BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

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

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HISTORIC PRESERVATION
LAND DIVISION
STATE PARKS
WATER RESOURCE MANAGEMENT

File No. HA-2800

MEMORANDUM

TO: Gary Gill, Director
Office of Environmental Quality Control

FROM: Charlene P. Unoki for
Dean Uchida, Administrator
Division of Land

SUBJECT: Final Environmental Assessment for GTE Fiber Optic Ductline at Haleakala

The Department of Land and Natural Resources has reviewed the comments received during the 30-day public comment period that began on March 22, 1996. The Department has determined that this project will not have significant environmental effect and has issued a negative declaration. Please publish this notice in your OEQC Bulletin as soon as possible.

We have enclosed a completed OEQC Bulletin Publication Form and four copies of the final EA. Please contact Don Horiuchi at 587-0381 if you have any questions.

Encl.

94

1996-08-23-MA-FEA-GTE Fiber Optic Ductline at Haleakala

Final Environmental Assessment

GTE Fiber Optic Ductline

Prepared for:

GTE Hawaiian Telephone Company, Incorporated

June 1996

MUNEKIYO & ARAKAWA, INC.

Final
Environmental Assessment

GTE Fiber Optic Ductline

Prepared for:

GTE Hawaiian Telephone Company, Incorporated

June 1996

MUNEKIYO & ARAKAWA, INC.

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LIST OF FIGURES

Preface

The Applicant, GTE Hawaiian Telephone Company, Incorporated, proposes to upgrade the facilities of its existing Haleakala Microwave Station by installing approximately 6.2 miles of fiber optic ductline and appurtenances that will extend from the microwave station near the summit of Mount Haleakala to Kula Highway, Kula, Maui, Hawaii (TMK 2-2-7:01, 02, 05, 10, 11, 12, and 2-2-6:09). Approximately 3.6 miles of the ductline alignment will traverse the State Conservation District. Pursuant to Chapter 343, Hawaii Revised Statutes, Chapter 200 of Title 11, *Administrative Rules*, Environmental Impact Statement Rules, this Final Environmental Assessment (EA) documents the project's technical characteristics and environmental impacts, and advances findings and conclusions relative to the significance of the project.

Summary

Applicant and Landowner

The Applicant for the proposed action is GTE Hawaiian Telephone Company, Incorporated (GTE). The fee property owners of the parcels underlying the proposed ductline alignment include the State of Hawaii (TMK 2-2-7:01, 05, 11 and 12) and Kaonoulu Ranch (TMK 2-2-6:09, 2-2-7:02 and 10).

Property Location and Description

The proposed ductline alignment (approximately 6.2 miles) will extend from GTE's Microwave Station near the summit of Mount Haleakala to Kula Highway, traversing varying environmental conditions along the way. Towards facilitating the analysis of the alignment development, the alignment has been divided into three (3) segments. The delineation of each segment is intended to define sections of the alignment which possesses similar environmental attributes. Each segment is defined as follows:

1. ***Haleakala Summit Segment***

   At its eastern terminus (approximately the 9,700 foot elevation), the proposed ductline will connect to GTE's Haleakala Microwave Station. From the station, the alignment will follow an existing paved roadway easement and a dirt road in a southwesterly direction, meandering approximately 1.6 miles southwest through lava cinders. Elevations along this segment range from approximately the 9,700 foot elevation to the 9,000 foot elevation. The Haleakala Summit segment is located within the State Conservation District.

   Surrounding uses in the vicinity of the microwave station include communication, observational and research buildings to the east and west and cinder lands to the north and east. Vehicular access to this segment is provided by a roadway easement extending from Crater Road.

   It is noted that the proposed ductline does not traverse the Haleakala National Park. The northern terminus of the proposed alignment, for example, is located 0.50 mile southwest from the Haleakala National Park boundaries.

2. ***Upper Kaonoulu Segment***

   Extending from the southern terminus of the Haleakala Summit segment, the proposed alignment will shift to a northwesterly direction and meander downslope for approximately 2.0 miles through the Upper Kaonoulu Segment Elevations along this alignment segment range from approximately the 9,000 foot

elevation to the 6,000 foot elevation. The parcels underlying the proposed ductline corridor are also within the State Conservation District and are currently open Alpine shrublands. The change from cinder lands to open shrublands is evident just below the 9,000 foot elevation.

Vegetation at the remaining portion of this segment include pine trees, and many shrubs and bushes such as ohelo, pukiawe, and pilo, with vegetation increasing in density at lower elevations. Kikuyu is the predominant grass covering at the lower elevations of this segment. Waipoli Road, an existing dirt road, crosses the proposed alignment at the 6,400 foot elevation and provides the only vehicular access to this segment of the alignment.

3. ***Kula Segment***

Extending from the western terminus of the Upper Kaonoulu segment, the proposed alignment will continue in a northwesterly direction for approximately 2.6 miles until reaching the mauka side of Kula Highway, approximately 2,000 feet southwest of its intersection with Kekaulike Avenue. Elevations along this segment range from approximately the 6,000 foot elevation to the 3,000 foot elevation.

The Kula segment, unlike the Haleakala Summit and Upper Kaonoulu segments, is located on State Agricultural District lands. This segment is predominantly vegetated with kikuyu grass, as well as pine and wattle trees and various lowlying shrubs and bushes. Surrounding land uses in proximity to this segment include open pasture use to the east and west and single-family residences further to the north. Kula Highway is located at the alignment's western terminus and is the only vehicular access to this segment of the alignment.

Proposed Action

The Applicant, GTE Hawaiian Telephone Company, Incorporated, proposes to install a fiber optic cable system connecting the GTE microwave radio station near the summit of Haleakala to the Kula Central Office on Kula Highway. The system will consist of approximately 6.2 miles of underground conduit and fiber optic cable and approximately 0.4 mile of overhead fiber cable on the existing utility poles along Kula Highway.

The existing GTE microwave radio system, which is operating close to capacity by GTE telephone customers, does not have the bandwidth (circuit capacity) to meet the anticipated telecommunication needs of the Haleakala scientific community. For example, typical microwave transmission systems have a bandwidth of 2,016 telephone lines, whereas current fiber optic transmission technology will provide a bandwidth of up to 32,256 telephone lines. With a typical communication, observational, or research

facility having the potential of requiring a bandwidth as large as 2,000 telephone lines, the existing Haleakala transmission system is currently unable to provide service to Haleakala's scientific community. The proposed fiber optic communications link will allow GTE to augment the existing microwave radio link and provide additional bandwidth for facilities at the summit of Haleakala. Thus, with the installation of the proposed fiber optic system, the additional bandwidth will provide the Haleakala scientific community the latest communication, observational, and research technology to support real time data processing without disrupting telephone service to existing and future GTE customers.

The proposed ductline will be constructed of two (2) PVC conduits (one (1) to contain the fiber optic cables and the other to remain empty for maintenance purposes) measuring approximately 1.5 inches in diameter. The conduit is intended to be placed approximately two (2) to three (3) feet below grade. Trench excavation, ductline installation and backfill are anticipated to occur simultaneously. Once the ductline is installed, at grade "pull boxes" measuring 3 feet by 5 feet and 3 feet deep will be strategically placed approximately 1,500 feet apart throughout the alignment for installation and maintenance of the conduit system and fiber optic cables.

The fiber optic installation activities will be concentrated at the locations of the pullboxes. Air compressors will be utilized to assist in the fiber optic cable installation to minimize cable/ductline friction.

An alignment corridor varying between 50 feet to 100 feet wide is proposed for the installation of the underground ductline. A wide corridor will allow installation flexibility of the ductline to avoid topographical, vegetal and other environmental constraints (e.g., endangered plant species, large lava beds, trees, large shrubs and archaeological sites) that may be encountered along the proposed 6.2-mile ductline alignment.

Findings and Conclusion

Construction of the proposed project will involve short-term environmental effects typically associated with construction activities. To mitigate air quality and noise impacts, construction activities will be limited to daylight hours. Appropriate dust control measures, such as sprinkling and watering, will be undertaken to minimize wind blown emissions. All construction activities are anticipated to be limited to normal daylight working hours. Although ambient noise conditions may be temporarily affected by construction activities, no significant adverse effects are anticipated.

From a long-term perspective, the proposed ductline and appurtenances are not anticipated to result in any adverse environmental impacts. Impacts to an endangered sandalwood tree and archaeological sites can be avoided due to the installation flexibility of the wide corridor (approximately 50 to 100 feet) for the proposed ductline alignment. No endangered fauna or avifauna, including the dark-rumped petrel and its

nesting burrows, were observed within the proposed corridor. However, coordination with Haleakala National Park's Resource Management Specialist to minimize any impacts to the area's avifauna population is anticipated. The temporary displacement of feral animals during the installation phase will also be minimized since trench excavation, ductline installation and backfill, are anticipated to occur simultaneously, thereby minimizing construction activity time along specific segments of the ductline alignment. Anticipated to be placed two (2) to three (3) feet below grade, the proposed ductline and subsequent fiber optic cable installation will not have an adverse impact upon the visual character along the proposed alignment. It is also noted that should there be a future need to utilize the second conduit for maintenance or growth purposes, all installation activities will be confined to the location of the pullboxes, thus minimizing impacts to the area's landform.

Once installed, ductline inspections for maintenance purposes will be performed as required by qualified GTE personnel or an approved contractor. Consequently, the proposed project is not anticipated to have an adverse effect upon infrastructure as well as public service needs, such as police, medical facilities and schools. In addition, the impacts upon roadways, water, wastewater, drainage and other infrastructure systems are not significant.

In light of the foregoing findings, it is concluded that the proposed action will not result in any significant impacts.

Chapter I

Project Overview

I. PROJECT OVERVIEW

A. PROJECT LOCATION, EXISTING USE AND LAND OWNERSHIP

The proposed ductline alignment, which extends approximately 6.2 miles from GTE Hawaiian Telephone Company, Incorporated's Microwave Station near the summit of Mount Haleakala to Kula Highway, approximately 0.4 mile southwest of its intersection with Kekaulike Avenue, traverses varying environmental conditions. Towards facilitating the assessment of alignment development, the alignment has been divided into three (3) segments. See Figure 1. The delineation of each segment is intended to define sections of the alignment possessing similar environmental attributes. Each segment is defined as follows:

1. Haleakala Summit Segment

At its eastern terminus (approximately the 9,700 foot elevation), the proposed ductline will connect to GTE's existing Haleakala Microwave Station. From the station, the alignment will follow an existing paved roadway easement and a dirt road in a southwesterly direction, meandering approximately 1.6 miles southwest through lava cinders. Elevations along this segment range from approximately the 9,700 foot elevation to the 9,000 foot elevation. The Haleakala Summit segment is located within the State Conservation District.

Surrounding uses in the vicinity of the microwave station include communication, observational and research buildings to the east and west, and cinder lands to the north and east. Vehicular access to this segment is provided by a roadway easement extending from Crater Road.

It is noted that the proposed ductline does not traverse the

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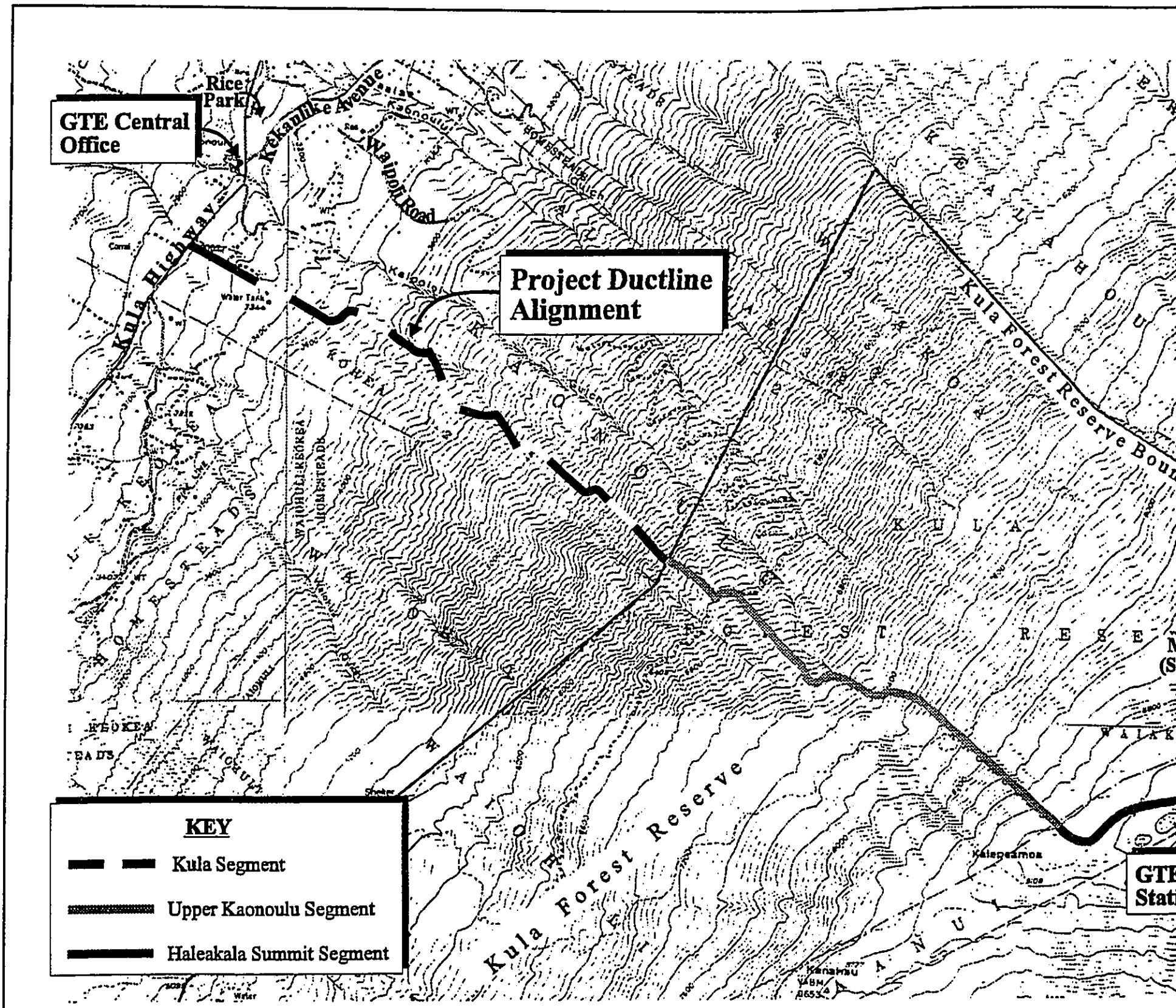

Figure 1

GTE Fiber Optic Ductline
Regional Location Map

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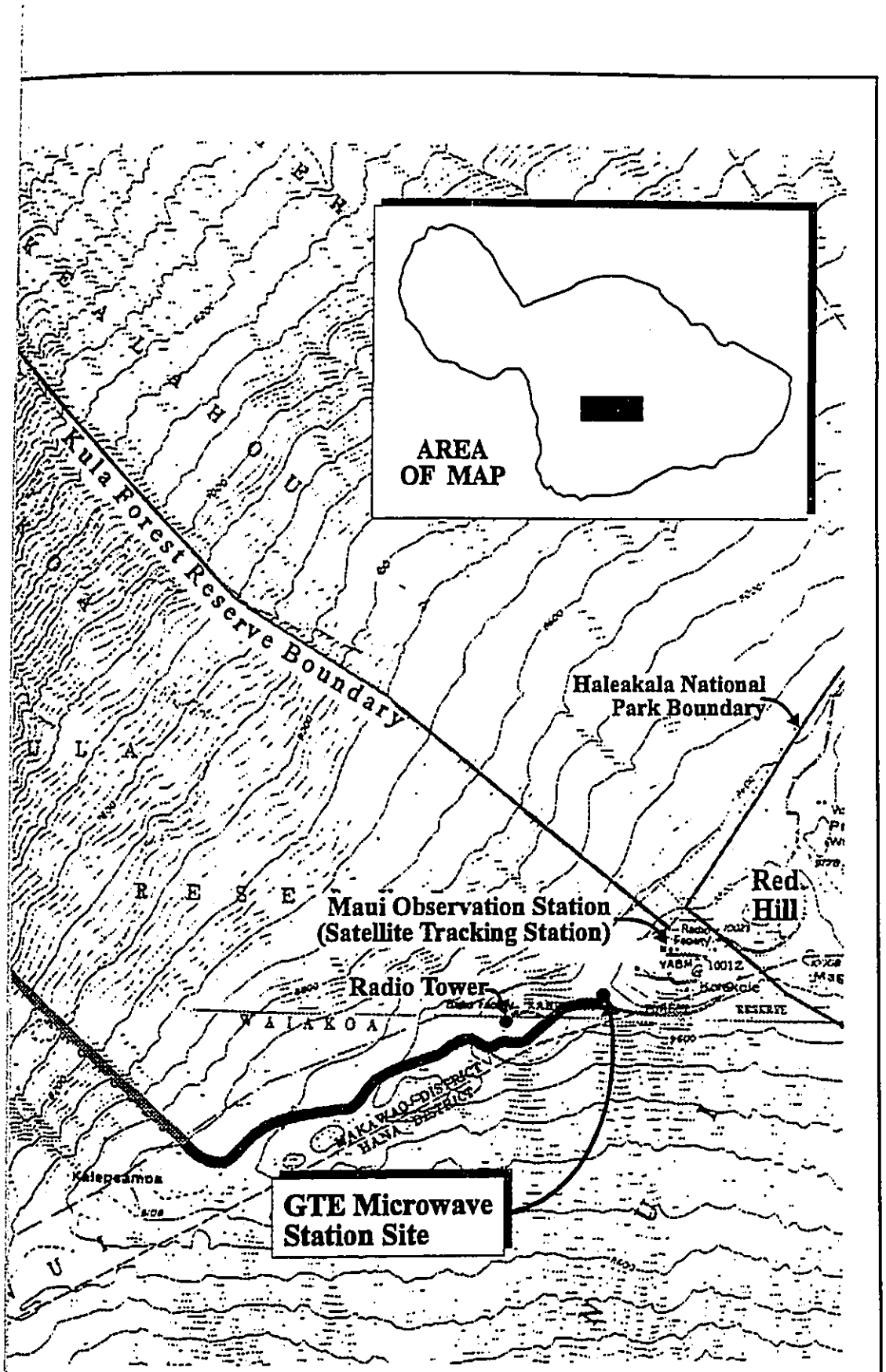

)uctline
Map

MUNEKIYO & ARAKAWA, INC.

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Haleakala National Park. The northern terminus of the proposed alignment, for example, is located 0.50 mile southwest from the Haleakala National Park boundaries.

2. ***Upper Kaonoulu Segment***

From the Haleakala Summit segment, the alignment shifts to a northwesterly direction and meanders downslope for approximately 2.0 miles through the Upper Kaonoulu Segment. Elevations along this segment range from approximately the 9,000 foot elevation to the 6,000 foot elevation. The parcels underlying the proposed ductline corridor within this segment are also within the State Conservation District and are characterized as open alpine shrublands. The change from cinder lands to open shrublands is evident just below the 9,000 foot elevation.

Vegetation along this segment include pine trees, and many shrubs and bushes such as ohelo, pukiawe, and pilo, with vegetation increasing in density at lower elevations. Kikuyu is the predominant grass covering at lower elevations of this segment. Waipoli Road, an existing dirt road, crosses the proposed alignment at the 6,400 foot elevation and provides the only vehicular access to this portion of the alignment.

3. ***Kula Segment***

Extending from the northern terminus of the Upper Kaonoulu segment, the proposed alignment will continue in a northwesterly direction for approximately 2.6 miles until reaching the mauka side of Kula Highway approximately 2,000 feet southwest of its intersection with Kekaulike Avenue. Elevations along this alignment range from approximately the 6,000 foot elevation to the

3,000 foot elevation.

The Kula segment, unlike the Haleakala Summit and the Upper Kaonoulu segments, is located on State Agricultural District lands. This segment is predominantly vegetated with kikuyu grass, as well as pine and wattle trees and various lowlying shrubs and bushes. Surrounding land uses in proximity to this segment include open pasture use to the east and west and single-family residences further to the north. Kula Highway is located at the alignment's western terminus and is the only paved vehicular access to this segment of the alignment.

The property owners affected by the proposed ductline alignment (from GTE's microwave station to Kula Highway) are noted in Table 1.

Table 1

GTE FIBER OPTIC DUCTLINE
LAND OWNERSHIP SUMMARY

Tax Map Key	*Landowner*	*Parcel Area*
2-2-7:01	State of Hawaii	5,866 acres
2-2-7:02	Kaonoulu Ranch	870 acres
2-2-7:05	State of Hawaii	153 acres
2-2-7:10	Kaonoulu Ranch	124 acres
2-2-7:11	State of Hawaii (United States of America - lease)	4.5 acres
2-2-7:12	State of Hawaii (GTE Hawaiian Telephone Company, Incorporated - lease)	0.26 acres
2-2-6:09	Kaonoulu Ranch	867 acres

GTE Hawaiian Telephone Company, Incorporated is in the process of obtaining utility and construction easements over the aforementioned properties that will accommodate the proposed ductline corridor (approximately 6.2 miles).

B. ***PROJECT NEED***

GTE's Microwave Radio Station, located near the summit of Haleakala, is part of a network of GTE microwave stations located throughout the State of Hawaii. These radio stations provide a communications link between the islands of Oahu, Kauai, Molokai, Maui, and Hawaii. GTE's Wailuku Central Office, the communications hub for Maui, utilizes the Haleakala Microwave Radio Station for transmitting and receiving microwave transmissions to and from Oahu. This microwave radio system is currently operating at its capacity.

Once installed, the proposed fiber optic cable system will provide capacity relief and route diversity for the transmission link between the Haleakala Microwave Radio Station (via Kula and Kahului Central Offices) and the Wailuku Central Office. This route diversity would ensure continued interisland microwave radio communications for Maui, should any transmission problems be encountered on the Haleakala/Wailuku Central Office microwave radio link.

The primary intent of the proposed fiber optic cable system, however, is to provide a transmission medium which is capable of meeting advanced network and customer circuit requirements to facilities located at Haleakala's "Science City", as well as the Kihei Research and Technology Park. For example, the fiber optic cable will increase the quantity of services as well as increase the bandwidth capabilities of these services not possible with GTE's existing microwave radio system. With state-of-

the-art technologies available in voice, video, and data, there is a greater demand for increased speed and signal bandwidth, which will be possible with GTE's proposed fiber optic cable system.

C. ***PROPOSED ACTION***

The Applicant, GTE Hawaiian Telephone Company, Incorporated, proposes to install a fiber optic cable system connecting the GTE microwave radio station at the summit of Haleakala to the Kula Central Office on Kula Highway. The system will consist of approximately 6.2 miles of underground conduit and fiber cable and approximately 0.4 mile of overhead fiber cable on the existing utility poles along Kula Highway.

The existing GTE microwave radio system, which is operating close to capacity by GTE telephone customers, does not have the bandwidth (circuit capacity) to meet the anticipated telecommunication needs of the Haleakala scientific community. For example, typical microwave transmission systems have a bandwidth of 2,016 telephone lines, whereas current fiber optic transmission technology will provide a bandwidth of up to 32,256 telephone lines. With a typical communication, observational, or research facility having the potential of requiring a bandwidth as large as 2,000 telephone lines, the existing Haleakala transmission system is currently unable to provide service to Haleakala's scientific community. The proposed fiber optic communications link will allow GTE to augment the existing microwave radio link and provide additional bandwidth for facilities at the summit of Haleakala. Thus, with the installation of the proposed fiber optic system, the additional bandwidth will provide the Haleakala scientific community the latest communication, observational, and research technology to support real time data processing without disrupting telephone service to existing and future GTE customers.

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The fiber optic installation activities will be concentrated at the locations of the pullboxes. Air compressors will be utilized to assist in the fiber optic cable installation to minimize cable/ductline friction.

An alignment corridor varying between 50 feet to 100 feet wide is proposed for the installation of the underground ductline. A wide corridor will allow installation flexibility of the ductline to avoid topographical, vegetal and other environmental constraints (e.g., endangered plant species, large lava beds, trees, large shrubs and archaeological sites) that may be encountered along the proposed 6.2-mile ductline alignment.

With regard to the installation of the fiber optic conduits, construction methods involve utilizing (1) track-mounted mechanical earth moving equipment with a plow, (2) trench excavator, or (3) backhoe, in order to plow a trench approximately two (2) to three (3) feet deep and 12 inches wide. In areas where there are lava cinders, a wider trench at least three (3) feet wide is anticipated to avoid complications of the loose texture of the cinders. If track-mounted equipment is used for plowing, a second vehicle will place the conduit into the trench and, at the same time, cover

the trench with backfill. A trench excavator is necessary in areas where large boulders or rocks are located at the subsurface of the alignment. Backhoes will be utilized in areas with steep grades. Although hand-shoveling is one option, it is not anticipated since the terrain allows the utilization of mechanical earth moving equipment throughout the alignment. Should the terrain prove to be too steep to accommodate mechanical equipment, winches will be used for equipment stabilization.

Construction materials and equipment will be trucked to the eastern-most portion of the alignment near the summit of Haleakala. Construction will then proceed to progressively lower elevations until reaching Kula Highway. Replacement conduit reels are anticipated to be brought in by trucks, track-mounted mechanical equipment, or by helicopter, if necessary, and remain within the project corridor until the completion of the project.

Preliminary estimates indicate that the project will cost approximately $2 to $3 million. Assuming all applicable permits are obtained, construction of the proposed project is anticipated to be completed in six (6) to nine (9) months from the date of commencement.

Chapter II

Description of the Existing Environment

II. DESCRIPTION OF THE EXISTING ENVIRONMENT

A. PHYSICAL SETTING

1. Surrounding Environment

The project site, delineated into three (3) segments in this report (Haleakala Summit, Upper Kaonoulu and Kula), will extend from the summit of Haleakala to Kula Highway, a distance of approximately 6.2 miles (refer to Figure 1).

a. Haleakala Summit Segment

The Haleakala Summit segment of the alignment is located near the summit of Haleakala and Haleakala National Park. The summit of Haleakala is characterized by an open space setting, primarily interspersed with Haleakala National Park facilities, forests and trails. Due to its location within the State Conservation District, very little development has occurred in the area aside from Haleakala National Park facilities and the nearby "Science City", which consists of various communication, observational and research buildings located to the southeast of Haleakala National Park. Once outside of "Science City", surrounding land uses in the Haleakala summit vicinity include cinder and lava lands. Elevations along this segment range from approximately the 9,700 foot elevation to the 9,000 foot elevation.

b. Upper Kaonoulu Segment

Proceeding to lower elevations, the Upper Kaonoulu segment of the alignment extends from the southern terminus of the Haleakala Summit segment (refer to Figure 1) and, like the Haleakala Summit segment, is

situated in the State Conservation District.

The Upper Kaonoulu segment is characterized by a rural setting interspersed with various agricultural farms, pasture lands or open space. The lands surrounding the proposed alignment in this segment are primarily characterized as pasture lands or open shrublands. Elevations along this segment range from approximately the 9,000 foot elevation to the 6,000 foot elevation.

c. Kula Segment

The Kula segment, which extends from the Upper Kaonoulu segment to Kula Highway, differs from the Upper Kaonoulu segment in terms of environmental features. The Kula segment, consisting predominantly of introduced, non-native plants, is primarily in pasture use and is not located within the State Conservation District. Surrounding areas in proximity to the Kula segment are predominantly in pasture use. However, agricultural lots with single-family residences are located further to the north of the proposed alignment. Kula Highway is located at the western terminus of the segment and provides the only vehicular access to this area of the alignment. Elevations along the alignment range from approximately the 6,000 foot elevation to the 3,000 foot elevation.

2. *Climate*

The area near the summit of Haleakala is subject to greater seasonal variations than other parts of Maui due to its high elevation. Fog is common during the day, as it drifts in from the

east through the Koolau and Kaupo gaps. Trade winds averaging approximately 5 to 15 miles per hour are persistent from March to November. Southwesterly (Kona) winds occasionally interrupt the trade wind pattern during the winter months, occasionally bringing heavy winds of 50 miles per hour or more. Winds in excess of 100 miles per hour have been recorded at the summit. During the winter months, periods of snow also occur at the crater rim; however, the snow is light and usually melts in a few hours or days (National Park Service, January 1995).

In 1993, the average annual temperature at the summit of Haleakala was 53.6 degrees. Also in 1993, annual rainfall near the summit averaged approximately 40 to 45 inches.

Kula's climatic pattern is typical of most mountainous areas in Hawaii. The morning periods are generally sunny, followed by an afternoon build up of cumulus clouds which may bring intense, yet brief, showers.

Average temperatures in the Kula region (based on temperatures recorded at the Kula Hospital) range from lows in the low-50's to highs in the mid-80's. Rainfall in the Kula region averages approximately 25 to 30 inches annually (Maui County Data Book, 1994). Winds in this region are generally typical of tradewind patterns, blowing from the northeast with some variations during the day and during exceptional weather conditions.

3. ***Topography and Soil Characteristics***

The proposed 6.2-mile ductline will extend from the summit of Haleakala (approximate elevation of 9,700 feet) to Kula Highway

(approximate elevation of 3,000 feet). Within the corridor limits, the topography can be characterized as steep to moderate from the 9,700 foot elevation to the 5,000 foot elevation. From the 5,000 foot elevation to Kula Highway, the alignment traverses through pasture lands described as moderate to gently sloping lands. The average slope of the lands underlying the proposed ductline alignment is approximately 15 percent.

Underlying the proposed ductline alignment are three (3) soil associations: Rock Land - Rough mountainous land (from 9,700 foot elevation to 8,000 foot elevation), Laumaia-Kaipoioi-Olinda (from 8,000 foot elevation to 4,000 foot elevation), and Puu Pa-Kula-Pane (from 4,000 foot elevation to 3,000 foot elevation). See Figure 2. The Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii characterizes each soil association as follows:

Rock land-Rough mountainous land association: This soil association, located on intermediate and high uplands on East and West Maui, consists of very shallow soils which are steep to very steep.

Laumaia-Kaipoioi-Olinda association: This soil association consists of well-drained, medium-textured soils that have a moderately fine texture or medium texture. This soil is gently sloping to very steep.

Puu Pa-Kula-Pane association: This soil association is characterized as deep, gently sloping to steep, well-drained soils that have a medium-textured or moderately fine textured subsoil or

LEGEND

① Pulehu-Ewa-Jaucas association

② Waiakoa-Keahua-Molokai association

③ Honolua-Olelo association

④ Rock land-Rough mountainous land association

⑤ Puu Pa-Kula-Pane association

⑥ Hydrandepts-Tropaquods association

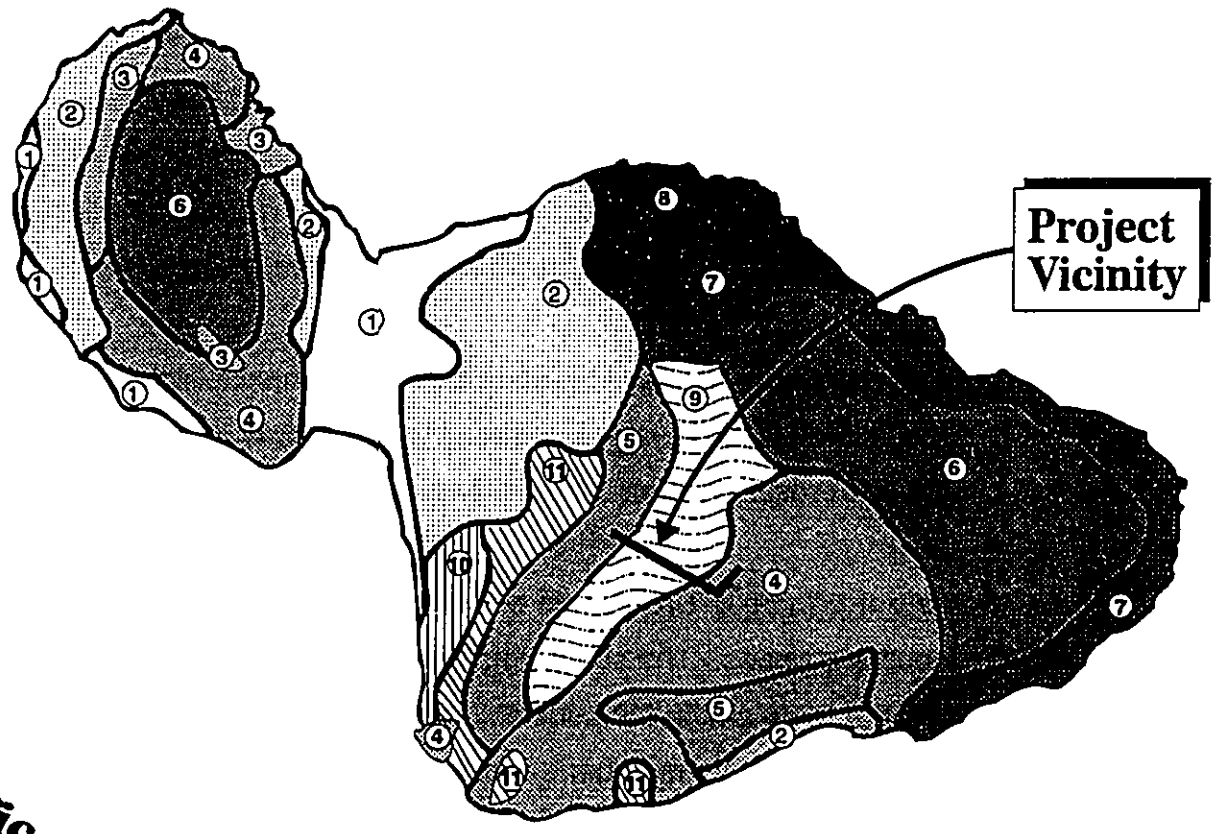
⑦ Hana-Makaalae-Kailua association

⑧ Pauwela-Haiku association

⑨ Laumaia-Kaipoipoi-Olinda association

⑩ Keawakapu-Makena association

⑪ Kamaole-Oanapuka association



Map Source: USDA Soil Conservation Service

Figure 2

GTE Fiber Optic Ductline
Soil Association Map

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underlying material.

Additionally, Figure 3 illustrates the soil types underlying the proposed ductline corridor, starting near the summit and extending to Kula Highway. The soil types are as follows:

Cinder Land (rCl): This soil type consists of bedded magmatic ejecta associated with cinder cones. It is a mixture of cinders, pumice and ash which show little or no evidence of soil development because of its loose nature and poor trafficability.

Laumaia extremely stony loam (LNE): This soil type is on complex, high mountain slopes. Permeability is moderately rapid, runoff is slow to medium, and the erosion hazard is slight to moderate. Stones cover 3 to 15 percent of the surface.

Laumaia loam (LME): This soil type is on complex, high mountain slopes. Permeability is moderately rapid, runoff is slow to medium, and the erosion hazard is slight to moderate.

Kaipoioi loam (KDlE): This soil type is on smooth to rolling high mountain slopes. The soil is neutral in the surface layer and mildly alkaline to neutral in the subsoil. Permeability is moderately rapid, runoff is slow to medium, and the erosion hazard is slight to moderate.

Kula cobbly loam (KxaD): This soil is located on intermediate uplands. The soil is slightly acid in the surface layer and slightly acid to neutral in the subsoil. Permeability is moderately rapid, runoff is medium, and the erosion hazard is moderate.

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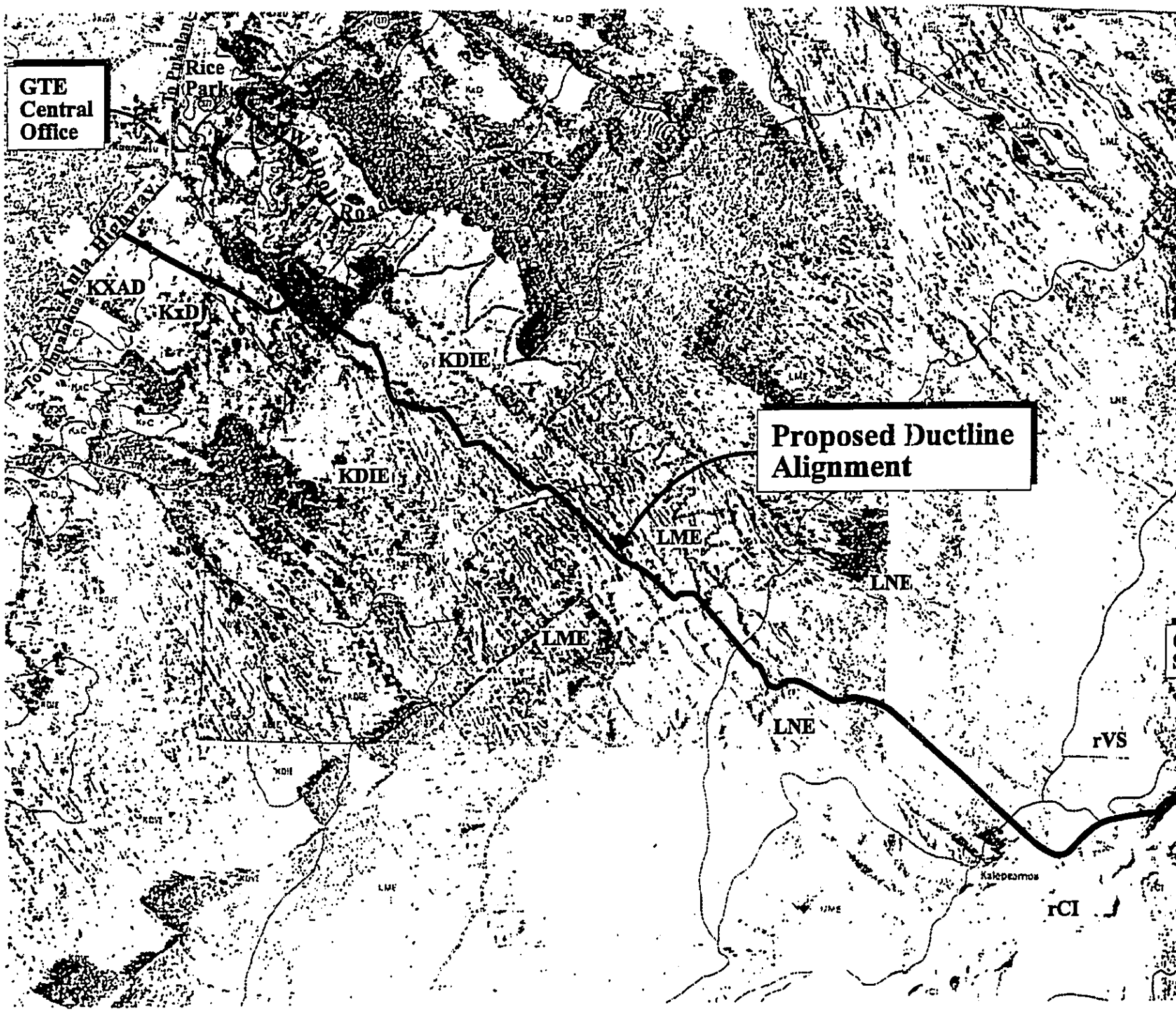

Figure 3

GTE Fiber Optic Ductline
Soil Classifications Map

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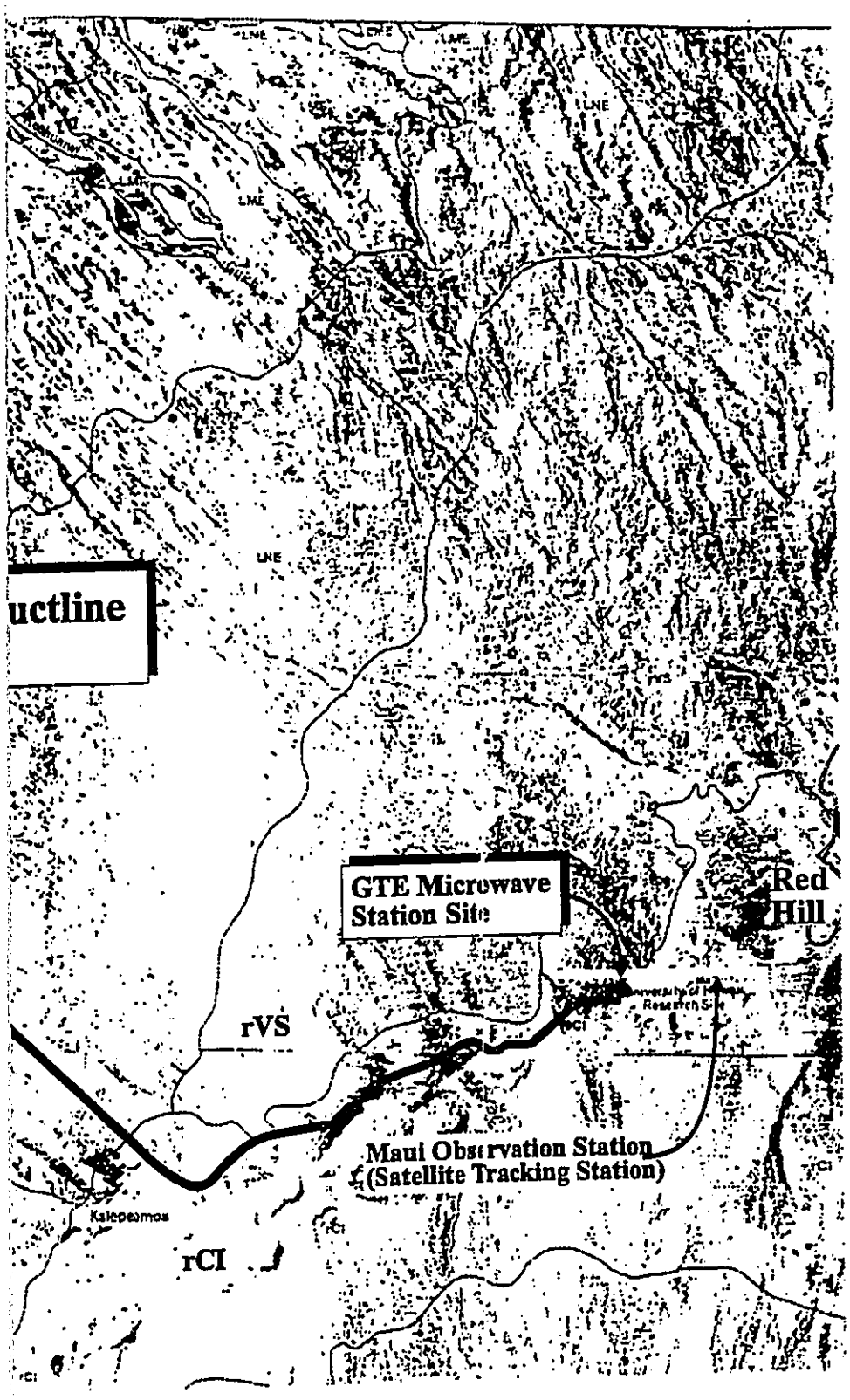

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The University of Hawaii, Land Study Bureau's Detailed Land Classification for Maui indicates that lands surrounding the Haleakala Summit and Upper Kaonoulu segments of the proposed alignment are designated "E". The Kula segment (located between the Upper Kaonoulu segment and Kula Highway) of the corridor encompasses lands designated either "C" or "D". A total productivity rating establishes a value system on a declining scale from "A" to "E", with "A" representing the highest level of productivity.

In addition, agricultural productivity is measured by the State of Hawaii, Department of Agriculture's Agricultural Lands of Importance to the State of Hawaii ("ALISH") maps. The ALISH maps designate five (5) land classifications for each Hawaiian Island. As previously mentioned, the Kula segment is located in the State Agricultural District (the Upper Kaonoulu segment and the Haleakala Summit segment are within the State Conservation District which are not classified on the ALISH maps). According to the ALISH, Island of Maui map, the Kula segment is located on lands designated as "Other Important Agricultural Land". See Figure 4.

4. ***Flood Hazard***

There are no flood insurance rate maps available for this region of Maui.

Based on topographic information along the proposed alignment, there are no apparent flood prone conditions affecting the proposed project. Slopes are steep to moderate, while soil types are largely

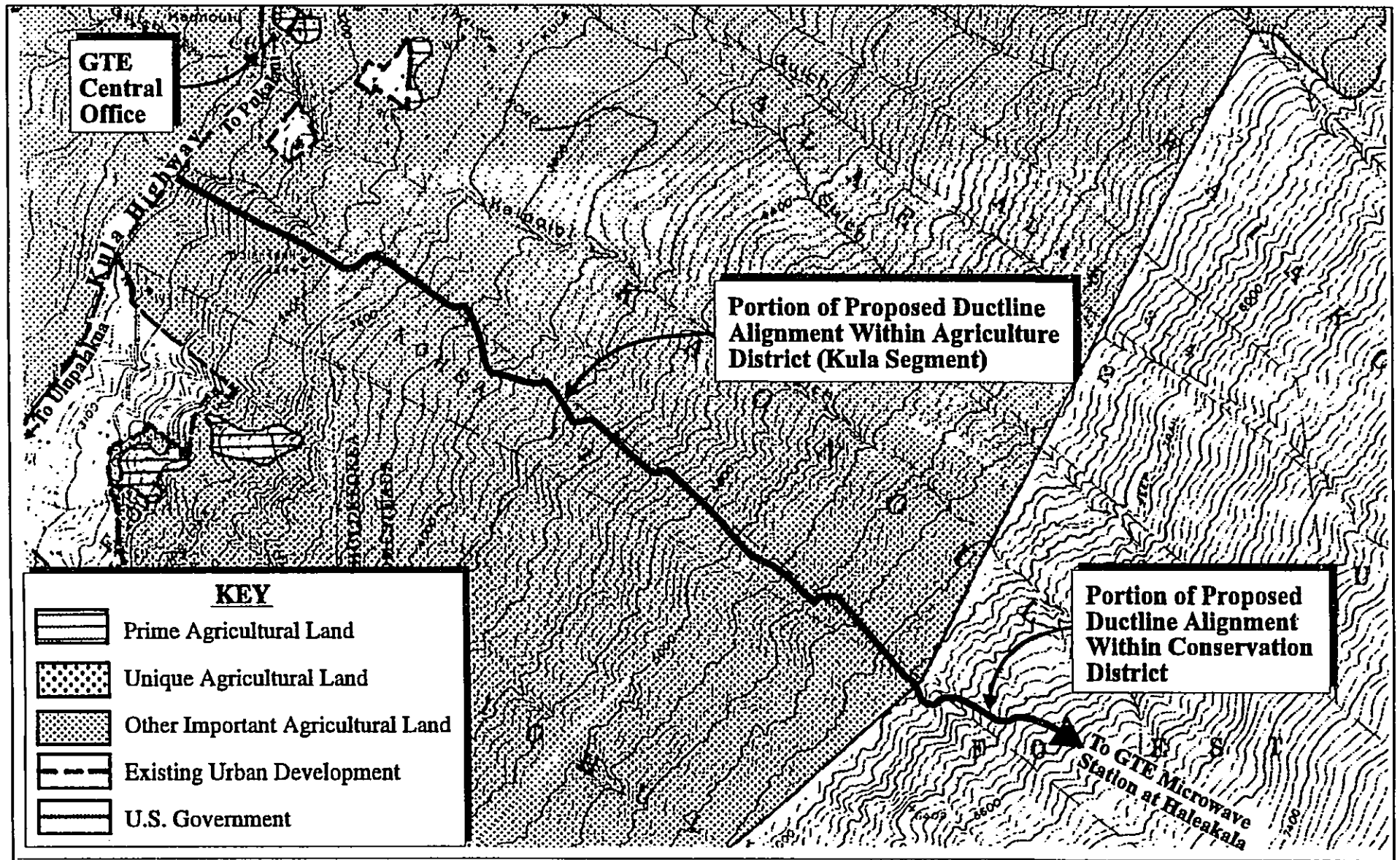

Figure 4

GTE Fiber Optic Ductline

Agricultural Lands of Importance to the State of Hawaii (ALISH) Map

Prepared for: Austin, Tsutsumi & Associates, Inc.

well drained. According to the United States Geological Survey map, an intermittent stream is located in close proximity to a portion of the proposed ductline alignment. This intermittent stream, called the Kaipoioi Gulch, meanders between the proposed ductline corridor and Waipoli Road from approximately the 7,000 to the 3,000 foot elevations. During periods of heavy rainfall, the majority of the surface runoff generated in the immediate area sheetflows downhill in a northwesterly direction and drains into the Kaipoioi Gulch. The remainder of runoff drains into lowlying areas until percolation or evaporation occurs. In this regard, the proposed ductline is not located in flood-prone areas.

5. <u>Flora</u>

The Haleakala Summit segment consists primarily of cinder lands. Patches of hairgrass and a shrub (kupaoa) species are, however, found in this segment.

Within the Upper Kaonoulu segment, from approximately the 9,000 foot elevation to the 6,000 foot elevation, typical lowlying vegetation include pamakani, sedge, highland ferns, ohelo bushes, pukiawe and brake fern. It is noted that this habitat is heavily affected by the browsing and uprooting of feral animals. See Appendix A. Other vegetation noted within this segment include the Hawaiian geranium, dandelion, and pilo, as well as lowlying trees such as sandalwood ('iliahi), mamane, pine and fire trees. It was observed that vegetation, within this segment, increases in density at lower elevations.

Within the Kula segment, introduced plant species, such as the pine, wattle, and fire trees are dominant. Kikuyu grass covers most

of the areas in this segment. Thick patches of mysore raspberry are displacing the native raspberry ('akala). Native species also observed were koa trees, laukahi ferns, and the Hawaiian strawberry (ohelo papa). This segment is primarily in pasture use.

A field survey conducted by Natural Science Fieldwork & Research on July 6, 1995 encountered a species of sandalwood (santalum freycinetianum var. lanaiense), or 'iliahi, directly on the southern edge of the proposed corridor. This sandalwood tree, which is listed Federally and by the State of Hawaii as endangered, was located at approximately the 6,900 foot elevation. Refer to Appendix A. Other endangered species, such as the Hawaiian silversword ('ahinahina), Hawaiian raspberry ('akala), a small crawling fern (asplemium fagile var. insulare C. Morton), Hawaiian geranium (hinahina) and a ko'oko'olau, are known to exist in habitats typical to that in the upper areas of the proposed alignment, but none were found there.

Two (2) other rare plants, but not endangered, were found within the proposed corridor. The pamakani (Teramolopium humile subsp. haleakalae) was found scattered in alpine shrubland along the northern extent of the corridor, at approximately the 9,000 foot elevation. The other is a sandalwood (Santalum haleakalae), or 'iliahi, which was found scattered among the subalpine dry forest and shrubland between approximately the 8,500 to 7,500 foot elevations.

6. ***Fauna and Avifauna***

Within Haleakala's barren lava and cinder lands, feral animals such as goats, Axis deer, mongoose and wild boars are infrequently

observed due to the lack of food sources (e.g., trees, shrubs and grasses). Haleakala Park officials have also implemented programs (i.e. live trapping, fences) to protect Haleakala's native flora and avifauna population from feral animal disturbances. The endangered Hawaiian Hoary bat was also observed near the Haleakala Summit area, although it is usually a resident of lowland areas (Haleakala National Park, January 1995).

In the Kula area, animal life becomes more abundant than at the summit. Domestic mammals such as dogs, cats, mice and mongoose are commonly seen. Goats, deer and wild boar are also found roaming for food in the forest areas of Kula. It is noted that denuding of plants and uprooting of plants and trees by these feral animals result in major native Hawaiian plant destruction and soil erosion.

Based on a flora and faunal survey conducted on July 6, 1995 (refer to Appendix A), bird species such as the short-eared owl (pueo), amakihi, apapane, Pacific golden plover (kolea), and the Maui creeper are known to exist in habitats similar to those found along the proposed ductline corridor. It is noted that the 'i'iwi, a native bird listed as endangered by the State of Hawaii on Oahu, Molokai and Lanai, but not on Maui, was sighted on a shrub within the corridor during the field survey. The shrub was examined for nests but none were found.

The endangered nene goose and the short-eared owl (pueo), which is a candidate for the endangered list, are also known to exist in habitats similar to those found along the proposed corridor. None of these species, however, were sighted during the field survey.

Haleakala is also the home of the endangered Hawaiian Dark-Rumped Petrel ('Ua'u), a ground nesting bird. Its nesting habitat on Maui is known to be in rock burrows within Haleakala Crater. Based on a field survey, however, Dark-Rumped Petrel nests within or in the vicinity of the proposed corridor were not found. See Chapter IX.

As vehicular traffic to the Haleakala National Park area increases, the potential of introducing non-native species to the Haleakala region also increases. With regard to the proposed project, Haleakala National Park biologists have expressed concerns on the gradual spreading and establishment of the Argentine ant (Iridomyrmex humilis) from lowland areas to the Haleakala region. Refer to Chapter IX. Already introduced to the Haleakala region, this invasive ant colony poses a threat to Haleakala's endemic plant ecology by displacing native arthropod species including the pollinators of the silversword (Medeiros and Loope, 1992).

7. ***Archaeological Resources***

An archaeological survey of the proposed ductline corridor, from the existing GTE Microwave Station at Mount Haleakala to Kula Highway, was conducted during July and August, 1995. See Appendix B. Based on this survey, four (4) archaeological sites were located within or in close proximity to the proposed alignment. They are described as follows:

a. ***Lava Tube Rock Shelter - Site 4132***

The lava tube rock shelter was located at the southern edge of the corridor, at approximately the 7,400 foot elevation. The entrance of the lava tube measured 2.5 meters wide

and 0.7 meters high and was located on the side of a small gulch formed by an ephemeral stream. Inspection of the interior was not possible due to a decomposing goat carcass which blocked the passageway.

b. ***Rock Shelter - Site 4133***

This second rock shelter was located at the northern edge of the proposed corridor, at approximately the 6,900 foot elevation. Located approximately 2 kilometers west of Site 4132, historic items observed on the surface included two (2) applied lip bottles from the mid-1800's, ceramics, two (2) applied end tin cans, scattered charcoal and a possible gourd fragment.

c. ***Agricultural and Habitation Area - Site 4134***

This site is located at approximately the 3,600 foot elevation, just south of a subsidiary gulch which joins Kaipoioi Gulch. This site contains remnants of a possible house platform and agricultural activity. Within this site, a depression approximately six (6) meters in diameter contained remnant 'ape (alocasia macrerrhiza) plants, which is similar to dryland taro. In addition, a possible terrace was noted adjacent to and downhill from the depression containing the 'ape plants. A mulberry (morus alba) tree and a large fig tree (ficus carica) were located at the edge of the gulch, which is adjacent to the site. Site 4134 is in poor condition and covered with kikuyu grass.

d. ***Historic Habitation Area - Site 4135***

This site is located at approximately the 3,200 to 3,080 foot

elevations and is approximately 60 meters east of Kula Highway, the western extent of the proposed alignment. Site 4135 is two (2) to three (3) hectares in area and consists of terracing, two (2) rock cairns, two (2) platforms, and a historic habitation area. Much of the terracing is rock faced on the downslope side. Subsurface investigations consisted of 10 test units ranging from 0.5 by 1 meter to 1 meter square. The results indicate that this site contains an indigenous component overlaid by a historic one. Portable cultural remains indicative of indigenous activity included volcanic glass flakes, a coral abrador, and utilized and unutilized basalt flakes. One charcoal sample was recovered from a hearth feature in this indigenous component and submitted for analysis, the results of which are pending.

It is noted that Sites 4132 and 4133 lie at the extreme edges of the proposed corridor and will not be impacted by the proposed project. Refer to Appendix B. However, portions of Sites 4134 and 4135 are within the corridor.

8. ***Air Quality***

There are no adverse air quality conditions along the proposed fiber optic alignment, as there are no sources of pollution between the summit of Haleakala and Kula Highway. In addition, the Island's constant exposure to winds typically results in the rapid dispersion of pollutants (e.g., automobile pollutants).

9. ***Noise Characteristics***

Surrounding noise levels near the summit of Haleakala are

characteristic of its conservation atmosphere and are considered relatively low. Background noise levels are primarily limited to weather conditions (e.g., wind, rain) or occasional vehicular noise.

In the Kula region, noise levels are characteristic of its rural atmosphere, as noise levels are limited to weather, traffic or agricultural related conditions.

10. Visual Resources

Situated at the summit of Haleakala and in the upper Kula region, the proposed fiber optic alignment offers an expansive panoramic and scenic view. At the summit, looking to the east and south, the Islands of Hawaii and Kahoolawe are visible. The Pacific Ocean is also visible. With the absence of lower level clouds, a panoramic view of Maui's central isthmus and the West Maui Mountains are also visible to the west. "Science City", a cluster of research, surveillance and communication buildings near the summit, can also be seen to the east and west of GTE's Microwave Station (the eastern terminus of the proposed ductline alignment). Other visual amenities at the summit during clear weather include the steep inner cliffs of Haleakala Crater and unobstructed views of the sunrise to the northeast and sunset to the southwest.

As the proposed alignment proceeds to lower elevations, view amenities in the upper and lower Kula region are still expansive. Views include a closer panoramic perspective of Maui's central isthmus, the Pacific Ocean, as well the verdant pastures and urban features of the lower Kula and Pukalani areas. Mountain views are also abundant, with the summit of Haleakala in clear view on

cloudless days.

B. SOCIO-ECONOMIC ENVIRONMENT

1. Population

The population of the County of Maui has exhibited relatively strong growth over the past decade with the 1990 population estimated to be 100,504, a 41.8 percent increase over the 1980 population of 70,847. Growth in the County is expected to continue, with resident population projections to the years 2000 and 2010, estimated to be 124,562 and 145,872, respectively (Community Resources, Inc., 1994).

The estimated 1990 population of the Makawao-Pukalani-Kula Community Plan region is 18,923. A projection of the region's population shows an increase to 21,760 by the year 2000. By the year 2010, population is anticipated to increase to 23,830 (Community Resources, Inc., 1994).

2. Economy

Agriculture and tourism are vital components of Maui's economy. The cultivation of pineapple and sugar cane and the tourist industry provides for much of the Island's economic stability.

The economy of Kula is heavily dependent upon agriculture. Kula's rich soil has helped the region become famous for the quality of vegetables and flowers exported to Hawaiian and international markets. Ranching of cattle and other farm animals is also an important element of Kula's economy. Maui's economy is also dependent on Haleakala National Park, considered to be a major tourist attraction for Maui. During 1993, visitation at the summit of

Haleakala totaled approximately 800,000 visitors. The average daily visitation during 1993 was approximately 2,200 persons, with the major concentration occurring between 9:30 a.m and noon (Haleakala National Park, January 1995). Points of interest found at the park include various hiking trails, picnic and camping areas as well as the "House of the Sun" visitor center, the most popular site on Maui to watch the sunrise.

Another popular recreational activity which attracts thousands of participants to the crater every year include daily bicycle tours down Haleakala Highway. Conducted by several private bicycle tour companies throughout the day, these tours start at the summit and wind down Haleakala Highway until stopping at destinations such as Kula, Makawao or Paia.

C. PUBLIC SERVICES

1. Police and Fire Protection

The County of Maui's Police Department is headquartered at its Wailuku Station. The Department consists of several patrol, investigative, and administrative divisions. The Department's Upcountry Patrol covers the Makawao-Pukalani-Kula region.

Presently, fire prevention, suppression and protection for the Kula region is offered by the County's Department of Fire Control newly built Kula Station, located 1.8 miles north of the western terminus of the proposed alignment. The Makawao Station, located eight (8) miles north of the subject property, also provides fire prevention, suppression and protection for the Kula region. Both stations are responsible for servicing all of Upcountry Maui (Makawao, Pukalani and Kula).

2. ***Medical Facilities***

Maui Memorial Hospital, the only major medical facility on the Island, services the Kula region. Acute, general and emergency care services are provided by the 185-bed facility which is located in Wailuku. Medical/dental offices are located in Kula, Pukalani and Makawao to serve the Upcountry region's residents.

3. ***Solid Waste***

With the closure of the Makawao Landfill, all solid wastes generated in the Upcountry and Haleakala regions are transported to the Central Maui Landfill in Puunene. Outside of Hana, the Central Maui Landfill is the only disposal site on the island of Maui. For the year 1995, solid waste arrived at the Central Maui Landfill at an estimated rate of approximately 400 tons per day (telephone conversation with Department of Public Works and Waste Management, Solid Waste Division employee Andy Hirose, August 1995).

4. ***Schools***

The State of Hawaii, Department of Education, operates five (5) public schools in Upcountry Maui. They are (with 1995 Fall enrollment in parenthesis): Makawao Elementary School (697), Kalama Intermediate School (1,260), Pukalani Elementary School (553), and Kula Elementary School (543). High school students from Upcountry are serviced by Kekaulike High School which opened in September 1995 with its initial freshman class enrollment of approximately 400 students (telephone conversation with Department of Education employee, David Keala, July 1995).

The region is also served by privately operated Haleakala School

(grades K to 8) and Seabury Hall (grades 6 to 12).

5. Recreational Facilities

Upcountry Maui is served by numerous recreational facilities offering diverse opportunities for the region's residents. These facilities include the County's Keokea Park, Rice Park, Kula Gym, Eddie Tam Park/Gym, and the Kula Community Center. In addition, Haleakala National Park and Polipoli State Park, located on the upper slopes of Haleakala, offer hiking, camping and sightseeing opportunities.

D. INFRASTRUCTURE

1. Roadways

Kula Highway (State Highway 37) is the main roadway servicing the Kula region. At its northern end, Kula Highway connects with Haleakala Highway (State Highway 377), which links Upcountry Maui with the rest of the Island. Extending off of Haleakala Highway is Haleakala Crater Road (State Highway 378), the only paved roadway access to the summit of Haleakala.

At the project's eastern terminus, within the Haleakala Summit segment, access to the ductline corridor will be via an existing roadway (dirt) easement extending from Haleakala Crater Road (State Highway 378).

Due to the Upper Kaonoulu segment's isolated location within the Conservation District, paved access to this segment is not available. However, at approximately the 6,400 foot elevation, Waipoli Road, an unpaved roadway, crosses the proposed alignment, providing the only vehicular access to this portion of the

alignment.

At the project's western terminus, the proposed ductline alignment connects to an existing utility pole located along Kula Highway. Accordingly, Kula Highway is the only vehicular access to this portion of the ductline alignment (Kula segment). Where vehicular access is unavailable, pedestrian access is anticipated for GTE employees and contractors.

2. ***Wastewater***

The Makawao-Pukalani-Kula region, which includes the Haleakala area, is not serviced by a County wastewater collection and treatment system. A portion of Pukalani is serviced by a private wastewater treatment system, while the remainder of the Upcountry area is served by cesspools or septic tanks. The State Department of Health (DOH) has designated most of the Island a critical wastewater disposal area, including the Makawao-Pukalani-Kula region.

In the long term, the proposed project will not generate new wastewater demand. However, during construction, wastewater disposal will be via a Department of Health approved portable sanitary facility.

3. ***Water***

Water at Haleakala National Park headquarters and governmental housing areas is collected, filtered, and stored via a water catchment system. Water quality is tested twice a month to meet the standards set by the Environmental Protection Agency for safe drinking water (Haleakala National Park, January 1995). Potable

water for the summit visitor center is hauled up from the headquarter's system and placed in water tanks.

Portions of the Kula area in the vicinity of the proposed alignment are serviced by the County of Maui Upper Kula municipal water system. The upper system, located at the 4,000 feet elevation, collects surface water from the Haipuaena, Puohakamoa and Waikamoi Streams (Wilson Okamoto & Associates, September 1992). The major storage reservoirs include a 10 million gallon (MG) Upper Waikamoi dam/reservoir, a lower concrete Waikamoi dam, two (2) 15 MG open concrete Waikamoi tanks, and a 3 MG steel Olinda tank.

An existing eight (8) inch water line intersects the proposed ductline alignment at approximately the 3,500 foot elevation, within the Lower Kula segment.

4. ***Drainage***

There are no existing drainage improvements in the vicinity of the proposed ductline alignment. Surface runoff flows downhill in a westerly direction and drains into natural drainageways such as the Kaipoioi Gulch and smaller unnamed gulches. Remaining runoff collects in lowlying areas until percolation or evaporation occurs.

5. ***Electrical***

Electrical power requirements associated with the proposed project will be supplied by Maui Electric Company, Ltd., which currently provides power to GTE's Microwave Station located at Haleakala.

Chapter III

Potential Impacts and Mitigation Measures

III. POTENTIAL IMPACTS AND MITIGATION MEASURES

A. PHYSICAL ENVIRONMENT

1. Surrounding Environment

The project site is located in the midst of an open space conservation setting interspersed with pasture lands and agricultural residential lots. Designed to be installed approximately two (2) to three (3) feet below grade, the proposed project is not anticipated to have any adverse effects on surrounding land uses.

2. Topography/Landform

The proposed project will involve the clearing and excavation of a trench approximately two (2) to three (3) deep and twelve (12) inches wide, for approximately 6.2 miles (extending from the summit of Haleakala to Kula Highway), within a 50 to 100 foot corridor. In general, finished contours will follow existing grades to minimize earthwork costs and maintain existing drainage patterns which tie into the immediate surrounding lands. Therefore, the proposed project is not anticipated to result in any adverse impacts to the topography or landform.

3. Flora

Trenching is anticipated to be done by track-mounted earth moving equipment such as a plow, trench excavator or backhoe which require a lane of approximately 15 to 20 feet in width. The actual trench, however, is anticipated to be approximately two (2) to (3) feet deep and 12 inches wide, with topsoil cover to follow immediately after the installation. At-grade "pull-boxes" are proposed to be located approximately 1,500 feet apart throughout the alignment. It encompasses a relatively small area of approximately 3 feet by 5 feet.

One plant species, the sandalwood ('iliahi), found within the proposed corridor is listed on the Federal and State of Hawaii endangered list. It is located on the southern edge of the corridor, at approximately the 6,900 foot elevation. To avoid impacts to this tree, any equipment and trenching work will be conducted to maintain a minimum "setback" distance of at least 5 meters (approximately 16.5 feet) from the tree. Flagging of this area is anticipated to highlight the "setback" limits. Due to the relative width of the ductline corridor (approximately 50 to 100 feet), avoidance of this tree can be accommodated. The wide corridor also allows installation flexibility of the ductline to avoid vegetal constraints such as trees and large shrubs which may be encountered along the ductline alignment.

No other endangered plants were located within the proposed corridor and, consequently, no impacts to the endangered plant communities are anticipated.

It is also anticipated that natural revegetation of the construction area will occur with species that have been established within the general vicinity. A revegetation program for the construction corridor is problematic due to the relative isolation, unique climate, and fauna of the area. However, revegetation will be done for those immediate portions abutting Waipoli Road and care will be taken to minimize the effects of construction throughout the corridor.

4. ***Fauna and Avifauna***

Endangered birds, such as the short-eared owl and the nene, and other native birds which are candidates for the endangered list, are

known to exist in habitats similar to those found in the proposed corridor. During a field survey conducted on July 6, 1995, however, these birds were not sighted within or adjacent to the proposed corridor. The 'i'iwi, which is listed as endangered by the State of Hawaii on Oahu, Molokai and Lanai, however, was observed on a shrub within the proposed corridor. A check for an 'i'iwi nest was conducted, but none were found. Refer to Appendix A. Nesting sites of the endangered dark-rumped petrel within the proposed ductline corridor were also not found. Refer to letter from David Paul to Donald Reeser, August 13, 1995 (Chapter IX of report). It is noted, however, that coordination with Haleakala National Park's Resource Management Specialist is ongoing to minimize any impacts the proposed project may have on any nearby petrel nesting areas as well a other native bird habitats. Thus, impacts to the avifauna population within or in close proximity to the proposed project are not considered adverse given corridor alignment flexibility and the relatively narrow construction corridor and trenching.

Also, due to the potential of the spreading of the Argentine ant into the Haleakala region, the following precautionary methods are considered for the proposed project:

1. Pressure wash all equipment prior to entering Haleakala National Park and inspect and remove any remaining organic matter;

2. Prohibit the importation of fill material to the construction site; and

3. Remove imported food and garbage from construction site.

It is noted that the proposed project does not involve the importation of fill material from lowland areas to the project site since trench excavation, ductline installation, and backfill will occur concurrently throughout the proposed ductline alignment.

The proposed project is not anticipated to impact the fauna and common avifauna population in the Haleakala and Kula regions.

In the event it is necessary to utilize helicopters to transport construction materials to areas of the alignment, materials drop-off areas will be designated within the corridor to avoid any adverse impacts to possible fauna and avifauna habitats.

5. ***Archaeological Resources***

Based on a recent archaeological survey of the proposed corridor, four (4) archaeological sites (2 rock shelters, an agricultural/habitation area, and a historic habitation area) were found within or in close proximity of the proposed alignment. The archaeological survey found that the two (2) rock shelters (Sites 4132 and 4133) are located at the edges of the proposed corridor and will not be impacted by the proposed project. Portions of the agricultural/habitation area (Site 4134), however, are within the corridor. Refer to Appendix B. The applicant will locate the ductline to avoid impacts to Site 4134.

Site 4135 consists primarily of rock terracing, rock cairns, a historic habitation area, as well as several subsurface features. Coordination with an archaeologist and the project engineer during the fiber optics trench design phase was conducted. Consequently, the proposed ductline is anticipated to be located

outside the northerly extent of the intact terracing and other surface features. Refer to Appendix B. In addition, archaeological monitoring is anticipated during the installation phase of this area of the alignment.

Should other archaeological remains be encountered during construction, the State Historic Preservation Division will be notified, and applicable procedures to ensure compliance with Chapter 6E, Hawaii Revised Statutes, will be followed.

6. ***Air Quality***

Air quality in the immediate vicinity of the project is anticipated to be affected by short-term construction activities. Material and equipment carrying vehicles,as well as earthwork operations via plowing, for example, will result in fugitive dust being generated. Should helicopter operations be utilized, dust will be generated for a brief period of time. Hand shoveling, although not anticipated, is also possible in areas where topographic constraints prevent the use of track-mounted equipment. Upon completion of conduit installation, it should be noted that trenched areas shall be immediately backfilled.

On a long-term basis, the project will not generate adverse air quality conditions.

7. ***Noise Quality***

There will be temporary impacts which would be associated with routine construction activities. Construction equipment, such as materials-carrying trucks and track-mounted earth moving equipment, would be the dominant source of noise during the site

construction period. Should helicopters be used, this would also be a brief but intense source of noise. All construction activities are anticipated to be limited to daylight hours only.

8. *Visual Resources*

The project's conduit is designed to be placed two (2) to three (3) feet below grade. "Pull boxes" are also to be placed at grade and spaced approximately 1,500 feet apart throughout the alignment. Accordingly, the proposed project will not have an adverse impact upon the visual character of the surrounding area.

B. *SOCIO-ECONOMIC ENVIRONMENT*

1. *Local Economy*

On a short-term basis, the project will support construction and construction-related employment.

On a long-term basis, the project will aid the long-term economic vitality of Maui by providing a more efficient data transmission system for observational, research and communication facilities at "Science City" and the Kihei Research and Technology Park.

2. *Public Services*

The proposed project is not anticipated to affect the service capabilities of police, fire and emergency medical operations. In addition, the project will not extend the existing service area limits of emergency services. The proposed project will not place new demands on educational services.

A solid waste management plan will be developed in coordination with the Solid Waste Division of the County Department of Public

Works and Waste Management for the disposal of clearing and grubbing material from the project site during construction. Once completed, the proposed project will not be considered a solid waste generator.

3. ***Recreational Facilities***

At approximately the 7,800 foot elevation, the proposed ductline alignment will intersect the Upper Waiakoa hiking trail. Additionally, at the Haleakala Summit Segment, approximately one mile of the ductline alignment is proposed to meander in close proximity along an existing dirt road from approximately the 9,600 foot to 9,000 foot elevations. This existing dirt road is a portion of what is also considered the Skyline Trail.

Hiking activities where the proposed ductline alignment will encounter both trails is anticipated to be temporarily interrupted during the ductline's installation phase. It is noted, however, that the proposed ductline will not be permanently obstructive to both trails and surrounding areas since the ductline system will be placed approximately two (2) to three (3) feet below grade. After construction, grades within the construction area will be restored to pre-construction conditions. Also, once the ductline system is installed, natural revegetation of all land areas are anticipated.

C. ***INFRASTRUCTURE***

1. ***Roadways***

Access to the proposed project site is via a dirt roadway easement at the alignment's northern terminus (Haleakala Summit segment) and Kula Highway, at the alignment's western terminus (Kula segment). Waipoli Road, a dirt road that intersects the proposed

alignment at approximately the 6,400 foot elevation provides vehicular access to this mid-point portion of the alignment (Upper Kaonoulu segment). There will be no new roadways constructed to move equipment into and along the proposed corridor.

With vehicular access points at Mount Haleakala and Waipoli Road, and the ability of the mechanical equipment to traverse the terrain itself or with the use of winches, impacts to the surrounding roadways are not considered adverse since vehicular access is not anticipated to be continuous.

Upon its completion, ductline inspections for maintenance purposes will be performed as required by qualified GTE personnel or an approved contractor. Since the inspections are anticipated to be conducted on an "as required" basis, the proposed project's impacts upon the public roadway system are not expected to be significant.

2. ***Water***

An eight (8) inch waterline at approximately the 6,400 foot elevation intersects with the proposed alignment, within the delineated area identified as the "Kula segment". During construction, relocation or avoidance of the waterline may be necessary to accommodate the proposed ductline. Upon its completion, the proposed project will not require water service.

3. ***Wastewater***

During the installation phase, the use of portable sanitary facilities are anticipated. Upon completion, however, the proposed project will not generate any wastewater.

Chapter IV

Relationships to Governmental Plans, Policies and Controls

IV. RELATIONSHIPS TO GOVERNMENTAL PLANS, POLICIES AND CONTROLS

A. STATE LAND USE DISTRICTS

Chapter 205, Hawaii Revised Statutes, relating to the Land Use Commission, establishes the four major land use districts in which all lands in the State are placed. These districts are designated "Urban", "Rural", "Agricultural", and "Conservation". The proposed project alignment traverses the "Agricultural" and "Conservation" districts. See Figure 5. Specifically, the segments designated as "Haleakala Summit" and "Upper Kaonoulu" segments are within the Conservation District, while the "Kula" segment is within the Agricultural District. The proposed project is permitted in the Agricultural District under the category as a "private utility line".

Chapter 2, of Title 13, Hawaii Administrative Rules, requires that a Conservation District Use Permit (CDUP) be issued by the State Board of Land and Natural Resources (DLNR) to conduct work within the Conservation District.

Title 13 establishes subzones within the Conservation District. These subzones are designated "Protective" (P), "Limited" (L), "Resource" (R), "General" (G), and "Special" (S). At the proposed alignment's eastern terminus located at Haleakala, approximately 2,000 feet of the alignment (within the Haleakala Summit segment) is situated within the "Limited" subzone. See Figure 6. The objective of the "Limited" subzone is to limit uses where natural conditions suggest constraints on human activities.

Makai of the initial "Limited" subzone segment is an approximately 3.2 mile segment of the alignment (within a portion of the Haleakala Summit segment and within the entire Upper Kaonoulu segment), which falls

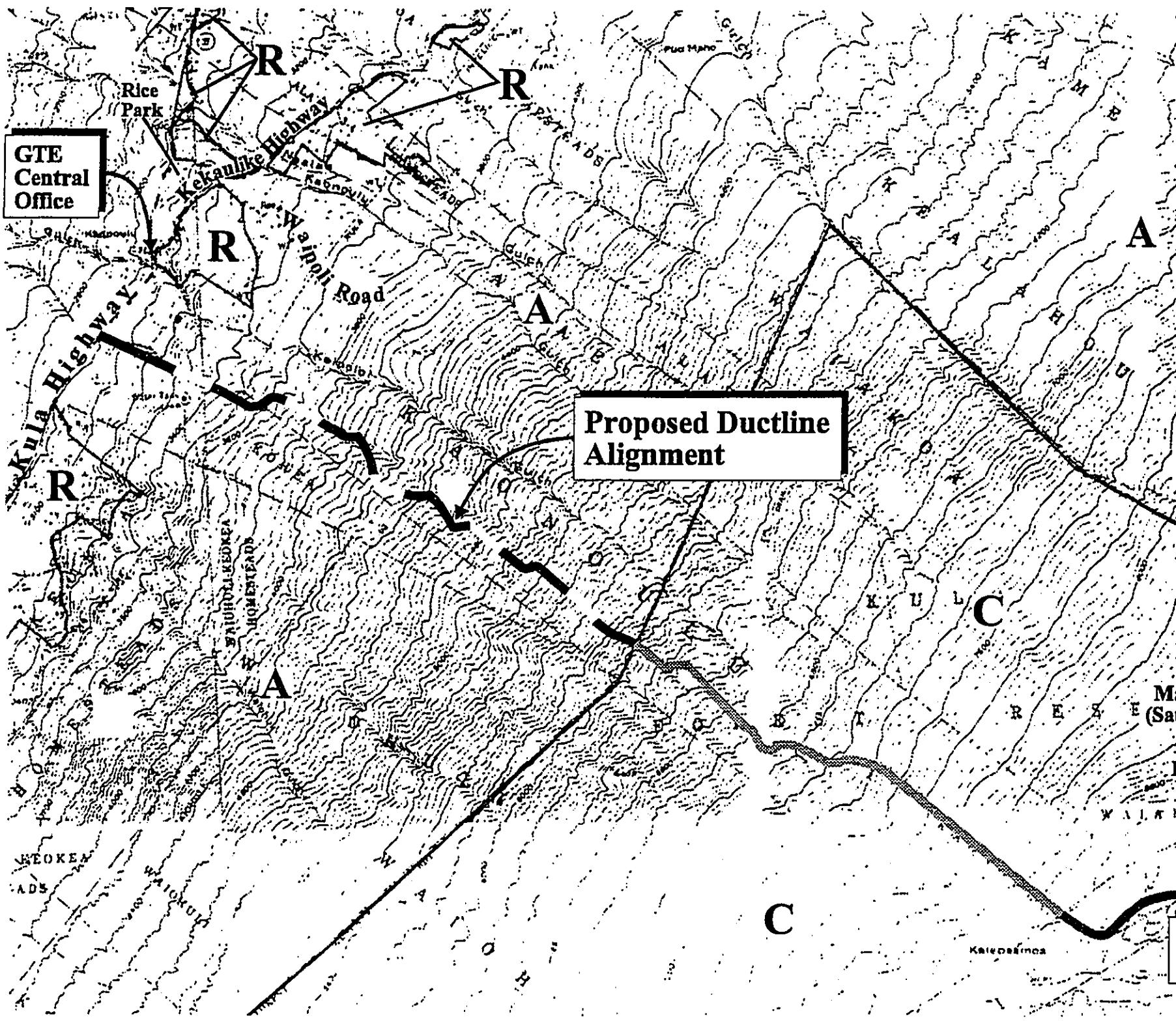

Figure 5

GTE Fiber Optic Ductline
State Land Use District Designations

Prepared for: Austin, Tsutsumi & Associates, Inc.

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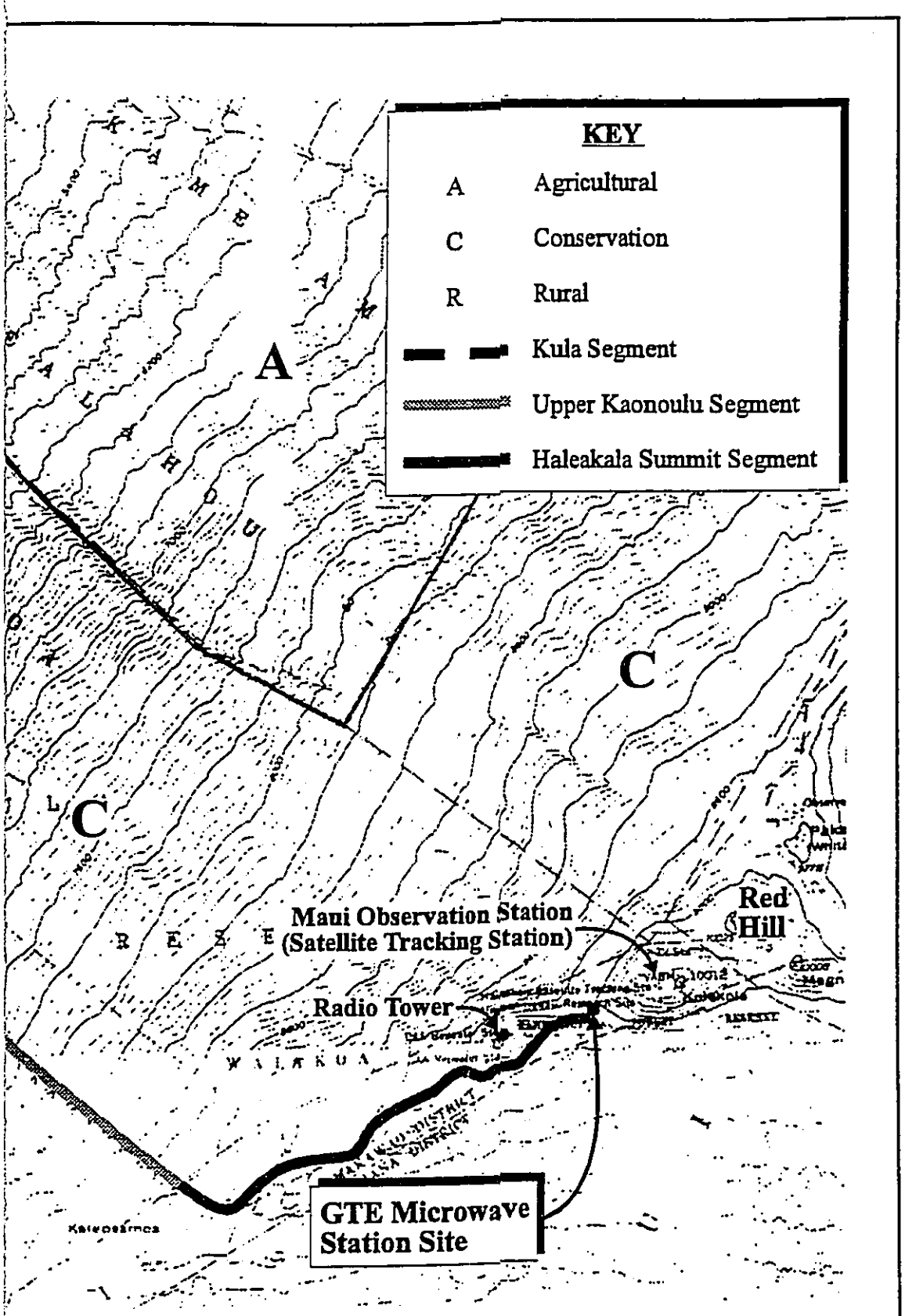

c Ductline

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MUNEKIYO & ARAKAWA, INC.

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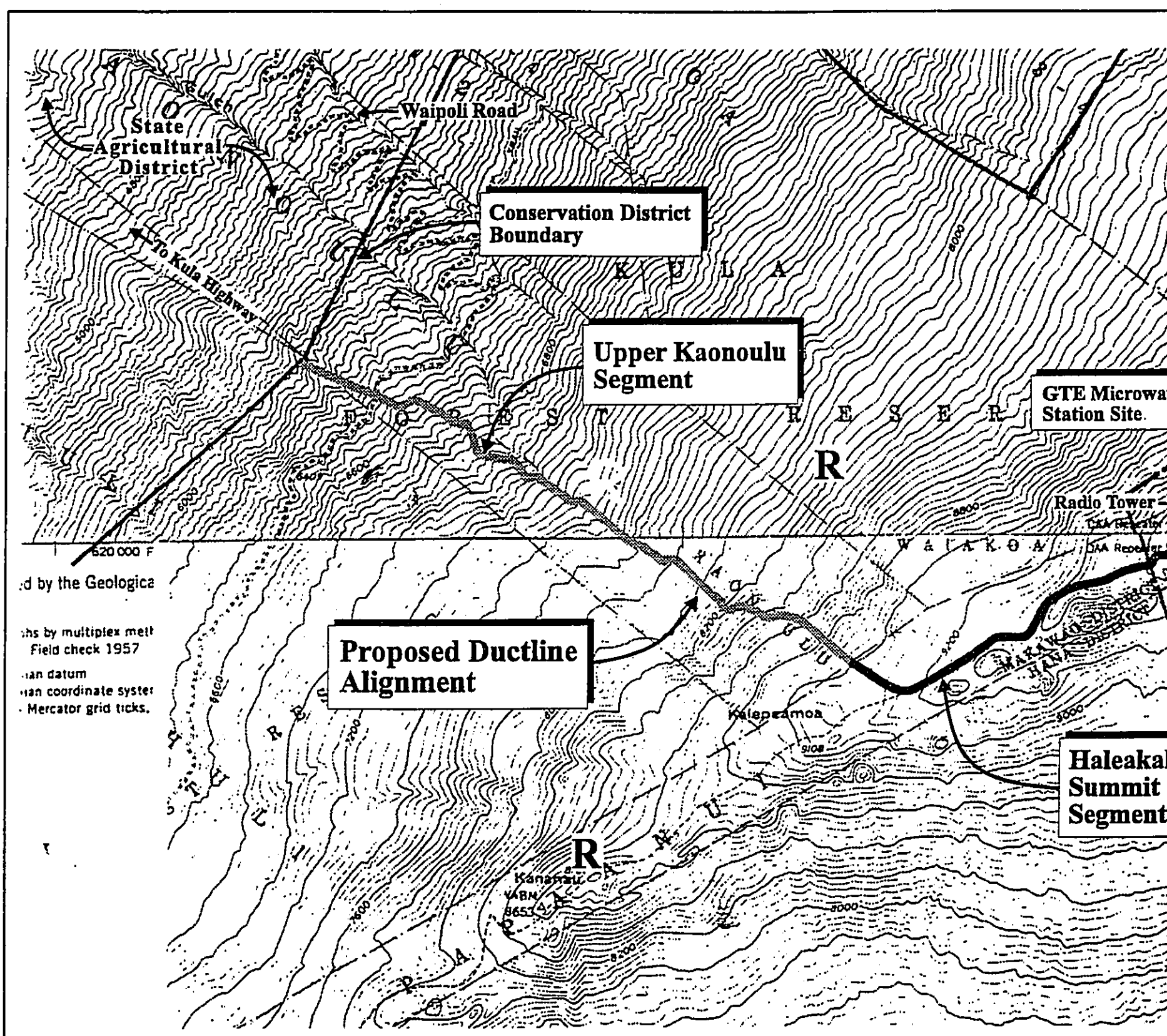

Figure 6

GTE Fiber Optic Ductline

Conservation District Subzone Designations

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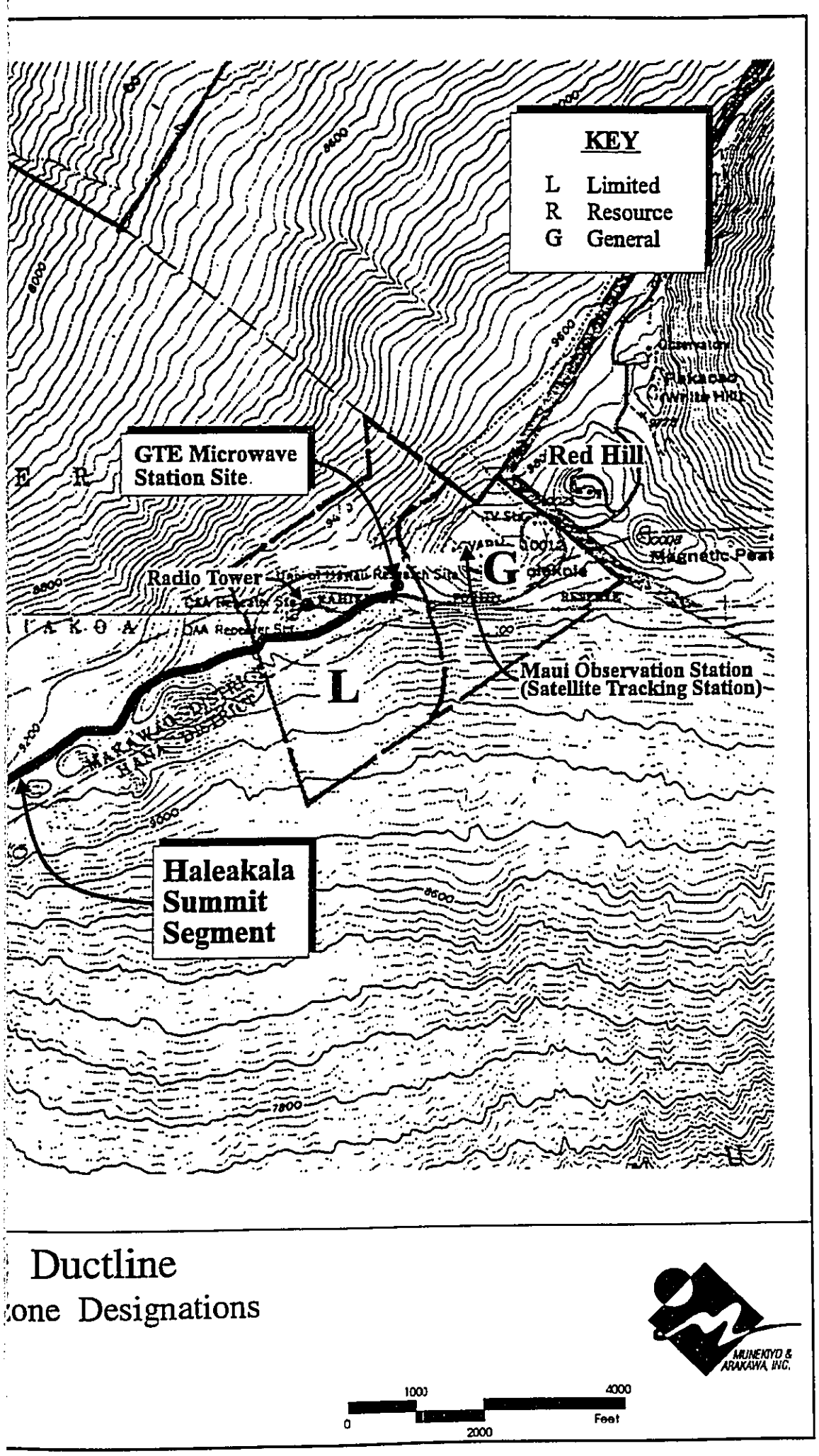


within the "Resource" subzone. Refer to Figure 6. The objective of the "Resource" subzone is to develop, with proper management, areas to ensure sustained use of the natural resources of those areas.

According to the Department of Land and Natural Resources Conservation District Rules, the proposed project may be considered an "identified use" as a public purpose use (D-2). A description of the public purpose use (D-2) is as follows:

> Transportation systems, transmission facilities for public utilities, water systems, energy generation facilities utilizing the renewable resources of the area (e.g., hydroelectric or wind farms) and communications systems and other such land uses which are undertaken by non-governmental entities which benefit the public and are consistent with the purpose of the conservation district.

Accordingly, an application for a Conservation District Use Permit for the proposed project will be prepared and processed in accordance with Title 13.

Thus, with regard to the proposed action's consistency with the purpose of the Conservation District, the following criteria are discussed:

1. ***The proposed land use is consistent with the purpose of the Conservation District:***

   As previously mentioned, according to Title 13 of the Department of Land and Natural Resources, Conservation District Rules, the proposed project is considered as an identified use (public purpose use (D-2)). Thus, the proposed fiber optic ductline project is not contrary to the objectives of the Conservation District.

2. ***The proposed land use is consistent with the objectives of the subzone of the land on which the use will occur:***

As previously mentioned, Conservation District Rules identify the proposed project as a permitted use, and is not contrary to the objectives of the applicable subzones (Limited, Resource).

3. ***The proposed land use complies with provisions and guidelines contained in Chapter 205A, Hawaii Revised Statutes (HRS), entitled "Coastal Zone Management", where applicable:***

The proposed Fiber Optic Ductline project meets the following objectives and policies of the Coastal Zone Management Program:

(a) Recreational Resources

Objective: Provide coastal recreational resources accessible to the public.

Policies:

1. Improve coordination and funding of coastal recreation planning and management; and

2. Provide adequate, accessible and diverse recreational opportunities in the coastal zone management area by:

   a. Protecting coastal resources uniquely suited for recreation activities that cannot be provided in other areas,

   b. Requiring replacement of coastal resources having significant recreational value, including but not limited to surfing sites, fishponds and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;

   c. Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with

recreational value;

d. Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;

e. Ensuring public recreational use of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;

f. Adopting water quality standards and regulating *point and non-point sources* of pollution to protect and where feasible, restore the recreational value of coastal waters;

g. Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and

h. Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, county planning commissions, and crediting such dedication against the requirements of section 46-6.

Response:

The proposed project will not affect coastal zone recreational opportunities. Accessibility to shoreline areas will not be impacted by the proposed action.

(b) Historical/Cultural Resources

Objective: Protect, preserve and where desirable, restore those natural and man-made historic and prehistoric resources in the coastal zone management areas that are significant in Hawaiian and American history and culture.

Policies:

1. Identify and analyze significant archaeological resources;

2. Maximize information retention through preservation of remains and artifacts or salvage operations; and

3. Support state goals for protection, restoration, interpretation and display of historic resources.

Response:

An archaeological survey was conducted within the proposed ductline corridor. Four (4) sites were located within the proposed corridor. Due to a wide corridor (50 to 100 feet), three (3) sites can be avoided. The fourth site (Site 4135 historic habitation area), however, is relatively extensive and falls within the corridor. Since the proposed ductline will be installed outside the northerly extent of Site 4135, disturbance to this site will be avoided. Furthermore archaeological monitoring during the installation phase is also anticipated.

(c) Scenic and Open Space Resources

Objective: Protect, preserve and where desirable, restore or improve the quality of coastal scenic and open space resources.

Policies:

1. Identify valued scenic resources in the coastal zone management area;

2. Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural land forms and existing public views to and along the shoreline;

3. Preserve, maintain and, where desirable, improve and restore shoreline open space and scenic resources; and

4. Encourage those developments which are not coastal dependent to locate in inland areas.

Response:

The proposed project will not adversely impact scenic or open space resources. Upon the completion of the ductline installation, the topographic character of the alignment will be restored to pre-construction conditions.

(d) Coastal Ecosystems

Objective:

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

Policies:

1. Improve the technical basis for natural resource management;

2. Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;

3. Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and

4. Promote water quantity and quality planning and management practices which reflect the tolerance of fresh water and marine ecosystems and prohibit land and water uses which violate state water quality standards.

Response:

The proposed project will not disrupt or impact coastal ecosystems.

(e) ***Economic Uses***

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

Policies:

1. Concentrate coastal dependent development in appropriate areas;

2. Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor facilities and energy-generating facilities, are located, designed, and constructed to minimize adverse social, visual and environmental impacts in the coastal zone management area; and

3. Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:

   a. Use of presently designated locations is not feasible,

   b. Adverse environmental effects are minimized, and

   c. The development is important to the State's economy.

Response:

The proposed project is not contrary to provision of public or private facilities and improvements in suitable locations.

(f) ***Coastal Hazards***

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

Policies:

1. Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;

2. Control development in areas subject to storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;

3. Ensure that developments comply with requirements of the Federal Flood Insurance Program;

4. Prevent coastal flooding from inland projects; and

5. Develop a coastal point and nonpoint source pollution control program.

Response:

The proposed action is governed by controls on development through the administration of Conservation District provisions. The proposed action is not anticipated to adversely impact downstream or adjacent properties, and is not located within flood-prone areas.

(g) Managing Development

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

Policies:

1. Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;

2. Facilitate timely processing of application for development permits and resolve overlapping of conflicting permit requirements; and

3. Communicate the potential short and long-term impacts of proposed significant coastal developments

early in their life-cycle and in terms understandable to the public to facilitate public participation in the planning and review process.

Response:

Agency input was solicited prior to and during the Environmental Assessment process. Public comments will also be afforded during the draft and final Environmental Assessment public review periods as well as the Conservation District Use Permit process.

(h) Public Participation

Objective: Stimulate public awareness, education, and participation in coastal management.

Policies:

1. Maintain a public advisory body to identify coastal management problems and to provide policy advice and assistance to the coastal zone management program;

2. Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal-related issues, developments, and government activities; and,

3. Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.

Response:

The proposed project is subject to the Environmental Assessment process and the Conservation District Use Permit process. The project is not contrary to the objective of public awareness, education, and participation in coastal management.

(i) ***Beach Protection***

Objective: Protect beaches for public use and recreation.

Policies:

1. Locate new structures inland from the shoreline setback to conserve open space and to minimize loss of improvements due to erosion;

2. Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and

3. Minimize the construction of public erosion-protection structures seaward of the shoreline.

Response:

The proposed ductline alignment extends approximately 6.2 miles from Mount Haleakala to Kula Highway and is not anticipated to impact shoreline activities.

4. The proposed land use will not cause substantial adverse impact to existing natural resources within the surrounding area, community or region:

As described in the previous chapters, the proposed project is not anticipated to adversely impact existing natural resources within the surrounding area of the ductline corridor.

5. The proposed land use, including buildings, structures and facilities, shall be compatible with the locality and surrounding areas, appropriate to the physical conditions and capabilities of the specific parcel or parcels:

The proposed ductline will be located approximately two (2) to three (3) feet below grade with "pull boxes" located at grade level. In this regard, there will be no significant visible changes to the environment as a result of the project.

6. ***The existing physical and environmental aspects of the land, such as natural beauty and open space characteristics, will be preserved or improved upon, whichever is applicable:***

Upon completion of the project, the existing land uses along the proposed fiber optic ductline is anticipated to remain as either open space, shrublands or pasture use. Thus, land use characteristics along the proposed ductline alignment will not be adversely impacted.

7. ***Subdivision of land will not be utilized to increase the intensity of land uses in the Conservation district:***

The proposed action does not involve the subdivision of land to increase land use intensity.

8. ***The proposed land use will not be materially detrimental to the public health, safety and welfare:***

The proposed project is not considered detrimental to the public's health, safety and welfare.

B. ***GENERAL PLAN OF THE COUNTY OF MAUI***

The General Plan of the County of Maui (1990) update provides long term goals, objectives and policies directed toward the betterment of living conditions in the county. Addressed are social, environmental, and economic issues which influence both the quantity and quality of growth in Maui County. The following General Plan objectives and policies are addressed by the proposed project:

Objective: To provide an economic climate which will encourage controlled expansion and diversification of the County's economic base.

Policies:

a. Maintain a diversified economic environment compatible with acceptable and consistent employment.

b. Support programs, services, and institutions which provide economic diversification.

It is anticipated that observational and research facilities will utilize GTE's fiber optic service as it will provide an efficient data processing and receiving system which will facilitate high technology research and operations.

C. ***MAKAWAO-PUKALANI-KULA COMMUNITY PLAN***

Nine (9) community plan regions have been established in Maui County. Each region's growth and development is guided by a Community Plan, which contain objectives and policies drafted in accordance with the County General Plan. The purpose of the Community Plan is to outline a relatively detailed agenda for carrying out these objectives.

Maps are included within each Community Plan in order to capture spatially the intent of the plan. Approximately 3.6 miles of the proposed alignment (beginning at the summit of Haleakala) is within lands designated "Conservation" by the Makawao-Pukalani-Kula Community Plan Land Use Map.

The remainder of the proposed alignment, proceeding down to Kula Highway, is on lands designated "Agriculture" by the region's Community Plan Land Use Map.

The proposed project is not contrary to the Makawao-Pukalani-Kula land use map.

D. ***OTHER REGULATORY CONSIDERATIONS***

At approximately the 7,000 foot elevation and above the approximately

3,000 foot elevation, the proposed ductline corridor meanders in close proximity (south) of the Kaipoioi Gulch. The Kaipoioi Gulch is delineated as an intermittent stream on the United States Geological Survey Map at these elevations. While the proposed ductline alignment is in proximity to the Kaipoioi Gulch, there will be no crossing of the gulch, nor will the installation of the ductline alter or disturb the Kaipoioi Gulch embankment. Accordingly, regulatory requirements such as the Department of the Army Permit, Stream Channel Alteration Permit, Section 401 Water Quality Certification and the Hawaii Coastal Zone Management Program Consistency Assessment are not applicable.

Chapter V

Summary of Adverse Environmental Effects Which Cannot be Avoided

V. SUMMARY OF ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

The proposed project development will result in some construction-related impacts as described in Chapter III, Potential Impacts and Mitigation Measures.

Potential effects include noise-generated impacts occurring from construction activities. In addition, there may be temporary air quality impacts associated with dust generated from construction activities, and exhaust emissions discharged by construction equipment.

Accordingly, the proposed project is not anticipated to create any long-term adverse environmental effects.

Chapter VI

Alternatives to the Proposed Action

VI. ALTERNATIVES TO THE PROPOSED ACTION

A. ALTERNATIVES CONSIDERED

With regard to construction costs, the proposed alignment corridor (50 to 100 feet wide) was selected since it avoids large lava beds typical of the Haleakala and forest areas typical of the upper Kula region. The proposed alignment corridor consists generally of soils suitable for the installation of the fiber optic ductline.

It is noted, however, that an alternative route was considered within the Kula Segment, at approximately the 4,500 foot elevation. At this point of the alignment, instead of meandering towards Kula Highway in a westerly direction, the alignment would have shifted in a northeasterly direction, cross Kaipoioi Gulch, and continue northerly to a utility line located on Waipoli Road. This alignment, however, was deemed too costly due to the construction requirements at the Kaipoioi Gulch crossing. (See Figure 7).

The use of above-ground utility poles was another alternative considered for the proposed project. This alternative involved an aerial cable run along the existing Maui Electric Company poleline to the summit of Haleakala. The concerns raised with this route involved wind moment loads, poleline accessibility, and exposure of the fiber optic cable to the weather. Wind moment load calculations performed by Maui Electric Company required that a majority of the 100 poles on their existing poleline to the summit would have to be replaced. Additional guy wires and anchors were required to ensure the structural integrity of the poleline. The accessibility of the poleline was also an issue. Many poles were initially set in lava rock and digging and setting the new pole would require a substantial amount of equipment to be flown into the remote locations. The final consideration for this alternative was the weather.

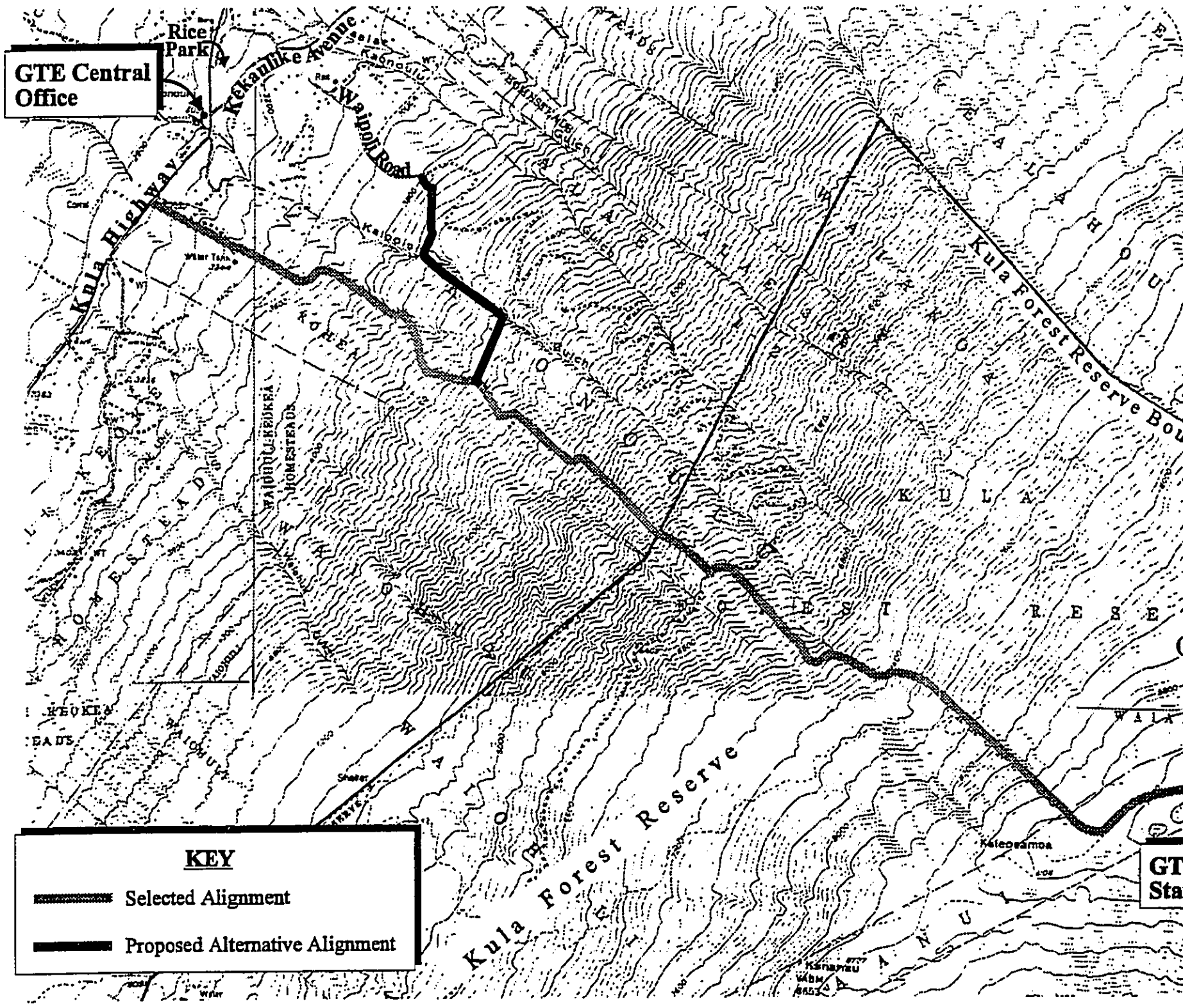
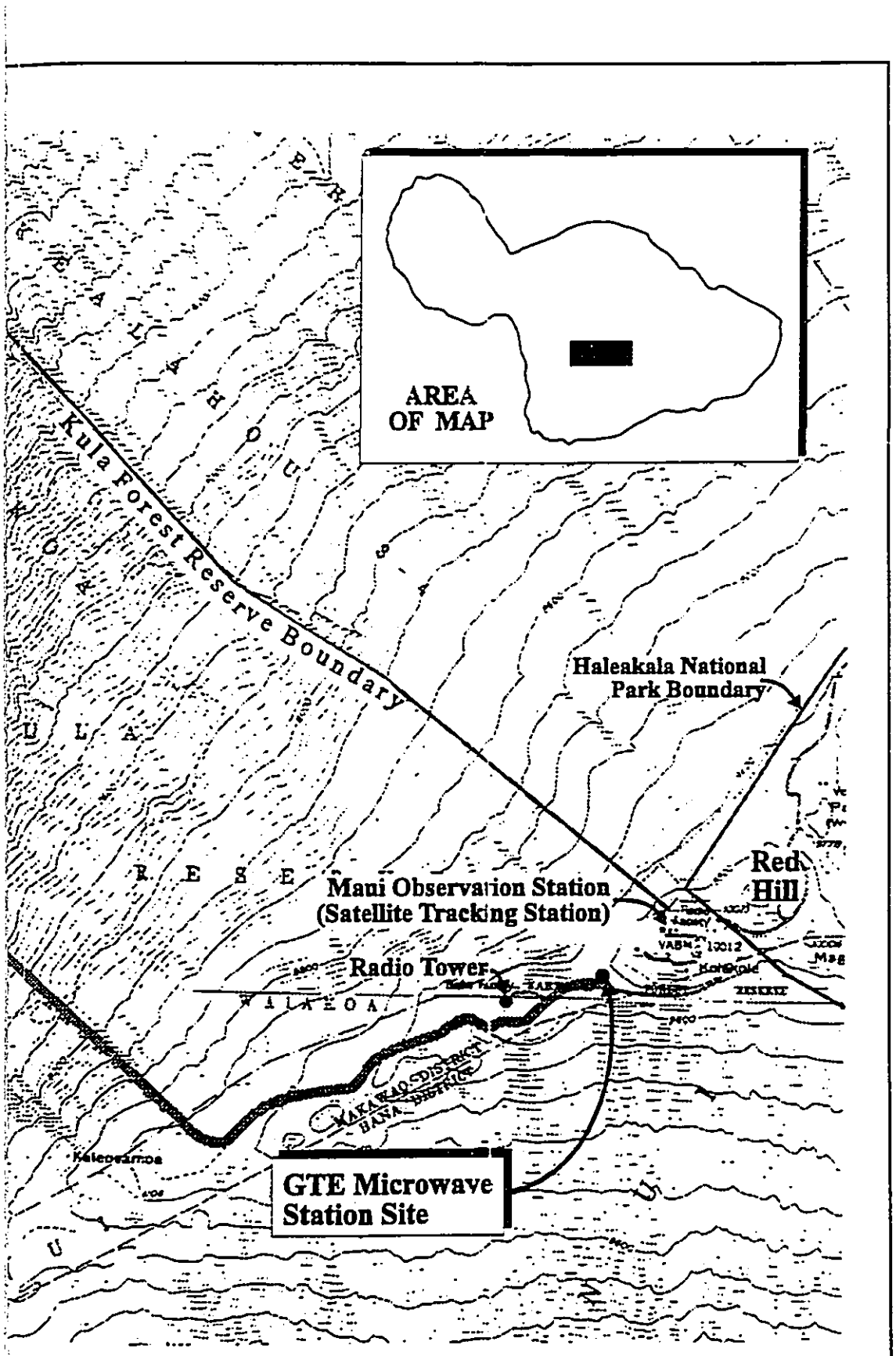


Figure 7

GTE Fiber Optic Ductline

Proposed Alternative Ductline Alignment

Prepared for: Austin, Tsutsumi & Associates, Inc.



Ductline

ctline Alignment

MUNEKIYO & ARAKAWA, INC.

NOT TO SCALE

With the annual winter storms along the slopes, and at the summit of Haleakala, the fiber optic cable strung along the aerial poleline would be subjected to damage and prolonged outages should poles or crossarms break. Customers utilizing the fiber optic cable will be running high speed, high capacity data, and prolonged outages will not be acceptable. All of the above factors added substantially to the cost of this alternative and still did not ensure the integrity of the fiber optic network.

Another alternative considered was to add additional microwave radio systems to the existing radio link at the Haleakala microwave station. This alternative, however, is not feasible due to the lack of usable frequencies allocated by the Federal Communications Commission. Also, microwave radio systems have limitations on their bandwidth capacity and will not be able to handle the requirements being requested/explored by existing and proposed GTE customers at "Science City" and the Kihei Research and Technology Park.

B. ***NO ACTION ALTERNATIVE***

The proposed fiber optic ductline is essential in enhancing the capacity and operational capabilities of the existing GTE microwave radio station at the summit of Haleakala. The microwave radio station is presently being utilized to its circuit capacity. Also, due to the limited bandwidth capacity of microwave radios, this present configuration is not capable of providing the full services requested by GTE customers at "Science City" and the Kihei Research and Technology Park.

As previously mentioned, the fiber optic cable will provide communications, observational, and research facilities on Maui with an efficient, high-capacity transmission system capable of transporting data faster and in greater quantities than the present transmission systems.

Potential customers of the fiber optic system include facilities located at Haleakala's "Science City" and the Kihei Research and Technology Park.

It is noted that another benefit of the fiber optic ductline project involves GTE's telephone customers. In the event that the Haleakala - Wailuku microwave transmission link should experience problems, the interisland traffic could be rerouted through the fiber optic system, thus minimizing customer impact.

Given the public benefits associated with the proposed action, the "no action" alternative was not considered appropriate.

Chapter VII

Irreversible and Irretrievable Commitments of Resources

VII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The proposed installation of the fiber optic ductline and appurtenances would involve the commitment of fuel, labor, funding, and material resources.

Development of the proposed project will involve the commitment of land for the proposed corridor alignment which may limit other land use options. After completion of the project, however, the ground surface will complement the adjacent topography. The only visual difference will be the pullboxes which will be above ground, approximately 1,500 feet apart. In the context of the surrounding Conservation and Agricultural District lands, this commitment of land resources is deemed appropriate.

Chapter VIII

Findings and Conclusions

VIII. FINDINGS AND CONCLUSIONS

The "Significance Criteria", Section 12 of Hawaii Administrative Rules Title 11, Chapter 200, "Environmental Impact Statement Rules", were reviewed and analyzed to determine whether the proposed project will have significant impacts to the environment. The following analysis is provided:

1. *No Irrevocable Commitment to Loss or Destruction of any Natural or Cultural Resource Would Occur as a Result of the Proposed Project*

An alignment corridor varying between 50 feet to 100 feet is proposed for the installation of the underground ductline. A wide corridor will allow installation flexibility of the ductline to avoid topographical, vegetal and other environmental constraints that may be encountered along the proposed 6.2-mile ductline alignment.

An archaeological survey was conducted within the proposed ductline corridor. Four (4) sites were located within the proposed corridor. Due to a wide corridor (50 to 100 feet), three (3) sites can be avoided. The fourth site, however, is relatively extensive and falls within the corridor. Since the proposed ductline will be installed outside the northerly extent of the fourth site, disturbance to this site will be avoided. Should any cultural remains be identified during construction, however, work will stop in the immediate vicinity and SHPD consulted to establish an appropriate mitigation strategy.

2. *The Proposed Action Would Not Curtail the Range of Beneficial Uses of the Environment*

The proposed project will involve the commitment of lands in the Conservation District which will preclude other land options for the site. Conservation District Rules, however, identify the proposed project as an

identified use (D-2) and is not contrary to the objectives of the Conservation District.

3. ***The Proposed Action Does Not Conflict With the State's Long-Term Environmental Policies or Goals or Guidelines as Expressed in Chapter 344, Hawaii Revised Statutes***

The State Environmental Policy and Guidelines are set forth in Chapter 344, Hawaii Revised Statutes (HRS) and were reviewed in connection with the proposed project. The proposed action is in consonance with the State's long-term environmental policies and goals of Chapter 344, HRS.

4. ***The Economic or Social Welfare of the Community or State Would Not be Substantially Affected***

It is anticipated that the development of the proposed project would result in economic and scientific benefits for the Island of Maui.

5. ***The Proposed Action Does Not Affect Public Health***

The proposed project site is isolated from urban activities and will be located at grade or two (2) to three (3) feet below grade No impacts to the public's health and welfare are anticipated.

6. ***No Substantial Secondary Impacts, Such As Population Changes or Effects On Public Facilities, Are Anticipated***

The proposed project will not affect the island's population base or place new demands on the Island's public facilities.

7. ***No Substantial Degradation of Environmental Quality is Anticipated***

Excavation and grading activities will create temporary nuisances related to noise and dust. Appropriate dust control measures will be implemented by the contractor to ensure that fugitive dust generated in connection with construction is minimized. Furthermore, construction-related noise at the enhancement site is not anticipated to be problematic since the site is located away from urban activities.

8. ***The Proposed Action Does Not Involve a Commitment to Larger Actions, Nor Would Cumulative Impacts Result in Considerable Effects On The Environment***

The proposed project is intended to upgrade the facilities of GTE's Haleakala Microwave Station and is not part of a larger action nor is it anticipated to create any significant long-term adverse environmental effects.

9. ***No Rare, Threatened or Endangered Species or Their Habitats Would Be Affected By The Proposed Action***

Coordination with the Haleakala National Park Service is currently ongoing to minimize any impacts the proposed project may have on any nearby dark-rumped petrel nesting areas as well as other avifauna common to the Haleakala and Kula regions. Impacts to the avifauna population within the project site are not anticipated to be adverse given corridor alignment flexibility and the relatively narrow construction corridor and trenching.

Additionally, one plant species, the sandalwood ('iliahi), found within the proposed corridor is listed on the Federal and State of Hawaii endangered list. To avoid impacts to this tree, construction activities to be conducted

will maintain a minimum setback distance of at least 5 meters (approximately 17 feet) from the tree. Also, as previously stated, the wide corridor allows installation flexibility to avoid endangered plant species such as the sandalwood tree.

10. *Air Quality, Water Quality or Ambient Noise Levels Would Not Be Detrimentally Affected by the Proposed Project*

Construction activities for the proposed project will primarily involve excavation and grading. This type of construction activity creates temporary nuisances related to noise and dust. Appropriate dust control measures (e.g., water application to freshly graded areas) will be implemented by the contractor where warranted (e.g., Haleakala segment, Waipoli Road) to minimize wind-blown emissions. For the remainder of the ductline alignment, fugitive dust due to construction activities will not have adverse impacts due to the relative isolation of this portion of the project site from urban activities.

All construction activities will be limited to normal daylight hours. Additionally, noise-related impacts are not considered adverse due to the relative isolation of the project site from urban activities.

It is noted that natural revegetation of the construction area will occur with species that have been established within the general vicinity. A revegetation program for the construction corridor is problematic due to the relative isolation, unique climate, and fauna of the area. However, revegetation will be done for those immediate areas abutting Waipoli Road and care will be taken to minimize the effects of construction throughout the corridor.

Water quality in the immediate area of the project site is not anticipated

to be adversely affected by the proposed project.

11. ***The Proposed Project Would Not Affect Environmentally Sensitive Areas, Such as Flood Plains, Tsunami Zones, Erosion-prone Areas, Geologically Hazardous Lands, Estuaries, Fresh Waters or Coastal Waters***

The proposed project, which is located near the summit of Haleakala and the Kula region, will not impact existing drainage patterns and will not affect drainage and/or flooding conditions at neighboring or downstream properties.

In light of the foregoing findings, it is concluded that the proposed action will not result in any significant impacts.

Chapter IX

Agencies Consulted During the Preparation of the Environmental Assessment

IX. AGENCIES CONSULTED DURING THE PREPARATION OF THE ENVIRONMENTAL ASSESSMENT

The following agencies were contacted prior to the preparation of the Draft Environmental Assessment.

1. U. S. Army Corps of Engineers
   Pacific Ocean Division
   Building 230
   Fort Shafter, Hawaii 96858

2. Mr. Neal Fujiwara
   U.S. Department of Agriculture
   Natural Resources
   Conservation Service
   210 Imi Kala Street, Suite 209
   Wailuku, Hawaii 96793

3. Department of the Interior
   National Park Service
   Haleakala National Park
   P.O. Box 369
   Makawao, Hawaii 96768

4. U.S. Fish and Wildlife Service
   Pacific Islands Office
   P. O. Box 50167
   Honolulu, HI 96850

5. Herb Matsubayashi, Acting
   Chief Sanitarian
   State of Hawaii
   Department of Health
   54 High Street
   Wailuku, Hawaii 96793

6. Department of Land and
   Natural Resources
   Office of Conservation and
   Environmental Affairs
   P. O. Box 621
   Honolulu, Hawaii 96809

7. Ms. Theresa Donham
   Department of Land and
   Natural Resources
   State Historic Preservation Division
   1325 L. Main Street, #108
   Wailuku, Hawaii 967938

8. Department of Land and Natural
   Resources
   Water Resources Management
   Division
   P. O. Box 621
   Honolulu, Hawaii 96809

9. Gwen Ohashi, Acting Director
   County of Maui
   Department of Planning
   250 South High Street
   Wailuku, Hawaii 96793

10. Charles Jencks, Director
    County of Maui
    Department of Public Works
    and Waste Management
    200 South High Street
    Wailuku, HI 96793

United States Department of the Interior

NATIONAL PARK SERVICE
Haleakala National Park
P.O. Box 369
Makawao, Maui, Hawaii 96768

IN REPLY REFER TO:

August 7, 1995

Mr. Milton Arakawa
Munekiyo & Arakawa, Inc.
1823 Wells Street, Suite 3
Wailuku, HI 96793

Dear Mr. Arakawa:

Your July 10, 1995 letter to our Regional Office in San Francisco has been forwarded to us for comments.

Although we assume that your EA process will address possible impacts on the native vegetation and invertebrates, we wish to convey our concerns regarding the federally and state endangered Hawaiian ground-nesting petrel or **'UA'U** (*Pterodroma phaeopygia sandwichesis*). Below are our concerns/comments:

What type of equipment will be used to trench within the proposed corridor? Will the project employ "earth shaking" equipment that may collapse **'UA'U** burrows within possible **'UA'U** habitat? The upper project area is a known fly-way for the **'UA'U** but has not been surveyed as a nesting area/habitat.

Will a helicopter be employed to pass materials along the way? This method may be economical but may be a potential hazard to the **'UA'U** with rotor wash and ground vibrations.

What time of year will the trenching take place? The **'UA'U** are around from March to November.

Lastly, will the fiber optic line be extended into the new Air Force facility currently under construction?

Please keep us informed as to the progress of your draft EA.

Sincerely,

Donald W Reeser

Donald W. Reeser
Superintendent

August 13, 1995

TO: Donald W. Reeser
Superintendent
National Park Service
Haleakala National Park
P.O. Box 369
Makawao, Maui, HI 96793

FROM: David Paul
Natural Science Fieldwork & Research
839 Manono St.
Hilo, HI 96720

RE: GTE Fiberoptics Project Corridor and the Hawaiian Petrel (*Pterodroma phaeopygia sandwichensis*).

Dear Mr. Reeser,

Your August 7, 1995 letter to Mr. Arakawa has been called to the attention of Xamanek Researches. I have been asked to comment on this matter as field biologist for Xamanek Researches.

The Hawaiian Petrel or 'ua'u (*Pterodroma phaeopygia sandwichensis*) typically does not reside in habitat found within the project area. It's nesting habitat on Maui is known to be in rock burrows on the steep slopes found within Haleakala Crater (Hawai'i Audubon Society, 1986, p.14; Pratt, et al, 1987, p.68).

The upper project area is an alpine cinder desert with little life occuring there. There are a few rock outcrops with hollows that could be used as burrows within and close to the corridor in that area. But, there was no evidence to be found that any macrofaunal species utilize these places, with the exception of the feces of feral goats. There were no nests of any kind found in the upper project area, and nests were not found anywhere within the entire corridor. The high incidence of feral animals in the corridor is explanatory to the lack of nests in that area.

Thank you.

David Paul

David Paul

REFERENCES:

Hawai'i Audubon Society. 1986. "Hawaii's Birds".
Hawai'i Audubon Society. Honolulu, HI. 96p.

Pratt, H. D., Bruner, P.L., & Berrett, D.G. 1987. "The Birds of Hawaii and the Tropical Pacific".
Princeton University Press. Princeton, NJ. 409p.

CORRECTION

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

August 13, 1995

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Superintendent
National Park Service
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Thank you.

David Paul

David Paul

REFERENCES:

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SEP 25 1995

United States Department of the Interior

NATIONAL PARK SERVICE
Haleakala National Park
P.O. Box 369
Makawao, Maui, Hawaii 96768

IN REPLY REFER TO:

September 21, 1995

David Paul
Natural Science Fieldwork & Research
839 Manono St.
Hilo, HI 96720

Dear Mr. Paul:

Thank you for your 13 August response concerning the Hawaiian Dark-rumped petrel. From this letter, we gather that you are involved with the environmental assessment for the GTE Fiber Optic Ductline on Maui. We hope that the following information will be of benefit to you and those involved parties.

As you may know, Haleakala is home to the world's largest known breeding colony of the Hawaiian Dark-rumped petrel, otherwise known as the 'UA'U. Work on the 'UA'U began in the mid-1960's by independent researchers, and was continued by the National Park Service in 1969 to 1978. In 1979, a graduate student from the University of Washington completed a doctoral dissertation on the biology and conservation of the 'UA'U. Seasonal staff monitored nests as a result of this dissertation. In 1988, the Park hired permanent staff to concentrate on the 'UA'U and other endangered species within the Park. Since then, Resource Management (RM) Specialist, Hodges, and her crew have conducted extensive work on the 'UA'U. Hodges also completed a completed a master's thesis on the effects of predator control on the 'UA'U in 1994.

On 24 August 1995, upon request from the U. S. Fish and Wildlife Service (USFWS), Hodges and her crew surveyed the proposed area and found active 'UA'U nests within 20 meters of the proposed corridor. This finding was conveyed to USFWS for their reference.

According to Hodges, 'UA'U nests can be easily overlooked, even with proper skills. Should you need future assistance on identifying active 'UA'U nests and techniques on finding nests, please contact Hodges at 572-9306 ext. 5960.

Sincerely,

Donald W. Reeser
Superintendent

cc: Munekiya & Arakawa, Inc.
USFWS, Ecological Services
Haleakala Resources Management

AUG 29 1995

United States Department of the Interior

FISH AND WILDLIFE SERVICE
PACIFIC ISLANDS OFFICE
500 ALA MOANA BLVD, SUITE 3-580
HONOLULU, HI 96813
tel:(808) 541-3441 fax:(808) 541-3470

In Reply Refer To: AAP

AUG 25 1995

Mr. Milton Arakawa
Munekiyo & Arakawa, Inc.
1823 Wells Street, Suite 3
Wailuku, Hawaii 96793

Re: Installation of Underground Fiber Optic Ductline, Maui, Hawaii

Dear Mr. Arakawa:

The U.S. Fish and Wildlife Service (Service) has reviewed the proposal to install 12 kilometers (7.75 miles) of underground ductlines containing fiber optic cables and appurtenances to upgrade a microwave station located near the Haleakala Crater in Maui, Hawaii. The project sponsor is the GTE Hawaiian Telephone Company. The Service offers the following comments for your consideration.

The purpose of the proposed project is to upgrade the existing GTE microwave station by providing additional microwave power for the telescopes of the observational and research stations located near the summit of Haleakala. Installation of the underground ductlines will require an alignment corridor measuring 15 meters [m] to 30 m (50 feet [ft] to 100 ft) in width. The main ductline will be placed 0.6 m (2 ft) below grade. A second ductline will also be placed beside the main ductline as a backup supply to the main ductline.

Although the proposed alignment appears to be the most direct route to the GTE microwave station site, we are concerned that the project may affect fish and wildlife resources along this alignment. Review of our historical and contemporary records indicate the presence of several populations of rare and endangered plants and sightings of native forest birds and the Hawaiian hoary bat (*Lasiurus cinereus semotus*) within the project area. Of particular concern to the Service is the potential for this project to negatively impact ground-nesting, dark-rumped petrels (*Pterodroma phaeopygia sandwichensis*). National Park Service staff have verified that active petrel nests are located within 10 m of the alignment corridor.

The Service recommends that the National Park Service data on petrels be included in the draft Environmental Assessment (EA). Additionally, we recommend that surveys be conducted in the

project area for other endangered and threatened species of flora and fauna. Surveys should also be conducted to identify other native species such as Category 1 Candidate species in the project area. A Category 1 Candidate Species is one for which the Service possesses substantial information to support a proposal to list as threatened or endangered. Example species in the area include a native Aiea plant (*Nothecestrum latifolium*) and the sphinx moth (*Manduca blackburni*). The results of these surveys should be incorporated into the draft EA. Potential impacts to native fish and wildlife species, including endangered and threatened species, and their habitats and mitigation measures to minimize any identified impacts should also be addressed in the draft EA.

The Service recommends that the project proponent explore additional routes that may avoid native forests and sensitive fish and wildlife resources. Justification for the selection of a preferred route over other alternatives and the width of the ductline should be provided in the document.

Finally, the Service is concerned with potential alien invasions of the Argentine ant (*Iridomyrmex humilis*) into the Red Hill area. Known ecological impacts associated with the invasion of this ant have been observed at the Haleakala National Park. This ant, which has been introduced to native habitats at Haleakala by humans during construction projects, poses a serious threat to shrubland ecosystems on Maui. Therefore, the Service recommends that the project proponent contact Dr. Lloyd Loope, National Biological Service Research Scientist at the Haleakala National Park, for information on specific measures that can be implemented as a part of this project to prevent accidental dispersion of this ant into Red Hill and adjacent areas. Dr. Loope's contact number is (808) 572-9306 extension 5936.

We appreciate the opportunity to comment and are willing to provide technical assistance upon request. If you have questions regarding these comments, please contact Fish and Wildlife Biologist Arlene Pangelinan at 808/541-3441.

Sincerely,

Brooks Harper

Brooks Harper
Field Supervisor
Ecological Services

cc: Cultural and Natural Resource Manager, Haleakala National Park, Maui
National Biological Service, Maui

Chapter X

Correspondence Received During the Review of Agency and Public Comment Period and Responses to Substantive Comments

APR . 1 5 1996

BENJAMIN J. CAYETANO
GOVERNOR

GARY GILL
DIRECTOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

220 SOUTH KING STREET
FOURTH FLOOR
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-4186

April 11, 1996

Michael Wilson, Chairperson
Office of Conservation and Environmental Affairs
Department of Land and Natural Resources
1151 Punchbowl St.
Honolulu, Hawaii 96813

Attention: Don Horiuchi

Dear Mr. Wilson:

Subject: Draft Environmental Assessment (EA) for GTE Fiber Optic Ductline, Haleakala to Kula, Maui; TMK: 2-2-7: 1, 2, 5, 10, 11, 12 and 2-2-6: 9

We believe it is likely that the environmetal impacts of this project will be greater than those caused by a narrow trench containing a fiber optic line. To construct the trench heavy equipment will be used and must be transported to and from the project site. Development of roadways to move this equipment into and along the proposed corridor may be environmentally significant. In the final EA include a discussion of the impacts of moving equipment in and out of the the project site corridor and any related mitigation measures.

In addition please consult with any neighbors and community groups and in the final EA inciude documentation of your contacts.

If you have any questions call Nancy Heinrich at 586-4185.

Sincerely,

GARY GILL
Director

c: Calvin Choi
Daniel Soares

GTE Hawaiian Tel
Beyond the call

GTE Hawaiian Telephone Company Incorporated
60 South Church Street • Wailuku, HI 96793 • 808 242-510

May 17, 1996

Mr. Gary Gill, Director
Office of Environmental Quality Control
Attn: Nancy Heinrich
220 South King Street
Fourth Floor
Honolulu, HI 96813

SUBJECT: Draft Environmental Assessment for GTE Fiber Optic Ductline, Haleakala to Kula, Maui

Dear Mr. Gill:

We have received a copy of your letter addressed to Michael Wilson, Director of the Department of Land and Natural Resources, Office of Conservation and Environmental Affairs dated April 11, 1996. We would like to take this opportunity to respond to your comments.

An alignment corridor varying between 50 feet to 100 feet near the summit of Haleakala to Kula Highway is proposed for the installation of the underground ductline. A wide corridor will allow installation flexibility for the ductline to avoid topographical, vegetal and other environmental constraints, (e.g., large lava beds, archaeological sites, endangered plants, trees, large shrubs) that may be encountered along the proposed 6.2 mile ductline alignment. This installation flexibility will aid in minimizing impact upon the existing environment.

Construction methods to install the ductline involve utilizing mechanical earth moving equipment which typically require a construction lane of approximately 15 to 20 feet in width in order to plow a trench approximately two (2) to three (3) feet deep and 12 inches wide.

Construction materials will be trucked in to the eastern-most portion of the alignment on existing roadways near the summit of Haleakala. Construction will then proceed within the alignment corridor to progressively lower elevations until reaching the Kula Highway. All equipment and materials are anticipated to be brought in by trucks, track-mounted mechanical earth moving equipment, or by helicopter, if necessary, and will remain within the project corridor until the completion of the project. There will be no new roadways constructed to move equipment into and along the corridor.

With regard to consultation with community groups, copies of the Draft Environmental Assessment were provided to the Kula Community Association for review. Additionally, an informational meeting on the proposed project was held on May 2, 1996 with the Kula Community Association Board of Directors.

We hope that the above responses address your concerns. Thank you again for your comments.

Very truly yours,

Wayne H. Kajiwara
Operations Supervisor
Outside Plant Engineering

cc: Don Horiuchi, DLNR, Office of Conservation and Environmental Affairs
Calvin Choy, GTE Hawaiian Tel
Ted Kawahigashi, Austin Tsutsumi & Associates, Inc.
Milton Arakawa, Munekiyo & Arakawa, Inc.

MAY 07 1996

Kula Community Association
P.O.Box 417
Kula, Maui, Hawaii 96790

"The specific purpose of this corporation is to improve the quality of life for the residents of Kula. to promote civic welfare and generally to benefit the community of Kula."

May 6, 1996

TO: Office of Environmental Quality Control

FROM: Kula Community Association Board of Directors

SUBJECT: Kula Fiber Optic Ductline

At its May 2nd Board meeting, the Kula Community Association Board of Directors heard representatives of GTE Hawaiian Telephone and Munekiyo & Arakawa, Inc. on the subject draft environmental impact statement. After a review of the concerns addressed in the draft report along with answers to specific questions raised by board members, the Board agreed to support the draft environmental impact statement.

However, the Board (and the Community) believes it is being short changed by GTE Hawaiian Telephone. Monies are apparently available for the needs of the Air Force to transmit data to Kihei. However, funds do not seem to be available for the citizens of Kula to provide us with convenient, up-to-date services and features from the Kula switching office. At the meeting in response to a question raised by a Board member, the Board was told the conversion of the Kula switch was pushed out to 1998. This was particularly startling in view of the previous report made to the Board last October of a 3rd quarter 1996 conversion

The Board decided not to use this agenda item as an opportunity to "hold up" GTE for a postponement that is now eight years after the 'original' (1990) schedule for updating the switch.

Instead the Board unanimously voted to have a copy of this letter transmitted to the Public Utilities Commission as the beginning of an effort to bring the citizens of Kula into the 20th Century as everyone else is about to enter the 21st.

c: Public Utility Commission
Munekiyo & Arakawa, Inc.
GTE Hawaiian Telephone

GTE Hawaiian Tel
Beyond the call

GTE Hawaiian Telephone Company Incorporated
60 South Church Street • Wailuku, HI 96793 • 808 242-5102

May 17, 1996

Mr. Alan Kaufman, President and Members
of the Board of Directors
Kula Community Association
P.O. Box 417
Kula, HI 96790

SUBJECT: Draft Environmental Assessment for GTE Fiber Optic Ductline, Haleakala to Kula, Maui

Dear Dr. Kaufman and Members of the Board:

We have received a copy of your memorandum dated May 6, 1996 to the Office of Environmental Quality Control relating to the subject project. We would like to thank you for the opportunity to meet with the Board to present our proposed project at its meeting of May 2, 1996. Your support of this project is also sincerely appreciated.

While the comments which we received relating to the updating of features and services for the Kula switching office have been an ongoing issue, please be assured that your concerns will be considered carefully in determining overall company-wide priorities within GTE Hawaiian Tel.

If you have any questions, please feel free to call me at 242-5105. Thank you for your interest and concern.

Very truly yours,

Wayne Kajiwara

Wayne H. Kajiwara
Operations Supervisor
Outside Plant Engineering

cc: Don Horiuchi, DLNR, Office of Conservation and Environmental Affairs
Calvin Choy, GTE Hawaiian Tel
Ted Kawahigashi, Austin Tsutsumi & Associates, Inc.
Milton Arakawa, Munekiyo & Arakawa, Inc.

Division of Forestry & Wildlife

1151 Punchbowl Street, Rm. 325 • Honolulu, HI 96813 • (808) 587-0166 • Fax: (808) 587-0160

January 19, 1996

ctswaynecdua\9596\gufiber.mem

MEMORANDUM

TO: Dean Uchida, Administrator
Division of Land Management

FROM: Michael G. Buck, Administrator

SUBJECT: **GTE Fiber Optic Ductline - Kula Forest Reserve**

We have reviewed the subject matter and have the following comments:

(1) The proposed project crosses the Waiakoa trail inlands owned by Kaonoulu Ranch between the 7,200 to 7,500-foot level within the Kula Forest Reserve. It also parallels Skyline trail (road) from approximately 9,000 to 9,700 feet on the western slope of Haleakala. Skyline is used by hunters, hikers, mountain bikers and other recreational users for access to the upper parts of the Kahikinui (Papaanui) and Kula Forest Reserve areas.

(2) The Maui DOFAW Branch is in the process of finalizing a License and Game Management Agreement between Kaonoulu Ranch and the State of Hawaii involving the lands above the Kula Forest Reserve access road of the Kaonoulu parcel. The Agreement includes public hunting on the upper Kaonoulu parcel and Papaanui Tract to be managed by DOFAW.

(3) At the upper section of Papaanui just east of the Skyline road gate, there are rock outcroppings used by the endangered dark-rumped petrel for nesting. Nesting for these birds is usually from March to October. Vibrations generated from the trenching work could possibly collapse the nesting burrows.

(4) Amakihi and apapane have been observed in areas adjacent to or in the corridor area. Game birds occurring in the corridor area include ring-necked pheasant, Chukar partridge, and California quail.

(5) It is doubtful whether track-mounted equipment or vehicles will be able to traverse the upper area of Kaonoulu near Kalepeamoa with the soft loose cinder-mixed soil.

(6) The Waiakoa trail offers the most remote of hiking experiences in the Kula Forest

Reserve. It is also part of a trail network connecting the northern and southern portions of the Reserve. Recreational use will soon be expanded through third party agreements to manage and maintain the trail.

(7) The effects of trench excavation, ductline excavation, back-fill and installation of "pull boxes" will be noticeable from the trail. Further, ductline construction and routine maintenance will impact the natural quality of the terrain along "...a lane of 15 to 20 feet in width..." in the long term. The result will be an apparent trail cleared of vegetation between the 3,000 and 9,000-foot elevations. This new "cable trail" will offer an access opportunity between the summit of Haleakala and Waipio Road. The problem with this is that it is on private property. Once the public traverses illegally over the private property to get to this "cable trail" and use this trail on a regular basis, it would be nearly impossible to restrict access to it. This potential problem is not discussed in Chapter V (Summary of Adverse Environmental Effects Which Cannot be Avoided), nor in Chapter VIII (Findings and Conclusions).

(8) Anytime there is any type of vegetative removal, the first plant species to return are non-native weeds. Therefore, it would be difficult to return the area to "pre-construction conditions". We recommend revegetation with native species and/or those species which have been established within the area. Short-term visual impacts will be evident until such time that the vegetation will grow back.

cc: Maui DOFAW

GTE Hawaiian Tel

Beyond the call

GTE Hawaiian Telephone Company Incorporated
60 South Church Street • Wailuku, HI 96793 • 808 242-5100

June 10, 1996

Michael G. Buck, Administrator
Division of Forestry & Wildlife
1151 Punchbowl Street, Room 325
Honolulu, Hawaii 96813

RE: Draft Environmental Assessment for GTE Fiber Optic Ductline, Haleakala to Kula, Maui (TMK 2-2-07:1,2,5,10,11,12 and 2-2-06:9)

Dear Mr. Buck:

We have received a copy of your memorandum addressed to Dean Uchida, Administrator of the Division of Land Management, dated January 19, 1996. See Attachment. We would like to take this opportunity to respond to your comments. It is noted that we have met with your Maui staff on June 4, 1996 to further discuss the components of your memorandum.

1. The proposed ductline alignment is proposed to cross or parallel the Skyline and Waiakoa trails. Recreational activities where the proposed ductline alignment encounters both trails will be temporarily interrupted during the ductline's construction phase. It is noted, however, that the proposed ductline will not be permanently obtrusive to both trails and surrounding areas since the ductline system will be placed approximately two (2) to three (3) feet below grade. After construction, it is anticipated that slopes will be restored to pre-construction conditions.

2. Since the proposed project will be installed underground, long-term hunting activities on the upper Kaonoulu parcel and Papaanui Tract should not be affected.

3. An alignment corridor varying between 50 feet to 100 feet is proposed for the installation of the underground ductline. A wide corridor will allow installation flexibility of the ductline to avoid topographical, vegetal and other environmental constraints (e.g., large lava beds, archaeological sites, endangered plants, trees, large shrubs) that may be encountered along the proposed 6.2-mile ductline alignment. Also, we are currently coordinating with Haleakala National Park's Resource Management Specialist to minimize any impacts the proposed project may have on any nearby petrel nesting areas and other avifauna common to the Haleakala and Kula regions.

4. We will also coordinate with the National Park Service on mitigating any impacts on native and game birds in the area.

5. Construction materials will be trucked to the eastern-most portion of the alignment near the summit of Haleakala. Construction will then proceed to progressively lower elevations. All equipment and materials are anticipated to be brought in by trucks, track-mounted mechanical equipment, or by helicopter if necessary Should the terrain prove to be too steep to accommodate mechanical equipment. winches will be used for equipment stabilization.

6. Refer to Response No. 1.

7. We intend to coordinate with Kaonoulu Ranch regarding access restrictions to Kaonoulu lands in the vicinity of the proposed ductline alignment. Additionally, Bob Hobdy, Division of Forestry and Wildlife - Maui Branch, recommended that matching the grade of the construction area to the surrounding lands and revegetating the construction area immediately mauka and makai of Waipoli Road with grasses found within the construction area may adequately camouflage the "cable trail", thus preventing the construction area from becoming a converted hiking trail.

8. It is anticipated that natural revegetation of the project site will occur with those species which have been established within the general vicinity A revegetation program for the construction corridor is problematic due to the relative isolation. unique climatic factors and fauna of the area. However. revegetation will be done for those immediate portions abutting Waipoli Road and care will be taken to minimize the effects of construction throughout the corridor

We hope that the above responses address your concerns. Thank you again for your comments.

Sincerely,

Wayne Kajiwara
Operations Supervisor
Outside Plant Engineering

Attachment
cc Don Horiuchi, Department of Land and Natural Resources
Ted Kawahigashi, Austin Tsutsumi & Associates
Calvin Choy, GTE Hawaiian Telephone
Wesley Wong, Division of Forestry and Wildlife - Maui Office
Milton Arakawa, Munekiyo & Arakawa, Inc.

References

References

Community Resources, Inc. Maui County Community Plan Update Program Socio-Economic Forecast Report, January 1994.

County of Maui, The General Plan of the County of Maui, Update 1990.

County of Maui, Makawao-Pukalani-Kula Community Plan, October 1987.

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Medeiros and Loope, A Review of the Arthropod Fauna at the Proposed Air Force Facility Construction Site at the Summit Area of Haleakala Volcano, Maui, Hawaii, 1992.

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University of Hawaii-Land Study Bureau, Detailed Land Classification - Island of Maui, May 1967.

Wilson Okamoto & Associates, Inc., Maui Community Plan Update Infrastructure Assessment, September 1992.

Appendices

Appendix A

Flora and Fauna Survey

FLORAL AND FAUNAL SURVEY FOR ENVIRONMENTAL ASSESSMENT GTE CORRIDOR FIBEROPTICS PROJECT MAKAWAO DISTRICT, EAST MAUI, HAWAI'I

SUBMITTED BY:
DAVID T. PAUL, B.A.
NATURAL SCIENCE FIELDWORK & RESEARCH
839 MANONO ST.
HILO, HAWAI'I 96720
(808) 934-7310

PREPARED FOR:
XAMANEK RESEARCHES
P.O. BOX 131
PUKALANI, HAWAI'I 96788

PREPARED BY:
DAVID T. PAUL
JULY 1995

FLORAL AND FAUNAL SURVEY

INTRODUCTION

A field survey was conducted for botanical resources and macrofauna along the GTE corridor for their fiberoptics project in Makawao District, East Maui, Hawai'i on July 6, 1995.

The corridor is 100 ft. wide and runs from the radio tower on Haleakala at c. 9,700 feet altitude in Papa'anui *ahupua'a* down to Ka'ono'ulu *ahupua'a* at 9,000 feet. From there the corridor runs through the southern side of Ka'ono'ulu *ahupua'a,* down past the water tank (3,344 ft. alt.) in Kohea *ahupua'a,* and out to Highway 37 at 3,000 feet altitude.

Special attention was made to locate species within the corridor that are listed by the United States or State of Hawai'i as endangered, as such species have legal status for protection and must be given consideration for planning.

METHODS

This study was initiated by searching literature to determine what species might occur in the area of the corridor that are listed as endangered Federally or by the State of Hawai'i.

On July 6, 1995 two field researchers (David Paul and Erik Fredericksen) meandered down through the GTE corridor, noting species of plants, birds, and mammals. Care was taken to locate species which are listed Federally or by the State of Hawai'i as endangered, as well as noting other non-listed rare species. Unique biological communities were also defined.

Plants identified include ferns and their allies (Pteridophytes), cone bearing plants (Gymnosperms), and flowering plants (Dicots and Monocots), and follow O. Degener (1930), M.C. Neal (1965), and W.L. Wagner, et al, (1990). Birds identified follow G.C. Munro (1944). Mammals identified follow P.Q. Tomich (1986).

Listed endangered species follow U.S. Fish and Wildlife Service (1994) and State of Hawai'i (1994, 1995).

Unique Biological Communities follow Gagne and Cuddihy (1990).

Plants were identified on contact or samples were collected and later defined. Birds were identified by sight, or with the aid of field glasses, in flight and in vegetation. Vegetation where birds were found was also searched for nests. Mammals were identified by

sight, living or dead, and by foraging habit.

RESULTS

All plant species encountered during the field survey are listed in Table 1. All bird and mammal species encountered during the field survey are listed in Table 2.

Rare Plants - One plant species which is listed Federally and by the State of Hawai'i as endangered was located during the field survey. This is a species of sandalwood or *'iliahi* (*Santalum freycinetianum* var. *lanaiense*) and is located at about 6,900 ft. alt. directly on the southern edge of the corridor (GPS location: Q2 - N.20 degrees 42'09.50" X W.156 degrees 17'16.13")

The Hawaiian silversword or *'ahinahina* (*Argyroxiphium sandwicense* subsp. *macrocephalum* DC) is a listed endangered species known to exist in habitat typical to that in the upper reaches of the corridor, but was not located there. A Hawaiian raspberry or *'akala* (*Rubus macraei* A. Gray), a small crawling fern (*Asplenium fragile* var. *insulare* C. Morton), a Hawaiian geranium or *hinahina* (*Geranium arboreum* A. Gray), and a *ko'oko'olau* (*Bidens micrantha* subsp. *kalealaha* Gaud.) are all listed endangered species known to exist in habitat similar to that in the corridor, but none of them were found there.

Two plants which are rare, but not endangered, were also found in the corridor. One is *pamakani* (*Tetramolopium humile* subsp. *haleakalae*) which is found scattered in alpine shrubland on old pahoehoe lava which just touches the northern side of the corridor at about 9,000 ft.. The other is a sandalwood or *'iliahi* (*Santalum haleakalae*) which is found scattered amongst subalpine dry forest and shrubland from about 8,500 to 7,500 ft.

Rare Birds - One bird species which is listed as endangered by the State of Hawai'i on O'ahu, Moloka'i and Lana'i, but not Maui was sighted during the field survey. This was the *'i'iwi* (*Vestiaria coccinea*). The *'i'iwi* was spotted in a large *'a'ali'i* bush (*Dodonaea viscosa*) at about 8,000 ft. The shrub was examined for nests but none were found. The *'i'iwi* is common on Maui, Hawai'i, and Kaua'i.

Two other native bird species were sighted during the field survey. These were the *amakihi* (*Chlorodrepanis virens wilsoni*), which was common along the upper reaches of the corridor, and the Maui creeper (*Paroreomyza maculata newtoni*) which was common along the lower reaches of the corridor. Neither of these species are endangered.

The *nene* goose (*Nesochen sandwicensis* Vigors) which is listed as endangered, the *pueo* or short-eared owl (*Aseo flammeus sandwicensis* Bloxam)which is a candidate for listing as endangered, and the *apapane* (*Himatione sanguinea* Gmelin)which is common, are known to exist in habitats similar to those found in the corridor. None of these species were sighted during the field survey.

Although a variety of bird species were sighted during the field survey, no nests were found within the corridor.

A migratory bird, the *kolea* or Pacific golden plover (*Pluvialis dominica fulva* Gmelin), which is indigenous to the Islands, is commonly seen throughout the State when it is in season. This species was not seen during the field survey as it was not in season; nor is it endangered.

Rare Mammals - The only listed endangered non-marine mammal in Hawai'i is the hoary bat (*Lasiurus cinereus semotus* H. Allen). The hoary bat is known to exist on Maui, and is usually seen late in the day in lowland areas. The field survey ended towards evening and at about 3,000 ft., but the hoary bat was not seen.

All other non-marine mammals in Hawai'i are alien or Polynesian introduced species, and are not endangered.

All mammals found within the corridor were alien cattle, feral animals, or rodents.

UNIQUE BIOLOGICAL COMMUNITIES

The uppermost reaches of the corridor contain a community known as alpine dry shrubland. This is followed by subalpine dry shrubland, subalpine dry forest, and montane mesic forest.

These communities and their placement within the corridor is explained below.

Alpine Dry Shrubland - This community is dominated by hairgrass (*Deschampsia nubigena*), *pili mauka* (*Trisetum glomeratum*), and kupaoa (*Dubautia menziesii*). It runs from c. 9,700 ft. at the beginning of the corridor, down to c. 8,700 ft., and is located mostly on loose cinder. Vegetation is sparse here.

A small area on the northern side of the corridor at c. 9,000 ft. contained more diversity and is located on old pahoehoe. Some of the plants found there are *pamakani* (*Tetramolopium humile* var. *haleakalae*), a sedge (*Gahnia gahniiformis*), highland ferns (*Asplenium spp.*), and *ohelo* (*Vaccinium reticulatum*).

Few alien species are found in this habitat.

Subalpine Dry Shrubland - This community is dominated by *ohelo* (*Vaccinium reticulatum*), *pukiawe* (*Styphelia tameiameia*), hairgrass (*Deschampsia nubigena*), and *paia* or brake fern (*Pteridium aquilinum* var. *decompositum*). It runs from c. 8,700 ft. down to c. 7,000 ft. and is located on loose loam and rock outcrops. This habitat is heavily affected by the browsing and rooting of feral animals. There is also evidence of rat foraging in this zone. Some other

species found here are *'iliahi* (*Santalum haleakalae*), *hinahina* (*Geranium cuneatum* subsp. *tridens*), *'a'ali'i* (*Dodonaea viscosa*), a sedge (*Gahnia gahniiformis*), and *mamane* (*Sophora chrysophylla*).

This habitat is where two Hawaiian honey-creepers were seen. The *'i'iwi* which was sighted once, as well as the *amakihi* which was seen commonly.

An alien plant, cat's ear (*Hypochoeris radicata*) becomes a dominant member of the groundcover in this community.

Subalpine Dry Forest - This community is dominated by *mamane* (*Sophora chrysophylla*), *pilo* (*Coprosma montana*), *'a'ali'i* (*Dodonaea viscosa*), *pukiawe* (*Styphelia tameiameia*), and *ohelo* (*Vaccinium reticulatum*). It runs from c. 7,000 ft. down to c. 6,500 ft. and is located on rock outcrops and loam.

This habitat is heavily damaged by feral animals and cattle.

The endangered sandalwood or *'iliahi* (*Santalum freycinetianum* var. *lanaiense*) is found here at about 6,900 ft.

Alien plants become common in this community, such as bluegrass (*Poa pratensis*), *pamakani* (*Ageratina adenophora*), and evening primrose (*Oenothera stricta* subsp. *stricta*). Two alien trees are invading this area of the corridor. Pine trees (*Pinus sp.*) which are naturalizing from groves planted nearby, and fire trees (*Myrica faya*) which are moving uphill from infestations below.

Montane Mesic Forest - This community is dominated by alien species. It runs from c. 6,500 ft. down to the bottom of the corridor at c. 3,000 ft., and is located on rich loamy topsoil.

There are remnants of the former native dominated forest, such as *koa* (*Acacia koa*), *'akala* (*Rubus hawaiensis*), *laukahi* fern (*Dryopteris wallichiana*), *palapalai* (*Microlepia strigosa*), *'ama'u* (*Sadleria cyatheoides*), and the Hawaiian strawberry, *ohelo papa* (*Fragaria chiloensis* subsp. *sandwicensis*).

The dominant trees there now are the fire tree (*Myrica faya*), wattle (*Acacia mearnsii*), and pine (*Pinus sp.*). Kikuyu grass (*Pennisetum clandestianum*) covers most of the area. The mysore raspberry (*Rubus niveus*) is forming dense impassable thickets and is displacing the native raspberry, *'akala* (*Rubus hawaiensis*).

The Maui creeper is commonly seen along the corridor in the upper areas of this community.

This habitat is extensively covered by cattle, and feral pig damage is quite evident.

An area in a gulch, directly above the water tank towards the bottom of the corridor, contains remnants of human cultivation, such as *'ape* (*Alocasia macrorrhiza*), mulberry (*Morus alba*), fig (*Ficus carica*), and peach (*Prunus persica*).

SUMMARY

The field survey on July 6, 1995 produced the following legally significant information.

One plant species was located within the corridor that is listed as endangered Federally and by the State of Hawai'i, and legally requires consideration for planning. This species is a sandalwood or *'iliahi* (*Santalum freycinetianum* var. *lanaiense*) and is located at about c. 6,900 ft. directly on the southern edge of the corridor (GPS location: Q2 - N.20 degrees 42'09.50" X W.156 degrees 17'16.13").

Other listed endangered plant species are known to exist in habitats similar to those found within the corridor, but no other listed endangered plants were found aside from the afore mentioned species.

One bird species was sighted within the corridor that is listed as endangered by the State of Hawai'i on O'ahu, Moloka'i and Lana'i, but not Maui. This was the *'i'iwi* (*Vestiaria coccinea*) and was spotted in an *'a'ali'i* bush (*Dodonea viscosa*) at about 8,000 ft. A search for nests was conducted but none were found. The *'i'iwi* is common on Maui, Hawai'i, and Kaua'i.

Listed endangered bird species are known to exist in habitats similar to those found in the corridor, but none were seen, and nests were not found anywhere within the corridor.

One non-marine mammal which is listed as endangered is located on Maui; the hoary bat (*Lasiurus cinereus semotus* H. Allen) which is known to be found in lowland areas, late in the day. The lower reaches of the corridor were traversed late in the day, but the hoary bat was not seen.

RECOMMENDATIONS AND DISCUSSION

To avoid impacts on the listed endangered sandalwood (*Santalum freycinetianum* var. *lanaiense*), the actions of the project should remain at least 5 meters (apprx. 16.5 ft.) away from the drip line of the tree.

As other endangered plant species were not found within the corridor, impacts to endangered plants from the project will be minimal.

As biological communities above 6,500 ft. are dominated by native species, care should be taken to avoid as much of the vegetation as possible there, especially shrubs and trees.

Special care should be taken to avoid the plant community on old pahoehoe at 9,000 ft.; and to avoid the sandalwoods (*Santalum haleakalae*) between 8,500 and 7,500 ft.

As no bird species seen within the corridor is listed as endangered on the island of Maui, and no nests of any kind were found within the corridor, impacts to endangered bird species (and any other bird species) will be minimal.

As endangered mammals were not seen in the corridor, and likely do not occur in habitats similar to those in the corridor, impacts on endangered mammals from the project will be non-existent. On the contrary, mammals found in the corridor are the single greatest threat to endangered species and the biological communities found there.

The community below 6,500 ft. is ranchland, endangered species were not found, and alien plants are dominant there.

Communities above 6,500 ft. are dominated by native species, endangered species are found there, but feral animals are heavily impacting the area. Goats are denuding vegetation as high as they can reach, especially on *mamane* (*Sophora chrysophylla*), sandalwood (*Santalum spp.*), and geraniums (*Geranium sp.*). Pigs are tilling up the soil and damaging the root systems of plants. If feral animals are not controlled, the native communities there will eventually be destroyed and soil erosion may become a significant problem.

As endangered species are not found in the corridor below 6,500 ft., there will be no impact to endangered species in that area.

Impacts to endangered species found in the corridor above 6,500 ft. will be minimal.

TABLE 1

Plant species encountered within the project corridor.

Botanical Name	Common Name	*Dist.	**Stat.
PTERIDOPHYTES			
DICKSONIACEAE Tree Fern Family			
Microlepia strigosa (Thunb.) Presl	*palapalai*	E, C	-
POLYPODIACEAE Common Fern Family			
Asplenium adiantum-nigrum L.	asplenium	E, C	-
Asplenium trichomanes L.	asplenium	E, C	-
Blechnum occidentale L.	blechnum	A, C	-
Cyclosorus dentatus (Forsk.) Ching	oak fern	A, C	-
Dryopteris wallichiana (Spreng.) Hyl	*laukahi*	E, C	-
Pellaea ternifolia Cav. Link	*kalamoho*	I, C	-
Pteridium aquilinum (L.) Kuhn. var. *decompositum* (Gaud.) Tryon	*pai'a*	E, C	-
Pteris vittata L.	sword brake	A, C	-
Sadleria cyatheoides Kaulf.	*'ama'u*	E, C	-
PSILOTACEAE Whisk Fern Family			
Psilotum nudum (L.) Griseb.	*moa*	I, C	-
GYMNOSPERMS			
PINACEAE Pine Family			
Pinus sp. L.	pine	A, C	-
DICOTYLEDONS			
APIACEAE Carrot Family			
Foeniculum vulgare Mill.	fennel	A, C	-
ASCLEPIADACEAE Milkweed Family			
Asclepias physocarpa (E.Mey.)Schlec.	balloon plant	A, C	-

ASTERACEAE Sunflower Family				
Ageratina adenophora (Spreng.) R. King & H. Robinson	*pamakani*	A, C	-	
Bidens pilosa L.	*ki nehe*	A, C	-	
Cirsium vulgare (Savi) Ten.	bull thistle	A, C	-	
Conyza canadensis (L.) Crong.	horseweed	A, C	-	
Crassocephalum crepidioides (Benth.) S. Moore	*pualele*	A, C	-	
Dubautia menziesii (A. Gray) D. Keck	*kupaoa*	E, C	-	
Emilia sonchifolia (L.) DC	*pualele*	A, C	-	
Gnaphalium purpureum L.	cudweed	A, C	-	
Hypochoeris glabra L.	cat's ear	A, C	-	
Hypochoeris radicata L.	cat's ear	A, C	-	
Taraxacum officinale W.W. Weber	dandelion	A, C	-	
Tetramolopium humile (A. Gray) Hillebr. subsp. *haleakalae*	*pamakani*	E, R	-	
BIGNONIACEAE Bignonia Family				
Jacaranda mimosifolia D. Don	jacaranda	A, C	-	
CACTACEAE Cactus Family				
Opuntia ficus-indica (L.) Mill.	*panini*	A, C	-	
CARYOPHYLACEAE Pink Family				
Polycarpon tetraphyllum (L.) L.	chickweed	A, C	-	
CHENOPODIACEAE Goosefoot Family				
Chenopodium oahuense (Meyen) Aellen	*'aheahea*	E, C	-	
EPACRIDACEAE Epacris Family				
Styphelia tameiameia (Cham. & Schlechtend.) F.v. Muell.	*pukiawe*	I, C	-	
ERICACEAE Blueberry Family				
Vaccinium reticulatum Sm.	*'ohelo*	E, C	-	
EUPHORBIACEAE Poinsettia Family				
Ricinus communis L.	castor bean	A, C	-	
FABACEAE Bean Family				
Acacia koa A. Gray	*koa*	E, C	-	

Acacia mearnsii De Wild.		wattle	A, C	-
Desmodium sandwicense E. Mey.		beggar's tick	A, C	-
Medicago lupulina L.		medick clover	A, C	-
Sophora chrysophylla (Salisb.) Seem.		*mamane*	E, C	-
Trifolium dubium Sibth.		hop clover	A, C	-
Trifolium repens L.		white clover	A, C	-
GERANIACEAE	Geranium Family			
Geranium cuneatum subsp. *tridens* Hook.		*hinahina*	E, C	-
Geranium dissectum L.		cranesbill	A, C	-
LAMIACEAE	Mint Family			
Prunella vulgaris L.		self-heal	A, C	-
Stachys arvensis L.		stagger weed	A, C	-
LYTHRACEAE	Loosestrife Family			
Cuphea hyssopifolia Kunth		false heather	A, C	-
MENISPERMACEAE	Moonseed Family			
Cocculus trilobus (Thunb.) DC		*huehue*	I, C	-
MORACEAE	Mulberry Family			
Ficus carica L.		fig	A, C	-
Morus alba L.		mulberry	A, C	-
MYRICACEAE	Bayberry Family			
Myrica faya Aiton		fire tree	A, C	-
ONAGRADACEAE	Evening Primrose Family			
Epilobium billardierianum Ser.		willow herb	A, C	-
Oenothera stricta Ledeb. ex Link subsp. *stricta*		evening primrose	A, C	-
OXALIDACEAE	Oxalis Family			
Oxalis corniculata L.		*'ihi*	P, C	-
PASSIFLORACEAE	Passionfruit Family			
Passiflora suberosa L.		*huehue haole*	A, C	-
PLANTAGINACEAE	Plantain Family			
Plantago lanceolata L.		*laukahi*	A, C	-

POLYGONACEAE	Buckwheat Family				
Rumex acetosella L.		sheep sorrel	A, C	-	
PRIMULACEAE	Primrose Family				
Anagallis arvensis L.		scarlet pimpernel	A, C	-	
PROTEACEAE	Protea Family				
Grevillea robusta A. Cunn. ex R. Br.		silk oak	A, C	-	
ROSACEAE	Rose Family				
Fragaria chiloensis (L.) Dushesne subsp. *sandwicensis*		*'ohelo papa*	E, C	-	
Prunus persica (L.) Batsch.		peach	A, C	-	
Rubus hawaiensis A. Gray		*'akala*	E, C	-	
Rubus niveus Thunb.		mysore raspberry	A, C	-	
RUBIACEAE	Coffee Family				
Coprosma ernodeoides A. Gray		*kukae nene*	E, C	-	
Coprosma montana Hillebr.		*pilo*	E, C	-	
SANTALACEAE	Sandalwood Family				
Santalum freycinetianum Gaud. var. *lanaiense* Rock		*'iliahi*	E, R	LE-LH	
Santalum haleakalae Hillebr.		*'iliahi*	E, R	-	
SAPINDACEAE	Soapberry Family				
Dodonaea viscosa Jacq.		*'a'ali'i*	I, C	-	
VERBENACEAE	Verbena Family				
Verbena litoralis Kunth.		*ha'uoi*	A, C	-	

MONOCOTYLEDONS

AGAVACEAE	Ti Family				
Agave americana L.		century plant	A, C	-	
ARACEAE	Taro Family				
Alocassia macrorrhiza (L.) Schott		*'ape*	P, C	-	
CYPERACEAE	Sedge Family				
Gahnia gahniiformis (Gaud.) A. Heller		gahnia	E, C	-	

POACEAE	Grass Family			
Avena fatua L.		wild oat	A, C	-
Cynodon dactylon (L.) Pers.		manienie	A, C	-
Deschampsia nubigena Hillebr.		hairgrass	E, C	-
Digitaria violascens Link		crabgrass	A, C	-
Eragrostis leptophylla Hitchc.		lovegrass	E, C	-
Paspalum dilatatum Poir.		dallis grass	A, C	-
Pennisetum clandestinum Hochst.		kikuyu	A, C	-
Poa pratensis L.		bluegrass	A, C	-
Rhynchelytrum repens (Willd.) Hubb.		natal redtop	A, C	-
Sporobolus indicus (L.) R. Br.		smutgrass	A, C	-
Trisetum glomeratum (Kunth) Trin.		*pili uka*	E, C	-
Vulpia bromoides (L.) S.F. Gray		fescue	A, C	-
ZINGIBERACEAE	Ginger Family			
Hedychium coronarium J. Konig		white ginger	A, C	-

TABLE 2

Birds and Mammals encountered in the project corridor.

Zoological Name	Common Name	*Dist.	**Stat.
	AVIANS		
ALAUDIDAE Lark Family			
Alauda arvensis L.	skylark	A, C	-
COLUMBIDAE Dove Family			
Columba livia Gmelin	pigeon	A, C	-
DREPANIDIDAE Honey-creeper Family			
Chlorodrepanis virens wilsoni Rothsch.	*'amakihi*	E, C	-
Paroreomyza maculata newtoni Rothsch.	Maui creeper	E, C	-
Vestiaria coccinea Forster	*'i'iwi*	E, C	-
MIMIDAE Mocking-bird Family			
Mimus polyglottos L.	mocking-bird	A, C	-

PHASIANIDAE	Chicken Family			
Alectoris graeca chukar **Gray**		**chukar**	**A, C**	-
Lophortyx califonica vallicola **Ridgway**		**quail**	**A, C**	-
Phasianus colchicus torquatus **Gmelin**		**pheasant**	**A, C**	-
TIMELLIDAE	Thrush Family			
Liothrix lutea **Scopoli**		**nightingale**	**A, C**	-

MAMMALIANS

BOVIDAE	Hollow-horned Ruminants Family			
Bos taurus **L.**		**cow, steer, bull**	**A, C**	-
Capra hircus hircus **L.**		**feral goat**	**A, C**	-
MURICIDAE	Mouse Family			
Rattus rattus sp. **Gray**		**rat**	**A/P, C**	-
SUIDAE	Old World Swine Family			
Sus scrofa scrofa **L.**		**feral pig**	**A, C**	-

***Distribution:**

E = Endemic, found only in Hawai'i.
I = Indigenous, found in Hawai'i and elsewhere.
P = Polynesian, brought to Hawai'i by Polynesians prior to European contact.
A = Alien, plants introduced to Hawai'i after European contact.
C = Common, found in abundance in many areas.
R = Rare, restricted and/or localized populations.

****Status:**

LE = listed as "Endangered" under the Federal Endangered Species Act.
LT = listed as "Threatened" under the Federal Endangered Species Act.
PE = "Proposed" as endangered under the Federal Endangered Species Act.
C1, C2, C3, = listed as "Candidates" for listing under the Federal Endangered Species Act.
LH = listed by the State of Hawai'i as endangered or threatened.

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Appendix B

Archaeological Inventory Survey Report

ARCHAEOLOGICAL INVENTORY SURVEY OF GTE HAWAIIAN TELEPHONE HALEAKALA FIBER OPTICS DUCTLINE CORRIDOR, PAPAANUI AND KAONOULU *AHUPUA'A*, MAKAWAO DISTRICT, MAUI ISLAND (TMK: 2-2-07: 1, 2, 5, 10, 11, 12; 2-2-06: 9)

Prepared for:
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January 1996

APPENDIX B: FLORAL AND FAUNAL SURVEY

by
David Paul, B.A.

ABSTRACT

An archaeological inventory survey of the GTE Hawaiian Telephone Haleakala Fiber Optics Ductline, Phase III proposed easement corridor was conducted on the island of Maui between July and September, 1995. The project area ranges from a maximum elevation of c. 9700 ft. AMSL near the summit of Haleakala to a minimum of c. 3000 ft. AMSL. The c. 30 m. wide by c. 10 km. long (30 hectares) corridor crosses the following TMKs: TMK 2-2-7: 12; TMK 2-2-7: 11; TMK 2-2-7: 05; TMK 2-2-7: 01; TMK 2-2-7: 02; TMK 2-2-7: 10; TMK 2-2-6: 09. A ductline trench c. 0.8 m. wide and c. 0.8 m. deep will be mechanically excavated within the corridor.

A total of 4 sites were found between c. 7400 ft. AMSL and c. 3080 ft. AMSL during the pedestrian phase of the inventory survey. Sites 50-50-15-4132 and 50-50-11-4133 are rock shelters which lie at or beyond the outside limits of the proposed GTE easement corridor. These 2 upper sites are deemed significant under Criterion "D" of State and Federal historic preservation guidelines. Both sites will not be impacted by trenching activities. Site 50-50-11-4134 is interpreted as an historic habitation area likely associated with past ranching activities. This site is also significant under Criterion "D". It will be possible to avoid this site. The lowest site, Site 50-50-10-4135, is interpreted as having both habitation and agricultural functions. This site contains terracing and is c. 2 to 3 hectares in area. It contains an historic component which appears to have disturbed an indigenous component. The historic agricultural activity is likely associated with 19th century potato production in Kula. Site 4135 is also deemed significant under Criterion "D" of the historic preservation guidelines.

Sites 4132, 4133 and 4134 will not be adversely affected by trenching activities associated with the GTE fiber optics ductline. Consequently, no further archaeological work is recommended for these 3 sites. In contrast, Site 4135 will be impacted by the GTE ductline. However, it is important to note that the corridor has been realigned in order to avoid any visible architectural features. Archaeological monitoring of trenching activities across Site 4135 is the recommended mitigation.

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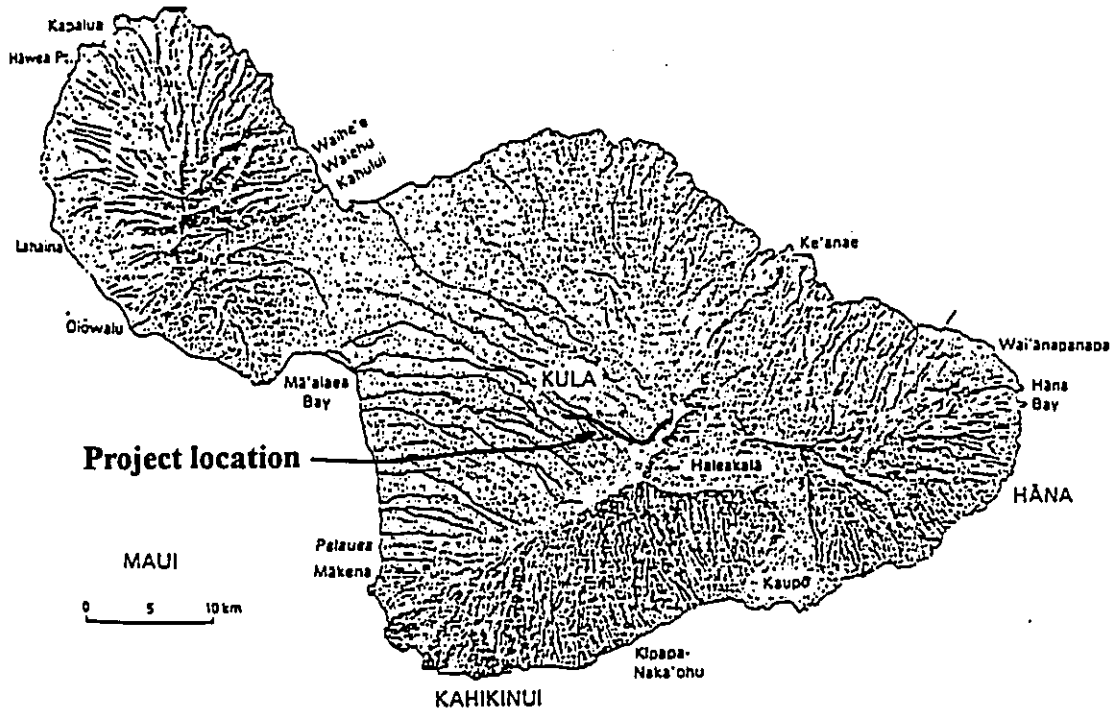
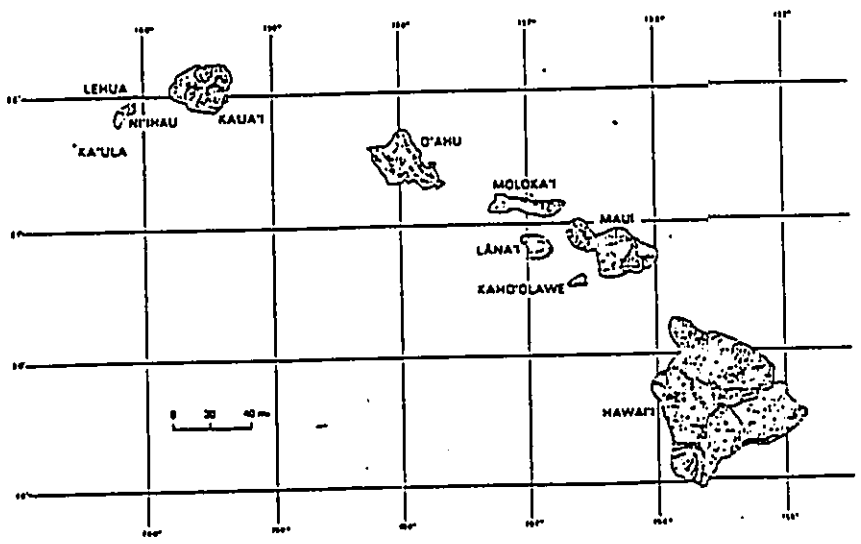
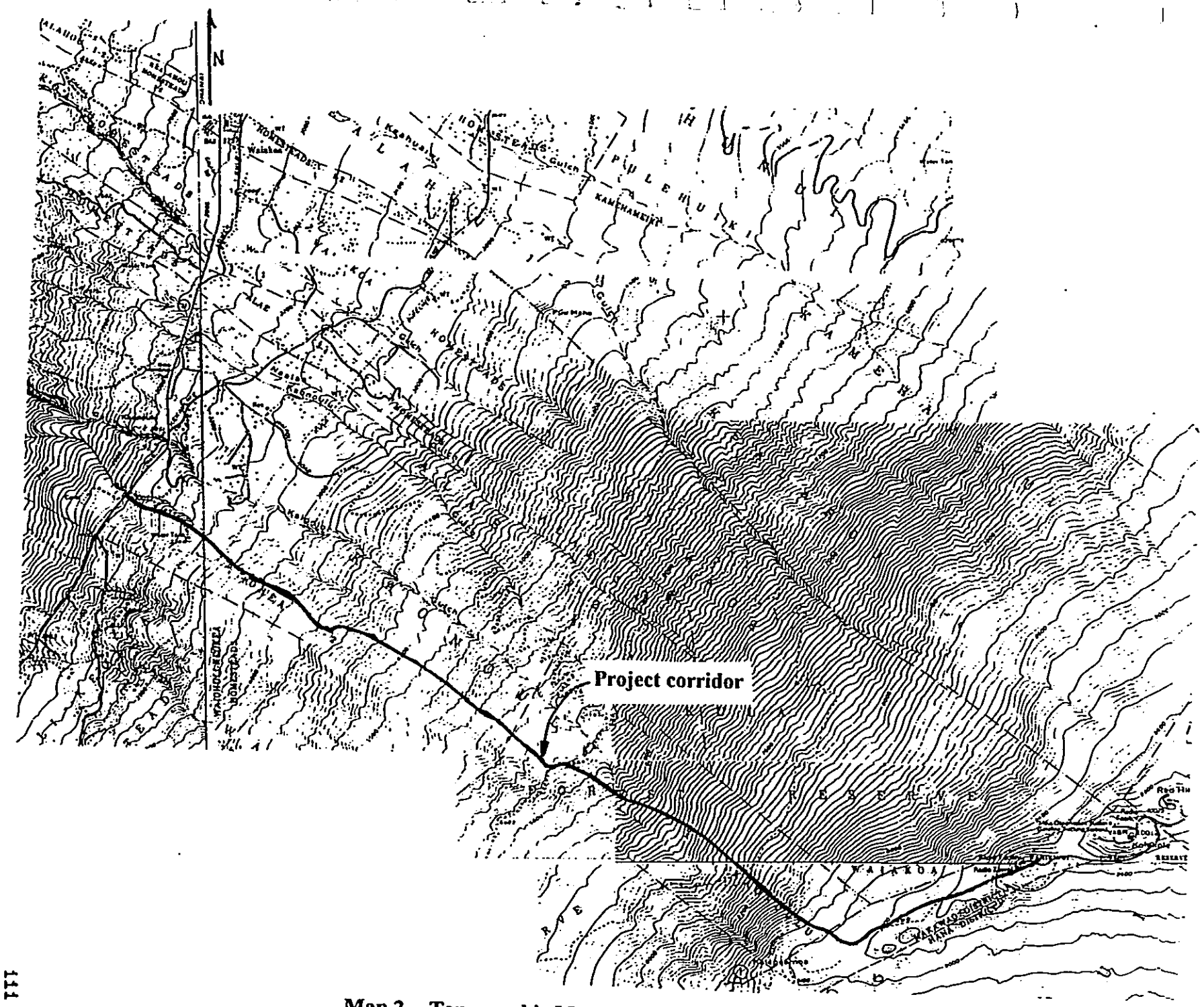
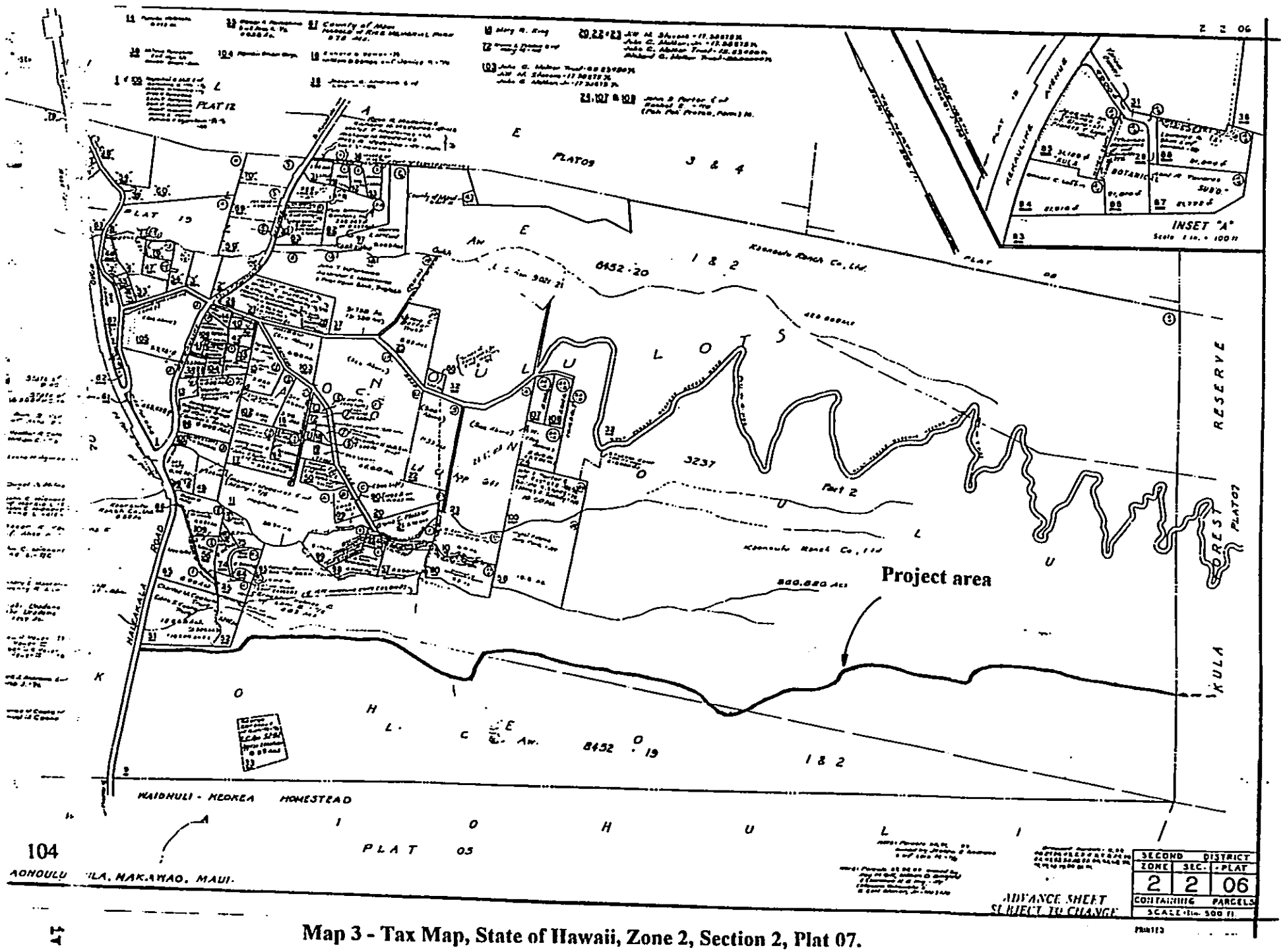




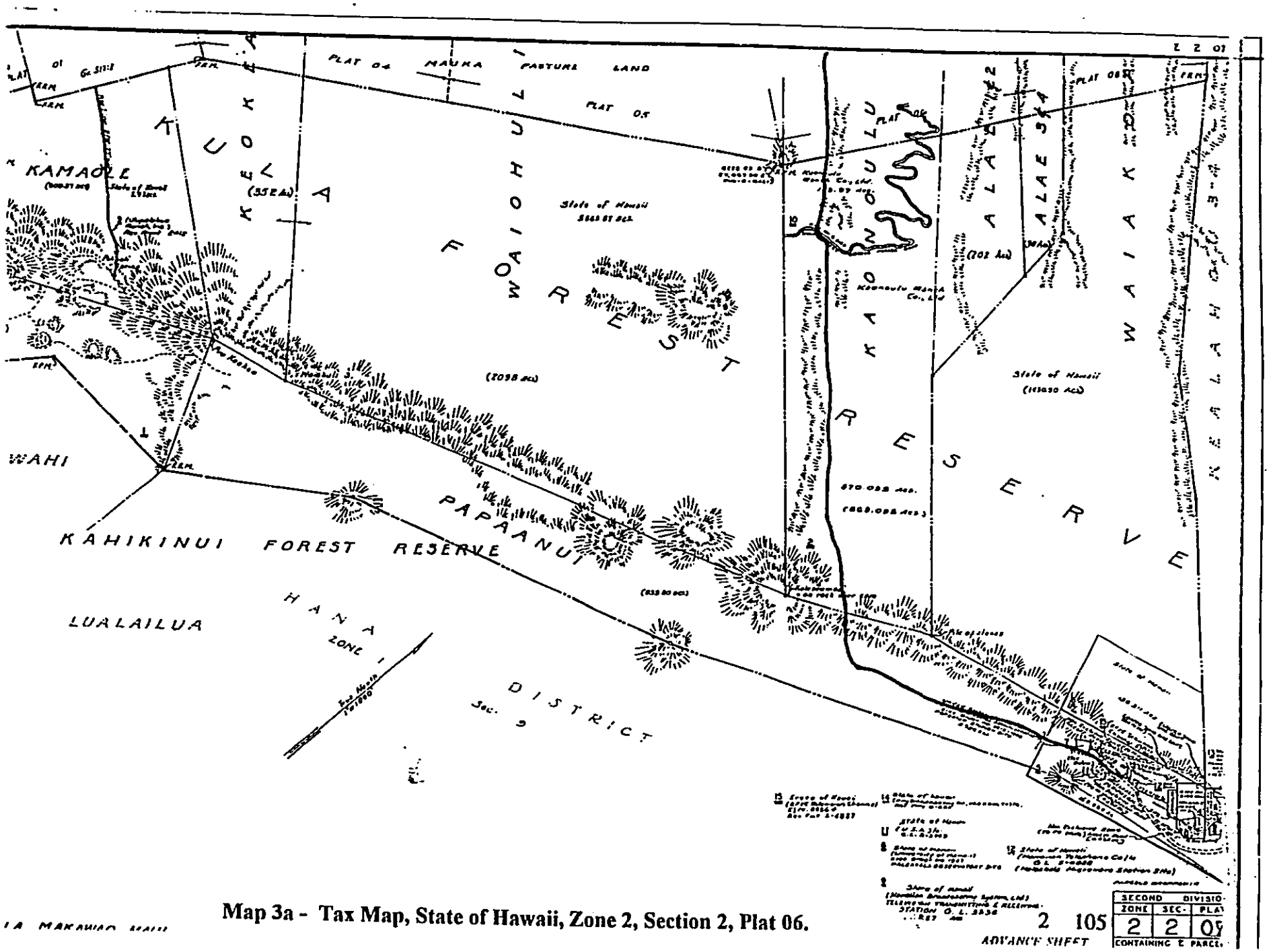
Map 1 - Map of Maui and the Hawaiian Islands, showing approximate project location.



Map 2 - Topographic Map, U.S.G.S. Composite map of Lualailua Hills, Kilohana and Puu O Kali quadrangles, 1983.



Map 3 - Tax Map, State of Hawaii, Zone 2, Section 2, Plat 07.



Map 3a - Tax Map, State of Hawaii, Zone 2, Section 2, Plat 06.

INTRODUCTION

Discussions were held with Munekiyo & Arakawa, Inc., Wailuku, Hawaii concerning the GTE Hawaiian Telephone Co. Inc. plan to run a fiber optic cable from their Microwave Station site near the summit of Haleakala (c. 9700 ft. AMSL) to a position near the GTE Substation in Kula, along the Kula Highway (c. 3060 ft. AMSL). The corridor is primarily located on Kaonoulu Ranch land.

Various permit requirements included both an archaeological inventory survey and a biota (floral/faunal) survey along the proposed fiber optics cable corridor. The study area consists of a strip of land c. 30 m. in width and nearly 10 km. in length, and totals c. 30 hectares (or c. 74 acres). The terrain is remote, steep and rugged. They asked us to prepare a proposal for the necessary scientific fieldwork, analysis and report preparation.

Our proposal was submitted June 14, 1995, and accepted shortly afterward. Work, however, did not begin until July, lasting until early August. A preliminary summary report of the fieldwork was submitted August 25, 1995, pending final report preparation. Additional fieldwork was completed during September, 1995.

Accessing the proposed GTE corridor included driving to the summit of Haleakala, and there descending down slope for some 6640 ft. of elevation and nearly 10 km. in length to its Kula Highway access. The proposed easement corridor exhibits notable relief and is quite steep. Much of the study area has been in ranch use for many years and remains remote and difficult to traverse. Access is quite limited, consisting in practical terms of entering the proposed corridor near the summit and exiting at Kula Highway. Returning to any portion of the corridor essentially means starting at the summit again, or being able to work upland from Kula Highway or Waipoli Road. Most of the area can be traversed on foot or horseback only, with four-wheel drive vehicles limited to certain portions.

A preliminary fieldtrip was undertaken by personnel from Xamanek Researches, Munekiyo & Arakawa, Inc. and Austin Tsutsumi Engineers, in order to establish the areal extent of the proposed corridor. Austin Tsutsumi Engineers had surveyed the proposed easement corridor, placing survey stakes, pins and colored plastic marker flags along the route. Our field party needed to locate as many relevant survey markers as possible to aid in undertaking the main field survey, including both the biota and archaeological inventory surveys.

After contacting Kaonoulu Ranch personnel, including the managing owner, Henry Rice, we were ready to undertake the main surveys. Both Mr. Rice and ranch personnel were considerate and helpful. They provided us with keys to access gates and also shared pertinent information about the ranch lands involved.

THE STUDY AREA

The GTE Hawaiian Telephone Haleakala Fiber Optics Ductline, Phase III proposed easement consists of a corridor c. 30 m. wide and nearly 10 km. long. The study area consists of c. 30 hectares (c. 74 acres) and ranges from a maximum elevation of c. 9700 ft. AMSL near the summit of Haleakala to a minimum of c. 3060 ft. AMSL. This long, narrow and winding corridor begins near the GTE substation located in Kula and extends to the GTE Hawaiian Telephone Co., Inc. Microwave Station site on Haleakala. While the proposed corridor is located primarily on Kaonoulu Ranch land in the *ahupua'a* of Kaonoulu, it also crosses portions of Papaanui and Kohea *ahupua'a*.

The proposed corridor passes through numerous Tax Maps. Beginning at the existing GTE Microwave Station near the summit, and presented by order of geographical descent, the TMKs are: TMK 2-2-7: 12 (GTE, summit); TMK 2-2-7: 11; TMK 2-2-7: 05; TMK 2-2-7: 01; TMK 2-2-7: 02; TMK 2-2-7: 10; TMK 2-2-6: 09 (Kula terminus).

The land is ranch land, and helps to support the Kaonoulu Ranch cattle herds. It has remained relatively undisturbed by residential or commercial land use construction activities. However, feral animals (i.e. goats and especially pigs) continue to impact the landscape. There are few dirt roads in the corridor area and access is generally difficult, due to the notable relief and steep slope of the land.

NATURAL HISTORY

Geologically, the corridor area is located entirely on the mid- and upper slopes of Mount Haleakala, with the lowest corridor altitude at c. 3060 feet AMSL. The entire corridor area rests on late stage lavas and post erosional lavas (University of Hawaii , 1983, pp. 32-36). These lavas are largely composed of *alkalic basalt* and *hawaiite* (Ibid., p. 35).

According to botanist David Paul (Paul, 1995, Appendix B, this report, pp. 3-5), altitudinal zonation strongly influences the nature of flora and fauna found in the corridor. There are four observed general plant communities present here. The upper-most corridor zonation consists of an alpine cinder desert, with relatively little life observable. Moving down-slope, environmental conditions range from subalpine dry

shrubland, subalpine dry forest, to montane mesic forest and grasslands. Observable flora and fauna increase with downslope descent (Paul, 1995).

Rainfall ranges from 20 to 50 inches per year in the corridor. Temperature ranges in the study area are broad due to altitude. Temperatures at the lower end of the corridor tend to be mild and extend from 60 to 80 degrees (F) summer and 55 to 75 degrees (F) in winter. By contrast, temperatures tend to be more extreme in the upper portions of the study area and may extend from the low 30 to 50 degree (F) range in the winter to the upper 40 to 60 degree (F) range in the summer (University of Hawaii, 1983, pp. 62-65).

Soil types observed in the project area range from mollisols in the lower portions of the corridor to loose, cinder or in the upper part of the corridor. According to the Atlas of Hawaii, the dominant, major soil types are classified as *mollisols and inceptisols* (Ibid., p. 46). *Inceptisols* are best developed on the thin mantle of volcanic ash which covers large areas of the slopes of Haleakala, while *mollisols* are relatively young, well-drained soils that develop on lava, but also coral or alluvium (Ibid., p. 39-41).

In general, indigenous and endemic plant species predominate in the two upper plant communities, while alien species become common in the subalpine dry forest community and dominant in the mesic forest and grasslands community.

Alpine dry shrubland is dominated by hairgrass (Deschampsia nubigena) and *kupaoa* (Dubautia menziesii). The community begins c. 9700 ft. AMSL (the upper limits of the corridor) and shifts to subalpine dry shrubland at c. 8700 ft. AMSL (Paul, 1995, p.3).

Subalpine dry shrubland is dominated by *ohelo* (Vaccinium reticulatum), *pukiawe* (Styphelia tameiameia), hairgrass (Deschampsia nubigena), and *paia*, or brake fern (Pteridium aquilinum var. decompositum). This community extends to c. 7000 ft. AMSL, where subalpine dry forest becomes expressed on rock outcrops and loam (Ibid. p. 4).

The subalpine dry forest community is dominated by *mamane* (Sophora chrysophylla), *pilo* (Coprosma montana), *'a'ali'i* (Dodonaea viscosa), *pukiawe* (Styphelia tameiameia), and *ohelo* (Vaccinium reticulatum). It extends through the relatively narrow band from c. 7000 ft. to 6500 ft. AMSL. This habitat is heavily damaged by feral ungulates and domestic cattle (Ibid.).

The Montane mesic forest and grasslands begins at ca. 6500 ft. and descends to the lower-most part of the corridor, at c. 3000 ft. AMSL. This zone is dominated by alien species and is located on rich loamy topsoil. Remnants of the former native forest such as *koa* (Acacia koa) are still to found in undisturbed areas (i.e. gulches). Dominant alien trees now include the fire tree (Myrica faya), wattle (Acacia mearnsii) and pine (Pinus sp.). At this elevation, the habitat has been impacted by range cattle, and extensively degraded by feral pigs and goats (Ibid., pp. 4-5).

The entire corridor area shows extensive damage caused by various feral animals and grazing cattle. In fact, as Paul discusses the conditions along the corridor, he says (Ibid., p. 6):

"As endangered mammals were not seen in the corridor, and likely do not occur in habitats similar to those in the corridor, impacts on endangered mammals from the project will be non-existent. On the contrary, mammals found in the corridor are the single greatest threat to endangered species and the biological communities found there."

BACKGROUND HISTORICAL RESEARCH

Precontact period

The slopes of Haleakala Crater were most likely areas which were exploited in precontact times for the timber and plant fibers growing there. In elevations ranging from 2500 to 4000 feet in elevation, with annual rainfall of 40 to 60 inches, there would have been mixed open forest with *ohia lehua* (Metrosideros collina, subsp. polymorpha) and *koa* (Acacia koa) predominating. At elevations ranging from 4000 to 7000 feet, open *koa* forest was the dominant plant community, while in elevations higher than 7000 feet would have been found shrubs such as *mamane* (Sophora chrysophylla), *pukiawe* (Styphelia tameiameia), *a'ali'i* (Dodonaea viscosa) and *ohelo* (Vaccinium reticulatum) (University of Hawaii, 1985. p. 70).

Extensive human habitation areas exist at the lower elevations to the south of the project corridor, in the adjoining *ahupua'a* of Keokea and Waiohuli (See discussion in section on Archaeological Background Research).

Handy and Handy (1972, p. 510) describe *kula* land as "open country, or plain, as distinct from valley...and has often been used as a term to distinguish between dry, or 'kula land' and 'wet taro land'". They also talk about the Kula area of Maui as a place where potatoes are grown in crumbly lava and humus in favorable "pockets and patches" on the slopes and hillsides. They go on to say the lands "in olden days were walled up all around with the big and small stones of the patch until there was a wall (kauiwi) about 2' high" (Ibid., p. 131).

In an earlier work, Handy (1940) speaks about Kula in the general descriptive sense, as "always an arid region, throughout its long, low seashore vast stony kula lands, and broad uplands. Both on the coast, where fishing was good, and on the lower westward slopes of Haleakala a considerable population existed. So far as I can learn Kula supported no Hawaiian taro, and the fisherman in this section must have depended for vegetable food mainly on poi brought from Waikapu and Wailuku across the plain to supplement their sweet potato staple diet." (Ibid., p. 161).

Post-contact period

Much of the upcountry area of Maui became part of a land distribution experiment conducted by the administration of Kamehameha III prior to the Great Mahele. Trial fee ownership of land by native Hawaiian families was suggested, as more and more concern arose about foreign encroachment. The King was pushed by this agitation to initiate the experiment, and armed with an action of the legislative committee which had been urged on by Dr. Judd, then minister of the interior, he visited Maui in December of 1845. In January of 1846, the King announced that the entire district of Makawao would be offered for sale to the native Hawaiian people. Thus the trial fee ownership was begun (Kuykendall, 1968, p. 283). Only a few parcels were purchased, however, as many people feared it was but another scheme designed to enrich the chiefs at their expense. The land sold for $1.00 per acre, and in all about 100 parcels ranging from 5 to 10 acres each were taken up (Ibid.). When the Great Mahele began in 1848, the bulk of the land in upcountry Kula became Government Lands.

Since the bulk of the study area lies within Kaonoulu Ranch lands[1], the history of land tenure and ownership of those properties is noted. A document on file in the offices of Kaonoulu Ranch reports on an early transfer of about 600 acres of land in Kaonoulu, extending from the top of the mountain *makai* to lower elevations. The text reads:

"Know all men by these presents that I, Keaka, of Koanaulu [sic.], *Island of Maui, for and in consideration of One Dollar to me this day paid in hand by Elizah Sniffin of Koanaulu* [sic.], *island of Maui, the receipt of which is hereby acknowledged, do grant, bargain, sell and by these presents convey unto him, the said Elijah* [sic.] *Sniffin and to his heirs, executors, administrators and assigns forever all that certain lot of land situate in Koanaulu.....as described as follows:*

Commencing at the crossing of the foot path at the first big Gulch, South of B.H. Sniffins house & running in the centre of the Gulch about six chains to where the gulch forks, thence following the centre of the Northern branch about one mile to where the Gulch forks again, thence following the centre of the Southern Branch up thro. the forest & continuing on the top of the mountain, commencing again at water hole at the crossing of above said foot path in the first big Gulch North of Torberts wooden house on Koheo & following the centre of the Northern branch up thro. the forest coming out on the left hand or Northern side of clumps of Koa trees situate on Koheo immediately above the forest and following the centre of said Gulch to the top of the mountain, commencing again at the first mentioned points on either side & running makai in the centre of above said Gulches until the [sic.] *meet together about two miles below. These boundaries are well defined & not to be mistaken but very difficult to chain including an area of six hundred acres, more or less.*

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[1] Kaonoulu Ranch occupies the entire *ahupua'a* of Kaonoulu, as well as portions Alae and Koheo 1 & 2. The ranch is comprised of nearly 9000 acres, stretching from Pi'ilani Highway in Kihei to near the summit of Haleakala, according to owner, and present manager, Henry Rice (Personal Communication, 1994).

To have and to hold the above conveyed premises and all the tenements and hereditaments situate thereon, with this my covenant of warranty and lawful seizures unto the said Elijah Sniffin his heirs, executors, administrators and assigns forever.

In witness whereof the said party, Keaka has hereunto set her hand and seal at Honolulu, this third day of October A.D. 1850."

In 1858 Kamehameha IV granted through Helu 4388, Royal Patent, land in Hana, Lahaina and Kula to A. Keohokalole. The document reads:

"BY THE KING, AND UPON CONFIRMATION OF AWARD BY THE LAND COMMISSIONERS.

Whereas, the Land Commissioners did by their decision, award to A. Keohokalole (Kuleana Helu 8452) the claim as herein below mentioned in fee simple, and whereas the Government has released its right in said premises without expense,

Therefore, by the Patent, Kamehameha IV in whom God has faith and placed him on the Hawaiian Islands, makes known to all men that it has this day for himself and for his Sovereign successors has granted and given in fee simple unto A. Keohokalole in an to all those premises at Hana, Lahaina and Kula....Excepting the kuleana of the natives. Reserving however to the Government all mines of minerals and metals."

This deed is signed by "Kamehameha" on June 23, 1858, with a notation "Kaahumanu" on the lower left hand side. The Kula parcels in this grant which are germane to the current study are Alae 3 and Koheo *ahupua'a*, adjacent to Kaonoulu *ahupua'a*. The exact size of the land contained within Alae 3 and Koheo is not specified.

Nearly the entire *ahupua'a* of Kaonoulu was included in Land Commission Award 3237, granted to H. Hewahewa, and consisted of 5715 acres.

By 1880, an A.H. Widemann held two mortgages on portions of the property made by Keano R. Eldridge and David P. Eldridge, Jr., her husband. After advertising for three weeks an intent to foreclose on the mortgages in the Commercial Advertiser and Kuoka, the two English and Hawaiian language newspapers published in Honolulu, he placed the property for sale at public auction on March 27, 1880. It was sold to Cecil Brown for the sum of $9,000.00 (Deed on file at Kaonoulu Ranch Office). On February 10, 1881, Cecil Brown sold the property described as the *ahupua'a* of Kaonoulu, containing 5715 acres "more or less, excepting so much thereof as may have been heretofore sold and conveyed and being the land awarded to one Hewahewa by Land Commission Award No. 3237 and Royal Patent No 7447", to Alaoka and Young Hee for the sum of $10,000.00.

Between 1881 and 1889, Young Hee acquired other pieces of land which were later incorporated into Kaonoulu Ranch. Having returned to China because of a family matter, Young Hee made J. Alfred Magoon his trustee in the business of his properties in the Hawaiian Islands. The lands were sold in 1899 to A.V. Gear and Theodore F. Lansing, business partners in Gear Lansing and Company of Honolulu for $32,000.00 in

"gold coin of the United States". William H. Cornwell had been looking for land on Maui to add to his own ranch, and promptly purchased the land before another large land holder and entrepreneur, Claus Spreckels had a chance to bid on it. Following Cornwell's death, the property was deeded to his widow and heirs in 1908. Harold W. Rice, grandfather of the present manager, Henry Rice, purchased the property from the Cornwell family in 1916.

An article in **THE MAUI NEWS**, dated August 25, 1916, states that Mr. Rice became the largest individual landowner on Maui with the purchase of the Cornwell property. It goes on to say that Mr. Rice resigned as the assistant manager of Maui Agricultural Company, where he had worked for five years, to devote himself full-time to his ranching activities. In 1918 he was elected senator from Maui to the territorial legislature, and served in that capacity for may terms.

Another article in **THE MAUI NEWS,** dated December 4, 1926, mentions the success of Kaonoulu Ranch:

"Kaonoulu Ranch, the property of Senator Harold Rice, is a combination of five different ranch properties, which were known as the Robinson Ranch, the Enos Ranch, the Frank Correa Ranch, part of the Freitas Ranch and the old Cornwall [sic.] *Ranch. It is one of the largest properties of its kind in the whole territory and from the outset has met with the greatest success. Cattle from its pastures, horses from its breed farm and hogs from its fattening lot are eagerly sought on the markets of the territory.*

Kaonoulu Ranch is a business concern pure and simple and Senator Rice gives it his personal supervision throughout the entire year. The ranch property extends over a wide area and there is not a month in the year in which the genial owner does not visit every portion of the property to keep in touch with the various phases of the industry of cattle raising."

Always on the lookout for ways to improve the products of the Ranch, Senator Rice began shipping beef, which had been fattened on pigeon peas, to market in Honolulu. **THE MAUI NEWS** reports (August 3, 1927):

"A unique feature of Senator Rice's new enterprise is the fact that he will do all his slaughtering at his Maui plant, shipping the dressed beef to Honolulu in cold storage.

'It has been my experience that livestock is frequently badly bruised when shipped from the other islands', said Rice, 'and this results in an inferior grade of beef. I believe we will obtain much better results by slaughtering on Maui and shipping the dressed beef.'

Senator Rice's cattle ranch on Maui is one of the showplaces of that island. All his stock is finished off on pigeon peas before being sent to market."

The Ranch has remained within the family ever since. In 1956, it was incorporated into Kaonoulu Ranch Company, and this company entered into a Limited Partnership in

1982. The present manager is the grandson of Senator Rice, Henry Rice. Numerous cattle range the ranch, and were often encountered during the inventory survey field work.

ARCHAEOLOGICAL BACKGROUND RESEARCH

Perusal of the literature indicates that no archaeological work has been done in the study parcel. However, extensive work has been done on the Hawaiian homes lands directly to the south in the *ahupua'a* of Waiohuli and Keokea.

At the request of the Department of Hawaiian Homes Lands, PHRI conducted an archaeological inventory survey of Keokea and Waiohuli Subdivisions (Brown and Haun, 1989). These subdivisions comprise 1025 acres (351 in Keokea and 674 in Waiohulu) and range in elevation from 1,800 to 3,000 feet AMSL. A total of 159 sites were located, which contained 274 features, ranging widely in form and function. Minor agricultural features, which apparently are quite numerous, were not documented in detail, but were generally described and plotted in terms of extent and spatial relationships (Ibid., p. ii).

Of the total number of sites, 108 were in Keokea and 51 are located in Waiohuli. Formal feature types were predominantly enclosures (66% in Keokea, and 48% in Waiohuli), followed by terraces (8% in Keokea and 8% in Waiohuli), overhangs (10% in Keokea and 5 % in Waiohulu), walls (8% in Keokea and 21% in Waiohuli) and a variety of other types ranging from alignments to mounds. One *heiau* was identified in Keokea, along with 6 platforms. Primary functional types were classified as habitation sites (c. 75% in Keokea and c. 55% in Waiohuli) [Ibid., pp. 14-15].

The radiocarbon analysis places most activity within the last 300 or so years, but a number of dates are earlier and range from 540 $\pm$ 90 to 450 $\pm$ 90 (AD 1270-1490). One early date of 1110 $\pm$ 100 came from Keokea site K-7, a rectangular enclosure tentatively assigned a permanent habitation function. This would suggest that the area had been inhabited for nearly a millennium (Ibid., pp. 18-20). The artifacts recovered from test excavations included abraders, a flaked lithic tool and lithic debitage (112 pieces), 37 pieces of volcanic glass, 60 pieces of flaked basalt, some polished basalt flakes, one shark tooth, and 2 pieces of coral. Marine gastropods, bivalves, fish and echinoderms were also recovered (Ibid., p. 18).

In discussing the findings, the authors state: "The overall data suggests that Keokea Subdivision was intensively expoited [sic.] in a variety of ways for at least two-thirds of the entirety of Hawaiian prehistory. There is evidence in the project area for change over time, spatial variety, functional (behavioral) variety, and interaction with peoples in other (coastal) areas.....The feature types in the area (*heiau* to agricultural mounds) do, however, reflect a full range of activities." (Ibid., p. 27).

Additional data collection on many of these sites has been done under the direction of Michael Kolb for the Department of Hawaiian Homes in 1994. He describes Kula as "a minor political district under the jurisdiction of the West Maui chiefs, containing five communities occupying land units which extended from the sea to the mountain (Kolb, in press; as cited in Moore and Kennedy, 1995, p. 5). Further discussion of the region by Kolb suggests that the growth of population in the 1400's to 1600's led to a change in the Kula upland agricultural system from small, isolated garden plots to a field system in areas where enough rainfall was present to support dryland agriculture (Ibid.). Permanent habitation was accompanied by construction of religious structures, one of which, Molohai Heiau (Site 50-50-10-1037) has been intensively studied by Kolb. He identified a series of occupational phases indicating ritual use from as early as AD 1057 until its abandonment at c. AD 1819 (Ibid., p. 7). Changes in the faunal species used in rituals during the different occupational phases may mirror environmental changes taking place in the woodland region of upland Maui (Ibid.).

Currently research is continuing under the direction of Boyd Dixon (Personal communication, Theresa Donham, November 9, 1995).

Archaeological Consultants of Hawaii conducted an inventory survey of a 100 foot wide corridor nearly 2,500 meters in length, for an 18 inch water transmission line. It runs roughly parallel to Kula Highway at an elevation of between 2600 and 2700 feet. The pedestrian survey located 8 significant historic sites, the functions of which were identified as agricultural and residential/burial (?). The feature types included walls, platforms, an enclosure, stone alignments, and a concrete water trough. No subsurface testing was undertaken since the waterline corridor was realigned to avoid the sites (Moore and Kennedy, 1995).

Another archaeological survey was conducted on a 22.25 acre parcel in Kaonoulu *ahupua'a*. This parcel is located just above Rice Park which is c. .5 km. to the north of the lower portion of the study corridor. This survey identified a total of 6 sites comprised of 29 features. These included the following formal types: terrace, wall; enclosure, cistern, mound, building and platform. Functional types included water catchment, agricultural, privy and undetermined, all of which were deemed historic. No further archaeological work was recommended (Burgett and Spear, 1995).

Xamanek Researches conducted an inventory survey on a parcel of land very close to the water line corridor studied by ACH. It was located where the new Kula Recreation Park and Fire Station now stand. A single site, Site 2899 consisting of a complex of 11 stone features was investigated. The features consisted of stone walls for erosion control, stone fences for animal containment and boundary markers, and several agricultural clear piles (Fredericksen and Fredericksen, 1992). Data recovery was done to determine if the sites were indigenous or historic. Excavations found that all were historic, and probably dated from early to mid-20th century (Fredericksen and Fredericksen, 1993).

Just downslope, south of Calasa Road, a 14 acre parcel was inventoried (Fredericksen and Fredericksen, November 1993).[2] A total of 15 stone features were identified and given site numbers. Two are border walls, 4 are circular or semi-circular modified outcrop structures, 2 are rectangular enclosures, 5 are rock alignments probably marking boundaries, or used for erosion control, 1 is a historic corral, and the last a complex containing a stone alignment, a circular modified bedrock enclosure and terraces. The terrace complex and several of the modified bedrock enclosures are reminiscent of what Handy refers to as "pocket gardens" (1972). Excavations were conducted in several of the stone enclosures, but results were inconclusive, as no cultural or datable materials were recovered. One long stone wall separates Land Grant 3875 from 3876, and the other borders Calasa Road. Data recovery was undertaken on the latter (Site 3713) since it was going to be partially destroyed by a road widening project (Fredericksen and Fredericksen, October 1994). It was found to have been built in historic times, probably at the same time that Calasa Road was constructed. Its function most likely was to keep animals from straying across the roadway.

The only recent archaeological study that has been done in the upper ranges of the study corridor is a cultural resources inventory and evaluation done for the U. S. Department of Energy in connection with the expansion of the Maui Space Surveillance Site at Science City, Mount Haleakala (Chatters, 1991). This area is located in the portion of the *ahupua'a* of Papaanui which runs along the ridgeline of the crater. Roughly a square kilometer was explored, and 4 groups of cultural features were found along with 2 associated artifacts. The features included 23 temporary shelters built against rock outcropping, and 1 short, low wall. All were found around the sides of Kolekole Hill, and most (19) were on the western side. The artifacts include a sling stone found in one of the enclosures, and an *opihi* shell found near another group of shelters. No clearly historic artifacts were found in association with the features, and they were interpreted to be prehistoric. The sites were not to be impacted by construction activities, so no further research was needed (Ibid.).

Given the findings of previous studies in the upcountry region in which the subject parcel lies, one would expect to find indigenous sites related to dryland agriculture, and possibly habitation. At the crater end one would expect to find temporary structures in which people could shelter themselves from the more extreme climatic conditions of high altitude. Since the lower slopes of Haleakala have been used extensively for farming and ranching, historic features associated with these activities would likely be present, as well. It would also be expected that considerably more alteration of the prehistoric landscape and sites would have occurred due to this activity in historic times.

[2] This parcel is adjacent to the water transmission line corridor which was inventoried by Archaeological Consultants of Hawaii (Moore and Kennedy, 1995).

ARCHAEOLOGICAL SURVEY METHODS

Field work was conducted by 3 to 6 personnel. The field director was Erik M. Fredericksen (M.A.) and project directors and coordinators were Walter M. Fredericksen (Professor emeritus) and Demaris L. Fredericksen (Professor emeritus).

The archaeological inventory survey consisted of two phases. A pedestrian survey covering 100% of the proposed corridor was first undertaken. Field personnel made *mauka - makai* sweeps of the c. 30 m. wide corridor easement beginning at c. 9700 ft. AMSL and ending at the Kula Highway (c. 3060 ft. AMSL). In general, visibility in the project area was good. Pedestrian sweeps were conducted with a 10 m. spacing. Four sites were encountered during the walkover portion of the inventory survey. When possible, sites were located with a hand held GPS (Global Positioning System) unit. In addition, the sites were located in the corridor with the aid of survey stations and markers left in place by Austin, Tsutsumi and Associates, Inc.

Following the surface inspection of the corridor, subsurface testing was conducted on the 2 lower sites. Two test units 0.5 by 0.5 m. were placed at Site 4134. A total of 11 units ranging from 0.5 by 1 m. to 1 m. square were excavated at the extensive Site 4135. Unit excavation was based on soil stratigraphy, with 10 cm. levels within soil layers. All test unit soil was screened through 1/8 inch mesh hardware cloth. One hundred percent of the material cultural remains were recovered for later laboratory analysis. One radiocarbon sample was recovered from a hearth remnant and placed in aluminum foil. This sample was sent to Beta Analytic, Inc. for analysis.

Site mapping was prepared using a hand bearing electronic compass, digital metric distance meters and metric survey tapes. Written descriptive notes were kept in the field. Photographs were taken with 35 mm. T-Max 400 black and white film, and Kodak 200 color film.

ARCHAEOLOGICAL SURVEY RESULTS

During the course of the pedestrian portion of the archaeological inventory survey, four sites were located (Map 4). Sites 50-50-15-4132 and 50-50-11-4133 are rock shelters, while Sites 50-50-11-4134 and 50-50-10-4135 are habitation and agricultural sites. Both rock shelters are at or beyond the outside limits of the proposed GTE corridor. Site 4132 lies at c. 7400 ft. AMSL and Site 4133 is located at c. 6900 ft. AMSL. The upper rock shelter consists of a lava tube with at least one rear chamber, while the lower shelter is a rock overhang. Neither site will be impacted by the GTE fiber

optics trench. Site 4134 lies at c. 3600 ft. AMSL south of and adjacent to a gulch. This site contains the remnants of an historic house platform and agricultural terracing. It will be possible to avoid impacting this site. Site 4135 lies between c. 3080 and 3200 ft. AMSL and is by far the largest site located during the inventory survey. This site contains at least one historic habitation area and extensive agricultural terracing. In several test instances, Site 4135 contains an upper historical component which overlays an indigenous component. A small portion of Site 4135 will be impacted by the GTE fiber optics trench. A discussion of the above survey findings follows. Refer to Tables 1 and 2 for summaries of subsurface findings at Site 4134 and 4135, respectively. See Table 3 for a summary of surface portable remains found at Site 4135 and Appendix A for stratigraphic profile descriptions.

Site 50-50-15-4132

This rock shelter was located at c. 7400 ft. AMSL, nearly 4 km. from the GTE Microwave Station site (see Map 4). Site 4132 lies on the side of a small, vegetated gulch which has been formed by a seasonal stream. Plant species observed in the vicinity of the small gulch included *paia* or brake fern (Pteridium aquilinum var. decompositum), *ohelo* (Vaccinium reticulatum), *pukiawe* (Styphelia tameiameia), and scattered *hinahina* (Geranium cuneatum subs. tridens), and *'a'ali'i* (Dodonaea viscosa). The shelter consists of an overhang of bedrock and a lava tube. The entrance to the lava tube is c. 2.5 m. wide by 0.7 m. high. The lava tube appears to be relatively spacious and extends back to the north-northwest 15 m. from the entrance. A small chamber lies near the rear of the visible portion of the tube. This chamber opens to c. 4 m. wide by 1.5 m. high. The site is presently utilized by feral goats. Unfortunately, it was not possible to closely inspect the interior because a decomposing goat carcass blocked the passageway c. 1 m. in from the entrance. It appeared that some stacked rocks were placed near the visible end of the tube which may extend further to the northwest. A few pieces of what appeared to be charcoal were visible amongst rocks which have been scattered by feral animals near the back of the lava tube. This site lies at the extreme southern edge of the GTE corridor and will not be adversely impacted by trenching activity which will occur further to the north.

Site 50-50-11-4133

This site lies some 2 km. west of Site 4132 at c. 6900 ft. AMSL. This second rock shelter is located on the northern bank of a small gulch which bounds the GTE corridor. Site 4133 consists of a rock overhang which is a maximum of c. 7 m. wide by 1.5 m. high by 3 m. deep. This overhang is currently utilized by feral pigs which are causing extensive damage to the surrounding vegetation. Historic items observed on the surface of the shelter floor included 2 applied lip bottles from the mid-1800s, brown and cream colored ceramic sherds, 2 applied end tin food cans, scattered charcoal and fire-cracked rocks and a dried gourd fragment. No subsurface excavation was conducted at Site 4133 because it lies just outside the GTE easement corridor and will not be adversely impacted by the project.

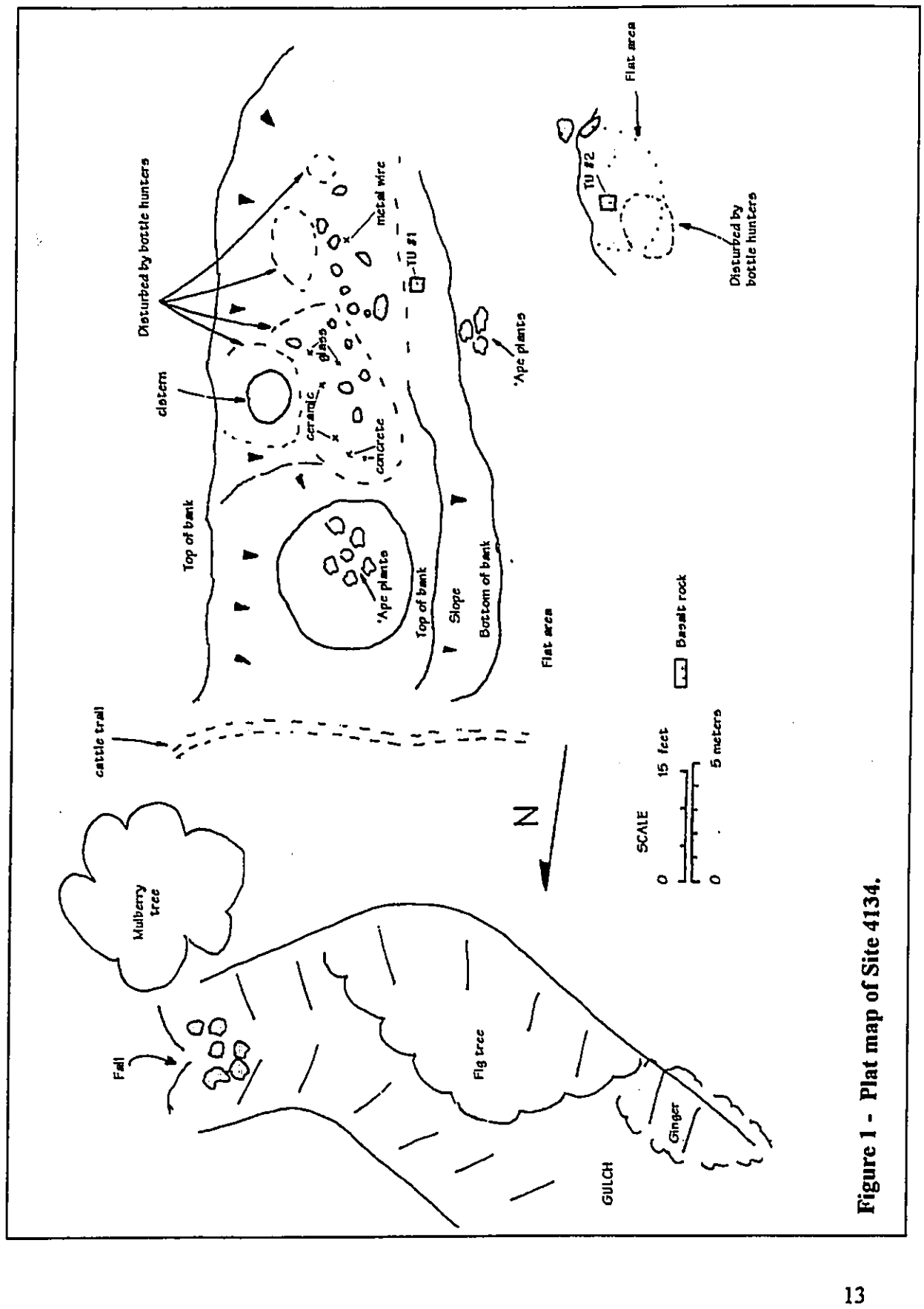

Figure 1 - Plat map of Site 4134.

Site 50-50-11-4134

Site 4134 is located c. 3 km. southwest of Site 4133 at c. 3600 ft. AMSL. It lies south of and adjacent to a subsidiary gulch which joins Kaipoioi Gulch. This site contains remnants of an historic house platform, a cistern, and agricultural terracing (Figure 1, Photo 1). A depression c. 6 m. in diameter contains indigenous *'ape* (Alocasia macrerrhiza) plants. In addition, a terrace remnant lies adjacent to and downhill from the depression with the *'ape* plants. An old mulberry (Morus alba) tree and a large fig (Ficus carica) tree are located at the edge of the gulch adjacent to the site. A series of dry land agricultural features primarily consisting of mounds and some terracing lie c. 100 m. south of Site 4134 on the side of a hill or *pu'u* outside the proposed GTE corridor. Site 4134 is covered with dense kikuyu grass and has been impacted by cattle and, possibly, bulldozing activities in the vicinity. In addition, this site was damaged by bottle hunters after it had been located by the pedestrian survey .

A plaster lined cistern c. 1.6 m. wide by 4.8 m. deep was completely dug out by bottle hunters (Photo 2). In addition, other portions of the site were also vandalized (see Figure 1). The lips and necks of 3 ceramic jugs were recovered from the area around the cistern. One of the ceramic jugs has a lead-based glaze (Personal. communication Theresa Donham, 1995). All 3 ceramic containers appear to have been broken recently and were likely damaged during site vandalism. Other disturbed portable remains noted on the surface included metal fragments, a section of cable, broken bottle glass fragments likely from the late 1800s, and galvanized metal roofing.

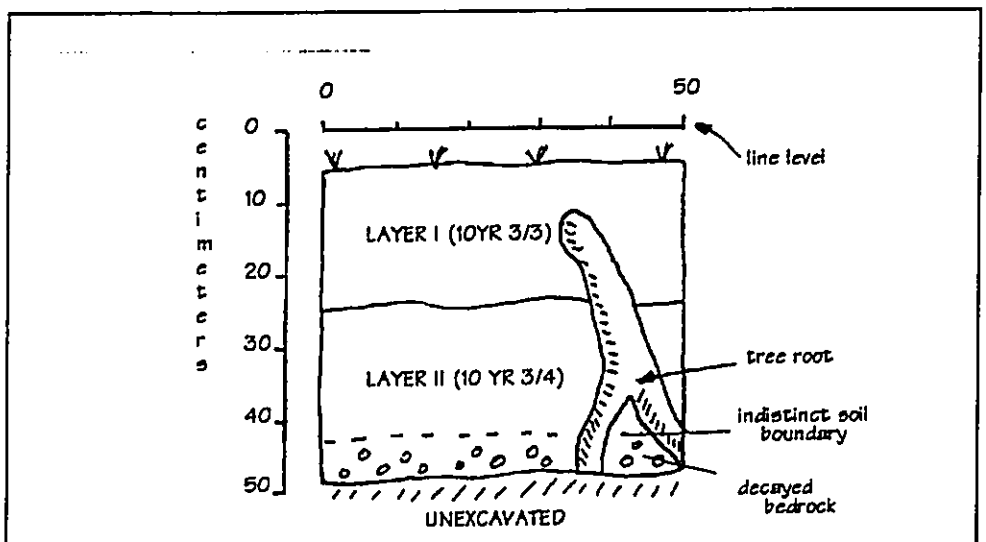

Figure 2 - North face profile of TU 1, Site 4134.

Site 4134 is in poor condition and has low research potential. Subsurface testing consisted of two 0.5 by 0.5 m. units. Results from both units indicate that this is an

historic site, dating possibly to the late 19th or early 20th century. The site was likely associated with past Kaonoulu Ranch activities.

Test Unit 1

This 0.5 by 0.5 m. test was placed in a flattened area that had recently been bottle hunted. Two soil layers were encountered before excavation was terminated in sterile subsoil and decayed bedrock c. 44-47 cmbs (Figure 2). The unit yielded only historic materials (see Table 1). Layer I (0 to 19 cmbs) consisted of friable, dark brown (10 YR 3/3) loam. Level 1 (0 to 10 cmbs) of Layer I produced 3 round head nails which were well weathered. Level 2 (10 to 19 cmbs) yielded additional materials including rusted metal, drawn square nails, mammal bone (bovine) and some clear bottle glass fragments.

Layer II (19 to 39 cmbs) was composed of dark yellowish brown (10 YR 3/4) clay loam which overlaid decayed bedrock. Level 1 (19 to 29 cmbs) contained historic materials such as rusted metal, round head nails and one drawn square nail. Level 2 (29 to 39 cmbs) of Layer II was sterile. Layer II graded into sterile (10 YR 3/6) subsoil, which contained decayed bedrock. Excavation was halted at c. 44 to 47 cmbs.

Test Unit 2

This unit was placed c. 10 m. downslope and west of TU 1. Unit dimensions were 0.5 by 0.5 m. by 0.44 mbs. Stratigraphy encountered in TU 2 was similar to that found in TU 1 (Figure 3). This unit also yielded historic materials. Layer I (0 to 17 cmbs) consisted of the same dark brown (10 YR 3/3) loam found in TU 1. Level 1 (0 to 10 cmbs) yielded metal and a round head nail. Level 2 (10 to 17 cmbs) contained 3 pieces of thick brown bottle glass.

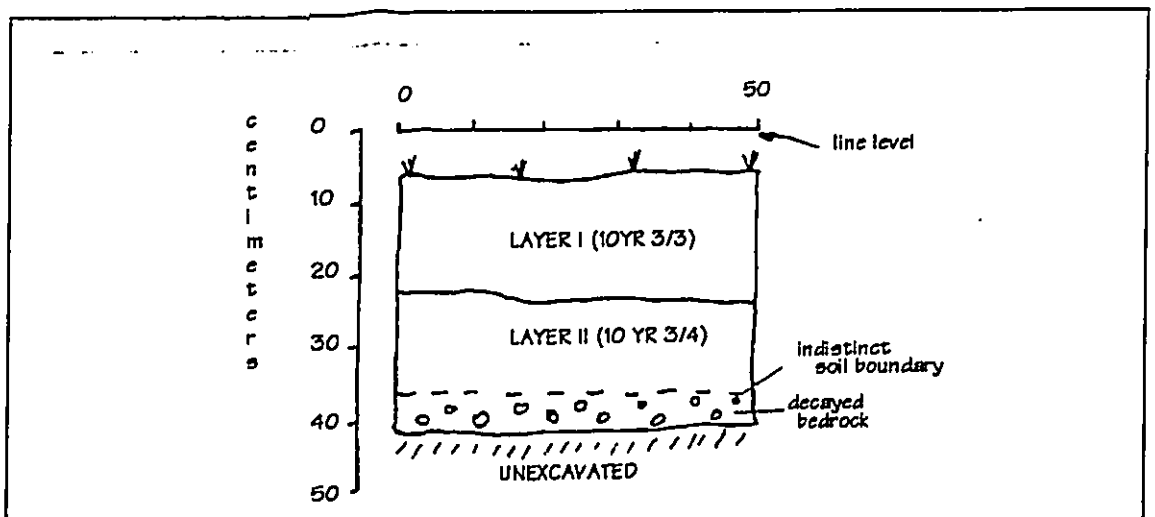

Figure 3 - South face profile of TU 2, Site 4134.

Layer II (17 to 38 cmbs) was sterile and consisted of dark yellowish brown (10 YR 3/4) clay loam. Layer II graded into sterile reddish brown subsoil (10 YR 3/6) which contained fragments of decayed bedrock between 36 and 40 cmbs. Excavation was abandoned at between c. 42 to 44 cmbs.

Site 50-50-10-4135

Site 4135 is by far the most extensive archaeological site which lies within the study area. The site is covered primarily by kikuyu grass, lies between c. 3080 and 3200 ft. AMSL and is about 60 m. east of Kula Highway. It is c. 2-3 hectares in area and consists of agricultural terracing, 2 rock cairns, 2 platforms and the remnants of an historic period habitation area. The historic habitation area lies in the GTE corridor and is identified as Feature A (Figure 4). Much of the terracing is rock faced on the downslope side. While Site 4135 is extensive in size, the fiber optics ductline trenching will only impact a small portion of this site (Map 5). Consequently, subsurface testing of Site 4135 was restricted to the corridor area. In addition, GTE does not own the land and will be obtaining an easement from the land owner--Kaonoulu Ranch. At the completion of our fieldwork, GTE chose to realign the fiber optics corridor in order to avoid impacting the terracing and Feature A.

In general, Site 4135 is in poor to fair condition, having been impacted by ranching activities over the years. A dirt access road utilized by ranch personnel, crosses the site well outside the corridor study area. In addition, some bulldozing has occurred in portions of Site 4135.

Subsurface investigation consisted of 12 test units (TU) ranging from 1.0 by 0.5 m. to 1.0 by 1.0 m. Test results indicate that many of the sampled portions of Site 4135 contain an historic component and an apparently disturbed indigenous one. Based on portable remains found, it appears that the historic component is roughly 100 years old. This historic component is likely resultant from agricultural activities associated with the production of potatoes for the Gold Rush in California and, apparently, later ranching activities. One small radiocarbon sample was recovered from TU 7, but it appears to be from the historic period. It was not possible to obtain a date for the indigenous component of Site 4135. In sampled areas, this component appears to have been impacted by historic agricultural activities. A brief discussion of the subsurface results follows.

Feature A

As noted earlier, Feature A was originally located in the GTE Fiber Optics corridor. Consequently, we placed 6 test units in the area of the feature (Figure 4). It consists of 3 terrace remnants and a curved rock alignment, c. 10 m. long. An historic surface scatter consisting of pieces of bottle glass (19th century), ceramics, rusted metal, a

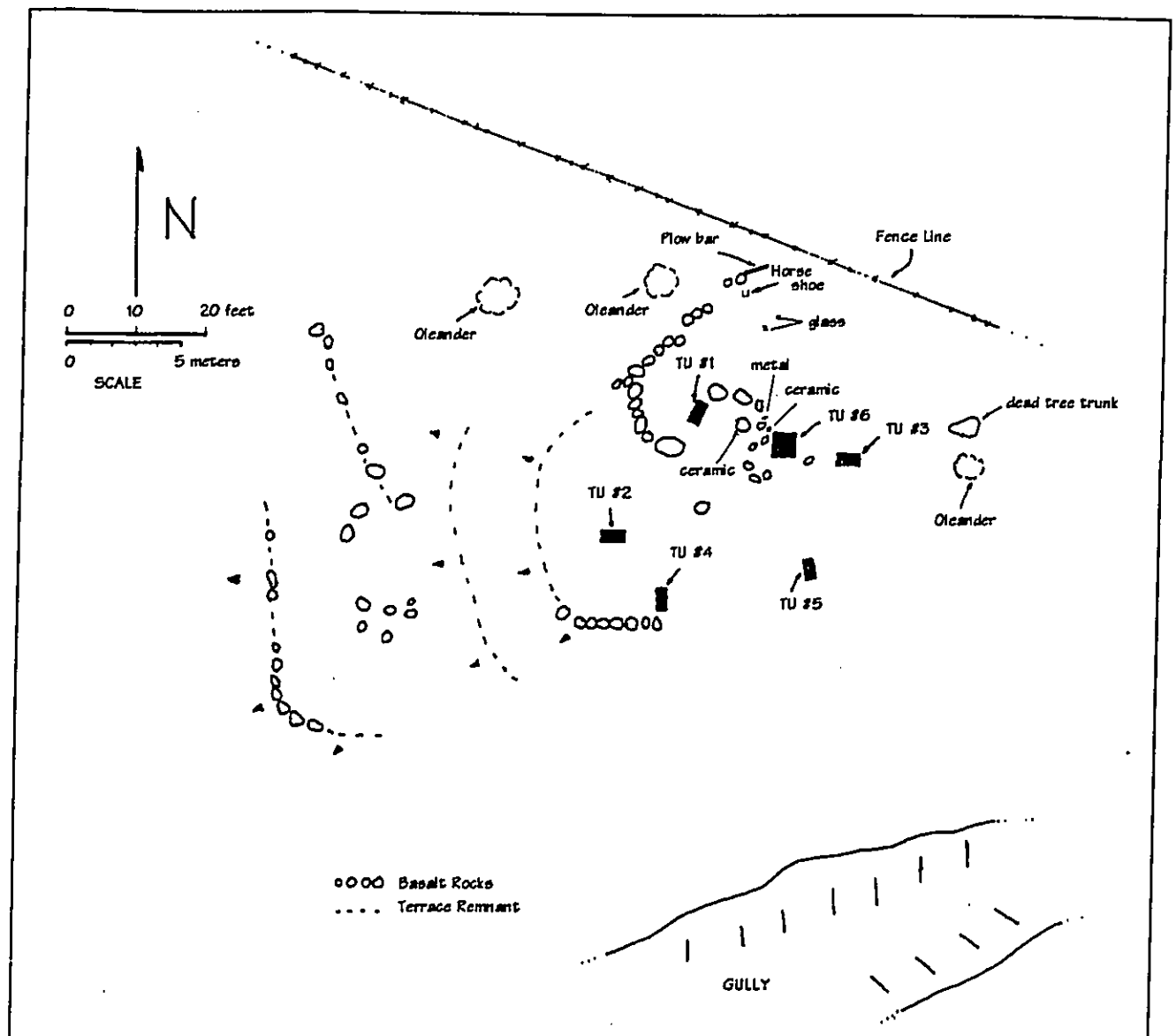

Figure 4 - Plan view of Feature A, Site 4135

horse drawn plow bar and a horse shoe were noted but not collected. In addition, 3 oleander (Nerium indicum) shrubs were found growing in the feature area. Overall areal dimensions of Feature A are c. 22 m. E-W by 18 m. N-S. The feature is interpreted as an historic habitation site that is in poor condition.

Test Unit 1

This 0.5 m. by 1 m. unit was oriented to 22 degrees magnetic. It was placed c. 4 m. east of the curved rock alignment. A total of 3 soil layers were encountered before the

unit was halted at c. 33 to 40 cmbs (Figure 5). This unit only yielded historic cultural materials (see Table 2). Layer I (c. 0 to 20 cmbs) was composed of friable, dark brown (10 YR 3/3) loam. This layer was about 15 cm. deep in the southern portion of TU 1. Level 1 (0 to 10 cmbs) produced various historic items including rusted nails (round and square head), a terra cotta sherd, and thick brown and clear bottle glass (c. late 1800s). In addition, 3 fire-cracked rocks were found. Level 2 (10 to 20 cmbs) yielded one small drawn square nail.

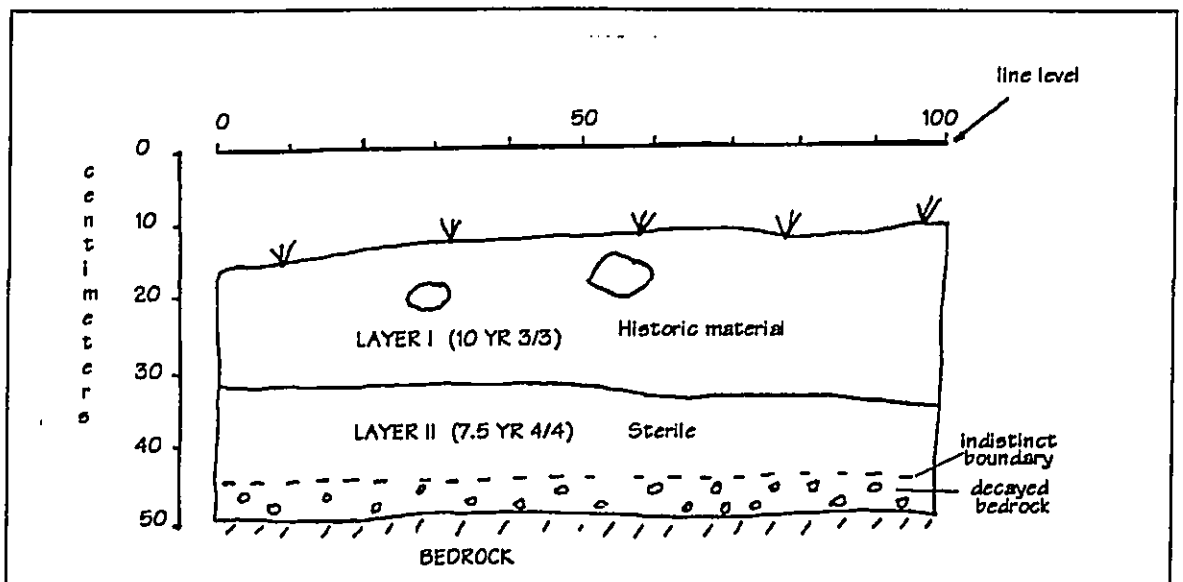

Figure 5 - West face profile of TU 1, Site 4135.

Layer II (20 to 34 cmbs) was composed of brown to dark brown (7.5 YR 4/4) loam. This soil layer contained no cultural materials and overlaid sterile, strong brown (7.5 YR 5/6) subsoil which contained decayed bedrock. Excavation was halted at a maximum depth of 40 cmbs.

Test Unit 2

This unit was placed c. 10 m. downslope and southwest of TU 1 in a terrace remnant. Unit dimensions were 0.5 by 1 m. by 0.42 m. deep and TU 2 was oriented E-W. Unit stratigraphy was similar to that in TU 1 (Figure 6). Layer I (0 to 18 cmbs) was the common dark brown (10 YR 3/3) loam present in all test instances at Site 4135. Level 1 (0 to 10 cmbs) yielded 1 piece of green bottle neck glass (early 20th century) and 4 rusty nails (1 possible square head). Level 2 (10 to 18 cmbs) was sterile.

Layer II (18 to 35 cmbs) brown to dark brown (7.5 YR 4/4) loam was sterile. This stratum graded into sterile strong brown (7.5 YR 5/6) subsoil. The unit was abandoned at a maximum depth of 42 cmbs.

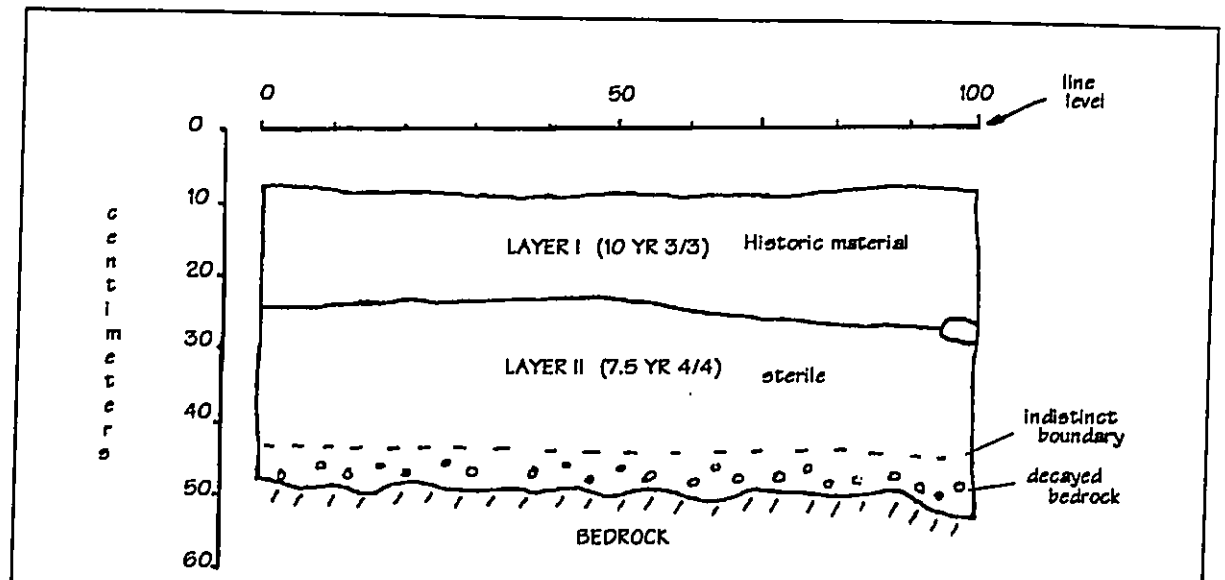

Figure 6 - South face profile of TU 2, Site 4135.

Test Unit 3

This 0.5 by 1.0 m. unit was oriented E-W. Two soil layers were encountered before sterile subsoil was reached (Figure 7). Layer I (0 to 16 cmbs) was composed of the

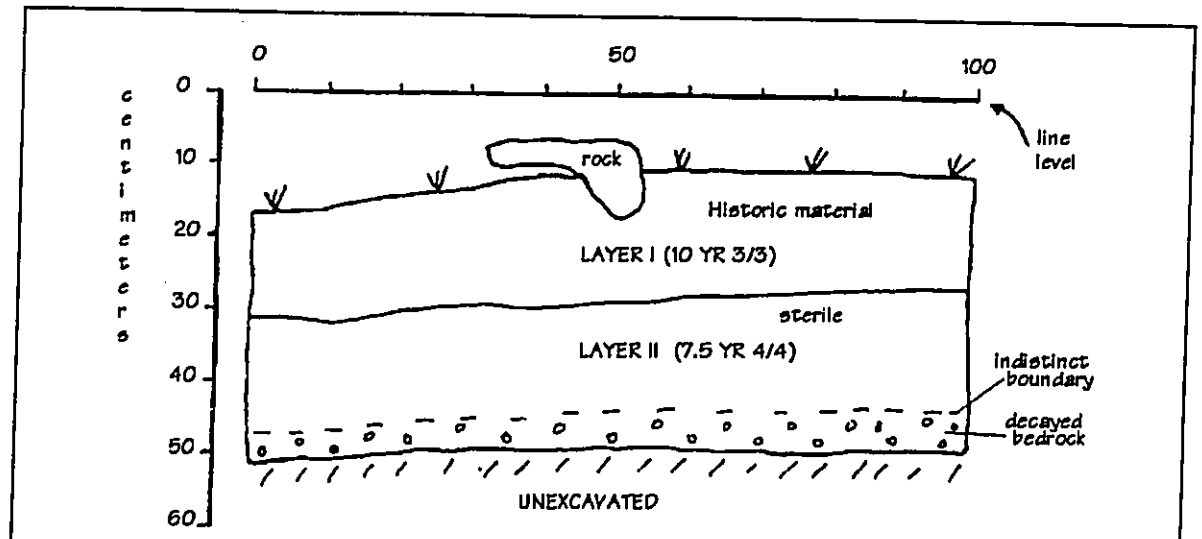

Figure 7 - North face profile of TU 3, Site 4135.

common dark brown (10 YR 3/3) loam. Level 1 (0 to 10 cmbs) produced a bone toothbrush and 36 nails (c. 80% drawn square nails). Level 2 (10 to 16 cmbs) yielded 3 drawn square nails and 2 round head nails.

Layer II (c. 16 to 30 cmbs) brown to dark brown (7.5 YR 4/4) loam was sterile. This stratum graded into sterile, strong brown (7.5 YR 5/6) subsoil. Excavation was completed at 34 to 36 cmbs.

Test Units 4 and 5

Stratigraphy in these two 0.5 by 1 m. units was similar to other subsurface tests (see Figures 8 and 9). However, both 0.5 by 1.0 m. units did not produce any material culture remains. Test Units 4 and 5 reached maximum depths of 33 and 31 cmbs, respectfully.

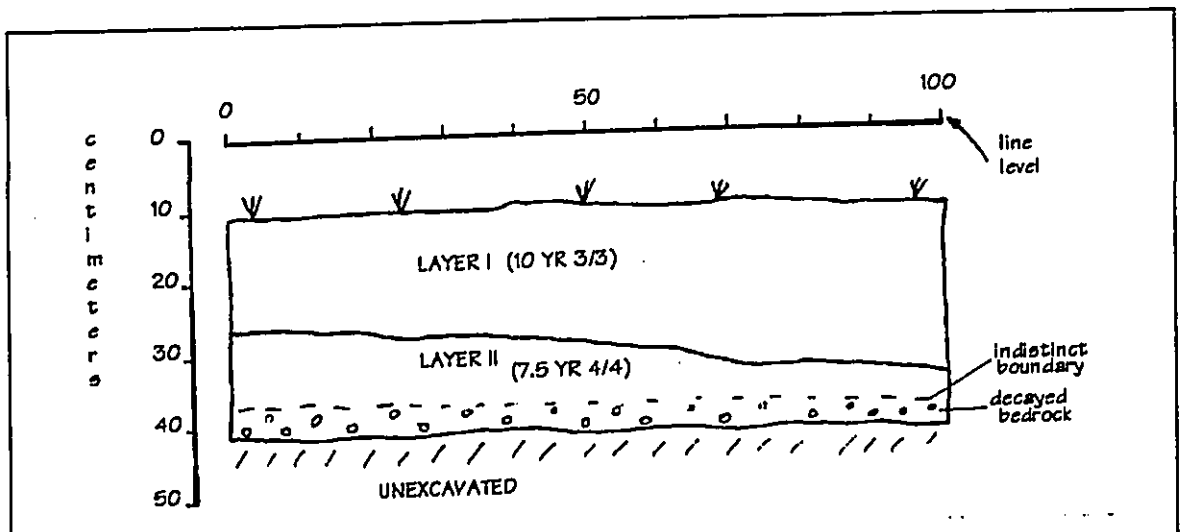

Figure 8 - East face profile of TU 4, Site 4135.

Test Unit 6

This unit was placed between TUs 1 and 3 in an area that contained scattered large basalt cobbles and historic materials. Stratigraphy was similar to other portions of Site 4135 (Figure 10). Unit dimensions for TU 6 were 1.0 by 1.0 m. by a maximum depth of 0.36 m. Layer I (0 to 17 cmbs) consisted of the common dark brown (10 YR 3/3) loam. This layer produced both historic materials and indigenous materials. Level 1 (0 to 10 cmbs) contained 1 piece of sawn mammal bone, 1 piece of thick green bottle glass from the early 20th century, 2 rusted metal washers, and over 20 pieces of rusted metal including 12 drawn square nails. The upper portion of Level 2 (10 to 17 cmbs) of Layer I contained 3 metal rods which were possibly from a horse drawn plow and 3 drawn square nails. The lower 2 to 3 cm. of Level 2 produced a small piece of unworked coral, a waste flake of volcanic glass and an unutilized basalt flake. The basalt flake is from a piece of dense, nearly black material.

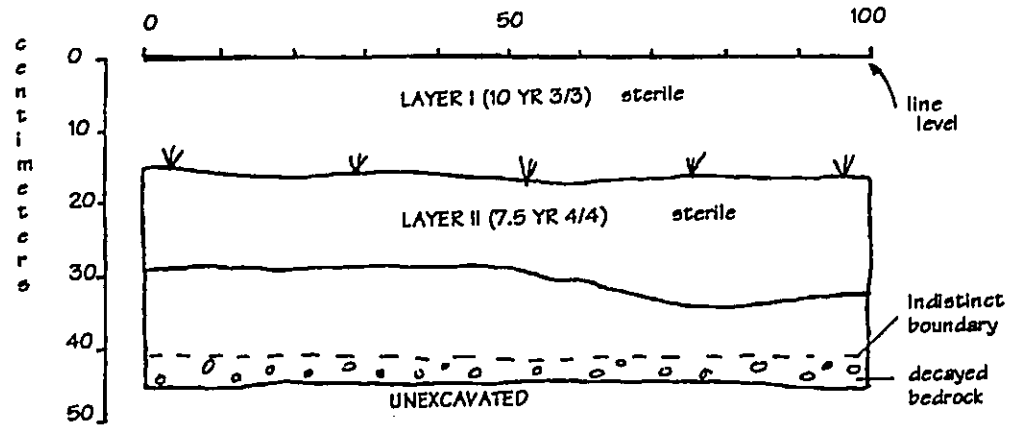

Figure 9 - East face profile of TU 5, Site 4135.

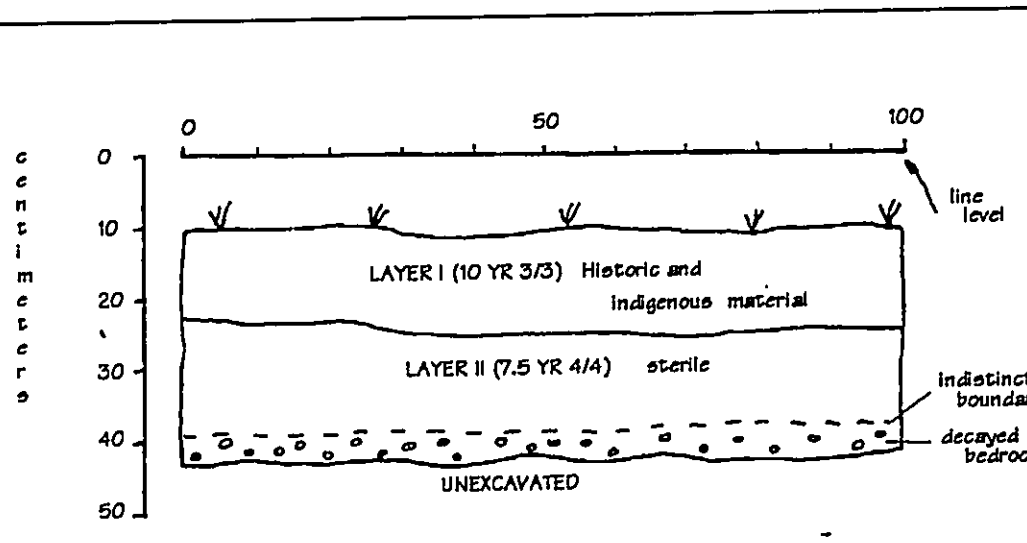

Figure 10 - South face profile of TU 6, Site 4135.

Layer I was underlain by the common Layer II. This soil layer was composed of brown to dark brown (7.5 YR 4/4) loam. Layer II (17 to 30 cmbs) was sterile and graded into strong brown (7.5 YR 5/6) subsoil between 30 and 32 cmbs. The unit was abandoned at a maximum depth of 36 cmbs.

Test Units 7 to 11

These 5 subsurface tests were placed downslope and to the west of Feature A in the GTE fiber optics corridor. In general, these units contained more indigenous cultural materials than units 1-6.

Test Unit 7

This unit was placed near what appeared to be the remnants of a terrace at the top of a c. 30 degree slope (Figures 11 and 12). A surface collection within 10 m. downslope of TU 7 yielded indigenous portable remains including an unutilized basalt flake, a possible coral abrader and 15 waste flakes of volcanic glass. These cultural materials appeared to have been deposited by upslope erosion.

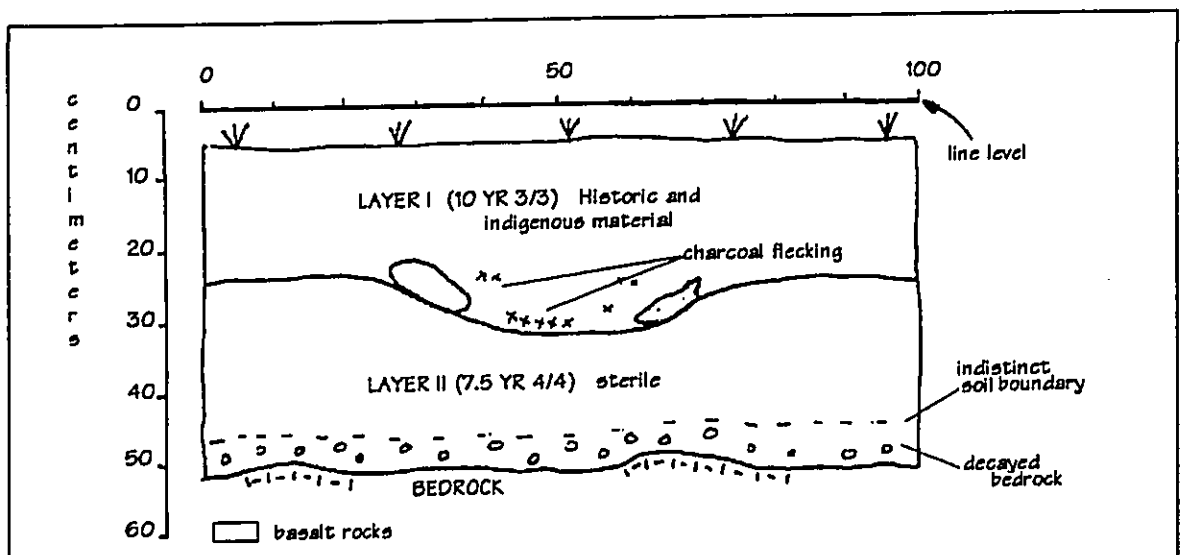

Figure 11 - West face profile of TU 7, including Feature 1--fire hearth remnant.

This test was located c. 70 m. downslope and west of Feature A. Dimensions for TU 7 were 1.0 by 1.0 m. by a maximum of 0.47 mbs and orientation was N-S. Stratigraphy encountered was similar to other units placed at Site 4135 (Figure 11). Layer I (0 to 19 cmbs) was composed of the common dark brown (10 YR 3/3) loam. Level 1 (0 to 10 cmbs) yielded 3 unutilized basalt flakes and 7 waste flakes of volcanic glass. Level 2 (10 to 19 cmbs) produced historic items including a piece of sawn mammal bone, a drawn square nail and a small shell button. Indigenous materials recovered included 2 pieces of kukui nut shell, 18 waste flakes of volcanic glass and 2 artifacts. In addition, 6 fire-cracked rocks and a hearth remnant were located in Level 2 of Layer I. The 2 indigenous artifacts are utilized basalt flakes. Both flakes are made from fine grained, dense basalt.

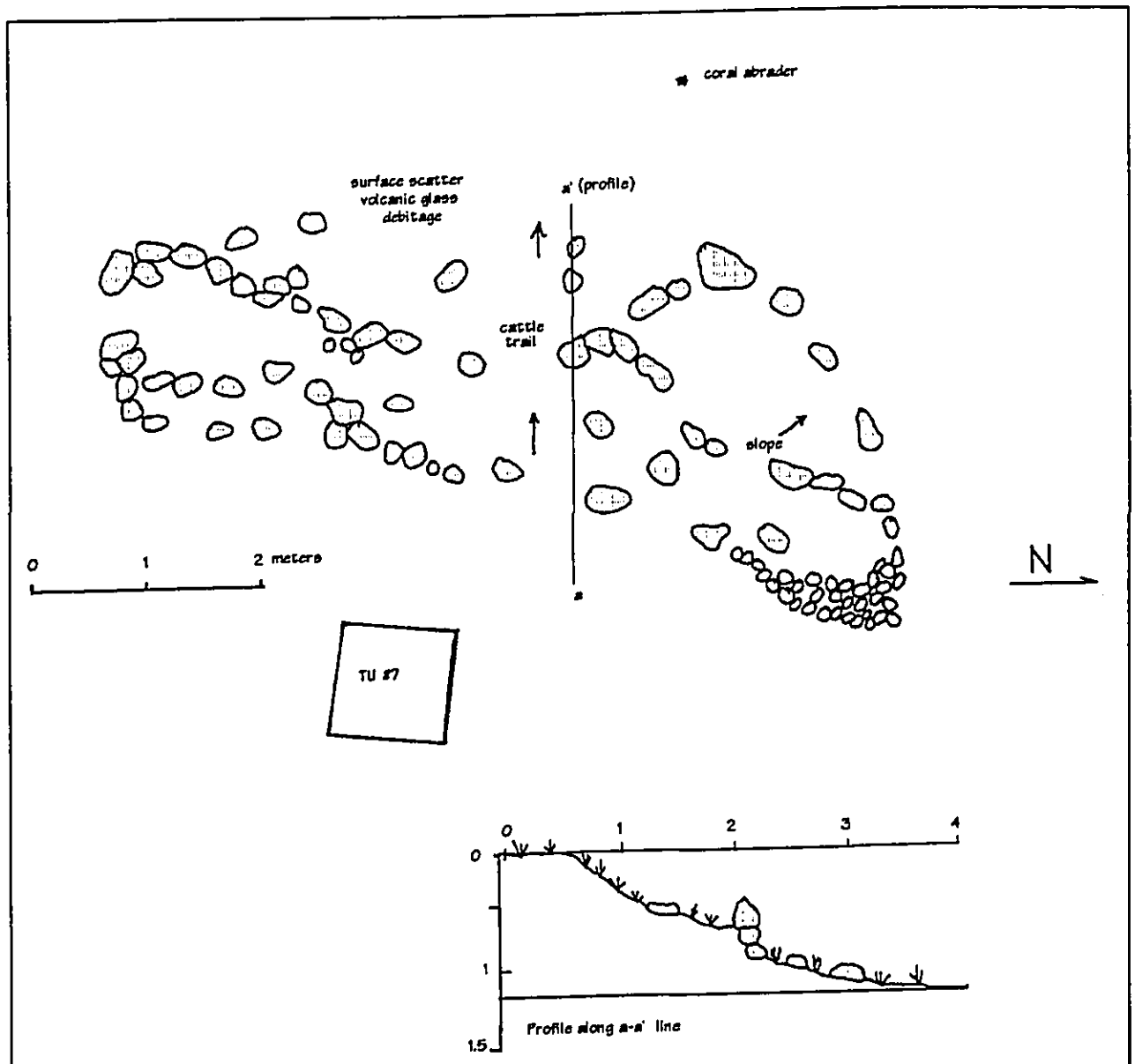

Figure 12 - Plan view and profile of terraced area in association with TU 7, Site 4135.

Feature 1 was encountered near the bottom of the level at c. 15 to 18 cmbs and extended into Layer II. Feature dimensions were c. 44 cm. in diameter by a maximum of c. 14 cm. thick. A small charcoal sample was obtained and submitted to Beta Analytic, Inc. for analysis. An extended count on the sample returned a date of 80 +/- 100 BP, or calibrated results at 2 sigma (95% probability) of cal. AD 1650 to 1950. This feature appears to be either an historic one, or an indigenous feature which had been disturbed during historic times. A single waste flake of volcanic glass was located within Feature 1. It appeared that the hearth had been disturbed, possibly by plowing.

Layer II (19 to 34 cmbs) was composed of the common brown to dark brown (7.5 YR 4/4) loam. Level 1 (19 to 29 cmbs) contained 4 waste flakes of volcanic glass. These flakes, along with those found in Layer I, consisted primarily of dense, dark material. No other cultural materials were located in Layer II. Sterile, strong brown (7.5 YR 5/6) subsoil appeared c. 34 to 36 cmbs. Excavation was halted in TU 7 at a maximum depth of 46 cmbs.

Test Unit 8

This subsurface test was located c. 20 m. downslope and west of Feature A in a large terrace. Unit dimensions were 0.5 by 1.0 m. by a maximum depth of 50 cmbs. Stratigraphy encountered was similar to other units. However, Layer I was somewhat thicker than other units (see Figure 13). Layer I (0 to 39 cmbs) was composed of dark brown (10 YR 3/3) loam. Level 1 (0 to 10 cmbs) produced an unutilized basalt flake (11.1 gm.). This flake consisted of nearly black, dense fine grained basalt. No other cultural materials were located in Layer I.

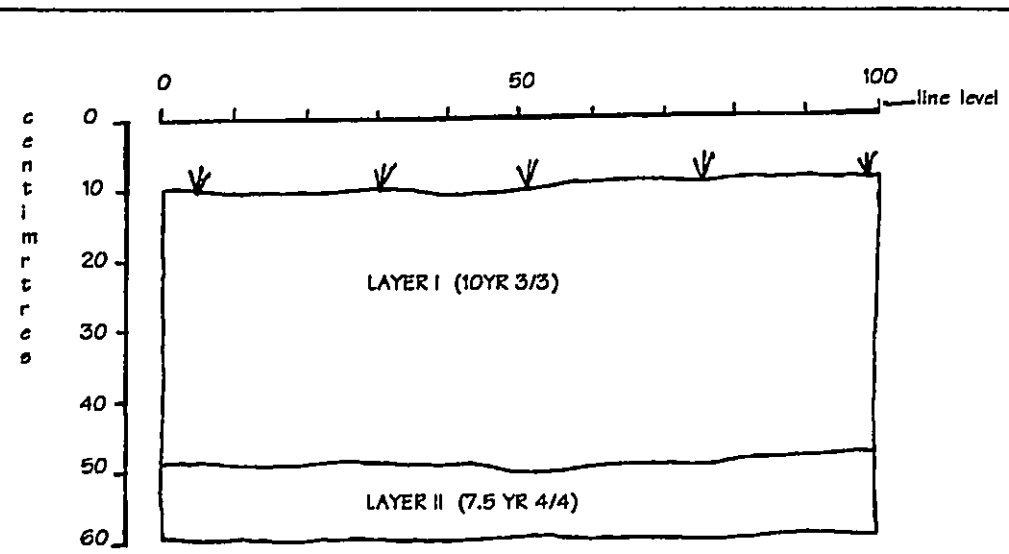

Figure 13 - North face profile of TU 8, Site 4135.

The common dark brown (7.5 YR 4/4) loam Layer II was encountered nearly 40 cmbs in this unit. Level 1 (39 to 49 cmbs) of Layer II proved to be sterile. Excavation was halted c. 50 cmbs.

Test Unit 9

This unit was placed roughly midway between TUs 7 and 8 in a flat area covered with kikuyu grass. This 0.5 by 1.0 m. by 0.48 m. deep unit yielded only indigenous

materials. Unit stratigraphy was similar to other tested portions of Site 4135. Layer I (0 to 20 cmbs) was composed of dark brown (10 YR 3/3) loam. This very friable soil layer contained scattered material culture remains. Level 1 (0 to 10 cmbs) produced a piece of kukui nut shell and 3 pieces of volcanic glass waste flakes. Level 2 (10 to 20 cmbs) yielded 2 unutilized basalt waste flakes, 3 volcanic glass waste flakes and a volcanic glass core (1.3 gm.). The volcanic glass was good quality material.

Layer I was underlain by common dark brown (7.5 YR 4/4) loam. Layer II (19 to 37 cmbs) yielded 1 waste flake of volcanic glass in Level 1 (19 to 29 cmbs) and a waterworn basalt pebble (possible pecking stone) in Level 2 (29 to 37 cmbs). Layer II graded into strong brown (7.5 YR 5/6) sterile subsoil. Excavation ended at a maximum depth of 48 cmbs. (Figure 14).

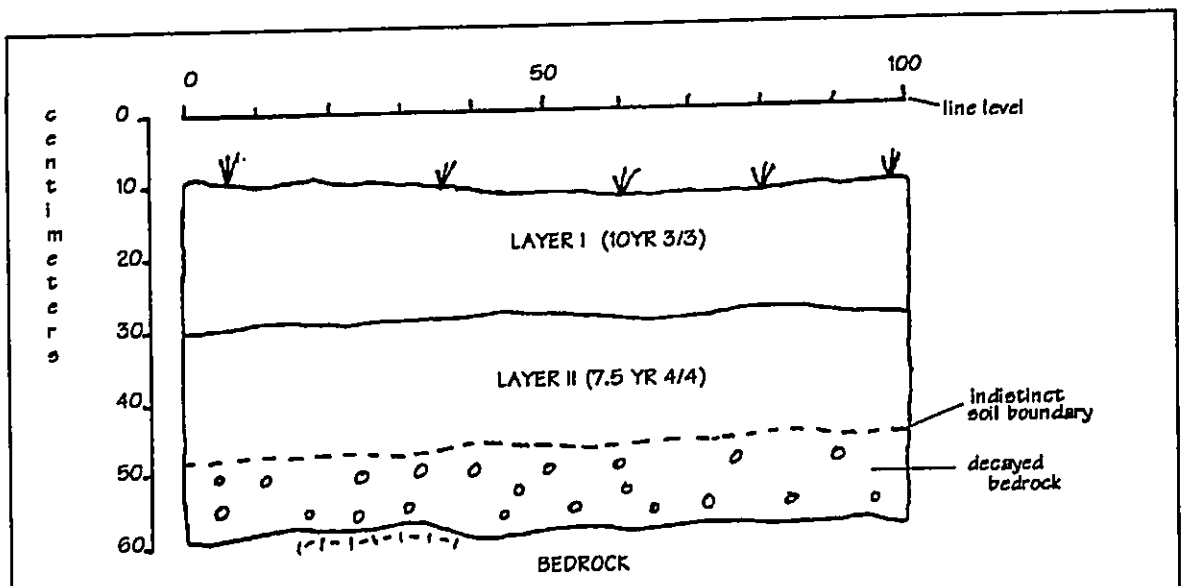

Figure 14 - North face profile of TU 9, Site 4135.

Test Unit 10

This unit was excavated c. 14 m. downslope and west of TU 7 in the remnants of an eroded terrace. Dimensions of TU 10 were 0.5 by 1.0 m. by a maximum depth of 32 cmbs (Figure 15). Common site stratigraphy was encountered in this unit. Layer I (0 to 15 cmbs) dark brown (10 YR 3/3) loam was somewhat rocky. Level 1 (0 to 10 cmbs) contained 1 sherd of blue and white porcelain, a kukui nut shell, a waste flake of volcanic glass and a possible basalt abrader (67.5 gm.). Level 2 (10 to 15 cmbs) was sterile.

Layer II brown to dark brown (7.5 YR 4/4) loam extended from c. 15 to 26 cmbs. This stratum was rocky and did not yield any portable remains. It graded into sterile,

strong brown (7.5 YR 5/6) subsoil. The unit was terminated on eroded bedrock at c. 30 to 32 cmbs.

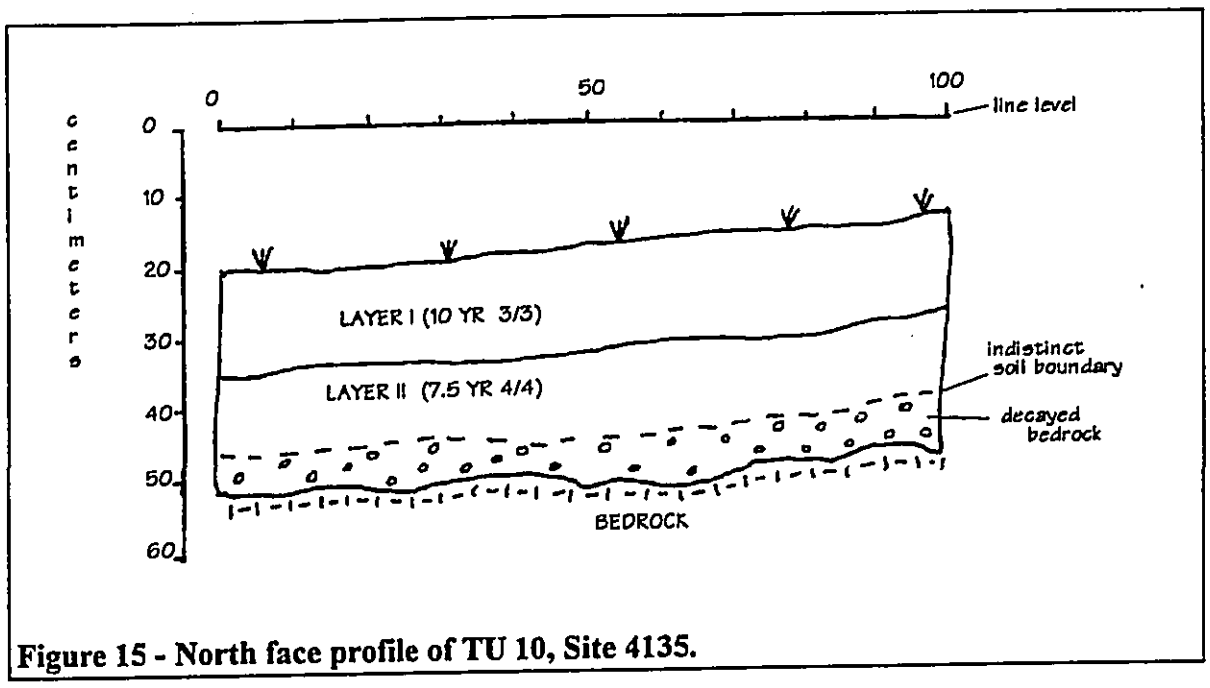

Figure 15 - North face profile of TU 10, Site 4135.

Test Unit 11

This unit was placed c. 14 m. west and downslope from TU 10 in an eroded terrace remnant. Stratigraphy similar to TU 10 was encountered. However, the soil deposit was shallower and sterile. Layer I (0 to 11 cmbs) consisted of the common dark brown (10 YR 3/3) loam. This rocky stratum overlaid the brown to dark brown (7.5 YR 4/4) loam of Layer II. This layer extended from c. 12 to 18 cmbs. Sterile, strong brown (7.5 YR 5/6) subsoil overlaid bedrock at c. 22 to 24 cmbs. No unit profile was prepared.

Test Unit 12

This subsurface test was the last unit excavated at Site 4135. It was located c. 16 m. southwest and downslope from TU 11 in a terrace remnant. Stratigraphy encountered was similar to other tested areas of the site. Like TU 11, this unit was also relatively rocky and shallow. Layer I (0 to 11 cmbs) was composed of common dark brown (10 YR 3/3) loam. This sterile stratum overlaid the common brown to dark brown (7.5 YR 4/4) loam of Layer II. Layer II was c. 7 to 9 cm thick and also sterile. Strong brown (7.5 YR 5/6) subsoil overlaid bedrock at c. 21 to 25 cmbs. No unit profile was drawn for TU 12.

SUMMARY AND CONCLUSIONS

Subsurface investigation at Sites 4134 and 4135 indicates that portions of these sites have been disturbed during historic times. With the exception of the vandalism at Site 4134, these impacts are likely associated with Kaonoulu Ranch activities. In addition, past agricultural activities at Site 4135 probably impacted the subsurface indigenous component.

Site 4134 is interpreted as an historic habitation area that is likely about 100 years old. This site is probably associated with past ranch activities. It is in poor condition and has low research potential. Based on the inventory level survey findings, Site 4134 is deemed significant under Criterion "D" of State and Federal historic preservation guidelines... "have yielded, or may be likely to yield, information important in prehistory or history". The GTE fiber optics condor will pass to the south of the site and will not impact it. Consequently, *no further archaeological work is recommended for Site 4134.*

It appears that Site 4135 consists of 2 components. It is interpreted as an historic agricultural site likely associated with 19th century potato production in the Kula region. This historic component appears to have impacted an earlier indigenous component. Scattered material culture remains such as lithic debitage and artifacts, and volcanic glass waste flakes may indicate that portions of Site 4135 were utilized for temporary or, possibly, permanent indigenous habitation. However, only a limited portion of the site was sampled, due to project constraints (i.e. easement corridor to GTE, with land ownership retained by Kaonoulu Ranch). It is possible that features associated with earlier indigenous agricultural activities in the project area were expanded by Chinese farm immigrants in the mid-19th century. Site 4135 is in generally poor to fair condition. Based on the inventory level survey findings, this site is deemed significant under Criterion "D" of State and Federal historic preservation guidelines. This site appears to have medium to high research potential. However, the corridor has been realigned in order to avoid any visible architectural features such as terraces, rock mounds and rock alignments. The GTE fiber optics corridor will impact only that portion of Site 4135 where a trench c. 0.6 m. wide by 0.6 m. deep will cross the site. It is possible that subsurface material culture remains will be encountered. Consequently, archaeological monitoring is the recommended mitigation for the area between Kula Highway and Feature A of Site 4135. If, during the course of trenching activities in the rest of the project area, cultural resources are located, an archaeologist should be notified immediately. Should any human burials be uncovered, work must stop immediately. Both the DLNR (SHPD) and the Maui and Lana'i Islands Burial Council will need to be consulted regarding appropriate mitigation measures.

As noted earlier, only areas within the GTE corridor were sampled. Archaeological monitoring of the fiber optics trenching at Site 4135 will help ensure that "no adverse affects" occur in the corridor. However, it is important to note that Site 4135 extends well to the south of the corridor and appears to be at least 2 to 3 hectares in size.

Therefore, it is recommended that an expanded archaeological inventory survey and/or data recovery project be undertaken at Site 4135 prior to any future development of the area (i.e. beyond the scope of the present GTE fiber optics project).

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TABLE 1

SUMMARY OF PORTABLE REMAINS AT SITE 4134

PORTABLE REMAINS	TEST UNIT	LAYER	LEVEL	PIECES
round head nails	1	1	1	3
asst. rusted metal, mostly nails	1	1	2	9
clear glass	1	1	2	2
bleached mammal bone	1	1	2	1
asst. rusted metal, mostly nails	1	2	1	10
square head nail	1	2	1	1
rusted metal	2	1	1	5
round head nail	2	1	1	1
brown bottle glass	2	1	2	3
sterile	2	2	1	-
sterile	2	2	2	-

TABLE 2

SUMMARY OF SUBSURFACE PORTABLE REMAINS FOUND AT SITE 4135

PORTABLE REMAINS	LAYER	LEVEL	L x W x H (mm.)	WT. (gm.)	PIECES
TEST UNIT 1					
fire-cracked rocks	1	1	-	-	3
rusted nails	1	1	-	-	12 (7*)
brown glass	1	1	-	-	3
clear glass	1	1	-	-	1
terra cotta sherd	1	1	-	-	1
drawn square nail	1	2	-	-	1*
TEST UNIT 2					
green bottle neck glass	1	1	-	-	1
rusty nails	1	1	-	-	4 (2*)
seeds	1	1	-	-	21
sterile	1	2	-	-	-
TEST UNIT 3					
bone toothbrush	1	1	133.0 x 13.0 x 7.5	11.5	-
mostly rusty square nails	1	1	-	-	36
rusty nails	1	2	-	-	5
TEST UNITS 4 and 5					
sterile					
TEST UNIT 6					
sawn bone (mammal)	1	1	83.0 x 47.0 x 34.0	-	1
green glass	1	1	-	-	1
rusty metal, mostly nails	1	1	-	-	27 (12*)
washers	1	1	-	-	2
rusty, metal nails	1	2	-	-	3*
metal rods	1	2	198.0 to 225.0 (L)	-	3
volcanic glass piece	1	2	2.0 x 5.0 x 8.0	0.8	1
basalt flake	1	2	12.0 x 35.0 x 56.0	28.9	1
coral piece	1	2	5.0 x 8.0 x 9.0	1.1	1
TEST UNIT 7					
basalt flakes	1	1	16.0 x 11.0 x 3.0 to 30.0 x 22.0 x 8.0	0.6 to 4.5	3
volcanic glass flakes	1	1	5.0 x 4.0 x 2.0 to 12.0 x 7.0 x 4.0	1.0	7
fire-cracked rocks	1	2	-	-	6
mammal bone	1	2	-	1.1	1
drawn square nail	1	2	-	-	1*
small shell button	1	2	12.0 (W)	-	1
basalt flakes	1	2	12.0 x 11.0 x 3.0 to 44.0 x 44.0 x 27.0	87.3	13
kukui shell	1	2	-	5.9	1

TABLE 2 (cont.)

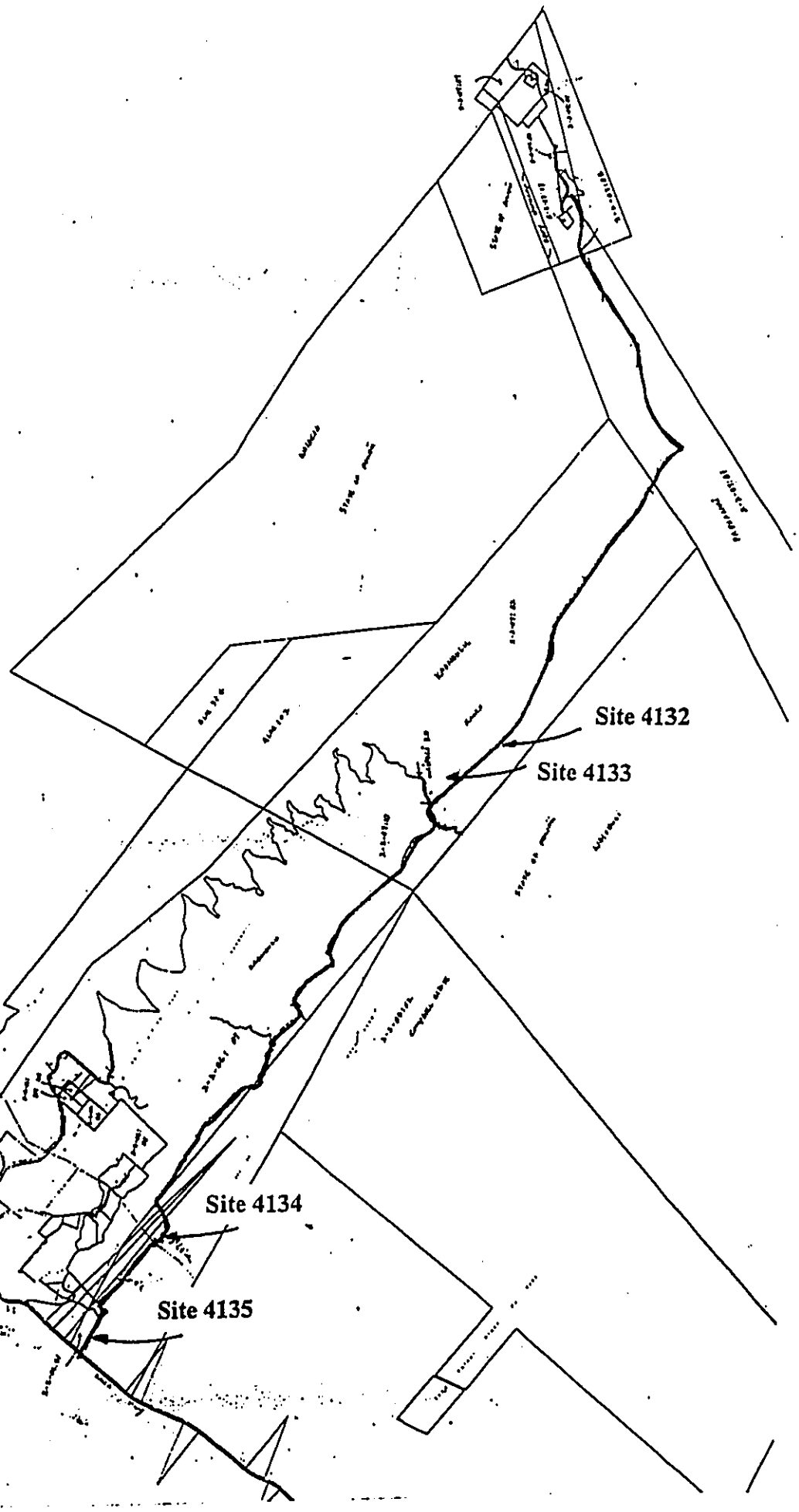
PORTABLE REMAINS	LAYER	LEVEL	L x W x L (mm.)	WT. (gm.)	PIECES
volcanic glass flakes	1	2	9.0 x 3.0 x 2.0 to 16.0 x 12.0 x 9.0	5.5	18
utilized basalt flake	1	2	37.0 x 34.0 x 16.0	16.8	1
utilized basalt flake	1	2	37.0 x 27.0 x 11.0	9.8	1
volcanic glass flake in Feature 1	1	2	9.0 x 7.0 x 3.0	1.2	1
volcanic glass flakes	2	1	3.0 x 3.0 x 2.0 to 14.0 x 10.0 x 4.0	1.0	4
TEST UNIT 8					
basalt flake	1	1	39.0 x 28.0 x 14.0	11.1	1
TEST UNIT 9					
kukui nut shell	1	1	-	1.0	1
volcanic glass flakes	1	1	6.0 x 4.0 x 1.0 to 12.0 x 8.0 x 4.0	1.2	3
volcanic glass core	1	2	14.0 x 11.0 x 8.0	1.3	1
volcanic glass flakes	1	2	6.0 x 4.0 x 3.0 to 8.0 x 5.0 x 3.0	1.1	3
basalt flakes	1	2	-	36.2	2
volcanic glass flake	2	1	13.0 x 7.0 x 7.0	0.9	1
waterworn basalt (poss. pecking stone)	2	2	67.0 x 60.0 x 47.0	281.3	1
TEST UNIT 10					
blue and white porcelain	1	1	-	-	1
kukui nut	1	1	-	5.0	1
possible basalt abrader	1	1	59.0 x 50.0 x 18.0	67.5	1
volcanic glass flake	1	1	10.0 x 9.0 x 3.0	0.8	1
TEST UNIT 11					
sterile					
TEST UNIT 12					
sterile					

*Drawn square nails

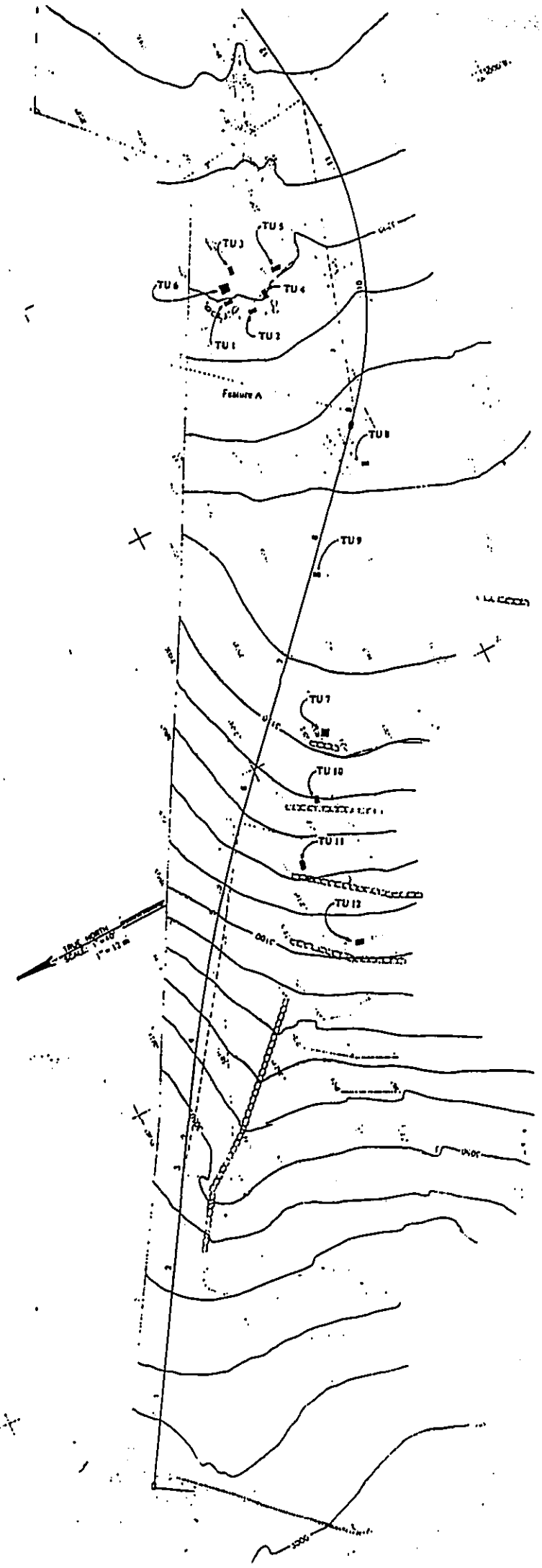
TABLE 3

SUMMARY OF SURFACE PORTABLE REMAINS: SITE 4135

PORTABLE REMAINS	L x W x H (mm.)	WEIGHT (gm.)	PIECES
6 m. DOWNSLOPE OF TEST UNIT 9			
volcanic glass flakes	6.0 x 5.0 x 3.0 14.0 x 9.0 x 4.0	1.3	5
4 m. SOUTH OF TEST UNIT 10			
possible coral abrader	22.0 x 17.0 x 14.0	2.8	1
10 m. DOWNSLOPE OF TEST UNIT 7			
basalt flake	27.0 x 23.0 x 7.0	4.1	1
volcanic glass flakes	7.0 x 4.0 x 3.0 to 14.0 x 10.0 x 8.0	2.5	15
possible coral abrader	20.0 x 16.0 x 12.0	2.3	1
NEAR FEATURE A			
horse shoe	-	-	1
VICINITY OF TEST UNIT 1, FEATURE A			
clear glass	-	-	1
thick green glass	-	-	7
thick brown glass	-	-	2
porcelain	-	-	3



Map 4 - GTE Hawaiian Telephone Haleakala Fiber Optics Duuctline corridor, showing the 4 sites located along its path.



Map 5 - Topographic map of Site 4135, showing the realignment of the corridor to avoid the major features of the site.

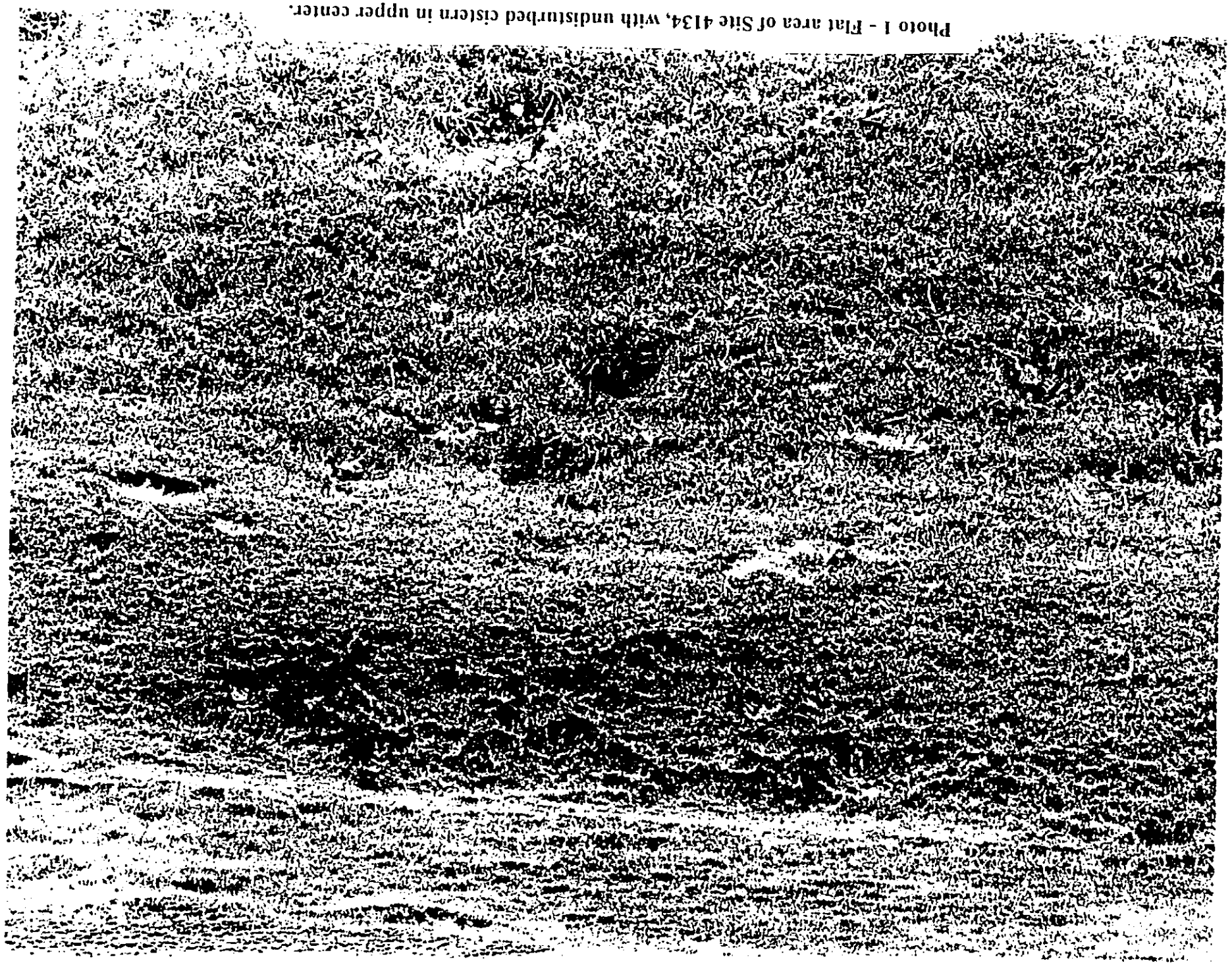


Photo 1 - Flat area of Site 4134, with undisturbed cistern in upper center.

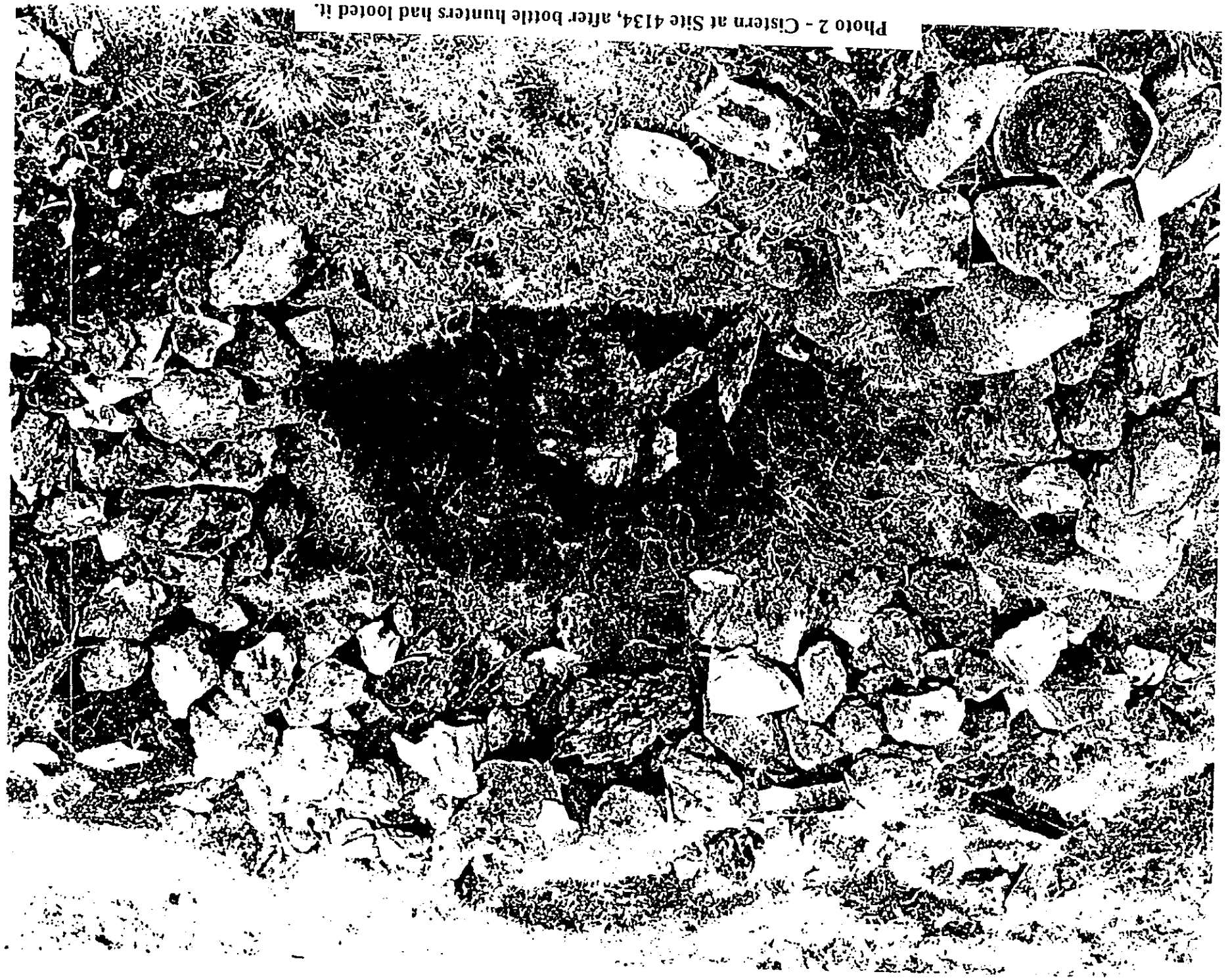


Photo 2 - Cistern at Site 4134, after bottle hunters had looted it.

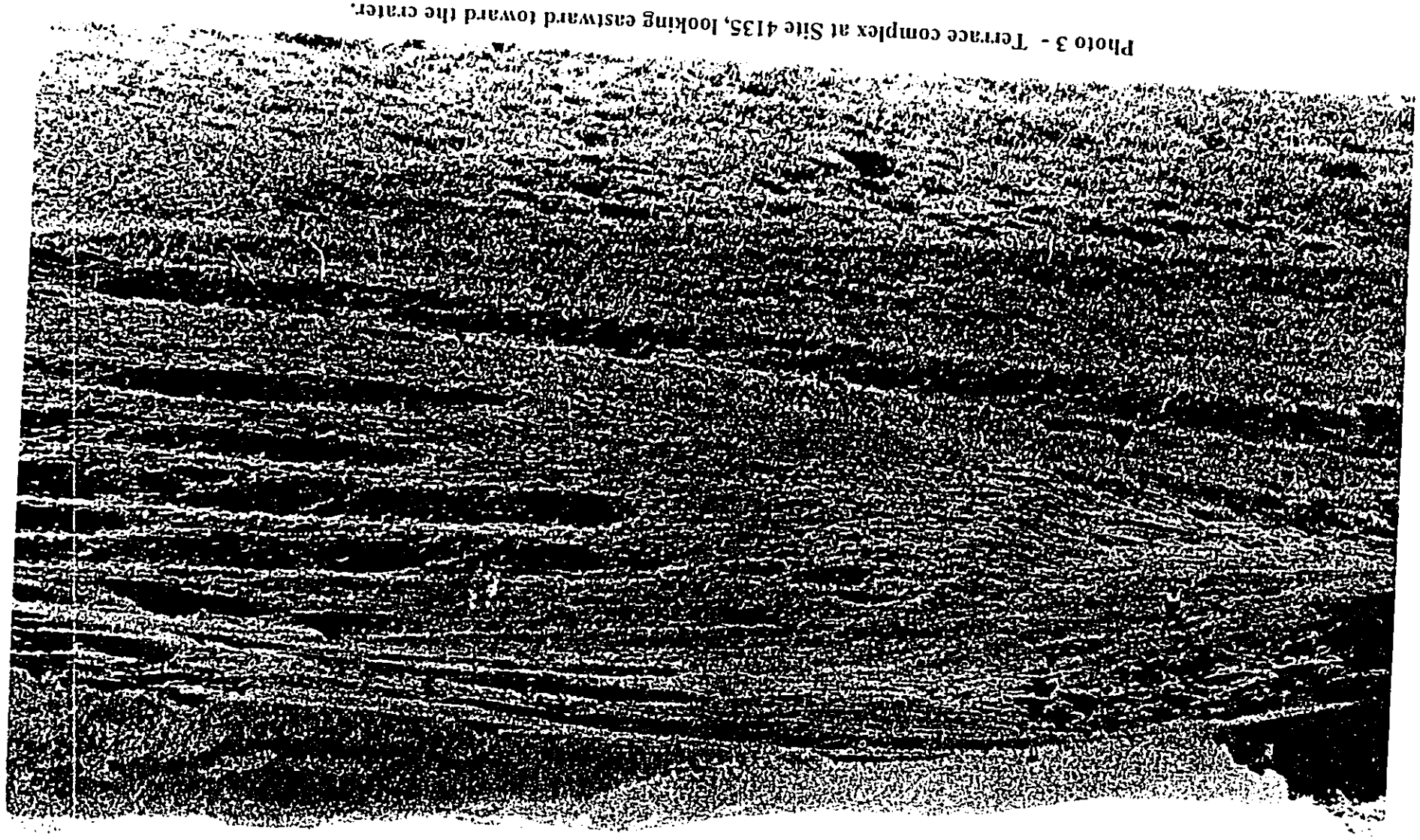


Photo 3 - Terrace complex at Site 4135, looking eastward toward the crater.

Photo 4 - View of Feature A at Site 4135.

Photo 5 - Terracing on the southern side of Site 41Ss.

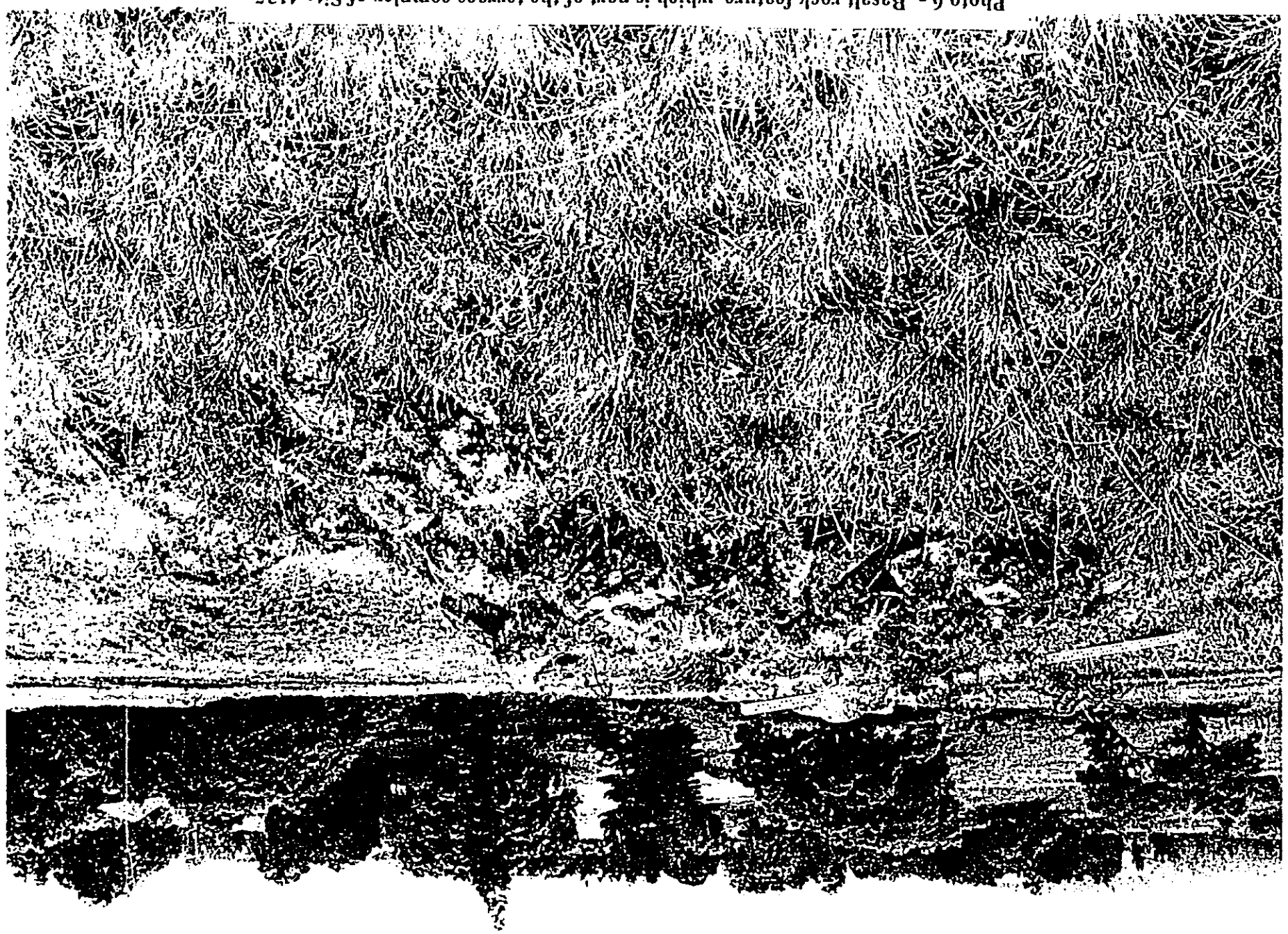


Photo 6 - Basalt rock feature, which is part of the terrace complex of Site 4135.

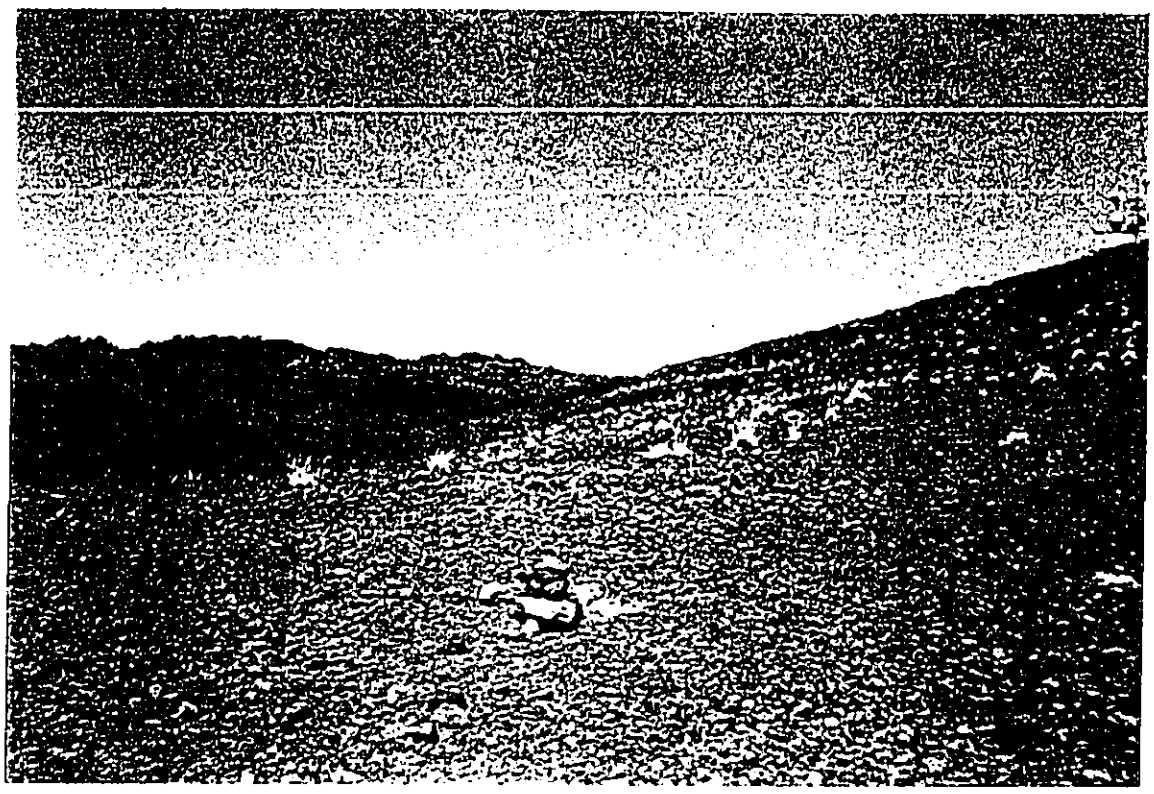


Photo 7 - Landscape in study area at the top of Haleakala Crater.

Photo 8 - View of the study corridor as it extends downslope from the summit.

APPENDIX A

Soil Profile Descriptions for Site 4134

Test Units 1 and 2

Layer I: Dark brown (10 YR 3/3); loam; moderate stones; weakly developed subangular blocky structure; friable, slightly moist consistency; common live rootlets; contains historic material. Layer I is c. 17 to 19 cm. thick.

Layer II: Dark yellowish brown (10 YR 3/4); clay loam; common stones; weakly developed subangular blocky structure; friable, moist consistency; live rootlets present; contains some historic materials. Layer II is c. 20 cm. thick.

Layer III: Dark yellowish brown (10 YR 3/6); clay loam, common fragments of decayed bedrock; weakly developed subangular blocky structure; firm, moist consistency; few live rootlets; sterile.

Soil Profile Descriptions for Site 4135

Representative Descriptions for Test Units 1 through 12

Layer I: Dark brown (10 YR 3/3); loam; few stones; weakly developed subangular blocky structure; very friable, moist consistency; common live rootlets; contains historic and/or indigenous cultural materials. Layer I ranges from c. 11 cm. to a maximum of 39 cm. thick in TU 8.

Layer II: Brown to dark brown (7.5 YR 4/4); loam; moderate stones; weakly developed subangular blocky structure; friable, moist consistency; common live rootlets; when present, contains low amounts of historic and/or indigenous cultural materials; where cultural materials present grades to sterile. Layer II ranges from c. 7 cm. to a maximum of 20 cm. thick.

Layer III: Strong brown (7.5 YR 5/6); clay loam; common fragments of decayed bedrock; weakly developed subangular blocky structure; firm; moist consistency; few live rootlets; sterile; overlies bedrock.

APPENDIX B

FLORAL AND FAUNAL SURVEY
by David Paul
July 1995

INTRODUCTION

A field survey was conducted for botanical resources and macrofauna along the GTE corridor for their fiberoptics project in Makawao District, East Maui, Hawai'i on July 6, 1995.

The corridor is 100 ft. wide and runs from the radio tower on Haleakala at c. 9,700 feet altitude in Papa'anui *ahupua'a* down to Ka'ono'ulu *ahupua'a* at 9,000 feet. From there the corridor runs through the southern side of Ka'ono'ulu *ahupua'a,* down past the water tank (3,344 ft. alt.) in Kohea *ahupua'a,* and out to Highway 37 at 3,000 feet altitude.

Special attention was made to locate species within the corridor that are listed by the United States or State of Hawai'i as endangered, as such species have legal status for protection and must be given consideration for planning.

METHODS

This study was initiated by searching literature to determine what species might occur in the area of the corridor that are listed as endangered Federally or by the State of Hawai'i.

On July 6, 1995 two field researchers (David Paul and Erik Fredericksen) meandered down through the GTE corridor, noting species of plants, birds, and mammals. Care was taken to locate species which are listed Federally or by the State of Hawai'i as endangered, as well as noting other non-listed rare species. Unique biological communities were also defined.

Plants identified include ferns and their allies (Pteridophytes), cone bearing plants (Gymnosperms), and flowering plants (Dicots and Monocots), and follow O. Degener (1930), M.C. Neal (1965), and W.L. Wagner, et al, (1990). Birds identified follow G.C. Munro (1944). Mammals identified follow P.Q. Tomich (1986).

Listed endangered species follow U.S. Fish and Wildlife Service (1994) and State of Hawai'i (1994, 1995).

Unique Biological Communities follow Gagne and Cuddihy (1990).

Plants were identified on contact or samples were collected and later defined. Birds were identified by sight, or with the aid of field glasses, in flight and in vegetation. Vegetation where

birds were found was also searched for nests. Mammals were identified by sight, living or dead, and by foraging habit.

RESULTS

All plant species encountered during the field survey are listed in Table 1. All bird and mammal species encountered during the field survey are listed in Table 2.

Rare Plants - One plant species which is listed Federally and by the State of Hawai'i as endangered was located during the field survey. This is a species of sandalwood or *'iliahi* (*Santalum freycinetianum* var. *lanaiense*) and is located at about 6,900 ft. alt. directly on the southern edge of the corridor (GPS location: Q2 - N.20 degrees 42'09.50" X W.156 degrees 17'16.13")

The Hawaiian silversword or *'ahinahina* (*Argyroxiphium sandwicense* subsp. *macrocephalum* DC) is a listed endangered species known to exist in habitat typical to that in the upper reaches of the corridor, but was not located there. A Hawaiian raspberry or *'akala* (*Rubus macraei* A. Gray), a small crawling fern (*Asplenium fragile* var. *insulare* C. Morton), a Hawaiian geranium or *hinahina* (*Geranium arboreum* A. Gray), and a *ko'oko'olau* (*Bidens micrantha* subsp. *kalealaha* Gaud.) are all listed endangered species known to exist in habitat similar to that in the corridor, but none of them were found there.

Two plants which are rare, but not endangered, were also found in the corridor. One is *pamakani* (*Tetramolopium humile* subsp. *haleakalae*) which is found scattered in alpine shrubland on old pahoehoe lava which just touches the northern side of the corridor at about 9,000 ft.. The other is a sandalwood or *'iliahi* (*Santalum haleakalae*) which is found scattered amongst subalpine dry forest and shrubland from about 8,500 to 7,500 ft.

Rare Birds - One bird species which is listed as endangered by the State of Hawai'i on O'ahu, Moloka'i and Lana'i, but not Maui was sighted during the field survey. This was the *'i'iwi* (*Vestiaria coccinea*). The *'i'iwi* was spotted in a large *'a'ali'i* bush (*Dodonaea viscosa*) at about 8,000 ft. The shrub was examined for nests but none were found. The *'i'iwi* is common on Maui, Hawai'i, and Kaua'i.

Two other native bird species were sighted during the field survey. These were the *amakihi* (*Chlorodrepanis virens wilsoni*), which was common along the upper reaches of the corridor, and the Maui creeper (*Paroreomyza maculata newtoni*) which was common along the lower reaches of the corridor. Neither of these species are endangered.

The *nene* goose (*Nesochen sandwicensis* Vigors) which is listed as endangered, the *pueo* or short-eared owl (*Aseo flammeus sandwicensis* Bloxam)which is a candidate for listing as endangered, and the *apapane* (*Himatione sanguinea* Gmelin)which is common, are known to exist in habitats similar to those found in the corridor. None of these species were sighted during the field survey.

Although a variety of bird species were sighted during the field survey, no nests were found within the corridor.

A migratory bird, the *kolea* or Pacific golden plover (*Pluvialis dominica fulva* Gmelin), which is indigenous to the Islands, is commonly seen throughout the State when it is in season. This species was not seen during the field survey as it was not in season; nor is it endangered.

Rare Mammals - The only listed endangered non-marine mammal in Hawai'i is the hoary bat (*Lasiurus cinereus semotus* H. Allen). The hoary bat is known to exist on Maui, and is usually seen late in the day in lowland areas. The field survey ended towards evening and at about 3,000 ft., but the hoary bat was not seen.

All other non-marine mammals in Hawai'i are alien or Polynesian introduced species, and are not endangered.

All mammals found within the corridor were alien cattle, feral animals, or rodents.

UNIQUE BIOLOGICAL COMMUNITIES

The uppermost reaches of the corridor contain a community known as alpine dry shrubland. This is followed by subalpine dry shrubland, subalpine dry forest, and montane mesic forest.

These communities and their placement within the corridor is explained below.

Alpine Dry Shrubland - This community is dominated by hairgrass (*Deschampsia nubigena*), *pili mauka* (*Trisetum glomeratum*), and kupaoa (*Dubautia menziesii*). It runs from c. 9,700 ft. at the beginning of the corridor, down to c. 8,700 ft., and is located mostly on loose cinder. Vegetation is sparse here.

A small area on the northern side of the corridor at c. 9,000 ft. contained more diversity and is located on old pahoehoe. Some of the plants found there are *pamakani* (*Tetramolopium humile* var. *haleakalae*), a sedge (*Gahnia gahniiformis*), highland ferns (*Asplenium spp.*), and *ohelo* (*Vaccinium reticulatum*).

Few alien species are found in this habitat.

Subalpine Dry Shrubland - This community is dominated by *ohelo* (*Vaccinium reticulatum*), *pukiawe* (*Styphelia tameiameia*), hairgrass (*Deschampsia nubigena*), and *paia* or brake fern (*Pteridium aquilinum* var. *decompositum*). It runs from c. 8,700 ft. down to c. 7,000 ft. and is located on loose loam and rock outcrops. This habitat is heavily affected by the browsing and rooting of feral animals. There is also evidence of rat foraging in this zone. Some other species found here are *'iliahi* (*Santalum haleakalae*), *hinahina* (*Geranium cuneatum* subsp. *tridens*),

'a'ali'i (*Dodonaea viscosa*), a sedge (*Gahnia gahniiformis*), and *mamane* (*Sophora chrysophylla*).

This habitat is where two Hawaiian honey-creepers were seen. The *'i'iwi* which was sighted once, as well as the *amakihi* which was seen commonly.

An alien plant, cat's ear (*Hypochoeris radicata*) becomes a dominant member of the groundcover in this community.

Subalpine Dry Forest - This community is dominated by *mamane* (*Sophora chrysophylla*), *pilo* (*Coprosma montana*), *'a'ali'i* (*Dodonaea viscosa*), *pukiawe* (*Styphelia tameiameia*), and *ohelo* (*Vaccinium reticulatum*). It runs from c. 7,000 ft. down to c. 6,500 ft. and is located on rock outcrops and loam.

This habitat is heavily damaged by feral animals and cattle.

The endangered sandalwood or *'iliahi* (*Santalum freycinetianum* var. *lanaiense*) is found here at about 6,900 ft.

Alien plants become common in this community, such as bluegrass (*Poa pratensis*), *pamakani* (*Ageratina adenophora*), and evening primrose (*Oenothera stricta* subsp. *stricta*). Two alien trees are invading this area of the corridor. Pine trees (*Pinus sp.*) which are naturalizing from groves planted nearby, and fire trees (*Myrica faya*) which are moving uphill from infestations below.

Montane Mesic Forest - This community is dominated by alien species. It runs from c. 6,500 ft. down to the bottom of the corridor at c. 3,000 ft., and is located on rich loamy topsoil.

There are remnants of the former native dominated forest, such as *koa* (*Acacia koa*), *'akala* (*Rubus hawaiensis*), *laukahi* fern (*Dryopteris wallichiana*), *palapalai* (*Microlepia strigosa*), *'ama'u* (*Sadleria cyatheoides*), and the Hawaiian strawberry, *ohelo papa* (*Fragaria chiloensis* subsp. *sandwicensis*).

The dominant trees there now are the fire tree (*Myrica faya*), wattle (*Acacia mearnsii*), and pine (*Pinus sp.*). Kikuyu grass (*Pennisetum clandestianum*) covers most of the area. The mysore raspberry (*Rubus niveus*) is forming dense impassable thickets and is displacing the native raspberry, *'akala* (*Rubus hawaiensis*).

The Maui creeper is commonly seen along the corridor in the upper areas of this community.

This habitat is extensively covered by cattle, and feral pig damage is quite evident.

An area in a gulch, directly above the water tank towards the bottom of the corridor, contains remnants of human cultivation, such as *'ape* (*Alocasia macrorrhiza*), mulberry (*Morus alba*), fig (*Ficus carica*), and peach (*Prunus persica*).

SUMMARY

The field survey on July 6, 1995 produced the following legally significant information.

One plant species was located within the corridor that is listed as endangered Federally and by the State of Hawai'i, and legally requires consideration for planning. This species is a sandalwood or *'iliahi* (*Santalum freycinetianum* var. *lanaiense*) and is located at about c. 6,900 ft. directly on the southern edge of the corridor (GPS location: Q2 - N.20 degrees 42'09.50" X W.156 degrees 17'16.13").

Other listed endangered plant species are known to exist in habitats similar to those found within the corridor, but no other listed endangered plants were found aside from the afore mentioned species.

One bird species was sighted within the corridor that is listed as endangered by the State of Hawai'i on O'ahu, Moloka'i and Lana'i, but not Maui. This was the *'i'iwi* (*Vestiaria coccinea*) and was spotted in an *'a'ali'i* bush (*Dodonea viscosa*) at about 8,000 ft. A search for nests was conducted but none were found. The *'i'iwi* is common on Maui, Hawai'i, and Kaua'i.

Listed endangered bird species are known to exist in habitats similar to those found in the corridor, but none were seen, and nests were not found anywhere within the corridor.

One non-marine mammal which is listed as endangered is located on Maui; the hoary bat (*Lasiurus cinereus semotus* H. Allen) which is known to be found in lowland areas, late in the day. The lower reaches of the corridor were traversed late in the day, but the hoary bat was not seen.

RECOMMENDATIONS AND DISCUSSION

To avoid impacts on the listed endangered sandalwood (*Santalum freycinetianum* var. *lanaiense*), the actions of the project should remain at least 5 meters (apprx. 16.5 ft.) away from the drip line of the tree.

As other endangered plant species were not found within the corridor, impacts to endangered plants from the project will be minimal.

As biological communities above 6,500 ft. are dominated by native species, care should be taken to avoid as much of the vegetation as possible there, especially shrubs and trees.

Special care should be taken to avoid the plant community on old pahoehoe at 9,000 ft.; and to avoid the sandalwoods (*Santalum haleakalae*) between 8,500 and 7,500 ft.

As no bird species seen within the corridor is listed as endangered on the island of Maui, and no nests of any kind were found within the corridor, impacts to endangered bird species (and any other bird species) will be minimal.

As endangered mammals were not seen in the corridor, and likely do not occur in habitats similar to those in the corridor, impacts on endangered mammals from the project will be non-existent. On the contrary, mammals found in the corridor are the single greatest threat to endangered species and the biological communities found there.

The community below 6,500 ft. is ranchland, endangered species were not found, and alien plants are dominant there.

Communities above 6,500 ft. are dominated by native species, endangered species are found there, but feral animals are heavily impacting the area. Goats are denuding vegetation as high as they can reach, especially on *mamane* (*Sophora chrysophylla*), sandalwood (*Santalum spp.*), and geraniums (*Geranium sp.*). Pigs are tilling up the soil and damaging the root systems of plants. If feral animals are not controlled, the native communities there will eventually be destroyed and soil erosion may become a significant problem.

As endangered species are not found in the corridor below 6,500 ft., there will be no impact to endangered species in that area.

Impacts to endangered species found in the corridor above 6,500 ft. will be minimal.

TABLE 1

Plant species encountered within the project corridor.

Botanical Name	Common Name	*Dist.	**Stat.
PTERIDOPHYTES			
DICKSONIACEAE Tree Fern Family			
Microlepia strigosa **(Thunb.) Presl**	*palapalai*	E, C	-
POLYPODIACEAE Common Fern Family			
Asplenium adiantum-nigrum **L.**	asplenium	E, C	-
Asplenium trichomanes **L.**	asplenium	E, C	-
Blechnum occidentale **L.**	blechnum	A, C	-
Cyclosorus dentatus **(Forsk.) Ching**	oak fern	A, C	-
Dryopteris wallichiana **(Spreng.) Hyl**	*laukahi*	E, C	-
Pellaea ternifolia **Cav. Link**	*kalamoho*	I, C	-
Pteridium aquilinum **(L.) Kuhn. var. *decompositum* (Gaud.) Tryon**	*pai'a*	E, C	-
Pteris vittata **L.**	sword brake	A, C	-
Sadleria cyatheoides **Kaulf.**	*'ama'u*	E, C	-
PSILOTACEAE Whisk Fern Family			
Psilotum nudum **(L.) Griseb.**	*moa*	I, C	-
GYMNOSPERMS			
PINACEAE Pine Family			
Pinus sp. **L.**	pine	A, C	-
DICOTYLEDONS			
APIACEAE Carrot Family			
Foeniculum vulgare **Mill.**	fennel	A, C	-
ASCLEPIADACEAE Milkweed Family			
Asclepias physocarpa **(E.Mey.)Schlec.**	balloon plant	A, C	-
ASTERACEAE Sunflower Family			
Ageratina adenophora	*pamakani*	A, C	-

(Spreng.) R. King & H. Robinson				
Bidens pilosa **L.**		*ki nehe*	**A, C**	-
Cirsium vulgare **(Savi) Ten.**		**bull thistle**	**A, C**	-
Conyza canadensis **(L.) Crong.**		**horseweed**	**A, C**	-
Crassocephalum crepidioides **(Benth.) S. Moore**		*pualele*	**A, C**	-
Dubautia menziesii **(A. Gray) D. Keck**		*kupaoa*	**E, C**	-
Emilia sonchifolia **(L.) DC**		*pualele*	**A, C**	-
Gnaphalium purpureum **L.**		**cudweed**	**A, C**	-
Hypochoeris glabra **L.**		**cat's ear**	**A, C**	-
Hypochoeris radicata **L.**		**cat's ear**	**A, C**	-
Taraxacum officinale **W.W. Weber**		**dandelion**	**A, C**	-
Tetramolopium humile **(A. Gray) Hillebr. subsp.** *haleakalae*		*pamakani*	**E, R**	-
BIGNONIACEAE	Bignonia Family			
Jacaranda mimosifolia **D. Don**		**jacaranda**	**A, C**	-
CACTACEAE	Cactus Family			
Opuntia ficus-indica **(L.) Mill.**		*panini*	**A, C**	-
CARYOPHYLACEAE	Pink Family			
Polycarpon tetraphyllum **(L.) L.**		**chickweed**	**A, C**	-
CHENOPODIACEAE	Goosefoot Family			
Chenopodium oahuense **(Meyen) Aellen**		*'aheahea*	**E, C**	-
EPACRIDACEAE	Epacris Family			
Styphelia tameiameia **(Cham. & Schlechtend.) F.v. Muell.**		*pukiawe*	**I, C**	-
ERICACEAE	Blueberry Family			
Vaccinium reticulatum **Sm.**		*'ohelo*	**E, C**	-
EUPHORBIACEAE	Poinsettia Family			
Ricinus communis **L.**		**castor bean**	**A, C**	-
FABACEAE	Bean Family			
Acacia koa **A. Gray**		*koa*	**E, C**	-
Acacia mearnsii **De Wild.**		**wattle**	**A, C**	-
Desmodium sandwicense **E. Mey.**		**beggar's tick**	**A, C**	-
Medicago lupulina **L.**		**medick clover**	**A, C**	-

Sophora chrysophylla **(Salisb.) Seem.**		*mamane*	E, C	-
Trifolium dubium **Sibth.**		hop clover	A, C	-
Trifolium repens **L.**		white clover	A, C	-
GERANIACEAE	Geranium Family			
Geranium cuneatum **subsp.** *tridens* **Hook.**		*hinahina*	E, C	-
Geranium dissectum **L.**		cranesbill	A, C	-
LAMIACEAE	Mint Family			
Prunella vulgaris **L.**		self-heal	A, C	-
Stachys arvensis **L.**		stagger weed	A, C	-
LYTHRACEAE	Loosestrife Family			
Cuphea hyssopifolia **Kunth**		false heather	A, C	-
MENISPERMACEAE	Moonseed Family			
Cocculus trilobus **(Thunb.) DC**		*huehue*	I, C	-
MORACEAE	Mulberry Family			
Ficus carica **L.**		fig	A, C	-
Morus alba **L.**		mulberry	A, C	-
MYRICACEAE	Bayberry Family			
Myrica faya **Aiton**		fire tree	A, C	-
ONAGRADACEAE	Evening Primrose Family			
Epilobium billardierianum **Ser.**		willow herb	A, C	-
Oenothera stricta **Ledeb. ex Link subsp.** *stricta*		evening primrose	A, C	-
OXALIDACEAE	Oxalis Family			
Oxalis corniculata **L.**		*'ihi*	P, C	-
PASSIFLORACEAE	Passionfruit Family			
Passiflora suberosa **L.**		*huehue haole*	A, C	-
PLANTAGINACEAE	Plantain Family			
Plantago lanceolata **L.**		*laukahi*	A, C	-
POLYGONACEAE	Buckwheat Family			
Rumex acetosella **L.**		sheep sorrel	A, C	-
PRIMULACEAE	Primrose Family			

Anagallis arvensis **L.**		**scarlet pimpernel**	**A, C**	**-**
PROTEACEAE Protea Family				
Grevillea robusta **A. Cunn. ex R. Br.**		**silk oak**	**A, C**	**-**
ROSACEAE Rose Family				
Fragaria chiloensis **(L.) Dushesne subsp.** *sandwicensis*		***'ohelo papa***	**E, C**	**-**
Prunus persica **(L.) Batsch.**		**peach**	**A, C**	**-**
Rubus hawaiensis **A. Gray**		***'akala***	**E, C**	**-**
Rubus niveus **Thunb.**		**mysore raspberry**	**A, C**	**-**
RUBIACEAE Coffee Family				
Coprosma ernodeoides **A. Gray**		***kukae nene***	**E, C**	**-**
Coprosma montana **Hillebr.**		***pilo***	**E, C**	**-**
SANTALACEAE Sandalwood Family				
Santalum freycinetianum **Gaud. var.** *lanaiense* **Rock**		***'iliahi***	**E, R**	**LE-LH**
Santalum haleakalae **Hillebr.**	***'iliahi***		**E, R**	**-**
SAPINDACEAE Soapberry Family				
Dodonaea viscosa **Jacq.**		***'a'ali'i***	**I, C**	**-**
VERBENACEAE Verbena Family				
Verbena litoralis **Kunth.**		***ha'uoi***	**A, C**	**-**

MONOCOTYLEDONS

AGAVACEAE Ti Family				
Agave americana **L.**		**century plant**	**A, C**	**-**
ARACEAE Taro Family				
Alocassia macrorrhiza **(L.) Schott**		***'ape***	**P, C**	**-**
CYPERACEAE Sedge Family				
Gahnia gahniiformis **(Gaud.) A. Heller**		**gahnia**	**E, C**	**-**
POACEAE Grass Family				
Avena fatua **L.**		**wild oat**	**A, C**	**-**
Cynodon dactylon **(L.) Pers.**		**manienie**	**A, C**	**-**
Deschampsia nubigena **Hillebr.**		**hairgrass**	**E, C**	**-**

Digitaria violascens **Link**	**crabgrass**	**A, C**	**-**	
Eragrostis leptophylla **Hitchc.**	**lovegrass**	**E, C**	**-**	
Paspalum dilatatum **Poir.**	**dallis grass**	**A, C**	**-**	
Pennisetum clandestinum **Hochst.**	**kikuyu**	**A, C**	**-**	
Poa pratensis **L.**	**bluegrass**	**A, C**	**-**	
Rhynchelytrum repens **(Willd.) Hubb.**	**natal redtop**	**A, C**	**-**	
Sporobolus indicus **(L.) R. Br.**	**smutgrass**	**A, C**	**-**	
Trisetum glomeratum **(Kunth) Trin.**	***pili uka***	**E, C**	**-**	
Vulpia bromoides **(L.) S.F. Gray**	**fescue**	**A, C**	**-**	
ZINGIBERACEAE Ginger Family				
Hedychium coronarium **J. Konig**	**white ginger**	**A, C**	**-**	

TABLE 2

Birds and Mammals encountered in the project corridor.

Zoological Name	Common Name	*Dist.	**Stat.
AVIANS			
ALAUDIDAE Lark Family			
Alauda arvensis **L.**	**skylark**	**A, C**	**-**
COLUMBIDAE Dove Family			
Columba livia **Gmelin**	**pigeon**	**A, C**	**-**
DREPANIDIDAE Honey-creeper Family			
Chlorodrepanis virens wilsoni **Rothsch.**	***'amakihi***	**E, C**	**-**
Paroreomyza maculata newtoni **Rothsch.**	**Maui creeper**	**E, C**	**-**
Vestiaria coccinea **Forster**	***'i'iwi***	**E, C**	**-**
MIMIDAE Mocking-bird Family			
Mimus polyglottos **L.**	**mocking-bird**	**A, C**	**-**
PHASIANIDAE Chicken Family			
Alectoris graeca chukar **Gray**	**chukar**	**A, C**	**-**
Lophortyx califonica vallicola **Ridgway**	**quail**	**A, C**	**-**
Phasianus colchicus torquatus **Gmelin**	**pheasant**	**A, C**	**-**
TIMELLIDAE Thrush Family			

Liothrix lutea **Scopoli**		**nightingale**	**A, C**	-

MAMMALIANS

BOVIDAE	Hollow-horned Ruminants Family			
Bos taurus **L.**		**cow, steer, bull**	**A, C**	-
Capra hircus hircus **L.**		**feral goat**	**A, C**	-
MURICIDAE	Mouse Family			
Rattus rattus sp. **Gray**		**rat**	**A/P, C**	-
SUIDAE	Old World Swine Family			
Sus scrofa scrofa **L.**		**feral pig**	**A, C**	-

***Distribution:**

E = Endemic, found only in Hawai'i.
I = Indigenous, found in Hawai'i and elsewhere.
P = Polynesian, brought to Hawai'i by Polynesians prior to European contact.
A = Alien, plants introduced to Hawai'i after European contact.
C = Common, found in abundance in many areas.
R = Rare, restricted and/or localized populations.

****Status:**

LE = listed as "Endangered" under the Federal Endangered Species Act.
LT = listed as "Threatened" under the Federal Endangered Species Act.
PE = "Proposed" as endangered under the Federal Endangered Species Act.
C1, C2, C3, = listed as "Candidates" for listing under the Federal Endangered Species Act.
LH = listed by the State of Hawai'i as endangered or threatened.

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EXHIBIT A - STATE LAND USE DISTRICT DESIGNATIONS MAP

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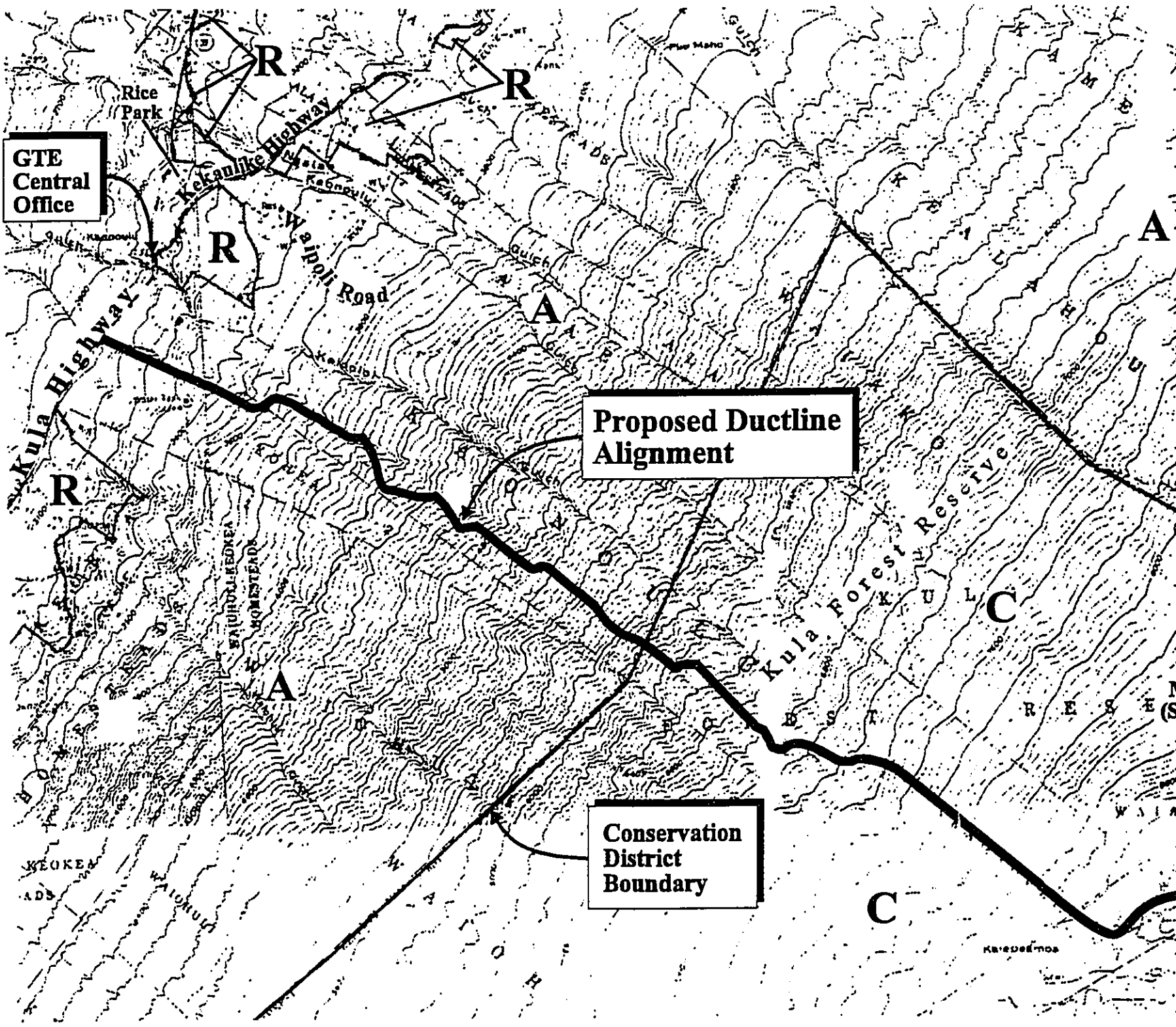

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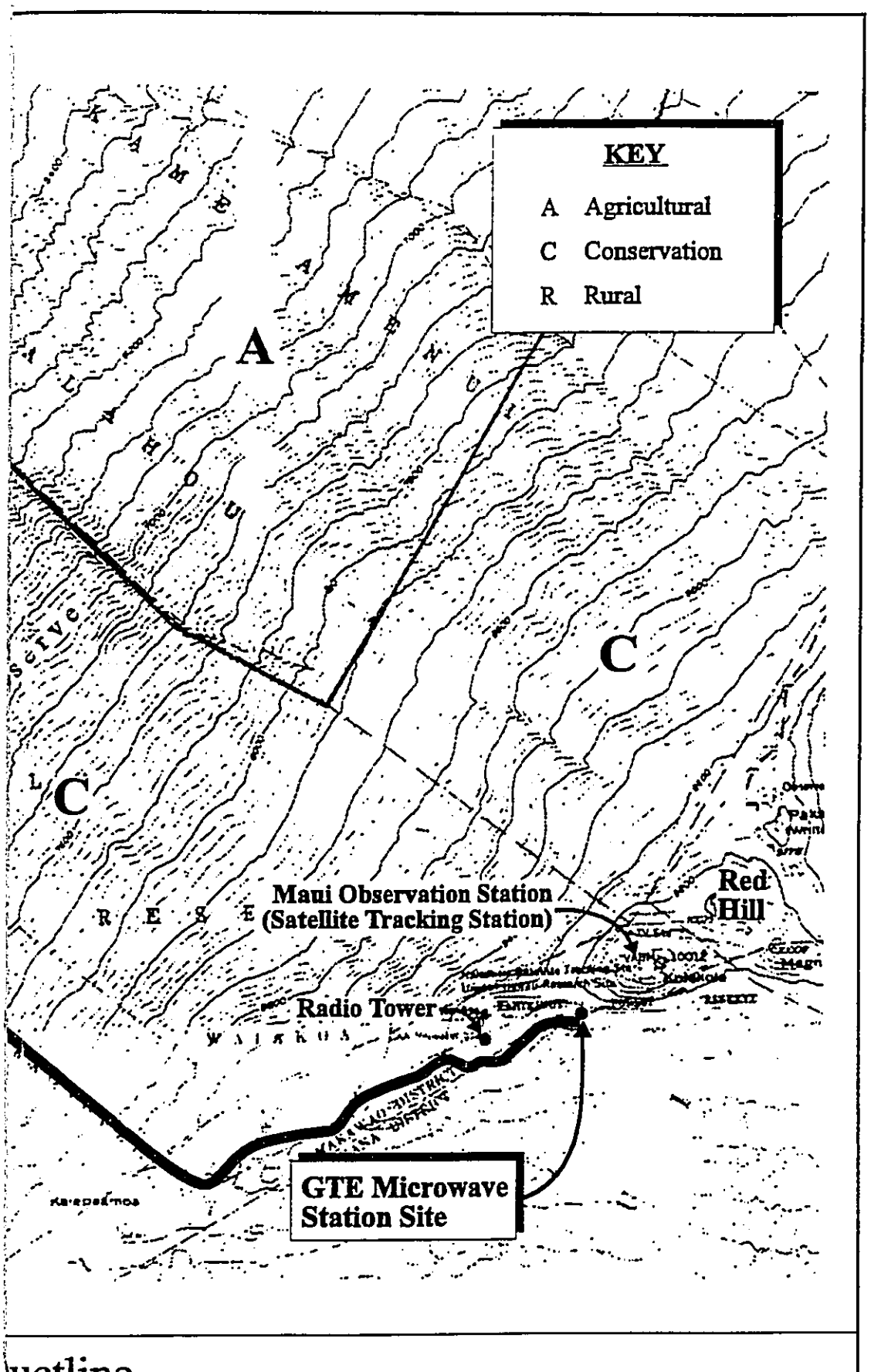

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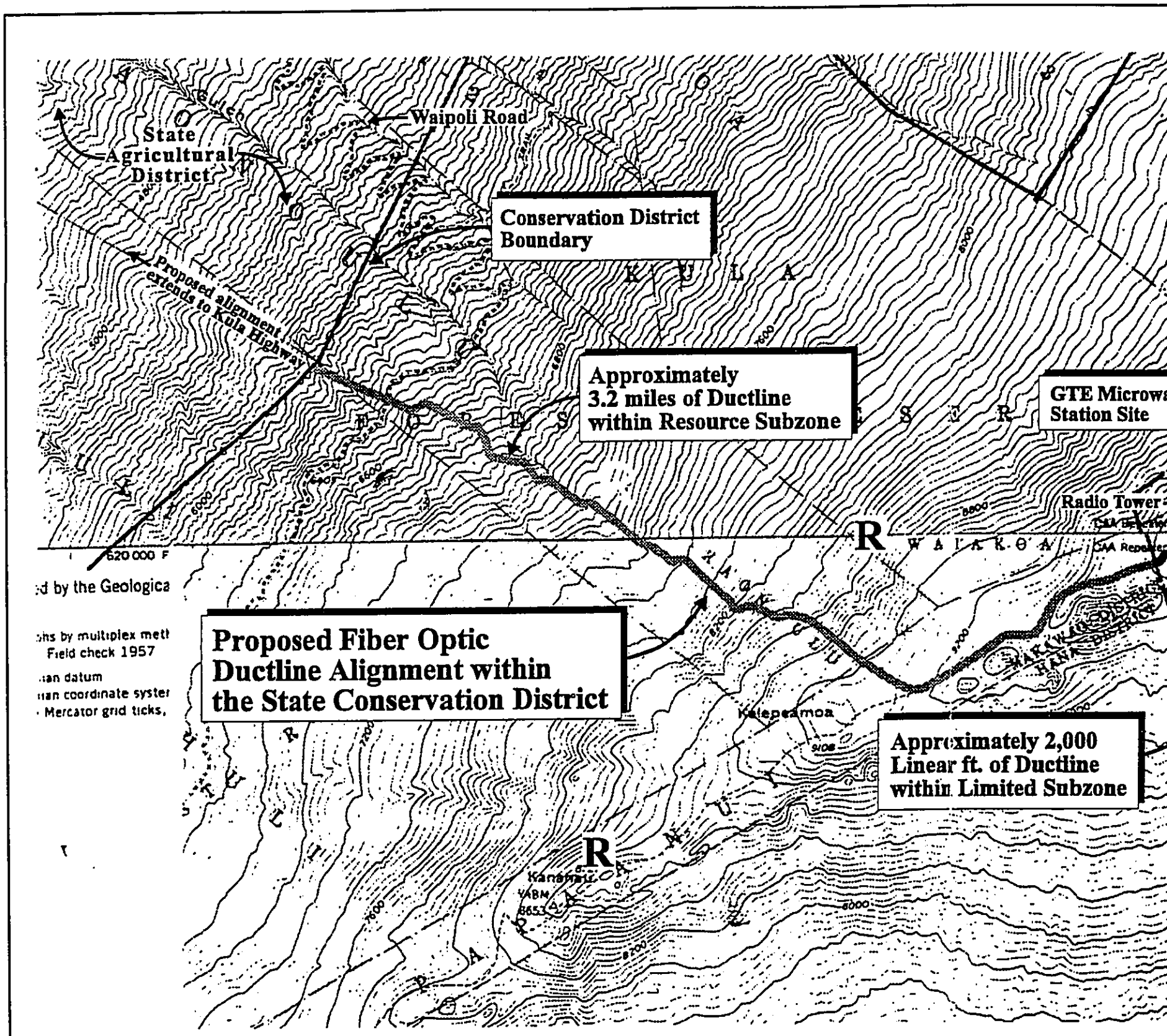

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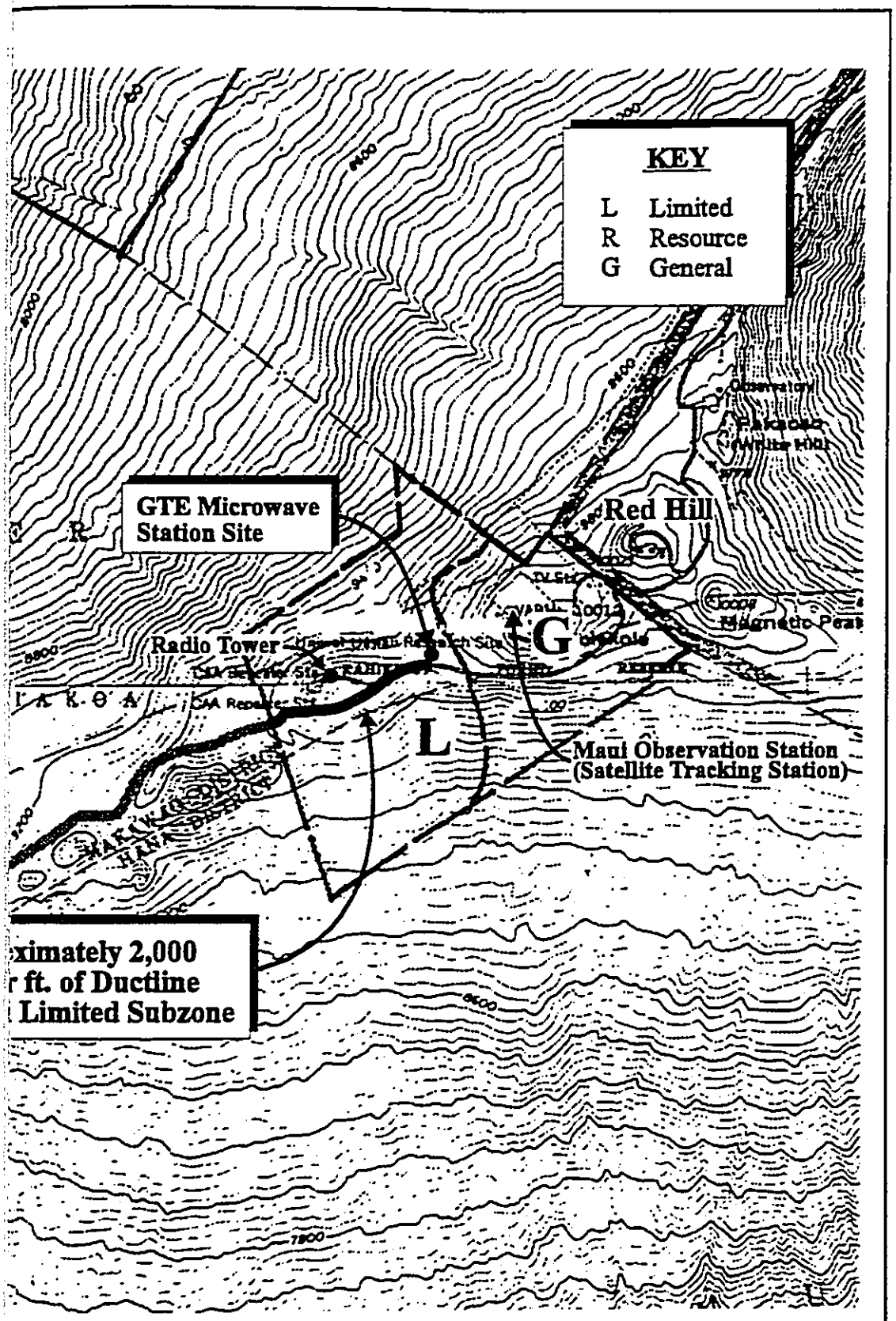

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Designations

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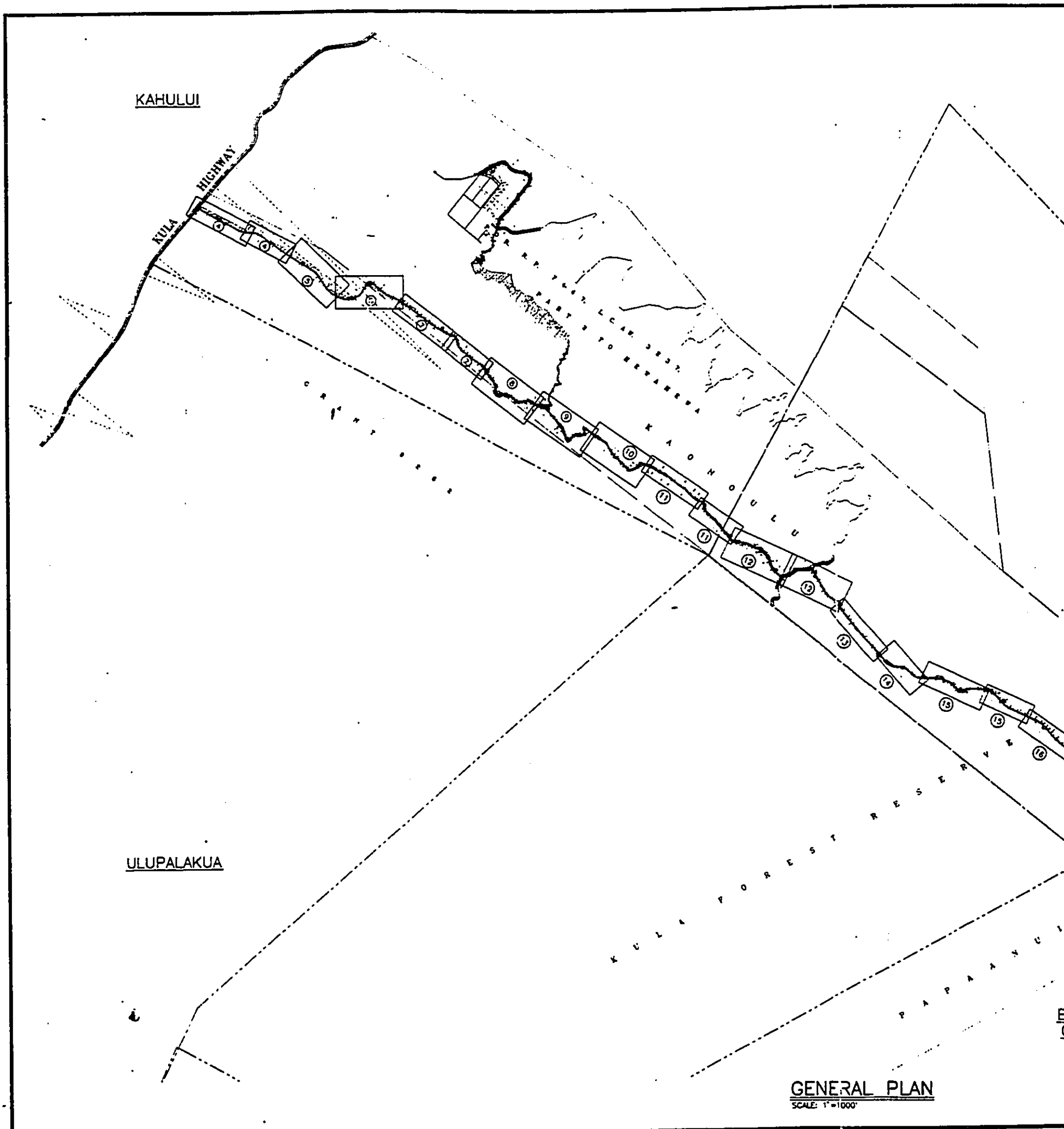
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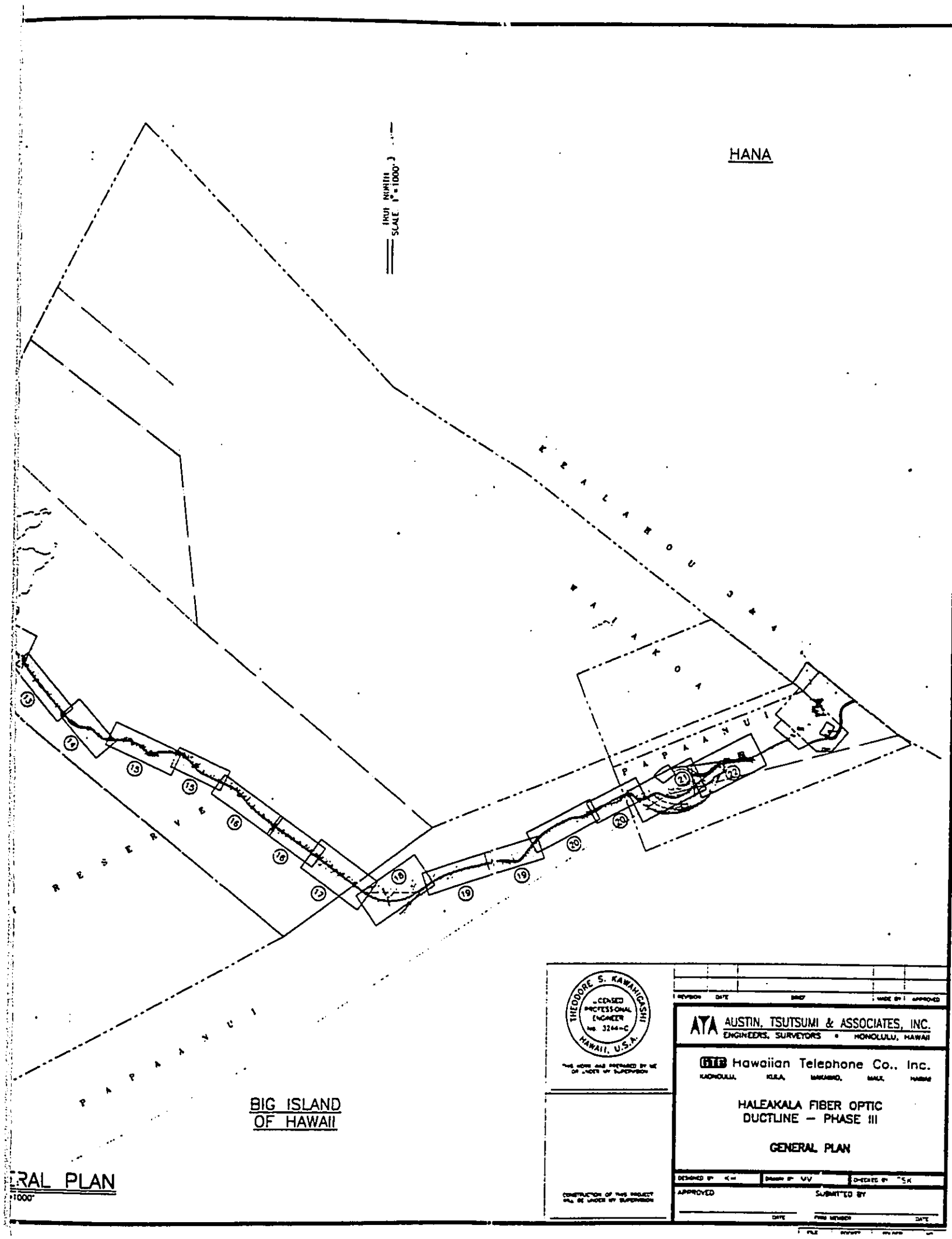

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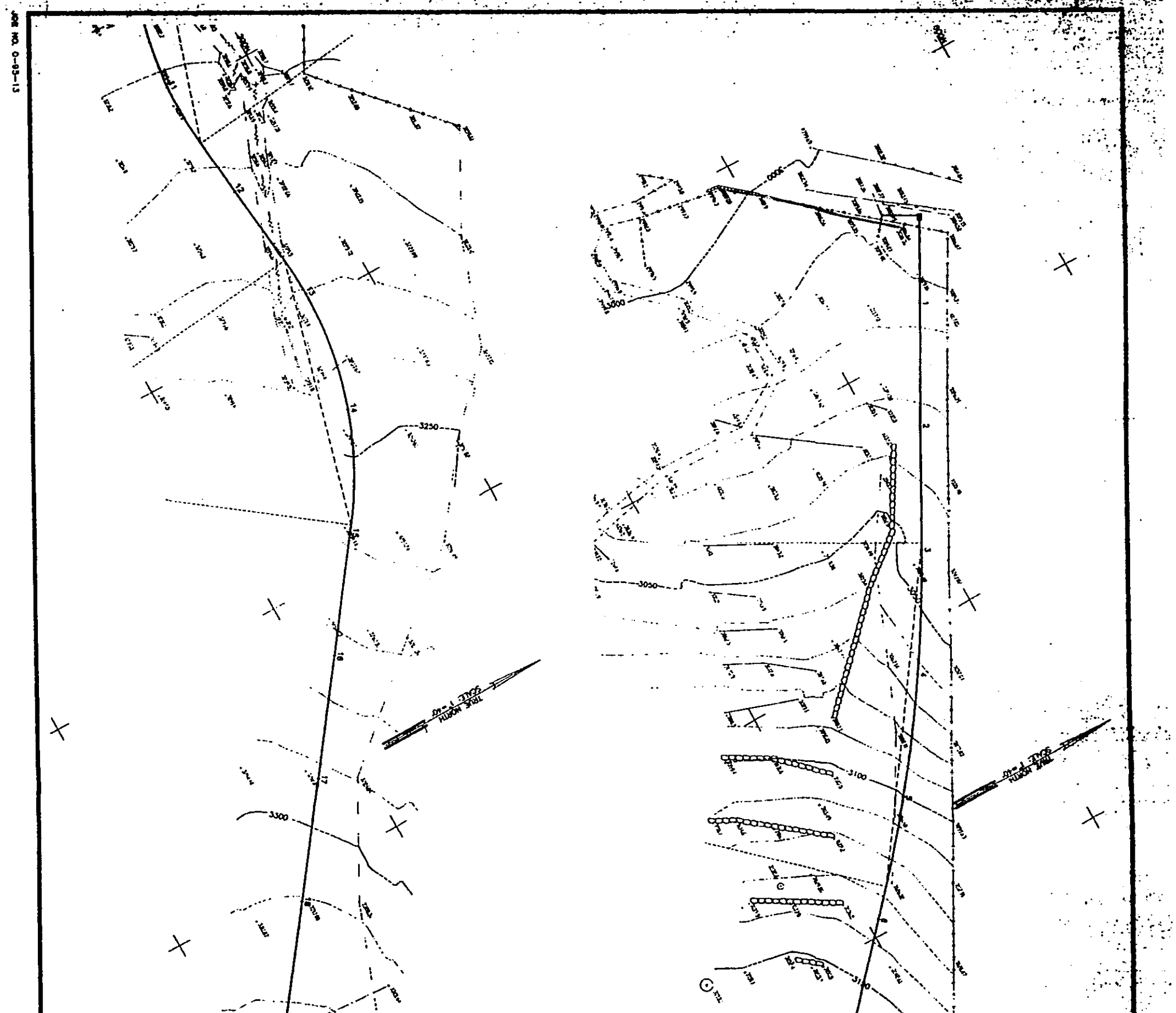
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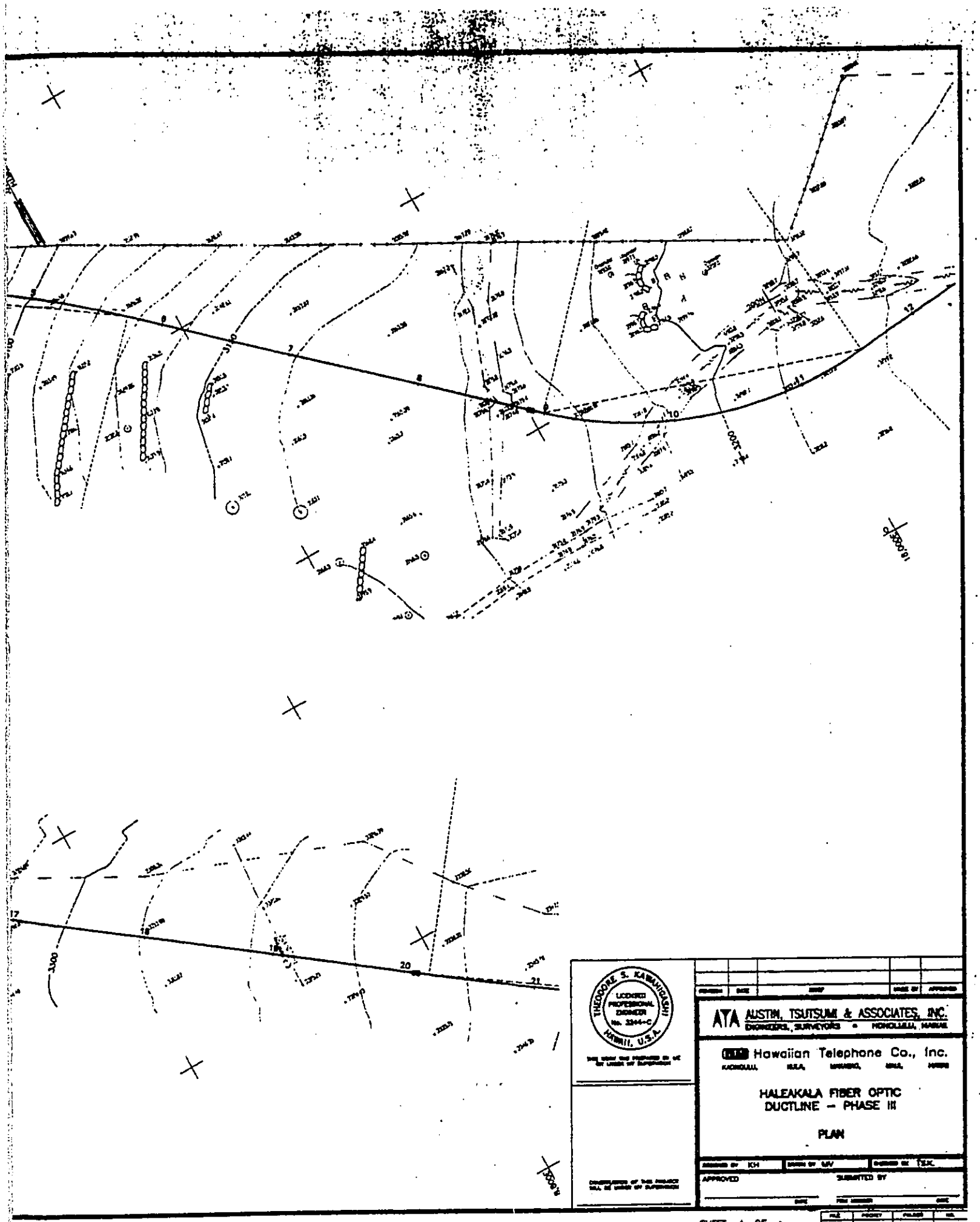

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APPROVED | SUBMITTED BY

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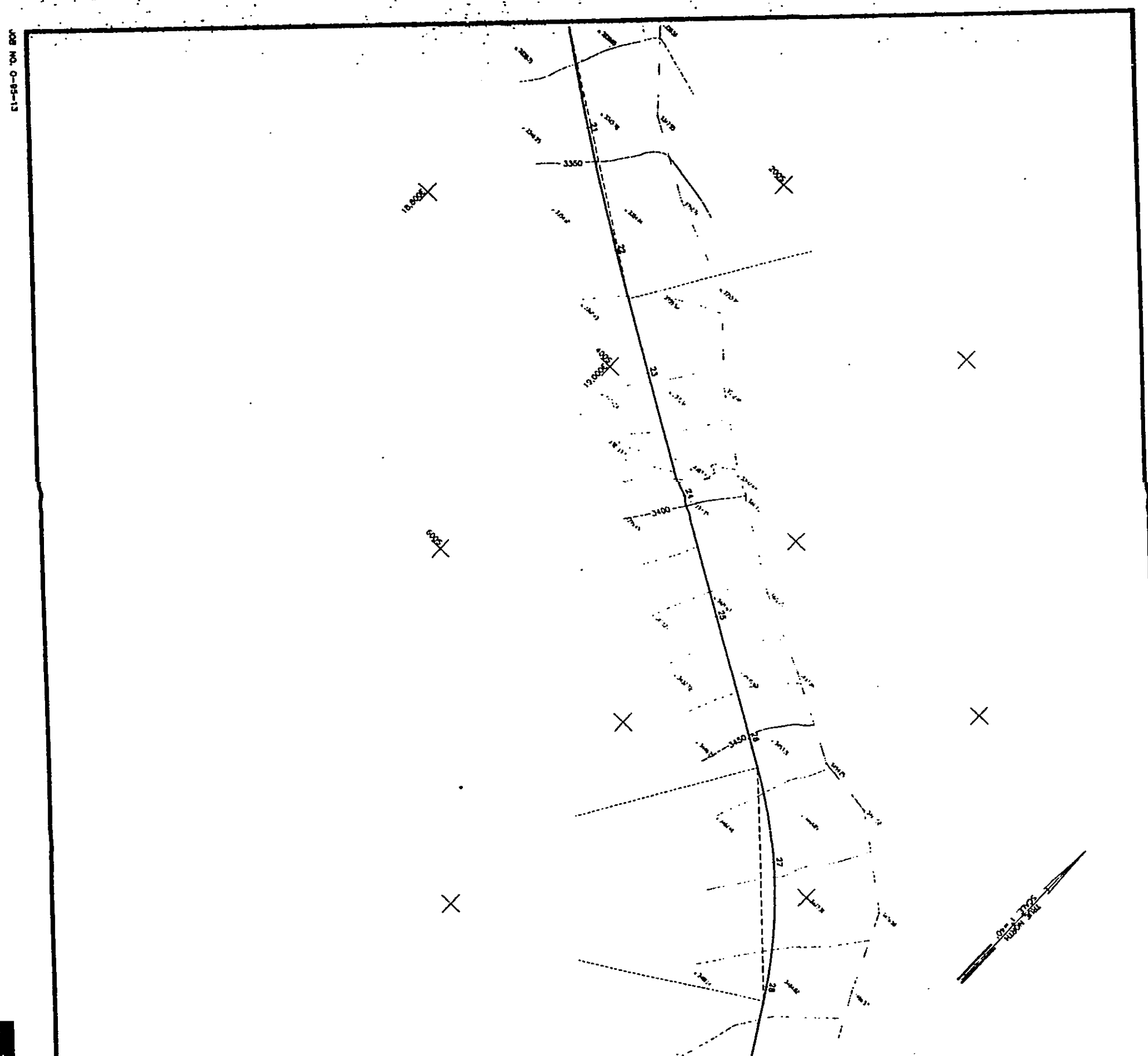
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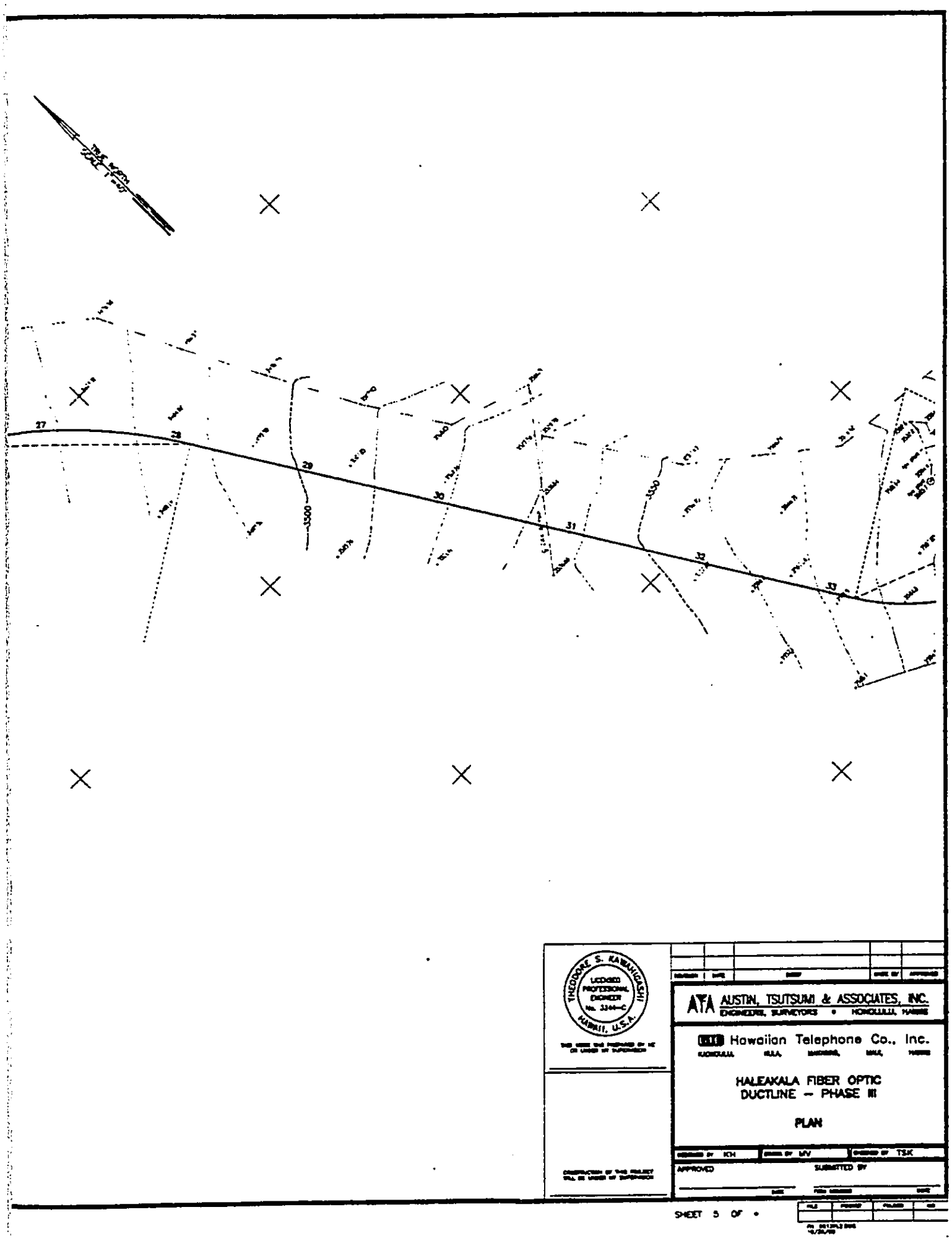

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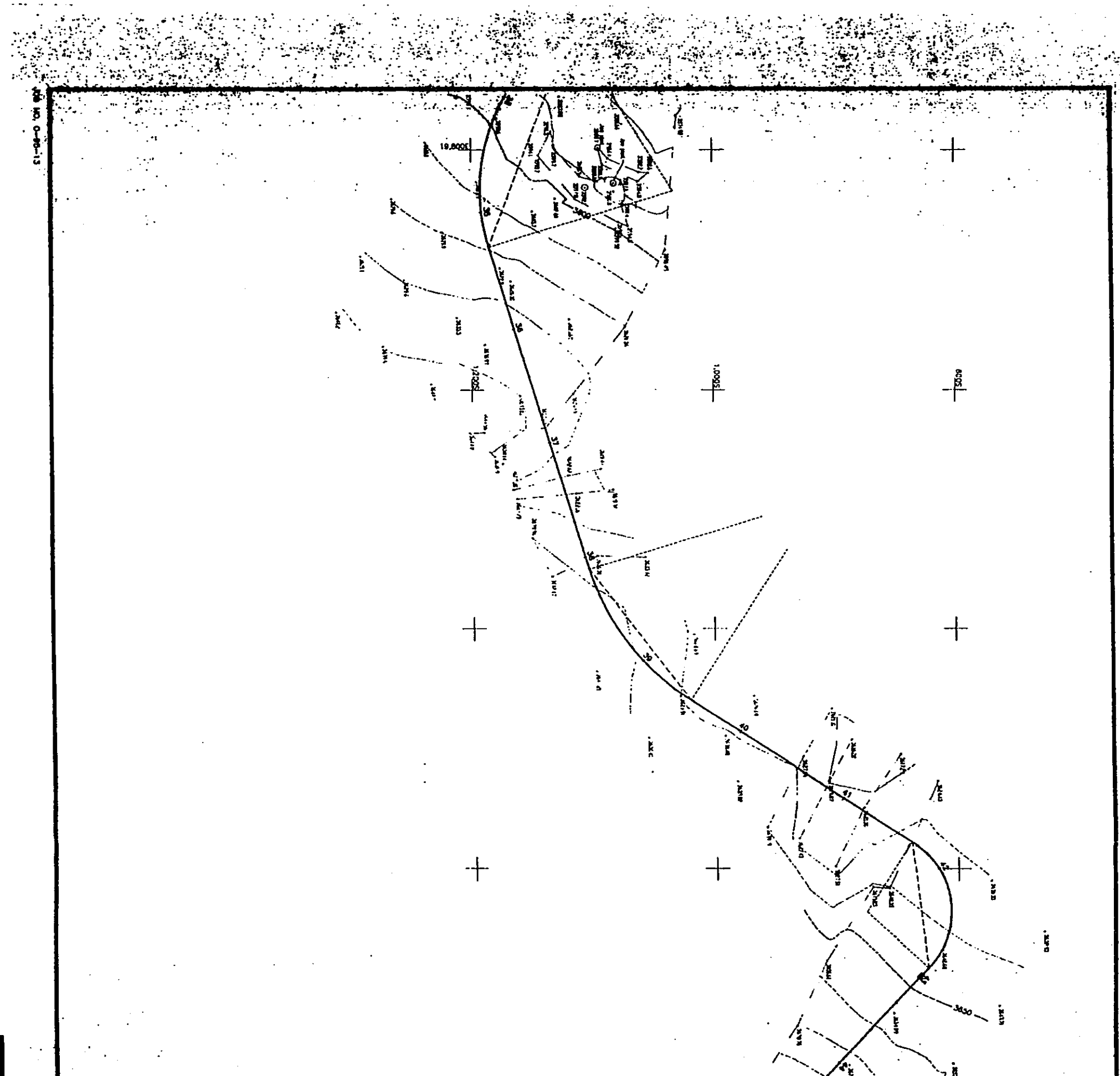

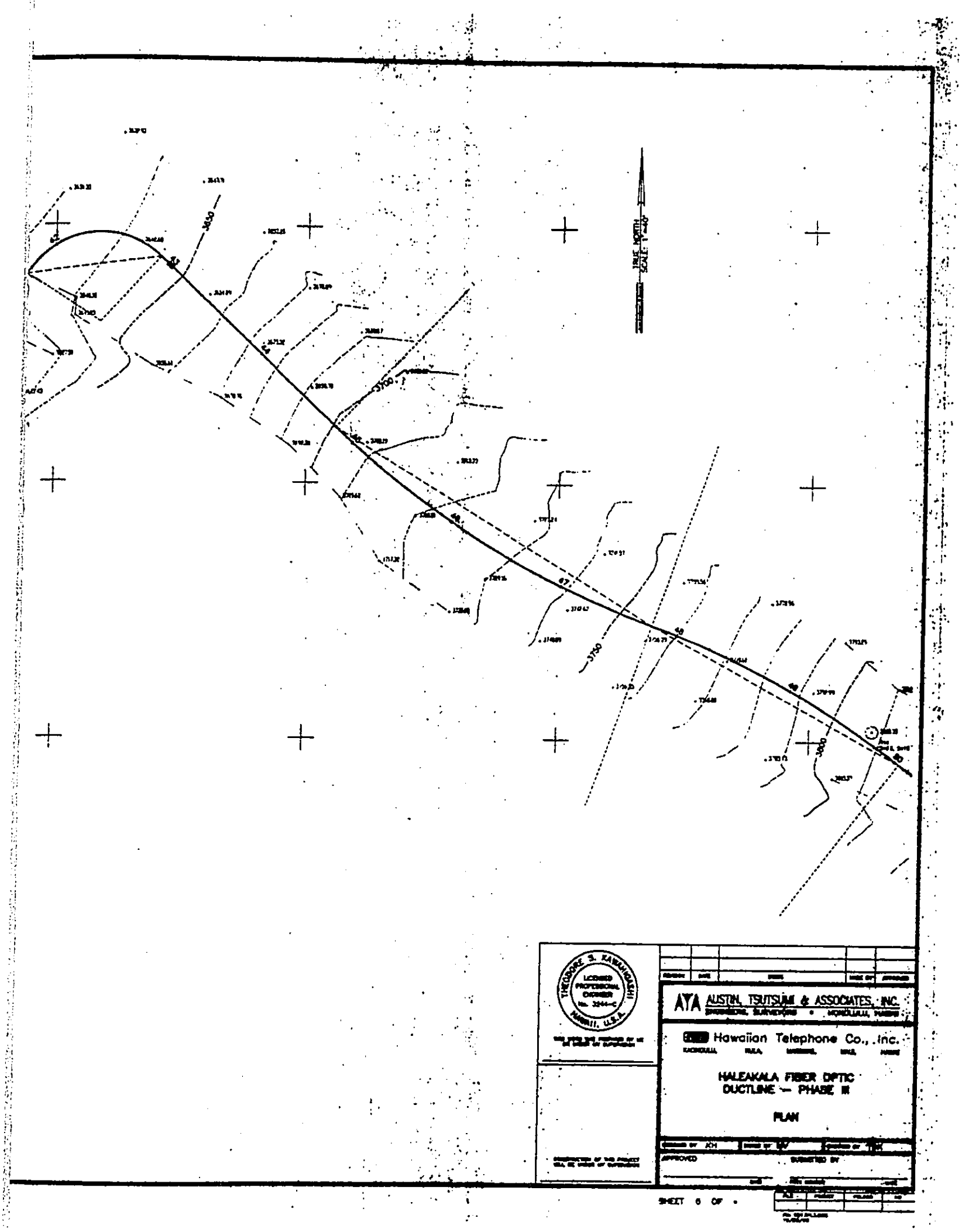

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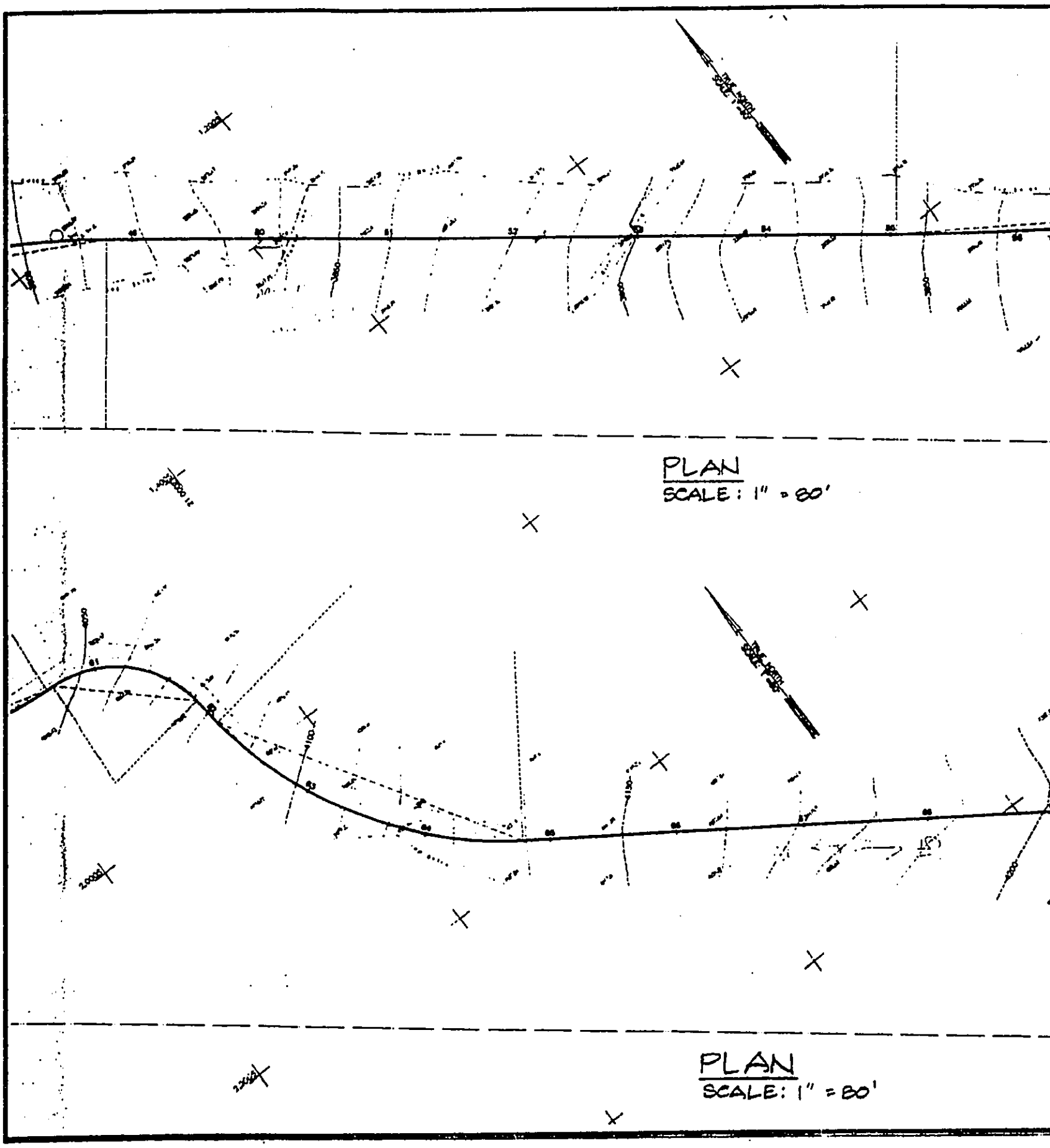

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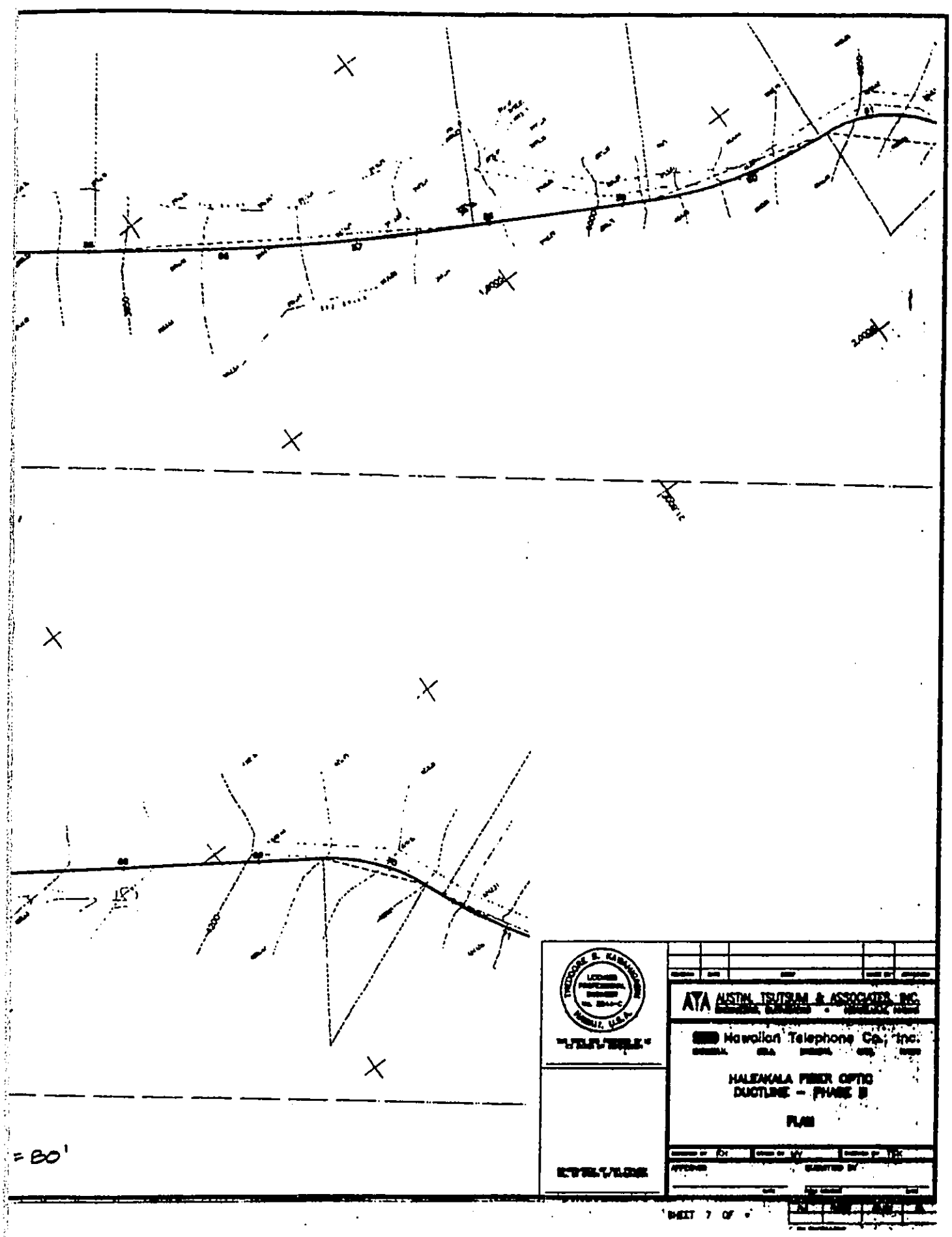
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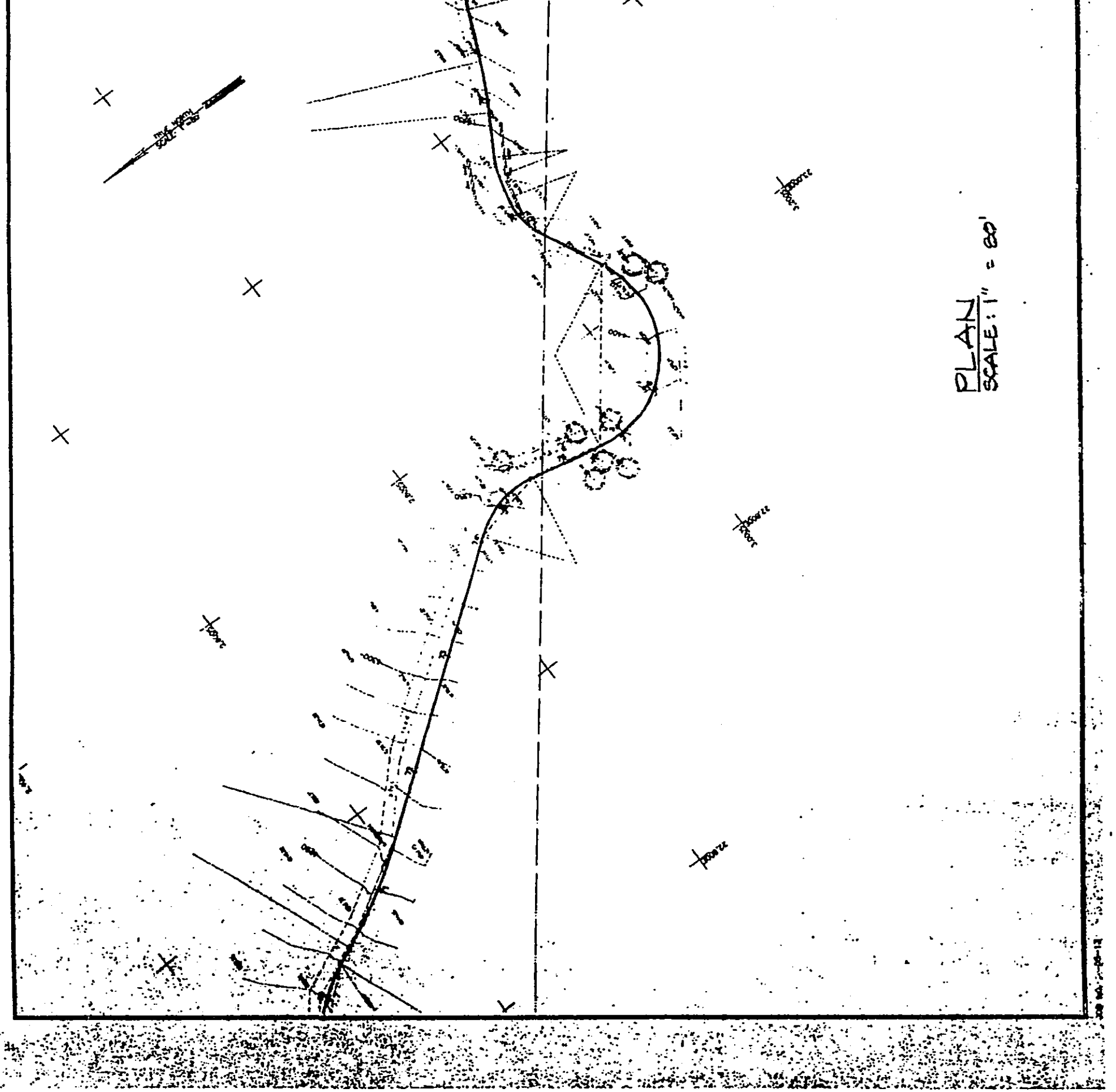

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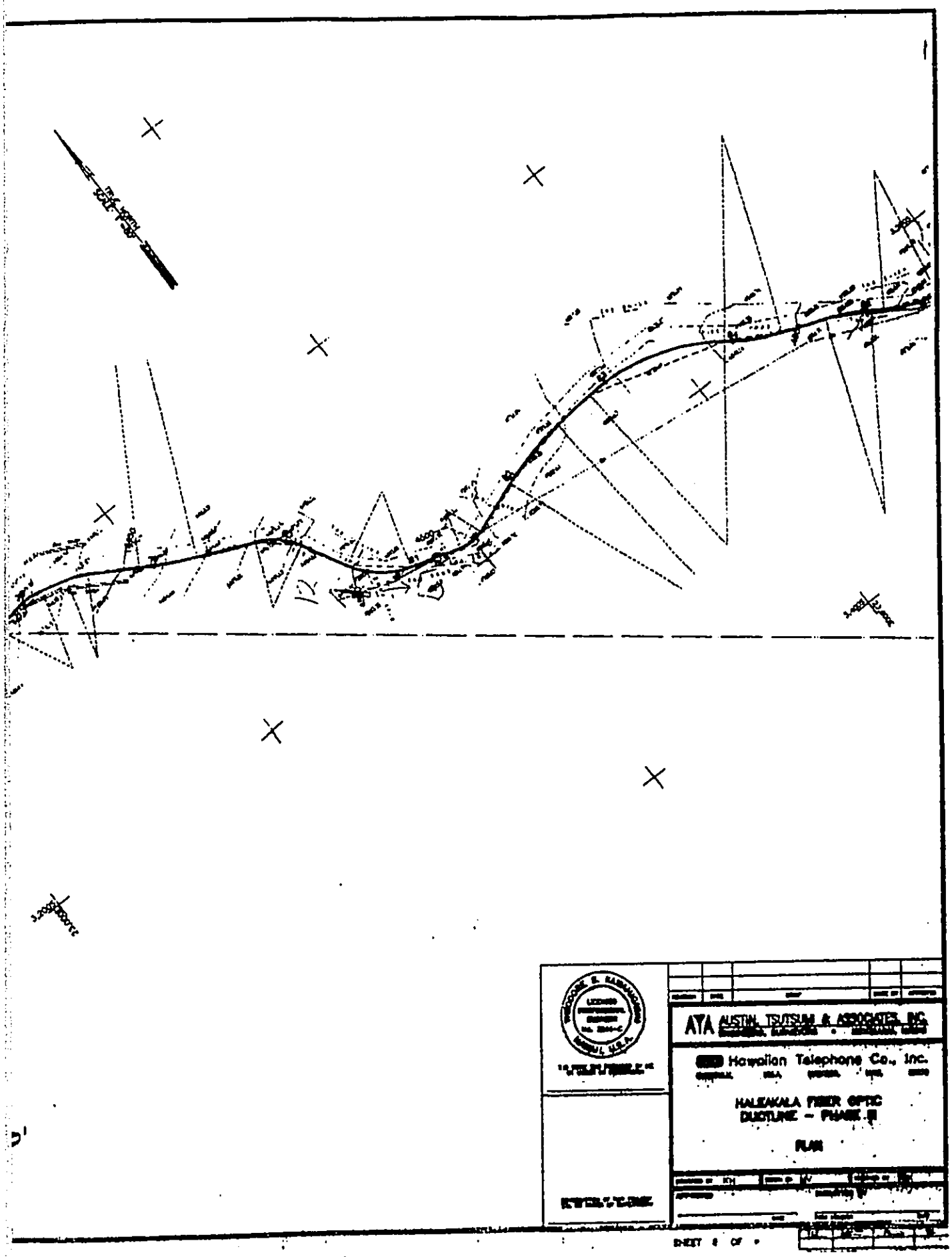

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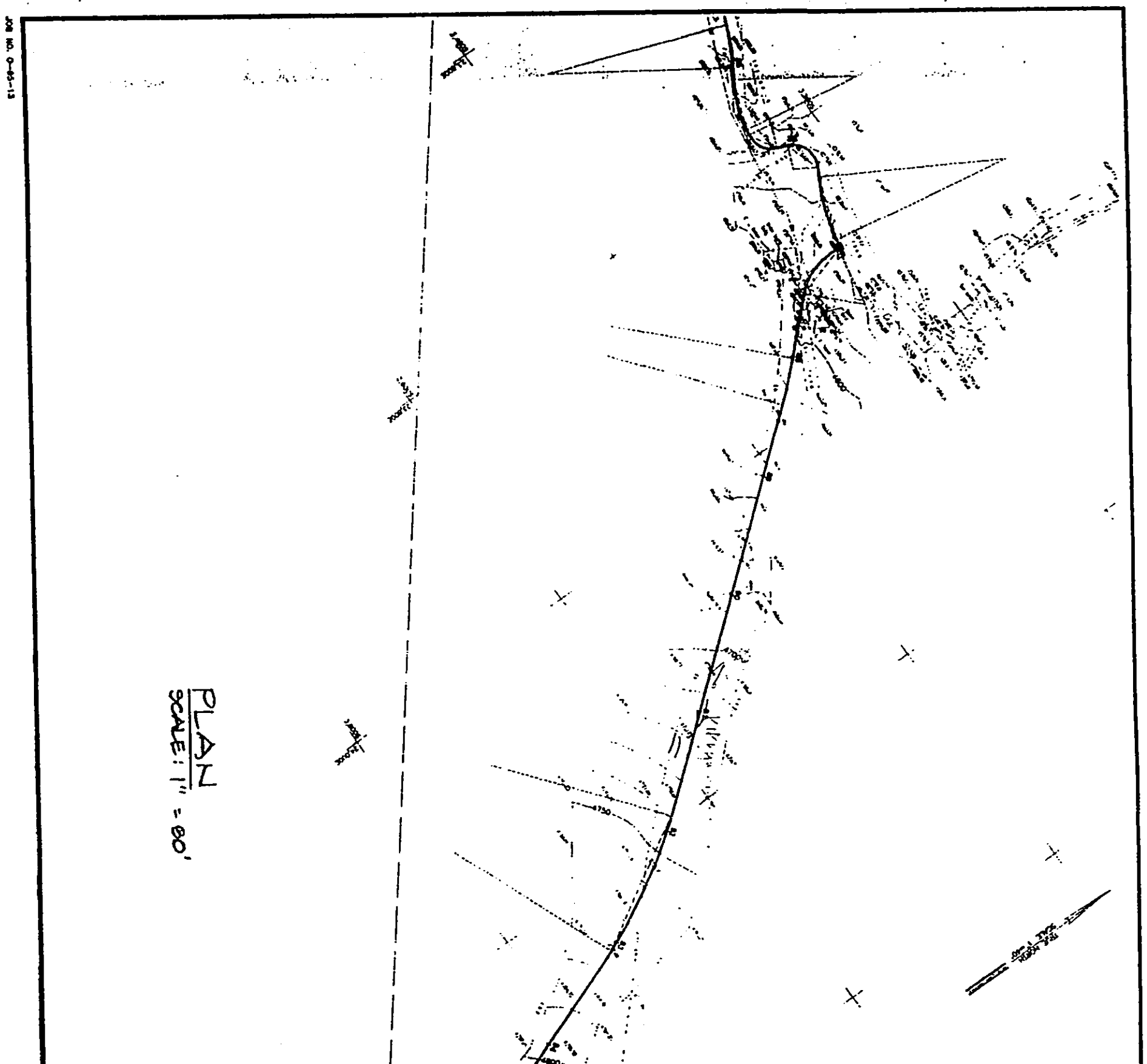

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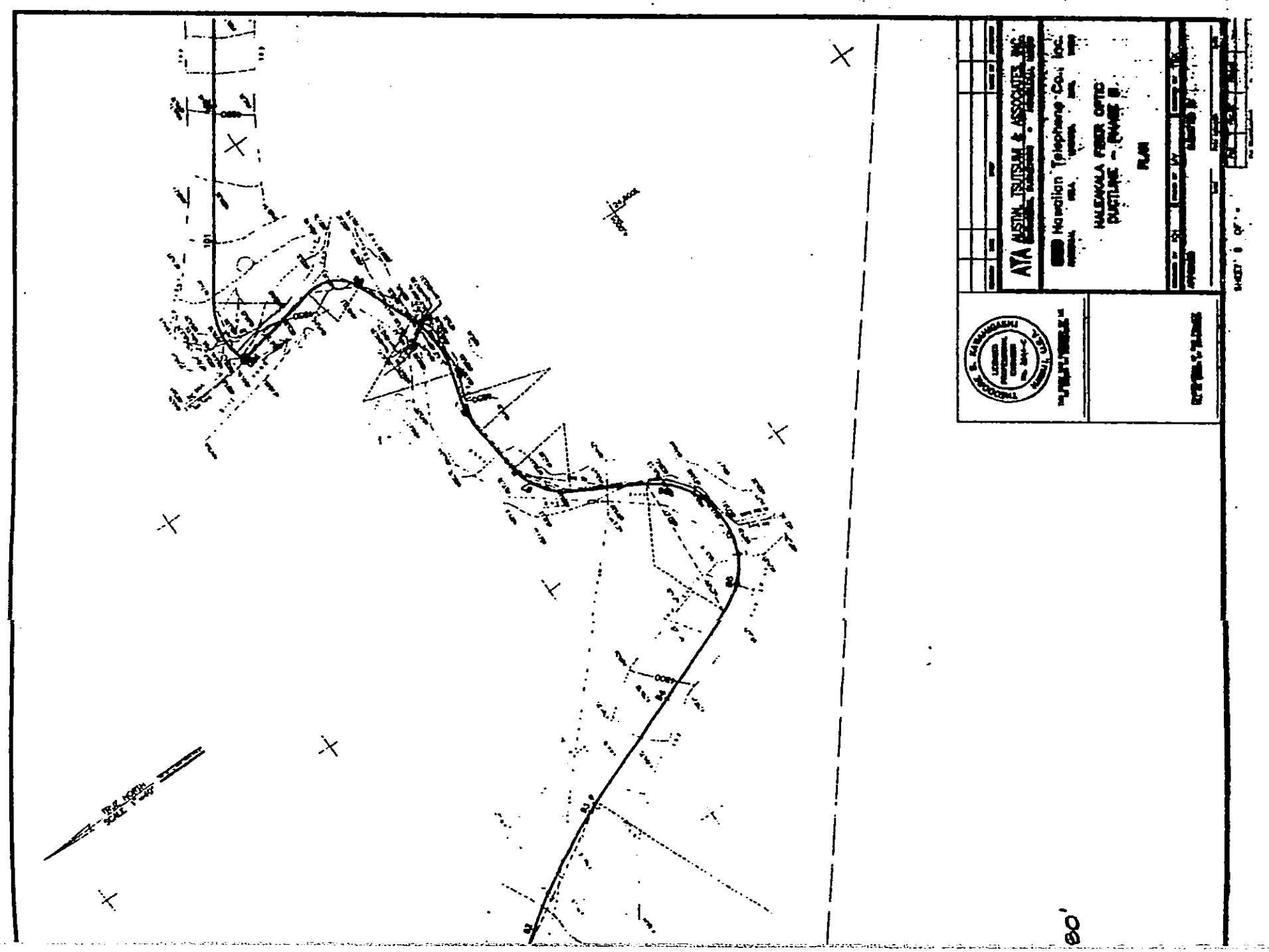

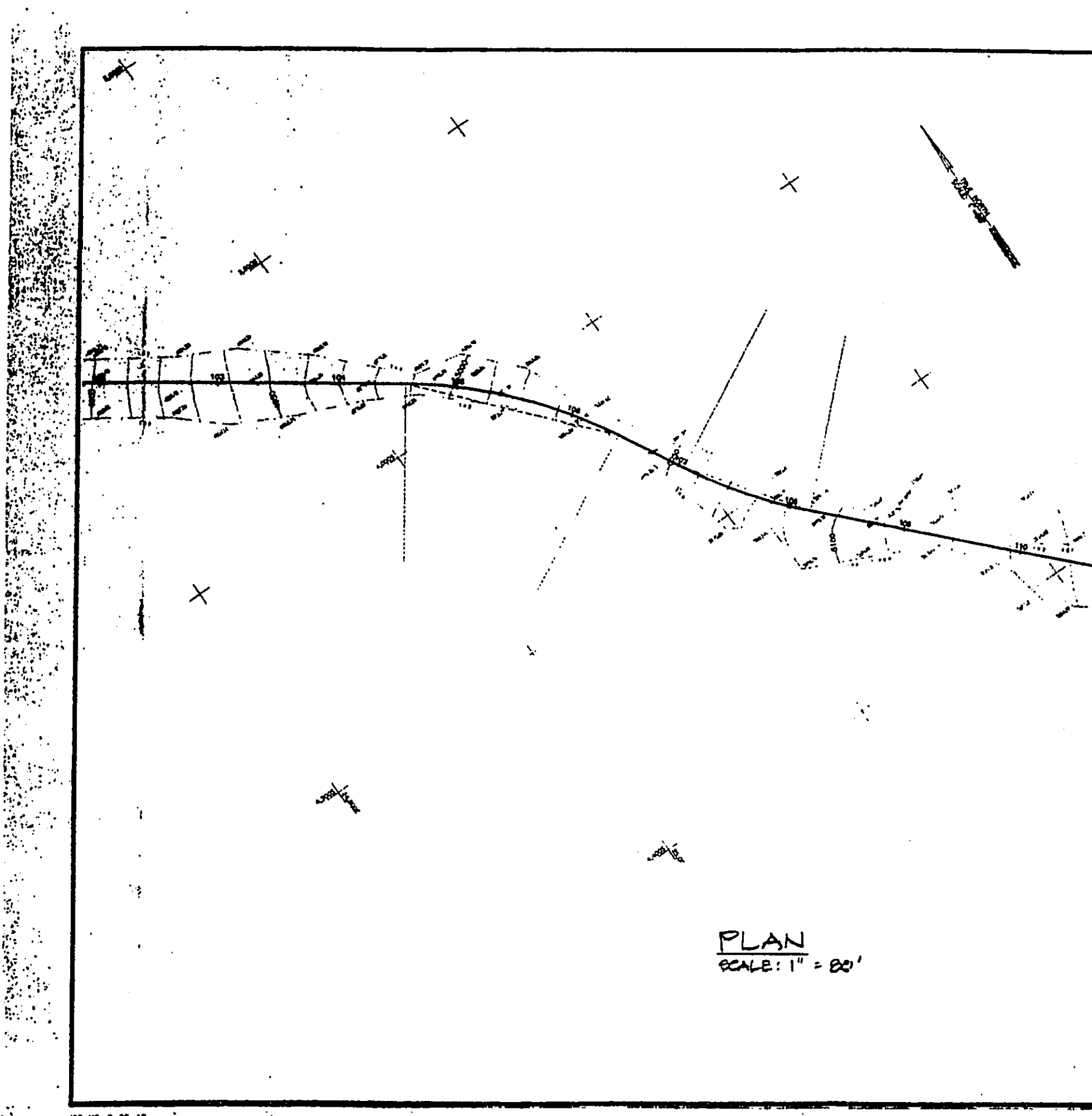

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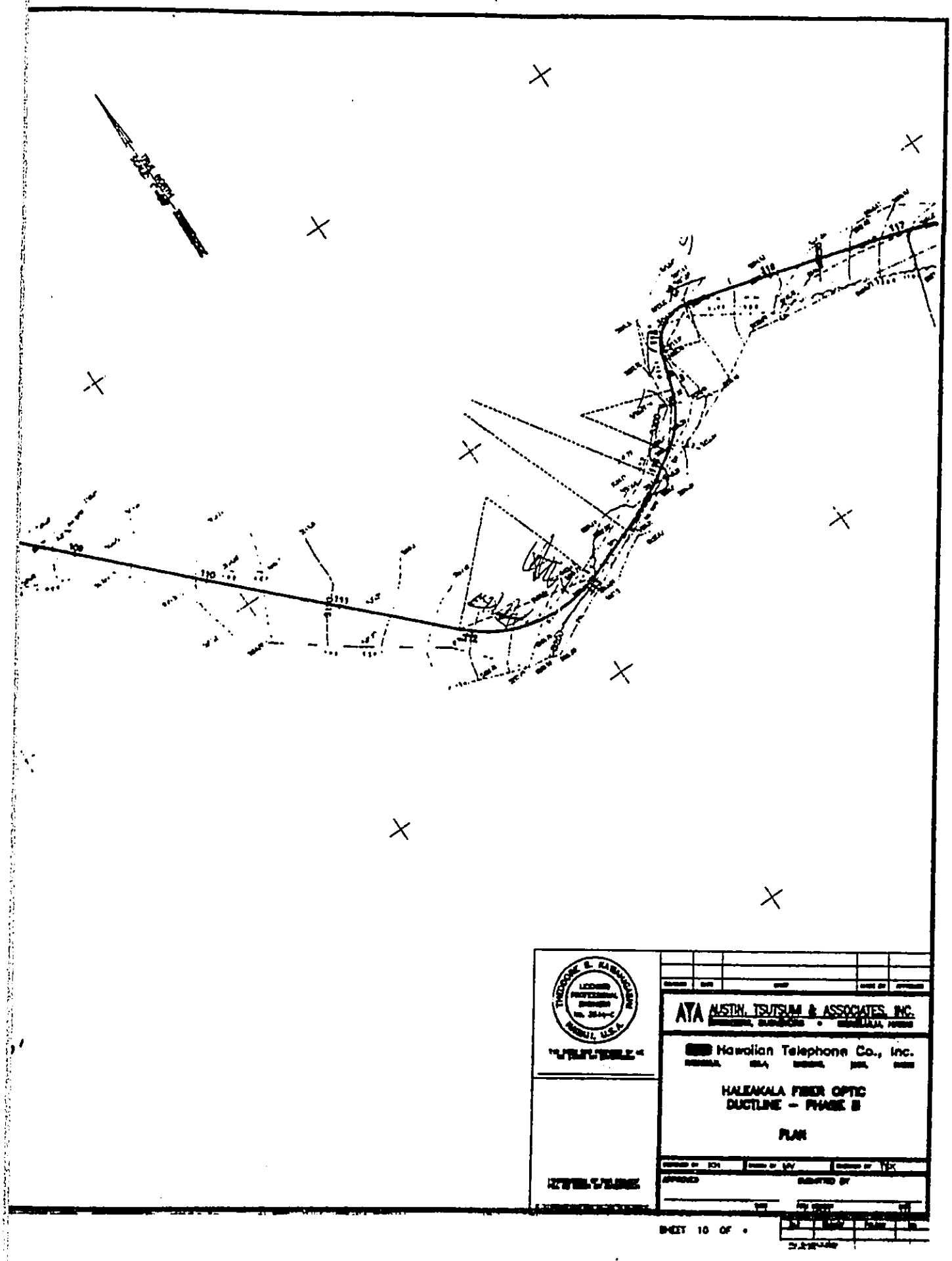

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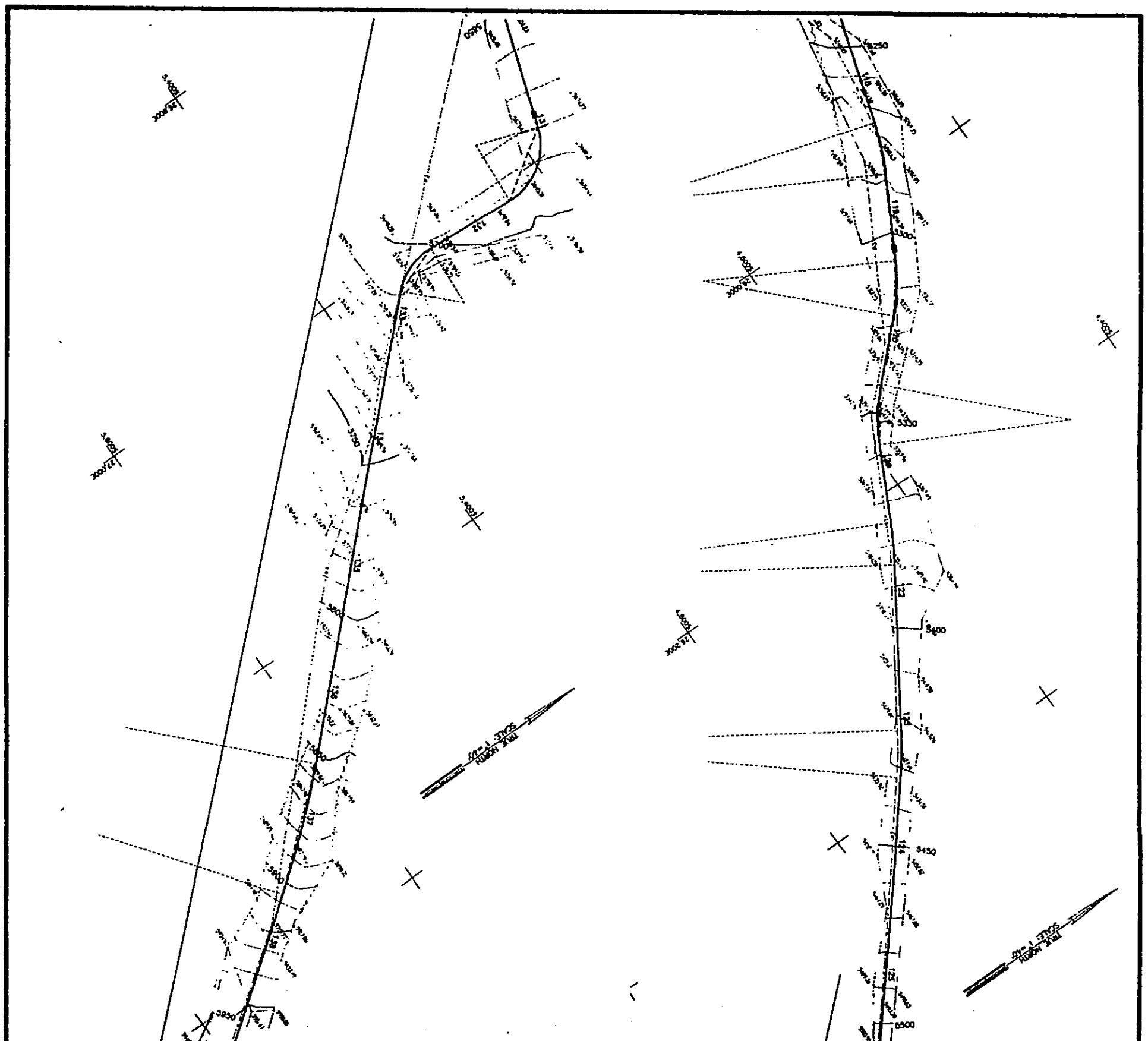

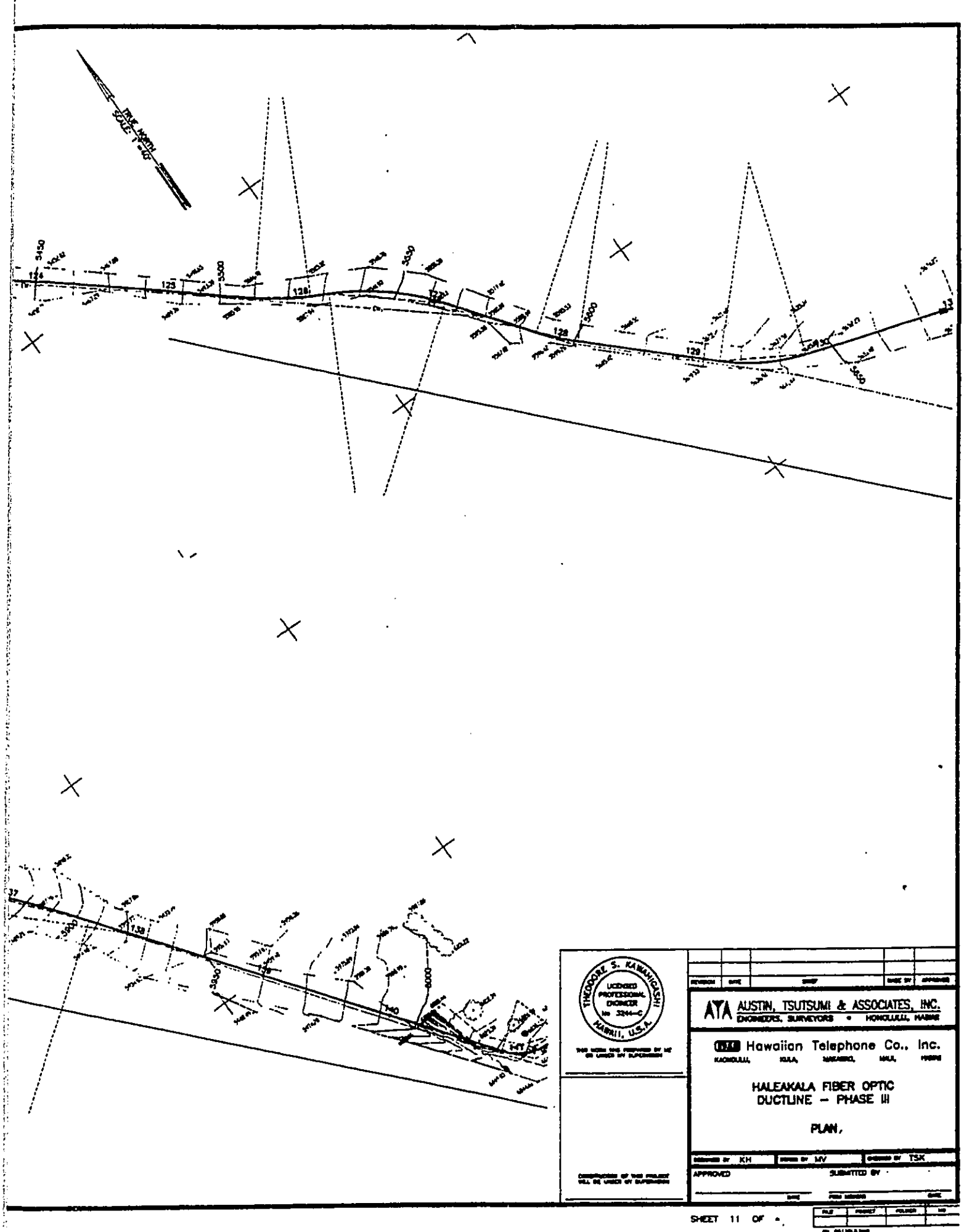

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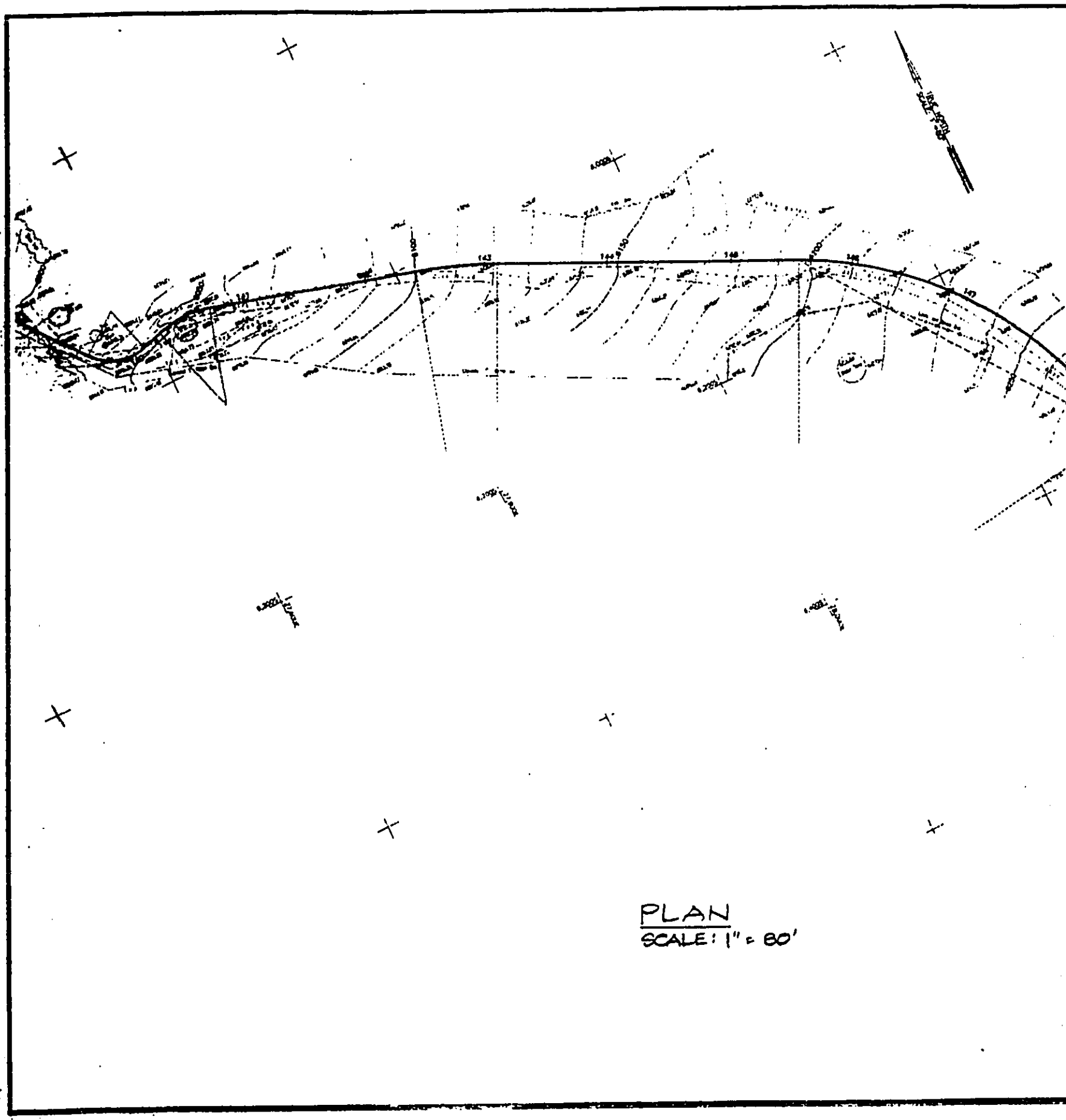

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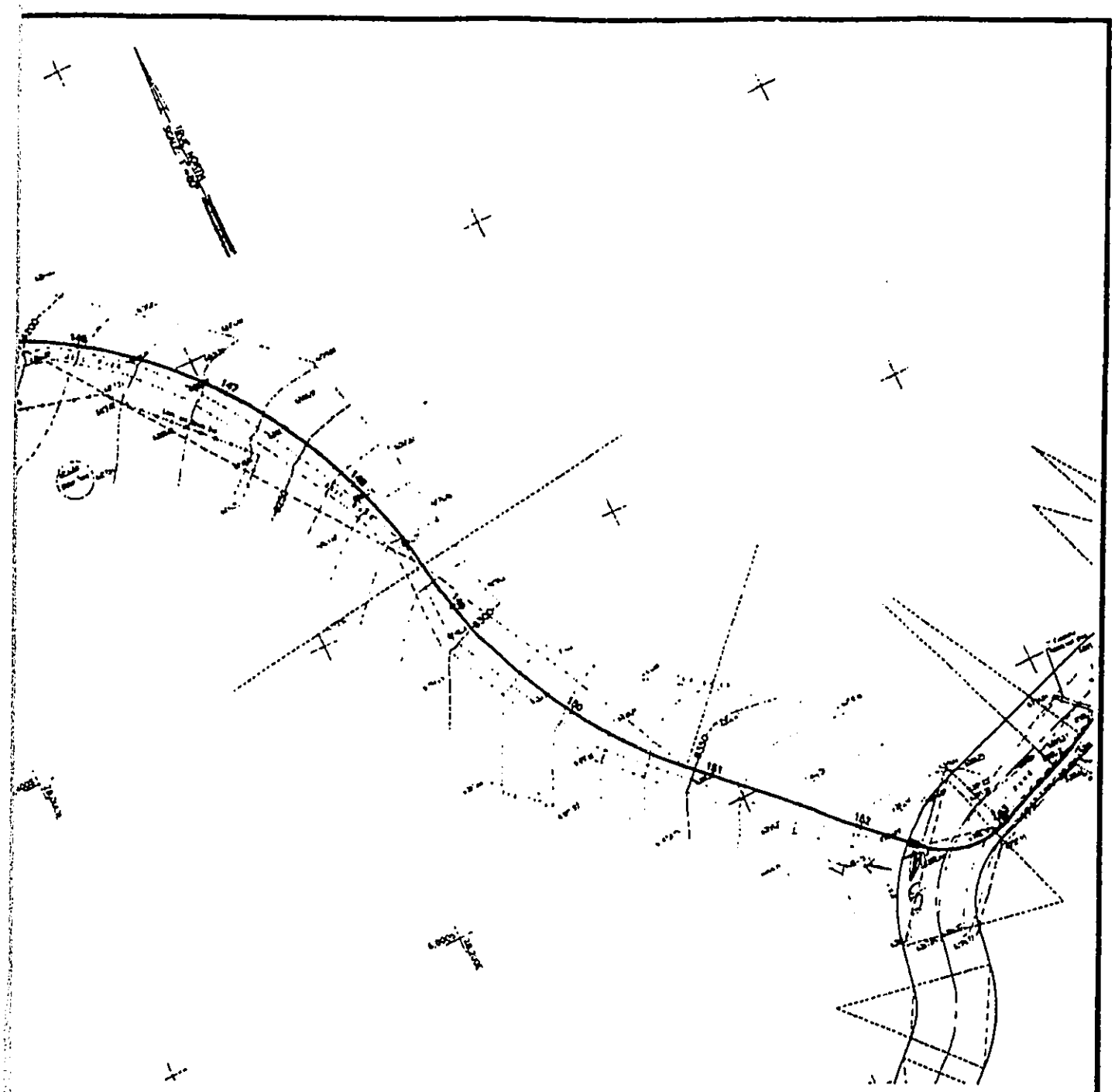

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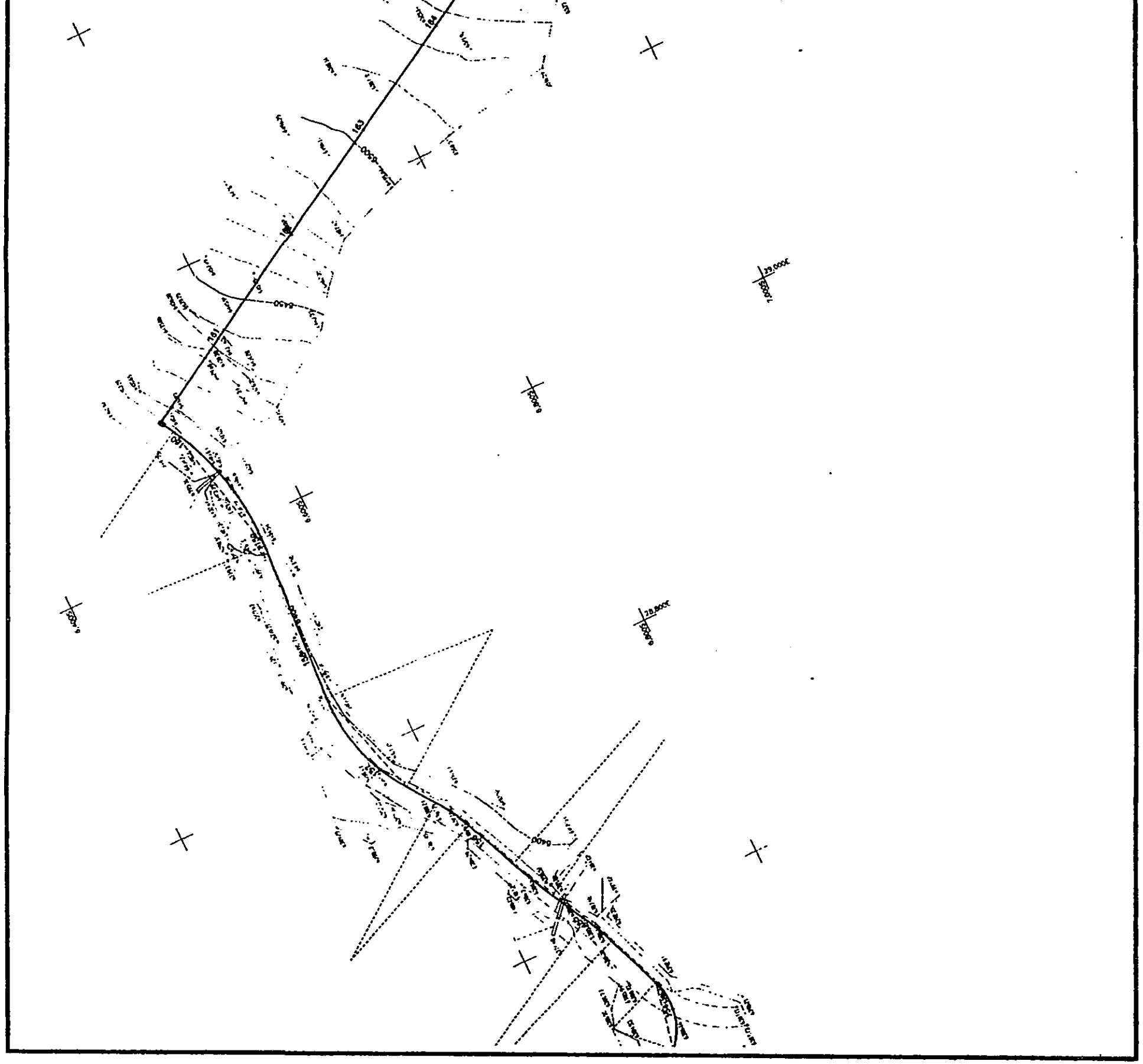

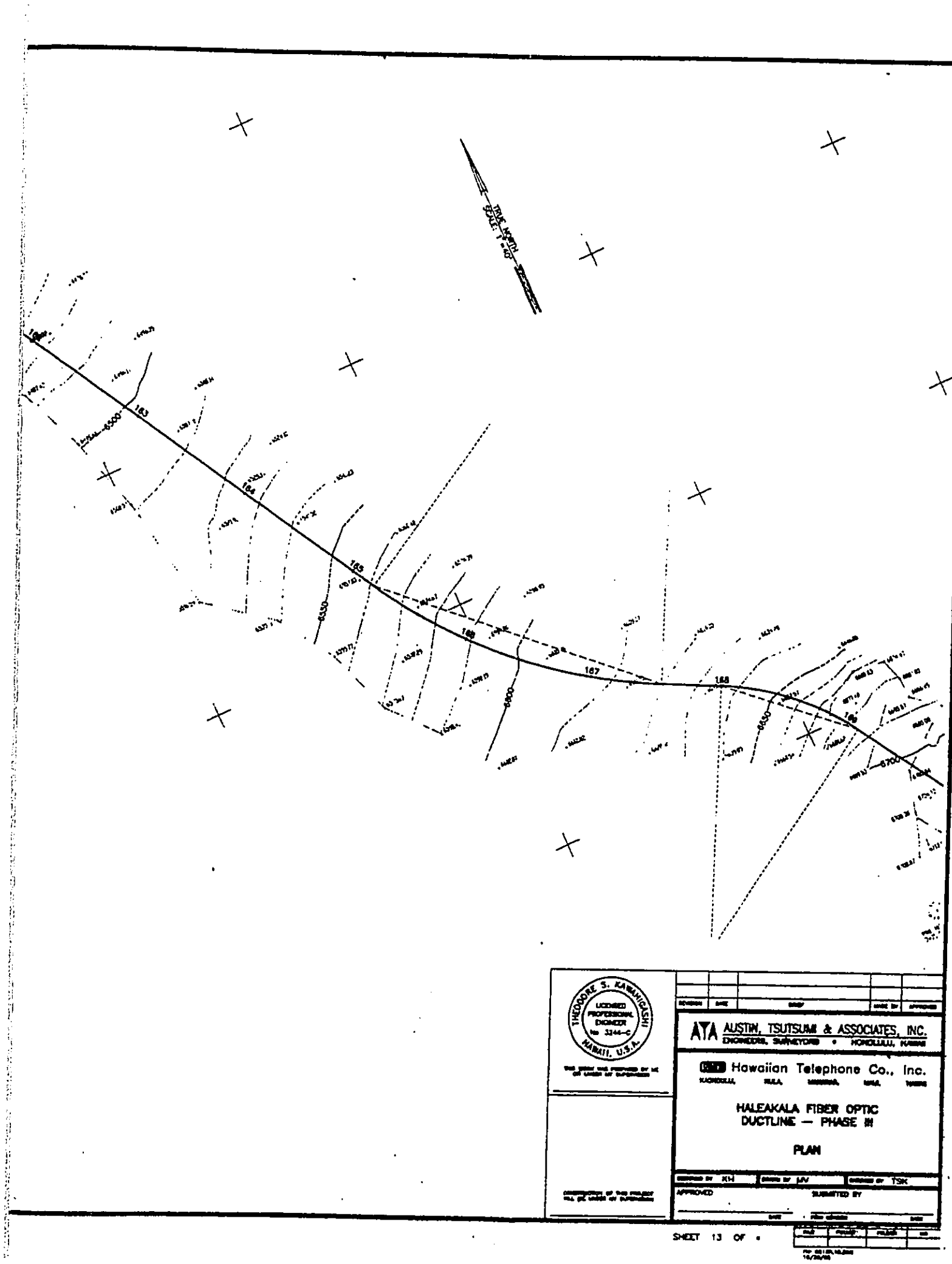

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DATE | DATE

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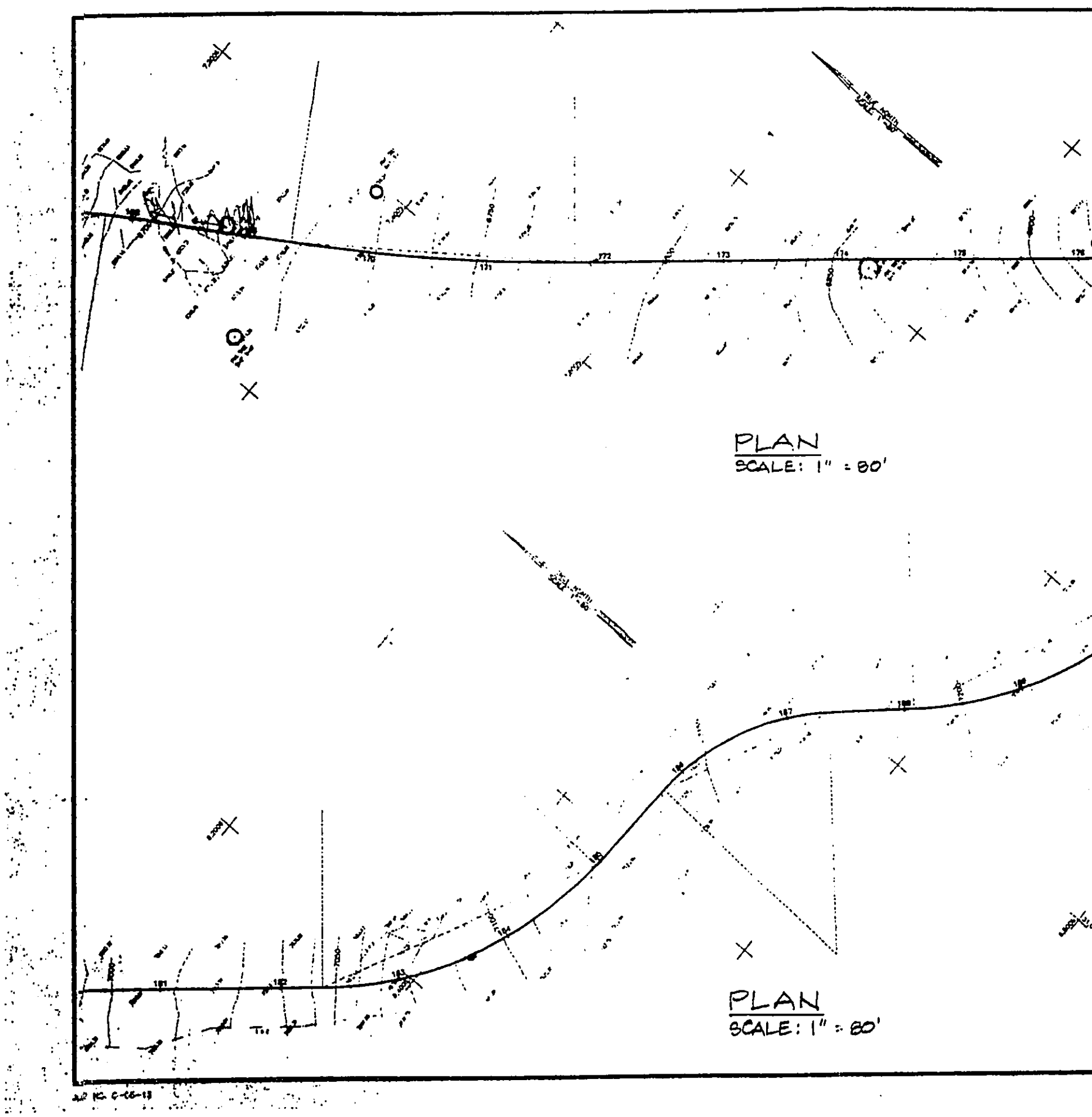

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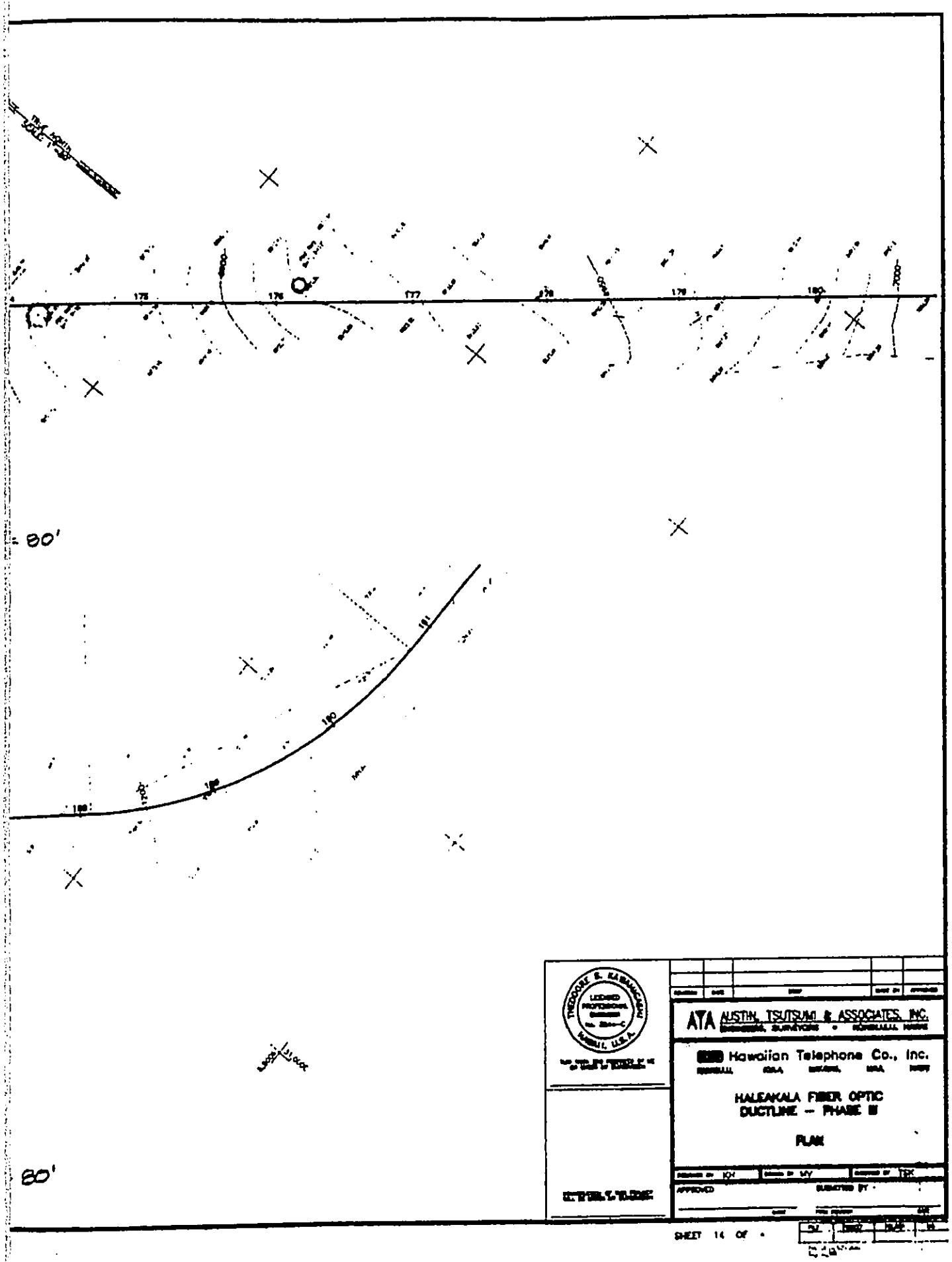

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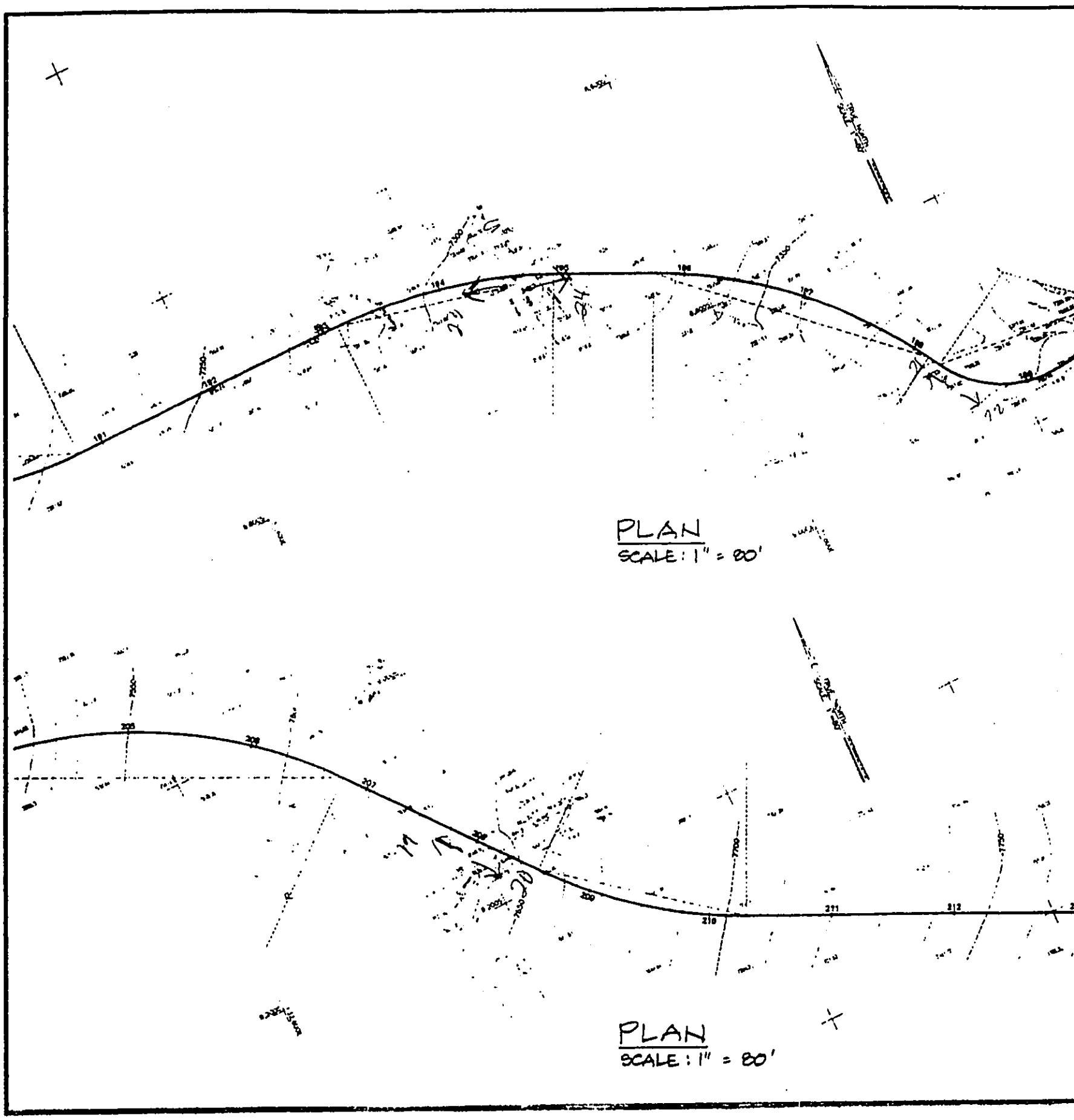

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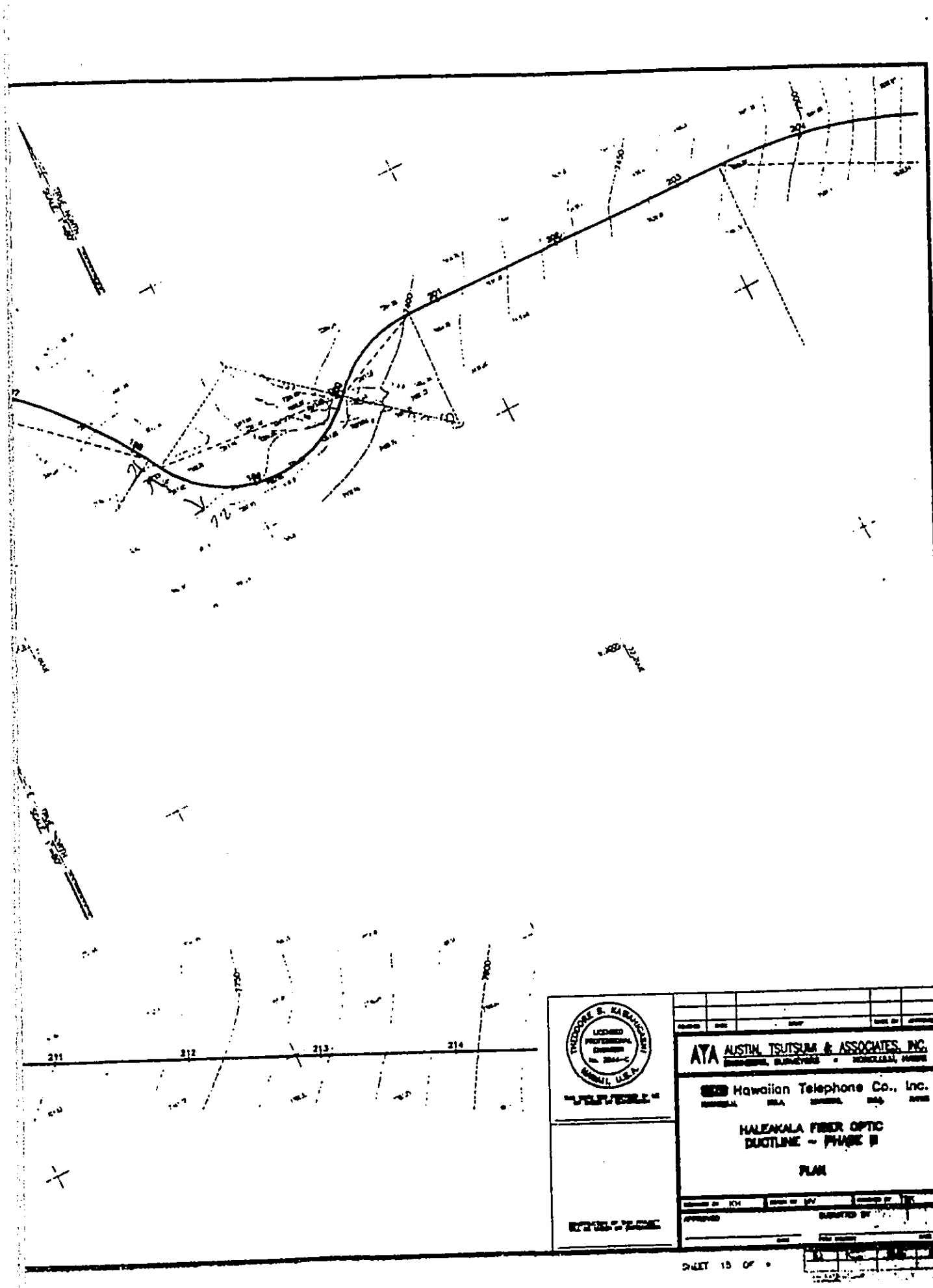
211
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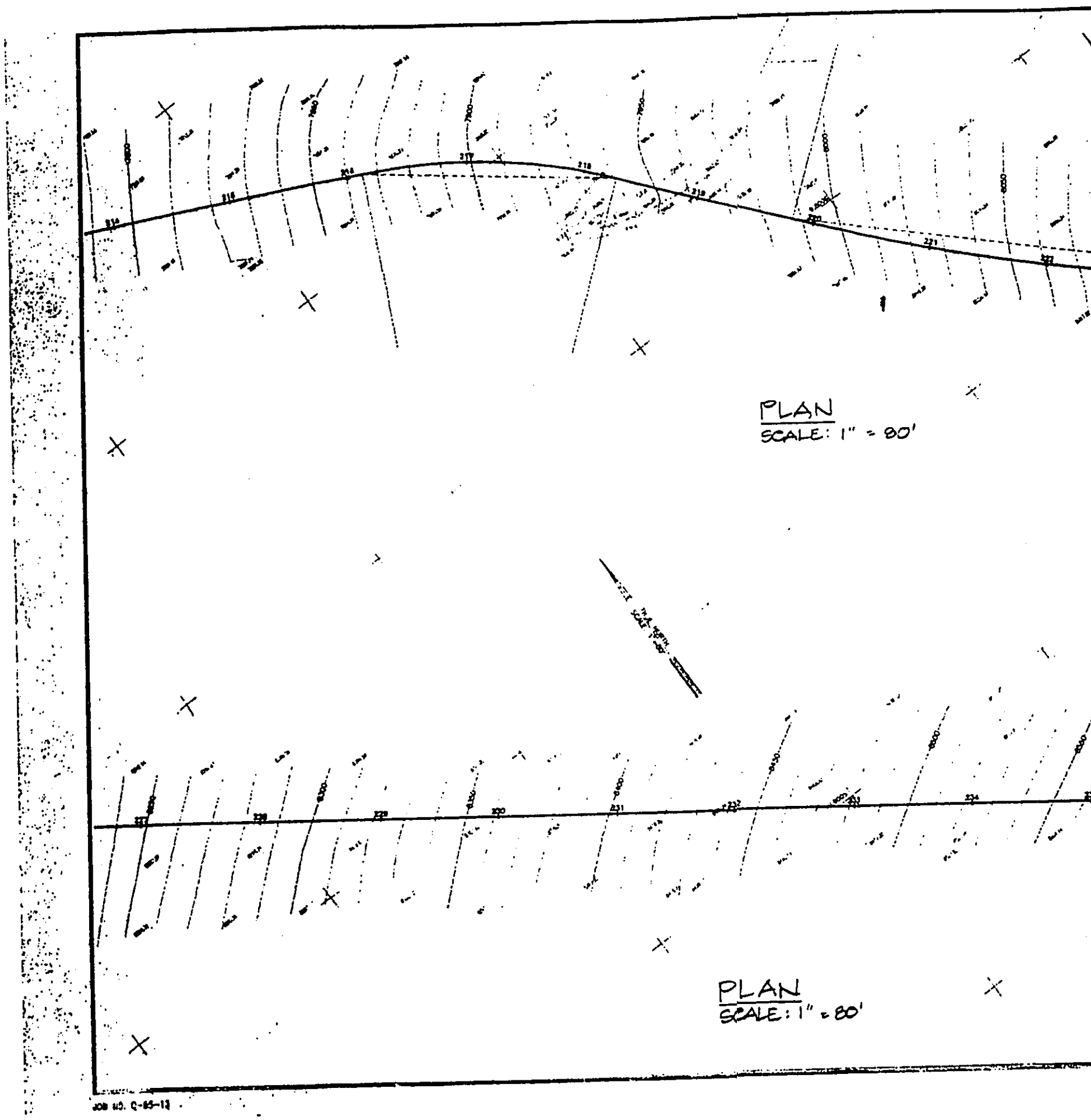
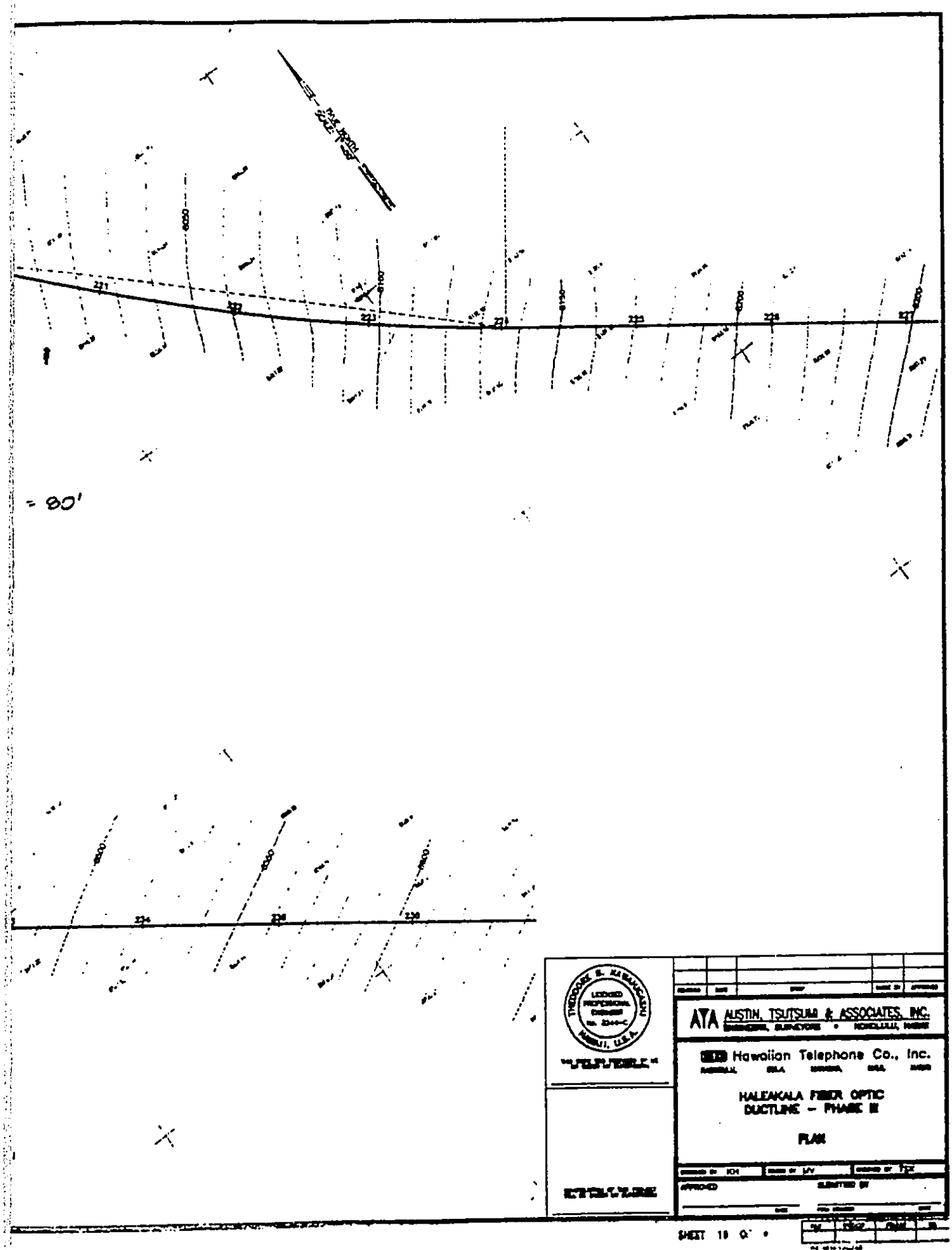
AYA AUSTIN, TSUTSUMI & ASSOCIATES, INC.
Hawaiian Telephone Co., Inc.
HALEAKALA FIBER OPTIC
DUCTLINE - PHASE II
PLAN
SHEET 15 OF

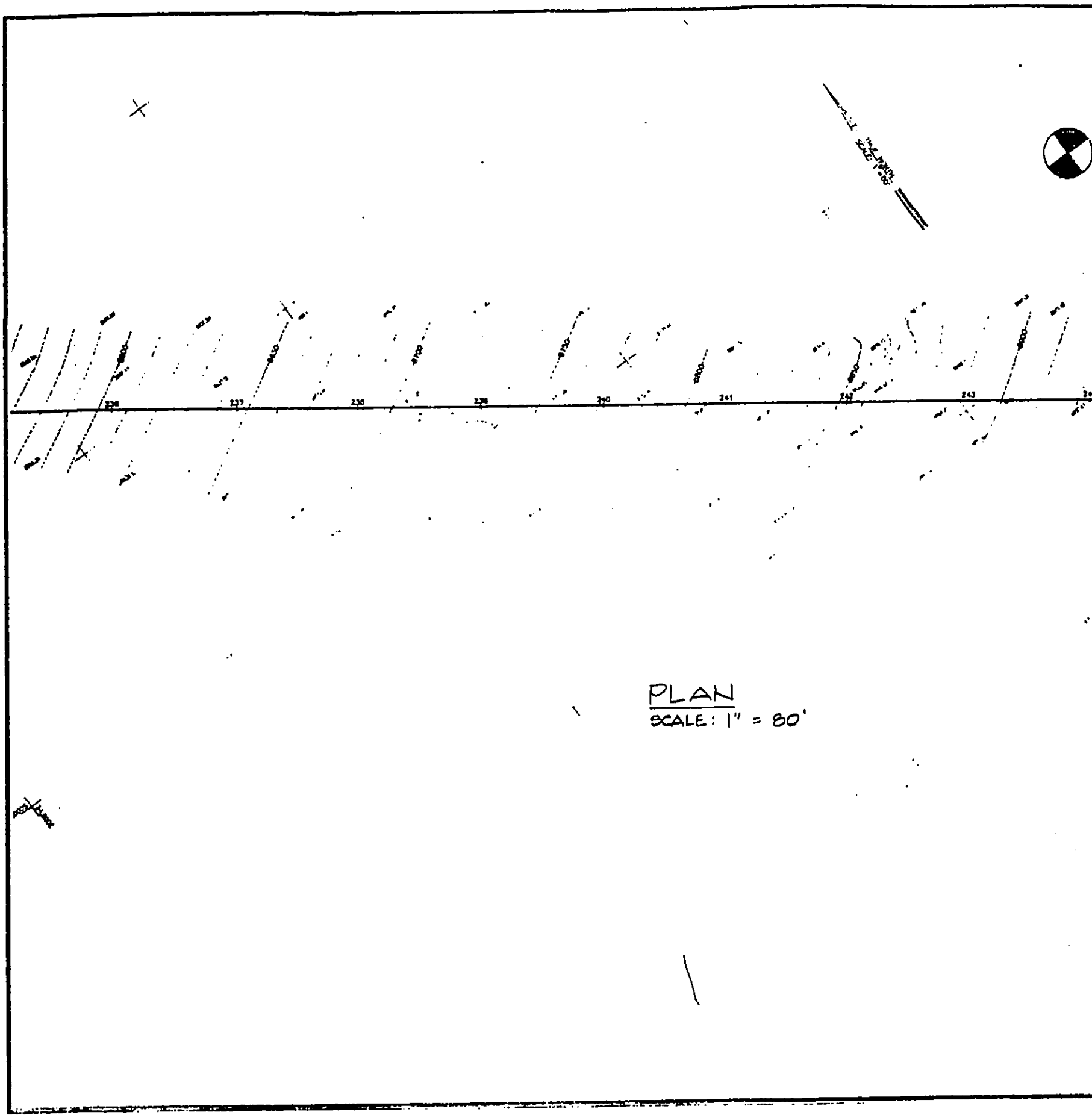


PLAN
SCALE: 1" = 80'

PLAN
SCALE: 1" = 80'

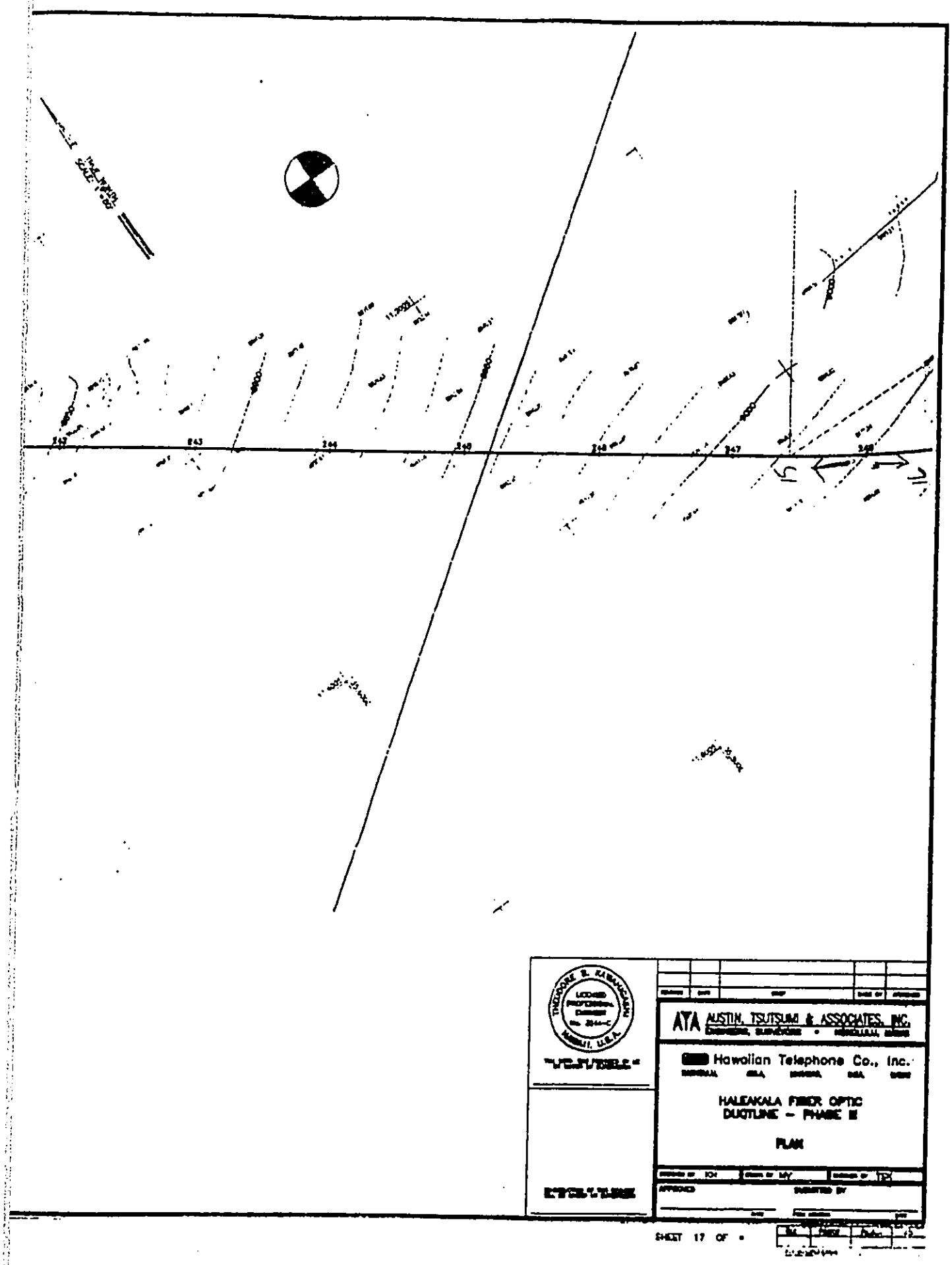
JOB NO. C-85-12

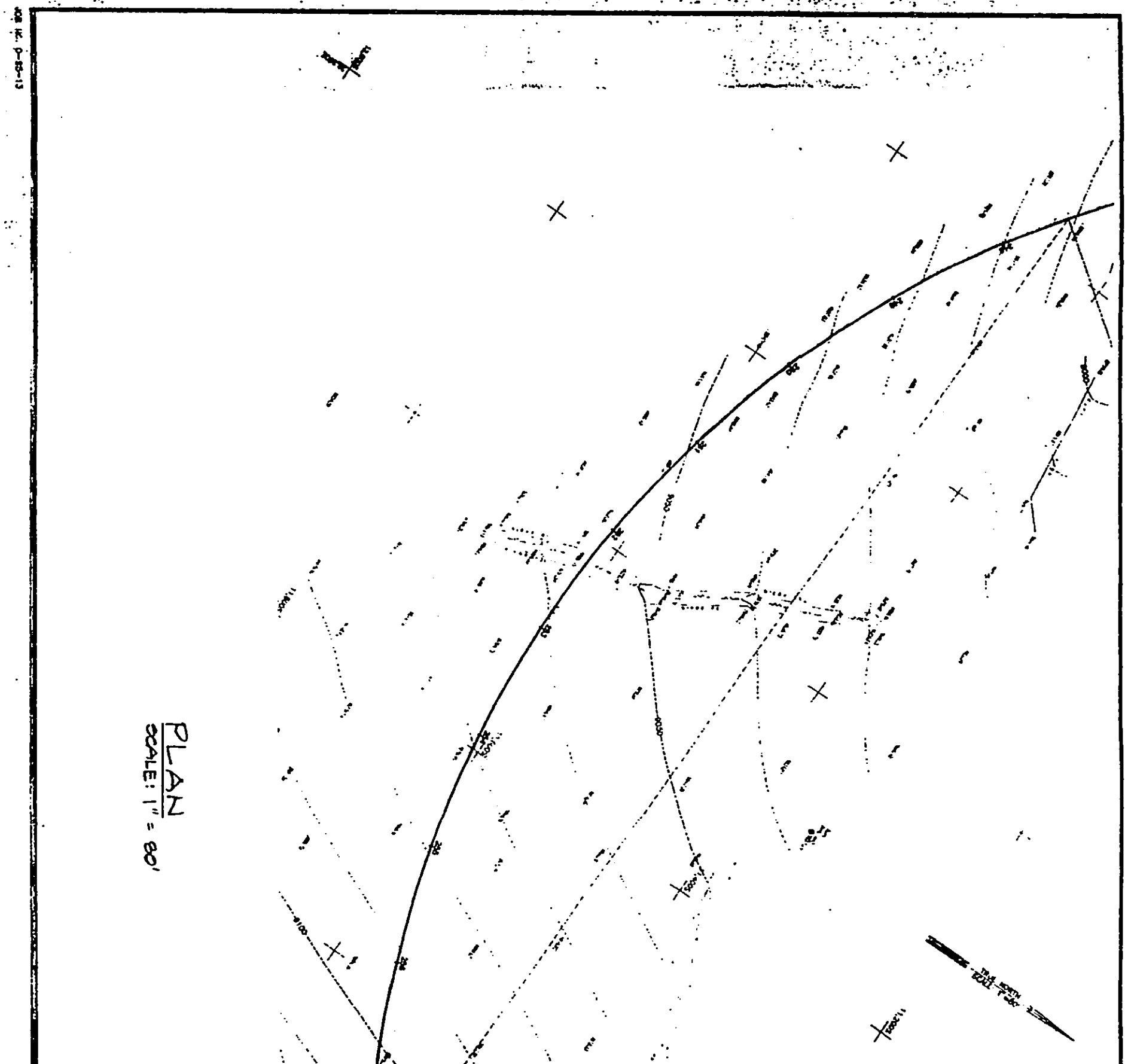

= 80'
THEODORE S. HAMAGUCHI
LICENSED PROFESSIONAL ENGINEER
No. 2644-C
HAWAII, U.S.A.
ATA AUSTIN, TSUTSUMI & ASSOCIATES, INC.
Hawaiian Telephone Co., Inc.
HALEAKALA FIBER OPTIC DUCTLINE – PHASE III
PLAN
SHEET 18 OF



PLAN
SCALE: 1" = 80'

JOB NO. 0-82-13


AYA AUSTIN, TSUTSUMI & ASSOCIATES, INC.
Hawaiian Telephone Co., Inc.
HALEAKALA FIBER OPTIC
DUCTLINE – PHASE III
PLAN
SHEET 17 OF •



PLAN
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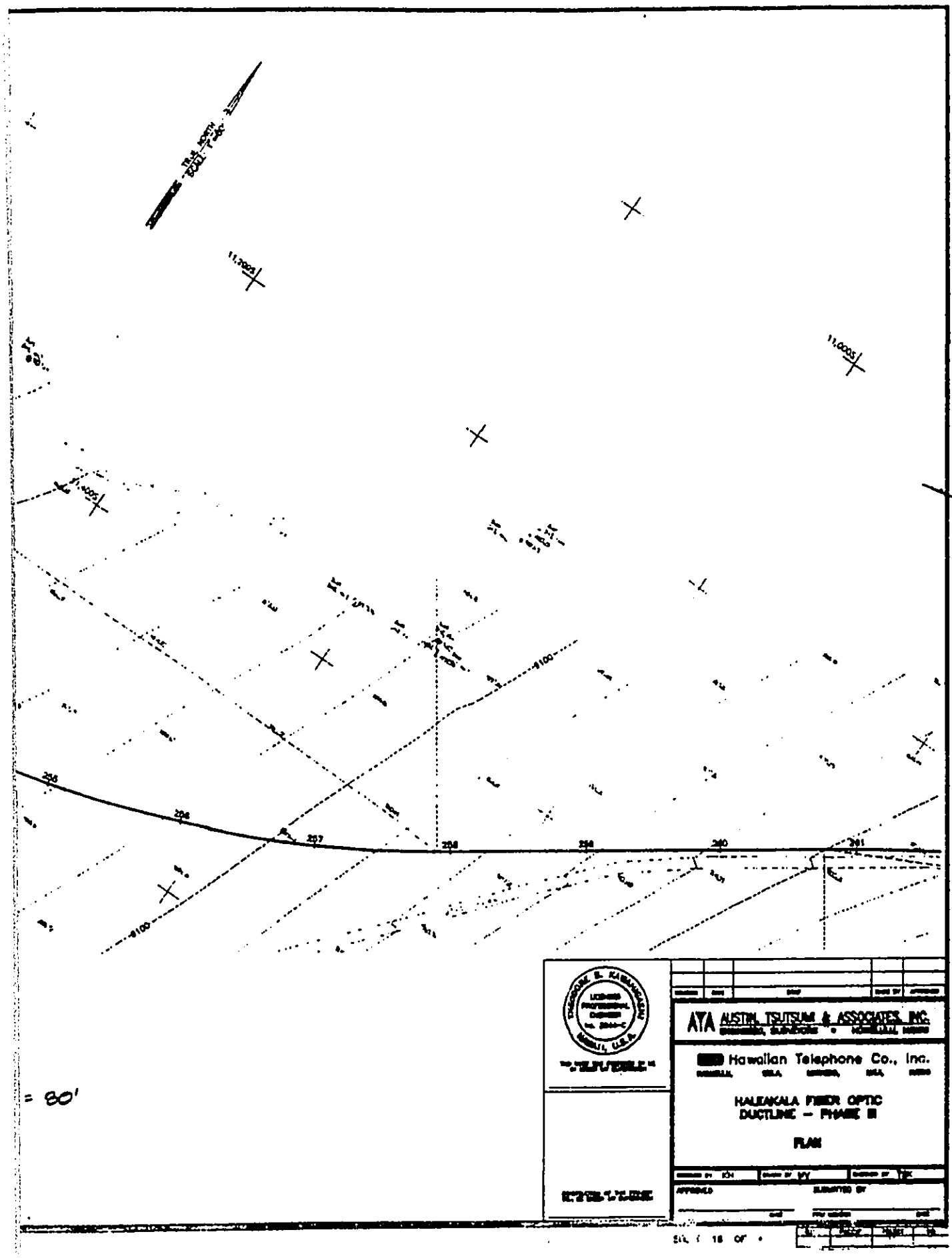
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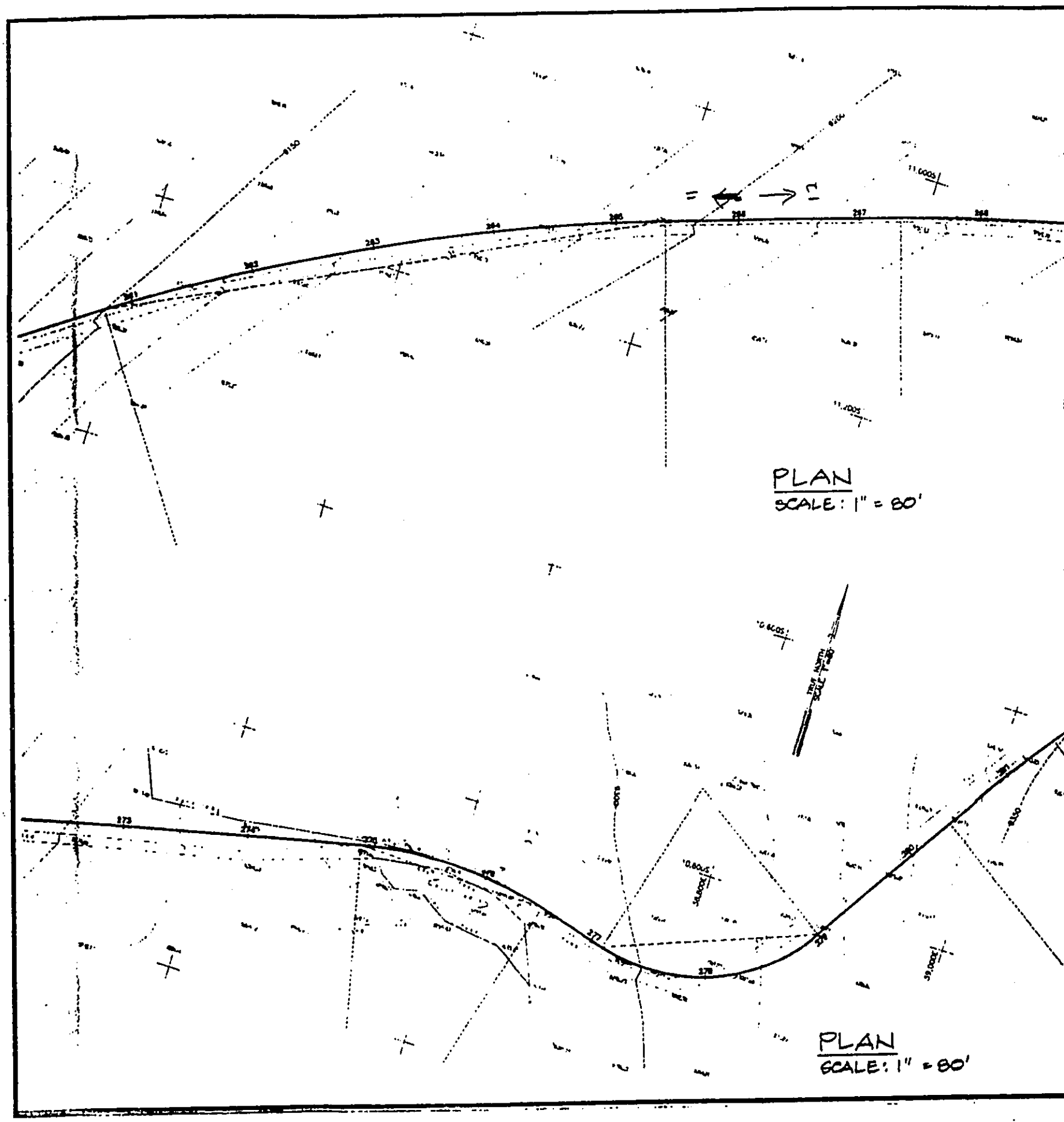
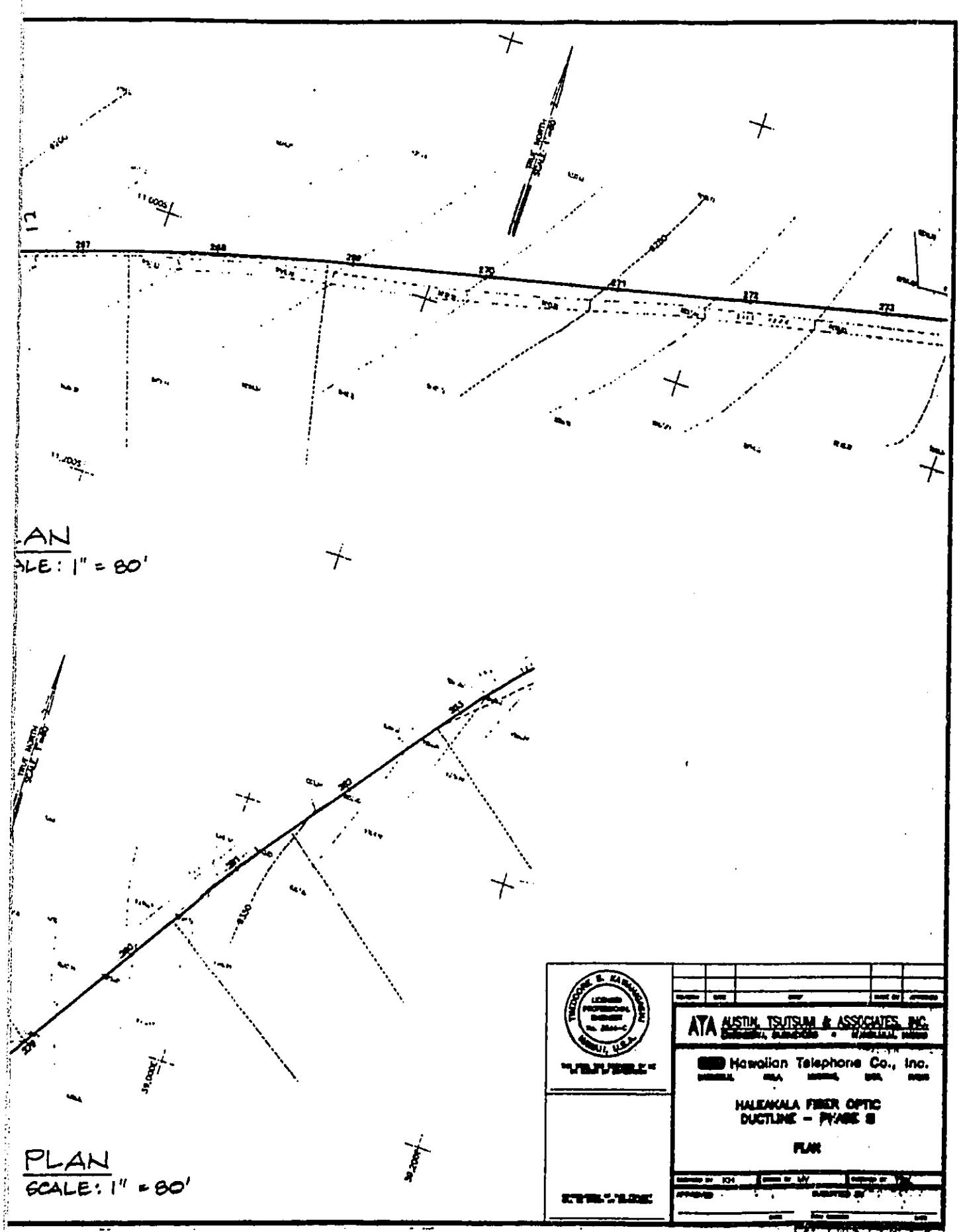
8100
= 80'
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
Hawaiian Telephone Co., Inc.
HALEAKALA FIBER OPTIC
DUCTLINE – PHASE III
PLAN



JOB NO. C-95-13



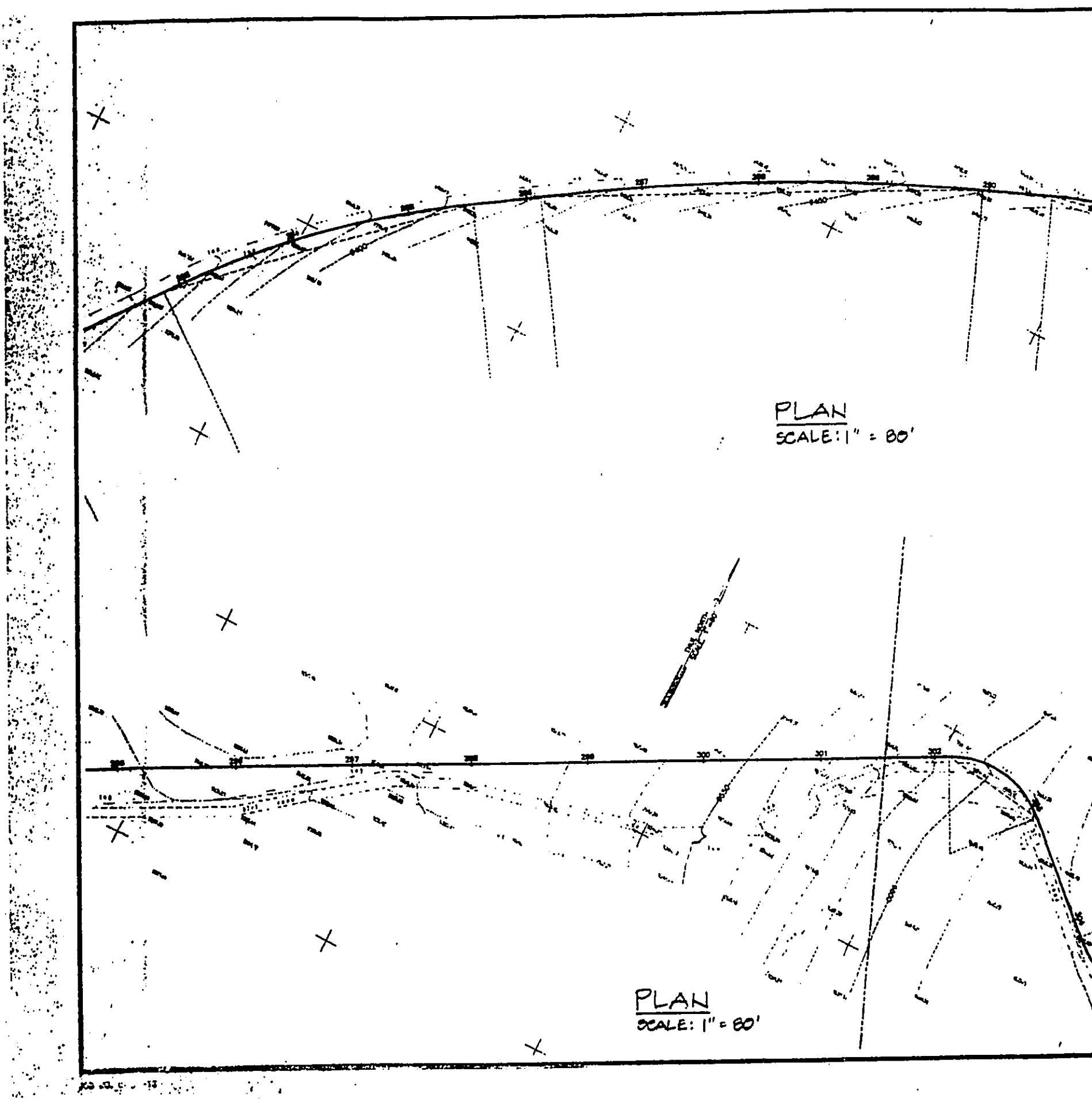
ATA AUSTIN, TSUTSUMI & ASSOCIATES, INC.

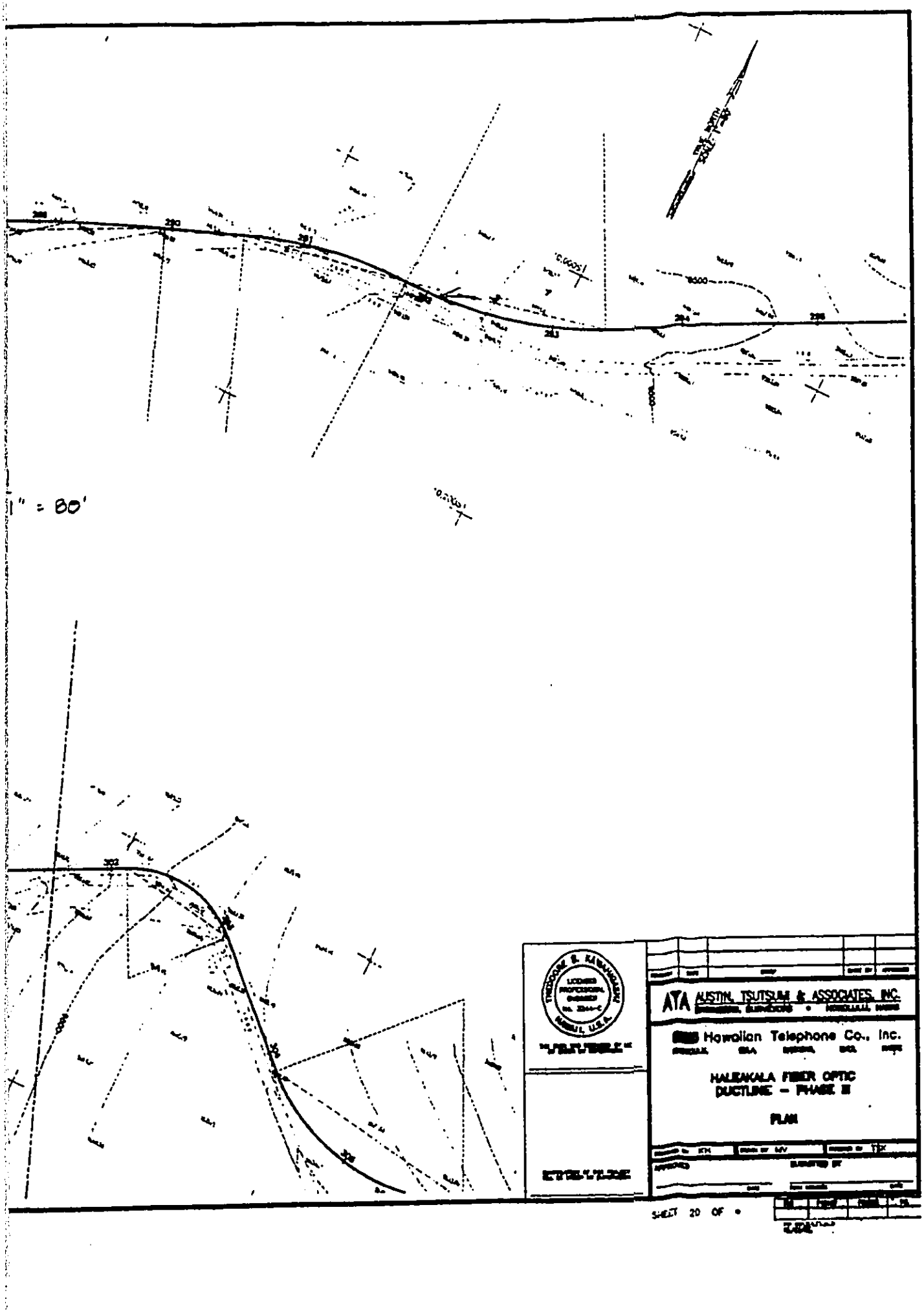
Hawaiian Telephone Co., Inc.

HALEAKALA FIBER OPTIC DUCTLINE – PHASE II

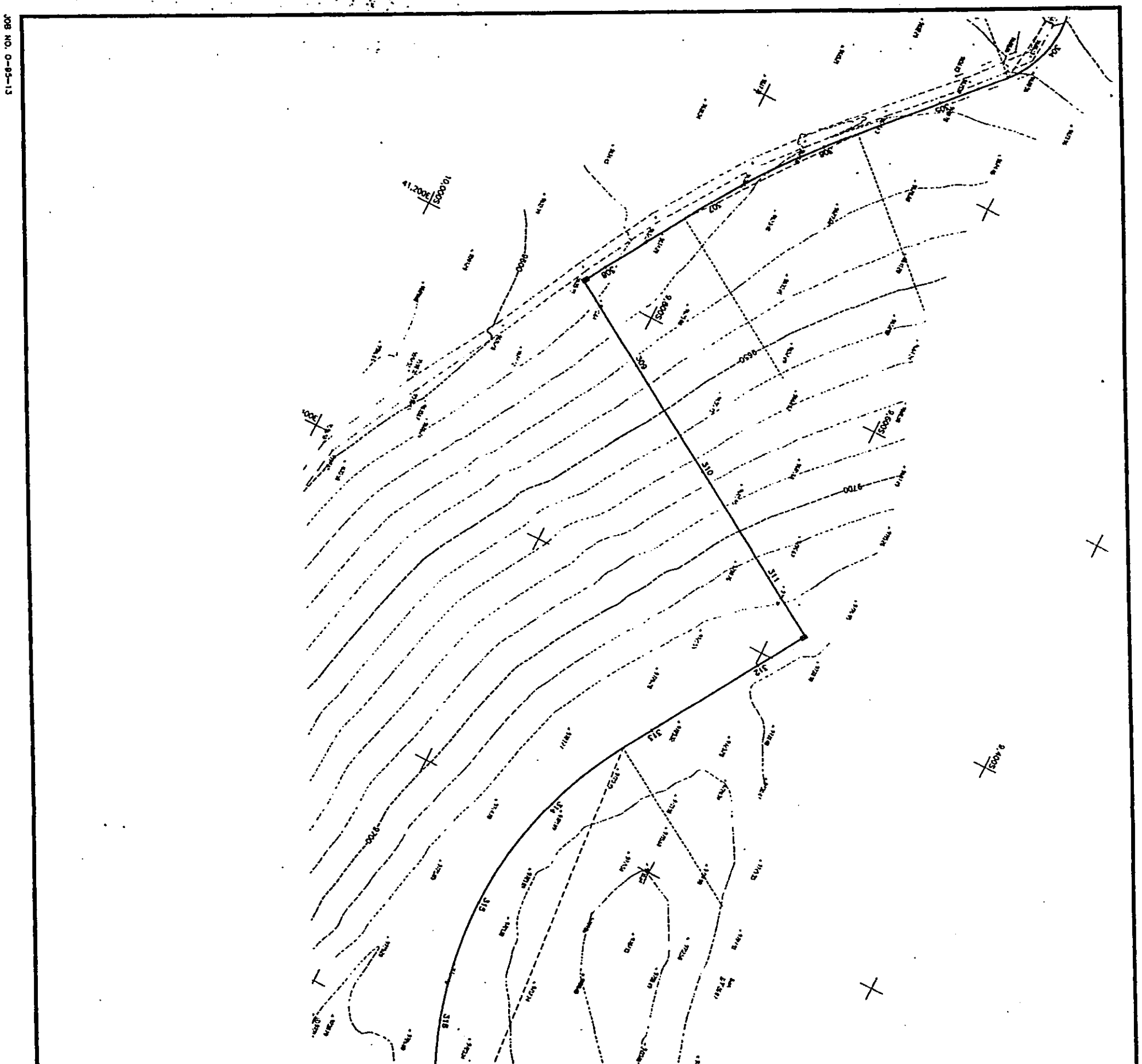
PLAN

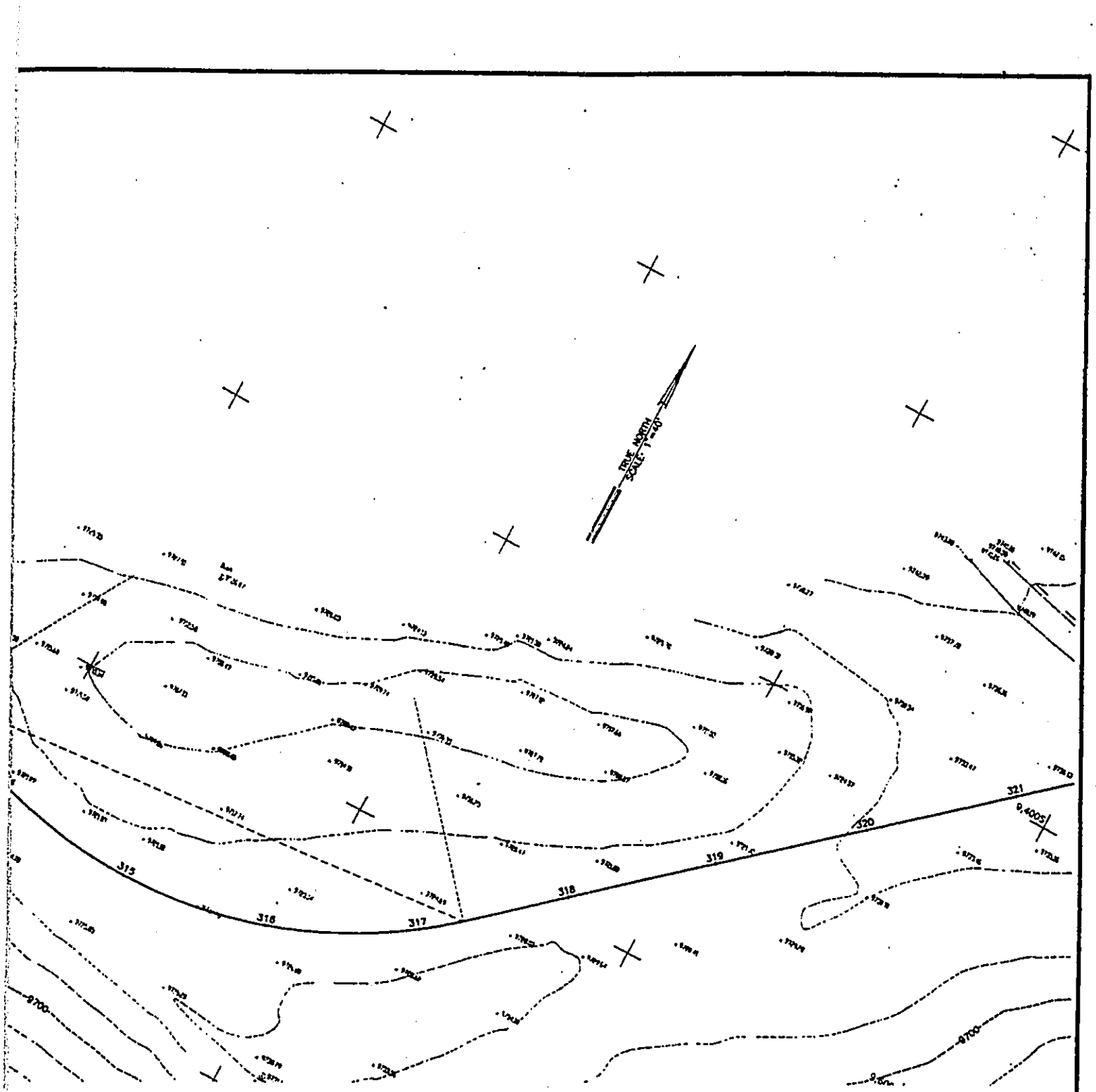
SHEET 19 OF


PLAN
SCALE: 1" = 80'
PLAN
SCALE: 1" = 80'


1" = 80'
HALEAKALA FIBER OPTIC
DUCTLINE – PHASE II
PLAN
Hawaiian Telephone Co., Inc.
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
SHEET 20 OF •

JOB NO. 0-85-13





THEODORE S. KAWAMIGASHI
LICENSED PROFESSIONAL ENGINEER
No. 3144-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY SUPERVISION

REVISION	DATE	BRIEF	MADE BY	APPROVED

ATA AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

HTE Hawaiian Telephone Co., Inc.
KAONOULU, KULA, MAKAWAO, MAUI, HAWAII

HALEAKALA FIBER OPTIC DUCTLINE — PHASE III

PLAN

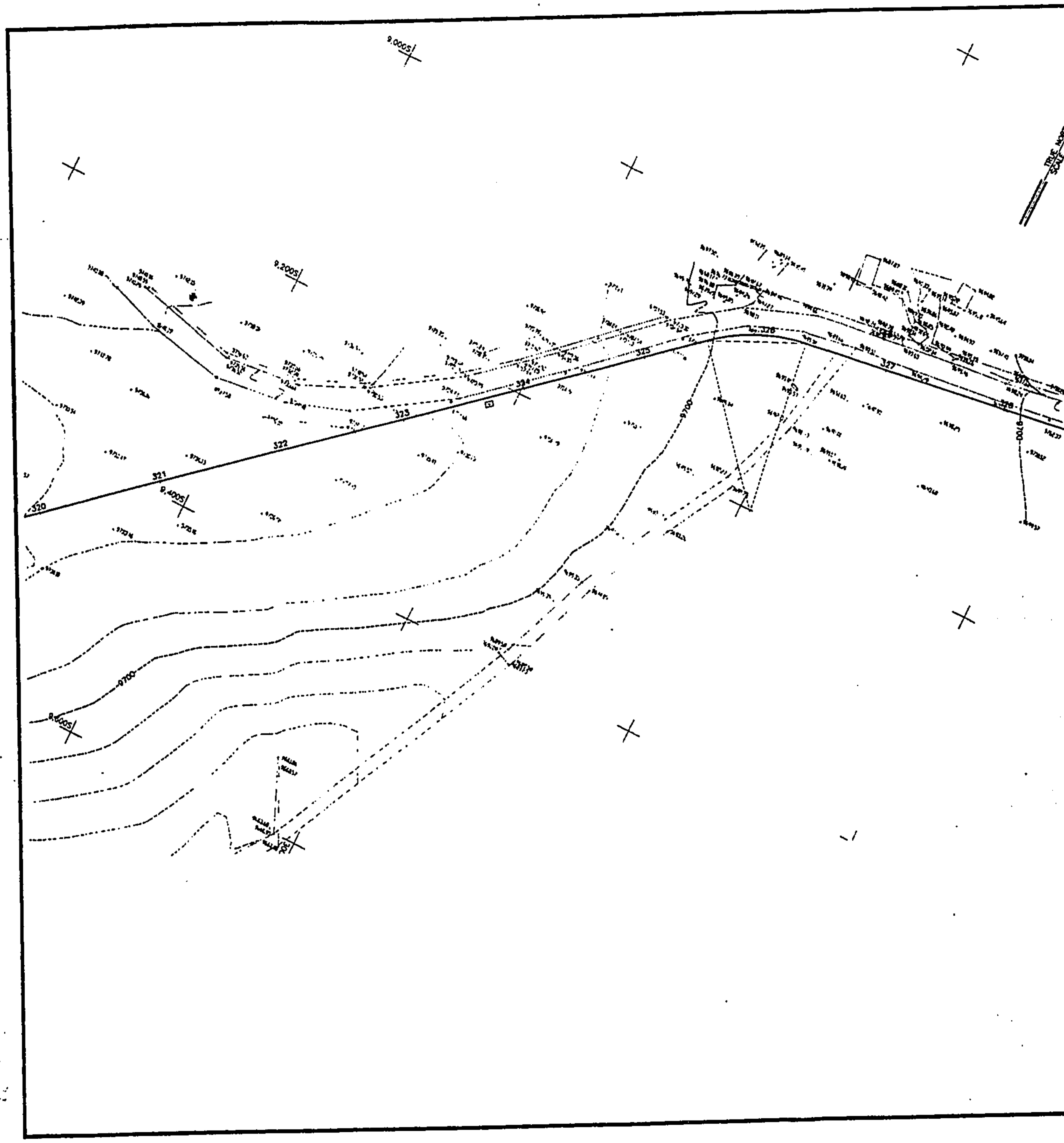
DESIGNED BY	DRAWN BY	CHECKED BY
KH	MV	TSK

APPROVED _____ DATE

SUBMITTED BY _____ FIRM MEMBER _____ DATE

FILE	POSTED	POLISH	NO

FN 961BPL10 DWG
10/30/96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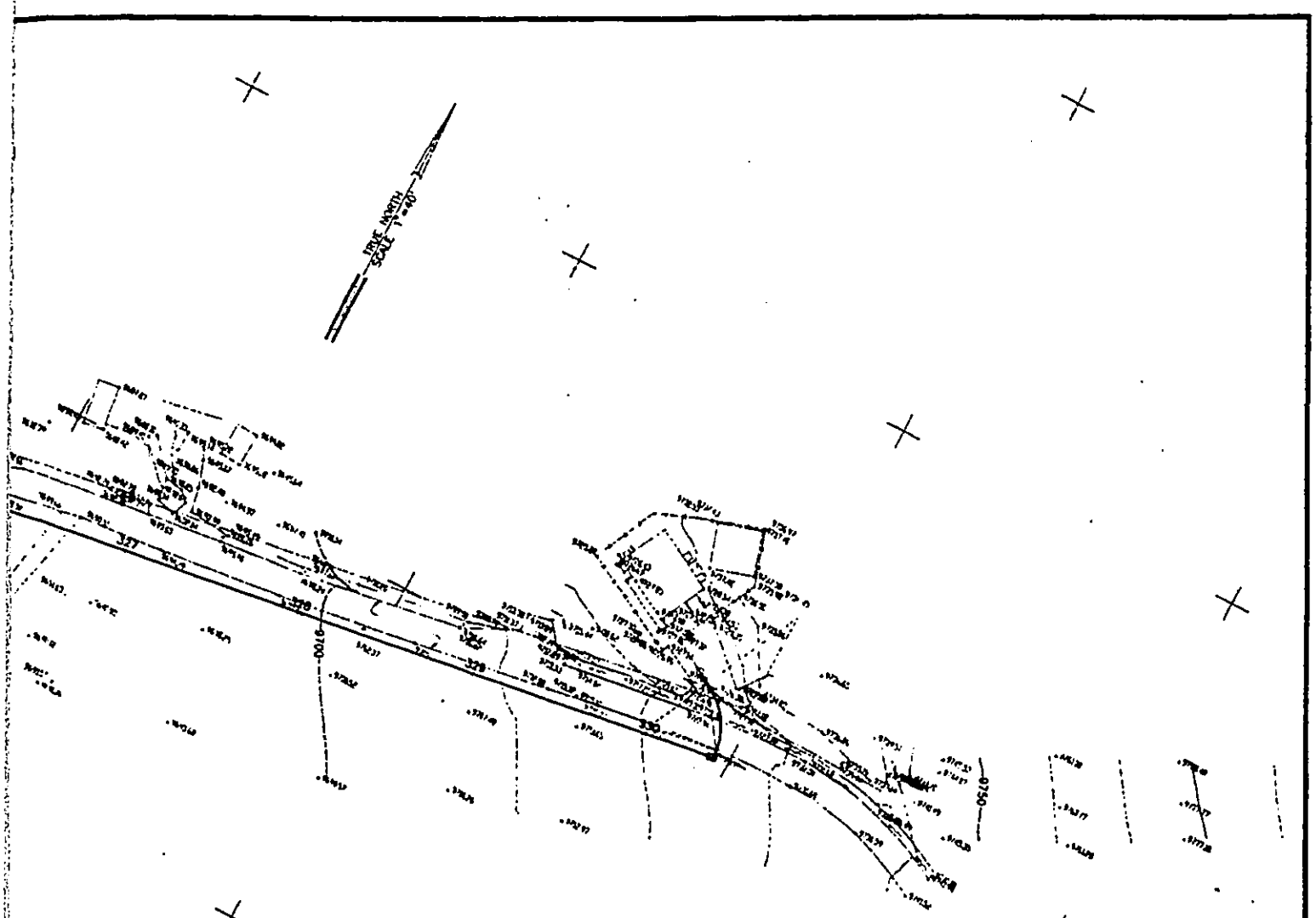
JOB NO 0-95-13



THEODORE S. KAWAHIGASHI
LICENSED PROFESSIONAL ENGINEER
No. 3244-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY SUPERVISION

REVISION	DATE	BRIEF	MADE BY	APPROVED

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

GTE Hawaiian Telephone Co., Inc.
KAONOULU, KULA, MAKAWAO, MAUI, HAWAII

HALEAKALA FIBER OPTIC DUCTLINE – PHASE III

PLAN

DESIGNED BY	DRAWN BY	CHECKED BY
KH	MV	TSK

APPROVED _____ DATE

SUBMITTED BY _____ FOR HONOLULU DATE

FILE	POCKET	FOLDED	NO.

FN 951.3PL18.DWG
10/20/95