Mahn (Hawaii Island, E. R. Hand, 1913).—On north coast of Hawaii, on northwest coast of Kohala, on the very low rounded rock point which is the most westerly, 1 mile south of Honoipu Landing (the buildings at the landing may be removed but conspicuous foundations will remain). Station is 20 meters off the water on the west, and about 10 meters west of the line where soil meets rocks. A fisherman's shanty, part wood and part stone, with gable roof, is set across a narrow height of the sea, 150 meters S. 18° E. Four small plants on the same distance on the west side, 25° S. 30° E. Pau Ua bears N. 75° E. Pau o Naho, southerly of two hills of equal height and similar appearance, bears S. 70° E. Station marked by a 1/2-inch pipe set upright in cement which is flush with the rock, the pipe projecting 2 feet above. The highest point, cement covered, of a very large detached rock, the highest point, is distant 0.95 meters (32 feet), on bearing N. 70° E. It has point on it.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: MAHU
ESTABLISHED BY: E.R.H.
YEAR: 1913
STATE: Hawaii
COUNTY: Hawaii

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

The station was recovered as described in 1913 with the following corrections:

The fisherman's shanty has been dismantled. According to natives the small plant now standing are different ones planted in a different locality. The large detached rock was apparently toppled over by recent tidal waves, for the distance is now 50 feet from cement part is on the bottom. The 1/2 inch pipe has rusted off flush with the cement.

To reach first obtain permission from the Parker Ranch authorities; go 3,75 miles west along the highway from the junction in Hanaloe; turn right through gate and property of Parker Ranch for 1,25 miles in a north westerly direction to beach and station.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: MAHU
ESTABLISHED BY: E.R.H.
YEAR: 1913
STATE: Hawaii
COUNTY: Hawaii

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

Station was recovered. Large kahoe trees now block view to all directions, except seaward. A complete description follows:

Station is located about 3 miles north of Mahukona and 1-1/2 miles south-southwest of the U.S. Coast Guard Loran Station, on a rocky point on the sea coast.

To reach station from the post office in Hanaloe, go north on State Highway 11 for 0.1 mile; turn left and go west on State Highway 27 for 2.5 miles to Coast Guard Station road on right. Continue ahead for 0.35 mile to locked gate on right. (Key was obtained at Parker Ranch buildings up the side road to left from here). Pass through gate and go westerly for 1.1 miles; take dirt right fork and go 0.5 mile to beach; turn left and go 0.1 mile; take side road right for 0.05 mile to rocky shoreline and station.

Station is the center of a 1-1/4-inch iron pipe, rusted flush with the rock, in a patch of cement. It is 40 feet west of a large rock with cement on the bottom side. This rock was once reported to be nearer the station, but moved by a tidal wave.
HORIZONTAL CONTROL DATA

by the
National Ocean Survey,
NATIONAL GEODETIC SURVEY

HAWAII
LATITUDE 20° 30' to 20° 30'
LONGITUDE 155° 30' to 156° 00'
OLD HAWAIIAN DATUM

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION MAHUKONA HARBOR FLAG A
STATE HAWAII
YEAR 1910
THIRD ORDER

SOURCE GSP156
NO OBSERVATION CHECK ON THIS POSITION

GEODETIC LATITUDE 20° 10' 29.86
GEODETIC LONGITUDE 155° 34' 13.19

ELEVATION

STATE COORDINATES (Ft)

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
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<th>Y</th>
<th>Z</th>
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<tbody>
<tr>
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* PLANE AZIMUTH HAS BEEN COMPUTED BY THE SINES XI FORMULA

TO STATION OR OBJECT

<table>
<thead>
<tr>
<th>GEODETIC AZIMUTH (FROM LT00)</th>
<th>PLANE AZIMUTH (FROM LT00)</th>
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<tbody>
<tr>
<td></td>
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</tbody>
</table>

00 232
NO ORIGINAL TEXT

Mahukona Harbor north day beacon (Hawaii Island, O. B. French, 1910; K. T. Adams, 1929).—At Mahukona, west coast of Kohala, northern part of Hawaii, at northern end of harbor shore line; a truncated, whitewashed cairn of stone approximately 12 feet in diameter at the base, 13 feet high and 3 feet in diameter at top. Placed as an aid to navigation.

RECOVERY NOTE. TRIANGULATION STATION
INTERSECTION

NAME OF STATION: Mahukona Harbor north day beacon
ESTABLISHED BY: O.B.F. YEAR: 1910 STATE: Hawaii BENCHMARK ALSO:
RECOVERED BY: Munson YEAR: 1960 COUNTY: Hawaii
AERIAL DISTANCE AND DIRECTION FROM NEAREST TOWN:

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

Station was recovered in poor condition. Reported previously to have been a large, truncated, whitewashed cairn about 12 feet in diameter at the base, 13 feet high, and 3 feet in diameter at the top; however the cairn has fallen apart and is now just a large, irregular pile of rocks, with the whitewashed rocks scattered throughout, about 5 feet high and 24 feet in diameter.

Located about 6 miles southwest of Hawi, on the north side of Mahukona Harbor, about 800 feet northwest of the Standard Oil tanks, near sea bluff, 60 feet northwest of a large, lone, kiae tree. No longer noticeable or prominent from seaward.

HORIZONTAL CONTROL DATA

STATE HAWAII YEAR 1910

NAME OF STATION MAHUKONA HARBOR N DAY BEACON

ADJUSTED HORIZONTAL CONTROL DATA

STATE HAWAII YEAR 1910

SOURCE 0-SP158

DEGIRIC LATITUDE: 20° 11' 24.50"
DEGIRIC LONGITUDE: 155° 54' 20.29"
ELEVATION: 50.60'鉈 Meters: 15.40"

STATE & CODE  X   Y  Z
HI 5101 360,902.72 492,906.50 3.18 24" 00° 08' 30"

PLAN ANGULAR ERROR: 0.00000000

TO STATION OR OBJECT

DEGIRIC ANGULAR
PLAN ANGULAR

00 227
NO ORIGINAL TEXT

Mahukona Harbor south day beacon (Hawaii Island, O. B. French, 1910; K. T. Adams, 1929).—At Mahukona, west coast of Kohala, northern part of Hawaii, at south end of harbor shore line; a truncated, white-washed cairn of stones 46.3 meters (149 feet) north by west of the present light (1929), approximately 12 feet in diameter at base, 2.6 feet in diameter at top, and 12 feet in height. Placed as an aid to navigation. This marks the position of the original light, discontinued in 1907.

RECOVERY NOTE, TRIANGULATION STATION INTERSECTION

NAME OF STATION: Mahukona Harbor south day beacon
ESTABLISHED BY: O.P.E. YEAR: 1910 STATE: Hawaii BENCH MARKED ALSO
RECOVERED BY: Munson YEAR: 1908 COUNTY: Hawaii AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

Detailed statement on the course of the triangulation, including details found, workshops, changes made, and other pertinent facts:

Station was recovered in poor condition. Reported previously to have been a truncated, whitewashed cairn 12 feet in diameter at the base, 2.5 feet in diameter at the top, and 12 feet high; however the cairn has fallen apart and all that remains is a 6-foot-high, whitewashed, bottom section, still intact.

Located about 0.1/2 miles southwest of Hawi, 1000 feet south of Mahukona Harbor, and 145 feet north of the U.S. Coast Guard's Mahukona Lighthouse.
HORIZONTAL CONTROL DATA
by the
National Ocean Survey
Old Hawaiian Datum

NO ORIGINAL TEXT
Mahukona Harbor wharf derrick (Hawaii Island, O. B. French, 1910; K. T. Adame, 1929).—On northwest coast of Hawaii, on the north side of the concrete landing dock at Mahukona Harbor. Base of derrick is about 3 feet above water. Derrick is of iron approximately 60 feet in height, with swinging member of same length.

ADJUSTED HORIZONTAL CONTROL DATA
NAME OF STATION: MAHUKONA HARBOR WHARF DERRICK
STATE: HAWAII
YEAR 1910
ORDER THIRD

SOURCE: G-SP15E

<table>
<thead>
<tr>
<th>State &amp; Zone</th>
<th>Code</th>
<th>X</th>
<th>Y</th>
<th>Elev.</th>
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</thead>
<tbody>
<tr>
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<td>5101</td>
<td>361.748.66</td>
<td>491.755.34</td>
<td>0.0821</td>
</tr>
</tbody>
</table>

*Plane azimuth has been computed by the two-term formula neglecting the second term.*
Mahukona Light (Hawaii Island, K. T. Adams, 1929)—In the northern part of Hawaii, west coast of Kohala, 800 meters south of the landing at Mahukona, about 40 meters inshore, 42.2 meters (138 feet) 8° 57' E. of the foundation of Mahukona Light mast, 1910, and 48.5 meters (160 feet) south by east of Mahukona Harbor south day beacon (the original Mahukona Light, discontinued in 1907). The light established in 1910, is on a concrete tower tapering from about 6 feet at its base to 2½ feet at its top, which is surrounded by a 5½-foot platform. The tower rests on a 9-foot concrete base. The focal plane of the light is about 20 feet above the ground.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: MAHUKONA LIGHT
STATE: HAWAII
YEAR: 1929
METERS

ELEVATION

DEG 11 05.250
15.535

DECIMAL

COORDINATES (Feet)

STATE & ZONE CODE X Y
HI 1 3101 361363.56 490446.79 - 2 08 22

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE FORMULA INCLUDNG THE SECOND TERM

TO STATION OR OBJECT:

GE 251
HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

HAWAII
LATITUDE 20°00' TO 20°30'
LONGITUDE 155°30' TO 156°00'
DIAGRAM NE 515 HAWAII

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: MAULI HTS

STATE: HAWAII
YEAR: 1948
THIRD ORDER

SOURCES: G-9276

GEODETIC LATITUDE: 20°12'45.981
GEODETIC LONGITUDE: 155°47'17.334
ELEVATION: 255.0 Meters

STATE COORDINATES (FAG)

STATE & ZONE CODE X Y
MI 1 5101 401,205.20 501,032.39

PLANE ADOJNTHC HAS BEEN COMPUTED BY THE \Delta = \Delta \cdot FORMULA REFLECTING THE SECOND TERM

TO STATION OR OBJECT GEODETIC AZIMUTH (From North) PLANE ADOJNTHC (From North) CODE
PULU LAPALAPA 302°45'33.6" 302°51'32" 5101

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

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

NAME OF STATION: MAULI HTS

STATE: HAWAII
YEAR: 1948

CHIEF OF PARTY: L. C. WILDER

DISTANCE AND DIRECTION TO ADJACENT MARKS, REFERENCE MARKS AND PROMINENT OBJECTS

Which can be seen from the ground at the station

QUANTITY MEASURE DISTANCE DIRECTION

Pul Lopolopo (metal pole &
target) NNE 00 00 00
Kauholo Point Lighthouse E 257 01 16.0
Sta. Muli (metal pole &
target) E 317 11 37.7

Located at the summit of a small brush covered hill in the same
fields, 1.5 miles from the main highway and from the Kauholo School
where the turn off from the main highway is made. (Also telephone pole No. 35)
The road is straight from the main highway to near by the station. From
the station this road, the Kauholo School and Kauholo Point Light are all
about in range.

Marked by a triangleStatusCode a in a ¾ inch diameter concrete post projecting 3 inches from the center of a triangle,
concrete plate projecting 6 inches from ground. Some very
large boulders have been pushed up by the station.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: MAULI HTS

ESTABLISHED BY: L. C. Wilder YEAR: 1948
RECOVERED BY: D. M. Whipp YEAR: 1967
STATE: Hawaii COUNTY: Hawaii
MOUNTAIN DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

Detailed specifications as to the source of the original description: including marks found, separately, changes made, and other pertinent facts:
Station was recovered. There is no longer a metal bar over the mark
since the metal support has rusted off. A complete description follows.
Station is located about 3 1/2 miles east-southeast of Kauhoi, 1-1/4 miles
southwest of Kauholo School, and about 500 feet south of the Kohala
Bitch, at about 958 feet elevation, on a grassy rise surrounded by cane.
To reach station from the post office at Kona, go east on State High-
way 27 for 1.2 miles to paved crossroad. Turn right and go upgrade for
1.35 miles to fork. Take left fork and go 0.1 mile to crossroad at weather
station, just before crossing canal. Turn left and go along left side of
canal for 0.1 mile; turn left and go north on cane road for 150 yards to
base of knoll on left. Walk about 100 feet up through cane field to station.
Station mark is a hole in the center of a triangle in the top of a 6
inch-diameter concrete post projecting 3 inches from the center of a tri-
angular, concrete platform projecting 6 inches from ground. Some very
large boulders have been pushed up by the station.

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

NOAA FORM 79-11
(7-75)
Niulli (Hawaii Island, E. R. Hand, 1913).—On north coast of Hawaii, northeast shore of Kohala, on a well-defined hill about 1/2 mile south of Niulli sugar mill. There is a wall of stone which crosses this hill; on the southeast side of the wall a pasture, and the land slopes abruptly down toward the main road and mill. Kohala Mill stack bears N. 70° W. from the station. A small church which is on a branch road (Poulo Gulch road) going “mauka” (inland) and a short distance from where this road joins the main road, bears N. 10° W. Niulli stack bears N. 11° E. Station is 96 meters west of the aforementioned branch road, and is marked by the upper end of an iron axle set up in concrete at the highest point of the above mentioned wall of stones; the axle projects about 2½ feet above the ground, and a cairn of stones is built around it to its top.

RECOVERY NOTE. TRIANGULATION STATION

NAME OF STATION: Niulli  State: Hawaii  County: Hawaii
Recovered by: Charles E. W. Taylor  Year: 1958

Detailed statement as to the stones of the original description:

Location of Station: On a well-defined hill about 250 feet above the Niulli-Poulo Valley road and about 3000 feet from Poulo Valley-Niulli Mill Road junction.

Old Mark found: 1 1/2" pipe in concrete marked “Niulli-1913”. The axle marking the original station was found on the ground nearby. Evidently the axle was replaced by the pipe by the office of James E. Mann, private surveyor.

New Mark: H.T.S. Type A monument six feet high with standard metal target.

RECOVERY NOTE. TRIANGULATION STATION

NAME OF STATION: Niulli  State: Hawaii  County: Hawaii
Recovered by: L. O. Wilder  Year: 1948  County: Hawaii

Detailed statement as to the stones of the original description:

The original station was not recovered. In 1915 the station was the upper end of an axle which was set in concrete. In 1918 the Hawaiian Terriory Survey reported finding a 1 1/2 inch iron pipe set into concrete and finding the iron axle on the ground nearby. They assumed that the axle was replaced by pipe by the office of James E. Mann, a private surveyor. Also in 1948 the Territory Survey built a concrete platform 3 feet high and 5 feet square over this station. The center of a 1 1/2 inch iron pipe which projects about 18 inches above the top of the concrete platform was used as the station for the 1948 survey. A new description follows—

The station is located near the summit of a low hill in a cane field about 3 miles southeast of Kamola Point, about 1.0 mile southwest of Akaa Point, about 0.8 mile southwest of the village of Makapala, about 0.1 mile northeast of a field road and about 2.5 feet east of the high ground.

To reach from the post office in Kapaau; go south on the road which leads toward Poulo Valley for 3.3 miles; cross a concrete bridge over a small stream and continue straight ahead for 0.6 mile; pass to the left hand side of Makapala School and continue southerly for 0.1 mile; continue straight ahead, southerly, as per the sign reading “Poulo Valley” and go 0.1 mile; continue straight ahead, on dirt road, for 0.2 mile. Turn right and go southerly, up grade, for 0.2 mile to the end of truck track. From this point

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

NIULII (continued)

pack northeast for about 0.1 mile to the station. The station is the center of a 2 1/2-inch iron pipe which projects about 18 inches above the top of a square concrete platform. The platform is 6 feet on each side and is 6 feet high.

<table>
<thead>
<tr>
<th>Object</th>
<th>Distance</th>
<th>Direction</th>
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</thead>
<tbody>
<tr>
<td>LAPALAPA (metal target) NTS</td>
<td>00 00 00</td>
<td></td>
</tr>
<tr>
<td>Halewa, Spire (Catholic Church)</td>
<td>79 26 46.4</td>
<td></td>
</tr>
<tr>
<td>Kohala, Steeck (Kohala Sugar Co.)</td>
<td>87 21 04.6</td>
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<tr>
<td>KAHULOA LIGHTHOUSE</td>
<td>108 58 03.20</td>
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RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: NIULII
ESTABLISHED BY: E.R. Hand YEAR: 1913 STATE: Hawaii BENCH MARKS ALSO:
RECOVERED BY: R.B. Meiley YEAR: 1978 COUNTY: Hawaii
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 4 MILE SOUTH OF NIULII

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

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

Station is located about 2-1/2 miles east-southeast of the Kohala Sugar Mill, 1/2-mile south of Niulii and about 300 feet west of the road to Pololu Valley, at about 394 feet elevation, on a hill in the cane fields.

To reach station from the post office at Kohala, go east on State Highway 27 for 4.1 miles; take right fork at sign "POLOLU VALLEY" and follow macadam road upgrade for 0.35 mile to fork. Take right fork and follow field road uphill for 0.1 mile to end of truck travel. Walk north across cane field for about 100 yards to station.

Station is marked by the center of a 1-1/2-inch iron pipe flush with the top of a 16-inch-diameter, concrete dome projecting 18 inches above ground. A Type A signal is centered over the mark, with the 6 x 6-foot concrete platform 6 feet above ground. A red and white metal target extends 8 feet above the platform.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: NIULII
ESTABLISHED BY: E.R. Hand YEAR: 1913 STATE: Hawaii BENCH MARKS ALSO:
RECOVERED BY: R.B. Meiley YEAR: 1978 COUNTY: Hawaii
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 4 MILE SOUTH OF NIULII

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

The station was recovered in good condition as described in 1978.
Nunalu (Hawaii Island, E.R. Hand, 1913).—In the northern part of Hawaii, north central part of Kohala District, on the high land 2 miles above the government road, at a point south of the "Kohala Club" buildings. As seen from the vicinity of the club, the station is on the skyline; a conspicuous clump of bamboo will be seen against the skyline bearing S. 20° W. from the church which adjoins the club property, and the station bears S. 23° W., distant 122 meters from this clump. Station is close to junction of wire fences. The fence post at the first angle southeast of this junction is 7.94 meters (26.0 feet) from station, in bearing N. 35° W., from this corner, which is southeast of the junction, the fence runs S. 28° W. Another post along this line is 9.26 meters (30.3 feet) from station, in bearing S. 80° W. The station is reached by taking the road which goes "mauka" from the main road at a point a short distance east of the church which adjoins the club; a telephone line goes along this road; follow this telephone line and when the bamboo clump above referred to bears about west by north turn west and cross the gulch (Nunalu Gulch) to the slight rise which will be seen south of the bamboo clump. Station marked underground by neck of bottle. Surface mark is center of iron nut in top of concrete cylinder flush with surface of ground and extending downward about 2½ feet.

This station was searched for only a short time as it was thought at the time that Nunalu 2 was the old station. This assumption was incorrect. Old station can probably be found by azimuth and distance from Nunalu 2.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: NUNALU
ESTABLISHED BY: E.R. Hand YEAR: 1913 STATE: HAWAII
RECOVERED BY: L.C. Wilder YEAR: 1948 COUNTY: HAWAII

Detailed statement as to the fitness of the original description:

Recovery Note: Triangulation Station

NAME OF STATION: NUNALU
ESTABLISHED BY: E.R. Hand YEAR: 1913 STATE: HAWAII
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Hawaii Island Hawaii

Detailed statement as to the fitness of the original description including marks used, scrapings, charges made, and other pertinent facts:

Station is destroyed. The point was determined by inverse from NUNALU 2 1948 and after some digging the neck of the bottle which was the underground mark was found, however it was laying on the side and is believed to have been disturbed by cultivation of the cane field.

OF 111
HORIZONTAL CONTROL DATA
by the National Ocean Survey
OLD MAUNA KEA DATUM

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: NUNULU 2  STATION: 1061
STATE: HAWAII  COUNTY: HAWAII
NAME OF PARTY: L. G. WILDER  YEAR: 1946

STATION is located 22 feet northwest of the centerline of a cane road known as Nululu Road, on a hedge line, which at the station is devoid of trees or underbrush. This hedge is also the southwest property line of the Harry Kata homestead. Station is about 150 yards southwest of a banana clump, the only one in the general locality.

From the juncture of main roads at Hami, go eastward on the Kohala-Winders road 1.2 miles (at Telephone pole 216) turn south on a hard surfaced road and proceed across the Kohala irrigation ditch, where a left turn onto a cane road, Nululu Road, should be made. From here it is approximately 1.1 miles to the station.

This station is marked by a 1½ inch iron pipe, set in a mass of concrete, and projecting a few inches above the ground. Station will become covered with grass.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: NUNULU 2
RECOVERED BY: D.M. WHIPP  YEAR: 1967
STATE: HAWAII  COUNTY: HAWAII
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:  Island: Hawaii

Detailed statements as to the location of the original description, including notes, code numbers, and other pertinent facts:
Station was recovered in good condition. A complete description follows. Station is located about 2½ miles south-southwest of Hami and 0.8 mile northeast of Puukoumau Reservoir, at about 1600 feet elevation, along the northwest side of a main, cane field road, on a small hummock covered with high grass, at the southeast end of a long, narrow, grass strip between two cane fields.
To reach station from the post office at Kohala, go west on State Highway 27 for 0.8 mile to paved crossroad; turn left and go 1.15 miles to side road leading to green tank. Turn left and follow dirt road 1.05 miles to fork. Take right fork and go 6½ yards to top of grade and station on right.
Station mark is the center of a 2-inch, iron pipe set in the center of a 16-inch-diameter, concrete monument flush with ground and with "NUNULU" inscribed in the top. It is 13 feet northwest of center line of road, 110 feet southwest from southeast end of a row of large trees, 49 feet northeast of the northeast end of a group of trees, 37 feet northeast of a T-road intersection, and about 4 feet higher than the road.

ADJUSTED HORIZONTAL CONTROL DATA

SOURCE: 9275

Table: Station Coordinates (feet)

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<th>POINT</th>
<th>STATE</th>
<th>CODE</th>
<th>X</th>
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<th>PLANES ADJF. (feet)</th>
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<td>1600</td>
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STATE COORDINATES (feet): 155 95 26.814

ELEVATION: 487.8 Meters

PLANES ADJF. (feet): 1600

DISTANCE FROM STATION TO OBJECT (feet): 337 52 25.6

COORDINATE (feet): 337 59 09 5101

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

Diagram no. 155 HAWAII
HORIZONTAL CONTROL DATA

by the National Ocean Survey
OLD HAWAIIAN DATUM

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: PRIMARY POINT #
ESTABLISHED BY: L.A. Critchlow
YEAR: 1977
STATE: Hawaii
COUNTY: Hawaii

AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: About 2 1/2 miles northwest of Hilo.
HEIGHT OF TELESOPIC IMAGE ABOVE STATION MARK: 5 ft.
HEIGHT OF LIGHT ABOVE STATION Mark: 3 ft.

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

OBJECT | RADIUS | DISTANCE | DIRECTION
------- | ------- | -------- | ----------
KENOHI HTS 1946 | EDM | 00 00 00 122.485 | 00 00 00 00 31 52 29.8
HAWI UPOULU AIRPORT BNC | EDM | 01 1/4 mile | 35 44 55.8
ILORAN A TOWER 1966 | EDM | 02 miles | 12 27 30 03
RH 1 | EDM | 01 24 27 | 12 07 30 03
RH 2 | EDM | 02 mile | 12 07 30 03
RH 3 | EDM | 02 mile | 12 07 30 03
RH 4 | EDM | 02 mile | 12 07 30 03

The station is located on the north side of the Upolu Airstrip, 91 feet west of the extended centerline of a graded road, 84 feet north of the north edge of the main runway, 74 feet north of a runway light and opposite an old metal building on the south side of the runway. It is a USGS disk, unstamped, in an irregular mass of concrete about 8 inches underground.

To reach the station from the junction of State Highways 25 and 27 in Hilo, go west on highway 27 for 1.23 miles to a road right, turn right and go north on paved and graded road for 1.8 miles to the Upolu Airstrip and the station as described.

Reference mark 1 is a cross on the top of a large utility pole, 31 feet north of the extended line of the south edge of a paved parking ramp 83 feet south of a blue runway light.

Reference mark 2 is a cross on the top of a large utility pole, 31 feet north of the extended line of the south edge of a paved parking ramp 83 feet south of a blue runway light.

Reference mark 3 is a cross on the top of a large utility pole, 31 feet north of the extended line of the south edge of a paved parking ramp 83 feet south of a blue runway light.

Reference mark 4 is a cross on the top of a large utility pole, 31 feet north of the extended line of the south edge of a paved parking ramp 83 feet south of a blue runway light.

These data obtained from adjustment of Jan 1977

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY
U.S. GOV: 1/1-05-000233

NOAA FORM 76-90
U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY
U.S. GOV: 1/1-05-000233

NOAA FORM 76-31
### HORIZONTAL CONTROL DATA

**NAME OF STATION:** PRIMARY POINT 2 BM 5

**ESTABLISHED BY:** L.A. Critchlow 1977

**COUNTY:** Hawaii

**DISTANCE AND DIRECTION FROM NEAREST TOWN:** About 2.5 miles northwest of Hau’i

**HEIGHT OF TELESCOPE ABOVE STATION MARK:** 5 feet

**HEIGHT OF LIGHT ABOVE STATION MARK:** 5 feet

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>NEAREND</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIMARY POINT 2' Geodetic Dist</td>
<td>(1988.89), 456,863</td>
<td>00 00 00.0</td>
<td>NE</td>
</tr>
<tr>
<td>HAWI UPOLO AIRPORT BM</td>
<td>SE</td>
<td>About 0.5 mile</td>
<td>92 19 47.7</td>
</tr>
<tr>
<td>LORAN C TOWER 1964</td>
<td>SW</td>
<td>About 2 miles</td>
<td>152 04 03.9</td>
</tr>
</tbody>
</table>

The station is located about 2.5 miles northwest of Hau’i, at the Upo Polo Airport and north of the runway.

To reach the station from the junction of State Highways 25 and 27 in Hau’i, go west on Highway 27 for 1.25 miles to a road turn. Right and go north on a paved and graded road for 1.8 miles to the Upo Polo Airstrip and the station as described.

The station mark is a U.S.G.S disk, unmarked, set in an irregular mass of concrete that is about 8 inches below the ground surface. It is 120 feet north of the north edge of the runway pavement. 201 feet east of an airsock, 32 feet south of the north edge of a small bluff and 152 feet northwest of a runway light.

**ADJUSTED HORIZONTAL CONTROL DATA**

<table>
<thead>
<tr>
<th>NAME OF STATION</th>
<th>OBS BY NGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIMARY POINT 2 BM 5</td>
<td>NGS</td>
</tr>
</tbody>
</table>

**STATE:** Hawaii

**YEAR:** 1977

**SECOND ORDER**

**SOURCE:** J-16491

**GEODETIC LATITUDE:** 20° 16' 35.6"

**GEODETIC LONGITUDE:** 155° 34' 51.7"

**ELEVATION:** 274 feet

**STATE COORDINATES (EPS):**

<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>587,656.81</td>
<td>521,223.37</td>
</tr>
</tbody>
</table>

**PLANE ADJUSTMENT HAS BEEN COMPUTED FROM THE 2 ND. ORDER FORMULA OMITTING THE SECOND TERM**

**STATION OR OBJECT**

| PRIMARY POINT 2 | 258 41 26.9 | 258 49 92 | 5101 |

**TOTAL ADJUSTMENT**

<table>
<thead>
<tr>
<th>PLANE ADJUSTMENT (feet north)</th>
<th>5101</th>
</tr>
</thead>
</table>

**TOTAL STATION ADJUSTMENT**

<table>
<thead>
<tr>
<th>STATION OR OBJECT</th>
<th>PLANE ADJUSTMENT (feet north)</th>
<th>TOTAL STATION ADJUSTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIMARY POINT 2</td>
<td>258 41 26.9</td>
<td>258 49 92</td>
</tr>
</tbody>
</table>

**TOTAL STATION ADJUSTMENT:**

<table>
<thead>
<tr>
<th>STATION OR OBJECT</th>
<th>TOTAL STATION ADJUSTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIMARY POINT 2</td>
<td>258 49 92</td>
</tr>
</tbody>
</table>

**These data utilized from adjustment of Jan 1979**

**SM 152**
HORIZONTAL CONTROL DATA

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

NAME OF STATION:   PUEU AIEA (HWS)   STATE:   HAWAII   COUNTY:   HAWAII

Chief of Party:   L. O. WILDER   Year:   1948   Described by:   C. J. KREPPLE

HEIGHT OF TELESPOE PEAK FROM STATION BASE

OBJECT

R M 1
Tank 3 miles
Gaia 1 mile

HEIGHT OF RHEAD FROM STATION BASE

8
W
NW

Table of Distances and Directions to Asymmetrical Marks, Reference Marks and Prominent Objects which can be seen from the Station at the Station:

DISTANCES AND DIRECTIONS TO ASYMETRICAL MARKS, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE CENTER OF THE STATION.

OBJECT

PUEU AIEA (Metal target)
R M 1
Tank 3 miles
Gaia 1 mile

DISTANCE

RECORD

12
12.717
5.865
0.00
0.00

DISTANCE

DIRECTIO.

0.00
30
30
132
132

The station is located on the summit of a low volcanic knob known as Pueu Aiea, about 12 miles northwest of Waimea, about 6 miles south southeast of Hawi, about 0.5 mile west of the road which runs between Hawi and Waimea, and about 1.0 mile west of the Kahua Ranch Headquarters.

To reach the post office in Waimea, go west and north on the road which leads toward Hawi for 12.4 miles; turn left, pass through a board gate at a fence corner, and go westerly for about 0.5 mile to the center of the hill and the station.

The station is the center of a drill hole which is in the center of a group of which is carved into a flat rock. The station rock is surrounded by a triangular slab of concrete which is 7 feet on each side. The station rock is about flush with the top of the hill and the concrete platform projects about 1 foot.

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

U.S. DEPARTMENT OF COMMERCE   COAST AND GEODETIC SURVEY

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION:   PUEU AIEA (HWS)   STATE:   HAWAII   COUNTY:   HAWAII

Description:   As described in the primary description, including marks found, stamplings, changes made, and other pertinent facts.

The station and reference mark were recovered in good condition.

A nail was driven into the center of the drill-hole.

First-order astronomic observations were performed at this station in advance of future Mira measurements. The original "to reach" is adequate.

An azimuth mark was established about 500 feet north of the gate at the highway, along the fenceline in an outcrop of bedrock. This mark is about 50 feet southeast of telephone pole number 124. It is a standard CSGS azimuth mark disk unstamped.

Object          Distance          Direction

PUEU AIEA 1913  00° 00' 0000'
RM NO 1         30 33 40.8
Az NE           299 51 15.5

(continued on next page)

NAME OF STATION:   PUEU AIEA (HWS)   STATE:   HAWAII   COUNTY:   HAWAII

Adjusted Horizontal Control Data

NAME OF STATION:   PUEU AIEA (HWS)   STATE:   HAWAII   COUNTY:   HAWAII

Geodeic Latitude:   20° 07' 35.884"   Geodeic Longitude:   159° 48' 15.870"

Elevation:   932.6   Meters   3060.3   Feet

State Coordinates (Zones)

State          Zone          Coord

H1 1           5101           395,763.51

Differences (in feet)

State          Zone          Coord

H1 1           5101           469,758.14

Plant Azimuth has been computed by the Z or C formula neglecting the second term.

Plant Azimuth:   255° 34' 41.8"   Plant Azimuth (from mark):   255° 40' 58"

NMDA FORM 76-31
(11-85)
HORIZONTAL CONTROL DATA

by the
NATIONAL GEODetic SURVEY
OLD HAWAIIAN DATUM

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PUU ATEA (HTS)
ESTABLISHED BY: L.C. Wilder
RECOVERED BY: D.M. Whipp
YEAR: 1948
STATE: Hawaii
COUNTY: Hawaii
Island: Hawaii
LATITUDE
LONGITUDE

HEIGHT OF TELESCOPE ABOVE STATION MARK
3.5 METERS
HEIGHT OF LIGHT ABOVE STATION MARK
2.5 METERS

DISTANCES AND DIRECTIONS TO ASIMUTH 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>KERENA (HGS) 1881</td>
<td>-----</td>
<td>1961</td>
<td>DISTANCE</td>
</tr>
<tr>
<td>Asimuth Mark 1</td>
<td>S</td>
<td>17.271</td>
<td>5.265</td>
</tr>
<tr>
<td>RM No. 1 (1948 distance)</td>
<td>1/24 mile</td>
<td>150 49 46.2</td>
<td></td>
</tr>
<tr>
<td>KERENA (HGS) 1881</td>
<td>-----</td>
<td>1967</td>
<td>DISTANCE</td>
</tr>
<tr>
<td>Asimuth Mark 1</td>
<td>SNE</td>
<td>17.238</td>
<td>5.255</td>
</tr>
<tr>
<td>R.M. No. 1</td>
<td>SSW</td>
<td>14.975</td>
<td>5.165</td>
</tr>
<tr>
<td>R.M. No. 2</td>
<td>GSW</td>
<td>14.975</td>
<td>5.165</td>
</tr>
</tbody>
</table>

Station, azimuth mark and R.M. 1 were recovered. Station was re-marked with a standard station disk, and a new reference mark, number two, was established. A complete description follows:

Station is located about 11 miles northwest of Kamuela, 8 miles southeast of Hawi, and 1 mile west of the Kahua Ranch headquarters, on the west rim of Puu Atea, an old crator of about 3052 feet elevation.

To reach station from the post office in Kamuela, go west on State Highway 25 for 2.1 miles; take right fork, continuing on Highway 25, and go 9.3 miles to the Kahua Ranch driveway on right. Continue ahead for 0.6 mile to gate on left. Pass through gate and go right, along fence, for 0.1 mile to azimuth mark in fence line on right. Go left, westerly on track road for 0.2 mile to lone post at base of hill. Continue westerly, on track road up onto south rim of crater, and go 0.45 mile to station.

Station mark is a standard disk stamped "PUU ATEA HTS 1948 1967", set in cement in drill hole in rock in a 9-inch-diameter recess in the center of a triangular, concrete platform 7 feet on each side and projecting 8 inches above ground.

Reference mark number one is a standard disk stamped "PUU ATEA 1 1948", cemented in a drill hole in an 8-inch rock outcrop projecting 2 inches above ground. It is 10 inches lower than station mark.

Reference mark number two is a standard disk stamped "PUU ATEA HTS 1948 2 1967", set in the top of a concrete-filled, 3-inch iron pipe that is set in concrete and projects 2 inches above ground. It is 2 feet lower than station mark.

Asimuth mark is a standard disk stamped "PUU ATEA HTS 1948 1961", cemented in a drill hole in the top of a sloping bedrock outcrop that projects 2 feet above ground. It is 93 feet east from power pole 124, 39 feet southwest of center line of State Highway 25, 50 feet northwest of highway culvert 9-92, 8 inches southeast of the fence, and a few inches lower than bottom wire of fence.

*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.

USCG-02-2779-PS
**HORIZONTAL CONTROL DATA**

**NAME OF STATION:** POU KAMALII  
**STATE:** HAWAII  
**YEAR:** 1928  
**STATION:** 1065  
**DIAGRAM:** NE 5-15  
**HAWAII**

**ADJUSTED HORIZONTAL CONTROL DATA**

**SOURCE:** G-SP156

<table>
<thead>
<tr>
<th>GEODETIC LATITUDE</th>
<th>20° 05' 09.391'</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEODETIC LONGITUDE</td>
<td>155° 49' 28.341'</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>X ANGLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>388,833.97</td>
<td>442,880.41</td>
<td>-0 06 40</td>
<td></td>
</tr>
</tbody>
</table>

*Plath Azimuth has been computed by the 2 th. 0.4 formula neglecting the second term.*

<table>
<thead>
<tr>
<th>TO STATION OR OBJECT</th>
<th>GEODETIC AZIMUTH (From south)</th>
<th>PLANAR AZIMUTH (From north)</th>
<th>CODI</th>
</tr>
</thead>
</table>

| QQ 237 |
HORIZONTAL CONTROL DATA
by the
National Ocean Survey
OLD HAWAIIAN DATUM

Puu Kamalii 2 (Hawaii Island, K. T. Adams, 1928).—Near northwest coast of Hawaii, on highest point of Puu Kamalii, which is 670 feet above, and 1,830 meters N. 40° E. (true) from the dock at Kawalahae. The station mark, which was found already in place by the 1928 party, had apparently been set by a party from another survey, and consisted of a 1½-inch galvanized pipe projecting 1 foot above a small mound of rock and cement, on which was inscribed "Puu Kamalii, Mar. 1924." In 1928, standard disk reference marks were set according to note 12, at the following distances and azimuths from the station:
No. 1: 11.8 meters (35.7 feet) 260° 39' N.; No. 2: 9.8 meters (32.2 feet), 106° 42' N.

RECOVERY NOTE, TRIANGULATION STATION

Recovery party: T. S. Adams Year: 1928 State: Hawaii County: Hawaii Recovered by L. C. Wilder Year: 1938

Detailed statement as to the source of the original description:
Location of station: On highest point of hill on line northeast of Kawalahae village near northwest coast of Hawaii.

Station mark found: 1 ¼" pipe in concrete.

New Station Mark: H.T.S. Type D-1 Monument (Triangular concrete monument 7 feet 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).

HORADICAL CONTROL DATA

NAME OF STATION: PUU KAMALII 2
STATE: HAWAII
YEAR: 1928
SECOND ORDER

SOURCE: 9275

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

ADJUSTED HORIZONTAL CONTROL DATA

STATE: HAWAII
YEAR: 1928
SECOND ORDER

RECOVERY NOTE, TRIANGULATION STATION

Recovery party: T. S. Adams Year: 1928 State: Hawaii County: Hawaii Recovered by L. C. Wilder Year: 1938

Detailed statement as to the source of the original description:
The station and reference mark number 2 were recovered in good condition. Reference mark number 1 was not found. In 1938 the Hawaii Territory Survey recovered the original station and established a new station mark. "Triangular concrete monument 7 feet 1/2 feet on each side with 1 7/8 inch steel bar 2 feet long set on steel legs over the station mark which is left exposed to view." A new description follows—
The station is located on the summit of a small rock and brush covered knoll, about 11 miles west northwest of Waimea, about 1 mile north northeast of Kawalahae, about 1 mile northwest of the Kawalahae Dock and about 0.2 mile north of a washed-out dirt road.

To reach the station from the road intersection in Kawalahae; go north, on the paved road which leads toward the dock, for 0.3 mile; continue straight ahead, pass through a board gate, turn right, pass to the north of the Standard Oil Tank Farm, and go about 0.1 mile to the end of truck travel. From this point pack easterly, up the gradual slope, for about 1 mile to the station. The ground continues to rise east of the station. The station is the center of a 1 7/8 inch iron bar which projects 2 feet above the top of a triangular slab of concrete which is 7 feet 1/2 feet on each side and is on the top of a carth which is about 5 feet high.

Reference mark number 2 is a standard disk, stamped 2, set into a drill hole in a boulder which projects about 2 feet and is about 5 feet lower than the station.

Object 1928 Distance 1948 Distance Direction
PUU ATTA 6 miles 00 00 00
PUU PILI target NE 1 mile 25 28 49.5
Kawalahae lighthouse W 1 mile 215 36 36.4
R. M. No. 2 WW 9.8 m 32.2 ft 9.653 m 31.622 ft 272 27 20

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

PUU KAMALII 2 (continued)

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

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION:  PUU KAMALII 2
ESTABLISHED BY:  K.T. Adams
RECOVERED BY:  D.M. Whipp
YEAR: 1928  STATE: Hawaii
YEAR: 1967  COUNTY: Hawaii
Elevation: Hawaii
Island: Hawaii
HEIGHT OF TELESCOPE ABOVE STATION MARK 1.56 METER
HEIGHT OF LIGHT ABOVE STATION MARK 1.56 METER

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>NO.</th>
<th>MEASUREMENT</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>FUKAO NW</td>
<td></td>
<td>1945 DISTANCE and</td>
<td>50</td>
<td>00 00</td>
</tr>
<tr>
<td>Kawahae Light</td>
<td></td>
<td>W</td>
<td>31.622</td>
<td>9.659</td>
</tr>
<tr>
<td>R.M. No. 2</td>
<td></td>
<td>WW</td>
<td>105</td>
<td>31 18</td>
</tr>
<tr>
<td>FUKAO NW 1946</td>
<td></td>
<td>1967 DISTANCE and</td>
<td>44</td>
<td>00 00</td>
</tr>
<tr>
<td>Kawahae Light</td>
<td></td>
<td>SW</td>
<td>31.517</td>
<td>9.608</td>
</tr>
<tr>
<td>R.M. No. 2</td>
<td></td>
<td>NW</td>
<td>105</td>
<td>31 31</td>
</tr>
<tr>
<td>R.M. No. 3</td>
<td></td>
<td>ENE</td>
<td>13.193</td>
<td>11.081</td>
</tr>
<tr>
<td>R.M. No. 1 (center of shank)</td>
<td></td>
<td>SSE</td>
<td>38.713</td>
<td>11.800</td>
</tr>
</tbody>
</table>

Station mark and reference mark number two were recovered in good condition. Reference mark number one has been broken off and only the shank remains in the drill hole. A new reference mark, number three, was established. A complete description follows:

Station is located about 10 miles west of Kamuela, 1 mile northeast of Kawahae, and 700 feet northwest of the Kawahae Uka Trail, a bulldozed (but badly washed-out) track road, at about 800 feet elevation, on a

prominent hill that has sparse kiawe trees on it.

To reach station from the post office in Kawahae, go northeast on the highway towards Mahukona for 0.1 mile to board gate on right. From here take northeast up washed-out road for about 1 mile, then go left about 700 feet to top of hill and station.

Station mark is the center of a 1-1/2-inch iron pipe projecting 1 inch from the center of a triangular, concrete platform about 7 feet on each side and flush with the rocks, on top of a raised, rock area that extends about 6 feet above surrounding ground. A 2-inch iron shaft about 2 feet long is centered over the mark, with 3 iron legs, and supports a red and white metal target.

Reference mark number two is a standard disk stamped "2", cemented in a drill hole in a 5-foot, triangular boulder that projects 2 feet above ground, and is 0.5 feet lower than station mark.

Reference mark number three is a standard disk stamped "KAMALII 2 HTS 1928 NO 3 1967", cemented in a drill hole in the top of a 4-foot-square boulder that projects 3 feet above ground. It is about 6 inches higher than station mark.

The shank of reference mark number one is cemented in a drill hole in a boulder, about 6 inches higher than station mark.

*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.
The station is located on the western summit of a low volcanic knoll named Puu Kehena. It is about 14 miles northwest of Waimea, about 6 miles south of Maui, and about 0.75 mile west of the road which runs between Waimea and Hilo and about 200 feet west of the center of the extinct crater.

To reach from the post office in Waimea, go west and north on the road which leads toward Hilo for 15 miles; pass over a cattle guard and continue north for 0.3 mile; turn left, pass through a board gate, and go across country, westerly, for 0.75 mile to the summit of the knoll and the station.

The station is the center of a 1 1/4 inch iron pipe which projects about 2 inches from a triangular slab of concrete which is about 7 feet on each side. The concrete slab projects about 1 foot.

Reference mark number 1 is a standard disk, stamped PUU KEHENA l 1946, set into a drill hole in a boulder which is flush with the surface of the ground and is about 1 foot lower than the station.
HORIZONTAL CONTROL DATA
by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

FUU KELENA (HTS) (continued)

NAME OF STATION: FUU KELENA (HTS)
ESTABLISHED BY: L.C. Wilder
YEAR: 1948
STATE: Hawaii
RECOVERED BY: D.W. Whipp
YEAR: 1967
COUNTY: Hawaii
ISLAND: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK: 1.2 Meters
WEIGHT OF LIGHT ABOVE STATION MARK: Meters

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>KELENA (HGS) 1881</td>
<td>NW</td>
<td>16.096</td>
<td>4.906</td>
</tr>
<tr>
<td>Cairn 1948</td>
<td></td>
<td></td>
<td>161 24 18.3</td>
</tr>
<tr>
<td>KELENA (HGS) 1881</td>
<td>NW</td>
<td>12.950</td>
<td>4.862</td>
</tr>
<tr>
<td>N.M. No. 1</td>
<td></td>
<td>7.747</td>
<td>2.302</td>
</tr>
<tr>
<td>Cairn, 1948</td>
<td>SE</td>
<td>241 24 19.2</td>
<td></td>
</tr>
</tbody>
</table>

Station mark and reference mark number one were recovered in good condition, however the metal legs of the target support have rusted off and there is no longer a target over the mark. A discrepancy was noted in the distance to NM No. 1; the 1967 distance was double-checked and is correct. A new reference mark, number two, was established. A complete description follows:

Station is located about 13-1/2 miles northwest of Kamuela, 5-1/2 miles south of Hau, and 0.6 mile southwest of State Highway 25, at about 2517 feet elevation, on the west rim of Puu Kehena, an old crater in open pasture land.

To reach station from the post office in Kamuela, follow State Highway 25 west and northwest towards Hau, for 14.1 miles to cattleguard; continue ahead on the highway for 0.3 mile to board gate on left at power pole 153. Turn left, through gate, and go southwest down across pasture for 0.35 mile to fence corner on left. Continue ahead for 0.25 mile to low saddle at north side of crater rim. Turn right onto top of rim and go 0.2 mile to station on west side.

Station is the center of a 1-1/4-inch iron pipe, rusted off flush with concrete, in the center of a triangular, concrete platform about 7 feet on each side and projecting 6 inches above ground.

Reference mark number one is a standard disk stamped "FUU KELENA L 1 1948" cemented in a drill hole in a 20-inch-diameter bedrock outcrop that projects 3 inches above ground. It is about 2 feet lower than station mark.

Reference mark number two is a standard disk stamped "FUU KELENA HTS 1967 NO 2 1967", cemented in a drill hole in the top of an 8-inch lava rock outcrop that projects 3 inches above ground. It is about 1-1/2 feet lower than station mark.

*None 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

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

JUN 1978

HORIZONTAL CONTROL DATA

by the National Ocean Survey
OLD HAWAIIAN DATUM

Q 201553 STATION 1068
HAWAII LATITUDE 20° 00' TO 20° 30'
LONGITUDE 155° 30' TO 156° 00'
DIAGRAM HE 3-1-5 HAWAII

NAME OF STATION: PUI LAPALAPA HTS
STATE: HAWAII YEAR 1948 THIRD ORDER

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: PUI LAPALAPA HTS
STATE: HAWAII YEAR 1948 THIRD ORDER

NOTE:

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

OBJECT

MAUIILI (metal target)
Kahola Point Light
Sta. MAUIILI (metal pole & target)
R.M., triangle out in rock

MEASURED

90 00 20
95 24 23.4
88 58 13.4
24.93 7.60 233 30 03

NORTH

DISTANCE

90 00 20
95 24 23.4
88 58 13.4
24.93 7.60 233 30 03

EAST

DETAILS:

Station is located on the top of a small brush covered knoll about 2 miles above Makapala village in North Kohala. It is about 1/2 mile from the Kehana ditch. It is reached by a reasonably straight cantilever road which leaves the main highway east of Makapala.

This station was established by the Hawaii Territory Survey.

A recovery note by them dated 1938 stated that the 5 in. cylindrical monument was recovered. This monument now has a triangle formed in the cement. In 1955 a concrete platform, steel pole and target was established. The center mark is now the same cylinder with a triangle in its top.

A triangle out in ledge is located 7.60 meters westward.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PUI LAPALAPA HTS
ESTABLISHED BY: L.G. WILDER YEAR: 1948 STATE: Hawaii BEACH MARKS ALSO
RECOVERED BY: B.M. Whipp YEAR: 1967 COUNTY: Hawaii
ISLAND: Hawaii

The station mark and reference triangle were recovered. Distance to the triangle was checked and found correct. There is no longer a metal target over the mark since the iron supports have rusted off. A complete description follows:

Station is located about 3 miles southeast of the Kohala Sugar Mill and 2 miles south-southwest of Makapala, on the east edge of Hinao Gulch, on a pointed, brushy knoll above the cane fields.

To reach station from the post office at Kohala, go east on State Highway 27 for 3.75 miles to crossroad just before Walkeni Gulch. Turn right and follow main cane road for 1.9 miles to fork just after crossing small concrete bridge. Take left fork and go 0.1 mile to side road right. Turn right and go 100 yards to end of truck travel at base of ridge on right. Walk westerly up steep slope, across narrow cane field, for about 100 yards to station on ridge line at brush edge.

Station mark is a small hole in the center of a triangle in the top of a 5-inch-diameter, concrete post projecting 6 inches from the center of a triangular, concrete platform that is 7 feet on each side and projects 1 foot above ground.

R.M. is an 8-inch triangle chiseled in the top of a 3-foot boulder that projects 1 foot from the ground. It is along edge of brush line and about 3 feet lower than station mark.
NO ORIGINAL TEXT

Puu Lea (Hawaii Island, Hawaiian Government Survey, 1876; E. R. Hand, 1913).—In northern part of Hawaii, in Kohala District, on Puu Lea about 6 miles east-northeast from Kawaihae, in an ancient stone fort, and 70 feet north of a very large pile of stones. In 1913 description given as follows: Mountain is about 8 miles out on the road from Waima toward Kohala; when Kawaihae wireless bears S. 55° W. the hill will be found on the upper side of the road on the opposite bearing. The original description of the marks was as follows: Mark is a hard 'ala' stone, marked with a triangle on its flat side, under a manama post to which a flagpole had been bolted, set 4 feet deep in a platform of stones, 10 feet on a side. The recovery of 1913 was as follows: A very large but irregular pile of stones is on the highest point of Puu Lea; on the top of this pile a thin wall had been built for a windbreak, and in the lee of this, on the southwestern side and 6 feet lower, were found two stones, each marked with an equilateral triangle, 5 inches on side, stones were side by side, 1 foot apart, triangles up. One stone was circular and had drill hole in center of triangle; the other was irregular, larger, and had no drill hole. Between the stones was found what may have been the original flagpole. A United States Geological Survey table has been placed in the stone with drill hole. Between the stones is a rectangular pile of stones about 6 feet high and 12 feet long and 22 meters distant on bearing S. 55° W.

RECOVERY NOTE. TRIANGULATION STATION

Hawaiian Government Survey
Established by H. G. S. Year: 1876 State: HAWAI'I
Reported by L. G. Wilder Year: 1913 County: HAWAI'I

Detailed statement as to the place of the original description: The station is now the center of a 2 1/2 inch iron pipe which projects about 1 1/2 feet from a concrete platform which is about 7 feet square. The platform is set on the top of a cliff which is about 50 feet in diameter and is about 8 feet high. A reference mark was established north of the station. A new description follows—

The station is located on the summit of a prominent volcanic knoll on the southeastern slope of the Kohala Mountains. The station lies about 7 miles northwest of Waima, about 1 mile east of the west shore of the island, about 1 mile east of the road which runs between Waima and Kohala, and 12 meters east of a rectangular pile of stones about 6 feet high and 13 feet long.

To reach from the post office in Waima, go north and west on the road which leads toward Hawaii for 7.0 miles; turn right, east, pass through a pole gate and go northeasterly, crossing numerous small gullies, for about 3.0 miles to the base of the knoll and the end of truck travel. From this point north through, up the steep slope, for about 0.3 mile to the summit and the station.

The station is the center of a 2 1/2 inch iron pipe which projects about 3 inches from the top of a concrete frustum of a pyramid which in turn projects about 1/8 feet from the top of a slab of concrete which is about 7 feet square.

*Note: Small stone slabs should be located here. The stone may actually be in another location to the north of the recovery area.

(continued on next page)
HORIZONTAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

PUU LOA (continued)

Reference mark number 1 is a standard disk, stamped "1 1948," set into a drill hole in a boulder which projects about 1 foot and is about 3.0 meters lower than the station.

Object | Distance | Direction
--- | --- | ---
Puu Pa | 00 00 00 | 00
Kawainah Lighthouse | 5 miles | 94 27 58.6
R.M. No. 1 | 10,046 m 33.61 ft | 171 47 06
Puu Pilli target | 5 miles | 190 23 40.5

The Hawaii Territory Survey reports: The 28 inch pipe is centered over a U.S.G.S. Tablet which had been set in the center of a triangle cut in stone. This 28 inch pipe was installed in 1939. An early recovery notes: "The original station was marked by large flag pole recovered by C. J. Birdsey in September 1911. In 1923 A. D. Durkland reports that a bronze tablet was set in the center of triangle cut in large rock. There was another old mark about 8 foot distant from the one where the tablet was set."

Recovery Note, triangulation station

Name of station: Puu Loa
Established by: H.G.S.
Year: 1876
State: Hawaii
County: Honolulu

Recovery notes:

Station and reference mark number one were recovered in good condition. A new "to reach" follows:

To reach the station from the intersection of Hawaii State Highways 19 and 25 in Waimalu, go north on Highway 25 toward Waialua for 6.6 miles. Two gates on opposite sides of the highway. Pass through the east gate and proceed across country, over numerous gullies to the east side of Puu Loa. From here, pass up the steep slope to the highest point and the station. A 10 minute pack.

Name of station: Puu Loa
Established by: C.A. Burroughs
Year: 1866
State: Hawaii
County: Honolulu

Recovery notes:

Station mark is a USGS disk, uninstalled in concrete in the bottom of a 7 x 24 inch recess 6 inches deep, in the center of a 6-foot-square concrete platform flush with surrounding rocks. A truncated trunked concrete pyramid, about 2 feet high, with a 2-1/2 inch pipe through the middle, is centered on the mark. Station mark is a 6 inch stone wall at south side of station platform. Reference mark number one is a standard disk stamped "1 1948," cemented in a drill hole in the 6 inch stone wall at east side of station platform. Reference mark number two is a standard disk stamped "Puul Loa HGS 1913 2 1948," cemented in a drill hole in a 10 inch stone boulder that projects 6 inches from ground. It is at the southeast end of the boulder area surrounding station, 42 feet northeast of the rectangular stone pile, and 6 feet lower than station mark.

*Note: Chief of party should be instructed to record a line in the station station.

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

by the
National Ocean Survey
OHD, HAWAIIAN DATUM

NAME OF STATION: PULU MAU NORTH (HTS) State: HAWAII COUNTY: HAWAII
CHIEF OF PARTY: L. C. WILDER YEARS: 1948

DESCRIPTION OF TRIANGULATION STATION
DISTANCES AND DIRECTIONS TO ADJACENT NODAL, 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>PRECIPITATION</td>
<td>6.7</td>
<td>123° 34' 45&quot;</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>15.2</td>
<td>180° 00' 00&quot;</td>
</tr>
</tbody>
</table>

Located in Hamakua District in the northern part of the Island of Hawaii, one mile east of Waipio Valley and two miles inland from the sea.

The station is an old H.T.S. station marked with a 4-inch circular concrete monument firmly in the ground on the top of a small sharp knoll. A U.S.G.S. disk is set in the top of the concrete monument. The H.T.S. recovered the station in 1953 and built a concrete triangular-shaped monument six feet on each side and surrounding the old station mark. A 2 1/2 inch pipe with three steel legs and two feet high was set in the concrete monument and centered and plumbed over the old mark. In the 8 1/2 inch pipe was set a 2-inch pipe ten feet long with a metal target at the top. When visited in 1948 the station was the same as constructed in 1953.

To reach the station proceed west from Honokaa Village along the main road to Waipio Valley a distance of about eight miles to the Kukuihele Landing Road junction. Turn left and follow rough plantation road which winds up through the same fields for a distance of 1.5 miles more or less to the station which is located on the west side of a sharp upward turn in the road. The station is about 100 feet west of a clump of ironwood trees.

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

PUU MAU NORTH (HTS) (continued)

NAME OF STATION: PUU MAU NORTH (HTS)
ESTABLISHED BY: L. C. WILDER YEAR: 1948 STATE: Hawaii
RECOVERED BY: D. M. WHIPP YEAR: 1966 COUNTY: Hawaii

HEIGHT OF STATION ABOVE MSL IN FEET: 160
HEIGHT OF STATION ABOVE STATION MARK IN FEET: 0

DISTANCE AND DIRECTIONS TO ADJACENT MARKS

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>BOREING</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAIKAEOE 3 1948</td>
<td>ESE</td>
<td>00 00 00.0</td>
<td></td>
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<tr>
<td>NM No. 1</td>
<td>00 00 00.0</td>
<td>17.220 5.249</td>
<td>50 07 00</td>
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<tr>
<td>NM No. 2</td>
<td>00 00 00.0</td>
<td>14.592 4.448</td>
<td>169 52 52</td>
</tr>
</tbody>
</table>

Station mark was recovered in good condition. Two reference marks were established. A complete description follows:

Station is located about 7 miles west of Honokaa and 1-1/2 miles south of Kukukuele, at about 1689 feet elevation, on a 25-foot-high cutbank on the northwest side of a macadam road, about 500 feet southwest of a diagonal crossroad and 75 yards west of a prominent grove of ironwood trees.

To reach station from the post office in Honokaa, go west towards Waipio for 2.5 miles to crossroad. Turn sharp left and go up grade 0.6 mile; take right fork and go 0.25 mile to macadam landing strip on right; continue west for 5.0 miles to fork. Take left fork and go 0.1 mile to diagonal crossroad. Bear left and go 0.1 mile to station on right.

Station mark is a U.S. Geological Survey disk stamped "1629", set in concrete in the center of a triangular, concrete platform 7 feet on each side and flush with the ground. A 2-1/2-inch iron pipe 2 feet long is mounted vertically over the mark, supported by 3 iron legs embedded in the concrete platform, and holds a red and white metal target that extends 7 feet above the platform. Station is 18 feet west of edge of cutbank and 25 feet east of edge of cane field.

Reference mark number one is a standard disk stamped "PUU MAU NORTH HTS NO 1 1948 1956", set in the top of a concrete-filled, 3-1/2-inch iron pipe that is set in concrete and projects 4 inches above ground. It is 12 feet west of edge of bank and about 2 feet lower than station mark.

Reference mark number two is a standard disk stamped "PUU MAU NORTH HTS NO 2 1948 1956", set in the top of a concrete-filled, 3-1/2-inch iron pipe that is set in concrete and projects 4 inches above ground. It is 12 feet west of a jog in the cutbank edge and about 3-1/2 feet lower than station mark.

Distance between reference marks is 25.87 feet.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PUU MAU NORTH (HTS)
ESTABLISHED BY: L. C. WILDER YEAR: 1948 STATE: Hawaii
RECOVERED BY: R. B. NESBY YEAR: 1978 COUNTY: Hawaii
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 7 MILES WEST OF HONOKAA

Detailed statement as to the merits of the original description; including marks broken, exposures, changes made, and other pertinent facts.

THE STATION AND REFERENCE MARKS WERE RECOVERED IN GOOD CONDITION AS DESCRIBED IN 1966.
NO ORIGINAL TEXT

Puu o Nale (Hawaii Island, Hawaiian Government Survey, 1891; E. R. Hand, 1918).—In northern part of Hawaii, in central part of northwest Kohala, on the summit of Puu o Nale, a very conspicuous and well-known, high, smooth, grassy hill. Hill is very symmetrical, sugar-loaf type, steep sides. It is about 300 meters west of the road which runs to Waimea; it is 4.0 miles inshore from Mahukona and about 6.5° E. from it; it is 4 1/2 miles from the coast on the north. The hill on which station Puu Ula is situated is about 38° W., and there is a prominent hill, much lower than Puu o Nale, to the west of and about midway of the line between Puu o Nale and Puu Ula. Puu o Nale bears S. 50° E. from Honipu Landing; S. 10° E. from Hona Mill; S. 45° W. from Kauhola Point Light. Station marked by a United States Geological Survey tablet in top of a post of dressed granite, 7 inches square.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PUU O NALE
ESTABLISHED BY: H.R.S. YEAR 1891 STATE: HAWAII COUNTY: HAWAII

Detailed statement as to the process of the original description: The station was located as described. It was impossible to determine what kind of disk was used to mark the station as it is surrouned by a square slab of concrete which projects about one foot above the ground. In 1913 Mr. E. R. Hand reported a United States Geological Survey Disk as the station mark. A new description follows—

The station is located on the summit of a low volcanic knoll, named Puu o Nale, about 16 miles northwest of Waimea, about 4 miles east northeast of Mahukona, about 5 miles south southwest of Hona, about 0.2 mile west of the road which leads between Waimea and Hona and about 0.1 mile north of a group of trees.

To reach from the post office in Waimea: go north on the road which leads toward Hona for 19.0 miles; turn left, west, pass through a wire gate and go northwest, across country, for 0.3 mile to the summit of the hill and the station.

The station is the center of a 2 1/2 inch iron pipe which projects about 2 feet from the top of a square concrete platform which is 6 feet on each side and projects about 1 foot.

Reference mark number 1 is a standard disk, stamped PUU O NALE NO 1, 1849, set into a drill hole in a boulder which is about 7 feet in diameter and projects about 2 feet. It is 3.0 meters lower than the station.

Object Distance Direction
E. LAKIKIOLA
R. No. 1 S 30.699 m 100.465 ft 0° 00' 00"
Haul Stake, NNE 3.0 miles 240 16 41.3
PUU ULA (metal target) 3.0 miles 180 45 58.0

Hawaii Territory Survey records show: In 1925, the Hawaii Territory Survey recovered the station which was marked with a USGS disk set on top of a granite post. A 1/2 inch pipe was set in concrete and centered over the mark.

Also records show: Original station recovered by Mr. H. Birdseye, April 1911. Marked by bronze tablet, stamped 1974, set in top of original granite post.

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

FUU O NALE (continued)

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

NAME OF STATION: FUU O NALE
ESTABLISHED BY: H.G.S.
YEAR: 1880 STATE: Hawaii
RECOVERED BY: H.G.S.
YEAR: 1961 COUNTY: Hawaii

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

This station has been destroyed by earthwork on the top of the puu. The Hawaiian Government Survey has established a new station on the east side of the puu called EAST O NALE 1960, which is a bronze disk in the center of a triangular, concrete slab.

(M.St.Surv., 1962)—Station due to be destroyed by VOR construction. Two new stations were established by the Hawaii State Surveyor as reference points. See description of FUU-O-NALE (west slope) and FUU-O-NALE (east slope).

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

NAME OF STATION: FUU O NALE
ESTABLISHED BY: H.G.S.
YEAR: 1880 STATE: Hawaii
RECOVERED BY: H.G.S.
YEAR: 1964 COUNTY: Hawaii

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

The station has evidently been destroyed since there is now an FAA VOR site on the summit of this mountain. There is however a new station marked EAST O NALE 1960 about 500 feet east of the VOR.

*Place of chief of party should be inserted here. The officer who actually visited the station should sign this name at the end of the recovery note. Note—One or more letters must be used for every missed measurement.

Quad DC 34714
**HORIZONTAL CONTROL DATA**

*by the National Ocean Survey, National Geodetic Survey*

**NAME OF STATION:** PUU O NALE EAST SLOPE

**Chief or Party:** Hawaii St. Surv. **Year:** 1960 **State:** Hawaii **County:** Hawaii

**Description:**

The station was established as a reference point for PUU O NALE in 1913 which was to be destroyed during the construction of Upolu VOR. It was located on the east slope of Puu-O-Nale Hill.

It is marked with a State Survey bronze disk stamped with a cross, set in concrete in the top of a 2-inch pipe, 6 feet long driven into the ground and flush with a flat terraced site. The 2-inch pipe was then set in a concrete block flush with the terrace top. Around the mark was constructed a triangular concrete platform 5 feet on each side and separate from the mark so that any surface destruction or movement of the platform would not affect the mark.

**RECOVERY NOTE, TRIANGULATION STATION**

**NAME OF STATION:** PUU O NALE East Slope

**Established by:** H. St. Surv. **Year:** 1960 **State:** Hawaii **County:** Hawaii

**Recovered by:** D.B. Whippe **Year:** 1967 **County:** Hawaii

**AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:** Island: Hawaii

**Decided distances are as in the frames of the original description; including marks found, azimuths, change made, and other pertinent facts:**

Station was recovered in good condition. Located about 2-1/4 miles south-southwest of Hawi and 200 feet west of State Highway 25, on the east slope of Puu O Nale, a hill that has an FAA VOR installation on the highest point (which was originally occupied by station PUU O NALE 1913).

To reach station from the post office in Hawi, go south on State Highway 25 for 1.8 miles to T-junction. Turn right and go 1.1 miles to top of grade and white gate on right, at macadam driveway to VOR site. Walk about 60 yards up driveway to fence line, then go right, up along fence over hill, for about 120 yards to station on left side of fence. Station mark is an unstamped Hawaii State Survey disk, set in concrete in the bottom of a 12 x 12-inch recess 3 inches deep, in the center of a triangular concrete platform 5 feet on each side. It is 22 feet west of the fence and about 400 feet east of the VOR antenna. The following is inscribed in the concrete platform: "EAST O NALE 10-19-40".

---

**ADJUSTED HORIZONTAL CONTROL DATA**

**NAME OF STATION:** PUU O NALE EAST SLOPE

**State:** Hawaii **Year:** 1960 **Second Order**

**Source:** G-12664

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<th>Y</th>
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<td>5101</td>
<td>3881621.08</td>
<td>497738.57</td>
<td>0.07 05</td>
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</tbody>
</table>

*PLANE AZIMUTH HAS BEEN COMPUTED BY THE *Z* = D*G* - FORMULA NEGLECTING THE SECOND TERM.*

---

**NOTE ON OBJECT**

**DETERMINED AZIMUTH**

**MEASURED ANGLE**

**CODE**

---

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

**No. 936**

[End of Document]
HORIZONTAL CONTROL DATA

NAME OF STATION: PUU O NALE WEST SLOPE

Municipality: HAWAII
State: HAWAII
Year: 1960

RECOVERY NOTE, TRIANGULATION STATION

Station was recovered. It was established when old station PUU O NALE was to be removed to make way for an FAA VOR installation on the hill. Located about 2-1/2 miles south-southwest of Hilo, at about 1770 feet elevation, on the west side of the top of Puu O Naie. To reach station from the post office in Hilo, go south on State Highway 25 for 1.8 miles to T-junction; turn right and go 1.15 miles to white gate on right, opposite power pole 198. Turn right, through gate, and go uphill on macadam drive for 0.1 mile to FAA building at end of drive. Walk up high, wooden stairway to flat, macadam-covered hilltop, then go left alone edge of macadam for 178 feet to station on left. Station is marked by a 1-inch iron pipe set in the center of a triangular concrete platform 1-1/2 feet on each side; pipe is flush with top of platform. "NALE 62" is inscribed in the concrete. Station is 57 feet northeast of a drain culvert grill, 115 feet northwest of the FAA thunderlite station (which is a 4-inch iron pipe set in a 4 x 4-foot concrete pad and projecting 4 feet above ground), 135 feet northwest of a white, 4-inch pipe 20 feet long, with ladder spikes up the sides, about 130 feet west of the VOR antenna, 21 feet west of the center line of a macadam drain ditch around perimeter of macadam surface, 10 feet west of edge of macadam surface, and hidden in high grass about 1 feet lower than the macadam surface.
PUU PILI (Hawaii Island, Hawaiian Government Survey, 1881)—In the northern part of Hawaii, in the central part of North Kohala, on Puu Pili. Marked by a stand for the instrument consisting of four iron posts and by three benches buried, radiating horizontally from the station, and ginger planted over them.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Puu Pili
STATE: Hawaii
COUNTY: Hawaii
DESCRIPTION OF STATION: In the central part of North Kohala on a high wooded hill called Puu Pili and situated about 1.8 miles southeast of Kahua Ranchhouse.

Old Mark found: 3" diameter concrete post marked with a U.S.G.S. bronze tablet stamped 4876 feet. The station is best approached from the south side of the hill up which a horse trail was cleared.

New Mark: H.T.S. Type E monument (Tripod built of 3" pipe 10 feet long for legs which is set firmly in the ground with concrete. A removable signal of 1 1/2" pipe 20 feet long is set over the station mark and thru the top of the tripod.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PUU PILI
ESTABLISHED BY: H.G.S.
YEAR: 1881
STATE: Hawaii
COUNTY: Hawaii
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

Station mark was recovered in good condition. Located about 9 miles north of Kamuela, 10 miles southeast of Hawi, and 2 miles south of the Kahua Ranch buildings, in the Kohala Mountains on top of Puu Pili a tree and brush-covered hill of about 4708 feet elevation.

To reach station from the post office in Kamuela, go west on State Highway 25, towards Hawi, for 11.1 miles to a board gate on right, 50 yards before reaching the Von Holt Memorial Park. Go through gate, turn right, and go 100 yards to gate in corner. Pass through gate and follow track road left, easterly, for 0.35 mile to fork. Take right fork and go 0.9 mile to fork at red tank by trees. Take left fork and go 0.3 mile to gate. Pass through gate and continue for 0.45 mile to a reservoir dam on right. Leave road and go up left up slope for 0.1 mile to fence line at base of hill. Pack northwest up steep slope about 1/2-mile to top and station.

Station mark is a U.S.G.S disc stamped "HAWAII 4876", set in the top of a 5-inch-diameter concrete post projecting 5 inches from ground. There is a large signal constructed of pipe, 8 feet high, centered over the mark, with a 30-foot-long pipe up the center.
HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

PUU ULA HTS
(Hawaii Island, E. R. Hand, 1913) — In northern part of Hawaii, and
northwest Kohala District, on the summit of Puu Ula, a very large, isolated, and
prominent conical hill, sharp and symmetrical. This hill is unmistakable,
showing up from seaward from south clear around to N. 30° E. It bears S. 80° E.
from Honopu Landing (abandoned); Honoa Mill (Hawai’i Mill & Plantation Co.)
bears N. 30° E. Station marked by cylinder of concrete 5 inches in diameter
and extending about 8 inches above ground; in its top is a hole in center of
triangle. Station covered with cairn of stones. Marked by Territorial Survey,
but determined by United States Coast and Geodetic Survey.

RECOVERY NOTE, TRIANGULATION STATION

Name of Station: Puu Ula, Hawaii
County: Hawaii
Established By: E. R. Hand
Year: 1913
Location: North Kohala, Hawaii
Resurveyed By: H. A. Murray
Year: 1936

Detailed statement as to the changes of the original description:
Location of Station: A very prominent and brush-covered hill about 3000
feet above the Hamahakona Road and about 2 miles
from Waikiki.

Old Station found on top of 6" concrete-filled metal cylinder firmly
set in ground.

New Mark: E.T.S. Type D-1 Monument (Triangular concrete monument 7-1/2
feet on each side with 1-7/8" steel bar 9 feet long set on steel
legs on the old mark which is left exposed to view. A
standard metal target is set on the steel bar.)

RECOVERY NOTE, TRIANGULATION STATION

Name of Station: Puu Ula, Hawaii
County: Hawaii
Established By: E. R. Hand
Year: 1913
Location: North Kohala, Hawaii
Resurveyed By: H. A. Murray
Year: 1936

Detailed statement as to the changes of the original description:
Recovered the concrete cylinder with triangle as described in 1913
pole and target in 1936, vertically over the mark.
Located at the summit of Puu Ula, a prominent hill about 3 miles
westward of Hamahakona Road and 2 miles from Upolu Point. It is about a mile
southwest of Puu Kohone. Puu Ula has a reddish color where cinders have been
removed from a pit.

To reach the station, turn southwest about 3/4 mile west of Hawi,
onto a sideroad, with one fields on the right hand. Proceed 11 miles until
abreast the prominent Puu Ula. Pass thru two gates to the hill.

OBJECT

DISTANCE

DIRECTION

PUU U LA, HAWAII
00 00 00
CAST (metal target)
69 27 05.1
KOHONI (metal target)
189 27 05.5
Hind Stock (center)
286 02 41.9

These data are updated from adjustment of 1951

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

PUU ULA (HTS) (continued)

Name of Station: PUU ULA (HTS)
Established by: E.R.H.
Year: 1913
State: Hawaii
County: Hawaii
Recovered at: R.G. Munson
Year: 1956
County: Hawaii

Recovery Note: Triangulation Station

Station was recovered in good condition as described in 1938 and 1968, except the steel bar and legs have rusted out and the metal pole and target have toppled over.

To reach go 0.65 west along the highway from the junction in Haiku; turn left, taking the most westerly of two dirt roads, and go 1.6 miles in a south westerly direction; turn right, passing on east side of small pond, and go about 0.5 mile on a dirt road to the south end of PUU ULA Hill. Walk up ridge to highest part of hill and station.

Recovery Note: Triangulation Station

Station was recovered in poor condition; wind erosion had undermined the east side of the station platform until it was in danger of toppling over. A support of stone and concrete was built along exposed edge of platform, and a cribbing of stone extended further out, to prevent further erosion. Two reference marks were also established. A complete description follows:

Station is located about 2 miles west-southwest of Hau village and 1.25 miles south of State Highway 27, on the summit of Puu Ula, a bare, red topped hill of about 921 feet elevation, in pasture land.

To reach station from the post office in Hau, go north on State Highway 25 for 0.1 mile, turn right and go west on State Highway 27 for 0.6 mile to power pole 25. Turn right and follow diagonal field road along power line for 0.4 miles to wire gate on right, at power pole 29. Go through gate and follow track road across pasture for 0.2 mile to end corner of field, and a gate on right. Pass through gate and go up over low ridge, then left, for 0.3 mile to top of hill and station. A 4-wheel drive vehicle is required.

Station mark is a 3/4-inch drill hole in the center of a canted triangle in the top of a 3-inch diameter concrete post projecting 3 inches from the center of a triangular concrete platform 7 feet on each side and projecting 12 inches above ground on the east side. The entire east side and southeast point of the platform are supported and protected by a large, stone and concrete cribbing.

Reference mark number one is a standard disk stamped "PUU ULA HTS 1913 NO 1 1968", set in the top of a concrete-filled, 3-inch iron pipe that is set in concrete and projects 2 inches from ground. It is about 8 inches lower than station mark.

Reference mark number two is a standard disk stamped "PUU ULA HTS 1913 NO 2 1968", set in the top of a concrete-filled, 3-inch iron pipe that is set in concrete and projects 2 inches from ground. It is about 15 inches lower than station mark.

*Note on file.

Recovery Note: Triangulation Station

Station found in good condition. To reach from the Post Office in Pahala, go one block N to a cross road, go straight ahead to State Hwy 13 (0.6 mile), go left (toward the volcano) 2.4 miles to angular rate on the right, pass thru rate and go about 200 feet to a fence corner, turn right along fence and go 0.15 miles in two stages, pass thru the north gate and angle to left to a dim road, after crossing wash angle to the right on a very dim trail and drive 2.9 miles to base of a small cone. Leave truck and pack about 300 yards to top of cone and station.
HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

NAME OF STATION: PUUKI
STATE: Hawaii
YEAR: 1872

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: PUUKI
STATE: Hawaii
YEAR: 1872

A complete description follows:

Station is located about 3/4-mile due north of Kamuela, on a grassy hill of about 3201 feet elevation, known as Puu Ki, overlooking 3 reservoirs to north and east.

To reach station from the post office in Kamuela, go northwest on State Highway 25 for 0.15 mile; continue ahead, on right fork, for 0.1 mile; take macadam T-road right and go 0.45 mile; turn right on track road and go 0.05 mile to locked gate at base of hill. Pass through gate and follow track road uphill for 0.32 mile to metal gate; pass through gate and continue for 0.3 mile to second metal gate; pass through gate and continue for 0.1 mile; turn left, along left side of third reservoir, and go southerly 0.2 mile to top of hill and station.

NOTE: Key for locked gate was obtained at Parker Ranch Office in Kamuela; a 4-wheel-drive vehicle is required to reach top of hill.

Station mark is a 1/4-inch drill hole in the top of an 8-inch square granite post flush with ground. It is surrounded by an 8 x 8-foot, pole fence.
NO ORIGINAL TEXT

Rail (Hawaii Island, O. B. French, 1910; K. T. Adams, 1920)—In northern part of Hawaii, west coast of Kohala, on the most prominent point of ridge about ¼ mile north of Mahukona. Marked by drill hole in solid rock. Reached by following along the railroad until it passes through a rock cut some 15 or 20 feet in height on side toward sea, when the station will be found on the first prominent point of ridge immediately to the north. A cairn was left over the station.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: RAIL
ESTABLISHED BY: O.B.F.
YEAR: 1910
STATE: Hawaii
BENCH MARKS: Included
RECOVERED BY: Munson
YEAR: 1968
COUNTY: Hawaii
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

Detailed treatment as to the license of the original description, including marks found, measurements, changes made, and other pertinent facts:

Station was recovered. Located about 5-½ miles southwest of Hawi, 1500 feet north of Mahukona Harbor, and 250 feet east of old railroad bed, on a rocky point at about 125 feet elevation, on slopes covered with kiawe trees.

To reach station from the post office in Hawi, go north on State Highway 25 for 0.1 mile; turn left and follow State Highway 27 west and southeast for 7.1 miles to Mahukona Harbor. Take track road right, passing in front of Standard Oil tanks, and follow old railroad bed north along coast for 0.6 mile to end of track travel at an old railroad cut, with rock point about 15 feet high, on left. Walk about 300 yards north along railroad grade, then go right, up slope about 250 feet to station.

Station is marked by a 1/2-inch drill hole in a flat rock. There is a cairn with a 3-inch-diameter target pole in it centered over the mark.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: RAIL
STATE: Hawaii
YEAR: 1910
THIRD ORDER
SOURCE: G-SP150

<table>
<thead>
<tr>
<th>GEOGRAPHIC LATITUDE</th>
<th>GEOGRAPHIC LONGITUDE</th>
<th>ELEVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>20° 11' 47.381''</td>
<td>155° 54' 16.762''</td>
<td>495' 203' 95&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>Z (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>361,244.38</td>
<td>495,203.95</td>
<td>0 08 25</td>
</tr>
</tbody>
</table>

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE P (N.G. H.) FORMULA NEGLECTING THE SECOND TERM.

NO DATA
HORIZONTAL CONTROL DATA

by the National Ocean Survey
OLD HAWAIIAN DATUM

RED TANK (Hawaii Island, L.C.W., 1946)—about 150 feet E of road to Kahului and distant 0.28 mile from Mahukona docks. Constructed of wood.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Red Tank
ESTABLISHED BY: L.C. Wilder
YEAR: 1948
STATE: Hawaii
COUNTY: Hawaii
LOCATION: 150 feet E of road to Kahului and distant 0.28 mile from Mahukona docks.

RECOVERED BY: D.R. Whipp
YEAR: 1967
COUNTY: Hawaii

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

Station was recovered in good condition. Located about 150 feet E of road to Kahului and distant 0.28 mile from Mahukona docks. Constructed of wood. Recovered by D.R. Whipp, 1967.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: RED TANK
STATE: HAWAII
YEAR: 1948
THIRD ORDER

NO OBSERVATION CHECK ON THIS POSITION

DEGREES LATITUDE: 20° 11' 23.69"
DEGREES LONGITUDE: 155° 54' 02.21"

ELEVATION: 492.80043

STATE COORDINATE (feet):
HI 1 510.0 362,624.67 492,800.43 -1.38 18

* Plane azimuth has been computed by the - P - P - P FORMULA NEGLECTING THE SECOND TERM

TO STATION OR OBJECT
GEODETIC LATITUDE
(If in miles)
PLANE AZIMUTH
(If in miles)

CODE

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: RED TANK
ESTABLISHED BY: L.C. Wilder
YEAR: 1948
STATE: Hawaii
COUNTY: Hawaii

RECOVERED BY: D.R. Whipp
YEAR: 1967
COUNTY: Hawaii

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

Recovered in good condition as described by D.R. Whipp, 1967.
HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

NO ORIGINAL TEXT

Ridge (Hawaii Island, O. B. French, 1910; K. T. Adams, 1929).—On northwest coast of Hawaii, western coast of Kohala, about 1 mile south of Mahukona south beacon, and 900 meters directly east of land.

The point on the shore where one turns inland is indicated by a triangle painted on the rocks. The station is on top of the most prominent ridge about 1/2 mile south of Mahukona, and on the most northern point visible from Kehena along the coast. Marked by a drill hole in the solid rock. A map was left at the station.

RECOVERY NOTE. TRIANGULATION STATION

RIDGE

State: HAWAII
Year: 1910

Old mark found: Drill hole in solid rock and small mound of rocks.

New Mark: H.T.S. Type D Station (Triangular concrete monument 7 1/2 feet on each side with 2 1/2" pipe 2 feet long set on steel legs over the old mark which is left exposed to view. A standard metal target is set in the 2 1/2" pipe.

ADJUSTED HORIZONTAL CONTROL DATA

STATE: HAWAII
YEAR: 1910
SECOND ORDER

SOURCE: G-9275

DEGREES LATITUDE: 20° 30' 21.5"
DEGREES LONGITUDE: 155° 33' 42.83"
ELEVATION: 921.9 Meters

STATE COORDINATES (Fermi)

HI 1
1 5101
364.475.04
487.411.23
-0 08 11

TO STATION OR OBJECT

DEGREES LATITUDE
DEGREES LONGITUDE
FLAME AZIMUTH

RIDGE
KEHENA
XEBENA
PUEO MALE
R. K. No. 1 1948
KEHENA (metal target)
CAST (metal target)

DISTANCE
00 00 00
24 41 45
9.593m 31.4deg.

45 00 00
30 00 20
5101

(continued on next page)
HORIZONTAL CONTROL DATA

by the
NATIONAL GEODATIC SURVEY
OLD HAWAIIAN DATUM

QUAD 201553 STATION 1079

LATITUDE ° / 10 ° / 10 °
LONGITUDE ° / 10 ° / 10 °

RIDGE (continued)

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: RIDGE
ESTABLISHED BY: 0.B.F.
RECOVERED BY: D.M. Whip
YEAR: 1910 STATE: Hawaii
YEAR: 1967 COUNTY: Hawaii
HEIGHT OF TELESCOPE ABOVE STATION MARK: 2.5 METERS
HEIGHT OF LIGHT ABOVE STATION MARK: METERS

DISTANCES AND DIRECTIONS TO AZIMUTH 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>Kewena (HGS) 1861-------1948 DISTANCE and DIRECTION-------</td>
<td>00 00 00.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mahukona Light 1929</td>
<td>31.48</td>
<td>9.59</td>
<td>271 32 15</td>
</tr>
<tr>
<td>Kewena (HGS) 1861-------1967 DISTANCE and DIRECTION-------</td>
<td>00 00 00.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mahukona Light 1929</td>
<td>NW</td>
<td>31.48</td>
<td>9.59</td>
</tr>
<tr>
<td>S.S. No. 2</td>
<td>14.05</td>
<td>4.28</td>
<td>390 09 31</td>
</tr>
</tbody>
</table>

Station mark 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 about 3/4-mile southeast of Mahukona, 1/2-mile inland from sea, and about 300 yards east of the new highway running between Kawaihae and Mahukona, at about 104 feet elevation, on a small rocky knoll along low ridge, among sparse kiiwe trees.

To reach station from the post office in Kawaihae, go northwest on the new highway along coast for 10.8 miles to end of truck trail at a long, high way cut. Pack Easterly about 300 yards to station up along ridge running east from cutbank. About a 10-minute pack.

Station mark is a 1/2-inch drill hole in a rock, in the bottom of a 7-inch-diameter hole 1/4 inches deep, in the center of a triangular, concrete platform about 7 feet on each side and projecting 4 inches above ground. 4 1/2-inch, iron pipe 2 feet long is centered over the mark, mounted on 3 iron legs, and supports the removable, red and white, metal target.

Reference mark number one is a standard disk stamped "HIGE 1194", cemented in a drill hole in a boulder about 2 feet, square and projecting 3 feet above ground. It is about 6 inches lower than station mark.

Reference mark number two is a standard disk stamped "HIGE 1910 NO 2 1967", cemented in a drill hole in a large boulder that projects about 2 feet above ground. It is at southeast edge of station knoll and about 1 foot lower than station mark.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: RIDGE
ESTABLISHED BY: 0.B.F.
RECOVERED BY: R.L. Newson
YEAR: 1910 STATE: Hawaii
YEAR: 1968 COUNTY: Hawaii

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

Station and both reference marks recovered in good condition as described by D.M. Whip, 1907. Corrections to Directions: Proceed 1/2 miles north from entrance to State Pier at Kawaihae (marked by stone monument). Post Office in Kawaihe is torn down.
HORIZONTAL CONTROL DATA
by the
National Ocean Survey
OLD HAWAIIAN DATUM

NO ORIGINAL TEXT

U. S. L. H. (Hawaii Island, E. R. E. H., K. T. Adams, 1929) — A station established by the Lighthouse Department, on north coast of Hawaii, at Kukuihele, on edge of cliff midway between the Derrick landing house and the cable landing house. At the point there is a group of very large and conspicuous stones; cane is planted all around. Station is 5 meters from cliff edge and is marked by a galvanized iron pipe cemented in an upright position in a crevice of the largest of the stones. Pipe projects 1 ½ feet above the cement surface, which is marked with the letters "U. S. L. H."

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: U.S.L.H.
ESTABLISHED BY: E. R. Hand
YEAR: 1913
STATE: HAWAI'I
COUNTY: HAWAI'I
AERIAL DISTANCE AND DIRECTION FROM NEAREST TOWN: Isolated; Hawaii

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

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

Station is located about 6-1/2 miles west-northwest of Honokaa and 1 mile northeast of Kukuihele village, along bluff edge on grassy knoll, about 20 yards west from end of the row of ironwoods bordering the cliff, and hidden inside a clump of tall brush.

To reach station from the post office in Honokaa, go west on Manane St., for 0.2 mile; turn right and go down hill on Lehua St., for 0.8 mile to T-junction. Go left 0.25 mile to T-junction down by mill. Turn left and go west 0.35 miles; take right fork and go 0.5 mile to fork by old warehouse, take right fork and go 0.05 mile; take right fork, a dirt cane road, downhill, for 0.15 mile to edge of field by trees and lighthouse. Turn left and go west along edge of field for 0.1 mile to the grassy knoll with clump of large brush and station.

Station mark is a 1-1/2-inch iron pipe projecting 1/2-inch from a mass of concrete, with "U.S.L.H." inscribed in it, in a crevice in a large bedrock outcrop that projects 1 foot above ground. It is 52 feet west of the old base of the original Kukuihele Lighthouse, which is 111 feet south of the new lighthouse, 150 feet west-northwest of a power pole that sets in the same field, 15 yards northwest of edge of cane field and about 25 feet southeast from bluff edge.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: U.S.L.H.
ESTABLISHED BY: E. R. Hand
YEAR: 1913
STATE: HAWAI'I
COUNTY: HAWAI'I
AERIAL DISTANCE AND DIRECTION FROM NEAREST TOWN: 65 MILES

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

The station was recovered as described in 1960. The station is in dense brush near the edge of a cane field.


table

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>H</th>
<th>V</th>
<th>θ OR Δ θ IN ANGLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI 1</td>
<td>5101</td>
<td>479.234.22</td>
<td>471.158.76</td>
<td>0° 31′ 15″</td>
</tr>
</tbody>
</table>

Plane azimuth has been computed by the P (H. H.) formula reflecting the second term.

<table>
<thead>
<tr>
<th>TO STATION OR DIRECTION</th>
<th>GEODETIC AZIMUTH (From North)</th>
<th>HORIZONAL AZIMUTH (From North)</th>
<th>CODE</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>U.S. DEPARTMENT OF COMMERCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION</td>
</tr>
<tr>
<td>NATIONAL OCEAN SURVEY</td>
</tr>
</tbody>
</table>

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: U.S.L.H.
STATE: HAWAI'I
YEAR: 1913
THIRD ORDER
SOURCE: N-92184

<table>
<thead>
<tr>
<th>GEOGRAPHIC LATITUDE:</th>
<th>20° 07′ 50.673′</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOGRAPHIC LONGITUDE:</td>
<td>155° 33′ 37.925′</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EROSION SCALED</th>
<th>METERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATE COORDINATE (FOOT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
</tr>
<tr>
<td>-------------------------</td>
</tr>
<tr>
<td>479.234.22</td>
</tr>
</tbody>
</table>
HORIZONTAL CONTROL DATA

WAILEE (Hawaii Island, K. T. Adams, 1928)—On the northwest coast of Hawaii, about 3.2 miles northwest of Kawahine Light, on the point on north side of Kamilo Bay, about 30 meters back from and 8 meters above high water line, and 18 meters toward the sea from the back wall, 1.8 meters high, of an old Hawaiian inclosure of stones, rectangular in shape. About 45 meters inland from the station an old trail runs parallel with the shore. The station is at the most northern point along the shore from which one can see Puu Kamoli. Marked by a standard disk station mark, note 2a, set in solid rock, flush with the surface of the ground. The exposed portion of the rock is about 1 meter in diameter. Two standard reference disks, note 10a, were set in the following-described locations, and at the following distances and azimuths from the station: No. 1, in solid lava rock toward the sea from and below the station, 11.6 meters (37.07 feet), 72° 30'; No. 2, inland from station and covered by a stone cairn, 56.46 meters (185.24 feet), 332° 58'.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: WAILEE
ESTABLISHED BY: K. T. Adams  YEAR: 1928  STATE: Hawaii
RECOVERED BY: R. C. Munson  YEAR: 1968  COUNTRY: Hawaii
HEIGHT OF TELESCOPE ABOVE STATION MARK: 1.59 Meters
HEIGHT OF LIGHT ABOVE STATION MARK: 1.59 Meters

STATION MARK: Standard disk with azimuth and distance noted.

DISTANCES AND DIRECTIONS TO AZIMUTH MARKS, REFERENCE MARKS AND PERMANENT 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>
</table>
| ANAEHOOMALI  | 37.07       | 11.1     | 64° 48' 13"
| R.M. No. 1   | 37.07       | 11.1     | 64° 48' 13"
| R.M. No. 2   | 185.26      | 56.46    | 230° 20' 13"
| ANAEHOOMALI  | 37.07       | 11.1     | 64° 48' 13"
| R.M. No. 1   | 37.07       | 11.1     | 64° 48' 13"
| R.M. No. 2   | 185.26      | 56.46    | 230° 20' 13"

Station was recovered and all marks found in good condition. Large kahoe trees block all view to north, east and southeast. A complete description follows:

Station is located about 3.1/2 miles northwest of Kawahne, on black, rocky point on seacoast, about 1/4-mile northwest of Waikapailo Bay and about 25 feet above sea level.

To reach station from the post office in Kawahine, go north on the new coast highway towards Mahuka for 1.1 miles to large bridge; continue for 2.1 miles to track side road left, about 35 yards before reaching fence line. Turn left and go 0.25 mile to metal gate on right, by old windmill by sea. Go right through gate, and follow old road northwest for 0.2 mile to large, square cairn on point on right. Continue ahead for 0.2 mile to end of truck trail just after dropping down off of rise. Walk left, westerly, through trees about 100 yards to station.

Station mark is a standard disk stamped "WAILEE 1928", cemented in a drill hole in a bedrock outcrop in small open area on west edge of trees. It is 100 feet east of extreme tip of rocks, 9 feet north of a 4-foot cairn, and 66.5 feet west of a 40-foot-long, north-south, stone wall about 4 feet high, hidden in the trees.

Reference mark number one is a standard disk stamped "WAILEE 1928", cemented in a drill hole in a rough lava outcrop projecting 2 feet above slope, about 18 feet above sea level and 7.1 feet lower than station mark.

Reference mark number two is a standard disk stamped "WAILEE 2 1928", cemented in a drill hole in a flat bedrock outcrop projecting 6 inches. It is 116 feet east of the stone wall, about 100 yards west of the old road, at the west edge of a 3-foot cairn, and 12.8 feet higher than station mark.

*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.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: WAILEE
STATE: HAWAII
YEAR: 1928
THIRD COORDINATE METHOD

SOURCE: G-SPI56

GEOGRAPHIC LATITUDE: 20° 54' 45.52"
GEOGRAPHIC LONGITUDE: 155° 30' 30.68"
ELEVATION: 3 Meters

STATE COORDINATES (U.S.):

STATION  CODE 3791.111.75  452.453.44  0.07 35

TO STATION OR OBJECT  SITE CODE 46.7  7  45  20  5101

REFERENCE MARK (S): G-SPI56

PLANE AZIMUTH:

00° 23' 26"
HORIZONTAL CONTROL DATA

**NAME OF STATION**: WAIKOKE 3

**STATE**: HAWAII

**YEAR**: 1940

**SECOND**: CHECK

**SOUND**: G-9275

**NO OBSERVATION CHECK ON THIS POSITION**

<table>
<thead>
<tr>
<th>Geodetic Latitude</th>
<th>Geodetic Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>20° 07' 44.744&quot;</td>
<td>155° 33' 57.968&quot;</td>
</tr>
</tbody>
</table>

**ELEVATION**: 123 Meters

**EAST COORDINATES (GRAD)**

| HI 1  | 5101 | 477,324.11 | 470,561.36 | - 3.01 22 |

*PLANE AZIMUTH HAS BEEN COMPUTED BY THE FORMULA FOR DISTANCE, FORMULA 1 FORMULAS, THE SECOND FORMULAS.

**POSITION DETERMINED BY TRAVERSE FROM STATION WAIKOKE 3**

<table>
<thead>
<tr>
<th>TO STATION OR OBJECT</th>
<th>GEODETIC AZIMUTH FROM OBJECT</th>
<th>PLANE AZIMUTH &quot;OF OBJECT</th>
<th>CODE</th>
</tr>
</thead>
</table>

QE 280
DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: WAIKOKEO 3
STATE: HAWAII
COUNTY: HAWAII

CROSS OF PARTY: L. C. Wilder
YEAR: 1948

HEIGHT OF TELESCOPE ABOVE STATION MARK
HEIGHT OF LIGHT ABOVE STATION MARK

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

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>MEASURE</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAIPIO</td>
<td>0 00</td>
<td>0 00</td>
<td>0 00</td>
</tr>
<tr>
<td>R. M. No. 1 NE</td>
<td>164.95</td>
<td>4,599</td>
<td>156.00 17</td>
</tr>
<tr>
<td>WAIKOKEO 2 E (N.S. Sta.)</td>
<td>85.65</td>
<td>27,337</td>
<td>171 37 44</td>
</tr>
</tbody>
</table>

Established by U.S.G.S., in 1948 and located on the northern part of Hawaii near the top of high sea bluff 1.8 miles east of the mouth of WaiPIO Valley.

The station is marked with a standard disk stamped "WAIKOKEO 3 1948" and cemented in drill hole in solid rock. The station is located in a narrow strip of waste land between the caneland and sea bluff.

Waikoeko 3, an old H.S. station was found. The top of the 10-inch circular concrete monument marking the station was badly broken from bullets, a target pit being dug near the station. Loose boulders from the pit surrounds the station.

One reference mark cemented in drill hole in solid rock was established near the station "Waikoeko 3".

To reach the station proceed westerly from Honokaa Village along the main road to WaiPIO Valley a distance of about 8 miles to the paved side road leading down to Kukuihale Landing. Follow the Kukuihale Landing Road for about 1 mile. The station is located at the top of sea bluff on high ground about 0.8 mile southwest of the Kukuihale Landing.

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

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: WAIKOKEO 3
ESTABLISHED BY: L.C. WILDER
YEAR: 1948
STATE: HAWAII
COUNTY: HAWAII

RECOVERED BY: R. D. WHIPP
YEAR: 1966

HEIGHT OF TELESCOPE ABOVE STATION MARK: 1.52 METERS
HEIGHT OF LIGHT ABOVE STATION MARK: METERS

DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PRINCIPAL 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>WAIKOKEO 3 (HGS) 1943</td>
<td>1.00</td>
<td>E 0.00 0.00 0.00</td>
</tr>
<tr>
<td>BM No. 1</td>
<td>1.00</td>
<td>E 0.00 0.00 0.00</td>
</tr>
<tr>
<td>WAIKOKEO 2 (HTS)</td>
<td>89.85</td>
<td>27.385</td>
</tr>
<tr>
<td>ANVUEU (HGS)</td>
<td>1.00</td>
<td>E 0.00 0.00 0.00</td>
</tr>
<tr>
<td>WAIKOKEO 2 (HTS)</td>
<td>89.85</td>
<td>27.385</td>
</tr>
<tr>
<td>BM No. 2</td>
<td>1.00</td>
<td>E 0.00 0.00 0.00</td>
</tr>
<tr>
<td>WAIKOKEO 2 (HTS) 1943</td>
<td>1.00</td>
<td>E 0.00 0.00 0.00</td>
</tr>
</tbody>
</table>

Station mark and reference mark were recovered in good condition. A new reference mark, number two, was established. The concrete monument of WAIKOKEO 2 (HTS) was recovered with the top broken open. There was no disk, however the imprint of one could be seen on the remaining concrete, so a new station disk was set. A complete description follows:

Station is located about 7 miles northwest of Honokaa, 3/4 mile north northeast of Kukuehae and 1700 feet west of old warehouse, at about 403 feet elevation near edge of bluff above sea, on a knoll, or rise, that is covered with tall grass and brush.

To reach station from the post office in Honokaa, go west on Mamane St. for 0.5 mile; turn right and go 0.8 mile on Lehua St. to T-junction. Go left for 0.25 mile to a T-junction down by mill. Turn left and go west 0.35 miles; take right fork and go 0.5 mile to fork by old warehouse. Take left fork and go 0.10 mile; turn sharp right and go north 0.6 miles to end of cane field and station on rise.

Station mark is a standard disk stamped "WAIKOKEO 3 1943", cemented in a drill hole in bedrock flush with ground. It is 30 feet north of edge of cane field, 26 feet south of bluff edge and 3-1/2 feet west of a white witness post.

Reference mark number one is a standard disk stamped "WAIKOKEO 3 1943 NO 1", cemented in a drill hole in a 14-inch-diameter bedrock cutcrop that projects 2 inches. It is along north edge of knoll, at brush edge, and is about 4 inches lower than station mark.

Reference mark number two is a standard disk stamped "WAIKOKEO 3 1948 NO 2 1956", cemented in a drill hole in a 4-foot rock projecting 16 inches above ground. It is along north edge of knoll at brush line and about 6 inches higher than station mark.

WAIKOKEO 2 (HTS) 1943 is a standard disk stamped "WAIKOKEO 2 HTS 1943 1966" set in the top of a 9-inch-diameter, concrete monument encased in sheet iron and projecting 18 inches above ground. It is 10 feet west of largest clump of brush on rise, 12 feet north of edge of cane road, 2-1/2 feet south from the edge of an 8-foot cliff and 1.8 feet lower than station mark.

NOTE: Distance between reference marks: 17.15 feet.

NOTE - One of these forms must be used for every station recovered.
WAIMEA-
Hawaii east base (Hawaii Island, Hawaiian Government Survey, 1873).—In the northern part of Hawaii, on the old road between Waimea village and Mana, on the eastern edge of the plain. Marked by a granite post.

RECOVERY NOTE, TRIANGULATION STATION

EAST BASE (HAWAII EAST BASE)
HAWAII
HAWAII

The station was recovered as described and in good condition. A new description follows—

The station is located at the western base of a low grassy ridge about 3.5 miles east of Waimea and about 1.5 miles south of the road which runs between Waimea and Honokaa.

To reach the post office in Waimea, go easterly on the road which leads toward Honokaa for 2.0 miles; pass to the south of the main gate leading into the O.K.O. camp; continue easterly for 0.1 mile; turn right, off the highway, and go south, on a dirt road, for 0.5 mile; cross over a cattle guard and continue southeast for 0.8 mile; turn right and go across country for 0.25 mile to the station.

The station is the center of a 1 inch square copper plug, set into the top of a 4 inch square granite post which projects 2 feet. A 25 foot concrete platform which projects 5 feet is set over the station mark. A 2.5 inch iron pipe, centered over the station mark, projects 4 inches from the top of the concrete platform.

Reference mark number 1 is a standard disk, stamped EAST BASE NO 1 1946, set into a drill hole in a boulder which is flush with the surface of the ground and is about 4 feet higher than the station.

Reference mark number 2 is a standard disk, stamped EAST BASE NO 2 1946, set into a drill hole in a boulder which projects about 1 foot and is about 6 feet higher than the station.

Object

HOLOHOLOKU (metal target)

R. M. No. 1 E
R. M. No. 2 E
HONOKAA (metal target)

Distance

25.114 m 82.130 ft
8.695 m 28.300 ft
81.19 57.1

Direction

00 00 00
32 30 57
19 57.1

An early recovery note reports: Original granite post recovered by C.M.
Birdseye in September 1911. Not remarked.

(continued on next page)
# Horizontal Control Data

**By the National Geodetic Survey, Old Hawaiian Datum**

### Waimea-Hawaii Z Base (continued)

**Recovery Note, Triangulation Station**

**Name of Station:** Waimea East Base (Hawaii East Base)

**Established By:** 1873  **State:** Hawaii

**Recovery By:** D.M. Whipp  **Year:** 1966  **County:** Hawaii

**Height of Telescope Above Station Mark:** 2.22 meters  **Height of Light Above Station Mark:**

<table>
<thead>
<tr>
<th>Object</th>
<th>Bearing</th>
<th>Distance (Feet)</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noloholoku</td>
<td>1948</td>
<td>00 00 00.0</td>
<td></td>
</tr>
<tr>
<td>BM No. 1</td>
<td>N</td>
<td>82,390</td>
<td>25,114</td>
</tr>
<tr>
<td>BM No. 2</td>
<td>NNW</td>
<td>82,318</td>
<td>25,092</td>
</tr>
<tr>
<td>BM No. 3</td>
<td>SSE</td>
<td>19,197</td>
<td>5,852</td>
</tr>
</tbody>
</table>

Station mark and reference mark number one were recovered in good condition. Reference mark number two was found destroyed so a new reference mark, number three, was established. A small discrepancy was noted in the distance to BM 1 and was checked in the field; the 1966 distance is correct. A complete description follows:

Station is located about 3 miles east of Kamuela and 0.2 mile south of Mana Road, at the west base of a low, grassy ridge, or mesa, that is about 30 feet higher than station.

To reach station from the post office in Kamuela, go east on State Highway 19 for 2.2 miles to red cinder side road right, near power pole 11. Turn right and go south 0.45 mile to T junction. Turn left and follow Mana Road east and south 1.0 mile to fork at corral. Take right fork, through cut, and go 0.1 mile to board gate. Pass through gate and go left across pasture 0.1 mile to fence line at end of short lane and end of truck traffic. Cross fence, pass through board gate in opposite fence, and go left about 70 yards to station.

Station mark is a 5/8-inch-square bolt head set flush in a drill hole in the rounded top of an 8-inch-square granite post that projects 30 inches from ground. It is 30 feet south of a fence line. A Type A signal is centered over the mark, with the 6-foot-square, concrete platform being 5 feet above ground.

Reference mark number one is a standard disk stamped "EAST BASE NO 1 1948", cemented in a drill hole in a 3 x 2-foot rock outcrop flush with ground. It is 32.8 feet north of the fence line, on slope of hill, 5.9 feet higher than station mark.

Reference mark number three is a standard disk stamped "WAIMEA EAST BASE 1966 NO 3 1966", cemented in a drill hole in an 18-inch, pyramidal boulder that projects 10 inches above ground. It is on slope of hillside, 3.7 feet higher than station mark.

**Recovery Note, Triangulation Station**

**Name of Station:** Waimea East Base (Hawaii East Base)

**Established By:** 1963  **State:** Hawaii  **Bench Marks Also**

**Recovery By:** F.D.  **Year:** 1970  **County:** Hawaii

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

3 mi, East of Kamuela

Detailed statement of the process of the original description, including marks found, surveying, changes made, and other pertinent facts:

Station and all marks recovered as described and in good condition.
HORIZONTAL CONTROL DATA
by the National Ocean Survey
OLD HAWAIIAN DATUM

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: WAIHEA WEST BASE
STATE: HAWAII
COUNTY: HAMAKA

CHIEF OF PARTY: L. G. WILDER
YEAR: 1946
DESCRIBED BY: C. J. ROEPPEL
NOTE: HEIGHT OF TELESCOPE ABOVE STATION MARK 1.6 METERS, HEIGHT OF LIGHT ABOVE STATION MARK 1.6 METERS.

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>BEARING</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOKULOA</td>
<td>NW</td>
<td>19.821</td>
<td>16 19 21</td>
</tr>
<tr>
<td>R. K. 2</td>
<td>NW</td>
<td>6.072</td>
<td>16 19 21</td>
</tr>
<tr>
<td>R. K. 1</td>
<td>NW</td>
<td>10.854</td>
<td>296 19 21</td>
</tr>
<tr>
<td>Weaia Tank</td>
<td>W</td>
<td>1.0 mile</td>
<td>321 31 30.6</td>
</tr>
</tbody>
</table>

The station is located on the summit of a low rocky ridge, about 1.5 miles southeast of Weaia, about 0.5 mile south of a transmission line and about 0.3 mile west of a wire fence.

To reach the station from the main road intersection in Weaia, go easterly, on the road which leads toward Honokaa, for 6 mile; turn right and follow the lane south for 0.2 mile; pass through a board gate and continue south for 0.5 mile to the high ground and the station.

The station is a standard disk, stamped BASE 1946, set into a drill hole in a boulder which projects about 18 inches.

Reference mark number 1 is a standard disk, stamped BASE 1 1946. Set into a drill hole in a boulder which projects about 4 inches and is about 2 feet lower than the station.

Reference mark number 2 is a standard disk, stamped BASE 2 1946, set into a drill hole in a boulder which is flush with the surface of the ground and is about 4 feet lower than the station.

The station was recovered and found to be in good condition.

A new to reach follows:

To reach the station from the center of the Town of Weaia, go easterly on State Highway 19 for 0.6 mile to a blacktop road on the right. Turn right and go south on the blacktop road for 0.65 mile to where the road turns sharp left. The station is about 400 paces from this point, on a rocky ridge, due south of the road. The station is marked by four steel posts, 1 feet high, which can be seen from the road.

(continued on next page)
HORIZONTAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

WAIMEA WEST BASE (continued)

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: WAIMEA WEST BASE
ESTABLISHED BY: L.C. Walden
YEAR: 1948
STATE: Hawaii
RECOVERED BY: D.M. Whipp
YEAR: 1967
COUNTY: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK: 1.2 METERS
HEIGHT OF LIGHT ABOVE STATION MARK: METERS

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

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>BAKING</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.WP PA (HGS) 1873--------1948 DISTANCE and DIRECTION--------00 00 00.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R.M. No. 1</td>
<td>35.600</td>
<td>10.854</td>
<td>01 59 02</td>
</tr>
<tr>
<td>R.M. No. 2</td>
<td>19.921</td>
<td>6.072</td>
<td>31 57 47</td>
</tr>
<tr>
<td>P.WP PA (HGS) 1873--------1967 DISTANCE and DIRECTION--------00 00 00.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R.M. No. 1</td>
<td>35.600</td>
<td>10.852</td>
<td>01 59 28</td>
</tr>
<tr>
<td>R.M. No. 2</td>
<td>19.920</td>
<td>6.072</td>
<td>31 57 47</td>
</tr>
<tr>
<td>Kamehameha Airports, VOR</td>
<td>SSW</td>
<td>1/2-mile 336 49 51.2</td>
<td></td>
</tr>
</tbody>
</table>

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

Station is located about 1 mile southeast of Kamehameha Airports, 1/2-mile northeast of the northeast end of Kamehameha Airports, on a low knoll in open pasture land.

To reach station from the main intersection in Kamehameha, go past the Bank of Hawaii and post office, go southeast around the Parker Ranch Office building, and then east, for 0.5 mile; turn right, on T-road, and go 0.35 mile; take right fork, past riding stables, and go 0.1 mile to board gate. Pass through gate and continue for 0.1 mile to board gate on fence on left. Pass through gate and follow track road for 0.3 mile to fence corner and 2 board gates. Pass through gate on left and go across pasture, northwardly, for 0.3 mile to highest point and station.

Station mark is a standard disk stamped "BASE 1948", cemented in the top of a pyramid-shaped boulder, 2 feet at the base and 6 inches at the top, projecting 16 inches above ground. It is in the center of 4 fence posts set in a 12-foot square.

Reference mark number one is a standard disk stamped "BASE 1948", cemented in a drill hole in a 10-inch, flat boulder projecting 3 inches from ground and 30 inches lower than station mark.

Reference mark number two is a standard disk stamped "BASE 2 1948", cemented in a drill hole in bedrock flush with ground, on north slope of knoll and 5 feet lower than station mark.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: WAIMEA WEST BASE
ESTABLISHED BY: L.C. Walden
YEAR: 1948
STATE: Hawaii
RECOVERED BY: D.M. Whipp
YEAR: 1967
COUNTY: Hawaii

AERIAL DISTANCE AND DIRECTION FROM NEAREST TOWN: 1 mile southeast of Kamehameha Airports, 1/2-mile west of Kamehameha Airports.

Detailed account as to the fitness of the original description; including marks lead, surveying, changes made, and other pertinent facts:

Station and all marks recovered as described and in good condition.
NO ORIGINAL TEXT

Waipio (Hawaii Island, Hawaiian Government Survey, 1877; E. R. Hand, 1913) - Near the north coast of Hawaii, on the north side of Waipio Valley, about 8 meters from the edge of the gulch which drops down precipitously to the rice fields, and 400 meters from the edge of the cliffs above the sea. To reach the station start up the zigzag trail which goes to the top from the beach at Waipio Valley, and upon reaching the top, turn "noaka" or ishore along the edge of the gulch. Station is on head of old wood slide. Marked originally by copper tube and a copper cylinder buried three feet deep, with an oil plot at surface.

In 1913 mark described as a concrete cylinder set upright, with United States Geodetic Survey plate in center. The station is surrounded by a calm of stones.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Waipio
STATE: HAWAII
COUNTY: HAWAII

RECOVERY BY: H. S. G.
YEAR: 1877
LOCATION: Top of Waipio Valley, Kamakua, Hawaii

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: WAIPIO
STATE: HAWAII
YEAR: 1877

ELEVATION: 422.8
W. H. W: 1087

STATE COORDINATES (IGB1)

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>E</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>463,981.33</td>
<td>468,926.02</td>
</tr>
</tbody>
</table>

*PLANE AXONOMY HAS BEEN COMPUTED BY THE 2.5-M. FORMULA NEGLECTING THE SECOND TERM*

TO STATION OR OBJECT

<table>
<thead>
<tr>
<th>KUILEI</th>
</tr>
</thead>
<tbody>
<tr>
<td>290 44 20.4</td>
</tr>
</tbody>
</table>

(continued on next page)
Station mark was recovered in good condition, however the support for the metal signal has rusted off and the signal no longer stands. The station is now completely hidden by a heavy growth of large ironwood trees. A complete description follows:

Station is located about 10 miles west-northwest of Honokaa and 7 1/2 miles northeast of Kamuela, along the heavily-timbered west rim of Waipio Valley at about 1387 feet elevation, about 2600 feet southwest of the coastline.

To reach station from the post office in Honokaa, go west on Mamane Street, and continue west on the road to Waipio, for 7.7 miles to the post office at E'ukiahele Village. Continue west for 1.25 miles to east rim of Waipio Valley. Go downgrade on steep road for 0.8 mile to T-junction. Turn right and go 0.5 mile to end of truck travel at beach. Park westerly along beach about 3/4 mile to west side of valley. Enter brush on trail 10 yards inland from large boulder strip and go 75 yards to trail fork. Take right fork, passing a Forest Service sign, and follow good trail up the steep side of the canyon about 1/2 mile to crest of ridge in ironwood trees. Leave trail and walk southwest up gradual ridge line through forest for about 400 yards to beginning of large bamboo grove. Continue, alongside of grove, for about 100 yards to its end, then continue along ridge about 90 yards to station. Packing time 1-1/2 hours.

Station mark is a U.S. Geological Survey disk, stamped "1387", set in concrete in the center of a triangular, concrete platform, 7 feet on each side and flush with the ground. It is 30 feet northwest of where the ridge drops off steeply into canyon, 15 feet southwest of a triangular blase on a 12-inch ironwood, 5 feet northeast of another triangular blase on an ironwood tree, and 5 feet west of a cairn that is built on the same point of the concrete platform.

A growth of smaller trees and brush among the large ironwoods partially obscures the station and makes it difficult to find.

NOTE: Although the trail is very good for hiking it has some rocky, washed-out points that are believed impassable for horses.

A 4-wheel drive vehicle is required for the steep road down into Waipio Valley.