

QUAD 211581 STATION 1051  
HAWAII  
LATITUDE 21 ° 30' TO 22 ° 00'  
LONGITUDE 158 ° 00' TO 158 ° 30'  
DIAGRAM NF 4-11 OAHU

Kaena (Oahu Island, Hawaiian Government Survey, 1875).—About 800 feet back from the extremity of Kaena Point, the extreme northwest point of Oahu, in the center of a small area, surrounded by stone walls, said to have been a "heiau." Marked by a concrete post projecting about 6 inches above the ground.

Form 528  
(11-8-55)

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

## RECOVERY NOTE, TRIANGULATION STATION

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

### ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KAENA

STATE: HAWAII

YEAR: 1875

**SECOND**

-00000

SOURCE: **G-14543**

NAME OF STATION: KAENA

ESTABLISHED BY: HGS

YEAR: 1875      STATE: Hawaii

Recovered by: W.R. Porter YEAR: 1963 COUNTY: Honolulu

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

Station is destroyed. Also reported destroyed in 1952. Sand has been removed until the edge of the hill is 60 feet from Kaena Point Light. The station was located out from the edge about 30 feet, in the area that is now many feet lower than the top of the dune.

GEODETIC LATITUDE: 21°34'38.368 GEODETIC LONGITUDE: 158 16 55.245	ELEVATION: 14 METERS SCALED FEET
--	-------------------------------------

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	Bearing or Angle
HI - 3	5103	404,176.76	149,253.50	- 0° 06' 13"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE
			QI 387

\* 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 24214

QI 387

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1052  
HAWAII  
LATITUDE 21° 30' TO 22° 00'  
LONGITUDE 158° 00' TO 158° 30'  
DIAGRAM NF 4-11 OAHU

## NO ORIGINAL TEXT

KAENA POINT (U.S.E.) (Hawaii, U.S.E., 1914; H.A.P., 1932)

--In the locality of Kaena Point.  
Marked by a concrete monument with a brass plate, set about 2 feet below ground. It is 4.58 meters W of the center of the lighthouse.

FORM 1000  
(10-10-65)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

### RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KAENA POINT (USE)  
ESTABLISHED BY: U.S. Eng. YEAR: 1914 STATE: Hawaii  
RECOVERED BY: W.R. Porter YEAR: 1963 COUNTY: Honolulu

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			
PUEO 1932				00	00	00.0
R.M. No. 2	WSW	11.930	3.637	154	49	26
R.M. No. 1	WNW	19.550	5.960	206	36	11

The station was recovered and found in good condition, however it is on the east side of the Kaena Point Light instead of the west side as stated in the first description. Two reference marks, numbers one and two, were established. A complete description follows:

Station is located on Kaena Point, the westernmost point of Oahu, at east side of lighthouse, on a prominent sand dune overlooking the rocky point about 200 yards west.

To reach station from the post office in Waiialua, go south on Goodale Avenue for 0.5 mile; turn right and follow State Highway 99 west for 7.0 miles to Camp Erdman on the right. Continue westerly, along coast road, for 3.6 miles to fork opposite old beach shack. Take right fork and follow old track road westerly for 0.2 mile to end of road in sand before reaching dune. Walk west about 150 yards to top of dune and station. (NOTE: The road becomes very rough, and almost impassable in wet weather, after leaving Camp Erdman).

Station mark is a 3 x 4-inch brass plate, stamped "US ENG ELEV", set in the top of a 6-inch-square, concrete post. It is in a small, open sand area surrounded by naupaka brush, 15.026 feet east of center of lighthouse and about 6 inches below surface of sand. A 1/4-inch brass plug projects 1/4-inch from the center of the brass plate.

Reference mark number one is a standard disk stamped "KAENA POINT USE NO 1 1914 1963", cemented in a drill hole in the southeast corner of the 9 x 9-foot, concrete foundation of the lighthouse. It is about 1 foot lower than station mark and covered with sand.

Reference mark number two is a standard disk stamped "KAENA POINT USE NO 2 1914 1963", cemented in a drill hole in the northwest corner of an old, 9 x 9, concrete foundation that sets at the north side of the lighthouse foundation. The mark is 10.5 feet north of the center of the lighthouse and about 1 foot lower than station mark.

(continued on next page)

### ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KAENA POINT USE

STATE: HAWAII

YEAR: 1914

SECOND

-ORDER

SOURCE: G-14543

GEODETIC LATITUDE	21° 34' 39.00655	ELEVATION	13.95 METERS
GEODETIC LONGITUDE	158° 16' 55.56322		45.8 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	# HOR Δ & ANGLE *
HI 3	5103	404,146.84	149,317.98	- 0 06 14

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE
KEPUHI NEW	329° 38' 22.1	329° 44' 36	5103

THESE DATA OBTAINED FROM ADJUSTMENT OF NOV 1970

QH 077

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1052

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

KAENA POINT USE (continued)

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KAENA POINT (USE)  
ESTABLISHED BY: U.S.E. YEAR: 1914 STATE: Hawaii BENCH MARK(S) ALSO ☐  
RECOVERED BY: C.A. Annis YEAR: 1969 COUNTY: Honolulu  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 9 3/4 miles west of Waiialua.

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 recovered as described and found in good condition. The to reach is adequate for reaching the station. The 1969 observations follow.

OBJECT	BEARING	FEET	METERS	DIRECTION
KEPUHI NEW 1927				0 00 00.0
RM 2	WSW	11.92	3.634	100 56 40
RM 1	NW	19.53	5.952	152 45 01
Radar Dome	ESE			318 40 52.4

No measurement was made between the reference marks due to a lighthouse on line.

FORM CG-55-526 (9-66)  
USCOMM-DC 88496-P88

U.S. DEPARTMENT OF COMMERCE  
ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KAENA POINT (USE)  
ESTABLISHED BY: US Engineers YEAR: 1914 STATE: Hawaii BENCH MARK ALSO ☐  
RECOVERED BY: G.M. Ward YEAR: 1970 COUNTY: Honolulu  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 9 miles west of Waiialua  
HEIGHT OF TELESCOPE ABOVE STATION MARK -- FEET. HEIGHT OF LIGHT ABOVE STATION MARK -- FEET.

DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION				
OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
<u>1963 DISTANCES AND DIRECTIONS</u>				
PUEO 1932	E			000 00 00.0
Reference Mark No. 2	WSW	11.930	3.637	154 49 26
Reference Mark No. 1	WNW	19.550	5.960	206 36 11
<u>1969 DISTANCES AND DIRECTIONS</u>				
KEPUHI NEW 1927	SE			000 00 00.0
Reference Mark No. 2	WSW	11.92	3.634	100 56 40
Reference Mark No. 1	NW	19.53	5.952	152 45 01
Kaena Point Radar Dome, 1969	ESE	Approx. 2.6 miles		318 40 52.4

Station and Reference Marks No. 1 and No. 2 were recovered. The recovery description of W.R. Porter, 1963 has the description of Reference Marks No. 1 and No. 2 reversed, but the box score in correct order. A distance in the to reach did not check. The recovery description of C.A. Annis, 1969 is in error in reporting the previous description as correct. A complete description follows:

Station is located on Kaena Point, the westernmost point of Oahu, at the east side of the Lighthouse, on a prominent sand dune about 45 feet above sea level, about 200 yards east from the extreme rocky point of the Island.

To reach from the Post Office in Waiialua, go south on Goodale Avenue for 0.5 mile, turn right and follow State Highway 99 west for 6.6 miles to Camp Erdman on the right, and further west 0.9 mile to the end of pavement, continue westerly along coast road for 2.3 miles to a fork at the point where the power line begins bending to the south. Take right fork and follow track road westerly for 0.4 mile to end of road in sand just before reaching dune. Walk west 100 yards to top of dune and station. (NOTE: The road is rough at points and becomes almost impassable in wet weather after end of pavement.)

Station mark is a 3x4 inch brass plate, stamped "US ENG ELEV", set in the top of a badly chipped, 6 inch square concrete post. It is in a small, open sand area surrounded by naupaka brush, about 15 feet east of center of the Lighthouse and about 1/2 foot below surface of sand. A 1/2 inch brass plug projects 1/2 inch from the center of the brass plate.

Reference mark No. 1 is a standard disk stamped "KAENA POINT USE NO 1 1914 1963", cemented in a drill hole in the northwest corner of an old 9x9 foot concrete foundation that sets at the north side of the Lighthouse foundation. The mark is about 13 1/2 feet north of the center of the Lighthouse and about 1 foot lower than station. The mark arrow points westerly of the actual station location.

Reference mark No. 2 is a standard disk stamped "KAENA POINT USE NO 2 1914 1963", cemented in a drill hole in the southeast corner of the 9x9 foot concrete foundation of the Lighthouse. It is about 1 foot lower than station, covered with sand, and slightly battered.

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1053  
HAWAII  
LATITUDE 21 ° 30' TO 22 ° 00'  
LONGITUDE 158 ° 00' TO 158 ° 30'  
DIAGRAM NF 4-11 OAHU

## NO ORIGINAL TEXT

KAENA POINT LIGHT ( Hawaii, L.G.S., 1927; H.A.P., 1932)  
--The Superintendent of Lighthouse Service  
advises that the position of this light has not changed since date  
of establishment, June 30, 1920. It is a white concrete tower,  
about 5 feet square at the base, 21.5 feet high, about 160 meters  
from the extreme tip of the point. It was occupied by lashing the  
tripod over the lamp.

OBJECT	DISTANCE	DIRECTION
BATH	meters	0°00'00"0
KAENA POINT (U.S.E.)	4.58	13 15 00
N.W. cor. Radio Station	10.63	20 48
Boundary mark		175 30 30
Boundary mark	62.51	197 00 30
Boundary mark		304 53 20

(11-B-55)

### RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: KAENA POINT LIGHT  
ESTABLISHED BY: L.G.S. YEAR: 1927 STATE: Hawaii  
RECOVERED BY: E.E.Jones YEAR: 1958 COUNTY: Honolulu

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

The station was recovered and found to be in good condition. The light house is maintained and in operation.

To reach the station from the post office in Waianae follow the main traveled road west and north for about 14.0 miles to Kaena Point and the station on the left, pack west across the live sand for 0.2 mile to the light house and the station, by removing the lens and finial a tripod may be set up over the center of the light with the legs on the concrete floor. The station may also be reached from the other side of the island by taking the paved road past Dillingham Air Force Base to Kaena Point.

\* 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.

### ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KAENA POINT LIGHT

STATE: HAWAII

YEAR: 1927

SECOND

—ORDER

SOURCE: G-14543

GEODETIC LATITUDE:	21 ° 34' 38.983	ELEVATION:	14	METERS
GEODETIC LONGITUDE:	158 16 55.772	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ (OR Δ θ) ANGLE *
HI 3	5103	404,127.13	149,315.64	- 0 ° 06' 14 "

\* 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

QI 385

(continued on next page)

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1053

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

KAENA POINT LIGHT (continued)

FORM 524a  
(5-10-58)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KAENA POINT LIGHT  
ESTABLISHED BY: L.G.S. YEAR: 1927 STATE: Hawaii  
RECOVERED BY: W.R. Porter YEAR: 1963 COUNTY: Honolulu

HEIGHT OF TELESCOPE ABOVE STATION MARK		7.2 METERS.		HEIGHT OF LIGHT ABOVE STATION MARK		METERS		
DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION								
OBJECT	BEARING	DISTANCE		DIRECTION				
		FEET	METERS	°	'	"		
BATH 1932				00	00	00.0		
KAENA POINT (USE) 1914	E	15.026	4.580	13	11	36		
Boundary Mark (drillhole)	W	204.869	62.444	197	01	28		

Station was re-covered and found in good condition. The drill hole in which one of the 3 boundary marks was set, was recovered. There is cement around the hole but the mark has been removed. The other two boundary marks, with no distances recorded, were not searched for. A complete description follows:  
Station is located on Kaena Point, the westernmost point of Oahu, on a prominent sand dune about 50 feet above sea level, about 200 yards east from the extreme rocky point of the island.

To reach station from the post office in Waialua, go south on Goodale Avenue for 0.5 mile; turn right and follow State Highway 99 west for

7.0 miles to Camp Erdman on the right. Continue west, along coast-line, for 3.6 miles to fork opposite old beach shack. Take right fork and follow old track road westerly for 0.2 mile to end of road in sand just before reaching dune. Walk west about 150 yards to station. (NOTE: The road becomes very rough, and almost impassable in wet weather, after leaving Camp Erdman.)

Station is center of Kaena Point Lighthouse; a 4-foot-square, concrete structure, painted white, and tapering slightly to the wooden platform which is 16 feet above ground. A clear glass light, 1.8 feet long and 1 foot diameter, sets on a base above the platform. Top of light is 20-1/2 feet above ground. The lighthouse sets on a 9-foot-square, concrete foundation. A similar concrete foundation is at the north side of the lighthouse.

The boundary mark drillhole is a 1-inch-diameter hole in the top of a round-topped boulder on the west slope of the dune. It is in a group of boulder, projects about 3 feet above ground, and is 24.72 feet lower than base of lighthouse.

\*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 27172-P58

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KAENA POINT LIGHT  
ESTABLISHED BY: L.G.S. YEAR: 1927 STATE: Hawaii BENCH MARK ALSO ☐  
RECOVERED BY: G.M. Ward YEAR: 1970 COUNTY: Honolulu  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 9 miles west of Waialua  
HEIGHT OF TELESCOPE ABOVE STATION MARK -- FEET. HEIGHT OF LIGHT ABOVE STATION MARK -- FEET.

1963 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	
BATH 1932	ENE			000 00 00.0
KAENA POINT (USE) 1914	E	15.026	4.580	013 11 36
Boundary Mark (drillhole)	W	204.869	62.444	197 01 28

Station and Boundary Mark(drillhole) were recovered. The other two boundary marks, with no distances recorded were not searched for. Some station differences were noted from the recovery description of W.R. Porter, 1963 and a distance in the to reach did not check. A complete description follows:

Station is located on Kaena Point, the westernmost point of Oahu, on a prominent sand dune about 45 feet above sea level, about 200 yards east from the extreme rocky point of the Island.

To reach from the Post Office in Waialua, go south on Goodale Avenue for 0.5 mile, turn right and follow State Highway 99 west for 6.6 miles to Camp Erdman on the right, and further west 0.9 mile to the end of pavement, continue westerly along coast road for 2.3 miles to a fork at the point where the power line begins bending to the south. Take right fork and follow track road westerly for 0.4 mile to end of road in sand just before reaching dune. Walk west 100 yards to top of dune and station. (NOTE: The road is rough at points and becomes almost impassable in wet weather after the end of pavement.)

Station is center of Kaena Point Lighthouse, a 4 foot square concrete structure, painted white, and tapering slightly to the concrete platform which is 16 feet above the ground. A clear plastic light, 1.8 feet high and 1 foot diameter, sets on a base above the platform. Top of light is 20 1/2 feet above the ground. The lighthouse sets on a 9 foot square concrete foundation. A similar concrete foundation is at the north side of the lighthouse.

The boundary mark(drillhole) is a 1 inch diameter hole in the top of a round topped boulder on the west slope of the dune. It is in group of boulders, projects about 3 feet above ground, and is reportedly 24.72 feet lower than base of lighthouse.

\*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-524a (12-58)  
USCOMM-DC 26581-P58

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1054  
HAWAII  
LATITUDE 21° 30' TO 22° 00'  
LONGITUDE 158° 00' TO 158° 30'  
DIAGRAM NF 4-11 OAHU

PUEO ( Hawaii, H.A.P., 1932)--About 3/4 mile E of Kaena Point, on the N side of the ridge, about 270 meters NW of the knob known as Puu Pueo, and on a narrow shoulder about 300 meters E of Kaena "S". This station sees all shore stations to land. Station and R.M.s 1 and 2 are standard disks set in concrete in depressions in outcropping bedrock.  
OBJECT DISTANCE DIRECTION  
KAENA PT. LT. meters 0°00'00.0  
R.M. 2 15.85 222 07 20  
R.M. 1 8.90 255 27 00  
Height of signal above station mark - 3 meters.  
Height of instrument above station mark - 1.5 meters.

DEPARTMENT OF COMMERCE  
U. S. COAST AND GEODETIC SURVEY  
Form 1285  
Rev. Aug. 1968

## RECOVERY NOTE DESCRIPTION OF TRIANGULATION STATION

R

NAME OF STATION: PUEO

STATE: HAWAII

COUNTY: Honolulu

Recovered By:  
CHIEF OF PARTY: E.E. Jones

YEAR: 1958

Described by: L.W.

NOTE*	HEIGHT OF TELESCOPE ABOVE STATION MARK		METERS. 1.5	HEIGHT OF LIGHT ABOVE STATION MARK 1.8		METERS
2a	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	
12a		MANINI 1932				00° 00' 00.0"
12a		RM 2	SE	51.65	15.742	45 47 58
12a		RM 1	S	29.18	8.895	89 20 32

The station was recovered and found to be in good condition, there was no sign of movement at the station or reference marks, however the distance and directions to the reference marks checks very poorly, an alternate route to the station follows.

To reach the station from the post office in Waiānae go west and north on the main traveled road for 6.9 miles to the end of the pavement at a cemetery on the right continue straight ahead for 1.5 miles to a T-road right, turn right and follow the winding road 1.6 miles to the top of the hill and a T-intersection, turn left and follow the main road west for 2.0 miles to its end at the bottom of a hill, pack west to the top of the hill and station ROCKY, thence down the ridge to a narrow shoulder and the station about a 15 minute pack.

Detailed description

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: PUEO

STATE: HAWAII

YEAR: 1932

SECOND

-ORDER

SOURCE: G-14543

GEODETIC LATITUDE:	21° 34' 35.36018	ELEVATION:	231.8 METERS
GEODETIC LONGITUDE:	158 16 17.03197		760 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ FOR Δ R1 ANGLE *
HI 3	5103	407,782.96	148,943.59	- 0° 05' 59"

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE θ FOR Δ R1 FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE
KAENA POINT USE	95° 46' 44.0"	95° 52' 43"	5103

THESE DATA OBTAINED FROM ADJUSTMENT OF NOV 1970

POSITION DETERMINED BY TRAVERSE FROM STATION KAENA PT USE

AND CHECKED BY ADDITIONAL OBSERVATIONS

QH 079

(continued on next page)

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

PUEO (continued)

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PUEO  
ESTABLISHED BY: H.A.P. YEAR: 1932 STATE: Hawaii  
RECOVERED BY: D.G. Rushford YEAR: 1964 COUNTY: Honolulu

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
KAENA POINT LIGHT 1927				00 00 00.0
R.M. No. 2	SE	51.565	15.718	221 52 00
R.M. No. 1	S	29.150	8.885	265 26 39

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

Station is located about 3/4 mile east of Kaena Point, at about 700 feet elevation, on a rock point along north side of ridge, about 270 yards northwest from Radar building No. 41 and 90 yards northwest from the terminal platform of an old WW-II aerial tram.

To reach station from the post office in Waianae, go northerly on Farrington Highway for 9.1 miles to a macadam side road right. Follow this road up side of ridge for 2.0 miles to top of ridge and a guard booth at radar site, at a T-junction. Turn left and follow macadam road

along ridge for 2.0 miles to end of road at Building No. 41. Pack down along ridge northwesterly for about 270 yards to station.

Station mark is a standard disk stamped "PUEO 1932", cemented in a drill hole in a 2 x 5-foot bedrock outcrop that projects 6 inches above ground. It is about 16 feet south from extreme edge of rock point.

Reference mark number one is a standard disk stamped "PUEO NO 1", cemented in a drill hole in a small bedrock outcrop that projects 2 inches above ground. It is 6 feet east of bluff edge and 1.9 feet higher than station mark.

Reference mark number two is a standard disk stamped "PUEO NO 2", cemented in a drill hole in a 3-foot-diameter, brown, flat-topped boulder that projects 1-1/2 feet above ground. The boulder is ringed by a semi-circle, about 15 feet in diameter, of whitish boulders, generally 3 to 4 feet higher than the mark. The mark is 3.5 feet higher than station mark.

NOTE: A difference in the distance and angle to reference mark number two was noted and checked in the field. It is believed that the boulder the mark is in has settled downhill.

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

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

HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

R

QUAD 211581 STATION 1054

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

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: PUEO  
ESTABLISHED BY: H.A.P. YEAR: 1932 STATE: Hawaii BENCH MARK ALSO ☐  
RECOVERED BY: C.A.A. YEAR: 1969 COUNTY: Honolulu  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 8 miles north-northwest of Makaha  
HEIGHT OF TELESCOPE ABOVE STATION MARK 5 FEET. HEIGHT OF LIGHT ABOVE STATION MARK 4 FEET.

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
KAENA POINT USE 1914 1919				0 00 00.0
R.M. 2	SE	51.54	15.711	221 48 43
R.M. 1	S	29.17	8.889	265 25 12

The station mark and both reference marks were recovered and found to be in good condition. A slight difference was found in the distance and direction to both reference marks, from what was recorded in 1964. A new description follows.

The station is located about 9 1/4 miles west of Waiialua, 8 miles north-northwest of Makaha, 3/4 mile east of Kaena Point and 90 yards west of the platform of an old aerial tram, on the north slope of a ridge.

To reach the station from the post office in Waianae, go northwest on State Highway 90 for 7.0 miles to Kaneana Cave on the right. Continue ahead on State Highway 90 for 2.3 miles to a side road right and sign "Restricted Area-United States Air Force Space and Missile Systems". Turn right on asphalt road, up steep hill, for 2.0 miles to a "T" road intersection and guard gate on the left. (Stop at guard shack for clearance.) Turn left, northwest on asphalt road for 2.0 miles to the end of the road, a building on the left and triangulation station PAD. Pack westerly along ridge through brush to the remains of some old buildings. Here bear right, leaving top of ridge, and pick way down to a rock ledge and the station.

The station mark is a standard disk, stamped PUEO 1932, cemented in a drill hole in bedrock which is projecting about 2 inches above the ground surface. It is about 90 yards west of the platform of an old aerial tram and 16 feet southeast of the edge of the rock ledge.

Reference mark 1 is a standard disk, stamped PUEO NO 1, cemented in a drill hole in bedrock which projects about 2 inches above the surface. It is about 6 feet east of the edge of the ledge and about 2 foot higher than the station.

Reference mark 2 is a standard disk, stamped PUEO NO 2, cemented in a drill hole in a boulder which is about 3 feet in diameter and projects about 18 inches. It is a flat topped boulder, brown in color and about 3 1/2 feet higher than the station.

Triangulation station PAD is only about 1/4 mile from this station, therefore no azimuth mark is needed.

No measurement between reference marks due to rough terrain.

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 211581 STATION 1055  
HAWAII  
LATITUDE 21° 30' TO 22° 00'  
LONGITUDE 158° 00' TO 158° 30'  
DIAGRAM NF 4-11 OAHU

DEPARTMENT OF COMMERCE  
U. S. COAST AND GEODETIC SURVEY  
Form 855  
Rev. Aug. 1963

## DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: RAD

STATE: HAWAII

COUNTY: Honolulu

CHIEF OF PARTY: E.E. Jones

YEAR: 1958

Described by: L. Wakefield

NOTE*	HEIGHT OF TELESCOPE ABOVE STATION MARK METERS. 1 6	HEIGHT OF LIGHT ABOVE STATION MARK 7.5 METERS.
2a	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:
		0 00 00.0
desc	MANINI 1932	
	MODEL	B 30.895 9.445 95 03 58

The station is on Kaena Point, Oahu Island, Hawaii, about 2.8 miles south-east of the west end of the Dillingham airforce runway, and about 1.6 miles east of the Point Kaena Light house.

To reach the station from the post office in Waianae go west and north for 6.9 miles to the end of the pavement and a cemetery on the right con-straight ahead 1.5 mile to a T-intersection, turn right and follow the winding road up the hill 1.6 miles to the top and a T-intersection, turn left on graded road and go 1.7 miles to the radar station on the left.

The station a standard disk stamped RAD 1958 is set in a drill hole in the radar tower floor, excess is had through a door which is keep locked.

Detailed description

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: RAD

STATE: HAWAII

YEAR 1958

SECOND

ORDER

SOURCE: G-14543

GEODETIC LATITUDE:	21° 34' 20.23309	ELEVATION	290.2 METERS
GEODETIC LONGITUDE:	158 15 55.33306	952	FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	STATION ANGLE *
HI 3	5103	409,828.42	147,413.70	- 0 05' 51"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE
KEPUHI NEW	336° 30' 00.5	336° 35' 52"	5103

THESE DATA OBTAINED FROM ADJUSTMENT OF NOV 1970  
POSITION DETERMINED BY TRAVERSE FROM STATION KEPUHI NEW  
AND CHECKED BY ADDITIONAL OBSERVATIONS

QH 080

(continued on next page)

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 211581

STATION 1055

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

RAD (continued)

## RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: RAD  
ESTABLISHED BY: E.E.J.  
RECOVERED BY: C.A. Annis  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 8 miles north of Makaha  
HEIGHT OF TELESCOPE ABOVE STATION MARK 5 FEET.  
YEAR: 1958  
STATE: Hawaii  
COUNTY: Honolulu  
HEIGHT OF LIGHT ABOVE STATION MARK FEET.  
BENCH MARK ALSO ☐

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	
KEPUHI NEW 1927				00 00 00.0
Point A	W	42.89	13.074	90 15 13.2
Reference mark	SE	81.89	24.958	319 45 42
Kaena Pt. Radio Mast	S	( 1 mile )		320 51 46.6
MODEL 1958	S	31.00	9.447	355 06 13

Station mark was recovered and found to be in good condition. The radar tower mentioned in the 1958 description is no longer at the station site. Station MODEL 1958 and reference mark 1 were observed for reference points. The distance to MODEL 1958 was checked and found to be correct.

Temporary point A was used for position check from KEPUHI NEW 1927. Geodimeter traverse was made to KEPUHI NEW 1927 from the station and point A.

A new description follows:

Station is located about 8 miles north of Makaha and 2 miles south-southeast of the Keana Point Lighthouse at the U.S. Air Force Kaena Point Satellite Tracking Station just south of building number 35.

To reach from the Keana Point Satellite Tracking Station guard gate, go northwesterly on surfaced road for 1.6 miles to building number 35 and station on the left.

Station mark, a standard disk stamped RAD 1958, is set in a drill hole in a 6 foot square concrete slab. The mark is 96 feet north of a power line pole, 81.5 feet southwest of center of gate and 48 feet south of the southeast corner of building number 35.

MODEL 1958, a standard disk stamped MODEL 1958, is set in a drill hole in the southwest corner of a large concrete slab. The mark is 90 feet southwest of center of gate, 68 feet northwest of a power line pole. and 66 feet south of the southeast corner on building number 35.

Reference mark, a standard disk stamped MODEL NO 1 1958, is set in a drill hole in a 3 foot square slab. The mark is 77 feet southwest of center of gate and 31 feet northeast of power line pole.

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 211581 STATION 1056  
HAWAII  
LATITUDE 21° 30' TO 22° 00'  
LONGITUDE 158° 00' TO 158° 30'  
DIAGRAM NF 4-11 OAHU

DEPARTMENT OF COMMERCE  
U. S. COAST AND GEODETIC SURVEY  
Form 526  
Rev. Aug. 1963

## DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: MODEL STATE: HAWAII COUNTY: Honolulu

CHIEF OF PARTY: E.E. Jones YEAR: 1958 Described by: L. Wakefield

NOTE*	HEIGHT OF TELESCOPE ABOVE STATION MARK METERS. 1.5	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 feet meters
	CLIFF	00 00 000
desc	MODEL	W 30.985 9.445 203 15 50

Detailed description

The station is on Kaena Point, Oahu Island, Hawaii, about 2.8 miles south-east of the west end of the Dillingham Airforce Base runway, and 1.6 mile east of Kaena Point Lighthouse.

To reach the station from the post office in Waianae go west and north for 6.9 miles to the end of the pavement and a cemetery on the right, continue straight ahead 1.5 miles to a T-intersection, turn right and follow the winding road up steep hill for 1.6 miles to the top and a T-intersection turn left and go 1.7 miles to the station on the left at the radar station.

The station a standard disk stamped MODEL 1958 is set in a drill hole in the large concrete platform on the east side of the radar station about 25 feet east and in front of the door leading into the tower, and 1.0 foot west of the east edge of the platform.

Form 526  
(11-8-55)

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

R

NAME OF STATION: MODEL  
ESTABLISHED BY: E.E. Jones YEAR: 1958 STATE: Hawaii  
RECOVERED BY: D.G. Rushford YEAR: 1964 COUNTY: Honolulu

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

Station mark was recovered in good condition as described in 1958.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: MODEL  
STATE: HAWAII YEAR: 1958 SECOND ORDER

SOURCE: G-14543

GEODETIC LATITUDE:	21° 34' 19.96287	ELEVATION	290	METERS
GEODETIC LONGITUDE:	158 15 55.17691	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	# OR Δ #1 ANGLE °
HI 3	5103	409,843.11	147,386.41	- 0° 05' 51"

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

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

THESE DATA OBTAINED FROM ADJUSTMENT OF OCT 1971  
POSITION DETERMINED BY TRAVERSE FROM STATION RAD  
AND CHECKED BY ADDITIONAL OBSERVATIONS

QH 081

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

QH 082



QI 303

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1060  
HAWAII  
LATITUDE 21 ° 30' TO 22 ° 00'  
LONGITUDE 158 ° 00' TO 158 ° 30'  
DIAGRAM NF 4-11 OAHU

**Makua 2 (Oahu Island, L. G. Simmons, 1927).**—On western coast of Oahu, about 1 mile south of Makua railroad station, on the first ridge south of Makua railroad station, on west end of ridge, and about 1/4 mile back from shore line. The old Army station, *Makua (U. S. E.)*, is about 70 yards up the ridge, in azimuth 127° 25'. Station marked according to note 2, a standard disk station mark in outcropping bedrock. Reference marks, note 12a, standard reference disks in outcropping bedrock, are at the following distances and azimuths from station: No. 1, 8.786 meters (28.83 feet), 318° 55'; No. 2, 5.420 meters (17.78 feet), 283° 32'. There is a 2-inch gas pipe 12.430 meters (40.78 feet) from station in azimuth 318° 23'. Re-marked according to note 14X in 1929.

FORM 526a  
(9-18-59)

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

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: MAKUA 2  
ESTABLISHED BY: L.G.S. YEAR: 1927 STATE: Hawaii  
RECOVERED BY: D.G. Rushford YEAR: 1964 COUNTY: Honolulu

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		Azimuth DIRECTION		
			FEET	METERS			
1927 DISTANCE & AZIMUTH							
R.M. No. 1			28.83	8.786	318	55	
R.M. No. 2			17.78	5.420	283	32	
Gas Pipe			40.78	12.430	318	23	
1964 DISTANCE-----							
R.M. No. 1		SE	28.814	8.783			
R.M. No. 2		ESE	17.747	5.410			
Gas Pipe		SE	40.760	12.425			

Station was re-covered and all marks found in good condition. A complete description follows:

Station is located about 3-1/2 miles north of Makaha village, at the southwest corner of Makua Valley, 1/4 mile east of State Highway 90 and Kaneana Cave, on a brushy knoll of about 958 feet elevation at the west end of the prominent ridge.

To reach station from the shopping center at Makaha village, go

north on State Highway 90 for 5.4 miles to a track crossroad at south side of old cemetery, just after crossing bridge. Turn right and follow main track road southeast along base of ridge for 0.9 mile to end of truck travel at parking area on right. Pack southerly up side of ridge to station. About a 20-minute pack.

Station mark is a standard disk stamped "MAKUA 2 1927", cemented in a drill hole in a red bedrock outcrop about 40 feet northwest from the highest part of the knoll.

Reference mark number one is a standard disk stamped "MAKUA NO 1", cemented in a drill hole in the northwest end of a grey bedrock wall that is 2-1/2 feet high and 12 feet long and is the most prominent rock on the hill. The mark is about 4 feet higher than station mark.

Reference mark number two is a standard disk stamped "MAKUA NO 2", cemented in a drill hole in an outcropping bedrock point that projects 2 feet above the general ledge line on northeast side of hill. The mark is about 1-1/2 feet lower than station mark.

Gas pipe is a 2-inch, iron pipe that projects about 1 foot from the ground. It is 4 feet southeast from the southeast end of the rock wall that R.M. 1 is in, and is about 3 feet higher than station mark.

(continued on next page)

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: MAKUA 2

STATE: HAWAII

YEAR: 1927

FIRST

ORDER

SOURCE: C-14543

GEODETIC LATITUDE: 21 ° 31 ' 17.69357	ELEVATION: 293.4 METERS
GEODETIC LONGITUDE: 158 13 35.94333	963 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ & ANGLE °
HI 3	5103	422,958.38	128,974.27	- 0 04 59 "

\* 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
KAENA POINT USE	137 ° 09 ' 27.5	137 ° 14 ' 27 "	5103

THESE DATA OBTAINED FROM ADJUSTMENT OF NOV 1970

QH 085

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1060

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

MAKUA 2 (continued)

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: MAKUA 2  
ESTABLISHED BY: L.G.S. YEAR: 1927 STATE: Hawaii BENCH MARK(S) ALSO ☐  
RECOVERED BY: C.A.A. YEAR: 1969 COUNTY: Honolulu  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 3 1/2 miles north of Makaha

R

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

The station mark and both reference marks were recovered as described and found to be in good condition. The station was reached by helicopter at this time therefore the "to reach" was not checked. A slight difference was found in the distance to both reference marks and the new distance and direction to both are listed below.

OBJECT	BEARING	FEET	METERS	DIRECTION
KAENA POINT 1914 1919 (USE)				0 00 00.0
R.M. 2	E	17.78	5.417	146 15 22
R.M. 1	SE	28.80	8.779	181 47 46
KAENA PT LIGHTHOUSE	NW	(Approx. 5 1/2 mi.)		359 58 36.1

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 211581 STATION 1061  
HAWAII  
LATITUDE 21° 30' TO 22° 00'  
LONGITUDE 158° 00' TO 158° 30'  
DIAGRAM NF 4-11 OAHU

NO ORIGINAL TEXT

## RECOVERY NOTE, BENCH MARK

**Bench Mark**  
K 3  
Nearest town Waialeale  
Distance and direction from nearest town 5.75 miles northwest  
Character of mark C&GS tidal mark disk  
Also horizontal control point ☐  
Established by C&GS  
Present condition Good  
Stamping K 3 1927  
Detailed description: 5.75 miles northwest along State Highway 90 from the post office at Waialeale, along the south side of a small asphalt turnout, along the east side of a bushy area, 70 yards northwest and across the highway from a metal gate, 34.8 feet west of the center line of the highway, 56.0 feet south of the south edge of a paved parking area, 99.0 feet northwest and across the highway from power pole 150, 134.5 feet southwest and across the highway from power pole 151, about level with the highway, and set in the top of a concrete post projecting 0.4 foot above the ground.

FD-159 C&GS-685A  
(11-67)

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

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: BENCH MARK K 3  
STATE: HAWAII YEAR: 1969 SECOND ORDER

SOURCE: G-14543

GEODETIC LATITUDE: 21° 30' 13.61832	ELEVATION: 5.22 METERS
GEODETIC LONGITUDE: 158° 13' 56.95661	17.1 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ (OR Δ) & ANGLE °
HI 3	5103	420,964.67	122,511.86	- 0° 05' 07"

\* 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
MAKUA 2	197° 03' 36.7	197° 08' 43"	5103

POSITION DETERMINED BY TRAVERSE FROM STATION MAKUA 2  
AND CHECKED BY ADDITIONAL OBSERVATIONS

QH 086

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1064  
HAWAII  
LATITUDE 21 ° 30' TO 22 ° 00'  
LONGITUDE 158 ° 00' TO 158 ° 30'  
DIAGRAM NF 4-11 OAHU

## DESCRIPTION OF BENCH MARK

Designation: STATE SURVEY 8-3 State Hawaii County Honolulu  
Nearest town: Waianae County Honolulu Chief of party: C. Symms  
Distance and direction from nearest town: 9.35 miles northwest Leveling date: July 1969  
Character of mark: SS disk Stamping: 8-3 1969  
Established by: State of Hawaii  
Detailed description: Section .T .R

9.35 miles northwest along State Highway 90 from the post office at Waianae, at the crossing of a power line, 0.05 mile southeast of the junction of a paved road northeast to Kaena P. T. Tracking Station, at the southeast end of a turnout, in the top of a lava rock projecting 0.3 foot above the ground which is at the northwest end of a cut, 22.7 feet southwest of the center line of the highway, 16.0 feet north of power pole 244, 15 feet northeast of the southwest ledge of a cliff, about level with the highway and 25 feet higher than the ocean.

FORM CGS-438  
(6-65)  
-- 10289-P66

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

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: STATE SURVEY 8-3

STATE: HAWAII

YEAR: 1969

SECOND

ORDER

SOURCE: G-14543

NO OBSERVATION CHECK ON THIS POSITION

GEODETIC LATITUDE:	21 ° 32' 55.96089	ELEVATION:	8.24 METERS
GEODETIC LONGITUDE:	158 14 34.39337		27.0 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ B: ANGLE *
HI 3	5103	417,454.91	138,897.96	- 0 ° 05' 21 "

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE
MAKUA 2	330 ° 53' 56.5	330 ° 59' 18 "	5103

POSITION DETERMINED BY TRAVERSE FROM STATION MAKUA 2

QH 085

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 211581 STATION 1065  
HAWAII  
LATITUDE 21 ° 30' TO 22 ° 00'  
LONGITUDE 158 ° 00' TO 158 ° 30'  
DIAGRAM NF 4-11 OAHU

## DESCRIPTION OF BENCH MARK

Designation STATE SURVEY 8-10 State Hawaii County Honolulu  
Nearest town Waianae County Honolulu Chief of party C. Symms  
Distance and direction from nearest town 7.8 miles northwest Leveling date July 1969  
Character of mark SS disk Stamping 8-10 1969  
Established by State of Hawaii  
Detailed description Section .T .R

7.8 miles northwest along State Highway 90 from the post office at Waianae, 0.2 mile north of the junction of a road northwest, along the east shoulder of the highway, 15.9 feet east of the center line of the highway, 250.0 feet south of the center line of a graveled road west to a beach, 458 feet south of the south end of the east head wall of a culvert, about level with the highway, and set in the top of a concrete post.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: STATE SURVEY 8-10

STATE: HAWAII

YEAR: 1969

SECOND

-ORDER

SOURCE: G-14543

NO OBSERVATION CHECK ON THIS POSITION

GEODETIC LATITUDE:	21 31 55.24969	ELEVATION:	5.37 METERS
GEODETIC LONGITUDE:	158 13 49.11383		17.6 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ OR $\Delta$ $\phi$ ANGLE *
HI 3	5103	421,720.40	132,765.58	- 0 ° 05 ' 04 "

\* 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 (From south) *	CODE
MAKUA 2	341 ° 49 ' 55.4	341 ° 54 ' 00 "	5103

POSITION DETERMINED BY TRAVERSE FROM STATION MAKUA 2

QH 090

FORM CGCS-638  
(6-68)  
NATIONAL OCEAN SURVEY 60288-P68

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## HORIZONTAL CONTROL DATA

QUAD 211581 STATION 1066  
HAWAII  
LATITUDE 21 ° 30' TO 22 ° 00'  
LONGITUDE 158 ° 00' TO 158 ° 30'  
DIAGRAM NF 4-11 OAHU

### ADJUSTED HORIZONTAL CONTROL DATA

**Description, including sketch of object:**

The station is the red light on top of the tower, which is located about one and one-half miles northeast of Wahiawa on the Naval Reservation, about 200 feet north of the gate. It is a three-legged red-and-white tower about 200 feet high. There are two radar dishes on top of the tower.

YEAR 1969

### THIRD

-ORDER

SOURCE: G-14543

GEODETIC LATITUDE:	21° 31' 09.13306	ELEVATION:	METERS
GEODETIC LONGITUDE:	158 00 30.86718		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ OR $\Delta$ RI ANGLE <sup>+</sup>
HI 3	5103	497,085.47	128,054.68	- 0° 00' 11"

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

GEODETIC AZIMUTH OF THE SECOND TERM GEODETIC AZIMUTH OF THE SECOND TERM			
TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE

QH 091

QH 091

FORM C&amp;GS-525b (12-68)

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

QUAD 211581 STATION 1067  
HAWAII  
LATITUDE 21 ° 30' TO 22 ° 00'  
LONGITUDE 158 ° 00' TO 158 ° 30'  
DIAGRAM NF 4-11 OAHU

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

## ORDER

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

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

QH 092

QUAD 211581 STATION 1068  
HAWAII  
LATITUDE 21 ° 30' TO 22 ° 00'  
LONGITUDE 158 ° 00' TO 158 ° 30'  
DIAGRAM NF 4-11 OAHU

QH 093

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1069  
HAWAII  
LATITUDE 21 ° 30' TO 22 ° 00'  
LONGITUDE 158 ° 00' TO 158 ° 30'  
DIAGRAM NF 4-11 OAHU

## NO ORIGINAL TEXT

**Waialua** Sugar Co. Mill Stack (Honolulu, Co., Hawaii, O.B.F., 1910; L.G.S., 1927).—Center of large steel smokestack on Waialua sugar mill. This was called station *Mill* in 1910.

**WAIALUA SUGAR CO. MILL STACK** (Honolulu County, Hawaii, O.B.F., 1910; 477th FA Obsn. Bn., 1945)  
--Station  
recovered as described.  
Station is  
in good condition.

Data of chimney: Was constructed in 1900 to a height of 185 feet. 30 feet has been taken off the top and consequently it now stands to a height of 155 feet. The diameter at the top is 11.5 feet. It is constructed of steel with a brick lining.

RECOVERY NOTE, ~~DEAN L. L. L. L.~~ STATION  
INTERSECTION

NAME OF STATION: **WAIALUA SUGAR CO MILL STACK**  
ESTABLISHED BY: O. B. F. YEAR: 1910 STATE: **Hawaii** BENCH MARK(S) ALSO ☐  
RECOVERED BY: Carl A. Annis YEAR: 1969 COUNTY: **Honolulu**  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:

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

The intersection station was recovered in good condition as described.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **WAIALUA SUGAR CO MILL STACK**

STATE: **HAWAII**

YEAR: **1910**

**THIRD**

-ORDER

SOURCE: **G-14543**

GEODETIC LATITUDE:	21 ° 34' 36.94449	ELEVATION:	METERS
GEODETIC LONGITUDE:	158 07 40.28921		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ ± ANGLE °
HI 3	5103	456,555.88	149,040.56	- 0° 02' 49"

\* 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

THESE DATA OBTAINED FROM ADJUSTMENT OF OCT 1971

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1070  
HAWAII  
LATITUDE 21 ° 30' TO 22 ° 00'  
LONGITUDE 158 ° 00' TO 158 ° 30'  
DIAGRAM NF 4-11 OAHU

ALEI ( Hawaii, H.A.P., 1932) -- Station is 2-2/3 miles E of Kaena Point, near edge of cliff at Alei Pali. A prominent rock (elevation about 800 feet) projects out from bluff about 0.1 mile NNE of station.

Station and R.M.s 1 and 2 are standard disks set in concrete in depressions in boulders.

This station can best be reached by the trail up to station KAUAHO and thence around gulches.

This station sees stations BATH and PUEO.

OBJECT	DISTANCE	DIRECTION
MANINI	meters	0°00'00"0
R.M. 2	9.23	67 33 40
R.M. 1	15.48	305 21 20

Height of signal above station mark - 3 meters.

Height of instrument above station mark - 1.5 meters.

COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: ALEI  
ESTABLISHED BY: H.A.P. YEAR: 1932 STATE: Hawaii  
RECOVERED BY: D.G. Rushford YEAR: 1964 COUNTY: Honolulu

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.50 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	
LUCK 1932				00 00 00.0
R.M. No. 2	NNW	28.987	8.835	00 47 27
R.M. No. 1	SW	50.769	15.475	238 34 49

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

Station is located about 2-3/4 miles east of Kaena Point and 1 mile west-southwest of Camp Erdman, at edge of bluff above Alei Pali. It is at the west side of a deep ravine and on the northeast corner of the broad flat-topped ridge that lies along the northeast side of Manini Gulch.

To reach station from the post office in Waianae, go north on State Highway 90 for 9.1 miles to paved side road right. Turn right and go 2.0 miles to top of hill and T-junction at guard shack. Turn right and go 0.6 mile; take right fork and follow track road down-grade, crossing canyon and going up other side, for 0.9 mile to top of ridge. Turn sharp left and go down along ridge for 0.45 mile to fork. Take right fork over top of ridge for 0.3 mile to dim fork. Keep ahead on left fork for 0.45 mile to fork at clump of ironwoods. Take dim right fork and keep northeast along east edge of ridge top, through grass and low brush, for 0.1 mile to end of hill and station. (A 4-wheel-drive vehicle is required).

Station mark is a standard disk stamped "ALEI 1932", cemented in a drill hole in a 1-1/2-foot boulder that projects 4 inches above ground.

Reference mark number one is a standard disk stamped "ALEI NO 1", cemented in a drill hole in a 3-foot boulder that projects 8 inches above ground. It is in a bare, rocky strip, resembling a road and is 0.9 foot higher than station mark.

Reference mark number two is a standard disk stamped "ALEI NO 2", cemented in a drill hole in a 3 x 4-foot boulder that projects 1-1/2 feet above ground. This boulder is the center of a pattern of 4 prominent rounded boulders that lay on the slope. The mark is 8.7 feet lower than station mark. NOTE: A considerable discrepancy was found in the distance to reference mark number two; the 1932 distance is believed to be inaccurate because of the great difference in elevation between station and reference mark. The distance in this description is computed from a slope measurement and a vertical angle.

\*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.

USCOMNAVDC 27173-P28

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: ALEI

STATE: HAWAII

YEAR: 1932

THIRD

ORDER

SOURCE: G- 9889

GEODETIC LATITUDE:	21 ° 34 ' 34.742	ELEVATION:	329	METERS
GEODETIC LONGITUDE:	158 14 30.847	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	B OR Δ B1 ANGLE *
HI 3	5103	417,805.16	148,864.71	- 0 05' 20"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH *	CODE
MANINI	89 16 18.6	89 21 39	5103

QF 184

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 211581 STATION 1071  
HAWAII  
LATITUDE 21° 30' TO 22° 00'  
LONGITUDE 158° 00' TO 158° 30'  
DIAGRAM NF 4-11 OAHU

DEPARTMENT OF COMMERCE  
U.S. COAST AND GEODETIC SURVEY  
FORM 326  
REV. AUG. 1965

## DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: ANTENNA STATE: Hawaii COUNTY: Honolulu

CHIEF OF PARTY: E.E. Jones YEAR: 1958 Described by: L.W.

NOTE.*	HEIGHT OF TELESCOPE ABOVE STATION MARK		METERS. 1.5		HEIGHT OF LIGHT ABOVE STATION MARK		1.8		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					
RED CACTUS			W			00 00 00.0 17 01 16				

The station is 6.5 miles north of Waiānae, 3.0 miles east of the Kaena Point Lighthouse and about 2.8 miles south-west of the west end of the Dillingham Air Force Base runway, it is in the center of the antenna installation on Kaena Point.

To reach the station from the post office in Waiānae go west and north on the main traveled road for 6.9 miles to a cemetery on the right at the end of the pavement, continue straight ahead for 1.5 miles to a T-road right turn right and follow the winding road up the hill for 1.6 miles to the top and a T-intersection, turn right and go east for 0.4 mile to the antenna installation on the right and the station.

The station, a standard disk stamped ANTENNA 1958, is set in the center of the second floor installation, access to the station is had through door, this station is enclosed in a cylindrical steel structure and sees no station or reference marks.

Form 326  
(11-8-65)

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

NAME OF STATION: ANTENNA

ESTABLISHED BY: E.E. Jones YEAR: 1958 STATE: Hawaii  
RECOVERED BY: D.G. Rushford YEAR: 1964 COUNTY: Honolulu

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

Station mark was recovered in good condition as described in 1958.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: ANTENNA

STATE: HAWAII

YEAR: 1958

THIRD

ORDER

SOURCE: G-11764

GEODETIC LATITUDE:	21° 33' 51.0898	ELEVATION:	414.8 METERS
GEODETIC LONGITUDE:	158 14 29.5574		1361 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	ANGLE °
HI 3	5103	417,920.06	144,459.89	- 0 05 20"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
RED	95 25 19.3	95 30 39	5103

QF 460

\* 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.

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 211581 STATION 1072  
HAWAII  
LATITUDE 21° 30' TO 22° 00'  
LONGITUDE 158° 00' TO 158° 30'  
DIAGRAM NF 4-11 OAHU

DEPARTMENT OF COMMERCE  
U. S. COAST AND GEODETIC SURVEY  
Form 525  
Rev. Aug. 1965

## DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: BENCH MARK 60 A (USE) STATE: Hawaii COUNTY: Honolulu

CHIEF OF PARTY: E.E. Jones YEAR: 1958 Described by: L.W.

NOTE*		HEIGHT OF TELESCOPE ABOVE STATION MARK		METERS.1 1.5		HEIGHT OF LIGHT ABOVE STATION MARK		1.8 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:1		
					feet	meters	°	'	"
desc		RED RM 1		S	48.61	14.812	00	00	00.0
							195	02	21

The station is 8.4 miles north of Waiānae, 4.5 miles south of the Kaena Point Light House, on the west side of the main road running from Waiānae to Kaena Point.

The station is a standard U.S. Army Corps of Engineers bronze disk set in a 12 inch concrete post flush with the old railway bed, the station is about 10 feet north of the north end of a concrete buttment for a railway bridge which is no longer there.

Reference mark 1, a standard disk stamped EM 60 A 1958 NO 1. is set in a drill hole in the south buttment of the old railway bridge. it is about 2 feet lower than the station and about 2 feet lower than the top of the buttment in a step formed to hold the lateral supports for the bridge.

To reach the station from the post office in Waiānae go west and north for 8.4 miles to the station on the left, this 0.15 miles past a T- intersection, pack west about 100 feet to the top of an old railway bed and the station.

Detailed description

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

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: BENCH MARK 60 A USE

STATE: HAWAII

YEAR: 1958

THIRD

-ORDER

SOURCE: G-11764

GEODETIC LATITUDE:	21° 33' 02.2081	ELEVATION:	6.0 METERS
GEODETIC LONGITUDE:	158 14 35.9838		20 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ OR ANGLE °
HI 3	5103	417,305.75	139,528.55	- 0° 05' 22"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH* (From south)	CODE
RED	145 04 32.3	145 09 54	5103

QF 461

(continued on next page)

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1074  
HAWAII  
LATITUDE 21 ° 30' TO 22 ° 00'  
LONGITUDE 158 ° 00' TO 158 ° 30'  
DIAGRAM NF 4-11 OAHU

DEPARTMENT OF COMMERCE  
U. S. COAST AND GEODETIC SURVEY  
FORM 1355  
Rev. Aug. 1965

## DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: CACTUS

STATE: Hawaii

COUNTY: Honolulu

CHIEF OF PARTY: E.E. Jones

YEAR: 1958

Described by: L.W. 1.8

NOTE,*	HEIGHT OF TELESCOPE ABOVE STATION MARK		1958 METERS. 1.5	HEIGHT OF LIGHT ABOVE STATION MARK		1.8 METERS.
2a	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				
12a	OBJECT	BEARING	DISTANCE		DIRECTION ° ' "	
			feet	meters		
	RED RM 1	S	30.49	9.390	00 00 00.0 94 44 50	

The station is 7.0 miles north of Waianae, 2.5 miles east of Kaena Point Light house and 2.5 miles south-west of the west end of the Dillingham Air Force Base runway.

To reach the station from the post office in Waianae go north on the main traveled road for 6.9 miles to the end of the pavement and a cemetery on the right, continue straight ahead for 1.5 miles to a T-road right, turn right and follow the winding road up the steep hill for 1.6 miles to the top and a T-intersection, Turn left and go 0.1 mile, then pack south to the top of the hill and the station, a 10 minute pack.

The station a standard disk stamped CACTUS 1958 is set in a drill hole in a boulder and is near the west end of the top of the hill.

Reference mark number 1, a standard disk stamped CACTUS NO 1, 1958 is set in a drill hole in a boulder and is about the same elevation as the station.

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: CACTUS

ESTABLISHED BY: E.E. Jones

YEAR: 1958

STATE: Hawaii

BENCH MARK(S) ALSO ☐

RECOVERED BY: G. Andreassen

YEAR: 1967

COUNTY: Honolulu

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:

Recovered as described and found in good condition.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: CACTUS

STATE: HAWAII

YEAR: 1958

THIRD

ORDER

SOURCE: G-11764

GEODETIC LATITUDE: 21 ° 34' 00.1515	ELEVATION: 411.4 METERS
GEODETIC LONGITUDE: 158 14 53.0095	1350 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	§ 10R Δ §1 ANGLE *
HI 3	5103	415,707.79	145,377.72	- 0° 05' 28"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
RED	76 41 07.1	76 46 35	5103

QF 458

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1075  
HAWAII  
LATITUDE 21° 30' TO 22° 00'  
LONGITUDE 158° 00' TO 158° 30'  
DIAGRAM NF 4-11 OAHU

Camp (Oahu Island, L. G. Simmons, 1927).—In Waialua district, on the north slope of Waianae Range, about 1¼ miles south and west of Kawaihapai railroad station, on the end of a ridge west of a lone ranch house about 140 feet north of or below a fence line. Best reached by first gulch east of station. Marked according to note 6a, standard disk station mark in cement in tile. Reference marks set according to note 13a, standard reference disks in concrete in tiles, are at the following distances and azimuths from the station: No. 1, 13.465 meters (44.18 feet), 260° 27'; No. 2, 21.490 meters (70.51 feet), 124° 11'. Re-marked according to note 14A in 1929.

CAMP ( Hawaii, L.G.S., 1927; H.A.P., 1932)  
--Station and R.M. 1 recovered in good condition. R.M. 2 has been destroyed. A good trail leads up the gulch 0.6 mile E of the station.

FORM 526a  
(9-18-66)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: CAMP  
ESTABLISHED BY: L.G.S. YEAR: 1927 STATE: Hawaii  
RECOVERED BY: D.G. Rushford YEAR: 1964 COUNTY: Honolulu

HEIGHT OF TELESCOPE ABOVE STATION MARK		2.51 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	° ' "			
MOKU 1927				00	00	00.0	
R.M. No. 1	ENE	44.092	13.438	281	08	48	
R.M. No. 3	SSE	46.947	14.310	357	48	00	

Station mark and reference mark number one were recovered in good condition. Reference mark number two has been destroyed by erosion. A new reference mark, number three, was established. A complete description follows:

Station is located about 5 miles west of Waialua, on the northwest point of the end of a ridge overlooking Dillingham Airfield. It is at about 1048 feet elevation and is about 500 feet west of an old cabin on point of ridge across draw.

To reach station from the post office in Waianae, go north on State Highway 90 for 9.1 miles; turn right, on paved side road, and go 2.0

miles to top of hill and T-junction. Turn right and go 0.6 mile; take right fork, dirt road downhill, and go 2.6 miles to large cabin on left. Continue on road along ridge for 0.2 mile to fork. Take left fork and go 1.0 mile to side road left, on hairpin right curve of main road. Go left down ridge for 1.25 miles to end of road. Continue ahead, picking way on dim track road through brush for 0.25 mile to station. (NOTE: A 4-wheel-drive vehicle is required).

Station mark could not be examined because a large iron yoke, which is part of the HTS Type A signal, rests upon it. The 5-inch soil pipe in which the mark is set projects 1 inch above ground. The 5-1/2-foot square concrete platform of the signal is about 3 feet above ground. A red and white metal target extends 6 feet above the platform.

Reference mark number one is a standard disk stamped "CAMP NO 1", set in cement in the top of a 5-inch soil pipe that projects 1 foot above ground. It is 10 feet east of the southeast corner of a bare, red, eroded area and is 1.7 feet lower than station mark.

Reference mark number three is a standard disk stamped "CAMP 1927 NO 3 1964", brazed to the top of a 1-1/2-inch iron pipe that is set in cement and projects 6 inches above ground. It is in a grass and brush area and is 4.8 feet higher than station mark.

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

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

USCOMMA-DC 27173-P59

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: CAMP  
STATE: HAWAII

YEAR: 1927

SECOND ORDER

SOURCE: G-SP156

GEODETIC LATITUDE: 21° 34' 16.883	ELEVATION: 319 METERS
GEODETIC LONGITUDE: 158° 12' 25.280	SCALED FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	§ 10R Δ § 1 ANGLE
HI 3	5103	429,654.44	147,045.62	- 0° 04' 34"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
MOKU	339° 18' 38.3	339° 23' 12"	5103

QI 294

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 211581 STATION 1078  
HAWAII  
LATITUDE 21 ° 30' TO 22 ° 00'  
LONGITUDE 158 ° 00' TO 158 ° 30'  
DIAGRAM NF 4-11 OAHU

SEE STATION DILLINGHAM

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: CROSS ON ROCK WALL

STATE: HAWAII

YEAR: 1964

SECOND

-ORDER

SOURCE: G-12664

NO OBSERVATION CHECK ON THIS POSITION

GEODETIC LATITUDE:	21 ° 35' 02.697	ELEVATION:	2	METERS
GEODETIC LONGITUDE:	158 10 30.536	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ - IOR $\Delta$ $\theta$ 1 ANGLE *
HI 3	5103	440,490.13	151,655.08	- 0° 03' 52"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE
	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 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# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1079  
HAWAII  
LATITUDE 21° 30' TO 22° 00'  
LONGITUDE 158° 00' TO 158° 30'  
DIAGRAM NF 4-11 OAHU

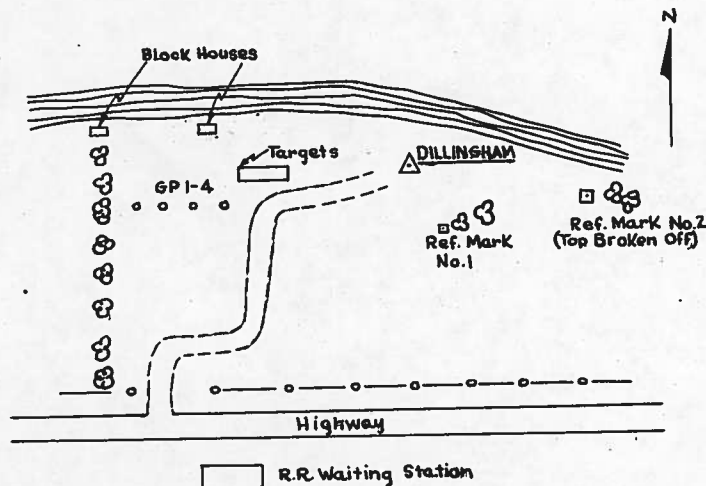
Dillingham (Oahu Island, L. G. Simmons, 1927).—In Waiāluā District, western coast of Oahu, about 1¼ miles east of Kawaihapai railroad station, ¼ mile west of Mokuleia railroad station, on edge of bank or dune in pasture of Dillingham ranch, on shore line, about 100 yards west of small boathouse and 200 yards east of fence line marking western limits of pasture. Marked according to note 1a, standard disk in concrete block. Reference marks, note 11a, standard reference disks in concrete blocks, were set at the following distances and azimuths from station: No. 1, 21.675 meters (71.11 feet), 23° 58'; No. 2, 45.960 meters, (150.79 feet), 319° 03'. Re-marked according to note 14A in 1929.

DILLINGHAM ( Hawaii, L.G.S., 1927; H.A.P., 1932)  
--Recovered in good condition. The boathouse E of station has been removed. Remains of an old pier were found. Storm high-water line is 5-1/2 meters N of station.

(477th FA Oban.Bn., 1945)--Station is about 1-1/2 miles E of Kawaihapai railroad station, 1/2 mile W of Mokuleia railroad station, on edge of bank or dune in pasture of Dillingham ranch, on shoreline, about 100 yards W of small boathouse, and 200 yards E of fence line marking W limits of pasture.

Station is marked with a standard station disk set in the top of a square block of concrete. This station is now marked as above with a concrete platform about 4 feet above the ground with a sleeve of 2-1/2-inch pipe with a signal pole 10 feet high carrying a metal target about 3 by 2 feet with 2-inch holes bored in it to cut down the wind resistance. The target is painted red and white.

OBJECT	DISTANCE meters	AZIMUTH
R.M. 1	21.675	23°58'
R.M. 2	45.960	319 03



(continued on next page)

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: DILLINGHAM

STATE: HAWAII

YEAR: 1927

SECOND

-ORDER

SOURCE: G-SP156

GEODETIC LATITUDE:	21° 35' 02.616	ELEVATION	2	METERS
GEODETIC LONGITUDE:	158 10 30.570	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	§ 108 Δ § 1 ANGLE °
HI 3	5103	440,486.92	151,646.91	- 0° 03' 52"

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE § 108 Δ § 1 FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
MOKU	29° 30' 37.1	29° 34' 29"	5103

QI 275

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1079

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

DILLINGHAM (continued)

FORM 326a  
(5-15-69)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: DILLINGHAM

ESTABLISHED BY: L.G.S.

RECOVERED BY: D.G. Rushford YEAR: 1927 STATE: Hawaii  
YEAR: 1964 COUNTY: Honolulu

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.51 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				METERS		
OBJECT	BEARING	DISTANCE		DIRECTION		
		FEET	METERS			
MOKU 1927				00	00	00.0
Cross on Rock Wall	NNE	8.790	2.680	171	58	16
R.M. No. 3	ESE	79.453	24.218	272	24	44
R.M. No. 4	SSW	71.071	21.662	354	29	29

The station sub-surface mark was recovered. The surface mark was destroyed by a tidal wave which has lowered the beach in the vicinity about 3 feet. At the same time the Hawaii Territorial Survey Type A signal was shifted seaward and nearly buried about 8 feet north of station. The concrete monument in which R.M. No. 1 was set was found with the top broken off and the mark gone. R.M. No. 2 was not found and is believed destroyed. The underground mark was lowered and a new surface mark set over it. Two new reference marks were established. A complete description follows: Station is located along the north shore of Oahu, about 3 miles west of Waialua, 1/2 mile west-northwest of the mouth of Makaleha Stream, 150 yards

east-southeast of northernmost tip of point and just outside the north fence of a large pasture owned by the Crowbar Ranch.

To reach station from the highway overpass at south end of Waialua, go west on State Highway 99 for 3.4 miles to red board gate on right (key may be obtained at the ranch office on left side of highway). Pass through gate and go north across pasture for 0.2 mile to fence and station just outside fence, in sand beach area.

Station mark is a standard disk stamped "DILLINGHAM 1927 1964", set in the top of a 2-foot-diameter mass of concrete and rock flush with sand. It is 15 yards west of a row of old pipes in the water, 5.5 feet north of fence, and 3 feet lower than bottom wire of fence.

Reference mark number three is a standard disk stamped "DILLINGHAM NO 3 1927 1964", set in the top of a 12-inch-square, concrete monument that projects 6 inches. It is on the bank, 2.8 feet north of fence, 7.3 feet southwest of a triangle blaze on ironwood tree, and 2.9 feet higher than station.

Reference mark number four is a standard disk stamped "DILLINGHAM NO 4 1927 1964", cemented in a drill hole in the top of a 12-inch-square, concrete monument that projects 2 inches (this is old R.M. No. 1 monument). It is on west edge of dim road, 28 feet west of a large ironwood that has been burned on west side, and is 0.37 feet higher than station.

Cross on rock wall is a 2-inch, chiseled cross in rock at center of the exposed part of the old HTS Type A signal, which is 7 feet long, 4 feet thick, constructed of stone and concrete, and projects 1-1/2 feet from the sand on a 45-degree tilt.

\*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.

USCOMDA-DC 27179-P99

QI 397

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1081  
HAWAII  
LATITUDE 21 ° 30' TO 22 ° 00'  
LONGITUDE 158 ° 00' TO 158 ° 30'  
DIAGRAM NF 4-11 OAHU

DEPARTMENT OF COMMERCE  
U. S. COAST AND GEODETIC SURVEY  
Form 522  
Rev. Aug. 1965

## DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: FENCE

STATE: Hawaii

COUNTY: Honolulu

CHIEF OF PARTY: E.E. Jones

YEAR: 1958

Described by: L.W.

NOTE	HEIGHT OF TELESCOPE ABOVE STATION MARK 1.5 METERS	HEIGHT OF LIGHT ABOVE STATION MARK 1.8 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: ° ' "
desc			CACTUS Towell Station No.13	W		00 00 00.0 357 48 03

The station is 6.5 miles north of Waianae, 3.0 miles east of Kaena Point Light House, and 2.8 miles south-west of the west end of the Dillingham Air Force Base runway.

To reach the station from the post office in Waianae go west and north on the main traveled road for 6.9 miles to a cemetery on the right at the end of the pavement, continue straight ahead for 1.5 miles to a T-intersection turn right and follow the winding road 1.6 miles to the top of the hill and a T-intersection, turn right and go 0.4 miles to the antenna installation on the right, the station is about 100 feet east of the radar antenna and about 8.0 feet west of a high mesh wire fence.

The station a standard disk stamped FENCE 1958 is set in a drill hole in a piece of buried concrete and is flush with the ground.

Towell station No 13 is an unstamped 1.0 inch iron pipe projecting 6 inches, it is 182 feet west of the station and almost on line with station CACTUS.

Form 522  
(11-8-65)

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

R

NAME OF STATION: FENCE

ESTABLISHED BY: E.E. Jones YEAR: 1958 STATE: Hawaii

RECOVERED BY: D.G. Rushford YEAR: 1964 COUNTY: Honolulu

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

Station mark was recovered and found in good condition, however Towell Station # 13 was not found; there are some mobile offices setting in this area and is believed destroyed.

Station is located on the ridge above Kaena Point, at the Kaena Point Tracking Station, in the east end of the antenna building compound, in a fence corner, about 1800 feet southeast from the T-junction at the Security Guard shack.

Station mark is a standard disk stamped "FENCE 1958", cemented in a drill hole in a piece of buried concrete that is about 6 inches in diameter on the top. It is 8 feet west of the north-south fence, 8.7 feet west-northwest of the fence corner post, 2.8 feet west-northwest of the northwest corner of a small, red, paint-storage shack and is about 4 inches below ground surface.

No reference marks established.

\*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.

CORS-DC 84314

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: FENCE

STATE: HAWAII

YEAR: 1958

THIRD

ORDER

SOURCE: G-11764

GEODETIC LATITUDE:	21 ° 33 ' 49.7629	ELEVATION:	408.3 METERS
GEODETIC LONGITUDE:	158 14 28.5375		1340 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ OR ANGLE *
HI 3	5103	418,016.12	144,325.86	- 0 05' 19"

\* 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
CACTUS	114 24 33.2	114 29 52	5103

QF 462

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 211581 STATION 1082  
HAWAII  
LATITUDE 21 ° 30' TO 22 ° 00'  
LONGITUDE 158 ° 00' TO 158 ° 30'  
DIAGRAM NF 4-11 OAHU

HAILI ( Hawaii, H.A.P., 1932)--Station is 4-1/2 miles E of Kaena Point, on a broad ridge E of Haili Gulch. A prominent shoulder (elevation 500 feet) projects out from general line of the cliff on the W side of this gulch. Station KAUHAO is visible. Station and R.M.s 1 and 2 are standard disks set in concrete in depressions in boulders.

To reach station, follow the trail past station CAMP and around gulches.

OBJECT	DISTANCE	DIRECTION
MAHOE	meters	0°00'00"0
R.M. 2	7.90	164 01 00
R.M. 1	7.46	254 15 40

Height of signal above station mark - 3 meters.  
Height of instrument above station mark - 1.5 meters.

HAILI ( Hawaii, H.A.P., 1932; G.A.N., 1954)  
--Station destroyed. Reference mark 1 disturbed. Reference mark 2 appears O.K. but is on a small rock which is easily movable as was reference mark 1.

(...-8-55)

## RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: HAILI  
ESTABLISHED BY: H.A.P. YEAR: 1932 STATE: Hawaii  
RECOVERED BY: D.G. Rushford YEAR: 1964 COUNTY: Honolulu

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

Station was searched for but not found. The entire ridge top in the vicinity of the station is badly eroded and completely bare. It is believed that all the marks have been washed away.

\* 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.

COBEN-17 14314

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: HAILI  
STATE: HAWAII

YEAR: 1932

THIRD

ORDER

SOURCE: G- 9889

GEODETIC LATITUDE:	21 ° 34' 29.155	ELEVATION:	305	METERS
GEODETIC LONGITUDE:	158 12 46.388	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ IOR Δ S1 ANGLE *
HI - 3	5103	427,663.79	148,286.58	- 0° 04' 42"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
MAHOE	158 54 45.4	158 59 27	5103

QF 178

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1083  
HAWAII  
LATITUDE 21° 30' TO 22° 00'  
LONGITUDE 158° 00' TO 158° 30'  
DIAGRAM NF 4-11 OAHU

HIKE (Hawaii, H.A.P., 1932)--Station is 3 miles E of Kaena Point and 0.6 mile W of the Y.M.C.A. camp on the N side of the railroad, where it passes through a small cut. Station and R.M.s 1 and 2 are standard disks set in concrete in depressions in boulders.

OBJECT	DISTANCE	DIRECTION
MAHOE	meters	0°00'00"0
Telephone pole 1090	16.64	42 48
N rail O.R. & L. track	8.15	80
R.M. 2	15.67	222 07 50
High-water line	23 1/2	270
R.M. 1	16.26	330

Height of signal above station mark - 3 meters.  
Height of instrument above station mark - 1.5 meters.

(477th FA Obsn. Bn., 1945)--Station is 2700 yards W of air strip, 27 feet N of railroad, and 50 feet N of Highway 11.  
R.M. 1 is 52 feet NE of station.  
R.M. 2 is 50 feet NW of station.  
Station and reference markers are embedded in coral. Marked by red flag at station and on telephone pole. Marks are in good condition.  
Station is 3 miles E of Kaena Point. Railroad passes through a small cut at this point.

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: HIKE  
ESTABLISHED BY: H.A.P. YEAR: 1932 STATE: Hawaii  
RECOVERED BY: W.R. Porter YEAR: 1963 COUNTY: Honolulu

Detailed statement as to the status of the original description; including marks found, stampings, changes made, and other pertinent facts:  
Station mark was recovered and found to be in good condition, however erosion is gradually undermining the rock and the station will be lost eventually. Reference mark number one is gone; its location, as determined by distance and angle, was at the mouth of a small wash and there are no boulders left in the vicinity. Reference mark number two was recovered, however there is some discrepancy in the distance. The boulder in which it is located sets on top of the bedrock beach and it has probably been shifted by high waves.

A new station, HIKE 2, was established nearby, but since the army uses station HIKE 1932 extensively, it was not removed upon completion of the establishing of the new station. Since the station will be lost no new reference marks were established. A complete description follows:

Station is located along the north coast of Oahu, about 3 miles airline east of Kaena Point and 3/4 mile west of Camp Erdman, on the east end of a dirt bank along the north side of an old railroad bed, where it passes through a large cut.

To reach station from the post office in Waialua, go south on Goodale Avenue for 0.5 mile; take right fork and go west on State Highway 99 for 6.1 miles to end of paved road; continue ahead on graded road along coastline for 0.85 mile to Camp Erdman gate on the right; continue ahead for 0.8 mile to road junction between power poles No. 243 and 244, and the station on right.

Station mark is a standard disk stamped "HIKE 1932", cemented in a drill hole in the top of a 2-foot boulder flush with the ground, but with its entire north side exposed due to water run-off. It is 30 feet north of center line of old railroad bed, 75 feet north of the edge of the north and lower one of two parallel roads (and about 20 feet lower than this road), 26.6 feet north-northeast of the stub of a 6 x 8-inch post, 220 feet northeast of power pole No. 244, 59.8 meters from station HIKE 2 in azimuth 118° 06' 02", and about 15 feet higher than the rock beach.

NOTE: See description for HIKE 2.

(continued on next page)

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: HIKE  
STATE: HAWAII YEAR: 1932 THIRD ORDER  
SOURCE: G- 9889

GEODETIC LATITUDE:	21° 34' 58.102	ELEVATION:	6	METERS
GEODETIC LONGITUDE:	158 14 17.564	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ & ANGLE °
HI 3	5103	419,062.49	151,219.87	- 0° 05' 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
MAHOE	268 18 43.0	268 23 59	5103

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 211581 STATION 1083

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

HIKE (continued)

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: HIKE  
ESTABLISHED BY: H.A.P. YEAR: 1932 STATE: Hawaii BENCH MARK(S) ALSO ☐  
RECOVERED BY: D.M. Whipp YEAR: 1965 COUNTY: Honolulu  
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:

R<sup>1</sup>

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

Station was found destroyed by erosion; the boulder had become dislodged and rolled down to the beach. The disk was removed and taken to the Coast and Geodetic Survey Office in Honolulu.

NOTE: This station was found to be in danger of loss due to erosion in 1963 so a new station, HIKE 2, was established nearby at that time. See description for HIKE 2.

FORM CG-5-528 (1-59)  
USCOMM-CC 1850-P-85

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

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 211581 STATION 1084  
HAWAII  
LATITUDE 21° 30' TO 22° 00'  
LONGITUDE 158° 00' TO 158° 30'  
DIAGRAM NF 4-11 OAHU

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

## DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: HILL

STATE: Hawaii

COUNTY: Honolulu

CHIEF OF PARTY: E.E. Jones

YEAR: 1958

Described by: L.W.

NOTE: HEIGHT OF TELESCOPE ABOVE STATION MARK METERS: 1.5 HEIGHT OF LIGHT ABOVE STATION MARK 1.8 METERS.

2a	Surface-station mark, Underground-station mark	DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION	BEARING	DISTANCE		DIRECTION
				feet	meters	
12a	CACTUS RM 1		NE	35.76	10.901	0 00 00.0 221 55 57

The station is on the highest part of a prominent hill 3.0 miles east of the Kaena Point Light House, 2.8 miles south-east of the west end of Dillingham Air Force Base runway and about 7.0 miles north of Waianae, on Oahu Island, T.H.

To reach the station from the post office in Waianae go west and north on the main road for 6.9 miles to the end of the pavement at a cemetery on the right, continue straight ahead for 1.5 miles to a T-intersection on the right, turn right and follow the winding road up the steep hill for 1.6 miles to the top and a T-intersection, turn right and follow the main road east and north 1.0 mile to its end, rack north up the hill to the highest point and the station, a 10 minute pack.

The station a standard disk stamped HILL 1958 is set in drill hole in an outcrop of bedrock on the highest part of the hill.

Reference mark no. 1 a standard disk stamped HILL 1958 NO 1, is set in a drill hole in a boulder and is about the same elevation as the station.

Form 526  
(11-8-68)

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

R

NAME OF STATION: HILL

ESTABLISHED BY: E.E.J.

YEAR: 1958

STATE: Hawaii

RECOVERED BY: W.R.P.

YEAR: 1960

COUNTY: Honolulu

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

This station was destroyed by construction.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: HILL

STATE: HAWAII

YEAR: 1958

THIRD

-ORDER

SOURCE: G-11764

GEODETIC LATITUDE: 21° 34' 04.3619	ELEVATION: 400.9 METERS
GEODETIC LONGITUDE: 158° 14' 33.3899	1315 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ FOR Δ & Δ ANGLE °
HI-3	5103	417,560.38	145,799.65	- 0° 05' 21"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
CACTUS	77° 04' 50.4"	77° 10' 11"	5103

QF 459

\* 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.

V W

Comp-DC 34314

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1085  
HAWAII  
LATITUDE 21° 30' TO 22° 00'  
LONGITUDE 158° 00' TO 158° 30'  
DIAGRAM NF 4-11 OAHU

FORM 525  
(9-18-69)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: **KAENA ASTRO** STATE: **Hawaii** COUNTY: **Honolulu**  
CHIEF OF PARTY: **C. Andreasen** YEAR: **1967** DESCRIBED BY: **C. Andreasen**

NOTE.	HEIGHT OF TELESCOPE ABOVE STATION MARK		METERS.†		HEIGHT OF LIGHT ABOVE STATION MARK		METERS.	
	SURFACE-STATION MARK, UNDERGROUND-STATION MARK		DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION					
	OBJECT		BEARING	DISTANCE		DIRECTION‡		
				FEET	METERS			

Station is located on the northwest corner of Oahu Island, at the Kaena Point Tracking Station, located about 1000 feet east of the Headquarters Building, on the highest part of a hill and about 150 feet east of a silver water tank.

To reach from the guard building at the gate, turn right, east, at the guard building and proceed 0.3 mile to a road left where the main road passes thru a gate into a fenced area, turn left northeast, and proceed 0.3 mile to a T-road right, turn right uphill for 0.15 mile passing thru a gate enroute to a silver water tank near the top of the hill, and of vehicle travel at the water tank, pack east via gate to the highest point of the hill and mark, approximately a 200 ft. pack.

The mark is set in the center of the top of an abandoned concrete antenna pier which is 4 feet square and projects 3.5 feet. The mark is a standard disk stamped "KAENA ASTRO 1967".

No reference marks or azimuth mark were set.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **KAENA ASTRO**  
STATE: **HAWAII** YEAR: **1967** SECOND -ORDER

SOURCE: **G-14000**

GEODETIC LATITUDE	21° 33' 47.4362	ELEVATION	455.5 METERS
GEODETIC LONGITUDE	158 14 19.0444		1494 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ 10R Δ θ1 ANGLE °
HI 3	5103	418,911.85	144,089.71	- 0° 05' 16"

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE θ 10R Δ θ1 FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH* (From south)	CODE
	0 1 2	0 1 2	

QF 450

\*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 211581 STATION 1086  
HAWAII  
LATITUDE 21° 30' TO 22° 30'  
LONGITUDE 158° 00' TO 158° 30'  
DIAGRAM NF 4-11 OAHU

KAENA "S" ( Hawaii, H.A.P., 1932)--About 0.6 mile E of Kaena Point, on the ridge leading down from Puu Puso, at an elevation of about 600 feet, a square concrete observation post built by the U.S. Army. The station is the center of the 2-inch pipe projecting about 1-1/2 feet through the roof.

A good trail leads up to the station from the N side of the point about 0.4 mile E of the light.

OBJECT	DISTANCE	DIRECTION
KAENA PT. LT.	meters	0°00'00"0
R.M. 1	18.93	46 11 50
R.M. 2	10.05	326 18 30

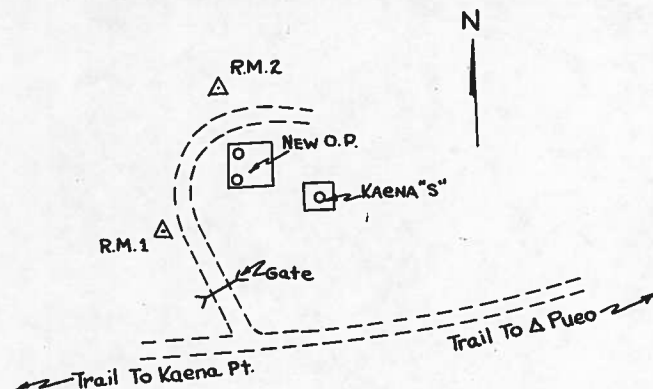
Height of signal above station mark - 3 meters.  
Height of instrument above station mark - 1.5 meters.

(477th FA Obsn.Bn., 1945)--About 890 yards E of Kaena Point on the ridge leading down from Puu Puso, at an elevation of 564 feet. The station is the center of the 2-inch pipe projecting about 1-1/2 feet through roof of old observation post. A new observation post has been constructed immediately in front of old Kaena "S".

To reach station, drive to gate which is located about 400 yards off main road and 600 yards E of Kaena Point Lighthouse. Thence proceed up stairs to trail and continue up trail to junction with trail off to left and station site. A gate will be seen just off main trail before the station site.

Station is in good condition, though abandoned.

Reference marks are U.S. Military Reservation Markers set in concrete posts. They are as described and in good condition.



## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KAENA S

STATE: HAWAII

YEAR: 1932

THIRD

ORDER

SOURCE: G- 9889

GEODETIC LATITUDE:	21° 34' 34.928	ELEVATION:	158	METERS
GEODETIC LONGITUDE:	158 16 28.046	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	φ OR Δ OR ANGLE
HI 3	5103	406,743.32	148,901.81	- 0° 06' 03"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
KAENA POINT LT	98 53 14.1	98 59 17	5103

QF 187

(continued on next page)

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1086

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

KAENA S (continued)

FORM 326a  
(2-12-65)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KAENA S  
ESTABLISHED BY: H.A.P. YEAR: 1932 STATE: Hawaii  
RECOVERED BY: D.G. Rushford YEAR: 1964 COUNTY: Honolulu

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.42 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			
KAENA POINT LIGHT 1927 R.M. No. 2	SW	32.940	10.040	00 326	00 19	00.0 19

Station mark and reference mark number two were recovered in good condition. Reference mark number one was searched for by distance and angle but was not found and is believed destroyed by erosion. A complete description follows:

Station is located at Kaena Point (the westernmost point of Oahu), 1/2-mile east of Kaena Point Light, at about 600 feet elevation, on the roof of an old military observation post.

To reach station from the highway overpass at Waialua, go west on State Highway 99 for 7.0 miles to Camp Erdman on the right. Continue on the highway for 3.4 miles to a fork at power pole No. 208, 0.1 mile before

reaching the right fork to Kaena Point Light. Take left fork and go up around end of ridge for 0.15 mile to end of truck travel by concrete camouflaged bank on left. Climb up this bank and follow trail up ridge to station. About a 20-minute pack.

Station is the center of a 2-inch-diameter iron cap on the top of an iron pipe that projects 2 feet from the concrete roof of the old observation post. A rock covering on the roof comes up to within 3 inches of the top of the pipe. Station is 5.5 feet east from west end of roof and 6.2 feet west-northwest of the northwest corner of the roof entrance of the observation post. A later observation post was constructed at the west end of the old one that the station is on. This later one is 4 feet lower and the two are separated by 4 feet.

Reference mark number two is a U.S. Military Reservation Boundary Mark, with a large cross in the center and stamped "4", set in the top of a 7-inch-square, concrete post flush with the ground. It is at the west edge of the old trail, above a stone bulkhead supporting the trail and is 16.2 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 27178-P88



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 211581 STATION 1088  
HAWAII  
LATITUDE 21° 30' TO 22° 00'  
LONGITUDE 158° 00' TO 158° 30'  
DIAGRAM NF 4-11 OAHU

KAUHAO ( Hawaii, H.A.P., 1932)--Station is 3 miles E of  
Kaena Point, midway between Kauhao and Alei Falls, at edge of  
bluff.

Station can best be reached by a trail starting from a red  
house 1/2 mile W of Y.M.C.A. Camp, following a small water line,  
and up the first draw W of the station.

Station and R.M.s 1 and 2 are standard disks set in con-  
crete in depressions in boulders.

OBJECT	DISTANCE	DIRECTION
ALEI	meters	0°00'00"0
R.M. 2	49.12	284 41 00
R.M. 1	11.84	338 07 00

Height of signal above station mark - 3 meters.

Height of instrument above station mark - 1.5 meters.

DEPARTMENT OF COMMERCE  
U. S. COAST AND GEODETIC SURVEY  
FORM 518  
(REV. Feb. 1965)

### RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Kauhao

ESTABLISHED BY: H. A. P. YEAR: 1932 STATE: Hawaii

RECOVERED BY: W. R. Porter YEAR: 1957 COUNTY: Honolulu

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

Recovered as described. Station in good condition. Red house mentioned  
in description burned down about 1930, however another house, belonging  
to a Mr. Bowman, occupies the same general location as the former red  
house.

\*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.

COM-DC 61207

### ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KAUHAO

STATE: HAWAII

YEAR: 1932

THIRD

ORDER

SOURCE: G- 9889

GEODETIC LATITUDE: 21° 34' 36.712	ELEVATION: 332 METERS
GEODETIC LONGITUDE: 158 14 11.935	SCALED FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	S. IOR Δ. R. ANGLE °
HI 3	5103	419,590.48	149,060.75	- 0° 05' 13"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
ALEI	83° 38' 53.9	83° 44' 07"	5103

QF 183

(continued on next page)

# HORIZONTAL CONTROL DATA

by the  
NATIONAL GEODETIC SURVEY  
OLD HAWAIIAN DATUM

QUAD 211581

STATION 1088

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

KAUHAO (continued)

FORM 526a  
(9-18-59)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: KAUHAO  
ESTABLISHED BY: H.A.P. YEAR: 1932 STATE: Hawaii  
RECOVERED BY: D.G. Rushford YEAR: 1964 COUNTY: Honolulu

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.45 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		
LUCK 1932				00	00 00.0
R.M. No. 2	S	160.676	(48.974)	240	49 08
R.M. No. 1	WSW	38.817	11.832	294	16 18

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

Station is located about 3 miles east of Kaena Point and 3/4 mile southwest of Camp Erdman at edge of bluff above Kauhao Pali.

To reach station from the post office in Waianae, go north on State Highway 90 for 9.1 miles to paved side road right. Turn right and go 2.0 miles to top of hill and T-junction at guard shack. Turn right and go 0.6 mile; take right fork and follow track road down-grade, crossing canyon and going up other side, for 0.9 mile to top of ridge. Turn sharp left and go down along ridge for 0.45 mile to fork. Take right

fork over top of ridge for 0.3 mile; take dim right fork and go down spur ridge for 0.2 mile to end of road. Pack northeast, down across draw and up onto the next ridge, then northerly down along it about 1/4 mile to station. (About a 20-minute pack).

Station mark is a standard disk stamped "KAUHAO 1932", cemented in a drill hole in a 2 x 3-foot boulder that projects 6 inches above ground. It is in an area covered with lantana and tall grass, at extreme north end of hill, about 15 yards up above the rock line.

Reference mark number one is a standard disk stamped "KAUHAO NO 1", cemented in a drill hole in a 2-1/2-foot boulder that projects 6 inches above ground. It is 16 feet south from edge of bluff and 2.1 feet higher than station mark.

Reference mark number two is a standard disk stamped "KAUHAO NO 2", cemented in a drill hole in the 8-inch exposed section of a boulder that projects 3 inches above ground on the west side. It is at the north end of the bare red-dirt area on the north slope of the higher knoll to south of station, 16 feet northeast of a small, lone ironwood tree and 20.5 feet higher than station mark.

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

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

USCOMH-DC 27179-P89

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1089  
HAWAII  
LATITUDE 21° 30' TO 22° 00'  
LONGITUDE 158° 00' TO 158° 30'  
DIAGRAM NF 4-11 OAHU

**Kaupakuhale** (Oahu Island, L. G. Simmons, 1927).—In western part of Oahu, on the summit of a prominent hill on the Waialua slope of the Waianae Range, of same name as station, about 2¼ miles south and a little east of Mokuleia railroad station. Station marked according to note 8a, a standard disk in concrete in tile. Reference marks were set according to note 13a, standard reference disks in concrete in tiles, at the following distances and azimuths from the station: No. 1, 4.845 meters (15.90 feet), 4° 51'; No. 2, 4.995 meters (16.39 feet), 129° 47'. Re-marked according to note 14A in 1929.

(R.M.Towill Corp., 1958)--Station recovered as described. Target repainted and some brush removed. Several large trees remain which should be removed.

FORM 324a  
(9-18-69)

U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KAUPAKUHALE  
ESTABLISHED BY: L.G.S. YEAR: 1927 STATE: Hawaii  
RECOVERED BY: D.G. Rushford YEAR: 1964 COUNTY: Honolulu

HEIGHT OF TELESCOPE ABOVE STATION MARK 2-1/2 METERS,		HEIGHT OF LIGHT ABOVE STATION MARK		METERS.	
DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION					
OBJECT	BEARING	DISTANCE		DIRECTION	
		FEET	METERS		
PUU IKI 1927				00	00 00.0
R.M. No. 1	S	15.943	4.860	92	36 53
R.M. No. 2	NW	16.338	4.980	217	20 08

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

Station is located about 2-1/2 miles airline southwest of Waialua on a brushy hill of about 1567 feet elevation that sets apart from the sloping foothills on the north side of the Waianae Range.

To reach station from the overpass in Waialua, go westerly on State Highway 99 for 1.5 miles to side road left at sign "MT KAALA". Turn left and follow hard surfaced road for 1.1 miles to side road left at edge of cane field. Turn left and follow dirt road for 0.6 mile to locked gate. Pass through gate and continue on track road winding around end of ridge and then upgrade for 1.6 miles to end of road at a bare,

red, eroded end of steep hill. From here pack southerly on trail up hill to top and station. A 20-minute pack.

Station mark is a standard disk set in concrete in the top of a 5-inch soil-pipe that projects 2 inches above ground. The stamping could not be checked because of a large iron yoke, which is a part of the HTS Type A signal, resting within 1/4 inch of the disk. Station is on the northwest and lower end of the hilltop. A "Type A" signal, built in 1929 by the Hawaii Territorial Survey, is centered over the station mark. The 5-1/2-foot-square, concrete platform is about 3 feet above ground and the red and white metal target extends about 8 feet above it.

Reference mark number one is a standard disk stamped "KAUPAKUHALE NO 1", cemented in a drill hole in the 14-inch, triangular-shaped, exposed surface of a large boulder. The mark is about 6 inches above ground surface, 1 foot higher than the station mark and located in dense brush.

Reference mark number two is a standard disk stamped "KAUPAKUHALE NO 2", set in concrete in the top of a 5-inch soil-pipe that projects 8 inches above ground. It is located in dense brush and is about 2 feet lower than station mark.

NOTE: Key for locked gate may be obtained by calling Mr. Silva, phone 635830.

(D.M.Whipp, 1965)--Station was recovered as described in 1964 and all marks found in good condition.

\*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 27179-P39

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KAUPAKUHALE

STATE: HAWAII

YEAR: 1927

SECOND

ORDER

SOURCE: G-SP156

GEODETIC LATITUDE: 21° 32' 33.806	ELEVATION: 478 METERS
GEODETIC LONGITUDE: 158 09 06.363	SCALED FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	± OR Δ ± ANGLE °
HI 3	5103	448,419.75	136,623.31	- 0° 03' 21"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From zenith)	PLANE AZIMUTH (From zenith)	CODE
PUU IKI	272° 13' 46.0	272° 17' 07"	5103

Q1 295

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1090  
HAWAII  
LATITUDE 21° 30' TO 22° 00'  
LONGITUDE 158° 00' TO 158° 30'  
DIAGRAM NF 4-11 OAHU

Kealia (Oahu Island, L. G. Simmons, 1927).—Near the western point of Oahu, on the divide of the Waianae Range, about 5 miles back from Kaena Point, on the summit of a prominent knoll on top of range near center of the Kealia district intercepted by the Waianae Range. Station is best reached from the Waialua side of range. Marked according to note 6a, a standard disk station mark in concrete in tile. Reference marks, note 13a, standard reference disks in concrete in tiles are at the following distances and azimuths from station: No. 1, 58.487 meters (191.89 feet), 41° 31'; No. 2, 19.025 meters (62.42 feet), 91° 23'. Re-marked according to note 14X in 1929.

KEALIA ( Hawaii, L.G.S., 1927; 477th FA Obs. Bn., 1945)  
--Near the W point of Oahu,

on the divide of the Waianae Range, about 5 miles back from Kaena Point, on the summit of a prominent knoll on top of range near center of Kealia District intercepted by the Waianae Range.

Station is best reached from Waialua. Follow Highway 11 W 2-3/4 miles from highway underpass of railroad just E of Andrew Cox School, turn left through Dillingham Ranch following mountain trail 8 miles to station. Station is about 100 feet N of trail on top of knoll.

Station mark, marked according to Note 14X, stands about 1 foot above surface. Concrete seat for pole has broken away on NW side.

R.M. 1, distant 191.89 feet, is on crown of ridge SW of R.M. 2, on bare ground 15 yards NNE of trail. It is a standard reference-mark disk set in concrete at the center of the top of a tile which is embedded in the ground.

R.M. 2, distant 62.42 feet, is on ridge W of station and about 7 feet above. It is a standard reference-mark disk set in concrete at the center of the top of a tile which is embedded in the ground.

11-0-00)

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KEALIA  
ESTABLISHED BY: L.G.S. YEAR: 1927 STATE: Hawaii  
RECOVERED BY: D.G. Rushford YEAR: 1964 COUNTY: Honolulu

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

Station was recovered, but the mark could not be examined because of a concrete block, which is part of the Hawaii Territorial Survey "Type X" signal. Both reference marks were found in good condition. The hill is now heavily covered with ironwoods and other trees and brush up to 30 feet high and the station is completely hidden. The distance to the reference marks was not checked because of trees on line. A complete description follows:

Station is located about 2 miles south of the west end of Dillingham Airfield and 1 mile west-northwest of a radar installation, on a timbered point at about 1924 feet elevation along the divide of the Waianae Range. To reach station from the post office in Waianae, go north on State Highway 90 for 9.1 miles to paved side road right. Turn right and go 2.0 miles to top of hill and T-junction at a guard shack. Turn right and go 0.6 mile; take right fork, dirt road downhill, and go 2.6 miles to large cabin on left. Continue on road along ridge for 0.2 mile to fork. Take left fork and go 0.2 mile to bare, red, dirt area on left, as road passes over ridge and starts downgrade. From here walk northeast on trail through

\*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.

FORM-DC 3451A

(continued on next page)

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KEALIA  
STATE: HAWAII

YEAR: 1927

SECOND ORDER

SOURCE: G-SP156

GEODETIC LATITUDE:	21° 33' 15.156	ELEVATION:	586	METERS
GEODETIC LONGITUDE:	158 12 48.766	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ 10R Δ 41 ANGLE *
HI 3	5103	427,429.11	140,820.20	- 0 04 42

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE θ 10R Δ 41 FORMULA NEGLECTING THE SECOND TERM.

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

QI 293

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 211581 STATION 1090

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

KEALIA (continued)

trees for about 80 yards to station.

The concrete block mounted over station mark is 12 inches square and projects 12 inches above ground. There is a metal plate in top of block, with a depression in it to center a guyed target. Station mark was originally described as a standard disk.

Reference mark number one is a standard disk stamped "KEALIA NO 1", set in cement in the top of a 5-inch soil pipe that projects 1 foot above ground. It is on ridge line, in timber, 20 feet northwest of the trail, 3 feet northeast of a triangle blaze on a tree, and 20 yards north of road.

Reference mark number two is a standard disk stamped "KEALIA NO 2", set in cement in the top of a 5-inch soil pipe that projects 8 inches above ground. It is along the southeast side of trail to station.

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1091  
HAWAII  
LATITUDE 21° 30' TO 22° 00'  
LONGITUDE 158° 30' TO 158° 30'  
DIAGRAM NF 4-11 OAHU

## NO ORIGINAL TEXT

KEALIA (U.S.E.) (Hawaii, U.S.E., 1914; H.A.P., 1932)  
--Station is 5-1/4 miles E of Kaena Point,  
about 100 meters N of the O.R. & L. tracks, opposite telephone pole  
1124, and about 400 meters W of the site of the old Kawaihapai sta-  
tion.

Station is marked by a 5-inch pipe, filled with concrete, pro-  
jecting 10 inches and surrounded by a rude mass of concrete. It  
has a brass plate and a 1/4-inch nipple in the top, inscribed  
"U.S. Engr.-Elev." Two reference marks were built. They are bronze  
disks set in concrete.

OBJECT	DISTANCE	DIRECTION
LAND	meters	0°00'00"0
R.M. 1	19.19	127 35 20
R.M. 2	15.47	226 58 10
Storm high-water line	21	276

(477th FA Oban.Bn., 1945)--Station is situated 150 feet N of  
Highway 11 and railroad. It is 1500 yards from E end of air  
strip, N of midpoint of air strip which lies S of highway and  
railroad.

Station mark is a standard U.S.E. marker on a 6-inch drain  
pipe marked by a red flag.

R.M. 1 is 62.8 feet from station. R.M. 2 is 50.8 feet from  
station.

NOTE--Truck hit station mark and monument and destroyed them.

FORM 558  
(11-8-55)

### RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: KEALIA (U.S.E.)  
ESTABLISHED BY: U.S.E. YEAR: 1914 STATE: Hawaii  
RECOVERED BY: 25th Div. Artillery YEAR: 1958 COUNTY: Honolulu

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

Station reported disturbed. Marker found leaning and later found  
straightened and reinforced.

FORM 558  
(11-8-55)

### RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: KEALIA (U.S.E.)  
ESTABLISHED BY: U.S.E. YEAR: 1914 STATE: Hawaii  
RECOVERED BY: W.R. Porter YEAR: 1963 COUNTY: Honolulu

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 none of the marks were recovered. Data  
obtained from the State Highway Department indicated a mark consisting of  
a cross on a stone nearby which was tied to the station at one time.  
This mark was not recovered either. The location of both the station and  
the cross were determined by traversing from highway survey markers along  
State Highway 99, and digging was done. A large area along the beach in  
this vicinity has had the sand stripped from the top and it is believed  
that all the marks were destroyed.

\* 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.  
Notes--One of these forms must be used for every station recovered.

COM-DC 34314

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KEALIA USE

STATE: HAWAII

YEAR: 1914

THIRD

ORDER

SOURCE: G- 9889

GEODETIC LATITUDE:	21° 35' 06.882	ELEVATION	2	METERS
GEODETIC LONGITUDE:	158 12 05.837	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ & ANGLE *
HI 3	5103	431,496.17	152,088.24	- 0° 04' 27"

\* 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
LAND	266° 29' 29.4	266° 33' 56"	5103

QF 176

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1092  
HAWAII  
LATITUDE 21 ° 30' TO 22 ° 00'  
LONGITUDE 158 ° 00' TO 158 ° 30'  
DIAGRAM NF 4-11 OAHU

NO ORIGINAL TEXT

KEAWAULA (ARMY) ( Hawaii, U.S.E., 1927; O.A.N., 1954 )  
Found a brass

plate set in a 5-in. concrete pipe.

Form 528  
(11-8-55)

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

R

NAME OF STATION: KEAWAULA (ARMY)  
ESTABLISHED BY: U.S.E. YEAR: 1927 STATE: Hawaii  
RECOVERED BY: D.G. Rushford YEAR: 1964 COUNTY: Honolulu

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

Station was recovered and is solid in the ground, however the brass plate was just set on top of the cement, not countersunk. The plate is loose on the stem and can be rotated. The stem is set solidly in the cement. A complete description follows:

Station is located about 5-1/2 miles west-southwest of Waialua, 5 miles east-southeast of Kaena Pt., and 2 miles south of Dillingham Airfield, on a timbered knoll of 1947 feet elevation along the Waianae Range..

To reach station from the post office in Waianae, go north on State Highway 90 for 9.1 miles; turn right on paved side road and go 2.0 miles to top of hill and T-junction at a guard shack. Turn right and go 0.6 mile to fork. Take right fork, dirt road, and go 2.6 miles to large cabin on left. Continue ahead on ridge road for 0.2 mile to fork. Take left fork and go 0.6 mile to bare, eroded patch on right, where road passes around point of hill. From here pack south up through trees for about 150 yards to station.

Station mark is a 3 x 4-inch brass plate, unstamped, set in cement in the top of a 5-inch soil pipe that projects 6 inches above ground. It is on the narrow, open part of hill at south side of tree line.

\* 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.

CONS-DC 34 ..

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KEAWAULA ARMY

STATE: HAWAII

YEAR: 1927

THIRD

ORDER

SOURCE: G-SP156

GEODETIC LATITUDE:	21 ° 33 ' 06.071	ELEVATION:	METERS
GEODETIC LONGITUDE:	158 12 41.147		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ S1 ANGLE *
HI 3	5103	428,147.09	139,902.52	- 0 04 ' 40 "

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

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

QI 384

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1093  
HAWAII  
LATITUDE 21° 30' TO 22° 00'  
LONGITUDE 158° 00' TO 158° 30'  
DIAGRAM NF 4-11 OAHU

KEEKEE ( Hawaii, H.A.P., 1932)--Station is 4-1/4 miles  
E of Kaena Point, on a sharp ridge between Keekee and Haili  
Gulches, about 10 meters back from edge of cliff, among large  
scattered surface boulders. This ridge has a prominent shoulder  
(elevation 500 feet) which projects about 300 meters out from  
the general line of the cliffs. It is possible to reach the  
station by a very difficult climb up either side of the ridge.  
Station and R.M.s 1 and 2 are standard disks set in concrete  
in depressions in boulders.

OBJECT	DISTANCE meters	AZIMUTH
R.M. 1	13.55	153°
R.M. 2	9.80	15

Height of signal above station mark - 3 meters.

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KEEKEE  
ESTABLISHED BY: H.A.P. YEAR: 1932 STATE: Hawaii  
RECOVERED BY: D.G. Rushford YEAR: 1964 COUNTY: Honolulu

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	
KAUHAO 1932				00 00 00.0
Camp Erdman, flagpole	NW	About 3/4 mile		32 02 51.7
RICE 1932 R.M. No. 1	NE			123 46 26.1
W.A. Co., tank	E	About 2-3/4 miles		175 06 00.8
R.M. No. 3	SSE	50.090	15.267	248 24 29
R.M. No. 4	W	23.289	7.098	355 06 23

Station mark was recovered in poor condition. Erosion has worn the  
hill away until the rock in which the station mark was set was almost com-  
pletely exposed. Both reference marks have been destroyed by erosion.  
An angle check indicated that the station mark was at the original loca-  
tion so the station was remarked and two new reference marks established.  
A complete description follows:

Station is located about 4 miles east of Kaena Point and 1/2 mile  
south of the west end of Dillingham Airfield, at about 1002 feet elevation,  
on the edge of the pali, between Haili and Keekee Gulches, and overlooking  
a large quarry. There are scattered ironwood trees on the point and the

station is at the north end of the main thicket.

To reach station from the post office in Waianae, go north on State  
Highway 90 for 9.1 miles to paved side road right. Turn right and go 2.0  
miles to guard shack at top of grade. Turn right and go 0.6 mile to side  
road right. Turn right and follow old track road for 2.6 miles to large  
cabin on left at side road left. Go left for 0.2 mile to fork; take left  
fork up around side of ridge and go 0.6 mile to end of truck travel. Pack  
left, northerly, downgrade, on dim trail for about 3/4 mile to end of  
ridge and station.

Station mark is a standard disk stamped "KEEKEE 1932 1964", brazed to  
the top of a 1-1/2-inch, iron pipe that is set in cement and projects 3  
inches above ground. It is 12 yards south of end of ridge.

Reference mark number three is a standard disk stamped "KEEKEE NO 3  
1932 1964", cemented in a drill hole in a bedrock outcrop on northeast  
side of a small knoll. It is 6.2 feet higher than station mark.

Reference mark number four is a standard disk stamped "KEEKEE NO 4  
1932 1964", cemented in a drill hole in sloping bedrock at the top of a  
sloping bedrock ledge at west side of ridge. It is 8.1 feet lower than  
station mark.

W.A. Co. Tank is a 98-foot-high, cylindrical, silver-colored tank,  
supported by 4 I-beam legs. It has an inverted "U" vent pipe at the  
center of it's top. Located 2-3/4 miles east of station, in middle of  
sugar-cane field, about 0.3 mile south-southeast of State Highway 99.

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

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

USCOMM-DC 27173-P28

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KEEKEE  
STATE: HAWAII

YEAR: 1932

THIRD

ORDER

SOURCE: G- 9885

GEODETIC LATITUDE:	21° 34' 32.711	ELEVATION:	305	METERS
GEODETIC LONGITUDE:	158 13 00.498	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	# OR Δ #1 ANGLE
HI 3	5103	426,332.50	148,647.22	- 0° 04' 47"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
KAUHAO	93° 25' 49.4	93° 30' 36"	5103

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1094  
HAWAII  
LATITUDE 21° 30' TO 22° 00'  
LONGITUDE 158° 00' TO 158° 30'  
DIAGRAM NF 4-11 OAHU

DEPARTMENT OF COMMERCE  
U. S. COAST AND GEODETIC SURVEY  
Form 535  
Rev. Aug. 1964

## DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION:	KPH	STATE:	Hawaii	COUNTY:	Honolulu
CHIEF OF PARTY:	D.M. Whipp	YEAR:	1965	Described by:	R.F. Hanson
NOTE:*	HEIGHT OF TELESCOPE ABOVE STATION MARK 1.5 METERS.†	HEIGHT OF LIGHT ABOVE STATION MARK	METERS.		
2	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	° ' "
	MAKUA 2 1927				00 00 00.0
	KAPUHI NEW 1927	S			12 19 09.1
	KAENA POINT (USE) 1914-1919	WNW			143 10 11.2

Station is located at the northwest tip of Oahu, about 1/2-mile east-southeast of the Kaena Point Light, at about 270 feet elevation, on steep slope of end of the high ridge, in front of entrance to old tunnel.

To reach station from Waialua High School in Waialua, go west on State Highway 99 for 6.5 miles to Camp Erdman on right. Continue on the highway, which later becomes rough dirt road, for 3.2 miles to fork, 0.2 mile before reaching old beach home on right. Take left fork and go upgrade for 0.2 mile to end of truck travel at beginning of dirt trail on left. Walk up trail about 1/4-mile to station in front of tunnel and just below old, concrete foundation.

Station mark is a standard disk stamped "KPH 1965", cemented in a drill hole in bedrock flush with ground. It is 14 inches southwest of southwest corner of the concrete walk leading to tunnel door and 3 feet northeast of edge where hill drops

down from edge of trail.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KPH  
STATE: HAWAII YEAR: 1965 THIRD ORDER

SOURCE: G-12664

GEODETIC LATITUDE:	21° 34' 33.774	ELEVATION	98 METERS
GEODETIC LONGITUDE:	158 16 31.811	SCALED	FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ FOR Δ θ 1 ANGLE *
HI-3	5103	406,387.75	148,785.99	- 0° 06' 05"

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

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

QF 626

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

‡ Direction-angle measured clockwise, referred to initial station.  
10-50250-1 U. S. GOVERNMENT PRINTING OFFICE

QF 625

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1096  
HAWAII  
LATITUDE 21 ° 30' TO 22 ° 00'  
LONGITUDE 158 ° 00' TO 158 ° 30'  
DIAGRAM NF 4-11 OAHU

KUILIMA ( Hawaii, H.A.P., 1932) -- About 1 mile WSW of Kahuku Point, 230 meters NW of the mouth of Kuilima Stream, on a long, narrow, rocky point, 12 meters N of the grass line. Station and R.M.s 1 and 2 are standard disks set in concrete in depressions in outcropping bedrock.

OBJECT	DISTANCE	DIRECTION
LAK	meters	0°00'00"0
R.M. 2	16.53	6 55 40
High-water line	23	70
High-water line	48	145
High-water line	22	225
R.M. 1	16.44	189 05 50

Height of signal above station mark - 3 meters.  
Height of instrument above station mark - 1.5 meters.

FORM 340  
(11-8-55)

## RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: KUILIMA

ESTABLISHED BY: H.A.P. YEAR: 1932 STATE: Hawaii  
RECOVERED BY: D.G. Rushford YEAR: 1964 COUNTY: Honolulu

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

Station has been destroyed. The only mark recovered was reference mark number one.

The correct point for the station was determined by setting a theodolite at the distance of reference mark number one, and on the old angle TIP-OPANA; the coral rock appears to be broken off. The distance and angle for reference mark number two was then laid off from this point and a search made, but it was not found.

\* 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.

COM-DC 34314

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KUILIMA

STATE: HAWAII

YEAR: 1932

THIRD

—ORDER

SOURCE: G- 9889

GEODETIC LATITUDE:	21 ° 42 ' 35.975	ELEVATION:	1	METERS
GEODETIC LONGITUDE:	158 00 07.543	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ HOR Δ G: ANGLE *
HI 3	5103	499,288.71	197,358.72	- 0 ° 00 ' 03 "

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE
LAK	2 08 27.7	2 08 31	5103

QF 163

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1097  
HAWAII  
LATITUDE 21° 30' TO 22° 00'  
LONGITUDE 158° 00' TO 158° 30'  
DIAGRAM NF 4-11 OAHU

LAND (Hawaii, H.A.P., 1932)--Station is 5-3/4 miles E of Kaena Point, about 170 meters N of the O.R. & L. tracks, opposite an emergency landing field.

R.M. 1 is 1 foot W of a wire fence.

A U.S.E. (?) survey mark was found 16 meters SW of the station. It is a corrugated-iron pipe filled with concrete with a brass plate in the top.

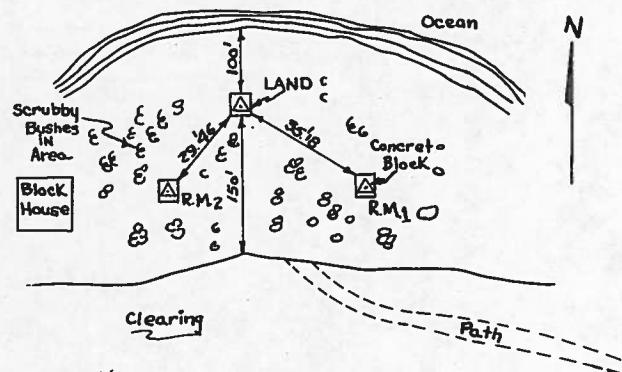
Station mark is a standard disk set in concrete. Under-ground mark is a standard disk set in a block of concrete 3 feet below the ground containing at the center of its upper surface a glass bottle with neck projecting a little above the concrete.

OBJECT	DISTANCE	DIRECTION
CAMP	meters	0°00'00"0
R.M. 2	8.89	9 33 30
Storm high-water line	10.00	150
R.M. 1	10.64	285 08 30

Height of signal above station mark - 3 meters.

Height of instrument above station mark - 1.5 meters.

(477th FA Obsn. Bn., 1945)--Station is 5-3/4 miles E of Kaena Point, about 170 meters N of railroad tracks, about 400 yards W of the E end of air strip, and 300 yards N of strip. Marks are in good condition.



LAND (Hawaii, H.A.P., 1932; G.A.N., 1954)  
--Station found, but center disk had been removed. Reference marks found intact.

U.S. DEPARTMENT OF COMMERCE  
(11-8-55)

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

R

NAME OF STATION: LAND  
ESTABLISHED BY: H.A.P. YEAR: 1932 STATE: Hawaii  
RECOVERED BY: 25th Div. Art. YEAR: 1958 COUNTY: Honolulu

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

Station destroyed. Point is completely torn out. Disc set in concrete found laying approximately 30 feet northwest of original position.

(continued on next page)

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: LAND

STATE: HAWAII

YEAR: 1932

THIRD

ORDER

SOURCE: G- 9885

GEODETIC LATITUDE:	21° 35' 08.558	ELEVATION:	1	METERS
GEODETIC LONGITUDE:	158 11 36.594	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	# OR Δ & ANGLE *
HI 3	5103	434,256.31	152,253.85	- 0 04 16

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE
CAMP	41 23 31.0	41 27 47	5103

QF 175

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 211581

STATION 1097

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

LAND (continued)

Form 556  
(11-8-55)

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

R

NAME OF STATION: LAND

ESTABLISHED BY: H.A.P.

YEAR: 1932 STATE: Hawaii

RECOVERED BY: W.R. Porter YEAR: 1963 COUNTY: Honolulu

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

Station was reported destroyed in 1958.

The only mark recovered was reference mark number two, which appears to be slightly tilted. Station point was determined by distance and angle from this mark, and also by traverse from a nearby pipe marker of the State of Hawaii Survey, and a search made for the underground mark. A 5-foot-deep hole was dug but it was not found. A bulldozer has been in the area and it is believed to have been destroyed.

A cut has been made through the sand dune where the U.S. Engineers mark was located and this mark is believed to have been destroyed.

Sand has been removed from a large area, beginning at the location of reference mark number one and running eastward; this mark could not be found and is believed to have been destroyed.

\* 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.

COM-DC 243 14

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 211581 STATION 1098  
HAWAII  
LATITUDE 21 ° 30' TO 22 ° 00'  
LONGITUDE 158 ° 00' TO 158 ° 30'  
DIAGRAM NF 4-11 OAHU

SEE STATION MOKULEIA

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: LEIA

STATE: HAWAII

YEAR: 1963

SECOND

—ORDER

SOURCE: G-12664

NO OBSERVATION CHECK ON THIS POSITION

GEODETIC LATITUDE:	21 ° 34' 54.052	ELEVATION:	2	METERS
GEODETIC LONGITUDE:	158 10 14.385	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	§ 10R Δ R1 ANGLE *
HI 3	5103	442,013.51	150,781.09	- 0° 03' 46"

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE § 10R Δ R1 FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE
POSITION DETERMINED BY TRAVERSE FROM STATION MOKULEIA			
QF 571			

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1099  
HAWAII  
LATITUDE 21 ° 30' TO 22 ° 00'  
LONGITUDE 158 ° 00' TO 158 ° 30'  
DIAGRAM NF 4-11 OAHU

LENA ( Hawaii, H.A.P., 1932)--Station is 1.6 miles NE of Waimea, midway between Paku lena and Paumalu Gulches, at crest of bluff about 20 meters N of NE corner of old pineapple field. A prominent wooded knoll is about 120 meters SE of station. The large building N of the highway at Waialea Industrial School (laundry) is visible from station. Station can best be reached by the road up the bluff from Waimea.

Station and reference marks 1 and 2 are standard disks set in concrete in depressions in outcropping bedrock.

OBJECT	DISTANCE	DIRECTION
WAIALEE	meters	0°00'00"0
R.M. 2	12.14	20 11 30
R.M. 1	11.85	95 26 55

Height of signal above station mark - 3 meters.

Height of instrument above station mark - 1.5 meters.

(477th FA Obsn.Bn., 1945)--Station lost. R.M. 1 and station mark have been destroyed.

(11-6-55)

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: LENA

ESTABLISHED BY: H.A.P.

YEAR: 1932 STATE: Hawaii

RECOVERED BY: D.G. Rushford YEAR: 1964 COUNTY: Honolulu

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. The land in this vicinity has been cultivated and converted to pasture and it is believed that the station and reference marks have been destroyed.

\* 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.

Com-DC 34314

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: LENA

STATE: HAWAII

YEAR: 1932

THIRD

ORDER

SOURCE: G- 9885

GEODETIC LATITUDE:	21 ° 40' 11.620	ELEVATION	137	METERS
GEODETIC LONGITUDE:	158 ° 02' 45.353	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\theta$ OR $\Delta$ OR ANGLE °
HI 3	5105	484,403.24	182,795.10	- 0 ° 01' 01 "

\* 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

QF 165

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1100  
HAWAII  
LATITUDE 21 ° 30' TO 22 ° 00'  
LONGITUDE 158 ° 00' TO 158 ° 30'  
DIAGRAM NF 4-11 OAHU

**Lolo** (Oahu Island, L. G. Simmons, 1927).—In western part of Oahu, on a prominent rise of first ridge south of Makua railroad station, the same ridge on which is situated station *Makua 2* (see description thereof), about 1½ miles south and east of Makua railroad station, and 1½ miles back from the shore line. Marked according to note 2, a standard disk station mark in outcropping bedrock. Reference marks, note 12a, standard reference disks in outcropping bedrock, are at the following distances and azimuths from the station: No. 1, 43.678 meters (143.30 feet), 280° 29'; No. 2, 1.134 meters (3.72 feet), 357° 00'. Re-marked according to note 14X in 1929.

(16-10-95)

U. S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

## RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: LOLO  
ESTABLISHED BY: L.G.S. YEAR: 1927 STATE: Hawaii  
RECOVERED BY: D.G. Rushford YEAR: 1964 COUNTY: Honolulu

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		Azimuth DIRECTION			
		FEET	METERS				
1927 DISTANCE & AZIMUTH							
R.M. No. 1		143.3	43.678	280	29		
R.M. No. 2		3.72	1.134	357	00		
1964 DISTANCE-----							
R.M. No. 1	ESE	143.287	(43.674)				
R.M. No. 2	S	3.720	1.134				

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

Station is located about 3 miles north of Makaha village and 1-1/4 miles east of State Highway 90, on a small, sharp, rocky point at about 2146 feet elevation along the prominent ridge on the south side of Makua Valley.

To reach station from the shopping center at Makaha village, go north on State Highway 90 for 5.4 miles to a track crossroad at south side of

old cemetery, just after crossing bridge. Turn right and follow main track road southeast along base of ridge for 0.9 mile to end of truck travel at parking area on right. Pack southerly up side of ridge to station MAKUA 2, then go easterly on trail along crest of ridge for about 1 mile to station. (NOTE: Station can also be reached from end of truck travel by bearing southeast towards the deep saddle about 1/4 mile east of MAKUA 2, where there is an old trail. The trail is quite plain part way down from the saddle, but is very faint as it nears the valley floor).

Station mark is a standard disk stamped "LOLO 1927", cemented in a drill hole in bedrock. The point on which it is located is about 200 yards west from a higher, grassy knoll that has 2 large, quite prominent bushes on it. The ridge-line makes a distinct change from west to northwest at the station.

Reference mark number one is a standard disk stamped "LOLO NO 1", cemented in a drill hole in a step in a rock ledge at base of steep slope. It is about 7 feet higher than station mark.

Reference mark number two is a standard disk stamped "LOLO NO 2", cemented in a drill hole in the south side of a bedrock ledge that projects 3 feet above ground on the south side. The mark is at about the same elevation as station mark.

NOTE: A 2-1/2-hour 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.

USCOMM-DC 37179-P99

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: LOLO

STATE: HAWAII

YEAR: 1927

SECOND

ORDER

SOURCE: G-SP156

GEODETIC LATITUDE:	21 ° 31' 01.524	ELEVATION:	648	METERS
GEODETIC LONGITUDE:	158 12 44.072	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ θ' ANGLE °
HI-3	5103	427,853.88	127,335.84	- 0 04' 40"

\* 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

Q1 292

# HORIZONTAL CONTROL DATA

by the  
National Ocean Survey  
OLD HAWAIIAN DATUM

QUAD 211581 STATION 1101  
HAWAII  
LATITUDE 21° 30' TO 22° 00'  
LONGITUDE 158° 00' TO 158° 30'  
DIAGRAM NF 4-11 OAHU

MAHOE ( Hawaii, H.A.P., 1932)--Station is 4-1/4 miles E of Kaena Point, near W end of Kawaihapai Military Reservation, on the sandy beach about 30 meters N of the railroad tracks.

Surface, underground, and R.M.s 1 and 2 are standard disks set in concrete.

Station CAMP is just visible from this station.

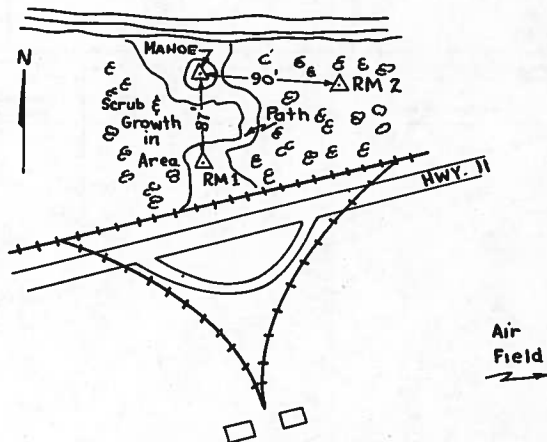
OBJECT	DISTANCE	DIRECTION
RICE	meters	0°00'00"0
R.M. 2	27.28	21 21 00
R.M. 1	26.49	97 58 50
High-water line	31	265

Height of signal above station mark - 3 meters.

Height of instrument above station mark - 1.5 meters.

(477th FA Obsn.Bn., 1945)--Station is located by red flag on beach. It is encased in 12-inch tile, sunk in beach 400 feet W of air strip and 100 feet N of Highway 11. It is 4-1/4 miles E of Kaena Point, near W end of Kawaihapai Military Reservation, on the sandy beach, and about 30 meters N of railroad.

Could not locate reference markers.



Form 525  
(11-8-55)

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

R

NAME OF STATION: MAHOE  
ESTABLISHED BY: H.A.P. YEAR: 1932 STATE: Hawaii  
RECOVERED BY: D.G. Rushford YEAR: 1964 COUNTY: Honolulu

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

Station was searched for but not found. The exact point was determined by measuring angles to 3 old stations. It was found to be in a sand area that is about 4 feet lower than the original elevation, either due to wave action or sand excavation.

A search was made for the reference marks by distance and angle, but they could not be found.

Station is believed destroyed.

## ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: MAHOE

STATE: HAWAII

YEAR: 1932

THIRD

-ORDER

SOURCE: G- 9889

GEODETIC LATITUDE:	21° 35' 00.257	ELEVATION:	2	METERS
GEODETIC LONGITUDE:	158 12 59.211	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ θ1 ANGLE °
HI 3	5103	426,457.83	151,426.52	- 0° 04' 47"

\* PLANE AZIMUTH HAS BEEN COMPUTED BY THE θ OR Δ θ1 FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
RICE	256 47 25.1	256 52 12	5103

QF 179