HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

PUAKO

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION PUAKO YEAR 1873 SECOND ORDER

SOURCE G-9279

ELEVATION 16 ft   56 WR

3895.4552

416.27159

- 0 06 50

STATE HAWAI

STATE COORDINATES (EAST)

9501

58.6 696.76

115

EAST METER

410 09 16.8

290 09 16.8

5101

SPACING BETWEEN PLANE ADJACENT TO THE SECOND ORDER

ODoboD

K0.01

K0.01

PUAKO NEW

9501

6 00 00

6 00 00

(continued on next page)
HORIZONTAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

PUAKO (continued)

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PUAKO
ESTABLISHED BY: HGS
RECOVERED BY: D.M. Whipp

YEAR: 1873
STATE: Hawaii
COUNTY: Hawaii
ISLAND: Hawaii
HEIGHT OF TELESCOPE ABOVE STATION MARK: 1.42 METERS
HEIGHT OF LIGHT ABOVE STATION MARK: METERS

QUAD 19355R
STATION 1051
LATITUDE
LONGITUDE
DIAMETER

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>PUAKO NEW---------1968 DISTANCE and DIRECTION----------00 00 00.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R.M. No. 1</td>
<td>76.30</td>
<td>23.325</td>
<td>79 55 14</td>
</tr>
<tr>
<td>R.M. No. 2</td>
<td>15.275</td>
<td>4.546</td>
<td>30 30 29</td>
</tr>
<tr>
<td>PUAKO NEW 1948----1967 DISTANCE and DIRECTION----------00 00 00.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R.M. No. 1</td>
<td>76.481</td>
<td>23.321</td>
<td>79 55 44</td>
</tr>
<tr>
<td>R.M. No. 2</td>
<td>15.310</td>
<td>4.666</td>
<td>26 26 02</td>
</tr>
</tbody>
</table>

Station was recovered and all marks found to be in good condition, however the station mark is a Coast and Geodetic Survey disk instead of a USGS disk as previously described. A complete description follows:

Station is located about 11 miles west-southwest of Kamuela, 4-1/2 miles south of Kawaihae, and 1 mile south of Hapuna Beach Park, at the northwest end of an open, grassy strip through the kiawe trees, about 1000 feet northwest from the junction of the Puako Road and road leading left to garbage dump.

To reach station from the post office in Kawaihae, go southerly on the main road for 1-1/2 miles; turn right at sign "PUAKO" and go 2.6 miles to side road right to Hapuna Beach Park; continue ahead on main road for 1.15 miles to side road right, between power poles 77 and 78. Turn right and go 0.15 mile; take left fork and go 0.05 mile to end of truck travel at a fence corner. Walk westerly along trail about 75 yards, then bear left about 30 yards to station on small knoll.

Station mark is a standard disk, unstamped, cemented in a drill hole in an 8-inch rock outcrop. It is about 400 feet east of the northeast corner of Puako Bay, 280 feet southwest of the fence corner, 80 yards south of power pole No. 1a and a fence-line, and 30 yards south of a trail. There is an 8-foot-tall, iron pipe tripod signal centered over the mark, with a 20-foot-long iron pipe in its center. The bottom of the pipe rests on a 4-legged, strap-iron support which is 20 inches higher than station mark.

Reference mark number one is a standard disk stamped "PUAKO HGS NO 1 1873," cemented in a drill hole in a black lava bedrock outcrop that projects 1 foot above ground. It is 5.6 feet lower than station mark.

Reference mark number two is a standard disk stamped "PUAKO HGS NO 2 1873," cemented in a drill hole in a lava bedrock at north edge of station mark, 3 feet northeast of a clump of kiawe and about 1/2-foot lower than station mark.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PUAKO
ESTABLISHED BY: HGS
RECOVERED BY: D. H. Holder

YEAR: 1873
STATE: Hawaii
COUNTY: Hawaii
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 4.5 miles south of Kawaihae.

Detailed instructions as to the presence of the original description; including marks found, excavated, changes made, and other pertinent facts:

The station and reference marks were recovered in good condition as described in 1967. This station was not occupied at this time.
HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

Hawaii

Latitude: 19°30' to 20°00'
Longitude: 155°20' to 156°30'

DIAGRAM No. 393-137 HAWAI

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION
PUAKO NEW

STATE: HAWAI'I
YEAR: 1948
SECOND ORDER

SOURCE: G-9279

GEODETIC LATITUDE: 19°34'320
GEODETIC LONGITUDE: 155°45'32.753
ELEVATION: 201.3

STATE & ZONE
HI

CODE
5101

STATE COORDINATES (FMS)
369.1404.96
415.3365.58

TO STATION OR OBJECT
PUAKO

COORDINATE
110 09 25.7
110 16 07
5101

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

PUAKO NEW (continued)

NAME OF STATION: PUAKO NEW
ESTABLISHED BY: L.C. Winder
RECOVERED BY: D.M. Whipp
YEAR: 1946
STATE: Hawaii
COUNTY: Hawaii
HEIGHT OF TELEVISE ABOVE STATION MARK: 1.66 Meters
HEIGHT OF LIGHT ABOVE STATION MARK: 1.67 Meters

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>BEARING</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUAKO (HGS) 1973</td>
<td>NW</td>
<td>74.981</td>
<td>22.855</td>
</tr>
<tr>
<td>R.M. No. 1</td>
<td>NW</td>
<td>23 36 10</td>
<td></td>
</tr>
<tr>
<td>Kawaihae Light 1928</td>
<td>NB</td>
<td>22.939</td>
<td>12.891</td>
</tr>
<tr>
<td>R.M. No. 1</td>
<td>NE</td>
<td>22.939</td>
<td>12.891</td>
</tr>
<tr>
<td>R.M. No. 4</td>
<td>NE</td>
<td>22.939</td>
<td>12.891</td>
</tr>
<tr>
<td>R.M. No. 1</td>
<td>SSE</td>
<td>90.998</td>
<td>27.737</td>
</tr>
</tbody>
</table>

Station was recovered and all marks found in good condition.

A complete description follows:

Station is located about 11 miles west-southwest of Kamuela and 4-1/2 miles north of Kawaihae, on a low, flat ridge, 1/2-mile east of the end of Puako Bay and 700 feet south of a group of 3 water tanks located about 500 yards east-southeast of the Puako road.

To reach station from the post office in Kawaihae, go southerly on main road for 1-1/2 miles to fork and sign "PUAKO." Take right fork and go 2.0 miles to side road to Napuna Beach Park on right. Continue ahead 1.25 miles to crossroad, where macadam road goes right, and the road left goes to garbage dump. Continue ahead, on a rough track road, for 0.1 mile to wire gate. Pass through gate and continue for 0.5 mile to second wire gate. Pass through gate, turn left, and follow bulldosed strip along fence for 0.15 mile to top of grade and station on left of fence.

Station mark is a standard disk stamped "PUAKO NEW 1946," cemented in a drill hole in a 4-inch square bedrock outcrop that projects 4 inches above ground. It is 99.7 feet west of the fence-line. Reference mark number one is a standard disk stamped "PUAKO NEW NO 3 1946," cemented in a drill hole in black lava outcrop that projects 2 feet above ground. It is 2 feet north of a large chiseled cross in the same rock, 3.3 feet southeast of the fence-line and 1.7 feet lower than station mark.

Reference mark number two is in a standard disk stamped "PUAKO NEW NO 2 1946," cemented in a drill hole in bedrock that projects 1 foot above ground. It is on a rocky point and about 3 feet lower than station mark.

Reference mark number three is a standard disk stamped "PUAKO NEW NO 3 1946," cemented in a drive hole in a 10 x 4-inch rock outcrop that projects about 3 inches above ground and is about 1 foot lower than station mark.

Reference mark number four is a standard disk stamped "PUAKO NEW NO 4 1946," cemented in a drill hole in the top of a small rock outcrop that projects 10 inches above ground and is 1/2 inch higher than station mark.

U.S. DEPARTMENT OF COMMERCE - COAST AND GEODETIC SURVEY
RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PUAKO NEW
ESTABLISHED BY: L.C. Winder
RECOVERED BY: D.M. Whipp
YEAR: 1946
STATE: Hawaii
COUNTY: Hawaii

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

Punohu (Hawaii Island, Hawaiian Government Survey, 1876).—In the northern part of Hawaii, on the northern slope of Mauna Kea, on the extreme west summit of the hill, Punohu, and 272 feet west of a post on the Paahau boundary marked "Paahau." Marked by a mamane post, with three triangular pits, 1 foot deep and each 3 feet on side distant 3 feet from station. A channel from each pit to center was filled with charcoal.
HORIZONTAL CONTROL DATA

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

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: Puu Hinai
STATE: Hawaii
COUNTY: Hawaii
Location: Kohala, Hawaii
Established by: U.S.G.S.
Year: 1938

Detailed statement as to the site of the original station:
Location of Station: On the southwest crater rim of a conspicuous hill named Puu Hinai situated about 4 1/2 miles below the Waimea Kona road at a point on the road about 7/2 miles distant from Kamuela.
Old Station mark found: The buried copper triangle and cow horn marking the station could not be found. However, the station was remeasured from the original ties and a stone is on the road about 7/2 miles distant from the station. This appears not to have been disturbed. All other original tie marks (on stones) were found removed. No surface mark identified the station; the tie mark 7/2 miles distant from the station appears to have been used as the station as a field station. And a flag stick was found over the tie mark.
New Station mark: U.S.G.S. Type C triangular monument (2 1/2" pipe 4-feet long set in triangular concrete monument 7 1/2 feet on each side, with standard metal target).

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Puu Hinai
State: Hawaii
Recoverer: L. C. Wilkin
Year: 1940
County: Hawaii

Detailed statement as to the site of the original station: Unable to locate the original description.

A new description follows:
The station is located on the western rim and the highest point of a prominent volcanic knoll named Puu Hinai which lies about 11 miles southwest of Waimea, about 6 miles east of Anahoomalu Bay, about 7 miles southeast of Puako Bay and about 4 miles west of the road which leads between Waimea and the Kona District.
To reach from the post office in Waimea, go south on the road which leads toward the Kona District, for 6.4 miles; continue straight ahead on the road which leads toward the Kona District for 4.8 miles; turn right, pass through a board gate and go westwardly, on a track road, for 4.6 miles to the base of the hill and the end of truck travel. From this point westwardly, up the steep slope, for about 6.3 miles to the summit and the station.
The station is the center of a 2 1/2 inch iron pipe which projects about 6 1/2 inches from the top of a concrete frustum of a pyramid, which in turn projects about 2 1/2 feet from the top of a triangular slab of concrete which is about 7 feet on each side.
Reference mark number 1 is a standard disk, stumped 1946, set in the top of a 2 1/2 inch iron pipe which is flush with the ground.
Reference mark number 2 is a cross cut in a flat rock, surrounded by a triangle which is about 6 inches on each side. The rock is flush with the ground and is at about the same elevation as the station.

(continued on next page)
HORIZONTAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

PUU HINAII (continued)

RECOVERY NOTE, TRIANGULATION STATION

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

NAME OF STATION: PUU HINAII
ESTABLISHED BY: MTS
YEAR: 1910
STATE: Hawaii
RECOVERED BY: J.M. Whipp
YEAR: 1967
COUNTY: Hawaii
Island: Hawaii
HEIGHT OF TELESCOPE ABOVE STATION MARK: 0.8 METERS
HEIGHT OF LENS ABOVE STATION MARK: METERS

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

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>RECOVERY</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>WNNOAIGAII (HGS) 1873--1948</td>
<td>S</td>
<td>38.096</td>
<td>117,015,37,46</td>
</tr>
<tr>
<td>R.M. No. 2</td>
<td>S</td>
<td>38.096</td>
<td>117,015,37,46</td>
</tr>
<tr>
<td>R.M. No. 1</td>
<td>W</td>
<td>21.450</td>
<td>67,21,32,18</td>
</tr>
<tr>
<td>WNNOAIGAII (HGS) 1873--1967</td>
<td>E</td>
<td>About 2 miles</td>
<td>117,015,37,46</td>
</tr>
<tr>
<td>Green Water Tank</td>
<td>S</td>
<td>38.022</td>
<td>117,015,37,46</td>
</tr>
<tr>
<td>R.M. No. 2</td>
<td>S</td>
<td>38.022</td>
<td>117,015,37,46</td>
</tr>
<tr>
<td>R.M. No. 1</td>
<td>S</td>
<td>21.450</td>
<td>67,21,32,18</td>
</tr>
</tbody>
</table>

Station mark was recovered in good condition. Reference mark number one and the chiseled cross and triangle marking RM 2 were also recovered. A new reference mark disk was established at the chiseled cross. A complete description follows:

Station is located about 11 miles southwest of Kamehame, 6-1/2 miles west-southwest of the junction of State Highways 19 and 20; and 6 miles southwest of Puako, at about 1679 feet elevation, on the west rim of Puu Hinaii, a prominent, grassy hill.

To reach station from the post office in Kamehame, go south on State Highway 19 for 5-1/2 miles to junction with State Highway 20. Continue on State Highway 19 for 4-1/2 miles to board gate on right, at power pole No. Pass through gate and follow track road west-northwest for 0.8 miles; take right fork and go 1.6 miles to green wooden water tank. Continue on track road for 2.2 miles to end of truck travel at base of hill. Pack west to highest point of hill. About a 15-minute pack.

Station is marked with a Type C signal constructed by the Hawaii Territorial Survey. This consists of a 2-1/2-inch iron pipe projecting 2 feet from the center of a triangular, concrete platform about 7 feet on each side and projecting 4 inches above ground. Station is center of the 2-1/2-inch pipe, which holds a removable, red and white metal target.

Reference mark number one is a standard disk stamped "1948", set in the top of a 2-inch iron pipe flush with ground and 4.9 feet below the top of station pipe.

Reference mark number two is a standard disk stamped "PUU HINAII HGS 1938 NO 2 1967", cemented in a drill hole in a 14-inch, triangular rock projecting 3 inches above ground, at the point marked by the chiseled cross in chiseled triangle, described as RM 2 in 1948.

Green Water Tank is a green, wooden, flat-topped, water tank 18 feet in diameter and 14 feet high.

NOTE: There is no "concrete frustum of a pyramid" on the platform as described in 1948.

NOTE - One 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.
HORIZONTAL CONTROL DATA
by the
National Ocean Survey
OLD HAWAIIAN DATUM

PUU IO (Hawaii Island, Hawaiian Government Survey, 1876).—In northern part of Hawaii, on Puu Io, at the foot of Mauna Kea, on the brow of the hill to the northeast (not on the summit). Marked by a mamoane post and a cairn of stones. A rock marked with two crosses is N. 40° E. from the station, distant 8 feet.

RECOVERY NOTE. TRIANGULATION STATION

Name of Station: Puu Io  
State: Hawaii  
County: Hawaii

Established by: Hawaiian Govt Survey 1876  
Locality: South Kohala, Hawaii

Recovered by: 1st Survey 1930

Detailed statement as to the Stone of the original description:

Location of Station: On the westerly crater rim of the hill called Puu Io which is about 10 miles easterly from Waimea via the Kawai road and about 1 1/2 miles south of the Kawai Dairy. Follow the road to the pump station on the side of Puu Io Hill.

Old Station mark found: U.S.G.S. bronze tablet in a 6” cylindrical concrete monument stamped 3033 feet. Elevation and covered with a small stonepile. The H.T.S. mark of 1876, a mamoane post, no longer exists. A large boulder with two large 4’s bears S 40° E 9 feet from the bronze tablet. The bearing to this immovable rock from the H.T.S. station of 1876 was 46°E 9 feet. The U.S.G.S. tablet has been adopted as the station since it apparently has been assumed to be the station by surveyors using it. However it should be re-triangulated on.

New Type of station mark: H.T.S. Type D monument set over the U.S.G.S. bronze tablet.

RECOVERY NOTE. TRIANGULATION STATION

Name of Station: PUU IO  
State: Hawaii  
County: Hawaii

Established by: Hawaiian Govt Survey 1876  
Locality: South Kohala, Hawaii

Recovered by: L. C. Wilder  
Year: 1948  
County: Hawaii

Detailed statement as to the Stone of the original description:

The 1876 station was not recovered (A mamoane post and cairn). The present station is the center of a U.S.G.S. bronze disk, stamped 3033, set in the top of a 6 inch cylindrical concrete post which is flush with the surface of the ground. This station was established about 1926 and it is not known if the original station was recovered at this time. In 1938 the Hawaiian Territorial Survey surrounded this station by a triangular concrete platform which is 7 feet on each side and projects about 1 foot. A new description follows—

The station is located on the summit of a low volcanic knoll known as Puu Io, about 12 miles northwest of the summit of Mauna Kea, about 9 miles southwest of Honokaa, about 8 miles east-southeast of Waimea and 25 meters north of two wooden water tanks.

To reach from the post office in Waimea; go east on the road which leads towards Kupuka for 2.1; turn right, onto a graded road, and go south and east for 4.6 miles; cross over a cattle guard, pass to the right hand side of a dairy farm and continue south and west for 3.1 miles; turn right, onto a track road, and go westerly for 0.5 mile; pass to the right hand side of a concrete water trough and continue westerly for 0.1 mile; pass through a board gate and follow the track road west and north for 0.7 mile to a ranch house at the western foot of the hill.

(continued on next page)
From this point peak easterly, up the steep slope, for about 0.2 mile to the summit of Puu I 0 and the station. This is a 20 minute peak.

Reference mark number 1 is a standard disk, stamped PUU I 0 NO 1 1946, set into a drill hole in a boulder which is flush with the ground on the west and projects about 2 feet on the east. It is about 3 feet lower on the west and is 45 feet from the north edge of the most easterly of two water tanks.

The two water tanks are constructed of wood and are 15 feet in diameter and their base is 1.43 meters lower than the station.

Object | Distance    | Direction
-------|-------------|------------
PAPALEKO'I 1946 | 11,563 m   | 37,999 ft  
R. M. No. 1 SSE | 12 34 21   |
East Tank 8 (center) | 25 67 89  |
West tank 8 (center) | 13 24 56  |
NOHONAHUI (metal target) | 97 06 45  |
NOKUULI (metal target) | 150 37 46  |

An early recovery note reports; Original station recovered by B. Barrington in January 1911. Marked by bronze tablet set in concrete, centered under old post, stamped 4068.

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

Station is located about 7 miles east-southeast of Kamuela and 0.1/2 miles southwest of Konoka, on the summit of Puu I 0, a bare hill of about 4083 feet elevation that has two green, wooded, water tanks on top.

To reach station from the post office in Kamuela, go easterly on State Highway 19 for 2.1 miles; turn right on graded road at power pole 19 and follow main road southeasterly for 0.5 miles to old ranch on left; continue for 1.5 miles to truck road right, at telephone pole 106. Take side road and go 0.75 mile to board gate. Pass through gate and go right for 0.1 mile to board gate on left side of lane. Pass through this gate and go cross-country 0.4 mile to end of truck travel at steep grade. Pack about 300 yards to top and station.

Station mark is a USGS disk set in the bottom of a hole 8 inches deep in the center of a triangular, concrete platform 7 feet on each side and flush with ground. NOTE: No stamping is discernible on the disk.

Reference mark number one is a standard disk stamped "PUU I 0 NO 1 1946", cemented in a drill hole in a red rock ledge, 0.1 foot lower than station.

Reference mark number two is a standard disk stamped "PUU I 0 1876 NO 2 1967", cemented in a drill hole in a 3-foot, red rock that projects 2 feet on the east side, and is at same elevation as station.

East Tank 1948 is a green, wooden, water tank, 17.8 feet in diameter and 11.1/2 feet high.

West Tank 1948 is a green, wooden, water tank, 17.8 feet in diameter and 11.1/2 feet high.

NOTE: The 1967 distance and direction to the tanks is considered the most accurate because the exact centers were determined by shooting both sides of the tanks.
HORIZONTAL CONTROL DATA
by the
National Ocean Survey
OLD HAWAIIAN DATUM

NO ORIGINAL TEXT

NO ORIGINAL TEXT

HORIZONTAL CONTROL DATA

NAME OF STATION: PUU KA PELE
STATE: HAWAII
RECOVERED BY: Y. Takahashi, Jr.
YEAR: 1950
COUNTY: Hawaii

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: PUU KA PELE
STATE: HAWAII
YEAR: 1882

SOURCE: G-SP156

STATE COORDINATES (M)/

STATE & ZONE COORD X Y P-ANGLE

MI 1 5101 452.355.12 340.299.52 - 0.02 49

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

1. When sheet or paper should be turned here. The officer who accuracy checked the sheet should sign his name at the end of the recovery note.

2. One of these letters must be used for every station measured.

C028-OC 34314

Q0 245
**HORIZONTAL CONTROL DATA**

by the
National Ocean Survey
OLD HAWAIIAN DATUM

**ADJUSTED HORIZONTAL CONTROL DATA**

**NAME OF STATION**: PUIU KEA  
**STATE**: HAWAI'I  
**YEAR**: 1982  
**THIRD ORDER**

**SOURCE**: G-5P156

<table>
<thead>
<tr>
<th>Geodetic Latitude</th>
<th>Geodetic Longitude</th>
<th>Elevation</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>19° 45' 48.826&quot;</td>
<td>155° 37' 37.316&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**STATE & ZONE**

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>Z SPD. IN INCHES</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>496,302.99</td>
<td>337,622.88</td>
<td>0.02 35</td>
</tr>
</tbody>
</table>

Footnote: Planes azimuth has been computed by the C.M.O. 13 formula neglecting the second term.

**TO STATION OR OBJECT**  

<table>
<thead>
<tr>
<th>Geodetic Azimuth (Plane Angle)</th>
<th>Planes Azimuth (Plane Angle)</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>150° 48b</td>
</tr>
</tbody>
</table>

---

**DIAGRAM**: NE 5:1 HAWAI'I
HORIZONTAL CONTROL DATA

DESCRIPTION OF TRIANGULATION STATION

PUU KUAINHO

WAIMEA

HAWAII COUNTY, HAWAII

NAME OF STATION: PUU KUAINHO

STATE: HAWAII

CHIEF OF PARTY: L. O. WILDER

YEAR: 1948

DEPT. OF THE INTERIOR, N.O.A.A.

1948

1.239

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

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>MEASURED DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEST PUU WAANAA</td>
<td>13.294 feet</td>
<td>NW</td>
</tr>
<tr>
<td>R. M. No. 1</td>
<td>4.053 feet</td>
<td></td>
</tr>
<tr>
<td>R. M. No. 2</td>
<td>00 00 00</td>
<td></td>
</tr>
<tr>
<td>WEST PUU WAANAA</td>
<td>12.188 feet</td>
<td></td>
</tr>
<tr>
<td>R. M. No. 1</td>
<td>3.715 feet</td>
<td></td>
</tr>
<tr>
<td>R. M. No. 2</td>
<td>273 46 46</td>
<td></td>
</tr>
</tbody>
</table>

The station is located on the summit of a low volcanic knoll, named Kuainho, which is about 35 miles southwest of Waimea, about 6 miles northeast of the Puu Waanaa Ranch, and about 0.2 mile south of the road which runs between Waimea and Kona District.

From this point south, on the road which leads toward the Kona District, for 1.5 miles; 4 miles; and for 4 miles; then at the end of truck travel at the northern slope of the low knoll. From this point south, on the road which leads toward the Kona District, for 1.5 miles; 4 miles; and for 4 miles; then at the end of truck travel at the northern slope of the low knoll. From this point south, on the road which leads toward the Kona District, for 1.5 miles; 4 miles; and for 4 miles; then at the end of truck travel at the northern slope of the low knoll.

The station is a standard disk, stamped PUU KUAINHO 1948, set into a drill hole in a boulder which projects about 2 inches.

Reference mark number 1 is a standard disk, stamped PUU KUAINHO NO 1 1948, set into a drill hole in a boulder which projects about 2 feet and is about 2 feet higher than the station.

Reference mark number 2 is a standard disk, stamped PUU KUAINHO NO 2 1948, set into a drill hole in a boulder which is flush with the ground and is about 1 foot higher than the station.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: PUU KUAINHO

STATE: HAWAII

YEAR: 1948

SECOND ORDER

SOURCE: G- 9279

STATE COORDINATE (E)

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>x</th>
<th>y</th>
<th>Z (ft. above NAVD 88)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>9101</td>
<td>406.573.45</td>
<td>365.912.00</td>
<td>0 05 32</td>
</tr>
</tbody>
</table>

* Plane azimuths have been computed by the Z = 0 formula neglecting the second term.

STATE COORDINATE (E)

<table>
<thead>
<tr>
<th>TO STATION OR OBJECT</th>
<th>DOWEN AZIMUTH</th>
<th>PLANE AZIMUTH</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEAMUKU</td>
<td>284 33 32 9</td>
<td>288 39 05 5</td>
<td>5101</td>
</tr>
</tbody>
</table>

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

PUU KUALINO (continued)

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PUU KUALINO
ESTABLISHED BY: L.C. Wilder
RECOVERED BY: D.M. Whipp
YEAR: 1948
STATE: Hawaii
COUNTY: Hawaii
Island: Hawaii

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

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

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>MEASURED DISTANCE</th>
<th>MEASURED DIRECTION</th>
<th>DISTANCE</th>
<th>MEASURED DIRECTION</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEAMUKU (HGS) 1882 ------1948 DISTANCE</td>
<td>12.186</td>
<td>31</td>
<td>59</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>R.M. No. 2</td>
<td>3 715</td>
<td>NW</td>
<td>215</td>
<td>14</td>
<td>27</td>
</tr>
<tr>
<td>R.M. No. 2</td>
<td>3 712</td>
<td>S</td>
<td>31</td>
<td>55</td>
<td>45</td>
</tr>
<tr>
<td>R.M. No. 1</td>
<td>4 090</td>
<td>NW</td>
<td>215</td>
<td>39</td>
<td>27</td>
</tr>
<tr>
<td>PUU HINA1 (HGS) 1938</td>
<td>248</td>
<td>08</td>
<td>51.6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Station was recovered and all marks found in good condition. A complete description follows: Station is located about 15 miles southwest of Kamuela, 6 miles northeast of Puu Waawaa Ranch, and 500 feet south of State Highway 19, on the summit of a cone, grassy hill of about 2715 feet elevation. To reach station from the post office in Kamuela, go south on State Highway 19 for 6.4 miles to junction with State Highway 20. Continue on State Highway 19 for 5.0 miles to power sub-station on right; continue on the highway for 4.1 miles to power pole 143 by hill on left, and end of track travel. Park southerly up hill for about 500 feet to top and station. Station mark is a standard disk stamped "PUU KUALINO 1948", cemented in a drill hole in a bedrock outcrop projecting 2 inches above ground. Reference mark number one is a standard disk stained "PUU KUALINO 1948", cemented in a drill hole in the northeast end of a 3 x 5-foot, sloping rock that projects 3 feet above ground. It is about 1 foot higher than station mark. Reference mark number two is a standard disk stained "PUU KUALINO 2 1948", cemented in a drill hole in a large square rock, 5 x 8 feet in size. It is about 10 inches 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.

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

**Station:** 1059  
**Latitude:** 19° 53' 28.667  
**Longitude:** 155° 36' 44.061  
**Elevation:** 61554  
**Diagram:** NE 515  
**Datum:** HAWAII

**NO TEXT**

**ADJUSTED HORIZONTAL CONTROL DATA**

**Station:** PUU LOA 2  
**State:** HAWAII  
**Year:** 1063  
**Third Order**

**Source:** G-SP158

<table>
<thead>
<tr>
<th>State &amp; Zone</th>
<th>Code</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI 1</td>
<td>5101</td>
<td>346,343.22</td>
<td>263,240.25</td>
<td>-0° 08' 57.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Plane azimuth has been computed by the $A + B + C$ formula neglecting the second term.*

**Table for Plane Angles:**

<table>
<thead>
<tr>
<th>Station or Benchmark</th>
<th>Geodetic Azimuth (from north)</th>
<th>Plane Azimuth (from north)</th>
<th>COIL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**QQ 255**
NO ORIGINAL TEXT

Puu Ohau (Hawaii Island, Hawaiian Government Survey, 1883; T. J. Maher, 1928).—On west coast of Hawaii, Kona District, on Puu Ohau, a conspicuous hill about 1½ miles north of Kealakekua Bay, 305 meters from the sea. There is an ancient stone platform about 4 meters west of the station, and across a deep volcanic pit, on opposite side of rim but much lower, is a tomb of white mortar. It bears S. 30° W. from station, distant 150 meters. Care must be taken not to mistake tomb for cairn, painted white, which was left over station (1918). Station marked by cartoneware bottle 2 feet below surface of ground. Surface mark is stone marked with triangle, while three stones marked with crosses are each 0.76 meter (2.5 feet) from station. In 1928 surface and witness marks found as described; subsurface mark not investigated. Additional witness marks established as follows: Cross cut in large boulder, distant 3.9 meters (13 feet), on bearing N. 30° W. (mag.); triangle blazed on tree, distant 11.2 meters (37 feet), on bearing S. 41° E. (mag.). Station may be reached over lava trail from Cooks Monument. In smooth weather landing may be made at base of Puu Ohau in small boat, on shore of which is a shack.

DEPARTMENT OF COMMERCE
RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PUU OHAU
ESTABLISHED BY HAWAIIAN GOVT., YEAR: 1883
RECOVERED BY L. C. WILDER, YEAR: 1948
COUNTY: HAWAII

Detailed statement as to the basis of the original description:
A 2 1/2 inch pipe was found projecting from the top of a square concrete platform and was used as the station. One reference mark was established for this station. A new description follows—The station is located on the boundary line of the North and South Kona Districts and on the summit of a prominent volcanic knoll, about 200 feet high, which lies about 4 miles south of Keauhou Bay, about 3 miles north of Kealakekua Bay, about 2.5 miles west of Kealakekua, about 0.4 mile north of a small beach shack, about 300 meters east of the beach and 200 feet east of an old stone platform.

To reach from the post office in Kealakekua; go south, on the road which leads toward Captain Cook, for 0.4 mile; turn right, pass through a board gate, and follow a track road, westward, for 0.5 mile; pass to the south of a house; pass through the west westerly of two gates and follow a dirt track road westerly for 0.7 mile; pass through a board gate, cross over the old railroad grade and continue westerly for 0.6 mile; pass through a gate in a rock wall and continue westerly for 0.2 mile; pass through a gate, which lies just east of a cactus patch, turn right and follow a track road north and west for 0.7 mile; take the right hand fork and go northerly, on a narrow, brush-covered, road for 0.3 mile to the end of truck travel. From this point, pack west and north, up the gentle slope, for about 0.2 mile to

(continued on next page)
the highest ground and the station.
The station is the center of a 2 1/2 inch iron pipe which projects 2 1/2 feet from the top of a square concrete platform which is about 6 feet on each side. The concrete platform projects about 1 foot above the ground.

Reference mark number 1 is a standard disk, stamped PUU OAHU 1 1946, set into a mound of concrete on the top of a boulder which is about 4 feet in diameter and projects about 3 feet. It is located 12 feet north of the crest of the crater's rim and is about the same elevation as the station.

<table>
<thead>
<tr>
<th>Object</th>
<th>Distance</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>KAUAIHOU COAST</td>
<td>00 00 00</td>
<td>E</td>
</tr>
<tr>
<td>Kalanaui Spire (St. Paul's Church)</td>
<td>5 miles NE</td>
<td>01 10 10.7</td>
</tr>
<tr>
<td>H. M. No. 1</td>
<td>44.063 ft</td>
<td>13,438 m</td>
</tr>
</tbody>
</table>

The following report by Cha. L. Murray, U.S. Geodetic Engineer, Hawaii Territory Survey: The old mark was a drill hole in a triangle cut in a set of stone was recovered by the R. T. S. in 1908. A 1 1/2 inch pipe was set in concrete and centered over the old mark.

Station mark and reference mark number one were recovered in good condition. A new reference mark, No. 2, was established. A complete description follows:

Station is located about 9 miles south-southeast of Kailua, 2 miles west of Kealakekua, on the North Kona-South Kona Boundary, and on the north rim of Puu Oahu, a timbered hill of about 230 feet elevation.

To reach station from the post office in Kealakekua, go south on State Highway 11 for 0.75 miles to power pole 135. Turn sharp right and go down grade on macadam truck road for 0.3 miles to board gate on left. Pass through gate and go 0.15 mile to locked board gate. Pass through gate and continue on field road for 0.65 mile to gate. Take through gate, turn right, and go 0.75 mile to fork. Take left fork for 30 yards to gate. Pass through gate and go 0.5 mile to gate; pass through gate and go 0.3 mile to gate in stone wall. Pass through gate then turn right and go 0.25 mile to locked gate; pass through gate, then turn gate in opposite direction for 0.25 mile to 3-way fork; take extreme left fork and go 0.15 mile to end of truck trail. Park southeast up hill about 200 yards to station.

Reference mark number one is a standard disk stamped "PUU OAHU 1 1948". Cemented in a drill hole in the top of a bedrock ledge projecting 2 feet above ground, and is about 6 inches higher than station mark.

Reference mark number two is a standard disk stamped "PUU OAHU HGS 1883 NO 2 1968", cemented in a drill hole in bedrock projecting 6 inches from ground. It is about 6 inches lower than station mark.

### RECOVERY NOTE, TRIANGULATION STATION

<table>
<thead>
<tr>
<th>Reference mark</th>
<th>Distance</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEALAKEKUA COAST</td>
<td>00 00 00</td>
<td>E</td>
</tr>
<tr>
<td>R. M. No. 1</td>
<td>44.063 ft</td>
<td>13,438 m</td>
</tr>
</tbody>
</table>

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

Station mark and reference marks 1 and 2 were recovered as described by R. C. Munson (1968) in good condition.
**Puu Pa (Hawaii Island, Hawaiian Government Survey, 1873)**—In the northern part of Hawaii, on hill of same name, 3 miles southwest of Waimea village. Station is on west summit of hill and is marked by a granite post.

**RECOVERY NOTE, TRIANGULATION STATION**

**NAME OF STATION:** PUU PA
**ESTABLISHED BY:** HAWAII GOVT. SURVEY **YEAR:** 1873
**RECOVERED BY:** L. O. WILDER **YEAR:** 1948 **COUNTY:** HAWAII

Detailed statements as to the theme of the original description: The station was recovered in good condition. The station mark is a U. S. Geological Survey bronze disk and not a granite post as described in the 1873 description. A new description follows.

The station is the center of a U. S. Geological Survey bronze disk set into concrete and surrounded by a 5 x 5 foot slab of concrete which projects 1 foot. A frustum of a pyramid, constructed of concrete, having a base of 18 inches and a top of 12 inches and having a 2.5 inch pipe running through its length is centered over the station mark.

The station is located on the west summit of a volcanic knoll known as Puu Pa and is about 4 miles southwest of Waimea.

To reach the post office in Waimea, go south on the road which leads toward Kona for 2.2 miles to telephone pole number 662; turn right, onto a back road, and go westerly for 1.5 miles; take the right hand fork and follow the main traveled road west for 0.6 mile to the high ground and the station.

Reference mark number 1 is a standard disk, stamped 1 1948, set into a drill hole in a boulder which projects about 1 inch and is about 4 feet lower than the station.

**OBJECT**
**DISTANCE**
**DIRECTION**
**H. R.** = 3,409.2 ft, 69.675°    280° 26' 33"

An early recovery note reports; Original station recovered by G. H. Birdseye in Sept ember 1911. Remarked by bronze tablet stamped 1917, centered over old mark.

(continued on next page)
HORIZONTAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY

OSD HAWAIIAN DATUM

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: FUU PA

ESTABLISHED BY: HGS
YEAR: 1873
STATE: Hawaii
COUNTY: Hawaii
ISLAND: Hawaii

RECOVERED BY: D.M. Whipp
YEAR: 1967

HEIGHT OF TELESCOPE ABOVE STATION MARK: 1.72 Meters
HEIGHT OF LIGHT ABOVE STATION MARK: 2.0 Meters

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

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOKUULA 2 (USGS)</td>
<td>1948</td>
<td>63.675</td>
</tr>
<tr>
<td>R.M. No. 1</td>
<td>N</td>
<td>63.675</td>
</tr>
<tr>
<td>HOKUULA 2 (USGS)</td>
<td>1948-1957</td>
<td>63.628</td>
</tr>
<tr>
<td>R.M. No. 1</td>
<td>NE</td>
<td>63.628</td>
</tr>
<tr>
<td>Kamuela Airport, VOR</td>
<td>BNE</td>
<td>63.628</td>
</tr>
<tr>
<td>R.M. No. 2</td>
<td>SSW</td>
<td>51.477</td>
</tr>
</tbody>
</table>

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

Station is located about 3 miles southwest of Kamuela and 2 miles west-southwest of the Kamuela Airport, on the highest point of a prominent grassy hill of about 2600 feet elevation.

To reach station from the post office in Kamuela, go south on State Highway 19 for 2.1 miles to track side road right, at Telephone pole 802. Go right for 0.05 mile; take left fork and go 0.1 mile to board gate.

Pass through gate and continue for 1.6 miles; leave track road and go right, up along gradual ridge, for 0.6 mile to highest point and station. Station mark is a USGS disk, unmarked, set in concrete 6 inches below the top of a 6 x 6-foot, concrete platform that projects 15 inches above ground. A truncated, concrete pyramid, 2 feet high, is at center of platform and supports a red and white metal target. Station mark is in the bottom of an 8 x 30-inch recess in center of platform.

Reference mark number one is a standard disk stamped "1948", cemented in a drill hole in a 20-inch, triangular, red boulder projecting 4 inches above ground, and is 5.1 feet lower than station mark.

Reference mark number two is a standard disk stamped "HGS 1873 NO 2 1967", cemented in a drill hole in a small bedrock outcrop that projects 3 inches above ground, and is 4.5 feet lower 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.

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

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: PUU PANINI (HTS)
STATE: HAWAI'I
COUNTY: HAWAI'I
NORTH KONA DISTRICT

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

NOTE: A dot indicates that the station is on the earth's surface.

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

OBJECT

SURFACE-LEVEL MARK

UNDERGROUND-LEVEL MARK

DISTANCE (METERS)

DIRECTION

PUU WAAWAA WEST

75° 01' 39.3"

166° 43' 29.7"

00° 00' 00"

KAUPULEHU FLOWS

(Their are 6 of them)

ANAHULU

The station is located on the crest of a long, grassy, northwest-southeast ridge which lies about 10 miles north of Kuualii Volcano, about 10 miles east of Lakea Bay, about 5 miles southeast of Kiholo Bay, about 1 mile west of Anahulu Homesteads, about 0.4 mile southeast of a grove of trees and 14.5 feet west of a wire fence. Land to the east is under cultivation. Land to the west drops off sharply and is mostly barren lava beds.

The station is the center of a 2 1/2 inch iron pipe which projects about 3 feet from the top of a triangular slab of concrete which is about 6 feet on each side and is flush with the surface of the ground.

To reach from the post office in Waimea; go south on the road which leads toward Kalua for 5.8 miles; continue straight ahead, toward Kalua for 14.6 miles to the village of Puu Anahulu Homesteads; turn right, off the highway, pass through a basketball court and go westerly for about 100 yards; pass through a board gate and follow a field road, northwesterly for 0.8 mile, pass through a board gate and continue northwesterly for 0.35 mile; turn left, pass through a board gate, and go across country, southeasterly, for 0.15 mile; pass through a board gate and go southwesternly, up a steep grade for about 100 yards to the crest of the ridge and the station.

(continued on next page)
HORIZONTAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY

PUU PANINI (HTS) (continued)

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PUU PANINI (HTS)
ESTABLISHED BY: L.C. Wilder YEAR: 1948 STATE: Hawaii
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

Detailed information as to the location of the original descriptions, including data found, site notes, changes made, and other pertinent facts:

Station is recovered in good condition. A complete description follows:
Station is located about 131/2 miles northeast of Kailua, 5 miles southeast of Koholo Bay, and 1/2-mile northwest of State Highway 19, at about 2260 feet elevation, on the crest of a narrow, grassy ridge running northwest-southeast, on the east boundary of the Puu Anahulu Homestead lands. The ridge has scattered milk oak trees along the west side.

To reach station from the post office in Kamuela, go south and southwest on State Highway 19 for 20.5 miles to side road right, just before long left curve of highway, at power pole 1152. Turn right, then take left fork and go 0.05 mile to board gate. Pass through gate and go 0.2 mile to 2 gates 40 yards apart. Pass through both gates and continue for 0.3 mile to board gate on left, by trees. Pass through gate and follow westerly along left side of fence for 0.1 mile to base of steep ridge and end of truck travel. Pack uphill about 100 yards to a narrow gate in fence, and station just beyond.

Station is the center of a 2-1/2-inch, iron pipe projecting 2 feet from the center of a triangular, concrete platform about 7 feet on each side and projecting 3 inches from ground. It is 15.4 feet west-southwest of the fence line and 18.7 feet west-northwest of a 7-junction of fence lines. A red and white metal target, 9 feet tall, is mounted in the station pipe.
HORIZONTAL CONTROL DATA

NAME OF STATION: PUU WAAWA WEST
STATE: HAWAII

LATITUDE: 19° 30'-70 00'
LONGITUDE: 156° 30'-70 150 00'

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: PUU WAAWA WEST
STATE: HAWAII
YEAR: 1946
SECOND ORDER

SOURCE: G-4279

DEGREES LATITUDE: 19° 46' 20.913
DEGREES LONGITUDE: 156° 50' 14.933
ELEVATION: 1295.0 METERS
3666 FEET

STATE COORDINATES (F.O.S.)

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>(\phi) OR (\phi - \alpha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>3839968.66</td>
<td>341156.18</td>
<td>- 0° 06' 51&quot;</td>
</tr>
</tbody>
</table>

*PLANE AZIMUTH HAS BEEN COMPUTED BY THE \( \phi - \alpha \) FORMULA NEGLECTING THE SECOND TERM

TO STATION OR OBJECT

<table>
<thead>
<tr>
<th>GEODETIC AZIMUTH (FROM STATION)</th>
<th>PLANE AZIMUTH (FROM STATION)</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUU HINAI</td>
<td>202 05 11.6</td>
<td>5101</td>
</tr>
</tbody>
</table>

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

PUU WAAWAA WEST (continued)

NAME OF STATION: PUU WAAWAA WEST
ESTABLISHED BY: L.C. Wilder Year 1948 STATE: Hawaii
RECOVERED BY: R.M. Whipp Year 1967 COUNTY: Hawaii
Island: Hawaii
HEIGHT OF TELESCOPE ABOVE STATION MAIN: 1.5 METER
WEIGHT OF LIGHT ABOVE STATION MAIN: METER

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>TRUE DISTANCE</th>
<th>TRUE DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>R.M. No. 2</td>
<td>17.79'</td>
<td>3.462'</td>
</tr>
<tr>
<td>R.M. No. 1</td>
<td>17.30'</td>
<td>3.270'</td>
</tr>
<tr>
<td>ANAHOLE (HTS) 1862</td>
<td>17.275'</td>
<td>3.266'</td>
</tr>
</tbody>
</table>

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

Station is located about 21 miles south of Kamuela, 11 miles northeast of Honokaa, and 2-1/2 miles south-southeast of State Highway 19, at about 3967 feet elevation, on the southwest side, and highest point, of Puu Waaawaa, a prominent, timbered, extinct crater. Station WAAWAA (HTS) 1862 is on the northeast point of the rim and has a red and white metal target on it.

To reach station from the post office in Kamuela, go southerly on State Highway 19 for 21.5 miles to the Puu Waaawaa Ranch gate on left. Go left for 2.0 miles to ranch headquarters buildings on right. (Permission to be on the ranch property was obtained here). Pass through board gate with sign "SMALL PALOA" and follow track road 0.15 mile; pass through gate and go up 0.15 mile; take left fork, go 30 yards, then take right fork, and go 0.25 mile; pass through gate and continue for 0.25 mile; take right fork and go 0.2 mile; pass through gate and go 0.4 mile to gate on left. Pass through gate and go along fence for 0.1 mile; pass through board gate at orchard corner and go right, along base of hill, for 0.8 mile to gate on left in lane, at east side of hill. Go left, through gate and up lane for 0.45 mile to top of grade. Go left for 60 yards; pass through gate and go uphill through trees for 0.2 mile to top and station.

Station mark is a standard disk stamped "PUU WAAWAA WEST 1948", set in the top of an iron pipe flush with ground. It is at west end of hilltop, in the middle of a 15-foot-square, board fence and 2.0 feet north-northeast of a white witness post.

Reference mark number one is a standard disk stamped "PUU WAAWAA WEST 1 1948", set in the top of an iron pipe flush with ground, at about same elevation as station.

Reference mark number two is a standard disk stamped "PUU WAAWAA WEST 2 1948", set in the top of an iron pipe flush with ground and at about same elevation as station mark.

Distance between reference marks is 15.85 feet.

NOTES: All marks become hidden by the tall, heavy grass.

*Note: chief of party should be informed here. The officer who actually visited the station should sign his name at the end of the recovery notes.

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

SIGNAL (Hawaii Island, T. J. Maher, 1928).—On western coast of Hawaii Island, on lava point at north side of entrance to Keauhou Bay. This is a Territorial station, and is marked by a cement base with piece of 1/2-inch galvanized iron pipe projecting about 12 inches above its surface. Further description may be obtained from Territorial Survey.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: SIGNAL
ESTABLISHED BY: T. J. Maher
YEAR: 1928
STATE: Hawaii
RECOVERED BY: D. M. Whipp
YEAR: 1967
COUNTY: Hawaii
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

Detailed statement as to the contents of the original description: indicating marks found, anamorphoses, changes made, and other pertinent facts:

Station was recovered in good condition. Located about 5 1/2 miles south-southeast of Kailua, 1/4-mile northwest of the small boat dock at Keauhou Bay, and on the north side of Hekia Bay, on a prominent lava knoll about 300 feet west of the sea bluff and 225 yards southwest of the edge of a golf course fairway.

Station mark is a 1/4-inch galvanized iron pipe projecting 7 inches from the top of a 10-inch-diameter concrete mound which has "HEIA 1924" inscribed in the south side.

To reach station from the post office in Kailua, go south on State Highway 19 for 0.1 mile to T-intersection. Turn right and follow highway through Kailua and along coast for 0.1 miles to south edge of golf course fairway, 0.2 mile before reaching the Keauhou Bay small boat dock. From here pack west along edge of fairway about 1/4 mile, then go south across lava bed about 225 yards to station.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: SIGNAL
ESTABLISHED BY: T. J. Maher
YEAR: 1928
STATE: Hawaii
RECOVERED BY: D. M. Whipp
YEAR: 1967
COUNTY: Hawaii
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

Detailed statement as to the contents of the original description: indicating marks found, anamorphoses, changes made, and other pertinent facts:

Station mark recovered as described by D. M. Whipp (1967) in good condition. The to-reach is adequate.
Square (Hawaii Island, T. J. Maher, 1928).—On west coast of Hawaii Island, in Kona District, west of Kailua Bay. Situated close to the main government road, station is gable at south end of shed or covering for water tanks, which appears as a long wooden barnlike structure.

RECOVERY NOTE: TRIANGULATION STATION INTERSECTION

NAME OF STATION: Square
ESTABLISHED BY: T.J. Maher
RECOVERED BY: D.M. Whipp
YEAR: 1928
YEAR: 1967
STATE: Hawaii
COUNTY: Hawaii
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

Station was recovered. Located 3 miles east of Kailua and 1 mile north of Holualoa, on hillside on east side of State Highway 19, at east side of two large, green, water tanks, and across highway from triangulation station MAIWA 1940.

Station is the gable at south end of a very large, weathered wooden building with a rusted, corrugated iron roof, that houses some water tanks (no longer used).
Target (Hawaii Island, T. J. Maher, 1928)—On western coast of Hawaii Island, on south side of entrance to Keahou Bay and to the southward of station Point on low lava point. Marked by the Territorial Survey with cement base with piece of ¾-inch galvanized iron pipe projecting above its top. Further description may be obtained from Territorial Survey.

RECOVERY NOTE. TRIANGULATION STATION

NAME OF STATION: TARGET

YEAR: 1928

STATE: Hawaii

COUPY: Hawaii

BENCH MARK: ALSO

NAME OF STATION: TARGET

YEAR: 1928

STATE: Hawaii

COUPY: Hawaii

BENCH MARK: ALSO

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: TARGET

YEAR: 1928

STATE: Hawaii

COUPY: Hawaii

BENCH MARK: ALSO

SOURCE: G - 550

MAX: 53.28625

MIN: 53.3368

ELEVATION: 5 ft.

STATE COORDINATES (1957):

HI 1

5101

338°552.73

263°221.96

-3°06'25"

PLANE AMBUSH HAVING BEEN COMPUTED BY THE "P. " FORMULA NEGLIGEING THE SECOND TERM.

TO STATION OR OBJECT

GEOGRAPHIC AMBUSH (DEGREES)

PLANE AMBUSH (DEGREES)

CODE

QF 350
NO ORIGINAL TEXT

HORIZONTAL CONTROL DATA
by the
National Ocean Survey
OLD HAWAIIAN DATUM

HAWAIIAN CONTROL DATA

NO ORIGINAL TEXT

RECOVERY NOTE. TRIANGULATION STATION

NAME OF STATION: WAAWAA
ESTABLISHED BY: H.O.S.
YEAR: 1882
STATE: HAWAII
COUNTY: HAWAII
RECOVERED BY: W. G. Wilder
YEAR: 1948
COUNTY: HAWAII

Detailed statement as to the course of the original description:

Location of station: In the westerly portion of Hawaii on the northerly crater rim (a little below the highest point) of Puu Waawa Hill.

Old station mark found: A cut in large stone buried 3 feet in ground. Only one old tile mark could be found but same appeared to have been disturbed.

New station mark: H.T.S. Type D-1 monument (Triangular concrete monument 7 1/2 feet on each side with 1 3/8 steel bar 2 feet long set on steel legs over the station mark which is in ex-
posed to view. A standard metal target is set over the steel bar).

RECOVERY NOTE. TRIANGULATION STATION

NAME OF STATION: WAAWAA
ESTABLISHED BY: H.O.S.
YEAR: 1882
STATE: HAWAII
COUNTY: HAWAII
RECOVERED BY: W. G. Wilder
YEAR: 1948
COUNTY: HAWAII

Detailed statement as to the course of the original description:

The Hawaii Territory Survey monumented this station in 1882 with a concrete platform, metal pole and target, plunged over the mark that was then found.

Their recovery note states: "Old mark found, a triangle cut in large stone buried 3' in ground. The only one old tile mark could be found but same appeared to have been disturbed.

Located on the northerly crater rim (somewhat below the highest point) of Puu Waawa Hill. A jeep can be driven to the top by going around to the south side. Inquire at Puu Waawa Ranch as permission must be obtained to enter property.

RECOVERY NOTE. TRIANGULATION STATION

NAME OF STATION: WAAWAA
ESTABLISHED BY: H.O.S.
YEAR: 1882
STATE: HAWAII
COUNTY: HAWAII
RECOVERED BY: W. G. Wilder
YEAR: 1948
COUNTY: HAWAII

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

Station was recovered in good condition. Located about 21 miles southeast of Kamuela, 11 miles northeast of Honokaa and 2 1/2 miles south-southeast of State Highway 19, at about 3820 feet elevation on the northeast rim of Puu Waawa, a prominent, timbered, extinct crater.

To reach station from the post office in Kamuela, go southerly on State Highway 19 for 21.5 miles to the Puu Waawa Ranch gate on left. Turn left and go 2.0 miles to ranch headquarters buildings on right. From here follow track roads around west and south side of hill for 2.1 miles; go left through gate and up lane for 0.45 mile to top of grade. Turn right, through 2 metal gates in T-fence corner, and go upgrade along right side of fence for about 200 yards to top and station.

Station is marked by the center of a 1-1/8-inch steel bar 2 feet long mounted on 3 iron legs, at the center of a triangular, concrete platform 7 feet on each side and flush with ground. A red and white metal target, 8 feet high, is mounted on the steel bar.
HORIZONTAL CONTROL DATA

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

JUN 1978
M. E. R. 188

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: WAIALA
STATE: HAWAII
COUNTY: HAWAII
DISTRICT: NORTH KONA

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

DISTANCE AND DIRECTION FROM TRIANGULATION STATION MARKS, MARKS AND OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>DEPARTING MARK</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>KAHELO (metal target)</td>
<td>NE</td>
<td>16.159'</td>
<td>310 25 05</td>
</tr>
<tr>
<td>R. M. 2</td>
<td>N</td>
<td>14.872'</td>
<td>276 26 26</td>
</tr>
</tbody>
</table>

The station is located on open grassy ground about 5 miles south of Honokohau, about 3 miles southeast of Kalua, about 1 mile north of Holualoa, about 0.1 mile south of Waianha Stream, 150 feet north of a house having a pyramid shaped roof, 125 feet west of the centerline of the highway which runs between Holualoa and Honokohau, 47.8 feet northeast of the closest edge of a wooden water tank, 30 feet south of a rock wall and 24 feet south of the center of a t Rack road.

To reach the road intersection in Holualoa, go north on the road which leads toward Honokohau for 1.65 miles; turn left onto a t rack road and go westerly for 1.25 miles to the station on the left side of the road.

The station is a standard disk, stamped "WAIALA 1948", set into a drill hole in a boulder which projects about 8 inches.

Reference mark number 1 is a standard disk, stamped "WHITE 1948", set into a mound of concrete on the top of a boulder which projects about 1 foot and is about 1 foot higher than the station.

Reference mark number 2 is a standard disk, stamped "ALOA 1948", set into a mound of concrete on the top of a boulder which projects about 1 foot and is about 1 foot higher than the station.

No azimuth mark was established for this station.

U. S. DEPARTMENT OF COMMERCE - COAST AND GEODETIC SURVEY
RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: WAIALA
ESTABLISHED: L. O. WILDER
YEAR: 1948
RECOVERED: L. O. WILDER
YEAR: 1948

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

Station was recovered as described with the exception of direction of wooden water tank. Station is located 4/3 feet NE of the closest edge of the wooden water tank.

(continued on next page)
HORIZONTAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

NAME OF STATION: WAIHA
ESTABLISHED BY: L.O. WILDER
YEAR: 1948
STATE: HAWAII
RECOVERED BY: D.M. WHIPP
YEAR: 1967
COUNTY: HAWAII
HEIGHT OF TELESCOPE ABOVE STATION MARK: 1.5 METERS
HEIGHT OF LIGHT ABOVE STATION MARK: METERS

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

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>BEARING</th>
<th>DISTANCE FEET</th>
<th>DISTANCE METERS</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kehenol</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R.M. 1</td>
<td>NE</td>
<td>18.159</td>
<td>5.536</td>
<td>130 25 05</td>
</tr>
<tr>
<td>R.M. 2</td>
<td>E</td>
<td>14.871</td>
<td>4.531</td>
<td>178 26 26</td>
</tr>
<tr>
<td>Kehenol (HGB) 1862</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R.M. No. 1</td>
<td>NE</td>
<td>14.199</td>
<td>4.531</td>
<td>120 26 08</td>
</tr>
<tr>
<td>R.M. No. 2</td>
<td>ENE</td>
<td>14.812</td>
<td>4.561</td>
<td>178 26 49</td>
</tr>
</tbody>
</table>

All marks were recovered, although the cement around the station disk and RM No. 1 was found to be coming loose from the rock, so they were re-cemented. The wooden tank mentioned in the 1948 description is gone. A witness post was set at station. A complete description follows:

Station is located about 3 miles east of Kailua and 1 mile north of Nokalua, in a brush-covered spot on west side of State Highway 18, just across the highway from 2 large, green water tanks.

To reach station from the post office in Nokalua, go north on State Highway 18 for 1.0 mile to track road left, at telephone pole 27, just below the water tanks. Turn left and go along left side of old stone fence for 125 feet to station on left.

Station mark is a standard disk stamped "WAIHA 1948", cemented in a drill hole in lava bedrock projecting 6 inches above ground. It is 125 feet west of center line of highway, 20 feet south of center line of track road, 33 feet south of the stone fence, 100 feet north of a red-roofed house, 44 feet north of a small, red-roofed out-building by the house, 31 feet north of west line of yard of the house, and 5 feet south-west of white witness post.

Reference mark number one is a standard disk stamped "WAIHA 1 1948", cemented in a drill hole in a bedrock outcrop projecting 2 inches above ground. It is 5-1/2 feet south of center line of track road and at same elevation as station.

Reference mark number two is a standard disk stamped "WAIHA 2 1948", cemented in a drill hole in a bedrock outcrop projecting 1 foot on the west side, and is 1 foot higher than station mark.

NOTE: All marks become covered by the heavy grass and other growth.

NAME OF STATION: WAIHA
ESTABLISHED BY: L.O. WILDER
YEAR: 1948
STATE: HAWAII
RECOVERED BY: D.M. WHIPP
YEAR: 1967
COUNTY: HAWAII
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 2.2 NM SSE of Kailua, Kona
HEIGHT OF TELESCOPE ABOVE STATION MARK: Tripodset Height of light above station mark: FEET.

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

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>BEARING</th>
<th>DISTANCE FEET</th>
<th>DISTANCE METERS</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kailua</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mokuaikawa Church Spire</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kailua Light, 1957</td>
<td></td>
<td>256 35 51.00</td>
<td>25.4</td>
<td></td>
</tr>
<tr>
<td>RM 1</td>
<td>ENE</td>
<td>18.20</td>
<td>5.536</td>
<td></td>
</tr>
<tr>
<td>RM 2</td>
<td>W</td>
<td>14.90</td>
<td>4.561</td>
<td>218 40 08.5</td>
</tr>
</tbody>
</table>

Station mark and Reference marks No. 1 and 2 were recovered in good condition as described by D.M. Whipp (1967).
**HORIZONTAL CONTROL DATA**

by the National Ocean Survey
OLD HAWAIIAN DATUM

**ADJUSTED HORIZONTAL CONTROL DATA**

**NAME OF STATION:** WEST TANK

**STATE:** HAWAII  **YEAR:** 1948  **SECOND ORDER**

**SOUNDING:** 0.976

**NO OBSERVATION CHECK ON THIS POSITION**

**DESCRIPTIVE LATITUDE:** 19° 59' 04.47" **ELEVATION:** 1236.4' METERS 4358' F.E.T.

**DESCRIPTIVE LONGITUDE:** 155° 34' 03.62"

**STATE COORDINATES (Feet):**

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X (Feet)</th>
<th>Y (Feet)</th>
<th>Z (Feet) D. ANGLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>476764.27</td>
<td>418075.42</td>
<td>-0 01 23</td>
</tr>
</tbody>
</table>

*PLANE AEROMETY HAS BEEN COMPUTED BY THE 3-LOG. H* FORMULA NEGLECTING THE SECOND TERM.

**TO STATION OR OBJECT**

<table>
<thead>
<tr>
<th>TO STATION OR OBJECT</th>
<th>DESCRIPTIVE AZIMUTH (From West)</th>
<th>PLANE AZIMUTH (From West)</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>WE 284</td>
</tr>
</tbody>
</table>

**POSITION DETERMINED BY TRAVERSE FROM STATION PUU IO**