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DEPARTMENT OF TRANSPORTATION
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IN REPLY REFER TO:

HWY-DS
2.1875

OFFICE OF ENVIRONMENTAL
QUALITY CONTROL

May 14, 1990

Dr. Marvin T. Miura
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

Subject: Hawaii Belt Road Improvements,
Honaunau to Papa
Project No. 11BC-01-90

We are transmitting a completed OEQC form for Publication of
EIS Documents in the OEQC Bulletin, and six (6) copies of the
Environmental Assessment/Negative Declaration dated May 1990,
for your further processing.

Very truly yours,

A handwritten signature in dark ink, appearing to read "T. Harano".

T. HARANO
Chief
Highways Division

Enclosure

1990-05-23-HA-FA

FILE COPY

ENVIRONMENTAL ASSESSMENT

① HAWAII BELT ROAD
IMPROVEMENTS
PAPA TO HONAUNAU*

FOR THE
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STATE OF HAWAII

PREPARED BY
ENVIRONMENTAL COMMUNICATIONS, INC.
May 1990

ENVIRONMENTAL ASSESSMENT

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PAPA TO HONAUNAU**

FOR THE
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
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Appendix

- A Phase I Archaeological Survey of Three Realignment Areas, Hawaii Belt Road Improvements, Ke'ei to Papa, Ahupa'a of 'Alika, Opihiale 2, and Kukuiopa'e 2, South Kona, Island of Hawaii
- B Project Location Map
Site Location Plans

I. SUMMARY

CHAPTER 343, HRS
ENVIRONMENTAL ASSESSMENT (EA)

Action: Agency
Department of Transportation
Highways Division
State of Hawaii

Project Name: Hawaii Belt Road Improvements
Papa to Honaunau
Project No. 11BC-01-90

Project Description: The proposed project consists of 9 minor Hawaii Belt Road improvements. The subject plan calls for the straightening of 3 curved segments; the widening of a segment section; the addition of a walkways along two populated sections; the extension of an existing culvert and the addition of a new culvert at two separate segments; and new edge markings and the addition of reflectors along the entire project distance. The improvement will require the relocation of some electrical and water utilities.

Project Location: The proposed project improvements are located on the Hawaii Belt Road within the South Kona district of the island Hawaii, State of Hawaii. These improvements lie between Honaunau to the north and Papa to the south.

State Land Use Designation: Agriculture, Rural and Conservation
(MP 89.7, MP 91.7)

County Development Plan: AG - 5, RA .5, Unplanned

II. PROJECT DESCRIPTION AND STATEMENT OF OBJECTIVES

The proposed project consists of various improvements to the South Kona District section of the Hawaii Belt Road. The improvements are primarily safety related which will improve geometrics, visibility and road surface conditions.

The subject environmental assessment details all improvements proposed for the South Kona District section of the subject road. Unit 1, Project No. 11 BC-01-90 does not include Sites 1 (MP 89.7), 2 (MP 91.7), and 3 (MP 93.5), and 6 (MP 103.6). These site improvements will be included in another funding phase. A description of the individual improvements is provided in this section and are shown in Appendix B.

A. Project Location

The proposed project improvements are located on the Hawaii Belt Road within the South Kona district of the island Hawaii, State of Hawaii. These improvements lie between Honaunau to the north and Papa to the south. The road generally traverses the coastline with a few access roads leading to the shoreline. Captain Cook is the only heavily populated area along the subject alignment. The City of Refuge National Historical Park also lies along this section of the road with several lava flows located throughout the southern half.

B. Technical Characteristics

The following description details the proposed improvements at their respective mile points.

Site 1 (MP 89.7)

This segment involves the realignment of the existing highway to eliminate a curve which has recorded many accidents at its apex. This segment is approximately 600 feet in length. This realignment section will be appropriately signed and the 35 mph speed limit posting is expected to remain.

Site 2 (MP 91.7)

This segment will realign a curved segment of the highway to improve visibility and safety. A number of accidents have occurred at the apex of this curve; therefore, the highway will be realigned to straighten this segment of approximately 400 feet. This section will retain its present 35 mph speed limit.

Site 3 (MP 93.5)

This segment contains a curve where accidents frequently occur on both sides of the apex. This segment will be straightened over a length of 550 feet to improve the geometrics and visibility. The speed limit will be retained at 35 miles per hour.

Site 4 (MP 95.7)

This site improvement consists of shoulder widening over a distance of approximately 200 feet. The existing roadway in this section will be widened to 22 feet with 8-foot shoulders. Existing grades beyond the shoulders and 50-foot right-of-way will be finish graded with stabilized cuts at 3/4 to 1 slopes. The existing road will be widened with a 6-inch asphalt concrete base finished with a bituminous pavement. An existing electrical pole will be relocated out of the proposed shoulder area.

Site 5 (MP 103)

The improvements on site MP 103 consists of the construction of a new sidewalk on the mauka side of the highway for a distance of approximately 1.9 miles. This sidewalk, which will connect with a number of driveways, will be approximately 5 feet wide over most of the length of the project. A 12-inch wide new standard type 6 bituminous curb will line the roadside edge. The road widening and curb will be underlain with a 6-inch asphalt concrete base and topped with a 1-1/2 inch A. C. mix. The sidewalk will consist of 3-inch A.C. Mix V. A number of poles and signs will be relocated to accommodate the sidewalk.

Site 6 (MP 103.6)

This site improvement consist of a 10-foot culvert extension.

Site 7 (MP 106.0)

This site consist of the addition of a walkway on the mauka side of the highway. This sidewalk will be approximately 350 feet in length. The 5-foot wide A.C. sidewalk will be bordered on the roadside with type 6 bituminous curb, and on the right-of -way side, with a 3-foot wide, six-inch deep, drainage swale. The sidewalk and swale will be composed of 3-inch A. C. Mix V. The new pavement section beneath the curb will have a 1-1/2-inch A.C. Mix V over a 6-inch asphalt concrete base. The existing

grade will be cut and finished with a 3/4 to 1 slope to accommodate the new sidewalk and swale. Water laterals will be relocated below the new finished grades while the water meter boxes will remain in their existing locations. Existing telephone poles will be relocated.

Site 8 (MP 106.8)

This site improvement consists of the installation of a new drainage culvert beneath the Hawaii Belt Road at MP 106.8. This culvert will be comprised of an inlet structure at Invert level 1223.00, two 48-inch CMP pipes, and an outlet structure at Invert level 1210.00. The concrete inlet structure will be located approximately 13 feet higher than the outlet structure. Two 48-inch corrugated metal pipes will be located beneath the road and will terminate at a concrete outlet structure 26'-8" x 11' x 11' in dimension.

Site 9 (MP 89.0 to MP 107.0)

This improvement consist of new edge travel lane striping and the addition of Type CL reflective markers. The edge striping will follow the existing edge of the pavement for roads without paved shoulders, or will follow the existing edge of the travel lane for roads with paved shoulders. Four-inch white edge striping of Type II Tape or thermoplastic extrusion will be used throughout. The type CL reflective markers will be red-clear.

C. Social Characteristics

The proposed project is not expected to have any social characteristics other than providing a safer thoroughfare between the project termini. No increases in traffic are expected as a result of the road improvements.

D. Economic Characteristics

The proposed project improvements are expected to be completed in two phases at a cost of approximately 3 million dollars. This cost will be borne by the State of Hawaii.

E. Environmental Characteristics

The proposed improvements are not expected to have any significant impacts since these improvements will occur on an existing road. All improvements are minor in scale and will not involve any large amounts of grading nor will they have any significant impact on flora or fauna in the area. Temporary construction related impacts such as traffic disruption will be experienced however these are considered minor inconveniences which will not continue past the construction period.

III. AFFECTED ENVIRONMENT

A. Geographical Characteristics

1. Topography

The project improvements occur over a number of varying locations. All of the improvement sites involve existing sections of the Hawaii Belt Road. These improvements are located within an 18 mile distance over varying elevations.

2. Geology

The South Kona district geologically consist of igneous rock resulting from lava flows from Mauna Loa. A thin cover of ash covers most of the area. Base rock primarily consists of the tholeiitic basalts and alkalic basalts.

3. Soils

According to the Soil Survey of Island of Hawaii, State of Hawaii, December 1973, by the United States Department of Agriculture, Soil Conservation Service, the project improvements will occur primarily on rocky lands or lava. The following classifications are located throughout the South Kona district section along the subject alignment.

a. Lava Flows, Aa

Lava flows, Aa (rLV), have been mapped as a miscellaneous land type. This lava has practically no soil covering and is bare of vegetation, except for mosses, lichens, ferns, and a few small ohia trees. It is at an elevation ranging from near sea level to 13,000 feet and receives from 10 to 250 inches of rainfall annually. It is associated with pahoehoe lava flows and many soils.

This lava is rough and broken. It is a mass of clinkery, hard, glassy, sharp pieces piled in tumbled heaps. In areas of high rainfall, it contributes substantially to the underground water supply and is used for watershed.

b. Lava Flows, Pahoehoe

Lava flows, pahoehoe (rLW), has been mapped as a miscellaneous land type. This lava has a billowy, glassy surface that is relatively smooth. In some areas, however, the surface is rough and broken, and there are hummocks and pressure domes.

Pahoehoe lava has no soil covering and is typically bare of vegetation except for mosses and lichens. In the areas of higher rainfall, however, scattered ohia trees, ohelo berry, and aalii have gained a foothold in cracks and crevices.

This miscellaneous land type is at an elevation from sea level to 13,000 feet. The annual rainfall ranges from 10 inches to more than 140 inches.

Some flat slabs of pahoehoe lava are used as facings on buildings and fireplaces. In areas of higher rainfall, this lava contributes to the ground-water supply.

c. Kaimu Series

The Kaimu series consists of well-drained, thin organic soils over Aa lava. These are gently sloping to moderately steep soils on uplands at an elevation ranging from near sea level to 1,000 feet. They receive from 40 to 60 inches of rainfall annually, and their mean annual soil temperature is between 72 ° and 74 ° F. The natural vegetation consists of Christmas berry, guava, guineagrass, and lantana. These soils and Kaalualu, Kainaliu, Naalehu, Pakini, Punaluu, and Waiaha soils are in the same general area.

Kaimu soils are used for pasture, macadamia nuts, papaya, and citrus fruits.

Kaimu extremely stony peat, 6 to 20 percent slopes (rKED). This soil is at low elevations on Mauna Loa.

In a representative profile the surface layer is very dark brown extremely stony peat about 3 inches

thick. It is underlain by fragmental Aa lava. This soil is neutral in reaction.

Permeability is rapid, runoff is slow, and the erosion hazard is light.

This soil is not suitable for cultivation. Most of it is in native woodland. Small areas are used for pasture, macadamia nuts, papaya, and citrus fruits.

d. Puna Series

The Puna series consists of well-drained, thin, extremely stony organic soils over fragmental Aa lava. These soils are gently sloping to moderately steep. They are on uplands at an elevation ranging from 1,000 to 3,500 feet and receive from 60 to 90 inches of rainfall annually. Their mean annual soil temperature is 63 degree F. The natural vegetation consists of ohia, guava, Christmas berry, and alapaio fern. These soils and Kona, Malama, and Opihikao soils are in the same general area.

Puna soils are used for woodland, pasture, and orchards.

Puna extremely stony muck, 3 to 25 percent slopes (rPXE). This soil is at intermediate elevations on Mauna Loa and Hualalai.

In a representative profile the surface layer is very dark brown extremely stony muck about 5 inches thick. It is underlain by fragmental Aa lava. This soil is neutral in reaction.

Permeability is rapid, runoff is slow, and the erosion hazard is slight. Roots are matted in the surface layer, but some roots extend to a depth of 20 inches into the cracks in the lava.

This soil is used for woodland, pasture, and orchards.

e. Punaluu Series

The Punaluu series consists of well-drained, thin organic soils over pahoehoe lava bedrock. These soils are gently sloping to moderately steep. They are on uplands at an elevation ranging from near sea level to 1,000 feet and receive from 60 to 90 inches of rainfall annually. The mean annual soil temperature is between 72 ° and 74 ° F. The natural vegetation consists of koa haole, Christmas berry, guineagrass, natal redtop, and sand bur. These soils and Kaalualu, Kaimu, Kainaliu, Malama, Pakini, and Waiaha soils are in the same general area.

Punaluu soils are used for pasture.

Punaluu extremely rocky peat, 6 to 20 percent slopes (rPYD). This soil is low on the leeward side of Mauna Loa. Rock outcrops occupy 40 to 50 percent of the surface.

In a representative profile the surface layer is black peat about 4 inches thick. It is underlain by pahoehoe lava bedrock. This soil is medium acid.

The peat is rapidly permeable. The pahoehoe lava is very slowly permeable, although water moves rapidly through the cracks. Runoff is slow, and the erosion hazard is slight. Roots are matted over the pahoehoe lava.

This soil is used for pasture.

B. Hydrological Characteristics

1. Drainage

The project improvements primarily occur on the existing highway which are currently undrained. Most of the highway is located on undeveloped land and drains naturally to the adjacent roadsides which have only minor erodibility characteristics. Project areas which will involve sidewalk additions will also be constructed with swales to keep walk areas drained.

2. Groundwater

The entire South Kona district is principally underlain with basal water floating on salt water according to the Atlas of Hawaii Second Edition by the Department of Geography, University of Hawaii. No surface water features are located on the proposed project sites.

3 Flood Zone

The South Kona district is primarily identified as Zone X, an area determined to be outside of the 500-year flood plain according to the FIRM Flood Insurance Rate Map Panels 155166 1157C and 155166 1167C by the Federal Emergency Management Agency, September 1988. Two project improvement sites have however been designated as Zone AE, Special Flood Hazard Areas Inundated by 100 Year Floods whose base elevations have been determined and Zone X, other Flood Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year floods.

The two sites, MP 103.6 and MP 106.8, consist of a drainage culvert extension and a new drainage culvert respectively. Both of these improvements are intended to alleviate the flooding potential identified by the FIRM Maps.

4. Tsunami Inundation

The Civil Defense Tsunami Inundation Maps from the Hawaii Telephone Directory indicate that the subject portions of the Hawaii Belt Road are not located in areas which maybe subject to tsunami inundation.

5. SMA

The proposed action will not require any Special Management Area permit. The project does not involve any shoreline areas.

C. Biological Characteristics

The project area limited quantities of flora. A number of noxious weedy and shrub species are dispersed in adjacent roadside areas however no rare, threatened or endangered

species are located on the improvement sites. Typical flora in the improvement areas include: lantana, koa haole, klu, panini, ilima, natal redtop grass, guava, Spanish clover, Burmuda grass, Boston fern, Hilo grass, basket grass, false staghorn fern, kukui, and hala.

The presence of fauna is also scarce due to the limited quantities of flora. It is expected that no rare or endangered fauna habitats are located on the project sites.

D. Historic and Archaeological Resources

Bishop Museum conducted a Phase I archaeological survey (designated as Bishop Museum Project 435) between Ke'ei and Papa, in the South Kona district, Hawai'i Island. This survey was required because of planned improvements to the Hawaii Belt Road between Ke'ei and Papa, South Kona. These improvements will include realignment, widening, and installation of culverts, all activities that are potentially destructive to cultural features within the realignment corridor. An initial surface assessment of the three realignment areas was conducted by Jeffrey Pantaleo and Aki Sinoto in July 1989 and resulted in the identification of eight structural features, each of which was assessed as meeting Criterion D of the National Register Significance Criteria which states: "that the site has yielded or has the potential to yield information significant for our understanding of traditional culture, history, and prehistory of the region". Subsequent Phase I survey work was conducted between March 13 through March 16, 1990, by Jeffrey Pantaleo and E. Dow Davidson, Jr., both of the Public Archaeology Section, Applied Research Group, Bishop Museum. This Phase I work entailed detailed plan mapping of eight features and excavation of five subsurface test units. The complete report is attached as Appendix A.

A Phase I Survey, such as the current project, normally provides data to evaluate site significance and determine the appropriate final disposition of sites through detailed mapping and limited test excavations. In the sites studied, because of the lack of deposit, midden, or artifacts, the potential for new or unique data is absent. Since the significance of the sites have been realized, the archaeological procedures performed to date can be considered adequate data recovery. Thus, further intensive data recovery is not recommended. An archaeological monitor is recommended to be present during any construction related clearing and grading activities to ensure the protection of any sites located near impact areas and to examine potential

archaeological features that may be exposed during such ground altering activities.

E. Infrastructure

The proposed project will involve the relocation of a number of utility poles, mile markers and water laterals. Some project sites will include the addition of drainage culverts or culvert extensions. All of the proposed changes will result in improvements to the existing highway and infrastructure therefore no negative impacts other than temporary construction related impacts will result from the subject project.

F. Public Facilities and Services

No changes to or demand for public facilities or services will result from the proposed action.

IV. SUMMARY OF MAJOR IMPACTS AND MITIGATIVE MEASURES

The proposed project consists of improvements to the existing belt highway. These improvements will result in better highway safety, pedestrian safety and improved drainage control therefore the project is considered beneficial. These benefits will not occur at the expense of any significant adverse environmental impacts.

Project related impacts that will result from the proposed project are minor, temporary, and construction related. These minor impacts will include; minor grading, traffic disruption, noise increases, and water service disruption. These types of impacts are generally associated with all typical improvement projects of this nature and these temporary inconveniences will ultimately result in significant long term benefits.

These construction related impacts will be mitigated whenever possible. Grading sites will be monitored and standard erosion control measures will be utilized. A traffic control plan has been developed to address traffic disruption. The proposed improvements will be subject to all applicable State and County construction standards, codes and regulations.

V. ALTERNATIVES CONSIDERED

No alternatives other than the "no alternative" were considered. The "no alternative" choice was rejected because the proposed improvements are considered essential for safety reasons. No action would result in the continuation of hazardous conditions which are unacceptable.

VI. DETERMINATION, FINDINGS AND REASONS SUPPORTING DETERMINATION

After completing an assessment of the potential environmental effects of the proposed project and consulting with other governmental agencies, it has been determined that an Environmental Impact Statement (EIS) is not required. Therefore, this document constitutes a Notice of Negative Declaration.

Reasons supporting the Negative Declaration determination are as follows, using as the criteria, the policy, guideline and provisions of Chapters 342, 343 and 344, HRS.

1. The proposed action primarily consists of public safety improvements, repairs, easement and drainage improvements and will not adversely affect the physical and social environment.
2. There will be no permanent degradation of existing ambient air and noise levels. During construction operations, air quality, and noise levels and traffic disruptions are expected to be affected, but these will be temporary and minor.
3. No residences or businesses will be displaced by this project.
4. There are no know endangered species of animal or plants within the project limits.
5. There are no natural, historic or archaeological sites within the project limits.
6. Grading will be required however the proposed improvements will stabilize these areas and ultimately result in safer traveling lanes. Erosion during construction will be minimized by standard mitigation measures as required by State and County regulations.
7. There are no secondary adverse effects on future development, population and public facilities.

VII. LIST OF PREPARERS AND AGENCIES CONSULTED

Department of Transportation, Highways Division
Engineers Surveyors Hawaii, Inc.
Environmental Communications, Inc.

CORRECTION

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

VII. LIST OF PREPARERS AND AGENCIES CONSULTED

Department of Transportation, Highways Division
Engineers Surveyors Hawaii, Inc.
Environmental Communications, Inc.

Appendix A

MS. 051890

INTRODUCTION

Under contract to Engineers Surveyors Hawaii, Inc., Bishop Museum conducted a Phase I archaeological survey (designated as Bishop Museum Project 135) between Ke'ei and Papa, in the South Kona district, Hawai'i Island (Figure 1). This survey was required because of planned improvements to the Hawaii Belt Road between Ke'ei and Papa, South Kona. These improvements will include realignment, widening, and installation of culverts, all activities that are potentially destructive to cultural features within the realignment corridor. An initial surface assessment of the three realignment areas was conducted by Jeffrey Pantaleo and Aki Sinoto in July 1987 and resulted in the identification of eight structural features, each of which was assessed as meeting Criterion D of the National Register Significance Criteria which states: "that the site has yielded or has the potential to yield information significant for our understanding of traditional culture, history, and prehistory of the region". Subsequent Phase I survey work was conducted between March 12 through March 16, 1990, by Jeffrey Pantaleo and E. Dow Davidson, Jr., both of the Public Archaeology Section, Applied Research Group, Bishop Museum. This Phase I work entailed detailed plan mapping of eight features and excavation of five subsurface test units.

PHASE I ARCHAEOLOGICAL SURVEY OF THREE REALIGNMENT AREAS,
HAWAII BELT ROAD IMPROVEMENTS, KE'EI TO PAPA,
AHUPUA'A OF 'ALIIKA, OPIHIHALE 2, AND KUKUIOPA'E 2
SOUTH KONA, ISLAND OF HAWAII

by

E. Dow Davidson, Jr.
and
Jeffrey Pantaleo, M.A.

May 1990

for
Engineers Surveyors Hawaii, Inc.
1020 Auahi St.
Suite 1, Building 6
Honolulu, Hawai'i

ENVIRONMENTAL SETTING

The areas under investigation are located on the leeward slopes of the Mauna Loa volcano, ranging in distance from 1.6 to 3.3 km (1.0 to 2.0 miles) seaward of the coast. Elevations range from c. 370 m (1,220 ft) to 500 m (1,640 ft) a.s.l. (above mean sea level) placing the project area within the shrub and closed forest vegetation zone of the Kona Slope. Rainfall averages about 1,500 mm (60 in) per year, the majority falling during the summer months. Soils in this upland region are of the Kekake-Keel-Kiloo series which

PUBLIC ARCHAEOLOGY SECTION
Applied Research Group
Bishop Museum Honolulu, Hawai'i

are very shallow, gently sloping to steep, well drained organic soils over aa or pahoehoe lava. Project area vegetation at the three sites is distinct, however they can generally be characterized as shrub and closed forest being dominated by 'ohi'a lehua (*Metrosideros polymorpha*), tree fern (*Cibotium splendens* Kröning), koa (*Acacia koa*), guava (*Piscidia guajana*) and Christmas Berry (*Schinus terebinthifolius*) (Sato et al. 1973).

HISTORICAL BACKGROUND

Early natives of the South Kona District subsisted mainly on deep-sea fishing and a minimal variety of agricultural products until the introduction of new crops and industries during the latter half of the nineteenth century. Archaeological evidence suggests that pre- and post-contact coastal activities centered on fishing (Kirch 1985:161). Literary material suggests an attempt by residents to develop, as in North Kona, new agricultural crops and industries in South Kona during the later nineteenth century (Allen 1986; Indices of Land Commission Awards, Vol. 8).

Research to date, dictated by the lack of development and research, has been scant in the South Kona District. Archaeological research has been concentrated in pre-contact sites at Honanau and South Point, and overshadowed by the post-contact events of North Kona (Kirch 1985, Day and Kuykendall 1976). The reader is referred to Marion Kelly's "Gardens of Kona" (1983), and Dorothy Barrère's "Kona: Kai Mauno A'Ehu" (1986), for concise historical overviews of the two Kona districts.

Information gleaned from testimonies given to the Board of Commissioners to Quiet Land Titles occurred prior to the Great Hehele of 1848. The awardees owned their land fee simple. The testimonies contain references to possible early landowners, Kahinalua, referring to himself as occasionally happened in the testimonies, stated that "I received my 'ili land from Kahinalua, who is the konohiki of 'Alike" (Native Register Vol. 8:538). A konohiki theoretically received his land from the king and had tenants under him. Konohiki also referred to an agent appointed by a landlord to look after the land and to direct the tenants (Kuykendall 1938:284). An equivalent term for the latter position is haku'aina. Makoke, the awardee of land in Kukupoe,

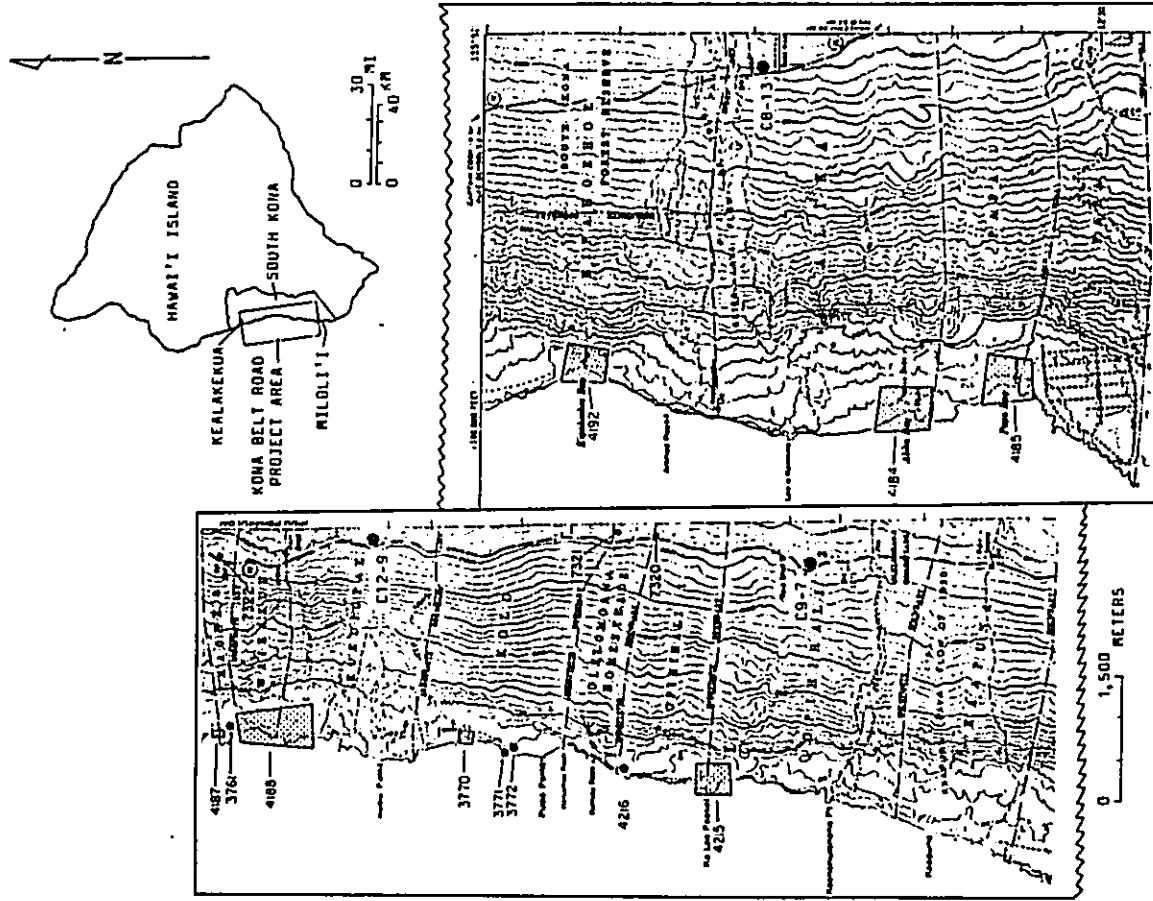


FIG. 1. PROJECT AREA LOCATION SHOWING ARCHAEOLOGICAL SITES.

specifically stated that "My Haku'aina is Kawaiki..." (Native Register Vol. 8:589).

The testimonies also provide early land use information. The awardee Kane stated that "Kukuiope ahupua'a: the kihapais are 3 mala of taro, 5 of sweet potatoes. He has 2 house lots" (Native Register Vol. 8:576). Two of the three awardees recorded in Kukuiope grew taro and sweet potatoe, and one, Haumea, grew one mala of coffee. The three awardees from 'Alika produced, with the exception of coffee, the same crops.

There was no information concerning Opihihale in the Indices of Land Commission Awards.

The remaining land in the ahupua'a was awarded to the government by Kamehameha III during the Great Hehele of 1848. 'Alika has Grant 3153; Opihihale has Grant 7597; and, Kukuiope's has Grant 1975.

Two parcels of land trace directly back to 1948. Included in the Royal Patent documents related to the 'Alika lands belonging to Kahinalua and Makia is a 1973 letter from James J. Deter, the program administrator of the Division of Land Management. The letter connects L.C.A. 8948 and L.C.A. 8950 with parcels 8 and 9 respectively. These parcels "...have a common boundary between them, which is a road. Apana 2 of L.C.A. 8948 has its West and Northwest boundary running along the 'Kai' - the effect is it runs along high-water mark" (Deter, original letter:1973). The road referred to may be the King's Highway, an old coastal route.

In 1883 Arthur C. Alexander took a surveying trip through South Kona for the purpose of selecting stations and setting signals. On the ninth day, after setting a signal at Honokua, "we pushed on and camped for the night in Opihihale on the edge of a large forest of 'ohia trees... All day long Friday, with the exception of one place where we left the road and went on foot down out of the forest on to the Aa, our view was cut off by a dense forest of tall 'ohia trees on each side of the road. It was so monotonous a ride as the horses stumbled along over the aa and through the 'ohia trees. It is worth mentioning that these trees always grow on the aa and in the rockiest

places. At last, about 3:30 P.M., we came out of this forest into an open place in the ahupua'a of 'Alika, where quite a little village has been built up out of the profits of the aa trade. We stopped here and watered our animals and had quite a little conversation with the old native, Makia, who owns 'Alika, and who in his own way is quite a character (BBPM Papers of Arthur C. Alexander)."

Kukuiope's ahupua'a, denoted by Tax Key 8-7-1, became forest land by Government Proclamation on May seventeenth, 1911, and was withdrawn from Federal Register by May 2, 1938.

The Land Use Series Map L-127 designates land use and land cover for the years 1976 through 1978 for Hawaii County, Hawaii. Kukuiope's, Opihihale, and 'Alika ahupua'a are largely forest land with little urban or built-up land. Site 50-Ha-C8-13 in 'Alika is near a small residential area adjacent to the highway as is Site 50-Ha-C12-9 in Kukuiope's. Site 50-Ha-C9-7 in Opihihale is quite isolated between forest land and mixed rangeland, both of which border on the lava flow of 1950.

Site 50-Ha-C8-13 in 'Alika ahupua'a is located on Parcel 7. Information taken from the deeds kept at the Board of Conveyances and the Tax Maps Branch History Sheets shows Dahlas Antoku and his wife Mieke, owned 492.5 acres of the parcel in 1980. The earliest taxpayer on record is Daniel H. Nathaniel who sold 165.40 acres to John Deniz, who deeded the property to his son Henry, in 1948. The property changed hands several times between individuals and corporations until 1966 when 'Alika Bay Land Corporation succeeded Victoria Corporation. 'Alika Bay Land Corporation increased the acreage, taking on the Antokus as part owners. The reader is referred to Tax Maps Branch History Sheets with Tax Key number 8-8-02-7 for specific details. The reader also is referred to Tax Maps Branch Sheet with Tax Key Number 8-7-10-12 for ownership information, which is extensive because of the long lists of owners and their various transactions, for the parcel in Kukuiope's.

Site 50-Ha-C9-7 in Opihikaha ahupua'a is located on Parcel 6 of which slightly more than 265 acres was left by Mr. D.L. Kellikuli in 1938 to his wife, five sons and Sarah Kekuanahu. The property remained in the Kellikuli family until 1981 when three-fourths of one acre were sold to Caroline Kodama, Catherine Tanaka, and Margaret Kawasoto.

More research would clarify the development of modern events of the South Kona District. Excerpts from Fukuaga's article printed in an appendix to Marion Kelly's "Gardens of Kona", provide a list of people who began plantations during the 1890's in South Kona. It would be enlightening to know where these plantations were located, what products they sent to which markets, who comprised the labor, and how these plantations affected contemporary and modern settlement patterns. This information may apply to the 'ohia and koo mills in Alika. A USCS 1928 quad map shows both mills, while the 1982 map shows only the 'ohia mill.

PREVIOUS ARCHAEOLOGICAL WORK

Due to the low rate of development activities in the subject portions of South Kona, archaeological studies have been limited. Most of the work has been concentrated along the coast, especially at Pu'uhonua O Hānaunau National Historic Park.

Several archaeological projects were conducted at 'Alika Bay about 1 mile downslope from the current project area. Kirch noted that although various sites, "including house platforms, heiau, lava tube shelters, burials and so on are frequently along the coast, little more than reconnaissance survey has been conducted in the region. At 'Alika Bay, north of the fishing village of Miloli'i, is a cluster of house platforms, a stone-lined well, a *hoiua* slide, and nearby, a particularly spacious rockshelter opening onto the front of a steep aa lava flow. This site, H10, was partially excavated by Soehren in 1965. A 14 meter long trench excavated across the length of the rockshelter, just inside the overhang, revealed a well-stratified deposit of five major layers, up to 80 centimeters deep. The excavations yielded 555 artifacts, most of them related to fishing activities, including a series of knobbed two-piece fishhook points" (Kirch 1985:161).

SCOPE OF WORK

The initial assessment that the remains appear to meet Criterion D of the National Register Significance Criteria requires that proper mitigation measures such as a program of progressively intensive data recovery or in-situ preservation be implemented. This current investigation is a Phase I Survey which included detailed locational and plan mapping of sites and features, with limited test excavations to permit assessments of extent, depth and chronology of subsurface components. The results of this phase will permit significance evaluations and determination of final site disposition.

Specifically the tasks included in the scope of work are as follows:

- Site 50-Ha-C8-13 (MP 89.66),
- record description of wall segment, and
 - map and record old road segment;

Site 50-Ha-C9-7 (MP 91.60).

- plan map and locate overhang shelters in relation to realignment corridor and test excavate if located within the impact area;

Site 50-Ha-C12-9 (MP 93.47).

- record description of portions of long walls that traverse the project area,
- plan map of L-shape feature, locate in relation to realignment corridor, and conduct test excavations if shown to be in impact area, and
- plan map and test excavations of enclosure to determine final disposition.

RESEARCH QUESTION

The focus of the present investigation is primarily to determine the archaeological and cultural significance of the specific sites that are slated for disturbance or destruction during the Hawaii Belt Road improvements. However, an important research question may be posed based on the geographic location of these sites in the South Kona district. The question is the relationship of the subject sites with the western Hawai'i agricultural

SURVEY AND EXCAVATION RESULTS

Site 50-HA-C8-13

This site is located on Highway 11 at the 89.66 mile location in the ahupua'a of Alike (Figure 2). Site 50-HA-C8-13 is situated at an approximate elevation of 500 m (1,640 ft) and about 3.3 km (2 miles) due east of the Alike ruins and *hoiua* slide on the ocean. The four features within the site are: 1) a long free-standing wall; 2) a historic road segment; 3) twelve rock mounds; and; 4) a wall segment.

The natural cover at this site is dominated by a canopy of Christmas Berry (*Schinus terebinthifolius*). Yellow ginger (*Hedyotis flavescens*), 'Ohi'a lehua (*Metrosideros polymorpha*), ti (*Cordia fruticosa*), guava (*Psidium guajava*) and eucalyptus are also present. The soil is designated as Punaluu extremely rocky peat (rPYD), 6 to 20 percent slopes and is characterized as being low on the leeward side of Mauna Loa with rock outcrops comprising 40 to 50 percent of the surface. A representative profile shows a black peat surface layer about 10 cm thick overlain by pahoehoe lava bedrock (Sato et al. 1973).

This site is down slope of Highway 11 and crosses a thickly vegetated gully. Feature 1 is a rock wall oriented north to south that ranges from 40 to 60 cm in width and 1.0 to 1.3 meters in height. The wall is 140 meters long and constructed of bilaterally faced stacked angular basalt, the average diameter of the construction materials ranges from 10 to 35 cm. The wall was found in good physical condition, not showing any physical alteration except where it has been terminated by the original Highway 11 construction activities at the far south end of the wall. No artifacts were observed in association with the wall.

Feature 2 is a road bed constructed of angular basalt that parallels the feature 1 wall and is separated from it by about 5 m. The construction materials range from 10 to 40 centimeters in diameter. The road is 3.4 m in width, 50 to 60 cm in height, and travels 140 m in a north-south orientation. The road has been built up forming a fairly level surface where it crosses at

complex, the Kona Field System (Newman 1970b:112-134), (Hawaii Register of Historic Places Site 10-37-6601). This extensive field system, as far as can be defined by aerial photography, is about 4.8 km by 29 km (3 miles by 18 miles) in size and extends from 10 km (6.2 miles) north of Kailua-Kona to the vicinity of Honauau in the south (Schilt 1984:2). Substantive mapping of the Kona Field System has been limited to the area immediately adjacent to Kealahou Bay, therefore a secure definition of the southern boundary of the System is still open to inquiry. Nevertheless, an examination of the soil associations located within the central area of the Kona Field System does show that those soils utilized for characteristic intensive dry land agriculture do not extend further south than Kauloua Point, which is still approximately 3.3 km (2 miles) north of the northernmost of the sites under study (Sato et al. 1973).

Methodology

Maps of the three sites including a total of eight features were drawn with compass and tape at a scale of 1 cm = 1 m, or 1 cm = 5 m. All measurements were taken using the metric system. Black and white and color photographs were taken of each site and assigned Bishop Museum negative numbers.

Test units were excavated by hand using trowel, pick, or shovel. Vertical control was by natural layer and arbitrary level. Soil descriptions have been based upon standard profiles (Sato et al. 1973) because of the paucity of soil; the matrix in most units consisting of either surface organic materials, or extremely high concentrations of gravel. Surface artifacts were collected and assigned BPPM artifact numbers. Excavated material was sifted through nested 1/4 and 1/8 inch mesh screen. Artifacts and sample material were retained. One charcoal sample was collected from Site 50-HA-C12-9, feature 1, for radiocarbon analysis by Beta Analytic Inc.

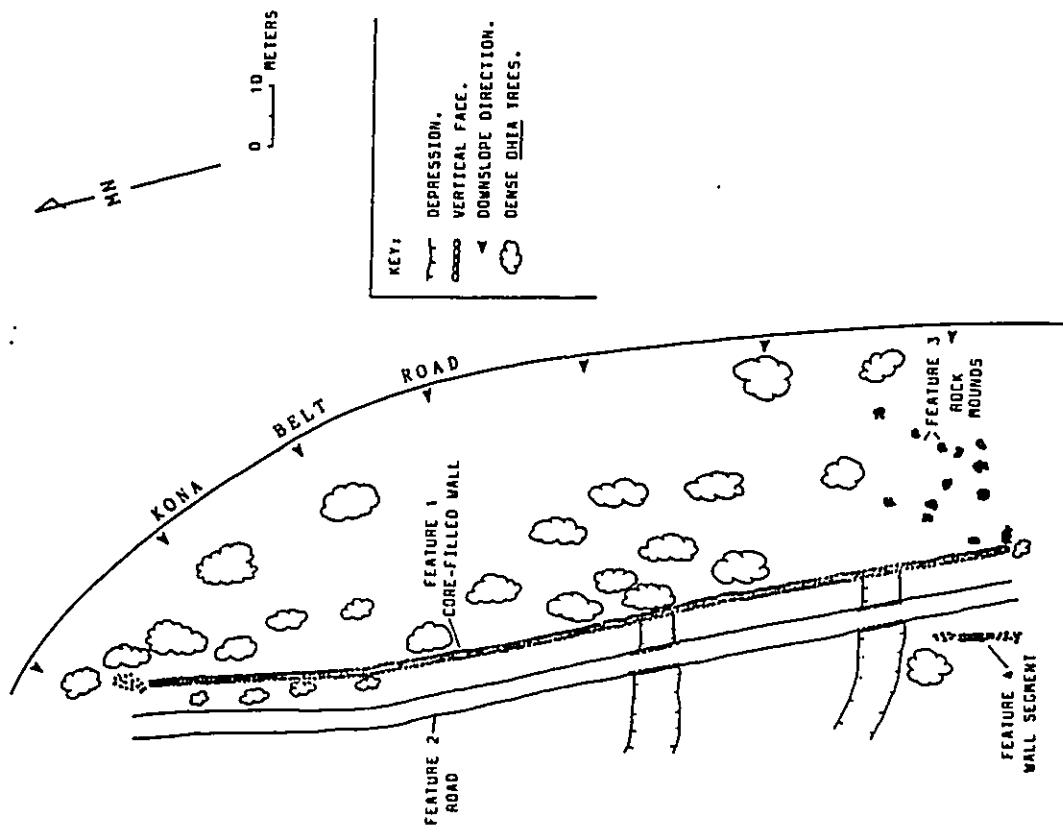


Fig. 2. PLAN VIEW OF SITE 50-Hb-C8-13. FEATURES 1-4.

least two 10 m wide gullies that evidently flood during heavy precipitation. The condition of the road is good, the only visible alteration being at the far south end, where like the associated wall (feature 1) it has been destroyed by the original construction of Highway 11. Two glass bottles were collected from the surface of the road bed. The first is a cylindrical, olive-green glass, beer bottle. This intact one quart bottle was manufactured using turn mold technology and exhibits a tapered collar lip. The second bottle is a cylindrical, amber glass, one quart capacity liquor bottle also manufactured by turn mold techniques. The manufacture date of both of these bottles can be placed in a range from 1887 to 1918 based upon the patent date and manufacturing life of the turn mold (Official Gazette 39:1268).

Feature 3 is a concentration of twelve rock mounds that were constructed by the piling up of angular basalt cobbles and boulders. The average dimensions of the rock mounds are 2.5 to 3.5 meters square and 50 to 80 cm in height. These irregularly shaped mounds are all located to the east of the feature 1 wall. The condition of the mounds is fair and appear to be unaltered. Two of the mounds were tested by removing the rocks across the center section down to the ground surface to determine the presence or absence of any cultural remains. The testing yielded no cultural material. The exposed soil was a dark brown to black peat, very fine granular structure; very friable; nonsticky; nonplastic; with abundant roots and rootlets.

Feature 4 is a wall segment located west of feature 2 road. It measures 14 m in length, 1 m in width, and 80 cm in height. The wall is bilaterally faced, free-standing, and in poor condition.

Discussion

It would seem reasonable that the wall and the road bed were constructed in the same general time period and were associated in usage. The two features are situated parallel to each other and this alignment is maintained even when the features make slight changes in orientation. A significant fact in the case of the rock mounds is their location exclusively on the east side of the wall. Presence of historic period artifacts at this site suggest that they are all historic period constructions. Additionally, the presence of a

road bed indicates the existence of a vehicle to travel the road, not a prehistoric activity. The bottles associated with the road also imply a historic time period, if we add a time lag factor of five to ten years for the arrival of the bottles to Hawai'i after their manufacture (Allen 1987:162) we are then presented with a date of 1892 to 1897 for their first use in the island. It then follows that even if these bottles were used and discarded as soon as they found their way to Hawai'i, the earliest they could have been disposed of upon the road would have been around 1892.

The construction of the rock mounds suggests agricultural use for planting sweet potato (Handy and Handy 1972:129-131), or clearance of surface rock before planting. The fact that the mounds are all on one side of the wall (east side, upslope) leads to the analysis of the wall as a land boundary or a cattle exclusion wall with plantings upslope.

Site 50-HA-C9-7

This site is located on Highway 11 at the 91.66 mile location in the *chupua'a* of Opihiali 2 (Figure 3). Site 50-HA-C9-7 is situated at an approximate elevation of 382 m (1,255 ft) and about 1.8 km (1.1 miles) east of Keananuihana Point. This site is a natural rockshelter formed by pahoehoe bedrock overhangs that have been modified by the construction of terraces. The overall site measures about 18 m and is 6 m east from Highway 11. The site is within the impact zone of the scheduled realignment work. The three features within the site are: 1) terraces; 2) smaller overhang shelter; and 3) larger overhang shelter. A complete plan map was made using compass and tape.

The vegetation at this site is predominantly *ōhi'a lehua* (*Metrosideros polymorpha*). *Ti* (*Cordyline fruticosa*), and various grasses are also present. The soil is designated as Kaimu extremely stony peat (rMED), 6 to 20 percent slopes and is characterized as being low on the leeward side of Mauna Loa. A representative profile shows a very dark brown extremely stony peat surface layer about 8 cm thick underlain by fragmental aa (Sato et al. 1973).

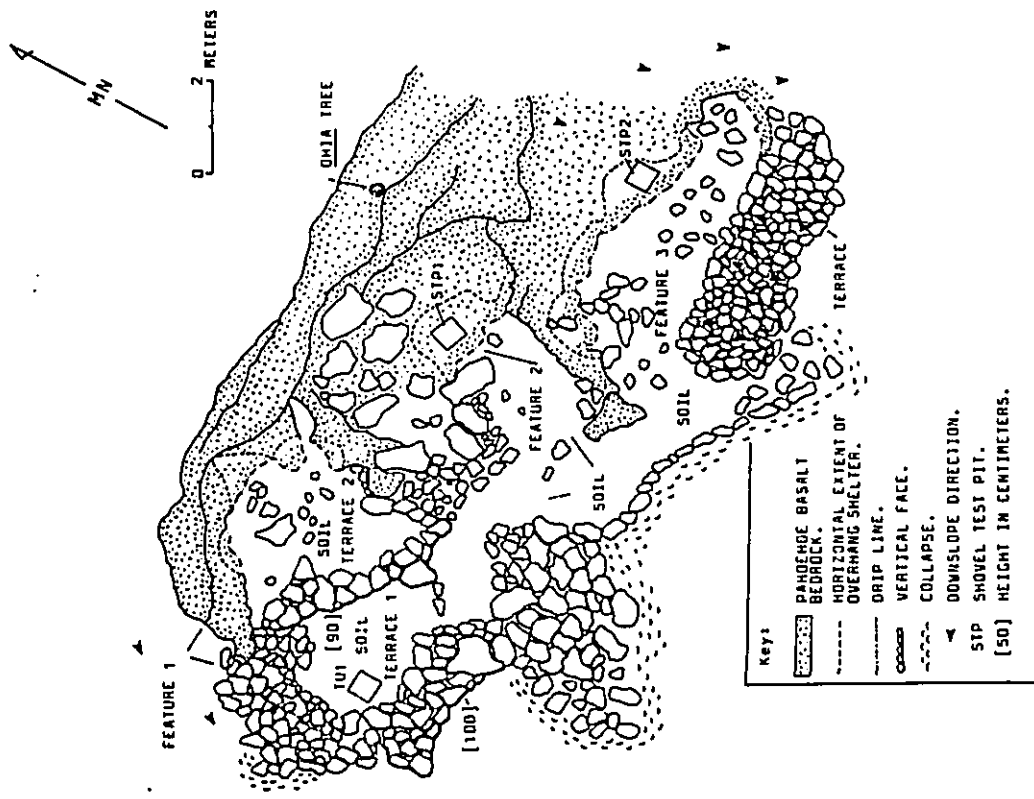
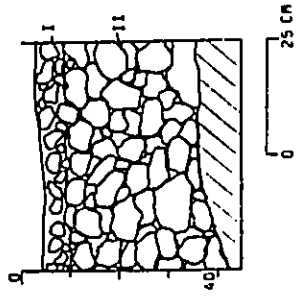


Fig. 3. PLAN VIEW OF SITE 50-HA-C9-7, FEATURES 1-3.

Feature 1 consists of a lower (number 1) and upper (number 2) terrace fronting a natural pahoehoe rock outcrop, forming a level soil area. Both terraces were constructed of stacked angular basalt cobbles and boulders. The long axis of the terraces is oriented northeast to southwest. Terrace 1 measures 3.5 m long by 2.9 m wide and its facing rises about 0.80 m from the ground surface. It appears that terrace 2, 3.3 m long by 3.2 m wide and 0.75 m high, may have originally exhibited more extensive facing but has since suffered some tumbling. However, the feature is in good condition and does not appear to have undergone significant alteration. The interior surface area of both terraces are overlain with thin rocky soil.

A .5 by .5 meter test excavation unit T01 was placed on the surface of terrace 1. Stratigraphic Layers I and II were present (Figure 4).

Layer	Thickness	Description
I/1	5-8 cm	Very dark brown gravelly, cobbly, silt loam with abundant roots and rootlets (0 horizon). The only cultural material found were two historic period metal fragments found 10 cm. below datum, 14 cm. from the N. line and 20 from the W. line. One of these has been identified as a square cut iron nail. No prehistoric cultural remains were evident.
II/1	10-13cm	Pahoehoe basalt (boulder to cobble) in very dark brown silt matrix. Silt infiltration weak, very fine, granular structure, very friable, nonsticky, and nonplastic; abundant roots, many fine pores; As fragments from gravel to stone make up 50 to 80 percent of the volume of this Layer. Excavation by level is difficult because of this abundance of stones. It appears that the terrace is rock filled. No cultural materials were present.



LAYER I VERY DARK BROWN, COBBLY, GRAVELLY, SILT LOAM; CONTAINS HISTORIC ARTIFACTS.
 LAYER II PAHOEHOE BASALT (BOULDER TO PEBBLE) IN VERY DARK BROWN, SILT MATRIX; CULTURALLY STERILE.
 UNEXCAVATED.

FIG. 4. PROFILE T01, NORTH FACE, SITE 50-Ha-C9-7, FE. 1.

11/2 15-16cm

Same soil characteristics as 11/1. After removing numerous rocks it was apparent that no cultural layer exists. Increasingly decomposed rock was encountered with depth indicating the parent layer. Bedrock was reached and the unit was terminated at an average depth below datum of 37 cm.

Feature 2 is a smaller overhang shelter to the east of feature 1 (Figure 5). It is a naturally occurring overhang formed into a pahoehoe outcrop and its long axis is oriented east to west. The drip line extends an average of 1 m from the back of the shelter wall, the height of the opening is about 90 cm, and the opening measures 2 m across.

Inspection of the rocky floor surface of the shelter revealed no artifacts or midden. A shovel test pit, STP1 was placed in the shelter to determine the presence or absence of cultural remains. No cultural deposition was discovered in STP1.

Feature 3, the larger overhang shelter, is located immediately to the east of feature 2. This naturally formed shelter measures 2.8 m across the entrance, 1.1 m in height, and 1.2 m in depth. It appears that there has been some amount of alteration through the partial collapse of the overhang. A roughly piled terrace, located 2 m to the south from the drip line, merges with the bedrock that forms the far eastern end of the shelter. The terrace is 4.2 m in length, 1.6 m in width, and 40 cm in height and constructed of angular basalt cobbles and boulders. There were no cultural materials, midden, or artifacts recorded on the surface. A shovel test pit STP2 was excavated in shelter floor with the same negative results as STP1.



Fig. 5. SITE 50-HA-007, FE. 2. BIRN Neg. No. HA(10)39-15.

Discussion

The absence of midden or any prehistoric period artifacts indicates a lack of food preparation activities at this site, thus suggesting that the terraces may have been constructed for temporary use.

The absence of subsurface remains limits the range of possible interpretations of this site. No indication of post holes that would have been necessary to hold up a roof was present. With no indication of a constructed roof, a careful look at the actual amount of "shelter" afforded by the bedrock overhang must be made. The maximum depth of the larger overhang (feature 3) is 1.2 m, and this into a floor surface that rises toward the back of the shelter very rapidly. There may be enough area to provide shelter for only one or two persons.

An alternative hypothesis for the use of the terraces could be agricultural. However, the high concentration of stones in the soil together with the modern classification of this Kaiau Extremely Stony Peat (XED) (Sato et al. 1973:23) as "not suitable for cultivation" would lead to the conclusion that cultivation of a crop was probably not the intent behind the building of these structures.

The presence of a ferrous square cut nail, 5 cm below the surface of TU1 may indicate that the terraces are historic in origin. Based upon manufacturing technique the nail has been dated to a range from 1830 to 1900.

In summary, it appears that no secure date can be attributed to site 50-HA-C9-7. The terraces exhibit cultural modification but no evidence of function. The only chronological evidence available is an iron nail, which would place feature 1, terrace 1 within the historic period. It is unknown whether the nail was deposited at the time of occupation or at a later introduction.

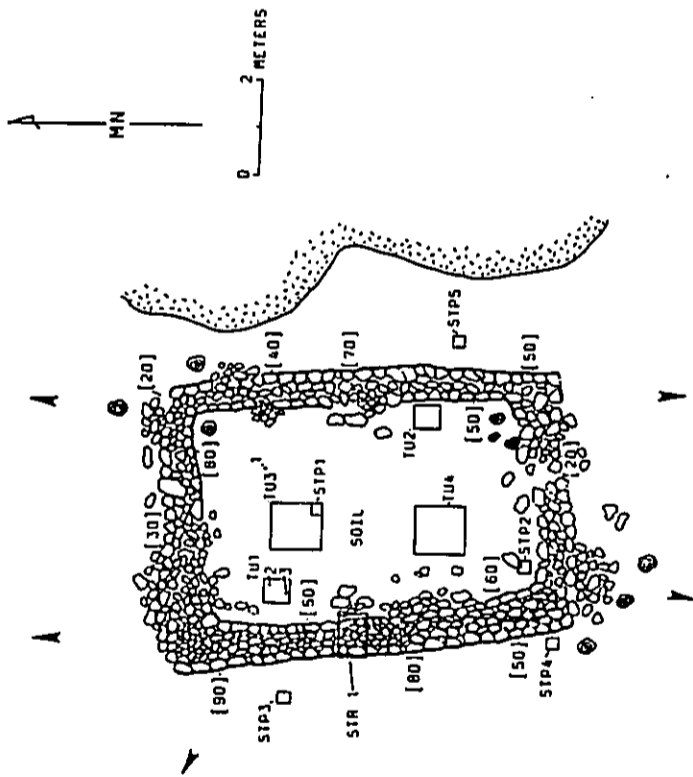
Site 50-HA-C12-9

This site is located in the *ohupua'a* of Kukuiope 2 on Highway 11 at the 93.47 mile location. Site 50-HA-C12-9 is situated at an approximate elevation of 372 m (1,220 ft) and about 1.6 km (1 mile) east of Anau Point. This site consists of two features both of which will be disturbed during road realignment work. The two features at this site are: 1) rectangular enclosure (Figure 6); and 2) L-shaped structure (Figure 7). A separate plan map was made of each feature using compass and tape. The Scope of Work included recording portions of the long walls that traverse the project area. However, since the current survey map plotted their location, a cursory check was completed and no attempt was made to collect additional data.

Flora at this site includes Christmas Berry (*Schinus terebinthifolius*), 'ohi'a lehua (*Metrosideros polymorpha*), ti (*Cordyline fruticosa*), guava (*Psidium guajava*), *Iau'e* (*Microsorium scolopendria*) and various types of grasses. The soil is designated as Punaluu extremely rocky peat (rPYD), 6 to 20 percent slopes and is characterized as being low on the leeward side of Mauna Loa with rock outcrops comprising 40 to 50 percent of the surface. A representative profile shows a black peat surface layer about 10 cm thick underlain by pahoehoe lava bedrock (Sato et al. 1973).

Feature 1 is a rectangular enclosure situated on a promontory of pahoehoe lava outcrop that runs east to west, mauka to makai. The enclosure walls are core filled, faced, and constructed of basalt cobbles and boulders. The enclosure measures 8.0 m long on the east and west sides, 5.8 m on the north side, and 5.7 m on the south side. The walls average 1.1 m in width and 80 to 90 cm in height. The interior dimensions of the enclosure are 6.4 by 3.9 m. Sections of the south wall are tumbled which may have been caused by tree roots; however, the structure is in good condition overall, and the majority of the walls are still intact.

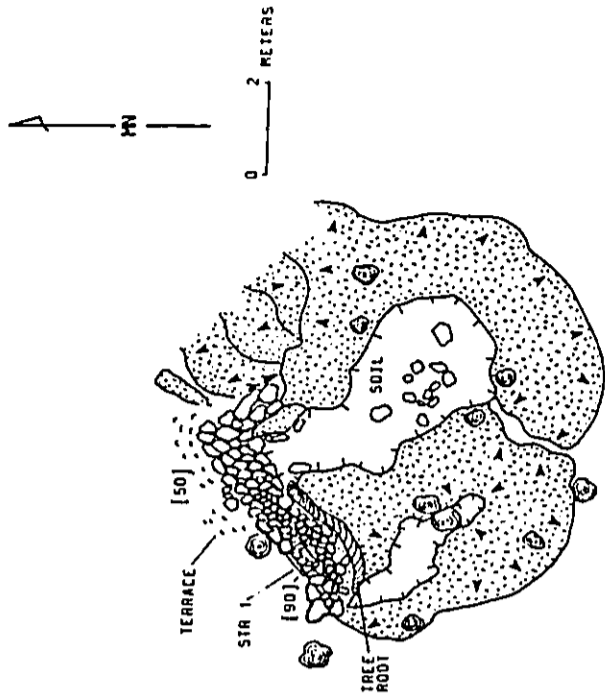
An iron kettle was collected from the surface in the south east quadrant of the enclosure. Although the base was missing it has been analyzed as a handled, squat, 4 footed cast-iron kettle. The shards of four bottle bases were also collected on the surface near the enclosure.



KEY:

- ▨ PANDEMOE BASALT BEDROCK.
- ▤ VERTICAL FACE.
- ▥ DOWNSLOPE DIRECTION.
- [25] HEIGHT IN CENTIMETERS.
- 1 METAL KETTLE.
- 2 BASALT MANUPORT.
- 3 PIPIDI SHELL.
- ⊙ OHIA TREE.
- STP SHOVEL TEST PIT.

Fig. 6. PLAN VIEW OF SITE 50-Ha-C12-9, FE. 1.



KEY:

- ▨ PANDEMOE BASALT BEDROCK.
- ▤ DEPRESSION.
- ▥ DOWNSLOPE DIRECTION.
- ▦ VERTICAL FACE.
- ▧ COLLAPSE.
- [50] HEIGHT IN CENTIMETERS.
- ⊙ OHIA TREE.
- ⊙ II PLANT.

Fig. 7. PLAN VIEW OF SITE 50-Ha-C12-9, FE. 2.

Four test units and two shovel test pits were excavated inside the enclosure. All test units were excavated by natural layers and the excavated soil was sifted through 1/4 and 1/8 inch mesh screens. One stratigraphic trench was placed through the west wall. Several shovel tests were also placed outside the enclosure. Layers I and II were present in these excavations. Test unit TU1 was a .5 m excavation located in the interior of the enclosure where surface cultural remains including a water-worn basalt manuport and several 'opihī shells (*Cellioma taicosa*) were collected. The surface consisted of loose basalt cobbles, decomposing twigs, leaves and abundant *laua'e* (*Microsorium scolopendria*).

TU1

<u>Layer</u> I/I	<u>Thickness</u> 4-8 cm	<u>Description</u> Very dark brown to black loam; weak, very fine, granular structure; very friable, nonsticky, nonplastic, and nonseamy; many roots and rootlets; many fine pores; abrupt wavy boundary. The roots are matted over the surface of the pahoehoe bedrock. The only cultural or midden material was an 'opihī shell (<i>Cellioma</i> spp.).
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Test unit TU2 was a .5 by .5 meter excavation in the interior of the enclosure abutted against the east wall. The purpose of this unit was to determine which layer the enclosure wall was constructed upon.

TU2

<u>Layer</u> I/I	<u>Thickness</u> 2-10 cm	<u>Description</u> Very dark brown to black loam; weak, very fine, granular structure; very friable, nonsticky, nonplastic, and nonseamy; many roots and rootlets; many fine pores; abrupt wavy boundary. The roots are matted over the surface of the pahoehoe bedrock. It appears that the wall was constructed directly on the pahoehoe bedrock.
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Shovel test pit STP1 was placed in the center of the enclosure. Metal fragments were surface collected; no prehistoric cultural material was found.

Test unit TU3, a 1 by 1 meter excavation, was an expansion of shovel test pit STP1. The purpose of this unit was to verify that the entire enclosure was underlain by pahoehoe lava flow bedrock at very shallow depths (4-10 cm.).

TU3

<u>Layer</u> I/I	<u>Thickness</u> 4-6 cm	<u>Description</u> Medium brown to black loam; weak, very fine, granular structure; very friable, nonsticky, nonplastic, and nonseamy; many roots and rootlets; many fine pores; abrupt wavy boundary. The roots are matted over the surface of the pahoehoe bedrock. A scatter of metal fragments were collected from the center of the unit centered around a concentration at 42 cm from the N. line, 60 cm. from the E. line, and 2 cm. below the surface. Over 250 gm. of metal fragments were collected, the majority from screening. No prehistoric cultural material or artifacts were recorded in the unit.
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Test unit TU4 was a 1 by 1 meter excavation in the southwest quadrant of the enclosure. The purpose of this unit was to continue verification that the entire enclosure was underlain by pahoehoe lava flow bedrock at very shallow depths (4-10 cm.).

TU4

<u>Layer</u> I/I	<u>Thickness</u> 5-10 cm	<u>Description</u> Very dark brown to black loam; weak, very fine, granular structure; very friable, nonsticky, nonplastic, and nonseamy; many roots and rootlets; many fine pores; abrupt wavy boundary. The roots are matted over
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the surface of the pahoehoe bedrock. A total of 26 gm. of charcoal was collected from this unit and assigned the number HRC 1012. A profile of the east wall of TU4 was drawn (Figure 8a).

Shovel test pit STP2 was placed in the southwest corner of the enclosure and the characteristics of all the previous units were exhibited. No prehistoric cultural material was found and the very shallow peat soil over pahoehoe bedrock was present.

A stratigraphic test trench, STR1 (Figure 8b) was cut across the west wall of the enclosure to determine which layer the enclosure was constructed on. A thin (1-2 cm.) layer of the "0" horizon soil was present on the surface of the pahoehoe, probably from infiltration under the wall. The enclosure was constructed directly on the pahoehoe bedrock. A large intact *opihiki* shell (*Ceillana talcosa*) was found in situ in the wall during excavation of STR1. Several *kakui* nuts (*Alcurites moluccana*) were also found at the base of the wall.

Shovel test pits STP3 through STP5 were placed outside the enclosure with the same results as the previous tests, shallow peat overlaying pahoehoe and no cultural materials present.

Discussion Feature 1

The rectangular enclosure was constructed directly upon a pahoehoe ridge. The low areas to the north and south probably flooded during heavy rains. The enclosure, therefore, provided a dry activity area.

The surface of the pahoehoe that was exposed during the excavations revealed abundant pahoehoe "ropes" or ridges (Figure 9). The presence of these impediments, and the absence of any paving materials strongly suggests that the enclosure was not used for human habitation because of the unfavorable condition of the floor.

One charcoal sample submitted for radiocarbon dating to Beta Analytic, Inc. resulted in a calibration of 130 +/- 50 b.p. (a.d. 1770-1870).

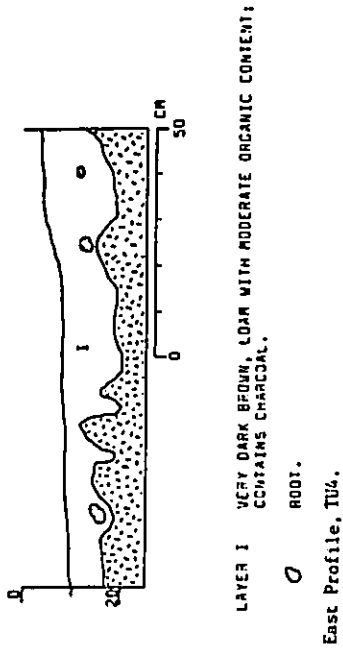


Fig. 8a. PROFILE OF TU4, EAST FACE, SITE 50-Ha-C12-9, FE. 1.

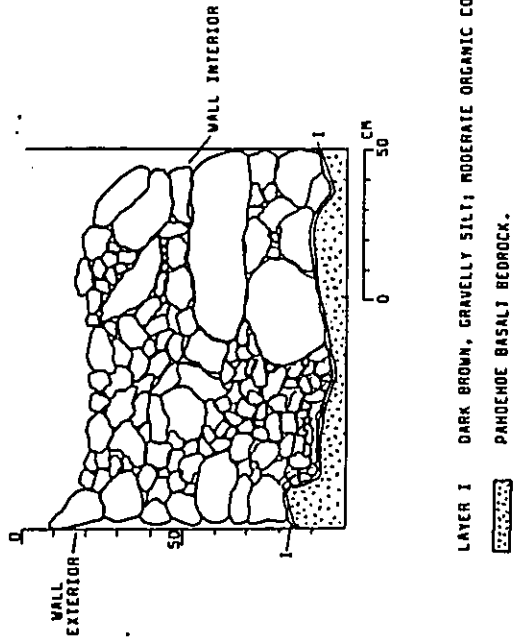


Fig. 8b. PROFILE OF STR1, NORTH FACE, SITE 50-Ha-C12-9, FE. 1.

Numerous historic age artifacts were collected at the enclosure. The bottle shards have been analyzed as being cold blown technology, thus dating from 1810 to 1870 (Munsey 1970:48, Scoville 1948:17). The abundant fragments of iron from TU3 have been identified as three types of cans, a lid, and assorted sheet metal. The date of manufacture of these items range from 1878 to the present (Hittell 1882:431, Official Gazette 1879:37).

The minimal amounts of cultural materials that are traditionally associated with prehistoric Hawaiian habitation compared with an abundance of datable historic period artifacts and a post-contact radiocarbon date suggest that the enclosure is a historic period construction most likely used for holding animals that could be penned in with a wall that was only 70 or 80 centimeters high and would not have been detrimentally affected by the rough floor. An animal that meets these criteria is the domestic swine. Therefore it seems reasonable that the enclosure was constructed to hold swine sometime post 1800.

Feature 2 is a L-shaped wall-alignment constructed across a natural ditch running east to west formed by an outcrop of pahoehoe lava. The wall segment is stacked and faced at the deepest part of the ditch, the remainder of the alignment was constructed using piled angular basalt cobbles and boulders. The structure measures 5.35 m in length, 2.60 m in width, and the wall averages 65 cm in height. The long axis of the wall is oriented northeast to southwest. There was an absence of surface artifacts or midden, and no post holes were observed. One stratigraphic test trench STR1 was placed into the faced section of the wall, indicating that the wall was built directly upon the pahoehoe bedrock.

Discussion Feature 2

The lack of any material or structural evidence suggests this alignment was not habitation related. The fact that a small ditch feeds directly into the basin that is formed by this feature leads to the conclusion that this was constructed as a water catchment or diversion. The wall/alignment would have functioned as a dam forming a pool in the natural basin.



Fig. 9. BASE OF EXCAVATION, TU3. BPEM Reg. No. Ha(a)639-35.

Historic Charcoal Kiln

A historic charcoal kiln was located along Highway 11 at the 99 mile location. This site is situated approximately 1 mile inland at an elevation of 1,100 feet. It is built into a talus slope, level with the height of the kiln.

This site is circular in shape, constructed of core-filled walls approximately 2.65 m in height and braced with mortar. Exterior dimension is 5.30 m in diameter, and interior dimension measures 4.40 m in diameter. A cement ceiling once existed but is now collapsed into the structure. A cement floor was evident under the rubble. A chimney was located at the east end of the kiln extending from the base of the interior wall to the top. A metal pipe was located at the southern top of the kiln which extended down into the base of the kiln. A doorway was located at the west end of the kiln which measured 1.5 by 0.7 m. No artifacts were seen on the surface.

Due to the circular shape of this structure, chimneys, and material used, this site is interpreted as a historic charcoal oven or kiln.

Artifacts

Artifacts recovered from Project 435 include a kettle, two whole bottles, glass sherds, and metal fragments.

One whole bottle, Artifact No. 435-1, is an olive-green colored, cylindrical, quart-sized beer bottle with a tapered collar lip. This bottle is 24.0 mm in height. The lip measures 2.8 mm in diameter; the shoulder measures 8.2 mm in diameter; and, the base is 5.9 mm in diameter. A second whole bottle, Artifact No. 435-2, is an amber colored, cylindrical, quart-sized, nearly intact liquor bottle with tapered collar lip. Approximately half of the lip is missing. This bottle is 24.5 mm in height. The lip measures 2.7 mm in diameter and the base measures 5.9 mm in diameter. Both bottles came from a turn mold and date between 1887 to 1918. The turn mold was patented by William F. Nokes of Stretator Bottle and Glass Works (Stretator, Illinois 1887). The patent number is 364,840. The turn mold was registered

in the U.S. Patent Office on June 14, 1887 (Official Gazette 39:1268). The end date given is the prohibition date.

A ferrous, square cut nail, Artifact No. 435-3, dates between 1830 and 1900. The nail is 3.6 mm long, 1.4 mm wide, and weighs 5.0 g. Square nails were manufactured in 1830 with a transition period beginning in 1790. Wire nails were introduced in the 1890's (Nelson ND:4,9).

The kettle, Artifact No. 435-4, was found on the surface. It is ferrous and square in shape with two small handles. It is 17.4 mm in height. The diameter at the rim is 23.7 mm. At the widest part of the kettle, the diameter is 25.7 mm. It has two of its original four feet. There is a large hole in the base. The kettle is cast iron approximately 0.44 mm thick.

Three olive green black glass sherds, Artifact No. 435-5 Lot-1, from a spirits bottle are cylindrical in shape and have an improved pontil. The total weight of the sherds is 185.3g. The diameter of the base measures 9.2 mm. The thickness of the glass ranges from 2.2 mm to 2.8 mm. They were mold blown which dates them between 1832 and 1860. The improved pontil is first noted in 1832 (McKearin 1970:89). Pontils no longer appeared after 1860 (Munsey 1970:48).

Two olive-amber black glass spirits bottle sherds, Artifact No. 435-2, are cylindrical in shape and mold blown. The total weight is 42.2 g. One sherd is L-shaped and is from the base. It measures 4.6 mm in height, 5.5 mm in length, and 2.6 mm in width. The second fragment has a long flat edge which measures 2.6 mm in length and 0.8 mm in thickness. The other edge curves outward in a circular fashion and measures 2.3 mm at the widest point. They date between 1810 and 1870. Bottle molds were introduced in 1810 (Munsey 1870:39). Chilled iron molds were introduced between 1865 and 1866 (Scoville 1948:17).

Eight metal fragments, Artifact No. 435 Lot-3, came from either a square or rectangular shaped can. The total weight amounts to 15.7 g. The sizes vary from 1.1 mm to 4.4 mm in length and 0.4 mm to 2.9 mm in width. The thickness of the metal remained somewhat constant at 0.1 mm. Seven of the

fragments are from the rim of the can. The technology used to make the can is "crimped". The can dates from 1880 to present. The crimping machine was patented by John West of Westport, Oregon in 1880 (Hittell 1882:433).

One metal fragment from the rolled rim of a cylindrical can was retained. An in situ piece, it is 2.2 mm long, 0.4 mm to 0.9 mm wide, and 0.5 mm thick. It weighs 0.9 g. It dates from 1878 to present. The rolled rim cans were patented by Robert Porter in Philadelphia on July 2, 1878 (Official Gazette p. 37).

The discarded undiagnostic material included a glass sherd, metal fragments, and a manuport. The glass sherd was olive-green and possibly from a freeblown piece. 430 metal fragments, 238.9 g in weight, were discarded. Of these, six ferrous fragments were from the corner/rim base or shoulder of a square or rectangular cylinder of unknown function. Two fragments were ferrous colored sheet metal, one from the lid of a square or rectangular piece, and the other from a cylindrical can. The remainder were ferrous colored sheetmetal fragments of mixed sizes and shapes from pieces of unknown function. The grey stone manuport weighed 342.6 g.

DISCUSSION

The predominance of historic artifacts place Sites 50-Ha-C8-13 and 50-Ha-C12-9, feature 1 in the post-contact era. The lack of historic or prehistoric associations at Site 50-Ha-C12-9, feature 2 and Site 50-Ha-C9-7 will not allow for accurate assignment to either periods.

The research question posed in this report cannot be properly addressed due to the rather late historical origins and the paucity of other data of these sites. Regional archaeological studies of the Kona field system were undertaken in Kealakekua *ohupua'a* at the Bishop Museum's Aay B. H. Greenwell Ethnobotanical garden. Dates from this investigation suggest that the Kona Field System was under intensive use in the seventeenth and eighteenth centuries (Kirch 1985:230). This date range is still significantly earlier than the historic period artifacts recovered during the current project that range from the mid to late 1800s.

However, the important question that still remains to be addressed concerns the determination of the southern extent of the Kona Field System.

RECOMMENDATIONS

A Phase I Survey, such as the current project, normally provides data to evaluate site significance and determine the appropriate final disposition of sites through detailed mapping and limited test excavations. In the sites studied, because of the lack of deposit, midden, or artifacts, the potential for new or unique data is absent. Since the significance of the sites have been realized, the archaeological procedures performed to date can be considered adequate data recovery. Thus, further intensive data recovery is not recommended. An archaeological monitor is recommended to be present during any construction related clearing and grading activities to ensure the protection of any sites located near impact areas and to examine potential archaeological features that may be exposed during such ground altering activities.

ARCHAEOLOGICAL SITE SUMMARY

Site and Feature BPRM	State	Feature	Description	Condition	Recommendations
50-Ha-C8-13	50-10-56-5334				
Feature 1		Wall		Good	No Further Work
Feature 2		Road Segment		Good	No Further Work
Feature 3		Rock Mounds		Fair	No Further Work
Feature 4		Wall		Poor	No Further Work
50-Ha-C9-7	50-10-56-5335				
Feature 1		Terraces		Good	No Further Work
Feature 2		Overhang		Good	No Further Work
Feature 3		Overhang		Fair	No Further Work
50-Ha-C12-9	50-10-56-5336				
Feature 1		Rectangular Enclosure		Good	No Further Work
Feature 2		L-shaped Structure		Fair	No Further Work

REFERENCES

- Alexander, Arthur C.
1959
"Through South Kona with a Donkey Train". BPHM, Ms. Group 208, Acc. 1959.84 folder II.
- Allen, Jane
1987
Five Upland 'Ili: Archaeological and Historical Investigations in the Kaneohe Interchange, Interstate Highway H-3, Island of O'ahu. Departmental Report Series 87-1. Honolulu: Dept. Anthropology, Bernice P. Bishop Mus.
- Barrère, Dorothy
1986
"Kona: Kai Mauna A'Ehu". Ms. Anthropology Department Report 101586.
- Clark, Stephen D.
1983
"Archaeological Reconnaissance Survey in Kealakakua Ahupua'a, South Kona, Island of Hawai'i." Ms. in Dept. Anthropology, B. P. Bishop Mus.
- Detor, James
1973
Letter of July 5, 1973 to Mr. Theodore L. Pica. Hawaii State Archives, Original Papers: R.P. 6588.
- Handy, E. S. Craighill,
1972
and Elizabeth Green Handy, with Mary Kawena Pukui, Native Planters in Old Hawaii - Their Life Lore, and Environment. Bernice P. Bishop Mus. Bull. 233. Honolulu: Bishop Mus. Press.
- Hittell, J.
1882
"The Commerce and Industries of the Pacific Coast." San Francisco: A.L. Bancroft and Co.
- Hosson, Robert J.
1969
"An Intensive Survey of the Northern Portion of Kaawaloa Kona, Hawaii." Ms. in Dept. Anthropology, B. P. Bishop Mus.
- Indices of Land Commission Awards
1929
Indices of Awards Made by the Board of Commissioners to Quiet Land Titles in the Hawaiian Islands. Honolulu: Territory of Hawaii.
- Kelly, Marion
1983
"Ma wale A Kona: Gardens of Kona." Honolulu: Department of Anthropology, BPHM
- Kirch, Patrick Vinton
1985
Feathered Gods and Fishhooks. Honolulu: Univ. Hawaii Press.
- Kuykendall, Ralph
1938
"The Hawaiian Kingdom, 1778-1854." Honolulu: The University of Hawaii Press
- Ladd, Edmund J.
1969
"A Preliminary Archaeological Survey of the North Shore of Honaunau Bay, South Kona, Hawaii." Ms. in Dept. Anthropology, B. P. Bishop Mus.
- Munsey, C.
1970
"The Illustrated Guide to Collecting Bottles." New York: Hawthorne Books
- Native Register
Native Register of Claims Presented to the Board of Commissioners to Quiet Land Titles, Vol. 8.
- Newman, T. Stell
1970b
"Hawaiian Fishing and Farming on the Island of Hawaii in A.D. 1778." Div. State Parks. DLNR, Honolulu.
- Sato, Harry, W. Ikeda, R. Paeth, R. Saythe, and M. Takehiro
1973
Soil Survey of the Island of Hawaii. State of Hawaii. U.S. Department of Agriculture, Soil Conservation Service, and Univ. Hawaii Agricultural Experiment Station.
- Schilt, A. Rose
1984
Subsistence and Conflict in Kona, Hawai'i. Departmental Report Series 84-1. Honolulu: Dept. Anthropology, Bernice P. Bishop Mus.
- Scoville, W.
1948
"Revolution in Glassmaking." Arno Press, N.Y.
- Soehren, Lloyd J.
1968
"An Evaluation of the Archaeological Features Between Honaunau and Kaawaloa, South Kona, Hawaii." Ms. in Dept. Anthropology, B. P. Bishop Mus.
- U.S. Patent Office
1879
Official Gazette: Washington: U.S. Government Printing Office.

Appendix B

STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
HONOLULU, HAWAII

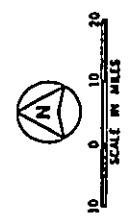
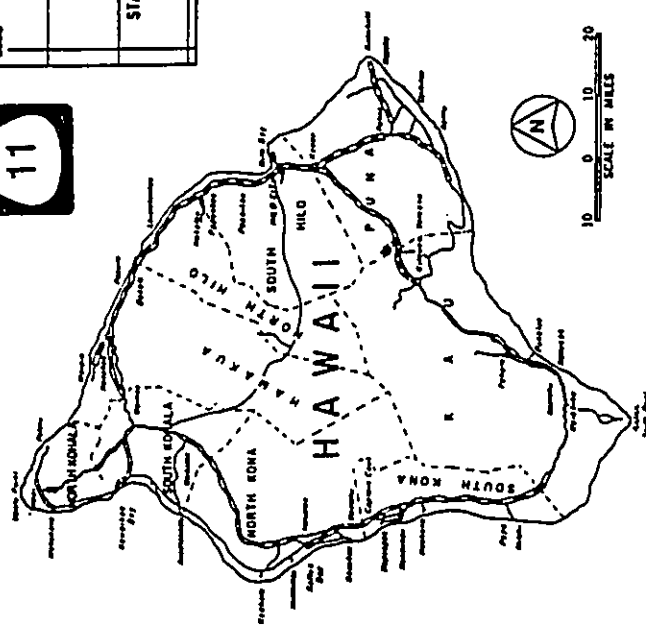
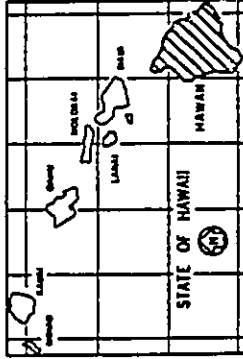
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HAWAII BELT ROAD IMPROVEMENTS

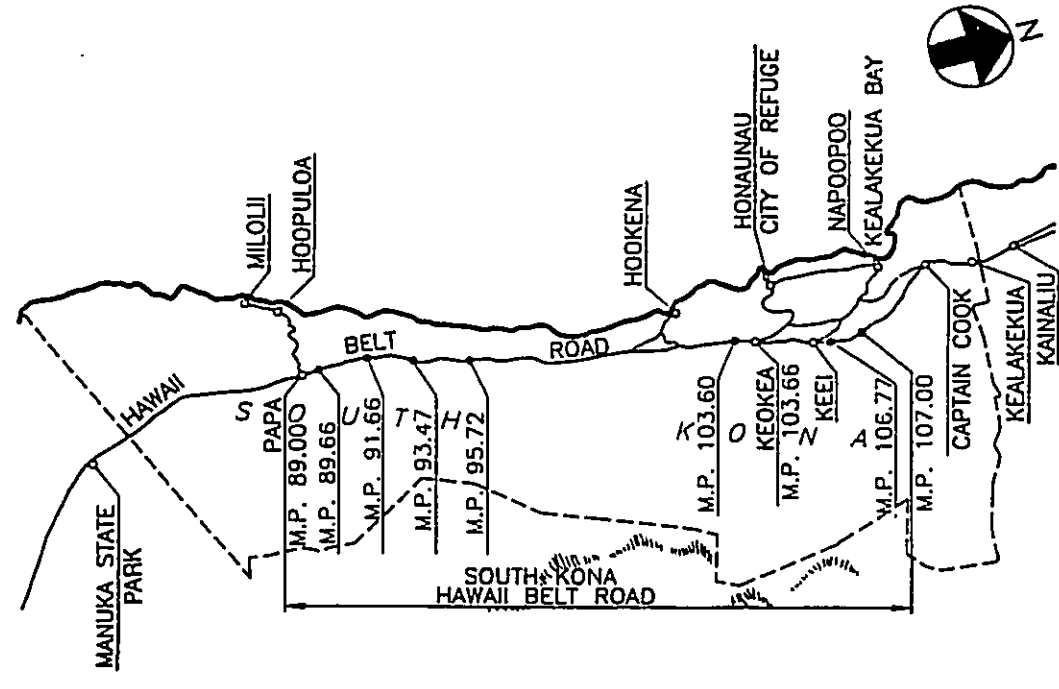
FROM PAPA TO HONAUNAU

UNIT 1

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AT SOUTH KONA, ISLAND OF HAWAII

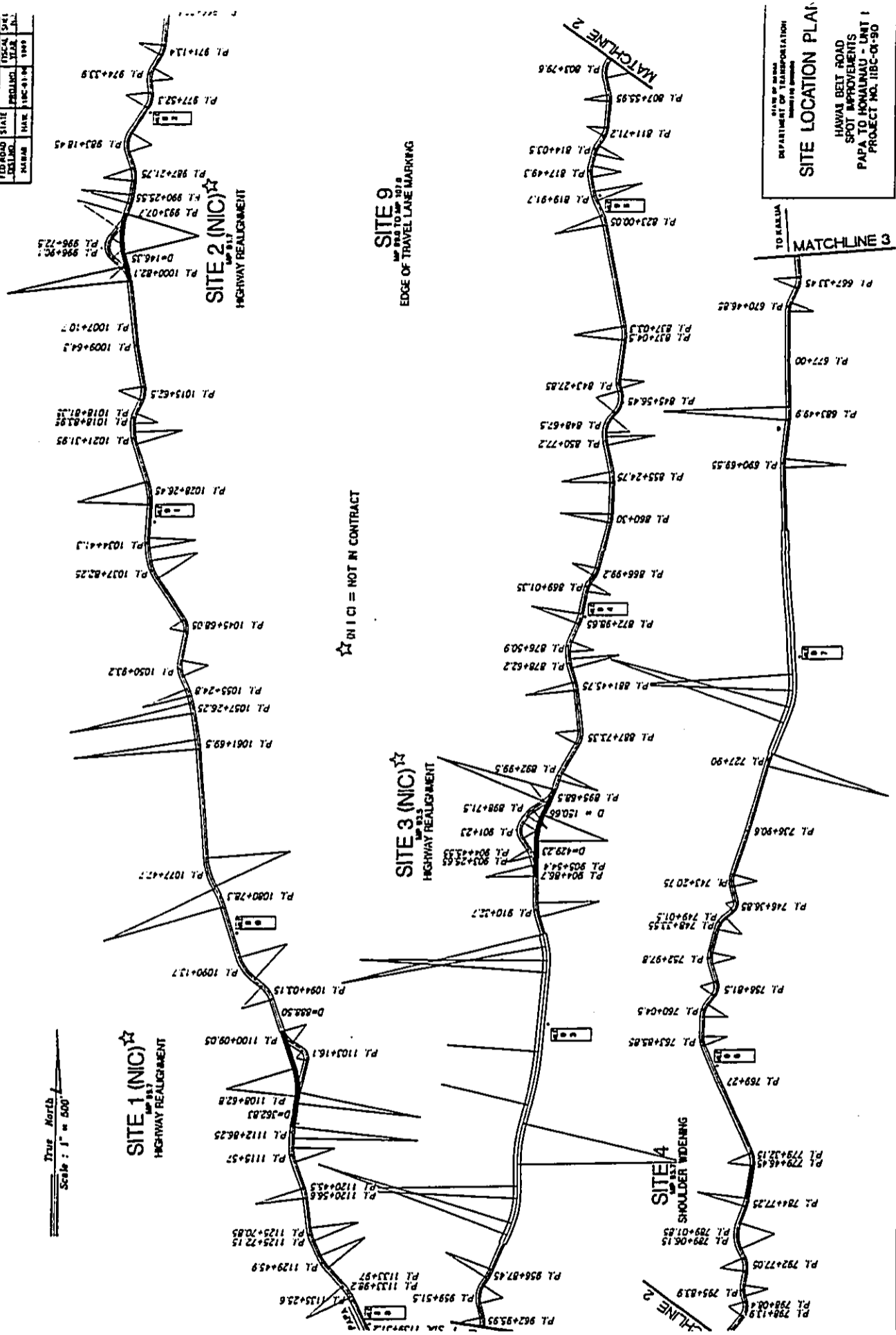


FEDERAL AID PROJECTS PREVIOUSLY CONSTRUCTED
OR UNDER CONSTRUCTION



LOCATION MAP
Not To Scale

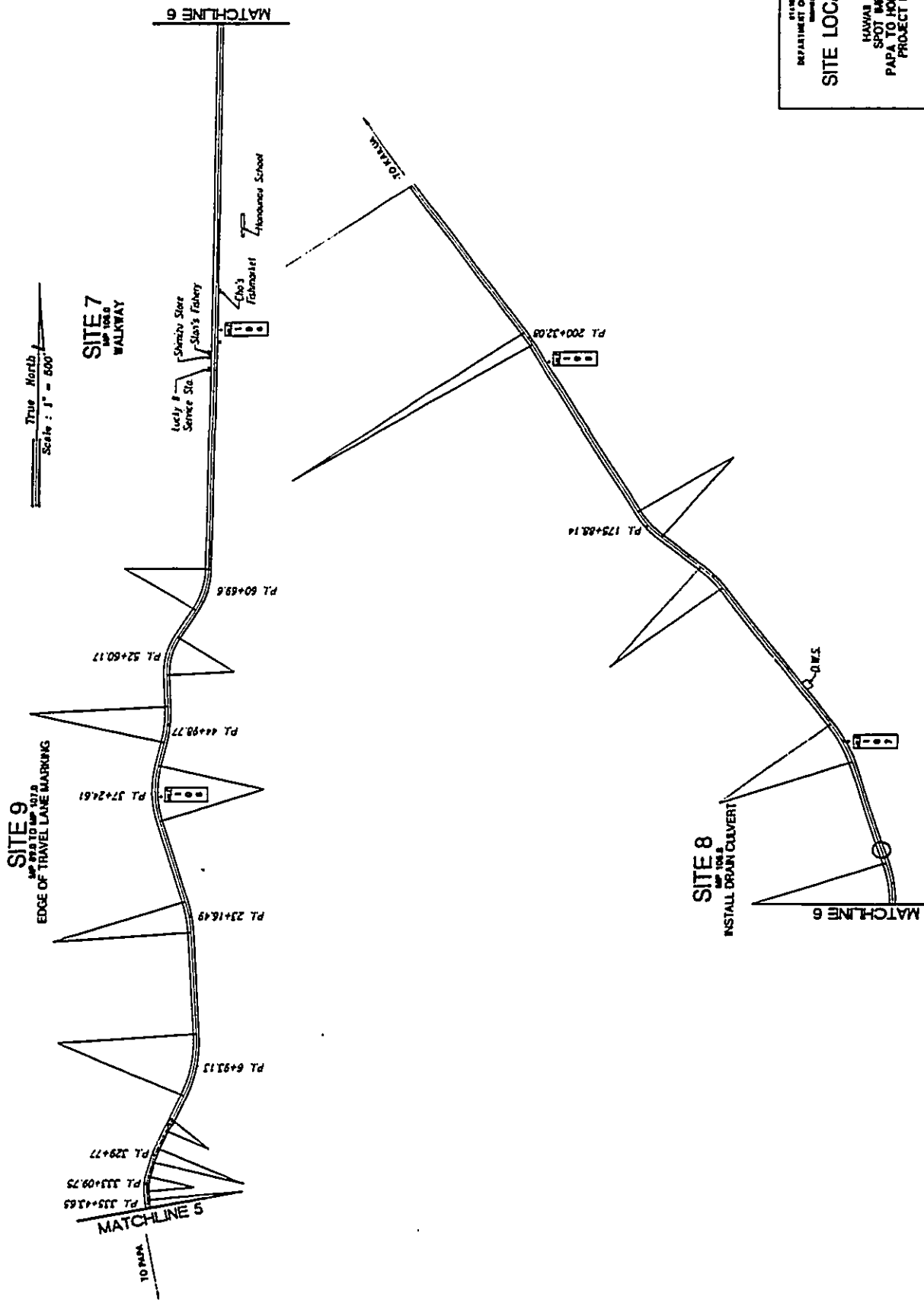
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True North
Scale: 1" = 500'

SITE LOCATION PLAN
HAWAII BELT ROAD
SPOT IMPROVEMENTS
PAPA TO HONOLULU - UNIT 1
PROJECT NO. 118C-01-90

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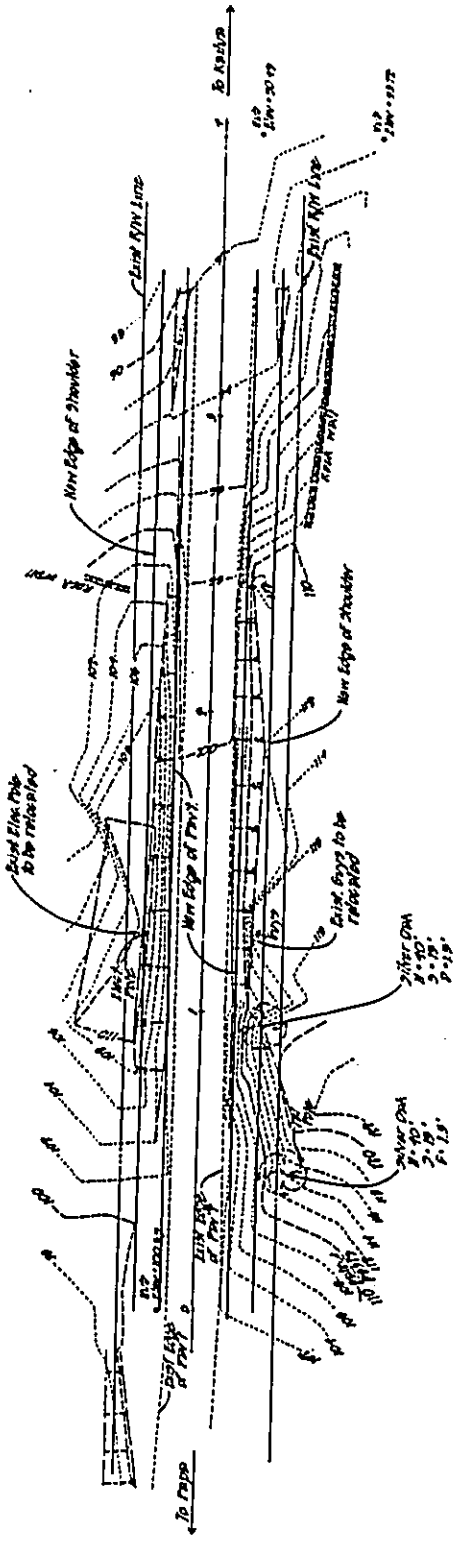
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 DEPARTMENT OF TRANSPORTATION
SITE LOCATION PLAN
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 SPOT IMPROVEMENTS
 PAPA'IU HONAUWAI PART I
 PROJECT NO. 118C-01-90

SHEET NO. OF SHEETS

6

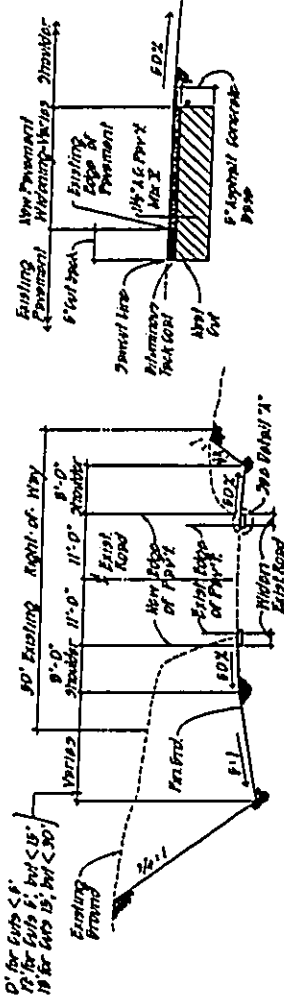
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True North
Scale: 1" = 30'



STATE OF MAINE
DEPARTMENT OF TRANSPORTATION
CONSTRUCTION DIVISION
SITE 4
SHOULDER WIDENING
HAYAN BELT ROAD
SECTION 10
PAPER NO. 118C-Q-90-1
PROJECT NO. 118C-Q-90

SHEET NO. OF SHEETS
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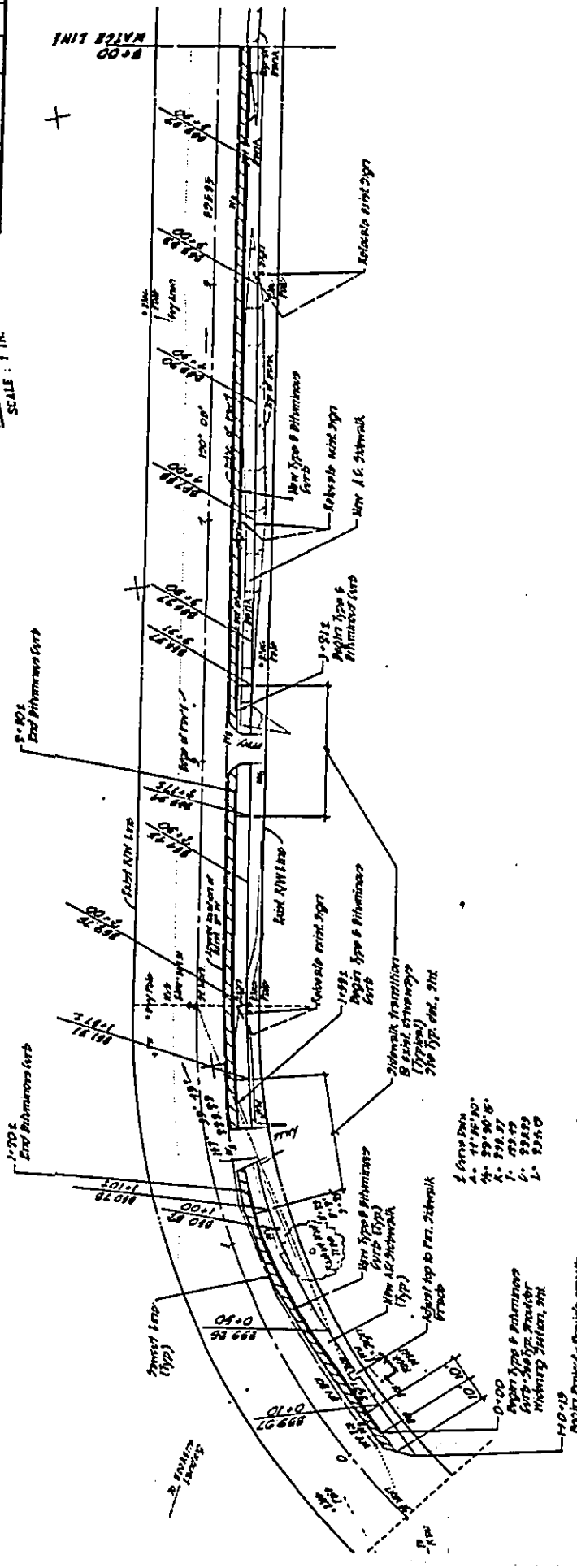
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Scale: 1" = 10'

TYPICAL ROAD SECTION
Scale: 1" = 10'

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D' for Elys 8' but < 15'
D' for Elys 15' but < 30'

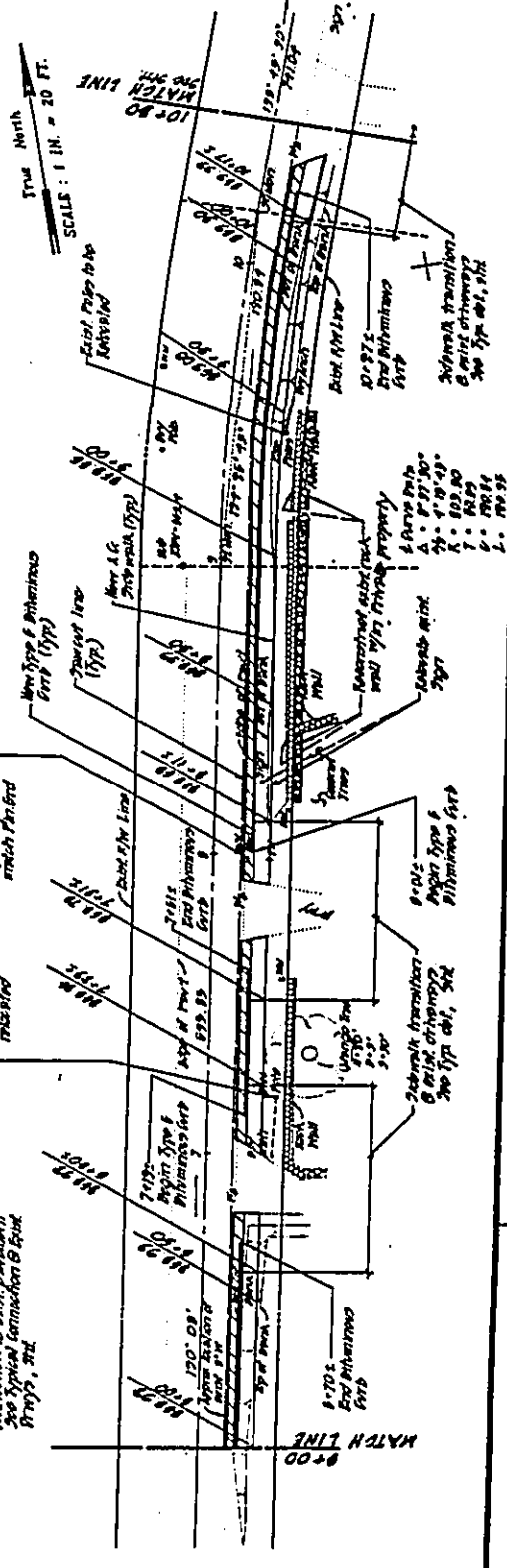
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NAME					

True North
SCALE: 1 IN. = 20 FT.



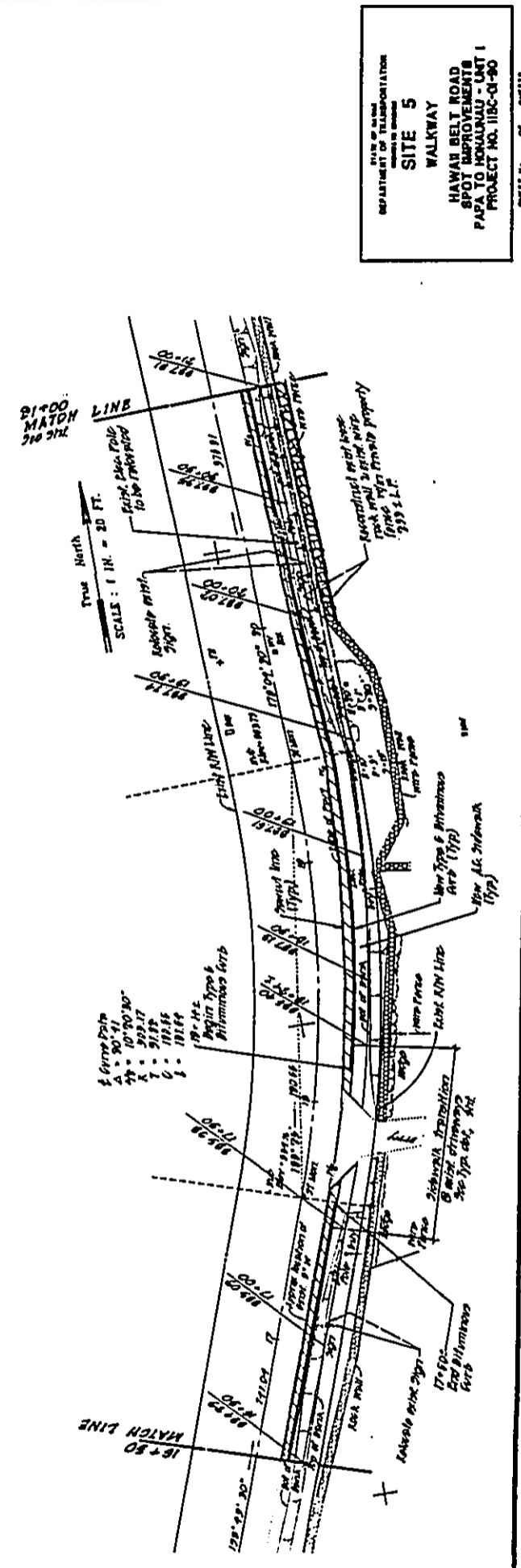
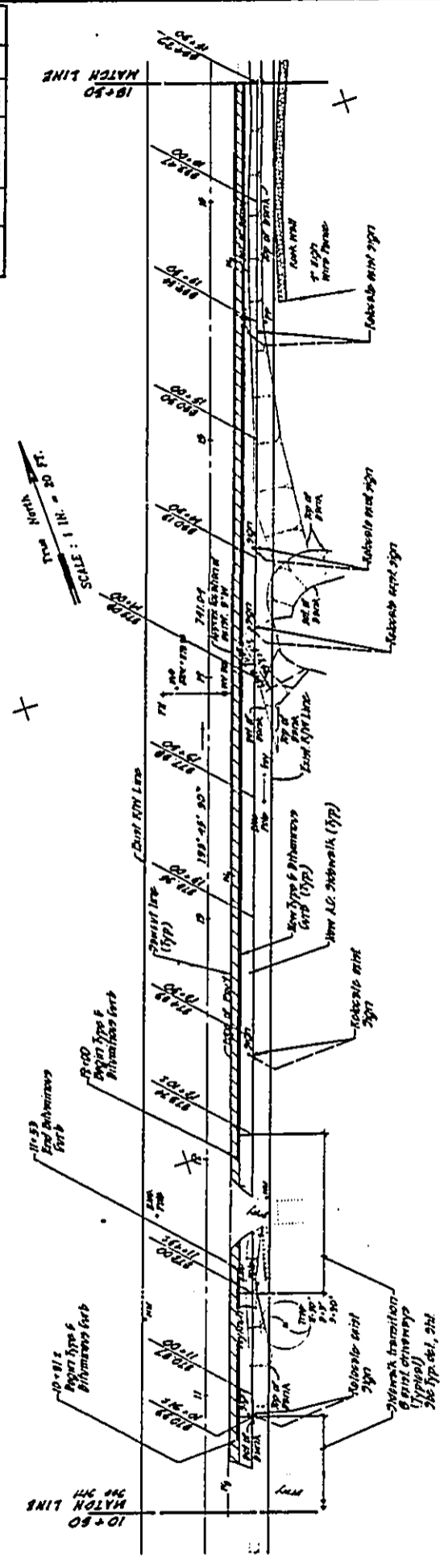
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- 2. 11.85' 20"
- 3. 23.70' 40"
- 4. 35.55' 00"
- 5. 47.40' 20"
- 6. 59.25' 40"
- 7. 71.10' 00"
- 8. 82.95' 20"
- 9. 94.80' 40"
- 10. 106.65' 00"

110-13
Slight Project - Profile shown
Connections to exist pavement
See Typical Connection & Elevation
Drawings, etc.



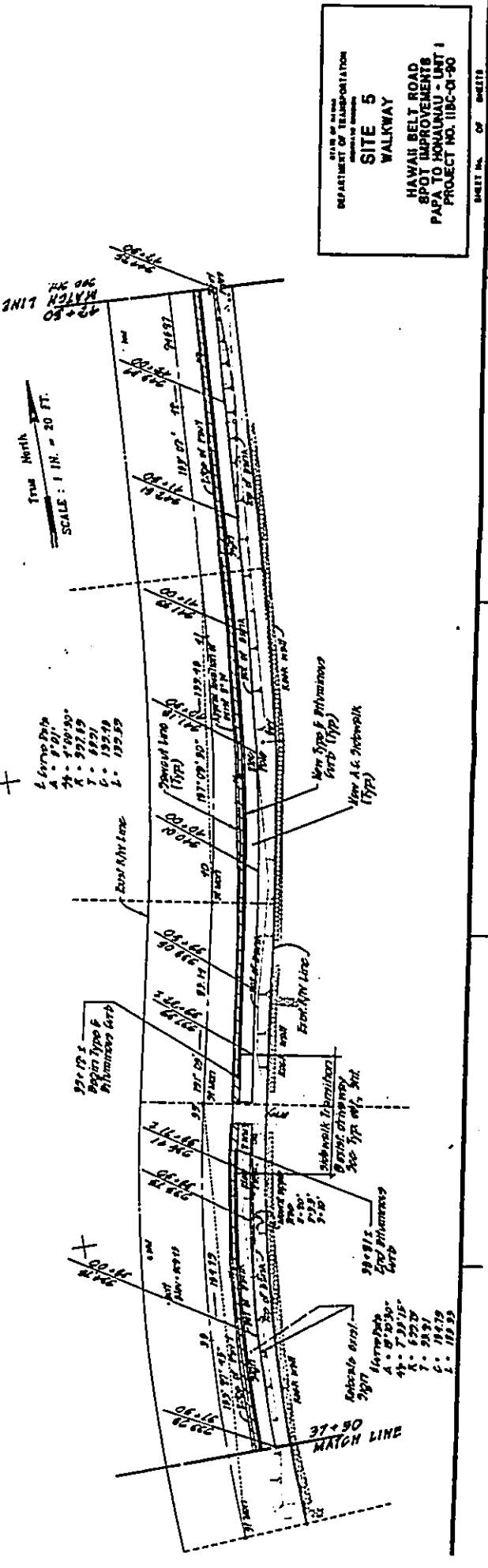
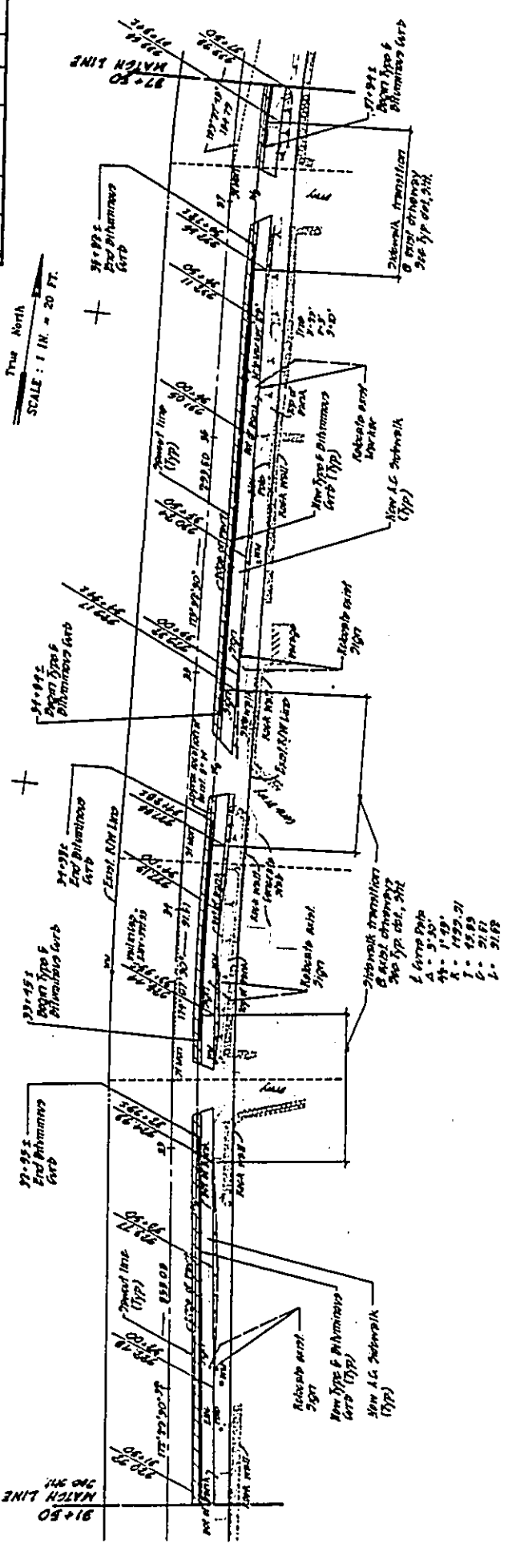
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
ROADS & HIGHWAYS
SITE 5
WALKWAY
HAWAII BELT ROAD
SPOT IMPROVEMENTS
PAPA TO HAWAIIANUMU
PROJECT NO. 118C-01-80

DESIGN DRAWN	STATE	FED. ROAD DISTRICT	PROJ. NO.	TOTAL SHEET NO.	TOTAL SHEETS
NAME	HAUAI	118C-01-90	1968		



HAWAIIAN
 DEPARTMENT OF TRANSPORTATION
SITE 5
WALKWAY
 HAWAII BELT ROAD
 SPOT IMPROVEMENTS
 PAPA TO HONOLULU - UNIT 1
 PROJECT NO. 118C-01-90
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NAME	DATE	PROJECT NO.	118C-Q1-80



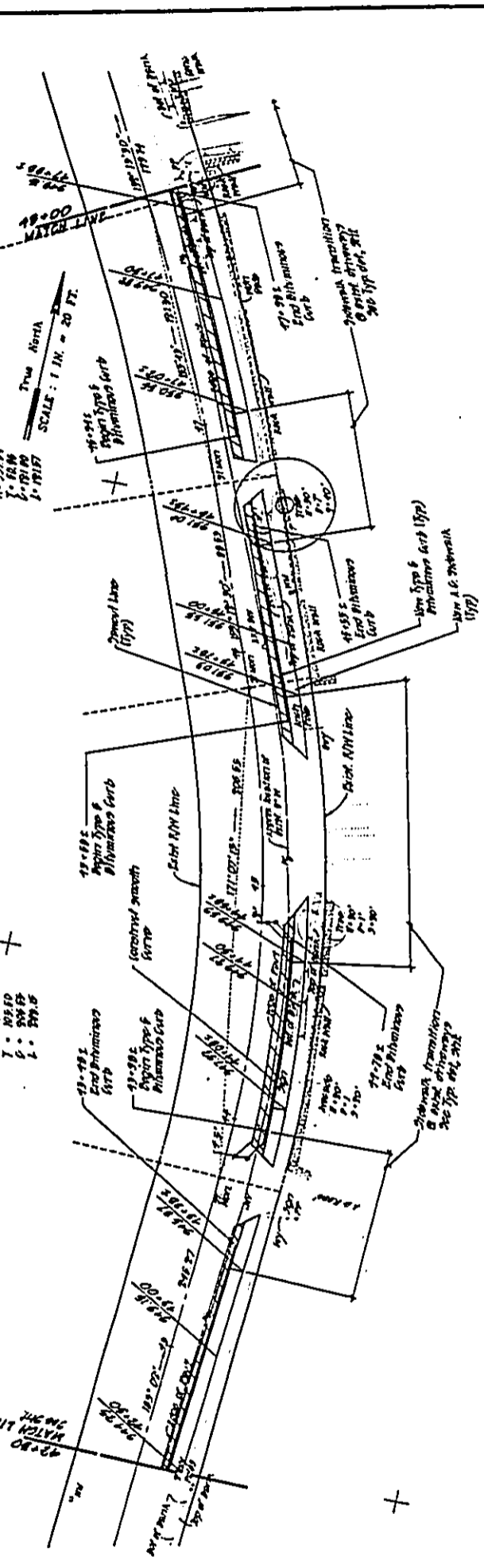
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SITE 5
WALKWAY
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 SPOT IMPROVEMENTS
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 PROJECT NO. 118C-Q1-80

SHEET NO. OF SHEETS

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4-1-80	A. J.
4-1-80	A. J.
4-1-80	A. J.
4-1-80	A. J.

DATE	BY	REVISION
4-1-80	A. J.
4-1-80	A. J.
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4-1-80	A. J.
4-1-80	A. J.



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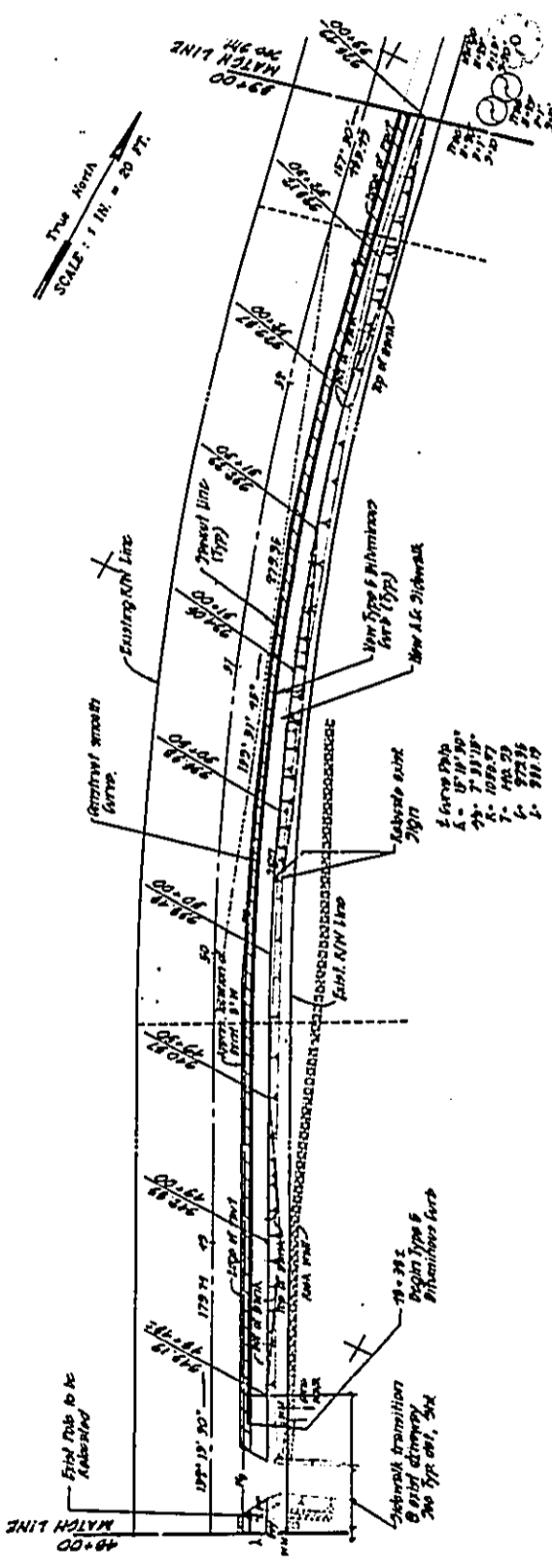
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HONOLULU, HAWAII

SITE 5
WALKWAY

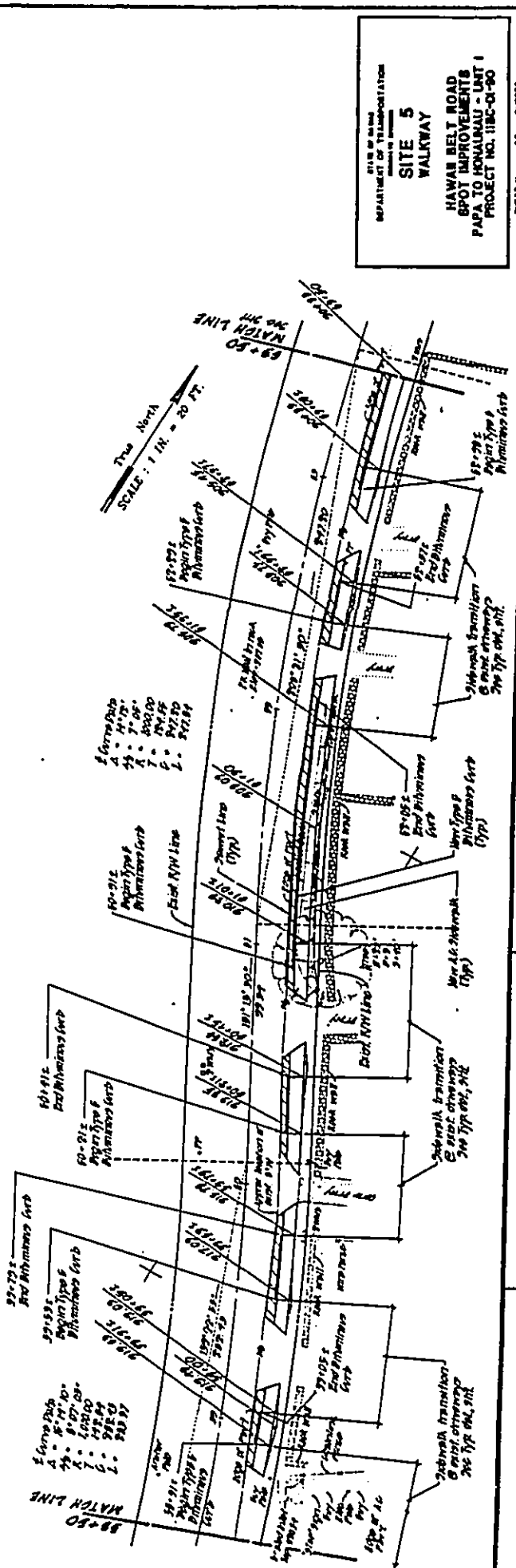
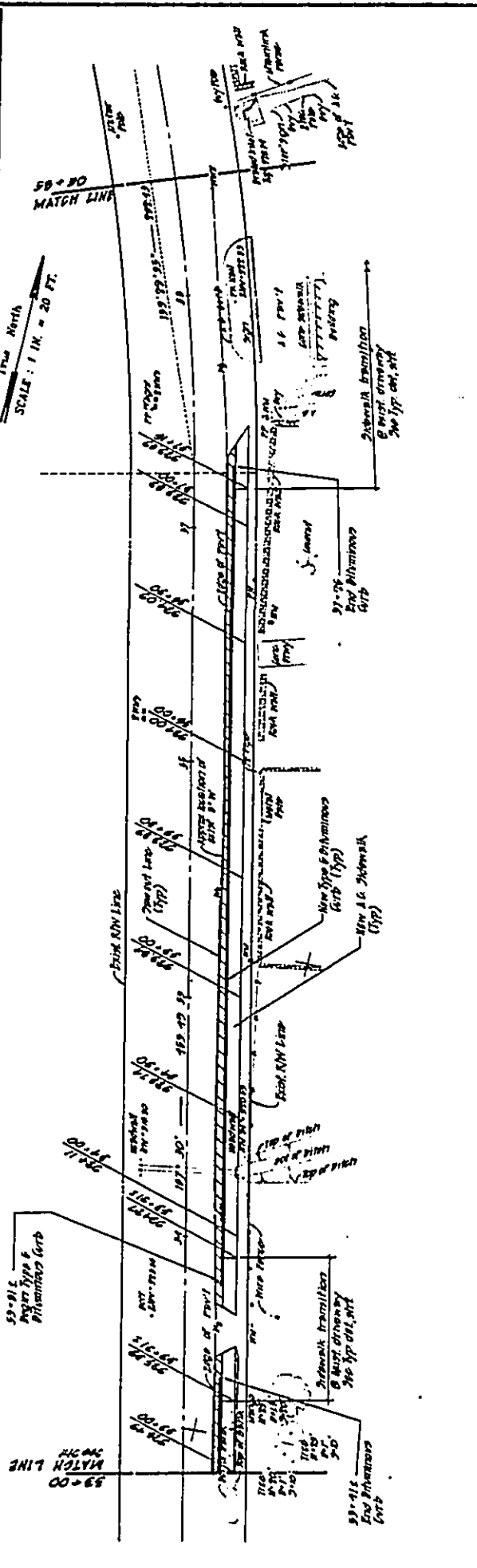
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SPOT IMPROVEMENTS
PAPA TO HONOLULU - UNIT 1
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SHEET NO. OF SHEETS



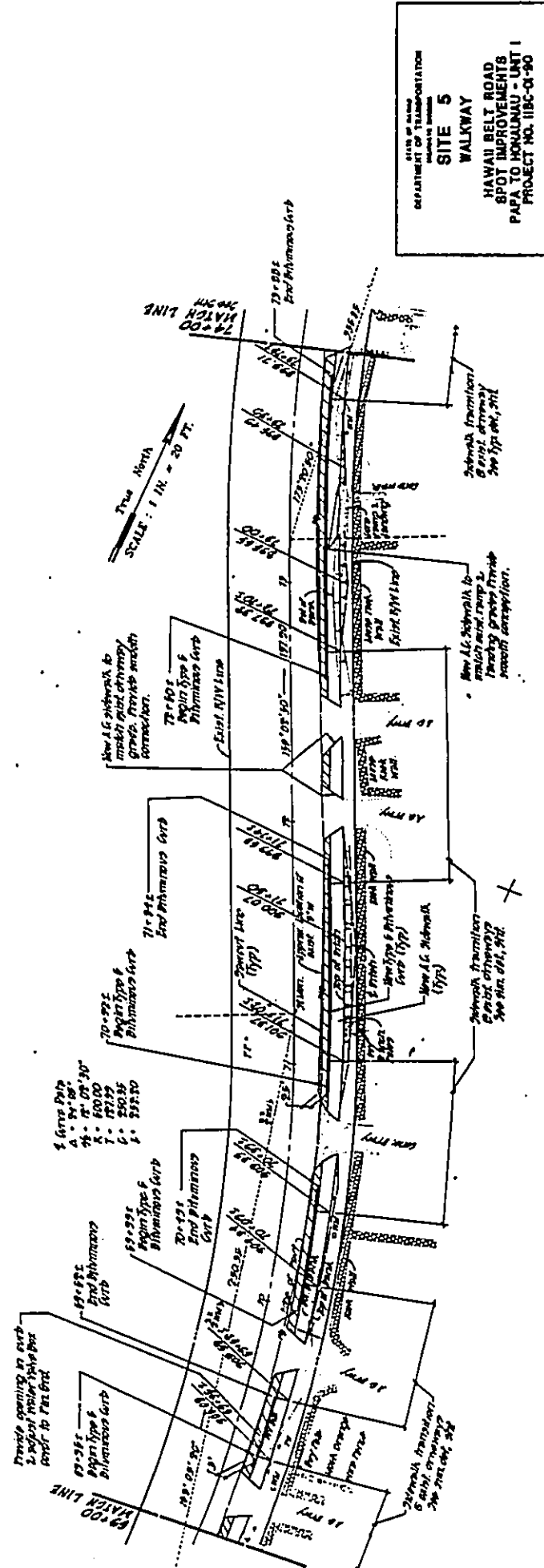
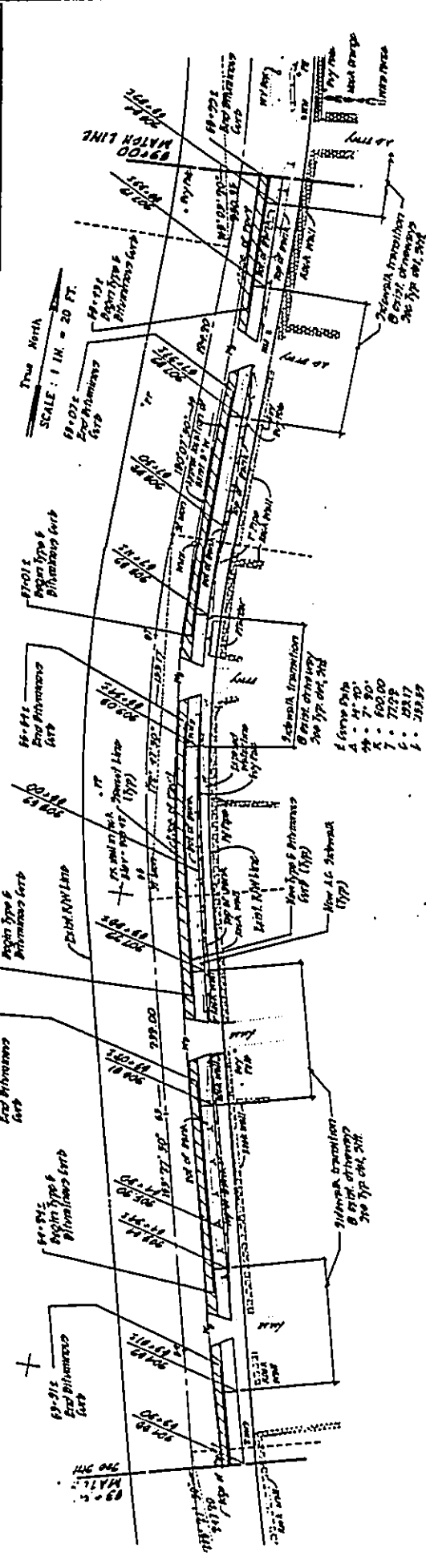
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SCALE: 1 IN. = 20 FT.

DESIGNED DATE: 11/18/80	STATE HAWAII	PROJ. NO. 118C-01-80	TOTAL SHEETS 10



HAWAIIAN
 DEPARTMENT OF TRANSPORTATION
**SITE 5
 WALKWAY**
 HAWAII BELT ROAD
 SPOT IMPROVEMENTS
 PAPA TO HONOLULU - UNIT 1
 PROJECT NO. 118C-01-80

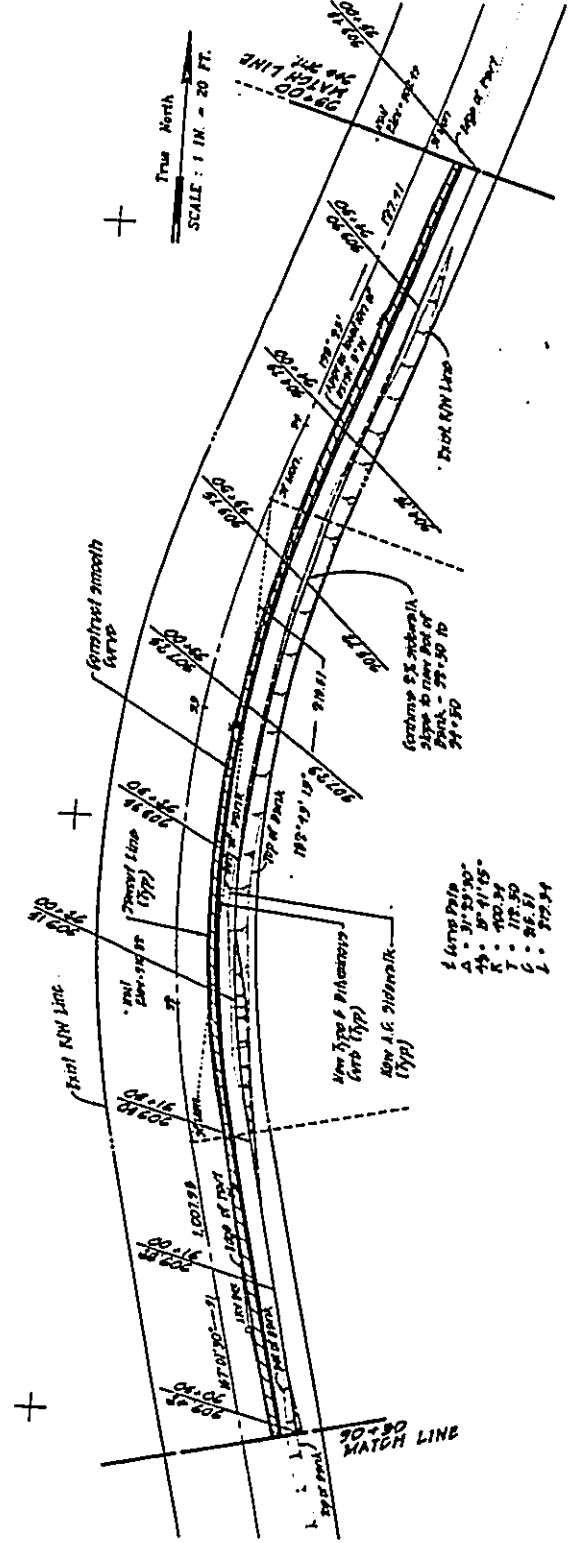
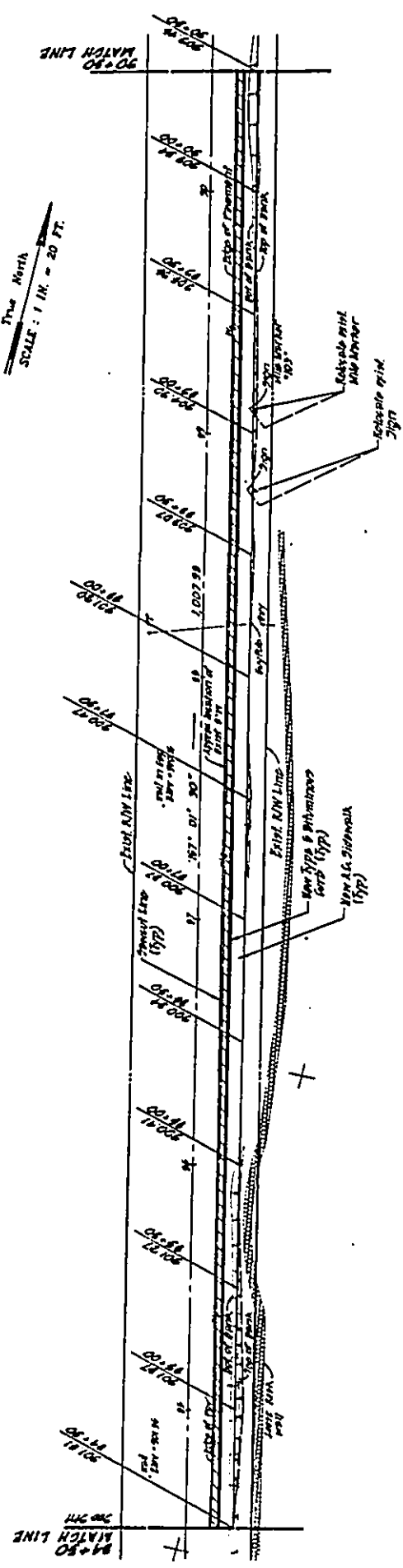
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DEPARTMENT OF TRANSPORTATION
SITE 5
WALKWAY
 HAWAII BELT ROAD
 SPOT IMPROVEMENTS
 PAPA TO HONOLULU - UNIT 1
 PROJECT NO. 118C-01-90

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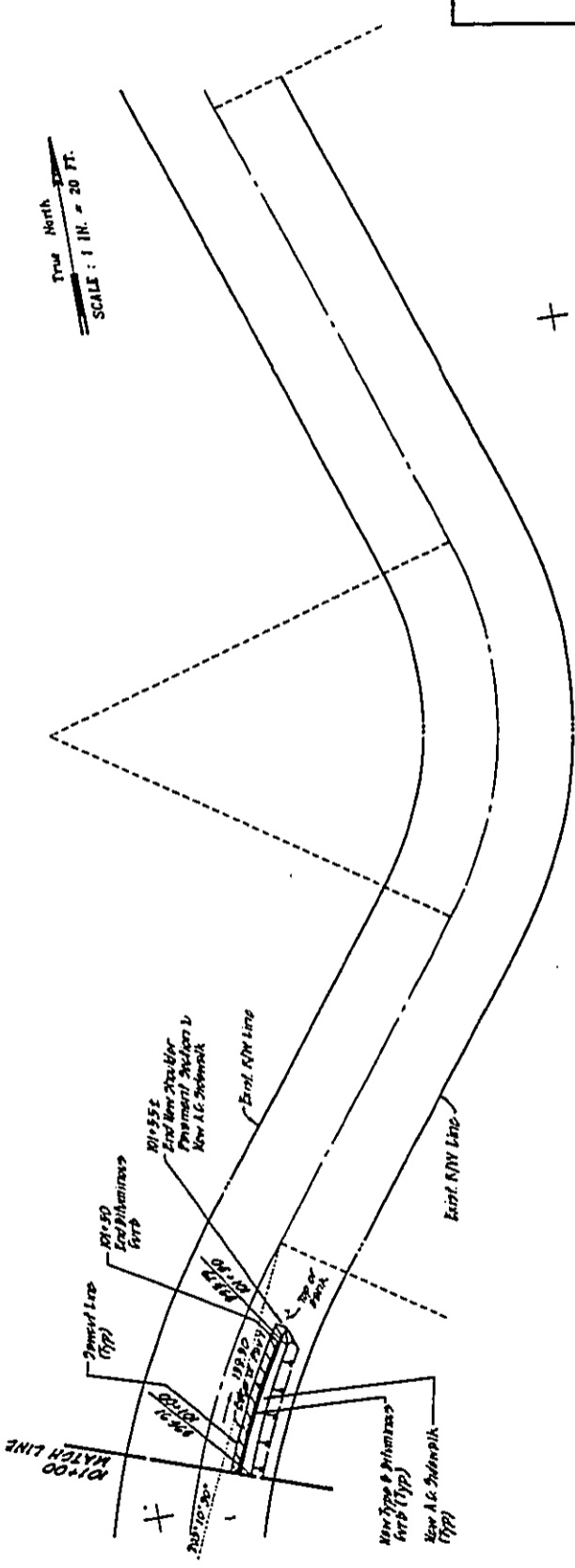
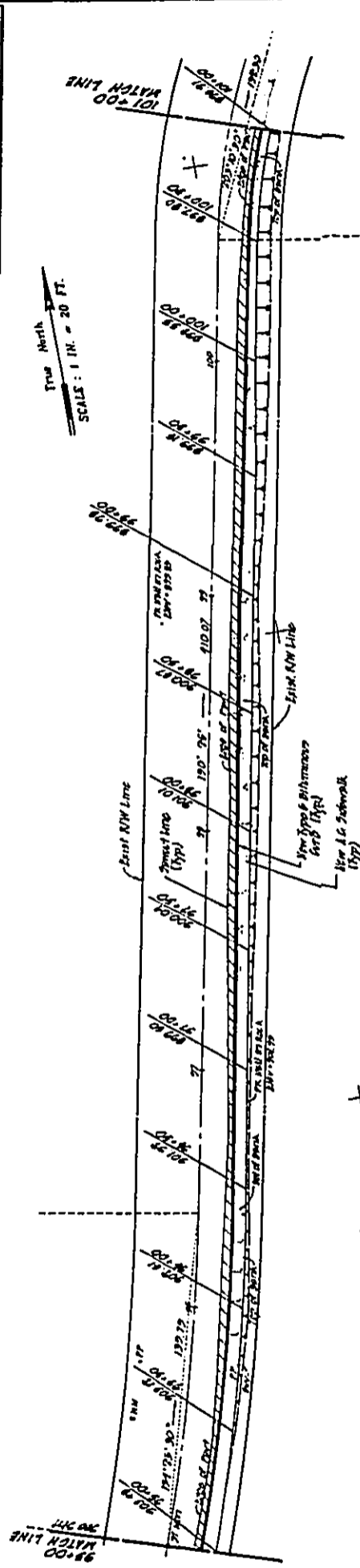


STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
ROADS & AIRCRAFT DIVISION
SITE 5
WALKWAY
HAWAII BELT ROAD
SPOT IMPROVEMENTS
PAIYA TO HONOLULU - UNIT 1
PROJECT NO. 118C-01-80
SHEET NO. OF SHEETS

True North
SCALE: 1 IN. = 20 FT.

Curve Data
A = 31° 23' 30"
R = 37' 41' 05"
T = 118' 50"
L = 372' 34"

FEDERAL ROAD DIST. NO.	STATE	PROJ. NO.	DISGN. YEAR	SHEET NO.	TOTAL SHEETS
	HAWAII	118C-01-80	1988		



STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
Engineering Division
SITE 5
WALKWAY
HAWAII BELT ROAD
SPOT IMPROVEMENTS
PAPA TO HONOLULU - UNIT 1
PROJECT NO. 118C-01-80

SHEET NO. OF SHEETS