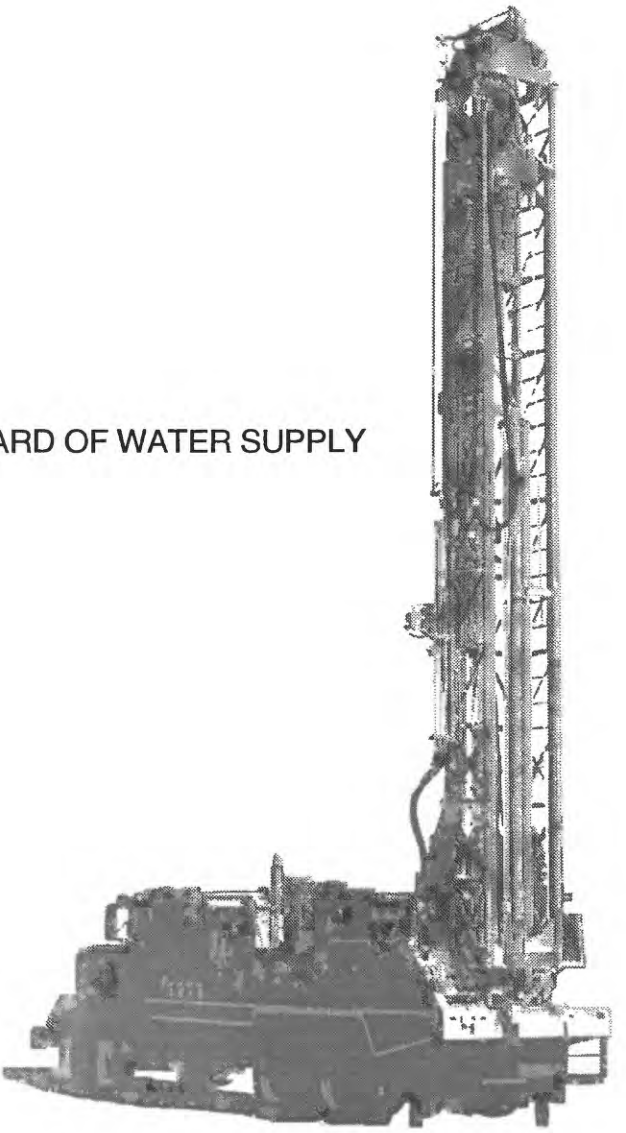
DRILLING, CONSTRUCTION, CALIPER-LOG, AND SPECIFIC-CONDUCTANCE DATA FOR WELL 3-3406-12, TWIN BRIDGE ROAD DEEP MONITOR WELL, OAHU, HAWAII

U.S. GEOLOGICAL SURVEY

Open-File Report 96-423



Prepared in cooperation with the

CITY AND COUNTY OF HONOLULU BOARD OF WATER SUPPLY

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Conversion Factors

Multiply	By	To obtain
foot (ft)	0.3048	meter
inch (in.)	25.4	millimeter

Elevations in this report are referenced relative to mean sea level.

Specific conductance is given in microsiemens per centimeter (μS/cm) at 25° Celsius. Microsiemens per centimeter is numerically equal to micromhos per centimeter.

Drilling, Construction, Caliper-Log, and Specific-Conductance Data for Well 3-3406-12, Twin Bridge Road Deep Monitor Well, Oahu, Hawaii

By Todd K. Presley and Delwyn S. Oki

Abstract

The Twin Bridge Road deep monitor well (State well number 3-3406-12) was drilled about 2,000 feet northeast of Weed Circle in the town of Haleiwa. The well is on agricultural land. The well penetrates through the freshwater lens and into the freshwater-saltwater transition zone of the Waialua ground-water area to an elevation of -596 feet below mean sea level. Well-construction data, logs of drilling notes, geologic descriptions for the samples, caliper-log, and specific-conductance data are presented for the well. The well is one of 12 exploratory wells drilled in the north-central Oahu area between July 1993 and May 1994 in cooperation with the Honolulu Board of Water Supply.

INTRODUCTION

Because of water-supply concerns associated with population increase on the island of Oahu, the Honolulu Board of Water Supply, in cooperation with the U.S. Geological Survey (USGS), conducted a study to assess the availability of ground water in north-central Oahu. This study included drilling 12 exploratory and monitoring wells between July 1993 and May 1994.

This report presents drilling data for the Twin Bridge Road deep monitor well (State well number 3-3406-12). The well is about 2,000 ft northeast of Weed Circle (figs. 1 and 2) in the town of Haleiwa. The purpose of the Twin Bridge Road deep monitor well is to estimate the thickness of the freshwater lens in the Waialua ground-water area (Rosenau and others, 1971; Dale, 1978; Hunt, in press). The well is the first deep monitoring well to be drilled in the Waialua ground-water area.

Regional Setting

The study area is located in north-central Oahu between the crests of the Koolau Range and the Waianae Range (fig. 1). Previous studies (Rosenau and others, 1971; Dale, 1978; Hunt, in press) that describe the physical and geological aspects of the study area are summarized here. The mountain ranges are the eroded remnants of two shield volcanoes. The Mokuleia and Waialua ground-water areas are separated by low-permeability paleosols and saprolite of the Waianae Volcano that lie below the geologic contact between the Waianae and Koolau Volcanoes. The Waialua and Kawailoa ground-water areas are separated by alluvium and weathered basalt in and beneath Anahulu Gulch. Seaward flow of ground water in the Mokuleia and Waialua ground-water areas is impeded by a coastal confining unit that is composed of marine and terrestrial sediment known locally as "caprock." The caprock creates a confined artesian condition at low elevations near the shore. Further inland however, the aquifer is unconfined.

Water levels in the Waialua and Kawailoa ground-water areas are about 12 ft and 4 ft above mean sea level, respectively. Water levels in the Mokuleia ground-water area are about 20 ft. Withdrawal from the Waialua, Kawailoa and Mokuleia ground-water areas is primarily for sugarcane irrigation, although there are also several municipal wells and numerous small capacity private wells. Natural ground-water discharge occurs at springs and by subsurface flow through the caprock to the ocean (Rosenau and others, 1971).

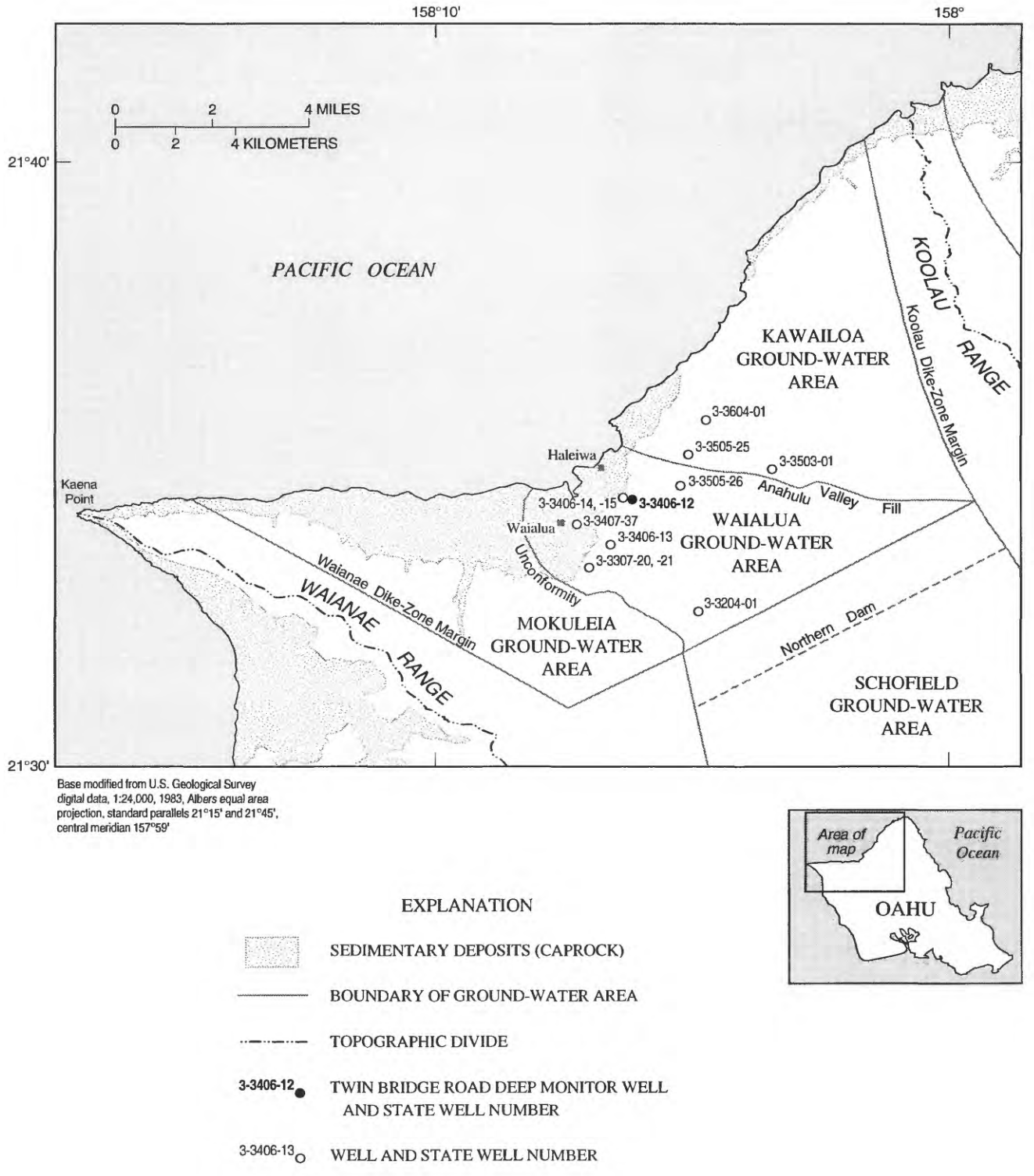

Figure 1. Ground-water areas of north-central Oahu (modified from Hunt, in press) and wells drilled during the study, Hawaii.

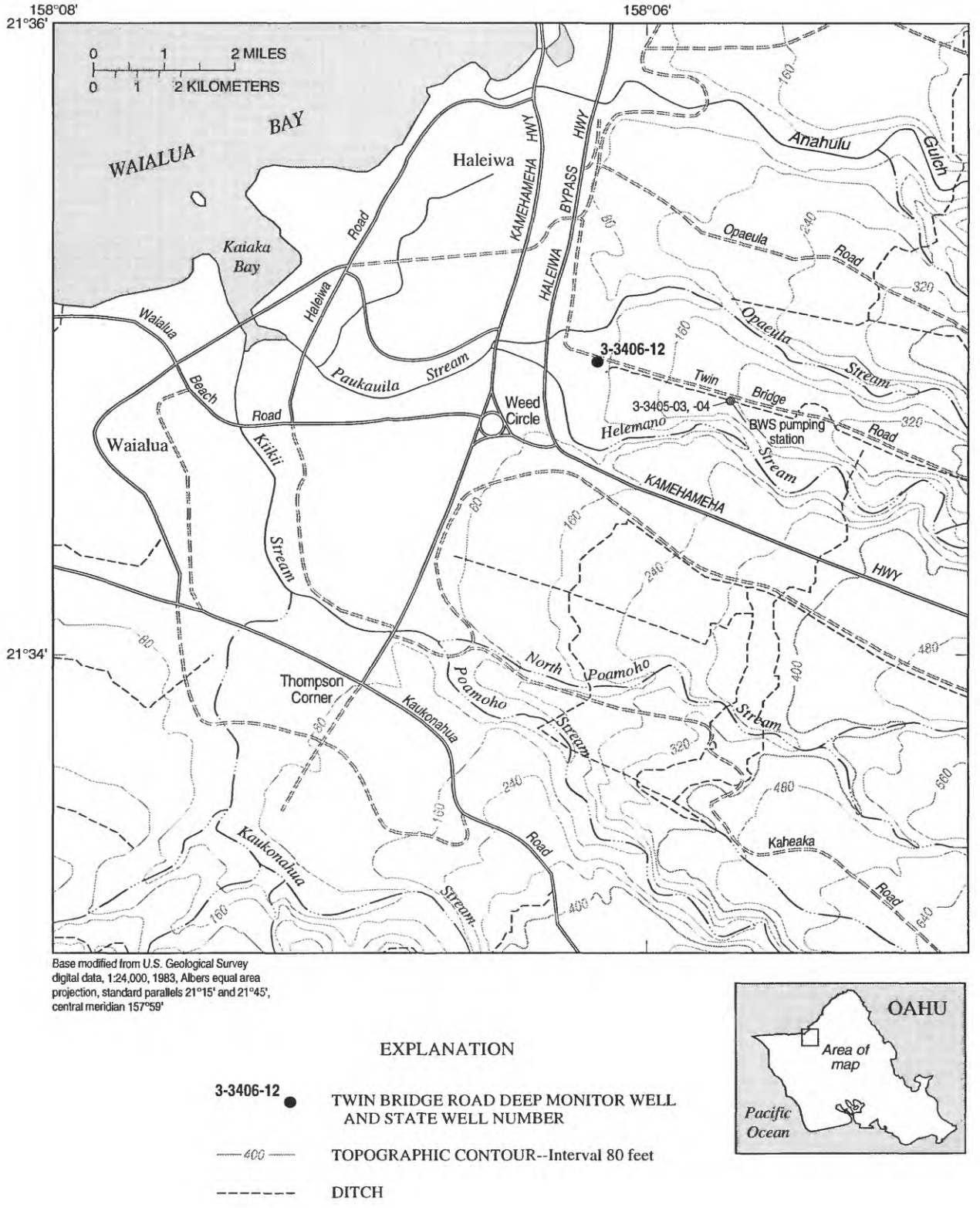

Figure 2. Location of Twin Bridge Road deep monitor well, Oahu, Hawaii.

Acknowledgments

The USGS gratefully acknowledges the Waialua Sugar Company for their assistance in identifying and preparing the drill site. The USGS also thanks the Castle and Cooke Land Company for permission to drill on their land.

DRILLING, CONSTRUCTION, CALIPER-LOG, AND SPECIFIC-CONDUCTANCE DATA

The Twin Bridge Road deep monitor well (State well number 3-3406-12) is about 2,000 ft northeast of Weed Circle. The site is directly downhill from an abandoned irrigation reservoir, and about 2,000 ft west along Twin Bridge Road from a pumping station operated by the Honolulu Board of Water Supply containing a municipal water tank and wells 3-3405-03 and -04 (fig. 2). The location of the well was chosen to maximize the distance from existing and future production wells. Well-construction data for the well is provided in table 1 and construction details are shown in figure 3.

The Twin Bridge Road deep monitor well was drilled using an air-rotary system with flush-jointed 4 1/2-in. diameter drill pipe. Drilling foam and polymer were injected into the air-circulation system to assist the removal of drill cuttings and to stabilize the hole. The elevation of the ground surface in the area of the drill site is about 52 ft above mean sea level. An 8 3/4-in. diameter hole was drilled to an elevation of about 9 ft. The well was then cased with 45 ft of 6 5/8-in. outside-diameter steel casing with a 0.188-in. wall thickness. The annular space was grouted with cement. A 6 1/4 in. diameter tri-cone tungsten-carbide button bit was then used to drill to an elevation of -596 ft. A caliper log was recorded after the total depth was reached. The well was cased with 4 1/2-in. outside-diameter flush-jointed steel casing. Slotted, 4 1/2-in. outside-diameter steel casing was installed below an elevation of 24 ft.

Geophysical logs of the well were recorded using a Well Reconnaissance logging unit for the caliper log, and a Mineral Logging Systems logging unit (operated by the Honolulu Board of Water Supply) with a Beckman Deepwell Solubridge downhole specific-conductance tool for the fluid conductance log.

The caliper log (fig. 4) shows many elevations where the arms of the caliper tool extend to a diameter greater than the size of the drill bit and a few elevations where the arms reach maximum extension (32 in.). The caliper tool has three 16-in. spring-loaded arms that are

Table 1. Construction data for Twin Bridge Road deep monitor well, Oahu, Hawaii.
[Elevation datum is mean sea level; in., inch; ft, feet; od, outside diameter]

Well name	Twin Bridge Road deep monitor well
State well number	3-3406-12
Latitude and longitude	21°34'56"N, 158°06'10"W
Hawaii tax map key number	6-4-01-1
Landowner	Castle and Cooke Land Company
Leaseholder	Waialua Sugar Company
Well completed	March 9, 1994
Working days to complete	27 days
Driller	Wayne Heick, USGS
Surface hole diameter	8 3/4 in.
Bottom of surface casing elevation	9 ft
Surface casing diameter and type	6 5/8-in. od steel, 0.188-in. thick wall
Final hole diameter	6 1/4 in.
Bottom of well elevation	-596 ft
Open interval elevations	9 ft to -596 ft
Screen interval elevations	24 ft to -596 ft
Inner casing diameter and type	4 1/2-in. od steel, flush-jointed
Screen type	4 1/2-in. od steel, slots cut longitudinally, 0.25 x 3.0 in.
Reference mark elevation (bolt)	52.64 ft
Top of casing measuring point elevation	53.10 ft (top of 4 1/2-in. inner steel casing)
Water level and date of measurement	11.10 ft, February 15, 1995

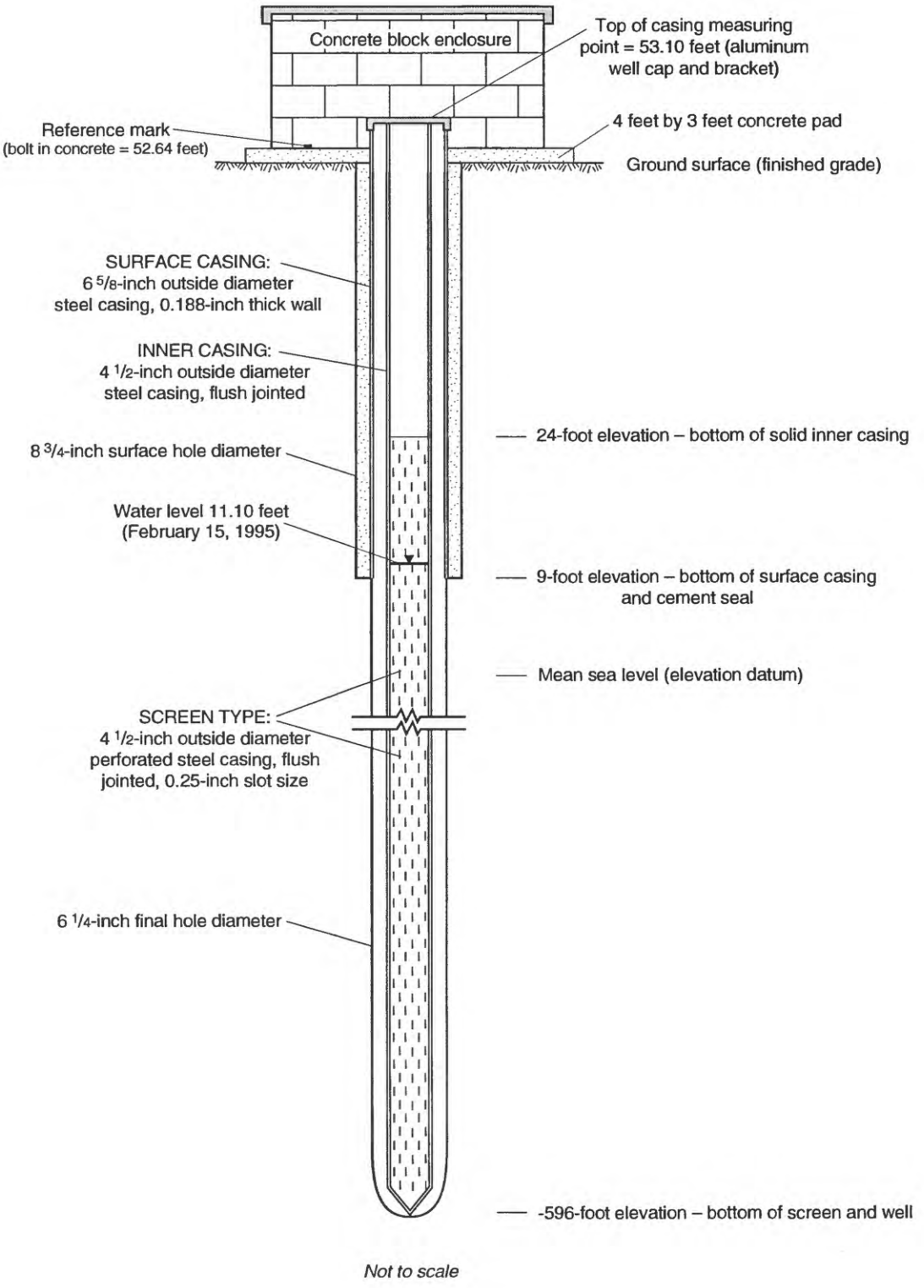

Figure 3. Construction details for Twin Bridge Road deep monitor well (State well number 3-3406-12), Oahu, Hawaii.

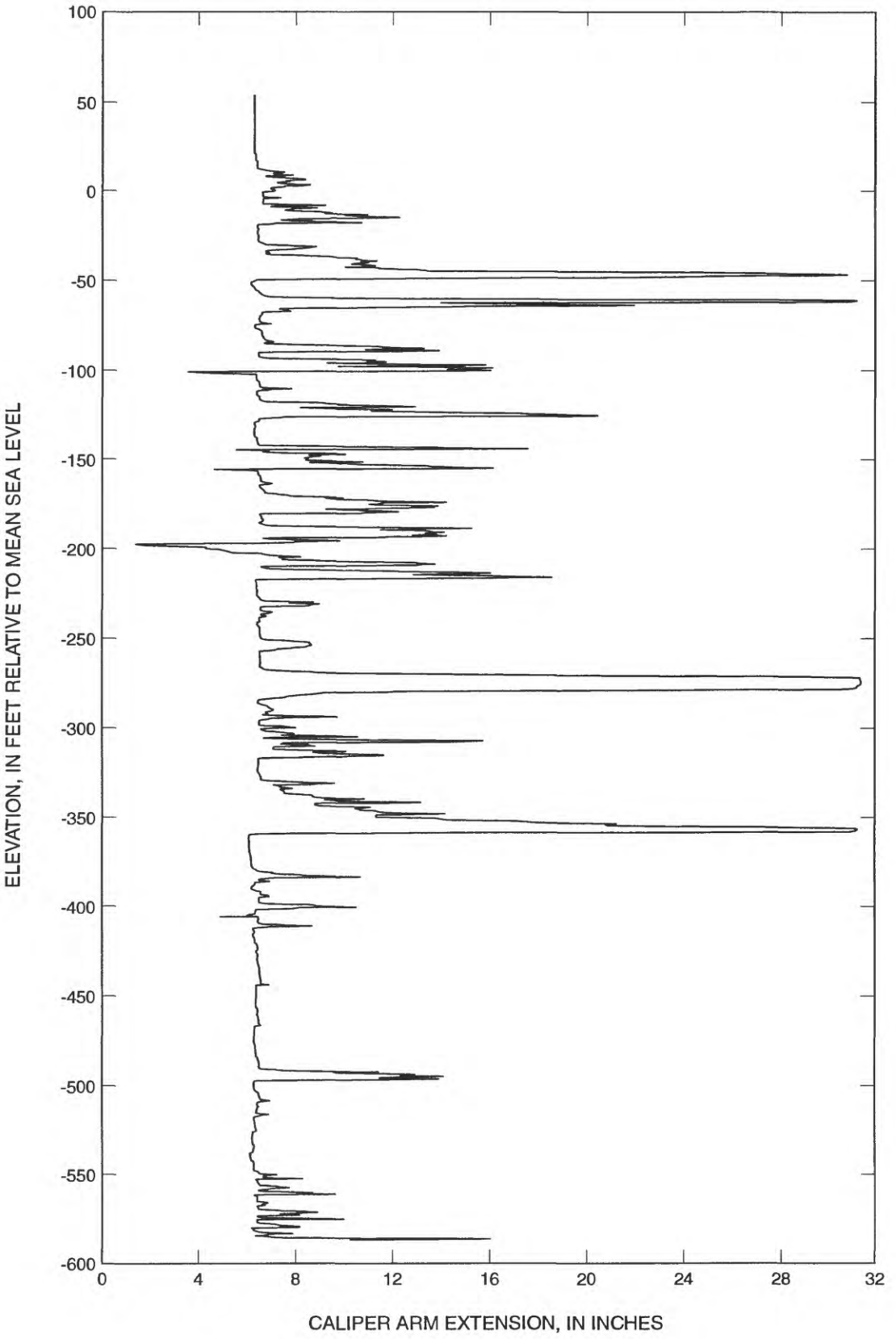

Figure 4. Caliper log for Twin Bridge Road deep monitor well (State well number 3-3406-12), Oahu, Hawaii.

extended when the tool is at the bottom of the hole. As the tool is raised, the logging unit records the extension of the arms as they drag against the walls of the bore. The caliper extension is an expression of hole diameter and wall smoothness, but the instrument does not measure these attributes directly.

The well penetrates about 607 ft into the aquifer. The specific-conductance log (fig. 5) shows an increase from about 500 µS/cm starting at an elevation of -325 ft to 50,000 µS/cm at an elevation of about -520 ft. The specific conductance reaches a maximum value of about 54,000 µS/cm at an elevation of about -585 ft.

Samples of the materials expelled by the circulation system while drilling were collected every 5 ft. At certain depths, the circulation was completely absorbed and no sample was recovered. The geologic log (geologic descriptions of the recovered samples from drilling) is presented in table 2, and the driller's log (driller's observations while drilling) is presented in table 3. From the surface, the bore penetrated about 40 ft of clay and saprolite with boulders, 5 ft of highly vesicular basalt, 16 ft of dark grey, silty material, and 604 ft of basalt.

The measuring point (elevation 53.10 ft) for water-level determination by measuring tape is located on the northwest side of the aluminum well-cap bracket affixed to the top of the 6 5/8-in. steel surface casing. An additional reference mark (elevation 52.64 ft) for the well site is the top of a stainless steel bolt emplaced into the concrete pad surrounding the well.

ADDITIONAL INFORMATION

Information for the 12 wells drilled during the north-central Oahu study is listed in table 4. Nine of the wells, including the Twin Bridge Road deep monitor well (State well number 3-3406-12), were drilled in the Waialua ground-water area, and three wells were drilled north of Anahulu Gulch in the Kawailoa ground-water area. Water-level time-series data were collected for all of the wells drilled and for numerous other existing wells as part of the overall monitoring effort for the project (unpublished data in files of the USGS, Honolulu). Data were collected using electronic data loggers coupled to shaft encoder-float systems or pressure transducers.

REFERENCES CITED

Dale, R.H., 1978, A ground-water inventory of the Waialua basal-water body, island of Oahu, Hawaii: U.S. Geological Survey Open-File Report 78-24, 71 p.

Hunt, C.D., Jr., in press, Geohydrology of the island of Oahu, Hawaii: U.S. Geological Survey Professional Paper 1412-B.

Rosenau, J.C., Lubke, E.R., and Nakahara, R.H., 1971, Water resources of north-central Oahu, Hawaii: U.S. Geological Survey Water-Supply Paper 1899-D, 40 p.

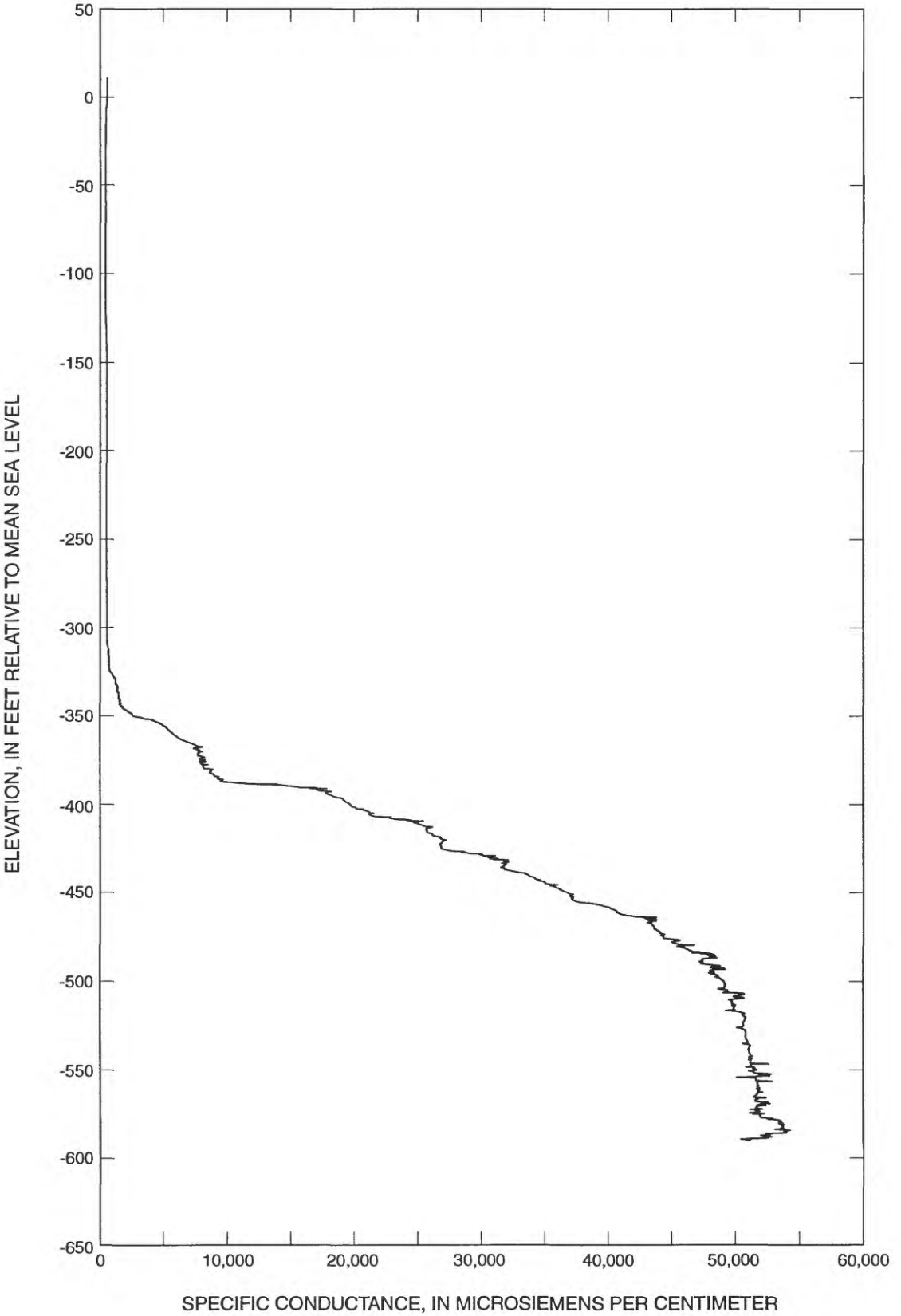

Figure 5. Specific conductance log for Twin Bridge Road deep monitor well (State well number 3-3406-12), May 18, 1994, Oahu, Hawaii (data from the Honolulu Board of Water Supply).

Table 2. Geologic log for Twin Bridge Road deep monitor well (State well number 3-3406-12), Oahu, Hawaii
[Elevation datum is mean sea level]

Depth below grade, (feet)	Elevation (feet)	Sample description	Comments
0 to 10	52 to 42	Red, hard clay; grey, friable, vesicular basalt	
10 to 20	42 to 32	Reddish-grey, hard clay	
20 to 30	32 to 22	Reddish-grey clay; grey, hard, vesicular basalt	
30 to 40	22 to 12	Reddish-brown saprolite; grey, hard, vesicular basalt	
40 to 45	12 to 7	Dark-grey, highly vesicular basalt	Red oxidation spots in vesicles
45 to 61	7 to -9	Dark-grey, silty material	
61 to 70	-9 to -18	Dark-grey, nonvesicular basalt; dark reddish-grey, vesicular basalt	
70 to 83	-18 to -31	Dark-grey, olivine-phyric, nonvesicular basalt	
83 to 90	-31 to -38	Dark-grey, olivine-phyric, nonvesicular basalt	
130 to 156	-78 to -104	Reddish-grey, slightly vesicular, hard basalt	Some olivine
156 to 183	-104 to -131	Dark-grey, hard, massive basalt; reddish-brownish-grey, vesicular basalt	Reddish chunks, probably clinker
183 to 194	-131 to -142	Dark-grey, hard, massive basalt; reddish-brownish-grey, vesicular basalt	
260 to 285	-208 to -233	Dark-grey, hard, massive basalt; reddish-brownish-grey, vesicular basalt	
300 to 323	-248 to -271	Dark-grey, hard, massive basalt; reddish-brownish-grey, vesicular basalt	
323 to 343	-271 to -291	Dark-grey, hard, massive basalt; reddish-brownish-grey, vesicular basalt	some olivine
360 to 365	-308 to -313	Dark-grey, hard, massive basalt; reddish-brownish-grey, vesicular basalt	
365 to 375	-313 to -323	Dark-grey, nonvesicular basalt; dark reddish-grey, vesicular basalt	
375 to 380	-323 to -328	Dark-grey, nonvesicular basalt; dark reddish-grey, vesicular basalt	
380 to 385	-328 to -333	Dark-grey, nonvesicular basalt; dark reddish-grey, vesicular basalt	
385 to 395	-333 to -343	Dark-grey, nonvesicular basalt; dark reddish-grey, vesicular basalt	
395 to 405	-343 to -353	Dark-grey, nonvesicular basalt; dark reddish-grey, vesicular basalt	
405 to 415	-353 to -363	Dark-grey, nonvesicular basalt; dark reddish-grey, vesicular basalt	
420 to 435	-368 to -383	Dark-grey, nonvesicular basalt; dark reddish-grey, vesicular basalt	Slightly darker than above
440 to 475	-388 to -423	Dark-grey, nonvesicular basalt; dark reddish-grey, vesicular basalt	Similar to above
506 to 525	-454 to -473	Dark-grey, nonvesicular basalt; dark reddish-grey, vesicular basalt	
525 to 545	-473 to -493	Dark-grey, nonvesicular basalt; dark reddish-grey, vesicular basalt	
545 to 565	-493 to -513	Dark-grey, nonvesicular basalt; dark reddish-grey, vesicular basalt	
565 to 585	-513 to -533	Dark-grey, nonvesicular basalt; dark reddish-grey, vesicular basalt	
585 to 605	-533 to -553	Dark-grey, nonvesicular basalt; dark reddish-grey, vesicular basalt	
605 to 625	-553 to -573	Dark-grey, nonvesicular basalt; dark reddish-grey, vesicular basalt	
625 to 645	-573 to -593	Dark-grey, nonvesicular basalt; dark reddish-grey, vesicular basalt	
645 to 665	-593 to -613	Dark-grey, nonvesicular basalt; dark reddish-grey, vesicular basalt	Very fine cuttings

Table 3. Driller's log for Twin Bridge Road deep monitor well (State well number 3-3406-12), Oahu, Hawaii
[Elevation datum is mean sea level]

Depth below grade (feet)	Elevation (feet)	Driller's notes
0 to 4	52 to 48	Gray-brown clay, dry
4 to 6	48 to 46	Brown, medium hard, dry
6 to 7	46 to 45	Hard, gray-blue rock dry
7 to 12	45 to 40	Brown, light-gray rock, dry
12 to 15	40 to 37	Gray, medium-hard rock, dry
15 to 22	37 to 30	Red, oxidized medium-hard rock, dry
22 to 26	30 to 26	Gray-blue, hard rock, dry
26 to 31	26 to 21	Brown, medium-soft rock, dry to damp
31 to 33	21 to 19	Blue, hard rock, dry
33 to 36	19 to 16	Brown, medium-soft rock, damp
36 to 40	16 to 12	Blue, medium-hard rock, dry
40 to 43	12 to 9	Brown clinker, soft
43 to 45	9 to 7	Black muck, very soft, water
45 to 50	7 to 2	Black, soft-medium rock, no return
50 to 59	2 to -7	Brown, medium, very broken, no return
59 to 61	-7 to -9	Blue rock, hard, no return
61 to 62	-9 to -10	Brown medium-hard hock, return, lots of water
62 to 65	-10 to -13	Blue hard rock, return
65 to 66	-13 to -14	Void, tools dropped, lots of water
66 to 67	-14 to -15	Blue rock, hard, good return, water
67 to 75	-15 to -23	Brown-red, medium-soft rock
75 to 85	-23 to -33	Blue rock, very hard, lots of water
85 to 91	-33 to -39	Brown-red, medium-soft rock, very fractured, lost circulation
91 to 106	-39 to -54	Red clinkers, soft, caving, lost circulation
106 to 115	-54 to -63	Blue rock, very hard, no return
115 to 130	-63 to -78	Red oxidized lava, medium-soft, return regained
130 to 131	-78 to -79	Large fracture, good return
136 to 140	-84 to -88	Blue rock, medium-hard, normal return
140 to 141	-88 to -89	Fractured rock zone, medium-hard, red-brown
141 to 146	-89 to -94	Red cinder, medium-soft, fractured
146 to 150	-94 to -98	Blue rock, hard, good return
150 to 156	-98 to -104	Red cinder, soft, good return
156 to 158	-104 to -106	Red-brown, medium-soft, no return
158 to 166	-106 to -114	Blue rock, very hard, no return
166 to 171	-114 to -119	Red-brown, medium-soft, good return
171 to 175	-119 to -123	Blue rock, medium-hard, good return
175 to 185	-123 to -133	Red-brown, medium-soft clinker, good return
185 to 188	-133 to -136	Blue rock, very hard, good return
188 to 193	-136 to -141	Red-brown, medium-hard, good return
193 to 199	-141 to -147	Blue rock, hard, good return
199 to 217	-147 to -165	Red-brown, caving, medium-soft clinker, loosing return
217 to 220	-165 to -168	Blue rock, medium-hard, good return
220 to 240	-168 to -188	Red-brown, medium-soft rock, very broken
240 to 250	-188 to -198	Blue rock, hard, good return, possible lava tube or void space
250 to 266	-198 to -214	Red clinkers, medium, broken, good return
266 to 270	-214 to -218	Blue rock, hard, fractured, good return
270 to 277	-218 to -225	Red-brown, broken, soft clinker, good return, lots of water
277 to 280	-225 to -228	Blue, hard rock
280 to 284	-228 to -232	Red-brown, broken clinker
284 to 288	-232 to -236	Blue, very hard rock, solid, good return
288 to 300	-236 to -248	Red-brown, loose, broken, good return
300 to 308	-248 to -256	Blue rock, very hard
308 to 318	-256 to -266	Red-brown to blue rock, medium-hard, good return
318 to 325	-266 to -273	Blue rock, very hard

Table 3. Driller's log for Twin Bridge Road deep monitor well (State well number 3-3406-12), Oahu, Hawaii--Continued
[Elevation datum is mean sea level]

Depth below grade (feet)	Elevation (feet)	Driller's notes
325 to -335	-273 to 387	Red-brown to blue rock, medium-hard, voids, clinkers
335 to -340	-283 to 392	Blue rock, very hard
340 to 347	-288 to -295	Broken clinkers, hole caving
347 to 354	-295 to -302	Blue rock, medium-hard
354 to 363	-302 to -311	Broken, red-brown
363 to 373	-311 to -321	Red-brown, very broken good return
373 to 387	-321 to -335	Blue rock, medium-hard
387 to 388	-335 to -336	Red-brown, caving clinkers, very soft. Caving problem area
388 to 390	-336 to -338	Hard, blue rock
390 to 403	-338 to -351	Broken, blue rock, medium-hard
403 to 415	-351 to -363	Red-brown, broken and boulder-like
415 to 423	-363 to -371	Blue rock, medium-hard, firm drilling
423 to 437	-371 to -385	Blue rock, very hard, good return
437 to 474	-385 to -422	Red-brown, medium-soft rock
474 to 477	-422 to -425	Blue rock, hard
477 to 505	-425 to -453	Red-brown, medium-soft, broken rock
505 to 517	-453 to -465	Red-brown, soft, oxidized rock. Noticeable salt water
517 to 521	-465 to -469	Blue rock, medium-hard, good return
521 to 548	-469 to -496	Red-brown, oxidized blue rock, medium-soft
548 to 556	-496 to -504	Red-brown, oxidized rock, medium-soft, clinker zone
556 to 560	-504 to -508	Red-brown, medium-soft, very broken
560 to 563	-508 to -511	Blue rock, hard, lost circulation
563 to 576	-511 to -524	Red-brown, medium-soft rock
576 to 578	-524 to -526	Blue rock, hard
578 to 582	-526 to -530	Red-brown, broken, medium-soft, returned circulation
582 to 590	-530 to -538	Blue rock, medium-hard,
590 to 601	-538 to -549	Red-brown, soft, broken rock, good return
601 to 604	-549 to -552	Blue rock, medium-hard, good return
604 to 617	-552 to -565	Red-brown, medium-soft rock, very broken
617 to 624	-565 to -572	Red-brown, soft rock
624 to 626	-572 to -574	Blue rock, medium, somewhat broken
626 to 636	-574 to -584	Red-brown, soft, broken rock
636 to 638	-584 to -586	Blue rock, medium-hard, broken
638 to 641	-586 to -589	Red-brown, medium-soft, good return
641 to 642	-589 to -590	Blue rock, hard, fractured
642 to 645	-590 to -593	Void or cavity, tools dropped
645 to 664	-593 to -612	Red-brown, soft rock, very broken
664 to 665	-612 to -613	Blue rock, medium-hard, good return, lots of water, high pressure

Table 4. Construction data for wells drilled during the study, Oahu, Hawaii

State well number	Well name	Latitude	Longitude	Hawaii state tax map key number	Landowner	Well completed	Working days to complete
3-3204-01	Kaheaka exploratory well	21°32'52"	158°04'52"	6-5-01-2	Castle and Cooke Land Company	March 2, 1994	16 days
3-3307-20	Thompson Corner exploratory well I	21°33'41"	158°07'02"	6-5-01-1	Castle and Cooke Land Company	July 9, 1993	14 days
3-3307-21	Thompson Corner exploratory well II	21°33'41"	158°07'02"	6-5-01-1	Castle and Cooke Land Company	August 9, 1993	15 days
3-3406-12	Twin Bridge Road deep monitor well	21°34'56"	158°06'10"	6-4-01-1	Castle and Cooke Land Company	March 9, 1994	27 days
3-3406-13	Kaamooloa exploratory well	21°34'06"	158°06'36"	6-5-01-2	Castle and Cooke Land Company	January 12, 1994	4 days
3-3406-14	Helemano exploratory well I	21°34'58"	158°06'21"	6-2-07-11	Castle and Cooke Land Company	October 15, 1993	11 days
3-3406-15	Helemano exploratory well II	21°34'58"	158°06'21"	6-2-07-11	Castle and Cooke Land Company	November 15, 1993	15 days
3-3407-37	Kiikii exploratory well	21°34'28"	158°07'16"	6-6-23-3	Castle and Cooke Land Company	April 21, 1994	27 days
3-3503-01	North Upper Anahulu exploratory well	21°35'30"	158°03'25"	6-2-09-1	Bishop Estate	May 5, 1994	8 days
3-3505-25	North Lower Anahulu exploratory well	21°35'45"	158°05'04"	6-2-09-1	Bishop Estate	December 23, 1993	7 days
3-3505-26	Opaeula exploratory well	21°35'11"	158°05'14"	6-2-10-1	Bishop Estate	October 4, 1993	10 days
3-3604-01	Kawailoa deep monitor well	21°36'24"	158°04'44"	6-1-05-1	Bishop Estate	January 9, 1994	28 days

Table 4. Construction data for wells drilled during the study, Oahu, Hawaii--Continued

State well number	Well name	Bottom of surface casing elevation (feet)	Surface casing outside diameter (inch)	Hole diameter (inch)	Bottom of well elevation (feet)	Open interval elevations (feet)	Inner casing outside diameter (inch) and type	Screened interval elevations (feet)	Measuring point elevation (feet)	Water level	
										Height above sea level (feet)	Date and time
3-3204-01	Kaheaka exploratory well	643	8 5/8	6 3/4	-55	643 to -55	4 1/2, steel	25 to -55	741.59 (top of casing)	12.44	Jan. 27,1995 17:20
3-3307-20	Thompson Corner exploratory well I	-65	12 5/8	12 1/4	-82	-65 to -82	12 5/8, steel	-65 to -82	99.10 (bolt)	11.32	Aug 5, 1993 15:51
3-3307-21	Thompson Corner exploratory well II	17	8 5/8	7 7/8	-80	17 to -80	4 1/2, PVC	20 to -80	101.40 (top of casing)	11.29	Aug. 5, 1993 15:51
3-3406-12	Twin Bridge Road deep monitor well	9	6 5/8	6 1/4	-596	9 to -596	4 1/2, steel	24 to -596	53.10 (top of casing)	11.10	Feb. 15, 1995 12:09
3-3406-13	Kaamooloa exploratory well	10	6 5/8	6 1/4	-10	10 to -10	4 1/2, PVC	10 to -10	42.35 (top of casing)	11.87	Feb. 13, 1995 14:45
3-3406-14	Helemano exploratory well I	-51	8 5/8	7 7/8	-78.5	-72 to -78.5	4 1/2, PVC	-68.5 to -78.5	13.79 (top of casing)	10.92	Feb. 15, 1995 12:26
3-3406-15	Helemano exploratory well II	-52	8 5/8	7 7/8	-291	-271 to -291	4 1/2, steel	-271 to -291	14.41 (top of casing)	11.15	Feb. 15, 1995 12:28
3-3407-37	Kiikii exploratory well	-115	8 5/8	6 3/4	-135	-125 to -135	4 1/2, steel	-115 to -135	14.68 (top of casing)	11.70	Feb. 13, 1995 13:44
3-3503-01	North Upper Anahulu exploratory well	592	8 5/8	6 3/4	-103	592 to -103	4 1/2, steel	17 to -103	671.74 (top of casing)	7.15	Feb 14, 1995 13:54
3-3505-25	North Lower Anahulu exploratory well	182	8 5/8	7 7/8	-18	182 to -18	4 1/2, PVC	22 to -18	234.24 (top of casing)	4.75	Feb.14, 1995 15:08
3-3505-26	Opaeula exploratory well	229	6 5/8	6 1/4	-65	229 to -65	4 1/2, PVC	15 to -65	288.08 (top of casing)	10.52	Feb. 15, 1995 11:14
3-3604-01	Kawailoa deep monitor well	190	6 5/8	6 1/4	-392	190 to -392	4 1/2, steel	9 to -391	309.01 (top of casing)	4.40	Feb. 14, 1995 14:18