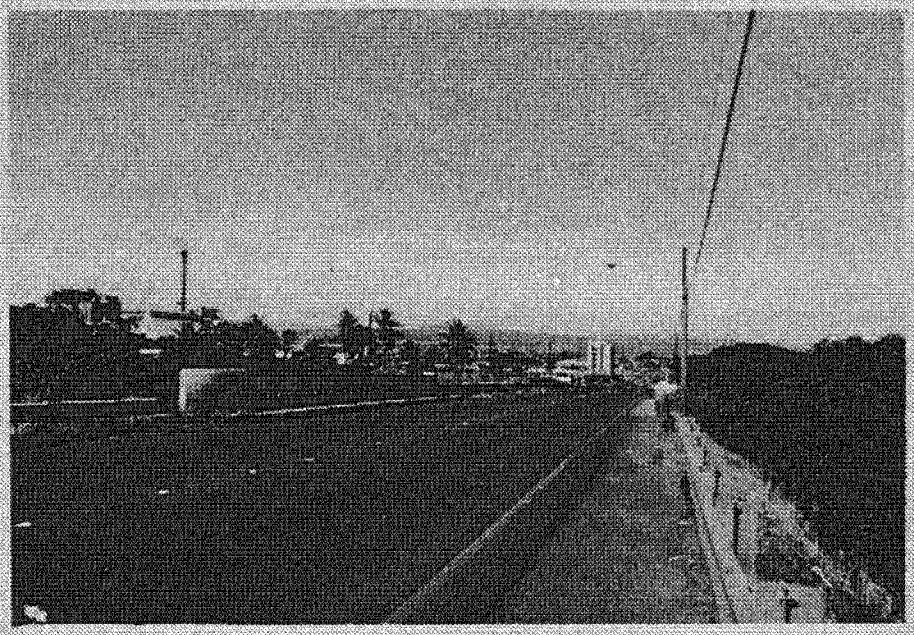
The bridge is a six span reinforced concrete deck girder structure, 268' in total length, 27.2' wide, and 23' in height. It has a design load capacity of H-15. The abutments and parapets are constructed of reinforced concrete. The design integrity is intact.

The bridge is an important transportation link between North Shore communities and is associated with a prominent Honolulu businessman. [13] The construction of the bridge aided in the economic growth of the area.

There are vantage points for easy public access and the view is good.

Aesthetically it is given an average rating.

AR00042467



Waipahu Railroad Overpass

AR00042468

The Waipahu railroad crossing overpass located on Farrington Highway .266 of a mile east of the intersection with Waikele Road, was built in 1939. The builder is unknown.

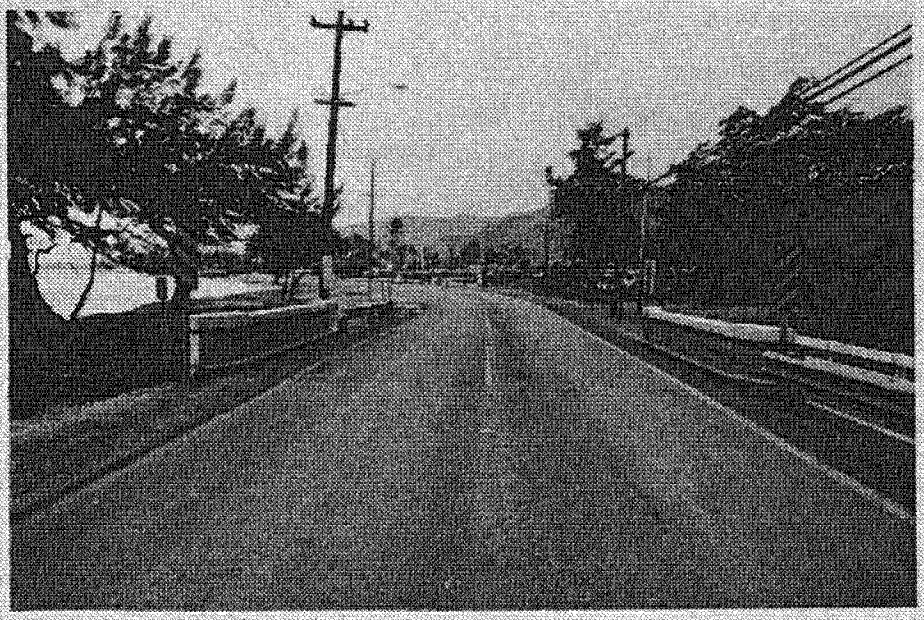
The structure is a one span reinforced concrete girder 50' in length, 32' wide and 24' in height. There are 3' sidewalks on both sides. The abutments and parapets are constructed of reinforced concrete. The design integrity is intact.

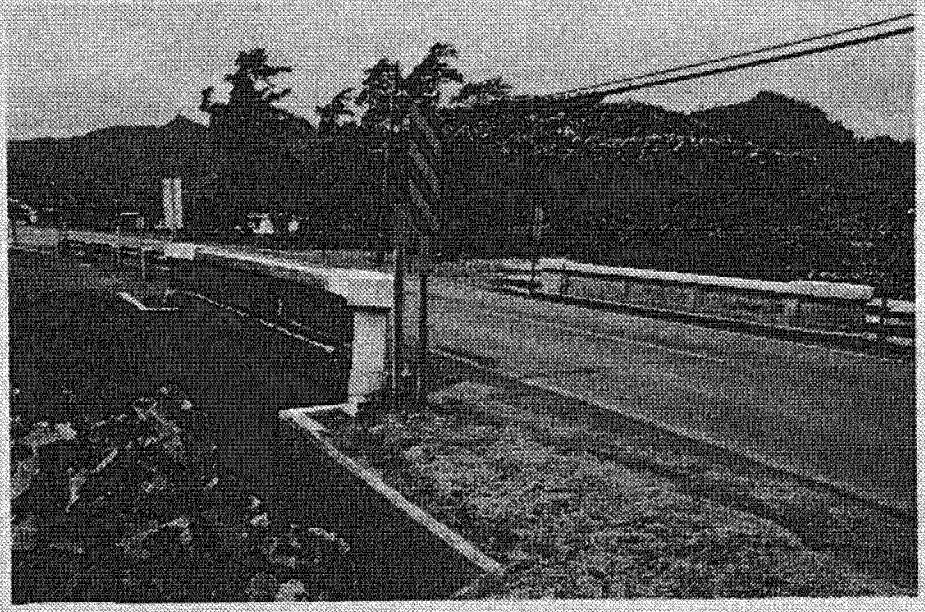
The structure is an important transportation link between Leeward communities.

There are vantage points for public access and the view is good.

Aesthetically it is rated poor.

AR00042469





Waipilopilo Bridge

AR00042470

The Waipiliopilo bridge located on Kamehameha Highway .034 of a mile southeast of the intersection with Imua Place was built in 1932. L. L. McCandless, a prolific builder and prominent Honolulu businessman, was the contractor.[13] He was awarded a contract of $190,117.51 to build a five mile road from Hauula to Kahuku that included the construction of seven bridges.*[5,6]

The bridge is a one span reinforced concrete deck girder 25' in total length and 27.3' wide. It has a design load capacity of H-15. The abutments and parapets are made of reinforced concrete. There is a wooden rail walkway on the right. The design integrity is not intact.

The structure is an important transportation link between Windward communities. It is also associated with a prominent Honolulu businessman.

The public has access to vantage points and the view is good.

Aesthetically it was judged average.

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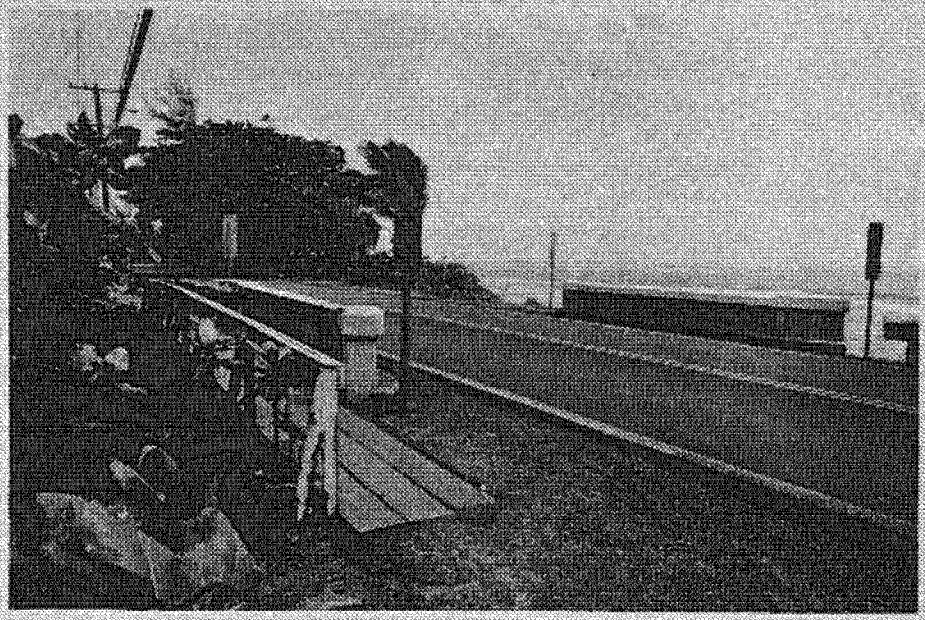
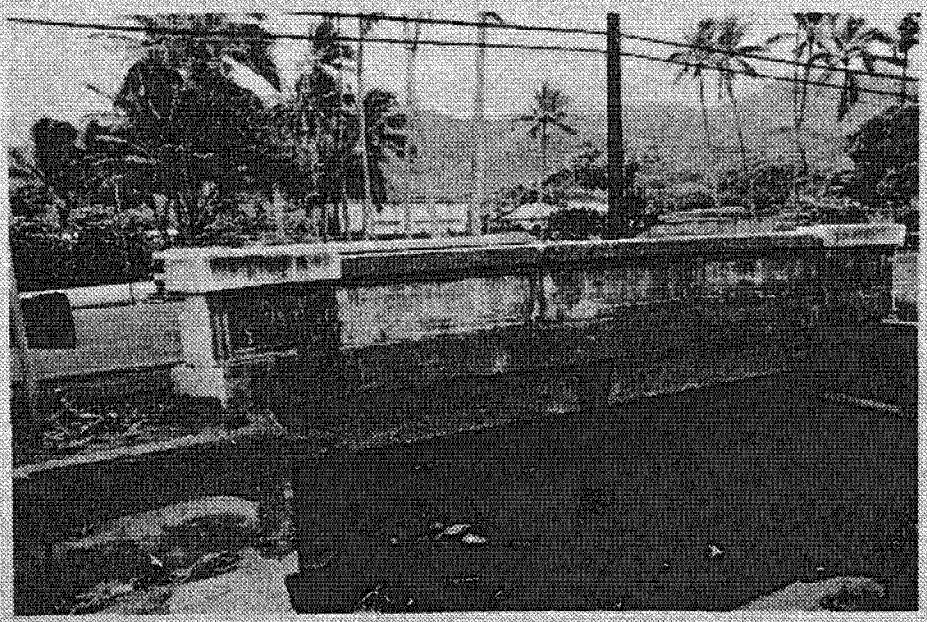
*Laiewai, Laiemaloo, Kaipapau, Muliwai, Hauula and Waipuhi are the other bridges built on this contract.

AR00042471





Waipuhi Bridge

AR00042472

The Waipuhi bridge located on Kamehameha Highway .222 of a mile southeast of the intersection with Kukuna Road was built in 1932. L. L. McCandless, a prolific builder and prominent Honolulu businessman, was the contractor.[13] He was awarded a contract of $190,117.51 to build a five mile road with seven bridges on it from Hauula to Kahuku.*[5,6]

The bridge is a one span reinforced concrete deck girder 24' in total length and 27.4' wide. It has a design load capacity of H-15. The abutments and parapets are made of reinforced concrete. There is a wooden rail walkway on the right. The design integrity is not intact.

The structure is an important transportation link between Windward communities. It is also associated with a famous Honolulu businessman.

There are vantage points for public access and the view is good.

Aesthetically the scene is judged average.

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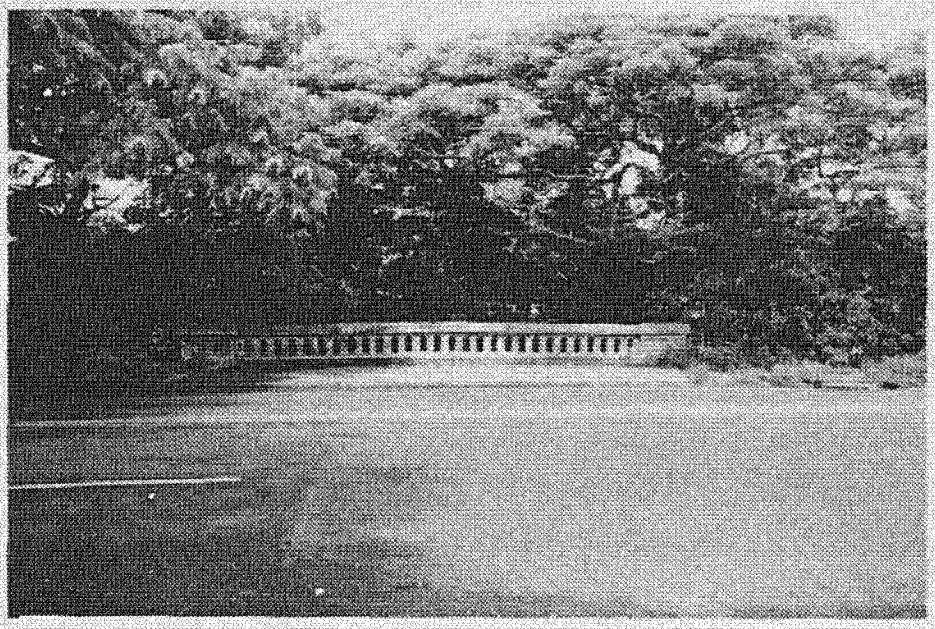
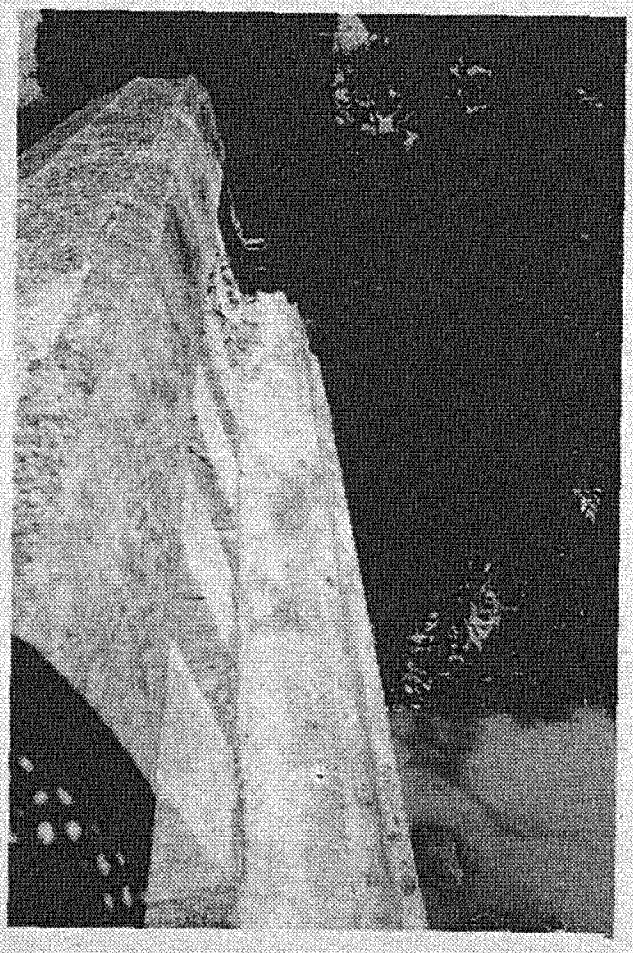
*Laiewai, Laiemaloo, Kaipapau, Waipilopilo, Muliwai and Hauula are the other bridges built on this contract as part of this belt-road.

AR00042473





Wyllie Street Bridge

AR00042474

The Wyllie Street bridge located across Waiolani stream 1200' west of the intersection with Nuuanu Street was built in 1931. The design engineer was G. K. Dawson. R. S. Mowry was the City and County Engineer. The builder is unknown.

The bridge is a one span reinforced concrete deck girder tee beam structure 33' in length, 58.8' wide, and 16' in height. The design load capacity is H-10. The abutments and parapets are made of reinforced concrete. There is a sidewalk on each side. The design integrity is intact.

The structure is an important transportation link.

There are no vantage points for easy public access, but the view is good from private properties.

Aesthetically the scene is judged to be average.

AR00042475

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[8] "Lincoln Loy McCandless, Political Veteran Dies."
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[9] "Lo-Ko Ea Bridge." Star Bulletin, 3/30/76.

AR00042476

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[11] E. E. Black
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AR00042477

CONCRETE GIRDER

OR

FLAT SLAB

AR00042478

The concrete girder or flat slab bridge became a popular construction form after 1875 in the United States. The early structures were of a plain or mass concrete, which possesses the same structural properties as stone; compressive but no tensile strength. The process of reinforcing concrete was discovered by R. Jean Monier of France, then was applied to the construction of bridges throughout the world.

The first Americans to experiment with the concept of reinforced concrete for bridge building were W. E. Ward in 1872, S. Bissel in 1881, and Thomas Clarke in 1885. Parallel metal I beam reinforcement was devised by Joseph Melan in the 1890's and popularized in the U.S. by Fritz von Empberger. [7] He is given credit for heralding a new and unimaginative era of bridge design that lasted over a half a century, limiting concrete to the traditions of stone masonry.

C. A. P. Turner invented the cylindrical mushroom slab column, but when loadings are not too great, the mushroom capital has been eliminated with the result that the slab form of construction has become prevalent in expressway bridges and vehicular viaducts of a more modern design. The basic flat slab reinforced concrete bridges built before 1940 are no longer being constructed. [7]

There is one rigid frame concrete structure included in this classification of bridge types, thus some brief mention should be made of its origins and significance in terms of design. One of the most important bridge building developments America imported from Germany was the rigid frame,

AR00042479

first introduced in the early 1920's by the American engineer Arthur Hayden who built seventy-four bridges in New York between 1922 and 1930, all of the rigid frame type. It was a very economical and swift method for building bridges where costs had to be minimized.

Architecturally the rigid frame suggests a lightness and fineness of structure that attempts to free concrete from the confines of stone masonry but this form has been superseded by the characterless stamp of pre-fabrication design obvious in pre-stressing. Pre-stressing then, proved to be the more economical system. The Date Street bridge is the only remaining rigid frame reinforced concrete structure on Oahu.

The reinforced concrete girder or flat slab bridges were acceptable structures in the late nineteenth and early twentieth century design annals because they were also economical to build, but architecturally they are a disappointing use of concrete, indicating the properties of the material were not clearly understood until a much later date. [9] This was not true of European bridge design where engineering expertise and the workers' tradition of fine craftsmanship combined to use concrete in new and sparing forms. This latter type of reinforced concrete bridge design did not become popular in the U.S. until a much later date, around 1950. The concrete girder or flat slab bridges of Oahu follow the earlier mainland architectural trend in terms of building durable but uninspiring structures.

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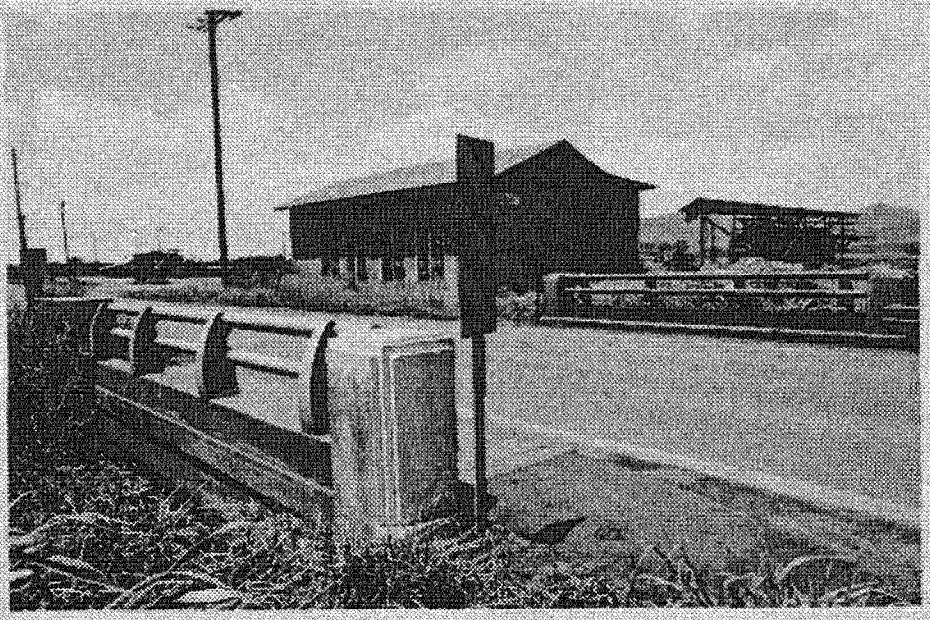


Brodie Camp No. 2 Bridge

AR00042481

The Brodie Camp #2 bridge on Kamehameha Highway crossing a stream .010 of a mile south of the intersection with Pupukea Road was built in 1937. Louis Cain was the Territorial Highway Department Engineer. E. E. Black reported that he recalls E. J. Lord as the builder.[8]

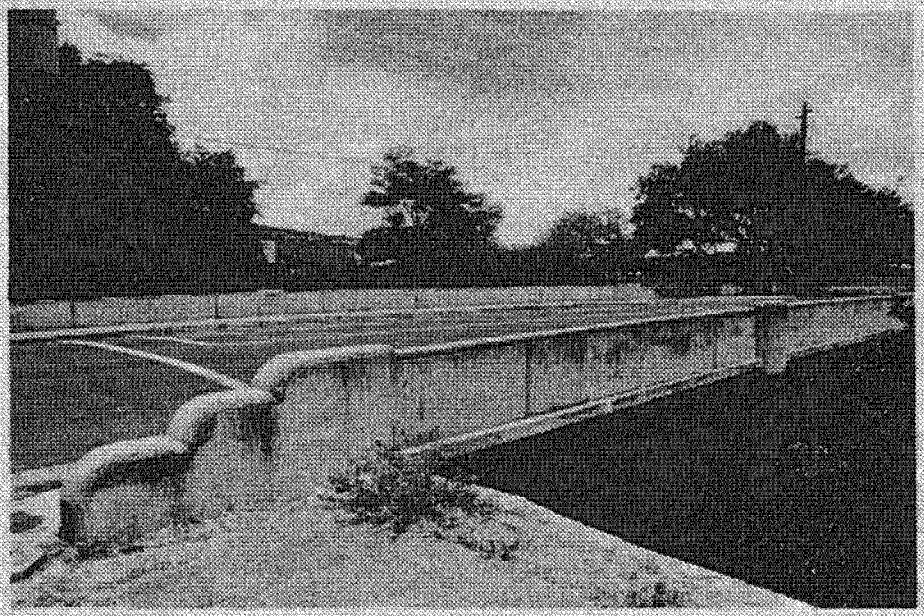
The bridge is a reinforced concrete flat slab 20' in length, 30.9' in width. It has a design load capacity of H-15. The railings are steel pipe and the parapets and abutments of reinforced concrete. There is a 5' sidewalk on the left side. The design integrity is intact.

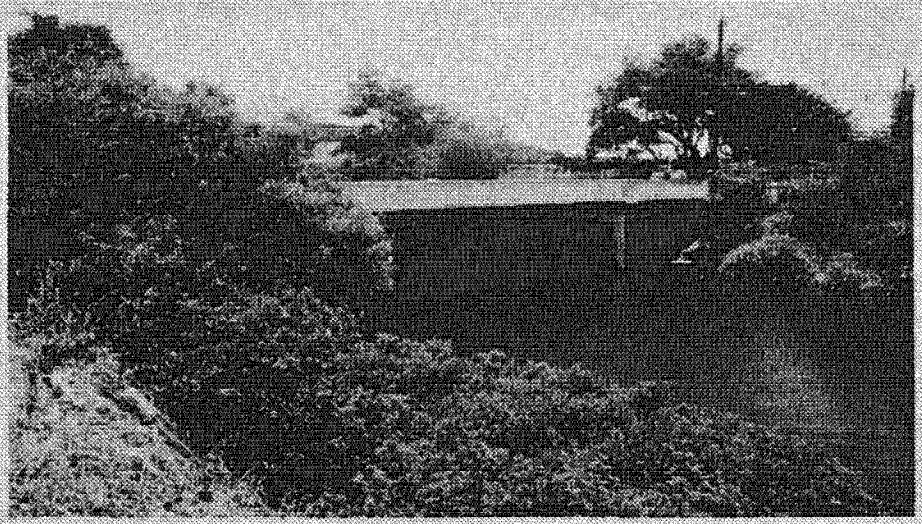
The structure is a transportation link between North Shore and Leeward communities and is apparently associated with a famous Honolulu builder.

There are vantage points available for easy public access and the view is good.

The aesthetics are rated poor.

AR00042482





Date Street Bridge

AR00042483

The Date Street bridge across the Manoa-Palolo stream at the intersection of Laau St. was built in 1937 under the direction of the City and County of Honolulu. The builder is unknown.

It is a rigid frame reinforced concrete girder flat slab structure, with three spans for a total length of 114' and a total width of 57.2'. The design load capacity is H-20. The slender abutments, parapets and railing walls are made of concrete. There are 5' sidewalks on both sides. The design integrity is intact. It is unique in its geometric construction. It possesses curved abutments.

The bridge is an important transportation link for the residents of the area to downtown Honolulu.

There are vantage points for easy public access and the view is good.

The aesthetics are excellent.

AR00042484

Farrington Highway Bridge (Fort Barrette Stream)

AR00042485

The Farrington Highway bridge across Fort Barrette stream was a City and County project built by Lincoln Loy McCandless, a prolific Honolulu builder and prominent businessman, in 1922. He was awarded a contract of $553,849.74 to build a road beginning at Railway Station #246, Honouliuli, extending 9.1 miles toward Waianae.[5,11] A total of ten bridges was included in the contract. The City and County Engineer was Fred Ohrt.

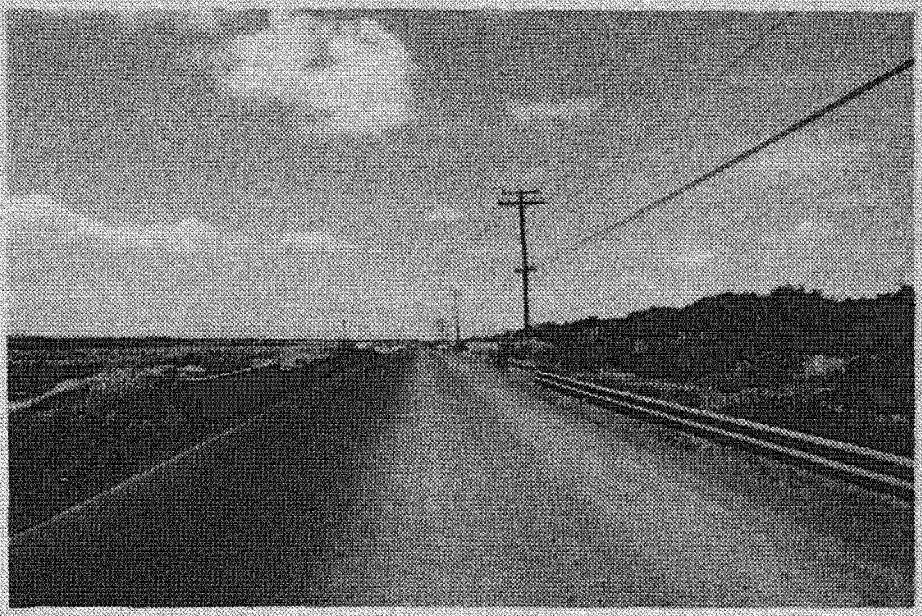
The Farrington Highway bridge across Ft. Barrette stream is a concrete slab one span structure, 20' in length and 27' wide. It has a design load capacity of H-10. The abutments are constructed of concrete as are the railings. The design integrity is intact.

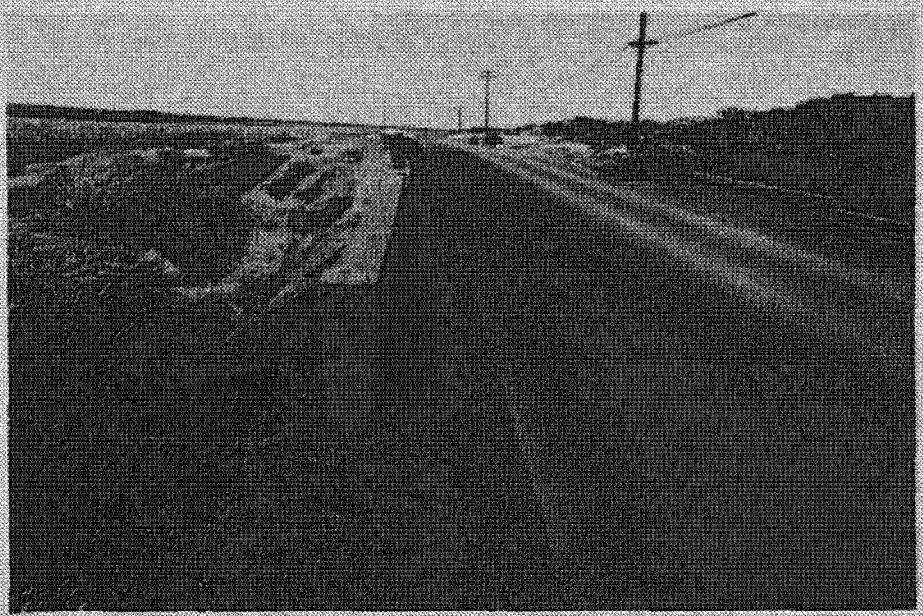
The bridge was an important transportation link for Ewa and Leeward communities. It is primarily used as a cane-haul road.

There are vantage points for public access. The view is poor.

Aesthetically it is rated poor.

AR00042486





Farrington Highway Bridge (Palehua Stream)

AR00042487

The Farrington Highway bridge across Palehua stream was a City and County project built by Lincoln Loy McCandless, a prolific builder, in 1922. He was awarded a contract of $553,849.74 to build a road beginning at Railway Station 246, Honouliuli, extending 9.1 miles towards Waianae. [5,11] A total of ten bridges was included in the contract. The City and County Engineer was F. Ohrt.

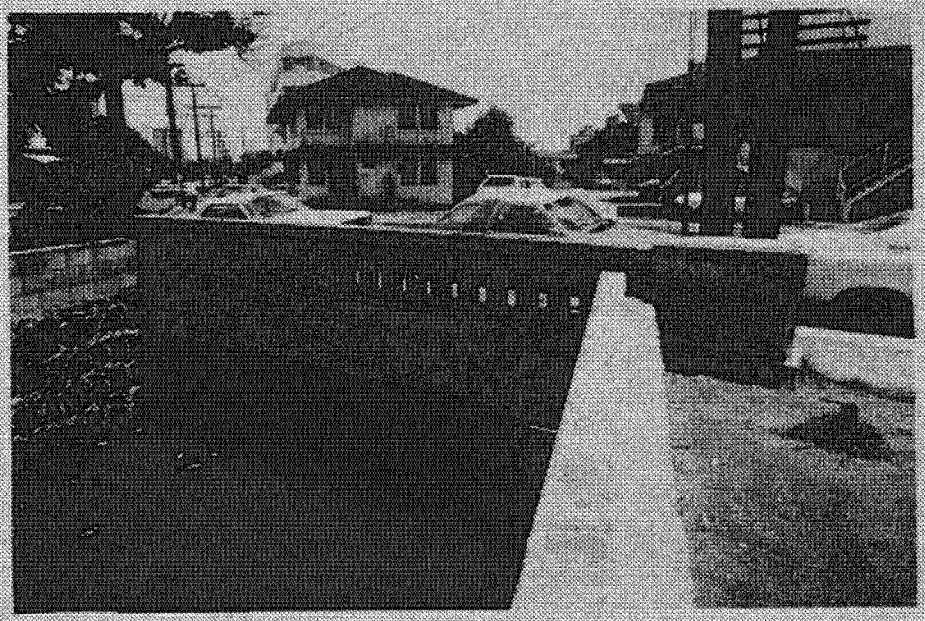
The Farrington Highway bridge across Palehua stream is a simple concrete slab one span structure, 22' in total length and 27' wide. It has a design load capacity of H-10. There are slender reinforced concrete abutments and railings. The design integrity remains intact.

The bridge was an important transportation link between Ewa and Waianae. It is now used primarily as a cane-haul road.

There are vantage points for public access. The view is good.

Aesthetically the scene is rated poor.

AR00042488



Fern Street Bridge

AR00042489

The Fern Street bridge over Makiki stream was built in 1931 by the City and County of Honolulu. It was part of the old Robinson tract. The design engineer was R. H. Whitehouse. The builder is unknown.

The bridge is a one span reinforced concrete flat slab 23' in length, 55.3' in width. It has a design load capacity of H-20. The structure has cement abutments and railings with an 8' wide sidewalk on both sides. The design integrity is intact.

The structure is a transportation link for residents of the area.

There are vantage points for public access. The view is good.

Aesthetically the scene is rated poor.

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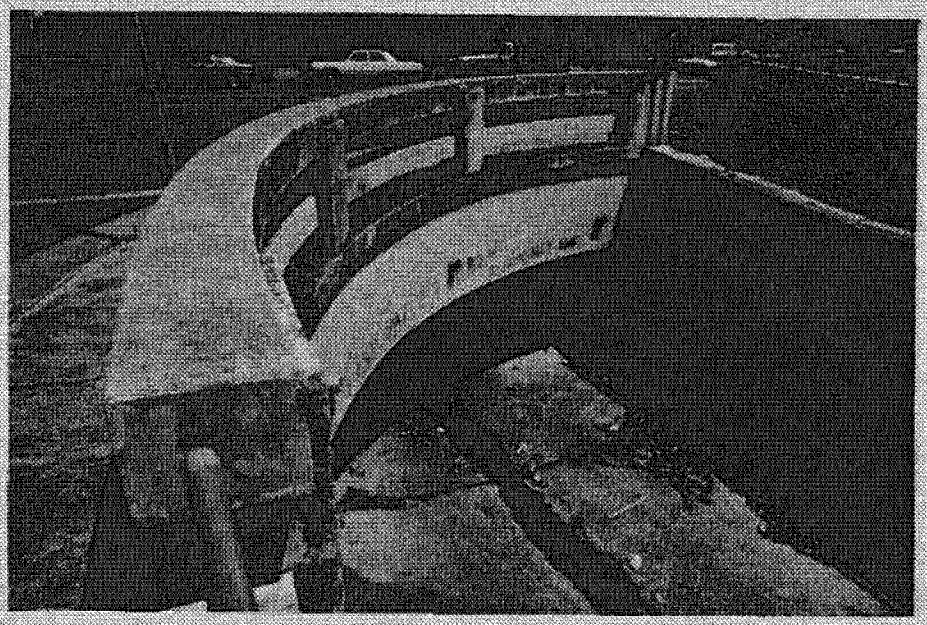


Houghtailing Street Bridge

AR00042491

The Houghtailing Street bridge over a part of the Kapalama drainage canal was originally built in 1937 then reconstructed in 1964 by the City and County of Honolulu. The City and County engineer was B. F. Rush. The design engineer was George K. Dawson. The builder is unknown.

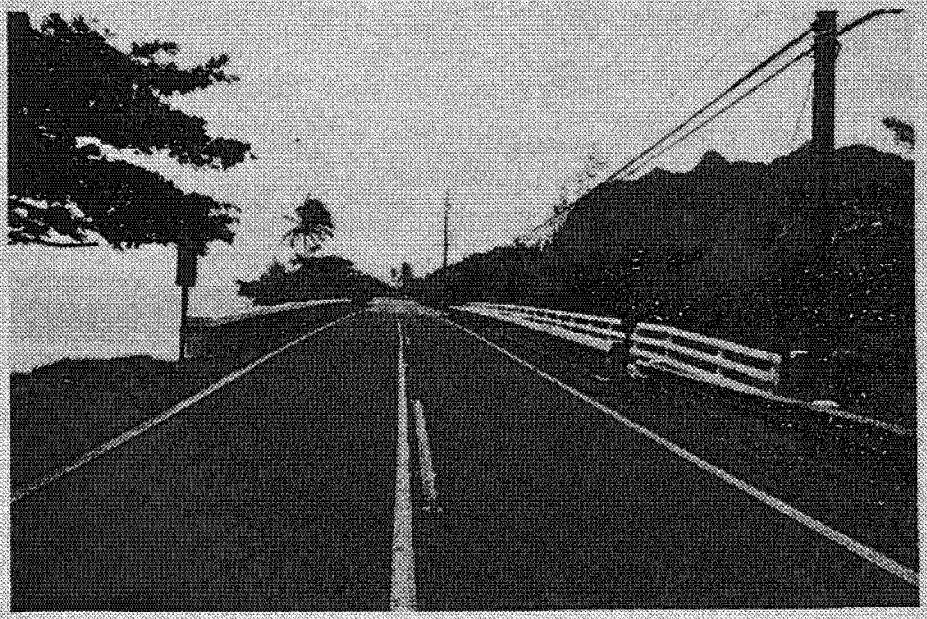
The bridge is a reinforced concrete flat slab structure, 20' in length and 82' in total width. It has a design load capacity of HS-20. The structure has two 8' sidewalks on each side with heavy cement and pipe railings. The structure is given an unusual rating for geometric configuration as it is curved. The design integrity is not intact.

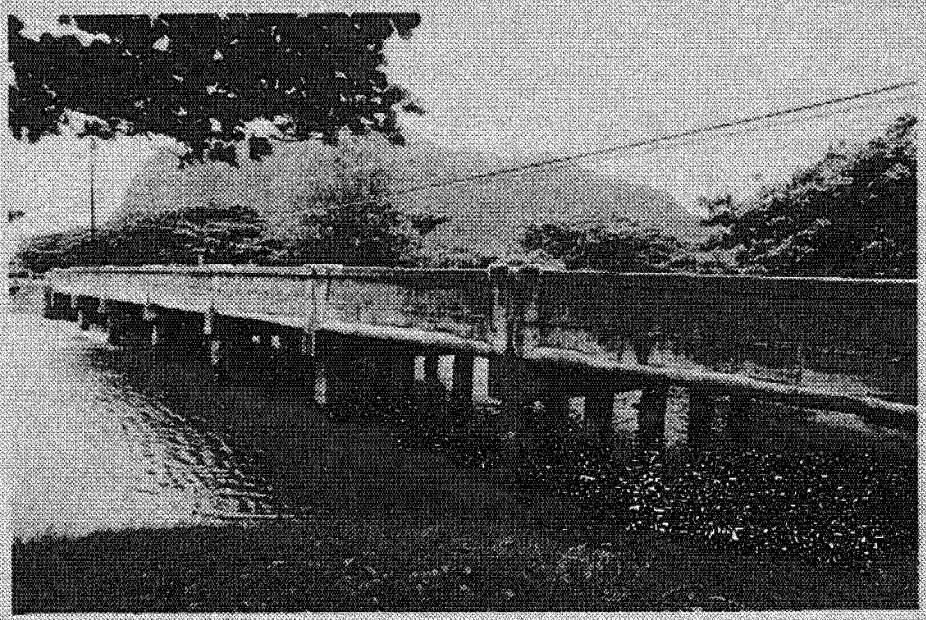
The structure is an important transportation link between Kalihi and downtown Honolulu.

There are vantage points for public access and the view is good.

Aesthetically the scene is given a poor rating.

AR00042492





Kaaawa Bridge

AR00042493

The Kaaawa bridge located on Kamehameha Highway over a stream .099 of a mile southeast of the intersection with Pohuehue Road was built in 1927. The builder is unknown.

The bridge is a seven span structure of reinforced concrete slabs on a railroad trestle. Its total length is 126', with a width of 26.4'. The design load is H-15. There is a sidewalk on the right side with wooden railings. The abutments, parapets and bridge railings are made of reinforced concrete. The design integrity is not intact.

The structure is an important transportation link between Windward communities.

There are vantage points for public access. The view is good.

Aesthetically the scene is rated excellent.

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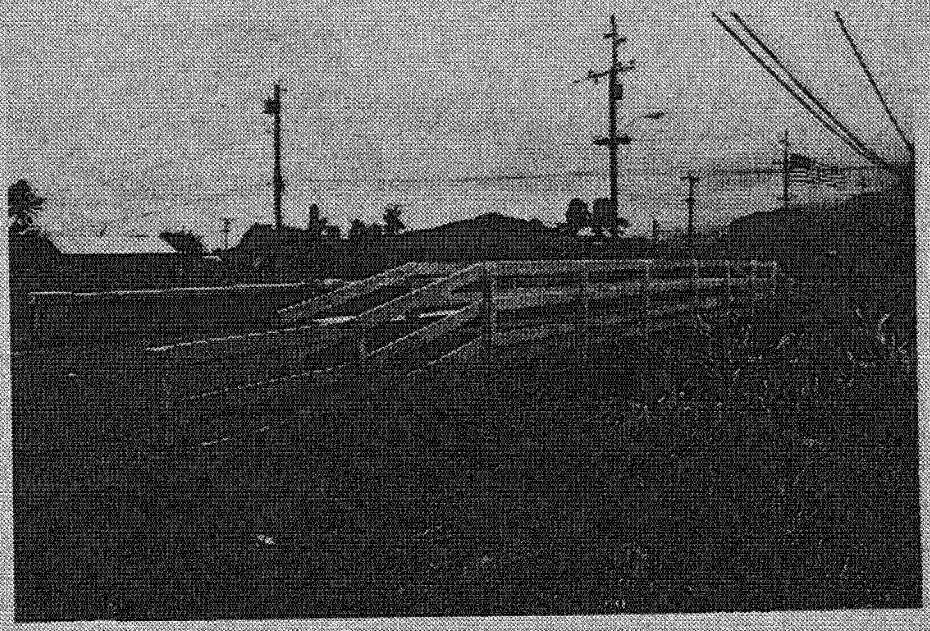


Kaalaea Bridge

AR00042495

The Kaalaea bridge on Kamehameha Highway located .024 of a mile south of the intersection with Kaalaea Street was built in 1923. Lyman Bigelow was the Superintendent of Public Works. The City and County engineer was F. Ohrt. The builder is unknown.

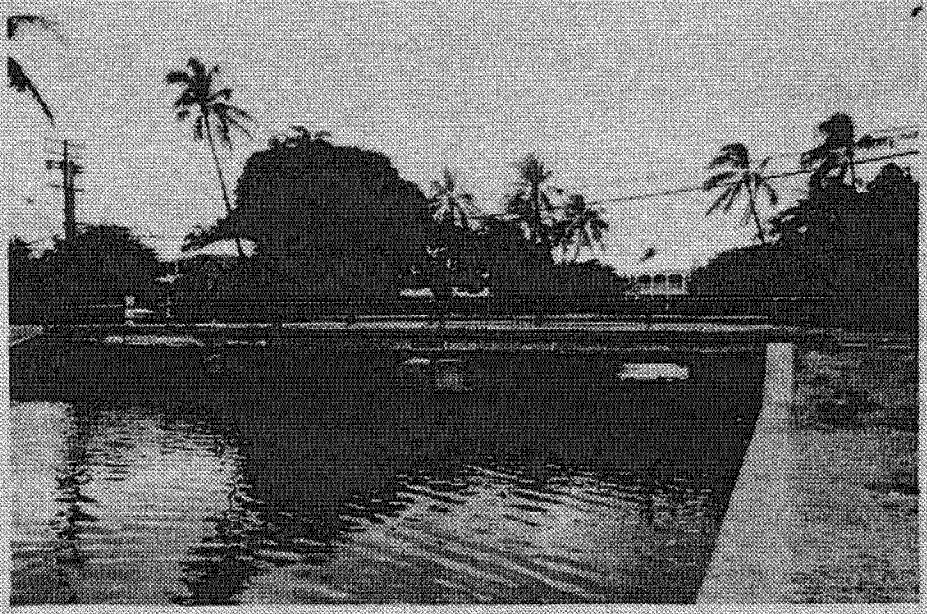
The bridge is a reinforced concrete flat slab structure with two spans, for a total length of 49'. It is 26.1' wide. The design load capacity is H-10. The abutments and railing are made of cement. There is a sidewalk with wooden railings on the right side. The design integrity is not intact.

The structure is an important transportation link between Windward communities.

There are public access vantage points. The view is good.

Aesthetically the scene is rated poor.

AR00042496



Kahala Avenue Bridge

AR00042497

The Kahala Avenue bridge over Kapakahi stream was originally built in 1927 by the City and County. The design engineer was S. Dodo. The builder is unknown. In 1952 the bridge was reconstructed then again modified along with the Kirkwood Street to May Way Widening Project under the Chief Territorial Engineer W. D. Bartel, in 1963.

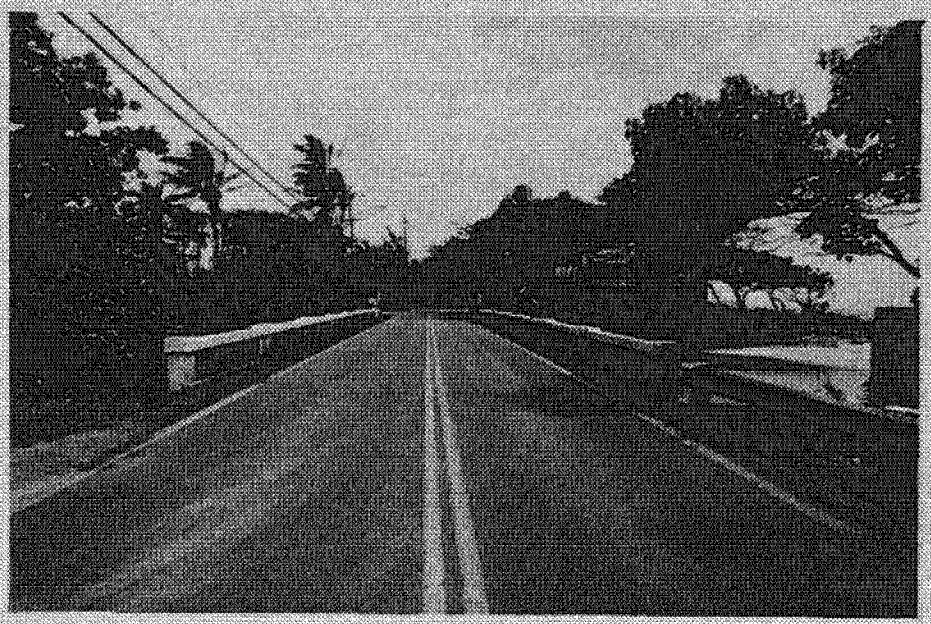
The bridge is 77' in length and 42' wide. It is a three span structure with a design load capacity of H-20. It has two pipe railings and an 8' sidewalk on each side. The design integrity is not intact.

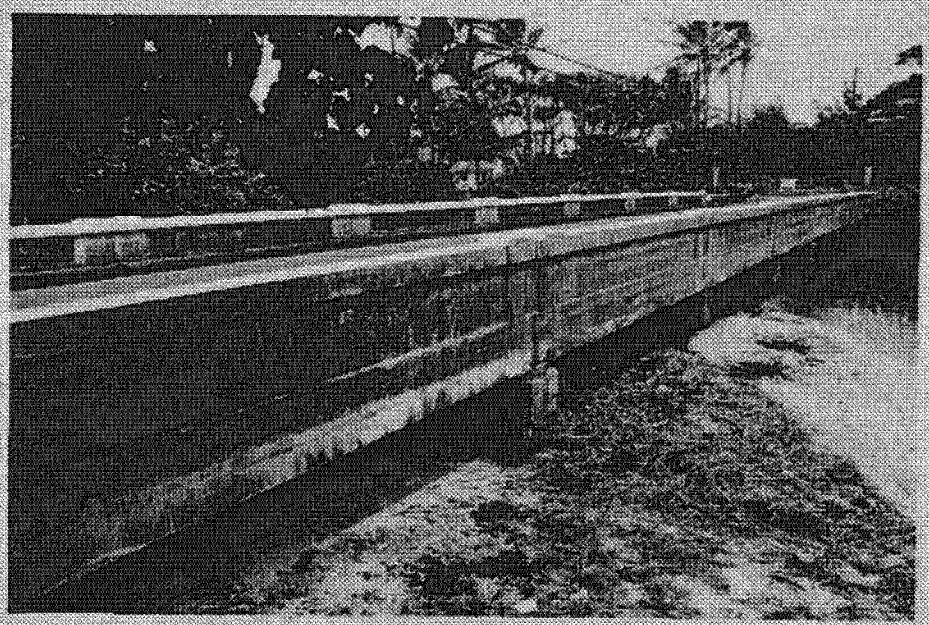
The structure is an important transportation link between Waialae-Kahala and Waikiki.

There are vantage points for easy public access. The view is good.

Aesthetically the scene is given an average rating.

AR00042498





Kaluanui Bridge

AR00042499

The Kaluanui bridge located on Kamehameha Highway .222 of a mile southeast of the intersection with Sacred Falls Road was built in 1926. The builder is unknown.

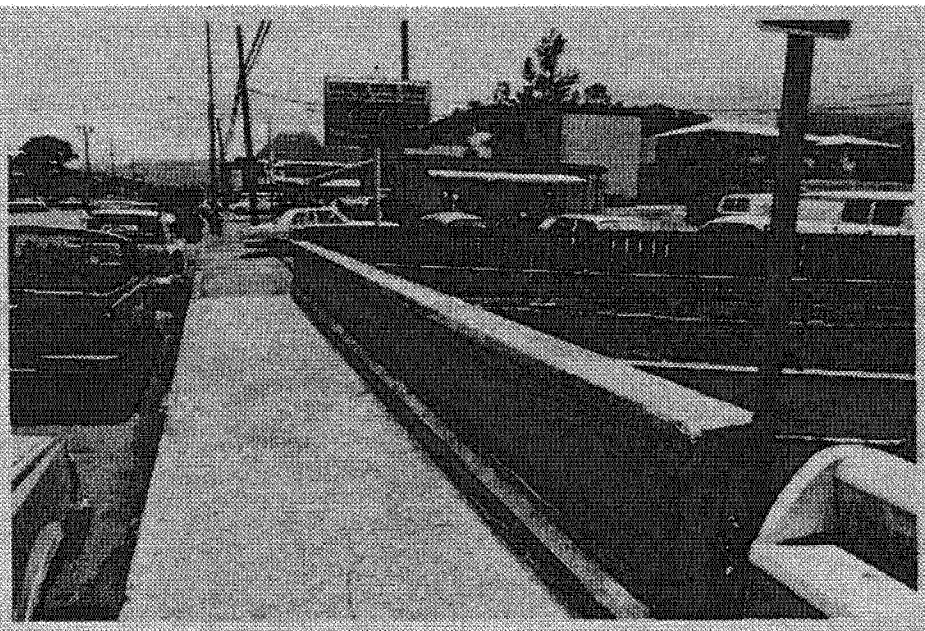
The bridge is a seven span reinforced concrete flat slab structure built on a railroad trestle. It is 126' in total length and 26.3' wide. It has cement abutments and railings. The design integrity is intact.

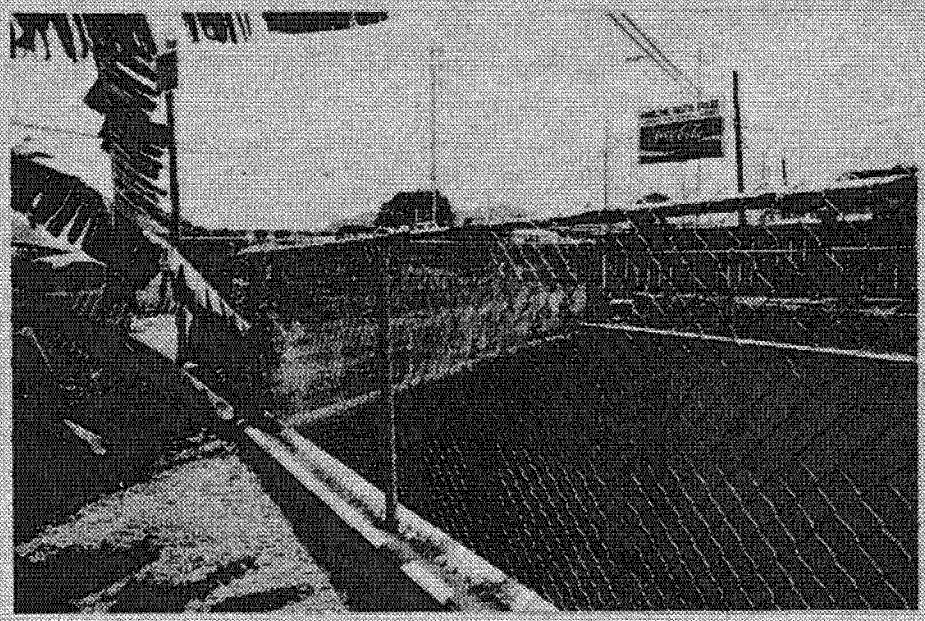
The structure is an important transportation link between Windward communities.

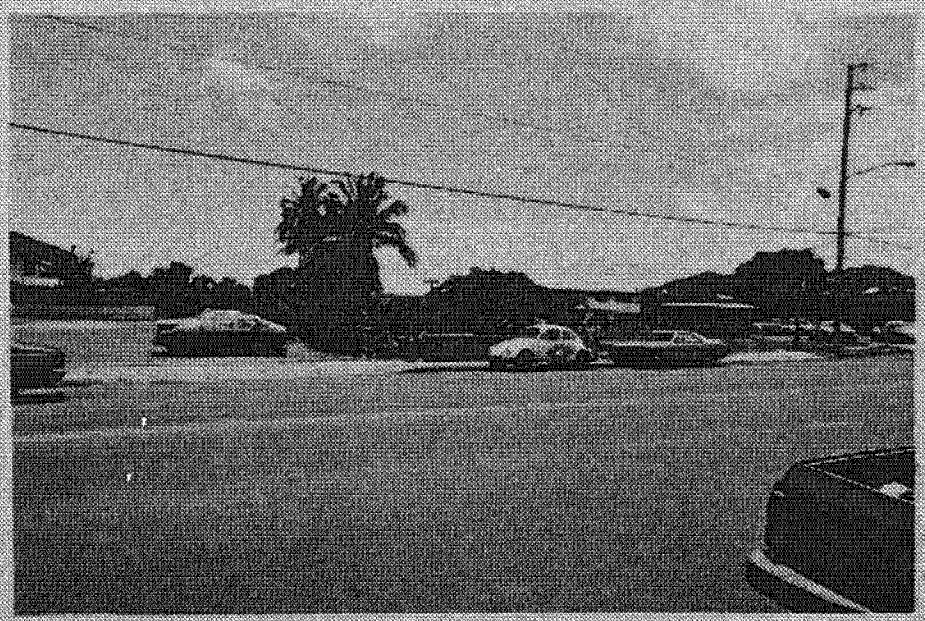
There are no vantage points for easy public access except from the beach. The view is good.

Aesthetically the scene is rated average.

AR00042500







Kaneohe Nc~Name Bridge (Keaahala Bridge)

AR00042501

The Kaneohe No-Name Bridge as listed in the State Bridge Log is called the Keaahala bridge by the City and County. It was originally built in 1918 then reconstructed in 1937. The original design engineer was F. E. Harvey. The City and County engineer was H. A. Austin. The builder is unknown.

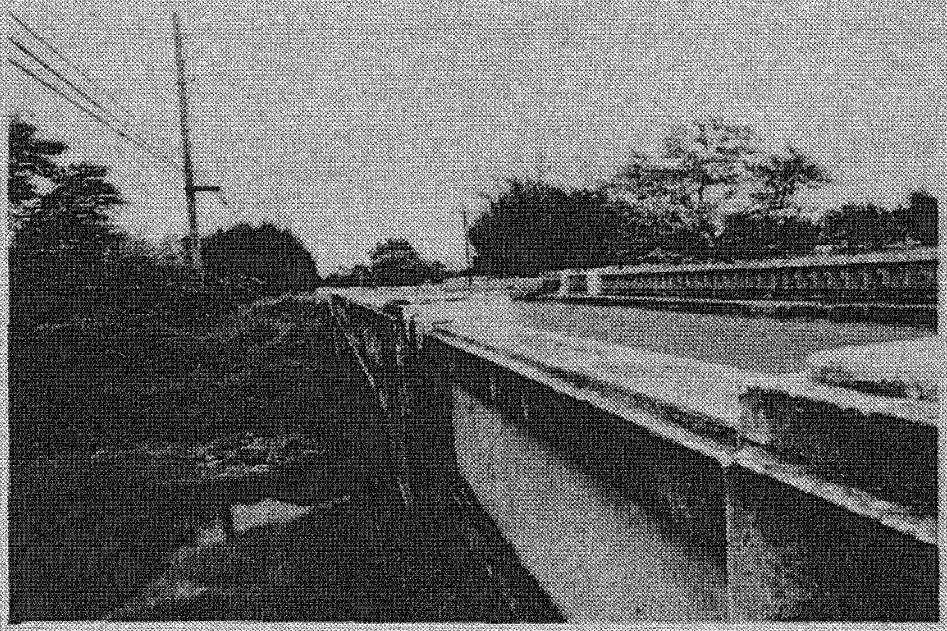
The bridge is reinforced concrete one span flat slab structure, 26' in length and 71.2' wide. It has a design load capacity of H-10. It has cement railings and a 6' sidewalk on both sides. The design integrity is intact.

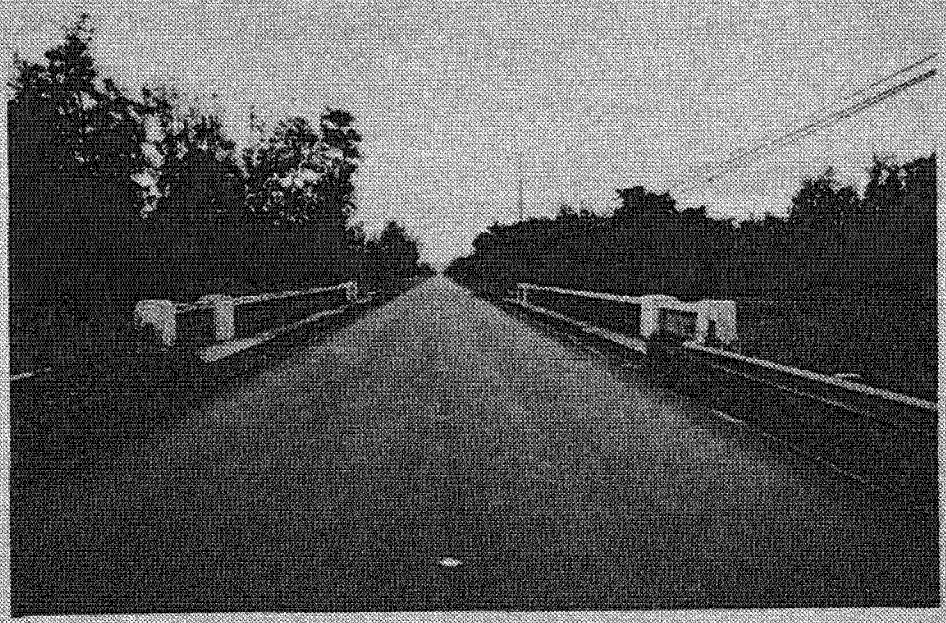
The structure is an important transportation link for Kaneohe traffic.

There are vantage points for easy public access. The view is poor.

Aesthetically it is given a poor rating.

AR00042502





Kapalaau Bridge

AR00042503

The Kapalaau bridge on Farrington Highway .290 of a mile south of the intersection with Hoomana Place was built in 1940. W. D. Bartel was the Territorial Chief Engineer. The builder is unknown.

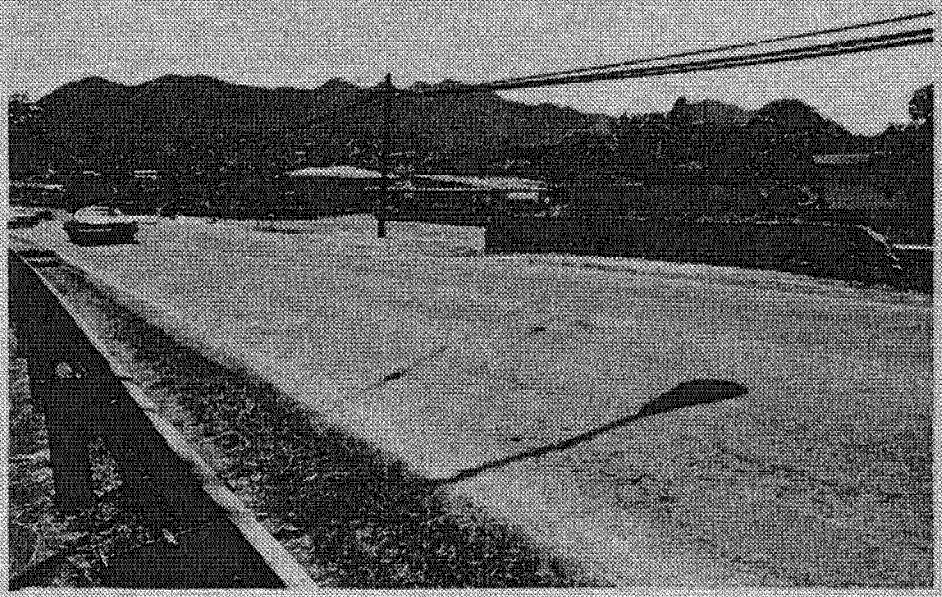
The bridge is a three span reinforced concrete flat slab structure, 96' in total length, 32' wide. It has a design load capacity of H-15, with cement abutments, parapets and railings. The design integrity is intact.

The structure is an important transportation link.

There are no safe vantage points for easy public access. The view is good.

The aesthetics of the scene are judged poor.

AR00042504



Kawa Bridge

AR00042505

The Kawa bridge located .021 of a mile east of the Kaneohe Bay Drive intersection with Puaae Road, over Kawa stream, was built in 1936. The City and County engineer was B. F. Rush, the design engineer, George Dawson. The builder is unknown.

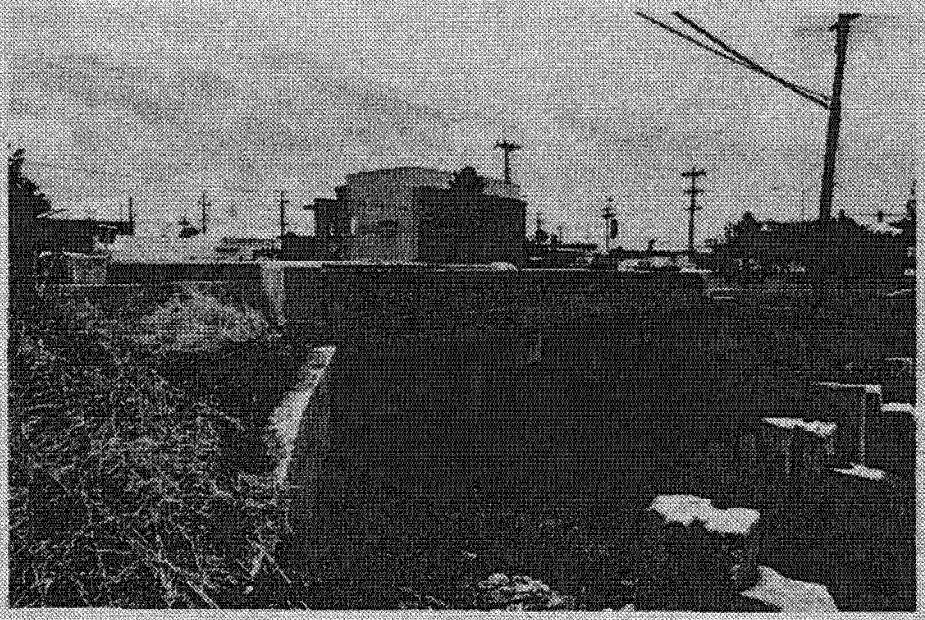
The bridge is a one span structure, reinforced concrete flat slab design, 20' in length, 50.2' in width and 25' in height. It has an unlimited design load capacity. The abutments are constructed of stone rubble masonry. The design integrity is intact.

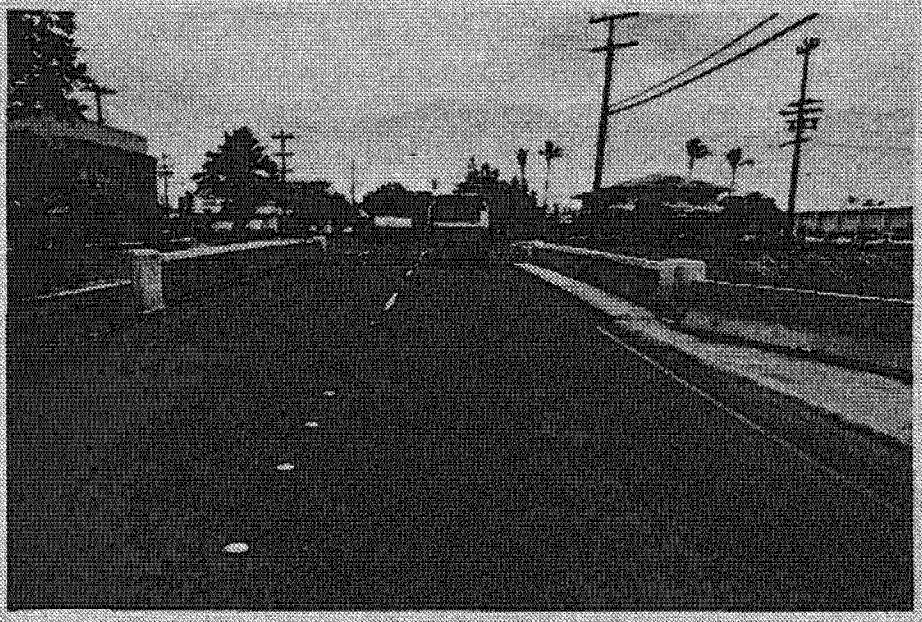
The bridge is an important transportation link for Kaneohe traffic.

There are vantage points for public access. The view is good.

Aesthetically the scene is judged average.

AR00042506





Kawainui Bridge (Inbound)

AR00042507

The Kawainui bridge (inbound) over Kailua stream on Kailua Road was built in 1940. The design engineer was T. Ting. The Chief Territorial Highway Engineer was W. D. Bartel. The contractor was E. E. Black, a prolific builder in Honolulu. [6]

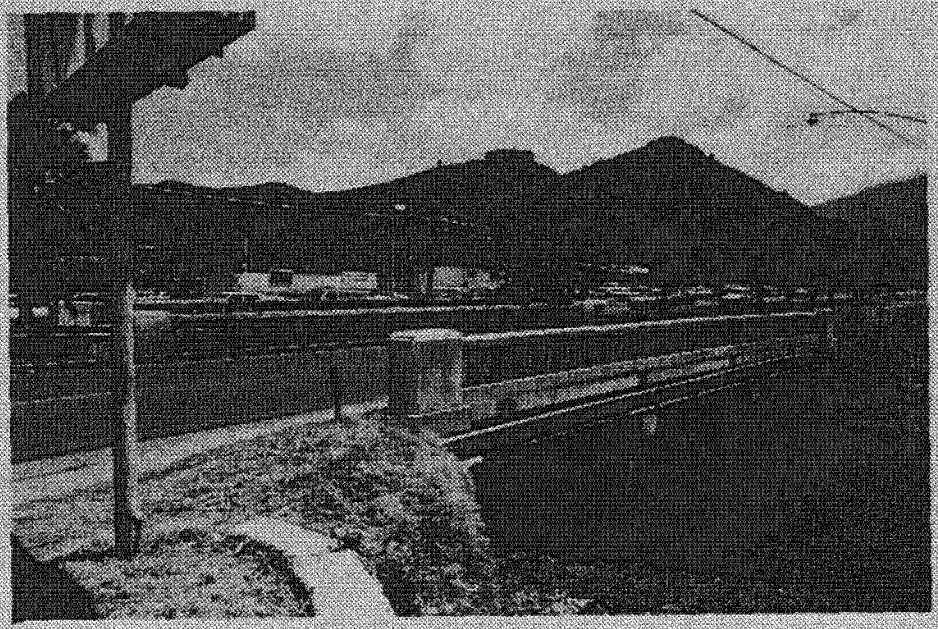
The bridge is a reinforced concrete flat slab three span structure, 57' in length, 30.3' wide, and 15' in height. It has a design load capacity estimated at H-15. The abutments and railings are constructed of concrete. There is a 3' sidewalk on the right side. The design integrity is intact.

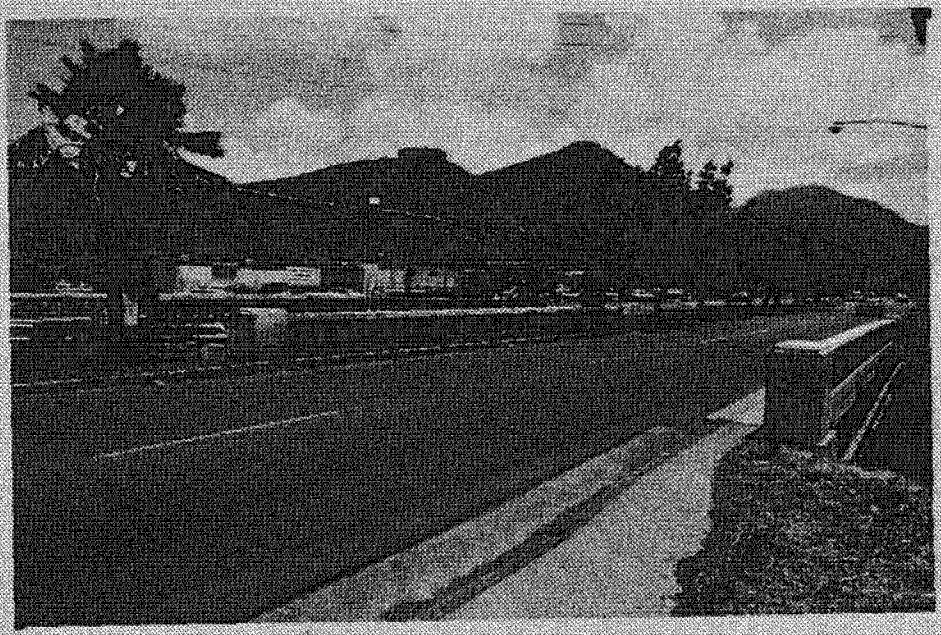
The structure is an important transportation link and it is associated with a famous builder. [10]

There are vantage points for easy public access. The view is good.

Aesthetically the view is judged poor.

AR00042508





Kawainui Bridge (Outbound)

AR00042509

The Kawainui bridge (outbound) over the Kailua stream on Kailua Road was built in 1940. The design engineer was T. Ting. The Chief Territorial Highway Engineer was W. D. Bartel. The contractor was E. E. Black, a prolific builder in Honolulu. [6]

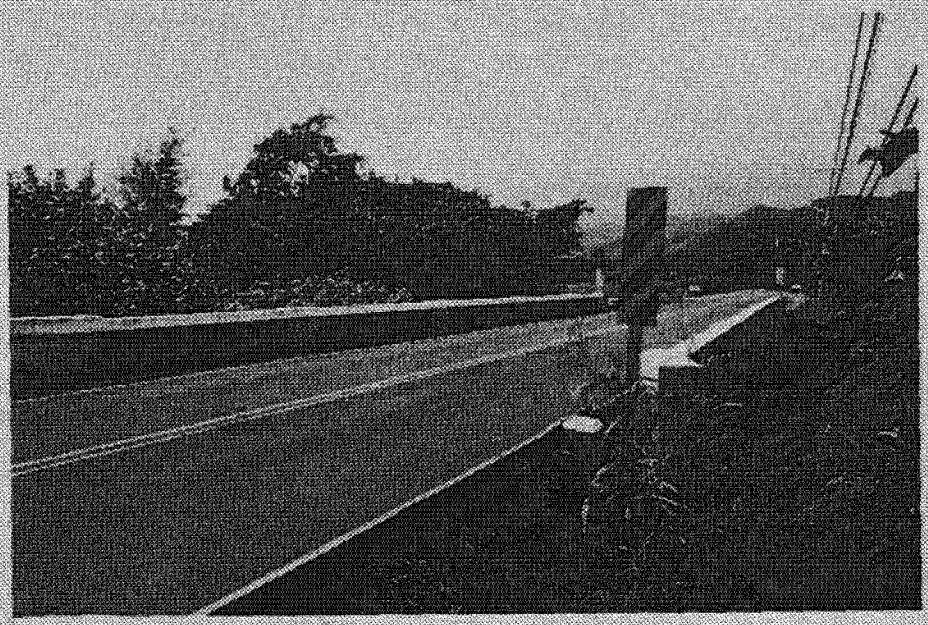
The bridge is a reinforced concrete flat slab three span structure, 54' in total length, 30.7' wide. It has a design load capacity estimated at H-15. The abutments and railings are constructed of concrete. There is a 3' sidewalk on the right side. The design integrity is intact.

The bridge is an important transportation link for Kaneohe traffic and it is associated with a famous builder. [10]

There are vantage points for public access. The view is good.

The aesthetics are judged poor.

AR00042510



Laiemaloo Bridge

AR00042511

The Laiemaloo bridge on Kamehameha Highway across Koloa stream was built in 1933, by the contractor L. L. McCandless, who was given a contract of $190,117.51 to construct five miles of road and seven concrete bridges. [6] McCandless was one of Honolulu's prolific builders. [10]

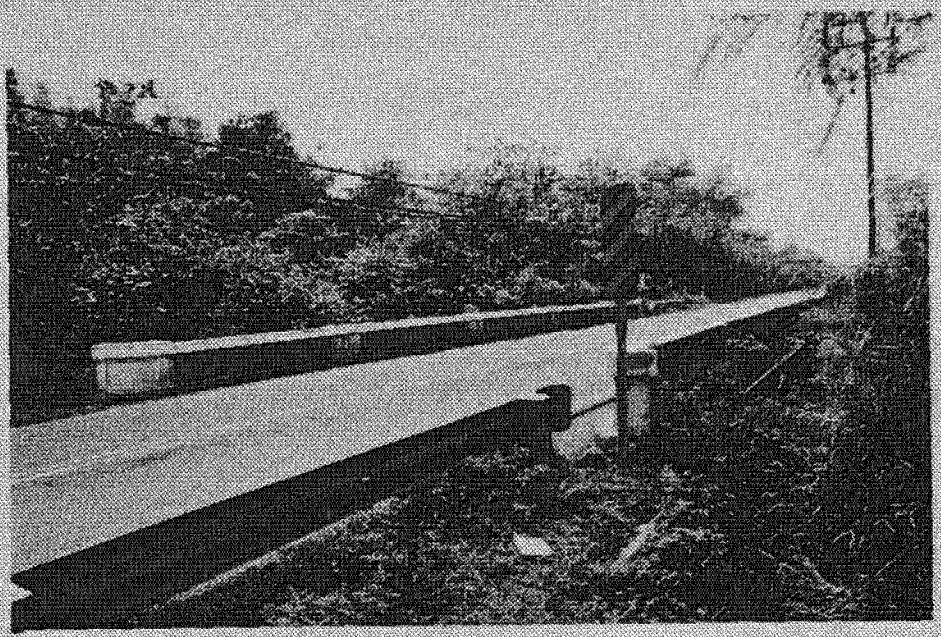
The bridge is a reinforced concrete flat slab five span structure with a total length of 90' and 27.2' wide. It has a design load capacity of H-10. The abutments, railings and parapets are constructed of concrete. The design integrity is intact.

The structure is an important transportation link for around the island traffic and is associated with a famous Honolulu businessman.

There are no vantage points for easy public access. The view is good.

The aesthetics are judged to be poor.

AR00042512



Laiewai Bridge

AR00042513

The Laiewai bridge on Kamehameha Highway across Kahawainui stream was built in 1933, by the contractor L. L. McCandless, who was given a contract of $190,117.51 to construct five miles of road and seven concrete bridges. [6] McCandless was one of Honolulu's prolific builders. [10]

The bridge is a reinforced concrete flat slab five span structure with a total length of 91' and a total width of 27.1'. It has a design load capacity of H-10. The abutments, railings and parapets are constructed of concrete. The design integrity is intact.

The structure is an important transportation link between North Shore and Windward communities. It is associated with a famous Honolulu businessman.

There are no safe vantage points for easy public access. The view is poor.

The aesthetics of the scene are poor.

AR00042514

Lauhulu Bridge

AR00042515

The Lauhulu bridge located on Kamehameha Highway .139 of a mile northeast of the intersection with Meadow Gold Farm Road, was built in 1937. John Padgett and H. Iwamoto were the design engineers for the Territorial Highway Department. The builder is unknown.

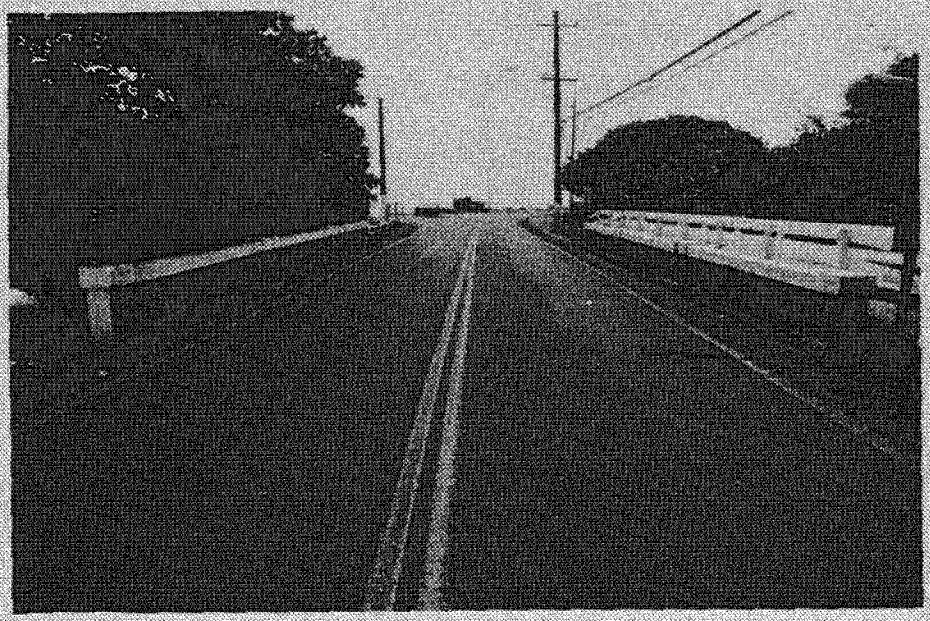
The bridge is a reinforced concrete two span flat slab structure 70' in length, 32.2' in width, and 10' in height. It has a design load capacity of H-15. The abutments, parapets and railings are concrete, with a narrow sidewalk on both sides. There is a wing abutment on the substructure of cement rubble masonry on the right side. The design integrity is intact.

The structure is an important transportation link.

There are vantage points for easy public access. The view is good.

The aesthetics are judged average.

AR00042516



Maheiwi Bridge

AR00042517

The Maheiwi bridge located on Kamehameha Highway .068 of a mile southeast of the intersection with Hauula Homestead Road was built in 1926. The builder is unknown.

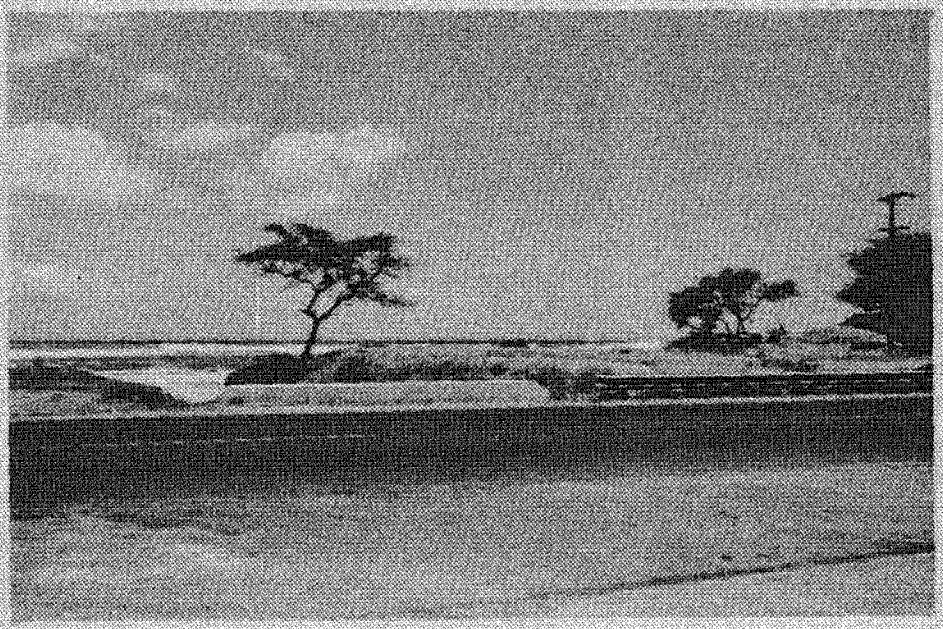
The bridge is a reinforced concrete three span flat slab structure 54' in total length, 26.4' in total width. It has a design load capacity of H-15. The abutments, parapets and railings are made of concrete. It has a 4' sidewalk on the right side with wooden railings. The design integrity is intact.

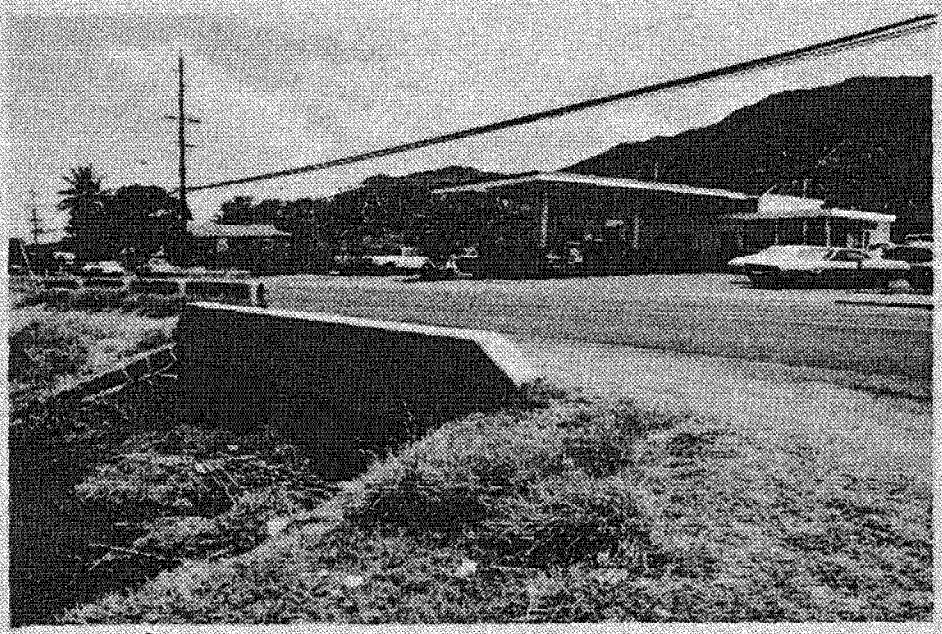
The structure is an important transportation link for around-the-island traffic.

There are easy access vantage points for public viewing. The view is poor.

The aesthetics are judged to be average.

AR00042518





Makaha No. 2A Bridge

AR00042519

The Makaha #2A bridge located on Farrington Highway .014 of a mile west of the intersection with Orange St. was built in 1937. W. D. Bartel was the Chief Territorial Engineer. The builder is unknown.

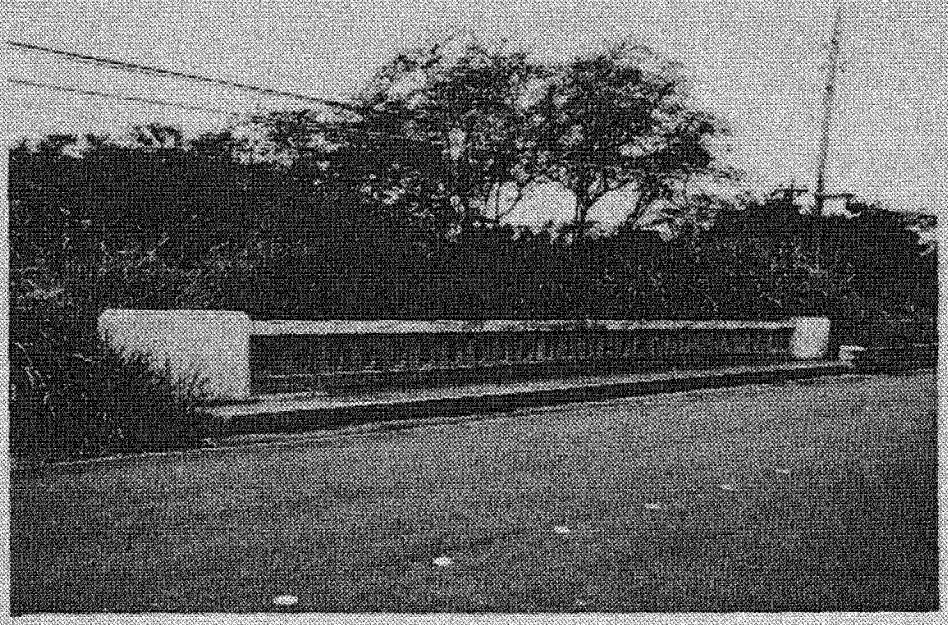
The bridge is a two span reinforced concrete flat slab structure, 25' in total length, 41' wide. It has a design load capacity of H-15. The railings are constructed of concrete. The design integrity is intact.

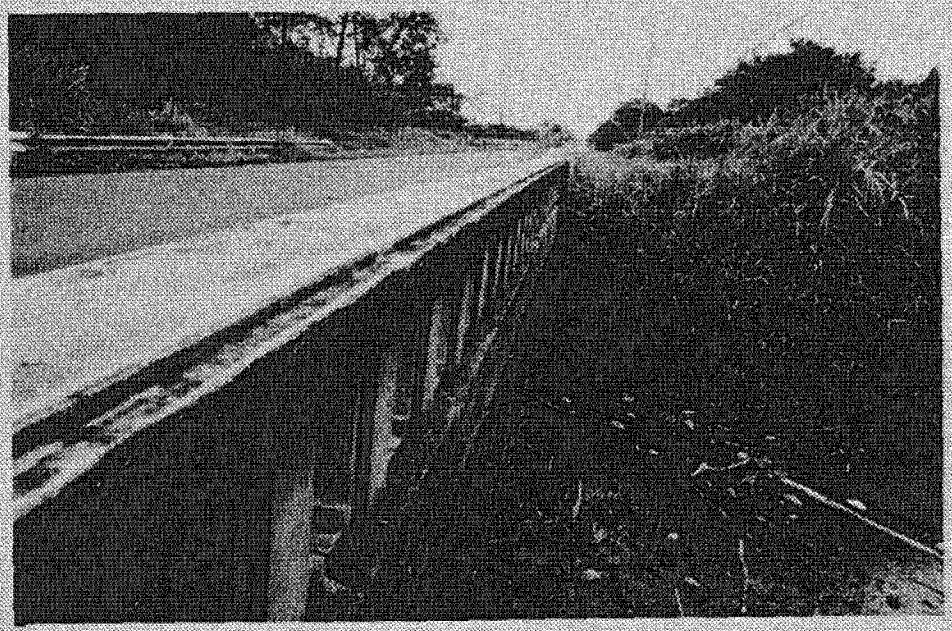
The structure is a transportation link between Waianae and other Leeward communities.

There are vantage points for easy public access. The view is good.

The aesthetics are judged to be poor.

AR00042520





Makaleha Bridge

AR00042521

The Makaleha bridge located on Farrington Highway .510 of a mile south of the intersection with Hoomana Place was built in 1940. T. Ting was the design engineer. W. D. Bartel was the Chief Territorial Highway Engineer. The builder is unknown.

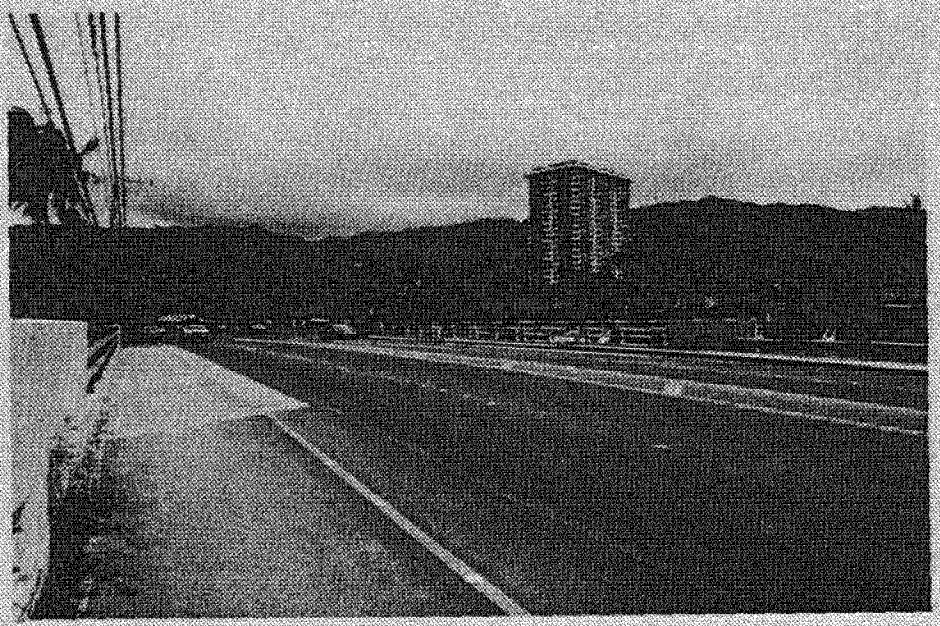
The bridge is a reinforced concrete two span flat slab structure, 50' in total length, 31.9' wide. The design load capacity is H-15. The abutments and railings are constructed of concrete. There is a 3' sidewalk on both sides. The design integrity is intact.

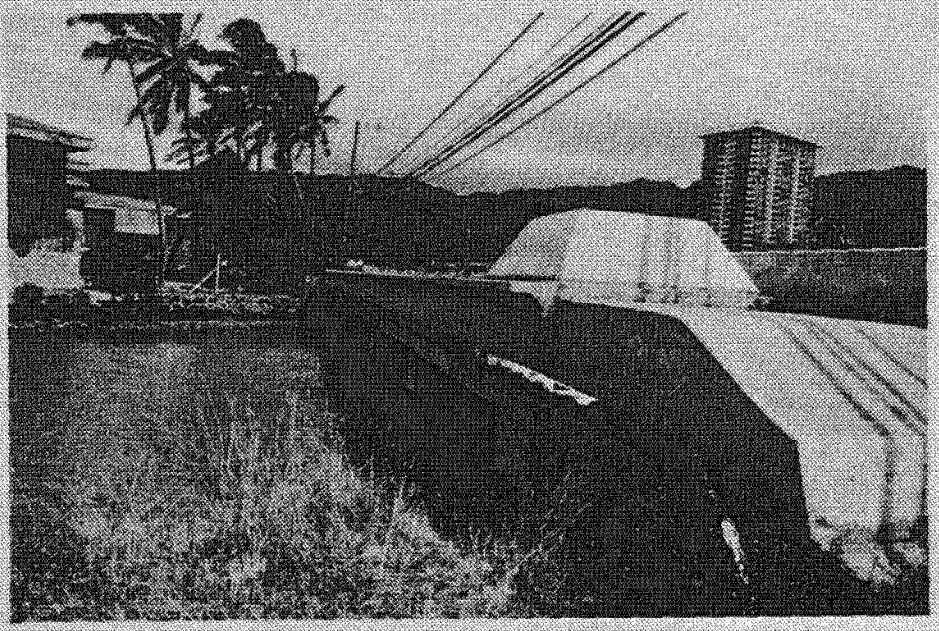
The structure is a transportation link between North Shore communities.

There are no safe public vantage points. The view is poor.

The aesthetics of the scene are judged to be poor.

AR00042522





Maunalua Bridge

AR00042523

The Maunalua bridge located on Kalanianaole Highway .080 of a mile northwest of the intersection with Hawaii Kai Drive was originally built in 1936, then reconstructed in 1971. It is across the Kuapa Pond outlet resting on an old railroad trestle. The builder is unknown.

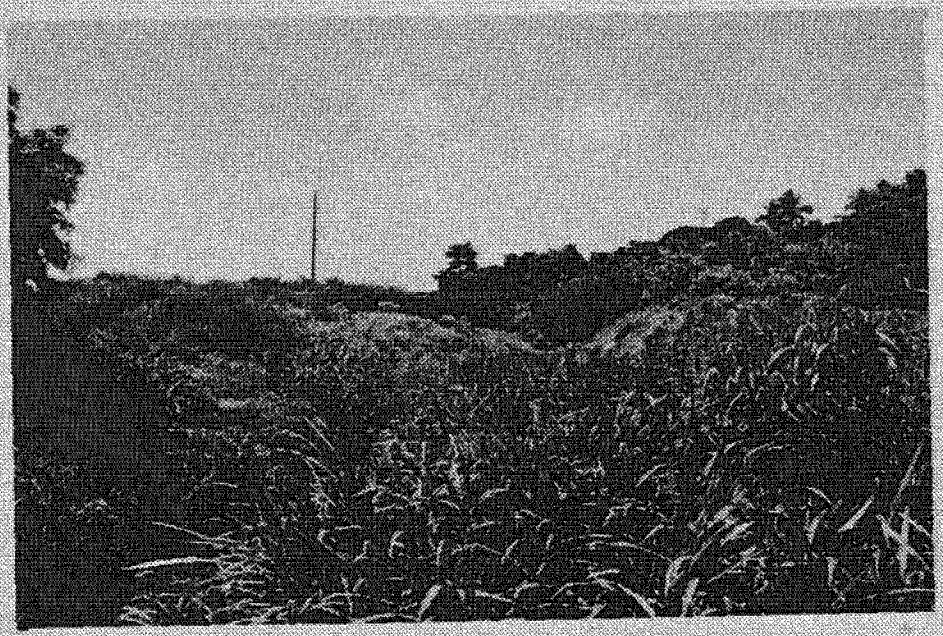
The bridge is a six span reinforced concrete flat slab structure, 109' in total length, 66.5' wide. It has a design load capacity of H-15. The railings are constructed of concrete and steel pipe. There is a sidewalk on the right side. The design integrity is not intact.

The structure is an important transportation link for Hawaii Kai traffic.

There are no vantage points for easy public access. The view is poor.

The aesthetics are judged to be poor.

AR00042524



Maunawili Road Bridge

AR00042525

The Maunawili Road bridge located across Maunawili stream was built in 1937 by the City and County under the direction of F. Ohrt. The builder is unknown.

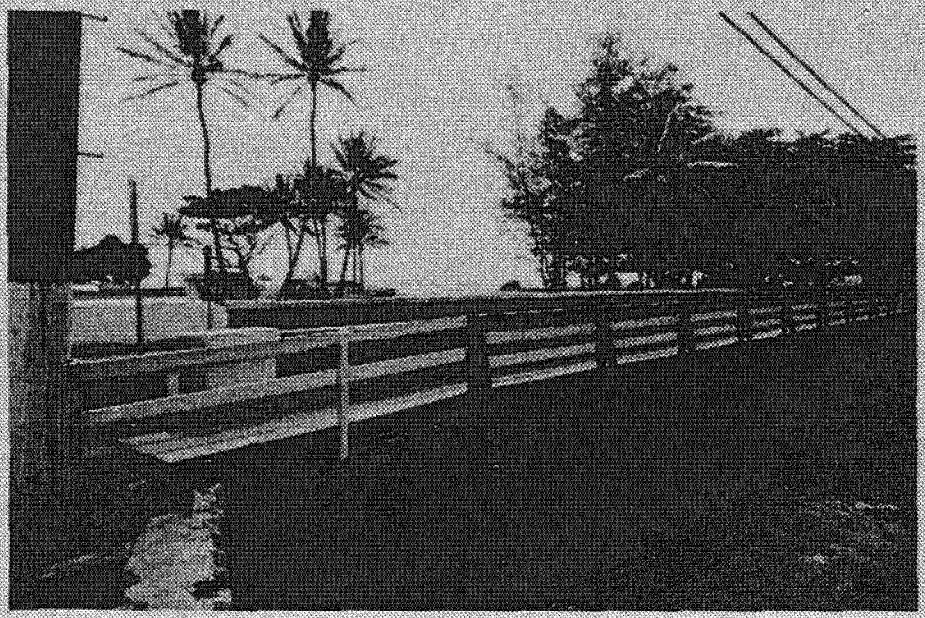
The bridge is a reinforced concrete continuous slab one span structure, 41' in total length, 18' wide, and 11' in height. The design load capacity is H-10. The abutments and railings are constructed of concrete. The design integrity is intact.

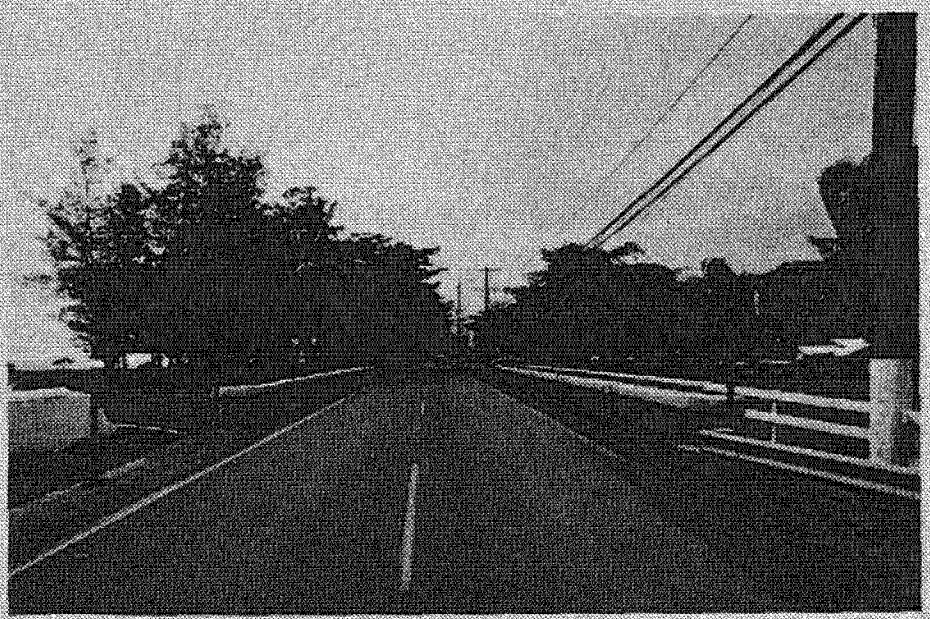
The structure is not a transportation link as it is rarely used on a nearly abandoned road.

There are no vantage points for safe public access. The view is poor.

The aesthetics are judged to be poor.

AR00042526





Muliwai Bridge

AR00042527

The Muliwai bridge located on Kamehameha Highway .20 of a mile southeast of the intersection with Hauula Homestead Road was built in 1932. L. L. McCandless, a prolific builder and prominent Honoluluan was the contractor. He was awarded a contract for $109,117.51 to build five miles of road and seven bridges from Hauula to Kahuku.* [6]

The bridge is a reinforced concrete six span flat slab structure, 110' in total length and 26.9' wide. The design load capacity is H-15. The abutments, parapets and railings are constructed of concrete. There is a narrow wooden railing walkway on the right side. The design integrity is not intact.

The structure is an important transportation link between Windward communities. It is associated with a famous Honolulu businessman. [10]

There are vantage points for easy public access. The view is good.

The aesthetics are given an average rating.

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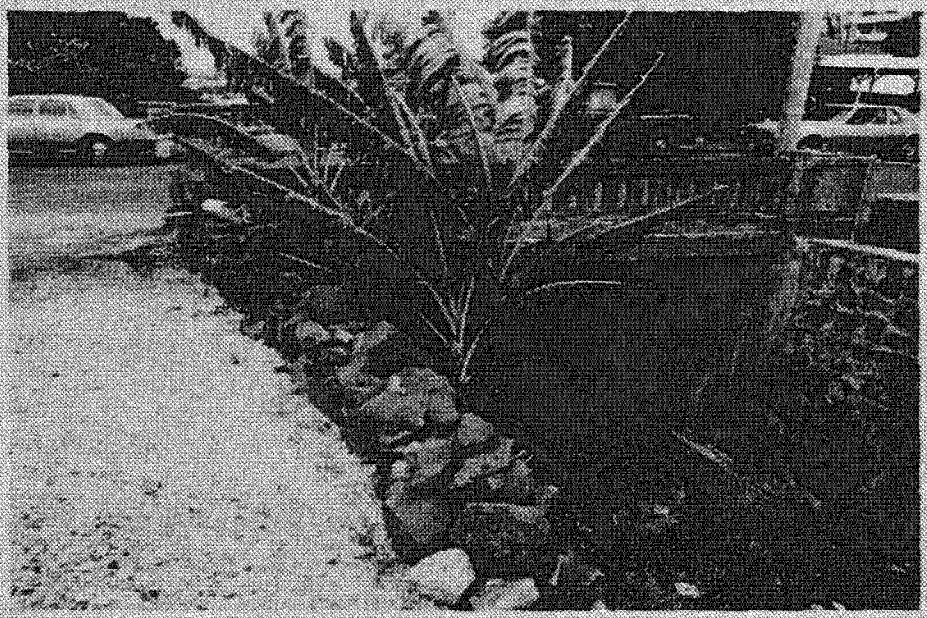
*Other structures included in this contract for this section of belt-road are the Laiewai, Laiemaloo, Kaipapau, Waipilopilo, Hauula and Waipuhi bridges.

AR00042528



Naio Street Bridge

AR00042529

The Naio Street bridge across Nuhelewai stream was built in 1927 by the City and County of Honolulu. The builder is unknown.

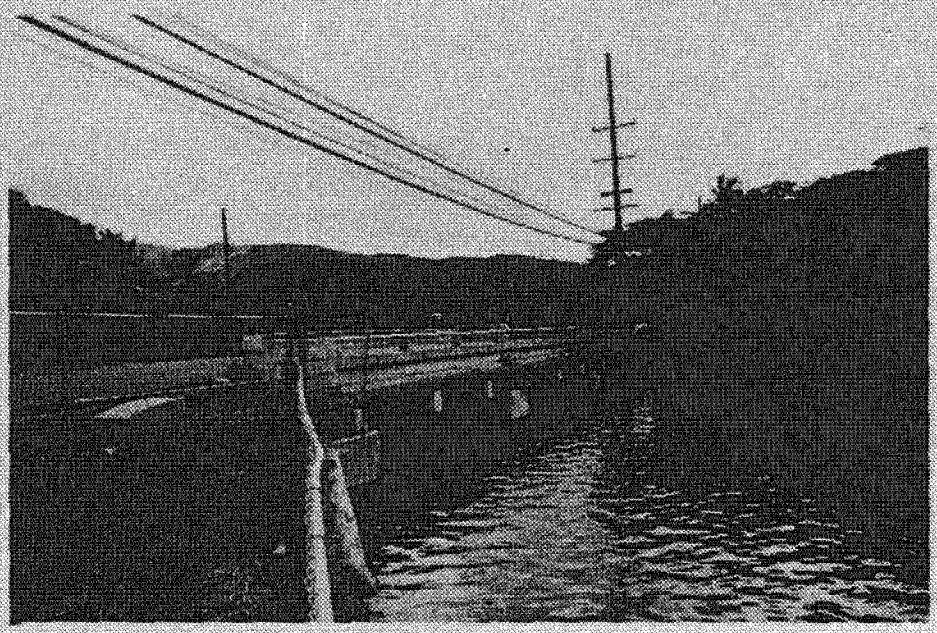
The bridge is a single span reinforced concrete slab structure, 23' in total length, 40.4' wide. The abutments and railings are made of concrete. There is a sidewalk on both sides. The design integrity is intact.

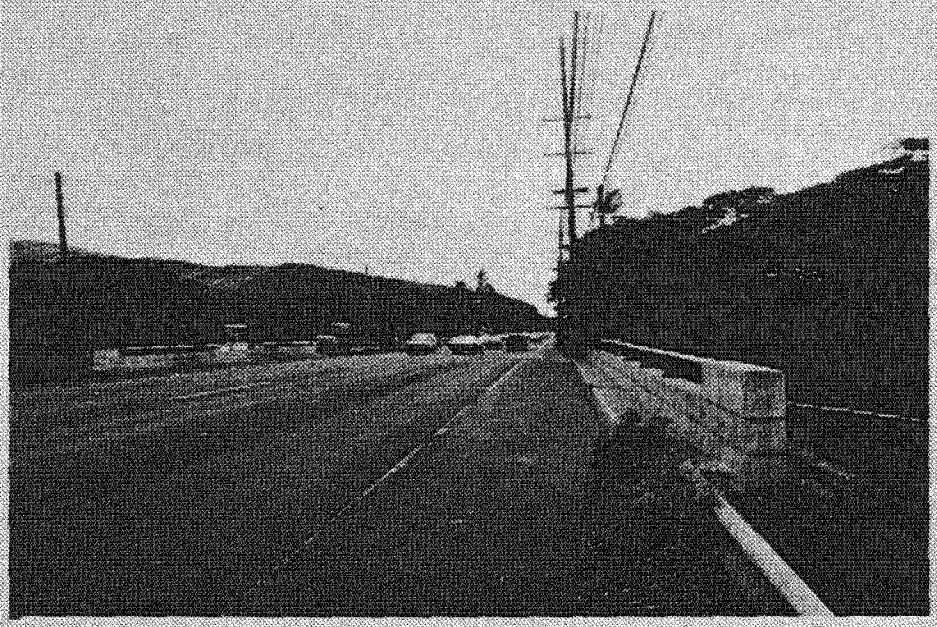
The structure is an important transportation link for residents of the area to downtown Honolulu.

There are vantage points for easy public access. The view is poor.

The aesthetics of the scene are judged to be poor.

AR00042530





Niu Bridge

AR00042531

The Niu bridge located on Kalanianaole Highway .111 of a mile west of the intersection with Nuiki Circle was originally constructed in 1934. W. D. Bartel was Chief Territorial Highway Engineer. It was reconstructed in 1964. The builders are unknown.

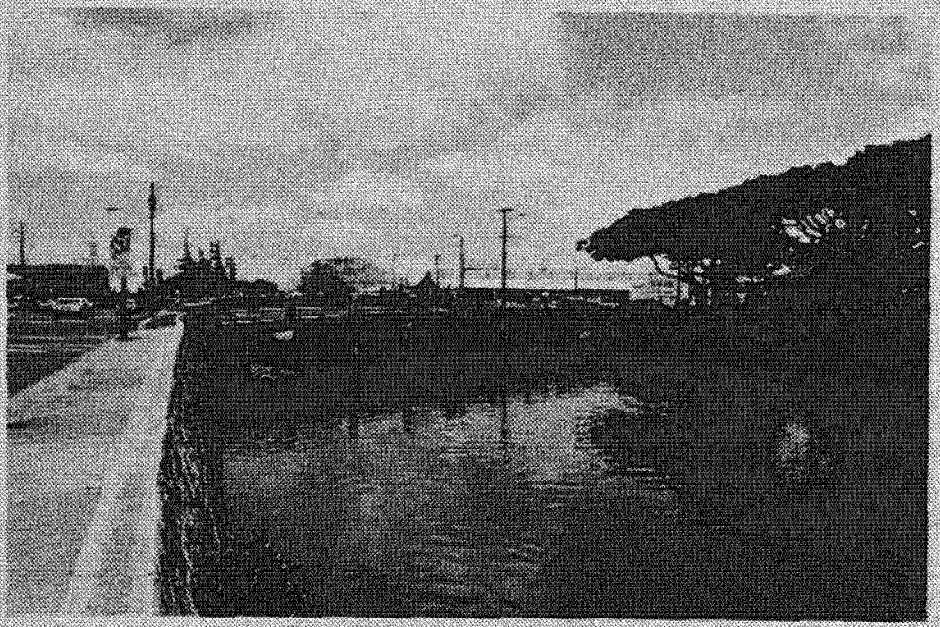
The bridge is a three span reinforced concrete flat slab structure, 80' in total length, 66' wide. It has a design load capacity of H-15. The abutments, parapets and railings are constructed of concrete and pipe. The design integrity is not intact.

The structure is an important transportation link for Hawaii Kai residents.

There are no vantage points for easy public access. The view is good.

The aesthetics are judged to be poor.

AR00042532



North Hotel Street Bridge

AR00042533

The North Hotel Street bridge located at the intersection of King Street across Nuuanu stream was built in 1936 by the City and County of Honolulu. The builder is unknown.

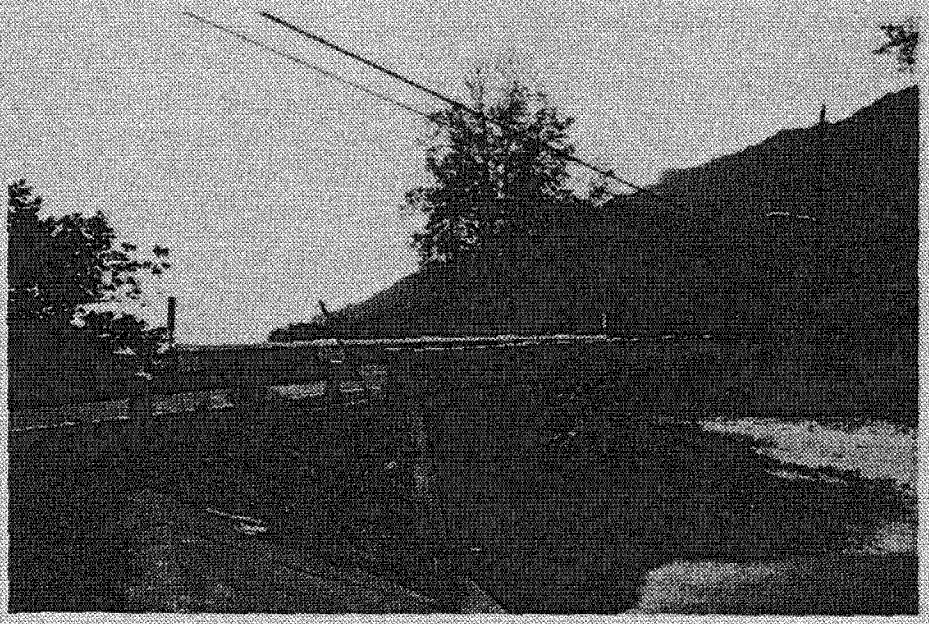
The bridge is a three span reinforced concrete continuous flat slab structure, 101' in length, 46' wide, and 20.3' in height. It has a design load capacity of H-20. The abutments, parapets and railings are made of concrete and pipe. The approach railings are curved. The design integrity is intact.

The structure is an important transportation link between Kalihi and downtown Honolulu.

There are vantage points for easy public access. The view is good.

The aesthetics are judged to be average.

AR00042534



North Kahana Bridge

AR00042535

The North Kahana bridge located on Kamehameha Highway 3.768 miles southwest of the intersection with Sacred Falls Road was built in 1927. The builder is unknown.

The bridge is a five span reinforced concrete flat slab on a concrete railroad trestle structure. It is 92' in total length and 26.4' in total width. It has a design load capacity estimated at H-15. The abutments, railings and parapets are made of concrete. The bridge is built on an old railroad trestle. The design integrity is intact.

The structure is an important transportation link for Windward communities. It is located across a significant, ancient Hawaiian fishing ground and fresh water estuary.

There are good vantage points for public access and the view is good.

The aesthetics are judged to be excellent.

AR00042536

North Punaluu Bridge

AR00042537

The North Punaluu bridge located on Kamehameha Highway 1.519 miles southeast of the intersection with Sacred Falls Road, was built in 1926. The builder is unknown.

The bridge is a two span reinforced concrete flat slab on a railroad trestle structure. It is 37' in total length and 26.4' in total width. It has a design load capacity of H-15. The abutments, parapets and railings are constructed of concrete. The design integrity is intact.

The structure is an important transportation link for windward communities.

There are no safe vantage points for public access except from the beach. The view is good.

The aesthetics are judged to be average.

AR00042538

North Waiahole Bridge

AR00042539

The North Waiahole bridge located .583 of a mile north of Waiahole Valley Road was built in 1928. There was a contract awarded to Hawaiian Contracting Co., owned by W. F. Dillingham, to build the road extending from Waiahole to Kuaka, for $728,441.15 in 1927, so it is assumed they built the bridge.[5]

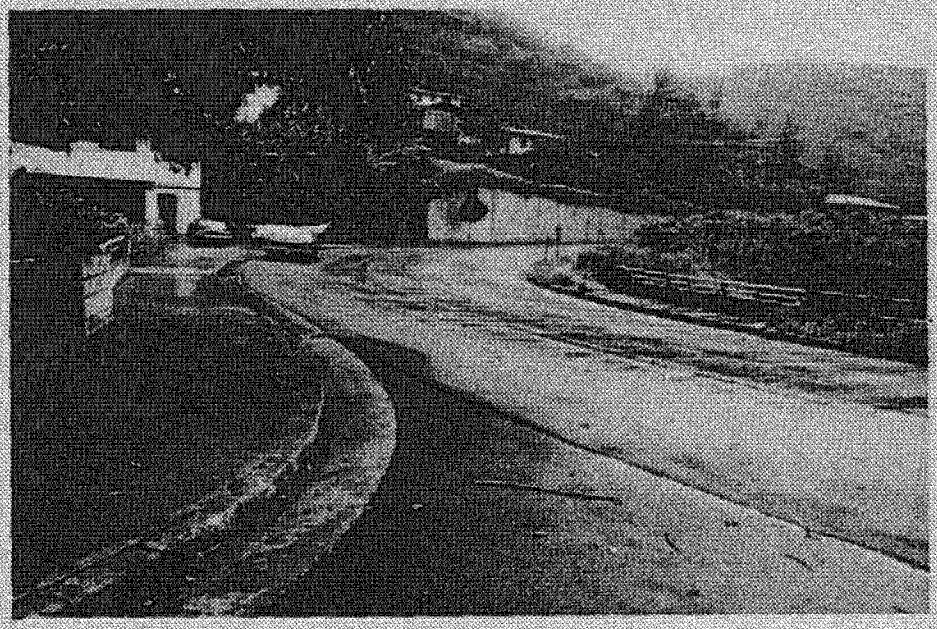
The bridge is a three span reinforced concrete slab resting on a railroad trestle structure. It is 54' in total length and 27' in total width. It has a design load capacity of H-15. The abutments and parapets are constructed of concrete. There is a 4' wooden walkway with railings on the right side. The design integrity is not intact.

The structure is an important transportation link between Windward communities. It is associated with a famous Honolulu businessman.[10]

There are no safe vantage points for easy public access. The view is poor.

The aesthetics are judged to be poor.

AR00042540



Palolo Avenue Bridge

AR00042541

The Palolo Avenue bridge across Pukele stream 50' east of the intersection with Palolo Place was originally built in 1928. The design engineer was George K. Dawson. The reconstruction date on the bridge is 1966. The builders are unknown.

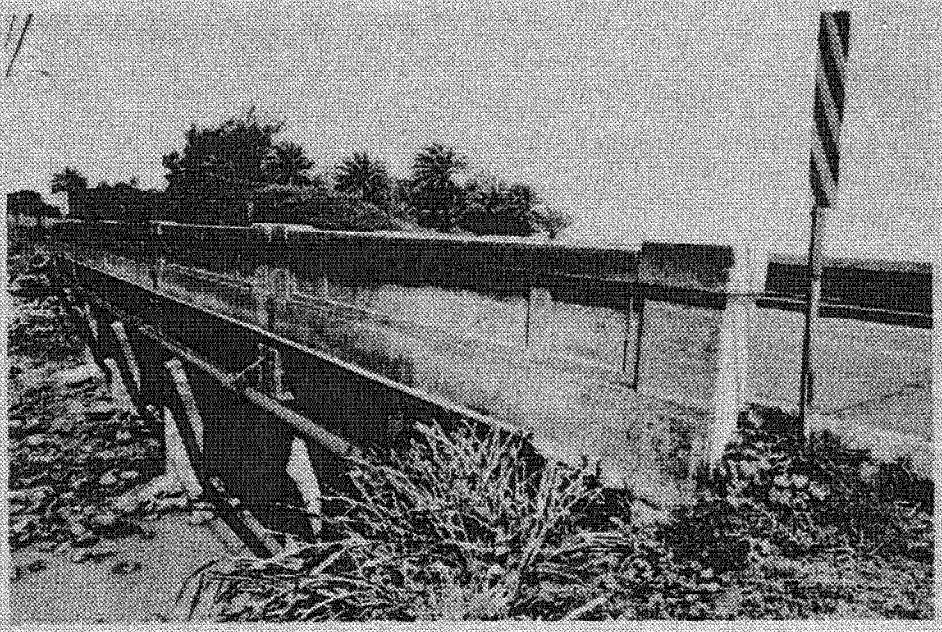
The structure is a one span reinforced concrete girder or slab bridge with a length of 28', a width of 46', and an approximate height of over 10'. The abutments and railings are constructed of concrete and pipe. The design integrity is not intact.

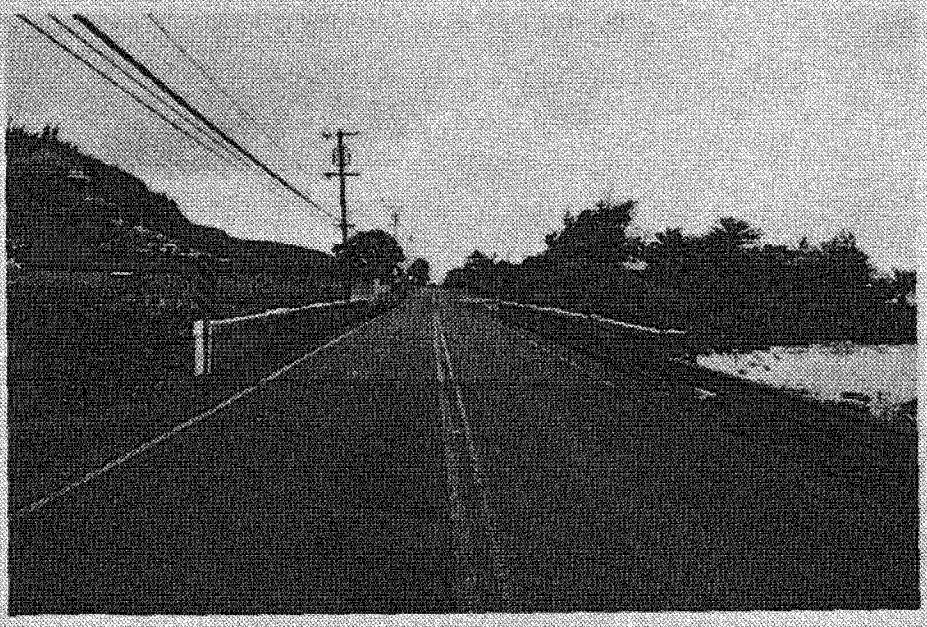
The bridge is an important transportation link for residential traffic.

There are vantage points for easy public access. The view is poor.

The aesthetics of the scene are judged to be poor.

AR00042542





Paumalu Bridge

AR00042543

The Paumalu bridge located on Kamehameha Highway .184 of a mile northeast of the intersection with Kenui Road was built in 1930. The design engineer was R. W. Hendry. The builder is unknown.

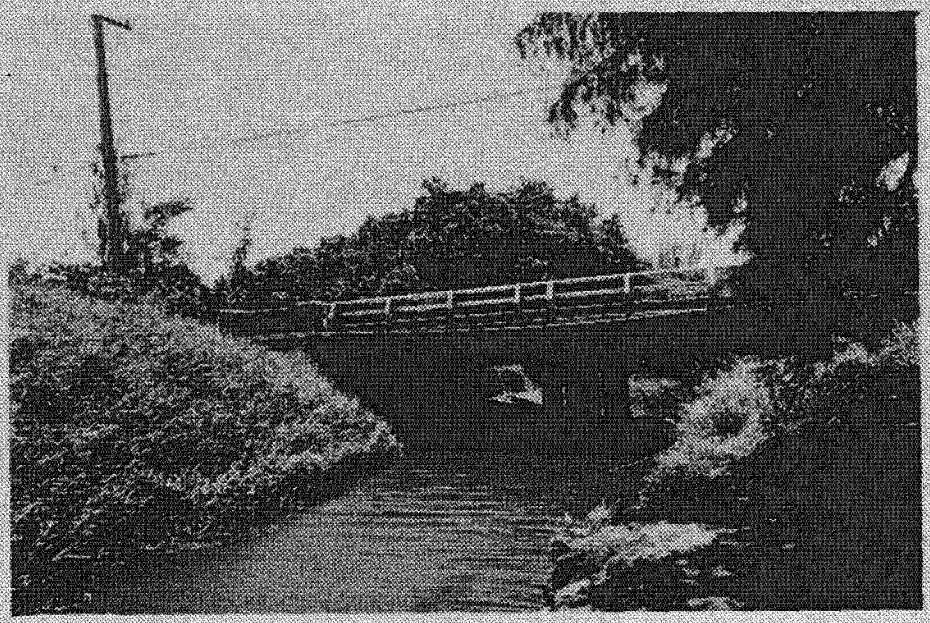
The bridge is a five span reinforced concrete flat slab structure, 90' in length, 23.8' in width, and 13' in height. It has a design load capacity of H-15. The abutments, parapets and railings are constructed of concrete. The design integrity is intact.

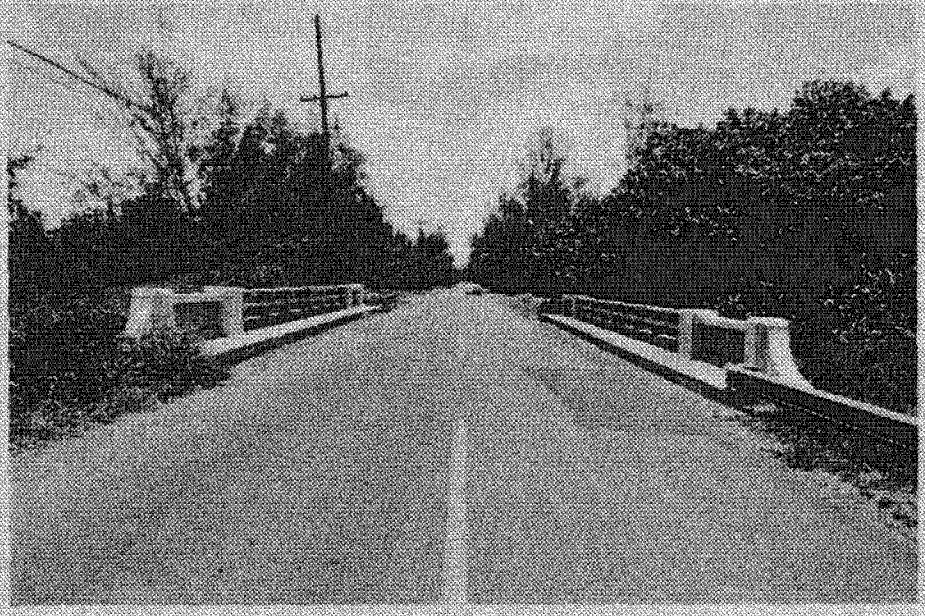
The structure is an important transportation link for windward communities.

There are no safe vantage points for public access. The view is good.

The aesthetics are judged to be poor.

AR00042544





Poli-Poli Bridge

AR00042545

The Poli-Poli bridge located on Farrington Highway .475 of a mile north of the intersection with Hoomana Place, was built in 1940. T. Ting was the design engineer. W. D. Bartel was the Chief Territorial Highway Engineer. The builder is unknown.

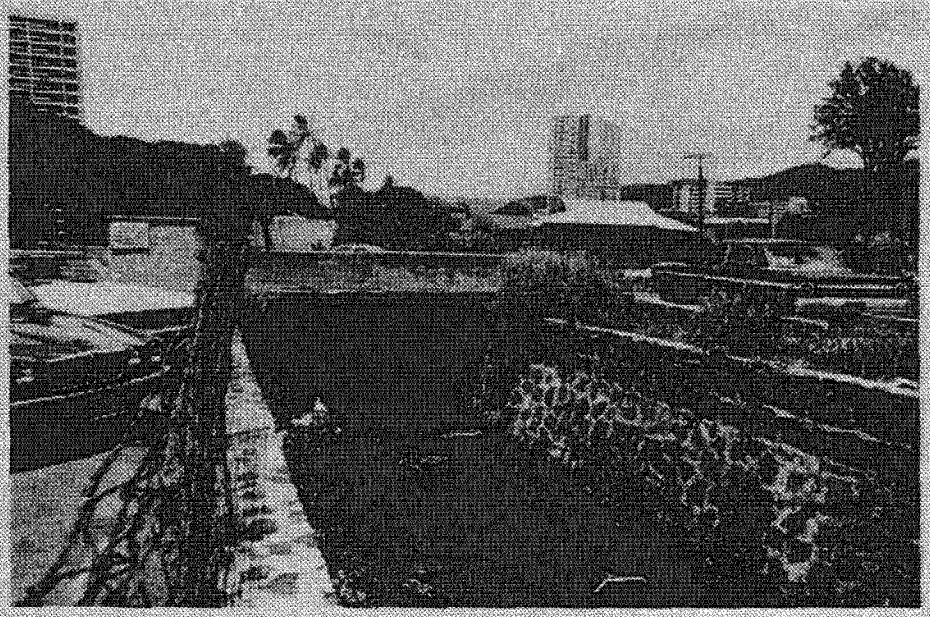
The bridge is a two span reinforced concrete flat slab structure, 52' in length, 32' in width, and 10' in height. It has a design load capacity of H-15. The abutments and parapets are constructed of concrete. The railings are made of pipe. There is a 3' sidewalk on each side. The design integrity is intact.

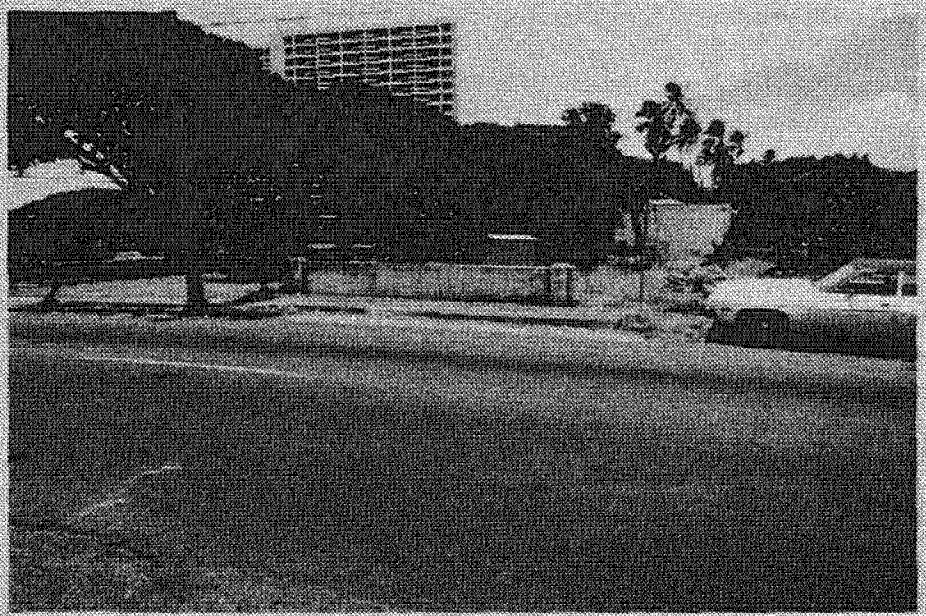
The bridge is an important transportation link between Mokuleia and Wahiawa.

There are vantage points for easy public access. The view is good.

Aesthetically the scene is judged to be average.

AR00042546





Phillip Street Bridge

AR00042547

The Phillip Street bridge across Makiki stream was built by the City and County of Honolulu in 1938. The land was part of the Robinson tract. The Bureau Engineer was R. H. Whitehouse. The builder is unknown.

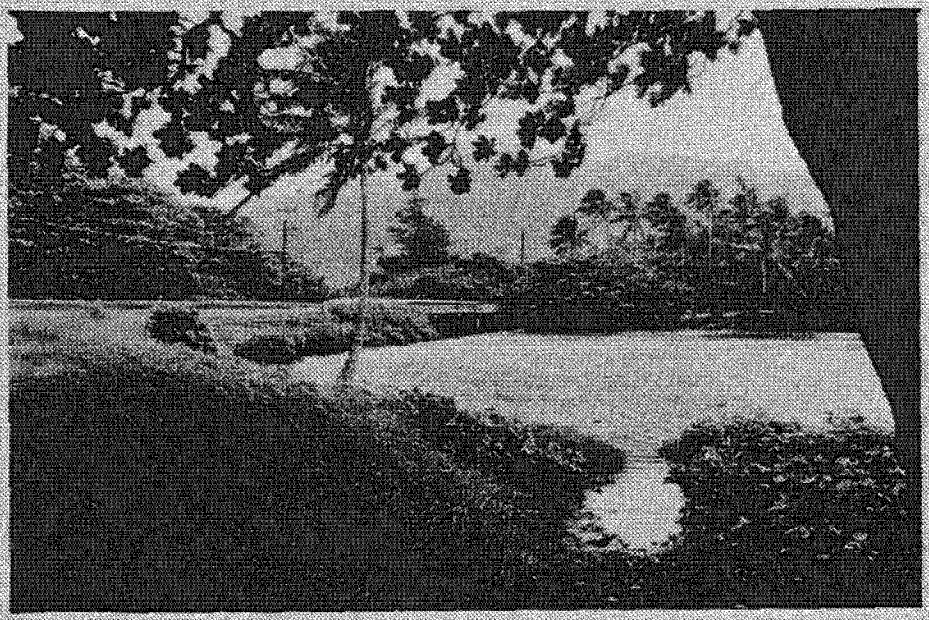
The bridge is a single span reinforced concrete flat slab structure 25' in total length, 48.5' in total width. It has a design load capacity of H-10. The abutments and railings are constructed of concrete. There are 5' sidewalks on each side. The design integrity is intact.

The structure is an important transportation link.

There are vantage points for easy public access. The view is good.

The aesthetics are rated poor.

AR00042548



South Kahana Bridge

AR00042549

The South Kahana bridge located on Kamehameha Highway .048 of a mile southeast of the intersection with Sacred Falls Road was built in 1927. The builder is unknown.

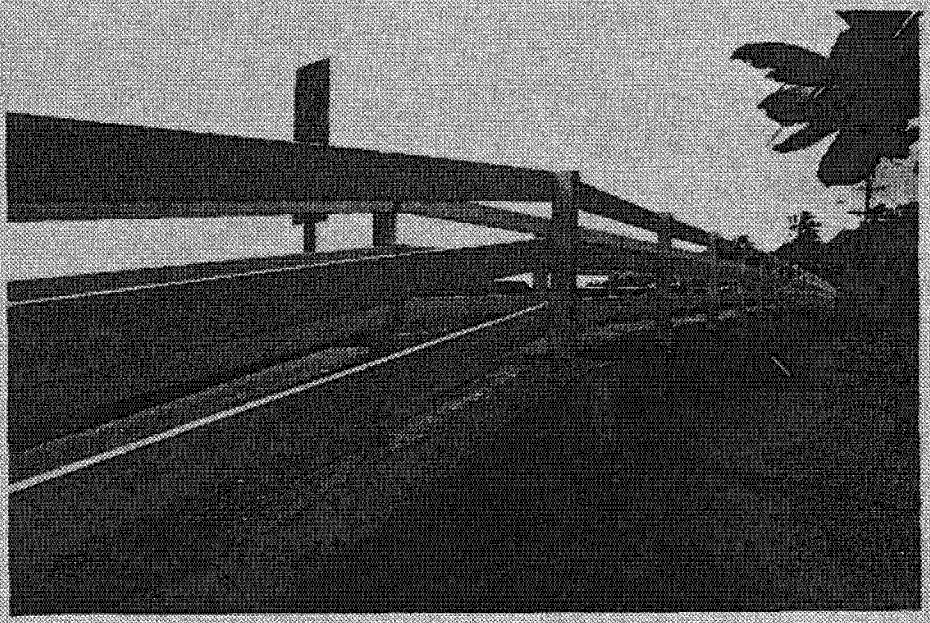
The bridge is a five span reinforced concrete flat slab structure on a railroad trestle, 90' in total length and 26.4' in total width. It has a design load capacity of H-15. There are concrete abutments and railings. There is a wooden walkway on the right side with wooden railings on both sides. The bridge is built on an old railroad trestle. The design integrity is not intact.

The structure is an important transportation link between Windward communities. The bridge is located across an ancient Hawaiian fishing ground on a fresh water estuary.

There are no easy access vantage points. The view is good.

The aesthetics are judged to be excellent.

AR00042550



South Punaluu Bridge

AR00042551

The South Punaluu bridge located on Kamehameha Highway 1.816 miles southeast of the intersection with Sacred Falls Road was built in 1926. The builder is unknown.

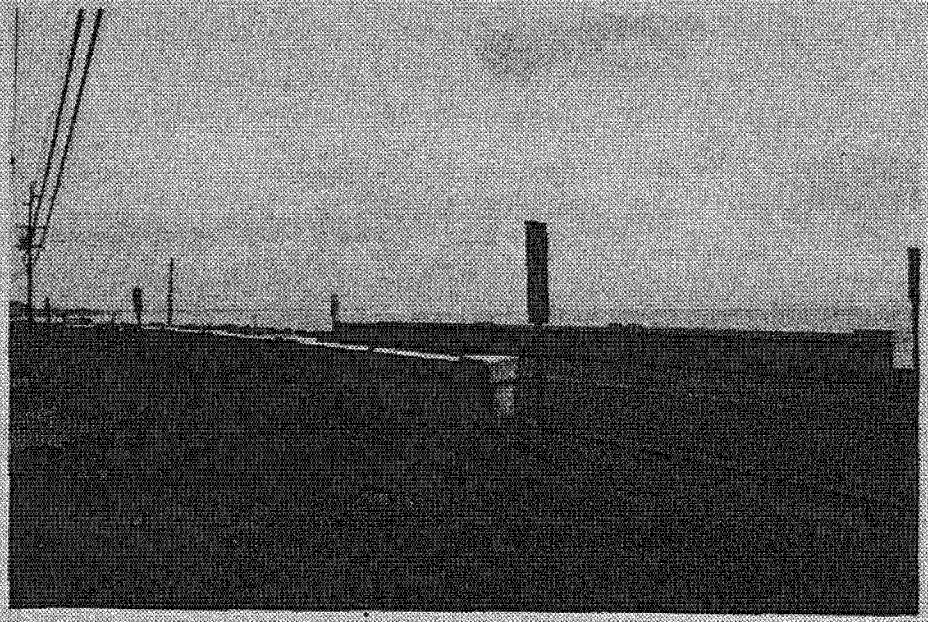
The bridge is a seven span reinforced concrete flat slab structure resting on a railroad trestle. The design load is H-15. It is 126' in length, 26.4' in width, and 12' in height. It has concrete abutments, parapets and railings. There is a concrete sidewalk on the right with wooden railings on both sides. The design integrity is not intact.

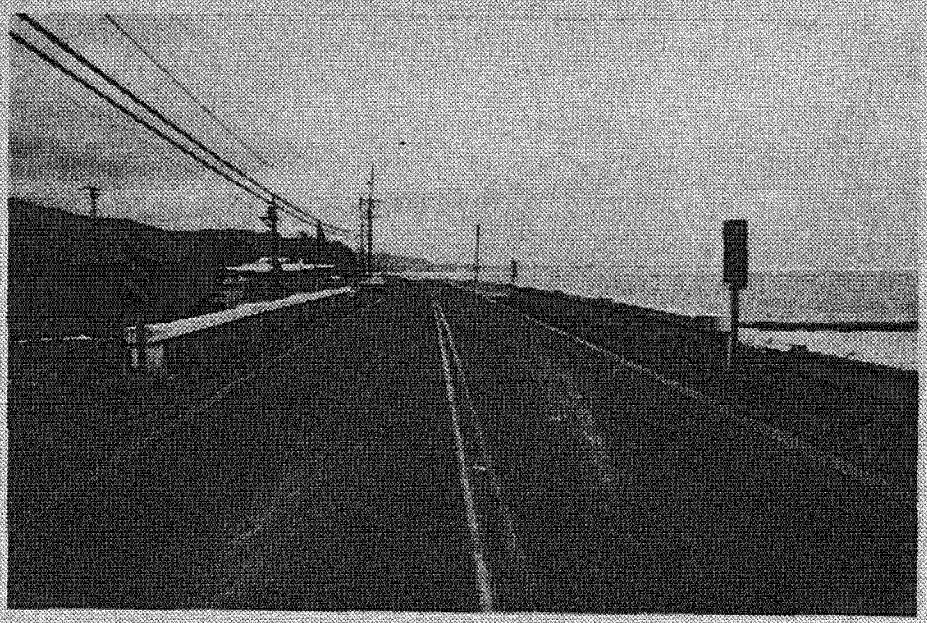
The structure is an important transportation link between Windward communities.

There are vantage points for easy public access. The view is good.

The aesthetics are judged to be poor.

AR00042552





Waimanamana Bridge

AR00042553

The Waimanamana bridge located on Kamehameha Highway .019 of a mile southeast of the intersection with Pokiwai Place was built in 1926. The builder is unknown.

The bridge is a reinforced concrete four span flat slab structure, 72' in length and 26.4' in width. It has a design load capacity of H-15. The abutments, parapets and railings are constructed of concrete. The design integrity is intact.

The bridge is on the around-the-island highway but is a good example of an unnecessary structure.

There are vantage points for easy public access. The view is good.

The aesthetics are judged to be poor.

AR00042554

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