WATER RESOURCES DEPARTMENT

GROUND WATER REPORT NO. 29

STATE OF OREGON

WILLIAM H. YOUNG
Director

GROUND WATER IN THE NORTHERN PART OF CLACKAMAS COUNTY OREGON

BY
A. R. LEONARD AND C. A. COLLINS

PREPARED IN COOPERATION WITH
THE UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
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Open-File Report 80-1049

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FACTORS FOR CONVERTING INCH-POUND UNITS TO METRIC UNITS

For readers who prefer SI (International System of Units) metric units rather than inch-pound units, the conversaion factors for the terms used in this report are listed below:

To convert from	To	
	Length	
foot (ft)	meter (m)	0.3048
inch (in.)	millimeter (mm)	25.4
mile (mi)	kilometer (km)	1.609
	Area	
acre	square meter (m^2)	4,047
	square mectometer (hm^2)	0.4047
square mile (mi^2)	square kilometer (km^2)	2.590
	Volume	
acre-foot (acre-ft)	cubic meter (m^3)	1,233
	cubic hectometer (hm^3)	0.001233
cubic foot (ft^3)	cubic meter (m^3)	0.02832
gallon (gal)	liter (L)	3.785
million gallons (Mgal)	cubic meter (m^3)	3,785
	Specific combinations	
cubic foot per second (ft^3/s)	cubic meter per second (m^3/s)	0.02832
foot per day (ft/d)	meter per day (m/d)	0.3048
foot squared per day (ft^2/d)	meter squared per day (m^2/d)	0.0929
gallon per minute (gal/min)	liter per second (L/s)	0.06309
gallon per minute per foot (gal/min)/ft	liter per second per meter (L/s)/m	0.2070
million gallons per day (Mgal/d)	cubic meter per day (m^3/d)	3,785
	cubic meter per second (m^3/s)	0.04381
	Temperature	
degree Fahrenheit (°F)	degree Celsius (°C)	([1])

[1]Temp °C = (temp °F-32)/1.8.

GROUND WATER IN THE NORTHERN PART OF CLACKAMAS COUNTY, OREGON

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ABSTRACT

Northern Clackamas County is part of the rapidly growing Portland metropolitan area. Population of this 250-square-mile area increased about 50 percent between 1970 and 1976. The study area includes a small segment of the Willamette River alluvial valley near Canby, and extends northward to the Clackamas River and eastward to the western boundary of Mount Hood National Forest. Also included is the narrow, well-populated corridor along U.S. Highway 26 from Cherryville to Government Camp.

The main part of the study area is largely a rolling upland underlain by volcanic and stream-deposited rocks ranging in age from Eocene to Holocene. In most places, these rocks yield water in quantities adequate for individual homes. Locally, ground-water supplies are adequate for small irrigation, industrial, or public-supply uses. Depths of wells range from 50 to 1,000 feet; wells generally are shallowest in lowlands near streams and deepest in upland locations near deeply incised stream valleys.

All aquifers receive recharge at sufficient rates to sustain present rates of natural and man-produced discharge. All aquifers could supply additional water, but careful engineering is needed to avoid overdevelopment problems for the Columbia River Basalt Group near Oregon City.

Chemical analyses indicate that the ground water in the study area is of good quality for drinking and other uses. Mineralized water reported from some wells northeast of Canby may be from rocks of the Skamania Volcanics, which locally are at shallow depth. Although ground water locally may be subject to bacterial contamination where it occurs at shallow depths in alluvium and other unconsolidated deposits, no contaminated water was identified during the study.

INTRODUCTION

Northern Clackamas County is part of the rapidly growing Portland suburban area. The population of the area is increasing rapidly as people move from older urban parts of the Portland metropolitan area and elsewhere. Farmlands are being subdivided for homesites, and many of the new subdivisions are not served by public water-supply and sewage systems; consequently, many homes require individual supply wells and septic-tank disposal systems.

Because of the diverse geology and topography, ground-water availability and occurrence vary throughout the area. A better understanding of subsurface geologic and hydrologic conditions is needed to help individual landowners and local officials make decisions about water supply and sewage disposal.

The objectives of this study were to identify and map the principal aquifers, obtain information on their thickness, extent, and water-yielding characteristics, evaluate water quality in the aquifers and identify water-quality problems, estimate ground-water use, and assess the potential for additional ground-water development.

Location and Geography

Northern Clackamas County is in northwestern Oregon southeast of Portland and extends from the Willamette Valley eastward into the foothills of the Cascade Range (fig. 1). The area of this study includes about 250 mi^2 of Clackamas County and is bounded on the west by the Willamette River, on the south by latitude 45°15', on the east by the Mount Hood National Forest, and on the north by the Clackamas River, Deep Creek, and Tickle Creek. Also included in the study area is a narrow zone (called Highway 26 corridor) that extends eastward along the valleys of the Sandy and Zigzag Rivers to Government Camp on the south flank of Mount Hood.

Oregon City, the largest town in the study area, had a population of about 13,300 in 1976. Other towns are Canby (1976 population, 5,775), Sandy (2,190), Estacada (1,690), and Barlow, 110). Unincorporated communities include Barton, Eagle Creek, Cherryville, Brightwood, Rhododendron, and Zigzag. Total 1976 population was estimated by the Oregon Center for Population Research to be about 44,000, representing an increase of about 50 percent since 1970.

Principal industries of the area are agriculture, livestock, forestry, manufacturing, and tourism. The chief products are berries, small grain (grass seed), vegetables, lumber, and wood byproducts. The nearby Cascade Range is a major recreation area that attracts many tourists, skiers, campers, and fishermen.

The topography of the area varies from broad alluvial valleys to the rugged terrain of Cascade Range. The western, main part of the area consists mostly of gently rolling hills deeply dissected by stream valleys that are incised 300 to 400 ft below ridge crests (pl. 1). However, near Canby, an 18-square-mile segment of the Willamette Valley is exceptionally flat and lies

FIGURE 1. – Location of Clackamas County and the study area.

at an altitude of 80 to 200 ft. In the western part of the study area, uplands rise from about 400 ft above sea level near Oregon City to about 800 ft near Estacada and to more than 2,000 ft at the southeast corner of T. 3 S., R. 5 E. Along the Highway 26 corridor that follows the Sandy and Zigzag Rivers (fig. 1), altitudes range from about 900 ft at Alder Creek to 3,800 ft at Government Camp. This corridor is characterized by an alluvial valley which is more than a mile wide west of Zigzag and one-fourth to half a mile wide eastward. The valley walls rise steeply to mountain crests 2,000 to 3,000 ft above the valley, generally less than 2 mi distant from the stream valleys.

The central part of the study area is drained by the Clackamas River and its tributaries. The southwestern part is drained by the Pudding and Molalla Rivers and Beaver Creek, which are tributaries to the Willamette River. The Sandy and Zigzag Rivers drain the northeastern part. Each of the principal streams has eroded a wide valley which generally has several terrace levels except where resistant rocks confine the river in a narrow channel, such as at Carver on the Clackamas River.

Climate

The climate of northern Clackamas County is a temperate-marine type; the summers are warm and dry and the winters are cool and wet. Weather stations in the project area are at Canby, Oregon City, Estacada, Brightwood, and Government Camp (fig. 2). Because of its intermediate geographic location and altitude, the Estacada station was used in this study as the representative station for the area (fig. 3). The other stations show trends in precipitation and seasonal temperature similar to those at Estacada (fig. 4). The average annual precipitation near Estacada was 57.5 in., of which more than 70 percent fell during October through March and only about 3 percent in July and August. Most of the precipitation occurs as rain, which is the ultimate source of ground-water recharge for the area. Mean and extreme values of monthly precipitation (fig. 4) show the ranges of annual values over the period of record (1909-72) at Estacada.

The average annual temperature at Estacada (altitude, 410 ft) is 51.7°F. The hottest month generally is July, which has an average temperature of 65.2°F, and the coldest month is January, which has an average temperature of 38.6°F. Daily fluctuations in temperature commonly are 30° to 40°F in summer but only 10° to 15°F in winter. The temperature pattern tends to be similar throughout the project area. However, temperatures in the low-lying Willamette Valley at all seasons generally are slightly higher than at Estacada, and temperatures in higher altitudes of the Cascade Range are markedly lower. At Estacada, the average date for the last killing frost in spring is April 23 and the first in fall is November 2, so that the growing season averages 193 days. The length of the growing season is a few days longer in the Willamette Valley lowland. For each 1,000 ft rise in altitude, the growing season is shortened by 50 to 60 days. At Government Camp, killing frost can be expected during any season.

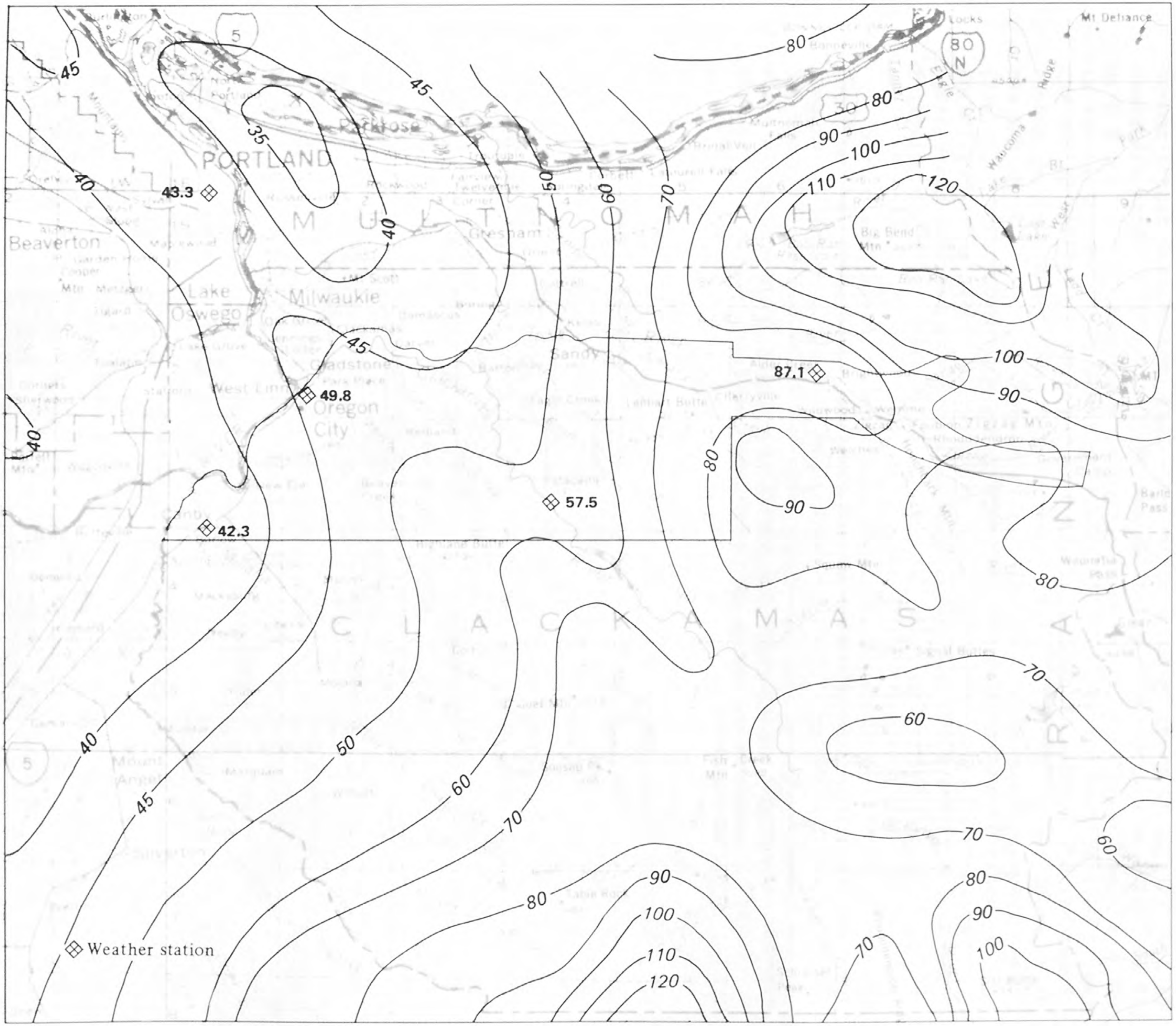

FIGURE 2. – Distribution of average annual precipitation, in inches, for Clackamas County. (Lines denote equal precipitation, and numbers indicate precipitation at selected weather stations.)

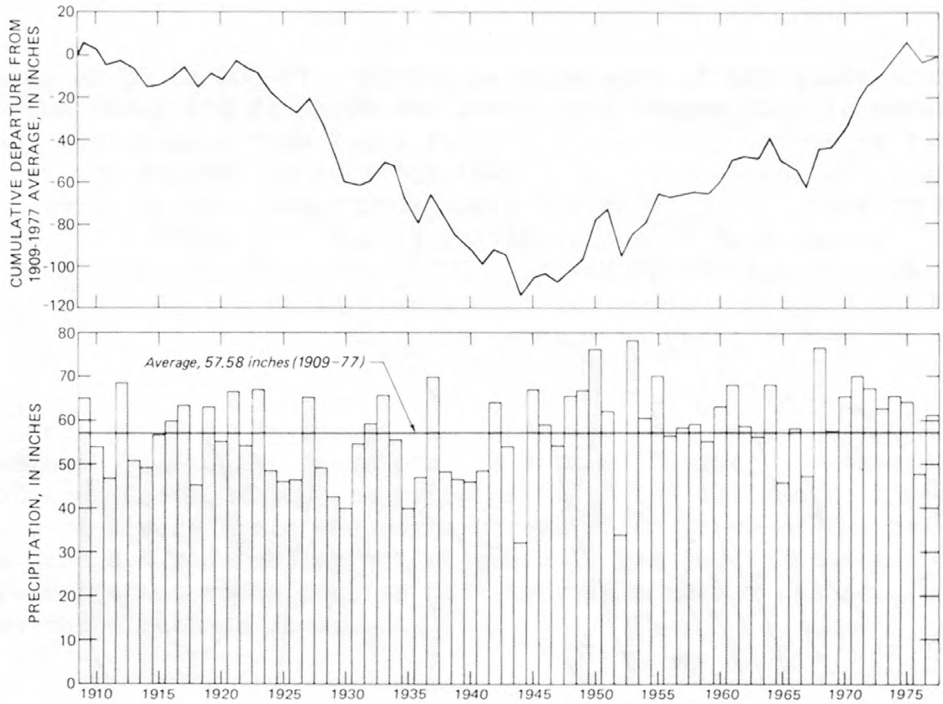

FIGURE 3. – Annual precipitation and cumulative departure from 1909-77 average precipitation near Estacada. (Data from National Oceanic and Atmospheric Administration.)

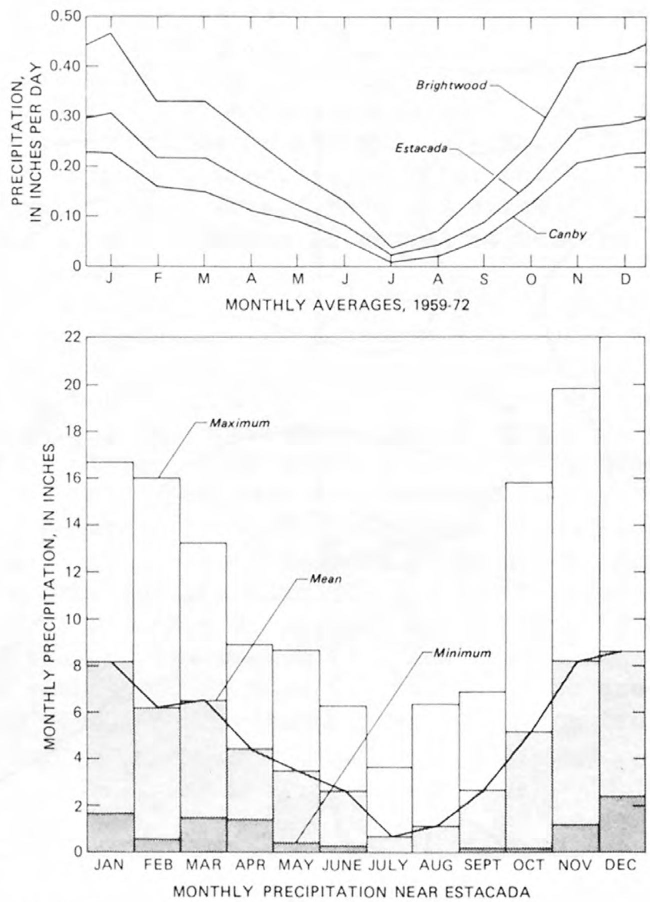

Figure 4. – Maximum, mean, and minimum monthly precipitation near Estacada and average daily precipitation at selected weather stations. (Data from National Oceanic and Atmospheric Administration.)

Well- and Spring-Numbering System

The well- and spring-numbering system used in this report is based on the rectangular system for subdivision of public land. Each "number" (actually a number-letter designation) indicates the location of the well with respect to township, range, and section. Number 2S/2E-16bab indicates a well in T. 2 S., R. 2 E., sec. 16. The letters show the location within the section, as shown in figure 5. The first letter (b) represents the quarter section (160 acres); the second letter (a), the quarter-quarter section (40 acres); and the third letter (b), the quarter-quarter-quarter section (10 acres). Well 16bab is in the NW¼ of the NE¼ of the NW¼ of section 16, township 2 south, range 2 east (fig. 5). Where more than one well is located within a 10-acre tract, a serial number is added following the letter sequence to distinguish them. Springs are numbered in the same manner except that the letter "s" is added following the final letter.

On the well-location map (pl. 2), each well symbol is identified only by the final letter sequence, inasmuch as the township, range, and section numbers are shown on the base map. In the well-data tables (tables 1, 2, and 3), the entire designations are used. On plate 1, a few well symbols are shown along with water-quality diagrams; for those wells, the section numbers also are included in the well designations.

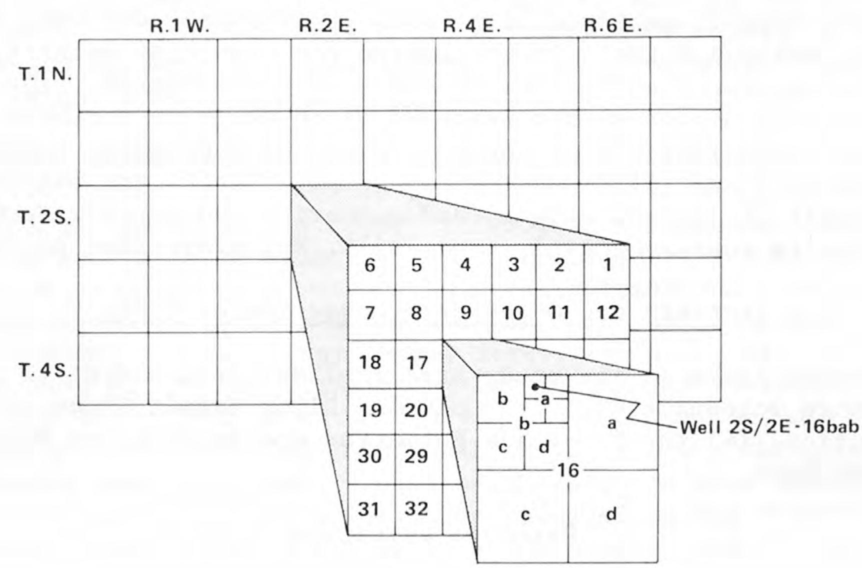

Figure 5. – Well- and spring-numbering system.

Acknowledgments

This investigation is part of a continuing cooperative program between the Oregon Water Resources Department (formerly Oregon State Engineer) and the U.S. Geological Survey to evaluate and describe the ground-water resources of Oregon. Much of the information in this report was derived from data supplied by well owners, drillers, and public officials. The helpful cooperation of those people, and especially well owners who permitted access to their wells to collect ground-water data, is gratefully acknowledged.

Previous Investigations

Part of the northern Clackamas County area was included in a study of the ground-water resources of the Willamette Valley by Piper (1942). Surface- and ground-water resources of the area are described in reports by the Willamette Basin Task Force (1969), Oregon Water Resources Board (1965), and U.S. Geological Survey (Griffin and others, 1956). The U.S. Geological Survey has also made cooperative studies in the Tualatin Valley (Hart and Newcomb, 1965), French Prairie (Price, 1967), Molalla-Salem Slope (Hampton, 1972), and East Portland (Hogenson and Foxworthy, 1965) areas which adjoin this study area on the west, southwest, south, and north, respectively. The geology shown on the geologic map (pl. 1) is adapted and modified from earlier geologic mapping by Trimble (1963), Peck and others (1964), and Wise (1969).

GEOLOGIC UNITS AND THEIR WATER-BEARING PROPERTIES

In western Oregon, geologic factors largely control the rate at which water enters a well, and they also determine the amount of water stored in and moving through rocks and the sites and rates of recharge. The formations exposed or lying at depths within reach of water wells in northern Clackamas County include consolidated rocks and unconsolidated deposits ranging in age from Eocene to Holocene (pl. 1). The consolidated rocks are basalt, andesite, breccia, and tuff of igneous origin, and nonmarine sedimentary rocks. Unconsolidated deposits contain gravel, sand, silt, and clay-sized particles.

Tertiary and Quaternary Consolidated Rocks

Consolidated rocks in the study area include, from oldest to youngest, (1) the Skamania Volcanics, (2) the Columbia River Basalt Group, (3) the Sardine Formation, (4) the Troutdale Formation and Sandy River Mudstone, and (5) the Boring Lava.

Skamania Volcanics

The Skamania Volcanics crops out only on Rock Island and along the banks of the Willamette River southwest of Oregon City in secs. 10, 11, 14, and 15, T. 3 S., R. 1 E. These rocks consist of highly altered layers of basalt and andesite that are resistant enough to form islands and reefs in the river. They are not known to supply water to wells in the study area but may be the source of mineralized water reported from wells tapping the lower part of the Columbia River Basalt Group at Gladstone (Hogenson and Foxworthy, 1965, p. 53).

North of Washougal, Wash., the Skamania Volcanics are several thousand feet thick (Trimble, 1963, p. 11), but only about 100 ft is exposed on Rock Island. These Eocene rocks underlie the Columbia River Basalt Group at considerable depth, except near the small outcrop area.

Columbia River Basalt Group

Rocks of the Columbia River Basalt Group overlie older Tertiary rocks in most of northern Oregon as well as the southern part of eastern Washington. In the study area, the basalt crops out only along the Willamette River from Oregon City southward to New Era but is exposed over a broad adjacent area west of the river. The basalt of Miocene age occurs at progressively greater depths to the east and northeast.

The lavas of the Columbia River Basalt Group were extruded on an irregular land surface that had several hundred feet of relief at places. As a result, the original thickness of the basalt varied considerably from place to place, and additional variation is the result of erosion, which has removed a large part of the basalt locally. Trimble (1963, p. 20) estimated that the original thickness in the Portland area was at least 1,000 ft. About 600 ft was reported in the Gladstone supply well 2S/2E-20bdd (Hogenson and Foxworthy, 1965, p. 68) just north of the Clackamas River, and about 500 ft in well 2S/4E-21daa (pl. 2, table 2). The basalt is only about 270 ft thick where it crops out near Rock Island, 4 mi south of Oregon City.

The basalt is weathered locally to depths as much as 200 ft (Hogenson and Foxworthy, 1965, p. 19). In well logs, the weathered basalt is commonly described as thick layers of brownish or reddish clay with occasional boulders of more resistant rock.

Individual basalt flows commonly range from 10 to 100 ft in thickness. The bottom few inches of most flows generally consist of glassy, fractured rock that grades upward into a dense, solid central section. The lava flows commonly have well-defined columnar joints formed during cooling. Polygonal columns may be as much as a few feet in cross section and tens of feet in length. The upper few feet of flows are commonly vesicular and locally scoriaceous or cindery. These cindery upper zones, combined with the fractured part at the base of the overlying flow, constitute the so-called interflow zones that are the principal water-bearing zones in the Columbia River Basalt Group. Locally, fractures and joints extend all the way through individual flows; although generally tight, these openings allow some water to move from one interflow zone to another. The large openings in the interflow zones transmit water readily, but because the zones make up only a small percentage of the basalt, the amount of water stored is small in proportion to the total volume of basalt.

The basalt has been downwarped in a northwest-trending syncline a few miles southeast of Oregon City. In that area, the top of the basalt is estimated to lie more than 1,000 ft below sea level. Eastward from the synclinal axis, the basalt surface rises again and its top is only about 60 ft below sea level at well 3S/3E-15bcd (table 2) and 80 ft below sea level at well

2S/4E-18dad. The Columbia River Basalt Group crops out at an altitude above 1,200 ft near Alder Creek and Brightwood (pl. 1). The top of the basalt was found at an altitude of about 700 ft in a geothermal test well in sec. 15, T. 2 S., R. 8 E. Thickness of the Columbia River Basalt Group in that hole reportedly was 1,220 ft (J. Riccio, Oregon Department of Geology and Mineral Industries, oral commun., 1979).

Because the unweathered and unfractured basalt flows provide dense, nearly impermeable barriers to the vertical movement of water, interflow zones and joints are the main source of water for wells. The thickness, hydrologic characteristics, and degree of interconnection between interflow zones may vary considerably over short distances. Consequently, yields of wells also may vary considerably, even in a small area. Five public-supply and school wells drilled in the Oregon City area produced 300 gal/min or more, although basalt wells in the study area have reported yields as low as 7 gal/min.

Water produced from the basalt in the study area is generally of suitable quality for drinking. Water too mineralized for domestic use recently was reported in a well tapping basalt northeast of Canby. Wells drilled for municipalities of Lake Oswego and Gladstone, which are outside the study area to the north and west, respectively, were completed in basalt and produced water unsuitable for public-supply use. Wells drilled completely through the Columbia River Basalt Group may yield mineralized water whose source is the Skamania Volcanics or underlying marine sedimentary rocks.

Sardine Formation

The Sardine Formation, of Pliocene and Miocene age, consists of volcanic mudflow deposits, andesitic lava flows, breccia, and tuff. It conformably overlies the Columbia River Basalt Group and is exposed in a wide area east of Estacada and along the Sandy and Zigzag River valleys. The formation also crops out at one small place in the valley of Clear Creek (sec. 25, T. 3 S., R. 3 E). West of Estacada, drillers' logs indicate that the Sardine underlies the Boring Lava and Troutdale Formation to at least the western part of R. 3 E., but it probably pinches out a few miles farther west.

In the study area, most of the rocks of the Sardine Formation are consolidated mudflow deposits and lava that in earlier reports were called the "Rhododendron Formation" (Trimble, 1963). However, the upper part of the formation also includes andesitic lava not assigned to the "Rhododendron" of Trimble's usage (Peck and others, 1964, pl. 1). The mudflow deposits consist largely of tuffaceous volcanic breccia containing angular blocks of lava several feet in diameter and abundant noncarbonized woody material. Locally, the deposits include cobbly conglomerate, tuffaceous siltstone, and claystone (Trimble, 1963, p. 23-25). Decomposed lava, conglomerate, and wood all are reported in drillers' logs of wells in the area. "Hard basalt" and "lava" also reported may indicate that lava is interbedded with the more common mudflow deposits and tuff.

The Sardine Formation is deeply weathered, and its upper 50 ft may consist of brownish or reddish laterite and saprolite. In drillers' logs, weathered "basalt" has been noted beneath Boring Lava at depths of a few hundred feet. (See log of well 3S/3E-32ada in table 2). Unweathered mudflow deposits form steep slopes and cliffs along Eagle Creek and the Clackamas and Sandy Rivers.

The Sardine Formation is estimated to be about 600 ft thick in the Estacada-Sandy area (Trimble, 1963, p. 23). It becomes a few thousand feet thick eastward but thins to the west, where it intertongues with the Troutdale Formation (Hampton, 1972, p. 20).

The Sardine Formation is a major water source for domestic wells in the eastern part of the study area, particularly in Tps. 2 and 3 S., R. 5 E. It also is tapped by several public-supply wells and numerous domestic wells in the Highway 26 corridor subarea (p.). Depths of wells tapping the Sardine commonly are 100 to 300 ft, but may be as much as 600 ft. Most wells supply adequate quantities for household supply, with yields ranging from a few to more than 50 gallons per minute. Most of the Sardine outcrop area is a recharge area where water levels become deeper with increasing well depth.

Troutdale Formation and Sandy River Mudstone

The Troutdale Formation and Sandy River Mudstone are both of early Pliocene age and unconformably overlie the Sardine Formation, or where it is absent, the Columbia River Basalt Group. The original "Troutdale Formation," named by Hodge (1933) and used by Treasher (1942) and Peck and others (1964), was subdivided by Trimble (1963) into two formations. The lower formation, which is predominantly dark, indurated clay and silt, was named the Sandy River Mudstone by Trimble. He also restricted the term Troutdale Formation to the section of conglomerate and sandstone beds that overlies the Sandy River Mudstone.

The Troutdale Formation and Sandy River Mudstone are exposed primarily along the valley walls of principal streams such as the Willamette, Clackamas, and Sandy Rivers, and smaller streams such as Abernethy, Clear, Days, and Cedar Creeks (pl. 1). The two formations underlie most of the study area west of a line that runs from near Estacada northeastward toward Cherryville. The formations are unconformably overlain by the Boring Lava, Springwater Formation, or Pleistocene stream deposits. The thickness of the two formations together totals more than 1,700 ft; however, the greatest amount penetrated by a well is about 720 ft. (See log of well 2S/4E-21daa, table 2.) In the study area, the greatest thickness probably occurs in the northeastern part of T. 2 S., R. 3 E., in the structural downwarp of the Columbia River Basalt and older rocks.

In general, the Troutdale Formation and Sandy River Mudstone is well indurated and forms steep valley walls, but locally is susceptible to slumping. Trimble (1963, p. 27) noted a massive landslide complex along Mosier Creek in secs. 27 and 28, T. 3 S., R. 3 E.

The Troutdale Formation consists of several hundred feet of sandstone and conglomerate. In the Portland area, this section is mostly poorly stratified pebble conglomerate that contains as much as 30 percent quartzite pebbles.

In places, the formation contains lenticular zones of quartzite or basalt cobbles several feet thick. Sandstone is the dominant lithology in the study area, and the section contains progressively more fine-grained material toward the southwest. In that area, the clay is derived from tuffs in the Cascade Range and the pebbles and cobbles from Cascade volcanic rocks (Hampton, 1972, p. 24).

The Sandy River Mudstone consists of 500 to 700 ft of mostly dark, thin-bedded siltstone and claystone. These beds are largely non-waterbearing and are commonly referred to in drillers' logs as blue, gray, or brown clay or shale. Locally, however, the Sandy River Mudstone contains thin beds of sandstone or conglomerate that yield a few to about 50 gal/min to wells that are a few hundred feet deep (see log of well 3S/2E-20bcc, table 2).

Only the coarse-grained zones in the Troutdale Formation and Sandy River Mudstone yield water readily to wells, and many wells tap two or three such zones to get an adequate supply. The lower, fine-grained section acts as a perching bed at places where it directly underlies Boring Lava or unconsolidated deposits. Seeps from perched-water zones are visible in valley walls north of Estacada and along Clear Creek southwest of Estacada. Prediction of performance of wells that tap the Troutdale Formation and Sandy River Mudstone is difficult because of variations in vertical and lateral permeability; however, most wells yield adequate water for domestic use. Where the saturated section is thick, as near Canby and north of Oregon City, well yields are adequate for small irrigation supplies.

Boring Lava and High Cascade Lavas

Lavas of Pliocene-Pleistocene age are exposed over a large part of the study area, especially in the southwestern part and the mountains between Cherryville and Government Camp (pl. 1).

Basaltic lava that caps a large part of the upland south and southeast of Oregon City has been called the Boring Lava (Trimble, 1963, p. 36-42). This lava flowed from a number of local vents in late Pliocene to middle or late Pleistocene time. One of the vents, Lenhart Butte (altitude, 2,117 ft), is near Cherryville in the northeastern part of the study area; another vent, Highland Butte (altitude, 1,594 ft), is about 1 mi south of the study area in sec. 9, T. 4 S., R. 3 E. The Boring Lava that caps the uplands around Oregon City flowed only about 11 mi from the vent at Highland Butte. The flows from Lenhart Butte extend only about 7 mi from their source.

In the eastern extension of the study area, other flows occurred at about the same time as the Boring and are referred to as the "volcanic rocks of the High Cascade Range" (Peck and others, 1964, p. 36-38). (For convenience, that informal name is shortened in this report to "High Cascade lavas," but applied to the same sequence of rocks.) These rocks are andesitic or basaltic andesite lavas, but include some basalt. Total thickness of the High Cascade lavas ranges from a few hundred to a few thousand feet. These rocks are known to be highly permeable at places and to contribute substantially to the low flow of streams draining the Cascade Range, although they are not the source of water for any of the wells listed in the well table or log table. A yield of at least a few hundred gallons per minute could reasonably be expected from a well that penetrates a few hundred feet of saturated volcanic rocks.

The Boring Lava erupted onto an irregular topographic surface, so it has a variable thickness ranging from as much as 500 ft near its source to 0 ft at its edges. In the southern part of T. 3 S., R. 3 E., lava apparently flowed down a small stream valley where it is at least 300 ft thick locally. In the western part of the study area, the Boring Lava directly overlies the Troutdale Formation, but the lava that occurs near Estacada overlies the Sardine Formation, as does most of the Lenhart Butte flow.

The Boring Lava is composed mainly of basalt flows, the upper surfaces of which commonly are scoriaceous. Locally, near eruptive vents, the formation contains cinders, tuff, and tuff breccia (log of well 3S/4E-23abc, table 2). The Boring is typically a lighter gray than the Columbia River Basalt Group, and columnar jointing is less common.

Where it has not weathered deeply, the formation is relatively resistant to erosion, and the cap provided by these lavas protects underlying rocks from extensive erosion. This accounts for the broad upland and steep-walled canyons southeast of Oregon City and in other parts of the area. At places, the Boring is deeply weathered, and along its thin western margin it consists of a reddish clay, 25 ft or more in thickness, containing rounded remnant boulders.

The saturated thickness of the Boring Lava varies due to the structure and lithology of the rocks, topographic position, and extent of surficial weathering. Local differences in water levels between closely spaced wells suggest that some wells are tapping shallow, discontinuous ground-water bodies in "perched zones" (see section on Ground Water). Because they are small and discontinuous, perched zones may be undependable as year-round sources of water.

An evaluation of the data from 260 drilled wells in the Boring Lava in a 16-square-mile area (T. 3 S., R. 2 E., secs. 14-16, 20-29, 33-35) indicated that well depths ranged from 18 to 510 ft and averaged about 180 ft. Yields ranged from 3 to 100 gal/min and averaged 23 gal/min. Water levels in wells tapping perched zones commonly are 20 to 50 ft, but water levels in many deep wells exceed 100 ft. Most wells yielded more than 10 gal/min--more than adequate for an ordinary household supply. Farther eastward, in T. 3 S., R. 3 E., the average depth of wells and depth to water were somewhat greater, but well yields were comparable.

Unconsolidated Deposits of Quaternary Age

Unconsolidated deposits of Quaternary age include (1) the Springwater Formation, (2) terrace deposits, and (3) alluvium. These deposits are largely of fluviatile origin but also include mudflow deposits. In addition, some fine-grained deposits in the Willamette Valley mapped as alluvium may be of lacustrine origin. The alluvium near Government Camp is mainly of glacial origin.

As these deposits are relatively young in terms of geologic time, they unconformably overlie most of the consolidated-rock formations in the study area.

Springwater Formation

The Springwater Formation consists largely of sandy clay, interstratified mudflow deposits, and poorly sorted sand, gravel, and cobbles derived from mafic volcanic rocks. The Springwater occurs principally between the Sandy and Clackamas Rivers, but also is present southwest of the town of Estacada where it underlies a terracelike ridge between Clear Creek and the Clackamas River. This formation, of early Pleistocene age, is believed to have been laid down as a piedmont deposit before the Sandy and Clackamas Rivers became entrenched (Hogenson and Foxworthy, 1965, p. 25). The formation varies considerably in thickness in the project area and may be more than 200 ft thick in a few areas; however, it is generally less than 100 ft thick. The formation is moderately dissected by streams and is believed to have extended originally over a much larger area than it now does. Altitude of the formation ranges from more than 1,200 ft in the eastern and southern outcrop areas to less than 500 ft just north of the study area. The Springwater Formation weathers readily and is reported in drillers' logs as red clay that is commonly more than 20 ft thick and may extend to a depth of about 75 ft locally. The weathered zone is poorly permeable and allows only a small part of the precipitation to infiltrate and percolate downward to the saturated zone. The Springwater Formation overlies the Troutdale Formation except in a few areas where it overlies the Boring Lava or Sardine Formation.

An evaluation of data from wells drilled in the Springwater Formation in the area south and west of Sandy indicates that well depths range generally from 45 to 500 ft. Yields of wells are generally between 2 and 100 gal/min; however, most well yields do not exceed 50 gal/min. The Springwater and Troutdale Formations cannot be distinguished in many drillers' logs because the terminology used by the drillers is virtually the same for both.

The Springwater is the principal source of supply for domestic wells in an area of several square miles east of Estacada. Wells there commonly are less than 100 ft deep, and most yield at least 10 gal/min of good-quality water. Along the ridge between the Clackamas River and Clear Creek west of Estacada, a few wells tapping the Springwater are of comparable depths and yields, but most are deeper and probably also tap the underlying Troutdale Formation.

Terrace Deposits

Stream-laid deposits representing several cycles of erosion and deposition are mapped collectively as terrace deposits on the geologic map (pl. 1). The surface of the deposits forms two benches flanking the Clackamas River valley downstream from Estacada. Similar deposits form a terrace above the Willamette River flood plain near Canby.

These deposits, of Pleistocene age, consist of poorly sorted sand and gravel near the Clackamas River, but are predominantly fine sand and silt near Canby. At places along the Clackamas River, they consist of sand, gravel, and cobbles, 20 to 30 ft thick, overlain by a section of sand and silt (logs of wells 2S/3E-34dcb and -35ccb, table 2). Thickness of the deposits ranges from a few feet locally to as much as several hundred feet near Canby. Maximum known thickness along the Clackamas River is about 150 ft.

Deposits underlying the highest terrace in the western part of the project area are weathered to depths of 20 to 25 ft, whereas the lower terraces are weathered to depths of about 4 ft. Clay soils formed in the weathered terrace deposits reduce the permeability and impede the downward movement of recharge.

Wells tapping coarse zones in the terrace deposits range generally in depth from 50 to 150 ft. Most wells in these deposits yield more than 10 gal/min, and several irrigation wells yield more than 100 gal/min (table 3). Several wells in T. 3 S., Rs. 3 and 4 E., that are more than 200 ft deep probably extend into the underlying Troutdale Formation and may obtain water from both the terrace deposits and Troutdale. Yields as great as 400 gal/min are reported from such wells.

The terrace deposits along the upper Sandy River and the Zigzag River are largely stream-deposited glacial outwash but may include some mudflow deposits. Little is known about the thickness or stratigraphic details of these deposits. They are generally very coarse grained and highly permeable and could be expected to yield very large quantities of water to properly constructed wells.

Alluvium

Alluvium occurs along nearly all major streams and some of the secondary streams in the project area. The area underlain by alluvium coincides generally with the active flood plain of a river and may extend to altitudes a few tens of feet above the present stream channel. Along the Pudding and Molalla Rivers, in the southwest corner of the study area, the alluvium consists mainly of silt and sand with occasional lenses of gravel. Along the Clackamas and Sandy Rivers the alluvium consists largely of cobble-sized gravel. The similarity of the alluvium and the low-level terrace deposits makes it difficult to distinguish them on the basis of lithology. Where they occur in close proximity, the alluvium and the terrace deposits may be hydraulically connected and may function as a single continuous aquifer.

Thickness of the alluvium may range from about 15 ft along the lower Clackamas River near Clackamas to more than 100 ft along the Sandy River near Zigzag. In the Zigzag-Rhododendron area, much of the mapped alluvium includes mudflow deposits originating on the flanks of Mount Hood and may contain boulders several feet in diameter.

Although it generally is unconsolidated, the alluvium locally consists of sand and gravel aggregated with clay and silt.

Where it contains a moderate to large thickness of saturated material, the alluvium is the best aquifer in the study area. For example, well 3S/1E-32caa is only 38 ft deep, but it was reported to yield 300 gal/min with only 1 ft of drawdown (table 1). Most of the wells along the Sandy and Zigzag Rivers derive water from the alluvium. Yields range from about 10 to 400 gal/min, and specific capacities range from about 1 to 20 gal/min per foot of drawdown. Wells close to a stream could induce the infiltration of surface water into the alluvium when the pumping water levels are drawn down below the adjacent stream levels.

GROUND WATER

The rocks and unconsolidated deposits underlying the Earth's surface contain many open spaces that may be filled with ground water. These openings include the joints and fractures in volcanic rocks, such as the Columbia River Basalt Group and Boring Lava, and pore spaces between particles of sand and gravel, as in the Troutdale Formation or alluvium. If other factors are equal, well-sorted granular material has the most numerous pore spaces, and coarse-grained material the largest and best-connected openings. Hence, well-sorted coarse-grained deposits normally will store and yield the most water and poorly sorted fine-grained deposits will store and yield the least water.

The ratio of the volume of openings in a rock to the total volume of the rock is the porosity. The porosity of a well-sorted sand or gravel may be 20 percent or more, whereas the porosity of a fractured or jointed basalt may be only 1 or 2 percent. Thus, the porosity reflects the amount of water a rock can hold or "store." Factors affecting porosity are discussed in detail by Meinzer (1923) and Lohman (1972).

The permeability of a rock is its capacity to transmit a fluid, such as water, under a hydraulic gradient (Lohman, 1972, p. 4). The size of open spaces in rocks and the degree of interconnection of those spaces are important features affecting permeability.

Rock units that contain ground water and yield it in usable quantities to wells and springs are called aquifers. All the geologic units in the study area serve as aquifers at one place or another. However, at some places the rocks exposed at the surface (as mapped on pl. 1) may not contain ground water or may not yield sufficient quantities for the intended use. Therefore, many wells pass through shallow geologic units to obtain water from an underlying formation. This is most common on uplands near deeply entrenched valleys and near the eroded margins of formations such as the Boring Lava in the western part of T. 3 S., R. 2 E., or the Springwater Formation near the southeast corner of that township.

Ground water is either confined or unconfined in an aquifer. Water in a confined aquifer is under pressure because the aquifer is overlain by relatively impermeable confining beds. When a well is drilled through the confining bed into the aquifer, water in the well rises above the top of the aquifer. In the northern Clackamas County area, ground water in all the consolidated rock units is confined, except at shallow depths. Water levels in wells drilled into confined-water zones are above the level where the water is found, but generally not enough to produce flowing artesian wells.

Unconfined ground water occurs in an aquifer that is only partly filled, so that the surface of the water (water table) is subject only to atmospheric pressure. In the study area, unconfined ground water occurs in the alluvium and terrace deposits and, locally, in the Springwater Formation. The water level in a well in an unconfined aquifer will be at the altitude of the local water table. Zones of saturation of small areal extent (perched-water tables) may occur above the regional water table. By definition, a perched-water table is separated from the main water table by an unsaturated zone (Lohman and others, 1972, p. 7), although this condition cannot be demonstrated for many apparently perched zones in the study area. Perched-water bodies occur in places in the Sardine and Springwater Formations and in the Boring Lava. Perched-water bodies in the northern Clackamas County area generally yield only small quantities of water to wells because both the thickness of the perched saturated zone and volume of water in the zone are small. Due to the small volume of storage, perched zones may be easily depleted by pumping where a number of wells tap the same perched-water zone.

Recharge

The northern Clackamas County area receives about 700,000 acre-ft of precipitation annually--70 percent of it from October through March when evapotranspiration is small (figs. 2, 4). That precipitation, falling as rain or snow, is the ultimate source of ground water in the area. Part of the precipitation evaporates, part is transpired to the atmosphere by vegetation, part runs off as surface flow, and part infiltrates into the ground to replenish soil moisture and the ground-water system. Water in the saturated zone moves downgradient to areas of discharge, such as springs, seeps along streams, or wells.

In addition to the direct infiltration of precipitation, aquifers in the study area receive some recharge by percolation from streams, primarily in headwater areas where stream channels are above the local water table.

Estimates of the annual rate of recharge range from about 1½ in., for areas directly underlain by basalt of the Columbia River Basalt Group (Oregon State Engineer, 1974), to 18 in. or more for the Willamette Valley (Hampton, 1972). Annual recharge for the study area as a whole probably is somewhere between these two estimates and may be as much as 20 percent of the precipitation falling on the area during an average year, or about 140,000 acre-ft per year. Recharge differs greatly from place to place, depending on both the local precipitation and the infiltration characteristics of the surficial soil and rock materials. Annual recharge probably exceeds 1 ft in the alluvial valley and terrace areas, in the main outcrop area of the Springwater Formation, and in the volcanic areas of the Cascade Range. Recharge probably is smallest in the highly dissected areas bordering the Clackamas River and in the outcrop areas of the Sardine Formation and Columbia River Basalt Group.

Water-Level Fluctuations

The water table rises and falls seasonally, as indicated by the water levels of wells whose hydrographs are presented in figures 6 and 7. These fluctuations represent changes in the volume of water stored in the various aquifers. In most aquifers, levels are highest and storage greatest in winter (December-March), during and just after the period when rainfall is greatest, and are lowest in early autumn when rainfall is least. Water-level records show that water levels in wells start to rise about November as precipitation and infiltration increase. By January or February, in most years, water levels are at their highest and ground-water storage is at an annual maximum. Water levels then start to decline; the decline accelerates about May when the precipitation rate becomes small, evapotranspiration increases, and pumping increases to meet summer public-supply and irrigation demands. Water levels in most wells return to high levels each winter, even following drought years when rainfall is below normal and pumpage is high. Some wells, however, may require more than one wet season to fully recover from an unusually dry period. For instance, water levels in well 3S/4E-26bcd, in the Springwater Formation, did not return to average seasonal highs in 1968 and 1977, reflecting the effects of below-normal recharge following drought periods in 1967 and 1976-77 (fig. 7). Wells 2S/4E-29dad and 3S/1E-34bdc also had water levels below normal in the early part of 1977 during the 1976-77 drought (fig. 7).

Water-level fluctuations also exhibit long-term trends similar to variations in precipitation shown by the cumulative departure curve (fig. 3). Examples of water-level trends are shown by the downward trend of about half a foot per year from 1962 to 1967 in well 3S/1E-26bcd and from 1966 to 1971 in well 3S/4E-26cdb.

Ground-Water Quality

In the northern Clackamas County area, the ground water is generally suitable for most uses, as judged by the constituents reported in table 3. Most of the ground water has low concentrations of dissolved minerals and is soft to moderately hard, averaging about 50 mg/L in hardness. However, water with undesirable amounts of dissolved minerals has been reported in deep public-supply wells drilled in the towns of Gladstone and Lake Oswego, adjacent to the northern and western boundaries of the study area (Hogenson and Foxworthy, 1965, p. 45; Hart and Newcomb, 1965, p. 157).

Chemical analyses of water from 48 wells, representing all the major aquifers in the area, and from one surface-water source (Sandy River) are shown in table 3. Table 4 summarizes information about the common chemical constituents dissolved in the water, their sources, significance with respect to use, and recommended limits for drinking water. Chemical analyses of water from selected wells are shown graphically in figure 8, and chemical-quality diagrams on plate 1 illustrate areal differences in ground-water quality.

The concentration of inorganic chemical constituents dissolved in ground water is referred to as dissolved solids and is expressed in units of milligrams per liter (mg/L) in table 3.

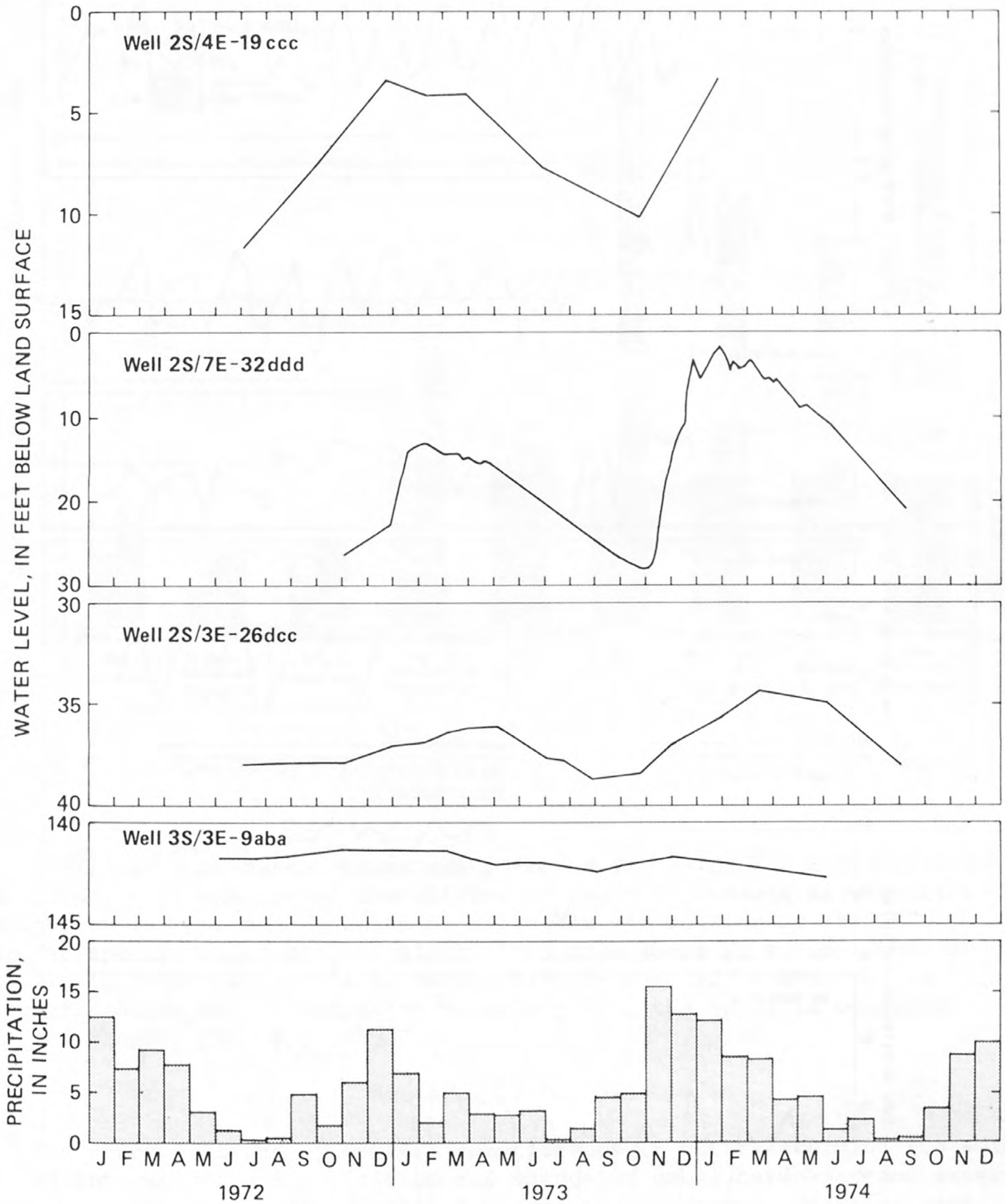

FIGURE 6. – Hydrographs of selected wells and monthly precipitation near Estacada, 1972-74. (Precipitation data from National Oceanic and Atmospheric Administration.)

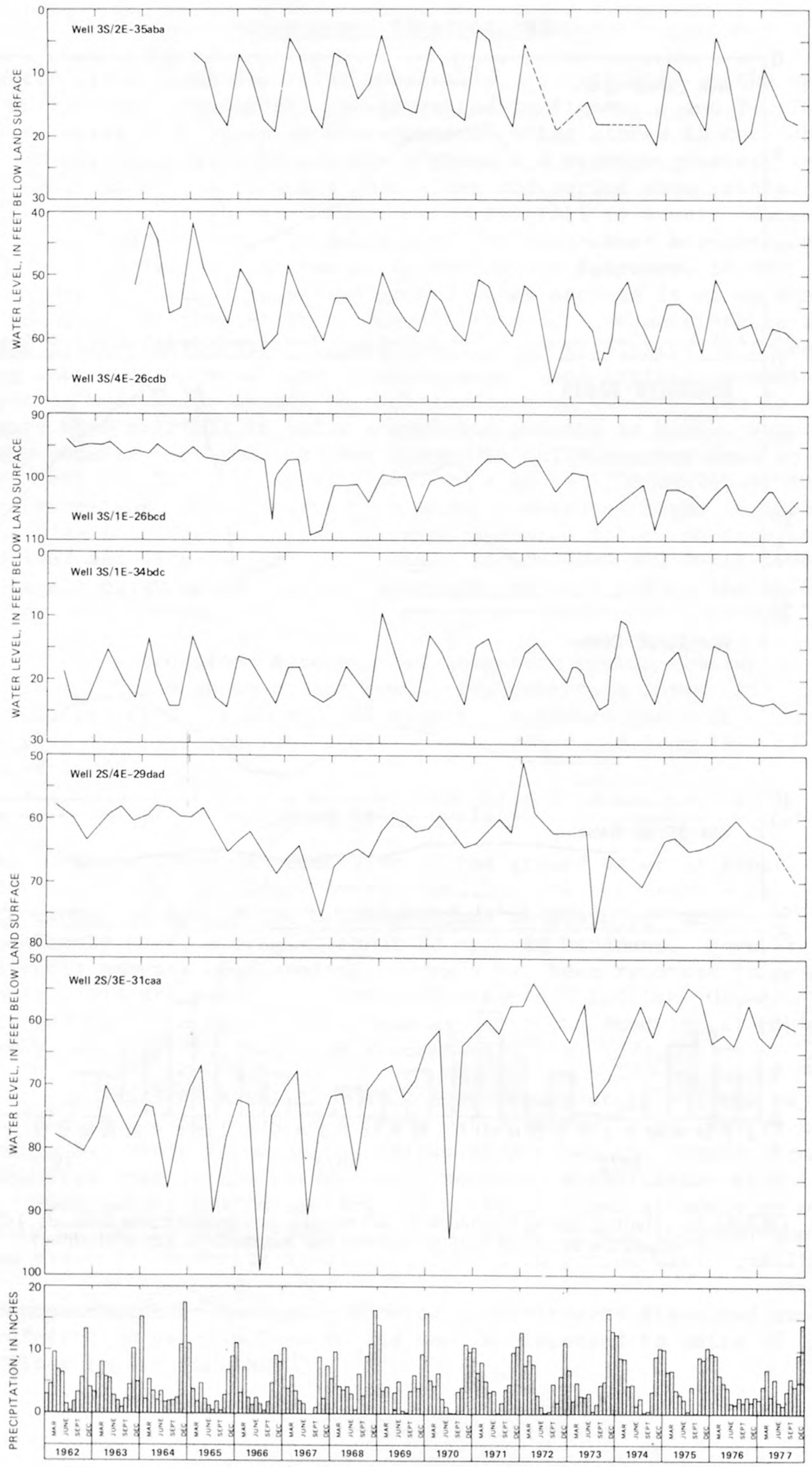

FIGURE 7. – Hydrographs of selected wells and monthly precipitation near Estacada, 1962-77.

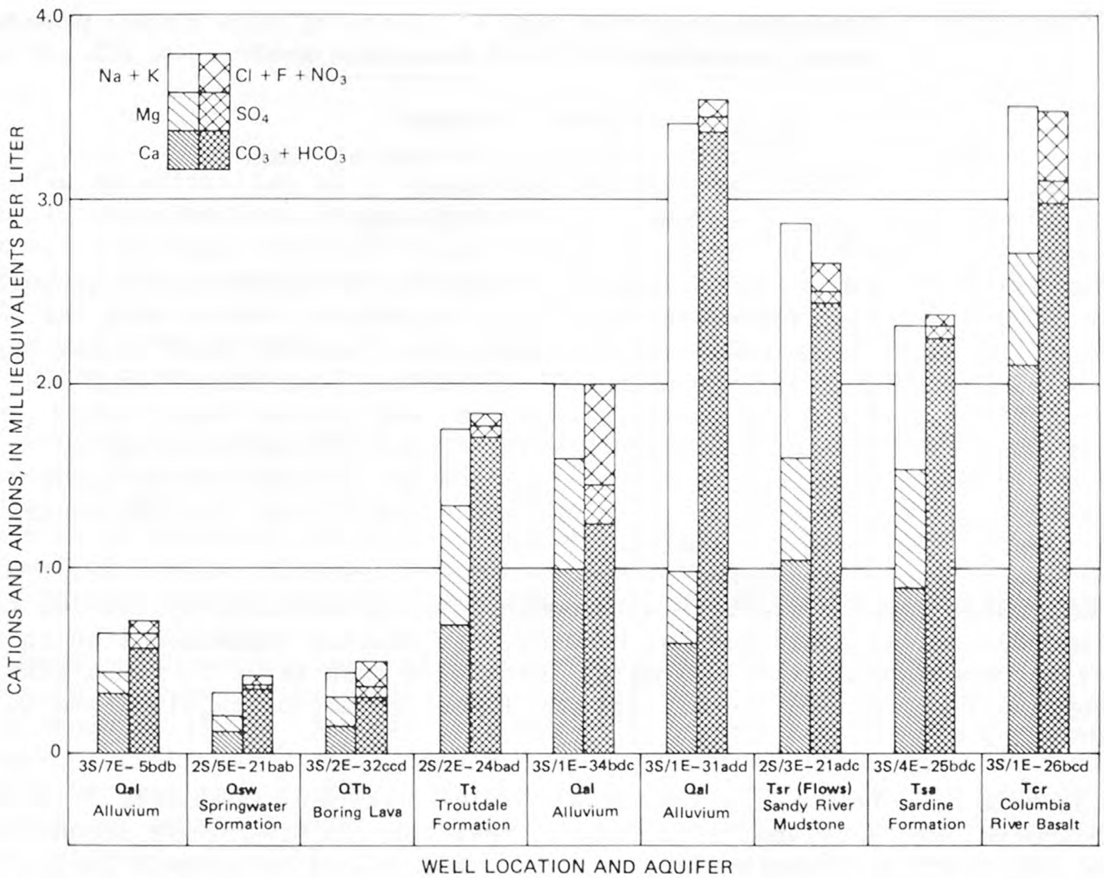

Figure 8. — Bar graphs showing chemical analyses of typical water from selected wells in the northern Clackamas County area.

Specific-conductance values are reported in tables 1 and 3. Specific conductance is a measure of the ability of water to conduct an electrical current; it is reported in units of micromhos per centimeter at 25°C. Measured specific-conductance values range from about 20 to more than 300. Specific conductance is related to the dissolved-solids concentration. The dissolved solids may be estimated by multiplying the specific conductance by a factor ranging from 0.5 to 0.7.

Suitability for Use

The concentrations of certain constituents in water determine its suitability for various uses. Calcium and magnesium cause hardness, and excessive hardness in water is objectionable for domestic and some industrial uses. Hardness is often associated with the property of water that causes waste of soap or formation of mineral deposits in water-heating equipment (see table 4). The following scale is used in this report to classify hardness of water:

Hardness range (mg/L of $CaCO_3$)	Description
0-60	Soft
61-120	Moderately hard
121-180	Hard
More than 180	Very hard

Excessive hardness has not been a problem in the study area, although a number of wells are equipped with commercial softeners. Water from the Sardine Formation and Columbia River Basalt Group tends to have higher hardness values than water from younger geologic units. One sample from the Columbia River Basalt Group (well 3S/5E-28cac) was in the "hard" range (190 mg/L). Most of the water from the Troutdale Formation and Sandy River Mudstone is moderately hard, and that from the Boring Lava and Springwater Formation is soft to very soft. The terrace deposits and alluvium contain water ranging from soft to moderately hard.

All water sampled was within recommended drinking-water limits for the determined chemical constituents; however, six samples contained iron in excess of the recommended limit of 0.3 mg/L. Excessive iron tends to cause staining of plumbing fixtures and laundry and may impart an objectionable taste to the water (table 4).

Because of a former arsenic problem in Lane County (Goldblatt, Van Denburgh, and Marsland, 1963), rural residents in Oregon who depend on ground water may be concerned about the concentrations of arsenic in the water. All water samples analyzed from the study area had less than the recommended limit of 0.05 mg/L of arsenic (table 4).

Concentrations of nitrates above a few milligrams per liter may be an indication of bacterial pollution, and concentrations above 10 mg/L (as N) can cause methemoglobinemia (blue-baby effect) in infants. Nitrate concentrations were not specifically determined; however, combinations of nitrate (NO_3) and nitrite (NO_2), expressed as nitrogen (N), are reported in table 3. Water from well 3S/1E-34bdc, tapping the alluvium, had the highest reading of NO_3+NO_2 (5.7 mg/L), which is considerably less than the recommended limit of 10 mg/L.

Boron is essential to plant growth; however, in concentrations of only a few milligrams per liter, boron may have a toxic effect on some plants. The optimum concentration needed by most plants is less than 1 mg/L, and the maximum concentration that sensitive plants such as nut and fruit trees can tolerate is about 0.8 mg/L. All water analyzed is suitable for irrigating even the most boron-sensitive plants.

For industrial purposes, the chemical suitability of the water varies considerably from one industry to another. The hardness and concentrations of dissolved solids and silica are of prime concern for boiler-feed water. For other uses, hardness and iron may be important. Because water in the northern

Clackamas County area generally is low in dissolved minerals, it probably is suitable for most industrial uses with little or no treatment.

Potential Contamination

The deterioration of ground-water quality, because of chemical or biological contamination, is one of the most likely problems expected to occur in the study area. Such contamination may originate from sewage products that enter the ground-water system from septic tanks, cesspools, or sewage ponds and lagoons used by some sewage-treatment plants. Other sources include the runoff from streets and other parts of an urban area, agricultural land (including stock pens), and leachate from solid-waste disposal sites.

Contaminants may move into ground-water bodies in the same manner as recharge; that is, by vertical infiltration down to the water table, then laterally with the natural ground-water flow. Inasmuch as recharge occurs over much of the study area, local surface sources of contamination or disposal of sewage or solid wastes into the ground could contaminate ground water in many places, especially where ground water occurs at shallow depths.

Many earth materials, particularly sand and silt, filter out solid contaminants, and bacteria commonly move only short distances in migrating ground water (Romero, 1970). Highly fractured or cavernous rock, such as basalt, however, is not a good filtration medium, and even bacteria can move a mile or more through such rocks. In addition, dissolved constituents are not filtered out by earth materials but will migrate with the ground water to wells, streams, or other areas of discharge. Examples are nitrate and chloride in domestic sewage and toxic metals from urban runoff or landfills. Such contamination from domestic sewage has been noted recently in the highly developed area between Portland and Gresham, a few miles north of the study area (Quan and others, 1964). Similar problems could develop in some rural parts of the study area where the increase in population is rapid, accompanied by increasing numbers of septic tanks and leach fields which dispose domestic waste water to the ground.

The chemical quality of ground water also can be degraded by the upward or lateral migration of highly mineralized (saline) water from underlying older formations (Hart and Newcomb, 1965, p. 52-55). For instance, a well drilled in basalt just north of the Clackamas River for the community of Gladstone produced water with significantly increased dissolved solids after a short period of use. A similar situation could develop near Oregon City, where the basalt aquifer is underlain at relatively shallow depths by older rocks. This problem also may be associated with intensive pumping of wells tapping the basalt.

Areas particularly susceptible to contamination by wastes or harmful substances include those where the unweathered, fractured Columbia River Basalt Group or the Boring Lava occur at or near the surface. Ground water in permeable terrace and alluvial deposits along the Clackamas and Sandy Rivers also is subject to degradation, especially where the water table is near the surface. Ground-water levels are at shallow depths in Quaternary alluvial deposits along the Clackamas, Sandy, and Zigzag Rivers, so waste water or other harmful substances have only a short distance to travel to reach the aquifer. During the 1973-74 winter months, water levels rose to within 2 ft of the land surface in well 2S/7E-32ddd and to within 3 ft of land surface in well 2S/4E-19ccc. Under those conditions, some septic-tank drain fields could have been beneath the water table.

Coliform tests were made for most of the water sampled in July 1973, including water from several wells where owners had reported previous contamination problems. Because coliform was not found in any of the samples, no coliform data are included in this report. The absence of coliform at that time indicates that bacterial contamination is neither chronic nor widespread but may be a seasonal problem. However, the continual addition of septic-tank disposal systems in the area creates the potential for future water-quality problems.

Use of Ground Water

Ground water in the study area is used for domestic, irrigation, and public supplies. The volume of water pumped for these uses in 1972 was about 5,900 acre-ft. Domestic consumption totaled 2,800 acre-ft, irrigation 2,300 acre-ft, and public supplies 800 acre-ft. Industries, such as wood-processing plants, use surface water almost exclusively in their manufacturing processes.

Domestic

In this report, domestic use includes water used for household purposes, lawns and small gardens, and domestic animals. The volume of ground water pumped for domestic use was estimated by multiplying the number of rural residents who are not served by water districts by a per capita water-consumption rate of 100 gal/d. The rural population, estimated to be about 25,000 (1976), would use about 2.5 Mgal/d (million gallons per day), or 2,800 acre-ft per year. The rate of use is increasing, because the number of people depending on individual wells is continually increasing in the area.

Irrigation

Water pumped for irrigation in a typical irrigation season was estimated to be 2,300 acre-ft, based on a factor of 1½ acre-ft of water per acre. In a report by the Willamette Basin Task Force (App. F, 1969), the total irrigated area in 1965 was estimated to be 2,100 acres. Due to changes in farming practices and increased suburban development, the number of acres irrigated probably has declined each year from the estimate for 1965. Also, the volume of water used for irrigation varies considerably from year to year, being determined largely by the amount of precipitation during the growing season and the acreages planted to specific crops.

Public Supply

A number of the communities in northern Clackamas County use wells or springs as sources of water. In 1972, the volume of ground water used by the communities of Barlow, Brightwood, Canby, Government Camp, Sandy, Welches, and Wemme was estimated to be 800 acre-ft. This estimate was computed by multiplying the number of residents served by those water systems by the per capita water-consumption figure of 100 gal/d. Other communities, such as Estacada, Redland, Rhododendron, and Zigzag, have surface-water sources for their supplies. The water source for Oregon City, the largest city in the area, is the North Fork Clackamas River, which is outside the study area.

Ground-Water Availability by Subareas

For the following discussion of the availability of ground water and its potential for future development, the study area has been divided into several subareas on the basis of geologic, hydrologic, and physiographic conditions (fig. 9). In addition to data in tables 1 and 2 and the available geologic information, records of several hundred wells in Geological Survey files were used to assess ground-water availability. These assessments are based largely on data reported by well drillers, including information on depth, water level, yield, and specific capacity (yield in gallons per minute divided by drawdown in feet). Small-yield wells, adequate for individual domestic supplies, can be obtained almost everywhere in the area, but conditions are favorable for large-yield irrigation or municipal-supply wells only in certain areas. However, at some places, even domestic wells must be drilled to depths of several hundred feet because of local geologic conditions and topographic relief.

Canby Subarea

The Canby subarea coincides with the part of the Willamette Valley lowland within the study area. The land-surface altitude is less than 200 ft, but local relief is more than 50 ft along the scarp between the terrace and alluvium west of the Molalla River (pl. 1). The entire subarea is underlain by unconsolidated stream- or lake-deposited materials 40 to 80 ft in thickness. The alluvium overlies up to 50 ft of sand, gravel, and clay of the Troutdale Formation, and several hundred feet of the Sandy River Mudstone, which is predominantly clay and silt (see logs of wells 3S/1E-28daa, -33cbd2, and -34bdc, table 2). Principal aquifers are sand-and-gravel layers in the alluvium and Troutdale Formation and thin beds of sand in the Sandy River Mudstone.

About half the domestic wells in the subarea are less than 100 ft deep and most are less than 150 ft. Most domestic wells yield at least 20 gal/min, and many yield 40 to 50 gal/min. Specific capacities of these wells range generally from about 0.4 to 3 gal/min per foot of drawdown--most are more than 1 gal/min per foot of drawdown.

There are several irrigation, industrial, and public-supply wells in the subarea that are between 50 and 650 ft in depth (table 1). Yields range from

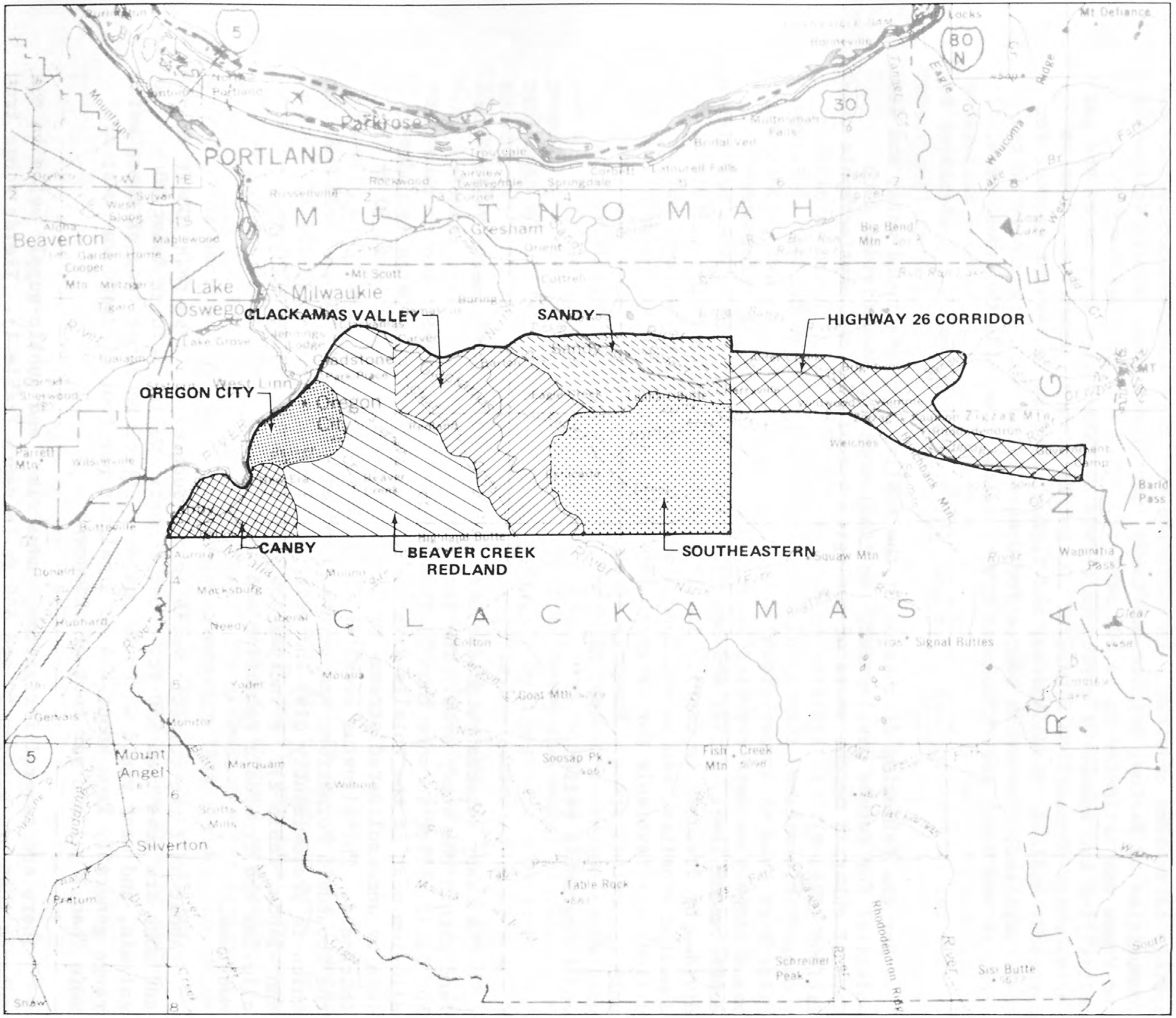

FIGURE 9. – Ground-water subareas in the Clackamas County study area.

150 to 600 gal/min and specific capacity from 1 to 43 gal/min per foot of drawdown. Well 4S/1E-4adb, south of Canby, had the highest reported yield and highest specific capacity; it was tested at a pumping rate of 600 gal/min with only 14 ft of drawdown, or a specific capacity of 43 gal/min per foot.

Large additional quantities of ground water can be developed in the subarea. Supplies adequate for domestic use can be readily obtained throughout the subarea. Wells yielding several hundred gallons per minute could be constructed in most places, but some localities are underlain by preponderantly fine-grained, poor water-yielding material of Sandy River Mudstone lithology (well 3S/1E-31add, table 2). Some exploration, using the common practice of first drilling a test hole, could aid in selecting favorable sites for irrigation wells. Test drilling would allow the owner and well driller to identify and tap the best water-bearing zones and to design the well so as to obtain a maximum yield.

Oregon City Subarea

The Oregon City subarea includes the upland around and south of Oregon City where the Columbia River Basalt Group is at or near the land surface. The basalt, which dips to the east, is overlain by the Troutdale Formation to the west and the Sandy River Mudstone to the east (Trimble, 1963, pl. 1). Those formations, in turn, are overlain by the Boring Lava. Wells in the subarea obtain water from all four formations. A few wells obtain water from perched zones in the Boring Lava, but most tap either the Columbia River Basalt Group, especially along the western edge of the subarea, or the Troutdale Formation. A few wells tap sand or sandstone zones in the Sandy River Mudstone (well 3S/2E-8bca, table 2).

Wells in the subarea range generally in depth from 40 to 600 ft; the median depth is about 200 ft. Only about 15 percent are less than 100 ft in depth and 60 percent are between 100 and 300 ft. Basalt wells tend to be somewhat deeper than those drilled into sandy zones of the Troutdale, perhaps because most of the larger yielding wells tap the basalt (table 1). However, the deepest well in the subarea, 3S/2E-8bca, was drilled to a depth of 638 ft to obtain water from sandstone of the Sandy River Mudstone.

Yields of wells that tap the Columbia River Basalt Group generally range from 20 to 350 gal/min and specific capacities from about 1 to 32 gal/min per foot of drawdown. However, well 3S/2E-4add (Portland General Electric Co.) yielded only 2 gal/min with 50 ft of drawdown and had a specific capacity of 0.04. As indicated in table 1, several public-supply, school, industrial, and irrigation wells obtain water from the basalt.

Although the Boring Lava has been mapped at the land surface over a large part of the subarea (pl. 1) and is more than 100 ft thick in places (see log of well 3S/1E-12ccc, table 2), it is not an important aquifer here. The Boring Lava lies largely above the water table because of its high topographic position relative to deeply cut valleys.

More than half the wells in the subarea obtain water from the Troutdale Formation and Sandy River Mudstone, especially in the eastern part where the Columbia River Basalt Group lies at a depth of several hundred feet. Most wells tapping the Troutdale Formation and Sandy River Mudstone are between 100 and 200 ft deep; the average is about 170 ft. Yields of the wells range from 10 to 275 gal/min, and specific capacity commonly is between 0.2 and 3 gal/min per foot of drawdown. Depths to water in wells tapping these formations range from only a few feet near Abernethy Creek to nearly 250 ft in the uplands; the median is about 50 ft.

In the eastern part of the subarea, yields of at least 100 gal/min could be obtained from wells several hundred feet in depth and tapping gravel, sand, and sandstone beds in the Troutdale Formation and Sandy River Mudstone. Additional water supplies for small-scale irrigation or commercial use could be developed from these aquifers.

The highest yields are obtained from wells that tap the Columbia River Basalt Group, such as Oregon City School wells 2S/2E-32bac and -33bcb. As noted in the section describing geologic units, the interflow zones in the basalt can transmit water readily but provide only a small volume of storage. In addition, the recharge area for the basalt is small and probably corresponds rather closely with the subarea. Consequently, this aquifer in the Oregon City subarea may be susceptible to overdevelopment such as occurred in the Cooper Mountain-Bull Mountain area of Washington County (Oregon State Engineer, 1974). Therefore, any new large-yielding wells in the basalt should be spaced as far as possible from other large-capacity wells to minimize well interference. Water levels should be monitored in existing and new wells to provide water-level data that would give early warning of any water-level declines and thereby aid management and development of the aquifer.

Beaver Creek-Redland Subarea

The Beaver Creek-Redland subarea includes the part of the study area southeast of Oregon City between the Willamette River valley on the west and the Clackamas River valley on the east. The subarea is mostly a well-dissected upland with local topographic relief as much as 400 ft along some creek valleys. The Boring Lava caps the highest parts of the upland throughout the subarea. The Boring is more than 400 ft thick in the southeastern part of T. 3 S., R. 3 E. (see logs of wells 3S/3E-30bbb and -32ada), but it thins northward. Along the north and west edges of its outcrop, the Boring has weathered to a thick section of red clay containing boulderlike masses of lava.

Wells in the subarea tap aquifers in the Boring Lava, the Troutdale Formation, and the Sandy River Mudstone, or both the Boring and the underlying unit. In the south half of T. 3 S., Rs. 2 and 3 E., about half the wells tap Boring Lava and half the Troutdale and Sandy River. In other parts of the subarea, the predominant aquifer is the Sandy River Mudstone; few wells obtain water from the Boring. Water levels in subarea wells range from 1 ft to nearly 500 ft (table 1), with a median level of about 50 ft. In general, wells tapping the Sandy River Mudstone have lower water levels and are deeper than wells tapping the Boring Lava.

Depths of wells in this subarea range widely, from about 20 to 700 ft, with a median depth of 150 ft. Well depths are greatest in uplands near stream valleys and in the Four Corners area near the middle of T. 3 S., R. 3 E. In that part of the subarea, many wells have been drilled through more than 200 ft of Boring Lava without obtaining sufficient water for household use (see well 3S/3E-15bcd, table 2), and several wells drilled to depths of several hundred feet were abandoned because of inadequate yields.

Shallow wells, less than 100 ft deep, obtain water adequate for a household supply from perched zones in the Boring at many places but are most common near the south edge of the subarea. For the entire subarea, wells in the Boring range from about 25 to 500 ft in depth, with a median of 120 ft. About one-third are less than 100 ft deep. Yields of those wells range from 1 to 100 gal/min and have a median of about 18 gal/min; about 14 percent produce less than 10 gal/min. Specific capacities range from 0.01 to 6 gal/min per foot of drawdown; the median is 0.4 gal/min per foot.

Erosion by Abernethy Creek and its tributaries has exposed the Troutdale Formation and Sandy River Mudstone along the valleys (pl. 1). Beds of typical Troutdale lithology (sand and gravel, conglomerate) are thin and occur erratically in a section of fine-grained beds totaling several hundred feet in thickness (see log of well 3S/3E-6aad, table 2). Therefore, most of the section underlying the Boring is judged to be part of the Sandy River Mudstone. The predominant clay lithology is one reason for small well yields near Four Corners and in the southwestern part of the subarea. Pumice, rock, wood, and shale reported in some drillers' logs may indicate that tuff and mudflow deposits of the Sardine Formation underlie the Sandy River in the eastern part of the subarea (see well 3S/3E-15bcd, table 2).

Most wells tapping the Troutdale Formation and Sandy River Mudstone are 100 to 200 ft in depth, and the median depth is 160 ft. Yields range from 1.5 to 250 gal/min, with a median of 18 gal/min. The yield of 84 percent of the recorded wells was at least 10 gal/min, an amount more than adequate for a domestic supply.

The Beaver Creek-Redland subarea has the highest percentage, in the study area, of wells deeper than 200 ft, and the most wells reported to produce inadequate supplies of water. Drilling records indicate that yields adequate for small-scale irrigation or commercial use may be difficult to obtain in most of the subarea. Wells several hundred feet deep probably would be needed in the central and southwestern parts, even for domestic supplies. The main problem is finding a zone or zones that will yield an adequate quantity of water. There is no indication that development to date has depleted the supply, affected the quality of ground water, or produced any interference problems among ground-water users in the subarea.

Clackamas Valley Subarea

The Clackamas Valley subarea includes the lowland and the series of terraces along the Clackamas River. The subarea extends approximately from Clear Creek on the southwest to Deep Creek on the northeast. The Clackamas River is bordered by a narrow band of alluvium and broad areas of stream terraces from Estacada to Oregon City. Individual benches commonly are separated by escarpments 100 to 150 ft high which, in many places, expose the Troutdale Formation or Sandy River Mudstone (pl. 1). Southwest of Estacada and east of the town of Eagle Creek, the intermediate-level terraces are absent, leaving only the upper terrace formed on the Springwater Formation as narrow ridges 200 to 500 ft above the adjacent lowlands.

Wells in the subarea obtain water from the alluvium, from deposits underlying each stream terrace, and from the Springwater and Troutdale Formations and Sandy River Mudstone. The Springwater is a source of water for a few wells only in the central part of the two narrow ridges northeast of Clear Creek and southwest of Deep Creek (pl. 1). Depths of these wells generally are less than 100 ft, water levels are less than 50 ft below land surface, and yields are at least 10 gal/min from local shallow water zones. Near the edges and upper slopes of these ridges, wells are drilled commonly to depths between 200 and 500 ft to tap the Troutdale Formation or thin water-bearing sand beds in the Sandy River Mudstone.

Only a few wells obtain water from the alluvium, which is erratic in both thickness and lithology. Many wells in the area mapped as alluvium on plate 1 go through a few feet of alluvium to tap more productive sand or sandstone zones in the underlying Sandy River Mudstone, in some cases at depths of several hundred feet (see well 2S/2E-11dab, tables 1 and 2). The highest recorded yield from a well tapping the alluvium is from well 3S/4E-19bdd, which was tested at 50 gal/min when drilled in 1964.

The terrace deposits are the source of water for nearly half the wells in the subarea. Wells tapping this unit have a median depth of 65 ft and a median depth to water of about 25 ft. Yields range from 2 to 60 gal/min, but nearly all are more than 10 gal/min--adequate for an individual domestic supply. Most specific capacities are between 0.2 and 3 gal/min per foot of drawdown, and the average is about 0.6. Most of the wells tapping the terrace deposits are less than 100 ft in depth and have not been drilled entirely through the deposits that have a thickness of 150 ft at places.

About half the wells in the Clackamas Valley subarea obtain water from the Troutdale Formation and Sandy River Mudstone, commonly beneath alluvium or terrace deposits. Wells tapping these formations range generally from 100 to 820 ft in depth, but 70 percent are between 100 and 200 ft, and only 12 percent are more than 300 ft. Reported yields of wells range from 3 to 500 gal/min, with a median yield of 30 gal/min and a median specific capacity of 0.6 gal/min per foot of drawdown. Some wells that are drilled through the overlying terrace deposits into the Sandy River Mudstone are finished with only a small amount of casing, such as well 2S/2E-23bab, and probably obtain water from both the Sandy River Mudstone and terrace deposits. Other wells that are perforated at shallow depths, such as wells 2S/2E-15bbb and 2S/3E-27cca, probably also tap both aquifers.

In general, wells yielding quantities of water adequate for an individual domestic supply can be obtained readily throughout the subarea. Yields of 100 to 500 gal/min can be obtained at many places, but not everywhere, and an exploratory test hole may be advisable to ascertain subsurface conditions, such as the quantity of water available at a given site, depth to the best water-yielding zones, and thickness and lithology of rock materials, before attempting to drill a large-yield well. In general, additional moderate supplies (100 to 500 gal/min) could be developed, at favorable sites in the subarea, from the terrace deposits, alluvium, and Troutdale and Sandy River aquifers without interfering with established water supplies.

Southeastern Subarea

The southeastern subarea includes the part of the study area south of Deep Creek and east of the longitude of Estacada. For 2 or 3 mi east of Estacada, the subarea is a gently sloping plain, but about the eastern part of R. 4 E. the terrain changes abruptly to steeper slopes and more deeply incised stream valleys. The northern part is characterized by the steep-walled valleys of Deep, Bear, and Eagle Creeks, cut 300 to 400 ft below the uplands. Altitudes exceed 2,000 ft in the southeastern part of the subarea, which is generally forested and relatively unpopulated, except for scattered homes along the east-west roads.

The Sardine Formation underlies the entire area and is at the land surface in much of it. The Sardine also is the principal aquifer supplying water to wells for most of the area. The Springwater Formation, Boring Lava, Troutdale Formation, and Sandy River Mudstone are all tapped by domestic wells in places in the subarea.

The depth to water and depth and yield of wells all vary greatly over the area as a result of diversities in topography and in the character of the Sardine rocks. The depths of wells tapping the Sardine range from about 50 to nearly 600 ft, but most wells are 100 to 300 ft in depth (table 1). Depths to water are generally between 10 and 300 ft, but most are less than 100 ft. Yields range from 4 to 65 gal/min; less than half the wells produce as much as 10 gal/min. Specific capacity generally is low--0.03 to 0.5 gal/min per foot of drawdown. Records of several wells report "total" drawdown, indicating not only low yields but high probability that the reported pumping rate could not be sustained for very long. The largest yields and highest specific capacities are in wells obtaining water from "lava" in the Sardine. "Sandstone" and "conglomerate," reported in drillers' logs, probably are coarse-textured tuff, mudflow deposits, or breccia.

Most domestic water supplies in a 10-square-mile area just east of Estacada are obtained from sand and gravel in the lower part of the Springwater Formation, which overlies the Sardine Formation there. Most wells in that part of the subarea are less than 100 ft deep and yield at least 10 gal/min. Specific capacity ranges from 0.2 to more than 2 gal/min per foot of drawdown. In part of the Springwater outcrop area, particularly along the west and north margins, a few wells as much as 240 ft in depth obtain water from the underlying Troutdale Formation or Sandy River Mudstone. Along the south and east sides, where the Springwater is thin and above the water table, wells are drilled through the Springwater and into the underlying Sardine.

Boring Lava crops out in the northern part of the subarea, in the southern part of T. 2 S., R. 5 E., and the northern part of T. 3 S., R. 5 E. About half the wells there obtain water from shallow zones in the Boring at depths of less than 100 ft. The yields from wells tapping the Boring tend to be higher than from wells tapping the Sardine; more than half the wells produce more than 10 gal/min and a fourth of them more than 20 gal/min. Brownell Spring, which is the principal source of water for the town of Sandy, discharges about 400 gal/min from the Boring in the NE¼ sec. 35, T. 2 S., R. 5 E. (pl. 2).

Near the northwest corner of T. 3 S., R. 5 E., some wells on the upland near the Deep and Bear Creek valleys obtain water from the Troutdale Formation and Sandy River Mudstone at depths of 100 to more than 300 ft (table 1).

Sandy Subarea

The Sandy subarea includes the area near Sandy north of Deep Creek, in T. 2 S., Rs. 4 and 5 E. The area south of the Sandy River is directly underlain by the Springwater Formation, and the surface is a rolling plain that slopes generally northwestward at 100 to 125 ft per mile. The Springwater has been completely eroded along the valleys of the deeply incised streams--Deep, Tickle, and Cedar Creeks, and the Sandy River. The Troutdale Formation and Sandy River Mudstone underlie the Springwater over a large part of the subarea and are exposed along the lower slopes of those stream valleys. The Sardine Formation crops out in a narrow band adjacent to the Sandy River and probably directly underlies the Springwater Formation along the east edge of the subarea and underlies the Sandy River Mudstone to the west. All four formations are aquifers at places in the subarea.

In the main part of the subarea, south of the Sandy River, about half the wells tap the Springwater Formation and about half go through the Springwater into the deeper Troutdale or Sardine aquifers. In T. 2 S., R. 5 E., well depths range from about 40 to 550 ft and average 150 ft. However, 75 percent of the wells are less than 200 ft deep and 40 percent less than 100 ft. The shallowest wells probably obtain water from local perched-water zones in the Springwater. Reported yields of wells range from 1/3 to 75 gal/min, with two-thirds producing more than 10 gal/min and only 8 percent of the wells less than 5 gal/min. The smallest yields are from deep wells completed in tuff or lava of the Sardine Formation or in clay or mudstone of the Sandy River Mudstone. Specific capacities range from 0.01 to 50 gal/min per foot of drawdown, with a median of about 0.3 gal/min per foot of drawdown.

In T. 2 S., R. 4 E., water levels and depths of wells vary more than in R. 5 E. Well depths range from 40 to 1,400 ft, and the median depth is about 150 ft. However, 60 percent of the wells are 100 to 250 ft in depth and only

10 percent are less than 100 ft. Well depths generally are greatest in the western part of the township, where Deep and Tickle Creeks have valleys eroded 200 to 400 ft below the adjacent upland. Most wells there are drilled several hundred feet deep to reach saturated sand in the Troutdale Formation or Sandy River Mudstone. Water levels range from 1 to nearly 600 ft below land surface; the median water-level depth is 125 ft. Reported well yields range from 2½ to 250 gal/min; the median yield is 20 gal/min, and 90 percent of the wells yield at least 10 gal/min. Reported specific capacities range from 0.02 to 20 gal/min per foot of drawdown, and the median is about 0.7 gal/min per foot of drawdown.

Along the Sandy River east of Sandy, several wells less than 100 ft in depth obtain water from terrace deposits. Water levels generally are less than 30 ft below land surface, and yields range from 20 to 50 gal/min. However, in that lowland area and the adjacent upland, known as Devils Backbone (pl. 1), most wells tap the Sandy River Mudstone or Sardine Formation. Wells at lower altitudes generally are 100 to 200 ft in depth; those on the ridge range from 100 to more than 600 ft. Water levels also vary, depending on the topographic setting and well depth, from 20 to nearly 500 ft. Reported yields range from 5 to 50 gal/min, but most are more than 10. The median specific capacity is 0.5 gal/min per foot of drawdown.

No large-yield wells have yet been developed in the Sandy subarea, and only a few produce as much as 50 gal/min. However, 20 percent of the wells in the subarea have specific capacities of more than 2 gal/min per foot of drawdown, indicating a potential for production at moderate rates from the Springwater or Troutdale Formation. The few wells in the subarea drilled to develop water from the Columbia River Basalt Group have low yields. The low yield and specific capacity of well 2S/3E-14cbc and the apparently low yield from well 2S/4E-21daa suggest that the basalt has little potential to supply moderate or large quantities of water in the subarea.

The potential for individual domestic wells is generally good throughout the subarea, and a reasonable amount of additional development is not likely to interfere with present use. Aquifers in the area accept recharge readily, and an annual recharge rate of 6 in. on 1 mi^2 would provide nearly 1,000 gal/d for 300 homes. On that basis, recharge should provide an adequate supply for expected suburban development relying on individual domestic wells.

Highway 26 Corridor

This subarea includes the lowlands and lower mountain slopes along the Sandy and Zigzag Rivers from Cherryville to Government Camp. Much of the lowland is privately owned, whereas the adjacent uplands are National Forest lands. Most of the population lives in the lowland near the streams, but there are settlements along the lower valley slopes north of Brightwood and Zigzag and in the Government Camp area. A large proportion of the population of the subarea obtains domestic water from public-supply systems, several of which utilize ground-water sources (table 1). The principal aquifers being tapped are the alluvium along stream valleys and the Sardine Formation on the valley slopes.

West of the junction of the Sandy and Zigzag Rivers, the alluvial deposits in the valley bottom extend over a width of 1 to 1½ mi; eastward, the valley width is ½ mi or less. Most wells obtain water from the alluvium, which is as much as 150 ft in thickness and consists largely of bouldery glacial outwash, particularly in the eastern part of the subarea. In the thickest part of these deposits, properly constructed wells should produce several hundred gallons per minute. The highest yielding well in the subarea, the Brightwood public-supply well (2S/6E-24dcd), reportedly was tested at 175 gal/min with 48 ft of drawdown (table 1).

Lava, tuff, and mudflow deposits of the Sardine Formation underlie the alluvium in the subarea and crop out along the lower valley slopes. These rocks supply water to several wells near the valley, including two public-supply wells (2S/7E-30acb and -34cbb) that each yield more than 100 gal/min. As elsewhere, yields from the Sardine vary erratically; the yield of well 2S/7E-34bbd was only ¼ gal/min. Depths of wells in the Sardine generally exceed 100 ft, and one well (2S/7E-30acb) is nearly 500 ft deep (table 1).

Additional large quantities of ground water can be developed in the subarea from the alluvium wherever it has sufficient saturated thickness. Because it is highly permeable and contains a shallow water table, it is subject to contamination from septic-tank wastes and other potential contaminants. Ground-water supplies obtained from the alluvial deposits should be tested frequently for the presence of coliform bacteria.

A recently drilled geothermal test well in Old Maid Flat penetrated a total thickness of about 2,000 ft of Sardine Formation and 1,000 ft of Columbia River Basalt Group (J. F. Riccio, Oregon Department of Geology and Mineral Industries, oral commun., 1979). Although the Columbia River Basalt Group is a good source of ground water near its surface outcrops elsewhere in the study area, it is not likely to be used as an aquifer in this subarea because it lies at considerable depths and reportedly has low transmissivity.

SUMMARY AND CONCLUSIONS

Ground water of good quality can be obtained in quantities adequate for individual domestic supplies nearly everywhere in the study area. However, a well several hundred feet deep may be required at places adjacent to deeply entrenched stream valleys, such as Deep Creek, and near local topographic highs, such as Lenhart and Highland Buttes. No long-term supply problems are anticipated for domestic water, because annual ground-water recharge is judged to be adequate to supply at least a few hundred homes per square mile in most of the area.

Problems of mutual interference between domestic wells have not been noted to date, despite the large number of wells drilled in the study area in recent years. Information developed for this report suggests that any such problems in the future are likely to be small and local in extent. Possible exceptions are where wells tap small, shallow perched-water bodies in the Springwater Formation or Boring Lava. The quantity of water stored in those zones may be small and easily exhausted by pumping a few domestic wells. Some owners of domestic wells tapping such zones resort to deepening the wells after a few years, indicating that the volume of water stored in those zones and the recharge to them are too small to sustain a pumping rate averaging even a few gallons per minute over a period of several years. Estimates of long-term sustained withdrawal rates from the perched zone generally are not possible from information in drillers' reports or from a pumping test of a few hours' duration. Periodic measurements should be made of the water levels and yields of low-yield wells (less than 10 gal/min), or those where pumping draws the water level down near the bottom of the well, to detect possible water-level declines and provide early warning of local depletion of the ground-water source.

Wells capable of producing ground water at large rates (several hundred gallons per minute or more) can be developed in only a few places in the study area. The most favorable areas are the alluvial deposits in the Willamette River valley near Canby and the Sandy and Zigzag River valleys east of Cherryville. Also, several hundred gallons per minute can be obtained from wells in the Columbia River Basalt Group near Oregon City. However, because the basalt has relatively low storage capacity compared to its capacity to transmit ground water, development of large supplies from the basalt aquifer should be based on sound hydrologic and engineering planning to avoid local overdevelopment.

Moderate quantities of ground water (50 to 200 gal/min) can be obtained at favorable sites in many different locations in the study area. In the western part of the Sandy subarea, wells several hundred feet deep could tap aquifers in the Springwater and Troutdale Formations and Sandy River Mudstone. In the Beaver Creek subarea, permeable layers in the Troutdale Formation and Sandy River Mudstone yield 50 gal/min or more to wells at places, especially in the northern part of the subarea; test drilling would help determine the aquifer potential at a given site in that subarea. The basalt aquifer in the Oregon City subarea probably is capable of yielding additional moderate quantities but is also susceptible to overdevelopment for reasons given above. The alluvial deposits along the Clackamas River valley are potential sources of moderate supplies but are somewhat erratic in occurrence; where they have a few tens of feet of saturated sand and gravel, they could readily yield moderate quantities of water to wells. Exploration and testing may be needed to determine ground-water potential at any given site, however. In the Highway 26 corridor subarea, good water-yielding zones occur in the Sardine Formation, but their locations and water-yielding characteristics are unpredictable. Records of wells in table 1 indicate that, at places, wells several hundred feet deep will yield more than 100 gal/min and similar wells elsewhere only a few gallons per minute.

No ground-water contamination due to liquid wastes or other contaminants was noted in the study area. However, the potential for such contamination exists, especially along the Sandy and Zigzag River valleys, where ground-water levels are shallow and where homes using septic-tank or cesspool disposal systems are closely spaced. Other places susceptible to such contamination are small areas in the Oregon City, Beaver Creek-Redland, and Sandy subareas, where the ground water lies at shallow depths. In most of the study area, however, water levels generally are at sufficient depth that contamination is much less likely.

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Table 1.--Records of representative wells and springs

Well number: See page 7 for description of well-numbering system.
Type of well: Type of well refers to method of drilling: A, rotary; C, cable tool; D, dug.
Depth of casing: Depth of casing indicates length of blank casing or distance to the top of the first perforations if perforated.
Finish: F, gravel packed, with perforations; O, open end; P, perforated; S, screened; X, open hole.
Altitude: Altitude of land surface at well, in feet above mean sea level, interpolated from topographic maps, generally to the nearest 5 feet.
Water level: Depths to water below land surface given in feet and decimals were measured by personnel of the Geological Survey or the Oregon State Engineer; those given in whole feet were reported by well driller or owner. F, flowing well whose static water level is not known.

Specific conductance: Field measurements by Geological Survey personnel. Units used: micromhos per centimeter at 25°C.
Type of pump: C, centrifugal; J, jet; N, none; P, piston; S, submersible; T, turbine.
Well performance: Yield in gallons per minute, and drawdown in feet below nondischarging water level, reported by owner, operator, driller, or pump company.
Use: H, domestic; I, irrigation; M, medicinal; N, industrial; P, public supply; R, recreational; T, institutional; U, unused; Z, test hole.
Remarks: C, chemical analysis reported in table 3; L, driller's log in table 2. A, air tested; B, bailed; P, pumped for indicated time to determine yield under "Well performance." O, observation well whose water level is measured periodically. OSE-GWR, Oregon State Engineer (now Oregon State Water Resources Department) ground-water report series; WSP, U.S. Geological Survey Water-Supply Paper series.

Well number	Owner	Type of well	Year completed	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Altitude (feet)	Water level: Feet below datum	Water level: Date	Specific conductance of water	Type of pump and hp	Well performance: Yield (gal/min)	Well performance: Drawdown (feet)	Use	Remarks
								T. 2 S., R. 2 E.									
11dab	River Bend Mobile Estates	A, C	1973	820	10	805	X	Coarse black sand	150	26.4	3/ 6/73	330	T	500	126	P	P 24 hr, L.
13aba	Riverview Mobile Court	A	1970	365	10	344	S 344-364	Sand	165	61	3/12/70	--	T	300	239	P	P 6 hr.
13dac	John Ransom	C	1971	75	6	62	P 62-72	Cemented gravel	165	21.6	11/ 8/72	--	J	20	20	H	B 1 hr.
14add	Allen Phillips	C	1969	112	6	102	X	Sandstone	75	1.5	4/ 6/73	228	S	30	80	H	B 2 hr, L, C.
14bad	Empire Building Materials Co.	C	1971	310	6	280	P 280-290	Gravel	125	50	12/ 3/71	--	S	35	150	N	B 2 hr.
15bbb	Byrum Morehouse	C	--	347	10	75	P 75-80, 135-145, 210-237, 255-302	Clay, sand, and gravel	105	11.5	5/18/73	--	T 20	470	70	I	P, O.
15cba	Norman McMillon	C	1965	79	6	79	O	Cemented gravel	110	40	10/ 7/65	--	S 3/4	15	Total	H	B 1 hr.
15dad	Virgil Dugger	C	1968	38	6	38	O	Sand and gravel	120	17	7/13/68	--	--	10	2½	H	P 2 hr.
16dab	Ken Shelton	C	1967	68	6	60	X	do	80	28.8	4/ 6/73	--	S	20	5	H	B 1 hr.
21baa	G. R. Kach	C	1966	56	6	56	O	Sand	55	7	2/27/66	--	--	30	11	H	B 2 hr.
21bac	John Cleland	C	1968	120	6	19	X	Basalt	60	47.6	4/ 6/73	--	S	60	7	H	B 2 hr, L.
21dac	A. M. Herbst	C	1957	272	6	266	X	Gravel	330	227	5/10/57	--	T	100	5	I	P 3 hr, L.
22abb	William Dickman	C	1967	187	6	143	P 143-185	Sand and gravel	270	106	8/30/67	--	--	35	15	H	B 1 hr.
22acc	Lewis and Jack Siri	C	1970	195	6	171	X	Rock	315	111.8	4/ 6/73	--	S	40	60	I	B 2 hr, L.
22cbc	Philip Setera	A	1968	400	6	350	P 350-390	Sand	360	260	8/21/68	--	--	30	120	H	P 2 hr.
23bab	A. L. Huitt	C	1969	325	8	24	X	Gravel	400	235.4	4/ 6/73	--	S	25	5	H	B.
24abd	Ray Sugden	C	1972	218	6	208	P 208-215	Sand and gravel	305	192	8/ 7/72	--	--	15	10	H	B 1 hr.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year com-pleted	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Alti-tude (feet)	Water level: Feet below datum	Water level: Date	Specific conduct-ance of water	Type of pump and hp	Well performance: Yield (gal/min)	Well performance: Draw-down (feet)	Use	Remarks
								T. 2 S., R. 2 E.--Continued									
24bad	Paul Daschel	A	1966	95	6	20	X	Sand and gravel	420	49.1	11/ 9/72	163	S	8	20	H	B 1 hr, L, C.
24dad	Ben Dick	C	1963	159	6	135	P 135-159	Sand	325	134	8/20/63	--	--	12	15	H	B 1 hr.
25bda	Harold Hickman	C	1972	177	6	168	X	Sandstone	525	143	7/11/72	--	--	27	12	H	Do.
25ccb	Kenneth Armstrong	A	1971	185	6	80	P 80-95, 145-180	Sand and sandy clay	360	66.8	4/ 6/73	--	S	10	104	H	P 1 hr, L.
25cdc	A. H. Becker	C	1967	96	6	92	X	Sand and gravel	385	44	10/10/67	--	--	24	30	H	B 1½ hr.
26aba	Elmer Kunz	C	1956	75	6	48	X	Lava	445	29.7	4/ 6/73	--	J	20	--	H	B.
26cac	R. B. Oberson	C	1958	100	6	55	X	Rock	415	36	12/ 6/58	--	--	9½	60	H	B 1 hr.
27abc	George Cook	A	1970	400	6	345	P 345-377	Gravel	535	285.4	4/ 6/73	--	S	12½	3	H	B 1 hr, L.
28baa	Clackamas Housing Authority	C	1963	560	10	222	X	Basalt	335	305	1/ 9/63	--	--	300	34	P	P 8 hr, L.
28bca	Park Place Water Dist.	C	1967	404	10	158	X	do	200	184	10/10/67	--	--	300	10	P	P 6 hr.
28cca	Robert Haun	A	1970	160	6	142	P 142-160	Sand and gravel	155	65.6	4/ 6/73	--	S	30	76	I	B 2 hr, L.
28dad	Curtis Robinson	C	1966	260	6	245	P 245-260	Sand	320	198	10/14/66	--	--	25	60	H	P 1 hr.
29bad	Rossman's Sanitary Landfill	C	1961	40	6	40	O	Gravel	30	6	12/29/61	--	--	40	10	U	B 1 hr. Well destroyed.
29bca	Oregon ReadyMix	C	1966	248	8	176	X	Lava rock	25	13	2/26/66	--	T	100	100	N	P 1 hr.
32bac	Oregon City Public Schools	A, C	1967	602	8	463	X	Basalt	250	236	7/21/67	--	T	350	11	T	P 8 hr, L.
33abb	C. E. Jones	C	1957	120	6	60	P 60-90	Sand	70	38	10/15/57	--	J 1½	20	Total	H	B 1 hr.
33bab	John King	A	1966	120	6	99	X	Lava	55	40	6/ 6/66	--	S 1½	55	70	H	P 1 hr.
33bcb	Oregon City Public Schools	C	1965	578	12	472	X	Rock	170	165	3/ 4/65	--	T	295	131	T	P 8 hr.
34bda	Wilbur Staats	C	1960	275	6	270	X	Sand	290	191.5	4/ 6/73	268	S	10	0	H	B 3 hr, L, C.
34dab	G. D. Thomas	C	1963	96	6	40	X	Lava and sand	370	81	3/29/63	--	J 1	20	5	H	B 1 hr.
35aab	Stanley Mott	C	1970	250	6	230	P 230-234	Gravel	425	92	8/24/70	--	--	10	115	H	B 3 hr.
35cbd	F. L. Rotrock	C	1957	159	6	38	X	Lava	455	110.0	4/ 6/73	--	N	½	59	U	
36ccd	Jerry Malin	C	1965	94	6	58	P 58-90	Sand and conglom-erate	515	20	6/21/65	--	J ½	8	Total	H	B 2 hr.
36dca	J. E. Schreiber	C	1962	205	6	42	X	Rock	460	57	6/ 4/62	--	S 3/4	45	37	H	B 1 hr.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year com-pleted	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Alti-tude (feet)	Water level: Feet below datum	Water level: Date	Specific conduct-ance of water	Type of pump and hp	Well performance: Yield (gal/min)	Well performance: Draw-down (feet)	Use	Remarks
T. 2 S., R. 3 E.																	
13cdc	Roger Crosby	C	1963	115	6	72	X	Sand and gravel	285	58.9	8/17/72	--	J	7	8	H	B 2 hr.
14cbc	Salvation Army	C	1948	600	8	751	X	Rock (basalt?)	200	48.5	4/23/73	--	S	30	200	P	P 1 hr, L. Well 14L1 in GWR 3.
14cdc	Forrest Kirk	C	1971	120	6	110	P 110-116	Sand	260	16.4	do	--	S	30	50	H	B 1 hr.
16ddd	P. L. Lenz	C	1957	282	6	241	--	do	235	40	7/29/57	--	S	35	100	H	P 1 hr. Well 16R1 in GWR 3.
18cbc	L. V. Mumpower	C	1967	125	6	64	P 64-70, 85-115	Sand and gravel	115	27.1	4/23/73	--	S	35	75	P	B 1½ hr.
18cdd	El Paso Natural Gas	C	1963	154	6	154	O	do	175	53.6	do	--	T 2	40	14	H, N	P 5 hr, L.
19bcc	Bernard Crown	C	1968	135	6	134	O	do	190	63	12/12/68	--	--	20	Total	H	B 3 hr.
19cbb	C. G. Gaylin	C	1968	130	6	125	X	do	190	59	12/29/68	--	--	30	Total	H	B 1 hr, L.
19ccb	C. N. Crisp	C	1963	49	6	48	O	Sand	240	24.2	8/27/73	--	S	18	12	H	B 1 hr.
19ccc	Alfred Aus	C	1959	64	6	55	P 55-63	Sand and gravel	250	20	6/17/59	--	--	25	40	H	B 1 hr.
19dda	Pleasant View Cemetery	C	1971	65	6	65	O	Gravel	250	29	6/10/71	--	--	16	Total	I	B 3 hr.
20bab	J. E. Svoboda	C	1967	40	6	40	O	Gravel and boulders	120	15	10/ 2/67	--	--	11	Total	H	B 2 hr.
20bbc	L. B. Taylor	C	1971	134	6	134	O	Sand and gravel	195	82.4	4/23/73	--	S	10	38	H	B 2 hr, L.
20dab	Elmore Mostul	C	1966	151	8	132	P 132-149	Clay and sand	215	78.2	4/24/73	--	S	40	Total	H	P 2 hr.
20dad	Fred Boss	C	1969	79	6	71	P 71-79	Gravel	215	46	12/12/69	--	--	15	20	H	B 2 hr.
21acd	Bruce Reed	C	1960	95	6	90	X	Sand	140	F	9/ 3/60	--	--	--	--	H	Flowing 3 gal/min.
21adc	Joe Novak	A	1970	60	6	39	X	do	145	F	7/ 1/70	--	--	--	--	H	L, C. Flowing 17 gal/min.
21cab	Gabreal Lang	C	1971	108	6	71	P 71-72	do	215	52	5/11/71	--	--	10	5	H	P 4 hr.
22cda	R. S. Smith	C	1964	125	6	109	X	do	300	78.1	8/27/73	--	S	20	35	H	B 1 hr.
22dac	Howard Ashton	C	1965	54	6	33	P 33-53	do	245	15.5	do	--	S	15	30	H	Do.
23aac	Elte Construction Co.	C	1965	151	6	145	S 146-151	do	265	63.3	8/28/73	180	S	35	25	H	B 1 hr, L.
23bdb	Clackamas County Parks	C	1961	142	6	118	X	Sandstone	250	80	1/24/61	--	--	6	20	H	B 2 hr, L.
24add	Walter McMahon	C	1968	95	6	85	P 85-95	Sand	295	42	2/21/68	--	--	20	18	H	B 2 hr.
24bab	P. A. Crosby	C	1969	124	6	98	P 99-117	Cemented gravel	290	60	5/7/69	--	--	12	20	H	B 4 hr.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year com-pleted	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Alti-tude (feet)	Water level: Feet below datum	Water level: Date	Specific conduct-ance of water	Type of pump and hp	Well performance: Yield (gal/min)	Well performance: Draw-down (feet)	Use	Remarks
								T. 2 S., R. 3 E.--Continued									
24bcb	Adolph Still	C	1960	44	6	44	O	Gravel	275	10.0	8/28/73	--	--	25	40	H	B 1 hr.
24dbc	Ray Walton	C	1968	118	6	113	S 113-115	Sand	295	43.7	4/23/73	--	S	20	15	H	B 2 hr, L.
26bca	Darris Young	A	1972	280	6	185	P 185-280	Clay and sand	310	107.7	do	--	S	80	172	H	P.
26cbc	L. E. Bristow	C	1970	73	6	65	P 65-73	Cemented gravel	325	35.1	7/20/73	105	J	15	15	H	B 2 hr, L, C.
26dcc	Bonneville Power Adm.	C	1952	62	6	--	--	--	335	36.1	4/ 5/73	--	S	--	--	H	O.
27abc	Elbert Simpkins	C	1965	301	6	289	X	Sand	295	85	10/14/65	--	S 3/4	20	75	H	B 2 hr.
27cca	Logan Egg Farm	C	1964	227	8	71	P 71-141	Sand and gravel	390	45.1	4/23/73	--	S	400	90	S	P 1/3 hr.
27dcb	W. D. Bowen	C	1969	143	6	141	O	Gravel	380	94.1	4/27/73	--	S	10	25	H	B 2 hr.
28cdc	Joe Larson	C	1969	65	6	65	O	do	420	17	9/ 2/69	--	--	60	18	H	B 1 hr.
29caa	D. D. Chasteen	C	1969	85	6	84	O	do	385	52	1/10/69	--	--	20	Total	H	Do.
29dab	Stan Weil	C	1971	140	6	130	X	Cemented gravel	400	36.6	4/23/73	--	S	20	30	H	Do.
31caa	H. R. DeLano	C	1959	270	8	86	P 86-97, 183-197, 254-267	Sand and gravel	310	57.0	5/18/73	--	T	235	84	H, I	P 4 hr, O.
31cac	Adolph Deininger	C	1964	87	6	85	O	do	340	54	4/19/64	--	--	17	Total	H	B 1 hr.
32aba	Lester Lutz	C	1970	115	6	108	X	Gravel	400	65	1/14/70	--	--	22	Total	H	B 3 hr.
32bdd	C. L. Hewitt	C	1964	83	6	82	O	Sand and gravel	250	44	3/21/64	--	--	17	Total	H	B 2 hr.
33abc	Elmore Mostul	C	1967	158	8	62	P 62-139	do	430	3.6	4/23/73	--	S 7½	125	131	I	P 7 hr, L, C.
33aca	do	C	1967	179	8	55	P 55-114	do	430	2.8	do	--	S 7½	60	95	I	B 2 hr.
33dda	Tommy O'Neill	C	1968	75	6	72	O	do	450	18.0	4/24/73	118	J	17	39	H	B 2 hr, L, C.
34acc	Lester Jensen	C	1969	95	6	93	O	Gravel	495	37	12/ 5/69	--	--	50	40	H	B 1 hr.
34cbc	Ed Seagraves	C	1968	60	6	60	O	Sand and gravel	455	15.2	8/29/73	--	--	45	Total	H	Do.
34dcb	Leon Swenson	C	1966	200	8	80	P 80-134	do	500	34	8/ 9/66	--	--	110	103	H	P 8 hr, L.
35ada	W. N. Wymore	C	1965	50	6	28	P 28-48	Cemented gravel	350	24	10/ /65	--	--	2	20	H	B 1 hr.
35ccb	Charles McCauley	A	1969	120	6	110	P 110-120	Sand and gravel	440	80	12/30/69	--	--	10	38	H	P 1 hr, L.
35dbb	Kenneth Eaden	C	1970	57	6	39	P 39-49	Cemented gravel	340	13	10/23/70	--	--	15	25	H	B 2 hr, L.
36cbd	Tichener	C	1965	85	6	75	X	Sand	360	49.4	8/23/72	--	--	20	17	H	B 1 hr, L.
36ccc	Elmer Andrus	A	1972	56	6	35	P 35-45	Gravel	365	25.6	8/31/73	--	--	25	15	H	P 2 hr.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year com-pleted	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Alti-tude (feet)	Water level: Feet below datum	Water level: Date	Specific conduct-ance of water	Type of pump and hp	Well performance: Yield (gal/min)	Well performance: Draw-down (feet)	Use	Remarks
T. 2 S., R. 4 E.																	
14cac	R. Bordner	C	1971	170	6	148	P 148-170	Clay and gravel	875	90	1/26/71	--	--	15	40	H	B 2 hr, L.
14cad	Gary Allison	C	1971	167	6	149	P 149-164	do	865	113	do	--	--	10	40	H	B 2 hr.
15dac	William Eichner	C	1968	96	6	80	P 80-95	Cemented gravel	770	51	10/ /68	--	--	12	15	H	B 2 hr, L.
15dad	William Clark	C	1968	212	6	140	P 140-150, 190-210	Sandstone and cemented gravel	770	152.3	8/ 8/72	--	S	20	95	H	B 4 hr.
16dad	S. G. Miller	C	1971	133	6	130	O	Sand and gravel	765	58.1	do	--	S	15	33	H	Do.
17cba	Ralph Gage	C	1969	107	6	70	P 70-90	Loose gravel	720	45	12/ 9/69	--	S	4	45	H	P 2 hr.
17dbb	Jay Bacon	C	1971	165	6	161	X	Cemented gravel	845	51	1/ 9/71	--	--	15	Total	H	B 2 hr.
18acb	Ernie Titsworth	C	1972	411	6	406	S 406-411	Sand	640	396	8/11/72	--	S	7	--	H	P 4 hr, L.
18acc	Fields	C	1970	240	6	220	P 220-235	Cemented gravel	645	211.5	8/ 9/72	--	S	9	10	H	B 1 hr.
18dad	W. E. Hoffmeister	C	1971	750	6	720	P 720-734	Rock	655	545	3/19/71	--	--	15	60	--	B 3 hr, L.
18dda	Schedeen Bros.	C	1947	904	6	743	X	do	665	550	1947	--	--	7	--	H	B. Well 18R1 in GWR 3.
19acd	Nola Clester	C	1970	120	6	119	O	Cemented gravel	635	100.2	8/10/72	--	S	10	55	H	B 1 hr.
19ccc	Douglas Ridge Rifle Club	C	1966	40	6	40	O	Gravel and boulders	305	11.6	do	--	S	25	10	H	B 1 hr, L, O.
20adb	Glen Zuercher	A	1969	140	6	118	P 118-126	Gravel	780	88.0	8/9/72	--	S	3	16	H	B 2 hr.
21bdd	Paul Bartlemay	C	1970	128	6	128	O	do	720	19	3/31/70	--	S ½	30	50	H	Do.
21cac	Arlo Baker	C	1968	78	6	60	P 60-78	do	695	22	3/ /68	--	S	25	30	H	Do.
21daa	Sandy Farms	C	1952	1,403	6	476	X	Rock	790	585	6/ 7/52	--	N	--	--	U	L. Well 21J1 in GWR 3.
22bbd	Donald Raymond	C	1970	215	6	191	P 191-215	Sandstone	810	174.0	8/10/72	--	S	18	10	H	B 1 hr.
22cac	Sandy Farms	A	1968	293	8	--	--	--	860	--	--	--	--	--	--	--	Test well; no water; abandoned.
22dad	E. J. Barnes	C	1972	542	8	500	P 500-535	Rock	940	286.9	8/30/72	--	S	100	44	H, S	P 6 hr.
23aad	Ken Flath	C	1966	120	6	60	P 60-110	Clay, gravel, and small boulders	960	34.2	8/ 8/72	--	S	8	50	H	P 1½ hr.
23bdd	T. O. Whitby	C	1969	260	6	230	P 230-260	Sandstone	945	210	4/22/69	--	S	7	20	H	B 2 hr.
23cdd	L. L. Kyle	C	1967	183	6	169	P 169-177	Sand and gravel	985	143	7/25/67	--	--	6	27	H	B 1 hr, L.
24abb	McGuire's Nursing Home	C	1967	370	6	225	X	Basalt	1,015	87	6/14/67	--	--	20	15	H	B 1½ hr, L.
24dba	B. Cook	C	1969	240	6	220	P 220-235	Sandstone	1,075	168.8	8/ 8/72	--	S	20	Total	H	B 1 hr, L.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year com- pleted	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Alti- tude (feet)	Water level		Specific conduct- ance of water	Type of pump and hp	Well performance		Use	Remarks
										Feet below datum	Date			Yield (gal/ min)	Draw- down (feet)		
								T. 2 S., R. 4 E.--Continued									
25bdc	C. W. Cochran	C	1963	137	6	122	P 122-137	Gravel	1,105	86.7	8/10/72	--	S	16	35	H	B 2 hr, L.
26bcd	R. C. Croonquist	C	1967	135	6	45	P 45-95	Clay, gravel, and boulders	1,015	32.6	8/11/72	--	S	2½	90	H	P 2 hr.
26cbb	E. M. Taylor	C	1968	184	6	180	X	Sandstone	1,010	161	9/17/68	--	--	12	0	H	B 1 hr.
27bab	Sandy Farms	C	1959	300	10	220	P 220-280	Gravel	905	215.6	4/20/72	--	T 30	250	70	I	P 48 hr, O.
27bda	L. B. Alexander	C	1968	340	5	240	P 240-270	Clay and sand- stone	920	238.3	8/11/72	--	S	18	0	H	B 1 hr, L.
28cda	Dick Woodcock, Jr.	C	1972	110	6	108	O	Sand	770	63.6	do	--	S	9	25	H	B 2 hr.
29dad	V. W. Nelson	C	1958	190	6	95	P 95-110, 129-149	Sand and gravel	710	59.0	4/20/72	--	T 7½	70	58	I	P 8 hr, L, O.
29ddb	S. E. Hottenstein	C	1969	110	6	96	X	Clay and sand	685	66.5	8/15/72	--	S	10	12	P	P 14 hr.
30bac	Charles McGee	C	1971	50	6	22	P 22-40	Gravel	310	5.5	8/31/73	--	S	14	25	H	B 1 hr, L.
30cbd	Dale Overton	C	1970	55	6	55	O	Gravel and cobbles	320	23.8	do	--	S	20	20	H	B 2 hr, L.
30dcb	Homer Glover	C	1968	48	8	28	P 28-43	Cemented gravel	325	6.4	8/15/72	--	S	15	30	I	B 1 hr.
30ddd	Estacada Elementary School Dist. 108	C	1968	257	6	240	P 240-257	Sand and gravel	395	136	9/16/68	--	S	75	114	T	P 6 hr, L.
31bcc	Marlin Gunderson	C	1971	59	6	59	O	do	330	28	9/ 1/71	--	--	25	20	H	B 1 hr.
31dcb	Rex Kirchhoff	C	1971	250	6	240	X	Sand	355	95	3/ 4/71	--	--	25	30	H	B 1 hr, L.
31ddc	Larry Lindland	C	1972	65	6	56	P 56-64	Clay and sand	360	26	8/17/72	--	--	8	Total	H	Do.
32bab	E. G. McKay	C	1970	70	6	64	P 64-68	Cemented gravel	420	22.0	8/15/72	--	J	7	40	H	B 1 hr.
32dab	H. G. Griffin	C	1972	55	6	53	O	do	430	11	7/28/72	--	S	20	35	H	B 1 hr, L.
33bcc	R. C. Schaefer, Jr.	C	1971	276	6	245	P 245-270	Sand and gravel	490	217	9/ 9/71	--	--	18	10	H	B 1 hr.
33bcd	Terry Boyer	C	1972	125	6	114	S 114-119	Sand	535	93.3	8/16/72	--	S	12	27	H	P 1 hr.
34bcc	Lloyd Potter	C	1960	96	6	95	O	Cemented gravel	800	42.2	do	--	S	35	Total	H	B 1 hr.
36baa	Ken Buss	C	1970	145	6	120	P 120-140	Sand and gravel	1,155	85	8/26/70	--	--	10	30	H	P 2 hr, L.
36cbb	F. E. Bordeaux	C	1968	255	6	232	P 232-242	Sand	1,125	206	10/19/68	--	--	14	Total	H	B 2 hr.
36dca	Charles Lindsey	C	1966	310	6	298	X	Clay and sand	1,200	276.9	8/16/72	--	S	5	53	H	B 1 hr, L.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year com-pleted	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Alti-tude (feet)	Water level: Feet below datum	Water level: Date	Specific conduct-ance of water	Type of pump and hp	Well performance: Yield (gal/min)	Well performance: Draw-down (feet)	Use	Remarks
T. 2 S., R. 5 E.																	
7ada	Harold Zemp	C	1969	60	6	50	P 50-60	Gravel	640	37.2	10/ 5/72	--	S	55	8	H	P 10 hr, L.
7bca	C. A. Pearson	C	1967	136	6	124	X	Lava rock	440	70	10/16/67	--	--	20	10	H	B 2 hr.
7bdb	Mark Hyatt	C	1969	233	6	128	X	Rock	440	69	4/12/69	--	--	7	Total	H	B 1 hr, L.
8cbd1	J. F. Remington	C, A	1971	269	6	134	X	do	600	117.2	10/ 5/72	--	S	18	17	H	B 1 hr.
8cbd2	do	C	1970	68	6	52	P 52-58	Cemented gravel	600	39.2	do	--	N	12	2	H	Do.
9dba	Lulu Winters	C	1964	567	6	337	X	Rock	1,160	464	11/ 6/64	--	S 1½	14	11	H	B 2 hr.
9dbd	Kenneth Keyser	C	1972	95	6	64	P 64-82	Cemented gravel	1,220	38	3/22/72	--	--	15	50	H	B 1 hr.
10bcc	R. A. Wise	C	1957	287	6	160	P 160-285	Gravel and rock	1,280	230	5/18/57	--	--	18	20	H	B.
10dab	John Pardue	C	1967	665	6	85	P 85-140, 225-315	Rock	1,360	>300	10/ 5/72	--	S	6	220	H	B 2½ hr, L. Static water level was 183 ft 10/9/67.
10dbb	Ross TenEyck	C	1970	173	6	115	P 115-165	Cemented gravel	1,380	92	2/ 6/70	--	--	16	Total	H	B 2 hr.
16cdd	Harlan Olson	C	1970	83	6	64	P 64-80	do	1,140	42	11/10/70	--	--	20	Total	H	B 1 hr.
17acc	Oral Hull Foun-dation	C	1971	220	6	83	P 83-185	"Eagle Creek Formation"	720	91.1	10/11/72	--	--	10	Total	H, I	B 2 hr.
17bac	Earl Persons	C	1968	110	6	100	P 100-110	Gravel and boulders	680	86	9/ /68	--	--	15	2	H	Do.
17bca	R. G. Ashton	C	1968	200	6	89	X	Lava	680	111	10/28/68	--	--	4	75	H	B 1 hr.
17cad	R. F. King	C	1963	116	6	102	P 102-112	Sand and gravel	840	96	10/ 7/63	--	S ½	20	1	H	B 2 hr.
18aca	William Taylor	C	1945	213	8	213	O	--	700	181.4	9/ 6/72	--	S 12	100	0	H, I	P, O.
18acc	Joe Cobb	C	1971	314	5	294	P 294-314	Rock	680	170.6	10/11/72	--	S	10	125	H	B 2 hr, L.
18bbc	J. N. Hartley	C	1966	66	6	46	X	do	640	19.6	do	--	S	50	Total	H	Do.
18bdd	Tom Novotny	C	1971	60	6	58	O	Gravel	660	36	11/16/71	--	--	25	Total	H	B 1 hr.
19bbb	Baunach-Home for the Aged	C	1964	56	6	43	X	Conglomerate	1,060	22	6/16/64	--	--	15	13	H	Do.
19bcb	Marvin Hall	C	1965	167	6	149	P 149-165	Sandy clay	1,060	123	9/17/65	--	--	12	55	H	B 2 hr.
19ccc	Tom Steffl	C	1972	191	8	191	O	Sandstone and gravel	1,140	79.3	10/12/72	--	S ½	35	80	H	B 2 hr, L.
19dcd	G. W. Bennett	C	1964	86	6	58	P 58-82	Rock	1,120	28	6/28/64	--	S 3/4	16	18	H	P 5 hr.
20bad	D. D. Wamboldt	C	1964	230	6	220	X	Sandstone	1,040	200.2	10/12/72	--	S	15	20	H	P 2 hr.
20cdc	Mount Hood Redi-Mix	C	1967	76	6	58	X	Conglomerate	1,180	24.4	do	55	S	12	52	N	B 1 hr, L, C.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year com-pleted	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Alti-tude (feet)	Water level: Feet below datum	Water level: Date	Specific conduct-ance of water	Type of pump and hp	Well performance: Yield (gal/min)	Well performance: Draw-down (feet)	Use	Remarks
T. 2 S., R. 5 E.--Continued																	
21abd	F. H. Bean	C	1970	101	6	86	P 86-101	Gravel and boulders	1,180	40	10/12/70	--	--	15	15	H	B 4 hr.
21add	D. Morris	C	1970	100	6	47	F 47-97	Sandstone and boulders	1,180	30	9/11/70	--	--	15	30	H	B 2 hr.
21bab	C. H. Kirkwood	C	1967	66	6	47	P 47-65	Sand and gravel	1,120	25.3	10/11/72	33	S	17	Total	H	B 1 hr, L, C.
22bdc	Herman Herrington	C	1967	96	6	96	O	Conglomerate	1,220	41.1	10/10/72	--	S	14	Total	H	B 2 hr.
22caa	C. W. Wilson	C	1971	74	6	57	P 57-72	do	1,220	35	9/22/71	--	--	12	30	H	B 1 hr.
22dbc	A. F. Garber	C	1968	107	6	98	P 98-105	Sandstone and cemented gravel	1,270	26	11/27/68	--	--	12	Total	H	B 1 hr, L.
23bab	Bennie Leundervolk	A	1967	367	6	35	X	Rock	1,200	220.0	10/10/72	--	S	22	172	H	P 1 hr.
24acc	Van Zand	C, A	1969	510	6	185	X	Sandstone and rock	1,120	320	2/20/69	--	--	10	5	H	B 3 hr, L.
24bac	V. E. Steele	C	1971	150	6	138	X	Sand, gravel, and rock	1,220	105	10/18/71	--	--	25	25	H	B 6 hr.
24bbd1	Elbert Bigelow	C	1971	102	6	58	P 58-61, 82-100	Cemented gravel	1,290	46.7	10/10/72	--	J	3½	90	H	B 4 hr.
24bbd2	David Mills	C	1971	230	6	175	P 175-230	Clay, sand, and gravel	1,290	137	5/11/71	--	--	10	29	H	P 4 hr, L.
25abb	S. Amundsen	C	1965	45	6	40	P 40-43	Sandstone	1,040	31	3/14/65	--	--	15	7	H	B 1 hr.
25acb	G. M. Allen	C	1964	305	6	56	X	Rock	1,140	150	9/21/64	--	--	15	45	H	B.
26aaa	Roland Holmes	A	1971	100	6	52	X	Basalt	1,000	18	7/ 1/71	--	--	30	62	H	A 1 hr.
26acc	A. B. Caudell	C	1968	225	6	100	P 100-115	Gravel	1,240	42	1/23/68	--	--	20	101	H	B 1 hr.
26add	Carl Sorrels	C	1965	82	6	39	X	Boulders and rock	1,240	43.5	10/13/72	--	J	1	Total	H	Do.
26cab	Oregon Candy Co.	C	1971	145	6	105	P 105-145	"Rhododendron Formation"	1,280	69.3	do	110	S 3/4	20	52	C, H	B 2 hr, L, C.
27ada	J. M. Callaghan	C	1970	207	6	97	X	Rock	1,240	105	9/ 9/70	--	--	35	60	H	B 2 hr.
27bad	Ohmit	C	1971	106	6	70	P 70-106	Cemented gravel	1,240	39.5	10/13/72	--	S	8	35	H	Do.
28aba	Robert Porter	A	1971	100	6	53	X	Clay with sandy layers	1,120	33.3	10/17/72	--	S	9	60	H, I	B 1 hr, L.
28abd	O. L. Preston	C	1971	153	6	101	X	"Rhododendron rock"	1,200	20	1/21/71	--	--	5	50	H	B 1 hr.
28baa	John Morehead	C	1969	75	6	66	P 66-74	Sand and gravel	1,200	22	8/ 1/69	--	--	6	Total	H	B 2 hr.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year com- pleted	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Alti- tude (feet)	Water level: Feet below datum	Water level: Date	Specific conduct- ance of water	Type of pump and hp	Well performance: Yield (gal/min)	Well performance: Draw-down (feet)	Use	Remarks
T. 2 S., R. 5 E.--Continued																	
29bcc	Lloyd Boswell	C	1966	118	6	74	P 74-117	Cinders and rock	1,300	67.0	10/17/72	--	S	30	20	H	B 1 hr.
29cdc	R. R. Shearman	C	1964	81	6	60	X	Lava rock	1,380	40	11/ 7/64	--	--	4	70	H	Do.
29dac	R. E. Fogle	A	1968	137	6	86	X	Rock	1,440	106	10/22/68	--	--	15	31	H	P 3 hr, L.
30add	Marvin Marjama	C	1971	205	6	160	P 160-175, 195-205	Sandstone and cemented gravel	1,280	120	12/15/71	--	--	20	5	H	B 2 hr.
30bbc	Jim Chandler	C	1971	200	6	175	P 175-200	Sandstone	1,140	140	11/30/71	--	--	30	10	H	Do.
30cdc	Ed Allgeier	C	1969	267	6	250	P 250-266	Silt, sand, and gravel	1,220	234.7	10/17/72	--	--	7	22	H	B 1 hr, L.
31bab	William Allgeier	C	1970	70	6	53	P 53-69	Sand and gravel	1,220	26	4/28/70	--	--	40	16	H	B 1 hr.
31bdd	Herbert Fenwick	C	1970	185	6	157	P 157-182	Sandstone	1,220	149	11/29/70	--	--	15	7	H	B 2 hr.
31dba	Ray Hodge	C	1968	103	6	84	P 84-103	Sandstone and gravel	1,210	77.3	10/19/72	--	S	15	10	H	B 2 hr, L.
31dca	J. L. Lovegrove	C	1971	184	6	176	P 176-183	Sand and gravel	1,200	156	4/30/71	--	--	15	8	H	B 1 hr.
32aba	D. F. Douglas, Jr.	C	1971	35	6	33	O	Shale and gravel	1,420	6	6/18/71	--	--	15	19	H	B 4 hr, L.
32cdc	Daryle Dowell	A	1968	210	6	37	X	Rock	1,380	29	4/15/68	--	--	5	81	H	P 5 hr.
32daa	J. R. Burns	A	1971	130	6	34	X	Basalt	1,450	84	10/29/71	--	--	20	5	H	B 1 hr.
32ddd	R. A. Nonamaker	A	1967	49	6	30	X	Rock	1,400	25.3	10/19/72	--	S	50	20	H	P 1 hr.
33abb	G. W. Timlin	A	1969	285	6	63	X	Sand and gravel	1,480	218	6/16/69	--	--	7	68	H	P 2 hr, L.
33cdd	T. A. Kasunic	C	1972	60	6	41	P 41-57	Rock	1,600	27	1/28/72	--	--	18	30	H	B 1 hr.
33dad	Robert Mackie	C	1963	58	6	41	P 41-58	do	1,600	26.2	10/19/72	--	N	25	12	H	B 4 hr, L.
34bab	R. N. Unger	A	1971	212	6	180	P 180-205	do	1,560	126	7/12/71	--	--	12	23	H	P 3 hr, L.
34bbb	Cledus Perkins	A	1972	54	6	42	X	do	1,540	16	3/20/72	--	--	40	2	H	B 1 hr.
34ccc	A. Anderson	C	1963	53	6	38	P 38-53	do	1,600	30.0	10/19/72	--	S	27	6	H	B 4 hr.
34ddc	L. D. Larson	A	1970	118	6	82	P 82-118	do	2,000	78	8/12/70	--	--	15	30	H	P 1 hr, L.
35aba(s)	City of Sandy	--	--	--	--	--	--	--	1,520	--	--	--	--	400	--	P	Brownell Spring.
T. 2 S., R. 6 E.																	
19cad	George Butler	C	1969	70	6	70	O	Sand	880	40	11/ 6/69	--	--	40	10	H	B 2 hr.
19cbc	S. H. White	C	1966	58	6	45	P 45-55	Sand and gravel	840	5	3/29/69	--	J ½	15	20	H	Do.
19dbc	T. R. Anderson	C	1971	59	6	59	O	Gravel	920	45.4	10/24/72	--	S	35	1	H	B 1 hr, L.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year completed	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Altitude (feet)	Water level: Feet below datum	Water level: Date	Specific conductance of water	Type of pump and hp	Well performance: Yield (gal/min)	Well performance: Drawdown (feet)	Use	Remarks
T. 2 S., R. 6 E.--Continued																	
22abb	M. L. Edwards	C	1968	42	6	40	O	Boulders	950	12.5	10/24/72	--	C	60	5	H	B 1 hr, L.
22bbc	R. R. Seiber	A	1970	57	6	47	X	Sandstone	940	26	10/14/70	--	--	10	19	H	P 1 hr.
22cac	Mrs. Lee Bishop	C	1970	75	6	65	P 65-74	Sand and boulders	1,040	41	5/23/70	--	--	30	Total	H	B 1 hr.
22cbb	P. T. Rice	C	1964	42	6	42	O	Gravel	960	16	12/19/64	--	S 3/4	12	20	H	Do.
23cbc	American-Swiss Model Gardens	A	1958	115	8	--	(?)	Cemented gravel	1,040	18	9/ 1/58	--	J 2	20	90	H	B 2 hr.
23cda	Harold Cox	C	1964	60	6	60	O	Boulders	1,060	30.1	10/25/72	75	S	32	10	H	B 2 hr, L, C.
23dcb	Walt Schmidt	C	1970	89	6	89	O	Gravel and boulders	1,060	26	4/ 2/70	--	--	30	34	H	B 2 hr.
24cdd	W. K. Swanson	C	1965	87	6	86	O	Sand	1,180	76	5/ 5/65	--	--	8	3	H	B 1 hr.
24dcd	Brightwood Water Works	C	1965	110	10	88	P 88-110	Sand and gravel	1,120	27	8/10/65	--	S, 15	175	48	P	P 4 hr, L.
25bca	Merrill Buck	C	1972	48	6	47	O	Gravel	1,100	12.9	10/30/72	--	S	35	17	H	B 1 hr.
26aac	Cleland	C	1965	81	6	81	O	Sand and gravel	1,120	67.2	do	--	S	30	0	H	B 1 hr, L.
T. 2 S., R. 7 E.																	
19ccc	George Donnell	C	1971	42	6	34	P 34-39	Gravel and boulders	1,100	4	11/29/71	--	--	30	10	H	B 1½ hr.
26bdb	Zigzag Village	C	1966	135	6	107	P 107-115	Sand and gravel	1,640	35.5	10/31/72	160	S 2	70	43	P	P 1 hr, L, C.
27adb	Claude Gudge	C	1972	74	6	73	O	do	1,660	49.2	do	--	--	35	4	H	B 2 hr.
30acb	Timberline Rim	A	1968	486	8	98	X	Lava	1,400	27	11/14/68	210	S 25	122	61	P	P 24 hr, L, C.
30caa	do	C	1969	97	6	97	O	Sand and gravel	1,180	13	5/17/69	--	--	35	22	R	B 2 hr.
31add	Bureau of Land Management	A	1967	150	--	--	--	--	1,240	--	--	--	--	--	--	--	Well abandoned because of insufficient good-quality water.
32cab	Clackamas County Bank	C	1966	119	6	113	X	Sand and boulders	1,300	23.4	10/30/72	--	S	30	57	H	B 2 hr.
32ddd	Willolla Limited of Oregon	C	1964(?)	53	8	--	--	--	1,330	28.2	11/ 3/72	--	N	--	--	U	Recorder site.
33cdd	River Bluff Park Co.	A	1971	100	8	100	O	Sand and gravel	1,390	35	12/23/71	--	--	80	40	P	A 1 hr.
34bbd	U.S. Forest Service	A, C	1966	294	6	55	X	"Andesite"	1,450	F	10/31/72	--	N	½	Total	U	P 1 hr, L, C.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year completed	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Altitude (feet)	Water level		Specific conductance of water	Type of pump and hp	Well performance		Use	Remarks
										Feet below datum	Date			Yield (gal/min)	Drawdown (feet)		
T. 2 S., R. 7 E.--Continued																	
34cbb	Strebin-Nottingham, Inc.	A	1970	150	6	113	X	Broken rock	1,420	8	12/ 1/70	--	J	120	80	P	B 2 hr.
T. 3 S., R. 1 W.																	
25dba	Oregon State Univ.	C	1959	155	10	115	P 115-130½, 146-148, 152-154½	Sand and gravel	160	42.15	1/18/73	--	T 25	350	11	H, I	P 27 hr, L, O. Originally drilled to 226 ft.
25dbc	do	C	1965	129	12	106	S 105-114	do	160	41	11/29/65	--	--	242	56	I	P 9 hr. Originally drilled to 226 ft.
T. 3 S., R. 1 E.																	
11cda	C. E. Miller	C	1971	220	6	92	P 92-100, 105-115	Sand	430	82.2	3/29/73	130	S 3/4	10	40	H	B 1 hr.
11ddc	P. W. Snyder	C	1970	100	6	80	P 80-100	Clay and sandy shale	465	44.1	10/12/71	120	S 3/4	12	40	H	do.
12abc	Bernard Brandow	C	1967	300	6	20	X	--	440	--	--	--	--	--	--	U	L. "Dry hole."
12bcc	N. D. Fitch	C	1958	106	6	98	X	Basalt	450	4.0	3/29/73	85	T 1	30	50	H	B 1 hr.
12ccc	W. Barney	A	1970	215	6	195	X	Sand	460	120	4/ 1/70	--	--	20	95	H	B 1 hr, L. Originally drilled to 460 ft.
12dda	Robert Parrish	C	1969	298	6	280	X	Sand and gravel	445	250.9	3/29/73	180	S 1½	15	19	H	B 1½ hr.
14bbd	R. R. Samuels	A	1971	77	6	43	X	Basalt	355	25	2/ 9/71	--	--	30	50	H	P 2 hr, L.
14ccd	Frank Hermans	C	1967	208	6	--	X	do	260	138	11/17/67	--	--	16	7	H	B 3/4 hr.
14dad	Lewis Zaronsenski	C	1971	138	6	84	X	Rock	205	97.1	3/29/73	--	S 1	10	40	H	B 1 hr.
14ddc	Fred Tuttle	C	1970	265	6	192	X	--	185	--	--	--	--	--	--	U	"Dry hole."
21cbc	Neal Thompson	C	1969	150	10	56	P 56-69	Sand	140	18	4/ 8/69	--	--	150	51	H, I	P 24 hr.
23acc	G. F. King	A	1970	60	6	41	P 41-54	Gravel and sand	160	31.3	3/29/73	180	--	9	24	H	P 2 hr.
23bbc	C. R. Bigej	C	1959	232	6	185	X	Basalt	140	82.2	do	--	--	20	15	H	B 1 hr, L.
23cac	Leo O'Rourke	C	1966	174	6	21	P 21-99	do	195	105	7/29/66	--	S 1	30	20	H	B 1 hr.
23cdd	Willow Island Mobile Estates	A	1971	335	8	275	X	Black rock	205	113.7	10/ 8/71	420	S 2	200	215	P	P 4 hr.
24add	W. M. Tolford	C	1961	415	10	362	P 362-392	Sand	415	240	10/ 6/71	--	T 15	100	120	H	Do.
24cad	Frank Vazdinski	C	1969	430	6	379	X	Rock	290	180	5/12/69	--	--	20	30	H	B 1 hr.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year com-pleted	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Alti-tude (feet)	Water level: Feet below datum	Water level: Date	Specific conduct-ance of water	Type of pump and hp	Well performance: Yield (gal/min)	Well performance: Draw-down (feet)	Use	Remarks
T. 3 S., R. 1 E.--Continued																	
24cbb	Gordon Andrus	C	1960	120	6	104	P 104-116	Sand	210	64	3/ 8/60	--	--	30	12	H	B 2 hr.
26bcd	A. R. Slaby	C	1955	230	6	173	X	Basalt	210	99.5	5/18/73	324	S	76	37	I, H	P 5½ hr, L, C, O.
26ccb	Jerry Franz	C	1968	157	6	52	X	Rock	195	113	10/17/68	--	--	30	0	H	B 2 hr.
27cbd	Leslie Jefferson	C	1970	110	6	105	X	Sandstone	100	24	10/27/70	--	--	45	15	H	Do.
27dad	Rees Meyrick	A	1967	190	6	68	X	Basalt	190	104.5	3/28/73	325	S 3/4	45	100	H	P 1 hr, L.
27ddd	Robert Milner	C	1969	110	6	74	P 74-83	Sand	170	69.2	do	210	--	20	24	H	B 1 hr. Originally drilled to 160 ft.
28cbd	Industrial Forestry Assoc.	C	1961	165	12	70	P 70-79, 104-106, 118-123	Sand and gravel	145	68.5	3/27/73	220	T	450	75	I	P 26 hr, L, C.
28daa	Willamette Valley Country Club	C	1963	189	12	60	P 60-100, 135-145, 165-188	do	135	43.4	3/28/73	--	T 50	400	115	I	P, L.
28dda	Vernon Beck	C	1968	95	6	58	P 58-60	Cemented gravel	125	35.6	do	--	N	25	11	U	P 2 hr.
29adc	John Herkamp	C	1970	110	6	110	O	Sand	135	54.5	9/17/71	220	S ½	30	20	H	B 2 hr, L.
29ddc	Ray Farnsworth	C	1968	96	6	85	P 85-89, 93-96	Sand and gravel	145	69	9/11/68	--	S 1	20	6	H	B 1 hr.
31add	J. L. Rider	C	1967	170	6	170	O	Sand	85	1.4	3/27/73	320	--	30	75	H	B 1½ hr, L, C.
31ddd	Merle Learfield	C	1967	93	6	93	O	Sand and gravel	100	13.1	do	225	S ½	40	15	H	B 1 hr.
32caa	CMA Camp	C	1957	38	8	23	X	Sand	85	6.4	4/24/74	--	N	300	1	U	B.
32dac	Globe-Union Battery Co.	C	1959	190	10	59	P 59-76, 87-93	Sand and gravel	155	57.6	1/19/71	--	S	225	59	N	P 3 hr, L, O. Known as D & S Farms well in OSE-GW reports.
32dad	City of Canby	C	1968	421	10	103	S 103-260	Sand	155	62.2	3/27/73	--	T, 50	403	33	P	P 8 hr.
33cbd1	do	C	1912	107	8	107	O	Gravel	150	--	--	--	N	--	--	U	C. Well 102 in WSP 890.
33cbd2	do	C	1921	652	8	530	X	Clay and sand	150	54.7	9/16/71	--	N	--	--	U	L, C. Well 103 in WSP 890.
34aac	Morris Torgeson	C	1968	103	6	99	X	Sand	165	56.1	3/28/73	300	S ½	40	25	H	B 1 hr.
34bdc	Ivan Arneson	C	1959	132	8	36	P 36-113	Sand and gravel	135	17.5	3/ 6/73	206	T 7½	200	43	I	P 3 hr, L, C, O.
34cdb	J. A. Vraves	C	1956	218	8	60	P 60-111, 146-148, 170-172, 190-193	do	160	40.5	5/18/73	--	T 15	465	108	H, I	P 5 hr, L, O.
35aad	C. L. Holmes	C	1967	195	6	189	S 189-194	Sand	250	80	7/21/67	--	--	20	3	H	B 2 hr.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year completed	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Altitude (feet)	Water level: Feet below datum	Water level: Date	Specific conductance of water	Type of pump and hp	Well performance: Yield (gal/min)	Well performance: Draw-down (feet)	Use	Remarks
T. 3 S., R. 1 E.--Continued																	
35bac	Al Delforge	C	1968	246	8	197	X	Basalt	190	102.4	3/28/73	--	S	150	5	I	P 1 hr.
35bdb	Del Smith	C	1961	430	8	90	P 90-105, 172-180, 310-325	Sand and gravel	185	18	10/24/61	--	--	140	200	H, I	P 8 hr.
35cbb	Del Rose Nursery	C	1966	237	6	170	P 170-195	Sand	185	78.0	3/28/73	280	S 5	140	70	I	P 6 hr.
35ddb	A. F. Kraft	C	1971	187	6	187	O	do	230	41.4	do	290	S 1	25	10	H	B 1 hr.
36abc	Lloyd Moles	A	1971	110	6	90	P 90-110	Sand and gravel	225	41.9	do	--	S 1	30	40	H	A 2 hr.
36acd	Darrell Jensen	C	1971	122	6	110	P 110-121	do	260	51.1	do	260	S 1½	35	17	H	B 1 hr.
36ccd	Joe Demsher	C	1956	193	8	193	O	Sand	245	85.1	5/18/73	--	T	255	88	I	P 4 hr, O.
T. 3 S., R. 2 E.																	
1aaa	A. E. Wesley	C	1966	275	6	262	X	Sand and gravel	435	240	3/10/66	--	S 1	24	5	H	B 1 hr.
1baa	Hansen	C	1965	113	6	46	X	Lava	535	80	11/ 5/65	--	S 1	30	8	H	B 2 hr.
1bad	Sacrison	C	1965	290	6	285	P 285-289	Sand	530	239	9/30/65	--	S 1	15	30	H	B 1 hr.
1ccc	Richard Leibelt	C	1964	197	6	190	P 190-197	do	385	162.2	4/ 5/73	--	S	15	5	H	B 1 hr, L.
2bcd	John Harris	C	1956	157	6	94	X	"Shale"	305	112	1/17/56	--	--	2½	40	H	B.
2cba	Wonder Well Water Co.	C	1959	190	8	148	P 148-155	Sand and gravel	215	85	4/ /59	260	T	300	29	M	P 4 hr, L, C.
3abd	L. A. Millikan	C	1967	128	6	116	X	Sand	145	58	8/ 8/67	--	S	15	22	H	B 2 hr.
4add	Portland General Electric Co.	C	1958	230	8	70	P 70-74, 98-102	Rock	395	11.9	11/17/72	--	S	2	50	H	P 2 hr.
4bba	Irvin Dugan	C	1956	415	6	363	X	do	360	324	7/28/56	--	--	15	56	H	B.
4cad	R. L. Striker	C	1958	80	6	50	P 50-78	Sandstone	410	50	8/20/58	--	--	40	5	H	B 1 hr.
5bac	Womplers Cleaners	C	1971	175	8	52	X	do	470	39	4/23/71	--	S	60	62	C	P 4 hr.
6add	Oregon City Public Schools	C	1955	550	8	452	X	Basalt	470	450	12/ /55	--	T	80	42	T	P 6 hr.
6cca	Clifford Chapin	C	1966	191	6	100	P 100-110, 140-180	Sandstone	470	40.0	4/ 5/73	106	S	275	80	I	P 3½ hr, L, C.
6cdc	Howard Colton	C	1968	107	6	25	X	Sandstone and gravel	465	50	2/28/68	--	--	30	12	H	B 1 hr.
6ddc	A. M. Frank	C	1957	101	6	20	X	Sand and lava	455	42	8/15/57	--	--	40	20	H	B.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year com-pleted	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Alti-tude (feet)	Water level: Feet below datum	Water level: Date	Specific conduct-ance of water	Type of pump and hp	Well performance: Yield (gal/min)	Well performance: Draw-down (feet)	Use	Remarks
								T. 3 S., R. 2 E.--Continued									
7adb	J. E. Love	C	1968	100	5½	85	P 85-95	Sandy clay	450	22.6	4/ 5/73	--	S	20	40	H	B 1 hr.
7bcc	H. A. Fensky	C	1956	164	6	155	X	Sand	455	--	--	--	P	22½	5	H	B.
8add	E. J. Wanke	C	1960	67	6	32	X	Sandstone	415	22	1/28/60	--	S ½	13	--	H	B 2 hr.
8bca	Rudy Pavlinac	C	1967	638	10	610	X	do	440	244.9	4/ 5/73	239	T 40	225	230	I	P 4 hr, L, C. Originally drilled to 664 ft.
9aba	Roy Crabb	C	1961	62	6	59	X	Lava	425	20	5/12/61	--	J 3/4	30	5	H	B 1 hr.
9bba	Ron Schief	C	1968	80	6	60	P 60-70	Sand	415	32.2	4/ 5/73	120	S	5	Total	H	B 2 hr, L, C.
9dcd	Alfred Hess	C	1958	42	6	40	X	do	430	8.0	do	170	J	17	30	H	B ½ hr, L, C.
11bba	Maynard Williams	C	1965	95	6	87	S 87-95	do	185	49.1	do	--	S	30	13	H	B 1 hr.
12ada	L. J. Van Dyke	C	1969	140	6	100	P 100-106, 118-123, 127-137	Claystone and rock	265	78.1	do	248	S	8	52	I	B 4 hr, L, C.
12bdd	Keith Vosberg	A	1970	65	6	50	P 50-65	Clay and sand	150	F	1/23/70	--	--	10	60	H	P 2 hr.
12ccb	Loyd Fleming	C	1967	207	6	200	X	Sand	275	93	5/11/67	--	--	20	3	H	B 1 hr.
12dca	Brooks	A	1967	159	6	128	X	do	190	48	3/ 2/67	--	--	40	--	H	P.
12dcc	B. D. Blagg	A	1967	119	6	100	P 100-118	do	190	14.0	4/ 5/73	--	S	100	119	H	P.
13bba	Charles Anderson	C	1970	143	6	140	X	Sand and gravel	380	92	7/20/70	--	--	5	87	H	B ½ hr.
15bdd	Dave Harris	C	1962	75	6	65	X	Sand	530	16	8/ 1/62	--	--	37½	16½	H	B 1 hr.
16aab	L. E. Long	C	1959	168	6	161	X	Sand and gravel	450	55.0	4/ 5/73	--	S	20	40	H	B 2 hr.
16bab	Herbert Smith	C	1961	210	6	210	P 65-70, 181-202	Sandy shale and rock	400	11	3/17/61	--	S 3/4	8	175	H	B 1 hr.
16bda	Towmbly	C	1957	152	6	31	X	Rock	410	32	5/17/57	--	--	15	100	H	Do.
17aaa	E. K. Broyles	A	1968	173	6	24	X	Claystone	405	137	3/20/68	--	--	2	31	H	P 1 hr, L.
17cac	Jerry Miles	C	1970	88	6	78	X	Sand and gravel	160	12	2/27/70	--	--	30	40	H	P 3 hr.
18add	W. E. Dillon	D	1958	72	33	--	--	do	250	65	8/21/58	--	--	5	--	H	P.
18dda	Mrs. Milton Rider	C	1969	94	6	90	P 90-93	Sand	160	15	8/15/69	--	S 1	25	47	H	B 2 hr.
18ddb	Joe Hoffman	C	1959	260	6	222	X	do	175	3	2/11/59	220	J 3/4	20	82	H	P 4 hr, L.
19ddc	H. L. Hugger	C	1968	140	6	100	P 100-140	Sand and gravel	390	95	3/ 1/68	--	S 1½	25	35	H	B 2 hr.
19ddd	J. Brosnahan	A	1966	290	6	60	P 60-176	Sandstone	400	53.2	4/ 4/73	--	S	5	110	H	B 1 hr, L.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year com-pleted	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Alti-tude (feet)	Water level: Feet below datum	Water level: Date	Specific conduct-ance of water	Type of pump and hp	Well performance: Yield (gal/min)	Well performance: Draw-down (feet)	Use	Remarks
								T. 3 S., R. 2 E.--Continued									
20abc	Chester Pruitt	A	1971	375	6	355	P 355-375	Sand and gravel	450	256.0	4/ 4/73	200	S 1½	12	Total	H	A 2 hr.
20bcc	W. D. Petrie	C	1968	170	6	159	X	do	320	110	4/12/68	210	--	20	25	H	P 8 hr, L.
20daa	Blanche Jones	C	1956	202	6	195	P 195-201	do	465	156	6/25/56	--	--	20	30	H	B.
21aab	Thornton	C	1958	135	6	60	P 60-63, 130-135	do	450	60	8/ 9/58	--	--	20	--	H	Do.
21ccd	Fred Leach	A	1971	325	6	61	P 60-246, 282-322	Lava	505	132.1	4/ 4/73	--	--	20	117	H	B 1 hr, L.
21dab	A. E. Timberman	C	1958	260	6	190	X	"Shale"	530	175	1/ 4/58	--	S 3/4	8	65	H	B 1 hr.
22cbc	G. D. Fulmore	C	1956	144	6	144	O	do	510	--	--	--	--	30	25	H	B.
22dbd	Jim Calico	C	1971	93	6	22	X	Sand	490	27.6	4/ 4/73	150	S ½	35	36	H	B 1 hr.
23abc	H. S. Francis	C	1966	300	6	18	X	Sandstone	600	166.2	do	140	S 1	10	170	H	B 2 hr.
23bda	William Hagedorn	A	1966	254	6	234	P 234-254	Sand	560	140	9/26/66	--	S 1½	20	90	H	P 2 hr.
24bca	Warren Atwell	A	1967	396	6	52	X	Lava and sand	680	138.9	4/ 4/73	130	S 3/4	7½	--	H	P, L.
24cbd	W. H. Harmon	C	1966	228	6	56	X	Rock	660	24	3/ 8/66	--	S	3	Total	H	B 2 hr.
25baa	W. N. Smith	C	1963	293	6	180	P 180-186, 200-205, 280-290	Rock and con-glomerate	650	165.9	4/ 4/73	--	T 5	60	146	I	P 4 hr.
25cbc	E. V. Smith	C	1962	115	6	43	X	Lava	630	63.0	7/11/73	110	S 3/4	30	49	H	B 1 hr, L, C.
25dbc	A. W. Brown	C	1969	222	6	220	O	Sand and gravel	610	75	4/12/69	--	--	40	53	H	B ½ hr.
26acb	Robert Hilts	A	1968	120	6	88	P 88-110	Boulders and sand	560	46.1	4/ 3/73	150	--	11	60	H	P 1 hr, L.
26daa	E. E. Thomas	C	1969	140	6	38	X	Sandstone	630	58.8	do	80	S 3/4	32	24	H	B 1 hr.
27aba	Ethel Griffith	C	1964	80	6	75	X	Sand	470	25	4/30/64	--	S 3/4	30	60	H	Do.
27cca	C. A. Gustaveson	A	1968	182	6	60	X	Lava	555	80.4	4/ 3/73	66	S 1½	22	151	H	P 1 hr, L, C.
27dab	Lance Randle	C	1965	100	6	25	X	Rock	520	22.5	do	70	S 3/4	15	10	H	B 2 hr.
27dcd	Eric Fisher	C	1970	214	6	209	X	do	595	71.4	do	125	--	20	63	H	P 2 hr.
28aba	L. W. Hooper	C	1965	157	6	27	X	Lava	530	109.9	11/12/71	--	S 3/4	18	21	H	B 2 hr.
28caa	Eldon Evans	C	1962	390	6	83	P 83-125, 235-255	Sand and shale	480	98	12/10/62	--	S 5	25	82	H	P 6 hr.
28cbd	K. N. Simmons	C	1966	117	8	65	P 65-97, 104-116	Rock	505	22.9	4/ 3/73	--	S 2½	100	55	H, I	P 5 hr.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year completed	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Altitude (feet)	Water level: Feet below datum	Water level: Date	Specific conductance of water	Type of pump and hp	Well performance: Yield (gal/min)	Well performance: Drawdown (feet)	Use	Remarks
								T. 3 S., R. 2 E.--Continued									
29abb	E. C. Evans	C, A	1967	500	8	40	P 40-500	Sandstone	405	93	5/29/67	177	S 5	250	52	I	P 6½ hr, L, C.
29bbb	R. D. Timperley	C	1969	118	6	100	X	Sand	380	84.2	4/ 3/73	180	S 1½	4½	20	H	B 2 hr, L.
29cdb	R. L. MacDonald	C	1970	125	6	70	P 70-125	Sandstone	370	93.4	11/15/71	140	S 1	20	35	H	B 1 hr.
29dbc	W. Oaks	C	1963	205	6	205	O	Sand	405	145	11/ 5/70	--	--	18	4	H	P 2 hr.
30bab	J. M. Dale	C	1966	202	6	188	X	Sand and gravel	350	167	9/19/66	--	S	22	10	H	B 2 hr.
30bba	Isaac Fullington	C	1964	225	6	209	X	Sand	325	145	6/15/64	--	--	10	15	H	B 3 hr.
30cbc	Dean Spence	A	1971	150	6	78	X	do	180	25.7	10/ 8/71	--	--	40	60	H	P 1 hr, L.
31cad	P. C. Keyser	C	1959	112	6	89	P 89-106	Sand and gravel	305	73	9/14/59	--	--	35	8	H	B 1 hr.
32abd	D. D. Seifert	C	1965	70	6	35	P 35-70	Lava	435	27	5/ 7/65	--	S 1	40	18	H	Do.
32ccd	D. J. Austen	C	1968	110	6	50	P 50-58	do	560	22.9	7/11/73	48	S 1	20	64	H	B 2 hr, L, C.
32dac	Harold Klug	C	1967	103	6	53	X	do	500	34.1	3/30/73	110	S 1	9	41	H	B 1 hr.
33bbc	W. B. Mars	C	1968	130	6	60	X	Lava and sand	455	22.8	11/15/71	70	S 1	32	28	H	B 1½ hr.
33cac	Dales Hughes	C	1966	91	6	63	X	Lava	450	13.8	4/ 2/73	125	--	30	40	H	B 1 hr.
33ddd	Moak	C	1957	196	8	48	P 48-60	do	620	19	11/ 5/57	60	S 2	45	25	H	B 2 hr.
34aab	Roy Linton	A	1968	102	6	34	X	Lava and sand	580	30	4/ 8/68	--	--	60	70	H	P ½ hr.
34bda	K. D. Hartberg	C	1970	105	6	34	X	Basalt	540	44.5	4/ 2/73	120	S 1	30	26	H	B 1 hr, L.
34dca	John Cooke	C	1970	100	6	40	P 40-90	Lava	580	15	10/12/70	--	--	15	60	H	B 2 hr.
35aba	Eugene Petitti	C	1956	101	6	48	X	Rock	645	14.6	5/18/73	123	S	35	35	H	B, L, C, O.
35bca	Albert Fisher	C	1969	128	6	105	P 105-110	Sandstone	680	67.5	4/ 2/73	55	S 3/4	13	52	H	B 2½ hr.
35dba	Robert Florey	C	1960	215	6	64	X	Conglomerate and rock	790	65	9/ 7/60	--	--	6	150	H	B 1 hr.
36cdb	K. L. Hawks	A	1968	696	6	20	X	--	835	--	--	--	--	--	--	--	L. "Dry hole."
36dba	Don Rider	C	1970	360	6	43	X	Lava	660	49.6	4/ 2/73	130	S 1	18	150	H	B 2 hr.
								T. 3 S., R. 3 E.									
2caa	Vincent Bliley	C	1968	130	6	103	P 103-130	Sand and gravel	530	65.3	4/27/73	--	S	7	53	H	B 1 hr.
2cac	Vincent Uhlig	C	1966	180	6	70	P 70-88	Gravel	525	42	9/ /66	--	--	30	30	H	B 2 hr.
3abc	Harding Grange	C	1961	58	6	56	O	do	485	19	1/ 5/61	--	--	25	Total	H	Do.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year com-pleted	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Alti-tude (feet)	Water level: Feet below datum	Water level: Date	Specific conduct-ance of water	Type of pump and hp	Well performance: Yield (gal/min)	Well performance: Draw-down (feet)	Use	Remarks
T. 3 S., R. 3 E.--Continued																	
3ada	Clayton Johnson	C	1968	65	6	65	O	Gravel	490	14.5	8/31/73	--	--	35	31	H	B 1 hr, L.
3cdd	Stanley Madsen	A	1972	72	6	50	P 50-65	Sand and gravel	350	52.0	4/24/73	--	S	15	15	H	B 1 hr.
4aac	George Sabin	C	1969	109	6	62	P 62-70, 85-100	do	450	50	8/16/69	--	--	22	Total	H	Do.
6aad	Harley Ward	C	1965	292	8	283	X	do	400	189.8	4/24/73	--	S	75	37	S	P 6 hr, L.
6acb	Marvin Van Zee	A	1967	210	6	175	X	Rock	370	116.6	4/25/73	--	X	45	125	H	P 1 hr.
6acd	L. R. Ostrander	C	1959	448	6	424	X	Sand	455	260	11/21/59	--	S 1	8	100	H	B 1 hr.
7dcd	James Kurtti	A	1968	335	6	285	P 285-325	Sandy clay	480	256.8	4/24/73	--	S	5	97	H	P 3 hr, L.
8aba	Kenneth St. Mary	C	1948	97	6	19	X	Rock	555	27.5	4/25/73	117	J 1	11	--	H	L, C.
8abb	Clyde Fry	A	1972	260	6	125	P 125-160	Basalt	570	186.3	6/28/73	--	S	25	129	H	P 1 hr, L.
8cdb	Roy Sawyer	A	1970	110	6	69	P 69-109	Lava	680	26.2	4/24/73	--	S	16	75	H	P 2 hr, L.
8cdd	Edward Feddern	A	1968	114	6	60	P 60-114	Rock	790	39.2	4/25/73	--	S	23	62	H	P 1 hr.
9aba	Charles O'Brien	C	1971	147	8	147	O	Sand and gravel	460	142.4	4/24/73	--	S	10	10	H	B 1 hr, O.
9abd	Frank Beers	C	1971	197	6	189	X	do	475	163.0	do	--	S	20	20	H	B 1 hr.
10dbd	John Ellenburg	C	1971	62	6	62	O	do	335	17.0	4/25/73	--	S	50	0	H	Do.
11acc	Melvin Welker	C	1958	75	6	60	P 60-68	Cemented gravel	560	13.3	4/26/73	--	J	50	33	H	B.
11ccb	John Farlow	C	1971	285	6	256	X	Sandy shale	500	207.2	4/25/73	--	S	20	60	H	B 1 hr, L.
11dda	C. A. Illig, Jr.	C	1956	96	6	75	X	Sand	620	55	2/ 8/56	--	--	4	35	H	
12bdc	Ralph Tatum	C	1965	85	6	78	P 78-85	Sandstone	245	10	3/ 4/65	--	--	15	50	H	B 2 hr.
13abc	Paradise Park Com-munity Club	C	1963	95	6	90	X	Sand	250	8	3/19/63	--	--	13	Total	P	Do.
13cbd	Warren Swenson	C	1971	65	6	50	P 50-60	Cemented gravel	695	7	3/31/71	--	--	30	Total	H	B 2 hr, L.
13cdc	E. T. Hanks	A	1969	131	6	105	P 105-119	Sand and gravel	740	49	6/17/69	--	--	15	71	H	P 1 hr.
14aad	Herman Durschmidt	C	1961	81	6	53	P 53-54, 73-80	Cemented gravel	660	31	8/18/61	--	--	8	Total	H	B 1 hr.
14acc	D. R. Smith	C	1967	220	8	135	P 135-150	Clay	660	50.8	4/25/73	--	S	18	174	I	B 1½ hr, L.
14bdd	William Willbroad	C	1964	96	6	45	P 45-46, 90-96	Sand and gravel	645	18	7/21/64	--	--	28	Total	H	B 1 hr.
15bbc	Fred Riedel	C	1970	314	6	304	P 304-314	Gravel	680	275	12/18/70	--	S	10	15	H	B 2 hr.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year completed	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Altitude (feet)	Water level: Feet below datum	Water level: Date	Specific conductance of water	Type of pump and hp	Well performance: Yield (gal/min)	Well performance: Drawdown (feet)	Use	Remarks
T. 3 S., R. 3 E.--Continued																	
15bcd	Robert Kiefer	A	1970	835	6	653	X	Sand	680	309.1	8/31/72	--	S	100	376	P	P 3 hr, L.
15bdb	Terry Kyle	C	1965	140	6	71	X	Basalt	690	118.2	4/25/73	--	S	24	5	H	B 1 hr.
16dac	Joe Cole	C	1958	278	6	255	P 255-265	Sand	655	189	7/31/58	--	--	15	10	H	Do.
16dad	R. L. Clark	C	1963	140	6	44	P 44-54	"Limestone"	650	7.5	4/25/73	--	J	4	100	H	B 3 hr.
17cbb	Richard Polehn	A	1970	602	8	540	X	Shale and gravel	710	>498	9/11/72	--	S	15	0	P	B 1 hr, L.
17dbd	John Weninger	A	1970	255	6	21	X	Sand and gravel	640	44	9/28/70	--	--	24	209	H	P 1 hr.
18abb	Glendon Baer	C	1969	408	6	400	X	Sand	530	340	7/ 7/69	--	--	20	8	H	B 2 hr.
18bad	Al Roberts	C	1968	85	6	80	X	Sand and gravel	405	59.1	4/23/73	--	S	20	0	H	Do.
18bba	Arthur Kyniston	C	1971	254	6	238	P 238-250	Sand	370	180	7/ 8/71	--	--	25	20	H	B 1 hr.
18bdb	Robert McCallum	A	1971	280	6	103	P 103-153	Sand and gravel	455	93.0	4/27/73	--	S	20	5	H	B 1 hr, L.
20cdd	Clayton Wills	C	1965	350	6	163	P 163	do	630	263.3	4/25/73	--	S	17	30	H	B 2 hr.
21dcc	Herbert Huskey	A	1968	342	6	319	X	Sandy clay and gravel	670	214.8	4/24/73	--	S	20	0	H	B 3 hr.
22aaa	LaFaye Fouts	C	1972	83	6	69	X	Sand	360	F	4/20/72	--	--	30	20	H	B 1 hr. Flowing 7 gal/min.
22aba	Arthur Smith	C	1971	50	6	37	P 37-41	do	360	22.9	4/26/73	--	S	50	Total	H	B 2 hr.
23ada	Ficken	C	1968	58	6	40	P 40-58	Sand and gravel	700	33.4	4/25/73	--	S	10	13	H	B 1 hr, L.
24acc	Dorothy Winzler	C	1964	63	6	50	P 50-60	Consolidated conglomerate	775	13.3	do	--	S	8	25	H	B 1 hr.
25bcb	Henry Tannler	C	1963	70	6	69	O	Clay and sand	400	12.8	do	--	S	12	25	H	Do.
30bbb	Vern Kjargaard, Jr.	C	1969	383	6	30	X	Lava	730	144.0	4/26/73	--	S	33	149	H	B 1 hr, L.
30bcc	Philip Snyder	C	1972	60	8	40	P 40-50	Sandy shale	600	21.7	do	--	S	60	0	P	Do.
31abd	J. V. Wendell	C	1960	85	6	39	X	Rock	835	48	1/ /60	--	--	30	Total	H	B 2 hr.
31dad	Ray Moehnke	C	1970	125	6	55	X	Lava	715	19	10/19/70	--	--	9½	Total	H	B 1½ hr, L.
31dcb	Henry Green	C	1964	125	6	97	X	do	775	13.9	4/26/73	110	J ½	16	90	H	B 1 hr.
32ada	Richard Sifford	A	1971	445	6	237	P 237-297	Sand, gravel, and lava	970	238	12/14/71	--	--	11	12	H	P 1½ hr, L.
32adc	Leo Gabriel	C	1966	146	6	131	X	Sandstone	925	102	6/ 8/66	--	--	20	25	H	B 2 hr.
33ccb	Gerald Dyck	A	1972	203	6	48	X	Lava	1,015	154.5	4/26/73	105	S	7½	--	H	A 2 hr, L. C.
33dca	G. L. Bryant	C	1963	100	6	47	X	do	1,065	10	6/26/63	--	S	20	65	H, S	B 3 hr.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year com-pleted	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Alti-tude (feet)	Water level: Feet below datum	Water level: Date	Specific conduct-ance of water	Type of pump and hp	Well performance: Yield (gal/min)	Well performance: Draw-down (feet)	Use	Remarks
								T. 3 S., R. 3 E.--Continued									
34adc	Harold Teske	A	1972	116	6	88	X	Lava	1,030	60.7	4/26/73	--	S	17	34	H	P 1 hr, L.
35dcd	Theodosios Koutalianos	A	1971	124	6	39	X	Sandstone and lava	1,010	32	9/ 8/71	--	S	25	10	H	B 1 hr.
36cca	W. E. Dodd	C	1967	205	6	75	X	Rock	995	35.7	4/26/73	--	S	12	Total	H	B 2 hr, L.
								T. 3 S., R. 4 E.									
1cac	A. W. Thomas	C	1962	160	6	114	X	Lava	1,165	134.4	7/25/72	--	S	20	2	H	B 2 hr.
1cad	Grant Ruple	A	1971	389	6	262	P 262-382	Rock	1,165	334	11/20/71	--	S	5	Total	H	P 1 hr, L.
2bca	John Joy	A	1969	187	6	157	P 157-187	Sand and gravel	1,055	146	11/ 7/69	--	S	5	30	H	P 2 hr.
2dcb	G. L. Mucken	C	1970	175	6	145	P 145-175	Gravel and rock	1,090	145.4	7/25/72	--	S	15	15	H	B 1 hr.
2ddc	Jack Shields	C	1970	225	6	155	P 155-225	Clay	1,100	134.5	do	--	S	2	Total	H	B 2 hr, L.
3aca	Irwin Barber	A	1971	143	6	80	X	Rock	930	32.0	do	--	S	25	92	H	P 1 hr.
3bad	J. C. Matt	A	1972	142	6	40	P 40-125	Sandstone and conglomerate	815	28.0	7/26/72	--	S	10	43	H	B 1 hr.
3bdd	Roy Knight	A	1971	79	6	52	P 52-76	Rock	865	45.9	7/25/72	--	S	10	20	H	P 1 hr.
4adb	M. D. Guthu	C	1965	63	6	60	O	Gravel and rock	510	31.6	7/26/72	--	J	10	10	H	B.
4bbc	Oscar Smith	C	1960	61	6	55	X	Sand and rock	465	21.4	7/27/72	80	S	20	4	H	B 1 hr, L, C.
4daa	P. J. Bennett	C	1964	68	6	56	P 56-64	Sand and gravel	510	27.7	7/26/72	--	J	8	30	H	P 3 hr.
5aba	David Hall	C	1970	59	6	57	O	Cemented gravel	445	23	11/17/70	--	--	10	Total	H	B 1 hr, L.
5bab	Publishers Paper Co.	C	1958	220	6	210	X	Sand and gravel	375	110	6/23/58	--	--	25	35	H	B 1 hr.
5bdc	Ault Acres Mobile Home Court	C	1970	725	6	200	P 200-300	Shale, sand, and gravel	380	115	12/30/70	--	--	80	125	P	P 7 hr, L.
5cdb	H. F. Brooks	C	1969	190	6	175	P 175-188	Sand and gravel	385	139.0	7/28/72	--	S	30	60	H	B 4 hr.
6bcc	M. M. Abbott	C	1968	35	6	35	O	Cemented gravel	355	7.4	do	168	J	8	18	H	B 1 hr, L, C.
6dba	Idelle Kolias	A	1970	240	6	218	X	Sand	360	110.1	do	--	S	75	133	H	P 1 hr, L.
7cdc	Oliver Teeters	C	1966	73	6	47	P 47-54	Clay, sand, and gravel	390	21	9/16/66	95	J 1½	10	Total	H	B 2 hr, L, C.
7dab	F. L. Stoecker	C	1964	80	6	45	P 45-47, 58-62	Sand and gravel	390	15	11/12/64	--	--	18	38	S	B 4 hr.
8aba	Herman Hauger	C	1963	225	6	205	P 205-220	do	450	138.1	8/ 1/72	--	S	14	Total	H	B 1 hr.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year completed	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Altitude (feet)	Water level: Feet below datum	Water level: Date	Specific conductance of water	Type of pump and hp	Well performance: Yield (gal/min)	Well performance: Drawdown (feet)	Use	Remarks
T. 3 S., R. 4 E.--Continued																	
8cbd	Stuart Puckett	C	1958	60	6	60	O	Cemented gravel and boulders	395	--	--	--	--	18	40	H	B, L.
8cdd	Jennie Walker	C	1965	72	6	60	X	Conglomerate	455	20	4/14/65	--	S	10	54	H	P 4 hr.
9cab	Harry Wallace	C	1964	90	6	85	P 85-89	Sand and gravel	670	84.0	8/ 1/72	--	S	6	5	H	B 1 hr.
9cad	Clarence Nelson	C	1969	60	6	58	O	Gravel	670	36	7/21/69	--	--	8	10	H	B 2 hr.
10ccb	Chuck Reed	C	1970	74	6	61	P 61-73	Clay and rock	830	23.7	8/ 2/72	--	J	15	25	H	B 1 hr.
10cdb	Chuck Walker	A	1971	338	6	280	P 280-333	Rock	810	281.6	do	--	S	8	51	H	B 1 hr, L.
11acb	Bureau of Land Management	C	1961	90	6	23	X	Basalt	565	F	do	230	--	18	80	R	Do.
11cba	Clackamas County Parks	C	1966	146	6	--	X	--	520	7	3/26/66	--	J ½	7	Total	R	B 1 hr.
12aac	Ralph Goins	C	1964	138	6	105	P 105-125	Clay and gravel	1,235	42	8/30/64	--	S 3/4	15	60	H	B 2 hr.
12bcb	Russell Niemi	A	1969	301	6	209	P 209-301	Basalt	930	125	4/ 8/69	--	--	12	171	H	P 1 hr, L.
13ccd	R. A. Jannsen	A	1969	158	6	59	X	Rock	635	11.5	8/20/72	--	S	16	142	H	Do.
14cba	O. G. Reisch	C	1967	152	6	52	X	Sandstone and rock	960	126	1/30/67	--	S 3/4	10	4	H	B 1 hr.
15acc	J. H. Canova	C	1969	80	6	68	P 68-80	Sand and gravel	890	21.2	7/20/72	26	S	18	23	H	B 1 hr, L, C.
15add	Eugene Phernetton	C	1968	213	6	213	O	Rock	880	180.4	7/19/72	--	S	10	20	H	B 1½ hr.
15bad	Frank Durand	A	1971	233	6	54	P 54-70	Conglomerate and rock	890	30.2	do	--	S	10	26	H	P 1 hr.
15bcb	Mt. View Mobile Estates	C	1968	70	6	30	P 30-60	Sand and gravel	850	15	5/28/68	--	S	30	0	P	B 2 hr.
16cbb	L. O. Closner	C	1971	50	6	28	P 28-30, 34-40	Cemented gravel	490	8	5/14/71	--	J	10	20	H	B 4 hr.
17bdd	Gene Dimick	C	1970	45½	6	45½	O	Sand	460	28.7	8/ 3/72	--	J	8	5	H	B 1 hr, L.
17dbc	J. Kellendonk	C	1957	57	6	57	O	Gravel and boulders	470	27	6/25/57	--	--	35	15	H	B 1 hr.
17dcc	Chester Bachmann	C	1965	60	6	60	O	do	480	23	3/24/65	--	J	12	Total	H	Do.
18bba	Walt Church	A	1971	150	6	90	P 90-150	Sandy clay	380	87.4	8/ 1/72	--	S	5	70	H	Do.
18dda	J. K. Platt	C	1966	51	6	51	O	Gravel and boulders	425	24	9/12/66	--	S	17	Total	H	B 2 hr, L.
19bdd	Oregon State Highway Div.	C	1964	40	6	20	P 20-25	Sand and boulders	305	10.1	8/22/72	--	N	50	0	U	B 2 hr.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year com-pleted	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Alti-tude (feet)	Water level: Feet below datum	Water level: Date	Specific conduct-ance of water	Type of pump and hp	Well performance: Yield (gal/min)	Well performance: Draw-down (feet)	Use	Remarks
T. 3 S., R. 4 E.--Continued																	
21adc	R. A. Young	C	1968	128	6	35	X	Rock	750	96.7	7/18/72	--	S 1	5	45	H	B 1 hr.
22bda	William Somerville	C	1971	66	6	58	P 58-65	Cemented gravel	880	25.2	do	85	S	16	10	H	B 4 hr, L.
23abc	Marvin Yonkers	A	1971	245	6	100	X	Lava	985	178	7/16/71	--	--	21	67	H	P 2 hr, L.
23bcc	P. D. Halloran	C	1970	98	6	80	P 80-98	Gravel	1,070	82.5	7/21/72	--	S	8	0	H	B 2 hr.
23cad	C. E. Merrill	A	1972	103	6	18	P 18-38, 58-100	Sand and gravel	1,090	26	2/ 8/72	--	S	13	69	H	P 2 hr.
23dca	Ben Richardson	A	1971	233	6	85	P 85-222	Conglomerate and rock	1,115	83	10/12/71	--	--	2	140	H	P 1 hr.
25bbb	Eldon Fray	C	1970	73	6	70	O	Gravel	1,090	36.3	9/19/72	--	S	10	0	H	B 2 hr.
25bdc	Glenn Underhill	C	1968	405	6	157	X	Rock and shale	1,110	185.6	do	215	S	3	Total	H	B 2 hr, L, C.
26abd	Lynn Lewis	C	1972	100	6	80	P 80-100	Clay, sand, and gravel	1,150	27.1	8/ 4/72	--	S	10	30	H	B 2 hr.
26cdb	W. O. Youngberg	C	1963	193	8	45	P 45-60	Sand	1,120	66.8	do	--	T 10	134	100	I	P 7 hr, L, O.
27add	Wilber Becktel	C	1970	84	6	84	O	Gravel	1,020	56	10/12/70	--	S	15	0	H	B 2 hr.
27cdb	F. A. Treptow	C	1971	261	6	50	X	Basalt	900	35	7/ 3/71	--	--	2	200	U	B 2 hr, L.
28ada	H. L. Duvall	C	1958	57	6	55	O	Cemented gravel	810	18	10/29/58	--	--	8	35	H	B 1 hr.
28bdd	D. E. Anderson	A	1967	466	6	20	X	Rock	720	26.9	8/ 4/72	--	S	½	Total	H	P 1 hr, L.
29bdb	H. S. Christner	C	1961	58	6	55	O	Sand and gravel	610	22	9/ 1/61	--	--	12	6	H	B 2 hr.
29cca	Michael McCulloch	C	1970	228	6	40	X	Broken rock	750	162.3	9/20/72	--	S	10	60	H	B 4 hr.
29dab	Dan Jennings	C	1965	105	6	82	P 82-90	Gravel and boulders	535	33.2	do	230	J	16	Total	I	B 2 hr.
29dbd	Manuel	C	1969	265	6	175	X	Rock	690	185	11/ 3/69	--	--	10	65	H	Do.
30bca	E. B. Sutter	C	1959	80	6	41	P 41-50	Cemented gravel	855	10	12/10/59	--	--	5	Total	H	Do.
30caa	Karl Mecklenburg	C	1969	401	6	311	X	Rock	885	321.9	9/20/72	--	S	11	Total	H	B 1 hr, L.
32acd	Ted Mellick	A	1971	190	6	73	X	do	1,045	148.1	9/21/72	--	S	10	70	H	A 2 hr.
32baa	F. G. Studer	C	1971	200	6	100	P 100-120, 140-180	Sand and gravel	990	77	4/ 1/71	--	--	5	Total	H	B 2 hr.
32cbb	S. E. Lawrence	C	1968	67	6	48	P 48-67	Sandstone and boulders	990	48.4	9/20/72	32	--	10	6	H	B 1 hr, L, C.
32dad	Jack Dmytryk	C	1968	108	6	60	X	Gravel and rock	1,095	35	5/ 3/68	--	--	15	0	H	B 1 hr.
33cdb	Irvin Joyner	C	1967	85	6	65	P 65-85	Rock	1,105	43.3	9/21/72	--	--	22	43	H	B 1 hr, L.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year com- pleted	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Alti- tude (feet)	Water level: Feet below datum	Water level: Date	Specific conduct- ance of water	Type of pump and hp	Well performance: Yield (gal/ min)	Well performance: Draw- down (feet)	Use	Remarks
T. 3 S., R. 4 E.--Continued																	
34aab	Larry Reichstein	C	1970	62	8	40	P 40-60	Gravel	1,090	12	6/20/70	--	--	54	6	H	B 2½ hr.
34ada	E. C. Grassman	A	1971	98	6	60	P 60-93	Conglomerate	1,160	31.7	9/19/72	--	--	100	Total	H	P 1 hr.
34add	Henry Beal	C	1970	105	6	85	P 85-105	Lava	1,165	40	8/31/70	--	--	20	0	H	B 2 hr, L.
35aca	D. L. Eadon	C	1965	50	6	23	P 23-50	Basalt	1,155	11	7/28/65	--	--	20	24	H	B 1 hr.
35dbc	John Hamilton	A	1969	103	6	47	X	Rock	1,180	35	8/15/69	--	--	4	60	H	P 1 hr.
36aba	Donald Wiese	A	1967	53	6	20	X	do	950	6	10/17/67	--	--	25	18	H	P 1 hr.
36ddb	Merle Webster	C	1970	90	6	36	X	do	1,230	44.3	9/19/72	--	S	11	30	H	B 1 hr.
T. 3 S., R. 5 E.																	
2ada	Fancher & Boyd	C	1965	87	6	26	X	Rock	1,640	24.7	9/26/72	--	S	6	50	H	P 3 hr, L.
3bda	Ben Tribby	C	1967	69	6	51	P 51-62	Sand and con- glomerate	1,720	22	4/ 6/67	--	--	40	6	H	B 2 hr.
3cca	L. R. Brian	C	1969	303	8	90	X	Rock	1,480	160	10/14/69	--	--	65	20	S	P 2½ hr.
4bcb	Harold Johnston	A	1968	126	6	102	X	do	1,440	86	1/12/68	--	--	10	30	H	P 1 hr.
4cad	Gary English	A	1972	55	6	34	X	Lava	1,520	35.7	9/26/72	<50	J	20	25	H	P 1 hr, L, C.
4ccc	A. D. Fleshman	A	1971	68	6	40	X	Rock	1,460	36	6/ 6/71	--	--	10	22	H	B 1 hr.
4dda	Frank Van Beck	C	1972	105	6	51	X	do	1,540	37	10/12/72	--	--	7	68	H	B 2 hr.
5aba	Clyde Updegrave	A	1971	153	6	120	P 120-146	do	1,420	84.1	9/26/72	--	S	25	58	H	P 1 hr, L.
5bcc	Michael Stroup	A	1970	68	6	51	P 51-65	Conglomerate and rock	1,300	34	10/22/70	--	--	30	24	H	P 1 hr.
6aca	J. W. Price	C	1967	420	6	199	P 199-203	Sand and gravel	1,240	166	7/14/67	--	--	30	14	H	B 1 hr, L.
6add	E. B. Winter	C	1969	131	6	95	P 95-115, 120-130	Rock	1,240	47	12/ 5/69	--	--	8	70	H	B 4 hr.
6bdd	A. Burghardt	C	1970	240	6	220	P 220-235	Clay and gravel	1,210	162.7	9/22/72	--	S	7	23	H	P 24 hr.
6dcd	G. N. Coleman	C	1965	288	6	110	P 110-288	Claystone and rock	1,280	172	3/15/65	--	--	2½	274	H	P 4 hr.
7bab	Raymond Wolflick	A	1969	272	6	241	X	Rock	1,240	176.4	9/28/72	--	S	7	91	H	P 1 hr, L.
7bbb	Bradford Edwards	C	1964	326	6	235	X	do	1,240	169	8/11/64	--	S	5	Total	H	B 2 hr.
8abc	Tim Kasch	A	1970	210	6	47	X	Lava	1,280	35.9	9/28/72	--	S	4	32	H	P 1 hr.
17bda	Stephen Day	C	1966	152	6	99	X	Basalt	1,240	39.4	9/22/72	--	S	12	10	H	B 1 hr, L.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year completed	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Altitude (feet)	Water level: Feet below datum	Water level: Date	Specific conductance of water	Type of pump and hp	Well performance: Yield (gal/min)	Well performance: Drawdown (feet)	Use	Remarks
T. 3 S., R. 5 E.--Continued																	
17cdb	R. A. Medearis	C	1961	70	6	58	X	Sand	1,160	50	9/28/61	--	S	8	20	H	B 1 hr.
18bdd	Frank Lohr	C	1961	165	6	60	X	Rock	1,180	80	do	--	--	8	85	H	Do.
18cda	D. H. Parsons	A	1967	182	6	127	P 127-145	Clay and basalt	1,100	50.2	9/28/72	--	S	43	90	H	P 2 hr.
19bbc	Paul Jackson	A	1967	293	6	42	X	Rock	1,140	32	2/12/68	--	--	17	251	H	P 1 hr.
19bca	Christenson	C	1964	165	6	120	P 120-164	Cemented gravel and basalt	1,120	105	5/ 1/64	--	--	6	52	H	B 2 hr, L.
19bcd	Gene Cain	A	1971	208	6	40	X	Rock	1,140	117	6/15/71	--	--	25	81	H	P 1 hr.
19dda	R. T. Rhoades	A	1967	293	6	253	P 253-293	do	1,300	227	10/ 5/67	--	--	7	58	H	Do.
20bcc	J. D. Schmidt	A	1969	217	6	40	X	do	1,320	150	8/26/69	--	S	6	62	H	Do.
20bdd	Gordon Franklin	A	1971	203	6	56	X	do	1,320	82.8	9/29/72	--	S	4	104	H	P 1 hr, L.
20dac	Harvey Carden	C	1966	202	6	53	X	do	1,440	83	10/29/66	--	--	12	Total	H	B 1 hr.
21cdc	H. J. Campbell	C	1966	280	6	56	X	do	1,520	95	11/28/66	--	--	9	Total	H	Do.
22acd	James Garland	C	1972	140	6	48	X	Gravel and lava	1,840	34.7	10/ 2/72	--	J	6	100	H	B 2 hr, L.
22bad	Dwayne Porter	A	1971	113	6	36	X	Rock	1,780	32	7/22/71	--	--	6	71	H	B 1 hr.
22bdd	D. A. Shumate	A	1970	53	6	33	P 33-52	do	1,760	11	6/22/70	--	--	65	27	H	P 1 hr.
28cac	Eagle Creek Fish Hatchery	C	1963	593	16	181	P 181-191, 375-425	Shale and basalt	920	79.2	9/29/72	302	S	60	504	H	P 24 hr, L, C.
29aba	Charles Kent, Jr.	A	1967	235	6	69	X	Rock	1,400	63.6	10/ 2/72	--	S	15	171	H	P 1 hr, L.
30bcd	T. E. Lee	C	1972	171	6	55	X	Basalt	1,120	105	10/21/72	--	--	18	40	H	B 4 hr.
30ddc	M. Bethel	A	1969	245	6	139	X	Volcanic ash	1,210	202.6	10/ 3/72	--	S	8½	15	H	B 1 hr, L.
31cda1	C. H. Hodson	C	1964	87	6	20	X	Rock and sand	1,320	22.3	do	--	J	12	--	H	B 1½ hr.
31cda2	C. H. Hodges	C	1966	140	6	50	X	Rock	1,330	34	12/27/66	--	--	15	--	H	B 2½ hr.
31cdd	D. J. Donaldson	C	1964	91	6	20	X	Rock and sand	1,360	44.8	10/ 3/72	--	J	8	--	H	B 2 hr.
31dac	Loren Bowman	A	1969	97	6	33	X	Rock	1,200	8	4/22/69	--	--	7½	84	H	P 1 hr.
32acd	Sidney Engelbretson	A	1970	320	6	49	X	Lava	1,440	151	5/22/70	--	--	35	219	H	Do.
32cab	Porter Mennonite Church	C	1967	72	6	46	P 46-66	Rock and gravel	1,280	14.3	10/ 3/72	--	J	9	0	H	B 2½ hr, L.
32cbb	O. Bowman	C	1966	182	6	46	P 46-76	Cemented gravel and boulders	1,280	35.3	do	--	S	6	0	H	B 3 hr.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year completed	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Altitude (feet)	Water level: Feet below datum	Water level: Date	Specific conductance of water	Type of pump and hp	Well performance: Yield (gal/min)	Well performance: Drawdown (feet)	Use	Remarks
								T. 3 S., R. 7 E.									
3bbb	U.S. Forest Service	C	1966	163	8	163	O	Sand and gravel	1,420	40	10/31/72	95	S 5	116	30	H	P 2 hr, L, C.
4aaa	Wendell Halseth	A	1971	60	6	55	X	Broken rock	1,410	14.5	11/ 3/72	87	S	35	20	H	A 1 hr, L, C.
4cbc	Mount Hood Golf Club	C	1958	155	8	155	X	Sand and gravel	1,340	52	3/19/58	--	T 30	385	51	H, I	P 8 hr.
4cdd	R. G. Pike	C	1964	170	6	137	X	Rock	1,360	F	9/18/64	--	--	12	150	H	B.
4dba	D. & R. Development Co.	C	1961	165	10	81	P 81-135	Gravel and boulders	1,500	20	4/ 3/61	--	--	165	75	P	P 10 hr.
5ada	do	C	1964	100	8	100	O	Gravel	1,375	16	4/15/64	--	N	60	70	U	B 4 hr.
5bdb	Camp Arrah Wanna	D	1959	14	48	14	O	Gravel and boulders	1,230	8.7	11/ 3/72	70	C 5	20	1	P	P 1 hr, L, C.
9caa	George McLane	C	1964	58	6	58	O	Sand	1,340	37.4	11/ 2/72	91	S	30	3	H	B 1 hr, L, C.
9cda	R. Zipprich	C	1968	62	6	62	O	Sand and gravel	1,360	33.0	do	--	S	40	12	H	B 2 hr.
11dab	J. A. Lake	A	1969	165	8	23	X	Rock	1,700	60	7/31/69	--	S	25	85	H	B 1 hr.
								T. 3 S., R. 8 E.									
23bbc1/	Multorpor, Inc.	A	1969	90	12	76	X	Volcanic rock	3,840	7.3	11/ 3/72	--	S	350	52	H, R	B 1 hr.
24abc	Everett Darr	A	--	--	6	--	--	--	3,730	--	--	80	S	--	--	H	C.
24bbd	Multorpor, Inc.	A	1967	75	8	51	X	Sand and gravel	3,660	29.2	11/ 3/72	--	S	60	30	H, R	B 1 hr.
								T. 4 S., R. 1 E.									
1adb	J. R. Hicks	A	1971	380	6	350	P 350-380	Sand and clay	330	140.4	3/26/73	240	S 1	20	160	H	A 2 hr, L.
1add	D. L. Schroder	C	1969	234	6	195	P 195-232	Sand	345	159.8	10/ 1/71	290	S 1	30	10	H	B 2 hr.
2abb	C. F. Dietz	C	1969	350	8	165	X	Basalt	180	89.6	9/23/71	900	S 5	50	172	H	P 12 hr, L.
2dca	Leo Woods	C	1970	87	6	85	O	Sand and gravel	150	6.7	3/26/73	310	J 1	25	29	H	B 1 hr.
3aca	Rev. Harold Dunson	C	1969	121	6	120	O	do	165	43.3	do	300	S 3/4	25	30	H	B 1½ hr.
3add	Raymond Weygandt	C	1965	90	6	88	O	do	160	55	10/20/65	--	S 1	40	10	H	P 4 hr.
3bba	A. A. Wright	C	1970	275	10	235	P 235-274	Sand	160	44.7	3/26/73	--	S 5	125	33	I	P 8 hr, L.
3dca	Canby Rod & Gun Club	C	1967	40	6	32	X	do	135	7.4	3/27/73	220	J 3/4	40	10	H	P 3 hr.
4adb	John Beck	C	1959	160	10	70	F 70-160	Sandstone	165	47.6	5/18/73	--	S	600	14	U	P 24 hr, L, O. Originally drilled to 270 ft.

1/ T. 3 S., R. 8½ E.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year com-pleted	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Alti-tude (feet)	Water level		Specific conduct-ance of water	Type of pump and hp	Well performance		Use	Remarks
										Feet below datum	Date			Yield (gal/min)	Draw-down (feet)		
								T. 4 S., R. 1 E.--Continued									
4cda	John Beck	C	1970	205	6	204	O	Sand and gravel	170	65.4	9/24/71	--	S 3/4	35	27	H	B 2 hr.
4dab	C. E. Kraft	C	1961	85	6	65	P 65-84	Cemented gravel	170	53	3/20/61	--	S 1	50	3	H	Do.
5bca	Elmer Barnes	C	1968	46	6	46	O	Sand and gravel	100	10.5	3/27/73	180	S ½	40	4	H	Do.
5bdb	Clem Meyerhofer	C	1965	50	8	37	X	Sand	100	8.6	do	--	J 1	75	23	I	B 1 hr.
5cba	Harold Miller	C	1970	50	6	50	O	Sand and gravel	100	10.8	do	240	S ½	35	24	H	P 6 hr.
6aab	Harold Culp	C	1968	50	6	48	O	do	100	8.2	do	140	S ½	40	6	H	P 1 hr.
6baa	do	C	1970	105	6	105	O	do	85	3.2	do	265	--	30	20	H	B 1 hr.
								T. 4 S., R. 2 E.									
1aca	J. B. Ladd	C	1971	115	6	50	X	Sand and gravel	785	58.6	4/ 2/73	--	--	20+	75	H	P 2 hr.
1bda	H. R. MacDonald, Jr.	A	1968	353	6	237	X	Rock	790	206.7	10/15/71	180	S 1	10	140	H	P 1½ hr, L.
2bca	Owen Dunlap	C, A	1970	169	6	125	P 125-140	Basalt	685	87.4	do	--	--	7	20	H	P 1 hr, L.
2bcd	William Mohr	C	1969	200	6	120	X	Rock	775	161.6	3/30/73	115	S 3/4	5	30	H	P 12 hr.
2dba	Jay Van Nice	C	1970	225	6	39	X	Lava	755	106	7/17/71	--	S 3/4	3½	Total	H	B 2 hr.
3abb	Earl Graves	C	1965	200	6	132	X	do	635	91.1	3/30/73	--	S 1½	8	90	H	B 2 hr, L.
3bcb	J. C. Stelle	C	1967	384	8	378	X	Gravel	615	338.5	10/29/71	--	S 2	20	8	H	B 6 hr, L.
3cbb	do	C	1965	115	6	70	X	Lava	585	40.8	3/30/73	60	J 3/4	10	20	H	B 2 hr.
4abc	Alfred Gaudin	C	1968	642	6	575	P 575-642	Sand and shale	650	415.5	7/10/73	198	S 3	15	20	H	B 1 hr, L, C.
4acb	John Pierson	C	1969	423	6	404	X	Sand	605	287	9/20/69	--	--	20	20	H	B 1 hr.
4baa	S. H. Griffith	C	1956	155	6	30	X	Lava	520	24	7/ 5/56	--	--	20	56	H	B.
4cac	Kenneth Friedrick	C	1968	135	6	44	X	Rock and sand	585	23	10/27/68	--	--	35	40	H	B 2 hr.
4cbb	C. H. Tracy	C	1968	93	6	78	X	Clay and gravel	590	15	7/15/68	--	--	10	70	H	P 2 hr.
5bca	John Massey	A	1971	180	6	170	P 170-178	Sand and gravel	500	115.4	3/30/73	140	S 3/4	30	54	H	P 1 hr.
5cac	F. E. Snow	C	1970	120	6	55	X	Lava	580	31.0	4/ 2/73	--	S 3/4	5	Total	H	B 2 hr.
5dca	C. T. Foster	C	1961	141	6	75	P 75-122	Sand	570	60	1/ 1/61	72	S 3/4	10	60	H	B 1 hr, L, C. Well 5Q1 in WSP 1997.

Table 1.--Records of representative wells and springs--Continued

Well number	Owner	Type of well	Year com- pleted	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing material	Alti- tude (feet)	Water level: Feet below datum	Water level: Date	Specific conduct- ance of water	Type of pump and hp	Well performance: Yield (gal/ min)	Well performance: Draw- down (feet)	Use	Remarks
								T. 4 S., R. 3 E.									
3aaa	Jim Larson	A	1970	145	6	80	X	Broken lava	1,140	99	11/24/70	--	--	25	41	H	P 1 hr.
3baa	Letha Marple	A	1967	300	6	72	X	do	1,140	171.0	4/26/73	--	S 1½	13	50	H	P 2 hr, L.
3dad	R. L. Beckman	A	1969	80	6	40	X	do	1,220	33.6	12/ 7/71	< 50	S 1	18	41	H	P 1 hr.
4bab	Dale King	C	1970	96	6	63	X	Lava	1,080	66	10/ 5/70	--	S	13	Total	H	B 2 hr.
4dbc	Dorn Baumeister	C	1971	44	8	21	X	Rock	1,310	10.3	12/ 1/71	< 50	S 3/4	7	9	H	B 1 hr, L. Two dry holes nearby.
4dcb	W. L. Perry	C	1955	387	6	50	X	Basalt	1,340	--	--	--	--	--	--	--	Well 4Q1 in GWR 2. "Dry hole."
5aac	Mike DeLair	A	1970	300	6	49	X	Lava	1,070	208	8/ 7/70	100	S 3/4	4	92	H	P 2 hr, L.
5caa	M. D. Phillips	A	1970	112	6	38	X	Porous lava	970	27.3	4/26/73	140	S 1	75	78	H	P 1 hr.
5cab	Melvin Bentdahl	A	1969	262	6	70	X	Lava	950	96.8	11/30/71	60	S 1	7½	75	H	Do.
6adc	Nick Storie	A	1967	61	6	30	X	Porous rock	785	12.1	4/26/73	20	S ½	20	38	H	P 1 hr, L, C.
6bbb	J. R. Ball	C	1970	90	6	90	O	Sand and cinders	730	12.0	do	110	S ½	20	0	H	B 3 hr.
6bcc	Kenneth Moehnke	C	1966	84	6	84	P 64-80	Conglomerate	815	40	7/19/66	--	--	12	Total	H	B 2 hr.
								T. 4 S., R. 4 E.									
1bbc	Earl Cooper	A	1969	194	6	167	X	Rock	1,190	110.8	9/22/72	--	S	8	80	H	P 1 hr.
3cbc	Aubrey Bollenbaugh	C	1966	100	6	21	P 21-98	Sandstone	1,170	42	1/ 5/66	--	--	20	26	H	B 1 hr.
4bdd	W. H. Tucker	C	1966	68	6	60	X	Basalt	1,120	14	9/12/66	--	--	10	14	H	B ½ hr.
4cbb	R. F. Gillette	C	1960	115	6	51	X	Weathered basalt	1,135	60	5/ 2/60	--	--	11	45	H	B ½ hr. Well 4M1 in GWR 2.
4dbb	Jim Kiggins	C	1965	54	6	33	P 33-53	Clay and boulders	1,145	31	10/ 1/65	--	S 1/3	10	11	H	B 1 hr.
5bbb	B. A. Dudley	C	1972	85	6	45	P 45-80	Conglomerate	1,040	13	2/24/72	--	--	60	30	H	B 2 hr.
5cbc	William Howell	C	1970	60	6	60	O	Clay and rock	1,020	17	6/16/70	--	--	16	Total	H	B 1 hr.
5cbd	Estacada Golf Course	C	1970	190	8	166	X	Rock	1,045	129.4	9/21/72	--	S	25	Total	I	B 2 hr, L.
5dab	Raymond Kozera	C	1960	50	6	25	P 25-42	Clay and mudstone	1,130	20	8/18/60	--	--	15	20	H	B 1½ hr.
								T. 4 S., R. 5 E.									
6acd	Les Lee	C	1965	188	6	188	P	Basalt	1,440	79	7/2/65	--	--	10	50	H	B 1 hr.
6bac	W. R. Daniels	C	1964	121	6	49	X	Lava	1,360	30	7/27/64	--	--	7	91	H	Do.

Table 2.--Logs of representative wells

Materials	Thick-ness (feet)	Depth (feet)
2S/2E-11dab. River Bend Mobile Estates. Altitude 150 ft. Drilled by S & M Drilling & Supply, Inc., 1973. Casing: 10-in. diam to 319 ft, 8-in. diam 250-805 ft; unperforated		
Soil	1	1
Clay, yellow	5	6
Boulders, cemented, and clay	33	39
Sandstone, yellow	79	118
Sandstone, brown	79	197
Sand, brown, with mica; water-bearing	21	218
Clay, gray	28	246
Sand, black, water-bearing	11	257
Sand, yellow, and silt; water-bearing	16	273
Clay, gray	8	281
Sand, gray, and silt; water-bearing	12	293
Sandstone, gray	41	334
Clay, blue, sticky	63	397
Sand, gray, and mica and silt	15	412
Clay, bluish-green, and silt	35	447
Sand, gray, and mica and silt	18	465
Sandstone with brown clay	13	478
Clay, blue, sticky	25	503
Sandstone, green, with mica; water-bearing	32	535
Claystone, green-blue, hard	65	600
Clay, blue, sticky	52	652
Clay, gray	13	665
Claystone, green-gray	2	667
Sand, white, fine, and mica	4	671
Claystone, gray	13	684
Claystone, green-blue	11	695
Clay, gray, sandy, and mica	81	776
Clay, blue	22	798
Sand, black, coarse	26	824
2S/2E-14add. Allen Phillips. Altitude 75 ft. Drilled by Steinman Bros., 1969. Casing: 6-in. diam to 102 ft; unperforated		
Clay, brown, sandy	9	9
Clay and gravel, brown	14	23
Clay, sand, and gravel, gray	14	37
Clay, silty, gray	59	96
Clay, gray, sticky	9	105
Sandstone, black	7	112
2S/2E-21bac. John Cleland. Altitude 60 ft. Drilled by Skyles Drilling & Supply, Inc., 1968. Casing: 6-in. diam to 19 ft; unperforated		
Clay, yellow, sandy	11	11
Gravel, cemented	3	14
Basalt, gray	31	45
Basalt, decomposed, gray	68	113
Basalt, hard	2	115
"Vegetation," black, decomposed, water-bearing	5	120
2S/2E-21dac. A. M. Herbst. Altitude 330 ft. Drilled by owner, 1957. Casing: 6-in. diam to 266 ft; unperforated		
Soil	2	2
Clay	16	18
Sand, fine	20	38
Clay, red	15	53
Clay, sandy	29	82
Sand	45	127
Gravel	65	192
Clay, black, water-bearing	35	227
Sand, black	31	258
Gravel, pea-sized	10	268
Clay, gray	4	272
2S/2E-22acc. Lewis and Jack Siri. Altitude 315 ft. Drilled by Steinman Bros., 1970. Casing: 8-in. diam to 35 ft, 6-in. diam to 171 ft; unperforated		
Clay, brown and yellow	29	29
Rock, broken	4	33
Rock, gray, hard	25	58
Rock, gray, soft	9	67
Rock, gray, hard	77	144
2S/2E-22acc.--Continued		
Rock, red, decomposed	24	168
Rock, gray, broken	27	195
2S/2E-24bad. Paul Daschel. Altitude 420 ft. Drilled by Ralph Turner, 1966. Casing: 6-in. diam to 20 ft; unperforated		
Soil	2	2
Clay, red	3	5
Clay, yellow	7	12
Rock, blue, hard	23	35
Gravel, cemented	55	90
Gravel and sand	5	95
2S/2E-25ccb. Kenneth Armstrong. Altitude 360 ft. Drilled by Skyles Drilling & Supply, Inc., 1971. Casing: 6-in. diam to 185 ft; perforated 80-95 ft, 145-180 ft		
Clay, brown, and gravel	30	30
Sand and gravel	36	66
Clay, brown	9	75
Clay, blue	5	80
Clay, gray	3	83
Clay, brown, sandy	4	87
Sand, brown	8	95
Clay, brown	9	104
Clay, gray	71	175
Clay, blue	3	178
Clay, green, sandy	5	183
Clay, gray	2	185
2S/2E-27abc. George Cook. Altitude 535 ft. Drilled by Skyles Drilling & Supply, Inc., 1969. Casing: 6-in. diam to 377 ft; perforated 345-377 ft		
Soi and broken rock	4	4
Clay, brown, and broken rock	7	11
Clay, brown	4	15
Clay, brown, and boulders	9	24
Lava, gray	204	228
Conglomerate	48	276
Clay, gray	56	332
Conglomerate	29	361
Gravel, medium	29	390
Sand, yellow and white, medium	10	400
2S/2E-28baa. Clackamas Housing Authority. Altitude 335 ft. Drilled by R. J. Strasser Drilling Co., 1963. Casing: 10-in. diam to 222 ft; unperforated		
Soil	2	2
Gravel, large, and clay	12	14
Clay, light-brown	66	80
Clay, brown, and fine sand	15	95
Sand, brown	10	105
Gravel	21	126
Sand, reddish-brown	14	140
Sand, brown, medium	71	211
Shale, green	4	215
Sand, brown	3	218
Basalt, black, broken	11	229
Basalt, black	66	295
Basalt, gray, hard	29	324
Rock, black, soft	6	330
Rock, black, medium-hard	15	345
Basalt, gray, hard	48	393
Rock, black, with seams	16	409
Rock, black, medium-hard	63	472
Rock, black, soft	44	516
Basalt, gray, hard	4	520
Rock, black, with crevices	34	554
Basalt, gray, hard	4	558
Rock, black	2	560

Table 2.--Logs of representative wells--Continued

2S/2E-28cca. Robert Haun. Altitude 155 ft. Drilled by S & M Drilling & Supply, 1970. Casing: 6-in. diam to 140 ft, 5-in. diam 135-160 ft; perforated 142-160 ft

Materials	Thickness (feet)	Depth (feet)
Soil, brown	2	2
Clay, brown, sandy	40	42
Sand, silty, fine, water-bearing	42	84
Clay, blue, sandy	10	94
Sand, fine, and mica; water-bearing	4	98
Sand, black, fine, and medium-sized gravel; water-bearing	2	100
Clay, blue	28	128
Clay, gray, sandy	10	138
Clay, gray, and trace of gravel; water-bearing	2	140
Clay, blue	16	156
Sand, medium	4	160

2S/2E-32bac. Oregon City Public Schools. Altitude 250 ft. Drilled by R. J. Strasser Drilling Co., 1967. Casing: 8-in. diam to 463 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Soil	2	2
Clay, red	12	14
Clay, blue	69	83
Clay, brown	15	98
Clay, blue	34	132
Clay, brown	48	180
Gravel, cemented	3	183
Clay, gray	63	246
Clay, blue-green, sticky	48	294
Clay, gray and blue	49	343
Clay, brown and red	70	413
Conglomerate, sticky	36	449
Clay, gray	11	460
Basalt, black, medium-soft	38	498
Basalt, dark-gray	25	523
Basalt, black, soft	21	544
Basalt, black	14	558
Basalt, black, broken	7	565
Basalt, black, hard	7	572
Rock, porous	8	580
Basalt, black	1	581
Rock, red, porous	9	590
Rock, black, porous	2	592
Basalt, black, medium-hard	10	602

2S/2E-34bda. Wilbur Staats. Altitude 290 ft. Drilled by Barron & Strayer, 1960. Casing: 6-in. diam to 270 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Clay	5	5
Clay and boulders	40	45
Clay, blue, and boulders	45	90
Clay, blue	20	110
Boulders and blue clay	35	145
Gravel, cemented	65	210
Clay, blue, and sand; water-bearing	35	245
Shale, green	25	270
Sand, black, water-bearing	5	275

2S/3E-14cbc. Salvation Army. Altitude 200 ft. Drilled by A. M. Jannsen, 1948. Casing: 8-in. diam to 571 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Soil	3	3
Gravel and boulders	6	9
Shale, blue	71	80
Shale, brown	40	120
Quicksand	40	160
Clay, blue	377	537
Clay, brown, and layers of shale	38	575
Rock, water-bearing	25	600

2S/3E-18cdd. El Paso Natural Gas. Altitude 175 ft. Drilled by Steinman Bros., 1963. Casing: 6-in. diam to 154 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Conglomerate, loose dirt, and boulders	24	24
Claystone, brown	5	29
Clay, gray	9	38
Shale and sand, gray	9	47

2S/3E-18cdd.--Continued

Materials	Thickness (feet)	Depth (feet)
Conglomerate, gray clay, and sand	62	109
Gravel, pea-sized, and coarse black sand	6	115
Clay, gray, sticky	28	143
Sand, gray, fine, loose	1	144
Gravel and sand, loose	10	154

2S/3E-19cbb. C. G. Gaylin. Altitude 190 ft. Drilled by Steinman Bros., 1968. Casing: 6-in. diam to 125 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Clay, brown	6	6
Clay, brown, with boulders	18	24
Sandstone	12	36
Gravel and sand	1	37
Clay, gray	14	51
Clay, gray, and conglomerate	32	83
Clay, gray, sticky	15	98
Sand, gray, fine	7	105
Clay, gray, sticky	17	122
Clay, gray, and conglomerate	2	124
Sand and gravel, loose, water-bearing	6	130

2S/3E-20bbc. L. B. Taylor. Altitude 195 ft. Drilled by R. J. Strasser Drilling Co., 1971. Casing: 6-in. diam to 134 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Soil	1	1
Clay and cobblestones	8	9
Gravel and cobbles	9	18
Clay, brown, sandy	4	22
Silt and gravel	10	32
Clay, yellow, sandy	8	40
Sandstone, blue, soft	13	53
Clay, blue	33	86
Sand	2	88
Clay, green	21	109
Clay, blue, sandy	20	129
Sand and gravel	5	134

2S/3E-21adc. Joe Novak. Altitude 145 ft. Drilled by Skyles Drilling & Supply, Inc., 1970. Casing: 6-in. diam to 39 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Loam, sandy	3	3
Sand, brown	4	7
Gravel, medium	11	18
Sand, brown, medium	2	20
Clay, blue	32	52
Sand, gray, fine	8	60

2S/3E-23aac. Elte Construction Co. Altitude 265 ft. Drilled by Steinman Bros., 1965. Casing: 6-in. diam to 145 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Soil	4	4
Gravel, cemented, and boulders	17	21
Clay, blue	17	38
Siltstone, bluish-gray	27	65
Clay, blue	16	81
Sand, bluish-gray, with trace of gravel	2	83
Clay, blue, sticky	29	112
Clay, gray, sticky	11	123
Silt, gray	8	131
Clay, blue, sticky	16	147
Sand, bluish-gray, water-bearing	4	151

2S/3E-23bdb. Clackamas County Parks. Altitude 250 ft. Drilled by Wm. J. Stennett, 1961. Casing: 6-in. diam to 118 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Gravel, loose, and cobblestones	28	28
Clay, blue	90	118
Sandstone, brown, fine-grained	10	128
Clay, brown, with mica; water-bearing	14	142

Materials	Thickness (feet)	Depth (feet)
2S/3E-24dbc. Ray Walton. Altitude 295 ft. Drilled by A. O. Olsen Well Drilling, 1968. Casing: 6-in. diam to 110 ft; 5-in. diam 93-115 ft; perforated 113-115 ft		
Soil	1	1
Cobbles, cemented	35	36
Clay, blue	79	115
Sand, fine	3	118
2S/3E-26cbc. L. E. Bristow. Altitude 325 ft. Drilled by A. O. Olsen Well Drilling, 1970. Casing: 6-in. diam to 73 ft; perforated 65-73 ft		
Soil	2	2
Clay, yellow	10	12
Gravel, cemented	40	52
Clay, blue	5	57
Sandstone, brown	3	60
Gravel, loosely cemented, water-bearing	7	67
Clay, blue	6	73
2S/3E-33abc. Elmore Mostul. Altitude 430 ft. Drilled by Steinman Bros., 1969. Casing: 8-in. diam to 157 ft; perforated 62-139 ft		
Soil	1	1
Gravel and clay	14	15
Gravel, loose	3	18
Gravel, cemented	16	34
Clay	1	35
Gravel, cemented	17	52
Gravel, loose	42	94
Gravel and boulder	19	113
Gravel, loose	12	125
Sand, coarse, and brown clay	8	133
Sandstone	2	135
Sand and clay, brown	15	150
Sand, brown, fine	8	158
2S/3E-33dda. Tommy O'Neill. Altitude 450 ft. Drilled by Tolleson Drilling Co., 1968. Casing: 6-in. diam to 72 ft; unperforated		
Soil	2	2
Clay, brown, and sand, gravel, and cobbles	21	23
Clay, light-brown	4	27
Clay, sand, and gravel	23	50
Sand and gravel, consolidated	25	75
2S/3E-34dcb. Leon Swenson. Altitude 500 ft. Drilled by Steinman Bros., 1966. Casing: 8-in. diam to 183 ft; perforated 80-134 ft		
Soil	1	1
Clay, brown, sticky	21	22
Clay, brown, and gravel	50	72
Gravel	54	126
Gravel and sand	8	134
Boulder	1	135
Clay, brown	9	144
Sand, brown, packed	17	161
Sand, brown, loose	1	162
Soapstone, brown	3	165
Clay, brown	14	179
Sand and gravel	1	180
Sand, brown, packed	11	191
Shale, brown, loose, dry	9	200
2S/3E-35ccb. Charles McCauley. Altitude 440 ft. Drilled by Skyles Drilling & Supply, Inc., 1969. Casing: 6-in. diam to 120 ft; perforated 110-120 ft		
Clay, brown	4	4
Gravel	9	13
Clay, brown	7	20
Gravel	8	28
Clay, brown	12	40
Gravel, layered	50	90
Gravel	26	116
Sand	4	120
2S/3E-35dbb. Kenneth Eaden. Altitude 340 ft. Drilled by A. O. Olsen Well Drilling, 1970. Casing: 6-in. diam to 49 ft; perforated 39-49 ft		
Soil	1	1
Clay, yellow	7	8
Cobbles, cemented	34	42
Gravel, loosely cemented, water-bearing	7	49
Clay, blue	8	57
2S/3E-36cbd. Tichener. Altitude 360 ft. Drilled by Skyles Drilling & Supply, Inc., 1965. Casing: 6-in. diam to 75 ft; unperforated		
Clay, brown	6	6
Clay and gravel, brown	8	14
Gravel	56	70
Clay and sand, green	4	74
Sand, green, fine, water-bearing	6	80
Clay, green	5	85
2S/4E-14cac. R. Bordner. Altitude 875 ft. Drilled by A. O. Olsen Well Drilling, 1971. Casing: 6-in. diam to 170 ft; perforated 148-170 ft		
Soil	1	1
Clay, red	4	5
Clay, red, sticky	16	21
Tuff, yellow	89	110
Clay and gravel	19	129
Sand, yellow	3	132
Gravel, cemented	21	153
Clay and gravel, water-bearing	17	170
2S/4E-15dac. William Eichner. Altitude 770 ft. Drilled by A. O. Olsen Well Drilling, 1968. Casing: 6-in. diam to 81 ft, 5-in. diam 73-98 ft; perforated 80-95 ft		
Soil	2	2
Clay, red	13	15
Sand, yellow	25	40
Boulders and sand	11	51
Sand, yellow	28	79
Gravel, cemented, water-bearing	17	96
2S/4E-18acb. Ernie Titsworth. Altitude 640 ft. Drilled by Keller Well Drilling Co., 1972. Casing: 6-in. diam to 406 ft; unperforated; screened 406-411 ft		
Soil	1	1
Clay, red	5	6
Clay, brown	14	20
Clay and small boulders	7	27
Clay, brown	65	92
Gravel, cemented	111	203
Clay, blue	32	235
Clay, brown	20	255
Clay, blue	27	282
Clay and sand	116	398
Sand	13	411
2S/4E-18dad. W. E. Hoffmeister. Altitude 655 ft. Drilled by Steinman Bros., 1971. Casing: 6-in. diam to 705 ft, 5-in. diam 676-736 ft; perforated 720-734 ft		
Clay, brown	6	6
Boulders and conglomerate	8	14
Clay, brown, sticky	50	64
Boulders	1	65
Clay, brown and gray, sandy	63	128
Clay, gray	10	138
Sand, brown, dirty	47	185
Clay, brown and gray	262	447
Rock, gray, soft	153	600
Clay, dark-brown	99	699
Clay, brown, sandy	11	710
Rock, gray, medium-soft	19	729
Clay, brown	5	734
Rock, gray, medium-hard	16	750

2S/4E-19ccc. Douglas Ridge Rifle Club. Altitude 305 ft. Drilled by Steinman Bros., 1966. Casing: 6-in. diam to 40 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Clay, yellow	5	5
Gravel, cemented	13	18
Gravel and boulders, loosely cemented	22	40

2S/4E-21daa. Sandy Farms. Altitude 790 ft. Drilled by A. M. Jannsen Drilling Co., 1952. Casing: 6-in. diam to 476 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Clay	9	9
Gravel and boulders	11	20
Gravel, cemented	50	70
Clay, sandy	5	75
Clay, sticky	10	85
Clay and decomposed rock (weathered gravel?)	56	141
Rock	19	160
Clay, brown, hard	8	168
Clay, green	4	172
Shale, blue	98	270
Shale, brown	615	885
Rock, black, water at 902 ft	150	1,035
Basalt, gray	40	1,075
Rock, black	20	1,095
Lava, brown	135	1,230
Lava, red	25	1,255
Rock, gray, and green lava at 1,295 ft	65	1,320
Lava	55	1,375
Shale, sticky, caving	10	1,385
Shale	18	1,403

2S/4E-23cdd. L. L. Kyle. Altitude 985 ft. Drilled by Calvin C. Bram Well Drilling, 1967. Casing: 6-in. diam to 169 ft, 5-in. diam 166-180 ft; perforated 169-177 ft

Materials	Thickness (feet)	Depth (feet)
Soil	2	2
Clay, red, sticky	20	22
Clay, sandy	8	30
Gravel, cobbles, and clay	10	40
Cobbles, boulders, and clay, water-bearing (5 gal/min)	27	67
Clay, sandy	8	75
Cobbles, hard	10	85
Clay, gray	5	90
Silica and sand	6	96
Clay, yellow, soft	5	101
Clay, green	8	109
Clay, brown	16	125
Clay, yellow	8	133
Clay, white	3	136
Gravel, with clay binder	17	153
Gravel, fine, and sand; water-bearing (1 gal/min)	1	154
Clay, sandy	12	166
Sand, green, and gravel; water-bearing (3 gal/min)	2	168
Gravel, water-bearing	9	177
Clay, gray	6	183

2S/4E-24abb. McGuire's Nursing Home. Altitude 1,015 ft. Drilled by Ross A. Jannsen Well Drilling, 1967. Casing: 6-in. diam to 225 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Clay, red	15	15
Clay, brown	15	30
Clay, brown, and boulders	15	45
Clay, brown	35	80
Gravel, cemented	37	117
Sand, red, water-bearing	4	121
Clay, brown	44	165
Sandstone, hard	5	170
Clay, brown	49	219
Basalt, gray	46	265
Rock, brown	35	300
Clay, blue	10	310
Clay, brown	25	335
Clay, blue	30	365
Basalt, black, water-bearing	5	370

2S/4E-24dba. B. Cook. Altitude 1,075 ft. Drilled by Steinman Bros., 1969. Casing: 6-in. diam to 240 ft; perforated 220-235 ft

Materials	Thickness (feet)	Depth (feet)
Clay, red, sticky	28	28
Clay, yellow, granular	27	55
Clay, tan, soft	19	74
Clay, yellow, and boulders	31	105
Clay, tan, granular	8	113
Gravel, cemented, water-bearing (4 gal/min)	11	124
Clay, brown	7	131
Clay, white	6	137
Clay, tan, soft	19	156
Silt, brown, fine	2	158
Clay, tan, gritty	6	164
Clay, white	7	171
Clay, tan, sandy	34	205
Rock, brown, decomposed	20	225
Sandstone, brown, water-bearing	9	234
Clay, gray, granular	6	240

2S/4E-25bdc. C. W. Cochran. Altitude 1,105 ft. Drilled by A. O. Olsen Well Drilling, 1963. Casing: 6-in. diam to 118 ft, 5-in. diam 115 to 137 ft; perforated 122-137 ft

Materials	Thickness (feet)	Depth (feet)
Soil	2	2
Clay, red	16	18
Tuff, yellow	67	85
Clay and gravel	32	117
Gravel, loose	13	130
Gravel, loose, water-bearing	7	137

2S/4E-27bda. L. B. Alexander. Altitude 920 ft. Drilled by Ross A. Jannsen Well Drilling, 1968. Casing: 8-in. diam to 250 ft, 5-in. diam to 290 ft; perforated 240-270 ft

Materials	Thickness (feet)	Depth (feet)
Clay, red	39	39
Clay, brown, sandy	83	122
Lava, broken	9	131
Sandstone, gray	114	245
Clay, blue	25	270
Sandstone, gray	10	280
Clay, blue	60	340

2S/4E-29dad. V. W. Nelson. Altitude 710 ft. Drilled by Steinman Bros., 1958. Casing: 6-in. diam to 176 ft; perforated 95-110 ft, 129-149 ft

Materials	Thickness (feet)	Depth (feet)
Clay	50	50
Sand, hard-packed	22	72
Gravel and sand	8	80
Gravel	29	109
Gravel and sand	6	115
Sand	13	128
Gravel, loosely cemented	20	148
Clay, brown	3	151
Clay, gray	11	162
Sand, black	3	165
Clay, blue	5	170
Clay, yellow	9	179
Clay, gray	11	190

2S/4E-30bac. Charles McGee. Altitude 310 ft. Drilled by Richard J. Murray, 1971. Casing: 6-in. diam to 49 ft; perforated 22-40 ft

Materials	Thickness (feet)	Depth (feet)
Soil, reddish-brown	6	6
Soil and medium-sized gravel	7	13
Gravel, medium-sized	22	35
Clay, blue	15	50

2S/4E-30cbd. Dale Overton. Altitude 320 ft. Drilled by A. O. Olsen Well Drilling, 1970. Casing: 6-in. diam to 55 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Soil	2	2
Cobbles and gravel	48	50
Gravel, loose, water-bearing	5	55

Materials	Thickness (feet)	Depth (feet)
2S/4E-30ddd. Estacada Elementary School Dist. 108. Altitude 395 ft. Drilled by Steinman Bros., 1968. Casing: 8-in. diam to 237 ft, 6-in. diam to 260 ft; perforated 240-257 ft		
Clay and gravel, yellow	14	14
Gravel, cemented, medium-hard	49	63
Clay, blue, sticky	12	75
Siltstone, gray	45	120
Silt, gray, packed (16 gal/min)	5	125
Siltstone, gray	20	145
Sand, gray, very fine	3	148
Clay, gray	7	155
Clay, bluish-gray, silty	6	161
Clay, blue, sticky	21	182
Clay, gray, silty	43	225
Clay, blue, sticky	16	241
Sand, bluish-gray, with a trace of white chalky gravel	7	248
Sandstone, gray, very thin layers	9	257
2S/4E-31dcb. Rex Kirchhoff. Altitude 355 ft. Drilled by Steinman Bros., 1971. Casing: 8-in. diam to 95 ft; 6-in. diam to 240 ft; unperforated		
Clay, tan	9	9
Gravel, cemented	46	55
Clay, blue	21	76
Sand, gray, fine	7	83
Clay, gray	45	128
Sand, fine, gray	19	147
Clay, blue	69	216
Clay, gray	24	240
Sand, gray, coarse	10	250
2S/4E-31ddc. Larry Lindland. Altitude 360 ft. Drilled by Steinman Bros., 1972. Casing: 6-in. diam to 65 ft; perforated 56-64 ft		
Clay, brown	4	4
Gravel, cemented	25	29
Gravel, loose	28	57
Sand, gray	2	59
Clay, gray	6	65
2S/4E-32dab. Henry Griffin. Altitude 430 ft. Drilled by Steinman Bros., 1972. Casing: 6-in. diam to 53 ft; unperforated		
Clay, brown	4	4
Gravel, cemented	26	30
Gravel, cemented, loose	25	55
2S/4E-36baa. Ken Buss. Altitude 1,155 ft. Drilled by Keller Well Drilling Co., 1970. Casing: 6-in. diam to 120 ft, 4-in. diam 115-145 ft		
Soil	2	2
Clay, red	17	19
Clay, brown	16	35
Clay, brown, and decomposed gravel	45	80
Clay, brown, soft, with some sand and gravel	10	90
Clay, brown	10	100
Clay, blue	15	115
Clay, brown	5	120
Clay, sand, and small gravel	20	140
Clay, brown	5	145
2S/4E-36dca. Charles Lindsey. Altitude 1,200 ft. Drilled by Ross A. Jannsen Well Drilling, 1966. Casing: 6-in. diam to 298 ft; unperforated		
Soil, red	2	2
Clay, red	25	27
Clay, yellow	40	67
Clay, brown, with small-sized gravel	12	79
Clay, gray, silt	21	100
Sand, fine	6	106
Sand, coarse	15	121
Claystone	9	130
Clay, brown, and coarse sand	20	150
2S/4E-36dca.--Continued		
Claystone, brown	17	167
Claystone, gray	9	176
Claystone, gray, and fine sand	7	183
Claystone, gray	80	263
Claystone, brown	14	277
Claystone, blue-green	19	296
Claystone, gray	11	307
Claystone, dark-gray, and coarse sand	3	310
2S/5E-7ada. Harold Zemp. Altitude 640 ft. Drilled by Haakon Bottner Drilling Co., 1969. Casing: 6-in. diam to 60 ft; perforated 50-60 ft		
Soil	3	3
Clay, brown	4	7
Clay, brown, and boulders	7	14
Boulders, large	9	23
Boulders and gravel, hard	9	32
Rock, broken, with clay seams	6	38
Boulders, large	5	43
Clay, brown, and boulders	12	55
Gravel, large, loose, water-bearing	5	60
2S/5E-7bdb. Mark Hyatt. Altitude 440 ft. Drilled by Steinman Bros., 1969. Casing: 6-in. diam to 128 ft; unperforated		
Sand, brown, loose	1	1
Sand, brown, packed	2	3
Sand, gravel, and boulders	24	27
Soapstone	5	32
Clay, brown, and boulders	2	34
Clay, gray	25	59
Clay, blue	13	72
Clay, gray	31	103
Gravel, cemented	3	106
Clay, gray	20	126
Rock, gray, soft	8	134
Rock, gray, medium	89	223
Rock, gray, hard	10	233
2S/5W-10dab. John Pardue. Altitude 1,360 ft. Drilled by Keller Well Drilling Co., 1967. Casing: 6-in. diam to 397 ft; perforated 85-140 ft and 225-315 ft		
Soil	2	2
Clay, brown	9	11
Rock, soft	22	33
Clay, brown	47	80
Rock, brown, soft (2 gal/min at 100 ft)	90	170
Rock, medium-hard (crevices between 170-180 ft)	16	186
Rock, brown, soft	27	213
Clay, brown	3	216
Rock, brown, soft	12	228
Clay, brown	3	231
Rock, brown, soft	15	246
Clay, brown	2	248
Rock, medium-hard	22	270
Rock, hard	5	275
Rock, soft	6	281
Rock, decomposed (2 gal/min at 285 ft)	6	287
Clay, blue	8	295
Rock, soft (1 gal/min between 295-300 ft)	5	300
Clay, brown and blue	75	375
Clay, blue and brown	21	396
Rock, gray, soft (dry crevice at 452 ft)	152	548
Clay, gray	5	553
Rock, gray, soft	23	576
Rock, red, soft	89	665

2S/5E-18acc. Joe Cobb. Altitude 680 ft. Drilled by H. O. Well Drilling, 1971. Casing: 6-in. diam to 228 ft, 5-in. diam 224-314 ft; perforated 294-314 ft

Materials	Thickness (feet)	Depth (feet)
Soil	3	3
Gravel, water-bearing	44	47
Gravel, cemented	8	55
Clay and gravel, blue	26	81
Sand, fine, dry	2	83
Clay, blue	29	112
Sand, fine, dry	3	115
Clay, blue	102	217
Rock	3	220
Ash, brown, volcanic	36	256
Rock, water-bearing	58	314

2S/5E-18bbc. J. N. Hartley. Altitude 640 ft. Drilled by Steinman Bros., 1967. Casing: 6-in. diam to 46 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Clay, brown, sticky	3	3
Gravel and boulders	43	46
Rock, gray, medium-soft	20	66

2S/5E-19ccc. Tom Steffl. Altitude 1,140 ft. Drilled by Steinman Bros., 1972. Casing: 8-in. diam to 191 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Clay, orange, sticky	22	22
Clay, granular	59	81
Gravel, cemented	14	95
Gravel, loose	26	121
Clay, brown	42	163
Sandstone, brown	14	177
Gravel, loose	12	189
Gravel, cemented	2	191

2S/5E-20cdc. Mount Hood Redi-Mix. Altitude 1,180 ft. Casing: 6-in. diam to 58 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Clay, yellow	28	28
Conglomerate	4	32
Clay, brown	6	38
Conglomerate	4	42
Clay, brown	10	52
Conglomerate	24	76

2S/5E-21bab. C. H. Kirkwood. Altitude 1,120 ft. Drilled by Steinman Bros., 1967. Casing: 6-in. diam to 56 ft, 5-in. diam 46-66 ft; perforated 47-65 ft

Materials	Thickness (feet)	Depth (feet)
Clay, yellow	17	17
Clay, yellow, sandy	13	30
Gravel, yellow, decomposed	3	33
Clay, yellow, sandy	22	55
Gravel and sand, brown, decomposed, water-bearing	11	66

2S/5E-22dbc. A. F. Garber. Altitude 1,270 ft. Drilled by Steinman Bros., 1968. Casing: 6-in. diam to 98 ft, 5-in. diam 97-106 ft; perforated 98-105 ft

Materials	Thickness (feet)	Depth (feet)
Clay, orange	16	16
Clay, brown, and boulders	23	39
Boulders and gravel	14	53
Clay, brown, granular	24	77
Gravel and boulders	6	83
Clay and gravel, brown	12	95
Sandstone, brown	5	100
Clay, brown	1	101
Gravel, cemented	6	107

2S/5E-24acc. Van Zand. Altitude 1,120 ft. Drilled by R. J. Strasser Drilling Co., 1969. Casing: 6-in. diam to 185 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Sand, brown, and boulders	20	20
Gravel	8	28
Sand, brown, and gravel	27	55
Clay, brown, sandy	17	72
Sandstone	35	107

2S/5E-24acc.--Continued

Materials	Thickness (feet)	Depth (feet)
Rock, gray	26	133
Sandstone, black	47	180
Sandstone, brown	42	222
Lava, black	48	270
Lava, brown	22	292
Rock, black, soft	65	357
Rock, black, broken	17	374
Rock, red and black	31	405
Rock, red	34	439
Sandstone	12	451
Rock, red	38	489
Sandstone	21	510

2S/5E- 24bbd2. David Mills. Altitude 1,290 ft. Drilled by Keller Well Drilling Co., 1971. Casing: 6-in. diam to 175 ft; 4½-in. diam 170-230 ft; perforated 175-230 ft

Materials	Thickness (feet)	Depth (feet)
Soil and small boulders	2	2
Clay, gray	2	4
Clay and large boulders	11	15
Clay, gray	12	27
Clay and boulders	59	86
Rock, gray, soft	49	135
Sandstone, brown, soft, and some gravel	34	169
Rock, gray, soft	11	180
Clay, sand, and gravel	41	221
Clay, blue, sandy	9	230

2S/5E-26cab. Oregon Candy Co. Altitude 1,280 ft. Drilled by A. O. Olsen Well Drilling, 1971. Casing: 6-in. diam to 145 ft; perforated 105-145 ft

Materials	Thickness (feet)	Depth (feet)
Soil	1	1
Tuff and boulders	43	44
Clay, brown	5	49
"Rhododendron Formation"	96	145

2S/5E-28aba. Robert Porter. Altitude 1,120 ft. Drilled by Skyles Drilling & Supply, Inc., 1971. Casing: 6-in. diam to 53 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Clay, brown, and soft boulders	22	22
Clay, white	14	36
Gravel and clay	16	52
Clay, white, with sandy layers	6	58
Lava, multicolored	35	93
Clay, brown	7	100

2S/5E-29dac. R. E. Fogle. Altitude 1,440 ft. Drilled by Ross A. Jannsen Well Drilling, 1968. Casing: 6-in. diam to 86 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Loam, brown	1	1
Clay, brown	13	14
Claystone, brown	56	70
Rock, gray and red, soft	16	86
Rock, gray, medium	9	95
Rock, gray, hard	13	108
Rock, gray, medium	2	110
Rock, gray with brown streaks	27	137

Materials	Thickness (feet)	Depth (feet)
2S/5E-30cdc. Ed Allgeier. Altitude 1,120 ft. Drilled by Calvin C. Bram Well Drilling, 1969. Casing: 6-in. diam to 250 ft, 5-in. diam 247-267 ft		
Soil	1	1
Clay, yellow	15	16
Clay, brown, and gravel and boulders; water-bearing	29	45
Rock, weathered	2	47
Rock, pink, soft	25	72
Rock, gray, hard	12	84
Clay, red	8	92
Cinders, red	7	99
Boulders, gravel, and clay	29	128
Sand and clay	71	199
Sand, water-bearing (12 gal/min)	1	200
Claystone, gray and brown	10	210
Sand, gray, water-bearing (12 gal/min)	1	211
Clay, blue, brown, and gray	17	228
Sand and silt, layered	26	254
Sand, black, coarse, and small gravel; water-bearing	4	258
Sand and clay	9	267
2S/5E-31dba. Ray Hodge. Altitude 1,210 ft. Drilled by A. O. Olsen Well Drilling, 1968. Casing: 6-in. diam to 103 ft; perforated 84-103 ft		
Soil	2	2
Clay	20	22
Cobbles and clay	38	60
Clay, sandy	20	80
Sandstone and gravel, water-bearing	16	96
Clay and gravel	7	103
2S/5E-32aba. D. F. Douglas, Jr. Altitude 1,420 ft. Drilled by Haakon Bottner Drilling Co., 1971. Casing: 6-in. diam to 33 ft		
Soil	2	2
Clay, gray	13	15
Clay, brown, sandy	12	27
Boulders, small, and clay	3	30
Shale, brown, and pea-sized gravel; water-bearing	2	32
Clay, brown	3	35
2S/5E-33abb. G. W. Timlin. Altitude 1,480 ft. Drilled by Skyles Drilling & Supply, Inc., 1969. Casing: 6-in. diam to 63 ft; unperforated		
Soil	1	1
Clay, brown	14	15
Clay, brown, and boulders	6	21
Lava, decomposed	9	30
Lava, gray, with hard and soft layers	37	67
Lava, gray, hard	36	103
Lava, brown	17	120
Gravel, cemented	150	270
Sand, brown, medium	12	282
Clay, blue	3	285
2S/5E-33dad. Robert Mackie. Altitude 1,600 ft. Drilled by American Well Drilling Co., 1963. Casing: 6-in. diam to 58 ft; perforated 41-58 ft		
Soil	2	2
Clay, red	19	21
Clay, yellow	17	38
Rock, broken, water-bearing	19	57
Rock, black, hard	1	58
2S/5E-34bab. R. N. Unger. Altitude 1,560 ft. Drilled by Keller Well Drilling Co., 1971. Casing: 6-in. diam to 50 ft, 5-in. diam 45-212 ft; perforated 180-205 ft		
Soil	1	1
Clay, red	18	19
Clay, brown, and boulders	18	37

Materials	Thickness (feet)	Depth (feet)
2S/5E-34bab.--Continued		
Rock, broken	9	46
Rock, gray, soft	8	54
Rock, gray, medium-hard	9	63
Rock, brown, soft	30	93
Rock, gray, soft	73	166
Rock, brown, soft, and some clay	4	170
Gravel, cemented	35	205
Rock, brown, porous	4	209
Rock, gray	3	212
2S/5E-34ddc. L. D. Larson. Altitude 2,000 ft. Drilled by Ross A. Jannsen Well Drilling, 1970. Casing: 6-in. diam to 66 ft, 5-in. diam 58-118 ft; unperforated		
Clay, brown, with boulders	53	53
Rock, brown, medium	41	94
Rock, gray, porous	24	118
2S/6E-19dbc. T. R. Anderson. Altitude 920 ft. Drilled by Steinman Bros., 1971. Casing: 6-in. diam to 59 ft; unperforated		
Clay, brown	13	13
Gravel, cemented	42	55
Gravel, loose	4	59
2S/6E-22abb. M. L. Edwards. Altitude 950 ft. Drilled by Steinman Bros., 1968. Casing: 6-in. diam to 40 ft; unperforated		
Sand	5	5
Sand and boulders	13	18
Sand, gravel, and boulders, cemented	12	30
Sand, gravel, and boulders, loosely cemented	7	37
Sand, gravel, and boulders, loose; water-bearing	3	40
Boulders	2	42
2S/6E-23cda. Harold Cox. Altitude 1,060 ft. Drilled by Barron & Strayer, 1964. Casing: 6-in. diam to 47 ft; unperforated		
Soil	3	3
Gravel	5	8
Gravel and boulders	7	15
Boulders	44	59
Boulders, water-bearing	1	60
2S/6E-24dcd. Brightwood Water Works. Altitude 1,120 ft. Drilled by Haakon Bottner Drilling Co., 1965. Casing: 10-in. diam to 88 ft, 8-in. diam 86-110 ft; perforated 88-110 ft		
Sand, yellow	3	3
Sand and gravel	11	14
Sand, water-bearing	3	17
Sand and boulders	14	31
Sand and gravel	14	45
Boulders	1	46
Clay, yellow	4	50
Gravel, cemented	10	60
Gravel, water-bearing (approx. 30 gal/min)	2	62
Rock, broken	7	69
Rock, loose, with sand	1	70
Gravel, cemented	18	88
Gravel and sand, water-bearing	22	110
2S/6E-26aac. Cleland. Altitude 1,120 ft. Drilled by Steinman Bros., 1965. Casing: 6-in. diam to 81 ft; unperforated		
Clay, brown, and conglomerate	24	24
Gravel, loose, with glacial boulders	19	43
Gravel and sand, glacial	38	81

Table 2.--Logs of representative wells--Continued

2S/7E-26bdb. Zigzag Village. Altitude 1,640 ft. Drilled by R. J. Strasser Drilling Co., 1966. Casing: 6-in. diam to 125 ft; perforated 107-115 ft

Materials	Thickness (feet)	Depth (feet)
Sand and boulders	25	25
Sand, cemented	5	30
Sand, cemented, and boulders	4	34
Sand, cemented	3	37
Sand and gravel	9	46
Sand and boulders, cemented	60	106
Sand and gravel	10	116
Sand	4	120
Sand, gravel, and boulders	10	130

2S/7E-30acb. Timberline Rim. Altitude 1,400 ft. Drilled by Skyles Drilling & Supply, Inc., 1968. Casing: 8-in. diam to 98 ft, 10-in. diam to 25 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Clay, brown, and boulders	25	25
Basalt, broken	68	93
Basalt, black	25	118
Lava, gray	172	290
Lava, gray, hard	51	341
Lava, gray	38	379
Basalt, black	6	385
Lava, gray	84	469
Lava, gray, porous	13	482
Lava, gray	4	486

2S/7E-34bbd. U.S. Forest Service. Altitude 1,450 ft. Drilled by Skyles Drilling & Supply, Inc., 1966. Casing: 6-in. diam to 55 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Sand, brown mud, and boulders	37	37
Sand, brown, coarse	6	43
Sand, brown, medium, and boulders	3	46
Sand, brown, coarse, and gravel	2	48
Andesite	246	294

3S/1W-25dba. Oregon State Univ. Altitude 165 ft. Drilled by Robinson Drilling & Supply Co., 1959. Casing: 10-in. diam to 155 ft; perforated 115-130½ ft, 146-148 ft, and 152½-154½ ft

Materials	Thickness (feet)	Depth (feet)
Soil and silt, yellow	10	10
Sand, silty, firm	20	30
Sand, brown, fine	8½	38½
Gravel, pea-sized	1½	40
Clay, yellow	24	64
Sand, brown, dirty	31	95
Gravel, fine, and compact yellow clay	8	103
Sand, black, fine	5	108
Sand, brown, dirty	6	114
Sand, brown, and fine gravel and clay	15	129
Gravel, fine, and yellow clay	3	132
Sand, yellow-brown	10	142
Sand, brown, coarser	3	145
Sand, black, and fine gravel	2	147
Sand, black, and wood fragments	4	151
Sand and gravel	2	153
Clay or shale, blue	27	180
Clay, yellow	10	190
Shale, blue	10	200

3S/1E-12abc. Bernard Brandow. Altitude 440 ft. Drilled by Skyles Drilling & Supply, Inc., 1967. Casing: 6-in. diam to 20 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Soil	3	3
Clay, brown	21	24
Clay, tan	9	33
Clay, yellow	6	39
Clay, tan	18	57
Clay, yellow	21	78
Sand, medium	4	82
Clay, gray	32	114
Sand, brown, fine	14	128
Clay, brown	4	132
Clay, gray, and sandy	39	171
Clay, brown, sandy	129	300

3S/1E-12ccc. W. Barney. Altitude 460 ft. Drilled by Skyles Drilling & Supply, 1970. Casing: 6-in. diam to 195 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Clay, brown, and basalt boulders	28	28
Lava, soft	87	115
Lava	20	135
Clay, brown	20	155
Clay, green	40	195
Clay, gray	5	200
Sand	15	215
Clay, gray	81	296
Clay, yellow	16	312
Shale, pink	26	338
Lava, soft	17	355
Lava	105	460

3S/1E-14bbd. R. R. Samuels. Altitude 355 ft. Drilled by Skyles Drilling & Supply, Inc., 1971. Casing: 6-in. diam to 43 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Clay, brown	5	5
Sand, brown	33	38
Basalt, black, hard	26	64
Basalt, black, soft	2	66
Basalt, gray, porous	11	77

3S/1E-23bbc. C. R. Bigej. Altitude 140 ft. Drilled by Meeker Well Drilling, 1959. Casing: 6-in. diam to 185 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Sand, hard-packed, and blue clay	24	24
Sand, brown, and clay, mixed	16	40
Clay, brown, with yellow ash	18	58
Basalt, medium	4	62
Rock, brown, soft	8	70
Rock, medium-gray	10	80
Basalt boulders, hard	5	85
Basalt, medium-gray, weathered	10	95
Clay, blue, soft, turning to light gray	23	118
Basalt	15	133
Shale, blue, with thin layer of clay	10	143
Clay, red	13	156
Clay, brown	15	171
Shale, blue, turning to weathered basalt	14	185
Basalt	25	210
Basalt, very hard	15	225
Basalt, medium, water-bearing	7	232
Basalt, very hard	--	--

3S/1E-26bcd. A. R. Slaby. Altitude 210 ft. Drilled by John Beck, 1955. Casing: 6-in. diam to 173 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Sand and soil	23	23
Sand, gravel, and clay	67	90
Sand, fine, and silt	1	91
Clay	63	154
Rock, weathered	15	169
Basalt, broken	4	173
Basalt rock	43	216
Rock, weathered and rotten, water-bearing	12	228
Basalt, black	2	230

3S/1E-27dad. Rees Meyrick. Altitude 190 ft. Drilled by Skyles Drilling & Supply, Inc. Casing: 6-in. diam to 68 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Soil	4	4
Sand, brown, medium-sized	34	38
Basalt, decomposed	24	62
Basalt, black	116	178
Basalt, broken, water-bearing	11	189
Basalt, black	1	190

Materials	Thickness (feet)	Depth (feet)
3S/1E-28cbd. Industrial Foresty Assoc. Altitude 145 ft. Drilled by Willamette Drilling Co., 1961. Casing: 12-in. diam to 148 ft; perforated 70-79 ft, 104-106 ft, and 118-123 ft		
Soil	3	3
Clay, sandy	41	44
Gravel, large-sized, and shale	16	60
Shale, brown	5	65
Shale, blue	5	70
Gravel and shale, cemented	9	79
Shale, gray, sandy	9	88
Shale, black, sandy	14	102
Sand, black, and gravel	4	106
Shale, gray	9	115
Gravel, black, pea-sized, and sand and shale	8	123
Shale, blue-gray, sticky	25	148
Shale, gray, sandy	4	152
Shale, black, sandy	16	168
Sand, black, and blue shale	8	176
3S/1E-28daa. Willamette Valley Country Club. Altitude 135 ft. Drilled by J. T. Miller, 1963. Casing: 12-in. diam to 148 ft; 8-in. diam 104-189 ft; perforated 60-100 ft, 135-145 ft, and 165-188 ft		
Soil	3	3
Clay, brown, sandy, hard	17	20
Clay, sandy, hard, and gravel	25	45
Boulders, cemented gravel, and clay	30	75
Sand, coarse, and gravel; water-bearing	10	85
Clay, broken, and gravel	5	90
Clay, blue, soft	10	100
Clay, blue, hard	30	130
Clay, dark-brown	5	135
Clay, with streaks of sand and gravel	9	144
Clay, blue	16	160
Clay, brown	4	164
Sand, coarse, and small-sized gravel	25	189
3S/1E-29adc. John Herkamp. Altitude 135 ft. Drilled by S & M Drilling & Supply, 1970. Casing: 6-in. diam to 110 ft; unperforated		
Sand, brown, fine	22	22
Gravel, cemented	46	68
Clay, blue	18	86
Clay, gray, and black sand; water-bearing	14	100
Clay, blue	5	105
Sand, black, medium-coarse, water-bearing	5	110
3S/1E-31add. J. L. Rider. Altitude 85 ft. Drilled by Skyles Drilling & Supply, Inc., 1967. Casing: 6-in. diam to 170 ft; unperforated		
Soil	3	3
Clay, brown, with sand and gravel	17	20
Clay, blue, with sand	15	35
Sand, black, fine	35	70
Sand, fine, with medium-sized gravel	2	72
Sand, black, fine	13	85
Clay, blue, sticky	18	103
Clay, green, sticky	13	116
Clay, green, with fine gray sand	14	130
Clay, blue, sandy	22	152
Clay, blue, sticky	18	170
Sand, black, medium-sized	5	175
Clay, blue	--	--
3S/1E-32dac. Globe-Union Battery Co. Altitude 155 ft. Drilled by Max Wymore, 1959. Casing: 10-in. diam to 100 ft; perforated 59-76 ft and 87-93 ft		
Soil	4	4
Clay, brown, sandy	5	9
Gravel, dry	16	25
Gravel, dry, and clay	29	54
Gravel, brown, and clay	12	66
Sand, brown, and gravel	14	80
Clay, sandy	7	87
Gravel and sand	6	93
Clay, blue	27	120
3S/1E-32dac.--Continued		
Cinders(?)	1	121
Clay, blue	69	190
3S/1E-33cbd2. City of Canby. Altitude 150 ft. Drilled by Peter Hornig, 1921. Casing: 8-in. diam to 530 ft; unperforated		
Gravel and boulders	87	87
Clay	20	107
Gravel and coarse sand, water-bearing	1½	108½
Clay, blue	171½	280
Sand, fine, clean	1	281
Clay, red	229	510
"Asphalt"	9	519
Sand, black	5	524
Sand, gray, fine, with alternating layers of blue clay; water-bearing	127	651
Sandstone, gray	1	652
3S/1E-34bdc. Ivan Arneson. Altitude 135 ft. Drilled by Fiese & Firstenberger, Inc., 1959. Casing: 8-in. diam to 114 ft; perforated 36-113 ft		
Soil	5	5
Sand, with clay	12	17
Gravel, cemented	11	28
Gravel, with some clay, water-bearing	25	53
Gravel, cemented	23	76
Gravel, cemented, changing to free gravel, water-bearing	4	80
Sand, blue, and gravel, with clay	6	86
Sand, blue, with clay and thin layers of gravel	21	107
Sand, blue, and clay	6	113
Clay, blue, tough	12	125
Clay, blue, and sand	3	128
Sand, blue, coarse-grained	1	129
Clay, blue, and sand	3	132
3S/1E-34cdb. J. A. Vraves. Altitude 160 ft. Drilled by J. W. Beck Well Drilling, 1956. Casing: 8-in. diam to 218 ft; perforated 60-111 ft, 146-148 ft, 170-172 ft, and 190-193 ft		
Soil	2	2
Silt, brown	8	10
Gravel, cemented, with brown clay	12	22
Gravel, cemented, with dark-red clay	6	28
Gravel, cemented, with brown clay	15	43
Clay, blue	4	47
Gravel, cemented	42	89
Sand and loose gravel	3	92
Gravel, cemented	9	101
Clay, blue	4	105
Sand and gravel	6	111
Clay, blue	21	132
Silt, blue	14	146
Sand and fine gravel	2	148
Clay, blue and green	17	165
Silt, dark-brown	5	170
Sand, coarse	2	172
Clay, blue	18	190
Sand, coarse	2	192
Clay, green	3	195
Silt, dark-blue	10	205
Silt, dark-red, soft	3	208
Sand, fine	7	215
Silt, dark-red, soft	3	218

Materials	Thickness (feet)	Depth (feet)
3S/2E-1ccc. Richard Leibelt. Altitude 385 ft. Drilled by Skyles Drilling & Supply, Inc., 1964. Casing: 6-in. diam to 185 ft, 5-in. diam 176-197 ft; perforated 190-197 ft		
Soil	4	4
Clay, brown	16	20
Clay, brown, with boulders	10	30
Lava	35	65
Clay, brown	15	80
Clay, green	85	165
Clay, blue	20	185
Sand, blue, coarse, water-bearing	12	197
3S/2E-2cba. Wonder Well Water Co. Altitude 215 ft. Drilled by A. O. Olsen, 1959. Casing: 8-in. diam to 161 ft; perforated 148-155 ft		
Soil	5	5
Clay, yellow	27	32
Clay, blue	15	47
Gravel, cemented	5	52
Clay, blue	73	125
Sand, blue	15	140
Gravel, sandy	6	146
Gravel, water-bearing	4	150
Sand and gravel, coarse	10	160
Clay, blue	5	165
Sandstone, water-bearing (100 gal/min)	15	180
Clay, blue	10	190
3S/2E-4add. Portland General Electric Co. Altitude 395 ft. Drilled by Wm. J. Stennett, 1958. Casing: 10-in. diam to 25 ft, 8-in. diam to 228 ft; perforated 70-74 ft, 98-102 ft		
Soil	5	5
Soil, red	10	15
Rock, soft	10	25
Rock, hard	68	93
Clay, yellow, with some gravel	10	103
Clay, yellow	12	115
Clay, gray	70	185
Clay, white and yellow	10	195
Shale, dark-colored	23	218
Gravel and clay	7	225
Shale, green	5	230
3S/2E-6cca. Clifford Chapin. Altitude 470 ft. Drilled by Wm. J. Stennett, 1966. Casing: 8-in. diam to 25 ft, 6-in. diam to 191 ft; perforated 100-110 ft, 140-180 ft		
Soil	2	2
Clay, red, hard	10	12
Clay, yellow, soft	7	19
Lava, gray	29	48
Clay, red, sticky	27	75
Clay, yellow, sandy	15	90
Sandstone, brown, water-bearing (35 gal/min)	28	118
Clay, blue	22	140
Clay, brown, sandy	15	155
Sand, light-brown, and fine gravel	17	172
Clay, blue	19	191
3S/2E-8bca. Rudy Pavlinac. Altitude 440 ft. Drilled by Wm. J. Stennett, 1967. Casing: 10-in. diam to 610 ft; unperforated		
Soil	11	11
Lava	10	21
Clay, red	14	35
Sand, brown, packed	33	68
Clay, blue	140	208
Sandstone	47	255
Clay, blue	78	333
Gravel, water-bearing (40 gal/min)	1	334
Clay, blue, and fine sand; water-bearing (40 gal/min)	111	445
Clay, blue; water bearing at 475 and 494 ft	49	494
Sand, fine, water-bearing	29	523
Clay, blue	92	615
Sandstone, coarse, water-bearing	23	638
Claystone, blue	26	664
3S/2E-9bba. Ron Schief. Altitude 415 ft. Drilled by Wm. J. Stennett, 1968. Casing: 6-in. diam to 80 ft; perforated 60-70 ft		
Soil	3	3
Clay, red	13	16
Lava, red, soft	22	38
Clay, brown	14	52
Clay, blue, hard	6	58
Clay, yellow	12	70
Sand, fine, packed, with blue mica; water-bearing	10	80
3S/2E-9dcd. Alfred Hess. Altitude 430 ft. Drilled by Steinman Bros., 1958. Casing: 6-in. diam to 40 ft; unperforated		
Clay, brown, and boulders	19	19
Clay, red	11	30
Sand, blue, packed, water-bearing	2	32
Clay, brown	10	42
3S/2E-12ada. L. J. Van Dyke. Altitude 265 ft. Drilled by Ross A. Jannsen Well Drilling, 1969. Casing: 6-in. diam to 100 ft, 5-in. diam 98-138 ft; perforated 100-106 ft, 118-123 ft, 127-137 ft		
Soil and clay, red to brown	22	22
Clay, with streaks of soft, broken rock	50	72
Clay, brown, sandy, with trace of water	4	76
Clay, gray to blue	14	90
Claystone, brown, water-bearing	15	105
Rock, gray, soft, broken	33	138
Clay, gray	2	140
3S/2E-17aaa. E. K. Broyles. Altitude 405 ft. Drilled by Ross A. Jannsen Well Drilling, 1968. Casing: 6-in. diam to 24 ft; unperforated		
Soil, brown	2	2
Clay, brown	16	18
Rock, gray, soft	2	20
Rock, gray, very hard	23	43
Rock, gray, hard, porous	3	46
Rock, gray-brown, medium	4	50
Conglomerate, brown and yellow, medium	35	85
Claystone, brown, soft	3	88
Claystone, gray, soft	75	163
Claystone, gray, medium	10	173
3S/2E-18ddb. Joe Hoffman. Altitude 175 ft. Drilled by John W. Beck Well Drilling, 1959. Casing: 6-in. diam to 222 ft; unperforated		
Soil and brown clay	8	8
Clay, brown, sandy	16	24
Silt, blue	14	38
Clay, blue	27	65
Clay, blue, with streaks of sand	10	75
Silt, blue	15	90
Silt, gray	30	120
Clay, blue	21	141
Silt, gray	87	228
Silt, gray, with streaks of sand	30	258
Clay, blue	2	260
3S/2E-19ddd1. Joseph Brosnahan. Altitude 400 ft. Drilled by Ralph Turner, 1966. Casing: 6-in. diam to 176 ft; perforated 60-176 ft		
Soil	2	2
Clay, red	13	15
Clay, yellow	5	20
Rock	4	24
Clay, yellow	31	55
Sandstone, yellow	30	85
Sandstone, blue	75	160
Clay, blue	130	290

Materials	Thickness (feet)	Depth (feet)
3S/2E-20bcc. W. D. Petrie. Altitude 320 ft. Drilled by John T. Miller Drilling, 1968. Casing: 6-in. diam to 159 ft; unperforated		
Clay, brown	17	17
Clay, brown, and boulders	9	26
Clay, brown, sandy	14	40
Clay, green	10	50
Clay, brown	13	63
Clay, brown, sandy	7	70
Sand, brown, dry	5	75
Clay, green	11	86
Clay, brown	15	101
Clay, blue	10	111
Sand, brown, fine	4	115
Clay, blue	44	159
Clay, blue, and gravel	1	160
Clay, blue, sandy	5	165
Sand, black, coarse	5	170
3S/2E-21ccd. Fred Leach. Altitude 505 ft. Drilled by Skyles Drilling & Supply, Inc., 1971. Casing: 6-in. diam to 322 ft; perforated 61-246 ft, 282-322 ft		
Soil	4	4
Clay, red	3	7
Clay, brown	11	18
Lava, gray, decomposed, and brown clay	3	21
Lava, gray, decomposed	4	25
Lava, red, decomposed	6	31
Lava, gray, fractured, water-bearing	9	40
Lava, gray	1	41
Lava, gray, decomposed	9	50
Lava, gray	7	57
Lava, red	3	60
Clay, red	3	63
Lava, gray, decomposed	24	87
Lava, red, decomposed	16	103
Sand, cemented	19	122
Clay, brown	14	136
Lava, brown, decomposed, water-bearing	7	143
Clay, blue	14	157
Clay, gray, sandy	5	162
Clay, blue and gray	16	178
Lava, gray, decomposed, water-bearing	5	183
Clay, gray	2	185
Lava, decomposed, water-bearing	18	203
Clay, gray, and brown sand	8	211
Lava, red, decomposed	37	248
Clay, gray, sandy	52	300
Lava, gray	12	312
Lava, gray, decomposed, water-bearing	6	318
Lava, red, decomposed	7	325
3S/2E-24bca. Warren Atwell. Altitude 680 ft. Drilled by Skyles Drilling & Supply, Inc., 1967. Casing: 6-in. diam to 52 ft; unperforated		
Soil	22	22
Clay, brown	24	46
Lava, gray	174	220
Lava, decomposed	11	231
Lava, gray	38	269
Lava, gray, medium	6	275
Clay, gray	121	396
3S/2E-25cbc. E. V. Smith. Altitude 630 ft. Drilled by Skyles Drilling & Supply, Inc., 1962. Casing: 6-in. diam to 43 ft; unperforated		
Soil	1	1
Clay, red	14	15
Clay, brown	20	35
Lava, black	25	60
Lava, gray	45	105
Lava, brown, porous	10	115
3S/2E-26acb. Robert Hilts. Altitude 560 ft. Drilled by John T. Miller Drilling, 1968. Casing: 6-in. diam to 48 ft, 5-in. diam 40-120 ft; perforated 88-110 ft		
Soil	2	2
Clay, orange	5	7
Clay, red	15	22
Clay, brown	23	45
Sandstone	35	80
Boulders, sand, and yellow clay	40	120
3S/2E-27cca. C. A. Gustaveson. Altitude 555 ft. Drilled by Skyles Drilling & Supply, 1968. Casing: 6-in. diam to 60 ft; unperforated		
Soil	3	3
Clay, brown	43	46
Lava, decomposed	6	52
Lava	12	64
Lava, soft	67	131
Lava, porous	9	140
Lava, soft	31	171
Lava, soft, water-bearing	7	178
3S/2E-29abb. E. C. Evans. Altitude 405 ft. Drilled by R. Stadeli & Sons, 1967. Casing: 8-in. diam to 500 ft; perforated 40-500 ft		
Soil, red	1	1
Clay, red	16	17
Sandstone, brown, soft	4	21
Basalt, black, medium	4	25
Clay, brown	9	34
Sandstone, brown, medium	57	91
Claystone, gray, medium	27	118
Sandstone, brown, soft	37	155
Clay, blue	88	243
Clay, gray, sandy	25	268
Clay, blue, sandy	88	356
Sandstone, gray, medium	3	359
Clay, green	24	383
Clay, gray, sandy	19	402
Log, brown, rotten	7	409
Clay, gray and green, sandy	78	487
Clay, green, sticky	13	500
3S/2E-29bbb. R. D. Timperley. Altitude 380 ft. Drilled by Wm. J. Stennett, 1969. Casing: 6-in. diam to 100 ft; unperforated		
Soil	3	3
Clay, red	15	18
Lava, gray	10	28
Clay, red	7	35
Sandstone, brown	24	59
Sandstone, blue	10	69
Clay, brown	12	81
Clay, blue	33	114
Sand, blue, water-bearing	1	115
Clay, blue	3	118
3S/2E-30cbc. Dean Spence. Altitude 180 ft. Drilled by Skyles Drilling & Supply, Inc., 1971. Casing: 6-in. diam to 78 ft; perforated		
Clay, brown	6	6
Clay, brown, sandy	28	34
Clay, brown	1	35
Clay, gray, sandy	10	45
Clay, gray	22	67
Clay, green	13	80
Clay, gray, sandy	10	90
Sand, green, fine	17	107
Clay, blue	43	150

Materials	Thickness (feet)	Depth (feet)
3S/2E-32ccd. D. J. Austen. Altitude 560 ft. Drilled by Wm. J. Stennett, 1968. Casing: 6-in. diam to 67 ft; perforated 50-58 ft		
Soil, red	5	5
Clay, red, sticky	20	25
Boulders, large, in red clay	24	49
Lava, gray, medium-hard	50	99
Clay, yellow	5	104
Sand, brown, packed	6	110
3S/2E-34bda. K. D. Hartberg. Altitude 540 ft. Drilled by R. J. Strasser Drilling Co., 1970. Casing: 6-in. diam to 34 ft; unperforated		
Soil	2	2
Clay, red	8	10
Clay, brown	7	17
Sandstone, brown	11	28
Basalt, black, porous	14	42
Basalt, gray, soft	4	46
Basalt, brown, soft	22	68
Basalt, red, soft	16	84
Basalt, black, porous	17	101
Basalt, black, medium-hard	4	105
3S/2E-35aba. Eugene Petitti. Altitude 645 ft. Drilled by Wm. J. Stennett, 1956. Casing: 6-in. diam to 48 ft; unperforated		
Soil, red	6	6
Clay, red, sticky	10	16
Sand	6	22
Rock, soft, decomposed, water-bearing	20	42
Sandstone, brown	20	62
Rock, red, water-bearing (8 gal/min)	16	78
Rock, gray, hard	2	80
Rock, red	16	96
Rock, brown, soft	5	101
3S/2E-36cdb. K. L. Hawks. Altitude 835 ft. Drilled by Skyles Drilling & Supply, 1968. Casing: 6-in. diam to 20 ft; unperforated		
Soil	3	3
Clay, brown	8	11
Clay, brown, sandy	6	17
Sandstone	18	35
Clay, tan	25	60
Clay, blue	28	88
Clay, tan	70	158
Clay, tan, sandy	8	166
Clay, tan	69	235
Shale, blue, hard	3	238
Clay, blue	38	276
Shale, blue, hard	8	284
Clay, blue	77	361
Shale, blue, hard	67	428
Clay, blue	268	696
3S/3E-3ada. Clayton Johnson. Altitude 49 ft. Drilled by Steinman Bros., 1968. Casing: 6-in. diam to 65 ft; unperforated		
Soil	1	1
Clay, brown	12	13
Gravel and conglomerate	39	52
Gravel, loose	13	65
3S/3E-6aad. Harley Ward. Altitude 400 ft. Drilled by Steinman Bros., 1965. Casing: 8-in. diam to 283 ft; unperforated		
Clay, yellow	15	15
Clay and gravel, yellow	9	24
Clay, yellow, granular	11	35
Clay, tan, soft	27	62
Clay, tan, with trace of gravel	8	70
Clay, tan, soft	15	85
Clay, yellow, soft	7	92
Clay, gray, sticky	26	118
Shale, blue, brittle	32	150
3S/3E-6aad.--Continued		
Clay, gray, sandy	20	170
Silt, yellow, sandy	5	175
Shale and sand, white, water-bearing	5	180
Clay, gray	15	195
Shale, black, brittle	4	199
Conglomerate, with green clay seams	9	208
Clay, gray, soft	45	253
Silt, brown, packed	11	264
Silt, gray, packed	14	278
Conglomerate, black	9	287
Sand, blue and black, water-bearing	5	292
3S/3E-7dcd. James Kurtti. Altitude 480 ft. Drilled by Ross A Jannsen Well Drilling, 1968. Casing: 6-in. diam to 273 ft, 4-in. diam to 86 ft, and 5-in. diam 86-335 ft; perforated 285-325 ft		
Loam, brown	3	3
Clay, gray	7	10
Clay, brown	2	12
Claystone, gray	90	102
Claystone, gray, hard	18	120
Rock, black, hard	19	139
Rock, black, medium	6	145
Claystone, gray	12	157
Clay, blue, soft	3	160
Rock, black, medium	33	193
Claystone, gray, medium	14	207
Clay, gray	54	261
Claystone, gray	8	269
Claystone, brown	12	281
Clay, gray, soft	2	283
Claystone, gray, sandy	52	335
3S/3E-8aba. Kenneth St. Mary. Altitude 555 ft. Drilled by Steinman Bros., 1948. Casing: 6-in. diam to 19 ft; unperforated		
Boulders	5	5
Hardpan, yellow, with boulders	11	16
Rock, yellow, soft, with cemented boulders	10	26
Rock, light-gray, fairly hard, with red clay seams	71	97
3S/3E-8abb. Clyde Fry. Altitude 570 ft. Drilled by Skyles Drilling & Supply, Inc., 1972. Casing: 6-in. diam to 220 ft; perforated 125-160 ft		
Clay, brown, and basalt boulders	6	6
Clay, brown	38	44
Basalt, weathered	27	71
Tuff, welded	49	120
Basalt, black	30	150
Basalt, weathered	42	192
Clay, gray	42	234
Sand and gravel	11	245
Clay, gray	15	260
3S/3E-8cdb. Roy Sawyer. Altitude 680 ft. Drilled by Skyles Drilling & Supply, Inc., 1970. Casing: 6-in. diam to 69 ft, 5-in. diam to 109 ft; perforated 69-109 ft		
Soil	4	4
Clay, brown	63	67
Clay, gray	6	73
Sand, gray	2	75
Lava, broken, water-bearing	4	79
Lava, gray	15	94
Lava, porous	2	96
Lava, gray	14	110

Table 2.--Logs of representative wells--Continued

3S/3E-11ccb. John Farlow. Altitude 500 ft. Drilled by J. F. Terrell Well Drilling, 1971. Casing: 6-in. diam to 256 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Boulders and red clay	20	20
Clay, yellow	44	64
Rock, hard	2	66
Clay, blue	9	75
Sandstone	10	85
Clay, blue	150	235
Shale, blue, sandy	10	245
Sand, black, coarse	5	250
Clay, gray	20	270
Shale, gray, sandy	15	285

3S/3E-13cbd. Warren Swenson. Altitude 695 ft. Drilled by Steinman Bros., 1971. Casing: 6-in. diam to 51 ft; 5½-in. diam 48-65 ft; perforated 50-60 ft

Materials	Thickness (feet)	Depth (feet)
Clay, brown	6	6
Clay, brown, sandy	21	27
Gravel, cemented	30	57
Clay, brown	8	65

3S/3E-14acc. D. R. Smith. Altitude 660 ft. Drilled by Ross A. Jannsen Well Drilling, 1967. Casing: 8-in. diam to 220 ft; perforated 135-150 ft

Materials	Thickness (feet)	Depth (feet)
Loam, brown	3	3
Clay, brown, and large-sized gravel	19	22
Gravel, large-sized	2	24
Gravel, cemented	59	83
Clay, gray	50	133
Clay, gray, and wood	19	152
Clay, light-blue	21	173
Clay, yellow, and white gravel	9	182
Clay, gray	38	220

3S/3E-15bcd. Robert Kiefer. Altitude 680 ft. Drilled by Skyles Drilling & Supply, Inc., 1970. Casing: 6-in. diam to 653 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Soil	4	4
Clay, red	18	22
Clay, brown	8	30
Clay, gray, and shale	10	40
Lava, broken, water-bearing (2 gal/min)	4	44
Lava, gray	226	270
Clay, gray	47	317
Gravel, water-bearing (4 gal/min)	4	321
Clay, gray	73	394
Gravel and pumice, water-bearing (18 gal/min)	22	416
Clay, gray	14	430
Sand, coarse, and small gravel	23	453
Clay, gray	19	472
Sand, gray, medium-sized	10	482
Clay, gray	90	572
Clay, black, hard	14	586
Clay	9	595
Sand, gray, water-bearing (30 gal/min)	10	605
Clay, gray	70	675
Sand, gray, water-bearing (42 gal/min)	7	682
Clay	5	687
Shale, gray	29	716
Clay, gray	26	742
Basalt, black	18	760
Basalt, black, soft	4	764
Clay, gray, soft to hard	71	835

3S/3E-17cbb. Richard Polehn. Altitude 710 ft. Drilled by Skyles Drilling & Supply, Inc., 1970. Casing: 8-in. diam to 540 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Soil	2	2
Clay, brown	16	18
Clay, yellow	77	95
Clay, brown and white	22	117
Clay, blue and gray	43	160
Clay, green	14	174
Clay, tan, sandy	22	196
Clay, gray and blue	209	405

3S/17cbb.--Continued

Materials	Thickness (feet)	Depth (feet)
Clay, brown	13	418
Shale, brown, with layers of black basalt	62	480
Shale, gray and brown	88	568
Gravel, medium	34	602

3S/3E-18bdb. Robert McCallum. Altitude 455 ft. Drilled by Skyles Drilling & Supply, Inc., 1969. Casing: 6-in. diam to 153 ft; perforated 103-153 ft

Materials	Thickness (feet)	Depth (feet)
Soil	2	2
Clay, brown	24	26
Clay, gray	41	67
Clay, gray, sandy	7	74
Clay, gray	20	94
Sand, coarse, and gravel	12	106
Clay, gray	14	120
Sand, fine	5	125
Clay, gray	3	128
Gravel, medium	2	130
Sand, fine and coarse	5	135
Sand and gravel, cemented	2	137
Sand and gravel	7	144
Sand, brown, medium	2	146
Shale, gray	4	150
Sand, gray, fine	9	159
Clay, gray	8	167
Sand, gray, fine, and gravel	30	197
Clay, gray	9	206
Sand and clay	28	234
Clay, gray	24	258
Gravel	2	260
Sand, multicolored	11	271
Sand, fine and medium	9	280

3S/3E-23ada. Mr. Ficken. Altitude 700 ft. Drilled by Ross A. Jannsen Well Drilling, 1968. Casing: 6-in. diam to 40 ft, 4-in. diam 38-58 ft; perforated 40-58 ft

Materials	Thickness (feet)	Depth (feet)
Clay, brown, sandy	22	22
Lava, broken, and boulders	23	45
Sandstone, soft, and gravel	13	58

3S/3E-30bbb. Vern Kjargaard. Altitude 730 ft. Drilled by Wm. J. Stennett, 1969. Casing: 6-in. diam to 30 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Soil	5	5
Clay, red	13	18
Lava, dark-colored, soft	6	24
Lava, gray, hard	30	54
Lava, gray, hard	60	114
Lava, gray, softer	15	129
Lava, gray, hard	91	220
Lava, gray, hard, with many small seams; trace of water	76	296
Lava, gray, hard	68	364
Lava, brown, soft	4	368
Claystone, gray	8	376
Lava, gray, very porous, water-bearing	7	383

3S/3E-30bcc. Philip Snyder. Altitude 600 ft. Drilled by J. F. Terrell Well Drilling, 1970. Casing: 8-in. diam to 50 ft; perforated 40-50 ft

Materials	Thickness (feet)	Depth (feet)
Soil, red	6	6
Clay, yellow	39	45
Shale, sandy, hard	15	60

Materials	Thickness (feet)	Depth (feet)

3S/3E-31dad. Ray Moehnke. Altitude 715 ft. Drilled by Wm. J. Stennett, 1970. Casing: 6-in. diam to 55 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Soil	2	2
Clay, red	20	22
Lava, yellow, soft	14	36
Lava, brown, medium-hard	60	96
Lava, gray, soft	26	122
Lava, gray, hard	2	124
Claystone, yellow, water-bearing	1	125

3S/3E-32ada. Richard Sifford. Altitude 970 ft. Drilled by Skyles Drilling & Supply, Inc., 1971. Casing: 6-in. diam to 298 ft; perforated 237-297 ft

Materials	Thickness (feet)	Depth (feet)
Soil	1	1
Clay, red, and boulders	3	4
Clay, red	4	8
Clay, brown, sandy	30	38
Lava, brown, decomposed	7	45
Clay, red	4	49
Lava, brown, decomposed	9	58
Clay, multicolored and brown, sandy	59	117
Clay, tan	19	136
Lava, black, decomposed	22	158
Clay, gray, sandy, water-bearing	46	204
Lava, black, decomposed	19	223
Shale, blue, and black lava	25	248
Gravel, water-bearing	20	268
Lava, brown, decomposed	22	290
Gravel	6	296
Clay, brown, sandy	15	311
Lava, black, gray, and brown, decomposed	40	351
Clay, red and multicolored	10	361
Sand, gray, cemented	12	373
Lava, brown, decomposed	20	393
Clay, brown, sandy	8	401
Lava, black, with seams of brown clay	12	413
Clay, red	14	427
Lava, brown, decomposed	15	442
Clay, blue	3	445

3S/3E-33ccb. Gerald Dyck. Altitude 1,015 ft. Drilled by C. G. Westerberg, 1972. Casing: 6-in. diam to 48 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Soil	1	1
Clay and cobblestones	12	13
Clay, brown, and seamy rock	21	34
Lava, gray, hard	8	42
Lava, red, medium	25	67
Basalt, gray, hard	3	70
Lava, gray, medium	71	141
Basalt, gray, hard	31	172
Lava, green and gray, hard	31	203

3S/3E-34adc. Harold Teske. Altitude 1,030 ft. Drilled by Skyles Drilling & Supply, Inc., 1972. Casing: 6-in. diam to 88 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Soil	1	1
Clay, brown	14	15
Lava, gray, broken	24	39
Lava, gray	15	54
Lava and red cinders	32	86
Lava, gray, soft	4	90
Lava, gray, porous, water-bearing	26	116

3S/3E-36cca. W. E. Dodd. Altitude 995 ft. Drilled by Steinman Bros., 1967. Casing: 6-in. diam to 75 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Clay, yellow, sandy	35	35
Boulders	14	49
Rock, gray, broken	9	58
Rock, gray, hard	40	98
Rock, gray, softer	5	103
Rock, brown, decomposed	41	144
Rock, gray, soft	19	163
Rock, brown, decomposed	33	196
Rock, gray, soft	9	205

3S/4E-1cad. Grant Ruple. Altitude 1,165 ft. Drilled by Ross A. Jannsen Well Drilling, 1971. Casing: 6-in. diam to 27 ft, 5-in. diam to 387 ft; perforated 262-382 ft

Materials	Thickness (feet)	Depth (feet)
Clay, brown	21	21
Rock, brown with gray, medium-hard	21	42
Rock, gray with brown, hard	108	150
Rock, gray with brown, porous	8	158
Conglomerate	5	163
Clay, brown	12	175
Claystone	135	310
Rock, gray with brown, hard	10	320
Rock, red, medium-hard	9	329
Rock, gray with brown, hard	35	364
Rock, red, hard	2	366
Rock, red with gray, hard	20	386
Rock, gray with brown, hard	3	389

3S/4E-2ddc. Jack Shields. Altitude 1,100 ft. Drilled by Keller Well Drilling Co., 1970. Casing: 6-in. diam to 225 ft; perforated 155-225 ft

Materials	Thickness (feet)	Depth (feet)
Soil	2	2
Clay, red, and boulders	4	6
Clay, brown	13	19
Rock, gray, decomposed	7	26
Rock, gray, hard	7	33
Clay, red	12	45
Rock, gray, broken	11	56
Rock, gray, soft	25	81
Rock, gray, broken	7	88
Clay	1	89
Rock, soft	2	91
Clay	5	96
Rock, broken	18	114
Rock, gray, soft	33	147
Rock, gray, hard	7	154
Clay, brown	16	170
Clay, blue	21	191
Clay, brown	34	225

3S/4E-4bbc. Oscar Smith. Altitude 465 ft. Drilled by Tolleson Drilling Co., 1960. Casing: 6-in. diam to 55 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Soil	2	2
Clay, brown, and rock and sand	48	50
Clay, hard	5	55
Rock and sand, water-bearing	6	61

3S/4E-5aba. David Hall. Altitude 445 ft. Drilled by Steinman Bros., 1970. Casing: 6-in. diam to 57 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Clay, brown	6	6
Gravel, cemented	40	46
Gravel, cemented, loose	13	59

Materials	Thickness (feet)	Depth (feet)
3S/4E-5bdc. Ault Acres Mobile Home Court. Altitude 380 ft. Drilled by Steinman Bros., 1970. Casing: 10-in. diam to 201 ft, 6-in. diam to 302 ft; perforated 200-300 ft		
Soil	3	3
Gravel and boulders, cemented	54	57
Clay, blue	13	70
Siltstone, gray	45	115
Clay, blue and gray, sandy	12	127
Clay and gravel, water-bearing (18 gal/min)	1	128
Clay, gray and blue	82	210
Shale, sand, and gravel, water-bearing	7	217
Clay, blue	8	225
Shale and sand, packed	4	229
Shale, light-gray, sticky	61	290
Shale, blue and pink, crumbly, water-bearing	15	305
Shale, gray and brown, hard	54	359
Rock, gray, with black and brown seams	61	420
Rock, gray, with white and red specks	104	524
Rock, gray, red, and brown	121	645
Shale, blue, with brown streaks	25	670
Clay, reddish-brown	40	710
Shale, brown and white, marbled, caving	15	725
3S/4E-6bcc. M. M. Abbott. Altitude 355 ft. Drilled by Ross A. Jannsen Well Drilling, 1968. Casing: 6-in. diam to 35 ft; unperforated		
Soil, black	2	2
Boulders, small	19	21
Gravel, cemented	14	35
3S/4E-6dba. Idelle Kolias. Altitude 360 ft. Drilled by Skyles Drilling & Supply, Inc., 1970. Casing: 6-in. diam to 218 ft; unperforated		
Clay and gravel	13	13
Sand and gravel	22	35
Clay, gravel, and sand	32	67
Clay, gray	28	95
Clay, gray, sandy	39	134
Clay, green and gray	103	237
Sand, black	3	240
3S/4E-7cdc. Oliver Teeters. Drilled by Steinman Bros., 1966. Casing: 6-in. diam to 73 ft; perforated 47-54 ft		
Soil	3	3
Gravel, cemented, and boulders	36	39
Gravel and sand, loose	8	47
Clay, blue	16	63
Clay, gray	10	73
3S/4E-8cbd. Stuart Puckett. Altitude 395 ft. Drilled by Steinman Bros., 1958. Casing: 6-in. diam to 60 ft; unperforated		
Soil	5	5
Gravel, cemented	36	41
Sand and gravel	4	45
Sand, gray	5	50
Clay, brown, sandy	2	52
Gravel, cemented, and boulders	8	60
3S/4E-10cdb. Chuck Walker. Altitude 810 ft. Drilled by Ross A. Jannsen Well Drilling, 1971. Casing: 6-in. diam to 115 ft, 5-in. diam to 338 ft; perforated 280-333 ft		
Clay, gray	18	18
Clay, brown	13	31
Claystone, brown	55	86
Claystone, green, soft	9	95
Claystone, gray, soft	19	114
Clay, blue, gray, and green	46	160
Rock, gray and green, soft	8	168
Rock, gray and red, hard	14	182
Rock, gray and brown, hard	108	290
Rock, gray and red, hard	48	338
3S/4E-11acb. Bureau of Land Management. Altitude 565 ft. Drilled by John W. Beck Well Drilling, 1961. Casing: 6-in. diam to 23 ft; unperforated		
Soil	3	3
Clay, red, and boulders	8	11
Shale, gray, and boulders	11	22
Basalt, gray, medium-hard	20	42
Clay, red	10	52
Basalt, gray	32	84
Basalt, broken	5	89
Clay, dark-red, burnt	1	90
3S/4E-12bcb. Russell Niemi. Altitude 930 ft. Drilled by Ross A. Jannsen Well Drilling, 1969. Casing: 6-in. diam to 208 ft, 5-in. diam 201-301 ft; perforated 209-301 ft		
Soil	2	2
Clay, brown	19	21
Clay, gray	23	44
Clay, blue and gray	4	48
Sand and gray clay	3	51
Clay, blue	25	76
Clay, gray	74	150
Shale, gray	18	168
Shale, blue	3	171
Lava, broken	49	220
Basalt, broken, medium-hard	50	270
Lava, red	15	285
Basalt, gray, hard	8	293
Basalt, broken	7	300
Basalt, gray, hard	1	301
3S/4E-13ccd. R. A. Jannsen. Altitude 635 ft. Drilled by Ross A. Jannsen Well Drilling, 1969. Casing: 6-in. diam to 59 ft; unperforated		
Soil, brown	3	3
Clay, brown, with boulders	20	23
Soapstone, grayish-brown	30	53
Rock, gray-brown, hard	21	74
Rock, blue-red, softer	6	80
Rock, blue-red, medium	36	116
Rock, green and brown, medium	18	134
Rock, brown and green	3	137
Rock, gray, hard	2	139
Rock, gray, brown, and green	5	144
Rock, gray, hard	2	146
Rock, gray, brown, and green	1	147
Rock, brownish-red	5	152
Rock, gray, hard	1	153
Rock, brown, medium	5	158
3S/4E-15acc. J. H. Canova. Altitude 890 ft. Drilled by Ross A. Jannsen Well Drilling, 1969. Casing: 6-in. diam to 69 ft, 5-in. diam 65-80 ft; perforated 68-80 ft		
Soil	2	2
Clay, brown, sandy	33	35
Clay, brown	7	42
Clay, coarse sand, and gravel	31	73
Clay and sand	7	80
3S/4E-17bdd. Gene Dimick. Altitude 460 ft. Drilled by Ross A. Jannsen Well Drilling, 1970. Casing: 6-in. diam to 45½ ft; unperforated		
Loam, black	1	1
Clay, boulders, and large-sized gravel	20	21
Gravel, cemented	23	44
Sand, black	1½	45½
3S/4E-18dda. J. K. Platt. Altitude 425 ft. Drilled by Steinman Bros., 1966. Casing: 6-in. diam to 51 ft; unperforated		
Clay, brown	4	4
Gravel and boulders, cemented	40	44
Gravel and boulders, loose, water-bearing	7	51

Table 2.--Logs of representative wells--Continued

Materials	Thickness (feet)	Depth (feet)
3S/4E-22bda. William Sommerville. Altitude 880 ft. Drilled by Howard L. Smith, 1971. Casing: 6-in. diam to 50 ft, 5-in. diam 48-66 ft; perforated 58-65 ft		
Soil and brown clay	3	3
Clay, brown, sandy	5	8
Rock, tan, broken, soft	29	37
Gravel, cemented	12	49
Clay, gray	11	60
Gravel, cemented, water-bearing	6	66
3S/4E-23abc. Marvin Yonkers. Altitude 985 ft. Drilled by Skyles Drilling & Supply, Inc., 1971. Casing: 6-in. diam to 100 ft; unperforated		
Soil	2	2
Clay, red	16	18
Clay, brown	17	35
Clay, brown, sandy	33	68
Lava, decomposed	10	78
Lava, multicolored, layers of soft and hard	11	89
Lava	31	120
Lava, red and clay	9	129
Lava, multicolored	54	183
Lava, broken, porous	57	240
Lava, gray	5	245
3S/4E-25bdc. Glenn Underhill. Altitude 1,110 ft. Drilled by Steinman Bros., 1968. Casing: 6-in. diam to 157 ft; unperforated		
Clay, yellow, granular	24	24
Clay, tan, granular	14	38
Rock, bluish-gray, soft	27	65
Rock, gray, with red and white specks	50	115
Rock, green and brown, soft	10	125
Rock, bluish-gray, soft	15	140
Rock, gray, soft	38	178
Rock, blue, with white specks	60	238
Rock, gray, soft, with some hard streaks	52	290
Rock, gray, with seams of brown shale	34	324
Rock, black, medium-soft	9	333
Rock, gray with white specks, soft	65	398
Shale, green, crumbly	7	405
3S/4E-26cdb. W. O. Youngberg. Altitude 1,120 ft. Drilled by Youngberg, 1963. Casing: 8-in. diam to 60 ft; perforated 45-60 ft		
Soil, brown, gravelly	40	40
Sand, very coarse, water-bearing	20	60
Clay, gray	38	98
Rock, sedimentary	22	120
Clay, red	8	128
Rock, sedimentary	4	132
Clay, red	6	138
Rock	2	140
Clay, light-brown	28	168
Rock	7	175
Clay, light-gray, hard	18	193
3S/4E-27cdb. F. A. Treptow. Altitude 900 ft. Drilled by Howard L. Smith, 1971. Casing: 6-in. diam to 50 ft; unperforated		
Soil and sandy clay	4	4
Clay, brown, sandy	32	36
Clay, brown, sticky	12	48
Claystone, gray	36	84
Rock, gray to brown, with cinder streaks; trace of water	177	261
3S/4E-28bdd. D. E. Anderson. Altitude 720 ft. Drilled by Ross A. Jannsen Well Drilling, 1967. Casing: 6-in. diam to 20 ft; unperforated		
Soil, brown	1	1
Clay, brown, with boulders	9	10
Rock, brown, medium-hard	6	16
Basalt, gray, very hard	2	18
Rock, gray, medium-hard	118	136
3S/4E-28bdd.--Continued		
Rock, brown, medium-hard	91	227
Rock, gray, medium	43	270
Rock, brown, medium	91	361
Rock, green, softer	1	362
Rock, gray, medium	7	369
Rock, green, softer	22	391
Rock, gray-green, medium	38	429
Rock, gray, medium	31	460
Rock, gray-green, softer	6	466
3S/4E-30caa. Karl Mecklenburg. Altitude 885 ft. Drilled by Steinman Bros., 1969. Casing: 6-in. diam to 311 ft; unperforated		
Clay, brown, sticky	3	3
Clay, brown, conglomerate	27	30
Clay, loose	3	33
Clay, yellow	23	56
Clay, gray	74	130
Sand, brown, packed, dry	18	148
Clay, gray	76	224
Sand, gray, coarse, packed, dry	8	232
Clay, gray	27	259
Sand, gray, conglomerate, dry	6	265
Clay, gray	46	311
Rock, gray, soft	76	387
Rock, black	14	401
3S/4E-32cbb. S. E. Lawrence. Altitude 990 ft. Drilled by Ross A. Jannsen Well Drilling, 1968. Casing: 6-in. diam to 48 ft, 5-in. diam 47-67 ft; perforated 48-67 ft		
Soil, brown	2	2
Sandstone, brown, and boulders	65	67
3S/4E-33cdb. Irvin Joyner. Altitude 1,105 ft. Drilled by Ross A. Jannsen Well Drilling, 1967. Casing: 6-in. diam to 85 ft; perforated 65-85 ft		
Clay, brown	55	55
Sandstone	5	60
Lava	10	70
Rock, red	15	85
3S/4E-34add. Henry Beal. Altitude 1,165 ft. Drilled by W. O. Youngberg, 1970. Casing: 6-in. diam to 60 ft, 5-in. diam 55-105 ft; perforated 85-105 ft		
Clay, red, and boulders	55	55
Clay, light-brown	35	90
Lava	15	105
3S/5E-2ada. Fancher & Boyd. Altitude 1,640 ft. Drilled by Andy M. Jannsen Well Drilling, 1965. Casing: 6-in. diam to 26 ft; unperforated		
Clay, yellow, and boulders	26	26
Rock, gray	61	87
3S/5E-4cad. Gary English. Altitude 1,520 ft. Drilled by Skyles Drilling & Supply, Inc., 1972. Casing: 6-in. diam to 34 ft; unperforated		
Soil	2	2
Clay, brown, and basalt boulders	12	14
Lava, soft, decomposed	18	32
Lava, gray, harder	6	38
Lava, gray and red, soft layers	17	55

Table 2.--Logs of representative wells--Continued

Materials	Thick-ness (feet)	Depth (feet)
3S/5E-5aba. Clyde Updegrave. Altitude 1,420 ft. Drilled by Ross A. Jannsen Well Drilling, 1971. Casing: 6-in. diam to 61 ft, 5-in. diam 58-153 ft; perforated 120-146 ft		
Clay, red	28	28
Clay, brown	15	43
Conglomerate	38	81
Clay, yellow	10	91
Clay, gray	25	116
Clay, brown	15	131
Rock, brown, soft	4	135
Rock, brown and gray, hard	18	153
3S/5E-6aca. J. W. Price. Altitude 1,240 ft. Drilled by Calvin C. Bram Well Drilling, 1967. Casing: 6-in. diam to 342 ft; perforated 199-203 ft		
Soil	2	2
Clay, yellow	23	25
Cobbles and gravel, with sandy clay binder	19	44
Gravel, pea-sized, and sand; water-bearing (25 gal/min)	2	46
Clay, pink	4	50
Rock, hard, "slanting"	6	56
Rock, hard and soft layers	38	94
Rock, gray, hard	29	123
Sand, gravel, boulders, and clay	48	171
Sand, brown, and gravel; water-bearing (14 gal/min)	6	177
Silt, blue, and sand and gravel	14	191
Sand and gravel, water-bearing (12 gal/min)	2	193
Gravel, cemented, with soft streaks	6	199
Sand and gravel, water-bearing (20 gal/min)	2	201
Gravel, cemented	22	223
Gravel, cemented, water-bearing (5 gal/min)	4	227
Gravel, cemented	3	230
Clay, purple-brown	25	255
Tuff, brick-colored	12	267
Gravel and coarse sand, with clay binder	41	308
Clay, pink	2	310
Gravel, with pink clay binder	5	315
Rock, with pink clay binder	25	340
Gravel, with blue clay binder	5	345
Gravel, with gray clay binder	20	365
Gravel, with blue clay binder	47	412
Cinders, red	5	417
Rock, pink	3	420
3S/5E-7bab. Raymond Wolflick. Altitude 1,240 ft. Drilled by Ross A. Jannsen Well Drilling, 1969. Casing: 6-in. diam to 241 ft; unperforated		
Soil, brown	1	1
Clay, yellow	52	53
Clay, brown	40	93
Claystone, brown	1	94
Clay, brown	23	117
Clay, red	11	128
Clay, yellow	40	168
Clay, gray	3	171
Clay, yellow	22	193
Claystone, brown, soft to medium	34	227
Rock, gray, hard	5	232
Rock, brown and gray	26	258
Rock, gray, brown, and green	14	272
3S/5E-17bda. Stephen Day. Altitude 1,240 ft. Drilled by Andy M. Jannsen Well Drilling, 1966. Casing: 6-in. diam to 99 ft; unperforated		
Clay, red	40	40
Sandstone, gray, soft	15	55
Basalt, weathered	42	97
Basalt	51	148
Basalt, weathered	4	152
3S/5E-19bca. Christenson. Altitude 1,120 ft. Drilled by American Well Drilling Co., 1964. Casing: 6-in. diam to 118 ft, 5-in. diam 115 to 165 ft; perforated 120-164 ft		
Soil	3	3
Clay, red	37	40
Clay, yellow and red	88	128
Gravel, cemented	22	150
Basalt, black	15	165
3S/5E-20bdd. Gordon Franklin. Altitude 1,320 ft. Drilled by Ross A. Jannsen Well Drilling, 1971. Casing: 6-in. diam to 56 ft; unperforated		
Soil, brown	2	2
Clay, brown	29	31
Rock, gray, hard	2	33
Rock, brown, medium	21	54
Rock, brown and gray, hard	83	137
Rock, green, hard	5	142
Rock, brown and gray, hard	61	203
3S/5E-22acd. James Garland. Altitude 1,840 ft. Drilled by Gaarsland Drilling Co., 1972. Casing: 6-in. diam to 48 ft; unperforated		
Soil	2	2
Clay, yellow	18	20
Boulders	2	22
Clay, yellow, and coarse gravel	26	48
Lava, gray	78	126
Cinders, red	4	130
Lava, gray	10	140
3S/5E-28cac. Eagle Creek Fish Hatchery. Altitude 920 ft. Drilled by Haakon Bottner Drilling Co., 1963. Casing: 16-in. diam to 180 ft, 12-in. diam 164-256 ft, 10-in. diam 250-500 ft; perforated 181-191 ft, 375-425 ft		
Boulders and clay	25	25
Shale, red	162	187
Boulders	2	189
Shale, red	55	244
Basalt, black	136	380
Basalt, red	60	440
Basalt, gray	130	570
Clay, red, sticky	23	593
3S/5E-29aba. Charles Kent, Jr. Altitude 1,400 ft. Drilled by Ross A. Jannsen Well Drilling, 1967. Casing: 6-in. diam to 69 ft; unperforated		
Soil, brown	1	1
Claystone, brown	19	20
Claystone, yellow	48	68
Sandstone, brown, medium	36	104
Rock, gray, medium-hard	99	203
Rock, blue-gray, medium-hard	4	207
Rock, gray, medium	9	216
Rock, blue-gray, harder	2	218
Rock, brown, medium	--	--
3S/5E-30ddc. M. Bethel. Altitude 1,210 ft. Drilled by Keller Well Drilling Co., 1969. Casing: 6-in. diam to 139 ft; unperforated		
Soil	2	2
Clay, yellow	16	18
Sand, cemented	16	34
Gravel, cemented	8	42
Sand, cemented	44	86
Basalt, decomposed	36	122
Basalt, gray, hard	36	158
Basalt, decomposed	14	172
Ash, red, volcanic, medium-hard	73	245

Table 2.--Logs of representative wells--Continued

3S/5E-32cab. Porter Mennonite Church. Altitude 1,280 ft. Drilled by W. O. Youngberg, 1967. Casing: 6-in. diam to 66 ft; perforated 46-66 ft

Materials	Thickness (feet)	Depth (feet)
Clay and boulders	43	43
Rock, hard	1	44
Rock, medium	16	60
Gravel, medium	6	66
Clay	6	72

3S/7E-3bbb. U.S. Forest Service. Altitude 420 ft. Drilled by Steinman Bros., 1966. Casing: 8-in. diam to 163 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Sand, gray, coarse	2	2
Sand, gray, and large boulders	43	45
Sand, gray, and boulders and wood	5	50
Sand, gray	17	67
Sand and gravel, water-bearing	5	72
Sand and boulders	85	157
Sand, reddish-brown, coarse	4	161
Gravel, coarse, and sand (artesian water)	2	163

3S/7E-4aaa. Wendell Halseth. Altitude 1,410 ft. Drilled by Ralph Turner Drilling Co., 1971. Casing: 6-in. to 55 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Soil	1	1
Sand and gravel	54	55
Rock, brown, broken	5	60

3S/7E-5bdb. Camp Arrah Wanna. Altitude 1,230 ft. Drilled by Barker Drilling & Supply, 1959. Casing: 48-in. diam to 14 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Rock, decomposed, and soil	2	2
Sand, gravel, and boulders	12	14

3S/7E-9caa. George McLane. Altitude 1,340 ft. Drilled by Skyles Drilling & Supply, Inc., 1964. Casing: 6-in. diam to 58 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Soil	5	5
Clay, brown, sandy	10	15
Clay and boulders	15	30
Sand, brown, medium-sized	20	50
Clay, brown, sandy	2	52
Sand, brown, medium-sized	6	58

4S/1E-1adb. J. R. Hicks. Altitude 330 ft. Drilled by S & M Drilling & Supply, 1971. Casing: 6-in. diam to 380 ft; perforated 350-380 ft

Materials	Thickness (feet)	Depth (feet)
Soil, brown	2	2
Clay, brown	98	100
Clay, blue	107	207
Clay, gray, sandy	68	275
Clay, blue	15	290
Clay, gray	45	335
Clay, blue, with streaks of fine sand; water	15	350
Clay, blue, and medium-sized sand and green claystone; water-bearing	30	380

4S/1E-2abb. C. F. Dietz. Altitude 180 ft. Drilled by J. W. Beck Well Drilling, 1969. Casing: 8-in. diam to 165 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Soil	3	3
Clay, brown and blue, and silt	35	38
Gravel, cemented	15	53
Clay, dark-blue	25	78
Clay, red	17	95
Clay, blue	46	141
Basalt, weathered	24	165
Basalt, dark-colored	88	253
Basalt, broken	47	300
Basalt, broken, and lava seams	50	350

4S/1E-3bba. A. A. Wright. Altitude 160 ft. Drilled by Steinman Bros., 1970. Casing: 10-in. diam to 24 ft, 6-in. diam 211-275 ft; perforated 235-274 ft

Materials	Thickness (feet)	Depth (feet)
Clay, tan, silty	4	4
Gravel, cemented	62	66
Sand and gravel, loose	8	74
Gravel, cemented, with streaks of clay	29	103
Clay, gray	11	114
Sand, blue-gray, packed	2	116
Clay, blue and gray	56	172
Sand, gray	13	185
Clay, blue and gray	37	222
Sand, gray, packed, water-bearing	4	226
Clay, gray	5	231
Clay, brown	20	251
Shale, gray	14	265
Sand, gray, packed, water-bearing	10	275

4S/1E-4adb. John Beck. Altitude 165 ft. Drilled by J. W. Beck Well Drilling, 1959. Casing: 10-in. diam to 160 ft; perforated 70-160 ft

Materials	Thickness (feet)	Depth (feet)
Soil	4	4
Boulders, large, and cemented gravel	45	49
Gravel, water-bearing	4	53
Gravel, cemented	11	64
Gravel, large	10	74
Clay, brown	6	80
Sandstone, brown	23	103
Clay, blue	42	145
Sandstone, dark-colored	15	160

4S/2E-1bda. H. R. MacDonald. Altitude 790 ft. Drilled by Ross A. Jannsen Well Drilling, 1968. Casing: 6-in. diam to 237 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Clay, brown, with boulders	6	6
Claystone, yellow	13	19
Claystone, brown	32	51
Sandstone, brown	30	81
Claystone, gray	46	127
Rock, black, medium-hard	3	130
Rock, black-brown	15	145
Conglomerate, gray	25	170
Claystone, brown, sandy, soft	27	197
Claystone, brown, medium-hard	37	234
Rock, black, hard	11	245
Rock, gray and green, hard	68	313
Rock, gray-brown, hard	2	315
Rock, gray, hard	29	344
Claystone, yellow, soft	9	353

4S/2E-2bca. Owen Dunlap. Altitude 685 ft. Drilled by Keller Well Drilling Co., 1970. Casing: 6-in. diam to 60 ft; 5-in. diam 56-169 ft

Materials	Thickness (feet)	Depth (feet)
Soil	2	2
Clay, red	13	15
Clay, gray	25	40
Basalt, broken	114	154
Clay, sandy	15	169

4S/2E-3abb. Earl Graves. Altitude 635 ft. Drilled by Wm. J. Stennett, 1965. Casing: 6-in. diam to 132 ft; unperforated

Materials	Thickness (feet)	Depth (feet)
Soil	3	3
Clay, white and yellow	32	35
Sand, fine	1	36
Clay, yellow	20	56
Clay, blue	16	72
Clay, brown	18	90
Sand, fine, water-bearing (very muddy; 15 gal/min)	4	94
Sand, with clay particles	21	115
Claystone, brown, hard	13	128
Lava, gray, medium-hard, water-bearing	72	200

Materials	Thickness (feet)	Depth (feet)
4S/2E-3bcb. J. C. Stelle. Altitude 615 ft. Drilled by Wm. J. Stennett, 1967. Casing: 8-in. diam to 378 ft; unperforated		
Soil and sandy clay	39	39
Lava, gray	25	64
Clay, red	6	70
Sand, brown, packed	65	135
Lava, decomposed	51	186
Clay, brown, sandy	69	255
Clay, blue	55	310
Sandstone	48	358
Claystone, blue	20	378
Gravel, water-bearing	2	380
Clay, blue, water-bearing	4	384
4S/2E-4abc. Alfred Gaudin. Altitude 650 ft. Drilled by C. G. Westerberg Well Drilling, 1968. Casing: 6-in. diam to 642 ft; perforated 575-642 ft		
Soil	1	1
Clay, brown	4	5
Clay, red to purple	62	67
Rock, gray, partly decomposed	12	79
Clay, tan	18	97
Rock and boulders	13	110
Clay, blue and tan	107	217
Clay, blue, and gravel	38	255
Clay, gray and blue; contains sand and mica	126	381
Sand, gray, dry	17	398
Clay, blue, sandy	32	430
Sand, medium, water-bearing (8 gal/min)	5	435
Clay, gray	41	476
Sand, fine, with mica; water-bearing	7	483
Clay, gray; contains mica	14	497
Shale, gray, broken	7	504
Sand, gray, fine, with mica	8	512
Clay, blue	33	545
Sand, fine, with mica	12	557
Clay, gray, soft to hard	18	575
Sand, gray, coarse, with pumice and wood	5	580
Shale, gray to blue, hard; contains pumice	16	596
Clay, gray and black	12	608
Sandstone and shale	7	615
Shale, green, broken	19	634
Sand, black, coarse	8	642
4S/2E-5dca. C. T. Foster. Altitude 570 ft. Drilled by C. G. Westerberg Well Drilling, 1961. Casing: 6-in. diam to 141 ft; perforated 75-122 ft		
Soil	2	2
Clay, red	6	8
Clay and boulders	27	35
Clay, tan	8	43
Boulders	9	52
Clay, with streaks of porous rock	16	68
Basalt	15	83
Clay, gray	27	110
Clay, sandy	5	115
Sand	7	122
Clay, tan	6	128
Clay, blue	13	141
4S/3E-3baa. Letha Marple. Altitude 1,140 ft. Drilled by Skyles Drilling & Supply, 1967. Casing: 6-in. diam to 72 ft; unperforated		
Soil	4	4
Clay, brown	15	19
Boulders and brown clay	3	22
Clay, brown	36	58
Lava, gray	29	87
Lava, decomposed	11	98
Lava, red	27	125
Lava, gray	93	218
Lava, broken, water-bearing (13 gal/min)	8	226
Lava, gray	49	275
Lava, red, decomposed	5	280
Lava	20	300
4S/3E-4dbc. Dorn Baumeister. Altitude 1,310 ft. Drilled by J. F. Terrell Well Drilling, 1971. Casing: 8-in. diam to 21 ft; unperforated		
Boulders and red clay	20	20
Rock	24	44
4S/3E-5aac. Mike DeLair. Altitude 1,070 ft. Drilled by Skyles Drilling & Supply, Inc., 1970. Casing: 10-in. diam to 49 ft; unperforated		
Clay, brown, with boulders	12	12
Clay, brown	4	16
Clay, brown, with boulders	28	44
Lava, gray	25	69
Lava, decomposed	24	93
Lava, gray	47	140
Lava, decomposed	12	152
Lava, gray, hard	20	172
Lava, red, soft	24	196
Lava, gray	32	228
Lava, red, soft	6	234
Lava, gray	66	300
4S/3E-6adc. Nick Storie. Altitude 785 ft. Drilled by Ross A. Jannsen Well Drilling, 1967. Casing: 6-in. diam to 30 ft; unperforated		
Clay, brown	26	26
Rock, brown, soft	13	39
Rock, red-brown, porous, soft	22	61
4S/4E-5cbd. Estacada Golf Course. Altitude 1,045 ft. Drilled by Steinman Bros., 1970. Casing: 8-in. diam to 166 ft; unperforated		
Clay, yellow, granular	33	33
Clay, gray, granular	6	39
Clay, yellow	7	46
Rock, gray, soft	4	50
Rock, brown, with clay seams	20	70
Rock, bluish-gray	20	90
Rock, brown, with clay seams	4	94
Rock, gray	10	104
Rock, gray, with brown clay.seams	11	115
Rock, gray, medium-hard	12	127
Rock, gray, with white and brown specks	14	141
Rock, gray, with yellow clay seams	4	145
Rock, gray, with trace of gravel	20	165
Rock, gray, with yellow clay seams	15	180
Rock, gray, soft	10	190

Table 3.--Chemical analyses of water in the northern Clackamas County area

[Analyses by the U.S. Geological Survey]

Location number	Water-bearing unit	Depth of well (feet)	Date of collection	Milligrams per liter																			Sodium-adsorption-ratio (SAR)	Specific conductance (micromhos/cm at 25°C)	pH	Temperature	
				Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrite + nitrate (as N)	Phosphate, ortho as P	Boron (B)	Arsenic (As)	Dissolved solids, calculated from determined constituents	Hardness (Ca, Mg)	Noncarbonate hardness				°C	°F
2S/2E-14add	Tts	112	7/13/73	52	0.31	0.28	16	12	12	3.4	142	0	2.0	2.5	0.3	0.01	0.18	0.01	0.00	171	89	0	0.6	228	7.7	12.5	54
-24bad	Tts	95	7/13/73	68	.04	.00	14	8.1	8.8	1.1	105	0	3.3	2.0	.1	.00	.12	.04	.00	158	68	0	.5	163	7.4	11.0	52
-34bda	Tts	275	6/15/60	38	.01	--	16	9.9	27	3.6	166	0	.8	6.2	.1	[1] .00	--	--	--	184	81	0	--	268	7.4	--	--
2S/3E-21adc	Tts	60	7/30/73	40	.21	.24	21	6.7	28	2.6	150	0	2.3	4.8	.1	.24	.39	.01	.015	182	80	0	1.4	238	8.2	10.0	50
-26cbc	Qt	73	7/20/73	59	.13	.00	17	8.9	10	2.6	118	0	3.2	3.7	.2	.00	.05	.02	.00	163	79	0	.5	193	7.2	13.0	55
-33abc	Tts	158	7/30/73	45	.02	.00	8.9	3.8	6.5	1.1	63	0	.7	1.6	.1	.53	.12	.00	.002	102	38	0	.5	103	8.1	12.0	54
-33dda	Qt	75	7/13/73	40	.04	.00	11	4.1	6.2	1.7	62	0	.5	2.5	.1	.00	.02	.01	.00	97	44	0	.4	118	7.6	12.0	54
2S/5E-20cdc	Qsw	76	7/19/73	33	7.0	1.9	3.3	2.0	3.3	.8	34	0	3.3	2.7	.1	.25	.02	.02	.00	75	16	0	.4	55	6.6	12.0	54
-21bab	Qsw	66	7/17/73	21	.01	.00	2.4	1.0	2.4	.9	22	0	.9	1.5	.0	.01	.01	.02	.00	41	10	0	.3	33	7.7	13.0	55
-26cab	Tsa	145	7/17/73	45	.01	.00	8.1	4.1	6.0	1.1	65	0	1.5	1.5	.0	.03	.06	.02	.00	100	37	0	.4	97	7.2	11.5	53
2S/6E-23cda	Qal	60	7/17/73	35	.08	.00	6.4	2.7	4.1	1.1	40	0	6.1	1.4	.0	.30	.03	.02	.00	78	27	0	.3	75	7.3	10.0	50
2S/7E-26bdb	Qal	135	7/16/73	53	.03	.10	14	3.2	7.5	3.3	85	0	2.3	1.4	.0	.18	.03	.00	.001	128	48	0	.5	135	7.6	12.0	54
-30acb	--	486	7/16/73	41	.01	.01	3.5	.2	40	1.1	96	12	3.3	1.4	.3	.08	.04	.12	.002	151	10	0	5.6	182	8.6	16.0	61
3S/1E-26bcd	Tts	230	7/10/73	63	1.7	.43	42	7.6	15	5.1	182	0	4.7	14	.2	.01	.06	.07	.00	244	140	0	.6	324	7.2	13.0	55
-28cbd	Qal	165	7/11/73	45	.02	.05	22	8.6	11	3.4	83	0	23	5.0	.1	[1] .00	.12	.03	.001	159	90	22	.5	248	7.4	16.0	61
-31add	Qal	170	7/10/73	34	.21	.05	12	4.6	55	2.1	206	0	3.8	3.1	.1	.01	1.1	.02	.01	220	49	0	3.4	320	7.4	13.5	56
-33cbd1	Qal	107	10/10/28	41	--	--	24	11	7.4	1.8	132	0	5.0	4.0	--	[1] .54	--	--	--	162	105	0	--	--	--	11.5	53
-33cbd2	Tts	652	10/10/28	45	--	--	11	5.5	93	2.9	258	0	4.1	29	--	[1] .23	--	--	--	319	50	0	--	--	--	15.5	60
-34bdc	Qal	132	7/10/73	56	.01	.00	20	7.4	8.0	2.5	76	0	10	4.4	.1	5.7	.10	.02	.00	171	80	18	.4	206	7.3	12.5	54
3S/2E-2cba	Tts	190	6/15/60	56	1.2	--	12	10	9.6	1.9	111	0	2.4	1.8	.1	[1] .00	--	--	--	149	72	0	--	178	7.2	13.5	56
-6cca	Tts	191	7/12/73	37	.07	.00	9.6	5.3	5.1	.5	65	0	1.5	1.4	.2	.01	.03	.00	.00	93	46	0	.3	106	7.3	12.5	54
-8bca	Tts	638	7/11/73	24	.02	.03	8.0	2.8	43	1.8	150	0	1.6	2.9	.2	.01	.13	.04	.00	159	32	0	3.3	239	7.5	17.0	63
-9bba	Tts	80	7/12/73	35	.01	.00	11	6.9	8.3	.6	89	0	1.8	1.5	.0	.00	.10	.02	.00	109	56	0	.5	139	8.2	11.5	53
-9dcd	Tts	40	7/11/73	40	.02	.00	15	9.0	7.2	.7	109	0	3.8	2.0	.0	.00	.04	.02	.002	132	75	0	.4	170	7.2	11.5	53
Sandy River[2]	--	--	1/26/59	14	--	--	3.5	.3	2.0	.3	15	0	2.2	1.0	.2	[1] .3	--	--	--	29	10	0	.3	31	6.8	7.0	44
do.	--	--	9/17/59	23	--	--	5.5	1.5	3.6	.7	26	0	6.0	2.0	.1	.1	--	--	--	56	20	0	.4	60	7.2	11.0	51

See footnotes at end of table.

Table 3.--Chemical analyses of water in the northern Clackamas County area--Continued

[Analyses by the U.S. Geological Survey]

Location number	Water-bearing unit	Depth of well (feet)	Date of collection	Milligrams per liter: Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrite + nitrate (as N)	Phosphate, ortho as P	Boron (B)	Arsenic (As)	Dissolved solids, calculated from determined constituents	Hardness (Ca, Mg)	Noncarbonate hardness	Sodium-adsorption-ratio (SAR)	Specific conductance (micromhos/cm at 25°C)	pH	Temperature °C	Temperature °F
3S/2E-12ada	Tts	140	7/13/73	54	0.19	0.13	25	10	12	1.5	151	0	6.3	2.2	0.3	0.02	0.03	0.01	0.00	186	100	0	0.5	248	7.1	14.0	57
-25cbc	QTb	115	7/11/73	40	.01	.00	12	5.1	4.8	.6	68	0	1.3	2.4	.0	.00	.04	.01	.00	100	51	0	.3	110	7.1	13.0	55
-27cca	QTb	182	7/11/73	26	.03	.00	4.8	3.4	3.2	.5	41	0	2.3	1.6	.1	.00	.02	.01	.00	62	26	0	.3	66	7.7	13.0	55
-29abb	Tts	500	7/11/73	46	.06	.00	13	9.9	8.1	2.2	111	0	4.6	2.1	.1	.00	.10	.03	.002	141	73	0	.4	177	7.6	11.5	53
-32ccd	QTb	110	7/11/73	18	.06	.00	2.8	2.1	2.7	.2	19	0	2.8	2.0	.1	.90	.01	.01	.00	44	16	0	.3	48	7.2	12.0	54
-35aba	QTb	101	7/11/73	62	.01	.00	11	5.6	7.1	1.3	80	0	1.6	1.9	.0	.01	.17	--	--	131	51	0	.4	123	7.3	11.5	53
3S/3E-8aba	QTb	97	7/12/73	36	.02	.00	11	5.4	5.3	.6	62	0	1.1	4.5	.1	1.1	.02	.01	.00	100	50	0	.3	117	7.0	11.5	53
-33ccb	QTb	203	7/12/73	30	.01	.00	6.8	4.0	5.0	.5	56	0	.9	2.1	.1	.22	.02	.01	.00	78	33	0	.4	89	7.6	15.0	59
3S/4E-4bbc	Qt	61	7/19/73	24	.09	.01	6.5	1.9	4.9	.6	33	0	1.3	3.7	.0	.00	.02	.07	.00	59	24	0	.4	68	7.6	11.5	53
-6bcc	Qt	35	7/13/73	45	.03	.00	16	6.6	6.1	3.2	81	0	5.3	3.0	.2	.86	.02	.02	.00	129	67	1	.3	168	7.1	14.0	57
-7cdc	Qt	73	2/ 1/74	23	.00	--	6.4	1.6	4.1	1.6	29	0	3.7	.6	.3	.86	.09	.05	.00	60	23	0	.4	70	6.4	12.0	54
-15acc	Qsw	80	7/19/73	16	.06	.01	4.0	.5	1.6	.5	19	0	.9	1.1	.1	.13	.00	.01	.009	35	12	0	.2	26	7.8	12.0	54
-25bdc	Tsa	405	7/19/73	28	.07	.01	18	7.8	16	3.5	137	0	3.3	2.0	.2	.00	.10	.07	.00	147	77	0	.8	215	7.6	11.5	53
-32cbb	Qsw	67	7/19/73	17	.07	.00	3.0	1.4	1.9	.6	17	0	3.0	1.4	.0	.87	.01	.01	.002	41	13	0	.2	32	7.9	13.5	56
3S/5E-4cad	QTb	55	7/19/73	8.9	.08	.00	.9	.6	2.0	.3	12	0	2.0	1.1	.0	.25	.01	.01	.002	23	5	0	.4	16	7.0	11.5	53
-28cac	Tts?	578	9/20/67	26	.24	--	2.0	.5	65	1.0	100	10	2.8	33	.4	1/ .00	--	--	--	190	7	0	--	298	9.0	15.0	59
3S/7E-3bbb	Qal	163	3/28/66	43	.13	.00	6.4	2.6	7.4	1.9	55	0	2.0	1.0	.1	1/ .00	--	--	--	93	30	0	--	95	7.3	8.5	47
-4aaa	Qal	60	7/15/73	33	.02	.08	7.6	1.7	6.6	1.8	46	0	2.9	3.8	.3	.29	.02	.02	.00	82	26	0	.6	87	7.0	11.0	52
-5bdb	Qal	14	7/17/73	26	.08	.00	6.6	1.4	4.0	.9	35	0	4.1	1.5	.1	.33	.01	.01	.00	63	22	0	.4	57	7.8	9.5	49
-9caa	Qal	58	7/17/73	36	.04	.00	9.8	3.8	4.7	1.2	60	0	3.7	1.4	.0	.20	.06	.02	.002	91	40	0	.3	91	7.7	8.0	46
3S/8E-24abc	--	--	7/16/73	48	.08	.01	6.7	2.8	8.0	1.2	50	0	5.7	1.5	.3	.02	.05	.00	.00	99	28	0	.7	80	7.0	--	--
4S/2E-4abc	Tts	642	7/10/73	58	.40	.12	17	7.1	14	1.8	127	0	2.5	2.6	.1	.04	.16	.02	.002	167	72	0	.7	198	7.7	14.5	58
-5dca	QTb	141	6/11/62	25	1.2	--	4.0	3.0	5.1	.4	40	0	.0	2.0	.0	1/ .00	.01	.03	--	61	22	0	.5	72	6.5	13.0	55
4S/3E-6adc	QTb	61	7/12/73	17	.05	.00	1.0	.8	1.5	.3	10	0	1.6	2.2	.1	.13	.01	.01	.00	30	6	0	.3	20	6.8	11.0	52

1/ NO_3 only.
2/ Sandy River near Marmot, station 14138000.

Table 4.--Sources and significance of common chemical constituents of water

Constituent	Recommended limits for drinking water[1/] (mg/L)	Principal sources	Significance with respect to use
Silica (SiO_2)	--	Dissolved from soils and rocks in the area.	May form scale in pipes used in zeolite-type water softeners and in boilers.
Iron (Fe)	0.3	Common iron-bearing minerals present in most rocks in the area.	More than about 0.3 mg/L may stain laundry and utensils. Larger quantities may color and impart objectionable taste to water.
Manganese (Mn)	.05	Dissolved from manganese-bearing minerals.	Same objectionable features as iron. Causes dark-brown or black stain.
Calcium (Ca) and magnesium (Mg).	--	Dissolved from soils and rocks common to the area.	Principal causes of hardness and the major constituents in scale deposits.
Sodium (Na) and potassium (K).	--	do.	Large concentrations in combination with chloride may give water a salty taste. Excessive amounts of sodium may reduce soil permeability and limit use of water for irrigation. Potassium is essential for proper plant nutrition.
Bicarbonate (HCO_3) and carbonate (CO_3).	--	Soil and carbonate minerals through the action of carbon dioxide in soil, atmosphere, and precipitation.	In combination with calcium or magnesium, causes carbonate hardness resulting in the deposit of boiler scale when used with hot-water facilities.
Sulfate (SO_4)	250	Gypsum, iron sulfides, and other sulfur compounds. Also commonly present in many industrial wastes.	Sulfates of calcium and magnesium form hard scale and are cathartic and unpleasant to taste.
Chloride (Cl)	250	Chloride salts, largely NaCl, in the consolidated rocks of marine origin.	In high concentrations, imparts salty taste and may accelerate corrosion in pipes and other fixtures.
Fluoride (F)	[2/]2.0	Occurs in trace amounts in many soils and rocks	Optimum concentrations tend to reduce decay of children's teeth; concentrations greater than several milligrams per liter may cause mottling of the enamel of the teeth.
Nitrate (NO_3) + nitrite (NO_2), as N).	10	Decayed organic matter, fertilizers, sewage, and nitrates in soil.	Values substantially higher than local average may suggest pollution. An excess of 10 mg/L in drinking water may cause methemoglobinemia, the so-called "blue-baby" disease in infants.
Phosphate (P)	--	Dissolved from soils and rocks in the area. Also found in soaps, detergents, and fertilizers.	Phosphate is essential to all forms of life. In certain forms, phosphates can interfere with coagulation processes at water-treatment plants.
Arsenic (As)	.05	Occurs naturally in water in varying, commonly minute concentrations.	Prolonged consumption of water containing arsenic above toxic level may cause chronic poisoning.
Boron (B)	--	Occurs in trace amounts in some of the rocks in the area.	Essential in small amounts for proper plant nutrition. Unsuitable in concentrations of more than 4 mg/L for even the most tolerant crops and about 0.7 mg/L for sensitive crops.

1/ Recommended limits by National Academy of Sciences and National Academy of Engineering (1974). Exceptions are arsenic, fluoride, and nitrate, for which limits are set by the U.S. Environmental Protection Agency (1975).

2/ Recommended values based on average maximum daily air temperature in a given area.