

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 191552 STATION 1051
 HAWAII
 LATITUDE 15° 00' TO 15° 30'
 LONGITUDE 155° 00' TO 155° 30'
 DIAGRAM NE 5-1.5 HAWAII

Puu Kapukapu (Hawaii Island, E. R. Hand, 1914).—On the southeastern coast of Hawaii, on the summit of the prominent hill of that name at the old Keauhou Landing, below Kilauea Volcano. Marked by a standard bronze disk set in heavy rock sunk in the ground and covered with a cairn.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **PUU KAPUKAPU**
 ESTABLISHED BY: **E.R. Hand** YEAR: **1914** STATE: **Hawaii** BENCH MARK(S) ALSO
 RECOVERED BY: **D.M. Whipp** YEAR: **1967** COUNTY: **Hawaii**
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: **Island: Hawaii**

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

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

Station is located about 10 miles due south of the Hawaii Volcanoes National Park Headquarters, on the southeastern coast of the island, on the west end of Puu Kapukapu, a short, prominent ridge of 1050 feet elevation, overlooking the coconut grove at end of Halape Trail.

To reach station from the Hawaii Volcanoes National Park Headquarters, go southeast on Crater Rim Road, past east end of the Volcano House Hotel, for 3.8 miles to crossroad; turn left on Chain of Craters Road and go 2.2 miles to Hilina Pali Park Road on right; continue ahead on Chain of Craters Road for 1.6 miles to graveled side road right, at sign "AINAHOU". Turn right and go 1.3 miles to locked board gate. Pass through gate and continue ahead for 0.4 mile to board gate ahead, at track road right, near buildings; pass through gate and continue ahead for 0.75 mile to large black tank on right. Jog to left about 100 feet, passing around end of fence, then angle right and go 0.1 mile to fence corner. Pass through the left 1 of 2 board gates and go southerly down grade for 0.1 mile to gate; pass through gate and continue for 0.2 mile to board gate. Pass through gate and follow jeep road southerly (it soon becomes very rough and slow) for 5.0 miles to end of road at boundary fence at about 670 feet elevation. From here pack westerly, generally following fence across lava land for about 1-1/2 miles to cross-fence. Pass through fence and continue, along fence angling southwest, for about 1-1/2 miles to station. A 4-wheel-drive vehicle is required for last 5 miles.

NOTE: Permission and a key must be obtained from Mr. Shipman at the Hilo Meat Co. in Hilo to cross the Ainahou Property.

Station mark is a standard disk, unstamped, cemented in a drill hole in the top of a rectangular, 10 x 24-inch boulder that projects 16 inches above ground. A large cairn is built over the mark.

(continued on next page)

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **PJU KAPUKAPU** OBS BY **CGS**
 STATE: **HAWAII** YEAR: **1914** **FIRST** ORDER

SOURCE: **G-16241**

GEODETIC LATITUDE	19 16 43.35512	ELEVATION:	318.6	METERS
GEODETIC LONGITUDE	155 15 44.46103		1045	FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ FOR Δ BY ANGLE °
HI 1	5101	501,956.06	161,787.20	+ 0°04'43"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE
PUU ULAUULA HTS	66°09'34.0	66°04'52"	5101

THESE DATA OBTAINED FROM ADJUSTMENT OF JAN 1979

THESE DATA SHOULD BE USED FOR ALL SURVEYS AFTER DEC 1975

HORIZONTAL CONTROL DATA

QUAD 191552 STATION 1051

by the
 NATIONAL GEODETIC SURVEY
 OLD HAWAIIAN DATUM

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

PUU KAPUKAPU (continued)

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: PUU KAPUKAPU
 ESTABLISHED BY: E.R. Hand YEAR: 1914 STATE: Hawaii BENCH MARK ALSO
 RECOVERED BY: L.A. Critchlow YEAR: 1977 COUNTY: Hawaii
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 15-1/2 miles northeast of Pahala
 HEIGHT OF TELESCOPE ABOVE STATION MARK 4 FEET. HEIGHT OF LIGHT ABOVE STATION MARK 4 FEET.

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
PUU ULAULA HTS 1914				° ' "
RM 2	WNW	29.99	9.141	00 00 00.0
RM 1	SE	31.86	9.711	37 15 46
				268 07 51

The station mark was recovered in good condition, but was slightly loose in the ground and it was reinforced with cement and rock at this time. Reference marks 1 and 2 was set at this time and due to changes a new description follows.

The station is located about 19 miles southwest of Kalapana, 15-1/2 miles northeast of Pahala and 10 miles south of the Hawaii Volcanoes National Park Headquarters, on the southeastern coast of the island, on the west end of Puu Kapukapu which is a short prominent ridge of about 1050 feet elevation, in the Hawaii Volcanoes National Park.

The station was reached by helicopter at this time, but the 1967 description to the station should be adequate.

The station mark is a C and GS disk, unstamped, cemented in a drill hole in a 10 by 24 inch boulder that projects about 16 inches above the ground surface and surrounded by a low rock wall.

Reference mark 1 is a NGS disk stamped PUU KAPUKAPU 1914 NO 1 1977, is cemented in a drill hole in a boulder that projects about 2 feet above the ground surface. It is on the edge of a bluff and about 5 feet lower than the station mark.

Reference mark 2 is a NGS disk stamped PUU KAPUKAPU 1914 NO 2 1977, is cemented in a drill in a boulder that projects about 6 inches above the ground surface and is about 3 feet lower than the station mark.

GEOLOGICAL SURVEY FORM 9-1105 (Rev. 12-74) REPORT ON PERMANENT SURVEY MARK AREA OFFICE

STATE Hawaii COUNTY Hawaii QUADRANGLE 16
 QUOTE PRIMARY REFERENCE West end of Puu Kapukapu ridge 10 mi due S. of Hawaii
Volcanoes National Park Hq. (Direction and distance)

DESIGNATION { LISTED PUU KAPUKAPU
 STAMPED TYPE OF MARK: BM TT TRIANG. X

Lat. <u>19</u> ° <u>16</u> ' <u>43.56</u> "	CONDITION	ESTABLISHED BY
Long. <u>155</u> ° <u>15</u> ' <u>44.62</u> "	Disturbed <input type="checkbox"/>	USGS <input type="checkbox"/> USBR <input type="checkbox"/>
Elev. <u>1050</u> feet	Destroyed <input type="checkbox"/>	USC&GS <input checked="" type="checkbox"/> State GS <input type="checkbox"/>
	Not Found <input type="checkbox"/>	USNPS <input type="checkbox"/> USNFS <input type="checkbox"/>
		USGLO <input type="checkbox"/> (Other) <input type="checkbox"/>
		USBLM <input type="checkbox"/>

REMARKS OR REVISED DESCRIPTION:

Station mark and RM's recovered in good condition.
 Reached via helicopter.

SUBMITTED BY Yukio Yamamoto
 TITLE CHPTG&SP&R DATE 1/26/78
 AGENCY USGS

Marks found in good condition need not be reported.

FILL IN ALL AVAILABLE INFORMATION

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

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

Q 191552 STATION 1052
 HAWAII
 LATITUDE 19 ° 00' TO 19 ° 30'
 LONGITUDE 155 ° 00' TO 155 ° 30'
 DIAGRAM NE 5-1,5 HAWAII

NO TEXT

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: PUU ULA

STATE: HAWAII

YEAR: 1854

THIRD

ORDER

SOURCE: G-SP156

GEODETIC LATITUDE:	19 12 25.529	ELEVATION:	METERS
GEODETIC LONGITUDE:	155 26 00.665		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ OR ANGLE*
HI 1	5101	522,936.91	135,727.90	+ 0 31 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

QO 297

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 191552 STATION 1053
 HAWAII
 LATITUDE 15° 00' TO 15° 30'
 LONGITUDE 155° 00' TO 155° 30'
 DIAGRAM NE 5-15 HAWAII

PUU ULAULA (HTS)

(Hawaii Island, E. R. Hand, 1914).—In southern Hawaii, on the highest point of a hill of same name 6½ miles northeast of Punaluu, and 1¾ miles from the sea. It stands isolated, is rather sharp, and has a slender conical cairn on top. About 1¼ miles to the southwest is another hill (Puu Kolekole), rough lava, but much lower. Puu Kolekole, Puu Ulaula and station Kamehame are on range. Station marked by standard bronze station mark.

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

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Puu Ulaula (HTS) STATE: Hawaii COUNTY: Hawaii
 ESTABLISHED BY: E.R.Hand YEAR: 1914 LOCALITY: Kau, Hawaii
 RECOVERED BY: *Chas.L.Lurray YEAR: 1933

Detailed statement as to the fitness of the original description:

Location of station: in the southern part of Hawaii about 3 miles east of Pahala and 6 1/2 miles northeast of Punaluu on top of a prominent reddish colored hill. The only other prominent hill lies about 1 1/3 miles southwest of the station.

Old station mark found: U.S.G.SGS. bronze tablet in concrete covered by a large stonepile.

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

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

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PUU ULAULA (HTS) STATE: HAWAII COUNTY: HAWAII
 ESTABLISHED BY: M. R. Hand YEAR: 1914
 RECOVERED BY: L. C. Wilder YEAR: 1949

Detailed statement as to the fitness of the original description: The marks of the original old station were not accessible. In 1938 the Territory Survey Department reported recovery of this station, also in 1938 the original station was set in a 2 1/2 inch iron pipe which projects about 2 feet from the top of a triangular slab of concrete. The top and center was used as the station in the 1949 survey. A new description follows—

The station is located on the summit of a low lava knoll, named Puu Ulaula, which lies about 6.5 miles northeast of Punaluu, about 3 miles east of Pahala, about 1.7 miles northwest of the sea and on the western rim of a small crater. Another hill of similar appearance lies about 1.3 miles southwest of the station hill and a higher and wooded hill lies about 1 mile north.

To reach from the post office at Naalehu; go easterly, on the road which leads toward Hilo for 3.5 miles; pass by the sugar mill in the village of Honuapo and continue northeast, toward Hilo, for 11.2 miles; turn right, pass through a board gate, and go southeasterly, across country, for 0.2 mile; pass to the left hand side of a circular water trough and follow an old road marked with cairns for about 2.9 miles to the foot of the hill and the end of truck travel. This is about a 200 foot pack.

The station is the center of a 2 1/2 inch iron pipe which projects about 2 feet from the top of a triangular slab of concrete which is about 6 feet on each side and is about 4 inches above the surrounding rock.

No reference or azimuth marks were established for this station.

Object	Direction	Distance
KAMEHAME 1939 (metal target)	00 00 00 SW	
Honuapo Stack, Hutchinson Sugar Co	15 06 52.0 SW	
Punaluu Spire (Oong. Ch.)	16 21 11.2 SW	

(continued on next page)

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: PUU ULAULA HTS OBS BY CGS
 STATE: HAWAII YEAR: 1914 FIRST ORDER
 SOURCE: G- 9279

GEODETIC LATITUDE: 19 12 24.45200	ELEVATION: 304.8 METERS
GEODETIC LONGITUDE: 155 25 00.45200	1000 FEET

STATE COORDINATES (FWS)				
STATE & ZONE	CODE	X	Y	± OR Δ ± ANGLE °
HI 1	5101	522,957.36	135,619.27	+ 0° 01' 19"

* 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
KAMEHAME NEW HTS	29 40 58.2	29 39 39 "	5101

THESE DATA ARE OBTAINED FROM ADJUSTMENT OF 1951

HORIZONTAL CONTROL DATA

by the
 NATIONAL GEODETIC SURVEY
 OLD HAWAIIAN DATUM

QUAD 191552 STATION 1053

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

PUU ULAULA (HTS) (continued)

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: PUU ULAULA (HTS)
 ESTABLISHED BY: E.R. Hand YEAR: 1914 STATE: Hawaii BENCH MARK(S) ALSO
 RECOVERED BY: D.M. Whipp YEAR: 1967 COUNTY: Hawaii
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

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

Station was recovered in good condition. A complete description follows:
 Station is located in the southern part of the island, about 3 miles east of Pahala, 1-1/2 miles northwest of the coastline, and at about 997 feet elevation, on the west rim of a prominent, red crater that lies about 1-1/3 miles northeast from a similar, but lower, hill.
 To reach station from the post office in Pahala, go southeast on Pihake St. for 0.2 mile; turn left and go 0.25 mile on Maile St; turn right and go southeast 0.3 mile to junction with State Highway 11; turn left and go northeast on State Highway 11 for 1.3 miles to dirt right fork, 50 yards beyond highway milepost 51. Take right fork and go 0.05 mile to locked gate in fence corner. Pass through gate, turn right, and go 0.25 mile to board gate in fence corner, just past a large, circular, water trough. Pass through gate, bear left, cross wash, and follow dim track road southeast for 0.4 mile to edge of rough lava area and end of truck travel. Walk southeast on direct line for about 1-3/4 miles to station.
 NOTE: Key for locked gate was obtained at the Hawaiian Ranch Co. Office in Maalehu.

Station mark is a standard disk, unstamped, 4 inches down inside the 3-1/2-inch hole in the center of a triangular, concrete platform about 7 feet on each side and flush with rocks of hilltop. The words "PUULA HTS" are inscribed in the concrete of the platform. A 2-1/2-inch iron pipe 2 feet high is centered vertically over the mark, supported by 3 iron legs embedded in the platform, and holds a removable, red and white metal target.

NOTE: On return trip from station the old jeep route across lava beds, marked with small cairns, was followed, however it was lost upon reaching the dense brush-land on northwest side of lava beds, and it is believed that extensive clearing would be required in order to drive to station. A 4-wheel-drive vehicle would be required.

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: PUU ULAULA HTS
 ESTABLISHED BY: E.R. Hand YEAR: 1914 STATE: Hawaii BENCH MARK ALSO
 RECOVERED BY: L.A. Critchlow YEAR: 1977 COUNTY: Hawaii
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 3 miles east of Pahala
 HEIGHT OF TELESCOPE ABOVE STATION MARK 4 FEET. HEIGHT OF LIGHT ABOVE STATION MARK 4 FEET.

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
KAMEHAME NEW HTS 1949				00 00 00.0
PAHALA KAU SUGAR CO STACK	W	About 3 miles		51 34 20.8
RM 2	N	54.68	16.665	154 50 42
RM 1	ESE	69.94	21.320	252 29 40

The station mark was recovered in good condition and reference marks 1 and 2 were set at this time. Due to changes, a new description follows.

The station is located in the southern part of the island, about 3 miles east of Pahala, 1-1/2 miles northwest of the coastline, on the west rim of a prominent red crater and is on property of the Iasco International Air Service Company, Mr. Charles Smith, Vice President, 1580 Kamole Street, Honolulu.

To reach the station from the post office in Pahala, go north on Pihake Street for 0.05 mile to a crossroad; turn right and go east on Kamani Street for 0.4 mile to the junction with State Highway 11; turn left and go northeast on highway 11 for 1.6 miles to Kaalaala Bridge; continue north for 0.05 mile to a track road right; turn right and go easterly on the track road through a Macadamia Nut Tree Orchard for 0.25 mile to a gate; continue easterly, crossing a small washed out creek for 2 miles on dim track road across lava flow to where the track road bears left; bear right and go southerly across lava flow for 0.5 mile to a point about 200 yards west of the station and end of truck travel. From here pack east uphill to the station.

The station mark is a C and GS disk, unstamped, 4 inches down inside the 3-1/2 inch hole in the center of a triangular shaped concrete platform about 7 feet on each side and flush with the rocks of the hillside. The words, PUULA HTS, are inscribed in the concrete platform. A 2-1/2 inch iron pipe 2 feet high is centered vertically over the mark, supported by 3 iron legs embedded in the platform and holds a removable red and white metal target.

Reference mark 1 is a 3/4 inch iron rebar, 18 inches long with a punch hole in the center, driven in the cinder rock, with a small mass of concrete around it and projecting about 2 inches above the surface of the cinder cone. It is on the south rim of the crater and about 11 feet below the station mark.

Reference mark 1 is a 3/4 inch iron rebar, 18 inches long with a punch hole in the center, driven in the cinder rock, with a small mass of concrete around it and projecting about 2 inches above the surface of the cinder cone. It is on the west rim of the crater and about 10 feet lower than the station mark.

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: PUU ULAULA (HTS)
 ESTABLISHED BY: E. R. HAND YEAR: 1914 STATE: HAWAII BENCH MARK(S) ALSO
 RECOVERED BY: R. B. MELBY YEAR: 1978 COUNTY: HAWAII
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 3 MILES EAST OF PAHALA

Detailed statement as to the fitness of the original description; including marks found, stampings, changes made, and other pertinent facts:
 THE STATION AND THE REFERENCE POINTS (IRON PINS SET IN CEMENT) WERE 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

0 151552 STATION 1054
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 00' TO 155° 30'
 DIAGRAM NE 5-1,5 HAWAII

Sand Hill (Hawaii Island, United States Geological Survey, 1920.)—In south-east Hawaii, 1 mile southwest of Halemaumau, on the southwest rim of Kilauea, on the southwest part of a flat-topped low hill of volcanic sand. Mark, a bronze tablet cemented in sunken rock, and a small cairn of rock centered over it.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: SAND HILL
 ESTABLISHED BY: U.S.G.S. YEAR: 1920 STATE: Hawaii BENCH MARK(S) ALSO
 RECOVERED BY: D.M. Whipp YEAR: 1967 COUNTY: Hawaii
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

R

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: SAND HILL
 STATE: HAWAII YEAR: 1920 THIRD ORDER

SOURCE: G-SP156

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. There is a hole in the ground at the approximate location.

GEODETIC LATITUDE:	19° 23' 46.460	ELEVATION:	1127.75 METERS
GEODETIC LONGITUDE:	155 17 39.258		3655.9 FEET

STATE COORDINATES (feet)				
STATE & ZONE	CODE	X	Y	HEIGHT ANGLE*
HI 1	5101	570,908.33	204,453.44	+ 0 04 06

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (from north)	PLANE AZIMUTH* (from north)	CODE

FORM C&GS-526 (1-65)
 USCOMM-OC 18509-P65

U.S. DEPARTMENT OF COMMERCE
 COAST AND GEODETIC SURVEY

00 302

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

QUAD 191552 STATION 1055
 HAWAII
 LATITUDE 19 00' TO 19 30'
 LONGITUDE 155 00' TO 155 30'
 DIAGRAM NE 5-1.5 HAWAII

DESCRIPTION TRIANGULATION STATION

NAME OF STATION: SAND HILL USGS
 ESTABLISHED BY: L.A. Critchlow YEAR: 1977 STATE: Hawaii BENCH MARK ALSO
 COUNTY: Hawaii
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 2 miles south of the National Volcano Observatory
 HEIGHT OF TELESCOPE ABOVE STATION MARK 4 FEET. HEIGHT OF LIGHT ABOVE STATION MARK 4 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	

The station is located about 2 miles south of the National Volcano Observatory, 1/2 mile south of the south rim of the Kilauea Crater and on property owned by the Hawaii Volcanoes National Park.

To reach the station from the entrance to the National Volcano Observatory (which is on the west rim of Kilauea Crater), go south and east on a paved road for 2.05 miles to a track road right at a highway curve sign. Turn right and go south-southwest on the track road for about 200 feet to the top of a low ridge and a rock cairn on the left. Turn left and go southeast on a track road for 0.05 mile to a fork. Take the left fork and continue southeast of the track road for 0.25 mile to a track road right. Turn right and go southwest on the track road for 0.05 mile to the top of a cinder ridge and station as described.

Station mark, stamped HAWAII SAND HILL, is a USGS Bench Mark disk set in an irregular mass of concrete which is about 1 foot in diameter and about 3 inches below the ground surface. It is 2 feet north of a rock cairn and a metal post driven into the ground. (Note desc.)
 Note: A traverse connection was made to this station from HVO 119 USGS the distance being 1.157 meters or 3.80 feet.

* 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.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: SAND HILL USGS OBS BY NGS
 STATE: HAWAII YEAR: 1977 SECOND ORDER

5-16241
 SOURCE NO OBSERVATION CHECK ON THIS POSITION

GEODETIC LATITUDE	19 23 45.38885	ELEVATION	1121.66 METERS
GEODETIC LONGITUDE	155 17 39.21237		3679.9 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	9 10R Δ 91 ANGLE
HI 1	5101	570,912.82	204,345.40	+ 0°04'06"

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE 9 10R Δ 91 FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
THESE DATA OBTAINED FROM ADJUSTMENT OF JAN 1979 LEVELING BY NGS			

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

Q 151552 STATION 1056
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 00' TO 155° 30'
 DIAGRAM NE 5-1,5 HAWAII

South rim (Hawaii Island, United States Geological Survey, 1920).—In south-eastern Hawaii, on the top of a small rise on the extreme edge of Kilauea Crater, and a little north of west of Halemaumau. Mark, a bronze tablet cemented in solid rock.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **SOUTH RIM**
 ESTABLISHED BY: **U.S.G.S.** YEAR: **1920** STATE: **Hawaii** BENCH MARK(S) ALSO
 RECOVERED BY: **D.M. Whipp** YEAR: **1967** COUNTY: **Hawaii**
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: **Island: Hawaii**

R

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **SOUTH RIM**
 STATE: **HAWAII** YEAR: **1920** THIRD ORDER

SOURCE: **G-SP156**

GEODETIC LATITUDE	19 24 48.883	ELEVATION	1122.39 METERS
GEODETIC LONGITUDE	155 17 37.186		3813.6 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	β OR Δ θ ANGLE*
HI 1	5101	571,099.14	210,750.59	+ 0 04 07

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

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

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

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

Station is located in the Hawaii Volcanoes National Park, about 2-1/2 miles southwest of the Park Headquarters Building, 465 yards northwest of the edge of Halemaumau Crater, and 0.4 mile east of where Crater Rim Road reaches its westernmost point before turning back to southeast. It is situated on the west rim of Kilauea Crater, at about 3814 feet elevation, on a low, rock rise.

To reach station from the Hawaii Volcanoes National Park Headquarters Building, go west and southwest on Crater Rim Road for 3.7 miles to end of truck travel at the westernmost point of the road. Walk east across rough area about 0.4 mile to station.

Station mark is a U.S. Geological Survey disk stamped "SOUTH RIM", cemented in a drill hole in bedrock, 10 feet west of edge of crater. A 2-foot cairn is built over the mark.

NOTE: It would be possible to drive to station with a 4-wheel-drive vehicle.

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 191552 STATION 1057
 HAWAII
 LATITUDE 19 00' TO 19 30'
 LONGITUDE 155 00' TO 155 30'
 DIAGRAM NE 5-15 HAWAII

Spit (Hawaii Island, United States Geological Survey, 1920).—In southeastern Hawaii, about 300 feet from the west end of the point of volcanic sand running out into Kilauea Crater, and about 800 feet southwest of the road running to Halemaumau, which follows out on this point of sand. It is about 1/2 mile south of Halemaumau. Mark, a bronze tablet cemented in top of a large boulder.
 RECOVERY NOTE, TRIANGULATION STATION

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: SPIT
 STATE: HAWAII YEAR: 1920 THIRD ORDER

R

NAME OF STATION: SPIT
 ESTABLISHED BY: USGS YEAR: 1920 STATE: Hawaii BENCH MARK(S) ALSO
 RECOVERED BY: D.M. Whipp YEAR: 1967 COUNTY: Hawaii
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

SOURCE G-SP156

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

Station mark was recovered in good condition. Located in the Hawaii Volcanoes National Park, about 3 miles south-southwest of the park headquarters building and 0.2 mile south of the large parking area at the observation platform at the south side of Halemaumau Crater, near the west end of a brown, sandy area that has been leveled off by grader.
 To reach station from the park headquarters building, go west on Crater Rim Road for 5.5 miles to east end of the large parking area at observation point; continue east on the road for 0.15 mile to track road right. Turn right and go southwest along graded strip for 0.2 mile to station.

Station mark is a U.S. Geological Survey disk stamped "SPIT", cemented in a drill hole in the top of a 30 x 40-inch, grey boulder that projects 16 inches. It is 100 yards east from west end of point and 4 feet southeast of a cairn.

GEODETIC LATITUDE:	19 24 06.447	ELEVATION:	1111.73 METERS
GEODETIC LONGITUDE:	155 17 02.462		3647.4 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	ϑ IOR Δ ϑ1 ANGLE °
HI 1	5101	574,428.15	206,473.93	+ 0° 04' 18"

PLANE AZIMUTH HAS BEEN COMPUTED BY THE ϑ IOR Δ ϑ1 FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH <i>(From south)</i>	PLANE AZIMUTH <i>(From south)</i>	CODE

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 191552 STATION 1058
 HAWAII
 LATITUDE 19 ° 00' TO 19 ° 30'
 LONGITUDE 155 ° 00' TO 155 ° 30'
 DIAGRAM NE 5-1,5 HAWAII

NO ORIGINAL TEXT

Uwekahuna (HGS) (Hawaii County, Hawaii, HGS, 1896; United States Geological Survey, 1920).—In southeastern part of Hawaii, on the highest point of the rim on the western side of the crater of Kilauea, about 30 feet from the edge of the precipice. Marked by a cross cut in a stone set in the ground, and by a huge stone cairn.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **UWEKAHUNA (HGS)** STATE: **HAWAII** COUNTY: **HAWAII**
 ESTABLISHED BY: **HAWAIIAN GOV.** YEAR: **1896** LOCALITY: **West Rim of Kilauea Volcano**
 RECOVERED BY: **J. H. Peters** YEAR: **1932**

Detailed statement as to the fitness of the original description: **Mark at this station has been changed. Type "A" station mark and signal have been erected.**

RECOVERY DESTRUCTION OF TRIANGULATION STATION

NAME OF STATION: **UWEKAHUNA (HGS)** STATE: **HAWAII** COUNTY: **HAWAII**

Established By: **Hawaiian G.S., 1896**
 Chief of Party: **L. C. Wilder** Year: **1949** Described by: **C. J. Hoepfel**

NOTE*	HEIGHT OF TELESCOPE ABOVE STATION MARK		HEIGHT OF LIGHT ABOVE STATION MARK		METERS.
	Surface-station mark	Underground-station mark	feet	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
FUU HULUHULU (HGS.)					
120°	R. M. 2	S	32.670	9.958	00 00 00 -
	Flag Pole	NE	1 mile		284 49 54.0 -
120°	R. M. 1	ENE	29.583	9.017	320 36 20 -

The station is located on the westerly rim of Kilauea Crater, about 2 miles west southwest of the Hawaiian National Park Headquarters, about 0.1 mile east of the Crater Rim Road, about 100 yards north of the U. S. Geological Survey Observatory and about 15 feet west of the rim of Kilauea Crater.

To reach from the Hawaiian National Park Headquarters; go westerly on the road which leads toward Naalehu for 2.1 miles; turn left, onto the Crater Rim Road and go southeast for 0.5 mile to the U. S. Geological Survey Observatory and the end of truck travel. From this point pack northerly for about 100 yards to the station.

The station is a U. S. Geological Survey bronze, Bench

Mark, disk, stamped 4088, set into a drill hole in a boulder which is flush with the surface of the ground. A stone and concrete platform 3 1/2 feet high has been erected over the station disk.

Reference mark number 1 is a standard disk, stamped UWEKAHUNA NO 1 1949, set into a drill hole in a boulder which is flush with the surface of the ground. It is located about 1 foot west of the edge of the bluff and is about the same elevation as the station.

Reference mark number 2 is a standard disk, stamped UWEKAHUNA NO 2 1949, set into a drill hole in a boulder which is flush with the surface of the ground. It is located about 10 feet west of the edge of the bluff and is about the same elevation as the station.

This station was monumented with a stone and concrete instrument platform, metal pole and target, by the Hawaii Territory Survey, in 1929. They recovered at that time a brass tablet, over which the present metal target was plumbed.

(continued on next page)

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **UWEKAHUNA HGS** OBS BY **CGS**
 STATE: **HAWAII** YEAR: **1896** **FIRST** ORDER

SOURCE: **G-16241**

GEODETIC LATITUDE: 19 25 26.81481	ELEVATION: 1246.8 METERS
GEODETIC LONGITUDE: 155 17 22.38070	4091 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	ϕ OR Δ OR ANGLE *
Hi 1	5101	572,511.57	214,578.67	+ 0° 04' 12"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
HVO 119 USGS	8° 55' 44.2"	8° 51' 32"	5101

THESE DATA OBTAINED FROM ADJUSTMENT OF JAN 1979

THESE DATA SHOULD BE USED FOR ALL SURVEYS AFTER DEC 1975

3M 152

HORIZONTAL CONTROL DATA

by the
 NATIONAL GEODETIC SURVEY
 OLD HAWAIIAN DATUM

QUAD 191552 STATION 1058
 LATITUDE ° ' TO ° ' .
 LONGITUDE ° ' TO ° ' .
 DIAGRAM

UWEKAHUNA (HGS) (continued)

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: UWEKAHUNA (HGS)
 ESTABLISHED BY: HGS YEAR: 1896 STATE: Hawaii BENCH MARK(S) ALSO
 RECOVERED BY: D.M. Whipp YEAR: 1967 COUNTY: Hawaii
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

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

Station was recovered and all marks found in good condition. Distance to reference marks was checked and found correct. A complete description follows:

Station is located on the west rim of Kilauea Crater, about 2 miles west-southwest of the Hawaii Volcanoes National Park Headquarters, 0.1 mile southeast of the Crater Rim Road and about 500 feet northeast of the U.S. Geological Survey Observatory.

To reach station from the Hawaiian Volcanoes National Park Headquarters, go west on Crater Rim Road for 2.4 miles; turn left and go 0.1 mile to the north side of the U.S.G.S. Observatory buildings; go left on track road for 0.1 mile to station.

Station mark is a U.S.G.S. disk, stamped "4088 1912", cemented in a boulder flush with ground, about 25 feet northwest from edge of crater. A Type-A signal is centered over the mark, with the 6 x 6-foot, concrete platform 3-1/2 feet above ground, and a red and white metal target extending 7 feet above the platform.

Reference mark number one is a standard disk stamped "UWEKAHUNA NO 1 1949", cemented in a drill hole in bedrock flush with ground, at edge of rim and about 4 feet lower than station mark.

Reference mark number two is a standard disk stamped "UWEKAHUNA NO 2 1949", cemented in a drill hole in a bedrock outcrop that projects 8 inches. It is near edge of crater rim and about 2 feet lower than station mark.

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: UWEKAHUNA (HGS)
 ESTABLISHED BY: H.G.S. YEAR: 1896 STATE: Hawaii BENCH MARK(S) ALSO
 RECOVERED BY: R. B. Melby YEAR: 1975 COUNTY: Hawaii
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 25 miles SW of Hilo

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

The station and reference marks were recovered in good condition. The station has a commanding view of the Kilauea Volcano crater.

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: UWEKAHUNA HGS
 ESTABLISHED BY: HGS YEAR: 1896 STATE: Hawaii BENCH MARK ALSO
 RECOVERED BY: L.A. Critchlow YEAR: 1977 COUNTY: Hawaii
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Located on the west rim of the Kilauea Crater
 HEIGHT OF TELESCOPE ABOVE STATION MARK 4 FEET. HEIGHT OF LIGHT ABOVE STATION MARK 4 FEET.

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
				00 00 00.0
HVO 119 USGS	W	5.53	1.681	85 20 15
HVO 113 USGS	N	about 7	miles	164 14 26.2
HAWAIIAN TELEPHONE CO TOWER	N	about 7	miles	164 19 23.7
CAMP INC CABLE TV MAST	E	29.562	9.011	254 24 38
RM 1	S	32.697	9.967	357 27 07
RM 2		48.76	14.864	
RM 1 to RM 2				

The station mark and reference marks 1 and 2 were recovered in good condition. The distance to reference mark 1 was found shorter by 0.006 meter and the direction was found larger by 01 minute and 32 seconds. The distance to reference mark 2 was found longer by 0.009 meter and the direction was found smaller by 16 seconds. A USGS Bench Mark: HVO 113 has been set near the station since the 1967 recovery note. A complete new description follows.

The station is located on the west rim of the Kilauea Crater, just north of the National Volcano Observatory and on property owned by the Hawaii Volcanoes National Park.

To reach the station from the National Volcano Observatory, go north on a track road for 0.15 mile to the station on the right near the rim of the crater.

Station mark, stamped 4088 1912, is a USGS Bench Mark disk cemented in a drill hole in a boulder which is flush with the ground surface. A 5 by 5 foot stone and concrete platform about 3 1/2 feet high is over the station. It is about 200 yards north of the observatory and 15 feet west of the west rim of the crater. (Note desc)

Reference mark 1, stamped UWEKAHUNA NO 1 1940, is a C&GS disk cemented in a drill hole in a boulder which is flush with the ground. It is 1 foot west of the bluff at the crater west rim and about 4 feet lower than the station. (Note 12c)

Reference mark 2, stamped UWEKAHUNA NO 2 1949, is a C&GS disk cemented in a drill hole in a boulder which is flush with the ground. It is 10 feet west of the bluff and about 2 feet lower than the station. (Note 12c)

HVO 113, stamped HVO 113, is an aluminum USGS disk cemented in a drill hole in a boulder which is about 1 by 2 feet in size and projects about 1/2 foot above the ground surface. It is 1.7 feet west of the southwest corner of the platform over the station. (Note desc)

* 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.

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 191552 STATION 1059 /
 HAWAII
 LATITUDE 19 ° 00' TO 19 ° 30'
 LONGITUDE 155 ° 00' TO 155 ° 30'
 DIAGRAM NE 5-1,5 HAWAII

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 FORM 515
 MAY, 1963 EDITION

DESCRIPTION OF TRIANGULATION STATION

FLAG STATE: Hawaii COUNTY: Hawaii

NAME OF STATION: VOLCANO HOUSE YEAR: 1949 Described by: C. J. Hoepfel

CHIEF OF PARTY: L. C. Wilder HEIGHT OF TELESCOPE ABOVE STATION MARK 3.94 METERS. HEIGHT OF LIGHT ABOVE STATION MARK METERS.

NOTE*	HEIGHT OF TELESCOPE ABOVE 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
	Surface-station mark		feet	
	Underground-station mark		meters	
	OHOLE (HGS) =	WNW =		00 00 00 =
	Flag Pole (K.M.C) = 1 mile =			88 03 47.3 =
Pipe	R. M. No. 1 =	NE = 40.453 =	12.331 =	209 46 39 =
Pipe	R. M. No. 2 =	SE = 37.524 =	11.438 =	305 48 44 =

The original station, "iron ring bolt in ground on east side of concrete monument", was not recovered. No information is available as to how the U. S. Geological Survey disk was established. Two 1/2 inch pipes set in concrete were recovered and are believed to be reference marks, however, they were both loose and were not out in. Two standard reference disks were established. A new description follows--

The station is located about 100 yards northwest of the Volcano House Hotel, about 200 yards west of the Hawaiian National Park Headquarters, about 150 yards south of a number of large wooden water tanks, 22 feet southwest of the centerline of the highway which runs between Hilo and Naalehu, 10 feet north of a paved foot trail which runs between the Volcano House Hotel and the highway and about 10 feet higher than the

highway.

The station is a U. S. Geological Survey bench mark, stamped 3973 1912, set in the top of a concrete monument which has a base of 5.6 feet by 3.7 feet and rises in terraces to a height of 4.6 feet.

Reference mark number 1 is a standard disk, stamped VOLCANO HOUSE FLAG NO 2 1949, set in the top of a 2 1/2 inch pipe which projects about 6 inches. It is located 31 feet south of the centerline of the highway and 13 feet north of a paved foot path. It is about 1 foot lower than the station.

Reference mark number 2 is a standard disk, stamped VOLCANO HOUSE FLAG NO 1 1949, set in the top of a 2 1/2 inch pipe which projects about 6 inches. It is located about 19 feet north of the centerline of the highway and about 4 feet lower than the station.

* Refers to notes in manuals of triangulation and state publications of triangulation. † Direction-angle measured clockwise, referred to initial station.
 16-58222-1 U. S. GOVERNMENT PRINTING OFFICE

(continued on next page)

ADJUSTED HORIZONTAL CONTROL DATA

ADJUSTMENT BY NBS

NAME OF STATION: VOLCANO HOUSE FLAG OBS BY CGS

STATE: HAWAII YEAR: 1949 FIRST ORDER

SOURCE: 0-16241

GEODETIC LATITUDE:	19 25 58.15452	ELEVATION:	1211.6 METERS
GEODETIC LONGITUDE:	155 15 42.26716		3975 FEET

STATE COORDINATES (Ft)				
STATE & ZONE	CODE	X	Y	ϕ OR Δ ± ANGLE *
HI 1	5101	582,089.09	217,752.55	+ 0°04'45"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From north)	PLANE AZIMUTH* (From south)	CODE
UWEKAHUNA HGS	71 44 40.7	71 39 55 "	5101

THESE DATA OBTAINED FROM ADJUSTMENT OF JAN 1979

THESE DATA SHOULD BE USED FOR ALL SURVEYS AFTER DEC 1975

HORIZONTAL CONTROL DATA

QUAD 191552 STATION 1059

by the
 NATIONAL GEODETIC SURVEY
 OLD HAWAIIAN DATUM

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

VOLCANO HOUSE FLAG (continued)

FORM 524e
 (8-18-68)

U.S. DEPARTMENT OF COMMERCE
 COAST AND GEODETIC SURVEY

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **VOLCANO HOUSE FLAG**
 ESTABLISHED BY: L.C. Wilder YEAR: 1949 STATE: Hawaii
 RECOVERED BY: D.M. Whipp YEAR: 1967 COUNTY: Hawaii
 Island: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK 0.9 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	
OHALE (HGS) -----1949 DISTANCE and DIRECTION				00 00 00.0
UWEKAHUNA (HGS)				59 52 56.7
R.M. No. 1	NE	40.453	12.331	209 46 39
OHALE (HGS) 1897-----1967 DISTANCE and DIRECTION				00 00 00.0
UWEKAHUNA (HGS) 1896				59 53 13.8
RM No. 1	NE	40.406	12.316	209 46 02
RM No. 3	SE	28.183	8.591	304 35 05

Station mark and reference mark number one were recovered in good condition. Reference mark number two was found destroyed, so a new reference mark, number three, was established. The line of sight to the K.M.C. Flagpole is now blocked by a distant tree. A complete description follows:

Station is located in the Hawaii Volcanoes National Park, along the southwest side of the Crater Rim Road, about 600 feet west of the Park Headquarters building and 250 feet north-northwest of the Volcano House

Hotel, on the cutbank where the highway begins dropping downgrade after leaving the Park Headquarters, going west.

To reach station from the Park Headquarters building, go westerly on the Crater Rim Road for 0.15 mile to station on left.

Station mark is a U.S. Geological Survey disk stamped "3973 1912", set in the top of a concrete monument extending about 5 feet above ground and built up in 4 terraced sections, beginning with a 4 x 6-foot concrete platform that projects 2 feet above ground, and ending with a 12-inch concrete block in which the mark is set. Station is 21 feet southwest of center line of highway, 8.5 feet northeast of a macadam footpath, 44 feet southeast of a jog in the footpath by a signboard, where the trail drops down steeply to the left.

Reference mark number one is a standard disk stamped "VOLCANO HOUSE FLAG NO 1 1949", cemented in the top of a 2-inch iron pipe that projects 4 inches from ground. It is across highway from station mark, 19.8 feet northeast of center line of highway, 12 feet southwest of a macadam footpath, about 8 feet higher than highway and 3.1 feet lower than station mark.

Reference mark number three is a standard disk stamped "VOLCANO HOUSE FLAG 1949 NO 3 1967", cemented in the top of a 2-inch iron pipe that is set in concrete and projects 4 inches. It is on same cutbank as station mark, 8 feet northeast of the footpath, 1 foot northwest of a clump of ohia and about 1 foot lower than station mark.

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

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

USCOMMA-DC 27178-P88

R

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: **VOLCANO HOUSE FLAG**
 ESTABLISHED BY: L.C. Wilder YEAR: 1949 STATE: Hawaii BENCH MARK ALSO
 RECOVERED BY: L.A. Critchlow YEAR: 1977 COUNTY: Hawaii
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: In Volcano National Park
 HEIGHT OF TELESCOPE ABOVE STATION MARK 5 FEET. HEIGHT OF LIGHT ABOVE STATION MARK 5 FEET.

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
UWEKAHUNA HGS 1896				00 00 00.0
R.M. No. 1	NE	40.435	12.324	149 52 27
R.M. No. 3	SE	28.175	8.588	244 41 07
R.M. No. 1 to R.M. No. 3		51.170	15.597	

The station mark, reference mark 1 and reference mark 3 were found as described and in good condition. The distance and direction to the marks compared favorably with the 1967 values.
 The 1967 Recovery Note is good.

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

NOAA FORM 76-96 SUPERSEDES CGS FORM 5126A WHICH MAY BE USED.
 (1-72)

U.S. DEPARTMENT OF COMMERCE
 NOAA

U.S. GPO: 1978-565-661/1220 RegJan 6

AUG 1979

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 191552 STATION 1060
HAWAII
LATITUDE 19 00' TO 19 30'
LONGITUDE 155 00' TO 155 30'
DIAGRAM NE 5-1,5 HAWAII

DESCRIPTION

NOTE, TRIANGULATION STATION

NAME OF STATION: VR 1-1 HIDI'
ESTABLISHED BY: L.A. Critchlow' YEAR: 1977' STATE: Hawaii' COUNTY: Hawaii' BENCH MARK ALSO
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 1/4 mile SW of Volcano'
HEIGHT OF TELESCOPE ABOVE STATION MARK 4 FEET. HEIGHT OF LIGHT ABOVE STATION MARK 4 FEET.

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
KULANI HGS 1891'				00 00 00.0
RM 1'	NE	38.75	11.808	99 22 53
RM 2'	S	18.58	5.662	200 39 13
RM 1 to RM 2		41.16	14.070	

The station is located on the southwest slope of Mauna Loa in the Puna District, about 11-1/2 miles southwest of Mountain View, 2 miles northeast of Volcano National Park Headquarters and 1/4 mile southwest of the Volcano Post Office. The station is near the intersection of State Highway 11 and Haunani Road.

To reach the station from Volcano Post Office, which is located in the Hongo Store, go south 0.2 mile to Haunani Road. Turn left and 30 east 0.15 mile to the junction of Highway 11 and the station site is on southeast side of Highway 11.

The station marks are State of Hawaii survey disks stamped VR 1-1 1977. The surface disk is set in a round concrete post 0.40 foot below the ground. The underground disk is set in an irregular mass of concrete about 4 feet below the ground. They are 50 feet southwest of highway junction and 27 feet southeast of the centerline of highway.

Reference mark 1, stamped 1, is a railroad spike with a punch hole marking the center, cemented in a drill hole in a rock outcrop 0.20 foot above the ground and is 39 feet southeast of the centerline of the highway and about the same elevation as station mark.

Reference mark 2 is a 3/4 inch steel reinforcing rod set in a concrete mass, the letters RM are marked into the concrete mass. The reference mark projects about 0.40 foot above the ground and is 45 feet southeast of the centerline of the highway.

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

NOAA FORM 76-96 (11-72) SUPERSEDES CGS FORM 828A WHICH MAY BE USED.

NOAA
976-645-641/1120 Page 6

NOAA FORM 76-31
(11-76)

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: VR 1-1 HIDI' OBS BY NGS
STATE: HAWAII YEAR: 1977 SECOND ORDER

SOURCE: G-16241

GEODETIC LATITUDE:	19 25 44.39250	ELEVATION:	1144.6 METERS
GEODETIC LONGITUDE:	155 14 11.47061		3755 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	φ OR Δ ± ANGLE
HI 1	5101	590,780.91	216,376.96	+ 0° 05' 16"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From 1928)	PLANE AZIMUTH* (From 1928)	CODE
KULANI HGS	146 48 02.5	146 42 47 "	5101

THESE DATA OBTAINED FROM ADJUSTMENT OF JAN 1979

34 155

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

QUAD 191552 STATION 1061
 HAWAII
 LATITUDE 19 00' TO 19 30'
 LONGITUDE 155 00' TO 155 30'
 DIAGRAM NE 5-1.5 HAWAII

DESCRIPTION ~~RECOVERY NOTE~~ TRIANGULATION STATION

NAME OF STATION: VR 1-8 HIDI
 ESTABLISHED BY: L.A. Critchlow YEAR: 1977 STATE: Hawaii BENCH MARK ALSO
 COUNTY: Hawaii
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: About 5 miles southwest of Mountain View
 HEIGHT OF TELESCOPE ABOVE STATION MARK FEET. HEIGHT OF LIGHT ABOVE STATION MARK FEET.

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
KULANI HGS 1091				00 00 00.0
RM 1	NE	49.31	15.028	116 27 49
RM 2	S	73.09	22.554	277 45 02
RM 1 to RM 2		121.73	37.105	

The station is located about 5 miles southwest of Mountain View and is on state property.

The station marks are State Of Hawaii Survey disks stamped VR 1-4 1977. The surface disk is set in the top of a 12-inch round concrete post that is 5 inches below the ground surface on the shoulder of the road in asphalt. It is 47.5 feet north of power pole number 117, 19.5 feet southeast of the center of State Highway 11 and 19.5 feet northwest of a wire fence. The underground disk is set in the top of an irregular mass of concrete that is about 48 inches below the ground surface.

Reference mark 1 is a 1/2 inch iron pipe, cemented in a round mass of concrete, with the letters 18A inscribed in the cement and projects about 1 inch above the surface of the ground. It is 24 feet southeast of the center of State Highway 11 and 15.6 feet northwest of the wire fence.

Reference mark 2 is a railroad spike stamped NO 2 on top of the spike with a punch hole in the center and is cemented in a drill hole in a 2 by 3 foot boulder that projects about 1 foot above the surface of the ground. It is 39 feet southeast of the center of State Highway 11, 6.5 feet south of power pole number 117, 0.5 feet northwest of the wire fence and about 3 feet above the level of the highway.

* 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.

ADJUSTED HORIZONTAL CONTROL DATA ADJUSTMENT BY NGS

NAME OF STATION: VR 1-8 HIDI OBS BY NGS
 STATE: HAWAII YEAR: 1978 SECOND ORDER

SOURCE: G-16241

GEODETIC LATITUDE	19 29 '37.59512	ELEVATION	698.5 METERS
GEODETIC LONGITUDE	155 09 08.21523		2292 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ OR ANGLE
H1 1	5101	619,757.26	239,953.09	+ 0 06 '58 "

* 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
KULANI HGS	101 52 '01.1	101 45 '03 "	5101

THESE DATA OBTAINED FROM ADJUSTMENT OF JAN 1979