

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

0 201553 STATION 1052  
HAWAII  
LATITUDE 20 °00' TO 20 °30'  
LONGITUDE 155 °30' TO 156 °00'  
DIAGRAM NE 5-1.5 HAWAII

**Mahu (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 from 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 seen across a narrow bight of the sea, 150 meters, S. 18° E. Four sisal plants about the same distance as the shack bear S. 30° E. Puu Ula bears N. 78° E.; Puu o Nale, the southerly of two hills of equal height and similar appearance, bears S. 70° E. Station marked by a 1¼-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 on the point, is distant 9.95 meters (32.6 feet), on bearing N. 70° E. It has paint on it.

(11-8-55)

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: MAHU  
ESTABLISHED BY: E.R.H. YEAR: 1913 STATE: Hawaii  
RECOVERED BY: H.O.F. YEAR: 1958 COUNTY: Hawaii

Detailed statement as to the fitness of the original description; including marks found, stampings, 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 sisal plants 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 40 feet away and cement part is on the bottom. The 1¼ 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 Hawi; 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. Hand YEAR: 1913 STATE: Hawaii BENCH MARK(S) ALSO ☐  
RECOVERED BY: D.M. Whipp YEAR: 1967 COUNTY: Hawaii  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

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

Station was recovered. Large kiawe 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 Hawi, go north on State Highway 25 for 0.1 mile; turn left and go west on State Highway 27 for 2.6 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 dim right fork and go 0.5 mile to beach; turn left and go 0.45 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 off 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.

FORM CGS-526 (11-65)  
USCOMM-DC 18508-P68

IMRCE  
COAST AND GEODETIC SURVEY

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: MAHU

STATE: HAWAII

YEAR: 1913

THIRD

ORDER

SOURCE: G-92184

GEODETIC LATITUDE:	20 14 00.159	ELEVATION:	5	METERS
GEODETIC LONGITUDE:	155 54 06.500	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ °OR Δ °1 ANGLE *
HI 1	5101	362,254.30	508,596.94	- 0 08 20

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE θ °OR Δ °1 FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From web)	PLANE AZIMUTH (From web)	CODE

QF 113

Q 201553 STATION 1053  
HAWAII  
LATITUDE 20 °00' TO 20 °30'  
LONGITUDE 155 °30' TO 156 °00'  
DIAGRAM NE 5-1,5 HAWAII

NO TEXT

### ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION MAHUKONA HARBOR FLAG A

STATE HAWAII

YEAR 1910

THIRD

-ORDER

SOURCE: G-SP156  
NO OBSERVAT

SOURCE NO G-SP156  
OBSERVATION CHECK ON THIS POSITION

GEODETTIC LATITUDE:	20° 10' 29.84	ELEVATION:	METERS
GEODETTIC LONGITUDE:	155 54 13.19		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ HOR $\Delta$ $\phi$ ANGLE
HI 1	5101	361,565.60	487,380.39	- 0° 08' 21"

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE  $\theta = \Delta \alpha$  FORMULA NEGLECTING THE SECOND TERM.

PLANE AZIMUTH HAS BEEN COMPUTED BY THE $\sin \Delta$ FORMULA NEGLECTING THE SECOND TERM.			
TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE

QO 232

Q0 232

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

0 201553 STATION 1054  
HAWAII  
LATITUDE 20 ° 00' TO 20 ° 30'  
LONGITUDE 155 ° 30' TO 156 ° 00'  
DIAGRAM NE 5-1,5 HAWAII

## 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, white-washed 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 BENCH MARK(S) ALSO ☐  
RECOVERED BY: Munson YEAR: 1968 COUNTY: Hawaii  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:

Detailed statement as to the fitness of the original description, including marks found, stampings, 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, at 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, kiawe tree.

No longer noticeable or prominent from seaward.

R

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: MAHUKONA HARBOR N DAY BEACON

STATE: HAWAII

YEAR: 1910

THIRD

ORDER

SOURCE: G-SP156

GEODETIC LATITUDE:	20 ° 11' 24.60	ELEVATION:	METERS
GEODETIC LONGITUDE:	155 54 20.29		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ OR $\Delta$ OR ANGLE *
HI 1	5101	360,902.72	492,906.50	- 0° 38' 24"

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE  $\theta$  OR  $\Delta$  OR FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

0 201553 STATION 1055  
HAWAII  
LATITUDE 20 ° 00' TO 20 ° 30'  
LONGITUDE 155 ° 30' TO 156 ° 00'  
DIAGRAM NE 5-1.5 HAWAII

## 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 45.3 meters (149 feet) north by west of the present light (1929), approximately 12 feet in diameter at base, 2.5 feet in diameter at top, and 15 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.R.F. YEAR: 1910 STATE: Hawaii BENCH MARK(S) ALSO ☐  
RECOVERED BY: Munson YEAR: 1968 COUNTY: Hawaii  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

Detailed statement as to the fitness of the original description, including marks found, stampings, 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 15 feet high; however the cairn has fallen apart and all that remains is a 6-foot-high, whitewashed, bottom section, still intact.

Located about 6-1/2 miles southwest of Hawi, 1000 feet south of Mahukona Harbor, and 145 feet north of the U.S. Coast Guard's Mahukona Lighthouse.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: MAHUKONA HARBOR S DAY BEACON

STATE: HAWAII

YEAR: 1910

THIRD

-ORDER

SOURCE G-SP150

GEODETIC LATITUDE:	20 ° 11 ' 01.98	ELEVATION:	METERS
GEODETIC LONGITUDE:	155 ° 54 ' 15.87		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ OR $\Delta$ $\theta$ 1 ANGLE *
HI 1	5101	361,318.19	490,623.46	- 0 08 22 "

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE  $\theta$  OR  $\Delta$   $\theta$ 1 FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE

QQ 226

JUN 1978

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

STATION 1056

**Mahukona Harbor wharf derrick** (Hawaii Island, O. B. French, 1910; K. T. Adams, 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 35 feet in height, with swinging member of same length.

NAME OF STATION: MAHUKONA HARBOR WHARF DERRICK

YEAR 1910

THIRD

**—ORDER**

GEODETIC LATITUDE: 20° 11' 13.25 GEODETIC LONGITUDE: 155 54 11.38	ELEVATION:	METERS FEET
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STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ OR $\Delta$ OR ANGLE °
HI 1	5101	361,748.66	491,755.35	- 0° 08' 21"

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE  $\theta = \arctan \frac{a}{b}$  FORMULA NEGLECTING THE SECOND TERM

FORMULA NEGLECTING THE SECOND TERM.			
TO STATION OR OBJECT	GEODETIC AZIMUTH (From north)	PLANE AZIMUTH* (From north)	CODE

QD 225

QD 225

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

Q 201553 STATION 1057  
HAWAII  
LATITUDE 20 °00' TO 20 °30'  
LONGITUDE 155 °30' TO 156 °00'  
DIAGRAM NE 5-1,5 HAWAII

**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) S. 0° 57' E. of the foundation of *Mahukona Light mast*, 1910, and 48.8 meters (160 feet) south by east of *Mahukona Harbor south day beacon* (the original Mahukona Light, discontinued in 1907). The light established in 1915, is on a concrete tower tapering from about 6 feet at its base to 2½ feet at its top, which is surmounted 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.

MAHUKONA LIGHT (Hawaii Island, K.T.A., 1929; L.C.W., 1945) --

## Additional measurements given:

Top of base to top of light - 21.85 feet (6.56 meters).  
Top of base to top of platform - 16.55 feet (5.045 meters).  
Base 0.20 meter above ground.  
Base 2.72 meters square (8.9 feet).

## RECOVERY NOTE, TRIANGULATION STATION INTERSECTION

NAME OF STATION: Mahukona Light  
ESTABLISHED BY: K.T. Adams YEAR: 1929 STATE: Hawaii BENCH MARK(S) ALSO ☐  
RECOVERED BY: D.M. Whipp YEAR: 1967 COUNTY: Hawaii  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

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

Station was recovered in good condition. Located about 11 miles northwest of Kawaihae and 1300 feet south of Mahukona Harbor, at Kaoma Point.

Station is center of white light mounted atop a square, white, tapering, concrete tower. Light is 22 feet above ground.

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Mahukona Light  
ESTABLISHED BY: K.T.A. YEAR: 1929 STATE: Hawaii BENCH MARK(S) ALSO ☐  
RECOVERED BY: D.M.W. YEAR: 1970 COUNTY: Hawaii  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:

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

The station was recovered in good condition as described by D.M.W. in 1967.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: MAHUKONA LIGHT

STATE: HAWAII

YEAR: 1929

THIRD

ORDER

SOURCE: G- 9279

GEODETIC LATITUDE	20 11 00.230	ELEVATION	METERS
GEODETIC LONGITUDE	155 54 15.385		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	§ 108 Δ α° ANGLE °
HI 1	5101	361,363.96	490,446.79	- 0 08 22

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE § 108 Δ α° FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE

QE 251

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

0 201553 STATION 1058  
HAWAII  
LATITUDE 20° 00' TO 20° 30'  
LONGITUDE 155° 30' TO 156° 00'  
DIAGRAM NE 5-1.5 HAWAII

DEPARTMENT OF COMMERCE  
U. S. COAST AND GEODETIC SURVEY  
Form 535  
Rev. Aug. 1963

## DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: MAULILI (HTS) STATE: HAWAII COUNTY: HAWAII

CHIEF OF PARTY: L. C. WILDER YEAR: 1948 Described by: L. C. WILDER

NOTE.	YEAR: 1970		Described by: L. C. WILDER				
	HEIGHT OF TELESCOPE ABOVE STATION MARK METERS.1		HEIGHT OF LIGHT ABOVE STATION MARK METERS				
	Surface-station mark, Underground-station mark	DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION					
OBJECT		BEARING	DISTANCE		DIRECTION:		
			feet	meters			
Puu Lapalapa (metal pole & target)		NNE E			00	00	00
Kauhola Point Lighthouse					257	01	16.0
Sta. Niulii (metal pole & target)					317	11	37.7

Located at the summit of a small brush covered hill in the cane fields, 1.3 miles from the main highway and from the Halaula 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 Halaula School and Kauhola Point Light are all about in range.

Marked by a triangle formed in a 4" cylinder of concrete and surrounded by a concrete platform, with metal pole and target over the mark. This monumenting (except the old center mark) was done in 1938 by the Hawaii Territory Survey, who then recovered the same cylinder of concrete. There is a small galvanized iron structure covering a grave adjacent to the station.

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: MAULILI (HTS)  
ESTABLISHED BY: L.C. Wilder YEAR: 1948 STATE: Hawaii BENCH MARK(S) ALSO ☐  
RECOVERED BY: D.M. Whipp YEAR: 1967 COUNTY: Hawaii  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

Detailed statement as to the fitness of the original description; including marks found, stampings, changes made, and other pertinent facts:  
Station was recovered. There is no longer a metal target 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 Hawi, 1-1/4 miles south-southwest of Halaula School, and about 500 feet south of the Kohala Ditch, at about 968 feet elevation, on a grassy rise surrounded by cane.  
To reach station from the post office at Kohala, go east on State Highway 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 5-inch-diameter concrete post projecting 3 inches from the center of a triangular, concrete platform projecting 6 inches from ground. Some very large boulders have been pushed up by the station.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: MAULILI HTS

STATE: HAWAII

YEAR: 1948

THIRD

ORDER

SOURCE G- 9275

GEODETIC LATITUDE	20 12 45.981	ELEVATION	295.0 METERS
GEODETIC LONGITUDE	155 47 17.334		968 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	# OR Δ 4' ANGLE
HI 1	5101	401,205.20	501,032.39	- 0 05 58

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE # OR Δ # FORMULA NEGLECTING THE SECOND TERM

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
PUU LAPALAPA	302 45 33.8	302 51 32	5101

QE 158

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

Q 201553 STATION 1059  
HAWAII  
LATITUDE 20° 30' TO 20° 30'  
LONGITUDE 155° 30' TO 156° 00'  
DIAGRAM NE 5-1.5 HAWAII

Niulii (Hawaii Island, E. R. Hand, 1913).—On north coast of Hawaii, northeast shore of Kohala, on a well-defined hill about 1/4 mile south of Niulii sugar mill. There is a wall of stone which crosses this hill; on the southwest side cane is planted; on the northeast side is 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 (Pololu Gulch road) going "mauka" (inland) and a short distance from where this road joins the main road, bears N. 16° W. Niulii stack bears N. 11° E. Station is 95 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 2 1/2 feet above the ground, and a cairn of stones is built around it to its top.

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Niulii STATE: Hawaii COUNTY: Hawaii  
ESTABLISHED BY: E. R. Hand YEAR: 1913 LOCALITY: Niulii, N. Kohala, Hawaii.  
RECOVERED BY: Chas. L. Murray YEAR: 1938

Detailed statement as to the fitness of the original description:

Location of Station: On a well-defined hill about 250 feet above the Niulii-Pololu Valley road and about 2000 feet from Pololu Valley-Niulii Mill Road junction.

Old Mark found: 1 1/2" pipe in concrete marked "Niulii-1931". The axle marking the original station was found on the ground nearby. Evidently the axle was replaced by the pipe in concrete by the office of James B. 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: NIULII  
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:

The original station was not recovered. In 1913 the station was the upper end of an axle which was set in concrete. In 1938 The Hawaiian Territory 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 B. Mann, a private surveyor. Also in 1938 the Territory Survey built a concrete platform 6 feet high and 6 feet square over this station. The center of a 2 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 Kauhola Point, about 1.0 mile southwest of Akakoa Point, about 0.8 mile southwest of the village of Makapala, about 0.1 mile northeast of a field road and about 25 feet east of the high ground.

To reach from the post office in Kapaau; go south on the road which leads toward Pololu Valley for 3.3 miles; cross a concrete bridge over a small stream and continue southerly for 0.5 mile; pass to the left hand side of Makapala School and continue southeasterly for 0.3 mile; continue straight ahead, southeasterly, as per the sign reading "Pololu Valley" and go 0.1 mile; continue straight ahead, on the dirt road, for 0.2 mile. Turn right and go southerly, up grade, for 0.2 mile to the end of truck travel. From this point

U. S. GOVERNMENT PRINTING OFFICE

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

H-2810-2

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: NIULII

STATE: HAWAII

YEAR: 1913

SECOND

ORDER

SOURCE: G- 9279

GEODETIC LATITUDE	20 13 10.024	ELEVATION	120.1 METERS
GEODETIC LONGITUDE	155 44 53.482		394 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ OR ANGLE
HI 1	5101	414,909.24	503,435.79	- 0 05 09"

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE θ OR Δ FORMULA NEGLECTING THE SECOND TERM

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE

QE 151

(continued on next page)



# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 201553 STATION 1059

LATITUDE ° ' TO ° '  
LONGITUDE ° ' TO ° '  
DIAGRAM

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.

Object	Distance	Direction
LAPALAPA (metal target) HTS		00 00 00
Halawa, Spire (Catholic Church)	1.5 NW	79 26 46.4
Kohala, Stack (Kohala Sugar Co.)	3.0 NW	87 21 06.6
KAUHOLA LIGHTHOUSE	3.0 NNW	108 58 03.23

## RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: NIULII  
ESTABLISHED BY: E.R. Hand YEAR: 1913 STATE: Hawaii BENCH MARK(S) ALSO ☐  
RECOVERED BY: D.M. Whipp YEAR: 1967 COUNTY: Hawaii  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

Detailed statement as to the fitness of the original description; including marks found, stampings, 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 canefields.

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 canefield 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

R

NAME OF STATION: NIULII  
ESTABLISHED BY: E. R. HAND YEAR: 1913 STATE: HAWAII BENCH MARK(S) ALSO ☐  
RECOVERED BY: R. B. MELBY YEAR: 1978 COUNTY: HAWAII  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 1/2 MILE SOUTH OF NIULII

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

THE STATION WAS RECOVERED IN GOOD CONDITION AS DESCRIBED IN 1967.

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

Q 201553 STATION 1060  
HAWAII  
LATITUDE 20° 00' TO 20° 30'  
LONGITUDE 155° 30' TO 156° 00'  
DIAGRAM NE 5-1.5 HAWAII

Nunulu (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 125 meters from this clump. Station is close to a 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 9.25 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 (Nunula 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.

DEPARTMENT OF COMMERCE  
U. S. COAST AND GEODETIC SURVEY  
Form 1358

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: NUNULU  
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:

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

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: NUNULU  
ESTABLISHED BY: E.R. Hand YEAR: 1913 STATE: Hawaii BENCH MARK(S) ALSO ☐  
RECOVERED BY: D.M. Whipp YEAR: 1967 COUNTY: Hawaii  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

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

Station is destroyed. The point was determined by inverse from NUNULU 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.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: NUNULU

STATE: HAWAII

YEAR: 1913

THIRD

ORDER

SOURCE: G-92184

GEODETIC LATITUDE:	20° 12' 24.952	ELEVATION	488	METERS
GEODETIC LONGITUDE:	155° 49' 26.462	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ OR ANGLE
HI 1	5101	388,902.92	498,933.58	- 0 06 43

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE θ OR Δ OR FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE

QF 111

014 3844-24321

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

Q 201553 STATION 1061  
HAWAII  
LATITUDE 20 °00' TO 20 °30'  
LONGITUDE 155 °30' TO 156 °00'  
DIAGRAM NE 5-15 HAWAII

DEPARTMENT OF COMMERCE  
U. S. COAST AND GEODETIC SURVEY  
Form 525  
Rev. Aug. 1948

CHIEF OF PARTY: **L. C. WILDER** YEAR: **1948** Described by: **L. C. WILDER**

NOTE: HEIGHT OF TELESCOPE ABOVE STATION MARK 4.85 METERS.1 HEIGHT OF LIGHT ABOVE STATION MARK METERS.

Detailed description:

From the junction of main roads at Hawi, go eastward on the Kohala-Waimea road 1.2 miles (at Telephone pole 216) turn south on a hard surfaced road and proceed until across the Kohala irrigation ditch, where a left turn onto a cane road, Nunula 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.

## R

NAME OF STATION: **NUNULU 2**  
 ESTABLISHED BY: **L.C. Wilder** YEAR: **1948** STATE: **Hawaii** BENCH MARK(S) ALSO ☐  
 RECOVERED BY: **D.M. Whipp** YEAR: **1967** COUNTY: **Hawaii**  
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: **Island: Hawaii**

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

Detailed statement as to the fitness of the original description; including marks found, stampings, changes made, and other pertinent facts:  
Station was recovered in good condition. A complete description follows:

Station is located about 2-1/4 miles south-southeast of Hawi and 0.8 mile northeast of Puuokumau Reservoir, at about 1600 feet elevation, along the northwest side of a main, canefield 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 left at green tank. Turn left and follow dirt road 1.05 miles to fork. Take right fork and go 65 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 southwest 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.

NAME OF STATION: NUNULU 2  
STATE: HAWAII YEAR: 1948 SECOND ORDER

SOURCE: G- 9275

GEODETIC LATITUDE	20 12' 25.496	ELEVATION	487.8 METERS
GEODETIC LONGITUDE	155 49 26.814		1600 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ DEG $\Delta$ $\theta$ ANGLE
HI 1	5101	388,869.50	498,988.53	- 0 00 43

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE  $\theta = \arctan \frac{a}{b}$  FORMULA NEGLECTING THE SECOND TERM

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE $\sin \Delta$ FORMULA NEGLECTING THE SECOND TERM			
TO STATION OR OBJECT	GEODETIC AZIMUTH (from south)	PLANE AZIMUTH (from south)	CODE
LAHIKIOLA EAST	337 52 25.6	337 59 09	510

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 201553 STATION 1062  
HAWAII  
LATITUDE 20 00' TO 20 30'  
LONGITUDE 155 03' TO 156 00'  
DIAGRAM NE 5-1.5 HAWAII

## DESCRIPTION ~~TRIANGULATION STATION~~ TRIANGULATION STATION

NAME OF STATION: PRIMARY POINT 2  
ESTABLISHED BY: L.A. Critchlow YEAR: 1977 STATE: Hawaii BENCH MARK ALSO ☐  
COUNTY: Hawaii  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: About 2-1/2 miles northwest of HAWAII  
HEIGHT OF TELESCOPE ABOVE STATION MARK 5 FEET. HEIGHT OF LIGHT ABOVE STATION MARK 5 FEET.

DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION				
OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
KEHONI HTS 1948				00 00 00.0
RM 1	EDM			00 58 21
HAWAII UPOLU AIRPORT BCN	SW	(401.85)	122.485	31 52 29.8
LORAN C TOWER 1964	SW	About 1/2 mile		35 44 55.8
RM 2	EDM	(244.27)	74.454	44 27 03
RM 5	Geodetic Distance	SW (1498.89)	456.863	60 12 41.89
RM 3	EDM	SE (138.40)	42.186	266 10 50
RM 4	EDM	SE (345.49)	105.305	302 21 37

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, set in an irregular mass of concrete about 8 inches underground.

To reach the station from the junction of State Highways 25 and 27 in Hawaii, go west on highway 27 for 1.25 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 brass surveyors cap surrounded by concrete and 4 inches below ground level. It is 32 feet northwest of a metal utility light pole, 31 feet north of the extended line of the south edge of a paved parking ramp and 83 feet southwest of a blue runway light.

Reference mark 2 is a cross on the top of a brass surveyors cap surrounded by concrete and about 8 inches below ground level. It is 24 feet north of the north edge of the main runway pavement and 40 feet northwest of a white runway light.

Reference mark 3 is a cross on the top of a brass surveyors cap surrounded by concrete and about 6 inches below ground level. It is 19 feet north of the north edge of main runway pavement, 78 feet west of a white runway light and 28 feet east of the extended centerline of the graded road.

Reference mark 4 is a standard USGS disk, unstamped, set in an irregular mass of concrete 6 inches below the ground level. It is 14 feet north of a fence, 22 feet northeast of a pipe fence corner post and 45 feet southeast of a blue runway light.

Reference mark 5 is a standard USGS disk, unstamped, set in an irregular mass of concrete about 8 inches below the ground surface. It is 128 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.

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

NOAA FORM 76-96 SUPERSEDES CGS FORM 526A WHICH MAY BE USED.  
(1-72)

U.S. DEPARTMENT OF COMMERCE  
NOAA

U.S. GPO: 1976-565-561/1220 Reprint 1

## ADJUSTED HORIZONTAL CONTROL DATA ADJUSTMENT BY NGS

NAME OF STATION: PRIMARY POINT 2 OBS BY NGS  
STATE: HAWAII YEAR: 1977 SECOND ORDER

SOURCE: G-1641

GEODETIC LATITUDE: 20 36 08.51686	ELEVATION: 24.7 METERS
GEODETIC LONGITUDE: 155 51 38.99427	81 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	# OR Δ & ANGLE *
HI 1	5101	576,329.19	521,514.05	- 0° 07' 30"

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE # OR Δ & FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE
KEHONI HTS	18 28 39.8	18 36 10 "	5101

THESE DATA OBTAINED FROM ADJUSTMENT OF JAN 1979

SM 135

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 201553 STATION 1063  
HAWAII  
LATITUDE 20 00' TO 20 30'  
LONGITUDE 155 03' TO 156 00'  
DIAGRAM NE 5-1.5 HAWAII

## DESCRIPTION ~~TRIANGULATION STATION~~ TRIANGULATION STATION

NAME OF STATION: PRIMARY POINT 2 RM 5  
ESTABLISHED BY: L. A. Critchlow YEAR: 1977 STATE: Hawaii BENCH MARK ALSO ☐  
COUNTY: Hawaii  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: About 2-1/2 miles northwest of HAWAII  
HEIGHT OF TELESCOPE ABOVE STATION MARK 5 FEET. HEIGHT OF LIGHT ABOVE STATION MARK 5 FEET.

DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION				
OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
PRIMARY POINT 2 Geodetic Distance	NE	(1498.89)	456.863	00 00 00.0
HAWAII UPOLU AIRPORT BCN	SE	About 0.15 mile		92 19 47.7
LORAN C TOWER 1964	SW	About 2 miles		152 04 03.9

The station is located about 2-1/2 miles northwest of HAWAII, at the Upolu Airport and north of the runway.  
To reach the station from the junction of State Highways 25 and 27 in HAWAII, go west on highway 27 for 1.25 miles to a road right. Turn right and go north on a paved and graded road for 1.8 miles to the Upolu Airstrip and the station as described.  
The station mark is a USGS disk, unstamped, set in an irregular mass of concrete that is about 8 inches below the ground surface. It is 128 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.  
PRIMARY POINT 2 is a USGS disk, unstamped, set in an irregular mass of concrete about 8 inches below the ground surface. It is 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.

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

NOAA FORM 76-96 SUPERSEDES C&GS FORM 526A WHICH MAY BE USED.  
(11-72)

U.S. DEPARTMENT OF COMMERCE  
U.S. GPO: 1976-665-661/1220 Region 6

## ADJUSTED HORIZONTAL CONTROL DATA ADJUSTMENT BY NGS

NAME OF STATION: PRIMARY POINT 2 RM 5 OBS BY NGS  
STATE: HAWAII YEAR: 1977 SECOND ORDER  
SOURCE: 5-16241

GEODETIC LATITUDE	20 26 05.60356	ELEVATION	27.2 METERS
GEODETIC LONGITUDE	155 51 54.43170		89 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ OR $\Delta$ OR ANGLE *
HI 1	5101	374,858.81	521,223.37	- 0 07 35 "

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE  $\theta$  OR  $\Delta$  FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
PRIMARY POINT 2	258 41 26.9	258 49 02 "	5101

THESE DATA OBTAINED FROM ADJUSTMENT OF JAN 1979

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

Q 201553 STATION 1064  
HAWAII  
LATITUDE 20° 00' TO 20° 30'  
LONGITUDE 155° 30' TO 156° 00'  
DIAGRAM NE 5-15 HAWAII

DEPARTMENT OF COMMERCE  
U.S. COAST AND GEODETIC SURVEY  
Form 528  
Rev. Aug. 1968

## DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: **PUU AIEA (HTS)**, STATE:

**HAWAII** COUNTY: **WAIMEA**  
**HAWAII**

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

Described by: **G. J. HOEPEL**

NOTE*	HEIGHT OF TELESCOPE ABOVE STATION MARK Surface-station mark; Underground-station mark	DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION	BEARING	DISTANCE		DIRECTION:
				feet	meters	
12c		PUU LOA (metal target) R M 1 Tank 3 miles Cairn 1 mile	S W NW	17.271	5.265	00 00 00
						30 32 34
						131 24 30.6
						210 18 32.1

The station is located on the summit of a low volcanic knoll known as Puu Aiea, about 12 miles northwest of Waimea, about 8 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 from 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 summit of the hill and the station.

The station is the center of a drill hole which is in the center of a cross 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 PUU AIEA 1 1948, set into a drill hole in a boulder which projects about 1 inch and is about 1 foot lower than the station.

Form 528  
(11-8-65)

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

**R**

NAME OF STATION: **PUU AIEA (HTS)**

ESTABLISHED BY: **L.C.W.** YEAR: **1948** STATE: **Hawaii**

RECOVERED BY: **R.E.A.** YEAR: **1961** COUNTY: **Hawaii**

Detailed statement as to the fitness of the original description; including marks found, stampings, 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 Hiran measurements. The original "to reach" is adequate.

An azimuth mark was established about 500 feet north of the gate at the highway, along the fence line in an outcrop of bedrock. This mark is about 80 feet southeast of telephone pole number 124. It is a standard C&GS azimuth mark disk unstamped.

Object	Distance	Direction
PUU LOA 1913		00° 00' 00.0
RM NO 1		30 33 40.8
Az Mk		299 51 15.5

(continued on next page)

\* 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.

COMB-DC 34314

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **PUU AIEA HTS**

STATE: **HAWAII**

YEAR: **1948**

**SECOND**

ORDER

SOURCE: **G- 9279**

GEODETIC LATITUDE	20 07 35.884	ELEVATION	532.6 METERS
GEODETIC LONGITUDE	155 48 13.870		3060 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ ON $\Delta$ $\theta$ ANGLE*
Hi 1	5101	395,763.51	469,758.14	- 0 06 16

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE  $\theta$  ON  $\Delta$   $\theta$  FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH* (From south)	CODE
AZIMUTH MARK	255 34 41.8	255 40 58	5101

QE 141

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 201553

STATION 1064

LATITUDE ° ' TO ° '  
LONGITUDE ° ' TO ° '  
DIAGRAM

PUU AIEA (HTS) (continued)

FORM 526a  
(10-18-68)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PUU AIEA (HTS)  
ESTABLISHED BY: L.C. Wilder YEAR: 1948 STATE: Hawaii  
RECOVERED BY: D.M. Whipp YEAR: 1967 COUNTY: Hawaii  
Island: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.5 METERS. HEIGHT OF LIGHT ABOVE STATION MARK METERS.  
DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
KEHENA (HGS) 1881 ----- 1961 DISTANCE and DIRECTION -----				00 00 00.0
Azimuth Mark				156 49 46.2
RM No. 1 (1948 distance)	S	17.271	5.265	247 32 11
KEHENA (HGS) 1881 ----- 1967 DISTANCE and DIRECTION -----				00 00 00.0
Azimuth Mark	ENE	1 1/2 mile		156 49 45.7
R.M. No. 1	SSE	17.238	5.255	247 38 34
R.M. No. 2	WSW	14.975	4.565	347 07 09

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 south-southeast of Hawi, and 1 mile west of the Kahua Ranch headquarters, on the west rim of Puu Aiea, an old crater 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 AIEA HTS 1948 1967", set in cement in drill hole in rock in a 6-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 AIEA 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 AIEA HTS 1948 NO 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.

Azimuth mark is a standard disk stamped "PUU AIEA 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 southwest 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.

USCOMMA-DC 27179-P69

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

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

0 201553 STATION 1065  
HAWAII  
LATITUDE 20 °00' TO 20 °30'  
LONGITUDE 155 °30' TO 156 °00'  
DIAGRAM NE S-1,5 HAWAII

NO TEXT

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: PUU KAMALII

STATE: HAWAII

YEAR: 1928

THIRD

ORDER

SOURCE: G-SP156

GEODETIC LATITUDE	20 °03' 09.391	ELEVATION	METERS
GEODETIC LONGITUDE	155 49 26.041		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	Bearing Angle *
HI 1	5101	388,833.97	442,886.41	- 0 06 40

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH *	CODE

QD 237



# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

0 201553 STATION 1066  
HAWAII  
LATITUDE 20 °00' TO 20 °30'  
LONGITUDE 155 °30' TO 156 °00'  
DIAGRAM NE 5-1.5 HAWAII

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION PUU KAMALII 2  
STATE HAWAII YEAR 1928 SECOND ORDER  
SOURCE G- 9275

GEODETIC LATITUDE	20 03 09.003	ELEVATION	209.2 METERS
GEODETIC LONGITUDE	155 49 26.223		686 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ OR $\Delta$ OR ANGLE
HI 1	5101	388,816.55	442,847.50	- 0 06 40

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE  $\theta$  OR  $\Delta$  OR FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
PUAKO NEW	1 17 49.6	1 24 30	5101

QE 167

Puu Kamalii 2 (Hawaii Island, K. T. Adams, 1928).—Near northwest coast of Hawaii, on highest point of Puu Kamalii, which is 670 feet in elevation, and 1,530 meters N. 46° E. (true) from the dock at Kawaihae. 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 1 1/4-inch galvanized pipe projecting 1 1/2 feet 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 12a, at the following distances and azimuths from the station: No. 1, 11.8 meters (38.7 feet), 256° 39'; No. 2, 9.8 meters (32.2 feet), 106° 42'.

### RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PUU KAMALII 2 STATE: Hawaii COUNTY: Hawaii  
ESTABLISHED BY: K.T.A. YEAR: 1928 LOCALITY: Kawaihae, Hawaii  
RECOVERED BY: Chas.L. Murray YEAR: 1938

Detailed statement as to the status of the original description:

Location of station: On highest point of hill one mile northeast of Kawaihae village near northwest coast of Hawaii

Station mark found: 1 1/4" pipe in concrete.

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

### RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PUU KAMALII 2 STATE: HAWAII  
ESTABLISHED BY: K. T. Adams YEAR: 1928 COUNTY: HAWAII  
RECOVERED BY: L. G. Wilder YEAR: 1948

Detailed statement as to the status 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 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 Kawaihae, about 1 mile northeast of the Kawaihae Dock and about 0.2 mile north of a washed-out dirt road.

To reach the station from the road intersection in Kawaihae; 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 1/2 feet on each side and is on the top of a cairn 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 AIEA			00 00 00
PUU PILI target NE		6 miles	25 28 49.5
Kawaihae lighthouse W		1 mile	219 36 35.4
R. M. No. 2 WNW	9.8 m 32.2 ft	9.639 m 31.622 ft	272 27 20

(continued on next page)

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 201553

STATION 1066

LATITUDE ° ' TO ° '  
LONGITUDE ° ' TO ° '  
DIAGRAM

PUU KAMALII 2 (continued)

FORM 526a  
(8-18-69)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

R

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PUU KAMALII 2  
ESTABLISHED BY: K.T. Adams YEAR: 1928 STATE: Hawaii  
RECOVERED BY: D.M. Whipp YEAR: 1967 COUNTY: Hawaii  
Island: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK		1.56 METERS,		HEIGHT OF LIGHT ABOVE STATION MARK		METERS.	
DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION							
OBJECT	BEARING	DISTANCE		DIRECTION			
		FEET	METERS	°	'	''	
PUAKO NEW-----1948 DISTANCE and DIRECTION-----				00	00	00.0	
Kawaihae Light 1928	W			52	40	33.9	
R.M. No. 2	WNW	31.622	9.639	105	31	18	
PUAKO NEW 1948-----1967 DISTANCE and DIRECTION-----				00	00	00.0	
Kawaihae Light 1928	SW			52	40	35.3	
R.M. No. 2	WNW	31.517	9.608	105	32	31	
R.M. No. 3	NNE	13.393	4.083	207	05	10	
R.M. No. 1 (center of shank)	ENE	38.713	11.800	255	12	38	

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 Kawaihae, and 700 feet northwest of the Kawaihae Uka Trail, a bulldozed (but badly washed-out) track road, at about 686 feet elevation, on a

prominent hill that has sparse kiawe trees on it.

To reach station from the post office in Kawaihae, go northeast on the highway towards Mahukona for 0.15 mile to board gate on right. From here pack 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 4 feet above surrounding ground. A 2-inch iron shaft about 2 feet long is centered over the mark, on 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 6.8 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.

\*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.

USCGM-DC 27175-P88

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

Q 201553 STATION 1067  
HAWAII  
LATITUDE 20 ° 00' TO 20 ° 30'  
LONGITUDE 155 ° 30' TO 156 ° 00'  
DIAGRAM NE 5-1.5 HAWAII

DEPARTMENT OF COMMERCE  
U. S. COAST AND GEODETIC SURVEY  
PORTS 555  
Rev. Aug. 1965

## DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: **PUU KEHENA (HTS)** State: **HAWAII** County: **HAWAII**

CHIEF OF PARTY: **L. O. WILDER** YEAR: **1948** Described by: **G. J. HOEPEL**  
NOTE: HEIGHT OF TELESCOPE ABOVE STATION MARK **1.7** METERS. HEIGHT OF LIGHT ABOVE STATION MARK METERS.

NOTE*	HEIGHT OF TELESCOPE ABOVE STATION MARK Surface-station mark, Underground-station mark	DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION	BEARING	DISTANCE		DIRECTION†
				feet	meters	
12e	PUU AIEA Mahukona Lighthouse R M No 1		WNW NW	16.098	4.906	00 00 00 143 37 05.5 179 50 11

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 Hawi, about 0.75 mile west of the road which runs between Waimea and Hawi 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 Hawi 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 1 1948, 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.

\* Refer to notes in manuals of triangulation and state publications of triangulation. † Direction-angle measured clockwise, referred to initial station.  
† To nearest meter only, when no trigonometric leveling is being done.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **PUU KEHENA HTS**

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

SOURCE: **G- 9275**

GEODETIC LATITUDE	20 05' 23.141	ELEVATION	767.1 METERS
GEODETIC LONGITUDE	155 49 29.882		2517 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ θ: ANGLE °
HI 1	5101	388,541.29	480,592.33	- 0 06 43 "

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE θ OR Δ θ: FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH* (From south)	CODE
KEHENA	74 04 08.6	74 10 52 "	5101

(continued on next page)

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 201553 STATION 1067

LATITUDE ° ' TO ° '  
LONGITUDE ° ' TO ° '  
DIAGRAM

PUU KEHENA (HTS) (continued)

FORM 524a  
(6-10-66)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PUU KEHENA (HTS)  
ESTABLISHED BY: L.C. Wilder YEAR: 1948 STATE: Hawaii  
RECOVERED BY: D.M. Whipp YEAR: 1967 COUNTY: Hawaii  
Island: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.2 METERS. HEIGHT OF LIGHT ABOVE STATION MARK METERS.  
DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
KEHENA (HGS) 1881 -----1948 DISTANCE	CE and	DIRECTION		
R.M. No. 1	NW	16.098	4.906	00 00 00.0
Cairn 1948				71 58 03
				241 24 18.3
KEHENA (HGS) 1881 -----1967 DISTANCE	CE and	DIRECTION		
R.M. No. 1	NW	15.950	4.862	00 00 00.0
R.M. No. 2	NE	7.747	2.362	71 59 33
Cairn, 1948	SE			158 33 22
				241 24 19.2

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 RM 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 Hawi, 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 Hawi, for 14.5 miles to cattleguard; continue ahead on the highway for 0.3 mile to board gate on left at power pole 158. 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 left up 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 "PUU KEHENA 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 "PUU KEHENA HTS 1948 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.

\*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.

USCOMMA-DC 27173-P28

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

0 201553 STATION 1068  
HAWAII  
LATITUDE 20 °00' TO 20 °30'  
LONGITUDE 155 °30' TO 156 °00'  
DIAGRAM NE 5-1.5 HAWAII

DEPARTMENT OF COMMERCE  
U.S. COAST AND GEODETIC SURVEY  
Form 823  
Rev. Aug. 1966

## DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: **PUU LAPALAPA (HTS)** State: **Hawaii** COUNTY: **HAWAII**

CHIEF OF PARTY: <b>L. C. WILDER</b>	YEAR: <b>1948</b>	Described by: <b>L. C. WILDER</b>
NOTE*	HEIGHT OF TELESCOPE ABOVE STATION MARK <b>1.80 METERS</b>	HEIGHT OF LIGHT ABOVE STATION MARK METERS.
Surface-station mark, Underground-station mark	DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION	
	OBJECT	DIRECTION
	BEARING	DISTANCE
		feet meters
	<b>Maulili (metal target)</b>	<b>00 00 00</b>
	<b>Kauhola Point Light</b>	<b>45 24 23.4</b>
	<b>Sta. Niulii (metal pole &amp; target)</b>	<b>88 52 13.4</b>
	<b>R. M., triangle out in rock</b>	<b>233 30 03</b>
	<b>NNE</b>	<b>24.93 7.60</b>
	<b>W</b>	

Station is located on the top of a small brush covered knoll about 2 miles above Makapala village in North Kohala. It is about 1/4 mile from the Kehena ditch. It is reached by a reasonably straight canefield 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 1938 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: **PUU LAPALAPA (HTS)**  
ESTABLISHED BY: **L.C. Wilder** YEAR: **1948** STATE: **Hawaii** BENCH MARK(S) ALSO ☐  
RECOVERED BY: **D.M. Whipp** YEAR: **1967** COUNTY: **Hawaii**  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: **Island: Hawaii**

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

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 Waikani 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.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **PUU LAPALAPA HTS**

STATE: **HAWAII**

YEAR: **1948**

THIRD

ORDER

SOURCE: **G- 9279**

GEODETIC LATITUDE: <b>20 °11' 50.225</b>	ELEVATION: <b>396.7 METERS</b>
GEODETIC LONGITUDE: <b>155 45 45.566</b>	<b>1301 FEET</b>

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ or ANGLE °
<b>HI 1</b>	<b>5101</b>	<b>409,936.25</b>	<b>455,392.97</b>	<b>- 0 05 27</b>

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE  $\theta$  OR  $\Delta$  FORMULA NEGLECTING THE SECOND TERM

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
<b>MAULILI</b>	<b>122 46 05.5</b>	<b>122 51 33</b>	<b>5101</b>

QE 197

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

Q 201553 STATION 1069  
HAWAII  
LATITUDE 20° 00' TO 20° 30'  
LONGITUDE 155° 30' TO 156° 00'  
DIAGRAM NE 5-1.5 HAWAII

## NO ORIGINAL TEXT

**Puu Loa (Hawaii Island, Hawaiian Government Survey, 1876; E. R. Hand, 1913).**—In northern part of Hawaii, in Kohala District, on Puu Loa about 6 miles east-northeast from Kawaihae, in an ancient stone fort, and 75 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 Waimea toward Kohala; when Kawaihae wireless bears S. 55° W. the hill will be found on the upper side of the road and 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 mamane 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 Loa; on the top of this pile a thin wall had been built for a windshield, and in the lee of this, on the southwest 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 tablet has been placed in the stone with drill hole. A rectangular pile of stones about 6 feet high and 12 feet long is 22 meters distant on bearing S. 55° W.

DEPARTMENT OF COMMERCE  
U. S. COAST AND GEODETIC SURVEY  
NOTED 888

### RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **PUU LOA**  
ESTABLISHED BY: **H.G.S.** YEAR: 1876 STATE: **HAWAII**  
RECOVERED BY: **L. C. Wilder** YEAR: 1948 COUNTY: **HAWAII**

Detailed statement as to the fitness of the original description: The station is now the center of a 2 1/2 inch iron pipe which projects about 2 1/2 feet from a concrete platform which is about 7 feet square. The platform is set on the top of a cairn 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 western slope of the Kohala Mountains. The station lies about 7 miles northwest of Waimea, about 7 miles east of the west shore of the island, about 1 mile east of the road which runs between Waimea and Hawi and 22 meters east of a rectangular pile of stones about 6 feet high and 13 feet long.

To reach from the post office in Waimea; go north and west on the road which leads toward Hawi 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 pack westerly, 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 2 1/2 feet from the top of a slab of concrete which is about 7 feet square.

\* 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.

H-2510-2

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **PUU LOA**

STATE: **HAWAII**

YEAR: 1876

SECOND

ORDER

SOURCE: G- 9279

GEODETIC LATITUDE:	20° 04' 38.617	ELEVATION:	1255.7 METERS
GEODETIC LONGITUDE:	155° 45' 10.971		4120 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ ON Δ ° ANGLE *
HI 1	5101	413,165.18	451,845.78	- 0° 05' 13"

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE θ ON Δ ° FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From 1982b)	PLANE AZIMUTH (From south)	CODE
PUU PA HGS	332 41 18.0	332 46 31	5101

QE 031

(continued on next page)

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 201553 STATION 1069  
LATITUDE ° ' TO ° '  
LONGITUDE ° ' TO ° '  
DIAGRAM

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
Kawaihae Lighthouse	WSW 6 miles	94 27 26.3
R. M. No. 1	NW 10.246 m 33.612 ft	171 47 06
PUU PILI target	NNW 3 miles	190 23 40.5

The Hawaii Territory Survey reports: The 2½ inch pipe is centered over a U. S. G. S. tablet which had been set in the center of a triangle cut in set-stone. This 2½ inch pipe was installed in 1929.

An early recovery note reports: Original station marked by large flag pole recovered by C.H. Birdseye in September 1911. In 1923 A.O. Burkland reports that a bronze tablet was set in the center of triangle cut in large rock. There was another old mark about 8" distant from the one where the tablet was set.

Form 526  
(11-8-55)

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

R

NAME OF STATION: PUU LOA  
ESTABLISHED BY: H.G.S. YEAR: 1876 STATE: Hawaii  
RECOVERED BY: R.E.A. YEAR: 1961 COUNTY: Hawaii

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

The station and one reference mark 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 Waimea, go north on Highway 25 toward Hawi for 6.6 miles to 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, pack up the steep slope to the high point and the station. A 10 minute pack.

Form 526  
(11-8-55)

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

R

NAME OF STATION: PUU LOA  
ESTABLISHED BY: H.G.S. YEAR: 1876 STATE: Hawaii  
RECOVERED BY: C.A. Burroughs YEAR: 1962 COUNTY: Hawaii

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

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

The station was visited by a lightkeeper only.

A new "to reach" follows:

To reach the station from the junction of State Highways 19 and 25 in Waimea, go north on State Highway 25 towards Hawi for 6.7 miles to two gates on opposite sides of the highway. From here the station knoll, a prominent volcanic knoll, can be seen to the northeast about ½ mile. Pass through the east gate and proceed across country, over numerous gullies to the east side of the station knoll. From here, pack up the steep slope, westerly, to the highest point and the station. A 10 minute pack.

\*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.

Comm-DC 34314

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PUU LOA  
ESTABLISHED BY: H.G.S. YEAR: 1876 STATE: Hawaii  
RECOVERED BY: D.M. Whipp YEAR: 1967 COUNTY: Hawaii  
Island: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.75 METERS.		HEIGHT OF LIGHT ABOVE STATION MARK METERS.			
DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION					
OBJECT	BEARING	DISTANCE		DIRECTION	
		FEET	METERS		
PUU PA (HGS) 1873	-----1948	DISTANCE	and DIRECTION-----	00 00 00.0	
Kawaihae Light	WSW	6 miles		94 27 26.3	
R.M. No. 1	NW	33.612	10.246	171 47 06	
PUU PA (HGS) 1873	-----1967	DISTANCE	and DIRECTION-----	00 00 00.0	
R.M. No. 2	SW	31.939	9.735	70 47 49	
Kawaihae Light 1928	WSW			94 27 19.3	
R.M. No. 1	NW	33.708	10.274	171 46 45	

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 6-1/2 miles northwest of Kamuela and 1/2-mile northeast of State Highway, in pasture land, on the summit of a bare hill of about 4120 feet elevation that has a large, jumbled pile of boulders on the highest point, and a large, rectangular pile of boulders, about 10 x 20 feet in size and 5 feet high, on a lower part of the hill, 75 feet

southwest of the station.

To reach station from the post office in Kamuela, go west on State Highway 25 for 2.3 miles; take right fork, continuing on State Highway 25, and go 4.9 miles to board gates on both sides of the highway, at telephone pole 190. Pass through gate on right and pick way up across pasture, crossing several shallow gullies, for 1.0 mile to end of truck travel at east side of hill. Pack westerly up to top of hill and station. A 10-minute pack.

Station mark is a USGS disk, unstamped, set 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, concrete pyramid, about 2 feet high, with a 2-1/2-inch pipe through the middle, is centered over the mark, and supports a removeable, red and white metal target. There is a 4-foot stone wall at east side of station platform.

Reference mark number one is a standard disk stamped "1 1948", cemented in a drill hole in the 6-inch top of a small boulder that projects 6 inches from ground, and is 9.4 feet lower than station mark.

Reference mark number two is a standard disk stamped "PUU LOA HGS 1913 NO 2 1967", cemented in a drill hole in a 10-inch-square boulder that projects 6 inches from ground. It is at the southwest end of the boulder area surrounding station, 42 feet northeast of the rectangular stone pile, and 5 feet lower than station mark.

\*Name of chief of party should be inserted here. The officer who actually visited the station should sign his name at the end of the recovery note.  
NOTE.—One of these forms must be used for every station recovered.

USCOMM-DC 27173-P89



# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

0 201553 STATION 1070  
HAWAII  
LATITUDE 20 °00' TO 20 °30'  
LONGITUDE 155 °30' TO 156 °00'  
DIAGRAM NE 5-1,5 HAWAII

DEPARTMENT OF COMMERCE  
U. S. COAST AND GEODETIC SURVEY  
Form 555  
Rev. Aug. 1963

## DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: PUU MAUU NORTH (HTS) State: HAWAII COUNTY: HAWAII

CHIEF OF PARTY: L. C. Wilder YEAR: 1948 Described by: C. L. Murray

NOTE	HEIGHT OF TELESCOPE ABOVE STATION MARK METERS.1	HEIGHT OF LIGHT ABOVE STATION MARK METERS.	DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION		
	Surface-station mark, Underground-station mark	OBJECT	BEARING	DISTANCE	DIRECTION: 0 1 2
				feet	meters

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 set 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 1938 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 2 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 1938.

To reach the station proceed west from Honokaa Village along the main road to Waipio Valley a distance of about eight miles to the Kukuihaele Landing Road junction. Turn left and follow rough plantation road which winds up through the cane 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.

\* Refer to notes in manuals of triangulation and state publications of triangulation. (Direction-angle measured clockwise, referred to initial station.  
(To nearest meter only, when no trigonometric leveling is being done.)  
16-58282-1 U. S. GOVERNMENT PRINTING OFFICE

(continued on next page)

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: PUU MAUU NORTH HTS

STATE: HAWAII

YEAR: 1948

SECOND

-ORDER

SOURCE: G- 9275

GEODETIC LATITUDE:	20 06 05.283	ELEVATION:	456.6 METERS
GEODETIC LONGITUDE:	155 34 30.615		1629 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ OR $\Delta$ OR ANGLE
HI 1	5101	474,208.66	460,528.81	- 0 01 33

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE  $\theta$  OR  $\Delta$  FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
WAIKOEKOE 3	196 48 31.2	196 50 04	5101

QE 185



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

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 201553

STATION 1070

LATITUDE ° ' TO ° '  
LONGITUDE ° ' TO ° '  
DIAGRAM

PUU MAUU NORTH (HTS) (continued)

FORM 524a  
(6-16-69)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PUU MAUU NORTH (HTS)  
ESTABLISHED BY: L.C. Wilder YEAR: 1948 STATE: Hawaii  
RECOVERED BY: D.M. Whipp YEAR: 1966 COUNTY: Hawaii  
Island: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.6 METERS. HEIGHT OF LIGHT ABOVE STATION MARK METERS.  
DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
WAIKOEKOE 3 1948				00 00 00.0
RM No. 1	ESE	17.220	5.249	60 07 00
RM No. 2	S	14.592	4.448	169 52 52

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 Kukuihaele, at about 1629 feet elevation, on a 25-foot-high cutbank on the northwest side of a macadam road, about 500 feet south-west 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 upgrade 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 MAUU NORTH HTS NO 1 1948 1966", 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 MAUU NORTH HTS NO 2 1948 1966", 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 MAUU NORTH (HTS)  
ESTABLISHED BY: L. C. Wilder YEAR: 1948 STATE: HAWAII BENCH MARK(S) ALSO ☐  
RECOVERED BY: R. B. MELBY YEAR: 1978 COUNTY: HAWAII  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 7 MILES WEST OF HONOKAA

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

THE STATION AND REFERENCE MARKS WERE RECOVERED IN GOOD CONDITION AS DESCRIBED IN 1966.

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

0 201553 STATION 1071  
HAWAII  
LATITUDE 20 ° 00' TO 20 ° 30'  
LONGITUDE 155 ° 30' TO 156 ° 00'  
DIAGRAM NE 5-15 HAWAII

## NO ORIGINAL TEXT

**Puu o Nale** (Hawaii Island, Hawaiian Government Survey, 1881; E. R. Hand, 1913).—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 200 meters west of the road which runs to Waimea; it is 4.0 miles inshore from Mahukona and bears N. 62° E. from it; it is 4½ miles from the coast on the north. The hill on which station Puu Ula is situated bears N. 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. 56° E. from Honoipu Landing; S. 10° E. from Hooa 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.G.S.** YEAR: 1881 STATE: **HAWAII**  
RECOVERED BY: **L. C. Wilder** YEAR: 1948 COUNTY: **HAWAII**

Detailed statement as to the fitness 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 surrounded 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 3 miles south southwest of Hawi, about 0.2 mile west of the road which leads between Waimea and Hawi and about 0.1 mile north of a grove of trees.

To reach from the post office in Waimea; go north on the road which leads toward Hawi for 19.0 miles; turn left, west, pass through a wire gate and go northwest, across country, for 0.2 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. 1948, set into a drill hole in a boulder which is about 7 feet in diameter and projects about 2 feet. It is 3.5 meters lower than the station.

Object	Distance	Direction
E. LAHIKIOLA		
R. M. No. 1 S	30.609 m 100.423 ft	00 00 00
Hawi Stack, Hind NNE		42 10 02
PUU ULA (metal target)	3.0 miles	240 16 41.3
		189 42 52.0

Hawaii Territory Survey records show; In 1928, the Hawaii Territory Survey recovered the station which was marked with a USGS disk set on top of a granite post. A 2½ inch pipe was set in concrete and centered over the mark.

Also records show; Original station recovered by C.H. Birdseye, April 1911. Remarked by bronze tablet, stamped 1779, set in top of original granite post.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **PUU O NALE**

STATE: **HAWAII**

YEAR: 1881

SECOND

—ORDER

SOURCE: G- 9279

GEODETIC LATITUDE	20 12 13.118	ELEVATION	541.7 METERS
GEODETIC LONGITUDE	155 50 46.741		1777 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	# OR Δ # ANGLE *
HI 1	5101	381,254.36	497,755.16	- 0 07 11

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE # OR Δ # FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE
LAHIKIOLA EAST	320 16 27.1	320 23 38	5101

QE 143

(continued on next page)

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

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 201553

STATION 1071

LATITUDE ° ' TO ° '  
LONGITUDE ° ' TO ° '  
DIAGRAM

PUU O NALE (continued)

Form 526  
(11-8-55)

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

R

NAME OF STATION: PUU O NALE  
ESTABLISHED BY: H.G.S. YEAR: 1881 STATE: Hawaii  
RECOVERED BY: R.E.A. YEAR: 1961 COUNTY: Hawaii

Detailed statement as to the fitness of the original description; including marks found, stampings, 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.

(H.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 PUU-O-NALE (west slope) and PUU-O-NALE (east slope).

Form 526  
(11-8-55)

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

R

NAME OF STATION: PUU O NALE  
ESTABLISHED BY: H.G.S. YEAR: 1881 STATE: Hawaii  
RECOVERED BY: E.P.C. YEAR: 1964 COUNTY: Hawaii

Detailed statement as to the fitness of the original description; including marks found, stampings, 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.

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

Q 201553 STATION 1072  
HAWAII  
LATITUDE 20° 00' TO 20° 30'  
LONGITUDE 155° 30' TO 156° 00'  
DIAGRAM NE 5-1,5 HAWAII

Form 525b  
(11-9-55)

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

## DESCRIPTION OF TRIANGULATION INTERSECTION STATION

NAME OF STATION: PUU O NALE EAST SLOPE

CHIEF OF PARTY: Hawaii St. Surv. YEAR: 1960 STATE: Hawaii COUNTY: Hawaii

Description, including sketch of object:

The station was established as a reference point for PUU O NALE 1913 which was to be destroyed during the construction of Upolu VOR. Station is 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, 2 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 BENCH MARK(S) ALSO ☐  
RECOVERED BY: D.M. Whipp YEAR: 1967 COUNTY: Hawaii  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

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

Station was recovered in good condition. Located about 2-3/4 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 5 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 10-19-60".

5-526 (11-59)  
C 18509-P25

U.S. DEPARTMENT OF  
COMMERCE

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: PUU O NALE EAST SLOPE

STATE: HAWAII

YEAR: 1960

SECOND

ORDER

SOURCE: G-12664

GEODETIC LATITUDE:	20 12 12.962	ELEVATION:	531.2 METERS
GEODETIC LONGITUDE:	155 50 42.471		1743 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	B OR Δ Δ ANGLE
HI 1	5101	381,661.03	497,738.57	- 0 07 09

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE B OR Δ Δ FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE

QF 436

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

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

Q 201553 STATION 1073  
HAWAII  
LATITUDE 20 ° 00' TO 20 ° 30'  
LONGITUDE 155 ° 30' TO 156 ° 00'  
DIAGRAM NE 5-1,5 HAWAII

Form 525b  
(11-8-55)

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

## DESCRIPTION OF TRIANGULATION INTERSECTION STATION

NAME OF STATION: PUU O NALE WEST SLOPE

CHIEF OF PARTY: Hawaii St. Surv. YEAR: 1960 STATE: Hawaii COUNTY: Hawaii

Description, including sketch of object:

The station was established as a reference point for PUU O NALE 1913 which was to be destroyed during the construction of Upolu VOR. Station is located on the west 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, 2 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

R

NAME OF STATION: PUU O NALE West Slope

ESTABLISHED BY: H. St. Surv. YEAR: 1960

RECOVERED BY: Munson YEAR: 1968

AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:

STATE: Hawaii BENCH MARK(S) ALSO ☐

COUNTY: Hawaii

Island: Hawaii

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

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 Hawi, at about 1770 feet elevation, on the west side of the top of Puu O Nale.

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 1.15 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 along 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 3-1/2 feet on each side; pipe is flush with top of platform. "O NALE 63" is inscribed in the concrete. Station is 57 feet northwest of a drain culvert grill, 114 feet northwest of the FAA theodolite station (which is a 4-inch iron pipe set in a 4 x 4-foot concrete pad and projecting 4 feet above ground), 133 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 4 feet lower than the macadam surface.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: PUU O NALE WEST SLOPE

STATE: HAWAII

YEAR: 1960

SECOND ORDER

SOURCE: G-12664

GEODETIC LATITUDE:	20 ° 12' 13.139	ELEVATION:	533.1 METERS
GEODETIC LONGITUDE:	155 50 47.809		1749 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ OR $\Delta$ OR ANGLE *
HI 1	5101	381,152.64	497,757.49	- 0 ° 07' 11"

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE  $\theta$  OR  $\Delta$  FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE

QF 435

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

0 201553 STATION 1074  
HAWAII  
LATITUDE 20 °00' TO 20 °30'  
LONGITUDE 155 °30' TO 156 °00'  
DIAGRAM NE 5-1.5 HAWAII

**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 ohia posts and by three bottles buried, radiating horizontally from the station, and ginger planted over them.

DEPARTMENT OF COMMERCE  
U.S. COAST AND GEODETIC SURVEY  
FORM 1325

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Puu Pili STATE: Hawaii COUNTY: Hawaii  
ESTABLISHED BY: H.G.S. YEAR: 1881 LOCALITY: N. Kohala, Hawaii  
RECOVERED BY: Chas. L. Murray YEAR: 1938

Detailed statement as to the fitness of the original description:

Location 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 4676 feet elevation. 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 2" 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: HGS YEAR: 1881 STATE: Hawaii BENCH MARK(S) ALSO ☐  
RECOVERED BY: R.C. Munson YEAR: 1968 COUNTY: Hawaii  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

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

Station mark was recovered in good condition. Located about 9 miles northwest of Kamuela, 10 miles southeast of Hawi, and 2 miles southeast 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 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 USGS disk stamped "HAWAII 4676", 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 20-foot-long pipe up the center.

FORM C&G-326 (11-65)  
USCGM-DC 1200-7-65

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: PUU PILI

STATE: HAWAII

YEAR: 1881

THIRD

-ORDER

SOURCE: G- 9279

GEODETIC LATITUDE	20 07 04.676	ELEVATION	1435.0 METERS
GEODETIC LONGITUDE	155 45 58.000		4708 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ ON $\Delta$ $\theta$ ANGLE *
HI 1	5101	408,705.81	466,587.62	- 0 °05 '30 "

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE  $\theta$  ON  $\Delta$   $\theta$  FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE

QE 156

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

0 201553 STATION 1075  
HAWAII  
LATITUDE 20 ° 00' TO 20 ° 30'  
LONGITUDE 155 ° 30' TO 156 ° 00'  
DIAGRAM NE 5-1.5 HAWAII

## 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. 80° E. It bears S. 80° E. from Honoipu Landing (abandoned); Hoesa Mill (Hawi Mill & Plantation Co.) bears N. 20° E. Station marked by cylinder of concrete 5 inches in diameter and extending about 3 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.

U. S. DEPARTMENT OF COMMERCE  
U. S. COAST AND GEODETIC SURVEY  
POTTS 235

### RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Puu Ula (HTS) STATE: Hawaii COUNTY: Hawaii  
ESTABLISHED BY: E.R. Hand YEAR: 1913 LOCALITY: North Kohala, Hawaii  
RECOVERED BY: Chas. L. Murray YEAR: 1938

Detailed statement as to the fitness of the original description:

Location of Station: On a very prominent and brush-covered hill about 3000 feet above the Hawi-Mahukona Road and about 2 miles from Hawi.

Old station found: A cut on top of 6" concrete-filled metal cylinder firmly set in ground.

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

U. S. DEPARTMENT OF COMMERCE  
U. S. COAST AND GEODETIC SURVEY  
POTTS 235

### RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PUU ULA (HTS)  
ESTABLISHED BY: E.R.H. YEAR: 1913 STATE: HAWAII  
RECOVERED BY: L. G. Wilder YEAR: 1948 COUNTY: HAWAII

Detailed statement as to the fitness of the original description:

Recovered the concrete cylinder with triangle as described in 1913 by E. R. Hand. The Territory Survey established a concrete platform, metal pole and target in 1938, vertically over the mark.

Located at the summit of Puu Ula, a prominent hill about 2 miles westward of Hawi and 2 1/2 miles from Upolu Point. It is about a mile south-eastward of Puu Kahone. Puu Ula has a redish 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 cane fields on the right hand. Proceed 1 1/2 miles until abreast the prominent Puu Ula. Pass thru two gates to the hill.

OBJECT	DISTANCE	DIRECTION
PUU O NALE		00 00 00
CAST (metal target)		69 .27 05.1
KEHONI (metal target)		189 27 02.5
Hind Staek (center)		288 02 41.9

\* 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.

N-2518-2

## ADJUSTED HORIZONTAL CONTROL DATA

ADJUSTMENT BY NGS

NAME OF STATION: PUU ULA HTS

OBS BY CGS

STATE: HAWAII

YEAR: 1913

FIRST

-ORDER

SOURCE: 6- 9279

GEODETIC LATITUDE:	20 13 54.17800	ELEVATION:	289.9	METERS
GEODETIC LONGITUDE:	155 31 51.64300		951	FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ (OR Δ) ANGLE *
H1 1	5101	375,096.24	508,468.28	- 0° 07' 34"

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE θ (OR Δ) FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE
CAST	39° 26' 05" 3	39° 33' 39" m	5101

THESE DATA ARE OBTAINED FROM ADJUSTMENT OF 1951

3M 140

(continued on next page)



# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 201553 STATION 1075

LATITUDE ° ' TO ° '  
LONGITUDE ° ' TO ° '  
DIAGRAM

PUU ULA (HTS) (continued)

Form 526  
(11-8-55)

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

R

NAME OF STATION: PUU ULA (HTS)  
ESTABLISHED BY: E.R.H. YEAR: 1913 STATE: Hawaii  
RECOVERED BY: H.O.F. YEAR: 1958 COUNTY: Hawaii

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

The station was recovered in good condition as described in 1938 and 1948, except the steel bar and legs have rusted off and the metal pole and target have toppled over.

To reach go 0.65 west along the highway from the junction in Hawi; 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.

Form 526  
(11-8-55)

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

R

NAME OF STATION: PUU ULA (HTS)  
ESTABLISHED BY: E.R.H. YEAR: 1913 STATE: HAWAII  
RECOVERED BY: U.G.Bartoo YEAR: 1963 COUNTY: HAWAII

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

Station recovered 1948 by USC&GS. Concrete platform set in 1938 by HTS still in good condition, metal target and pole gone. The ground has eroded along the east and south sides of the concrete, and one corner is presently unsupported and hanging free. It appears that at least a few years will be necessary before there is any motion in the monument itself. It is very stable and is 6 feet on a ridge.

At present the best approach to the station is from the south. A dirt road passes about 1000 feet from the station here, before it swings to the west and circles the top of the hill. It is a short five minute walk across open fields from the road.

Form 526  
(11-8-55)

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

R

NAME OF STATION: PUU ULA (HTS)  
ESTABLISHED BY: E.R.H. YEAR: 1913 STATE: Hawaii  
RECOVERED BY: U.S.G.S. YEAR: 1964 COUNTY: Hawaii

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

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 11, (0.6 mile), go left (toward the volcano) 2.4 miles to angular gate on the right, pass thru gate and go about 200 feet to a fence corner, turn right along fence and go 0.15 mile to two gates, pass thru the north gate and angle to left to a dirt road, after crossing wahh angle to the right on a very dirt trail and drive 2.9 miles to base of a small cone. Leave truck and pack about 100 yards to top of cone and station.

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PUU ULA (HTS)  
ESTABLISHED BY: E.R.H. YEAR: 1913 STATE: Hawaii  
RECOVERED BY: R.C. Munson YEAR: 1968 COUNTY: Hawaii  
Island: Hawaii

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
CAST 1910				00 00 00.0
R.M. No. 2	W	10.236	3.120	60 18 11
Loran C Tower, 1964	WNW			87 55 11.7
Hind Stack	ENE			218 35 39.5
R.M. No. 1	SW	15.219	4.639	357 06 15

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 Hawi village and 1/2-mile south of State Highway 27, on the summit of Puu Ula, a bare, red topped hill of about 951 feet elevation, in pasture land.

To reach station from the post office in Hawi, go north on State Highway 25 for 0.1 mile; turn left and go west on State Highway 27 for 0.6

mile to power pole 25. Turn left and follow diagonal field road along power line for 1.4 miles to wire gate on right, at power pole 39. Go through gate and follow track road across pasture for 0.2 mile to gate in fence. Pass through gate and continue for 0.2 mile to end corner of field, and a gate on right. Pass through gate and go up onto 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 chiseled triangle in the top of a 5-inch-diameter concrete post projecting 3 inches from the center of a triangular concrete platform 7 feet on each side and projecting 18 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.

\*Name of the recovery officer to be inserted here. The officer who actually visited the station should sign his name at the end of the recovery.

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

USCGM-OC 27178-P89





# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

Q 201553 STATION 1077  
HAWAII  
LATITUDE 20 °00' TO 20 °30'  
LONGITUDE 155 °30' TO 156 °00'  
DIAGRAM NE 5-1.5 HAWAII

## NO ORIGINAL TEXT

Rail (Hawaii Island, O. B. French, 1910; K. T. Adams, 1929.)—In northern part of Hawaii, west coast of Kohala, on the most prominent point of ridge about 1/4 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 MARK(S) ALSO ☐  
RECOVERED BY: Munson YEAR: 1968 COUNTY: Hawaii  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

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

Station was recovered. Located about 5-1/2 miles southwest of Hawi, 3500 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 southwest for 7.3 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 truck travel at an old railroad cut, with rock point about 15 feet high, on left. Walk about 150 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

GEODETIC LATITUDE:	20 11 47.381	ELEVATION	40	METERS
GEODETIC LONGITUDE:	155 54 16.762	SCALED		FEET

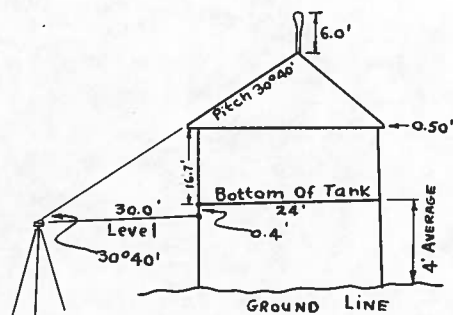
STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ (OR $\Delta$ $\theta$ ) ANGLE *
HI 1	5101	361,244.38	495,203.95	- 0 08 23

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE  $\theta$  (OR  $\Delta$   $\theta$ ) FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE

Q 201553 STATION 1078  
HAWAII  
LATITUDE 20 °00' TO 20 °30'  
LONGITUDE 155 °30' TO 156 °00'  
DIAGRAM NE 5-15 HAWAII

RED TANK (Hawaii Island, L.C.W., 1948)--About 150 feet E of road to Mahukona and distant 0.25 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 BENCH MARK(S) ALSO ☐  
RECOVERED BY: D.M. Whipp YEAR: 1967 COUNTY: Hawaii  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

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

Station was recovered in good condition. Located about 11 miles northwest of Kawaihae, 1400 feet northeast of Mahukona Harbor, and about 50 yards southeast of the Mahukona-Kohala highway, on a low knoll covered with kiawe trees, which obscure all except the top of the tank. Station is a large, red, wooden, water tank 25 feet in diameter. Bottom of tank sets on a foundation, 4 feet above ground, wall of tank is 15 feet high, and a conical roof extends about 8 feet above top of wall. A white wooden pole, with small ball on top, is mounted on peak of roof and extends about 5 feet above it.

Form 526  
(11-8-85)

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

NAME OF STATION: RED TANK  
ESTABLISHED BY: L.C. Wilder YEAR: 1948 STATE: Hawaii  
RECOVERED BY: \* R.L. Newsom YEAR: 1968 COUNTY: Hawaii

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

Recovered in good condition as described by D.M. Whipp, 1967.

## HORIZONTAL CONTROL DATA

NAME OF STATION RED TANK

STATE HAWAII

1948

THIRD

**ORDER**

... G- 9279

SOURCE: 8-3219  
NO OBSERVATION CHECK ON THIS POSITION

GEODETTIC LATITUDE	20 11' 23.59
GEODETTIC LONGITUDE	155 54 02.21

ELEVATION: \_\_\_\_\_ METERS

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ $\rightarrow$ $\Delta$ $\theta$ $\rightarrow$ ANGLE
HI 1	5101	302,624.67	492,800.43	- 0 08 18

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE  $\theta \approx \Delta \theta$  FORMULA NEGLECTING THE SECOND TERM

FORMS HEREON HAVE BEEN COMPUTED BY THE $\frac{1}{2}$ FORMULA REFLECTING THE SECOND TERM			
TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE

QE 252

QE 252

## HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

Q 201553 STATION 1079  
HAWAII  
LATITUDE 20° 00' TO 20° 30'  
LONGITUDE 155° 30' TO 156° 00'  
DIAGRAM NE 5-1.5 HAWAII

### NO ORIGINAL TEXT

Ridge (Hawaii Island, O. B. French, 1910; K. T. Adams, 1929).—On northwest coast of Hawaii, western coast of Kohala, about 1,100 meters south of Mahukona south beacon, and 900 meters directly east or inland. 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 cairn was left over the station.

U. S. DEPARTMENT OF COMMERCE  
N. O. AND GEODETIC SURVEY  
FOOTER 556

#### RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Ridge STATE: Hawaii COUNTY: Hawaii  
ESTABLISHED BY: O. B. French YEAR: 1910 LOCALITY: North Kohala, Hawaii  
RECOVERED BY: Chas. L. Murray YEAR: 1938

Detailed statement as to the fitness of the original description:

Location of Station: The station is located on top of a small knoll at the highest point of the most prominent ridge about one mile southeast of Mahukona and about 1/2 mile inland from shore.

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.

U. S. DEPARTMENT OF COMMERCE  
N. O. AND GEODETIC SURVEY  
FOOTER 556

#### RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: RIDGE  
ESTABLISHED BY: O. B. French YEAR: 1910 STATE: HAWAII  
RECOVERED BY: L. O. Wilder YEAR: 1948 COUNTY: HAWAII

Detailed statement as to the fitness of the original description:

Station is located on a ridge, on the highest ground in the general vicinity, about one mile south of Mahukona and 1/2 mile in from the shore. Mahukona Light bears N 46 W true. The station would be difficult to locate, except for the metal pole and target which has been erected by the Hawaii Territory Survey.

To reach the station proceed from Mahukona to the end of the trail road, which ends at about the seaward end of the ridge upon which the station is located. There is a small house, here adjacent to the shore. Pack up the ridge for about 1/2 mile.

Station is a drill hole in ledge, presumably the original. This was so recovered in 1938 by the Hawaii Territory Survey and surrounded by a concrete platform and a metal pole and target erected.

R. M. No. 1 1948 is distant 9.593 meters.

OBJECT	DIRECTION	DISTANCE
PUU O NALE	00 00 00	
R. M. No. 1 1948	24 41 43	9.593m 31.48ft.
KEHENA (metal target)	113 09 27.8	
CAST (Metal target)	295 03 21.2	

\* Name of chief of party should be inserted here. The officer who actually visited the station should sign his name at the end of the recovery note.  
Note.—One of these forms must be used for every station recovery.

H-2010-2

### ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION RIDGE

STATE: HAWAII

YEAR: 1910

SECOND

ORDER

SOURCE: G- 9275

GEODETIC LATITUDE:	20° 10' 30.215	ELEVATION	92.6 METERS
GEODETIC LONGITUDE:	155 53 42.650		304 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	H OR Δ U. S. ANGLE
HI 1	5101	364,475.04	487,411.23	- 0 06 11

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE HORIZONTAL FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
KEHENA	351 22 08.9	351 30 20	5101

QE 145

(continued on next page)

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 201553 STATION 1079

LATITUDE ° ' TO ° '  
LONGITUDE ° ' TO ° '  
DIAGRAM

RIDGE (continued)

FORM 526a  
(8-18-68)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: RIDGE  
ESTABLISHED BY: O.B.F. YEAR: 1910 STATE: Hawaii  
RECOVERED BY: D.M. Whipp YEAR: 1967 COUNTY: Hawaii  
Island: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.5 METERS.		HEIGHT OF LIGHT ABOVE STATION MARK METERS.		
DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION				
OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
KEHENA (HGS) 1881-----1948 DISTANCE and DIRECTION-----				--00 00 00.0
Mahukona Light 1929				142 47 23.8
R.M. No. 1		31.48	9.593	271 32 15
KEHENA (HGS) 1881-----1967 DISTANCE and DIRECTION-----				--00 00 00.0
Mahukona Light 1929	NW			142 47 25.0
R.M. No. 1	E	31.433	9.581	271 32 13
R.M. No. 2	SSE	14.052	4.283	350 09 31

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, 10-1/2 miles northwest of Kawaihae, 1/2-mile inland from sea, and about 300 yards east of the new highway running between Kawaihae and Mahukona, at about 304 feet elevation, on a small rocky knoll along low ridge, among sparse kiawe 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 travel at a long, highway 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 4 inches deep, in the center of a triangular, concrete platform about 7 feet on each side and projecting 4 inches above ground. A 2-1/2-inch, iron pipe 2 feet long is centered over the mark, mounted on 3 iron legs, and supports a removeable, red and white, metal target.

Reference mark number one is a standard disk stamped "RIDGE 1 1948", cemented in a drill hole in a boulder about 2 feet square and projecting 3 feet above ground. It is about 8 inches lower than station mark.

Reference mark number two is a standard disk stamped "RIDGE 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: O.B.F. YEAR: 1910 STATE: Hawaii BENCH MARK(S) ALSO ☐  
RECOVERED BY: R.L. Newsom YEAR: 1968 COUNTY: Hawaii  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:

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

Station and both reference marks recovered in good condition as described by D.M. Whipp, 1967. Corrections to Directions: Proceed 11.8 miles north from entrance to State Pier at Kawaihae (marked by stone monument). Post Office in Kawaihae is torn down.

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: RIDGE  
ESTABLISHED BY: O.B.F. YEAR: 1910 STATE: Hawaii BENCH MARK(S) ALSO ☐  
RECOVERED BY: D.M. Whipp YEAR: 1970 COUNTY: Hawaii  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:

Detailed statement as to the fitness of the original description; including marks found, stampings, changes made, and other pertinent facts:  
The station and both reference marks were recovered as described by D.M. Whipp in 1967.

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

0 201553 STATION 1080  
HAWAII  
LATITUDE 20 °00' TO 20 °30'  
LONGITUDE 155 °30' TO 156 °00'  
DIAGRAM NE 5-1.5 HAWAII

## NO ORIGINAL TEXT

U. S. L. H. (Hawaii Island, E. R. Hand, 1913; K. T. Adams, 1929).—A station established by the Lighthouse Department, on north coast of Hawaii, at Kukuihaele, on edge of cliff midway between the derrick landing house and the cable landing house. At this 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 1½ 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: Hawaii BENCH MARK(S) ALSO ☐  
RECOVERED BY: D.M. Whipp YEAR: 1966 COUNTY: Hawaii  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

Detailed statement as to the fitness of the original description; including marks found, stampings, 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 Kukuihaele 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 Mamane 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 6.35 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 light-house. 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 "USLH" inscribed in it, in a crevasse in a large bedrock outcrop that projects 4 feet above ground. It is 525 feet west of the old base of the original Kukuihaele Light, which is 114 feet south of the new lighthouse, 150 feet west-northwest of a power-pole that sets in the cane 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: Hawaii BENCH MARK(S) ALSO ☐  
RECOVERED BY: R. B. MELBY YEAR: 1978 COUNTY: Hawaii  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 6½ MILES

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

THE STATION WAS RECOVERED AS DESCRIBED IN 1966. THE STATION IS IN DENSE BRUSH NEAR THE EDGE OF A CANE FIELD.

### ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: U S L H

STATE: HAWAII

YEAR: 1913

THIRD

ORDER

SOURCE: G-92184

GEODETIC LATITUDE: 20 °07' 50.673	ELEVATION: 70 METERS
GEODETIC LONGITUDE: 155 33 37.925	SCALED FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ OR ANGLE *
HI 1	5101	479,234.22	471,158.76	- 0 ° 01 ' 15 "

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE θ OR Δ OR FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE

QF 106

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

0 201553 STATION 1081  
HAWAII  
LATITUDE 20 °00' TO 20 °30'  
LONGITUDE 155 °30' TO 156 °00'  
DIAGRAM NE 5-15 HAWAII

Waiele (Hawaii Island, K. T. Adams, 1928).—On the northwest coast of Hawaii, about 3.2 miles northwest of Kawaihae 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, 1.5 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 Kamalii. 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 12a, 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, 11.3 meters (37.07 feet), 72° 26'; No. 2, inland from station and covered by a stone cairn, 56.46 meters (185.24 feet), 237° 58'.

(19-18-00)

COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: WAIELE  
ESTABLISHED BY: K.T. Adams YEAR: 1928 STATE: Hawaii  
RECOVERED BY: R.C. Munson YEAR: 1968 COUNTY: Hawaii  
Island: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.59 METERS, HEIGHT OF LIGHT ABOVE STATION MARK METERS.

DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION				
OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
ANAEHOOMALU -----1928		DISTANCE and DIRECTION-----		00 00 00.0
R.M. No. 1		37.07	11.3	64 48 13
R.M. No. 2		185.24	56.46	230 20 13
ANAEHOOMALU 1913 -----1968		DISTANCE and DIRECTION-----		00 00 00.0
R.M. No. 1	WSW	37.057	11.296	64 50 18
R.M. No. 2	NE	184.990	(56.385)	230 21 11

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

Station is located about 3-1/2 miles northwest of Kawaihae, on black, rocky point on seacoast, about 1/4-mile northwest of Waiakailio Bay and about 25 feet above sea level.

To reach station from the post office in Kawaihae, go northwest on the new coast highway towards Mahukona 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 travel just after dropping down off of rise. Walk left, westerly, through trees about 150 yards to station.

Station mark is a standard disk stamped "WAIELE 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 68.5 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 "WAIELE 1 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 "WAIELE 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.

\*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.

USCOMA-DC 27179-P88

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: WAIELE  
STATE: HAWAII YEAR: 1928 THIRD ORDER

SOURCE G-SP156

GEODETIC LATITUDE	20 °04 '45.504	ELEVATION	3 METERS
GEODETIC LONGITUDE	155 52 00.688	SCALED	FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ OR $\Delta$ OR ANGLE *
HI 1	5101	374,111.75	452,653.44	- 0 07 33

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE  $\theta$  OR  $\Delta$  OR FORMULA NEGLECTING THE SECOND TERM

TO STATION OR OBJECT	GEODETIC AZIMUTH (from north)	PLANE AZIMUTH (from north)	CODE
ANAEHOOMALU	7 37 46.7	7 45 20	5101

QQ 236

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

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

Q 201553 STATION 1082  
HAWAII  
LATITUDE 20° 03' TO 20° 30'  
LONGITUDE 155° 50' TO 156° 00'  
DIAGRAM NE 5-1,5 HAWAII

SEE STATION WAIKOEKOE 3

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION WAIKOEKOE 2

STATE HAWAII

YEAR 1948

SECOND

ORDER

SOURCE G- 9279

NO OBSERVATION CHECK ON THIS POSITION

GEODETIC LATITUDE	20 07' 44.744	ELEVATION	123	METERS
GEODETIC LONGITUDE	155 33 57.968	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ OR $\Delta$ 41 ANGLE *
HI 1	5101	477,324.11	470,561.36	- 0 01' 22"

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE  $\theta$  OR  $\Delta$  41 FORMULA NEGLECTING THE SECOND TERM

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE

POSITION DETERMINED BY TRAVERSE FROM STATION WAIKOEKOE 3

QE 280



# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

Q 201553 STATION 1083  
HAWAII  
LATITUDE 20° 00' TO 20° 30'  
LONGITUDE 155° 30' TO 156° 00'  
DIAGRAM NE 5-1.5 HAWAII

DEPARTMENT OF COMMERCE  
U. S. COAST AND GEODETIC SURVEY  
Form 625  
Rev. Aug. 1948

## DESCRIPTION OF TRIANGULATION STATION

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

CHIEF OF PARTY: L. C. Wilder YEAR: 1948 Described by: G. L. Murray

NOTE*	HEIGHT OF TELESCOPE ABOVE STATION MARK METERS.†	DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION	HEIGHT OF LIGHT ABOVE STATION MARK METERS.	DIRECTION:	
				° ' "	° ' "
	Surface-station mark, Underground-station mark	OBJECT	BEARING	DISTANCE	
				feet	meters
		WAIPIO			0 00 00
		R. M. No. 1 NE		14.95	4.558
		WAIKOEKOE 2 E (H.T.S.Sta.)		89.85	27.385
				159 09 17	171 37 44

Established by U.S.C.&G.S. in 1948 and located on the northern part of Hawaii near the top of high sea bluff 1.5 miles east of the mouth of Waipio Valley.

The station is marked with a standard disk stamped "WAIKOEKOE 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.

Waikoeke 2, an old H.T.S. station was found. The top of the 10-inch circular concrete monument marking the station was badly broken from bullets, a target pit having been 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 "Waikoeke 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 Kukuihaele Landing. Follow the Kukuihaele Landing Road for about 1 mile. The station is located at the top of sea bluff on high ground about 0.2 mile southwest of the Kukuihaele Landing.

Dist. 1000 ft. 1000 ft. 1000 ft.

\* Refers to notes in manuals of triangulation and state publications.  
† To nearest meter only, when no trigonometric leveling is being done.

‡ Direction-angle measured clockwise, referred to initial station.  
10-10000-1 U. S. GOVERNMENT PRINTING OFFICE

(continued on next page)

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: WAIKOEKOE 3

STATE: HAWAII

YEAR: 1948

SECOND

ORDER

SOURCE: G- 9275

GEODETIC LATITUDE: 20° 07' 44.515	ELEVATION: 122.7 METERS
GEODETIC LONGITUDE: 155° 33' 58.879	403 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ or ANGLE °
HI 1	5101	477,237.29	470,538.29	- 0° 01' 22"

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE θ OR Δ or FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH* (From south)	CODE
ANUENUE	320 34 44.7	320 36 07	5101

QE 184

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 201553 STATION 1083

LATITUDE ° ' TO ° '  
LONGITUDE ° ' TO ° '  
DIAGRAM

WAIKOEKOE 3 (continued)

FORM 326a  
(9-15-69)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: WAIKOEKOE 3  
ESTABLISHED BY: L.C. Wilder YEAR: 1948 STATE: Hawaii  
RECOVERED BY: D.M. Whipp YEAR: 1966 COUNTY: Hawaii  
Island: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK		1.52 METERS.		HEIGHT OF LIGHT ABOVE STATION MARK		METERS.	
DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION							
OBJECT	BEARING	DISTANCE		DIRECTION			
		FEET	METERS				
ANUENUE (HGS) 1913-----1948		DISTANCE and DIRECTION-----		-00	00	00.0	
RM No. 1	NE	14.95	4.558	282	03	20	
WAIKOEKOE 2 (HTS)	E	89.85	27.385	294	31	47	
ANUENUE (HGS) 1913-----1966		DISTANCE and DIRECTION-----		-00	00	00.0	
RM No. 2	NW	3.998	1.219	165	43	04	
RM No. 1	NE	14.942	4.555	282	04	38	
WAIKOEKOE 2 (HTS) 1948	ENE	89.808	27.372	294	31	22.6	

Station mark and reference mark were recovered in good condition. A new reference mark, number two, was established. The concrete monument of WAIKOEKOE 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 northeast of Kukuihaele 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 0.2 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 6.35 miles; take right fork and go 0.5 mile to fork by old warehouse. Take left fork and go 0.35 mile; turn sharp right and go north 0.1 mile to end of cane field and station on rise.

Station mark is a standard disk stamped "WAIKOEKOE 3 1948", 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 "WAIKOEKOE 3 1948 NO 1", cemented in a drill hole in a 14-inch-diameter bedrock outcrop 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 "WAIKOEKOE 3 1948 NO 2 1966", 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.

WAIKOEKOE 2 (HTS) 1948 is a standard disk stamped "WAIKOEKOE 2 HTS 1948 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.

\*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.

USCOM 27173-P-69

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: WAIKOEKOE 3  
ESTABLISHED BY: L. C. Wilder YEAR: 1948 STATE: Hawaii BENCH MARK(S) ALSO ☐  
RECOVERED BY: R. B. MELBY YEAR: 1978 COUNTY: Hawaii  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 7 MILES NORTHWEST OF HONOKAA

Detailed statement as to the fitness of the original description, including marks found, stampings, changes made, and other pertinent facts:  
THE STATION WAS RECOVERED IN GOOD CONDITION.

NOAA FORM 76-165  
(12-72)  
OLD C&GS 5261

U. S. DEPARTMENT OF COMMERCE  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION  
NATIONAL OCEAN SURVEY  
U. S. GOVERNMENT PRINTING OFFICE: 1976-665661/1138 REGION NO. 6

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

0 201553 STATION 1084  
HAWAII  
LATITUDE 20 °00' TO 20 °30'  
LONGITUDE 155 °30' TO 156 °00'  
DIAGRAM NE 5-1,5 HAWAII

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.

## ADJUSTED HORIZONTAL CONTROL DATA

DEPARTMENT OF COMMERCE  
U. S. COAST AND GEODETIC SURVEY  
POTTER 550  
RECOVERY NOTE, TRIANGULATION STATION  
NAME OF STATION: WAIMEA  
EAST BASE (HAWAII EAST BASE)  
ESTABLISHED BY: Hawaiian Govt YEAR: 1873 STATE: HAWAII  
RECOVERED BY: L. C. Wilder YEAR: 1948 COUNTY: HAWAII

R

Detailed statement as to the fitness of the original description: 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 from 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.O.C. 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 0.6 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 5x5 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 1948, 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 1 1948, set into a drill hole in a boulder which projects about 1 foot and is about 6 feet higher than the station.

Object	Distance	Direction
HOLOHOLOKU (metal target)		00 00 00
R. M. No. 1 N	25.114 m	82.390 ft
R. M. No. 2 E	8.645 m	28.360 ft
HOKUULA 2 (metal target)		81 19 57.1

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

NAME OF STATION: WAIMEA-HAWAII E BASE

STATE: HAWAII

YEAR: 1873

SECOND

ORDER

SOURCE: G- 9275

GEODETIC LATITUDE:	20 °01' 20.934	ELEVATION:	876.7 METERS
GEODETIC LONGITUDE:	155 37 38.350		2876 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	φ OR Δ ± ANGLE °
HI 1	5101	456,254.43	431,854.00	- 0 02 37

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE φ OR Δ ± FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
HOLOHOLOKU	21 58 15.4	22 00 52	5101

QE 13b

(continued on next page)

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 201553 STATION 1084

LATITUDE ° ' TO ° '  
LONGITUDE ° ' TO ° '  
DIAGRAM

WAIMEA-HAWAII E BASE (continued)

FORM 526a  
(9-18-69)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: WAIMEA EAST BASE (HAWAII EAST BASE)  
ESTABLISHED BY: HGS YEAR: 1873 STATE: Hawaii  
RECOVERED BY: D.M. Whipp YEAR: 1966 COUNTY: Hawaii  
Island: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK 2.32 METERS.		HEIGHT OF LIGHT ABOVE STATION MARK		METERS		
DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION						
OBJECT	BEARING	DISTANCE		DIRECTION		
		FEET	METERS			
HOLOHOKU-----1948 DISTANCE AND DIRECTION-----				00	00	00.0
RM No. 1	N	82.390	25.114	152	38	57
HOLOHOKU (HGS) 1873--1966 DISTANCE AND DIRECTION-----				00	00	00.0
RM No. 1	NNW	82.318	25.092	152	39	25
RM No. 3	ESE	19.197	5.852	270	07	21

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 RM 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 1X. 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 corrals. 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 a short lane and end of truck travel. 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 1 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 1873 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: HGS YEAR: 1873 STATE: HAWAII BENCH MARK(S) ALSO ☐  
RECOVERED BY: PDC YEAR: 1978 COUNTY: HAWAII

AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:  
3 mis. East of Kamuela

Detailed statement as to the fitness of the original description; including marks found, stampings, 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

Q 201553 STATION 1085  
HAWAII  
LATITUDE 20° 00' TO 20° 30'  
LONGITUDE 155° 30' TO 156° 30'  
DIAGRAM NE 5-15 HAWAII

U. S. DEPARTMENT OF COMMERCE  
U. S. COAST AND GEODETIC SURVEY  
Form 526  
Rev. Aug. 1968

## DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: WAIMEA WEST BASE STATE:

HAWAII COUNTY: HAWAII

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

Described by: C. J. HOEPEL

NOTE	HEIGHT OF TELESCOPE ABOVE STATION MARK METERS	HEIGHT OF LIGHT ABOVE STATION MARK METERS	DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION			
			OBJECT	BEARING	DISTANCE feet meters	DIRECTION ° ' "
4	1.6		HOKUULA	NW	19.921	00 00 00
12e			R. M. 2		6.073	16 19 21
12e			R. M. 1	WSW	35.608	296 19 31
			Waimea Tank 1.0 mile	W	10.854	321 31 30.6

The station is located on the summit of a low rocky ridge, about 1.5 miles southeast of Waimea, 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 Waimea; 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 0.2 mile; pass under the transmission line and continue south for 0.5 mile to the high ground and the station.

The station is a standard disk, stamped BASE 1948, set into a drill hole in a boulder which projects about 18 inches.

Reference mark number 1 is a standard disk, stamped BASE 1 1948 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 1948, 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.

Form 526  
(11-8-55)

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

R

NAME OF STATION: WAIMEA WEST BASE  
ESTABLISHED BY: L.C.W. YEAR: 1948 STATE: Hawaii  
RECOVERED BY: R.E.A. YEAR: 1961 COUNTY: Hawaii

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

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 Waimea, 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 .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, 3 feet high, which can be seen from the road.

(continued on next page)

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: WAIMEA WEST BASE

STATE: HAWAII

YEAR: 1948

SECOND ORDER

SOURCE: G- 9279

GEODETIC LATITUDE:	20 01 02.503	ELEVATION:	840.1 METERS
GEODETIC LONGITUDE:	155 39 32.287		2756 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	# HOR Δ or ANGLE *
HI 1	5101	445,428.28	430,003.64	- 0° 03' 16"

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE  $\theta = \arctan \frac{Y}{X}$  FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From 1984)	PLANE AZIMUTH * (From 1984)	CODE
PUU PA HGS	61 40 18.1	61 43 34	5101

QE 159

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 201553 STATION 1085

LATITUDE ° ' TO ° '  
LONGITUDE ° ' TO ° '  
DIAGRAM

WAIMEA WEST BASE (continued)

FORM 526a  
(10-10-66)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

R

## RECOVERY NOTE, TRIANGULATION STATION

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

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.2 METERS,		HEIGHT OF LIGHT ABOVE STATION MARK METERS.			
DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION					
OBJECT	BEARING	DISTANCE		DIRECTION	
		FEET	METERS		
PUU PA (HGS) 1873-----1948	DISTANCE	and DIRECTION-----		00	00 00.0
R.M. No. 1	WSW	35.608	10.854	01	59 02
R.M. No. 2	NW	19.921	6.073	81	57 47
PUU PA (HGS) 1873-----1967	DISTANCE	and DIRECTION-----		00	00 00.0
R.M. No. 1	SW	35.600	10.852	01	59 28
R.M. No. 2	NW	19.920	6.072	81	57 47
Kamuela Airport, VOR	SSW	about 1/2-mile		336	49 51.2

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

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

To reach station from the main intersection in Kamuela, by the Bank of Hawaii and post office, go southeast, around the Parker Ranch Office Building, and then east, for 0.2 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 in fence on left. Pass through gate and follow track road for 0.3 mile to fence corner and 2 board gates. Pass through the gate on left and go across pasture, north-easterly, 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 1 1948", cemented in a drill hole in a 16-inch, flat boulder projecting 3 inches from ground, and is 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

R

NAME OF STATION: WAIMEA WEST BASE  
ESTABLISHED BY: LCN YEAR: 1948 STATE: Hawaii BENCH MARK(S) ALSO ☐  
RECOVERED BY: PDC YEAR: 1978 COUNTY: HAWAII

AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:  
1 mile southeast of Kamuela

Detailed statement as to the fitness of the original description; including marks found, stampings, 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

Q 201553 STATION 1086  
HAWAII  
LATITUDE 20° 30' TO 20° 30'  
LONGITUDE 155° 30' TO 156° 00'  
DIAGRAM NE 5-1.5 HAWAII

## 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 600 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 "mauka" or inshore along the edge of the gulch. Station is at head of old wood slide. Marked originally by copper tube and a copper cylinder buried 3 feet deep, with an ohia post at surface.

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

RECOVERY NOTE, TRIANGULATION STATION

R

DEPARTMENT OF COMMERCE  
U. S. COAST AND GEODETIC SURVEY  
FORM 536

NAME OF STATION: Waipio STATE: Hawaii COUNTY: Hawaii  
ESTABLISHED BY: H.G.S. YEAR: 1877 LOCALITY: Top of Waipio Valley, Hamakua, Hawaii  
RECOVERED BY: Chas. L. Murray YEAR: 1938

Detailed statement as to the fitness of the original description:

Location of station: Near North coast of Hawaii about 2000 feet above the sea bluffs and 25 feet away from the north edge of Waipio Valley.

Old station mark found: U.S.C.S. bronze tablet set in stone in concrete monument.

New station mark: H.T.S. Type D monument (Triangular concrete monument 7 1/2 ft 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.

DEPARTMENT OF COMMERCE  
U. S. COAST AND GEODETIC SURVEY  
FORM 536

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: WAIPIO  
ESTABLISHED BY: Haw. Govt. Survey YEAR: 1877 STATE: HAWAII  
RECOVERED BY: L. C. Wilder YEAR: 1948 COUNTY: HAWAII

Detailed statement as to the fitness of the original description: On the western rim of Waipio Canyon, about 30 feet back from where rim drops sharply and 15 feet back of the trail leading along the edge. About 700 yards southwestward of the sea cliffs. At the station the shoreline at Waipio beach is about in range with the shoreline north of Honokaa. Lines have been cleared through three rows of ironwood trees on the line to Kaala. Smaller trees have been cleared in front of the station as seen from the Hamakua Coast.

In 1948 the best means of reaching the station, was by mule from the east side of the canyon. The trails are too steep for horses. The very steep zig zag trail up the west side of the canyon is the most difficult, as it is badly gutted and is not maintained. Upon reaching the upper rim turn southwest along the edge of the canyon for about 500 yards, to reach the station.

The station recovered was a USGS bronze tablet set in cement. The station was so recovered in 1938 by the Hawaii Territory Survey and a concrete platform, metal pole and target installed, at this time. No information is available regarding the recovery of the original marks, a copper tube and a copper cylinder buried three feet.

Object	Direction	Distance
KUILEI (metal target)	00 00 00	
ANUENUE (metal target)	03 33 17.5	
PUU MAUU NORTH (metal target)	16 15 50.3	

An early recovery note reports: Original station recovered by A.O. Burkland in December 1911. Remarkd by bronze tablet centered over in original rock marking station. Stamped 1389 V.A.

(continued on next page)

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: WAIPIO

STATE: HAWAII

YEAR: 1877

SECOND

ORDER

SOURCE G- 5275

GEODETIC LATITUDE	20 07 28.460	ELEVATION	422.8 METERS
GEODETIC LONGITUDE	155 36 27.425		1387 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ (OR Δ) ANGLE
HI 1	5101	463,081.33	468,926.02	- 0 02 13

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE θ (OR Δ) FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
KUILEI	290 44 20.4	290 46 33	5101

QE 134

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 201553 STATION 1086  
LATITUDE ° ' TO ° '  
LONGITUDE ° ' TO ° '  
DIAGRAM

WAIPIO (continued)

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **WAIPIO**  
ESTABLISHED BY: **HGS** YEAR: **1877** STATE: **Hawaii** BENCH MARK(S) ALSO ☐  
RECOVERED BY: **D.M. Whipp** YEAR: **1966** COUNTY: **Hawaii**  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: **Island: Hawaii**

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

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 Kukuihaele 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 sharp right and go 0.5 mile to end of truck travel at beach. Pack 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 140 yards to it's 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 blaze on a 12-inch ironwood, 6 feet northeast of another triangular blaze on an ironwood tree and 4 feet west of a cairn that is built on the east 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.

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U.S. DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY  
FORM 9-1165  
(Rev. 12-74)

## REPORT ON PERMANENT SURVEY MARK

AREA OFFICE

STATE Hawaii COUNTY Hawaii QUADRANGLE 70  
QUOTE PRIMARY REFERENCE Top of Waipio Valley  
(Direction and distance)

DESIGNATION { LISTED WAIPIO  
STAMPED \_\_\_\_\_ TYPE OF MARK: BM \_\_\_\_\_ TT \_\_\_\_\_ TRIANG. X

Lat. <u>20</u> ° <u>07</u> ' <u>28.460</u> "	CONDITION	ESTABLISHED BY
Long. <u>155</u> ° <u>36</u> ' <u>27.425</u> "	Disturbed <input type="checkbox"/>	USGS <input type="checkbox"/> USBR <input type="checkbox"/>
Elev. <u>1387</u> feet	Destroyed <input type="checkbox"/>	USC&GS <input checked="" type="checkbox"/> State GS <input type="checkbox"/>
	Not Found <input type="checkbox"/>	USNPS <input type="checkbox"/> USNFS <input type="checkbox"/>
		USGLO <input type="checkbox"/> (Other) <input type="checkbox"/>
		USBLM <input type="checkbox"/>

### REMARKS OR REVISED DESCRIPTION:

Station mark was recovered in good condition. Recovery note and to reach description by D. M. Whipp, NGS in 1966 adequate.

SUBMITTED BY Yukio Yamamoto  
TITLE Cartographer DATE 1/26/78  
AGENCY USGS

Marks found in good condition need not be reported.

FILL IN ALL AVAILABLE INFORMATION