HORIZONTAL CONTROL DATA

NAME OF STATION: MILO, HONOKANJI
CHURCH STEEPLE

CHIEF OF PARTY: C. T. Nuseneyer
YEAR: 1949

STATE: Hawaii
COUNTY: Hawaii

HAWAIIAN DATUM

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: MILO, HONOKANJI CHURCH STEEPLE

YEAR: 1949

STATE: Hawaii
COUNTY: Hawaii

LATITUDE: 19° 35’ 19.6”
LONGITUDE: 155° 05’ 10.14”

DIAGRAM: NE 5,5, 5, 5, HAWAII

Table:

<table>
<thead>
<tr>
<th>State &amp; Zone</th>
<th>Code</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>642631.95</td>
<td>323188.21</td>
<td>+ 3 J8 30</td>
</tr>
</tbody>
</table>

RECOVERY NOTES:

The station was recovered as described in 1966.
HORIZONTAL CONTROL DATA

The station is located in the east part of Hilo and is the top of a 4-legged steel tower about 180 feet high that is painted orange and white, has a light mounted on the top, is about 250 feet southwest of a house at 1630 Kalaniaeolani Street, and is owned by the KILO Radio Station.

<table>
<thead>
<tr>
<th>State</th>
<th>County</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAWAI</td>
<td>HAWAI</td>
</tr>
</tbody>
</table>

**ADJUSTED HORIZONTAL CONTROL DATA**

<table>
<thead>
<tr>
<th>State</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAWAI</td>
<td>1977</td>
</tr>
</tbody>
</table>

**Source:** U.S. DEPARTMENT OF COMMERCE

<table>
<thead>
<tr>
<th>DEGREE</th>
<th>DEGREE</th>
</tr>
</thead>
<tbody>
<tr>
<td>19 49 19.45043</td>
<td>155 02 07.02060</td>
</tr>
</tbody>
</table>

**Elevation (feet):**

16644

**State Coordinates (feet):**

<table>
<thead>
<tr>
<th>State &amp; Zone</th>
<th>Code</th>
<th>X (feet)</th>
<th>Y (feet)</th>
<th>Z (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI-1</td>
<td>B101</td>
<td>609,737.04</td>
<td>226,104.22</td>
<td>0.0925</td>
</tr>
</tbody>
</table>

**Plane Azimuth:**

- Plane Azimuth has been computed by the U.S. orn. formula neglecting the second order.

**Data Unadjusted From Adjustment of Jan 1979**

**Code:**

0H 091
HORIZONTAL CONTROL DATA

DESCRIPTION OF TRIANGULATION INTERSECTION STATION

NAME OF STATION: HILO KHVH TV MAST
YEAR: 1967
STATE: Hawaii
COUNTY: Hawaii

CHIEF OF PARTY: D.M. Whipp

Description, including sketch of object:
Station is located about 1-1/2 miles east of Hilo, on Waiakea Peninsula, at the south side of Hilo Bay.
Station is the white mast, about 35 feet tall, with red obstruction light on top, mounted on the roof of the Naniloa Hotel, 48 feet south from north end of roof. Top of mast is 139 feet above ground. Naniloa Hotel is a long, narrow, slightly curving structure, 13 stories high; the roof is about 104 feet above ground. The elevator housing, on north end of building, extends about 16 feet above the roof line.

RECOVERY NOTE:

NAME OF STATION: HILO KHVH TV MAST
YEAR: 1967
STATE: Hawaii
COUNTY: Hawaii

CHIEF OF PARTY: L.A. Critchlow

Description, including sketch of object:

The station was recovered in good condition and the 1967 description is adequate with the exception that the station call letters are now KHVH TV and the mast is the tallest one of two masts on the top of the Naniloa Hotel.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: HILO KHVH TV MAST
YEAR: 1967
STATE: Hawaii
COUNTY: Hawaii

COORDINATE SYSTEM: 3rd order

SOURCE: G-13903

DESCRIPTIVE LATITUDE: 19° 30' 36.5828
DESCRIPTIVE LONGITUDE: 155° 04' 03.5428

ELEVATION METERS: 600.68583

STATE & ZONE: HI 1

COO \[°\]: 9101

\["\]: 326.713.36

\["\]: + 0.08 40

PLAN POSITION:

TO STATION OF OBJECT:

DESCRIPTIVE AZIMUTH (FROM NORTH):

计划值

COO \[°\]:

PLAN AZIMUTH " "

COO \[°\]:

U.S. DEPARTMENT OF COMMERCE

M. D. W. 70-11

M. D. W. 70-11
HORIZONTAL CONTROL DATA

by the National Ocean Survey
OLD HAWAIIAN DATUM

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: HILO LATITUDE STATION
STATE: HAWAII
YEAR: 1887
SECOND ORDER

SOURCE: G-9276
NO OBSERVATION CHECK ON THIS POSITION

GEODETIC LATITUDE: 19° 43' 10.771
GEODETIC LONGITUDE: 155° 05' 37.632
ELEVATION: 91 METERS

STATE COORDINATES (METERS)

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>Z (M.A. - 46)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>637,756.02</td>
<td>322,024.77</td>
<td>+0 08 07</td>
</tr>
</tbody>
</table>

*PLANE AZIMUTH HAS BEEN COMPUTED BY THE # (0.0) FORMULA NEGLECTING THE SECOND TERM

POSITION DETERMINED BY TRAVERSE FROM STATION HALAI

QE 271
### HORIZONTAL CONTROL DATA

**HAWAII**

**LATTITUDE:** 1° 30' TO 20° 00'

**LONGITUDE:** 155° 00' TO 155° 30'

**DIAgRAM:** NE 518, HAWAII

---

**ADJUSTED HORIZONTAL CONTROL DATA**

**NAME OF STATION:** MILO MIDDLE BASE  

**STATE:** HAWAII  

**YEAR:** 1914  

**THIRD ORDER**

**SOURCE:** C-50156

<table>
<thead>
<tr>
<th>GEODETIC LATITUDE:</th>
<th>43° 30.731</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEODETIC LONGITUDE:</td>
<td>155° 04.42.749</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>Z COO, Z ANGLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>644,947.05</td>
<td>324,055.66</td>
<td>+ 0 08 32</td>
<td></td>
</tr>
</tbody>
</table>

*Plane Azimuth has been computed by the formula neglecting the second term.*

<table>
<thead>
<tr>
<th>TO STATION OR OBJECT</th>
<th>GEODETIC AZIMUTH (from north)</th>
<th>PLANE AZIMUTH* (from north)</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**STATION:** QO 318
HORIZONTAL CONTROL DATA

NAME OF STATION: Hilo North Base
STATE: Hawaii

CHIEF OF PARTY: C. T. Husemeyer
YEAR: 1949

NOTE:
- Hilo Railroad North Base is a 1 1/2 inch iron pipe
- Projected about 1 foot from the top of a square concrete post which is one foot on each side
- Located on the bank about 15 feet west of the railroad tracks and about 4 feet higher than the track.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Hilo North Base
EXPLAINED BY: C.T. H.
YEAR: 1949
STATE: Hawaii
RECOVERED BY: D.M. Whipp
YEAR: 1966
COUNTY: Hawaii

Detailed statement as to the status of the original description, including marks found, features of the features, and other pertinent facts.

This section is now an industrial complex and there is a large lumber warehouse setting approximately on the point occupied by the station.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: Hilo North Base
STATE: Hawaii
YEAR: 1949
SECOND: 13
CHER

SOURCE: 9279

<table>
<thead>
<tr>
<th>DEPARTMENT OF COMMERCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 43 14.82 0</td>
</tr>
<tr>
<td>155 04 33.66 0</td>
</tr>
<tr>
<td>9 141551</td>
</tr>
<tr>
<td>1056</td>
</tr>
<tr>
<td>HAWAI'I</td>
</tr>
<tr>
<td>LATITUDE 15° 30' TO 20° 00'</td>
</tr>
<tr>
<td>LONGITUDE 155° 00' TO 158° 30'</td>
</tr>
<tr>
<td>DIAGRAM NE 5-15 HAWAI'I</td>
</tr>
</tbody>
</table>

STATE COORDINATES (H)

<table>
<thead>
<tr>
<th>H</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>5101</td>
<td>648,685</td>
</tr>
</tbody>
</table>

TO STATION OR OBJECT

| POSITION DETERMINED BY TRAVERSE FROM STATION Hilo South Base |

AND CHECKED BY ADDITIONAL OBSERVATIONS

DEPARTMENT OF COMMERCE

[Signature]

JUN 1978

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY, NATIONAL GEOFIC SCIENCE
HORIZONTAL CONTROL DATA

JUN 1976
U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY, NATIONAL GEODETIC SURVEY

DEPARTMENT OF COMMERCE
NATIONAL SURVEY

DESCRIPTION OF TRIANGULATION INTERSECTION STATION

NAME OF STATION: HILLO RADIO RANGE
YEAR: 1949
STATE: Hawaii
COUNTY: Hawaii

CHIEF OF PARTY: C.T. Husemeyer

Description, including sketch of object: The station is the top of the center tower of five towers which comprise the radio range for General Lyman Air Field in the town of Hilo.

The tower is constructed of steel, 156 feet in height, and rests on a concrete base about 6 feet square.

The station lies about 4.6 miles east of the mouth of the Waiau River, about 1.9 miles east of the Airport, about 1.3 miles west of Kolekole Point and 80 feet west of the radio transmission house.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Hilo Radio Range
ESTABLISHED BY: C.T. Husemeyer
YEAR: 1949
STATE: Hawaii
COUNTY: Hawaii

RECOVERED BY: D.M. Whipp
YEAR: 1966
COUNTY: Hawaii

AERIAL DISTANCE AND DIRECTION FROM NEAREST TOWN:
Island: Hawaii

Detailed measurements to the likeness of the original direction, including points found, surveys, changes made, and other pertinent facts:

Recovered as described in 1949. The main runway has been lengthened and the station is now 3/4-mile northeast of the new runway end.

Station is the center tower of the 5 radio range towers, located about 4-1/2 miles east of Hilo.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Hilo Radio Range
ESTABLISHED BY: C.T. Husemeyer
YEAR: 1949
STATE: Hawaii
COUNTY: Hawaii

RECOVERED BY: R.B. Melby
YEAR: 1979
COUNTY: Hawaii

AERIAL DISTANCE AND DIRECTION FROM NEAREST TOWN:
48 miles east of Hilo

Detailed measurements to the likeness of the original direction, including points found, surveys, changes made, and other pertinent facts:

The station was recovered in good condition as described in 1949.

The station is the center tower of five identical towers except the center tower has several horizontal antennas extending from its sides.

RECOVERY NOTE REMARKS OF TRIANGULATION INTERSECTION STATION

NAME OF STATION: Hilo Radio Range
CHIEF OF PARTY: L.A. Critchlow
YEAR: 1977
STATE: Hawaii
COUNTY: Hawaii

Description, including sketch of object: The station was recovered in good condition and the previous description is adequate with the exceptions that the four towers that were around the center tower which marks the station have been torn down and the tower is now owned and operated by TV Station KHNT.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: Hilo Radio Range
YEAR: 1949
STATE: Hawaii

THIRD ORDER

SOURCE: G-9279

DEGREES LATITUDE: 19°53′55.317
METERS ELEVATION: 155 01 32.190

STATE CODE: HI
ZONE: 5101
EASTING: 003,125.38

PLANE AZIMUTH:

TO STATION OF OBJECT
DEGREES AZIMUTH (FROM NORTH)
PLANE AZIMUTH (FROM NORTH)

QE 153
HORIZONTAL CONTROL DATA

DESCRIPTION OF TRIANGULATION INTERSECTION STATION

NAME OF STATION: Hilo Radio Station
YEAR: 1949
STATE: Hawaii
COUNTY: Hawaii

DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY, NATIONAL GEODETIC SURVEY

Description, including sketch of object: The station is the red light on the top of the radio mast of station HRC.

It is constructed of steel about 5 feet in height and rests on a concrete base about 8 feet square.

In Hilo, about 200 yards south of the Waianuenue River and 100 feet east of the town center.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Hilo Radio Station
YEAR: 1949
STATE: Hawaii
COUNTY: Hawaii

DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY, NATIONAL GEODETIC SURVEY

Detailed statement as to the times of the original description, including marks found, stamplings, changes made, and other pertinent facts:

Station was recovered as described in 1949.

To reach from Hilo, go 1.1 miles S.W. on Waianuenue St., from the post office, at fork of road keep straight ahead on right fork past the Hilo Memorial Hospital on right fork for 1.0 miles; at fork of road keep straight ahead on right fork for 0.6 mile, then turn right on gravel road and to station 0.1 mile on right.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Hilo Radio Station
YEAR: 1949
STATE: Hawaii
COUNTY: Hawaii

DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY, NATIONAL GEODETIC SURVEY

Detailed statement as to the times of the original description, including marks found, stamplings, changes made, and other pertinent facts:

The station was recovered in good condition as described and by following the directions given in the 1950 recovery note by H.O.F. The upper section of the mast, as it existed when the station was located, was removed in 1956 and another section of the same length was substituted for television broadcasting.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Hilo Radio Station
YEAR: 1949
STATE: Hawaii
COUNTY: Hawaii

DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY, NATIONAL GEODETIC SURVEY

Detailed statement as to the times of the original description, including marks found, stamplings, changes made, and other pertinent facts:

Station was recovered. A tall, skeleton-steel mast, painted alternate red and white, with 2 sets of guy-cables; located about 3 miles west-southwest of Hilo, along the south side of Waianuenue Rd., about 625 feet north of Waianuenue Rd. and 200 feet east of the radio station quonset building which sets at east side of Kamaolea Place.

Note: One of these notes must be used for every station recovered.
HORIZONTAL CONTROL DATA

QUAD 101551

HAWAII
LATITUDE 19°30' TO 20°00'
LONGITUDE 155°00' TO 155°30'
DIAGRAM NE 8.1 HAWII

NO STATION ASSIGNED TO THIS NUMBER.
**HORIZONTAL CONTROL DATA**

**NAME OF STATION:** Hilo Radio Station KIPA, MAST

**CHIEF OF PARTY:** C.T. Nussmeier

**Description:** The station is the red light on top of the mast. The mast is constructed of steel, about 3 feet in width and 220 feet in height. It rests on a concrete base about 8 feet square.

The station is located in open pasture land about 9 miles southwest of Pepekeo Point, about 4.1 miles west of the Hilo Business District, about 800 yards south of the forest area, about 300 feet west of the transmission house, and 20 feet west of a small coral.

**RECOVERY NOTE, TRIANGULATION STATION**

To reach, go 0.2 mile N.W. along Mainau St., from the post office in Hilo, across the third bridge over the Wailuku River; turn left at Annamolu Road, and go west for 4.4 miles to the station.

---

**ADJUSTED HORIZONTAL CONTROL DATA**

**NAME OF STATION:** Hilo Radio Station KIPA, MAST

**YEAR:** 1944

**STATE:** Hawaii

**SOURCE:** C-9279

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>X Coord. &amp; Y Coord.</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>417,908.93</td>
<td>330,467.24</td>
<td>+ 0.06 57</td>
</tr>
</tbody>
</table>

---

**RECOVERY NOTE, TRIANGULATION STATION**

**NAME OF STATION:** Hilo Radio Station KIPA, Mast

**ESTABLISHED BY:** C.T. Nussmeier

**YEAR:** 1944

**RECOVERED BY:** D.M. Whipp

**YEAR:** 1956

**STATE:** Hawaii

**Island:** Hawaii

**Detailed statement as to the status of the original description, including marks found, stampings, changes made, and other pertinent facts:**

Station was recovered. A tall, skeleton-steel mast, painted alternate red and white, with red obstruction light on top, which was the point intersected; located about 4-1/2 miles west-northwest of Hilo, in pasture land just west of edge of the cane fields, at south side of Annamolu Road and 200 feet west of an old red building.

---

**RECOVERY NOTE, TRIANGULATION STATION**

**NAME OF STATION:** Hilo Radio Station KIPA, Mast

**ESTABLISHED BY:** C.T. Nussmeier

**YEAR:** 1944

**STATE:** Hawaii

**RECOVERED BY:** J.M. Collins

**YEAR:** 1944

**STATE:** Hawaii

**Table:**

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>X Coord. &amp; Y Coord.</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>417,908.93</td>
<td>330,467.24</td>
<td>+ 0.06 57</td>
</tr>
</tbody>
</table>

---

**RECOVERY NOTE:**

**NAME OF STATION:** Hilo Radio Station KIPA, Mast

**RECOVERED BY:** J.M. Collins

**YEAR:** 1944

**STATE:** Hawaii

**Island:** Hawaii

**Detailed statement as to the status of the original description, including marks found, stampings, changes made, and other pertinent facts:**

Station recovered as described in 1944.
HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

HAWAII
LATTITUDE 19° 30' TO 20° 00'
LONGITUDE 155° 00' TO 155° 30'
DIAGRAM NE 5-12 HAWAII

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: HILO RAILROAD NORTH BASE
STATE: HAWAII
YEAR: 1949
SECOND ORDER

MEASURED G-9275
NO OBSERVATION CHECK ON THIS POSITION

| GEODETIC LATITUDE: | 19° 43' 10.982 |
| GEODETIC LONGITUDE: | 155° 04' 02.302 |
| ELEVATION: | 7+1 FEET |

STATE COORDINATES (FMS)

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>N</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>648.811.41</td>
<td>322.078.08</td>
</tr>
</tbody>
</table>

*PLANAR AZIMUTH HAS BEEN COMPUTED BY THE \( a = \Delta \varphi \) FORMULA NEGLECTING THE SECOND TERMS...

POSITION DETERMINED BY TRAVERSE FROM STATION HILO NORTH BASE

QE 272
HORIZONTAL CONTROL DATA
by the
National Ocean Survey
OLD HAWASAN DATUM

NAME OF STATION: HILO RAILROAD SOUTH BASE
STATE: HAWAII
YEAR: 1949
THIRD ORDER

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: HILO RAILROAD SOUTH BASE
STATE: HAWAII
YEAR: 1949
THIRD ORDER

COORDINATES (State Plane)

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>A (ON A) ANGLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>651,037.97</td>
<td>313,946.54</td>
<td>0 08 55</td>
</tr>
</tbody>
</table>

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE 1947 N. FORMULA NEGLECTING THE SECOND TERM.

POSITION DETERMINED BY TRAVERSE FROM STATION HILO RR N BASE

NO ORIGINAL TEXT

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: HILO RAILROAD SOUTH BASE
ESTABLISHED BY: C.E. Hughes  YEAR: 1949
RECOVERED BY: D.M. Whipp  YEAR: 1966
AIRLINE DISTANCE AND DIRECTION FROM Nearest Town: Inland: Hawaii

Detailed statement as to the Status of the original description; including marks found, stampings, changes made, and other pertinent facts:

The Territorial Surveyors Office reported that the mark was destroyed in 1953 when a boulder in regrading the old railroad bed for a road pushed the station out of position.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: HILO RAILROAD SOUTH BASE
ESTABLISHED BY: C.E. Hughes  YEAR: 1949
RECOVERED BY: D.M. Whipp  YEAR: 1966
AIRLINE DISTANCE AND DIRECTION FROM Nearest Town: Inland: Hawaii

Detailed statement as to the Status of the original description; including marks found, stampings, changes made, and other pertinent facts:

Station is believed destroyed. A mark consisting of a 12-inch square concrete block with a 1-1/2-inch iron pipe projecting 10 inches from the center was found at the approximate location of the station, however it is very loose and leaning about 3 inches out of plumb. It is 9 feet northeast of the center line of the track road which is the roadbed of the old railroad, and 36 feet northwest of a track side road running northeast. No other mark could be found in the vicinity.

A check of the location by angle could not be made due to trees.
HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

NAME OF STATION: MILO RAILROAD S B OFFSET
STATE: HAWAII
YEAR: 1949
THIRD ORDER

SOURCES: G-927S

NO OBSERVATION CHECK ON THIS POSITION

DEG: 41 50.31
DEG: 155 03 33.10
ELEVATION: 31.7 METER FEET

STATE COORDINATES (FEET)

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>ORI. AT ANGLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>651227.19</td>
<td>313942.08</td>
<td>+ 0.08 35</td>
<td></td>
</tr>
</tbody>
</table>

* PLANES AZIMUTH HAS BEEN COMPUTED BY THE GO. A. K FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT

<table>
<thead>
<tr>
<th>DEG: 41 50.31</th>
<th>PLANE AZIMUTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>(From south)</td>
<td>(From north)</td>
</tr>
</tbody>
</table>

POSITION DETERMINED BY TRaverse FROM STATION MILO RR S BASE

QE 274
HORIZONTAL CONTROL DATA

DESCRIPTION OF TRIANGULATION INTERSECTION STATION

NAME OF STATION: Hilo St Joseph's Catholic Church Cross

CHIEF OF PARTY: L.A. Orzechow
YEAR: 1977
STATE: Hawaii
COUNTY: Hawaii

Description: The station is located in Hilo, in the north quadrant of the intersection of Alii and Kapiolani Streets, and is the center and top of a cross on the top of the gold dome on the Saint Joseph's Catholic Church. It is about 75 feet high.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: Hilo St Joseph's Cath Ch Cross
OBS BY NGS

STATE: Hawaii
YEAR: 1977

ELEVATION: N.A.S. FEET

Source: 5-10-91

<table>
<thead>
<tr>
<th>GEODETIC LATITUDE</th>
<th>19 93 S1 76177</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEODETIC LONGITUDE</td>
<td>155 05 W144311</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>X (UNO, FEET)</th>
<th>Y (UNO, FEET)</th>
<th>FORMULA</th>
<th>( \theta ) (LONG, FEET)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>3151</td>
<td>324,147,54</td>
<td>+ 0'08 15'</td>
<td></td>
</tr>
</tbody>
</table>

Plane Azimuth was computed by the 2-UNO, N FORMULA neglecting the second term.

These data obtained from adjustment of Jan 1979

SM 044
HORIZONTAL CONTROL DATA

by the National Ocean Survey

OLD HAWAIIAN DATUM

JUN 1949
U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY - NATIONAL GEODETIC SURVEY

NAME OF STATION: Hilo South Base
State: Hawaii
Chief of Party: G.T. Hoepf

OBJECT
WAIAKEA MAUKA f.d.05)
R. N. No. S
Hilo, Radio Mast (Station 1.119)
R. N. No. 1

DISTANCES AND DIRECTIONS TO HORIZON MARK, REFERENCE MAKERS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION
OBJECT
WAIAKEA MAUKA f.td.05)
R. N. No. S
Hilo, Radio Mast (Station 1.119)
R. N. No. 1

DIRECTION
W
NW
N
S
DIRECTION
31.612°
27.835°
32.480°
33.635°
DIRECTION
31.612°
27.835°
32.480°
33.635°

The station is located on a brush covered, rocky ridge which forms the south tangent of the Hilo to Olaa railroad. (Tracks and ties are being removed at the time of this survey.) Higher ground lies about 30 feet west of the station. The station is about 5 miles southeast of the business district of Hilo, 2.35 miles south-southeast of the railroad yards and triangulation station Hilo North Base; about 1 mile east-southeast of Waiakea Waena School, 37 feet west of the center of the railroad tracks, about 15 feet west of the edge of the cut bank and about 15 feet higher than the road-bed.

The station is a standard disk, stamped Hilo S BASE 1949, set in a foot of concrete pier which is about 1 foot in diameter and projects about 8 inches. Reference mark number 1 is a standard disk, stamped Hilo S BASE No. 1 1949, brazed to the top of a 2 inch pipe which projects about 2 feet. It is located 42 feet west of the center of the railroad tracks and about 3 feet higher than the station.

Reference mark number 2 is a standard disk, stamped Hilo S BASE No. 2 1949, brazed to the top of a 2 inch pipe which projects about 1 foot. It is located on the crest of the low ridge about 10 feet higher than the station.

Reference mark number 3 is a standard disk, stamped Hilo S BASE No. 3 1949, brazed to the top of a 2 inch pipe which projects about 16 inches. It is located 40 feet west of the center of the railroad tracks and about 3 feet higher than the station.

To reach from the intersection of Waianuenue and Keawe streets, in the eastern section of the town of Hilo, go southerly on Keawe Street for 1.6 miles; turn left Onto Leilukea Street and go 0.7 mile; turn right, onto Kamiloʻehau Street and go 0.3 mile; turn left, onto a graded road, and go southerly for 1.7 miles to a sign reading MON 18; turn left and go easterly for 0.5 mile to a sign reading Hon 18; turn left again and go easterly for 0.8 mile to a sign reading Hon 20; turn right again and go easterly for 0.2 mile to a sign reading Hon 25. From this point it is 0.4 mile to the railroad tracks and the station.

(continued on next page)
Kamehameha Ave. in Hilo, go east on Kamehameha Ave. for 1.65 miles; turn right and go south on Kamehameha Ave. for 3.8 miles to Makalika St. on left (the highway is divided here and it is necessary to continue a short distance and make a U-turn). Go easterly on Makalika St. for 1.0 mile to T-junction; turn left and go northwest on track road, old railroad bed, for 0.4 mile to station on left.

Reference mark number one is a standard disk stamped "HILO S BASE 1949", braced to the top of a 2-inch iron pipe that projects 14 inches and is about 3 feet higher than station mark.

Reference mark number three is a standard disk stamped "HILO S BASE 3 1949", braced to the top of a 2-inch iron pipe that projects 1 foot and is about 1 foot higher than station mark.
HORIZONTAL CONTROL DATA

DEPARTMENT OF COMMERCE
U.S. DEPARTMENT OF COMMERCE
UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY, NATIONAL GEODETIC SURVEY

JUN 1978

DESCRIPTION OF TRIANGULATION INTERSECTION STATION

NAME OF STATION: Hilo Sugar Co., Stack
STATE: Hawaii
COUNTY: Hawaii

CHIEF OF PARTY: C. T. Huemeyer

The station is located on property of the Hilo Sugar Company, which is about 1 mile north of the Hilo business district. The Hilo Sugar Company Mill is on the Kilauea Volcano. It is not known if the present stack is the same position as the old Kilauea Volcano stack.

The stack is the top of the metal stack, painted gray, with a black top, located on the Hilo Sugar Plantation Co., grounds at Aleah's Pt., about 0.8 mile north of the port office in Hilo. Stack is 105 feet above the water.

RECOVERY NOTE, TRIANGULATION STATION

STATE & ZONE

MI 1

ELEVATION: 640.352.62 METER
329.708.45 FEET

STATE COORDINATES (FOOT)

X
Y
Z
05 33 837

PLANE AZIMUTH HAS BEEN COMPUTED BY THE "A - 0.5 - A FORMULA NEGLECTING THE SECOND TERM"

TO STATION OR OBJECT

DEGREES AZIMUTH FROM NORTH

PLANE AZIMUTH FROM NORTH

CODE

RECOVERED IN GOOD CONDITION AS DESCRIBED IN 1949.

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

Hawaii
LATITUDE 19° 30' TO 20° 00' LONGITUDE 155° 00' TO 155° 30'
DIAGRAM 5 551 555 HAWAI

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: Hilo Sugar Co. Stack
STATE: Hawaii
YEAR: 1949

DEGREES LATITUDE: 19° 44' 27.8" 
DEGREES LONGITUDE: 155° 05' 33.8" 

ELEVATION: 640.352.62 METER
329.708.45 FEET

DIRECTIONS AND DISTANCES FROM NEAREST TOWN:

1 MILE NORTH OF Hilo

Recovered in good condition as described in 1949.
NO STATION ASSIGNED TO THIS NUMBER
# Horizontal Control Data

**Station**: 1068
**State**: HAWAII
**Year**: 1914

**Source**: G-SPI56

<table>
<thead>
<tr>
<th>Geographic Latitude</th>
<th>Geographic Longitude</th>
<th>Elevation</th>
<th>Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>19° 43' 39.886&quot;</td>
<td>155° 05' 17.148&quot;</td>
<td>324.568.13&quot;</td>
<td>0 08 21</td>
</tr>
</tbody>
</table>

**State Coordinates (State Plane Coordinates)**

<table>
<thead>
<tr>
<th>State &amp; Zone</th>
<th>Code</th>
<th>X (feet)</th>
<th>Y (feet)</th>
<th>Zone of Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>641,658.54&quot;</td>
<td>324,569.13&quot;</td>
<td>0 08 21</td>
</tr>
</tbody>
</table>

*Plane azimuth has been computed by the *θ*° ° formula neglecting the second term.*

<table>
<thead>
<tr>
<th>To Station or Object</th>
<th>Geodetic Azimuth (From North)</th>
<th>Plane Azimuth (From North)</th>
<th>Code</th>
</tr>
</thead>
</table>

**Diagram**: NE 5-12, HAWAII
HORIZONTAL CONTROL DATA

HONOHINA

NO ORIGINAL TEXT

Honohipa (Hawaii Island, Hawaiian Government Survey, 1877; E. R. Rand, 1912).—On east coast of Hawaii, in North Hilo, land of Opea, on a small hill called Kaula, and east of a gulch. Just south of Honohipa there is a steady rise in the ground on the southeast side of the main road, terminating in a sharp tit some distance inland; this tit can not be seen from any place along the road. It is reached by taking the trail which leaves the main road at right angles at a point about 200 meters from the house of Mr. Lucas, employed on the Honohipa plantation; Mr. Lucas's house is on the main road, about 1 mile out (south-east) of Honohipa, and the trail branches off between his house and Honohipa. Follow the trail uphill through cane till camp is on left, turn to right along trail, crossing a small brook (possibly a flume later) about 100 meters beyond which is a forked road, at which point turn to right to climb the tit above mentioned. The station is on this tit, and is marked by a copper tablet marked "U. S. G. S." set in concrete and covered with a Cairn of stones. The old underground mark was a copper triangle buried 3 feet underground.

RECOVERY

HONOHINA

Located on the east coast of Hawaii, in North Hilo, land of Opea, on a small hill in same land called Kaula, and east of a gulch. Just south of Honohipa there is a steady rise in the ground on the southeast side of the main road, terminating in a sharp tit some distance inland. This tit can not be seen from any place along the road.

Hawaii Territory Survey description is as follows: An erroneous station has been used at this place since 1899. Original buried copper was recovered and true station restored by W. H. Kins, Dec. 1918. Erroneous station is marked by U. S. G. S. tablet set in stone. Mark: station is marked by a one-inch iron pipe set in concrete block, 3 feet below the surface and entirely separate is a bronze pin set in a concrete post. Tripod signal over station. The U. S. G. S. station occupied by W. H. Kins in 1918 was recovered in 1919 in poor condition. The disk was removed and destroyed. In 1929 the Territory Survey placed a six-foot square concrete platform with four foot high mason work supports over the station. The center of the one-inch iron pipe was used as the station.

To reach from the post office at Hilo: go north on the coast highway for 15.1 miles to the Makaihau post office. Continue ahead for 2.9 miles; then onto a plantation dirt road and go 0.6 mile to a point where the road turns left at foot of a low knoll. From here take turn and come for about 100 yards to top of knoll and station.

(continued on next page)
Station mark was recovered in good condition. The reference mark was recovered; the disk is slightly scarred from machinery, however, the rock in which it is set is solid and the arrow on the disk points to the station. A check of the distance and angle shows a considerable difference from the 1949 values, so since the number and date had not been previously stamped on the disk it was stamped NO 2 at this time. No additional reference marks were set as the sugar cane is planted up to the station on all sides. A complete description follows:

Station is located about 2 miles northwest of Nakalou and 0.8 mile southeast of State Highway 19, on a knoll in a cane field, at 704 feet elevation.

To reach station from the post office at Pepeekoa, go northerly on State Highway 19 for 1.2 miles to Nakalou; continue on the highway for 1.0 miles to side road left at sign "HONOHINA". Turn left and go 0.2 mile to Honohina Store; continue on paved road for 0.75 mile to paved T-road right. Turn right and go up steep hill for 0.4 mile to end of paving; continue ahead for 0.25 mile to end of a short, steep, paved strip at top of grade, 25 yards before a clearing and end of truck travel. Walk north through cane field about 75 yards to station.

Station mark is a 1-inch iron pipe, projecting 6 inches from the center of a 10-inch-square, concrete block that projects 2 inches above ground. A Type A signal is centered over the mark, with the 6-foot-square concrete platform 4 feet above ground. There is a raised concrete base, with "HONOHINA" 1928" inscribed in it, on the platform around the center pipe.

Reference mark number two is a standard disk stamped "HONOHINA HGS NO 2 1949 1066", cemented in a drill hole in a 2-foot boulder that projects 1 foot above ground and is at about same elevation as station mark.
**HORIZONTAL CONTROL DATA**

**NAME OF STATION:** HONOMAIINJA

**STATE:** HAWAII

**YEAR:** 1901

**THIRD ORDER**

**SOURCE:** G-52156

**GEODETIC LATITUDE:** 19° 57' 22.927

**GEODETIC LONGITUDE:** 159° 11' 21.887

**ELEVATION:** 0

**METERS:** 0

**FEET:** 0

**STATE COORDINATES (GRID):**

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>606,601.58</td>
<td>407,695.41</td>
<td>0.06 24</td>
</tr>
</tbody>
</table>

* Plane Azimuth has been computed by the 2+lnD formula neglecting the second term.

**TO STATION OR OBJECT**

<table>
<thead>
<tr>
<th>GEOGRAPHIC AZIMUTH (True North)</th>
<th>PLANE AZIMUTH (True North)</th>
<th>CODE</th>
</tr>
</thead>
</table>

**QQ 353**
Honoumu (Hawaii Island, E. R. Hand, 1912).—On east coast of Hawaii, in the cane field about ½ mile southeast of Honoumu Sugar Mill, on the north side of Honoumu Gulch, on a very slight knoll which is about 80 meters southwest from the railroad cut, and about 20 meters northwest from the steep side of the gulch, at edge of cane. Inshore or to the southwest the land is fairly level, and soon begins to rise. The following bearings are from the station: Mill stack, N. 41° W.; gable (cupola) of freight house at cliff edge, N. 32° W.; large isolated mango tree across gulch, S. 30° E.; flagstaff on Japanese school on public road, S. 67° W.; and railroad cut on other side of gulch, S. 50° E. Station is reached from Honoumu store by proceeding towards Hilo on public road, passing at about ½ mile a Japanese school and temple on the seaward side of the road, and a short distance beyond turning seaward through a gate and following trail to bridge which crosses railroad cut. Return 80 meters from edge of bridge back along trail, and follow along parallel to the railroad cut until the land begins to fall towards gulch, when the station knoll will be reached. Sub-surface mark is a soda water bottle, bottom up (neck cracked) 3 feet below surface of ground. Five inches above the bottle is the bottom of the surface mark, a conical mass of concrete in which is a ½ inch galvanized-iron pipe, projecting three feet above surface of ground.

RECOVERY NOTE, TRIANGULATION STATION

Detailed corrections as to the figures of the original description, including marks found, corrections, changes made, and other pertinent facts:

Station was searched for but not found. The surface mark was destroyed long ago by sugar cane operations.

A search was made for the underground mark described by distance and angle from a temporary point established in the vicinity by triangulation from KAUKU and HONOUINA, but it was not recovered.

---

HORIZONTAL CONTROL DATA

by the National Ocean Survey
OLD HAWAIIAN DATUM

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: HONOUMU
STATE: HAWAII
YEAR: 1912
THIRD ORDER

SOURCES: G-52184

<table>
<thead>
<tr>
<th>STATE CODE</th>
<th>COORD. (METERS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101 634050.02 377786.32 0 07' 58&quot;</td>
</tr>
</tbody>
</table>

PLANE AZIMUTH HAS BEEN COMPUTED BY THE z = A = E FORMULA DECREASED THE SECOND TERM.

<table>
<thead>
<tr>
<th>TO STATION OR OBJECT</th>
<th>GEOGRAPHIC AZIMUTH</th>
<th>PLANE AZIMUTH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

OF 068
HORIZONTAL CONTROL DATA

by the National Ocean Survey
OLD HAWAIIAN DATUM

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: MUIKAU
STATE: HAWAII
YEAR: 1891
THIRD ORDER

SOURCE: G-SP158

GEODETIC LATITUDE: 19°24'37"N
GEODETIC LONGITUDE: 155°26'34.120"W
ELEVATION: 519.707.23

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>φ</th>
<th>Σ</th>
</tr>
</thead>
</table>
| HI 1         | 5101 | 515,666.53 | 519,707.23 | +0°01'05"

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE CLOSING FORMULA NEGLECTING THE SECOND TERMS.

TO STATION OR OBJECT
GEODETIC AZIMUTH
PLANE AZIMUTH
CODE

00 362
HORIZONTAL CONTROL DATA

NAME OF STATION: KAALIALI
STATE: Hawaii
COUNTY: Hawaii

BROKEN LINES AND DIRECTIONS TO ADJUSTED HORIZON, ORIGIN, AND DIRECTION OF OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>MEASURE</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>KANEHO (238)</td>
<td>120°</td>
<td>2 miles</td>
<td>00 00 00</td>
</tr>
<tr>
<td>KANEHO (238)</td>
<td>120°</td>
<td>35.380</td>
<td>11.680</td>
</tr>
<tr>
<td>H. L. Ho. 1'</td>
<td>120°</td>
<td>20.123</td>
<td>5.226</td>
</tr>
<tr>
<td>H. L. Ho. 2'</td>
<td>120°</td>
<td>1.5 miles</td>
<td>331 22 33.8</td>
</tr>
</tbody>
</table>

The station is located on the southerly rim of a low volcanic cone which lies on the easterly slope of Haleakula about 11.5 miles south of Paunilee, about 6.5 miles north of the summit of Maui's, about 1.5 miles south of the Puu Kaka ranch house and at an elevation of about 900 feet. The station hill is slightly above timberline and slopes sharply to the westward.

To reach the post office at Hille, go northwesterly on the road which leads toward Hualalai, for 4.5 miles; pass the Hualalai Post Office and continue northwesterly towards Hualalai, for 12 miles; turn sharp left, at telephone pole number 176, and go southeasterly about 0.5 miles on the paved road, for 0.5 miles, pass to the right hand side of the Hualalai Ranch Garage and go west for 0.8 miles; pass through the coral and continue southwest for 1.2 miles; pass to the right hand side of two large water tanks and follow the poor track road secondarily, for 2.7 miles; turn left, as per the sign reading "Kaneho", and go southeasterly for 0.36 mile; pass through a board gate and continue south for 0.8 mile, turn right and go southwest for 0.28 mile; pass to the right hand side of a large water shed and tanks, and follow the dim track road southwest for 3.6 miles; pass through two board gates into the yard of the Puu Kaka ranch house and the end of the track travel. (Water can be obtained at this point.) From this point, hike through the board gate, about 100 yards south of the house, and follow the sandy trail, southwest, for about 1.5 miles to a point where the trail passes to the south of the station hill. Leave the trail at this point and park westerly for about 300 yards to the high ground and the station.

The station is a standard disk, stamped KAALIALI 1949, set in a drill hole in a boulder which is flush with the surface of the ground.

Reference mark number 1 is a standard disk, stamped KAALIALI NO 1 1949, set into a drill hole in a boulder which is about 2 feet in diameter and projects about 1 foot. It is located about 100 yards from the station.

Reference mark number 2 is a standard disk, stamped KAALIALI NO 2 1949, set into a drill hole in a boulder which forms part of the southerly wall of an old grave and projects about 3 feet. It is located about 3 feet higher than the station.

(continued on next page)
HORIZONTAL CONTROL DATA
by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

KAALALI (continued)

NAME OF STATION: KAALALI
ESTABLISHED BY: C.T. Hunnemann
YEAR: 1949
STATE: Hawaii
COUNTY: Hawaii
Island: Hawaii

RECOVERY NOTE, TRIANGULATION STATION

HEIGHT OF TELESCOPE ABOVE STATION MARK: 1.5 Meters
HEIGHT OF LIGHT ABOVE STATION MARK: 1.0 Meters

DISTANCES AND DIRECTIONS TO UNEARTHED MARK, REFERENCE MARKS AND PRINCIPAL OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>MEASURED</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>KINE (HDS) --- 1949 DISTANCE</td>
<td>36.352</td>
<td>11.080</td>
<td>S 60° 00' 00.0</td>
</tr>
<tr>
<td>HM No. 1</td>
<td>W 20.412</td>
<td>6.222</td>
<td>269° 48' 33.3</td>
</tr>
<tr>
<td>KINE (HDS) 1876 --- 1966 DISTANCE</td>
<td>36.340</td>
<td>11.077</td>
<td>S 60° 00' 00.0</td>
</tr>
<tr>
<td>HM No. 2</td>
<td>W 20.412</td>
<td>6.222</td>
<td>269° 50' 15.0</td>
</tr>
</tbody>
</table>

Station was recovered and all marks found in good condition. A complete description follows:

Station is located about 1.5 km southeast of Laupahoehoe, 23 miles northwest of Hilo, and 7 miles south-southwest of Uilkaone village, on the south rim of a bare, red, volcanic cone of about 1,500 feet elevation, that lies at the northeast side of a good, jeep road, just above timber-line.

To reach station from the post office in Hilo, go west on Waimanu Ave., and continue on the Saddle Road, for 28.4 miles to sign "KUHULA SHEEP STATION EST. 1876". Turn right and follow gravel road 2.2 miles to fork. Take right fork and go 12.4 miles on Kamehame Rd, to board gate at station KAALALI. Pass through gate and continue for 0.5 mile to fork. Take left fork and go 1.2 miles; take right fork and go 0.4 mile to fork about 1/2-mile before reaching a cabin. Take left fork and go 0.1 mile. Here turn right, off of main road, and pick up along very thin old road westerly for 1.4 miles to the Kanahaleau Ranger Station. Pass through locked gate and follow good cinder road upgrade for 0.9 mile to fence. Turn right and follow road along fence for 0.25 mile; turn left through gate and continue on road for 1.25 miles to saddle at south side of Paua Kanaalaenii. Continue on good road northerly, downhill, for 1.5 miles to station hill on right. Go right, 0.05 miles across cinder area, to base of hill. 100 yards about 200 yards to top and station.

Station mark is a standard disk stamped "KAALALI 1949", cemented in a drill hole in a flat bedrock outcrop that projects 6 inches. It is 25 feet west of a large rock pile comprising highest point of hill.

Reference mark number one is a standard disk stamped "KAALALI NO 1 1949", cemented in a drill hole in a flat, 3 x 4-foot lava rock outcrop that projects 1 foot and 10 inches higher than station mark.

Reference mark number two is a standard disk stamped "KAALALI NO 2 1949", cemented in a drill hole in a lava rock ledge 3 feet above ground. It is at the east edge of the large rock pile and about 3 feet higher than station mark.

NOTE: A 4-wheel-drive vehicle is required.

Key for locked gate was obtained at Forest Service Headquarters in Hilo.

Note: One of these forms must be used for every station recovered.

USGS-NOAA-ASHEVILLE
**HORIZONTAL CONTROL DATA**

**NAME OF STATION:** KAMILIKU  
**STATE:** HAWAII  
**YEAR:** 1962  
**ADJUSTED HORIZONTAL CONTROL DATA**  
**SOURCE:** G-SP156

<table>
<thead>
<tr>
<th>DEGREE LATITUDE</th>
<th>DEGREE LONGITUDE</th>
<th>ELEVATION</th>
<th>FEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 41 25.423</td>
<td>159 23 42.004</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>Z (in cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>9101</td>
<td>556.118.28</td>
<td>311.465.70</td>
<td>+ 0 02 0</td>
</tr>
</tbody>
</table>

*Plane Azimuth has been computed by the S (Ord. & Fang) formula neglecting the second term.*

<table>
<thead>
<tr>
<th>TO STATION OR OBJECT</th>
<th>GEOGRAPHIC AZIMUTH</th>
<th>PLANE AZIMUTH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Q2 276**
<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>( \Delta )</th>
<th>( \Delta )</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>4157707.21</td>
<td>400258.37</td>
<td>+ 0.0654</td>
<td></td>
</tr>
</tbody>
</table>

*Plane Azimuth has been computed by the \( \theta = \Delta Y - \Delta X \) formula neglecting the second term.

<table>
<thead>
<tr>
<th>TO STATION OR OBJECT</th>
<th>GEODETIC AZIMUTH (( \theta ) in degrees)</th>
<th>PLANE AZIMUTH</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

GO 561
NO TEXT
HORIZONTAL CONTROL DATA

C 151551

HAWAII

LATITUDE 19° 30' TO 20° 00'

LONGITUDE 155° 00' TO 155° 50'

DIAGRAM NE 1.5 HAWAII

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KAWIKI H-4 USGS

STATE: HAWAII

YEAR: 1919

FIRST ORDER

SOURCE: 1945 1:20,000

BEARING AND DISTANCES TO ADJUSTED MARKS TO REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>MEASURING BEARING</th>
<th>DEGREE</th>
<th>DISTANCE</th>
<th>METER</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI ALA</td>
<td>6.3 miles</td>
<td>107°</td>
<td>222</td>
<td>692</td>
</tr>
<tr>
<td>HILO</td>
<td>6.3 miles</td>
<td>107°</td>
<td>222</td>
<td>692</td>
</tr>
</tbody>
</table>

The station is located on the easterly brow of a low knoll, planted in sugar cane, which lies about 4 miles northwest of Hilo, about 3 miles west of the sea, 10 feet east of a large stone pile and in a small cemetery.

To reach the post office at Hilo; go northward, on the road which leads toward Honomu, for 1.1 miles; turn left onto the Kawiki homestead road, and go westerly, up grade, for 3.45 miles; turn right onto a graded road and go northward for 0.2; turn right and go southeast for 0.3 mile to a point where the road turns north and the end of truck travel. From this point pack southeast, down the wooden flume, for about 500 yards; turn right and pack southwest for about 100 yards to the high ground and the station.

The station is a U.S. Geological Survey bronze disk, stamped 1210, set in the top of a concrete cylinder which projects about 2 inches above the top of a square concrete platform which is about 6 feet on each side.

Reference mark number 1 is in a standard disk, stamped KAWIKI

HAW USG NO 1 1949, set in the top of a 2 1/2 inch pipe which projects 5 inches. It is located at about the same elevation as the station.

Reference mark number 2 is in a standard disk, stamped KAWIKI

HAW USG NO 2 1949, set in the top of a 2 1/2 inch iron pipe which projects about 6 inches and is located at about the same elevation as the station.

STATE COORDINATES (FED)

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>Z (UTM-Alidade)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>622,578.93</td>
<td>356,293.05</td>
<td>+ 0.87 25</td>
</tr>
</tbody>
</table>

PLANE ADJUSTMENT WAS COMPLETED AT THE 1919-20 FORMULA REFLECTING THE SECOND TERM

TO STATION OR OBJECT | GEOGRAPHIC ADJUST. (FROM SATE) | PLANE ADJUST. (FROM SATE) | CODE |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AI ALA</td>
<td>195 04 46.2</td>
<td>195 05 13.5</td>
<td>5101</td>
</tr>
</tbody>
</table>

These data are obtained from adjustment of 1951

NAME OF STATION: KAWIKI H-4 (USGS)

ESTABLISHED BY: C.T.H.

YEAR: 1949

STATE: Hawaii

RECORDER OF: H.J.S.

YEAR: 1962

COUNTY: Hawaii

Details statement as to the source of the original description, including marks found, changes made, and other pertinent facts.

The station and both reference marks were recorded in good condition as described in 1949. The directions for reaching the station given in the 1958 recovery note by H.J.S. are adequate.

The station is located on a grassy knoll south of a cane field and north of a deep gully.
HORIZONTAL CONTROL DATA
by the NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

RECOVERY NOTE, TRIANGULATION STATION

| NAME OF STATION: KAIWIKI NEW USGS |
| ESTABLISHED BY: C.T. Husemeyer |
| YEAR: 1949 |
| STATE: Hawaii |
| RECOVERED BY: R.B. Halby |
| YEAR: 1975 |
| COUNTY: Hawaii |

| NAME OF STATION: KAIWIKI NEW USGS |
| ESTABLISHED BY: L.A. Critchlow |
| YEAR: 1977 |
| STATE: Hawaii |
| RECOVERED BY: L.A. Critchlow |
| YEAR: 1977 |
| COUNTY: Hawaii |

| AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 3-1/2 miles north-northeast of Hilo |
| HEIGHT OF TELESCOPE ABOVE STATION MARK: 50 ft. |
| HEIGHT OF LIGHT ABOVE STATION MARK: 120 ft. |

<table>
<thead>
<tr>
<th>DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>OBJECT</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>ALALO (HSG) 1877--------1949</td>
</tr>
<tr>
<td>HM No. 1</td>
</tr>
<tr>
<td>HM No. 2</td>
</tr>
<tr>
<td>HM No. 3</td>
</tr>
<tr>
<td>HM No. 4</td>
</tr>
<tr>
<td>HM No. 5</td>
</tr>
<tr>
<td>HM No. 6</td>
</tr>
</tbody>
</table>

| RECOVERY NOTE, TRIANGULATION STATION |

Station was recovered and all marks found in good condition. A complete description follows:

Station is located about 3-1/2 miles northwest of Hilo, on a small, flat-topped knoll about 40 feet in diameter, with sheaf, 8-foot sides, in cane fields, at 1120 feet elevation.

To reach station from the post office in Hilo, go west on Hilo-Maui Rd. 0.5 miles; turn right, across large bridge, and follow Waikiki Rd. north for 0.9 miles to crossroad. From 0.9 miles to crossroad, turn right and follow cinder road 0.2 miles to T-junction. Turn right and go east 0.1 mile to brow of hill and end of truck trail by trail on cane road. Walk southerly through cane about 80 yards to knoll and station.

Station mark is a U.S. Geological Survey disk stamped "KAIWIKI NEW USGS NO 1 1949", set in the top of an 8-inch-square, concrete monument that projects 10 inches above ground and is at about same elevation as station.

Reference mark number one is a standard disk stamped "KAIWIKI NEW USGS NO 1 1949", set in the top of an 8-inch-square, concrete monument that projects 2 inches above ground. It is 2 feet north-northeast of south edge of knoll and at about same elevation as station.

Reference mark number two is a standard disk stamped "KAIWIKI NEW USGS NO 2 1949", set in the top of an 8-inch-square, concrete monument that projects 2 inches above ground. It is 2 feet north-northeast of south edge of knoll and at about same elevation as station.

Detailed statement as to the licenses of the original description, including marks issued, corrections made, and other pertinent facts:

The station and reference marks were recovered in good condition as described in 1949 except the reference marks are set in 8 inch square, concrete monuments instead of 2-inch, iron pipes.
HORIZONTAL CONTROL DATA

Kawaihialilahi (Hawaii Island, Hawaiian Government Survey, 1877)—Station generally believed lost. Kawaihialilahi I established in 1913 in same location.

RECOVERY NOTE, TRIANGULATION STATION

Kawaihialilahi

Established by: H.O.S.
Year: 1877
Location: Papahoa, N. Hilo, Hawaii

New Mark: H.O.S. Type D Monument (Triangular concrete monument 1 1/2 feet on each side with 2 1/2" pipe 1 1/2 feet long set on steel legs over the old mark which is left exposed to view); inasmuch the station is situated within a group of camp houses no target has been placed on same. In order to get sights to this station it will be necessary to place a long pole over the station.

RECOVERY NOTE, TRIANGULATION STATION

Kawaihialilahi

Established by: R.C. Munson
Year: 1966
Location: Hawaii

Airline distance and direction from nearest town: Hawaii.

Station was recovered. Located about 1/4-mile southeast of Papahoa, between houses No. 421 and 422.

To reach station from the post office in Papahoa, go south for 0.25 mile; turn left and follow 1-way loop road for 0.5 mile to station on right.

Station mark is a 1-inch drill hole in the center of a cross in a stone, of a triangular, concrete platform about 7 feet on each side, with "Kawaihialilahi" inscribed in top of platform. It is 11 feet southeast of house No. 421, 8 feet southwest of a garage, and about 40 feet northeast of street.

NOTE: There is a USGS disk, stamped "281 1913", set in the top of a 5-inch-diameter concrete post, 1.31 meters from station mark, in azimuth about 25°, which may be station Kawaihialilahi 2 1913.
Kaawilahilahi 2 (Hawaii Island, E. R. Hand, 1913).—On northeastern coast of Hawaii, in North Hilo district, land of Kaawilahilahi, on top of the cliffs about 25 meters from the edge at the point just next to Papanos and toward Hilo (southeast). This spot is flat and generally covered with high cane; a group of white cottages, red roofs, very symmetrically laid out, will be seen on this point, and station is directly between them and cliff edge. Station marked by a cement cylinder, 5 inches in diameter, with United States Geological Survey tablets in top which is flush with ground and surrounded by pile of stones. Water tank at houses aforementioned bears 5 37° W., distant 80 meters. Slender stack in same group of houses (station #2) is 112 meters south.

**HORIZONTAL CONTROL DATA**

**NAME OF STATION:** Kaimilahilahi 2  
**STATE:** Hawaii  
**YEAR:** 1913  
**THIRD**:  

**SOURCE:** G-92184

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>Z (M.O. B. ANGLE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI</td>
<td>5101</td>
<td>566,905.81</td>
<td>415,886.80</td>
<td>+ 0 05 47</td>
</tr>
</tbody>
</table>

**STATE COORDINATES (feet)**

**GEODETIC LATITUDE:** 19° 58' 42.013  
**GEODETIC LONGITUDE:** 155° 13' 04.013  
**ELEVATION:** 87  
**SCALED:**  
**FEET**

**HORIZONTAL ADJACENT RADIATION:**

**TO STATION OR OBJECT**  
**GEODETIC ADJACENT** (feet north)  
**PLANE ADJACENT** (feet north)  
**EAST**

**QF 092**
**HORIZONTAL CONTROL DATA**

**NO TEXT**
NO ORIGINAL TEXT

HORIZONTAL CONTROL DATA

NO. 161551 STATION 1081
HAWAII
LATITUDE 15° 30' TO 20° 00'
LONGITUDE 155° 00' TO 159° 30'
DIAGRAM HE 51.5 HAWAII

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION KALAIEA PUU
STATE: HAWAII YEAR: 1891 THIRD ORDER

SOURCE: G-SP156

<table>
<thead>
<tr>
<th>GEOGRAPHIC LATITUDE</th>
<th>GEOGRAPHIC LONGITUDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.42 26.272</td>
<td>155 26 26.786</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>METERS</th>
<th>FEET</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>COORD 0</th>
<th>COORD 90</th>
<th>V</th>
<th>Φ</th>
<th>ΔΦ = AVERAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>520,371,05</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*EQUATION OF THE FORMULA: ΔΦ = AVERAGE

<table>
<thead>
<tr>
<th>STATION OR OBJECT</th>
<th>GEOGRAPHIC AZIMUTH (From north)</th>
<th>PLANE AZIMUTH (From geodetic)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*NAME OF PARTY SHOULDN'T BE INFORMED.*
"The officer who actually visited the station should sign his name."
"He/She should read the remarks to be noted for every station visited.
Come 192 343340
HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

Kalepa (Hawaii Island, Hawaiian Government Survey, 1876)—In northern part of Hawaii, on the summit of Puu Kalepa, on the northeast slope of Mauna Kea. Marked by a piece of copper tubing buried about 1 foot below the surface of the ground, in the center of a triangle of stones set in the ground.

RECOVERY NOTE: TRIANGULATION STATION

KALEPA
Kawaihae Station

Recovery by C. C. Hassenberger, Yea, 1849

Detailed statement as to the status of the original description:

The station was recovered, as described, in good condition. A standard station disk was established over the original underground mark which was found to be about 2.2 meter southeast of the surface mark. The sub surface mark was selected as it was considered less subject to change. The following are the original description and recovery notes:

Station mark, a piece of copper tubing buried 1 foot beneath the surface in a triangle of stones set in the ground on the summit of Puu Kalepa by C.C. Hassenberger, 1849. Recovery of this tria was made by a large arm about 5 feet high and 10 feet in diameter. Set up an arm, found portion of old flag and copper sleeve, tied another flag to old portion remaining. (S. Hopkins 1912)

The station is located on the summit of a brush covered hill, named Puu Kalepa, which lies about 21 miles southeast of Hilo, about 15.5 miles south-southeast of Hilo, about 2 miles southeast of the Puu Kila ranch house, about 0.1 mile south of a wire fence.

To reach the post office at Hilo, go north, on the road which leads toward Hilo, for 3.6 miles; pass the Hilo Post Office and continue northeasterly for 12.8 miles; turn left and go south and west, toward The Island Ranch, for 4.1 miles; pass through the Hilo Ranch and continue northerly, on the graded road, for 0.2 mile; pass through the lookout and continue northerly, on the paved road, for 0.2 mile; pass through the lookout and continue northerly, on the graded road, for 1.3 miles; turn left, as per the sign reading KALEPA, and go southerly for 0.5 mile, pass through a board gate and continue southerly for 0.5 mile; turn right, onto a dirt road, and go southerly for 0.6 mile; pass through the left hand side of a large tin water shed and continue southerly, on the main traveled road, for 1.3 miles; turn left, as per the sign reading KALEPA, and go southerly for 0.5 mile; pass through a board gate and continue southerly for 0.5 mile; turn right, onto a dirt road, and go southerly for 0.6 mile; pass through the left hand side of a large tin water shed and continue southerly, on the main traveled road, for 1.3 miles; turn left, just before reaching the gate into the ranch house yard, and go southerly, across country, for about 180 yards, pass through a board gate and continue southerly, across country, for 2.5 miles to the northwesterly foot of the hill and the end of truck travel. From this point cross over the wire fence and pass southeast for about 0.1 mile to the summit of the hill and the station.

The station is a standard disk, stamped KALEPA NSG 1949, set into a drill hole in a buried boulder which is about flush with the surface of the ground. The upper sleeve was buried under this disk at depths of 2 and 3 feet. Reference mark number 1 is a standard disk, stamped KALEPA NSG 01 1949, set into a drill hole in a boulder which is about flush with the surface of the ground and is about 1 foot lower than the station. Reference mark number 2 is a standard disk, stamped KALEPA NSG 02 1949, set into a drill hole in a boulder which is about 3 feet in diameter and projects about 1 foot. It is located about 1 foot lower than the station.

<table>
<thead>
<tr>
<th>CODE</th>
<th>DESCRIPTION</th>
<th>VALUE</th>
<th>UNITS</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>NSG NSG 01</td>
<td>34,968</td>
<td>ft</td>
<td>245 82 38</td>
</tr>
<tr>
<td>120</td>
<td>NSG NSG 02</td>
<td>35,099</td>
<td>ft</td>
<td>195 55 49</td>
</tr>
<tr>
<td>120</td>
<td>NSG NSG 03</td>
<td>36,273</td>
<td>ft</td>
<td>225 75 49</td>
</tr>
</tbody>
</table>

ADJUSTED HORIZONTAL CONTROL DATA

<table>
<thead>
<tr>
<th>CODE</th>
<th>DESCRIPTION</th>
<th>VALUE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>NSG NSG 01</td>
<td>34,968</td>
<td>ft</td>
</tr>
<tr>
<td>0</td>
<td>NSG NSG 02</td>
<td>35,099</td>
<td>ft</td>
</tr>
<tr>
<td>0</td>
<td>NSG NSG 03</td>
<td>36,273</td>
<td>ft</td>
</tr>
</tbody>
</table>

(continued on next page)
**HORIZONTAL CONTROL DATA**

by the

NATIONAL GEOIGIC SURVEY

OLD HAWAIIAN DATUM

---

**KALEPA (continued)**

---

**RECOVERY NOTE, TRIANGULATION STATION**

**NAME OF STATION:** KALEPA

**ESTABLISHED BY:** HGS

**RECOVERED BY:** D.W. Whipp

**YEAR:** 1876

**STATE:** Hawaii

**YEAR:** 1966

**COUNTY:** Hawaii

**Island:** Hawaii

**HEIGHT OF TELESCOPE ABOVE STATION MARK:** 1.5 Meters

**HEIGHT OF LIGHT ABOVE STATION MARK:** Meters

**DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION**

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>MEASUREMENTS</th>
<th>DISTANCE (METERS)</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>RED HILL (HGS)</td>
<td>1949 DISTANCE and DIRECTION</td>
<td>33.899</td>
<td>1.312</td>
</tr>
<tr>
<td>R.M. No. 2</td>
<td>W</td>
<td>26.956</td>
<td>7.610</td>
</tr>
<tr>
<td>R/M No. 3</td>
<td>NW</td>
<td>24.156</td>
<td>7.090</td>
</tr>
<tr>
<td>RED HILL (HGS)</td>
<td>1876 --1966 DISTANCE and DIRECTION</td>
<td>33.899</td>
<td>10.329</td>
</tr>
<tr>
<td>R.M. No. 2</td>
<td>W</td>
<td>26.956</td>
<td>7.584</td>
</tr>
</tbody>
</table>

---

Station was recovered and all marks found in good condition. A slight difference in distance to RM 1 was noted and checked in the field; the 1966 distance is correct. A complete description follows:

Station is located about 11 miles southwest of Laupahoehoe, 21 miles northeast of Hilo and 7 miles south of Umikoa Village, on the highest point of Puu Kalepa, a brushy hill of 971 feet elevation.

To reach station from the post office at Laupahoehoe, go northwest for 0.1 mile; turn left and continue northwest, on state Highway 19, for 9.3 miles to crossroad at telephone pole #175. Turn left and follow macadam road 6.5 miles to Kuakai Ranch Building at Umikoa Village. Pass through board gate by shops and follow track road 0.8 mile to gate. Pass through gate and follow main track road toward mountain for 3.0 miles to board gate by T-fence intersection on right. Pass through gate and go 0.50 mile to T-road right and sign "HANAIPOE 5 MI. KINAKAMOLO 5.5." Continue ahead for 0.25 mile to board gate. Pass through gate and go 0.2 mile to fork. Take right fork and go south for 0.25 mile to board gate above large rain shed and tanks. Pass through gate and continue for 2.2 miles to fork near catchment basin by Puu Kina. Take left fork and go 0.25 mile to fork about 100 yards before old ranch buildings. Go left for 0.15 mile to board gate. Pass through gate and go 1.0 mile to small black tank; continue on dim track road for 1.0 miles to end of truck travel at south end of deep ravine at southeast base of hill. Cross fence and park northeast up steep hill about 300 yards to station. A 15-minute hike. **NOTE:** A 4-wheel-drive vehicle is required from Umikoa Village.

Station mark is a standard disk stamped "KALEPA HGS 1949," cemented in a drill hole in an 8 x 12-inch boulder flush with ground. The old description states that 2 underground marks, consisting of copper sleeves, were buried at 2 and 3-foot intervals beneath surface mark.

Reference mark number one is a standard disk stamped "KALEPA HGS NO 1 1949," cemented in a drill hole in the south end of a 2 x 4-foot, flat rock. It is 2 feet lower than station mark.

Reference mark number two is a standard disk stamped "KALEPA HGS NO 2 1949," cemented in a drill hole in a 3-foot boulder projecting 2 feet.

---

**NOTE:** Out of these forms must be used for every station recovered.
HORIZONTAL CONTROL DATA

See Station KALEPA

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KALEPA OLD SURFACE STA
STATE: HAWAI'I
YEAR: 1876
SECOND ORDER

NO OBSERVATION CHECK ON THIS POSITION

DETECTIC LATITUDE: 19°33'27.937
DETECTIC LONGITUDE: 155°22'34.323
ELEVATION: 2338 METERS
SCALE: FEET

STATE & ZONE CODE X Y θ θ VER. REG. ANGLE
HI 1 5101 545,377.82 382,121.37 +0 02 42

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE θ θ VER. FORMULA INCLUDING THE SECOND TERM.

POSITION DETERMINED BY TRaverse FROM STATION KALEPA

QE 278
DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: KALOALOA (HGS)
STATE: Hawaii
COUNTY: Hawaii
CHARGE PARTY: C.S. BUSCHMANN
YEAR: 1949
DEPICTION: B.G.G.
NOTE: SURVEY OF INTERESTING AMERICAN RANGES MADE 1949
NOTE: SURVEY OF INTERESTING AMERICAN RANGES MADE 1949

Station is located about 10 miles, airline, west of Pila, on the east slope of Looma Lava, on a low east and west ridge in pasture land, about 200 yards southeast of a wire fence and about 300 yards southeast of a graded road and dirt tank.

Original station was marked by the Hawaii Govt. Survey in 1979 by a buried copper triangle with a mmm on post set over it. Station recovered in 1949 was a square topped concrete block with a glass vial set in it. This block was replaced with a standard station disk set in exact location of original block. Station No. 1 is set in a square topped concrete post projecting 3 inches above the ground. Stamped KALOALOA 1949.

Underground mark is a standard station disk set in concrete 40 inches below the surface. Stamped KALOALOA 1949. Reference mark No. 2 is set in a large iron bollard at the fence line, projecting about 5 feet above the ground. A standard disk stamped KALOALOA No 1 1949.

Reference mark No. 2 is a square topped concrete post projecting 5 inches above the ground and is one foot below the level of the surface. A standard disk stamped KALOALOA No 2 1949.

To reach from the Post Office at Pila: go 2.2 miles, turn right onto a graded road, pass sign KALOALOA, and go northwesterly past Pahala Sheep Station for 2.2 miles. Take right fork and continue northwesterly on main traveled road for 12.5 miles to dirt road on right. From here station lies about 300 yards southeast and reference mark No. 1 is plainly visible.

(continued on next page)
HORIZONTAL CONTROL DATA
by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KALOALOA (HOS)
ESTABLISHED BY: C.T. Hueneyer YEAR: 1949
RECOVERED BY: B.M. Whipp YEAR: 1966
STATE: Hawaii COUNTY: Hawaii
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:
HEIGHT OF TELESCOPE ABOVE STATION MARK: 1.54 METER
HEIGHT OF LIGHT ABOVE STATION MARK: 4.4 FEET
NAME OF STATION: KALOALOA H33
ESTABLISHED BY: C.T. Hueneyer YEAR: 1949
RECOVERED BY: I.I. Critchlow YEAR: 1977
STATE: Hawaii COUNTY: Hawaii
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:
HEIGHT OF TELESCOPE ABOVE STATION MARK: 4.4 FEET
HEIGHT OF LIGHT ABOVE STATION MARK: 4.4 FEET

DISTANCES AND DIRECTIONS TO NEAREST MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>MEASUREMENT</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHAUNULA (HOS) 1891-1949</td>
<td>N 547.000</td>
<td>137.000</td>
<td>E 31 39 33</td>
</tr>
<tr>
<td>HM No. 1</td>
<td>NWW</td>
<td>27.199</td>
<td>8.399</td>
</tr>
<tr>
<td>HM No. 2</td>
<td>SWW</td>
<td>19.565</td>
<td>116.937</td>
</tr>
<tr>
<td>HM No. 3</td>
<td>SWW</td>
<td>27.474</td>
<td>8.375</td>
</tr>
</tbody>
</table>

The station was recovered and all marks found in good condition. Because of the extreme distance to HM 1 a new reference mark was established. A slight discrepancy was noted in the distance to HM 2 and was double-checked in the field; the 1966 distance is correct. A complete description follows:

Station is located about 18 miles west-northwest of Hilo and 11 miles northeast of Humula Sheep Station, at about 6640 feet elevation, on a rise in rolling pastureland, 900 feet east of Kamakolu Road.

To reach station from the post office in Hilo, go west on Maunakea St. and the Saddle Road for 26.5 miles to sign "HUMULA SHEEP STATION EST. 1876." Turn right and follow gravel road north 2.1 miles, passing the sheep station, to a fork. Take the right fork and go 12.2 miles to board gate and small pond. Pass through gate and go 0.2 mile to another pond, small pond on right and board gate ahead. Go right, along fence, for 100 yards to a board gate in fence corner. Pass through gate and go cross country, keeping to right of another pond, for 0.1 mile to station on rise.

Station mark is a standard disk stamped "KALOALOA 1949," set in the top of an 8-inch-square, concrete monument that projects 3 inches. It is about 200 feet south of west end of pond, 560 feet east of fence line, and 575 feet east-southeast of the board gate.

Reference mark number one is a standard disk stamped "KALOALOA NO 1 1949," cemented in a drill hole in the top of a prominent, large rock about 8 feet in diameter and projecting about 3 feet above ground. It is 13.5 feet east of fence line, on high point above pond and is 27.9 feet higher than station mark.

Reference mark number two is a standard disk stamped "KALOALOA NO 2 1949," set in the top of an 8-inch-square, concrete monument that projects 5 inches. It is about 2 feet lower than station mark.

Reference mark number three is a standard disk stamped "KALOALOA HOS 1949 NO 3 1966," set in the top of a 10-inch-diameter, concrete and stone monument flush with the ground. It is about 1 foot higher than station mark.

NOTE: Distance between HM 2 and HM 3 is 38.44 feet.

*Name or code of party should be inserted here. The person who actually visited the station should sign at the end of the recovery note.

NOTE: One of these forms must be used for every station recovered.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KALOALOA H33
ESTABLISHED BY: C.T. Hueneyer YEAR: 1949
RECOVERED BY: I.I. Critchlow YEAR: 1977
STATE: Hawaii COUNTY: Hawaii
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:
HEIGHT OF TELESCOPE ABOVE STATION MARK: 4.4 FEET
HEIGHT OF LIGHT ABOVE STATION MARK: 4.4 FEET

DISTANCES AND DIRECTIONS TO NEAREST MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>MEASUREMENT</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHAUNULA (HOS) 1891-1949</td>
<td>N 547.000</td>
<td>137.000</td>
<td>E 31 39 33</td>
</tr>
<tr>
<td>HM 1 2</td>
<td>NWW</td>
<td>19.565</td>
<td>116.937</td>
</tr>
<tr>
<td>BM 1 2</td>
<td>NWN</td>
<td>27.474</td>
<td>8.375</td>
</tr>
</tbody>
</table>

The station and reference marks were recovered in good condition. The directions and distances measured on this date compare favorably with the 1967 measurements. Reference mark 3 was found to differ by 0.006 meters from the 1967 distance. The measurements on this date are taken with a small amount of correction from the 1949 measurements. The 1967 recovery note is in good agreement with the following notes to reach description.

To reach the station from the Hilo Post Office, go west on State Highway 20 for 27.7 miles to side road right. Turn right and go north along paved road leading to Humula Pasture for 2.1 miles to side road right. Turn right and follow dirt road 10.6 miles to W-R, continue north along main road 1.35 miles to gate, continue through gate and go 0.2 miles to wooden gate. Turn right and follow along southern side of fence 0.1 mile to gate, pass through gate and continue east-southeast 0.1 mile to top of ridge and station site.

*Name or code of party should be inserted here. The person who actually visited the station should sign his name at the end of the recovery note.

RECEIVED ON FORM 76-86 SUPERSECRETARY CASE FORM 285A WHICH MAY BE USED

U.S. DEP. OF COMMERCE NOAA ADMIN. DAY 9-21-71

U.S. DEP. 76-48-017743 Begin 4
HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

Kaluakai\n(Hawaii Island, Hawaiian Government Survey, 1876).—In the
northern part of Hawaii, on a hill of the same name, on the northern slope of
Mauna Kea. Station is on northern brow of the hill. Marked by a copper tube
buried in an ancient graveyard, and covered with calms of stones. Three trian-
gular holes were drilled in the lava, 7 feet north, 7 feet south, and 6 feet east of
the station. A circular wall surrounds the station.

RECOVERY NOTE: TRIANGULATION STATION

NAME OF STATION: Kaluakai
STATUS: Hawaii
COUNTY: Hawaii
DATE: 1876
DESCRIPTION: Mauna Kea Slope, Hamakua, Hawaii
REMARKS: 1876

Location of station: On the easterly crater rim of a hill named Kaluakai
and situated near the foot of the Mauna Kea north slope.

Old station mark found: 1 1/4" pipe in pile of stones. The two original
triangular pit ties out in rock found but the pit 6 feet east could not be
found.

New station mark: N.T.S. Type D-1 monument(Triangular concrete monument
7 1/2 feet on each side with 1 7/8 steel bar 2 feet long set on steel legs
over the station mark which is left exposed to view. A standard metal
target is set over the steel bar.)

RECOVERY NOTE: TRIANGULATION STATION

NAME OF STATION: Kaluakai
STATUS: Hawaii
COUNTY: Hawaii
DATE: 1876
DESCRIPTION: Mauna Kea Slope, Hamakua, Hawaii
REMARKS: 1876

This station has a concrete platform, metal pole and target
established in 1936 by the Hawaii Territory Survey, which at that time
recovered a 1 1/4" pipe in a pile of stones. Their recovery note states
"The two original triangular pit ties out in rock found but the pit 6
feet east could not be found". The metal pole was established over
the old pipe marker.

On the easterly crater rim of a hill named Kaluakai and
situated on the north slope of Mauna Kea. The target and hill are prominent.

Four wheel drive vehicles can be driven to the foot of the hill
where there is a small building. Inquire of Parker Ranch.

HAWAII
LATITUDE 19° 30' TO 20° 00'
LONGITUDE 155° 00' TO 155° 30'
DIAGRAM HS 513 HAWAII

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: Kaluakai
STATE: Hawaii
YEAR: 1876

SOURCE: G-SP58

GEODETIC LATITUDE: 19° 54' 31.963
GEODETIC LONGITUDE: 155° 29' 31.227
ELEVATION: 2510 METERS

STATE COORDINATES (Foot)

STATE & ZONE CODE X Y Z
HI 1 5101 502,745.55 390,521.67 + 0.0010

TO STATION OR TARGET GEODETIC LATITUDE PLANE ASPECT* CODE

M O A A F 0 M 3 1

M O A A F 0 M 3 1

QQ 393
NO ORIGINAL TEXT

Kauku (Hawaii Island, Hawaiian Government Survey, 1877; E. R. Hand, 1912).—On east coast of Hawaii, on the conspicuous isolated mountain which lies directly inshore (S. 35° W.) from the town of Hakalau. This mountain is heavily wooded at top, its lower slopes are covered with cane; it is unmistakable, showing up prominently along coast. Station is on highest point of mountain, a perfectly flat area covered with ferns, and commanding a view of the coast from northwest to east. Reached by taking the road going inland at Pepeekeo store, passing two plantation camps; road goes directly to foot of mountain. The highest tree on the summit is 30 meters from the station, bearing S. 47° W. Station marked by tablet marked "U. S. G. S." set in concrete. A cairn of smooth stones was erected over the station.

DEPARTMENT OF COMMERCE

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY, NATIONAL GEODETIC SURVEY

HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION KAU ku

STATE HAWAI I YEAR 1877 SECOND ORDER

SOURCE G 9276

ADJUSTED COORDINATES (1968)

STATE & ZONE CODE X Y

HI 1 5101 617,592.92 364,302.70 + 0'06'57

PLANE ADJUSTMENT BASED ON THE J. D. F. FORMULA NECESSITATING THE SECOND TERM

TOLEDO 159 49 35.1 159 42 38 5101

(continued on next page)
Station was recovered in good condition. A complete description follows:

Station is located about 8 miles northeast of Hilo and 4 miles west-northwest of Pepekeke, on the heavily-timbered north rim of an old crater, at 1964 feet elevation. The ridge top just southwest of the station is flat and free of underbrush among the large banyan trees, and there are 2 piles of unusual, rounded, smooth stones, averaging 4 inches in size in this area, and also a round hole about 7 feet deep and 14 inches in diameter.

To reach station from the post office at Pepekeke, go north on State Highway 19 for 0.7 mile to paved crossroad. Turn left and go 0.5 mile to fork in plantation village; take right fork and go 0.4 mile to crossroad. Turn left and go 1.7 miles to fork; take left fork and go 0.15 mile to fork; take right fork and go 0.75 mile to end of road and end of cane field at fence, below an old house in meadow. Park to upper right corner of field at fence, below an old house in meadow. Park to upper right corner of field at fence, below an old house in meadow.

Station mark is a U.S. Geological Survey disk [no stamping is visible] cemented in a drill hole in rock. A Type B-1 signal is centered over the mark and the concrete platform is about flush with ground. Station is 50 feet northeast of the largest, scattered pile of stones and 43 feet north-northeast of the deep hole.

NOTE: Station site soon becomes overgrown with ginger and ferns and can be difficult to find. Sight to most directions from the station is blocked by trees.
HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

QUAD 191351  STATION 1087
HAWAI'I  LATITUDE 19° 36' 00" N  LONGITUDE 155° 46' 00" W
DIAGRAM HC 5-15 HAWAI'I

ADJUSTED HORIZONTAL CONTROL DATA
OBS BY NGS
SECONDS ORDER
G 10:41
SOURCE
19  49  35.24  256  22.1  25.2  0,000 00.00
LATITUDE: 19° 36' 00" N  LONGITUDE: 155° 46' 00" W
ELEVATION 4201.2 METERS FEET 13783

NAME OF STATION: KEA
STATE: HAWAI'I  YEAR: 1977

TO STATION OF OBJECT GEOGRAPHIC AZIMUTH* (FROM N. E.) PLANE AZIMUTH* (FROM N. E.) CODE
KALUALOA HGS 274° 39' 56.9" 355° 41' 21" 5104

TOTAL DATA OBTAINED FROM ADJUSTMENT OF JAN 1979
3H 084

* Planar azimuth has been computed by the $\theta \cos \phi \ - \ \phi$ formula neglecting the second term.

NAME OF STATION: W2
ESTABLISHED BY: L.A. Critchlow YEAR: 1977
STATE: HAWAI'I  COUNTY: HAWAI'I
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 25.3 miles northwest of Hilo.
HEIGHT OF TELESCOPE ABOVE STATION MARK: 4 FEET.
HEIGHT OF LIGHT ABOVE STATION MARK: 4 FEET.

DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION:

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>bearing</th>
<th>distance</th>
<th>direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>KALUALOA HGS 1949</td>
<td>SH</td>
<td>53.55</td>
<td>260° 19' 30&quot;</td>
</tr>
<tr>
<td>SUGITI USGS</td>
<td>EXU</td>
<td>6.3</td>
<td>64° 21' 35.5</td>
</tr>
<tr>
<td>SN T</td>
<td>¥ (74.00)</td>
<td>23.5</td>
<td>270° 12' 32.1</td>
</tr>
<tr>
<td>HSA HSA A</td>
<td>trav. dist.</td>
<td>N</td>
<td>180° 21' 32.3</td>
</tr>
<tr>
<td>HSA HSA A to W T</td>
<td>trav. dist.</td>
<td>W</td>
<td>0° 37' 32.6</td>
</tr>
</tbody>
</table>

Station is located near the summit of Mauna Kea (13,796 feet) and about 100 feet southeast of the entrance to the Mauna Kea University of Hawaii Observatory.

To reach the station from the post office in Hilo, go westward on State Highway 20 for 17.3 miles to a surfaced road right. Turn right and go northerly on the surfaced road (which turns into gravel at about 7500 feet level) to the summit, University of Hawaii Observatory and the station as described.

The station marks are standard disks stamped KSA 1977. The surface disk is set in a round concrete post flush with the ground surface and the underground disk is set in an irregular mass of concrete about 36 inches below the ground surface. They are 98 feet southeast of the entrance to the observatory, 98 feet east of the southeastern corner of the observatory and 7 feet west of the southeast edge of the hill. (Note 1a,1b,2a)

Reference mark A, is a standard disk stamped KSA HSA A 1977. The surface disk is set in a round concrete post flush with the ground surface and the underground disk is set in an irregular mass of concrete about 36 inches below the ground surface. They are 110 feet northwest of the southeastern corner of the observatory, 63 feet east of the entrance to the observatory and 23 feet west of the east edge of the hill. (Note 1b,desc.)

Reference mark T, is a plain bronze disk with no stamping and organization unknown. It is set in a square concrete post flush with the ground surface and the concrete is inscribed HSA T 1977. It is 64.4 feet south of the entrance to the observatory, 23.4 feet east of the southeastern corner of the observatory, 2.3 feet west of the center of a concrete sidewalk and 2.3 feet north of center of a concrete sidewalk. (Note desc.)

* Name of chief of party should be inserted here. The person who actually visited the station should sign his name at end of the survey mark.

HMA FORM 76-56  SUPERREDICE CARDS FORM SHEET WHICH MAY BE USED

HMA FORM 76-11
(11-74)
HORIZONTAL CONTROL DATA
by the
National Ocean Survey
OLD HAWAIIAN DATUM

QUAD 191451  STATION 1088
HAWAII
LATITUDE 20°30' TO 20°40'
LONGITUDE 155°00' TO 155°30'
DIAMET 51.5 HAWAII

ADJUSTED HORIZONTAL CONTROL DATA
ADJUSTMENT OF OBS
OBS BY OBS

NAME OF STATION: KEA, RN A
STATE: HAWAII
YEAR: 1977
SECOND ORDER
6-16241

DESCRIPTIVE LATITUDE: 19°49'33.760669'
DESCRIPTIVE LONGITUDE: 155°28'18.89107'
ELEVATION: 9201.4 METERS

STATE COORDINATES (foot)

STATE & ZONE CODE X Y Z
11 5660 360499.20 0 00 34

THREE DATA OBTAINED FROM ADJUSTMENT OF JAN 1979

TO STATION OR OBJECT
DESCRIPTIVE AZIMUTH
PLANE AZIMUTH

KALOAIOA NGS
274°00'40.7 274°48'06.7 5101

NAME OF STATION: KALOAIOA, RN A
ESTABLISHED BY: L.A. Otschak, 1977
BENCH MARK ALSO
COUNTY: HAWAII
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN 28 miles northwest of Hilo.
HEIGHT OF TELESCOPE ABOVE STATION MARK 100 FEET
HEIGHT OF LIGHT ABOVE STATION MARK 100 FEET

DISTANCES AND DIRECTIONS TO ASPIRING MARK REFRIGE AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION:

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>BEARING</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>KALOAIOA NGS</td>
<td>S</td>
<td>22.5637</td>
<td>00 07 00.7</td>
</tr>
<tr>
<td>KEA RN A</td>
<td>NW</td>
<td>101.48</td>
<td>30 93.2</td>
</tr>
<tr>
<td>MAUNA KEA UNIV OF HAWAII OBS DOME</td>
<td>NW</td>
<td>120.34</td>
<td>36 07.89</td>
</tr>
<tr>
<td>51090 RN A</td>
<td>E</td>
<td>22.8371</td>
<td>270 00 53.4</td>
</tr>
<tr>
<td>51090 RN A</td>
<td>S</td>
<td>77.17</td>
<td>23 52.2</td>
</tr>
<tr>
<td>KALOAIOA NGS</td>
<td>NW</td>
<td>203.04</td>
<td>63 12.06</td>
</tr>
</tbody>
</table>

Station is located near the summit of Mauna Kea Mountain and about 60 feet west of the entrance to the University of Hawaii Observatory. To reach the station from the post office in Hilo, go westerly on State Highway 20 for 27.3 miles to paved side road right. Turn right and go northerly on the paved road (which turns into gravel at about the 9000 foot level.) to the summit, University of Hawaii Observatory and the station as described. The station marks are standard reference mark disks stamped KEA RN A 1977. The surface disk is set in a round concrete post flush with the ground surface and the underground disk is set in an irregular mass of concrete about 36 inches below the ground surface. They are 110 feet northeast of the southeast corner of the observatory and 20 feet east of the entrance to the observatory and 23 feet west of the east edge of the hill. (Note 11b, desc.)

KSA, stamped 1977, are standard station mark disks. The surface disk is set in a round concrete post flush with the ground surface and the underground disk is set in an irregular mass of concrete about 36 inches below the ground surface. They are 200 feet southeast of the entrance to the observatory, 98 feet east of the southeast corner of the observatory and 7 feet northwest of the southeast edge of the hill. (Note 11b, 7a)

Reference mark T, is a plain bronze disk with no stamping and organization unknown. It is set in a 6-inch square concrete post flush with the ground surface and the concrete is inscribed RN T 1971. It is 59.4 feet south of the entrance to the observatory, 2.1 feet west of center of a concrete sidewalk and 2.3 north of center of a concrete sidewalk. (Note desc.)

NHSA FORM 76-96 SUPERSEDES CASE FORM 764A WHICH MAY BE USED

*Note of chief of party should be inserted here. The person who actually visited the station should sign his name at the end of the recovery note.*
HORIZONTAL CONTROL DATA

NAME OF STATION: KEAAU

STATE: Hawaii

COUNTY: Hawaii

CHIEF OF PARTY: C. T. Hunsberger
YEAR: 1949

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: KEAAU
STATE: Hawaii
COUNTY: Hawaii
CHIEF OF PARTY: C. T. Hunsberger
YEAR: 1949

DISTANCES AND DIRECTIONS TO ADJACENT MARKS, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>MEASURED</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEAAU</td>
<td>00 00 00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Olaa, Tank</td>
<td>NE 0.5 mile</td>
<td>19 29 46.3</td>
<td></td>
</tr>
<tr>
<td>H M No. 1</td>
<td>NE - 15.376</td>
<td>21 36 44.7</td>
<td></td>
</tr>
<tr>
<td>OLAAT</td>
<td>SW - 0.6 mile</td>
<td>197 24 27.6</td>
<td></td>
</tr>
<tr>
<td>H M No. 2</td>
<td>WSW - 15.890</td>
<td>279 27 06</td>
<td></td>
</tr>
</tbody>
</table>

The station is located on the summit of a low grassy knoll which lies about 1.0 miles southwest of the village of Olaa; about 0.1 mile north of the Olaa Hospital and 0.1 mile west of the road which runs between Olaa and the Hawaiian National Park. Several small knolls of equal height lie about 0.1 mile south of the station hill.

To reach from the Hongwanji Church in the village of Olaa: go west, on the road which leads toward the Hawaiian National Park, for 1.15 miles, turn right, onto a gravelled road, and go westerly for 0.1 mile to the summit of a low knoll and the station.

The station is a standard disk, stamped KEAAU 1949, set in the top of a square concrete post which projects about 3 inches.

Reference mark number 1 is a standard disk, stamped KEAAU No. 1 1949, set in the top of a square concrete post which projects 6 inches and is about the same elevation as the station.

Reference mark number 2 is a standard disk, stamped KEAAU No. 2 1949, set in the top of a square concrete post which projects about 4 inches and is about the same elevation as the station.

(continued on next page)
Station was recovered and all marks found in good condition. A complete description follows:

Station is located about 1 mile southwest of Olaa and 1 mile northwest of Kurutaino, along the northwest side of State Highway 11, on the summit of a low, rounded, brush-covered hill of about 600 feet elevation which has a tall, wooden antenna pole and small green house on it.

To reach station from the post office in Olaa, go northeast on the main street for 0.1 mile to crossroad. Turn left and go 0.1 mile to State Highway 11. Turn left and go southwest on the highway for 1.1 miles to gravelled side road right, at telephone pole #23. Turn right and go 0.2 mile; turn sharp right and go 0.5 mile on track road to summit of hill and station.

Station mark is a standard disk stamped "KEAU 1949", set in the top of an 8-inch-square, concrete monument that projects 2 inches above ground. It is 13.5 feet east-northeast of the antenna pole and 18.5 feet northeast of the southeast corner of the small building. Reference mark number one is a standard disk stamped "KEAU NO 1 1949", set in the top of an 8-inch-square, concrete monument that projects 4 inches above ground. It is 11.4 feet north of the antenna pole, 19.0 feet north-northwest of the door of the building and about 6 inches lower than station mark.

Distance between reference marks is 27.0 feet.

Note: All marks are usually hidden by tall, dense grass.

<table>
<thead>
<tr>
<th>Object</th>
<th>Bearing</th>
<th>Distance (Feet)</th>
<th>Distance (Meters)</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>OLAH (HGS)</td>
<td>000.0</td>
<td>00</td>
<td>00</td>
<td>00.0</td>
</tr>
<tr>
<td>RM No. 2</td>
<td>18.850</td>
<td>5.758</td>
<td>00</td>
<td>92.8</td>
</tr>
<tr>
<td>RM No. 3</td>
<td>15.375</td>
<td>4.682</td>
<td>00</td>
<td>06.15</td>
</tr>
<tr>
<td>OLAA (HGS) 1896</td>
<td>000.0</td>
<td>00</td>
<td>00</td>
<td>00.0</td>
</tr>
<tr>
<td>RM No. 2</td>
<td>14.875</td>
<td>4.529</td>
<td>00</td>
<td>53.05</td>
</tr>
<tr>
<td>RM No. 3</td>
<td>15.359</td>
<td>4.682</td>
<td>00</td>
<td>06.12</td>
</tr>
<tr>
<td>Olaa, Olaa Sugar Co., stack, 1949</td>
<td>00.0</td>
<td>00</td>
<td>00</td>
<td>00.0</td>
</tr>
</tbody>
</table>

The station mark and reference mark 1 were recovered in good condition. Reference mark 2 was found lying on its side. It was reset in its original cement and reset marked. The distance to reference mark 1 was found longer by 0.006 meter and the direction was found smaller by 0.5 second. A complete new description follows.

The station is about 1 mile southwest of KRN, 1 mile northeast of Kurutaino, along the northwest side of State Highway 11, on a small hill, with a wooden antenna pole on top of it and on property owned by the H. Shimpan Corporation.

To reach the station from the junction of State Highway 11 and 13 in KRN, go southwest on highway 11 for 1.05 miles to a field road left right. Turn right and go east on the field road for 0.15 mile to a KRN fork. Just before reaching a T-junction, turn sharp right and go east-northeast uphill for 0.1 mile to the top of the hill and the station as described.

Station mark, stamped KEAU 1949, is a CGOS disk set in a concrete monument which projects about 2 inches above the ground surface. It is 11.3 feet northeast of the northeast corner of a small building and 13.5 feet east-northeast of a wooden antenna pole. The 1949 description does not mention an underground mark (Note 3a).

Reference mark 1, stamped KEAU NO 1 1949, is a CGOS disk set in a square concrete monument which projects about 2 inches above the ground surface. It is 11.3 feet northeast of the antenna pole, 26.7 feet east of a guy wire anchor and about 2 inches lower than the station. (Note 11a)

Reference mark 2, stamped KEAU NO 2 1949, is a CGOS disk set in a square concrete monument which projects about 5 inches above the ground surface. It is 11.3 feet northeast of the antenna pole, 11.5 feet south-southwest of a guy wire anchor and about 6 inches lower than the station. (Note 11a)
HORIZONTAL CONTROL DATA

DEPARTMENT OF COMMERCE
U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANOGRAPHIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY + NATIONAL GEODETIC SURVEY

HORIZONTAL CONTROL DATA

NAME OF STATION: KEAUKAHA
STATE: Hawaii
COUNTY: Hawaii

CHIEF OF PARTY: G. J. H. H. Hoepel
YEAR: 1949

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: KEAUKAHA
YEAR: 1949
STATE: Hawaii
COUNTY: Hawaii

RECOVRED BY: G. J. H. H. Hoepel
YEAR: 1958

D Kent: Detailed statement as to the States of the original description, including marks found, stampings, changes made, and other pertinent facts:

The station and B. M. No. 1 and 2 were recovered as described in 1949 in good
condition, except for the following additions and corrections:

The main traveled road is Kamehameha Ave., and Kalamaluaole St.

The Punnalula Hospital is now abandoned.

The old shack mentioned in B. M. No. 2 has been moved and the mark is now 20,7 feet
E of the B. M. corner of the shack.

(continued on next page)
HORIZONTAL CONTROL DATA
by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

QUAD 191551 STATION 1090

LATITUDE / TO / LONGITUDE / TO /

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KEAUKA

AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 5 miles east of Hilo

Detailed statement as to the sources of the original description; including marks found, stanzas, changes made, and other pertinent data:

The station and reference marks were recovered in good condition. The station and reference marks were recovered in heavy brush and would require a tower or extensive clearing to even see the reference marks.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KEAUKA

AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

Detailed statement as to the sources of the original description; including marks found, stanzas, changes made, and other pertinent data:

The station was recovered and all marks found in good condition. The station was recovered in heavy brush and would require a tower or extensive clearing to even see the reference marks.
Keokea (Hawaii Island, Hawaiian Government Survey, 1878).—On eastern shore of Hawaii, at Keokea Point, east of Hilo Bay, on a grassy islet. The surf breaks all around it. Marked by an iron pin let into the rock.

### HORIZONTAL CONTROL DATA

<table>
<thead>
<tr>
<th>Station</th>
<th>2091</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latitude</td>
<td>15° 30' to 20° 00'</td>
</tr>
<tr>
<td>Longitude</td>
<td>155° 00' to 155° 30'</td>
</tr>
</tbody>
</table>

ADJUSTED HORIZONTAL CONTROL DATA

#### Station Information
- **Name of Station**: Keokea
- **State**: Hawaii
- **Year**: 1877
- **Third Order**

#### Geodetic Coordinates
- **Geodetic Latitude**: 19° 44' 30.9" N
- **Geodetic Longitude**: 155° 02' 34.29" W

#### State Coordinates

<table>
<thead>
<tr>
<th>State &amp; Zone</th>
<th>Code</th>
<th>X</th>
<th>Y</th>
<th>θ</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>657.202</td>
<td>350.166</td>
<td>+ 0 09 16</td>
</tr>
</tbody>
</table>

*Plane azimuth has been computed by the 2 FORMULAS, neglecting the second term.*

#### Station or Object

<table>
<thead>
<tr>
<th>Station or Object</th>
<th>Geodetic Azimuth (from north)</th>
<th>Plane Azimuth* (from north)</th>
<th>Code</th>
</tr>
</thead>
</table>

*QO 315*
HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

JUN 1978
U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY, NATIONAL GEODETIC SURVEY

HORIZONTAL CONTROL DATA

0 191551
STATION 1092
HAWAII
LATITUDE 19° 30' TO 29° 00'
LONGITUDE 155° 00' TO 155° 30'
DIAGRAM NE 5-1-3 HAWAII

NO ORIGINAL TEXT

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Keokea 2
ESTABLISHED BY: C.T. Husenmeyer YEAR: 1951 STATE: Hawaii
RECOVERED BY: R.B.N. YEAR: 1976 COUNTY: Hawaii
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 3.0 miles west of Hilo
HEIGHT OF TELESCOPE ABOVE STATION MARK: 40
HEIGHT OF LIGHT ABOVE STATION MARK: 0

DISTANCES AND DIRECTIONS TO ACREITY MARKS, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>BEARING</th>
<th>DISTANCE</th>
<th>METER</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>COCONUT POINT LIGHT</td>
<td>00 00 00.0</td>
<td>1050 126 30</td>
<td>558 22 32.6</td>
<td></td>
</tr>
<tr>
<td>MOROFOA 2</td>
<td>00 00 00.0</td>
<td>1050 126 30</td>
<td>508 22 32.6</td>
<td></td>
</tr>
</tbody>
</table>

Station was recovered in good condition.
A discrepancy was noted in the name of the station. The published name in Keokea 2 1951, the markings on the station read Keokea 2 Aug. 1974. All directions and distances observed to the station indicated the published position to be correct.
The station can be reached from the post office in Hilo by proceeding north-east on Waiau St. for 0.15 miles, bear right onto Keaahelena Ave. for 1.75 miles, bear left onto Kalanianaole St. for 1.6 miles, turn left onto Andrews Ave. for 80 yards, turn right onto Apppaa Rd. for 40 yards, then turn left onto Lihikai St. for 0.1 miles, turn right into a clearing containing old building foundations. Walk westerly along beach for 100 yards.
Station is a rock with a triangle inscribed. Plowed over the station is a 6 ft. red and white metal crossbeater built on a 3 ft. by 3 ft. concrete platform 3.5 ft. in height. No reference marks were found.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Keokea 2
ESTABLISHED BY: C.T. Husenmeyer YEAR: 1951 STATE: Hawaii
RECOVERED BY: R.B.N. YEAR: 1976 COUNTY: Hawaii
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 3 miles west of Hilo

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: Keokea 2 OBS BY CGS
STATE: Hawaii YEAR: 1951 THIRD

SOURCE:
G = 9.23

GEODETIC LATITUDE: 19° 44' 25.39" N
ELEVATION: 3
GEODETIC LONGITUDE: 155° 12' 42.67" W

STATE COORDINATES (m):
<table>
<thead>
<tr>
<th>U</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

THESE DATA ARE UTILIZED FROM ADJUSTMENT OF 1967

THEM IN METER

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>GEODETIC AZIMUTH (FROM MARK)</th>
<th>PLANE AZIMUTH (FROM MARK)</th>
<th>CHORD</th>
</tr>
</thead>
<tbody>
<tr>
<td>COCONUT POINT LIGHT</td>
<td>75° 31' 01.1&quot;</td>
<td>75° 31' 01.1&quot;</td>
<td>5101</td>
</tr>
</tbody>
</table>

Dotted squares are the figures of the original description; includes marks found, overprints, changes made, and other pertinent facts.
The station was recovered as described in 1976 except in the 'to reach' description, turn left on Keokea Loop Road instead of Andrews Avenue.
HORIZONTAL CONTROL DATA

Kihe (Hawaii Island, Hawaiian Government Survey, 1876).—In northern part of Hawaii, on northeast slope of Mauna Kea, on northwest side of Kihe crater. Marked by a manmade post in the center of a platform of stone, 5 feet high and 8 feet square. A cross cut on a stone in situ bears 35° (magnetic), distant 90 feet.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Kihe
STATE: Hawaii
COUNTY: Hawaii
Established by: H.O.S.
Year: 1876
Surveyed by M.S. Hurley
Year: 1898

Detailed statement as to the source of the original description:

Location of Station: In the northern part of Hawaii on the northeast crater rim of the hill called Pii Kihe. This hill is situated on the northeast slope of Mauna Kea at the upper limits of Kukuiu Ranch.

Old mark found: The original manmade post marking the station could not be found but a 1 1/2 inch pipe in concrete set in the middle of the large rock pile which covered the original station was found. This mark was set by Jas. B. Ham private surveyor, and has been adopted since the only tie mark established in 1876 has been destroyed presumably by wild pigs which have uprooted the grounds surrounding the station.

New Station Marks: H.T.S. Type D monument.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Kihe
STATE: Hawaii
COUNTY: Hawaii
Established by: U.S. Coast and Geodetic Survey
Year: 1898
Surveyed by C. B. Russell
Year: 1949

Detailed statement as to the source of the original description:

The original station, "A manmade post in the center of a platform of stone, 8 feet high and 8 feet square," was not recovered. In 1898 the Hawaii Terrestrial Survey wrote the following notes on this station. "The original manmade post marking the station could not be found but a 1 1/2 inch iron pipe in concrete set in the middle of a large rock pile which covered the original station was found. This mark was set by Jas. B. Ham private surveyor, and has been adopted since the only tie mark established in 1876 has been destroyed presumably by wild pigs which have uprooted the grounds surrounding the station." In 1899 the Territorial Survey surveyed this station with a triangular slab of concrete, 6 feet on each side, leaving the 1 1/2 inch pipe exposed to view. This mark was recovered in good condition. The reference mark was not recovered. Two reference marks were established. A new description follows:

The station is located on the northeast slope of Mauna Kea, on the northwest rim of Kihe crater, about 10 miles south southeast of Hilo, about 6 miles south south of the Kekaha Kauai Headquarters, about 0.1 mile north of the Puu Kihe ranch house and about 0.1 mile northwest of a track road. Higher ground is about 500 feet southwest of the station.

To reach from the post office at Hilo, go northerly on the road toward Hangoa, for 26.5 miles; pass the Hangoa Post Office and continue northerly toward Hangoa, for 12.2 miles to telephone pole number 176.

(continued on next page)
HORIZONTAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

QUAD 193551
STATION 1093

LATITUDE ° ' "
LONGITUDE ° ' "

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEAN SERVICE
NATIONAL GEOGRAPHIC SURVEY

KIDE (continued)

Turn left and go south and west, toward the Kukuiu Ranch for 4.1 miles; pass through a board gate and continue westerly for 0.2 miles; pass through the normal and continue westerly, on a poor track road, for 1.2 miles; pass to the right hand side of two large water tanks and continue southwesterly for 2.7 miles; turn left, as per the sign reading Kakekaneo, and go southerly for 0.25 mile; pass through a board gate and continue south for 0.2 mile; turn right and go southerly for 0.35 mile; pass to the right hand side of a large rain shed and follow the 4th track road, southeasterly, for 2.6 miles to the road and end of truck travel. From this point you are for about 0.1 mile to the summit of the northeastern rim of the crater and the station. From the summit you can obtain the island house 0.25 mile south of the station.

The station is the center of a 1 1/2 inch iron pipe which projects about 2 inches above an irregular mass of concrete which is flush with the surface of the ground.

Reference mark number 1 is a standard disk, stamped "PUE KINE HS 1949", set in a drill hole in a boulder which is about 1 foot in diameter and 1.7 feet lower than the station.

Reference mark number 2 is a standard disk, stamed 01-1949, set in a drill hole in a boulder which is about 4 feet in diameter and projects about 3 feet. It is located 1.5 feet higher than the station.

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>BEARING</th>
<th>DISTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>KIDE No. 1</td>
<td>E 59.04°</td>
<td>0.25 m</td>
</tr>
<tr>
<td>KIDE No. 2</td>
<td>E 39.94°</td>
<td>0.25 m</td>
</tr>
</tbody>
</table>

KIDE was recovered on 26-3-1949.

Station was recovered and all marks found in condition.

A complete description follows:

Station is located about 12 miles southwest of Laopehale, 5-1/2 miles south of the Kukuiu Ranch Headquarters in Uahe Village, and 0.2 mile north of the old Pue Kine Ranch buildings, on the southeast rim of Kike Crater, a bare, grassy hill of about 782 feet elevation.

To reach station from the post office at Laopehale, go northwest for 0.1 mile; turn left and continue northwest, on State Highway 19, for 9.1 miles to telephone pole #170 on left. Turn sharp left and go 6.5 miles to Kukuiu Ranch buildings. Continue west for 0.1 mile; pass through board gate and continue on track road, toward mountain, for 0.8 mile to board gate. Pass through gate and continue for 0.1 mile; pass through a board gate and continue for 0.90 mile to board gate by wooden tank. Pass through gate and continue for 1.2 miles to gate at a T fence intersection.

Pass through gate and go 0.05 mile to side road right and sign HANAIPOE 5.95. Continue ahead for 0.7 mile to fork. Take right fork and go south 0.75 mile to board gate above large rain shed and tanks.

Pass through gate and continue for 2.2 miles to fork near large tank and catchment basin at southwest base of station hill. Take left fork and go east 0.15 mile to end of truck travel by cinder quarry. Pack north up and along hill about 200 yards to station. NOTE: A 4-wheel drive truck is required after leaving ranch headquarters.

Station mark is the center of a 1 1/2 inch iron pipe that projects 1 inch from the center of a triangular concrete platform 7 feet on each side and flush with ground. A 2 1/2 inch iron pipe is mounted vertically over the mark, supported by 3 iron legs embedded in the concrete platform, and holds a metal target 7 feet tall. Station is about 250 feet north of highest point of the hill.

Reference mark number one is a standard disk stamped "PUE KINE HGS NO 1 1949", cemented in a drill hole in an 18-inch, pointed, triangular rock outcrop that projects 1 foot above ground. It is about 4-1/2 feet lower than station mark.

Reference mark number two is a standard disk cemented in a drill hole in a large rock, lava outcrop 7 feet in diameter, and projects 1 foot. It is about 4-1/2 feet higher than station mark. Stamped "PUE KINE HGS NO 2 1949".

*Note: Chief of party should be informed here. The officer who actually placed the station should sign his name at the end of the recovery note.

NOTE: One of these forms must be used for every station recovered.
**HORIZONTAL CONTROL DATA**

by the National Ocean Survey
OLD HAWAIIAN DATUM

**ADJUSTED HORIZONTAL CONTROL DATA**

**NAME OF STATION:** KOLE  
**STATE:** HAWAII  
**YEAR:** 1891  
**THIRD ORDER**

<table>
<thead>
<tr>
<th>DEGREECTIC LATITUDE</th>
<th>ELEVATION</th>
<th>DEGREECTIC LONGITUDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>19° 46' 02.081</td>
<td></td>
<td>155° 25' 14.491</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>Z (M.D. R. ANGLE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>9101</td>
<td>524,795.36</td>
<td>333,097.09</td>
<td>0 01 35</td>
</tr>
</tbody>
</table>

*Plan Azenith has been computed by the S U.G. N. Formula, neglecting the second term.*
HORIZONTAL CONTROL DATA

by the National Ocean Survey
OLD HAWAIIAN DATUM

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KOLE-M
STATE: HAWAII
YEAR: 1877
THIRD ORDER

SOURCE: G-SP156

<table>
<thead>
<tr>
<th>DEGREE LATITUDE</th>
<th>ELEVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>19° 33' 15.239&quot;</td>
<td>196.9154</td>
</tr>
<tr>
<td>155° 27' 06.914&quot;</td>
<td>382.84256</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>PLANE AZIMUTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>516918.44</td>
<td>382.84256</td>
<td>+ 0 00 55</td>
</tr>
</tbody>
</table>

*PLANE AZIMUTH HAS BEEN COMPUTED BY THE J. UMN. E. FORMULA NEGLECTING THE SECOND TERM*
DESCRIPTION OF TRIANGULATION INTERSECTION STATION

NAME OF STATION: Kukio Bay, Range Front Light

CHIEF OF PARTY: C.K. Townsend

Year: 1976

STATE: Hawaii

COUNTY: Hawaii

Description, including chain of evidence:

Located in the city of Hilo, at Kukio Wharf Pier 61 on the western shore of Kukio Bay. Station is located in an unloading area for container ships.

The station is the metal pole that supports a green directional navigation light 70 feet above the ground. A daymark is displayed in front of the light.

Station Kukio Bay Range Front Light 1975 as described in 1975 by R.B.M. has been relocated 80 meters east. It should be noted that this description is for the 1976 position, and a recovery note for the 1975 position has been submitted stating Kukio Bay Range Front Light has been destroyed. It should be noted that this station is listed as Hilo Harbor Range Front Light in the 1976 Coast Guard Light List Vol. III.

HORIZONTAL CONTROL DATA

QUAD 191551

HAWAI'I

LATITUDE: 19 49' 07", 74'06"

LONGITUDE: 155 03' 23", 06'09"

DIAGRAM: NE 2-1-3

HAWAI'I

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KUKIO BAY RANGE FRONT LIGHT

STATE: HAWAI'I

YEAR: 1976

THIRD ORDER

SOURCE:

4-10-241

STATE COORDINATES (X,Y,Z)

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>P O.C. X ANGLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1 1</td>
<td>3101</td>
<td>632,644.88</td>
<td>327,004.63</td>
<td>+ 0° 09' 00&quot;</td>
<td></td>
</tr>
</tbody>
</table>

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE X-Y-Z-CORRUGATED FORMULA, NEGLECTING THE SECOND TERM.

STATE CODES (X,Y,Z)

<table>
<thead>
<tr>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>105</td>
</tr>
<tr>
<td>155</td>
</tr>
<tr>
<td>3101</td>
</tr>
</tbody>
</table>

THESE DATA OBTAINED FROM ADJUSTMENT OF JAN 1979

3A 095
HORIZONTAL CONTROL DATA

DESCRIPTION OF TRIANGULATION INTERSECTION STATION

NAME OF STATION: Kuhio Bay, Range Rear Light


Description, including sketch of object:

Located in the city of Hilo, along the south shore of Pohio Bay, about 250 yards east-southeast of the inner end of the Hilo Harbor Breakwater. The station is the spindles that support a green, directional, navigational light on a tall, slender, skeleton tower. The light is about 125 feet above sea level. Designated as No. 3677 in the publication "Light List, Volume III, Pacific Coast and Pacific Islands, 1975".

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Kuhio Bay, Range Rear Light

ESTABLISHED BY: R.B.N.  YEAR: 1975  STATE: Hawaii  BENCH MARKS ALSO

RECOVERED BY: C.P. Townsend  YEAR: 1976  COUNTY: Hawaii

AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:

Located in Hilo

Detailed description as to the features of the original descriptions, including marks found, changes made, and other pertinent facts:

Recovered in good condition as described in 1975. It should be noted that this station is listed as Hilo Harbor Range Rear Light in the 1976 Light List Vol. No. 3.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KUHIO HARBOR RANGE REAR LIGHT

STATE: Hawaii  YEAR: 1976  THIRD ORDER

SOURCE: 16.42

<table>
<thead>
<tr>
<th>GEOGRAPHIC LATITUDE</th>
<th>GEOGRAPHIC LONGITUDE</th>
<th>ELEVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>19° 45' 02.9737&quot;</td>
<td>155° 03' 07.4332&quot;</td>
<td>327.684.25</td>
</tr>
</tbody>
</table>

STATE COORDINATES (feet):

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>H &quot;R&quot; &quot;a&quot; &quot;R&quot;, &quot;ANGLE&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>5106</td>
<td>654.037.84</td>
<td>327.684.25</td>
<td>+ 00 00 09.05</td>
</tr>
</tbody>
</table>

This data obtained from adjustment of Jan 1979
HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

KULANI (HGS)
(Hawaii Island, Hawaiian Government Survey, 1891).—Southeast of the center of Hawaii, on the summit of Kulanu Cone, a conspicuous hill at the junction of the lands of Waiawa, Ola, and Kauhau. Marked by a copper bolt set in a block of concrete, and a huge "ahu" of hapuu logs.

RECOVERY

COORDINATES OF TRIANGULATION STATION

NAME OF STATION: KULANI (HGS)
STATE: Hawaii County, Hawaii
Established By: Hawaiian G.S., 1891
Chief of Party: F. J. Hesmerger, Year 1900

NOTE: Height of telescope above the station base is 1.90 meters.

DISTANCES AND DIRECTIONS TO ADJACENT MARKS, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN HE SEEN FROM THE CURVED AT THE STATION

OBJECT

MARK

DISTANCE (METERS)

DIRECTION

ADJACENT MARK

N 0° 00' 00"

Hilo Radio Mast (KIPA)

W 0° 18' 00"

SE 0° 29' 02"

8° 03' 09"

10° 03' 09"

45' 06' 15"

The station is located on the summit of Kulanu Cone which lies about 20 miles southwest 44 degrees west of Hilo; about 8 miles southwest of Kulanu Prison Camp and about 0.4 mile west of the end of the road at the small pond. The station hill is the highest ground in the vicinity.

This station was established by the Hawaiian Government Survey in 1891 and was recovered in good condition.

To reach from the post office at Hilo, go westerly on the road which leads toward Waimea; for 0.1 miles, follow the road for 1.8 miles; then turn left at the sign reading "Kulanu Prison Camp" and go southerly for 7.3 miles; then turn right and go southwesterly for 11.7 miles; pass through the gate into the prison yard; and continue south for 0.6 miles; turn left and follow the graded road, southerly, for 0.6 miles; turn right and pass the right hand side of two large water tanks and continue south for 1.7 miles to the end of the road at a small pond and pump house. From this point head southwest, up the steep slope, for about 0.6 mile to the top of the hill and the station.

The station is the center of a 1 inch copper bolt which projects about 2 inches from the top of a concrete post which is 6 inches square. Reference mark number 1 is a standard disk, stamped KULANI NO 1 1949, set in the top of a 1 1/2 inch pipe which projects about 10 inches above the ground.

Reference mark number 2 is a standard disk, stamped KULANI NO 2 1949, set in the top of a 1 1/2 inch pipe which projects about 10 inches above the ground.

The azimuth mark is a standard disk, stamped KULANI 1940, set in the top of a 1 inch pipe which projects about 4 inches. It is located about 2 miles north northeast of the station, 20 feet southeast of the center of the prison gate and 50 feet west of the center of the road.

(continued on next page)
HORIZONTAL CONTROL DATA
by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN STATION

KUALANI (H83) (continued)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY • NATIONAL GEODETIC SURVEY

RECOVERY NOTE: TRIANGULATION STATION

NAME OF STATION: KUALANI (H83) YEAR: 1891 STATE: Hawaii
Island: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK
0.44 METER
HEIGHT OF LIGHT ABOVE STATION MARK
1.64 METER

DISTANCES AND DIRECTIONS TO REFERENCE MARKS, MEASURES, AND OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>BEARING</th>
<th>DISTANCE FEET</th>
<th>DISTANCE METER</th>
</tr>
</thead>
<tbody>
<tr>
<td>KLAH</td>
<td>28.287</td>
<td>8.618</td>
<td>28 00 00</td>
</tr>
<tr>
<td>KLAH</td>
<td>37.952</td>
<td>11.552</td>
<td>37 03 58</td>
</tr>
<tr>
<td>KHAH</td>
<td>28.186</td>
<td>8.580</td>
<td>28 09 50</td>
</tr>
<tr>
<td>KHAH</td>
<td>36.928</td>
<td>11.412</td>
<td>36 29 49</td>
</tr>
<tr>
<td>Hawaiian Tel. Co., Micro-wave tower</td>
<td>222 57 27.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base B (H83) (Azimuth mark)</td>
<td>282 01 17.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Station mark and both reference marks were recovered in good condition. The azimuth mark was found destroyed so a survey mark of the Hawaii State Survey was used for a new azimuth mark. There is now a road to top of hill, also a telephone micro-wave relay tower and a smaller antenna on top of hill. A complete description follows:

Station is located about 20 miles southeast of Hilo and 2 miles south of Kualani Honor Camp, on the summit of Kualani Cone, a brush-covered hill of about 5518 feet elevation.

To reach station from the junction of State Highways 19 and 11, about 1-½ miles east of Hilo, go south on State Highway 11 for 4.0 miles to sign "KUALANI 19". Turn right and go 18.9 miles to entrance to Kualani Honor Camp. Continue ahead for 0.15 mile; take left fork and go 0.1 mile to crossroad by gas pumps. Turn left and go 0.1 mile to crossroad. Turn right and go along telephone and power lines for 1.15 miles to fork. Take right fork, along power line, for 0.85 mile to top of hill and station.

NOTE: A 4-wheel-drive vehicle is required for lane mileage.

Station is marked with a 1-inch copper pin projecting 2 inches from the top of a 7-inch-square, concrete monument that projects 3 inches from ground. It is 10 feet southwest of edge of cutbank, 63 feet northeast of a 40-foot, 3-legged radio antenna and 21 feet northwest of base of antenna guy-cable.

Reference mark number one is a standard disk stamped "KUALANI NO 1 1949", cemented in the top of a 1-½-inch iron pipe projecting 3 inches. It is 12 feet southwest of cutbank and 2.7 feet lower than station mark.

Reference mark number two is a standard disk stamped "KUALANI NO 2 1949", cemented in the top of a 2-inch iron pipe projecting 5 inches. It is 17 feet north-northeast of the radio antenna, 25.4 feet east of a wooden power pole, and 8 inches higher than station mark.

Base B (H83) will serve as the azimuth mark. It is a 6-foot-square, concrete platform, with a tapering, concrete pillar about 18 inches high, at the center. A 2-½-inch iron pipe is in the center of the pillar, and
HORIZONTAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

QUAD 191551
STATION 1098

LATITUDE \* \* TO \* \*
LONGITUDE \* \* TO \* \*
DIAGRAM

of the edge of a cutbank.
Reference mark 1 is a standard disk stamped KULANI NO 1 1949. It is cemented in the top of a 1-1/2 inch iron pipe that projects about 3 inches above the ground surface and is about 3 feet lower than the northeast of an 8-inch tree.

Reference mark 3 is a standard disk stamped KULANI 1891 NO 3 1977. It is cemented in a drill hole in the northeast corner of the concrete base of an electric generator and projects about 3 inches above the ground surface. It is 24.6 feet east of a power pole, 12.6 feet west of the triangular shaped radio tower and 5.5 feet northeast of the northeast corner of a small metal building.

Azimuth mark is the center of a 2-1/2 inch iron pipe that is cemented in the center of a tapering concrete pillar that projects about 2 feet above its 5 foot square concrete foundation, with the letters BASE B, inscribed in the foundation. It is 237 feet southeast of a metal light pole and 68 feet northeast of a power pole number 5.

U.S. DEPARTMENT OF THE INTERIOR
GEODESY AND GEOMATICS ENGINEERING
WASHINGTON, D.C.

REPORT ON PERMANENT SURVEY MARK

Acrobatic Latitude 21° 31' 59.79" N
Longitude 155° 17' 09.280" W

LATITUDE

8585 feet

ELEVATION

0.00

Type

9

Established by

USGS

Remarks or Revised Description:
The station was recovered in good condition as described in recovery note by D. H. Whipp in 1967. Description adequate.

Yukio Yamamoto

Submittal Date: 12/26/76

FILL IN ALL AVAILABLE INFORMATION

USGS FORM 76-31A

311-71R
HORIZONTAL CONTROL DATA

by the National Ocean Survey
OLD MAUNA KEA DATUM

ADJUSTED HORIZONTAL CONTROL DATA

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>Bearing</th>
<th>Distance FEET</th>
<th>Distance METERS</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kulani HGS 1891 EK I</td>
<td>SSE</td>
<td>3143.199</td>
<td>00 00 00 00.0</td>
<td></td>
</tr>
<tr>
<td>Kulani HGS 1891</td>
<td>SSE</td>
<td>3136.932</td>
<td>00 06 28.8</td>
<td></td>
</tr>
<tr>
<td>Camp Inc. CABLE TV Mast</td>
<td>SSE</td>
<td>About 2 miles</td>
<td>30 38.9</td>
<td></td>
</tr>
<tr>
<td>Hawaiian Telephone Co TIMES TOWER</td>
<td>SSE</td>
<td>About 2 miles</td>
<td>00 47 34.0</td>
<td></td>
</tr>
</tbody>
</table>

The station is located about 20 miles southwest of Hilo, 12 miles west of Mountain View and at the Kulani Honor Camp.

To reach the station from the junction of State Highways 19 and 11 which is about 1/4 mile east of Hilo, go south on Highway 11 for 4.0 miles to a crossroad and sign, Kulani 19. Turn right and go one mile to a horse fork on the right, continue westward on the paved road for 13.55 miles to an iron gate, located at times, continue westward on the paved road for 5.2 miles to an iron gate and the entrance to the Kulani Honor Camp. Continue southwest for 0.2 mile to the office building on the right, continue ahead for 0.5 mile to some gas pumps on the left, bear right and go westerly on the gravel road for 0.5 mile a mile on the right. Turn right on a gravel road and go 0.05 mile, passing to the left of some buildings, then left across rocky terrain for 0.05 mile to a slight rise and the station.

The station is the center of a 2-1/2 inch iron pipe that is cemented in the center of a tapering concrete pillar that projects about 2 feet above its 5 foot square concrete foundation, with the letters "HKS" D, inscribed on the foundation. It is 237 feet southwest of a metal light pole and 68 feet northeast of a power pole number 5.

*Person in charge of party should be inserted here. The person who actually visited the station should sign his name at the end of the recovery note.
HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KULANI RH 1
STATE: HI
YEAR: 1978
OBS BY: NGS
SOURCE: 0-10-41

<table>
<thead>
<tr>
<th>DEGREES</th>
<th>MINUTES</th>
<th>SECONDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>31</td>
<td>24.43</td>
</tr>
<tr>
<td>155</td>
<td>4.08</td>
<td>33</td>
</tr>
</tbody>
</table>

ELEVATION: 1682.1
HEIGHT: 5519

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>566,292.33</td>
<td>250,646.02</td>
</tr>
</tbody>
</table>

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE 2 WIDTH FORMULA NEGLIGEABLE THE SECOND TERM.

TO STATION OR OBJECT | GEOGRAPHIC AZIMUTH | PLANE AZIMUTH | CODE |
|---------------------|--------------------|---------------|------|

THese DATA OBTAINED FROM ADJUSTMENT OF JAN 1979

JAN 099
NO ORIGINAL TEXT
Laimi (Hawaii Island, Hawaiian Government Survey, 1877; E. R. Hand, 1912).—On east coast of Hawaii in North Hilo, land of Laimi, on main road between Honomu and Pepekeko, at No. 1 camp of the Honomu plantation. It is about 60 meters (estimated) S. 10° W. from the camp flagpole. The station was marked by a large stone marked with a cross, in center of which is an iron bolt in drill hole. In 1912 it was reported that it was believed that the true position of this station had been permanently lost, and that the mark was 1 meter or more out of place. When standing at camp flagpole the station would appear midway between porch post and corner of nearest house.