

DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

*Elevations and Descriptions for Second Order
Level Bench Marks Surveyed by the
Hawaiian Volcano Observatory on
the Island of Hawaii*

by

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*This report is preliminary and has not been
reviewed for conformity with U. S. Geological
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names is for descriptive purposes only and
does not imply endorsement by the USGS.*

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INTRODUCTION

Through the years many different techniques have been used by the U.S. Geological Survey (USGS), Hawaiian Volcano Observatory (HVO) to measure ground deformation associated with volcanism or tectonics in Hawaii.

At Kilauea, Hawaii, leveling and dry tilt measurements have emerged as principle techniques for monitoring vertical changes of ground deformation. Both of these systems require stable and permanent marks to which future changes can be referenced. These reference points are called bench marks.

The first level lines surveyed in the Territory of Hawaii, Island of Hawaii, were run by the U. S. Geological Survey in 1910 (Marshall, 1914). Since that initial survey, large ground deformation associated with eruptions and/or earthquakes have occurred on the Island of Hawaii, necessitating the establishment of new bench marks and elevations. Through the years, many bench marks were destroyed due to man's progress or as a result of nature's unpredictable rampages. Scrutiny of level data has dictated the abandonment of some bench marks and the establishment of new bench marks. Roads and trails have changed, making bench-mark locations obsolete and requiring new descriptions.

PURPOSE OF REPORT

Bench marks along level lines used by the Hawaiian Volcano Observatory to monitor vertical displacement were installed by the National Oceanographic and Atmospheric Agency (NOAA, formally USC&GS), the Hawaiian Volcano Observatory, and the Smithsonian Institution (see special note under "Acknowledgements"). This report will attempt to consolidate current information about leveling from all these agencies into a complete listing.

Yamashita (1981) described the dry tilt technique and Hanatani (1987a, 1987b) documented the dry tilt station locations.

This report presents tabulated elevations, descriptions and maps for level bench marks (past and present) currently used by HVO as of March 1987.

LEVEL HISTORY

Since the initial survey in 1910, surveys tying the bench marks to sea level in Hilo were run in 1926 (Rappleye, 1926), 1958 (Yamamoto, 1959), (Karren, 1959), 1966 (USC&GS), 1971 (Okamura and Swanson, 1971), 1975, (NGS, 1977), 1976 and 1979 (HVO unpublished report). Although there have been numerous surveys by HVO to study local deformation, data for these surveys will not be included, since the initial starting points were not fixed to sea level but rather were "floating" elevations. Exceptions are the "Great Crack" level line on the southwest rift of Kilauea, and the "Ainapo" level line on the summit of Mauna Loa. These have been included because of their critical location and the infrequent ties to sea level.

DATA

All data presented have been obtained from published reports or from

unpublished data of the Hawaiian Volcano Observatory. No effort will be made to interpret the leveling results, to analyze the method in which the data was collected, or to report on how the final results were obtained.

One exception to the above is that not all surveys used E-2 as the starting bench mark, and even in those surveys using E-2, not all surveys used 2.419 m as the starting elevation. In order to make all these surveys comparable, 0.005 m was added to the 1966 USC&GS Hilo to Mauna Loa survey, 0.090 m was added to the 1975 NGS Hilo to Mauna Loa survey, and 0.097 m added to the 1976 HVO level survey.

Karren applied Rod corrections and distributed the closure error for the 1958 survey, Okamura and Swanson did likewise for the 1971 survey; rod corrections and closure error were also distributed by NGS for the 1975 survey, and HVO did likewise for the 1976 and 1979 surveys. Only final values are available for the 1910, 1914, and 1966 surveys and it is assumed that all corrections were applied.

The table of elevation (Table I) in this report is included to show the kind of changes that do occur on Hawaiian volcanoes, and should not be used for reference elevations.

ACKNOWLEDGMENTS

This paper would not have been possible without the help of numerous people; especially Ronald Hanatani and Maurice Sako of the Hawaiian Volcano Observatory for field checking some of the descriptions, Norman Banks of the Cascades Volcano Observatory for allowing us to use his notes describing the location of those bench marks on the Southwest Rift level line, Gary Bohren of the USGS Vancouver, Wa., for his description on the Kalapana Trail level line, and Jack Lockwood, HVO, for providing elevations for the 1921 Southwest Rift level line. Thanks to R.S. Fiske and E. Nielsen of the Smithsonian Institution for providing their descriptions for bench marks between Pahoa and Kaimu, and between Pohoiki and Honolulu landing.

Descriptions for bench marks between the end of the Mauna Loa Strip Road and the summit of Mauna Loa were provided by the National Oceanographic and Atmospheric Agency; special thanks to Dan Dzurisin, for giving us the time to put this report together, and to Michael Doukas and Ron Hanatani for their critical review of this manuscript.

Special note: Between 1985 and 1986 R.S. Fiske and E. Nielsen of the Smithsonian Institution installed 80 new bench marks at 500 meter spacing between Pahoa and Kaimu, and Pohoiki and Honolulu landing. Descriptions for their bench marks have not been included in this report, because Fiske and Nielsen have already put together a comprehensive in-house report, at HVO, describing the bench marks, including photos for each bench mark. This is an unpublished report.

TABLE I

Elevations of Bench marks

**** LINE 01 ** HILO TO ML STRIP ROAD ****

All elevations are in meters. © This Bench mark is held "fixed".

BENCH MARK ID	1912 SURVEY	1976 SURVEY	1958 SURVEY	1966 SURVEY	1971 SURVEY	1975 SURVEY	1976 SURVEY	1979 SURVEY	COMMENTS
E 2©		2.419	2.419	2.419	2.419	2.419	2.419	2.419	
Pier1				2.306	2.296	2.291	2.276		
F 2		2.432	2.350	2.337	2.334	2.302	2.251		
D 2			2.566	2.573	2.573	2.574	2.574		DESTROYED
TIDAL #4						3.340	3.342	3.349	
A100			3.558	3.561		3.578	3.578	3.578	
BM5.83	1.804	1.792	1.798	1.809	1.805	1.821			
3YYY			12.975		12.994	12.996	13.008	12.906	DESTROYED
4YYY			33.635		33.657	33.669	33.657	33.665	
5YYY			45.022		45.049	45.047	45.056	45.045	
B 2		60.390	60.358	60.395	60.358	60.376	60.386	60.368	
D 20					76.311	76.321	76.299	76.315	
6YY			74.473		74.483	74.495	74.587	74.569	
E 20					87.767	87.771	87.743	87.769	
A 2		84.682	84.673	84.687	84.708	84.710	84.715	84.688	
F 20						94.159	94.163	94.134	
7YYYReset					84.860	84.865	84.867	84.840	
G 20						90.765	90.765	90.735	
Z 1			100.011	99.995		100.018	99.923	99.919	
BM359.3	109.525	109.522	109.521	109.527	109.545	109.559	109.553		DESTROYED
H 20						154.401	154.393	154.348	
8YY			171.013		171.034	170.959	171.039	171.000	
J 20						181.073	182.064	182.021	DESTROYED
1YY			198.418		198.439	198.452	198.438	198.403	
Y 1		210.424	210.410	210.429	210.436	210.445	210.431	210.403	
2YY			268.748		268.771	268.774	268.757	268.732	
L 20						277.469	277.450	277.425	
3YY					318.059	318.082	318.088	318.073	
K 20						348.174	348.154	348.130	
T 20						386.378	386.364	386.336	
4YY			426.094		426.112	426.120	426.104	426.073	
W 1 RESET		466.539	466.520	466.543	466.539	466.544	466.527	466.501	
M 20						506.677	506.659	506.628	
5YY			525.483		525.490	525.503	525.489	525.455	
N 20						560.742	560.733	560.693	
BM2002	610.220	610.400	610.385	610.405	610.389	610.402	610.391	610.347	
V 1 RESET		646.199	646.042		646.034	646.079	646.063	646.017	
P 20						648.564	648.622	648.572	
6YY RESET			658.092		658.080	657.101	657.072	657.026	
Q 20						671.668	671.633	671.585	

**** LINE 01 CONTINUED ** HILO - ML STRIP ROAD ****

BENCH MARK ID	1912 SURVEY	1926 SURVEY	1958 SURVEY	1966 SURVEY	1971 SURVEY	1975 SURVEY	1976 SURVEY	1979 SURVEY	COMMENTS
7YY RESET						678.214	678.180	678.130	
R 20						698.279	698.236	698.185	
U 1						715.571	715.558	715.557	DESTROYED
U1 RESET								718.958	DESTROYED
8YY			754.450		754.445	754.488	754.532	754.381	
9YY			758.079		758.074	758.221	758.160	758.007	
U 20						796.220	796.156	796.094	
10YY			817.280		817.295	817.338	817.269	817.203	
11YY			838.694		838.719	838.764	838.698	838.617	
12YY			881.839		881.866	881.706	881.834	881.744	
W 20						913.842	913.768	913.674	
13YY			962.364		962.399	962.434	962.340	962.246	
V 20						1003.634	1003.529	1003.423	
14YY			1041.734		1041.756	1041.816	1041.698	1041.576	
15YY			1040.537		1040.558	1040.619	1040.501	1040.379	
S 1		1073.548	1073.554	1073.553	1073.588	1073.656	1073.513	1073.380	
BM3565 RESET			1086.917		1086.951	1087.033	1086.875	1086.733	
S 20						1110.108	1109.918	1109.756	
16YY			1134.856		1134.897	1134.954	1134.720	1134.537	
X 20						1142.501	1142.234	1142.038	
17YY RESET						1163.696	1163.325	1163.082	
90YY RESET						1181.161	1181.303	1180.874	
BM3973	1210.998	1210.833	1210.861	1210.838	1211.016	1211.134	1210.780	1210.630	
Y 20							1202.151	1201.783	
92YY			1202.014		1202.152	1202.260	1201.889	1201.606	
HVO143						1214.649	1214.407	1214.135	
93YY			1219.198		1219.322	1219.434	1219.089	1210.394	
Z 20							1229.118	1228.775	
94YYRESET						1226.313	1226.448	1226.130	
95YY					1219.453		1219.600	1219.394	
96YY			1216.909		1217.033	1217.175	1216.893	1216.868	
HVO25						1208.757	1208.881	1208.650	
HVO24						1209.366	1209.476	1209.284	
P 1 1926		1204.155	1204.202	1204.160	1204.251	1204.348	1204.189	1204.178	
HVO23					1191.155	1191.248	1191.106	1191.101	
97YY			1247.363			1247.468	1247.344	1247.351	
X 21						1279.527	1279.420	1279.433	
98YY			1317.131			1317.203	1317.116	1317.128	
99YY			1384.939			1384.993	1384.913	1384.935	
Y 21						1423.672	1423.590	1423.627	
100YY			1461.548			1461.585	1461.507	1461.542	
W 21						1484.307	1484.232	1484.267	
V 21						1529.855	1529.783	1529.821	
101YY			1566.187			1566.204	1566.141	1566.174	
102YY			1642.630			1642.637	1642.583	1642.608	

**** LINE 01 CONTINUED ** HILO - ML STRIP ROAD ****

BENCH MARK ID	1912 SURVEY	1926 SURVEY	1958 SURVEY	1966 SURVEY	1971 SURVEY	1975 SURVEY	1976 SURVEY	1979 SURVEY	COMMENTS
103YY			1723.547			1723.568	1723.512	1723.535	
104YY			1803.167			1803.189	1803.136	1803.170	
U 21						1858.599	1858.552	1858.592	
105YY			1886.518			1886.540	1886.492	1886.531	
106YY			1976.090			1976.117	1976.069	1976.110	
STRIP						2030.619	2030.573		
107YY			2031.125			2031.152	2031.106	2031.151	

**** LINE 02 ** STRIP ROAD TO MAUNA LOA SUMMIT VIA RED HILL ****

BENCH MARK ID	1912 SURVEY	1926 SURVEY	1958 SURVEY	1966 SURVEY	1971 SURVEY	1975 SURVEY	COMMENTS
F 21						2075.187	
T 21						2163.570	
G 21						2235.384	
K 1		2312.342		2312.347		2312.245	
S 21						2334.519	
R 21						2482.897	
Q 21						2593.209	
ISIS						2743.347	
I 1		2842.503		2842.508		2842.543	
P 21						2926.953	
N 21						3058.820	
PUU ULAULA						3066.514	
D 21						3094.869	
G 1		3095.538		3095.543		3095.415	
E 21						3175.884	
H 21						3258.064	
F 1		3299.480		3299.485		3299.061	
J 21						3355.151	
K 21						3415.935	
E 1		3475.407		3475.412		3475.132	
L 21						3497.962	
M 21						3595.507	
D 1		3660.717		3660.722		3660.733	
B 22						3741.998	
C 21						3922.724	
C 1		3968.111		3968.116		3968.313	
Z 21						3987.931	
HVO10						3972.340	
A 22						4021.918	

****** LINE 02 CONTINUED ** STRIP ROAD TO MAUNA LOA SUMMIT VIA RED HILL ******

BENCH MARK ID	1912 SURVEY	1926 SURVEY	1958 SURVEY	1966 SURVEY	1971 SURVEY	1975 SURVEY	COMMENTS
B 21						4075.574	
HV094						4101.323	
HV093						4135.052	
B 1		4161.792		4161.797		4162.462	
A 1		4160.097		4160.102		4160.793	
A 21						4169.454	

****** LINE 03 ** AINAO TRAIL ******

© This Bench mark is held "fixed".

BENCH MARK ID	1976 SURVEY	1977 SURVEY	1981 SURVEY	1983 SURVEY	1984 SURVEY	1985 SURVEY	COMMENTS
VENT©			3915.253	3915.253	3915.253	3915.253	
ML81-100			3947.183	3947.190	3947.144	3947.150	
C 1			3968.121	3968.138	3968.029	3968.042	
ML81-101			3969.673	3969.699			
ML81-102			3984.167	3984.203	3984.112	3984.149	
HV0133			4040.547	4040.582	4040.343	4040.399	
ML81-103				4036.600	4036.187	4036.266	
HV092			4045.880	4045.937	4045.441	4045.521	
ML81-104			4040.027	4040.098	4039.519	4039.598	
ML81-105			4033.376	4033.450	4032.834	4032.914	
ML81-106			4034.475	4034.547	4033.918	4034.001	
ML81-107			4033.769	4033.834	4033.242	4033.324	
ML-1	4053.224©		4053.224	4053.271	4052.838	4052.904	
ML81-108				4009.102	4008.572	4008.633	
ML-2	3923.035		3975.245	3975.324	3974.767	3974.815	
TAG44					3939.893	3939.926	
ML-3			3923.065	3923.136	3922.674	3922.694	
ML-4	3800.644		3800.625	3800.695	3800.342	3800.344	
ML-5			3565.563	3565.617	3565.424	3565.434	
ML-6			3361.921	3361.955	3361.856	3361.866	
ML-7				3196.390	3196.335	3196.344	
SW-7				3177.951	3177.893	3177.902	
ML-8	2992.101				2992.109	2992.122	

****** LINE 04 ** CRATER RIM DRIVE ******

BENCH MARK ID	1912 SURVEY	1926 SURVEY	1958 SURVEY	1971 SURVEY	1975 SURVEY	19076 SURVEY	1979 SURVEY	COMMENTS
HVO26				1227.487		1227.292	1227.243	
HVO27				1243.506		1243.290	1243.211	
HVO28				1221.565		1221.377	1221.281	
203YY			1201.923	1202.148		1201.983	1201.862	
HVO29				1182.809		1182.659	1182.478	
204YY			1151.669	1151.991		1151.863	1151.579	
117YY			1140.694	1141.084		1140.986	1140.612	
118YY			1139.070	1139.472		1139.090	1138.668	
HVO31				1113.900		1113.748	1113.228	
HVO32				1111.267		1111.068	1110.507	
HVO33				1119.095		1118.828	1118.237	
205YY			1109.448	1109.370		1108.708	1108.073	
HVO34				1107.409		1107.014	1106.318	
HVO35				1108.639		1108.152	1107.432	
BM79-508							1115.144	
HVO10R							1119.075	
REBAR1							1140.651	
22YY			1134.256	1134.497		1133.977	1133.574	
REBAR2							1136.926	
21YY			1147.240	1147.351		1146.907		
20YY			1168.931				1168.410	
19YY			1194.185				1193.745	
HVO114							1177.594	

****** SPUR LINE FROM LINE 04 ** CONE PEAK ******

BENCH MARK ID	1912 SURVEY	1926 SURVEY	1958 SURVEY	1971 SURVEY	1975 SURVEY	1976 SURVEY	1979 SURVEY	COMMENTS
CONE PEAK	113.536	1113.376	1113.325	1113.684		1113.692	1113.229	

****SPUR LINE FROM LINE 04 ** CALDERA LOOP ****

BENCH MARK ID	1912 SURVEY	1926 SURVEY	1958 SURVEY	1971 SURVEY	1975 SURVEY	1976 SURVEY	1979 SURVEY	COMMENTS
HVO41				1103.869		1103.279	1103.001	
HVO42				1102.780		1102.120	1101.600	DESTROYED
HVO43				1126.541		1095.309	1094.800	DESTROYED
HVO44				1082.313		1081.563	1081.038	
110YY		1082.736		1082.506		1081.734	1081.293	
HVO45				1078.763		1078.075	1077.710	
109YY		1074.898		1074.707		1074.079	1073.786	
HVO46				1076.419		1075.738	1075.396	
HVO47				1080.687		1079.971	1079.586	
HVO48				1087.514		1086.839	1086.461	
HVO49				1095.185		1094.474	1094.087	

***** LINE 05 ** DESERT *****

BENCH MARK ID	1912 SURVEY	1926 SURVEY	1958 SURVEY	1971 SURVEY	1975 SURVEY	1976 SURVEY	1979 SURVEY	COMMENTS
SPIT			1111.734	1112.052		1111.700	1111.032	
HVO36				1105.198		1104.689	1103.988	DESTROYED
111YY			1103.146	1103.585		1103.021	1102.322	DESTROYED
HVO37				1098.176		1097.545	1096.847	
112YY			1085.972	1086.446		1085.736	1085.061	
TAG83-500								
113YY			1064.902	1065.452		1064.769	1064.269	
BM79-114								
BM79-115								
TAG0000							1036.409	
TAG1500							1031.567	
TAG3000							1026.927	
TAG4500							1010.448	
TAG6000							1015.367	
TAG7500							994.581	
TAG9000							985.626	
TAG10500							966.912	

**** LINE 06 ** FOOTPRINTS TRAIL ****

BENCH MARK ID	1912 SURVEY	1926 SURVEY	1958 SURVEY	1971 SURVEY	1975 SURVEY	1976 SURVEY	1979 SURVEY	COMMENTS
TAG75-57							970.951	
TAG75-62							971.685	
TAG75-63							967.629	
TAG75-64							970.506	
TAG75-65							963.322	
TAG75-66							959.741	
TAG75-67							957.671	
TAG75-68							955.914	
TAG75-69							945.142	
TAG75-70							933.165	
TAG75-71							944.949	
TAG75-72							948.413	
TAG75-73							946.086	
TAG75-74							950.833	
TAG75-75							951.838	
TAG75-76							943.835	
TAG75-77							936.080	
TAG75-78							931.063	
TAG75-79							927.918	
TAG75-80							922.639	
TAG75-81							917.242	
TAG75-82							906.427	
TAG75-83							897.690	
TAG75-84							890.676	
TAG75-85							896.753	
TAG75-86							907.499	
TAG75-87							920.503	
TAG75-88							927.775	
TAG75-89							929.364	

**** LINE 07 ** HILINA PALI ROAD ****

BENCH MARK ID	1912 SURVEY	1926 SURVEY	1958 SURVEY	1971 SURVEY	1975 SURVEY	1976 SURVEY	1979 SURVEY	COMMENTS
BM79-511							1033.210	
BM79-514							1017.478	
131YY			1009.046	1006.917		1006.451	1006.333	
BM79-515							1009.176	
132YY			998.423	997.640		997.169	997.196	
BM79-516							984.361	

**** LINE 07 CONTINUED ** HILINA PALI ROAD ****

BENCH MARK ID	1912 SURVEY	1926 SURVEY	1958 SURVEY	1971 SURVEY	1975 SURVEY	1976 SURVEY	1979 SURVEY	COMMENTS
133YY			983.085	981.195		980.470	980.614	
BM79-517							965.729	
BM79-518							964.095	
BM79-519							969.147	
BM79-520							970.755	
134YY			960.335	961.278		960.807	960.938	
135YY			892.033	892.495		891.894		
136YY			862.166	862.461		861.893		
137YY			800.899	801.028		800.350		
138YY			751.640	751.700		751.045		
139YY			695.825	695.845		695.110		

**** LINE 08 ** CHAIN OF CRATERS TO HONOLULU LANDING ****

BENCH MARK ID	1912 SURVEY	1921 SURVEY	1958 SURVEY	1971 SURVEY	1975 SURVEY	1976 SURVEY	1979 SURVEY	COMMENTS
BM79-509							1107.611	
BM79-510							1103.334	
25YY			1073.385	1073.657		1073.088	1072.578	
26YY			1045.782	1046.020		1045.477	1044.934	DESTROYED
26YY RESET								
BM79-511							1033.119	
27YY			1002.134	1000.924		1000.045	999.538	DESTROYED
27YY RESET							998.960	
28YY RESET							979.953	
29YY			985.123	985.125		984.718	984.666	
BM79-500							977.396	
KF-5								
HVO101						971.965	971.898	
HVO104				960.902		960.459	960.586	
BM79-501							971.247	
HVO77-2							908.533	
HVO77-3							866.665	
HVO77-4							824.644	
BM79-506							774.599	
BM79-507							743.622	
HVO77-7							720.156	
HVO77-10							664.818	
BM80-1							613.338	
BM79-502							619.383	
BM79-503							582.172	

*** LINE 08 CONTINUED ** CHAIN OF CRATERS TO HONOLULU LANDING ***

BENCH MARK ID	1912 SURVEY	1921 SURVEY	1958 SURVEY	1971 SURVEY	1975 SURVEY	1976 SURVEY	1979 SURVEY	COMMENTS
HV077-13							517.116	
HV063				466.611			465.721	
HV064				435.878			435.027	
HV0162				421.933			421.039	
HV065				396.507			395.649	
HV066				349.482			348.533	
BM79-504							268.669	
HV077-15							198.780	
HV077-16							166.612	
HV077-17							113.743	
BM79-505							54.472	
HV076				45.270		43.639	43.860	
HV077				34.736		33.430	33.647	
HV078				25.369		24.132	24.347	
HV079				14.140		13.057	13.269	
HV080				19.920		18.715	18.912	
HV081				18.970		18.024	18.204	
HV082				22.307		21.478	21.658	
HV083				13.049		12.291	12.460	
HV084				10.594		9.828	9.960	
HV085				11.349		10.634	10.761	
HV086				4.666		3.690	3.811	
KUPAPAU				7.464		6.745		
48YY			5.964	6.076		5.325	5.456	
BM34		10.420	10.584	10.691		10.071	10.203	
49YY			12.625	12.732		12.144	12.270	
50YY			13.061	13.161			12.355	
51YY			9.814	9.907		9.489	9.581	
BM10			3.296	3.389		2.722		
BM79-535							2.711	
52YY			5.166			4.611	4.643	
52YYRESET							7.270	
185YY			9.856			9.409		
MOANA HAUAE				22.996			22.562	
184YY			22.410			21.990		
183YY			31.002			30.611		
181YY			15.689			15.272		
180YY			13.138			12.717		
179YY			9.565			9.144		
178YY			6.204			5.787		
177YY			6.783			6.369		
176YY			23.650			23.244		
175YY			8.445			8.053		
174YY			11.310			10.949		

****** LINE 08 CONTINUED ** CHAIN OF CRATERS TO HONOLULU LANDING ******

BENCH MARK ID	1912 SURVEY	1921 SURVEY	1958 SURVEY	1971 SURVEY	1975 SURVEY	1976 SURVEY	1979 SURVEY	COMMENTS
171YY			19.417			19.083		
170YY			19.313			18.988		
169YY			17.414			17.124		
168YY			14.452			14.183		
167YY			11.998			11.735		
166YY			24.477			24.233		
HV07						33.360		
HV02						32.306		
HV03						34.037		
HV04						37.374		DESTROYED
HV05						35.462		DESTROYED
HV06						32.454		
191YY			29.842			29.828		DESTROYED
192YY			13.035			13.039		
193YY			4.877			4.910		

****** SPUR LINE OFF LINE 08 ** ESCAPE ROAD ******

BENCH MARK ID	1912 SURVEY	1926 SURVEY	1958 SURVEY	1971 SURVEY	1975 SURVEY	1976 SURVEY	1979 SURVEY	COMMENTS
29YY			985.123			984.718	984.666	
BM3269	996.507	996.617	995.887			995.656	995.461	
KF-46								
HV096				1015.275		1014.767	1014.565	
HV095				1034.343		1033.747	1033.625	

****** LINE 09 ** KALAPANA TRAIL ******

BENCH MARK ID	1912 SURVEY	1921 SURVEY	1958 SURVEY	1971 SURVEY	1975 SURVEY	1976 SURVEY	COMMENTS
BM2503		762.751	762.650	763.650		762.946	
36YY			762.380	763.628		762.677	
37YY			700.254	701.077		700.202	
BM2302		701.300	701.964	702.790		701.913	
38YY			701.778	702.688		701.783	
39YY			650.722	651.439		650.600	
40YY			584.772	585.302		584.397	
BM1638		499.431	499.828	500.299		499.525	
41YY			438.967	439.385		438.639	
42YY			381.379	381.723		381.011	
BM1082		329.563	329.887	330.191		329.509	
43YY			282.640	282.925		282.233	
44YY			170.465	170.714		170.040	
BM557		169.845	170.014	170.261		169.586	
BM352		106.954	107.188	107.368		106.697	
45YY			51.195	51.325		50.639	
BM167		50.817	51.023	51.153		50.467	
46YY			23.232	23.324		22.519	
BM64		19.378	19.559	19.652		18.838	

****** LINE 10 ** KEAAU TO KALAPANA VIA PAHOA ******

BENCH MARK ID	1912 SURVEY	1926 SURVEY	1958 SURVEY	1971 SURVEY	1975 SURVEY	1976 SURVEY	1979 SURVEY	COMMENTS
89YY			109.043			109.077	109.053	
87YY			90.616			90.643	90.609	
86YY			106.909			106.937	106.916	
85YY			115.187			115.214	115.202	
84YY			130.734			130.757	130.761	
BM497			151.307			151.318	151.332	
83YY			159.928			159.937	159.953	
82YY			181.603			181.595	181.626	
81YY			186.193			186.159	186.205	
BM655			199.527			199.553	199.598	
BM79-533							207.342	
BM79-540							212.689	
HV01						251.847	251.867	

**** LINE 10 CONTINUED ** KEAAU TO KALAPANA VIA PAHOA ****

BENCH MARK ID	1912 SURVEY	1926 SURVEY	1958 SURVEY	1971 SURVEY	1975 SURVEY	1976 SURVEY	1979 SURVEY	COMMENTS
BM79-534							263.769	DESTROYED
BM82-110							264.082	
BM82-111							288.368	
BM79-541							288.317	DESTROYED
76YY			295.149			294.851	294.878	
BM82-112							304.525	
BM82-114							313.433	
74YY			314.067				313.665	DESTROYED
HVO91						324.295	324.328	
HVO200							316.030	
HVO201							310.472	
HVO202							298.345	
HVO203							277.707	
HVO204							265.619	
HVO205							259.551	
HVO124						253.337	253.409	
62YYRESET						237.065	237.156	
WASHER			224.072			223.620	223.708	
BM737			224.825			224.375	224.465	
61YYRESET						206.204	206.300	
HVO206							188.628	
59YY			170.549			170.122	170.219	
HVO207							147.248	
HVO208							106.336	
56YY			74.736			74.271	74.346	
HVO209							55.265	DESTROYED
54YY			28.908			28.411	28.470	
53YY			3.688			3.167	3.200	

**** LINE 11 ** PAHOA TO KAPOHO ****

BENCH MARK ID	1912 SURVEY	1926 SURVEY	1958 SURVEY	1971 SURVEY	1975 SURVEY	1976 SURVEY	1979 SURVEY	COMMENTS
141YY			198.770			198.571	198.677	DESTROYED
141YY RESET								
142YY			198.510					DESTROYED
143YY			202.631			202.410	202.903	DESTROYED
143YY RESET								
144YY			206.440			206.165		DESTROYED
144YY RESET								

**** LINE 11 CONTINUED ** PAHOA TO KAPOHO ****

BENCH ID	MARK	1912 SURVEY	1926 SURVEY	1958 SURVEY	1971 SURVEY	1975 SURVEY	1976 SURVEY	1979 SURVEY	COMMENTS
145YY				195.156			194.832	194.795	
147YY				188.467			188.133		
148YY				182.814			182.480		
149YY				170.590			170.251		
150YY				152.145			151.804		
151YY				143.543			143.196		DESTROYED
152YY				127.389			126.983		
153YY				116.708					
154YY				101.733					DESTROYED
155YY				92.182			91.805		
156YY				72.605					
157YY				62.540			62.225		
158YY				52.263			51.870		
159YY				43.835			43.555		
160YY				50.596			50.286		
HV09							39.772		
HV08							31.870		
HV07							33.360		

**** LINE 12 ** LEILANI BLVD.****

BENCH ID	MARK	1912 SURVEY	1926 SURVEY	1958 SURVEY	1971 SURVEY	1975 SURVEY	1976 SURVEY	1979 SURVEY	COMMENTS
BM81-1									
BM81-2									
BM81-3									
BM81-4									
BMX									

No ties to sea level

**** LINE 13 ** KAPOHO/PAHOA JUNCTION TO POHOIKI ****

BENCH MARK ID	1912 SURVEY	1926 SURVEY	1958 SURVEY	1971 SURVEY	1975 SURVEY	1976 SURVEY	1979 SURVEY	COMMENTS
194YY			189.278			188.875	188.826	
195YY			187.594			187.155	187.097	
196YY			181.789			181.348	181.282	
197YY			168.308			167.884	167.813	
198YY			161.185			159.842	159.768	
200YY			148.290			147.932		
201YY			110.901			110.541	110.463	
202YY			60.328			59.975	59.912	
174YY			11.310			10.949	10.905	

**** LINE 14 ** SW RIFT GREAT CRACK LEVEL ****

© This Bench mark is held "fixed".

BENCH MARK ID	1921 SURVEY	1958 SURVEY	1971 SURVEY	1975 SURVEY	1976 SURVEY	1979 SURVEY	1981 SURVEY	COMMENTS
BM1855©	565.805			565.805	565.805		565.805	
TAG75-11				550.760	550.762			
TAG75-12				531.982	531.984			
TAG75-13				524.405	524.405		524.397	
TAG75-14				516.870	516.869		516.858	
TAG75-15				511.711	511.708		511.695	
TAG75-16				512.693	512.683		512.665	
TAG75-17				505.184	505.166		505.149	
TAG75-18				492.413	492.399		492.382	
TAG75-19				481.630	481.612		481.592	
TAG75-20				472.644	472.618		472.599	
TAG75-21				462.872	462.849		462.826	
TAG75-22				459.880	459.856		459.833	
TAG75-23				469.380	469.353		469.331	
TAG75-24				460.797	460.753		460.728	
TAG75-25				450.433			450.360	
BM1471	448.555			448.484	448.424		448.408	
TAG75-26				445.058	444.995		444.975	
TAG75-27				434.373	434.307		434.289	
TAG75-28				422.770	422.702		422.684	
TAG75-29				412.496	412.406		412.005	
TAG75-30				407.476	407.349		407.339	
TAG75-31				397.930	397.774		397.769	
TAG75-32				385.498	385.367		385.370	

**** LINE 14 CONTINUED ** SW RIFT GREAT CRACK LEVEL ****

BENCH MARK ID	1921 SURVEY	1958 SURVEY	1971 SURVEY	1975 SURVEY	1976 SURVEY	1979 SURVEY	1981 SURVEY	COMMENTS
BM1250	381.018			381.001	380.800		380.799	
TAG75-33				369.774	369.534		369.532	
TAG75-34				359.869	359.639		359.641	
TAG75-35				349.684	349.342		349.344	
TAG75-36				338.203	337.853		337.856	
TAG75-37				331.897	331.513		331.525	
TAG75-38				322.181	321.751		321.769	
TAG75-39				312.006	311.564		311.585	
TAG75-40				306.712	306.281		306.308	
BM1027	313.152			313.129	312.735		312.762	
TAG75-41				302.108	301.677		301.709	
TAG75-42				293.683	293.158		293.195	
TAG75-43				282.522	281.931		281.974	
TAG75-44				270.008	269.422		269.467	
TAG75-45				259.957	259.348		259.397	
TAG75-46				235.460	234.678		234.728	
TAG75-47				218.276	217.291		217.335	
TAG75-48				202.114	200.568		200.578	
TAG75-49				191.840	189.965		190.010	
TAG75-50				181.027	179.388		179.430	
TAG75-51				171.456	169.897		169.948	
BM540	164.488			164.297	162.743		162.806	
TAG76-14					146.300		146.338	
TAG76-13					137.379		137.425	
TAG76-12					134.484		134.523	
TAG76-11					128.832		128.864	
TAG76-10					122.257		122.314	
TAG76-9					116.281		116.337	
TAG76-8					102.610		102.660	
TAG76-7					94.129		94.171	
NALI					93.760		93.804	

TABLE II

ALPHABETICAL AND NUMERICAL LISTING OF BENCH MARKS AND PAGES KEYED TO THEIR LOCATION FOR ELEVATION AND TOPOGRAPHIC QUADS.

BENCH MARK ID	BM IN LINE NO.	BM ELEV ON PAGE	TOPOGRAPHIC 7 1/2 QUAD	QUADRANT
A 1	02	09	MAUNA LOA	NW 1/4
A 21	02	09	MAUNA LOA	NW 1/4
A 22	02	08	MAUNA LOA	NW 1/4
A100	01	06	HILO	NE 1/4
BM (SEE PAGE 23 FOR BM'S)				
B 1	02	09	MAUNA LOA	NW 1/4
B 21	02	09	MAUNA LOA	NW 1/4
B 22	02	08	KOKOOLAU	SW 1/4
B 2	01	06	HILO	SW 1/4
C 1	02	08	MAUNA LOA	NW 1/4
C 21	12	08	MAUNA LOA	NW 1/4
CONE PEAK	04	10	KILAUEA CRATER	SE 1/4
D 1	02	08	KOKOOLAU	SE 1/4
D 21	02	08	PUU ULAULA	SW 1/4
D 20	01	06	HILO	SE 1/4
E 1	02	08	KOKOOLAU	SE 1/4
E 2	01	06	HILO	NE 1/4
E 20	01	06	HILO	SE 1/4
E 21	02	08	PUU ULAULA	SW 1/4
F 1	02	08	PUU ULAULA	SW 1/4
F 2	01	06	HILO	NE 1/4
F 20	01	06	HILO	SE 1/4
F 21	02	08	PUU ULAULA	SE 1/4
G 1	02	08	PUU ULAULA	SW 1/4
G 20	01	06	HILO	SE 1/4
G 21	02	08	PUU ULAULA	SW 1/4
HVO (SEE PAGE 24 FOR HVO BM'S)				
H 20	01	06	MOUNTAIN VIEW	NE 1/4
H 21	02	08	PUU ULAULA	SW 1/4
ISIS	02	08	PUU ULAULA	SE 1/4
I 1	02	08	PUU ULAULA	SW 1/4
J 21	02	08	KOKOOLAU	SE 1/4
KUPAPAU	08	14	KALAPANA	NE 1/4
K 1	02	08	PUU ULAULA	SE 1/4
K 20	01	06	MOUNTAIN VIEW	NE 1/4
K 21	02	08	KOKOOLAU	SE 1/4
KF-5	08	13	MAKAOPUHI CRATER	NW 1/4
KF-43	04	10	KILAUEA CRATER	SE 1/4
KF-44	04	10	KILAUEA CRATER	SE 1/4
KF-45	08	15	MAKAOPUHI CRATER	NW 1/4
KF-46	08	15	VOLCANO	SW 1/4
L 20	01	06	MOUNTAIN VIEW	NE 1/4
L 21	01	06	KOKOOLAU	SE 1/4
ML (SEE ML'S)				
MOANA HAUAE	08	14	PAHOA SOUTH	SW 1/4
M 20	01	06	MOUNTAIN VIEW	SW 1/4

BENCH MARK ID	BM IN LINE NO.	BM ELEV ON PAGE	TOPOGRAPHIC 7 1/2 QUAD	QUADRANT
M 21	02	09	KOKOOLAU	SW 1/4
NALI	14	21	NALIIKAKANI POINT	NW 1/4
N 20	01	06	PUU MAKAAALA	SE 1/4
N 21	02	08	PUU ULAULA	SW 1/4
PIER 1	01	06	HILO	NE 1/4
PUU ULAULA	02	08	PUU ULAULA	SW 1/4
P 1 1926	01	07	KILAUEA CRATER	SW 1/4
P 20	01	06	PUU MAKAAALA	SE 1/4
P 21	02	08	PUU ULAULA	SE 1/4
Q 20	01	06	PUU MAKAAALA	SE 1/4
Q 21	02	08	PUU ULAULA	SE 1/4
REBAR1	04	10	KILAUEA CRATER	SE 1/4
REBAR2	04	10	KILAUEA CRATER	SE 1/4
R 20	01	06	VOLCANO	NE 1/4
R 21	02	08	PUU ULAULA	SE 1/4
SPIT	04	11	KILAUEA CRATER	SE 1/4
STRIP	01	08	KIPUKA PAKEKAKE	NE 1/4
S 1	01	07	VOLCANO	NW 1/4
S 20	01	07	VOLCANO	SW 1/4
S 21	02	08	PUU ULAULA	SE 1/4
TAG (SEE PAGE 26 FOR TAG #'S)				
T 20	01	06	MOUNTAIN VIEW	SW 1/4
T 21	02	08	PUU ULAULA	SE 1/4
U 20	01	07	VOLCANO	NE 1/4
U 21	01	08	KIPUKA PAKEKAKE	NE 1/4
VENT	01	09	KOKOOLAU	SW 1/4
V 1Reset	01	06	PUU MAKAAALA	SE 1/4
V 20	01	07	VOLCANO	NW 1/4
V 21	02	07	KILAUEA CRATER	NE 1/4
WASHER	10	17	PAHOA SOUTH	SW 1/4
W 1Reset	01	06	MOUNTAIN VIEW	SW 1/4
W 20	01	07	VOLCANO	NW 1/4
W 21	02	07	KILAUEA CRATER	NE 1/4
X 20	01	07	VOLCANO	SW 1/4
X 21	02	07	KILAUEA CRATER	NE 1/4
YY (SEE PAGE 27 FOR YY BM'S)				
Y 1	01	06	MOUNTAIN VIEW	NE 1/4
Y 20	01	07	KILAUEA CRATER	SE 1/4
Y 21	02	07	KILAUEA CRATER	NE 1/4
Z 1	01	06	MAUNA LOA	NW 1/4
Z 20	01	07	KILAUEA CRATER	SE 1/4
Z 21	02	08	MAUNA LOA	NW 1/4

BENCH MARK ID	BM IN LINE NO.	BM LISTED ON PAGE	TOPOGRAPHIC 7 1/2 QUAD	QUADRANT
BMX	16	18	PAHOA SOUTH	SE 1/4
BM5.83	01	07	HILO	NW 1/4
BM34	08	14	KALAPANA	NE 1/4
BM64	09	16	KALAPANA	NW 1/4
BM167	09	16	KALAPANA	NW 1/4
BM280	14	18	NALIIKAKANI	NE 1/4
BM352	09	16	KALAPANA	NW 1/4
BM497	10	16	PAHOA NORTH	SW 1/4
BM540	14	21	NALIIKAKANI	NW 1/4
BM557	09	16	KALAPANA	NW 1/4
BM655	10	16	PAHOA SOUTH	NW 1/4
BM737	10	17	PAHOA SOUTH	SW 1/4
BM1027	14	21	PAHALA	NE 1/4
BM1082	09	16	KALAPANA	NW 1/4
BM1250	14	21	PAHALA	NW 1/4
BM1471	14	19	PAHALA	NW 1/4
BM1638	09	16	KALAPANA	NW 1/4
BM1855	14	19	WOOD VALLEY	SE 1/4
BM2002	01	05	PUU MAKAAALA	SE 1/4
BM2302	09	16	MAKAOPUHI CRATER	NE 1/4
BM2503	09	16	MAKAOPUHI CRATER	NE 1/4
BM3269	08	15	VOLCANO	SW 1/4
BM3565R	01	07	VOLCANO	SW 1/4
BM3973	01	07	KILAUEA CRATER	SW 1/4
BM79-114	05	11	KILAUEA CRATER	SE 1/4
BM79-115	05	11	KILAUEA CRATER	SE 1/4
BM79-500	08	15	MAKAOPUKI CRATER	NW 1/4
BM79-501	08	13	MAKAOPUHI CRATER	NW 1/4
BM79-502	08	13	MAKAOPUHI CRATER	NE 1/4
BM79-503	08	13	MAKAOPUHI CRATER	SE 1/4
BM79-504	08	14	MAKAOPUHI CRATER	SE 1/4
BM79-505	08	14	MAKAOPUHI CRATER	SE 1/4
BM79-506	08	13	MAKAOPUHI CRATER	NW 1/4
BM79-507	08	13	MAKAOPUHI CRATER	NW 1/4
BM79-508	04	13	KILAUEA CRATER	SE 1/4
BM79-509	08	13	KILAUEA CRATER	SE 1/4
BM79-510	08	13	KILAUEA CRATER	SE 1/4
BM79-511	08, 07	12, 13	VOLCANO	SW 1/4
BM79-514	07	12	MAKAOPUHI CRATER	NW 1/4
BM79-515	07	12	KAU DESERT	NE 1/4
BM79-516	07	12	KAU DESERT	NE 1/4
BM79-517	07	13	KAU DESERT	NE 1/4
BM79-518	07	13	KAU DESERT	NE 1/4
BM79-519	07	13	KAU DESERT	NE 1/4
BM79-520	07	13	KAU DESERT	NE 1/4

BENCH MARK ID	BM IN LINE NO.	BM LISTED ON PAGE	TOPOGRAPHIC 1/4 QUAD	QUADRANT
BM79-533	10	16	PAHOA SOUTH	NW 1/4
BM79-535	08	14	KALAPANA	NE 1/4
BM79-540	10	16	PAHOA SOUTH	NW 1/4
BM80-1	08	13	MAKAOPUHI CRATER	SE 1/4
BM81-1	12		PAHOA SOUTH	NW 1/4
BM81-2	12		PAHOA SOUTH	NW 1/4
BM81-3	12		PAHOA SOUTH	NW 1/4
BM81-4	12		PAHOA SOUTH	NE 1/4
BM82-111	10	17	PAHOA SOUTH	NE 1/4
BM82-112	10	17	PAHOA SOUTH	NE 1/4
BM82-114	10	13	PAHOA SOUTH	NW 1/4
BM82-500	04		KILAUEA CRATER	SE 1/4
BM82-501	04		KILAUEA CRATER	SE 1/4
HVO1	10	16	PAHOA SOUTH	NW 1/4
HVO2	08	15	KAPOHO	NW 1/4
HVO3	08	15	KAPOHO	NW 1/4
HVO6	08	15	KAPOHO	NW 1/4
HVO7	08	15	KAPOHO	NW 1/4
HVO8	11	18	KAPOHO	NW 1/4
HVO9	11	18	KAPOHO	NW 1/4
HVO10	02	08	KOKOOLAU	SW 1/4
HVO23	01	07	KILAUEA CRATER	SE 1/4
HVO24	01	07	KILAUEA CRATER	SE 1/4
HVO25	01	07	KILAUEA CRATER	SE 1/4
HVO26	04	10	KILAUEA CRATER	SE 1/4
HVO27	04	10	KILAUEA CRATER	SE 1/4
HVO28	04	10	KILAUEA CRATER	SE 1/4
HVO29	04	10	KILAUEA CRATER	SE 1/4
HVO31	04	10	KILAUEA CRATER	SE 1/2
HVO32	04	10	KILAUEA CRATER	SE 1/4
HVO33	04	10	KILAUEA CRATER	SE 1/4
HVO34	04	10	KILAUEA CRATER	SE 1/4
HVO35	04	10	KILAUEA CRATER	SE 1/4
HVO41	04	11	KILAUEA CRATER	SE 1/4
HVO44	04	11	KILAUEA CRATER	SE 1/4
HVO45	04	11	KILAUEA CRATER	SE 1/4
HVO46	04	11	KILAUEA CRATER	SE 1/4
HVO47	04	11	KILAUEA CRATER	SE 1/4
HVO48	04	11	KILAUEA CRATER	SE 1/4
HVO49	04	11	KILAUEA CRATER	SE 1/4

BENCH MARK ID	BM IN LINE NO.	BM LISTED ON PAGE	TOPOGRAPHIC 7 1/2 QUAD	QUADRANT
HVO63	08	14	MAKAOPUHI CRATER	SE 1/4
HVO64	08	14	MAKAOPUHI CRATER	SE 1/4
HVO65	08	14	MAKAOPUHI CRATER	SE 1/4
HVO66	08	14	MAKAOPUHI CRATER	SE 1/4
HVO76	08	14	MAKAOPUHI CRATER	SE 1/4
HVO77	08	14	MAKAOPUHI CRATER	SE 1/4
HVO77-2	08	13	MAKAOPUHI CRATER	NW 1/4
HVO77-3	08	13	MAKAOPUHI CRATER	NW 1/4
HVO77-4	08	13	MAKAOPUHI CRATER	NW 1/4
HVO77-7	08	13	MAKAOPUHI CRATER	NW 1/4
HVO77-10	08	13	MAKAOPUHI CRATER	SE 1/4
HVO77-13	08	14	MAKAOPUHI CRATER	SE 1/4
HVO77-15	08	14	MAKAOPUHI CRATER	SE 1/4
HVO77-16	08	14	MAKAOPUHI CRATER	SE 1/4
HVO77-17	08	14	MAKAOPUHI CRATER	SE 1/4
HVO78	08	14	KALAPANA	SW 1/4
HVO79	08	14	KALAPANA	SW 1/4
HVO80	08	14	KALAPANA	SW 1/4
HVO81	08	14	KALAPANA	SW 1/4
HVO81-6	12	19	PAHOA SOUTH	NE 1/4
HVO83	08	14	KALAPANA	SW 1/4
HVO84	08	14	KALAPANA	SW 1/4
HVO85	08	14	KALAPANA	SW 1/4
HVO86	08	14	KALAPANA	SW 1/4
HVO86-100	01	No elevations	VOLCANO	NE 1/4
HVO86-101	01		VOLCANO	NE 1/4
HVO86-102	01		PUU MAKAALA	SE 1/4
HVO86-103	01		MOUNTAIN VIEW	SW 1/4
HVO86-104	01		MOUNTAIN VIEW	SW 1/4
HVO86-105	01		MOUNTAIN VIEW	NE 1/4
HVO86-106	01		MOUNTAIN VIEW	NE 1/4
HVO86-107	08		MOUNTAIN VIEW	NE 1/4
HVO86-108	08		MAKAOPUHI CRATER	SE 1/4
HVO91	10	17	PAHOA SOUTH	SW 1/4
HVO92	03	09	MAUNA LOA	NW 1/4
HVO93	02	09	MAUNA LOA	NW 1/4
HVO95	08	15	VOLCANO	SW 1/4
HVO94	02	09	MAUNA LOA	NW 1/4
HVO96	08	15	VOLCANO	SW 1/4
HVO101	08	13	MAKAOPUHI CRATER	NW 1/4
HVO104	08	13	MAKAOPUHI CRATER	NW 1/4
HVO114	04	10	VOLCANO	SW 1/4
HVO124	08	17	PAHOA SOUTH	SW 1/4
HVO133	03	09	MAUNA LOA	NW 1/4
HVO143	01	07	KILAUEA CRATER	NW 1/4
HVO162	08	14	MAKAOPUHI CRATER	SE 1/4
HVO200	08	17	PAHOA SOUTH	NW 1/4
HVO201	08	17	PAHOA SOUTH	NW 1/4
HVO202	08	17	PAHOA SOUTH	SW 1/4
HVO203	08	17	PAHOA SOUTH	SW 1/4
HVO204	08	17	PAHOA SOUTH	SW 1/4

BENCH MARK ID	BM IN LINE NO.	BM LISTED ON PAGE	TOPOGRAPHIC 7 1/2 QUAD	QUADRANT
HVO205	08	17	PAHOA SOUTH	SW 1/4
HVO206	08	17	PAHOA SOUTH	SW 1/4
HVO207	08	17	PAHOA SOUTH	SW 1/4
HVO208	08	17	PAHOA SOUTH	SW 1/4
ML-1	03	09	MAUNA LOA	NW 1/4
ML-2	03	09	MAUNA LOA	NW 1/4
ML-3	03	09	MAUNA LOA	NW 1/4
ML-4	03	09	MAUNA LOA	NW 1/4
ML-5	03	09	MAUNA LOA	SE 1/4
ML-6	03	09	MAUNA LOA	SE 1/4
ML-7	03	09	MAUNA LOA	SE 1/4
ML-8	03	09	MAUNA LOA	SE 1/4
ML81-100	03	09	KOKOOLAU	SW 1/4
ML81-101	03	09	MAUNA LOA	NW 1/4
ML81-102	03	09	MAUNA LOA	NW 1/4
ML81-103	03	09	MAUNA LOA	NW 1/4
ML81-104	03	09	MAUNA LOA	NW 1/4
ML81-105	03	09	MAUNA LOA	NW 1/4
ML81-106	03	09	MAUNA LOA	NW 1/4
ML81-107	03	09	MAUNA LOA	NW 1/4
ML81-108	03	09	MAUNA LOA	NW 1/4
TAG0000	05	11	KILAUEA CRATER	SE 1/4
TAG44	03	09	MAUNA LOA	NE 1/4
TAG1500	05	11	KILAUEA CRATER	SE 1/4
TAG3000	05	11	KAU DESERT	NE 1/4
TAG4500	05	11	KAU DESERT	NE 1/4
TAG6000	05	11	KAU DESERT	NE 1/4
TAG7500	05	11	KAU DESERT	NE 1/4
TAG9000	05	11	KAU DESERT	NE 1/4
TAG10500	05	11	KAU DESERT	NE 1/4
TAG83-503	05	11	KILAUEA CRATER	SE 1/4
TAG75-11 TO TAG75-18	LINE 14	PAGE 19	WOOD VALLEY	SE 1/4
TAG75-19 TO TAG75-42	LINE 14	PAGE 19,20	PAHALA	NE 1/4
TAG75-43 TO TAG75-51	LINE 14	PAGE 20	NALIIKAKANI POINT	NW 1/4
TAG75-57 TO TAG75-70	LINE 06	PAGE 11	KAU DESERT	NE 1/4
TAG75-71 TO TAG75-89	LINE 06	PAGE 11	KAU DESERT	NW 1/4
TAG76-7 TO TAG76 14	LINE 14	PAGE 20	NALIIKAKANI POINT	NW 1/4

BENCH MARK ID	BM IN LINE NO.	BM LISTED ON PAGE	TOPOGRAPH 7 1/2 QUAD	QUADRANT
1YY	01	06	MOUNTAIN VIEW	NE 1/4
2YY	01	06	MOUNTAIN VIEW	NE 1/4
3YY	01	06	MOUNTAIN VIEW	NW 1/4
4YYY	01	06	MOUNTAIN VIEW	SW 1/4
4YY	01	06	HILO	NW 1/4
5YY	01	06	MOUNTAIN VIEW	SW 1/4
5YYY	01	07	HILO	SW 1/4
6YY RESET	01	06	PUU MAKALA	SE 1/4
7YY RESET	01	06	VOLCANO	NE 1/4
8YY	01	07	VOLCANO	NE 1/4
8YYY	01	06	MOUNTAIN VIEW	NE 1/4
9YY	01	07	VOLCANO	NE 1/4
10YY	01	07	VOLCANO	NE 1/4
11YY	01	07	VOLCANO	NE 1/4
12YY	01	07	VOLCANO	NE 1/4
13YY	01	07	VOLCANO	NW 1/4
14YY	01	07	VOLCANO	NW 1/4
15YY	01	07	VOLCANO	NW 1/4
16YY	01	07	VOLCANO	SW 1/4
17YY RESET	01	07	VOLCANO	SW 1/4
19YY	04	10	VOLCANO	SW 1/4
20YY	04	10	VOLCANO	SW 1/4
21YY	04	10	KILAUEA CRATER	SE 1/4
22YY	04	10	KILAUEA CRATER	SE 1/4
25YY	08	13	VOLCANO	SW 1/4
26YY RESET	08	13	VOLCANO	SW 1/4
27YY RESET	08	13	VOLCANO	SW 1/4
28YY RESET	08	13	MAKAOPUHI CRATER	NW 1/4
29YY	08	13	MAKAOPUHI CRATER	NW 1/4
36YY	09	16	MAKAOPUHI CRATER	NE 1/4
37YY	09	16	MAKAOPUHI CRATER	NE 1/4
38YY	09	16	MAKAOPUHI CRATER	NE 1/4
39YY	09	16	MAKAOPUHI CRATER	NE 1/4
40YY	09	16	MAKAOPUHI	NE 1/4
41YY	09	16	KALAPANA	NW 1/4
42YY	09	16	KALAPANA	NW 1/4
43YY	09	16	KALAPANA	NW 1/4
44YY	09	16	KALAPANA	NW 1/4
45YY	09	16	KALAPANA	NW 1/4
46YY	09	16	KALAPANA	NW 1/4
48YY	08	14	KALAPANA	NE 1/4
50YY	08	14	KALAPANA	NE 1/4
51YY	08	14	KALAPANA	NE 1/4
52YY	08	14	KALAPANA	NE 1/4
52YY RESET	08	14	KALAPANA	NE 1/4
53YY	08	14	KALAPANA	NE 1/4
54YY	10	17	KALAPANA	NE 1/4
56YY	10	17	PAHOA SOUTH	SW 1/4
59YY	10	17	PAHOA SOUTH	SW 1/4

BENCH MARK ID	BM IN LINE NO.	BM LISTED ON PAGE	TOPOGRAPHIC 1/2 QUAD	QUADRANT
61YY RESET	10	17	PAHOA SOUTH	SW 1/4
62YY RESET	10	17	PAHOA SOUTH	SW 1/4
76YY	10	17	PAHOA SOUTH	NW 1/4
81YY	10	17	PAHOA NORTH	SW 1/4
82YY	10	17	PAHOA NORTH	SW 1/4
83YY	10	17	PAHOA NORTH	SW 1/4
84YY	10	17	PAHOA NORTH	NW 1/4
85YY	10	17	PAHOA NORTH	NW 1/4
86YY	10	17	MOUNTAIN VIEW	NE 1/4
87YY	10	16	MOUNTAIN VIEW	NE 1/4
89YY	10	16	MOUNTAIN VIEW	NE 1/4
90YY RESET	01	07	KILAUEA CRATER	SE 1/4
92YY	01	07	KILAUEA CRATER	NE 1/4
93YY	01	07	KILAUEA CRATER	NE 1/4
94YY RESET	01	07	KILAUEA CRATER	NE 1/4
95YY	01	07	KILAUEA CRATER	NE 1/4
96YY	01	07	KILAUEA CRATER	NE 1/4
97YY	01	07	KILAUEA CRATER	NE 1/4
98YY	01	07	KILAUEA CRATER	NW 1/4
99YY	01	07	KILAUEA CRATER	NW 1/4
100YY	01	07	KILAUEA CRATER	NW 1/4
101YY	01	07	KILAUEA CRATER	NW 1/4
102YY	01	07	KILAUEA CRATER	NW 1/4
103YY	01	08	KILAUEA CRATER	NW 1/4
104YY	01	08	KIPUKA PAKEKAKE	NE 1/4
105YY	01	08	KIPUKA PAKEKAKE	NE 1/4
106YY	01	08	KIPUKA PAKEKAKE	NE 1/4
107YY	01	08	KIPUKA PAKEKAKE	NE 1/4
109YY	04	11	KILAUEA CRATER	SE 1/4
110YY	04	11	KILAUEA CRATER	SE 1/4
112YY	05	11	KILAUEA CRATER	SE 1/4
113YY	05	11	KILAUEA CRATER	SE 1/4
117YY	04	10	KILAUEA CRATER	SE 1/4
118YY	04	10	KILAUEA CRATER	SE 1/4
131Y	07	12	MAKAOPUHI CRATER	NW 1/4
132YY	07	12	KAU DESERT	NE 1/4
133YY	07	13	KAU DESERT	NE 1/4
134YY	07	13	KAU DESERT	NE 1/4
135YY	07	13	KAU DESERT	NE 1/4
136YY	07	13	KAU DESERT	NE 1/4
137YY	07	13	KAU DESERT	SE 1/4
138YY	07	13	KAU DESERT	SE 1/4
139YY	07	13	KAU DESERT	SE 1/4
141YY Reset	11	17	PAHOA SOUTH	NE 1/4
142YY Reset	11	17	PAHOA SOUTH	NE 1/4
143YY Reset	11	17	PAHOA SOUTH	NE 1/4
144YY Reset	11	17	PAHOA SOUTH	NE 1/4

BENCH MARK ID	BM IN LINE NO.	BM LISTED ON PAGE	TOPOGRAPHIC 7 1/2 QUAD	QUADRANT
145YY	11	18	PAHOA SOUTH	NE 1/4
147YY	11	18	PAHOA SOUTH	NE 1/4
148YY	11	18	PAHOA SOUTH	NE 1/4
149YY	11	18	PAHOA SOUTH	NE 1/4
150YY	11	18	PAHOA SOUTH	NE 1/4
152YY	11	18	PAHOA SOUTH	NE 1/4
153YY	11	18	KAPOHO	SW 1/4
155YY	11	18	KAPOHO	SW 1/4
157YY	11	18	KAPOHO	SW 1/4
158YY	11	18	KAPOHO	SW 1/4
159YY	11	18	KAPOHO	SW 1/4
160YY	11	18	KAPOHO	SW 1/4
166YY	08	15	KAPOHO	SW 1/4
167YY	08	15	KAPOHO	SW 1/4
168YY	08	15	KAPOHO	SW 1/4
169YY	08	15	KAPOHO	SW 1/4
170YY	08	15	KAPOHO	SW 1/4
171YY	08	15	KAPOHO	SW 1/4
174YY	08, 13	14, 19	KAPOHO	SW 1/4
175YY	08	14	KAPOHO	SW 1/4
176YY	08	14	KAPOHO	SW 1/4
177YY	08	14	PAHOA SOUTH	SW 1/4
178YY	08	14	PAHOA SOUTH	SW 1/4
179YY	08	14	PAHOA SOUTH	SW 1/4
180YY	08	14	PAHOA SOUTH	SW 1/4
181YY	08	14	PAHOA SOUTH	SW 1/4
183YY	08	14	PAHOA SOUTH	SW 1/4
184YY	08	14	PAHOA SOUTH	SW 1/4
185YY	08	14	KALAPANA	NE 1/4
192YY	08	15	KAPOHO	NW 1/4
193YY	08	15	PAHOA NORTH	NE 1/4
194YY	13	19	PAHOA SOUTH	NE 1/4
196YY	13	19	PAHOA SOUTH	NE 1/4
197YY	13	19	PAHOA SOUTH	NE 1/4
201YY	13	19	KAPOHO	SW 1/4
202YY	13	19	KAPOHO	SW 1/4
203YY	04	10	KILAUEA CRATER	SE 1/4
204YY	04	10	KILAUEA CRATER	SE 1/4
205YY	04	10	KILAUEA CRATER	SE 1/4

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APPENDIX I

Descriptions of Bench marks

HILO TO MAUNA LOA STRIP ROAD (LINE 01)

FROM THE INTERSECTION OF STATE HIGHWAY 11 (KAMEHAMEHA AVE.), STATE HIGHWAY 19 (KANOELEHUA AVE.), AND STATE HIGHWAY 120 (KALANIANA'OLE AVE.), PROCEED NORTHEAST ALONG STATE HIGHWAY 120 FOR 0.7 MILE UNTIL THE INTERSECTION WITH KUHIO ST., THEN LEFT (NORTH) FOR 0.1 MILE AT THE ENTRANCE TO PORT OF HILO.

- PIER 1 Bench mark is set 124 feet south of the northwest corner of Pier 1, and 113 feet northwest of the northwest corner of pier 1 building. Reference Disc stamped "Pier 1".
- E 2 Bench mark is set 41.0 feet west of southwest corner of building, 12.3 feet north of the north end of the concrete curbing, 1.3 feet east of the west Pier, and on the concrete floor 2 inches below the asphalt covering. Mark is a USC&GS bench mark stamped "E 2 1926".
- F 2 Bench mark is 1 foot northeast of the southwest edge of the Pier, 1 foot southwest of a 2.5 by 3.5 feet steel cover. Cemented on the top of the concrete pier, and flush with top of pier. Stamped "F".
- Tidal #4 Cemented on top of the east corner of a 2 feet square concrete base, of the northeast leg of a water tower, and 1 foot higher than ground level. USC&GS tablet stamped "No. 4 1951".

SPUR LINE

- BM5.83 0.4 mile east along State Highway 19 (Kamehameha Ave.) from the intersection of State Highway 11, and State Highway 19, then right (north) along Lihawi street (at bridge), to old wharf and fish market on left. Cemented on top of a stone wall which extends into the water, 12 feet northeast of the southwest end of the wall extending into the water. Standard U.S.G.S. tablet stamped "5.83 1919".
- 0.00 Intersection of State Highways 120, 19, AND 11.
- A100 Bench mark is set on the northeast corner of the intersections of State Highway 11 (Kanoelehua Ave.), State Highway 19 (Kamehameha Ave.), and State Highway 120 (Kalaniana'ole Ave.), in front of the Dairy Queen Drive-In, 3 feet north of the north curb of State Highway 19, 2 feet west of a pole with transformers, 4 feet southeast of a signal light pole, and 6 inches above highway level. USC&GS tablet stamped "A100 1967".
- 4YY 1.9 miles south along State Highway 11 (Kanoelehua Ave.) to the intersection with Puainako St. (at KTA shopping complex), turn right (west). Continue 0.2 mile to the intersection with Kilauea Ave., then left (south), for 0.1 mile along Kilauea Ave. Bench mark is set on the first concrete step of the Kalahiki residence, 55 feet east of centerline of the north-bound lanes of Kilauea Ave., 3.5 feet west of

the southwest corner of the house, and 6 inches above walkway. Standard U.S.G.S. tablet stamped "4YY 111 1957".

5YY 0.90 mile southeast of 4YY, 1.0 mile south along Kilauea Ave., from the intersection with Puainako St. Cemented on the north end of the first step leading to the Administration Bldg. at Waiakea-Waena school, 29 feet west of the centerline of the south-bound lanes of Kilauea Ave., and 6 inches above the walkway level. Standard U.S.G.S. tablet stamped "5YY 148 1957".

B 2 0.4 mile southeast of 5YY, 1.4 miles along Kilauea Ave. Cemented on the south end of the west concrete guard rail of a small, narrow bridge (4 mile bridge), 10 feet southwest of the centerline, and 2 feet above the road level. Standard USG&GS tablet stamped "B 2 1926".

D 20 0.35 mile southeast of B 2 along Kilauea Ave., to merge with State Highway 11, then 0.3 mile along State Highway 11 to the junction with Lama street. Cemented on bedrock 90 feet southeast of the center of Lama street, 24 feet northeast of the centerline of the south-bound lanes of State Highway 11, and 2.5 feet above the road level. Standard N.G.S. tablet stamped "D 20 1975".

6YYReset 0.65 mile southeast of D 20, 0.95 mile along State Highway 11 from the intersection with Kilauea Ave. Cemented on an outcrop in the median strip, near "Hale Nani" Police Academy, 66 feet southwest of the centerline of Highway 11 northeast-bound lanes, 64 feet northeast of the centerline of the southeast-bound lanes, and 39 feet southeast of the centerline of cross over street. Standard U.S.G.S. tablet stamped "6YY reset 1958 reset 1962".

E 20 0.85 mile southeast of 66YY reset, 1.7 miles along State Highway 11 from the intersection with Kilauea Ave. Cemented on bedrock in the median strip, 52 feet northeast of the centerline of the southeast-bound lanes of Hawaii 11, 25 feet northeast of the centerline of Highway 11 northwest-bound lanes, across the highway from mile post 7, and 3 feet above the highway. Standard N.G.S. tablet stamped "E 20 1975".

F 20 0.65 mile southeast of E 20, 2.35 miles along State Highway 11 from the intersection with Kilauea Ave. Cemented on bedrock 30 feet southwest of the centerline of the south-bound lanes of Highway 11, and 4 feet above the road level. Standard N.G.S. tablet stamped "F 20 1975".

7YYReset 0.55 mile southeast of F 20, 2.9 miles along State Highway 11 from the intersection with Kilauea Ave. Cemented on a rock outcrop 77 feet southeast of power pole #49, 29 feet southwest of the centerline of the south-bound lanes of Highway 11, 9 feet west of "Highway 11" sign, and at road level. Standard U.S.G.S. tablet stamped "7 YY 1957 reset 1971".

G 20 0.55 mile southeast of 7YY reset, 3.45 miles along State Highway 11 from the intersection with Kilauea Ave. Cemented on a large lava

outcrop at the "V" formed by the junction of State Highway 11 and Main Street of Keaau. Bench mark is 80 feet west of the centerline of Main Street, 32 feet south of the centerline of the crossover, 24 feet northeast of a power pole with a street light, and 2.5 feet above the ground level. Standard N.G.S. tablet stamped "G 20 1975".

- Z 1 0.2 mile south of G 20, 3.45 miles along State Highway 11, from the intersection with Kilaua Ave. then 0.2 miles along Main Street to Puna Hongwanji Church. Cemented on the concrete pad of a flag pole in the Church yard, 34 feet north from the center of a marble monument, 14 feet east of the east edge of the sidewalk, and 15 feet west of the stone wall at the west end of the parking lot. Stamped "Z1 1926 Reset 1963".
- HVO86-106 0.65 mile southwest of Z 1 along Main Street. Cemented on bedrock 300 feet south of the junction with State Highway 11, 71 feet east of a metal barricade, 7 feet east of pole #38, 5 feet south of the centerline, and 2 feet higher than the road level. Standard U.S.G.S. brass tablet stamped "HVO86-106".
- H 20 0.35 mile southwest of HVO86-106, 0.9 mile southwest along State Highway 11 from the junction with State Highway 130. Cemented on a rock outcropping, 101 feet north of the centerline of a side road, 39 feet west of the centerline of Highway 11, 11 feet southeast of pole #119, and 6 feet above the highway. Standard N.G.S. tablet stamped "H 20 1975".
- 8YY 0.30 mile southwest of H 20, 1.2 miles southwest along State Highway 11 from the Junction with State Highway 130. Cemented on the north end of the east headwall of a concrete culvert, 41 feet northeast of pole #81, 25 feet east of the centerline of Highway 11, and 1.5 feet below the road level. Standard U.S.G.S. tablet stamped "8YY 561 1957".
- HVO86-105 0.4 mile southwest of 8YY, 1.6 miles southwest along State Highway 11 from the junction with State Highway 130. Cemented on bedrock 0.05 mile southwest of Kurtistown Water Pump Station, 92 feet northeast of power pole #135, 53 feet northwest of the centerline of State Highway 11, 3 feet above road, and across the highway from pole #87. Standard U.S.G.S. brass tablet stamped "HVO86-105".
- 1YY 0.65 mile southwest of HVO86-105, 2.25 miles southwest along State Highway 11 from the junction with State Highway 130. Cemented on the north end of the first concrete step of a house, 52 feet northwest of the centerline of State Highway 11, 49 feet northeast of the center of a side road, 34 feet northwest of power pole #149, and 1 foot above the ground level. Standard U.S.G.S. tablet stamped "1 YY 651 1958".
- Y 1 0.55 mile southwest of 1YY, 2.8 miles southwest along State Highway 11 from the junction with State Highway 130. Cemented on bedrock in a yard, 65 feet west of the centerline of State Highway 11, 20 feet south of the center of a side road, 25 feet southeast of the northeast corner of a rock wall, 9 feet north of the south edge of a

rock wall, and 1 foot below the ground level. Stamped "Y1 1926".

2YY 0.85 mile southwest of Y 1, 3.65 miles southwest along State Highway 11 from junction with State Highway 130. Cemented on the third concrete step of the Olaa Congregational Church, 60 feet northwest of the centerline of Highway 11, and 2 feet above road level. Standard U.S.G.S. tablet stamped "2YY 882 1958".

L 20 0.25 mile southwest of 2YY, 3.9 miles southwest along State Highway 11 from the junction with State Highway 130. Cemented on the northeast end of the west concrete headwall of a large concrete pipe culvert, 47 feet southwest of pole #192, 26 feet northwest of the centerline of Highway 11, and 1.5 feet below the road level. Standard N.G.S. tablet stamped "L 20 1975".

3YY 0.8 mile southwest of L 20, 4.7 miles southwest along State Highway 11 from the junction with State Highway 130. Cemented on the first concrete step of a house, 37 feet northeast of the center of a driveway, 29 feet southeast of the centerline of Highway 11, and 1 foot above the road level. Standard U.S.G.S. tablet stamped "3 YY 1043 1958".

K 20 0.5 mile southwest of 3YY, 5.2 miles southwest along State Highway 11 from the junction with State Highway 130. Cemented on the southwest end of the northwest concrete headwall of a large concrete culvert, 154 feet southwest of the centerline of Kukui Camp road, 26 feet northwest of the centerline of Highway 11, and 1 foot above the road level. Standard N.G.S. tablet stamped "K 20 1975".

HV086-104 0.30 mile southwest of K 20, 5.50 miles southwest along State Highway 11 from the junction with State Highway 130. Cemented on a road cut, 158 feet west of pole #171, 97 feet east of pole #172, 63 feet west of a driveway, 27 feet east of the centerline of Highway 11, and 1.5 feet below the road level. Standard U.S.G.S. brass tablet stamped "HV086-104".

T 20 0.35 mile southwest of HV086-104, 5.85 miles southwest along State Highway 11 from the junction with State Highway 130, then left (southeast, just past transformer station), continue 0.1 mile along old road. Cemented on lava outcrop on northwest side of road, 18 feet northeast of road center, 43 feet south of lone railroad tie fence post, 43 feet northeast of the center of the junction of the old road and a dirt road to abandoned cane field, and 2.5 feet above the old road level. Standard N.G.S. tablet stamped "T20 1975".

4YY 0.85 mile southwest of T 20, 6.7 miles southwest along State Highway 11 from the junction with State Highway 130. Cemented on the northwest side of a circular concrete pad of flag pole in the middle of the circular drive at Mountain View Elementary School. Standard U.S.G.S. tablet stamped "4YY 1398 1958".

W 1 0.35 mile southwest of 4YY, and Mountain View School, along State Highway 11. Cemented on bedrock 2 inches below ground level at the southwest end of lawn, 40 feet southeast of the centerline of Highway

11, and 13 feet northeast of the center of a driveway. Standard US&GS tablet stamped "W 1 Reset 1948".

HV086-103 0.35 mile southwest of 4YY, and Mountain View School along State Highway 11. Cemented on a road cut on the northwest side of a side road, 26 feet west of the centerline of Highway 11, 2 feet above the road level, and across the highway from W-1. Standard U.S.G.S. brass tablet stamped "HV086-103".

M 20 0.6 mile southwest of HV086-103, 0.95 mile southwest along State Highway 11 from Mountain View School. Cemented on bedrock, 84 feet northeast of the center of a side road, 80 feet southwest of the most southwesternly of 2 power poles, 26 feet southeast of the centerline of Highway 11, and 2 feet above the road level. Standard N.G.S. tablet stamped "M 20 1975".

5YY 0.3 mile southwest of M 20, 1.25 miles southwest along Highway 11 from Mountain View School. Cemented on top and near the north end of the west concrete headwall of a culvert, 23 feet northwest of the centerline of Highway 11 and 14 feet southwest of the center of a dirt road, across from pole #53, and at road level. Standard U.S.G.S. tablet stamped "5YY 1724 1958".

N 20 0.5 mile southwest of 5YY, 1.75 miles southwest along Highway 11 from Mountain View School, near mile post 16. Cemented on the top center of the northwest end of a concrete culvert, 29 feet northwest of the centerline of Highway 11, and at road level. Standard N.G.S. tablet stamped "N 20 1975".

HV086-102 0.5 mile southwest of N 20, 2.25 miles southwest along State Highway 11 from Mountain View School, and across entrance to "Oshiro" road. Cemented on a concrete culvert and drain, 28 feet southeast of the centerline of Highway 11, 4 feet east of pole #66, and 3 feet below the road level. Standard U.S.G.S. aluminum tablet stamped "HV086-102".

BM2002 0.1 mile southwest of HV086-102, 2.35 miles southwest along State Highway 11 from Mountain View School. Cemented on the north end of the first concrete step of house, 140 feet south of the centerline of Highway 11, and 1 foot higher than the ground level. Stamped "2002".

V 1 Reset 0.65 mile southwest of BM2002, 3.0 miles southwest along State Highway 11 from Mountain View School. Cemented on an 12 inch square concrete pier, 62 feet northwest of the centerline of State Highway 11, midway and across highway from poles number 78 and 79, 40 feet west of the west end of a metal guard rail, about 20 feet into a bamboo thicket, and 8 inches above the ground level. Standard USC&GS brass tablet stamped "V 1 1926 Reset 1967".

P 20 0.55 mile southwest of V 1 Reset, 3.55 miles southwest along State Highway 11 from Mountain View School. Cemented at the east end of a concrete culvert, 43 feet southeast of the centerline of State Highway 11, 20 feet east of a metal guard rail and, 5 feet lower than the road level. Standard N.G.S. tablet stamped "P 20 1975".

6YY Reset 0.45 mile southwest of P 20, 4.0 miles southwest along State Highway 11 from Mountain View School. Cemented on an 8 inch square concrete pier, 62 feet southeast of the centerline of State Highway 11, 37 feet southeast of power pole #95, 3 inches above ground level and 1 foot below the road level. Standard U.S.G.S. tablet stamped "6YY 1958, Reset 1967".

Q 20 0.6 mile southwest of 6YY Reset, 4.6 miles southwest along State Highway 11 from Mountain View School. Cemented at the south end of the west headwall of a large concrete culvert, 143 feet south of the center of a road leading into subdivision, 25 feet west of the centerline of State Highway 11, and at road level. Standard N.G.S. tablet stamped "Q 20 1975".

7YY Reset 0.15 mile southwest of Q 20, 4.75 miles southwest along State Highway 11 from Mountain View School. Cemented on an 8 inch square concrete pier, 63 feet northwest of the centerline of State Highway 11, projecting 3 inches above ground level, and 6.5 feet below the road level. Standard U.S.G.S. tablet stamped "7YY 1958 Reset 1967".

R 20 0.65 mile southwest of 7YY reset, 5.4 miles southwest along State Highway 11 from Mountain View School. Cemented at the southeast end of a large concrete culvert, 0.10 mile northeast of Glenwood Park and Store, 32 feet southeast of the centerline of State Highway 11, midway between poles number 119 and 120, and 6 feet below the road level. Standard N.G.S. tablet stamped "R 20 1975".

HVO86-101 0.55 mile southeast of R 20, 0.5 mile southeast along State Highway 11 from Glenwood Park. Cemented on a concrete culvert, 27 feet northwest of the centerline of State Highway 11, 5 feet southwest of the center of a driveway, and 2 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "HVO86-101".

8YYY 0.55 mile southwest of HVO86-101, 1.05 miles southwest along State Highway 11 from Glenwood Park. Cemented at the southeast end of a concrete culvert, 162 feet south of the center of a driveway, 30 feet southeast of the centerline of State Highway 11, and 1 foot below the road level. Standard U.S.G.S. tablet stamped "8YY 2475 1958".

9YY 0.35 mile south of 8YY, 1.40 miles south along State Highway 11 from Glenwood Park. Cemented at the west end of a concrete culvert, 112 feet south of the center of a driveway, 66 feet northwest and across the highway from the northernmost of two power poles, 26 feet east of pole #134G, 25 feet west of the centerline of State Highway 11, 20 feet west of the "21 mile" marker, and at road level. Standard U.S.G.S. tablet stamped "9YY 2487 1958".

U 20 0.55 mile south of 9YY, 1.95 miles south along State Highway 11 from Glenwood Park. Cemented on bedrock at the north end of a lava outcrop, 28 feet northwest of the centerline of State Highway 11, 19 feet southwest of the center of a short paved side road, 11 feet east of a utility pole, across highway and west of pole #142; 1.5 feet above the ground and road level. Standard N.G.S tablet stamped "U 20

1975".

- 10YY 0.25 mile south of U 20, 2.2 miles south along State Highway 11 from Glenwood Park. Cemented on a road cut, 37 feet north of the centerline of State Highway 11, midway and across highway from poles #146 and #147, 6 feet above the road level and 4 feet north of telephone pole #469. Standard U.S.G.S. tablet stamped "10 YY 2681 1958".
- 11YY 0.45 mile south of 10YY, 2.65 miles south along State Highway 11 from Glenwood Park. Cemented on a concrete culvert, about 225 feet south of Highway 11 on the south side of the "old" Volcano highway, 105 feet north of a power pole, 13 feet south of the center of the old highway and 1 foot above road level. Standard U.S.G.S. tablet stamped "11YY 2751 1958".
- HV086-100 0.55 mile south of 10YY, 2.75 miles south along State Highway 11 from Glenwood Park. Cemented on a roadcut 150 feet east of a gravel road and the "Hawaiian Tropical Orchid Farm Inc." farm, 27 feet northwest of the centerline of State Highway 11, 26 feet east of pole #484, and 2 feet above the road level. Standard U.S.G.S. brass tablet stamped "HV086-100".
- 12YY 0.9 mile south of HV086-100, 3.65 miles south along State Highway 11 from Glenwood Park. Cemented on exposed rock at old highway, 78 feet north of and across the old highway from the centerline of State Highway 11, 20 feet north of the centerline of old highway, and 1.5 feet below the road level. Standard U.S.G.S. tablet stamped "12YY 2893 1958".
- W 20 0.30 mile south of 12YY, 3.95 miles south along State Highway 11 from Glenwood Park. Cemented on a roadcut 29 feet south of the centerline of State Highway 11, 0.05 mile north of a paved side road, and 4 feet above the road level. Standard U.S.G.S. tablet stamped "W 20 1975".
- 13YY 0.35 mile southwest of W 20 then left on Keone road (south) for 0.05 mile, then right (southwest) on "old" Volcano highway for 0.2 mile. Cemented on bedrock 53 feet south of the centerline of the old highway, 36 feet east of telephone pole #521X, and at road level. Standard U.S.G.S. tablet stamped "13 YY 3157 1958".
- V 20 0.45 mile southwest of 13YY, 4.95 miles southeast of Glenwood Park along old Volcano Highway. Cemented on bedrock, 20 feet north of telephone pole #53, 16 feet southeast of the centerline of the old road, and at road level. Standard U.S.G.S. tablet stamped "V 20 1975".
- 14YY 0.45 mile southwest of 14YY, 5.40 miles southwest of Glenwood Park along old Volcano Highway. Cemented on the southeast end of a concrete culvert, 30 feet northeast of telephone pole #540, 13 feet southeast of the center of the old highway, and at road level. Standard U.S.G.S. tablet stamped "14YY 3417 1958".
- S 1 0.45 mile southwest of V 20, 5.85 miles southeast of Glenwood Park

along old Volcano Highway. Cemented on bedrock at the south end of the old road, 37 feet southeast of the center of the old road, 26 feet east of the east end of barricade closing old road, and at road level. Standard USC&GS tablet stamped "S 1 1926".

BM3565 0.20 mile southwest of S 1, 6.05 miles southeast of Glenwood Park along State Highway 11. Cemented on an 8 inch square concrete pier, 116 feet southeast of State Highway 11, 30 feet northeast of Jade Ave., 15 feet northeast of a power pole, and 6 inches below the ground level. Standard U.S.G.S. tablet stamped "3565 1912 Reset 1972".

S 20 0.40 mile southwest of BM3565, 6.45 miles southeast of Glenwood Park along State Highway 11. Cemented on the northeast end of a large concrete culvert, about 116 feet northeast of the center of Pearl street, 46 feet northwest of the centerline of State Highway 11, 2 feet above ground level, and 1 foot lower than the road level. Standard N.G.S. tablet stamped "S 20 1975".

16YY Reset

0.20 mile southwest of S 20, 6.65 miles southeast of Glenwood Park along State Highway 11, then right (north) for 0.05 mile on Wright road (Highway 140) to the Volcano Highway, then left (west) on the old highway for 0.25 mile to the village store. Bench mark is set on a road cut, 33 feet northeast of a power pole with transformer, 15 feet southeast of the centerline of the old highway, and 1.5 feet above the road level. Standard U.S.G.S. tablet stamped "16YY Reset June 1969".

X 20 0.2 mile southwest of 16YY Reset, 0.45 mile southwest along old Volcano highway, from the junction with Wright road and the old Volcano highway, Then left (south) on Haunani road for 0.05 mile. Bench mark is set on a road cut 25 feet northeast of the centerline of Haunani road, and 2.5 feet above the road level. Standard N.G.S. tablet stamped "X 20 1975".

17YY Reset

0.65 mile southwest of X 20. 0.55 mile southwest along State Highway 11 from the junction of State Highway 11 and Haunani road. Cemented on bedrock 74 feet southeast of the centerline of State Highway 11, 40 feet west of a chain barricade, and 20 feet southwest of the center of a paved access road (Escape road). Standard U.S.G.S. tablet stamped "17 YY Reset 1975".

90YY 0.45 mile southwest of 17YY Reset, 1.0 mile southwest along State Highway 11 from the junction of State Highway 11 and Haunani road. Cemented on an 8 inch square concrete pier, 36 feet north of the centerline of State Highway 11, in grassy area flush with the ground. Standard U.S.G.S. tablet stamped "90YY 1958 Reset 1962".

Y 20 0.55 mile southwest of 90YY, 1.55 miles southwest along State Highway 11 from the junction of State Highway 11 and junction of Haunani road. Cemented on a road cut 160 feet northwest from the intersection with the entrance road to the Hawaii National Park, 29

feet southwest of the centerline of State Highway 11, and 2 feet above the road level. Standard N.G.S. tablet stamped "Y 20 1975".

- BM3973 0.4 mile along Crater Rim Drive, west of Y-20 and State Highway 11, 0.10 mile west of National Park Headquarters. Bench mark is set on the top of a 6 feet high, 3 tier concrete monument, 21 feet south of the centerline, 9 feet north of an asphalt path, and 12 feet higher than the road level. U.S.G.S. brass tablet stamped "3973 1912".
- 92YY 0.50 mile west of BM3973, 0.90 mile west along Crater Rim Drive, from State Highway 11. Cemented on an 8 inch square concrete pier, 3 inches above ground and the road level, 40 feet south of the centerline, and 40 feet east of the centerline of the road to steaming vent. Standard U.S.G.S. brass tablet stamped "92YY 1958 3943".
- HV0143 0.25 mile west of 92YY, 1.15 miles west along Crater Rim Drive, from State Highway 11. Cemented on the top of a road cut, 3.5 feet higher than road level, approximately 300 feet east of the east entrance to Kilauea Military Camp, and 14 feet north of the centerline. Standard aluminum tablet stamped "HV0143 1964".
- 93YY 0.15 mile west of HV0143, 1.30 miles west along Crater Rim drive, from State Highway 11. Cemented 1 foot higher than road level on the east base of large stone pier at entrance to military camp, 27 feet north of the centerline, and 33 feet east of the center of the roadway into the military camp. Standard aluminum tablet stamped "93YY 1958 3990".
- Z 20 0.70 mile west of 93YY, 2.0 miles west along Crater Rim drive, from State Highway 11; at "T" intersection to Mauna Loa Strip road. Cemented on a 3 feet high road cut, 105 feet northwest of the centerline of Crater Rim drive, 15 feet northeast of the centerline of Mauna Loa Strip road, and 6 inches higher than road level, . Standard NGS tablet stamped "Z 20 1975".
- 94YY 0.2 mile northeast of Z 20, 0.1 mile northeast along State Highway 11 from junction of Mauna Loa Strip Road and State Highway 11. Cemented on a road cut 16 feet north of the centerline of Highway 11, and 3 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "94YY 1958 4022".

LINE 01 CONTINUED (MAUNA LOA STRIP ROAD)

BEGINNING FROM THE TOWN OF HILO AT THE JUNCTIONS OF STATE HIGHWAY 19 (KAMEHAMEHA AVE.), STATE HIGHWAY 11 (KANOELEHUA AVE.), AND STATE HIGHWAY 120 (KALANIANA'OLE AVE.), PROCEED SOUTHWEST ALONG STATE HIGHWAY 11 FOR 30.7 MILES TO CROSS ROAD. SOUTH ROAD IS CLOSED AND NORTH ROAD GOES TO MAUNA LOA STRIP ROAD.

0.00 JUNCTION OF STATE HIGHWAY 11 AND MAUNA LOA STRIP ROAD

96YY 0.50 mile north then southwesterly along ML Strip road. Cemented on

a 2 feet diameter boulder 26 feet east of the centerline, 1 foot higher than ground level, and at road level. Standard U.S.G.S. aluminum tablet stamped "96YY 1958 3991".

HVO25 0.35 mile northwest of 96YY, 0.85 mile along ML Strip road. Cemented on a road cut 18 feet west of the centerline, and 2 feet above the road level. Standard U.S.G.S. brass tablet stamped "HVO25 1964".

HVO24 0.3 mile northwest of HVO25, 1.15 miles along ML Strip road. Cemented on bedrock 31 feet north of the centerline, and at road level. Standard U.S.G.S. brass tablet stamped "HVO24 1964".

P 1 0.3 mile northwest of HVO24, 1.45 miles along ML Strip road, at the junction of Strip road and paved road leading to "Bird Park picnic area". Cemented on bedrock 126 feet north of the centerline of ML Strip road, 126 feet east of center of road to "Bird Park picnic area", 31 feet south of blocked off track road, and 3 feet higher than "Bird Park picnic area" road level. U.S.G.S. brass tablet stamped "P 1 1926".

Note: 0.15 mile northwest of P 1, 1.5 miles along ML Strip road. Stone pillars at the north end of circular drive and parking at "Bird park".

HVO23 0.15 mile northwest of the stone pillars, 1.75 miles along ML Strip road. Cemented on bedrock 31 feet southwest of center of road, and 2 feet above the road level. Standard U.S.G.S. brass tablet stamped "HVO23 1964".

97YY 0.75 mile northwest of HVO23, 2.5 miles along ML Strip road. Cemented on an aa outcrop, 30 feet south of a sharp curve, 17 feet north of center of road, at the east edge of an aa flow, and at road level. Standard U.S.G.S. brass tablet stamped "97YY 1958 4091".

X 21 0.55 mile northwest of 97YY, 3.05 miles along ML Strip road. Cemented on a large boulder, 16 feet northeast of center of the road, on the inside of a sharp curve, in an 8 feet thick aa road cut, and 4 feet higher than the road level. Standard NGS vertical control brass tablet stamped "X 21 1975".

98YY 0.5 mile northwest of X 21, 3.55 miles along ML Strip road. Cemented on bedrock at the southern end of sharp curve, 11 feet north of the center of the road, and 2 feet above the road level. Standard U.S.G.S. brass tablet stamped "98YY 1958 4320".

Note: 0.30 mile northwest of X 21, 3.85 miles along ML Strip road, cattle guard, and turn out on the southwest side of the road.

99YY 0.7 mile northwest of cattle guard, 4.55 miles along ML Strip road. Cemented on an 8 inch square concrete pier, 17 feet west of the center of the road, 6 inches above ground level, and 1 foot above the road level. Standard U.S.G.S. brass tablet stamped "99YY 1958 4535".

Y 21 0.55 mile northwest of 99YY, 5.1 miles along ML Strip road. Cemented on bedrock on the outside of a curve, 13 feet west of center of road, and 2 feet higher than the road level. Standard NGS vertical control brass tablet stamped "Y 21 1975".

100YY 0.55 mile northwest of Y 21, 5.65 miles along ML Strip road. Cemented on a prominent tumulus 40 feet east of road, and 6 feet higher than the road level. Standard U.S.G.S. brass tablet stamped "100YY 1958 4794".

W 21 0.30 mile northwest of 100YY, 5.95 miles along ML Strip road. Cemented on a road cut, approximately 75 feet north of a curve, 9 feet north of center of road, and 1 foot higher than the road level. Standard NGS vertical control tablet stamped "W 21 1975".

Note: 0.10 mile northwest of W 21, 6.05 miles along ML Strip road, "high tension" power lines, and intersection with dirt road (powerline road).

V 21 0.5 mile northwest of power lines, 6.55 miles along ML Strip road. Cemented on a road cut 10 feet north of center of road, 2 feet above the road level, and on the inside of a curve. Standard NGS vertical control tablet stamped "V 21 1975".

101YY 0.5 mile northwest of V 21, 7.05 miles along ML Strip road. Cemented on bedrock, 56 feet northeast of center of road, and 15 feet west of the west edge of a lava flow near a grove of Koa trees. Standard U.S.G.S. brass tablet stamped "101YY 1958 5137".

102YY 0.7 mile northwest of 101YY, 7.75 miles along ML Strip road, approximately 75 feet north of curve, 40 feet west of center of road, in middle of grassy area with scrub trees. Cemented on a 3 by 3 feet diameter boulder, 8 inches above ground level, and 2 feet above the road level. Standard U.S.G.S. brass tablet stamped "102YY 1958 5137".

Note: 0.60 mile northwest of 102YY, 8.35 miles along ML Strip road, and Sign "KEAMOKU FLOW" and lava channel.

103YY 0.2 mile northwest of lava channel, 8.55 miles along ML Strip road. Cemented on a road cut 9 feet northeast of center of road, and at road level. Standard U.S.G.S. brass tablet stamped "103YY 1958 5653".

104YY 0.80 mile northwest of 103YY, 9.35 miles along ML Strip road. Cemented on a 3 feet road cut, 7 feet northeast of center of road, and 6 inches above the road level. Standard U.S.G.S. brass tablet stamped "104YY 1958 5914".

Note: 0.25 mile northwest of 104YY, 9.6 miles along ML Strip road, sign "6000 ft."

U 21 0.25 mile northwest of the "6000 ft." sign, 9.85 miles along ML Strip road. Cemented on a 3.5 feet road cut, approximately 75 feet west of

a curve, 9 feet north of the center of the road, and 1 foot above the road level . Standard NGS brass tablet stamped "U 21 1975".

105YY 0.30 mile northwest of U 21, 10.15 miles along ML Strip road. Cemented on a 4.5 feet road cut, 9 feet north of center of the road, and at road level. Standard U.S.G.S. brass tablet stamped "105YY 1958 6188".

Note: 0.30 mile northwest of 105YY, 10.45 miles along ML Strip road, a large unimproved turn-out area on west side of road.

106YY 0.5 mile northwest of turn-out, 10.95 miles along ML Strip road. Cemented on a 2 feet road cut, 10 feet north of the center of the road, and 1 foot above the road level. Standard U.S.G.S. brass tablet stamped "106YY 1958 6481".

107Y 0.5 mile northwest of 106YY, 11.45 miles along ML Strip road and at the end of road and parking area. Cemented in a shallow depression, in bedrock, 35 feet south of the south corner of a rock shelter, and 33 feet east of the center of the road. Standard brass U.S.G.S. tablet stamped "107YY 1958 6662".

LINE 02 (MAUNA LOA SUMMIT TRAIL VIA RED HILL ROAD)

BEGINNING FROM THE TOWN OF HILO AT THE JUNCTIONS OF STATE HIGHWAY 19 (KAMEHAMEHA AVE.), STATE HIGHWAY 11 (KANOELEHUA AVE.), AND STATE HIGHWAY 120 (KALANIANA'OLE AVE.), PROCEED SOUTHWEST ALONG STATE HIGHWAY 11 FOR 30.7 MILES TO CROSS ROADS. SOUTH ROAD IS CLOSED AND NORTH ROAD GOES TO MAUNA LOA STRIP ROAD.

F 21 11.45 miles from State Highway 11 and junction to ML Strip road, 0.45 mile northwest of 107YY and end of ML road, along Mauna Loa Trail (ML trail), to a gate. Bench mark is set on the top of a large rock 28 feet northwest from the center of a gate and trail, 8.5 feet southeast of a small tree, 2.8 feet southwest of a fence, and 2.5 feet above the ground level. Standard N.G.S. tablet stamped "F 21 1975".

T 21 0.5 mile northwest of F 21, 0.95 mile along ML trail. Cemented on bedrock, 57 feet northwest of the "7000 feet" sign, 11.5 feet northwest of a tree, 10 feet northwest of trail, and at the same level as the trail. Standard N. G. S. tablet stamped "T 21 1975".

G 21 0.4 mile northwest of T 21, 1.35 miles along ML trail. Cemented on bedrock, 3.5 feet northwest of and 1 foot higher than the trail. Standard N.G.S. tablet stamped "G21 1975".

K 1 0.35 mile northwest of G 21, 1.7 miles along ML trail, then northeasterly across an old lava flow for 0.15 mile to mark. Cemented on flat bedrock, about 600 feet northeast of the present trail, 10 feet northeast of the old trail, and 4 feet northeast of a 4 feet high cairn. USC&GS tablet stamped "K 1 1926".

- S 21 0.1 mile northwest of G 21, 1.8 miles along ML trail. Cemented on a rock outcrop 15 feet southwest of and 1.5 feet above the trail. Standard N.G.S. tablet stamped "S 21 1975".
- R 21 0.9 mile northwest of S 21, 2.7 miles along ML trail. Cemented on bedrock, 3 feet southwest of the trail, 1.6 feet northeast of a small cairn, and 1 foot above the trail. Standard N.G.S. tablet stamped "R 21 1975".
- Q 21 0.75 mile northwest of R 21, 3.45 miles along ML trail. Cemented on bedrock, 13 feet north of the trail, 1 foot west of a large cairn, and at same level as the trail. Standard N.G.S. tablet stamped "Q 21 1975".
- ISIS 0.85 mile northwest of Q 21, 4.3 miles along ML trail. Cemented on top of a large boulder, 31 feet north of the trail, 8 feet southwest of a large cairn, and 6.5 feet above the trail. Standard U.S.G.S. tablet stamped "ML-75-8 ISIS".
- I 1 0.7 mile northwest of Isis, 5.0 miles along ML trail. Cemented on bedrock 550 feet up the right fork of two forks, 34 feet southwest of the trail, and 8 feet southwest of a large cairn. Standard USC&GS tablet stamped " I 1 1926". Note: cairn is visible from trail.
- P 21 0.7 mile northwest of I 1, 5.7 miles along ML trail. Cemented on bedrock, 25 feet southeast and downhill from the edge of a very rough and grayish black lava flow, 7 feet north of the trail, 2 feet southwest of a small cairn, and level with the trail. Standard N.G.S. tablet stamped "P 21 1975".
- N 21 0.85 mile northwest of P 21, 6.55 miles along ML trail. Cemented on bedrock at the base of a rocky slope, 44 feet north of the northeast corner of the cabin at Red Hill, 25 feet northeast of the northeast corner of the outside toilet, and at ground level. Standard N.G.S. tablet stamped "N 21 1975".
- PUU ULAULA
- 0.85 mile northwest of P 21, 6.55 miles along ML trail, then 0.1 mile north-northeast and up a sandy slope, about 25 feet east of a fork and to the mark on a large boulder. Standard U.S.G.S. tablet stamped "ML-75-7 Puu Ulaula".
- D 21 0.45 mile northwest of Puu Ulaula, 7.0 miles along ML trail. Cemented on a rock outcrop, 13 feet south of the trail, 10 feet southwest of a 5 feet high trail-marker cairn, and at trail level. Standard N.G.S. tablet stamped "D 21 1975".
- G 1 0.4 mile northwest of Puu Ulaula, 7.0 miles along ML trail, then south, leaving trail, going across country for 0.15 mile, and across a rugged black lava flow to a brown colored lava flow. Bench mark is cemented on bedrock, 50 yards west from beginning of brown lava. 20 feet south of black lava, at the east base of a noticeable lava tumulus, and 8 feet east of a large cairn. USC&GS tablet stamped "G

1 1926".

- E 21 0.6 mile west of D 21, 7.6 miles along ML trail. Cemented on bedrock 40 feet northeast of a 5 feet tall trail-marker cairn, 2 feet north of and 1 foot above the trail. Standard N.G.S. tablet stamped "E 21 1975".
- H 21 0.8 mile west of E 21, 8.3 miles along trail. Cemented on bedrock, next to a small cairn, 3 feet south of and 1.5 feet above the trail. Standard N.G.S. tablet stamped "H 21 1975".
- F 1 0.45 mile west of H 21, 8.75 miles along ML trail. Cemented on bedrock, about 150 feet north of the present trail, at the point where the trail leaves the rough lava and goes onto black pahoehoe, 25 feet north of the old trail, and 0.5 foot northwest of large cairn. Standard USC&GS tablet stamped "F 1 1926".
- J 21 0.6 mile west of F 1, 9.35 miles along ML trail. Cemented on a rock outcrop, approximately 63 feet west of the "11000 feet" sign, 33 feet north of a large cairn trail-marker, 28 feet northwest and up hill from the trail, and 6 feet above the trail level. Standard N.G.S. tablet stamped "J 21".
- E 1 0.7 mile west of J 21, 10.05 miles along ML trail. Cemented on bedrock near four black cairn, 12 feet south of the trail, $\frac{1}{4}$ mile west of Dewey Cone, about 50 yards west of some red cinder banks, 3 feet west of a large cairn, and 2 feet south of the 8 inch long figure "E1" made with cement. USC&GS tablet stamped "E 1 1926".
- L 21 0.3 mile west of K 21, 10.35 miles along ML trail. Cemented on bedrock, 5 feet north of a cairn, 2.5 feet south of the trail, and at trail level. Standard N.G.S. tablet stamped "L 21 1975".
- M 21 0.9 mile west of L 21, 11.25 miles along ML trail. Cemented on a rock outcrop, 0.2 mile southwesterly of Steaming Cone, 21 feet northeast of a cairn on top of a large tumulus, 18 feet north of the trail, 2.8 feet northwest of a small cairn, and 1.5 feet above the trail. Standard N.G.S. tablet stamped "M 21 1975".
- D 1 0.7 mile west of M 21, 11.95 miles along ML trail. Cemented on bedrock, about 1300 feet east of Pohaku Hanalei cinder cone, 9 feet south of the "12,000 feet" level sign, 13 feet southeast of and at trail level. USC&GS tablet stamped "D 1 1926".
- B 22 0.70 mile west of D 1, 12.65 miles along ML trail. Cemented on bedrock, 72 feet east-southeast of "Oponaku O Nanale" sign, 42 feet southeast of the trail, 38 feet south of a trail cairn, and 2 feet above the trail. Standard N.G.S. tablet stamped "B 22 1975".
- C 21 1.40 miles southwest of B 22, 14.05 miles along ML trail. Cemented on a rock outcrop, 60 feet southeast and up grade from the southeast edge of the 1975 lava flow, 12 feet southeast of trail, 2 feet west of a small cairn, and 1 foot above the trail level. Standard N.G.S. tablet stamped "C 21 1975".

- C 1 0.5 mile southwest of C 21, 14.55 miles along ML trail. Cemented on bedrock 60 feet northeast of North Pit rim, 22 feet southwest of Jaggars Cave entrance, 6 feet northeast of a 4 feet high cairn and about 3 feet lower than the trail, in a small depression of broken and jumbled rock. Tablet stamped "C 1 1926".
- Z 21 0.9 mile southwest of C 1, 15.45 miles along ML trail until junction with jeep trail. Turn left (west), continue 0.10 mile along jeep trail to mark on left. Bench mark is set on bedrock, 3.6 feet northwest of a small cairn, 0.2 mile southwest of HVO 10, 10.2 feet southeast of road center, and 0.5 foot above the jeep trail. Standard N.G.S. tablet stamped "Z 21 1975".
- A 22 0.35 mile southwest of Z 21; from the junction with jeep trail and ML trail, turn left (west) and follow jeep trail for 0.45 mile to mark on left. Bench mark is cemented on bedrock 10 feet southeast of the center of the jeep trail, and 3.5 feet above the trail. Standard N.G.S. tablet stamped "A 22 1975".
- B 21 0.85 mile southwest of Z 21; from the junction with jeep trail and ML the trail, turn left (west) and follow the jeep trail for 0.95 mile to mark on left (0.5 mile west of A22). Bench mark is set on bedrock, 15 feet west of the center of the jeep trail, 2 feet north of a cairn, 0.2 mile from west-end of jeep trail, and 1 foot higher than road level. Standard N.G.S. tablet stamped "B 21 1975".
- HVO94 0.2 mile west of B21, 1.05 miles southwest of Z 21. From the junction with jeep trail and ML trail, turn left (west) and follow jeep trail 1.15 miles to the end of the jeep trail and mark on right. Bench mark is set on bedrock, 51 feet east of the east corner of a concrete pad, 50 feet north of the center of the jeep trail, and 2 feet higher than the jeep trail. Standard U.S.G.S aluminum tablet stamped "HVO 94 1965".
- HVO93 1.35 miles southwest of Z21; from the junction with jeep trail and ML trail, turn left (west) and follow the jeep trail 1.15 mile until it ends. Turn south and follow the hiking trail for 0.3 mile to mark, cemented on bedrock 65 feet northwest of the northwest side of crater, and 5 feet south of a cairn. Standard U.S.G.S. aluminum tablet stamped "HVO 93 1965".
- B 1 1.65 miles southwest of Z 21; from the junction with jeep trail and ML trail, turn left (west) and follow jeep trail 1.15 miles until it ends. Turn south and follow cairn trail markers for 0.6 mile to mark. Bench mark is set on bedrock, 130 feet northeast of the edge of crater, 42 feet south of a U.S.G.S. copper nail with washer, on top of a 4 X 4 feet rock outcrop; BM is in a flat area and lower than the surrounding area. USC&GS tablet stamped "B 1 1926".
- A 1 1.85 miles southwest of Z 21; from the junction with jeep trail and ML trail, turn left (west) and follow jeep trail 1.15 miles until it ends. Turn south and follow cairn trail-markers for 0.8 mile to mark. Bench mark is set on bedrock, 35 feet southeast of a large

cairn with a small metal hikers "Registry Box", 30 feet northwest of craters edge, and flush with the ground. USC&GS tablet stamped "A1 1926".

- A 21 2.0 miles southwest of Z21; from the junction with jeep trail and ML trail, turn left (west) and follow jeep trail 1.15 miles until it ends. Turn south and follow cairn trail markers for 0.95 mile along crater rim and to highest point on Mauna Loa. Bench mark is set on bedrock, 8 feet west of the crater's edge, 4 feet north of a large cairn, and at ground level. Standard N.G.S. tablet stamped "A 21 1975".
- HVO 10 0.7 mile southwest of C 1, 15.45 miles along ML trail until junction with jeep trail. Turn right (northeast), continue 0.20 mile along jeep trail to mark on right. Bench mark is set on bedrock, 41 feet southeast of a trail marker sign "Mauna Loa Observatory 3 Miles", 35 feet northeast of a trail marker sign "North Pit Trail", 26 feet east of the center of the jeep trail, 5 feet north of a cairn, and 2.5 feet above the trail. Standard U.S.G.S. aluminum tablet stamped "HVO 10 1965".

LINE 03 (AINAPO TRAIL)

TO REACH THIS LEVEL LINE, DRIVE 27.85 MILES WEST FROM THE INTERSECTION OF KOMOHANA STREET AND WAIANUENUE AVE., IN HILO, TO A PAVED ROAD LEFT (SOUTH), AND AT THE EDGE OF A PAHOEHOE LAVE FIELD, 0.1 MILE BEFORE A LARGE PREHISTORIC CINDER CONE, ON THE LEFT (SOUTH), AND 0.2 MILE EAST OF A HUNTERS' SHACK AND THE ROAD TO MAUNA KEA. FOLLOW THE PAVED SIDE ROAD SOUTH, FOR 8.9 MILES, TO A SHARP RIGHT TURN AND A PIPE BARRICADE. CONTINUE PAST THE BARRICADE FOR 6.7 MILES TO POWER POLE #265 AND A 4 WHEEL DRIVE ROAD ON THE LEFT (SOUTH). TURN INTO THE TRACK ROAD AND CONTINUE FOR 3 MILES TO A "T" INTERSECTION. TAKE THE LEFT TURN AND CONTINUE FOR 0.3 MILE TO A FORK IN THE ROAD. TAKE THE RIGHT FORK AND CONTINUE 1.8 MILES TO A PIPE BARRICADE (NEED KEY FROM THE NATIONAL PARK SERVICE). CONTINUE PAST BARRICADE ANOTHER 1.1 MILES TO A ROW OF LOW VENTS CUTTING ACROSS THE ROAD.

ALTERNATE ROUTE

3.0 MILES SOUTHWEST ALONG THE TRAIL TO MAUNA LOA SUMMIT FROM THE MAUNA LOA WEATHER OBSERVATORY THEN LEFT (NORTHWEST), ALONG THE 4 WHEEL DRIVE ROAD FOR 0.7 MILE.

- Vent Located at the 12,845 foot level on shelly pahoehoe 15 feet north of the jeep trail. Standard U.S.G.S. aluminum tablet stamped "vent".
- ML81-100 The line to ML81-100 goes across country on a heading due south for 1,380 feet (all distance from stadia readings) to an area of fairly flat pahoehoe. Bench mark is set on the west side of a slight high area. Standard U.S.G.S. aluminum tablet stamped "ML81-100".
- C 1 The level line from ML81-100 continues in a westerly direction to C

1. At the intersection with the trail, follow the trail towards the left (east), until the trail splits and turns right (west) into the north end of North pit. Total distance from ML81-100 to C-1 is 1,870 feet. Bench mark is set on bedrock 60 feet northeast of the edge of North Pit rim, 22 feet southeast of Jaggar's Cave entrance, 6 feet northeast of a 4 feet cairn, and about 3 feet lower than the trail, in a small broken area. Standard tablet stamped "C 1 1926".

ML81-101 2,470 feet south of C 1, cemented on bedrock on the west side of the trail. Standard U.S.G.S. aluminum tablet stamped "ML81-101".

ML81-102 1,158 feet south of ML81-101, 3,628 feet from Jaggar's Cave. Cemented on bedrock on the west side of the trail. Standard U.S.G.S. aluminum tablet stamped "ML81-102".

HVO133 2,854 feet south of ML81-102, 6,482 feet from Jaggar's Cave. Cemented on bedrock on the north side of the trail. Standard U.S.G.S. aluminum tablet stamped "HVO133".

ML81-103 2,926 feet south of HVO133, 9,408 feet from Jaggar's Cave. Cemented on bedrock 35 feet east of the trail opposite a large cairn on the north side of the trail. Standard U.S.G.S. aluminum tablet stamped "ML81-103".

HVO92 1,516 feet southwest of ML81-103, 10,924 feet from Jaggar's Cave. Cemented on old pahoehoe, 161 feet N15°E of the northwest corner of cabin, 115 feet east of the crater rim and 9 feet south of the trail. Standard U.S.G.S. aluminum tablet stamped "HVO 92 1965".

ML81-104 1712 feet south of HVO92, 12,636 feet from Jaggar's Cave. Cemented on flat Pahoehoe, south of the water hole. Standard U.S.G.S. aluminum tablet stamped "ML81-104".

NOTE: Level line leaves trail and follows the south rim of the caldera.

ML81-105 990 feet south of ML81-104, 13,626 feet south of Jaggar's Cave. Cemented on bedrock. Standard U.S.G.S. aluminum tablet stamped "ML81-105".

ML81-106 1,336 feet southwest of ML81-105, 14,962 feet south of Jaggar's Cave, set on bedrock. Standard U.S.G.S. aluminum tablet stamped "ML81-106".

ML81-107 1,448 feet southwest of ML81-106, 16,410 feet south of Jaggar's Cave set on bedrock. Standard U.S.G.S. aluminum tablet stamped "ML81-107".

ML-1 2,230 feet southwest of ML81-107, 18,640 feet from Jaggar's Cave, set on top of a low oval-shaped tumulus about 15 m south of the caldera rim. Standard U.S.G.S. aluminum tablet stamped "ML-1".

ML-2 4,798 feet southeast of ML-1

ML-3 3,795 feet southeast of ML-2, 8,593 feet southeast of ML-1

ML-4 3,510 feet southeast of ML-3, 12,103 feet southeast of ML-1
TAG N29 2,300 feet southeast of ML-4, 14,403 feet southeast of ML-1
ML-5 4,066 feet southeast of TAG N29, 18,469 feet southeast of ML-1
ML-6 4,620 feet southeast of ML-6, 23,089 feet southeast of ML-1
ML-7 3,128 feet southeast of ML-6, 26,217 feet southeast of ML-1
ML-8 4,316 feet southeast of ML-7, 30,533 feet southeast of ML-1

LINE 04 (CRATER RIM DRIVE, WEST SIDE)

BEGINNING FROM THE TOWN OF HILO AT THE JUNCTIONS OF STATE HIGHWAY 19 (KAMEHAMEHA AVE.), STATE HIGHWAY 120 (KALANIANA'OLE AVE.), AND STATE HIGHWAY 11 (KANOELEHUA AVE.), PROCEED SOUTHWEST ALONG STATE HIGHWAY 11 FOR 28.4 MILES TO THE ENTRANCE INTO NATIONAL PARK HEADQUARTERS AND CRATER RIM DRIVE.

0.00 MILES JUNCTION OF STATE HIGHWAY 11 AND CRATER RIM DRIVE

BM3973 0.10 mile west of National Park Headquarters, 0.40 mile counter-clockwise along Crater Rim drive. 21 feet south of centerline of road, 12 feet higher than the road level, 9 feet north of the asphalt path. Bench mark is set on the top of a 6 feet high, 3 tier concrete monument. U.S.G.S. brass tablet stamped "3973 1912".

92YY 0.50 mile west of BM3973, 0.90 mile counter-clockwise along Crater Rim Drive,. Cemented on an 8 inch square concrete pier, 3 inches above the ground and the road level, 40 feet south of the centerline of the road, and 40 feet east of the centerline of the road to steaming vent. Standard U.S.G.S. brass tablet stamped "92YY 1958 3943".

HV0143 0.25 mile west of 92YY, 1.15 miles counter-clockwise along Crater Rim Drive. Cemented on a road cut, approximately 300 feet east of the east entrance to "Kilauea Military Camp", 14 feet north of the centerline of the road, and 3.5 feet higher than the road level. Standard U.S.G.S. aluminum tablet stamped "HV0143 1964".

93YY 0.15 mile west of HV0143, 1.30 miles counter-clockwise along Crater Rim drive. Set 1 foot higher than the road level on the east base of a large stone pier at the entrance to the military camp, 33 feet east of the center of the road into the military camp, and 27 feet north of the centerline. Standard U.S.G.S. aluminum tablet stamped "93YY 1958 3990".

Z 20 0.70 mile west of 93YY, 2.0 miles counter-clockwise along Crater Rim drive, at the "T" intersection to Mauna Loa Strip road (now

- closed). Cemented on a 3 feet high road cut, 105 feet northwest of the centerline of Crater Rim drive, 15 feet northeast of the centerline of Mauna Loa Strip road, and 6 inches higher than the road level, . Standard NGS tablet stamped "Z 20 1975".
- HV026 0.45 mile west of Z 20, 2.45 miles counter-clockwise along Crater Rim drive, from State Highway 11; at the remnants of the old road leading to the north. Approximately 220 feet north of Crater Rim drive. Cemented on a rock culvert 12 feet east of the center of the old road. Standard U.S.G.S. brass tablet stamped "HV026 1964".
- HV027 0.30 mile west of HV026, 2.75 miles counter-clockwise along Crater Rim drive, from State Highway 11, at the north entrance to the "Hawaiian Volcano Observatory". Cemented on a stone curbing, 93 feet southeast of the centerline of the road, 32 feet south of the center of the entry road, at ground level, 8 inches higher than the parking lot level, and at the north end of the parking lot. Standard U.S.G.S. aluminum tablet stamped "HV027 1964".
- HV028 0.30 mile southwest of HV027, 3.05 miles counter-clockwise along Crater Rim drive, from State Highway 11, 30 feet east of the centerline, 1 foot lower than the road level in a rock and mortar drain. Standard U.S.G.S. aluminum tablet stamped "HV028 1964".
- 203YY 0.25 mile southwest of HV028, 3.30 miles counter-clockwise along Crater Rim drive, from State Highway 11. Cemented on a 2 feet road cut, 20 feet east of the centerline, on the inside of a curve, and at road level. Standard U.S.G.S. tablet stamped "203YY 1958 3778".
- HV029 0.35 mile southwest of 203YY, 3.65 miles counter-clockwise along Crater Rim drive, from State Highway 11. Cemented on a road cut 3 feet higher than the road level, 19 feet east of the centerline and at the top of rise before a steep downgrade. Standard U.S.G.S. aluminum tablet stamped "HV029 1964".
- 204YY 0.40 mile south of HV029, 4.05 miles counter-clockwise along Crater Rim drive, from State Highway 11. Cemented on a stone culvert, approximately 50 feet south of a 3 foot diameter boulder, 16 feet west of the centerline, at the flats, and 1 foot lower than the road level. Standard U.S.G.S. aluminum tablet stamped "204YY", "1958 3778".
- 117YY 0.25 mile south of 204YY, 4.30 miles counter-clockwise along Crater Rim drive, from State Highway 11. Cemented on a 2 by 4 foot boulder, 160 feet east of the centerline, and 18 inches above ground level. Standard U.S.G.S. aluminum tablet stamped "117YY 1958 3742".
- 118YY 0.15 mile south of 118YY, 4.45 miles counter-clockwise along Crater Rim drive, from State Highway 11. Cemented on a stone culvert, 18 feet west of the centerline, 4 feet lower than the road level, and 3.5 feet above the ground level. Standard U.S.G.S. aluminum tablet stamped "118YY 1958 3736".
- HV031 0.40 mile south of 117YY, 4.85 miles counter-clockwise along Crater

Rim drive, from State Highway 11. Cemented on a rock drainage ditch, 25 feet south of the centerline and 4 feet lower than the road level, on the outside of a wide sweeping curve and at the intersection of two drainage system. Standard U.S.G.S. aluminum tablet stamped "HVO31 1964".

HVO32 0.25 mile east of HVO31, 5.10 miles counter-clockwise along Crater Rim drive, from State Highway 11. Cemented on bedrock, 40 feet east of and southwest of the east end of the parking area, and 30 feet south of the centerline. Standard U.S.G.S. aluminum tablet stamped "HVO32 1964".

HVO33 0.25 mile east of HVO32, 5.35 miles counter-clockwise along Crater Rim road, from State Highway 11. Cemented on bedrock 30 feet south of the centerline. Standard U.S.G.S. aluminum tablet stamped "HVO33 1964".

205YY 0.25 mile east of HVO33, 5.60 miles counter-clockwise along Crater Rim road, from State Highway 11. Cemented at the far northeast end of the parking lot at Halemaumau, 170 feet north of the parking lot, and 10 feet east of the trail on a flat pahoehoe slab. Standard U.S.G.S. aluminum tablet stamped "205YY 1958 3639".

HVO34 0.20 mile east of 205YY, 5.80 miles counter-clockwise along Crater Rim drive, from State Highway 11. Cemented on a 1 foot square boulder, 40 feet south of the centerline, 35 feet east of a track road, 30 feet east of a 3 X 4 X 5 foot boulder, 8 inches above the ground level, and 2 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "HVO34 1964".

HVO35 0.20 mile east of HVO34, 6.00 miles counter-clockwise along Crater Rim drive, from State Highway 11. Cemented on a 1 foot square boulder, 30 feet south of the centerline, 8 inches above ground level, and 1 foot higher than the road level; at the west end of parking lot, and on the south side of the road. Bench mark is worn and hard to read stamping. Standard U.S.G.S. aluminum tablet stamped "HVO35 1964".

BM79-508 0.25 mile east of HVO35, 6.25 miles counter-clockwise along Crater Rim drive, from State Highway 11. Cemented on a boulder, 50 feet east of the east-end of the parking area, 32 feet northwest of the centerline, and 4 feet higher than the road level. Standard U.S.G.S. aluminum tablet stamped "79-508".

HVO10 R 0.35 mile east of BM79-508, 6.60 miles counter-clockwise along crater Rim drive, from State Highway 11. Cemented on new lava, 30 feet north of the centerline, 30 feet west of the path, 3 feet above the road level and parking lot. Standard U.S.G.S. aluminum tablet stamped "KEANAKAKOI RESET".

REBAR1 0.45 mile east of HVO10R, 7.05 miles counter-clockwise along Crater Rim drive. Mark is a 1 inch diameter re-enforcing bar, 33 feet southeast of the centerline, 6 inches above the 1959 pumice deposit, and 1 foot above the road level. Bar is unstamped.

22YY 0.40 mile east of REBAR1, 7.45 miles counter-clockwise along Crater Rim drive. Approximately 60 feet south of Crater Rim drive along Chain of Craters road; remnants of old road bed on west side. Bench mark is 40 feet west of the centerline of Chain of Craters road on the north side of old road bed, 4 feet above new road level and 3 feet above old road level. Standard U.S.G.S. aluminum tablet stamped "22YY 1958 3720".

LINE 04 CONTINUED (CRATER RIM DRIVE ,EAST SIDE)

BEGINNING FROM THE TOWN OF HILO AT THE JUNCTIONS OF STATE HIGHWAY 19 (KAMEHAMEHA AVE.), STATE HIGHWAY 120 (KALANIANA'OLE AVE.), AND STATE HIGHWAY 11 (KANOELEHUA AVE.), PROCEED SOUTHWEST ALONG STATE HIGHWAY 11 FOR 28.1 MILES TO THE WEST ENTRANCE INTO VOLCANO VILLAGE.

0.00 JUNCTION OF STATE HIGHWAY 11 AND WEST ENTRANCE TO VOLCANO VILLAGE

17YY

Reset 0.55 mile west of the junction of State Highway 11 and Haunani road, across west entrance to Volcano Village and north exit from the "Escape Road". Bench mark is set 74 feet south of the centerline of State Highway 11, 10 feet west of the pavement edge of "Escape Road", and 40 feet north of a chain barricade on "Escape Road". Standard U.S.G.S. aluminum tablet stamped "17YY Reset 1975".

HV0114 0.1 mile south along "Escape Road" to a "T" junction, then left (southeast), for 0.15 mile to a clearing on the left (north). Cemented on flat pahoehoe bedrock at the southeast end of a clearing and obscure track road going northeast, and 20 feet northeast of the center of the track road on west edge of side road. Standard U.S.G.S. aluminum tablet stamped HV0114".

19YY 0.35 mile south of HV0114, 0.60 mile south along "Escape Road", from State Highway 11, to the paved pathway to Thurston Lava Tube. Follow the pathway to Crater Rim Drive and the parking lot, then for 340 feet clockwise along Crater Rim Drive to the north end of a rock wall. Cemented on top of a 2 feet high rock wall, 0.10 mile north of a cattle-guard, 12.5 feet west of centerline, and 2 feet higher than the road level. Standard U.S.G.S. aluminum tablet stamped "19YY 1958 3917".

20YY 0.60 mile south of 19YY, 1.25 miles south of State Highway 11 along "Escape Road" then along Crater Rim Drive. Cemented on a road cut 14 feet north of the centerline, and 1.5 feet higher than the road level. Standard U.S.G.S. aluminum tablet stamped "20YY 1958 3834".

REBAR2 0.50 mile south of 20YY, 1.75 miles south of State highway 11, along "Escape Road" then along Crater Rim drive. Mark is a $\frac{1}{2}$ inch copper-coated rod, 43 feet northwest of the centerline, at the west side of the intersection to Puu Puai parking, and overlook, protruding 6 inches above the ground level and at the same elevation as the road.

LINE 05 (DESERT LINE)

BEGINNING AT THE TOWN OF HILO, AT THE JUNCTIONS OF STATE HIGHWAY 19 (KAMEHAMEHA AVE.), STATE HIGHWAY 120 (KALANIANA'OLE AVE.), AND STATE HIGHWAY 11 (KANO'OLEHUA AVE.), PROCEED SOUTHWEST ALONG STATE HIGHWAY 11 FOR 28.4 MILES TO THE ENTRANCE INTO NATIONAL PARK HEADQUARTERS AND CRATER RIM DRIVE. EXIT STATE HIGHWAY 11 AND PROCEED SOUTHWEST ALONG CRATER RIM DRIVE. CONTINUE ALONG CRATER RIM DRIVE FOR 1.15 MILES TO THE EAST ENTRANCE TO "KILAUEA MILITARY CAMP" (KMC). CONTINUE ALONG CRATER RIM DRIVE 1.60 MILE PAST THE EAST ENTRANCE OF THE "HAWAIIAN VOLCANO OBSERVATORY" (HVO) AND ANOTHER 2.85 MILES, TO THE NORTHEAST END OF THE PARKING LOT AT HALEMAU'AU CRATER.

- SPIT 1,268 feet (All distances are from stadia readings) from northeast end of Halemau'au parking lot on a bearing of 180°. Cemented on a 2 by 2.5 feet boulder, 116 feet north of a 15 feet scarp, and 14 inches above the ground level.. Standard U.S.G.S. brass tablet stamped "Spit"
- HVO37 2,244 feet south of Spit on a bearing of 175°, 3,512 feet from the parking lot. Cemented on a boulder, 92 feet east of a 10 feet wide wash and 5 feet lower than the track road. Standard U.S.G.S. brass tablet stamped "HVO37 1964".
- 112YY 1,242 feet south of HVO37 on a bearing of 177°, 4,754 feet from the parking lot. Cemented on an 8 inch square concrete pier flush with the ground, 30 feet west of the 1982 lavas, and 10 feet higher than the lava flow. Standard U.S.G.S. aluminum tablet stamped " 112YY 1958 3562".
- BM83-500 1,600 feet south of 112YY on a bearing of 160°, 6,354 feet from the parking lot. Cemented on new lava, 27 feet west of and 3 feet higher than a sandy wash. Standard U.S.G.S. aluminum tablet stamped "83-500".
- 113YY 1,700 feet southeast of 83-500 on a bearing of 123°, 8,054 feet from parking lot. Cemented on a 2 X 4 feet boulder, 1 foot higher than the ground level, and at the intersection of a 4-way cross road. Standard U.S.G.S. aluminum tablet stamped "113YY 1958 3493".
- BM79-114 2,260 feet southwest of 113YY on a bearing of 227°, 10,314 feet from parking lot. Cemented on weathered pahoehoe outcrop, 180 feet south of the track road, 82 feet south of the western lobe of 1971 lavas, and 4 feet higher and north of the sandy wash. A bearing of 347° degrees was obtained to the Hawaiian Volcano Observatory (HVO). Standard U.S.G.S. aluminum tablet stamped "79-114".
- BM79-115 1,000 feet southwest of BM79-114 on bearing of 260°, 11,314 feet from the parking lot. Cemented on weathered pahoehoe in the middle of a sandy wash. Standard U.S.G.S. aluminum tablet stamped "79-115".
- TAG000 1,000 feet southwest of BM79-115 on a bearing of 277°, 12,314 feet from the parking lot. Set on weathered pahoehoe, 30 feet north of the track road. "P-K" nail with 1 by 2 inch aluminum tag stamped

"000".

- TAG1500 1,522 feet south of TAG000 on a bearing of 178°; heading cross country. Set on weathered pahoehoe 35 feet east of a 6 feet deep collapsed lava tube. A bearing of N004°W degrees was made to HVO and 235° to Puu Koae cinder cone. P-K nail with 1 by 2 inch aluminum tag stamped "1500".
- TAG3000 1,558 feet south of TAG1500 on a bearing of 177°, 3,080 feet from TAG000. Set on weathered pahoehoe, 1 foot north of an 8 inch wide crack. A bearing of 355° was made to HVO, 252° to Puu Koae and 005° to Kulani Cone. P-K nail with 1 by 2 inch aluminum tag stamped "3000".
- TAG4500 1,576 feet south of TAG3000 on a bearing of 179°, 4,656 feet from TAG000, old nail is rusted and missing a tag, the new nail is set on top of a 40 feet long pressure ridge, approximately 150 feet north of a fault scarp, in a low depression, making it impossible to see distant features for compass sightings. New P-K nail with 1 by 2 inch Tag stamped "4500".
- TAG6000 1,530 feet south of TAG4500 on a bearing of 170°, 6,186 feet from TAG000. Set on weathered pahoehoe in a "none descript" area. A bearing of N157°E was made to the trig flag at Ohale. The level line passes 50 feet west of Ohale trig station. P-K nail with 1 by 2 inch aluminum tag stamped "6000".
- TAG7500 1,732 feet south of TAG6000 on a bearing of 167°, 7,918 feet from TAG000. Set on weathered pahoehoe, approximately 150 feet north of a fault scarp, and 30 feet south of a 20 feet high multi-branch Ohia tree. P-K nail with 1 by 2 inch aluminum tag stamped "7500".
- TAG9000 1,794 feet south of TAG7500 on a bearing of 167°, 9,712 feet from TAG000. Set at the west end of a small pressure bubble approximately 1000 feet north of Ohale, and 500 feet north of a large pressure bubble with a north facing cave. A bearing of 176° was made to Ohale. P-K nail with 1 by 2 inch aluminum tag stamped "9000".
- TAG10500 1,684 feet south of TAG9000 on a bearing of 180° degrees, 11,396 feet from TAG000. Set on weathered pahoehoe in a low grassy area, amongst mature 10-20 feet tall Ohia trees. P-K nail with 1 by 2 inch aluminum tag stamped "10500".
- BM79-518 1,472 feet south of TAG10500, 12,868 feet from TAG000, 3.60 miles south of the Junction of Chain of Craters road and Hilina Pali road, along Hilina Pali road. Set on flat pahoehoe 18 feet north of the road center, 2 feet north of the gravel road edge, and 1.5 feet lower than the road level. Standard U.S.G.S. aluminum tablet stamped " 79-518".

LINE 06 (FOOTPRINTS TRAIL)

BEGINNING AT THE TOWN OF HILO AT THE JUNCTIONS OF STATE HIGHWAY 19

(KAMEHAMEHA AVE.), STATE HIGHWAY 120 (KALANIANA'OLE AVE.), AND STATE HIGHWAY 11 (KANOELEHUA AVE), PROCEED SOUTHWEST ALONG STATE HIGHWAY 11 FOR 28.4 MILES TO THE ENTRANCE INTO NATIONAL PARK HEADQUARTERS AND CRATER RIM DRIVE. EXIT STATE HIGHWAY 11 AND PROCEED SOUTHWEST ALONG CRATER RIM DRIVE FOR 0.10 MILE, THEN LEFT, TOWARDS THE SOUTH, ALONG CRATER RIM DRIVE FOR 0.50 MILE TO "T" INTERSECTION, THEN LEFT AGAIN, TOWARDS THE EAST, FOR 2.40 MILES ALONG CRATER RIM DRIVE TO THE INTERSECTION WITH CRATER RIM DRIVE AND CHAIN OF CRATERS ROAD, THEN LEFT AGAIN TOWARD THE SOUTH, ALONG THE CHAIN OF CRATERS ROAD FOR 2.1 MILES TO JUNCTION WITH HILINA PALI ROAD, THEN RIGHT TOWARDS THE SOUTHWEST ALONG HILINA PALI ROAD FOR 3.70 MILES CROSSING A FAULT SCARP AND SHARP CURVE IN THE ROAD.

- BM79-520 3.70 miles, southwest of junction of Chain of Craters road and Hilina Pali road. Set on pahoehoe, approximately 105 feet west of a 15 feet wide, 15 feet deep, fault crack, 37 feet south of center of road, 22 feet east of Mauna Iki trail, 15 feet southeast of the trail sign, and 1.5 feet lower than the road level. Standard U.S.G.S. aluminum tablet stamped "79-520".
- TAG75-57 92 feet (All distances are from stadia readings) west of TAG79-520, set on pahoehoe 5 feet east of the trail at the same level as the trail. P-K nail with 1 by 2 inch aluminum tag stamped "75-57".
- TAG75-62 1,072 feet west of TAG75-62, 1,164 feet west along the trail. Set on pahoehoe 5 feet north of trail, and at same level as trail. A bearing of 023° was made to "OHALE" trig station. P-K nail with 1 by 2 inch aluminum tag stamped "75-62".
- TAG75-63 1,347 feet west of TAG75-62, 2,511 feet west along the trail. Tag nail was not found, however it probably is there but the tag may be gone.
- TAG75-64 1,548 feet west of TAG75-63, 4,059 feet west along the trail. Set at the edge of ropy pahoehoe, 5 feet south of the trail, and at the east end of a 100 feet diameter sandy wash covered with 2 feet high Puukeawe plants. P-K nail with 1 by 2 inch aluminum tag stamped "75-64".
- TAG75-65 1,100 feet west of TAG75-64, 5,159 feet west along the trail. Set on the west end of ropy pahoehoe, 30 feet south of a 12 inch diameter Ohia tree, 8 feet north, and 1 foot higher than trail. P-K nail with 1 by 2 inch aluminum tag stamped "75-65".
- TAG75-66 1,260 feet west of TAG75-65, 6,419 feet west along the trail. Set on flat pahoehoe, 50 feet north of "bent over" Ohia tree, 12 feet north of the trail, and at the north side of a large sandy area. P-K nail with 1 by 2 inch aluminum tag stamped "75-66".
- TAG75-67 1,408 feet west of TAG75-66, 7,827 feet west along the trail. Set on pahoehoe 50 feet east of a 50 feet diameter sandy area, and 5 feet south of the trail. P-K nail with 1 by 2 inch aluminum tag stamped "75-67".

- TAG75-68 1,512 feet west of TAG75-67, 9,339 feet west along the trail. Set on broken pahoehoe, on a high point, 15 feet north, and 5 feet higher than the trail, and 5 feet west of a 3 feet wide crack. P-K nail with 1 by 2 inch aluminum tag stamped "75-68".
- TAG75-69 1,168 feet west of TAG75-68, 10,507 feet west along the trail. Set on pahoehoe, 46 feet east of a 20 feet wide crack, and at the northeast edge of a fault system, in a depression 8 feet south of the trail. P-K nail with 1 by 2 inch aluminum tag stamped "75-69".
- TAG75-70 1,682 feet west of TAG75-69, 12,189 feet west along the trail. Set on new lava approximately 250 feet northwest of contact with old lava, and at the northwest edge of a sandy area on the trail. P-K nail with 1 by 2 inch aluminum tag stamped "75-70".
- TAG75-71 1,200 feet west of TAG75-70, 13,389 feet west along the trail. Set on new lavas 5 feet north of the trail, at the edge of a rise in the slope of lava. P-K nail with 1 by 2 inch aluminum tag stamped "75-71".
- TAG75-72 1,368 feet west of TAG75-71, 14,757 feet west along the trail. Set on a small pad of old weathered pahoehoe, approximately 350 feet northwest of new lavas, 38 feet east, and 3 feet higher than the trail. P-K nail with 1 by 2 inch aluminum tag stamped "75-72".
- TAG75-73 1,614 feet west of TAG75-72, 16,371 feet west along the trail. Tag nail was not found.
- TAG75-74 1,322 feet west of TAG75-73, 17,693 feet west along the trail. Set on a small exposure of old weathered aa-pahoehoe type lava, protruding 1.5 feet above sandy-pumice cover at the base of Puu Koae cinder cone and 7 feet south of the trail. P-K nail with 1 by 2 inch aluminum tag stamped "75-74".
- TAG75-75 1,378 feet west of TAG75-74, 19,071 feet west along the trail. Set on one of many exposed old weathered aa-pahoehoe type lava, 75 feet east of the intersection of the trail and a track road, 7 feet north, and 1.5 feet higher than the trail. P-K nail with 1 by 2 inch aluminum tag stamped "75-75".
- TAG75-76 1,386 feet west of TAG75-75, 20,457 feet west along the trail. Set on old pahoehoe approximately 400 feet west of a large sandy wash, 75 feet west of a 3 feet high rock cairn, 5 feet north, and 1 foot higher than the trail in a sandy area. P-K nail with 1 by 2 inch aluminum tag stamped "75-76".
- TAG75-77 1,584 feet west of TAG75-76, 22,041 feet west along the trail. Set on "glassy" pahoehoe lava, 12 feet north, and 3.5 feet higher than the trail. P-K nail with 1 by 2 inch aluminum tag stamped "75-77".
- TAG75-78 1,228 feet west of TAG75-77, 23,269 feet west along the trail. Set on old weathered pahoehoe, 50 feet west of a 3 feet high, mature Ohia tree, 10 feet east of a 50 feet diameter sandy depression, 4 feet south and 2 feet higher than the trail. P-K nail with 1 by 2 inch aluminum tag stamped "75-78".

TAG75-79 1,452 feet west of TAG75-78, 24,721 feet west along the trail. Set on flat pahoehoe approximately 500 feet south of new lavas, 45 feet north of a 40 feet diameter sandy area, and 14 feet south of the trail. P-K nail with 1 by 2 inch aluminum tag stamped "75-79".

NOTE: 468 feet west of TAG75-79, at contact with new lavas, trail takes a 90 degree turn to the south; but the level line continues straight ahead on a bearing of 270° across the new flow.

TAG75-80 1,238 feet west of TAG75-79, 770 feet west of trail, in the middle of new "shelly" pahoehoe flow. P-K nail with 1 by 2 inch aluminum tag stamped "75-80".

TAG75-81 1,238 feet west of TAG75-80 on a bearing of 265°, 2,008 feet west of the trail at the western end of flat, new, "shelly" pahoehoe, and at eastern edge of extremely shelly pahoehoe, and small steaming fissures. P-K nail with 1 by 2 inch aluminum tag stamped "75-81".

TAG75-82 1,762 feet west of TAG75-81 on a bearing of 255° and in line with a 40 feet tall Ohia tree 400 feet in the distance, 3,770 feet west of trail, set on old, weathered, "shelly" pahoehoe, approximately 180 feet from Mauna Iki lava flow, 30 feet north of a sandy wash. P-K nail with 1 by 2 inch aluminum tag stamped "75-82".

TAG75-83 1,678 feet west of TAG75-82, 4,448 feet west of trail. Set on Mauna Iki lava, 70 feet south of the north edge of a 50 feet wide lava finger, 50 feet east of a finger of Mauna Iki lava, and 45 feet west of a kipuka of old lava. P-K nail with 1 by 2 inch aluminum tag stamped "75-83".

Note: 803 feet west of TAG75-83 on a bearing of 285° the level line intersects the Footprints trail, at which point the level line follows the trail for 520 feet towards the north, and to TAG75-84.

TAG75-84 1,323 feet west of TAG75-83, 520 feet along the trail. Set on weathered pahoehoe, 15 feet east of a 3 feet deep, 30 feet wide, lava channel, 2 feet higher than the sandy wash and 2 feet east of the trail. P-K nail with 1 by 2 inch aluminum tag stamped "75-84".

Note: 1358 feet beyond TAG75-84 level line leaves trail, and cuts cross country for 70 feet to TAG75-85.

TAG75-85 1,428 feet west of TAG75-84, 1,948 feet along the trail. Set on pahoehoe 70 feet north of the trail. P-K nail with 1 by 2 inch aluminum tag stamped "75-85".

TAG75-86 1 214 feet west of TAG75-85, 3,162 feet north along the trail. Set on old pahoehoe flow, 10 feet north of a 30 feet diameter sandy depression, and 8 feet east of the old Footprints trail. P-K nail with 1 by 2 inch aluminum tag stamped "75-86".

Note: 258 feet beyond TAG75-86 on a bearing of 330°, the level line again intersects the footprints trail. From this point, the level line

follows the trail to the west, and Highway 11.

TAG75-87 1,214 feet west of TAG75-86. TAG75-87 was not found and has probably been destroyed because of widening of the trail.

TAG75-88 1,294 feet west of TAG75-87, 2,508 feet north of TAG75-86. Set on an aa boulder on the east side, 8 inches higher than the trail. Tag has been broken off.

TAG75-89 930 feet west of TAG75-88, 3,438 feet north of TAG75-86. Set on the asphalt pavement in the parking lot at "trail head" to "Footprints Trail". Tag has been broken off.

LINE 07 (HILINA PALI ROAD)

BEGINNING AT THE TOWN OF HILO, AT THE JUNCTIONS OF STATE HIGHWAY 19 (KAMEHAMEHA AVE.), STATE HIGHWAY 120 (KALANIANA'OLE AVE.), AND STATE HIGHWAY 11 (KANOELEHUA AVE), PROCEED SOUTHWEST ALONG STATE HIGHWAY 11 FOR 28.4 MILES TO THE ENTRANCE INTO NATIONAL PARK HEADQUARTERS AND CRATER RIM DRIVE. EXIT STATE HIGHWAY 11 AND PROCEED SOUTHWEST ALONG CRATER RIM DRIVE ROAD FOR 0.10 MILE, THEN LEFT, FOR 0.05 MILE TOWARDS THE SOUTH, ALONG CRATER RIM DRIVE TO "T" INTERSECTION, THEN LEFT AGAIN TOWARDS THE EAST, FOR 2.40 MILES ALONG CRATER RIM DRIVE, TO THE INTERSECTION WITH CRATER RIM DRIVE AND CHAIN OF CRATERS ROAD, THEN LEFT AGAIN TOWARD THE SOUTH, ALONG THE CHAIN OF CRATERS ROAD FOR 2.1 MILES TO JUNCTION WITH HILINA PALI ROAD.

0.00 MILES, JUNCTION OF CRATER RIM DRIVE AND CHAIN OF CRATERS ROAD.

BM79-511 2.15 miles southeast of junction along Chain of Craters Road. Bench mark is across the entrance to Hilina Pali road, 14 feet north of the centerline of Crater Rim road, 5 feet north of the pavement edge, 7 feet east of the information sign post and approximately 75 feet west of the pipe barricade. Standard U.S.G.S. aluminum tablet stamped "79-511".

BM79-514 0.45 mile southwest along Hilina Pali road and BM79-511. Cemented on a small pad of pahoehoe, among Ohia trees, 17 feet east of center of road, and 3 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "79-514".

131YY 0.55 mile southwest of BM79-514, 1.00 mile southwest along Hilina Pali road. Cemented on flat outcropping of pahoehoe, 22 feet north of the center of the road, 15 feet west of a 15 inch diameter Ohia tree, and at road level. Standard U.S.G.S. aluminum tablet stamped "131YY 1958 3310".

BM79-515 0.45 mile southwest of 131YY, 1.45 miles southwest along Hilina Pali road. Cemented on a small outcropping of pahoehoe, 21 feet southeast of the center of the road, and 1.5 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "79-515".

- 132YY 0.55 mile southwest of BM79-515, 2.00 miles southwest along Hilina Pali road. Cemented on a pahoehoe road cut, at a rise, 8 feet west of the center of the road, and at road level. Standard U.S.G.S. aluminum tablet stamped "132YY 1958 3275".
- BM79-516 0.45 mile southwest of 132YY, 2.45 miles southwest along Hilina Pali road. Cemented on flat pahoehoe outcrop, 20 feet north of the center of the road, and at road level. Standard U.S.G.S. aluminum tablet stamped "79-516".
- 133YY 0.55 mile southwest of BM79-516, 3.00 miles southwest along Hilina Pali road. Cemented on flat pahoehoe, 37 feet south of the center and curve in the road, and at road level. Standard U.S.G.S. tablet stamped "133YY 1958 3225".
- BM79-517 0.45 mile southwest of 133YY, 3.45 miles southwest along Hilina Pali road. Cemented on pahoehoe, 20 feet south of the center, and curve in the road, 7 feet north of the twin trunk Ohia tree, and at road level. Standard U.S.G.S. aluminum tablet stamped "79-517".
- BM79-518 0.15 mile southwest of BM79-517, 3.60 miles southwest along Hilina Pali road. Cemented on flat pahoehoe, 18 feet north of the center of the road, 2 feet north of the road edge, and 1.5 feet lower than the road level. Standard U.S.G.S. aluminum tablet stamped "79-518".
- BM79-519 0.10 mile southwest of BM79-518, 3.70 miles southwest along Hilina Pali road. Cemented on bedrock, 37 feet north of the center of the road, 15 feet west of a 15 feet wide, 20 feet deep fault crack, 4 feet north of a 1 inch square bar protruding 8 inches above pahoehoe bedrock and 1.5 feet lower than the road level. Standard U.S.G.S. aluminum tablet stamped "79-519".
- BM79-520 Approximately 140 feet south of BM79-519, and approximately 105 feet west of a 15 feet wide, 20 feet deep fault crack. Cemented on bedrock 3.75 miles along Hilina Pali road, 37 feet south of the center of the road, 22 feet east of the Mauna Iki trail, 15 feet southeast of the trail sign, and 1.5 feet lower than the road level. Standard U.S.G.S. aluminum tablet stamped "79-520".
- 134YY 0.30 mile southwest of BM79-520, 4.05 miles southwest along Hilina Pali road. Cemented on a road cut, 16 feet west of the center of the road, 36 feet west of a 24 inch diameter Ohia tree, and 4 feet above the road level. Standard U.S.G.S aluminum tablet stamped "134YY 1958 3150".
- 135YY 0.9 mile southwest of 134YY, 4.95 miles southwest along Hilina Pali road. Cemented on bedrock on the inside bend of the road, at Kipuka Nene picnic area, 176 feet east of the west shelter, 52 feet northeast of a fire shed, 25 feet west of the center of the road, and 25 feet east of an Ohia tree. Standard U.S.G.S. aluminum tablet stamped "135YY 1958 2926".
- 136YY 1.1 miles southwest of 135YY, 6.05 miles southwest along Hilina Pali road. Cemented on bedrock 35 feet northeast of a leaning Ohia tree,

19 feet south of a 12 inch diameter Ohia tree, and 17 feet north of the center of the road. Standard U.S.G.S. aluminum tablet stamped "136YY 1958 2828".

137YY 1.0 mile southwest of 136YY, 7.05 miles southwest along Hilina Pali road. Cemented on bedrock where the road winds around a large tumulus, 105 feet northwest from the tip of the large tumulus, 56 feet west of and 5 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "137YY 1958 2627".

138YY 0.8 mile southwest of 137YY, 7.85 miles southwest along Hilina Pali road. Cemented on bedrock, 140 feet southwest of a large Ohia tree, 58 feet west of the center of the road, and at the south edge of the road. Standard U.S.G.S. aluminum tablet stamped "138YY 1958 2465".

139YY 0.6 mile southwest of 138YY, 8.45 miles southwest along Hilina Pali road. Cemented on bedrock, 20 feet east of the northeast corner, and 19 feet northeast of the southeast corner of the pavilion. 14 feet north of the center of the road, at road's end. Standard U.S.G.S. aluminum tablet stamped "139YY 1958 2282".

LINE 08 (VOLCANO TO HONOLULU LANDING VIA KALAPANA AND KAPOHO)

BEGINNING AT THE TOWN OF HILO, AT THE JUNCTIONS OF STATE HIGHWAY 19 (KAMEHAMEHA AVE.), STATE HIGHWAY 120 (KALANIANA'OLE AVE.), AND STATE HIGHWAY 11 (KANOELEHUA AVE), PROCEED SOUTHWEST ALONG STATE HIGHWAY 11 FOR 28.4 MILES, TO THE ENTRANCE INTO NATIONAL PARK HEADQUARTERS AND CRATER RIM DRIVE. EXIT STATE HIGHWAY 11 AND PROCEED SOUTHWEST ALONG CRATER RIM DRIVE FOR 0.10 MILE, THEN LEFT, TOWARDS THE SOUTH, ALONG CRATER RIM DRIVE FOR 0.50 MILE TO "T" INTERSECTION, THEN LEFT AGAIN TOWARDS THE EAST FOR 2.40 MILES ALONG CRATER RIM DRIVE, TO THE INTERSECTION WITH CRATER RIM DRIVE AND CHAIN OF CRATERS ROAD.

0.00 JUNCTION OF CRATER RIM DRIVE AND CHAIN OF CRATERS ROAD.

22YY Approximately 60 feet south of Crater Rim drive, southeast along Chain of Craters road; remnants of old road bed on west side. Bench mark is set 40 feet west of the centerline of Chain of craters road, 16 feet north of the center of the old road, 4 feet higher than the new road, and 3 feet higher than the old road level. Standard U.S.G.S. aluminum tablet stamped "22YY 1958 3720".

BM79-509 0.45 mile south of 22YY and junction. Cemented on the south end of, and across the road from the parking area at Lua Manu crater, 12 feet east of the centerline, on toe of 1974 lava, and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "79-509".

BM79-510 0.4 mile south of BM79-509, 0.85 mile along Chain of Craters Road. Cemented on a road cut at a slight grade; across from steaming cracks on the west side of the road, 15 feet east of the centerline, 3.5 feet north of the pavement edge, and 1 foot above the road level. Standard U.S.G.S. tablet stamped "79-510".

- 25YY 0.65 mile southeast of BM79-510, 1.5 miles along Chain of Craters Road. Cemented on a stone wall at the east edge of Kokoolau crater, 40 feet southwest of the southwest edge of the parking area curb, 4 feet lower than the road level, and 2.5 feet above the ground level. Standard U.S.G.S. tablet stamped "25 YY 3521 1958".
- 26YY Reset
0.5 mile southeast of 25YY, 2.0 miles along Chain of Craters Road. Cemented on a road cut 18 feet northeast of the centerline, and 1.5 feet above the road level. Standard U.S.G.S. tablet stamped "26YYR 1984".
- BM79-511 0.65 mile southeast of 25YY, 2.65 miles along Chain of Craters Road. Cemented on bedrock across the entrance to Hilina Pali road, 75 feet northwest of a pipe barricade, 14 feet east of the centerline, 7 feet southeast of the sign post, and at road level. Standard U.S.G.S. aluminum tablet stamped "79-511".
- 27YY Reset
0.65 mile southeast of BM79-511, 3.3 miles along Chain of Craters Road. Cemented on a roadcut on the south and outside of the curve in the road, 450 feet southeast of the parking lot at Hiiaka crater, 5 feet southwest of the road edge, 20 feet southwest of the centerline, and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "27YYR 1984".
- 28YY Reset
0.45 mile southeast of 27YY Reset, 3.75 miles along Chain of Craters Road. Cemented on a pahoehoe roadcut, across the road from the northwest entrance of Pauahi crater parking lot; 14 feet southwest of the centerline, and at road level. Standard U.S.G.S. tablet stamped "28YY Reset 1984".
- BM79-500 0.6 mile southeast of 28YY Reset, 4.35 miles along Chain of Craters Road. Cemented on a 3 feet Pahoehoe road cut, 17 feet west of the centerline, 4 feet west of the road edge, and 1.5 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "79-500".
- KF-5 0.15 mile south of BM79-500, 4.50 miles along Chain of Craters Road. Cemented on a Pahoehoe road cut, 25 feet east of the centerline, 4 feet east of the north end of the parking area, in the middle of the 1969 lava flow, and 0.5 foot above the road level. Standard U.S.G.S. tablet stamped "KF 5".
- HVO101 0.45 mile south of KF-5, 4.95 miles along Chain of Craters Road. Cemented on old Pahoehoe in cleared area, 30 feet west of the centerline, 15 feet west of a lone, tall Ohia tree, and 0.5 foot below the road level. Standard U.S.G.S. Aluminum tablet stamped "HVO101".
- BM79-501 0.1 mile south of HVO101, 5.05 miles along Chain of Craters Road. Cemented on an 8 feet road cut at the intersection of Aina Hou Ranch Road and Chain of Craters Road; 73 feet west of the centerline of

Chain of Craters Road, 17 feet northwest of the center of Aina Hou Ranch Road, and 1 foot above the road level, on a 3 by 4 feet bench. Standard U.S.G.S. aluminum tablet stamped "79-501".

- HV077-2 0.6 mile south of BM79-501, 5.65 miles along Chain of Craters Road. Cemented on bedrock 57 feet east of the centerline. Standard U.S.G.S. aluminum tablet stamped "HV077 2".
- HV077-3 0.5 mile southeast of HV077-3, 6.15 miles along Chain of Craters Road. Cemented on bedrock, 0.1 mile south of NPS sign "Kipuka Kahalii" at the south end of the parking area, 72 feet east of the centerline. Standard U.S.G.S. tablet stamped "HV077 3".
- HV077-4 0.7 mile southeast of HV077-3, 6.85 miles along Chain of Craters Road. Cemented on bedrock at the west end of the Muliwai parking lot, 545 feet east of 1974 lava flow, 147 feet northeast of the NPS "Mau Loa O Mauna Loa" sign, 76 feet north of the centerline, and 2 feet lower than the road level. Standard U.S.G.S. aluminum tablet stamped "HV077 4".
- BM79-506 0.6 mile southeast of HV077-4, 7.45 miles along Chain of Craters Road. Cemented on a roadcut 16 feet south of the centerline, and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "79-506".
- BM79-507 0.65 mile southeast of BM79-506, 8.10 miles along Chain of Craters Road. Cemented on a roadcut 102 feet east of the NPS "Muliwai a Pele" sign, at the east end of the parking lot, 18 feet north of the centerline, on the inside of a curve, and at road level. Standard U.S.G.S. aluminum tablet stamped "79-507".
- HV077-7 0.65 mile southeast of BM79-507, 8.75 miles along Chain of Craters Road. Cemented on old pahoehoe lava, 104 feet east of the centerline, in "bushes", and 2 feet above the road level. Standard U.S.G.S. tablet stamped "HV077 7".
- HV077-10 0.65 mile southeast of HV077-7, 9.40 miles along Chain of Craters Road. Cemented on 1970 lavas, 500 feet east of the flow edge, 65 feet north of the centerline, and 4 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "HV077 10".
- BM80-1 0.55 mile southeast of HV077-7, 9.95 miles along Chain of Craters Road. Cemented on a Pahoehoe "bubble" at the western end of the parking lot, 15 feet south of the parking lot curb, and 2 feet below the road level. Standard U.S.G.S. aluminum tablet stamped "80-1".
- BM79-502 0.1 mile southeast of BM80-1, 10.05 miles along Chain of Craters Road. Cemented on bedrock 24 feet north of the centerline, at the far east end of and across the road from the parking area, and 0.5 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "79-502".
- HV077-13 1.25 miles southeast of BM79-502, 11.30 miles along Chain of Craters Road. Cemented on bedrock 76 feet north of the centerline, and 5

- feet above the road level. Standard U.S.G.S. aluminum tablet stamped "HVO77 13".
- HVO63 0.45 mile southeast of HVO77-13, 11.75 miles along Chain of Craters Road. Cemented on a road cut 17 feet south of the centerline, and 2 feet above the road level. Standard U.S.G.S. tablet stamped "HVO63 1965".
- HVO64 0.4 mile southeast of HVO63, 12.15 miles along Chain of Craters Road. Cemented on bedrock 22 feet south of the centerline, and 3 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "HVO64 1965".
- HVO162 0.15 mile southeast of HVO64, 12.30 miles along Chain of Craters Road. Cemented on the backside of a prominent pahoehoe outcrop, 28 feet south of the centerline, and 6 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "HVO162 1970".
- HVO65 0.4 mile southeast of HVO162, 12.75 miles along Chain of Craters Road. Cemented on a road cut 24 feet south of the centerline, and 2 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "HVO65 1965".
- HVO66 0.4 mile southwest of HVO65, 13.10 miles along Chain of Craters Road. Cemented on bedrock at the south end of and opposite a guard rail, 24 feet north of the centerline, and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "HVO65 1965".
- HVO86-108 0.35 mile southwest of HVO66, 13.45 miles along Chain of Craters Road. Cemented on bedrock on the south side of the road, 120 feet northeast of the "1000 ft." sign. Standard U.S.G.S. aluminum tablet stamped "HVO86-108".
- BM79-504 0.35 mile southeast of HVO108, 13.80 miles along Chain of Craters Road. Cemented on bedrock at edge of 1972 lavas, at the east end of a guard rail, 20 feet south of the centerline, 3 feet south of the guard rail, and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "79-504".
- HVO77-15 0.7 mile southeast of BM79-504, 14.50 miles along Chain of Craters Road. Cemented on old lavas, 75 feet south of the centerline, and 3 feet lower than the road level. Standard U.S.G.S. aluminum tablet stamped "HVO77 15".
- HVO77-16 0.6 mile southeast of HVO77-16, 15.10 miles along Chain of Craters Road. Cemented on new lavas on the inside of a big curve in the road, 69 feet east of the centerline, and 3 feet lower than the road level. Standard U.S.G.S. aluminum tablet stamped "HVO77 16".
- HVO77-17 0.6 mile southeast of HVO77-16, 15.70 miles along Chain of Craters Road. Cemented on new lavas at the east edge of a lava flow, 65 feet north of the centerline, and 2 feet above the road level. When the search was made, bench mark was completely covered by Morning Glory vines. Standard U.S.G.S. aluminum tablet stamped " HVO77 17".

- BM79-505 0.7 mile southeast of HVO77-505, 16.40 miles along Chain of Craters road. Cemented on a roadcut 129 feet east of the west edge of 1972 lavas, 15 feet south of the centerline, and 1.5 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "79-505".
- HVO76 0.45 miles southeast of BM79-505, 16.85 miles along Chain of Craters Road. Cemented on a small mound 80 feet west of "Puu Loa Petroglyphs" sign, 18 feet south of the centerline and 3 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "HVO76 1965".
- Note: 0.1 mile southeast of HVO76, 16.95 miles along Chain of Craters Road, at the west end of Petroglyph parking area and a pipe barricade.
- HVO77 0.4 mile southeast of HVO76, 17.25 miles along Chain of Craters Road. Cemented on bedrock 28 feet south of the centerline, and at the road level. Standard U.S.G.S. aluminum tablet stamped "HVO77 1965".
- HVO78 0.4 mile southeast of HVO77, 17.65 miles along Chain of Craters Road. Cemented in a small depression of pahoehoe lava, 18 feet north of the centerline, and 1.5 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "HVO78 1965".
- Note: 0.5 mile northeast of HVO78, 18.15 miles southeast along Chain of Craters Road, the west end of the parking area at "NAULU ARCHES", on the south side of the road.
- HVO79 1.0 mile northeast of HVO78, 18.65 miles along Chain of Craters Road. Cemented on a small pahoehoe ridge, 122 feet west of the west end of the parking area, 30 feet north of the centerline, and 2 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "HVO79 1965".
- HVO80 0.9 mile northeast of HVO79, 19.55 miles southeast along Chain of craters Road. Cemented on bedrock, 100 feet west of a 9 foot road cut, 20 feet north of the centerline, and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "HVO 80 1965".
- HVO81 1.2 miles northeast of HVO80, 20.75 miles southeast along Chain of Craters Road. Cemented on bedrock 30 feet north of the centerline, and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "HVO 81 1965".
- HVO82 0.9 mile northeast of HVO81, 21.65 miles southeast along Chain of Craters Road. Cemented on bedrock 31 feet south of the centerline, and 2 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "HVO 82 1965".
- HVO83 1.0 mile northeast of HVO82, 22.65 miles southeast along Chain of Craters Road. Cemented on flat pahoehoe 0.1 mile southwest of the entrance to Kamoamoa campgrounds, and 32 feet south of the road, between two road cuts. Standard U.S.G.S. aluminun tablet stamped

"HVO 83 1965".

Note: 0.1 mile northeast of HVO83, 22.75 miles southeast along Chain of Craters Road, entrance to Kamoamoa campgrounds on south side of road.

HVO84 1.0 mile northeast of HVO83, 23.65 miles southeast along Chain of Craters road. Cemented on pahoehoe 38 feet north of the centerline, and 2 feet lower than the road level. Standard U.S.G.S. aluminum tablet stamped " HVO 84 1965".

HVO85 1.1 miles northeast of HVO84, 24.75 miles southeast along Chain of Craters Road. Cemented on bedrock 0.1 mile southwest, of the west entrance into "Wahaula" visitor's center, 30 feet west of a 6 feet road cut, 27 feet south of the centerline, and 0.5 foot lower than the road level. Standard U.S.G.S. aluminum tablet stamped " HVO 85 1965".

HVO86 1.0 mile northeast of HVO85, 25.75 miles southeast along Chain of Craters Road. Cemented on flat pahoehoe, 0.1 mile west of a cattle guard (National Park Boundary), 26 feet southeast of the centerline, and 1 foot lower than the road level. Standard U.S.G.S. aluminum tablet stamped "HVO86 1965".

QUEEN'S BATH

0.2 mile northeast of HVO86, 25.95 miles southeast along Chain of Craters Road. Cemented on a road cut 200 feet northeast of the entrance into Royal Gardens subdivision, 37 feet south of the centerline, and 2 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "Q. BATH 81"

48YY 0.1 mile northeast of Queen's Bath, 26.05 miles southeast along Chain of Craters Road, about 400 feet west of Queen's Bath. Cemented on bedrock 30 feet north of the centerline, and 1.5 feet above the road level. Standard aluminum tablet stamped "48YY 1958 20".

Note: 0.85 mile southwest of 51YY; Junction of "old" Kalapana road and "new" bypass road.

51YY 0.7 mile southeast of BM79-535, 1.8 miles southwest from the junction with Pahoa and Opihikao roads (Highway 137). Cemented on bedrock 43 feet south of the road center, 27 feet northeast of a large Mango tree, 9 feet west of a track road, 5 feet southeast of a multi-branch tree, and 4 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "51 YY 1958 32".

BM79-535 0.85 mile southwest of 52YY, 1.15 miles southwest from the junction of Pahoa and Opihikao roads. Cemented on bedrock 41 feet southeast of center of the road, 15 feet south of pole #210, 10 feet west of the track road, and 6 inches above the road level. Standard U.S.G.S. aluminum tablet stamped "79-535".

52YY 0.1 mile southwest of 52YY reset, 0.3 mile southwest of junction of Pahoa and Opihikao roads. Cemented at the base of a 3 feet deep road cut, 50 feet east of pole #191, 13 feet west of the road center, 11

feet southeast of a stone wall, and 0.5 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "52 YY 1958 17".

52YYReset

0.2 mile southwest of 53YY. Cemented on bedrock 3 feet northwest of a coconut tree, 16 feet north of the center of the road, 4 feet west of a rock wall, and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped " 52YY reset 1977".

0.00 Junction of Highway 137 and road to Kalapana By-pass Highway.

53YY Bench mark is set in the southeast corner of a triangle formed by Highway 137 (new road to Opihikao) and the old beach road. Cemented on bedrock, 63 feet southeast of the intersection of Highway 130 and 137, 47 feet southeast of Highway 137, 31 feet northwest of a stone wall, 22 feet north of old paved beach road, and at road level. Standard U.S.G.S. aluminum tablet stamped "53YY 1958 12".

185YY 1.05 miles northeast of 53YY along Highway 137, from the junction. Cemented on flat pahoe-hoe lava, approximately 45 feet east of the east entrance into solid waste transfer site, 18 feet southeast of the center of the road, and 12 feet west of a 2 feet drop. Standard U.S.G.S. aluminum tablet stamped "185YY 33 1958".

MOANA HAUAE TRIANGULATION STATION

0.25 mile northeast of 185YY, 1.30 miles along State Highway 137, from the junction. Cemented on the top of a prominent lava blister approximately 290 feet south of the road. Standard U.S.G.S. brass tablet, unstamped.

Note: 0.55 mile east of Moana Hauae, 1.85 miles along State Highway 137, Large opening of a collapsed lava tube. Currently used as a dump!

184YY 0.65 mile northeast of Moana Hauae, 1.95 miles along State Highway 137, 0.10 mile east of collapsed lava tube. Cemented on sloping pahoe-hoe, 80 feet east of a small opening of a collapsed lava tube, 27 feet northwest of the center of the road and, 2 feet higher than the road level. Standard U.S.G.S. aluminum tablet stamped "184YY 74 1958". Bench mark is in a cleared turnout area.

183YY 0.80 mile northeast of 184YY, 2.75 miles along State Highway 137. Cemented on bedrock at road level, 200 feet north of a bend in the road, and 26 feet northwest of the center of the road. Standard U.S.G.S. tablet stamped "183YY 102 1958". Area is overgrown and bench mark is difficult to find.

181YY 1.80 miles northeast of 183YY, 4.55 miles along State Highway 137. Cemented in an open area along the coast in a "forest" of Naupaka shrubs, 100 feet east of the east edge of an aa lava flow, 33 feet southeast of the center of the road, and 3 feet lower than the road level. Standard U.S.G.S. tablet stamped "181YY 52 1958".

180YY 0.60 mile northeast of 181YY, 5.15 miles along State Highway 137. Cemented on bedrock at road level, 30 feet southeast of the center of

the road, 27 feet north of the ocean cliff, 19 feet east of a circular collapsed area, and 12 feet west of a track road. Standard U.S.G.S. aluminum tablet stamped "180YY 43 1958".

- 179YY 0.20 mile east of 180YY, 5.35 miles along State Highway 137. Cemented on bedrock, 75 feet west of the area where the road is being eroded by wave action, 3 feet higher than the road level, 27 feet southeast of the road center, and 3 feet south of a coconut tree. Standard U.S.G.S. aluminum tablet stamped "179YY 32 1958".
- 178YY 1.65 mile east of 179YY, 7.00 miles along State Highway 137. Cemented on bedrock at an open area on the coast, with small tidal pools nearby. 33 feet southeast of road center, 11 feet east of a coconut tree, and 1.5 feet lower than the road level. Standard U.S.G.S. aluminum tablet stamped "178YY 21 1958".
- 0.00 JUNCTION OF OPIHIKAO AND POHOIKI TO KALAPANA ROAD.
- 176YY 1.45 miles northeast from jct. Cemented on bedrock 40 feet west of the driveway into MacKenzie park, and 42 feet south of the center of the main road. Standard U.S.G.S aluminum tablet stamped "176YY 78 1958".
- 175YY 0.95 mile northeast of 176YY, 2.40 miles from jct. Cemented on flat pahoehoe, in a cleared area, 39 feet north of road center, and 15 feet east of a pahoehoe flow. Standard U.S.G.S. tablet stamped "175YY 28 1958".
- Note: 1.05 miles east of 175YY junction with Pahoia road.
- 174YY 1.05 miles east of 175YY. Cemented in an 8 inch deep depression, 7.5 feet north of a 36 inch diameter Mango tree, and 18 feet east of the projected middle of Pohoiki road. Standard U.S.G.S. aluminum tablet stamped "174YY 37 1958". NOTE: bench mark is badly etched and difficult to read.
- 171YY 2.05 miles northeast of 174YY, 2.05 miles from jct. Cemented on an 8 inch square concrete pier, 35 feet west of the centerline, 30 feet north of track road, 6 feet south of telephone pole #70, 4 feet above the road level, and 6 inches above ground level. Standard U.S.G.S. aluminum tablet stamped "171YY 64 1958".
- 170YY 0.35 mile north of 174YY, 2.40 miles from jct. Cemented on an 8 inch square concrete pier protruding 8 inches above ground level, 67 feet north of pole #65, and 22 feet east of the center of the road. Standard U.S.G.S. aluminum tablet stamped "170YY 64 1958".
- 169YY 0.15 mile north of 170YY, 2.55 miles northeast from the jct. Cemented on an 8 inch square concrete pier, at the north edge of the 1955 lava flow, 7 feet south of pole #59, 25 feet west of the center of the road, 13 feet northeast of "9 mile" marker, and 4 feet higher than the road level. Standard U.S.G.S. tablet stamped "169YY 57 1958".

- 168YY 0.25 mile north of 170YY, 2.80 miles northeast from the jct. Cemented on bedrock, 56 feet west of the centerline, 11 feet east of an 8 inch diameter metal gate post, 10 feet south of a 6 inch diameter Mango tree, and 47 feet northwest of pole #54. Standard U.S.G.S. aluminum tablet stamped "168YY 48 1958". NOTE: bench mark is difficult to find because of the thick grass.
- 167YY 0.25 mile north of 168YY, 3.05 miles northeast from the jct. Cemented on bedrock, 108 feet south of pole #49, 34 feet east of the centerline, and 5 feet lower than the road level. Standard U.S.G.S. aluminum tablet stamped "167YY 40 1958".
- 166YY 0.35 mile north of 167YY, 3.40 miles northeast of the Pahoa, Kalapana jct. Cemented on bedrock, 80 feet south of the road to "Kapoho Beach Lots", 71 feet north of a fire hydrant, 36 feet east of the centerline, 26 feet north of a utility pole, and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "166YY 1958".
- HVO2 0.2 mile south of Highway 132 and Highway 137 junction, 0.25 mile north of 166YY. Cemented on flat pahoehoe 500 feet north of the south edge of the 1960 lava flow, 51 feet east of and at road level. Standard U.S.G.S. aluminum tablet stamped "HVO2".
- HVO7 0.25 mile north of HVO2, at the southeast corner of Highway 132 and Highway 137. Cemented on bedrock, 41 feet east of the centerline of Highway 137, 42 feet south of the center of the road to Kapoho lighthouse, and 1 foot lower than the road level. Standard U.S.G.S. aluminum tablet stamped "HVO7 1964".
- HVO3 0.3 mile north of HVO7, 0.3 mile north of Highway 132 and Highway 137. Cemented on bedrock, 36 feet west of the center of the road, and 6 feet lower than the road level. Standard U.S.G.S. aluminum tablet stamped "HVO3 1964".
- HVO6 0.8 mile north of HVO3, 1.1 miles north of Highway 132 and Highway 137. Cemented on shelly pahoehoe, 38 feet west of the road center, and 1 foot lower than the road level. Standard U.S.G.S. aluminum tablet stamped "HVO6 1964".
- 192YY 2.75 miles north of HVO6, 3.85 miles north of Highway 132 and Highway 137. Cemented on bedrock, in an obscure track road towards ocean, 26 feet northeast of the center of the road, 50 feet east of a metal pin on top of a concrete gate post, and 1 foot below the ground level. Standard U.S.G.S. aluminum tablet stamped "192YY 43 1958".
- 193YY 1.0 mile north of 192YY, 4.85 miles north of Highway 132 and Highway 137. Cemented on a large boulder, 44 feet northeast of the road center, near large "false" Ironwood trees. Standard U.S.G.S. aluminum tablet stamped " 193YY 16 1958".

LINE 09 (KALAPANA TRAIL)

BEGINNING AT THE TOWN OF HILO, AT THE JUNCTIONS OF STATE HIGHWAY 19

(KAMEHAMEHA AVE.), STATE HIGHWAY 120 (KALANIANA'OLE AVE.), AND STATE HIGHWAY 11 (KANO'ELEHUA AVE). PROCEED SOUTHWEST ALONG STATE HIGHWAY 11 FOR 28.4 MILES TO THE ENTRANCE INTO NATIONAL PARK HEADQUARTERS AND CRATER RIM DRIVE. EXIT STATE HIGHWAY 11 AND PROCEED SOUTHWEST ALONG CRATER RIM DRIVE FOR 0.10 MILE, THEN LEFT, TOWARDS THE SOUTH, ALONG CRATER RIM DRIVE FOR 0.50 MILE TO "T" INTERSECTION, THEN LEFT AGAIN TOWARDS THE EAST FOR 2.40 MILES ALONG CRATER RIM DRIVE TO THE INTERSECTION WITH CRATER RIM DRIVE AND CHAIN OF CRATERS ROAD, THEN LEFT AGAIN TOWARD THE SOUTH, FOLLOWING THE CHAIN OF CRATERS ROAD SOUTHEAST FOR 3.8 MILES TO JUNCTION WITH ROAD ON LEFT (EAST). TURN LEFT AND FOLLOW ROAD (MAUNA ULU PARKING) TO DEAD END AND PARKING LOT. FROM BARRICADE, FOLLOW CLOSED ROAD 250 FEET EAST TO DISPLAY CASE AND NAPA'U TRAIL ON LEFT (NORTH).

- BM2503 From the end of the road and trail head, follow Napau trail north for 1.05 miles to the south side of Puu Huluhulu; continue along trail for 2.9 miles around the north side of Mauna Ulu then to the south side of Makaopuki crater until the junction with Kalapana trail. Take the right fork (south) on the Kalapana trail and follow the trail for 1.1 miles to the junction with Naulu trail. Take the left fork (southeast), staying on the Kalapana trail, for 0.55 mile to the bench mark on the south edge of the trail. BM is a copper nail with a washer, set inside a chiseled triangle, with the triangle being filled with cement. Elevation of BM is 2502 feet.
- 36YY 85 feet east of BM2503 and approximately 2985 feet southeast of junction with Naulu trail, along the Kalapana trail. Cemented on bedrock at a bend in the trail, around a Pahoehoe blister, 38 feet west of a blazed Ohia tree, 3 feet south of and 1 foot above the trail. Standard U.S.G.S. aluminum tablet stamped "36YY 1958 2501".
- BM2302 5,688 feet (Distance is by stadia readings) southeast of 36YY, approximately 8673 feet southeast of the trail junction, along the Kalapana trail. Cemented on bedrock at the north edge of the trail. Bench mark is a copper nail and washer surrounded by a chiseled triangle filled with cement.
- 37YY 134 feet southeast of BM2302, approximately 8807 feet southeast of trail junction along the Kalapana trail. Cemented on bedrock 39 feet southeast of a blazed Ohia tree, at the south edge of the trail. Standard U.S.G.S. aluminum tablet stamped "37YY 1958 2297".
- 38YY 2,582 feet southeast of 37YY, 11,389 feet southeast of the trail junction along the Kalapana trail. Cemented on bedrock 14 feet northeast of a blazed Ohia tree, at a slight rise, and on the south side of the trail. Standard U.S.G.S. tablet stamped "38YY 1958 2302".
- 39YY 2,834 feet southeast of 38YY, 14,223 feet southeast of the trail junction along the Kalapana trail. Cemented on bedrock at the south edge of the trail, 150 feet southeast of a bend around a lava blister, 30 feet south of a blazed Ohia tree, 20 feet north of a blazed Ohia tree, and 18 feet west of a double trunk Ohia tree. Standard U.S.G.S. aluminum tablet stamped "39YY 1958 2134".

- 40YY 2,440 feet southeast of 39YY, 16,663 feet southeast of the trail junction along the Kalapana trail. Cemented on bedrock at the east edge of trail, 290 feet south of a prominent cut in a lava blister, and 145 feet south of a sharp bend, at the top of a steep pitch. Standard U.S.G.S. aluminum tablet stamped "40YY 1958 1918".
- BM1638 3,120 feet southeast of 40YY, 19,783 feet southeast of the trail junction along the Kalapana trail. Cemented on bedrock at the east edge of the trail, and at the east end of a slight sag in the trail. Tablet stamped "1638".
- 41YY 3,250 feet southeast of BM1638, 23,033 feet southeast of the trail junction along the Kalapana trail. Cemented on bedrock at the north edge of the trail, at a prominent rise, 100 feet west of a giant Ohia tree, and 9 feet north of a blazed Ohia tree. Standard U.S.G.S. aluminum tablet stamped "41YY 1958 1440".
- 42YY 2,202 feet southeast of 41YY, 25,235 feet southeast of the trail junction along the Kalapana trail. Cemented on a pahoe-hoe ridge at a bend in the trail, and 7 feet south of the trail. Standard U.S.G.S. aluminum tablet stamped "42YY 1958 1251".
- BM1082 1,776 feet southeast of 42YY, 27,011 feet southeast of a trail junction along the Kalapana trail. Cemented on bedrock at a corner gate post in the stone wall in front of an old ranch house. Mark is a copper nail with a washer.
- 43YY 1594 feet southeast of BM1082, 28,605 feet southeast of the trail junction along the Kalapana trail. Cemented on bedrock above a small cut in aa lava, at an aa ridge, 33 feet north of a lone Ohia tree growing on pahoe-hoe lava, and 9 feet north of the trail. Standard U.S.G.S. aluminum tablet stamped "43YY 1958 927".
- 44YY 2934 feet southeast of 43YY, 31,539 feet southeast of the trail junction along the Kalapana trail. Cemented on bedrock 72 feet west of a prominent lava blister, 53 feet west of Wilson's nail "557", and 20 feet north of the trail. Standard U.S.G.S. aluminum tablet stamped "44YY 1958 559".
- BM557 53 feet southeast of 44YY, 31,592 feet southeast of the trail junction along the Kalapana trail. Cemented on bedrock west of a dip in the trail and on the south side of the trail opposite a large lava knob. Mark is a copper nail with washer, surrounded by a chiseled triangle filled with cement.

Note: The trail has been re-routed from this point to BM 46YY, where the old and new trails merge together.

- BM352 4567 feet southeast of BM557, 36,159 feet southeast of the trail junction along the old Kalapana trail (now abandoned). Cemented on bedrock 30 feet east of and 5 feet lower than top of a steep pitch, and 7 feet south of the trail. Standard tablet stamped "352".

45YY 5382 feet southeast of BM352, 41,541 feet southeast of the junction along the old Kalapana trail (now abandoned). Cemented on bedrock 15 feet north of the trail at the southern tip of an old aa flow, at a prominent bench, and 21 feet north of Wilson's nail "168". Standard U.S.G.S. aluminum tablet stamped "45YY 1958 168".

BM167 25 feet southeast of 45YY, 41,566 feet southeast of the trail junction along the old Kalapana trail (now abandoned). Cemented on bedrock at the edge of the trail in a long, low area. Mark is a copper nail and washer surrounded by a chiseled triangle filled with cement.

Note: Old and new trails merge together.

46YY 5648 feet southeast of BM167, 47,214 feet southeast of the trail junction along the Kalapana trail. Cemented on bedrock, on a high bench, overlooking the surrounding area, south of a prominent pahoehoe flow, at the north edge of the trail, and on the west edge of a pahoehoe blister. Standard U.S.G.S. aluminum tablet stamped "46YY 1958 76".

BM64 560 feet east of 46YY, 2350 feet west of the last paved road (Royal Ave.) and the stone pillars, and 8080 feet west of junction with State Highway 130. Cemented on bedrock at the edge of the trail. Mark is a copper nail and washer surrounded by a chiseled triangle filled with concrete.

LINE 10 (KEAAU TO KALAPANA VIA PAHOA)

BEGINNING AT THE TOWN OF HILO, AT THE JUNCTIONS OF STATE HIGHWAY 19 (KAMEHAMEHA AVE.), STATE HIGHWAY 11 (KANOELEHUA AVE.), AND STATE HIGHWAY 120 (KALANIANA'OLE AVE.). PROCEED SOUTH ALONG STATE HIGHWAY 11 FOR 7.25 MILES TO THE JUNCTION WITH STATE HIGHWAY 130, AT THE TOWN OF KEAAU. FROM KEAAU, TAKE STATE HIGHWAY 130 SOUTHEAST TOWARDS THE TOWN OF PAHOA.

0.00 Junctions of State Highways 130 and 11.

89YY 1.00 mile southeast of Keaau along State Highway 130. Cemented on bedrock in the front lawn of the former manager of the Puna Sugar Plantation, 135 feet north of driveway, 28 feet west of the rock wall and 3 inches below the lawn level. Standard U.S.G.S. aluminum tablet stamped "89YY 1958 358".

HV086-107 1.00 mile southeast of 89YY, 2.00 miles along State Highway 130. Cemented on a rock outcrop, 31 feet southwest of the centerline, 71 feet north of a "2 mile" marker, 23 feet north of pole #533, and 3 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "HV086-107".

87YY 1.20 miles southeast of HV086-107, 3.20 miles along State Highway 130, Cemented on the southwest end of a concrete bridge, on the old highway, 40 feet west of the new highway and bridge, 13 feet west of

the center of the old road, and 1 foot lower than the road level. Standard U.S.G.S. aluminum tablet stamped "87YY 1958 297".

- 86YY 1.25 miles southeast of 87YY, 4.45 miles along State Highway 130. Cemented on a 6 feet high island of pahoehoe left by the construction of the old highway and the new highway, 7 feet west of a 36 inch diameter mango tree, 89 feet north of a metal barricade closing off the old highway, 52 feet east of pole #110, 40 feet southeast of a water hydrant, and 3.5 feet higher than the old road level. Standard U.S.G.S. aluminum tablet stamped "86YY 1958 351".
- 85YY 0.90 mile southeast of 86YY, 5.35 miles along State Highway 130. Cemented on bedrock 35 feet southwest of the centerline, 22 feet northwest of a utility pole, 115 feet north of a drive way, and across, and northwest of pole #107. Standard U.S.G.S. aluminum tablet stamped "85YY 1958 351".
- 84YY 1.10 miles southeast of 85YY, 6.45 miles along State Highway 130. Cemented on bedrock 26 feet northeast of the centerline, and 15 feet north of a cut in a lava blister. Standard U.S.G.S aluminum tablet stamped "84YY 1958 429".
- BM497 0.95 mile southeast of 84YY, 7.40 miles along State Highway 130. Cemented on bedrock across private gravel driveway, 49 feet north of a paved driveway into Government installation, 24 feet northeast of the centerline, 2 feet southwest of a wooden fence, and 2 feet lower than the road level. Standard U.S.G.S. aluminum tablet stamped "497".
- 83YY 0.95 mile southeast of 497, 8.35 miles along State Highway 130. Cemented on bedrock 320 feet south of a track road leading west, 4 feet north of utility pole #205, 25 feet southwest of the centerline, and at road level. Standard U.S.G.S aluminum tablet stamped "83YY 1958 525".
- 82YY 0.75 mile southeast of 83YY, 9.10 miles along State Highway 130. Cemented on a roadcut, across the highway from pole #222, 18 feet northeast of the centerline, and 3 feet higher than the road level. Standard U.S.G.S aluminum tablet stamped "82YY 1958 596"
- 81YY 1.0 mile southeast of 82YY, 10.1 miles along State Highway 130. Cemented on bedrock, 33 feet southwest of the centerline, 15 feet south of a concrete culvert, 15 feet northwest of the sign "ROAD NARROWS", and 5 feet lower than the road level. Standard U.S.G.S. aluminum tablet stamped "81YY 1958 511".
- BM655 0.85 mile southeast of 81YY, 10.95 miles along State Highway 130. Cemented on bedrock, across the intersection from the post office in Pahoa but on same side of the highway as the post office, 23 feet northeast of the centerline, 9 feet north of the south end of a rock wall, 1.5 feet east of the rock wall, and 3 feet higher than the road level. Standard U.S.G.S. tablet stamped "655 reset 1964".
- BM79-533 0.55 mile southeast of BM665, 11.50 miles along State Highway 130,

southeast end of ball field, then right (south) 0.1 mile to the school parking lot and gymnasium. Cemented on a rock outcropping at the base of a rock wall, 29 feet south of a utility pole with street light, 13 feet east of the centerline, and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "79-533".

Note: 0.65 mile southeast of BM655, Pahoa School and a fork in the road, the left fork is junction 132 and the right fork is Highway 130. 11.60 miles from junction with Highway 11.

BM79-540 0.6 mile south of BM79-533, 0.4 mile south along Highway 130, from junction of Highways 130 and 132. Bench mark is set on bedrock, 53 feet south of a utility pole, 25 feet west of the centerline, and at road level. Standard U.S.G.S. aluminum tablet stamped "79-540".

HV01 0.8 mile south of BM79-540, 1.2 miles south along Highway 130. Cemented on the concrete footing of a stone wall, and the gate to a water tank, 57 feet north of a power pole, and 23 feet west of the centerline. Standard U.S. G.S. aluminum tablet stamped "HVO 1".

BM82-110 0.3 mile south of HV01, 1.5 miles south along Highway 130. Cemented on a roadcut, 124 feet south of power pole #25, 23 feet east of the centerline, and 2 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "82-110".

BM82-111 0.5 mile south of BM82-110, 2.0 miles south along Highway 130. Cemented on a pahoehoe outcrop, 70 feet south of pole #35, 19 feet east of the centerline, and 2 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "82-111".

76YY 0.35 mile south of BM82-111, 2.35 miles south along Highway 130. Cemented on a pahoehoe roadcut at the southeast corner of Leilani Blvd, 62 feet south of the centerline of Leilani Blvd., 22 feet east of the centerline of Highway 130, 16 feet north of a power pole, and 4 feet above the road level. Standard U.S.G.S. aluminum tablet stamped " 76YY 968 1958".

BM82-112 0.20 mile south of 76YY, 2.55 miles south along Highway 130. Cemented on a road cut, 87 feet south of pole #44, 18 feet east of the centerline, and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "82-112".

BM82-114 0.30 mile south of BM82-112, 2.85 miles south along Highway 130. Cemented on a roadcut 16 feet east of the centerline, 10 feet south of pole #49, and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "82-114".

HV091 0.50 mile south of BM82-114, 3.35 miles south along Highway 130. Cemented on a pahoehoe ledge in a roadcut, 112 feet north of pole #58, 18 feet east of the centerline, and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "HV091".

HV0200 0.35 mile south of HV091, 3.70 miles south along Highway 130. Cemented on a roadcut ledge, 127 feet south of pole #63, 19 feet east

of the centerline, and 2 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "HVO200".

HVO201 0.2 mile south of HVO200, 3.9 miles south along Highway 130. Cemented on a roadcut, 105 feet south of power pole 67, 19 feet east of the centerline, and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "HVO201".

HVO202 0.3 mile south of HVO201, 4.2 miles south along Highway 130. cemented on a road cut, 85 feet south of pole #72, about 100 feet south of "Opihikao 5" sign, 20 east of the centerline, and 2 feet above road level. Standard U.S.G.S. aluminum tablet stamped "HVO202"

HVO203 0.25 mile south of HVO202, 4.45 miles south along Highway 130. Cemented on a roadcut ledge, 63 feet south of pole #77, 19 feet west of the centerline, and 2 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "HVO203".

HVO204 0.25 mile south of HVO203, 4.70 miles south along Highway 130. Cemented on a roadcut, 64 feet south of pole #81, 20 feet west of the centerline, and 3 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "HVO204".

HVO205 0.30 mile south of HVO204, 5.0 miles south along Highway 130. Cemented on a road cut, 127 feet south of power pole #83, 20 feet west of the centerline, and 2.5 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "HVO205".

HVO124 0.40 mile south of HVO205, 5.40 miles south along Highway 130. Cemented on top of a road cut, 124 feet east of the centerline, 38 feet north of pole #94, and 5 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "HVO124".

62YYReset 0.35 mile south of HVO124, 5.75 miles south along Highway 130. Cemented on bedrock, 76 feet west of the centerline, 20 feet northeast of the center pole of the gate to a water tank, and 6 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "66YY reset 1970".

BM737 0.2 mile south of 62YY reset, 5.95 miles along Highway 130, then left (east), 0.05 mile, to cross roads. Bench mark is set on bedrock, 295 feet east of the centerline of highway 130, 14 feet east of the center of the old road, and 1 foot above the road level. Tablet stamped "737".

WILSON'S WASHER

Mark is, 96 feet south of BM737, 37 feet south of a power pole, and 1 foot above the road level. Mark is a copper nail with a brass washer.

61YY 0.25 mile south of intersection to BM737 and Wilson's washer, 6.20 miles south along highway 130. Cemented on bedrock, 62 feet north of pole #111, 48 feet east of the centerline, and 6 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "61YY".

- HVO206 0.2 mile south of 61YY, 6.4 miles south along Highway 130. Cemented on a road cut 29 feet west of the centerline, 25 feet south of pole #116, and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "HVO206".
- 59YY 0.35 mile south of HVO206, then left (east) 90 feet along old road. 6.75 miles south along Highway 130. Cemented on bedrock, 83 feet east of the centerline of Highway 130, 33 feet south of pole #120, 12 feet east of the center of the old road, and at road level. Standard U.S.G.S. aluminum tablet stamped "59YY 1958 560".
- HVO207 0.4 mile south of 59YY, 7.15 miles south along Highway 130. Cemented on top of a road bank, 115 feet south of pole #131, 39 feet east of the centerline, and 5 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "HVO207".
- HVO208 0.5 mile south of HVO207, 7.65 miles south along Highway 130. Cemented on a road cut, 105 feet north of pole #143, 31 feet west of the centerline, and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "HVO208".
- 56YY 0.3 mile south of HVO208, 7.95 miles south along Highway 130, then left (east) 0.2 mile along the old road. Bench mark is set on bedrock, 98 feet north of a power pole, 14 feet east of the center of the old road, and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped " 56YY 95 1958".
- Note: 0.35 mile south of 56YY, intersection with Highway 130.
- 54YY 0.95 mile south of 56YY, 8.90 miles along Highway 130, then the old highway, then on Highway 130 and back to the old highway. Bench mark is set on bedrock, 105 feet north of pole #171, 18 feet east of the center of the old road, and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "56YY 1958 245".
- 53YY 0.55 mile south of 54YY, approximately 9.45 miles south along Highway 130, at the intersection with Highway 137 at Kaimu beach. Bench mark is set on bedrock in the southeast corner of a triangle formed by Highway 137 (new road to Opihikao), and the old beach road; 63 feet southeast of the intersection of Highways 130 and 137, 47 feet southeast of Highway 137, 31 feet northeast of a stone wall, 22 feet north of the old paved beach road, and at road level. Standard U.S.G.S. aluminum tablet stamped "53YY 1958 12".

LINE 11 (PAHOA TO KAPOHO)

BEGINNING FROM THE TOWN OF HILO, AT THE JUNCTIONS OF STATE HIGHWAY 19 (KAMEHAMEHA AVE.), STATE HIGHWAY 120 (KALANIANA'OLE), AND HIGHWAY 11 (KANOELEHUA AVE.), PROCEED SOUTH ALONG STATE HIGHWAY 11 FOR 7.25 MILES TO THE JUNCTION WITH HIGHWAY 130 AT THE TOWN OF KEAAU. FROM KEAAU, TAKE STATE HIGHWAY 130 SOUTHEAST FOR 11.60 MILES, PASSING

THROUGH THE TOWN OF PAHOA. TURN RIGHT (SOUTH), (AFTER THE PLAYGROUND AND BEFORE THE INTERSECTION), 0.05 MILES TO PAHOA SCHOOL GYMNASIUM.

BM79-533 At the southeast end of the ball field, then right (south), 0.05 mile to school parking lot and Gymnasium. Cemented on an outcropping of rock at the base of a rock wall, 13 feet east of the centerline, 29 feet south of a utility pole with a street light, and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "79-533".

141YY Reset

0.80 mile southeast along State Highway 132, from the junction with State Highway 130. Bench mark is set on an aa road cut 27 feet south of the centerline, and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "141YY 1985 Reset 1985".

Note: 0.45 mile southeast of 141YY reset, 1.25 miles along State Highway 132, entrance to Kanaihiku village.

HV081-6 0.10 mile southeast of Kanaihiku village, 1.35 miles along State Highway 132. Cemented on a pahoe-hoe road cut 28 feet north of the centerline, and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "HV081-6".

143YY Reset

0.70 mile southeast of HV081-6, 2.05 miles along State Highway 132. Cemented on the top of a 6 inch square concrete pier, 35 feet south of the centerline, 6 inches above the ground level, and 3 feet above the road level. Standard U.S.G.S. tablet stamped "143YY reset 666 1975".

Note: 0.85 mile southeast of 143YY, 2.90 miles along State Highway 132; junction to Pohoiki and Kapoho.

145YY 2.9 miles southeast of Junction with State Highway 130 at Pahoa school, along Highway 132. Bench mark is set on solid pahoe-hoe 195 feet east of the road to Pohoiki, 15 feet east of pole #5, and 33 feet south of the centerline. Standard U.S.G.S. aluminum tablet stamped "145YY 640 1958". Bench mark has been scraped and it is hard to read the stamping.

149YY 1.05 miles east of 145YY, 1.05 miles east along State Highway 132 and junction with Pohoiki road. Cemented on a road cut, 648 feet east of a drive way, 460 feet west of the east end of long road cut, 20 feet south of the centerline, and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "149YY 1958 560".

150YY 0.3 mile east of 149YY, 1.35 miles east along State Highway 132 and junction with Pohoiki road. Cemented on a road cut 100 feet east of driveway to "Chow's" house, 19 feet south of the centerline, 60 feet west and across highway from power pole #111, 60 feet west of a telephone pole, and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "150 YY 1958 499".

152YY 0.6 mile east of 150YY, 1.95 miles east along State Highway 132 and

- junction with Pohoiki road. Cemented on a road cut on the 1955 lava flow, 18 feet south of the centerline, and 1.5 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "152YY 1958 418".
- 153YY 0.3 mile east of 152YY, 2.25 miles east along State Highway 132 and junction with Pohoiki road. Cemented on an 8 inch square concrete pier 70 feet east and opposite a side road, 27 feet north of the centerline, 2.5 feet above the road level, and 8 inches above the ground level. Standard U.S.G.S. aluminum tablet stamped "153YY 1958 383".
- 155YY 0.4 mile east of 153YY, 2.65 miles east along State Highway 132 and junction with Pohoiki road. Cemented on 1955 lavas 88 feet west of a driveway, 50 feet west of the west end of a road cut, 30 feet west and across from pole #70, 18 feet north of the centerline, and at road level. Standard U.S.G.S. aluminum tablaet stamped "155YY 1958 303".
- 157YY 0.3 mile east of 155YY, 3.25 miles east along State Highway 132 and junction with Pohoiki road. Cemented on a roadcut 92 feet southwest of cross roads, 20 feet south of the centerline, 10 feet northeast and across highway from pole #135G, and 2.5 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "157YY 1958 205".
- 158YY 0.2 mile east of 157YY, 3.45 miles east along State Highway 132 and junction with Pohoiki road. Cemented on a road cut, 19 feet southeast of the centerline, across highway from pole #138, and at road level. Standard U.S.G.S. aluminum tablet stamped "158YY 1958 172".
- 159YY 0.3 mile east of 158YY, 3.75 miles east along State Highway 132 and junction with Pohoiki road. Cemented on bedrock, 40 feet west of pole #142, 30 feet north of a small road cut on the west side, 21 feet northwest of the centerline, and 0.5 foot lower than the road level. Standard U.S.G.S. aluminum tablet stamped 159YY 1958 144".
- 160YY 0.3 mile east of 159YY, 4.05 miles east along State Highway 132 and junction with Pohoiki road. Cemented on bedrock at a road intersection, 24 feet northwest of the centerline, 11 feet south of the corner of a stone wall, 8 feet north of a side road, and at road level. Standard U.S.G.S. aluminum tablet stamped " 160YY 1958 166".
- HVO8 0.6 mile east of 160YY, 4.65 miles east along State Highway 132 and junction with Pohoiki road, 0.3 mile west of the intersection to Kapoho lighthouse. Cemented on bedrock 50 feet east of a kipuka in the 1960 lava flow, 30 feet south of the centerline, and 3 feet lower than the road level. Standard U.S.G.S. aluminum tablet stamped "HVO 8".
- HVO7 0.3 mile east of HVO9, 4.95 miles east along State Highway 132 and junction with Pohoiki road, 61 feet southeast of the center of the intersection of Kapoho, Pahoa, Honolulu Landing and Light House roads, 22 feet east of "FAP" marker, and 1 foot lower than the road level. Standard U.S.G.S. aluminum tablet stamped "HVO 7 1964".

LINE 12 (LEILANI BLVD.)

BEGINNING FROM THE TOWN OF HILO, AT THE JUNCTIONS OF STATE HIGHWAY 19 (KAMEHAMEHA AVE.), STATE HIGHWAY 120 (KALANIANA'OLE), AND STATE HIGHWAY 11 (KANO'OLEHUA AVE.), PROCEED SOUTH ALONG STATE HIGHWAY 11 FOR 7.25 MILES TO THE JUNCTION WITH STATE HIGHWAY 130 AT THE TOWN OF KEAAU. FROM KEAAU, TAKE STATE HIGHWAY 130 SOUTHEAST FOR 11.65 MILES, PASSING THROUGH THE TOWN OF PAHOA AND TO THE JUNCTION WITH STATE HIGHWAY 132 (JUST PAST THE HIGH SCHOOL), TURN RIGHT (SOUTH), AND FOLLOW STATE HIGHWAY 130 FOR 2.15 MILES TO THE INTERSECTION WITH LEILANI BLVD.

0.00 JUNCTION OF STATE HIGHWAY 130 AND LEILANI BLVD.

76YY Bench mark is set on bedrock, 62 feet south of the centerline of Leilani Blvd, 22 feet east of the centerline of State Highway 130, 16 feet north of a power pole, and 4 feet above the road level. Standard U.S.G.S. aluminum tablet stamped "76YY 1958 969".

BM81-1 0.65 mile east of 76YY along Leilani Blvd. Cemented on a road cut opposite Kula street, 18 feet north of the centerline, and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "81-1".

BM81-2 0.55 mile east of BM81-1, 1.20 miles along Leilani Blvd. Cemented on a road cut, 31 feet east of the centerline of Kumukahi St., 22 feet south of the centerline of Leilani Blvd., and at road level. Standard U.S.G.S. aluminum tablet stamped "81-2".

BM81-3 0.70 mile east of BM81-2, 1.90 miles east along Leilani Blvd. Cemented on a road cut 25 feet south of the centerline of Leilani Blvd., 14 feet west of the centerline of Kupono St., and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "81-3".

BM81-4 0.55 mile east of BM81-3, 2.45 miles east along Leilani Blvd. Cemented on bedrock, 42 feet east of the centerline of Makamae St., 24 feet north of the centerline of Leilani Blvd. and 1 foot above the road level. Standard U.S.G.S. aluminum tablet stamped "81-4".

BMX 0.45 mile east of BM81-4, 2.90 miles east along Leilani Blvd. Cemented on bedrock, approximately 125 feet south of a paved drive way and pole #67, 34 feet southeast of the centerline of Leilani Blvd., and on the outside of a sharp bend in the road. Unstamped, non-standard bench mark used as part of a triangular array for determining tilt.

Note: 0.75 mile east of BMX, 3.65 miles east along Leilani Blvd.; Junction of Leilani Blvd., County road, and Geothermal plant on northeast side of road. Left turn goes to Pahoa, Right turn to Pohoiki.

LINE 13 (PAHOA/ KAPOHO JUNCTION TO POHOIKI)

BEGINNING FROM THE TOWN OF HILO, AT THE JUNCTIONS OF STATE HIGHWAY 19 (KAMEHAMEHA AVE.), STATE HIGHWAY 120 (KALANIANA'OLE), AND HIGHWAY 11 (KANOELEHUA AVE.), PROCEED SOUTH ALONG STATE HIGHWAY 11 FOR 7.25 MILES TO THE JUNCTION WITH HIGHWAY 130 AT THE TOWN OF KEAAU. FROM KEAAU, TAKE STATE HIGHWAY 130 SOUTHEAST FOR 11.60 MILES, PASSING THROUGH THE TOWN OF PAHOA UNTIL JUNCTION WITH STATE HIGHWAY 132 (JUST PAST THE SCHOOL). TAKE THE LEFT FORK AND CONTINUE FOR 2.9 MILES TO THE JUNCTION WITH POHOIKI ROAD.

- 145YY 0.85 mile southeast of 143YY. Bench mark is set on solid pahoehoe at the southeast corner of a triangle formed by highways 132 and the road to Pohoiki, 26 feet south of the centerline, and 15 feet east of pole #5. Standard U.S.G.S. aluminum tablet stamped "145YY 640 1958". Bench mark as been scraped and is hard to read stamping.
- 194YY 0.50 mile southeast of 145YY along Pohoiki road. Cemented on a 8 inch square concrete pier, 1.5 feet above ground level, on the south side of a triangular shaped rock wall, 42 feet north of a gravel driveway, 35 feet southwest of the centerline, and 6 feet west of the southeast corner of a stone wall. Standard U.S.G.S. aluminum tablet stamped "194YY 621 1958".
- HVO81-5 0.2 mile southeast of 196YY, 0.70 mile along Pohoiki road. Cemented on bedrock 6 inches above road level, approximately 100 feet north of a curve in the road, 28 feet north of a "ROAD CURVE" sign, and 17 feet southwest of the centerline. Standard U.S.G.S. aluminum tablet stamped "HVO81-5".
- Note: 0.30 mile southeast of HVO81-5, 1.00 mile along Pohoiki road, junction with Leilani Blvd; also Geothermal Power Plant.
- 196YY 0.35 mile southeast of HVO81-5, 1.35 miles along Pohoiki road. Cemented on bedrock at road level, 28 feet northeast of the centerline. Standard U.S.G.S. tablet stamped "196YY 1958".
- 197YY 0.30 mile southeast of 196YY, 1.65 miles along Pohoiki road. Cemented on bedrock, approximately 150 feet southwest of the centerline of Pohoiki road, 48 feet north of a "T" road, 20.5 feet northeast of the center of the old road, and 25 feet south of an aa lava flow. Standard U.S.G.S. aluminum tablet stamped "197YY 552 1958".
- 201YY 1.25 miles southeast of 197YY, 2.95 miles along Pohoiki road. Cemented on top of an 8 inch square concrete pier, 8 inches above ground level, approximately 100 feet north of cross roads, approximately 100 feet north of a "Curvy Road" sign, 24 feet southwest of the center of the road, and 4 feet south of a 6 inch diameter Ohia tree. Standard U.S.G.S. aluminum tablet stamped "201YY 364 1958".
- 202YY 0.95 mile southeast of 201YY, 3.90 miles along Pohoiki road. Cemented on top of an 8 inch square concrete pier, 0.5 foot above ground level, 21 feet northeast of the center of the road, and 14

feet west of a 36 inch diameter Mango tree. There are 3 large Mango trees with in 5 feet of each other. Standard U.S.G.S. aluminum tablet stamped "202YY 198 1958".

174YY 0.95 mile southeast of 202YY, 4.85 miles along Pohoiki road. Cemented in an 8 inch depression on the northeast side of the intersection of Kapoho, Kalapana, Pahoa junction, 18 feet northeast of the center of Pohoiki road, and 7.5 feet northwest of a 36 inch diameter Mango tree. Standard U.S.G.S. aluminum tablet stamped "174YY 37 1958". Stamping is very difficult to read.

LINE 14 (SW RIFT LEVEL (Great Crack))

BEGINNING AT THE TOWN OF HILO, AT THE JUNCTIONS OF STATE HIGHWAY 19 (KAMEHAMEAHA AVE.), STATE HIGHWAY 120 (KALANIANA'OLE AVE.), AND STATE HIGHWAY 11 (KANOELEHUA AVE.), PROCEED SOUTHWEST ALONG STATE HIGHWAY 11 FOR 38.65 MILES, TO THE SOUTH ENTRANCE OF HAWAII NATIONAL PARK. CONTINUE SOUTH ALONG STATE HIGHWAY 11 FOR 6.6 MILES, TO A ROAD GOING RIGHT (WEST), AND SIGN "KAPAPALA RANCH". TURN INTO RANCH ROAD AND CONTINUE ALONG ROAD FOR 0.1 MILE TO A SHARP TURN LEFT (SOUTH), CONTINUE 0.35 MILE TO THE INTERSECTION OF ROAD TO RANCH HEADQUARTERS ON RIGHT.

NOTE: Access to this level line is through the James Ranch property. Permission and key to the entrance gate should be obtained in advance from Mr. James.

BM1855 At intersection of old paved road and track road to Kapapala ranch, about 100 feet northeast of and west of paved road. Bench mark is set on top of a small mound of lava. Standard U.S.G.S. brass tablet stamped "1855".

TAG75-13 0.7 mile south along old volcano highway, then cross the main highway (Highway 11). Mark is a tagged nail set on a road cut on the southwest side of the highway, 10 feet southwest of the ranch road and the corrals. Mark is a "P-K" nail with an aluminum tag stamped "75-13".

TAG75-14 1,292 feet (All distance are from stadia readings) southeast of State Highway 11 along a jeep trail. Set on a tumulus 20 feet northeast of the jeep road just before going into a grassy area on ash. P-K nail with an aluminum tag stamped "75-14".

TAG75-15 914 feet east of TAG75-14, 2,206 feet east of State Highway 11 along the jeep trail. Set on bedrock, southwest of the trail, before rounding a large tumulus. P-K nail with aluminum an tag stamped "75-15".

TAG75-16 1,004 feet southeast of TAG75-15, on southwest edge of silver oak grove, 3,210 feet southeast of State Highway 11 along the jeep trail, just beyond the top of a rise through the grove. P-K nail with an aluminum tag stamped "75-16".

- TAG75-17 1,680 feet southeast of TAG75-16, 4,890 feet southeast of State Highway 11 along the jeep trail. Set on a 1.5 feet by 3 feet diameter rise at the northeast edge of the trail. P-K nail with an aluminum tag stamped "75-17".
- TAG75-18 1,502 feet southeast of TAG75-17, 6,392 feet southeast of State Highway 11 along the jeep trail. Set on the southwest side of the trail just before the grassy flats at Nahaha and right after an impressive 4 feet drop in trail. P-K nail with an aluminum tag stamped "75-19".
- TAG75-19 1,088 feet southeast of TAG75-18, 7,480 feet southeast of State Highway 11 along the jeep trail. Set on the southwest side of the road at the first major left after crossing the flats at Nahaha. P-K nail with an aluminum tag stamped "75-19".
- TAG75-20 960 feet southeast of TAG75-19, 8,440 feet southeast of State Highway 11 along the jeep trail. Set on the east side of the trail. P-K nail with an aluminum tag stamped "75-20".
- TAG75-21 830 feet southeast of TAG75-20, 9,270 feet southeast of State Highway 11 along the jeep trail. Set on the west edge of the trail near a rock cairn. P-K nail with an aluminum tag stamped "75-21".
- NOTE: Between TAG75-21 and TAG75-22 the road forks. Take the left (north) fork.
- TAG75-22 1,044 feet beyond TAG75-21, 10,314 feet southeast of State Highway 11 along the jeep trail. Set on the east side of the trail just below last steep 30 feet rise in trail and 200 feet before the Great Crack crossover. P-K nail with an aluminum tag stamped "75-22".
- TAG75-23 1,126 feet northeast of TAG75-22, 11,440 feet southeast of State Highway 11 along the jeep trail. Set on the south side of the trail, 200 feet south of a fence line and the National Park boundry. P-K nail with an aluminum tag stamped "75-23".
- TAG75-24 1,064 feet east of TAG75-23, 12,504 feet southeast of State Highway 11 along the jeep trail. Set 3 feet south of the trail, just pass a lone Ohia tree, over a rise south of the National Park boundry. P-K nail with an aluminum tag stamped "75-24".
- TAG75-25 1,342 feet southwest of TAG75-24, 13,846 feet southeast of State Highway 11 along the jeep trail. Set on the south edge of the road next to a rock cairn 150 feet beyond the south end of the first aa lobe. P-K nail with an aluminum tag stamped "75-25".
- BM1471 381 feet southeast of TAG75-25, 14,227 feet southeast of State Highway 11 along the jeep trail. Cemented on the south side of the trail at the beginning of a rise beyond TAG75-25. Standard U.S.G.S. brass tablet stamped "1471".
- TAG75-26 1,364 feet southeast of BM1471, 15,591 feet southeast of State

Highway 11 along the jeep trail, cross aa flow then turn left, then turn right. Mark is set approximately 175 feet north of the trail and 20 feet northwest of an old barrel. P-K nail with an aluminum tag stamped "75-26".

TAG75-27 616 feet southeast of TAG75-26, 16,207 feet southeast of State Highway 11 along the jeep trail. Set 10 feet south of the trail by a rock cairn and a lantana bush, 45 feet down the first drop past TAG75-26. P-K nail with an aluminum tag stamped "75-27".

TAG75-28 430 feet southeast of TAG75-27, 16,637 feet southeast of State Highway 11 along the jeep trail. Set on the south side of the trail by a rock cairn. P-K nail with an aluminum tag stamped "75-28".

TAG75-29 Not found, stadia indicates it should be 596 feet beyond TAG75-28.

TAG75-30 1,319 feet southeast of TAG75-28, 17,956 feet southeast of State Highway 11 along the jeep trail. Set 40 feet north of the trail and a rock cairn, opposite two large tumuli south of the trail. P-K nail with an aluminum tag stamped "75-30".

TAG75-31 928 feet east of TAG75-30, 18,884 feet southeast of State Highway 11 along the jeep trail. Set 40 feet south of the trail on a small rise near a rock cairn. P-K nail with an aluminum tag stamped "75-31".

Note: The jeep trail ends. The rest of the line is on a foot trail.

TAG75-32 1,126 feet east of TAG75-31, 20,010 feet southeast of State Highway 11 along the trail and at the end of the jeep trail. P-K nail with an aluminum tag stamped "75-32".

BM1250 922 feet east of TAG75-32, 20,932 feet southeast of State Highway 11 along the trail. Cemented on the south side of the foot trail. Brass nail with washer stamped "1250".

TAG75-33 1,006 feet east of BM1250, 21,938 feet southeast of State Highway 11 along the trail. Set on clear pahoehoe south of the trail, about 60 feet north of a subtle gulch. P-K nail with an aluminum tag stamped "75-33".

TAG75-34 910 feet east of TAG75-33, 22,848 feet southeast of State Highway 11 along the trail. Set on the north side of the trail and a small rock cairn. A nondescript area. P-K nail with an aluminum tag stamped "75-34".

TAG75-35 1,204 feet east of TAG75-34, 24,052 feet southeast of State Highway 11 along the trail. Set on top of an obvious tumulus with a rock cairn, 45 feet north of the trail and 210 feet west of the aa contact. P-K nail with aluminum tag stamped "75-35".

TAG75-36 724 feet east of TAG75-35, 24,776 feet southeast of State Highway 11 along the trail. Set in the center of an older aa ridge with a rock cairn, 210 feet west of younger aa. P-K nail with an aluminum tag stamped "75-36".

- TAG75-37 662 feet east of TAG75-36, 25,438 feet southeast of State Highway 11 along the trail. Set 1.5 feet north of the trail with a rock cairn, midway between two pahoehoe fingers on the east edge and south of two older aa kipukas. P-K nail with an aluminum tag stamped "75-37".
- TAG75-38 544 feet east of TAG75-37, 25,982 feet southeast of State Highway 11 along the trail. Set in the middle of the trail with a rock cairn, on a pahoehoe chute in a younger aa flow. P-K nail with an aluminum tag stamped "75-38".
- TAG75-39 510 feet east of TAG75-38, 26,492 feet southeast of State Highway 11 along the trail. Set on the north edge of the trail, 120 feet west of a pahoehoe kipuka in the trail. P-K nail with an aluminum tag stamped "75-39".
- TAG75-40 940 feet east of TAG75-39, 27,432 feet southeast of State Highway 11 along the trail. Set on a tumulus with an ahu, on the south side of the trail, 150 feet east of a young aa flow. P-K nail with an aluminum tag stamped "75-40".
- BM1027 736 feet east of TAG75-40, 28,168 feet southeast of State Highway 11 along the trail. Cemented on the north side of the trail with a rock cairn, on an east trending low narrow tumulus, 240 feet east of the west contact of young black pahoehoe. Standard U.S.G.S. brass tablet stamped "1027".
- TAG75-41 540 feet east of BM1027, 28,708 feet southeast of State Highway 11 along the trail. Set on the north side of the trail 90 feet west of the first main gulch east of BM1027; gulch has two 15-25 feet diameter kipukas on the north side of the trail. P-K nail with an aluminum tag stamped "75-41".
- TAG75-42 728 feet east of TAG75-41, 29,436 feet southeast of State Highway 11 along the trail. Set on the north side of the trail with a rock cairn, and at the west end of an intraflow aa lobe terminus. P-K nail with an aluminum tag stamped "75-42".
- TAG75-43 638 feet east of TAG75-42, 30,074 feet southeast of State Highway 11 along the trail. Set on the north side of the trail, 300 feet west of the east edge of a young pahoehoe flow, at the top of a ropy pahoehoe channel. P-K nail with an aluminum tag stamped "75-43".
- TAG75-44 462 feet east of TAG75-43, 30,536 feet southeast of State Highway 11 along the trail. Set 60 feet west of the east edge of young pahoehoe, 1/2 way between two closely growing Ohias and a single Ohia on the south side. P-K nail with an aluminum tag stamped "75-44".
- TAG75-45 602 feet east of TAG75-44, 31,138 feet southeast of State Highway 11 along the trail. Set near a small ahu 15 feet north of a large rock cairn, by an old Hawaiian house. Near a large petroglyph field. P-K nail with an aluminum tag stamped "75-45".
- TAG75-46 722 feet east of and on a bearing of 111° from TAG75-45, 31,860 feet

southeast of State Highway 11 along the trail. Set on young pahoe-hoe lavas 6 feet north of the trail. P-K nail with an aluminum tag stamped "75-46".

- TAG75-47 350 feet east of and on a bearing of 122° from TAG75-46, 32,210 feet southeast of State Highway 11 along the trail. Set 9 feet north of the trail, 1.5 feet west of a large ahu and east of young pahoe-hoe lavas. P-K nail with an aluminum tag stamped "75-47".
- TAG75-48 300 feet east of and on a bearing of 122° from TAG75-47, 32,510 feet southeast of State Highway 11 along the trail. Set 27 feet south of the trail, at a break in slope on south side of a sand patch. P-K nail with an aluminum tag stamped "75-48".
- TAG75-49 488 feet east of and on a bearing of 101° from TAG75-48, 32,998 feet southeast of State Highway 11 along the trail. Set 8 feet south of the trail and 90 feet west of the terminus of the middle lobe of the flow. P-K nail with an aluminum tag stamped "75-50".
- TAG75-51 498 feet east of and on a bearing of 81° from TAG75-49, 33,496 feet southeast of State Highway 11 along the trail. Set in the center of the trail, 90 feet east of the east lobe of an aa flow. P-K nail with an aluminum tag stamped "75-51".
- BM540 538 feet east of and on a bearing of 72° from TAG75-51, 34,034 feet southeast of State Highway 11 along the trail. Cemented 8 feet north of the trail and west of 2 ahu's. Standard U.S.G.S. brass tablet stamped "540".
- TAG76-2 496 feet east of and on a bearing of 77° from BM540, 34,530 feet southeast of State Highway 11 along the trail. Set 18 feet south of the trail near a large ahu and 60 feet west of a goat fence. P-K nail with an aluminum tag stamped "76-2".
- TAG76-3 666 feet east of and on a bearing of 65° from TAG6-2, 35,196 feet southeast of State Highway 11 along the trail. The level line leaves the trail to the north, following yellow paint spots. P-K nail with an aluminum tag stamped "76-3".
- TAG76-4 896 feet east of and on a bearing of 74° from TAG76-3, 36,092 feet southeast of State Highway 11. There is an ahu 6 feet north of the tag nail and a fence 24 feet north of the nail. Nail is south of an aa flow on the pali. P-K nail with an aluminum tag stamped "76-4".
- TAG76-5 942 feet east of and on a bearing of 74° from TAG76-4, 37,034 feet southeast of State Highway 11. There is a large rock cairn next to the nail. P-K nail with an aluminum tag stamped "76-4".
- TAG75-6 982 feet northeast of and on a bearing of 74° from TAG76-5, 38,016 feet south of State Highway 11. Nail is near a large rock cairn 150 feet south of a draped aa terminus. P-K nail with an aluminum tag stamped "76-6".
- BM280 874 feet northeast of and on a bearing of 59° from TAG76-6, 38,890

feet southeast of State Highway 11. Bench mark is cemented on a tumulus with a wooden cross.

Note: The following bench mark descriptions are for a spur line to bench mark "NALI".

- TAG76-14 Approximately 900 feet due south of TAG76-3, 36,096 feet southeast of State Highway 11. There is a large rock cairn next to the nail. P-K nail with an aluminum tag stamped "76-14".
- TAG76-13 1,326 feet south of and on a bearing of 178° from TAG76-14, 37,422 feet southeast of State Highway 11. The nail is N50°E of terminus of an aa finger. P-K nail with an aluminum tag stamped "76-13".
- TAG76-12 1,236 feet southwest of and on a bearing of 157° from TAG76-13, 38,658 feet southeast of State Highway 11. Nail is east of an obvious smooth lava channel and 150 feet north of an obvious jagged tumulus. P-K nail with an aluminum tag stamped "76-12".
- TAG76-11 1,336 feet southwest of and on a bearing of 156° from TAG76-12, 39,994 feet southeast of State Highway 11. Nail is on a tumulus, not the highest in the area. There is a round kipuka 150-200 feet south of this nail. P-K nail with an aluminum tag stamped "76-11".
- TAG76-10 1,272 feet southwest of and on a bearing of 160° from TAG76-11, 41,266 feet southeast of State Highway 11. Nail is at the north edge of a grassy kipuka. P-K nail with an aluminum tag stamped "76-10".
- TAG76-9 1,126 feet southwest of and on a bearing of 157° from TAG76-9, 42,392 feet southeast of State Highway 11. Nail is on an obvious ragged tumulus, near a rock cairn and a small lava tube skylights 90 feet north, and 30 feet west of nail. P-K nail with an aluminum tag Stamped "76-9".
- TAG76-8 1,080 feet southwest of and on a bearing of 161° from TAG76-9, 43,472 feet southeast of State Highway 11. There is a rock cairn north of a pressure ridge and east of a rough black lava patch. P-K nail with an aluminum tag stamped "76-8".
- TAG76-7 1,346 feet southwest of and on a bearing of 162° from TAG76-8, 44,818 feet southeast of State Highway 11. Nail is set on pahoehoe on the north side of a pressure ridge. P-K nail with an aluminum tag stamped "76-7".
- NALI 1,320 feet southwest of and on a bearing of 164° of TAG76-7, 46,138 feet southeast of State Highway 11. Bench mark is on a prominent tumulus with a wooden cross marker.

Figure 1

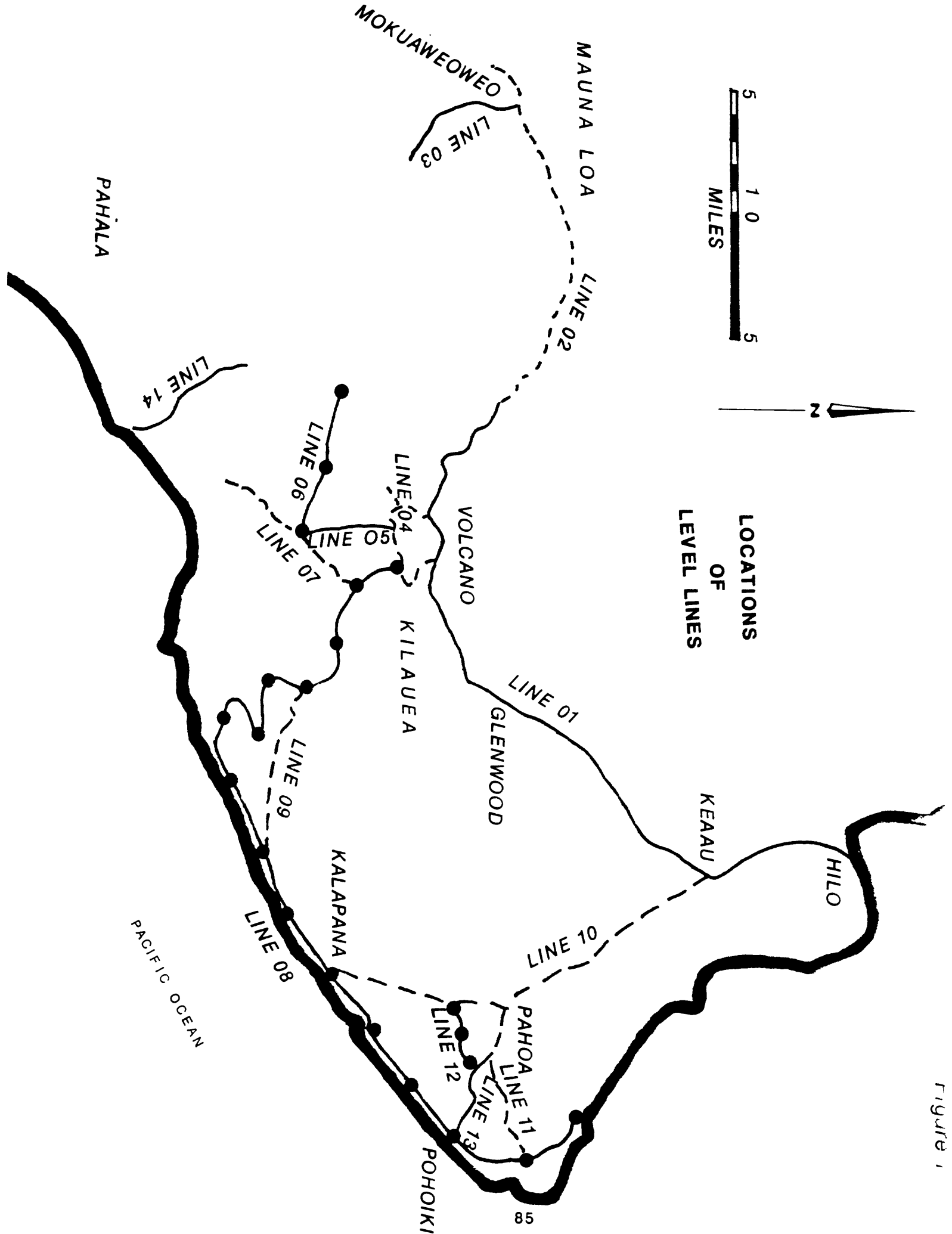


Figure 2

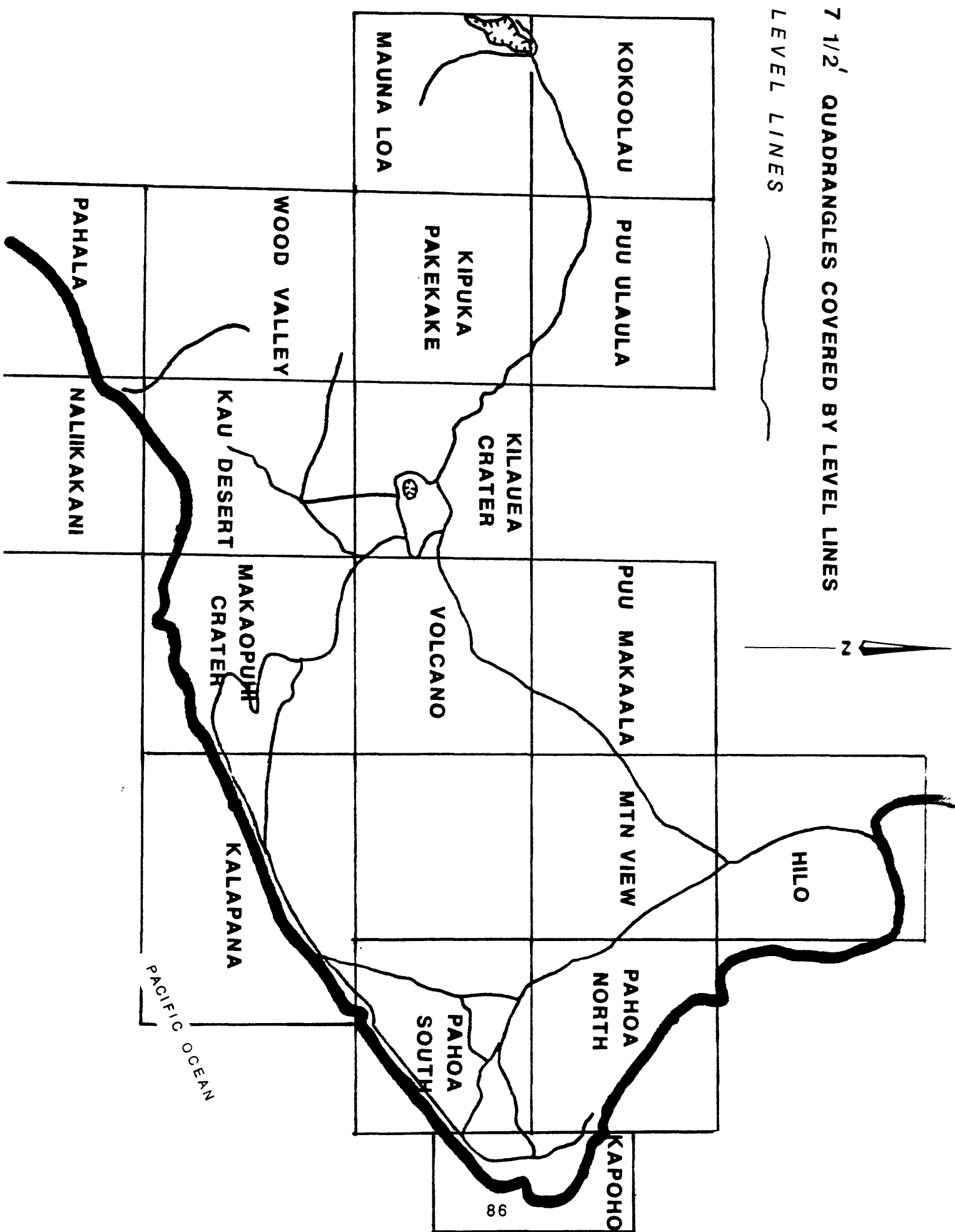
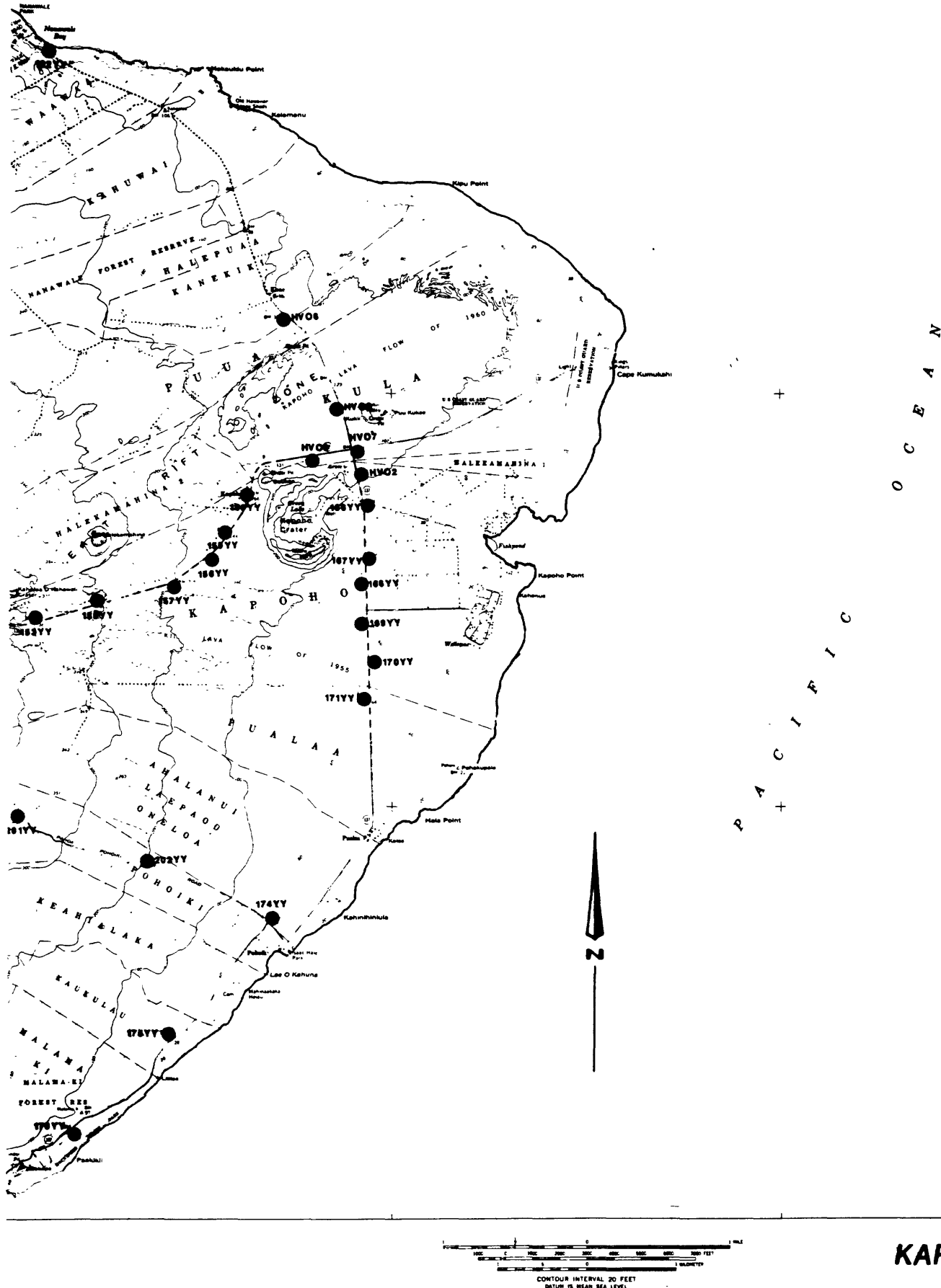
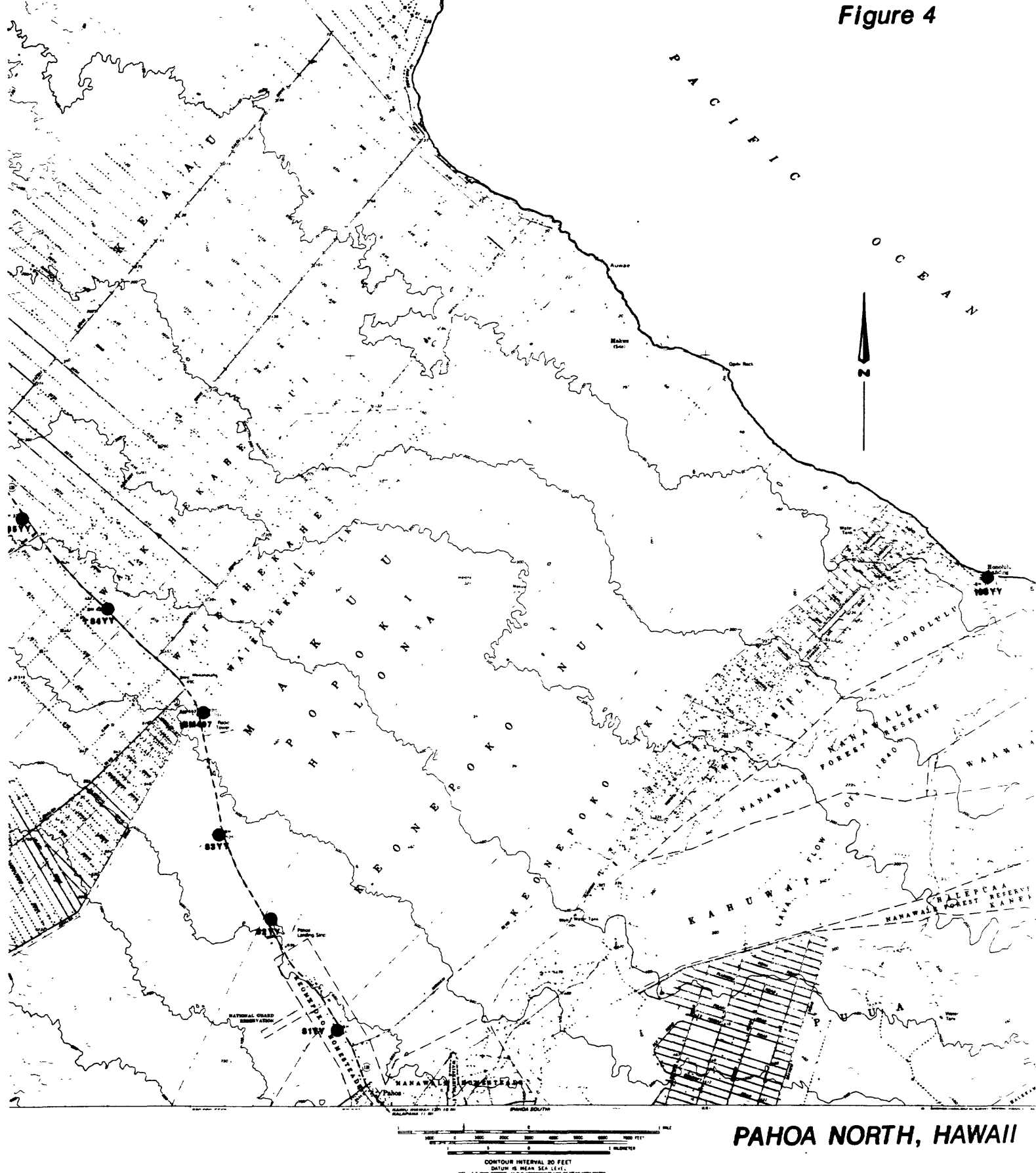


Figure 3



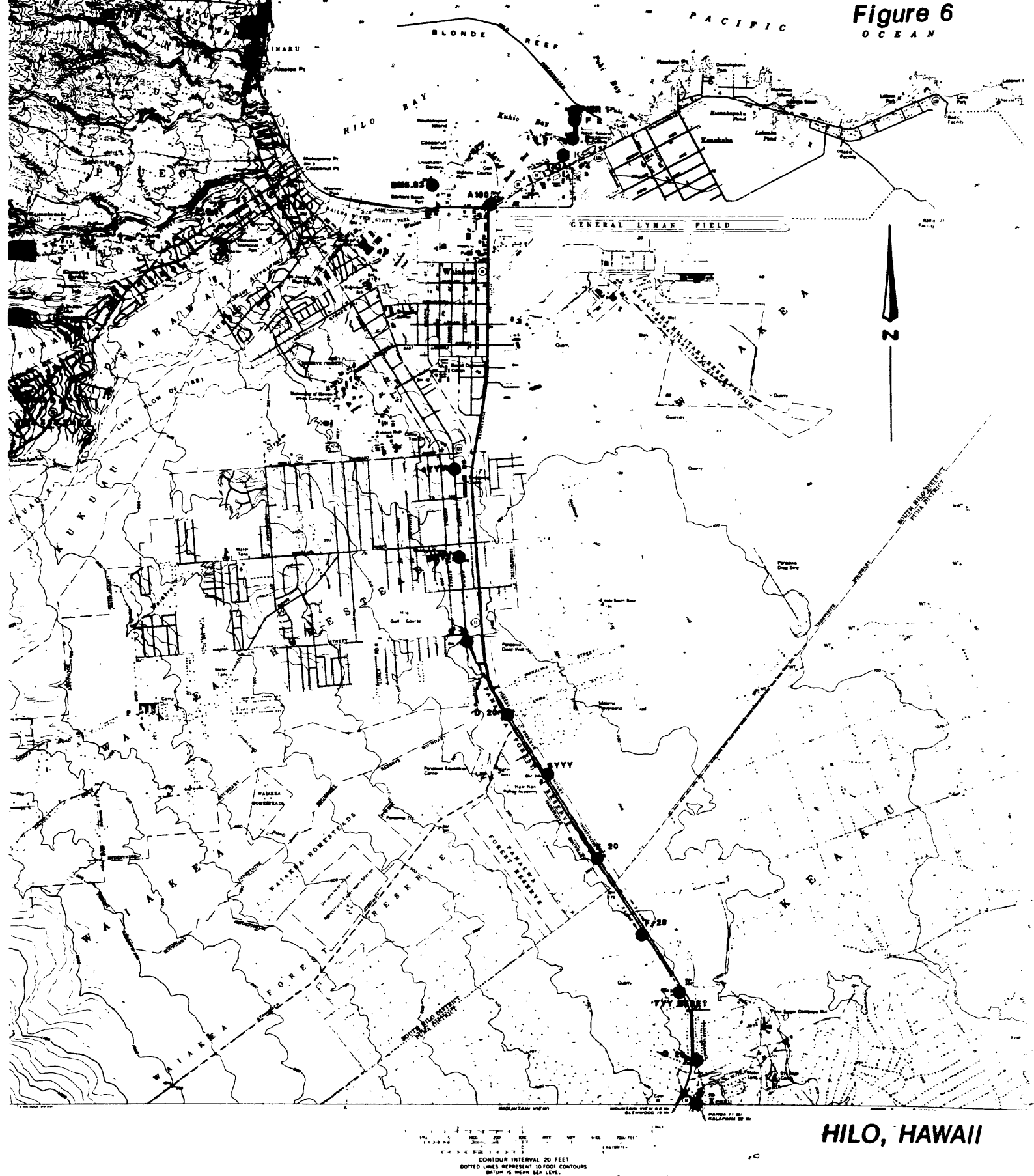
Kapoho, Hawaii 7 1/2' topographic quadrangle showing level benchmarks. Latitude of lower right hand corner is 19° 26' and Longitude is 155° 45'. Latitude of upper left hand corner is 19° 33' 30" and Longitude is 155° 52' 30".

Figure 4



Pahoa North, Hawaii $7\frac{1}{2}$ topographic quadrangle showing level benchmarks.
 Latitude of lower right hand corner is $19^{\circ} 30'$ and Longitude is $155^{\circ} 52' 30''$.
 Latitude of upper left hand corner is $19^{\circ} 37' 30''$ and Longitude is $155^{\circ} 00'$.

Figure 6
OCEAN



Hilo, Hawaii 7 1/2' topographic quadrangle showing level benchmarks. Latitude of lower right hand corner is 19° 37' 30" and Longitude is 155° 00'. Latitude of upper left hand corner is 19° 45" and Longitude is 155° 07' 30" .

KALAPANA, HAWAII

Kalapana, Hawaii $7\frac{1}{2}$ topographic quadrangle showing level benchmarks.
 Latitude of lower right hand corner is $19^{\circ} 16' 30''$ and Longitude is $154^{\circ} 57' 30''$. Latitude of upper left hand corner is $19^{\circ} 22' 30''$ and Longitude is $155^{\circ} 07' 30''$.

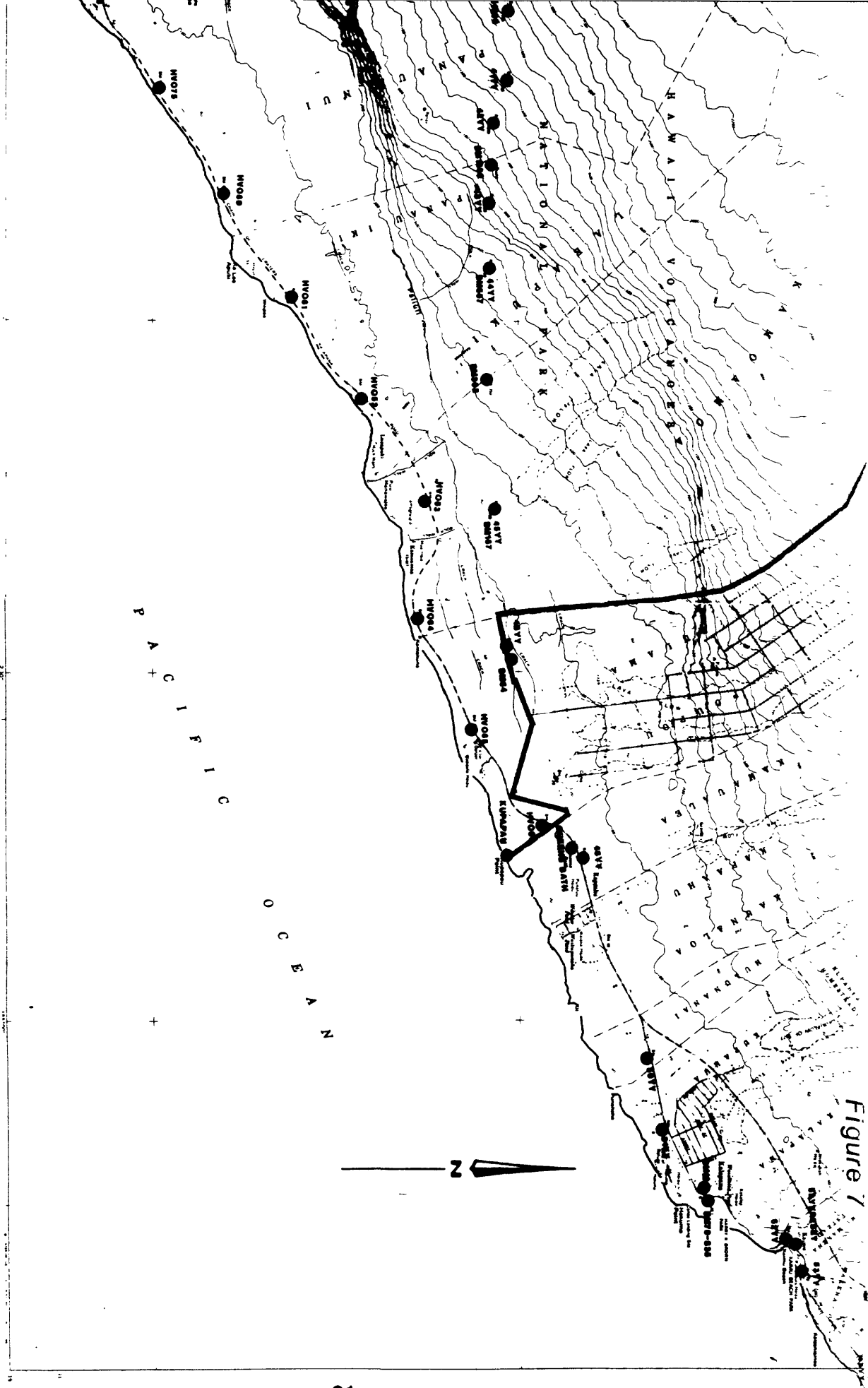


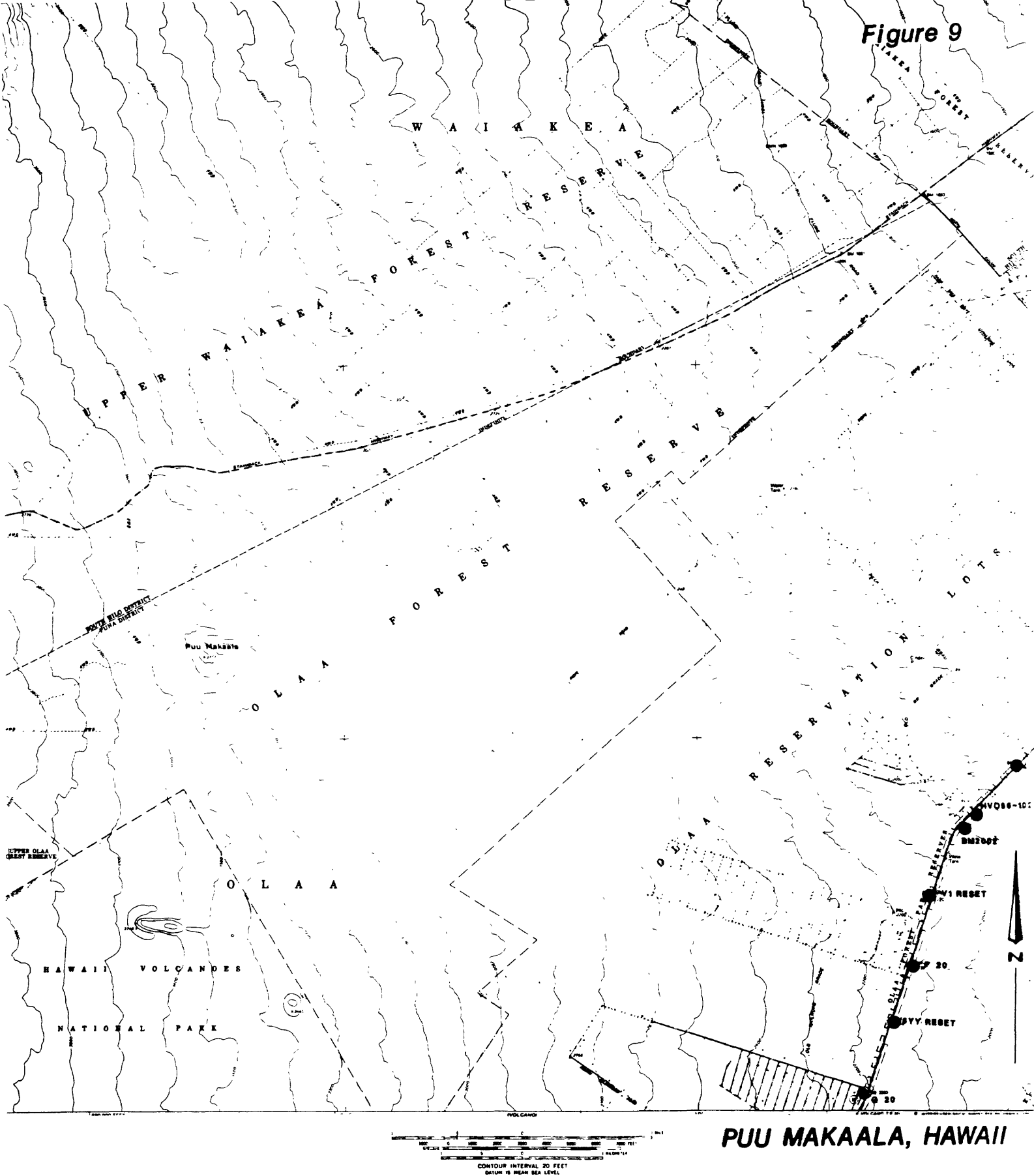
Figure 8



MOUNTAIN VIEW, HAWAII

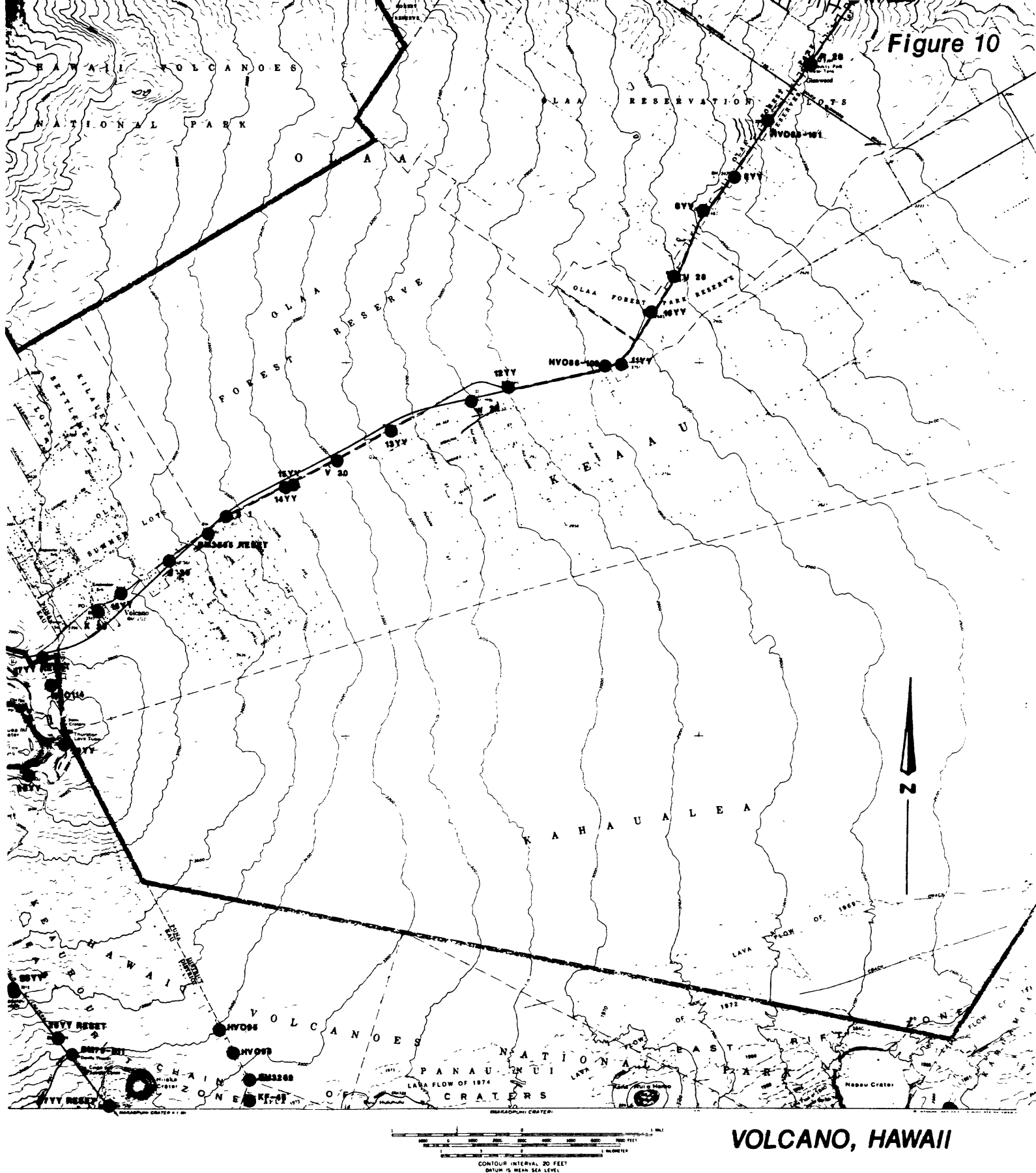
Mountain View, Hawaii 7 1/2 topographic quadrangle showing level benchmarks.
 Latitude of lower right hand corner is 19° 30' and Longitude is 155° 00'.
 Latitude of upper left hand corner is 19° 37' 30" and Longitude is 155° 07' 30".

Figure 9



Puu Makaala, Hawaii 7 1/2 topographic quadrangle showing level benchmarks.
 Latitude of lower right hand corner is 19° 30' and Longitude is 155° 07' 30".
 Latitude of upper left hand corner is 19° 37' 30" and Longitude is 155° 15'.

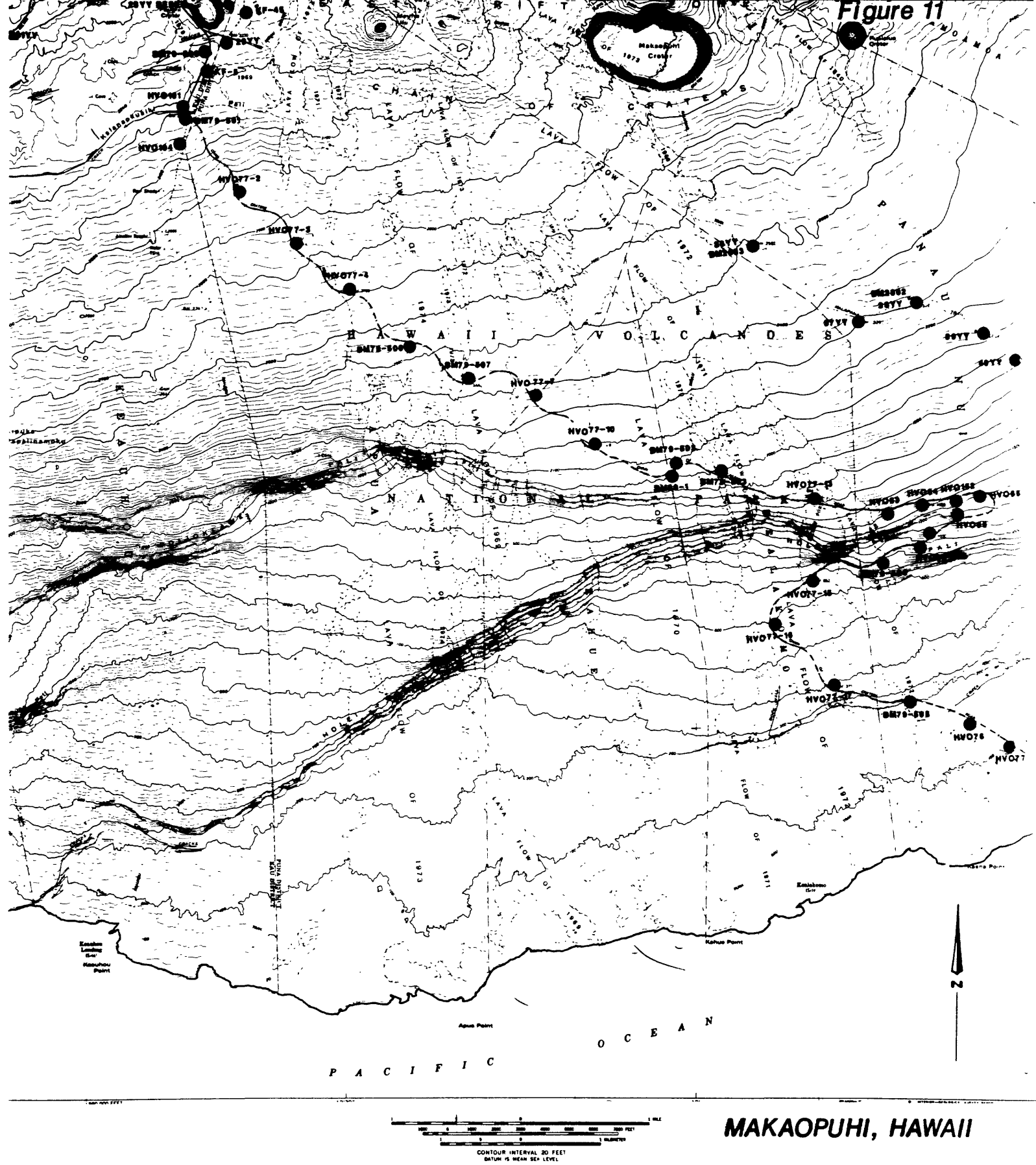
Figure 10



VOLCANO, HAWAII

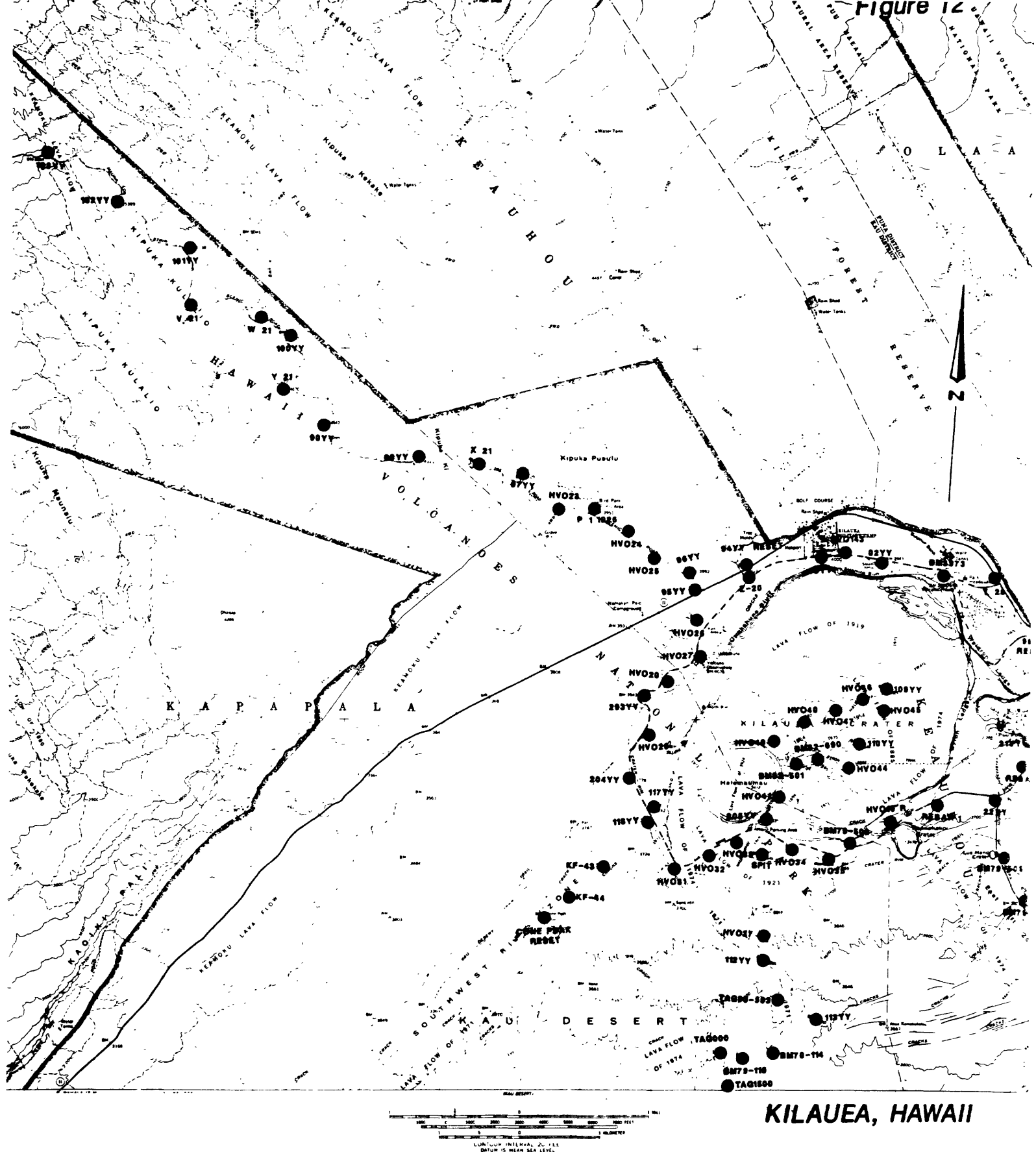
Volcano, Hawaii $7\frac{1}{2}$ ' topographic quadrangle showing level benchmarks. Latitude of lower right hand corner is $19^{\circ} 22' 30''$ and Longitude is $155^{\circ} 07' 30''$. Latitude of upper left hand corner is $19^{\circ} 30'$ and Longitude is $155^{\circ} 15'$.

Figure 11



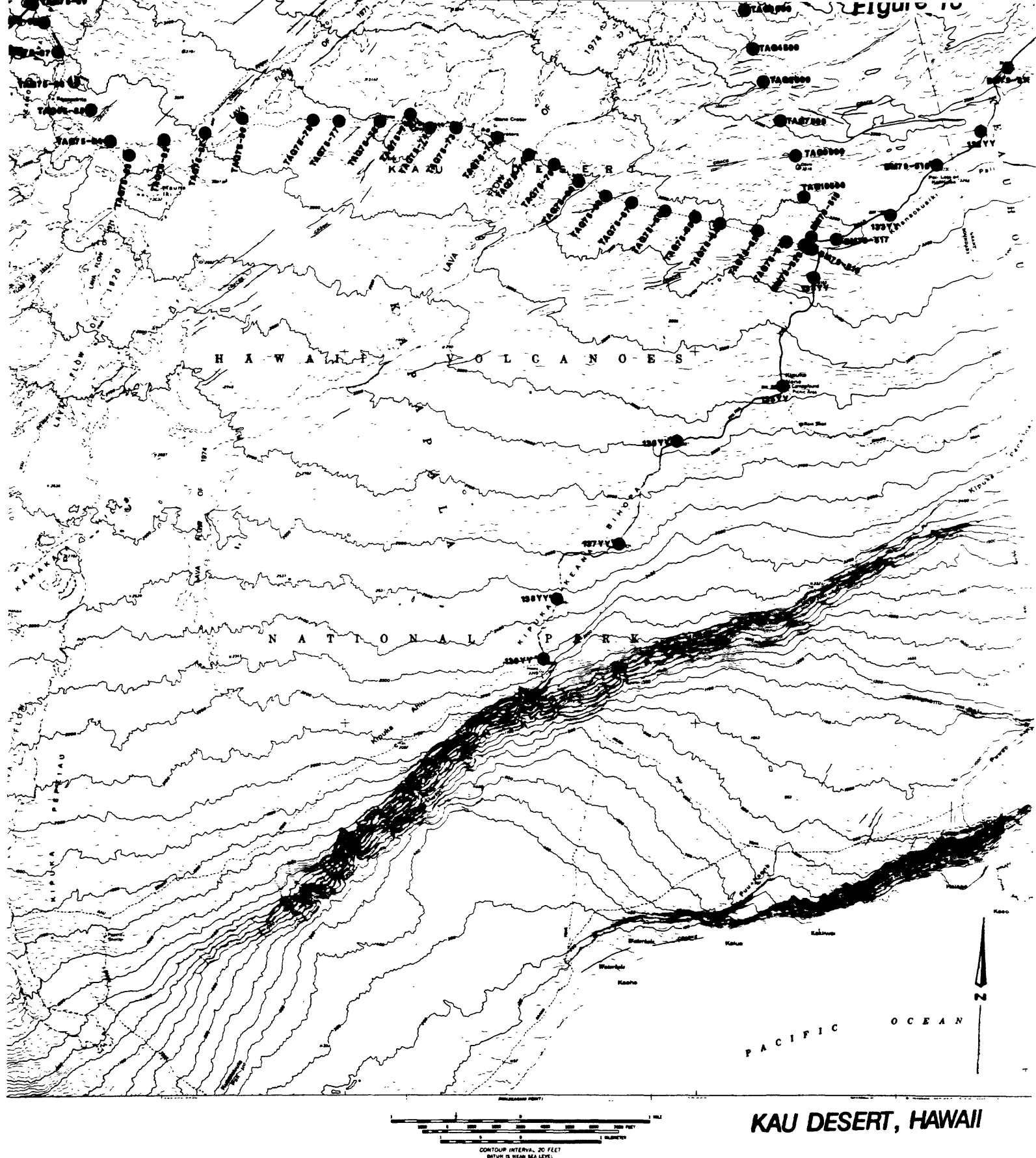
Makaopuhi Crater, Hawaii $7\frac{1}{2}$ ' topographic quadrangle showing level benchmarks. Latitude of lower right hand corner is $19^{\circ} 15'$ and Longitude is $155^{\circ} 07' 30''$. Latitude of upper left hand corner is $19^{\circ} 22' 30''$ and Longitude is $155^{\circ} 15'$.

Figure 12



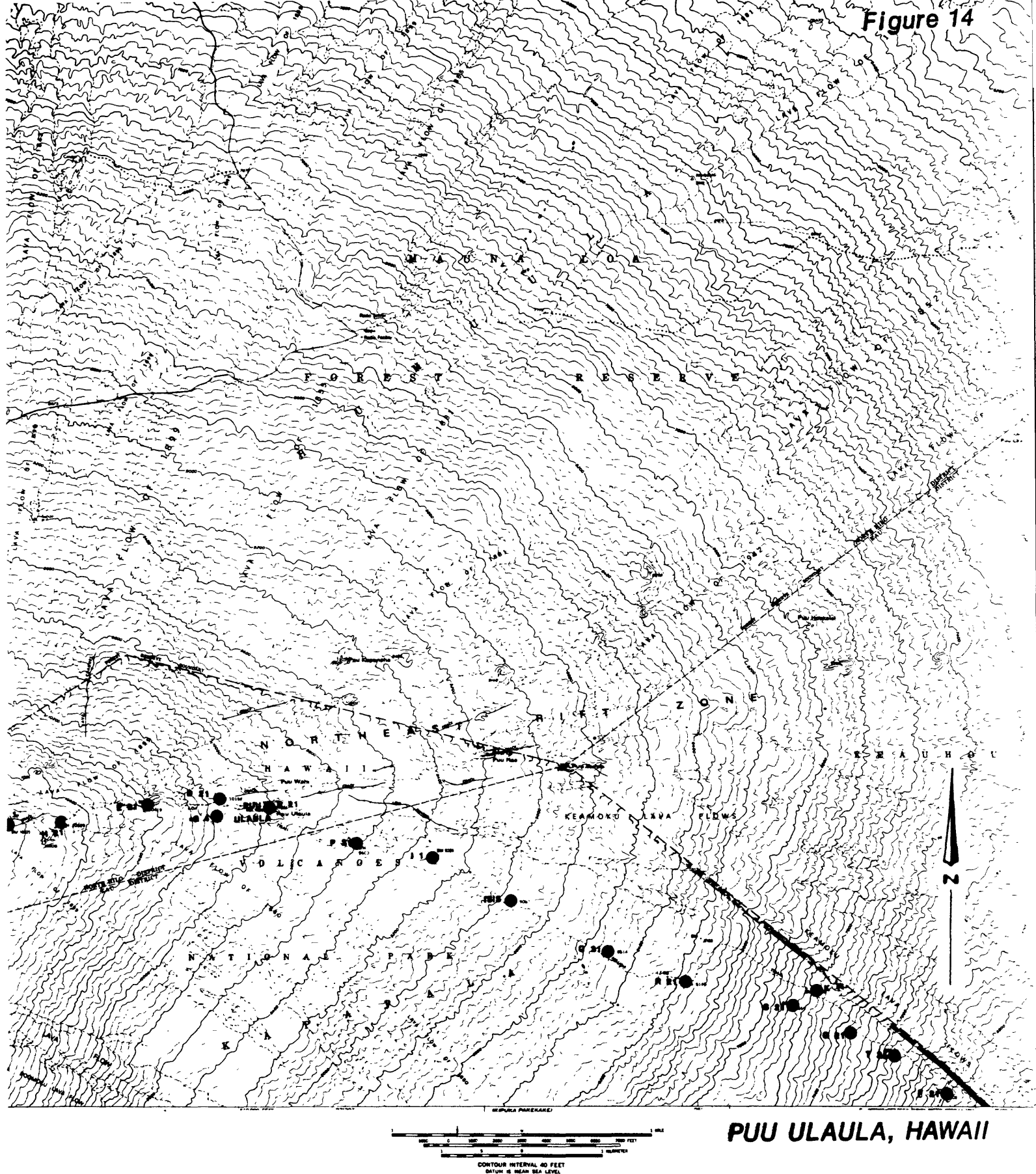
KILAUEA, HAWAII

Kilauea, Hawaii 7 1/2 topographic quadrangle showing level benchmarks. Latitude of lower right hand corner is 19° 15' 19" and Longitude is 155° 15'. Latitude of upper left hand corner is 19° 30' and Longitude is 155° 20' 30"



Kau Desert, Hawaii 7 1/2 topographic quadrangle showing level benchmarks.
 Latitude of lower right hand corner is 19° 15' and Longitude is 155° 15'.
 Latitude of upper left hand corner is 19° 22' 30" and Longitude is 155° 15'.

Figure 14



PUU ULAULA, HAWAII

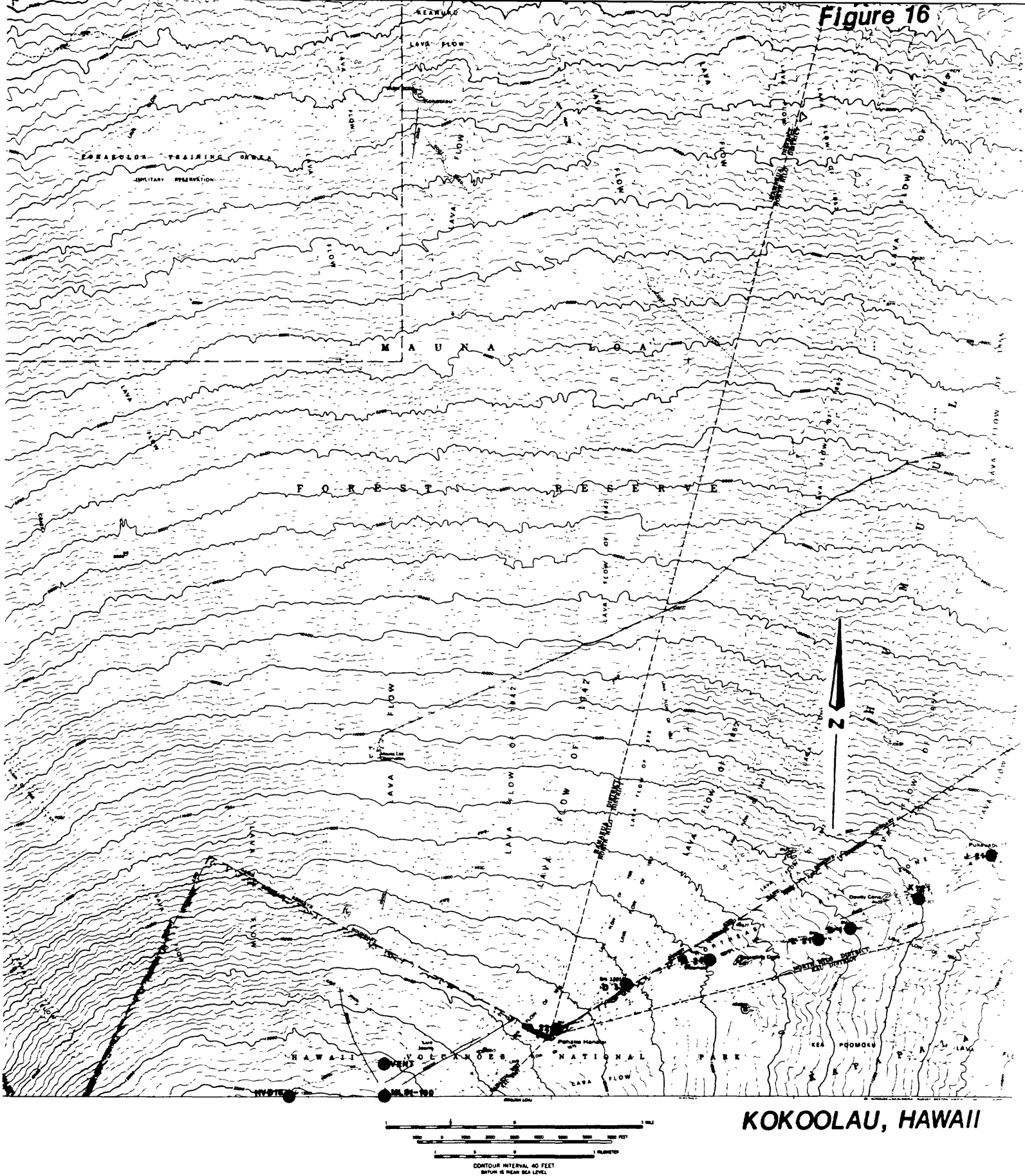
Puu Ulaula, Hawaii $7\frac{1}{2}$ topographic quadrangle showing level benchmarks.
 Latitude of lower right hand corner is $19^{\circ} 30'$ and Longitude is $155^{\circ} 22' 30''$.
 Latitude of upper left hand corner is $19^{\circ} 37' 30''$ and Longitude is $155^{\circ} 30'$.

This topographic map, labeled 'Figure 15', depicts the Kapaemahu Forest Reserve and surrounding areas in Hawaii. The map is characterized by numerous contour lines indicating elevation. Key geographical features include several large lava flows, such as the 'KE A POONOKU LAVA FLOW' and 'KAPAPA LAVA FLOW'. The 'KAPAEMAHU FOREST RESERVE' is clearly delineated by a boundary line. Other labeled areas include 'HAWAII VOLCANOES NATIONAL PARK' and 'KAPAPA LA'. The map also shows various roads, including 'Hwy 1' and 'Hwy 2', and specific locations like 'ANIPERHI' and 'KAPAPA LA'. A north arrow is positioned in the lower right corner, pointing towards the top of the map. The overall terrain is rugged and mountainous.

CONTOUR INTERVAL 40 FEET
 DATUM IS MEAN SEA LEVEL

99

Figure 16



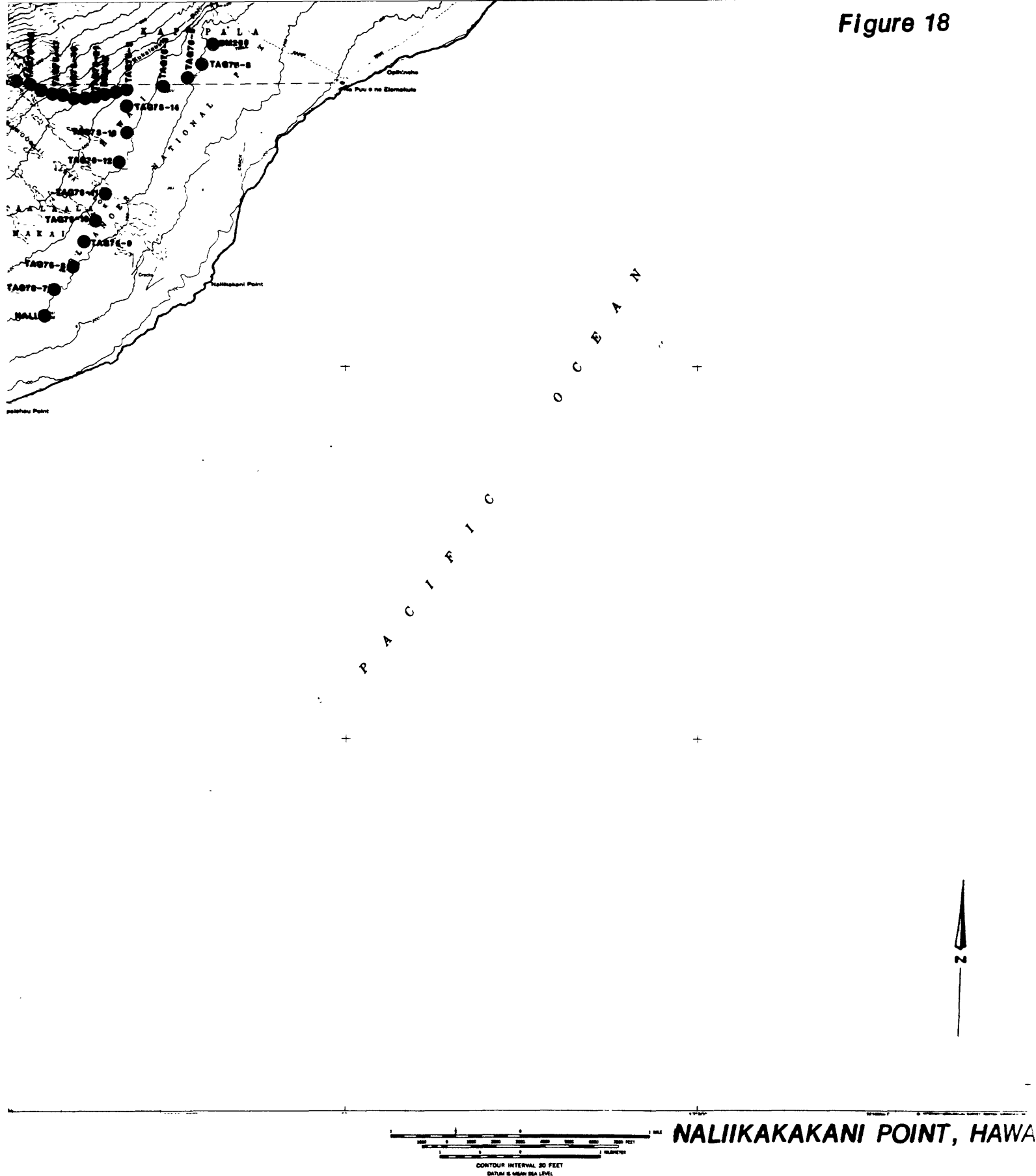
KOKOOLAU, HAWAII

Kokoolau, Hawaii 7 1/2 topographic quadrangle showing level benchmarks.
 Latitude of lower right hand corner is 19° 30' and Longitude is 155° 30'.
 Latitude of upper left hand corner is 19° 37' 30" and Longitude is 155° 37' 30".

CONTOUR INTERVAL 40 FEET

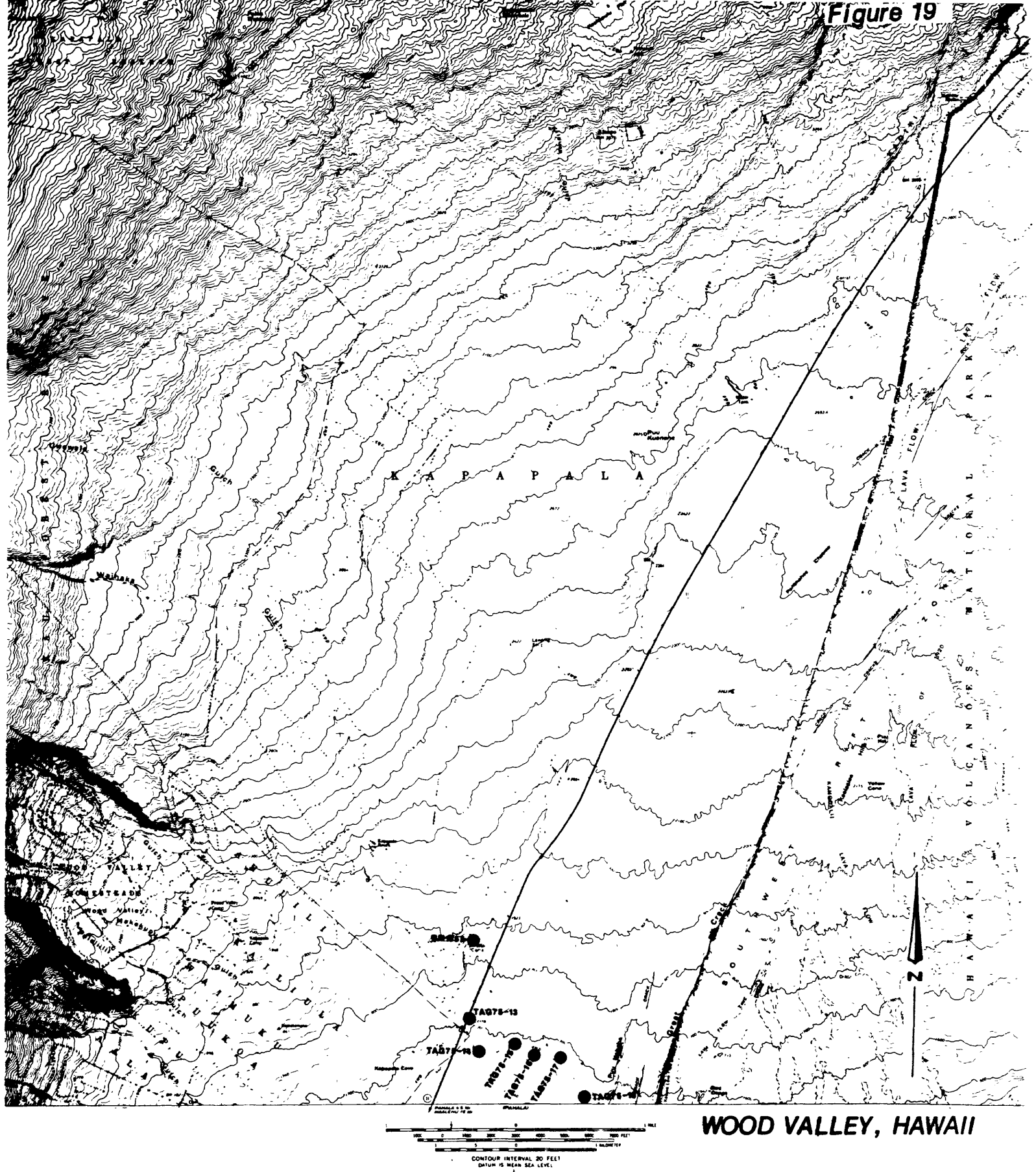
101

Figure 18



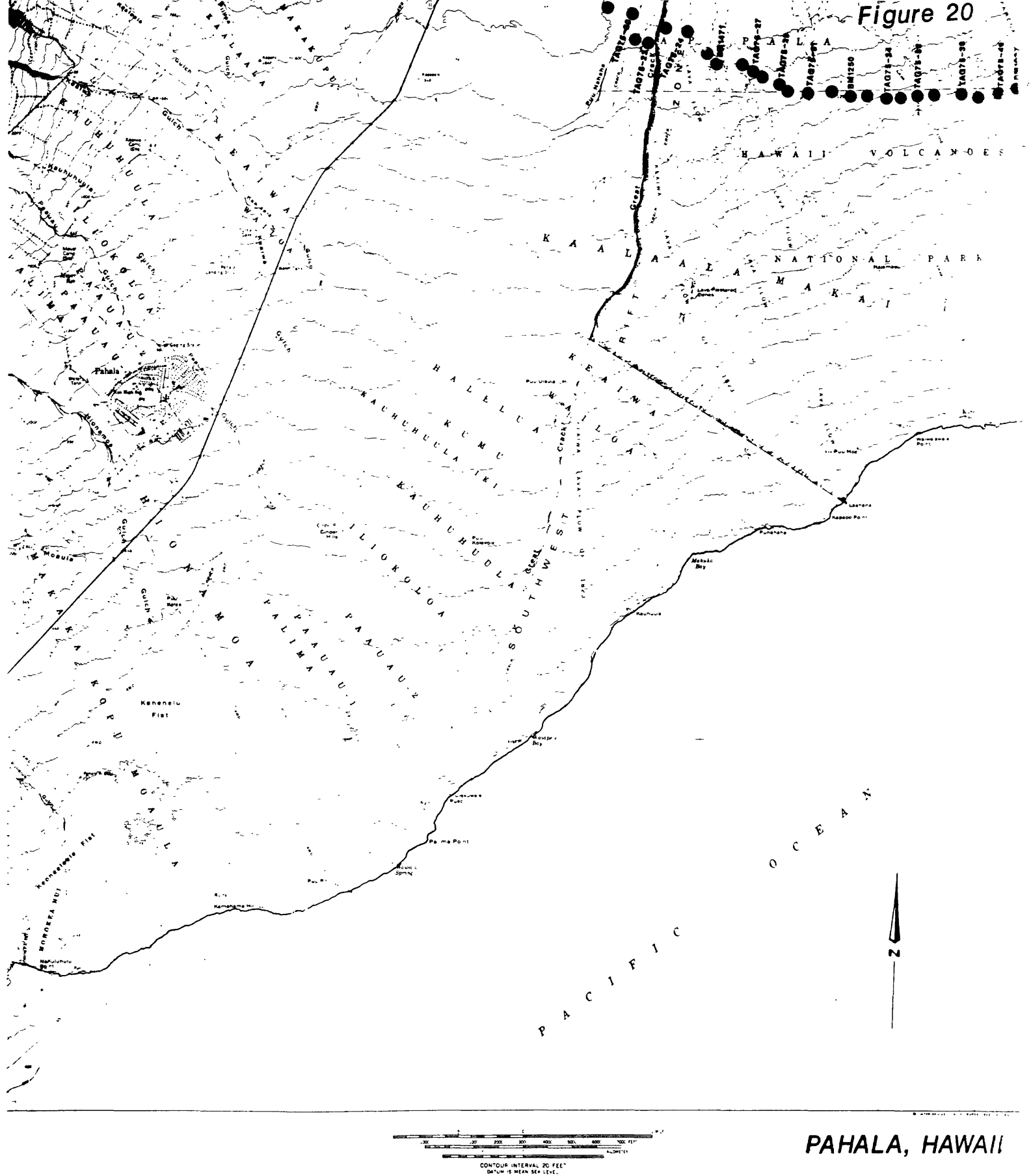
Naliikakakani Point, Hawaii $7\frac{1}{2}'$ topographic quadrangle showing level benchmarks. Latitude of lower right hand corner is $19^{\circ} 07' 30''$ and Longitude is $155^{\circ} 15'$. Latitude of upper left hand corner is $19^{\circ} 15'$ and Longitude is $155^{\circ} 22' 30''$.

Figure 19



Wood Valley, Hawaii $7\frac{1}{2}$ topographic quadrangle showing level benchmarks.
 Latitude of lower right hand corner is $19^{\circ} 15'$ and Longitude is $155^{\circ} 22' 30''$.
 Latitude of upper left hand corner is $19^{\circ} 22' 30''$ and Longitude is $155^{\circ} 30'$.

Figure 20



Pahala, Hawaii 7 1/2 topographic quadrangle showing level benchmarks. Latitude of lower right hand corner is 19° 07' 30" and Longitude is 155° 22' 30". Latitude of upper left hand corner is 19° 15' and Longitude is 155° 30'.