Lori / City

Lorraine R. Inouye
Mayor

Bruce C. McClure
Chief Engineer

Laurence E. Capellas
Deputy Chief Engineer

Department of Public Works

25 Aupuni Street, Room 202 • Hilo, Hawaii 96720 • (808) 961-8321 • Fax (808) 969-7138

February 1, 1991

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
ATTENTION BRUCE S ANDERSON PHD ACTING DIRECTOR
465 SOUTH KING STREET ROOM 104
HONOLULU HI 96813

SUBJECT: Proposed Henry Street, Kailua, North Kona District, Hawaii
Issuance of Negative Declaration on Environmental Assessment

The County of Hawaii Department of Public Works has reviewed the subject Environmental Assessment (EA) prepared for the proposed development of Henry Street and has issued a Negative Declaration for this project.

Based upon the findings presented in the EA and supporting technical studies, the potential impacts of the development and operation of Henry Street have been sufficiently examined and discussed. With the implementation of the mitigative measures recommended in the EA, the action will not result in significant adverse effects on the natural and human environment. Further consideration of the project's impacts through preparation and circulation of a Draft Environmental Impact Statement is determined not to be warranted.

Of note, the name Henry Street is used for the EA, which is a temporary name. The actual Hawaiian name to be given to this roadway will be determined in the near future through the County's formal street naming procedure.

We are sending two copies of the EA and the completed OEQC information sheet for your use. Our goal is to have the Negative Declaration published in the February 8, 1991, issue of the OEQC Bulletin. If you have any questions or require additional information, please contact me.

Bruce C. McClure

BRUCE C. McCLURE, P.E.
Chief Engineer

Enclosures

cc: COH Planning Department
Lanihau Center Venture

23

1991-02-08-HI-FEA

FILE COPY

ENVIRONMENTAL ASSESSMENT

* HENRY STREET

Kailua, North Kona District, * Island of Hawaii

Joint Project Sponsors:

COUNTY OF HAWAII
DEPARTMENT OF PUBLIC WORKS
and
LANIHAU CENTER VENTURE

JANUARY 1991

Group 70 Limited • Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX (808) 523-5874

ENVIRONMENTAL ASSESSMENT

HENRY STREET

Kailua, North Kona District, Island of Hawaii

Joint Project Sponsors:

COUNTY OF HAWAII
DEPARTMENT OF PUBLIC WORKS
and
LANIHAU CENTER VENTURE

Prepared by:

GROUP 70 LIMITED
Architects•Planners•Interior Designers
924 Bethel Street
Honolulu, Hawaii 96813

JANUARY 1991

Executive Summary

EXECUTIVE SUMMARY

A new mauka/makai collector street is planned for development in Kailua Village, Hawaii, identified temporarily as Henry Street. The actual Hawaiian name to be given to this roadway will be determined in the near future through the County's formal street naming procedure. This summary includes brief descriptions of the proposed project, its beneficial and adverse impacts, proposed mitigative measures, and alternatives. The project's relationship to existing government policies and plans for the area is also summarized.

DESCRIPTION OF THE PROPOSED PROJECT

The proposed Henry Street is planned for a site in Kailua Village on the island of Hawaii. The County of Hawaii is disclosing its plans for constructing the new street and related improvements by publication of this environmental assessment.

The initial proposal to construct this new collector street was made by Lanihau Center Venture in 1985 as part of the master plan for development of Lanihau Center. With the planned expansion of Lanihau Center and growth of traffic in the region, Henry Street has become a necessity for both the developer of Lanihau Center and the County of Hawaii. Henry Street will become a new connector between Kuakini Highway and Queen Kaahumanu Highway, and serve as a secondary access for Lanihau Center. The developer and the County of Hawaii will enter into a Joint Development Agreement to construct Henry Street and associated drainage facilities. The processing and approval of this Environmental Assessment is projected to be completed in February 1991. Final approvals for plans and engineering details for the roadway and drainage facilities could be granted by July 1991. Construction of the project is expected to require approximately eight months.

Henry Street is being jointly developed by the County of Hawaii and Lanihau Center Venture to serve the general public, including patrons of Lanihau Center. After completion, Henry Street will be dedicated to the County of Hawaii and become part of the County-owned and maintained system of streets and highways.

The entire project site for the Henry Street right-of-way and drainage facilities is approximately 5.6 acres in size. The project area includes: 3.1 acres for the Henry Street right-of-way (80 feet wide); 1.6 acres for additional clearing necessary along either side (20 feet) of the right-of-way; and 0.9 acres for a drainage retention basin. Henry Street will extend approximately 1,700 feet between Queen Kaahumanu Highway and Kuakini Highway on presently vacant land. Henry Street will extend along the southern boundary of the site planned for the expansion of Lanihau Center (Phase II). Also adjacent to the north side of the proposed street is Kalanikai, a condominium development. Separated from the Henry Street right-of-way by approximately 50 to 200 feet of vacant land on the southern side are a commercial laundry service facility, several multi-family residential buildings of the Kona Lani residential area, and the Lono Kona single-family residential subdivision.

The project site is classified mostly for Urban use by the State, and General Commercial use by the County zoning plan. However, a small portion of the proposed right-of-way crosses over an adjoining parcel which is classified for Agriculture by the State. No land use classification changes will be required by the State or County to complete this project.

The intent of the road construction project is both to improve traffic circulation for Kailua Village and provide access to the Lanihau Center. Henry Street is also expected to enhance Queen Kaahumanu Highway's function as an alternative bypass route for traffic traveling north and south on the leeward side of the island.

The various elements of the design plan for Henry Street site include an 80 foot right-of-way with two 13-foot travel lanes in both directions, an eight-foot wide planter median, and curbs and gutters and a four-foot wide sidewalk in either direction. Approximately 20 feet of land will be cleared beyond the roadway on either side for roadway grading purposes, which will be landscaped after construction is completed.

An integrated stormwater drainage system is also proposed to control runoff from the street, as well as the flows from the North Keopu Stream drainageway which is crossed by the Henry Street right-of-way. As part of the construction of this proposed street, other utility systems will be integrated, including electrical, water, and telephone.

Construction activities at the project will involve vegetation clearing, grading (cut and fill), excavation, rock drilling or blasting, construction of the roadways, and landscaping. Construction is anticipated to start in August 1991 and be completed by August 1992.

The proposed project will create both beneficial and adverse effects on the natural and human environment. A detailed description of the existing environmental conditions was prepared for each environmental factor, and this was used as a background to assess potential benefits and adverse effects.

BENEFICIAL IMPACTS

There are a number of project impacts that will be beneficial to residents of the Kailua Village and West Hawaii area residents in general. Anticipated beneficial impacts of the proposed project are listed below.

1. The Kailua Village community will gain an alternative east/west route connecting Kuakini Highway and Queen Kaahumanu Highway, as an alternative to using Palani Road. Traffic congestion on Palani Road will be somewhat relieved by the operation of Henry Street. This alternative route will also provide an alternate emergency route when there is an accident or repairs are required on Palani Road, or evacuation of the Village is necessary.

2. An integrated drainage system will be developed which will control on-site generated runoff and create flood control for this portion of the North Keopu Drainageway for up to a 10-year flood level.

3. The amount of suspended sediments eroded from this site as a result of storm runoff is expected to be less with development than under existing conditions .

4. Archaeological resources have been inventoried in the project area, and sites with sensitive resources have had surveys conducted and data collected for future education and research. Known burial sites and signficant archaeological sites in the Henry Street project area will be treated in accordance with agreements reached with the State of Hawaii Historic Preservation Program and the Island of Hawaii Council on Burials.

5. Construction employment resulting from this project will amount to 180 man-months of on-site jobs and 36 man-months of off-site jobs.

6. As a result of the project, the State government is expected to gain $123,260 (1990 dollars) in excise taxes for construction materials and professional services. Benefits to the County of Hawaii will be realized from the anticipated increased valuation of the involved and adjacent properties, and the taxes which will be collected as a result.

ANTICIPATED SHORT-TERM IMPACTS AND MITIGATIVE MEASURES

Development activities will involve the clearing, grubbing, and grading of the site, construction of the stormwater drainage system, the roadway, sidewalks, and curbs. Also required will be the installation of street lights, fire hydrants, a water supply system, and other utilities. Short-term construction-related impacts on the environment will be generated by the project, and mitigative measures will be implemented to minimize these impacts.

Anticipated short-term adverse impacts and mitigative measures are listed below.

1. Modifications to Kuakini Highway and Queen Kaahumanu Highway will be undertaken to construct intersections at Henry Street. The maintenance and protection of traffic during construction at these locations will be undertaken according to State of Hawaii Department of Transportation and and County of Hawaii Department of Public Works requirements.

2. Soils on the site will be disturbed for grading and excavation, and some soil erosion will occur. Proposed mitigation will include implementation of soils management measures and drainage controls according to County regulations that will minimize soil erosion.

3. Air quality in the area of the project will be affected by the generation of fugitive dust, and construction equipment and worker vehicle emissions.

Dust conditions will be controlled by frequent watering of roadways, and construction equipment will be maintained in proper working order to minimize emissions.

4. Trucks and worker vehicles will create a short-term effect on traffic conditions on local roadways, mainly Queen Kaahumanu Highway and Kuakini Highway and their nearby intersections. Short-term traffic effects will be minimized by off-peak truck use of highways, and possibly staggered working times.

5. Noise will be generated by construction activities on the project site. Construction operations must comply with State and County noise regulations, which limit construction operations to daytime hours and sets maximum allowable noise levels.

6. The quality of storm runoff water on site, and drainage from the site, will be slightly affected by the introduction of additional suspended sediments as a result of soil erosion during the construction period. Proposed soil management measures and drainage controls will minimize soil erosion on the site and the subsequent addition of suspended sediments to storm water runoff.

7. Introduced wildlife species occurring in the area of the project site will temporarily be displaced to undisturbed areas due to land clearing for construction. Landscape plantings are expected to provide some replacement habitat on the site for many wildlife types which currently inhabit the site.

8. Construction activities will be most visible along Kuakini Highway and Queen Kaahumanu Highway in the vicinity of the project site. Adjacent residential areas may also experience views of the construction activities. Views of the construction operations on the site will be minimized by proper equipment and materials storage, minimized vegetation clearing to only the project limits, expedient re-vegetation of, and the use of landscaped areas, and non-intrusive security lighting.

9. Emergency medical facilities in Kailua may occasionally be utilized by construction workers during the construction period. The development of Henry Street will place an additional burden on the Police Department in terms of creating a new enforcement area.

ANTICIPATED LONG-TERM IMPACTS AND MITIGATIVE MEASURES

Once Henry Street is constructed and opened for public use, some long-term adverse effects will have occurred or will continue to occur. Mitigative measures have also been proposed to minimize the long-term adverse effects of the project.

Anticipated long-term adverse impacts and proposed mitigative measures are listed below.

1. The completed Henry Street (1992) will involve new intersections of Henry Street with Queen Kaahumanu Highway and Kuakini Highway. Traffic operations on these roadways during peak hour traffic periods will experience Level-of-Service (LOS) D or better conditions at these new intersections.

2. Noise will be generated by vehicles traveling on Henry Street. However, noise levels at the adjoining residential land uses, however, are expected to remain within Federal noise guidelines for residential areas.

3. Air quality will be affected by vehicle emissions from vehicles traveling on Henry Street. Federal air quality emission standards will not be violated at the project site.

4. Grading of the Henry Street site will change some of its topographic features. Grading changes will be coordinated with drainage improvements for the site. A County of Hawaii Grading Permit must be obtained prior to construction.

5. Several archaeological sites will be affected as a result of the project. Through intensive surveys, these materials have been carefully documented to preserve their historical and research value. Treatment of these sensitive sites has been been reviewed and authorized by the Department of Land and Natural Resources, Historic Preservation Program and Island of Hawaii Council on Burials

6. Minor contributions of fertilizer constituents and pesticides could enter stormwater runoff from landscaped portions of the street right-of-way. The stormwater drainage system will collect and transport runoff during peak precipitation periods. Fertilizers and pesticides (approved types) will be carefully controlled in amounts applied, and no applications will be made during high precipitation periods.

ALTERNATIVES TO THE PROPOSED PROJECT

Alternative alignments to the proposed Henry Street alignment have been considered. The no-action alternative has also been considered. A third alternative considered is the expansion of Kalani Street in place of Henry Street.

The no-action alternative would keep the project site in its present undeveloped condition. No beneficial environmental effects would be generated by this alternative. Without the development of Henry Street in the near future, however, traffic on Palani Road would become worse than exists at present. Public access to the site would also not be allowed. In terms of environmental consequences, this alternative would create the least adverse and beneficial effects of all alternatives considered.

Alternative street alignments to the north and south over the western 500 feet of Henry Street were considered which could avoid affecting some or all of the archaeological sites. The alternative alignments considered would not, however, allow for the proper design of a right angle intersection of Henry Street with Kuakini Highway as required for traffic safety reasons and for compliance with State and County highway design standards. Predicted noise levels at either adjoining residential areas could also be increased slightly if the alignment of Henry Street followed a more northerly or southerly route than currently proposed.

Another alternative which is considered in this study is the expansion of Kalani Street, which serves the Lono Kona subdivision, into a connector roadway between Kuakini Highway and Queen Kaahumanu Highway. Lanihau Center would be served by an expanded Alahou Street connecting with the expanded Kalani Street. Unlike Henry Street, this route would avoid the creation of a new signalized intersection on Kuakini Highway. However, a new signalized intersection on Queen Kaahumanu Highway would be created. Extensive land taking and grading would be involved for widening along the Kalani Street route. The Kalani Street alternative would also cause a substantial increase in traffic and noise through this predominantly residential area. Overall costs for this alternative could be comparable or greater than for Henry Street because of the earthwork and condemnation costs.

RELATIONSHIP TO EXISTING PLANS AND POLICIES

The Environmental Assessment includes a detailed discussion of how the proposed project is generally consistent with existing State and County policies and plans for the area. Specific measures are being taken to minimize project plans which contradict any of these policies and plans. Plans and policies considered in this evaluation were:

- Hawaii State Plan Objectives and Policies, Priority Guidelines, and Functional Plans
- County of Hawaii General Plan
- Kailua Village Design Plan (1988 Draft, not yet adopted)

An extensive discussion of the consistency of the project with these policies and plans is contained in Section 5.

DETERMINATION

Based upon the findings presented in this Environmental Assessment and supporting technical studies, the potential impacts of the development and operation of Henry Street have been sufficiently examined and discussed. With the implementation of the mitigative measures recommended in the EA, the action will not result in significant adverse effects on the natural and human environment.

Further consideration of the project's impacts through preparation and circulation of a Draft Environmental Impact Statement is determined not to be warranted.

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SECTION 1

Introduction

ESSENTIAL INFORMATION

1. PROJECT SPONSOR:	County of Hawaii Department of Public Works 25 Aupuni Street, Room 202 Hilo, HI 96720 Contact: Bruce McClure, P.E., Deputy Chief Engineer Telephone: (808) 961-8321 Lanihau Center Venture 345 Queen Street, Suite 400 Honolulu, HI 96813 Contact: Philip Russell Telephone: (808) 524-5151
2. LAND OWNERS:	(1) KKI, Inc. (Fee Interest) Lanihau Center Venture (Leasehold) (2) Charles Forman and JBE Associates (Fee Interest) (3) County of Hawaii (4) State of Hawaii
3. REQUEST:	Approval to construct a 2,000 foot collector street (temporarily named Henry Street) between Kuakini Highway and Queen Kaahumanu Highway in Kailua Village
4. AREA:	Approximately 5.6 acre project area
5. PROJECT LOCATION:	In Kailua Village, Hawaii
7. TMK:	TMK 7-5-04: portions of 6, 7, and 13
8. EXISTING USE:	Vacant
9. STATE LAND USE:	Urban and Agriculture
10. COUNTY GENERAL PLAN:	High Density and Medium Density Urban Development
11. COUNTY ZONING:	General Commercial and Agriculture

1.0 INTRODUCTION

This section presents the background information on the project site, a general description of the proposed road construction plan, and the purpose of this Environmental Assessment. Detailed information regarding the project plans, environmental factors, assessment of environmental impacts, alternatives and consistency with existing land use plans and policies is presented in the following sections of this report.

1.1 BACKGROUND

The applicant, the County of Hawaii, is planning the construction of a new four-lane collector street connecting Kuakini Highway with Queen Kaahumanu Highway on land adjacent to the Lanihau Center Phase II in Kailua Village. This proposed roadway has been temporarily named Henry Street, pending formal assignment of a Hawaiian name through the County's street naming procedure. Henry Street would intersect Kuakini Highway at approximately 1,200 feet south of Palani Road, and it would intersect Queen Kaahumanu Highway approximately 1,750 feet south of Falani Road. Portions of properties with Tax Map Key (TMK) numbers 7-5-04: 6, 7, and 13 will be involved with the construction of this project.

Figure 1 shows the location of the project site in relationship to the North Kona District of the island of Hawaii. Figure 2 shows the location of this site within Kailua Village.

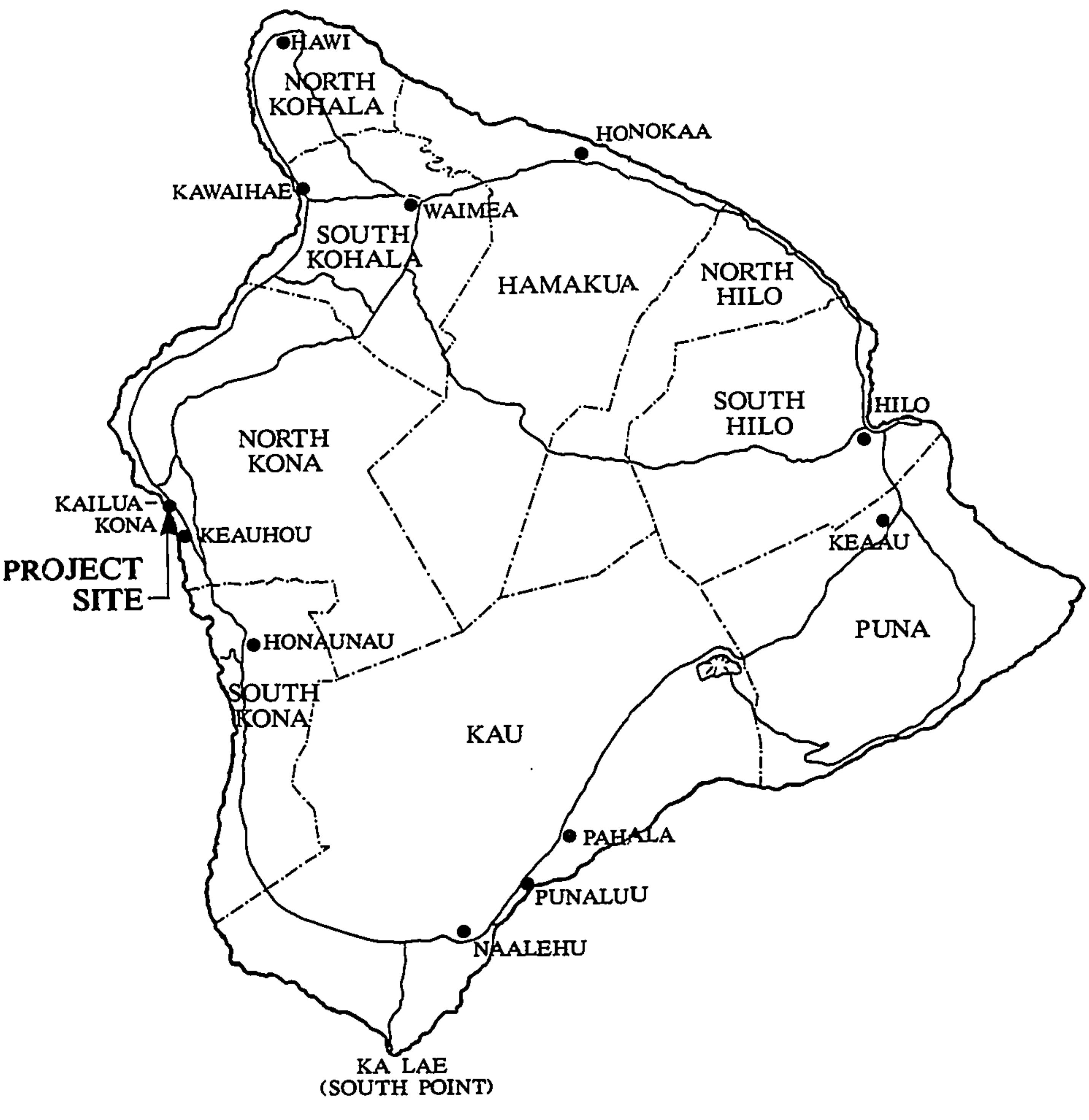
The elevation of the Henry Street site ranges from approximately 40 feet above mean sea level (msl) near Kuakini Highway, to nearly 170 feet above msl in the mauka portions of the site, near Queen Kaahumanu Highway. This site is unutilized vacant land with broad open areas and gentle to steep slopes. The probable past use of this land was grazing.

1.2 GENERAL DEVELOPMENT PROPOSAL

The initial proposal to construct this new collector street was made by Lanihau Center Venture in 1985 as part of the master plan for development of Lanihau Center. With the planned expansion of Lanihau Center and growth of traffic in the region, Henry Street has become a necessity.

The developer and the County of Hawaii will enter into a Joint Development Agreement to construct Henry Street and drainage facilities. The processing and approval of this Environmental Assessment is projected to be complete by February 1991, assuming issuance of a Negative Declaration by the County of Hawaii Department of Public Works. Final approvals for plans and engineering details for the road and support facilities could be received by July 1991. Construction of the project is expected to require approximately 12 months, with completion anticipated by the August 1992.

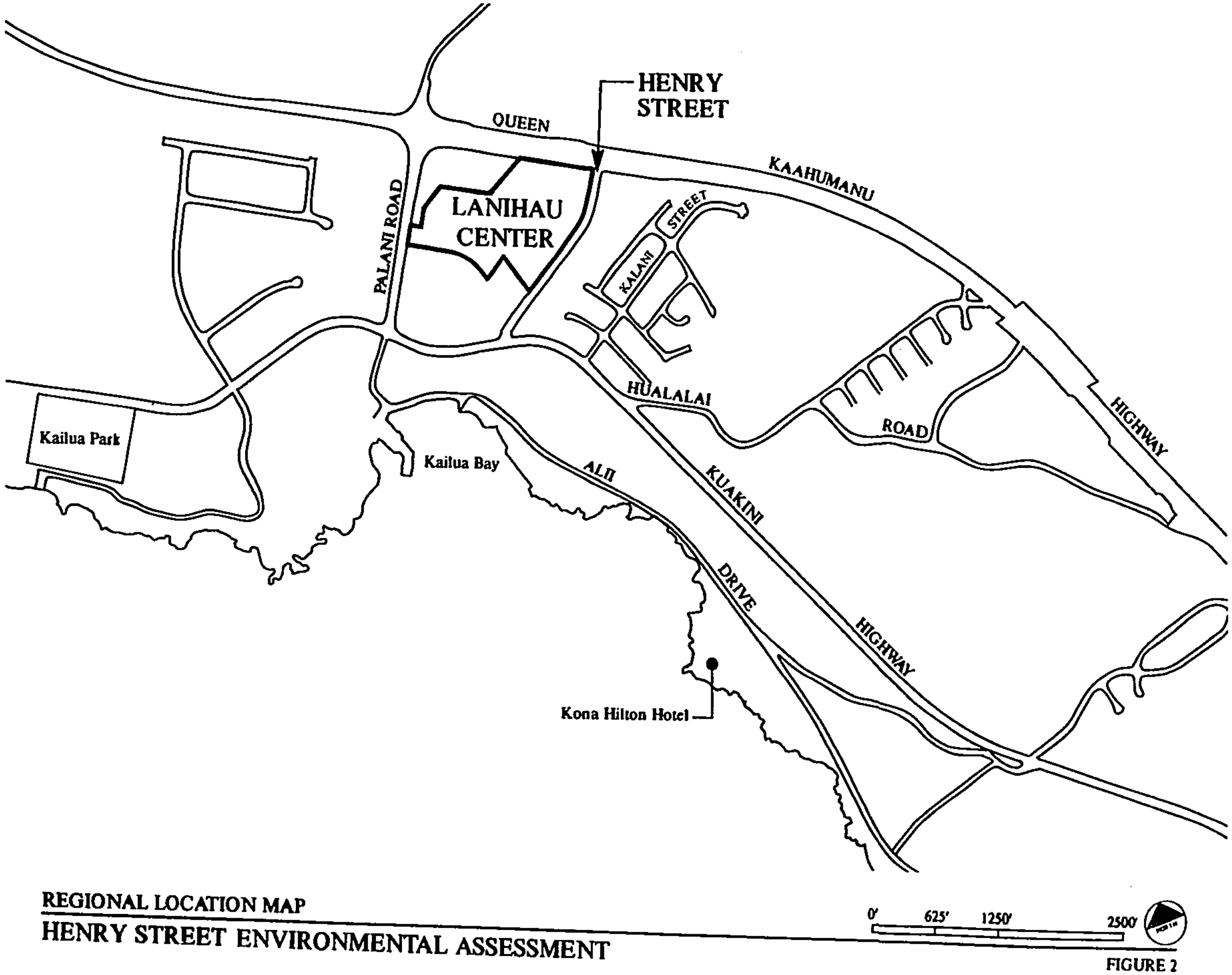
Except for the intersection with Queen Kaahumanu Highway, the County of Hawaii will be acquiring the fee simple ownership interest in the Henry Street right-of-way, as it will be dedicated by the fee owner, KKI, Inc., and the developer of Lanihau Center, Lanihau Center Venture. The intersection with Queen Kaahumanu Highway will be owned by the State of Hawaii.



HAWAII LOCATION MAP

HENRY STREET ENVIRONMENTAL ASSESSMENT

FIGURE 1



REGIONAL LOCATION MAP

HENRY STREET ENVIRONMENTAL ASSESSMENT

FIGURE 2

1.3 PURPOSE AND NEED FOR THE PROJECT

The intent of the road construction project is to provide a new mauka/makai connection between Queen Kaahumanu Highway and Kuakini Highway in Kailua Village, and serve the expanded Lanihau Center. Henry Street will also enhance Queen Kaahumanu Highway's function as the main route for traffic traveling north and south on the leeward side of the island. Henry Street will also provide an alternate emergency route when Palani Road is closed for repairs or due to an accident.

One of the purposes for the Queen Kaahumanu Highway extension built in 1984, as stated in the Final Environmental Impact Statement for that project, was to "assist in achieving its (the General Plan's) goals by enhancing the possibilities of developing adjacent unimproved lands." To achieve this, it is clear that enhancement only can be realized via the provision of vehicular access to develop unimproved lands adjacent to the Queen Kaahumanu Highway extension. The need for access is important because of the County's zoning designation permitting medium and high density development in this area.

1.4 PURPOSE AND CONTENTS OF THE ENVIRONMENTAL ASSESSMENT

This Environmental Assessment (EA) has been prepared to identify and evaluate the existing conditions and potential impacts of the development of Henry Street on the natural and human environment. An EA must be prepared for the project because it will be funded in part by the County of Hawaii, and involves public land at the highway intersections. The County of Hawaii Public Works Department is the applicant for this project, but since there is no specific discretionary permit required, the County's mayor or his representative will make a decision on acceptance of the EA, and either issue a Negative Declaration or a Notice of Preparation for an Environmental Impact Statement (EIS).

This document has been prepared in accordance with the provisions of Chapter 343, HRS and Title 11, Chapter 200 of the State Department of Health Administrative Rules, which together set forth the requirements for the preparation of environmental assessments and impact statements. In addition, an EA scope document was approved by the County of Hawaii, attached as Appendix A.

There is an Executive Summary prepared which summarizes the entire document, and includes a Summary Sheet. Section 1 is the Introduction which presents background on the project, the generalized development proposal, and the purpose and contents of the document. Section 2 contains a detailed project description, including ownership and present use of the site, the master plan, construction activities, scheduling and costs, and benefits to the community.

Section 3 includes the description of existing environmental conditions, anticipated environmental impacts and recommended mitigation measures. The environmental factors considered in this EA include soils, water quality and use, ecology, traffic, archaeological resources, views, land use designations, noise, and socio-economic characteristics, along with other factors. Mitigative measures are recommended to minimize potential adverse impacts generated by the project.

Section 4 is a presentation of alternatives to the proposed action, including no-action and street alignment alternatives. Section 5 includes a discussion of the relationship of the project to existing policies and plans for the area. The determination of the significance of the project's impact is stated in Section 6. References, a List of Preparers, and Résumés of Preparers are included in Section 7. This section also includes a List of Consulted Parties.

Section 8 includes copies of technical reports prepared by consultants for the project. Specific technical reports have been prepared to evaluate the disciplines of botany and terrestrial vertebrates, archaeological resources, stormwater drainage, traffic, noise, and air quality. Information contained in these reports have been highlighted in the applicable parts of Section 3.

SECTION 2

Project Description

2.0 PROJECT DESCRIPTION

This section presents a discussion of the ownership and present use of the project site, and details of the proposed collector street, Henry Street, including the development goals and construction activities. The development timetable is described in this section, along with project costs. Various benefits to the community that will result from this project are also described herein.

2.1 OWNERSHIP AND PRESENT USE

This project concerns approximately 5.6 acres of property briefly described in Section 1, located at Kailua Village in the North Kona Judicial District of the island of Hawaii.

The site includes portions of parcels with Tax Map Key designations TMK 7-5-04: 6, 7, and 13. TMK 7-5-04:7 is owned fee simple by KKI, leased to Lanihau Partners, L.P., and subleased to Lanihau Center Venture; parcels 6 and 13 of TMK 7-5-04 are owned in fee by Charles Forman & JBE Associates. The site of the proposed intersections of Henry Street with Queen Kaahumanu Highway is owned by the State of Hawaii, and the intersection with Kuakini is owned by the County of Hawaii

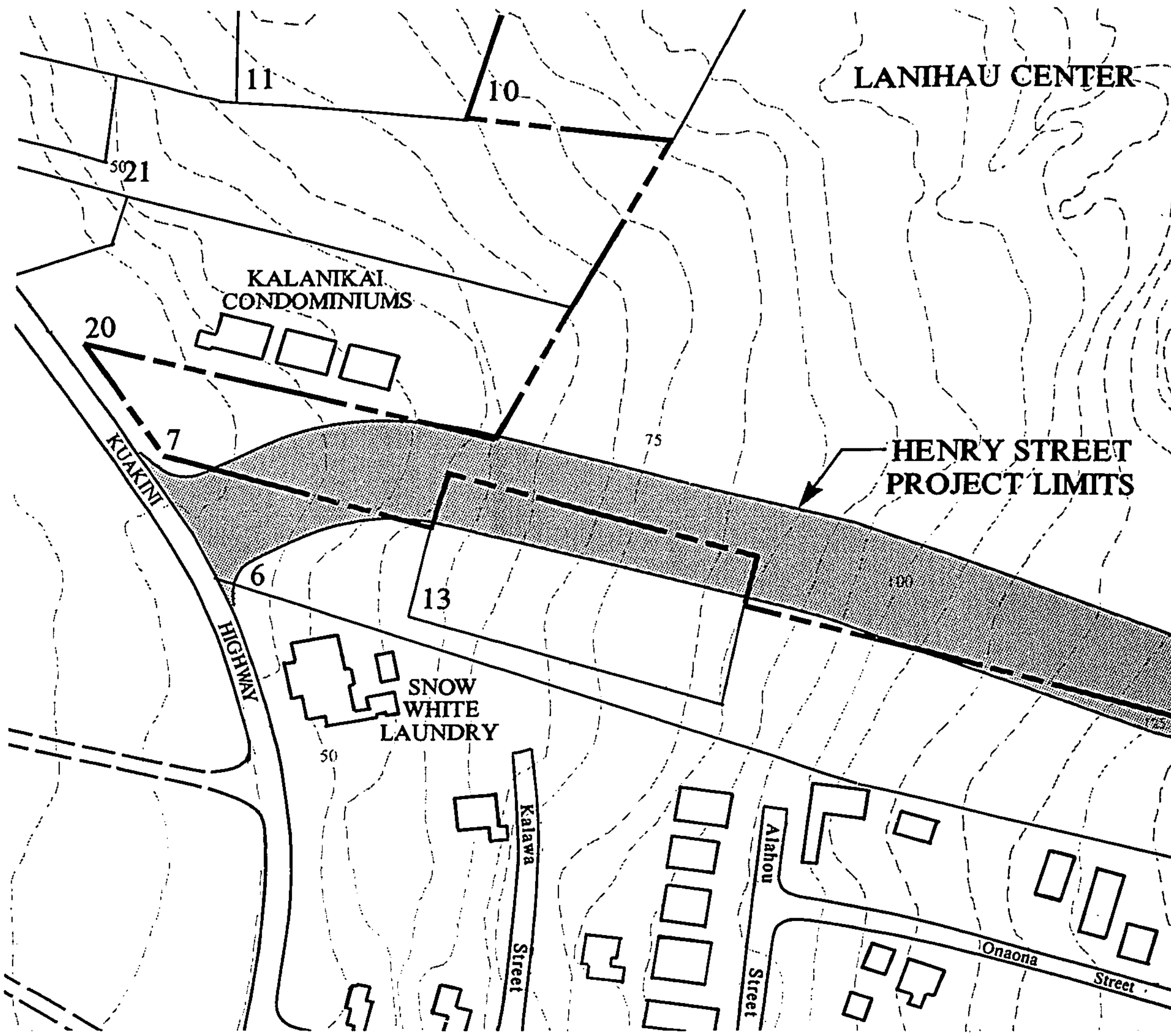
Figure 3 depicts the project limits planned for the Henry Street site and topography. The site consists primarily of vacant, former pasture land. Vegetation cover at the site is extensive. Portions of the site contain remnants of archaeological and historical features. A natural drainageway, the North Keopu Drainageway, runs mauka/makai including portions of the proposed Henry Street right-of-way.

Land uses of properties adjoining the Henry Street site include vacant land and residential and commercial uses. The Kalanikai condominium apartments abut the site on the north side at the planned intersection with Kuakini Highway. On the opposite side of the proposed street, at the same intersection, exists Snow White Linen Laundry, a commercial laundry service facility. The laundry service will be separated from the Henry Street right-of-way by approximately 150 feet of currently vacant open space. A single and multi-family residential subdivision, Lono Kona, borders the Henry Street right-of-way along its entire southern boundary, but it is separated from it by approximately 100 to 200 feet of currently vacant open space.

To the north of the Henry Street right-of-way is the presently vacant site at which the Lanihau Center will be expanding. Figure 4 shows the relationship of Henry Street with the Lanihau Center as it is planned when its site is fully developed.

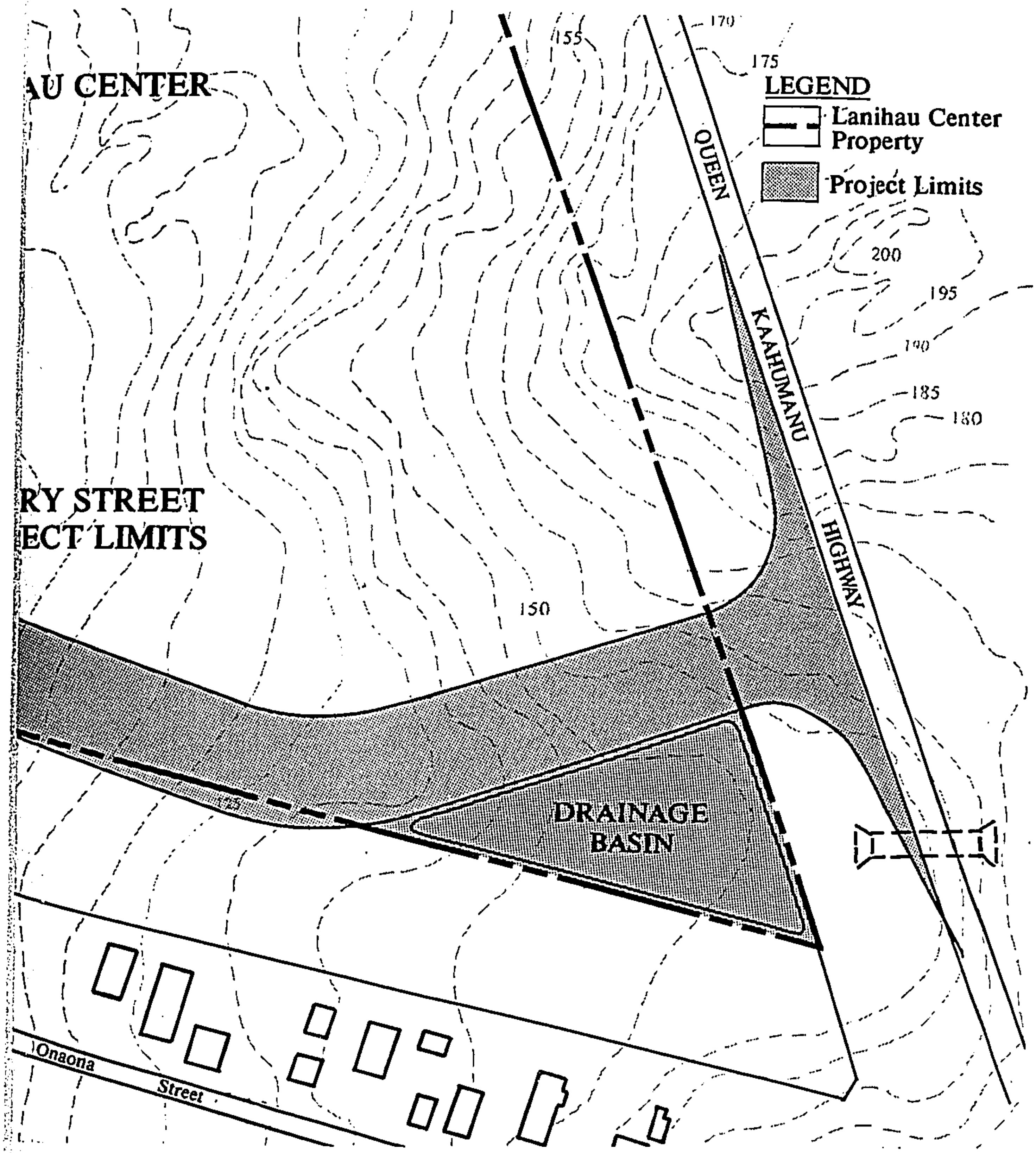
On the west (makai) side of Kuakini Highway at the proposed street intersection, the land is presently vacant, and similar in character to the makai portion of the project site. To the south of this vacant land is a small shopping center with a Jack-in-the Box restaurant located on Kuakini Highway.

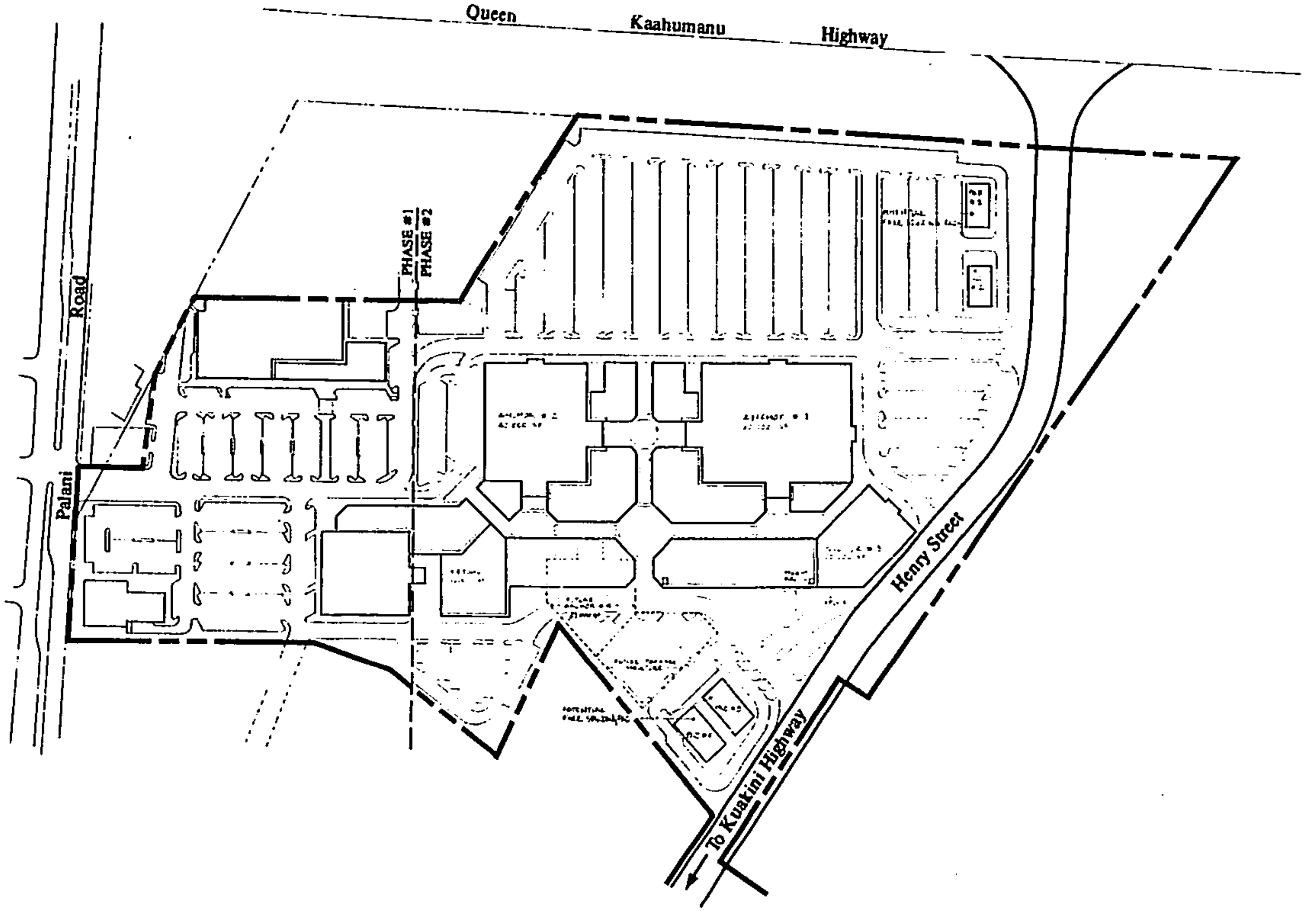
On the east (mauka) side of Queen Kaahumanu Highway opposite the proposed intersection of Henry Street, the land is presently vacant, and is similar in character to the mauka portion of the Henry Street site. The Great Wall of Kuakini, an historic rock wall extending though this area of North Kona, is located nearby.



HENRY STREET PROJECT LIMITS AND SURROUNDING PROPERTIES

HENRY STREET ENVIRONMENTAL ASSESSMENT


AU CENTER
RY STREET
ECT LIMITS
LEGEND
Lanihau Center Property
Project Limits
QUEEN KAAHUMANU HIGHWAY
DRAINAGE BASIN
Onaona Street
155
170
175
200
195
190
185
180
150
125
0'
75'
150'
300'
FIGURE 3



LANIHAU CENTER MASTER PLAN

HENRY STREET ENVIRONMENTAL ASSESSMENT

FIGURE 4

2.2 PROJECT ELEMENTS

The Henry Street project involves the development of a new roadway and intersections, drainage facilities, and utilities installation. These project elements are described below.

A. Roadway and Intersections

The various elements of the design plan for Henry Street (Hida, Okamoto and Associates; April 1990) are shown in Figure 5. Figure 6 depicts the proposed typical roadway section. These elements include an 80 foot right-of-way, 56 feet (64 feet with left turn lane) of paved surface, eight feet of sidewalks, curbs, street lights, and landscaping.

As shown in Figure 5, Henry Street will extend for approximately 1,700 feet and occupy approximately 3.1 acres of land. It will have an asphalt surface, concrete curbs and sidewalks, and grassed shoulder area with landscaping,. The Henry Street right-of-way will be owned and maintained by the County of Hawaii.

To create stable grades along Henry Street, an additional 1.6 acres will be cleared and graded - a 20 feet wide strip on both sides of the 80-foot right-of-way. The grading operation will require easements or acquisition of affected properties adjacent to Lanihau Center. This open space will be landscaped and remain as non-active parts of the site.

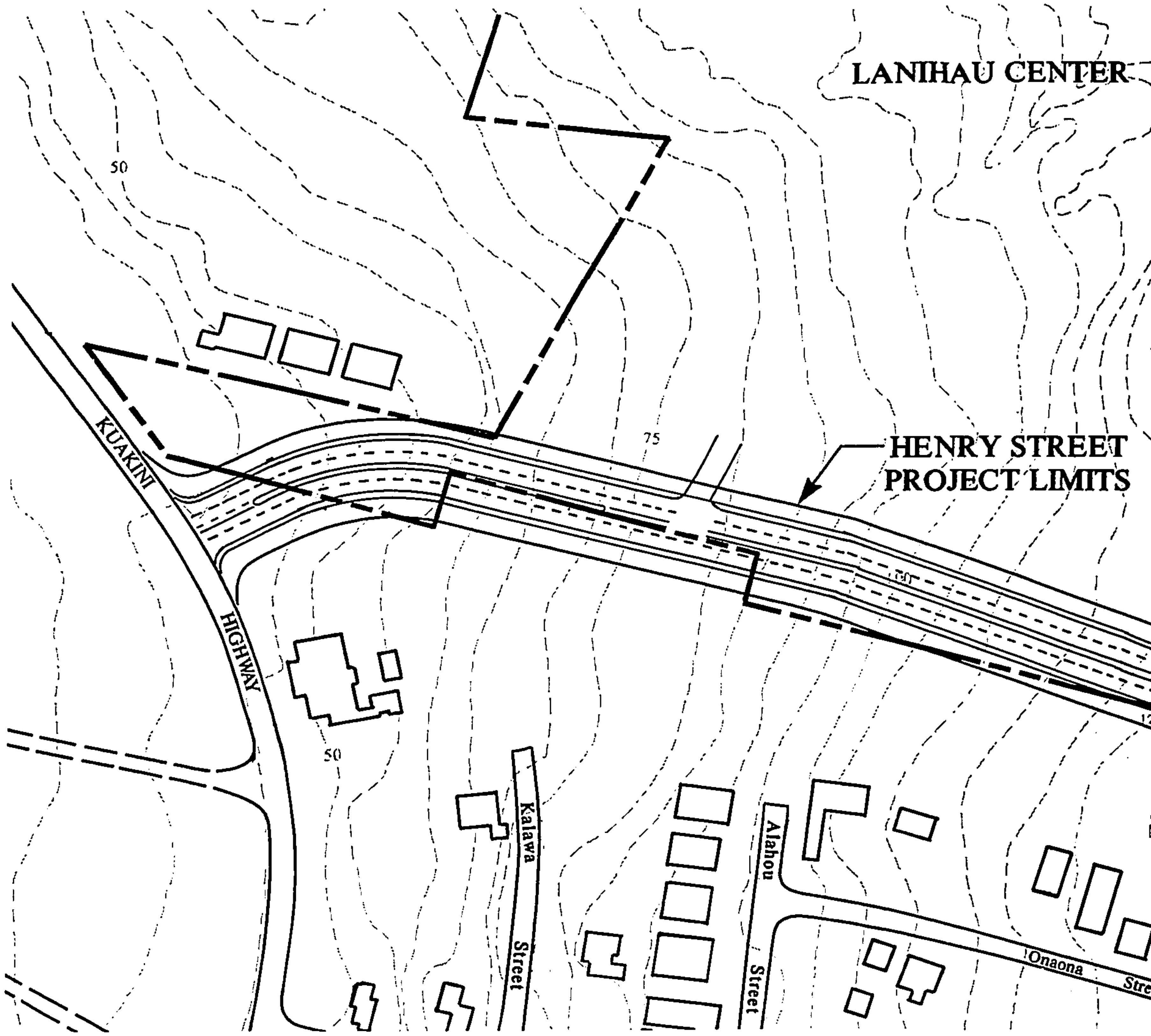
Full movement intersections with traffic signals are planned for both Queen Kaahumanu Highway and Kuakini Highway at Henry Street, as shown in Figure 7. The intersections of the Lanihau Center East Driveway and West Driveway with Henry Street will be controlled by stop signs. Traffic analysis of the projected traffic flows has determined the need for these traffic controls. A detailed discussion of existing traffic conditions and projected future conditions with Henry Street is included in Section 3.8.

B. Drainage Facilities

Development of Henry Street will include the creation of detention areas, culverts, swales, and collection basins to which storm water runoff will be routed. Some of these areas will serve as temporary detention and sedimentation basins during construction, while others will be designed as permanent water control features within the street design. Figure 8 shows the various drainage system elements.

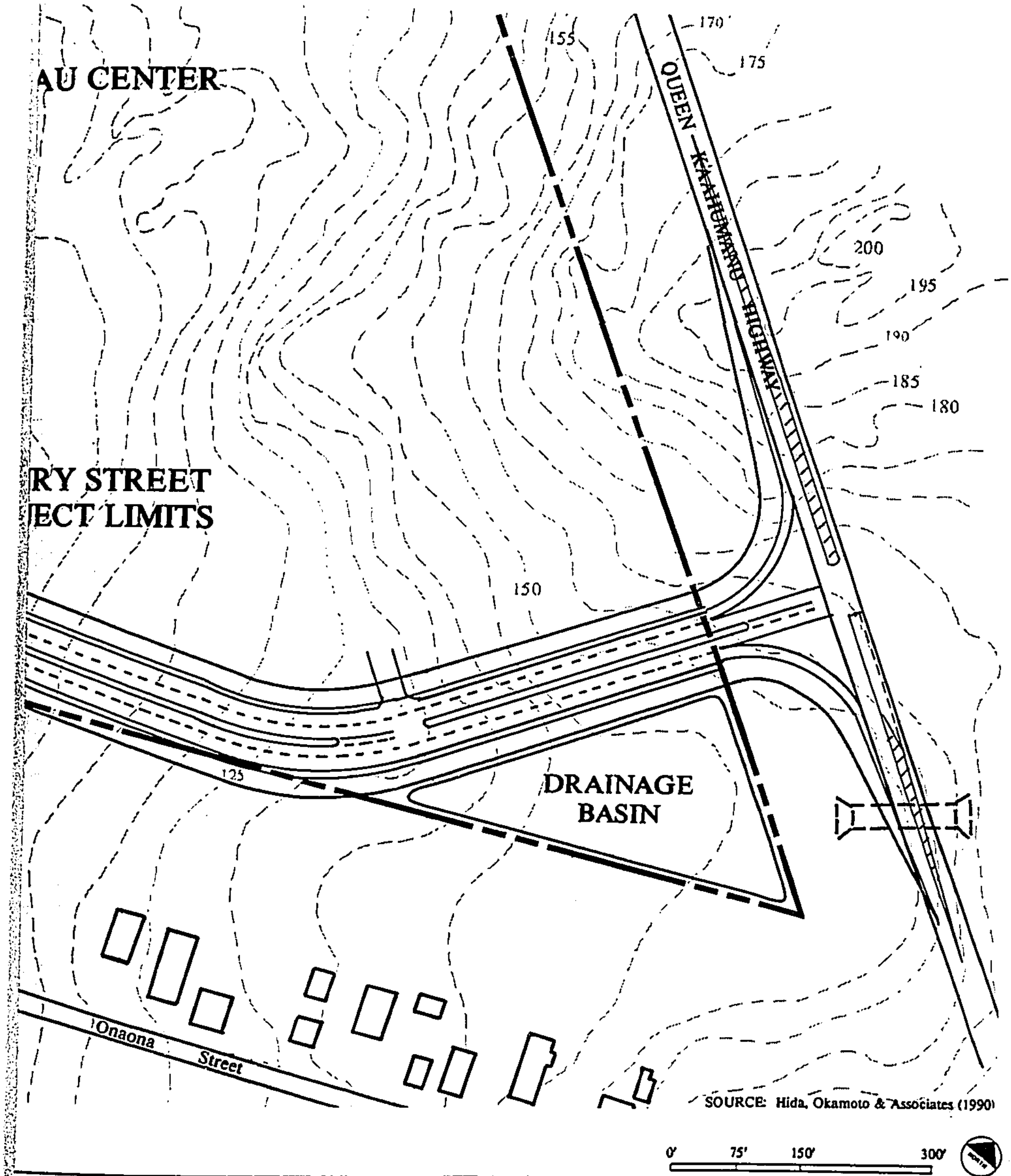
The project includes development of a 0.9 acre percolation/detention area to be located at the eastern end of Henry Street on the southern side. Eleven drywells will be installed in the basin, and two 42-inch diameter overflow pipes will collect overflow from this basin. A series of 10 catch basin/drywells will be installed on each side of the Henry Street roadway. The drainage facilities system will have a capacity to detain a 10 ten-year storm level of runoff (590 cfs).

Additional drainage improvements will be continued along the mauka side of Kuakini Highway to accommodate and dissipate over and beyond a 10-year storm level of runoff. The proposed road side catch basins along Kuakini Highway will act as outlets allowing the 100-year storm to overflow. The 100-year storm overflow peak discharge should be reduced due to construction of the drainage system along Henry Street. Flood condition and inundation of areas makai of Kuakini Highway will not be changed and the peak discharge for the drainage basin will be decreased.



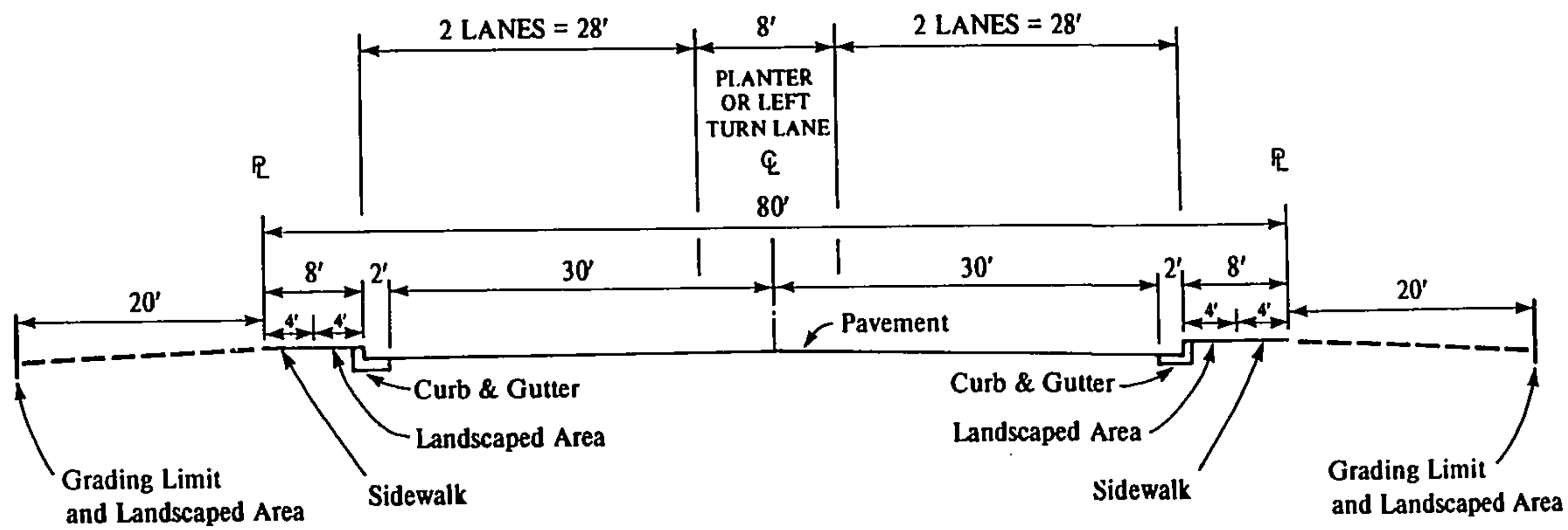
HENRY STREET DESIGN PLAN

HENRY STREET ENVIRONMENTAL ASSESSMENT



AU CENTER
RY STREET
JECT LIMITS
QUEEN KAAHUMANU HIGHWAY
DRAINAGE
BASIN
Onaona Street
155
170
175
200
195
190
185
180
150
125
SOURCE: Hida, Okamoto & Associates (1990)
0'
75'
150'
300'

FIGURE 5

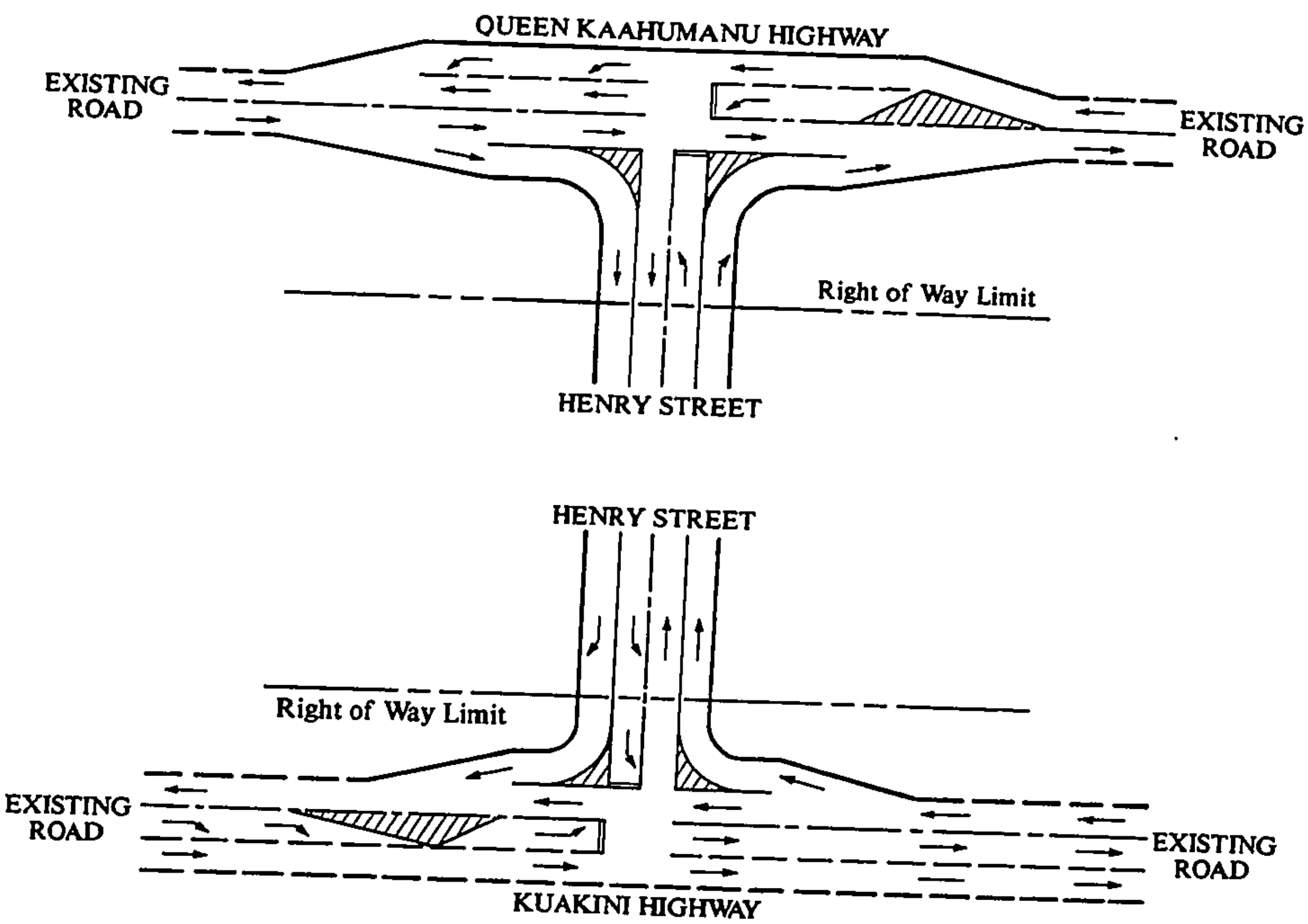


TYPICAL ROADWAY SECTION

HENRY STREET ENVIRONMENTAL ASSESSMENT

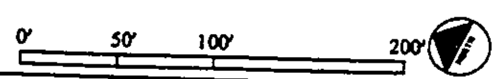
SOURCE: Hida, Okamoto & Associates (1990)

FIGURE 6



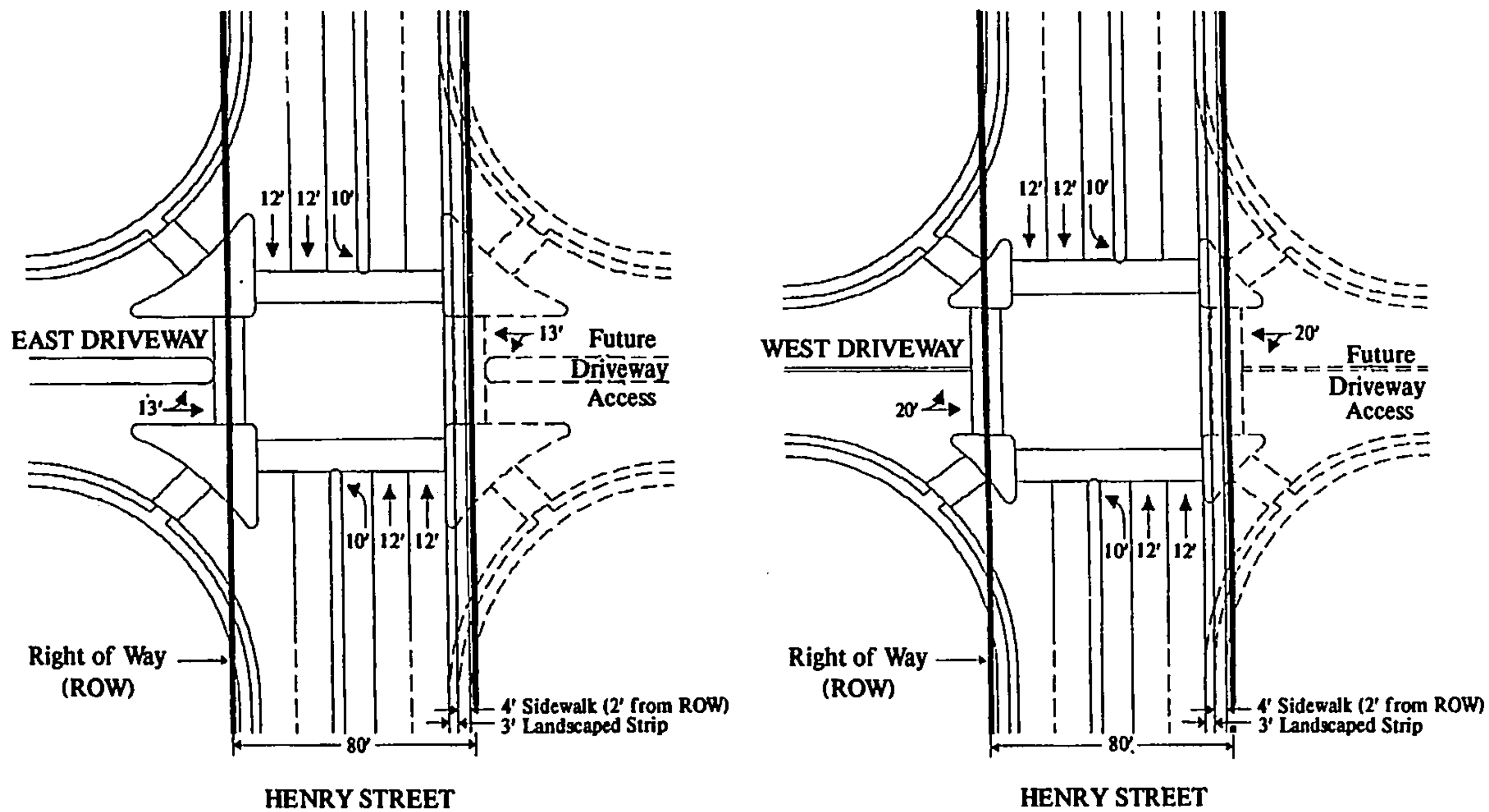
SOURCE: Hida, Okamoto, & Associates, Inc. (June 1990)

PROPOSED HENRY STREET/
HIGHWAY INTERSECTIONS



HENRY STREET ENVIRONMENTAL ASSESSMENT

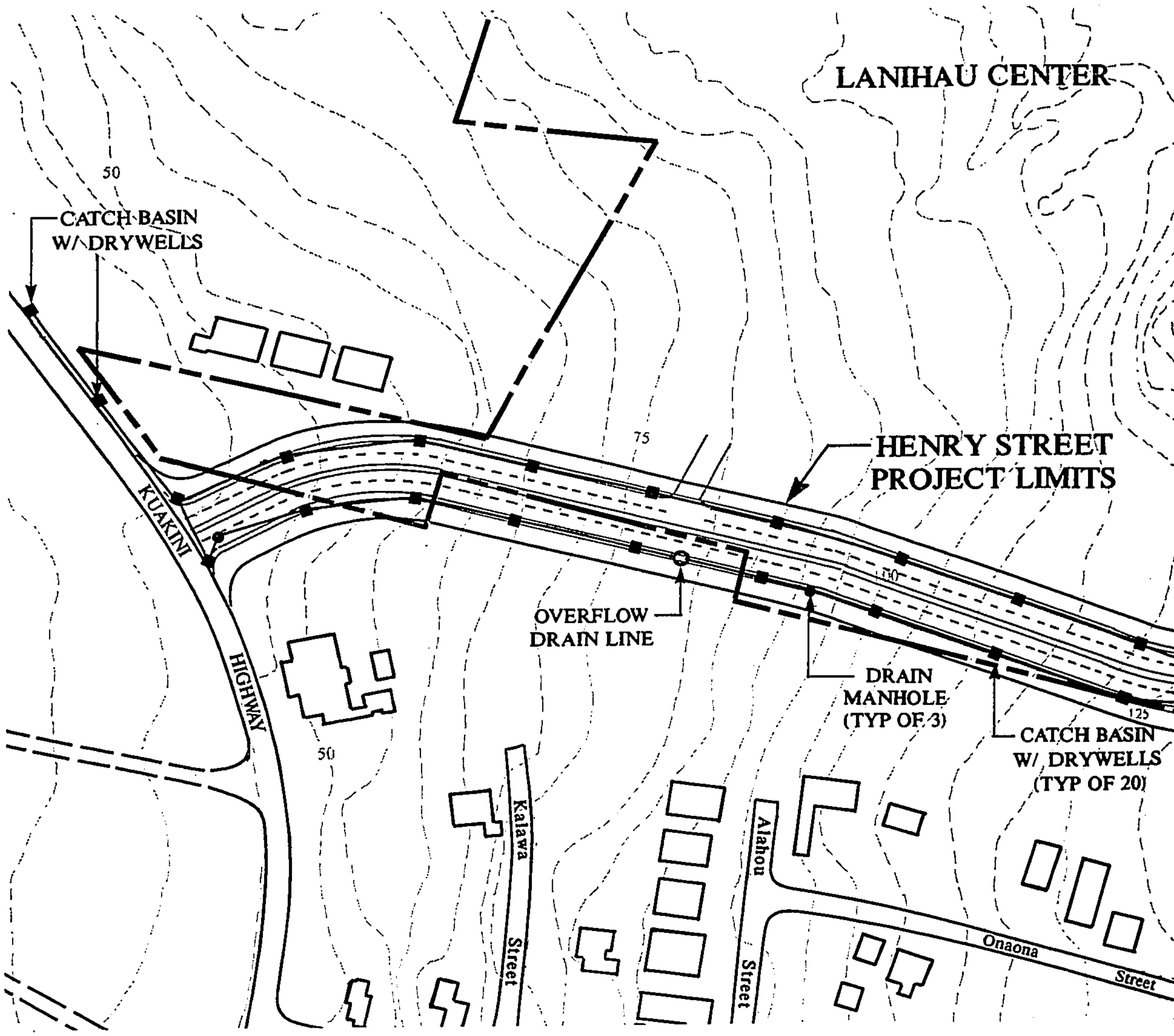
FIGURE 7A



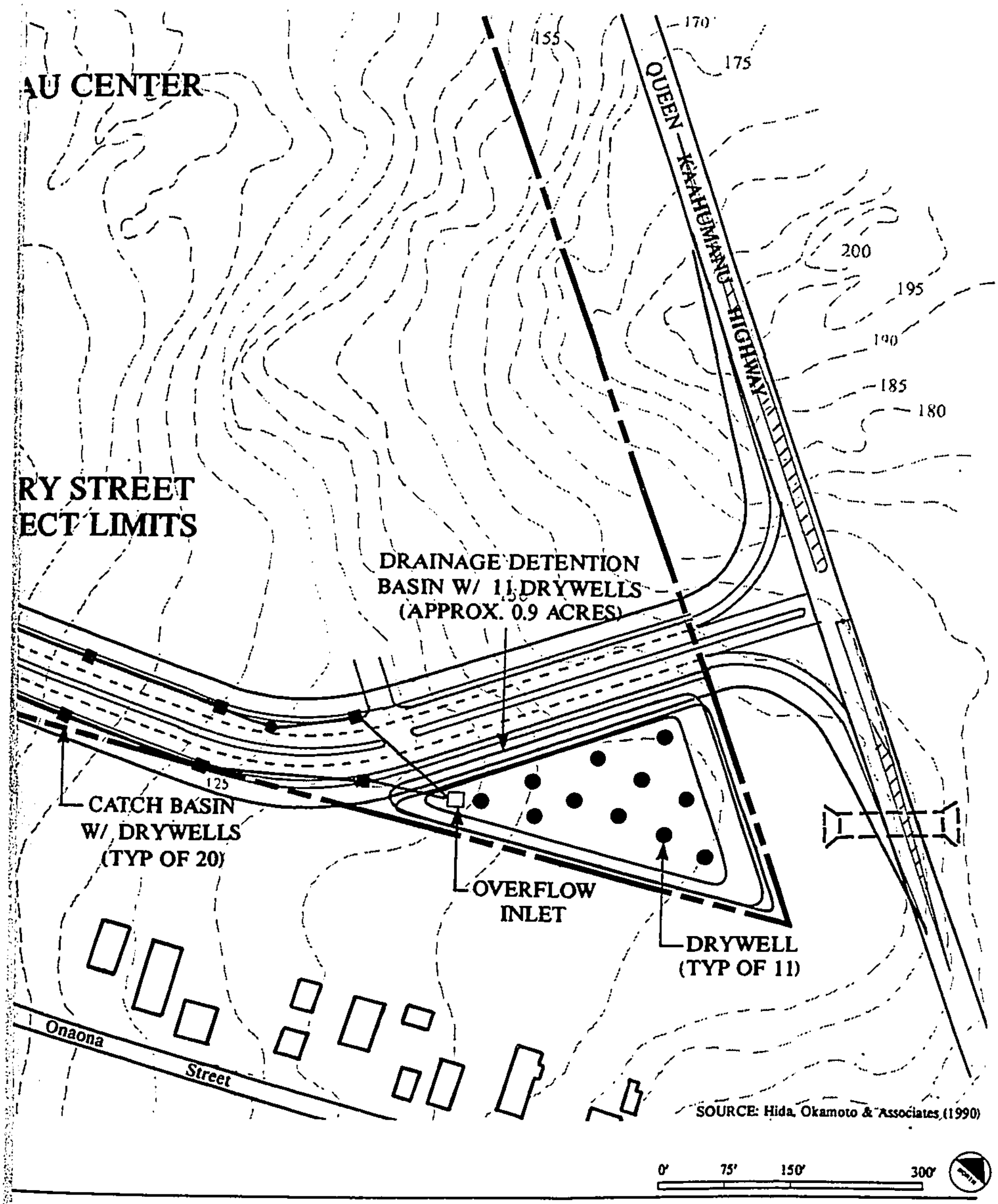
PROPOSED HENRY STREET/LANIHAU CENTER INTERSECTIONS

HENRY STREET ENVIRONMENTAL ASSESSMENT

FIGURE 7B



ON-SITE DRAINAGE SYSTEM PLAN
HENRY STREET ENVIRONMENTAL ASSESSMENT



AU CENTER
RY STREET
ECT LIMITS
QUEEN KAAHUMANU HIGHWAY
155
170
175
200
195
190
185
180
125
DRAINAGE DETENTION
BASIN W/ 11 DRYWELLS
(APPROX. 0.9 ACRES)
CATCH BASIN
W/ DRYWELLS
(TYP OF 20)
OVERFLOW
INLET
DRYWELL
(TYP OF 11)
Onaona
Street
SOURCE: Hida, Okamoto & Associates (1990)
0' 75' 150' 300'

FIGURE 8

C. Utilities

Water supply for irrigation will be routed into the Henry Street right-of-way. Electricity, telephone, and cable television conduits will also be carried in the right-of-way. Details of these project elements have yet to be finalized.

2.3 CONSTRUCTION ACTIVITIES

Construction activities at the project will involve vegetation clearing, grading (cut and fill), excavation, rock drilling or blasting, construction of the roadways, and planting and landscaping. A brief description of the extent of each construction activity follows. The development timetable is presented in Section 2.4.

A. Vegetation Clearing and Grubbing

To accommodate construction of the project elements, complete clearing and grubbing will occur over the entire street right-of-way, and approximately 20 feet beyond the street right-of way on each side. Vegetation clearing will be required over approximately 4.7 acres. An additional 0.9 acres will be cleared for drainage facilities development. Thus, a total of 5.6 acres will be cleared for this project. Utilities will be installed in the sidewalk and roadway shoulder portions of the the right-of-way.

Impacts to vegetation are discussed for both roadway and drainage sites in Section 3.7. Cleared vegetation from the site will be trucked off-site.

B. Grading (Cut and Fill)

Site grading will be required to accommodate the construction of the project elements, described in Section 2.2. Clearing and grading is estimated to affect an area including the Henry Street right-of-way, and approximately 20 feet beyond on each side. Earthwork on-site will grade the land to allow for roadway and drainage facilities to be constructed. An estimated 7,000 cubic yards of excess material will be disposed of off-site.

C. Excavations

Excavations will be required for the development of roadways and drainage facilities. Utility installations will occur along the shoulder and sidewalk portions of the new collector roadway. Water lines and other utilities will be extended from Kuakini Highway. Additional excavation work may be necessary along Kuakini Highway to connect proposed utilities to the existing distribution systems. Materials excavated for the trenches and foundations are expected to be reused on-site.

D. Rock Drilling and Blasting

To enable the construction of some sections of the roadway and installation of utilities, it may be necessary to conduct rock drilling and/or blasting to remove rock. Rock debris will be utilized on-site and not transported off-site for disposal. The amount of rock drilling and/or blasting required for this site is expected to be small. Actual amounts required will be determined after the completion of geological studies and the preparation of construction plans.

E. Construction of Roadways

Roadway development will involve clearing, grading, road bed construction, drainage facilities installation, paving, lighting and other safety provisions according to both County and State of Hawaii standards.

F. Planting and Landscaping

Landscape plantings will be incorporated in the eight foot wide roadway planter median, and the cleared border areas. Extensive landscaping is planned for the highway intersection areas and the Lanihau Center driveways.

2.4 PROJECT TIMETABLE

The proposed project completion schedule for Henry Street is shown in Figure 9. The initial proposal to construct this new collector street was made by Lanihau Center Venture in 1985 as part of the master plan for development of Lanihau Center. With the planned expansion of Lanihau Center and growth of traffic in the region, Henry Street has become a necessity. The developer and the County of Hawaii will enter into a joint development agreement to construct Henry Street and drainage facilities. The processing and approval of this Environmental Assessment is projected to be complete by February 1991, assuming issuance of a Negative Declaration. Final approvals for plans and engineering details for the road and support facilities could be received by July 1991. Construction of the project is expected to require approximately 12 months with completion anticipated by August 1992.

2.5 PROJECT COSTS

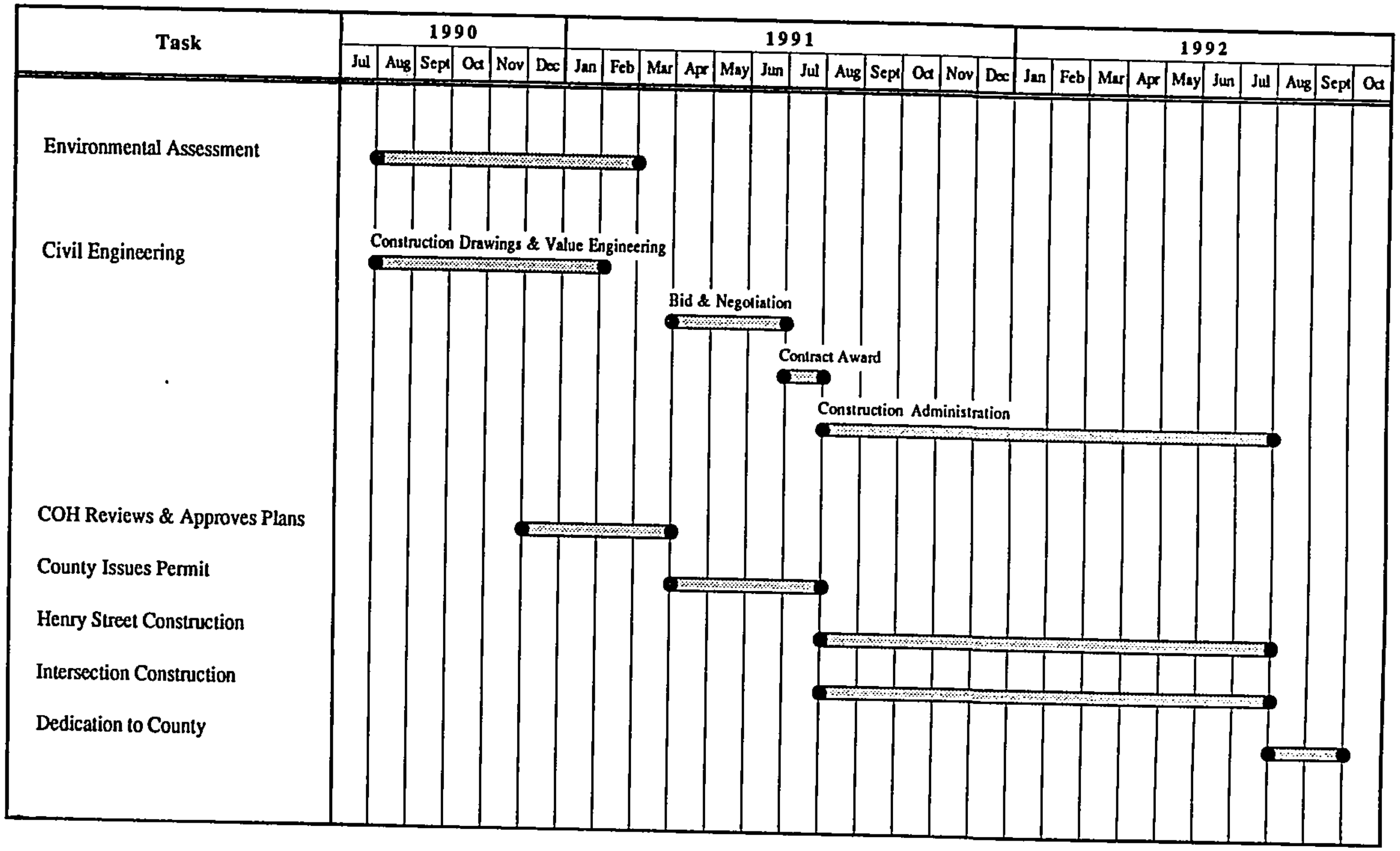
Preliminary estimates of project construction costs for Henry Street have been prepared by Hida, Okamoto, and Associates, Inc. (May 1990).

The total estimated roadway construction cost for the Henry Street project, including both work within the County and the State Highway rights-of-way, is approximately $2.82 million. These costs include clearing; excavation; disposal of excess material; construction of roads, sidewalks, curbs, gutters, retaining walls, and guard rails; signalization of both intersections; landscaping; electrical work; improvements along Kuakini Highway; bond; tax; contingency; and engineering and County coordination.

The costs for the development of drainage facilities, as currently planned, amount to a total of $700,000.

2.6 BENEFITS TO THE KAILUA VILLAGE AND NORTH KONA COMMUNITY

The operation of Henry Street as a local collector street is expected to improve traffic flow conditions at existing nearby intersections. Traffic circulation will also be facilitated for patrons of Lanihau Center. Vehicular traffic between Kuakini Highway and Queen Kaahumanu Highway in the vicinity of Lanihau Center will be able to bypass Palani Road. The new mauka/makai collector road will also provide an alternate emergency route when Palani Road is closed due to road work or an accident.



PROJECT SCHEDULE

HENRY STREET ENVIRONMENTAL ASSESSMENT

SOURCE: Hida, Okamoto & Associates (1990)

FIGURE 9

SECTION 3

Environmental Setting, Anticipated Impacts and Mitigative Measures

3.0 DESCRIPTION OF THE ENVIRONMENTAL SETTING, ANTICIPATED IMPACTS AND MITIGATIVE MEASURES

This section presents background information on the existing human and natural environment. Utilizing this background, the proposed project is evaluated as to the potential for it to generate significant environmental impacts. Impacts can be either short-term construction-related impacts, or long-term operations-related impacts.

Mitigative measures have also been recommended to minimize the potential impact of the project construction and operation. Technical consultant reports have been prepared to supplement the impact assessment. Findings from these reports are included herein, and the report texts are enclosed as Appendices B through H.

3.1 CLIMATE

A. EXISTING CONDITIONS

Average daily maximum and minimum temperatures range from the low 60's (degrees Fahrenheit) to the mid-80's, depending on the time of day and the season. Daily temperatures vary by about five degrees between winter and summer seasons, and 15 to 18 degrees between day and night. Cooler temperatures are experienced at higher elevations in this area.

Precipitation has a definite seasonality on the island of Hawaii and at the site. The adjusted median annual rainfall for this location amounts to approximately 35 inches. The distribution is uneven and varies from month to month, heavy at some times and non-existent at others. Summer months typically have the most rainfall.

The Kona area is sheltered by the mountains, Mauna Kea and Mauna Loa, and locally by Hualalai, from northeasterly tradewinds. Consequently what winds exist are usually light and variable onshore sea breezes during the day and offshore land breezes at night. Relative humidity is moderate. Stronger winds are occasionally experienced during Kona storm conditions, and come from the southwest.

Cloud cover tends to be more abundant during the day than at night. Clouds form during the day in the onshore sea breezes as they glide up the mountain, and dissipate by evening when the flow reverses and moves out to sea.

B. ANTICIPATED IMPACTS AND MITIGATIVE MEASURES

The Henry Street project will have no effect on climatic conditions, and no mitigation measures are required.

3.2 TOPOGRAPHY

A. EXISTING CONDITIONS

The Henry Street site consists of moderately sloping land (slopes of 5-10 percent) in the makai and central areas of the site, and gentle slopes (slopes of 0-5 percent) from the central area up to

Queen Kaahumanu Highway (Figure 3). Approximately 40 percent of the site area is moderately sloping, the remaining 60 percent of the site has very slight or gentle slopes.

Elevations on the site range from 40 feet above mean sea level (msl) near Kuakini Highway, to nearly 160 feet above msl in the mauka portion at Queen Kaahumanu Highway. The generalized topography of the Henry Street site and surrounding land is shown in Figure 3.

The project site for the proposed Henry Street is within the North Keopu Stream drainageway. North Keopu Stream passes through a culvert underneath Queen Kaahumanu Highway onto the site, forming a broad flood plain without a defined stream channel. The 100 year flood inundation area map and other drainageway data are included in Appendix E. Drainage is discussed in detail in Section 3.4.

B. ANTICIPATED IMPACTS AND MITIGATIVE MEASURES

The development of Henry Street will require substantial disturbance of the natural grades. As discussed in Section 2.3, grading will occur to prepare the lands for the construction of the street, sidewalks, drainage system, and installation of utilities. A total of approximately 5.6 acres will be graded for construction in this project.

Blasting and/or rock drilling may be required and this activity will be kept to a minimum. Material from rock removal and excavations will be retained on the project site as much as possible. The amounts of cut and fill will be balanced in the grading plan to minimize the need to import fill or to export excavated material. Hida, Okamoto and Associates, Inc. (May 1990) have estimated approximately 7,000 cubic yards of excess material will need to be disposed of off-site at an appropriate County or private landfill.

All grading operations will be conducted in a manner which will ensure full compliance with dust and erosion control and other requirements of the County of Hawaii Grading Ordinance. A Grading Permit must be obtained from the County to modify the topography of the site. The grading plans for the site are reviewed in this process and specific conditions will be attached to the permit issued by the Department of Public Works.

3.3 SOILS

A. EXISTING CONDITIONS

The soil classification for the project site is based upon soil surveys by the USDA Soil Conservation Service (SCS, 1972). The soil of the Henry Street site is characterized as belonging to the Punaluu Series, extremely rocky peat, underlain within ten (10) inches from the surface by pahoehoe lava. This series has a permeability of from 6.3 to 20 inches per hour and a moderately acidic pH reaction, ranging from 5.6 to 6.0. Runoff is slow and the erosion hazard is slight. The roots of vegetation are matted over the pahoehoe lava. The soil, in SCS soil capability class VIIs, is capable of being used for pasture only, and has no other agricultural value.

B. ANTICIPATED IMPACTS AND MITIGATIVE MEASURES

Preparation of the land for construction will involve grading and clearing operations to accommodate the project development. Clearing and grubbing activities during construction will temporarily disturb the soil retention value of the existing vegetation, exposing the soil to erosion forces. The impact of construction activities on soils will be mitigated by conducting construction activities following strict erosion control measures, particularly those specified in the following:

- County of Hawaii Grading Ordinance
- State of Hawaii, Department of Health, Water Quality Standards, Chapter 37-A, Public Health Requirements (1968);
- USDA Soil Conservation Service, Erosion and Sediment Control Guide for Hawaii (1968).

In particular, an effective watering program will be used to minimize fugitive dust particulate emission levels from the construction site. Other control measures include good housekeeping on the job site, and landscaping of bare soils areas as quickly as possible. Planting and landscaping of the unpaved sections of the site will generally return the soil retention values of the removed vegetation, and in some areas improve the site over current soil retention conditions.

3.4 DRAINAGE AND WATER QUALITY

This section presents a discussion of the existing surface water conditions at the proposed Henry Street site. Potential impacts of the proposed project on surface water are discussed in detail, including a technical consultant report to address the feasibility of construction of flood water control structures. Mitigative measures are recommended to minimize flood damage, drainage, and water quality impacts.

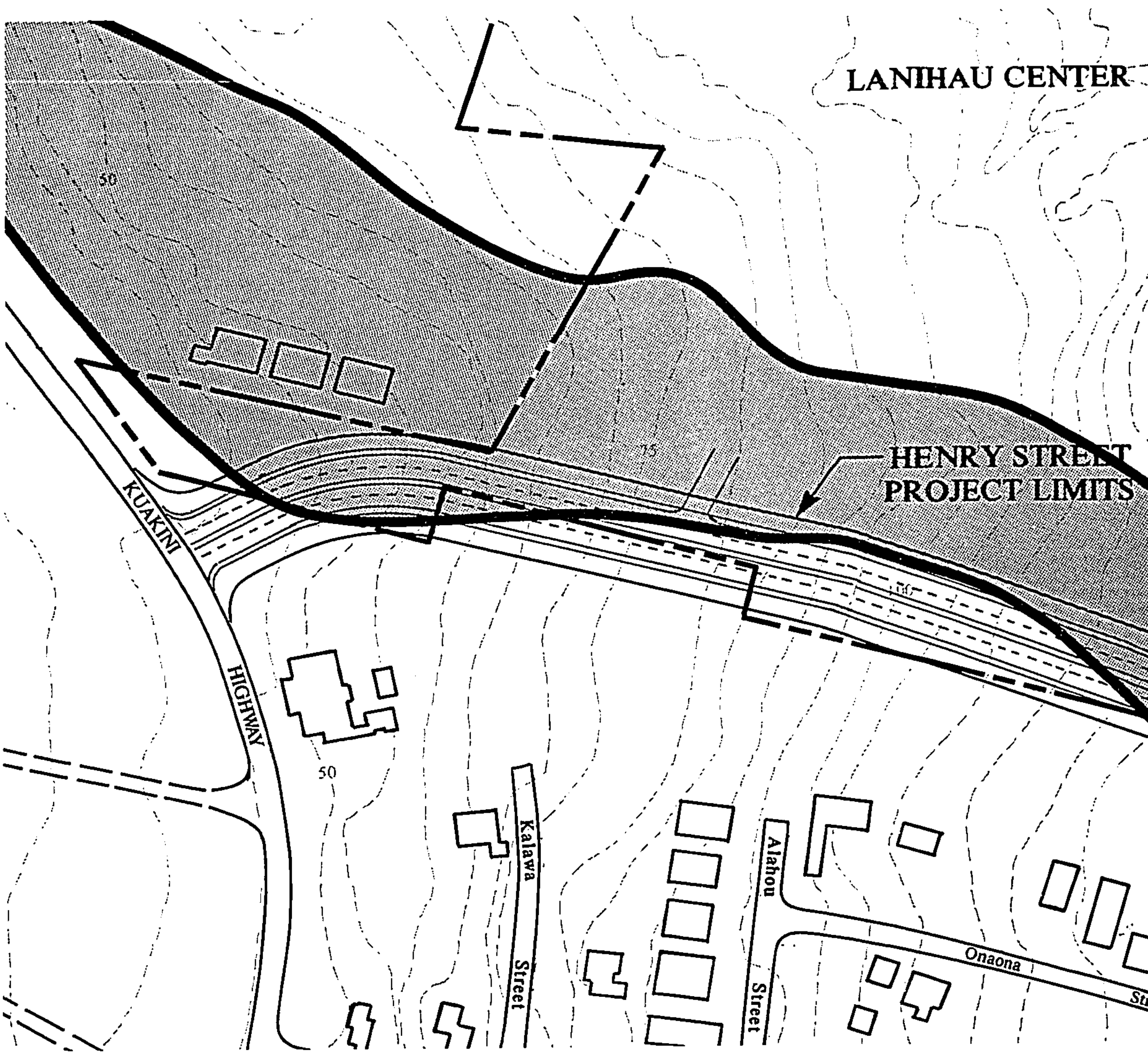
Drainage conditions within the project site, and potential project impacts on drainage, were evaluated by Hida, Okamoto and Associates, Inc. (December 1990) and their report is included in Appendix E. The findings from these reports, as they apply to the proposed project, are summarized below.

A. EXISTING CONDITIONS

The project site for the proposed Henry Street is within the North Keopu Stream drainageway. During periods of peak precipitation, runoff water is carried by this intermittent stream. Storm runoff flow is from east to west (mauka/makai), passing underneath Queen Kaahumanu Highway through a culvert. A portion of the Henry Street site is inundated by the runoff water during these periods.

The extent of the 100-year flood inundation area on the site is shown in Figure 10. Flood discharge rates and other drainageway data are summarized in Table 1, and shown in greater detail in Appendix E. The data indicate an average flood depth of four feet and a flood width of 200 feet within the drainageway, which extends through a large section of the project site to Kuakini Highway. Beyond Kuakini Highway the drainageway encompasses the entire area between Palani Road and Sarona Road until it overflows Alii Drive to Kailua Bay. There are currently no existing drainage systems between Queen Kaahumanu Highway and Alii Drive capable of accommodating the 100-year flood.

The portion of the North Keopu Stream watershed area mauka of the project site is characterized by steep slopes of 25 percent adjacent to the project's west border, becoming less



DRAINAGEWAY AND FLOOD HAZARD AREA

HENRY STREET ENVIRONMENTAL ASSESSMENT

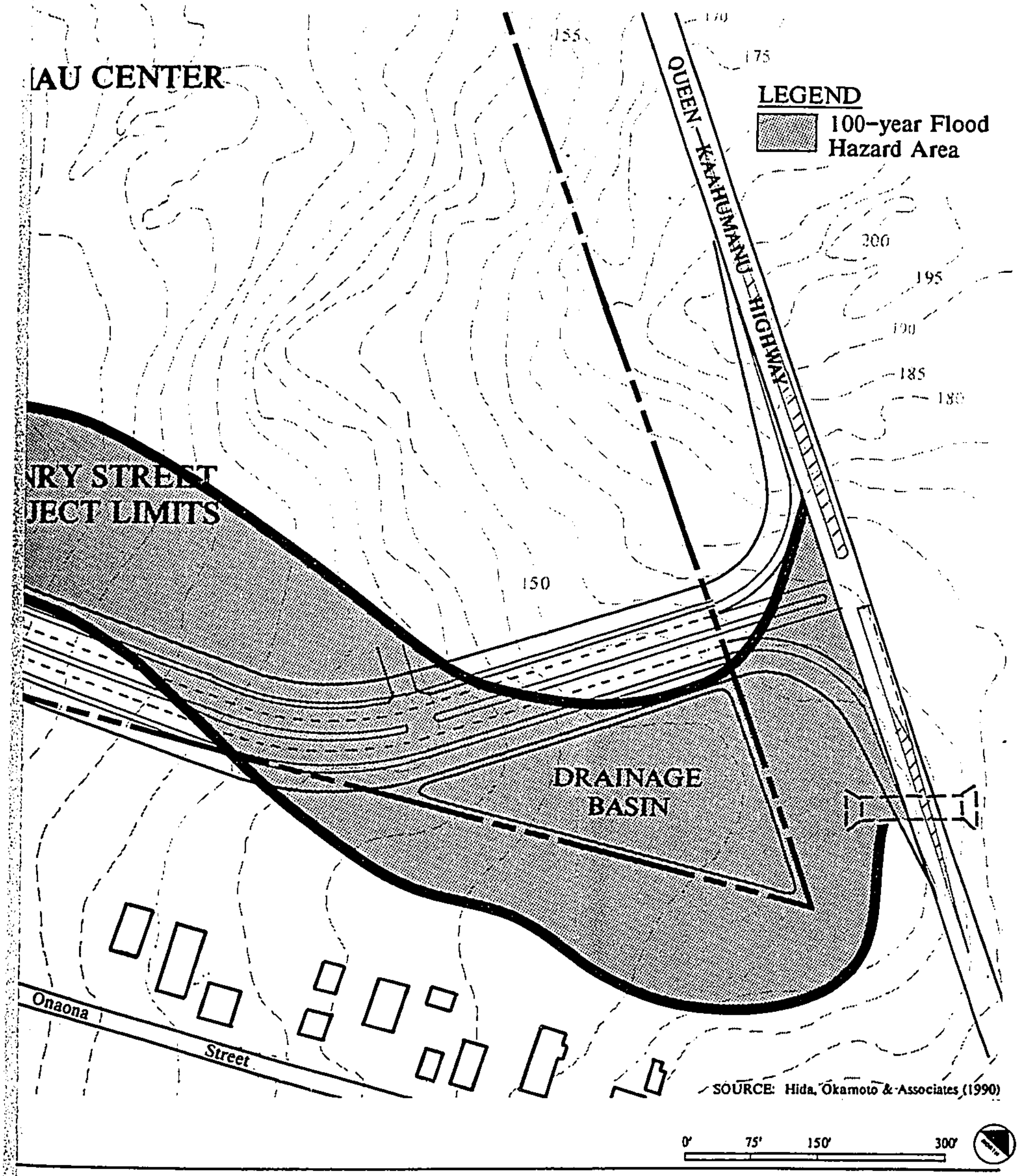

AU CENTER
LEGEND
100-year Flood Hazard Area
QUEEN KAAHUMANU HIGHWAY
NRY STREET
JECT LIMITS
DRAINAGE
BASIN
150
155
175
200
195
185
Onaona
Street
SOURCE: Hida, Okamoto & Associates (1990)
0'
75'
150'
300'

FIGURE 10

steep up to an elevation of 3,000 feet, and then becoming very steep (slopes of 25 percent or greater) again up to the peak of Hualalai, far mauka of the site.

Elevations within the watershed vary from 155 feet above msl near the project's western border to 8,271 feet above msl at the peak of Hualalai, the mauka boundary of the watershed. The off-site area between the eastern boundary (elevation: 46 feet above msl) and Kailua Bay consists of uniformly sloping lands (two to five percent).

Vegetation cover is variable throughout the drainage basin, with areas of high grasses, scrub brush and trees, as described in Section 3.5. A few bare soil areas on the site exist as erosion pockets on slopes.

Surface water in the North Keopu Drainageway occurs intermittently on the site. There is no defined stream bed, and runoff disperses through overland sheet flow within the drainageway. Water quality of the runoff is generally poor due to high suspended sediment concentrations from eroded soils.

B. ANTICIPATED IMPACTS

Development of Henry Street will change the character of portions of the existing site. The vegetation cover on the site will be cleared, and hard paved road surfacing, curbs, and gutters will be constructed over approximately 90 percent of the site's area. As a result of the proposed roadway improvements, the volume of the storm runoff generated on-site are expected to increase. The increase in on-site runoff volume is created by the increased coverage of ground with an impermeable, hard-paved surface. Also, the existing drainageway flows must be diverted away from the proposed roadway. Drainage patterns for overland runoff will also change, due to the installation of the new drainage system, as shown in Figure 10.

The stormwater constituent of greatest concern with respect to water quality is turbidity. Usually, runoff with soil erosion from agricultural land operation is considered significant, and turbidity due to erosion apparently decreases somewhat as a result of urbanization. However, an increase in turbidity could result from construction activities, especially if a heavy storm occurs during the interim period between the earth moving operation and exposed soil conditions. There is no perennial flow in the North Keopu Drainageway. Therefore, silt in runoff could be contained on-site by standard construction erosion control practices.

C. MITIGATIVE MEASURES

The installation of new drainage facilities proposed for this site, including a detention basin and series of drywells will control runoff on the site. The actual on-site peak discharge runoff rate will decrease by as much as 79 percent from existing conditions during occurrences of the 10-year flood level, or by 18 percent during occurrences of the more rare 500-year flood level, as shown in Table 1.

The proposed on-site drainage system will be designed to handle the North Keopu Drainageway design flood of 466 cubic feet per second (cfs) and will enter a percolation and detention basin, 20 feet in depth (three to five feet of freeboard), sized to store 280 cfs of stormwater runoff for a one hour duration. In addition, 11 drywells will be constructed within the basin, each sized to handle six (6) cfs. Two 42-inch diameter overflow pipes will connect to a dual 42-inch diameter drainage line within Henry Street. Each drain line will connect to a series of 10 drywells with catch basin openings along Henry Street on each side of the street,

TABLE 1

PEAK DISCHARGE STORMWATER RUNOFF RATES

	Peak Discharge in Cubic Feet per Second			
	Storm Magnitude			
	10-Yr.	50-Yr.	100-Yr.	500-Yr.
Existing Condition	590	1,170	1,680	2,540
Condition with Proposed Improvements*	124	704	1,214	1,074
Decrease in Peak Discharge Rate	79%	38%	28%	18%

* Improvements include detention basin and a series of dry wells

Source: Hida, Okamoto and Associates, Inc. (December 1990) each designed to handle 6 cfs. The proposed level of flood protection will be a significant improvement over the existing conditions. Any storm greater than the proposed design storm will likely overflow the catch basins spilling onto Henry Street and Kuakini Highway. Hida, Okamoto and Associates, Inc. (April 1990) found that the 100-year overflow would not be expected to adversely affect the existing or proposed structures makai of Queen Kaahumanu Highway beyond its current or pre-development exposures to flood effects. Henry Street may be inundated and rendered unusable for short-term periods resulting from runoff from storms of greater than 10-year frequency. No adverse change in flood conditions (i.e., volume, velocity, and inundation area) will result from installation of the proposed drainage system.

The detention basin will provide substantial runoff storage capacity. Based upon the Soil Conservation Service *Hydrology Guide*, and the California Highways and Public Works *California Culverts Practice*, the estimated time of concentration-travel time of storm runoff from the length and slope of the North Keopu drainageway is determined to be 0.25 hours (15 minutes). As a result of these characteristics, floods are typified by sharp peaks of short duration. For example, the October 1974 storm was of a short duration and the Kainaliu (number 73.2) rain gauge measured 3.77 inches in a two-hour period which approaches a 100-year event. A 60-minute storage capacity for the detention basin would provide for adequate storage to contain the peak runoff for a storm lasting less than one hour in duration. Design for storms of greater duration would not be economically feasible.

Adherence to strict erosion control measures will minimize the impact of silt runoff on surface water quality during construction activities. To minimize long term silt contributions to runoff, additional design measures are proposed. The *County of Hawaii Drainage Standards* allows for six cfs per drywell. A design capacity of 6 cfs per drywell is proposed realizing that the percolation/detention basin will act as a sedimentation basin to minimize silt deposition at the drywells along the proposed Henry Street. The basin will dissipate the speed of the runoff and provide an opportunity for particulate matter to settle out. Minimized silt in storm runoff will help to maintain the water quality of runoff and improve turbidity.

Based on discussions and correspondence with the County of Hawaii Department of Public Works, the following actions are being undertaken by Hida, Okamoto & Associates, Inc:

1) 100-year overflow conditions will be checked using a worst case scenario of 6.0 cfs capacity and a 15 percent failure rate. This analysis will be included as part of a Final Drainage Study to be completed during the Preliminary Design Phase of Henry Street development.

2) A two-foot contour interval aerial topographic map will be prepared for the makai area of Kuakini Highway to allow for comparison of post and pre-construction conditions for flood inundation areas.

3) A request for Conditional Letter of Map Revision (LOMR) will be prepared and submitted to the Federal Emergency Management Agency as soon as possible.

3.5 VEGETATION

A botanical survey of the project site has been completed by Kenneth M. Nagata (February 1990). Findings from this survey have been summarized in this section and the complete report is included in Appendix H.

A. EXISTING CONDITIONS

The vegetation of the project site is typical of that in most of the vacant and undeveloped properties throughout the North Kona District. It is comprised of an overstory of kiawe (*Prosopis pallida*), a secondary canopy of koa-haole (*Leucaena leucocephala*) and a ground cover of Guinea grass (*Panicum maximum*). Two vegetation cover types were identified on the site, both similar in species composition but differing in structure. These vegetation communities are designated in Figure 11.

The dominant vegetation type is the Kiawe Forest which is characterized by kiawe 25 to 40 feet tall, a secondary canopy of koa-haole 10 to 15 feet tall, and a dense herb layer of Guinea grass three to seven feet in height. Canopy cover provided by kiawe exceeds 50 percent. The trees and shrubs are often festooned with *Coccinea grandis* and moon flower (*Ipomoea alba*). Only a few other plant species are found in this community and only in very small numbers.

Towards the makai portion of the site, koa-haole becomes the dominant arborescent species with canopy cover exceeding 50 percent. Guinea grass continues as the dominant species in the herb layer. *Coccinea* and fountain grass (*Pennisetum setaceum*) are common in this community.

Several abandoned or escaped ornamentals including bougainvillea (*Bougainvillea x*), Moreton Bay fig (*Ficus macrophylla*), Chinese banyan (*F. microcarpa*), pencil tree (*Euphorbia tirucalli*) and Scotch attorney (*Clausa rosea*) are found in small numbers. Natal redtop (*Rhynchelytrum repens*), rouge plant (*Rivina humilis*), and *Talinum triangulare* are occasional species.

In the makai portion of the drainageway, the vegetation is one of herbs dominated by Guinea grass. Very few shrubs or arborescent species are found in this area.

No rare, endangered, or threatened plant species were identified in the field survey, nor are any expected to occur on the project site.

B. ANTICIPATED IMPACTS

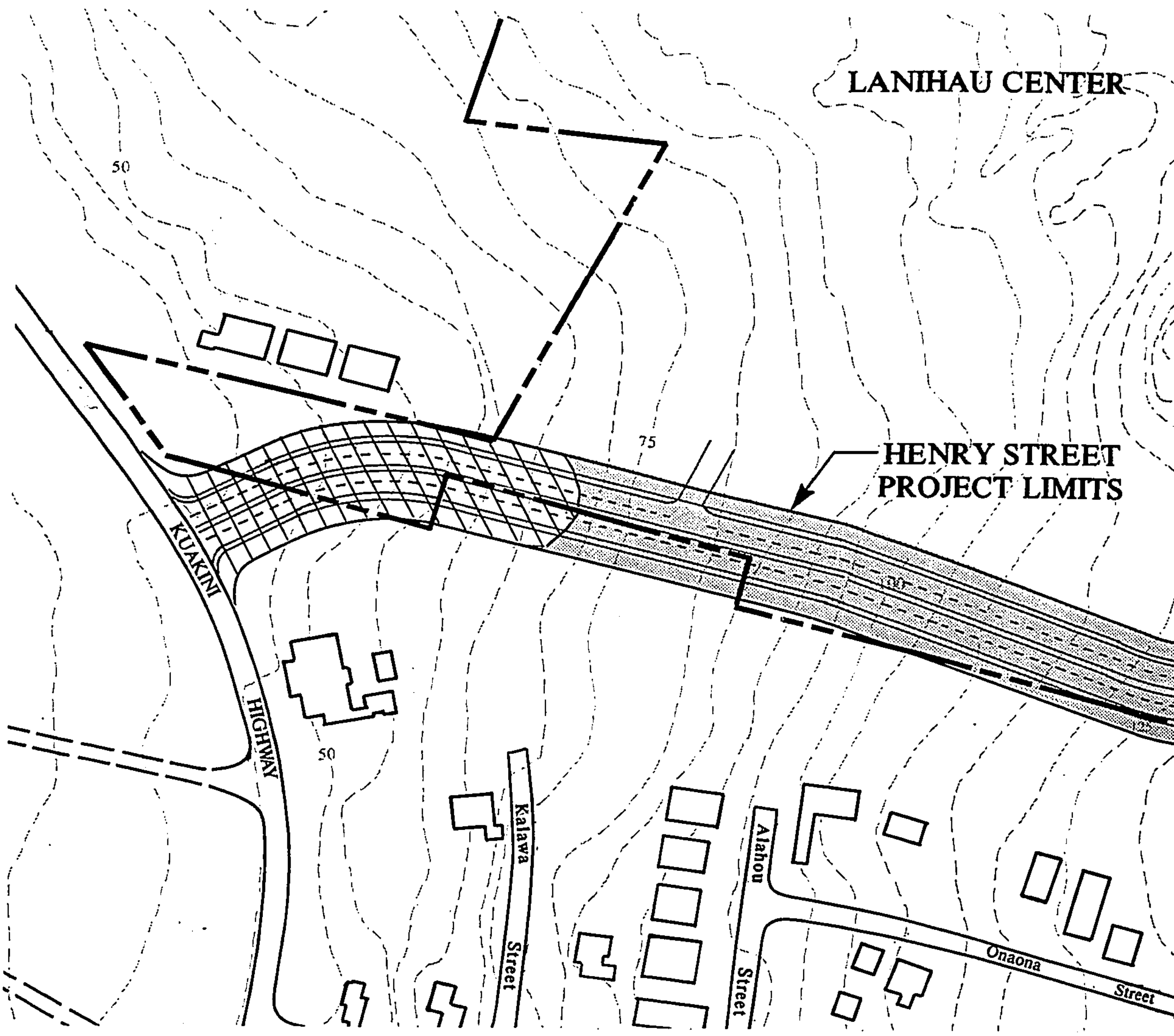
The proposed Henry Street development will essentially remove and destroy all existing vegetation within the project limits (5.6 acres). There is the possibility that some mature trees could be retained within the project limits if their size and location is compatible with the design of the roadway and drainage facilities. New landscape material will be provided in unpaved portions of the right-of-way.

C. MITIGATIVE MEASURES

Extensive landscaping will be introduced along the edges of the Henry Street right-of-way and intersections with the State and County Highways, and also within the planter median. The trees, shrubs, grass, and other landscape material to be planted will complement the existing vegetation of the surrounding area. Native vegetation species will be utilized wherever possible in the landscaping.

3.6 WILDLIFE

A general survey of wildlife existing on the site, and wildlife species expected to occur on the site, was conducted by Kenneth M. Nagata (March 1990). A summary of the findings of this survey is included in this section and in Appendix H.



VEGETATION COVER TYPES

HENRY STREET ENVIRONMENTAL ASSESSMENT

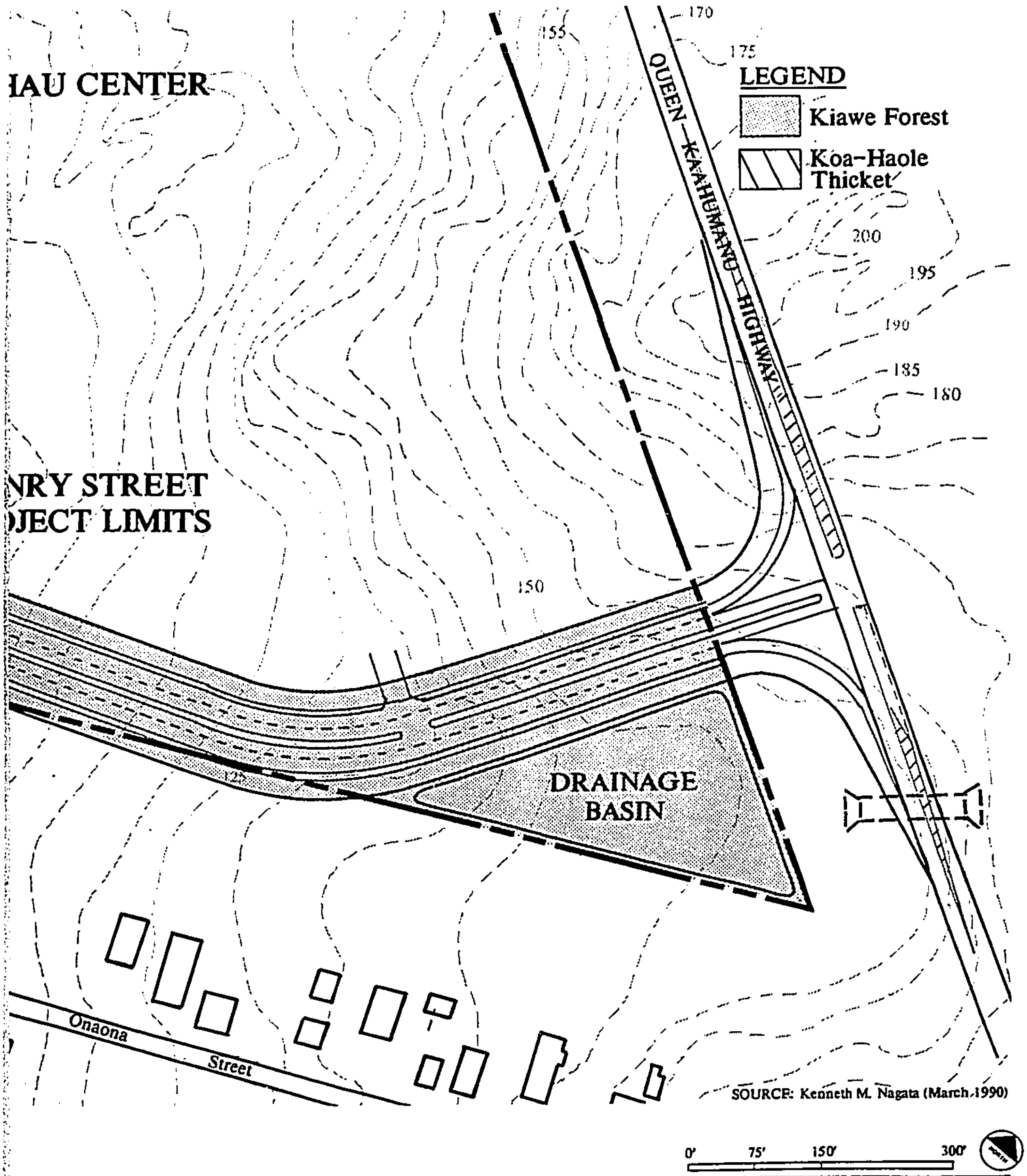

IAU CENTER
NRY STREET
JECT LIMITS
LEGEND
Kiawe Forest
Koa-Haole Thicket
QUEEN KAAHUMANU HIGHWAY
DRAINAGE BASIN
Onaona Street
170
175
200
195
190
185
180
155
150
SOURCE: Kenneth M. Nagata (March 1990)
0'
75'
150'
300'

FIGURE 11

A. EXISTING CONDITIONS.

Five common urban birds were observed on the project site: barred dove (*Geopelia striata*), common mynah (*Acridotheres tristis*), Kentucky cardinal (*Richmondena cardinalis*), Japanese white-eye (*Zosterops japonica*), and house sparrow (*Passer domesticus*). Although not actually seen, mongoose (*Herpestes auropunctatus*) is probably present on the site. Additionally, because of its close proximity to residences and business establishments, other mammals, such as feral cats (*Felis catus*) and one or more species of rats (*Rattus spp.*)) are likely to be on the site.

No rare, endangered, or threatened wildlife species were identified on the site, nor are expected to utilize the project site as a habitat.

B. ANTICIPATED IMPACTS

The proposed Henry Street development will remove and destroy nearly all of the existing vegetation within the right-of-way and the habitat for wildlife which it provides. Wildlife species currently utilizing the site will mostly be displaced into adjacent undeveloped buffer lands.

C. MITIGATIVE MEASURES

New landscaped areas will be provided in unpaved portions of the right-of-way, which will establish a new habitat which may allow some types of birds and mammals to utilize the site.

3.7 ARCHAEOLOGICAL/HISTORICAL RESOURCES

An archaeological inventory survey was conducted for the Lanihau Center site by Cultural Surveys Hawaii in 1989 (Hammatt & Shidler 1989), and this survey covered most of the Henry Street project area. The remainder of the project area was covered in part of an archaeological inventory survey of a Keopu parcel (TMK: 7-5-4:6, 13) by Paul H. Rosendahl, Ph.D. Inc. (PHRI) in December 1989 (Walker and Rosendahl, 1990). The findings of these studies have been summarized in this section, based on discussions and review by the State of Hawaii's Historic Preservation Program (HPP), and the entire report is included as Appendix B. The PHRI final report is currently being completed.

A. EXISTING CONDITIONS

1. Previous Archaeological Work

Prior to the studies conducted by Cultural Surveys Hawaii and PHRI, there were four previous archaeological studies conducted in the area of the project site including: Soehren (1977), Rosendahl (1979, 1980), and Soehren (1985). These studies consisted primarily of preliminary research. Within the Belt Road area immediately adjacent to the project area, two important archaeological studies were conducted by the Bishop Museum (Schilt; 1984) and Han, et al, (1986). These two studies identified excavated and removed a major prehistoric cemetery site, just east and south of this project's drainage basin.

2. Known Historic Site Patterns Based on Archaeological and Historical Work

Archaeological and historical work in ths part of Kailua-Kona indicate that prehistorically the coastal areas (seaward of the Kuakini Highway) held permanent housing, some associated burials (in small clusters of platforms, clustered in cemetaries, and/or in lava tube caves), and major and minor heiau. Well inland, above the 40 inch annual rainfall line, were formal walled taro and sweet potato fields. The intervening areas -- in which the Henry Street project is located -- appears to have had informal agricultural fields (modified outcrops, mounds clearings, terraces) which may have been seasonally cultivated. These informal fields decrease in density descending down the slopes, and below the Queen Kaahumanu Highway, where soil is quite limited and rainfall quite low, these fields are only found in small patches. From the Queen Kaahumanu Highway down to the coastal housing, some permanent housing and temporary habitation sites are present, scattered and in low numbers. The same is true for burial sites -- occasional platforms -- with the exception of the large prehistoric cemetery in Keopu, just seaward of the Kuakini Wall. Here, 355 burials were uncovered in low platforms or below ground-level parings.

Initial permanent settlement of this area is expected to have begun around 1000 to 1200 A.D. Dates from the Keapu cemetery suggest use of the cemetery by permanent coastal residents beginning around 1200 to 1400 A.D. Undoubtedly, population gradually increased in late prehistory. Kamehameha I's court was at Kailua during 1813-1819; thus increasing coastal population in those years.

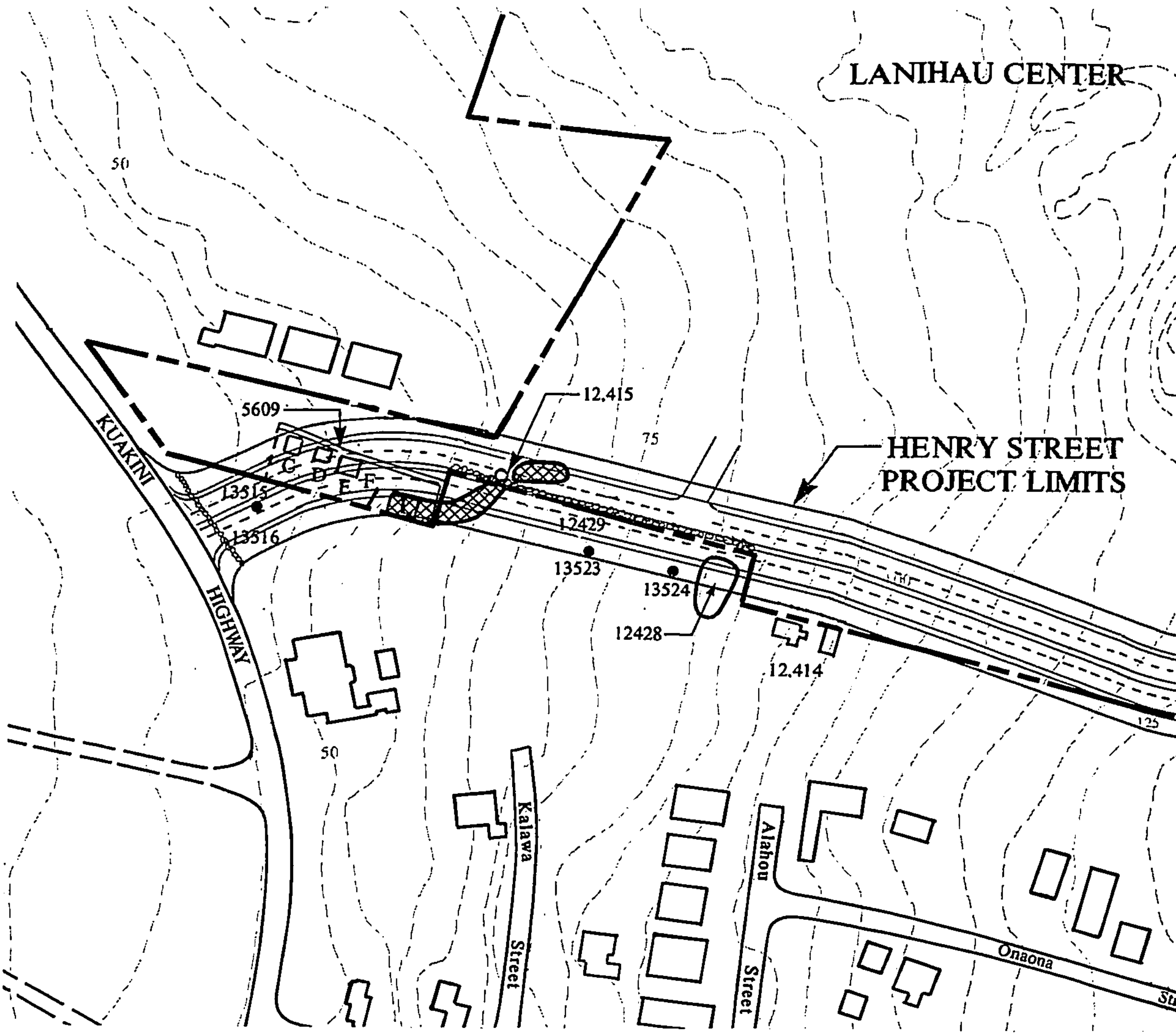
With European contact and resulting depopulation, the coastal population and their housing and cemetaries contracted closer to Alii Drive. Habitation sites in the project area seem to have largely been abandoned (except for site 5609) and the informal agricultural fields appear to have been abandoned. The Kuakini Wall was built to either keep pigs out of the remaining fields or to keep cows out of the housing areas. By the late 1800's, cattle use of the lands began, with stone walls being built along the *ahupua'a* boundaries in the late 1800's.

3. Archaeological and Historic Findings on the Project Site

An inventory survey of the Lanihau parcel was conducted by Cultural Surveys Hawaii (CSH) during the week of January 30 - February 3, 1989. The survey covered a 26-acre study area including the Lanihau Center Phase II expansion site, as well as portions of the Henry Street project site. The archaeological team investigated a total of 33 archaeological sites. PHRI's inventory survey of the 9.5-acre Keopu parcel occurred in December 1989, and 34 sites were located.

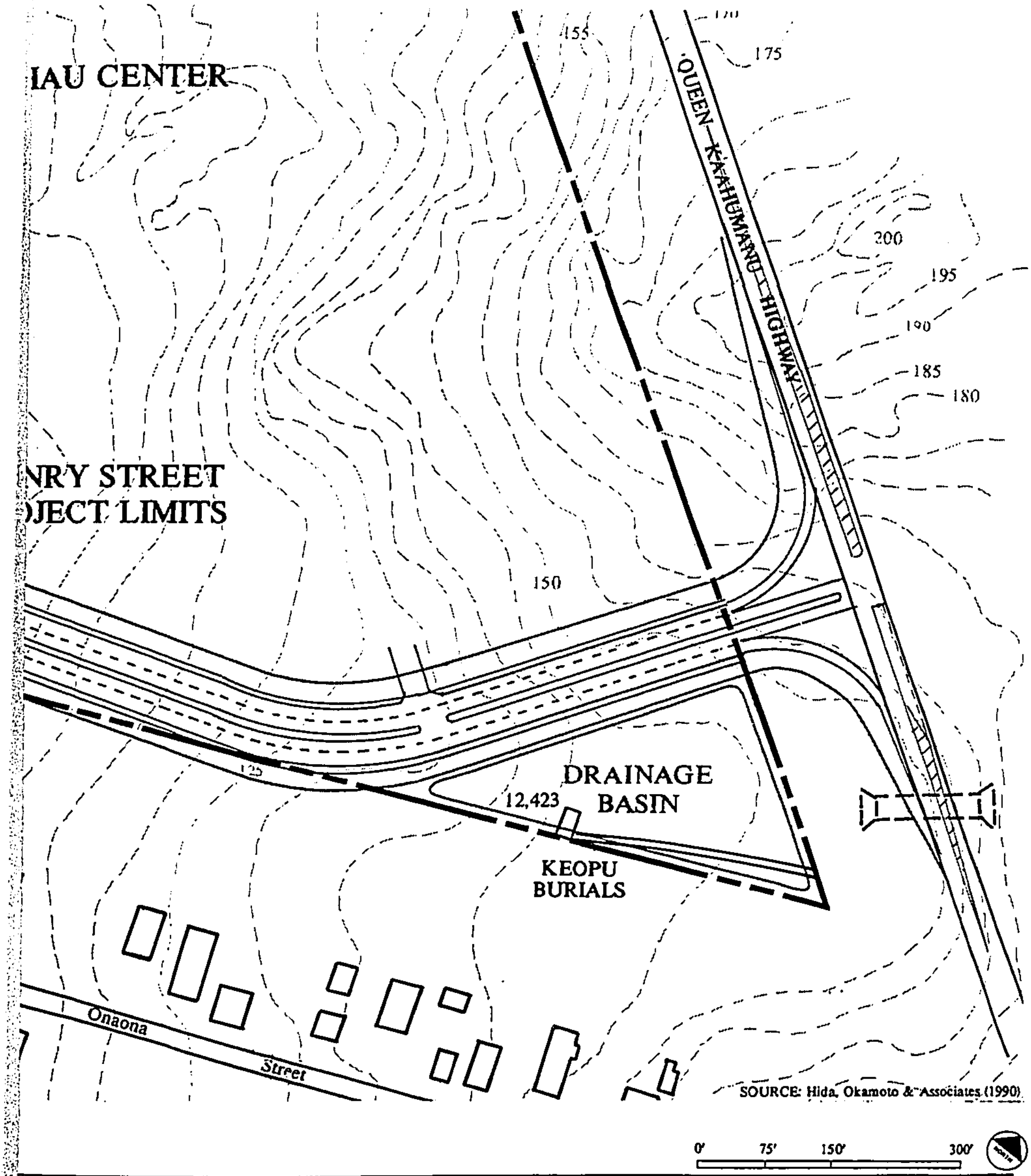
Four sites identified by CSH and six sites identified by PHRI are within the Henry Street project area. The locations of these archaeological sites are indicated in Figure 12 and the sites are listed in Table 2. Hawaii State Inventory site numbers are used which is a requirement of the State Historic Preservation Program to resolve confusion from prior multiple numbering. All archaeological sites are described in the CSH (1989) and PHRI (1990) reports included in Appendix B.

5609: This site is a a large enclosure and its included features including four platforms (Features C-E, G), one two-tiered terrace (Feature L) and an internal wall (Feature F). Figure 13 includes photographs of this site. The platforms and terrace are moderate-sized and Feature E is somewhat larger. The site has been interpreted as a permanent dwelling site (*Kauhale*) which once held multiple houses. It appears to have been used at least in early historic period times. Between 1979 and 1989 bulldozing obliterated portions of the site. The southeastern wall and the southeastern portion of the east wall are gone. Bulldozing extends to the west side of



ARCHAEOLOGICAL SITES LOCATION

HENRY STREET ENVIRONMENTAL ASSESSMENT



IAU CENTER
NRY STREET
JECT LIMITS
QUEEN KAAHUMANU HIGHWAY
155
175
200
195
190
185
180
150
125
DRAINAGE
BASIN
12,423
KEOPU
BURIALS
Onaona
Street
SOURCE: Hida, Okamoto & Associates (1990)
0'
75'
150'
300'

FIGURE 12

PART OF STONE ENCLOSURE, ROSENDAHL FEATURE "B"

A RESIDENTIAL PLATFORM WITHIN
ROSENDAHL FEATURE "B"

PHOTOGRAPHS OF ARCHAEOLOGICAL FEATURES

HENRY STREET ENVIRONMENTAL ASSESSMENT

FIGURE 13

TABLE 2

ARCHAEOLOGICAL SITES SUMMARY

Site	(Prior #'s)	Function	Significance A	B	C	D	E	NLS
5609	(515-18, PHRI A-J, L)	Permanent Habitation				X		
12,415	(CSH1)	Temporary Habitation and Burial				X	X	
12,414	(S13A, 13B)	Burial Platforms			X	X	X	
*13,523		Temporary Habitation and Possible Burial in Modified Outcrop				X		
*13,524		Temporary Habitation, and Possible Burial				X		
12,423	(CSH9)	Temporary Habitation or Cattle Loading Ramp				X		
*12,428		Habitation, Agriculture, Burial				X	X	
*12,429		Permanent Habitation(?)				X		
*13,515		Habitation				X		
*13,516		Border Wall						X

TOTAL = 9

( ) Significant if burial found to be present.

* Initial significance evaluations only; the State's HPP has yet to review these proposed evaluations.

A Site reflects major trends or events in the history of the State or nation
B Site is associated with the lives of persons significant in our past
C Site is an excellent example of a site type
D Site may be likely to yield information important in prehistory or history
E Site has cultural significance; probable religious structures (shrines, *heiau* and/or burials present

Feature "C", but the four major platforms, Features "C", "D", "E", and "L" are intact. Feature "G" was enclosed but is now barely discernable and effectively lost due to the heavy impact of bulldozing. The remaining portions of the site's enclosing wall are about three and one-half feet high and three feet wide, and jumbled in places.

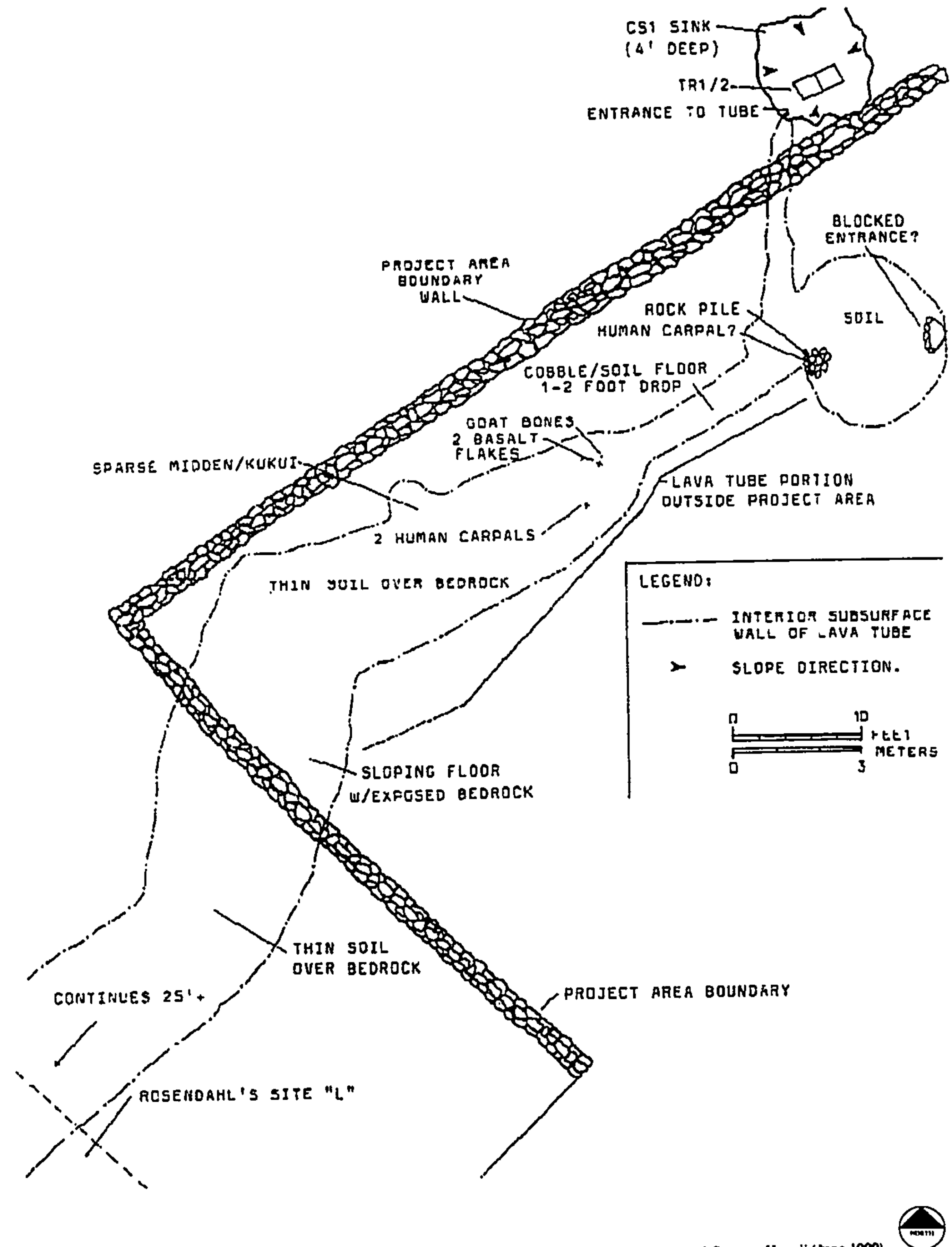
12.414: These two platforms are in good condition, and are interpreted as graves based on form. The large platform has a maximum length east/west of 35 feet and an average width of 35 feet, and an average width of 20 feet north/south. There is a paved area, paved with pebbles and cobbles, measuring 20 feet east/west by 16 feet north/south in the makai portion of the platform. Portions of the north and west sides of the platform have collapsed but it is still in good condition. The height of the platform ranges from 1.5 to 5.5 feet. Two smaller platforms abut this large platform on the east and south sides. They both measure about ten feet long by six feet wide by one and one-half feet high. Branch coral was noted on the surface. CSH (1989) believes that this feature contains three to five burials.

The lower rough platform to the east is 24 feet long north/south and 12 feet wide east/west, and has a maximum height of approximately 3.3 feet. It is constructed with boulders and cobbles. There are two levels to the platform with the higher level to the south being one foot higher than the northern level. The higher level is cobble paved and the lower level has an uneven boulder and cobble paving. No coral, midden, manuports, or artifacts were observed on the surface. CSH (1989) believed the likelihood of one burial in each level.

12.415: Initial 1989 studies identified this site as a small sink lava tube measuring 8.0 feet north/south and 12.0 feet east/west with a maximum depth of 3.5 feet. This lava tube extends between two bedrock sinks, each about 10 feet in diameter. The floor of this sink is covered with fine textured soil to a depth of 16 inches (40 cm). Abundant shell midden lies on the surface of the soil floor indicating previous use for habitation. Figure 14 presents the CSH (1990) drawing of the sink hole and lava tube caves. No human remains were identified in the initial survey and the site was interpreted as a temporary habitation shelter.

Archaeological excavation work in October of 1989, however, discovered this site was larger and contains at least one burial. There are two lava tube caves whose entrances extend from the wall of the sink. One extends to the east for a distance of 30 feet and pinches out. The tube is 2 to 5 feet wide and 1.5 to 2 feet in height. There is no evidence of former use except for a pile of small boulders measuring 3 feet wide by 1 foot high by 6 feet long. This pile is directly on bedrock and the cave floor in general is solid pahoehoe. The south tube has a 2.5 foot wide by 2 foot high entrance with a 15 foot long narrow bedrock crawl space. At the end of this narrow tunnel is a 12 inch diameter chamber with a small entrance on the east side, which is presently closed with piled boulders. This chamber contains a soil floor up to 16 inches in depth with evidence of Hawaiian occupation, including small quantities of shell midden. At the south side of this chamber is a 2 foot in diameter rock pile on a soil base with a human carpal bone on the soil surface. This rock pile could mark the place of a single human burial.

From the chamber the tube continues in a southwesterly direction. Twenty feet from the chamber, two human carpals were observed on thin soil deposit over bedrock. These carpels could have been moved downslope from the chamber area during flooding of the tube. Scattered shell midden and basalt flakes are visible as far as 30 feet from the chamber. The tube continues 110 feet southwesterly beyond the chamber, however the ceiling becomes progressively lower and the cave floor is bedrock. Within the open sink area of the site two test trenches (one meter square) were excavated to bedrock. Recovered artifacts consist of one piece of cut pearl shell, fragments of polished basalt adzer and basalt flakes. The assemblage indicates that the sink was a temporary habitation area used for craft activities involving wood and shell working.



SOURCE: Cultural Surveys Hawaii (June 1990)

LAVA TUBE – SITE 12,415

HENRY STREET ENVIRONMENTAL ASSESMENT

FIGURE 14

12,423: This irregularly shaped site consists of two distinct adjoining features, a boulder terrace to the north and a platform to the south. The north feature is a well defined boulder terrace measuring ten feet north/south by four feet east/west with the rubble terrace six feet wide on the makai side. The southern feature is a platform measuring 10 feet north/south by six feet east/west with a makai (west) vertical face of stacked boulders four feet high. The mauka portion of the platform is somewhat C-shaped, and opens in the mauka direction. There is a 2.5 foot facing on the south, east, and north sides. The C-shape area has a rocky soil surface where two pieces of coral were observed. This site has been interpreted either as a pre-historic temporary habitation feature that has been severely impacted by rock robbing for the construction of a nearby wall or as a late 1800's-early 1900's a cattle ramp feature.

12,428: This site complex lies within TMK 705-04:13 and consists of a habitation/agricultural complex. The site contains a single burial, located to the south of the project limits.

12,924: A portion of this site lies within the Henry Street project limits, including a rock wall enclosure. This enclosure is tentatively interpreted as a habitation enclosure.

13,515: This site lies within TMK 7-5-04:6, near Kuakini Highway. The site is a midden scatter which shows evidence of habitation.

13,516: This site is a wall which represents a property line boundary between TMK 7-5-04:6 and Kuakini Highway.

13,523: This site complex lies within TMK 7-5-04:13 and consists of a habitation complex of three sites, including two modified outcrops and a mound.

13,524: This site complex lies within TMK 7-5-04:13 and consists of a habitation and agriculture complex of five sites, including three caves and two mounds.

One major concern of the State's HPP was whether some burials in the Keopu cemetery might still be present under the soil in the swale planned for the Henry Street drainage basin. As a follow-up to the initial survey in both parcels, the HPP required subsurface testing to evaluate this question. CSH did the testing in October 1989 and found no remains. The analyst of the soils in the Bishop Museum's Keopu burial project participated to ensure no mistakes in interpreting prior soil and burial locations occurred. CSH feels confident no burials from the Keopu cemetery are in the drainage basin. The report on the testing findings will be submitted to the HPP so they may verify this conclusion.

4. Significance Evaluations

All four sites on the Lanihau parcel (5609, 12,415, 12,423, 12,429) were determined significant after review by the State's HPP in July 1989. The six sites in the Keopu parcel (13,515, 13,516, 13,523, 13,524, 12,414, 12,428) have yet to have their significance officially fixed in consultation with the State's HPP, but the initial evaluations of PHRI are that five of the six sites are still significant. Table 2 presents the agreed upon significance evaluations and the proposed evaluations for the Keopu sites.

Four of the ten sites are considered significant solely for their information content. Four others are considered significant for their information content and also are culturally significant because of the presence or possible presence of burials. One site (12,414) is considered significant for its information content, culturally significant as a burial site, and significant as an excellent example of a Kona platform burial site type. Site 13,516 is considered "no longer significant" because its important information was adequately recorded during inventory survey work.

These evaluations, if approved by the State's HPP, mean that nine significant historic sites are within the Henry Street project area.

B. ANTICIPATED IMPACTS

It is believed that construction will destroy all the sites in the Henry Street right-of-way, except for site 12,414, and a portion of 12,415 and 12,428. It is likely that construction activities will affect eight of the nine significant sites. It is anticipated that this effect can become a "no adverse effect" with the execution of an approved mitigation plan which will preserve site 12,414, and portions of 12,415 and 12,428, and archaeologically data recover the other six significant sites.

C. MITIGATIVE MEASURES

As part of the Lanihau Center develoment, a general mitigation plan was approved by the State's HPP and the County's Planning Department for the Lanihau parcel in July of 1989. This plan covers the four significant sites on the Lanihau portion of the Henry Street project. Site 12,415 will be partially preserved as discussed further below. Sites 5609, 12,423, and 12,429 have undergone archaeological data recovery. A detailed preservation plan will be prepared and approved for a portion of site 12,415 and a detailed archaeological data recovery plan has been approved for the other three sites, with approval in both cases by the State's HPP and the County's Planning Department. A data recovery plan was approved in July 1989 and the field work was conducted in October 1989. An interim report is available (Borthwick & Hammatt, 1989), and the final data recovery report is being reviewed, so the State's HPP and the County's Planning Department can verify that the work was adequately executed. The work did discover human remains in site 12,415 – requiring burial treatment planning for a portion of the site. A preservation plan for a portion of site 12,415, will be submitted to the State's HPP and the County's Planning Department for approval.

In September 1990, Site 12,415 was partially excavated by Borthwick & Hammett under guidance of the State's HSS to determine the extent of human remains and cultural materials. Additional human remains were found and the Island of Hawaii Council required that a portion of the site be treated as a formal burial site. Based on three meetings with the State's HPP and the Council on Burials (July, August, September; 1990) there was a requirement set which mandates preservation of the 12,415 burial site at the chamber portion. The alignment of Henry Street will be allowed to pass above the chamber portion of 12,415 with separation between the ground surface and the road structure (DLNR; October 11, 1990)

A mitigation plan for the sites in the Keopu parcel has yet to be worked out. However, a detailed preservation plan will be prepared for the 12,414 site and a portion of parcel 12,428. Before such a plan can be agreed upon, the State's HPP and the County's Planning Department will need to see the inventory report for this parcel to verify that sites have been adequately identified and to fix significance evaluations. One site complex contains a burial, however, the burial portion of the site is outsite the Henry Street project area. A preservation plan for a portion of site 12,428 will be submitted to the State's HPP and the County's Planning Department for approval along with a data recovery plan for sites 13,515, 13,523, 13,524 and 12,414.

It is proposed that mitigation of the remaining sites in the Henry Street project area will be handled as follows:

a) To avoid the need to remove burials at sites 12,415 and 12,428 (confirmed burial sites) design modifications to Henry Street have been implemented which would eliminate the need to remove any burials. The preservation plan for site 12,414 and a portion of site 12,415 will be submitted for review and approval to the State's HPP and the County's Planning Department. It is recognized that the State's HPP will consult with its Hawaii Island Burial Council prior to approving this plan.

Each known or suspected burial site will be carefully protected during construction. A temporary fence and markers would be erected around the preserved site, and construction crews would be notified about the need to avoid any disturbance to the site.

b) Data recovery work will occur in sites 12,429, 13,516, 13,523 and 13,524 in the Keopu parcel, in accordance with a data recovery plan that must be first approved by the State's HPP and the County's Planning Department. These sites will undergo data recovery, in accordance with a data recovery plan that must be first approved by the State's HPP and the County's Planning Department.

c. During project construction, there is the remote possibility of encountering unknown or unexpected cultural features, deposits, or burials. A monitoring archaeologist will observe clearing, grading and excavation activities near those sites planned for preservation to insure their protection. In a situation where a burial or other potentially significant cultural feature is encountered elsewhere on the site, work in the area of such a feature will be suspended immediately until the monitoring archaeologist has the opportunity to inspect and evaluate the significance of the newly discovered materials. The State's HPP and the County's Planning Department will be immediately notified to determine the appropriate course of action.

3.8 ROADWAYS AND TRAFFIC

This section includes a presentation of the existing roadways and traffic conditions at the project site and its surrounding area. The potential impact of the project on future traffic conditions is assessed in this section, as well as the recommended mitigative measures to minimize adverse effects on traffic and transportation. A detailed Traffic Impact Study was prepared for the project by Barton-Aschman Associates, Inc. (May 1990). A summary of this report is included in this section, and the entire report is included as Appendix C.

A. <u>EXISTING CONDITIONS</u>

As shown in Figure 2, the Henry Street site is bounded by two transportation corridors; Queen Kaahumanu Highway (State of Hawaii Route 11/19) to the east, and Kuakini Highway (County of Hawaii) to the west. These and other roadways of importance to the project area are discussed below, as well as the methodology for analyzing existing traffic circulation in this area.

1. Surrounding Area Roadways and Observed Traffic Conditions

Palani Road is a four-lane, divided highway adjacent to the northerly boundary of the site. East of its intersection with Queen Kaahumanu Highway, however, Palani Road is a two-lane, undivided road. Similarly, west of Kuakini Highway, Palani Road provides only two travel lanes into and through Kailua Village. Palani Road's intersections with Kuakini Highway, Queen Kaahumanu Highway, and the Shopping Center Driveway currently operate under traffic signal control.

Kuakini Highway is a two-lane, undivided roadway located just west of the site. However, south of Palani Road to Hualalai Road, a three-lane road is in place, thereby providing a separate left-turn lane throughout most of this half-mile section. Kuakini Highway's intersections with Paiani Road, Hanama Place, Kalani Street, and Hualalai Road currently operate under traffic signal control.

Queen Kaahumanu Highway is a two-lane, undivided State highway located adjacent to the site's eastern boundary. This highway parallels the Kona coast, serving as the principal north-south transportation corridor in this area. Between its southerly terminus at Kuakini Highway and Palani Road (a distance of approximately 3.1 miles), Queen Kaahumanu Highway is State Route 11; north of Palani Road it is State Route 19. Queen Kaahumanu Highway's intersection with Palani Road currently operates under traffic signal control.

Hualalai Road is a two-lane, undivided County roadway which extends between Kuakini Highway and Queen Kaahumanu Highway to the south of the Henry Street project area. This collector roadway serves as a collector road for local residential subdivision streets.

Alii Drive is a two-lane, undivided roadway which generally parallels Kuakini Highway between Kuakini Highway and the coastline. Although intended for local travel within Kailua Village, Alii Drive also serves as an alternative routing to Kuakini Highway during peak traffic periods.

Kopiko Street is a two-lane, undivided north-south roadway located south of Palani Road and approximately 550 feet east of Kuakini Highway. At present Kopiko Street terminates approximately 400 feet south of Palani Road. Its prime function is to provide local access to abutting land uses.

2. Methodology for Analysis of Existing Conditions

In order to make a thorough evaluation of the existing traffic conditions in the area, several procedures were undertaken, as listed below. Existing conditions are used as a baseline for comparison with future traffic conditions later in this section.

Collection of Data: Information was collected and reviewed from: transportation-oriented documents; traffic flow data from the County and the State; plans for proposed roadway improvements; aerial photographs; population data; and marketing information. Counts of peak-hour traffic were also obtained in vicinity of the project site.

Analysis of Directions of Approach and Departure: The distribution of traffic on the roadway network was determined based upon trade area information and population estimates.

Analysis of Through Traffic: Base conditions of "background" or through traffic were established based upon trade area information and population estimates.

Analysis of Roadway Capacity: Detailed capacity analyses were conducted for existing conditions at all critical intersections in the vicinity of the project site to determine the adequacy of the existing roadway system.

3. Level-of-Service

Traffic movements at intersections can be described in terms of a Level-of-Service (LOS) rating. The LOS rating of an intersection is classified into six categories ranging from little or no delay, LOS A, to extreme delays, LOS F. LOS E and F are typically considered unsatisfactory, and indicate a need for roadway improvements or additional traffic control measures. Levels-of-Service ratings for signalized and unsignalized intersections are defined in Table 3.

As a baseline for comparison with future conditions, existing traffic flow conditions at the signalized intersections of Palani Road/Kuakini Highway and Palani Road/Queen Kaahumanu Highway were analyzed in this study. Present (1990) Level-of-Service ratings of these intersections are shown in Table 4. Existing PM peak hour LOS for the Palani Road intersections are as follows: LOS A at Queen Kaahumanu Highway, LOS D at the Lanihau Center Driveway, and LOS F at Kuakini Highway.

B. ANTICIPATED IMPACTS

Henry Street is a proposed four-lane collector street to be constructed to County of Hawaii standards. Henry Street would intersect Kuakini Highway approximately 1,200 feet south of Palani Road, and it would intersect Queen Kaahumanu Highway approximately 1,750 feet south of Palani Road (measured between centerlines). The focus of the traffic impact analysis for this project is to evaluate the potential impact of the development and operation of Henry Street, which is discussed below.

1. Analysis Methodology

Future traffic forecasts with and without the establishment of Henry Street were estimated for 1995, the anticipated year of completion and full operation of the expanded Lanihau Center. Future traffic conditions were evaluated using the following procedures.

Projection of Traffic Volumes: Traffic volumes (1995) on Henry Street and the surrounding roadway network were estimated based upon vehicle trip generation rates for Lanihau Center and development in the area, along with a growth factor applied to ambient traffic volumes.

Assignment of Traffic: The direction of travel and volume of traffic involving Lanihau Center and through (non-site) traffic was conducted to allow an evaluation of the total traffic demand on Henry Street and surrounding roadways.

Analysis of Roadway Capacity: Detailed capacity analyses were conducted at all critical intersections in the vicinity of the project site to determine the adequacy of the roadway system to accommodate future (1995) demand.

2. Future Ambient Traffic

Traffic on the area's roadways is expected to increase as a result of expected new development in Kailua and the North Kona region. Future traffic has been estimated for this study by applying an annual growth rate of 1.5 percent to the existing traffic volumes (7.5 percent over 1990-1995), and then adding the traffic which will be generated by any new projects anticipated in the area.

TABLE 3

LEVEL-OF-SERVICE (LOS) DEFINITIONS

SIGNALIZED INTERSECTIONS

Level-of-Service	Interpretation
A,B	Uncongested operations; all vehicles clear in a single cycle.
C	Light congestion; occasional backups on critical approaches.
D	Congestion on critical approaches, but intersection functional. Vehicles required to wait through more than one cycle during short peaks. No long-standing lines formed.
E	Severe congestion with some long-standing lines on critical approaches. Blockage of intersection may occur if traffic signal does not provide for protected turning movements.
F	Total breakdown with stop-and-go operation

UNSIGNALIZED INTERSECTIONS

Level-of-Service	Interpretation
A	Little or no delay
B	Short traffic delays
C	Average traffic delays
D	Long traffic delays
E	Very long traffic delays
F	Extreme delays, usually warrants improvements

Source: Highway Capacity Manual, 1985

TABLE 4

EXISTING AND PROJECTED 1995 AM/PM WEEKDAY

PEAK HOUR LEVELS OF SERVICE

Intersection	Existing (1990) (AM/PM)	Without Henry Street (1995) (AM/PM)	With Henry Street (1995) (AM/PM)
	LEVEL-OF-SERVICE (LOS)		
Palani Road/Kuakini Highway	A/A	A/F	A/D
Palani Road/ Shopping Center Driveway*	--/D	A/E	A/D
Palani Road/ Queen Kaahumanu Highway	A/F	A/E	A/D
Henry Street/ Queen Kaahumanu Highway	---	---	A/D
Henry Street/ Kuakini Highway	---	---	A/D
Henry Street/ Lanihau Center East Driveway	---	---	A/B
Henry Street/ Lanihau Center West Driveway	---	---	A/B

(See Table 3 for definitions of Level-of-Service for signalized and unsignalized intersections.)

* Due to negligible traffic generated by the shopping center in the AM peak hour, volume counts were not obtained at the driveway intersection in the morning

Source: Barton-Aschman Associates, Inc. (May 1990)

The State Department of Transportation-Highways Division publishes an annual report titled Traffic Summary containing travel characteristics for traffic on the Island of Hawaii. Using data from this report, the annual vehicle miles of travel between 1980 and 1988 increased at a simple compounded rate of 4.0% per year. The 1995 cumulative volumes used for this report include the 1.5 percent growth rate and the addition of site-specific traffic from planned projects. For comparison purposes to Traffic Summary data, growth on the link volume on Queen Kaahumanu Highway is equivalent to a simple compounded rate of 4.25%. Since these simple compounded rates closely correspond, and the 4.25% simple compounded rate is calculated directly from the 1.5% noncompounded rate, the 1.5% growth rate for background traffic is considered appropriate.

Lanihau Center Phase II expansion includes 260,075 square feet of retail space and 14,500 square feet on four separate concrete building pads. A worst-case scenario assumed a fast food restaurant, a sit-down restaurant, a rental car office, and a bank on these pads.

In addition to the expansion of Lanihau Center, three new projects which are under construction, have been approved for construction, or could be developed by 1995, would have impacts on the intersections under study. These projects include: the Kailua Park expansion; a 100 unit condominium development off Kuakini Highway, located south of Kaiwai Road; and a 90,000 square foot commercial development to the south of the Henry Street route. All three projects were considered to be complete for the analysis of 1995 conditions for a worst-case scenario.

3. Trip Generation

Henry Street itself will not generate vehicle trips. Future volumes on the surrounding roadways in the vicinity of the Lanihau Center would be comprised of through traffic plus the traffic generated by the shopping center, other area businesses, and residential areas. Peak-hour traffic volumes approaching and departing Lanihau Center have been estimated for the purpose of delineating necessary roadway improvements at Henry Street and site access requirements.

The completed Lanihau Center will generate approximately 1,284 inbound trips and 1,448 outbound trips during the 1995 weekday evening peak hour. The estimates of shopper trips have been assumed to be totally via automobile. In reality, however, "walk-in" trade could be generated from adjacent residential, commercial and resort development. This factor would likely reduce the estimated number of vehicle trips generated. However, it was not applied in the analysis.

4. Construction Traffic Impacts

Short-term traffic impacts will occur as a result of construction-related traffic entering and exiting the Henry Street project site. Trucks hauling equipment and construction materials such as cement, pipes, crushed rock and asphalt concrete will average one or two trips per day initially. For approximately four weeks during the roadway construction period, a maximum of 5 to 10 trucks per hour or 40 to 80 trucks per day will be hauling asphalt concrete to the project site.

Traffic generated by construction workers will occur during the early morning hours and when workers leave the project in the afternoon. An estimated 60 workers are expected at the project each day, which are expected to generate approximately 20-30 vehicle trips during the morning and afternoon peak hours. Many of the workers will be transported to the project on company trucks from base yards. Preliminary plans call for all earth moving operations to be confined to the project site, as much as possible. However, trucks are expected to remove 7,000 cubic yards of excess excavated material from the site. Truck traffic in and out of the project and along Queen Kaahumanu Highway and Kuakini Highway will be minimized as much as possible.

5. Future Roadway Capacity Analysis

Figure 15 shows existing and proposed lane configurations in the area with the addition of Henry Street. Traffic volumes during the weekday AM and PM peak hours are shown in Figures 16 and 17.

Traffic flow conditions and intersection operation at the Henry Street intersections and the Palani Road intersections were assessed by the Level-of-Service (LOS) for the morning and afternoon peak periods. Diagrams of the Henry Street intersection lane configurations are shown in Figures 7A and 7B. The results of capacity analyses for these intersections are shown in Table 4.

The results of the Level-of-Service analysis indicate that traffic conditions at the Henry Street intersections with the two Lanihau Center driveways will operate at LOS B, and involve light congestion and short traffic delays. No traffic flow problems are expected at these driveways. Some delays in left-turn movements out of the shopping center onto Henry Street from the East Driveway will occur.

The Henry Street intersections at Queen Kaahumanu Highway and Kuakini Highway are both expected to operate at LOS D during the weekday afternoon peak hour, representing significant traffic congestion on critical intersection approaches. Vehicles will be required to wait through more than one cycle during short peaks. However, no long-standing lines of cars will form. LOS D is considered the lowest acceptable traffic flow rating before further roadway improvements are warranted. These intersections will be signalized to allow for the best possible traffic flow conditions. The Level-of-Service D on Henry Street results from a shift in travel patterns from Palani Road.

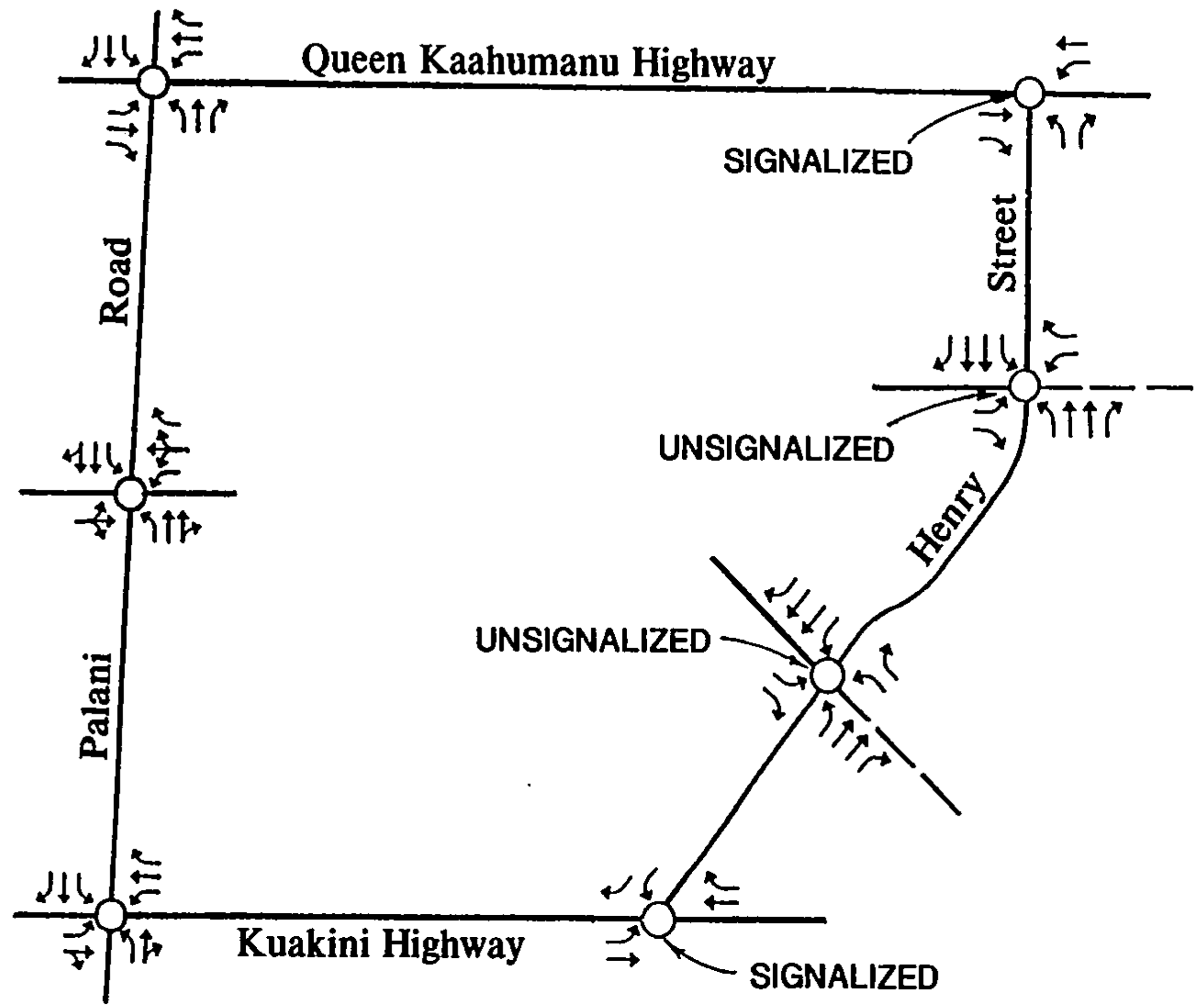
The LOS analysis indicates that the signalized intersections of Palani Road with Queen Kaahumanu Highway, the Shopping Center Driveway, and Kuakini Highway will all operate at LOS D for the 1995 PM weekday peak hour. However, the operation of Henry Street is expected to provide some relief to traffic conditions on Palani Road. Table 4 shows the predicted 1995 PM weekday peak hour LOS for the Palani Road intersections ranging from LOS D to LOS F. Without Henry Street, these intersections would likely experience a total breakdown in traffic flow, with stop and go operations.

6. Area-Wide Traffic Impacts

Henry Street is expected to help provide some relief for mauka/makai traffic flow in Kailua. Considering the planned development on lands between Kailua and the Keahole Airport, there will be significant additional traffic on the area's roadways in the coming years. Henry Street will create a localized traffic flow improvement in Kailua, but is expected to have little effect on area-wide traffic conditions.

C. MITIGATIVE MEASURES

The development of Henry Street has been planned by the County for over five years as a measure to ease mauka/makai traffic flow in the Kailua area. Palani Road is currently the only mauka/makai route in the area capable of handling significant volumes of traffic. Henry

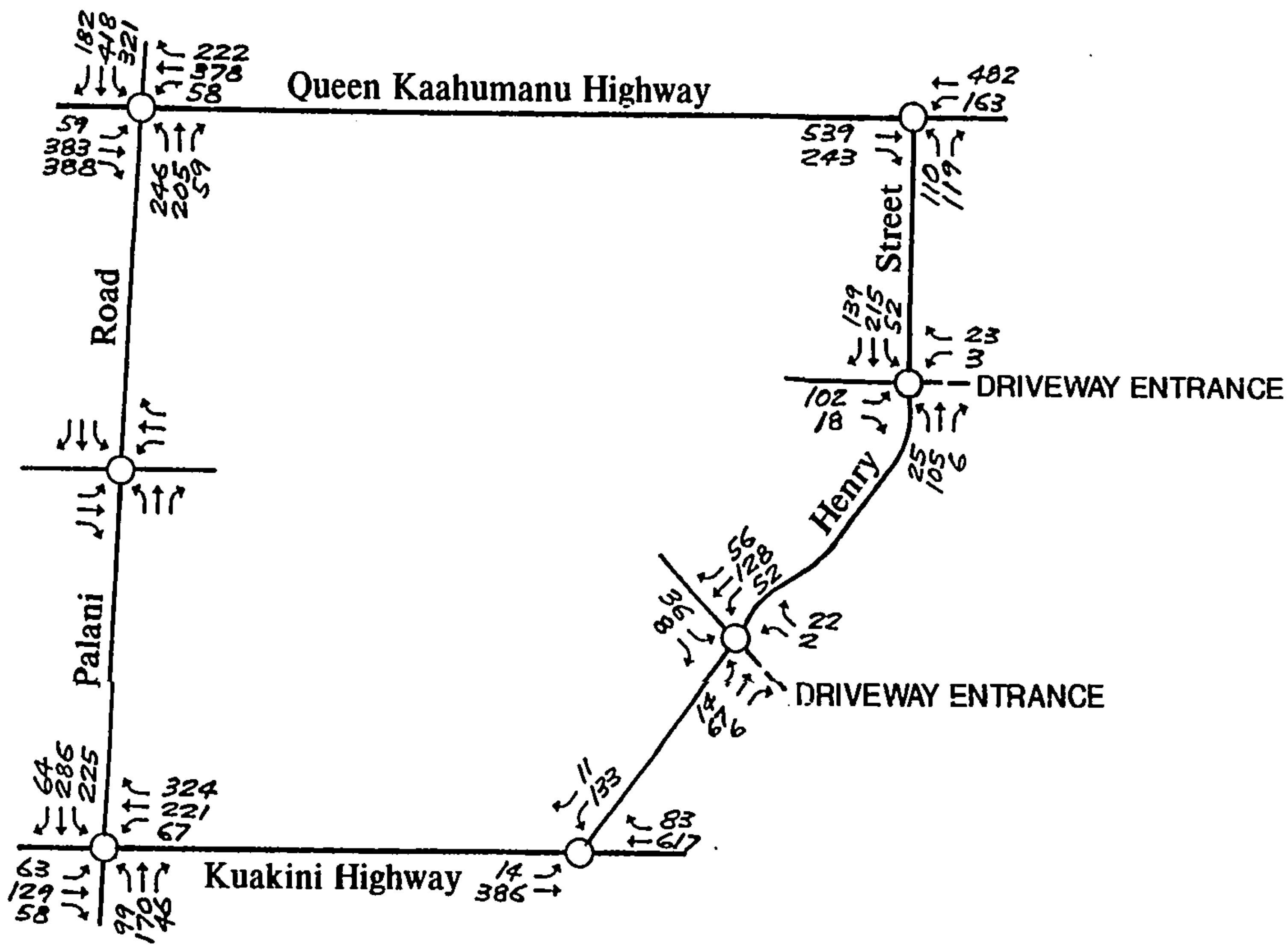


PROPOSED LANE CONFIGURATIONS

HENRY STREET ENVIRONMENTAL ASSESSMENT

SOURCE: Barton-Aschman Associates, Inc. (April 1990)

FIGURE 15

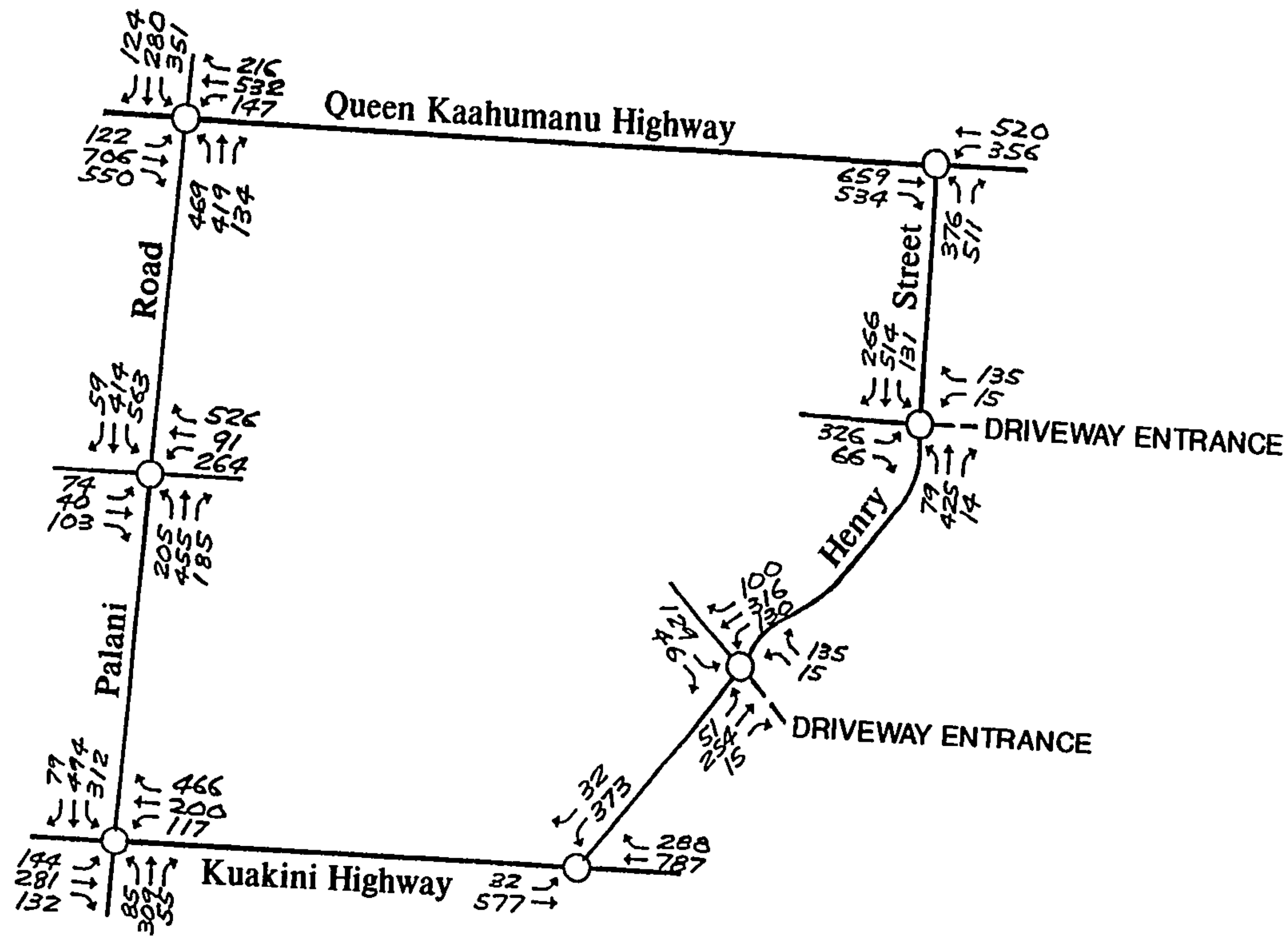


1995 AM PEAK HOUR TRAFFIC VOLUMES

HENRY STREET ENVIRONMENTAL ASSESSMENT

SOURCE: Barton-Aschman Associates, Inc. (April 1990)

FIGURE 16



1995 PM PEAK HOUR TRAFFIC VOLUMES

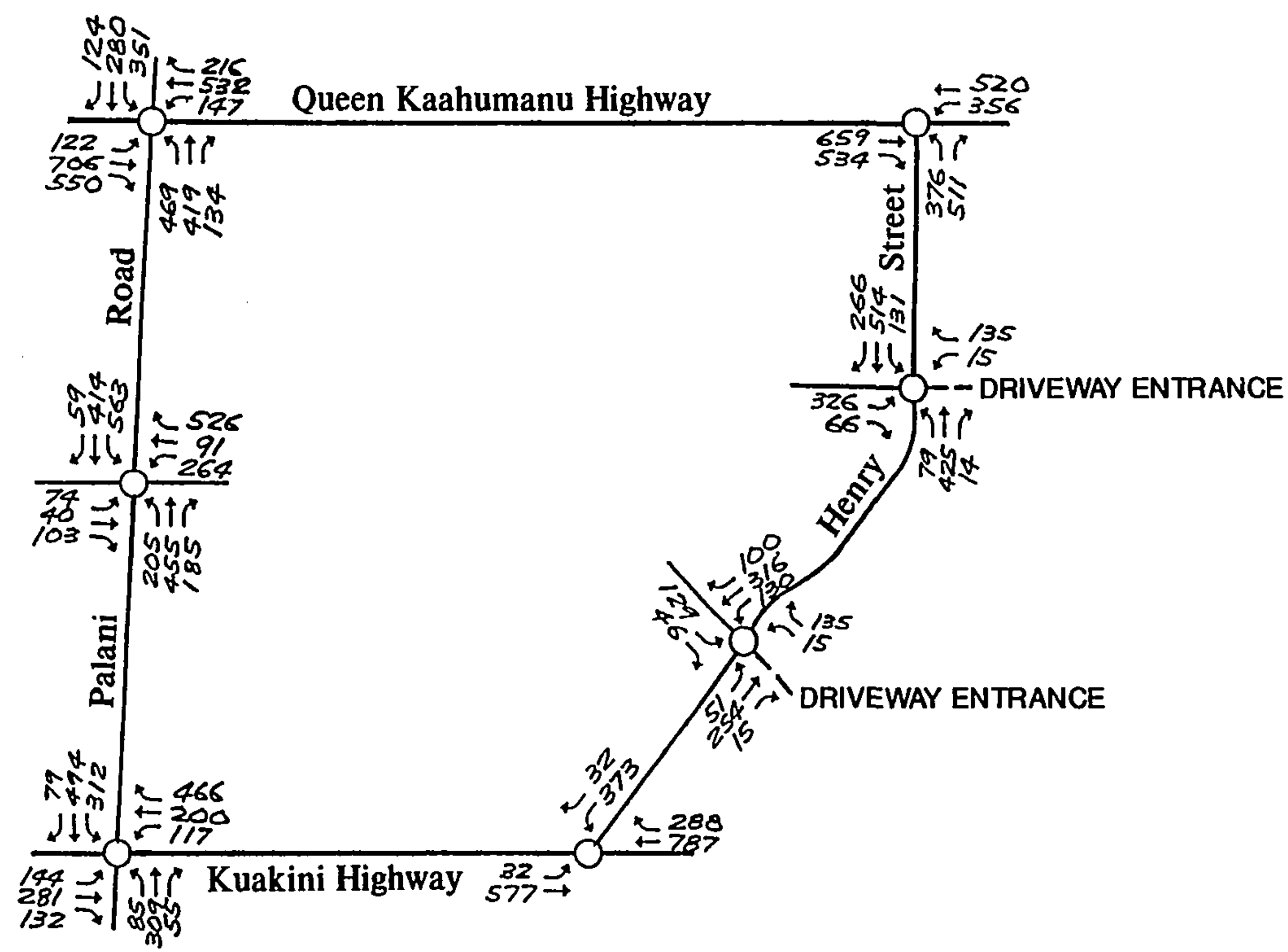
HENRY STREET ENVIRONMENTAL ASSESSMENT

SOURCE: Barton-Aschman Associates, Inc. (April 1990)

FIGURE 17

CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING



1995 PM PEAK HOUR TRAFFIC VOLUMES

SOURCE: Barton-Aschman Associates, Inc. (April 1990)

HENRY STREET ENVIRONMENTAL ASSESSMENT

FIGURE 17

Street will serve to relieve some of this traffic burden, and help improve the Level-of-Service at the Palani Street intersections for the near future.

The LOS analysis indicates, however, that during PM weekday peak hours Henry Street will operate at LOS D at its intersections with Queen Kaahumanu Highway and KuakiniHighway. These intersections will be signalized to afford the best possible traffic flow conditions. The two driveway intersections are expected to operate adequately without signalization. It is possible that there may be a need for signalization at these intersections after 1995 if traffic volumes continue to grow and their function declines to LOS E or worse. The County and State will monitor the operation of these intersections in the future, to determine if and when further improvements are required. No special additional requirements are proposed beyond the current plans, and future studies will reassess these intersections to insure that reasonable traffic flow conditions will exist on Henry Street and the area's roadways. Underground conduits and pull boxes will be installed by Lanihau Center Venture for their portion of the driveway intersections during the initial construction of Henry Street.

3.9 NOISE

Existing noise conditions and the potential future noise conditions at the project and its surrounding areas were evaluated by Darby & Associates (April 1990). This technical report is included in its entirety as Appendix F. Excerpts from the report are included for the following discussion of noise conditions.

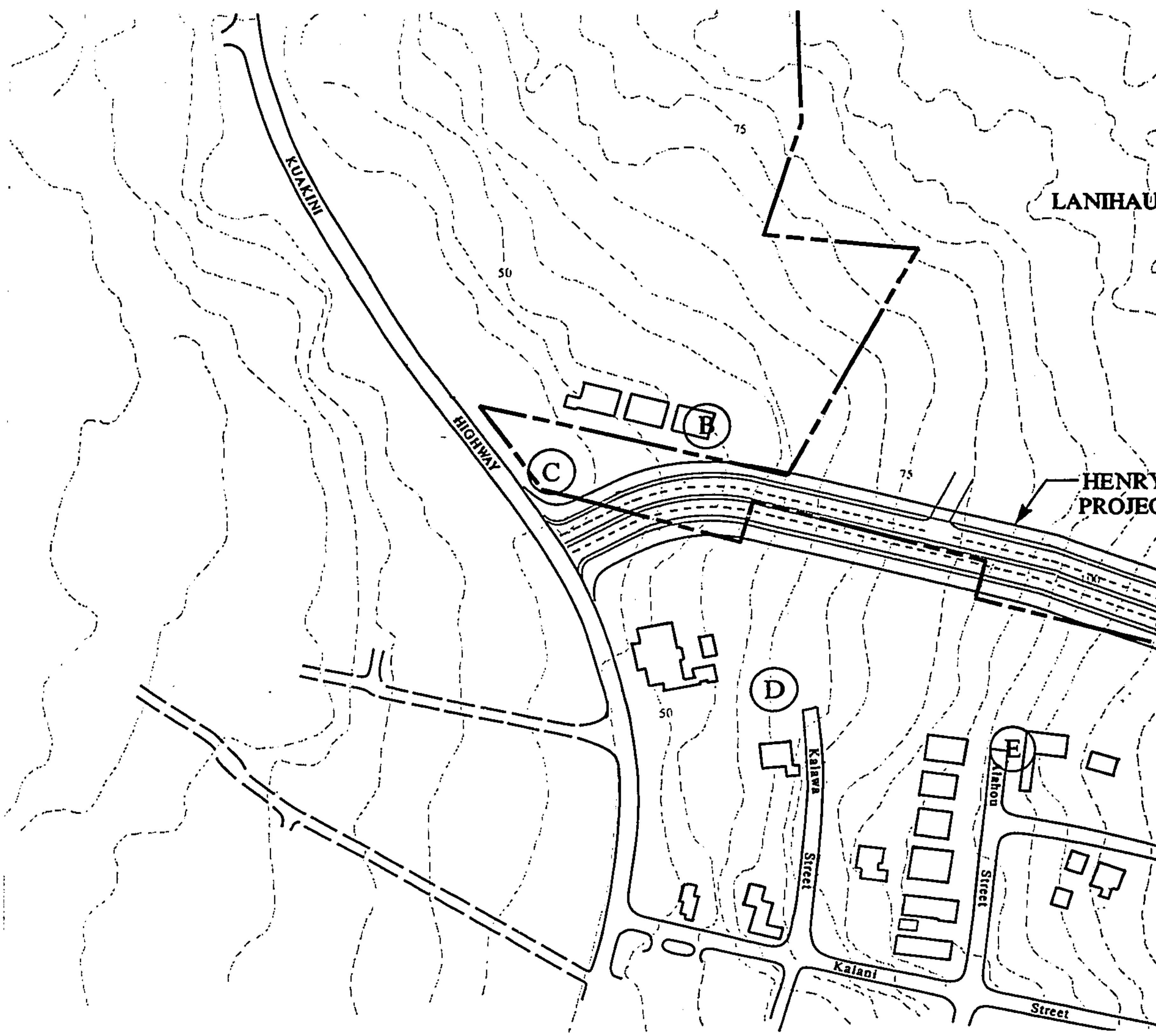
A. EXISTING CONDITIONS

Noise from sources such as traffic is commonly measured in A-weighted decibel units (dBA). The A weighting refers to the emphasis of certain sound frequencies over others to simulate the sensitivity of the human ear. The decibel scale is logarithmic, and a 10-fold increase in sound energy results in an increase of 10 dBA. With an instantaneous change in noise, doubling of the noise level results in an increase of three dBA, the smallest change in noise level considered to be noticeable by the majority of people.

Several federal agencies including the Department of Housing and Urban Development (HUD) normally allow residential uses at areas where the Day-Night Average Sound Level (Ldn) is less than 65 decibels (dB). However, an Ldn of 55 dB is considered by the U.S. Environmental Protection Agency (EPA) as a long-term goal to "ensure protection of the public health and welfare from all adverse effects of noise based on present knowledge."

To determine the existing acoustical conditions at the Henry Street site and its vicinity, noise measurements were performed during the late morning and the early afternoon hours of April 13, 1990. The locations used for noise monitoring measurements are shown in Figure 18, and the results are presented in Table 5. These locations were chosen primarily because they represent potential sensitive noise receptors from traffic on the proposed Henry Street, such as residences. Brief descriptions of these locations and their existing noise conditions are included below, along with their reference label from Figure 18.

The letters B through F correspond to noise monitoring sites given in the Noise Impact Assessment in Appendix F. Sites A, G, and H are not included on this figure because they do not involve sensitive receptors for noise which will be generated at Henry Street.



NOISE MONITORING LOCATIONS

HENRY STREET ENVIRONMENTAL ASSESSMENT

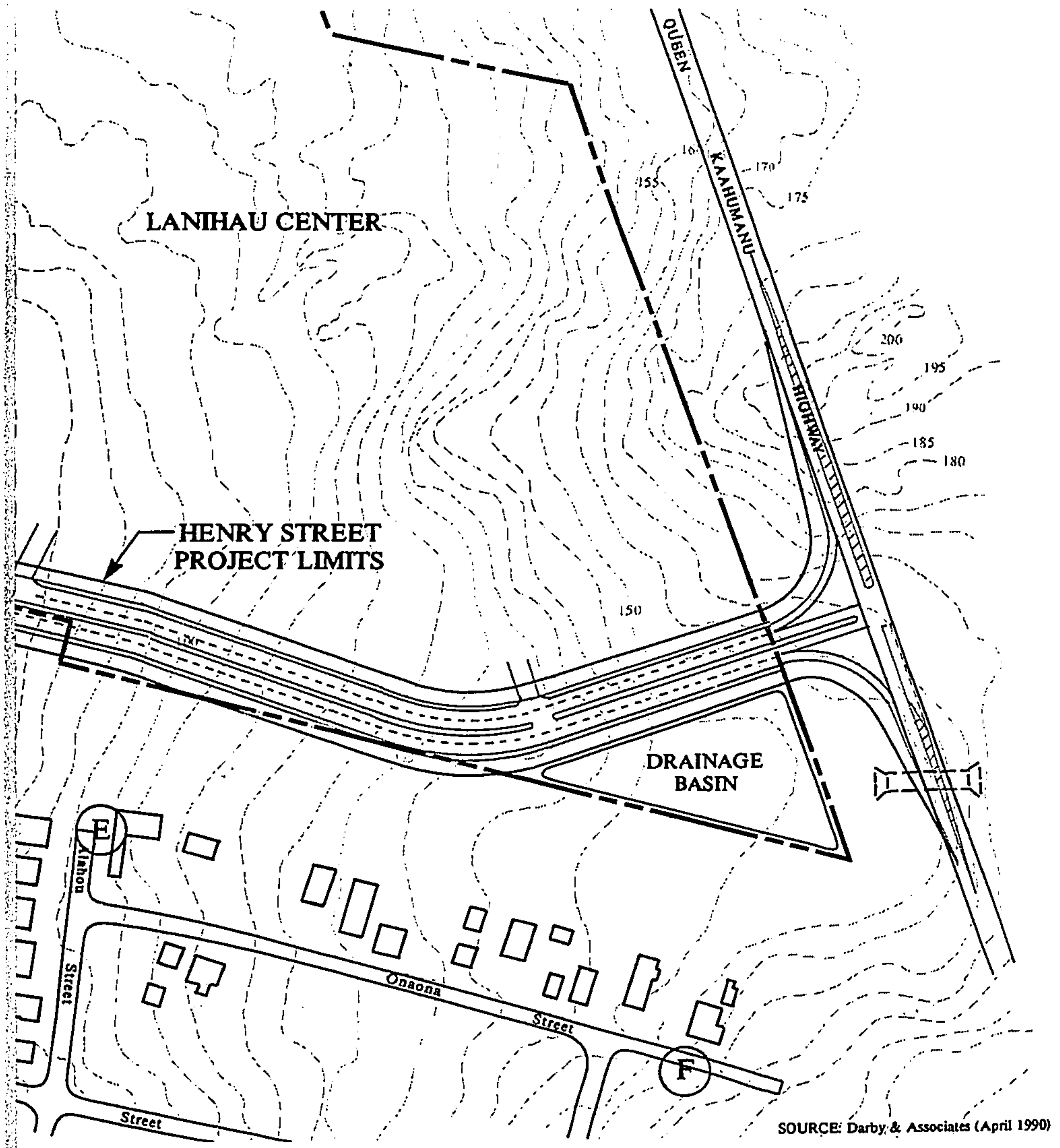

LANIHAU CENTER
HENRY STREET
PROJECT LIMITS
QUEEN
KAAHUMANU
HIGHWAY
DRAINAGE
BASIN
155
170
175
206
195
190
185
180
150
Onaona
Street
Street
Street
E
F
SOURCE: Darby & Associates (April 1990)
0'
100'
200'
400'

FIGURE 18

TABLE 5

NOISE MONITORING RESULTS - EXISTING AND 1995

PREDICTED PEAK HOUR AVERAGE TRAFFIC NOISE LEVELS

	Noise Levels (dBA)		
Location	Existing Average Levels	1995 Peak Hour Average Levels Without Henry Street	1995 Peak Hour Average Levels With Henry Street
(B) Kalanikai Condominiums	50*	51-53	62-64
(D/E) Alahou Street/ Kalawa Street Multifamily Housing	55-57**	54	57-59
(F) Northern side of Ala Onaona St. Single family Housing	45***	51 - 53	56-58

* Measurement Period: 13:05 - 13:20, April 13, 1990

** Measurement Period: 11:30 - 11:45, April 13, 1990

*** Measurement Period: 11:05 - 11:20, April 13, 1990

Source: Darby and Associates, Inc. (April 1990)

Monitoring Sites B and C) Kalanikai and Kailua Bay Condominiums: Several two-story and three-story resort-type condominium buildings exist on the mauka side of Kuakini Highway, just north of the Henry Street route. Most of the units within the southern portion of Kalanikai will have a line-of-site to Henry Street, with the nearest units to the Henry Street right-of-way located at a distance of about 50 feet. The average existing noise level in this area, away from the traffic noise, was measured at 50 dBA. Closer to Kuakini Highway, at position B, noise levels are influenced by highway traffic, averaging 72 dBA.

D and E) Multi-family homes on the northern side of Kalawa Street and Alahou Street: Most of the northern facing multi-family units (such as Kona Lani) will have line-of site to Henry Street. The closest units are located at about 220 feet from the Henry Street right-of-way. The average existing noise levels in this area were measured at 55 to 57 dBA.

F) Single-family homes on the northern side of Ala Onaona Street: Most of the habitable spaces at the northern side of the homes will have line-of site to Henry Street. The closest homes are located at about 220 feet to 360 feet from the Henry Street right-of-way. The average existing noise level in this area was measured at 45 dBA.

Other less likely but potentially sensitive locations in the area of Henry Street are described briefly below.

Single-family home and church located at the mauka end of Kalani Street: No line-of-sight to Henry Street is expected to exist from this area, and this location is primarily affected by noise levels generated from Queen Kaahumanu Highway. The average existing noise level in this area was measured at 43 dBA.

Multi-family buildings and churches on the makai side of Kuakini Highway: Only the portion of Henry Street intersecting Kuakini Highway will have a line-of-site from these areas. Noise levels from Kuakini Highway primarily affect this location. Existing noise levels range near 72 dBA at this location due to traffic on the highway.

Single family homes located adjacent to the Queen Kaahumanu Highway near Poni Place and Aloha-Kona Drive: No line-of-sight to Henry Street will exist. Noise levels from Queen Kaahumanu Highway primarily affect this location. Existing noise levels range near 70 dBA at this location due to traffic on the highway.

The existing noise level measurement results indicate that the existing conditions vary widely depending on their locations relative to Queen Kaahumanu Highway and Kuakini Highway. The measured average levels (Leq's) were up to 70 to 72 dB at locations near the highways. At locations away from the highways, the levels ranged from about 43 to 45 dB, and are considered typical of quiet residential neighborhoods with natural conditions (wind and bird sounds) and locally generated sounds being dominant.

B. ANTICIPATED IMPACTS

Two sources of potential traffic noise are at the existing highways due to increases in traffic volumes resulting from the development of Henry Street and the proposed Lanihau Center expansion, and noise generated by traffic movements on Henry Street itself. Particular consideration is given at the noise sensitive residential locations nearest to the proposed street, and located away from both highways. Also addressed in this assessment are potential impacts due to construction activities related to the proposed street.

Traffic noise estimates have been made using the Federal Highways Administration (FHWA) Highway Traffic Noise Prediction Model. In order to calibrate the model, noise measurements have been obtained at locations near Queen Kaahumanu and Kuakini Highways together with traffic counts, including the mix of vehicles. Once the model was calibrated, new traffic data were used to predict the future (1995) noise levels for scenarios with and without the development of Henry Street.

1. Noise Levels at the Existing Highways

The results of noise estimates indicate that the future (1995) traffic noise levels for Queen Kaahumanu Highway , with the Henry Street and Lanihau Center expansion, will increase by, at most, about 1 dB. The future traffic noise levels predicted for Kuakini Highway, with the Henry Street development, are expected to be less than those occurring without the new street. This decrease in traffic noise results from Henry Street alleviating a portion of the traffic demand on Kuakini Highway. Such changes in traffic noise levels for both highways are considered negligible and will not cause any significant noise impact.

2. Noise Generated by Traffic on Henry Street

The FHWA traffic model has also been used to estimate the future traffic noise from Henry Street. Detailed traffic information to accurately predict the noise levels is not available. Therefore, the following assumptions have been made and were used in the calculations:

- Four lane street with a centerline median/turning lane
- 30 mph average travel speed
- One to two percent medium and heavy truck mixes
- Three percent grade near Kuakini Highway and greater than seven percent for the remainder

The results of the traffic noise calculations are provided in Table 5. The future case without Henry Street would still have traffic entering/exiting the expanded shopping center at the same locations as Henry Street entrances to both of the existing highways. This condition would not allow for organized through-traffic between the two highways.

The noise model results indicate that all the existing residential areas near the proposed street are expected to be exposed to noise levels of less than 65 dB (Ldn), and therefore, which is in HUD's maximum noise level standards for residential uses. The results also indicate that the residents living near the proposed street will experience increases in noise levels of about 2 to 13 dB (Ldn), when comparing the future traffic levels with and without the development and operation of Henry Street. Note that peak hour average levels are, in general, numerically equivalent to Ldn levels.

In terms of subjective perceptibility to changes in noise levels, a person with normal hearing will start to notice the change when there is an increase in noise level of about 3 dB, and will notice a marked difference when the increase approaches 10 dB, which is considered a doubling of loudness. In general, an increase of more than about 5 dB in noise level is considered a significant impact, subjectively.

Using these guidelines, it is possible that the residents of units within the Kalanikai condominiums near the proposed street and away from Kuakini Highway, may notice a marked increase in noise level. Most of the units within Kalanikai are equipped with air conditioners, however, and the interior noise levels with air conditioners on are not expected to change significantly with the Henry Street development. The residents of the other dwelling units near the proposed street may experience marginally noticeable to clearly noticeable noise level changes.

3. Noise Impact from Construction

Development of the proposed street will involve extensive construction activities, such as grubbing, excavating, grading and paving. The various construction phases of a development project may generate significant amounts of noise, and the actual amounts are dependent upon the methods employed during each stage of the process. Typical construction equipment noise ranges in dBA are shown in Figure 19. Earthmoving equipment, such as bulldozers and diesel trucks will probably be the loudest equipment used during construction, generating noise levels as high as 95 dB at the nearest residential areas. Such exposures are only a short-term condition, occurring during normal working hours, and construction noise is not generally considered a significant impact.

The construction of the access roads and other features on the site may require rock removal. Equipment typically used for rock removal include rock hammers and drills, as well as blasting equipment. Equipment using impact to break rock is noisy, as shown in Figure 19, where 82 to 98 dBA at 50 feet is typical of jack hammers and rock drills. The breaking of rock by explosion usually creates a muffled "thump" sound. Noise created during rock removal may affect the nearby residents. This impact will be short-term in duration, and the actual time period required for drilling and blasting will be assessed after final design and geotechnical studies for the access road are complete.

C. MITIGATIVE MEASURES

1. Traffic Noise

Predicted traffic noise levels at nearby sensitive receptors comply with the HUD's maximum noise level standard of 65 dB Ldn, and therefore no mitigation measures are required. However, implementation of three measures would reduce the potential noise impact at the residences located near the proposed Henry Street. These measures include:

- Posted speed limit of no greater than 25 mph on Henry Street
- Administrative controls to prohibit or reduce the number of early morning and night time heavy truck movements on Henry Street for the shopping center
- Establishing an extensive tall vegetation buffer along the border of Henry Street and the Kalanikai condominiums (although its benefit will be mainly psychological)

2. Construction Noise Mitigation

Although the State Department of Health (DOH)'s noise regulations only apply on the island of Oahu, it is recommended that the construction activities comply with the following DOH regulations:

> "No... construction activities creating excessive noise [shall be allowed] before 7:00 a.m. and after 6:00 p.m. of the same day."
>
> "No...construction activities which emit noise in excess of ninety-five dBA...[shall be allowed] except between 9:00 a.m. and 5:30 p.m. of the same day."
>
> "No...construction activities which exceed the allowable noise levels on Sundays and on...[certain] holidays [shall not be allowed]. Activities exceeding ninety-five dBA shall [also] be prohibited on Saturdays."

All construction equipment and on-site vehicles or devices requiring an exhaust of gas or air should be equipped with mufflers.

All construction vehicles, when using trafficways, should comply with the noise level requirements defined in Chapter 42 - Vehicular Noise Control for Oahu, Department of Health, State of Hawaii, Administrative Rules, Title 11, 1981.

3.10 AIR QUALITY

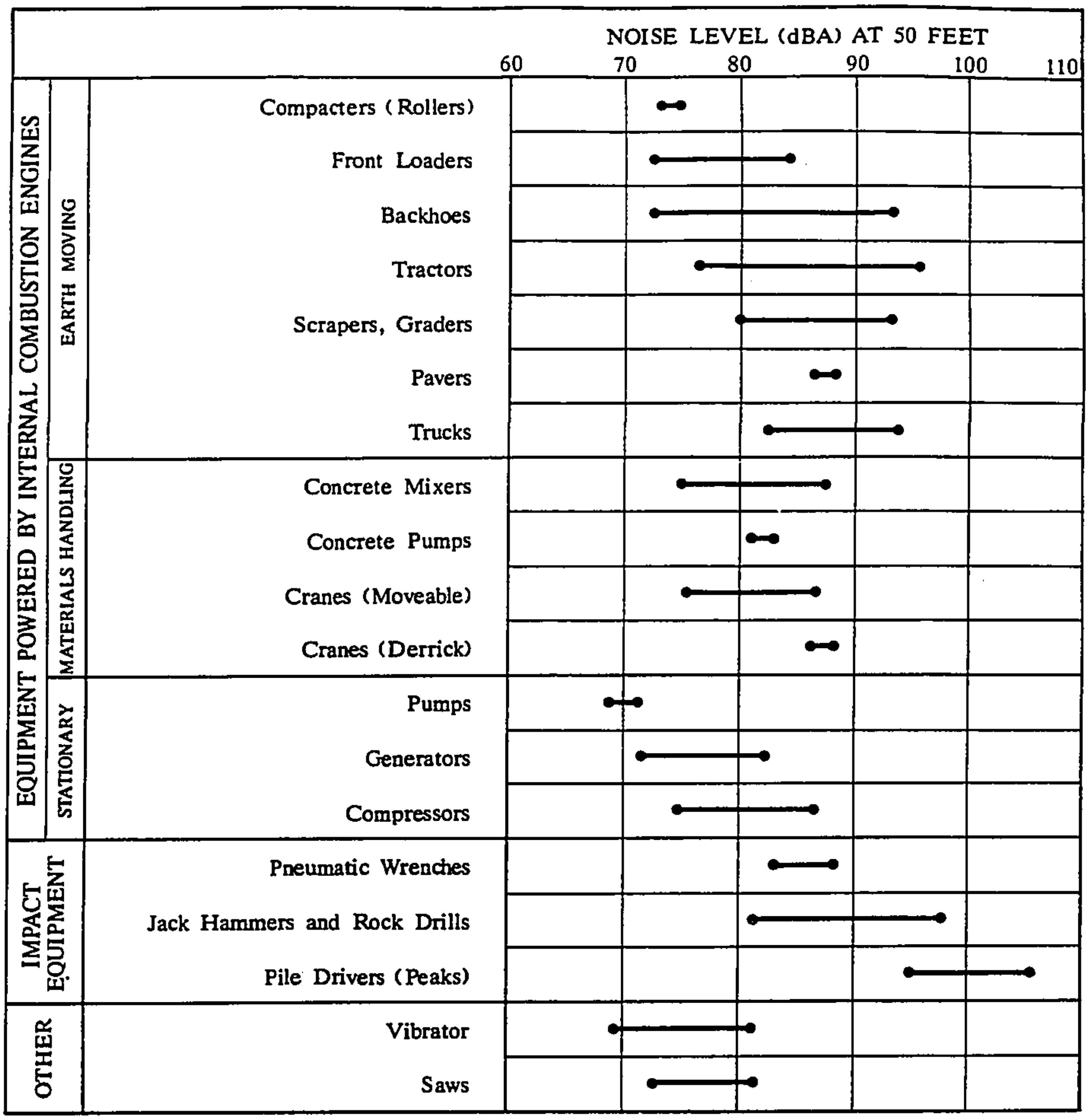
An air quality study of the proposed project has been prepared by Barry D. Neal and Associates (April 1990). The information included in this study is summarized below, and the actual report is included in Appendix G.

A. EXISTING CONDITIONS

Present air quality in the project area is mostly affected by air pollutants from natural, industrial, agricultural, and/or vehicular sources. Natural sources of air pollution emissions which may affect the project area but cannot be quantified very accurately include the ocean (sea spray), plants (aero-allergens), wind-blown dust, and volcanoes.

Of these natural sources of air pollution, volcanoes are the most significant. Volcanic emissions periodically plague the project area. This is especially so since the latest eruption phase of the Kilauea Volcano began in 1983. Air pollution emissions from the Hawaiian volcanoes consist primarily of sulfur dioxide. After entering the atmosphere, these sulfur dioxide emissions are carried away by the wind and gradually transformed into particulate sulfates. Although emissions from Kilauea are vented more than 50 miles east of the project site, the prevailing wind patterns eventually carry the emissions into the Kona area. These emissions can be seen in the form of the volcanic haze (vog) which persistently hangs over the area. The American Lung Association is currently studying the character and concentrations of volcanic air pollution in the Kona area, but to date no results of the study are available.

The major industrial sources in the project vicinity include the Keahole Power Plant, operated by the Hawaii Electric Light Company, and the Kailua Landfill, operated by the County of Hawaii. Air pollution emissions from Keahole Power Plant consist mostly of sulfur dioxide and



Note: Based on Limited Available Data Samples
SOURCE: U.S. Environmental Protection Agency (1972)

TYPICAL CONSTRUCTION NOISE LEVELS

HENRY STREET ENVIRONMENTAL ASSESSMENT

FIGURE 19

oxides of nitrogen. Emissions from the County landfill consist mainly of fugitive dust from heavy equipment operations and noxious fumes from underground fires, the latter of which has been the subject of numerous complaints from people residing and working nearby. Studies at the landfill conducted by the U. S. Environmental Protection Agency (EPA) suggest that the problem is not a threat to public health.

The State Department of Health operates a network of air quality monitoring stations at various locations around the state. Unfortunately very little information is available for the island of Hawaii, and even less is available for the Kona area specifically. The only existing monitoring data in the vicinity of the project site consist of sulfur dioxide and particulate measurements that were made about 10 miles to the south at Kealakekua during 1985 and 1986. During the two-year period, measurements of 24-hour average sulfur dioxide concentrations at this location were consistently low with daily mean values ranging from less than 5 to 12 $\mu g/m^3$. No exceedences of the State/national 24-hour Ambient Air Quality Standard (AAQS) for sulfur dioxide were recorded. Twenty-four hour average particulate concentrations ranged from 4 to 28 $\mu g/m^3$; no violations of the State AAQS were measured.

At this time, there were no reported measurements of lead, ozone, nitrogen dioxide or carbon monoxide in the project vicinity. These are mostly motor vehicle related air pollutants. Lead, ozone, and nitrogen dioxide are primarily regional scale problems; concentrations of these contaminants generally have not been found to exceed AAQS elsewhere in the State. Carbon monoxide air pollution, on the other hand, typically is a microscale problem caused by congested motor vehicular traffic. In traffic congested areas, such as urban Honolulu, carbon monoxide concentrations have been found to occasionally exceed the State AAQS. Present concentrations of carbon monoxide in the project area are estimated later in this study based on air quality modeling of vehicular emissions.

B. ANTICIPATED IMPACTS

1. Short-Term Air Quality Impacts

There will be two types of short-term air quality impacts that will result from construction at Henry Street: fugitive dust generation and on-site emissions from construction equipment. There will also be short-term indirect impacts from slow moving construction equipment traveling to and from the project site, and from an increase in local traffic caused by commuting construction workers.

Fugitive dust emissions may arise from grading and dirt/rock-moving activities associated with site preparation once the area is cleared. The emission rate for fugitive dust emissions from construction activities is difficult to estimate accurately because of its elusive nature and because the potential for its generation varies greatly depending upon the type of earth-disturbing activity taking place. A rough estimate of uncontrolled fugitive dust emissions from construction activity has been provided by the U.S. Environmental Protection Agency (1987), estimated at 1.2 tons per acre per month under conditions of "medium" activity and moderate climatic conditions. Uncontrolled fugitive dust emissions from construction of Henry Street would probably be similar to these estimates, if not controlled by watering operations. State of Hawaii Air Pollution Control Regulations require that no visible emissions of fugitive dust from construction activity should occur.

On-site mobile and stationary construction equipment will also emit some air pollutants in the form of engine exhausts. The larger types of equipment are usually diesel-powered. Nitrogen oxides emissions from diesel engines can be relatively high compared to gasoline-powered equipment, but the standard for nitrogen dioxide is set on an annual basis and is not likely to be violated by short-term construction equipment emissions. Carbon monoxide emissions from diesel engines, on the other hand, are very low and should be relatively insignificant compared to normal vehicular emissions on nearby Kuakini Highway and Queen Kaahumanu Highway.

2. Long-Term Air Quality Impacts

The primary long-term air pollution impact will arise from the increased motor vehicle traffic associated with the operation of Henry Street. Henry Street itself is not the source of this motor vehicle traffic, however, the introduction of this new roadway will establish new traffic patterns in this part of Kailua, and vehicle emissions will result.

In order to evaluate the potential long-term indirect air quality impact of traffic operations at the Henry Street intersections, a carbon monoxide modeling effort was carried out. Carbon monoxide was selected for modeling because it is both the most stable and the most abundant of the motor vehicle generated pollutants, and it is also the air pollutant with the greatest likelihood of violating State of Hawaii Air Pollution Control Regulations and National Ambient Air Quality Standards (NAAQS).

For this project, three scenarios were selected for the carbon monoxide modeling study: (1) 1990 with present conditions, (2) 1995 without the project, and (3) 1995 assuming the project is built and complete. To begin the modeling study, critical receptor areas in the vicinity of the project were identified for analysis. Generally speaking, roadway intersections are the primary concern because of the increase in vehicular emissions associated with traffic cycling: decelerating, stopping, queuing, and accelerating. For this study, the same key intersections identified in the traffic study prepared by Barton-Aschman and Associates, Inc. (April 1990) were also selected for air quality analysis. These intersections include: Henry Street at Queen Kaahumanu Highway and at Kuakini Highway, Henry Street at the Lanihau Center East Driveway and West Driveway, and Palani Road at Queen Kaahumanu Highway and at Kuakini Highway.

The main objectives of the modeling study were to estimate both current and projected levels of maximum one-hour average carbon monoxide concentrations which could then be directly compared to the National and State AAQS. The traffic study indicates that traffic volumes generally are, or will be, higher during the afternoon peak hour than during the morning peak period. However, worst-case emission and meteorological dispersion conditions typically occur during the morning hours at many locations. Thus, to ensure that worst-case concentrations were identified, both morning and afternoon peak traffic hours were examined.

Critical receptor areas were set for study in this model at each of the intersections of Henry Street and the Palani Road intersections with the highways. The results of the modeling effort are presented in Table 6.

Based upon the mathematical modeling of projected vehicular emissions, it is predicted that either without or with Henry Street and despite an increase in traffic, maximum carbon monoxide concentrations along Palani Road in the year 1995 will be lower than existing levels. This is due to the attrition of older motor vehicles fitted with less efficient emission control devices. With Henry Street, estimated worst-case concentrations in 1995 (compared to the without project case) will remain about the same along Palani Road but will obviously increase within the area where Henry Street will be constructed. The predicted highest carbon monoxide concentrations should remain within the National one-hour Ambient Air Quality standard set by the U.S. Environmental Protection Agency. The more stringent State one-hour Standard may be exceeded either with or without Henry Street near busy or congested intersections in the project area. The model predicts that the State one-hour carbon monoxide standard is already being exceeded at the Palani Road/Kuakini Highway intersection, and also at the Palani Road/Queen Kaahumanu Highway intersection.

The resulting estimated worst-case eight-hour concentrations are also indicated in Table 6. The U.S. EPA eight-hour standard for carbon monoxide is estimated to be met during the current year at all locations that were studied, and compliance is projected either without or with Henry Street in 1995. The more stringent State eight-hour standard for carbon monoxide may be exceeded at times during the current year and either with or without Henry Street in 1995 along Palani Road. With Henry Street, 1995 concentrations will likely exceed the State eight-hour standard both at Henry Street/Queen Kaahumanu Highway and Henry Street/East Driveway intersections. The State standards for carbon monoxide, however, are set so low they are probably exceeded at many intersections in the State that have even moderate traffic volumes.

It is worth noting that although National AAQS allow higher levels of carbon monoxide, these standards were developed after extensive research with the objective of defining levels of air quality that would protect the public health with an adequate margin of safety.

The results of this study reflect several assumptions that must be made concerning traffic movement and worst-case meteorological conditions. One such assumption concerning worst-case meteorological conditions is that a wind speed of one meter per second with a steady direction for one-hour will occur. A steady wind of one meter per second blowing from a single direction for an hour is not very likely, and it may occur only once a year or less. With wind speeds of two meters per second, for example, the computed carbon monoxide concentration would be only about half the estimated worst case value.

C. MITIGATIVE MEASURES

Strict compliance with State of Hawaii Pollution Control Regulations regarding establishment of a regular dust-watering program and covering of dirt-hauling trucks will be required to effectively mitigate fugitive dust emissions from construction activities. Twice daily watering is estimated to reduce dust emissions by up to 50 percent. Paving of roadway areas and establishment of landscaping early in the construction schedule will also help to control dust. Increased vehicular emissions due to disruption of traffic by construction equipment and/or commuting construction workers can be alleviated by moving equipment and personnel to the site during off-peak traffic hours.

Options available to mitigate traffic related air pollution are to improve roadways, reduce traffic or reduce individual vehicular emissions. Beyond the development of Henry Street, no additional roadway improvements should be required to maintain air quality for the near future. Monitoring of traffic conditions in this area will be conducted periodically by the County after Henry Street is in operation. This information will be available for use in assessing the potential for any adverse air quality conditions occurring in the area.

Aside from improving roadways, air pollution impacts from vehicular emissions can also be mitigated by reducing traffic through the use of mass transit and car pooling and/or adjusting local school and business hours to begin and end during off-peak times.

Further, it is conceivable that at some point in the future the efficiency of motor vehicle engines and/or emission control equipment will be improved or that vehicles will be developed which burn cleaner fuels. With regard to the latter, vehicles burning methanol or compressed natural gas or powered by electrical motors are some of the possibilities for technological development that are currently being contemplated.

TABLE 6

ESTIMATED WORST-CASE CARBON MONOXIDE CONCENTRATIONS

Estimated Worst Case Eight-Hour Carbon Monoxide Concentrations

Roadway Intersection	Year/Scenario (1) 1990/ Present	1995/ Without Henry St.	1995/ With Henry St.
Henry Street at:			
Queen Kaahumanu Highway	0.8*	0.6*	6.8
East Driveway	-	-	7.8
West Driveway	-	-	1.9
Kuakini Highway	0.9*	0.7*	3.2
Palani Road at:			
Queen Kaahumanu Highway	9.3	6.3	7.0
Kuakini Highway	8.7	5.9	5.9

Hawaii State Ambient Air Quality Standard: 5
National Ambient Air Quality Standard: 10

Estimated Worst Case One-Hour Carbon Monoxide Concentrations

Roadway Intersection	Year/Scenario (1) 1990/ Present AM	PM	1995/ Without Project AM	PM	1995/ With Project AM	PM
Henry Street at:						
Queen Kaahumanu Highway	1.5*	1.3*	1.2*	1.0*	12.4	13.7
East Driveway	-	-	-	-	2.3	15.5
West Driveway	-	-	-	-	1.3	3.7
Kuakini Highway	1.8*	1.6*	1.4*	1.3*	6.0	6.4
Palani Road at:						
Queen Kaahumanu Highway	18.6	15.4	12.6	11.2	13.1	14.1
Kuakini Highway	14.4	17.4	10.7	11.7	10.8	11.7

Hawaii State AAQS: 10
National AAQS: 40

(1) Carbon monoxide concentrations in milligrams per cubic meter.
* Assumes through traffic only

Source: Barry D. Neal (May 1990)

Lastly, even without technological breakthroughs, it is also possible that at some point in the future the State may decide to adopt a motor vehicle inspection and maintenance program which would ensure that emission control devices are properly maintained, and thereby reduce emissions.

3.11 VISUAL RESOURCES

Existing views of the Henry Street site from the surrounding areas have been inventoried in this section, both descriptively and by photographs. Short-term and long-term effects on views of the site which will result from development of Henry Street are assessed, and measures are proposed to minimize adverse effects.

A. EXISTING CONDITIONS

Views of the Henry Street project site are available from Queen Kaahumanu Highway, Kuakini Highway, and from some of the adjoining residential areas on the north and south sides of the proposed Henry Street. Photographs showing various views of the project site, and the proposed intersection locations, are included in Figures 20 and 21.

Views of the site from Queen Kaahumanu Highway are broad and expansive at some locations. Views of the site from Kuakini Highway are limited by tall, dense grasses and shrubs along the existing highway frontage. Because of the dense vegetative growth present throughout the site, little of the ground surface can be seen from off-site locations.

B. ANTICIPATED IMPACTS

1. Short-Term Visual Impacts

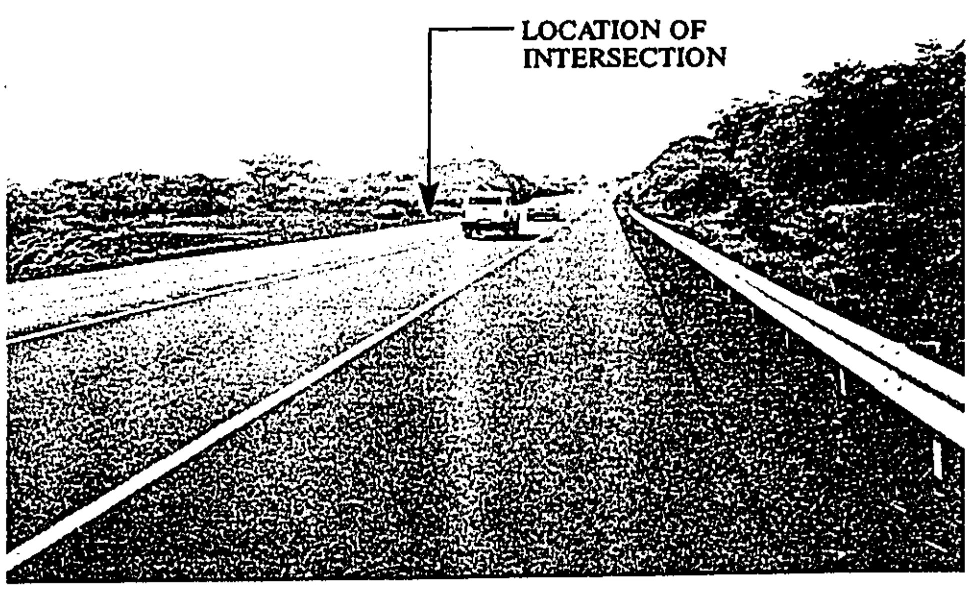
The activities associated with the construction of Henry Street will create some adverse effects on the views of the project site. Construction activities at the Henry Street intersections will be visible from Queen Kaahumanu Highway and Kuakini Highway. Construction activities on the remainder of the roadway will also be visible from some sections of the adjoining residential areas.

Vegetation clearing and grading operations will be visible, as will the construction of some portions of the roadway and utilities installations. Nearly all of the existing vegetation in the 120-foot wide Henry Street construction path will be removed, which will be noticeable at highway and from some residential locations. Heavy equipment activities will also be visible during the construction. Some construction site lighting may be required for security purposes, which may be visible at adjoining residential areas.

2. Long-Term Visual Impacts

The intersections of Henry Street with Queen Kaahumanu Highway and Kuakini Highway will be visible from these highways. The completed Henry Street will also be visible from some residential areas adjoining the site. Where available, views of the completed roadway's traffic activity and surrounding areas will change the visual character of this land from its former vacant woodland setting. Night lighting of the roadway will not be obtrusive at neighboring residences.

(A) VIEW OF HENRY STREET SITE FROM QUEEN KAAH

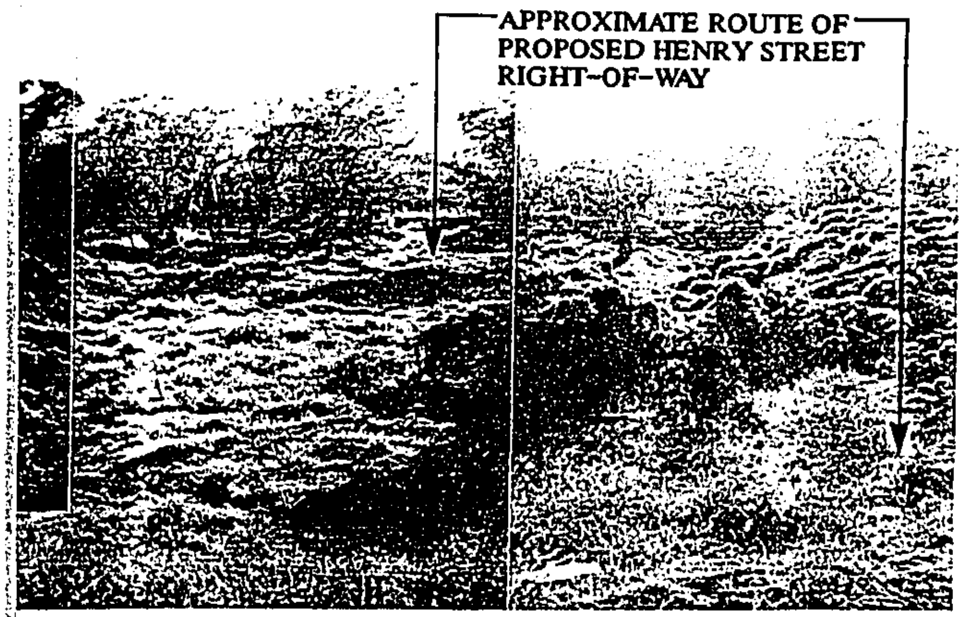


(B) QUEEN KAAHUMANU HIGHWAY INTERSECTION WITH HENRY STREET (FROM 200 FEET TO SOUTH)

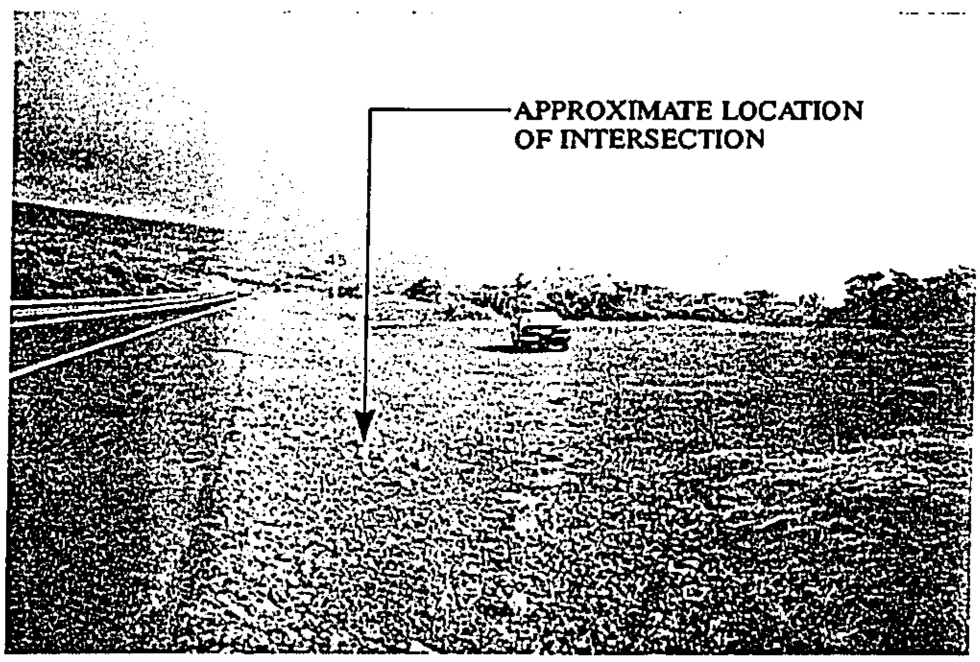
(C)

PHOTOGRAPHS OF PROJECT SITE

HENRY STREET ENVIRONMENTAL ASSESSMENT

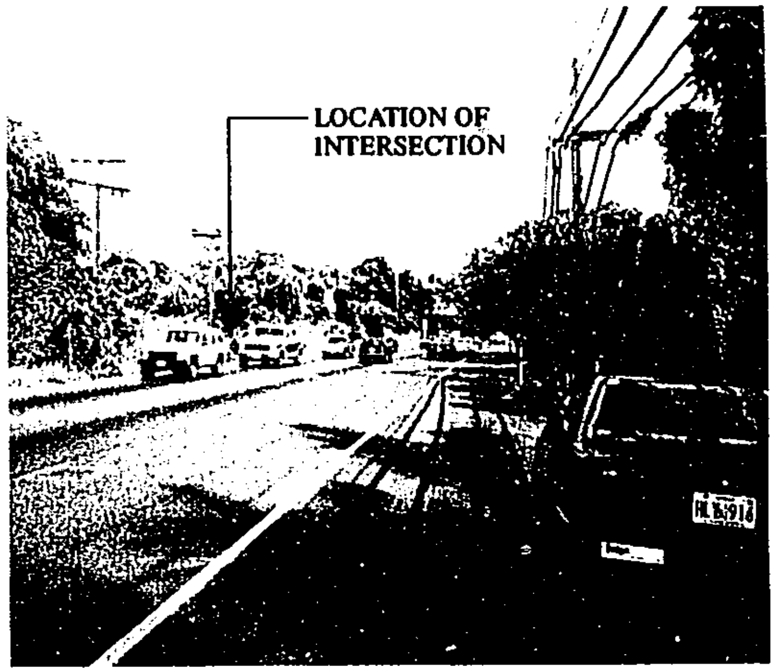


ROM QUEEN KAAHUMANU HIGHWAY

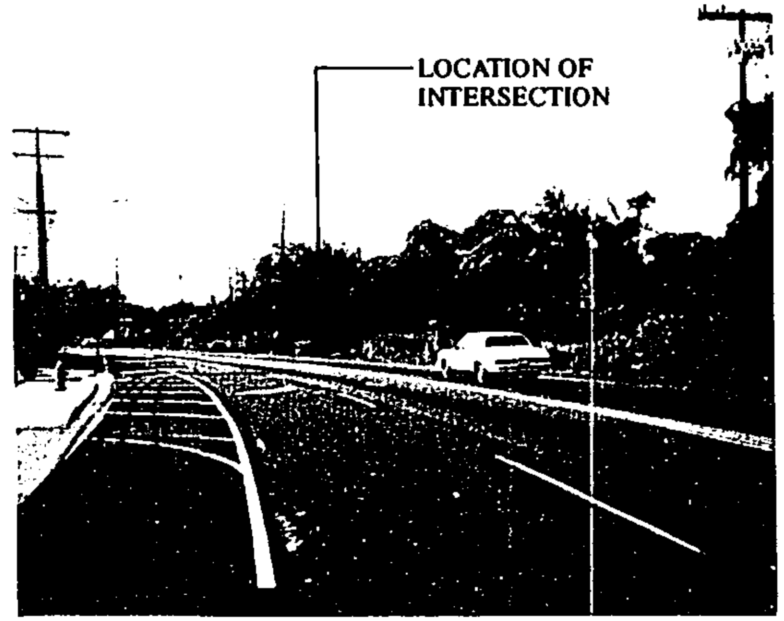


(C) QUEEN KAAHUMANU HIGHWAY INTERSECTION WITH
HENRY STREET (FROM 200 FEET NORTH)

FIGURE 20



Ⓓ VIEW OF MAKAI PORTION OF PROJECT SITE
ALONG KUAKINI HIGHWAY (100 FEET TO NORTH)



Ⓔ VIEW OF MAKAI PORTION OF PROJECT SITE
ALONG KUAKINI HIGHWAY (100 FEET TO SOUTH)

PHOTOGRAPHS OF PROJECT SITE

HENRY STREET ENVIRONMENTAL ASSESSMENT

FIGURE 21

C. MITIGATIVE MEASURES

Most significantly of proposed mitigative measures, Henry Street project edges and planter median will contain extensive new vegetation and landscape planting. This replanting will be accomplished as soon as possible to protect bare areas outside of the right-of-way created when clearing the Henry Street right-of-way. As shown in the typical section of Henry Street (Figure 6), the roadway will include an eight-foot wide planter median strip along most of its length. The planter strip and enhanced vegetation along the sides of Henry Street will establish a new, but pleasant, visual setting. the Street lighting design will avoid glare effects on neighboring residential areas.

Several other mitigative measures have been proposed to minimize the impact on views of the site. Construction equipment will generally be confined to storage areas during non-working periods, which will minimize views from Queen Kaahumanu Highway, Kuakini Highway, and adjoining residences. To minimize a variety of impacts including adverse visual effects, work on the Henry Street intersections with the highways will be completed in the shortest *possible time period.*

3.12 LAND USE DESIGNATIONS

This section includes a description of the existing State and County land use and zoning designations for the project site and lands surrounding them. No changes in land use classification and zoning are required to implement the proposed action.

A. EXISTING CONDITIONS

State Land Use

As shown in Figure 22, almost the entire 5.6-acre project site is located within the State Land Use Urban District, as is most of the surrounding area. However, a small portion of the Henry Street right-of-way includes part of TMK 7-5-04:13, which is within the State Agriculture District.

County General Plan

The objectives and policies of the County of Hawaii General Plan set forth comprehensive statements concerning the needs of the people of Hawaii and the functions of government. The project site is comprised of lands which are designated as high and medium density urban areas by the County General Plan.

Kailua Village Design Plan (Draft 1988)

A draft of the Kailua Village Design Plan has been formulated, but it has not yet been officially adopted. The design plan makes no land use proposal or designation for the land on which Henry Street is proposed.

County Zoning

According to County Ordinance 74, the Lanihau Center and Henry Street area is to be developed as a General Commercial area, as part of the planned expansion of Kailua Village. The surrounding land adjacent to Henry Street is zoned as shown in Figure 22. Generally the surrounding lands are zoned for high density urban type uses such as resort hotels, multifamily housing, and commercial buildings.

B. ANTICIPATED IMPACTS AND MITIGATIVE MEASURES

In order to construct Henry Street as proposed it will not be necessary to obtain any land use approvals from the County of Hawaii or the State of Hawaii. Thus, there will be no impact on existing land use laws, plans, and regulations. Approvals required for improvements and utilities installations are listed below.

- County of Hawaii Department of Public Works Roadway Construction Approval
- County of Hawaii Department of Public Works - Signal Installation on County Highway
- State of Hawaii Department of Transportation Highway Entrance Approval
- State of Hawaii Department of Transportation - Signal Installation at Intersection with State Highway.

3.13 SOCIO-ECONOMIC CHARACTERISTICS

The potential effects of the project on the socio-economic characteristics of Kailua, Hawaii County and the State are considered in this section. Included is a presentation of demographic conditions, economic factors and employment in the project area, as well as government expenditures and revenues. A brief discussion of lifestyles is also presented herein.

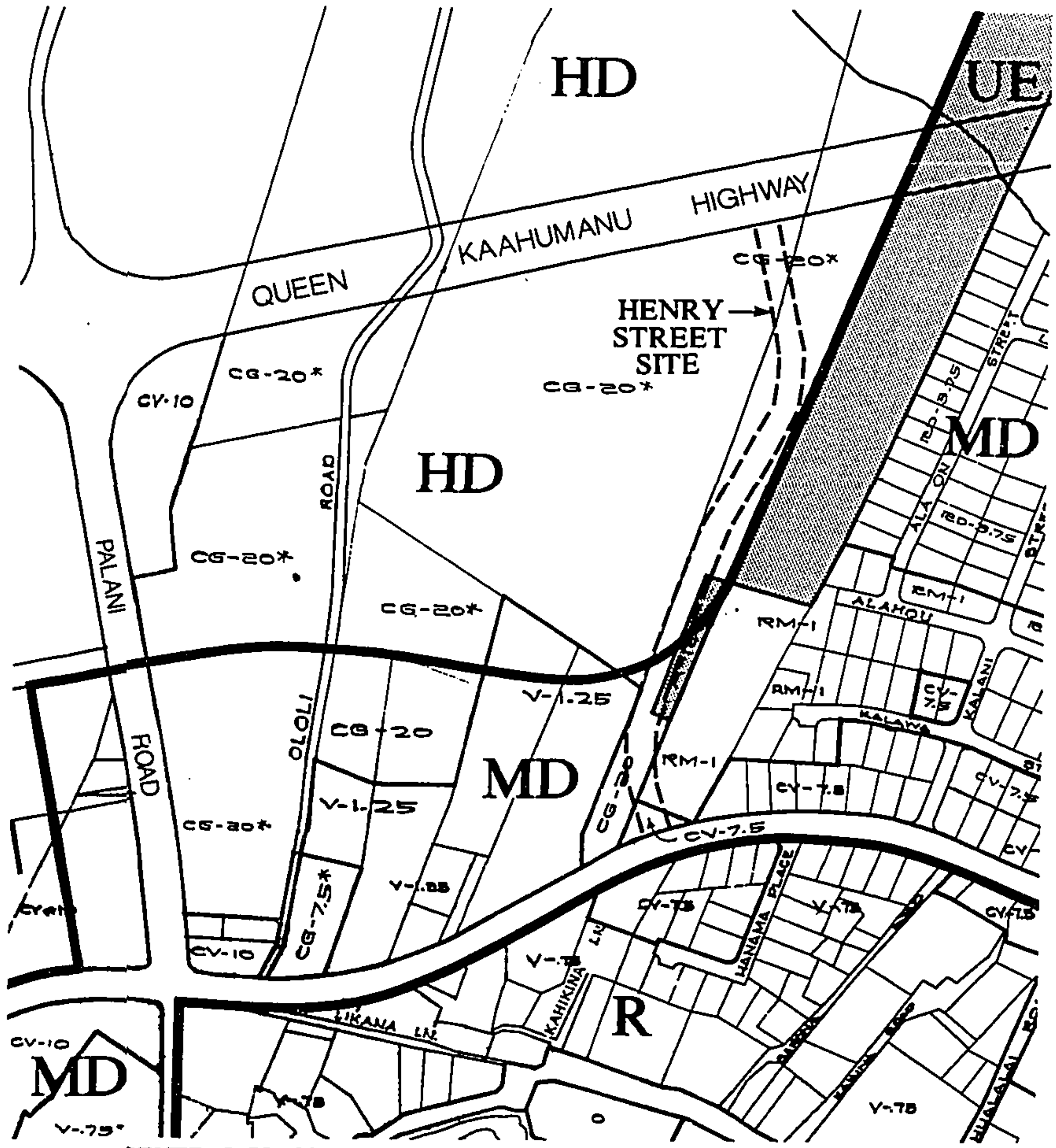
3.13.1 POPULATION

A. EXISTING CONDITIONS

Based upon population data provided by the U.S. Bureau of the Census, the resident population of the surrounding census districts of North Kohala, South Kohala, North Kona and South Kona in 1980 was approximately 27,500 persons. Within the immediate neighborhood of the proposed Henry Street, the Kailua Village Census Designated Population (CDP) was 4,751 in 1980.

B. ANTICIPATED IMPACTS

There will be no residential development involved with the construction of Henry Street, therefore, no resident population will be added at this site. The only population impacts involved with the construction of Henry Street will be the on-site employment population.



COUNTY GENERAL PLAN	
HD	High Density
MD	Medium Density
R	Resort
UE	Urban Expansion

KAILUA URBAN ZONE	
CG	General Commercial
CV	Village Commercial
V	Resort Hotel
RM	Multi-Family Residential
RD	Double Family Residential
O	Open Space

STATE LAND USE
Agriculture
Urban

0' 200' 400' 800'

COUNTY AND STATE LAND USE DESIGNATIONS

HENRY STREET ENVIRONMENTAL ASSESSMENT FIGURE 22

These workers will likely be present local residents who will commute to the construction site, or outside workers who will temporarily reside in the area during the duration of the construction.

C. MITIGATIVE MEASURES

The project does not involve the development of new residential housing and therefore, does not require mitigative measures related to population in the area of the project.

3.13.2 EMPLOYMENT AND ECONOMIC DEVELOPMENT

A. EXISTING CONDITIONS

Within the Kailua Village Census Designated Place (CDP) in 1980, approximately 2,450 persons were in the labor force, of which 2,380 were employed, and three percent of the labor force was unemployed. Approximately 31 percent of employment in the community was technical sales and administrative support. Approximately 25 percent of all the jobs, were retail trade and personal entertainment and recreation services. Kailua's resort development has generally increased faster in the past decade than other industries; these labor force characteristics have been likely changed.

Approximately 75 percent of all employed persons drive a private vehicle to work, and nearly 22 percent carpool. Approximately 11 percent walk to work, and the remainder use public transportation, or other means; or work at home. The average travel time to work is slightly more than 30 minutes.

B. ANTICIPATED IMPACTS

Direct and indirect construction employment will be created by this project. Direct employment effects would be those created by construction expenditures generated by the project. Construction of the Henry Street project will require approximately 180 man-months of on-site construction jobs and 36 man-months of off-site jobs.

The total employment effects include the direct employment effect, in addition to indirect and induced effects realized through spending multipliers throughout the County and State. Any construction project involves both on-site and off-site employment. Off-site jobs include support personnel and administration. Construction further supports secondary employment generated by the purchase of materials from other businesses and the expenditure of worker's wages. Secondary employment can be estimated at 80 percent of the total on- and off-site construction jobs, based on the State of Hawaii's construction model.

Except for maintenance work for the County, there will be no employment generated after construction is completed.

C. MITIGATIVE MEASURES

The project will have a small beneficial effect on construction employment to the area residents and businesses. Consequently, no mitigative measures are needed or recommended.

3.13.3 GOVERNMENT REVENUES AND EXPENDITURES

A. EXISTING CONDITIONS

The Henry Street site is currently vacant and generates approximately $2,000 per year in County property tax revenues. There is no current economic activity at the Henry Street site, therefore State revenues are negligible from the lands.

B. ANTICIPATED IMPACTS

1. Revenues

As a result of the construction work involved with development of Henry Street, the State would derive an estimated $123,260 in general excise taxes. This estimate is based on 4.17 percent of the construction costs, which is approximately $2,956,000 including both the proposed roadway and drainage system. Since ownership of the land under Henry Street will be transferred to the County in dedication, County property taxes will no longer be collected on this land.

An indirect consequence of construction of Henry Street may be the increased valuation of adjacent properties, such as the Lanihau Center and neighboring vacant residential and commercial zoned land which could be served by Henry Street. The potential increased valuations of adjacent properties has not been determined as part of this study.

2. Expenditures

Costs for the Henry Street project are being shared between the County and Lanihau Center Venture. The County of Hawaii will spend $1,399,500 for the construction of Henry Street, financed by way of a capital appropriation approved in the 1989 State legislature. The County will also incur maintenance costs for Henry Street, which will be approximately $5,000 per year.

Lanihau Center Venture will spend approximately $1,420,500 for the roadway construction, and $700,000 for the drainage system construction. Lanihau Center Venture financing will come from a loan which is also covering the development of Lanihau Center Phase II.

3. Net Fiscal Impacts

The County of Hawaii will experience annual costs estimated at $5,000 for Henry Street. A comparison of projected public revenues and expenditures attributable to the project's development yields the net fiscal impacts expected to the County annually due to Henry Street maintenance requirements. The State government will benefit only from the general excise tax revenues from construction expenses.

C. MITIGATIVE MEASURES

The development of Henry Street in a shared cost process with Lanihau Center Venture is advantageous to the residents of Hawaii County. No additional mitigative measures are considered necessary with respect to government expenditures.

3.13.4 LIFESTYLES

A. EXISTING CONDITIONS

Lifestyles and values result in a large part from an area's history, geography, economic base, and the ethnic heritage of its people. The Kailua Village Design Plan (Chee, Draft 1988) states that the most important contributions of the 1960 Plan for Kona was the coining of the Phrase "Kona way of life." The "Kona way of life" is defined as one which is "slow, peaceful, relaxed, quiet, natural, casual, unhurried, and uncrowded." Although the Kailua Village area in which Henry Street is proposed has been growing in population and becoming more urban, with increased commercial and hotel development, residents generally seem to see their village as non-urban in its basic character.

B. ANTICIPATED IMPACTS

The proposed Henry Street will support increased commercial and urban-type development in Kailua Village, especially the expansion of Lanihau Center. Henry Street will contribute to maintaining the *"Kona way of life" in-so-far that this additional* collector street will help relieve congestion on Palani Road and promote a more orderly traffic flow in the area.

C. MITIGATIVE MEASURES

The proposed landscape planting for the new street will provide a tasteful visual setting which is compatible with the existing Kailua Village.

3.14 UNAVOIDABLE ADVERSE IMPACTS

The development and operation of Henry Street will create limited adverse environmental impacts which cannot be fully mitigated by the measures planned to be implemented. The following list includes those short-term and long-term impacts that are expected to be unavoidable, including those that are minor in significance.

3.14.1 UNAVOIDABLE ADVERSE SHORT-TERM ENVIRONMENTAL IMPACTS

1. Soils will be temporarily disturbed by grading, excavation and mounding activities at the site during construction.

2. Temporary increases in soil erosion will also result from construction operations, and minor amounts of soil will be carried off-site in surface runoff water.

3. Vegetation will be removed from approximately 5.6 acres on the site to allow for construction of the roadway and drainage facilities.

4. Wildlife utilizing the site and adjacent areas will be displaced by construction activities into nearby woods. Construction operations will temporarily discourage wildlife from feeding at or migrating through the site.

5. Operation of construction equipment, trucks and worker vehicles may temporarily impede traffic in the area during the construction period.

6. Negligible releases of air contaminants will occur from construction equipment. Emissions of fugitive dust may occur during dry periods as a result of construction operations.

7. The visual character of the area will be affected by construction activities and by the presence and operation of construction equipment.

8. Increases in noise levels will result from construction activities.

3.14.2 UNAVOIDABLE ADVERSE LONG-TERM ENVIRONMENTAL IMPACTS

1. Modifications to the site's topography will be made to accommodate development of the new roadway and drainage facilities.

2. Stormwater runoff from the project site, while reduced in volume, will contain some minor quantities of fertilizer nitrates and pesticides that are not currently present.

3. Some archaeological sites on the project site will be eliminated and others will be affected by construction of Henry Street.

4. Traffic on Queen Kaahumanu Highway and Kuakini Highway will be affected by the new intersections with Henry Street.

5. Additional noise levels will result at adjoining residential areas due to traffic using Henry Street.

6. Air quality in the vicinity of Henry Street will be affected by vehicle emissions.

7. Views of the project site will be changed by the roadway, sidewalks, landscaping, and streetlights which are components of Henry Street.

8. A minor demand on public services will result from roadway maintenance requirements.

3.15 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The construction and maintenance of Henry Street will involve the irretrievable commitment of certain natural and fiscal resources. The major resource commitment will be the 5.6 acres of land required for the development of the project. Financial resources, construction materials, manpower, and energy will all be expended to complete construction and maintain these facilities. Other commitments of resources required to accomplish the project include labor and materials, which are mostly nonrenewable and irretrievable. The construction of the project will also include the consumption of potable water and petroleum-generated electricity which also represent irretrievable commitments of resources.

There will be a permanent commitment of private and public funds and resources to complete this project. The impact of utilizing these resources should, however, be weighed against the benefits to the residents of the region, County and State, and the consequences resulting from not proceeding with the project. It is expected that increased tax revenues will be indirectly generated along with an increase in the with an increase in appreciated value of adjacent properties, especially the presently undeveloped lands. Time will be saved by motorists who will have an alternative route to the presently congested Palani Road for reaching areas along the Kona coast.

3.16 GROWTH-INDUCING FACTORS

The potential for inducing new growth in Kailua as a result of the development of Henry Street must be considered. This new connector roadway between Kuakini Highway and Queen Kaahumanu Highway has been planned primarily to provide an additional mauka/makai route between these highways for existing traffic and predicted ambient traffic growth in Kailua. The other reason for creating Henry Street has been to create an organized traffic circulation route for vehicles entering and exiting the expanding Lanihau Center. Without Henry Street, the access and egress from the expanded center would involve driveways onto the two highways without providing an organized routing for through-traffic. Lanihau Center Venture is sharing in the cost of developing Henry Street. For these two reasons, Henry Street will only be supporting existing traffic of the area and anticipated future growth.

The only new development which Henry Street will facilitate is the plans for new commercial land use on lands directly south of the roadway. This land could not be practically accessed off Kuakini Highway or Queen Kaahumanu Highway, and the use of Henry Street would allow organized traffic flow to and from the site. The development of Kona Center is proposed for this 9.5 acre site, which will require approval of an application for commercial rezoning. Kona Center is the only new growth which is expected to be induced by the development of Henry Street.

3.17 SUMMARY OF UNRESOLVED ISSUES

During the preparation of the Environmental Assessment, there were no issues raised which remain unresolved. Each of the subject area outlined in the Environmental Assessment Scope Agreement between Lanihau Canter Venture and the County of Hawaii, have been addressed in this document.

New concerns may arise in the future, which will be addressed in the County review process. The mitigative measures involving burial sites affected were set forth at the September 20, 1990 meeting of the Island of Hawaii Council on Burials. Other interested parties will be given an opportunity to make comments on this document once the project is announced in the OEQC Bulletin in February 1991.

SECTION 4

Alternatives

4.0 ALTERNATIVES

Three alternatives to the proposed construction of Henry Street are discussed in this section. A No-Action Alternative was considered, which would leave the project site in its present state. An alternative for the project has also been considered to align Henry Street in such a way as to avoid demolition of the archaeological sites. Another alternative would involve the expansion of Kalani Street to create a new connector roadway. A discussion of each alternative is presented below.

4.1 NO ACTION ALTERNATIVE

The no-action alternative would involve no changes to the existing project site for the foreseeable future. The vacant status of the Henry Street site would likely continue for at least the near future.

With respect to the environmental characteristics of the project site, its topography, soils, surface water, ground water, runoff, flooding, vegetation, and wildlife would not change. Other factors that would not be affected under the no-action alternative would include archaeological resources, employment, government expenditures, infrastructure, and public services. The generation of property taxes by the site and adjacent properties would continue at the existing levels.

Without Henry Street, traffic congestion will become heavier in the future on Palani Road and its intersections. As a result, air quality and noise conditions would be expected to become worse along this roadway. The operation of Queen Kaahumanu Highway and Kuakini Highway would also be affected adversely.

As compared to the proposed project, the no-action alternative would create fewer environmental effects. However, traffic flow improvements in Kailua, as well as social and economic benefits, would not be generated by the no-action alternative.

4.2 ALTERNATIVE ROADWAY ALIGNMENT

Two alternative roadway alignments were considered which would route the westernmost 500 feet of Henry Street along a path which would cause fewer impacts to archaeological resources, and also be further removed from residential development to minimize noise.

One alignment would shift the route of Henry Street further south of its proposed path over the final 500 feet at the western end of the route. The connection of Henry Street to Kuakini Highway would be within 50 to 100 feet south of its proposed location. The alternative route would allow for the preservation of some sensitive archaeological sites (including known burials) adjacent to the Kalanikai condominium complex. This route could somewhat reduce the potential for adverse noise impacts on the Kalanikai residents. The potential noise impacts could, however, be increased for residents of the Lono Kona residential area. The closest buildings in this area are not air conditioned, and would likely experience increased noise beyond that predicted for the proposed Henry Street route.

Another concern of the southern route alternative is the requirement for additional land acquisition which is outside the ownership of Lanihau Center. Almost one acre of land would be required to allow this route, which would be prohibitively expensive for the private or public interests to acquire.

A second alternative alignment would shift the route of Henry Street further north to minimize potential adverse noise effects on the residents to the south of Henry Street. This route would bring Henry Street closer to the Kalanikai residents, likely increasing the predicted noise levels at that location. No additional archaeological resources would be preserved under this alternative route.

Another consideration of the northern route alternative is the proper engineering design of the Henry Street intersection with Kuakini Highway. A right-angle approach to Kuakini Highway is required for safety and traffic flow considerations. The southern route alternative could achieve this design requirement, however, the northern route alternative could not achieve a right-angle.

4.3 KALANI STREET EXPANSION ALTERNATIVE

The third alternative considered to the Henry Street project is the potential expansion of Kalani Street into a connecting roadway between Kuakini Highway and Queen Kaahumanu Highway. This expansion would require widening of Kalani Street along its route, and the creation of a new signalized intersection with Queen Kaahumanu Highway. Unlike Henry Street, this alternative would utilize an existing signalized intersection with Kuakini Highway.

Kalani Street would serve the purpose of Henry Street as the new mauka/makai connection for traffic between the two major routes in Kailua. A connection between Kalani Street and the expanded Lanihau Center would also be created, probably utilizing Alahou Street. Because of the volume of traffic anticipated, Kalani Street would be widened from its present 16 foot width (40 foot right-of way) to include four 12-foot wide travel lanes with curbs, gutters and sidewalks (60 foot right-of way). Alahou Street would also be widened to 24 feet with curbs, gutters and sidewalks.

To accommodate the widening of Kalani Street and the connecting road to Lanihau Center, some private homeowners, multi-family residences and commercial businesses would likely be displaced through condemnation, or lose a significant amount of land along their boundary with these roads. Compensation and/or relocation assistance would be required to aid affected property owners, residents and businesses. It would be expected that this major effect on an established residential area would not be easily accepted by Kailua residents.

Other major concerns of this alternative would be the impact of traffic and noise on residents in the Kalani Street neighborhood, including the Lono Kona subdivision. Traffic volumes projected in Section 3.8 for Henry Street would be added to Kalani Street, on top of the local residential traffic currently using Kalani Street. Traffic noise generated from this increased traffic would be comparable to that predicted for receptors adjacent to Henry Street. Residences located along Kalani Street would experience noise levels in excess of the guidelines established for residential areas by the State of Hawaii and U. S. Environmental Protection Agency.

The environmental impacts of the proposed construction of Henry Street, such as vegetation loss and archaeological site disturbance, would not occur under this alternative. Drainage improvements to the North Keopu drainageway on the Henry Street project site would not occur with the Kalani Street expansion. Overall costs to the County for implementation of this alternative, including compensation and relocation costs, could be comparable to the costs estimated for Henry Street.

The County of Hawaii Department of Public Works conducted an evaluation of the use of Kalani Street as a connector roadway with Queen Kaahumanu Highway during July 1988. Appendix I includes a copy of the Chief Engineer's report on the proposed connection. The report states that the Hawaii District office of the State Department of Transportation was consulted in their analysis, concluding that no access to Queen Kaahumanu Highway could be permitted in the vicinity of Kalani Street. A planned connection was already reserved in 1981 for Henry Street, as a condition placed on the zoning change approval for Lanihau Center (Ordinance No. 684; April 1981) which requires the developer to build Henry Street.

The Engineering Division of the County Department of Public Works has also expressed reservations about using Kalani Street as a major new connector roadway with Queen Kaahumanu Highway. Kalani Street is an old roadway which was built to less strict standards than the current County standards. The grade differential at the mauka end of Kalani Street would create the need for significant grading to connect with the Highway. Property and driveways for residences along this section of the road would be affected. There would likely be a need for construction of a retaining wall along these mauka residential sections where the grading would be greatest.

SECTION 5

Relationship to Existing Policies and Plans for the Affected Area

5.0 RELATIONSHIP TO EXISTING POLICIES AND PLANS FOR THE AFFECTED AREA

This section includes a discussion of the relationship of the project to the objectives and policies of the Hawaii State Plan, the County of Hawaii General Plan, and the Kailua Village Design Plan (Draft 1988).

5.1 HAWAII STATE PLAN

This section includes an assessment of the conformity of the Henry Street project to the applicable goals, objectives and policies of the Hawaii State Plan, Chapter 226, HRS, and applicable priority guidelines and functional plan policies.

5.1.1 OBJECTIVES AND POLICIES

Section 11(a): Objectives for the physical environment - land - based, shoreline, and marine resources:

(1) Prudent use of Hawaii's land - based, shoreline, and marine resources.

Section 11(b): Applicable policies:

(3) Take into account the physical attributes of areas when planning and designing activities.

Discussion: Henry Street has been designed with consideration of the natural features on the site and revegetation of disturbed edge areas will be undertaken. Extensive landscape planting will also be included for the eight foot wide median strip.

No rare or endangered plant or animal species are found on the project site, and no habitat for these species will be affected by the project.

The development of this collector street will create new opportunities to view the surrounding lands, mountains and ocean.

Section 12(a): Objective for the physical environment - scenic, natural beauty, and historic resources:

Enhancement of Hawaii's scenic assets, natural beauty, and multicultural/historical resources.

Section 12(b): Applicable policies:

(4) Protect those special areas, structures, and elements that are an integral and functional part of Hawaii's ethnic and cultural heritage.

Discussion: The development of Henry Street will unavoidably conflict with the preservation of a group of prehistoric Hawaiian residential compounds, terraces, and burial sites. These archaeological sites have been thoroughly examined by trained archaeologists and State officials. All significant data has been, or will be, recovered and documented as a result of these investigations. The historic and archaeological resources in the vicinity of the Henry

Street right-of-way will be protected during construction of Henry Street. Refer to Section 3.7 regarding archaeology.

The project will not create any interference in the views and vistas from points outside the project boundaries. Scenic views and open space will be maintained in the area surrounding the new roadway.

<u>Section 13(a): Objectives for the physical environment - land, air, water quality</u>:

(1) Maintenance and pursuit of improved quality in Hawaii's land, air, and water resources.

<u>Section 13(b): Applicable policies</u>:

(2) Promote the proper management of Hawaii's land and water resources.

(3) Promote effective measures to achieve desired quality in Hawaii's surface, ground, and coastal waters.

(5) Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters.

<u>Discussion</u>: The land and water resources of the project site will be properly managed. Stormwater runoff will be controlled in the drainage area on the site and downstream areas through the development of an extensive stormwater runoff control system for the North Keopu Drainageway. Total runoff from the project will be lower than under existing conditions, and the drainage facilities will control runoff from a 10-year storm intensity. This will provide new flood protection to downstream areas of Kailua. Soil erosion will also be less than under existing conditions.

<u>Section 17(a): Objective for facility systems - transportation</u>:

A statewide transportation system consistent with planned growth objectives.

<u>Section 17(b): Applicable policies:</u>

(6) Encourage transportation systems that serve to accommodate present and future development needs of communities.

(10) Encourage the design and development of transportation systems sensitive to the needs of affected communities and the quality of Hawaii's natural environment.

<u>Discussion</u>: In order to alleviate the expected traffic increase associated with the growth of west Hawaii, including the Lanihau Center expansion, Henry Street is being proposed as a new mauka/makai collector road. Full-movement, signalized intersections will be created at the intersection of Henry Street with Queen Kaahumanu Highway and Kuakini Highway. The operation of Henry Street is predicted to provide relief to the current and predicted traffic congestion in nearby sections of Kailua Village, especially on Palani Road.

5.1.2 PRIORITY GUIDELINES

The purpose of the State Plan priority guidelines is to address areas of statewide concern. The following discussion provides an assessment of how the proposed project conforms to the relevant priority guidelines.

Land Resource Priority Guidelines:

Section 104 (b)(2):

Make available marginal or non-essential agricultural lands for appropriate urban uses while maintaining agricultural lands of importance in the agricultural district.

Discussion: As previously noted, the site contains land which is marginal and non-essential for agricultural use due to its poor soil type, and some steep slopes and gullies that exist on this site. The proposed use is appropriate to the urban character of the area, and the site is generally zoned for commercial use.

Section 104 (b)(6):

Seek participation from the private sector for the cost of building infrastructure and utilities, and maintaining open spaces.

Discussion: The objective of this project is to build a needed mauka/makai collector roadway. The private developer of Lanihau Center is jointly developing Henry Street for public use with the County of Hawaii government.

5.1.3 FUNCTIONAL PLANS

The State Functional Plans translate the broad goals and objectives of the Hawaii State Plan into detailed courses of action. The relationship of the proposed actions within the project to the relevant State Functional Plan objectives and implementing actions is described below.

State Agricultural Functional Plan - Land

B (5). Applicable Policy:

Provide greater protection to agricultural lands in accordance with the Hawaii State Constitution.

B (5) (c). Applicable Implementing Action:

Until standards and criteria to conserve and protect important agricultural lands are enacted by the Legislature, important agricultural lands should be classified in the State Agricultural District and zoned for agricultural use, except where, by preponderance of the evidence presented, injustice or inequity will result, or overriding public interest exists to provide such lands for other objectives of the Hawaii State Plan.

Discussion: Various soils surveys and classifications systems provide evidence that the land within the project area is of marginal agricultural importance, as reported in Section 3.3. The absence of any agricultural activities at the site supports this conclusion. In addition, the site is generally not designated for agricultural use on State or County plans.

State Transportation Functional Plan

C (3). Applicable Policy:

Promote the planning for and improvement of the primary, secondary, and urban highway and street systems consistent with State and County plans to control growth.

C (3) (b). Applicable Implementing Action:

Improve vehicular and pedestrian safety on State and County highways and streets.

Discussion:

The construction of Henry Street relates directly to the network of urban highways and has been anticipated by County agencies such as the Planning Department and Kailua Village Design Commission. (A discussion of the *Kailua Village Design Plan Draft 1988* is included in Section 5.3). Henry Street is being designed to meet applicable State and County traffic and roadway design standards. The improvement and organization of traffic flow in Kailua as a result of Henry Street will indirectly improve vehicular and pedestrian safety.

State Historic Preservation Functional Plan

Almost all of the policies and implementing actions in the State Historic Preservation Functional Plan are directed at State agencies, especially the Department of Land and Natural Resources (DLNR). An archaeological survey of the project site has been conducted and the findings of the survey have been reviewed and accepted by DLNR.

The remaining functional plans -- State Education, Higher Education, Employment, Water Resources Development, Conservation Land, Health, Housing, Tourism, Human Services, and Energy Functional Plans -- are not directly relevant to the proposed project.

5.2 GENERAL PLAN FOR HAWAII COUNTY

The following discussion provides an assessment of how the proposed development of Henry Street conforms to and implements the 1989 General Plan adopted by the County of Hawaii.

5.2.1 FLOOD CONTROL AND DRAINAGE

GOALS:

Protect human life.

Prevent damage to man-made improvements.

Control pollution.

Prevent damage from inundation.

Reduce surface water and sediment runoff.

APPLICABLE POLICIES:

It is the responsibility of both government and the private sector to maintain and improve existing drainage systems and to construct new drainage facilities.

APPLICABLE STANDARDS:

"Storm Drainage Standards," County of Hawaii, October 1970, and as revised.

Applicable standards and regulations of chapter 27, "Flood Control," of the Hawaii County Code.

Applicable standards and regulations of the Federal Emergency Management Agency (FEMA)

Applicable standards and regulations of Chapter 10, "Erosion and Sedimentation Control," of the Hawaii County Code.

Discussion: Runoff and drainage at the project site will be properly managed according to the applicable County standards and policies. This control will be achieved through a joint County and private project to build Henry Street and the drainage facilities. Stormwater runoff will be controlled through an extensive drainage facilities design, as described in Section 3.3, and the discussion of Hawaii State Plan Section 13(a) and 13(b).

5.2.2 HISTORIC SITES

GOALS:

Protect and enhance the sites, buildings, and objects of significant historical and cultural importance to Hawaii.

Discussion: The development of Henry Street will unavoidably conflict with the preservation of a group of prehistoric Hawaiian residential compounds, terraces, and burials. These sites are not significant with respect to other examples of these features on Hawaii. Nevertheless, all archaeological sites on the site have been properly documented. Refer to the discussion included in Section 3.7 and the discussion regarding the Hawaii State Plan Section 12(a) and 12(b).

5.2.3 NATURAL RESOURCES AND SHORELINE

GOALS:

Ensure that the alterations to existing land forms and vegetation, except crops, and construction of structures cause minimum adverse effect to water resources, and scenic and recreational amenities, and minimum danger of floods, landslides, erosion, and siltation, or failure in the event of earthquake.

APPLICABLE POLICIES:

The installation of utility facilities, highways, and related public improvements in natural and wild land areas should avoid the contamination or despoilment of of natural resources where feasible by design review, conservation principles, and by mutual agreement between the County and affected agencies.

Encourage the use of native plants for screening and landscaping.

Discussion: The development of this new collector street will cause minimum adverse effect on coastal water resources due to erosion control planned for construction. Refer to Sections 3.2, 3.3, 3.5, and 3.11 of this document, and discussion of the Hawaii State Plan Section 11(a) and 11(b).

To harmonize with the surrounding vegetation, landscaping will be provided along the street, including native plants where possible and appropriate.

5.2.4 TRANSPORTATION

GOALS (GENERAL):

Provide a transportation system whereby people and goods can move efficiently, safely, comfortably, and economically.

Make available a variety of modes of transportation which best meets the needs of the County.

APPLICABLE POLICIES (GENERAL):

The agencies concerned with transportation systems shall provide for present traffic and future demands, including mass transit programs for high growth areas.

The improvement of transportation service shall be encouraged.

GOALS (THOROUGHFARES AND STREETS):

Provide a system of thoroughfares and streets for the safe, efficient, and comfortable movement of people and goods between and within the various sections of the County.

APPLICABLE POLICIES (THOROUGHFARES AND STREETS):

The County shall encourage the programmed improvement of existing thoroughfares and streets by both public and private sectors.

The County shall investigate various methods of funding road improvements, including private sector participation, to meet the growing transportation needs of the island.

Transportation and drainage systems shall be integrated where feasible.

The design of urban streets shall consider their implications for urban design and potential multiple uses of the right-of-way within the limits of feasibility and quality road design.

APPLICABLE STANDARD:

Collector Street: Any street supplementary to the arterial street system which is a means of transit between this system and smaller areas; used to some extent for through traffic and to some extent for access to abutting properties; collect and distribute traffic between neighborhood and arterial system.

Discussion: The proposed collector street, Henry Street, will improve the existing network of primary and secondary streets and highways in the area by providing an alternative route for Palani Road for traffic traveling east/west. The planning and design of Henry Street has involved the cooperation of and coordination with the State and County transportation, planning, and public works agencies. Also refer to the discussion of Hawaii State Plan and State Functional Plan C.3.(b) and Section 3.8.

5.2.5 NORTH KONA

5.2.9.1 ECONOMIC

APPLICABLE COURSES OF ACTION:

Resort development in the area shall be in balance with the social and physical goals as well as economic desires of the residents of the district. Necessary pollution controls should be available prior to development. Other necessary support facilities such as transportation and nursery facilities shall also be provided.

Discussion: The proposed Henry Street will complement the existing commercial and resort development of the area by providing an improvement to the local transportation facilities.

5.2.5.1 FLOOD CONTROL AND DRAINAGE

APPLICABLE COURSES OF ACTION:

Drainage systems for the Keopu/Hienaloli, Wai'aha, Kamalumalu, and the Holualoa/Horseshoe Bend drainageways shall be developed and implemented. These systems, in addition to the installation and maintenance of proper soil and water conservation practices, could alleviate the major flood control and drainage problems.

Establish and maintain appropriate vegetative cover in high rainfall, sediment, and debris producing areas.

Discussion: The Keopu/Hienaloli drainageway will be improved by construction of an on-site drainage system integrated with the Henry Street project. Through the use of a percolation and retention basin, drywells, and and other measures, a 10-year level of flood protection will be provided, an improvement over the present lack of any drainage system. The 100-year storm overflow is not expected to adversely affect the existing or proposed structures makai of Queen Kaahumanu Highway. Appropriate vegetative cover will be maintained on the site. Refer to Section 3.5.

5.2.9.3 TRANSPORTATION

APPLICABLE COURSES OF ACTION:

Convert Kuakini Highway to limited access status.

Encourage the expansion of Queen Kaahumanu Highway as the need arises.

Discussion: The development of Henry Street will not directly implement the above described courses of action. However, it will allow organized traffic flow on these two highways in the area of Lanihau Center and Palani Road. Refer to the Section 3.8.

5.2.9.4 LAND USE - RESORT

Improve and provide adequate roadways, sewer and water systems, and other basic amenities in all areas where higher density uses are allowed.

Discussion: The Henry Street project will create a new roadway to serve the Kailua area, and improve traffic flow on existing roadways in the area.

5.3 KAILUA VILLAGE DESIGN PLAN 1988 (DRAFT)

The *Kailua Village Design Plan* (Draft, 1988) has been prepared for the County of Hawaii Planning Department by Wil Chee - Planning (July 1988). At present this is a draft document and has not yet been adopted by the community or the County government. Nevertheless, the construction of Henry Street is anticipated in the draft plan. One of the circulation proposals put forward states:

Implement the Henry Street connection between Kuakini and Queen Kaahumanu Highways. Aligned along the southern boundary of the Lanihau Shopping Center and intended to primarily serve the shopping center, Henry Street should alleviate some congestion now experienced on Palani Road.

Also in the document are several other proposals which relate directly, or indirectly, to Henry Street and its function as an alternative route connecting Kuakini Highway to Queen Kaahumanu Highway. For instance, Alahou Street is proposed to be extended to the Henry Street alignment. Other roads in the area - an extension of Nani Kailua Drive and an alternative entrance road to the village at Kailua Park (old Kona Airport) - are proposed as additional connections between Kuakini Highway and Queen Kaahumanu Highway. Also proposed in the document is the improvement of Kuakini Highway between Palani and Hualalai Roads to accommodate four traffic lanes, sidewalks on both sides, and a planted medial strip separating north and south bound traffic lanes. It is proposed that the road's 80-foot right-of-way proposed in the 1976 plan be maintained.

The development of Henry Street as proposed in this project is consistent with the Kailua Village Design Plan.

SECTION 6

Determination, Findings and Reasons Supporting Determination

6.0 DETERMINATION, FINDINGS, AND REASONS SUPPORTING DETERMINATION

Based upon the findings presented in this Environmental Assessment and supporting technical studies, the potential impacts of the development and operation of Henry Street have been sufficiently examined and discussed. With the implementation of the mitigative measures recommended in the EA, the action will not result in significant adverse effects on the natural or human environment. Further consideration of the project's impacts through preparation of a Draft Environmental Impact Statement is determined not to be warranted.

SECTION 7

References and Preparers

7.0 REFERENCES, CONSULTED PARTIES, AND LIST OF PREPARERS

7.1 REFERENCES

Barry Neal, April 1990
Air Quality Study for the Proposed Henry Street Project ,Kailua-Kona, Hawaii; Honolulu, Hawaii

Barton-Aschman Associates, Inc., April 1990
Traffic Impact Study for Lanihau Center and Henry Street in Kailua-Kona, Hawaii; Honolulu, Hawaii

Cultural Surveys Hawaii, February 1989;*Archaeological Reconnaissance of 24 acres in Lanihau;* Kailua, Hawaii

______________, July 1989; Data Recovery Plan for Archaeological Sites in a 24-Acre Parcel Lanihau, Kona, Hawaii Island (TMK 7-5-04:7, Por. 9)

______________, October 1989; Lanihau II: Lanihau Shopping Center Expansion, Parcel TMK 7-5-04:7 (Por 9), Kailua-Kona, Hawaii - Preliminary Report: End of Field Work and Progress Report

Darby & Associates, Inc., April 23, 1990; Noise Impact Assessment, Henry Street, Kailua-Kona; Kailua, Hawaii

Federal Emergency Management Agency, September 16, 1988; Flood Insurance Rate Map, County of Hawaii; Panel No. (155166 0001 0713), Washington, D.C.

Graham Murata Russell, April 4, 1990; Memorandum answering question regarding Henry Street Project

Hida, Okamoto and Associates, Inc., February 1990; Proposed Henry Road Final Flood Control Study; Honolulu, Hawaii

______, May 1, 1990; Memorandum answering technical questions regarding design of Henry Street and flood control facilities.

Paul H. Rosendahl, Ph.D., Inc. February 1990. Interim Report: Archeological Inventory Survey of the Proposed Kona Center Development Site, North Kona Dsitrict, Island of Hawaii. Hilo Hawaii

Lloyd J. Soehren, September 30, 1985; Lloyd J. Soehren's 1985 Archaeological Report on TMK: 7-5-4:6 and 13

U.S. Department of Agriculture, August 1972
Soil Survey of Islands of Kauai, Oahu, Maui, Molokai and Lanai; State of Hawaii. Soil Conservation Service, in cooperation with the University of Hawaii Agricultural Experiment Station.

7.2 CONSULTED PARTIES

Listed below are the agencies and organizations consulted in the preparation of the Environmental Assessment This is followed by the written comments received and responses.

A. FEDERAL AGENCIES

U.S. Department of Agriculture

B. STATE OF HAWAII AGENCIES

Office of Environmental Quality Control
Department of Transportation
Department of Land and Natural Resources, Historic Sites Section
Island of Hawaii, Council on Burials

C. COUNTY OF HAWAII AGENCIES

Planning Department
Department of Public Works

7.3 LIST OF PREPARERS

This Environmental Assessment has been prepared by the planners and environmental analysts at GROUP 70 Limited Architects/Planners/Interior Designers, 924 Bethel Street, Honolulu, Hawaii 96813, Telephone (808) 523-5866. The GROUP 70 Limited staff involved in the preparation of this document included:

Francis S. Oda, AIA, AICP	Chairman of Group 70
Jeffrey H. Overton, AICP	Project Manager
Terry L. Hildebrand	Planner
Edith Masaki	Graphics
Kathy Hida	Graphics

Several technical consultants to GROUP 70 were employed to provide specific assessments of environmental factors for this project.

Hallett H. Hammatt, Ph.D. David Shideler, M.A.	Cultural Surveys Hawaii	Archaeology
Harvey Hida, P.E.	Hida, Okamoto and Assoc.	Civil Engineering
Kenneth Nagata	Consultant	Botany
Ronald Darby, P.E.	Darby & Associates, Inc.	Noise
Barry D. Neal, CCM	Barry D. Neal and Assoc.	Air Quality
Phillip J. Rowell, P.E. Sohrab Rashid	Barton-Aschman Assoc., Inc.	Traffic

RESUMES OF ALL PREPARERS ARE ATTACHED BELOW

GROUP 70

FRANCIS S. ODA, AICP, AIA
Chief Executive Officer

EDUCATION

B.A. Architecture - 1964, Cornell University, Ithaca, New York
Graduate Studies - University of Hawaii, Pacific Urban Regional Planning Program

PROFESSIONAL REGISTRATIONS AND ASSOCIATIONS

American Institute of Certified Planners - 1985
Architect, State of Hawaii
Architect, State of California
Hawaii Chapter, American Planning Association
Hawaii Society, American Institute of Architects, President (1982)

PROFESSIONAL EXPERIENCE

Mr. Oda has nearly twenty years of professional experience as an architect and planner in Hawaii, and elsewhere in the United States, Australia, Saipan, Indonesia, New Caledonia and Japan. Mr. Oda is Chairman of Group 70 Limited, and is Principal-in-Charge for many of the firm's major planning and architecture projects. Mr. Oda has been a Principal with Group 70 Limited since 1973.

Mr. Oda's work in planning has included the development of master plans for several major resorts, residential communities, science research facilities and a university. Mr. Oda's architectural projects include the design of several resort hotels, office buildings, churches, military base facilities, residential developments, educational facilities and town centers. Mr. Oda has recieved numerous awards from various professional associations for his work.

Several representative planning and EIS projects directed by Mr. Oda include:

- Kapolei City Design Plan and Implementation Guide -- Ewa, Oahu
- Kuilima Resort Expansion Master Plan/EIS -- Kahuku, Oahu
- Kaanapali Resort Master Plan -- Kaanapali, Maui
- Kona Village Resort Master Plan -- North Kona, Hawaii
- University of Hawaii Long Range Development Plan -- Manoa Campus, Oahu
- Mid-Elevation Facilities Master Plan/EIS -- Hale Pohaku, Hawaii
- Mauna Kea Science Reserve Complex Master Plan/EIS -- Hale Pohaku, Hawaii
- California Institute of Technology 10.4 m Telescope EIS -- Mauna Kea, Hawaii
- Aloha Tower Plaza EIS -- Honolulu, Oahu

Prior to his work at Group 70 Limited, Mr. Oda was the University Architect for the University of Hawaii, Honolulu, Hawaii (1971-73). He was a Partner with the architectural firm of Carson/Oda in El Paso, Texas during 1970-74. From 1970-72, Mr. Oda was also a Partner with the architectural firm of Quinn and Oda in Berkeley, California.

GROUP 70

JEFFREY H. OVERTON, AICP
Planner/Environmental Analyst

EDUCATION

M.S. Environmental Sciences, 1983 - State University of New York, Stony Brook, N.Y.
B.S. Zoology, 1979 - Duke University, Durham, N.C.

PROFESSIONAL REGISTRATIONS AND ASSOCIATIONS

American Institute of Certified Planners - 1989
Hawaii Chapter, Americal Planning Association
Urban Land Institute

PROFESSIONAL EXPERIENCE

Mr. Overton has seven years of professional experience in the environmental analysis of private and municipal development projects. During this period he has prepared over 35 environmental assessments and EIS documents for projects involving public infrastructure expansion and various private site developments. Mr. Overton has also participated in the preparation of several community and area-wide master plans.

At Group 70 Limited, Mr. Overton is a Project Manager responsible for the preparation of enviromental assessments and EIS documents and permit applications associated with private and municipal development projects. He coordinates the activites of technical consultants participating in these projects, as well as community advisory group activities and governmental approval processes. Several representative projects include:

- University of Hawaii, Long Range Development Plan, Plan Review Use, Manoa Campus -- Honolulu, Oahu
- Lihi Lani Recreational Community -- Pupukea, Oahu
- The Country Courses at Kahuku -- Kahuku, Oahu
- Hawea Point Residence -- Kapalua, Maui
- Kawela Bay Desilting Project -- Kahuku, Oahu
- Pikoiloa Cemetery Expansion -- Kaneohe, Oahu

Previously, Mr. Overton was a Senior Environmental Planner with a major Long Island, N.Y. engineering consulting firm (1984-88), where he managed the preparation of environmental assessments, EIS, permit applications and master plans. His project experience includes the expansion of major highway, solid waste and drainage facilities for municipal clients, as well as several private residential, recreational and corporate site developments. Project locations included New York, New Jersey and Connecticut.

Mr. Overton was a Marine Extension Agent for the New York Sea Grant Extension Program (1983-84), where he conducted educational programming in southeastern New York coastal communities. Mr. Overton also was an environmental planning intern with the Long Island Regional Planning Board (1979-80).

GROUP 70

TERRY L. HILDEBRAND
Planner

EDUCATION

Masters in Urban and Regional Planning, 1986 - University of Hawaii at Manoa, Honolulu, HI
Bachelors in Architecture, 1978 - Illinois Institute of Technology, Chicago, IL.

PROFESSIONAL REGISTRATIONS AND ASSOCIATIONS

Hawaii Chapter, American Planning Association
Hawaii Society, American Institute of Architects

PROFESSIONAL EXPERIENCE

Mr. Hildebrand has two years of professional experience in planning residential, institutional and military facilities in Hawaii, as well as two years of professional architectural experience working on small scale commercial and residential projects.

At Group 70 Limited, Mr. Hildebrand assists with physical and master planning of residential and resort developments, and military facilities. Mr. Hildebrand's architectural and physical planning background is being applied to projects requiring site development and urban design. He is also involved with the preparation of environmental documentation and permit applications associated with several residential and recreational facility development projects.

Several representative projects include:

- Laie Master Plan - Laie, Oahu
- Kuilima Resort Development, Maintenance Facilities Plans - Kahuku, Oahu
- Camp Butler Marine Corps Base, Master Plan Update - Okinawa, Japan
- HECO Ward Avenue Complex, Master Plan - Honolulu, Oahu
- Malaekahana Golf Course, Permits - Malaekahana, Oahu

Previously, Mr. Hildebrand was a planner and architectural programmer with Aotani & Associates in Honolulu from 1987 to 1989. Several representative projects that he was involved with include: formulation of the Statewide Ocean Recreation Management Plan; programming and conceptual design of the Pacific Ocean Science and Technology (POST) Building at the University of Hawaii; preparation of a master plan for the Helemano Military Reservation; and facility management inspections of Camp Smith, Oahu. He also prepared environmental assessments for the Hawaii State Library and the POST Building at UH, and completed a feasibility study of Kamehameha Homes for the Hawaii Housing Authority.

Mr. Hildebrand has experience as an architectural designer and drafter at architectural offices in Hawaii, Illinois and Thailand. He also was a Graduate Research Assistant in the Department of Urban and Regional Planning, University of Hawaii, where he performed computer data base analysis and report writing in a social science research project. Mr. Hildebrand worked three years as a Peace Corps Volunteer, serving as a development planner in the Phillipines.

BARRY D. NEAL

METEOROLOGIST

2377 St. Louis Drive
Honolulu, Hawaii 96816

Telephone
(808) 732-1995

WORK EXPERIENCE

CURRENT, since 1988: CONSULTING METEOROLOGIST, Barry D. Neal & Associates, Honolulu, Hawaii. Provide consulting services in air quality and applied meteorology to government, industry, utilities, engineering firms and architect/planning organizations. Prepare air quality assessments for environmental impact statements and for air pollution permit applications. Conduct air quality modeling and monitoring studies.

1983 - 1987: SENIOR METEOROLOGIST/AIR QUALITY SPECIALIST, Amartech, Ltd, Saudi Arabia. Provided air quality and meteorological consulting services to industrial and governmental clients. Major assignments included managing an environmental study for a new oil-fired power plant and operating a network of nine meteorological/air quality monitoring stations surrounding a new industrial center. Other duties included supplying expertise in the use of meteorological data for engineering design, providing advice on air pollution emissions and emissions control, and performing atmospheric dispersion assessments.

1977 - 1983: METEOROLOGIST, Bechtel Group, Inc., San Francisco, California. Provided expertise in many areas of industrial and applied meteorology for projects located around the U.S. and the world. Areas of expertise provided included: air quality modeling, air quality and meteorological monitoring, air pollution emissions and emissions control equipment, engineering design, and environmental regulations and permit applications.

EDUCATION

1977: Graduate Studies, Department of Meteorology, San Jose State University, San Jose, California.

1976: B.S. Meteorology, San Jose State University, San Jose, California.

PROFESSIONAL DATA

Certified Consulting Meteorologist. Member of the American Meteorological Society and the Air Pollution Control Association.

PHILLIP J. ROWELL
SENIOR ASSOCIATE
BARTON-ASCHMAN ASSOCIATES, INC

EDUCATION

MS, Civil Engineering, 1972, Clemson University
BS, Civil Engineering, 1971, Clemson University

REGISTRATIONS

Professional Civil Engineer in California (1975), South Carolina (1978), Kentucky (1978), Hawaii (1989)

PROFESSIONAL ASSOCIATIONS

Member, Institute of Transportation Engineers

EXPERIENCE AND REPRESENTATIVE PROJECTS

1989 to Present

Senior Associate, Barton-Aschman Associates, Honolulu, HI
Currently in residence in Honolulu serving as Senior Traffic Engineer for the Castle Junction Interchange Project being conducted for the Hawaii DOT jointly with Parsons Hawaii. Other projects include:

- One Alii Place Traffic Impact Study
- Traffic & Parking Studies for Honolulu International Air Terminal
- Traffic Impact Study for Kailua Kona Regional Park

1984 to Present

Senior Associate, Barton-Aschman Associates, Pasadena, CA
Responsible for traffic impact and parking studies in California, Hawaii, Arizona, and Nevada. Representative projects include:

- General Telephone Co. HQ Traffic Study, Thousand Oaks, CA
- Citywide Traffic Impact Mitigation Fee Study, Carlsbad, CA
- Ave R/Ave S Corridor Study, Palmdale, CA
- HUSITE Transportation Planning Study, Las Vegas, NV
- CBD Redevelopment Transportation Study, Las Vegas, NV
- Pacific Nations Traffic Study, Honolulu, HI
- City Hall Annex and Police HQ Traffic Study, Honolulu, HI
- Harbor Gateway Transportation Study, Los Angeles, CA
- West Hollywood City-wide Parking Study, West Hollywood, CA
- Hollywood Parking Study, Los Angeles, CA
- Arrowhead Ranch Traffic Study, Glendale, AZ
- Tucson Mall/Tucson Place Traffic Study, Tucson, AZ

In addition, Mr. Rowell has managed numerous traffic impact studies for residential and smaller commercial, retail and office developments in these areas.

1982 to 1984

City Traffic Engineer and Assistant Director of Transportation, Beverly Hills, CA
Responsibilities included the day-to-day operations of the engineering and parking sections of the DOT; review of all traffic impact studies submitted to the City; installation and maintenance

of traffic signals; independently conducting traffic studies for City projects; and implemenation of the City's street and alley lighting program, public shuttle bus programs, and Street Master Plan.

1980 to 1982

Project Design Engineer, Wilbur Smith and Associates, Kuala Lumpur, Malaysia and Hong Kong, B.C.C
Conducted traffic studies and preparedpreleminary geometric plans for 11 interchanges along the Jitra-Butterworth Toll Road in Malaysia. Subsequently prepared final plans for the interchanges. In Hong Kong, prepared plans for a new interchange connecting mainland China with Hong Kong.

1978 to 1980

Project Design Engineer, Wilbur Smith and Associates, Lexington, KY
Prepared plans and specs for the following:

- Main Street Interchange, Lexington, KY
- Edgewood Boulevard, Lansing, MI
- I-40/I-640 Interchange, Knoxville, TN
- Kenwood Subdivision, Lexington, KY

1974 to 1980

Senior Traffic Engineer, Wilbur Smith and Associates, Los Angeles, CA
Major projects worked on were:

- Walt Disney World Transportation Study, Orlando, Florida
- City-Wide Circulation Study, Santa Maria, California
- San Gabriel Valley Transit Study for SCRTD, Los Angeles, California
- West Los Angeles Transit Study for SCRTD, Los Angeles, California

1972 to 1974

Design Engineer, Wilbur Smith and Associates, Columbia, SC
Representative projects include:

- South Mountain Retirement Resort, Burke County, North Carolina
- Waccamaw Plantation, Waccamaw, South Carolina
- Monroe Downtown Redevelopment Project, Monroe, North Carolina
- Seaboard Park Redevelopment Project, Columbia, South Carolina

1971 to 1972

Graduate Teaching Assistant, Civil Engineering Department, Clemson University, Clemson, SC
Graduate teaching assistant in the Civil Engineering Department. Classes included transportation planning and traffic engineering.

SOHRAB RASHID
ASSOCIATE ENGINEER
BARTON-ASCHMAN ASSOCIATES, INC.

EDUCATION

San Jose State University, San Jose, CA
Bachelor of Science in Mechanical Engineering, May 1988.

REGISTRATION

Engineer-in-Training (California) #XE071962

EXPERIENCE

3/89 to Present

Barton-Aschman Associates, Inc., Honolulu, Hawaii
Associate Traffic Engineer - Conducting field services and preparing calculations on several projects including Aloha Tower Traffic Study and the Honolulu International Airport Parking Study.

7/88 to 3/89

Barton-Aschman Associates, Inc., San Jose, CA
Associate Engineer - Participated in a variety of transportation/traffic engineering projects. Accomplished all aspects of studies from data collection and analyses to final report preparation. Responsible for alternatives analysis report of a proposed 18-mile freeway. Report included operations analyses, interchange design and local traffic impacts throughout the corridor. Aided in the development of a computer model for a county-wide transportation/planning study. Conducted numerous traffic impact studies, signal warrant analyses, and signing and striping plans.

6/84 to 2/88

Santa Clara County Transportation Agency, San Jose, CA
Engineering Intern - University Fellowship Program

8/86 to 2/88

Light Rail Start-Up Team - Formulated and executed test procedures and wrote test reports for signals, vehicles, overhead power systems, etc. Acted as liaison between shop personnel and testing team and aided in quality assurance tasks.

9/84 to 8/86

Bus Support Services/Bus Shelter Program - Wrote installation and maintenance procedures, installed A/C motors and completed pneumatic brake retrofit. Performed extensive surveying and designing/drafting of road pavement and shelter sites.

6/84 to 9/84

Survey Crew - Responsible for all survey duties including traverse analysis and facility layout practices.

REPRESENTATIVE PROJECTS

- Analysis of Interchange Alternatives for State Route 85 in Santa Clara County, California. These studies included freeway operations analysis, weaving and merge/diverge analysis, and conceptual interchange design. Regional and local impacts were examined and presented to the public at community meetings.

- Traffic, Parking and Pedestrian Circulation Studies for the downtown arena in San Jose, California.

- Traffic Signal Warrant Analyses in San Jose, Saratoga, Campbell and Los Gatos, California.

- Signing and Striping Improvements in San Jose, California.

- Site Traffic Impact Analyses in San Jose, Santa Clara and Cupertino, California; and on the Naval Station at Treasure Island, near San Francisco, California.

SKILLS

CAD training and computer modeling (network coding). Knowledge of BASIC, Fortran and various applications on Macintosh and IBM-compatible computers. Programs include Highway Capacity Software, Lotus 123 and several word processing programs.

AWARDS

SPEEDY Award presented by the Santa Clara County Traffic Authority for commendable performance on the State Route 85/17 Interchange Traffic Analysis.

First place in division for Engineering Excellence Day (Senior Project Competition) at San Jose University.

[illegible]

DARBY & ASSOCIATES

[illegible]

RESUME OF RONALD A. DARBY, P.E.

EDUCATION:	B.S. in Mechanical Engineering [illegible] M.S. in Engineering [illegible] Engineering at [illegible] courses at University of Maryland [illegible]
PROFESSIONAL ENGINEER:	State of Hawaii, PE [illegible] State of Maryland, PE [illegible]
PROFESSIONAL AFFILIATION:	Member of Acoustical Society of America, National Society of Professional Engineers, Tau Beta Pi, and Pi Tau Sigma
1970 TO PRESENT:	President of Darby & Associates which specializes in [illegible] noise control engineering. [illegible] exposure measurements, [illegible] performed in the Hawaiian Islands, Guam and the [illegible] Architectural and mechanical equipment noise control [illegible] been made for new and existing building projects in the Pacific [illegible] mainland U.S.A. and Japan.
1967 TO 1970:	Research Scientist, LTV Research Center, [illegible] Involved in all phases of deep ocean underwater [illegible] measurement exercises planning, data collection, data [illegible] (analog and digital), analysis, and reporting. [illegible] long range sound transmission loss values, [illegible] source levels. Developed unique method to measure [illegible] levels of submarines using aircraft. Served as a member of [illegible] Analysis Group for Commander, Anti-submarine Warfare [illegible] Pacific at Pearl Harbor.
1960 TO 1967:	Research Mechanical Engineer at the Marine Engineering Laboratory, Annapolis, Maryland [illegible] secretary of the [illegible] of Undersea Warfare, National Academy of Sciences [illegible] [illegible]
[illegible]	[illegible]

[illegible]

[illegible]

CORRECTION

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& ASSOCIATES
ACOUSTICAL CONSULTANTS

RESUME OF RONALD A. DARBY, P.E.

EDUCATION:	B.S. in Mechanical Engineering, Pennsylvania State University, 1954. M. S. In Engineering, 1967, and all course work for Doctor of Engineering at Catholic University, Washington, D.C., Graduate courses at University of Maryland and The University of Hawaii.
PROFESSIONAL ENGINEER:	State of Hawaii, PE 3002-E State of Maryland, PE 6482-ME
PROFESSIONAL AFFILIATION:	Member of Acoustical Society of America, National Society of Profes sional Engineers, Tau Beta Pi, and Pi Tau Sigma.
1970 TO PRESENT:	President of Darby & Associates* which specializes in acoustics and noise control engineering. Airport, community and industrial noise exposure measurements, evaluations, and studies have been performed in the Hawaiian Islands, Guam and the mainland U.S.A. Architectural and mechanical equipment noise control efforts have been made for new and existing building projects in the Pacific Basin, mainland U.S.A. and Japan.
1967 TO 1970:	Research Scientist, LTV Research Center, Hawaiian Division. Involved in all phases of deep ocean underwater acoustic measurement exercises: planning, data collection, data processing (analog and digital), analysis , and reporting. Typical results were long range sound transmission loss values, ambient noise levels and source levels. Developed unique method to measure radiated noise levels of submarines using aircraft. Served as a member of Tactical Analysis Group for Commander, Anti-submarine Warfare Forces, Pacific at Pearl Harbor.
1960 TO 1967:	Research Mechanical Engineer at the Marine Engineering Laboratory Annapolis, Maryland (Now NSRDC). Was technical secretary of the "Submarine Noise Measurement Panel", Committee of Undersea Warfare, National Academy of Science for one and a half years. Developed practical technique for predicting radiated noise from ship's machinery. Developed laboratory techniques and special transducers for measuring structural noise transmission from machines. Created technological forecasts and cost effectiveness studies on machinery noise. Devised practical experiments to evaluate machinery noise quieting devices, i.e., isolation mounts, flexible hoses, sound enclosures, etc.
1959 TO 1960:	Engineer at Westinghouse Electric Corp., Defense Center, Baltimore, Maryland. Team member in developing high frequency sonar transducers for Navy Applications.

*Formerly Ronald A. Darby & Associates and Darby-Ebisu & Associates, Inc.

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DARBY
& ASSOCIATES
ACOUSTICAL CONSULTANTS

RESUME OF MIKE SANG LEE

EDUCATION:

University of Wisconsin-Madison, Madison, WI
January 1983 - May 1985
Degree: Master of Arts - May 1985
Major: Mathematics with emphasis on Numerical Analysis

University of Hawaii at Manoa, Honolulu, HI
January 1977 - December 1982
Degree: Bachelor of Science
Major: Mathematics and Physics

PROFESSIONAL AFFILIATION:

Associate Member of Acoustical Society of America (ASA); March 1987 - present

Affiliate Member of Institute of Noise Control Engineering (INCE); January 1988 - present.

WORK EXPERIENCE:

December 1988 - Present
Senior Acoustical Consultant
Darby & Associates, Kailua, Hawaii

Conducted noise studies for projects in the Hawaiian Islands in the following areas of acoustics: field noise measurements, impact assessment analysis and research, noise and vibration mitigation measures. The studies involved noise sources such as aircraft, traffic, machinery, musical performance, and construction activity.

October 19985 - November 1988
Senior, Associate Acoustical Engineer
J. J. Van Houten & Associates, Anaheim, CA

Performed noise studies in the following areas of acoustics: field noise and vibration measurements; impact assessment analysis; mitigation measures for noise sources such as aircraft, arterial, trains, mechanical equipment and industrial plants; noise tests for compliance with standards; noise elements studies.

PALI PALMS PLAZA • 970 NO. KALAHEO AVENUE • SUITE A-311
KAILUA, HAWAII 96734 • (808) 254-3318 • FAX (808) 254-5295

TECHNICAL RESUME

HARVEY K. HIDA
President
Hida, Okamoto & Associates, Inc.
Consulting Civil Engineers
2600 S. King Street, Suite 207
Honolulu, Hawaii 96826
Phone: (808) 942-0066
Fax: (808) 947-7546

EDUCATION (FORMAL)

1966 to 1971 University of Hawaii
Bachelor of Science in Civil Engineering

ENGINEERING REGISTRATION

1977 Professional Engineer, State of Hawaii
Certificate No. 4363C

1982 Value Engineering Training Workshop Certificate

SPECIAL SKILLS

Fluent in Japanese

PROFESSIONAL HISTORY

March 1987 to Present President of Hida, Okamoto & Associates, Inc.

October 1976 to March 1987 Vice President, Chief Engineer and Project Manager of Smith, Young & Hida, Inc.

The Project Manager of a multidisciplined Tactical Equipment Maintenance Facility for the Corps of Engineers at Wheeler Air Force Base and Waiahole Valley Agricultural Park Water System. Engineering responsibility included development of source, storage, transmission and distribution of domestic, fire and irrigation water system.

In addition, the project manager for the following military construction projects: Aircraft Maintenance Hangar at PMRF, Kauai; Meteorological Bldg at Pearl Harbor; SIMA at Pearl Harbor; Maintenance Facilities at Camp Smith, and Kaneohe MCAS; Airfield Pavement Shoulders and Taxiway Repair at NAS Barbers Point; UEPH at subbase and Pearl Harbor.

Project Engineer in charge of design work on Mokuleia Agricultural Subdivision. Responsibility included preparation of study, plans and specifications for treatment, collection and effluent for the sewage system.

Project Engineer in charge of field work on Kailua Sewage Treatment Plant and Sewer System Study and Ebeye (Marshall Islands) Water Supply System Study. Served as Project Civil Engineer on the $52 million Diamond Head Extention at Honolulu International Airport. Project Engineer in charge of field work on Midway Island Water Systems assessments and Salt Water Fire Protection project at Pearl Harbor.

COMMERCIAL DEVELOPMENT/SHOPPING CENTER PROJECTS

The Civil Engineer for the following Commercial Development/ Shopping Center Projects:

*Princeville Shopping Center - Princeville, Kauai
*Navy Exchange Complex - Naval Station, Pearl Harbor
*Navy Exchange Complex - Iroquois Point, Oahu
*Parking Lot Improvement - Koko Marina Shopping Center
*McCully Shopping Center - McCully, Oahu
*Lanihau Shopping Center, Phase I - North Kona, Hawaii
*Waikiki Bazaar/KFC - Waikiki, Oahu
*425 Kam Highway - Waiau, Oahu
*Piikoi/Kona Shopping Center - Ala Moana, Oahu
*Arcade Renovation, Pearl City Shopping Center - Pearl City, Oahu
*Mini Mart/Pumping Facility - NAS Barbers Point, Oahu
*Kahaluu Commercial Development - Kahaluu, Oahu
*7-Eleven, Kaneohe - Kaneohe, Oahu

SEWER PROJECTS

The Project Engineer for the following sewer projects:

*Pumehana Street Relief Sewer - McCully, Oahu
*Kahuku Village Sewage Treatment Plant Expansion - Kahuku, Oahu
*Helemano Sewage Treatment Plant Upgrade - Helemano, Oahu
*Likini Street Relief Sewer - Salt Lake, Oahu
*Hanapepe Intercepter Sewer System - Hanapepe, Kauai
*Kohou Street Relief Sewer - Kalihi, Oahu

Design Engineer for two sewage pump stations, stand-by generator building, ejector station, force mains and gravity interceptor sewage system for Hanapepe Sewerage System, Kauai.

ADDITIONAL PROJECTS

The Project Engineer for the following additional projects:

*Gas Express - Various Locations throughout Oahu
*Development for First Assembly of God - Red Hill, Moanalua, Oahu

*Hawaii School for Girls - Gymnasium/Student Center La Pietra, Waikiki
*Vehicle Support Facility - Hickam Air Force Base
*P-541 Aircraft Rinse Facility - Kaneohe MCAS, Oahu
*Sea Life Park Dining Facility - Makapuu, Oahu
*Kuliouou Cluster Development - Kuliouou, Oahu
*E. M. Club - Camp Smith, Halawa Heights, Oahu
*745 Isenberg - McCully, Oahu
*Princeville Cottages & Golf Course - Princeville, Kauai
*Wailea Golf Course - Wailea, Maui

<u>November 1973 to October 1976</u> Design Engineer with Tryck, Nyman & Hayes.

Designed storm drainage and special culvert. Conducted hydraulics study and cost estimate for Lilipuna Drainage Improvement Plan. Development of subdivision, designed grading, roadway alignment, parking lot, and utilities including drainage, sewer and water and conducted cost estimate for the following projects: Sleeping Giant Subdivision; Wailua Half Acre Subdivision; Makakilo Townhouse Subdivision; Sandy Beach Subdivision and Paia Low and Moderate Income Housing Project. Designed new water system at Kula, Maui, including redwood tank and new distribution system, and conducted cost estimating and specifications.

<u>November 1971 to November 1973</u> Field Engineer for HHC 84th Engineer Battalion, U. S. Army

Engaged in designing, cost estimating and supervision of construction for such projects as: Pahakaloa Training Area Helicopter Pad (site and paving design and cost estimate), Schofield Barracks Military Motor Pool (design of site and paving, cost estimating, and supervision of construction), Wheeler Base Recreation Field (design of site, cost estimating and supervision of construction).

Cultural Surveys Hawaii **Archeological Studies**

49 S. Kalaheo Avenue ◇ Kailua, Hawaii 96734
Bus (808) 262-9972 ◇ Res (808) 261-8293

Hallett H. Hammatt, Ph.D., owner and sole proprietor

Services: Cultural Surveys Hawaii is a small company offering expertise in archaeological reconnaissance, intensive surveys, excavations, site and area management and assessments, site stabilization and development. The emphasis is on a professional but realistic approach to archaeology and its relation to land development.

Cultural Surveys has an excellent record of timely completion of reports. The proprietor is not simply a name to be used in proposals but is a full-time participant in all phases of every project. This accounts for the consistency of the work and the first-hand nature of the reports.

Personnel and Associates

Hallett H. Hammatt, Ph.D. (Proprietor)

Twenty-six years experience in archaeology, 15 years in Hawaiian archaeology, directed and completed approximately 350 archaeological projects in Hawaii, involving work on all major islands and in most aspects of Hawaiian archaeology. Fourteen years experience in consulting with over 50 governmental agencies and private companies in Hawaii. Member of the Hawaii Historic Places Review Board for 10 years, expert witness at many public hearings.

Douglas Borthwick (Associate)

B.A. in Archaeology, graduate study in Pacific Islands Studies, 14 years experience in Hawaiian archaeology work on all major islands, specialty in site survey, artifact analysis, historical search.

David Shideler (Associate)

B.S. in Zoology, B.A. Anthropology, M.A. Environmental Health Management, 14 years experience in Hawaiian archaeology, founding member of the Hawaii Malacological Society, specialty in floral and faunal identification, ecology, analysis of faunal remains from archaeological sites.

Stephen Clark (Associate)

B.A. in Anthropology, 18 years experience in Hawaiian archaeology, field and laboratory studies, archaeological drafting.

Kirsten Nakamura (Associate)

Field and laboratory assistant, 14 years experience in archaeology, cataloging, illustration.

Mark Stride (Associate)

Field and laboratory assistant, 3 years experience in archaeology, field survey, excavation, cataloging.

Other Associates and Sub-Consultants

William Kikuchi, Ph.D.

Kauai Community College, Crafts Hawaii, volcanic glass dating, petrographic studies, Hawaiian fishponds.

Founded 1982

Michael Pietrusewsky, Ph.D.
University of Hawaii, Manoa, physical anthropology, osteological analysis.

Alan Ziegler, Ph.D.
Zoological Studies, faunal remains.

Other consultants in Hawaiian language, Hawaiian history, radiocarbon dating, botany, floral and faunal identification, planning.

Areas of Experience

Reconnaissance, survey, excavations, coring, site stabilization, site and area management, mapping, aerial survey, recovery of human burials, stratigraphy, historic search, fishponds, beach sites, cave sites, petroglyphs, survey of unaccessible areas, interpretive display development, historic archaeology, urban archaeology, federal and state regulations in historic preservation.

Field and Laboratory Equipment and Facilities

Cultural Surveys has a full range of field and laboratory equipment. The laboratory and office facility of 800 square feet is equipped with measuring and photographic equipment, scales, etc. and a Nikon petrographic microscope. There is also a sizable reference library on Hawaiian archaeology and history.

Clients

County
Kaua'i County
Maui County
Honolulu Board of Water Supply
Honolulu Department of Public Works

State
Division of State Parks
Hawaii Community Development Authority
Department of Transportation
Hawaii Housing authority
State Department of Agriculture
Hawaii Air National Guard
Department of Hawaiian Home Lands
Department of Accounting and General Services
Department of Business and Economic Development

Federal
U.S. Army Corps of Engineers
U.S. Air Force
National Radio Astronomy Observatory

Private and Non Profit Groups
Alexander and Baldwin
BPM Mining Corp
Belt, Collins and Associates
Bingham Engineering
CH2 M Hill
D.H. Realty
Dames and Moore
Engineering Concepts Inc.
*Friends of I'olani Palace
Gamlon Corp.
Hasigawa Komoten
Hawaii Omori Corp.
Hemmeter Resorts
Hida Okomoto and Associates
Imata and Associates
Kalani Sunset Corp
Kaluakoi Corp.
Kamehameha Investment Corp.
Joseph Kealoha Realtors
Keauhou-Kona Realty
Keauhou-Kona Resorts
Kodani Associates
Kohala Ranch
Lanai Company (Castle and Cook)
Landmark Suites
Lanihau Corp
*Liliu'okalani Trust
Lone Star Hawaii
M and E Pacific
MCM Planning
Marriott Hotels
Maunakea Properties
Moana Corp.
Oceanic Properties
Pacific Atlas Hawaii Inc.
Pacific Basin Resorts
Gerald Park, Urban Planner
Parsons Hawaii
Portugal and Associates
Princeville Corp.
Project Planners Hawaii
Signal Oil
Sports Shinko Group
Taiyo Fudosan
R.M. Towill
*Waioli Mission
Ward Pacific

* Non-profit

Archaeological Projects Directed

Major Projects (exceeding $40,000)

1989	Archaeological Survey of 2,400 acres, Kawaihae, Hawaii for Dept. of Hawaiian Homelands
1988	Archaeological Survey of 1000 acres at Kukuiula, Kaua'i for Alexander and Baldwin
1987	Archaeological Testing of Hawaii Air National Guard Facilities (Hickam Air Force Base)
1986	Archaeological Monitoring at Kaka'ako for Hawaii Community Development Authority
1985-86	Archaeological Excavations at Wai'anae Army Recreation Center, Poka'i Bay, Wai'anae, O'ahu for U.S. Army Corps of Engineers
1984	Archaeological Survey and Excavations for a 9-hole Golf Course Extension, Keauhou, Kona for Keauhou-Kona Resort
1983-84	Archaeological Survey and Excavation of 174 acres, Holualoa, Kona, for Gamlon Corp.
1981	A Management Plan for Archaeological Research at the Keauhou-Kona Resort, for Kamehameha Investment Corp.
1981	Archaeological and Paleontological Investigations at Barber's Point, Ewa, for U.S. Army Corps of Engineers
1980	Archaeological Excavations of a 155-acre parcel, Kona, for Pacific Basin Resorts
1979	Archaeological Investigations at Waioli Mission Hall, Hanalei, Kauai, for the Waioli Church and the State of Hawaii.
1978	Archaeological Survey of the Proposed Kiahuna Golf Village, Koloa, Kauai for Moana Corp.
1978	Archaeological Excavations at Ha'ena State Park, Ha'ena, Kaua'i, for State of Hawaii Division of State Parks

Geographical Experience

Oahu:	Bellows, Olomana, Kualoa, Waiahole, Kaneohe, Kaka'ako, I'olani Palace, Mokapu, Waipio, Pearl Harbor, Barber's Point, Waiau, Moanalua, Ewa beach, Wai'anae Valley, Poka'i Bay, Makaha, Makua, 'Ohikilolo, Keeau, Waimanalo, Nu'uanu, Kipapa, Luluku, Haula, La'ie, Kaena Pt., Urban Honolulu
Hawaii:	Hilo, Puna King's Landing, Waimea, Kohala, Ka'u, South Kona, Keauhou, Kahaluu, La'aloa, Holualoa, Kailua, Kaloko, Keahole, Lalamilo, Honalo, Kawaihae, Keala Kehe, South Point, Lanihau.
Kauai:	Lihue, Koloa, Poipu, Hanapepe, Waimea, Wailua, Hanalei Valley, Waioli, Ha'ena, Kapa'a, Princeville, Kilauea
Lanai:	Manele, Koele
Molokai:	West Molokai - Kaluako'i

Maui:	Ka'anapali, Wailuku, Kihei, Kahului, Haleakala
Kaho'o lawe:	Entire island site survey

Summary of Professional Experience in Hawaii

Directed over 350 archaeological investigations in Hawaii, including reconnaissance, survey, subsurface testing and coring, historical research, archaeological site and area management, site stabilization and reconstruction, intrepretive display development. These studies have involved work on O'ahu, Kaua'i, Lana'i, Moloka'i, Maui, Hawai'i Island and Kaho'olawe.

Investigations include small-scale reconnaissance, surveys of up to 3,000 acres, major excavations on all main islands, recovery of human burials, historic archaeology, investigation of beach sites, cave sites, mapping and investigation of Hawaiian fishponds and aerial surveys. Besides project reports, there are formal publications, professional papers, and research grants.

Special Contributions to Hawaiian Archaeology

- Discovery and documentation of the oldest known human occupation on Kaua'i (Ha'ena, 980 A.D.)
- Documentation of a previously unknown and one of the most complex Hawaiian irrigation systems in Hawai'i, Koloa, Kaua'i.
- Obtaining the first radiocarbon dates on Hawaiian fishponds with a coring technique especially designed for fishponds (Mokapu and Pu'uloa)
- Excavation of the most intact bone fishhook workshop in Hawai'i with documentation of raw materials and stages of manufacture (Kawakiu, Moloka'i)
- Developing the only complete archaeological record of an early Christian Mission Station in Hawai'i (Waioli, Hanalei, Kaua'i)
- Most complete mapping study of a segment of the Kona Field System (Pahoehoe, Kapalaalaea, La'aloa, Kona)
- Rediscovery of extensive Hawaiian agricultural and habitation complexes in upper Hanalei Valley only briefly reported on in 1931
- Rediscovery of Moka'ena Heiau, Ka'ena Point, O'ahu, thought to have been destroyed in 1940s.
- Disinterment of 120 human burials from storm drain excavations at Queen and Punchbowl Street and coordination of reburial in Kawaiaha'o Cemetery
- Excavation of monarchy materials on the grounds of I'olani Palace
- Ongoing cooperative educational project with Punahou School training High School Students in field archaeology

SECTION 8

Technical Appendices

APPENDIX A

Environmental Assessment Scope of Services

SCOPE OF ENVIRONMENTAL ASSESSMENT
FOR THE DEVELOPMENT OF HENRY STREET

19 March 1990

The Environmental Assessment (EA) shall contain the following information:

(1) Identification of applicant or proposing agency;

The EA will contain a description of the applicant being the County, through its Department of Public Works, as a result of a Joint Development Agreement with Lanihau Center Venture.

(2) Identification of approving agency, if applicable;

Since no specific discretionary permit is to be granted in this case, there is no approving agency. The County will, however, make a decision on acceptance of the EA, and either issue a Negative Declaration or a Notice of Preparation for an EIS.

(3) Identification of agencies consulted in making assessment;

The EA will list the various agencies consulted in preparation of the EA. Besides the County of Hawaii Department of Public Works and Planning Department, we propose consulting the State Department of Transportation regarding traffic data, and the State Department of Land and Natural Resources - Historic Sites Section regarding archaeological sites. Are there other agencies we should be in contact with?

(4) General description of the action's technical, economic, social, and environmental characteristics;

The EA will include a general description in each of these areas, including:

(a) the project site, in terms of ownership and present use of the site, background of the project, purpose and need for the project, location maps;
(b) the development proposal, including project elements and construction activities;
(c) the development timetable and costs;
(d) the expected benefits to the community;
(e) the existing land use and zoning controls; and
(f) the generalized environmental and social characteristics, referencing the following detailed discussions of these topics.

(5) Summary description of the affected environment, including suitable and adequate location and site maps;
AND

(6) Identification and summary of major impacts and alternatives considered, if any;

AND

(7) Proposed mitigative measures, if any;

The EA will present a discussion of the existing conditions, potential adverse impacts, and recommended mitigative measures for each of the following subject areas:

(a) Climate - general description of temp., precip., winds, etc.
(b) Topography - topo map, discussion of grading effects
(c) Soils - soils map, erosion effects discussed, erosion protection
(d) Drainage and Flood Hazards - technical study by Hida, Okamoto and Associates, Inc. (February 1990), existing drainage and flood maps, proposed drainage improvements and maps
(e) Vegetation - cover types, map, effects on veg., landscape plantings
(f) Wildlife - existing habitat and species, construction effects
(g) Archaeological Resources - technical study by Hallet H. Hammatt, Ph.D. (February 1989), existing sites, map, effects, documentation
(h) Roadways and Traffic - technical study by Barton-Aschman Assoc., Inc. (September 1985)(updated April 1990), existing traffic, improvements, future traffic projections, maps, mitigative improvements
(i) Noise - discussion of existing/future conditions, noise modeling
(j) Air Quality - discussion of exist/future conds., air modeling
(k) Visual Resources - existing views, photos, effects of road, landscaping
(l) Socio-economic Characteristics - general desc. of population, etc.
(m) Public Infrastructure - existing roads, drainage, water, and project effect
(n) Public Facilities - general description of police, fire, schools

Summary discussions will be included for the following:

(o) Unavoidable Adverse Impacts
(p) Irreversible and Irretrievable Commitments of Resources
(q) Summary of Unresolved Issues

Alternatives will be addressed for the No-Action Alternative and an Alternative Alignment for Henry Street. The Relationship to Existing Policies and Plans for the Affected Area will also be addressed, including existing State and County plans.

Appendices to the EA will include the technical studies prepared to address the environmental impact areas listed below.

(a) Drainage - Hida, Okamoto and Associates, Inc. (February 1990)
(b) Traffic - Barton-Aschman Associates, Inc. (1985, updated April 1990)
(c) Archaeology - Hallet H. Hammatt, Ph.D. (February 1989)
(d) Noise - Darby & Associates, Inc. (April 1990)
(e) Air Quality - Barry D. Neal (April 1990)

No additional specific technical studies or updates are proposed to be prepared for the EA unless required by the County and Lanihau Center Venture.

APPENDIX B

Archaeological Reconnaissance Reports

RECEIVED FEB 1 3 1989

ARCHEOLOGICAL RECONNAISSANCE

OF 24 ACRES IN LANIHAU

by
Hallett H. Hammatt, Ph.D.
David Shideler, M.A.

Prepared for

Lanihau Partners

by
Cultural Surveys Hawaii
February 1989

TABLE OF CONTENTS

I. INTRODUCTION

During the week of January 30th Cultural Surveys Hawaii conducted an archaeological reconnaissance of approximately 24 acres south of Lanihau Center in Kona for Lanihau Partners. This study was done specifically to provide the following information.

1. To relocate all sites and place them on the 1 inch = 40 foot map provided.
2. To assess the sites in terms of further data recovery required and preservation options.
3. To test selected sites specifically to provide estimates of number and locations of human burials.

In order to accomplish these tasks some descriptive and background information was generated which will be of use in further stages of archaeological work.

The site descriptions and excavation results are included as well as a previous archaeological summary. The most useful information for planning purposes is contained within the summary and recommendations.

The site numbers of previous reports on the property were used (Soehren and Rosendahl) except for the newly discovered sites which were assigned Cultural Surveys Hawaii numbers (CSH#).

II. PREVIOUS ARCHAEOLOGY

Three previous archaeological studies have been conducted on the present study area (Soehren 1977, Rosendahl 1979, and Rosendahl 1980). Soehren (1977), in a five-page report on an archaeological reconnaissance survey, describes and locates eighteen sites of which he called twelve grave sites. Four sites (Soehren 15-18) he regarded as house platforms which "very likely comprise the house compound of a person of some rank, who could afford separate men's and women's eating houses, a common sleeping house and other domestic structures" (Soehren 1977:1).

In a 1979 archaeological reconnaissance survey Rosendahl designated fourteen features for which he assigned alphabetic designations A through N. Structural features B through G and L were assigned Hawaii State Register Site No. 50-10-28-5609. Rosendahl designated a large stone walled enclosure Feature K and equated it with the in-lying parcel No. 13. While Rosendahl noted several other features upslope of the enclosure only two individual features were designated (M,N) for a historic tomb and a lava tube shelter, respectively. In this 1979 report Rosendahl discusses Site no. 50-10-28-5609 as a domestic residence complex. Rosendahl suggests that the platforms, observed but not designated, between the in-lying parcel and the Great Wall of Kaukini might well represent burial monuments.

A third archaeological investigation (Rosendahl, 1980) was conducted to determine the relationship between Soehren's features 15, 16, and 17 and the features reported by Rosendahl in

1979. It was concluded that Soehren's features 15, 16, 17, and 18 were the same as Rosendahl's features L, E, C, and G, respectively. Rosendahl determined by transit and tape that the Keauhou-side boundary just touches the northwest end of the platform called feature "18" by Soehren and "G" by Rosendahl in 1979. Rosendahl concluded that "an access roadway corridor having a maximum width of 40 feet, as measured from the Keahole-side boundary of the subject area would pass between that boundary and the northwest wall of the enclosure containing the various archaeological features." An access roadway corridor any wider would impact these archaeological features.

In addition to the above-mentioned studies four other archaeological studies have been conducted in the immediate vicinity (Schilt 1981, Schilt 1984, Han et al. 1986, and Rosendahl 1988).

In 1981 the B.P. Bishop Museum (Schilt, 1981) conducted a reconnaissance level survey of two parcels ("A" - 1.9 acres and "B" - 2.7 acres) immediately adjacent and to the west of the northwest portion of the present study area. Eight sites or site complexes were recorded and two phases of further archaeological investigations were suggested.

From 1980 to 1982 the B.P. Bishop Museum conducted several seasons of field work in the Kuakini Highway realignment corridor (Schilt 1984) which forms the northeast boundary of the present study area. This research investigated a number of sites in close proximity to the project boundary. Several sites, including D8-19, a mauka/makai trail; D8-20, platform and terraces; D8-21, modified outcrops; D8-22, a historic house; D8-23, walls, modified outcrops, and platform; and D8-30 the burial complex, all lie within 200 feet of the project area and must be considered in the analysis of the prehistory of the present project area.

The B.P. Bishop Museum undertook complete excavation of burial complex D8-30 (Han et al. 1986) and exhumed 355 burials. These burials were thought to be commoners (maka'ainana) and dated from perhaps as early as the mid-thirteenth century into historic times. This burial ground of long standing extended to within about fifty feet of the northeast corner of the project area. While "complete excavation of Site D8-30" is asserted (Han 1986:1), the presence of such a large burial ground so close to the project area deserves special consideration.

In 1988 Margaret Rosendahl conducted an archaeological reconnaissance survey of the same area (Parcel B) that Rose Schilt (1981) had conducted an archaeological reconnaissance survey of seven years earlier. It appears that Rosendahl Inc. was unaware of Schilt's 1981 work: "no previous archaeological work had been conducted within the project area (Rosendahl 1988:2). Rosendahl Inc.'s "Recommended General Treatment" differs significantly from Schilt's recommendations (1981:12).

More than thirty separate archaeological reports have been produced on Lanihau ahupua'a (Spriggs and Tanaka 1988). Thorough background research should involve an attempt to place the prehistory of the project area within the context of the ahupua'a.

III. SUMMARY OF RESULTS

A field crew of four under the direction of Hallett H. Hammatt, Ph.D. conducted an archaeological survey and subsurface testing of lands at Lanihau 1st and 2nd North Kona, Hawaii (TMK 7-5-04:7 and Por 9) for Lanihau Partners from January 30 to February 3, 1989. Forty-six archaeological sites were investigated and are described and summarized below and in the appendix of this report. Of these sites, eight are believed to be or to have been, outside of the project property (Soehren 14 and 18 and Rosendahl H, I, J, K, M and N). Of the remaining 38 archaeological sites that are within the project area there have been almost completely destroyed (Soehren Sites 9 and 12 and Rosendahl Site "A") and two have been damaged by bulldozing (Rosendahl "K" and CSH Site 4).

The sites within the project area are primarily agricultural and residential features.

Lanihau Sites Summary Table

Site Numbers Soeh-ren	Rosen-dahl	CSH	Work done	Comments
1			Located	Probable agricultural terrace
2(a)			Located, tested	Habitation site, no burials
2(B)			Located, tested	Habitation site, no burials
3			Located, tested	Major habitation deposits, no burials found, but possibility of secondary burials
4			Located	Habitation site, probably no burial
5(A)			Located	Small habitation site, probably no burial
5(B)				
6			Located, tested	Habitation site, no burials
7			Located, tested	Habitation site, no burials
8			Located, tested	Small habitation, no burial
9			Not Located	Bulldozed?
10			Located	disturbed, no burials
11			Located	Habitation site, probably no burials
12			Partially destroyed	Outside property
13(A)			Located	Burial platform
13(B)			Located	Burial platform
14			Located	Outside property
15	L		Located	Paved terraces, probably no burials
16	E		Platform	Habitation site, probably no burials
17	C		Platform	Habitation site, probably no burials
18	G		Located	Partly on property, but bulldozed
	A		Located?	Destroyed
	B		Located	Walled enclosure partly destroyed
	D		Located	Habitation site, probably no burials
	F		Located	Wall remnant, partly bulldozed
	H		Located?	Outside property, bulldozed
	I		Located?	Outside property, bulldozed
	J		Located	
	K		Located	Outside property
	M		Not located	Outside property
	N		Not located	Outside property
		1	Located	Possible habitation, no burials
		2	Located	Habitation, no burials
		3	Located	Habitation, no burials
		4	Located	Partly bulldozed habitation platform

Site Numbers Soeh-ren	Rosen-dahl	CSH	Work done	Comments
		5A-D	Located	Habitation Complex, 1 possible burial (5C)
		6	Located	Habitation, possible burial
		7	Located	Possible burial platform
		8	Located	Terrace (agricultural)
		9	Located	Habitation? no burials
		10	Located	Modified bluff, no burials
		11(BM11)	Located	Terrace, no burials
		12 BM121	Located	Modified outcrop, no burials

Subsurface testing, involving the excavation of nine test trenches at the seven sites soehren believed to be grave sites (Soehren Sites 2A, 2B, 3, 5, 6, 7, 8) uncovered no burials or indication of the proximity of burials. At this time it is our belief that only three sites (Soehren 13A & 13B and CSH 7) have a high probability of containing burials and that another three sites (CSH 2, 5C and 6) have a moderate potential for containing burials. No burial ground is thought to exist on the property. However, the southeast boundary of the property abuts onto the well-known Keopu burial ground from which the Bishop Museum removed 355 human burials in the early 1980s from the Kuakini Highway realignment. Our review of the Bishop Museum report indicates that most, if not all, of the burials were recovered. Inspection of the southeast boundary area during the present project shows no archaeological features within the project area. It is believed that the northern limits of the burial ground conform to the Moeauoa - Keopu Ahupua'a boundary which is thought to follow an existing stone wall. The study area property includes a maximum 40 foot wide strip of land to the south of the wall. There is a possibility that burials are present in this wedge-shaped portion, south of the stone wall.

Our archaeological reconnaissance suggests that the majority of the archaeological sites within the project area are agricultural or short-term habitation features which would merit relatively little further endeavor. However, significant archaeological sites are located within the property. These fall into three relatively concise groups. The first is composed of Soehren sites 15, 16, and 17 and their associated features (Rosendahl Sites B, D, F) which Soehren, Rosendahl, the County of Hawaii and ourselves agree is most likely a residential compound. Our study confirms Rosendahl's assertion (1980:3) that "an access roadway corridor having a maximum width of 40', as measured from the Ke-Ahole side boundary of the subject area, would pass between that boundary and the northwest wall of the enclosure...and would not damage these features" and that 1980:4) "An access roadway corridor of any width greater than 40' would certainly affect the existing archaeological features."

A second residential compound exists in the central portion of the project and includes Soehren Sites 2, 3, 4, 5, 6, 7, and 8 and CSH 6, 7, and 8. Test excavations at Soehren Site 3 show that this is a major residential site containing abundant cultural ~~remains~~.

Thirdly, there are two structures (only partly within the property) which appear to be typical Kona platform burial sites - Soehren 13A, 13B. These two sites along with CSH 7 in the center of the property are the only archaeological sites in which burials almost certainly occur.

IV. RECOMMENDATIONS

The following observations are made relevant to further investigations and final disposition of sites.

Preservation

The complex of residential sites in the southwest portion of the property have been badly impacted by bulldozing at adjacent properties. From our perspective there are sites of greater integrity and better preservation value in the central portion of the property.

Two of the 3 burial sites are at least two-thirds off the property and could be preserved with minimal loss of land. The third burial site is part of a well-preserved residential complex along a high bluff forming an integrated complex of sites, which in our opinion, is more suitable for preservation than those in the southwestern portion.

Data Recovery

Data recovery efforts will be concentrated mostly in excavation and documentation of habitation sites. Burial removal will be a minor or non-existent portion of the task. Major excavation will be necessary at only a few sites. The rest need only be tested and further documented. If a residential complex can be preserved then data recovery efforts would be decreased accordingly.

Burials

In considering the sites 100% on the property, it is likely that only a few burials would be found. There is almost certainly no "burial ground" present. However, caution must be advised in the southeast portion of the property which adjoins the Keopu burial site.

In future planning, earth moving and grading should be avoided within the 50 foot wide and 300 foot long portion of the property south of the existing stone wall.

The following steps are suggested:

1. Reach a decision on the issue of preservation of sites and coordinate with the State and County. A field trip with both Virginia Goldstein and Ross Cordy would greatly facilitate this process. At this time the question of grubbing portions of the property without sites should be addressed.
2. Preparation of a data recovery plan which would include a summary of the information generated in this report as well as historic background on the property and Land Courts Awards. This plan should be approved by both the State and County.
3. Data Recovery - probably 3-4 weeks of field work and 6-8 weeks of report preparation. It should be possible to obtain a grubbing permit following the end of field work with the approval of the State and County.

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APPENDIX

SITE DESCRIPTION, ARTIFACT AND MIDDEN TABLES

LANIHAU SITE DESCRIPTIONS

Site #: Soehren 1

Location: In the northeast portion of the project area about 30' south of the makai fence of the Queen Ka'ahumanu Highway road corridor and 105' east of a sharp bend in a long stone wall.

Description: Soehren describes this site as a crack in the top of a pahoehoe mound filled with small rubble and as a grave site. The site measures 18' long north/south by 8' wide east/-west. The boulder fill in the crack in the top surface of a small bluff has a sloping surface and a crude facing. The site appears to be a small paved terrace. An alignment was observed in the boulder fill. No coral, midden, artifacts or manuports were observed. This site is not thought to contain burials. The site was not tested.

Site #: Soehren 2 (A)

Location: In the east central portion of the project area on a bluff top, 20' from Soehren 2B, both of which are surrounded by a low (2 1/2') stone wall.

Description: This modified outcrop (Fig. 1) was described by Soehren as a large irregular crack in the top of a lava pressure ridge filled with large stones, chinked and covered with smaller pebbles, with a central area quite smooth and flat.

This site is situated on the top of a bluff with a nearly vertical 9' high bedrock cliff dropping away on the west side. The maximum dimensions of the site are 24' by 24'. Along the southwest side is a large crack or natural linear depression in the bedrock which extends for 19' from northwest to southeast averaging about 7' wide at the bedrock surface. This crack has been roughly filled with piled angular boulders to within 3' of the bedrock surface of the bluff. Another V-shaped crack extends for 12' from east/west across the eastern portion of the site. This crack has been filled with boulders and cobbles to be roughly flush with the top of the outcrop. In the central portion of the site is a roughly oval shaped level paving of cobbles and pebbles measuring 8' east/west by 10' north/south. Just north of this paving is a soil filled depression in the bedrock measuring 12' north/south by 7' east/west. There is another soil filled depression 8' long east/west by 6' wide north /south in the southwest portion of the site.

Three water-worn basalt pebbles and a few pieces of branched

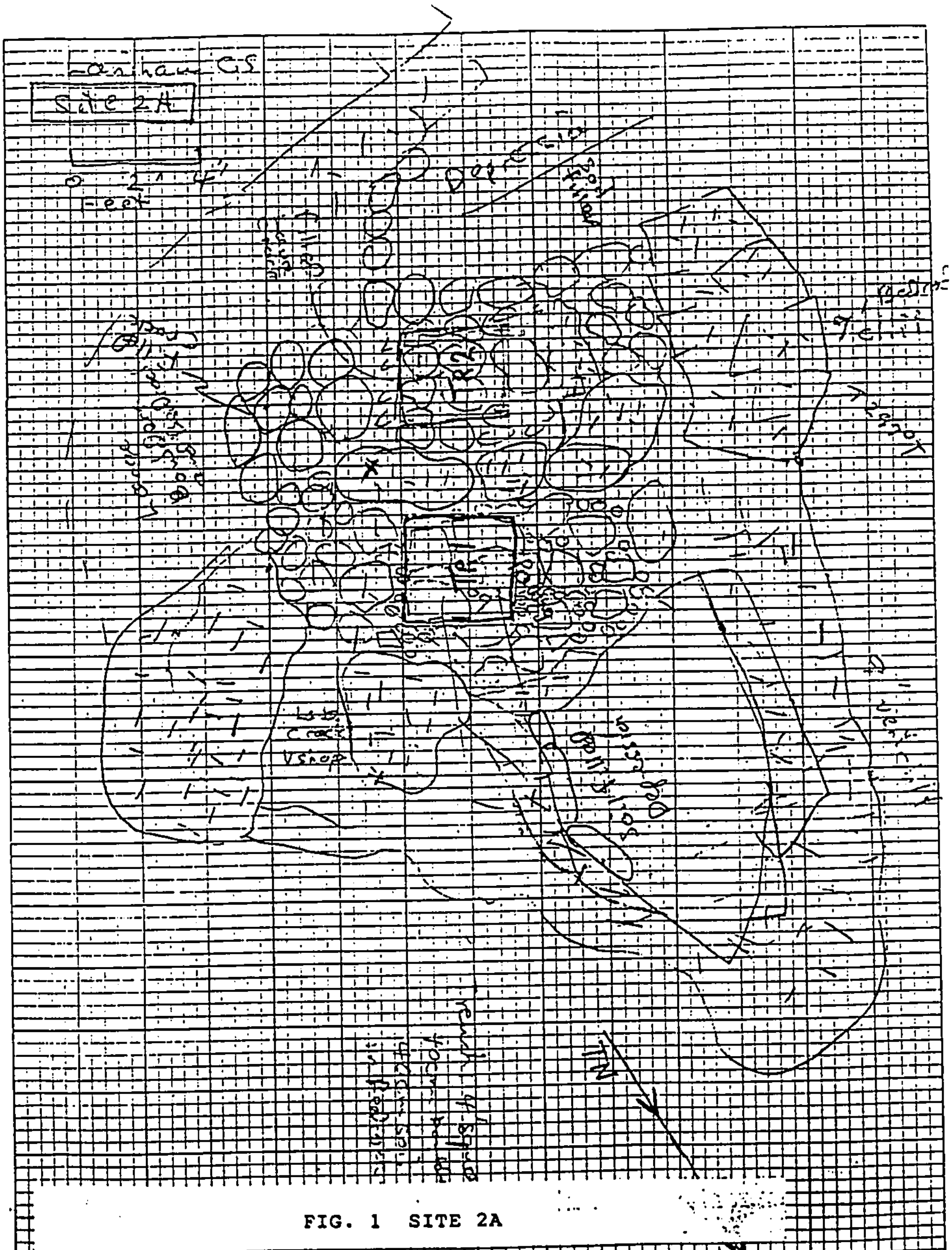

FIG. 1 SITE 2A

coral were observed on the surface of the level paving. One to three burials were thought to be present.

Excavation: Two test pits were excavated. Trench 2 was a 1.3 m square unit and was excavated in the paving. Forty centimeters of boulder and cobble fill and a maximum depth of 40 cms of soil in bedrock cracks were excavated. The volume of soil was approximately 0.07 m^3. There was an abundance of branch coral, 102 grams of marine shell midden, 37 volcanic glass flakes, and 3 volcanic glass cores, but no other artifacts. A good charcoal sample was collected from the screen for carbon isotope analysis.

A second unit (Trench 2) was excavated 3' to the south in a portion of a filled crack. This 1 m^2 unit yielded much less coral, a sparse 26 grams of marine shell midden, 2 basalt flakes and one volcanic glass flake from approximately 0.07 m^3 of soil. No burials were encountered. The testing suggests that the likelihood of burials is much less than was thought.

Site #: Soehren 2 (B)

Location: In the east central portion of the project area 20' from Soehren 2A, both of which are surrounded by a low 2 1/2' stone wall.

Description: This site (Fig. 2) was described by Soehren as a rough mound of rubble greatly disturbed and indistinct. This paved terrace is 24' long northeast/southwest by 11' wide mauka-makai. The surface is relatively level boulders and cobbles. The makai face averages 2.5' - 3' high. A depression or collapsed area was noted just back from the middle of the makai side. A smaller depression was noted in the mauka central portion of the site. This site is much more formal and is better preserved than Soehren's description suggests.

Excavation: A 1 m^2 test trench (Trench 1) was excavated in the depression in the middle of the makai side. Sixty centimeters of platform fill and a maximum depth of 40 cm of soil and rubble were removed. There was an abundance of coral but only 24 grams of marine shall and kukui midden and no volcanic glass or other artifacts. No burials were encountered. The probability of burials here is low.

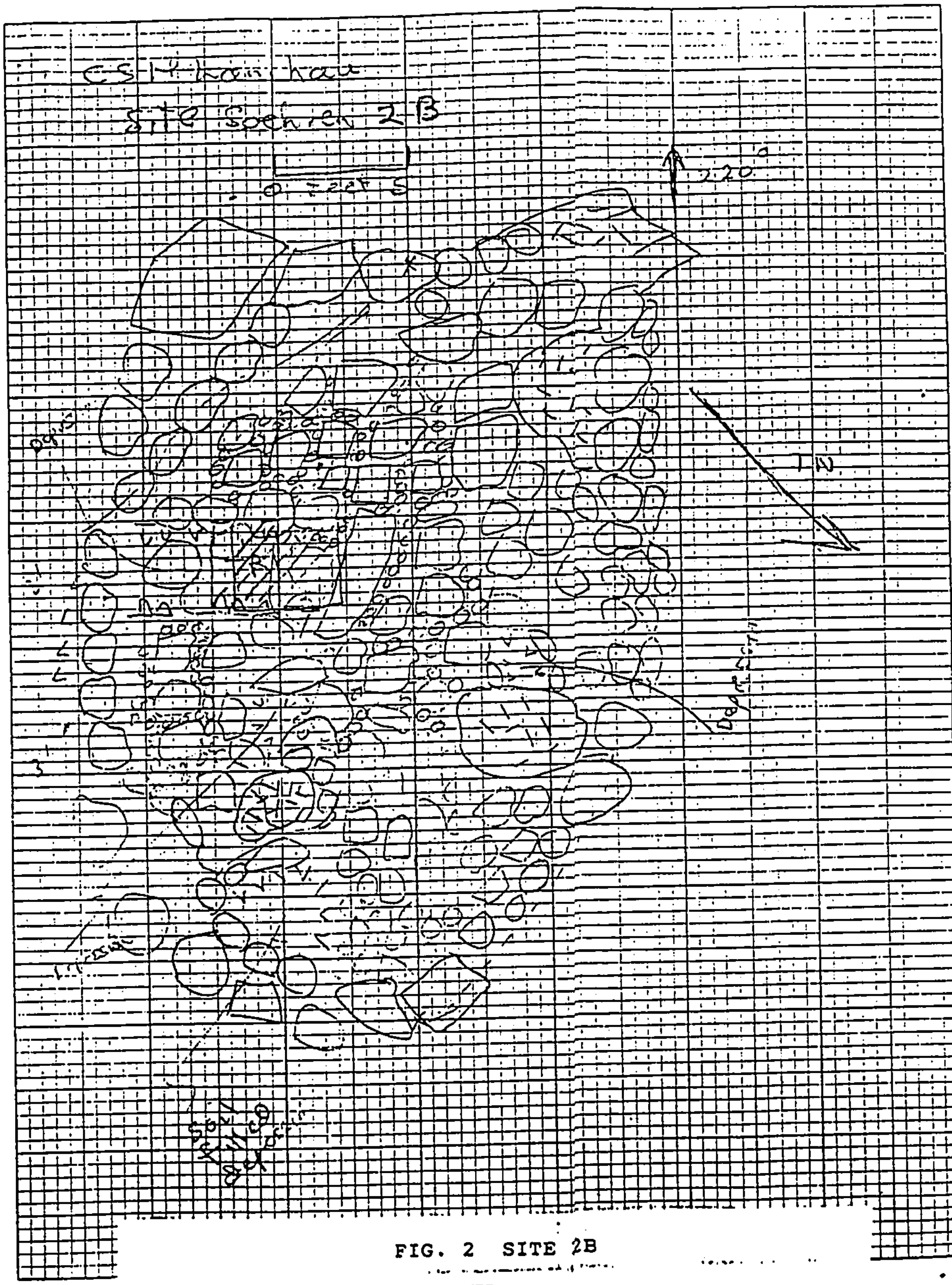

FIG. 2 SITE 2B

Site #: Soehren 3

Location: In the east central portion of the project area on a bluff 70' west of the wall surrounding Site 2 and 20' northwest of Soehren 4.

Description: This site (Fig. 3) was described by Soehren as a very rough platform greatly disturbed by cattle and as a grave site. This roughly rectangular large platform measures 27' north/south by 24' east/west. It is constructed of boulders and the very rough surface slopes down slightly to the west. The west face is in the best condition and the southern portion of this is still vertically faced 3.5' high. The northeast corner of the site has some boulder stacking 1.5' above the platform surface and angular basalt boulders have been piled along the east and south margins of the platform. A depression was noted in the central portion of the site. No midden, coral or artifacts were observed on the surface of the site, but one water-rounded basalt cobble was noted.

Excavation: A 1 m^2 test trench (Trench 2) was excavated into the depression. The platform fill averaged 1 m in depth under which was 30 cm. of loose dark brown silt loam. This unit yielded an abundance of coral, a large quantity of midden, including pig bone, bird bone, fish bone, kukui, and shell fish and the following artifacts: 1 basalt core, 2 scoria files, 3 hammerstones, 1 bone preform fishhook, a pearl shell preform fishhook, the barb of a 2-piece bone fishhook, 2 kupee shell beads, 3 coral abraders, 1 opihi shell scraper, 7 polished basalt

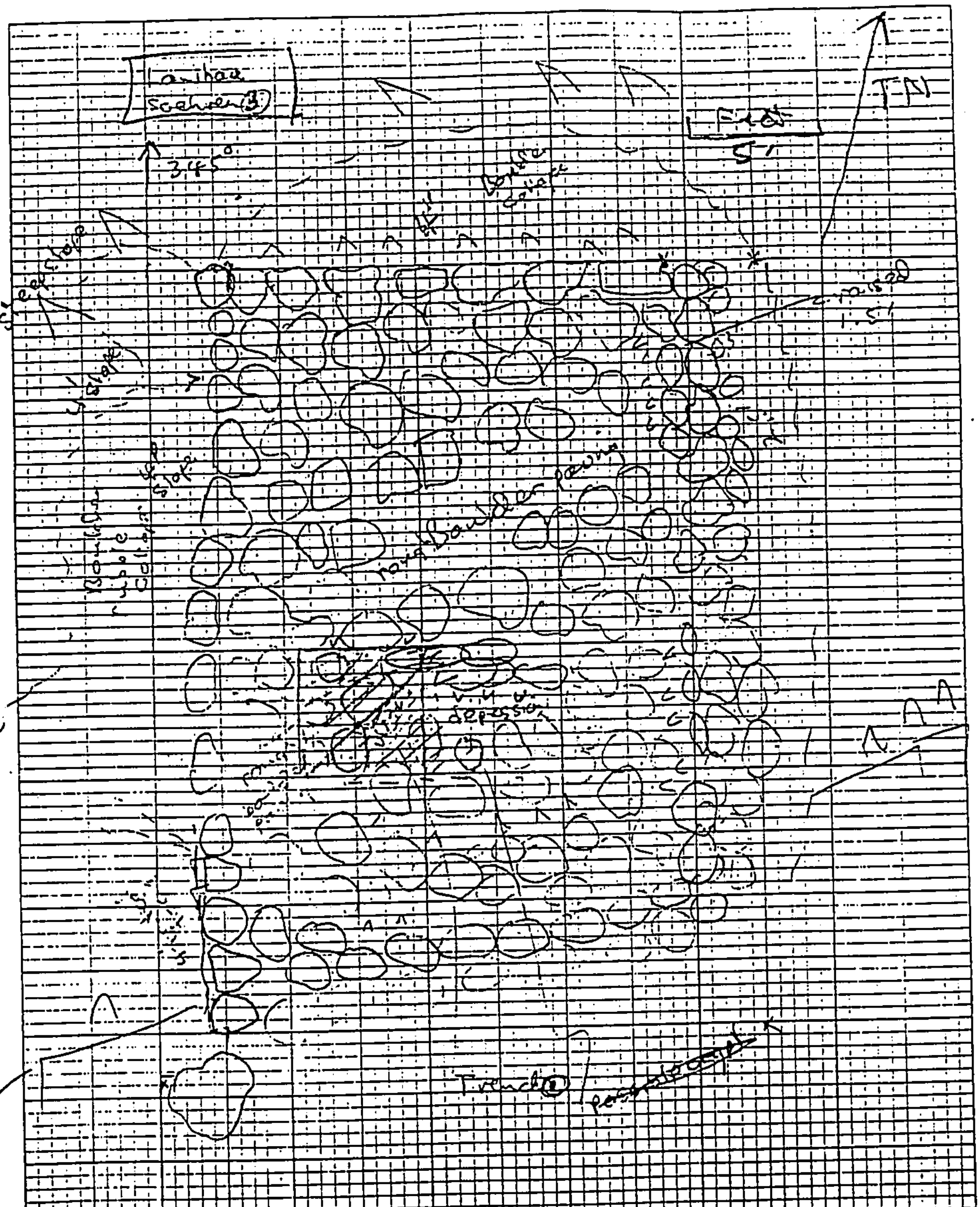

FIG. 3 SITE 3

flakes, 45 volcanic glass flakes, 1 bird bone pick, 2 pieces of cut bone and 4 sea urchin files. In addition, more than a dozen water-rounded basalt pebbles were noted. Several of these were fractured indicating their possible use as anvil stones. No burials were encountered. The probability of burials is low.

Site #: Soehren 4

Location: In the east central portion of the project area on the top of a prominent bluff, 20' southeast of Soehren 3 and 30' north of CSH Site 6.

Description: This site was described as an indistinct and disturbed very rough platform. We perceived this site as two adjacent terraces constructed of pebbles, cobbles, and boulders on the top of a prominent bluff. The upper level measured 17' north/south by 13' east/west and is very well faced (3' high) on the <u>mauka</u> side. Just <u>mauka</u> of this terrace is a level soil area with a "hippie camp" construction of boards and plywood. Just south of this terrace and a foot lower is a rougher second terrace which slopes down toward the south. This second terrace measures about 15' square. No coral, midden, artifacts, manuports were observed on the surface of this site. No testing was undertaken. The probability of burials is low.

Site #: Soehren 5 (A)

Location: In the east central portion of the project area 10' south of Soehren 5B, 40' east of Soehren 7 and 80' west of Soehren 3.

Description: Soehren describes his Site 5 as a rough platform and as a grave site. We perceived Site 5 as a larger area which includes two adjacent platforms (5A and 5B). Site 5A is the south platform and measures 10' north/south by 17' east/-west, is cobble paved, and has a maximum height of 3.5'. No coral, midden, artifacts, or manuports were observed on the surface of the site. The site was not tested. The probability of burials is low.

Site #: Soehren 5(B)

Location: In the east central portion of the project area 10' north of Soehren 5(A) 50' east of Soehren 6 and 90' west of the terrace feature of Soehren 3.

Description: Soehren Site 5B, the north platform, measures 22' by 22' and has a central soil filled depression measuring 5' east/west by 8' north/south and a surface 1.5' below the platform surface. No vertical facings were observed. It is assumed that this soil filled depression is the "opened" portion referred to by Soehren in his site description. No midden, coral, artifacts, or manuports were observed on the surface of the site.

Excavation: A 1 m^2 test trench (Trench 1) was excavated into the depression area which was found to actually be paved with cobbles. The trench was excavated to bedrock at 70 cm. and yielded a polished adz fragment, one volcanic glass flake, and 24 grams of marine shell midden.

The probability of burials is low.

Site #: Soehren 6

Location: In the north central portion of the project area this site is only about 80' southeast of the southern end of the shopping center graded area. This site is 35' north of soehren 7 and 70' west of Soehren 5(B).

Description: This low platform (Fig. 4) was described by Soehren as a grave site, very rough and considerably disturbed by cattle. This boulder and cobble paved platform measures 25' long by an average width of 15' with a maximum height on the west side of 2'. In the central portion of the site was a recent fireplace constructed of five boulders which had been removed from the surface of the platform immediately to the southeast. Otherwise this platform is in good shape. It is level and well constructed. No coral, midden, or artifacts were observed on the surface.

Excavation: One 1 m x 2 m test trench (Trench 1) was excavated in the south central portion of the platform to pahoehoe bedrock at 85 cms below the platform surface. Excavation through 45 cm of rubble and a maximum of 40 cm of soil disclosed abundant coral pebbles, 67 volcanic glass flakes, 3 volcanic glass cores, 2 basalt hammerstones, 3 basalt flakes, and 2 polished basalt flakes. No burials or pit features were encountered. This site does not appear to be a burial site, but obviously was the locus of much prehistoric enterprise.

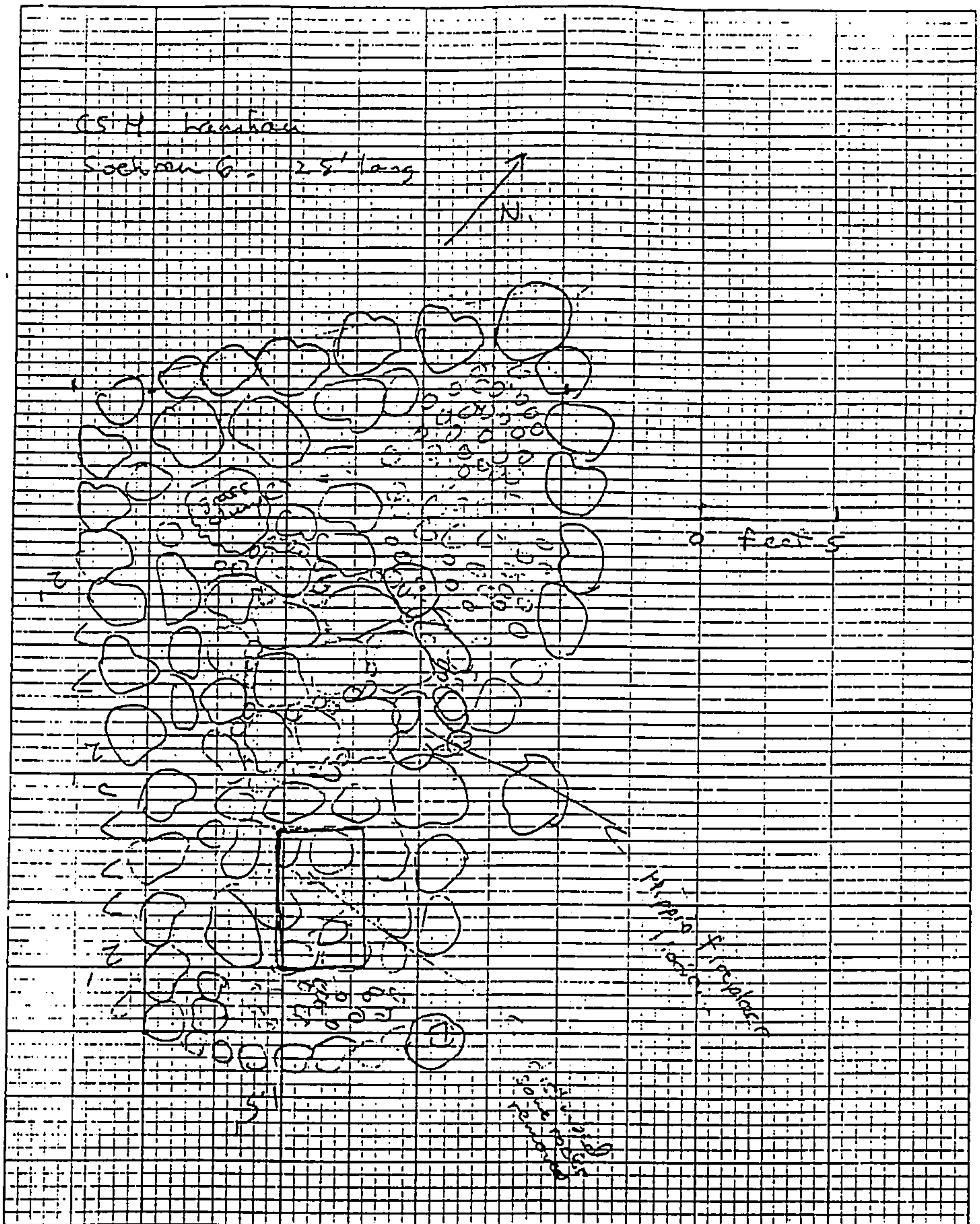

FIG. 4 SITE 6

Site #: Soehren 7

Location: In the north central portion of the project area this site is only about 120' southeast of the southern end of the shopping center graded area. This site is 40' south of Soehren 6 and 40' west of Soehren 5A.

Description: Soehren describes this site as a disturbed long narrow platform and as a grave site. This roughly rectangular terrace (Fig. 5) measures 48' east/west (276° TN) by 14' north/south. The south side is 2-3' high and the north side is level with the ground's surface. No good facings are extant. The surface is boulders and cobbles. The "sunken" portion Soehren refers to is in the western central portion of the site. This site appears to be a rock clearance mound. Soehren probably only referred to the western portion as his Site 7 with the mauka or eastern portion, which has a rougher boulder surface, discounted but it is one continuous site. One piece of coral was observed on the surface but no midden, manuports, or artifacts.

Excavation: Two test trenches (Trench 2 and Trench 2) were excavated into the central portion of this site. Trench 1 (1 m by 2 m)was excavated into the face of the terrace and yielded 40 grams of marine shell midden, some coral, and no artifacts. Trench 2 (1 m x 1.2 m)was excavated in the linear depression in the back of the site and produced 10 grams of shell midden, some coral, and no artifacts.

The probability of burials at this site is thought to be low.

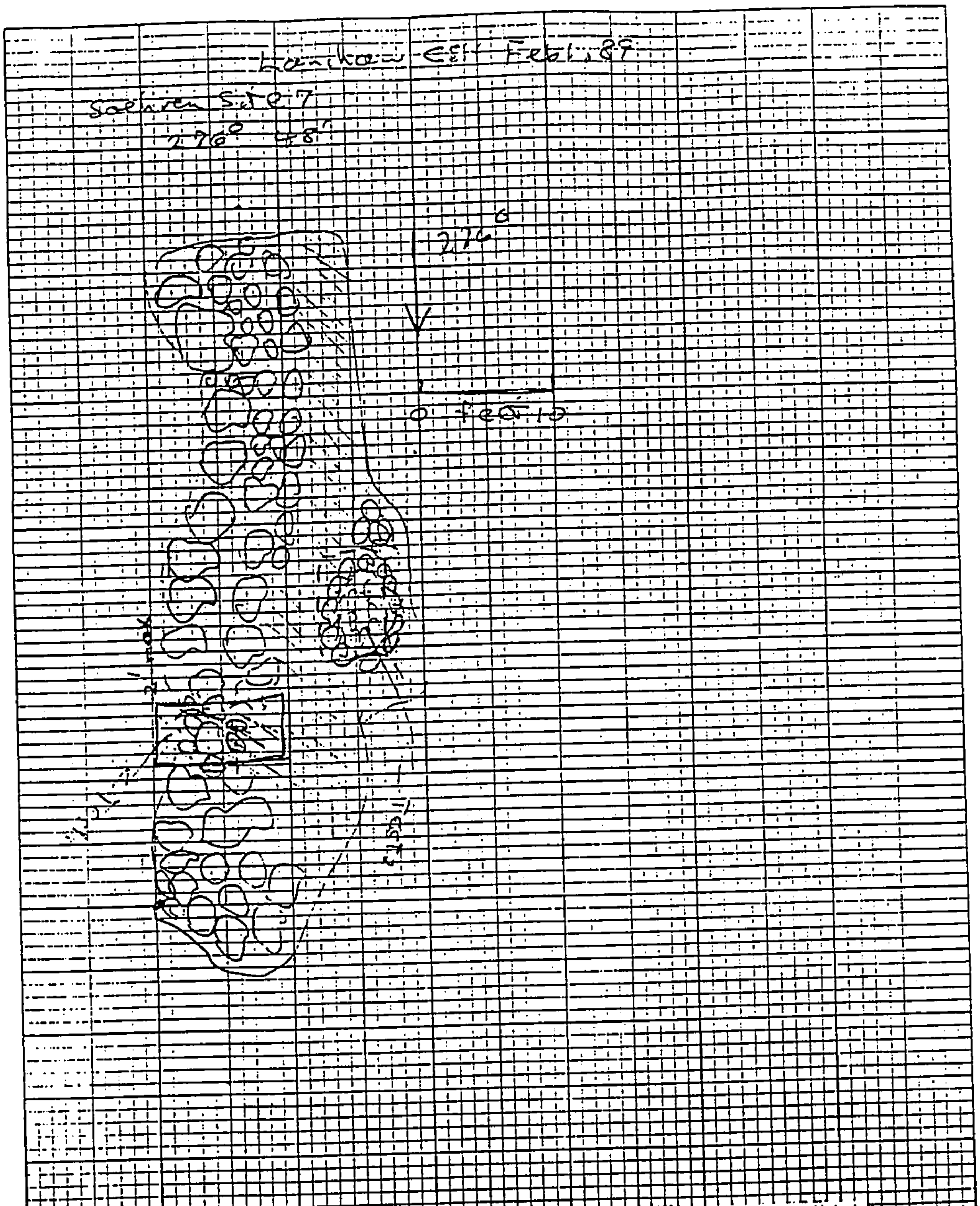

FIG. 5 SITE 7

Site #: Soehren 8

Location: In the center of the project area this site is 40' southwest of Soehren 7 and is about 130' southeast of the edge of the shopping center grading.

Description: Soehren describes this site as a narrow crack in a small pressure ridge filled with small rubble and as a grave site. This boulder and cobble filled crevice is 25' long northeast/southwest (225° TN) by 13' northwest/southeast. The site has a maximum height of 4' but is mostly bedrock. A few water-rounded basalt cobble and boulder manuports, a few pieces of coral, and fragments of cowry shell were noticed on the surface of the site.

Excavation: A 1.2 m x .75 m test trench (Trench 1) was excavated in the central portion of the crevice to a maximum depth of 90 cm below the platform surface. The maximum depth of the soil in bedrock cracks was 40 cm. Excavation yielded 262 grams of midden, a scoria file and a coral abrader. It is highly unlikely that this site contains a burial.

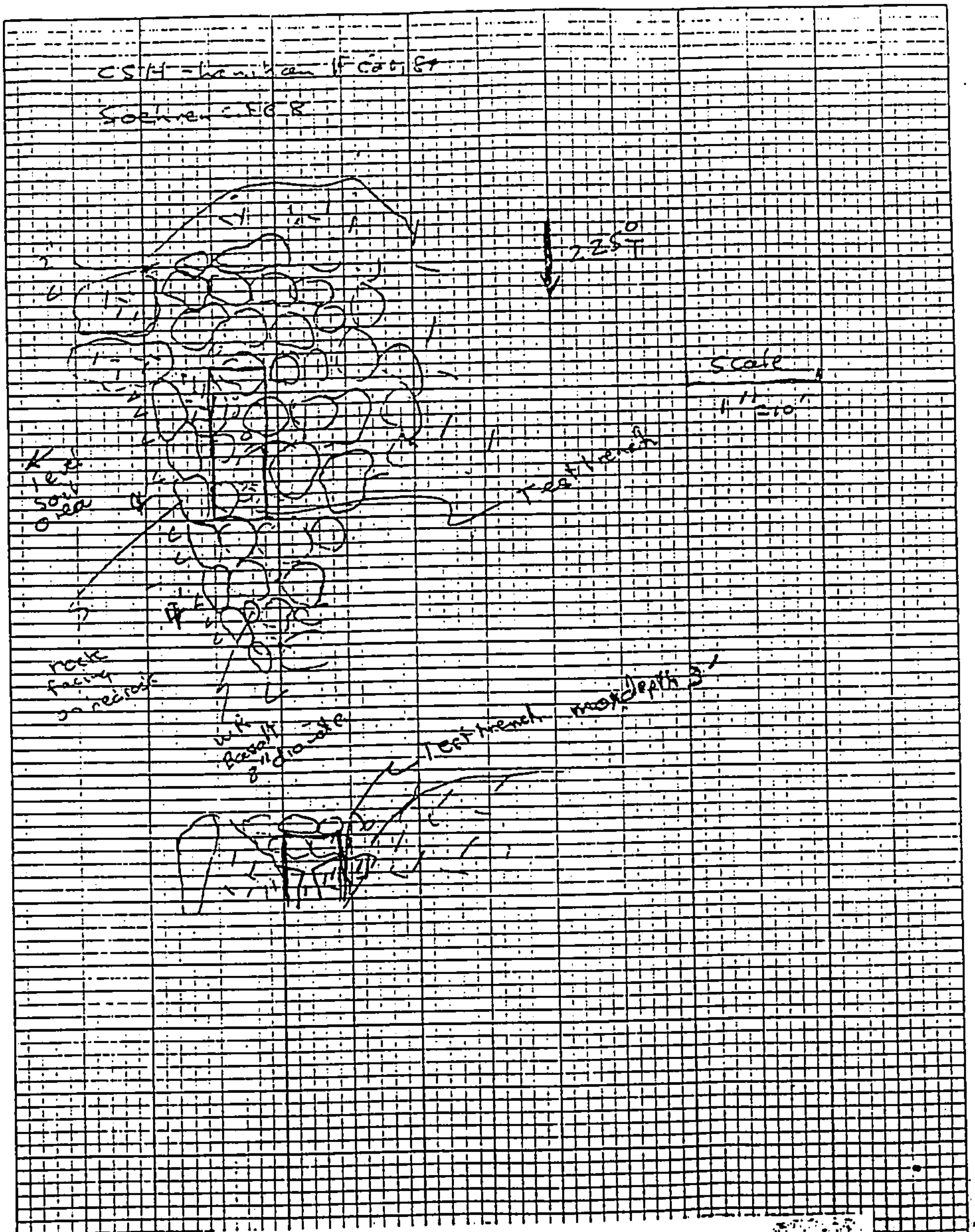

FIG. 6 SITE 8

Site #: Soehren 9

Location: This site was in the north central portion of the project area but has been partially destroyed by bulldozing associated with the shopping center construction.

Description: Soehren describes this as a platform grave site. The remnant extant appears as a paving about 12' by 4' but this site is basically destroyed. The probability of a burial is low.

Site #: Soehren 10

Location: In the northwest portion of the project area this site is 60' east of the wire fence on the east side of the Condos and is 60' northwest (287° TN) of site CSH 3. This site is 10' south of bulldozer push from shopping center grading.

Description: Soehren describes this as a midden scatter with an extensive area of rubble a few yards to the east as a possible house site. This site presently consists of midden scatter on bedrock with many coral fragments and some sandy sediment. The immediate area is badly disturbed by recent bulldozing. There are no burials here.

Site #: Soehren 11

Location: In the western portion of the project area this site is 60' east of the wire fence on the east side of the condos and is 60' west of site CSH 5D.

Description: Soehren describes this site as a series of contiguous platforms and as a grave site. This site measures 65' mauka/makai (240° TN) and consists of two paved surfaces separated by an ill defined space of boulders and bedrock. The upper rough paving measures 18' north/south by 21' east/west and is delineated by an informal boulder alignment (1' high) on the south and makai sides. The intervening boulder and bedrock area measures 7' east/west by 10' north/south and may be roughly terraced. The lower level is 27' long east/west by 17' north/south and is cobble paved. There is a boulder alignment (2' high) along the south side of this lower paving. There is no distinct makai face. The "paved" surfaces of this site appears to be essentially filling in of rough pahoehoe with smaller stones as bedrock is evident in some places. Coral was observed on the lower paving but no midden or artifacts.

The probability of a burial is low.

Site #: Soehren 12

Location: In the southern portion of the project area just east of the excluded parcel (L.C.A. 9971) and just south (outside) the property line. This site remnant is 50' southwest of Soehren Site 13B.

Description: Soehren describes this as a platform, platform remnant, and midden scatters and suggests it is a grave and habitation site. This site was tentatively relocated and appears to be a former platform but the site has been heavily impacted by bulldozing from the south and is too disturbed to tell. Several water-rounded manuports and a substantial midden scatter was observed. The site is lost.

Site #: Soehren 13(A)

Location: On the southern boundary of the property 50' east of the excluded property (L.C.A. 9971). This site straddles the property line and is mostly south (outside) the property.

Description: Soehren describes this as a paved platform in good condition and as a grave site. This large platform has a maximum length east/west of 35' and an average width of 20' north /south. There is a paved area, paved with pebbles and cobbles, measuring 20' east/west by 16' north/south in the makai portion of the platform. Portions of the north and west sides of the platform have collapsed but it is still in good shape. The maximum height of this site is 6'. The north side is 4' high, the west side is 5.5' high, the south side is 4.5' high and the mauka or east side is 1.5' high. Two smaller platforms abut this large platform on the east and south sides. They both measure about 10' long by 6' wide by 1.5' high. Branch coral was noted on the surface of the site. This site has a high probability of being a grave site and 3-5 burials are estimated.

Site #: Soehren 13(B)

Location: On the southern boundary of the property, 110' east of the excluded property (L.C.A. 9971) and 30' east of Soehren 13(A). This site straddles the property line.

Description: Soehren describes this site as a lower rough platform to the east of 13(A) and as a grave site. This platform is 24' long north/south by 12' wide east/west and has a maximum height of 3.3'. This site is constructed with boulders and cobbles. There are two levels to the platform with the higher level to the south being 1' higher than the northern level. The higher level is cobble paved and the lower level has an uneven boulder and cobble paving. No coral, midden, manuports, or artifacts were observed on the surface. There is a high probability of burials with the likelihood of one burial in each level.

Site #: Soehren 14

Location: This site lies within the eastern portion of the excluded property (L.C.A. 9971) and is thus outside the project area.

Description: Soehren describes this as an old Hawaiian house site, terraces, and midden scatter. This site was identified and includes a relatively large cave shelter 30' to the northwest. There is much midden and many modern historic artifacts in the area. As the site is outside the project area it was examined only briefly.

Site #: Soehren 15 (called "L" by Rosendahl)

Location: In the extreme southwestern portion of the project area. This site is adjacent to and northwest of (inside) the southern property boundary. This site lies almost entirely within the project area. This site is 30' southeast of the north wall of the walled enclosure and is 40' east of Soehren 16 (called "E" by Rosendahl)

Description: Soehren (1977) describes this site as a stone house platform or _kahua_ _hale_ and considers it as port of a _kauhale_ including Soehren sites 16, 17, and 18. Rosendahl (1979) seemingly unaware of Soehren's work called this site feature "L" and described it as a probable residential feature and as a stepped platform. Rosendahl also regarded this site as a component of a _kauhale_ which he designated feature "B" and assigned Hawaii State Register Site No. 50-10-28-5609. The upper terrace measures 25' north/south by 30' east/west. The lower terrace measures 10' east/west by 20' north/south. The _makai_ face of the upper terrace is 2' high and in good condition. The upper paving is in poor condition and the lower paving is in good condition. Rosendahl's map (1979:Fig.2) of the site and its relationship to the other features of the _kauhale_ is essentially correct. This site does not have the appearance of a burial site.

Site #: Soehren 16 (called "E" by Rosendahl)

Location: In the extreme southwestern portion of the project area this site is adjacent to the north wall of the walled enclosure. This site is 40' west of Soehren 15 and 15' east of Rosendahl's Site "D".

Description: Soehren (1977) describes this site as a habitation platform or kahua hale and considers it as part of a kauhale including Soehren Sites 15, 17, and 18. Rosendahl (1979) again seemingly unaware of Soehren's work, called this site feature "E" and described it as a platform and probable residential feature. This platform measures 21' north/south by 27' east /west and 1.5' high. It has a level boulder and cobble surface with a boulder facing on the west side. Soehren's "children's fort" is probably a C-shape constructed on the platform surface and may be older than Soehren thought. This site is not considered to contain burials.

Site #: Soehren 17 (called "C" by Rosendahl)

Location: In the extreme southwestern portion of the project area this site is adjacent to the north wall of the walled enclosure and lies 50' southeast of the project boundary with the Kalani Kai Condo. The southwest wall of the walled enclosure has been bulldozed up to the southwest edge of this site.

Description: Soehren (1977) describes this site as a habitation platform or _kahua hale_ and considers it as part of a _kauhale_ including Soehren sites 15, 16, and 18. Rosendahl (1979), seemingly unaware of Soehren's work, called this site feature "C" and described it as a platform and probable residential feature. This platform is 15' long east/west by 14' wide north/south and is 1' high. Bulldozing has pushed right up to the southwest edge of this site but it appears intact. This site does not appear to be a burial site.

Site #: Soehren 18 (called "G" by Rosendahl)

Location: In the extreme southwestern portion of the project area this now demolished site lay just south (outside) of the south boundary of the property. A remnant of this site remains 30' southeast of the south corner of Soehren Site 16.

Description: Soehren (1977) describes this site as another <u>kahua hale</u> and considers it a part of a <u>kauhale</u> including Soehren Sites 15, 16, and 17. Rosendahl (1979), seemingly unaware of Soehren's work calls this feature "G" and describes it as a platform and probable residential feature. This site has been heavily impacted by bulldozing and only a portion of paving about 8' square remains. As this site has been essentially destroyed and is outside of the project area, it was examined only briefly.

Site #: Rosendahl "A"

Location: Was located in the southwestern portion of the project area seaward of the inlying parcel L.C.A. 9971 just north of Kuakini Highway.

Description: Described by Rosendahl in 1979 as a cattle pen with loading ramp, this historic site has since been obliterated by bulldozing. No trace remains.

Site #: Rosendahl "B"

Location: In the extreme southwestern portion of the project area seaward of the inlying parcel L.C.A. 9971.

Description: Rosendahl uses "Feature B" to designate a large enclosure and its included features (Rosendahl Features C through G and L). He later described B and its included features as site no. 50-10-28-5609. Rosendahl discusses this as a probable residential complex enclosure. These designations are for the same walled "house compound" Soehren discusses in regard to his cluster of four house platforms (Soehren Sites 15, 16, 17, 18).

Between 1979 and 1989 bulldozing obliterated the southern portion of Rosendahl's Feature B enclosure. The southeast wall and the southeast portion of the east wall are gone. Bulldozing push extends to the west side of Soehren's Feature 17 (Rosendahl's "C") but the four major platforms (Soehren Sites 17, 16, and 15 and Rosendahl's platform Feature "D") are intact. The wall section Rosendahl designates "F" is about as intact as it was as the bulldozing ends about 10' away to the west and south. Rosendahl's feature "G" which was enclosed and included in his feature "B" is effectively lost. The site location is discernable but it has been heavily impacted by bulldozing. The remaining portions of Rosendahl's Feature "B" wall are about 3.5' high and 3' wide and are pretty jumbled in some places.

Site #: Rosendahl "D"

Location: In the extreme southwestern portion of the project area this site lies within the walled enclosure (Rosendahl "B") and is 10' west of Soehren 16 and is 10' east of Soehren 17.

Description: This site was described by Rosendahl as a platform and probable residential feature. This platform measures 11' east/west by 12' north/south and is 1' high. This site has a relatively level cobble paving. It does not have the appearance of a burial site.

Site #: Rosendahl "F"

Location: In the extreme southwestern portion of the project area within the walled enclosure (Rosendahl "B"), the best portion of this wall is 20' east of Soehren 16.

Description: Described by Rosendahl as a wall section 1.0 m. wide, 1.5 m high and 4.7 m long with a possible wall foundation extending an additional 6.2 m to the southeast. This is a bifaced core filled wall, the foundation of which can be traced for 39'. As the southeastern wall of the residential complex has not been cut by bulldozing until about 10' southwest of this wall remnant, it appears that this wall remnant has not been further damaged since 1979. There are no burials here.

Site #: Rosendahl "H"

Location: In the extreme southwestern portion of the project area just south (outside) of the property boundary this site is now obliterated.

Description: This designated platform/terrace has been obliterated by bulldozing in the last ten years. Rosendahl (1979) reported it as a crude feature and possible burial 3 m wide, 4 m long and 0.2 m high. As this area has been extensive bulldozed and lies outside of the project area little time was spent searching for the remaining trace of this site.

Site #: Rosendahl "I"

Location: In the extreme southwestern portion of the project area just south (outside) of the property boundary this site is now obliterated.

Description: This designated enclosure, possibly a residential feature or animal pen has been obliterated by bulldozing in the last ten years. Rosendahl (1979) reported it had a length of 9.8 m, a wide of 7.5 m and a height of up to 1.5 m. As this area lies outside the project area and has been extensively bulldozed, little time was spent searching for a remaining trace of this site.

Site #: Rosendahl "J"

Location: In the extreme southwestern portion of the project area just south (outside) of the property boundary this site is now obliterated.

Description: This designated wall section has been obliterated by bulldozing in the last ten years. Rosendahl (1979) reported it as a low retaining wall section measuring 5 m long, 1 m wide, and 0.2 m high. As this area lies outside the project area and has been extensively bulldozed, little time was spent searching for a remaining trace of this site.

Site #: Rosendahl "K"

Location: In the extreme southwestern portion of the project area it appears that this enclosure wall forms the large in-lying parcel and is thus a boundary of the project area.

Description: This large enclosure wall appears to be intact where it borders the project area but some sections are jumbled. The wall is 3-4' high and 3' wide. As this wall forms a boundary of the project area little time was spent examining this inlying excluded parcel.

Site #: Rosendahl "M"

Location: Rosendahl (1979) places feature M, a historic tomb about 100' west of the Great Wall of Kuakini in the easternmost end of his survey corridor. Because of some confusion about the location of the exclusion parcel (L.C.A. 9971) in his Figure 1, how far south of the project boundary the crypt lies is unclear but it is almost certainly well outside the project area.

Description: This site was not encountered and is believed to have been east and south of the project area. Rosendahl describes this as a historic tomb with an arched roof and low enclosing wall. The tomb measured 3 m long by 2 m wide by 1.3 m high. It is believed to be outside the property to the east and south.

Site #: Rosendahl "N"

Location: Rosendahl (1979) places this cave shelter about 100' east of the east boundary of the excluded property (L.C.A.9971). However, because of some confusion about the location of the excluded parcel in his Figure 1, the location of the cave entrance is unclear. While a few lava tubes were encountered just east of the excluded property, none were anywhere near the 30 m long cave Rosendahl reports.

Description: This site was not relocated and may lie far south of the project area. Rosendahl reports this as a cave shelter, with a width of greater than 5 m, a length estimated at 30 m and a maximum height of 2 m. He reports a substantial soil deposit and several interior modifications. While some small lava tube features were examined, in the south portion of the project area just east of the excluded property, nothing approaching this size was encountered.

Site #: CSH 1

Location: In the southwestern portion of the project area 15' northwest of the excluded parcel (L.C.A. 9971) and 70' northeast of the west corner of the excluded parcel.

Description: This site was a small sink lava tube with a length of 15', a maximum height of 1', and a width of 3' to 4'. This lava tube extends between two bedrock sinks, each about 10' in diameter. The floor of the tube is soil about 10 cm thick. Marine midden was observed in the tube nd there has been some stacking of stones in the <u>mauka</u> portion of the tube to improve it. No artifacts were observed and there are no burials.

Site #: CSH 2

Location: In the southwestern portion of the project area this site is 240' northwest of the north wall of the excluded parcel (L.C.A. 9971), 180; east of the wire fence near the Kalani Kai Condos and 280' southwest of Soehren Site 11. There are no other sites or notable land forms in the immediate vicinity. It is 190' TN to the big kiawe tree of the CSH Site 1 lava tube.

Description: This is a roughly rectangular habitation platform and/or burial measuring 14' north/south by 8' east/west with a rough cobble surface and a maximum height of 1.5'. The probability of burials is fair.

Site #: CSH 3

Location: In the northwest portion of the project area this site is 90' northwest of Soehren 11 and is 50; east of the fence line and 80' south of the nearest bulldozing associated with the shopping center development.

Description: This is a small roughly square platform measuring 8' by 8' and 1.5' high built on a bedrock ledge. This possible field shelter is roughly level and is constructed of cobbles. Some marine shell midden was observed on the surface of the site with more midden and coral just mauka. The probability of burials is low.

Site #: CSH 4

Location: In the northwest portion of the project area 60' north, northeast of Soehren 10 and adjacent to the fence of the construction baseyard. Bulldozer push from the shopping center development has destroyed the northwest portion of the site.

Description: This roughly triangular shaped platform remnant has been bulldozed on the north and west sides. The remnant is 30' by 30' with a roughly leveled boulder and cobble surface. There is an intact facing 1.5' high on the southeast side. No manuports or artifacts were observed. The probability of burials is low.

Site #: CSH 4

Location: In the northwest portion of the project area 60' north, northeast of Soehren 10 and adjacent to the fence of the construction baseyard. Bulldozer push from the shopping center development has destroyed the northwest portion of the site.

Description: This roughly triangular shaped platform remnant has been bulldozed on the north and west sides. The remnant is 30' by 30' with a roughly leveled boulder and cobble surface. There is an intact facing 1.5' high on the southeast side. No manuports or artifacts were observed. The probability of burials is low.

Site #: CSH 5A

Location: In the west central portion of the project area, this feature is 110' northeast of Soehren 11 and 190' west of Soehren 8. CSH Site 5 Feature A is just north of Site 5 Features B, C, and D.

Description: This is a large roughly U-shaped habitation enclosure with a north/south length of 36', an outer width of 22' and an interior width of 5'. The opening is to the north. The site is constructed of piled boulders with the boulders piled directly on bedrock on the makai side. The maximum height is 3' and it has a soil interior. No coral, midden, manuports, or artifacts were observed. The probability of burials is very low.

Site #: CSH 5B

Location: In the west central portion of the project area, this feature is 120' east, northeast of Soehren 11 and 180' southwest of Soehren 8. CSH Site 5 Feature B is 30' southeast of Feature A and 15' east of Site 5 Feature C.

Description: This modified bluff has a rough sloping terrace constructed of piled boulders at the top of the bluff. This possible field shelter is 15' square but has some exposed bedrock. Basically, it is boulders piled on the mauka and makai sides of the small bluff top. The mauka side has a good facing 3' high. The probability of burials is low.

Site #: CSH 5C

Location: In the west central portion of the project area, 90' east, northeast of Soehren 11 and 210' west, southwest of Soehren 8. CSH Site 5 Feature C is 15' west of Feature B.

Description: This platform measures 13' north/south by 11' mauka/makai and is 4' high on the makai side. The makai portion of the platform has a mounded appearance and slopes makai with no good facing. This site is relatively level on the mauka side with a paving of boulders and some cobbles. There is a probable boulder facing on the southeast side. This is a possible grave containing one burial.

Site #: CSH 5D

Location: In the west central portion of the project area, this feature is 70' northeast of Soehren 11 and 30' southwest of CSH Site 5 Feature C.

Description: This probable clearing feature is roughly L-shaped with the long axis running 15' north/south and the short leg extending 8[' to the east upslope. This site consists of the facing up of the bottom slope on the makai side of a bluff. The facing is constructed of large boulders and in some places as much as 4' high. There is some coral scattered on this site. A 4' wide narrow rocky terrace has been constructed, probably as a result of clearing the land immediately makai. The probability of burials is low.

Site #: CSH 6

Location: In the east central portion of the project area, this feature is 40' south of Soehren 4.

Description: This is a modified outcrop consisting of (1) an oval shaped level cobble paved surface on top of an outcrop measuring 10' by 13' (44° TN); (2) a mauka level area 2' to the east and 1' to 2' above the surrounding terrain measuring 8' east /west by 14' north/south; and (3) a long terrace, 8' below the oval paving, on the makai side of the slope measuring 42' long by 7' wide and constructed of piled boulders. In the mauka level area a constructed cupboard like feature measuring about 2' wide, 1.5' high and 4' into the construction was observed. This is a probable burial feature.

Site #: CSH 7

Location: In the east central portion of the project area, this feature is 50' southwest of Soehren 4.

Description: This well-faced terrace measures 17' north/south by 10' east/west. The makai face is an impressive 5.5' high of well stacked boulders. The surface of this terrace is of boulders and cobbles. There is some piling of boulders upslope from the south side of the terrace. This site has a high probability of being a burial site.

Site #: CSH 8

Location: In the south central portion of the project area, this site is 110' south of Soehren 4, 50' south of CSH 6.

Description: This terrace measures 18' northwest/southeast by 8' northeast/southwest and is 4' high. It is well faced on the makai side. It is of stacked boulder construction and has a level boulder and cobble surface. This is probably an agricultural feature but is a possible habitation. The probability of burials is low.

Site #: CSH 9

Location: In the eastern corner of the project area, this site is 25' north of the southern property boundary and is about 240' southwest of the Queen Ka'ahumanu Highway corridor.

Description: This irregularly shaped site consists of two distinct adjoining features, a boulder terrace to the north and a platform to the south. The north feature is a well defined boulder terrace measuring 10' north/south by 4' east/west with the rubble terrace 6' wide on the makai side.

The southern feature is a platform measuring 10' north/south by 6' east/west with a makai (west) vertical face of stacked boulders 4' high. The mauka portion of the platform is somewhat C-shape open mauka. There is a 2.5' facing on the south, east, and north sides. The C-shape area has a rocky soil surface where two pieces of coral were observed.

This site is probably a pre-historic habitation feature that has been severely impacted by rock robbing for the construction of a nearby wall. The site may be a cattle ramp feature but no historic artifacts were observed. Burial probability appears low.

Site #: CSH 10

Location: In the northeast portion of the project area, this site is 110' northwest of Soehren 2A and 105' southwest of Soehren 1 and 100' south of the sharp angle in the stone wall (D8-23) near the Queen Ka'ahumanu Highway corridor.

Description: This modified outcrop consists of a faced and leveled bluff scarp with the northern edge roughly faced for 10' with an 8' wide leveled area behind it. This leveling has produced an 8' wide boulder paving. No artifacts, midden or manuports were observed. The probability of burials is low.

Site #: CSH 11 (B.P. Bishop Museum Site D 8-21)

Location: In the northeast portion of the project area, this site is 30' northwest of the sharp angle in the stone wall (D8-23) near the Queen Ka'ahumanu Highway corridor. Site CSH 11 is 135' northwest of Soehren 1, 120' north, northwest of CSH 10 and 95' northeast of Site CSH 12.

Description: This fairly level terrace is 9' square on the north side of a low bluff. It is constructed of boulders and leveled off with cobbles. The face of this terrace is mostly bedrock with some boulder stacking 3' high. One water-worn basalt cobble was observed. This site is believed to have been designated as D8-21 by the B.P. Bishop Museum (Schilt 84:29). The probability of burials is low.

Site #: CSH 12

Location: In the northeast portion of the project area, this site is 120' west, southwest of the sharp angle in the stone wall (D8-23) near the Queen Ka'ahumanu Highway corridor. Site CSH 12 is 95' southwest of CSH 11 and 135' northwest of CSH 10.

Description: This small modified outcrop has a very uneven top surface of bedrock with some boulder leveling. There has been some piling of boulders along the north edge of the outcrop to a maximum height of 3.5' and extending for 20' to the southeast. No midden, manuports or artifacts were observed. This site is also believed to have been designated by the B.P. Bishop Museum as Site D8-21 (Schilt 84:29). The probability of burials is low.

AU S ESCRI TABL

Site	Description	Test Trenches	Coral	Midden	Artifacts	Possible Burials	Comments
Soehren1	TERRACE	---	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED	NO	TEST TR 1 CONTAINED MORE MATERIAN THAN +.+.2
Soehren2A	MOD.OUTCROP	2 1MSQ	ABUNDANT	ABUNDANT	VOL.GLASS & BASATL FLAKES	NO	
Soehren2B	PAVED TERRACE	1 MSQ	ABUNDANT	SPARSE	2WATERWORN STONES ON SRFC	NO	CORAL & WATERWORN STONES OBSV'D ON SURFACE
Soehren3	PLATFORM	1 MSQ	ABUNDANT	ABUNDANT	ABUNDANT ASSORTED ARTFCS	NO	
Soehren4	2 ADJ.TERRACES	---	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED	NO	
Soehren5A	PLATFORM	---	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED	NO	
Soehren5B	PLATFORM	1 MSQ	FEW PIECES	SPARSE	1 VOL.GLASS FLAKE	NO	
Soehren6	PLATFORM	1Mx2M	ABUNDANT	MODERATE AMT	ABUNDANT VOL.GLASS	NO	MOSTLY PEBBLE CORAL
Soehren7	TERRACE	1Mx2M,1Mx1.2M	FEW PIECES	SPARSE	2 HAMMRSTN, ADZ FLAKES	NO	
Soehren8	FILLED CREVICE	1 1.2Mx.75M	ABUNDANT	ABUNDANT	NONE OBSERVED	NO	
Soehren9	PLATFORM	---	MANY FRAG.S OBSV	SURFACE SCATTER	SCORIA FILE-CORAL ABRADER	NO	BULLDOZED
Soehren10	MIDDEN SCATTER	---	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED	NO	MIDDEN SCATTER ON BEDROCK
Soehren11	2 PAVED AREAS	---	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED	NO	
Soehren12	PLATFORM?	---	FEW PIECES	SOME SURFACE SC	WATER-ROUNDED MANUPORTS	NO	DISTURBED BY BULLDOZING
Soehren13A	PLATFORM	---	FEW PIECES	NONE OBSERVED	NONE OBSERVED	YES/3-5	
Soehren13B	MOUND	---	MODERATE AMT	NONE OBSERVED	ADZ FRAG. ON SURFACE	YES/1-2	
Soehren14	HAB.SITE	---	NONE OBSERVED	MODERATE AMT	NONE OBSERVED	NO	OUTSIDE PROPERTY
Soehren15	PLATFORM	---	FEW CHUNKS	NONE OBSERVED	NONE OBSERVED	NO	ROSENDAHL "L"
Soehren16	PLATFORM	---	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED	NO	ROSENDAHL "E"
Soehren17	PLATFORM	---	FEW CHUNKS OBS	NONE OBSERVED	FEW WATERWORN PEBBLES	NO	ROSENDAHL "C"
Soehren18	PLATFORM	---	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED	NO	ROSENDAHL "G",OUTSIDE PROPERTY, BULLDOZED
RosendahlA	CATTLE PEN	---	---	---	---	---	BULLDOZED
RosendahlB	ENCLOSURE	---	FEW PIECES	SPARSE	NONE OBSERVED	NO	SOUTH PORTION BULLDOZED
RosendahlC	PLATFORM	---	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED	NO	
RosendahlD	WALL	---	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED	NO	
RosendahlF	---	---	---	---	---	---	BULLDOZED, OUTSIDE PROPERTY
RosendahlH	---	---	---	---	---	---	BULLDOZED, OUTSIDE PROPERTY
RosendahlI	---	---	---	---	---	---	BULLDOZED, OUTSIDE PROPERTY
RosendahlJ	---	---					OUTSIDE PROPERTY(DEFINES L.C.A. 9971
RosendahlK	ENCLOSURE	---					OUTSIDE PROPERTY
RosendahlM	HISTORIC TOMB	---					OUTSIDE PROPERTY
RosendahlN	CAVE SHELTER	---					OUTSIDE PROPERTY?

LANIHAU SITE DESCRIPTION TABLE

CSH1	SML CAVE	---	SOME MARINE MIDD	NONE OBSERVED	NONE OBSERVED	NO	
CSH2	PLATFORM	---	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED	YES/?	
CSH3	PLATFORM	---	SOME MIDDEN	SOME CORAL	NONE OBSERVED	NO	
CSH4	PLATFORM	---	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED	NO	DAMAGED BY BULLDOZING
CSH5A	ENCLOSURE	---	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED	NO	
CSH5B	MOD.BLUFF	---	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED	NO	
CSH5C	TERRACE	---	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED	YES/?	
CSH5D	TERRACE	---	SOME OBSERVED	NONE OBSERVED	NONE OBSERVED	NO	
CSH6	MOD.OUTCROP	---	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED	YES?	
CSH7	TERRACE	---	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED	YES/?	
CSH8	TERRACE	---	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED	NO	
CSH9	HAB.FLAT	---	FEW PIECES	NONE OBSERVED	NONE OBSERVED	NO	POSSIBLE HISTORIC CATTLE RAMP
CSH10	MOD.BLUFF	---	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED	NO	
CSH11	TERRACE	---	NONE OBSERVED	1WATERWORNSTONE	NONE OBSERVED	NO	
CSH12	MOD.OUTCROP	---	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED	NO	

LANIHAU ARTIFACTS

ACC	BAG	SITE	TRNCH	TR.SIZE	# PCS	LENGTH	WIDTH	THKNESS	WEIGHT	MATERIAL	TYPE	COMMENTS
1	1	3(SOEHREN)	1	1 MSQ	1	4.2	2.8	2.5	45.6	Stone, basalt	core	PLATFORM FILL
2	1	3(SOEHREN)	1	1 MSQ	1	6.7	4.1	1.7	32.0	Stone, scoria	file/saw	PLATFORM FILL
3	1	3(SOEHREN)	1	1 MSQ	2	3.4,5.2	2.9,3.5	0.8,2.2	62.6	Stone, basalt	adz frag	PLATFORM FILL
4	1	3(SOEHREN)	1	1 MSQ	1	2.0	1.7	0.9	5.2	Stone, basalt	konani stone possibly	PLATFORM FILL
5	1	3(SOEHREN)	1	1 MSQ	1	1.4	1.1	0.5	1.1	Vol.glass	flake	PLATFORM FILL
6	1	3(SOEHREN)	1	1 MSQ	1	5.4	5.1	3.6	84.0	Coral	hammerstone, round	
7	1	3(SOEHREN)	1	1 MSQ	1	4.3	2.1	1.8	27.2	Stone, basalt	hammerstone	
8	1	3(SOEHREN)	1	1 MSQ	1	5.1	2.1	0.7	5.3	Bone	preform fishhook	
9	1	3(SOEHREN)	1	1 MSQ	1	5.2	0.8	0.6	1.1	Bone	birdbone pick	
10	1	3(SOEHREN)	1	1 MSQ	1	2.4	2.3	0.3	3.1	Shell, cut	prl shell fishhook preform frag	
11	1	3(SOEHREN)	1	1 MSQ	1	5.6	5.0	0.3	15.2	Shell	opihi shell scraper	
12	1	3(SOEHREN)	1	1 MSQ	1	4.4	1.5	0.4	1.6	Bone	barb of 2-piece fisshook	
13	1	3(SOEHREN)	1	1 MSQ	2	2.0,2.1	1.6,1.6	1.1,1.1	3.5	Shell, bead	kupee	
14	1	3(SOEHREN)	1	1 MSQ	1	3.7	2.1	1.3	8.2	Coral	abrader	
15	1	3(SOEHREN)	1	1 MSQ	1	2.9	1.5	0.9	2.6	Coral	abrader	
16	1	3(SOEHREN)	1	1 MSQ	1	1.6	1.4	1.0	1.7	Coral	abrader	
17	1	3(SOEHREN)	1	1 MSQ	2	2.3,3.6	1.3,1.2	0.4,0.3	2.1	Bone, cut		
18	1	3(SOEHREN)	1	1 MSQ	1	5.7	0.7	0.5	1.2	Sea urchin	file	
19	1	3(SOEHREN)	1	1 MSQ	1	2.9	1.6	1.5	0.8	Sea urchin	file frag	
20	1	3(SOEHREN)	1	1 MSQ	1	3.4	0.9	0.6	0.9	Sea urchin	file	
21	1	3(SOEHREN)	1	1 MSQ	1	3.2	1.6	0.9	3.2	Stone, scoria	file/saw tip	
22	1	3(SOEHREN)	1	1 MSQ	5	1.6-2.9	1.1-2.0	0.2-1.1	12.2	Stone, basalt	adz frags, polished	
23	1	3(SOEHREN)	1	1 MSQ	45	1.1-3.4	0.6-1.8	0.3-0.8	28.0	Vol.glass	flakes	
24	1	3(SOEHREN)	1	1 MSQ	1	2.1	0.7	0.3	0.5	Vol.glass	file tip	
25	2	2A(SOEHREN)	1	1 MSQ	37	1.0-2.5	0.7-1.9	0.2-1.1	34.3	Stone, basalt	flakes	
26	2	2A(SOEHREN)	1	1 MSQ	3	2.0-2.7	1.3-2.1	1.0-1.7	20.4	Vol.glass	cores	0-40 B.S.S.
27	2	2A(SOEHREN)	2	1 MSQ	2	1.0,1.6	0.8,1.1	0.2	0.9	Stone, basalt	flakes	0-40 B.S.S.
28	2	2A(SOEHREN)	2	1 MSQ	1	1.2	1.0	0.4	0.8	Vol.glass	flake	0-40 B.S.S.
29	3	5B(SOEHREN)	1	1 MSQ	1	2.3	1.8	0.6	3.1	Vol.glass	adz frag	0-40 B.S.S.
30	3	5B(SOEHREN)	1	1 MSQ	1	1.8	1.3	0.3	1.0	Vol.glass	flake	
31	4	6(SOEHREN)	1	1Mx2M	67	0.9-2.4	0.8-2.1	0.1-0.9	49.0	Vol.glass	flakes	
32	4	6(SOEHREN)	1	1Mx2M	3	2.3-3.2	1.4-1.8	1.4-2.0	31.3	Vol.glass	cores	
33	4	6(SOEHREN)	1	1Mx2M	2	5.0,5.4	3.6,3.8	2.5,3.3	167.1	Stone, basalt	waterrounded hammerstones	
34	4	6(SOEHREN)	1	1Mx2M	2	1.3,1.6	0.6,1.3	0.5,0.5	2.9	Stone, basalt	flakes, polished	
35	4	6(SOEHREN)	1	1Mx2M	3	1.6-1.8	0.8-1.1	0.4-0.5	2.7	Stone, basalt	flakes	
36	5	8(SOEHREN)	1	1Mx2.8M	1	3.6	1.5	0.7	3.3	Stone, scoria	file/saw	
37	5	8(SOEHREN)	1	1Mx2.8M	1	5.2	3.4	3.5	4.4	Coral	abrader	

LANIHAU MIDDEN

BAGSITE	TRENCH	TRNCH SIZE	CORAL	MIDDEN	ARTIFACTS	COMMENTS
1 2ASOEHREN	1	1 MSQ	ABUNDANCE	101.5	VOL.GLASS & BASALT FLAKES	ABUND.CORAL & MIDDEN, MOSTLY MARINE SHELL W/SOME KUKUI
1 2ASOEHREN	2	1 MSQ	SOME	26.0	BASALT & VOL.GLASS	SPARSE MIDDEN W/ SOME CORAL
2 2BSOEHREN	1		ABUNDANCE	24.5	NONE	ABUND.CORAL W/SOME MIDDEN,MOSTLY MARINE SHELLS,1 KUKUI
3 3SOEHREN	1	1 MSQ	ABUNDANCE	164.2	ABUNDANCE	MIDDEN FR.PLATFRMFILL/ABUND MOSTLY MAR.SHELL W/SOME BONE
3 3SOEHREN	1	1 MSQ	ABUNDANCE	800.0	ABUNDANCE	MAR.SHELLS,ABUND KUKUI,BIRD,FISH,&PIG BONES, SHARK TOOTH
4 5BSOEHREN	1	1 MSQ	SOME	24.1	POLISHED FL & VOL.GLASS FL	MARINE SHELL MIDDEN
5 6SOEHREN	1	1 Mx2M	ABUNDANCE	67.6	ABUND. VOL.GLASS W/ SOME BASALT FL	MARINE SHELL MIDDEN
6 7SOEHREN	1	1 Mx2M	SOME	37.9	NONE	MARINE SHELL MIDDEN
6 7SOEHREN	2	1 Mx1.2M	SOME	9.5	NONE	SPARSE MARINE SHELL MIDDEN
7 8SOEHREN	1	1 Mx2.8M	ABUNDANCE	262.0	SCORIA FILE & CORAL ABRADER	ABUNDANT MARINE SHELL MIDDEN

DATA RECOVERY PLAN FOR
ARCHEOLOGICAL SITES
IN A 24-ACRE PARCEL
LANIHAU, KONA, HAWAI'I ISLAND
(TMK 7-5-04:7, Por.9)

by
Hallett H. Hammatt, Ph.D.

Prepared for

Lanihau Partners

by
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July 1989

Introduction

This plan has been prepared as part of mitigation measures for significant archaeological sites within a 24-acre parcel south of the present Lanihau Shopping Center (TMK 7-5-04:7 por.9). This parcel is planned for development as an extension of the existing shopping center. It is bounded on the north side by the present Lanihau Shopping Center, on the east side by Queen Ka'ahumanu Highway extension, on the south side by a property line marked in places by a stone cattle wall. The west or makai boundary adjoins the existing condominiums and undeveloped lots. The northwest portion of the study area has been previously graded during construction of the present Lanihau Shopping Center and recent bulldozing has disturbed the southwest boundary area. The rest of the property is undisturbed in modern times and has been used for pasturage.

The parcel is basically rectangular, except for 100-foot wide corridor which extends makai to Kuakini Highway. Elevation ranges from 40 feet to 170 feet above sea level.

The bulk of the parcel lies within the ahupua'a of Lanihau (2nd) but the southern portion includes the entire width of Moeauoa (2nd). The southern property boundary is also the ahupua'a boundary between Moeauoa and Keopu. There is a small rectangular exclusion at the southern boundary of the property which is a land grant in Moeauoa.

Previous Archaeological Research

Four previous archaeological studies have been conducted in the present study area. These are briefly described as follows:

Soehren (1977)

This five-page reconnaissance report briefly describes eighteen sites, of which 12 are identified as grave sites. A cluster of 4 house platforms were identified in the southeast portion which were thought to be "the house compound of a person of some rank" (Soehren 1977:1).

Rosendahl (1979)

A short reconnaissance survey by Rosendahl reports on fourteen archaeological features designated A through N, some of which were newly located features and other were relocations of features found by Soehren. rosendahl assigned the residential com;lex in the southeast corner State Site No. 50-10-28-5609 (Rosendahl, 1979).

Rosendahl (1980)

An additional project was conducted by Rosendahl to address specific questions of site locations in the southeast corner of the project area and to make correlations of Rosendahl's 1979 sites and Soehren's 1977 sites (Rosendahl 1980).

Hammatt, Shideler (1989)

In 1989 Cultural Surveys conducted a systematic reconnaissance survey of the entire project area. This report (Hammatt and Shideler 1989) contains the following information.

1. Location of all archaeological features on a 1-inch = 40 ft scale topographical map of the project area;
2. Descriptions of all sites with sketch maps of major features;
3. Results of excavation of nine test pits at seven archaeological features. The purpose of the testing was to determine site function (burial, agricultural, residential, etc.) and to estimate specifically the location and number of burials and the extent of cultural deposits within the sites;
4. Evaluation of site significance according tot he National Register criteria;
5. Recommendations for preservation and further data recovery.

It was determined through testing, in all cases to sterile deposits on bedrock, that the majority of sites previously identified as burials are either agricultural mounds or residential features. Three features were evaluated as probable burials and an additional 3 with a moderate potential for containing burials. No human burials were encountered in the test excavations. The majority of archaeological features were identified as agricultural mounds or terraces or short-term habitation features. Permanent residential features do occur in 2 clusters - one at the southeast end and the other in the central portion. The most productive residential feature in terms of the testing results, was Soehren Site 3.

Studies in Adjacent Areas

In addition to the above-mentioned studies, four other archaeological studies have been conducted in the immediate vicinity (Schilt 1981, Schilt 1984, Han et al. 1986, and Rosendahl 1988).

In 1981 the B.P. Bishop Museum (Schilt, 1981) conducted a reconnaissance level survey of two parcels ("A" - 1.9 acres and "B" - 2.7 acres) immediately adjacent and to the west of the northwest portion of the present study area. Eight sites or site complexes were recorded and two phases of further archaeological investigations were suggested.

From 1980 to 1982 the B.P. Bishop Museum conducted several seasons of field work in the Kuakini Highway realignment corridor (Schilt 1984) which forms the northeast boundary of the present study area. This research investigated a number of sites in close proximity to the project boundary. Several sites, including D8-19, a mauka/makai trail; D8-20, platform and terraces; D8-21, modified outcrops; D8-22, a historic house; D8-23, walls, modified outcrops, and platform; and D8-30 the burial complex, all lie within 200 feet of the project area and must be considered in the analysis of the prehistory of the present project area.

The B.P. Bishop Museum undertook complete excavation of burial complex D8-30 (Han et al. 1986) and exhumed 355 burials. These burials were thought to be commoners (maka'ainana) and dated from perhaps as early as the mid-thirteenth century into historic times. This burial ground of long standing extended to within about fifty feet of the northeast corner of the project area. While "complete excavation of Site D8-30" is asserted (Han 1986:1), the presence of such a large burial ground so close to the project area deserves special consideration.

In all, more than thirty separate archaeological reports have been produced on Lanihau _ahupua'a_ (Spriggs and Tanaka 1988). Thorough background research should involve an attempt to place the prehistory of the project area within the context of the _ahupua'a_.

Number of Sites and Significance Evaluations

A total of 37 archaeological features are determined to be on the property. Of these, 4 are evaluated as being no longer significant because of previous disturbance or lack of cultural or scientific interest beyond their location on a map (all segments, etc). This leaves 33 significant features remaining. All of these are evaluated as being "likely to yield information important to prehistory or history." Six sites likely to contain burials are evaluated as having cultural significance (Soehren 13A, 13B, CSH2, CSH5C CSH6 and CSH57). The only 2 sites which are virtually certain to contain burials are Soehren 13A and B. These two sites (which straddle the southern property line) are also evaluated as excellent examples of site types. Table 1 presents a summary list of sites with significance assessments.

Table 1

Lanihau Sites Summary Table and Significance Evaluations

Site Numbers Soeh-ren	Rosen-dahl	CSH	Work done	Comments	
1			Located	Probable agricultural terrace	D
2(a)			Located, tested	Habitation site, no burials	D
2(B)			Located, tested	Habitation site, no burials	D
3			Located, tested	Major habitation deposits, no burials found, but possibility of secondary burials	D
4			Located	Habitation site, probably no burial	D
5(A) 5(B)			Located	Small habitation site, probably no burial	D
6			Located, tested	Habitation site, no burials	D
7			Located, tested	Habitation site, no burials	D
8			Located, tested	Small habitation, no burial	D
9			Not Located	Bulldozed?	-
10			Located	disturbed, no burials	NLS
11			Located	Habitation site, probably no burials	D
12			Partially destroyed	Outside property	-
13(A)			Located	Burial platform	C,D,E
13(B)			Located	Burial platform	D,E
14			Located	Outside property	-
15	L		Located	Paved terraces, probably no burials	D
16	E		Platform	Habitation site, probably no burials	D
17	C		Platform	Habitation site, probably no burials	D
18	G		Located	Partly on property, but bulldozed	NLS
	A		Located?	Destroyed	NLS
	B		Located	Walled enclosure partly destroyed	D
	D		Located	Habitation site, probably no burials	D
	F		Located	Wall remnant, partly bulldozed	NLS
	H		Located?	Outside property, bulldozed	NLS
	I		Located?	Outside property, bulldozed	NLS
	J		Located		NLS
	K		Located	Outside property	-
	M		Not located	Outside property	-
	N		Not located	Outside property	-

Site Numbers Soeh-ren	Rosen-dahl	CSH	Work done	Comments	
		1	Located	Possible habitation, no burials	D
		2	Located	Habitation, burials	D,E*
		3	Located	Habitation, no burials	D
		4	Located	Partly bulldozed habitation platform	D
		5A-D	Located	Habitation Complex, 1 possible burial (5C)	D(E*)
		6	Located	Habitation, possible burial	D,E*
		7	Located	Possible burial platform	D,E*
		8	Located	Terrace (agricultural)	D
		9	Located	Habitation? no burials	D
		10	Located	Modified bluff, no burials	D
		11(BM11)	Located	Terrace, no burials	D
		12 BM121	Located	Modified outcrop, no burials	D

CODES FOR CRITERIA FOR SITE SIGNIFICANCE

NS	Not Significant
NLS	No Longer Significant
A	Site reflects major trends or events in the history of the state or nation
B	Site is associated with the lives of persons significant in our past
C	Site is an excellent example of a site type.
D	Site may be likely to yield information important in prehistory or history.
E	Site has cultural significance; probable religious structures (shrines, heiau) and/or burials present

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E* Signifies site is only a possible burial or religious feature.
( ) Parenthesis used for feature criterion
D Letter without parenthesis used for site criterion

Present Mitigation Plans

As a result of consultation with the State Historic Preservation Office and the landowner, two sites have been designated for preservation: Soehren Sites 13A and B are actually located on the south property line and are at least 1/2 off the property. In any case, these are identified as features virtually certain to contain burials and both are excellent examples of site types, being fine examples of Kona monumental burial platforms. For these reasons, preservation of these sites is justified.

The residential complex at the southwest corner of the property at one time represented an intact residential compound, but has since been heavily impacted by bulldozing and is not an excellent example of site types. The other permanent and temporary habitation sites are also not evaluated as excellent examples of site types and are considered of significance for their informational content alone with impact to be mitigated through data recovery, including excavation and analysis.

The Sites - Historical and Archaeological Context

Functional Categories

There are 14 general functional categories of sites within the project area. Each of these is discussed briefly below with presumed archaeological and historical context. Table 2 shows probable functions for each feature.

Permanent Residential Structures

There are a total of 9 features identified as such on the basis of size, structural formality, and in some cases testing results. Except for CSH4 which is isolated at the northwestern end of the property, partly covered by grading debris, and Soehren 11, isolated at the makai end, these permanent residences form 2 general clusters.

A remnant of a residential compound at the southwestern corner includes 4 intact residential platforms (Rosendahl C, D, E, L). These platforms, although well defined, rectangular pavings, are generally less than 2' high and have the appearance of early historic style structures, probably mauka extensions of the early historic settlement of Kailua. These structures were not tested so their age cannot be established with certainty at this time. The cannot be correlated to a specific LCA and are located mauka of any 19th Century LCA house lot awards, most of which appear to be on the makai side of the present Kuakini Highway. The closest LCA houselot is LCA 4104 which shows 2 house sites at least 400 feet makai and in the adjacent ahupua'a of Keopu. It is predicted that this residential complex will date to the early peak historic period 1810-1850 (Allen 1986). The fact that it was surrounded by an enclosing wall argues for at least part of its use post-dating the introduction of cattle.

The second cluster of features identified as permanent residences is located in the central mauka portion of the study area and incudes 3 features: Soehren3, Soehren4 and CSH6. ONe of the sites was tested (Soehren 3) and contained plentiful evidence of prehistoric habitation with no evidence of historic use. It is predicted that all of these habitation sites are prehistoric and represent habitation associated with the northern portion of the Kona field system, which predates the development of Kailua as a political center during the early historic era. These sites are viewed as representing the dispersed settlements of Hawaiians whose activities and economy were based on fishing and planting in surrounding gardens.

Temporary Residential Structures

There are approximately 16 features within the study area which are classified as temporary residential structures. There are generally 10 feet or less in diameter and are informally constructed, consisting of rough pavings, modified outcrops or terraces. These are referred to as "field hales" and generally show evidence of intermittent use for activities associated with surrounding gardening. They are abundant throughout the Kona Field System and commonly contain plentiful volcanic glass, a few

Table 2

Site No	Permanent Habitation	Temporary Habitation	Agricultural	Burial	Miscellaneous
Soehren					
1			✓		
2A		✓			
2B		✓			
3	✓				
4	✓				
5A		✓			
5B		✓			
6		✓			
7		✓			
8		✓			
11				✓(preserve)	
113A				✓(preserve)	
13B					
Rosendahl					
B					wall
F					wall
L	✓				
E	✓				
C	✓				
C	✓				
Cultural Surveys Hawaii					
1		✓			
2		✓?		Burial?	
3		✓			
4	✓				
5A		✓			
5B		✓			
5C		✓?		Burial?	
5D		✓			
6	✓			Burial?	
7				Burial?	
8			✓		
9		✓?			caneshute historic
10		✓			
11		✓			
12		✓			

basalt flakes, but sparse midden and few artifacts of categories other than volcanic glass. These features, to reiterate, are assumed to be connected with surrounding agricultural productivity and are assigned to the prehistoric era. A number of these features were tested by Cultural Surveys Hawaii in 1989. The results of the testing further reinforce this hypothesis.

Burial Features

There are 2 features which are definitely identified as burials: Soehren 13A and Soehren 13B. These features are typical of the Kona monument burials of formal construction and are designated for preservation. Other features on the property are designated only as possible burials (CSH2, CSH5C, CSH6, CSH7). None of these features are of formal construction nor are they large. If burials are present they will, in all probability, be prehistoric burials of makainana (common people).

Miscellaneous Sites

These features include wall sections, agricultural features associated with traditionally rocky land dry planting and one possible ranching era loading ramp (CSH9).

Historical and Chronological Context of the Sites

Allen (1986) has constructed a general phase scheme for chronology of occupation in the Kailua area based on her work in 'Auhaukea'e in Kailua Town. She divides previous occupation:

1. Prehistoric occupation by 1650 A.D. with only casual use.
2. "Early Peak" historic period (1810-1850) with substantial use of the shoreline are to occupation and work activities (connected to Kamehameha I residence in Kailua and his heirs).
3. "Later Peak" period (1890-1935) characterized by the Euro-American acculturation and the establishment of the market economy.

The high status residences associated with the "Early Peak" historic period would have been clustered along the coastal strip in Kailua itself, including Lanihau. We know from excavations conducted by Cultural Surveys Hawaii in 1988 on major residential sites in 'Auhaukea'e that some of the house sites show continuous occupation with associated structural additions from the prehistoric era to the Early Peak period (Hammatt 1989, in preparation).

The prehistoric era in the area of Kona has been most thoroughly and broadly studied by Schilt (1984) who divided prehistory and history into 5 phases, beginning with the pioneer settlement after 1050 A.D. and permanent habitation after 1650 (Schilt 1984:284). Given the probable predominance of prehistoric era (rather than historic) settlement in the project area Schilt's scheme is most appropriate. An additional consideration is also important. Lanihau is the northernmost narrow ahupua'a within the Kona Field System. North of Lanihau are younger barren lavas and the 30-inch per year rainfall line turns mauka making subsistence agriculture less productive.

It appears then that the following generalizations apply to the archaeological sites in the present project area.

1. High status habitation is not present. The project area is slightly above the coastal strip where these high status residences are clustered.
2. Historic era occupation will be represented (if at all) only in the south makai corner by the cluster of house platforms (Rosendahl C,D,E,L). This kauhale is not correlatable to a specific LCA and appears to be on the mauka fringes of the early historic community of Kailua.
3. All other permanent habitation and virtually all temporary habitation appears to be late prehistoric and associated with agricultural activities at the northern extremity of the Kona Field System.
4. Based partly on testing results, and partly on the physical appearance of the sites, it appears unlikely that any one single site or site complex will show a long sequence of occupation spanning the prehistoric and historic era.

Research Questions and Methods

A number of research questions regarding the Kailua area in the late prehistoric and early historic times have been addressed by Barrere (1975), Kelly 1983, Allen 1986, Hammatt and Borthwick (1987). Based on the above discussion, the following questions are relevant to the sites on this parcel.

1. Chronology

Schilt dated 2 sites within Lanihau slightly mauka of the project area to around 1600 with abandonment round 1700 A.D. (Schilt 1984:279). It is believed that dating of the mauka cluster of permanent and temporary habitation sites within the present study area will considerably extend the range of occupation into the earlier phases of prehistory and demonstrate the use of the lands for gardening long before the late prehistoric aggregation of settlement around Kailua.

Chronological investigation will be undertaken at both permanent and temporary habitation sites. To test the phases of occupation developed by Schilt on a localized level.

An additional question is - if Lanihau is on the northern fringe of the Kula growing zone it may not have been developed for agriculture until a later time period. Chronological investigation can shed light on the possibility of later development of the fringe areas of the Kona Field System.

If historic occupation is found, as anticipated in the makai permanent habitation sites (Rosendahl C,D,E,L.) than chronological study will allow an assignment of occupation to one of Allen's historic phases.

To collect chronological evidence the following will be done at each site:

a. Collection of charcoal and other organic samples for radiocarbon analysis from major strata, particularly the highest and lowest and strata linked to architectural features;

b. Collection of volcanic glass for alteration rind age analysis from major strata;

c. Dating of historic cultural debris - bottles, nails, ceramics - to determine age of manufacture.

2. <u>Defining Functional Attribute Within a Kauhale Complex</u>

This question applies specifically to the permanent habitation which are in close spatial clusterings. Rosendahl C,D,E,L are four closely spaced platform features of similar construction but varying construction. Systematic excavation of these features may show differing functions (eating, sleeping mens' house, etc.) for each feature based on variations in midden and artifact assemblages. Conversely, if there is little variation in assemblages these features could simply represent single multipurpose residences of related individuals. Similarly, Soehren 3, 4, and CSH 6 represent another closely spaced complex of permanent habitation sites. The same questions apply to this cluster.

3. Defining Shifting Domestic Patterns Through Time

This question is related to Number 2, but with the additional assumption that both a prehistoric cluster and historic era cluster or kauhale is represented. There may be significant variation in use of closely spaced domestic sites through time and particularly from the prehistoric to historic era (developing stratification and the end of the kapu system). If the ages of these 2 clusters are different then a comparison of the degree of specialty in domestic use of components within each cluster will be significant in interpreting changing social patterns. This can be accomplished through comparison of the results of excavations of each of the permanent occupation clusters.

Specific Tasks

Fieldwork - Excavation Sampling

Permanent Habitation sites

10-20% excavation of all features

Temporary Habitation Sites

At least 2 square meter excavations in each feature

Suspected Burial Sites

At least 2 square meter excavations in each feature in areas likely to contain burials

Miscellaneous Sites

At least 1 square meter in each feature to determine site function.

Fieldwork - Methods

the following methods will be used in the excavation of all trenches:

1. Screening of all sediments through 1/8 inch mesh screen;
2. Recovery of all artifacts and shell and bone midden;
3. Recovery of all charcoal both as "in situ" samples and from the screen;
4. Recording of stratigraphy by scale drawing of at least one profile in each 1-meter square trench;
5. All trenches will be excavated to culturally sterile soil deposits or bedrock;

6. The sites chosen for excavation will be mapped to scale showing all internal features and excavated trenches.

Laboratory Methods and Report Preparation

Laboratory Methods

This phase of work will involve the following:

1. Identification and cataloguing of artifactual material including both historic as well as prehistoric forms. Artifacts will be measured with representative samples drawn and/or photographed to scale.
2. Identification, weighing, and analysis of midden material to genus and species. This information will be tabulated for each layer within each stratigraphic unit within each site.
3. Preparation, submittal and dating of datable samples (volcanic glass and charcoal).
4. Dating and identification of historic era artifacts.
5. Preparation and submittal of faunal remains recovered from cave excavations to the Smithsonian Institution.

Report Preparation

The final report will contain the following:

1. An in-depth presentation of each research question incorporating prior archaeological and historic studies in the Kailua area, including research on L.C.A.s and past land use specific to the study area;

2. Site findings, maps, descriptions, surface collections for each site will be discussed separately. site maps, and stratigraphic profiles will be included. Summary tables of artifacts and midden--at least by layer--will be included and discussed;
3. A separate section on artifact analysis;
4. A separate section on midden analysis.
5. A separate section on volcanic glass and radiocarbon and historic period artifact chronology;
6. A summary chapter which re-evaluates the findings on each research question;
7. References;
8. Appendices
    a. Master Artifact Catalog
    b. Volcanic Glass Dating Lab Report

Report Review Procedures

A draft report will be submitted to the State Historic Preservation Office (SHPO) and Hawaii County Planning Departments for review, to ensure all information is included and completely presented.

A final report shall then be produced, incorporating any recommended revisions. If **Cultural Surveys Hawaii** disagrees with recommended revisions, consultation will occur with the SHPO and the County Planning Department to resolve these problems.

CORRECTION

THE PRECEDING DOCUMENT(S) HAS BEEN REPHOTOGRAPHED TO ASSURE LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

2. Site findings, maps, descriptions, surface collections for each site will be discussed separately. site maps, and stratigraphic profiles will be included. Summary tables of artifacts and midden--at least by layer--will be included and discussed;
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Consultation will occur with both of these offices before the final report is produced.

Report Dissemination

Copies of the final report will be sent to the State Historic Preservation Office, Hawaii County Planning Department, a depository of the County's choice and the Office of Hawaiian Affairs (OHA).

Disposition of Finds and Documentary Data

All materials generated by this project will be deposited for curation at a facility on Hawaii acceptable to the landowner, the State's SHPO and County's Planning Department.

Treatment of Burials

This data recovery plan includes provision for testing of suspected burial sites to determine location and number of burials. If burials are found their actual removal, treatment and final disposition will be handled separately and will be in accordance with Act 265 (Chapter 6E revised).

1. Notification of OHA by the State Historic Preservation Office, is skeletal remains are likely to be native Hawaiian.
2. Attempts to identify lineal descendants of those buried. If lineal descendants are found and to not

wish osteological analyses to occur for their ancestors, such analyses shall not occur.

3. The State Historic Preservation Office (SHPO) is to determine final disposition after consultation with OHA, the landowner, and any identified lineal descendants. Practice has been to have OHA work up a written Memorandum of Agreement on disposition in consultation with the landowner and descendants, and the SHPO. The SHPO, thus, shall notify the landowner of this procedure, and the landowner and OHA are then expected to work up an agreement on final disposition. Once all parties sign this agreement, then final disposition shall occur - after all osteological analyses are completed.

In the meantime, it is recommended that an appropriate reburial place be set aside on the property as this is generally the preferred alternative.

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LANIHAU II: LANIHAU SHOPPING CENTER EXPANSION

PARCEL TMK 7-5-04:7 (POR 9)

KAILUA KONA HAWAII

Preliminary Report; End of Field Work

and Progress Report

by

Douglas F. Borthwick
Dr. Hallett H. Hammatt

for

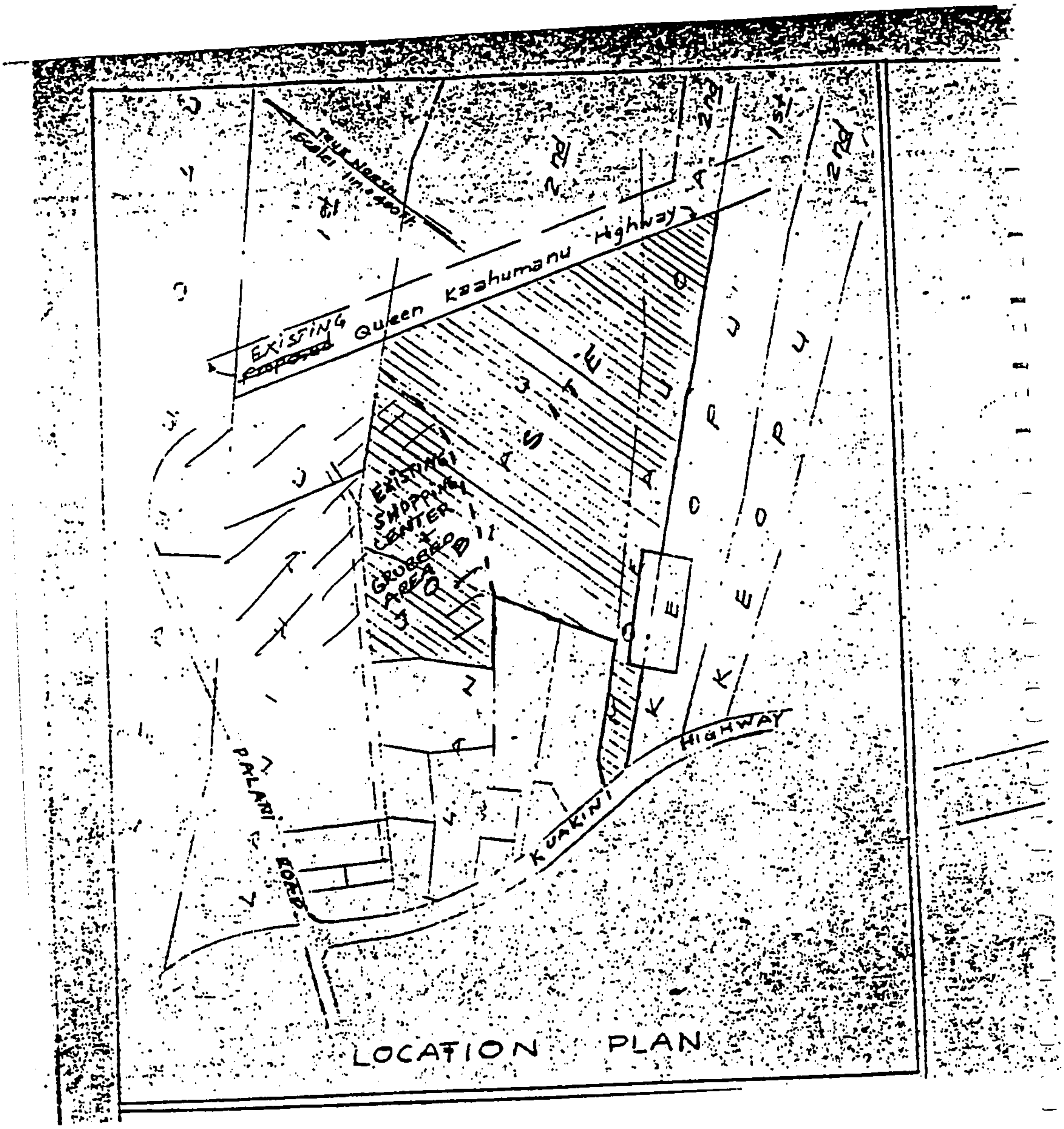
Lanihau Partners

October 1989

Cultural Surveys Hawaii spent a total of seven weeks excavating portions of 25 different sites within the proposed Lanihau Shopping Center Expansion parcel (TMK 7-5-04:7, por. 9). There were approximately 90 square meters excavated within these 25 sites. The excavations yielded large quantities of both midden and artifacts. During this phase of archaeological work three new sites (CSH 13, 14, 15) were located and tested,a nd a lava tube system, associated with Site CSH 1, was further explored and more accurately mapped.

The excavations were undertaken under the guidelines and research questions addressed in the Data Recovery Plan (DRP) prepared for Lanihau Partners (Hammatt 7/89). The major research questions posed in the DRP dealt with chronology, defining functional attributes of spatially clustered habitation features, possibly in terms of a "Kauhale Complex," and whether these attributes change through time.

There have been but a few dated pre-historic sites within the Ahupua'a of Lanihau (Schilt 1984:279) and the recovered charcoal samples (8 of which will be sent for carbon isotope dating) will contribute to a broader data base. Other more specific questions related to Lanihau chronology include correlations to pre-historic phases of occupation discussed by R. Schilt (Ibid.:284) and similar correlations to J. Allen's Historic Phase Sequence for Kailua Kona (Allen 1986). Analysis of these questions will be discussed within the main report.



Lanihau Shopping Center Expansion, Parcel TMK 7-5-04:7 (por. 9)

The research questions concerning defining (archaeologically) clustered sites in terms of a kauhale complex and whether there is change in the kauhale concept through time will also be discussed in the main report as analysis of midden and artifacts is completed. However, it does appear as if the two clusters discussed in the DRP do represent closely associated features, with different functional attributes. The mauka cluster of sites, Soehren Sites 3 and 4, and CSH 7, did not have any early historic artifacts, indicating abandonment prior to western contact (ca. A.D. 1776). The makai cluster, Rosendahl C, D, E, L did contain some early historic artifacts, as anticipated. Comparisons of these two clusters relating to "shifting domestic patterns through time" and "changing social patterns" will be undertaken within the main report.

Specific tasks outlined in the DRP were related to presumed functional categories of sites. The functional categories, included permanent habitation sites, temporary habitation sites, suspected burial features, and miscellaneous sites (wall sections, agricultural features, etc.). The guidelines for excavation of the functional categories included: 10-20% excavation of permanent habitation sites; 2 square meters at temporary habitation sites; at least 2 square meters at suspected burial features; and at least 1 square meter within each of the miscellaneous site types.

The following table details work accomplished and includes preliminary data available at this stage of lab work:

Lanihau II

(LI = Work done during reconnaissance & testing stage)

Site No.	Permanent Habitation	Temporary Habitation	Burials	Misc.	Midden (gr.)	Indigenous Artifacts (less v.g.)	V.G. # of pcs
Soehren							
1				1 m^2(AG)	--	--	
2A	$2m^2$(LI)				102 (LI)	--	40 LI
2B	$1m^2$(LI) $1m^2$(LII)				24(LI),1,056	7 LII	
3	$9m^2$($1m^2$LI)				800(LI),2,641	48 LI Acc#1-138	45 LI
4	$7m^2$				3,837	Acc# 149-245	
5A		$2.25m^2$			792	15	
5B		$1m^2$(LI)			24(LI)	1(LI)	1 LI
6		$2m^2$(LI)			68(LI)	7(LI)	70 LI
7		$3m^2$(LI)			50(LI)	--	--
8		$1m^2$(LI)			262(LI)	2(LI)	--
11		$8m^2$			416	27	
13A			Preserved	No testing undertaken	8,742(LII)	≈ 290 LII	
13B			Preserved		1,330(LI)	58 LI	156 LI
Soehren Sites Total					10,072	348	
Rosendahl	# m^2 excavated at each site						
B				wall			
F				wall			
L	$8m^2$				6,696	Acc.# 542-656	
E	$6m^2$				876	18	
C	$2m^2$				2,696	30	
D	$3m^2$				1,147	11	
Rosendahl Sites Total	19 m^2 excavated				11,415g	≈ 173 artifacts	

*

Site No.	Permanent Habitation	Temporary Habitation	Burials	Misc.	Midden (gr.)	Indigenous Artifacts (less v.g.)	V.G. # of pcs
Cultural Surveys Hawaii							
1	$2m^2$				744		
2		$2m^2$			121	2	
3		$1m^2$			55	7	
4	$5m^2$				488	9	
5A		$2m^2$			31	--	
5B		$2m^2$			76	1	
5C		$2m^2$			270	3	
5D	$4m^2$				6,679	35	
Total Site CSH 5					7,056	39	
6		$5m^2$			234	9	
7	$4.5m^2$				2,775	Acc# 336-456	
8		$1m^2$			46	--	
9				$1m^2$	--	--	
10		$2m^2$			117	4	
10B		$1m^2$			46	--	
11		$2m^2$			90	--	
12		$1m^2$			--	1 (Hist)	--
13		$2m^2$			90	2	
14	$1m^2$				1,132	37	
15		$1m^2$			12	2	
CSH Sites Total					13,006	≈ 271	
Lanihau II Totals					33,163LII	≈ 734	
Lanihau I Totals					1,336LI	58 LI	156
					34,493	≈ 792 (800)	

As mentioned previously the excavations yielded large quantities of both midden and artifacts. There was approximately 33 kilograms of midden recovered during the present phase (Lanihau II) of work. Adding the midden collected during the previous phase (Lanihau I) brings the total to nearly 34.5 kilograms (80 lbs). Indigenous artifacts recovered (not including volcanic glass) from the two phases of work number roughly 800 items. There were also roughly 100 historic artifacts collected all but two (2) recovered from the makai cluster of permanent habitation sites (Rosendahl Sites C, D, E, and L).

The midden and artifact assemblages are somewhat unusual in terms of both the large quantities recovered and the variety of midden components and artifact types. For example, included within the midden weight, at this preliminary stage, is an entire pig skeleton recovered at Site Rosendahl L. The "pig burial" appears to have ritual connotations. Two Conus shell adzes were also recovered from Site Rosendahl L. Shell adzes are rare within the Hawaiian Islands. The artifact assemblage also includes a number of basalt adzes, fishhooks, abraders, and ornaments which will be discussed both individually and within site specific groupings in the main report.

The excavations associated with site clusters appear to support the assumptions that these clusters represent closely related habitation features. The clustered habitation features may well represent "kauhale" complexes and hopefully analyses of the recovered material will lead to archaeologically defining specific functions of the separate features within the clusters.

There were no burials encountered within any of the excavations at any of the sites. However, during detailed mapping of the lava tube cave associated with Site CSH1 (a natural sink) a probable burial feature (piled rock mound) was encountered. Observed within the rock mound was a human metacarpal (finger bone). There were also two metacarpals observed on the tube floor some twenty feet _makai_ of the mound. The tube also contains observable midden and other manuports on the mostly soil floor area, though the soil layer does thin out to just a few centimeters thick some 50 feet _makai_ of the entrance. The tube appears to be periodically subjected to water runoff during heavy rains as well as having plentiful ceiling drips. The environment of the cave is moist and preservation of cultural material, including possible burials appear poor.

The tube complex is mostly outside of the project area, just south, but the _makai_ portion of the tube does "re-enter" the project area (below ground and with no observable cultural material) in the vicinity of Rosendahl Site L. The tube complex can be accessed through CSH1 and another small opening just outside the project boundary. Since the majority of the tube containing cultural material is outside the project, and as the entrance area within the project area has been tested and as the dampness and low ceiling height make excavation exceedingly difficult, no further archaeological testing is recommended. However, archaeological monitoring during ground preparation work (grubbing) is recommended.

Work still to be accomplished includes backhoe testing force burials in the eastern portion of the project area and the preparation of a preservation plan for Soehren Sites 13A and 13B. The backhoe testing will be done in the large swale that was associated with the Keopu burials which were removed as part of the Queen Ka'ahumanu Hwy Extension job. The preservation plan will be a separate report dealing with just the two burial monuments.

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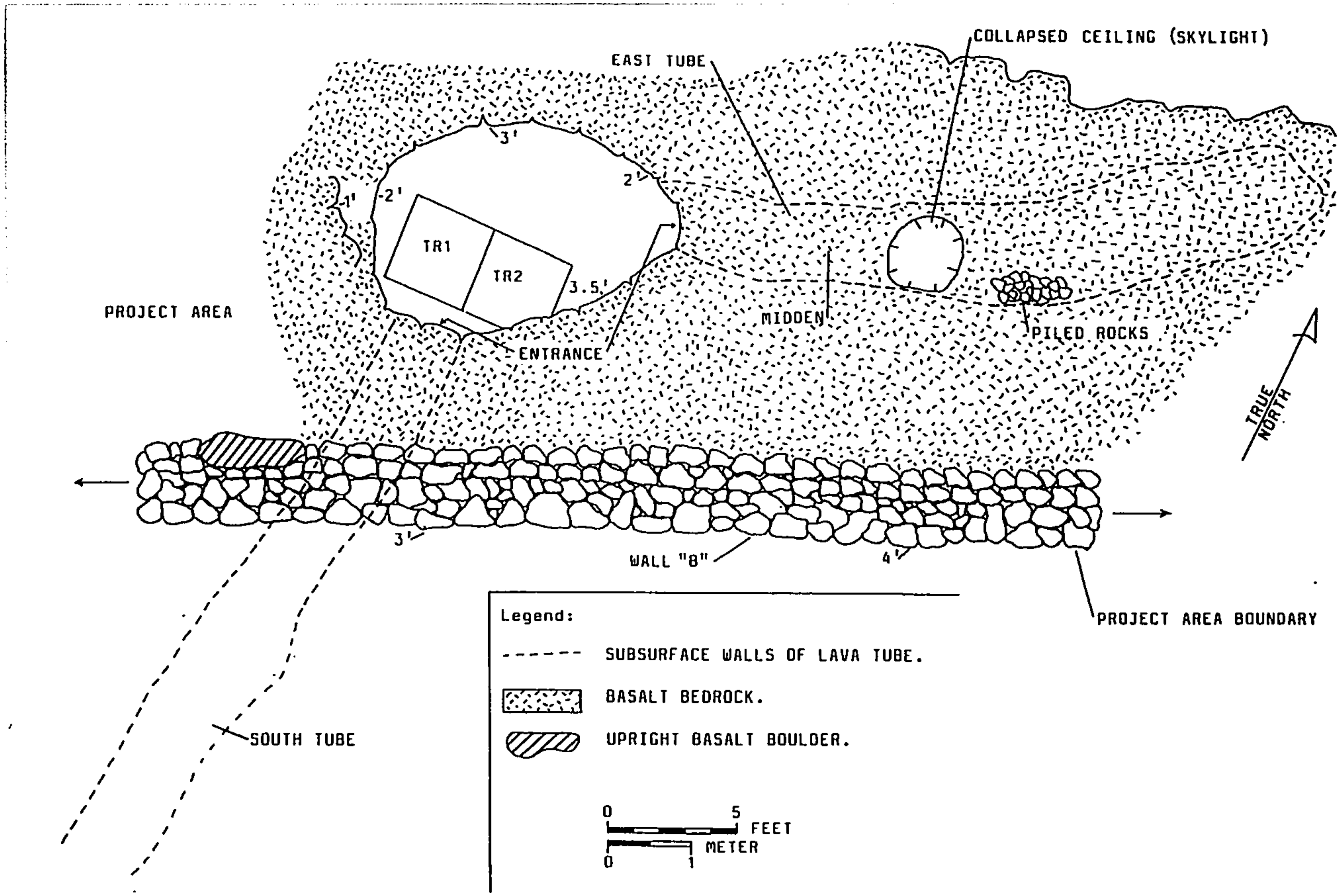


Fig. Site CS1, Plan View.

APPENDIX C

Archaeological Reconnaissance Report - Soehren (1985)

KILO 'AINA

RR1 BOX 581 • CAPTAIN COOK, HAWAII 96704 • (808) 328-2569 329-5190

30 September, 1985

Mr. Hiroshi Kasamoto
Lycurgus Building, Room 211
Hilo, HI 96720

Sir:

In reponse to your telephoned request I have searched for archaeological and historic features on the parcels identified by Tax Map Keys 7-5-04:6 and 13, situated at Keopu 1, North Kona, Hawaii.

At the Mahele of 1848 Keopu 1 was awarded to Kekauonohi, granddaughter of Kamehameha the Great and great-granddaughter of Kekaulike, ruler of Maui. The upland portions of the ahupuaa had been included in Kamehameha's personal gardens, Kuahewa, while his residence was for a time on the shore at Kalakee where now stands Hulihee Palace.

The parcels examined lie near the shore, between Kuakini and Kaahumanu Highways, on soils classified by the Soil Conservation Service as "Punaluu extremely rocky peat...underlain by pahoehoe bedrock." Although they are within the area identified as the "Kona Field System" which has been declared eligible for inclusion on the National Register of Historic Places, such soils had extremely limited horticultural value to the aboriginal Hawaiians and have been used historically for pasture. The vegetation is now predominantly guinea grass, kiawe and ekoa, all forage plants. The grass is now so thick and high as to obscure all but large stone structures and impede the search for less obvious features.

Prior to the construction of the Kaahumanu Highway extension the mauka boundary of parcel 6 was the Great Wall of Kuakini. This monumental stone wall generally marks the mauka limits of the prehistoric littoral habitation zone. Archaeological features are therefore to be anticipated on the parcel, particularly habitation sites and grave monuments. Agricultural activities were limited to cultivation of short term crops and resulted in few or no permanent agricultural structures. Such stone walls as are now found in the vicinity are associated with cattle or recent property lines. Parcel 6 is fenced only along Kuakini Highway and portions of the north and south boundaries west of parcel 13, as shown on the attached sketch map. The "Lono Kona" subdivision bounds parcel 6 on the south but the lack of a line fence on the north side makes it difficult to estimate locations of features along that side.

Parcel 13 is said to have been the site of a Chinese church. It is enclosed by a low stone wall and is unusual in the way it lies astride an ahupuaa boundary. Nothing now remains of the church except a few scraps of lumber and iron roofing, yet there are traces of prehistoric Hawaiian occupation to be found, as shown on the accompanying sketch map. A county sewer line which crosses the parcel from south to north has been roughly backfilled and may have destroyed some features.

The approximate locations of fourteen archaeological features are shown on the attached sketch map. Several papamū (checkerboards) were also seen on exposed pahoehoe lava but not numbered; others may well be concealed by vegetation. They are commonly associated with house sites. Several patches of scattered midden, coral fragments and shellfish remains, are also noted on the sketch map; they imply a former habitation but lack other structural features or depth of deposit.

1. Remains of an enclosure, perhaps a pen, about 3 by 4 fathoms built in a hollow in the pahoehoe. Only part of the south wall remains, standing about 3 feet high inside, neatly faced. No midden was seen on the sandy floor.

A low house platform 2 by 3 fathoms was seen in 1977 a few yards north of feature 1 but is now overgrown by rank vegetation and was not relocated.

2. Probably remains of a house platform from which the large stones have been taken to build nearby fences. Small rubble, coral and waterworn pebbles are abundant on and around a flat pahoehoe outcrop.

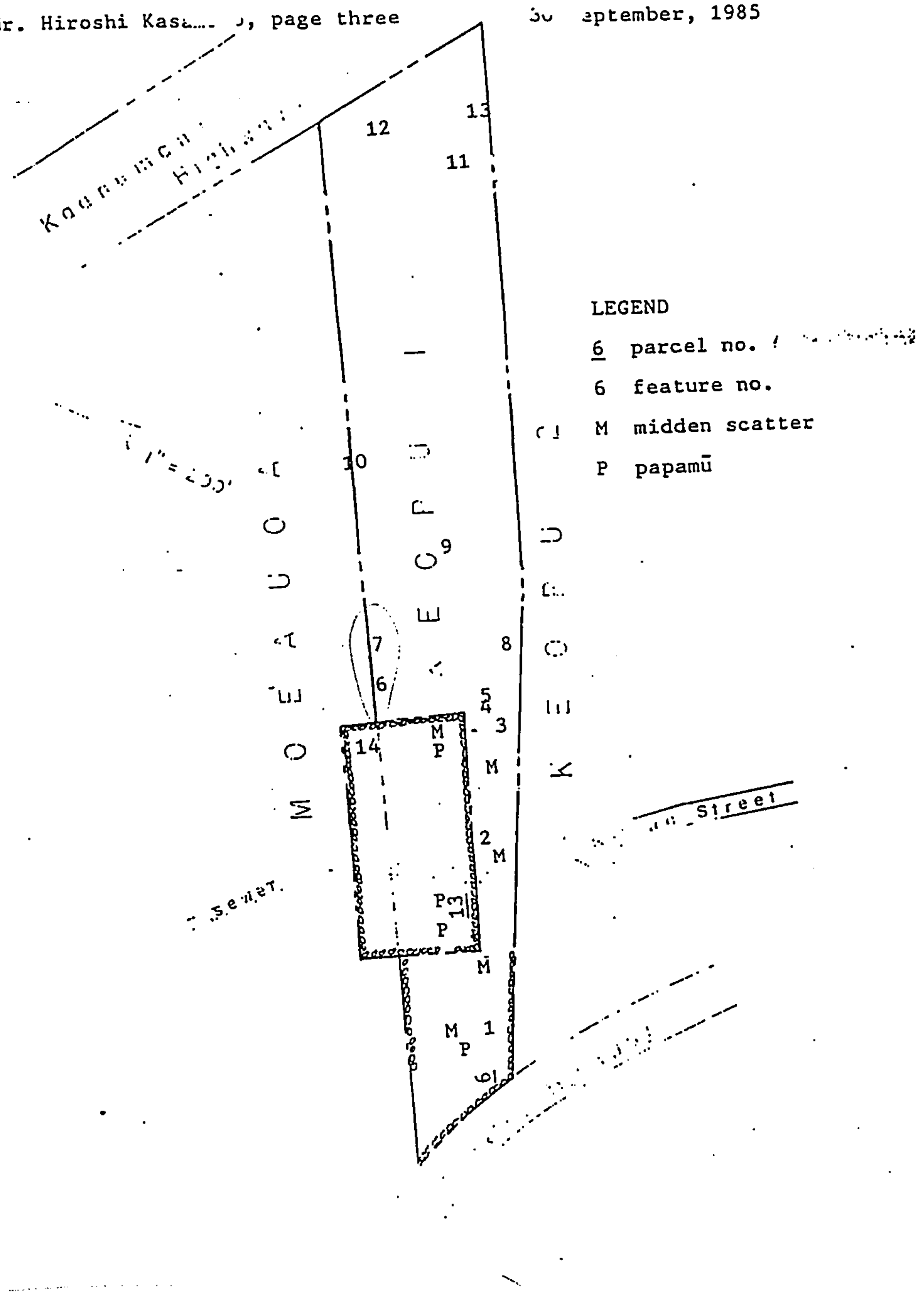
3. A platform about 3 by 7 fathoms, north-south, sloping makai and well paved with small field pebbles over rough boulders, stands 3 to 4 feet high on the makai side but without any facings. Several large pieces of coral and waterworn pebbles were noted but no shellfish or midden. Two fathoms makai is another paved area about 4 by 5 fathoms, much disturbed by a recent wall crossing it. At the north edge of the pavement is a neat cairn 3 feet by 5 feet, 2 feet high. The entire complex suggests an old burial place.

4. A few yards mauka is a grave platform one fathom square, 1.5 feet high, well paved with pebbles.

5. Almost touching feature 4 is another grave platform, about one by 1.5 fathoms, one foot high, also well paved.

6. A large platform 2.5 by 4 fathoms, east-west, 4 feet high probably contains several graves. It is in fairly good condition and paved with small field pebbles. A lower, rough platform about 2 fathoms long abuts on the mauka side.

7. A grave platform 2 fathoms square, one to 3 feet high, was built on a house platform. Adjoining low walls appear to have


Street
LEGEND
6 parcel no.
6 feature no.
M midden scatter
P papamū

been robbed of stone to build the grave platform. Coral and shellfish remains are abundant around the site.

8. Three separate but adjoining grave platforms: thenorthern one is very disturbed, about 2 fathoms square, 3 to 4 feet high; the center one is about the same size but in better condition, with some very large stones in the base course of its facings. The southern platform is only about one fathom square and one foot high but is well paved with pebbles.

9. About 20 yards south of feature 7 are the remains of a house foundation with much shellfish and coral scattered about. The larger stones were probably taken for the grave platform at feature 7 or 8. A small blister cave in front of the site has no cultural deposits.

10. A low, rough platform about 3 by 4 fathoms, east-west, one foot high and another 1.5 by 2 fathoms, east-west, in better condition about 10 feet mauka are also probably graves. Their location with respect to the unmarked boundary of parcel 6 is uncertain and must be established by a surveyor.

11. What appears to be a rubble filled crack in a low pahoehoe mound has small stones on top of an irregular area about one fathom across. It may contain a grave.

12. A grave platform 2 by 3 fathoms, east-west, 3 feet high in fair condition.

13. The low entrance to a lava tube running makai opens into a chamber about 20 by 30 feet up to 5 feet high. A stone wall has been built inside the entrance to the left to reduce the size of the opening. There is considerable depth of soil inside, together with trash and toys left by younger residents of the nearby subdivision. The site has research potential.

14. At the northeast corner of parcel 13 are traces of a house site on a flat pahoehohe knoll. The larger stone has been removed to build the fence around the curch lot, leaving only the smaller pebbles and much shellfish and coral.

Of the foregoing, feature 13 warrants further examination and testing for subsurface remains. All features identified as grave platforms must be dismantled and carefully searched for human remains prior to their destruction. Features 1, 2, 9 and 14 have little research value and can be destroyed after recording in more detail than contained here.

Because the parcels are on pahoehoe lava there is a possibility that lava tubes might be exposed during the course of construction. If so, they should be examined by an archaeologistfor evidence of human occupation or the presence of human remains. In the event human remains are found, whether in a lava tube or elsewhere on the parcels, provision of section 338-25.5, Hawaii Revised Statutes, are applicable. Disinterment and reburial of human remains should be carried out with respect for both scientific and community values.

If I can be of further assistance please do not hesitate to call. My invoice is enclosed.

Very truly yours,

Lloyd J. Soehren

Lloyd J. Soehren
Consulting archaeologist

Encl.

APPENDIX D

Traffic Impact Study

TRAFFIC IMPACT STUDY FOR LANIHAU CENTER AND HENRY STREET IN KAILUA-KONA, HAWAII

Prepared For

LANIHAU CENTER VENTURE

Prepared By

BARTON-ASCHMAN ASSOCIATES, INC.

HONOLULU, HAWAII

May, 1990

Barton-Aschman Associates, Inc.

567 South King Street, Suite 105
Honolulu, Hawaii 96813
USA

Phone: (808) 523-5464
Telex: RCA 8627
Fax: (808) 545-7837

May 14, 1990

Mr. Phil Russell
Lanihau Center Venture
c/o Graham, Murata, Russell
345 Queen Street, Suite 400
Honolulu, Hawaii 96813

Re: Traffic Impact Study for Lanihau Center and Henry Street
Our Project No. 2080.01.01

Dear Mr. Russell:

Enclosed is the above referenced traffic study prepared in accordance with our agreement. The study was prepared to determine the traffic impacts of the proposed Henry Street and the proposed Phase II expansion of the Lanihau Center in Kailua-Kona, Hawaii. Henry Street is a proposed four-lane, divided roadway between Queen Kaahumanu Highway and Kuakini Highway south of Palani Road. The Phase II expansion includes 260,075 s.f. of retail space and four additional building pads encompassing 14,500 s.f. Two proposed driveways on Henry Street would provide access to the Lanihau Center.

The project was analyzed under three scenarios: existing conditions, 1995 cumulative conditions and 1995 cumulative plus project conditions. Cumulative conditions refer to background growth of existing volumes and the addition of traffic generated by other "future" developments in the vicinity. The project in this study refers to the Lanihau Center expansion.

The basis for analysis of traffic conditions was the operating efficiency of intersections near the project site in the AM and PM peak hours. Operating efficiency can be categorized by several different criteria. In this study, the ratio of calculated critical volume to the capacity of an intersection (V/C ratio) was used to describe operating conditions. Each V/C ratio corresponds to a level-of-service (LoS). There are six (6) levels, A through F, which relate to the driving conditions from best to worse, respectively.

In order to determine the impacts of Henry Street on the surrounding roadway network, traffic volumes for existing conditions and 1995 cumulative conditions are shown without and with Henry Street. Level-of-service analysis was completed for both layouts, and the construction of Henry Street improved the level-of-service at every intersection analyzed. The new, four-lane roadway would reduce congestion on Palani Road, would provide additional access to the existing and expanded Lanihau Center, and would improve general traffic circulation in the area. All intersections would operate at Level-of-Service C or better under 1995 cumulative conditions.

Impacts of the Lanihau Center expansion were determined by comparing the AM and PM Peak hour level-of-service under 1995 cumulative conditions with and without project traffic. A significant traffic impact is defined as change in V/C ratio greater than 0.03 due to the introduction of project traffic at an intersection which operates at Level-of-Service E or F. Under 1995 cumulative plus project conditions, all of the intersection operate at Level-of-Service D or better. Thus, the Lanihau Center expansion does not create any significant traffic impacts with Henry Street constructed.

We have enjoyed working with you on this project and hope we can work together in the near future on other projects. In the meantime, we will be glad to respond to comments on the Lanihau Center report as needed.

Respectfully submitted,
BARTON-ASCHMAN ASSOCIATES, INC.

Phillip J. Rowell, P.E.

PJR:dao

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1. INTRODUCTION

Barton-Aschman Associates Inc. has been retained by Lanihau Center Venture to conduct a traffic impact study for a new roadway called Henry Street and the proposed Phase II expansion of the existing Lanihau Center in Kailua-Kona, Hawaii.

The following report has been prepared to describe the traffic characteristics of the project and the traffic-related impacts of the project and the construction of Henry Street on the adjacent roadway network. In this report, the expansion of Lanihau Center is referred to as the "project".

This introductory chapter discusses the location of the project, the proposed development scenario, and the study methodology.

PROJECT LOCATION AND DESCRIPTION

The location of the project and the proposed Henry Street alignment are shown on Figure 1. Henry Street is a proposed roadway between Queen Kaahumanu Highway and Kuakini Highway south of Palani Road and the existing Lanihau Center. The cross-section will be a four-lane divided roadway in an 80-foot right-of-way with a median wide enough to accommodate separate left turn lanes. This will require the median to be a minimum of 16 feet. Two access driveways on Henry Street into the shopping center are also planned.

The Lanihau Center site is bounded by Kuakini Highway to the west, Palani Road to the north, Queen Kaahumanu Highway to the east, and the Henry Street alignment to the south. The existing center includes approximately 87,500 s.f. of gross leasable area (G.L.A.). The Phase II expansion includes an additional 260,075 s.f. of retail space and four separate building pads with a combined total of 14,500 s.f. Four different land uses were assumed in order to develop a worst-case scenario for this part of the development. These uses include a fast-food restaurant, a sit-down restaurant, a rental car office and a bank.

STUDY METHODOLOGY

The approach to this analysis involved first determining the impacts of Henry Street on traffic circulation in the study area, and next, addressing the impacts of the Lanihau Center expansion on the new roadway network. Under two of the three analysis scenarios, traffic conditions were examined with and without Henry Street. It was assumed that the project would not be built without the construction of Henry Street.

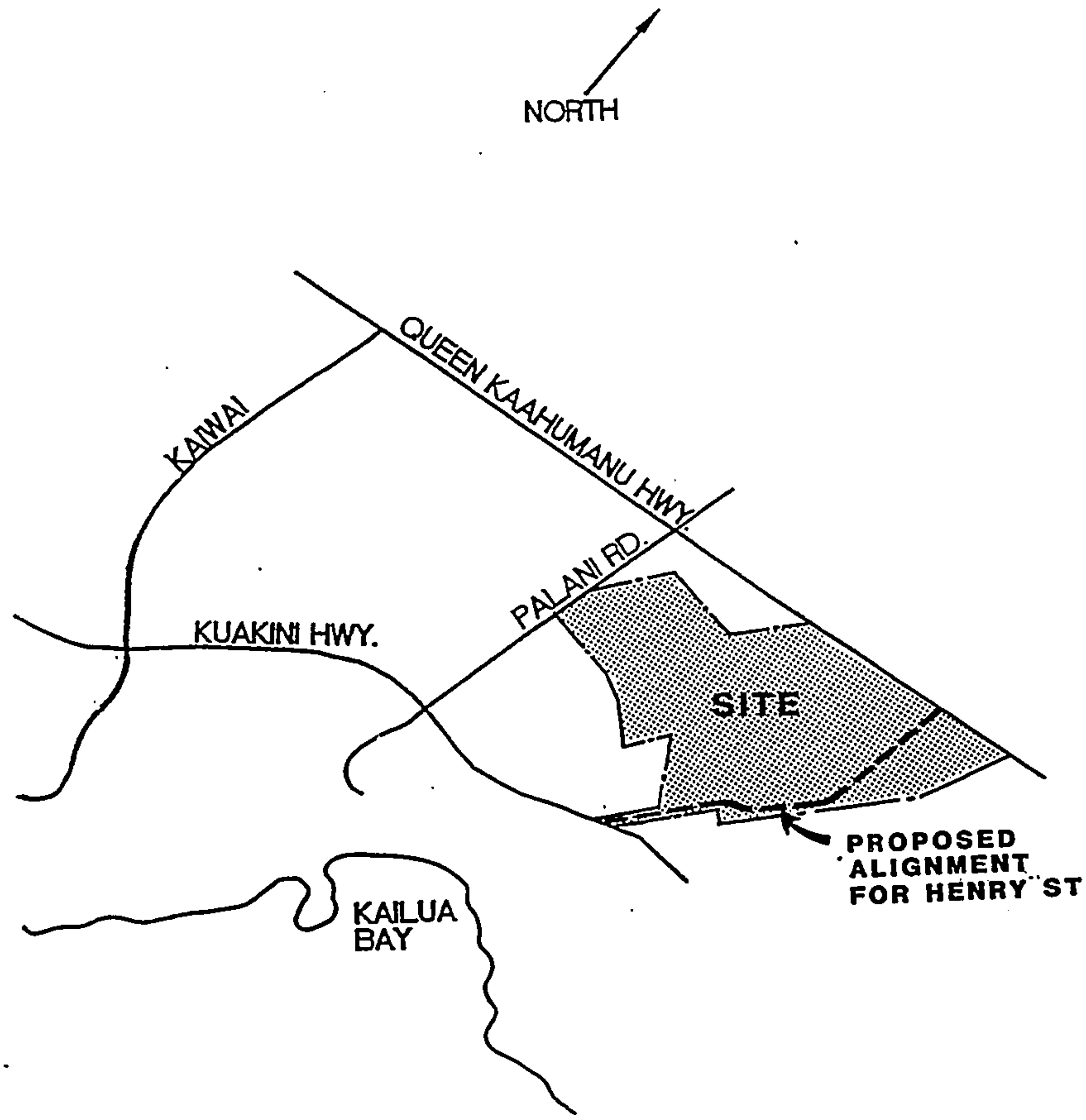


FIGURE 1

SITE LOCATION.

In order to conduct this traffic study, several tasks were performed. These are discussed in the following paragraphs.

1. Data Collection

Five intersections were selected for study and they are listed below.

1. Palani Road and Queen Kaahumanu Highway
2. Palani Road and Existing Lanihau Center Driveway
3. Palani Road and Kuakini Highway
4. Henry Street and Queen Kaahumanu Highway (Future)
5. Henry Street and Kuakini Highway (Future)

A substantial amount of traffic-related information was collected in order to analyze the existing traffic conditions and to estimate the future traffic volumes on the roadways adjacent to the study site. The data collected included the following:

- development plan data;
- roadway network;
- existing morning and afternoon (AM and PM) peak hour traffic volumes;
- traffic information for other planned projects; and
- previous traffic studies conducted for projects in the adjacent area.

Because the Queen Kaahumanu Highway is generally a north-south route on the island of Hawaii, it serves as the north reference point for intersection calculations and discussions in this report. Thus, Kuakini Highway, a parallel facility, runs north-south and Palani Road and Henry Street are considered east-west streets.

2. Selection of Operational Analysis Techniques

The operational method described in the 1985 Highway Capacity Manual (HCM) was used to determine the level-of-service (LoS) at the three existing signalized intersections listed above and any intersections that would be signalized under future conditions. For unsignalized intersection analysis, the 1985 HCM was also used as a reference. Level-of-Service is a qualitative measure of the operating conditions at an intersection. The LoS concepts for both methods are presented in Chapter 2 of this report.

3. Analysis of Existing Traffic Conditions

Utilizing the existing data collected, the traffic conditions in the vicinity of the project were determined under present conditions. The operational methods described above were used to determine the level-of-service at the three existing signalized intersections. Existing conditions were also analyzed assuming Henry Street was in operation today. This exercise was completed to provide a reference for the shift in travel patterns. Thus, the level-of-service was also calculated at the two signalized intersections on Henry Street and the two unsignalized driveway intersections serving Lanihau Center. Signalization of an intersection was base on warrant analyses completed under future cumulative conditions.

4. Determination of Cumulative Traffic Projections

Construction is to be completed and the center occupied in 1992. However, 1995 was used as the design year, based on comments from the County regarding previous studies.

Future cumulative traffic volumes have two components. The first is background growth. The second is traffic generated by other planned projects in the vicinity and is referred to as "related project trips." The total future cumulative traffic is the sum of existing plus background growth plus related project trips. The assumptions used to estimate the 1995 cumulative trips and the resulting traffic projections are presented in Chapter 3 of this report. Again, operating conditions at the study intersections were analyzed with and without Henry Street using level-of-service calculations.

5. Analysis of Project-Related Traffic Impacts

The next step in the traffic analysis of the project was to estimate the AM and PM peak-hour traffic that would be generated by the proposed development. This was done using trip generation rates from Trip Generation (Fourth Edition, 1987), an informational report prepared by the Institute of Transportation Engineers (ITE).

These trips were distributed and assigned to the various traffic turning movements at the adjacent intersections. The site-generated traffic was then superimposed on 1995 cumulative traffic volumes at the subject intersections. The HCM method was then used again to conduct a level-of-service analysis for conditions with Henry Street. A comparison of 1995 cumulative peak hour conditions to 1995 conditions with the project was made in order to determine the impact of this additional traffic on the roadway network. The resulting traffic projections for Year 1995 with the project are presented in Chapter 4.

The analysis of the project-related impacts and the conclusions of the analyses are discussed in Chapter 5.

2.
ANALYSIS OF EXISTING CONDITIONS

This chapter presents and discusses the existing traffic conditions and volumes on the roadways in the vicinity of future Henry Street and the proposed project. The level-of-service concept and the results of the level-of-service analysis for existing conditions are also presented. The purpose of this analysis is to establish the base conditions for the determination of the impacts Henry Street and the project, which will be described in a subsequent chapter.

The study intersections, which were analyzed to establish the base conditions, were selected based upon the access routes to and from the project location. The intersections listed in Chapter 1 and existing lane configurations on the accompanying street network are shown on Figure 2. Although Henry Street does not exist at the present time, analyses of intersection operation assuming it in place were completed under existing conditions for reference purposes.

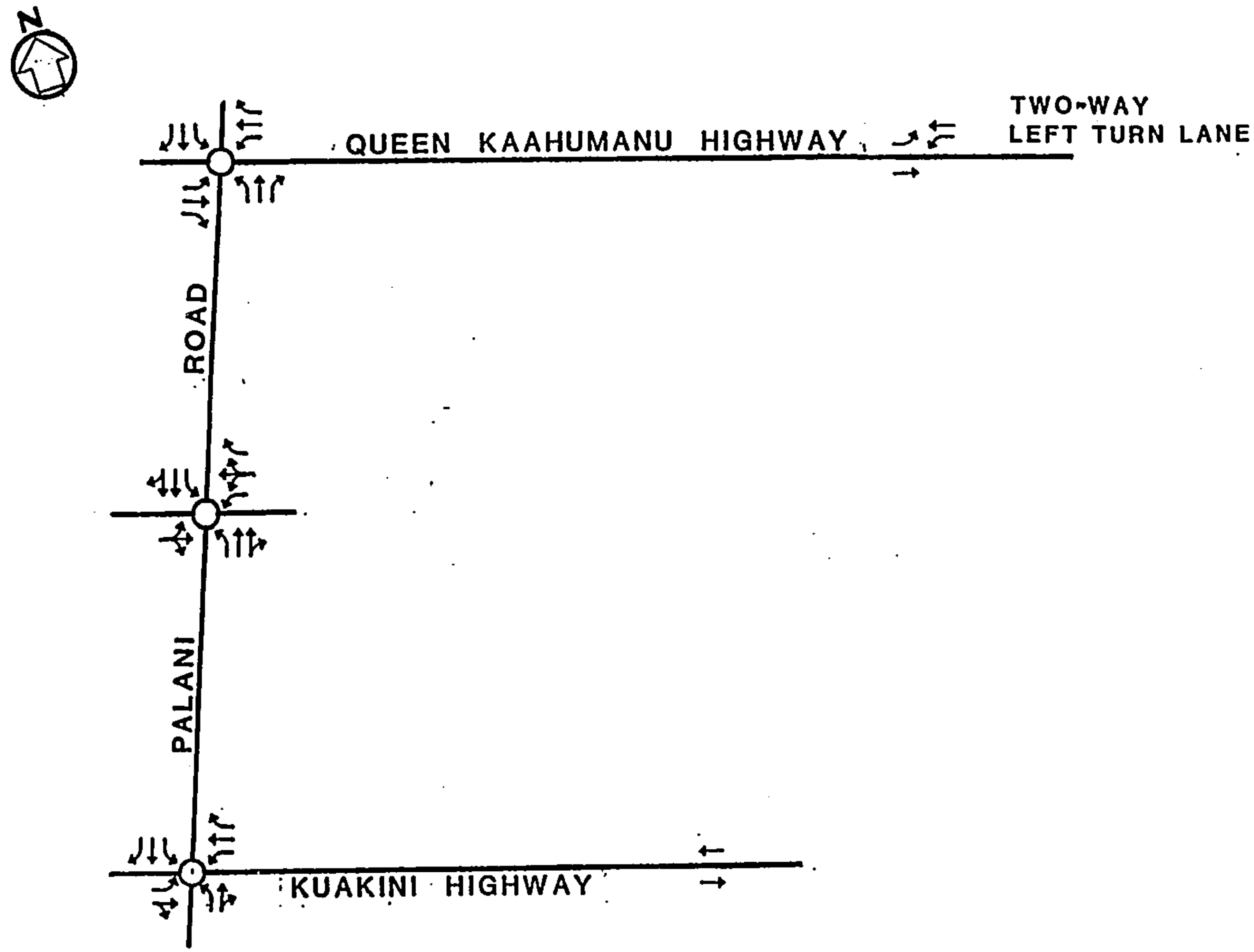


FIGURE 2

EXISTING LANE CONFIGURATIONS

EXISTING PEAK HOUR TRAFFIC VOLUMES

The existing AM and PM peak hour traffic volumes at the three intersections on Palani Road were obtained from field counts conducted during March 1990. These counts are shown in Figures 3 and 4 for the AM and PM peak hours, respectively. Due to negligible traffic generated by Lanihau Center in the AM peak hour, volume counts were not obtained at the driveway intersection in the morning.

The first step in analyzing the impact of Henry Street on existing traffic conditions is to estimate the trips that would be diverted from Palani Road to Henry Street. Second, trips from the existing Lanihau Center using the two proposed access driveways were assigned to Henry Street. The resulting volumes are shown in Figure 5 and 6.

LEVEL-OF-SERVICE CONCEPT

Signalized Intersections

The operational method described in the 1985 Highway Capacity Manual (HCM) was used to analyze the operating efficiency of the signalized intersections adjacent to the study site. This method involves the calculation of a volume/capacity (V/C) ratio which is related to a level-of-service.

"Level-of-Service" is a term which denotes any of an infinite number of combinations of traffic operating conditions that may occur on a given lane or roadway when it is subjected to various traffic volumes. Level-of-service is a qualitative measure of the effect of a number of factors which include:

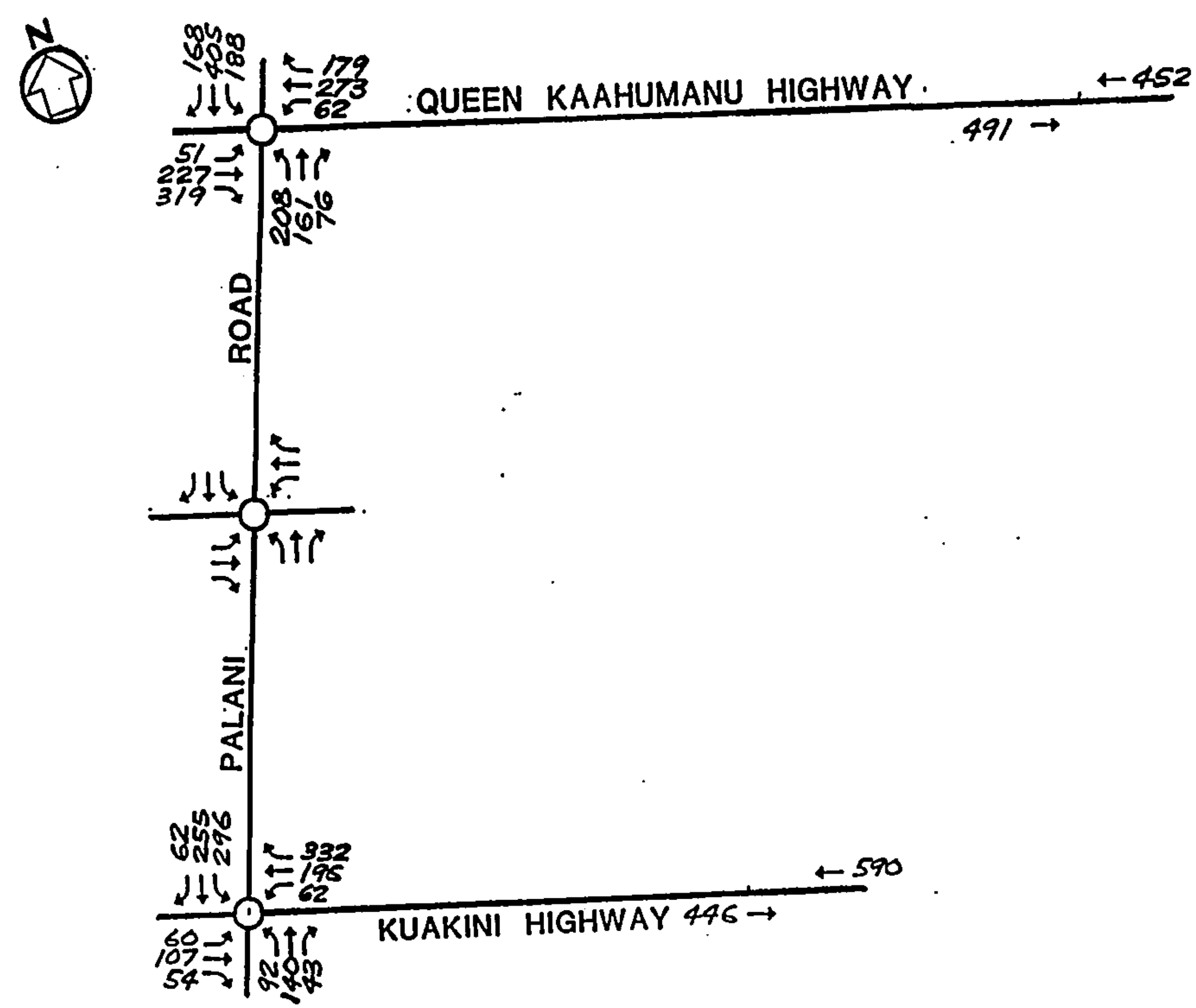


FIGURE 3

EXISTING AM PEAK HOUR VOLUMES WITHOUT HENRY STREET

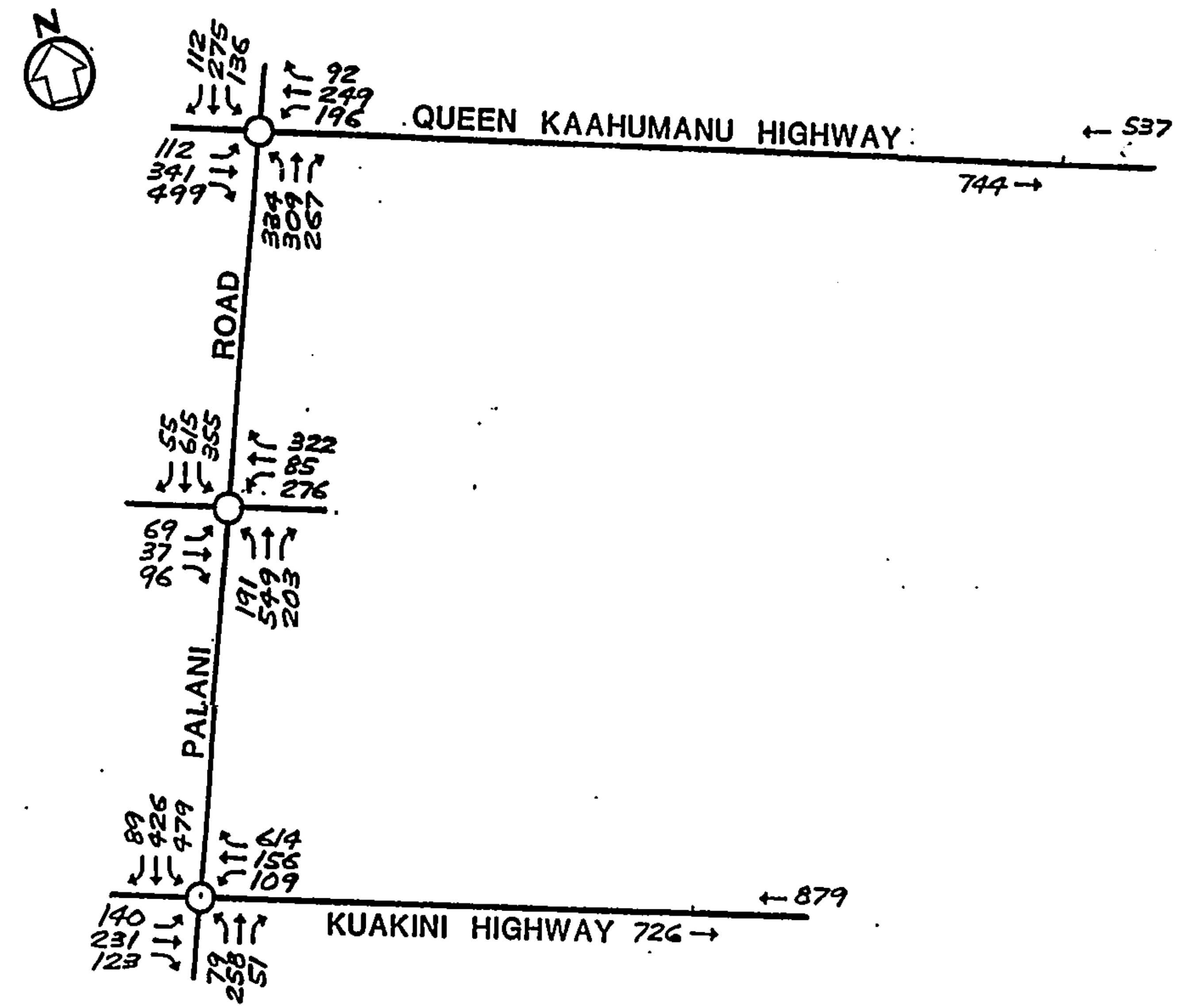


FIGURE 4

EXISTING PM PEAK HOUR VOLUMES WITHOUT HENRY STREET

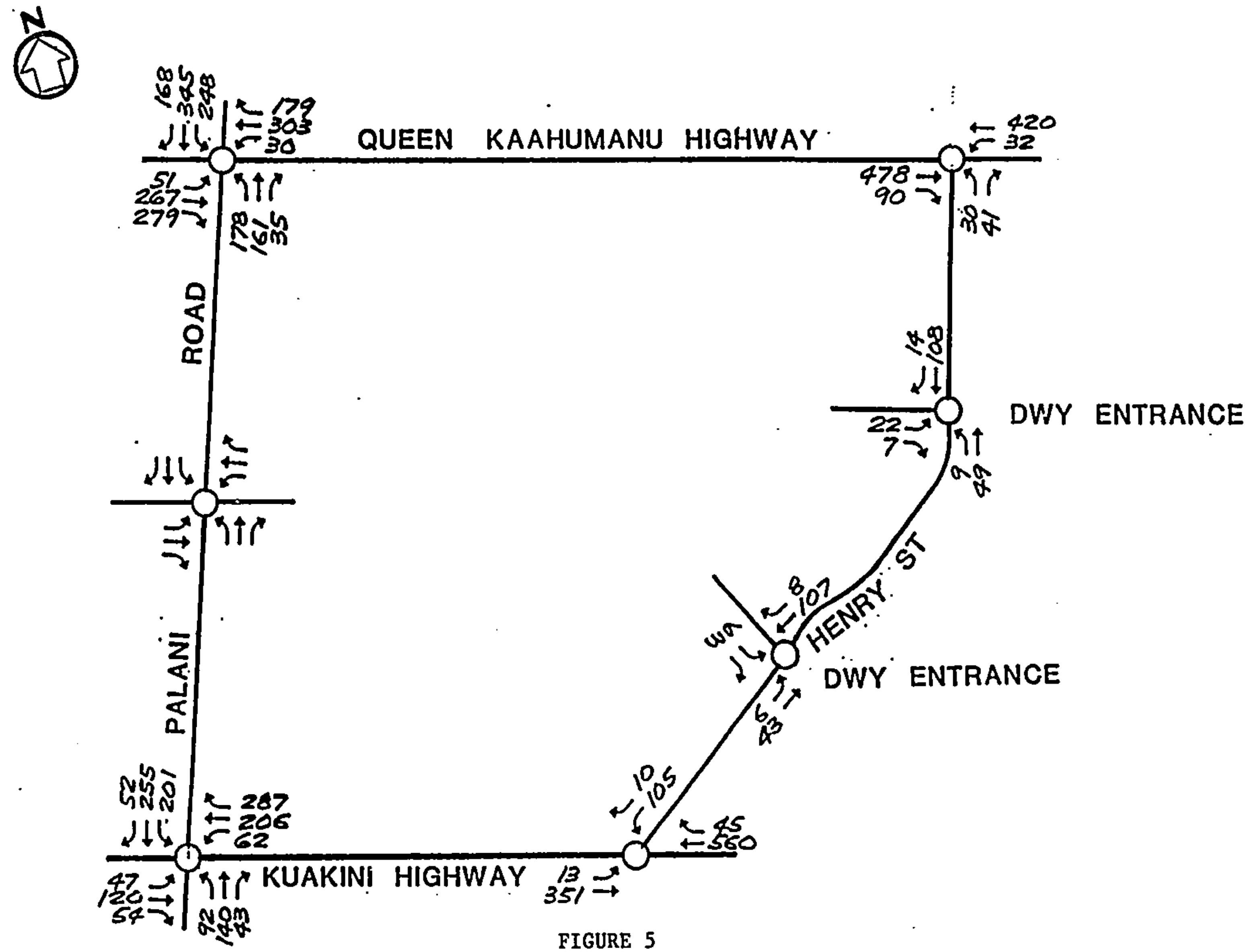


FIGURE 5

EXISTING AM PEAK HOUR VOLUMES WITH HENRY STREET

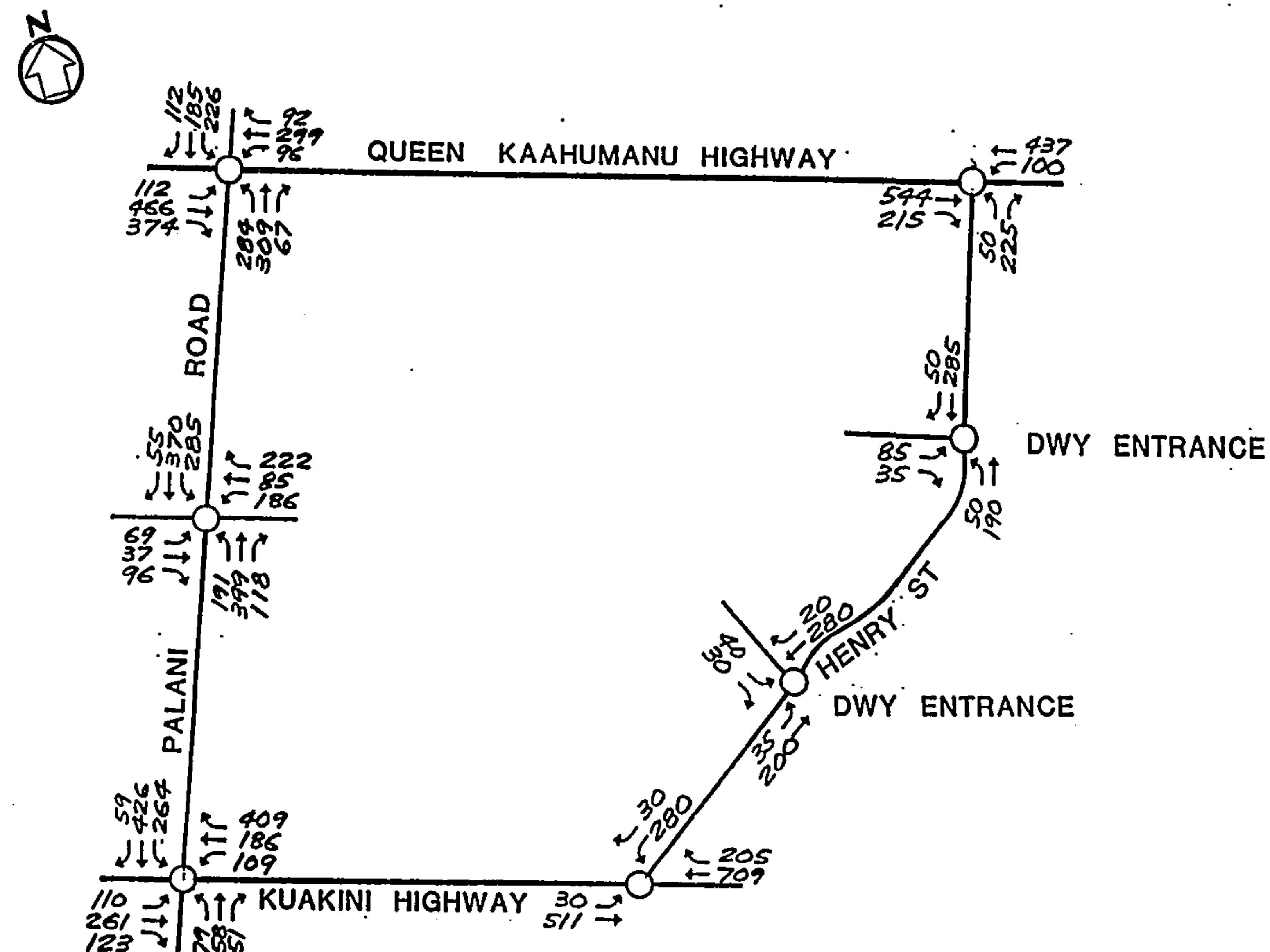


FIGURE 6

EXISTING PM PEAK HOUR VOLUMES WITH HENRY STREET

- Speed,
- Travel Time,
- Traffic Interruptions,
- Freedom to Maneuver,
- Safety,
- Driving Comfort, and
- Convenience

There are six (6) levels-of-service, A through F, which relate to the driving conditions from best to worst, respectively. The characteristics of traffic operations for each level-of-service are summarized in Table 1. In general, Level-of-Service A represents free-flow conditions with no congestion. Level-of-Service F, on the other hand, represents severe congestion with stop-and-go conditions.

Corresponding to each level-of-service shown in the table is a volume/capacity ratio. This is the ratio of either existing or projected traffic volumes to the capacity of the intersection. Capacity is defined as the maximum number of vehicles that can be accommodated by the roadway during a specified period of time. The capacity of a particular roadway is dependent upon its physical characteristics such as the number of lanes, the operational characteristics of the roadway (one-way, two-way, turn prohibitions, bus stops, etc.), and the type of traffic using the roadway (trucks, buses, etc.) and turning movements.

Unsignalized Intersections

Like signalized intersections, the operating conditions of intersections controlled by stop signs can be classified by a level-of-service from A to F. However, the method for determining level-of-service for unsignalized intersections is based on the use of gaps in traffic on the major street by vehicles crossing or turning through that stream. Specifically, the capacity of the controlled legs of an intersection (in this case, the two proposed driveways) is based on two factors: 1)

TABLE 1
LEVEL OF SERVICE DEFINITIONS FOR SIGNALIZED INTERSECTIONS
TRAFFIC STUDY FOR LANIHAU CENTER/HENRY STREET
APRIL, 1990

Level of Service	Interpretation	Volume to Capacity Ratio	Stopped Delay Per Vehicle (Seconds)
A,B	Uncongested operations; all vehicles clear in a single signal cycle.	0.000-0.700	< 15.0
C	Light congestion; occasional backups on critical approaches.	0.701-0.800	15.1-25.0
D	Congestion on critical approaches but intersection functional. Vehicles required to wait through more than one cycle during short peaks. No long standing lines formed.	0.801-0.900	25.1-40.0
E	Severe congestion with some standing lines on critical approaches. Blockage of intersection may occur if traffic signal does not provide for protected turning movements.	0.901-1.000	40.1-60.0
F	Total breakdown with stop-and-go operation.	> 1.001	> 60.0

NOTES: (1): Source: Highway Capacity Manual, 1985.
(2): This is the ratio of the calculated critical volume to Level of Service E Capacity.

the distribution of gaps in the major street traffic stream, and 2) driver judgement in selecting gaps through which to execute the desired maneuver.

The criteria for level-of-service at an unsignalized intersection is therefore based on delay and the potential or reserve capacity of each turning movement. Table 2 summarizes the definitions for level-of-service and the corresponding reserve capacity. A subsequent calculation to determine an overall level-of-service was made, and these results are presented in tables to summarize traffic conditions using parameters similar to those used for signalized intersections.

EXISTING LEVEL-OF-SERVICE ANALYSIS

Based on projected volumes for 1995 cumulative conditions detailed in Chapter 3, the two new intersections of Henry Street at Queen Kaahumanu Highway and Kuakini Highway should be signalized. The projected 1995 volumes satisfy signal warrants for new streets at both locations. Thus, these intersections were analyzed using the signalized method under existing conditions for reference purposes.

A warrant analysis was also completed for the two proposed driveway intersections on Henry Street, and it was determined that these intersections should be stop-sign controlled. Consequently, the unsignalized method was used for analysis of these intersections. Additional information and specifics regarding these warrant analyses are presented in Chapter 3.

The results of the level-of-service analysis for existing traffic conditions are shown in Table 3 for signalized intersections and Table 4 for unsignalized intersections. The calculation sheets are presented in Appendix A.

TABLE 2
LEVEL-OF-SERVICE DEFINITIONS FOR UNSIGNALIZED INTERSECTIONS
TRAFFIC STUDY FOR LANIHAU CENTER/HENRY STREET
APRIL, 1990

Level of Service	Expected Delay to Minor Street Traffic	Reserve Capacity
A	Little or no delay	> 400
B	Short traffic delays	300 - 399
C	Average traffic delays	200 - 299
D	Long traffic delays	100 - 199
E	Very long traffic delays	0 - 99
F	See Note (2) below	-

NOTES: (1): Source: Highway Capacity Manual, 1985.
(2): When demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing which may cause severe congestion affecting other traffic movements in the intersection. This condition usually warrants improvement to the intersection.

TABLE 3
EXISTING LEVEL-OF-SERVICE FOR SIGNALIZED INTERSECTIONS WITH AND WITHOUT HENRY STREET[1]

Intersection	AM Peak Hour				PM Peak Hour			
	w/o Henry		w/ Henry		w/o Henry		w/ Henry	
	LoS[2]	V/C[3]	LoS	V/C	LoS	V/C	LoS	V/C
1. Palani Road and Queen Kaahumanu Hwy	A	0.467	A	0.453	A	0.518	A	0.514
2. Palani Road and Lanihau Center Dwy	---	---	---	---	D	0.840	B	0.632
3. Palani Road and Kuakini Hwy	A	0.551	A	0.469	F	1.060	C	0.726
4. Henry Street and Queen Kaahumanu Hwy	---	---	A	0.351	---	---	A	0.496
5. Henry Street and Kuakini Hwy	---	---	A	0.474	---	---	C	0.717

NOTES: (1): Level-of-Service with Henry Street under existing conditions is for reference purposes only. Traffic at intersections 4 and 5 on Henry Street includes only diverted trips and re-assigned Lanihau Center trips.
(2): LoS = Level-of-Service
(3): V/C = Volume-to-Capacity ratio

TABLE 4
EXISTING LEVEL-OF-SERVICE FOR UNSIGNALIZED INTERSECTIONS

Intersection	AM Peak Hour LoS[1]	PM Peak Hour LoS
1. Henry Street and West Driveway[2]	A	A
2. Henry Street and East Driveway	A	A

NOTES: (1): LoS = Level-of-Service
(2): West Driveway is closest to Kuakini Highway.

From Table 3, the intersection of Palani Road and Kuakini Highway is currently operating at Level-of-Service F in the PM peak hour. If Henry Street was in place today, it would serve as an alternate route for through traffic on Palani Street, and as an alternate access route to existing Lanihau Center. Accordingly, traffic conditions at all three of the intersections along Palani Road would improve and operate at acceptable conditions upon completion of Henry Street.

3.

PROJECTED CUMULATIVE TRAFFIC CONDITIONS

The purpose of this chapter is to discuss the assumptions and data used to estimate 1995 cumulative traffic conditions. Cumulative traffic conditions are defined as the traffic conditions resulting from background growth and related projects.

Cumulative traffic volumes or trips include background growth between the present and 1995 and trips generated by related projects in the vicinity.

BACKGROUND TRAFFIC GROWTH RATE

The first component of cumulative trips is background growth. Based on input from the City and County of Hawaii DPW, it was determined that the background growth rate may be expected to range from 1 to 1.5 percent per year. This growth represents ambient background growth not associated with any particular project. The 1.5 percent growth factor has been used on several past studies. Therefore, a noncompounded growth rate of 1.5 percent per year was used for this study. This is equivalent to a 7.5 percent growth over the next five years (1990 through 1995).

RELATED PROJECTS

The second component in estimating future traffic conditions without the project is the traffic generated by related projects in the vicinity. Related projects are defined as those projects that are under construction or have been approved for construction which would significantly impact traffic in the intersection being analyzed.

Based upon the information obtained from the City and County, three projects would generate traffic that should be included in this category. The Kailua Park expansion is presently in the review process. In addition, there are two parcels in the immediate area which, if developed by 1995, could generate traffic and impact the study intersections. A 3.3 acre parcel west of Kuakini Highway and south of Kaiwai Road is currently zoned for residential developement. Based on this zoning, approximately 100 condominium units could be constructed. The second parcel is a 9-acre area immediately south of the Henry Street alignment between Queen Kaahumanu Highway and Kuakini Highway. It is zoned for a commercial development of approximately 90,000 s.f. As a conservative estimate, traffic from these developments was included in the analysis.

The trips generated by the Kailua Park expansion were extracted from the associated traffic study, and the trips for the two future developments were obtained from the ITE Trip Generation report previously cited. This data includes peak hour and daily trip generation and inbound/outbound distribution.

1995 CUMULATIVE TRAFFIC VOLUMES

Cumulative traffic volumes for 1995 were calculated by superimposing background growth and related project trips onto existing traffic volumes. A factor of 1.075 was applied to existing traffic and the trips from the related projects described above were added to obtain the 1995 cumulative traffic volumes. Volumes were assigned to the roadway network for conditions with and without Henry Street for both peak hours as shown on Figures 7 through 10.

PROPOSED LANE CONFIGURATIONS

Henry Street is currently proposed as a four-lane facility, two lanes in each direction divided by a raised median. Based on the projected cumulative traffic volumes for 1995, it is recommended that the intersection of Henry Street at Queen Kaahumanu Highway be constructed to include two approach lanes plus a right turn lane on the eastbound approach. The proposed intersection shows a "T-intersection" with channelized right turns for the eastbound and southbound approaches. Initially, the two lane approach would be striped for a single left turn lane. However, future widening of Queen Kaahumanu Highway would allow striping of an additional left turn or through lane should volumes warrant it.

Similarly, the westbound approach at the intersection of Henry Street and Kuakini Highway should be constructed so as to allow for the addition of a second left turn lane in the future. The proposed lane configurations for future conditions are shown on Figure 11. The channelized right turn lanes on Henry Street are represented by a standard right turn arrow for reference purposes, although the right-turn traffic does not pass through the intersection.

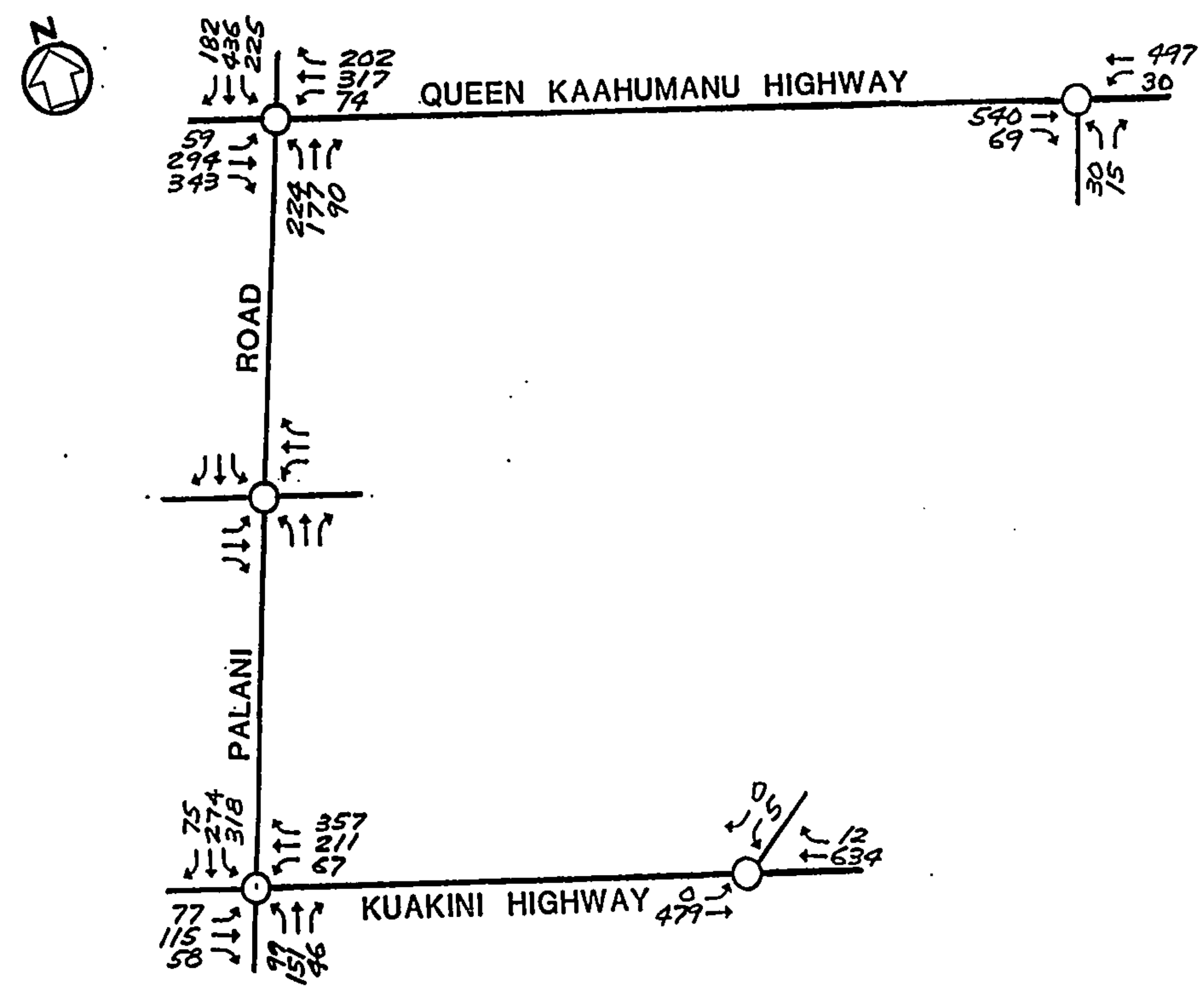


FIGURE 7

1995 CUMULATIVE AM PEAK HOUR VOLUMES WITHOUT HENRY STREET

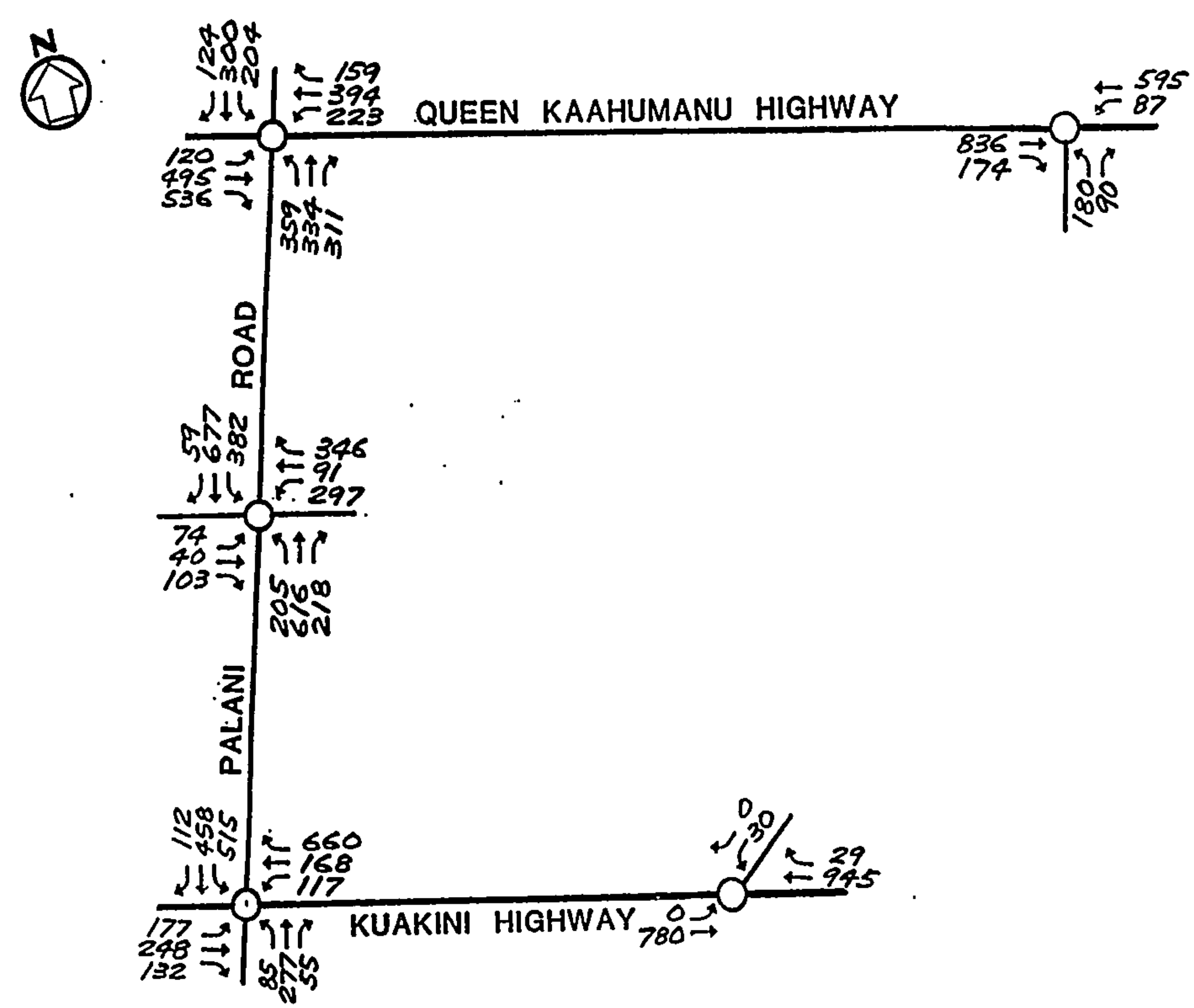


FIGURE 8

1995 CUMULATIVE PM PEAK HOUR VOLUMES WITHOUT HENRY STREET

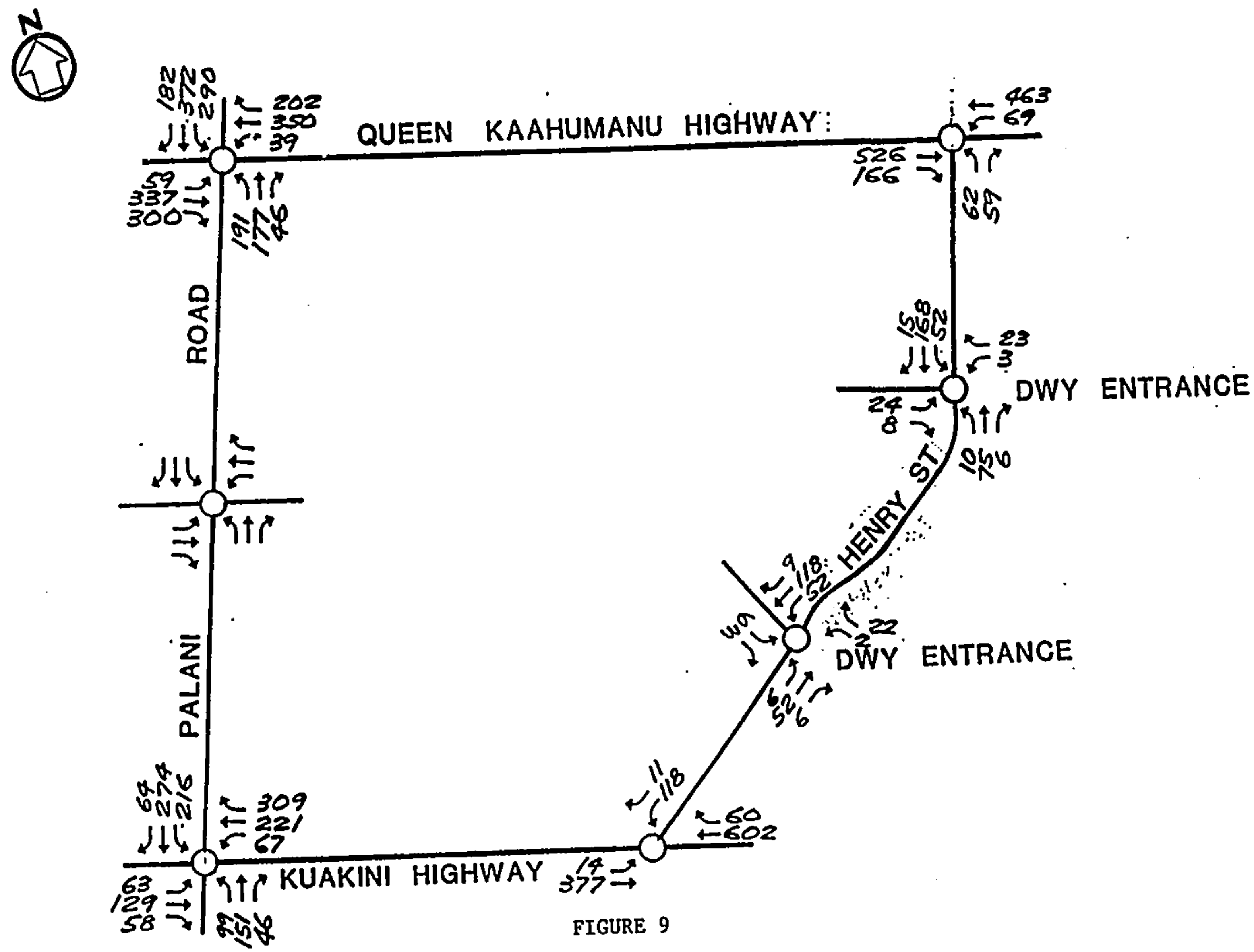


FIGURE 9

1995 CUMULATIVE AM PEAK HOUR VOLUMES WITH HENRY STREET

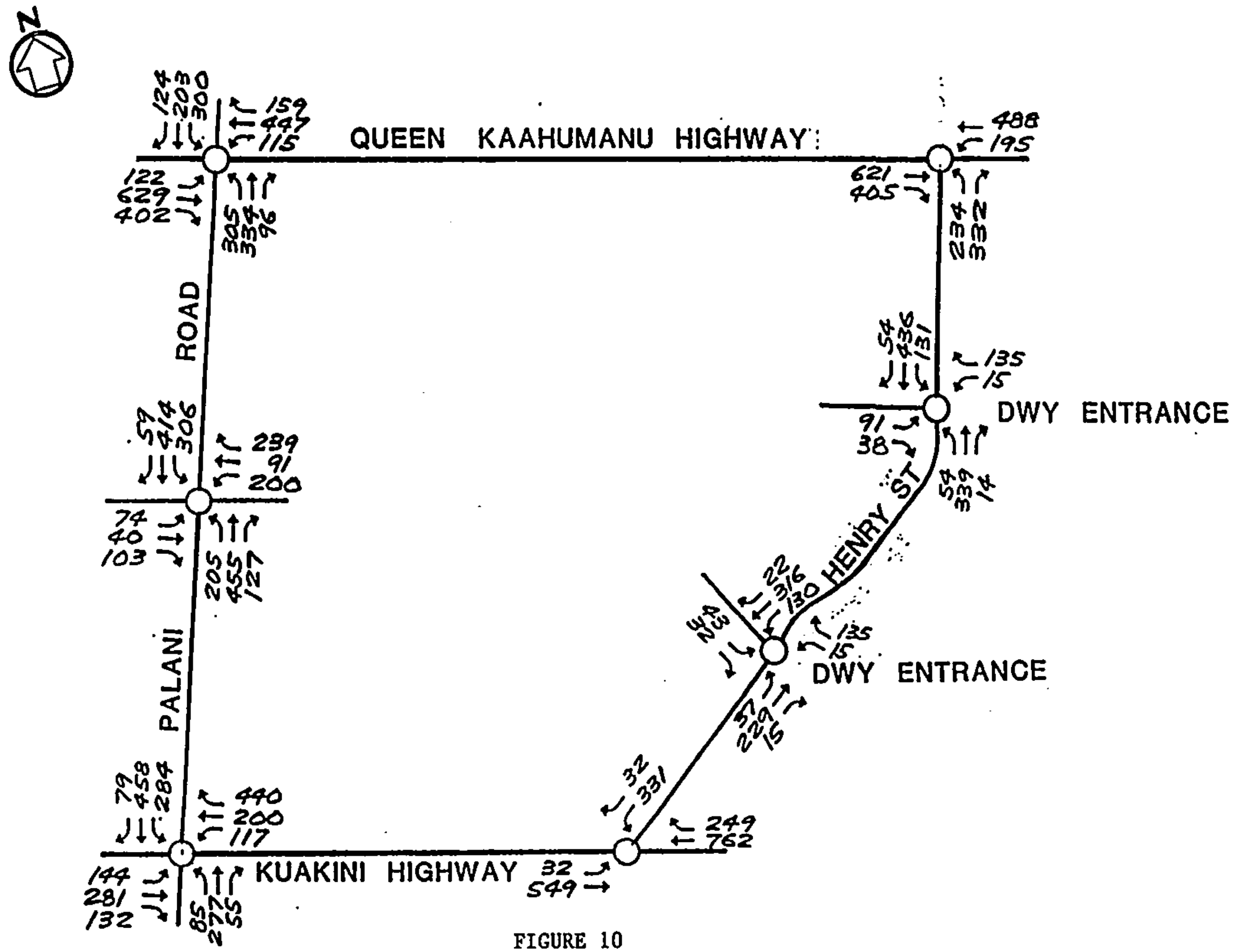


FIGURE 10

1995 CUMULATIVE PM PEAK HOUR VOLUMES WITH HENRY STREET

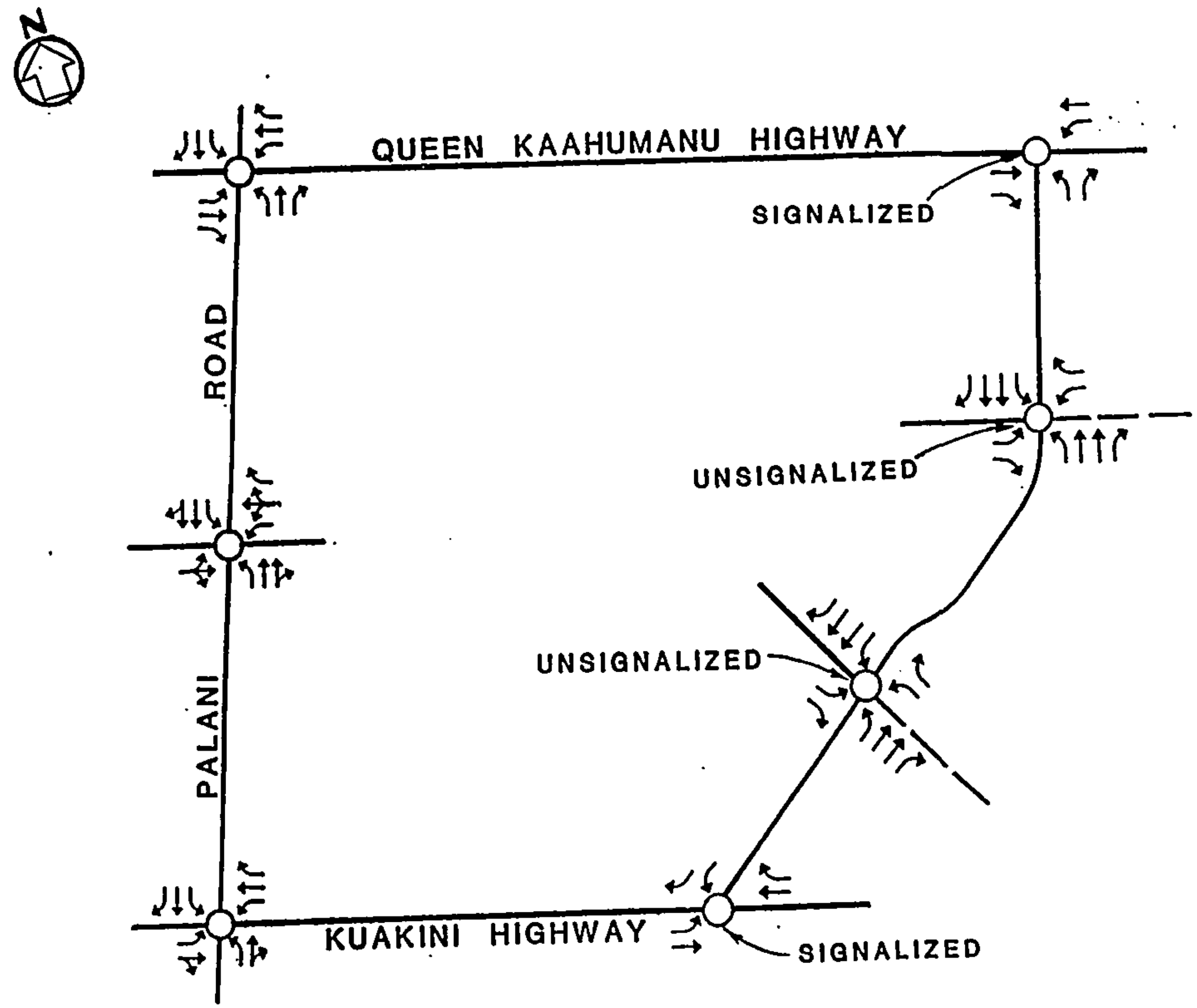


FIGURE 11

PROPOSED LANE CONFIGURATIONS

1995 CUMULATIVE LEVEL-OF-SERVICE ANALYSIS

The projected volumes discussed above were used to determine if signalization of the intersections of Henry Street at Queen Kaahumanu Highway would be warranted. The warrant analysis for new streets described in the Manual of Uniform Traffic Control Devices, (1988) was used in this study. The warrant accounts for average daily traffic on an existing facility and estimated average daily traffic on a new intersecting street. Based on these parameters, signalization of both intersections would be warranted in the PM peak hour. The warrant analysis summary sheet is included in Appendix B.

A warrant analysis was also completed for the two proposed driveway intersections on Henry Street using the methods described in the Uniform Manual in Appendix B of this report. It was determined that the peak hour volumes on Henry Street and either driveway would not warrant a signal and would operate under acceptable conditions with stop-sign control on the driveway approaches. The driveways would serve the existing traffic from Lanihau Center and traffic from Phase II. Traffic on Henry Street would not be required to stop. Thus, these intersections were analyzed using the method for unsignalized intersections described in the source cited prviously, the 1985 Highway Capacity Manual. The intersections are distinguished by their geographic location and are designated as the West and East Driveways; the West Diveway is closest to Kuakini Highway.

The results of the level-of-service analysis for the five signalized intersections under cumulative conditions are shown in Table 5. The results for the two unsignalized, driveway intersections are summarized in Table 6.

As was the case under existing conditions, all of the intersections would experience no capacity problems without Henry Street in the AM peak hour in 1995 considering growth and related trips. However, the intersections of Palani Road at the Shopping Center Driveway and at Kuakini Highway would experience unacceptable operating conditions of LoS E and F, respectively, during the PM peak hour without Henry Street.

The construction of Henry Street would alleviate some of the congestion from the Palani Road signalized intersections and would improve the level of operation from LoS E to B at Palani Road and the Lanihau Center Driveway. The lower level-of-service at Palani Road and Queen Kaahumanu Highway results from a shift in traffic between turning movements and slightly increases the V/C ratio. The decrease in volume-to-capacity ratio (from 1.168 to 0.794) at Palani Road and Kuakini Highway is a major improvement. All signalized intersections would operate at Level of Service C or better with Henry Street. Overall, the driveway intersections on Henry Street both operate under acceptable conditions (LoS A or B) during both the AM and PM peak hours.

TABLE 5
1995 CUMULATIVE LEVEL-OF-SERVICE
FOR SIGNALIZED INTERSECTIONS
WITH AND WITHOUT HENRY STREET

	AM Peak Hour				PM Peak Hour			
	w/o Henry		w/ Henry		w/o Henry		w/ Henry	
Intersection	LoS[1]	V/C[2]	LoS	V/C	LoS	V/C	LoS	V/C
1. Palani Road and Queen Kaahumanu Hwy	A	0.519	A	0.505	A	0.591	B	0.635
2. Palani Road and Lanihau Center Dwy	---	---	---	---	E	0.921	B	0.692
3. Palani Road and Kuakini Hwy	B	0.605	A	0.505	F	1.168	C	0.794
4. Henry Street and Queen Kaahumanu Hwy	---	---	A	0.418	---	---	B	0.650
5. Henry Street and Kuakini Hwy	---	---	A	0.513	---	---	C	0.793

NOTES: (1): LoS = Level-of-Service
(2): V/C = Volume-to-Capacity ratio

TABLE 6
1995 CUMULATIVE LEVEL-OF-SERVICE FOR UNSIGNALIZED INTERSECTIONS

Intersection	AM Peak Hour LoS[1]	PM Peak Hour LoS
1. Henry Street and West Driveway[2]	A	A
2. Henry Street and East Driveway	A	B

NOTES: (1): LoS = Level-of-Service
(2): West Driveway is closest to Kuakini Highway.

4.

CUMULATIVE PLUS PROJECT TRAFFIC CONDITIONS

This chapter discusses the methodology used to identify the traffic-related impacts of the proposed Lanihau Center expansion. This methodology involves the three step process of trip generation, distribution and assignment. First, the number of weekday AM and PM peak-hour trips that would be generated by the proposed project was determined. These trips were then distributed on the major approach and departure routes. Next, each trip was assigned a specific path to and from the site based on access/egress locations and travel patterns. Finally, the level-of-service was calculated at each of the study intersections subsequent to the addition of project volumes to the roadway network.

TRIP GENERATION

Traffic volumes for the proposed project were determined using trip generation equations contained in Trip Generation (Fourth Edition, 1987), an informational report prepared by the ITE. The Phase II expansion includes 260,075 s.f. of retail space and 14,500 s.f. on four separate building pads. A worst-case scenario for this development assumed a fast food restaurant, a sit-down restaurant, a rental car office and a bank on these pads. The trip generation analysis and the resulting peak hour volumes are summarized in Table 7.

TRIP DISTRIBUTION

The project-related trips were distributed based on the future distribution of population and the anticipated approach and departure routes to the project site. This information was obtained from previously conducted traffic studies for the area. The directions of approach and departure are shown on Figure 12.

TRIP ASSIGNMENT

Using the trip generation and trip distribution previously discussed, site-generated traffic was assigned to the various turning movements at the intersections studied. The trip assignments for the AM and PM peak hours are shown on Figures 13 and 14.

TABLE 7
PROJECT TRIP GENERATION ANALYSIS
LANIHAU CENTER PHASE II EXPANSION
APRIL, 1990

Land Use	Daily[1]	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Phase II (260,075 s.f.)	13,411	217	93	310	494	558	1,052
Fast Food Restaurant (3,000 s.f.)	2,686	88	88	176	51	50	101
Sit-Down Restaurant (4,250 s.f.)	600	45	36	81	42	37	79
Rental Car Office (3,000 s.f.)	110	6	4	10	6	4	10
Bank (4,250 s.f.)	803	25	16	41	50	62	112
Total Trips	17,610	381	237	618	643	711	1,354

NOTES: (1): Daily trips are for informational use only.

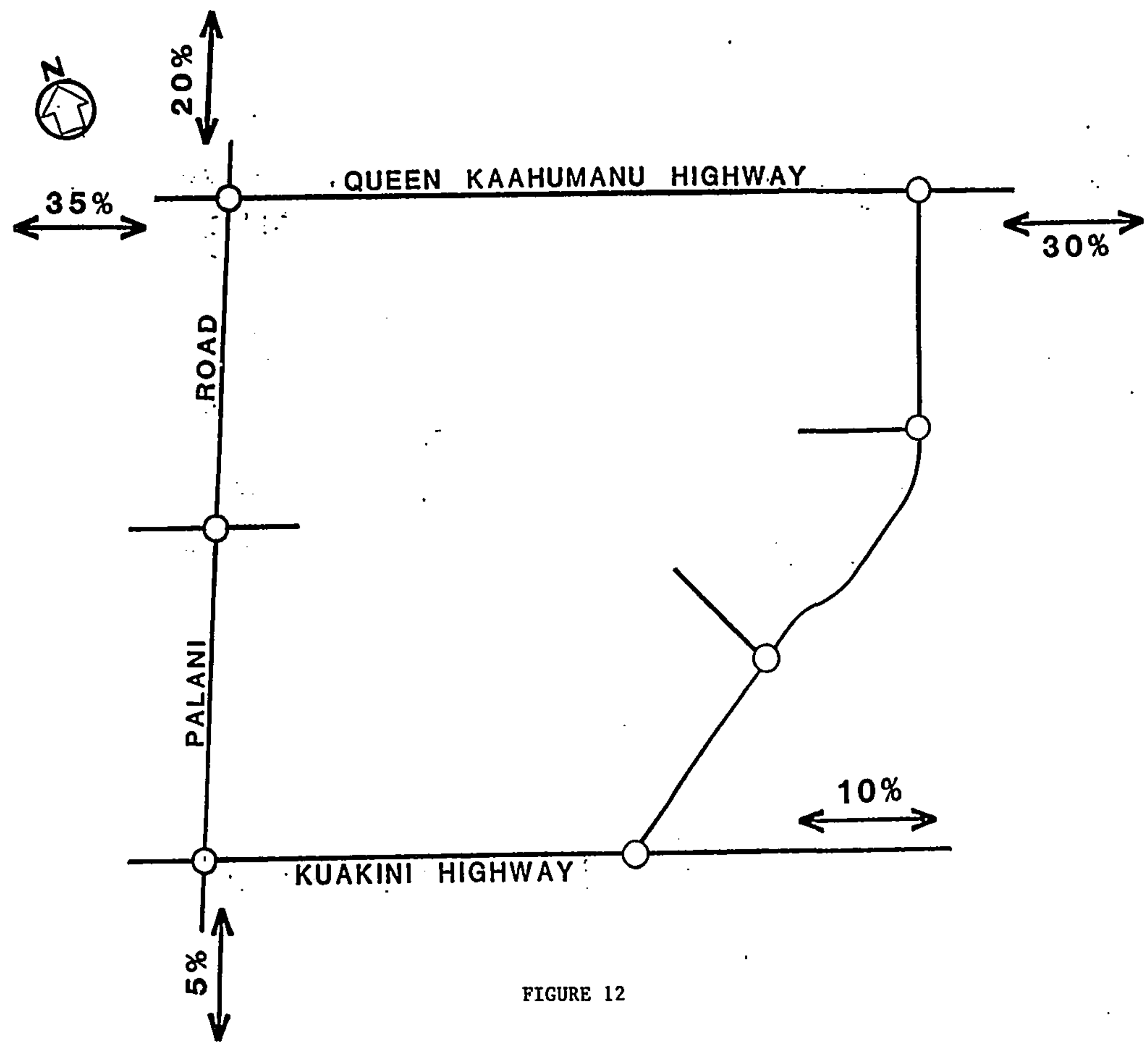


FIGURE 12

DIRECTIONS OF APPROACH AND DEPARTURE

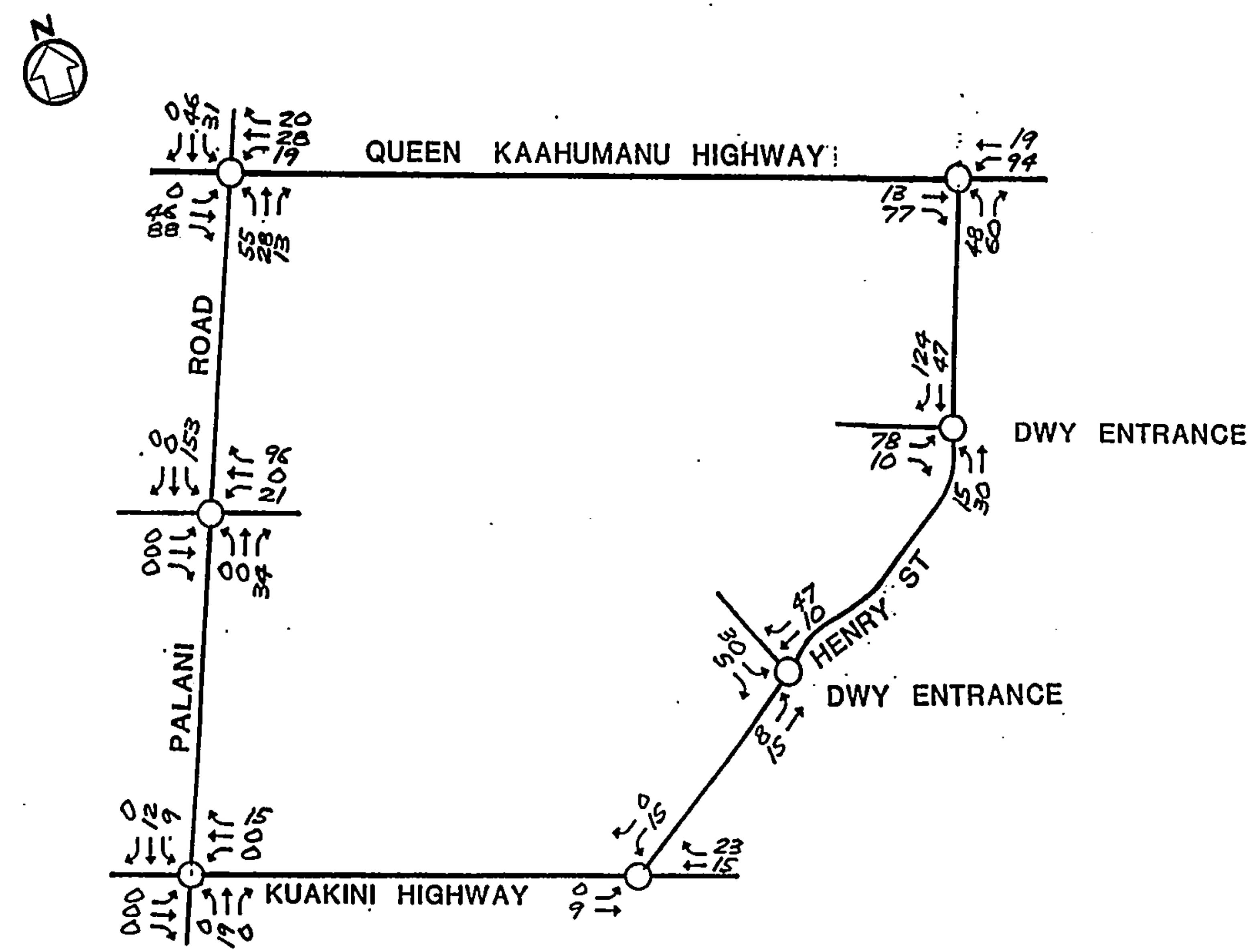


FIGURE 13

PROJECT RELATED AM PEAK HOUR VOLUMES

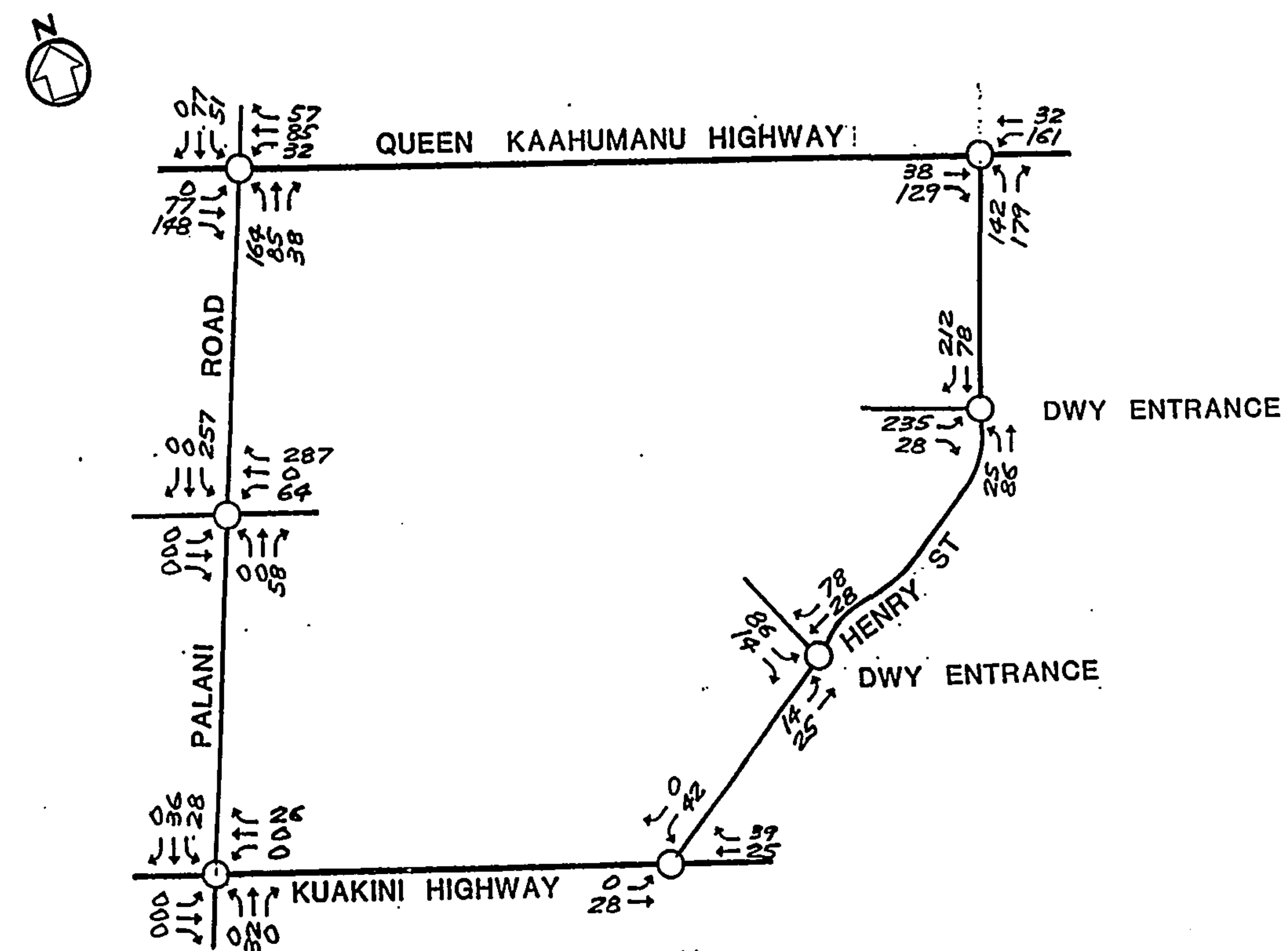


FIGURE 14

PROJECT RELATED PM PEAK HOUR VOLUMES

TOTAL PEAK HOUR TRAFFIC VOLUMES

Future traffic volumes with the project were determined by superimposing the site-generated traffic on the cumulative traffic volumes presented in the previous chapter. Thus, operating conditions under this scenario include existing traffic, background growth, related projects and proposed project trips on the future roadway network. It is assumed that Henry Street would be constructed for any Lanihau Center expansion.

The resulting 1995 cumulative plus project traffic volumes are shown for the AM and PM peak hours on Figures 15 and 16, respectively. The results of the level-of-service analysis for the signalized intersections are presented in Table 8. Similarly, the results of the analysis of the two proposed driveways on Henry Street are presented in Table 9.

With project trips superimposed upon cumulative traffic conditions, all intersections operate at an acceptable level-of-service (D or better) in the PM peak hour. All other intersections operate at LoS D or better during both peak hours with project traffic.

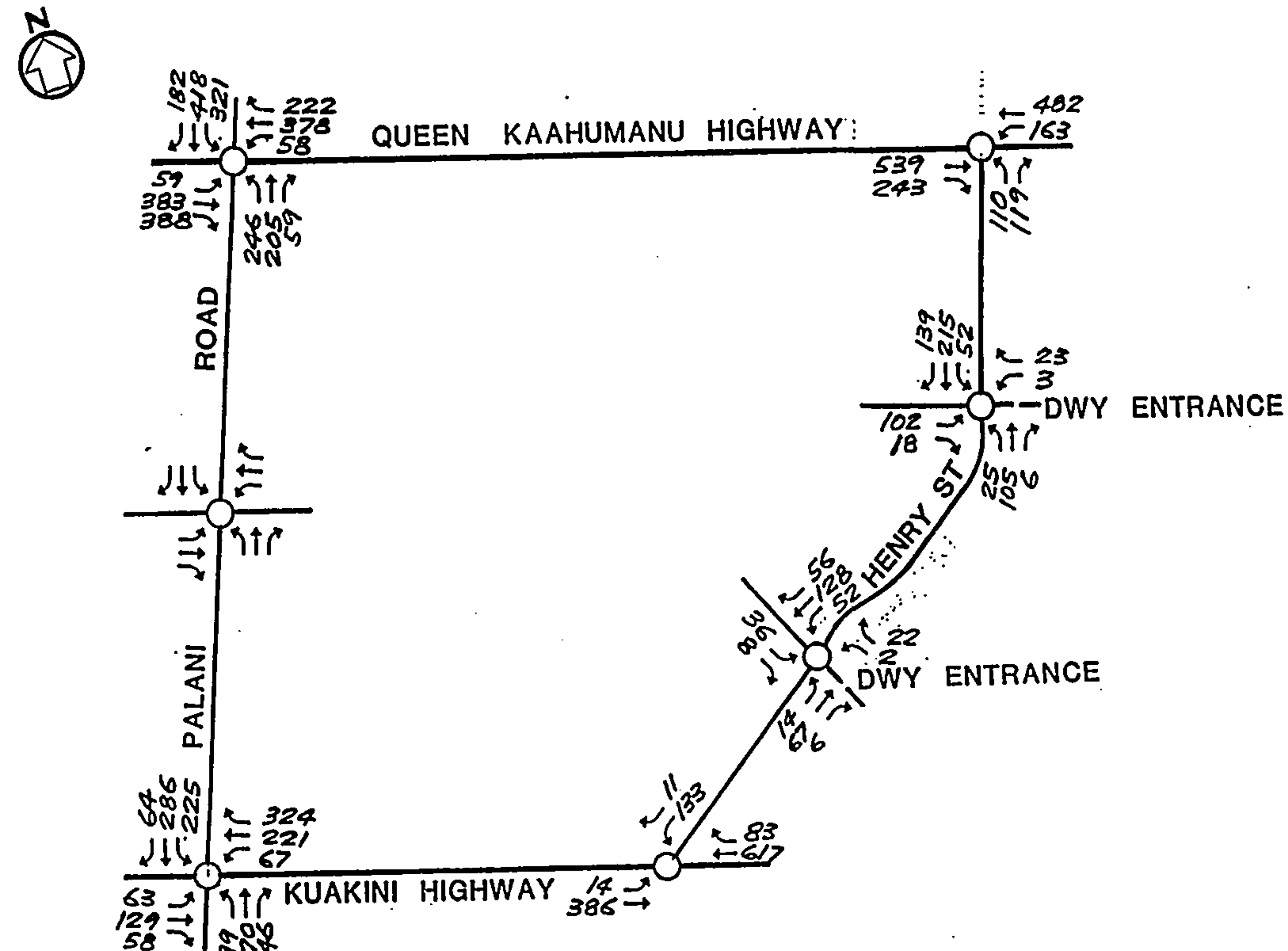


FIGURE 15

1995 CUMULATIVE PLUS PROJECT AM PEAK HOUR VOLUMES

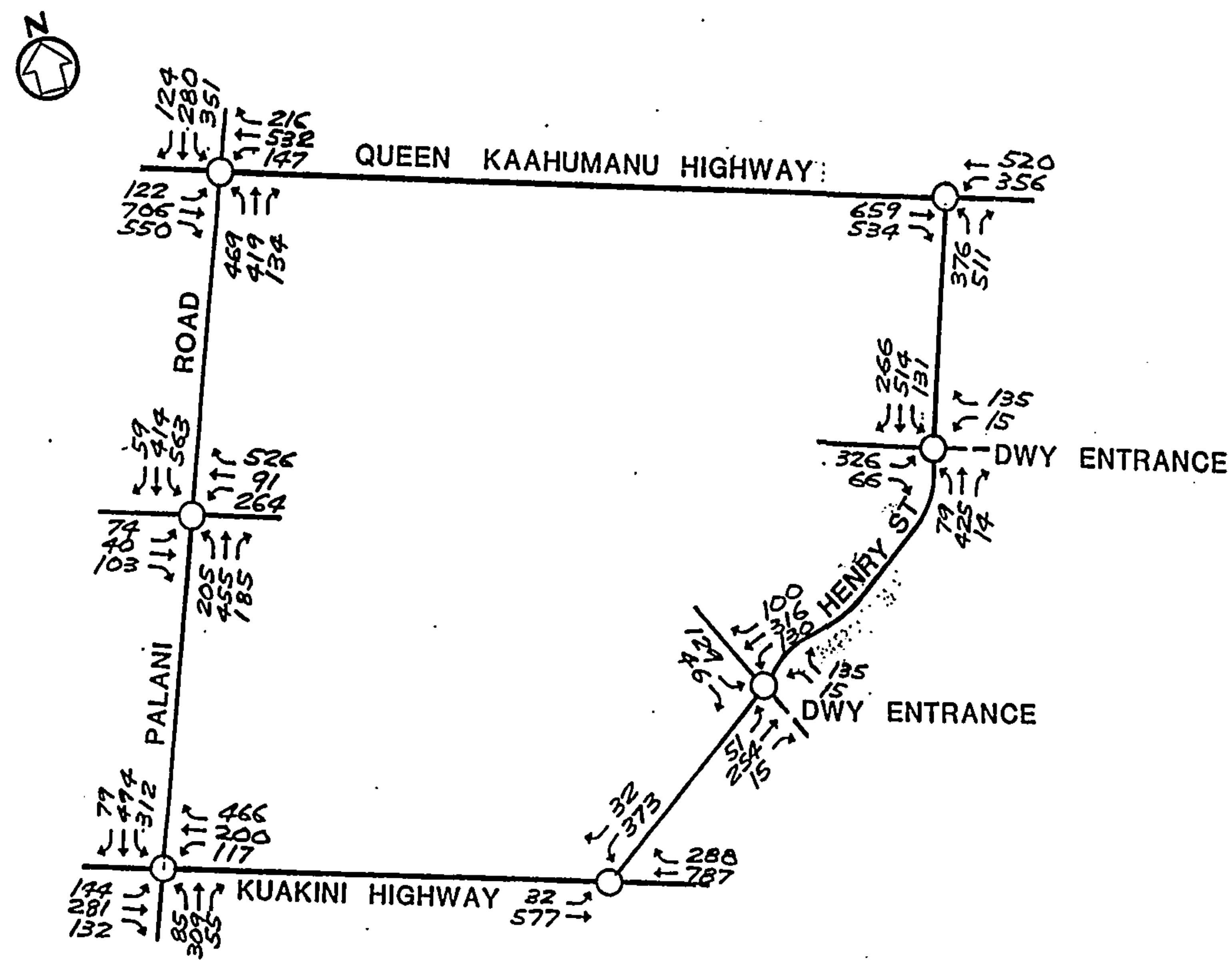


FIGURE 16

1995 CUMULATIVE PLUS PROJECT PM PEAK HOUR VOLUMES

TABLE 8
1995 CUMULATIVE PLUS PROJECT
LEVEL-OF-SERVICE FOR
SIGNALIZED INTERSECTIONS

Intersection	AM Peak Hour LoS[1]	AM Peak Hour V/C[2]	PM Peak Hour LoS	PM Peak Hour V/C
1. Palani Road and Queen Kaahumanu Hwy	A	0.554	D	0.806
2. Palani Road and Lanihau Center Dwy	-	-	D	0.897
3. Palani Road and Kuakini Hwy	A	0.525	D	0.830
4. Henry Street and Queen Kaahumanu Hwy	A	0.493	D	0.837
5. Henry Street and Kuakini Hwy	A	0.535	D	0.841

Notes: (1): LoS = Level-of-Service
(2): V/C = Volume-to-Capacity ratio

TABLE 9
1995 CUMULATIVE PLUS PROJECT
LEVEL-OF-SERVICE FOR
UNSIGNALIZED INTERSECTIONS

Intersection	AM Peak Hour LoS[1]	PM Peak Hour LoS
1. Henry Street and West Driveway[2]	A	B
2. Henry Street and East Driveway	A	B

Notes: (1): LoS = Level-of-Service
(2): West Driveway is closest to Kuakini Highway.

5.

SUMMARY OF IMPACTS AND MITIGATION MEASURES

The purpose of this chapter is to present the results of the level-of-service analyses which identify the project-related impacts, and the impacts of Henry Street on the surrounding roadway network. In addition, any mitigation measures necessary and feasible are identified.

DEFINITION OF SIGNIFICANT IMPACTS

Criteria have been established in various cities to define a significant traffic impact requiring mitigation. These criteria were used in this study as Kailua-Kona has not established similar guidelines. Generally, the criteria are as follows: if the level of service under cumulative conditions without the project is E or F, and the volume/capacity (V/C) ratio changes less than 0.030, the project's traffic impacts are considered insignificant. However, if the V/C ratio change is greater than 0.030, then mitigation measures which will reduce the V/C ratio change to less than 0.030 must be identified. For this project, the 0.030 criterion has been used. If the level-of-service with project traffic is D or better, then no mitigation measures need to be identified.

PROJECT-RELATED TRAFFIC IMPACTS

A summary of the level-of-service analyses results for the intersections under study is presented in Table 10. All scenarios are shown for conditions with and without Henry Street.

The introduction of project traffic onto the roadway network under 1995 cumulative conditions does not cause a significant impact at any of the signalized or unsignalized study intersections. All of the intersections would operate at LoS D or better under project conditions.

In conclusion, the construction of Henry Street will improve the operating conditions at intersections along Palani Road to acceptable levels and will improve general circulation in the immediate area. The two proposed driveways to the Lanihau Center on Henry Street should not be signalized in the forseeable future unless there is significant related project development in the area. If traffic increases caused by these related projects do occur, responsibility should be assigned to them accordingly.

TABLE 10
SUMMARY OF LEVEL OF SERVICE ANALYSIS RESULTS
LANIHAU CENTER/HENRY STREET
APRIL 1990

	EXISTING CONDITIONS								CUMULATIVE CONDITIONS								CUMULATIVE PLUS PROJECT CONDITIONS			
	AM Peak Hour				PM Peak Hour				AM Peak Hour				PM Peak Hour				AM Peak Hour		PM Peak Hour	
	w/o Henry		w/Henry		w/o Henry		w/Henry		w/o Henry		w/Henry		w/o Henry		w/Henry		w/Henry		w/Henry	
Signalized Intersection	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C
1. Palani Road @ Queen Kaahumanu Highway	A	0.467	A	0.453	A	0.518	A	0.514	A	0.519	A	0.505	A	0.591	A	0.635	A	0.544	D	0.806
2. Palani Road @ Lanihau Center Driveway	----		----		D	0.840	B	0.632	----		----		E	0.921	B	0.692	----		D	0.897
3. Palani Road @ Kuakini Highway	A	0.551	A	0.469	F	1.060	C	0.726	B	0.605	A	0.505	F	1.168	C	0.794	A	0.525	D	0.830
4. Henry Street @ Queen Kaahumanu Highway	----		A	0.351	----		A	0.496	----		A	0.418	----		B	0.650	A	0.493	D	0.837
5. Henry Street @ Kuakini Highway	----		A	0.474	----		C	0.717	----		A	0.513	----		C	0.793	A	0.535	D	0.841
Unsignalized Intersection																				
6. Henry Street @ West Driveway	----		A	----	----		A	----	----		A	---	----		A	---	A	---	B	---
7. Henry Street @ East Driveway	----		A	----	----		A	----	----		A	---	----		A	---	A	---	B	---

Notes:
LOS = Level of Service
V/C = Volume-to-Capacity Ratio
--- = Data for calculation not available or applicable under specific conditions

The Traffic Impact Study's Appendices A, B, and C

Are Available Upon Request

APPENDIX E

Flood Control Study

PROPOSED HENRY ROAD
FINAL FLOOD CONTROL STUDY
Kailua-Kona, Hawaii
Tax Map Key: 3rd Div. 7-5-04: 10

Prepared By:

HIDA, OKAMOTO & ASSOCIATES, INC.
Consulting Engineers
2600 South King Street
Suite 207
Honolulu, Hawaii 96826

February 1990

CONTENTS

Existing Conditions

Based on the North Kona Flood Plain Management Study prepared in December 1984 by the U.S. Department of Agriculture, Soil Conservation Service, the project site for the proposed Henry Street and the Lanihau Center, Phases II and III are within the North Keopu Stream drainageway. The 100 year flood inundation area map, flood discharge data, and drainageway flood profiles are included in Appendix A. The data indicates an average flood depth of 4 feet and a flood width of 200 feet within the drainageway, which extends through the project site to Kuakini Highway. Beyond Kuakini Highway, the drainageway encompasses the entire area between Palani Road and Sarona Road until it overflows Alii Drive to Kailua Bay. There are currently no existing drainage systems between Queen Kaahumanu Highway and Alii Drive, capable of accommodating the 100 year flood.

The U.S. Army Corp of Engineers compiled a study entitled "Reconnaissance Report for Flood Damage Reduction for Keopu-Hienaloli Streams, North Kona, Island of Hawaii" dated February 1988. This report presented six different plans "A" thru "P", designed to alleviate the expected flood damages based on the 100 year design flood. These are reproduced in Appendix B. The various plans considered include diverting the North Keopu Stream to South Keopu Stream, constructing an outlet channel for North Keopu Stream, or combinations of stream diversions and outlet channel improvements. The highest Benefit to Cost Ratio was 0.3, on a scale where the Benefit to Cost Ratio must be greater than 1.0 in order to become economically feasible. In fact, the analysis was even revised to down grade two of the least costly alternatives, plans "D" and "E" to a 10 year level of flood protection in lieu of a 100 year level. The sixth alternative for a 10 year level of protection, plan "F", was also added. Even with this approach, the highest Benefit to Cost Ratio was only 0.6.

The Corp of Engineers completed their investigations at the end of the Reconnaissance Phase. A summary of findings indicated that no federal interest could be established for a plan of improvement in the Keopu-Heinaloli area at that time, since all of the alternatives show Benefit to Cost Ratios less than one.

Proposed Drainage Alternatives

The U.S. Corp of Engineers in their Reconnaissance Report had already undertaken an intensive study to identify all of the economically viable alternatives for flood mitigation. We have been unable to develop any other alternatives to supplement these, however, in analyzing the Corp of Engineers' study, the following appears to be possible alternatives that would mitigate the Henry Street drainage situation:

(1) Plan D Construct a diversion channel to divert excess Hienaloli and South Keopu Stream flows to North Keopu Stream. Construct a new outlet channel for South Keopu Stream. This offers a 100 year level of flood protection, but can also be constructed to a 10 year level of protection for a reduced cost.

(2) Plan F Construct a diversion channel from North Keopu to South Keopu Stream. Extend a diversion bank at the Keopu debris basin to South Keopu Stream. This offers a 10 year level of flood protection.

Estimated costs based on the October 1987 price levels are summarized below:

Level of Protection	100 Year	10 Year
Plan D	$12,900,000	$6,730,000
Plan F	---	$7,530,000

Summary of Findings and Recommendations

Both of the previously discussed alternatives will mitigate the flood situation in the vicinity of the Henry Street project, however in both cases, the costs appear to be prohibitive without any Federal assistance. (In comparison, the entire on-site work for Lanihau Center, Phase II and III are estimated to be $7,000,000.)

Plan D does not appear to be economically feasible to the County, as an outlet channel between Kuakini Highway and Kailua Bay would require land acquisition and condemnation. Under Plan D, the County will also have to bear the full costs of any off-site land acquisition, design and construction costs. We assume that the County's capital expenditure priorities does not permit this project in the forcible future. The County could choose to do nothing, which does not mitigate any flood risks or the County could adopt a 10 year level of flood protection to lessen the flood risks. It is strongly recommended that the County consider adopting for design purposes, a 10 year level of flood protection in lieu of a 100 year level of flood protection. If a 10 year level of flood protection is acceptable to the County, the design consultants for Lanihau Center will be responsible for designing an on-site drainage system to accommodate the 10 year flood from the culvert at Queen Kaahumanu Highway at no cost to the County. The proposed on-site drainage system and calculations are shown in Appendix C.

The on-site drainage system will be designed to handle the 10 year design flood of 590 cfs and will enter a percolation and retention basin sized to store 280 cfs of stormwater runoff for a 1 hour duration. In addition, 11 drywells will be constructed within the basin, each sized to handle 10 cfs. Two 42-inch diameter overflow pipes will connect to a dual 42-inch diameter drainage line within Henry Street. Each drain line will connect to a series of 10 drywells with catch basin openings along Henry Street on each side of the street, each designed to handle 10 cfs. Any storm greater than the 10 year design storm will overflow the catch basins into Henry Street and into Kuakini Highway. This should be acceptable, since design will be based on a 10 year level of flood protection, which is a significant improvement over the existing conditions. This flood mitigation alternative is estimated to cost $700,000. The cost is in addition to the estimated construction cost of $1,420,000, which has been recognized by the County for Henry Street within the Lanihau Center property.

If the 10 year flood level design alternative is not acceptable to the County, Plan F is recommended (at County's expense) because there would be less cost in land acquisitions compared to Plan D.

Introduction

This supplemental flood control study provides the hydrologic and hydraulic data concerning the flooding problems associated with the proposed drainage system which is designed for a 10-year storm and will overflow during a 100-year storm. Included in this study are the following:

1. Determination of elevation/discharge relationships for the Keopu Drainageway makai of the Queen Kaahumanu Highway for the 100-year frequency storm overflow compared with the existing 100-year frequency storm.

2. Delineation of flood plain area in the Keopu Drainageway for a 100-year frequency storm overflow compared with the existing 100-year frequency storm on the flood hazards map with a aerial photo contour base (See Figure 2).

This study was derived from the "North Kona Flood Plan Management Study" (Management Study) prepared by the U.S. Department of Agriculture, Soil Conservation Services, December 1984.

Analysis

The existing peak discharge of 1,680 cfs and a flow depth at each station for a 100-year frequency storm is based on the Flood Plain Management Study (See Appendix A). The proposed drainage system will provide a 10-year level of protection or eliminate approximately 590 cfs. A 100-year frequency storm overflow would be 1,090 cfs.

The flow area/cross sectional area of the existing flooding was determined by a back water curve analysis using the standard step method (See Appendix E), and the flood hazard maps.

In addition, a back water curve analysis, using the standard step method was used to determine the water surface elevation and the top width-discharge at several stations makai of Queen Kaahumanu Highway and were computed based on a overflow of 1,090 cfs (See Appendix E).

At section KEN-01 (Station 0+00), minimum specific energy equation $A^3/T = Q^2/g$. (Equation 21-84, Standard Handbook for Civil Engineers, Merritt), where T is the top width-discharge in feet, A is area of flow in sq. ft. and Q is discharge in cfs was used to determine the flow depth (See Appendix D).

Conclusion

It appears that the analysis using a back water curve provides a data consistent with the Flood Plain Management Study. The 100-year overflow does not appear to adversely affect the existing or proposed structures makai of Queen Kaahumanu Highway. No adverse change in flood conditions (i.e. volume, velocity, and inundation area) will appear by the proposed drainage system.

Stormwater quality constituents of general concern include turbidity. Usually, runoff with soil erosion from agricultural land operation is considered significant, and turbidity due to erosion apparently decreases somewhat as a result of urbanization. However, increase in constituent loads could result from construction activities, especially if a considerable storm occurs during the interim period between the earth moving operation or exposed soil conditions. The impact of construction activities can be minimized by adhering to strict erosion control measures.

APPENDIX A

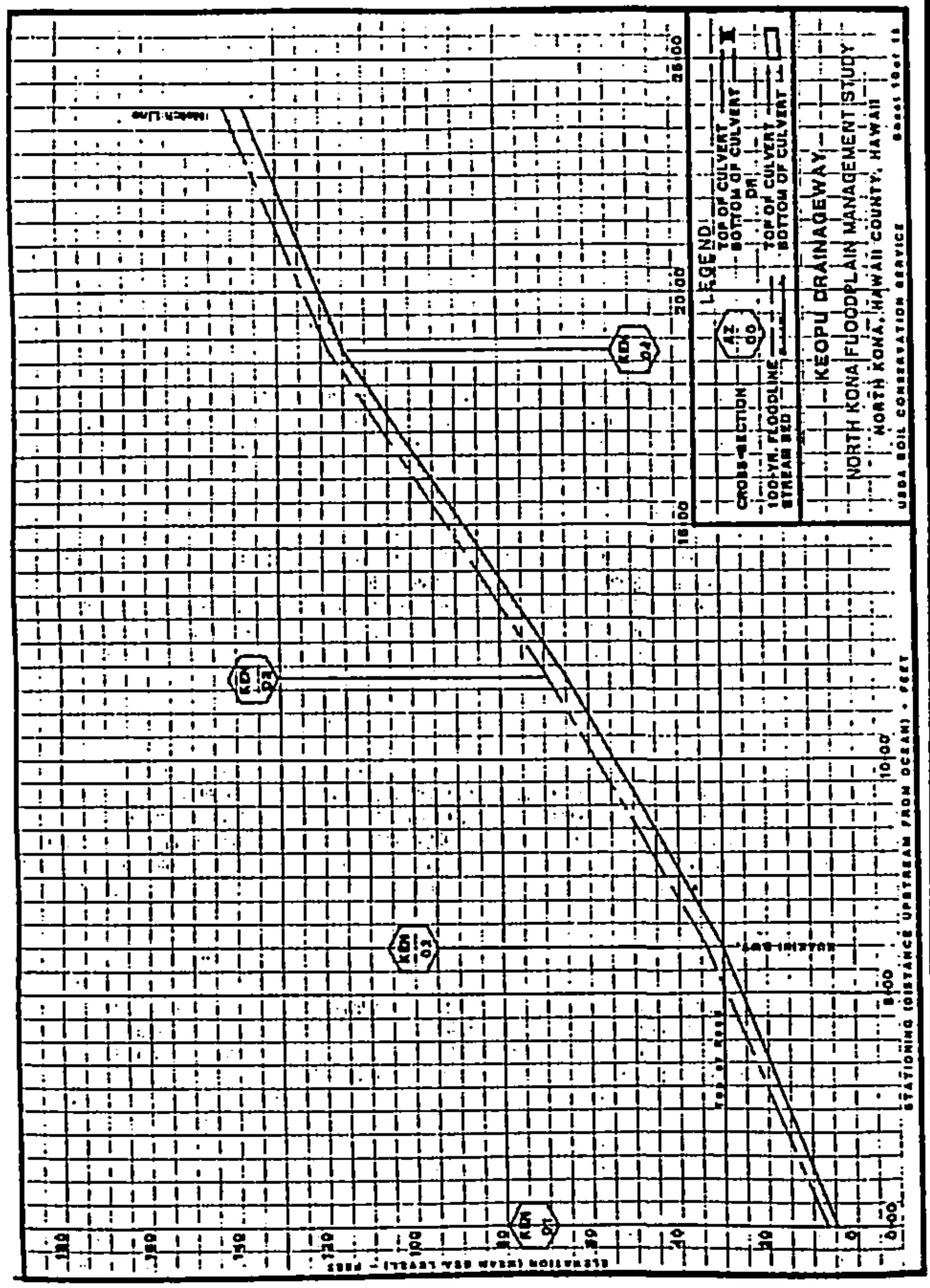
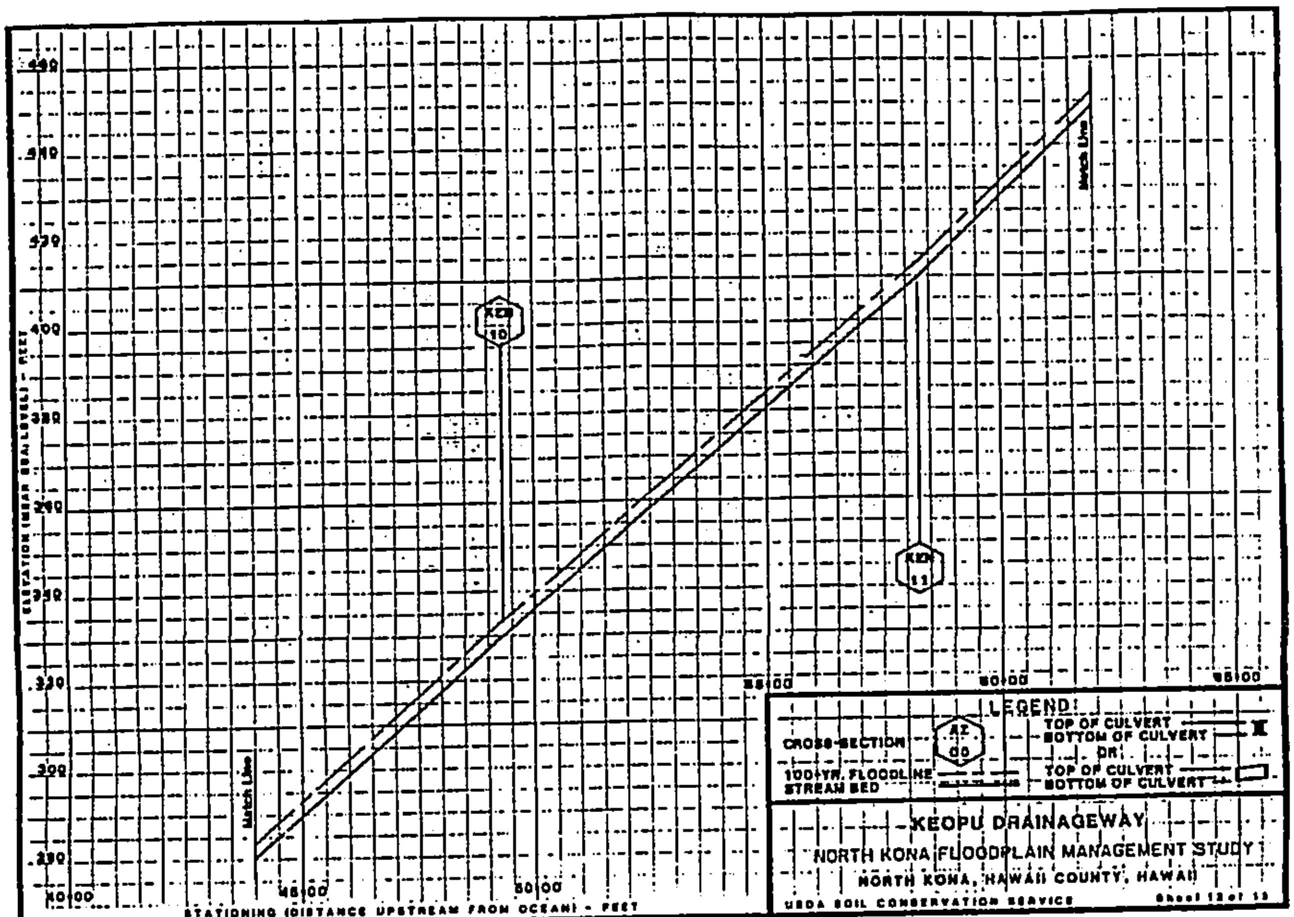
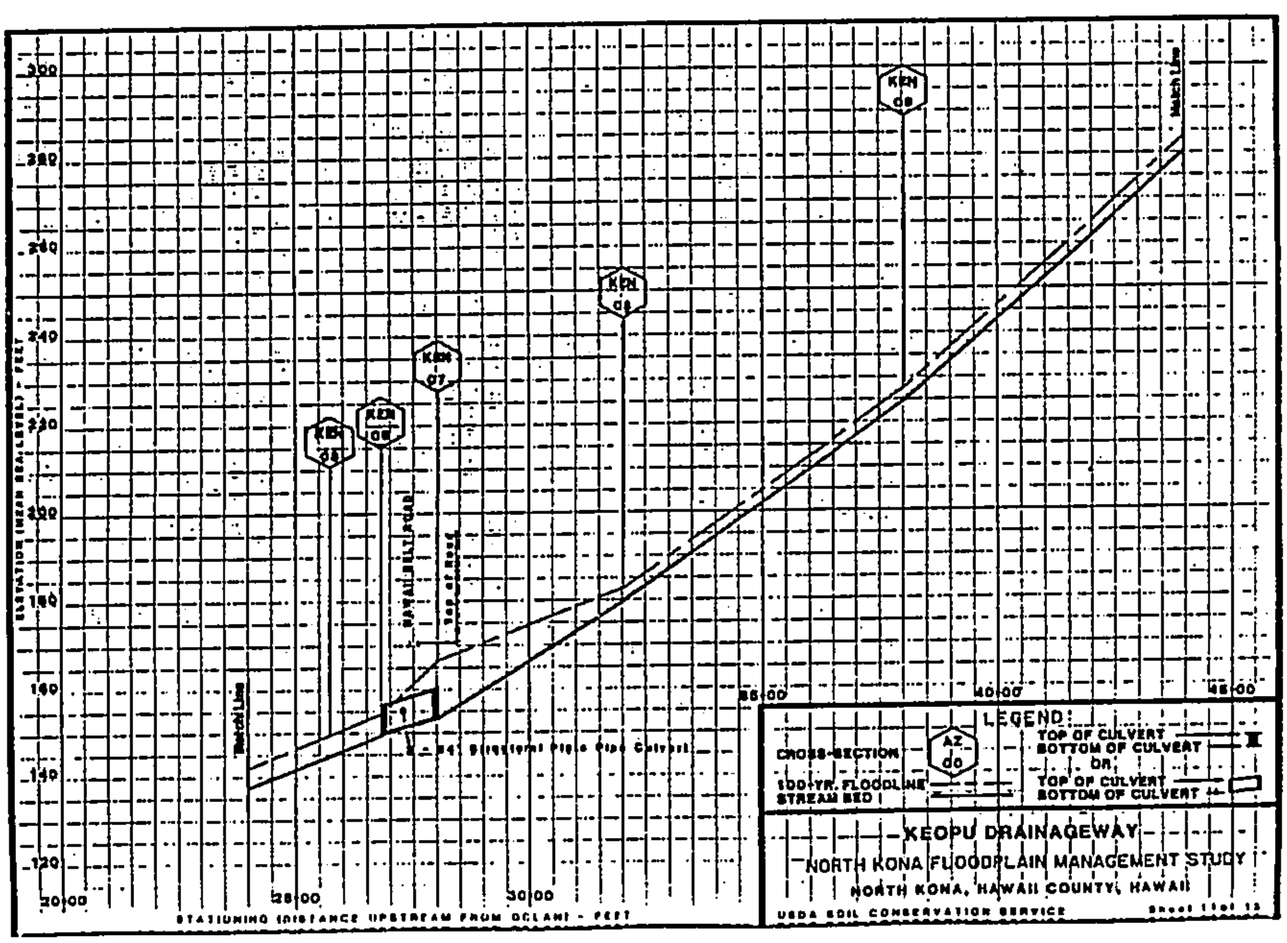


Table C-1 (page 3 of 3)
Flood Discharge - Elevation - Frequency Data
Keopu Drainageway

Number	Station	Streambed: Elevation: (Ft. MSL)	Peak Discharge Cubic Feet Per Second (cfs) Year 10	50	100	500	Water Surface Elevation Feet Mean Sea Level (MSL) Year 10	50	100	500
KEN01	0+00	4.5	590	1170	1680	2540	6.2	6.6	6.8	7.1
KEN02	6+00	30.0	590	1170	1680	2540	32.4	33.2	33.7	34.4
KEN03	11+75	65.0	590	1170	1680	2540	67.6	68.7	69.3	70.0
KEN04	18+75	115.0	590	1170	1680	2540	117.0	117.8	118.4	118.9
KEN05	25+75	145.3	590	1170	1680	2540	148.1	149.0	149.6	150.4
KEN06	26+85	149.7	590	1170	1680	2540	151.9	153.3	154.4	155.8
KEN07	28+05	153.3	590	1130	1630	2470	157.5	162.4	166.8	174.0
KEN08	32+05	180.0	550	1130	1630	2470	180.4	182.1	182.8	183.5
KEN09	38+05	225.0	550	1130	1630	2470	226.6	227.4	227.8	228.4
KEN10	49+30	330.0	550	1130	1630	2470	332.0	332.7	333.1	333.6
KEN11	58+30	410.0	550	1130	1630	2470	411.9	412.7	413.2	413.9
KEN12	66+80	500.0	550	1130	1630	2470	501.8	502.6	503.1	503.6
KE22.01	7+00	800.0	-	-	-	385	-	-	-	802.5
KE22.02	18+80	944.0	-	-	-	385	-	-	-	946.9
KE22.03	28+60	1070.0	-	-	-	385	-	-	-	1072.5
KE22.04	38+20	1244.0	-	-	-	385	-	-	-	1246.5
KE22.05	50+80	1430.0	-	-	-	385	-	-	-	1433.6
KE22.06	N/A	1230.0	-	-	-	385	-	-	-	1233.9


KEH 10
KEH 11
Match Line
ELEVATION (MEAN SEA LEVEL) - FEET
STATIONING (DISTANCE UPSTREAM FROM OCEAN) - FEET
LEGEND:
CROSS-SECTION
100-YR. FLOODLINE
STREAM BED
TOP OF CULVERT
BOTTOM OF CULVERT
OR
TOP OF CULVERT
BOTTOM OF CULVERT
KEOPU DRAINAGEWAY
NORTH KONA FLOODPLAIN MANAGEMENT STUDY
NORTH KONA, HAWAII COUNTY, HAWAII
USDA SOIL CONSERVATION SERVICE


KEH 05
KEH 06
KEH 07
KEH 08
KEH 09
Match Line
HAWAII BELT ROAD
Top of Road
ELEVATION (MEAN SEA LEVEL) - FEET
STATIONING (DISTANCE UPSTREAM FROM OCEAN) - FEET
LEGEND:
CROSS-SECTION
100-YR. FLOODLINE
STREAM BED
TOP OF CULVERT
BOTTOM OF CULVERT
OR
TOP OF CULVERT
BOTTOM OF CULVERT
KEOPU DRAINAGEWAY
NORTH KONA FLOODPLAIN MANAGEMENT STUDY
NORTH KONA, HAWAII COUNTY, HAWAII
USDA SOIL CONSERVATION SERVICE

APPENDIX B

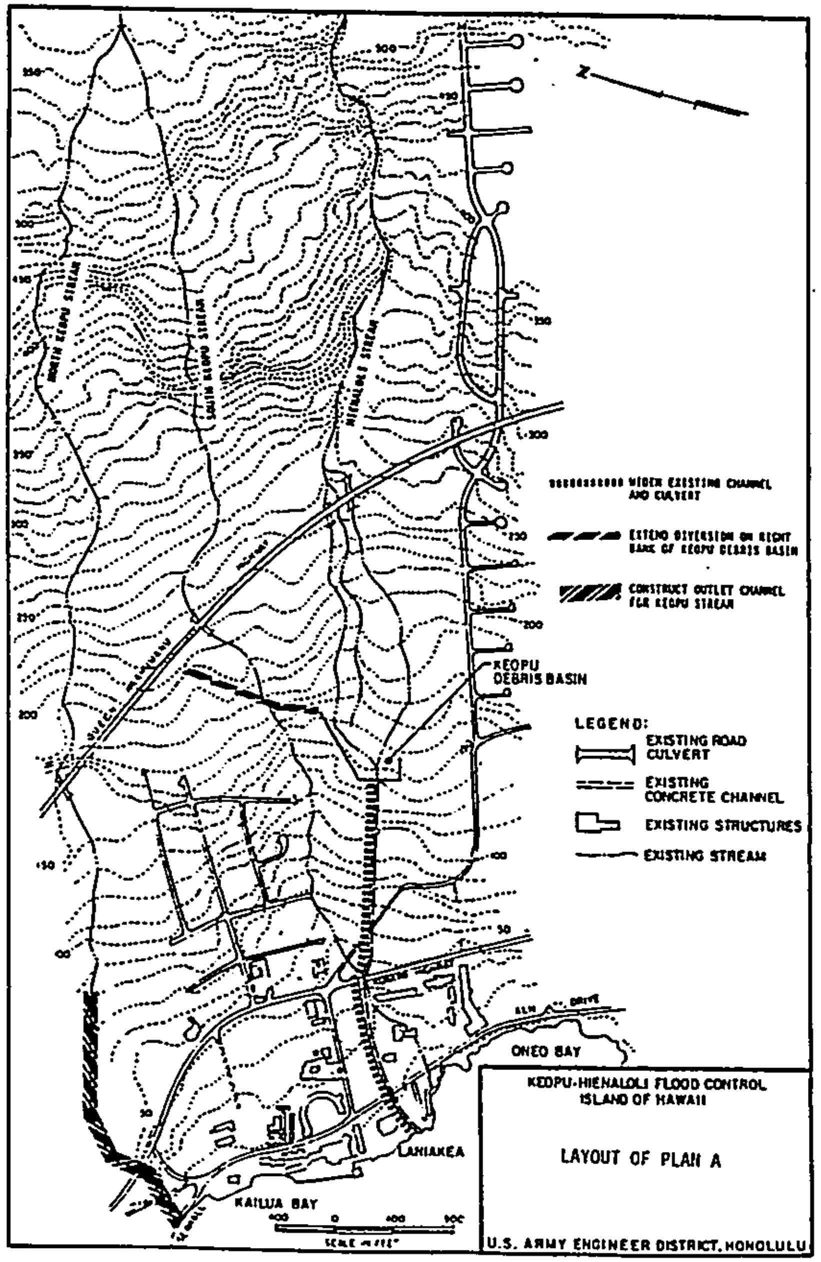


FIGURE 5

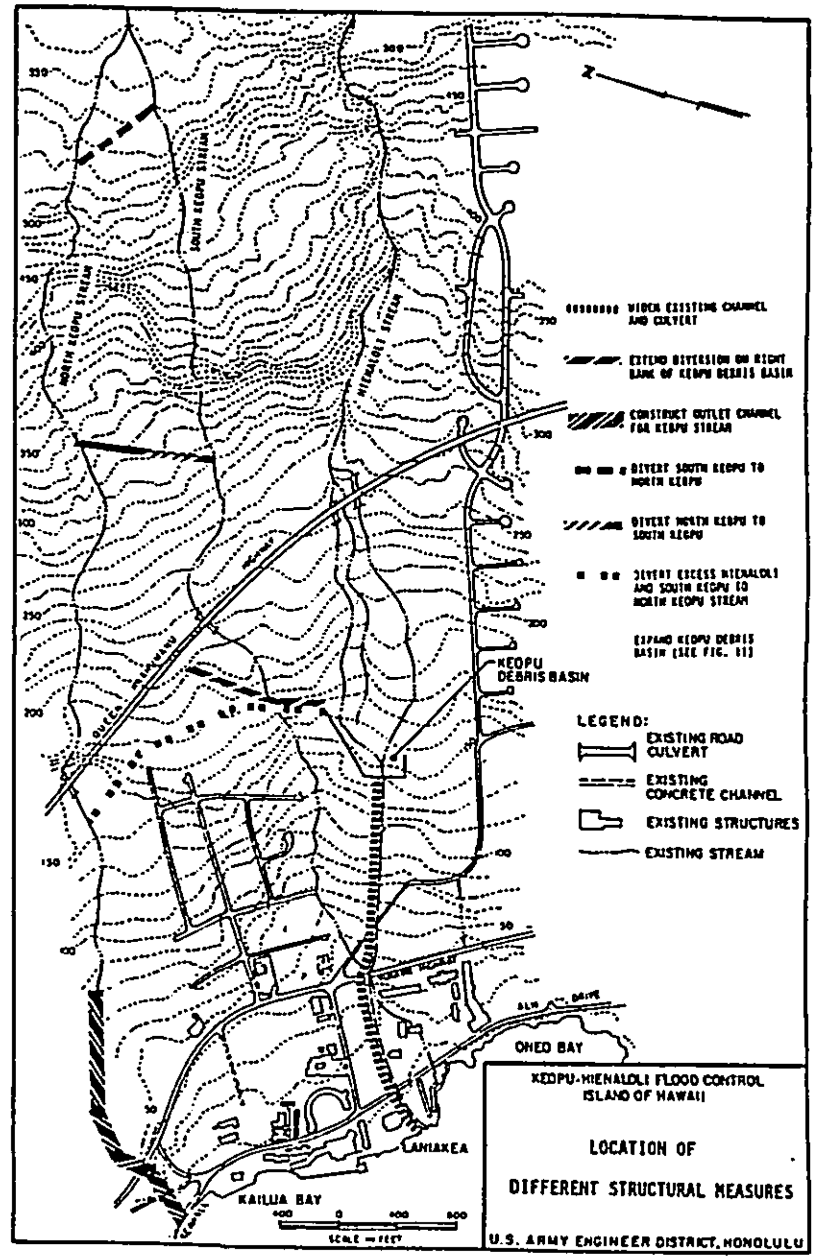


FIGURE 4

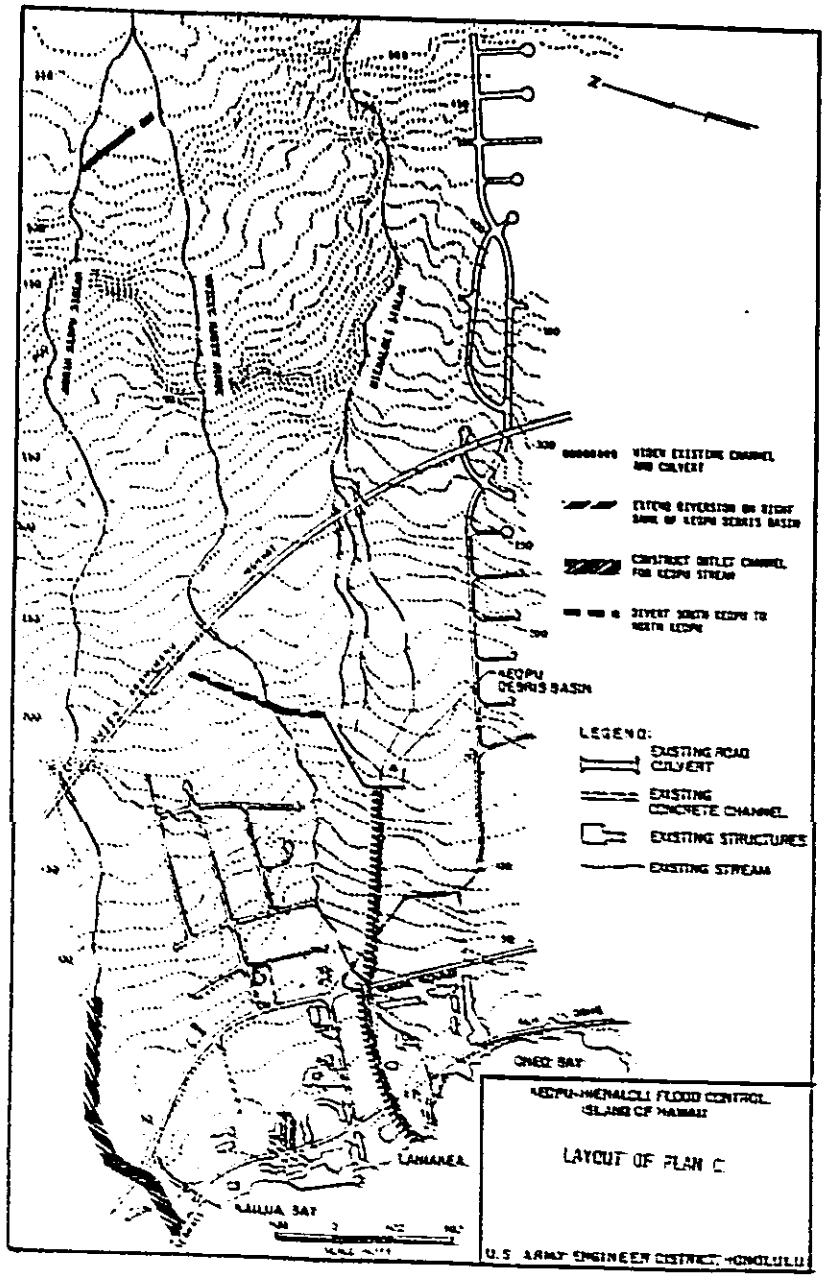


FIGURE 7

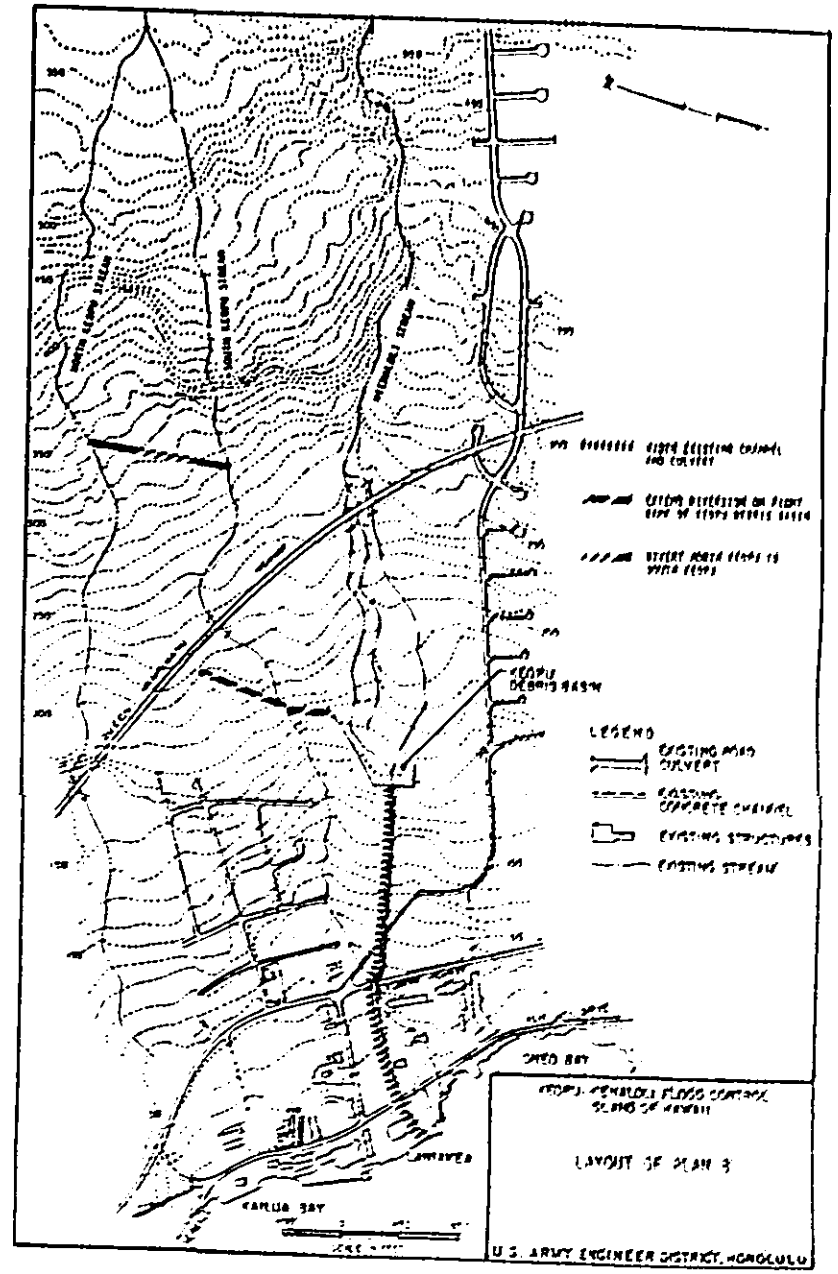


FIGURE 6

CORRECTION

THE PRECEDING DOCUMENT(S) HAS BEEN REPHOTOGRAPHED TO ASSURE LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

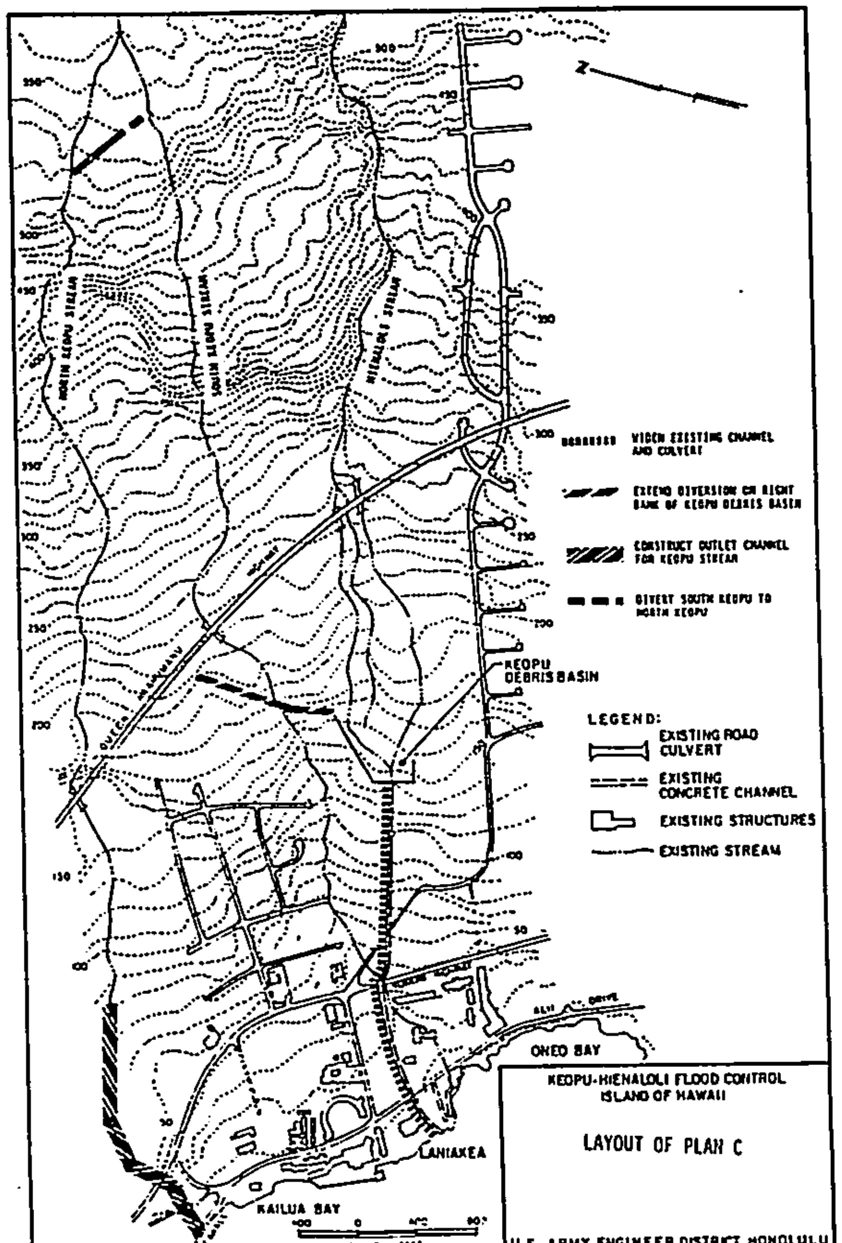


FIGURE 7

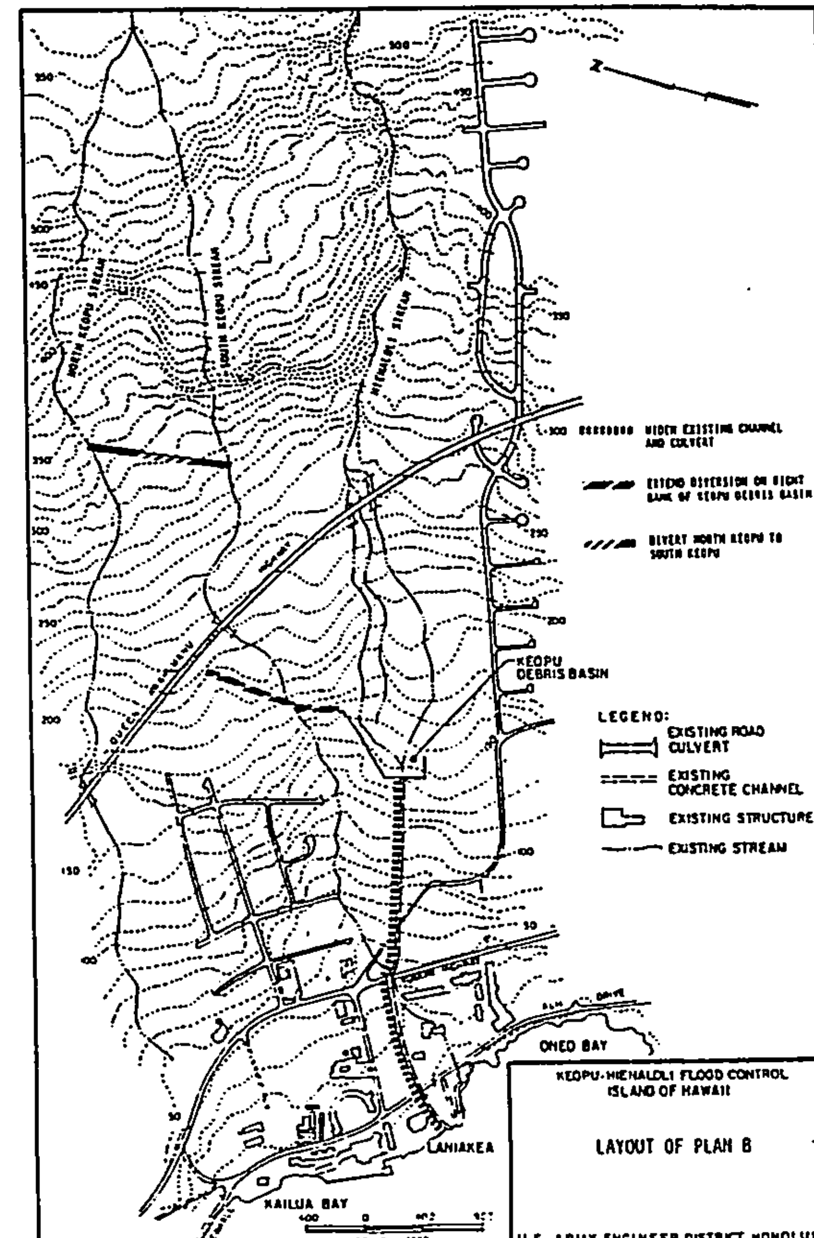


FIGURE 6

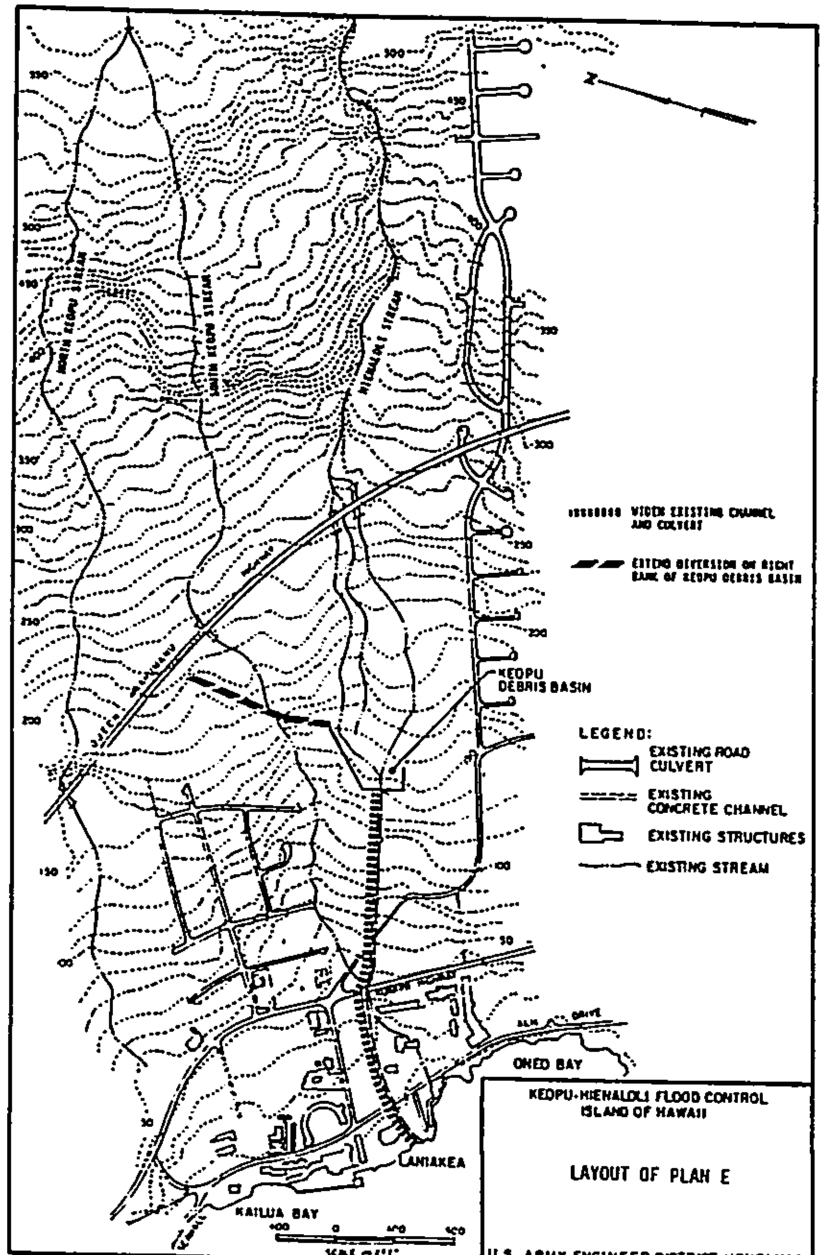


FIGURE 9

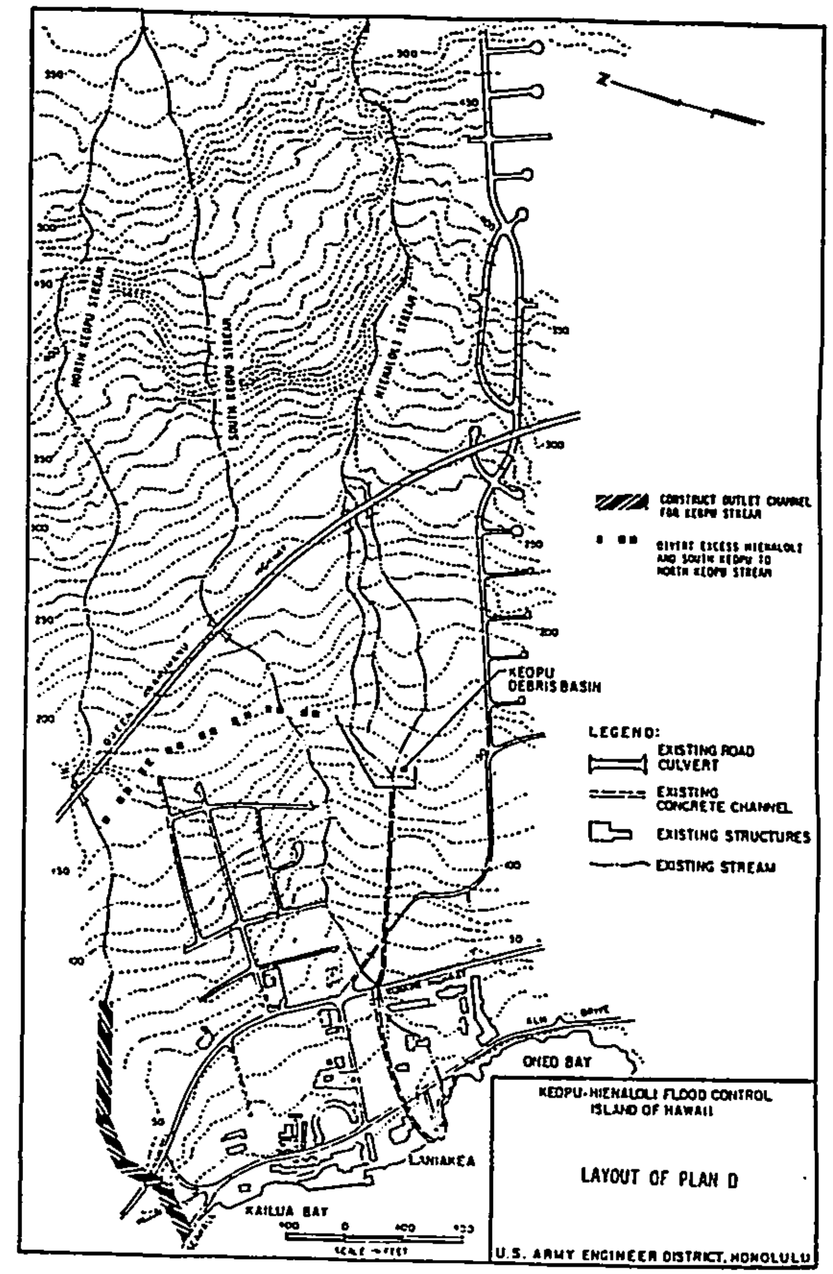


FIGURE 8

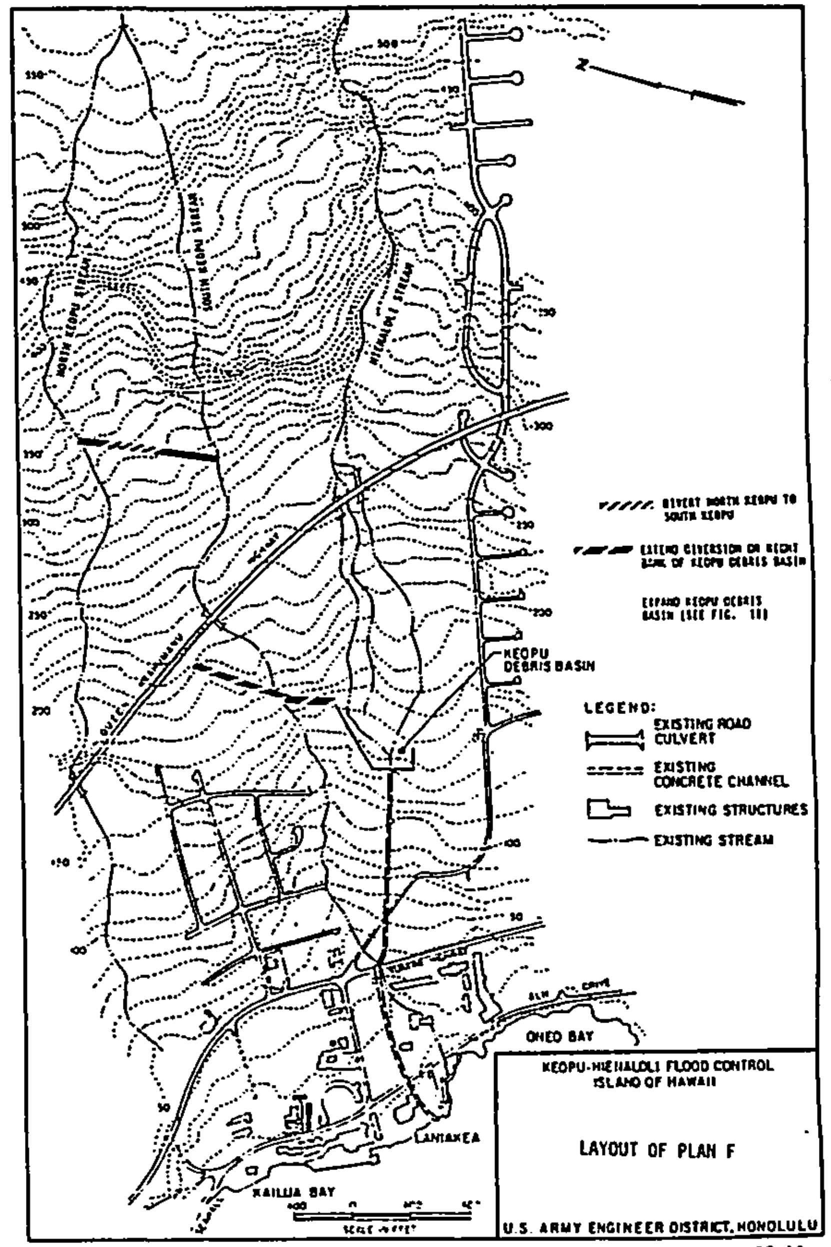
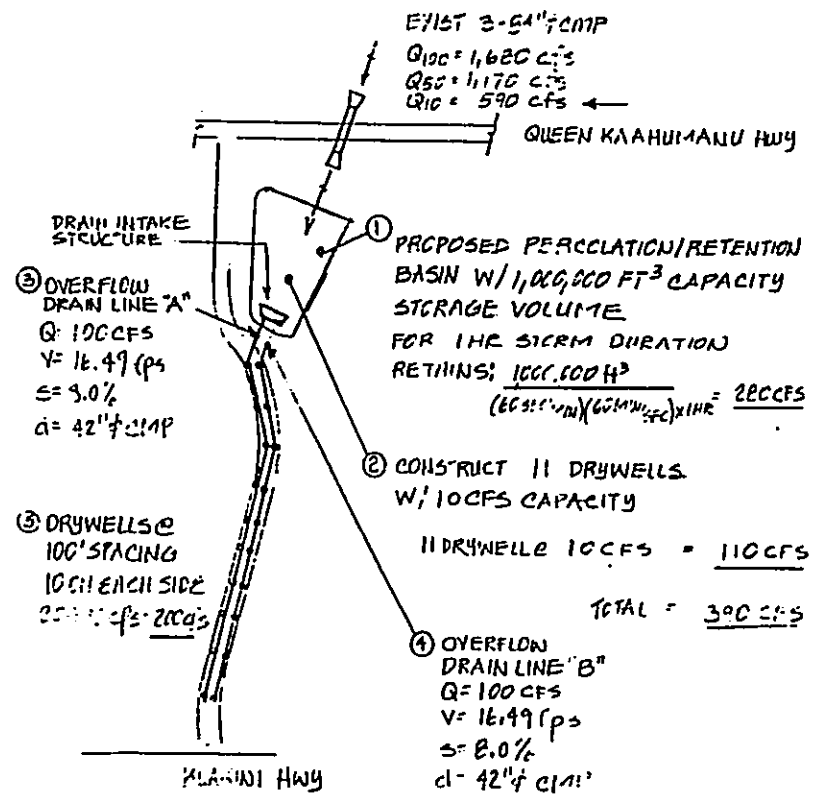

KEOPU DEBRIS BASIN
LEGEND:
EXISTING ROAD CULVERT
EXISTING CONCRETE CHANNEL
EXISTING STRUCTURES
EXISTING STREAM
OHEO BAY
LANIAKEA
KAILUA BAY
KEOPU-HIENALOLI FLOOD CONTROL
ISLAND OF HAWAII
LAYOUT OF PLAN F
U.S. ARMY ENGINEER DISTRICT, HONOLULU

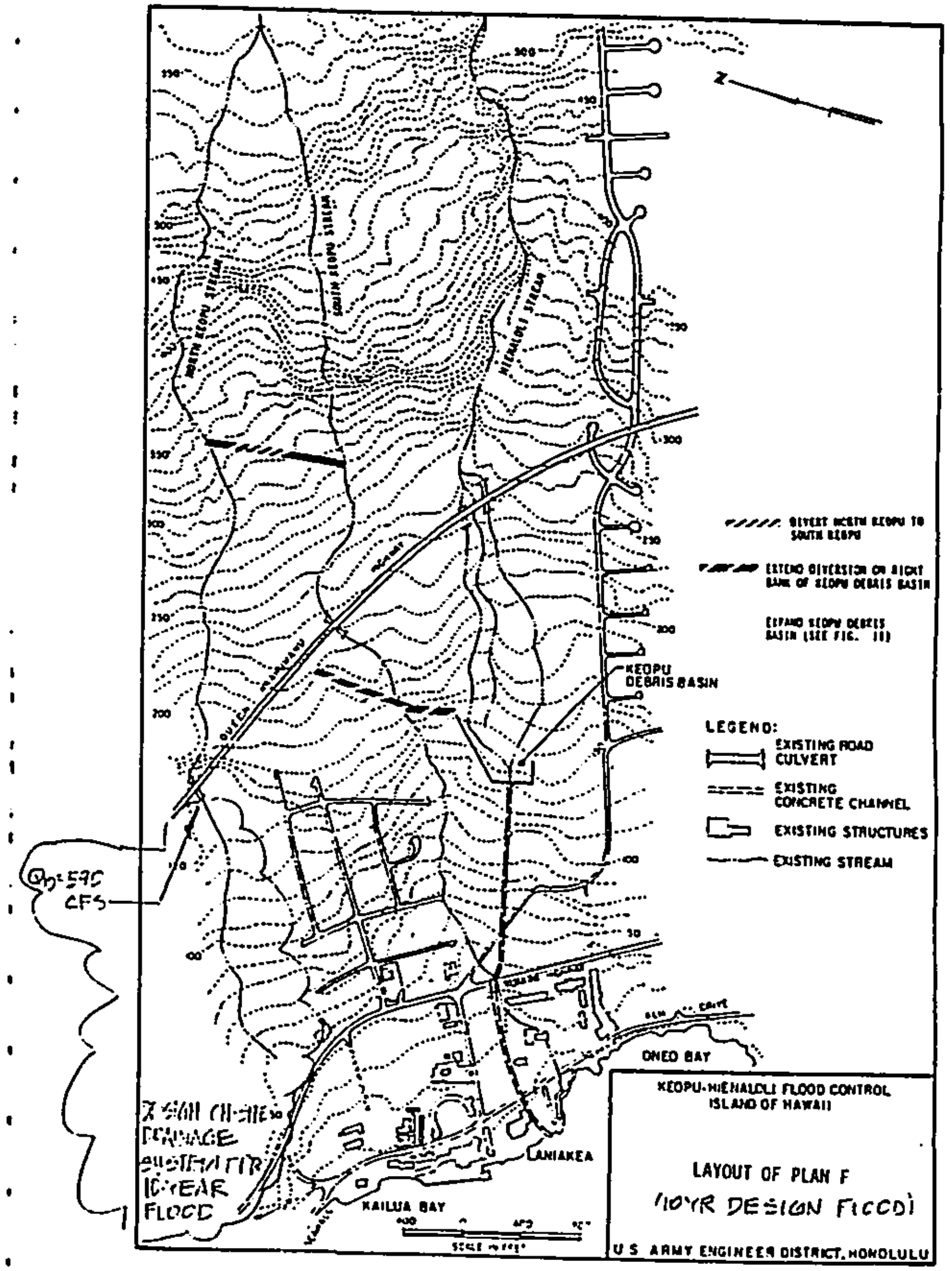
FIGURE 10

APPENDIX C

Job No. 83222
Subject: PROPOSED [illegible] ST DRAINAGE SYSTEM IMPROVEMENTS
By: ATO Date: 10/21/89
Sheet 1 of
Check: Date:



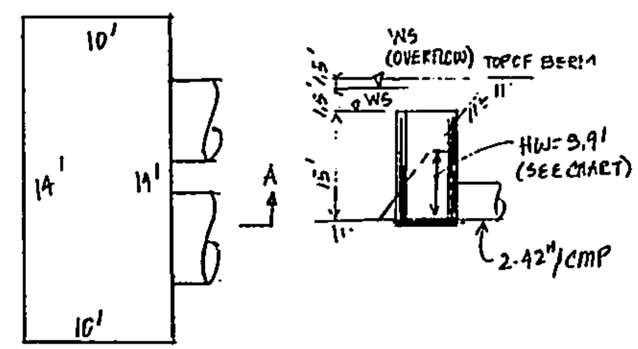
SCHEMATIC DRAINAGE SYSTEM PLAN
NOT TO SCALE



KAWAMOTO & ASSOCIATES, INC. CONSULTING ENGINEERS

Job No. 89-252 Sheet 3 of
Subject PROPOSED HENRY ST By ATO Date 10/21/89
DRAINAGE SYSTEM IMPROVEMENTS Check Date

CHECK INTAKE STRUCTURE



PLAN ELEVATION

CHECK FLOW OVER WEIR

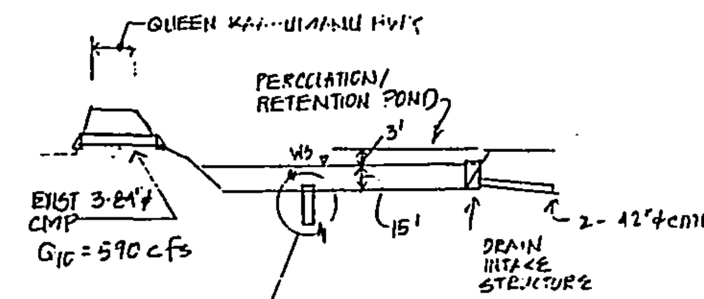
$Q = CLH^{3/2}$

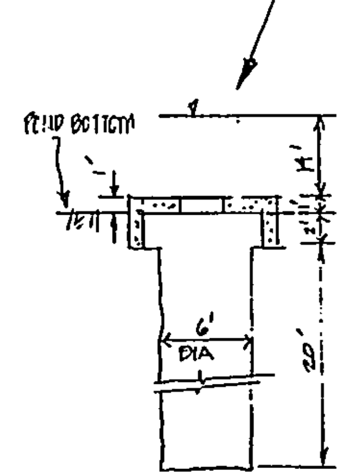
C = DISCHARGE COEFF
L = LENGTH (PERIMETER)
Q = FLOW

$Q = 3.5(49)(1.5)^{3/2} = 264\ cfs > \underline{200\ cfs}$ OK ✓

CONSULTING ENGINEERS

Job No. 89-252 Sheet 2 of
Subject PROPOSED HENRY ST By ATO Date 10/21/89
DRAINAGE SYSTEM IMPROVEMENTS Check Date





TYPICAL DRYWELL

CHECK DRYWELL CAPACITY USING ORIFICE FORMULA

$Q = CA\sqrt{2gh}$

A = OPENING OF GRATE

h = DEPTH OF HEAD REQ'D

C = 0.67

Q = 10 cfs

$\frac{Q^2}{C^2A^2} = 2gh$

$h = \frac{Q^2}{2gC^2A^2} = \frac{(10)^2}{2(32.2)(0.67)^2(2)^2} = 0.9$

$< 14'$

$\therefore$ OK

CONSULTING ENGINEERS

E

-IDA, OKAMOTO & ASSOCIATES, INC.
CONSULTING ENGINEERS

PROJECT Henry St Drainage system Design

JOB NO 89-202

DATE: 10-21-89
BY: ATO
FILE: 202dr

MANNING'S EQ. Qf = (0.463/N)*D^8/3*S^1/2
Vf = Qf/A
Dn = Df*(Dn/Df)
Vn = Vf*(Vn/Vf)

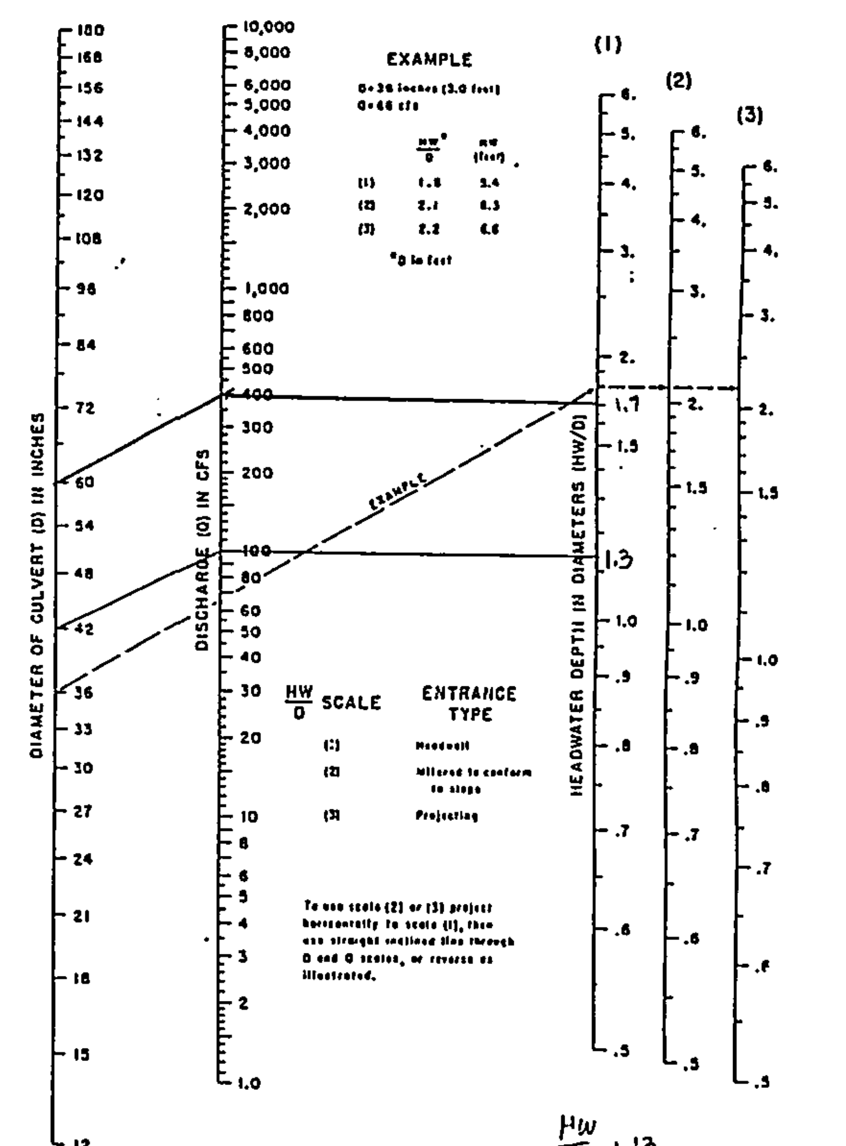
DATA INPUT: PIPE DIA, PIPE SLOPE, ROUGHNESS COEFFICIENT, DESIGN FLOW

ANALYSIS: CHECK PIPE CAPACITY
CHECK MINIMUM VELOCITY @ FULL FLOW(Vf) AND NORMAL FLOW(Vn)

OPEN CHANNEL PIPE FLOW CALCULATIONS

PIPE LINE	PIPE DIA (in) d	PIPE SLOPE (ft/ft) s	ROUGH-NESS n	FLOW FULL (cfs) Qf	VELOCITY FULL (fps) Vf	FLOW NORMAL (cfs) Qn	CHECK PIPE CAP. Qf)Qn	CHECK MIN. VEL. Vf)2.5	COMPUTE FLOW RATIO Qn/Qf	COMPUTE DEPTH RATIO Dn/Df	COMPUTE VEL. RATIO Vn/Vf	COMPUTE DEPTH (ft) Dn	COMPUTE VEL. (fps) Vn	CHECK MIN. VEL Vn)2.0
A	42.00	0.080	0.025	147.38	15.38	100.000	OK	OK	0.68	0.5990	1.0720	2.10	16.49	OK
B	42.00	0.080	0.025	147.38	15.38	100.000	OK	OK	0.68	0.5990	1.0720	2.10	16.49	OK

NOMOGRAPH FOR C.M. PIPE CULVERTS WITH ENTRANCE CONTROL



$\frac{HW}{D} = 1.13$

$HW = 1.13(3.5) = 3.9' < 15$

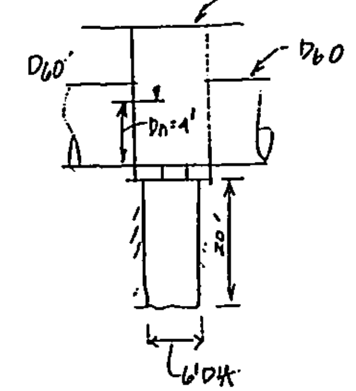
BUREAU OF PUBLIC ROADS

Plate 21

36

Job No. 89-282
Subject PROPOSED HENRY ST
DRAINAGE SYSTEM IMPROVEMENTS
By ATO
Sheet 6 of
Date 10/21/89
Check
Date

CHECK DRYWELL WITH OUTLET



CHECK DRYWELL CAPACITY
USING ORIFICE FORMULA

$Q = CA\sqrt{2gh}$

$h = \frac{Q^2}{2gC^2A^2} = \frac{(10)^2}{2(32.2)(0.67)^2(2)^2}$

$= 0.86'$

$< 4.0' \therefore OK$

APPENDIX D

Job No. [illegible]

Subject: Proposed Henry Road Drainage System Improvement

By: [illegible]   Check:

Sheet ___ of ___   Date: Date:

Minimum Specific Energy Equation:

$A^3/T = Q^2/g$ (21-86) (Std. Handbook for Civil Engineer, Merritt)

Where A : area of flow (sq. ft)

T : width of flow (ft)

Q : flow volume (cfs)

$A^3/1000' = 1{,}680^2/32.2$

$A = 444$ sq. ft.

$V = Q/A = 1{,}680/444 = 4.17$ fps

$A = K\,d\,T$, where d is flow depth

$444 = K(2.3)(1000)$

$K = 0.193$

$T = K'd$

$1000 = K'(2.3)$

$K' = 435$

Proposed Condition

$Q = 1{,}090$ cfs

$A = (0.193)(d')(435d') = 83.955d'^2$

$(83.955d'^2)^3/(435d') = (1{,}090)^2/32.2$

$d' = 1.9'$

$V_{prop.} = Q'/A' = 1{,}090/83.955(1.9)^2 = 3.6$ fps.

APPENDIX E

HIDA, OKAMOTO & ASSOCIATES, INC.
CONSULTING ENGINEERS

PROJECT: PROPOSED HENRY ROAD DRAINAGE SYSTEM — DATE: 02/23/90

JOB NO: 89-282

REMARKS: BACKWATER CURVE ANALYSIS USING THE STANDARD STEP METHOD
(REFERENCE: HANDBOOK FOR CIVIL ENGINEERS, 2ND EDITION BY MERRITT)

FRICTION SLOPE (Sf) = $N^2 V^2 /(2.21)(R^{4/3})$
FRICTION SLOPE AVERAGE (Sa) = AVERAGE SLOPE BETWEEN EACH STATION
FRICTION LOSS (hf) = FRICTION SLOPE AVE (Sa) X LENGTH (L)
TOTAL HEAD (H) = TOTAL HEAD (H) OF PREVIOUS STATION + FRICTION LOSS (hf)

ANALYSIS: BY TRIAL, CHECK TOTAL HEAD (h) VERSUS TOTAL HEAD (H)

INPUT: FLOW DEPTH (Dn), FLOW AREA (A), WETTED PERIMETER (P) LENGTH (L) BETWEEN STATIONS

FLOW: 1,680 cfs (FROM FLOOD PLAIN MANAGEMENT STUDY)
ROUGHNESS: 0.04 (FOR STREAM CHANNELS)

B A C K W A T E R   C U R V E   A N A L Y S I S   S T A N D A R D   S T E P   M E T H O D

STATION	FLOW DEPTH Dn (ft)	FLOW AREA A (sf)	MEAN VEL. V (fps)	VELOCITY HEAD $V^2/2g$ (ft)	TOTAL HEAD (h) $Dn+V^2/2g$ (ft)	WETTED PERIMETER P (ft)	HYDRAULIC RADIUS R = A/P (ft)	$R^{4/3}$	FRICTION SLOPE Sf (ft/ft)	FRICTION SLOPE AVE. Sa (ft/ft)	LENGTH L (ft)	FRICT. LOSS hf (ft)	TOTAL HEAD H (ft)
01 0+00					(4.50)								
	2.3	444	4.17	0.27	7.07	1000	0.24	0.15	0.0825				
02 6+00					(30.00)								(7.07)
	3.7	400	4.20	0.27	33.97	740	0.54	0.44	0.0289	0.0557	600	33.43	40.50 NG
	3.7	500	3.36	0.18	33.88	740	0.68	0.59	0.0138	0.0481	600	28.88	35.95 NG
	3.7	600	2.80	0.12	33.82	740	0.81	0.76	0.0075	0.0450	600	27.00	34.07 NG
	3.7	650	2.58	0.10	33.80	740	0.88	0.84	0.0057	0.0441	600	26.47	33.53 OK
03 11+75					(65.00)								(33.80)
	4.3	200	8.40	1.09	70.39	290	0.69	0.61	0.0838	0.0448	575	25.74	59.53 NG
	4.3	175	9.60	1.43	70.73	290	0.60	0.51	0.1308	0.0683	575	39.25	73.05 NG
	4.3	185	9.08	1.28	70.58	290	0.64	0.55	0.1087	0.0572	575	32.88	66.68 NG
	4.3	180	9.33	1.35	70.65	290	0.62	0.53	0.1190	0.0624	575	35.85	69.65 OK
04 18+75					(115.00)								(70.65)
	3.4	260	6.46	0.65	119.05	240	1.08	1.11	0.0272	0.0731	700	51.15	121.80 NG
	3.4	270	6.22	0.60	119.00	240	1.13	1.17	0.0239	0.0715	700	50.03	120.68 NG
	3.4	280	6.00	0.56	118.96	240	1.17	1.23	0.0212	0.0701	700	49.08	119.72 NG
	3.4	300	5.60	0.49	118.89	240	1.25	1.35	0.0169	0.0679	700	47.55	118.20 OK

APPENDIX F

HIDA, OKAMOTO & ASSOCIATES, INC.
CONSULTING ENGINEERS

PROJECT: PROPOSED HENRY ROAD DRAINAGE SYSTEM
JOB NO: 89-282 DATE: 02/23/90

REMARKS: BACKWATER CURVE ANALYSIS USING THE STANDARD STEP METHOD
(REFERENCE: HANDBOOK FOR CIVIL ENGINEERS, 2ND EDITION BY MERRITT)

FRICTION SLOPE (Sf) = $N^2 V^2 /(2.21)(R^{4/3})$
FRICTION SLOPE AVERAGE (Sa) = AVERAGE SLOPE BETWEEN EACH STATION
FRICTION LOSS (hf) = FRICTION SLOPE AVE (Sa) X LENGTH (L)
TOTAL HEAD (H) = TOTAL HEAD (H) OF PREVIOUS STATION + FRICTION LOSS (hf)

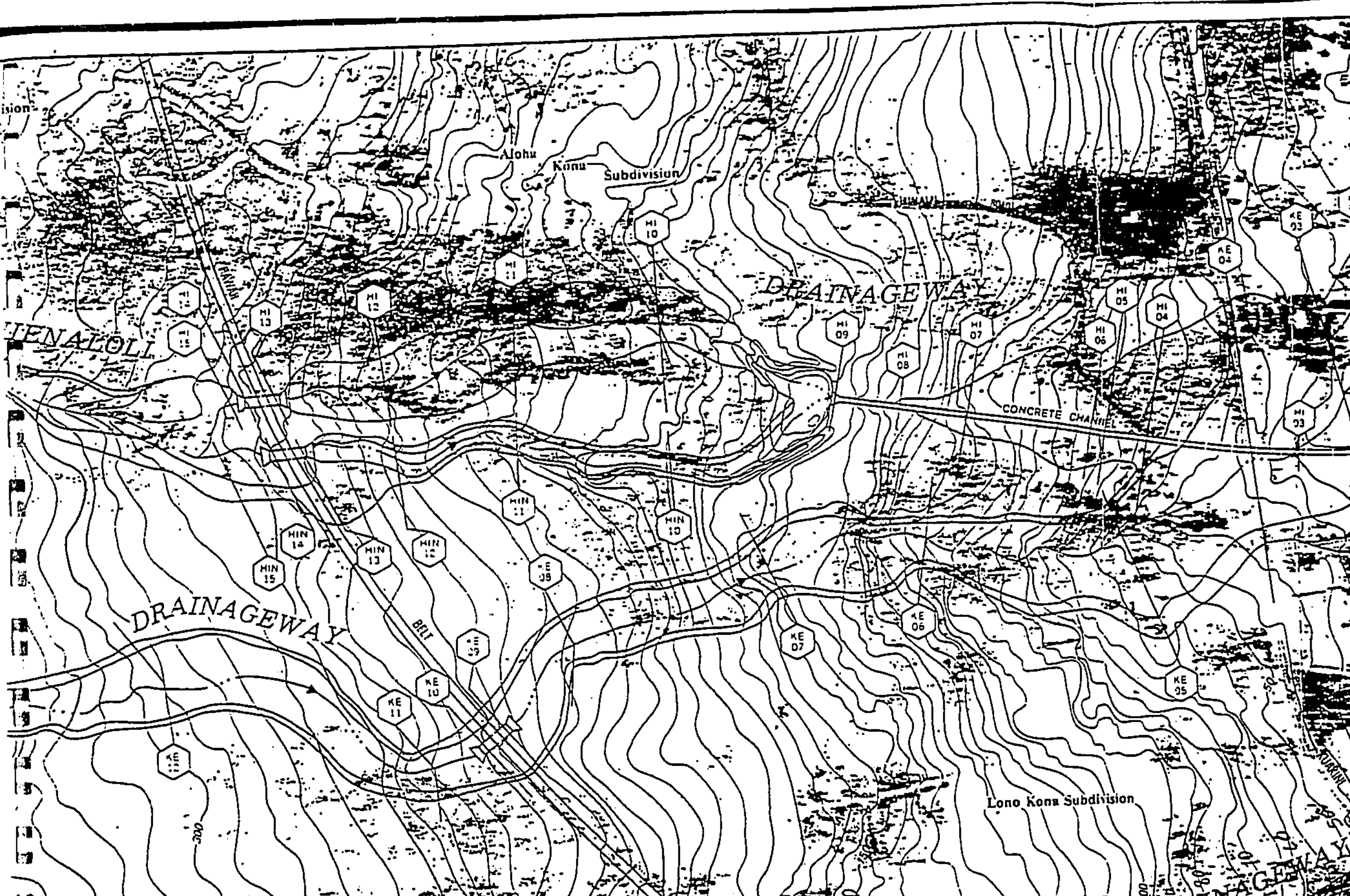
ANALYSIS: BY TRIAL, CHECK TOTAL HEAD (h) VERSUS TOTAL HEAD (H)

INPUT: FLOW DEPTH (Dn), FLOW AREA (A), WETTED PERIMETER (P) LENGTH (L) BETWEEN STATIONS

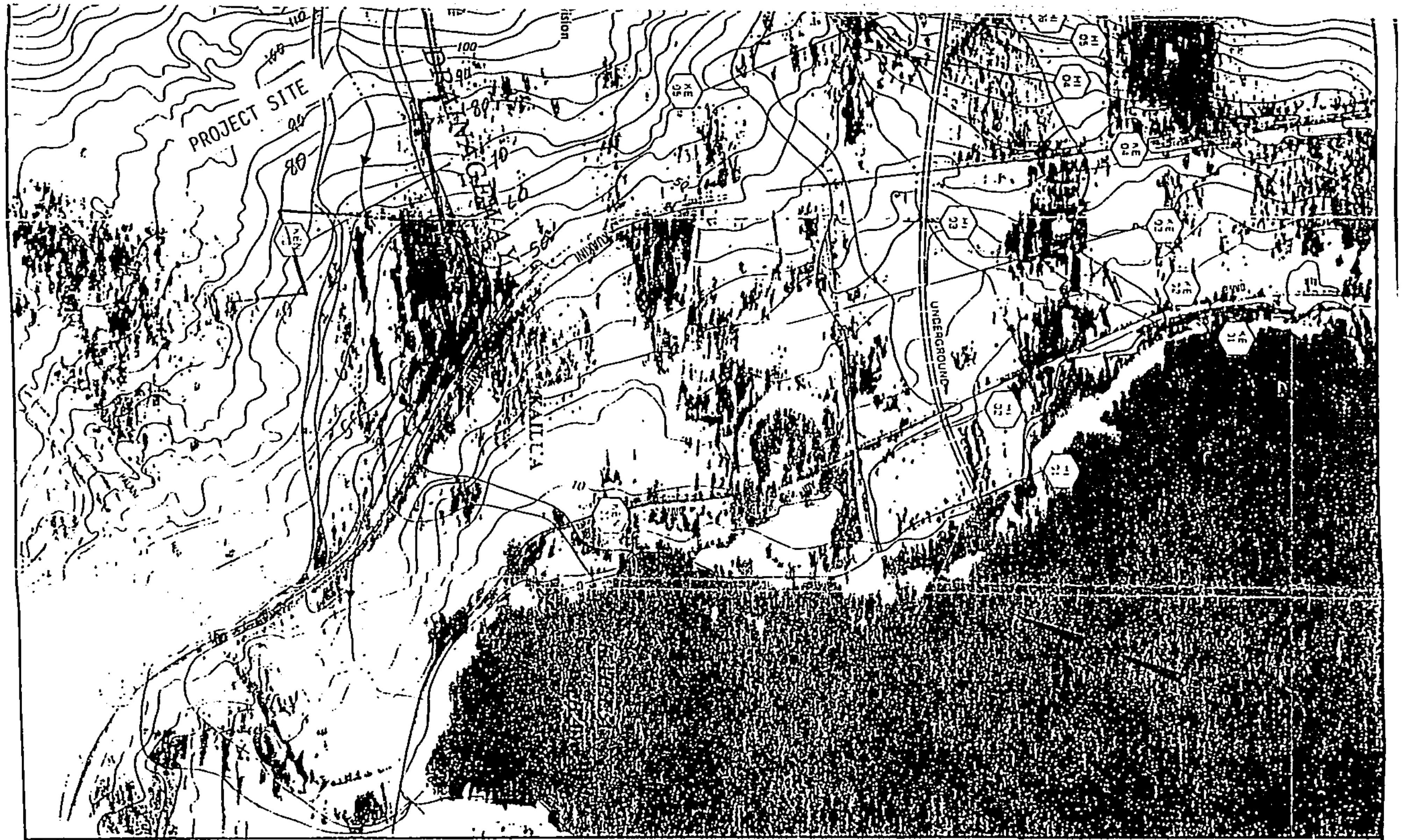
FLOW: 1,090 cfs (FROM CALCULATION)
ROUGHNESS: 0.04 (FOR STREAM CHANNELS)

BACKWATER CURVE ANALYSIS STANDARD STEP METHOD

STATION	FLOW DEPTH Dn (ft)	FLOW AREA A (sf)	MEAN VEL. V (fps)	VELOCITY HEAD $V^2/2g$ (ft)	TOTAL HEAD (h) $Dn+V^2/2g$ (ft)	WETTED PERIMETER P (ft)	HYDRAULIC RADIUS R = A/P (ft)	$R^{4/3}$	FRICTION SLOPE Sf (ft/ft)	FRICTION SLOPE AVE. Sa (ft/ft)	LENGTH L (ft)	FRICT. LOSS hf (ft)	TOTAL HEAD H (ft)
01 0+00					(4.50)								
	1.9	303	3.60	0.20	6.60	827	0.37	0.26	0.0361				
02 6+00					(30.00)								(6.60)
	2.5	297	3.67	0.21	32.71	500	0.59	0.50	0.0195	0.0278	600	16.69	23.29 NG
	2.0	190	5.74	0.51	32.51	400	0.48	0.37	0.0643	0.0502	600	30.13	36.73 NG
	2.3	251	4.34	0.29	32.59	460	0.55	0.45	0.0306	0.0333	600	20.00	26.60 NG
	2.1	209	5.21	0.42	32.52	420	0.50	0.39	0.0498	0.0430	600	25.78	32.38 OK
03 11+75					(65.00)								(32.52)
	3.0	88	12.44	2.40	70.41	202	0.43	0.33	0.3399	0.1948	575	112.03	144.55 NG
	3.5	119	9.14	1.30	69.80	236	0.50	0.40	0.1507	0.1002	575	57.64	90.16 NG
	3.9	148	7.36	0.84	69.74	263	0.56	0.46	0.0844	0.0671	575	38.58	71.10 NG
	4.0	156	7.00	0.76	69.76	270	0.58	0.48	0.0737	0.0618	575	35.51	68.03 OK
04 18+75					(115.00)								(69.76)
	2.6	175	6.21	0.60	118.20	184	0.95	0.94	0.0297	0.0517	700	36.21	105.97 NG
	2.4	149	7.29	0.83	118.23	169	0.88	0.84	0.0457	0.0597	700	41.78	111.54 NG
	2.2	126	8.68	1.17	118.37	155	0.81	0.76	0.0721	0.0729	700	51.02	120.78 NG
	2.3	137	7.94	0.98	118.28	162	0.84	0.80	0.0572	0.0655	700	45.82	115.58 OK



Subdivision
DRAINAGEWAY
DRAINAGEWAY
DRAINAGEWAY
CONCRETE CHANNEL
Lono Kona Subdivision
PROJECT SITE
BELT
ROAD
HI 03
HI 04
HI 05
HI 06
HI 07
HI 08
HI 09
HI 10
HI 12
HI 13
HIN 10
HIN 12
HIN 13
HIN 14
HIN 15
KE 03
KE 04
KE 05
KE 06
KE 07
KE 08
KE 09
KE 10
KE 11
KEN 04
KEN 06
300
150
140
130
120
110
100
90



100 Year Flood Hazard Area
500 Year Flood Hazard Area
Cross Section Location
Stream Channel

X BM 1 Elevation Reference Marks

Limits of Flooding May Vary From Actual Ground Location

Contour Data Derived From R.M. Towill Corp., Honolulu Hawaii

Contour Interval Change From 5' to 10' Intervals After 250' Elevation

U S G S Ortho Photography 1977

SCALE 0 400 800 FEET
0 100 200 METERS
APPROXIMATE

NORTH KONA
FLOOD PLAIN MANAGEMENT STUDY
NORTH KONA DISTRICT, HAWAII

FLOOD HAZARD AREA

KEOPU/HIENALOLI DRAINAGEWAYS

SHEET 3 OF 13

FEB 198

FIGURE 1

APPENDIX F

Noise Impact Assessment

DARBY ACOUSTICAL CONSULTANTS, LTD.
dba
DARBY
& ASSOCIATES
ACOUSTICAL CONSULTANTS

J90-18
April 23, 1990

Jeffrey H. Overton, AICP
Group 70 Limited
924 Bethel Street
Honolulu, Hawaii 96813

RE: NOISE IMPACT ASSESSMENT, HENRY STREET, KAILUA-KONA

Dear Mr. Overton:

Noise measurements and analyses have been performed to assess the noise impact due to the development of the proposed collector road, Henry Street. The following provides our findings:

I. <u>SUMMARY</u>

A. The existing noise sensitive locations which may be impacted by the project development are multi-family and single family residential units located near the proposed Henry Street site, away from the existing Queen Kaahumanu and Kuakini Highways.

B. Noise measurement results indicate that the existing acoustical environment at the potentially-impacted noise sensitive areas is, in general, typical of quiet neighborhoods, with natural conditions (e.g., wind and bird sounds) and locally generated sounds being dominant.

C. Predictions of noise levels due to traffic movements on Henry Street indicate that all residential units near the street will be exposed to future (1995) Ldn levels of less than 65 dB, therefore complying with HUD's standards for residential uses. However, most residents living near the proposed street will experience some increase in noise levels, ranging from marginally noticeable to clearly noticeable changes. The predicted increase in Ldn ranges from about 2 to 13 dB, when comparing the future levels with and without the Henry Street development. In terms of subjective perceptibility to changes in noise levels, increases of more than about 5 dB are, in general, considered as significant noise impacts and, therefore, some residents living near the proposed street may be significantly impacted.

D. Calculations indicate that, at Queen Kaahumanu and Kuakini Highways, the increases in noise levels due to the proposed development (including the shopping center expansion) will be, at most, about 1 dB and will not cause any significant noise impact at the existing noise sensitive areas.

E. During the construction of the proposed street, construction activities are expected to generate significant amounts of noise at the nearby homes. However, this is a short-term condition and, therefore, is not considered a significant impact.

F. Measures to reduce any potential impact are provided in Section VI.

II. <u>PROJECT DESCRIPTION</u> -- The proposed Henry Street will run in the mauka-makai direction connecting the Queen Kaahumanu and Kuakini Highways, to the south of Palani Road (see Figure 1). It will provide an alternate access to each highway and to the Lanihau Shopping Center. Due to the natural topography, the proposed street is expected to have a grade of about 3 to 8%.

III. <u>NOISE STANDARDS AND GUIDELINES</u> -- Several federal agencies including the Department of Housing and Urban Development (HUD) normally allow residential uses at areas where the Day-Night Average Sound Level (Ldn) is less than 65 dB (Reference 1). However, an Ldn of 55 dB is considered by the U.S. Environmental Protection Agency (EPA) as a long-term goal to "ensure protection of the public health and welfare from all adverse effects of noise based on present knowledge." (Reference 2).

IV. <u>EXISTING ACOUSTICAL ENVIRONMENT</u> -- The existing noise sensitive areas located in the vicinity of the project site, which may be impacted by the project development, are:

- Kalanikai and Kailua Bay Resort -- two to three story resort-type multi-family buildings on the mauka side of Kuakini Highway; most of the units within the south side of Kalanikai will have line-of-sight to Henry Street, with the nearest units to the Henry Street right-of-way located at a distance of about 50'; some of the upper floor units within the southern side of the Kailua Bay Resort buildings may have line-of-sight to Henry Street.

- Two to three story multi-family residential buildings located on the northern end of Alahou and Kalawa Streets; most of the northern units near the cul-de-sac will have line-of-sight to Henry Street, with the nearest buildings located at a distance of about 220'.

- One to two story single family homes on the northern side of Ala Onaona Street; most of the habitable spaces at the northern side of the homes will have line-of-sight to Henry Street; closest homes are located at about 220' to 360'.

- A single family home and a church (Church Of Jesus Christ Of Latter-Day Saints) located at the mauka end of Kalani Street; a line-of-sight to Henry Street is not expected to exist; any potential impact will be due to the increase in noise levels at Queen Kaahumanu Highway.

- Multi-family buildings and churches on the makai side of Kuakini Highway; only the portion of Henry Street intersecting Kuakini Highway will be visible; any potential impact will be due to the increase in noise levels at Kuakini Highway.

- Single family homes located adjacent to Queen Kaahumanu Highway near Poni Place and Aloha Kona Drive; no line-of-sight to Henry Street will exist; any potential impact will be due to the increase in noise levels at Queen Kaahumanu Highway.

Noise measurements were performed during the late morning and the early afternoon hours of April 13, 1990, to determine the existing acoustical conditions at these areas, and the results are presented in Table 1. The measurement results indicate that the existing conditions vary widely depending on their locations relative to the highways. The measured average levels (Leq's) were up to 70 to 72 dB at locations near the highways. At locations away from the highways, the levels ranged from about 43 to 45 dB, and are considered typical of quiet residential neighborhoods with natural conditions (wind and bird sounds) and locally generated sounds being dominant. The sky was clear and a very light tradewind breeze prevailed during the measurements.

V. <u>ASSESSMENT OF POTENTIAL IMPACT</u> -- Two sources of potential traffic noise impact are discussed: increases in noise levels at the existing highways due to increases in traffic volumes resulting from the development of Henry Street and the proposed Lanihau Shopping Center expansion; and noise generated by traffic movements on Henry Street itself. Particular consideration is given at the noise sensitive locations nearest to the proposed street, and located further away from both highways. Also included in the assessment are potential impacts due to construction activities related to the proposed street.

A. Noise Levels at the Existing Highways -- Traffic noise estimates have been made using the Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (Reference 3). In order to calibrate the model, noise measurements have been obtained at locations near Queen Kaahumanu and Kuakini Highways together with traffic counts, including the mix of vehicles. Once the model was calibrated, new traffic data (Reference 4) were used to predict the future noise levels for various scenarios (e.g., with and without the Henry Street development, etc.). Table 2 provides the results of these calculations. The results indicate that the future (1995) traffic noise levels for Queen Kaahumanu Highway, with the Henry Street development and the shopping center expansion, will increase by, at most, about 1 dB. The future traffic noise levels for Kuakini Highway, with the Henry Street development, are expected to be less than those without the new street. This decrease in traffic noise results from Henry Street alleviating the traffic demand on Kuakini Highway. Such changes in traffic noise levels for both highways are considered negligible and will not cause any significant noise impact.

B. Noise Generated by Traffic on Henry Street -- The FHWA traffic model has also been used to estimate the future traffic noise from Henry Street. Detailed traffic information to accurately predict the noise levels is not available, therefore, the following assumptions have been made and were used in the calculations:

- 2 lane street with a centerline median/turning lane
- 30 mph average traveling speed
- 1 to 2% medium and heavy truck mixes
- 3% grade near Kuakini Highway and greater than 7% for the remainder

The results of the traffic noise calculations are provided in Table 3. Note that the future case without Henry Street will still have traffic entering/exiting the expanded shopping center at the same locations as the case with the proposed street, i.e., near the existing highways.

The calculation results indicate that all the existing residential areas near the proposed street are expected to be exposed to Ldn levels of less than 65 dB, therefore, complying with HUD's standards for residential uses.

The results also indicate that the residents living near the proposed street will experience increases in Ldn levels of about 2 to 13 dB, when comparing the future traffic levels with and without the Henry Street development. In terms of subjective perceptibility to changes in noise levels, a person with normal hearing will start to notice the change when there is an increase in noise level of about 3 dB, and will notice a marked difference when the increase approaches 10 dB, which is considered a doubling of loudness. In general, an increase of more than about 5 dB in noise level is considered a significant impact, subjectively.

Using these subjective guidelines, it is possible that the residents of units within Kalanikai, near the proposed street and away from Kuakini Highway, will notice a marked change in noise level. It should be noted that most of the units within Kalanikai are equipped with individual air conditioners, and the interior Ldn levels, with the air conditioners on, are not expected to change significantly with the Henry Street development. The residents of the other dwelling units near the proposed street will experience marginally noticeable to clearly noticeable changes, and some of these residents may be significantly impacted.

C. Noise Impact from Construction -- Development of the proposed street will involve grubbing and grading. The various construction phases of a development project may generate significant amounts of noise; the actual amounts are dependent upon the methods employed during each stage of the process. Typical construction equipment noise ranges in dBA are shown on Figure 3. Earthmoving equipment such as bulldozers and diesel trucks will probably be the loudest equipment used during construction, generating noise levels as high as 95 dB at the nearest residential areas. Such exposures are not a long-term condition, and construction noise is not generally considered a significant impact.

VI. RECOMMENDATIONS -- The predicted traffic noise levels comply with the HUD's noise standard of 65 dB Ldn, and therefore, no mitigation measures are required. However, implementation of the following guidelines will reduce any potential noise impact at the residences located near the proposed Henry Street:

- Posted speed limit of no greater than 25 mph
- Administrative controls to prohibit or reduce the number of early morning and night time heavy truck movements on Henry Street associated with the shopping center

- Although the State Department of Health (DOH)'s noise regulations (Reference 5) only apply on the island of Oahu, it is recommended that the construction activities comply with the following DOH regulations:

  "No...construction activities creating excessive noise...[shall be allowed] before 7:00 a.m. and after 6:00 p.m. of the same day."

  "No...construction activities which emit noise in excess of ninety-five dBA...[shall be allowed] except between 9:00 a.m. and 5:30 p.m. of the same day."

  "No...construction activities which exceed the allowable noise levels on Sundays and on...[certain] holidays [shall be allowed]. Activities exceeding ninety-five dBA shall [also] be prohibited on Saturdays."

- All construction equipment and on-site vehicles or devices requiring an exhaust of gas or air should be equipped with mufflers.

- All construction vehicles, when using trafficways, should comply with the noise level requirements defined in Reference 6.

Please call if you have any questions on the above.

Sincerely,

Mike S. Lee

MSL/msl

REFERENCES:

1. "HUD Environmental Criteria and Standards", 24 CFR Part 51, Federal Register, Volume 44, No. 135, July 12, 1979; amended 49 FR 880, January 6, 1984.

2. "Toward a National Strategy for Noise Control," U.S. Environmental Protection Agency, April 1977

3. "FHWA Highway Traffic Noise Prediction Model", FHWA-RD-77-108; U.S. Department of Transportation, December 1978.

4. Traffic data provided by Barton-Aschman Associates, Inc., received on April 11, 1990

5. "Chapter 43 - Community Noise Control for Oahu", Department of Health, State of Hawaii, Administrative Rules, Title 11, 1981

6. "Chapter 42 - Vehicular Noise Control for Oahu", Department of Health, State of Hawaii, Administrative Rules, Title 11, 1981

Table 1. Summary of Short-Term Ambient Noise Measurements Obtained in the Vicinity of the Proposed Henry Street, April 13, 1990

Measurement Location (see Figure 2)	Average Levels Leq	Exceedence Levels Ln *	Dominant Sound Source(s)
Position A -- southern end of the existing shopping center parking lot	52 dBA	L_1 : 58 dBA L_{10}: 55 L_{50}: 52 L_{90}: 48	birds, air-conditioners, typical parking lot activities
Position B -- mauka end of Kalanikai resort-type multi-family area.	50	L_1 : 57 L_{10}: 52 L_{50}: 49 L_{90}: 48	birds, individual air-conditioning units
Position C -- adjacent to the mauka side right-of-way of Kuakini Highway (measurement result used to calibrate the FHWA model)	72	L_1 : 82 L_{10}: 73 L_{50}: 69 L_{90}: 62	traffic on Kuakini Highway
Position D -- makai end of Kona Lani multi-family area, northern end of Kalawa St.	57	L_1 : 60 L_{10}: 58 L_{50}: 57 L_{90}: 56	mechanical equipment at the adjacent commercial area, distant traffic
Position E -- multi-family area at the northern end of Alahou St.	55	L_1 : 62 L_{10}: 60 L_{50}: 52 L_{90}: 48	birds, neighborhood activities
Position F -- adjacent to the single family homes on Ala Onaona St.	45	L_1 : 49 L_{10}: 47 L_{50}: 44 L_{90}: 43	birds
Position G -- adjacent to the makai side right-of-way of Queen Kaahumanu Highway (data used to calibrate the FHWA model)	70	L_1 : 82 L_{10}: 72 L_{50}: 66 L_{90}: 48	traffic on Queen Kaahumanu Highway
Position H -- mauka end of Kalani St.	43	L_1 : 51 L_{10}: 46 L_{50}: 42 L_{90}: 38	distant traffic on Queen Kaahumanu Highway

* Ln -- sound pressure level exceeded for n% of the measurement period; L_1 - near maximum level, L_{50} - the mean level, L_{90} - a near minimum, or background level

Table 2. Summary of and Future (1995) Traffic Noise Predictions for Various Cases, Queen Kaahumanu & Kuakini Highway

CASE	PM PEAK HR AVER. NOISE LEVELS (Leq) @ 50 FEET	RELATIVE CHANGE IN THE PEAK HOUR Leq COMPARED TO THE CASE WITHOUT HENRY STREET (1995)
Queen Kaahumanu Hwy. - 1995 cumulative without Henry Street	71.0 - 71.5 dBA	not applicable
Queen Kaahumanu Hwy. - 1995 cumulative with Henry Street	71.1 - 71.4	0.1 dBA
Queen Kaahumanu Hwy. - 1995 cumulative with Henry Street plus the shopping center expansion	72.1 - 72.2	+0.7 to +1.1
Kuakini Hwy. - 1995 cumulative without Henry Street	66.3 - 66.4	not applicable
Kuakini Hwy. - 1995 cumulative with Henry Street	65.3 - 66.7	-1.0 to +0.3
Kuakini Hwy. - 1995 cumulative with Henry Street plus the shopping center expansion	65.5 - 67.0	-0.8 to +0.6

Table 3. Summary of Future (1995) Traffic Noise Predictions, Henry Street

LOCATION	DAY-NIGHT AVERAGE SOUND LEVEL (Ldn)			RELATIVE CHANGES IN FUTURE Ldn LEVELS	
	FUTURE WITHOUT HENRY STREET	FUTURE WITH HENRY STREET	FUTURE WITH HENRY STREET (INCL. SHOPPING CTR. EXP.)	WITHOUT-WITH HENRY STREET	WITHOUT-WITH HENRY ST. INCL. SHOPP. CTR. EXP.
nearest units within the Kalanikai multi-family area	51 - 53 dB	62 - 64 dB	62 - 64 dB	9 - 13 dB	9 - 13 dB
multi-family residential buildings on the northern end of Alahou and Kalawa Sts.	54 *	56 - 58	57 - 59	2 - 4	3 - 5
single family homes on the northern side of Ala Onaona St.	51 - 53	54 - 57	56 - 58	3 - 6	3 - 7

* -- ESTIMATED USING THE MEASURED EXISTING BACKGROUND LEVEL PLUS 6 dB.

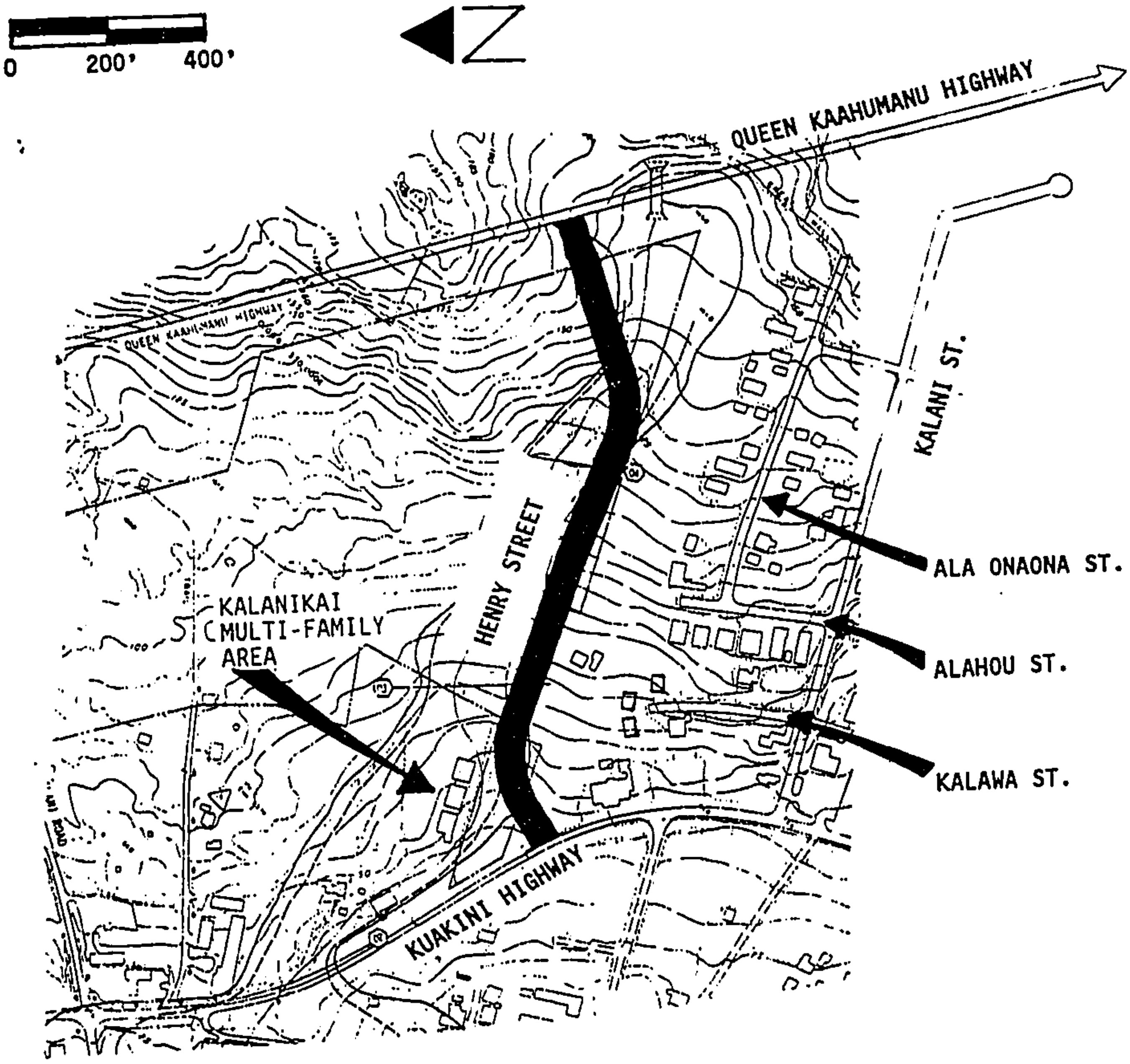


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FIGURE 1. LOCATION OF THE PROPOSED HENRY STREET

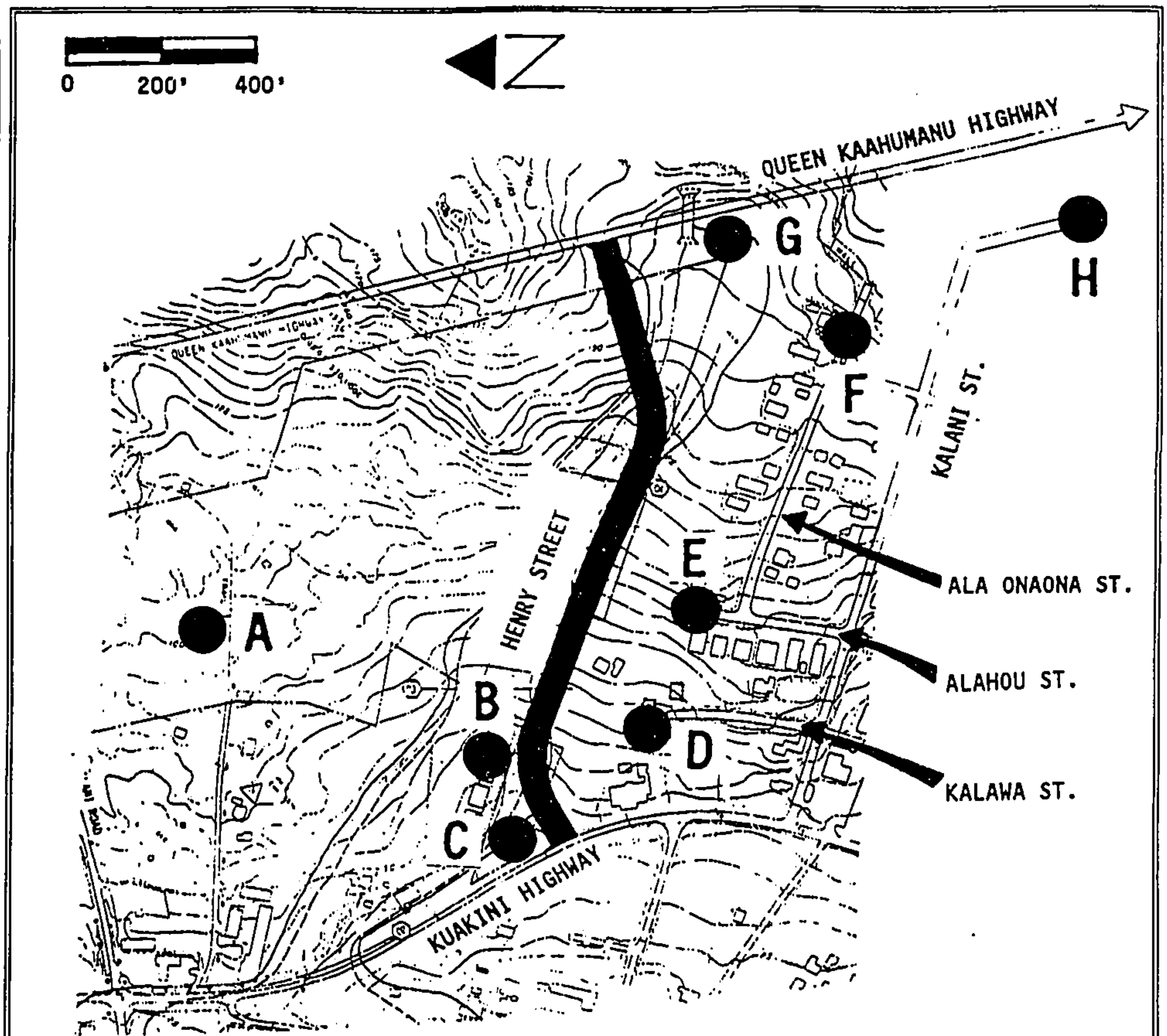

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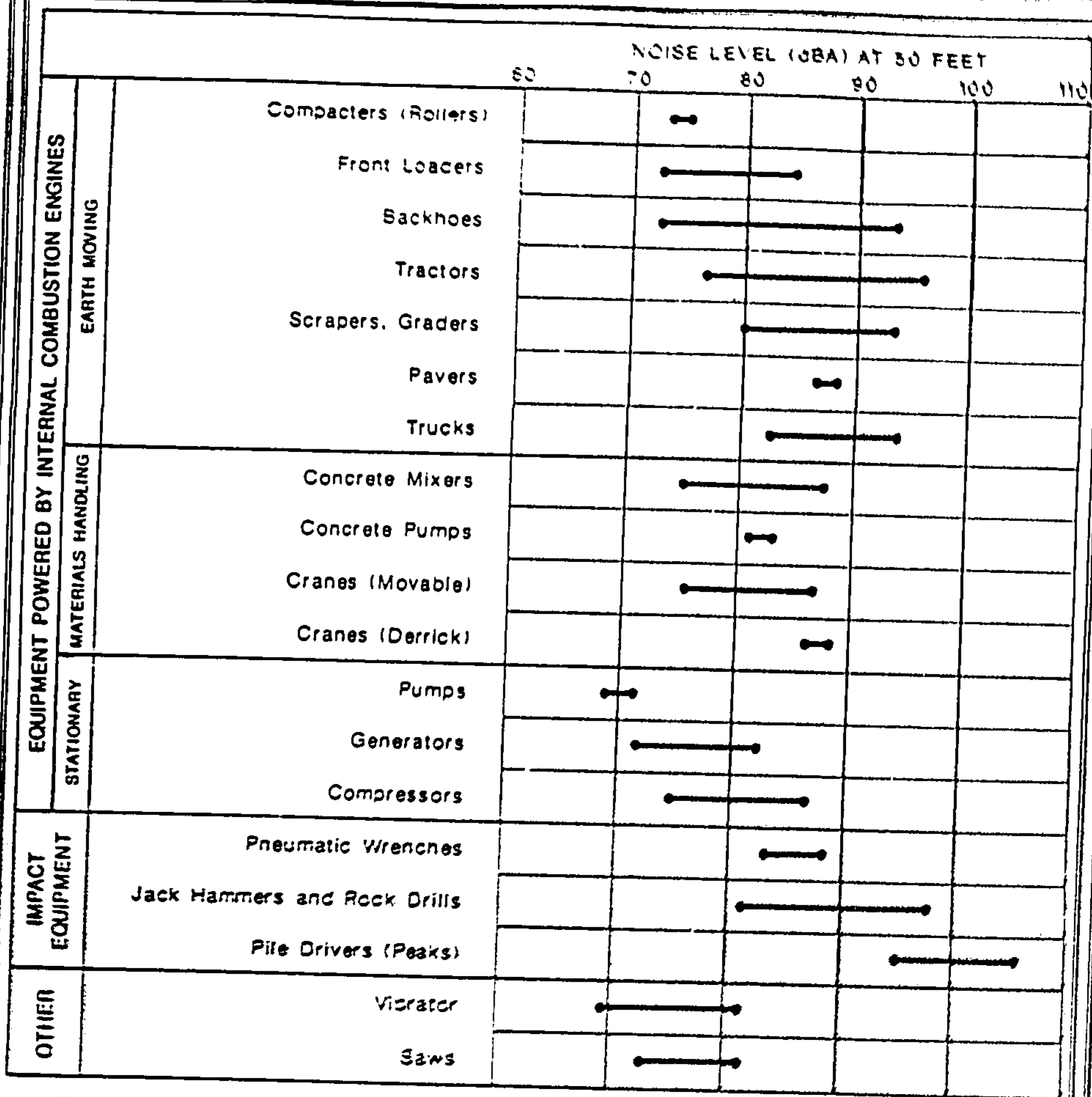
FIGURE 2. LOCATION OF THE MEASUREMENT POSITIONS



Note: Based on Limited Available Data Samples

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FIGURE 3. CONSTRUCTION ACTIVITY NOISE LEVELS

SOURCE: U.S. ENVIRONMENTAL PROTECTION AGENCY 1972

APPENDIX G

Air Quality Study

AIR QUALITY STUDY
FOR THE PROPOSED
HENRY STREET PROJECT

KAILUA-KONA, HAWAII

Prepared for:

Group 70, Limited

May 1990

BARRY D. NEAL & ASSOCIATES
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2377 ST. LOUIS DRIVE, HONOLULU, HAWAII 96816
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CONTENTS

FIGURES

TABLES

1.0 INTRODUCTION AND PROJECT DESCRIPTION

The County of Hawaii and Lanihau Center Venture are proposing to jointly develop the Henry Street Project in the vicinity of Kailua Village, North Kona, on the Island of Hawaii (see Figure 1). After completion, Henry Street will become part of the County owned and maintained system of streets and highways. The proposed mauka-makai roadway connecting Kaahumanu Highway and Kuakini Highway will involve an 80-foot wide strip of vacant land totaling approximately 3.5 acres. The intent of the road construction project is to provide access to developable adjacent lands and to enhance Queen Kaahumanu Highway's function as an alternative route for traffic traveling north and south on the leeward side of the island. Development of the proposed project is expected to be completed by 1995.

The purpose of this study is to describe existing air quality in the project area and to assess the potential short-term and long-term direct and indirect air quality impacts that could result from construction and use of the proposed roadway. Measures to mitigate these impacts are suggested where possible and appropriate.

2.0 AMBIENT AIR QUALITY STANDARDS

Ambient concentrations of air pollution are regulated by both national and state ambient air quality standards (AAQS). National AAQS are specified in Section 40, Part 50 of the Code of Federal Regulations (CFR), while State of Hawaii AAQS are defined in Chapter 11-59 of the Hawaii Administrative Rules. Table 1 summarizes both the national and the state AAQS that are specified in the cited documents. As indicated in the table, AAQS have been established for six air pollutants. These regulated air pollutants include: particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone and lead. National AAQS are stated in terms of primary and secondary standards. National primary standards are designed to protect the public health with an "adequate margin of safety". National secondary standards, on the other hand, define levels of air quality necessary to protect the public welfare from "any known or anticipated adverse effects of a pollutant". Secondary public welfare impacts may include such effects as decreased visibility, diminished comfort levels, or other potential injury to the natural or man-made environment, e.g., soiling of materials, damage to vegetation or other economic damage. In contrast to the national AAQS, Hawaii State AAQS are given in terms of a single standard that is designed "to protect public health and welfare and to prevent the significant deterioration of air quality".

Each of the regulated air pollutants has the potential to create or exacerbate some form of adverse health effect or to produce environmental degradation when present in sufficiently high concentration for prolonged periods of time. The AAQS specify a maximum allowable concentration for a given air pollutant for one or more averaging times to prevent harmful effects. Averaging times vary from one hour to one year depending on the pollutant and type of exposure necessary to cause adverse effects. In the case of the short-term (i.e., 1- to 24-hour) AAQS, both national and state standards allow one exceedance per year.

State of Hawaii AAQS are in some cases considerably more stringent than comparable national AAQS. In particular, the State of Hawaii 1-hour AAQS for carbon monoxide is four times more stringent than the comparable national limit.

Under the provisions of the Federal Clean Air Act [1], the U.S. Environmental Protection Agency (EPA) is required to periodically review and re-evaluate national AAQS in light of research findings more recent than those which were available at the time the standards were originally set. Occasionally new standards are created as well. Most recently, the national standard for particulate matter has been revised to include specific limits for particulates 10 microns or less in diameter (PM-10) [2]. The State of Hawaii has not explicitly addressed the question of whether to set limits for this category of air pollutant, but national AAQS prevail where states have not set their own more stringent levels.

Hawaii AAQS for sulfur dioxide were relaxed in 1986 to make them essentially the same as national limits. It has been proposed in various forums that the state also relax its carbon monoxide standards to the national levels, but at present there are no indications that such a change is being considered.

3.0 REGIONAL AND LOCAL CLIMATOLOGY

Regional and local climatology significantly affect the air quality of a given location. Wind, temperature, atmospheric turbulence, mixing height and rainfall all influence air quality. Although the climate of Hawaii is relatively moderate throughout most of the state and most of the year, significant differences in these parameters may occur from one location to another. Most differences in regional and local climates within the state are caused by the mountainous topography.

Kailua-Kona, the site of the proposed project, is located near the midpoint of the western coast of the island of Hawaii. The topography of this island is dominated by the great volcanic masses of Mauna Loa (13,653 feet), Mauna Kea (13,796 feet), and of Hualalai, the Kohala Mountains and Kilauea. The island consists entirely of the slopes of these mountains and of the broad saddles between them. Mauna Loa and Kilauea, located on the southern half of the island, are still active volcanoes. The site of the proposed project lies at the foot of Hualalai at an elevation of about 125 feet.

Hawaii lies well within the belt of northeasterly trade winds generated by the semi-permanent Pacific high pressure cell to the north and east. Nearly the entire western coast of the island of Hawaii, however, is sheltered from the trade winds by high mountains, except when unusually strong trade winds sweep through the saddle between the Kohala Mountains and Mauna Kea and reach the areas to the lee. Due to wind shadow effects caused by the terrain, winds in the Kailua-Kona area are predominantly light and variable. Local winds such as land/sea breezes and/or upslope/ downslope winds tend to dominate the wind pattern of the area. During the daytime, winds typically move onshore because of seabreeze and/or upslope effects. At night, winds generally are land breezes and/or drainage winds which move downslope and out to sea. Calms occur about 29 percent of the time at nearby Keahole Airport.

Air pollution emissions from motor vehicles, the formation of photochemical smog and smoke plume rise all depend in part on air temperature. Colder temperatures tend to result in higher emissions of contaminants from automobiles but lower concentrations of photochemical smog and ground-level concentrations of air pollution from elevated plumes. In Hawaii, the annual and daily variation of temperature depends to a large degree on elevation above sea level, distance inland and exposure to the trade winds. Average temperatures at locations near sea level generally are warmer than those at higher elevations. Areas exposed to the trade winds tend to have the least temperature variation, while inland and leeward areas often have the most. The project site's leeward location and low-level elevation results in a relatively moderate temperature profile compared to windward locations near sea level. At the Old Kona Airport located about 1 mile to the northwest, average daily minimum and maximum temperatures are 67°F and 83°F, respectively. The extreme minimum temperature on record at this location is 47°F, and the extreme maximum is 93°F. Temperatures at the project site are probably very close to this.

Small scale, random motions in the atmosphere (turbulence) cause air pollutants to be dispersed as a function of distance or time from the point of emission. Turbulence is caused by both mechanical and thermal forces in the atmosphere. It is oftentimes measured and described in terms of Pasquill-Gifford stability class. Stability class 1 is the most turbulent and class 6 the least. Thus, air pollution dissipates the best during stability class 1 conditions and the worst when stability class 6 prevails. In suburban, coastal areas like Kailua-Kona, stability class 5 or 6 is generally the highest stability class that occurs, developing during clear, calm nighttime or early morning conditions. Stability classes 1 through 4 occur during the daytime, depending mainly on the amount of cloud cover and the onset and extent of the sea breeze.

Mixing height is defined as the height above the surface through which relatively vigorous vertical mixing occurs. Low mixing heights can result in high ground-level air pollution concentrations because contaminants emitted from or near the surface can become trapped within the mixing layer. In Hawaii, minimum mixing heights tend to be high because of mechanical mixing caused by the trade winds and because of the temperature moderating effect of the surrounding ocean. Low mixing heights may sometimes occur, however, at inland locations and even at times along coastal areas early in the morning following a clear, cool, windless night. Coastal areas may also experience low mixing levels during sea breeze conditions when cooler ocean air rushes in over warmer land. Although there are no mixing height data for the Kailua-Kona area, mixing heights elsewhere in the state typically are above 3000 feet (1000 meters). Mixing heights in the project area probably tend to be somewhat lower on the average due to the fact that light winds often prevail. Sea breeze conditions that frequently develop during the daytime may also result in low level mixing heights on occasion.

Rainfall can have a beneficial effect on the air quality of an area in that it helps to suppress fugitive dust emissions, and it may also "washout" gaseous contaminants that are water soluble. Rainfall in Hawaii is highly variable depending on elevation and on location with respect to the trade wind. The Kailua-Kona area being a leeward location experiences a relatively dry climate. Some of the rainfall occurs in conjunction with winter storms, and some occurs during summer afternoons and evenings as a result of the onshore and upslope movement of moisture laden marine air. At the Old Kona Airport, average annual rainfall amounts to about 24 inches but may vary significantly from one year to the next. Average annual rainfall at the project site is similar to that at the old airport.

4.0 PRESENT AIR QUALITY

Present air quality in the project area is mostly affected by air pollutants from natural, industrial, agricultural and/or vehicular sources. Natural sources of air pollution emissions which may affect the project area but cannot be quantified very accurately include the ocean (sea spray), plants (aero-allergens), wind-blown dust, and volcanoes. Of these natural sources of air pollution, volcanoes are the most significant. Volcanic emissions periodically plague the project area. This is especially so since the latest eruption phase of the Kilauea Volcano began in 1983. Air pollution emissions from the Hawaiian volcanoes consistent primarily of sulfur dioxide. After entering the atmosphere, these sulfur dioxide emissions are carried away by the wind and gradually transformed into particulate sulfates. Although emissions from Kilauea are vented more than 50 miles east of the project site, the prevailing wind patterns eventually carry the emissions into the Kona area. These emissions can be seen in the form of the volcanic haze (vog) which persistently hangs over the area. The American Lung Association is currently studying the character and concentrations of volcanic air pollution in the Kona area, but to date no results of the study are available.

The major industrial sources in the project vicinity include the Keahole Power Plant, operated by Hawaii Electric Light Company, and the Kailua Landfill, operated by the County of Hawaii. Air pollution emissions from Keahole Power Plant consist mostly of sulfur dioxide and oxides of nitrogen. Emissions from the county landfill consist mainly of fugitive dust from heavy equipment operations and noxious fumes from underground fires, the latter of which has been the subject of numerous complaints from people residing and working nearby. Studies at the landfill conducted by the U.S. Environmental Protection Agency suggest that the problem is not a threat to public health.

The State Department of Health operates a network of air quality monitoring stations at various locations around the state. Unfortunately, very little data are available for the Island of Hawaii, and even less are available for the Kona area specifically. As indicated in Table 2, the only existing monitoring data in the vicinity of the project site consist of sulfur dioxide and particulate measurements that were made about 10 miles to the south at Kealakekua during 1985 and 1986. During the two-year period, measurements of 24-hour average sulfur dioxide concentration at this location were consistently low with daily mean values ranging from less than 5 to 12 $\mu g/m^3$. No exceedances of the state/national 24-hour AAQS for sulfur dioxide were recorded. Twenty-four hour average particulate concentrations ranged from 4 to 28 $\mu g/m^3$; no violations of the state AAQS were measured.

At this time, there are no reported measurements of lead, ozone, nitrogen dioxide or carbon monoxide in the project vicinity. These are mostly motor vehicle related air pollutants. Lead, ozone and nitrogen dioxide are primarily regional scale problems; concentrations of these contaminants generally have not been found to exceed AAQS elsewhere in the state. Carbon monoxide air pollution, on the other hand, typically is a microscale problem caused by congested motor vehicular traffic. In traffic congested areas such as urban Honolulu, carbon monoxide concentrations have been found to occasionally exceed the state AAQS. Present concentrations of carbon monoxide in the project area are estimated later in this study based on air quality modeling of vehicular emissions.

5.0 SHORT-TERM IMPACTS OF PROJECT

Short-term direct and indirect impacts on air quality could potentially occur due to project construction. For a project of this nature, there are two potential types of air pollution emissions which could directly result in short-term air quality impacts during the construction phase: (1) fugitive dust from vehicle movement and site excavation; and (2) exhaust emissions from on-site construction equipment. Indirectly, there could also be short-term impacts from slow-moving construction equipment traveling to and from the project site and from a temporary increase in local traffic caused by commuting construction workers.

Fugitive dust emissions may arise from the grading and dirt/rock-moving activities associated with site preparation once the area is cleared. The emission rate for fugitive dust emissions from construction activities is difficult to estimate accurately because of its elusive nature and because the potential for its generation varies greatly depending upon the type of soil at the construction site, the amount and type of earth-disturbing activity taking place, the moisture content of exposed soil in work areas, and the wind speed. The EPA [3] has provided a rough estimate for uncontrolled fugitive dust emissions from construction activity of 1.2 tons per acre per month under conditions of "medium" activity, moderate soil silt content (30%), and precipitation/evaporation (P/E) index of 50. Uncontrolled fugitive dust emissions in the project area would probably be somewhere near this level. In any case, State of Hawaii Air Pollution Control Regulations [4] prohibit visible emissions of fugitive dust from construction activities at the property line. Thus, an effective dust control plan for the project construction phase is essential.

Adequate fugitive dust control can usually be accomplished by the establishment of a frequent watering program to keep bare-earth surfaces in work areas from becoming significant dust generators. In some cases, limiting the area that can be disturbed at any given time may be necessary. Control regulations also require that open-bodied trucks be covered at all times when in motion if they are transporting materials likely to give rise to airborne dust. Paving of parking areas and/or establishment of landscaping as early in the construction process as possible can also lower the potential for fugitive dust emissions.

On-site mobile and stationary construction equipment will also emit some air pollutants in the form of engine exhausts. The largest of this equipment is usually diesel-powered. Nitrogen oxides emissions from diesel engines can be relatively high compared to gasoline-powered equipment, but the standard for nitrogen dioxide is set on an annual basis and is not likely to be violated by short-term construction equipment emissions. Carbon monoxide emissions from diesel engines, on the other hand, are low and should be relatively insignificant compared to vehicular emissions on nearby roadways.

Indirectly, slow-moving construction vehicles on roadways leading to and from the project site could obstruct the normal flow of traffic to such an extent that overall vehicular emissions are increased, but this impact can be mitigated by moving heavy construction equipment during periods of low traffic volume. Likewise, the schedules of commuting construction workers can be adjusted to avoid peak hours in the project vicinity. Thus, most potential short-term air quality impacts from project construction can be mitigated.

6.0 LONG-TERM IMPACTS OF PROJECT

After construction is completed, use of the proposed roadway by motor vehicles will result in potential long-term impacts on ambient air quality in adjacent areas. Motor vehicles with gasoline-powered engines are significant sources of carbon monoxide. They also emit nitrogen oxides, and those burning leaded gasoline contribute lead to the atmosphere. The use of leaded gasoline in new automobiles is now prohibited. As older vehicles continue to disappear from the numbers of those currently operating on the state's roadways, lead emissions are approaching zero. Nationally, so few vehicles now require leaded gasoline that the EPA is proposing a total ban on leaded gasoline to take effect immediately. Even without such a ban, reported quarterly averages of lead in air samples collected in urban Honolulu have been near zero since early 1986. Thus, lead in the atmosphere is not considered to be a problem anywhere in the state.

Federal air pollution control regulations also call for increased efficiency in removing carbon monoxide and nitrogen oxides from the exhausts of new motor vehicles. By the year 1995 carbon monoxide emissions are expected to be about 30 percent less than the amounts now emitted due to the replacement of older vehicles with newer models. Further reductions in vehicular emissions have recently been proposed by the President for areas of the country which do not currently meet AAQS.

To evaluate the potential long-term indirect ambient air quality impact of increased roadway traffic associated with a project such as this, computerized emission and atmospheric dispersion models can be used to estimate ambient carbon monoxide concentrations along roadways leading to and from the project. Carbon monoxide is selected for modeling because it is both the most stable and the most abundant of the pollutants generated by motor vehicles. Furthermore, carbon monoxide air pollution is generally considered to be a microscale problem, whereas nitrogen oxides air pollution usually is a regional issue. This is reflected in the fact that the AAQS for carbon monoxide are specified on a short-term basis (1-hour and 8-hour averaging times) while the AAQS for nitrogen dioxide is set on an annual basis.

For this project, three scenarios were selected for the carbon monoxide modeling study: year 1990 with present conditions, year 1995 without the project, and year 1995 assuming the project is built and complete. To begin the modeling study, critical receptor areas in the vicinity of the project were identified for analysis. Generally speaking, roadway intersections are the primary concern because of traffic congestion and because of the increase in vehicular emissions associated with traffic cycling: decelerating, stopping, queuing and accelerating. For this study, the same key intersections identified in the traffic study were also selected for air quality analysis. These include: Henry Street at Queen Kaahumanu Highway and at Kuakini Highway, Henry Street at East Driveway and at West Driveway, and Palani Road at Queen Kaahumanu and at Kuakini Highway. The traffic impact assessment report for the project [5] describes the present and future conditions and configurations of these intersections in detail.

The main objectives of the modeling study were to estimate both current and projected levels of maximum 1-hour average carbon monoxide concentrations which could then be directly compared to the national and state AAQS. The traffic impact assessment report indicates that traffic volumes generally are or will be higher during the afternoon peak hour than during the morning peak period. Worst-case emission and meteorological dispersion conditions typically occur during the morning hours at many locations. Thus, to ensure that worst-case concentrations were identified, both morning and afternoon peak traffic hours were examined.

The EPA computer model MOBILE4 [6] was used to calculate vehicular carbon monoxide emissions for each of the years studied. One of the key inputs to MOBILE4 is vehicle mix. Based on recent vehicle registration figures, the present and projected vehicle mix in the project area is estimated to be 91.9% light-duty gasoline-powered vehicles, 4.2% light-duty gasoline-powered trucks and vans, 0.5% heavy-duty gasoline-powered vehicles, 1% diesel-powered trucks and buses, and 1% motorcycles.

Other key inputs to the MOBILE4 emission model are the cold/hot start fractions. Motor vehicles operating in a cold- or hot-start mode emit excess air pollution. Typically, motor vehicles reach stabilized operating temperatures after about 4 miles of driving. For traffic operating within the immediate project area, it was assumed that about 25 percent of all vehicles would be operating in the cold-start mode and that about 5 percent would be operating in the hot-start mode. These operational mode values were estimated based on a report from the California Department of Transportation [7] and taking into consideration the likely origins of traffic in the project area. MOBILE4 idle emissions were adjusted to account for excess cold/hot-start emissions per a recent U.S. EPA memorandum [8].

Ambient temperatures of 59 and 68°F were used for morning and afternoon peak-hour emission computations, respectively. These are conservative assumptions since morning/afternoon ambient temperatures will generally be warmer than this, and emission estimates given by MOBILE4 are inversely proportional to the ambient temperature.

After computing vehicular carbon monoxide emissions through the use of MOBILE4, these data were then input to the latest version of the computer model CALINE4 [9]. CALINE4 was developed by the California Transportation Department to simulate vehicular movement and atmospheric dispersion of vehicular emissions. It is designed to predict maximum 1-hour average pollutant concentrations along roadways based on input traffic and emission data, roadway/receptor geometry and meteorological conditions.

Input peak-hour traffic data were obtained from the traffic study cited previously. The traffic volumes given in the traffic study for the future scenarios include project traffic as well as traffic from other growth that is expected to occur in the area by the year 1995. Traffic queuing estimates were made based on the project traffic study, Transportation Research Board procedures [10], U.S. EPA guidelines [11], and traffic observations at the subject intersections.

Model roadways were set up to reflect actual roadway geometry, physical dimensions and operating characteristics. Most pedestrian walkways in the project area are located relatively close to the traveled roadways. Thus, most model receptor sites were located between about 2 and 4 meters from the edge of the roadways near the intersections studied. All receptor heights were placed at 1.5 meters above ground to simulate levels within the normal human breathing zone.

Input meteorological conditions for this study were defined to provide "worst-case" results. One of the key meteorological inputs is atmospheric stability category. For these analyses, stability category 6 was assumed for the morning case and stability category 4 was used for the afternoon case. These are the most conservative stability categories that can be used for estimating pollutant dispersion for these time periods. A surface roughness length of 150 cm was assumed with a mixing height of 300 meters. Worst-case wind conditions were defined as a wind speed of 1 meter per second with a wind direction resulting in the highest predicted concentration.

Existing background concentrations of carbon monoxide in the project vicinity are believed to be low. Background contributions of carbon monoxide from sources or distant roadways not directly considered in the analyses were accounted for by adding a background concentration of 0.1 ppm to all predicted concentrations for both the 1990 and the 1995 scenarios.

Table 3 summarizes the final results of the modeling study in the form of the estimated worst-case 1-hour morning and afternoon ambient carbon monoxide concentrations. These results can be compared directly to the state and the national AAQS. Estimated worst-case carbon monoxide concentrations are presented in the table for three scenarios: year 1990 with existing traffic, year 1995 without project traffic and year 1995 with project traffic. The locations of these estimated worst-case 1-hour concentrations all occurred at or very near the indicated intersections.

As indicated in the table, the estimated present worst-case 1-hour carbon monoxide concentration in the project area, 18.6 mg/m^3, occurs during the morning peak hour near the intersection of Palani Road and Queen Kaahumanu Highway. The next highest concentration, 17.4 mg/m^3, is predicted to occur near Palani Road at Kuakini Highway during the afternoon. Estimated existing worst-case concentrations along both Queen Kaahumanu Highway and Kuakini Highway near the proposed intersections with Henry Street (assuming through traffic only) were less than 2 mg/m^3.

In the year 1995 without the proposed project, a worst-case 1-hour concentration of 12.6 mg/m^3 was predicted to occur during the morning peak traffic hour near the intersection of Palani Road and Queen Kaahumanu Highway, the same location and time as the highest concentration for the existing case. Values at the other locations studied for this scenario ranged from 1.0 mg/m^3 during the afternoon peak hour along Queen Kaahumanu Highway near the proposed Henry Street intersection to 11.7 mg/m^3 during the afternoon near Palani Road at Kuakini Highway. Compared to the 1990 scenario, the estimated worst-case 1995 without project concentrations are about 25 to 30 percent lower even though traffic volumes will be higher. This is due to the anticipated attrition of older model vehicles.

Predicted 1-hour worst-case concentrations for the 1995 with project scenario range from 1.3 mg/m^3 during the morning at Henry Street and West Driveway to 15.5 mg/m^3 during the afternoon at Henry Street and East Driveway. The higher concentration that is estimated to occur in the vicinity of the East Driveway during the afternoon is comparable to worst-case values that are estimated to occur presently in the project vicinity. Estimated 1995 concentrations along Palani Road are about the same with or without the project.

Thus, all estimated worst-case 1-hour carbon monoxide levels are well within the national AAQS of 40 mg/m^3. It appears likely, however, that existing concentrations of carbon monoxide as well as future concentrations either without or with the project may exceed the State of Hawaii 1-hour AAQS of 10 mg/m^3 on occasion near traffic congested intersections within the project area.

Worst-case 8-hour carbon monoxide concentrations were estimated by multiplying the worst-case 1-hour values by a persistence factor of 0.5. This accounts for two factors: (1) traffic volumes averaged over eight hours are lower than peak 1-hour values, and (2) meteorological dispersion conditions are more variable (and hence more favorable) over an 8-hour period than they are for a single hour. Based on monitoring data, 1-hour to 8-hour persistence factors for most locations generally vary from 0.4 to 0.8 with 0.6 being the most typical. One recent study based on modeling [12] concluded that 1-hour to 8-hour persistence factors could typically be expected to range from 0.4 to 0.5. EPA guidelines [11] recommend using a value of 0.6 to 0.7 unless a locally derived persistence factor is available. Recent monitoring data for Honolulu reported by the Department of Health [13] suggests that this factor may range between about 0.35 and 0.55 depending on location and traffic variability. Considering the location of the project, the variability of the wind and the traffic pattern for the area, a 1-hour to 8-hour persistence factor of 0.5 is probably most appropriate for this application.

The resulting estimated worst-case 8-hour concentrations are indicated in Table 4. For the 1990 scenario, the estimated worst-case 8-hour carbon monoxide concentration was 9.3 mg/m^3 at the intersection of Palani Road and Queen Kaahumanu Highway. Concentrations at other locations ranged from 0.8 mg/m^3 for through traffic along Queen Kaahumanu Highway to 8.7 mg/m^3 near the intersection of Palani Road and Kuakini Highway. The predicted maximum values for the year 1995 without and with project scenarios were 6.3 and 7.8 mg/m^3, respectively, with the former occurring near Palani Road at Queen Kaahumanu Highway and the latter occurring along Henry Street at East Driveway. Either with or without the project, 1995 concentrations can be expected to be lower than existing concentrations along Palani Road, but concentrations in the area along Henry Street will obviously be higher than if the proposed street did not exist. Comparing the predicted values for the existing case to the AAQS, it appears that the state 8-hour standard may currently be exceeded along Palani Road but that current concentrations are in compliance with the national 8-hour standard. This applies also either without or with the project in 1995. If Henry Street is not built, 8-hour carbon monoxide concentrations in 1995 will likely remain within both state and national standards within the area that the roadway would occupy; if Henry Street is built, concentrations at some locations along the roadway will likely exceed the state AAQS but meet the national standard.

The results of this study reflect several assumptions that must be made concerning traffic movement and worst-case meteorological conditions. One such assumption concerning worst-case meteorological conditions is that a wind speed of 1 meter per second with a steady direction for 1 hour will occur. A steady wind of 1 meter per second blowing from a single direction for an hour is not very likely, and it may occur only once a year or less. With wind speeds of 2 meters per second, for example, computed carbon monoxide concentrations would be only about half the values given above.

7.0 SUMMARY OF IMPACTS AND MITIGATIVE CONSIDERATIONS

7.1 Impacts Summary

The major short-term air quality impact will be the potential emission of significant quantities of fugitive dust during project construction. Uncontrolled fugitive dust emissions from construction activities are estimated to amount to about 1.2 tons per acre per month. During construction phases, emissions from engine exhausts (primarily consisting of carbon monoxide and nitrogen oxides) will also occur both from on-site construction equipment and from vehicles used by construction workers traveling through the area to and from the project.

The primary long-term air pollution impact will arise from the increased motor vehicle traffic associated with the project. Potential increased levels of carbon monoxide concentrations will be the main concern. Based on mathematical modeling of projected vehicular traffic and on atmospheric dispersion estimates of vehicular emissions, it is predicted that either without or with the proposed project and despite an increase in traffic maximum carbon monoxide concentrations along Palani Road in the year 1995 will be lower than existing levels. This is due to the attrition of older motor vehicles fitted with less efficient emission control devices. With the project, estimated worst-case concentrations in 1995 compared to the without project case will remain about the same along Palani Road but will obviously increase within the area where Henry Street will be constructed. The predicted highest carbon monoxide concentrations should remain within the national 1-hour ambient air quality standard set by the U.S. Environmental Protection Agency, but the more stringent state 1-hour standard may be exceeded either with or without the project (as it is presently) near busy or congested intersections in the project area a few times per year. The U.S. EPA 8-hour standard for carbon monoxide is estimated to be met during the current year at all locations that were studied, and compliance is projected either without or with the project in 1995. The more stringent state 8-hour standard for carbon monoxide may be exceeded occasionally during the current year and either with or without the project in the year 1995 along Palani Road. With the project, 1995 concentrations will likely exceed the state 8-hour standard both at Henry Street/Queen Kaahumanu Highway and Henry Street/East Driveway intersections. The state standards for carbon monoxide are set so low, however, they are probably exceeded at many intersections in the state that have even moderate traffic volumes. It is worth noting here that, although the national AAQS allow higher levels of carbon monoxide, these standards were developed after extensive research with the objective of defining levels of air quality that would protect the public health with an adequate margin of safety.

7.2 Mitigative Considerations

Strict compliance with State of Hawaii Air Pollution Control Regulations regarding establishment of a regular dust-watering program and covering of dirt-hauling trucks will be required to effectively mitigate fugitive dust emissions from construction activities. Twice daily watering is estimated to reduce dust emissions by up to 50 percent. Paving of parking areas and establishment of landscaping early in the construction schedule will also help to control dust. Increased vehicular emissions due to disruption of traffic by construction equipment and/or commuting construction workers can be alleviated by moving equipment and personnel to the site during off-peak traffic hours.

Options available to mitigate traffic-related air pollution are to improve roadways, reduce traffic or reduce individual vehicular emissions. Long-term projections of carbon monoxide emissions from vehicular traffic associated with the completed development are based on the traffic impact study findings. Further improvement of roadways is always a potential mitigative measure to reduce traffic-related air pollution impacts, although this is not always possible or feasible. So long as the NAAQS are achieved, further roadway improvement probably is not warranted. Aside from improving roadways, air pollution impacts from vehicular emissions can also be mitigated by reducing traffic through the use of mass transit and car pooling and/or by adjusting local school and business hours to begin and end during off peak times. Further, it is conceivable that at some point in the future the efficiency of motor vehicle engines and/or emission control equipment will be improved or that vehicles will be developed which burn cleaner fuels. With regard to the latter, vehicles burning methanol or compressed natural gas or powered by electrical motors are some of the possibilities for technological development that are currently being contemplated. Lastly, even without technological breakthroughs, it is also possible that at some point in the future the state may decide to adopt a motor vehicle inspection and maintenance program which would ensure that emission control devices are properly maintained, and thereby reduce emissions.

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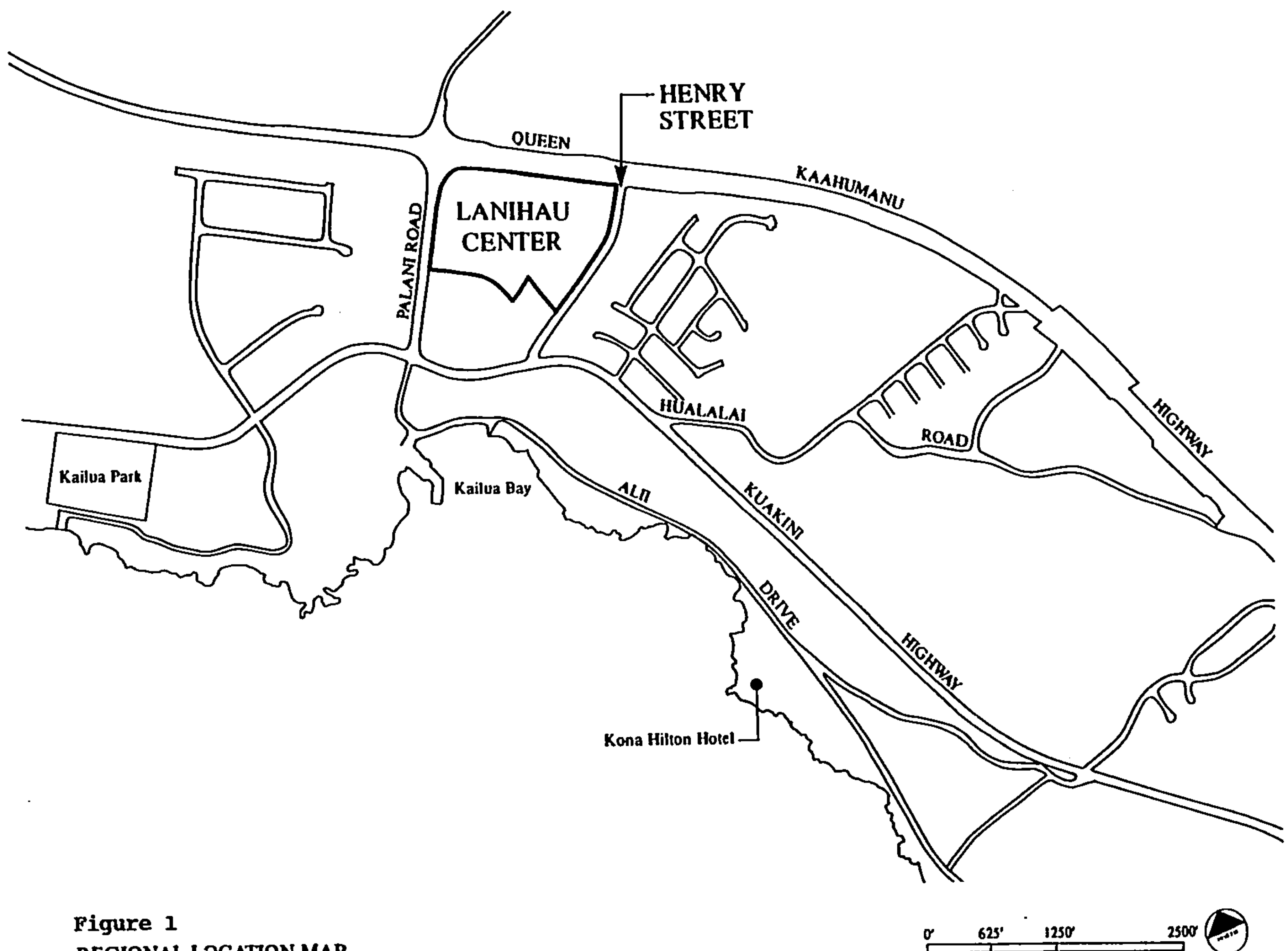


Figure 1
REGIONAL LOCATION MAP
HENRY STREET

Table 1

SUMMARY OF STATE OF HAWAII AND NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Units	Averaging Time	Maximum Allowable Concentration National Primary	National Secondary	State of Hawaii
Suspended Particulate Matter	$\mu g/m^3$	Annual	-	-	60[a]
		24 Hours	-	-	150[b]
Particulate Matter[c]	$\mu g/m^3$	Annual	50	50	-
		24 Hours	150[b]	150[b]	-
Sulfur Dioxide	$\mu g/m^3$	Annual	80	-	80
		24 Hours	365[b]	-	365[b]
		3 Hours	-	1300[b]	1300[b]
Nitrogen Dioxide	$\mu g/m^3$	Annual	100	100	70
Carbon Monoxide	mg/m^3	8 Hours	10[b]	-	5[b]
		1 Hour	40[b]	-	10[b]
Ozone	$\mu g/m^3$	1 Hour	235[b]	235[b]	100[b]
Lead	$\mu g/m^3$	Calendar Quarter	1.5	1.5	1.5

[a]Geometric mean

[b]Not to be exceeded more than once per year

[c]Particles less than or equal to 10 microns aerodynamic diameter

Table 2

ANNUAL SUMMARY OF AIR QUALITY MEASUREMENTS FOR MONITORING STATIONS NEAREST HENRY STREET PROJECT

Parameter / Location	1985	1986
Sulfur Dioxide / Kealakekua, Kona		
Period of Sampling (months)	7	8
No. of 24-Hr Samples	31	40
Range of 24-Hr Values (ug/m3)	<5-8	<5-12
Average Daily Value (ug/m3)	<5	<5
No. of State AAQS Exceedances	0	0
Particulate / Kealakekua, Kona		
Period of Sampling (months)	7	8
No. of 24-Hr Samples	34	40
Range of 24-Hr Values (ug/m3)	6-22	4-28
Average Daily Value (ug/m3)	12	16
No. of State AAQS Exceedances	0	0

Source: State of Hawaii Department of Health, "Hawaii Air Quality Data for the Period of January 1985 to December 1987"

Table 3

ESTIMATED WORST-CASE 1-HOUR CARBON MONOXIDE CONCENTRATIONS ALONG ROADWAYS NEAR HENRY STREET PROJECT (milligrams per cubic meter)

Roadway Intersection	Year/Scenario					
	1990/ Present		1995/ Without Project		1995/ With Project	
	AM	PM	AM	PM	AM	PM
Henry Street at:						
Queen Kaahumanu Hwy	1.5[a]	1.3[a]	1.2[a]	1.0[a]	12.4	13.7
East Driveway	-	-	-	-	2.3	15.5
West Driveway	-	-	-	-	1.3	3.7
Kuakini Hwy	1.8[a]	1.6[a]	1.4[a]	1.3[a]	6.0	6.4
Palani Road at:						
Queen Kaahumanu Hwy	18.6	15.4	12.6	11.2	13.1	14.1
Kuakini Hwy	14.4	17.4	10.7	11.7	10.8	11.7

Hawaii State AAQS: 10
National AAQS: 40

[a]Assumes through traffic only.

Table 4

ESTIMATED WORST-CASE 8-HOUR CARBON MONOXIDE CONCENTRATIONS
ALONG ROADWAYS NEAR HENRY STREET PROJECT
(milligrams per cubic meter)

Roadway Intersection	Year/Scenario 1990/ Present	1995/ Without Project	1995/ With Project
Henry Street at:			
Queen Kaahumanu Hwy	0.8[a]	0.6[a]	6.8
East Driveway	-	-	7.8
West Driveway	-	-	1.9
Kuakini Hwy	0.9[a]	0.7[a]	3.2
Palani Road at:			
Queen Kaahumanu Hwy	9.3	6.3	7.0
Kuakini Hwy	8.7	5.9	5.9

Hawaii State AAQS: 5
National AAQS: 10

[a]Assumes through traffic only.

APPENDIX H

Botanical and Wildlife Survey

BOTANICAL AND WILDLIFE SURVEY, HENRY STREET SITE

FLORA

The general vegetation of the project site is typical of that in most of the vacant or undeveloped properties throughout the South Kona District - ie. an overstory of kiawe (Prosopis pallida), a secondary canopy of koa-haole (Leucaena leucocephala) and a ground cover of Guinea grass (Panicum maximum). Two vegetation types were identified in the site, both similar in species composition but differing in structure. These communities are depicted in the accompanying vegetation map with distinct boundaries but it must be remembered that in nature such boundaries do not exist. Rather, vegetation exists as a continuum with one community grading into another.

Kiawe Forest (KF)

The dominant vegetation type in the property is the Kiawe Forest which is characterized by kiawe 25-40' tall, a secondary canopy of koa-haole 10-15' tall and a dense herb layer of Guinea grass 3-7' tall. Canopy cover provided by kiawe exceeds 50%. The trees and shrubs are often festooned with Coccinea grandis and moon flower (Ipomoea alba). Only a few other species are found in this community and only in very small numbers.

Koa-Haole Thicket (KHT)

Towards the makai portion of the site kiawe ceases to be an important species. Koa-haole becomes the dominant arborescent species with canopy cover exceeding 50%. Guinea grass continues as the dominant species in the herb layer. Coccinea and fountain grass (Pennisetum setaceum) are common in this community. Several abandoned or escaped ornamentals including bougainvillea (Bougainvillea x) Moreton Bay fig (Ficus macrophylla), Chinese banyan (F. microcarpa), pencil tree (Euphorbia tirucalli) and Scotch attorney (Clusea rosea) are found in small numbers. Natal redtop (Rhynchelytrum repens), rouge plant (Rivina humilis) and Talinum triangulare are occasional species.

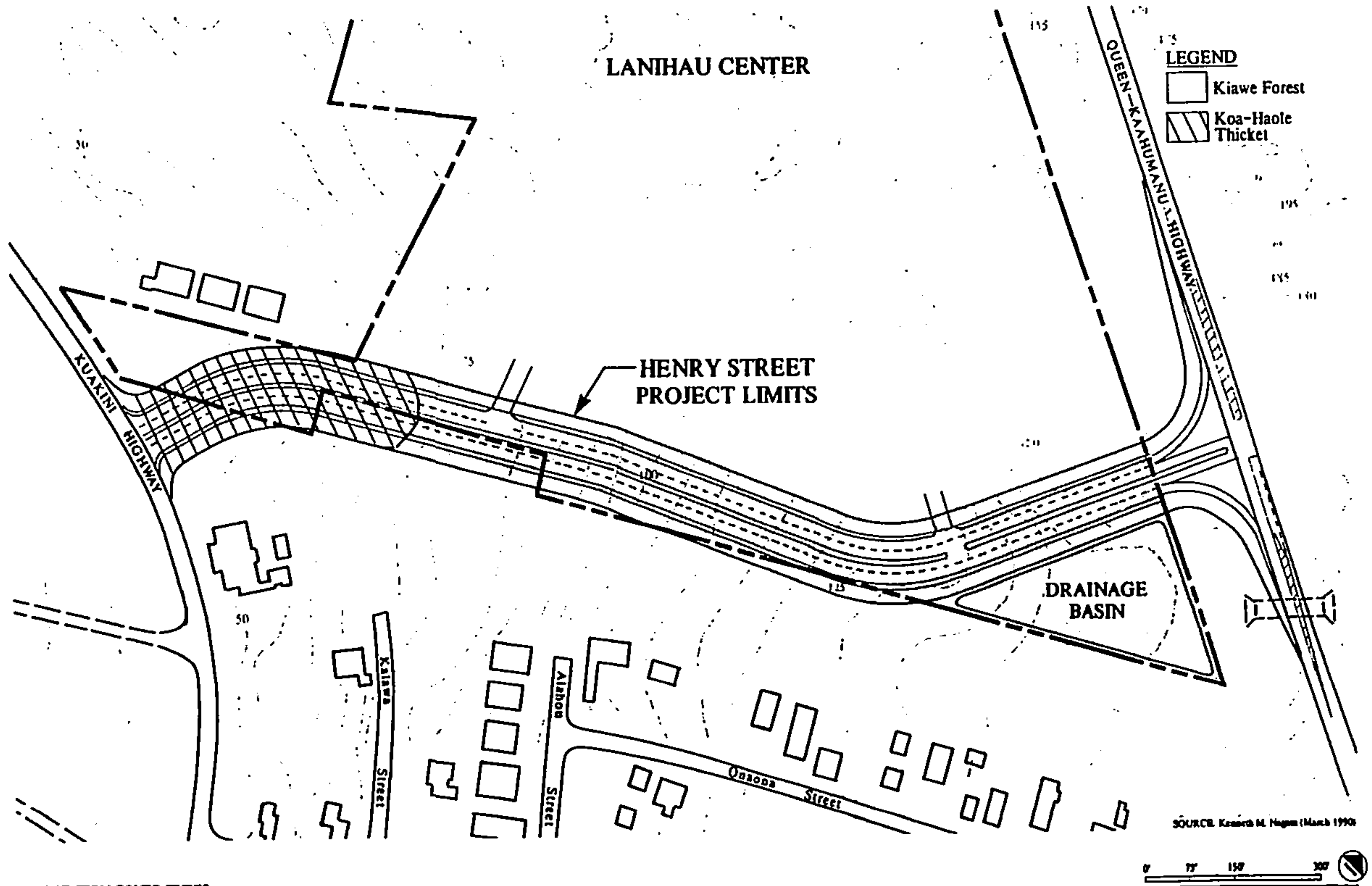
In the makai portion of the drainage and adjacent to Kuakini Highway but outside the project area the vegetation is one of herbs dominated by Guinea grass. Very few shrubs or arborescent species are found in this area.

FAUNA

Five common urban birds were observed in the project site - barred dove (Geopelia striata), common mynah (Acridotheres tristis), Kentucky cardinal (Richmondena cardinalis), Japanese white-eye (Zosterops japonica) and house sparrow (Passer domesticus). Although not actually seen, mongoose (Herpestes auropunctatus) is probably present in the site. Additionally, because of its close proximity to residences and business establishments, animals such as feral cats (Felis catus) and one or more species of rats (Rattus spp.) are likely to be in the site.

ENDANGERED SPECIES

No endangered plant or animal species are present in the project site. No native species were observed.



VEGETATION COVER TYPES
HENRY STREET ENVIRONMENTAL ASSESSMENT

APPENDIX I

Kalani Street Alternative

DANTE K. CARPENTER
Mayor

HUGH Y. ONO
Chief Engineer

BRUCE C. McCLURE
Deputy Chief Engineer

DEPARTMENT OF PUBLIC WORKS

COUNTY OF HAWAII - 25 AUPUNI STREET - HILO, HAWAII 96720 - TELEPHONE (808) 961-8321

July 18, 1988

HONORABLE CHAIRMAN AND MEMBERS
HAWAII COUNTY COUNCIL
HAWAII COUNTY BUILDING
HILO HI 96720

SUBJECT: Chief Engineer's Report for Resolution No. 455-88 -- Proposed Connection of Kalani Street to F.A.P. Route 11, Queen Kaahumanu Highway in Kailua-Kona

We have conferred with the Hawaii District office of the State Department of Transportation who is responsible for Route 11, Queen Kaahumanu Highway. They said that this route is a controlled access road and as such connections are kept to an absolute minimum and are permitted only at predetermined places. There is no access permitted in the vicinity of the dead end of Kalani Street. For this reason, it would not be possible to make the proposed connection.

The street that will resolve the concerns raised in the resolution is Henry Street. There is a place reserved for its connection on Route 11 and its other end is on Kuakini Highway.

Henry Street will run on the south side of the extended Lanihau Shopping Center property. The developer is required to build it as conditions G and H of Ordinance No. 684 which became effective April 10, 1981.

APPROVED:

HUGH Y. ONO, P.E.
Chief Engineer

DANTE K. CARPENTER
Mayor

BCM:ctc

cc: Mr. Alvah Miyamoto, DOT-Hawaii District

Comm. No. 1727
File No. RDS/KH
Ref. To: PWC
JUL 25 1988

COUNTY OF HAWAII STATE OF HAWAII

RESOLUTION

WHEREAS, the Kalani Street and Kuakini Highway intersection leading into the Lono Kona Subdivision is beginning to realize an increasing amount of traffic flow; and

WHEREAS, the completion of the Church of Jesus Christ of Latter Day Saints Building and the present construction of the Salvation Army Center in the same area as the Lono Kona Subdivision will inevitably accelerate the traffic onto the Kalani/Kuakini intersection; and

WHEREAS, additional mauka to makai linkages between the Queen Kaahumanu Highway and Kuakini Highway are alternatives by which the traffic congestion could be eased; and

WHEREAS, although Kalani Street is not currently connected to the Queen Kaahumanu Highway, it does seem to qualify as a roadway which could possibly serve as another thoroughfare between the Queen Kaahumanu Highway and the Kuakini Highway.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE COUNTY OF HAWAII that it requests the Chief Engineer to investigate the possibility of extending Kalani Street to the Queen Kaahumanu Highway and that a report of his findings be submitted to the Council.

BE IT FURTHER RESOLVED that the Clerk of the County of Hawaii transmit a copy of this resolution to the Honorable Dante K. Carpenter, Mayor, and Mr. Hugh Ono, Chief Engineer.

Dated at Kona, Hawaii, this 1st day of June, 1988.

INTRODUCED BY:

[signature]
COUNCIL MEMBER, COUNTY OF HAWAII

COUNTY COUNCIL
County of Hawaii
Hilo, Hawaii

I hereby certify that the foregoing RESOLUTION was by the vote indicated to the right hereof adopted by the COUNCIL of the County of Hawaii on June 1, 1988.

ATTEST:

[signature]
COUNTY CLERK
LA/HAT

[signature]
CHAIRMAN & PRESIDING OFFICER

ROLL CALL VOTE

	AYES	NOES	ABS	EX
DAHLBERG	X			
DE LUZ	X			
DOMINGO	X			
~~HARRIS~~ GREENWELL	X			
JITCHAKU-INOUYE	X			
KOKUBUN	X			
LAI	X			
SCHUTTE	X			
YAMASHIRO	X			
	9	0	0	0

Reference PWC-252

RESOLUTION NO. 455 88