# CONSTRUCTION, GEOLOGIC LOG, AND AQUIFER TESTS OF THE NORTHEAST KILOHANA MONITOR WELL (STATE WELL 2-0124-01), LIHUE, KAUAI, HAWAII

*By* Scot K. Izuka and Stephen B. Gingerich

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## CONVERSION FACTORS, ABBREVIATIONS, AND VERTICAL DATUM

| Multiply | By | To obtain |
|---|---|---|
| inch (in.) | 2.54 | centimeter |
| foot (ft) | 0.3048 | meter |
| cubic foot per minute ($ft^3$/min) | 0.02832 | cubic meter per minute |
| gallon per minute (gal/Min) | 3.785 | liter per minute |
| mile, statute (mi) | 1.609 | kilometer |

**Other Useful Conversions**

1 $ft^3/s$ = 448.8 gal/min

1 $ft^3/s$ = 0.6463 Mgal/d

**Vertical datum**

All elevations in this report are referenced relative to mean sea level

**Abbreviation:**

µS/cm, microsiemens per centimeter at 25 degrees Celsius.

# Construction, Geologic Log, and Aquifer Tests of the Northeast Kilohana Monitor Well (State Well 2-0124-01), Lihue, Kauai, Hawaii

*By* Scot K. Izuka and Stephen B. Gingerich

## Abstract

The Northeast Kilohana monitor well, located in the center of the Lihue basin on the northeast slope of Kilohana Crater, was drilled in 1995 and tested to study the hydrology and geology in an area where no other well information is available. The well was drilled to a depth of 1,047 feet from a ground elevation of 466.42 feet above sea level and penetrated mafic lava flows (which may include nephelinite, melilitite, basanite, and alkalic basalt) and alluvium characteristic of the Koloa Volcanics. Relatively thick sections of unconsolidated sedimentary and clinker layers were found between 316 and 131 feet elevation and between -304 and -574 feet elevation. Water levels decreased with depth during drilling from 428 feet above sea level when the hole bottom was at 305 feet to 375 feet when the hole bottom was at -581 feet.

Step-drawdown and 7-day sustained-rate pumping tests were conducted to test aquifer properties. The maximum drawdown measured in the well during 7 days of sustained pumping at an average rate of 316 gallons per minute was 49.54 feet from an initial water-level elevation of 375.5 feet above sea level. Well loss, analyzed from the step-drawdown data, was estimated to be 14.32 feet. A marked decrease in the drawdown at 5,000 minutes into the sustained-rate test is apparent from the drawdown data.

## INTRODUCTION

The Lihue basin is the center of population, government, and industry for Kauai. Recent population growth in the basin has greatly increased the demand for water in the area. The economic setback caused by Hurricane Iniki in 1993 slowed growth on Kauai and may have kept the water supply from reaching a critical stage; however, an ample water supply is needed for the island's economic recovery. Pre-Iniki studies placed Lihue's supply at the highest priority in Kauai's water plans (Commission on Water Resources Management, 1990).

The Northeast Kilohana monitor well (State well 2-0124-01) is one of six monitor wells drilled in the period from April 1995 to April 1996 by the U.S. Geological Survey (USGS) in cooperation with the County of Kauai Department of Water to study the availability of ground-water in the southern Lihue basin (fig. 1). The six monitor wells were sited in areas where no wells had been drilled and no subsurface information was available. Five of the six monitor wells were drilled in the central part of the Lihue basin. The sixth well was drilled in the southern part of the basin. The Northeast Kilohana monitor well is more than 2 mi from the nearest pumping wells and provides data for defining the regional ground-water system of the Lihue basin. The Department of Water considers the Northeast Kilohana area as a potential site for future ground-water exploration and development.

The objectives of this study were met by analysis of data collected during and after the drilling operation. These data included (1) the driller's description of the physical characteristics of the rocks penetrated, (2) water levels monitored as the well was deepened,

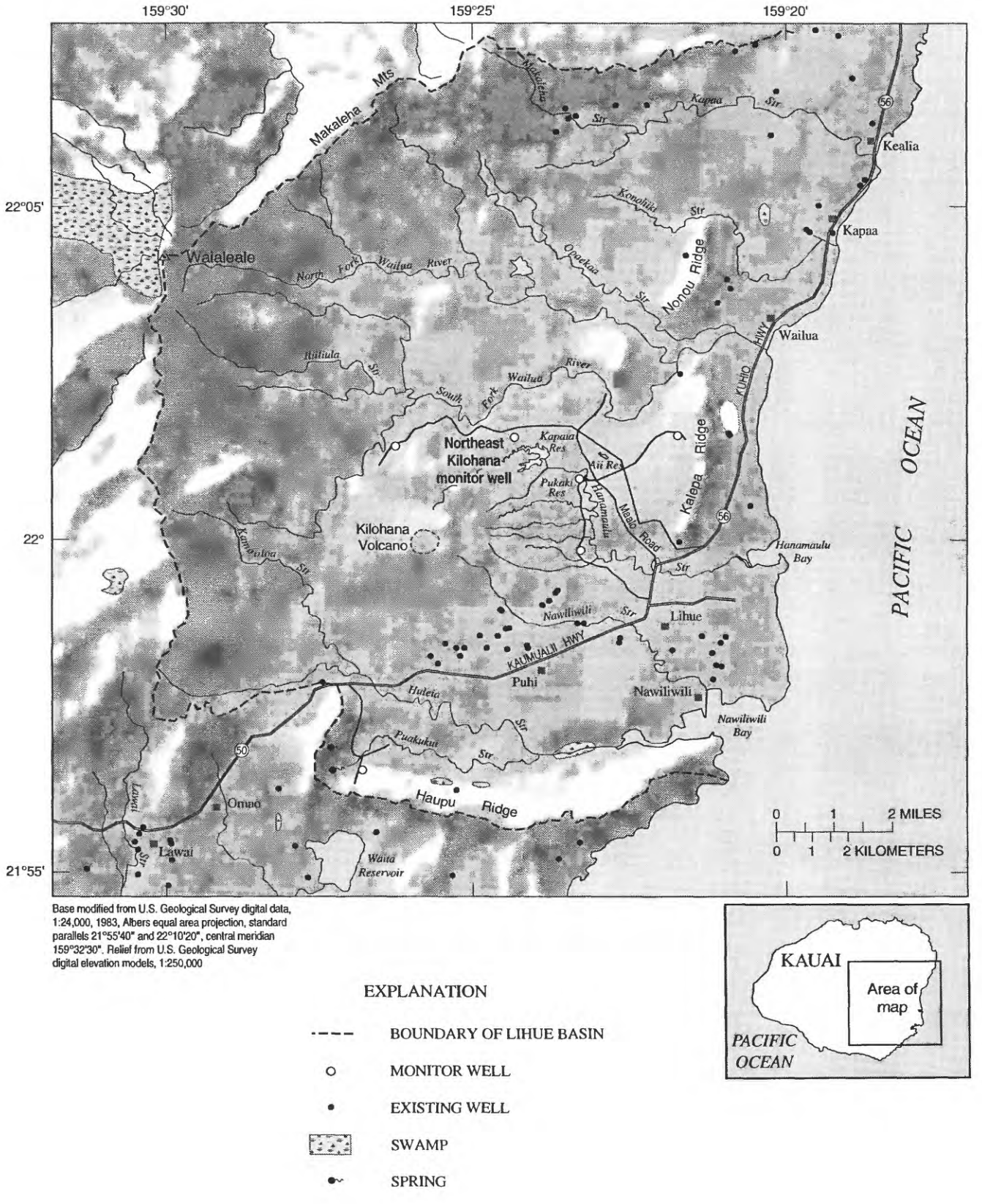


**Figure 1.** Location of the Northeast Kilohana monitor well (State well 2-0124-01) and existing wells in the Lihue basin, Kauai, Hawaii.

(3) a caliper log of the uncased well boring, (4) a description of the geology from rock chips (cuttings) brought to the surface during drilling, and (5) the step-drawdown and 7-day aquifer tests. This report documents the location, drilling history, construction details, geologic log, and aquifer-test results of the Northeast Kilohana monitor well.

## Setting

The Northeast Kilohana monitor well is located in the Lihue basin, a large depression bounded on the west by the high mountains of central Kauai, on the south by Haupu Ridge, and on the north by the Makaleha Mountains (fig. 1). The area has undergone substantial stream erosion, weathering, and faulting followed by rejuvenated, sporadic, scattered volcanism. Two major stratigraphic units are found in the Lihue basin (fig. 2): (1) the Waimea Canyon Basalt of Pliocene and Miocene (?) age which was erupted during the main shield-volcano-building stage of Kauai and forms the bulk of the island, including the mountains surrounding the Lihue basin, and (2) the Koloa Volcanics of Pleistocene and Pliocene age which include the rejuvenated-stage lava flows and sedimentary units that partly cover and fill the floor of the basin (Hinds, 1930; Stearns, 1946; Macdonald and others, 1960). Both the Waimea Canyon Basalt and the Koloa Volcanics have been given formational rank (Langenheim and Clague, 1987).

Kilohana Volcano in the center of the Lihue basin is a prominent edifice of the Koloa Volcanics. Macdonald and others (1960) described the Lihue basin as a subsidiary caldera that formed to the east of a central main caldera of the Kauai shield volcano. Stearns (1946) described the basin as the result of advanced stream erosion and the coalescing of many amphitheater-headed valleys. Numerous subsequent geologic investigations include a gravity survey (Kivroy and others, 1965), petrologic and geochemical analyses (Macdonald, 1968; Feigenson, 1984; Clague and Dalrymple, 1988; Maaloe and others, 1992), and radiometric dating (Clague and Dalrymple, 1988). These studies have advanced the understanding of the geology of Kauai, yet the origin of the Lihue basin remains an enigma.

Ground-water exploration in the Lihue basin has been only moderately successful, owing in part to the basin's complex ground-water hydrology. Most of the ground water in the Lihue basin is developed from wells in the Koloa Volcanics, which cover almost the entire basin floor. The Koloa Volcanics are generally considered to have low to moderate permeabilities (Macdonald and others, 1960), but specific capacities of wells in this unit are highly variable. Water levels during drilling in many of these wells declined with depth in the aquifer, indicating substantial vertical head gradients. At the base of the Koloa Volcanics and resting unconformably on the underlying Waimea Canyon Basalt, are the weathered rocks and sedimentary deposits that formed during the period of erosion between the shield-volcano eruptions and the rejuvenated volcanism. These deposits probably have very low permeabilities and may retard the flow of water between the Koloa Volcanics and the Waimea Canyon Basalt.

The Waimea Canyon Basalt in the Lihue basin is represented by the Napali Member, the thick accumulations of thin lava flows that formed on the flank of the Kauai shield volcano. In western Kauai, the Napali Member is extensive and forms the most permeable aquifers on Kauai, but in the Lihue basin, the Napali Member crops out only in the mountains encircling the basin. It is not certain whether any of the wells drilled thus far in the center of the basin have passed through the Koloa Volcanics and into the underlying Napali Member. Therefore, the thickness of the Koloa Volcanics and the hydrologic properties of the underlying Napali Member are unknown.

## Location

The Northeast Kilohana monitor well is located in the center of the Lihue basin between sugarcane fields on the northeast slope of Kilohana Crater (fig. 1, table 1). The site is on the south shoulder of a sugar plantation

**Table 1.** Location, elevation, and State number of the Northeast Kilohana monitor well, Kauai, Hawaii
[Datum is mean sea level]

| | |
|---|---|
| Latitude | 22°01′33″N |
| Longitude | 159°24′20″W |
| Ground elevation at brass plate in concrete pad | 466.42 feet |
| Measuring-point elevation at top of well casing | 467.12 feet |
| Distance and direction from Lihue | 3.7 miles northwest |
| Distance and direction from nearest shoreline | 3.8 miles west |
| State well number | 2-0124-01 |

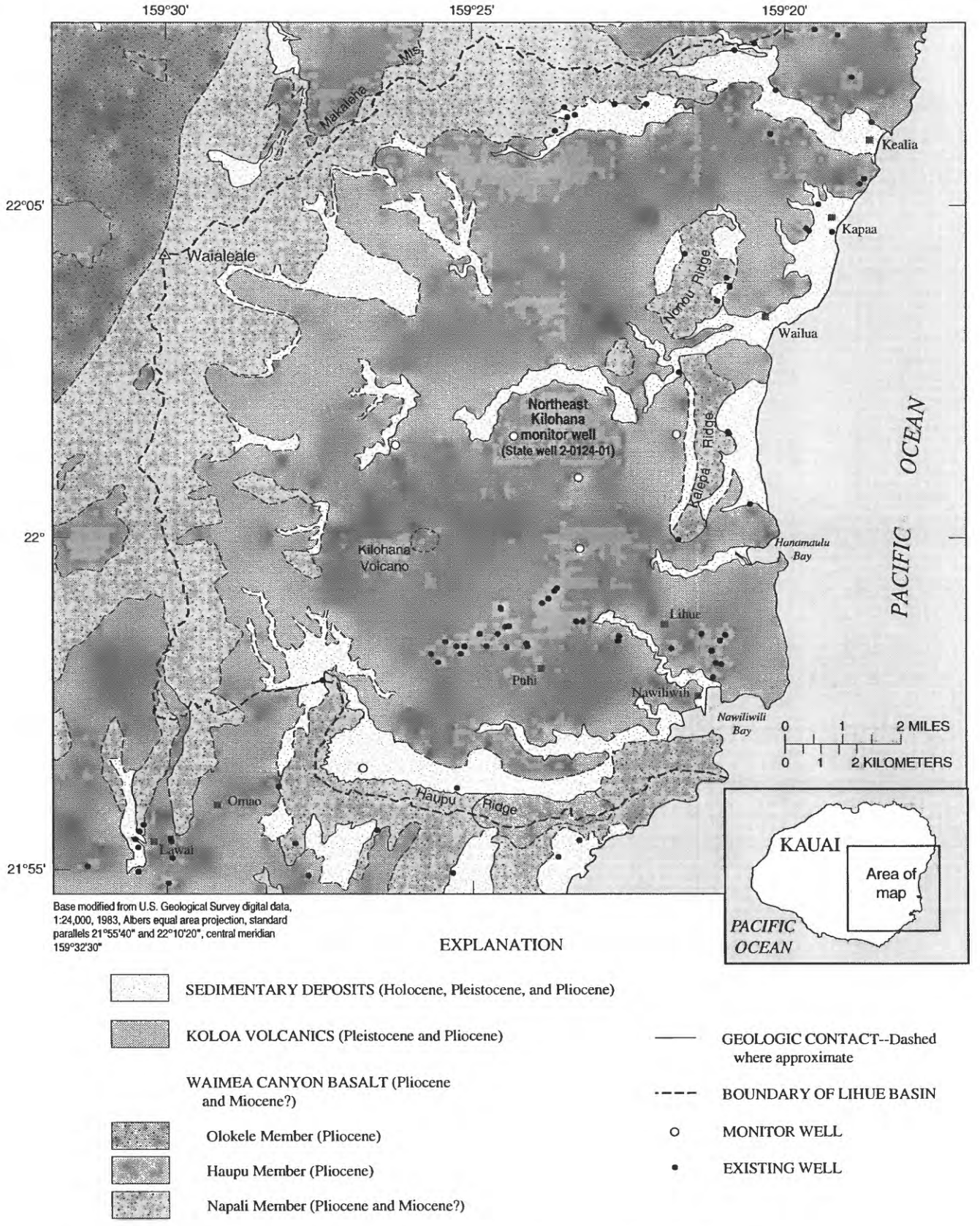


**Figure 2.** Geology of the Lihue basin area, Kauai, Hawaii (modified from Macdonald and others, 1960).

**Table 2.** Summary of construction of the Northeast Kilohana monitor well (State well 2-0124-01), Kauai, Hawaii
[Datum for water-level and bottom-of-hole elevations is mean sea level. Land surface elevation is 466.42 ft above mean sea level; ft, feet]

| Date | | Significant events |
|---|---|---|
| June 1995 | 6 | Drilling began |
| | 13 | Water level 428 ft elevation and bottom-of-hole 305 ft elevation |
| | 16 | Installed surface casing |
| | 18 | Increase in water lifted out of well at 295 to 279 ft elevation and again at 264 to 244 ft elevation; continued drilling to 163 ft elevation |
| | 19 | Water level 345 ft elevation and bottom-of-hole 163 ft elevation |
| | 21 | Increase in water lifted out of well at 163 to 141 ft elevation; continued drilling to 121 ft elevation |
| | 27 | Water level before drilling 379 ft elevation and bottom-of-hole 121 ft elevation; continued drilling to 1 ft elevation |
| | 28 | Water level 378 ft elevation, hole logged with caliper |
| | 30 | Water level 375 ft elevation, step-drawdown test conducted |
| July 1995 | 1 | Began 7-day aquifer test at 316 gallons per minute |
| | 8 | End of 7-day aquifer test at 141 ft of drawdown, began recovery measurements |
| | 18 | Drilling resumed from 1 ft elevation |
| | 27 | Water level before drilling 376 ft elevation and bottom-of-hole -57 ft elevation; possible increase in water lifted out of well at -85 ft elevation; continued drilling to -179 ft elevation |
| | 28 | Possible increase in water lifted out of well at depth of -274 to -284 ft elevation; continued drilling to -339 ft elevation |
| | 29 | Drilling halted at -581 ft elevation (total depth of 1,047 ft), maximum depth attainable with circulation system |
| | 31 | Logged upper 767 ft of hole with caliper; blockage at -301 ft elevation discovered |
| August 1995 | 2 | Water level 375 ft elevation |
| | 7 | Water level 375 ft elevation |
| | 8 | Casing installed, well completed |

road, about 1 mi west of the intersection with Maalo Road. The well was assigned the well number 2-0124-01 by the State of Hawaii Commission on Water Resources Management using the State well numbering system.

The area within a 1 mi radius of the well is covered by a network of artificial and natural surface-water bodies. Kapaia Reservoir lies 0.2 mi to the southeast and the south fork of the Wailua River is within 0.7 mi northwest of the well. A small irrigation ditch lies a few feet to the east of the site. The well is located about 3.8 mi inland from the eastern coast of Kauai.


### Acknowledgments

The construction, data collection, and testing of the Northeast Kilohana monitor well was made possible with the cooperation and assistance of Mr. Murl Nielsen, Manager and Chief Engineer, and the staff of the County of Kauai Department of Water. We are grateful to Mr. Michael Furukawa for permitting the construction of the well on Amfac/JMB Hawaii, Lihue Plantation land. Drilling, aquifer-test, and elevation information were drawn extensively from the notes of G. Wayne Heick of the U.S. Geological Survey.


## DRILLING METHODS AND HISTORY

The well was bored by rotary drilling with a 9.875-in. diameter tungsten-carbide bit. Air and foam were injected down through the hollow drill stem and circulated back up the space between the stem and the well boring to remove cuttings from the hole. Greater lifting power was needed as the drilling penetrated deeper below the water table. The depth of drilling was thus limited by the capacity of the air compressor to provide the circulation. Table 2 summarizes the construction history of the well and shows that water levels decreased as the well was deepened. Drilling was halted temporarily at 1 ft elevation, so that an aquifer test could be conducted before the well was deepened below sea level. A caliper tool was lowered down the hole at two different times to record the caliper-arm extension, an indication of the variation in hole diameter with depth.

At -301 ft elevation a blockage was discovered; flush-jointed, 4-in. (outer diameter) steel casing was installed through the blockage and the well was completed. The elevation of a brass plate in the concrete pad surrounding the well casing is 466.42 ft. The elevation of the measuring point at the top of the casing is 467.12 ft. The well is 1,047 ft deep (bottom is at -581 ft elevation). Construction details of the finished well are shown in figure 3.

## GEOLOGIC LOG

The geologic log of the Northeast Kilohana monitor well was compiled by examination of cuttings brought to the surface by the air and foam circulated through the well bore. Samples were collected at 5-ft depth intervals and air dried before being examined macroscopically. The complete lithologic descriptions appear in appendix 1; the geologic log is shown in figure 4.

The Northeast Kilohana monitor well penetrated a 1,047-ft section of mafic lava flows and alluvium ("mafic rock" in this report may include nephelinite, melilitite, basanite, and alkalic basalt, all of which are dark, fine-grained, igneous rocks but have specific compositions that are not distinguishable in hand specimen). The uppermost part of the section consists of a 10-ft layer of surface soil and 145 ft of mafic lava flows, the upper 125 ft of which are deeply weathered. Below that is a 55-ft section of clinker and vesicular lava flows underlain by 130 ft of alternating alluvium and lava flows, a 25-ft-thick layer of well-indurated volcanic breccia, and a 35-ft-thick section of lava flows. Samples from the next 45 ft of rock are a mixture of dense mafic rock and sand-size particles of ash, indicating the presence of at least one thin ash layer in this interval, but the precise location of the ash layer (or layers) cannot be determined. The underlying 325 ft is predominated by dense mafic rock but also containing some amygdaloidal vesicular mafic rock and a 10-ft-thick layer of olive-green mud. This dense mafic rock is underlain by a 115-ft section of alternating layers of mafic lava flows and alluvial gravel. The base of the section consists of 155 ft of brown sandy mud and alluvial gravel.

The caliper log of the Northeast Kilohana monitor well (fig. 4) shows intervals where the hole is larger than the drill-bit diameter. Rock layers that are unconsolidated or thin tend to crumble and cave to produce enlargements in the well boring. In contrast, rocks that are hard, massive, and thick tend to hold the shape of the boring, and thus give a smoother, unvarying log. A few feet below the surface casing (surface casing shows as the smooth upper 160 ft of the caliper log), the log shows prominent enlargements between 300 and 142 ft elevation that correspond with the clinker zones and alluvium noted in the drill cuttings between 316 and 131 ft elevation. Between 131 and -301 ft elevation, the caliper log is unvarying, indicating the rocks are hard and dense and the wall of the well boring is smooth. This interval corresponds with a thick section of massive mafic lava flows in the geologic log. The caliper log extends down to a depth of only 767 ft because of a blockage below that point. The blockage may have been caused by caving from one or more of the alluvial layers that occur in the lower intervals of the hole.

## AQUIFER TESTS

A step-drawdown aquifer test and 7-day sustained-rate aquifer test were conducted using a 50-horsepower, 6-in. diameter submersible pump with the intake elevation set at 19 ft. Measurements of the depth to water in the pumping well were made using an electric tape. The flow rate was measured using a totalizing flow meter.

The step-drawdown test, conducted on June 30, 1995 consisted of four 60-min steps at average rates of 43, 100, 205, and 313 gal/min followed by 920 min of recovery monitoring (fig. 5 and appendix 2). The elevation of static water level at the start of the test was 375 ft. The data were analyzed to estimate the two components of drawdown in the pumped well: (1) the hydraulic head loss in the aquifer, and (2) the hydraulic head losses from water entering the well. Estimates of the aquifer loss and well loss shown in table 3 were obtained using the methods of Hantush and Bierschenk, and of Eden and Hazel (in Kruseman and de Ridder, 1994).

Values of drawdown measured in the pumped well during the sustained test were corrected by subtracting the estimated well loss at the measured pumping rate from the observed drawdown. Well loss at a specific pumping rate is calculated using:

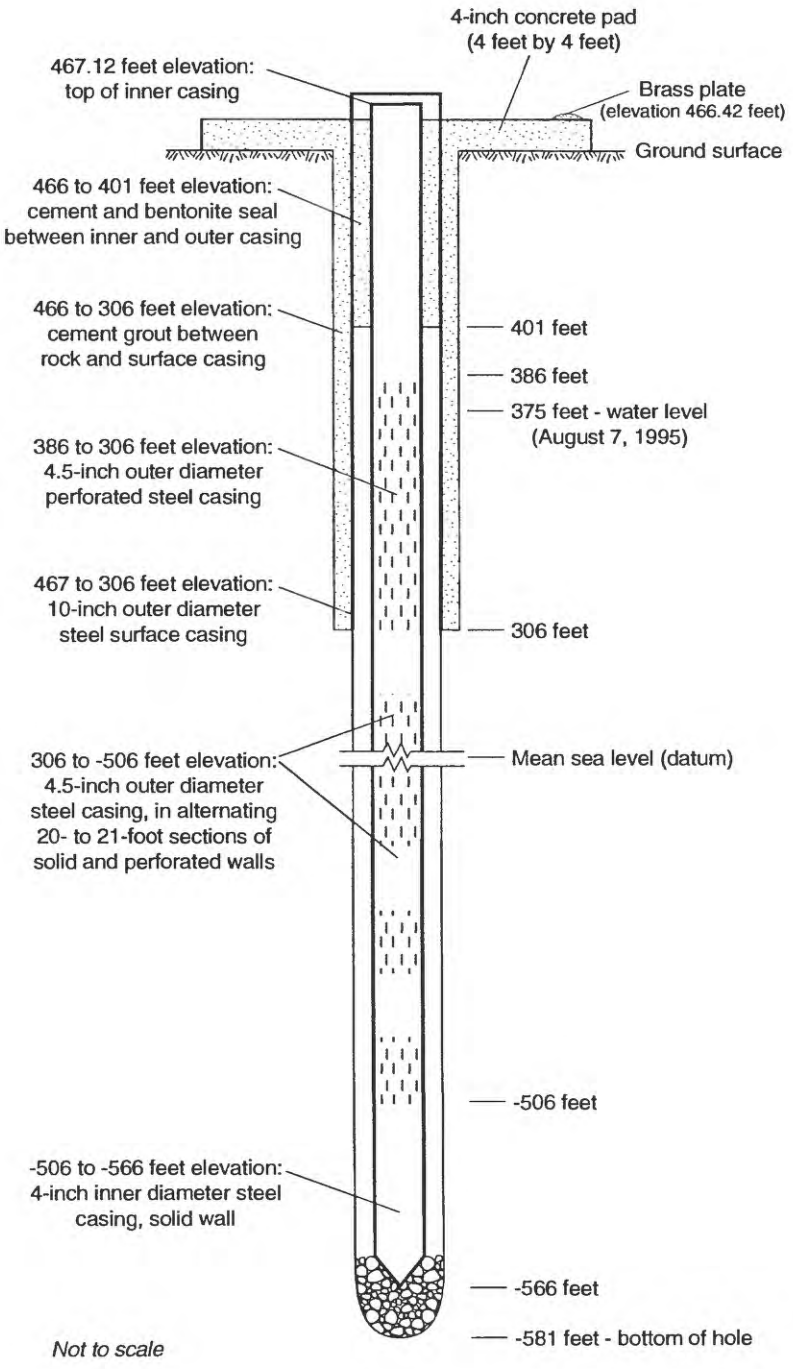


**Figure 3.** Construction details of the Northeast Kilohana monitor well (State well 2-0124-01), Kauai, Hawaii.

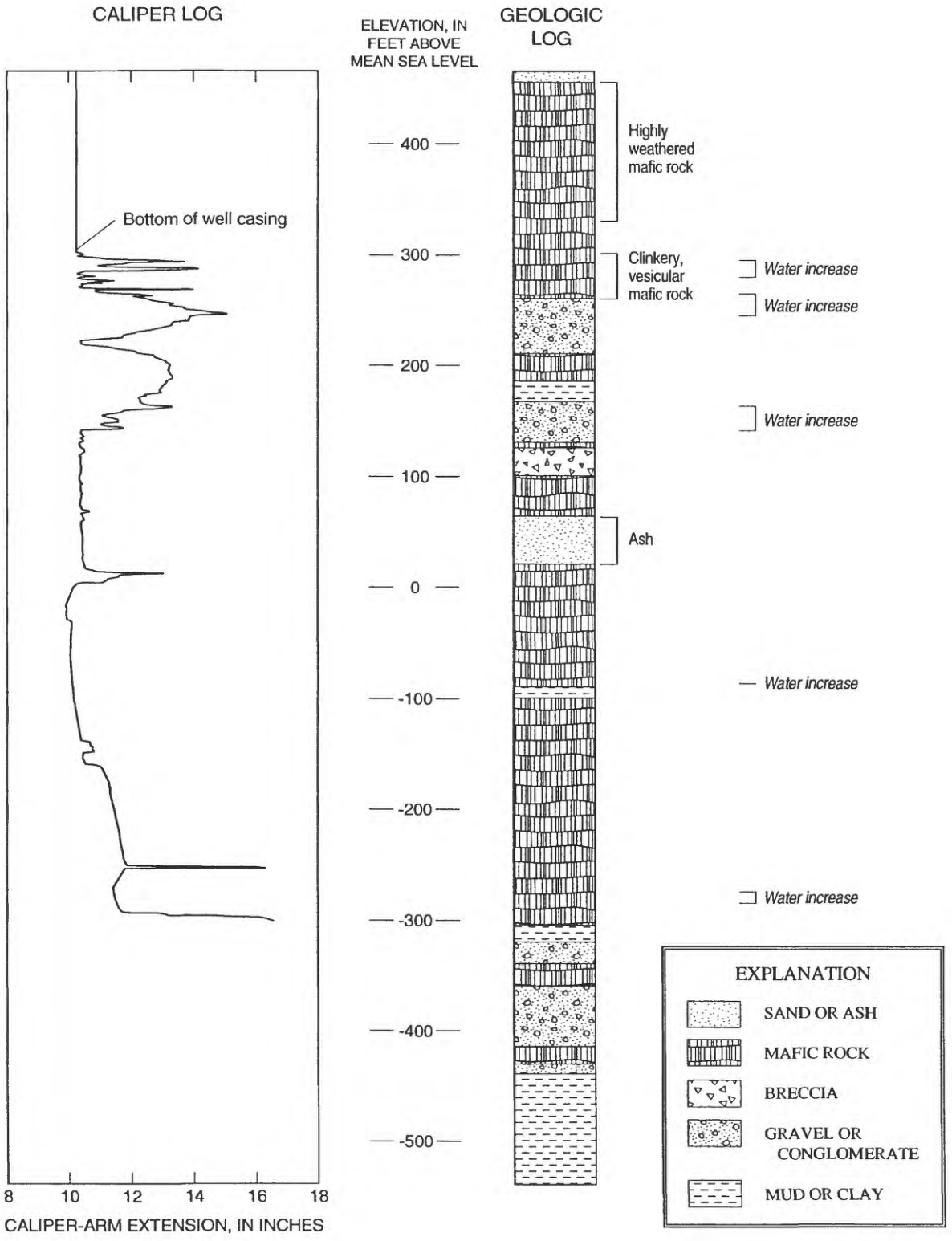


**Figure 4.** Geologic log and caliper-arm extension with depth in the Northeast Kilohana monitor well (State well 2-0124-01), Kauai, Hawaii.

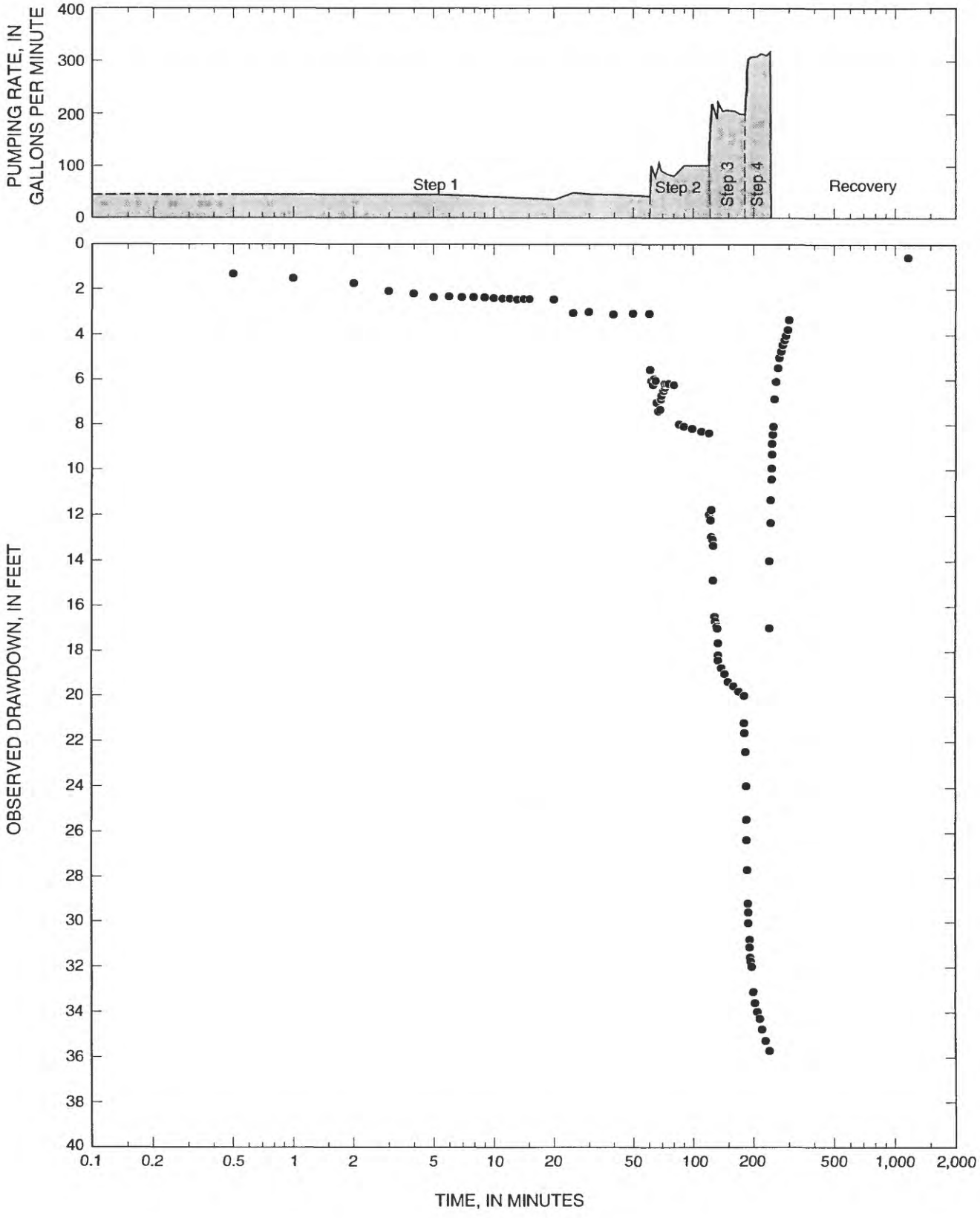


**Figure 5.** Drawdown with time during step-drawdown aquifer test (June 30, 1995), Northeast Kilohana monitor well (State well 2-0124-01), Kauai, Hawaii.

**Table 3.** Step-drawdown aquifer-test results, Northeast Kilohana monitor well (State well 2-0124-01), Kauai, Hawaii
[min/ft$^2$, minutes per square foot; min$^2$/ft$^5$, minutes squared per feet raised to the fifth power]

| Analysis method[1] | Aquifer loss, *B* (min/ft$^2$) | Well loss, *C* (min$^2$/ft$^5$) | Well loss at pumping rate of 316 gallons per minute (feet) |
|---|---|---|---|
| Hantush and Bierschenk | $4.985\times10^{-1}$ | $8.282\times10^{-3}$ | 14.78 |
| Eden and Hazel | $1.584\times10^{-1}$ | $7.770\times10^{-3}$ | 13.87 |
| Average | $3.224\times10^{-1}$ | $8.026\times10^{-3}$ | 14.32 |

[1]Methods of analysis documented in Kruseman and de Ridder (1994)

$$s_w = CQ^2, \quad (1)$$

where:

$s_w$ = well loss, in feet;

$C$ = coefficient of well loss, in minutes squared per feet raised to the fifth power; and

$Q$ = pumping rate, in feet cubed per minute.

For an average pumping rate of 316 gal/min (42.25 ft$^3$/min), the estimated well loss from equation 1 is 14.32 ft.

The sustained-rate aquifer test was conducted from July 1–8, 1995 for 10,080 min (about 7 days) at an average rate of 316 gal/min; recovery was monitored for 300 min at the end of the test (appendix 3). Flow rates during the sustained test fluctuated between 328 and 312 gal/min with the higher flow rates occurring in the first 60 min. The maximum drawdown measured in the pumped well was 49.54 ft after 4,680 min into the test. The elevation of static water level at the start of the test was 375.5 ft. The pumped water was discharged to an unlined ditch which carried the water to Kapaia Reservoir about 830 ft away from the pumping well. Seepage losses in the ditch during the sustained test were measured and determined to be about 2.4 gal/min per 1,000 ft of ditch. The total amount of water estimated to have been lost by seepage is about 20,000 gal which is about 0.6 percent of the total pumped during the sustained test.

A marked decrease in drawdown at 5,000 min into the sustained-rate (fig. 6) is apparent in the plot. At this point, the rate of drawdown slightly reversed and the well actually recovered as much as 0.39 ft during the last 4,000 min of the test. The record of pumping rate shows that the measured rate dropped 2 to 3 gal/min over this time period. This decrease in pumping of less than 1 percent of the total pumping rate is probably not large enough to account for the flatness of the drawdown curve near the end of the test.

## SUMMARY

The Northeast Kilohana monitor well (State well number 2-0124-01) is located in the center of the Lihue basin between sugarcane fields on the northeast slope of Kilohana Crater. The well was constructed during the period from June 6 to August 8, 1995 to study the hydrology and geology in an area where no other well information is available. The ground elevation at the well is 466.42 feet and the well is 1,047 feet deep (bottom is at -581 feet elevation) and has a boring diameter of 10 inches. Flush-jointed 4-inch (outer diameter) steel casing, with perforated sections between the water table and the bottom, was installed in the hole.

During drilling, water levels decreased with depth from 428 ft elevation when the hole bottom was at 305 feet elevation to 375 feet elevation when the hole was 1,047 feet deep. The drillers reported a noticeable increase in water being circulated from the hole in the intervals between 295 and 279 feet elevation, 264 and 244 feet elevation, 163 and 141 feet elevation, at -85 feet elevation, and between -274 and -284 feet elevation.

The Northeast Kilohana monitor well penetrated a 1,047-foot section of mafic lava flows and alluvium. The predominance of thick, massive, sparsely vesicular mafic lava flows interspersed with sedimentary layers is characteristic of the Koloa Volcanics.

A relatively thick section of unconsolidated sedimentary and clinker layers occurs between 316 and 131 feet elevation. Another section predominated by sedimentary layers occurs between -304 and -581 ft elevation. These unconsolidated sections partially caved into the wellbore before casing was installed and may have

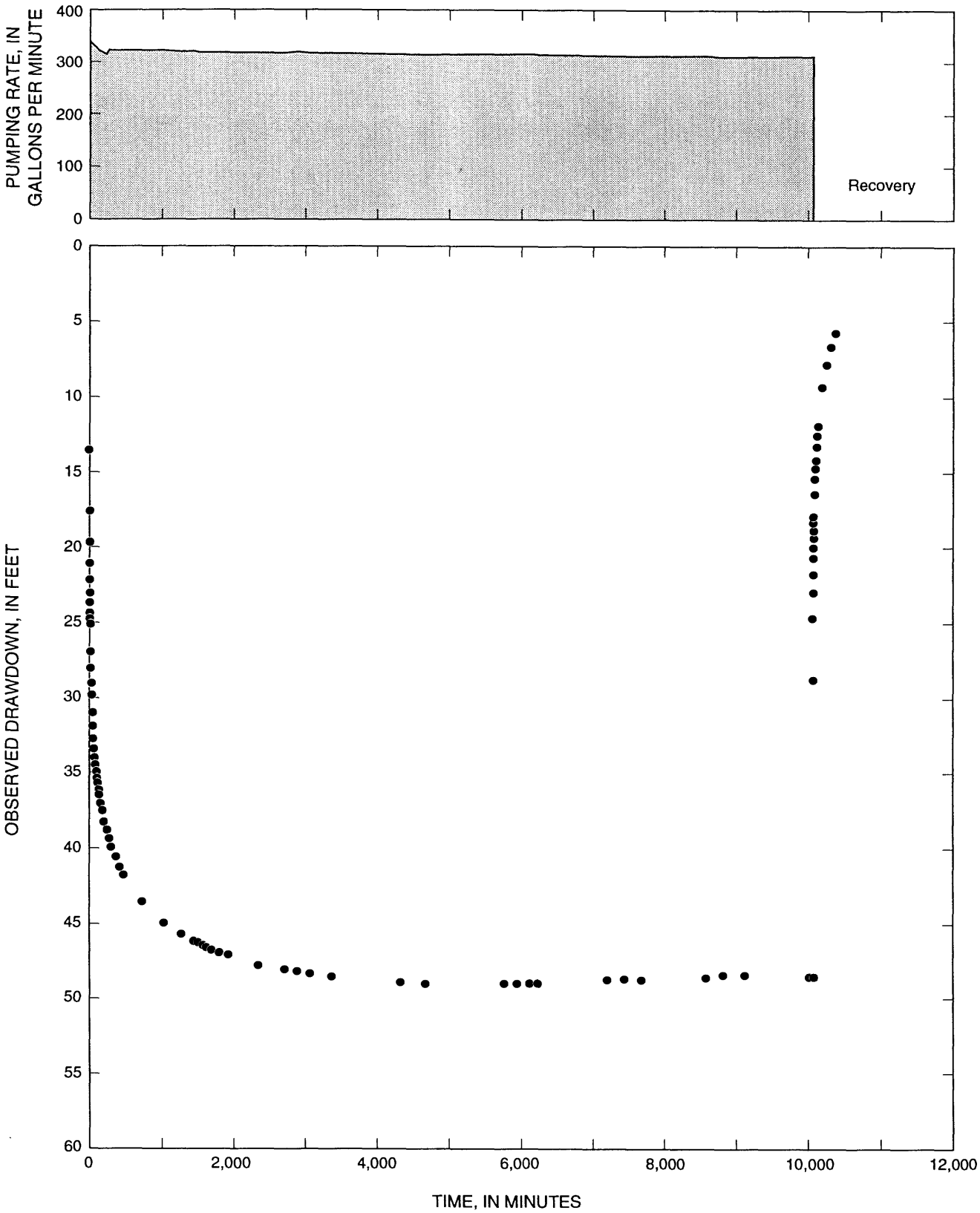


**Figure 6.** Drawdown with time during 7-day sustained-rate aquifer test (July 1–8, 1995), Northeast Kilohana monitor well (State well 2-0124-01), Kauai, Hawaii.

contributed to blockages found during caliper logging of the boring.

Step-drawdown and 7-day sustained-pumping-rate tests were conducted to test aquifer properties. The maximum drawdown measured in the pumped well was 49.54 feet (initial water-level elevation was 375.5 feet) during 7 days of sustained pumping at an average rate of 316 gallons per minute. Well loss, analyzed from the step-drawdown data was estimated to be 14.32 feet for an average pumping rate of 316 gallons per minute.

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**Appendix 1.** Lithologic descriptions of drill cuttings from Northeast Kilohana monitor well (State well 2-0124-01), Kauai, Hawaii
[Datum is mean sea level; depth measured from 466.42 feet above sea level]

| Elevation (feet) | | | Depth (feet) | | | Sample description[1] |
|---|---|---|---|---|---|---|
| 465 | to | 462 | 1 | to | 5 | brown soil |
| 461 | to | 456 | 5 | to | 10 | brown soil |
| 456 | to | 451 | 10 | to | 15 | yellowish-brown mud with highly weathered mafic rock |
| 451 | to | 446 | 10 | to | 20 | yellowish-brown mud with highly weathered mafic rock |
| 446 | to | 441 | 20 | to | 25 | yellowish-brown mud with highly weathered mafic rock |
| 441 | to | 436 | 25 | to | 30 | yellowish-brown mud with highly weathered mafic rock |
| 436 | to | 431 | 30 | to | 35 | yellowish-brown mud with highly weathered mafic rock |
| 431 | to | 426 | 35 | to | 40 | yellowish-brown mud with highly weathered mafic rock |
| 426 | to | 421 | 40 | to | 45 | yellowish-brown mud with highly weathered mafic rock |
| 421 | to | 416 | 45 | to | 50 | yellowish-brown mud with highly weathered mafic rock |
| 416 | to | 411 | 50 | to | 55 | yellowish-brown mud with highly weathered mafic rock |
| 411 | to | 406 | 55 | to | 60 | yellowish-brown mud with highly weathered mafic rock |
| 406 | to | 401 | 60 | to | 65 | yellowish-brown mud with highly weathered mafic rock |
| 401 | to | 396 | 65 | to | 70 | yellowish-brown mud with highly weathered mafic rock |
| 396 | to | 391 | 70 | to | 75 | highly weathered, vesicular mafic rock with brown mud |
| 391 | to | 386 | 75 | to | 80 | highly weathered, vesicular mafic rock with brown mud |
| 386 | to | 381 | 80 | to | 85 | highly weathered, vesicular mafic rock with brown mud |
| 381 | to | 376 | 85 | to | 90 | highly weathered, vesicular mafic rock with brown mud |
| 376 | to | 371 | 90 | to | 95 | highly weathered, vesicular mafic rock with brown mud |
| 371 | to | 366 | 95 | to | 100 | highly weathered, vesicular mafic rock with brown mud |
| 366 | to | 361 | 100 | to | 105 | highly weathered, vesicular mafic rock with brown mud |
| 361 | to | 356 | 105 | to | 110 | highly weathered, vesicular mafic rock with brown mud |
| 356 | to | 351 | 110 | to | 115 | highly weathered, vesicular mafic rock with brown mud |
| 351 | to | 346 | 115 | to | 120 | highly weathered, vesicular mafic rock with brown mud |
| 346 | to | 331 | 120 | to | 135 | highly weathered, vesicular mafic rock with brown mud |
| 331 | to | 326 | 135 | to | 140 | medium-gray, vesicular mafic rock |
| 326 | to | 321 | 140 | to | 145 | medium-gray, vesicular mafic rock |
| 321 | to | 316 | 145 | to | 150 | medium-gray, vesicular mafic rock |
| 316 | to | 311 | 150 | to | 155 | medium-gray, clinkery vesicular mafic rock |
| 311 | to | 306 | 155 | to | 160 | medium-gray, vesicular clinkery mafic rock |
| 306 | to | 301 | 160 | to | 165 | light-gray, dense mafic rock |
| 301 | to | 296 | 165 | to | 170 | medium-gray, vesicular clinkery mafic rock |
| 296 | to | 291 | 170 | to | 175 | medium-gray, vesicular clinkery mafic rock mixed with sand-size cuttings |
| 291 | to | 286 | 175 | to | 180 | medium-gray, vesicular clinkery mafic rock mixed with sand-size cuttings |
| 286 | to | 281 | 180 | to | 185 | medium-gray, vesicular clinkery mafic rock mixed with sand-size cuttings |
| 281 | to | 276 | 185 | to | 190 | yellowish medium-gray vesicular mafic rock |
| 276 | to | 271 | 190 | to | 195 | yellowish medium-gray vesicular mafic rock |
| 271 | to | 266 | 195 | to | 200 | yellowish medium-gray vesicular mafic rock |
| 266 | to | 261 | 200 | to | 205 | yellowish medium-gray vesicular mafic rock with few weathered, yellow chips |
| 261 | to | 256 | 205 | to | 210 | weathered yellow-brown, rounded gravel |
| 256 | to | 251 | 210 | to | 215 | weathered yellow-brown, rounded gravel |
| 251 | to | 246 | 215 | to | 220 | weathered yellow-brown, rounded gravel |
| 246 | to | 241 | 220 | to | 225 | yellow-brown mud with weathered, yellow-brown, rounded gravel |
| 241 | to | 236 | 225 | to | 230 | yellow-brown mud with weathered, yellow-brown, rounded gravel |
| 236 | to | 231 | 230 | to | 235 | yellow-brown mud with weathered, rounded gravel and some dense mafic rock |
| 231 | to | 226 | 235 | to | 240 | yellow-brown mud with weathered, rounded gravel and some dense mafic rock |
| 226 | to | 221 | 240 | to | 245 | weathered yellow-brown rounded gravel, mixed sizes |
| 221 | to | 216 | 245 | to | 250 | gravel with vesicular mafic rock |
| 216 | to | 211 | 250 | to | 255 | brown sticky clay with mafic rock chips |
| 211 | to | 206 | 255 | to | 260 | dark-gray, dense mafic rock with some weathered chips |
| 206 | to | 201 | 260 | to | 265 | dark-gray, dense mafic rock with some weathered chips |
| 201 | to | 196 | 265 | to | 270 | dark-gray, dense mafic rock with some weathered chips |

**Appendix 1.** Lithologic descriptions of drill cuttings from Northeast Kilohana monitor well (State well 2-0124-01), Kauai, Hawaii--Continued

| Elevation (feet) | | | Depth (feet) | | | Sample description[1] |
|---|---|---|---|---|---|---|
| 196 | to | 191 | 270 | to | 275 | dark-gray, dense mafic rock with some weathered chips |
| 191 | to | 186 | 275 | to | 280 | dark-gray, dense mafic rock with some weathered chips |
| 186 | to | 181 | 280 | to | 285 | sticky yellowish-brown clay with dense black mafic rock |
| 181 | to | 176 | 285 | to | 290 | sticky yellowish-brown clay with dense black mafic rock |
| 176 | to | 171 | 290 | to | 295 | sticky yellowish-brown clay with dense black mafic rock |
| 171 | to | 166 | 295 | to | 300 | sticky yellowish-brown clay with dense black mafic rock |
| 166 | to | 161 | 300 | to | 305 | yellow-brown weathered, rounded gravel |
| 161 | to | 156 | 305 | to | 310 | yellow-brown weathered, rounded gravel |
| 156 | to | 151 | 310 | to | 315 | yellow-brown weathered, rounded gravel with few fresh vesicular mafic rock pieces |
| 151 | to | 146 | 315 | to | 320 | yellow-brown weathered, rounded gravel with few fresh vesicular mafic rock pieces |
| 146 | to | 141 | 320 | to | 325 | yellow-brown weathered, rounded gravel with few fresh vesicular mafic rock pieces |
| 141 | to | 136 | 325 | to | 330 | yellowish, rounded slightly to moderately weathered mafic rock gravel |
| 136 | to | 131 | 330 | to | 335 | yellowish, rounded slightly to moderately weathered mafic rock gravel |
| 131 | to | 126 | 335 | to | 340 | yellowish-gray, dense mafic rock with few weathered, red-brown chips |
| 126 | to | 121 | 340 | to | 345 | purplish-gray dense welded mafic rock breccia |
| 121 | to | 116 | 345 | to | 350 | purplish-gray dense welded mafic rock breccia |
| 116 | to | 111 | 350 | to | 355 | purplish-gray dense welded mafic rock breccia |
| 111 | to | 106 | 355 | to | 360 | purplish-gray dense welded mafic rock breccia |
| 106 | to | 101 | 360 | to | 365 | purplish-gray dense welded mafic rock breccia |
| 101 | to | 96 | 365 | to | 370 | dark-gray dense medium-crystalline mafic rock |
| 96 | to | 91 | 370 | to | 375 | dark-gray dense medium-crystalline mafic rock |
| 91 | to | 86 | 375 | to | 380 | dark-gray dense medium-crystalline mafic rock |
| 86 | to | 81 | 380 | to | 385 | dark-gray dense medium-crystalline mafic rock |
| 81 | to | 76 | 385 | to | 390 | dark-gray dense medium-crystalline mafic rock |
| 76 | to | 71 | 390 | to | 395 | dark-gray dense medium-crystalline mafic rock |
| 71 | to | 66 | 395 | to | 400 | dark-gray dense medium-crystalline mafic rock |
| 66 | to | 61 | 400 | to | 405 | moderately weathered, brownish-gray dense mafic rock mixed with sand-size particles |
| 61 | to | 56 | 405 | to | 410 | moderately weathered, brownish-gray dense mafic rock mixed with sand-size particles |
| 56 | to | 51 | 410 | to | 415 | moderately weathered, brownish-gray dense mafic rock mixed with sand-size particles |
| 51 | to | 46 | 415 | to | 420 | moderately weathered, brownish-gray dense mafic rock mixed with sand-size particles |
| 46 | to | 41 | 420 | to | 425 | moderately weathered, brownish-gray dense mafic rock mixed with sand-size particles |
| 41 | to | 36 | 425 | to | 430 | moderately weathered, brownish-gray dense mafic rock mixed with sand-size particles |
| 36 | to | 31 | 430 | to | 435 | moderately weathered, brownish-gray dense mafic rock mixed with sand-size particles |
| 31 | to | 26 | 435 | to | 440 | moderately weathered, brownish-gray dense mafic rock mixed with sand-size particles |
| 26 | to | 21 | 440 | to | 445 | moderately weathered, brownish-gray dense mafic rock mixed with sand-size particles |
| 21 | to | 16 | 445 | to | 450 | yellowish-gray slightly weathered, dense mafic rock |
| 16 | to | 11 | 450 | to | 455 | yellowish-gray slightly weathered, dense mafic rock |
| 11 | to | 6 | 455 | to | 460 | yellowish-gray slightly weathered, dense mafic rock |
| 6 | to | 1 | 460 | to | 465 | yellowish-gray slightly weathered, dense mafic rock |
| 1 | to | -4 | 465 | to | 470 | yellow-brown to dark-gray, moderately to highly weathered, dense mafic rock |
| -4 | to | -9 | 470 | to | 475 | yellow-brown to dark-gray, moderately to highly weathered, dense mafic rock |
| -9 | to | -14 | 475 | to | 480 | dark-gray, slightly vesicular, amygdaloidal mafic rock |
| -14 | to | -19 | 480 | to | 485 | dark-gray, slightly vesicular, amygdaloidal mafic rock |
| -19 | to | -24 | 485 | to | 490 | dark-gray, slightly vesicular, amygdaloidal mafic rock |
| -24 | to | -29 | 490 | to | 495 | dark-gray, slightly vesicular, amygdaloidal mafic rock |
| -29 | to | -34 | 495 | to | 520 | dark-gray, slightly vesicular, amygdaloidal mafic rock |
| -34 | to | -59 | 500 | to | 525 | yellow-brown, weathered mafic rock mixed with dark-gray, dense mafic rock |
| -59 | to | -64 | 525 | to | 530 | yellow-brown, weathered mafic rock mixed with dark-gray, dense mafic rock |
| -64 | to | -69 | 530 | to | 535 | dark-gray, dense, amygdaloidal mafic rock |
| -69 | to | -74 | 535 | to | 540 | dark-gray, dense, amygdaloidal mafic rock |
| -74 | to | -79 | 540 | to | 545 | dark-gray, dense, amygdaloidal mafic rock |

**Appendix 1.** Lithologic descriptions of drill cuttings from Northeast Kilohana monitor well (State well 2-0124-01), Kauai, Hawaii--Continued

| Elevation (feet) | | | Depth (feet) | | | Sample description[1] |
|---|---|---|---|---|---|---|
| -79 | to | -84 | 545 | to | 550 | dark-gray, dense, amygdaloidal mafic rock |
| -84 | to | -89 | 550 | to | 555 | dark-gray, dense, amygdaloidal mafic rock |
| -89 | to | -94 | 555 | to | 560 | greenish-gray, sticky mud |
| -94 | to | -99 | 560 | to | 565 | greenish-gray, sticky mud |
| -99 | to | -104 | 565 | to | 570 | dark-gray, dense mafic rock |
| -104 | to | -109 | 570 | to | 575 | dark-gray, dense mafic rock |
| -109 | to | -114 | 575 | to | 580 | dark-gray, dense mafic rock |
| -114 | to | -119 | 580 | to | 585 | dark-gray, dense mafic rock |
| -119 | to | -124 | 585 | to | 590 | medium-gray, dense mafic rock with some light-gray and yellow, weathered mafic rock |
| -124 | to | -129 | 590 | to | 595 | medium-gray, dense mafic rock with some light-gray and yellow, weathered mafic rock |
| -129 | to | -134 | 595 | to | 600 | medium-gray, dense mafic rock with some light-gray and yellow, weathered mafic rock |
| -134 | to | -139 | 600 | to | 605 | dark-gray, dense mafic rock |
| -139 | to | -144 | 605 | to | 610 | medium-gray, dense mafic rock mixed with yellow-brown, weathered mafic rock |
| -144 | to | -149 | 610 | to | 615 | medium-gray, dense mafic rock mixed with yellow-brown, weathered mafic rock |
| -149 | to | -154 | 615 | to | 620 | medium-gray, dense mafic rock mixed with yellow-brown, weathered mafic rock |
| -154 | to | -159 | 620 | to | 625 | medium-gray, dense mafic rock mixed with yellow-brown, weathered mafic rock |
| -159 | to | -164 | 625 | to | 630 | brown, slightly weathered mafic rock with some dark-gray mafic rock |
| -164 | to | -169 | 630 | to | 635 | moderately to highly weathered, dense mafic rock with some chalky carbonate |
| -169 | to | -174 | 636 | to | 640 | moderately to highly weathered, dense mafic rock with some chalky carbonate |
| -174 | to | -179 | 640 | to | 645 | medium-gray, dense mafic rock with olivine phenocrysts |
| -179 | to | -184 | 645 | to | 650 | medium-gray, dense mafic rock with olivine phenocrysts |
| -184 | to | -189 | 650 | to | 655 | medium-gray, dense mafic rock with olivine phenocrysts |
| -189 | to | -194 | 655 | to | 660 | medium-gray, dense mafic rock with olivine phenocrysts |
| -194 | to | -199 | 660 | to | 665 | greenish-brown highly weathered mafic rock |
| -199 | to | -204 | 665 | to | 670 | greenish dark-gray mafic rock with weathered, greenish-white phenocrysts |
| -204 | to | -209 | 670 | to | 675 | greenish dark-gray mafic rock with weathered, greenish-white phenocrysts |
| -209 | to | -214 | 675 | to | 680 | greenish dark-gray mafic rock with weathered, greenish-white phenocrysts |
| -214 | to | -219 | 680 | to | 685 | greenish dark-gray mafic rock with weathered, greenish-white phenocrysts |
| -219 | to | -224 | 685 | to | 690 | greenish dark-gray mafic rock with weathered, greenish-white phenocrysts |
| -224 | to | -229 | 690 | to | 695 | greenish dark-gray mafic rock with weathered, greenish-white phenocrysts |
| -229 | to | -234 | 695 | to | 700 | greenish dark-gray mafic rock with weathered, greenish-white phenocrysts |
| -234 | to | -239 | 700 | to | 705 | dark-gray, dense mafic rock |
| -239 | to | -244 | 705 | to | 710 | greenish-gray, dense mafic rock |
| -244 | to | -249 | 710 | to | 715 | medium-gray, dense mafic rock |
| -249 | to | -254 | 715 | to | 720 | medium-gray, dense mafic rock |
| -254 | to | -259 | 720 | to | 725 | greenish-gray, dense mafic rock |
| -259 | to | -264 | 725 | to | 730 | greenish-gray, partly weathered, amygdaloidal mafic rock |
| -264 | to | -269 | 730 | to | 735 | dark-gray, moderately vesicular, amygdaloidal mafic rock |
| -269 | to | -274 | 735 | to | 740 | dark-gray, moderately vesicular, amygdaloidal mafic rock |
| -274 | to | -279 | 740 | to | 745 | dark-gray, moderately vesicular, amygdaloidal mafic rock |
| -279 | to | -284 | 745 | to | 750 | dark-gray, moderately vesicular, amygdaloidal mafic rock |
| -284 | to | -289 | 750 | to | 755 | dark-gray, moderately vesicular, amygdaloidal mafic rock |
| -289 | to | -294 | 755 | to | 760 | dark-gray, moderately vesicular, amygdaloidal mafic rock |
| -294 | to | -299 | 760 | to | 765 | dark-gray, moderately vesicular, amygdaloidal mafic rock |
| -299 | to | -304 | 765 | to | 770 | medium-gray, amygdaloidal mafic rock |
| -304 | to | -309 | 770 | to | 775 | red-brown clay |
| -309 | to | -314 | 775 | to | 780 | red-brown clay |
| -314 | to | -319 | 780 | to | 785 | red-brown clay |
| -319 | to | -324 | 785 | to | 790 | rounded mafic rock gravel and red-brown mud |
| -324 | to | -329 | 790 | to | 795 | rounded mafic rock gravel and red-brown mud |
| -329 | to | -334 | 795 | to | 800 | rounded mafic rock gravel and red-brown mud |

**Appendix 1.** Lithologic descriptions of drill cuttings from Northeast Kilohana monitor well (State well 2-0124-01), Kauai, Hawaii--Continued

| Elevation (feet) | | | Depth (feet) | | | Sample description[1] |
|---|---|---|---|---|---|---|
| -334 | to | -339 | 800 | to | 805 | rounded mafic rock gravel and red-brown mud |
| -339 | to | -344 | 805 | to | 810 | yellowish-gray, slightly weathered, dense mafic rock |
| -344 | to | -349 | 810 | to | 815 | yellowish-gray, slightly weathered, dense mafic rock |
| -349 | to | -354 | 815 | to | 820 | yellowish-gray, slightly weathered, dense mafic rock |
| -354 | to | -359 | 820 | to | 825 | yellowish-gray, slightly weathered, dense mafic rock |
| -359 | to | -364 | 825 | to | 830 | red-brown mud with rounded mafic rock gravel |
| -364 | to | -369 | 830 | to | 835 | red-brown mud with rounded mafic rock gravel |
| -369 | to | -374 | 835 | to | 840 | rounded, variously weathered, mafic rock gravel |
| -374 | to | -379 | 840 | to | 845 | rounded, variously weathered, mafic rock gravel |
| -379 | to | -384 | 845 | to | 850 | red-brown to gray mafic rock gravel and gray, sandy soil |
| -384 | to | -389 | 850 | to | 855 | red-brown to gray mafic rock gravel and gray, sandy soil |
| -389 | to | -394 | 855 | to | 860 | red-brown to gray mafic rock gravel and gray, sandy soil |
| -394 | to | -399 | 860 | to | 865 | red-brown to gray mafic rock gravel and gray, sandy soil |
| -399 | to | -404 | 865 | to | 870 | red-brown to gray mafic rock gravel and gray, sandy soil |
| -404 | to | -409 | 870 | to | 875 | red-brown to gray mafic rock gravel and gray, sandy soil |
| -409 | to | -414 | 875 | to | 880 | red-brown to gray mafic rock gravel and gray, sandy soil |
| -414 | to | -419 | 880 | to | 885 | hard, dark- gray, dense mafic rock |
| -419 | to | -424 | 885 | to | 890 | weathered mafic rock gravel |
| -424 | to | -429 | 890 | to | 895 | dark- gray, dense mafic rock |
| -429 | to | -434 | 895 | to | 900 | weathered mafic rock gravel |
| -434 | to | -439 | 900 | to | 905 | weathered mafic rock gravel |
| -439 | to | -444 | 905 | to | 910 | brown, sandy mud |
| -444 | to | -449 | 910 | to | 915 | brown, sandy mud |
| -449 | to | -454 | 915 | to | 920 | brown, sandy mud |
| -454 | to | -459 | 920 | to | 925 | brown, sandy mud |
| -459 | to | -464 | 925 | to | 930 | brown, sandy mud |
| -464 | to | -469 | 930 | to | 935 | brown, sandy mud |
| -469 | to | -474 | 935 | to | 940 | brown, sandy mud |
| -474 | to | -479 | 940 | to | 945 | brown, sandy mud |
| -479 | to | -484 | 945 | to | 950 | brown, sandy mud |
| -484 | to | -489 | 950 | to | 955 | brown, sandy mud |
| -489 | to | -494 | 955 | to | 960 | brown, sandy mud |
| -494 | to | -499 | 960 | to | 965 | brown, sandy mud |
| -499 | to | -504 | 965 | to | 970 | brown, sandy mud |
| -504 | to | -509 | 970 | to | 975 | brown, sandy mud |
| -509 | to | -514 | 975 | to | 980 | brown, sandy mud |
| -514 | to | -519 | 980 | to | 985 | brown, sandy mud |
| -519 | to | -524 | 985 | to | 990 | brown, sandy mud |
| -524 | to | -529 | 990 | to | 995 | brown, sandy mud |
| -529 | to | -534 | 995 | to | 1,000 | brown, sandy mud |
| -534 | to | -539 | 1,000 | to | 1,005 | brown, sandy mud |
| -539 | to | -544 | 1,005 | to | 1,010 | brown, sandy mud |
| -544 | to | -549 | 1,010 | to | 1,015 | brown, sandy mud |
| -549 | to | -554 | 1,015 | to | 1,020 | brown, sandy mud |
| -554 | to | -559 | 1,020 | to | 1,025 | brown, sandy mud |
| -559 | to | -564 | 1,025 | to | 1,030 | brown, sandy mud |
| -564 | to | -569 | 1,030 | to | 1,035 | brown, sandy mud |
| -569 | to | -574 | 1,035 | to | 1,040 | brown, sandy mud |

[1]Rotary-drilling cuttings lifted with air, foam, and polymer. Sample repository: U.S. Geological Survey, Hawaii District office. Date of logging: May, 1996.

**Appendix 2.** Data from step-drawdown aquifer test, June 30, 1995, Northeast Kilohana monitor well (2-0124-01), Kauai, Hawaii

[min, minutes; ft, feet; gal/min, gallons per minute; depth to water measured from 466.42 ft above mean sea level; -, no measurement made]

| Time (min) | Depth to water (ft) | Drawdown (ft) | Pumping rate (gal/min) |
|---|---|---|---|
| 0 | 91.10 | 0 | - |
| 0.5 | 92.42 | 1.32 | - |
| 1 | 92.61 | 1.51 | - |
| 2 | 92.83 | 1.73 | - |
| 3 | 93.17 | 2.07 | - |
| 4 | 93.27 | 2.17 | - |
| 5 | 93.42 | 2.32 | 44 |
| 6 | 93.41 | 2.31 | - |
| 7 | 93.42 | 2.32 | - |
| 8 | 93.44 | 2.34 | - |
| 9 | 93.46 | 2.36 | - |
| 10 | 93.44 | 2.34 | - |
| 11 | 93.47 | 2.37 | 40 |
| 12 | 93.47 | 2.37 | - |
| 13 | 93.51 | 2.41 | - |
| 14 | 93.50 | 2.40 | 38 |
| 15 | 93.52 | 2.42 | 38 |
| 20 | 93.52 | 2.42 | 35 |
| 25 | 94.12 | 3.02 | 47 |
| 30 | 94.06 | 2.96 | 45 |
| 40 | 94.17 | 3.07 | 44 |
| 50 | 94.14 | 3.04 | 43 |
| 60 | 94.15 | 3.05 | 42 |
| 61 | 96.66 | 5.56 | 43 |
| 62 | 97.16 | 6.06 | 100 |
| 63 | 97.27 | 6.17 | - |
| 64 | 97.05 | 5.95 | 80 |
| 65 | 97.12 | 6.02 | 80 |
| 66 | 98.10 | 7.00 | - |
| 67 | 98.47 | 7.37 | 105 |
| 68 | 98.38 | 7.28 | 105 |
| 69 | 97.93 | 6.83 | 90 |
| 70 | 97.78 | 6.68 | 85 |
| 71 | 97.56 | 6.46 | 94 |
| 72 | 97.42 | 6.32 | 85 |
| 73 | 97.26 | 6.16 | - |
| 74 | 97.27 | 6.17 | 81 |
| 75 | 97.26 | 6.16 | 85 |
| 80 | 97.30 | 6.20 | 80 |
| 85 | 99.05 | 7.95 | - |
| 90 | 99.14 | 8.04 | 100 |
| 100 | 99.24 | 8.14 | 99 |
| 110 | 99.39 | 8.29 | 100 |
| 120 | 99.46 | 8.36 | 100 |
| 121 | 103.04 | 11.94 | 175 |
| 122 | 103.31 | 12.21 | - |
| 123 | 102.86 | 11.76 | 145 |

**Appendix 2.** Data from step-drawdown aquifer test, June 30, 1995, Northeast Kilohana monitor well (2-0124-01), Kauai, Hawaii --Continued

[min, minutes; ft, feet; gal/min, gallons per minute; depth to water measured from 466.42 ft above mean sea level; -, no measurement made]

| Time (min) | Depth to water (ft) | Drawdown (ft) | Pumping rate (gal/min) |
|---|---|---|---|
| 124 | 104.04 | 12.94 | 218 |
| 125 | 104.15 | 13.05 | 160 |
| 126 | 104.42 | 13.32 | - |
| 127 | 105.94 | 14.84 | 190 |
| 128 | 107.53 | 16.43 | 200 |
| 129 | 107.76 | 16.66 | - |
| 130 | 107.97 | 16.87 | - |
| 131 | 107.99 | 16.89 | - |
| 132 | 108.06 | 16.96 | 192 |
| 133 | 108.72 | 17.62 | - |
| 134 | 109.26 | 18.16 | 220 |
| 135 | 109.50 | 18.40 | 215 |
| 140 | 109.82 | 18.72 | 206 |
| 145 | 110.07 | 18.97 | 208 |
| 150 | 110.43 | 19.33 | 205 |
| 160 | 110.62 | 19.52 | 205 |
| 170 | 110.86 | 19.76 | 200 |
| 180 | 111.05 | 19.95 | 200 |
| 181 | 112.27 | 21.17 | 225 |
| 182 | 112.72 | 21.62 | - |
| 183 | 113.54 | 22.44 | 235 |
| 184 | 115.03 | 23.93 | 245 |
| 185 | 116.51 | 25.41 | 280 |
| 186 | 117.41 | 26.31 | - |
| 187 | 118.74 | 27.64 | 295 |
| 188 | 120.25 | 29.15 | 305 |
| 189 | 120.66 | 29.56 | - |
| 190 | 121.11 | 30.01 | 300 |
| 191 | 121.86 | 30.76 | 310 |
| 192 | 122.21 | 31.11 | 310 |
| 193 | 122.66 | 31.56 | 310 |
| 194 | 122.83 | 31.73 | - |
| 195 | 123.08 | 31.98 | 305 |
| 200 | 124.20 | 33.10 | 310 |
| 205 | 124.68 | 33.58 | 310 |
| 210 | 125.09 | 33.99 | 312 |
| 215 | 125.40 | 34.30 | 315 |
| 220 | 125.84 | 34.74 | 312 |
| 230 | 126.36 | 35.26 | 313 |
| 240 | 126.80 | 35.70 | 315 |
| 241 | 108.06 | 16.96 | 0 |
| 242 | 105.06 | 13.96 | 0 |
| 243 | 103.43 | 12.33 | 0 |
| 244 | 102.43 | 11.33 | 0 |
| 245 | 101.50 | 10.40 | 0 |
| 246 | 100.99 | 9.89 | 0 |
| 247 | 100.39 | 9.29 | 0 |
| 248 | 99.90 | 8.80 | 0 |

**Appendix 2.** Data from step-drawdown aquifer test, June 30, 1995, Northeast Kilohana monitor well (2-0124-01), Kauai, Hawaii --Continued

[min, minutes; ft, feet; gal/min, gallons per minute; depth to water measured from 466.42 ft above mean sea level; -, no measurement made]

| Time (min) | Depth to water (ft) | Drawdown (ft) | Pumping rate (gal/min) |
|---|---|---|---|
| 249 | 99.53 | 8.43 | 0 |
| 250 | 99.18 | 8.08 | 0 |
| 255 | 97.94 | 6.84 | 0 |
| 260 | 97.16 | 6.06 | 0 |
| 265 | 96.56 | 5.46 | 0 |
| 270 | 96.12 | 5.02 | 0 |
| 275 | 95.81 | 4.71 | 0 |
| 280 | 95.53 | 4.43 | 0 |
| 285 | 95.32 | 4.22 | 0 |
| 290 | 95.12 | 4.02 | 0 |
| 295 | 94.84 | 3.74 | 0 |
| 300 | 94.42 | 3.32 | 0 |
| 1,160 | 91.67 | 0.57 | 0 |

**Appendix 3.** Data from 7-day sustained-rate aquifer test, July 1–8, 1995, Northeast Kilohana monitor well (2-0124-01), Kauai, Hawaii

[min, minutes; ft, feet; gal/min, gallons per minute; °C, degrees Celsius; (µS/cm), microsiemens per centimeter at 25°C static water level at start of test was 374.90 feet above mean sea level; depth to water measured from 466.42 feet above mean sea level; -, no measurement made]

| Time (min) | Depth to water (ft) | Drawdown (ft) | Pumping rate (gal/min) | Drawdown, corrected for well loss (ft) | Temperature (°C) | Specific conductance (µS/cm) |
|---|---|---|---|---|---|---|
| 0 | 91.64 | 0 | 0 | 0 | - | - |
| 1 | 108.98 | 17.34 | 320 | 2.65 | - | - |
| 2 | 112.68 | 21.04 | | 6.35 | - | - |
| 3 | 114.59 | 22.95 | 328 | 7.52 | - | - |
| 4 | 115.84 | 24.2 | 328 | 8.77 | - | - |
| 5 | 116.85 | 25.21 | 328 | 9.78 | - | - |
| 6 | 117.64 | 26.00 | 328 | 10.57 | - | - |
| 7 | 118.23 | 26.59 | - | 11.16 | - | - |
| 8 | 118.82 | 27.18 | 325 | 12.03 | - | - |
| 9 | 119.21 | 27.57 | 320 | 12.88 | - | - |
| 10 | 119.56 | 27.92 | 328 | 12.49 | - | - |
| 15 | 121.18 | 29.54 | 328 | 14.11 | - | - |
| 20 | 122.17 | 30.53 | 325 | 15.38 | - | - |
| 25 | 123.07 | 31.43 | 325 | 16.28 | - | - |
| 30 | 123.80 | 32.16 | 323 | 17.19 | - | - |
| 40 | 124.87 | 33.23 | 324 | 18.17 | 25.1 | 207 |
| 50 | 125.67 | 34.03 | 324 | 18.97 | - | - |
| 60 | 126.43 | 34.79 | 323 | 19.82 | - | - |
| 70 | 127.02 | 35.38 | 322 | 20.51 | - | - |
| 80 | 127.60 | 35.96 | 323 | 20.99 | - | - |
| 90 | 128.03 | 36.39 | 323 | 21.42 | - | - |
| 100 | 128.47 | 36.83 | 324 | 21.77 | - | - |
| 110 | 128.84 | 37.20 | 323 | 22.23 | 25.2 | 207 |
| 120 | 129.17 | 37.53 | 323 | 22.56 | 25.1 | 207 |
| 130 | 129.54 | 37.90 | 323 | 22.93 | - | - |
| 140 | 129.85 | 38.21 | 324 | 23.15 | - | - |
| 160 | 130.38 | 38.74 | 325 | 23.59 | - | - |
| 180 | 130.79 | 39.15 | 322 | 24.28 | - | - |
| 210 | 131.47 | 39.83 | 320 | 25.14 | - | - |
| 240 | 131.92 | 40.28 | 315 | 26.05 | 25.3 | 208 |
| 270 | 132.49 | 40.85 | 325 | 25.70 | - | - |
| 300 | 132.95 | 41.31 | 323 | 26.34 | - | - |
| 360 | 133.54 | 41.90 | 322 | 27.03 | - | - |
| 420 | 134.15 | 42.51 | 323 | 27.54 | - | - |
| 480 | 134.63 | 42.99 | 323 | 28.02 | 24.8 | 209 |
| 720 | 136.27 | 44.63 | 322 | 29.76 | 24.6 | 207 |
| 1,020 | 137.53 | 45.89 | 322 | 31.02 | 24.6 | 207 |
| 1,260 | 138.21 | 46.57 | 320 | 31.88 | 24.5 | 207 |
| 1,440 | 138.62 | 46.98 | 320 | 32.29 | 24.8 | 207 |
| 1,500 | 138.70 | 47.06 | 318 | 32.55 | - | - |
| 1,560 | 138.88 | 47.24 | 318 | 32.73 | - | - |
| 1,620 | 139.03 | 47.39 | 318 | 32.88 | 25.1 | 207 |
| 1,680 | 139.14 | 47.50 | 318 | 32.99 | - | - |
| 1,800 | 139.34 | 47.70 | 318 | 33.19 | - | - |
| 1,920 | 139.47 | 47.83 | 318 | 33.32 | 24.8 | 207 |
| 2,340 | 140.05 | 48.41 | 318 | 33.90 | 24.5 | 207 |
| 2,700 | 140.34 | 48.70 | 318 | 34.19 | 24.5 | 207 |
| 2,880 | 140.45 | 48.81 | 320 | 34.12 | 24.8 | 207 |
| 3,060 | 140.57 | 48.93 | 318 | 34.42 | - | - |
| 3,360 | 140.78 | 49.14 | 319 | 34.54 | 24.9 | 207 |

**Appendix 3.** Data from 7-day sustained-rate aquifer test, July 1–8, 1995, Northeast Kilohana monitor well (2-0124-01), Kauai, Hawaii--Continued

[min, minutes; ft, feet; gal/min, gallons per minute; °C, degrees Celsius; (µS/cm), microsiemens per centimeter at 25°C static water level at start of test was 374.90 feet above mean sea level; depth to water measured from 466.42 feet above mean sea level; -, no measurement made]

| Time (min) | Depth to water (ft) | Drawdown (ft) | Pumping rate (gal/min) | Drawdown, corrected for well loss (ft) | Temperature (°C) | Specific conductance (µS/cm) |
|---|---|---|---|---|---|---|
| 4,320 | 141.13 | 49.49 | 317 | 35.07 | 24.8 | 207 |
| 4,680 | 141.18 | 49.54 | 315 | 35.31 | - | - |
| 5,760 | 141.16 | 49.52 | 316 | 35.20 | 24.6 | 206 |
| 5,940 | 141.14 | 49.50 | 317 | 35.08 | - | - |
| 6,120 | 141.15 | 49.51 | 317 | 35.09 | - | - |
| 6,240 | 141.14 | 49.50 | 315 | 35.27 | 24.9 | 206 |
| 7,200 | 140.93 | 49.29 | 313 | 35.24 | 24.7 | 206 |
| 7,440 | 140.90 | 49.26 | 313 | 35.21 | 24.9 | 207 |
| 7,680 | 140.92 | 49.28 | 313 | 35.23 | 24.6 | 205 |
| 8,580 | 140.81 | 49.17 | 313 | 35.12 | - | - |
| 8,820 | 140.65 | 49.01 | 312 | 35.05 | 24.9 | 206 |
| 9,120 | 140.62 | 48.98 | 313 | 34.93 | 24.6 | 206 |
| 10,020 | 140.73 | 49.09 | 312 | 35.13 | - | - |
| 10,080 | 140.73 | 49.09 | 312 | 35.13 | - | - |
| 10,081 | 122.76 | 31.12 | 0 | 31.12 | - | - |
| 10,082 | 119.02 | 27.38 | 0 | 27.38 | - | - |
| 10,083 | 117.46 | 25.82 | 0 | 25.82 | - | - |
| 10,084 | 116.36 | 24.72 | 0 | 24.72 | - | - |
| 10,085 | 115.41 | 23.77 | 0 | 23.77 | - | - |
| 10,086 | 114.80 | 23.16 | 0 | 23.16 | - | - |
| 10,087 | 114.21 | 22.57 | 0 | 22.57 | - | - |
| 10,088 | 113.75 | 22.11 | 0 | 22.11 | - | - |
| 10,089 | 113.27 | 21.63 | 0 | 21.63 | - | - |
| 10,090 | 112.86 | 21.22 | 0 | 21.22 | - | - |
| 10,095 | 111.53 | 19.89 | 0 | 19.89 | - | - |
| 10,100 | 110.62 | 18.98 | 0 | 18.98 | - | - |
| 10,105 | 109.98 | 18.34 | 0 | 18.34 | - | - |
| 10,110 | 109.46 | 17.82 | 0 | 17.82 | - | - |
| 10,120 | 108.65 | 17.01 | 0 | 17.01 | - | - |
| 10,130 | 107.98 | 16.34 | 0 | 16.34 | - | - |
| 10,140 | 107.39 | 15.75 | 0 | 15.75 | - | - |
| 10,200 | 105.10 | 13.46 | 0 | 13.46 | - | - |
| 10,260 | 103.73 | 12.09 | 0 | 12.09 | - | - |
| 10,320 | 102.68 | 11.04 | 0 | 11.04 | - | - |
| 10,380 | 101.82 | 10.18 | 0 | 10.18 | - | - |