**Puu Kapukau (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 Keanhou 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 Kapukau

**Established by:** E. R. Hand

**Year:** 1914

**State:** Hawaii

**County:** Hawaii

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

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 Kapukau, a short, prominent ridge of 1050 feet elevation, overlooking the coconut grove at end of Kalapana 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 Puu Kapukau; then left on Chain of Craters Road and go 2.2 miles to Hills Fall Park Road on right; continue ahead on Chain of Craters Road for 2.6 miles to gravel 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 0.25 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 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 Ainanhou Property.

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

(continued on next page)
**HORIZONTAL CONTROL DATA**

by the

NATIONAL GEODETIC SURVEY

OLD HAWAIIAN DATUM

**PUU KAPUKAPU (continued)**

**RECOVERY NOTE, TRIANGULATION STATION**

**NAME OF STATION:** PUU KAPUKAPU

**ESTABLISHED BY:** T.H. Han 1914

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

**YEAR:** 1914

**STATE:** Hawaii

**COUNTY:** Hamakua

**BENCHMARK ALSO:**

**HEIGHT OF TELESCOPE ABOVE STATION MARK:** 4 FEET

**HEIGHT OF LIGHT ABOVE STATION MARK:** 4 FEET

<table>
<thead>
<tr>
<th>DISTANCES AND DIRECTIONS TO ADJACENT MARKS, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN</th>
<th>READING</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>FROM THE GROUND AT THE STATION</td>
<td>FEET</td>
<td>METERS</td>
<td></td>
</tr>
<tr>
<td>PUU ULUA HTS 1914'</td>
<td>NW</td>
<td>29.99</td>
<td>9.141</td>
</tr>
<tr>
<td>SE</td>
<td>31.86</td>
<td>9.711</td>
<td></td>
</tr>
</tbody>
</table>

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 were set at this time and due to changes a new description follows.

The station is located about 19 miles southeast 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 Puna 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 G5 disk, unmarked, 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 K5s 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 cliff 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 2 feet lower than the station mark.

**REPORT ON PERMANENT SURVEY MARK**

**AREA OFFICE:**

**State:** Hawaii

**County:** Hamakua

**Quarantine:** 16

**Volcanoes National Park Elevation:** 10 miles due S. of Hawaii

**DESIGNATION:** [Listed - PUU KAPUKAPU]

**TYPE OF MARK:** BM

**TT:**

**TMM:**

**Established by:**

**Lat.:** 19° 36’ 43.56”

**Long.:** 155° 44’ 62.58”

**Elev.:** 1050. . . . . . . . feet

**Conditions:**

- Disturbed
- Distracted
- Unmarked
- Not Found

**Marks Listed:**

- UBG
- UBG
- UBG
- UBG
- UBG
- UBG
- UBG

**Remarks or Revised Description:**

Station mark and BM’s recovered in good condition.

Reached via helicopter.

**Submitter:**

Yukio Yamamoto

**Title:** Cartographer

**Agency:** USGS

**Date:** 1/26/78

Marks found in good condition need not be repeated.
HORIZONTAL CONTROL DATA

NO TEXT
PUULULA (HTS)
(Hawaii Island, E. R. Hand, 1914).—In southern Hawaii, on
the highest point of a hill of same name 0.5 miles northeast of Punalu'u, and 3
miles in from the sea. It stands isolated, is rather sharp, and has a slender
conical cairn on top. About 0.5 miles to the southwest is another hill (Puu
Kolekole), rough lava, but much lower. Puu Uula and stations
Kamehame are on range. Station marked by standard bronze station mark.

RECOVERY NOTE, TRIANGULATION STATION

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

PUULULA (HTS)
STATE: Hawaii
COUNTY: HAWAII

NAME OF STATION: PUULULA (HTS)
YEAR: 1914
SURVEYED BY: E. R. Hand
LOCALE: E.A., Hawaii
RECOVERYED BY: CHARLES L. ORR

Detailed statement as to the States of the original description:

Location of station: in the southern part of Hawaii about 3 miles east
of Pahala and 0.5 miles northeast of Punalu'u on top of a prominent
reddish colored hill. The only other prominent hill lies about 1.5
miles southwest of the station.

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

New station mark: H.TS. 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. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY, NATIONAL GEOGRAPHIC SURVEY

PUULULA (HTS)
STATE: Hawaii
COUNTY: HAWAII

NAME OF STATION: PUULULA (HTS)
YEAR: 1949
SURVEYED BY: L. G. WILLER
LOCALE: HAWAII

Detailed statement as to the States of the original description:

The marks of the original old station
were not accessible. In 1938 the Territory Survey Departmept 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 1938
survey. A new description follows—

The station is located on the summit of a low lava knob, named
Puulula, which lies about 0.5 miles northeast of Punalu'u, about 3 miles
east of Pahala, about 1.7 miles northeast of the sea and on the western
flank of a small crater. Another hill of similar appearance lies about 1.5
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 0.5 miles; pass by the sugar mill in the village of
Honomu and continue northeast, toward Hilo, for 1.5 miles; turn right
pass through a board gate, and go southeasterly, across country, for 0.5
miles; pass to the left hand side of a circular water trough, and follow an
old road marked with rails for about 0.5 miles to the foot of the hill and
the end of truck travel. This is about a 200 foot peak.

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
plays a role.

No reference or azimuth marks were established for this station.

Object

KAMEHAMA 1939 (metal target) 00 00 00 SW
Honuapo Stake, Huluhinoo Sugar Co 10 06 00.0 SW
Punalu'u Spire (pond, Oh.) 10 21 11.2 SW

(continued on next page)
HORIZONTAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

PUULUNA (HTS) (continued)

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: PUULUNA (HTS)
ESTABLISHED BY: E.R. Hand
YEAR: 1914
STATE: Hawaii
BENCHMARK MARKED: ALSO
RECOVERED BY: D.M. Whipp
YEAR: 1978
COUNTY: Hawaii
Island: Hawaii

The station 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 northeast of the coastline, on the west rim of a prominent red crater and is on property of the Lasko International Air Service Company, Mr. Charles Smith, Vice President, 1580 Kaneohe Boulevard, Honolulu.

To reach the station from the post office in Pahala, go north on Pahokee Street for 0.25 mile to the junction with State Highway 11; turn left and go northeast on Highway 11 for 1.6 miles to Kalaalea Bridge; continue north for 0.2 mile to a track road right; turn right and go easterly on the track road through a advertise The Tree Orchard for 0.25 mile to a gate; continue easterly, crossing a small washout creek for 2 miles on dim track road across lava flow to where the track road bears left; bear right and go southeasterly across lava flow for 0.5 mile to a point about 200 yards west of the station and end of track travel.

From here pack east uphill to the station.

The station is marked on the ground with a concrete slab about 7 feet on each side and flush with the rocks of the hillside. The words, PUULUNA HTS, are inscribed in the concrete slab. 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 west rim of the crater and about 10 feet below the station mark.

Reference mark 2 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

NAME OF STATION: PUULUNA (HTS)
ESTABLISHED BY: E.R. Hand
YEAR: 1914
STATE: Hawaii
BENCHMARK MARKED: ALSO
RECOVERED BY: D.M. Whipp
YEAR: 1978
COUNTY: Hawaii
Island: Hawaii

DISTANCES AND DIRECTIONS TO MARKS WHICH CAN BE SEEN FROM THE GRID AT THE STATION

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>KAHABEKA NEW HTS 1949</td>
<td>W</td>
<td>00</td>
<td>00</td>
<td>00</td>
</tr>
<tr>
<td>PAHALA KAU SUGAR CO STACK</td>
<td>N</td>
<td>39,68</td>
<td>16,665</td>
<td>88% 50</td>
</tr>
<tr>
<td>K1</td>
<td>ESE</td>
<td>69.94</td>
<td>21,320</td>
<td>29</td>
</tr>
</tbody>
</table>
Sand Hill (Hawaii Island, United States Geological Survey, 1920)—In southeast Hawaii, 1 mile southwest of Halaumaau, 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 midden 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
**RECOVERED BY:** D.H. Whipp **YEAR:** 1967 **COUNTY:** Hawaii
**AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:** Island: Hawaii

Station was searched for but not found. There is a hole in the ground at the approximate location.
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-southeast 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 0.5 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 0.5 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 ft in diameter and about 3 inches below the ground surface. It is 7 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.
South Rim (Hawaii Island, United States Geological Survey, 1920). In southeastern 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, TRAINGLEATION STATION

NAME OF STATION: SOUTH RIM
ESTABLISHED BY: U.S.G.S. YEAR: 1920 STATE: Hawaii
RECOVERED BY: D.M. Whipp YEAR: 1957 COUNTY: Hawaii
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

Determined statement as to the course of the original description; including marks found, bearings, 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, 469 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 1811 feet elevation, on a low, rocky 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 the 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 the station with a 4-wheel-drive vehicle.

ADJUSTED HORIZONTAL CONTROL DATA

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

SOURCE G-SP156

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>H</th>
<th>V</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>571,099.14</td>
<td>210,750.59</td>
<td>3813.6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Plane azimuth has been computed by the 2-GR0.45 formula neglecting the second term.

** STATION OR OBJECT** | GEOGRAPHIC AZIMUTH (FROM NORTH) | PLANE AZIMUTH | CODE |
|----------------------|---------------------------------|---------------|------|

0 141552 STATION 1056
HAWAII
LATTITUDE 19° 00' TO 19° 30'
LONGITUDE 155° 00' TO 155° 30'
DIAGRAM NE 51.5 HAWAII
HORIZONTAL CONTROL DATA

SPLIT (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 ¼ mile south of Halemaumau. Mark, a bronze tablet cemented in top of a large boulder.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: SPLIT
ESTABLISHED BY: USGS
YEAR: 1920
STATE: HAWAII
RECOVERED BY: D.M. Whipp
YEAR: 1967
COUNTY: HAWAII
ISLAND: HAWAII

Detailed statement as to the contents of the original description; including scale factor, wenchings, 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 "SPLIT", 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 ½ feet southeast of a cairn.

ADJUSTED HORIZONTAL CONTROL DATA

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

SOURCE: G-SP150

DESCRIPTIVE LATITUDE: 19° 24' 06.7447"
DESCRIPTIVE LONGITUDE: 155° 17' 02.462" ELEVATION: 1111.73 METERS
3647.4 FEET

STATE COORDINATES (DEG):

<table>
<thead>
<tr>
<th>STATE &amp; CODE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>D-CHORD</th>
<th>H-ANGLE</th>
</tr>
</thead>
</table>
| HI 1         | 5101 | 574,428.15 | 206,473.93 | + 0° 04' 18"

*Plane azimuth has been computed by the P + 0° method, neglecting the second term.*

TO STATION OR OBJECT | GEOGRAPHIC AZIMUTH (DEGREES) | PLANE AZIMUTH (DEGREES) | CODE
|--------------------|------------------------------|-------------------------|-------
| QQ 308             |                              |                         |       |
NO ORIGINAL TEXT

HORIZONTAL CONTROL DATA

by the
National Ocean Survey
NEW HAWAIIAN DATUM

ADJUSTED HORIZONTAL CONTROL DATA

Hawaii

STATE: Hawaii

YEAR: 1936

FIRST ORDER

SOURCE: G-1641

DESCRIPTIVE LATITUDE: 19° 45' 28.511841

DESCRIPTIVE LONGITUDE: 155° 17' 24.36070

ELEVATION: 1246.60

METERS

STATE COORDINATES (State Plane)

STATE E Z

5301 572,511,57 214,578,67 + 0'04'12"

PLANE ASMOOTH HAS BEEN COMPUTED BY THE E 214.0 D AND FORMULA NEGLIGIBLY THE SECOND TERM.

HVD 119 USGS

9 55 44.2

9'51'52' 5101

THESE DATA OBTAINED FROM ADJUSTMENT OF JAN 1979

THESE DATA SHOULD BE USED FOR ALL SURVEYS AFTER DEC 1979

JAN 152

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

RECOVERY NOTE, TRIANGULATION STATION
NAME OF STATION: UWEKAHUNA (HGS)
ESTABLISHED BY: HGS YEAR: 1896 STATE: Hawaii
AERIAL DISTANCE AND DIRECTION FROM NEAREST TOWN:
Detailed statements as to the sources of the original descriptions; exclusive marks found, snapping, charge marks, 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 the 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 300 feet northeast of the U.S. Geological Survey Observatory.
To reach station from the Kilauea 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 "LO88 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 0 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 two 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 three 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
NAME OF STATION: UWEKAHUNA (HGS)
ESTABLISHED BY: HGS YEAR: 1896 STATE: Hawaii
RECORDED BY: R.B. Nolby YEAR: 1975 COUNTY: Hawaii
AERIAL DISTANCE AND DIRECTION FROM NEAREST TOWN:
Detailed statements as to the sources of the original descriptions; exclusive marks found, snapping, charge marks, 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.

DISTANCES AND DIRECTIONS TO Auxiliary MARKS AND PROXIMATE OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>BEARING</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVO 119 USGS</td>
<td></td>
<td></td>
<td>00 00 00.0</td>
</tr>
<tr>
<td>HVO 113 USGS</td>
<td>5.57</td>
<td>1.661</td>
<td></td>
</tr>
<tr>
<td>HAWAIIAN TELEPHONE Co. TOWER</td>
<td>1</td>
<td>0.141</td>
<td>26.2</td>
</tr>
<tr>
<td>GAPF 400 CABLE TV HAST</td>
<td>29.365</td>
<td>9.083</td>
<td>23.7</td>
</tr>
<tr>
<td>BM 1</td>
<td></td>
<td></td>
<td>BM 1 to BM 2</td>
</tr>
<tr>
<td>BM 2</td>
<td></td>
<td></td>
<td>BM 1 to BM 2</td>
</tr>
</tbody>
</table>

The station mark and reference marks 1 and 2 were recovered in good condition. The distance to reference mark 1 was found shorter by 0.096 meter and the direction was found larger by 0.007 minute and 32.009 seconds. The distance to reference mark 2 was found longer by 0.007 meter and the direction was found smaller by 16 seconds. A USGS Bench mark and the direction was found larger by 0.009 seconds. The station has been recovered in good condition.

- Reference marks 1 and 2 were recovered in good condition.
- The station is located on the west rim of the Kilauea Crater, just north of the United States Geological Survey and on property owned by the Hawaii Volcanoes National Park.
- To reach the station from the National Volcanic Observatory, go north on track road for 0.1 mile to the station on the right near the rim of the crater.
- Station mark, stamped "LO88 1912", is a USGS Bench Mark disk cemented in a drill hole in a boulder which is flush with the ground surface.
- Reference mark 1, stamped "UWEKAHUNA NO 1 1940", is a USGS 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.
- Reference mark 2, stamped "UWEKAHUNA NO 2 1949", is a USGS 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.
- Reference mark 3, stamped "UWEKAHUNA NO 3 1949", 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 west of the ground surface. It is 1.7 feet west of the southwest corner of the platform over the station.
HORIZONTAL CONTROL DATA

by the National Ocean Survey
OLD HAWAIIAN DATUM

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: VOLCANO HOUSE FLAG

OBS BY CGS

YEAR: 1949

STATES: HAWAII

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

JUN 1978

NAME OF STATION: VOLCANO HOUSE

STATE: HAWAII

CHIEF OF PARTY: L. G. Wilder

YEAR: 1949

MARKED BY C. J. Hoeppe1

The original station, a 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 in two. 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 southeast of the centerline of the highway which runs between Moku and Maalaea, 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 2973 1918, set in the top of a concrete monument which has a base of 5.6 feet by 5.7 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 8 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 HOUSEFLAG NO 2 1949, set in the top of a 8 1/2 inch pipe which projects about 6 inches. It is located about 10 feet north of the centerline of the highway and about 4 feet lower than the station.

* Reference to notes in margins of triangulation and map publications of triangulation. 10-degree single-meridian quadrangle, related to initial station.

1 Chief of survey only, when no inoperable building is being done. 10-DEG.10' 10-deg. single-meridian area.

(continued on next page)
**HORIZONTAL CONTROL DATA**

by the
NATIONAL GEODETIC SURVEY

OLD HAWAIIAN DATUM

**RECOVERY NOTE, TRIANGULATION STATION**

**NAME OF STATION**: VOLCANO HOUSE FLAG

**ESTABLISHED BY**: L.C. Wilder

**RECOVERED BY**: D.N. Whipp

**YEAR**: 1949

**STATE**: Hawaii

**COUNTY**: Hawaii

**HEIGHT OF TELESCOPE ABOVE STATION MARK**: 0.9 Meters

**HEIGHT OF LIGHT ABOVE STATION MARK**: Meters

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

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>Bearing</th>
<th>Distance (FEET)</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>OHALE (HGS)</td>
<td>NE 40.453</td>
<td>12.331</td>
<td>00 00 00.0</td>
</tr>
<tr>
<td>OAHU (HGS)</td>
<td>SE 40.606</td>
<td>12.316</td>
<td>00 00 00.0</td>
</tr>
<tr>
<td>R.M. No. 1</td>
<td>NE 40.453</td>
<td>12.331</td>
<td>00 00 00.0</td>
</tr>
<tr>
<td>R.M. No. 3</td>
<td>SE 28.125</td>
<td>8.591</td>
<td>00 00 00.0</td>
</tr>
</tbody>
</table>

Station mark and reference mark number one were recovered in good condition. Reference mark number two was found destroyed, so a new reference mark, number three, was established. 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, 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 "977 1919," set in the top of a concrete monument extending about 5 feet above ground and built up in 4 terraced sections, beginning with a 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 south 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 onia and about 1 foot lower than station mark.

---

**RECOVERY NOTE, TRIANGULATION STATION**

**NAME OF STATION**: VOLCANO HOUSE FLAG

**ESTABLISHED BY**: L.C. Wilder

**RECOVERED BY**: L.A. Critchlow

**YEAR**: 1949

**STATE**: Hawaii

**COUNTY**: Hawaii

**BENCH MARK ALSO**: 0

**AERIAL DISTANCE AND DIRECTION FROM NEAREST TOWN**: In Volcano National Park

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

**DISTANCES AND DIRECTIONS TO GPS MARK, REFERENCE MARKS AND PROXIMATE OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION**

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>Bearing</th>
<th>Distance (METERS)</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>UWEAKAHUNA (HGS) 1896</td>
<td>NE 40.435</td>
<td>12.324</td>
<td>00 00 00.0</td>
</tr>
<tr>
<td>R.M. No. 1</td>
<td>SE 20.175</td>
<td>8.588</td>
<td>00 00 00.0</td>
</tr>
<tr>
<td>R.M. No. 3</td>
<td>SE 51.170</td>
<td>15.597</td>
<td>00 00 00.0</td>
</tr>
</tbody>
</table>

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.
HORIZONTAL CONTROL DATA

ADJUSTED HORIZONTAL CONTROL DATA

<table>
<thead>
<tr>
<th>NAME OF STATION</th>
<th>VR 1-1 HIDT</th>
</tr>
</thead>
<tbody>
<tr>
<td>COUNTY</td>
<td>HAWAII</td>
</tr>
<tr>
<td>LATITUDE</td>
<td>19°00'00&quot;</td>
</tr>
<tr>
<td>LONGITUDE</td>
<td>155°14'00&quot;</td>
</tr>
<tr>
<td>ELEVATION</td>
<td>1144.6</td>
</tr>
<tr>
<td>METERS</td>
<td>3755</td>
</tr>
<tr>
<td>SOURCE</td>
<td>G-16241</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATN</th>
<th>11101</th>
<th>590,780.91</th>
<th>216,376.96</th>
<th>+ 0.05 16</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATE</td>
<td>HAWAII</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZONE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CODE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

THESE DATA OBTAINED FROM ADJUSTMENT OF JAN 1979

**NOTES:**
- **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 party note.
- **HORAG FORM 94-162 REVISED 08/31/77 FORM 06/01/79**

---

**DESCRIPTION:**

**NOTE, TRIANGULATION STATION**

**NAME OF STATION:** VR 1-1 HIDT

**ESTABLISHED BY:** L.A. Crittendon

**YEAR, 1977:**

**STATE:** HAWAII

**COUNTY:** HAWAII

**BENCHMARK:**

**REFERENCE MARKS AND OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION:**

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>METER</th>
<th>FEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>FULLI NO 1591</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>BN 1</td>
<td>0.15</td>
<td>0.50</td>
</tr>
<tr>
<td>BN 2</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**DISTANCE AND DIRECTIONS TO NEAREST TOWNS:**

- **1/4 mile SW of Volcano Post Office:**
- **2 miles NE of Volcano Post Office:**

**HEIGHT OF TELESCOPE ABOVE STATION MARK**

- **0.00**

**HEIGHT OF LIGHT ABOVE STATION MARK**

- **0.00**

**ADJUSTMENT BY NGS**

- **OBS BY NGS**

**SOURCE:**

- **G-16241**

**STATE & ZONE CODE**

- **H1 11101**
- **590,780.91**
- **216,376.96**
- **+ 0.05 16**

**STATE COORDINATES (EAST):**

- **N 11101**
- **590,780.91**
- **216,376.96**
- **+ 0.05 16**

---

**ADJACENT STATION OBJECT**

<table>
<thead>
<tr>
<th>STATION OR OBJECT</th>
<th>GEOGRAPHIC LONGITUDE</th>
<th>GEOGRAPHIC LATITUDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAWAI 11101</td>
<td>155°14'00&quot;</td>
<td>19°00'00&quot;</td>
</tr>
</tbody>
</table>

**PLANE ASHORTH HAS BEEN COMPUTED BY THE Z HHU Z HHU FORMULA NEGLIGATING THE SECOND TERM**

**PLANE ASHORTH:**

- **146°48'32.5"**
- **146°42'47"**
- **5101**

---

**SM 155**
**HORIZONTAL CONTROL DATA**

**DESCRIPTION**

**NAME OF STATION:** VR 1-8 HIUI

**ESTABLISHED DATE:** 1974

**YEAR:** 1977

**STATE:** HAWAII

**COUNTY:** HAWAII

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

**HEIGHT OF TELESCOPE ABOVE STATION MARK:**

**HEIGHT OF LIGHT ABOVE STATION MARK:**

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

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>MEASUREMENT</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>W 120° 1' N 99° 1'</td>
<td>VE</td>
<td>10.32</td>
<td>35.026</td>
</tr>
<tr>
<td>W 120° 1' N 99° 1'</td>
<td>S</td>
<td>75.79</td>
<td>23.556</td>
</tr>
<tr>
<td>T 1 to T 1'</td>
<td>121.73</td>
<td>37.150</td>
<td></td>
</tr>
</tbody>
</table>

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

The station marks are State Of Hawaii Survey dims staked 1/2" 1977. The surface disk is set in the top of a 12-inch round concrete post that is 8 inches below the ground surface on the shoulder of the road. It is 375 feet north of power pole number 117, 115.5 feet southeast of the center of State Highway 11 and 19.5 feet north of a wire fence. The underground disk is set in the top of an irregular mass of concrete that is about 45 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 38 inserted in the center and projects about 1 inch above the surface of the ground. It is 24 feet southeast of the center of State Highway 11 and 35.0 feet northwest of the wire fence.

- Reference mark 2 is a railroad spike staked NO 2 on top of the spire with a punch hole in the center and is cemented in a drill hole in 3 by 3 feet boulder that projects about 1 foot above the surface of the ground. It is 30 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.

---

**ADJUSTED HORIZONTAL CONTROL DATA**

**NAME OF STATION:** VR 1-8 HIUI

**STATE:** HAWAII

**YEAR:** 1977

**SECOND ORDER**

**ELEVEN**

**CODE**

**LATITUDE**

**LONGITUDE**

**ELEVATION**

**METERS**

**FEET**

**STATE COORDINATES (Ft)**

<table>
<thead>
<tr>
<th>STATE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>ELEV</th>
<th>M</th>
<th>FET</th>
<th>FEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI</td>
<td>3101</td>
<td>619,797.26</td>
<td>239,923.89</td>
<td>+ 0 06' 58&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*These data obtained from adjustment of Jan 1979*

---

*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 property form.*

**FEDERAL FORM 75-95**

**SUPERSEDES**

**FEDERAL FORM 75-72**

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**U.S. DEPARTMENT OF COMMERCE**

**NOAA**

**1979**

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**DIAGRAM NO 51.5**

**HAWAII**