

QI 168

QUAD 221593 STATION 1052  
HAWAII  
LATITUDE 22 ° 00' TO 22 ° 30'  
LONGITUDE 159 ° 30' TO 160 ° 00'  
DIAGRAM NF 46 KAUAI

**Kalalau** (Kauai Island, O. B. French, 1910).—On northwest coast of Kauai, on Mount Alealau, on a very bold point at the "makai" (seaward) end of the "pali" which runs along the east side of the Kalalau canyon. Approached by a trail along the "pali" from Pihea. Station is on highest point of summit and was marked by a  $\frac{1}{4}$  by 15 inch iron rod driven into the solid earth. Reference marks were as follows: No. 1, a bottle buried with  $1\frac{1}{4}$  inches of neck projecting; it is alongside lihue stump and is protected with guard stakes; it is 7.1 feet from station in azimuth  $351^{\circ} 10'$ ; No. 2, a cross cut in soft rock which outcrops on the slopes, 8.7 feet,  $82^{\circ} 39'$ ; No. 3, cross cut in soft surface rock (similar to No. 2), 18.1 feet,  $216^{\circ} 57'$ ; and No. 4, cross cut in soft rock (similar to No. 2), 20.3 feet,  $234^{\circ} 44'$ .

DIVISION OF TERRITORY  
COAST AND GEODETIC SURVEY

**R**

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KALALAU  
ESTABLISHED BY: O.B.F. YEAR: 1910 STATE: Hawaii  
RECOVERED BY: D.M. Whipp YEAR: 1966 COUNTY: Kauai  
Island: Kauai

Island: <u>Rauai</u>	
HEIGHT OF TELESCOPE ABOVE STATION MARK	HEIGHT OF LIGHT ABOVE STATION MARK
METERS.	METERS.

DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION		DISTANCE		DIRECTION  (AZIMUTH)
OBJECT	BEARING	FEET	METERS	
RM No. 1 (bottle)	SSE	7.090	2.161	351 10
RM No. 2 (iron pin)	NE	6.140	1.872	220 00

Station mark and reference mark number one were recovered in good condition. The 3 reference crosses were not recovered; all the rock is a compressed clay which erodes rapidly due to vegetation growth on it. Station was re-marked with a standard disk, the bottle was used for one reference mark and the old iron pin station mark was used for another reference mark. A complete description follows:

Station is located about 3-1/2 miles northeast of Kokee Park Headquarters, at about 3900 feet elevation, on the extreme north tip of the ridge bordering the east side of Kalalau Valley, in a small patch that is free of vegetation, at the point where the ridge line rises up to the tip.

To reach station from the Kokee Park Headquarters, go north on main road for 2.5 miles; take right fork at radar station and go 0.2 mile to dirt right fork at entrance to Kalalau Lookout parking area. Take this right fork and go 2.0 miles to end of road (a 4-wheel-drive vehicle is required). From here pack easterly on trail through brush for about 1/4 mile to top of first hill and station PIHEA. Here leave trail and make way northerly along ridge line, (about 1-1/2 miles airline) to end of ridge and station.

Station mark is a standard disk stamped "KALALAU 1910 1966", secured to the top of a 1-inch iron pipe that is set in cement and projects 4 inches.

Reference mark No. 1 is a bottle, with the neck projecting 3 inches, set at the south side of a lehua stump.

Reference mark number 2 is a 3/4-inch diameter iron pin driven into the ground and projecting 3 inches.

NOTE: A 3-1/2-hour pack after trail is cleared. About 2 days required to clear trail. Helicopter not suitable due to trees and brush.

### ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KALALAU

STATE: HAWAII

YEAR: 1910

**SECOND**

SOURCE: G-SP156

GEODETIC LATITUDE: 22° 10' 39.533 GEODETIC LONGITUDE: 159 37 44.739	ELEVATION: 1181 SCALED METERS FEET
--	---

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ HOR $\Delta$ $\phi$ ANGLE °
HI 4	5104	456,319.08	125,076.45	- 0° 02' 55"

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

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

Q1 023

QI 023

\*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-P80

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

QUAD 221593 STATION 1053  
HAWAII  
LATITUDE 22 ° 00' TO 22 ° 30'  
LONGITUDE 159 ° 30' TO 160 ° 00'  
DIAGRAM NF 4-6 KAUAI

**Kalolo** (Kauai Island, F. G. Engle, 1927).—On western coast of Kauai, on a dune of the Lapa Dunes. It is reached by following the road past the Barking Sands, northeast through the pasture lands and cane fields as far as it goes. Station is about 50 meters from this road. It is marked by a 2-inch pipe set in a mass of concrete and rocks. A reference mark, note 11c, standard reference disk in concrete mass, was set 8.752 meters (28.71 feet) from station in azimuth 211° 29'.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KALOLO

STATE HAWAII

YEAR 1927

THIRD

ORDER

SOURCE: G-SP156

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KALOLO  
ESTABLISHED BY: F.G.E. YEAR: 1927 STATE: Hawaii BENCH MARK(S) ALSO ☐  
RECOVERED BY: D.M. Whipp YEAR: 1966 COUNTY: Kauai  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Kauai

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

Station was searched for but not found. A trial point was established in the vicinity and the station location determined by inverse from this. Some broken pieces of a stone and concrete monument were found and also a piece of cement bearing the imprint of part of a disk. It is believed that the station is destroyed.

R

GEODETIC LATITUDE:	22 ° 05 ' 25 . 203	ELEVATION:	14	METERS
GEODETIC LONGITUDE:	159 45 26.500	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ OR ANGLE °
HI 4	5104	412,864.26	93,432.93	- 0 ° 05 ' 48 "

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE  $\theta$  OR  $\Delta$  OR  $\theta$  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

QUAD 221593 STATION 1054  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 159° 30' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KILA

STATE: HAWAII

YEAR: 1910

SECOND

ORDER

SOURCE: G-SP150

GEODETIC LATITUDE:	22° 08' 41.242	ELEVATION:	1288	METERS
GEODETIC LONGITUDE:	159 38 37.175	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ FOR $\Delta$ & ANGLE *
HI 4	5104	451,379.33	113,164.37	- 0° 03' 15"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE
AWAA	111 53 04.7	111 56 20	5104

QI 025

Kila (Kauai Island, O. B. French, 1910).—In northwest Kauai, on Puu o Kila, a peak of the Kaunuohua Ridge, about 5 miles northeast of Puu Ka Pele, from which place it shows as a rounding summit with a thin growth of tall trees which stand out against the sky. Station is near the center of the rather flat summit. Marked by cross in top of a stone 4 by 6 by 15 inches set to project 3 inches above the surface. Just alongside and south of it is another stone 18 by 36 by 6 inches which leans against a log. Reference marks, crosses cut in rocks on surface of ground, were at the following distances and azimuths from the station: No. 1, 21.9 feet, 212° 35'; No. 2, 26.0 feet, 278° 39'; No. 3, 35.5 feet, 112° 44'.

KILA (Kauai County, Hawaii, O.B.F., 1910; Lt. R.L. Rowe, U.S.A., --Station, a stone with a cross and hole in the top, is badly worn but still in place.

Reference mark 1 is lost (there exists a cross on a stone at 220° 46' and 19.6 ft.). A path has been cut through the recorded position of reference mark 1 and the stone removed.

Reference marks 2 and 3 are lost. Stones in the neighborhood have been moved and broken.

New reference marks were put in 1943:

Reference mark 4 is an iron bolt (3/4- by 3/4-in.) with a nut on the top 2 in. above ground, near a large tree at 134° 58' and 35 ft.

Reference mark 5 is an iron pipe (3/4- by 3/8-in.) 2 in. above ground at 226° 09' and 50 ft.

Reference mark 6 is an iron pipe (3/4- by 3/8-in.) 2 in. above ground, near a large dead tree at 0° 53' and 30 ft.

(continued on next page)

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 221593 STATION 1054

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

KILA (continued)

FORM 524a  
(9-14-68)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

R

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KILA  
ESTABLISHED BY: O.B.F. YEAR: 1910 STATE: Hawaii  
RECOVERED BY: D.M. Whipp YEAR: 1966 COUNTY: Kauai  
Island: Kauai

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				
AWAA 1910				00 00 00.0			
RM No. 1	NE	13.385	4.080	101 01 08			
Ref. Cross # 1	NE	20.628	6.287	111 49 50			
Ref. Cross # 2	E	26.044	7.938	166 42 37			
RM No. 2	WNW	33.955	10.350	358 32 52			

A shallow 1/4-inch hole at center of a faint cross was recovered and subsequent observations proved this to be the original station mark. Reference crosses # 1 and 2 were recovered, however the distance and azimuth to cross # 1 did not check very well. Reference cross # 3 was not found. The station was re-marked with a standard disk, and two new reference marks were established. A complete description follows:

Station is located in northwest part of Kauai, about 1-1/4 miles north-east of Kokee Park Headquarters and 1/2 mile southeast of the Air National Guard site, on a low, flat-topped hill of 4200 feet elevation with some very large trees on it, along Kaumohua Ridge. There is a slightly high-

er and more conspicuous, sharper topped hill about 250 yards northeast of station, and on opposite side of the Forest Service trail.

To reach station from the Kokee Park Headquarters, go northerly on paved road for 2.5 miles; take right fork and go 0.2 mile to dirt right fork at entrance to Kalalau Lookout parking area. Take this right fork and go 0.2 mile; take dim side road right (Forest Service trail) and go 0.7 mile to a fork and sign on left "KALALAU LOOKOUT" and end of truck travel. Pack southerly on dim trail up through brush midway between the trail forks, and then work way up through dense brush for about 200 yards to top and station near center of hill. A 15-minute pack.

Station mark is a standard disk stamped "KILA 1910 1966", cemented in a drill hole in the top of a 4 x 6-inch boulder that projects 2 inches. It is in a small grassy area, the rest of the hilltop being covered with ferns and vines, and is 37 feet southeast of a 50-foot tree, the tallest one on the hill.

Reference mark number one is a standard disk stamped "KILA 1910 NO 1 1966", cemented in a drill hole in a 2-foot boulder that projects 10 inches. It is 8 feet southwest of cross # 1.

Reference mark number two is a standard disk stamped "KILA 1910 NO 2 1966", cemented in a drill hole in a 2-foot boulder that projects 1 foot. It is 18 feet west of the large lehua tree.

Cross # 1 is chiseled in the top of a triangle-shaped boulder that projects 2 feet.

Cross # 2 is chiseled in a 10-inch-diameter exposed portion of a boulder, flush with ground.

NOTE: Jeep needed for Forest Service trail.

\*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.

27178-P89

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

QUAD 221593 STATION 1055  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 159° 30' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

FORM 525  
(10-18-59)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: KOLO STATE: Hawaii COUNTY: Kauai  
CHIEF OF PARTY: D.J. Florwiock YEAR: 1964 DESCRIBED BY: K.R.

NOTE.	DESC	HEIGHT OF TELESCOPE ABOVE STATION MARK 1 METERS.1		HEIGHT OF LIGHT ABOVE STATION MARK 1 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 FEET METERS	DIRECTION
		OHAHULA			
	12a	Bonham AIF Control Tower	SSE	(Approx. 4 miles)	00 00 00.00
	12c	Reference Mark No. 1	NNE	57.976	34 06 33.4
		Reference Mark No. 2	E	23.866	210 12 54
				7.273	259 15 09

The station is located on the western part of Kauai Island, on the west end of Kolo Ridge and on the extreme west edge of a prominent mesa of about 1000 feet elevation. There is a deep canyon about 1/2 mile to the south of the station and a higher point along the bluff to the north. The station overlooks some prominent sand dunes at Barking Sands Beach to the east-southeast and a small, almost square pond to the north-northeast in the cane fields below.

To reach the station from the junction of State Highways 50 and 55 in Kekaha, go northerly on State Highway 55 for 12.8 miles to a dim bladed road on the left, opposite a paved road leading to a microwave site. Turn left and go downhill for 0.15 mile to a locked wooden gate. Pass through gate and continue on bladed road for 2.25 miles to another locked wooden gate. Pass through gate and continue on bladed road for 0.7 mile to a fork. Take the left fork and continue on bladed road for 0.4 mile to a very dim fork on right. Take the right fork and go downhill for 2.15 miles to a point where the jeep trail leaves the timber and becomes very difficult to follow. From here go westerly, through heavy, low brush over a hill that has thin timber on top for 1.3 miles to the edge of the bluff and the station, as described below.

The station mark is a standard disk, stamped KOLO 1964, set in the top of a 5-inch cement-filled cast iron sewer pipe that projects 10 inches above the surface of the ground. It is fenced in on three sides by a low fence of barbed wire and steel fence posts and is at the west edge of a bare, eroded area of red earth strewn with boulders.

Reference mark No. 1 is a standard disk, stamped KOLO NO 1 1964, cemented in a drill hole in outcropping bedrock that is about flush with the surface of the ground. It is across a gully from the station mark and about 2 1/2 feet higher in elevation.

Reference mark No. 2 is a standard disk, stamped KOLO NO 2 1964, cemented in a drill hole in the west end of a 5-foot by 8-foot boulder that projects 2 1/2 feet above the surface of the ground. It is about 6 1/2 feet higher in elevation than the station.

A 4-wheel drive vehicle is required to reach the station.  
Keys to the locked gates may be obtained from Mr. Sakai Koike, chief of the survey department of the Kekaha Sugar Company in Kekaha.

\*Refers 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.

COMMA-DC 27171-Pgs

(continued on next page)

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KOLO  
STATE: HAWAII YEAR: 1964 SECOND ORDER

SOURCE: G-13403

GEODETIC LATITUDE:	22° 04' 24.5941	ELEVATION:	323 METERS
GEODETIC LONGITUDE:	159° 45' 16.2072	SCALED	FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ ± ANGLE
HI 4	5104	413,822.08	87,315.31	- 0° 05' 44"

\* 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
OHAHULA	3 58 24.8	4 04 09	5104

QF 416



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 221593

STATION 1055

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

KOLO (continued)

FORM 526a  
(9-18-59)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

R

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KOLO  
ESTABLISHED BY: D.J.F.  
RECOVERED BY: D.M. Whipp  
YEAR: 1964  
STATE: Hawaii  
COUNTY: Kauai  
Island: Kauai

OBJECT	BEARING	DISTANCE		DIRECTION		
		FEET	METERS	°	'	"
OHAIULA				00	00	00.0
Bonham, ALF, Control Tower 1964	SW	About 4	miles	34	06	35.9
RM No. 1	NE	58.000	17.678	210	12	56
RM No. 2	ENE	23.873	7.277	259	13	11

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

Station is located in western part of Kauai, about 2-3/4 miles airline northeast of Mana village, on edge of mesa, at extreme west end of Kolo Ridge, and at about 1000 feet elevation at the west end of a large, bare, red, eroded area strewn with boulders.

To reach station from the post office in Kekaha, go northwest for 0.2 mile; turn right and follow State Highway 55 for 12.0 miles to side road left and sign "TRAIL NO 2", at Puu Ka Pele. Turn left and go 0.2 mile to locked wooden gate. Pass through gate and continue for 2.1 miles to

second locked wooden gate. Pass through and continue for 0.7 mile; take left fork and go 0.4 mile to dim right fork. Take right fork and go 2.75 miles to dim bladed crossroad. Continue ahead for 1.0 mile, on road which becomes brushy and dim, to east end of a large, bare, red, eroded area. Leave road and go right, across the red area, for 0.1 mile to station at west end.

Station mark is a standard disk stamped "KOLO 1964", set in the top of a 4-inch cast-iron pipe that is filled with concrete and projects 8 inches. It is surrounded by a 12-foot-square wire fence on 4 metal posts.

Reference mark number one is a standard disk stamped "KOLO NO 1 1964", cemented in a drill hole in the southwest end of a bedrock outcrop that projects 2 feet above ground on the lower side. It is across small gully from station and about 2 feet higher than station mark.

Reference mark number two is a standard disk stamped "KOLO NO 2 1964", cemented in the west end of a large, 5 x 8-foot boulder that projects 2-1/2 feet. It is 6 feet higher than station mark.

NOTE: Key for locked gates may be obtained at the offices of the Kekaha Sugar Company at Kekaha.

\*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 27175-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

QUAD 221593 STATION 1056  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 159° 30' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

FORM 525  
(8-18-61)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: LAPA STATE: Hawaii COUNTY: Kauai

CHIEF OF PARTY: P.C. Johnson YEAR: 1967 DESCRIBED BY: R.M.M.

NOTE.*	HEIGHT OF TELESCOPE ABOVE STATION MARK 1 METERS,†		HEIGHT OF LIGHT ABOVE STATION MARK 1 METERS.					
DESCO.	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	"	"	"	
	KOLO 1964	/			00	00	00.0	
Desc.	Reference Mark No. 1	/	SSW	62.62	19.087	109	29	48
Desc.	Reference Mark No. 2	/	WNW	70.98	21.634	201	39	50
	R.M. 1 To R.M. 2	/		96.42	29.389			

The station is 2.2 miles north of the main gate of PMR Barking Sands, near the north end of a group of sand dunes which have been leveled for a launch site.

To reach the station from the main gate at PMR Barking Sands, go north on an oiled road for 1.4 miles to a fork in the road. Take the right fork and continue north on a track and bladed road for 0.8 mile to a side road left. Turn left and go west and south on a bladed road for 0.2 mile to the top of the sand dune and the station as described near the northeast corner of a small leveled area.

The station mark, a standard disk stamped LAPA 1967, is set in the top of a 6-inch round soil pipe which projects 10 inches above the surface of the ground. It is 12 feet west-northwest of the east edge of the sand dune and 5.2 feet southwest of a 4 x 4-inch witness post.

Reference mark No. 1, a standard disk stamped LAPA NO 1 1967, is set in the top of a 6-inch round soil pipe which projects 10 inches above the surface of the ground. It is 8 feet west-northwest of the east edge of the sand dune and 1.8 feet north of a 4 x 4-inch witness post.

Reference mark No. 2, a standard disk stamped LAPA NO 2 1967, is set in the top of a 6-inch round soil pipe which projects 8 inches above the surface of the ground. It is 15 feet east-southeast of the west edge of the sand dune and 2.3 feet south-southwest of a 4 x 4-inch witness post.

Note: This area is under construction at this time and the local measurements may be subject to change.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: LAPA

STATE: HAWAII

YEAR: 1967

SECOND

ORDER

SOURCE: G-13403

GEODETIC LATITUDE: 22° 04' 17.0686	ELEVATION: 27.18 METERS
GEODETIC LONGITUDE: 159° 46' 38.4528	89.2 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	S FOR Δ S1 ANGLE *
HI 4	5104	406,084.68	86,569.42	- 0° 06' 15"

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE S FOR Δ S1 FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
KOLO	264 23 21.6	264 29 37	5104

QF 505

\*Refers 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.





JUN 1978

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

STATION 1058

Described by \_\_\_\_\_  
U.S. DEPARTMENT OF COMMERCE  
ESSA  
COAST AND GEODETIC SURVEY

AZIMUTH HAS BEEN COMPUTED BY THE $\sin^2 \Delta$ FORMULA NEGLECTING THE SECOND TERM.			
TO STATION OR OBJECT	GEODETTIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE

QF 591

QF 591

QUAD 221593 STATION 1059  
HAWAII  
LATITUDE 22 ° 00' TO 22 ° 30'  
LONGITUDE 159 ° 30' TO 160 ° 00'  
DIAGRAM NF 4-6 KAUAI

QF 592

QF 553

QUAD 221593 STATION 1061  
HAWAII  
LATITUDE 22 ° 00' TO 22 ° 30'  
LONGITUDE 159 ° 30' TO 160 ° 00'  
DIAGRAM NF 4-6 KAUAI

## HORIZONTAL CONTROL DATA

QUAD 221593 STATION 1062  
HAWAII  
LATITUDE 22 ° 00' TO 22 ° 30'  
LONGITUDE 159 ° 30' TO 160 ° 00'  
DIAGRAM NF 4-6 KAUAI

### ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: LAUNCHER 611

STATE: HAWAII

YEAR: 1967

**SECOND**

**ORDER**

SOURCE: G-14044

GEODETIC LATITUDE: 22°03'50.9753 GEODETIC LONGITUDE: 159 46 56.6701	ELEVATION: 3 METERS SCALED FEET
--	------------------------------------

## STATE COORDINATES (Feet)

STATE & ZONE	CODE	X	Y	$\theta$ FOR $\Delta$ & $\theta$ ANGLE*
HI 4	5104	404,366.26	83,935.51	- 0° 06' 22"

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

Described by \_\_\_\_\_  
U.S. DEPARTMENT OF COMMERCE  
ESSA  
COAST AND GEODETIC SURVEY

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

QF 595

QF 595



QF 596

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

QUAD 221593 STATION 1064  
HAWAII  
LATITUDE 22 ° 30' TO 22 ° 30'  
LONGITUDE 159 ° 30' TO 160 ° 00'  
DIAGRAM NF 4-6 KAUAI

## DESCRIPTION OF TRIANGULATION INTERSECTION STATION

NAME OF STATION: **Launcher 613**

CHIEF OF PARTY: P.C. Johnson    YEAR: 1967    STATE: Hawaii    COUNTY: Kauai

Description, including sketch or object: From the Main Gate of the Barking Sands Pacific Missile Range Facility, go northerly along an asphalt road for 2.05 miles to a steel gate at the entrance to a large fenced compound. Continue straight ahead, northwesterly, along an oiled road for 0.05 mile to a "T" intersection. Turn left and go southwest for 0.05 mile to a road on the right. Turn right and go northwest along a dirt road for about 250 feet to the station.

The station is a white-painted steel cylinder, about 7 feet tall, with a conical turret and movable steel boom mounted on top. Point observed was a bolt in the top and center of the launcher.

FORM C&GS-525b (12-65)  
USCOMM-DC 38290-P65

Described by U.S. DEPARTMENT OF COMMERCE  
ESSA  
COAST AND GEODETIC SURVEY

### ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: LAUNCHER 613

STATE: HAWAII

YEAR 1967

**SECOND**

- ORDER #

SOURCE: G-14044

GEODETIC LATITUDE: 22° 03' 52.2521 GEODETIC LONGITUDE: 159 46 55.0413	ELEVATION: 3 SCALED METERS FEET
--	---------------------------------------

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	# OR Δ S' ANGLE °
H1 4	5104	404,519.71	84,068.07	- 0° 06' 21"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south) ° ' "	PLANE AZIMUTH <sup>a</sup> (From south) ° ' "	CODE

QF 597

QF 597

QF 558





QUAD 221593 STATION 1067  
HAWAII  
LATITUDE 22 ° 00' TO 22 ° 30'  
LONGITUDE 159 ° 30' TO 160 ° 00'  
DIAGRAM NF 4-6 KAUAI

DESCRIPTION OF TRIANGULATION INTERSECTION STATION

NAME OF STATION: Launcher 616

CHIEF OF PARTY: P.C. Johnson    YEAR: 1967    STATE: Hawaii    COUNTY: Kauai

Description, including sketch of object: From the Main Gate of the Barking Sands Pacific Missile Range Facility, go northerly along an asphalt road for 2.05 miles to a steel gate at the entrance to a large fenced compound. Continue straight ahead, northwesterly, along an oiled road for 0.05 mile to a "Y" intersection. Turn right and go northeast for 0.05 mile to a road on the left. Turn left and go northwest along a dirt road for about 150 feet to the station.   
    
 

The station is a white-painted steel cylinder, about 7 feet tall, with a conical turret and movable steel boom mounted on top. Point observed was a bolt in the top and center of the launcher.

FORM C&GS-525b (12-65)  
USCOMM-DC 36280-P88

Described by U.S. DEPARTMENT OF COMMERCE  
ESSA  
COAST AND GEODETIC SURVEY

### ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: LAUNCHER 616

STATE: HAWAII

YEAR: 1967

SECOND ORDER

SOURCE: G-14044

GEODETIC LATITUDE: 22° 03' 53.0203 GEODETIC LONGITUDE: 159 46 51.5725	ELEVATION: 3 SCALED METERS FEET
--	---------------------------------------

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ (OR $\Delta$ B) ANGLE
HI 4	5104	404,846.15	84,144.98	- 0° 06' 20"

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

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE $\sin^2 \Delta$ FORMULA NEGLECTING THE SECOND TERM.			
TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH* (From south)	CODE
	0 1 2 3 4	0 1 2 3 4	

QF 600

QF 600

## HORIZONTAL CONTROL DATA

QUAD 221593 STATION 1068  
HAWAII  
LATITUDE 22 ° 00' TO 22 ° 30'  
LONGITUDE 159 ° 30' TO 160 ° 00'  
DIAGRAM NF 4-6 KAUAI

### ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: LAUNCHER 619

STATE: HAWAII

YEAR: 1967

**SECOND**

## ORDER

SOURCE: G-14044

GEODETIC LATITUDE: 22°03'57.5893 GEODETIC LONGITUDE: 159 46 51.5201	ELEVATION: 5 SCALED METERS FEET
--	---------------------------------------

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ OR $\Delta$ OR $\angle$
HI 4	5104	404,851.93	84,606.03	- 0 06' 20"

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

PLANE AZIMUTH HAS BEEN COMPUTED BY THE $\sin^2 \Delta$ FORMULA NEGLECTING THE SECOND TERM.			
TO STATION OR OBJECT	GEODETIC AZIMUTH (From south) 0 1 2 3 4	PLANE AZIMUTH (From south) 0 1 2 3 4	CODE

QF 601

QF 601

Described by \_\_\_\_\_  
U.S. DEPARTMENT OF COMMERCE  
ESSA  
COAST AND GEODETIC SURVEY



QI 027

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 221593 STATION 1070  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 159° 30' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

**Lolo 2 (Kauai Island, F. G. Engle, 1927).**—Near northwestern coast of Kauai, on ridge just west of the Nualolo Canyon, 5 miles from the "pali," and close to but not identical with the old station used by the United States Geological Survey. Station is very close to location of old station *Lolo 1910*, the center mark of which had been destroyed, but the reference marks recovered, though they had apparently suffered some very slight displacement. Station is in small plot of grass; the surrounding ground has been eroded. Reached by the Nualolo trail over the Kaunuuohua Ridge; this trail is marked and kept up by the forest rangers. Marked according to note 4, standard disk in bowlder. Reference marks are standard reference disks (note 12c) set in the cross reference marks of 1910. These are at the following distances and azimuths from the station: No. 1, in soft rock, 12.743 meters (41.81 feet), 49° 54'; No. 2, in soft rock, 28.100 meters (92.19 feet), 114° 07'; No. 3, in rock on surface, 9.172 meters (30.09 feet), 272° 22'. The old Geological Survey station, marked by a small stone at center of "ahu" (cairn) is 17.2 feet from station in azimuth 282° 24'.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **Lolo 2**  
ESTABLISHED BY: **F.G.E.** YEAR: **1927** STATE: **Hawaii** BENCH MARK(S) ALSO ☐  
RECOVERED BY: **U.S.G.S.** YEAR: **1962** COUNTY: **Kauai**  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:

**R**

Detailed statement as to the fitness of the original description, including marks found, stampings, changes made, and other pertinent facts:  
Station and R.M. recovered. Both appear to be in place but erosion in area threatens the station.  
Located on a flat-topped and fairly bare ridge in NW part of Kauai about one mile from the coast and on S side of Nualolo Valley and about 3 miles from the Kokee Ranger Station.  
Station mark is a USC&GS tablet stamped Lolo 1927 set in concrete and rocks. (Note: station mark is not stamped Lolo 2).  
R.M. is a USC&GS reference mark disk stamped Lolo 2 1927 cemented in rock 91.36 feet from station in azimuth 114° 05' 20".  
To reach from the Kokee Ranger station, take the Nualolo trail from a point near the Park Service equipment sheds uphill along old fence to the NW; at top of hill take trail fork to the right downhill following trail in and near the drain for about one mile to a point where trail leaves drain and turns uphill to ridge N of drain; follow trail along ridges to trail fork near the head of Kaahole Valley; take right fork around head of valley and onto the ridge which drops off abruptly into Nualolo Valley on the N; continue N.W along ridge about 0.50 mile to large flat area and station. A 2½ hour pack if trail is open. Local inquiry should be made concerning trail conditions.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **Lolo 2**

STATE: **HAWAII**

YEAR: **1927**

SECOND

ORDER

SOURCE: **G-SP156**

GEODETIC LATITUDE:	22° 09' 12.708	ELEVATION:	681.0 METERS
GEODETIC LONGITUDE:	159° 41' 58.615		2234 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ OR ANGLE
HI 4	5104	432,445.68	116,360.98	- 0 04 31

\* 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
AWAA	275 41 26.6	275 45 58	5104

Q1 159

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 221593 STATION 1070  
LATITUDE ° ' TO ° '  
LONGITUDE ° ' TO ° '  
DIAGRAM

LOLO 2 (continued)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: LOLO 2  
ESTABLISHED BY: F.G.E.  
RECOVERED BY: D.M. Whipp  
YEAR: 1927 STATE: Hawaii  
YEAR: 1966 COUNTY: Kauai

OBJECT	BEARING	DISTANCE		DIRECTION		
		FEET	METERS	°	'	"
AWAA 1910	ESE	9.445	2.879	00	00	00.0
RM No. 4	WSW	29.093	95.448	205	36	01
RM No. 5	N	1.238	0.377	265	29	53
Iron Pin						

Station mark and reference mark No. 2 were recovered in poor condition. Reference marks No. 1 and 3 have been lost due to erosion. The station was re-marked with a standard disk and two new reference marks were established. A complete description follows:

Station is located in northwest part of Kauai, about 3 miles airline west-northwest of Kokee Park Headquarters, at about 2240 feet elevation, on a prominent, bare, red ridge along the southwest rim of Nualolo Canyon, and about 3/4-mile south of the mouth of Nualolo Stream. To reach station from the Kokee Park Headquarters, go south on highway for 0.1 mile to end of truck travel at sign on right "NUALOLO TRAIL

5.2 MILES". Pack westerly on good trail about 1-1/2 miles to fork. Take right fork and follow trail about 1 mile to T-junction down on steep hillside. Go left and follow trail about 1/2 mile to open meadow along rim of Nualolo Canyon. Follow down almost to end of meadow, then pick up trail on left and follow around head of timbered ravine and then out to the open ridge, about 1/2 mile, to trail junction on ridge line. Go right, down along open ridge line about 1/2 mile to station.

Station mark is a standard disk stamped "LOLO 2 1927 1966", secured to the top of a 1-inch iron pipe set in a mass of rock and cement, flush with ground. It is on small bump on bare, eroded ridge, 18 feet southwest of edge of ridge and 125 feet north of a slightly higher point that is covered with low, dense brush.

Reference mark number four is a standard disk stamped "LOLO 2 1927 NO 4 1966", secured to the top of a 1-inch iron pipe that is set in a mass of rock and cement at south end of station bump. It is about 3 inches higher than station mark and projects 2 inches above ground.

Reference mark number 5 is a standard disk stamped "LOLO 2 1927 5", cemented in a drill hole in a 2-foot boulder that projects 1 foot above ground. It sets along crest of ridge, 14 feet lower than station mark.

NOTE: Packing time to station is about 2-1/2 hours. End of truck travel is at 3700 feet elevation so return to truck requires more time since station is at about 2240 feet elevation.

\*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 37179-P88

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: LOLO 2  
ESTABLISHED BY: F.G.E.  
RECOVERED BY: P.O. Johnson  
YEAR: 1927 STATE: Hawaii  
YEAR: 1967 COUNTY: Kauai  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 13 miles north of Kekaha  
HEIGHT OF TELESCOPE ABOVE STATION MARK 4 FEET. HEIGHT OF LIGHT ABOVE STATION MARK 4 FEET.

OBJECT	BEARING	DISTANCE		DIRECTION		
		FEET	METERS	°	'	"
AWAA 1910	ESE	9.44	2.877	00	00	00.0
Reference Mark No. 4	SE	153.362	46.745	25	38	01
Reference Mark No. 6	WNW	95.45	29.095	205	36	05
Reference Mark No. 5		1.24	.379			
Iron Pin						

The station mark, reference mark No. 4, reference mark No. 5 and the Iron Pin were recovered as described in 1966 and found in good condition. Reference mark No. 6 was established at this time. The horizontal distance and direction to the original reference marks were checked and verified. The 1966 "To Reach" was presumed to be adequate as this station was reached by helicopter from PWR Barking Sands at this occupation.

The station is on the northwest part of Kauai, about 3 miles west-northwest of Kokee Park Headquarters, on a bare, red ridge along the southwest rim of Nualolo Canyon and 3/4 mile south of the mouth of Nualolo Stream.

The station mark, a standard disk stamped LOLO 2 1927 1966, is secured to the top of a 1-inch iron pipe set in a mass of rock and cement and is set flush with the surface of the ground. It is 18 feet southwest of the edge of the ridge and 150 feet north of a slightly higher point that is covered with low, dense brush.

Reference mark No. 4, a standard disk stamped LOLO 2 1927 NO 4 1966, is secured to the top of a 1-inch iron pipe set in a mass of rock and cement and projects 2 inches above the surface of the ground.

Reference mark No. 5, a standard disk stamped LOLO 2 1927 5, is cemented in a drill hole in a 2-foot boulder that projects 1 foot above the surface of the ground. It is about 15 feet lower in elevation than the station mark.

Reference mark No. 6, a plain bronze disk stamped LOLO 2 1927 RM 6 1967, is set in the top of a 6-inch iron pipe which projects 6 inches above the surface of the ground. It is about 6 feet higher in elevation than the station mark.

\*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.

FORM CGS-526a (12-68)  
USCOMM-DC 38291-P88

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 221593 STATION 1071  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 159° 30' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

Lua (Kauai Island, O. B. French, 1910).—In western part of Kauai, on a wooded hill of the same name, on the highest part and near the middle of its slightly rounding summit. Most of the trees (koa) have been cleared from the top, but those on the sides give the hill the appearance of being uncleared. Approached by cow path leading from the road to Halemanu. Marked by a ¾ by 15 inch iron rod driven flush with the ground. Reference marks were set as follows: No. 1, five nails (four in square with one at center) driven into top of a 1-inch koa stump which was previously flattened off, 29.6 feet from station in azimuth 110° 58'; No. 2, five nails (same as No. 1) driven into top of koa stump, 10.0 feet, 187° 50'; No. 3, cross cut in rock on surface, 62.4 feet, 276° 47'.

(15-18-89)

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: LUA  
ESTABLISHED BY: O.B.F. YEAR: 1910 STATE: Hawaii  
RECOVERED BY: Walter R. Helm YEAR: 1961 COUNTY: Kauai

HEIGHT OF TELESCOPE ABOVE STATION MARK		HEIGHT OF LIGHT ABOVE STATION MARK		DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION	
1.5 METERS					
OBJECT	BEARING	DISTANCE		DIRECTION	
		FEET	METERS		
MAKAHA 2 1927				0 00 00.0	
RM 3	E	62.480	19.043	129 18 38	
RM 4	SW	20.980	6.395	241 58 29	

The station and reference mark 3 were recovered and found to be in good condition. The station mark (an iron rod) was replaced with a standard disk secured to a pipe at this time. Reference mark 4 was established at this time. A new description follows:

The station is located 9 miles, air line, north-northeast of Kekaha, 4 miles, air line, east of the west coast of Kauai Island, and 0.2 mile west of State Highway 55. It is on Puu Lua Mountain.

To reach the station from the Kokee Park Headquarters, go south on State Highway 55 for 3.75 miles to a dirt road right and sign 'Puu Lua Reservoir'. Turn right and follow the dirt road west for 0.3 mile to a fork. Take the left fork and go 100 yards to the end of truck travel. Pack west and south up the north side of the mountain to the highest point and the station. A 15-minute pack.

The station mark, a standard disk secured to the top of a 2-inch soil pipe, is stamped LUA 1910 1961. The pipe projects 6 inches above the ground.

Reference mark 3 is a chisled cross in an 8x10-inch boulder which projects 2 inches above the ground.

Reference mark 4, a standard disk stamped LUA NO 4 1910 1961, is secured to the top of a 2-inch soil pipe which projects 8 inches above the ground.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: LUA

STATE: HAWAII

YEAR: 1910

SECOND ORDER

SOURCE: G-SP156

GEODETIC LATITUDE:	22° 05' 35.909	ELEVATION:	1059.0 METERS
GEODETIC LONGITUDE:	159 40 55.189		3474 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ θ ANGLE °
HI 4	5104	438,381.96	94,476.47	- 0° 04' 06"

\* 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
OPAE	25 37 12.5	25 41 18	5104

Q1-030

(continued on next page)

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 221593

STATION 1071

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

LUA (continued)

FORM 524a  
(9-18-66)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: LUA  
ESTABLISHED BY: O.B.F.  
RECOVERED BY: D.J. Florwick  
YEAR: 1910  
STATE: Hawaii  
YEAR: 1964  
COUNTY: Kauai

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.5 METERS,		HEIGHT OF LIGHT ABOVE STATION MARK 1.5 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	
OPAE 1910 1927				0 00 00.0
RM 4	SW	21.020	6.407	03 52 38
RM 3	E	62.485	19.044	251 12 19

The station mark, reference mark number 3 and reference mark number 4 were recovered and found to be in good condition. A new description follows.

The station is located 9.0 miles north-northeast of Kekaha, 4.0 miles east of the west coast of Kauai Island and 0.2 mile west of State Highway 55. It is on Puu Lua Mountain.

To reach the station from the Kokee Park Headquarters, go southerly on State Highway 55 for 3.6 miles to a side road right and sign 'Puu Lua Reservoir'. Turn right and follow the dirt road west for 0.3 mile to a fork. Take the left fork and go westerly for 0.1 mile to a road leading

to the reservoir, continue westerly for 0.02 mile to end of truck travel. Pack west and south up the north side of the mountain to the highest point and the station. A 20-minute pack.

The station mark, a standard disk secured to the top of a 2-inch soil pipe, is stamped LUA 1910 1961. The mark projects 6 inches above the ground.

Reference mark number 3, is a chiseled cross in an 8x10-inch boulder projecting 2 inches above the ground.

Reference mark number 4, a standard disk secured to the top of a 2-inch soil pipe, is stamped LUA NO 4 1910 1961. The mark projects 8 inches above the ground.

\*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

FORM 524a  
(9-18-66)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: LUA  
ESTABLISHED BY: O.B.F.  
RECOVERED BY: D.M. Whipp  
YEAR: 1910  
STATE: Hawaii  
YEAR: 1966  
COUNTY: Kauai  
Island: Kauai

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	(AZIMUTH) "		
RM No. 4	SW	20.988	6.397	29	29 51	
RM No. 5	E	62.465	19.040	276	50 36	

Station mark and reference mark number 4 were recovered in good condition. Reference cross # 3 was also recovered. A new reference mark, number 5, was established at the point occupied by reference cross # 3. A complete description follows:

Station is located about 9 miles north-northeast of Kekaha and 7-1/2 miles northeast of Bonham Airbase, on the summit of Puu Lua, a tree-covered hill of about 3476 feet elevation that sets at the northwest side of a reservoir and about 2000 feet west of State Highway 55.

To reach station from the Kokee Park Headquarters, go southerly on State Highway 55 for 3.6 miles to a side road right and a green sign

"PUU LUA RESERVOIR". Turn sharp right and go 0.1 mile to fork. Take right fork and go 0.2 mile to dim crossroad; continue ahead for 0.1 mile to base of hill on right. From here pack westerly up steep hillside to top and station. A 20-minute pack.

Station mark is a standard disk stamped "LUA 1910 1961", brazed to the top of a 2-1/2-inch, iron pipe projecting 8 inches from the ground, near west end of hilltop.

Reference mark number 4 is a standard disk stamped "LUA 1910 NO 4 1961", brazed to the top of a 2-1/2-inch, iron pipe projecting 1 foot above ground. It is at the southwest edge of hilltop.

Reference mark number 5 is a standard disk stamped "LUA 1910 NO 5 1966", cemented in a drill hole at the center of old reference cross # 3 in the top of a flat rock projecting 2 inches above ground. It is 3 feet lower than station mark and 40 feet south of trail to station.

\*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

QUAD 221593 STATION 1072  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 159° 30' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

FORM 525  
(6-18-69)

U. S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: LUCKY ✓ STATE: Hawaii ✓ COUNTY: Kauai ✓  
CHIEF OF PARTY: W.S. Simmons ✓ YEAR: 1966 ✓ DESCRIBED BY: A.K.R. ✓

NOTE*	HEIGHT OF TELESCOPE ABOVE STATION MARK 2 METERS,†	HEIGHT OF LIGHT ABOVE STATION MARK 2 METERS.	DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION			
			DISTANCE		DIRECTION‡	
	SURFACE-STATION MARK, UNDERGROUND-STATION MARK		FEET	METERS		
	1964-2 (USNHO)				00 00 00.00	
12c	Reference Mark No. 1	SSE	21.483	6.549	164° 10' 23"	
12c	Reference Mark No. 2	SW	22.421	6.836	231° 12' 28"	
	RM 1 to RM 2		24.259	7.395		

The station is located on a rocky, eroded point near the end of Makaha Ridge, about 11-1/2 miles north of Kekaha, 7-1/2 miles north-northeast of Bonham Auxiliary Landing Field and 4 miles west of Kokee Lodge.

To reach the station from the junction of Hawaii State Highways 50 and 55 at Kekaha, go northerly on State Highway 55 for 15.5 miles to an asphalt road on the left. Turn left and go westerly, downhill, for 4.5 miles to a bladed road on the left. Turn sharp left and go south-westerly, downhill, for 0.25 mile to a crossroad. Turn right and go southwesterly along a track road for 0.15 mile to the end of the road and the station.

The station mark is a standard disk, stamped LUCKY 1966, cemented in a drill hole in the top of a large boulder that projects 6 inches above the surface of the ground. It is 8-1/2 feet northwest of a wooden witness post with sign.

Reference mark No. 1 is a standard disk, stamped LUCKY NO 1 1966, cemented in a drill hole in the top of a large boulder that projects 15 inches above the surface of the ground. It is 16 feet south of a wooden witness post with sign and is about 3 feet higher in elevation than the station mark.

Reference mark No. 2 is a standard disk, stamped LUCKY NO 2 1966, cemented in a drill hole in the top of a large boulder that projects 6 inches above the surface of the ground. It is 26-1/2 feet west-southwest of a wooden witness post with sign and is about 1 foot lower in elevation than the station mark.

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

‡Direction-angle measured clockwise, referred to initial station.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: LUCKY  
STATE: HAWAII YEAR: 1967 SECOND ORDER

SOURCE G-13403

GEODETIC LATITUDE	22° 07' 58.1229	ELEVATION	479	METERS
GEODETIC LONGITUDE	159° 43' 50.8470	SCALED		FEET

STATE COORDINATES (Fwi)				
STATE & ZONE	CODE	X	Y	θ OR Δ ± ANGLE *
HI 4	5104	421,883.70	108,849.56	- 0° 05' 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
1964 2 USNHO	172 12 06.7	172 17 20	5104



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

QUAD 221563 STATION 1073  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 159° 30' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

TRAVERSE  
DESCRIPTION OF ~~STATION~~ STATION

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: M 33 Radar

CHIEF OF PARTY: F. L. Jeffries YEAR: 1968 STATE: Hawaii COUNTY: Kauai

Description, including sketch of object: From the main gate of the Barking Sands Pacific Missile Range Facility, go south on Nohili Road South for 0.2 mile to Pala Place. Turn left and go east on Pala Place for 0.05 mile to Kalanamahiki Place South. Turn right and go south on Kalanamahiki Place South for 0.2 mile to Lalana Place. Turn right and go west on Lalana Place for 0.1 mile. Turn left and go south on an asphalt road for 0.1 mile to a large asphalt area and the station near the southwest corner.

The M 33 Radar is an 8-foot, white-painted mesh dish, mounted on the roof of van No. 97-19749, which is the second van north of the southwest corner of the asphalt area.

A connection was made to triangulation station BARK 1964, distance being 40.351 meters (132.385 feet) north-northeast of station BARK. Tangents were observed on the base of the radar.

NAME OF STATION: M 33 RADAR

STATE: HAWAII

YEAR 1968

SECOND -ORDER

SOURCE: G-14107  
NO OBSERVATION CHECK ON THIS POSITION

GEODETIC LATITUDE:	22° 01' 41.25085	ELEVATION:	9	METERS
GEODETIC LONGITUDE:	159 47 09.39018	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ (OR $\Delta$ ) ANGLE *
HI 4	5104	403,145.21	70,851.40	- 0° 06' 26"

\* 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
POSITION DETERMINED BY TRAVERSE FROM STATION BARK			

FORM C&GS-525b (1-68)  
USCOMM-DC 10810-P03

Described by U. S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

QF 014

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 221593 STATION 1074  
HAWAII  
LATITUDE 22 ° 00' TO 22 ° 30'  
LONGITUDE 159 ° 30' TO 160 ° 00'  
DIAGRAM NF 4-6 KAUAI

**Maka (Kauai Island, F. G. Engle, 1927).**—On the west coast of Kauai, on the shingle beach at Makaha Point. Best reached by small boat in smooth weather. In rougher weather a landing can be made in the lee of a shelf 1½ miles northeast of Makaha Point. Marked according to note 5, a standard disk in concrete in boulder. Two reference marks, note 12c, standard reference disks in boulders, are at the following distances and azimuths from station: No. 1, 16.85 meters (55.3 feet), 277° 36'; No. 2, 14.65 meters (48.1 feet), 333° 49'.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **Maka**  
ESTABLISHED BY: **F.G.E.** YEAR: **1927** STATE: **Hawaii** BENCH MARK(S) ALSO ☐  
RECOVERED BY: **U.S.G.S.** YEAR: **1962** COUNTY: **Kauai**  
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 searched for and not found. R.M. 1 and R.M. 2 recovered in good condition.

The station mark was located in an area where high tides and storms could wash it out and it has probably been destroyed.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **MAKA**  
ESTABLISHED BY: **F.G.E.** YEAR: **1927** STATE: **Hawaii** BENCH MARK(S) ALSO ☐  
RECOVERED BY: **D.M. Whipp** YEAR: **1966** COUNTY: **Kauai**  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: **Island: Kauai**

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

Station mark has been destroyed. Both reference marks were recovered in good condition. It is likely that severe wave action has removed the boulder the station mark was in.

R.M. 1 is an unstamped disk cemented in a drill hole in an 8-foot black rock projecting 3 feet. It is 16 feet makai from cliff base.

R.M. 2 is an unstamped disk cemented in a drill hole in the south-west end of a long, black lava rock ledge running down from cliff edge. It is 30 feet makai from cliff base and 4 feet above general beach rock line.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **MAKA**

STATE: **HAWAII**

YEAR: **1927**

THIRD

ORDER

SOURCE: **G-SP156**

GEODETIC LATITUDE:	22 ° 08 ' 30.495	ELEVATION:	11	METERS
GEODETIC LONGITUDE:	159 44 00.901	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	B OR Δ or ANGLE *
HI 4	5104	420,943.43	112,117.66	- 0 05 ' 17 "

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

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

91 028

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 221593 STATION 1076  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 159° 30' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

**Makaha 2** (Kauai Island, F. G. Engle, 1927).—In western part of Kauai, on a hump in the Makaha Ridge about 2 miles north-northwest of Halemanu and 2 miles "mauka" (inland) from "palis" along shore. The point is practically bare. It is reached by taking a trail which leaves the main road about 1/4 mile southwest of Hale. Take first fork to the left and continue down the Makaha Ridge. Do not take Milolii trail. Station is close to location of station Makaha of 1910, the center mark of which was not recovered. Marked according to note 4, standard disk in boulder. There are five reference marks, Nos. 1, 2, and 3 being standard reference disks in boulders, note 12c, at the following distances and azimuths from the station: No. 1, 2.847 meters (9.34 feet), 288° 21'; No. 2, 2.770 meters (9.09 feet), 2° 44'; and No. 3, 7.864 meters (25.8 feet), 113° 44'. Nos. 4 and 5, identical with reference marks Nos. 1 and 2 of the 1910 station, are blazes on koa trees at the following distances and azimuths from the station: No. 4, 41.30 feet, 263° 27'; No. 5, 39.25 feet, 277° 39'.

FORM 3400  
(10-10-68)

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

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: MAKAHA 2  
ESTABLISHED BY: F.G.E. YEAR: 1927 STATE: Hawaii  
RECOVERED BY: Walter R. Helm YEAR: 1961 COUNTY: Kauai

HEIGHT OF TELESCOPE ABOVE STATION MARK 3.7 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	
KOKEE				
RM 1	ESE	9.344	2.848	0 00 00.0
RM 2	S	9.075	2.765	29 00
RM 3	WNW	25.682	7.830	99 57
				211 11 28

The station and reference marks were recovered and found to be in good condition. The difference noted in distance to Reference Mark 3 is believed to be caused by the original measurement probably being a mark to mark measurement. A new description follows:

The station is located 10-3/4 miles, air line, north of Kekaha, 2 miles, air line, east of the west coast of Kauai Island, 2 miles, air line, west of State Highway 55, and is on Makaha Ridge.

To reach the station from the Kokee Park Headquarters, go south on State Highway 55 for 1.55 miles to a dirt road right. Turn right and go 0.2 mile to a T-road right. Turn right and go 0.05 mile to a locked gate. (Key may be obtained at Kokee Park Headquarters.) Pass through the gate and follow road westerly for 2.4 miles. Turn right off road and drive to top of small hill and the station, a distance of 0.05 mile.

The station mark, a standard disk stamped MAKAHA 1927, is set in a small boulder which projects 5 inches above the ground. It is on the summit of a small knoll 150 yards north of the dirt road. The knoll has some small brush on top and has red streaks to south.

Reference mark 1, a standard disk stamped MAKAHA 1 1927, is set in a small boulder which projects 1 inch above the ground. It is about the same elevation as the station mark.

Reference mark 2, a standard disk stamped MAKAHA 1927, is set in a small boulder which projects 2 inches above the ground. It is about the same elevation as the station mark.

Reference mark 3, a standard disk stamped MAKAHA 3 1927, is set in a small boulder which projects 1 inch above the ground. It is about 2 feet lower than the station mark.

Note: A 4-wheel drive vehicle is required to drive to the station, because of slick and washed out roads.

(continued on next page)

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: MAKAHA 2

STATE: HAWAII

YEAR: 1927

SECOND

ORDER

SOURCE: G-SP150

GEODETIC LATITUDE: 22° 07' 30.841	ELEVATION: 817.34 METERS
GEODETIC LONGITUDE: 159° 42' 13.740	2681.5 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ OR ANGLE
HI 4	5104	431,010.05	106,083.51	- 0° 04' 36"

\* 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
AWAA	241° 17' 36.8	241° 22' 13	5104

QI 161

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 221593 STATION 1076  
LATITUDE ° ' TO ° '  
LONGITUDE ° ' TO ° '  
DIAGRAM

MAKAHA 2 (continued)

FORM 3246  
(9-18-68)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: MAKAHA 2 STATE: Hawaii COUNTY: Kauai  
Established by: F.G.E. Year 1927  
CHIEF OF PARTY: D.J. Florwick Year 1964 DESCRIBED BY: R.K. Moore

NOTE.	HEIGHT OF TELESCOPE ABOVE STATION MARK	METERS.1	HEIGHT OF LIGHT ABOVE STATION MARK	METERS.
4	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 FEET METERS	DIRECTION1
	MANU 1961			00 00 00.0
12c	RM #1	ESE	9.344 2.848	24 26
12c	RM #2	S	9.088 2.770	45 00
12c	RM #3	WNW	25.710 7.836	206 18 58

The station mark, reference mark number 1, reference mark number 2 and reference mark number 3 were recovered and found in good condition. A complete and new description follows.  
The station is located on the west side of Kauai Island, about 2.4 miles east of the west end of the Makaha Ridge, about 3.5 miles southwest of the Kokee Park Headquarters and 2.5 miles west of State Highway 55.  
To reach the station from the Kokee Park Headquarters on Kauai Island, go southwest on State Highway 55 for 1.5 miles to a side road right and sign Makaha and Trail number 7. Turn right and go west on the trail road for 0.15 mile to a side road right. Turn right and go north on the trail road for 0.2 mile to a fork. Take the left fork and go north-west for 0.15 mile to a locked gate. (Key may be obtained at the Kokee Park Headquarters) Continue northwest on the trail road for 2.05 miles to the highest point and the station on the right. A four wheel drive truck is required.  
The station mark, a standard disk stamped MAKAHA 1927, is cemented in a drill hole in the top of a small boulder projecting 3 inches above the ground. It is 0.1 mile north of the trail road.  
Reference mark number 1, a standard disk stamped MAKAHA 1 1927, is cemented in a drill hole in the top of a small boulder flush with the ground. It is the same elevation as the station.  
Reference mark number 2, a standard disk stamped MAKAHA 1927, is cemented in a drill hole in the top of a small boulder flush with the ground. It is the same elevation as the station.  
Reference mark number 3, a standard disk stamped MAKAHA 3 1927, is cemented in a drill hole in the top of a small boulder flush with the ground. It is the same elevation as the station.

FORM 3266  
(9-18-68)

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: MAKAHA 2  
ESTABLISHED BY: F.G.E. YEAR: 1927 STATE: Hawaii  
RECOVERED BY: W.S. Simmons YEAR: 1966 COUNTY: Kauai

HEIGHT OF TELESCOPE ABOVE STATION MARK	2	METERS.	HEIGHT OF LIGHT ABOVE STATION MARK	2	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		
LUA 1910	S	9.075 2.766	00 00 00.00		
Reference Mark No. 2	WNW	25.699 7.832	146 13 47		
Reference Mark No. 3	ESE	9.332 2.845	320 54		
Reference Mark No. 1					

The station mark, reference mark No. 1, reference mark No. 2 and reference mark No. 3 were recovered and found to be in good condition. The distances to all three reference marks were verified, as was the direction to reference mark No. 3, but a check was not obtained on the directions to reference marks No. 1 and No. 2. A new description follows:

The station is located on an inconspicuous knoll on Makaha Ridge that has been recently planted with pine trees, about 11 miles north of Kekaha, 8 miles northeast of Bonham Auxiliary Landing Field and 2.2 miles west-northwest of Hawaii State Highway 55.  
To reach the station from the junction of State Highways 50 and 55 at Kekaha, go northerly on State Highway 55 for 15.5 miles to an asphalt road on the left. Turn left and go westerly, downhill, for 2.5 miles. Turn right and go westerly, cross-country, for 0.1 mile to the summit of the knoll and the station.  
The station mark is a standard disk, stamped MAKAHA 1927, cemented in a drill hole in the top of a small boulder that projects 5 inches above the surface of the ground. It is 11-1/2 feet north-northeast of a wooden witness post with sign.  
Reference mark No. 1 is a standard disk, stamped MAKAHA 1 1927, cemented in a drill hole in the top of a small boulder that projects 1 inch above the surface of the ground. It is 14-1/2 feet northeast of a wooden witness post with sign and about the same elevation as the station mark.  
Reference mark No. 2 is a standard disk, stamped MAKAHA 1927, cemented in a drill hole in the top of a small boulder that projects 3 inches above the surface of the ground. It is 3 feet northeast of a wooden witness post with sign and about the same elevation as the station mark.  
Reference mark No. 3 is a standard disk, stamped MAKAHA 3 1927, cemented in a drill hole in the top of a small boulder that projects 2 inches above the surface of the ground. It is 29-1/2 feet northwest of a wooden witness post and sign and about 2-1/2 feet lower in elevation than the 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.

73-P89

(continued on next page)

\*Refers to notes in manuals of triangulation and state publications of triangulation. 1 Direction-angle measured clockwise, referred to initial station.  
1 To nearest meter only, when no trigonometric leveling is being done

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

MAKAHA 2 (continued)

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 221593 STATION 1076

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

FORM 526a  
(10-15-65)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **MAKAHA 2**  
ESTABLISHED BY: **F.G.E.** YEAR: **1927** STATE: **Hawaii**  
RECOVERED BY: **D.M. Whipp** YEAR: **1966** COUNTY: **Kauai**  
Island: **Kauai**

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		DIRECTION			
		FEET	METERS				
AWAA 1910				00	00	00.0	
RM No. 1	ESE	9.333	2.844	47	07	09	
RM No. 2	S	9.074	2.766	121	14	08	
RM No. 3	WNW	25.696	7.832	232	25	49	

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

Station is located about 11 miles north of Kekaha and 2 miles west-northwest of the Kokee Tracking Station, at about 2881 feet elevation, on a prominent point on Makaha Ridge, along the north side of a new macadam road.

To reach station from the post office in Kekaha, go northwest for 0.2 mile; turn right and follow State Highway 55 for 14.8 miles to macadam T-road left. Turn left and follow this road (Makaha Ridge Road) for 2.5 miles; turn right, off of macadam road and go westerly along open flat

area for 0.1 mile to station.

Station mark is a standard disk stamped "MAKAHA 1927", cemented in a drill hole in a 12-inch boulder that projects 3 inches. It is 11.6 feet north of a white witness post and about 90 yards north of macadam road.

Reference mark number one is a standard disk stamped "MAKAHA 1 1927", cemented in a drill hole in a 6-inch rock that projects 1 inch. It is about 6 inches higher than station mark.

Reference mark number two is a standard disk stamped "MAKAHA 1927", cemented in a drill hole in a 10-inch boulder that projects 2 inches. It is 3 feet northeast of the witness post and about 6 inches lower than station mark.

Reference mark number three is a standard disk stamped "MAKAHA 3 1927", cemented in a 6-inch, exposed section of bedrock that projects 2 inches. It is 25 feet east from end of hill and about 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.

USCOMM-DC 37178-P80

FORM 526  
(11-6-65)

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **MAKAHA 2**  
ESTABLISHED BY: **F.G.E.** YEAR: **1927** STATE: **Hawaii**  
RECOVERED BY: **E.H.F.** YEAR: **1971** COUNTY: **Kauai**

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

All marks found in good condition. Previous description by D.M. Whipp is adequate. The open flat area mentioned in the to reach portion of the description is now covered with a new growth of evergreen trees spaced 6-feet apart. After following Makaha Road westerly for 2.5 miles, pack westerly about 500 feet to open unplanted area and station near edge of ridge running about in a north-south direction and about perpendicular to and north of first sharp curve of road west of end of truck travel. It is possible, however, to drive a jeep type vehicle between the trees to station after clearing the brush.

A Type A station with side walls built of concrete tile blocks with a 6x6 foot concrete observing platform about 3½ feet above ground level has been constructed over the station mark as well as a metal target. The station mark is exposed at ground level and accessible for inspection. This work was done on August 12, 1971.

\*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



# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 221593 STATION 1077  
HAWAII  
LATITUDE 22 ° 00' TO 22 ° 30'  
LONGITUDE 159 ° 30' TO 160 ° 00'  
DIAGRAM NF 4-6 KAUAI

NO ORIGINAL TEXT

## ADJUSTED HORIZONTAL CONTROL DATA

Form 526  
(11-8-65)

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

R

NAME OF STATION: Makana  
ESTABLISHED BY: O.B.F. YEAR: 1910 STATE: Hawaii  
RECOVERED BY: D.M. Whipp YEAR: 1965 COUNTY: Kauai  
Island: Kauai

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

Station was identified and is in good condition. Located about 5-1/2 miles west-northwest of Hanalei, at Kailiu Point, on north end of the ridge on west side of Limahuli Stream. Station is a slightly round-topped peak, or spire, of about 1100 feet elevation, with sides rising almost straight up.

NOTE: This peak was intersected again in 1927 and named Flat 1927; both stations are identical.

STATION  
As Seen from vicinity of Station HANALEI,  
looking westward.

\* 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. COMS-DC

NAME OF STATION: MAKANA  
STATE: HAWAII

YEAR: 1910

THIRD ORDER

SOURCE: G-SP156

GEODETIC LATITUDE:	22 13 17.44	ELEVATION:	METERS
GEODETIC LONGITUDE:	159 54 58.12		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ OR $\Delta$ OR ANGLE *
HI 4	5104	471,988.36	141,020.08	- 0 01 53 "

\* 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

Q1 132

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

QUAD 221593 STATION 1078  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 159° 30' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

FORM 525  
(5-18-59)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY  
DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: MAKAW STATE: Hawaii COUNTY: Kauai  
CHIEF OF PARTY: W.S. Simmons YEAR: 1966 DESCRIBED BY: R.M.M.

NOTE.	1b SURFACE-STATION MARK, 7a UNDERGROUND-STATION MARK	HEIGHT OF TELESCOPE ABOVE STATION MARK 3 METERS.1 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	
Desc.	MAKAHA 2 1927		E	22.200	6.767	00 00 00
12c	Cliff (pipe)		WNW	28.590	8.715	0 55 37
12a	Reference Mark No. 2		ENE	19.135	5.833	204 53 02
	Reference Mark No. 1					327 20 05

Detailed description:

The station is 13 miles north of Kekaha, 4.5 miles west of State Highway 55, on Makaha Ridge at the west end of Kauai Island and at the west end of a radar complex.

To reach the station from the junction of State Highway 50 and 55 in Kekaha, go north on State Highway 55 for 15.5 miles to an asphalt road on the left. Turn left and follow the asphalt road down the ridge for 5.1 miles to the end of the road and the station as described.

The station mark, a standard disk stamped MAKAW 1966, is set in the top of a 12-inch round concrete monument which projects 7 inches above the surface of the ground. It is 3.3 feet north-northwest of a 4 by 4-inch white witness post and sign. Note: The underground disk is stamped MAKAW 1966.

Reference mark No. 1, a standard disk stamped MAKAW NO 1 1966, is cemented in a drill hole in outcropping bedrock. It is 19.7 feet east-northeast of the 4 by 4-inch white witness post and sign and is 6 inches higher in elevation than the station mark.

Reference mark No. 2, a standard disk stamped MAKAW NO 2 1966, is cemented in a drill hole in a boulder which projects 6 inches above the surface of the ground. It is 21.4 feet west-northwest of the 4 by 4-inch white witness post and sign and is 3 feet lower in elevation than the station mark.

Cliff, a survey point of undetermined denomination is a 3/4-inch galvanized pipe which projects 4 inches above the surface of the ground.

Note: This area is under construction at this time and is subject to change.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: MAKAW STATE: HAWAII YEAR: 1966 SECOND ORDER

SOURCE: G-13720

GEODETIC LATITUDE: 22° 08' 17.6894	ELEVATION: 453.40 METERS
GEODETIC LONGITUDE: 159° 43' 52.5041	1487.5 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ ± ANGLE °
HI 4	5104	421,730.90	110,824.24	- 0 05 14

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
MAKAHA 2	296 58 31.5	297 03 46	5104

QF 467

\*Refers 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.



# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 221593 STATION 1080  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 159° 30' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

**Mana 2** (Kauai Island, F. G. Engle, 1927).—On western coast of Kauai, 1 mile west of Mana, on a low sand hill about 150 meters south of a pasture fence and near a clump of algeroba trees. Reached by taking the Barking Sands road from Mana and turning left when the road approaches the shore. Station is 42.50 meters from mean high water. Marked according to note 6a, a standard disk being cemented into a 2-inch iron pipe which was found already in place. A pile of rocks was placed around it and the mass cemented together. The rock in which the station and reference marks were set is a light crumbly sandstone. The reference marks, note 12a, standard reference disks in outcropping bedrock, are at the following distances and azimuths from the station: No. 1, 3.959 meters (12.99 feet), 46° 49'; No. 2, 4.335 meters (14.22 feet), 170° 46'.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **Mana 2**  
ESTABLISHED BY: **F.G.E.** YEAR: **1927** STATE: **Hawaii** BENCH MARK(S) ALSO ☐  
RECOVERED BY: **U.S.G.S.** YEAR: **1962** COUNTY: **Kauai**  
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:

Searched for not found, the station could be found was probably destroyed by construction work around Bonham Naval Airfield.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **MANA 2**  
ESTABLISHED BY: **F.G.E.** YEAR: **1927** STATE: **Hawaii** BENCH MARK(S) ALSO ☐  
RECOVERED BY: **D.M. Whipp** YEAR: **1966** COUNTY: **Kauai**  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: **Island: Kauai**

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

Station is gone. A new station, BONHAM 1961, has been established nearby, and a search was made by distance and azimuth from it, but none of the marks of MANA 2 were found.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION **MANA 2**  
STATE **HAWAII** YEAR **1927** SECOND ORDER  
SOURCE **G-SP156**

GEODETIC LATITUDE:	22° 02' 17.002	ELEVATION	5	METERS
GEODETIC LONGITUDE:	159° 47' 20.949	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ OR $\Delta$ $\theta$ ANGLE *
HI 4	5104	402,064.47	74,461.05	- 0 06' 31"

\* 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 *	CODE

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

QUAD 221593 STATION 1081  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 159° 20' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

Form 323b  
(11-6-55)

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

## DESCRIPTION OF ~~XXXXXXXXXXXXXXXXXXXX~~ STATION

NAME OF STATION: MPS-25 Feedhorn

CHIEF OF PARTY: D.J. Florwick YEAR: 1964 STATE: Hawaii COUNTY: Kauai

Description, including sketch of object: The station is located on the Bonham, Auxiliary Landing Field, about 0.5 mile southeast of the main gate and about 0.3 mile northwest of the Pacific Missile Range Headquarters Building.

A traverse connection was made from triangulation station CABLE 1964, distance being 8.3672 meters (27.451 feet) north of station CABLE 1964. The mark is a plain brass disk stamped MPS-25 FEEDHORN 1964, set in the top of a 4-inch round cast iron pipe projecting 10 inches above the ground. The mark is plumbed under the MPS-25 Feedhorn which is projecting 77.161 feet.

Described by \_\_\_\_\_

Comm-DC 34313

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: MPS-25 FEEDHORN

STATE: HAWAII

YEAR: 1967

SECOND

ORDER

SOURCE: G-14044

NO OBSERVATION CHECK ON THIS POSITION

GEODETIC LATITUDE:	22° 01' 55.5812	ELEVATION:	6.85 METERS
GEODETIC LONGITUDE:	159 47 09.1163		22.5 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ OR $\Delta$ OR ANGLE *
HI 4	5104	405,173.68	72,297.41	- 0° 06' 26"

\* 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
POSITION DETERMINED BY TRAVERSE FROM STATION CABLE			
QF 585			

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

QUAD 221593 STATION 1082  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 159° 30' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

## ADJUSTED HORIZONTAL CONTROL DATA

DESCRIPTION OF ~~STATION~~ <sup>TRAVERSE</sup> STATION

NAME OF STATION: MPS 26 Radar

CHIEF OF PARTY: F.L. Jeffries YEAR: 1968 STATE: Hawaii COUNTY: Kauai

Description, including sketch of object: From the main gate of the Barking Sands Pacific Missile Range Facility, go south on Nohili Road South for 0.2 mile to Pala Place. Turn left and go east on Pala Place for 0.05 mile to Kalanamahiki Place South. Turn right and go south on Kalanamahiki Place South for 0.2 mile to Lalana Place. Turn right and go west on Lalana Place for 0.1 mile. Turn left and go south on an asphalt road for 0.1 mile to the station, near the center of a large asphalt area.

MPS 26 Radar is an 8-foot, white-painted mesh dish, mounted on the roof of van No. 97-17990, which is parked near the center of the asphalt area, on the west side of a cable rack.

A connection was made to triangulation station BARK 1964, distance being 56.610 meters (185.728 feet) northeast of station BARK.

Tangents were observed on the pedestal of the radar.

NAME OF STATION: MPS 26 RADAR

STATE: HAWAII

YEAR: 1968

SECOND

ORDER

SOURCE: G-14107

NO OBSERVATION CHECK ON THIS POSITION

GEODETIC LATITUDE:	22° 01' 41.55217	ELEVATION:	9	METERS
GEODETIC LONGITUDE:	159 47 08.71875	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ HOR $\Delta$ $\theta$ ANGLE *
HI 4	5104	403,208.44	70,881.69	- 0° 06' 26"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE
POSITION DETERMINED BY TRAVERSE FROM STATION BARK			

QF 613

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

QUAD 221553 STATION 1083  
HAWAII  
LATITUDE 22 ° 00' TO 22 ° 30'  
LONGITUDE 159 ° 30' TO 160 ° 00'  
DIAGRAM NF 4-6 KAUAI

Form 555b  
(11-8-58)

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

## TRAVERSE

### DESCRIPTION OF ~~STATION~~ STATION

NAME OF STATION: MPS 26 RADAR 323102

CHIEF OF PARTY: W.S. Simmons YEAR: 1966 STATE: Hawaii COUNTY: Kauai

Description, including sketch of object: 6.55 miles northwest along State Highway 50 from the junction with State Highway 55 at Kekaha, thence 0.4 mile west along the left fork to the main gate at Bonham Auxiliary Landing Field, thence 0.8 mile south along an oiled road, thence 0.1 mile west along an oiled road, thence 0.05 mile south along an oiled road, in a paved parking area, 53 feet west of a machine shop, 29 feet north of a generator, 15.5 feet east of an electric outlet. The mark is plain brass disk, stamped MPS 26 RADAR 1966, set in the top of a small concrete plug that is flush with the surface of the asphalt.

A traverse connection was made to traverse station MPS 26 RADAR 323101 1965, distance being 12.8687 meters (42.220 feet) northeast of traverse station MPS 26 RADAR 323101 1965.

Described by .....

Comm-DC 34813

### ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: MPS-26 RADAR 323102

STATE: HAWAII

YEAR: 1966

SECOND

ORDER

SOURCE: G-13724

NO OBSERVATION CHECK ON THIS POSITION

GEODETIC LATITUDE:	22 ° 01' 42.4861	ELEVATION	9	METERS
GEODETIC LONGITUDE:	159 47 08.2316	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ OR $\Delta$ or ANGLE °
HI 4	5104	403,254.45	70,975.84	- 0° 06' 26 "

\* 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
	° ' "	° ' "	

POSITION DETERMINED BY TRAVERSE FROM STATION MPS-26 323101

QF 470



# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 221593 STATION 1084  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 159° 30' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

Form 525b  
(11-8-85)

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

## TRAVERSE

### DESCRIPTION OF ~~TRIANGULATION~~ STATION

NAME OF STATION: MW ANT DISH

CHIEF OF PARTY: Phillip C. Johnson YEAR: 1967 STATE: Hawaii COUNTY: Kauai

Description, including sketch of object:

15.5 miles north along State Highway 55 from the junction of State Highway 50 and 55 in Kekaha, thence 5 miles west down the ridge on an asphalt road.  
A traverse connection was made to triangulation station ADOBE, distance being 19,012 meters (62,376 feet) north of triangulation station ADOBE. The mark is a plain bronze disk set in the top of a mass of concrete. It is 1 foot south of the south side of a triangular shaped tower which is located near the west corner of the communications building. This point is plumbed directly under the center of the gray micro-wave dish.

Described by .....

COM-DC 3431

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: MW ANT DISH

STATE: HAWAII

YEAR: 1967

SECOND

-ORDER

SOURCE: G-13403

NO OBSERVATION CHECK ON THIS POSITION

GEODETIC LATITUDE:	22° 08' 11.7616	ELEVATION:	469.02 METERS
GEODETIC LONGITUDE:	159° 43' 48.7226		1538.8 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ OR $\Delta$ OR ANGLE *
HI 4	5104	422,085.52	110,225.53	- 0° 05' 12"

\* 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
POSITION DETERMINED BY TRAVERSE FROM STATION ADOBE			

QF 520

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 221593 STATION 1085  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 155° 30' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

Na (Kauai Island, O. B. French, 1910).—In northwest part of Kauai, on a low summit of the ridge which runs north through the Na Pali district. Approached by a trail leading along the ridge over numerous hills from the main trail along the Kaunuuohua Ridge; the trail leaves this latter on the easterly of the three summits called Pihea about 250 meters east of the station. Station marked by a ¾ by 15 inch iron rod driven flush with the surface of the ground (clay), from which moss, roots, and humus had been stripped. Reference marks were established as follows: No. 1, iron rod ¾ by 15 inches driven into cleared ground with 2 inches projecting; it is 1.3 feet from station, in azimuth 225°; No. 2, nail driven into a nearly vertical cut in large lihue root at edge of cleared spot, 3.5 feet, 91°; No. 3, five nails driven into smoothed-off top of 10-inch lihue stump 3½ feet from ground, 9.4 feet, 19° 59'.

(11-8-66)

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: NA  
ESTABLISHED BY: O.B.F. YEAR: 1910 STATE: Hawaii  
RECOVERED BY: D.M. Whipp YEAR: 1966 COUNTY: Kauai  
Island: Kauai

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

Original station mark and reference mark 1, both iron rods, were recovered in good condition. Station rod was removed and station re-marked with a standard disk; the rod was used for reference mark 2. A complete description follows:

Station is located in the northwest part of Kauai, about 4 miles air-line northeast of Kokee Park Headquarters, on a point of about 4040 feet elevation on a narrow winding ridge that runs northerly from the main Kaunuuohua Ridge, beginning at the second peak east from station PIHEA. It is about 500 feet north of a prominent, and slightly higher, tree-covered peak, and is on the small point where the ridge line makes a turn from north to northwest, leading towards station EX. The vegetation and humus were stripped from the point when the station was set in 1910 and an 8 x 12-foot patch still remains free of vegetation, although it now has an 8-inch layer of brown humus on the clay soil.

To reach station from the Kokee Park Headquarters, go north on paved road for 2.5 miles; take right fork at radar station and go 0.2 mile to dirt right fork at entrance to Kalalau Lookout parking area. Take this right fork (a 4-wheel-drive vehicle is required) and go 2.0 miles to end of road. From here pack easterly on trail for about 1/4 mile to station PIHEA; continue on trail about 1/4 mile, to top of second peak. Leave trail, going to left down along ridge line, (difficult to find) cross saddle and follow along the narrow winding ridge line for about 2 miles to station 500 feet after reaching the higher peak. A 2-1/2-hour pack after trail is cleared; about 2 days required to clear trail through dense uluhi fern and brush.

Station mark is a standard disk stamped "NA 1910 1966", riveted to the top of a 1-inch iron pipe set in cement and projecting 4 inches, at the center of the 8 x 12-foot bare patch.

Reference rod # 1 is a 3/4-inch diameter iron rod, flush with clay surface beneath 8-inch humus layer.

Reference rod # 2 is a 3/4-inch iron rod, 15 inches long, driven into the ground with 2 inches projecting. It is 5 feet east of trail, at entrance to the bare patch.

	Reference rod # 1	Reference rod # 2	meters	feet	NE	NW	Azimuth
			0.396	1.300			225°
			1.595	5.233			126°

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: NA  
STATE: HAWAII YEAR: 1910 SECOND ORDER  
SOURCE: G-SP156

GEODETIC LATITUDE	22° 10' 15.549	ELEVATION, SCALED	1221 METERS
GEODETIC LONGITUDE	159 36 44.085		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	8 (OR Δ) ANGLE °
HI 4	5134	462,018.49	123,075.53	- 0° 02' 33"

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE 8 (OR Δ) FORMULA NEGLECTING THE SECOND TERM.

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

QI 024

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 221593 STATION 1086  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 159° 30' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

**Niha 2** (Kauai Island, F. G. Engle, 1927).—On north coast of Kauai, on west side of Wainiha Bay, on a sandy point named Kepuhi, about 1 mile northwest of the village of Wainiha, and ¼ mile from the government highway. Station is about 10 meters from high-water line and is marked by a standard disk station mark driven in the top of a wooden post which projects 1 foot above surface. Reference mark No. 1 is a standard disk set in top of a wooden post which projects 1 foot above ground; it is 5.626 meters (18.46 feet) from station in azimuth 148° 26'. Reference mark No. 2, a standard reference disk in bowlder, note 12c, is 3.934 meters (12.91 feet) from station in azimuth 253° 46'.  
RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: NIHA 2  
ESTABLISHED BY: F.G.E. YEAR: 1927 STATE: Hawaii  
RECOVERED BY: D.M. Whipp YEAR: 1965 COUNTY: Kauai

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 where it was located was determined by angle check, using HINIHINI, HANAIEI and inverse azimuth to Staff 1927. The sand beach has worn away a few feet inland from this point and as both reference marks were seaward from station they are also gone.

\* 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. COMS-DC 34314

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: NIHA 2

STATE: HAWAII

YEAR: 1927

THIRD

—ORDER

SOURCE: G-SP156

GEODETIC LATITUDE:	22° 13' 34".141	ELEVATION:	2 METERS
GEODETIC LONGITUDE:	159° 32' 55".767	SCALED	FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ OR $\Delta$ OR ANGLE *
HI 4	5104	483,485.31	142,700.39	- 0 01' 07"

\* 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

Q1 131

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

QUAD 221593 STATION 1087  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 159° 30' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

**Nohili** (Kauai Island, O. B. French, 1910).—On west coast of Kauai, on the highest summit of the sand ridge where the shore line turns from north to northeast. The station is near the old Hawaiian Government Survey station, the 1-inch pipe marking the latter having been pulled out or undercut and drifted loose. This pipe was driven in to mark the new station. In 1910 the old Barking Sands flag was still standing on a summit about 100 meters to the south. Reference marks were set as follows: No. 1, cross cut in stone set in the sand, distance 38.8 feet, azimuth 17° 14'; No. 2, cross cut in stone set in the sand, 27.4 feet, 83° 07'; No. 3, cross cut in stone set in the sand, 20.9 feet, 207° 00'. In 1927 a 2-inch pipe found in the vicinity, but not on highest point of sand dune, proved not to be original station. No reference marks were found. A new station was established over the 2-inch pipe and called *Nohili 2* (see description thereof).

### ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: NOHILI

STATE: HAWAII

YEAR: 1910

THIRD

ORDER

SOURCE: G-SP156

GEODETIC LATITUDE:	22° 04' 01.678	ELEVATION:	24	METERS
GEODETIC LONGITUDE:	159 47 06.990	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\beta$ OR $\Delta$ G: ANGLE *
HI 4	5104	403,397.52	85,021.32	- 0° 06' 26 "

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

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

QI 173



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

QUAD 221593 STATION 1089  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 159° 30' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

FORM 223  
(9-18-69)

U. S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: OHAIULA

STATE: Hawaii

COUNTY: Kauai

CHIEF OF PARTY: D.J. Florwick

YEAR: 1964

DESCRIBED BY: K.R.

NOTE	HEIGHT OF TELESCOPE ABOVE STATION MARK 1 METERS.1		HEIGHT OF LIGHT ABOVE STATION MARK 1 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 FEET METERS	DIRECTION1
	KOLO			00 00 00.00
12a	Reference Mark No. 1	E	23.939	111 04 58
	Bonham ALF Control Tower	SW	(Approx. 3 miles)	233 03 03.3
12a	Reference Mark No. 2	WSW	46.296	238 20 22

Detailed description:

The station is located on the west end of Mana Ridge, which is part of a prominent mesa on the west side of Kauai Island. It is about 2 miles east of the Sandia Corporation's Barking Sands Missile Site.

To reach the station from the junction of State Highways 50 and 55 in Kekaha, go northerly on State Highway 55 for 12.8 miles to a dim bladed road on the left, opposite a paved road leading to a microwave site. Turn left and go downhill for 0.15 mile to a locked wooden gate. Pass through gate and continue on the bladed road for 2.25 miles to another locked wooden gate. Pass through gate and continue on the bladed road for 0.7 mile to a fork. Take the left fork and continue on the main road for 0.4 mile to a very dim road on right. Take the left fork and continue on the main road for 2.8 miles to a level area between two low, brush-covered hills and a point where the jeep trail becomes very dim and difficult to follow. From here, go westerly through heavy brush for 0.85 mile to the edge of the bluff and the station mark.

The station mark is a standard disk, stamped OHAIULA 1964, set in the top of a 5-inch cement-filled cast iron sewer pipe that projects 10 inches above the surface of the ground. It is about 100 feet east of the bluff and on ground that slopes slightly to the west. There are three ridges visible to the north of the station, the nearest being about 0.1 mile. The station overlooks Mana Village to the southwest and some prominent sand dunes at Barking Sands Beach to the west. There is an old survey target about 0.1 mile to the southwest, but is not visible from the station.

Reference Mark No. 1 is a standard disk, stamped OHAIULA NO 1 1964, cemented in a drill hole in outcropping bedrock that projects about 4 inches above the surface of the ground. It is about 1½ feet higher in elevation than the station mark.

Reference Mark No. 2 is a standard disk, stamped OHAIULA NO 2 1964, cemented in a drill hole in outcropping bedrock that is flush with the surface of the ground. It is about 3½ feet lower in elevation than the station.

A 4-wheel drive vehicle is required to reach the station.

Keys to the locked gates may be obtained from Mr. Sakai Koike, chief of the survey department of the Kekaha Sugar Company in Kekaha.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: OHAIULA

STATE: HAWAII

YEAR: 1964

SECOND

ORDER

SOURCE G-13403

GEODETIC LATITUDE: 22° 03' 12.0433	ELEVATION: 306 METERS
GEODETIC LONGITUDE: 159° 45' 21.6130	SCALED FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	B FOR Δ B1 ANGL1 *
HI 4	5104	413,301.32	79,995.15	- 0° 05' 46"

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE B FOR Δ B1 FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE
BONHAM	63 39 21.4	63 45 07	5104

QF 413

\*Refers to notes in manuals of triangulation and state publications of triangulation. 1 Direction-angle measured clockwise, referred to INITIAL station.  
! To nearest meter only, when no trigonometric leveling is being done.

(continued on next page)



# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 221593 STATION 1089

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

OHAULUA (continued)

## RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: OHAULUA  
ESTABLISHED BY: D.J.F. YEAR: 1964 STATE: Hawaii BENCH MARK ALSO ☐  
RECOVERED BY: D.J. Florwick YEAR: 1965 COUNTY: Kauai  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 6-1/2 miles north-northwest  
HEIGHT OF TELESCOPE ABOVE STATION MARK FEET. HEIGHT OF LIGHT ABOVE STATION MARK FEET.

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
MPS 25 OPTICAL TARGET 324102				00 00' 00.0
Reference Mark No. 2	WSW	46.300	14.112	72 13 13
Reference Mark No. 1	E	23.940	7.298	304 57 05

The station mark, reference marks No. 1 and No. 2 were recovered and were found to be in good condition. The distances and directions to the reference marks were checked in the field and were found to be adequate.

The station is on the west side of Mana Ridge, which is a prominent ridge on the west side of Kauai Island. It is about 6-1/2 miles north-northwest of Kekaha, 5 miles west of State Highway 55 and 2-1/2 miles east of the Pacific Ocean.

To reach the station from the post office in Kekaha, go west on the

main street for 0.2 mile to the junction of State Highway 55. Turn right, north, on State Highway 55 for 11.85 miles to a side road left. Turn left, west, on a bladed road and Trail No. 2 for 0.15 mile to a locked gate. Pass through the gate and continue westerly on Trail No. 2 for 1.1 miles to a fork. Turn right, westerly, on a bladed road for 1.05 miles to another locked gate. Pass through the gate and continue west on bladed road for 2.8 miles to a fork. Take the left fork, west, on the bladed road for 0.7 mile to a dim fork. Take the left fork, south-west and west on the bladed road for 1.3 miles to where the road turns north. Turn right, north, staying on the bladed road for 0.1 mile to the station on the right side of the road. This is a 4-wheel drive station and keys to the locked gates may be obtained from the Kekaha Sugar Company in Kekaha.

The station mark is a standard disk, stamped OHAULUA 1964, set in the top of a 5-inch cement-filled cast iron pipe that projects 7 inches above the surface of the ground. It is 23 feet northeast of the center of a bladed road and 12 feet southwest of the center of a track road.

Reference mark No. 1 is a standard disk, stamped OHAULUA NO 1 1964, cemented in a drill hole in outcropping bedrock that projects 4 inches. It is 44 feet east of the center of a bladed road and 14 feet southeast of the center of a track road.

Reference mark No. 2 is a standard disk, stamped OHAULUA NO 2 1964, cemented in a drill hole in outcropping bedrock that is flush with the surface of the ground. It is 15-1/2 feet west of the center of a bladed road.

\* 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.

C&GS-5264 (6-24-64)  
NA-DC 8991-P64

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: OHAULUA  
ESTABLISHED BY: D.J.F. YEAR: 1964 STATE: Hawaii  
RECOVERED BY: D.M. Whipp YEAR: 1966 COUNTY: Kauai  
Island: Kauai

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
BONHAM 1961				00 00' 00.0
RM No. 1	ESE	23.930	7.294	231 24 17
Bonham, Auxiliary Landing Field, Control Tower (center) 1964	SW			353 22 05.5
RM No. 2	WSW	46.301	14.113	358 39 33

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

Station is located about 6-1/2 miles airline north-northwest of Kekaha and 2 miles northeast of Bonham Airbase, on the extreme south-west end of Mana Ridge, overlooking the canefields to the west.

To reach station from the junction of State Highways 50 & 55 in Kekaha, follow State Highway 55 northerly, winding upgrade for 12.3 miles to a side road left and sign "TRAIL NO. 2", opposite Puu Ka Pele. Go left for 0.2 mile to locked board gate. Pass through gate and continue

for 2.2 miles to second locked board gate. Pass through and continue for 0.7 mile to fork. Keep ahead, on left fork, for 0.4 mile to dim side road right. Keep ahead for 0.7 mile to fork. Take left fork for 1.3 miles to fork. Take left fork and follow bladed road along left side of open, brush-covered ridge for 0.9 mile to station on right at T-junction of track roads.

Station mark is a standard disk stamped "OHAULUA 1964" set in the top of a cement-filled, 5-inch, cast-iron pipe projecting 7 inches. It is about 75 feet east-northeast of ridge end and in southeast angle of T-junction, 18-1/2 feet northeast of centerline of main track road.

Reference mark number one is a standard disk stamped "OHAULUA NO 1 1964", cemented in a drill hole in a 16-inch boulder that projects 7 inches above ground. It is 1-1/2 feet higher than station mark.

Reference mark number two is a standard disk stamped "OHAULUA NO 2 1964", cemented in a drill hole in a small outcropping section of a boulder flush with ground. It is 16 feet southwest of center line of main track road and 3 feet lower than station mark.

NOTE: Key for locked gates may be obtained at the office of the Kekaha Sugar Company in Kekaha.

A 2-wheel-drive vehicle may now be driven to the station, however a 4-wheel-drive vehicle would be necessary in wet weather.

## RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: OHAULUA  
ESTABLISHED BY: D.J.F. YEAR: 1964 STATE: Hawaii  
RECOVERED BY: E.H.F. YEAR: 1971 COUNTY: Kauai

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

A Type A structure has been built over the station mark with side walls of concrete tile and 36-inches high to top of 6' x 6' observing concrete platform. A red and white metal target is over the station and station mark is exposed at ground level.



# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 221593 STATION 1090  
HAWAII  
LATITUDE 22 ° 30' TO 22 ° 30'  
LONGITUDE 159 ° 30' TO 160 ° 00'  
DIAGRAM NF 4-6 KAUAI

## NO ORIGINAL TEXT

Opae (Kauai Island, O. B. French, 1910; F. G. Engle, 1927).—In the western uplands of Kauai, on Puu Opae. Station may be reached by traveling Knutzen's old wagon road, which starts near a shack west of the Knutzen estate and goes up the Pulehu Ridge, and ends at the new Puu Ka Pele macadam road about 1 mile south of Puu Ka Pele. With truck it is best to leave the truck where this road joins the public road, 1 mile south of Puu Ka Pele, hike along the old road to Opae, and afterwards continue south and meet the truck at the lower end of the road near Knutzen's. Station is identical with old Government survey station "Puu Opae," the original mark for which was said to be a 3-inch galvanized iron pipe set in cement and surrounded by a cairn of stones. In 1910 the mark at center was a small stone with cross in center set between four larger stones which project 8 inches above the surface. In 1927 a standard disk station mark was set directly over the cross in the center stone and three of the four surrounding stones, being recovered, were cemented into the station. In 1927 standard reference disks were cemented into the crosses in the rocks which formed the earlier reference marks. They are at the following distances and azimuths from the station: No. 1, 6.257 meters (20.53 feet), 75° 59'; No. 2, on opposite side of fence which crosses hill just south of station, 11.036 meters (36.21 feet), 355° 12'; No. 3, 3.451 meters (11.32 feet), 258° 55'.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: OP AE

STATE: HAWAII

YEAR: 1910

SECOND

ORDER

SOURCE: G-SP156

GEODETIC LATITUDE:	22 ° 02 ' 22.593	ELEVATION:	653.0 METERS
GEODETIC LONGITUDE:	159 42 34.616		2142 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ ° OR Δ ° ANGLE *
HI 4	5104	429,004.39	74,981.23	- 0 04 43

\* 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
OHAUULA	107 37 45.2	107 42 28	5104

Q1 032

(continued on next page)

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 221593 STATION 1090

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

OPAE (continued)

FORM 526a  
(2-18-69)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: OPAE  
ESTABLISHED BY: O.B.F. YEAR: 1910 STATE: Hawaii  
RECOVERED BY: Walter R. Helm YEAR: 1961 COUNTY: Kauai

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
CORAL 1927	E	11.265	3.434	0 00 00.0
RM 3	S	36.126	11.013	185 06 52
RM 2				281 20 51

The station mark and reference mark 3 were recovered and found to be in good condition. Reference mark 1 has been destroyed. Reference mark 2 has been damaged, the disk has been broken out and was not found, but the original cross in the rock was recovered. A new description follows:

The station is located on Puu Opa Mountain. It is 5 miles, air line, east of the west coast of Kauai Island, 4-3/4 miles, air line, north of Kekaha, 4 miles, air line, east of Mana, and 1-1/2 miles, air line, northwest of State Highway 55.

To reach the station from the junction of State Highways 50 and 55 in Kekaha, go northerly on State Highway 55 for 6.1 miles to a dirt road left. Turn left and follow the road northwesterly for 3.1 miles to a reverse Y-fork. Continue straight ahead for 0.2 mile to a fork. Turn left and go about 150 feet to a dim track road right and end of 2-wheel drive travel. Turn right and go up the mountain along the track road for 0.3 mile to the end of truck travel. Pack westerly along dim trail to highest point and the station. A 10 minute pack.

The station mark, a standard disk stamped OPAE 1927, is set in the top of a mass of concrete which is flush with the ground. The mark is surrounded by an 8-foot square concrete platform which has a 2-foot monument built over the mark. The monument has a 2-inch opening down through it which allows for optical plumb, but is too small to be plumbed with a plumbob. There is a slot running under the monument.

Reference mark 2 is a chiseled cross in the top of a 3-foot boulder. Reference mark 3, a standard disk stamped OPAE 3 1927, is cemented in the top of an 8-inch concrete slab secured to the top of a boulder. The boulder projects 6 inches above the ground.

\*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.

C 27179-P88

FORM 526a  
(2-18-69)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: OPAE  
ESTABLISHED BY: O.B.F. YEAR: 1910 STATE: Hawaii  
RECOVERED BY: W.R. Porter YEAR: 1964 COUNTY: Kauai

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
CORAL				00 00 00.0
R.M. No. 3	ENE	11.271	3.436	185 07 22
R.M. No. 2	S	36.119	11.009	281 19 55
Kekaha, U.S. Army Training Station, Radio Mast, Center and highest 1 of 9	SW	5	miles	323 29 50.4

Station mark and reference mark number three were recovered and found in good condition. The chiseled cross marking reference mark number two was recovered; the disk is gone and the drill hole has been filled with cement. Reference mark number one has been destroyed, probably by construction, as there are some old concrete foundations and the remains of a large wooden tower at the station. A complete description follows:

Station is located, airline, about 6 miles north-northwest of Waimea

village and 4 miles due east of old Mana village, on the summit of a timbered hill of 2147 feet elevation known as Puu Opa.

To reach station from the junction of State Highways 50 & 55 at Kekaha, go northerly on State Highway 55 for 6.0 miles to a graded side road left. Turn left, passing a hunter checking station, and go 3.0 miles to a reverse-Y. Continue ahead, downgrade, for 0.2 mile to a fork with wooden gate on right fork. Take left fork for about 50 yards to a dim jeep road on the right. (4-wheel drive vehicle is necessary). Go up this old road for 0.25 mile to end of road on hillside. Pack up along dim trail along left side of ridge line and along fence line for about 200 yards to station.

Station mark is a standard disk stamped "OPAE 1927", set in concrete. There is a "Type B", Hawaii Territory Survey signal centered over the mark, with the 6-foot-square concrete platform about 1 foot above ground and a red and white metal target extending 8 feet above the floor. Station mark is 15 feet north of a fence line.

Reference mark number two is a 4-inch, chiseled cross, with a cement-filled drill hole at its center, in the top of a 4-foot boulder that projects 3 feet above ground. It is located in an open, gray dirt area, 24 feet south of the fence line and about 1-1/2 feet lower than station.

Reference mark number three is a standard disk stamped "OPAE 3 1927", set in the top of a 12-inch-diameter mass of concrete and small stones that is secured to the top of a 3-foot boulder that projects 1 foot above ground. It is 12 feet north of the fence line and at about the same elevation as the station.

\*Name of chief of party should be inserted here. The officer who actually visited the station of the recovery note.

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

USCOMM-DC 27179-P88

(continued on next page)

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

OPAE (continued)

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 221593 STATION 1090  
LATITUDE ° ' TO ° '  
LONGITUDE ° ' TO ° '  
DIAGRAM

FORM 526a  
(8-18-68)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: OPAE  
ESTABLISHED BY: O.B.F. YEAR: 1910 STATE: Hawaii  
RECOVERED BY: D.J. Florwick YEAR: 1964 COUNTY: Kauai

HEIGHT OF TELESCOPE ABOVE STATION MARK 2 METERS.		HEIGHT OF LIGHT ABOVE STATION MARK 2 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	
CORAL 1927				00 00 00.00
Bonham ALF Control Tower	W	(Approx. 4.5 miles)		12 04 00.4
Reference Mark No. 3	E	11.289	3.441	185 06 01
Reference Mark No. 4	S	36.116	11.007	281 19 43

The station mark and reference mark No. 3 were recovered and found to be in good condition. The drill hole that was used as reference mark No. 2 was recovered and a new reference disk cemented in it by this party. A new and complete description follows:

The station is about 6 miles north-northwest of Waimea and 4 miles east of Mana Village, on the timbered summit of a hill of 2147 feet elevation known as Puu Opa.

To reach the station from the junction of State Highways 50 and 55 in Kekaha, go northerly on State Highway 55 for 6.0 miles to a bladed road on left. Turn left, passing a hunter checking station and go 3.0 miles to a triangular intersection with a

road on the right. Continue straight ahead and go downgrade for 0.2 mile to a fork. Take the left fork for about 50 yards to a dirt track road on right. Turn right and go uphill, through thick brush for 0.25 mile to the end of the road on the hillside. Pack up dirt trail along the left side of the ridge, parallel to fence, for about 200 yards to the station.

The station mark is a standard disk set in concrete and recessed in the center of a 6-foot square concrete slab. There is a truncated pyramid 2 feet high over the mark, with a hole in the center to support an 8-foot metal target. The mark is 22 feet east-northeast of the concrete base of an old wooden tower, 15 feet north-northwest of a fence and 6 feet southeast of a mass of concrete with an inscription in it referring to Pearl Harbor. It was not possible to ascertain the stamping on the disk.

Reference mark No. 3 is a standard disk, stamped OPAE 3 1927, set in the top of a mass of concrete and small stones adhering to the top of a boulder that projects about 1 foot above the surface of the ground. It is 11 feet north-northwest of the fence and about the same elevation as the station.

Reference mark No. 4 is a standard disk, stamped OPAE NO 4 1964, cemented in a drill hole in the top of a boulder that projects about 2 feet above the surface of the ground. It is in a gray, bare area, 22 feet south-southeast of the fence and about the same elevation as the station.

A 4-wheel drive vehicle is required to reach the station.

\*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-P88

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: OPAE  
ESTABLISHED BY: O.B.F. YEAR: 1910 STATE: Hawaii BENCH MARK(S) ALSO ☐  
RECOVERED BY: D.M. Whipp YEAR: 1966 COUNTY: Kauai  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Kauai

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

Station was recovered as described in 1964 and all marks found in good condition. Distance and angle to both reference marks were checked and coincided very closely with the 1964 measurements.

OBJECT	BEARING	DISTANCES	DIRECTION
OHAUUA 1964			
Reference mark No. 3	ESE	11.268 ft., 3.435 m.	00 00 00.0
Makawili mill chimney 1910-1926	SE		221 19 58.0
Reference mark No. 4	S	36.115 ft., 11.008 m.	247 29 53

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: OPAE  
ESTABLISHED BY: O.B.F. YEAR: 1910 STATE: Hawaii BENCH MARK(S) ALSO ☐  
RECOVERED BY: F.L. Jeffries YEAR: 1968 COUNTY: Kauai  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 4 miles east of Mana

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

The station mark, reference mark No. 3 and reference mark No. 4 were recovered and found in good condition. The horizontal distance and direction to both reference marks were checked and verified. The 1964 description is adequate with the exception that there is now a locked gate in route to the station and the key may be obtained from the Kekaha Sugar Company in Kekaha.

FORM CGS-526 (8-68)  
USCOMM-DC 26496-P88

U.S. DEPARTMENT OF COMMERCE  
ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION  
COAST AND GEODETIC SURVEY

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 221593 STATION 1091  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 159° 30' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

**Pali** (Kauai Island, O. B. French, 1910).—In northwest Kauai, on middle of three sharp peaks at the edge of the Wainihi Pali, about ¼ mile north of the east end of the Kaunuuohua Ridge. Station is on highest part of summit at its north side, and is approached by trail from east end of Kaunuuohua Ridge across an open marshy spot, thence up over the first peak. These peaks along the "pali" are all covered with an exceedingly dense and tangled mat of lihue and other underbrush. Marked by a bottle set in the ground with neck flush with the clay surface from which the humus and roots have been cleared. Reference marks are as follows: No. 1, a ¾ by 15 inch iron rod driven in cleared ground, with 2 inches projecting. It is 1.6 feet from station in azimuth 177°; No. 2, similar to No. 1, distant 2.6 feet azimuth 19½°.

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PALI  
ESTABLISHED BY: O.B.F. YEAR: 1910 STATE: Hawaii  
RECOVERED BY: D.M. Whipp YEAR: 1966 COUNTY: Kauai  
Island: Kauai

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
Reference rod No. 1	SW	1.639	0.500	50 00
Reference rod No. 2	ESE	2.548	0.777	257 00
Reference bottle No. 3	SE	2.158	0.658	309 00

Station was recovered and all marks found in good condition, although the azimuths to both reference rods were found to be in error. The station was re-marked with a standard disk, and the old bottle was set for an additional reference mark. A complete description follows:

Station is located in northwest Kauai, about 6-1/2 miles southwest of Hanalei, along Wainiha Ridge, about 1/4-mile north of its junction with Kaunuuohua Ridge, and about 200 yards north of a large, prominent, bare area in saddle, on the middle one of 3 closely-grouped points on an extremely narrow, rugged part of the ridge. The point is covered with brush and small trees.

To reach station from the Kokee Park Headquarters, go north on main road for 0.35 mile; take gravel side road right, at sign "MOHIHI 6.2 MILES", and go 0.7 mile; take right fork and go 0.4 mile; take left fork at sign "MOHIHI 5.1 MILES" and go 0.3 mile; take left fork and go 0.05 mile; take right fork at sign "MOHIHI 4.7 MILES" and go 1.5 miles; take left fork at sign "ALAKAI SWAMP TRAIL 1/4" and follow old road for 0.9 mile to end of road at a telephone pole. Pack easterly on trail along old telephone line about 2 miles to milepost # 3. Here leave trail and go due north, clearing trail through brush, down across shallow canyon and then up onto ridge, about 1/2-mile, to station after crossing bare area. About a 2-hour pack.

Station mark is a standard disk stamped "PALI 1910 1966", secured to the top of a 1-inch iron pipe that is set in cement and projects 3 inches from ground. It is in the center of a small bare patch.

Reference rod number one is a 3/4-inch-diameter iron rod that projects 1 inch from ground. It is at southwest end of the bare patch and at same elevation as station.

Reference rod number two is a 3/4-inch-diameter iron rod that projects 2 inches from ground and is at same elevation as station.

Reference bottle number three is a 1-quart bottle, set with the neck projecting 3 inches from ground.

NOTE: 4-wheel-drive vehicle required for last mile of road travel.

\*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 37173-P89

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: PALI  
STATE: HAWAII YEAR: 1910 SECOND -ORDER

SOURCE: G-SP156

GEODETIC LATITUDE: 22° 05' 57.297	ELEVATION: 1250 METERS
GEODETIC LONGITUDE: 159° 36' 00.243	SCALED FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ ± ANGLE °
HI 4	5104	466,137.89	120,627.20	- 0 02 16 "

\* 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

Q1 019

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

QUAD 221553 STATION 1092  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 159° 30' TO 160° 30'  
DIAGRAM NF 4-6 KAUAI

FORM 525  
(10-15-65)

U. S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: PEACH STATE: Hawaii COUNTY: Kauai  
CHIEF OF PARTY: P.C. Johnson YEAR: 1967 DESCRIBED BY: J.E.S.

NOTE*	HEIGHT OF TELESCOPE ABOVE STATION MARK SURFACE-STATION MARK, UNDERGROUND-STATION MARK	METERS, I	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
1b				
7a				
	OBJECT	BEARING	DISTANCE FEET METERS	DIRECTION
	PEAR			
11b	Reference Mark No. 1	E	34.50 10.517	00 00 00.00
11b	Reference Mark No. 2	S	40.65 12.390	250 00 44
	R.M. 1 to R.M. 2		54.58 16.635	342 43 01

The station is located at the Barking Sands Pacific Missile Range Facility, in a large fenced compound controlled by the Sandia Corporation, about 2.25 miles north of the control tower, 0.5 mile northeast of the beach and 0.2 mile west of the east boundary of the base.

To reach the station from the Main Gate of the Barking Sands Pacific Missile Range Facility, go north on an asphalt road for 2.05 miles to the Sandia Corporation Headquarters. Turn right and go northwest, around the east corner of a small fenced area, for 0.2 mile to a "T" intersection within a larger fenced area. Turn right and go northeast on an oiled road for 0.15 mile to the station, atop a low knoll on the left.

The station mark is a standard disk, stamped PEACH 1967, set in the top of a 12-inch diameter concrete post that is about 5 inches below ground level. It is 176-1/2 feet north of a large metal building, 127-1/2 feet southwest of the center of a dirt road and 45 feet northwest of the center of the oiled road.

Reference mark No. 1 is a standard disk, stamped PEACH NO 1 1967, set in the top of a 12-inch diameter concrete post that is flush with the surface of the ground. It is 103 feet southwest of the center of a dirt road and 20 feet northwest of the center of the oiled road.

Reference mark No. 2 is a standard disk, stamped PEACH NO 2 1967, set in the top of a 12-inch diameter concrete post that is flush with the surface of the ground. It is 135 feet north of the large metal building and 19 feet northwest of the center of the oiled road.

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PEACH  
ESTABLISHED BY: P.C. Johnson YEAR: 1967 STATE: Hawaii BENCH MARK(S) ALSO ☒  
RECOVERED BY: U.S. Navy YEAR: 1971 COUNTY: Kauai  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: At the Barking Sands Pacific Missile Range Facility.

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 marks were searched for, but were not recovered. It is believed that the marks were all destroyed by construction equipment.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: PEACH  
STATE: HAWAII YEAR: 1967 SECOND ORDER

SOURCE: G-14044

GEODETIC LATITUDE: 22° 03' 56.3902	ELEVATION: 5.62 METERS
GEODETIC LONGITUDE: 159° 46' 45.5092	18.4 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ C: ANGLE *
HI 4	5104	405,417.12	84,483.99	- 0 06 18

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE
PEAR	26 45 15.7	26 51 34	5104

QF 508



# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 221593 STATION 1093  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 159° 30' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

FORM 525  
(8-15-57)

U. S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: PEAR STATE: Hawaii COUNTY: Kauai  
CHIEF OF PARTY: P.C. Johnson YEAR: 1967 DESCRIBED BY: G.S.J.

NOTE	HEIGHT OF TELESCOPE ABOVE STATION MARK	METERS, 1	HEIGHT OF LIGHT ABOVE STATION MARK	METERS.
1b	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		
7a	OBJECT	BEARING	DISTANCE FEET METERS	DIRECTION
11c	SANDIA 1964	SE	66.510	00 00 00.00
11b	RM #1	SE	69.722	256 43 05
	RM #2	SW	91.753	21.253 341 20 39
	RM 1 To RM 2		27.965	

The station is located on Barking Sands Pacific Missile Range Facility, in the Sandia Corporation Compound. It is 2.0 miles north of the control tower, 0.4 mile east of the ocean shore line, 0.3 mile northwest of Sandia northeast boundary line and 0.1 mile north of Sandia Corporation Headquarters.

To reach the station from the Main Gate of Barking Sands Pacific Missile Range Facility, go northerly on asphalt road for 2.05 miles to the Sandia Corporation Headquarters. Turn right, northwest on oiled road for 0.1 mile to gate. Continue straight ahead for 50 feet and the station on right.

The station mark is a standard disk, stamped PEAR 1967, set in the top of a 12-inch round concrete monument, flush with the ground. It is 72-1/2 feet east of a fence corner, 68-1/2 feet northwest of a gate across the oiled road and 20 feet northeast of the centerline of the oiled road.

Reference mark number one is a standard disk, stamped PEAR NO 1 1967, set in a drill hole in a mass of concrete, flush with the ground and is 2 feet lower than the station. It is 59 feet northeast of a fence corner, 6-1/2 feet northeast of centerline of the oiled road and 6-inches northwest of a 4-inch iron gate post.

Reference mark number two is a standard disk, stamped PEAR NO 2 1967, set in the top of a 12-inch round concrete monument, flush with the ground and is the same elevation as the station. It is 9 feet southeast of a fence corner and 1.3 feet northeast of a southeast and northwest fence line.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: PEAR STATE: HAWAII YEAR: 1967 SECOND ORDER

SOURCE G-14044

GEODETIC LATITUDE:	22 03 48.7184	ELEVATION:	4.30 METERS
GEODETIC LONGITUDE:	159 46 49.6582		14.1 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	# OR Δ H ANGLE
HI 4	5104	405,025.42	83,710.55	- 0 06 19

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
SANDIA	73 22 26.0	73 28 45	5104

QF 589

\*Refers 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.

## HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 221593 STATION 1094  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 159° 30' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

### NO ORIGINAL TEXT

Pele (Kauai Island, O. B. French, 1910; C. L. Garner, 1926).—In western Kauai, on the high conical peak named Puu Ka Pele, about 13 kilometers due north of Waimea. This is identical with station Puu Ka Pele of the Hawaiian Government Survey, and was marked by a 3-inch galvanized iron pipe set upright in a mass of cement, and surrounded by a cairn. In 1926 a standard triangulation disk marked "Kapele, 1926" was cemented into the pipe, and a standard disk reference mark was set in rock outcrop 13.70 meters (4.9 feet) from the station in azimuth 143° 23'. A United States Geological Survey bench mark stamped "3655" is 7.89 meters (25.9 feet) from the station in azimuth 282° 36'.

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

#### RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PELE  
ESTABLISHED BY: O.B.F.  
RECOVERED BY: Walter K. Helm  
YEAR: 1910  
STATE: Hawaii  
COUNTY: Kauai

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		DIRECTION			
		FEET	METERS				
LANI 1910-1926				0	00	00.0	
RM	NW	44.293	13.500	173	13	32	
Bench Mark 3655 (USGS)	ESE	24.900	7.591	312	19	33	

The station mark, reference mark, and a U.S. Geological Survey bench mark were recovered and found to be in good condition. A concrete platform has been built around the station mark. A large difference in distance and direction to the reference mark and bench mark were noted. A new description follows:

The station is located on the summit of Puu Ka Pele Mountain. It is 8-1/2 miles, airline, north of Waimea, 8-1/2 miles, airline, north-northeast of Kekaha, and 7-3/4 miles, airline, east-northeast of the west coast of Kauai Island at an area known as Barking Sands. It is 0.1 mile east of State Highway 55.

To reach the station from the Kokee Park Headquarters, go south on State Highway 55 for 4.55 miles to a road left at a telephone microwave station and the end of truck travel. Pack northerly up the hill to the highest point and the station. A 10 minute pack.

The station mark, a standard disk stamped PELE 1926, is set in a mass of concrete flush with the ground. The mark is surrounded by an 8-foot square concrete base, which has a 2-foot concrete monument built over the mark. The monument has a 2-inch opening down through it which allows for optical plumb, but is too small to be plumbed with a plumbob. There is a slot running under the monument.

The reference mark is a standard disk stamped PELE 1926. It is set in a drill hole in the top of a large boulder which projects 4 inches above the ground. It is about 4 feet lower than the station mark.

Bench mark 3655 is a U.S. Geological Survey disk stamped 3655 ft. It is set in a drill hole in the top of a large boulder which projects 3 feet above the ground.

(continued on next page)

#### ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: PELE

STATE: HAWAII

YEAR: 1910

SECOND

-ORDER

SOURCE: G-SP156

GEODETIC LATITUDE:	22° 05' 01.800	ELEVATION:	1116.0 METERS
GEODETIC LONGITUDE:	159° 40' 09.417		3661 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	B OR A B' ANGLE
HI 4	5104	442,682.83	91,029.61	- 0° 03' 49"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
OPAE	40 22 42.0	40 26 31	5104

Q1 033



# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 221593 STATION 1094  
LATITUDE ° ' TO ° '  
LONGITUDE ° ' TO ° '  
DIAGRAM

PELE (continued)

FORM 526  
(11-8-55)

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

R

NAME OF STATION: PELE  
ESTABLISHED BY: O.B.F. YEAR: 1910 STATE: Hawaii  
RECOVERED BY: C.A. Burroughs YEAR: 1962 COUNTY: Kauai

Detailed statement as to the fitness of the original description; including marks found, stampings, changes made, and other pertinent facts:  
The station mark, reference mark, and a U.S. Geological Survey bench mark were recovered and found to be in good condition. The station was recovered as per a recovery note by Walter R. Helm in 1961.  
The station was visited by a lightkeeper only.

FORM 526  
(11-8-55)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PELE STATE: Hawaii COUNTY: Kauai  
ESTABLISHED BY: O.B.F. YEAR: 1910  
CHIEF OF PARTY: D.J. Florwick YEAR: 1964 DESCRIBED BY: R.K. Moore

NOTE.*	HEIGHT OF TELESCOPE ABOVE STATION MARK		1.5 METERS,	HEIGHT OF LIGHT ABOVE STATION MARK		METERS.	
DESC.	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		
12c	LUA 1910					0 00 00 "	
DESC.	RM		NW	44.279	13.496	14 56 13	
	Bench Mark 3655 (USGS)		ESE	24.892	7.586	154 00 42	

The station mark, reference mark and a U.S. Geological Survey bench mark were recovered and found in good condition. A complete and new description follows.

The station is located on the summit of Puu Ka Pele Mountain, about 6.5 miles north of Waimea, about 8.5 miles north-northeast of Kekaha and 0.1 mile east of State Highway 55.

To reach the station from the Kokee Park Headquarters, go south on State Highway 55 for 4.5 miles to a side road left and the Hawaii Telephone Microwave Station and the end of truck travel. Pack northerly up the hill to the highest point and the station. A 10 minute pack.

The station mark, a standard disk stamped PELE 1926, is set in a mass of concrete flush with the ground. The mark is surrounded by an 8-foot square concrete base, which has a 2-foot concrete monument built over the mark. The monument has a 2-inch opening down through it which allows for optical plumb, but is too small to be plumbed with a plumbob. There is a slot running under the monument. It is 75 feet northwest of the Microwave tower.

The reference mark is a standard disk stamped PELE 1926, is cemented in a drill hole in the top of a large boulder projecting 4 inches above the ground. It is 119 feet northwest of the Microwave tower and about 6 feet lower than the station.

Bench mark 3655 is a U.S. Geological Survey disk stamped 3655 ft, is cemented in a drill hole in the top of a large boulder projecting 3 feet above the ground. It is 50 feet north of the Microwave tower and 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: PELE  
ESTABLISHED BY: O.B.F. YEAR: 1910 STATE: Hawaii  
RECOVERED BY: D.M. Whipp YEAR: 1966 COUNTY: Kauai  
Island: Kauai

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
OPAE 1910-1927				00 00 00.0
RM No. 1	NW	44.302	13.504	103 12 25
BM 3655 (USGS) (RM No. 2)	ESE	24.885	7.585	242 15 07

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

Station is located about 8-1/2 miles northeast of Kekaha, on the summit of Puu Ka Pele, a peak of about 3662 feet elevation, on the rim of Waimea Canyon and along the east side of State Highway 55. There is a telephone company micro-wave relay tower on this hill.

To reach station from the post office in Kekaha, go northwest for 0.2 mile; turn right and follow State Highway 55 for 12.1 miles to Puu Ka Pele on right. Go right 0.05 mile to telephone company building and end of truck travel. Pack up steep hill about 150 yards to station.

Station mark is a standard disk stamped "PELE 1926", set in concrete 6 inches beneath a 6 x 6-foot, concrete platform, on highest point of hill, 66 feet northwest of the micro-wave relay tower. A red and white, metal signal extends from the center of the concrete platform.

Reference mark number one is a standard disk stamped "PELE 1927", cemented in a drill hole in a round, 6-foot boulder that projects 4 feet on the northwest side and is flush with ground on the uphill side. It is in brush, under a eucalyptus tree and 9 feet lower than station mark.

USGS Bench Mark 3655 serves as reference mark number two; it is a bronze USGS disk stamped "3655", cemented in a drill hole in a 3-foot boulder that projects 2 feet. It is on east slope of hilltop and 4.9 feet lower than station mark.

FORM 526  
(11-8-55)

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

R

NAME OF STATION: PELE  
ESTABLISHED BY: O.B.F. YEAR: 1910 STATE: Hawaii  
RECOVERED BY: F.L. Jeffries YEAR: 1968 COUNTY: Kauai

Detailed statement as to the fitness of the original description; including marks found, stampings, changes made, and other pertinent facts:  
The station mark, reference mark, and a U.S. Geological Survey bench mark were recovered and found to be in good condition. All marks found to be as described in 1961.

\*Refers 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.

\*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.—Use of these forms must be used for every station recovered.

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 221593 STATION 1095  
HAWAII  
LATITUDE 22° 30' TO 22° 33'  
LONGITUDE 159° 30' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

## NO ORIGINAL TEXT

Pihea (Kauai Island, O. B. French, 1910; F. G. Engle, 1927).—In northwest Kauai, on the most westerly of the three peaks called Pihea, at the northwest end of the Alakai Swamp. It is about 6 miles from the Puu Ka Pele, from which the three summits appear as one. The summit was originally timbered but in 1910 was cleared. In 1927 the trees and brush were cleared off in the directions of stations Hale and Kala. Pihea is reached by taking the trail to Kalalau Lookout; a trail was then cut eastward and then northeast along the Kaunuoehua Ridge. The last 2 miles are extremely bad going. Marked by a ¼ by 15 inch iron rod, driven flush with ground. In 1927 a standard disk station mark was set directly above this iron rod in a cement mound. Reference mark No. 1, 1910, is lost. Other reference marks are as follows: No. 2, a ¼ by 15 inch iron rod driven in the ground with 2 inches projecting, and protected by three guard stakes, is 1.574 meters (5.16 feet) from station in azimuth 310° 20'; No. 3, a ¼ by 15 inch iron rod driven in the ground with 2 inches projecting, is close to a lihue stump and is protected by three guard stakes. It is 1.371 meters (4.50 feet) from station, in azimuth 22° 53'.

### RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PIHEA  
ESTABLISHED BY: O.B.F. YEAR: 1910 STATE: Hawaii  
RECOVERED BY: D.M. Whipp YEAR: 1966 COUNTY: Kauai  
Island: Kauai

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		DIRECTION
		FEET	METERS	
PELE 1910-1926				
RM No. 1	NE	7.686	2.343	00 00 00.0
RM No. 2	SE	5.039	1.536	180 18 42
Iron rod (RM 3 1910)	SW	4.394	1.340	278 10 53
				351 18 14

Station mark and old iron-rod reference points No. 2 and 3 were recovered in good condition. Rod No. 2 was removed and one of the two new reference marks established at this time was set in its place. A complete description follows:

Station is located in the northwest part of Kauai, about 3-1/2 miles airline northeast of Kokee Park Headquarters, on the westerly one of 3 similar peaks along Kaunuoehua Ridge, at the southeast corner of Kalalau Valley and about 1/4 mile east from the end of a jeep road.

To reach station from the Kokee Park Headquarters, go northerly on

paved road for 2.5 miles; take right fork at Air National Guard site and go 0.2 mile to dirt right fork at entrance to Kalalau Lookout parking area. Take this right fork and go 2.0 mile to end of road (a 4-wheel-drive vehicle is required). From here pack easterly on trail through brush for about 1/4 mile to top of first peak and station.

Station mark is a standard disk stamped "PIHEA 1927", set in the top of a 10-inch-diameter concrete monument flush with ground on high point. Reference mark number one is a standard disk stamped "PIHEA 1910 NO 1 1966", riveted to the top of a 1-inch iron pipe that is set in cement and projects 3 inches above ground. It is 1 foot south of the trail and about 4 inches higher than station mark.

Reference mark number two is a standard disk stamped "PIHEA 1910 NO 2 1966", riveted to the top of a 1-inch iron pipe that is set in cement, projects 3 inches above ground, and is about 3 inches lower than station mark. It is set at the point where iron-rod reference point # 2 was recovered.

Iron-rod reference point # 3 is a 3/4-inch iron rod projecting 3 inches above ground. It is 1 foot southwest of the trail and about 3 inches lower than station mark.

NOTE: A 20-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.

USCOMNAV-DC 37173-P89

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: PIHEA

STATE: HAWAII

YEAR: 1910

SECOND

ORDER

SOURCE: G-SP156

GEODETIC LATITUDE:	22° 09' 29.132	ELEVATION:	1506.0 METERS
GEODETIC LONGITUDE:	159° 37' 12.831		4285 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ RI ANGLE °
HI 4	5104	459,312.51	117,990.04	- 0° 02' 43"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
PELE	31 37 19.3	31 40 02	5104

Q1 022

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 221593 STATION 1096  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 155° 30' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

FORM 525  
(9-10-69)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: POLIHALE STATE: Hawaii COUNTY: Kauai  
CHIEF OF PARTY: W.S. Simmons YEAR: 1966 DESCRIBED BY: A.K.R.

NOTE	HEIGHT OF TELESCOPE ABOVE STATION MARK	METERS,†	HEIGHT OF LIGHT ABOVE STATION MARK	METERS.
1b	SURFACE-STATION MARK		DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION	
7a	UNDERGROUND-STATION MARK			
	OBJECT	BEARING	DISTANCE	DIRECTION
			FEET	METERS
11b	CANUTE (H&N) 1964	N	23.079	7.035
11b	Reference Mark No. 1	E	25.372	7.733
	Reference Mark No. 2		34.436	10.495
	RM 1 to RM 2			

The station is located on Polihale Ridge, in the Puu Ka Pele Forest Preserve, about 9 miles north of Kekaha, 6 miles northeast of Bonham Auxiliary Landing Field and 4 miles west of Hawaii State Highway 55.

To reach the station from the junction of State Highways 50 and 55 at Kekaha, go northerly on State Highway 55 for 14.8 miles to a dirt road on the left. Turn left and go westerly, downhill, passing a picnic shelter on the left, for 0.1 mile to a three-way fork. Take the extreme left fork, as per sign, "TRAIL NO. 4" and go south for 0.1 mile to a fork and a house on the right. Take the right fork and continue south, parallel to fence, for 0.1 mile to a locked gate and sign, "GAME MANAGEMENT AREA". Pass through the locked gate and go westerly, downhill, along a bladed road for 4.0 miles to the station on the right.

The key to the locked gate may be obtained from the State Division of Forestry in Lihue.

The station mark is a standard disk, stamped POLIHALE 1966, set in the top of an 11-inch diameter concrete post that projects 5 inches above the surface of the ground. It is 78 feet north of the center of the bladed road and 11 feet west-southwest of a wooden witness post and sign.

Reference mark No. 1 is a standard disk, stamped POLIHALE NO 1 1966, set in the top of a 15-inch diameter concrete post that is flush with the surface of the ground. It is 101 feet north of the center of the bladed road and 23 feet northwest of a wooden witness post and sign.

Reference mark No. 2 is a standard disk, stamped POLIHALE NO 2 1966, set in the top of a 12-inch diameter concrete post that projects 8 inches above the surface of the ground. It is 68-1/2 feet north of the center of the bladed road and 15 feet east of a wooden witness post and sign.

\*Refers 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: POLIHALE  
STATE: HAWAII YEAR: 1966 SECOND ORDER

SOURCE: G-13726

GEODETIC LATITUDE:	22° 06' 03.0780	ELEVATION:	518
GEODETIC LONGITUDE:	159° 43' 55.9885	SCALED	METERS FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	8-10-11 ANGLE
HI 4	5104	421,582.58	97,441.19	- 0° 05' 15"

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE 8-10-11 FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
CANUTE H N	54 36 25.6	54 41 41	5104

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

QUAD 221593 STATION 1097  
 HAWAII  
 LATITUDE 22° 00' TO 22° 30'  
 LONGITUDE 159° 30' TO 160° 00'  
 DIAGRAM NF 4-6 KAUAI

SEE STATION WEATHER VANE 204

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: RAIN GAGE

STATE: HAWAII

YEAR: 1967

THIRD

ORDER

SOURCE: G-13403

NO OBSERVATION CHECK ON THIS POSITION

GEODETIC LATITUDE:	22° 07' 43.8816	ELEVATION	METERS
GEODETIC LONGITUDE:	159° 43' 37.2940		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ HOR $\Delta$ $\alpha$ ANGLE *
HI 4	5104	425,976.50	107,406.43	- 0° 04' 57"

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

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

POSITION DETERMINED BY TRAVERSE FROM STATION WEA VANE 204

QF 529

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

QUAD 221553 STATION 1098  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 159° 30' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

## ADJUSTED HORIZONTAL CONTROL DATA

Form 525b  
(11-8-55)

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

### DESCRIPTION OF TRAVERSE AND STATION

NAME OF STATION: RANGE C

CHIEF OF PARTY: P.C. Johnson YEAR: 1967 STATE: Hawaii COUNTY: Kauai

Description, including sketch of object: 0.6 mile north along an oiled road from the main gate at FMR Barking Sands, thence 0.25 mile west along an oiled road, thence 0.5 mile north along a bladed road, a plain bronze disk, stamped RANGE C 1967, is set in the top of a 6-inch round soil pipe which projects 6 inches above the surface of the ground.  
A traverse connection was made to triangulation station HIGH 1965, distance being 28.0726 meters, (92.102 feet), south of station HIGH 1965.

Described by \_\_\_\_\_

Comm-DC 34311

NAME OF STATION: RANGE C

STATE: HAWAII

YEAR: 1967

SECOND ORDER

SOURCE: G-13403

NO OBSERVATION CHECK ON THIS POSITION

GEODETIC LATITUDE:	22° 05' 17.4127	ELEVATION:	4	METERS
GEODETIC LONGITUDE:	159 47 12.2381	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	# OR Δ or ANGLE *
HI 4	5104	402,895.47	80,555.48	- 0° 06' 28"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
POSITION DETERMINED BY TRAVERSE FROM STATION HIGH			

QF 521

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

QUAD 221593 STATION 1099  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 159° 30' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

Form 525b  
(11-6-65)

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

## DESCRIPTION OF TRIANGULATION INTERSECTION STATION

NAME OF STATION: RANGE D

CHIEF OF PARTY: P.C. Johnson YEAR: 1967 STATE: Hawaii COUNTY: Kauai

Description, including sketch of object: From the sentry post at the entrance of FMR Barking Sands, go north along an oiled road for 0.6 mile to an oiled road on the left. Turn left and go westerly, around the north end of of the runway, for 0.25 mile to a fork. Take the left fork and go west and south, around the west edge of a large asphalt area, for 0.4 mile to an asphalt road on the right. Turn right and go west on the asphalt road for 0.1 mile to the end of the road. Pack northwesterly over sand dune for about 0.05 mile to the mark.

The mark is a plain brass disk, stamped RANGE D 1967, set in the top of a cement-filled 4-inch iron sewer pipe that projects about 8 inches above the surface of the ground.

A traverse connection was made to triangulation station SANDS 1964, distance being 345.9152 meters (1,134.890 feet) northwest of station SANDS.

Described by \_\_\_\_\_

COM-DC 34311

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: RANGE D

STATE: HAWAII

YEAR: 1967

SECOND

ORDER

SOURCE: G-13403

NO OBSERVATION CHECK ON THIS POSITION

GEODETIC LATITUDE:	22° 02' 44.4828	ELEVATION:	0	METERS
GEODETIC LONGITUDE:	159 47 16.4036	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	B OR Δ Δ1 ANGLE *
HI 4	5104	402,497.34	77,233.29	- 0° 06' 29"

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE B OR Δ Δ1 FORMULA NEGLECTING THE SECOND TERM

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

POSITION DETERMINED BY TRAVERSE FROM STATION SANDS

QF 522



# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 221593 STATION 1100  
HAWAII  
LATITUDE 22° 00' TO 22° 30'  
LONGITUDE 159° 30' TO 160° 00'  
DIAGRAM NF 4-6 KAUAI

FORM 525  
(6-16-69)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: SANDIA STATE: Hawaii COUNTY: Kauai  
CHIEF OF PARTY: D.J.Florwick YEAR: 1964 DESCRIBED BY: R.K.Moore

NOTE.*	HEIGHT OF TELESCOPE ABOVE STATION MARK 1.5 METERS,1		HEIGHT OF LIGHT ABOVE STATION MARK 1.5 METERS.			
Desc.	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		
	KOLO				0 00' 00.00	
Desc.	RM 1	E	26.655	8.126	22 03 33	
	Sandia NO 2 Launcher	ESE			32 51 55.4	
Desc.	RM 2	N	27.655	8.429	287 21 01	
	Sandia NO 1 Launcher	NE			338 01 04.0	

Detailed description:

The station is located on the Bonham Auxiliary Landing Field, about 9.5 miles west of the town of Waimea, about 0.1 mile east of the Pacific Ocean and on the south-west side of a security area.

To reach the station from the Bonham Auxiliary Landing Field, go north on a macadam road for 1.05 miles to a gravel road. Continue north on gravel road for 0.2 mile to a locked gate. Pass through the gate and continue north on the gravel road for 0.5 mile to a security area. Continue north for 0.1 mile to a crossroad. Turn left and go west on a dirt road for 0.3 mile to the station.

The station mark, a standard disk stamped SANDIA 1964, is cemented in a drill hole in concrete on the south edge of the launcher pad. It is 116 feet east of the west security fence and 19.5 feet south-southwest of the center of the launcher pad.

Reference mark number 1, a standard disk stamped SANDIA NO 1 1964, is cemented in a drill hole in concrete on the east-southeast edge of the launcher pad. It is 140 feet east of the west security fence and 19.5 feet east-southeast of the center of the launcher pad.

Reference mark number 2, a standard disk stamped SANDIA NO 2 1964, is cemented in a drill hole in concrete on the west-northwest edge of the launcher pad. It is 110 feet east of the west security fence and 19.5 feet west-northwest of the center of the launcher pad.

## RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: SANDIA  
ESTABLISHED BY: D.J. Florwick YEAR: 1964 STATE: Hawaii BENCH MARK(S) ALSO ☒  
RECOVERED BY: U.S. Navy YEAR: 1971 COUNTY: Kauai  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: At the Barking Sands Pacific Missile Range Facility.

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 marks 1 and 2 were not recovered. The concrete launching pad that all 3 disks were cemented in has been destroyed, resulting in the loss of all 3 marks.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: SANDIA  
STATE: HAWAII YEAR: 1964 SECOND ORDER

SOURCE G-13403

GEODETIC LATITUDE: 22° 05' 44.4605	ELEVATION: 5.77 METERS
GEODETIC LONGITUDE: 159° 47' 04.9535	12.4 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ 10H Δ θ 1 ANGLE °
HI 4	5104	403,585.84	83,283.56	- 0° 06' 25"

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE θ 10H Δ θ 1 FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
KOLO	248 23 42.0	248 30 07	5104

QF 417