HORIZONTAL CONTROL DATA
by the National Ocean Survey
OLD HAWAIIAN DATUM

NO TEXT

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: AHUOLA
STATE: HAWAII
YEAR: 1914
THIRD ORDER

SOURCE: G-SPI2
NO OBSERVATION CHECK ON THIS POSITION

DEG. DEC.   ELEVATION (METERS)
LATITUDE: 19° 05' 40.6"
LONGITUDE: 159° 34' 36.46"

ELEVATION:}

STATE COORDINATES (FT):

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>Z (OR D)</th>
<th>ANGLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
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<td>3580400.41</td>
<td>53035.15</td>
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</tr>
</tbody>
</table>

* PLANE AZIMUTH HAS BEEN COMPUTED FROM THE SINES FORMULA ABOLISHING THE SECOND TERM

<table>
<thead>
<tr>
<th>TO STATION OR OBJECT</th>
<th>DEG. DEC.</th>
<th>PLANAR AZIMUTH</th>
</tr>
</thead>
</table>

| CODE | 4G 284 |
HORIZONTAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

AKIHI (continued)

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: AKIHI
ESTABLISHED BY: H.B.
YEAR: 1890
STATE: Hawaii
RECOVERED BY: S.M. Whipp
YEAR: 1907
COUNTY: Hawaii
AIRCRAFT DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

Station was recovered in good condition. All lines are now blocked by Ohi'a trees. It is now possible to drive within 75 yards of the station. A complete description follows:

Station is located about 0.5 miles west-northwest of Kkealaleu and 2 miles north of State Highway 11, on the tiki-covered south rim, and highest point, of an old volcanic crater, at about 2850 feet elevation, along a tiki-covered ridge, on Kamoku Ranch property.

To reach station from the post office in Kaalehu, go west on State Highway 11 for 6.7 miles to red cinder side road right, at sign "KAMOKU RANCH". Turn right and go 0.55 mile; take left fork and go 0.3 mile to landing strip; continue ahead for 1.1 miles to side road right, 50 yards before corrals. Go right, up steep grade, for 0.35 mile to crossroad. Turn left and follow track road along ridge line for 0.35 mile to bladed side road left. Go left 0.1 mile to end of truck travel. Pack northward up through ferns and brush about 75 yards to high point and station.

Station is marked by a 2-1/2-inch, iron pipe 2 feet long, mounted vertically over a 4-inch hole in the center of a triangular, concrete platform 7 feet on each side and flush with the ground. A metal target, set into the 2-foot pipe, extends 8 feet above the platform.
HORIZONTAL CONTROL DATA

NO TEXT

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: ALILI
STATE: HAWAII
YEAR: 1854
THIRD

SOURCE: G-SP156

DESCRIPTIVE LATITUDE: 19° 14.28'
DESCRIPTIVE LONGITUDE: 155° 31.12'

STATE COORDINATES

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
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<tr>
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<td>5101</td>
<td>444.142.98</td>
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<td>-0 00 20</td>
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*THE AZIMUTH HAS BEEN COMPUTED BY THE 'F. D. P.' FORMULA NEGLECTING THE SECOND TERM

TO STATION OR OBJECT | GEOGRAPHIC AZIMUTH | PLANE AZIMUTH* | CODE
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Q3 254</td>
</tr>
</tbody>
</table>
HORIZONTAL CONTROL DATA

by the
National Ocean Survey
Old Hawaiian Datum

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: AUAA
STATE: HAWAII
YEAR: 1972
SECOND: 1

SOURCE: S-14950

STATION 1004
HAIF
LATITUDE 19° 00' TO 19° 37'
LONGITUDE 155° 30' TO 156° 00'
DIAGRAM NE 5 1/2
HAWAII

ADJUSTMENT BY NGS
OBS BY NGS

STATION: AUAA
STATE: HAWAII
YEAR: 1972
SECOND: 1

PERIOD: 1972

H Horizon: 3
VERT: 1
SEAL: 3
SAD: 3

SCALING: 1 METERS
SCALING: 1 FEET

COORDINATES (DEGREES)

STATE CODE X Y Z
HI 5161 364,928.14 171,066.30 - 0 07 46

Plane Azimuth:

TO STATION OR OBJECT

Plane Azimuth (Degr. Sec.)

These data obtained from adjustment of Sep 1979

Detailed Description:

Station is located on the northern rim of an old volcano vent, approximately 12 miles south of Kealakekua Bay and 7 miles south of the town of Kealakekua, on the eastern coast of Hawaii island.

To reach station from State Highway 11, turn towards sea on Pebble Beach Estates road, about 1.1 miles south of Alae School and about 0.6 mile south of Pahoehe 2 lava flow of 1950. Road is paved and may have a gate across it. Follow road to beach, thence peak southward along shoreline about 1 mile to northern rim of an old volcano vent. Station is located at highest point of the northern rim, set in red-brown rock. It is staked "AUAA 1972".

Reference mark number 1 is a 1/4 inch galvanized pipe protruding about 12 inches from a circular mound of concrete about 15 inches in diameter. "REF POINT OCT 70 AEM" is inscribed on the concrete. This station was located by intersection from stations MOOKNA, FUIWA, and WAIRAKU H.

*Refers to errors in reading of computations and other publications of computations. Directional angle measured clockwise, referred to usual station.
1 To avoid some error, when no improvement leveling is being done.
Bara (Hawaii Island, E. K. Hand, 1914).-Near southwest coast of Hawaii, about 3 miles east by north from Okoe Bay, an immense barn (120 by 40 feet) formerly owned by W. R. Castle and used for tobacco drying, but now part of the Mrs. Allen estate, and controlled by Robert McWayne of Hoomaluhia. Station is the south-southwest gable of barn.

**Recovery Note:** Triangulation station

**Intersection:**

**Name of Station:** Barn

**Established by:** R. C. Hanson

**Year:** 1914

**State:** Hawaii

**County:** Hawaii

**Areal Distance and Direction from Nearest Town:** Island: Hawaii

**Detailed Statement:**

Station was recovered. It is a huge, weathered, gable-roofed barn, with rusted metal roof, located about 3-1/4 miles southeast of Milolii and 1/4-mile west of State Highway 11, on property of the Honouliuli Agriculture Co., and is 0.2 mile southwest along a track road from the company's office building.

---

**HORIZONTAL CONTROL DATA**

<table>
<thead>
<tr>
<th>Station Number</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>1005</td>
<td>19° 55' 55.8030S</td>
<td>159° 52' 12.3540W</td>
</tr>
</tbody>
</table>

**ADJUSTED HORIZONTAL CONTROL DATA**

<table>
<thead>
<tr>
<th>Station Number</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>1005</td>
<td>19° 55' 55.8030S</td>
<td>159° 52' 12.3540W</td>
</tr>
</tbody>
</table>

**Geodetic Coordinates:**

<table>
<thead>
<tr>
<th>State &amp; Zone</th>
<th>Code</th>
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<th>(y)</th>
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<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>372,275.93</td>
<td>120,755.82</td>
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</table>

**Plane Azimuth:**

- Plane azimuth has been computed by the A-1 technique, neglecting the second term.
HORIZONTAL CONTROL DATA

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: BISHOP
STATE: HAWAII
COUNTY: KONA DISTRICT
HAWAII

CHIEF OF PARTY: L. O. WILDER
YEAR: 1948

Hawaii County Survey

O. J. HOEPPLE

NOTE: 1) HORIZONTAL ANGLES READ TO MINUTES
2) NUMERICAL VALUES ARE GIVEN TO THE NEAREST MILLIMETER
3) HEIGHT OF STATION DETERMINED BY METHODS OF VARIOUS SURVEYORS
4) COORINDATES DETERMINED BY HAWAIIAN SYSTEM OF SURVEY

1a) SURFACE MARK

DISTANCES AND DIRECTIONS TO ADJACENT MARKS, REFERENCE MARKS AND PROMINENT OBJECTS

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>MEASURING</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>KALAPA</td>
<td>SW</td>
<td>11,610</td>
<td>00 00 00</td>
</tr>
<tr>
<td>R. M. 2</td>
<td>ENW</td>
<td>20,682</td>
<td>55 32 35</td>
</tr>
<tr>
<td>R. M. 1</td>
<td>ENW</td>
<td>20,682</td>
<td>55 32 35</td>
</tr>
</tbody>
</table>

The station is located on the edge of a cultivated lot about 3 miles south southeast of Kealakekua, about 2 miles east of Napoopoo, about 100 feet west of a small shack, about 100 feet east of a road intersection, 57 feet northeast of telephone pole number 893, 32 feet north of the center of a graded road and about 10 feet higher than the road.

To reach from the post office at Captain Cook; go southerly, on the road which leads toward Keokea, for 2.9 miles to telephone pole number 893; turn left, onto a graded road, and go easterly for about 100 feet to the station on the bank to the left hand side of the road.

The station is a standard disk, stamped BISHOP 1948, set in the top of a square concrete post which projects about 5 inches, and in a 1 inch pipe which is the Bishop Estate survey station "BISHOP".

Reference mark number 1 is a standard disk, stamped BISHOP NO 1 1948, set into a drill hole in a boulder which projects about 4 inches. It is located 39 feet north of the center of a graded road and is about 2 feet higher than the station.

Reference mark number 2 is a standard disk, stamped BISHOP NO 2 1948, set into a drill hole in a boulder which projects about 5 inches. It is located 22 feet north of the center of a graded road and about 2 feet lower than the station.

The distance between reference mark number 1 and reference mark number 2 is 8,950 m or 29,361 feet.

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

by the

NATIONAL GEODETIC SURVEY

H.G. Munson

NAME OF STATION: BISHOP

ESTABLISHED BY: L.C. Wilder YEAR: 1948 STATE: Hawaii

RECOVERED BY: H.G. Munson YEAR: 1968 COUNTY: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION METER: 1.5 DISTANCE FROM GROUND METER:

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>BEARING FEET</th>
<th>DISTANCE METER</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.A.E. KANOKI (POS) 1864-1948</td>
<td>ENE</td>
<td>20,862</td>
<td>40,639</td>
</tr>
<tr>
<td>KEEI SOUTH BASE</td>
<td>SW</td>
<td>11,810</td>
<td>34,357</td>
</tr>
<tr>
<td>H.M. No. 1</td>
<td>SW</td>
<td>11,799</td>
<td>34,353</td>
</tr>
<tr>
<td>H.M. No. 2</td>
<td>SW</td>
<td>11,799</td>
<td>34,353</td>
</tr>
</tbody>
</table>

Station was recovered and all marks found in good condition. A house has been built nearby. The distance and angle to H.M. No. 1 was not checked as the line is blocked by a large tree fern. A complete description follows:

Station is located about 21/2 miles southeast of Captain Cook and 2 miles north of Honouliuli, along the northeast side of State Highway 11, in front of a small house on a coffee grove, about 5.5 feet higher than the highway, on small, flat area just above driveway.

To reach station from the post office at Captain Cook go southeast on State Highway 11 for 2.5 miles to driveway on left, near telephone pole No. 891. Park left and go up driveway for 100 yards to house on left on flat above drive, and station.

Station mark is a standard disk stamped "BISHOP 1948", set in the top of a 10-inch-square, concrete monument that projects 7 inches above ground. It is 15.5 feet southeast of edge of house, 56 feet east of telephone pole No. 891, 12.3 feet east of power pole No. 1, 10 feet north of the northwest 1 of 2 coconut palms, and 10 feet northwest of line extended from southeast end of house.

Reference mark number one is a standard disk stamped "BISHOP NO 1 1948" cemented in a small hole in a boulder that projects 4.5 inches above ground. It is 9.5 feet south of southwest corner of the house and 1 foot southeast of a large tree fern which blocks the line to station mark.

Reference mark number two is a standard disk stamped "BISHOP NO 2 1948" cemented in a small hole in a small bedrock outcrop that projects 6 inches above ground, and 2 feet lower than station mark.

**RECOVERY NOTE, TRIANGULATION STATION**

NAME OF STATION: BISHOP

ESTABLISHED BY: L.C. Wilder YEAR: 1948 STATE: Hawaii

RECOVERED BY: H.G. Munson YEAR: 1976 COUNTY: Hawaii

Station mark and Reference marks 1 and 2 were recovered as described by H.G. Munson (1968) in good condition.
HORIZONTAL CONTROL DATA

by the National Ocean Survey
OLD HAWAIIAN DATUM

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: BOUNDARY MONUMENT 4
STATE: HAWAII
YEAR: 1948
SECOND

SOURCE: G-9275
NO OBSERVATION CHECK ON THIS POSITION

GUARDIAN LATITUDE: 19° 16' 05.437
GUARDIAN LONGITUDE: 159° 55' 18.328
ELEVATION: 230.713,57

STATE COORDINATE SYSTEM:
STATE CODE ELEVATION (FEET)
HI 1 3101 359,720.08 230.713.57 0 08 26

PLANE ABNO. HAS BEEN COMPUTED BY THE FORMULA, NEGLECTING THE SECOND TERM

POSITION DETERMINED BY TRAVERSE FROM STATION KEEI NORTH BASE
Station was visited and found to be nearly gone, with only a few of the base rocks left, so was rebuilt. Angles were checked to it from stations OHEPUPU, NIUOU and HANAKEAUKO and found to differ somewhat from the 1948 angles.

Station is a 3-foot cairn, located about 4-1/2 miles south of Milolii, 1/2-mile south of station NIUOU 1948, 1600 feet east-southeast of Kanewa Point and 3500 feet west-northwest of a bombing target, on a high point in rough, jagged lava area.
HORIZONTAL CONTROL DATA

Captain Cook's monument (Hawaii Island, E. R. Hand, 1928).—On west coast of Hawaii, a well-known and conspicuous monument standing at the north end of Kealakekua Bay. It is an obelisk of concrete, built in 1876, and stands in a tiny grass plot on the shore, inside a square inclosure formed by cannon upright in cement, with heavy chain pendant from gun to gun.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Captain Cook's Monument
ESTABLISHED BY: R. K. Hand
YEAR: 1926
STATE: Hawaii
COUNTY: Hawaii
RECOVERY BY: R. K. Hand
YEAR: 1926
STATE: Hawaii
COUNTY: Hawaii

Detailed statement as to the limits of the original description, including marks found, omissions made, and other pertinent facts:

Station was recovered. Located about 2.1/4 miles southeast of Kealakekua and 1 mile northwest of Hanaupu Point, in the north end of Kealakekua Bay, at east side of Keokua Point, about 1300 feet northeast from Hanaupu Light.

Station is a square, white, tapering, concrete monument, about 30 feet tall, with a pyramid top, set on a large concrete base. It is surrounded by a re-painted fence made of heavy chain supported by large cannon barrels set in cement.

The monument is 75 feet northwest from a small wants dock.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Captain Cook's Monument
ESTABLISHED BY: R. K. Hand
YEAR: 1926
STATE: Hawaii
COUNTY: Hawaii
RECOVERY BY: R. K. Hand
YEAR: 1926
STATE: Hawaii
COUNTY: Hawaii

Detailed statement as to the limits of the original description, including marks found, omissions made, and other pertinent facts:

Recovered as described by R. K. Hand.
### HORIZONTAL CONTROL DATA

By the National Ocean Survey
Old Hawaiian Datum

### QUAD 191553 STATION 1010

- **HAWAII**
  - **LATITUDE**: 19° 00' to 19° 30'
  - **LONGITUDE**: 155° 30' to 156° 00'
  - **DIAGRAM**: 51.5 HAWAII

### ADJUSTED HORIZONTAL CONTROL DATA

- **NAME OF STATION**: CAROL
- **STATE**: HAWAII
- **YEAR**: 1972
- **SECOND**: OEM

**SOURCE**: G-14950

- **DESCRIPTORS**
  - **GEODETIC LATITUDE**: 19° 23' 45.51755
  - **ELEVATION**: 527.3 ft
  - **GEODETIC LONGITUDE**: 155° 32' 19.21589

- **STATE COORDINATES (ft)**
  - **HI 1**: 5101

**STATE OF ORIGIN**

- **CODE**: 371,801,44
- **LAT**: 204,429.20
- **A**: 0° 17' 25.20

**PLAN ARMS (ft)**

- **LAE O KANONI**: 40° 00' 15.15
- **PLAN ARM**: 130° 15' 40.00

**DIAGRAM**: 51.5

---

**Note:**

- Stations to notes in manuals of triangulations and state publications of triangulations.
- **Distance—angle measured electronically, referred to initial station:**
- **To ensure meter units, when no trigonometric leveling is being done.**

### DESCRIPTION OF TRIANGULATION STATION

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>MEASURING</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAE O KANONI 1972</td>
<td>SW</td>
<td>73.44</td>
<td>22.550</td>
</tr>
<tr>
<td>R.M. No. 2</td>
<td>SW</td>
<td>23.69</td>
<td>7.230</td>
</tr>
<tr>
<td>H.M. No. 1</td>
<td>SW</td>
<td>00</td>
<td>00.0</td>
</tr>
</tbody>
</table>

**Station is located in a crushed lava rock pit, about 2 1/2 miles south-southeast of Honunau, about 2 miles northeast of Hookena, about 1 mile east of State Highway 11 on the west coast of the island of Hawaii.**

To reach station from post office at Honunau, go south on Highway 11 for 3.2 miles to the store in Hookena village. Continue on highway for 0.25 mile and turn left onto a gravel road. Go east 0.1 mile to chain gate, then another 0.2 mile to a levelled crushed lava rock pit. A rusty corrugated metal water tank about 5 feet high and 15 feet in diameter is located on left side of the gravel road 0.3 miles uphill from the rock pit and station. The rock pit is bordered on the southeast side by a unlevelled lava mound. Station is located about 60 feet north of the gravel road and about 10 feet west of a stand of Guava trees. It is cemented into a drill hole in a rock imbedded in the crushed lava and soil.

Station is a standard bronze disk stamped "CAROL 1972."

**Reference mark number 1 is located about 1 foot higher than station on the unlevelled lava rock and soil mound about 70 feet southwest of station. It is cemented in a drill hole in a 2 foot by 6 foot rock, 2.5 feet higher than surrounding ground. 10 feet northeast of the track road. It is a standard bronze disk stamped "CAROL NO. 1 1972."

**Reference mark number 2 is located about 10 feet south of the north border of the rock pit, about 2 feet lower than the station on a rock imbedded in crushed lava and soil. It is a standard bronze disk stamped "CAROL NO. 2 1972."**

**These data obtained from adjustment of Sep 1979**

**RL 181**
HORIZONTAL CONTROL DATA

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: FORREST
STATE: HAWAII
COUNTY: SOUTH KONA

CHIEF OF PARTY: L. C. WILDER
YEAR: 1946

Describer by: G. L. MURRAY

NOTES:
- Surface-distance mark
- Underground-distance mark
- Distances and directions to adjacent mark, reference marks and prominent objects which can be seen from the ground at the station

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>HEADING</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>KAPUKAWA</td>
<td>SSW</td>
<td>10.17</td>
<td>150° 31'</td>
</tr>
<tr>
<td>R. M. No. 1</td>
<td>NNE</td>
<td>3.102</td>
<td>31° 20'</td>
</tr>
<tr>
<td>R. M. No. 2</td>
<td>SSE</td>
<td>4.007</td>
<td>19° 30'</td>
</tr>
</tbody>
</table>

Located in the South Kona Forest Reserve in the land of Kipahouehoe, about two miles above the Government main road and one half mile south of the trail leading from the Government main road to the old Kapanu Ranch House. The station mark is a standard disk cemented in drill hole in solid rock on the highest point of a prominent wooded volcanic hill. The station is on the NE rim of three deep lava channels that intersect the hill and is near the angle formed by the channels running north and east. To reach the station, take the Kapuna Ranch trail which commences at a wooden corral on the upper side of the Government road about 1 mile south of the Oli Lodge (a roadside inn). Proceed easterly up a steep trail to a point about 2 miles distant. This trail follows on and near the north edge of a wooded lava flow and passes through open pasture in places. From this point proceed southerly through the forest of dense fern underbrush and scattered trees, for 1/2 mile. It is best located by using a barometer and following the 2500 foot contour as there are no trails through this area. R. M. No. 1 is NNE of the station and is a standard disk cemented in a drill hole in solid lava rock mound 1.2 feet high and 3 feet in diameter at its base. The RM is about the same elevation as the station mark. R. M. No. 2 is SSE of the station and is a standard disk cemented in a drill hole in solid flat lava rock which is at about the same elevation as the station mark.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: FORREST
ESTABLISHED BY: L. C. WILDER
YEAR: 1946
STATE: HAWAII
COUNTY: SOUTH KONA

Recovered by: R. C. Munson
YEAR: 1948
STATE: HAWAII
COUNTY: SOUTH KONA

AERIAL DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

Detailed statement as to the nature of the original description, including marks found, monuments, changes made, and other pertinent data:

Not recovered, although 2 days were spent in searching. The station is probably still in existence due to the isolated location, but is difficult to search for because of dense covering of Uluru fern up to 10 feet high in forest of large ohia trees.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: FORREST
STATE: HAWAII
YEAR: 1948
SEC. 072

SOURCE: G-9279

DEGREES & MINUTES

| GEODETIC LATITUDE | 15° 15' 03.668"
|------------------|------------------|
| GEODETIC LONGITUDE | 155° 51' 25.185"

ELEVATION: 830.0 FEET

PLANE COORDINATES (LMS)

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>(x)</th>
<th>(y)</th>
<th>(z)</th>
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</thead>
<tbody>
<tr>
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<td>5101</td>
<td>370,864.74</td>
<td>151,803.67</td>
<td>-0.0734</td>
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PLANES AND ADJUSTMENTS HAVE BEEN COMPUTED BY THE D.R.O. FORMULA, NEGLECTING THE SECOND TERM.

<table>
<thead>
<tr>
<th>TO STATION OR OBJECT</th>
<th>GEODETIC ADJUSTMENT</th>
<th>PLANE ADJUSTMENT</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>KAPUKAWA</td>
<td>39 51 17.8</td>
<td>39 51 21</td>
<td>5401</td>
</tr>
</tbody>
</table>

NOAA FORM 76-81
(11-71)
HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

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

NAME OF STATION: HAAO
STATE: HAWAII
RECEIVED BY: L. C. WILDER
YEAR: 1949
COUNTY: HAWAII

HAWAII

Description of Triangulation Station

No information is available on the original station. At the time of this survey a 1 inch drill hole was recovered in good condition. One reference mark was established. A new description follows:

The station is located in open pasture land about 3.0 miles north-west of Kaaialii, about 1 mile north of Waikini, about 300 yards southeast of Kaaialii Road, and about 100 yards east of a steel fence and about 90 yards east of a dirt road. A stone wall has been built over the station.

To reach the post office in Kaaialii, go north on the gravel road for 2.2 miles; turn left on a dirt road for 1.2 miles; pass through a board gate and follow the steel fence south for 0.1 mile; turn right on a dirt road, across country, for about 100 yards to the high ground and the station.

The station is the center of a 1 inch drill hole in a flat rock which is about 1 foot in diameter and projects about 3 inches. Reference mark number 1 is a standard disk, stamped 'R N 1 1949,' cemented in the top of a 2 1/2 inch iron pipe which projects about 4 inches and is at the same elevation as the station.

Object Distance

AKIHI (metal target) W 00 00 00
KIPAEPAK (metal target) SE 364 44 29.1
R. M. No. 1 W 356 14 05 27.030 ft 8.238 m

An old Hawaii Government Survey description states that this mark was a cross on a stone with a square or round hole at the center, a cairn built over same.

There is little question but that the 1949 recovery, is the old station unless the stone has been moved. It was found solid in the ground and there was a cairn of rocks over same.

Recovery Note, Triangulation Station

NAME OF STATION: HAAO
ESTABLISHED BY: L. C. WILDER
YEAR: 1949
STATE: HAWAII
STATE STATION MARKS: Also
RECEIVED BY: R. C. MUNSON
YEAR: 1968
COUNTY: HAWAII
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

Detailed examination on the line of the original description, including stakes found, occupancy, changes made, and other pertinent factors:

Station mark was recovered in good condition. RM No. 1 has been destroyed. The area has been developed into cane land and the station is now in the middle of a sugar cane field. No new RM's were set for this reason.

Station is located about 2 1/2 miles north of Kaaialii and 1 1/4 miles north-northwest of Waikini, at about 235 feet elevation, on point of hill to north up above a sharp jog in an irrigation canal, in cane field.

To reach station from the post office in Kaaialii, go east on State Highway 11 for 0.1 mile to crossroad. Turn left and go uphill for 2.1 miles to crossroad. Turn left and go west on main cane road for 2.5 miles to side road left; turn left and go southwest for 1.0 mile to side road left, where main road makes a sharp left curve. Turn right and go uphill for 0.2 mile to crossroad; turn left and go 0.1 mile to crest of ridge. Turn left and go down along hill through cane field about 500 feet to station.

Station is marked by a 1 inch drill hole in flat rock. There is a large, flat-topped stone piers built up around station mark.
HORIZONTAL CONTROL DATA

HAWAII

LATITUDE
19° 20' 15.30"

LONGITUDE
155° 51' 54.96"

ELEVATION
31.3

METERS
102

FOOT
336

STATE & ZONE
HI 1

CODE
5131

X
374.977

Y
183.243

Z
- 0.37 15

STATE COORDINATES (USNG)

PLANE AZIMUTH HAS BEEN COMPUTED BY THE \( \theta = \phi + \delta \) FORMULA NEGLECTING THE SECOND TERM

TO STATION OR OBJECT

GEODETIC AZIMUTH

PLANE AZIMUTH

COORD.

QO 278
HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: HALEPUSHAHA
STATE: HAWAII
YEAR: 1914
THIRD ORDER

SOURCE: G-SP156

<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>5101</td>
<td>418,217.56</td>
<td>113,533.24</td>
<td>0.0440</td>
</tr>
</tbody>
</table>

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

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

00 291
NO ORIGINAL TEXT

Hanakeaumoe (Hawaii Island, Hawaiian Government Survey, 1890; E. R. Hand, 1914).—On southwest coast of Hawaii, in South Kona, land of Kapua, about 365 miles south of Koke Bay, between Kanewaa Point and Ahulea (or Kamoi) Point, and 660 meters inside the cliffs. Station is on a sharp mound which rises abruptly some 15 meters above a level expanse of "aa" lava, and is noticeable for a long way up and down the coast. Marked by a cross cut in the rock. Over it a cairn was erected and painted white.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: HANAKEAUMOE
ESTABLISHED BY: Hawaiian Govt.
YEAR: 1890
STATE: HAWAII
COUNTY: KONA

Detailed statement as to the fitness of the original description: The original station was recovered in good condition. A standard disk was set in the center of the cove which was carved in the rock and two reference disks were established. A new description follows:

The station is located 6 miles south of Milolii, about 2 miles north of Lee O Kamoi, about 1.8 miles south of the southern boundary of the South Kona District, about 0.6 mile east of the sea and on the summit of a lava mound which rises about 40 feet above the level plane.

To reach from the schoolhouse in Waikiki; go north, on the road which leads toward Captain Cook, for 19.7 miles to triangulation station Kuhalei; turn left, onto a very poor graded road, and go westerly, down grade, for 6.4 miles to Lee O Kamoi and the end of truck travel. From this point pack northerly for about 2 miles to the prominent lava mound and the station.

The station is a standard disk, marked HANAKEAUMOE 1946, set into a drill hole in a boulder. A rock cairn was built over the station. Reference mark number 1 is a standard disk, marked HANAKEAUMOE R.M. NO. 1 1946, set into a drill hole in a boulder which projects about 4 feet and is about the same elevation as the station.

Reference mark number 2 is a standard disk, marked HANAKEAUMOE R.M. NO. 2 1946, set into a drill hole in a boulder which projects about 5 feet and is about the same elevation as the station.

Object Distance Direction

<table>
<thead>
<tr>
<th></th>
<th>ft</th>
<th>m</th>
<th>东</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEIWI</td>
<td>126.646</td>
<td>38.544</td>
<td>00</td>
</tr>
<tr>
<td>R. M. 2</td>
<td>224.584</td>
<td>68.210</td>
<td>10</td>
</tr>
<tr>
<td>R. M. 1</td>
<td>304.918</td>
<td>92.840</td>
<td>10</td>
</tr>
<tr>
<td>Calm</td>
<td>353</td>
<td>107.2</td>
<td>30.3</td>
</tr>
<tr>
<td>KANAHAWAI (metal target)</td>
<td>69</td>
<td>20.78</td>
<td>30.6</td>
</tr>
</tbody>
</table>

(continued on next page)
HORizontal Control DATA
by the NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

HanaKeaumoe (continued)

Name of Station: HanaKeaumoe
Established by: HGS
Recovered by: R.C. Munson
Year: 1890
State: Hawaii
County: Hawaii
Recovery station: Hawaii

Recovery Note: Triangulation Station

Recovery Method: Meters

Height of Line Above Station Meters: 1.73

Distance and Directions to Azimuth Marks:

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA FUU A FELE (HGS) 1891-1948</td>
<td>00 00 00.0</td>
<td></td>
</tr>
<tr>
<td>R.M. No. 2</td>
<td>6.16</td>
<td>5.00</td>
</tr>
<tr>
<td>R.M. No. 1</td>
<td>13.7</td>
<td>6.71</td>
</tr>
<tr>
<td>Cairn 1948</td>
<td>0 00 00</td>
<td>00 00 00.0</td>
</tr>
</tbody>
</table>

Station was recovered and all marks found in good condition.

Station is located about 5-1/2 miles south of Milolii, 4-1/2 miles southeast of the Honololai Agriculture Co. Office, 1-3/4 miles north of Kaolii Point, and 3800 feet south of a bomb target area, on a jagged, rocky hill of about 320 feet elevation, that rises about 50 feet above the surrounding smooth lava and grass flats.

To reach station from the post office at Hanaunau, go south on State Highway 11 for 19.7 miles to the Honololai Agriculture Co. drive on the right; continue on the highway for 1.3 miles to gravel crossroad between power poles 301 and 302. Turn right, through gate, and go 0.6 mile to a Navy electronics building. Continue downhill for 2.9 miles to fork at gate on left fork. Take right fork and go 1.4 miles to end road left, 75 yards before reaching second observation hut. Turn left and follow rough road for 1.3 miles to end of truck travel at target area. Pack south across fairly smooth lava land about 3/4 mile to station.

Station mark is a standard disk stamped "HanaKeaumoe", cemented in a drill hole in bedrock on top of a 10-foot-diameter, flat-topped, rock knob.

Reference mark number one is a standard disk stamped "HanaKeaumoe RM NO 1 1948", cemented in a drill hole in a sharp rock outcrop that projects 4 feet above ground. It is at about same elevation as station.

Reference mark number two is a standard disk stamped "HanaKeaumoe RM NO 2 1948", cemented in a drill hole in a large rock, 0.4 foot higher than station.

---

*Note of chief of party should be inserted here. The officer who actually visited 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.

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Survey
Hawaii Division
# HORIZONTAL CONTROL DATA

**STATION 1016**

**HAWAII**

**LATITUDE**

19° 00' to 19° 30'

**LONGITUDE**

155° 30' to 156° 00'

**DIAGRAM**

No 3-13 HAWAII

---

## ADJUSTED HORIZONTAL CONTROL DATA

**NAME OF STATION:** HANAMALO 1

**STATE:** HAWAII

**YEAR:** 1890

**SECOND ORDER**

---

**SOURCE:** No 9276

**NO OBSERVATION CHECK ON THIS POSITION**

<table>
<thead>
<tr>
<th>Geodetic Latitude</th>
<th>19° 05' 33.95&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geodetic Longitude</td>
<td>155° 25' 04.85&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Elevation</th>
<th>12</th>
<th>FEET</th>
</tr>
</thead>
</table>

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<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>X &quot;NO. 4 ANGL. &quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>9101</td>
<td>355,737.83</td>
<td>118,546.89</td>
<td>- 3 08 14</td>
</tr>
</tbody>
</table>

---

*Plane azimuth has been computed by the 2 thrd. &. 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>

---

**POSITION DETERMINED BY TRAVERSE FROM STATION HANAMALO 2**
NO ORIGINAL TEXT

HANAMALO 2 (Hawaii Island, Hawaiian Government Survey, 1890; E. R. Hand, 1913).—On west coast of Hawaii, in South Kona, land of Okeo, 3 miles south of Hoopuaoa, on Cape Hanamalo (or Point Hanamalo), close to the water. Marked by a triangle cut in the solid rock in the “ha” (lava); it is 8.75 meters (28.8 feet) southeast of the position of Hanamalo Point. The action of the waves made the change necessary. A large cairn was placed over the station and painted white.

RECOVERY NOTE. TRIANGULATION STATION

The station was recovered as described. The original station Hanamalo 1 has been washed out by wave action. A standard station mark and reference mark were established. A new description follows—

The station is located on Hanamalo Point about 2 miles south of Milolii, about 0.5 mile north of Okeo Bay, about 72 feet east of the beach and about 50 feet west of a dim beach trail.

The station is best reached, by boat, from the village of Milolii. A landing can be made off the point in an average sea. If the sea is rough, the station can be reached by beach trail from the village of Milolii.

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

The reference mark number 1 is a standard disk, unmarked, set into a mass of loose rock which projects about 4 inches. The disk is located in the center of the beach trail and is about 1 foot lower than the station.

Object Distance Direction
KAPUKAWAA (metal target) 62,270 ft 19°01′11″
N 1 ENE 00 00 00

RECOVERY NOTE. TRIANGULATION STATION

The station recovered.

To reach from the school house at Hookena, proceed southerly along main road for 17.2 miles to the main ranch buildings at Honom invade Ranch; turn right going past houses for 0.1 mile; take left fork thru gate for 1.6 miles to wire corral, turn into corral and continue out gate on west side of corral and continue down hill for 2.3 miles to coastline; take right fork and go northerly across lava for 0.6 mile; turn left at road fork and continue for 0.6 mile to sand beach and end of truck travel; from here pack northerly along beach for 0.3 mile to station.

Form 528 (11-15-24)

U.S. DEPARTMENT OF COMMERCE - COAST AND GEODETIC SURVEY

RECOVERY NOTE. TRIANGULATION STATION

The station recovered was in good condition as described.

The station is best reached by boat from the village of Milolii.

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

RECOVERY NOTE, TRIANGULATION STATION
HANAMALO 2 (continued)

Name of Station: HANAMALO 2
Established by: USGS
Year: 1890
State: Hawaii
Recovered by: C. A. Borroughs
Year: 1952
County: Hawaii

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

The station and reference marks were recovered in good condition and as described.

The station was visited by a lightkeeper only. It was reached by trail from Milolii because the sea was rough. It is a 1 1/2 hour walk by trail. The best way is by boat.

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>BEARING</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>KAPUKAUA (HOS) 1884</td>
<td>1901</td>
<td>19.011</td>
<td>57 22 38</td>
</tr>
<tr>
<td>KAPUKAUA (HOS) 1884</td>
<td>1893</td>
<td>18.934</td>
<td>57 22 15</td>
</tr>
<tr>
<td>R.M. No. 1</td>
<td>NE</td>
<td>62.130</td>
<td>166 55 46</td>
</tr>
<tr>
<td>R.M. No. 2</td>
<td>S</td>
<td>62.130</td>
<td>166 55 46</td>
</tr>
<tr>
<td>Milolii Point Light</td>
<td>NNE</td>
<td>About 2 miles</td>
<td>358 57 39.4</td>
</tr>
</tbody>
</table>

Station mark and R.M. No. 1 were recovered in good condition. A new reference mark, No. 2, was established. It is now possible to drive to within 1 1/2 miles of station with a 4-wheel-drive vehicle. A complete description follows:

Station is located about 2 miles south-southwest of Milolii and 3 1/2 miles west of the Honomalino Agriculture Co. Headquarters, on Hanamalo Point, in bare lava area and about 2000 feet northwest of the kiawe grove at Oko Bay.

To reach station from the Honomalino Agriculture Co. Office which is 20 miles south on State Highway 11 from the post office at Honokaa, go south on narrow macadam road for 0.25 mile to start of macadam orchards on both sides of road. Continue ahead for 100 yards, then go right, and follow track road west down through orchard and then pasture. For 1.25 miles to locked gate (obtain key at the above office). Pass through gate and go 0.35 mile to T-junction. Turn right and go 0.05 mile to coral. Turn left and follow track road westerly for 2.35 miles to open water sea. Take right fork and go northerly for 0.7 miles to old stone trail opposite kiawe grove, and end of track travel. Walk west along trail, then follow sea coast northwest to station; about a 1/2-mile pack.

Station mark is a standard disk, unstamped, cemented in a drill hole in rock flush with ground, on a low knoll, about 100 yards east of extreme rock point and 10 yards southwest of edge of sea bluff that curves in from the point. There is a large cairn, with a 3 x 3-inch target about 12 feet tall, centered over the mark.

Reference mark number one is a standard disk, unstamped, cemented in a drill hole in a lava rock outcrop projecting 10 inches from ground. It is across a small dip from station mark, on a low rise, and is 0.9 foot lower than station mark.

Reference mark number two is a standard disk, stamped "HANAMALO 2 HOS 1890 NO 2 1968", cemented in a drill hole in a 10-inch rock, flush with ground and 2.6 feet lower than station mark.

NOTE: discrepancy in distance to R.M. No. 1 was noted and checked; the 1968 distance is correct.

*Note of chief of survey should be inserted here. The officer who actually visited the stations 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

**NAME OF STATION**: HAPAIMANU  
**STATE**: HAWAII  
**YEAR**: 1914  
**THIRD**: HAWAII  
**SOURCE**: 0-SP156

<table>
<thead>
<tr>
<th>GEOGRAPHIC LATITUDE</th>
<th>ELEVATION</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>18° 10' 57.82&quot; N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>156° 45' 30.07&quot; W</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**STATE COORDINATES (METERS)**

<table>
<thead>
<tr>
<th>STATE &amp; CODE</th>
<th>X (METERS)</th>
<th>Y (METERS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>410,751.83</td>
<td>1,249,048.85</td>
</tr>
</tbody>
</table>

-more data

### ADJUSTED HORIZONTAL CONTROL DATA

**CODE**: QQ 289
HORIZONTAL CONTROL DATA

HILL-PUEHU
(Hawaii Island, E. R. Hand, 1914)—In southern Hawaii, on the hill northwest of Punalu warehouse, 1,300 meters distant. Mark is a truncated pyramid of concrete, white.

RECOVERY NOTE. TRIANGULATION STATION

NAME OF STATION: HILL (Puehu) STATE: Hawaii COUNTY: Hawaii
Established by: E. R. Hand YEAR: 1914 LOCALITY: Southeast Coast of Hawaii
Recovered by: E. R. Hand YEAR: 1929

Detailed statement as to the status of the original description:

On the top of a barren, reddish colored, rounded hill about 1,300 meters N.W. of the warehouse at Punalu, Hawaii; marked by a truncated pyramid of concrete 3 feet in height with the sides 3 feet in height at the base and 1 foot in width at the top. A 2 inch pipe projects about 8 inches above the top and center. The inscription, "PUEHU, 1904, E", is impressed in the seamed face.

RECOVERY NOTE. TRIANGULATION STATION

NAME OF STATION: HILL (Puehu) STATE: Hawaii COUNTY: Hawaii
Established by: E. R. Hand YEAR: 1914 LOCALITY: East, Hawaii
Recovered by: E. R. Hand YEAR: 1929

Detailed statement as to the status of the original description:

Location of station: In the southern part of Hawaii on the top of low reddish dirt hill about 3/4 mile above Punalu Village, 1/2 mile below the Pahala-Honomu Government main road and a few hundred feet southwest of the road leading down to Punalu.

Old station mark found: 2" pipe in concrete marked "Puehu 1904".

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

RECOVERY

ATOMICITY OF TRIANGULATION INTERSECTION STATION

NAME OF STATION: HILL (PUEHU) YEAR: 1949 STATE: Hawaii COUNTY: Hawaii
Established by: E. R. Hand, 1914
Chiefs of Party: E. G. Wilder

Description, including sketch of object: The station is the center of a steel target at triangulation station HILL (PUEHU) which was established by the Hawaiian Survey. The station is located on the summit of a red cinder hill which has been dug away on the south and west sides. It lies about 4.5 miles southwest of Pahala; about 4.5 miles northeast of Honomu, about 0.7 mile northwest of Punalu and about 100 yards east of the highway which runs between Naalehu and Pahala.

The top of the target is 3 feet higher than the concrete platform on which it is set. Station may soon be destroyed due to heavy cinder excavation being made by the Hawaiian Agricultural Company.

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

QUAD 191553
STATION 1019

LATITUDE 0° 10' 00"
LONGITUDE 156° 10' 00"

HILL-PUPU (continued)

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION HILL (PUPU )
ESTABLISHED BY E.R. Hand YEAR 1914 STATE Hawaii
RECOVERED BY D.H. Whipp YEAR 1967 COUNTY Hawaii
AIRLINES DISTANCE AND DIRECTION FROM NEAREST TOWN Island: Hawaii

Detailed statement as to the form of the original description, including means found, changes made, and other pertinent facts:

Station was recovered in good condition. A complete description follows:

Station is located about 3/4 mile northwest of Punalu'u and about 1/2 miles northeast of Honopu, along southeast side of State Highway 11, on a cinder hill that has been quarried on the southeast side and has a sheer cliff.

To reach station from the post office in Pahala, go south on Pikake St. for 0.2 mile; turn right and go 0.65 mile; turn right and go southwest on State Highway 11 3.8 miles to the Punalu'u road. Continue on the highway 0.2 mile to board gate on left, just beyond milepost No. 37. Walk south across pasture about 125 yards to station.

Station mark is the center of a 2-1/4-inch iron pipe in the center of a triangular, concrete platform about 7 feet on each side and projecting 8 inches above ground. A 2-inch, steel shaft about 2 feet long, is centered over the pipe and supports a red and white, metal target 8 feet high. Station is 10 feet northwest of edge of cliff and 30 feet northeast of southwest end of hilltop.
HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: MOKEANA CHURCH SPIRE
STATE: HAWAII
YEAR: 1884
STATION: 1020
HAWAII
LATITUDE 19° 00' TO 19° 30'
LONGITUDE 155° 30' TO 156° 00'
DIAGRAM NE 5-15 HAWAII

SOURCE: G-SP156

<table>
<thead>
<tr>
<th>GEODETIC LATITUDE</th>
<th>ELEVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>19° 18' 57.003&quot;</td>
<td></td>
</tr>
<tr>
<td>19° 18' 57.003&quot;</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GEODETIC LONGITUDE</th>
<th>METERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>155° 52' 37.367&quot;</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATE CODE</th>
<th>X</th>
<th>Y</th>
<th>A (MGA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>15101</td>
<td>370000.37</td>
<td>175354.04</td>
</tr>
</tbody>
</table>

*PLANE AZIMUTH HAS BEEN COMPUTED BY THE G-SP156 FORMULA NEGLECTING THE SECOND TERM.

<table>
<thead>
<tr>
<th>TO STATION OR OBJECT</th>
<th>GEODETIC AZIMUTH (FROM SITE)</th>
<th>PLANE AZIMUTH* (FROM SITE)</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>00 281</td>
</tr>
</tbody>
</table>
HORIZONTAL CONTROL DATA

NAME OF STATION: HOKUKO HOQ (GSS)
ESTABLISHED BY: L.A. Gayet YEAR 1977
STATE: "Hawaii"
COUNTY: "Hawaii"
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:

5 miles northeast of Hakehu:

HEIGHT OF TELESCOPE ABOVE STATION MARK: 6 FEET
HEIGHT OF LIGHT ABOVE STATION MARK: 6 FEET

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>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAAHALA 1090</td>
<td>00 00 00.8</td>
<td>00 00 00.8</td>
</tr>
<tr>
<td>PUHALA 1090 CO STATION</td>
<td>02 32 55.9</td>
<td>02 32 55.9</td>
</tr>
<tr>
<td>W1 1</td>
<td>10 21</td>
<td>10 21</td>
</tr>
<tr>
<td>W2 1 to W2 1</td>
<td>19 43</td>
<td>19 43</td>
</tr>
</tbody>
</table>

The station is located about 5 miles southwest of Pahala, 5 miles northeast of Hakehu, 92 feet northeast of State Highway 11 and on a high lava ridge.

To reach the station from the junction of Piihau and Honani Streets, go east on Honani Street for 0.4 mile to the junction of State Highway 11. Turn right and go south for 7.0 miles to a slight curve in the highway and the station on the right as described.

Station mark, established HOKUKO 1977, is a State of Hawaii Survey disk cemented in the top of a concrete post centered on an 8 feet diameter live-rock platform which projects about 1/8 inches above the ground surface. It is 22 feet north of the center line of Highway 11 and on a prominent lava ridge. (Note desc)

Reference mark 1, stamped 1, is a railroad spike with a punch hole marking the center cemented in a drill hole in lava rock which is about 4 by 7 feet in size and projects about 2 1/2 feet above the ground surface. It is 1 foot southeast of the top edge of the bank and about the same elevation as the station. (Note desc)

Reference mark 2, stamped 2, is a railroad spike with a punch hole marking the center cemented in a drill hole in lava rock which is about 1 1/2 by 3 feet in size and projects about 2 feet above the ground surface. It is 1 foot northeast of the top edge of the bank and about the same elevation as the station. (Note desc)
HORIZONTAL CONTROL DATA

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

HORIZONTAL CONTROL DATA

ST. BENEDICT CATHOLIC CHURCH
HAWAI'I COUNTY, HAWAII

PICTURE-SPIRE SPIRE

BASE OF SPIRE IS 150 FEET FROM CENTER OF OBJECT

This is an intersection station.

The station is the top of the spire on the top of the small
ornate spire, the spire of the St. Benedict Catholic Church in the village of Honaaau. This church is known as the painted church and is regularly visited by tourists.

The church is constructed of wood, painted white; the roof is
tin, painted white and a small, intricate, spire is near the west end of the roof.

It is located about 150 feet east of the "Middle Road", about
100 feet north of an open shed and about 50 feet northwest of a white house.

The top of the spire is about 35 feet above ground.

RECOVERY NOTE: TRIANGULATION STATION

INTERSECTION

NAME OF STATION: Honauna, St. Benedict Catholic Church, spire
ESTABLISHED BY: L.O. WILDER YEAR: 1948 STATE: Hawaii
RECOVERED BY: R.C. Munson YEAR: 1968 COUNTY: Hawaii
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

Detailed statement as to the features of the original description including marks found, censposing, charges made, and other pertinent data:

Station was recovered. Located about 3/4-mile southwest of the post office in Honauna, along east side of old macadam road known as Middle Road.

Station is a white cross atop a prominent, sharp, white, conical
spire on a square, white, intricately-designed base, on the west end of a rectangular church building which is painted white and has a
bright green roof. This church is known as the Painted Church.
HORIZONITAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

Honoapu (Hawaii Island, E. R. Hand, 1914).—On southern coast of Hawaii, on the first point east of Honoapu Wharf, and across the entrance to the lagoon upon which the old lading and derrick (abandoned) are situated. The old derrick bears N. 70° W. 220 meters. The tailer of two stacks on sugar mill (station Stack, Honoapu) of Hutchinson Sugar Plantation Co. bears N. 25° W. 660 meters. Marked by a standard bronze station disk set flush in the surface of the lava. Above it was built a cairn 9 feet high, whitewashed. There was an old cairn on this spot for a number of years previous which was used as a beacon. The new cairn will serve both as a triangulation mark and as a beacon; its elevation is 21 feet above mean high water.

RECOVERY NOTE. TRIANGULATION STATION

NAME OF STATION: Honoapu
STATE: Hawaii
COUNTRY: Hawaii
ESTABLISHED BY: E. R. Hand
YEAR: 1914
LOCALITY: Southeast Coast of Hawaii
REOVERYED BY: E. W. Adams
YEAR: 1929

Detailed statement as to the stones of the original description:
A bronze disc set flush in the surface of the lava on the first prominent point, which bears N. 96° E. (true) from the end of the dock at Honoapu, on the east side of the bay at Honoapu. Above it is built a cairn of stone 9 feet high and whitewashed. This cairn shows prominently. The steeple of the Catholic Church, triangulation station OAHU, Honoapu, is N. 82° W. (true) from the station, and the stack at the Honoapu sugar mill is N. 16° W. (true) from the station.

RECOVERY NOTE. TRIANGULATION STATION

NAME OF STATION: Honoapu
STATE: Hawaii
COUNTRY: Hawaii
ESTABLISHED BY: E. R. Hand
YEAR: 1914
LOCALITY: Honoapu, Kau, Hawaii
REOVERYED BY: Chas. L. Har:ry
YEAR: 1938

Detailed statement as to the stones of the original description:
Location of station: On southern coast of Hawaii on the first point of land east of Honoapu Landing and across the entrance to a lagoon.

Old station mark found: U.S.G.S. bronze tablet set in concrete and covered by a large white-washed stone pile formerly used as a beacon.

New station mark: 6 foot 8 ½" pipe set in concrete over the bronze tablet. The stone pile was rebuilt 10 feet in diameter and 8 feet high and plastered with mortar. The top of this: "tonepile is a concreted platform. A standard metal target is set in the 8 ½" pipe.

NOTE.—One of these targets must be used on every station measured.

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

HONUAPU (continued)

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: HONUAPU
EXPLODED BY: E. R. Haid
YEAR: 1914
STATE: HAWAII

RECOVERY NOTES

Detailed description as to the stones of the original description. The original station, marked by a standard disk, was not recovered. In 1938 the Hawaiian Survey reported recovering a U. S. Geological Survey bronze disk and no information is available as to when this disk was established. Also in 1938 the Territorial Survey set a 1 1/2 inch pipe 6 feet long over the bronze disk and built a stone and concrete platform around this pipe. The top and center of this pipe was used as the station in the 1969 survey. One reference mark was established in 1969.

A new description follows:

The station is located about 0.4 mile southeast of Honuapu, about 300 yards northeast of the Honuapu wharf, about 100 yards southeast of a stone and cinder causeway and about 50 feet north of the ocean.

To reach the post office at Naalehu; go north, on the road which leads toward Milo, for 3.8 miles; turn right and go southwest for 0.98 mile to the large warehouse; turn left and go southeast, crossing over a stone causeway, for 0.3 mile to the end of the road in a rough lava bed. From this point park southerly for about 100 yards to the small point and the station.

The station is the center of a 2 1/2 inch pipe which projects about 2 feet from the top of a regular stone and concrete platform. This platform is about 6 feet high and about 10 feet in diameter.

Reference mark number 1 is a standard disk, stamped NO 1, set into a drill hole in bedrock which is flush with the surrounding rock. It is located about 7 feet lower than the top of the pipe which was used as the station.

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

NAME OF STATION: HONUAPU
EXPLODED BY: E. R. Haid
YEAR: 1914
STATE: Hawaii

RECOVERY NOTIONS

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>MEASUREMENT</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Makapuu No. 2</td>
<td>NE</td>
<td>19.150</td>
<td>32</td>
</tr>
<tr>
<td>NW</td>
<td>19.150</td>
<td>5.870</td>
<td>32</td>
</tr>
<tr>
<td>Pahala, Hawaiian Agriculture Co., stack 1967</td>
<td>NE</td>
<td>33.614</td>
<td>5.870</td>
</tr>
<tr>
<td>NW</td>
<td>33.614</td>
<td>10.246</td>
<td>5.870</td>
</tr>
</tbody>
</table>

Station monument and reference mark number one were recovered in good condition. A new reference mark, number two, was established. A complete description follows:

Station is located in the southern part of the island, about 3 miles northeast of Naalehu, at northeast end of Honuapu Bay, about 2200 feet south-southeast of the Hutchinson Sugar Mill in Honuapu, 1200 feet east-northeast of Whittington Park and old wharf, and on the finger of land at east side of cove.

To reach station from post office Naalehu, go northeast on State Highway 11 for 3.5 miles to the sugar mill at Honuapu. Turn sharp right and go south on old road north, then take side road left and go east for 0.1 mile to end of truck travel at end of grassy point. Walk east, across old stone causeway remains, and then southeast around edge of cove about 200 yards to end of point and station.

The station is the center of a 2 1/2-inch iron pipe projecting 10 inches from the center of a large, prominent, flat-topped, stone and concrete monument 10 feet in diameter and 5 1/2 feet high. It is 75 feet north of water line and about 700 feet southeast of south side of pond.

Reference mark number one is a standard disk stamped "NO 1", cemented in a drill hole in flat lava area, 5 feet southeast of a large crack, 3 feet northeast of a 2-inch iron pipe set in cement in the bedrock, with "WILCOX" inscribed in the concrete, and 6.1 feet lower than top of station pipe.

Reference mark number two is a standard disk stamped "HONUAPU 1914 NO 2 1967", cemented in a drill hole in lava bedrock between two nānāpaka patches and 7.4 feet lower than top of station pipe.

*Note: chief of party should initial here. The officer who actually visited the station should sign his name at the end of the recovery notes.*
HORIZONTAL CONTROL DATA

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

DESCRIPTION OF TRIANGULATION INTERSECTION STATION

Honuapo, Hutchinson

NAME OF STATION: Sugar Co. Mill, YEAR: 1967
STATE: Hawaii COUNTY: Hawaii
ISLAND: Hawaii

CHIEF OF PARTY: D.M. Whipp

Description, including sketch of object:

Located in the southern part of the island, about 3 miles north-
east of Maalehu, at the Hutchinson Sugar Co. Mill at Honuapo.
Station is the center of a short, silver-colored, steel stack,
that extends about 30 feet from the southeast end of the mill roof.
Top of stack is 99 feet above ground.

HORIZONTAL DATA

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: HONUAPU HUTCHINSON MILL STACK
STATE: HAWAII YEAR: 1967

SOURCE: G-13903

DEGREES LATITUDE
19 05 37.2550
DEGREES LONGITUDE
155 33 05.3408

ELEVATION | US FEET
100

STATE COORDINATES (FMD)

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>N</th>
<th>D</th>
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</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>482,225.55</td>
<td>54,542.55</td>
<td>0</td>
<td>01 01</td>
</tr>
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</table>

PLANE AZIMUTH HAS BEEN COMPUTED BY THE F M D O. K FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT | DEGREES AZIMUTH (FROM NORTH) | PLANES AZIMUTH (FROM NORTH) | CODE
|---------------------|-----------------------------|-----------------------------|------|

OF 497
HORIZONTAL CONTROL DATA

HOOKEWA

NAME OF STATION: HOOKENA

STATE: Hawaii

COUNTY: Hawaii

NEAREST TOWN: Hookena

CHIEF OF PARTY: JRP

DESCRIPTION OF HOOKENA STATION

EXPLANATORY NOTES

HEIGHT OF TELESCOPE ABOVE STATION MARK: 1.0 METER

HEIGHT OF MOUNTING MARK: 1.0 METER

OBJECT NAME: HOOKENA

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>MEASUREMENT</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAA MAMO 1972</td>
<td>N</td>
<td>63.61</td>
<td>19° 38'</td>
</tr>
<tr>
<td>RM 1</td>
<td>SSE</td>
<td>28.58</td>
<td>8° 10'</td>
</tr>
<tr>
<td>RM 2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Station is located approximately 3 miles SSE of the City of Refuge near the small town of Hookena on the Kona Coast of Hawaii Island. Station is near the small point 200 feet south of Faahina Point, near the northern edge of Kauhako Bay; approximately 5 feet above sea-level and 100 feet east of the high-water line.

To reach station from post office at Kona Post, travel south on State Hwy 11 for 3.0 miles to Hookena School; continue on Highway 11 for 0.4 mile to fork and sign "Hookena"; take right fork and go 0.25 miles along paved road to gravel track crossroad, just before reaching Hookena Beach; turn right and travel through trees for 0.1 mile to where the road turns north along the beach. Park southerly for approximately 100 feet to the station on the lava beach.

Station mark is a standard triangulation disk stamped HOOKENA 1972, set in a drill hole in the lava field, approximately 50 feet from the edge of the vegetation.

Reference mark 1 is a standard disk set in the lava field at the same elevation as the station. Disk is stamped "NO. 1 1972".

Reference mark 2 is a standard disk set in the lava field at the same elevation as the station. Disk is stamped "NO. 2 1972".

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: HOOKENA

YEAR: 1972

STATE: Hawaii

SOURCE: 6-14958

GEOGRAPHICAL LATITUDE: 19° 23' 00" 066E

GEOGRAPHICAL LONGITUDE: 155° 34' 10" 34147

ELEVATION: 1.5 METER

STATE COORDINATES (FOOT)

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI</td>
<td>5101</td>
<td>361,192.05</td>
<td>199,954.60</td>
</tr>
</tbody>
</table>

 THESE DATA OBTAINED FROM ADJUSTMENT OF SEP 1979

R. L. 178
HORIZONTAL CONTROL DATA

NO TEXT
## HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

### ADJUSTED HORIZONTAL CONTROL DATA

<table>
<thead>
<tr>
<th>NAME OF STATION</th>
<th>KAIPAPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATE</td>
<td>HAWAII</td>
</tr>
<tr>
<td>YEAR</td>
<td>1890</td>
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</tbody>
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<table>
<thead>
<tr>
<th>SOURCE</th>
<th>G-SP156</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEODETIC LATITUDE</td>
<td>19° 15' 12.4&quot;</td>
</tr>
<tr>
<td>GEODETIC LONGITUDE</td>
<td>155° 40' 41.0&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>X and Y ANGLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>352,592.21</td>
<td>152,660.10</td>
<td>0° 06' 10&quot;</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 (True North)</th>
<th>PLANE AZIMUTH* (From North)</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QQ 216</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
RECOVERY NOTE. TRIANGULATION STATION

NAME OF STATION: KAHANA
Established by U. S. GOVT. SURVEYMAN: 1897
RECOVRED BY: L. C. MILNER YEAR: 1949 COUNTY: HAWAII

Detailed statement as to the stones of the original description:

The station mark was not recovered. However the stone "ahu" was not recovered. At the time of this survey a pile of fern logs about 16 feet in diameter and 2 feet high was found over the station mark. This station was not occupied during the 1949 survey but was located by distance and direction from triangulation station KAHANA 2. A new description follows—

The station is located on the crest of a low ridge, heavily grown over with ferns and scrub trees, which lies about 3 miles north of Pahala, about 3 miles west-southwest of the Kapalua Ranch, about 0.2 mile north of the west mouth of a water tunnel and about 100 yards east of a well marked trail. It is 20,801 feet northwest of triangulation station KAHANA 2.

For a detailed description on how to reach this station from the village of Pahala, see the description on triangulation station KAHANA 2 which was established in 1949.

NO OBSERVATION CHECK ON THIS POSITION

Geodetic Latitude: 19° 16' 08.000"
Geodetic Longitude: 155° 30' 02.795"

Elevation: 1115.2 meters

Revised:

STATE COORDINATES (EAST)

HI 1
5101 459,735.68 158.124.71 -0.0001

PLANE AZIMUTHS HAVE BEEN COMPUTED BY THE FORMULA ADDRESSING THE SECOND TRAVERS

POSITION DETERMINED BY TRAVERSE FROM STATION KAHANA 2

---

* Plane azimuths have been computed by the * formula reflecting the second term.

---

* Plane azimuth should be checked here. The officer who actually visited the station should sign his name at the end of this survey.

---

M. 3018.2

---

* Plane azimuth should be checked here. The officer who actually visited the station should sign his name at the end of this survey.

---

M. 3018.2
DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: KAHANA 2
STATE: HAWAII
COUNTY: HAWAII

CHIEF OF PARTY: L. C. WELDER
YEAR: 1949

DEPARTMENT OF COMMERCE U.S. GOVERNMENT PRINTING OFFICE 1948
WASHINGTON, D.C.

NOTE: All measurements are in feet above mean sea level, unless otherwise indicated.

Table 1: Distances and Angles to Aligned Marks

<table>
<thead>
<tr>
<th>Object</th>
<th>Bearing</th>
<th>Distance</th>
<th>Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>NNW</td>
<td>20.621</td>
<td>6146</td>
<td>130</td>
</tr>
<tr>
<td>N</td>
<td>45.000</td>
<td>13852</td>
<td>221</td>
</tr>
<tr>
<td>NW</td>
<td>20.625</td>
<td>6014</td>
<td>352</td>
</tr>
</tbody>
</table>

Station KAHANA 2 is located on a low ridge about 5 1/2 miles north of Pahala, about 1 mile north of a low wooded knoll, about 0.7 mile northeast of a cultivated field, about 0.2 mile north of the westerly end of a tunnel and about 100 yards east of a good trail. Higher ground is to the north.

The station is located on the crest of a low ridge about 5 1/2 miles north of Pahala, about 1 mile north of a low wooded knoll, about 0.2 mile north of the westerly end of a tunnel and about 100 yards east of a good trail. Higher ground is to the north.

To reach from the post office at Pahala, go easterly for one block; turn left and follow the paved road northerly for 3.5 miles to power pole number 100; turn left, onto a graded road, and go westerly for 0.6 mile; turn right and go northerly for 0.1 mile; cross over a rocky wash and continue on the main traveled road for 0.5 mile to a wooden water flume and the end of truck travel. From this point pack northerly, through the cultivated field, for about 0.4 mile to the edge of the brush and the timber. From this point cut out your way, through the dense tangle of ferns and brush for about 0.6 mile to a wooden flume; turn right and pack easterly, following the lower flumes, for about 0.3 mile to the mouth of a tunnel; turn left and follow a good trail, up grade, northerly for about 0.1 mile; turn right and cut out your way through the ferns for about 100 yards to the crest of a low ridge and the station.

The station is a standard disk, stamped KAHANA 2 1949, set in the top of a 3 inch pipe which projects about 4 inches.

Reference mark number 1 is a standard disk, stamped KAHANA 2 NO 1 1949, set in the top of a 3 inch pipe which projects about 4 inches and is located about 5 feet lower than the station.

Reference mark number 2 is a standard disk, stamped KAHANA 2 NO 2 1949, set in the top of a 3 inch pipe which projects about 3 inches and is located about 2 feet higher than the station.

KAHANA is a 1 inch drill hole, surrounded by a crown, in a flat rock which is set flush with the surface of the ground. The mark is surrounded by a pile of farm logs about 16 feet in diameter and about 5 feet high. It is about 1 foot higher than the station.

(continued on next page)
HORIZONTAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KAHAPA 2
ESTABLISHED BY: L. G. Wilder
YEAR: 1949
STATE: Hawaii
RECOVERED BY: D. M. Whipp
YEAR: 1967
COUNTY: Hawaii
HEIGHT OF TELESCOPE ABOVE STATION MARK: 1.6 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>BEARING</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PULU LAILA 1914-1949 DISTANCE and DIRECTION</td>
<td>NW 20.821</td>
<td>6.348</td>
<td>190 01 52</td>
</tr>
<tr>
<td>KAHAPA (HGS) 1967</td>
<td>N 45.140</td>
<td>13.862</td>
<td>221 39 30</td>
</tr>
<tr>
<td>BM No. 2</td>
<td>S 25.289</td>
<td>8.014</td>
<td>352 36 36</td>
</tr>
<tr>
<td>BM No. 1</td>
<td>N 20.729</td>
<td>6.306</td>
<td>190 01 47</td>
</tr>
</tbody>
</table>

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

To reach station from the post office in Pahala, go north on Pikake St. and State Highway 131 for 2.8 miles. Go right and go 0.6 mile; take right fork and go 0.65 mile; take left fork and go 0.5 mile; take right fork and go 0.25 mile; take left fork and go 0.05 mile; take right fork and go 0.35 mile along edge of cane field to point 29 yards below metal flume on left, and end of truck trail. Walk northeast along flume about 3/16 mile to 3rd flume fork, keeping along the lower, right, fork each time. Continue on right fork about 300 yards to mouth of tunnel. Take trail to left about 50 yards to trail. Dim left fork and go northwest about 275 yards, then leave trail and go right, northeast, about 100 yards to fern-covered point and station.

Station mark is a standard disk stamped "KAHAPA 2 1949", set in the top of a 2-inch, iron pipe flush with ground. NOTE: Station soon becomes hidden by dense ferns; the remains of a 20-foot, wooden tower are laying at station.

Reference mark number one is a standard disk stamped "KAHAPA 2 NO 1 1949", set in the top of a 5-inch dome of cement and small stones projecting 4 inches from ground. It is 6.3 feet lower than station mark and hidden in ferns.

Reference mark number two is a standard disk stamped "KAHAPA 2 NO 2 1949", set in the top of a 2-inch, iron pipe projecting 2 inches. It is 3 feet south of a 5-inch lehua tree and 3.3 feet higher than station mark. KAHAPA (HGS) 1897 is a 3/4-inch drill hole in center of a chiseled triangle in the top of a stone, at the bottom of a 12-inch-diameter hole, about 3 feet below present ground level, and 4.5 feet below station mark.

The station mark and reference marks 1 and 2 were recovered in good condition. KAHAPA (HGS) 1897 was not searched for at this time. The distance to reference mark 1 was found longer by 0.063 meter and the direction was found larger by 9.6 seconds. The distance to reference mark 2 was found longer by 0.002 meter and the direction was found smaller by 16 seconds.

The station was reached at this time by helicopter. It can be walked to by following the 1967 recovery note.

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

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANOGRAPHIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY
NATIONAL GEODETIC SURVEY
## Horizontal Control Data

### Description of Triangulation Station

**Name of Station:** KAHAAWAII

**State:** HAWAII

**Date:** 1948

**Object:** KAMOI

**Note:** This is an old Hawaii Territory survey station, but no record is available regarding the original station. In 1948, a concrete platform, metal pole, and target were installed at which time a recovery note states that a drill hole in a rock and a large pile of stones were recovered. The present metal pole and target were centered over the drill hole.

**Location:** The station is close to the main highway, on lower side of same and plainly visible, at the South Kona - Kau boundary, about 3.7 miles westward of the 1907 lava flow. On the opposite side of the road is a concrete post marked Kona - Kau, designating the boundary.

**Description:** The steel bar which supports the pipe pole and target was used as the station. From this station a rough road over lava, leads to Lee O Kamo.

### Recovery Note, Triangulation Station

**Name of Station:** KAHAAWAII

**Established by:** L.C. Wilder

**Year:** 1948

**State:** Hawaii

**Bench Marks:** Also recovered by D.H. Whipp

**Year:** 1967

**County:** Hawaii

**Island:** Hawaii

**Airely Distance and Direction from Nearest Town:**

Station was recovered in good condition. A complete description follows:

- **Station Location:** Located about 17 miles west-northwest of Naalehu and 21 miles south of Honomali, at the South Kona - Kau boundary, on a lava bluff on northeast side of State Highway 11 and at the southwest edge of the old highway, across this old road from the State Highway Base Yard.
- **To Reach Station:** From post office in Naalehu, go west on State Highway 11 for 19.1 miles to truck crossing just after passing a boundary sign on bank on right. Turn right and go 100 yards to T-junction. Go right about 50 yards on old highway to station on right.
- **Station Features:** Station is the corner of a 2-inch-diameter, steel shaft 2 ft long, mounted vertically on iron legs at the center of a triangular, concrete platform 7 ft each on each side. It is 12 feet southwest of centerline of old road, about 200 feet northeast of State Highway 11, 14.6 feet south of telephone pole 370, and 40 feet up of a large eucalyptus tree. A red and white metal target 8 feet high is supported by the steel shaft.

(C.A. Burroughs, 1973)—Station was recovered on as described in 1967.
HORIZONTAL CONTROL DATA
by the
National Ocean Survey
Old Hawaiian Datum

NAME OF STATION: KAHOE
STATE: HAWAII
COUNTY: HAWAII
QUADRANT IN: 191553
YEAR: 1972
DESCRIPTION OF TRIANGULATION STATION

HEIGHT OF TELESCOPE ABOVE STATION METER
HEIGHT OF LIGHT ABOVE STATION METER
1.5
SATE

SURFACE STATION NAME:
PRESENTATION MARK
RM NO. 1
RM NO. 2

DISTANCES AND DIRECTIONS TO A STATION MARK, REFERENCE MARKS AND POINTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION
OBJECT
BEARING
DISTANCE
FOOT
METER

RM NO. 1
ENE
69.07
11.985

RM NO. 2
S
23.71
7.230

Station is located on a small lava knoll on the western coast of Hawaii Island, approximately 0.75 mile southeast of Kaulua Point and about 0.6 miles south-southeast of Kealia. To reach station from Kealia, travel south on State Hwy, 11 to the Ala School, continue south for about 1.1 miles to the Pebble Beach Estates road on the right. Turn right and travel down the paved side road toward the beach for 0.9 mile to the station on the right. The station is on a small brush covered lava knoll, immediately below and across the road from a large level graded lookout area rising approximately 30 feet above the station.

Station is a standard triangulation disk stamped "KAHOE 1972" cemented in a drill hole stop a small lava knoll about six feet above road level. It is located approximately 1.50 feet north of the centerline of the road in a small clear area, near the highest point on the knoll.

Reference mark No. 1 is a standard disk cemented in a drill hole in a rock ledge about seven feet lower than the station. It is about 0.05 feet north of the centerline of the road and five feet lower than the level of the road at this point.

Reference mark No. 2 is a standard disk cemented in a drill hole in lava bedrock about five feet lower than the station. It is about 20 feet north of the centerline of the road and one foot above the level of the road at this point.

Reference mark No. 1 is stamped "No. 1 1972"
Reference mark No. 2 is stamped "No. 2 1972"

This station was located by intersection from HOOKENA, PUIWA, and WAIKAKU H4.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KAHOE
STATE: HAWAII
YEAR: 1972
SECOND ORDER

SOURCE:
G-14950

DEGREES LATTITUDE: 19°19'02"59566
DEGREES LONGITUDE: 155°53'12.47149
SECONDS

STATE CODE COORDINATE
H1 5101 366,639.49 175,916.47 0.07.41

These data obtained from adjustment of Sep 1979

RL 184
**HORIZONTAL CONTROL DATA**

by the National Ocean Survey

**ADJUSTED HORIZONTAL CONTROL DATA**

**NAME OF STATION:** KAPOLO FLAG

**STATE:** HAWAII

**YEAR:** 1884

**THIRD ORDER**

**SOURCE:** G-S0150

<table>
<thead>
<tr>
<th>GEODETIC LATITUDE</th>
<th>15°20'24.24&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEODETIC LONGITUDE</td>
<td>155°33'09.00&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>METERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.000000</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATE COORDINATES (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATE &amp; ZONE</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>HI 1</td>
</tr>
</tbody>
</table>

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE $\delta$-$\phi$-$\delta$ FORMULA NEGLECTING THE SECOND TERM.

<table>
<thead>
<tr>
<th>TO STATION OR OBJECT</th>
<th>GEODETIC AZIMUTH (degrees)</th>
<th>PLANAR AZIMUTH (degrees)</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

00° 27'5
HORIZONTAL CONTROL DATA

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

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

DESCRIPTION OF TRIANGULATION STATION

KAHAKU N.W. BASE
HAWAII COUNTY: HAWAII
NAME OF STATION: KAHAKU N.W. BASE
STATE: HAWAII

CHIEF OF PARTY: L. G. WILDER
YEAR: 1949
Described by: G. J. HOFPEL


<table>
<thead>
<tr>
<th>OBJECT</th>
<th>MEASUREMENT</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>KAHAKU S E BASE</td>
<td>S</td>
<td>57,490</td>
<td>17,523</td>
</tr>
<tr>
<td>KAHAKU N W BASE</td>
<td>W</td>
<td>58,469</td>
<td>17,853</td>
</tr>
<tr>
<td>KAHAKU mark</td>
<td>MM</td>
<td>30.6 mile</td>
<td>35 45</td>
</tr>
</tbody>
</table>

The station is located about 7 miles east northeast of Kawa Point, about 7 miles northwest of the Kauhak N.W. M. Mark and a little south of the centerline of a paved road, 57.4 feet northeast of telephone pole number 253, 41 feet southwest of a rock wall and about 5 feet higher than the paved road.

To reach from the schoolhouse and church in the village of Waihou, go west and north on the road which leads toward Captain Cook for 16.3 miles to the station on the left hand side of the road.

The station is a standard disk, stamped KAHAKU N.S. BASE 1949, set in the top of an irregular mass of concrete which is about flush with the surface of the ground.

Reference mark number 1 is a standard disk, stamped R. M. 1 1949, set into a drill hole in a boulder which projects about 3 feet and is located 62 feet southwest of the highway and about 5 feet higher than the station.

Reference mark number 2 is a standard disk, stamped R. M. 2 1949, set into a drill hole in a boulder which projects about 3 feet and is about the same elevation as the station. A large tree lies on line between the disk and the station.

A rock calm with black and white pole plumbed over the mark has been built over this station 4/7/49.

(continued on next page)
HORIZONTAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

KAHAKU N.W. BASE (continued)

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KAHAKU N.W. BASE
ESTABLISHED BY: L.C. Wilder YEAR: 1946 STATE: Hawaii
RECOVERED BY: R.C. Munson YEAR: 1968 COUNTY: Hawaii
Island: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.9 METERS METERS
HEIGHT OF LIGHT ABOVE STATION MARK

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

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>BEARING</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA PUU A PELE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R.M. No. 1</td>
<td>W</td>
<td>58.696</td>
<td>17.084</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>57.429</td>
<td>17.523</td>
</tr>
<tr>
<td>R.M. No. 2</td>
<td></td>
<td>32 36 08</td>
<td></td>
</tr>
<tr>
<td>R.M. No. 3</td>
<td></td>
<td>30 06 19</td>
<td></td>
</tr>
<tr>
<td>NA PUU A PELE (HGS)</td>
<td>1891 ---1966</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R.M. No. 1</td>
<td>W</td>
<td>30.617</td>
<td>17.867</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>30 36 28</td>
<td></td>
</tr>
<tr>
<td>R.M. No. 2</td>
<td></td>
<td>32 35 28</td>
<td></td>
</tr>
<tr>
<td>Azimuth Mark</td>
<td>NNE</td>
<td>0.25 mile</td>
<td>57 47 29.4</td>
</tr>
<tr>
<td>R.M. No. 2</td>
<td></td>
<td>30 06 31</td>
<td></td>
</tr>
</tbody>
</table>

Station mark and both reference marks were recovered in good condition. A thorough search was made for the azimuth mark but it could not be found, and is believed destroyed. A new azimuth mark was established. A complete description follows:

Station is located about 9 miles west of Waipahu and 8 miles southeast of the Honolulu Agriculture Co. Office, along southwest side of State Highway 11, across highway from power pole No. 380, on a rocky knoll with a stone fence along the northeast edge, and diagonally across the highway from the Keaka Parkway entrance to the Hawaiian Ocean View Estates subdivision.

To reach station from the post office at Honolulu, go southerly on State Highway 11 for 21.6 miles to Manuka State Park; continue on the highway for 1.45 miles to junction with Waipahu Blvd. on left; continue on the highway for 0.1 mile to azimuth mark on right; continue on highway for 0.25 mile to station on right.

Station mark is a standard disk stamped "KAHAKU N.W. BASE 1946", set in a concrete mass 1 foot below general rock level; 17 feet southeast of centerline of highway, 59 feet west of telephone pole No. 293, 11 feet southwest of the stone fence, 3-1/2 feet northeast of a large ohia tree which is on line to No. 2, and 193 feet west-southwest of the intersection of State Highway 11 with Keaka Parkway.

Reference mark number one is a standard disk stamped "BM 1 1946", cemented in a drill hole in the top of a large, rough lava mound that projects 5 feet above ground. It is 33 feet southwest of the stone fence.

Reference mark number two is a standard disk stamped "BM 2 1946", cemented in a drill hole in a boulder that projects 2 feet above ground.

Azimuth mark is a standard disk stamped "KAHAKU N.W. BASE 1948 1968", cemented in a drill hole in a bedrock outcrop in the middle of a stone fence up on a cutbank, across highway from power pole No. 376, 25 feet southwest of center line of highway, 90 feet southeast of telephone pole No. 293, 15 feet northeast of a large, 3-foot ohia tree, and about 8 feet higher than highway. NOTE: The large ohia tree is the first large tree northwest along highway from station.

*Note: Chief of party should be inserted here. The officer who actually visited 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

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: KAHUKU S E BASE
STATE: HAWAII
COUNTY: KAUAI DISTRICT

CHIEF OF PARTY: L. G. WILDER
YEAR: 1949

NOTE: HEIGHT OF TELESCOPE ABOVE STATION BASE 2.5 M. HEIGHT OF LIGHT ABOVE STATION BASE 2.5 M.

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

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>BEARING</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHEE (metal target)</td>
<td>00</td>
<td>32.189</td>
<td>32.189</td>
</tr>
<tr>
<td>R N 1</td>
<td>00</td>
<td>9.412</td>
<td>9.412</td>
</tr>
<tr>
<td>R N 2</td>
<td>00</td>
<td>110</td>
<td>110</td>
</tr>
<tr>
<td>R N 3</td>
<td>00</td>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td>JUW 2 KANOA (metal target)</td>
<td>00</td>
<td>426</td>
<td>426</td>
</tr>
<tr>
<td>PON 2 KANOA (metal target)</td>
<td>00</td>
<td>52</td>
<td>52</td>
</tr>
</tbody>
</table>

The station is located on a lava bed about 8 miles west of the village of Waialua, about 5 miles northeast of the sea, about 1.5 miles west northwest of the Kahuku Ranch, about 370 feet southeast of a rock crag, about 80 feet north of the road which runs between Captain Cook and Waialua, 25.6 feet northwest of telephone pole number 187, 24 feet southeast of a 1 inch pipe set in concrete and 5 feet east of a pipe line.

To reach from the old school house and church in the village of Waialua, go west and north, on the road which leads toward Captain Cook, for 8.5 miles to the station on the right hand side of the road.

The station is a standard disk, stamped KAHUKU S E BASE 1946, set in the top of an irregular mass of concrete which is flush with the surrounding rock.

Reference mark number 1 is a standard disk, stamped KAHUKU S E BASE NO 1 1946, set into a drill hole in a boulder which projects about 2 feet and is about the same elevation as the station.

Reference mark number 2 is a standard disk, stamped KAHUKU S E BASE NO 2 1946, set into a drill hole in a boulder which projects about 3 feet and is about 3 feet higher than the station. It is located 1 foot south of a 1 inch pipe which projects 1 foot from the top of a mound of cement.

A rock cairn with black and white pole plumbed over the station has been built over the station 4/7/49.

(continued on next page)
HORIZONTAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

NAME OF STATION: KAHUKU S.E. BASE

ESTABLISHED BY: E.C. Wilder
YEAR: 1949
COUNTY: Hawaii
STATE: Hawaii
ISLAND: Hawaii

RECOVERY NOTE, TRIANGULATION STATION

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.54 METER
HEIGHT OF LIGHT ABOVE STATION MARK 0.9 METER

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

FORM 1136
10-10-67

191553
10934

R

LATITUDE ° ' " TO ° '
LONGITUDE ° ' " TO ° '

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>UKIS AHU (HGS) 1947</td>
<td>S</td>
<td>32.189</td>
<td>00.00</td>
</tr>
<tr>
<td>RR No. 1</td>
<td>S</td>
<td>9.812</td>
<td>00.00</td>
</tr>
<tr>
<td>RR No. 2</td>
<td>N</td>
<td>23.029</td>
<td>00.00</td>
</tr>
<tr>
<td>WU O KAMAOA</td>
<td>N</td>
<td>32.245</td>
<td>00.00</td>
</tr>
<tr>
<td>WU O KAMAOA</td>
<td>NW</td>
<td>9.828</td>
<td>00.00</td>
</tr>
<tr>
<td>WU O KAMAOA</td>
<td>NW</td>
<td>32.245</td>
<td>00.00</td>
</tr>
<tr>
<td>WU O KAMAOA</td>
<td>NW</td>
<td>23.000</td>
<td>00.00</td>
</tr>
</tbody>
</table>

Station was recovered and all marks found in good condition, however slight discrepancies in distance and angle to R.M. No. 1 were noted. A complete description follows:

Station is located about 9 miles west of Naalehu, along the northeast side of State Highway 11, at about 1000 feet elevation, on a lava hill that sets in a jog in the highway, where it rounds the left side of the hill.

To reach station from the Post Office in Naalehu, go west on State Highway 11 for 5.7 miles to junction with South Point Road. Continue on the highway for 4.7 miles to station on right.

Station mark is a standard disk stamped "KAHU S.E. BASE 1948", set in the top of a 10-inch-diameter, concrete monument that projects 2 inches above ground. It is 55.7 feet southwest of power pole 43, 29.5 feet north of telephone pole 187, and 4.3 feet south of a 1-inch iron pipe projecting 4 inches from a 10-inch-diameter, concrete base in which the letters "P.O.T." are inscribed.

Reference mark number one is a standard disk stamped "KAHU S.E. BASE 1948", cemented in a drill hole in a triangular-shaped, 3-foot bedrock boulder projecting 18 inches above ground. It is 3.4 feet southeast of telephones pole 187 and 0.4 foot lower than station mark.

Reference mark number two is a standard disk stamped "KAHU S.E. BASE NO 2 1948", cemented in a drill hole in a bedrock ledge. It is 1 foot south of a 1-inch iron pipe cemented in the ledge, and is 3.8 feet higher than station mark.

*Name of chief of party should be inserted here. The officer who actually visited the station should sign his name at the end of the recovery note.
NO ORIGINAL TEXT

Kaholena (Hawaii Island, Hawaiian Government Survey, 1897; E. B. Hand, 1914).—In the southern part of Hawaii, in central Ka-u, on the summit of Kaholena Mountain, a steep, sharp-ridged, wooded hogback, behind Puu Enuie and Makanau Hill. Marked by a triangle cut in a large stone, and three logs planted vertically in the ground as an instrument support, and covered with a pile of hapa'u logs, 16 feet in diameter. Not searched for in 1914, when part of above description was written.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KAHOLENA
Established by: H.O.S. Year 1897 State: Hawaii
Recovered by: L.C. Milder Year 1949 County: Hawaii

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

After the position of the new station KAHOLENA 2 was calculated, a tie was figured to the old station which was found by roughly taping thru the heavy underbrush. The old mark is a Δ triangle and drill hole cut in stone set in ground.

Due to the difficulty of reaching the station and clearing the heavy underbrush between the stations, the old station was not tied in by traverse to the new station KAHOLENA 2.

*Plane azimuth was computed by the 0 formula neglecting the second term.
HORIZONTAL CONTROL DATA

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: KAINOLEA 2
STATE: HAWAII
COUNTY: KONA

NOTE:
- Before-station marks
- Interst-nodal marks
- Reference marks
- Prominent objects

DISTANCES AND DIRECTIONS TO ADJUSTED MARKS, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE CRAWLING AT THE STATION:

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>SEPARATION</th>
<th>DISTANCE (m)</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>YAHIKA 2</td>
<td>00</td>
<td>12,662</td>
<td>3,860</td>
</tr>
<tr>
<td>HM1</td>
<td>152</td>
<td>13,479</td>
<td>4,108</td>
</tr>
<tr>
<td>HM2</td>
<td>152</td>
<td>13,479</td>
<td>4,108</td>
</tr>
<tr>
<td>PUU ULUALA (metal target)</td>
<td>37</td>
<td>48</td>
<td>24.8</td>
</tr>
</tbody>
</table>

The station is located near the summit of a prominence, wooded knoll which lies about 5 miles north of Kaneohe, about 7 miles west of Punalu'u, about 6.5 miles north-northeast of Hamaka, and about 0.7 mile east of the Hikina Gulch. The highest ground on the knob lies about 200 yards to the northwest of the station.

To reach from the post office at Kealakekua go north and east, on the good under road for 0.7 miles to a point where the road crosses the Hikina Gulch Creek and the end of truck travel. From this point walk northwesterly, up the creek bed, for about 3.0 miles to a point where the creek runs near a long north-south spur ridge; leave the creek bed and out your way through the dense jungle growth, northerly, for about 0.1 mile to the foot of the spur ridge; thence up the ridge for about 1.0 mile to the summit of the hill. From this point walk southerly down the long slope, for about 300 yards to the station. Considerable clearing was done at this station and may aid in future recovery. Water may be obtained from a spring which is located about 300 feet west of the highest ground. This is about a 5 hour walk with a clear trail and about 10 hours if clearing is necessary. The ground at the station site is soft and muddy and floor boards will be necessary for observing.

The station is a standard disk, stamped KAINOLEA 2 1949, set into a drill hole in a buried boulder which is about 1 inch below the surface of the ground.

Reference mark number 1 is a standard disk, stamped KAINOLEA 2 R M NO 1 1949, set in the top of a 2 inch pipe which projects about 6 inches and is about 1 foot lower than the station.

Reference mark number 2 is a standard disk, stamped KAINOLEA 1 R M NO 2 1949, set in the top of a 2 inch pipe which projects about 6 inches and is about 2 feet higher than the station.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KAINOLEA 2
STATE: HAWAII
YEARS: 1949

DISTANCE TO STATION OR OBJECT:

<table>
<thead>
<tr>
<th>STATE &amp; CODE</th>
<th>ELEVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1930 9996606</td>
<td>1136.1</td>
</tr>
<tr>
<td>155 54 04.757</td>
<td>9727</td>
</tr>
</tbody>
</table>

STATE COORDINATES (class):

<table>
<thead>
<tr>
<th>STATE &amp; CODE</th>
<th>ELEVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1 5101</td>
<td>971,534.62</td>
</tr>
<tr>
<td>124,377.92</td>
<td>-0.01 56</td>
</tr>
</tbody>
</table>

PLANE ALIGNED HAS BEEN COMPUTED BY THE 200-0.5 FORMULA RELATING THE SECOND TERM.

FROM OBJECT    TO STATION OR OBJECT:

<table>
<thead>
<tr>
<th>TO STATION OR OBJECT</th>
<th>PLANE ALIGNED</th>
</tr>
</thead>
<tbody>
<tr>
<td>257 30 12.9</td>
<td>257 30 50</td>
</tr>
</tbody>
</table>

THese DATA ARE OBTAINED FROM ADJUSTMENT OF 1951

(continued on next page)

NOSA FORM 16-47 (11-76)
HORIZONTAL CONTROL DATA
by the NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

KAIHOLENA 2 (continued)

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KAIHOLENA 2
ESTABLISHED BY: L.G. Milder
YEAR: 1949
STATE: Hawaii
BENCH MARK ALSO:
RECOVERED BY: R.C. Munson
YEAR: 1968
COUNTY: Hawaii
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:
Island: Hawaii

Detailed instructions as to the location of the original discipline, including marks found, measurements, changes made, and other pertinent facts:

Station was recovered and all marks found in good condition, although the station mark was under an 8-inch cover of dirt, moss, and heath. The distance to reference marks was checked and found correct. A complete description follows:

Station is located about 8 miles north of Kona and 6-1/2 miles north-northwest of the sugar mill at Honomu on a prominent, wooded, steep-sided hill of about 4000 feet elevation, known as Kaohele. The hill has a large, diamond-shaped, rather flat top, with the highest point being near the northwest end; the station is at about 3750 feet elevation, on the southeast point, about 1000 feet southeast from the highest point, and where this southeast point becomes very narrow, just before steep drop down to southeast.

To reach station from the post office in Kona, go northeast on State Highway 11 for 3.4 miles to fork at Honomu bridge, 0.1 mile before reaching sugar mill. Take left fork and go uphill for 3.1 miles. Take right fork and go 0.35 mile; take left fork and go northwest 1.5 miles; take left fork, leaving main road, and go 0.3 mile on cane-field road; take side road next, following cane road around base of station hill, for 0.2 mile to side road right. Then go right, go 0.75 miles to end of truck travel at old T-junction. Pack mortar on old road about 3/4-mile to saddle, then go right, southeast, up narrow ridge to top of hill and continue southeast about 1000 feet to station. About a 3-hour walk.

Station mark is a standard disk stamped "KAIHOLENA 2 1949", cemented in a drill hole in a 7-inch boulder flush with ground. It is 10 feet southwest of a large ohia tree that was chopped off in 1949, and 20 feet southeast of a 15-inch ohia tree.

Reference mark number one is a standard disk stamped "KAIHOLENA 2 MM NO 1 1949", set in the top of a 2-inch pipe that projects 1 foot from ground, and is 1 foot lower than station mark. It is 3.850 m (12.662 ft.) from station, in azimuth 12° 09° 26".

Reference mark number two is a standard disk stamped "KAIHOLENA 2 MM NO 2 1949", set in the top of a 2-inch pipe that projects 1 foot from ground, and is about 2 feet higher than station mark. It is 4.105 m (13.500 ft.) from station, in azimuth 141° 21° 30".

The station mark and reference marks 1 and 2 were recovered. The reference marks are a little loose in the ground. The distance to reference mark 1 was found longer by 0.025 meter and the direction was found smaller by 15 minutes and 10 seconds. The distance to reference mark 2 was found shorter by 0.027 meter and the direction was found smaller by 20 minutes and 10 seconds.

The station was reached at this time by helicopter, and it can be walked to by following the 1968 recovery note.

NAME OF STATION: "KAIHOLENA 2"
ESTABLISHED BY: L.G. Milder
YEAR: 1949
STATE: Hawaii
BENCH MARK ALSO:
RECOVERED BY: R.C. Munson
YEAR: 1968
COUNTY: Hawaii
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:
Island: Hawaii
HEIGHT OF LIGHT ABOVE STATION MARK: 4' FEET
HEIGHT OF LIGHT ABOVE STATION MARK:

DISTANCES AND DIRECTIONS TO 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>PIU ULALOA HTS 1914</td>
<td>SEV</td>
<td>12.785</td>
<td>3° 97° 14° 03&quot;</td>
</tr>
<tr>
<td>HT 1</td>
<td>N8° 22° 11&quot;</td>
<td>13.305</td>
<td>4° 08&quot;</td>
</tr>
<tr>
<td>HT 2</td>
<td>N8° 35° 02&quot;</td>
<td>23.61</td>
<td>7° 19° 46&quot;</td>
</tr>
<tr>
<td>PAHULA PAH SUGAR CO STACK</td>
<td>N8° 22° 11&quot;</td>
<td>13.305</td>
<td>4° 08&quot;</td>
</tr>
<tr>
<td>HT 1 to HT 2</td>
<td>N8° 35° 02&quot;</td>
<td>23.61</td>
<td>7° 19° 46&quot;</td>
</tr>
</tbody>
</table>

Note: A chief of party should be stationed here. The person who actually visited the station should sign his name at the end of the recovery note.

HGS FORM 26-96 2005-00173446706110 Check for use in 1943
ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KALAMA UNI
STATE: HAWAII
YEAR: 1913
THIRD ORDER

SOURCE: C-SP150

<table>
<thead>
<tr>
<th>MGRS LATITUDE</th>
<th>GEODETIC LATITUDE</th>
<th>ELEVATION</th>
<th>ELEVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 24 29 776</td>
<td>155 33 56 157</td>
<td>FEET</td>
<td>METERS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>Z or 0 ANGLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>362,983.70</td>
<td>238,798.27</td>
<td>0° 07' 50&quot;</td>
</tr>
</tbody>
</table>

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE θ FORMULA.: FORMULA INCLUDING 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>

QD 265
Kalapa (Hawaii Island, Hawaiian Government Survey, 1884: E. L. Hand, 1928.—In Kona, on highest part of prominent hill in Keokea called Kalapa, about 1,200 feet "mauka" (inland) from the government road, and immediately north of the big buildings of the Kona Tobacco Co. The gable of packing house bears S. 15° W., distant about 300 meters; the boarding house bears S. 3° E., about 300 meters; the nearer one of two "mauka" (inland) drying barns bears S. 80° E., about 320 meters. In 1928 station was recovered. Reported difficult because top of hill heavily overgrown with guava and other bushes. The Kona Tobacco Co. is no longer operating, and the whole place has a run-down appearance. Station marked by 1½-inch iron pipe set upright in a truncated pyramid of concrete, with the legend "Kalapa, 1921, JBM, Primary" scratched thereon. In 1913 two of the four original reference marks were recovered; they were cut out in stones, 3.25 feet to the north, and 3.47 feet to the south of the station.

Recovery note, triangulation station R

Name of Station: Kalapa
Established by Hawaiian Govt. Year: 1884 State: Hawaii
Recovered by L. C. Wilder Year: 1948 County: Hawaii

Detailed statement as to the source of the original description: The station was recovered, in good condition, as described in the 1928 description. A new description follows:

The station is located on the summit of a brush covered knoll, named Puu Kalapa, which lies about 8 miles southeast of Hapuna, about 4 miles east of Kona, about 1200 feet east of the highway which runs between Captain Cook and Waikiki, about 100 yards north of a coffee plantation and about 200 feet south of a gravel pit.

To reach from the post office at Honomalino, go south on the road which leads toward Waikiki for 1.60 miles; turn left, onto a graded road, and go easterly for 0.5 mile to a T road intersection; continue straight ahead, northerly, for 0.8 mile to a small gravel pit and the end of truck travel. From this point park southwest for about 200 feet to the high ground and the station.

The station is the center of a 2 ½ inch iron pipe (plastered over the old mark) which projects about 3 feet from the top of a square concrete platform which is about 6 feet on each side and projects about 18 inches.

Reference mark number 1 (established in 1848) is a standard disk stamped KALAPA NO 1 1848, set into a drill hole in a boulder which projects about 2 feet on its north side and is flush on the south.

Reference mark number 2 (established in 1848) is a standard disk, stamped KALAPA NO 2 1848, set into a drill hole in a boulder which is about 2 feet in diameter and projects about 2 feet. It is located about 3 feet lower than the station.

Object | Distance | Direction
--- | --- | ---
LAE LOA | 6,549 ft | 1,996 m
R. M. No. 1 | 6,549 ft | 1,996 m
R. M. No. 2 | 6,078 ft | 1,857 m

* Too close to focus

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

NAME OF STATION: KALAPA
ESTABLISHED BY: HDS
YEAR: 1884
STATE: Hawaii
COUNTY: Hawaii
ISLAND: Hawaii

RECOVERY NOTE, TRIANGULATION STATION

Station mark was recovered in good condition. Both reference marks have been destroyed by clearing of the land for cultivation, and for this reason no new ones were set. A complete description follows:

Station is located about 1-1/2 miles south of the post office at Honaunau and 1400 feet northeast of the junction of State Highways 11 and 16, at about 1270 feet elevation, on an open, grassy hill at west end of a ridge and macadamia orchard. There is a wide, flat, bulldozed area about 30 yards west from station and about 30 feet lower.

To reach station from the post office at Honaunau, go south on State Highway 11 for 1.4 miles to board gate on left, by power pole No. 313, go through gate and follow track road upgrade for 0.2 mile to fork; take right fork and go 0.1 mile to fence and end of truck travel. Pack south-erly along old road about 250 yards to station.

Station is marked by a 1-inch iron pipe set in concrete, down inside a 6 x 30-inch recess in the center of a 6-foot-square, concrete platform. A concrete pier, 2 feet high, with a 2-1/2-inch pipe through the middle, is centered over the mark, and supports a red and white metal target.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KALAPA
ESTABLISHED BY: HDS
YEAR: 1884
STATE: Hawaii
COUNTY: Hawaii
ISLAND: Hawaii

Station found as described in 1966 recovery note in good condition.

A much easier route to the station is the following:

To reach station from the post office at Honaunau, go south on State Route 11 for 1.6 miles and turn left on stone road opposite power pole No. 317. There is a stone wall on each side of the road. Go up the stone road for 0.2 mile and take the left fork. Continue up the left fork for 0.3 mile and the station is clearly visible on the grassy hill to the right.

Also, from the junction of State Route 11 and State Route 16 go north on S.R. 11 for 0.2 mile and turn right on the above mentioned stone road opposite power pole No. 317.
**HORIZONTAL CONTROL DATA**

**NO TEXT**

**ADJUSTED HORIZONTAL CONTROL DATA**

**NAME OF STATION:** KALINA  
**STATE:** HAWAII  
**YEAR:** 1914

**SOURCE:** 6-SPI56  
**NOTE:** OBSERVATION CHECK ON THIS POSITION

<table>
<thead>
<tr>
<th>Geodetic Latitude</th>
<th>Geodetic Longitude</th>
<th>Elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>19° 08' 18.81&quot;</td>
<td>155° 30' 44.41&quot;</td>
<td>3.000'</td>
</tr>
</tbody>
</table>

**STATE COORDINATES (FOOT):**

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>X &amp; Y DEG. &amp; MILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>3608650.85</td>
<td>110654.55</td>
<td>2 06 48</td>
</tr>
</tbody>
</table>

*Plane Azimuth has been computed by the ∝ T.N.O. C. formula neglecting the second term.*

**TO STATION OR OBJECT**

<table>
<thead>
<tr>
<th>Plane Azimuth (From South)</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q3 683</td>
<td></td>
</tr>
</tbody>
</table>
NO ORIGINAL TEXT

Kalua o Lapaumila (Hawaii Island, Hawaiian Government Survey, 1884; E. R. Hand, 1913) — On western coast of Hawaii, Kona District, on the rim of the crater which is directly on the coast 8½ miles south of Hookena. No other formation along the coast similar to this except at Puu Oahau, many miles to the north. It shows up as a crescent, steep-sided, and open toward the sea. The original station mark, an iron bolt, was not found in 1913, apparently having been destroyed by a slide. There was recovered a stone marked with drill hole and triangle set in the cinder very close to a recent slide. The position of this stone checked out with that of the triangulation station as closely as plane table tests would permit, showing it to be of sufficient accuracy for topographic and hydrographic work, but not for triangulation.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KALUA O LAPAUMILA
ESTABLISHED BY: H.R.S. YEAR: 1884 STATE: Hawaii
RECOVERED BY: R.C. Munson YEAR: 1968 COUNTY: Hawaii
AERIAL DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

Detailed recovery notes as to the location of the original description, including marks found, measurements, changes made, and other pertinent facts:

Station was recovered, however no check was made on it's position. Located about 8 miles north of Mililii and 5-1/2 miles south of Hookena, near sea, at Anau Point, on the northwest rim of an old crater, and about 1 mile south of a macadam road coming down from the highway.

To reach station from the post office at Honokaa, go south on State Highway 11 for 8.6 miles to the middle lava flow of 1950; continue on the highway for 0.5 mile to a macadam side road right, at power pole No. 99. Turn right and go down steep road for 1.2 miles to end of road at sea. Pack south along coast for about 1 mile to station on northwest rim of the crater.

Station is marked by a 1-inch-square hole in the center of a 6-inch chiseled triangle in the center of a smooth, oval-shaped, 1 x 2-foot stone projecting 2 inches from ground.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KALUA O LAPAUMILA
STATE: HAWAII YEAR: 1884 THIRD ORDER
SOURCE: G-SP150

<table>
<thead>
<tr>
<th>Geodetic Latitude</th>
<th>Geodetic Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>15° 18' 14.740&quot;</td>
<td>155° 53' 29.783&quot;</td>
</tr>
</tbody>
</table>

ELEVATION: 27 METERS SCALED 27 FEET

<table>
<thead>
<tr>
<th>STATION</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI1</td>
<td>5101</td>
<td>364,970.62</td>
<td>171,101.50</td>
<td>0'07.46</td>
</tr>
</tbody>
</table>

*PLANE AZIMUTH HAS BEEN COMPUTED BY THE Z - INC. & FORMULA NEGLECTING THE SECOND TERM.

<table>
<thead>
<tr>
<th>TO STATION 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>

U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY
HORIZONTAL CONTROL DATA

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

HORIZONTAL CONTROL DATA

KU DISTRICT

NAME OF STATION: KAMOI

STATE: HAWAII

COUNTY: KAUAI

CHIEF OF PARTY: L. O. WILDE

YEAR: 1945

Described by: C. J. HOFFPEL

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

DISTANCES AND DIRECTIONS TO PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>HANAKEAUNGE</td>
<td>NE</td>
<td>25.078</td>
</tr>
<tr>
<td>KAMOI</td>
<td>NW</td>
<td>12.285</td>
</tr>
</tbody>
</table>

The station is located about 3 miles south of Kilolii, about 0.2 mile south of the Kau and South Kona Districts, about 250 yards east of the beach, about 200 yards east of a small shack and about 200 yards south of a graded road.

To return from the school house and church, in the village of Waikamau, west of the beach, the road leads towards Captain Cook, for 19.7 miles to triangulation station KAMOVI, turn left onto a very poor graded road, and go westerly, down grade, for 6.4 miles to the end of the road at a small cove and two old fishing shacks. From this point pack easterly for about 200 yards to a low lava slope and the station.

The station is a standard disk, stamped KAMOVI 1945, set into a drain hole in a flat rock which is covered with small rocks which formed a low mound on the lava bed.

Reference mark number 1 is a standard disk, stamped NO 1, set into a drain hole in the vertical face of a boulder which is about 10 feet in diameter and projects about 5 feet. The arrow on the disk points straight down, into the ground. It is located about 6 feet lower than the station.

Reference mark number 2 is a standard disk, stamped NO 2, set into a crevice in a boulder which is about 3 feet in diameter and projects about 4 feet. It is located about 5 feet lower than the station.

A 8 x 8 black and white pole has been plumbed over this station and a scarp of rocks built around the pole.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KAMOI

STATE: HAWAII

COUNTY: KAUAI

CHIEF OF PARTY: L. O. WILDE

YEAR: 1948

Described by: C. J. HOFFPEL

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

DISTANCES AND DIRECTIONS TO PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>HANAKEAUNGE</td>
<td>NE</td>
<td>25.078</td>
</tr>
<tr>
<td>KAMOI</td>
<td>NW</td>
<td>12.285</td>
</tr>
</tbody>
</table>

GEODETIC LATITUDE: 19°04'57.581"

GEODETIC LONGITUDE: 159°54'12.952"

ELEVATION: 15.7 METERS

STATE COORDINATES (2DF):

<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>360,649.60</td>
<td>50,658.85</td>
<td>- 0 07 55</td>
</tr>
</tbody>
</table>

PLAN COORDINATES (2DF):

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>HANAKEAUNGE</td>
<td>HI 1</td>
<td>5101</td>
<td>186.17</td>
<td>01.6</td>
</tr>
</tbody>
</table>

(continued on next page)
HORIZONTAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

KAMO (continued)

QUAD 191553
STATION 1041

LATITUDE o ° 00' 00" .0
LONGITUDE o ° 00' 00" .0

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KAMO
ESTABLISHED BY: L. C. WILDER YEAR: 1948 STATE: Hawaii
RECOVERED BY: C. A. BURCHOUPE YEAR: 1973 COUNTY: Hawaii

AIRLINES DISTANCE AND DIRECTION FROM NEAREST TOWN:

Detailed statement as to the likeness of the original description, including marks found,amps, charges made, and other pertinent facts:

Triangulation station and reference marks were recovered as described and all marks were found in good condition.

To reach station from seaward, proceed into northeast corner of Manuka Bay and head toward junction of dark rough lava flow and light colored coral and sand beach. The station mark is approximately 600 feet northeast of this junction.
HORIZONTAL CONTROL DATA

NAME OF STATION: KAPUA
STATE: HAWAII
YEAR: 1948
SECOND ORDER

SOURCE: G-6275

GEODETIC LATITUDE: 19° 08' 34.3" N
GEODETIC LONGITUDE: 155° 51' 10.22" W
ELEVATION: 447.7 ft

STATE COORDINATES (FT)

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>5101</td>
<td>378,239.25</td>
<td>113,330.52</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-06'57&quot;</td>
<td></td>
</tr>
</tbody>
</table>

*PLANE AZIMUTH HAS BEEN COMPUTED BY THE ZYX FORMULA NEGLIGATING THE SECOND TERM

TO STATION OR OBJECT | GEODETIC AZIMUTH (from north) | PLAN A AZIMUTH (from object) | CODE |
---------------------|-------------------------------|-----------------------------|------|
AZIMUTH MARK 1948   | 300 28.28                     | 300 26 26                   | 5101 |

(continued on next page)
Station mark and BM No. 2 were recovered in good condition. BM No. 1 has been destroyed. A new reference mark and an azimuth mark were established and a witness post was set. A complete description follows:

Station is located about 5 miles southeast of Milolii, 2 miles southeast of the Homolino Agriculture Co. Office. 50 feet southwest of State Highway 11 and power pole No. 285, and 550 feet southwest of old macadam road, at the southeast edge of a large rectangular, ohi'a grove, at the northwest side of a large cleared field on a low rocky rise about 6 feet higher than the field.

To reach station from the post office at Hanalei, go southerly on State Highway 11 for 19.7 miles to right fork leading to the Homolino Agriculture Co. Office; continue ahead on the highway for 1.9 miles to right fork at power pole 281. Take right fork and go parallel to the highway for 0.5 miles to southeast edge of the ohi'a grove, opposite power pole 285. Turn right and go across field for about 550 feet to station.

Station mark is a standard disk stamped "KAPUA 1948", set in the top of a 14-inch-diameter, concrete monument flush with ground, with a chain built up over it, and in 2-1/2 feet east of a white witness post.

Reference mark number two is a standard disk stamped "KAPUA NO 2 1948", cemented in a drill hole in the top of a 3-foot-square rock projecting 2 feet above ground, and is 5.2 feet higher than station mark.

Reference mark number three is a standard disk stamped "KAPUA 1948 NO 3 1968", cemented in a drill hole in a bedrock knob on the south edge of the station rise, and is 1.7 feet higher than station mark.

Azimuth mark is a standard disk stamped "KAPUA 1948 1968", cemented in a drill hole in a 12-inch, bedrock knob on a rock hump, located above a bedrock ledge cutbank along northwest side of the old macadam road, 49-5 feet north of telephone pole 392, 24-5 feet northeast of center line of road, 8 feet higher than road, 8 feet back from edge of cutbank, 12 feet south of a triangular blem on a 10-inch ohi'a tree, about 35 yards southeast of a curve in the road, and 2 feet west of a ca. 2-foot area around the mark has been capped with concrete and it looks like a concrete dome.

### Table: Distances and Directions to Azimuth Mark

<table>
<thead>
<tr>
<th>Object</th>
<th>Reference BM</th>
<th>Distance FEET</th>
<th>Distance METERS</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM No. 1</td>
<td>N</td>
<td>34.283</td>
<td>10.775</td>
<td>00° 00' 00.0</td>
</tr>
<tr>
<td>BM No. 2</td>
<td>N</td>
<td>34.283</td>
<td>10.735</td>
<td>01° 26' 57.7</td>
</tr>
<tr>
<td>BM No. 3</td>
<td>E</td>
<td>32.264</td>
<td>10.769</td>
<td>01° 26' 57.7</td>
</tr>
<tr>
<td>Azimuth Mark</td>
<td>ESE</td>
<td>About 0.3 mile</td>
<td>298 54 43.1</td>
<td></td>
</tr>
</tbody>
</table>
# HORIZONTAL CONTROL DATA

by the National Ocean Survey

**DIG HAWAIIAN DATUM**

---

## NO ORIGINAL TEXT

**Kapukawa (Hawaii Island, Hawaiian Government Survey, 1884; E. R. Hand, 1913).**

- On west coast of Hawaii, South Kona District, 1,080 meters south of Hoopulau Wharf, about 10 meters from the water, and just inshore from the "Kapukawa Rock" out in the sea, and 162 meters west of the trail between Hoopulau and Milolii. Marked by three galvanized iron bolts with circular heads set in drill holes in rock on "aa" (lava) and by four crossbars cut in the rock, the line connecting them diagonally intersecting at the station. A large cairn was erected over the station and painted white.

---

## RECOVERY NOTE, TRIANGULATION STATION

**NAME OF STATION: KAPUKAWA**

- State: **HAWAII**
- County: **Kona**

**Established by:** H.G.S. *Year:* 1884
**Location:** Milolii, S. Kona Hawaii
**Recovered by:** C.H., Murray *Year:* 1939

**Detailed statement as to the stations of the original description:**

- Location of station: On seacoast about 700 feet north of Milolii wharf.
- Old station mark found: 3 iron bolts in a rock over which was a pile of rocks. The bolts are practically rusted away.
- New station mark: H.G.S. Type D-1 Monument (Triangular 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).

---

## ADJUSTED HORIZONTAL CONTROL DATA

- **NAME OF STATION:** KAPUKAWA
- **STATE:** HAWAII
- **YEAR:** 1884
- **SECOND ORDER**

| SOURCE | 6 = 5279 |

**GEODETIC LATITUDE:** 19° 11' 25.269
**GEODETIC LONGITUDE:** 155° 54' 30.268
**ELEVATION:** 12.5 Meters

---

## STATE COORDINATES (feet)

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI 1</td>
<td>5101</td>
<td>358,905.13</td>
<td>126,311.42</td>
</tr>
</tbody>
</table>

*PLANE AZIMUTH HAS BEEN COMPUTED BY THE 2° DCP X FORMULA NEGLECTING THE SECOND TERM.*

---

## TO STATION OR OBJECT

| GE 065 |

---

## KEEL S BASE

<table>
<thead>
<tr>
<th>KEEL</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>R. N. 1</td>
<td>14.116 m</td>
<td>66,310 ft</td>
</tr>
<tr>
<td>R. N. 2</td>
<td>14.872 m</td>
<td>44,850 ft</td>
</tr>
</tbody>
</table>

A recovery note of the Hawaii Territory Survey, in 1939, states that the original three spikes were recovered and the 1-inch iron pipe installed over same.

(continued on next page)

---

**NOAA FORM 76-31**

(1178)
HORIZONTAL CONTROL DATA
by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

KAPUKAWAA (continued)

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KAPUKAWAA
ESTABLISHED BY: H.O.
RECOVERED BY: W.E.A.
YEAR: 1884
YEAR: 1961
STATE: Hawaii
COUNTY: Hawaii

DIRECTIONS AND DISTANCES FROM STATION KAPUKAWAA

R.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KAPUKAWAA
ESTABLISHED BY: H.O.
RECOVERED BY: W.E.A.
YEAR: 1884
YEAR: 1961
STATE: Hawaii
COUNTY: Hawaii

DIRECTIONS AND DISTANCES FROM STATION KAPUKAWAA

R.

Milolii Point light consists of a white, 7-inch-diameter, iron pipe 16 feet tall, with a 4 x 4-foot steel platform. The white light is mounted on a 4-inch iron pipe 4-1/2 feet above the platform, is offset from center of platform, on seaward edge of platform. A small white booth sets north side of light base.

From this light, vessels can see the Molokai Bank, the Molokai Channel, and the Molokai Shoal. The light is located on the east side of the channel, approximately 1/2 mile north of the Molokai Bank.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KAPUKAWAA
ESTABLISHED BY: H.O.
RECOVERED BY: W.E.A.
YEAR: 1884
YEAR: 1961
STATE: Hawaii
COUNTY: Hawaii

DIRECTIONS AND DISTANCES FROM STATION KAPUKAWAA

R.

The station was recovered as described except for the following: the 1-1/2 inch iron bar has the punch mark for the station now leaning three feet to the east. All reference marks were in good condition.

From this light, vessels can see the Molokai Bank, the Molokai Channel, and the Molokai Shoal. The light is located on the east side of the channel, approximately 1/2 mile north of the Molokai Bank.
NO ORIGINAL TEXT

Kapuna 2 (Hawaii Island, Hawaiian Government Survey, 1898; E. R. Hand. 1914).—In southern part of Hawaii, in southern Ka-u, near the top of the rounded grass-topped hill known as Puu Hoomahana, and shown on chart as Kapuna Mountain, just northeast of Waikini village. There is a grove of eucalyptus trees whose center is approximately 120 meters from the station, and whose left tangent is in range with this station and station Kiparape, the bearing from Kiparape being N. 42° W. Marked by a 5-inch iron pipe set deep into the ground, and surrounded by stones set in cement, a stone cairn being placed above it.

Department of Commerce
RECOVERY NOTE. TRIANGULATION STATION

HANYU 9
Established by Hawaiian Govt. Year: 1998. STATE: HAWAII
RECOVERY BY L. O. WILDER Year: 1949. COUNTY: HAWAII

Detailed statement as to the missing of the original description:

The station was recovered as described.

Two reference marks were established. A new description follows—

The station is located on a rounded hill, planted in sugar cane, which lies about 1 1/2 miles northeast of Naalehu, about 1.5 miles northeast of Waikini, about 0.4 mile west of a line of eucalyptus trees, about 100 yards east of a reservoir and about 200 feet south of a graded road. Higher ground is to the westward.

To reach from the post office in Naalehu; go north, on the good cinder road, for 1.4 miles; turn left, across over a cattle guard, and go northerly for 1.9 miles; turn left and go westerly for 0.4 mile to a large reservoir; turn left, just east of the reservoir, and go southerly for about 100 feet; turn left and go easterly, through the cane field for about 200 feet to the station. A rock cairn has been built over the station.

The station is the center of a 5-inch iron pipe which is set in the ground and is surrounded by stones and bottles set in cement. The pipe projects about 10 inches above the soil.

Reference mark number 1 is a standard disk, stamped NO 1 1949, set in the top of a 1 1/2 inch iron pipe which projects about 6 inches and is about 1 foot lower than the station.

Reference mark number 2 is a standard disk, stamped NO 2 1949, set in the top of a 1 1/2 inch iron pipe which projects about 6 inches and is about 1 foot lower than the station.

Both reference marks are subject to loss or movement when the cane crop is harvested.

Object Distance Direction
KIPARAPE (metal target) 00 00 00
H. N. 1 8 29,052 ft 0.546 m 00 10 54
H. N. 2 8 29,052 ft 0.546 m 00 30 04

(continued on next page)
Station pipe has been pushed over by sugar cane machinery, and leans to one side. Both reference marks have been destroyed. At time of recovery it was not possible to re-mark and re-survey the station because of high cane.

Located 1-1/4 mile northwest of Naalehu and 1-1/4 miles northeast of Waikoulu, at about 2108 feet elevation, on Puu Hooma, a flat hill planted in sugar cane field.

To reach station from the post office in Naalehu, go east on State Highway 11 for 0.1 mile to crossroad. Turn left and go uphill for 2.1 miles to crossroad. Turn left and follow main cane road west for 1.9 miles to side road left. Turn left and go 0.4 mile to top of hill and side road left. Go left 200 feet, then turn left and go 200 feet into cane field to station.

Station is marked by a 5-inch iron pipe projecting about 1 foot from ground, and surrounded by a cairn.
**HORIZONTAL CONTROL DATA**

**NAME OF STATION:** Kauluda

**STATE:** Hawaii

**COUNTRY:** Hawaii

**QUADRANGLE NO.:** 191553

**YEAR:** 1972

**DESCRIPTION OF TRIANGULATION STATION**

- **NAME OF STATION:** Kauluda
- **STATE:** Hawaii
- **COUNTRY:** Hawaii
- **QUADRANGLE NO.:** 191553
- **YEAR:** 1972

**ADJUSTED HORIZONTAL CONTROL DATA**

**NAME OF STATION:** Kauluda

**STATE:** Hawaii

**YEAR:** 1972

**SOURCE:** G-14950

**ADJUSTMENT BY NGS**

| OBS BY NGS | 1

**STATE & ZONE CODE**

| HI 1 | 5191 |

**STATE COORDINATES (Ft)**

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
<th>±</th>
<th>E. D. N. W. ANGLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>355,000.06</td>
<td>178,895.56</td>
<td>0</td>
<td>0° 07' 47&quot;</td>
</tr>
</tbody>
</table>

**STATE COORDINATES (Ft)**

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
<th>±</th>
<th>E. D. N. W. ANGLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>355,000.06</td>
<td>178,895.56</td>
<td>0</td>
<td>0° 07' 47&quot;</td>
</tr>
</tbody>
</table>

**THESE DATA OBTAINED FROM ADJUSTMENT OF SIS 1979**

**RL 183**

---

*Refers to some in manuals of triangulation and some publications of triangulation. Elevation-angle measured clockwise, referred to initial station. To ensure more, when no impingement leading to being done.

HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KAUNA POINT LIGHT
STATE: HAWAII
YEAR: 1946
SECOND ORDER

SOURCE: G-1977

GEODetic LATITUDE: 19°0'15.337"E
GEODetic LONGITUDE: 156°54'53.784"
ELEVATION: 10.9 Meters
55 Feet

STATE COORDINATES (FEET)

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>X'1000 (1.980 \times 10^5)</th>
<th>Y'1000 (1.980 \times 10^5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI 1</td>
<td>5101</td>
<td>566,306.54</td>
<td>74,114.18</td>
<td>- 0°07'28&quot;</td>
<td></td>
</tr>
</tbody>
</table>

PLANE ADJACENCY HAS BEEN COMPUTED BY THE Z-URD Formula neglecting the second term.

TO STATION OR OBJECT | GEODetic ADJACENCY (FROM STATION) |
---------------------|----------------------------------|

R

U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY

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

DEPARTMENT OF COMMERCE

NAME OF STATION: KAUNA POINT LIGHT
HAWAII DISTRICT: KAU DISTRICT
HAWAII

CHIEF OF PARTY: L.C. WILDER
YEAR: 1946

The station is located on Kauna Point, about 75 feet east of the water. The station is the center of the lighthouse which is 31.16 feet in height and rests on a square concrete base which projects 3 feet above the rock. The lighthouse is a wooden structure with a ladder on its south side. The light is located at the top and in the center of the tower. It is a fixed, flashing, light and is run by gas, there being no lighthouse at this station.

The station is best reached, by boat, from the village of Miloli'i. Landing can be made in a small cove which lies about 200 yards north of the station.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KAUNA POINT LIGHT
ESTABLISHED BY: L.C. WILDER
YEAR: 1946

AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

Divided attention to the format of the original descriptions; including marks found, wavelengths, changes made, and other pertinent facts:

Station is gone. The light tower has been removed and a new light established by the U.S. Coast Guard at Miloli'i. The old concrete foundation of the light remains and could probably be used for aerial photography control, as it is a 12-foot-square, white foundation that projects about 3 feet above ground.
**HORIZONTAL CONTROL DATA**

**DESCRIPTION OF TRIANGULATION INTERSECTION STATION**

**NAME OF STATION:** KEAWE

**YEAR:** 1948  **STATE:** Hawaii  **COUNTY:** Hawaii Island

Description, including sketch of object:

The station, a boundary monument, is a 1 inch iron pipe which projects about 1 foot from the top of a square concrete post. The concrete post is stamped J & H KEAWE 1920. It is located on the south side of a rock wall, 27.4 feet west of the centerline of the highway and is about 7 feet lower than station KEAI SOUTH BASE. This mark is believed to be a boundary marker for the Bishop Estate.

**RECOVERY NOTE, TRIANGULATION STATION**

**NAME OF STATION:** KEAWE

**YEAR:** 1948  **STATE:** Hawaii  **COUNTY:** Hawaii

Station was recovered in good condition, although the distance published from station KEAI SOUTH BASE was found to be in error about 10 meters.

Located about 2-1/2 miles west-southwest of Hoomau, 2-3/4 miles south of Naopoo Bay and 1 mile north of the City of Refuge National Park, along west side of macadam road.

Station is marked by a 1-inch iron pipe, projecting 11 inches from the top of a 10 x 10-inch concrete block with "KEAWE 3 JIR 1920" inscribed in it. It is 16 inches south of a stone wall, 9 feet north of a metal gate, 27 feet west of center line of road.

The correct distance from station KEAI SOUTH BASE to the mark is 29.332 meters, (96.547 ft.)

---

**ADJUSTED HORIZONTAL CONTROL DATA**

**NAME OF STATION:** KEAWE

**YEAR:** 1948  **SECOND ORDER**

**SOURCE:** G-12644

**NO OBSERVATION CHECK ON THIS POSITION**

**GEODETIC LATITUDE:** 16°26'15.40"  **ELEVATION:** 42.0 Meters

**GEODETIC LONGITUDE:** 158°55'03.635"

**ELEVATION MEASURED:** 130.1 F.E.

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>45° 4 ANGLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>356,098.57</td>
<td>219,610.04</td>
<td>-</td>
<td>0'08.20</td>
</tr>
</tbody>
</table>

Plane Aziimuth has been computed by the 3 (3 O.D.) formula neglecting the second term.

**TO STATION OR OBJECT**

<table>
<thead>
<tr>
<th>GEODETIC AZIOTH</th>
<th>PLAN AZIOTH</th>
</tr>
</thead>
</table>

**POSITION DETERMINED BY TRAVERSE FROM STATION KEAI SOUTH BASE**

OF 429
HORIZONTAL CONTROL DATA

SEE STATION KEEI SOUTH BASE

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KEAWE
ESTABLISHED BY: L.C. Wilder YEAR: 1944 STATE: Hawaii
RECOVERED BY: H.C. Hunsen YEAR: 1968 COUNTY: Hawaii
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

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

Station was recovered in good condition, although the distance published from station KEEI SOUTH BASE was found to be in error about 10 meters.
Located about 2-1/2 miles west-southwest of Honaunau, 2-3/4 miles south of Napoopoo Bay and 1 mile north of the City of Refuge National Park, along west side of macadam road.
Station is marked by a 1-inch iron pipe, projecting 14 inches from the top of a 10 x 10-inch concrete block with "KEAWE 2 JAN 1920" inscribed in it. It is 10 inches south of a stone wall, 9 feet north of a metal gate, 97 feet west of centerline of road.
The correct distance from station KEEI SOUTH BASE to the mark is 23.332 meters, (76.547 ft.)

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KEAWE
STATE: Hawaii YEAR: 1944 SECOND ORDER

SOURCE: G-1264
NO OBSERVATION CHECK ON THIS POSITION

<table>
<thead>
<tr>
<th>GEODETIC LATITUDE</th>
<th>GEODETIC LONGITUDE</th>
<th>ELEVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>19° 26' 50.401&quot;</td>
<td>155° 55' 03.635&quot;</td>
<td>32.0 Meters</td>
</tr>
<tr>
<td></td>
<td></td>
<td>108 feet</td>
</tr>
</tbody>
</table>

STATE COORDINATES (First)

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>ELEVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>9101</td>
<td>359,107.13</td>
<td>223,140.73</td>
<td>-308.21</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* PLAN ARMS USED IN COMPUTING BY THE P.O.D. FORMULA NEGLCING THE SECOND TERM.

POSITION DETERMINED BY TRAVERSE FROM STATION KEEI SOUTH BASE

QF 025
NO ORIGINAL TEXT

Keawekahoe (Hawaii Island, Hawaiian Government Survey, 1891; E. R. Hand, 1928).—On the west coast of Hawaii, in South Kona District, on Keawekahoe Point, 50 meters from the water to the south, and 40 meters from the water to the west. It is about 1,340 meters from Napoopoo Light, which is seen just a few feet north of a line to Napoopoo Church. Marked by a drill hole and triangle cut in rock, and also 4 crosstrees in the rock equidistant from it. An iron bolt mentioned in original description as being 1 meter southwest of station was not found in 1918. A cairn was built over the station in 1918 and painted white. In 1928 the cairn was found, built substantially as it was in 1913. It had, however, been taken down and rebuilt since that year, as shown by the painting on the stones not being continuous. The cairn was not disturbed in 1928, and mark not seen.

RECOVERY NOTE. TRIANGULATION STATION

NAME OF STATION: KEAWKEAHEA

ELEVATION: 10.2 METERS, 33 FEET

SOURCE: G-9275

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KEAWKEAHEA

STATE: HAWAII

YEAR: 1891

SECOND ORDER

GEODETIC LATITUDE: 19° 29' 14.402"
GEODETIC LONGITUDE: 155° 57' 03.772"

ELEVATION: 10.2 METERS

STATE COORDINATES (FOOT)

STATE & ZONE CODE X Y Z (1) (1)
HI 1 5101 344,648.41 237,716.38 -0 05' 02"

PLAN AZIMUTH HAS BEEN COMPUTED BY THE 2 = (X2 - X1) FORMULA REFLECTING THE SECOND TERM

TO STATION OF OBJECT

GEODETIC AZIMUTH (FROM SOUTH)

PLAN AZIMUTH (FROM SOUTH)

COD

PUU OHAU 170° 36' 46.8" 170° 36' 48" 5101

(continued on next page)
Station was recovered and all marks found in good condition, however, a discrepancy of .032 m was noted in the distance to RM No. 1. A complete description follows:

Station is located about 2-3/4 miles southwest of Kealakekua, 1 mile west-northwest of the Captain Cook Monument, and 1397 feet southeast of station KEOPUKA 1948, on a low lava mound about 200 feet east from sea bluff and 33 feet above sea level.

To reach station from the post office in Kealakekua, go south on State Highway 11 for 0.75 mile to power pole 125. Turn sharp right and go downhill on macadam track road for 0.3 mile to board gate on left. Pass through gate and go 0.15 mile to locked gate; pass through gate and continue on field road for 0.65 mile to gate. Pass through gate, take left fork, and go 0.25 mile to fork. Take left fork for 30 yards to gate; pass through gate and go 0.55 mile to gate. Pass through gate and go 0.3 mile to gate in same wall. Pass through gate and continue ahead on old track road downgrade for 0.3 mile to T-junction. Go left, south, for 0.25 mile to board gate. Pass through gate and go 0.2 mile to track road right. Go right, along edge of lava flow, for 0.2 mile to end of truck travel at trees. Pack southerly about 1/2-mile to KEOPUKA, then continue, southeast for 1397 feet to station.

Station mark is a standard disk stamped "KEAWAIAKEA 1948" cemented in a drill hole in lava bedrock. There is a large, 4-foot-high cairn, with old 4-foot stand and a tall, 3 x 3-inch, target pole, in the center, over the mark.

Reference mark number one is a standard disk stamped "KEAWAIAKEA 1 1948" cemented in a drill hole in flat bedrock, about 1-1/2 feet lower than station mark.

Reference mark number two is a standard disk stamped "KEAWAIAKEA 2 1948" cemented in a drill hole in flat lava bedrock, about 3 feet lower than station mark.
**HORIZONTAL CONTROL DATA**

**DESCRIPTION OF TRIANGULATION STATION**

<table>
<thead>
<tr>
<th>NAME OF STATION</th>
<th>KEELI</th>
<th>STATE</th>
<th>HAWAII COUNTY</th>
<th>HAWAII</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHIEF OF PARTY</td>
<td>L. G. WILDER</td>
<td>YEAR</td>
<td>1946</td>
<td></td>
</tr>
<tr>
<td>NOTE*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Surface-Station Park</td>
<td>Underground-Station Park</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>12a</td>
<td>LAB LOA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12a</td>
<td>R M 1</td>
<td>NE</td>
<td>35.356</td>
<td>10.760</td>
</tr>
<tr>
<td>12a</td>
<td>R M 2</td>
<td>NE</td>
<td>40.569</td>
<td>12.211</td>
</tr>
</tbody>
</table>

The station is located on the crest of a brush and tree covered ridge about 2.2 miles southeast of Napoiope, about 2 miles northeast of Honoumau Bay, about 1.9 miles east of the town, about 0.75 mile east of the road which runs between Napoiope and Honomana Bay and about 100 yards southwest of a low knoll. Higher ground is to the east and northeast.

To reach the post office at Napoiope: go south, on the road which leads toward Honomana Bay, for 1.9 miles to the end of truck travel. From this point cross over a rock wall and peak easterly for about 0.75 mile to the crest of the ridge and the station.

The station is a standard disk, untrimmed, set into a drill hole in bedrock which projects about 8 feet above the surrounding lava.

Reference mark number 1 is a standard disk, untrimmed, set into a drill hole in bedrock which projects about 2 feet and is about 4 feet lower than the station.

Reference mark number 2 is a standard disk, untrimmed, set into a drill hole in bedrock which projects about 5 feet on its south side and is about 4 feet lower than the station.

A rock cairn with black and white pole plumbed over the mark has been built over this station.

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

QUAD 191553  STATION 1040

LATITUDE  °  °  "
LONGITUDE  °  °  "

RECOVERY NOTE, TRIANGULATION STATION
NAME OF STATION: KEEI
RECOVERY BY: R. C. Munson
YEAR: 1968
STATE: Hawaii
COUNTY: Hawaii
ISLAND: Hawaii
HEIGHT OF TELESCOPE ABOVE STATION MARK: 1.07 METERS
HEIGHT OF LIGHT ABOVE STATION MARK: METERS

DISTANCES AND DIRECTIONS TO ASOUTH MARK, REFERENCE MARKS AND PROXIMITY 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>KEEI SOUTH BASE 1948</td>
<td>NW</td>
<td>00° 00' 00.0&quot;</td>
<td>00° 00' 00.0&quot;</td>
</tr>
<tr>
<td>Napooopo Light, 1928</td>
<td>N</td>
<td>34.162</td>
<td>10.414</td>
</tr>
<tr>
<td>R.M. No. 3</td>
<td>ESE</td>
<td>40.013</td>
<td>12.197</td>
</tr>
<tr>
<td>R.M. No. 2</td>
<td>E</td>
<td>24.824</td>
<td>8.482</td>
</tr>
</tbody>
</table>

Station mark and RM No. 2 were recovered in good condition. RM No. 1 has been destroyed. A new reference mark, number 3, was established. A complete description follows:

Station is located about 2 miles north-northeast of the City of Refuge, 2 miles southeast of Napooopo and about 3500 feet east of the road running between Napooopo and the City of Refuge, at about 317 feet elevation, the very brushy and rough country sloping up to east from the road. The area the station is in has the appearance of a low ridge when seen from the road.

To reach station from the post office in Honomu, go south on State Highway 11 for 1.5 miles to junction with State Highway 16. Turn sharp right and go downhill on State Highway 16 for 3.5 miles to road junction at the City of Refuge. Continue ahead on the road to Napooopo for 0.75 mile to station KEEI SOUTH BASE 1948 on right; continue on the road for 1.3 miles to lookout board gate on right. (Key may be obtained from Mr. K. Yonezawa at Holualoa). Pass through gate and follow track road for 0.3 mile to corral and water trough, and end of track travels. Go through gates, get on left side of fence line, and walk south along fence for 150 yards to pasture corner. Cross fence and go left up through trees along cattle trail, for about 300 yards to cairn. Here leave trail and pick way southeast across brushy lava country, gradually gaining elevation, for about 500 yards to station.

Station mark is a standard disk stamped "KEEI 1948", cemented in a drill hole in bedrock on a small mound that is about 8 feet higher than surrounding area. There is a 10-foot-diameter, stone pier, about 4 feet high, built over the mark, with a tall, 3 x 3-inch signal pole in the center.

Reference mark number two is a standard disk stamped "KEEI 1948", cemented in a drill hole in the top of a sloping, bedrock ledge 4 feet high on the west side, and 2 feet lower than station mark.

Reference mark number three is a standard disk stamped "KEEI 1948
NO 3 1948", cemented in a drill hole in smooth bedrock area, 3.5 feet lower than station mark.

NOTE: Station is difficult to locate due to big trees and brush, and an altimeter is of help in recovery. Most lines are blocked by trees.

*Name of chief of party should be inserted here. The officer who actually visited 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**

**DESCRIPTION OF TRIANGULATION STATION**

**NAME OF STATION:** KEEI NORTH BASE  
**STATE:** HAWAII COUNTY: SOUTH END OF DISTRICT

**CHIEF OF PARTY:** L. G. WILDER  
**YEAR:** 1948

**HEIGHT OF TELESCOPE ABOVE STATION BASE 12.6 METERS**  
**MÉTHODE OF LIGHT ABOVE STATION BASE 126 METERS**

<table>
<thead>
<tr>
<th>ORDER</th>
<th>SQUARE STATION WITH SUBSIGNED STATION MARK</th>
<th>DISTANCES AND DIRECTIONS TO ADJACENT BASE DESCRIPTION MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION</th>
<th>DEGREE</th>
<th>RADIANT</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>11a</td>
<td>BISHOP</td>
<td>EXE 104,376 31,624 00 00 00 10 26 43</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Boundary Monument 9 Bishop</td>
<td>EXE 130,762 42,209 43 55 32.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Estate</td>
<td>EXE 90,475 27,730 70 10 19</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The station is located on a rough lava bed about 0.7 mile northeast of Palaekona Point, about 0.6 mile south of Mapeo, about 100 yards south of a T road intersection, 36.7 feet north northwest of a cattail guard, 86.7 feet north of a rock wall and 85.8 feet west of the centerline of the highway which runs between Mapeo and Honouula.

To reach the post office, at the T road intersection, in Mapeo; go south on the road which leads toward Honouula for 0.5 mile; continue straight ahead for 0.1 mile to the station on the west or right hand side of the road.

The station is a standard disk, stamped KEEI NO BASE 1948, set in the top of an irregular mass of concrete which is about 6 inches below the surface of the surrounding roack.

Reference mark number 1 is a standard disk, stamped KEEI NO BASE NO 1 1948, set into a drill hole in the most westerly of two concrete abutments of a cattle guard. It is located 10 feet west of the centerline of a road and 4.8 feet north of the center of a rock wall.

Reference mark number 2 is a standard disk, stamped KEEI NO BASE NO 2 1948, set in the top of a square concrete post which projects about 6 inches. It is located 56.3 feet east of the centerline of a road and about 2 feet higher than the station.

A rock cairn with black and white pole plumbed over the mark has been built over this station.

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

KEEI NORTH BASE (continued)

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KEEI NORTH BASE
ESTABLISHED BY: L.C. Wilder
YEAR: 1948
STATE: Hawaii

RECOVERED BY: R.C. Munson
YEAR: 1968
COUNTRY: Hawaii

QUAD: 191553
STATION: 1050

HEIGHT OF TELESCOPE ABOVE STATION MARK: 1.5 METERS
HEIGHT OF LIGHT ABOVE STATION MARK: 4.0 METERS

DISTANCES AND DIRECTIONS TO ADJACENT 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>KALAPA</td>
<td>SE</td>
<td>90.978</td>
<td>27,730</td>
</tr>
<tr>
<td>K.M. No. 2</td>
<td>ESE</td>
<td>104,376</td>
<td>31,814</td>
</tr>
<tr>
<td>KALAPA (HGS) 1884</td>
<td>SSE</td>
<td>90,979</td>
<td>27,700</td>
</tr>
<tr>
<td>K.M. No. 1</td>
<td>NW</td>
<td>104,562</td>
<td>(31,871)</td>
</tr>
<tr>
<td>Napapoo Light, 1928</td>
<td>E</td>
<td>319</td>
<td>59,37</td>
</tr>
</tbody>
</table>

Station was recovered. EM No. 2 was found slightly loose, so was reinforced with concrete. There is now a power pole on line with Boundary Monument No. 2. A complete description follows:

Station is located about 3 miles northwest of Honolua and 1/2 mile south of Napapoo Bay, along west side of macadam road, 375 feet south of road fork leading southwest to Palemano Point.

To reach station from the post office in Honolua, go south on State Highway 11 for 1.7 miles; turn sharp right on State Highway 16 and go 3.5 miles to road junction at the City of Refuge. Continue ahead, north, on macadam road for 3.0 miles to stone wall, cattle guard, and station, on left, just beyond stone wall.

Station mark is a standard disk stamped "KEEI NO BASE 1948", cemented in a drill hole in rock about flush with surrounding area. It is 18 feet west of center line of road, 107 feet northwest of center of cattle guard, 87 feet northwest of power pole No. 2 and about 135 feet northwest of the entrance to the Keel rubbish dump. There is a 9-foot-diameter stone pier, with a tall target pole in center, built over the mark.

Reference mark number one is a standard disk stamped "KEEI NO BASE NO 1 1948", cemented in a drill hole in the north end of the west concrete abutment of the cattle guard, about 3-1/2 feet higher than station mark.

Reference mark number two is a standard disk stamped "KEEI NO BASE NO 2 1948", set in the top of a 12-inch-square, concrete monument projecting 2 inches. It is 20 feet east of center line of road and about 3-1/2 feet higher than station mark.

Boundary Monument No. 9 (Bishop Estate) is a 1-inch iron pipe projecting 1 foot from the center of a 12-inch, concrete mound, with "BM" inscribed in it. It is on the stone wall, about 3-1/2 feet above ground and 21 feet southeast of power pole No. 2.

*Name of chief of party should be inserted here. The officer who actually visited 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.