STATE OF WASHINGTON
Albert D. Rosellini, Governor

DEPARTMENT OF CONSERVATION
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DIVISION OF WATER RESOURCES
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Water Supply Bulletin No. 9

Geology and Ground Water Resources of Clark County, Washington

By

M. J. Mundorff

Prepared in Cooperation with
UNITED STATES GEOLOGICAL SURVEY
GROUND WATER BRANCH
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GEOLOGY AND GROUND-WATER RESOURCES OF CLARK COUNTY, WASHINGTON, WITH A DESCRIPTION OF A MAJOR ALLUVIAL AQUIFER ALONG THE COLUMBIA RIVER

By M. J. Mundorff

ABSTRACT

This report presents the results of an investigation of the ground-water resources of the populated parts of Clark County. The investigation was undertaken initially at the request of the U. S. Bureau of Reclamation, and later expanded as a part of the program in cooperation between the Washington State Department of Conservation, Division of Water Resources, and the U. S. Geological Survey.

The important conclusions of the report are that yields adequate for irrigation can be obtained from wells in most farmed areas in Clark County. The total available supply is sufficient for all foreseeable irrigation developments. In a few local areas aquifers are fine-grained, and yields of individual wells are low.

An enormous ground-water supply is available from aquifers underlying the flood plain of the Columbia River in the vicinity of Vancouver, Camas, and Washougal, where aquifers are recharged, in part, by infiltration from the river. Yields of individual wells are large, ranging up to 4,000 gpm (gallons per minute).

Clark County lies along the western flank of the Cascade Mountains, in the structural lowland (Willamette-Puget Trough) between those mountains and the Pacific Coast Range to the west. The area covered by the report includes the urban, the suburban, and most of the agricultural lands in the county. These lands lie on a series of nearly flat plains and benches which rise steplike from the level of the Columbia River (a few feet above sea level) to about 800 feet above sea level.

Clark County is drained by the Columbia River (the trunk stream of the Pacific Northwest) and its tributaries. The Columbia River forms the southern and western boundaries of the county.

Although the climate of the county is considered to be humid, the precipitation ranging from about 37 to more than 110 inches annually in various parts of the county; the unequal seasonal distribution (about 1.5 inches total for July and August in the agricultural area) makes irrigation highly desirable for most crops and essential for some specialized crops.

Consolidated rocks of Eocene to Miocene age, chiefly volcanic lava flows and pyroclastics but including some sedimentary strata, crop out in the foothills of the Cascades in the eastern part of the county and underlie the younger, unconsolidated rocks in the lowlands to the west.

At most places small to moderate quantities of water can be obtained from fractures in the older consolidated rocks. However, in the populated parts of the county, these rocks generally are overlain by considerable thicknesses of more permeable materials, and few wells have been drilled in them. Springs and dug wells yield an ample domestic supply at a number of outlying farms in the foothills.

The younger (Pliocene to Recent) unconsolidated materials were deposited chiefly by streams, in the basin formed by downwarping of the older rocks. However, some lake deposits and glacial drift also are included. The oldest unit of this group, the lower member of the Troutdale formation of Pliocene age, consists chiefly of clay, silt, and fine sand but includes lenses of coarser sand and, rarely, gravel. The maximum known thickness of the lower member of the Troutdale formation is about 660 feet. This unit is not a good aquifer because most of the strata are fine grained. However, at a few places drilled wells have encountered lenses of coarser grained materials in these deposits and have obtained small to moderate amounts of water from them.

The upper member of the Troutdale formation consists almost entirely of lightly to moderately cemented gravel, of which the most striking feature is the presence of a considerable percentage of quartzite pebbles. The average thickness of the upper member of the Troutdale may originally have been 300 to 400 feet. The member crops out over considerable areas in the county and, where conditions of topography and exposure are optimum, has been very deeply weathered. It is suggested that the upper member of the Troutdale formation may prove to be of early Pleistocene age. This member is one of the best aquifers, and more drilled wells have been completed in this unit than in any other in the county. Most irrigation supplies are obtained from it. The best aquifers are the cleaner, uncemented or only lightly cemented sand and gravel layers below the weathered zone. Yields of several hundred gallons per minute are common and some wells yield more than 1,000 gpm.

Basaltic lava flows (Boring lava) overlie the Troutdale formation at a few places. The flows were extruded from local vents (on the western end of Prune Hill, Green Mountain north of Camas, Brunner Hill, and at Battle Ground Lake) which cut through the Troutdale and the older formations, and lava flows, scoria, and cinders were spread over relatively small areas.

The Boring lava generally is a moderately good aquifer, yielding water from vesicular, scoriaceous, and cinder zones. Because most of the relatively small area of outcrop in the county is sparsely inhabited hill land, few wells obtain water from the Boring lava.

Glacial drift, including till, glaciofluvial outwash, and deposits of glacial lakes or ponds, blanket much of the area north and northeast of Battle Ground. The glacial drift was deposited by or derived from a broad thick lobe of ice (probably more than 15 miles wide at places and more than 1,000 feet thick) which extended into the area from Mount St. Helens. The glaciofluvial-outwash deposits underlying Chelatchie Prairie and Yacolt Basin are permeable and probably are good aquifers, but few wells have been drilled in these areas and the deposits are largely untested as a source of ground water. Except for the glaciofluvial outwash the glacial deposits are unimportant as aquifers.

Gravel, sand, silt, and clay were deposited as a great deltaic fan of the Columbia River downstream from the mouth of the gorge near Washougal. These deposits chiefly lie directly on the upper member of the Troutdale formation, but at a few places lie ~~directly~~ on other rocks. The base of the deltaic deposits extends below sea level along the course of the ancestral Columbia River but is generally 100 to 220 feet above sea level in adjacent areas that underlie much of the Fourth Plains area. The deposits are very coarse toward the apex of the delta or fan but become progressively finer away from the apex. Later, the Columbia River cut down through the delta and largely reoccupied its former channel, leaving a series of wide benches and terraces.

The coarser phases of these deposits are extremely permeable and yield large quantities of water. Many domestic and a number of irrigation supplies are obtained from them, although much of the rural part of the county is underlain by the finer grained phases. Some broad benches are underlain by the coarser, more permeable strata which lie above the zone of saturation. The largest supplies are obtained along the valley of the Columbia River at Washougal, Camas, and Vancouver, where most industrial and municipal wells obtain water from these deposits. Yields are commonly more than 1,000 gpm with drawdowns of only a few feet. Several wells have yielded more than 4,000 gpm.

Surface-water resources of the county are very large; the average discharge of the Columbia River at The Dalles is about 194,000 cfs (cubic feet per second). Other streams tributary to the Columbia River also are important as possible sources of supply.

The occurrence of ground water in various parts of the county is directly related to the character of the rock and to landforms.

The foothills area is underlain chiefly by consolidated rocks of volcanic origin which will yield only small to moderate supplies of water from joints and other fractures. These rocks generally are deeply weathered, and the residuum yields small supplies (but generally ample for domestic use) to dug wells. The area is sparsely inhabited and the few water supplies are obtained mostly from dug wells or springs. In the larger intermontane valleys, water supplies are obtained from fluvial and glaciofluvial sand and gravel which were deposited over the valley floors. Although moderate to large supplies probably are available at several places, generally only small supplies, for domestic use, have been developed.

In the alluvial plains and benches, which include most of the farmlands in the county, wells obtain water from sand and gravel strata at depths less than 300 feet. The Troutdale bench, ranging from about 400 to 1,000 feet above sea level, is the highest. It extends from Camas and Washougal, in a direction slightly west of north, to the Lewis River between Woodland and Fargher Lake. The entire bench is underlain by the Troutdale formation, which has been weathered to depths of 100 feet or more. At some places, particularly in areas of higher elevation, weathering has reached or nearly reached the base of the upper member of the Troutdale. As the weathering reduces the permeability, and as the lower member of the Troutdale is not a good aquifer, little or no water has been obtained. At other places, particularly in areas not so greatly elevated, weathering has been less deep, and moderate supplies are obtained from the upper member of the Troutdale. A few wells obtain small to moderate yields from the Boring lava, and some wells obtain scanty to moderately small supplies (maximum 35 gpm) from the volcanic rocks beneath the Troutdale formation.

The Fourth Plains area lies chiefly between the altitudes of 150 and 300 feet and includes most of the better grade of farmland and most of the irrigation wells. There are two important aquifers in the area: (1) the Pleistocene alluvial deposits which are utilized for most domestic and some irrigation supplies; and (2) the upper member of the Troutdale formation, which is utilized for most irrigation and municipal supplies. The Pleistocene alluvial deposits in general form a blanket, from a few feet to about 200 feet thick, over the Fourth Plains area. However, where they are thickest and most permeable, the ground water drains out readily and the water table generally is far below the surface, so that these deposits are dry or saturated only near the base. Where the deposits are thin or are finer grained and therefore less permeable, perched or semiperched ground water is obtained from lenses of coarser grained materials. Most of the irrigation wells tapping these deposits are in the area between Burntbridge and Salmon Creeks.

The upper member of the Troutdale formation furnishes several hundred gallons per minute to 1,000 gpm almost everythwere in the Fourth Plains area except in the area northwest of Pioneer. Total annual recharge to the principal aquifers in the upper member of the Troutdale formation in the Fourth Plains area is estimated to be on the order of 150,000 acre-feet. A large part of this ground water could be recovered if it were needed.

The lowland and flood-plain areas along the Columbia, Lewis, and the East Fork of the Lewis River are underlain by alluvial deposits including silt, sand, and gravel ranging from a few feet to more than 100 feet in thickness. The coarser grained strata are extremely permeable and yield very large amounts of water. West of Vancouver, coarse sand and gravel in the Troutdale formation underlie the alluvial deposits and also yield large amounts of water. Many wells in the vicinities of Camas and Vancouver yield more than 1,000 gpm, and several wells were tested at rates of 4,000 gpm or more. Specific capacities (yield in gallons per minute per foot of drawdown) commonly are several hundred and for a few wells exceed 1,000. Recharge is derived in part from underflow from upland areas to the north and east but also in part from the Columbia River.

The chemical quality of the ground water in Clark County is such that the water is suitable in most respects for all uses.

Domestic and stock use of ground water in the County is estimated to be 3.6 mgd (million gallons per day). Public-supply systems use an average of about 9 mgd of water, of which more than 7 mgd is ground water obtained from wells and springs. Much of the water used by industry is obtained from wells. Total industrial use of ground water which is concentrated in the Vancouver and Camas areas, is about 75 mgd. Records of the Washington State Department of Conservation, Division of Water Resources, showed that 137 farms irrigated more than 3,000 acres from wells in 1955. This report lists 172 irrigation wells, which annually pump an estimated 8,000 to 10,000 acre-feet.

INTRODUCTION

PURPOSE AND SCOPE OF THE INVESTIGATION

The investigation of the ground-water resources in the Fourth Plains area of Clark County was undertaken at the request of the Bureau of Reclamation for the purpose of determining whether ground-water supplies were sufficient for irrigation of the area. In order to determine the lateral extent and continuity of the aquifers and to define the areas of recharge it was necessary to extend the study somewhat beyond the irrigable area.

Because of the interest of the State and Federal governments in the water resources of the area, the investigation was extended further to include all the heavily populated area of the county, and was supported in part by funds from the program conducted by the U. S. Geological Survey in cooperation with the Washington State Department of Conservation, Division of Water Resources.

A large number of wells were canvassed; depths of wells, water levels, discharge of springs, and dry-weather discharge of streams were measured; well logs were collected from drillers; and the geology was mapped. These data were analyzed and interpreted in terms of ground-water occurrence and availability. Most of the wells were canvassed during 1949 and 1950, although considerable field work was done during 1954 and 1955.

LOCATION AND EXTENT OF THE AREA

Clark County is in the southernmost part of the State on the west flank of the Cascade Mountains. The county lies chiefly within the northward continuation of the same structural basin that contains the Willamette Valley in Oregon. Vancouver, the largest city in Clark County, is on the north bank of the Columbia River, across the river from Portland, Oregon. The Columbia River forms the southern boundary of Clark County and of the State of Washington. A few miles west of Vancouver the Columbia River turns northward and thus also forms the western boundary of the county. The Lewis River forms the northern boundary and the meridian between Ranges 4 and 5 E. forms the eastern boundary.

The area covered by the investigation (fig. 1) includes most of the county except the thinly populated hilly and mountainous sections. However, fieldwork was concentrated in the dominantly agricultural areas which appeared to be amenable to irrigation. The largest of these areas, lying north and east of Vancouver, is known as the Fourth Plains area and contains about 50,000 acres of land susceptible to irrigation.

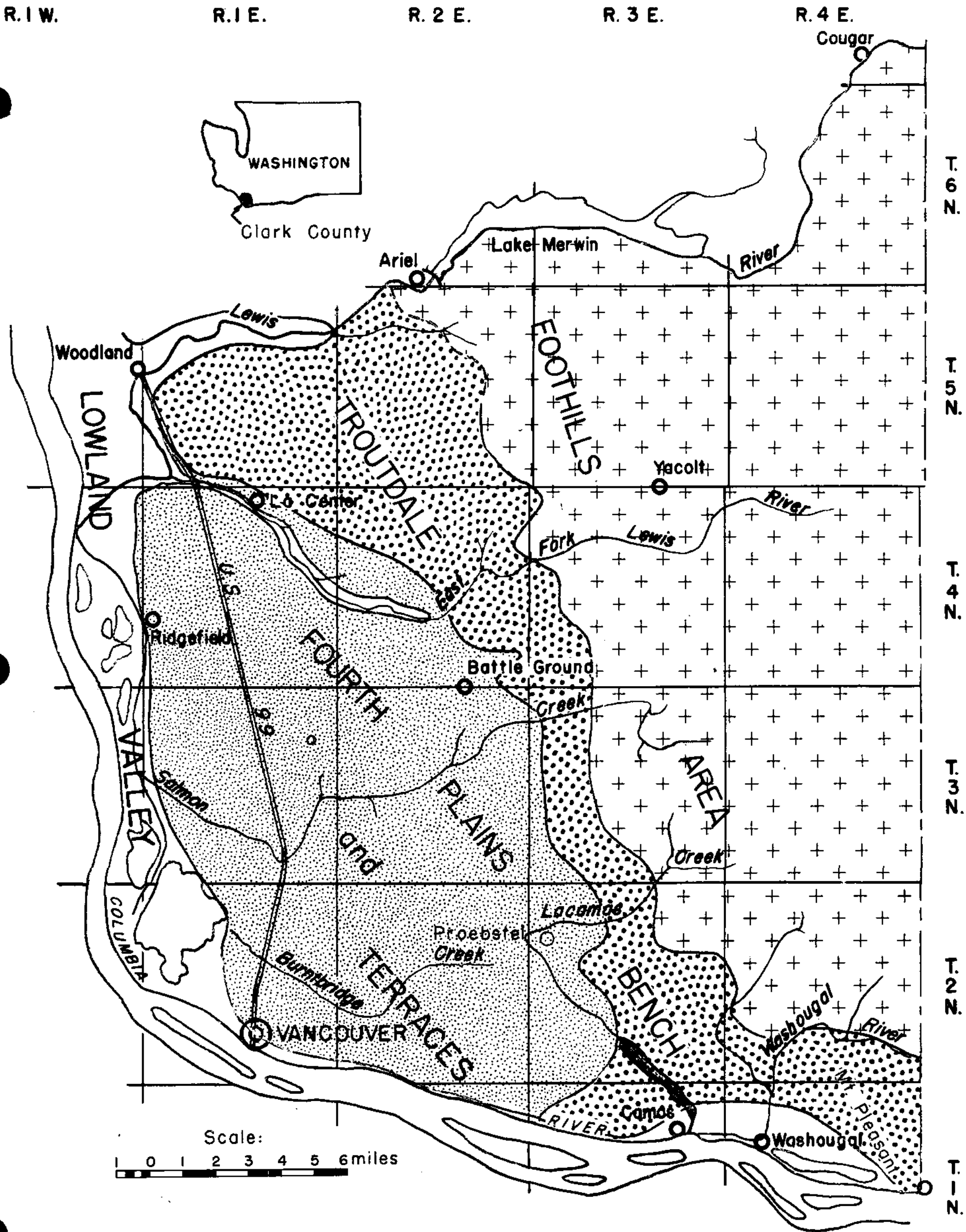


Figure I.- Location map of Clark County, Wash., showing physiographic divisions and ground-water areas.

WELL- AND SPRING-NUMBERING SYSTEM

Well numbers used by the Geological Survey in the State of Washington are based on and show locations of wells according to the rectangular system for subdivision of public land, which indicates township, range, section, and 40-acre tract within the section. For example, in the well number 3/2-15P1, the part preceding the hyphen indicates successively the township and range (T. 3 N., R. 2 E.) north and east of the Willamette base line and meridian. Because all townships in Washington are north of the Willamette base line the letter "N", indicating north, is omitted; and because most of the State is east of the Willamette meridian the letter "E" is omitted for those ranges east of the Willamette meridian, but "W" is included when the range lies west of the Willamette meridian. The first number following the hyphen indicates the section. In the example cited above, the well is in sec. 15. Each section is divided into 40-acre tracts and each of these is assigned a letter, beginning with A in the northeast corner, and ending with R in the southeast corner. The 40-acre tracts are lettered serially in the same sequence used in numbering sections within a township. The letters "I" and "O" are omitted because of the likelihood of mistaking them for "one" and "zero." The last number (1) is the serial number of the well in the particular 40-acre tract. In the cited example, the designation "-15P1" indicates that the well is in the SE$\frac{1}{4}$SW$\frac{1}{4}$ sec. 15 and that it is the first well to be canvassed within that 40-acre tract. The next well to be canvassed there would, of course, be designated 3/2-15P2.

Springs are numbered in the same manner except that the letter (s) is added following the complete number. That is, the first spring recorded in the SE$\frac{1}{4}$SW$\frac{1}{4}$ sec. 15 would have the number 3/2-15P1s. Geologic features are numbered in the same way but using small letters of the alphabet instead of numbers. Thus, the first outcrop described in the SE$\frac{1}{4}$SW$\frac{1}{4}$ would have the number 3/2-15Pa and the second outcrop would have the number 3/2-15Pb.

PREVIOUS INVESTIGATIONS

There have been no previous investigations of ground water in the county. However, some of the hydrologic information obtained during the course of this investigation was used in a report on the water resources of the Portland-Vancouver area by W. C. Griffin and others (1956). A few geologic reports briefly mention localities in Clark County, and some more detailed reports cover small parts of the county. On the State Geologic Map (Culver, 1936) the geology of Clark County is shown but is greatly generalized. Geologic reports containing some information on Clark County include those by Shedd (1903, 1910), Darton (1909), Landes (1911), Leighton (1919), Allison (1935, 1936), Hodge (1938), Felts (1939), Treasher 1942a), Wilkinson and others (1946), and Baldwin and Lowry (1952).

ACKNOWLEDGMENTS

The well records were obtained chiefly from well owners and users and from well drillers. The friendly cooperation of these people and other residents in the area is gratefully acknowledged. Additional well data were obtained from the files of the Washington State Department of Conservation, Division of Water Resources, and the cooperation of the personnel of that department also is greatly appreciated.

CLIMATE

Clark County has the mild, equable climate typical of northwestern Oregon and western Washington. The chief characteristics are the mild wet winters and moderately warm dry summers. The climate of the county shows clearly the orographic influence of the northward-trending Cascade Mountains to the east and the parallel Coast Range to the west.

Data on the weather have been obtained by the U. S. Weather Bureau at the stations shown in table 1. The locations of these stations are shown on figure 4. Annual precipitation at Vancouver, Battle Ground, and Ariel Dam for all years of record, is shown graphically in figure 2.

Table 1.—U. S. Weather Bureau stations, active through 1955, and discontinued, in the Clark County area.

Station	Altitude (feet)	Precipitation: Years of record	Precipitation: Period 1/	Precipitation: Average annual (inches)	Mean annual temperature (°F)
Ariel Dam	224	20	1932-	66.09	..
Battle Ground	295	17	1934-1939, 1940-	47.22	..
Cougar 5E	630	23	?	114.65	..
LaCenter	200	41	1896-1923, 1925-1940	48.85	50.5
Mount Pleasant	650	22	1900-1921	56.84	51.6
Vancouver	100	71	1849-1868, 1888-1892, 1898-	37.32	52.5
Yacolt	737	32	1912-1946	75.76	..

1/ Includes some years of partial or incomplete records.

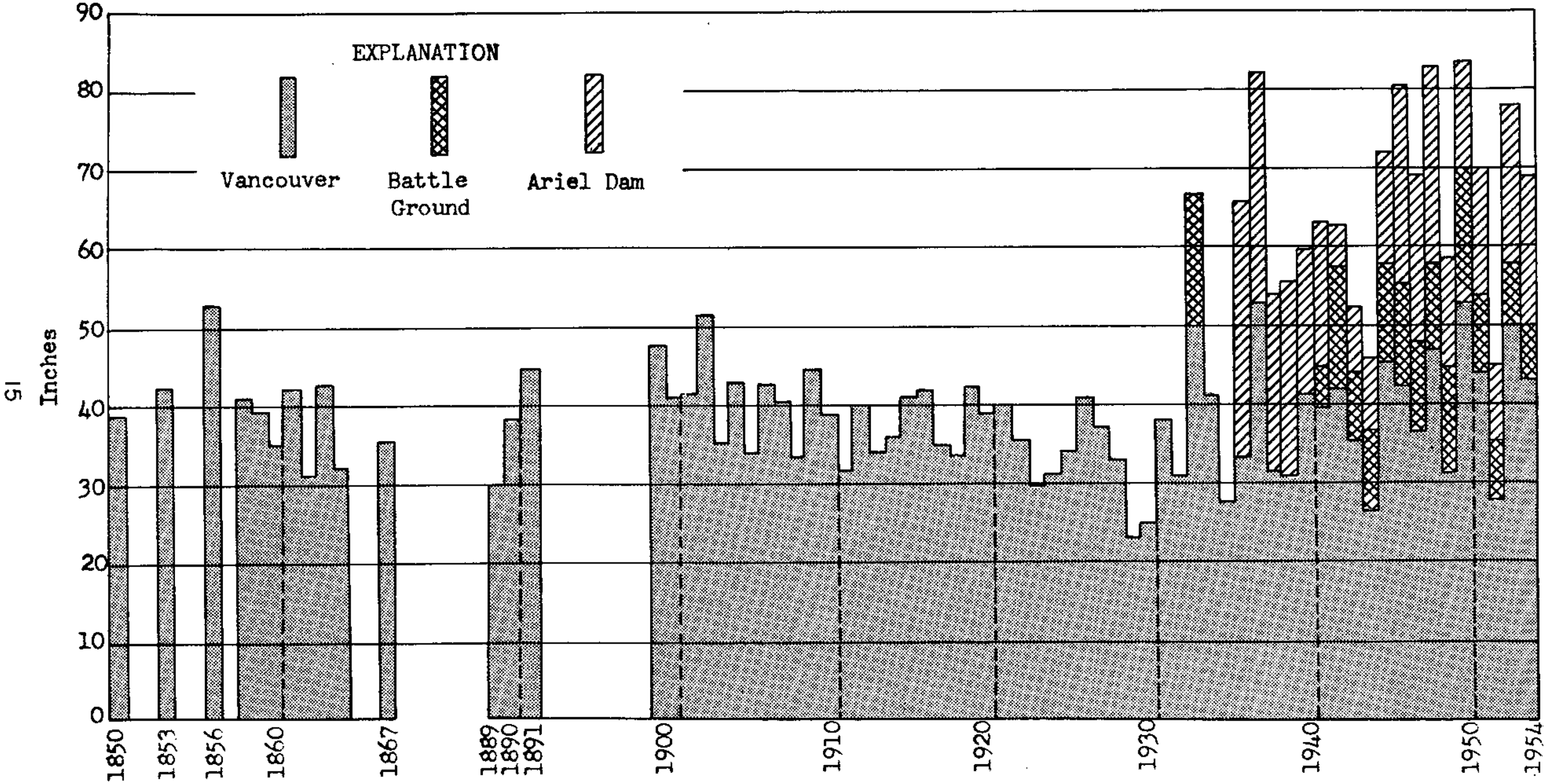


Figure 2.--Annual precipitation at Vancouver, Battle Ground, and Ariel Dam.

PRECIPITATION

Most of the precipitation in Clark County is caused by the passage of low-pressure areas along a fairly well-defined path from the north Pacific Ocean eastward over the continent. The usual summer and early autumn path of these storm centers is to the north of Clark County and the State, so that there is little precipitation during this period. In autumn, usually in the latter part of September or in October, the storm path shifts southward and starts the rainy season, which generally continues until March or April. Almost exactly 75 percent of the precipitation in Clark County normally occurs during the 6-month period from October 1 to March 31. The remaining 6 months, from April 1 to September 30, receive only 25 percent of the precipitation, and the average precipitation in the 2-month period of July-August is only 3.2 percent of the average annual precipitation. It is this shortage of rainfall during the growing season that makes supplemental irrigation so beneficial in Clark County. The seasonal distribution of precipitation at Vancouver is illustrated in figure 3, which shows the maximum and minimum of record and the average monthly precipitation. Shown also are the ranges for the lowest 25 percent, the highest 25 percent, and the middle 50 percent of years of record. It is interesting to note, and important to irrigation, that precipitation in July and August was average or below in 75 percent of the years. It is obvious that the average for these months has been raised considerably by unusually heavy rainfall in relatively few years.

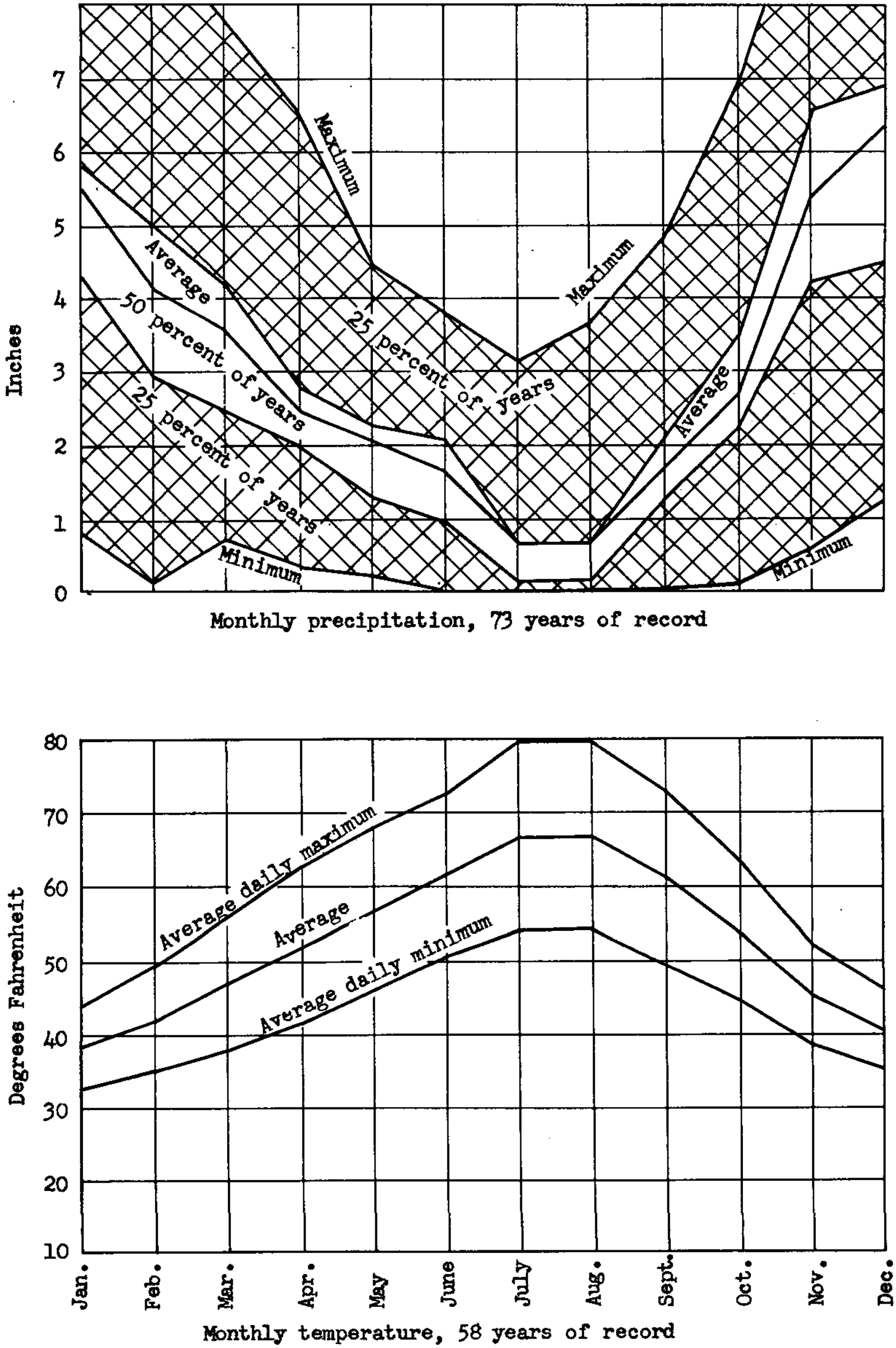


Figure 3.--Climatological data for Vancouver.

The average annual precipitation in Clark County differs greatly from place to place, and this difference is directly related to orographic effects of the two bordering mountain ranges. Average annual precipitation on much of the Coast Range to the west and the Cascade Mountains to the east exceeds 100 inches. Precipitation at lower altitudes, and toward the center of the basin between the two mountain ranges, is much less. At Vancouver, which is the driest weather station in Clark County, precipitation averages only about 37 inches annually. At Battle Ground, 12.3 miles northeast of Vancouver, the average annual precipitation is more than 47 inches and at Yacolt, 21 miles northeast of Vancouver, the average is more than 75 inches. The isohyetal map, figure 4, illustrates the distribution of the average annual precipitation in Clark County. The average precipitation ranges from Vancouver's 37 inches to more than 114 inches in the extreme northeast corner of the county. Precipitation data for both active and discontinued stations are summarized in table 2.

Although the range in annual precipitation is great, the range during the growing season is less. For example, precipitation for July and August combined averages 1.40 inches at Vancouver, the driest staion, in comparison with 2.77 inches at Cougar, the wettest station.

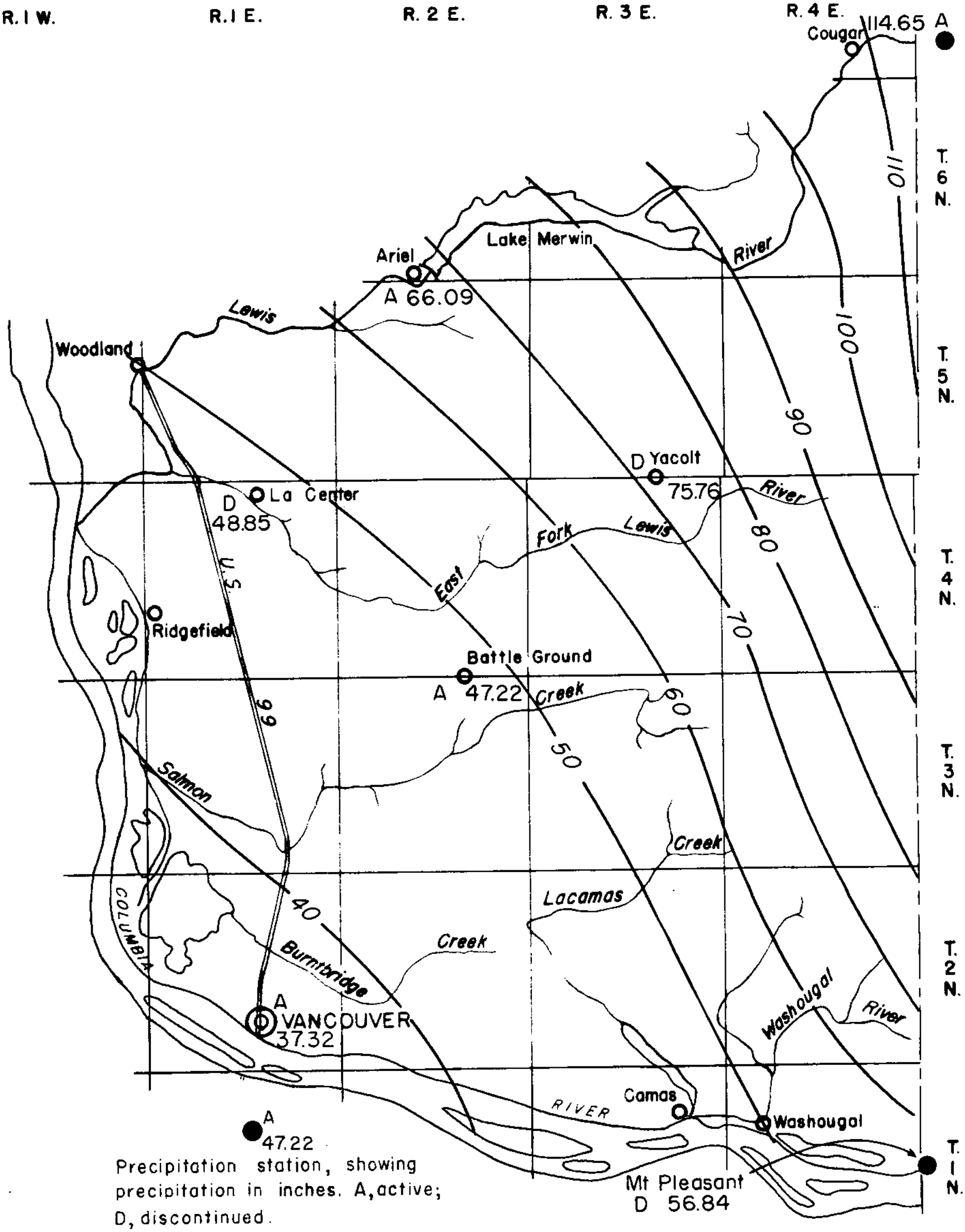


Figure 4.—Isohyetal map of Clark County showing average annual precipitation, in inches.

Table 2.--Average monthly and annual precipitation, in inches, at U. S. Weather Bureau Stations in the Clark County area

Station	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Ariel Dam	8.19	7.97	7.47	4.24	2.82	2.84	1.00	1.14	2.68	6.43	9.80	11.51	66.09
Battle Ground	5.80	4.40	4.99	3.14	3.03	2.43	.47	.70	2.32	4.68	6.90	8.36	47.22
Cougar, 5E	14.96	13.08	14.60	7.69	4.92	4.02	1.24	1.53	4.15	10.90	16.48	21.08	114.65
La Center	6.85	5.81	4.89	3.38	2.71	1.90	.71	1.04	2.64	4.09	7.61	7.22	48.85
Mount Pleasant	7.91	6.11	5.76	4.37	3.77	2.75	1.12	1.06	3.03	4.48	8.91	7.57	56.84
Vancouver	5.54	4.14	3.57	2.48	2.08	1.68	.71	.69	1.79	2.72	5.53	6.39	37.32
Yacolt	10.74	8.55	8.89	5.47	3.58	2.85	.94	1.35	3.38	6.35	10.71	12.95	75.76
Average	8.57	7.15	7.17	4.40	3.27	2.64	.88	1.07	2.86	5.66	9.42	10.73	63.82

Table 2a.--Average monthly and annual temperatures, in degrees Fahrenheit, at U. S. Weather Bureau Stations in the Clark County area

La Center	37.4	40.4	44.3	49.4	54.4	59.7	64.2	64.2	58.6	51.2	43.6	39.7	50.5
Mount Pleasant	37.6	40.4	46.0	50.8	54.8	60.0	64.8	65.5	60.8	54.2	45.6	39.0	51.6
Vancouver	38.4	41.8	47.0	52.0	57.0	62.0	66.8	66.9	61.4	54.3	45.5	40.4	52.5

Table 2b.--Average total evaporation, in inches, at U. S. Weather Bureau Stations in Western Washington[1/]

Seattle Maple Leaf Reservoir	0.50(E)	0.89	1.76	2.91	4.40	4.77	6.28	4.97	3.25	1.55	0.65	0.53	..
Wind River (Skamania Co.)	..	..	..	3.20	4.86	5.55	7.07	6.82	3.50	1.57	..	..	..

1/ Measured in standard Weather Bureau class A land pan, 4-foot diameter

(E) estimated for this report

TEMPERATURE

Temperature data are available for only three weather stations in Clark County; Vancouver, La Center, and Mount Pleasant; all these are at low altitudes. The data for the three stations are summarized in table 2a. Records of these stations suggest that temperatures throughout the populated areas of the county are remarkably uniform. If data for higher elevations were available, a considerably greater range would be shown.

At Vancouver the mean annual temperature is 52.5°F, only slightly greater than that at LaCenter and Mount Pleasant. January is the coldest month, with an average temperature of 38.4°F at Vancouver. July and August are the warmest months, with an average temperature of 66.8°F and 66.9°F respectively, at Vancouver. Thus, the difference between the average temperatures of the coldest and the warmest months is only 28.5°F. Average, average maximum, and average minimum monthly temperatures at Vancouver are shown in figure 3.

Average temperatures, though important, give only a partial picture. The annual and seasonal extremes, the duration of these extremes, the day-to-day variation, and the diurnal variation also are important factors. These factors, though easy to measure, are difficult to express statistically. Some of these data are enlightening, however. At Vancouver for the period 1931-52, the average maximum temperature for August was 80°F. In only 2 of the 22 years was the average maximum for August more than 83°F. During the same period the average minimum temperature for January was 34.6°F. In only 5 of the 22 years was the average minimum for the month less than 31°F.

GROWING SEASON, SNOWFALL, AND EVAPORATION

At Vancouver the average date of the last killing frost in the spring is March 29. The average date of the first killing frost in the autumn is November 13. On this basis the average length of the growing season is 229 days; however, most crops have matured long before the first autumn frost so that this date is not very important except, perhaps, for pastures. The last frost in spring is important because it determines the date on which it is comparatively safe to plant crops. For 55 years of record at Vancouver through 1952, the latest date for a killing frost in the spring is April 29. During more than 75 percent of the time no killing frost has occurred after April 15, and since 1927, only twice has a killing frost occurred after April 10.

Average annual snowfall at Vancouver is about 8.4 inches. Snowfall at other weather stations in the county ranges from 8.9 inches at Mount Pleasant to 22.5 inches at Yacolt. These stations are all at comparatively low altitudes; Yacolt, the highest, is 737 feet above sea level. At higher altitudes snowfall is much greater, probably exceeding 200 inches at 3,000 feet.

There are no Weather Bureau evaporation stations in Clark County. The nearest station is at Wind River, in Skamania County. Evaporation rates at Seattle Maple Leaf Reservoir probably are also comparable to those in Clark County. Average monthly evaporation at the two stations is given in table 2b. At the Seattle station average evaporation is given for every month except January. Adding an estimated 0.50 inch for January gives an average annual evaporation of 32.46 inches. Weather Bureau evaporation data are based on evaporation from the Weather Bureau's Class A land pan. A coefficient of 0.70 commonly is applied to evaporation records from this type of pan to reduce them to equivalent reservoir-evaporation figures; thus, average annual reservoir evaporation at Seattle would be about 22.6 inches. Evaporation, as shown in figure 5, commonly exceeds precipitation in the months of May, June, July, and August, and thus throughout most of the growing season.

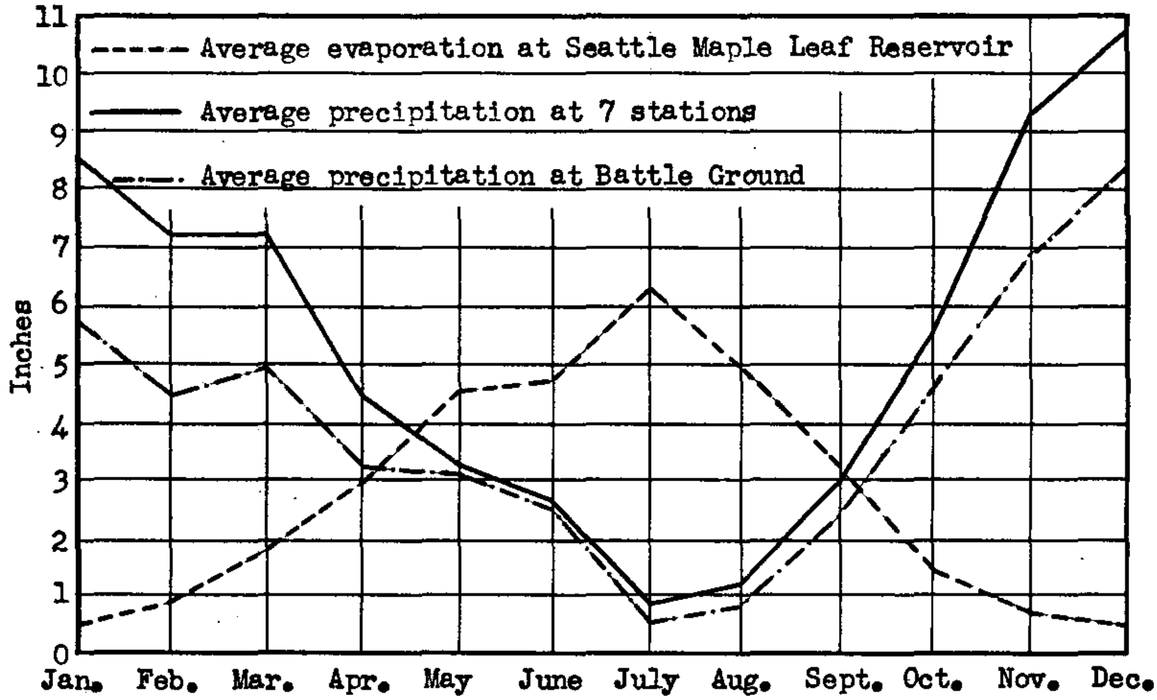


Figure 5.--Average precipitation of 7 stations, and at Battle Ground, and average evaporation at Seattle Maple Leaf Reservoir.

ECONOMIC DEVELOPMENT

Economic development in Clark County is quite well diversified. Agriculture is important but in total value of products is secondary to industry, which includes lumbering, pulp and paper, chemical, and aluminum production.

AGRICULTURE

Most of the farmland lies in the southwestern part of the county on terraces and terrace plains ranging from about 30 to 800 feet above sea level. The hilly and mountainous areas in the northern and eastern parts of the county chiefly are forested or logged-off brush lands in which farming is confined to the larger valleys.

Dairy products account for more than 40 percent of the value of farm products sold. Livestock and poultry products are second and third in value, respectively. Orchard crops, berries, and vegetables also are important crops. Part of the reason for the rapid increase in irrigation is the type of crops produced. Pasture for livestock and dairy cattle, and berries and vegetable crops, require supplemental water during the dry summer.

INDUSTRY

Industry, although based to a considerable extent on the availability of cheap electrical power, availability of raw materials, and harbor facilities for ocean-going shipping, is based also upon the ready availability of large supplies of ground water. The chief industries are the manufacture of aluminum, chemicals, paper and allied products, lumber and plywood, and food products. Vancouver and Camas are the largest industrial centers.

PHYSIOGRAPHY

Clark County lies in the long structural basin (Willamette-Puget Trough) between the Pacific Coast ranges on the west and the parallel Cascade Range on the east. The Columbia River, which is the major trunk stream of the Pacific Northwest, cuts through both mountain systems and crosses the trough to empty into the Pacific Ocean to the west. Clark County is bounded on the south and west by the Columbia River and is drained by streams tributary to that river.

The western and more thickly populated half of the county consists of a series of nearly flat plains and benches rising steplike from the level of the Columbia River (fig. 1). These range in elevation from only a few feet to about 800 feet above sea level. The eastern half of the county consists of foothills along the western slope of the Cascade Mountains. The boundary between these two distinctly different physiographic units trends roughly 20° west of north from Washougal, passing a few miles east of Battle Ground.

FOOTHILLS AREA

The foothills area of Clark County is part of the middle Cascade Mountain section of the Sierra-Cascade province as defined by Fenneman (1917). The part of this section within Clark County lies entirely on the west slope of the Cascade Mountains. The topography of the foothills has been produced chiefly by erosion, in contrast to the topography of the plains to the west which in considerable part is depositional.

The foothills area as a whole presents the appearance of a maturely, and in some places sharply, dissected westward-sloping plateau. Along the eastern margin of the county some of the higher peaks rise to altitudes of nearly 4,000 feet. Peaks between 2,000 and 3,000 feet in altitude are common. Some of the lower hills are moderately rounded, but many of the higher ones are flat-topped and bounded by steep scarps. Scarps which descend 1,000 feet in a lateral distance of half a mile are not uncommon.

A few ridges are hogbacks formed by differential erosion of dipping strata. Other hills and mountains have been formed by volcanic activity. Tum Tum Mountain, which rises to about 1,950 feet at the northeastern end of Chelatchie Prairie, is a volcanic cone practically unmarked by erosion. A postulated fault trace along the southeastern edge of Chelatchie Prairie (p. 47) passes beneath Tum Tum Mountain, and it is believed that the volcanic material came up along the fault plane.

Within the foothills area are several large, flat-bottomed basins, the largest of which are Chelatchie Prairie and the Yacolt Basin. Chelatchie Prairie is about 5 miles long and averages nearly three-quarters of a mile in width. The altitude of the prairie ranges from about 400 feet at the southwest end to nearly 600 feet at the northeast. The Yacolt Basin is about 4 miles long and averages nearly a mile in width. The altitude of the floor ranges from about 600 feet at the southeast end to more than 700 feet at the northwest end. Neither of these basins can be explained on the basis of ordinary stream erosion. It seems probable that both basins, and probably several other smaller ones, were formed by faulting and partial filling with alluvium at the base of the fault scarps.

In the Yacolt-Amboy-Fargher Lake area the topography has been considerably modified by glaciation. A great tongue of ice apparently came down the Lewis River valley and covered a considerable part of northeastern Clark County. The most prominent glacial features are the rounded rock hills and spurs (rock drumlins), many of them elongated in the direction of ice movement. They are especially numerous along the north flank of Chelatchie Prairie, and between Amboy and Fargher Lake. Generally they are covered with a blanket of till. Rock drumlins are especially prominent immediately north of Amboy and along Cedar Creek west of Amboy.

Ice-marginal drainage channels were cut high on the flanks of Green Mountain northwest of Amboy and on the north flank of Bells Mountain along the south side of the East Fork of the Lewis River. Lesser channels, now abandoned, are found at a number of other places.

The very irregular, "knobby" topography west of Fargher Lake appears to be due to deposition of ground moraine over the very irregular erosion surface on the Troutdale formation and the old volcanic and consolidated sedimentary rocks. Hummocky ground moraine also is prominent along the East Fork of the Lewis River about 4 miles southeast of Yacolt.

Several major drainage changes are believed to have been caused by the glaciation. Prior to glaciation, Lewis River probably flowed southwestward through Chelatchie Prairie and down the valley now occupied by Cedar Creek west of Amboy. The East Fork of the Lewis River is believed to have entered Lewis River at Amboy. The opposed courses of Cedar and Yacolt Creeks near Yacolt are striking examples of the changes produced by glaciation.

ALLUVIAL BENCHES AND PLAINS AREA

The foothills area gives way rather abruptly to the alluvial plains. Generally the boundary is marked by a pronounced change in slope and a change in lithology from the volcanic rocks of the foothills to the unconsolidated and semiconsolidated sedimentary rocks of the plains. However, in the area north of the East Fork of the Lewis River, between Battle Ground and Ariel Dam, the contact between the Troutdale formation and the older rocks is covered by glacial drift and the physiographic boundary is rather indefinite.

Troutdale Bench

The highest plain or bench is formed almost entirely on the moderately eroded and very deeply weathered surface of the Troutdale formation. This bench extends from the extreme southeastern corner of the county at Mount Pleasant westerly towards Camas, then northwesterly towards Proebstel, then northerly towards Battle Ground. At Battle Ground the boundary between this bench and the foothills continues in a northerly direction to the Lewis River, but its boundary with the lower plains swings northwestward to Woodland. The segment from Proebstel to Battle Ground is known as Fifth Plain and the segment north of the East Fork of the Lewis River is known as the Highland Area. From Mount Pleasant to Battle Ground, a distance of some 20 miles, the bench is fairly uniform in width; generally about 2 miles wide; northward and northwestward from Battle Ground its maximum width is about 7 miles.

The elevation of the bench is quite uniform throughout most of its length; however, the two ends are somewhat higher.

At Mount Pleasant the Troutdale formation is partially covered by younger volcanic rocks (Boring lava). The surface of the Troutdale bench ranges in altitude from 600 to 900 feet at the contact with the Boring lava to about 500 feet at its outer, southwestern margin. Northwestward from this point the altitude of the flat upland segments between erosion channels generally ranges from 400 to 600 feet. The outward slope (away from the foothills) is moderate, and generally is not more than about 50 feet per mile. North and northwest of Battle Ground the surface of the bench rises somewhat, and it is highest along the northward-facing scarp about a mile south of the Lewis River. It seems probable that the Troutdale bench abutted the hills to the north and northwest in southern Cowlitz County, and sloped southwestward to the East Fork of the Lewis River. The Lewis River has cut down approximately along the contact of the Troutdale formation with the older volcanic rocks which form the hills, and has left only a few isolated patches of the Troutdale formation on the north side of the river. The altitudes along the scarp that forms the northern margin of the bench is generally not more than 800 feet, and from that scarp the surface, between present erosion channels, slopes slightly west to south, to an altitude of 500 or 600 feet, at an average of about 100 feet per mile.

Whether the flat westward- and southwestward-sloping remnants of the Troutdale bench represent essentially the original depositional slope on the Troutdale formation, or whether the deposits were tilted, is not certain. However, at some other places it is apparent that the Troutdale formation has been gently warped and folded.

For almost its entire length the Troutdale bench is separated from the lower plains by a scarp 100 to 200 feet high. This scarp is believed to be largely of structural origin, probably chiefly a downwarping to the west, but in part it may also have been caused by downfaulting to the west.

Fourth Plains Area and Terraces

South and west of the Troutdale bench is a broad plain known as Fourth Plains. During late Pleistocene time alluvium of the Columbia River, possibly glacial outwash from eastern Washington, filled the area to a level which now stands approximately 300 feet above sea level. The constructional surface on this fill is not, and probably never was, exactly level; at the highest surfaces, as on Mill Plain, it now reaches an altitude of about 315 feet, although a few ridges attain a height of 340 feet above sea level (see also p. 34). At other places the original surface apparently was as much as 50 feet lower.

While the Columbia River was building its great fan or delta at the mouth of the gorge, streams tributary to the Columbia downstream from the gorge were choked with the debris and were forced to aggrade their courses. Deposits of these tributary streams, including the Washougal and the Little Washougal Rivers, Salmon Creek, the East Fork of the Lewis River, Lewis River, and many smaller streams, interfingered with the deposits of the Columbia River around the margins of the area of alluviation. Generally these subsidiary fans have slopes steeper than that of the Columbia River delta but they show a marked decrease in slope near their toes. Upstream along the tributaries the fans merge with remnants of terraces formed along the stream channels at the same time the fans were built.

The largest fan is at Battle Ground, where the East Fork of the Lewis River debouched on the plain. Other, smaller tributaries built fans that coalesce with it northwest of Battle Ground. The toe of the Battle Ground fan, where it coalesces with the "Portland delta" is at an altitude of about 270 feet. As shown by scattered remnants, this fan rises eastward to an altitude of about 450 feet at Heisson. Upstream from Heisson the East Fork of the Lewis River flows through a narrow canyon and the fan materials there are preserved in only a few terrace remnants. At least the uppermost part of the fill in the broad Yacolt Basin appears to have been aggraded to the level of the fan surface. Because the Yacolt Basin is believed to have been formed by downfaulting along the west flank of the basin, at a time much earlier than that during which the "Portland delta" and the Battle Ground fan were being formed, the bulk of the fill in the Yacolt Basin probably is older than the fan materials and the "Portland delta."

Undoubtedly the Lewis River built a fan or delta at Woodland which was subsequently removed by the downcutting Columbia River. Terrace remnants occur on both sides of the river sloping upstream from Woodland. The surficial deposits underlying the broad terrace at Yale, in Cowlitz County, and the Chelatchie Prairie, at the head of Cedar Creek, are remnants of this fill. Both are at altitudes of 420 to 500 feet. Another prominent fan was formed between Lacamas Lake and Proebstel by a stream or streams which headed in the mountains to the east.

The Fourth Plains area includes both the remnants of the original alluvial fill and several of the higher terraces cut when the Columbia River re-excavated the fill.

When the Columbia River bagan to cut down, its course was northwest from Camas through the channel now occupied by Lacamas Lake and lower Lacamas Creek, and thence westward to Orchards. At Orchards the channel divides, one branch continuing generally westward along the Burntbridge Creek channel, the other trending slightly west of north to Salmon Creek. At Salmon Creek this northern channel also divides, one branch continuing almost due northward to the East Fork of the Lewis River, the other swinging westward to form the Salmon Creek channel. Downcutting seems to have been fairly continuous; there is little evidence of long stillstands of base level as has been postulated by some writers. Terrace remnants are found at almost every level below the original surface of the fill. North of Proebstel remnants are 255 to 270 feet above sea level, and 2 miles southeast of Orchards an isolated terrace remnant is about 250 feet above sea level. The channel floor south of the last-mentioned terrace is at an altitude of 225 to 230 feet. This floor is continuous with the surface on a terrace remnant to the southeast along the southwest side of the Lacamas Creek channel. The altitude of the floor becomes progressively higher upstream, reaching 250 feet just west of the northwest end of Lacamas Lake. In general, all terraces that can be traced for any considerable distance, slope downstream at a gradient of about 3 to 4 feet per mile.

The channel northward from Orchards apparently was abandoned first. The divide between it and the main channel down Burntbridge Creek, about half a mile northeast of Orchards, is at an altitude of slightly more than 210 feet, about 15 feet higher than the floor of the Burntbridge Creek channel. At Salmon Creek the floor of the northern channel is at an altitude of about 195 feet. The branch of the channel that extends north between Salmon Creek and the East Fork of Lewis River, may have been abandoned slightly earlier; the divide on this channel is at an altitude of slightly more than 200 feet, although later erosion has cut a narrow drainage outlet slightly below 200 feet.

Protruding through the Pleistocene fill and rising 100 to 150 feet above the level of the plain are several hills of the Troutdale formation. Well logs indicate that these hills are structural highs, although erosion may have had some part in increasing their prominence. One of the more striking of these is a smooth dome-like hill about 3 miles west of Battle Ground. Most of the others form a series of low hills extending from Salmon Creek, just east of U. S. Highway 99, northwest to the Lewis River immediately below its junction with the East Fork.

Within an area of nearly 10 square miles, a few miles northeast of Vancouver, a series of unusual ridges rise above the general level of Fourth Plains. They occur chiefly in sections 7 and 18, T. 2 N., R. 2 E. and in sections 1, 2, 11, 12, 13, and 14, T. 2 N., R. 1 E. Mostly they are long and very narrow, roughly parallel, with closed depressions between them. Many of the depressions contain ponds fed by ground water. In the southern part of this area the ridges trend generally westward; farther north they trend northwestward. Some of the ridges are so strikingly elongated as to have been confused with eskers.

It is the writer's belief that these ridges, and the intervening depressions, are chiefly erosional features formed by the Columbia River at flood stage or stages. None of the closed depressions are found above 280 feet nor below 230 feet, and the ridges are all at altitudes above 230 feet. It seems probable that the general level of the channels was about 240 feet when the flood or floods occurred. On the other hand, they could have been at 250 feet or higher and some of the scouring could have taken place later when the channels had been lowered to about 240 feet above sea level. Floodwater probably reached an altitude of 280 feet or more with a depth of at least 30 feet and possibly as much as 50 feet.

An interesting feature of these ridges, and one difficult to explain, is the height of the ridge tops. Several of them rise above 330 feet and one rises to an altitude of 355 feet. This is higher than the highest points on Mill Plain or on the plain about Brush Prairie--plains which are believed to preserve the original constructional surface. Of course, a rapidly growing delta or alluvial fan is not built as a smooth plain, and it is to be expected that the axis of a delta would be somewhat higher than the flanks, so it may be that these ridges are axial remnants; however, it does seem odd that a flood or floods would cut down along this higher axis, leaving untouched the slightly lower surfaces on either side. A possible alternative explanation is that these ridge tops were formed at about the same altitude as the surrounding plains, but that subsequently there has been slight warping of the alluvial plains in the area of the ridges.

The course of the Columbia River across Fourth Plains was abandoned and the former course from Camas to Vancouver resumed because the Troutdale formation was more resistant to erosion than the alluvial deposits which had filled in the former course. The floor of the abandoned channel at Camas, at an altitude of 210 to 220 feet, is cut on hard sandstone of the Troutdale formation. About half a mile north of Camas at the southeast end of Lacamas Lake, the floor of the channel dropped sharply to less than 190 feet, either because the Troutdale formation was softer northwest of this point, or because the surface of the Troutdale formation sloped to the northwest.

The present divide between the drainage of Burntbridge and Lacamas Creeks is a drained bottom-land area south of Orchards and Sifton and is at an altitude of about 195 feet, some 10 feet higher than Lacamas Lake. This situation is somewhat anomalous, as the channel floor of the ancestral Columbia River originally must have sloped from the lake westward past Orchards. It is possible that after the Columbia River was diverted from the channel, Lacamas Creek flowed into Burntbridge Creek. Eventually, however, the course of Lacamas Creek, between Orchards and Sifton, was aggraded until the creek was diverted into Lacamas Lake, and from there it cut a canyon to the Washougal River. A possible alternative explanation is that the warping postulated to explain the ridges, only a mile or two to the west, also caused the diversion.

The divide between the Lacamas Lake channel and the Columbia River is at an altitude of approximately 215 feet; however, considering that the general downstream slope of terrace remnants along the Lacamas Creek channel is 3 to 4 feet per mile, it seems likely that all the terraces down to an altitude of 160 feet, immediately north of Vancouver, were formed before diversion of the Columbia from the Lacamas Creek channel.

After diversion of the Columbia River at Camas to approximately its present course, terraces were formed at various levels below 215 feet as the river continued to cut down. Terrace remnants are found at altitudes of approximately 190, 175, 150, 130, 110, 75, 60, 50, and 40 feet. Terrace remnants at slightly different altitudes may actually be parts of the same terrace. For example, a terrace remnant whose surface is at an altitude of about 60 feet at Camas may be equivalent to a terrace remnant with an altitude of about 50 feet, 10 miles downstream near Vancouver. The gradient of the present flood plain of the Columbia River is only a few tenths of a foot per mile and the downstream slope of the lower terraces is much less than that of the higher terraces. The present flood plain lies chiefly between elevations of 25 and 30 feet above sea level.

Scattered over the land surface in the Fourth Plains area are large erratic boulders, which consist of types of rock that are different from the bedrock in the area, some basalt boulders also are found. Many of the erratic boulders are of coarse-grained granitic rocks. At some places these boulders lie on gravel, but at other places they lie on fine sand or silt deposits. Erratic boulders were found in Clark County at various altitudes ranging from 190 to 360 feet above sea level. Although erratic boulders were found in most parts of the Fourth Plains area, the largest concentration is along the Lacamas Lake channel between Lacamas Lake and Orchards, where boulder fields and boulder trains were found. Most of the boulders here are of basalt or other volcanic rock types, but many are of granitic rocks. The boulders along this channel may have been rolled along the bottom of the channel by flood waters, but the boulders resting on fine sand and silt must have been rafted into place, presumably by ice.

Erratics in the Portland-Vancouver area have been described by Allison (1933, 1935) and others. Most investigators believe that all of the erratics were rafted into the area at about the same time, and because the erratics are found at many different altitudes, ranging from about 35 to more than 400 feet above sea level, have postualted either a gigantic flood or a lake in which ice floes floated, dropping boulders and other debris here and there on the bottom. Supposedly the lake was formed by damming of the Columbia River downstream from the Portland-Vancouver area. However, it is possible, or even probable, that erratics were carried into the area more or less continuously during deposition of the "Portland delta." Erratic boulders found in gravel quarries, many feet below the present land surface, would appear to support this hypothesis. The Willamette River in Oregon must have been ponded by the rapid accumulation of the "Portland delta" and ice flows, floating in the lake formed south of Portland, dropped erratics as far south as Eugene, Oreg. (Allison, 1935).

GEOLOGIC SETTING

The ground-water conditions in any area are directly related to the geology of that area. The depths of the aquifers, their thickness, and their lateral distribution and continuity are determined by the mode of origin of the materials, by their environment at the time of deposition, and by their subsequent history. Aquifer permeability (ability of an aquifer to transmit water) is dependent upon the size and amount of pores and the way in which the pores are interconnected. The initial permeability of the aquifer, however, may be modified by later geologic processes such as cementation, solution, and weathering--processes which change the size or degree of interconnection of the pore spaces. Recharge of water to the aquifer, discharge of water from the aquifer, and movement of water through the aquifer are related to distribution of the geologic units at the surface, to the underlying geologic structure, and to the physiography of the area.

Thus, it is apparent that a thorough and detailed knowledge of the geology, geologic history, and physiography of an area is an essential requirement for an understanding of the hydrology of the area.

RESUMÉ OF GEOLOGY

The rock units in Clark County consist of two general types. The older consolidated rocks, which are chiefly volcanic, generally form the foothills and underlie the younger unconsolidated and semiconsolidated gravel, sand, silt, and clay which form the terraces and plains. These younger sedimentary deposits are the chief aquifers in the county.

The older consolidated rocks, of Eocene to Miocene age, include lava flows, agglomerates, tuffs, and breccias, and probably some interbedded sedimentary rocks. Overlying the older consolidated rocks, in basins formed chiefly by folding and faulting of these rocks, are silt, sand, and gravel of the Troutdale formation. At a few places younger volcanic rocks, chiefly lava flows, tuffs, and breccias, overlie the older volcanic rocks and the Troutdale formation. Most of the southwestern part of the county is covered by alluvial deposits of sand and gravel which form terraces and plains up to an altitude of approximately 325 feet. The stratigraphic relations of the rock formations cited above are shown on figure 6. Their lithologic description and water-bearing characteristics are outlined in table 3.

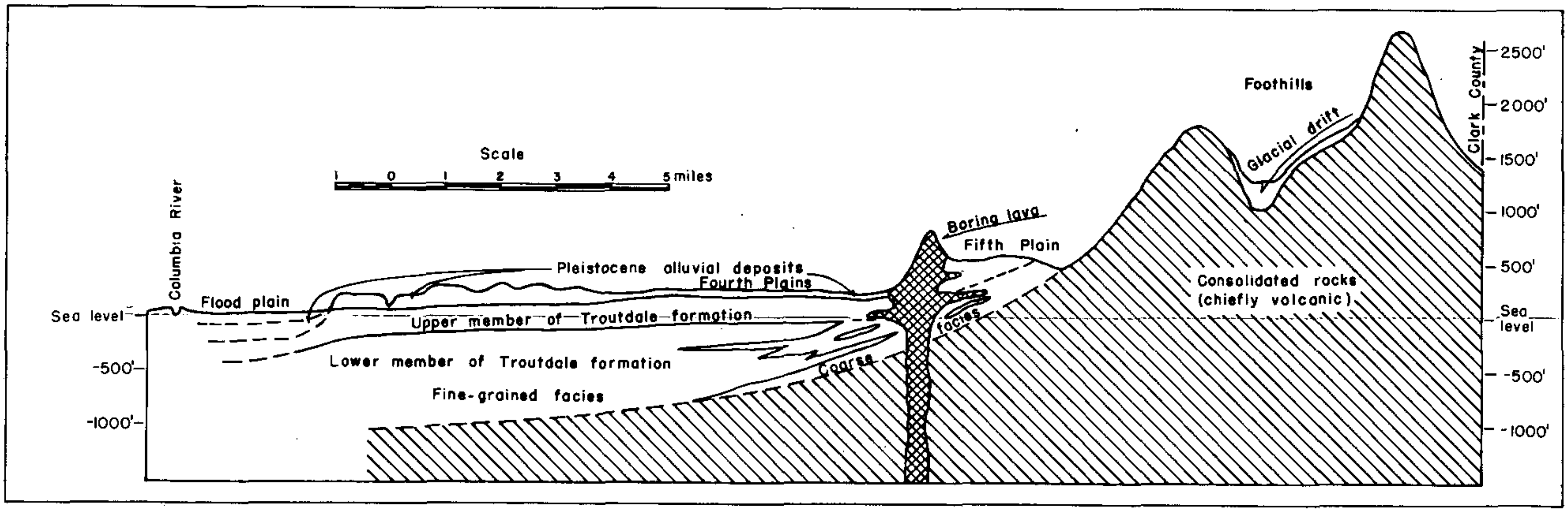


Figure 6 – Generalized east-west section across Clark County

Table 3.--Summary of rock formations and their water-bearing characteristics

Age	*Formation*	*Lithologic description*	Water-bearing characteristics
Recent	Alluvium	Flood-plain and stream-channel deposits of silt, clay, sand, and gravel. Mostly basaltic and andesitic rock materials. Generally well sorted and stratified	Moderately large yields (up to 300 or 400 gpm) are obtained from shallow wells in the coarser sand and gravel along the Lewis and the East Fork of the Lewis Rivers
Pleistocene	Stream, alluvial-fan, and terrace deposits	Stratified, crossbedded, and lenticular deposits of clay, silt, sand, and gravel. Chiefly volcanic materials, mostly basaltic. Generally loose or only very slightly cemented. Predominantly coarse-grained materials, near mouth of Columbia Gorge at Camas, becomes progressively finer downstream	Large yields are obtained from gravel and coarser sand where these strata are in the zone of saturation. Very large yields are obtained in the flood plain of the Columbia River at Camas and Vancouver (to 1,000 gpm per foot of drawdown)
	Glacial drift	Glacial till, silt, and clay; outwash sand and gravel, poorly to well stratified, deltaic, and lenticular. Mostly volcanic materials, a few fragments of granitic rocks. At places rather deeply weathered	Sand and gravel should yield moderate to large supplies at Chelatchie and Yacolt Prairies and from terrace deposits along Cedar Creek, Lewis River, and the East Fork of the Lewis River
	Boring lava	Gray, highly vesiculated basalt lava flows, with some red scoria, cinders, ash, and other pyroclastic materials. Generally fresh, unaltered. Weathers to chocolate-brown loamy soil	Moderately permeable; water level far below surface at some places. Relatively few inhabitants because of hilly terrane, therefore not utilized greatly. Moderate yields obtained where pumping lifts are not too great
Pliocene	Troutdale formation, Upper member	Predominantly cemented sandy gravel with considerable amount of quartzite pebbles and cobbles. Some lenses of sandstone. Deeply weathered (red, orange, yellow, brown) in many areas	Unweathered, lightly cemented phases yield large supplies (more than 1,000 gpm to some wells). Majority of irrigation wells in county are in this aquifer. Weathered, indurated, and finer grained phases yield much less
	Troutdale formation, Lower member	Predominantly fine sand, silt, and clay; only about $1\frac{1}{2}$ percent of materials penetrated were logged as "gravel" or "sand and gravel"	Small yields obtained from fine sands. Moderate yields (up to a few hundred gpm) are obtained from scattered lenses of gravel
Eocene to Miocene	Older consolidated rocks	Basalt and andesite lava flows, pyroclastics, tuff, shale, and agglomerate. Generally dense and moderately hard, or hard	Upper weathered zone yields small supplies for domestic use. Unweathered rock at depth generally yields small supplies. At a few favorable locations large yields might be obtained. Very few wells obtain water from these rocks

GEOLOGIC HISTORY

The oldest rocks in Clark County, and therefore, those containing the earliest geologic record, are the basalt lava flows, breccias, and associated sedimentary rocks of the Goble volcanic series of late Eocene age. From the Eocene epoch through the Miocene epoch widespread vulcanism alternated with deposition of sedimentary strata which included both marine and nonmarine deposits. Probably some folding and faulting occurred at intervals, but there is no clear record of deformation until about the end of the Oligocene epoch, when the area was uplifted and the rocks were folded. Undoubtedly many parts of the area had been subjected to some erosion at various times during the Eocene and Oligocene epochs, but the end of the Oligocene was marked by a considerable period of erosion.

In Miocene time, following deformation and erosion of the Eocene and Oligocene rocks, basalt and andesite lava flows (Columbia River basalt) erupted and spread out over the surface, forming the great lava plateaus of eastern Washington and Oregon as well as the less extensive flows in western parts of these states.

It is probable that the rocks were folded and faulted during at least the latter part of this period of vulcanism. In late Miocene and early Pliocene time a basin was formed in the Portland-Vancouver area by downwarping or faulting. At least 1,000 feet of clay, silt, and sand (lower member of the Troutdale formation) accumulated in a lake or estuary. Deposition probably was contemporaneous with subsidence, as indicated by lenses of coarser grained materials which were deposited only in shallow water and are now found at different depths in wells.

The source of the sediments is believed to have been to the east, as the materials in the lower member of the Troutdale become coarser in that direction. Quartzite pebbles and cobbles in these deposits near Camas indicate that the ancestral Columbia River was discharging into this basin.

Contemporaneously with the deposition of these chiefly fine-grained materials in the southwestern part of Clark County, much of the eastern part of the area underwent a period of weathering and erosion.

In later Pliocene or possible early Pleistocene time depositional conditions changed very markedly. Widespread deposits of coarse gravel (upper member of the Troutdale formation) were laid down as a great fluviatile piedmont fan along the western foot of the Cascade Mountains. This gravel blanket originally covered most of the western two-thirds of Clark County, and extends many miles to the north and to the south. The source of the gravel was chiefly the Cascade Mountains to the east. In Clark County these gravels contain a considerable proportion of quartzite pebbles and cobbles which apparently were brought from northeastern Washington by the Columbia River. It is not definitely known whether the gravel resulted entirely from stream erosion or whether it originated as a result of glacial action, possibly from the earliest glaciation in the Pleistocene epoch.

During the latter part of this time interval, numerous volcanoes became active and basalt flows, scoria, and breccia (Boring lava) were extruded, at places interbedded with the gravels, although at most places overlying the gravels, these volcanics, unlike the Miocene volcanics, were extruded from many cones, and did not spread far from their individual sources.

Following deposition of the gravels, the strata were warped and gently folded. Faulting also took place. A long period of weathering and erosion followed, during which the gravel in exposed locations was decayed so completely as to obliterate the original shapes and textures, except for pebbles and cobbles of quartzite, which were virtually unchanged.

Later in Pleistocene time, an ice tongue moved down the valley of the Lewis River, from Mount St. Helens, into the northeast corner of Clark County. At its maximum extent the glacier covered the Chelatchie Prairie-Yacolt Basin area, almost overriding Yacolt Mountain. The ice sheet extended southward across the valley of the East Fork of the Lewis River at least as far downstream as Lewisville Park immediately north of Battle Ground. Northwestward, a tongue of ice extended down the Lewis River, possibly almost to Woodland. Differences in elevations of exposures of glacial till indicate that the ice sheet was 1,000 to 1,200 feet thick in the vicinity of Chelatchie Prairie. Tum Tum Mountain, (fig. 10A) at the eastern end of Chelatchie Prairie, was built as a volcanic cone on top of the glacial deposits after the glacier had melted back.

Sometime during the Pleistocene epoch, the Columbia River cut a broad valley in the Troutdale formation somewhat deeper than the present valley. In late Pleistocene (possibly Wisconsin) time, the Columbia River began to build a great delta, or fan, downstream from the mouth of the gorge near Washougal. Whether the river was dammed in some downstream reach, or whether it began aggrading because of an overload of debris is not definitely known. Whatever the reason, it filled the valley with coarse sand and gravel and then spread out over the bordering lowlands, depositing coarse-grained materials near the mouth of the Columbia Gorge, and finer grained materials farther away. The source of the clastic materials apparently was the ice sheet that occupied northeastern Washington during this period. The delta was built up to an altitude of somewhat more than 350 feet when conditions changed and the Columbia River began to cut away the delta, eventually returning to essentially its former channel.

STRUCTURE

The attitude of the beds, and the areal relations of the various rock types clearly indicate that the rock units of Eocene to Miocene age, collectively mapped as "older consolidated rocks" have been considerably deformed, by both folding and faulting. Because these rocks are relatively unimportant as aquifers, no attempt was made to study their structure in detail.

Because the younger deposits are very important as aquifers, their structure was given critical study. The structure of the Troutdale formation is particularly important with respect to ground-water occurrence and movement. The Troutdale formation accumulated in a broad, shallow basin, possibly 15 to 20 miles wide. The base of the Troutdale around the margins of the basin, in Clark County, ranges generally from 400 to 800 feet above sea level. The lowest known point of the basin, from the Ladd well in Portland, Oreg. (Piper, 1942, p. 132), is about 1,080 feet below sea level. The present westward slope of the basin floor underlying the Troutdale thus is on the order of 100 feet per mile.

The lithology of the Troutdale indicates that it was deposited chiefly in shallow water; thus it is apparent that downwarping occurred more or less simultaneously with deposition. The Troutdale formation also apparently has been folded slightly. In some places the structure is reflected in the topography. The low, round hill 2 miles southwest of Battle Ground apparently is a small domal structure, for the log of well 3/2-5R1 indicates that the top of the lower member of the Troutdale is considerably higher beneath this hill than in surrounding areas. Several hills and ridges extend along a line from Salmon Creek near U. S. Highway 99, northwest to the mouth of the East Fork of the Lewis River (near Allen Canyon) between Ridgefield and La Center; well logs indicate that this topographic high also reflects the underlying structure. Contours on the top of the lower member of the Troutdale formation are shown on figure 7.

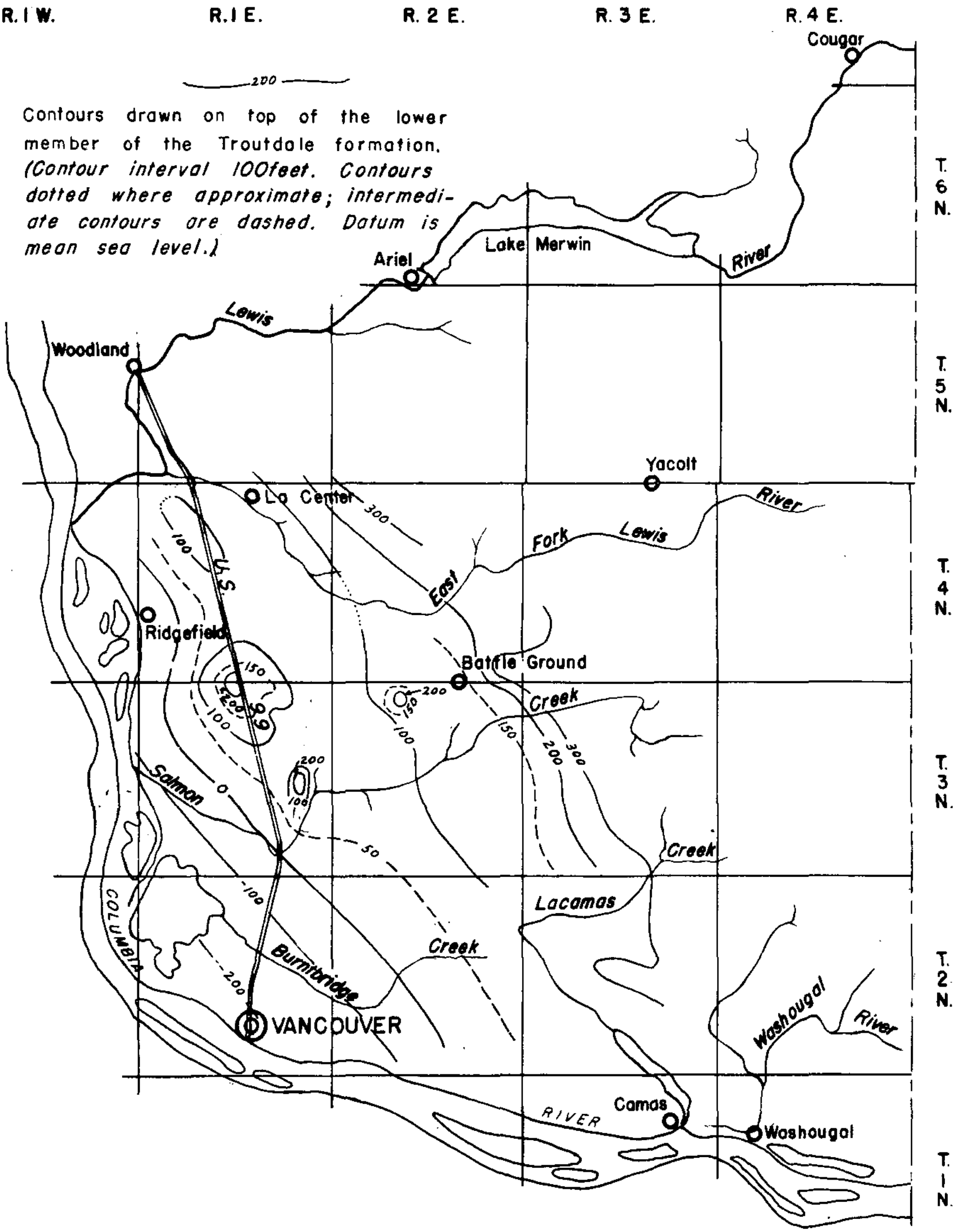


Figure 7.—Contours on top of lower member of Troutdale formation in Clark County

Several faults that cut the older consolidated rocks and the Troutdale formation are shown on plate 1. Generally the actual fault trace is obscured by a deeply weathered mantle, by soil creep, and by landslides, and the faults have been inferred chiefly from the topography and derangement of the drainage. However, slickensided and sheared zones were found at a few places.

The faults mapped are believed to be normal faults; the actual amount of displacement is not known but for some of them must have been many hundreds of feet. The fault or fault zone extending along the southeast margin of Chelatchie Prairie is one of the most prominent. The same fault, or a parallel one, is believed to extend from Amboy southwest to Fargher Lake. Chelatchie Prairie and Fargher Lake were formed in the down-dropped block. A parallel fault about 1 mile southeast of the Chelatchie fault is suggested by the topography and drainage.

Another prominent fault is responsible for Yacolt Basin. This fault extends northwest along the western margin of the basin. Although the trace has been shown for a distance of some 7 or 8 miles, the topography and drainage suggest that the fault zone may acutally extend several miles farther at its southeastern end. A parallel fault forms a somewhat smaller basin along upper Salmon Creek near Venersborg about 5 miles southwest of the Yacolt fault. This fault zone is also along the southwest margin of the basin.

Two faults nearly at right angles were mapped at Camas. The one extending in a northwest direction is the more clearly defined. Slickensides and sheared zones mark the fault trace at its southeastern end along Lacamas Creek. The other fault, which extends northeastward from Camas is less clearly marked. It has been postulated in part on topographic expression, but chiefly on a presumed offset in sandstone beds in the Troutdale formation. These beds are believed to have been relatively uplifted to the northwest of the fault.

All of the faults mapped fall into two sets, one trending north 45° to 80° east, the other trending north 35° to 45° west.

THE ROCK FORMATIONS AND THEIR WATER-BEARING CHARACTERISTICS

Differences between rock types have a marked effect on the occurrence of ground water. In addition, physical and chemical changes of the rock units subsequent to their genesis may modify their water-bearing characteristics very greatly. For example, nearly impermeable crystalline rocks may become much more permeable by fracturing, shearing, and faulting which accompany deformation of the earth. On the other hand, these same openings may later be sealed with minerals deposited from solutions circulating through them and the permeability again becomes very low. Sand and gravel strata which were very permeable when deposited may be compacted by weight of overlying material, and also may have their pore space greatly reduced by deposition of minerals between the grains. Thus, hard sandstone and conglomerate are generally much less porous and permeable than loose sand and gravel. However, subsequent to compaction and cementation the porosities and permeabilities of sandstone and conglomerate may be increased by fracturing which accompanies earth movements.

Weathering processes, generally confined to the upper 100 feet of material can greatly modify the water-bearing characteristics of the parent rock. At many places, the permeability and effective porosity of crystalline rocks--originally very low--has increased greatly when the rock is changed, through chemical and mechanical processes, to a mixture of clay and grit. Contrariwise, the storage capacity, porosity, and permeability of loose sand and gravel generally are reduced greatly by weathering processes. Thus, the water-bearing characteristics of the rock formations in Clark County depend not only upon the type of rock, but also upon the history of the rock from its origin to the present time.

OLDER CONSOLIDATED ROCKS

The rocks of this group are mostly of volcanic origin and are chiefly of Eocene to Miocene age. Included in the group are rocks of the Goble volcanic series, the Eagle Creek formation, the Keechelus andesitic series (Skamania andesite series of Felts, 1939) and the Columbia River basalt. Also included are one or two areas of intrusive rocks such as the Silver Star granodiorite stock (Felts, 1939). With a few exceptions these older consolidated rocks crop out in the foothills and in the mountainous northern and eastern parts of the county. Because these areas are largely uninhabited, the rocks are not economically important as aquifers. Therefore, no attempt was made during the present investigation to delineate precisely the individual units.

The oldest rocks in the group probably belong to the Goble volcanic series. This series has been described as follows (Wilkinson, and others, 1946, p. 4):

"The name Goble volcanic series is herein proposed by Lowery and Baldwin for a thick section of basaltic flows, pyroclastics, and minor amounts of sediments all of which are well exposed in the vicinity of Goble, Oregon, just north of the St. Helens quadrangle as well as elsewhere along both the Oregon and Washington sides of the Columbia River. . . . Studies of the faunas in the sediments underlying and overlying Goble volcanic rocks indidate that the series is interfingered with the marine Cowlitz formation of upper Eocene age and is unconformably overlain by beds tentatively correlated with the Gries Ranch stage of the lower Oligocene."

Volcanic rocks and associated breccias, tuffs, and conglomerates, tentatively correlated with the Goble volcanic series, crop out in southeastern Clark County in the vicinity of Camas and Washougal and in the extreme northern and northeastern part of the county.

Vitric tuffs belonging to the Eagle Creek formation were mapped by Felts (1939) in Skamania County a few miles east of the eastern margin of Clark County. It is probable that some of the tuffs in Clark County belong to this formation, but in this report they are not separated from tuffs in the underlying Goble volcanic series and in the overlying andesites.

Andesite is by far the most extensive volcanic rock in Clark County. It crops out in irregular patches immediately east of Woodland and Highland, south of Lake Merwin, and occupies an area 6 to 10 miles wide along almost the entire eastern margin of the county. The andesite ranges from medium- to very fine-grained (sometimes almost glassy), is very commonly porphyritic, and is medium to brownish gray in color. At a few places the andesite is fairly massive, and at a few places weathering along joints has produced a columnar structure. However, at many places the andesite has been considerably sheared and fractured.

These andesites have been mapped in Skamania County by Felts (1939) immediately adjacent to the eastern boundary of Clark County, under the name Skamania andesites and have been correlated by Felts with the Keechelus andesitic series of central Washington.

At a few places, fine-grained, black, sometimes vesicular, basalt crops out. Generally the basalt has the columnar structure so characteristic of the Columbia River basalt and is believed to be correlative with that series. The basalt exposed along the railroad about 1 mile north of Ridgefiled probably belongs to this series, as possibly does the basalt exposed at several places between Camas and Washougal.

An area of intrusive granodiorite, mapped by Felts (op. cit.) in T. 3 N., R. 5 E. in Skamania County, is known to extend southwestward into Clark County. However, that extension is not within the area shown on the map accompanying this report.

In general, except for the Columbia River basalt, and possibly some of the coarse-grained pyroclastics, the consolidated rocks described above are poor aquifers. The rocks have been considerably jointed and sheared, but secondary mineralization and alteration have generally sealed most of these openings. At places these rocks are weathered to depths of several tens of feet below the surface, and considerable quantities of water are stored in the saturated subsoil. Where this zone is sufficiently thick, dug wells generally yield supplies adequate for domestic use. The unweathered rock beneath generally holds little water in storage, and wells drilled into it commonly yield only enough water for limited domestic use.

In some areas, particularly in eastern Washington, the Columbia River basalt is an important and productive water-yield formation. Ground water in the basalt occurs chiefly in the vesicular, broken, and brecciated upper portions of the individual lava flows, immediately below the bases of the overlying flows. However, not all these interflow zones are good aquifers. In Clark County, very few wells have been drilled into the Columbia River basalt.

The older consolidated rocks crop out chiefly in the thinly populated foothills and nonpopulated mountains. Water supplies in these areas generally are obtained from springs and dug wells, and at most places are adequate. Yields of the few wells that have been drilled into these rocks are small.

TROUTDALE FORMATION

The name Troutdale was applied by Hodge (1938) to alluvial sand and gravel deposited as a "great piedmont fan" on the west side of the Cascades. It was named for the excellent exposures found near Troutdale, Oregon.

The Troutdale formation, consisting of semiconsolidated clay, silt, sand and gravel, is the most widespread formation and its upper unit is the most important aquifer in the county, although the actual outcrop area of the Troutdale formation in Clark County is smaller than that of the Pleistocene terrace deposits.

The Troutdale formation crops out in a belt extending from the southeastern corner of the county, at Mount Pleasant, where it is 2 or 3 miles wide, westward to Camas, and thence northward to Battle Ground. At Battle Ground the belt of outcrop broadens and swings westward forming a highland between the East Fork of the Lewis River and the Lewis River. This broad upland extends westward to the flood plain of the Columbia. South of this upland, and west of the belt of Troutdale between Camas and Battle Ground, the Troutdale formation is overlain by as much as 150 feet of unconsolidated silt, sand, and gravel. However, the Troutdale formation is exposed at numerous places in the southward- and westward-facing scarps along the flood plain of the Columbia River, in the valleys of several streams where the overlying alluvial deposits have been cut through by the streams, and in several low hills which protrude through these deposits.

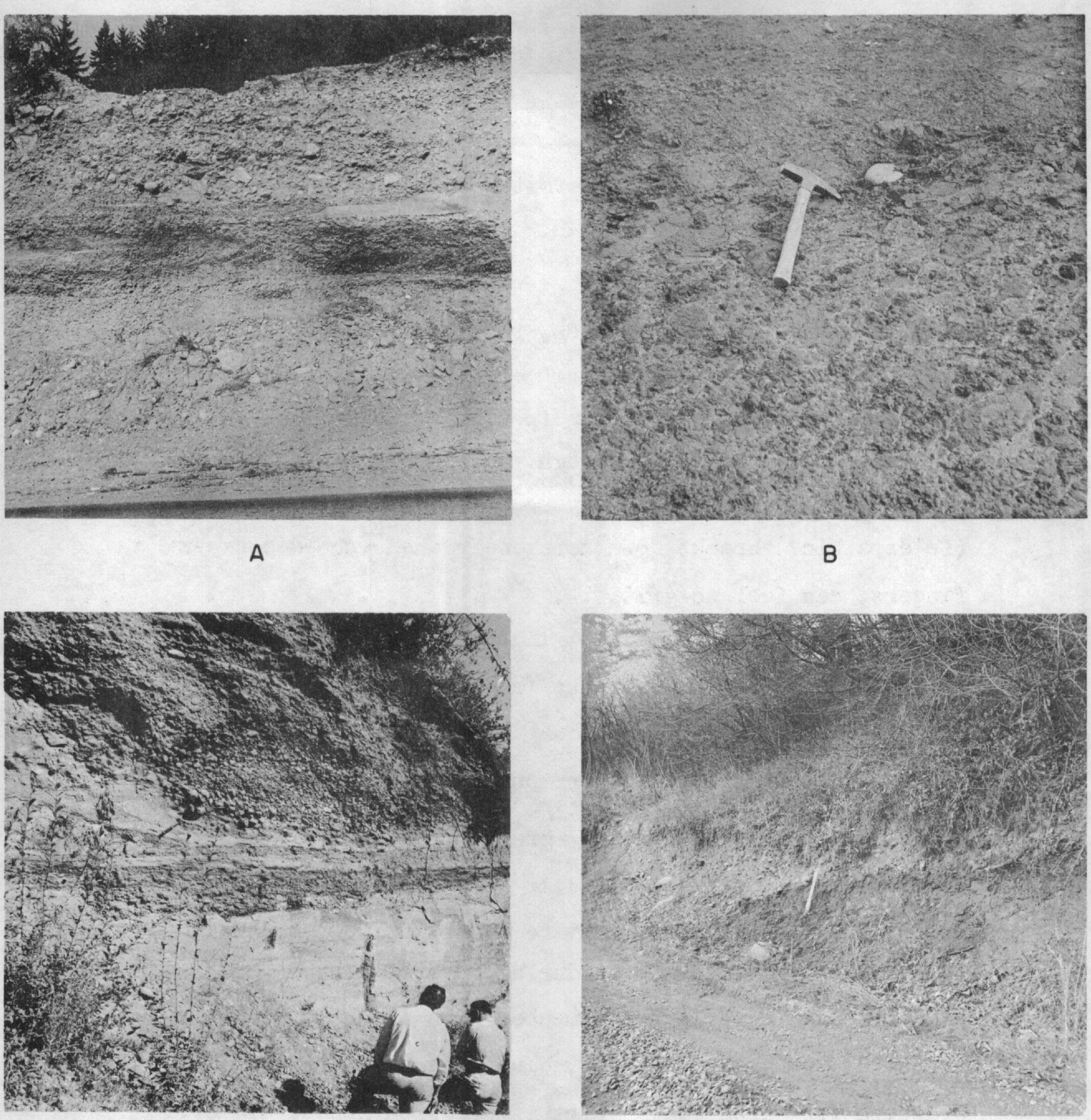
Lower Member of the Troutdale Formation

In Clark County the Troutdale formation consists of two members distinguishable on the basis of lithology. The lower member, through most of the county, consists almost entirely of fine-grained materials. However, in the vicinity of Camas and, in general, eastward toward the foothills of the Cascade Mountains, the fine-grained materials near the top of the lower member of the Troutdale formation may grade into coarser sand and gravel which are not distinguishable lithologically from the materials in the upper member of the Troutdale formation. It should be noted that the thickest sections of coarse materials correlated with the upper member of the Troutdale were found near the eastern margin of outcrop of the Troutdale formation and it is possible that some of the deeper sand and gravel strata at those places are age-equivalents of fine-grained sedimentary materials which have been designated as the lower member of the Troutdale formation farther to the west.

The lower member of the Troutdale formation crops out in only a few places, where folding has elevated the deeper strata. In the upwarp forming the highland north of the East Fork of the Lewis River the unit is exposed at several places (fig. 8C). Good exposures are found in the bluffs overlooking the river and in some of the tributary canyons on the north side of the river. Especially good exposures are found near Daybreak Bridge in sec. 20, T. 4 N., R. 2 E. and at the county road crossing over an unnamed creek near the southwest corner of sec. 36, T. 5 N., R. 1 E. Other outcrops were found along the south bank of Lewis River in the SE¼ sec. 31, T. 5 N., R. 1 E., and along the railroad in the SE¼ sec. 1 and in the NE¼ sec. 12, T. 4 N., R. 1 W., where 20 to 40 feet of light buff to blue laminated silty clay is exposed, overlain by typical weathered and cemented gravel of the upper member of the Troutdale. The following section probably is fairly representative of the lower member of the Troutdale:

Partial section exposed in bluff on north side of the East Fork of the Lewis River, 100 yards upstream from Daybreak Bridge, sec. 20, T. 4 N., R. 2 E. Altitude at top of section about 185 feet.

Materials	Thickness (feet)
Top of scarp	
Pleistocene terrace gravel	
Soil, gray, gravelly and bouldery.	1.5- 2
Gravel, coarse, bouldery, interstices filled with pebbles and sand, stained a rusty color. Lightly cemented, moderately open gravels; appear to be very permeable .	4



A B C D

Figure 8.--A. Fresh-appearing river-terrace gravels overlying upper member of the Troutdale formation at 4/2-27Ba, near Lewisville County Park. The Troutdale is lenticular, moderately weathered, rusty red and brown to yellow conglomerate containing much quartzite. B. Very deeply weathered, red, brown, orange, conglomerate of the Troutdale formation in Mount Norway area (1/4-2Ra). View is 45° slope cut by road grader blade showing outline of completely rotted volcanic pebbles and cobbles. Quartzite pebble at pick point is unweathered. C. Upper member of Troutdale unconformably overlying lower member of Troutdale 2 miles east of La Center (5/1-36Na). Upper Troutdale is deeply weathered, cemented, quartzite gravel; lower Troutdale is stratified fine-grained blue silty clay and bluish-green clay.
D. Deeply weathered quartzite-bearing conglomerate of the Troutdale overlying older volcanic rock on east flank of Prune Hill near Camas (1/3-10Ea). Angular blocks of lava in base of Troutdale; red to purplish soil zone at top of volcanics.

Materials	Thickness Feet (~~Depth~~)
-Unconformity-	
Troutdale formation	
Lower member	
Sand, fine-grained, gray at base, rusty near and at top . .	3
Clay, silty, blue, hard and tough, no bedding apparent, but some zones more sandy, softer (poorly exposed).	16
Sand, micaceous, very fine, tough and compact, gray with orange streaks along some layers, finely laminated. Sand (feldspathic?) breaks down completely when rubbed between fingers, can feel no grit.	7
Sand, silty, very fine-grained, light gray color with yellowish and orangish streaks (section not well exposed at any one place, but occasional exposures at different places and levels along escarpment give a composite section)	35
Clay, sandy, tough and compact, gray and yellow to orange gray, thinly stratified, sand is very fine-grained . . .	10
Sand, silty, fine-grained, gray to orange or red, moderately loose except some layers harder because of greater proportion of clay, some layers cemented with iron.	6
Clay, sandy, tough and compact, blue to gray to reddish and brownish from iron stain; stratified, with lenses of very tough blue-gray clay, and sandy clay.	2.5

A number of wells have penetrated to considerable depths in the lower member of the Troutdale formation; these give additional information on the character, extent, and thickness of the unit. Logs of wells 3/1-3M1, 4A1, 7D2, 24L1; 3/2-5R1, 14P1; 4/1-5E1, 20C1, 26M1, and 4/2-9E1 (See table 17) show the general character of the materials in the lower member of the Troutdale formation.

The maximum thickness of the lower member of the Troutdale formation in Clark County is not known, because wells in the center of the basin do not completely penetrate it. The greatest thickness was at well 3/1-24L1, where 663 feet of clay and sand were penetrated between 85 and 748 feet below the surface without encountering formations older than the Troutdale. Piper (1942, p. 34) cites the log of the "Ladd well" in Portland, Oregon. This well was drilled in sec. 36, T. 1 N., R. 1 E., about 8 miles south of Vancouver, and is believed to have entered the Columbia River basalt at a depth of 1,300 feet. The interval from 405 to 1,300 feet probably is correlative with the lower member of the Troutdale formation in Clark County.

The Troutdale formation, as named and described by Hodge (1938, p. 873), was considered to be Pleistocene age. However, plant fossils from the Troutdale formation at localities along the Sandy River several miles upstream from Troutdale, Oregon, were considered to be of Pliocene age by Chaney (1944, p. 323-353). Plant fossils were also collected from the Troutdale formation at a locality near Woodland, Washington, and these also indicate a Pliocene age (Wilkinson, and others, 1946, p. 28).

It is the belief of the writer that the Woodland locality and the localities along the Sandy River in Oregon are in the lower member of the Troutdale formation. The very sharp break in lithology which is observed at most places between the lower and upper member of the Troutdale (fig. 8C) suggests the possibility of a considerable difference in age. Certainly a very great change in depositional conditions is indicated. Such a great flood of gravel suddenly appearing in the downstream reaches of the Columbia River would seem to require an explanation, and one that seems obvious to the writer is that these gravels were outwash deposits from a continental ice sheet in the upper Columbia River Basin during early or middle Pleistocene time. However, the age of the upper member of the Troutdale formation has not been determined, as yet, nor is enough other information available to make possible a definite conclusion as to its age and origin.

Upper Member of the Troutdale Formation

The upper member of the Troutdale formation is the member generally exposed at the surface. It is predominantly a cemented gravel or semi-consolidated conglomerate, with scattered lenses and stringers of sand. At most places the matrix in the gravel consists of medium- to coarse-grained sand, derived chiefly from volcanic rocks, with minor amounts of quartz sand. The gravel is chiefly of volcanic origin, with basalt and andesite (some porphyritic) rocks predominating. However, the most distinctive characteristic is the presence of considerable amounts of pebbles and cobbles of metamorphic and igneous rocks which are believed to be foreign to the area. That is, bedrock of these types is unknown within the drainage area. Many different rocks are represented, including several varieties of granite, diorite, gneiss, schist, and slate, but the most striking and most abundant foreign constituent is buff or pink quartzite, occurring as pebbles and cobbles.

The cementing materials are in part iron oxides and in part clay minerals formed as alteration products during weathering, but in some places the chief cementing material appears to be silica.

The upper member of the Troutdale is very deeply weathered except at places where it has been protected from weathering by overlying deposits. As seen in numerous road cuts and similar exposures, the upper 8 to 10 feet of this material is a silty residual clay with not even the pebble outlines remaining; only occasional quartzite pebbles remain to indicate the true nature of the outcrops. At depths of 12 to 15 feet, pebble outlines are well preserved. At still greater depths below the top of the weathering profile, rotten pebbles and cobbles can be dug out of the matrix. Because erosion has removed varying thicknesses of material, any part of the weathering profile may be exposed in stream and road cuts.

Most outcrops of the upper member of the Troutdale formation are predominately gravel, (or were gravel before being weathered to clay), with sand lenses comprising only 10 to 20 percent of the total. However, in and immediately north of Camas, a bed of coarse cemented gritty sandstone containing only a few pebbles extends over a square mile or more, forming a bench at an altitude of 200 to 300 feet. Although the sandstone bed may be considerably more extensive, its actual extent cannot be determined, because it is overlain by other deposits. A pebbly sandstone, or conglomerate very similar in appearance, but with a larger proportion of pebbles and cobbles, crops out in Lacamas Creek, about 4½ miles northwest of Camas, in the SE¼ of sec. 20; although volcanic pebbles predominate, quartzite pebbles and cobbles also were noted. The sandstone is greenish where newly exposed, but changes to yellow or reddish brown upon continued exposure.

Because of the large number of erratics (quartzite, granite, gneiss, schist, and other rock types) found nearly everywhere in the upper member of the Troutdale formation, it is believed that the formation was deposited by a major stream (presumably the Columbia River or an ancestral Columbia River) flowing from east of the Cascade Range.

The upper member of the Troutdale formation was deposited in a very broad, shallow valley; the outcrop belt is as much as 15 miles wide in Clark County and extends for a width of at least an additional 5 miles on the west side of the Columbia River in Oregon (Geologic map of the St. Helens quadrangle, Wilkinson, and others, 1946).

Almost all wells obtaining water from the Troutdale formation do so from the upper member. The average thickness of the upper member may originally have been 300 to 400 feet. Wells 2/2-30C1 and 2/2-30K1, a few miles east of Vancouver, penetrate 231 feet and 234 feet, respectively, of the upper member of the Troutdale formation without reaching its base. The log of well 1/3-3M1 shows the thickest known section of the upper member of the Troutdale formation, with 395 feet of clay and cemented gravel overlying volcanic rocks; the lower member of the Troutdale formation apparently is absent at this place. Nearly 7 miles north, well 2/3-3D1 penetrated 290 feet of the upper member of the Troutdale formation before entering volcanic rocks. Through much of the area, particularly in the Fourth Plains, a very considerable part of the upper member of the Troutdale formation has been removed by erosion, and the average thickness in that area may not be more than about 100 to 150 feet.

The upper member of the Troutdale formation originally consisted almost entirely of sand and gravel, frequently lightly to moderately cemented. Probably less than 5 percent of the unit consisted of finer grained materials. However, some of the well logs are misleading in that they show many feet of soil, clay, sandy clay, or silt in the upper part, whereas nearby outcrops show that this material actually is deeply weathered, almost completely altered and decomposed, sand and gravel. This is particularly true of the Fifth Plain area between Camas and Battle Ground and in the upland east and northeast of La Center. In both these areas the Troutdale formation appears to have been exposed to a long and continuous period of weathering.

Some of the flat upland surface between drainage channels may be essentially the original depositional surface of the formation. At other places a considerable part of the upper member of the Troutdale formation was removed prior to significant weathering or early in the weathering period. Outcrops and well logs in the upland areas show that weathering has progressed to depths of more than 100 feet.

Water Supply

The sand and gravel strata in the upper member of the Troutdale formation generally have a moderate to high permeability, except at places and in zones where the permeability has been reduced by compaction, cementation, weathering, and other geologic processes. Cementation has greatly reduced the permeability of some strata, but generally other strata above or below are only slightly cemented, so that wells drilled a few tens of feet below the water table in the upper member of the Troutdale formation usually yield moderate to large supplies of water, except where this unit has been deeply weathered. At some places, as on the upland east of La Center, the upper member of the Troutdale formation has been weathered from the land surface to the base of the unit and yields little water to wells.

The upper member of the Troutdale formation is the most important aquifer through most of Clark County, and many hundreds of wells have been drilled into it. Well records tabulated in this report (table 15) include 60 wells in this unit which are reported to be capable of yielding 100 gpm or more. Of these 60 wells, 18 are reported to have yields ranging from 200 to 499 gpm, and for 7 the reported yields range from 500 to 3,000 gpm. Depths to the bottom of the aquifer range from 17 to 285 feet, except for one well which obtains water from several aquifers at depths of 123 to 406 feet below land surface.

The lower member of the Troutdale formation is a very poor source of water in most places. Table 4 lists 39 wells which were drilled into it, none of the wells completely penetrating the formation. The average thickness of the lower member of the Troutdale formation penetrated in the 39 wells was 169 feet. Of these 39 wells, gravel of the lower member of the Troutdale formation was reported in only 8. The gravel, or gravel and sand, encountered in these wells totaled only 100 feet out of an aggregate of 6,610 feet of material penetrated, or barely 1½ percent of the deposits encountered in the lower member of the Troutdale formation. Although considerable sand is shown in the logs, very frequently the sand is described as "fine," "quicksand," or "heaving," indicating that the materials encountered were very fine grained. This is in marked contrast to the very high proportion of gravel and coarse sand encountered in the upper member of the Troutdale formation, and is the reason for the great difference in water-yielding ability of the two units. Few wells obtain more than small yields from the lower member of the Troutdale formation, and development of even these small amounts has been difficult in some of them because of the fineness of the sand.

Table 4.--Wells Penetrating the Lower Member of the Troutdale Formation

Well	Depth (feet)	Yield (gpm)	Lower member of Troutdale			
			From (feet)	To (feet)	Thickness Total (feet)	Thickness Gravel (feet)
2/3-5P1	290	a 300	260	290	30	0
3/1-4A1	385	..	172	385	213	0
-7D2	471	b 360	204	471	267	6
-3M1	393	..	193	393	200	0
-23R1	268	..	122	268	146	0
-24H2	108	..	63	108	45	0
-24L1	748	a 100	85	748	663	0
3/2-3E1	177	a 100	139	177	38	0
-5R1	400	..	110	400	290	0
-9H1	195	..	159	195	36	0
-14P1	215	..	170	215	45	0
-25L1	305	b 300	148	305	157	0
-27F1	253	..	153	253	100	c 3
-28C2	247	b 120	190 (?)	247	57	33
4/1-5E1	300	20	140	300	160	4
-7H1	359	..	238 (?)	359	121	21
-7R1	203	2½	165	203	38	0
-8M1	406	10+	140	406	266	0
-8N1	257	7	150	257	107	0
-11B1	135	0	47	135	88	0
-11B2	141	0	21	141	120	0
-16C1	274	10	170	274	104	0
-16D1	277	10	215	277	62	0
-17H1	660	0	130	660	530	0
-17H2	209	30	107	209	102	0
-17H3	200	30	87	200	113	0
-17R1	360	53	190 (?)	370	180	0
-20C1	343	60	180	343	163	8
-26M1	675	b 150	162	675	513	11
4/2-8K1	129	small	58	129	71	0
-9E1	495	small	113	495	382	0
-11F1	328	(d)	45	328	283	0
-16D1	125	..	80	125	45	0
-18D1	183	7½	80	183	103	0
-22H1	240	a 130	37	240	203	0
-34R1	301	a 200	165	301	136	0
4/3-30J1	200	..	50	200	150	0
5/1-34G2	231	75	0	231	231	14
-35P1	212	b 15	160	212	52	0

a No water from lower member of the Troutdale formation
b Most of water obtained from upper member of Troutdale formation
c Reported in the well log as sand and gravel
d Discharge rate not measured; very small

BORING LAVA

The Boring lava was named by Treasher (1942a, p.10) for the late Pliocene or early Pleistocene volcanics which were extruded from numerous vents over a considerable area in the vicinity of Portland, Oregon. The name of the lava was derived from the type occurrence in the Boring Hills southeast of Portland.

In Clark County the Boring lava crops out as irregular isolated bodies in a belt extending from Mount Pleasant in the southeast corner of the county, to the East Fork of the Lewis River near Battle Ground in the center of the county. The largest area is north of Battle Ground, where the formation covers about 6 square miles, chiefly as tabular lava flows. However, the rugged hills in secs. 24 and 25, T. 4 N., R. 2 E. appear to mark centers of extrusion. Battle Ground Lake, in sec. 30, T. 4 N., R. 3 E. is an excellent example of a crater lake. (Contrary to local popular belief the lake is not "bottomless;" maximum depth determined by sounding was 56 feet.) To the southeast, Green Mountain and Brunner Hill are made up of volcanic rocks with a lava flow or flows extending a short distance from the center of extrusion. The west and southwest flank of Prune Hill, just west of Camas, is a similar type of occurrence, differing, however, in that considerable amounts of red scoria are associated with the lavas. Mount Norway, Nichols Hill, and Bear Prairie, are capped by Boring lava flows.

At most places the Boring lava is a gray, finely vesiculated (sometimes termed "inflated") basalt. The basalt has a characteristic and and distinctive appearance and generally is readily recognizable in the field. Along the north flank of Prune Hill, immediately west of Camas, very red, scoriaceous lava forms a vertical cliff. Pebbles and cobbles of gravels of the upper member of the Troutdale formation are imbedded in and coated by the scoria, having been picked up and incorporated into the scoria as it broke through and spilled out at the surface.

The Boring lava overlies the upper member of the Troutdale formation at numerous places, but at a few places well logs show the upper member of the Troutdale formation both below and above Boring lava. It is not certain whether the gravel was deposited on the lava, or whether the lava was injected into the gravel as sills. The log of well 2/3-8Q1, about half a mile north of the base of Green Mountain, shows alternating intervals of rock and sand or gravel. Logs of several wells north of Battle Ground (4/2-25K1, -35H1, -35H2) show the upper member of the Troutdale formation both above and below the Boring lava. If this lava was injected as sills, then there is no instance known in Clark County in which any part of the Troutdale formation was deposited after emplacement of the Boring lava. However, a report by Wilkinson and others (1946, p. 29) describes a volcanic breccia interbedded in the Troutdale formation a few miles north of Clark County, along U. S. Highway 99 about 1 mile north of Woodland. The volcanic breccia overlies sandstone and shale which may belong to the lower member of the Troutdale formation. Overlying the breccia are sand and gravel up to an altitude of about 750 feet, nearly 600 feet above the top of the volcanic breccia. The volcanic breccia was correlated with the Boring lava by Wilkinson and others (1946, p. 30), and if this correlation is correct, extrusion of Boring lava extended from some time during deposition of the lower member of the Troutdale formation until after deposition of most, or all of the upper member of the Troutdale formation.

Weathering of the Boring lava results in a brown loamy soil and a dark chocolate brown clayey subsoil which is somewhat mottled and rather gritty. Maximum weathered depth observed was about 10 feet, but locally it is probably considerably deeper. On Prune Hill for example, well records indicate that the Boring lava is weathered to a depth of 25 or 30 feet.

The Boring lava, which covers approximately 15 square miles in Clark County, generally is a fairly good aquifer; apparently the vesicular and scoriaceous zones common at the tops of flows are moderately permeable. The cinders, ash, and other pyroclastics reported in well logs apparently also serve as aquifers. However, because much of the area it underlies is rugged hill land, with few inhabitants, comparatively few wells have been drilled or dug in this formation. Water levels in wells in the Boring lava on the west end of Prune Hill range from about 300 to 400 feet below the surface. Apparently, continuity of vertical jointing of the lava permits downward percolation of water without too much hindrance. Thus, there is no perched ground water in the Prune Hill area, and although the Boring lava is weathered to depths of 25 to 30 feet locally, attempts to obtain water from the weathered zone have not been successful. However, wells dug in most other areas underlain by Boring lava have yielded sufficient water for domestic use. Depths of these wells generally range from 20 to 40 feet. Locally several wells have been drilled through the Boring lava, obtaining water from underlying gravel of Troutdale age.

GLACIAL DRIFT

Drift was deposited in northeastern Clark County by glaciers that extended down valleys from the Cascade Mountains lying to the east. The most extensive deposits were formed by a lobe of ice that extended down the Lewis River from Mount St. Helens.

It is quite possible that the area was glaciated more than once; however, for this report, distinction of different glacial advances was not attempted. The ice apparently spread south and west in a very broad lobe in northeastern Clark County, and the immediate walls of the Lewis River valley were overtopped by ice many hundreds of feet thick. Not all the area has been mapped, so the total extent of the ice is not known; however, in the Battle Ground-Yacolt-Amboy-Ariel Dam area it must have been more than 15 miles wide and at places more than 1,000 feet thick. The main lobe of the ice advanced 3 to 4 miles westward beyond Fargher Lake, on a front extending from the East Fork of the Lewis River, near the county-owned Lewisville Park, northward across Lewis River west of Ariel. Along the Lewis River the ice apparently advanced several miles farther west, as till is found on the valley wall 1 mile east of Woodland. South of Yacolt, an ice tongue apparently extended eastward up the East Fork of the Lewis River.

The area shown on the map as glacial drift totals about 110 square miles, including both till and outwash deposits. At most places the till is fairly thin but at other places it is 30 to 40 feet thick. The till forms a blanket over the area that was occupied by the ice, except where it has been removed by erosion from steep slopes and in stream valleys. It has been weathered rather deeply as has the underlying rock, and at places, especially where the till is thin and vegetative cover is heavy, it is difficult to delineate the exact areas occupied by till.

Typically the till is an intimate mixture of mineral dust, grit, and larger fragments ground and churned by the ice into a tough brown concretelike mass (fig. 9A). Because of the almost complete lack of sorting, the till is dense and compact. At most places the fragments and boulders in the till consist chiefly of volcanic materials (fig. 9A) with some sedimentary rock fragments including shale and siltstone. However, at several localities near the western margin of the glacial drift the till contains scattered pebbles of quartzite and granitic rocks. The only places where the occurrence of these has been noted are in areas where the drift is underlain by the Troutdale fomration, and undoubtedly the quartzite and granite were derived from it.

Generally the till is gravelly and bouldery; boulders more than 8 feet across were observed. However its texture varies considerably from place to place, and clayey till with relatively few pebbles and cobbles was noted in several outcrops. At low elevations, the till in most shallow exposures is brown and moderately to greatly weathered. In many exposures at higher elevations the till is very deeply weathered, with some pebbles nearly completely decayed. On the other hand, in exposures along the East Fork of the Lewis River where bluffs range up to 200 feet high, till exposed toward the center of the cliff is tough, gray, and comparatively fresh. It is apparent that the difference in degree of weathering is due at least in part to the length of time and conditions of exposure to weathering. It is also possible that more than one age of till is represented.

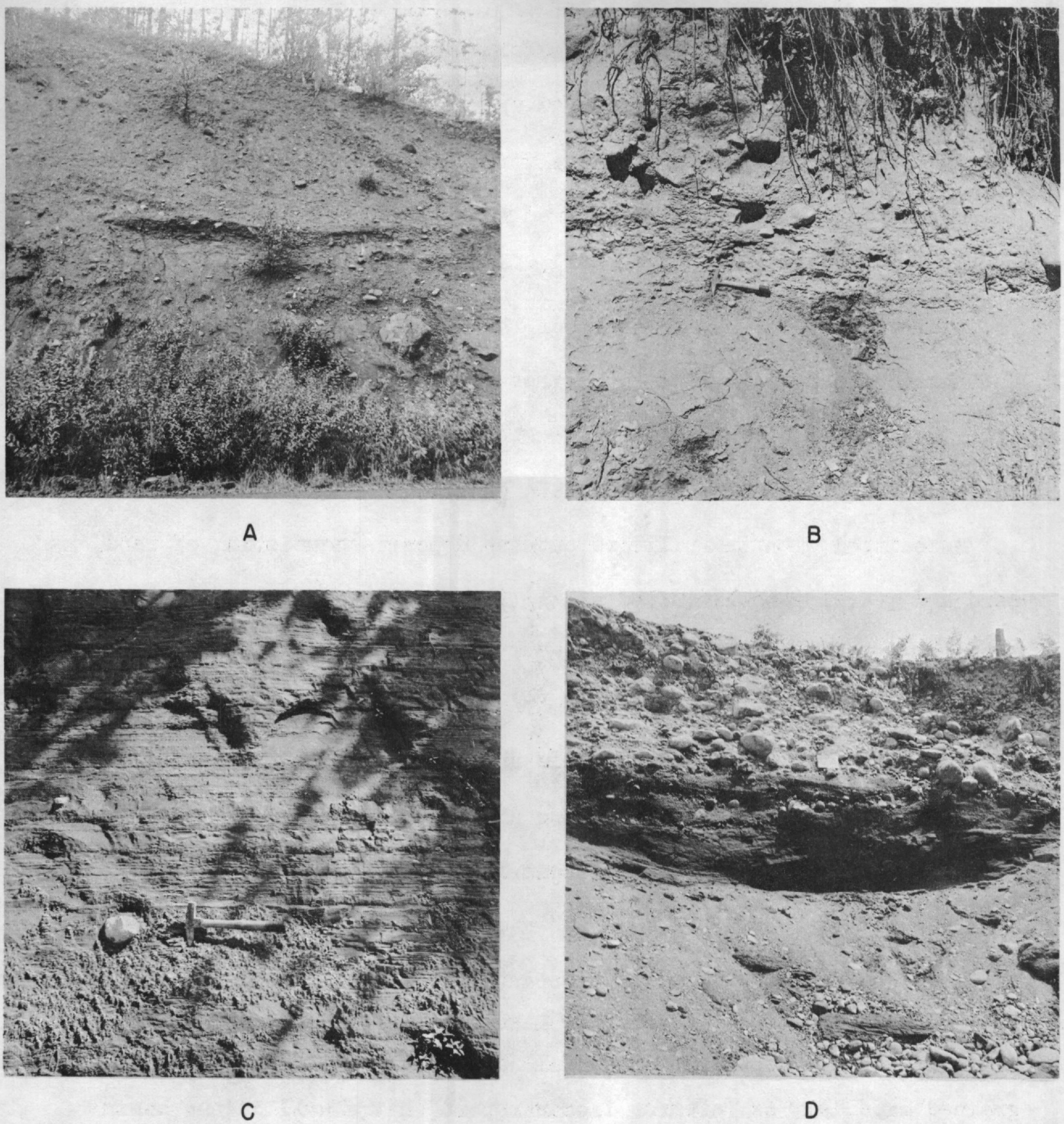


Figure 9.--A. Glacial till in bluff above East Fork of Lewis River (4/2-14Ea). Very hard, tough, very rude stratification at some places. Gravel, cobbles, and boulders in a brown sand and silt matrix. Considerably weathered toward top of section. B. Glacial till, tough, brown, overlying weathered volcanic rocks 2½ miles SE of Yacolt in East Fork of Lewis River valley (4/3-13Ga). Till contains only volcanic pebbles. C. Laminated glacial silt and fine sand deposited in lake (5/4-2Ka) formed by damming of Canyon Creek by ice tongue from Mount St. Helens. Ice-rafted pebbles and cobbles are scattered through silt and sand. D. Stratified lenticular glacial outwash in gravel pit along Cedar Creek 1½ miles NW of Amboy (5/4-8Na). Dark layer below upper coarse gravel is brick red, to tan, to gray, cross-bedded sand.

PLEISTOCENE ALLUVIAL DEPOSITS

The Pleistocene alluvial deposits crop out as broad plains and terraces in the southwestern part of the county at altitudes ranging from a few feet to about 370 feet above sea level. Nearly one-third of the county is underlain by these deposits. The name "Portland delta gravels" was applied to them by Buwalda and Moore (1930). Various other authors have called them "Portland gravels" (Treasher, 1942b) Baldwin and Lowry, 1952) and "terrace deposits and related alluvial materials" (Piper, 1942, p. 32-34).

In the Portland-Vancouver area the alluvial deposits accumulated in the valley of the Columbia River downstream from the outlet to the upper gorge which is at the eastern edge of Clark County. Whether the valley was submerged by a change in sea level, as is thought by some, or the river was simply loaded so heavily that it could not carry all its load downstream from the constricted upper gorge is not known. Whatever the reason for sedimentation, it appears that the deposits accumulated as a great delta or deltaic fan at the mouth of the gorge. The deposits at the mouth of the gorge, or in the vicinity of Camas, are very coarse-grained, containing a large proportion of gravel. Downstream the materials are progressively finer, and northwest of Vancouver they consist chiefly of sand.

The materials are predominantly basaltic, but also include considerable quartz and mica. At places occasional granitic and quartzite pebbles are found, but generally these are much less plentiful than in the Troutdale formation. Pebbles and cobbles of Boring lava, including both the dark gray basaltic and the red scoriaceous types, are common.

The sand and gravel everywhere is comparatively fresh and unweathered. Although occasional rotted pebbles are found, these apparently have been reworked from an older deposit, probably the Troutdale formation. In general the materials are well sorted, but the degree of sorting is much better in the finer grained phases than in the coarse. At a few places the gravels are lightly cemented, but not enough so that the porosity is greatly reduced.

Deltaic bedding was observed at almost every place where the structure could be seen and occurred both in the coarse sand and gravel and in the fine sand and silt (fig. 10C). Foresets in some of the coarser deposits are 20 to 25 feet long, and slopes range up to 25 degrees (fig. 10D). At a number of places topset, foreset, and bottomset beds are all well developed in the same section.

Except for a few small areas where they overlie volcanic rocks, the Pleistocene alluvial deposits overlie the Troutdale formation (fig. 10B). The contact is marked by an erosional unconformity, although throughout much of the Fourth Plains and Mill Plain areas the top of the Troutdale formation is quite regular, generally ranging from 100 to 200 feet above sea level, with a general, gentle slope to the southwest. The valley of the ancestral Columbia River appears to have been roughly in the same location as the present valley; wells on the present flood plain at Vancouver penetrate as much as 173 feet of Pleistocene alluvial deposits (well 2/1-16C1) before reaching the top of the Troutdale, 138 feet below sea level. Apparently, however, at Vancouver the northeast wall of this ancestral valley lay slightly northeast of the present escarpment of the Troutdale formation, and extends in nearly a straight line from a point about half a mile northwest of Vancouver Junction, southeast through Vancouver Juncion, to the northwest corner of sec. 31, T. 2 N., R. 2 E.

A

B

C

D

Figure 10.--A. Tum Tum Mountain, at east end of Chelatchie Prairie, a volcanic cone built on a glacial-drift plain. B. Pleistocene alluvial deposits overlying conglomerate of upper member of Troutdale formation 5 miles NW of Battle Ground (4/2-18La). Troutdale is considerably weathered, orange, yellow, and brown. Alluvial deposits are fine-grained, well-stratified, brown to tan and gray sand and silt. C. Pleistocene alluvial deposits, fine- to medium-grained, exposed in cut through long, narrow ridge 3 miles NE of Vancouver (2/1-12Na). Top of section includes topset, foreset, and bottomset beds inclined to north. Base of section is horizontally bedded sand. D. Pleistocene alluvial deposits along highway 2½ miles east of Vancouver (2/2-31Da). Coarse, clean terrace gravels, foreset beds incline 22° to the west, are overlain by horizontally stratified sand.

The till overlies the Troutdale formation in the area north of Battle Ground. At the few exposures where till can be observed resting directly upon the Troutdale formation, the underlying Troutdale formation is much more weathered than the till, indicating a lapse of considerable geologic time between the deposition of the Troutdale formation and the entry of the ice sheet into the area. The physiographic relations and degree of weathering indicate that the till is considerably older than the Pleistocene alluvial deposits which are believed to be of Wisconsin age.

Associated with the till are outwash deposits consisting of sand, sand and gravel, and laminated silts (fig. 9C, D). Excellent outcrops of deltaic sand and gravel and finely laminated silts are exposed up Canyon Creek east of Tum Tum Mountain. The sand and gravel underlying Chelatchie Prairie and the Yacolt Basin are believed to be chiefly outwash deposits; sand and gravel deposits, which form terraces along Cedar Creek downstream from Amboy (fig. 9D, also 8A) also are glacial outwash.

The areas of outwash most important hydrologically are Chelatchie Prairie and Yacolt Basin. Fargher Lake basin also contains a deep fill, of unknown depth, but this fill apparently is all of fine-grained material, as inferred from a report that a well in the basin was drilled to a depth of 550 feet entirely in fine-grained materials and in quicksand to the bottom. Chelatchie Prairie, the Yacolt Basin, and Fargher Lake all are basins formed by faulting. The thickness of alluvial fill in the Yacolt Basin is not known, but it could be as much as several hundred feet. In Chelatchie Prairie well 5/4-7M1 which penetrated 217 feet of sand and gravel, was drilled to 598 feet, ending in consolidated rock. It was reported to have been tested at 800 gpm with a 60-ft drawdown. The well is cased to the bottom and the casing is perforated at five zones in the gravel and one zone (near the bottom) in the consolidated rock. Probably most of the water from this well is obtained from the gravel.

So far as is known, the thickest section of the Pleistocene alluvial deposits is in the triangular terrace block bounded on the northeast by the buried Troutdale escarpment and on the south and west by the escarpment of the present flood plain. Several wells of the city of Vancouver (wells 2/1-15Q1, 23Q1, 23Q3, 23Q4, and 23R1) penetrate 220 to 273 feet of these deposits before reaching the Troutdale. The base of the Pleistocene alluvial deposits ranges from 45 to 53 feet below sea level in these 5 wells, and as the highest point on the terrace within the block is about 290 feet, the present maximum thickness is believed to be about 340 feet. As the log of well 2/1-16C1, near the center of the ancestral valley, shows the base of the sand and gravel of the Pleistocene alluvial deposits to be 138 feet below sea level the maximum thickness of the Pleistocene alluvial deposits probably was more than 400 feet after deposition of the alluvium, and before re-excavation of the valley by the Columbia River.

The highest point on the delta surface was at the apex in the mouth of the gorge. Remnants of the Pleistocene alluvial deposits have been found at altitudes up to 370 feet near Camas, Washington and Troutdale, Oregon.

During the period following accumulation of the delta deposits, and during downcutting of these deposits by the Columbia River, some of the materials were reworked by the normal cut and fill processes by which terraces are formed. No attempt was made to distinguish between the reworked materials and the original delta deposits.

Water Supply

The coarser sand and gravel phases of the Pleistocene alluvial deposits are extremely permeable and yield large quantities of water wherever an appreciable thickness is saturated. As the deposits become progressively finer grained downstream (westward) from the mouth of the Columbia Gorge in the vicinity of Washougal and Camas, the most permeable materials are found within the wedge-shaped area between Washougal, Vancouver, and Brush Prairie. Northwest of an arc connecting Brush Prairie and Vancouver the deposits generally are fine sand and silt and are much less permeable.

Through much of the area the base of these deposits is 100 to 200 feet above river level, and they are above the zone of saturation, or only the bottom few feet (on top of the weathered Troutdale) is saturated. Therefore, although the deposits are exceedingly permeable, only small to moderate yields can be obtained. Where the Pleistocene alluvial deposits filled the valley of the ancestral Columbia River (which was cut into the Troutdale formation) the deposits extend 60 to 100 feet below river level and are saturated. Many wells have been drilled into the Pleistocene alluvial deposits at Washougal, Camas, and in the vicinity of Vancouver. Few have failed to yield 1,000 gpm or more, and some yield as much 1,000 gpm per foot of drawdown. Well records tabulated in this report include those of 45 municipal and industrial wells in the Camas-Washougal and Vancouver areas with a reported yield of 1,000 gpm or more. Yield and drawdown data both are given for 36 municipal and industrial wells of which a few yield slightly less than 1,000 gpm. The average yield of the 36 wells is 1,583 gpm with an average drawdown of 11 feet. Elimination of the two least productive wells leaves an average yield of 1,610 gpm with an average drawdown of 8 feet.

Yields from the finer grained phases of the Pleistocene alluvial deposits are much less, but there are several dozen shallow wells (less than 50 feet deep) north of Vancouver that obtain 40 to 150 gpm from permeable sand layers in the Pleistocene alluvial deposits.

Along the broad shallow channel now occupied by Burntbridge Creek in secs. 10, 11, 14, 15, 19, 20, 21, and 30, T. 2 N., R. 2 E. a considerable number of dug wells obtain moderately large yields from coarse sand and gravel. These materials were reworked chiefly from alluvial delta deposits, but also in part from the upper member of the Troutdale formation, at the time the channel was cut into the Troutdale formation by the Columbia River. The reworked gravels are comparatively shallow, 10 to 22 feet thick, and apparently directly overlie the Troutdale formation. The dug wells generally range from 10 to 20 feet deep and yields commonly are 100 to 200 gpm with only a few feet of drawdown. Locations of these and other shallow irrigation wells in the Pleistocene alluvial deposits are shown on figure 11.

ALLUVIAL-FAN AND ASSOCIATED DEPOSITS

The deposits included with this group are the fans, terrace deposits, and basin fill which accumulated along streams tributary to the Columbia River downstream from the gorge. Deposits of these tributary streams, including the Washougal, and Little Washougal Rivers, Salmon Creek, the East Fork of the Lewis River, Cedar Creek, Lewis River, and many smaller streams, interfinger with the deposits of the Columbia River around the margins of the area of alluviation. Although these deposits cannot be distinguished from the Pleistocene alluvial deposits on the basis of well logs or well cuttings where they occur below the surface, at many places the surficial beds can be differentiated on the basis of topography and lithologic characteristics.

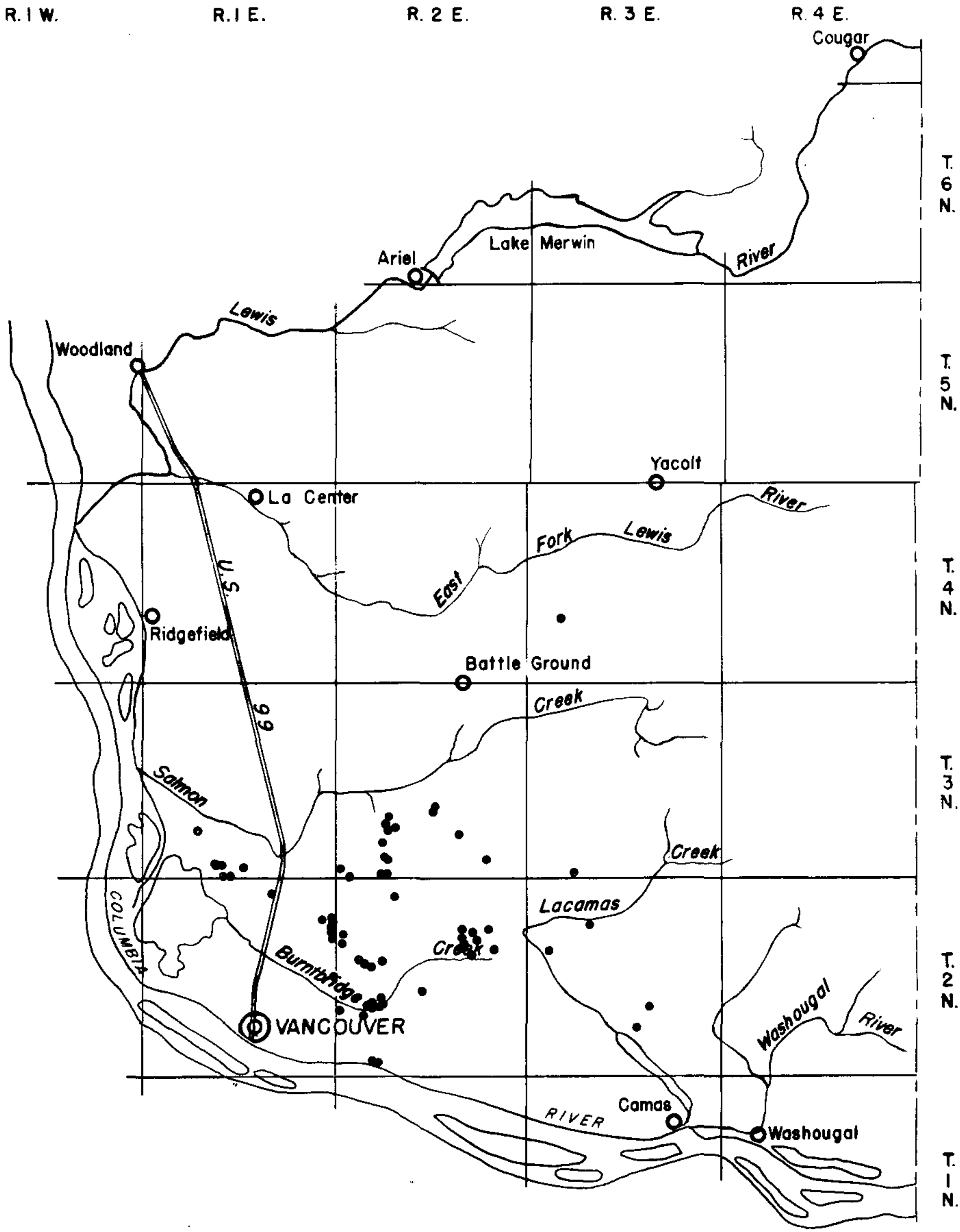


Figure 11.— Map showing location of shallow irrigation wells in Pleistocene alluvial deposits. (Includes infiltration trenches, dug wells, and drilled wells less than 50 feet deep.)

The largest fans are the Proebstel and Battle Ground fans, deposited by streams running off Livingston Mountain and by the East Fork of the Lewis River, respectively. Terrace remnants are graded upstream from these fans. The fan at the mouth of Lewis River was removed by down-cutting of the Columbia River, but a number of terrace remnants are preserved upstream from Woodland. Terraces along Cedar Creek and Chelatchie Prairie consist chiefly of glacial outwash but are veneered with fine- to medium-grained brown sand which probably correlates with these deposits. Yacolt Basin, in the drainage of the East Fork of the Lewis River, also is veneered with fine to medium-grained brown sand. The surface of the Yacolt Basin apparently grades downstream to the Battle Ground fan (p.31). The surficial deposits of the Fargher Lake bottom also probably belong to the same group of deposits.

The materials in the margins of the Battle Ground and Proebstel fans are fine-grained sands and silts. Toward the apexes of the fans and in the terraces along the stream channels, the materials are much coarser, grading to coarse sand and gravel.

A number of domestic water supplies have been obtained from these deposits, mostly from dug wells. The terrace sand and gravel along the streams probably are moderately permeable and would yield fairly large supplies.

TERRACE DEPOSITS

In addition to the terraces and terrace deposits described with the Pleistocene alluvial deposits and alluvial fan deposits, several terrace remnants border the East Fork of the Lewis River north of Battle Ground. These terraces, like the others, were formed following alluviation of the area when the Columbia River began to cut down through the alluvial deposits. However, unlike the other terrace deposits which consist largely of reworked materials from the adjacent alluvial deposits, those along the East Fork of the Lewis River differ markedly from adjacent deposits, and therefore have been mapped separately.

These terrace deposits consist of very coarse gravel in a sandy matrix. Pebbles include quartzite and granitic types apparently reworked from the Troutdale formation and the glacial drift. At most places the deposit is poorly sorted and only crudely stratified. The coarse texture and the lithology is in great contrast to the texture and lithology of the adjacent Pleistocene alluvial deposits and alluvial-fan deposits which consist of very fine sand (basaltic and andesitic), and silt and clay.

No records were obtained of wells in these deposits. Undoubtedly the gravel is very permeable, except where its base extends below river level.

RECENT ALLUVIUM

Deposits of alluvium of Recent age are confined chiefly to the flood plains and low terraces along rivers and creeks in the area. The largest deposit is west of Vancouver along the Columbia River. Other deposits were mapped along the Lewis River, the East Fork of the Lewis River, and Salmon Creek. Small deposits are found along the Little Washougal and the Washougal Rivers and some of the smaller streams, but these generally are too small to show on the map.

Along the Columbia River the deposits apparently are predominantly fine-grained, chiefly medium- to fine-grained sand and silt. A few wells have been completed in them, and most of these are for domestic purposes.

Along the East Fork of the Lewis River and the Lewis River the deposits range from coarse sand to sand and gravel. The deposits are moderately permeable and yields of several hundred gallons a minute probably could be obtained at many places.

SURFACE-WATER RESOURCES

The entire county is drained by the Columbia River and its tributaries. In addition to its prime importance as a source of water, the Columbia River serves as a control for the movement of all other water in the county. All surface streams discharge into it, and it is base level for ground water so that any ground water leaving the county does so by discharging into the Columbia River or its tributaries. At some places, particularly at Vancouver, where ground-water withdrawals are heavy, Columbia River water recharges the aquifers bordering the river.

The principal tributaries in, or bordering Clark County, are the Lewis River, the East Fork of the Lewis River, Cedar Creek, Washougal River, Little Washougal River, and Salmon Creek. In 1958 the Water Resources Division of the U. S. Geological Survey maintained gaging stations on four of these streams, as well as on the main stem of the Columbia River at The Dalles, Oregon. Detailed records for stations on these streams are given in the annual Water-Supply Papers, "Surface-Water Supply of the United States, part 14, Pacific Slope Basins in Oregon and Lower Columbia River Basin." A summary of stream-discharge data is given in table 5, and some of the most important characteristics of these streams are given following table 5.

Table 5.—Summary of stream-discharge data[1]

Stream	Gaging station	Records used	Drainage area sq. mi.	Discharge, cubic feet per second Maximum	Minimum	Average
Columbia River	The Dalles, Oregon 11 miles east of	1878-1958	237,000	1,240,000	35,000	195,500
Washougal River	Washougal, Wash. 5½ miles northeast of	1944-1958	108	17,700	41	896
Little Washougal River	Washougal, Wash. 2½ miles north of	1951-1955	23.8	1,620	4.1	—
Salmon Creek	Battle Ground, Wash. 4 miles east of	1943-1958	18.3	1,500	1.3	61.4
Lewis River	Ariel, Wash.	1922-1958	731	129,000	0[2]	4,709
Cedar Creek	Ariel, Wash. 2½ miles southeast of	1951-1955	41.3	1,900	4.6	—
East Fork Lewis River	Heisson, Wash. 1½ miles northeast of	1929-1958	125	15,600	29	746

[1] For detailed discharge records see U. S. Geol. Survey water-supply papers on Surface Water Supply of the United States, Part 14, Pacific Slope Basins in Oregon and Lower Columbia River basin, for individual years.

[2] Periods of no flow caused by regulation of Ariel Dam during construction.

COLUMBIA RIVER

This river, which forms the southern and western boundaries of the county, is the main trunk stream in the Pacific Northwest. At The Dalles, 85 miles upstream from Vancouver the average discharge for the 80-year period 1878-1958 is 195,000 cfs (cubic feet per second). The main use of water in the lower reaches of the Columbia River is for power generation and navigation. Actual withdrawal from this reach is very small. Mean discharge by months for the 1951 water year (Oct. 1950 through Sept. 1951) is shown in figure 12. Although the discharge for 1951 was about 15 percent above average, the graph is fairly typical of the seasonal distribution. Discharge is lowest in September and October, and highest during May, June, and July because of snowmelt in the mountains.

WASHOUGAL RIVER

The Washougal River heads in the foothills in southeastern Clark County and southwestern Skamania County and enters the Columbia River at Camas. Average discharge at the station about 7 miles upstream from the mouth of the river is nearly 900 cfs. Discharge responds very quickly to precipitation and it appears that ground-water storage in the bedrock is small.

LITTLE WASHOUGAL RIVER

The Little Washougal River drains an area underlain chiefly by volcanic rocks directly north of Camas and Washougal and enters the Washougal River a few miles upstream from the Columbia River. The city of Camas diverts some water from the headwaters for public supply. Low flow is sustained to a limited extent by discharge from the Troutdale formation along the lower reaches.

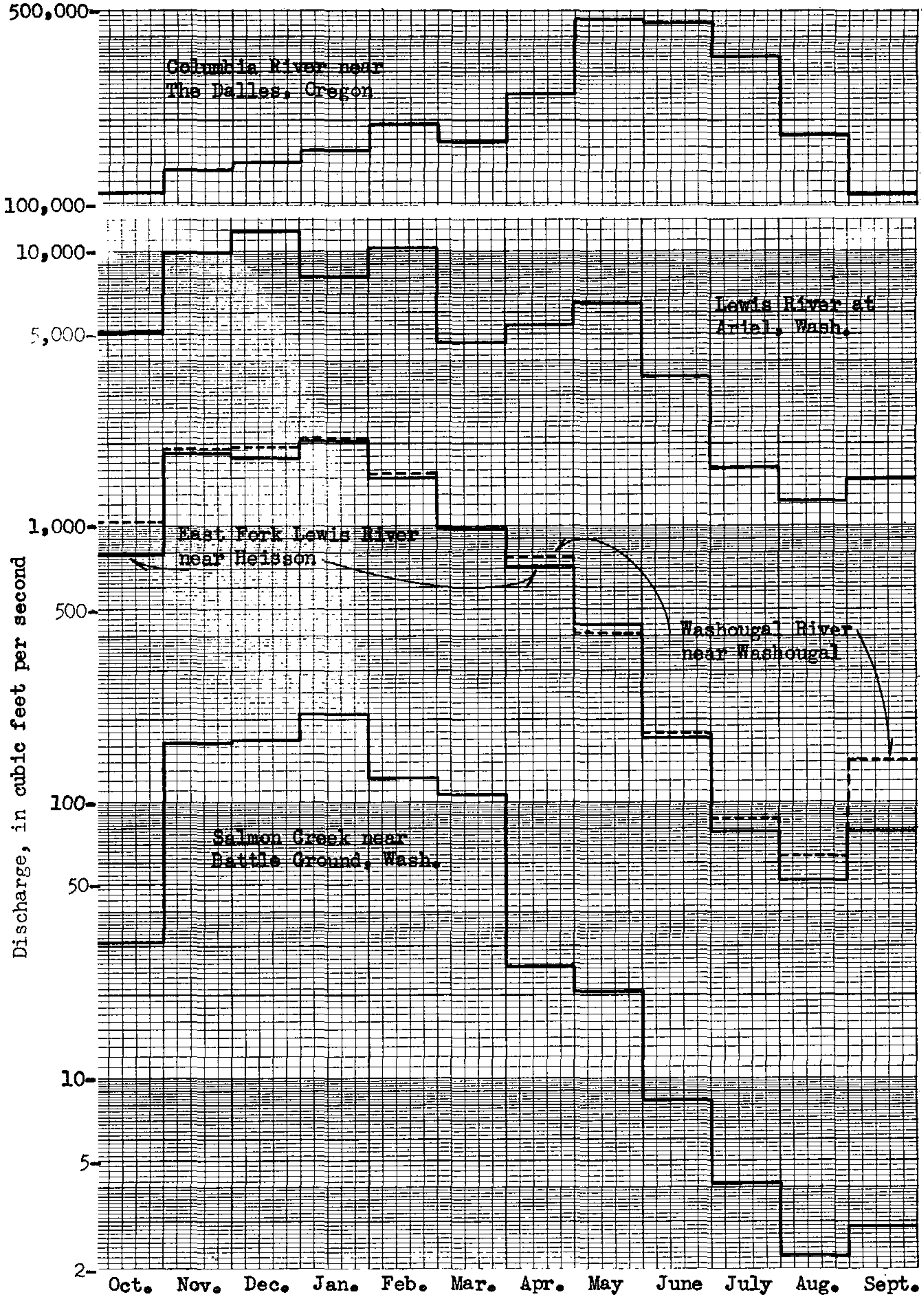


Figure 12.--Mean monthly discharge, 1951 water year.

SALMON CREEK

Salmon Creek rises in the foothills in eastern Clark County. The basin upstream from the gaging station is underlain chiefly by volcanic rocks. Average discharge at the station south of Battle Ground, approximately 14 miles upstream from the mouth of the creek, is about 61 cubic feet per second. The graph in figure 12 shows the marked seasonal difference in discharge. Discharge in July, August, and September, 1951 was less than 2 percent of the discharge for the winter months of November, December, and January 1950-51. It is apparent that groundwater storage in the bedrock is very small.

LEWIS RIVER

Lewis River, forming the northern boundary of the county, rises on the slopes of Mount St. Helens. Principal water use is for power generation. There are practically no withdrawals or diversions from the river. The average discharge, half a mile below Ariel Dam, about 19 miles upstream from the mouth of the river, is approximately 4,600 cubic feet per second. The graph in figure 12, showing mean discharge by months for the 1951 water year, indicates that precipitation is the chief factor in seasonal distribution of runoff, with peak discharge coming in the rainy winter months. However, spring snowmelt on the flanks of Mount St. Helens causes a secondary period of high discharge in April and May.

CEDAR CREEK

The Cedar Creek basin is underlain chiefly by volcanic rocks but the trunk stream, including the main tributary, Chelatchie Creek, flows through basins underlain by alluvial fill. The alluvial fill apparently contains a great deal of water in storage and discharge from these underground reservoirs during dry periods sustains runoff at a somewhat higher rate in Cedar Creek than in comparable streams in the area not having such underground reservoirs.

EAST FORK OF THE LEWIS RIVER

This stream heads in the foothills along the west slope of the Cascade Mountains in the eastern part of Clark County and in Skamania County to the east of Clark County. The basin is underlain almost entirely by volcanic rocks. Average discharge at the station near Heisson, about 16 miles above the mouth of the river, is approximately 730 cubic feet per second. The graph in figure 12 shows that seasonal distribution of runoff is directly related to precipitation. It appears that most of the basin is at too low an altitude to be greatly influenced by snowmelt.

GROUND-WATER RESOURCES

Ground water is the most important source of water supply in Clark County. Nearly all domestic supplies, most industrial and municipal supplies, and more than half the irrigation supplies are obtained from ground-water sources.

In its occurrence ground water obeys certain definite physical laws or principals.. Because ground water occurs beneath the land surface and cannot be observed directly, to many people it seems mysterious and unpredictable. However, if it seems to occur or to behave unpredicatably, it is not because it violates any law or principle, but rather because the conditions relating to its occurrence are unknown or have been misinterpreted.

A knowledge of the governing principles is indispensable to an understanding of the occurrence of ground water.

PRINCIPLES OF GROUND-WATER OCCURRENCE[1]

Subsurface water is generaly considered to include all water beneath the earth's surface contained in the interstices of the rock or rock materials. Subsurface water can be divided into two classes, (1) ground water, which is water in the zone of saturation, and (2) vadose water, which is the water in the zone of aeration (in the soil and subsoil above the zone of saturation).

Source

Most ground water is derived from precipitation. A small amount may be connate water, trapped in sedimentary beds at the time they were deposited. Connate water is most often found in sedimentary materials that were deposited in lakes or oceans. A small additional amount of ground water is juvenile water derived from within the earth itself. In Clark County practically all of the ground water is derived from precipitation except at a few places where some water is believed to be diluted connate water.

[1]See Meinzer, O. E., (1923a and b) for a detailed discussion of the principles governing the occurrence and movement of ground water.

Average annual precipitation in Clark County ranges from slightly less than 40 to more than 100 inches (see fig. 4, p. 19) however, precipitation over most of the populated and agricultural areas ranges from slightly less than 40 to about 60 inches annually. Of the rainfall that reaches the earth's surface, a part runs off directly into streams, another part moves laterally through the soil and subsoil to the streams, part is held within the pores of soil and subsoil, and later evaporated or transpired, and part percolates downward to the zone of saturation to become ground water. The ground water moves toward surface outlets in springs or streams, or toward wells; as it approaches the natural outlets it may lie at depths shallow enough for part of it to be discharged by evapotranspiration.

Occurrence

Large quantities of ground water are contained below the surface of the earth in openings or interstices in the rocks in the zone of saturation. In unconsolidated rocks such as gravel, sand, clay, and silt, the interstices are openings or pores between the ~~between the~~ grains. Crystalline rocks such as granite, gneiss, and schist have little pore space between the component grains. In these rocks the joints and other fractures are the principal interstices. Consolidated sedimentary rocks such as conglomerate, sandstone, and shale have had their primary porosity (space between the grains) reduced by compaction and by deposition of minerals between the grains. In these rocks, as in the case of the crystalline rocks, the chief interstices are in fractures.

Volcanic rocks are a somewhat special case. In unconsolidated fragmental volcanic rocks, such as tuff, cinders, and breccia, the interstices are between the grains, just as in gravel and sand. Volcanic lava flows, on the other hand, are crystalline rocks and the crystals or grains are interlocked so tightly that there are no interstices between the grains. However, many lava flows, especially of basalt, are porous in their upper part. Expanding gases leave bubble holes (vesicles) in the lava as it chilled. As the surface solidified the still molten lava beneath exerted pressure, churning and brecciating the chilled crust. Tiny cracks formed connecting the vesicles and at places molten lava flowed out from between walls of cooled rock, leaving hollow tubes. When the next lava flow spread out over the very irregular surface of the lava beneath, the viscous lava was chilled very quickly at the contact with the comparatively cool rock beneath and therefore was unable to fill all the irregularities of the former surface. It is these irregular porous zones at the tops of successive lava flows that serve as aquifers in the basalt. Other interstices include joints formed during and after cooling of the lava.

The porosity of a rock is the percentage of the total volume that is occupied by the interstices. Porosities of rock (and rock materials) cover a wide range; from considerably more than 50 percent in some clays to less than 1 percent in some massive crystalline rocks such as granite or the dense parts of lava flows. The porosities of clean, uniform-sized sand or gravel commonly are between 20 and 40 percent. The addition of a comparatively small percentage of fine sand, silt, or clay to such a sand or gravel reduces the porosity considerably. When sand and clay are cemented or compacted to form sandstone and shale, their porosity is greatly reduced.

A saturated rock (or rock material such as sand and clay) may have a large porosity and yet yield little water even though allowed to drain for a long time. For example, clay having a high porosity might yield little water because of the smallness of the pores, the water being retained because of molecular attraction. Some water also may be retained in a rock because the interstices are isolated or poorly interconnected. Even in a clean, coarse, well-sorted sand an appreciable part of the water will be retained as a thin film on the surface of the grains, and thicker films will be retained at the intersections of the surfaces of the grains. The ratio of the volume of water yielded, by gravity drainage, to the total volume of rock is known as the specific yield and is expressed as a percentage. (See Glossary, p.170.)

One of the most important characteristics of an aquifer is its permeability--that is, its relative ability to transmit water. This characteristic may have little relation to porosity; for example, a clay having a porosity of 50 percent may transmit water very slowly or not at all under the gradients that exist in nature, whereas a sand or gravel having a porosity half as great may transmit large quantities of water in a short time. In silt and extremely fine sand the pores are larger and friction is less than in clay, but it may still be so great that water is transmitted very slowly. Clean, well-sorted medium- or coarse-grained sand and gravel will transmit water very rapidly, but an admixture of a small amount of clay or fine sand will greatly reduce their permeability.

The concepts of porosity, specific yield, and permeability apply particularly to more or less homogeneous materials such as soil, clay, sand, gravel, and semiconsolidated sand and gravel. It is more difficult to apply these concepts to rocks in which the interstices consist entirely of joints, cleavage planes, and similar openings because these rocks generally are nonhomogeneous.

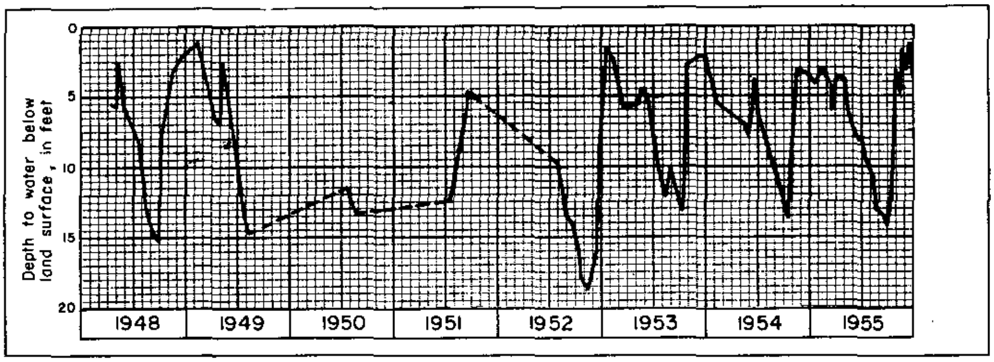
The movement of ground water in most places is due entirely to the force of gravity, and ordinarily the velocity of flow varies directly with the hydraulic gradient. That is, doubling the hydraulic gradient will double the velocity of ground-water movement, other factors remaining the same. Under usual conditions the points or areas of ground-water discharge are at lower elevations than the points or areas of recharge.

In a humid or subhumid area, such as in Clark County, recharge to the ground-water body takes place in the interstream areas. The ground water discharges into the perennial streams and lakes and the lowest points on the water table are at these places. Rainwater percolates downward to the water table and then moves laterally down gradient toward the points of discharge in streams, lakes, or swamps. the streams contribute to ground-water recharge only in periods of floods, when they recharge the rock materials along their channels. This water generally drains back quickly into the streams when the floods pass.

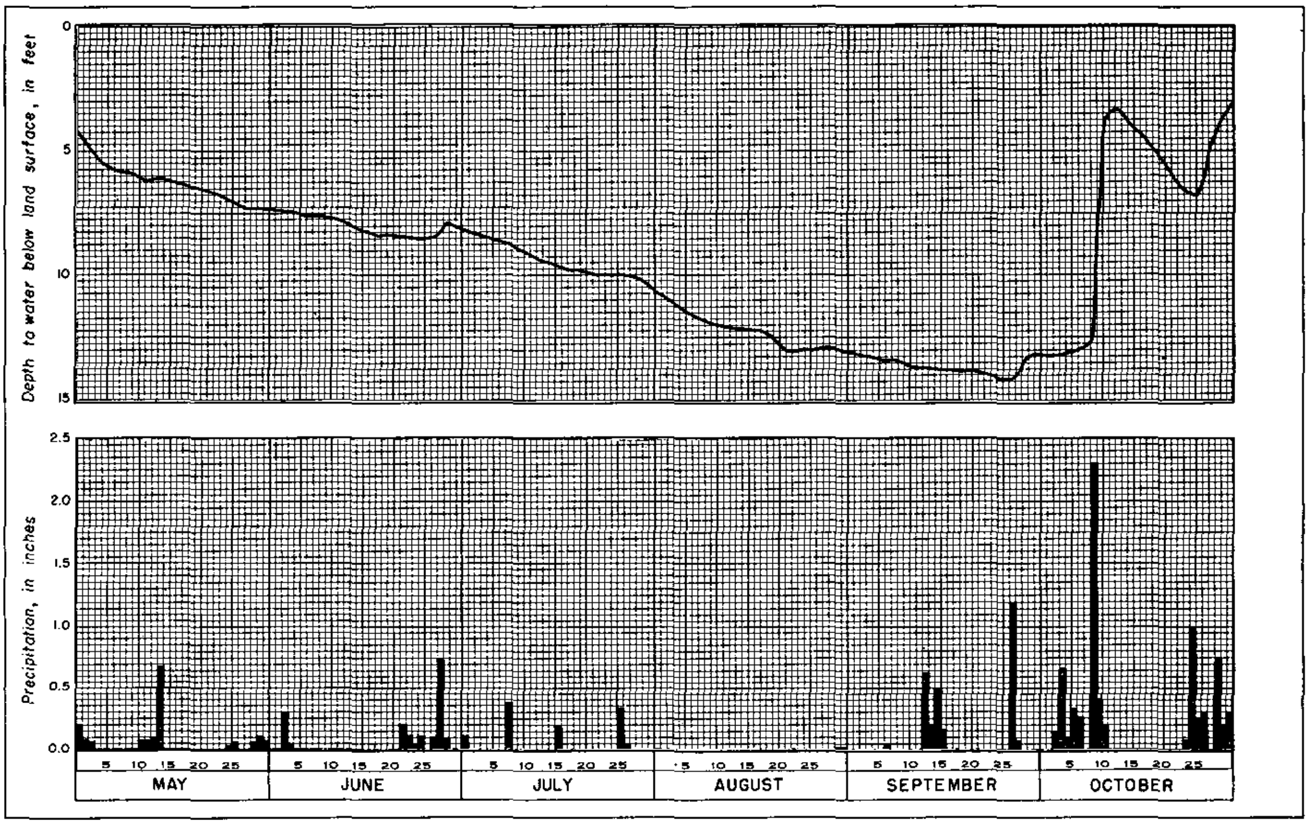
The Water Table

Part of the rain falling on an area percolates downward through the soil until it reaches the zone of saturation, within which all of the pores and interstices are completely filled with water under hydrostatic pressure. The surface of the zone of saturation is the water table. The water occurring under water-table conditions is not confined and the water surface rises or falls as water is added to or discharged from the aquifer (fig. 13). The water table is not a stationary surface but is continually fluctuating, rising during and immediately after periods of rainfall and declining during periods of fair weather. In humid regions, such as in Clark County, the water table is an undulating surface, usually reflecting, in a subdued way, the irregularities of the topography. The relief--that is, the difference in elevation between high and low points--of the water table generally is much less than the relief of the topography.

The depth to water and the general shape of the water table depend chiefly upon the climate, the topography, and the character of the rocks. In places the rocks are more or less homogeneous over considerable areas, so that precipitation and topography largely determine the depth to and shape of the water table. At other places the rock materials differ considerably in porosity and permeability, and the shape and slope of the water table is influenced to some extent by these lateral or vertical differences.



A. Hydrograph of well 2/3-26Q2 for the period 1948-55



B. Hydrograph of well 2/3-26Q2 for the period May-October 1955, showing effect of precipitation

Figure 13.—Hydrographs of well 2/3-26Q2

Perched Ground Water

At some places precipitation falling on an area is prevented from percolating freely downward to the main water table because of the presence of a body of impermeable or poorly permeable rocks. At such places a second zone of saturation may be perched on the strata of low permeability above the main water table.

A body of ground water is not considered to be perched unless there is unsaturated material between it and the main body of ground water. Many perched aquifers are seasonal; during the rainy season they may be a few to more than 10 feet thick and of large areal extent, but during the dry season they drain laterally, or vertically if the perching layer is somewhat permeable, and may become unsaturated. Other perched ground-water bodies may be permanent aquifers of large extent and considerable thickness and may support important ground-water developments.

Artesian Pressure

Water entering the ground in an area of recharge, after it becomes a part of the ground-water body, moves laterally to some point or area of discharge. This movement is always in the direction of declining head. In such underground travel the water may pass beneath a layer that is only slightly permeable. If the aquifer beneath this layer is completely saturated and the water exerts a hydrostatic pressure upward on the base of the confining layer, the ground water is under artesian pressure, and water will then rise above the bottom of the confining layer in wells tapping the aquifer.

If the hydrostatic pressure is sufficient, the water will rise above the surface and the well will flow. All wells in which the water level rises above the confining bed are artesian wells. The height to which water will rise in wells drilled into an artesian aquifer at various places defines an imaginary plane termed the piezometric surface. Whether an artesian well will flow at the surface depends to a considerable extent upon the topography and in some cases, upon the season of the year. Two wells may be drilled into the same aquifer only a few tens of feet apart but at different altitudes; the one in the valley will flow, the other on the terrace will not. A third well on the slope between the two might flow during late winter and spring but cease to flow as the water level declines in summer and fall.

Most artesian aquifers have nonartesian (water-table) extensions; most frequently these are in the area of outcrop where recharge takes place. Moreover, at some places the aquifer may extend entirely above the zone of saturation; in such a place, of course, it is no longer an aquifer.

OCCURRENCE IN CLARK COUNTY

Ground water in Clark County is derived from precipitation; directly from rain and snow falling on the area, indirectly from streams fed by rainfall and snowfall on adjacent areas. It moves, owing to the force of gravity, through subsurface interstices from areas of recharge to places of discharge. The recharge, movement, and discharge of water and the quantity and quality of water available are directly related to the character of the rock and to landforms. The occurrence of ground water in each of the geologic terranes in Clark County is described below. The areas are shown on the map, figure 1, p. 11.

Ground Water in the Foothills Area

The foothills area comprises roughly the eastern half of Clark County as shown in figure 1. The hills and mountains are sparsely populated; the only inhabitants are a few farmers and timber workers. The consolidated rocks that underlie the area are chiefly volcanic in origin, and generally do not yield large amounts of water, although moderate amounts probably could be developed from some of the volcanic rocks at a few places. However, very few wells have been drilled into the consolidated rocks. Most water supplies are obtained from springs or dug wells. On the gentler slopes where the farms and homesteads are located, weathering of the rock generally is moderately deep, so that dug wells almost always yield an adequate supply of water. Most of the springs utilized are in draws and are fed by water percolating downward through the weathered mantle or rock. The water levels in wells are apt to be low and the flow of springs tend to diminish after a dry summer and autumn. The quality of the water is generally very good.

Intermontaine Valleys

The intermontane valleys range in size from small creek valleys to basins several square miles in area. Chelatchie and Yacolt prairies, each covering 2 or 3 square miles, are the largest of these. Most of the valleys are farmed to some extent, and are inhabited also by loggers, lumber workers, and suburban residents.

The valleys are cut into the consolidated volcanic and sedimentary rocks that form the hills and mountains. However, most of the valleys contain fluvial and glaciofluvial sand and gravel capable of yielding larger amounts of ground water than does the underlying rock. The amount of water available depends generally upon the thickness of the deposits; small to moderate supplies are available where the deposits are thin and larger supplies where they are thick.

Along the Washougal and Little Washougal Rivers a few farmers and suburban residents utilize springs and wells yielding water from sand and gravel. Most of the wells are dug and are not more than 20 to 25 feet deep. Probably moderately large yields could be obtained at places along these streams.

A few drilled wells and a number of dug wells and springs are utilized by residents along the East Fork of the Lewis River east of Heisson. Although only small amounts of water are used or needed, the terrace deposits appear to be permeable enough to yield moderately large quantities of water.

So far as known, no wells have been drilled on the Yacolt Prairie, and only a few on Chelatchie Prairie. Most water supplies are obtained from wells dug into the sand and gravel. The dug wells generally range from 10 to 30 feet in depth and yield a supply adequate for domestic use. Well 5/4-7M1, which is 598 feet deep, furnishes the only record of strata underlying Chelatchie Prairie. The log of this well shows alluvial materials to a depth of 217 feet, with water-bearing gravel at several horizons. The well was tested for 1 hour at 800 gpm with 60 feet of drawdown, but it is not known what proportion of the water was coming from the gravel or from the rock below the gravel. Undoubtedly however, the gravel will yield large supplies to properly constructed wells.

Ground Water in the Alluvial Plains and Benches

The alluvial plains and benches include most of the farmlands in the county. The majority of the irrigation wells, most domestic wells, a considerable number of municipal wells, and a few industrial wells are located in these areas. Ground water is obtained from sand and gravel strata generally ranging in thickness from a few feet to about 300 feet.

Troutdale Bench

The Troutdale bench includes the bench extending northward from Woodburn Hill north of Washougal to Battle Ground Lake and the highland north of the East Fork of the Lewis River extending from Woodland to Fargher Lake. It includes also Prune Hill and the upland bench immediately south of Mount Norway (pl. 1). The unit is shown in figure 1, p. 11.

Woodburn Hill, at the southeast end of the bench, is underlain by volcanic lava flows. A number of wells have been drilled into the rock and most of them yield an adequate amount of water for domestic use. The largest yield reported, about 35 gpm, is from well 1/3-1H1. Yields from a few wells are reported to be scanty or inadequate. Drilled wells are as much as 401 feet deep; dug wells range from about 20 to about 50 feet in depth. A number of wells have been drilled on Prune Hill, generally obtaining water from the upper member of the Troutdale formation or the Boring lava. The water level is only slightly higher beneath Prune Hill than in the surrounding plains and therefore is generally far below the surface, although some perched water is obtained from the weathered part of the upper member of the Troutdale formation at higher levels on the southeastern part of Prune

Hill. Wells range in depth from 210 to 798 feet and water levels are as much as 500 feet below the surface. Yields generally are adequate, but the great depth to water makes it expensive to develop larger supplies. Larger yields are obtained from wells drilled on the low Troutdale bench in sections 33 and 34 at the northwest foot of Prune Hill. Drilled wells in that area range from about 50 to 220 feet in depth and the largest yield reported is from well 1/3-4C1 which was tested at 550 gpm with a drawdown of 18 feet. This well is 220 feet deep and encountered water-bearing gravel at 140 and 193 feet.

A few wells have been drilled in the upper member of the Troutdale formation on the high Troutdale bench south of Mount Norway and Nichols Hill. Drilled wells range from about 80 to 180 feet in depth. The largest yield is from well 1/4-9B1 which is reported to have been tested at 225 gpm with 40 feet of drawdown. Dug wells on this bench generally range from 25 to 50 feet in depth and yield adequate to ample supplies.

A considerable number of wells have been drilled in the upper member of the Troutdale formation north of Woodburn Hill and in the vicinity of Fern Prairie. Depths range from about 40 to more than 200 feet. The largest yield reported is 240 gpm with a drawdown of 175 feet from well 2/3-14N1. However, wells with yields reported as "30 gpm with 3 inches drawdown," "20 gpm with 10 feet of drawdown," "20 gpm with no drawdown" apparently have a greater specific capacity (yield in gallons a minute per foot of drawdown) than well 2/3-14N1. The casing of well 2/3-14N1 is perforated; most of the other wells are neither perforated nor screened and undoubtedly could yield much larger supplies if completed as described in the section of the report on well construction. Dug wells range in depth from about 15 to 50 feet and generally yield adequate supplies for domestic and limited irrigation use. However, the upper part of the upper member of the Troutdale formation has been weathered in this area reducing the permeability so that the shallow wells generally do not yield as much water as the deeper ones.

Between Munsel Hill and Battle Ground Lake most wells are dug, and most of the comparatively few drilled wells are used for domestic purposes. The drilled wells range in depth from about 60 to 200 feet. Most of them obtain their water from sand and gravel in the Troutdale formation and most of them are reported to yield "plenty of water" or to have a "large supply." Several are reported to have "no drawdown" when bailed or pumped. The largest yield reported, from well 4/3-29B1, was 350 gpm with 10 feet of drawdown. Most of the wells are completed with open-end casing only and it is obvious that larger yields could be obtained by use of a screen or perforations of correct size.

Dug wells generally are from 15 to 40 feet in depth. Most of these yield an adequate supply; the largest yield reported, 100 gpm with a 4-foot drawdown, is from well 3/3-32P1, 15 feet deep. A few wells along the eastern edge of the bench, where the Troutdale formation is thin, were drilled through the Troutdale formation and obtain water from the volcanic rocks beneath. Most of these are reported to have adequate yields.

The highland bench between Lewis River and the East Fork of the Lewis River extending from Battle Ground and Fargher Lake on the east to Woodland on the west is underlain chiefly by the Troutdale formation. On the higher parts of the bench the Troutdale has been deeply weathered, and the surface has been considerably dissected. Weathering has progressed so far and so deep that the upper 50 to 100 feet of the Troutdale is of low permeability and yields only small amounts of water. In this area, as in most other places, the lower member of the Troutdale is fine grained and generally yields only small amounts of water. Where weathering has progressed to the base, or nearly to the base, of the upper member of the Troutdale formation it is difficult to develop even moderate yields of water. The best supplies are obtained from sand and gravel near the base of the upper member. Drilled wells generally range from 60 to 160 feet in depth. A few have been drilled deeper, into the lower member of the Troutdale formation. In some of these wells the water was salty; in others the materials encountered were so fine grained as to yield little or no water. Dug wells are in the weathered upper member of the Troutdale formation and generally range from 10 to 50 feet in depth. Because of their large storage capacity, resulting from their large diameter, they usually yield supplies adequate for domestic use.

On the lower slopes and terraces of the Highland area the upper member of the Troutdale formation has not weathered so deeply and somewhat larger yields can be obtained.

The volcanic rocks which underlie the Troutdale formation protrude through it at a few places. A few wells are drilled into these rocks where they are exposed at the surface or where the overlying Troutdale is thin. Generally the yields from such wells do not exceed a few gallons per minute.

Fourth Plains Area

The Fourth Plains area, as used in this report, includes the remnants of the "Portland delta" and the terraces formed during degradation of that delta. Most of the Fourth Plains area lies between 150 and 300 feet above sea level, but lower terraces occupy limited areas ranging downward to about 25 feet in elevation. The Fourth Plains area is bounded on the east and north by the Troutdale bench extending north from Prune Hill to Battle Ground and thence northwest to Woodland. The southern and western boundaries are formed by the flood plain of the Columbia River.

The Fourth Plains area contains the majority of the better grade of farmlands and most irrigation wells are in this area. There are two important aquifers; (1) the Pleistocene alluvial deposits which are utilized by the majority of domestic and some irrigation supplies, and (2) the upper member of the Troutdale formation which is utilized by most irrigation and municipal supplies.

The Pleistocene alluvial deposits, in general, form a blanket over the Fourth Plains area ranging from a few feet to about 200 feet in thickness. However, where the deposits are thickest and most permeable the ground water drains out readily so that they are dry or are saturated only near the base. Where the deposits are thin, or are finer grained and therefore less permeable, perched ground water is obtained from lenses of coarser grained materials.

Almost everywhere in the area the upper member of the Troutdale formation is an important aquifer. The unit ranges generally from 125 to 200 feet in thickness and consists predominantly of sand and gravel which at most places is saturated. At some places the upper strata have been weathered enough to reduce their permeability. Some of the deeper strata have had their permeability reduced by cementation. However, except in the area northwest of Pioneer, beds of loose, coarse, permeable sand and gravel are found at some level almost everywhere in the Fourth Plains area. Ground-water occurrences in the Fourth Plains area are shown diagrammatically in figures 14, 15, 16 and 17.

<u>Recharge</u>

Recharge is derived chiefly from precipitation that falls on the area (fig. 13, p. 92). It is possible that some recharge is derived also from runoff from adjacent slopes bordering the Fourth Plains to the east and north, but such recharge is believed to constitute a very small part of the total.

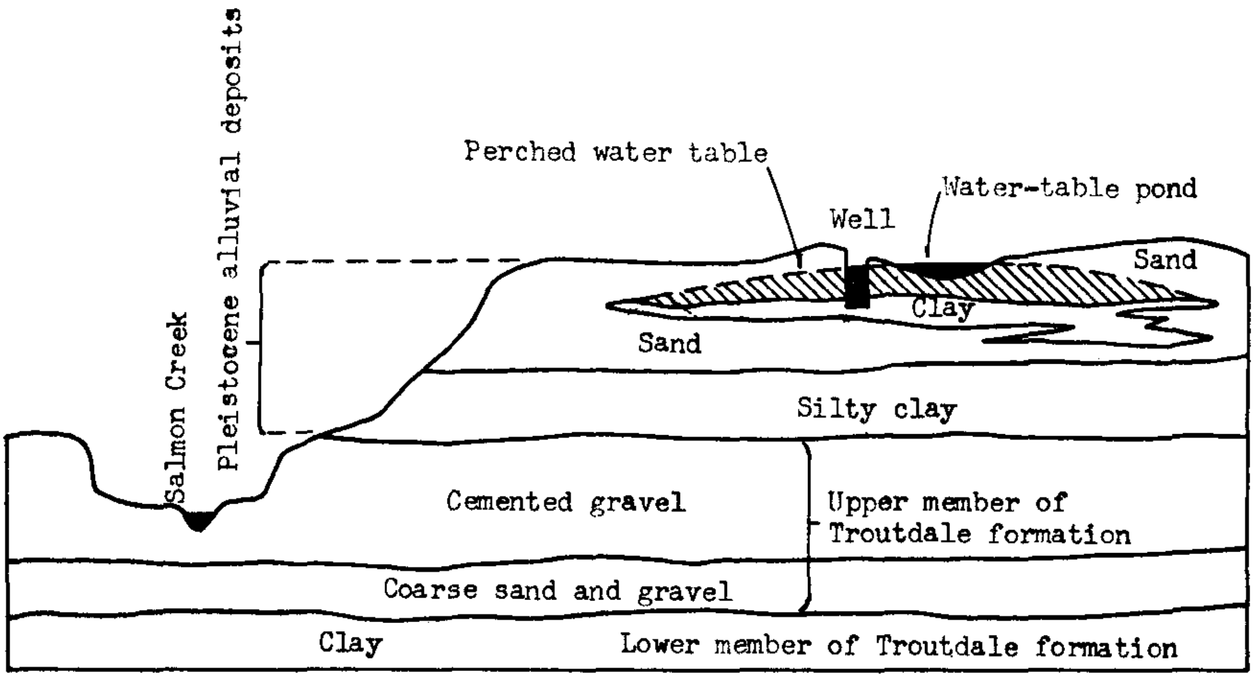


Figure 14.--Generalized section in area north of Vancouver showing well supplied by water perched above main body of ground water on impervious clay layer. The perched water is recharged by precipitation on immediate area. After reaching perched water table, water moves laterally to edges of clay layer and then percolates downward to main body of ground water. The perched water table declines greatly every autumn and yield then becomes very small.

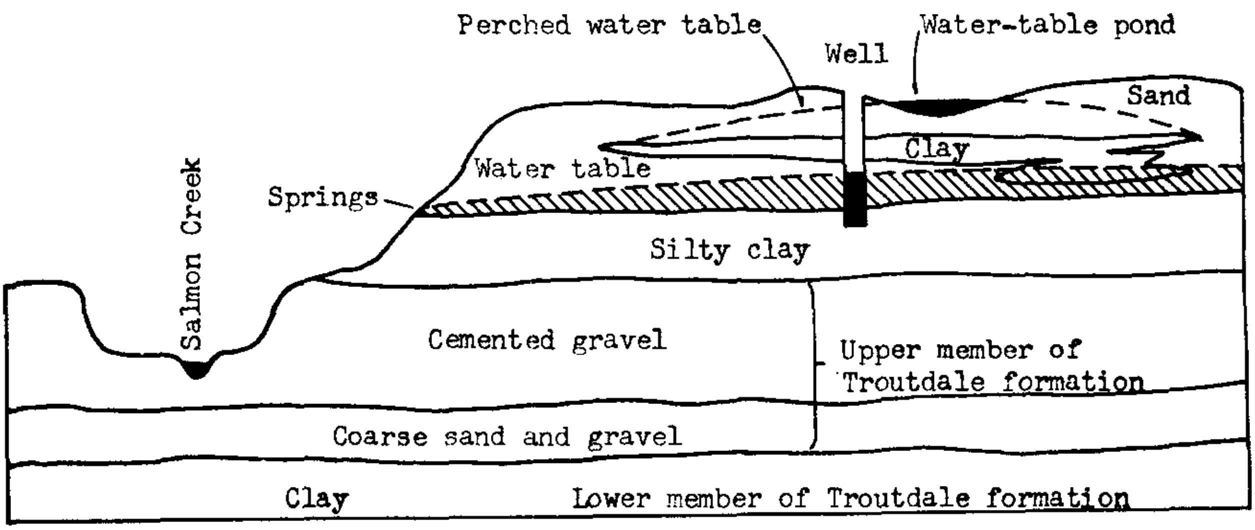


Figure 15.--Generalized section in area north of Vancouver showing well which has been deepened and which now obtains water from main body of unconfined ground water. The perched ground water is shut out by well casing. If well were not cased, water from perched horizon would run down inside of well to join water below. Recharge to water table is from leakage from perched ground water, and from direct precipitation where relatively impermeable clay layer is absent.

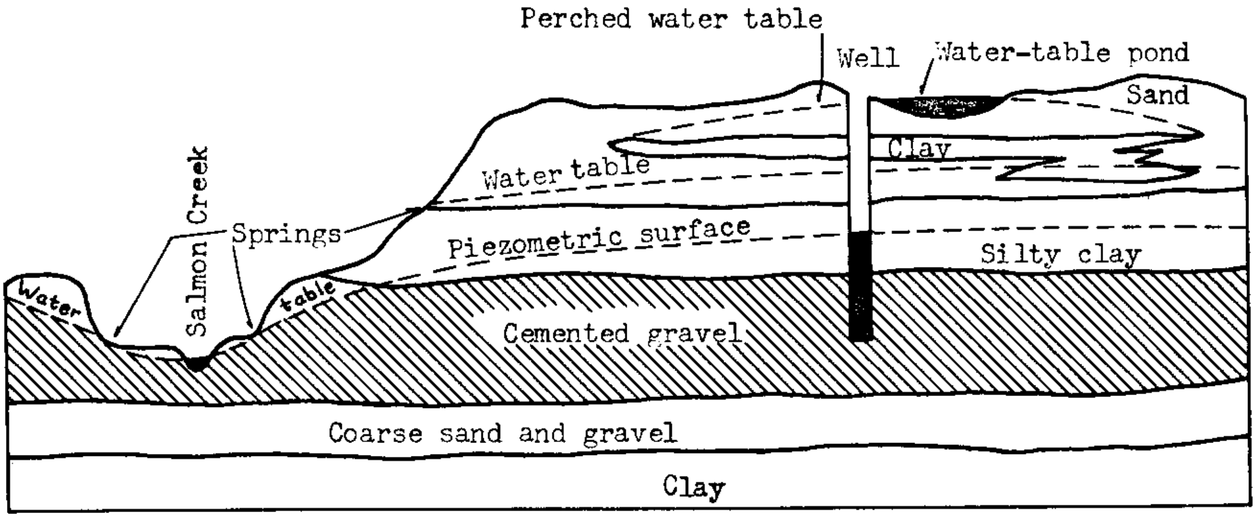


Figure 16.--Generalized section in area north of Vancouver showing well which has been deepened because water table declined so much during an extended period of drought that yield became insufficient. The deepened well (artesian) is supplied by water confined in cemented gravel. Cemented gravel is not very good aquifer, and yields only enough water for domestic and stock use. However, the piezometric surface fluctuates only very slightly, hence it is a more dependable supply. The silty clay grades into sand a few miles away and recharge to cemented gravel is from precipitation which percolates downward through sand in that area.

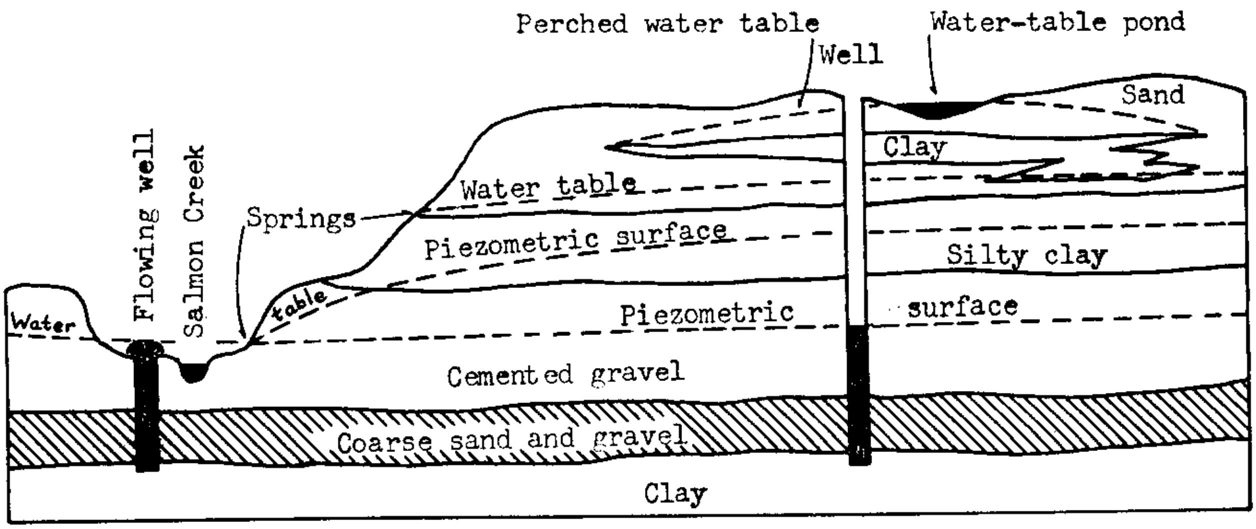


Figure 17.--Generalized section in area north of Vancouver showing well which was deepened still further because larger supply of water was needed for irrigation. A layer of very permeable sand and gravel was encountered beneath cemented gravel. Water rose in casing above aquifer so the aquifer is classified as artesian, although static water level is lower than when well was in shallower aquifers. However, aquifer is so permeable that drawdown is very small when well is pumped at yield required (150 gpm), and pumping level is higher at that rate than it was when 5 gpm was pumped from cemented gravel.

Precipitation on the area probably averages about 45 inches annually (fig. 4, p. 19). Over much of the area the soils are coarse sand and gravel, and in areas of considerable extent such as Mill Plain and in the vicinity of Orchards northward to Battle Ground, there is practically no direct surface runoff. Through much of the rest of the area the materials range from silt to sand of moderately high vertical permeability and the amount of direct runoff is small. It is probable that in the area as a whole, direct runoff does not average more than 1 or 2 inches per year. However, runoff from springs and seeps fed by shallow perched ground water undoubtedly is considerably greater.

Consumptive-use data are not available for Clark County; however, on the basis of data from other areas it is believed that the average annual consumptive use in the entire Fourth Plains area, including both cultivated and noncultivated land, is between 15 and 20 inches.

If consumptive use and direct runoff together are assumed to equal 20 inches annually, approximately 25 inches of precipitation becomes ground water. This is more than 2 acre-feet per acre, or about 1,300 acre-feet per square mile. Annual recharge on the total of about 185 square miles included in the Fourth Plains area would be about 240,000 acre-feet. However, a considerable part of this probably enters perched aquifers, whence much of it is discharged rather quickly into the streams.

Movement and discharge

Except for the small amount that runs off directly, precipitation falling on the area enters the soil and subsoil to replace soil moisture that may have been depleted by evaporation or transpiration. Water in excess of that required to replace the deficiency in soil moisture percolates downward to the water table. After reaching the water table it percolates laterally toward the points or areas of discharge, which are always at a lower elevation than the recharge area. Rate of movement of the ground water generally is rather slow; in the Fourth Plains area the rate is estimated to range between a fraction of a foot and several feet per day, except at a few places where it is higher, perhaps as much as 100 feet per day.

The shape of the water table in the shallow aquifers is, to a considerable extent, a subdued reflection of the surface topography. The lowest points on the water table are along the stream courses where the ground water discharges and the highest points occur beneath the higher lands between the streams. Because of the complexity of the topography in the Fourth Plains area it was not feasible to show the shape of the water table. Water levels of wells in the deeper aquifers in the Troutdale formation, especially where the water in these aquifers is confined, are more uniform. However, because of the lenticular character of the deposits, wells of the same depth a short distance apart may obtain water from different lenses within the aquifer and thus may have considerably different water levels. The actual path a particle of water follows from its point of entrance into the formation to its point of discharge may be quite complex. The water-level contours shown on plate 2, representing the height to which water will rise in wells that end in the principal aquifer in the upper member of the Troutdale formation, therefore, are considerably generalized.

At most places other, lesser aquifers, both in the Pleistocene alluvial deposits and near the top of the Troutdale formation, are encountered above the principal aquifer. Water levels of wells ending in these shallower aquifers generally are higher than water levels in the principal aquifer.

The Columbia River is the ultimate drain for all surface and ground-water discharge from the County. Although some ground water may discharge directly into the Columbia River, a great deal of ground water reaches the surface through seeps and springs which feed the tributary streams which in turn discharge into the Columbia River. Measurement of total ground-water discharge from the Fourth Plains area is not feasible and was not attempted; however, certain components were measured and estimates were made of other components.

Spring discharge.--Springs are common where the Troutdale formation is exposed along the flanks of the valleys, particularly along the Columbia River, Salmon Creek, and the East Fork of the Lewis River. Especially prominent are the series of springs that discharge along the scarp extending from the eastern edge of Vancouver to Prune Hill, a distance of about 6 miles. Most of the springs discharge at an altitude of about 150 to 175 feet and the water apparently is discharging from the base of the alluvial deposits and the top of the upper member of the Troutdale formation. The water table is held at this high level by relatively impermeable materials at and near the top of the Troutdale formation. During the period April 11 to 19, 1949, the flow of most of the larger springs along this reach was measured and estimates were made of the flow of the smaller springs. Although the measuring points were along creeks a few hundred feet to about one-eighth mile downstream from the head of the creek there was no precipitation during this period and there had been none for the previous 9 days, so that the water measured was entirely ground-water discharge. The following table lists the springs and the measured or estimated discharge.

Table 6.--Discharge of springs and spring-fed creeks between Prune Hill and the eastern edge of Vancouver, April 11-19, 1949.

Spring	Location and/or owner	Distance from Ellsworth-Mill Plain Road, (miles)	Discharge (cubic ft per second)	Discharge (gallons per minute)
1/3-7G1s	1.0 mile east of Fisher	4.01 east	1.16	520
1/3-7F2s	0.9 mile east of Fisher	3.91 east	.41	185
1/3-7F1s	0.75 mile east of Fisher	3.75 east	.22 a/	100 a/
1/3-7E1s	at Ten Mile Tavern	3.44 east	1.22	550
1/2-12B1s	Mrs. Emma Allen residence	2.90 east	.5 a/	225 a/
1/2-12C1s	--	2.65 east	.62	280
1/2-2Q1s	Dawson residence	1.98 east	1.5 a/	675 a/
1/2-2M1s	0.6 mile east of State Hatchery	1.39 east	3.92	1,760
1/2-3J2s	E. Wood and E. B. Wood	1.22 east	1.48	665
1/2-3K	Creek near State Hatchery	.85 east	13.5	6,050
1/2-F1s	0.6 mile west of State Hatchery	.60 east	1.36	610
1/2-3E1s	near L. Maynard residence	.25 east	.45 a/	200 a/
1/2-4B2s	Dr. Brougher residence	.10 west	.45	200
1/2-4B1s	near Felix Baranovich residence	.32 west	2.96	1,330
1/2-33M1s L1s, P1s	Ellsworth Springs	.60 west	4.64	2,085 b/
1/2-4D1s	near Russell Landing	.78 west	.16 a/	75 a/
2/2-32Q1s	near Hahn's Chrysanthemum Gardens	1.22 west	.11 a/	50 a/
2/2-31J1s	near Columbia Marine Service	1.96 west	.22 a/	100 a/

a/estimated

b/measured by city of Vancouver, October 15, 1945

The total discharge along this line was almost 35 cfs, more than 5½ cfs per mile. Beginning at the east edge of Vancouver in sec. 31, T. 2 N., R. 2 E., and extending northwest to the mouth of Burntbridge Creek at Vancouver Junction is a stretch of the escarpment in which there are no springs. Ground-water underflow from Fourth Plains into the Columbia River in this reach is entirely underground because the Troutdale formation is not exposed, and the overlying alluvial deposits are permeable sand and gravel which permit the ground water to reach the Columbia River without coming to the land surface.

North of Vancouver Junction the Troutdale formation is again exposed in the bluff overlooking the flood plain and a few small springs discharge some ground water; however, most of the ground-water discharge in this area is into the Burntbridge, Salmon, Whipple, Gee and other Creeks south of the East Fork of the Lewis River.

Of the springs that discharge into the East Fork of the Lewis River, measurements were made on only a few. It is probable that ground-water discharge in the reach of the river between La Center and Battle Ground would be comparable to the discharge into the Columbia River between Vancouver and Prune Hill.

Records are not available regarding fluctuations in discharge rate of the springs. Undoubtedly the measurements made were neither the highest nor the lowest rates of discharge but possibly were somewhat above average. If it is assumed that ground-water discharge from the measured 6-mile reach is representative of discharge from the Fourth Plains along the entire reach of nearly 30 miles bordering the Columbia River, then total discharge from the base of the Pleistocene alluvial deposits and the shallower aquifers in the upper member of the Troutdale formation might be on the order of 150 cfs, or more than 100,000 acre-feet per year. In addition to the spring discharge from the base of the Pleistocene alluvial deposits and the top of the Troutdale, there undoubtedly is a great deal of underflow from the area, both from shallow perched aquifers and through the deeper aquifers in the upper member of the Troutdale formation. Underflow through the deeper aquifers cannot be measured and is difficult to estimate. However, some idea of discharge from both the shallow and the deeper aquifers can be gained by studying stream-discharge records.

Ground-water component of streamflow.--During periods of fair weather, the flow of most streams is maintained by discharge from seeps and springs. Lakes and swamps under natural conditions, and manmade reservoirs, also help to maintain base flow. The relationship between fair-weather discharge of a stream and the altitude of the water table is shown in figure 18. On this graph the discharge of Salmon Creek at station LC 373, 4 miles east of Battle Ground, in the NE¼NW¼ sec. 4, T. 3 N., R. 3 E. is plotted against water levels in well 2/3-26Q2, a 21-foot well about 1 mile southeast of Fern Prairie. A fairly well-defined relationship between the two is shown even though the materials tapped by the well are not in hydraulic contact with the stream. Where continuous records of streamflow are available the ground-water component of streamflow generally can be determined with a reasonable degree of accuracy. Unfortunately, continuous records of flow are not available for the smaller streams in Clark County, and all the gaging stations are upstream from the alluvial-plains area. However, by correlating short records in the alluvial-plains area with longer ones at nearby stations, rough estimates of ground-water discharge can be made.

The gaging station LC 373, upstream from the alluvial-plains area, has been maintained since October 1943. Discharge hydrographs for the period October 1943-October 1954 were used in constructing the base-flow recession curve shown in figure 19. Upstream from gaging station LC 373 the Salmon Creek basin is underlain almost entirely by volcanic rocks. On the gentler slopes a deep soil and subsoil have developed which can hold considerable amounts of water, but the unweathered bedrock beneath is comparatively impervious. The combination of a shallow pervious mantle and relatively impervious rock beneath results in a low direct-surface runoff and a high subsurface runoff that depletes repidly.

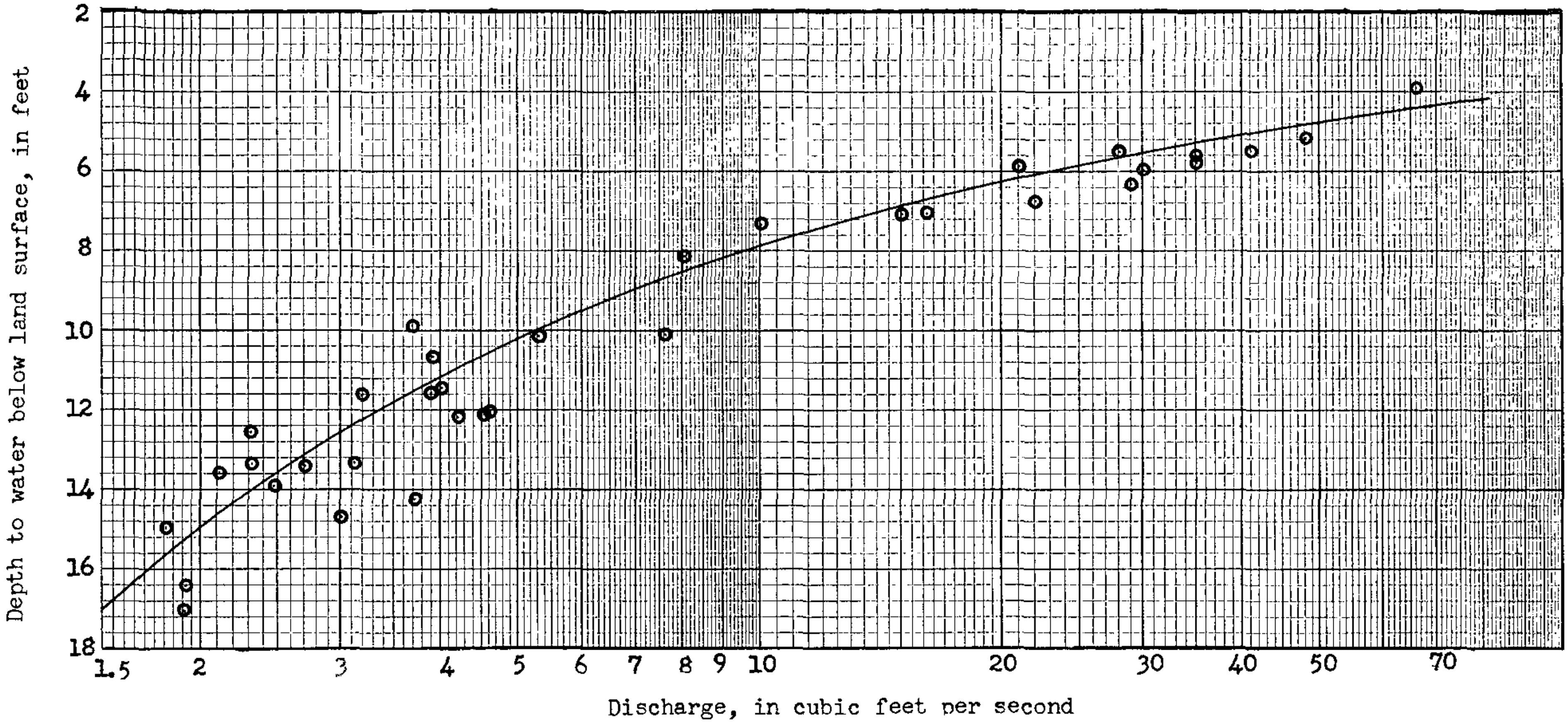


Figure 18.--Relation between base flow of Salmon Creek at gaging station LC 373 near Battle Ground and level of the water table ~~in~~ at well 2/3-26Q2.

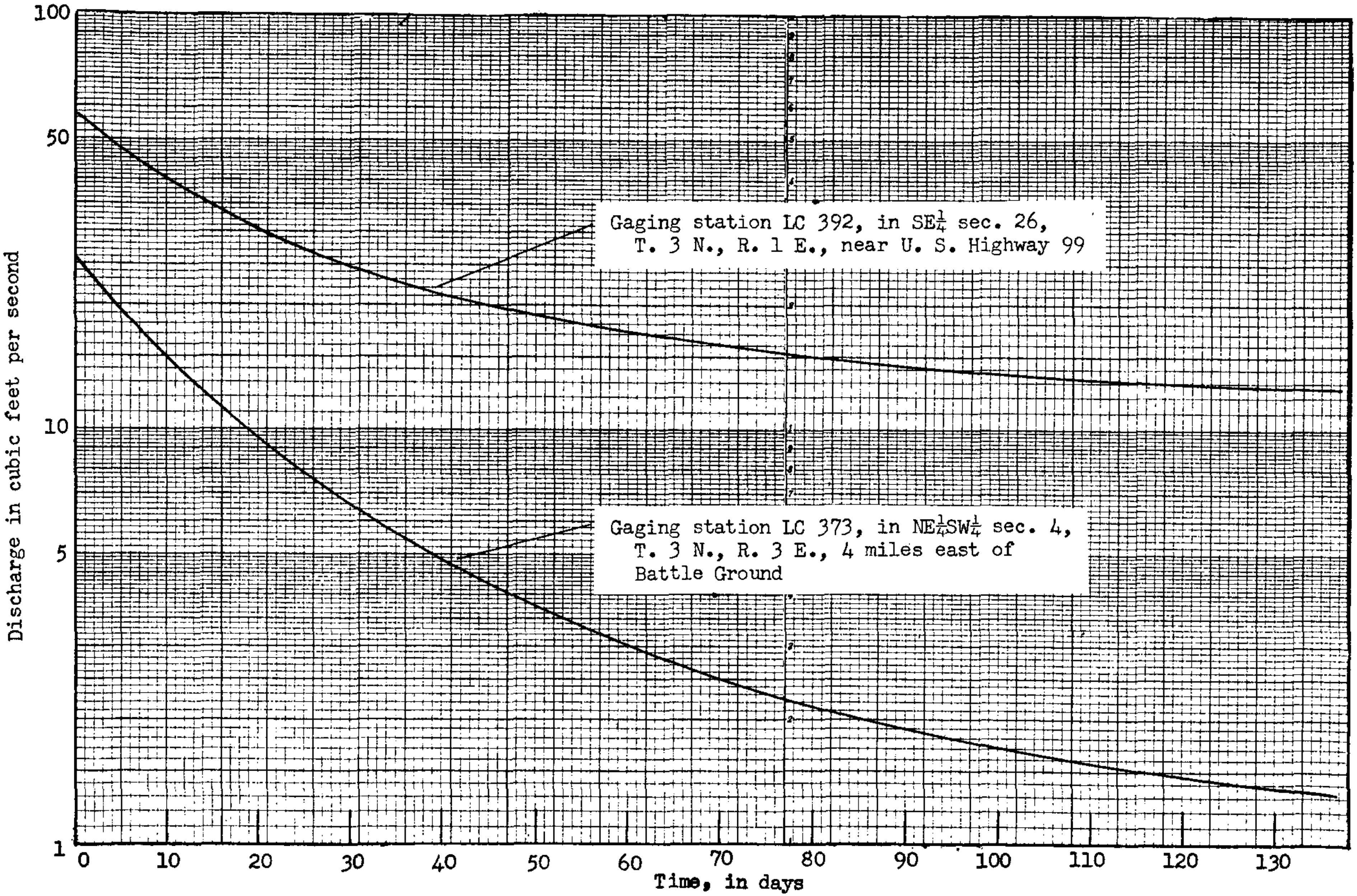


Figure 19.--Base flow recession curves for two stations on Salmon Creek.

Within the Fourth Plains area, occasional streamflow measurements were made at several different places downstream from gaging station LC 373. In 1951, a recorder was maintained at gaging station LC 392, in the SE¼ sec. 26, T. 3 N., R. 1 E., a short distance upstream from the bridge on U. S. Highway 99. The base-flow recessinn curve for Salmon Creek at station LC 392, shown on figure 19 along with the one at station LC 373, was constructed by using the hydrograph obtained in 1951 together with occasional measurements made at other times.

The hydrographs of flow in Salmon Creek at the two gaging stations, LC 373 and LC 392, are shown on figure 20 for the period June-September, 1951. The relation of precipitation and temperature to discharge also is shown on figure 20. The daily precipitation amounts and temperatures, in degrees Fahrenheit, are those recorded at the weather station at Battle Ground. In 1950, occasional measurements of streamflow were made at gaging station LC 393, a short distance downstream from station LC 392. On figure 21, the few measurements obtained at station LC 393 during the period May-September, 1950 are compared with the hydrograph for station LC 373, southeast of Battle Ground for the same period.

As mentioned earlier, upstream from gaging station LC 373, the Salmon Creek basin is underlain almost entirely by volcanic rocks, with only a shallow pervious mantle, resulting in a high subsurface runoff that depletes rapidly. Downstream from gaging station LC 373, but above stations LC 392 and 393, the Salmon Creek basin is within the plains area. It is underlain by porous soil and subsoil conducive to percolation. Little water runs off directly; however, at places, relatively impermeable silt or clay lenses or the weathered upper part of the Troutdale are at shallow depth and impede downward movement of the ground water. This results in bodies of shallow perched ground water whose water levels rise rapidly during rainy periods and decline steadily during periods of fair weather. The hydrograph of well 2/3-26Q2, 21 feet deep, shown on figure 13, p. 92 illustrates this cycle.

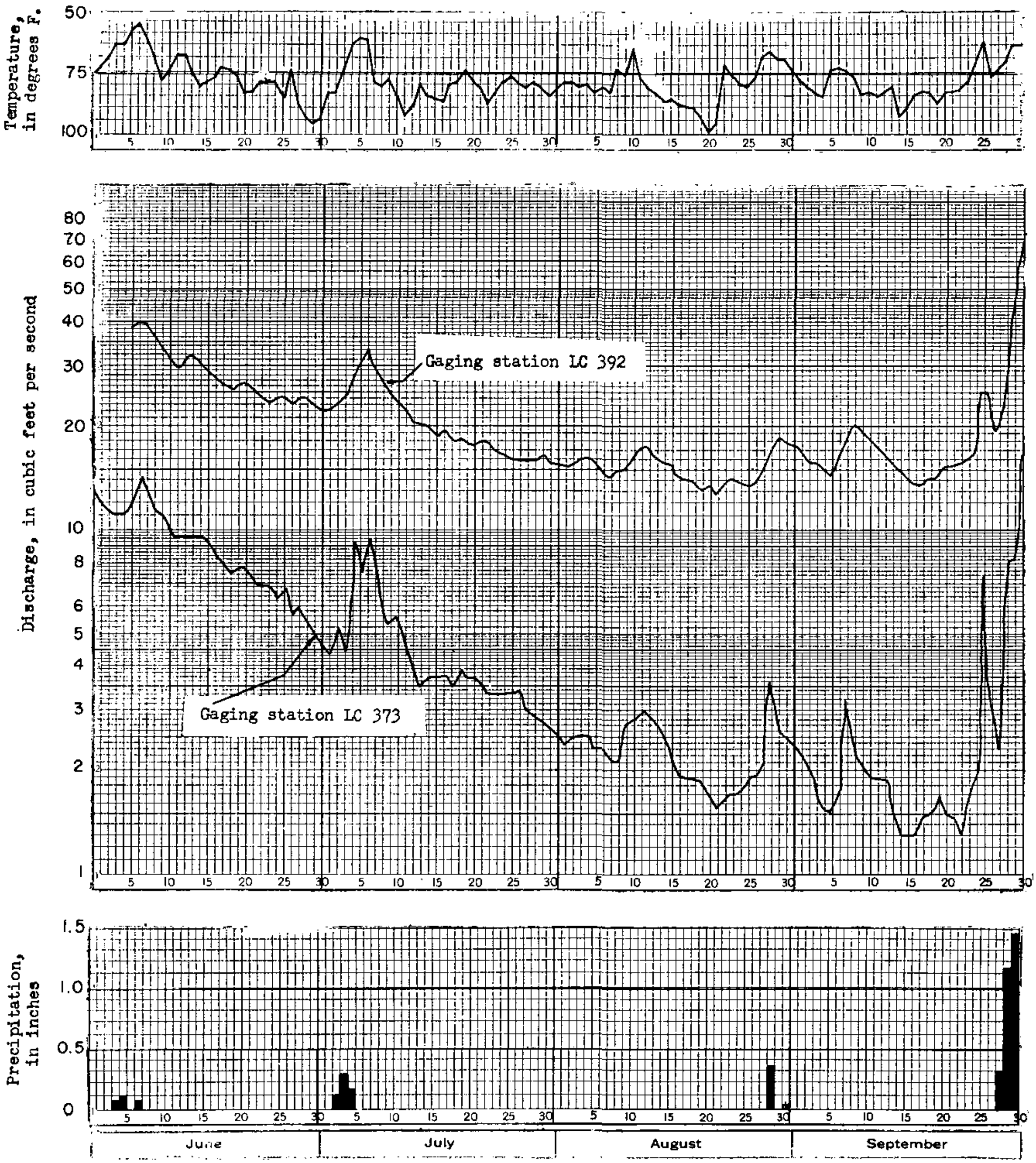


Figure 20.--Discharge at two stations on Salmon Creek, precipitation and maximum temperature at Battle Ground, 1951

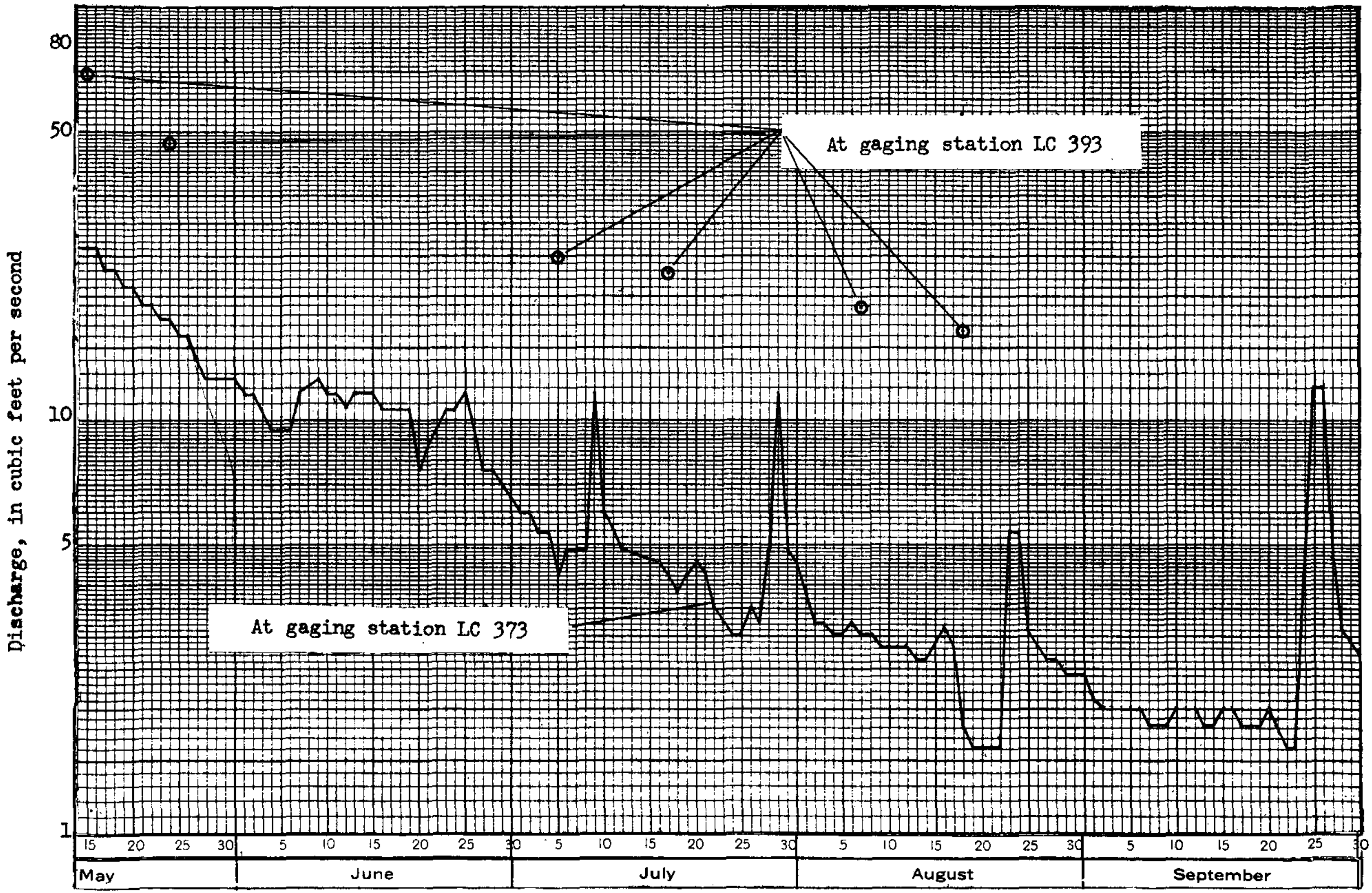


Figure 21.--Discharge of Salmon Creek, 1950

In comparing the hydrology of the Salmon Creek basin above gaging station LC 373 with that of the part of the basin between LC 373 and LC 392, or LC 393 (that is, within the plains area), it would seem obvious that a larger proportion of precipitation in the downstream reach becomes ground-water recharge, ultimately to reappear in the stream as base flow. However, when base flows at the upstream station are compared to those at the downstream station (fig. 20) it is seen that, except at very low rates of discharge, the downstream stations have a smaller base flow per square mile of drainage area. For example, from figure 20, the streamflow at station LC 392 on June 10, 1951, was 30.9 cfs. At station LC 373 on that date, the flow was 9.7 cfs. The ground-water effluent to the stream between the two stations was, therefore, 21.2 cfs. The drainage area above station LC 373 is 18.3 square miles and that between stations LC 392 and LC 373 is 70.1 square miles. The base flow, per square mile, above LC 373 was, therefore, 0.53 cfs and below LC 373 it was 0.30 cfs. Selecting values of streamflow during relatively low rate of discharge the situation is reversed. On September 15, 1959, base flow above station LC 373 was 0.07 cfs per square mile and the base flow below station LC 373 was 0.2 cfs per square mile. The probable explanation is that some of the recharge in the Fourth Plains area does not reappear as base flow but percolates downward to recharge deeper aquifers. Also, the ground-water discharge to the stream in the plains area is slower because ground-water gradients are lower in the plains area.

The relation between base flows at upstream and downstream stations is more clearly understood by comparing simultaneous flows from the recession curves or from miscellaneous measurements at each station. This relationship is presented graphically by the curved line in figure 22. The data shown graphically in figure 20, plus a few measurements from station LC 375, were used in constructing this curve, station LC 375, on Salmon Creek, is about 3½ miles downstream from station LC 373.

In figure 22, the straight line across the graph at a 45° angle is an "equal yield line," corrected for the difference in average precipitation on the area above each station. That is, simultaneous discharges from the two stations would plot along this line if the discharge were directly in proportion to drainage area. The correction for lesser average precipitation in that part of the basin downstream from station LC 373 was made by subtracting the estimated average annual consumptive use in the area from the average annual precipitation for each area. Consumptive use was estimated at 20 inches based on data, not here presented, supplied by the Department of the Army, Corps of Engineers. The residual precipitation above the downstream station was expressed as a percentage of the residual precipitation above the upstream station, and the equal-yield line was shifted to the left accordingly. If the basin above station LC 373 is considered as the standard, and only base flows at the two stations LC 373 and LC 392 are compared, the equal yield line may be considered as a "potential base flow" line for base flows at station LC 392. It represents the amount of base flow that would occur if all the precipitation that enters aquifers feeding the stream discharged to the stream at the same rate at downstream stations as they do at upstream stations. The difference between the potential base flow line and the actual relation between base flows at upstream and downstream stations can be explained by differences in the hydrology of the two basins.

The following three features are shown in figure 22: (1) for rates of flow from 11.8 to 26.5 cfs at station LC 392 the actual flow is greater than the potential flow, (2) for rates of actual flow greater than 26.5 cfs the actual flow is less than the potential flow, and (3) for rates of actual flow greater than about 170 cfs, the potential flow is greater than the actual flow by an approximately fixed amount, of about 150 cfs. With regard to the first two features: Below 26.5 cfs of actual flow, more water apparently is discharged into the stream than can be accounted for. Above 26.5 cfs of actual flow, less water is discharged to the stream than should be on the basis of the potential flow line; therefore some loss other than by percolation to the stream is indicated.

With regard to the latter situation--loss from the shallow body other than to the stream--it has already been explained (p. 109) that deeper aquifers largely discharge directly into the Columbia River; and recharge to these, in large part, is derived from overlying shallow aquifers. To complicate this picture, however, a part of the discharge from the deeper aquifers enters Salmon Creek, as illustrated diagrammatically in figures 16 and 17. Although the discharge from shallow aquifers both to the stream and to deeper aquifers varies greatly because water levels fluctuate over a wide range, the head on the deeper aquifers fluctuates very little and consequently the rate of discharge from these deeper aquifers both to the Salmon Creek and to the Columbia River is fairly constant.

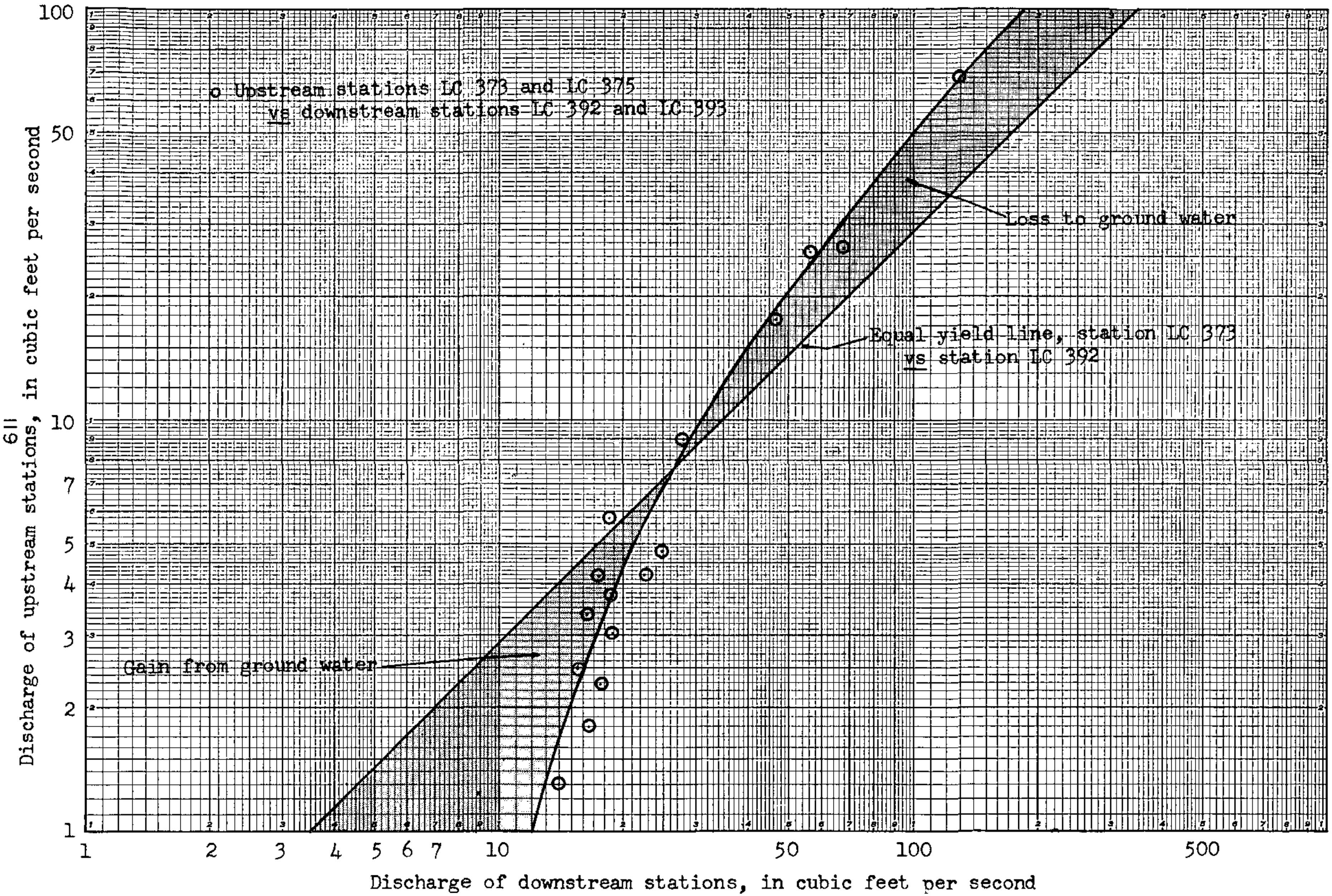


Figure 22.--Comparison of base flow of Salmon Creek at upstream and downstream stations

On the basis of foregoing discussion, under those conditions where actual base flow is less than potential base flow, the difference is accounted for by loss of water from the shallow aquifers to the deeper aquifers in an amount greater than the amount gained by the stream from the deeper aquifers. Conversely, when the actual base flow is greater than the potential base flow, more water is added to the stream than can originate from the shallow aquifers. This difference is made up of discharge from deeper aquifers to the stream during those periods of low level in the shallow aquifers when water loss from them to the deeper aquifers is relatively small.

As both the loss from the shallow to the deeper aquifers and from the shallow aquifers to the stream are dependent, in part, on the head--or position of water level--in the shallow aquifers, it follows that there should be some type of definite relationship between the actual base flow in Salmon Creek and that part of the potential base flow that is lost to the deeper aquifers.

Using data supplied by figure 22, and disregarding for the moment the fact that actual base flow includes the increment contributed to the stream from deeper aquifers, the actual base flow can be plotted against the difference between actual and potential base flow. This has been done on figure 23.

The point on the curve in figure 23 where the curve crosses the zero ordinate represents the base flow when the actual and potential base flows are equal. For this situation to occur, the loss from shallow to deep zones must be exactly balanced by the contribution from the deeper aquifers to Salmon Creek. From the curve, this point occurs at an actual base flow of 26.5 cfs.

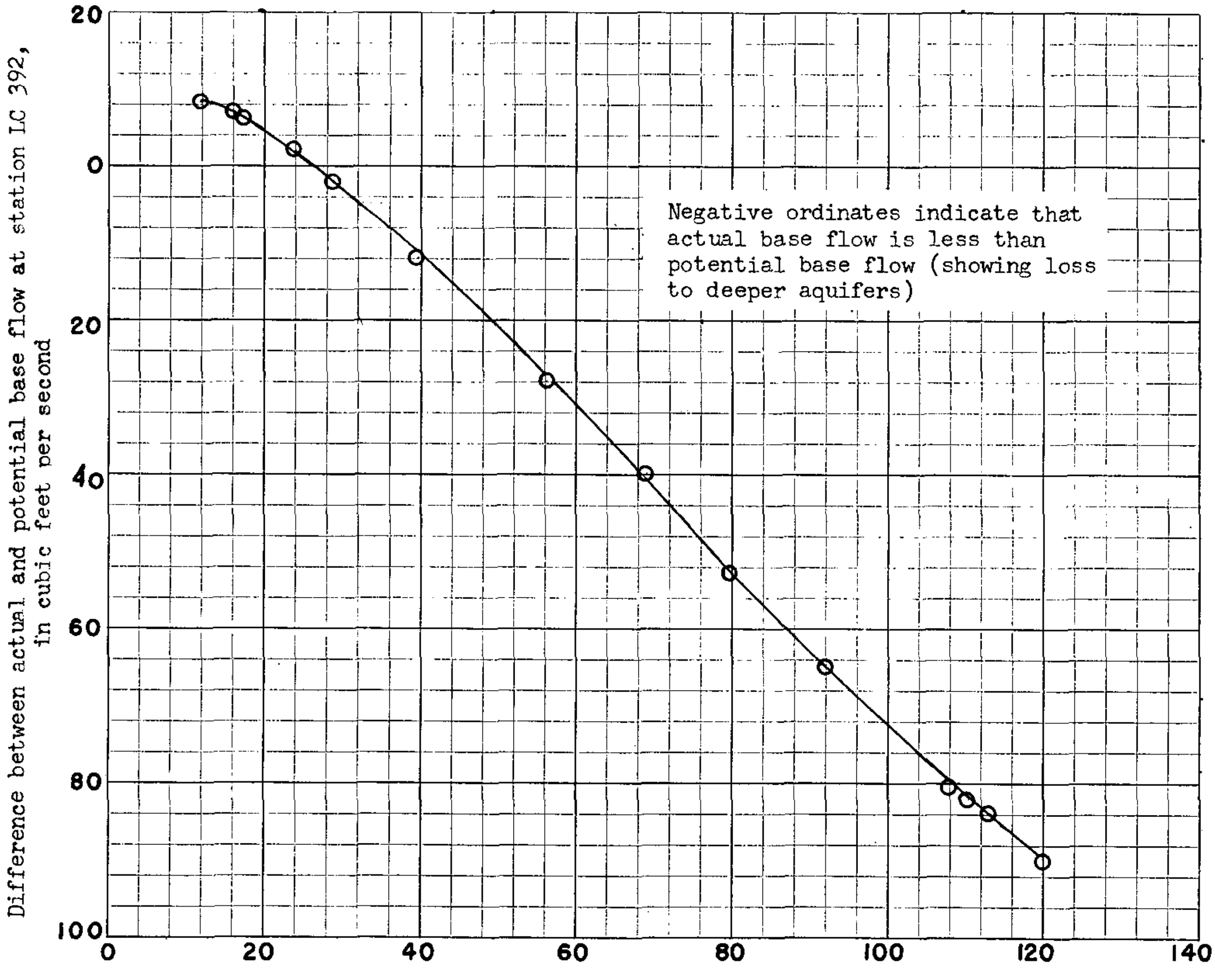


Figure 23.--Actual base flow at station LC 392 (from base-flow relation curve) compared with difference between actual and potential base flow

Another point on the curves in figures 22 and 23 is of interest. It will be noted that, at an actual base flow of about 12 cfs, the potential base flow is about 3.5 cfs, and the difference between actual and potential base flows is about 8.5 cfs. That is, at a base flow of about 12 cfs, the gain to the stream from the deeper aquifers exceeds the loss from the shallow to the deeper aquifers by about 8.5 cfs. Thus, at a discharge of 12 cfs, the contribution to the stream from the deeper aquifers cannot be less than 8.5 cfs, nor can it exceed 12 cfs. The contribution of the deeper aquifers therefore probably is between 9 and 10 cfs.

The average monthly base flow and potential base flow at the downstream station were obtained by selecting values from the base-flow relation graph in figure 22 that corresponded to the average monthly base flow at the upstream station LC 373, that were determined from hydrographs for the period 1944-54.

Table 7.--Mean discharge at various stations on Salmon Creek
(cubic feet per second)

Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
A. Base flow, Salmon Creek at LC 373, near Battle Ground												
8.7	31	55	57	60	54	38	24	14.5	6.3	3.3	2.7	29.5
B. Base flow, Salmon Creek at LC 392 (from base flow-relation curve, figure 22)												
28.5	69	110	115	120	108	80	56	39	24	17.5	16	65.2
C. Potential base flow at Sta. LC 392 (from straight-line graph, figure 22)												
30.5	109	192	199	210	189	133	84	51	22	11.5	9.5	..
D. Difference between potential and actual base flow at LC 392 (C-B) (lost to deep percolation)												
2	40	82	84	90	81	53	28	12	-2	-6	-6.5	38
E. Ground-water recharge to deeper aquifers (D+10)												
12	50	92	94	100	91	63	38	22	8	4	3.5	48

Line D in the table, difference between actual and potential base flow at station LC 392, gives the amount of water lost by deep percolatinn; water that presumably percolates downward into the Troutdale formation and moves southwestward to discharge directly into the Columbia River. The average loss during the year is 38 cfs, which is more than 27,000 acre-feet. The drainage area of Salmon Creek above station LC 392 within the Fourth Plains area is about 40 square miles. The ground water lost to deep percolation thus would be a little more than 1 acre-foot per acre. Actual recharge to the deeper aquifers would be the amount lost to deep percolation plus the discharge from the deeper aquifers into Salmon Creek, or 38 plus 10, giving a total recharge of 48 cfs, say 50 cfs, which is equivalent to about 1.4 acre-feet per acre.

The foregoing estimates were based largely in the unproved assumption that differences between base flow from the plains area and the foothills area are caused for the most part, by loss of water to deep percolation. A corallary to that assumption is that evapotranspiration per unit area in the plains area is no greater than in the foothills area, an assumption that appears to be reasonable but has not been proved. Also the estimates were on incomplete field data. For these reasons they should be considered as rough estimates only.

Quantity available

It has been shown that discharge from the shallower aquifers, including perched aquifers, dwindles to only a few cubic feet per second during periods of prolonged dry weather. However, even though natural discharge from these aquifers is comparatively small, there probably are large quantities of water available in storage which could be utilized by wells. If the average saturated thickness of the shallow aquifers is only 20 feet at low stage, there still would be about 5 acre-feet of water per acre in storage. At some places the saturated thickness may be less, but generally it probably is more than that. Water withdrawn from shallow storage during summer months would be replenished early in the winter.

It was estimated that annual recharge to the deeper aquifers within the Salmon Creek drainage is more than 1 1/3 acre-feet per acre. Of the total, more than 1 acre-foot per acre is believed to move southwestward and to discharge into the Columbia River, while the remainder discharges into Salmon Creek. Projecting the rate of recharge to include all of the Fourth Plains area (about 180 square miles), the total annual recharge would be more than 150,000 acre-feet. It seems probable that a large part of this ground water could be recovered through wells if it were needed.

Lowland and Flood-Plain Areas

The lowlands and flood plains included in this section are those of the Columbia River, Lewis River, and East Fork of the Lewis River. The valley floors are underlain by silt, sand, gravel, and boulders deposited in stream channels and on the adjacent flood plains. These alluvial deposits range in thickness from a few feet to more than 100 feet. The coarser grained strata are extremely permeable and yield very large amounts of water. At some places coarse sand and gravel in the Troutdale formation underlie the alluvial deposits and also yield large amounts of water.

Columbia River lowland

The flood plain of the Columbia River on the Clark County (Washington) side of the river ranges from a few hundred feet to slightly more than 3 miles in width. Actually, the usable flood plain on this side of the river is confined largely to two locations: a strip extending nearly 6 miles eastward from Camas, and an area extending some 7 or 8 miles southeast and northwest of Vancouver.

Vancouver area.--The eastern limit of the flood plain at Vancouver is about 3 miles east of the Interstate Bridge at Vancouver. From a narrow point at its eastern end the flood plain broadens to a width of about three-quarters of a mile half way to the bridge. Northwest of the bridge the flood plain broadens to about 3 miles in width. Although the flood plain continues northwestward beyond the northwest corner of the county, beyond a point about 4 or 5 miles northwest of the bridge the surface is low and is covered largely by lakes and swamps.

The aquifers underlying the slope and benches on which the city of Vancouver lies are hydraulically continuous with the aquifers underlying the flood plain and are considered with the aquifers in the lowland area. As was explained in the section on geology, the valley wall of the ancestral Columbia River extends northwestward from a point in the NW¼ sec. 31, T. 2 N., R. 2 E. to Vancouver Junction.

Approximately 70 wells have been drilled in the lowland area at Vancouver. Most of the wells obtain water from Recent alluvium and the Pleistocene alluvial deposits, although some wells have veen drilled through these deposits into the upper part of the Troutdale formation. On the flood plain the top of the Troutdale formation ranges from 100 to 120 feet below the land surface (70 to 90 feet below sea level). On the terraces the depth to the top of the Troutdale is as much as 273 feet, depending upon the altitude of the land surface. The top of the Troutdale formation apparently rises slightly toward the northeast, and is about 45 to 55 feet below sea level in the north part of Vancouver.

At the east end of the Vancouver area the Pleistocene deposits consist almost entirely of gravel and sand. This is illustrated by the logs of wells 2/1-23Q1 to Q4, 23R1, 26G1, 36B1 to B8 (city of Vancouver), wells 2/1-35F1 to F4 (Buffalo Electro- Chemical Co.), and wells 2/1-27M1 to M8 (Columbia River Paper Mills). Westward the upper strata are fine-grained sand or silt, and the top of the gravel is encountered at progressively greater depths as shown by the log of well 2/1-28G3 (Port of Vancouver) and by the logs of wells 2/1-21N1 and N2 (The Carborundum Co.). About 2 miles northwestward, as indicated by the logs of wells in secs. 18 and 19, T. 2 N., R. 1 E. (Aluminum Company of America), the gravel of Pleistocene age has largely pinched out between the thickening sand and silt section and the nearly horizontal upper surface of the Troutdale formation.

Nearly 50 industrial, municipal, and institutional wells, with yields as much as 4,600 gpm, have been drilled into the Pleistocene sand and gravel deposits. Of 21 municipal and industrial wells for which both yield and drawdown data were reported the average yield is 1,560 gpm with an average drawdown of 8.3 feet. All these wells were completed by perforating the casings; the wide range in drawdown in wells only short distances apart indicates that some of the wells have a low efficiency. Several wells were reported to yield 2,000 gpm with a 4-foot drawdown. Wells 2/1-21N1 and N2 were reported to yield 1,600 and 1,540 gpm, respectively, both with a 1½-foot drawdown. Wells 2/1-35F3 and F4 were reported to yield 4,000 gpm each, with drawdowns of 4 and 3 feet, respectively. Wells 2/1-27M7 and M8 were reported to yield 4,600 gpm but the drawdowns are not known. From the yield-drawdown data it would appear that maximum specific capacities exceed 1,000 gpm per foot; although aquifer tests have not been made, these data suggest that coefficients of transmissibilities are on the order of 2 or 3 million gallons per day per foot.

The gravel strata tapped by wells of the Aluminum Co. of America (locations are shown in fig. 24) are believed to be in the upper part of the Troutdale formation. The top of these gravel strata range from 96 to 107 feet below the surface, or about 67 to 88 feet below sea level. In 1954, pumping tests were made on some of the wells by John W. Robinson, consulting geologist of Tacoma, Wash., and by the Aluminum Co. of America personnel. The data obtained during these tests were made available to the Geological Survey and have been analyzed by the writer. Precise evaluation of hydrologic factors were precluded by the physical conditions prevailing during the tests. Operation of the plant could not be interrupted and various individual wells and well groups, which are on automatic operation, cut off and on at frequent intervals. The general trend of water-level fluctuations in the wells closely parallel tidal fluctuations in the Columbia River and these trends must be compensated. However, the data obtained did permit determinations of approximate values for coefficients of transmissibility and storage.

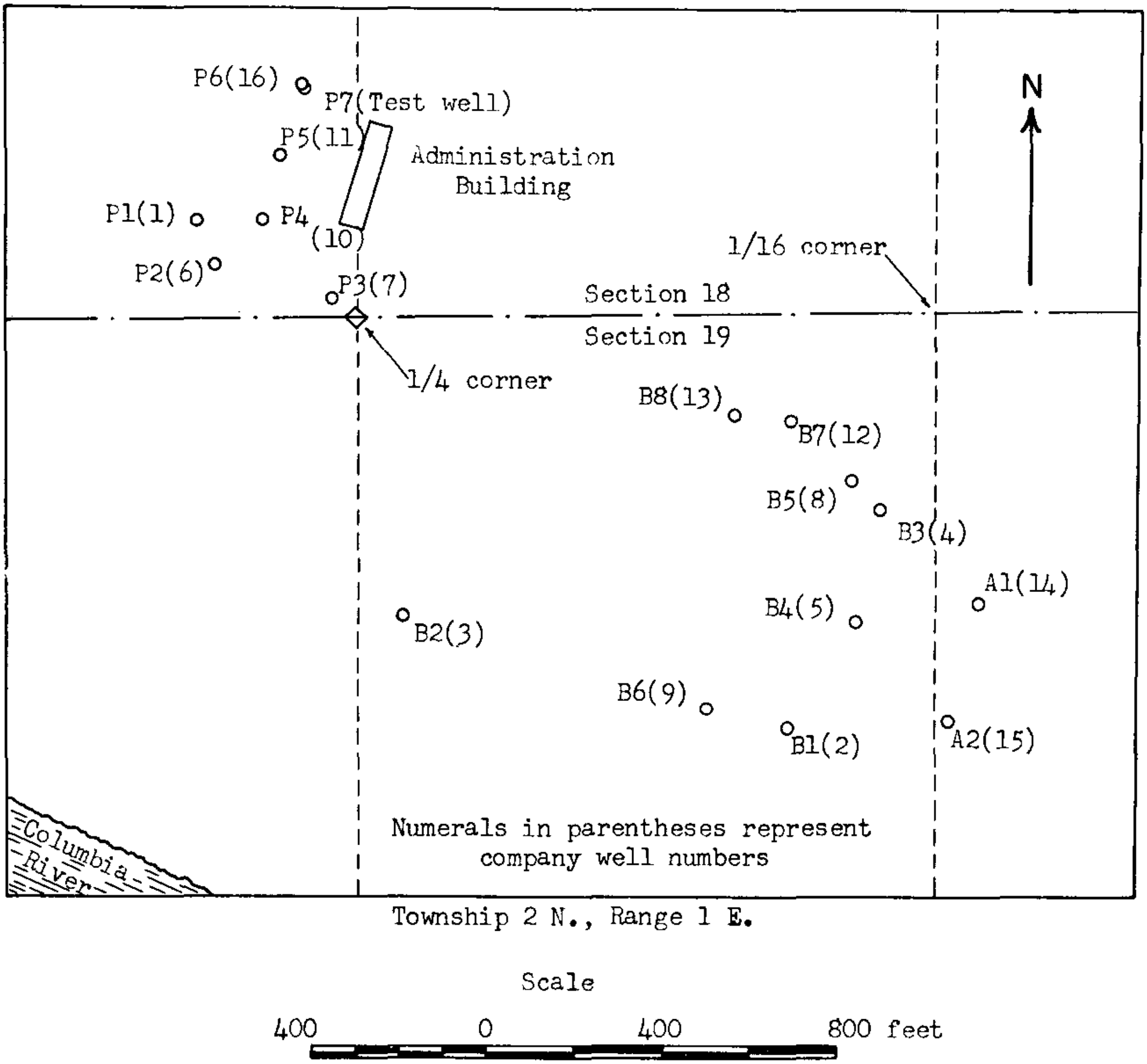


Figure 24.--Sketch map showing locations of Aluminum Company of America wells

Although the sand overlying the aquifer at the Aluminum Co. plant is not impermeable, and water falling on the area can percolate downward, the transmissibility of the aquifer is so much greater than the transmissibility of the overlying sand that the aquifer reacts as an artesian aquifer during pumping. The aquifer apparently is recharged indirectly from the nearby Columbia River, through the overlying sand. Because of the very great difference between the horizontal permeability of the gravel and the vertical permeability of the overlying sand (probably on the order of 1,000 to 1) the effective distance to the recharge boundary is several times the distance of the wells from the river. Eastward toward Vancouver the aquifer is directly overlain by Pleistocene gravel aquifers, which apparently are recharged directly by the Columbia River. Relation of the river stage and altitude of the water table at Vancouver are shown on figure 25.

Because of the high transmissibility of the aquifers at the aluminum plant, and the moderately low coefficient of storage, the cone of pressure relief surrounding a pumped well expands very rapidly and reaches a source of recharge within a short time after pumping begins. For that reason only the first few minutes of the pumping test could be used for evaluating aquifer characteristics. Water-level recorders were maintained on wells 2/1-19B2 and 18P2 and on 18P7 at various times. Drawdowns in these observation wells due to pumping of the different wells and pairs of wells are shown in the traces on these charts. Transmissibilities determined by analysis of these data appear to be fairly reliable. Table 8 lists pertinent data.

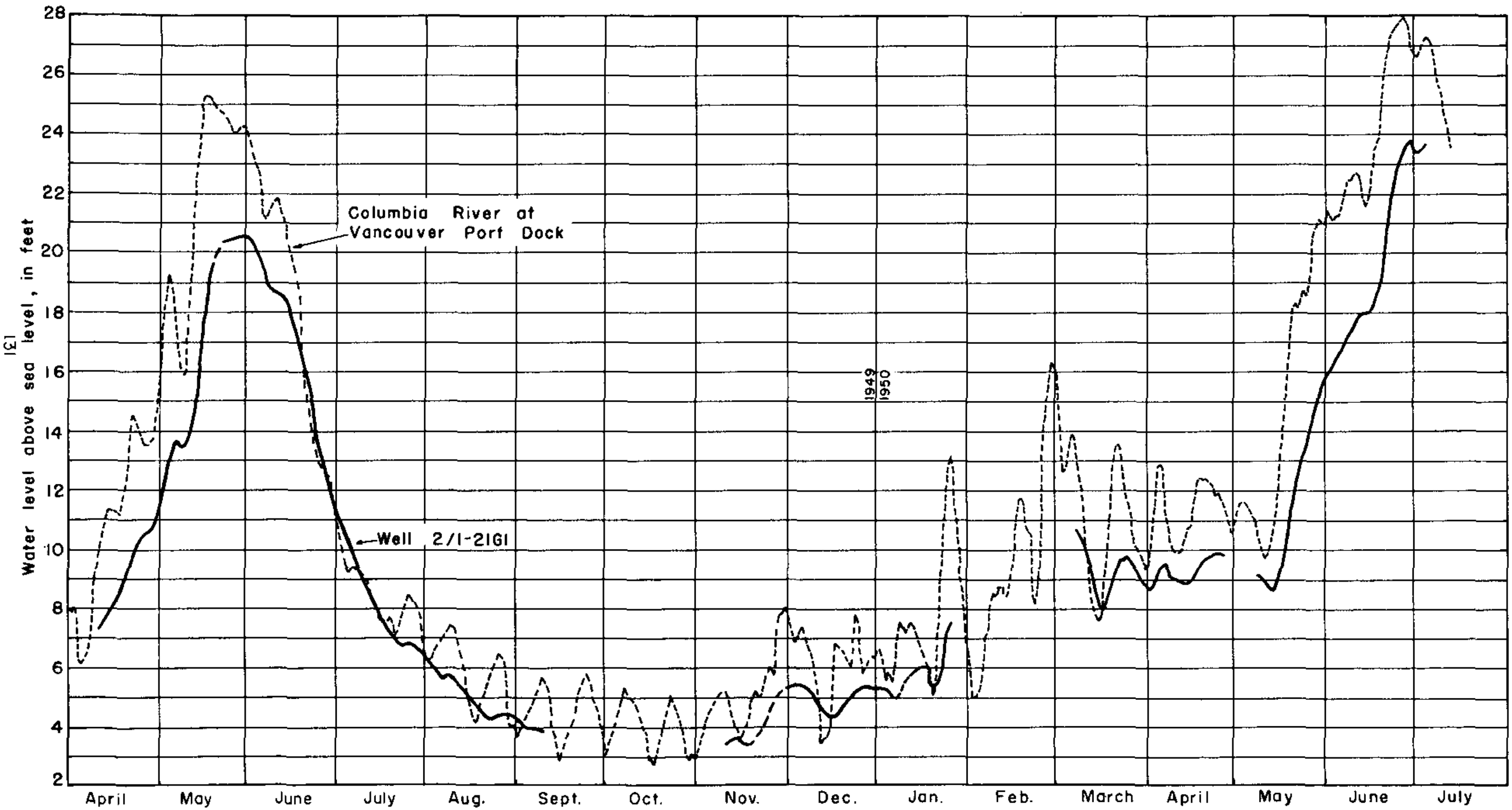


Figure 25.--Stage of Columbia River and water level in well 2/1-21G1, 1949-50.

Table 8.--Aquifer-test data, wells of the Aluminum Co. of America, at Vancouver, Wash.

Observation well 2/1-19B2[b]

Pumping well	Yield (gpm)	Drawdown [a] (feet)	Drawdown ÷ by yield	Distance from well 2/1-19B2 (feet)
19B3, 19B5	1,700	0.28	1.65×10^{-4}	1,110
19B1, 19B6	2,000	.40	2.00×10^{-4}	785
19B4	770	.15	1.95×10^{-4}	1,025
18P6	4,300	.65	1.51×10^{-4}	1,240

Observation well 2/1-18P2[c]

Pumping well	Yield (gpm)	Drawdown [a] (feet)	Drawdown ÷ by yield	Distance from well (feet)
19B3, 19B5	1,700	.17	1.0×10^{-4}	1,585
19B1, 19B6	2,000	.18	$.9 \times 10^{-4}$	1,575
19B4	770	.085	1.10×10^{-4}	1,675
18P6	4,000	1.00	2.5×10^{-4}	460

Observation well 2/1-18P7[d]

Pumping well	Yield (gpm)	Drawdown [a] (feet)	Drawdown ÷ by yield	Distance from well (feet)
19B4	770	.08	1.03×10^{-4}	1,760
18P6	4,000	1.76	4.4×10^{-4}	13
19B1, 19B6	1,750	.18	1.03×10^{-4}	1,780

a/ Drawdowns at end of 20 minutes, 1.39×10^{-2} day.

b/ Analysis of the data shown on figure 26

c/ Analysis of the data shown on figure 27

d/ Analysis of the data shown on figure 28

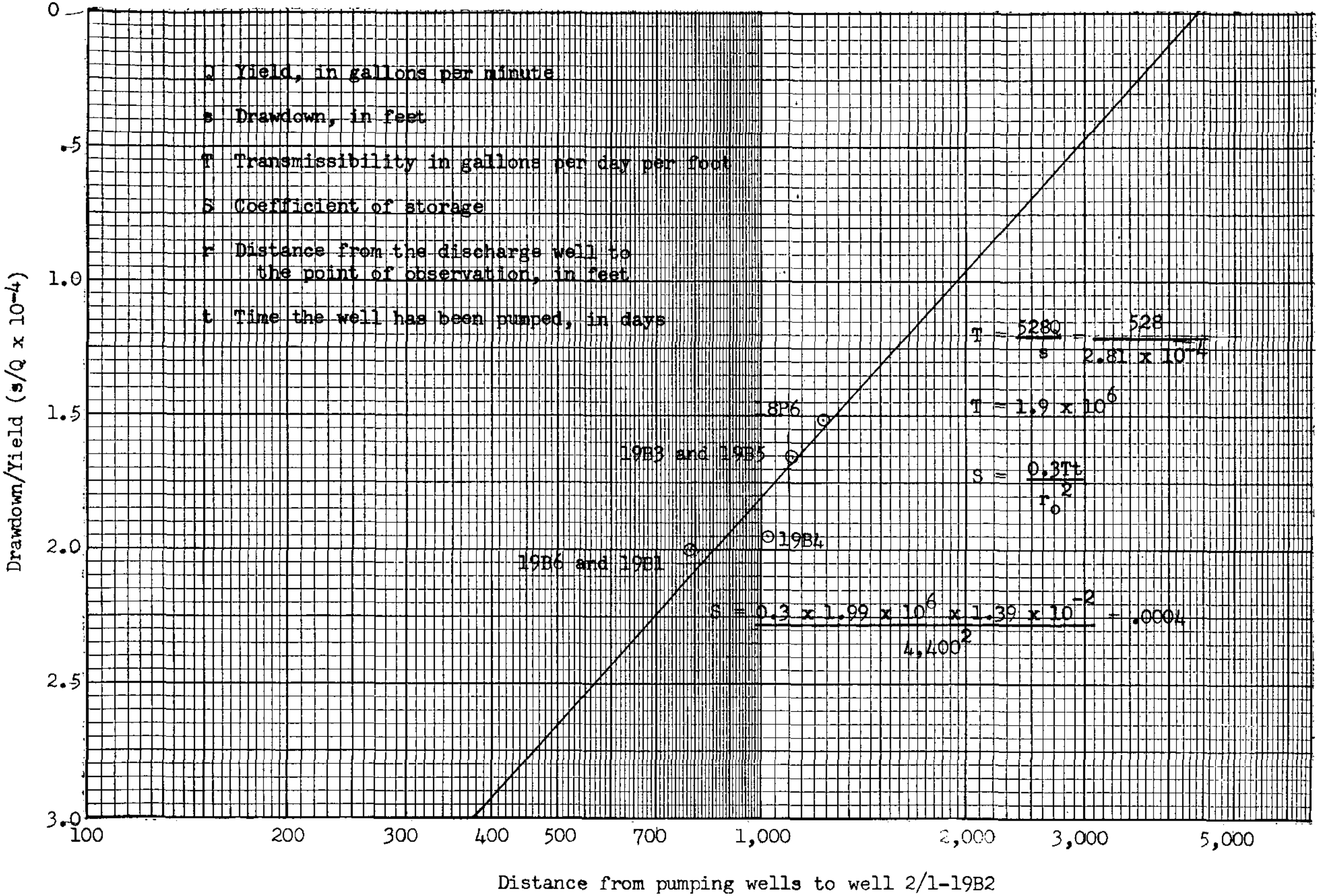


Figure 26.--Drawdowns in well 2/1-19B2 caused by pumping of wells 19B3 and 19B5, 19B1 and 19B6, 19B4 and 18P6.

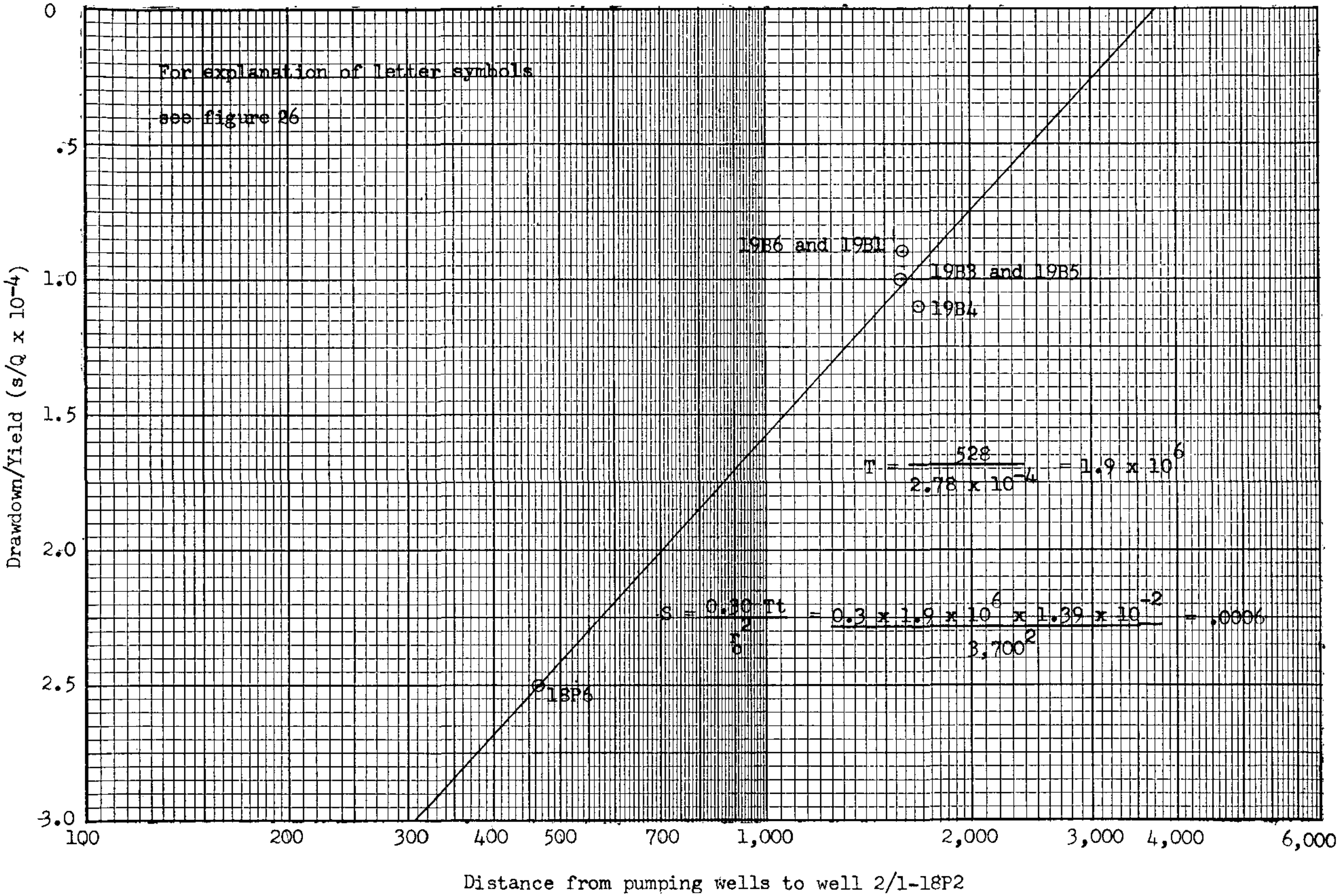


Figure 27.--Drawdowns in well 2/1-18P2 caused by pumping of wells 18P6, 19B4, 19B3 and 19B5, 19B1 and 19B6.

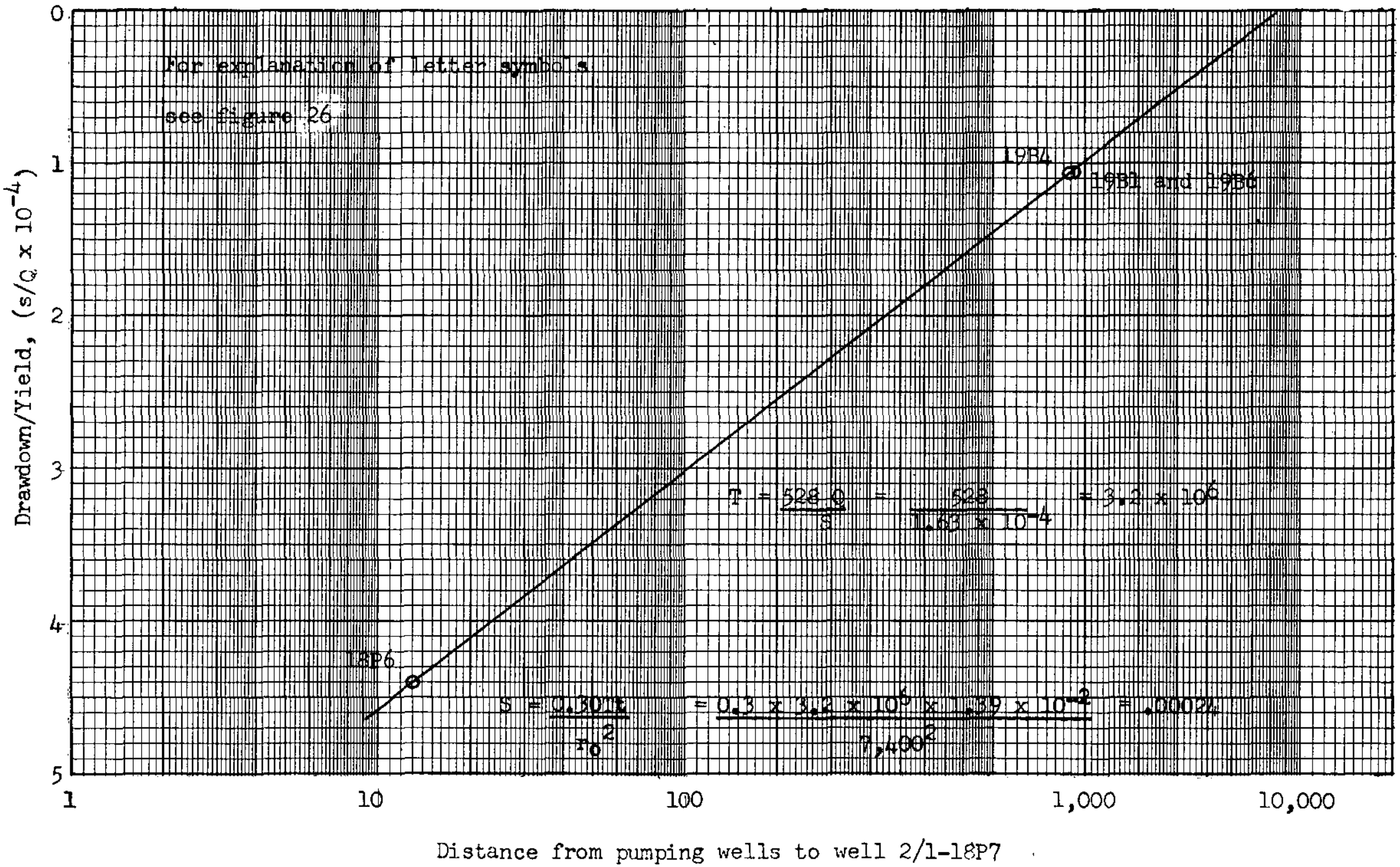


Figure 28.--Drawdowns in well 2/1-18P7 caused by pumping of wells 19B4, 18P6, and 19B1 and 19B6

Transmissibility and coefficient of storage determined from observations in well 2/1-19B2 while wells 2/1-19B1, B3-B6, and 18P6 were pumped either individually or in pairs, at different rates, have been computed graphically on figure 26, p. 133. The equation used for computing transmissibility is shown below and has been adapted from Cooper and Jacob (1946, p. 526-534).

$$T = \frac{528\ Q\ \log_{10} \frac{r_2}{r_1}}{s_1 - s_2}$$

The procedure used in applying the above equation was to select a convenient interval of time after pumping began, in this case 20 minutes, and determine the drawdown produced in the observation well by pumping other wells or pairs of wells. It should be pointed out that pumping of the wells (or pairs) was done at different times and the drawdown resulting was caused only by that particular well (or pair). Also, the wells were pumped at different rates, and as the drawdown in an observation well is directly proportional to the rate of pumping, each drawdown was divided by the respective pumping rate so that each would be on an equivalent basis. The drawdown divided by yield ($^s/_Q$) was plotted on the arithmetic scale on semi-log coordinate paper, and the distance from the pumped well to the observation well (r) was plotted on the logarithmic scale. A straight line through the plotted points defines the locus of all possible values of $^s/_Q$ and r. By selecting r_2 and r_1 one log cycle apart, the equation given above reduces to $T = \frac{528}{\Delta\, ^s/_Q}$ where $\Delta\, ^s/_Q$ is the change in this factor over a log cycle.

For the test data on figure 26, Δs is 2.81×10^{-4}, making $T = 1.9 \times 10^{6}$ gpd per foot.

The equation used to compute the coefficient of storage is

$$S = 0.3 \frac{T\,t}{r_o^2},$$

where r_o is the value of r at the zero intercept. Because the drawdowns in well 2/1-19B2 were measured at the end of a 20-minute pumping period, t is taken as 20 minutes or 1.39×10^{-2} day. With these data inserted into the equation, $S = 4.15 \times 10^{-4}$.

Figure 27 shows the plotted data obtained from observations at well 2/1-18P2 while wells 2/1-19B1 and B6, B3 and B5, 19B4, and 18P6 were pumped either individually or in pairs. Similarly, on figure 28, data are shown that were obtained from observations at well 2/1-18P7 while wells 19B4 and P6 were pumped individually and also while wells 19B1 and B6 were pumped simultaneously.

An aquifer test, made October 20, 1954 on well 2/1-18P6 with observations on well 2/1-18P7 and on 2/1-18P2 also appears to give reliable results. Data obtained during the test are shown on the following table. The graphical analysis of these data is shown on figure 29, p. 140.

Table 9.—Aquifer-test data for well 2/1-18P6

Time	Observation well	Water level (feet)	Drawdown(-) or Recovery(+) (feet)	Tidal correction (feet)	Corrected drawdown or recovery (feet)
9:30a	(started pumping well 2/1-18P6 at 3,000 gpm)				
9:45	2/1-18P7	28.45	..	..	..
10:00	(low tide)				
10:15	2/1-18P7	28.46	..	..	..
10:40	2/1-18P7	28.50	..	..	..
10:41	2/1-18P2	29.03	..	..	..
10:42	(stopped pumping well 2/1-18P6)				
10:45	2/1-18P7	27.26	+1.24	0	+1.24
11:02	2/1-18P7	26.97	+1.53	-.03	+1.50
11:02	2/1-18P2	28.22	+ .81	-.03	+ .78
11:30	2/1-18P7	27.05	..	..	..
11:33	2/1-18P7	26.94	..	..	..
11:33	2/1-18P2	28.05	..	..	..
11:34	(started pumping well 2/1-18P6 at 4,000 gpm)				
11:45	2/1-18P7	28.81	-1.87	-.02	-1.89
11:54	2/1-18P2	29.07	-1.02	-.03	-1.05
12:00N	2/1-18P2	29.06	(well 2/1-18P6 stopped pumping)		
12:20p	2/1-18P2	28.00	+1.06	-.03	+1.03
12:20	2/1-18P7	26.84	+1.97	-.03	+1.94

The data are analyzed graphically on figure 29. After well 2/1-18P6 had discontinued pumping at a rate of 3,000 gpm, the recovery in well 18P7, 13 feet distant, was 1.50 feet and the recovery in well 18P2, 460 feet distant, was 0.78 feet. The slope of the line connecting these two points on the graph is 0.46. Evaluating the expression $528/\Delta s$ yields a transmissibility of 3.4×10^6. Similarly, the recovery measurements on wells 18P7 and 18P2 after well 18P6 had discontinued pumping at a rate of 4,000 gpm were plotted. These data fall on a line, the slope of which is 0.59. The transmissibility, derived from these data, is therefore, 3.6×10^6.

Three other aquifer tests were run on wells of the Aluminum Company of America in 1954. At different times, well 2/1-19B5 was pumped and water levels were measured in well 19B3, well 19B3 was pumped and measurements made in well 19B5, and well 19A1 was pumped and levels were measured in well 19A2. The following table lists the coefficients of transmissibility and storage determined from all of the foregoing several aquifer tests. The following table lists the coefficients of transmissibility and storage determined from all of the foregoing several aquifer tests.

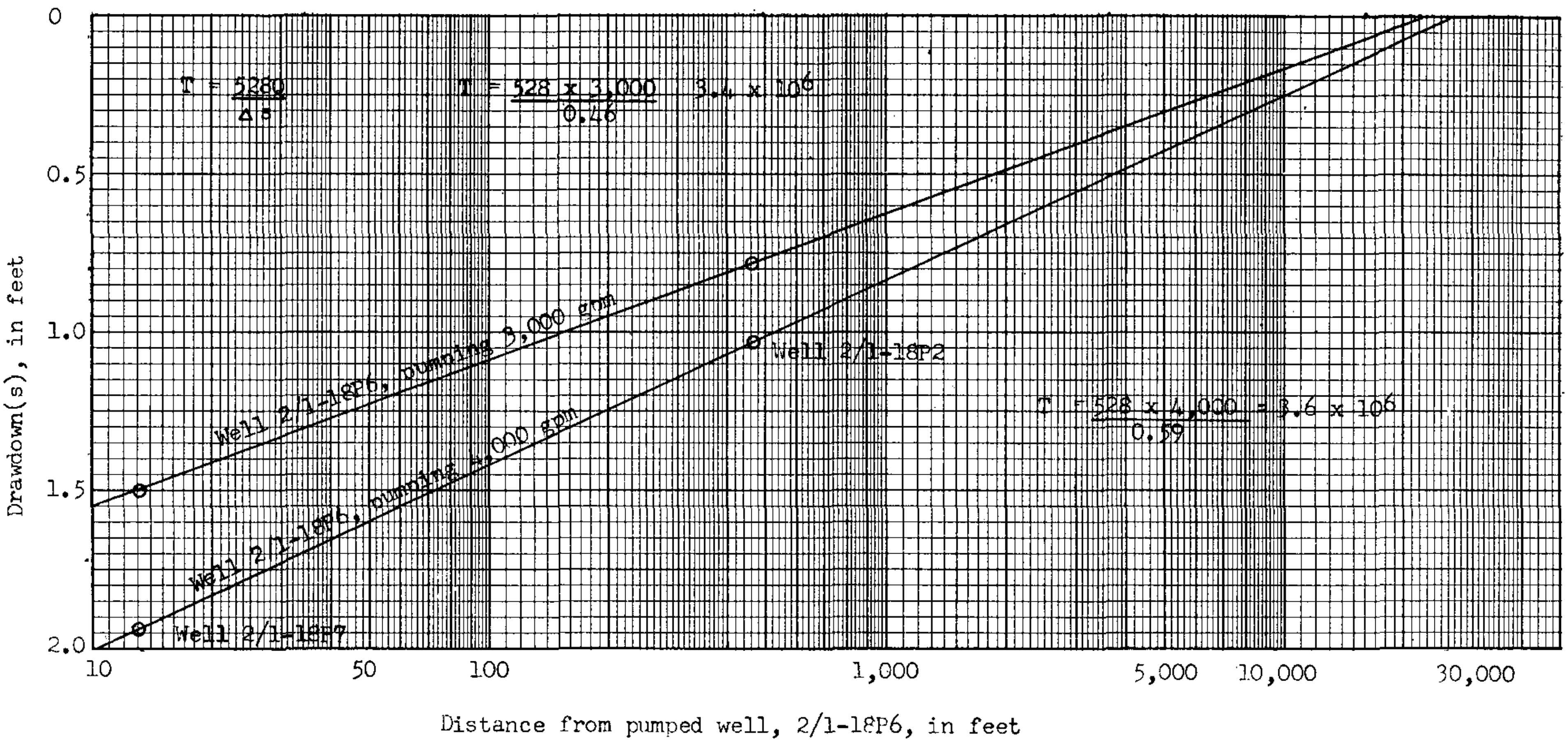


Figure 29.--Aquifer test on well 2/1-18P6, Vancouver, October 20, 1954.

Table 10.--Summary of aquifer-test data for wells at the Aluminum Co. of of America, Vancouver plant

Pumped well	Observation well	Distance from pumped well to observation well (feet)	Coefficients of Transmissibility	Coefficients of Storage
2/1-19B5	2/1-19B3	85	2.9×10^6	0.0003
2/1-19B3	2/1-19B5	85	2.3×10^6	.00017
2/1-19A1	2/1-19A2	285	3.3×10^6	.00055
2/1-19B3 and 19B5, 19B6 and 19B1, 19B4, 18P6	2/1-19B2	..	1.9×10^6	.0004
2/1-18B3 and 19B5, 19B6 and 19B1, 19B4 18P6	2/1-18P2	..	1.9×10^6	.0006
2/1-19B6 and 19B1, 19B4, and 18P6	2/1-18P7	..	3.2×10^6	.00024
2/1-18P6	2/1-18P7 and 18P2	..	a 3.5×10^6	..

a Average of two tests shown on figure 29 (p. 140).

The above data indicate that aquifer transmissibility is fairly uniform from well to well throughout the well field, and that large quantities of water are available in the Columbia River lowland. With a very large source of recharge close at hand (minimum flow of the Columbia River is about 35,000 cfs), with a static head of 70 to 80 feet above the top of the aquifer and with transmissibilities ranging from 2 to 4 million gallons a day per foot, yields in the order of 50 to 100 mgd might be obtained per mile length of lowland along the river. Total potential yield for the 7- to 8-mile strip might approach half a billion gallons a day.

Camas-Washougal area.—The strip of Columbia River valley lowland which terminates abruptly, at the western edge of Camas, against the volcanic rocks forming Prune Hill, extends nearly 3 miles upstream from Washougal, a total length of about 6 miles. The average width of this strip is about 1 mile, but except for a narrow strip along the Columbia River, the alluvium forms a bench considerably above the present-day flood line. The Washougal River, which enters the valley of the Columbia midway along this stretch apparently built a broad, but very short, fan into the Columbia River valley at this point. The alluvial materials underlying the bench apparently were deposited chiefly as a fan by the Washougal River. Surface exposures and well logs indicate that these materials are almost entirely coarse sand and gravel, with some boulder horizons.

Approximately 25 wells have been drilled in the lowland in the Camas-Washougal area. Although a few of these wells apparently entered the upper member of the Troutdale formation at elevations of 20 to 40 feet below sea level, almost all ground-water supplies have been developed in the overlying Pleistocene alluvium. The wells range in depth from 41 to 142 feet, averaging about 100 feet. Yields are as great as 2,600 gpm.

The largest development of ground water was made by the Crown-Zellerbach Corp., which has 9 wells yielding 1,220 to 2,600 gpm, with a reported average of 2,080 gpm. Drawdowns range from 4 to 11 and average 6.7 feet. The best reported specific capacity is 525 gpm per foot, 2,100 gpm with a 4-foot drawdown. All these wells are in a small area near the western end of the alluvial bench, within a few hundred feet of the Washougal River.

The city of Camas has three wells a short distance east of the Crown-Zellerbach wells. When tested, these wells reportedly ranged in yield from 1,200 to 1,800 gpm. The Columbia Water Co., supplying the town of Washougal, has 2 wells about 1 mile east, and 3 wells about 3 miles east of the Crown-Zellerbach wells. The yields of these well range from 625 to 1,200 gpm.

All the wells described above were completed with perforated casings instead of well screens; it is likely that even larger specific capacities generally would result if screens, of the proper slot size, were used. Although no aquifer tests were made in the area, it is obvious that coefficients of transmissibility are very high, probably about the same as in the Vancouver area where they range from 2 to 4 mgd per foot.

Recharge to the alluvial bench is from precipitation on the bench, seepage from streams rising on Mount Norway and Nichols Hill, and infiltration induced from the Washougal and Columbia Rivers. Logs of wells indicate that there is good hydraulic connection between the aquifers and the rivers. Reported static levels, measured at the time the wells were drilled, obviously are related to river stage, also indicating good hydraulic connection. The Crown-Zellerbach Co. pumps 20,000,000 gpd (gallons per day) from a very small area, apparently without excessive interference between wells. It seems obvious that the source of a large part of this water is the Washougal River. The wells of the city of Camas and two wells of the Columbia Water Co. are located about midway between the Washougal and Columbia Rivers; pumping of these wells probably induces infiltration from both rivers. The other three Columbia Water Co. wells are on the bank of the Washougal River, near the apex of the fan.

It is apparent that there are many other locations on the alluvial bench that would be suitable for ground-water development. It is probable that the potential yield along the 6-mile reach is at least several hundred million gallons a day.

East Fork of the Lewis River flood plain

The East Fork of the Lewis River flows in a flood plain underlain by stream alluvium from La Center upstream to Lewisville Park, directly north of Battle Ground. The average width of the flood plain in this 6-mile reach is more than half a mile. Upstream from the park the river is confined to a much narrower valley, with alluvial terrace remnants at places forming the stream banks within the valley. The alluvial deposits are coarse and permeable, and although shallow, are capable of yielding moderately large supplies of water. Only a few wells have been dug or drilled into these deposits. Yield data have been reported for only three wells tapping these deposits, as follows: well 4/1-13J1, 364 gpm with 1½-foot drawdown; well 4/2-19C1, 147 gpm; well 4/2-22H1, 130 gpm with 15-foot drawdown. It is very likely that comparable yields could be obtained from wells at many other places along the flood plain.

Lewis River flood plain

The Lewis River, which forms the boundary between Clark and Cowlitz Counties, enters the flood plain of the Columbia River at Woodland. The combined flood plain, below Woodland, which is 2 to 3 miles wide, lies almost entirely within Cowlitz County. More than a dozen wells ranging in depth from 12 to 40 feet have been dug or drilled on the flood plain for irrigation purposes, all within Cowlitz County. The records indicate that the alluvial deposits are much finer grained than those at Vancouver or Camas. However, 13 wells reportedly range in yield from 150 to 500 gpm and average nearly 325 gpm.

From Woodland to a point about 6 miles upstream the flood plain averages about three quarters of a mile in width and a considerable portion is in Clark County. Although several wells have been dug or drilled on the flood plain in Clark County, these are chiefly for domestic and stock use. In sec. 18, T. 5 N., R. 1 E., in Cowlitz County two wells, both 40 feet deep have been drilled on the flood plain for irrigation use. Of these, one has a reported yield of 400 gpm with 6 feet of drawdown and the other has a reported yield of 300 gpm with 5 feet of drawdown. The aquifers tapped by them are coarse sand and gravel. Moderately large to large yields probably can be obtained at most places from the alluvial deposits in the flood plain of the Lewis River.

CHEMICAL QUALITY OF GROUND WATER

The chemical quality of ground water is very important to all water users, because certain mineral elements are detrimental or injurious if present in too great a concentration. In most respects the water in Clark County is suitable for all uses.

Water vapor in the air contains no minerals; however, as it collects into raindrops and snowflakes and falls to the ground it picks up some atmospheric gases and dust particles which in part dissolve, so that rainwater generally has a very small amount of dissolved mineral matter. More important, the rainwater contains appreciable amounts of carbon dioxide and oxygen which aid the water in dissolving minerals from the soil and rock with which it comes in contact. Acids formed by decomposition of vegetation are picked up by the water as it percolates through the soil, and these also increase the ability of the water to dissolve minerals.

There is a wide range in the solubility of minerals, and the presence or absence of readily soluble minerals is an important factor in determining whether the ground water will contain a large of a small amount of dissolved mineral matter. It is apparent that the lithologic character of the formation through which the ground water percolates is an important factor in shaping the chemical character of the water. The concentratinn and kind of minerals dissolved in the water determines the hardness, salinity, iron content, corrosiveness, and other characteristics of the water. Chemical characteristics of the ground water in the various formations were discussed briefly in the section on water-bearing characteristics of the rock formation.

Table 18 lists 12 partial or comprehensive analyses of ground water in Clark County. In addition to these analyses, chloride and hardness were determined by field methods for a number of water samples, and results of these tests, which are only approximate, are given in parts per million (ppm) in table 19.

Hardness

Hardness of water is caused by soap-consuming and scale-forming materials, chiefly calcium and magnesium. Water that is hard requires large amounts of soap to form a lather. Hard water also produces scaly deposits in pipes and tanks with which it comes in contact, especially when the water is heated while in contact with the pipes and tanks.

Most of the water samples that were tested for hardness in Clark County are in the categories of soft (0-60 ppm) or moderately hard (61-120 ppm). Of the 12 analyses and 254 field tests, 83 were of soft water, 168 were of moderately hard water, and 15 were of hard water (121-180 ppm). Most of the wells yielding soft water are less than 50 feet deep, suggesting that the distance traversed and length of time that water is in contact with the rock are factors in determining how much calcium and magnesium will go into solution.

The hardest water tested had a hardness of 170 ppm, which is not excessive in comparison with that of water used in many other parts of the United States. Therefore, although hardness of ground water in Clark County may present somewhat of a problem to a few users, it will give little or no trouble to most users.

Chloride

Chloride in ground water commonly is thought of as being present as a result of the solution of sodium chloride (common salt). Of 266 water samples analyzed for chloride, only 13, less than 5 percent, contained more than 20 ppm of chloride. Only one sample had a chloride content of more than 75 ppm. This sample, from well 4/3-18N2, a flowing well reported to be 580 feet deep had a chloride content of 224 ppm. However, several drillers have reported encountering water too salty for use in a few wells drilled north of the East Fork of the Lewis River. The saline water in that area apparently comes from the lower part of the Troutdale formation.

The U. S. Public Health Service (1943) recommends that the chloride content of public water supplies preferably should not exceed 250 ppm where other and more suitable supplies are available. So far as is known, no public or private domestic supplies in the county approach the limit.

Iron

In general use of the water, more trouble is caused by excessive amounts of iron in ground water than by any other mineral or chemical characteristic.

Iron is not known to be injurious to the health (Negus, 1938, p. 253) nor is it known to affect adversely the use of the water for irrigation. However, excessive amounts will produce certain undesirable effects. Excessive iron in drinking water gives the water a taste that is unpleasant to most people. It causes a yellow or reddish stain on plumbing fixtures and cooking utensils, and stains clothes washed in the water. Many industrial porcesses cannot tolerate excessive iron in the water.

According to the U. S. Public Health Service drinking-water standards, an iron and manganese content of more than 0.3 ppm is undesirable. Concentrations of iron that will be detrimental for industrial use depends upon the nature of the industry, but for many industrial uses iron in excess of 0.3 ppm is highly undesirable. Of the 8 water samples for which iron was determined 3 had an iron content of more than that amount. No field tests were made for iron, but a number of users reported objectionable amounts of iron in the water.

Treatment of water for removal of iron is relatively simple. The most common method is aeration and filtration. Ordinary zeolite water softeners also will remove the iron if the concentration is not more than about 1 ppm and the iron is in a reduced state. Iron removal in large municipal and industrial supplies is generally accomplished by aeration which oxidizes the iron and causes it to precipitate. Subsequent filtration removes the precipitate.

Fluoride

Fluoride in water in excess of about 1 ppm may cause the dental defect known as mottled enamel if the water is used for drinking and cooking during the formation of the teeth (Dean, 1936). The severity and percent of incidence increase markedly with an increase in fluoride content until at 6 ppm an incidence of 100 percent is not unusual.

Water containing small amounts of fluoride, however, is reported by Dean (1942), to be beneficial in prevention of dental decay. It has been shown that school children using water containing about 1 ppm of fluoride experience only one-half to one-third as much dental decay as comparable groups using water that contains no fluoride.

Fluoride determinations were made in 9 of the 12 analyses of ground water listed in table 18. The concentrations of fluoride range from 0 to 0.6 ppm. It is apparent that the fluoride content shown for each of the 9 is well below the harmful range.

Corrosiveness

Oxygen, carbon dioxide, and vegetable acids are the principal constituents of ground water that cause corrosion. Corrosion causes deterioration of well casing, pump pipes, pumps, tanks and water pipes in distribution systems. Often, however, the deterioration is not as objectionable as is the presence of the iron which goes into solution in the process of deterioration, resulting in the staining of utensils, plumbing fixtures, and laundry.

Water from shallow depths usually is more corrosive than that from greater depths. Rainwater contains considerable oxygen and carbon dioxide. As the water percolates downward through the soil and rocks, the free oxygen combines with organic and inorganic materials. The reaction of carbon dioxide with water forms carbonic acid which, in turn, reacts with various minerals to form bicarbonates. The farther the water percolates into the ground, the less free oxygen and carbon dioxide remain to cause corrosion. For this reason hard water, in which the carbon dioxide has been used up in dissolving the minerals, causing hardness, and in which there has been time for the oxygen content also to be reduced, generally is less corrosive than water of low mineral content and hardness.

The pH of a water is a measure of its acidity or corrosiveness. Water having a pH of less than 7 is acidic in reaction, and one having a pH of more than 7 is alkaline in reaction. Of the 12 water samples for which chemical analyses are listed in table 18, pH determinations were made on 11. Of these, the pH of only 2 is less than 7. Hence, only 2 of 11 water samples are likely to be corrosive. However, it is probable that the water from many of the shallow wells is somewhat corrosive.

Suitability of Water for Irrigation

Several chemical factors affect the suitability of water for agricultural use. The most important are (1) the total concentration of soluble salts, (2) the relative proportion of sodium to other cations, and (3) the concentration of boron.

The concentration of soluble salts (dissolved solids) is reported in parts per million in table 18. The specific conductance of the water also is an indication of the concentration of soluble salts. When specific conductance has not been determined, its value in micromhos per centimeters can be approximated by multiplying total solids in parts per million by the factor 1.6. According to Agriculture Handbook No. 60 (U. S. Salinity Laboratory staff, 1954 p. 71), water having a conductivity of less than 750 micromhos per centimeter generally are satisfactory for irrigation insofar as salt content is concerned. The highest conductivity measured in ground water of Clark County is 376 micromhos. The highest concentration of dissolved solids determined is 238 ppm, equivalent to a conductivity of approximately 380 micromhos. Thus, all of the water samples tested contain far less dissolved solids than the upper limit given for satisfactory irrigation use.

The relative proportion of sodium to other cations is known as "percent sodium." However, a better index as to the sodium (alkali) hazard of a water is given by the sodium-adsorption-ratio (SAR), which is related to the adsorption of sodium by the soil. This ratio is defined by the equation:

$$SAR = \frac{Na^{+}}{\sqrt{(Ca^{++} + Mg^{++})/2}},$$

in which the concentration of the respective ions is expressed in milliequivalents per liter. Sodium-adsorption-ratios are given for 9 ground-water samples in table 18. None of these values are more than 0.5, which, according to the classification given in Agriculture Handbook No. 60 (p. 80), would represent an extremely low sodium (alkali) hazard.

Although boron is essential to normal growth of plants the amount required is very small. An excess of boron is very injurious to some plants. According to Scofield and Wilcox (1931, p. 3), irrigation water with boron concentration of less than 0.5 ppm is considered as class 1 water, with respect to boron, for even the most sensitive crops. The maximum boron concentration of any of the water samples from Clark County was 0.02 ppm.

Thus it seems probable that the chemical quality of all the ground water used in Clark County is very satisfactory for irrigating all types of plants.

UTILIZATION OF GROUND WATER

The use of ground water exceeds the use of surface water in Clark County, both in number of supplies and in total quantity. Chief uses include domestic, municipal, industrial, and irrigation. Total ground-water consumption probably is more than 100 mgd, or somewhat more than 110,000 acre-feet per year. (See also fig. 30.)

Domestic Supplies

By far the largest number of wells in Clark County are used for domestic purposes. The tabulation of wells in this report includes only a small percentage of all the domestic wells in the county. On the basis of rural population (more than 38,000 in 1950) it is estimated that there are 10,000 to 12,000 domestic wells in the county. Probably the majority of domestic wells are dug, but several thousand are drilled. Driven and bored (augered) wells are in the minority. Several hundred springs also are used, chiefly in the upland and foothills areas.

Assuming a total of 12,000 rural domestic wells and an average usage of 300 gpd per well, the average ground-water withdrawal for rural domestic (and stock) use is 3.6 mgd.

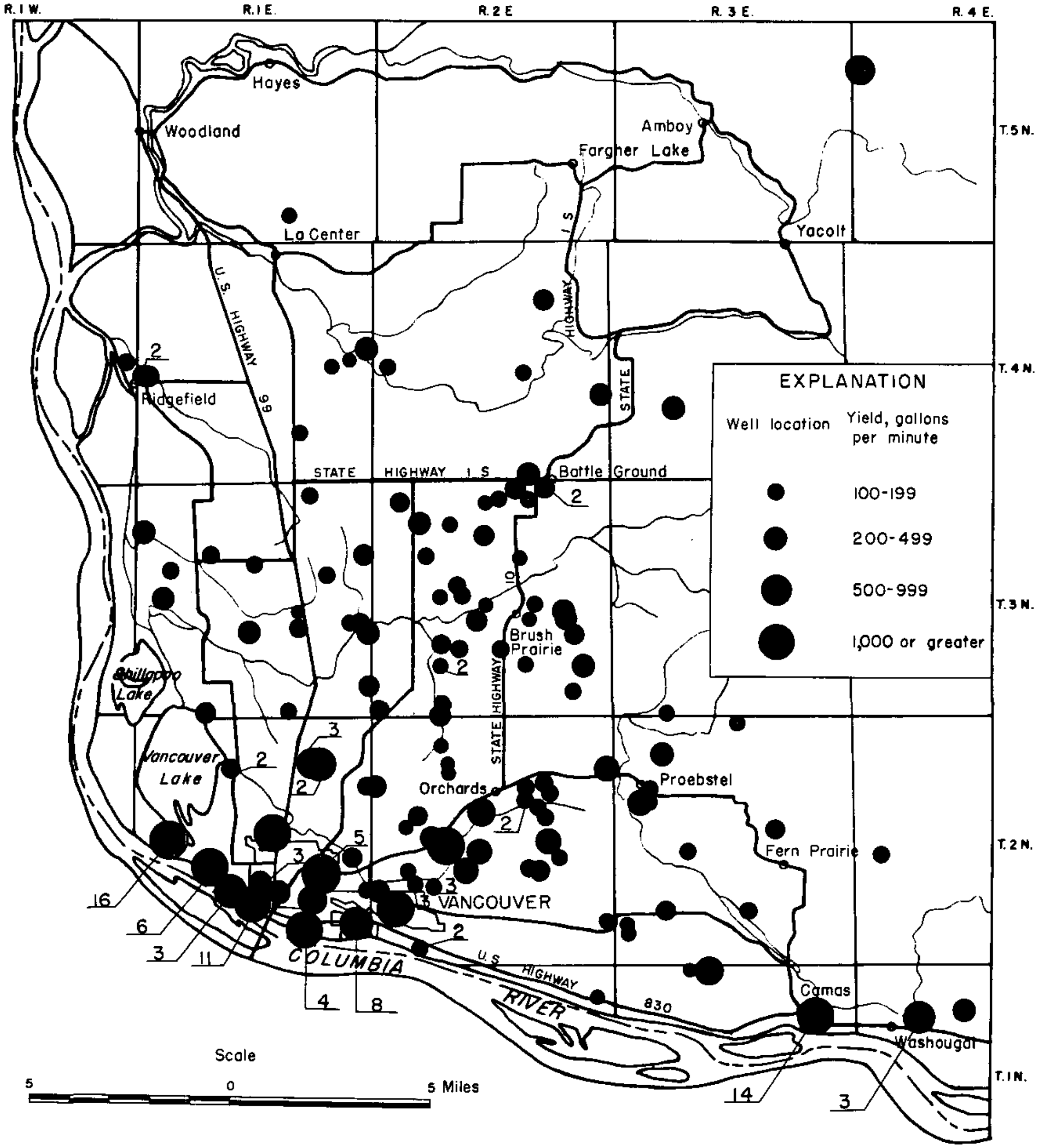


Figure 30.--Wells in Clark County capable of yielding 100 gallons per minute or more.
(Numbers indicate number of wells of that capacity at location shown.)

Public Supplies

There are eight public water-supply systems in the county, with a combined average demand of about 9.5 mgd. Of the 8, 1 is owned by a public utility district, 1 is privately owned, and 6 are municipally owned. Six of the systems are supplied entirely from wells and springs, 1 is supplied from a creek, and 1 is supplied in part from creeks and in part from wells. Ground water is the source of about 90 percent of the water used for public supply. The following table summarizes the data for these eight systems.

Table 11.--Public Water Supplies in Clark County

Town or locality	Population served	Source of supply	Capacity (mgd)	Average use (mgd)	Treatment
Battle Ground	a 850	2 wells	0.8	0.06	Chlorination
Camas	5,600	Boulder and Jones Creeks,	..	2.5	Do
		3 wells	4.3		None
Hazelwood (Utility district)	a 4,000	4 wells	?	a 1.0	None(?)
La Center	195	Wells	a .7	.025	None
Ridgefield	800	3 wells	..	.075	Do
Vancouver	50,500	3 springs	2.5	5.4	Chlorination
		17 wells	57		None
Washougal	1,400	Wells	3.13	.42	Do
Yacolt	330	Big Creek	..	a .03	Do

a, estimated

In addition to these public water-supply systems in which water is sold to regular customers through distribution mains, there are a number of public supplies used for schools, hospitals, parks, and similar places. In the table of well data, use of water from wells supplying these latter places is listed as "institutional." Total ground-water usage by such institutions probably is 0.2 to 0.5 mgd.

Industrial Supplies

A large part of the water used by industry is obtained from ground-water sources, although the largest user, the Crown-Zellerbach Corp., at Camas, uses both surface and ground-water sources.

The chief industrial uses are for manufacture or processing of pulp and paper, aluminum, chemicals, and food and drink products, concrete and brick products, and lumber and plywood.

The following table gives data pertinent to the larger industrial supplies in the county.

Table 12.--Industrial water supplies in Clark County

Name	Location	Source	Average use (gals/day)
Crown-Zellerbach Paper Co.	Camas	Surface	66,000,000
		9 wells	20,000,000
Columbia River Paper Mills	Vancouver	8 wells	24,000,000
Aluminum Co. of America	do.	15 wells	16,000,000
Great Western Malting Co.	do.	3 wells	4,960,000
Vancouver Plywood Co.	do.	wells[a]	4,330,000
Buffalo Electro-Chemical Co.	do.	4 wells	2,880,000
Port of Vancouver	do.	1 well	1,330,000[b]
Carborundum Co.	do.	2 wells	1,000,000
Interstate Brewery Co.	do.	2 wells	500,000
Spokane, Portland & Seattle RR	do.	2 wells	300,000[b]
Bonneville Power Administration	do.	1 well	..
Harbor Plywood Corp.	Amboy	1 well	220,000[b]
Clark County PUD #1	Vancouver	2 wells[c]	
Northern Pacific RR	Ridgefield	1 well	82,000[b]
Vancouver Ice & Cold Storage	Vancouver		..
Clark County Dairyman's Assoc.	Battle Ground	2 wells	..
Du Bois Lumber Co.	Vancouver		..
C. A. Robinson	Pioneer	1 well	..

[a] Supplied by Vancouver Port Authority.

[b] Quantity allotted by State on certificate of water right.

[c] Used for heat pump system, returned to ground

In addition to the industries listed there are many smaller industries which use ground-water supplies in their operations. The total ground water use by the industries listed in the table is about 75 mgd, or 84,000 acre-feet per year. The smaller industries not listed probably use several million gallons a day in addition.

Industrial use is concentrated chiefly in two areas on the flood plain of the Columbia River—at Camas and at Vancouver. Use at Camas, almost entirely by the Crown-Zellerbach Corp., is about 20 mgd (22,400 acre-feet per year). Industrial use at Vancouver totals more than 55 mgd (61,600 acre-feet per year). Most of the wells in these two areas obtain water from gravel aquifers in the Pleistocene terrace deposits, although a few wells also tap aquifers in the gravel of the upper member of the Troutdale formation. Because of the very great transmissibility of the aquifers, much of the water withdrawn is recharged by lateral percolation from the Columbia River and there has been no undue lowering of the water table. Potential ground-water supplies in both the Vancouver and Camas areas probably are many times greater than the quantity now being used (See also p. 125-145).

Irrigation Supplies

The upland plains and benches in Clark County are ideally suited to irrigation. According to the Bureau of Reclamation unpublished report "Lewis River basin, Washington, reconnaissance report" some 30,000 acres on the alluvial plains below an altitude of 300 feet south of the East Fork of the Lewis River are irrigable. Additional irrigable lands are located on the higher benches north of the East Fork, on alluvial terraces north and east of Battle Ground, in the vicinity of Yacolt, on the Chelatchie Prairie and on the Fifth Plains between Camas and Battle Ground.

Irrigation in Clark County, as in most of western Washington, has increased very rapidly since World War II. Census Bureau reports show 20 farms irrigated 194 acres in 1945. By 1950 the number of irrigated farms had increased to 80, with 1,228 acres under irrigation. (These figures include farms being supplied by water from both surface- and ground-water sources.) Of the 80 farms irrigated in 1950, 45 were supplied by wells, and 8 by springs, representing an aggregate of 624 acres. Records obtained from the files of the Washington State Department of Conservation show 137 farms irrigating 3,082 acres from wells in 1955. The increase in irrigation, and in use of ground water for irrigation from 1935 to 1955 is shown graphically in figure 31. The map of Clark County, figure 32, shows the locations of 172 irrigation wells. The difference in numbers (137 farms vs 172 wells) is due in part to the fact that some farms have more than one irrigation well, but is also due in part to the failure of some farmers to apply for water rights. The total amount of ground water used for irrigation in Clark County is not known but may be on the order of 8,000 to 10,000 acre-feet annually.

The chief source of ground water for irrigation is the gravel of the upper member of the Troutdale formation. More than 110 irrigation wells have been drilled into this unit and yields are as much as 1,000 gpm. Few wells are screened: some are not even perforated, and many are inadequately perforated opposite the aquifer. There is no doubt that many of the wells would yield much larger amounts of water if they were completed with more adequate openings into the aquifer.

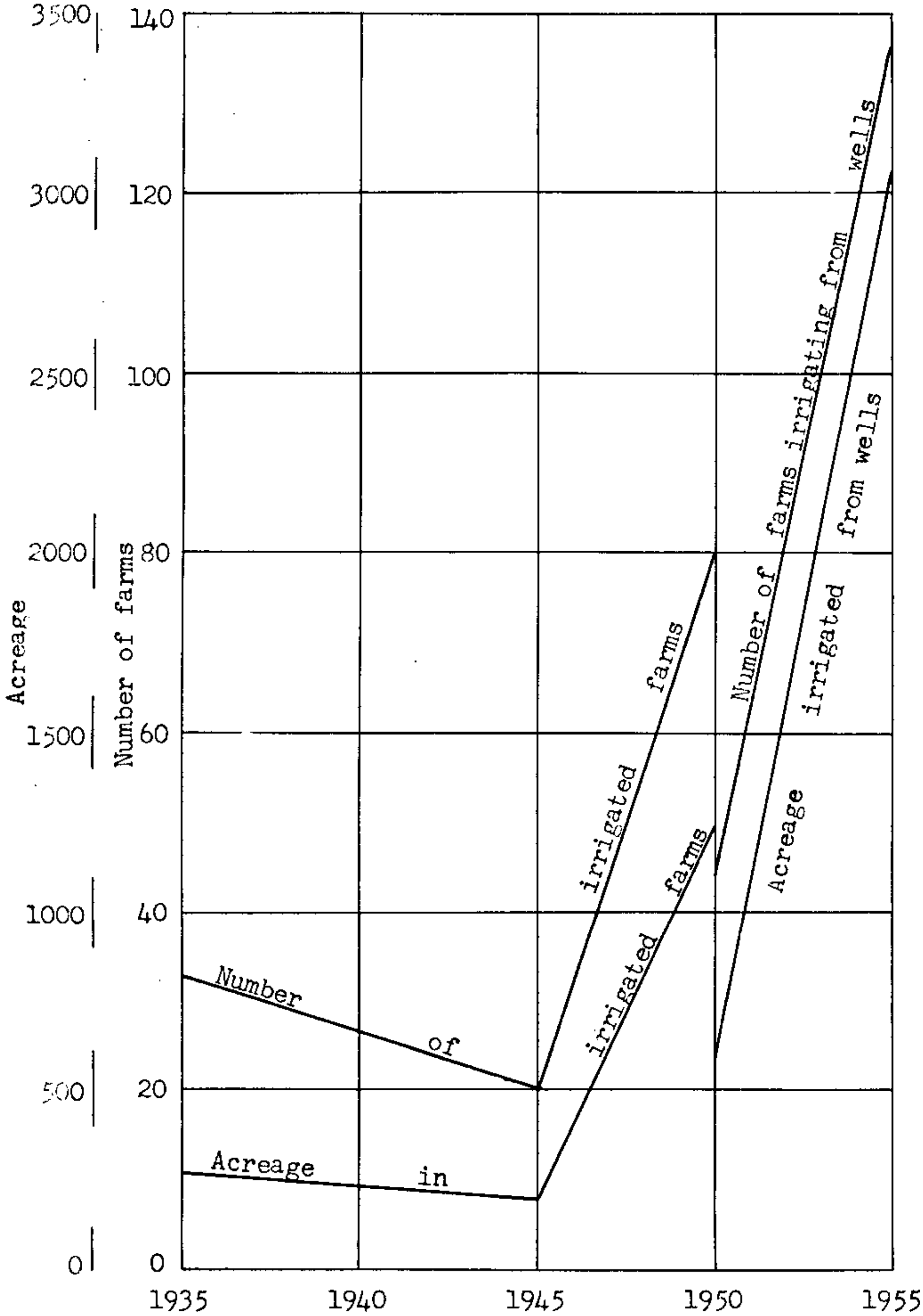


Figure 31.--Increase in irrigation in Clark County (data for 1935, 1945, 1950 from U. S. Bureau of Census reports. Data for 1955 from State Department of Conservation, Division of Water Resources.)

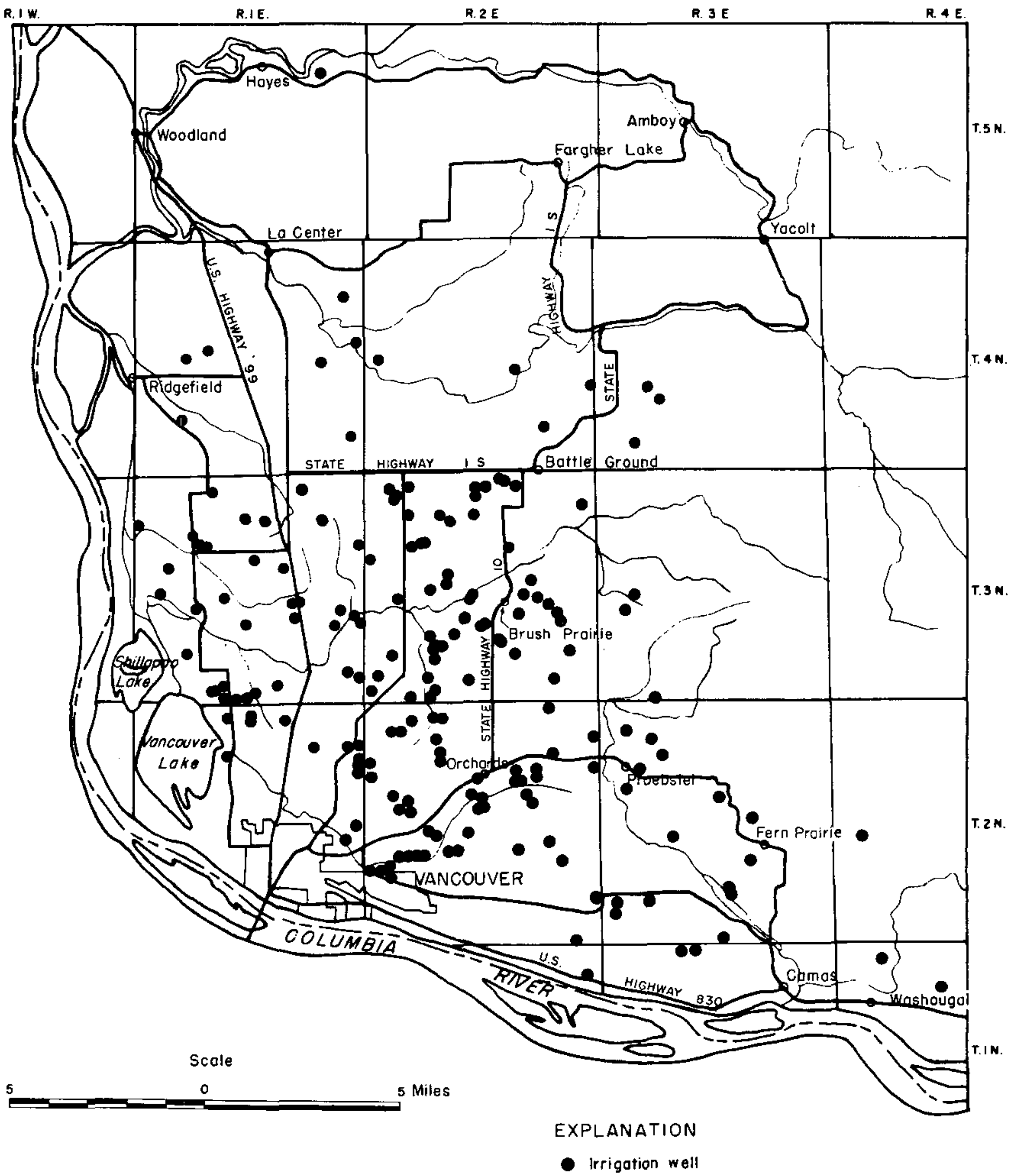


Figure 32.--Irrigation wells in Clark County.

At a number of places sand and gravel aquifers in the Pleistocene alluvial deposits supply moderate to large yields of water for irrigation. Most of the wells are shallow dug wells or trenches; yields of several hundred gallons a minute have been reported. Most of the irrigation wells drawing water from this formation are in the area between Burnt-bridge and Salmon Creeks, extending from Felida to Proebstel.

The glaciofluvial deposits underlying Chelatchie and Yacolt Prairies are capable of yielding moderate to large supplies of water for irrigation, although only a few irrigation wells have been constructed in these areas. Seven irrigation wells along the Lewis River and the East Fork of the Lewis River obtain water from the alluvial deposits. Yields up to 364 gpm have been reported for wells less than 50 feet deep. All these deposits are capable of supplying much more water than is now being withdrawn from them.

DEVELOPMENT OF GROUND-WATER SUPPLIES

Many wells in Clark County yield less water than the owner or user wants and needs. Many others that yield the needed amount do so only at the expense of a large drawdown which results in increased pumping costs. Probably the majority of wells that are inadequate could have produced an adequate yield if they had been properly constructed and developed. Good well construction is based on a clear understanding of what happens in the aquifer in the vicinity of the pumped well.

Well Hydraulics

The general principles governing the occurrence of ground water were given in a previous section of the report (p. 86-93). These principles may be briefly summarized as follows: Ground water occurs in the interstices (openings) of the rocks beneath the earth's surface within the zone of saturation. Where the surface of the zone of saturation is in permeable material and can move up or down depending on recharge from precipitation and on discharge, the surface (as defined by water levels in wells) is termed the water table. During its travel underground water may pass beneath a layer that is only slightly permeable. If the aquifer beneath this layer is saturated and the water exerts a hydrostatic pressure upward on the base of the confining layer, the ground water is under artesian pressure. If a tightly cased well is drilled into the aquifer, water will rise above the confining layer. The water levels of a number of wells penetrating an artesian aquifer defines an imaginary surface termed the piezometric surface.

The same principles that govern the movement of water underground, from the area of recharge to the point or area of natural discharge, govern the movement of water to a well when pumping begins. As soon as pumping begins the water level drops from its static position to a new level (pumping level) which is not a fixed level, but which continually declines as long as the well is pumped at a constant rate (until a source of recharge is intercepted). Water entering the well flows from all directions toward the well, and because the cross-sectional area through which the water moves is progressively smaller nearer the well, the gradient toward the well is progressively greater. The area in which the water level declines (the area of influence) assumes the shape of an inverted cone (fig. 33). When pumping first begins the pumping level drops rapidly and the cone of depression expands rapidly. As pumping continues and the area of influence becomes larger the rate of decline of the water level and of the expansion of the cone of depression is much slower. These relations are shown in figure 33. It is obvious that the drawdown in a well is not constant, but continually increases as long as pumping continues at the same rate, until the cone of depression reaches a source of recharge. If the pumping level is held constant before the cone of depression reaches a source of recharge, the discharge rate will then decrease. A common method of comparing the relative water-yielding ability of several wells is to compare their specific capacities. However, it is apparent from the above discussion that the specific capacities determined will vary with the length of time a well is pumped.

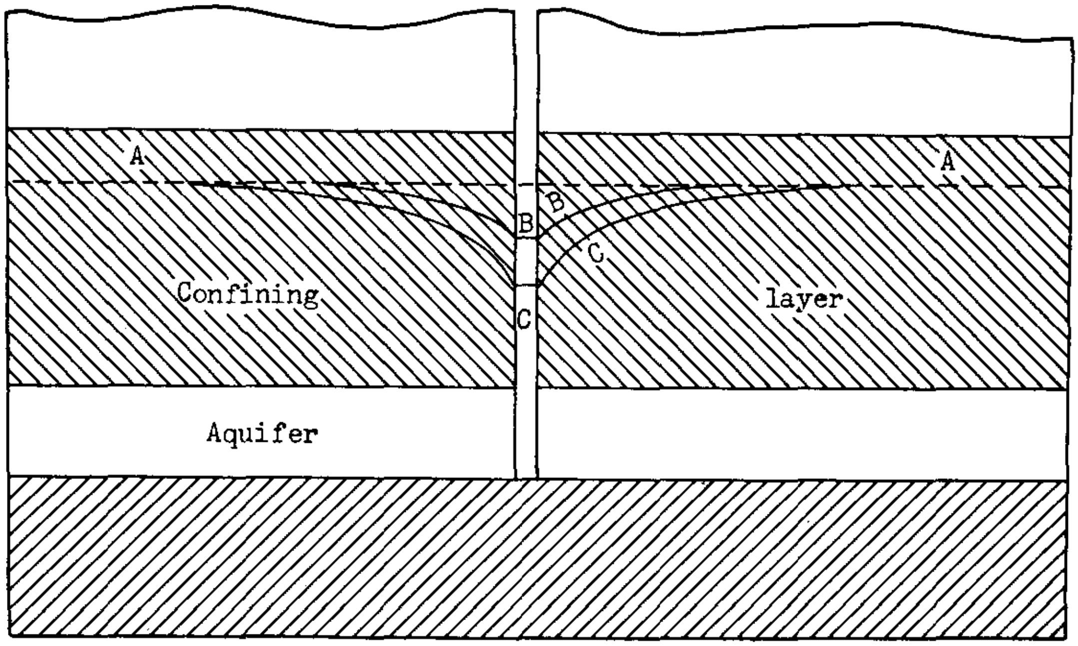


Figure 33.--Diagrammatic section showing piezometric surface of an artesian aquifer before and after pumping a well whose casing is perforated through the full thickness of an aquifer. (A-A, static water level or piezometric surface before pumping begins; B-B, water level after pumping one hour; C-C, water level after pumping 10 hours.)

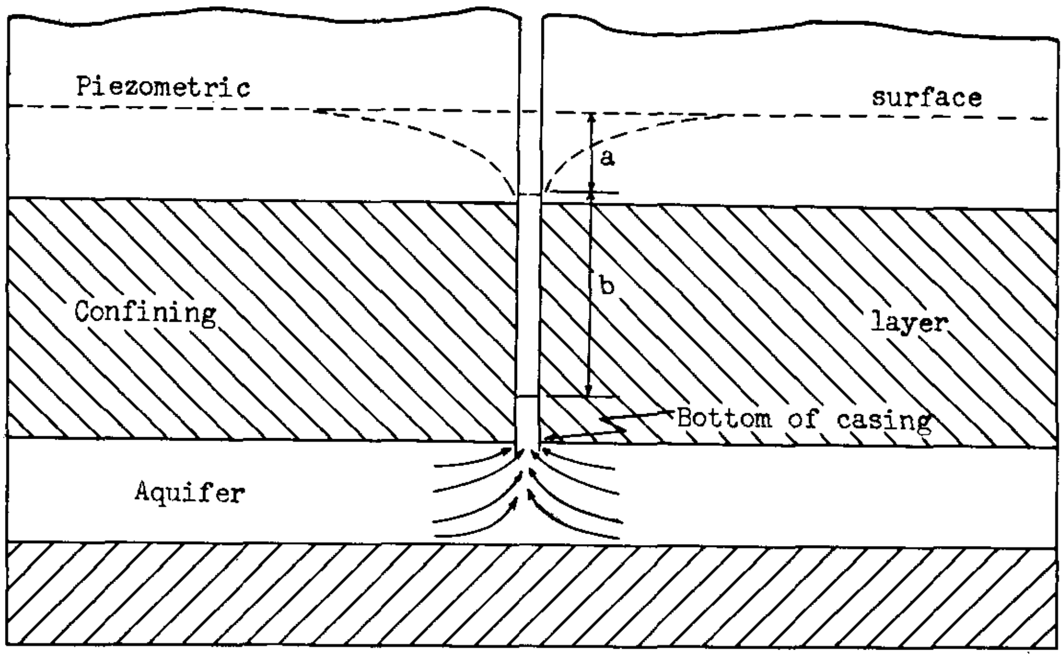


Figure 34.--Diagrammatic section showing drawdown in a pumped well into which water can enter only through the open end of the casing. (a, drawdown in aquifer; b, drawdown due to entrance loss into casing because of convergence of flow lines toward the open end of the casing.)

Well Construction

In figure 33 and in the previous discussion water is assumed to flow into the well without the entrance loss which is generally caused by the presence of a casing or screen; it is assumed the well was drilled without disturbing the aquifer surrounding the hole, and without the necessity of using a screen or casing. Where the aquifer is consolidated, it may be possible to construct such a well, but in Clark County where the aquifer nearly always consists of loose or only slightly consolidated sand or gravel, a slotted casing or screen is needed to keep the well open and still permit water to enter. Ideally, a casing should hold back the formation without interfering appreciably with the flow of water into the well. With the proper type of well construction and development, this objective can be approached; however, it is unfortunate that, because of improper construction and development, many wells have a low efficiency. Many wells fail to yield the required amount of water because of excessive drawdown due to entrance loss; others that yield sufficient water do so only because the drawdown is much greater than it should be, resulting in increased pumping costs. Many wells, because the openings into the casing are inadequate to permit free entrance of water into the well, will yield only 10 or 20 percent of the water that the aquifer is capable of delivering to them. This is particularly true of wells that draw all their water through the open bottom of the casing, or through an inadequate number of perforations as illustrated in figures 34 and 35. Where an open casing is used water must not only converge radially towards the well, but must also converge vertically toward the bottom of the casing. For example, in an aquifer 10 feet thick penetrated by a well 8 inches in diameter, the surface area of the well bore adjacent to the casing is 21 square feet, which is the area through which the water would enter if there were no casing to impede the flow of water into the well. With only the bottom of the casing open, the water must flow into the well through an area of only 0.35 square foot, less than 2 percent of the area of water-bearing formation that would be open to the well under ideal conditions.

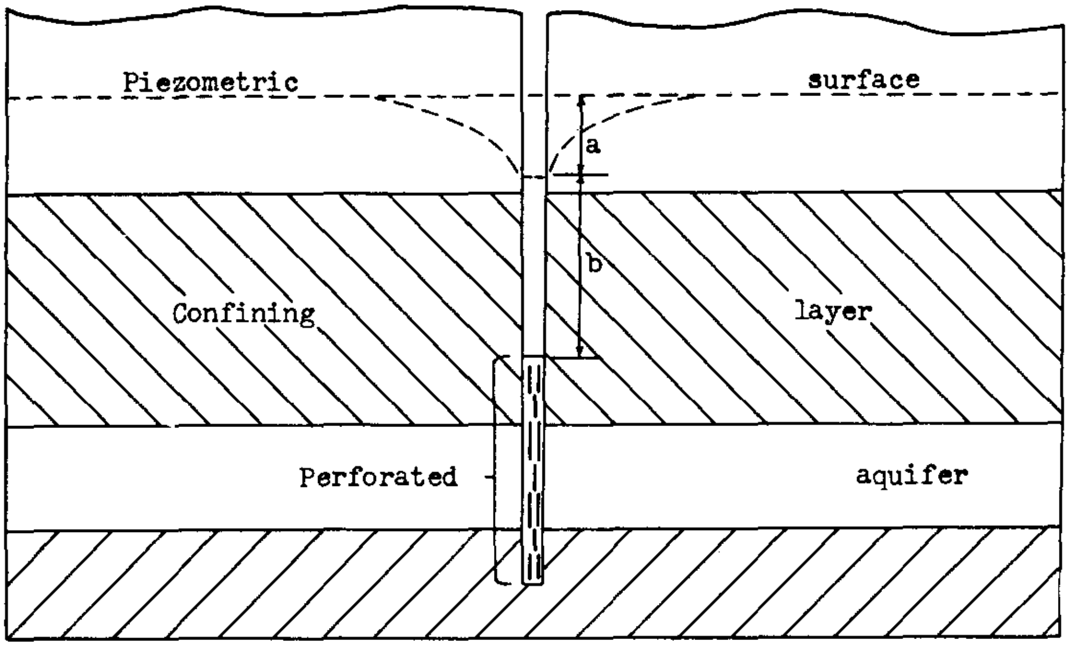


Figure 35.--Diagrammatic section showing drawdown in a pumped well having insufficient number of perforations opposite aquifer. (a, drawdown in aquifer; b, drawdown due to entrance loss into casing because of convergence of flow lines toward the slots--see figure 36. More than half the perforations are in non-productive zones.)

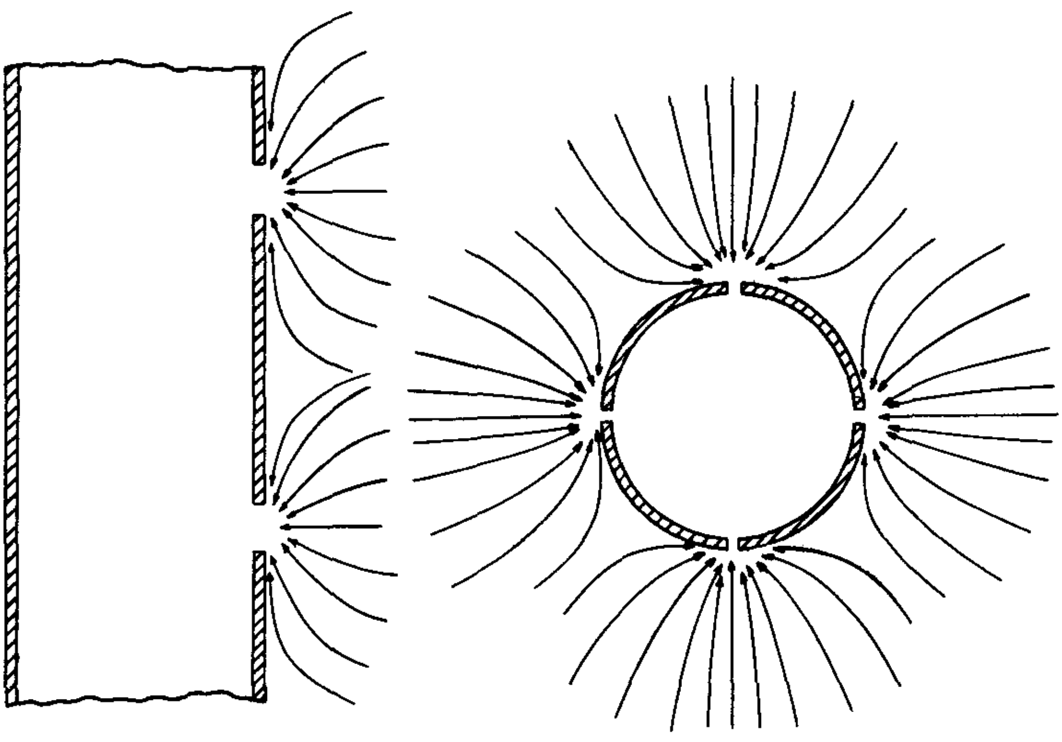


Figure 36.--Longitudinal and cross sections through well casing showing convergence of flow lines towards slots and illustrating the cause of the large loss of head upon entrance of water into well casing.

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In wells having perforated casings the number and spacing of perforations vary a great deal. A common arrangement is a row of 6 to 8 perforations around the circumference, one row per foot of casing. A common size of perforation is 3/8 inch by 1½ inch. This spacing gives a total of only 60 to 80 perforations in an aquifer 10 feet thick, each having an area of slightly more than one-half square inch. Assuming an area of one-half square inch, the total area of perforation would be about one-half square foot, only slightly more area than the open end of an 8-inch casing. Actually, the jagged slot left by most perforators is somewhat less than the nominal size. The head loss due to convergence of water toward these scattered openings (as illustrated in fig. 36 is very great. Very often perforated casing is set opposite non-water-yielding materials; although the total area of perforation may appear to be large in such wells, the effective area acutally is very much smaller.

With sand-size materials, maximum yields can be obtained by use of a screen of the proper size. General practice now is to use a size of opening that will permit passage of the finer grained 60 to 80 percent of the material into the well. Development of the well by surging, bailing, pumping, or by other means washes the finer grains into the well where they are removed, leaving a coarser and much more permeable sand zone surrounding the screen. With wire-wound screens, a type very commonly used, the width of the wire is about the same regardless of the width of opening or space between each turn. Thus the ratio of opening to total area of the screen varies almost directly as the slot size. Table 12 gives the approximate open area for well screens of various slot sizes.

Table 13.—Relation of open area of screen to well diameter and slot size_/

Well diameter (inches)	Open area of slots in square feet per 10-foot length of screen					
	Slot number 10	20	40	60	80	100
6	1.475	2.68	4.53	5.90	6.93	7.75
8	1.96	3.57	6.03	7.85	9.27	10.33
10	2.48	4.52	7.67	10.00	11.73	13.08
12	2.95	5.35	9.07	11.80	12.07	13.75
14	3.46	6.30	10.67	11.90	14.20	16.08

_/ (Adopted from catalog 148 of the Edward E. Johnson Co.)

Perforated casings are used instead of screens only when the granular material is coarse. Slots cut with a casing knife generally are 3/8-inch wide or wider. Pre-perforated slots are usually cut in widths ranging down to 1/8-inch. The width of slot probably should be of a size that will retain about 20 to 40 percent of the grains. The number of perforations should be the maximum number that can be cut without rupturing the casing, especially if the aquifer is thin. Generally pre-perforated casing allows a larger area of opening per square foot than can be attained with a casing knife after the casing is in place. When the aquifer is thin, use of pre-perforated casing would be especially advantageous. Table 14 gives approximate open area for various arrangements of perforations.

Table 14.--Open area of perforations in well casings

Casing, inside diameter (inches)	Open area of perforations, in square feet, per 10-foot length of perforated casing					
	Pre-perforated casing, $\frac{1}{4}$ x 6-inch, one row per foot		Knife-cut perforations, 3/8 x $1\frac{1}{2}$ inch			
			Slots spaced 6 inches between centers, around casing		Slots spaced 3 inches between centers, around casing	
	Slots spaced 2 inches between centers around casing	Slots spaced 4 inches between centers around casing	1 row per foot	2 rows per foot	1 row per foot	2 rows per foot
6	1.04	0.52	0.11	0.22	0.22	0.44
8	1.35	.68	.16	.32	.32	.64
10	1.66	.83	.19	.38	.38	.76
12	2.08	1.04	.23	.46	.46	.92
14	2.45	1.23	.27	.54	.54	1.08
16	2.81	1.41	.31	.62	.62	1.24

Well Development

After the well is drilled, and the screen set or the casing perforated, some "development" work is usually done to remove the finer grained materials in the aquifer adjacent to the well. This generally has two beneficial results: (1) the specific capacity of the well is increased by increasing the transmissibility of the aquifer in the immediate vicinity of the well, and (2) the finer particles, which might have injured the pump if they had remained to be pumped out during operation of the well, are removed. Development is usually accomplished by surging, bailing, or pumping and backwashing. Surging is usually done by fastening a tight-fitting plunger to the drill rod so that water is alternately drawn from and forced back through the screen (or perforations) into the formation as the plunger is churned up and down. The material close to the well is kept agitated and the finer particles are drawn into the well. These settle to the bottom of the well, from where they are removed by bailing. Rapid bailing in itself serves to some extent in agitating the fine-grained materials and in drawing them into the well, but generally bailing is not as effective as surging. In the pumping and backwashing method the pump is operated momentarily to draw water in through the screen and then shut off to allow the water in the pump column to surge back down the well. This method is most effective when the tail pipe is opposite the aquifer.

GLOSSARY

Aquifer - A formation, group of formations, or part of a formation that is water bearing (Meinzer, 1923b, p. 30).

Area of influence - The area beneath which ground-water or pressure-surface contours are modified by pumping (Tolman, 1937, p. 557).

Base flow - The discharge entering stream channels from ground water or other delayed sources (Am. Soc. Civil Engr., 1949, p, 106).

Base flow recession curve - On a hydrograph, that part of the descending limb from the point of inflection to the time when direct runoff has ceased (Am. Soc. Civil Engineers, 1949a, p. 55).

Coefficient of permeability - The rate of flow of water, in gallons a day, through a cross-sectional area of 1 square foot under a hydraulic gradient of 100 per cent at a temperature of 60°F. (Stearns, 1928, p. 148).

Coefficient of storage - The volume of water of a certain density released from storage within the column of aquifer underlying a unit surface area during a decline in head of unity (Jacob, 1940, p. 576).

Coefficient of transmissibility - The number of gallons of water which will move in 1 day through a vertical strip of the aquifer 1 foot wide and having the height of the aquifer when the hydraulic gradient is unity. The coefficient of transmissibility quantitatively describes the ability of the whole aquifer to transmit water (Theis, 1935). In this report, to compute the coefficient of transmissibility, water-level and yield data were analyzed by means of the nonequilibrium formula of Theis (1935), using the graphical solutions of Cooper and Jacob (1946). The formulas used are: $T = \frac{528\ Q}{\Delta s}$ and $S = \frac{0.30Tt}{r^2}$

where:

T = the coefficient of transmissibility, in gallons per day per foot.

S = the coefficient of storage

Q = the discharge of the pumped well, in gallons per minute

Δs = the change in drawdown, in feet per log cycle

t = time since pumping began, in days

r = distance, in feet, of observation point of drawdown from center of pumping

r_0 = distance, in feet, at which drawdown is zero

Consumptive use - The quality of water transpired and evaporated from a cropped area or the normal loss of water from the soil by evaporation and plant transpiration (Blaney, 1951a).

Cone of pressure relief - An imaginary surface indicating pressure-relief conditions in a confined aquifer due to pumping or during well flow (Tolman, 1937, p. 58-59).

Drawdown - Lowering of the water level in a well caused by pumping (Tolman, 1937, p. 558).

Ground water - That part of subsurface water which is in the zone of saturation (Meinzer, 1923a, p. 38-39).

Hydrostatic pressure - The pressure exerted by the water at any given point in a body of water at rest. That of ground water generally is due to the weight of water at higher levels in the same zone of saturation (Meinzer, 1923b, p. 37).

Hydraulic gradient - A profile showing the static level of water at all points on the profile. Hydraulic gradient of ground water records the head consumed by friction of flow between any selected points on the profile. For percolating water the slope is expressed by h/l where h is the difference in elevation between any two points and l is the distance between them. The water table registers the hydraulic gradients of free ground water, and the pressure surface those of confined water (Tolman, 1937, p. 560).

Isohyetal line - An isohyetal line, or an isohyet, is a line on a land or water surface all points along which recieve the same amount of precipitation (Meinzer, 1923b, p. 15).

Juvenile water - Water that is derived from the interior of the earth, and has not previously existed as atmospheric or surface water (Meinzer, 1923b, p. 31).

Permeability - The volume of a fluid of unit viscosity passing through a unit cross section of the medium in unit time under the action of a unit-pressure gradient (Muskat, 1936).

Piezometric surface of an aquifer - An imaginary surface that everywhere coincides with the static level of the water in the aquifer (Meinzer, 1923b, p. 39).

Sodium-adsorption ratio - A ratio for soil extracts and irrigation waters used to express the relative activity of sodium ions in exchange reactions with the soil complex - all concentrations of ions expressed in equivalents per million (U. S. Salinity Laboratory Staff, 1954, p. 156).

$$SAR \quad \frac{Na^{+}}{\sqrt{\frac{Ca^{++}+Mg^{++}}{2}}}$$

Specific capacity - The discharge of a well expressed as rate of yield per unit of drawdown, generally gallons a minute per foot of drawdown (Tolman, 1937, p. 563).

Specific yield - The quantity of water that a formation will yield under the pull of gravity if it is first saturated and then allowed to drain; the ratio expressed in percent, of the volume of the water to the total volume of the formation that is drained (Stearns, 1928, p. 144).

Stillstand - To remain stationary with respect to sea level or to the center of the earth (Merriam-Webster, 1952).

Transpiration - The quantity of water absorbed by the crop and transpired and used directly in the building of plant tissue, in a specified time. It does not include soil evaporation (Blaney, 1951b).

Vadose water - Water in the zone of aeration (Meinzer, 1923b, p. 22).

Zone of aeration - The zone in which the interstices of the functional permeable rocks are not filled (except temporarily) with water. The water is under pressure less than atmospheric (Meinzer, 1923b, p. 21)

Zone of saturation - The zone in which the functional permeable rocks are saturated with water under pressure equal to or greater than atmospheric (Meinzer, 1923b, p. 21).

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Table 15.--Records of representative

(Locations of wells

Topography and approximate altitude: Ba, basin; Fp, flood plain; H, hill; S, slope; T, terrace; Ub, upland bench; Uc, upland channel; Up, upland plain. Altitude of land-surface datum at well from barometric traverses or interpolated from topographic maps.

Type of well: Bd, bored; Dg, dug; Dn, driven; Dr, drilled.

Depth and water-level: Depth of well recorded to nearest whole foot below land surface. Water-level measurements expressed in feet and decimal fractions of feet were made by the Geological Survey; measurments recorded to nearest whole foot were reported by owner, tenant, or driller. The dates of such measurments often are not known.

Well	Owner or tenant	Topography and approximate altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
							Depth to top (feet)	Thickness (feet)
T. 1 N., R. 2 E.								
1G1	Gus Bekter	Up, 270	Dg	53	--	--	--	--
1G2	do.	Up, 270	Dr	243	4	--	--	--
1K1	Fisher Grange	S, 230	Dr	145	6	--	--	--

wells in Clark County, Washington

are shown on pl. 2)

A flowing well whose static head is known has "+" preceding the water level indicating static head in feet above land-surface datum. A flowing well whose static head is not known is indicated by "Flows."

Type of pump: C, centrifugal; J, jet-centrifugal; N, none; P, lift or jack (plunger); Sc, screw; Sub, submersible; T, deep-well turbine.

Use of water: D, domestic; De, destroyed; Ind, industrial; Inst, institutional; Irr, irrigation; NU, not in use; PS, public supply; S, stock.

Remarks: C, comprehensive chemical analyses in table 18; Cp, partial chemical analyses in table 19; dd, drawdown; gpm, gallons per minute; L, log in table 17; Temp, temperature in °Fahrenheit.

zone(s)	Water level		Pump			
Character of material	Feet below land-surface datum	Date	Type	H. P.	Use	Remarks
--	48.1	4- 5-49	N	--	--	
Sand (?)	198	--	P	3/4	D	Sand at bottom caves occasionally. Cp.
Gravel, cemented	--	--	--	--	Inst	L.

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thick-ness (feet)
T. 1 N., R. 2 E.									
1L1	R. I. Madison	S.	210	Dg	33	30	--	--	--
1Q1	E. A. Scott	S.	185	Dr	142	4	--	--	--
1R1	Mrs. Julia Brown	S.	210	Dg	18	60	--	--	--
2B1	Charles E. Runyan	S.	260	Dr	88	6	84 (?)	--	--
2B2	Guy Wilson	S.	247	Dr	72	6	60 (?)	58	2
2G1	K. R. Steem	S.	190	Dr	35	4	--	--	--
2Q1	J. W. Barnes	T.	40	Dr	112	6	--	--	--
2Q2	Bob Eldred	S.	110	Dr	61	6	--	--	--
3E1	G. C. Dowd	T.	34	Dr	46	6	46	44	2
3F1	John Emory	T.	65	Dg	12	24	12 (?)	--	--
3G1	State Trout Hatchery	T.	60	Dr	75	6	--	--	--
3K1	S. Unander	T.	44	Dr	55	6	55	26	29
4A1	R. Roberts	S.	170	Dr	61	6	61	52	9
4A2	--Vraspir	Up.	180	Dr	50	6	--	28	22
4B1	S. A. Warner	T.	89	Dr	49	6	49	--	--
4B2	. . . do	T.	110	Dr	53	6	--	--	--
4B3	Louis Cannell	T.	115	Dr	55	6	53	50	5
4G1	H. B. Stapleton	T.	110	Dr	34	6	34	24	10

zone(s)	Water level		Pump		Use	Remarks
Character of material	Feet	Date	Type	H. P.		
--	15.5	4- 4-49	P	1/3	D	Cp.
Gravel and boulders	--	--	T	5	D, Irr	Cp.
do.	8.4	6- 2-49	C	1/2	D	Very large boulders of Boring lava, only slightly water worn, exposed nearby. Report large supply of water.
Sand and gravel	58	--	J	1	D	L.
Sand	57.8	10- 3-50	--	--	D	Large supply reported at 60 ft, but well deepened later.
Gravel	32	10- 3-50	J	1/3	D	
do.	--	--	P	3/4	D	
do.	--	--	J	1/2	D	
Sand, black	26	--	J	3/4	D	Bailer test, "no dd." L.
--	10	--	J	1/2	D	
--	35	--	--	--	D	Cp.
Gravel	24	--	--	--	D	Bailer test, 2-ft dd, L.
do.	46	--	J	1/3	D	Bailer test, 3-ft dd, L.
do.	28	--	J	1/3	D	Pumped 20 gpm, "no dd."
--	29	--	J	1	D	
Gravel	35	--	P	1/2	D	
Sand, black (and gravel?)	18	--	J	--	D	Bailer test, "no dd," L.
Sand and gravel	13	--	J	1/2	D	Bailer test, 12-ft dd, L.

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thickness (feet)
T. 1 N., R. 2 E.--Con.									
4C2	R. Farmer	T.	100	Dr	66	6	55	61	5
4D1	B. L. Mitts	S.	88	Dr	82	6	--	--	--
4D2	A. J. Mitchell	T.	92	Dr	114	6	114	95	11
12D1	A. L. Karnath	T.	100	Dg	62	--	--	--	--
T. 1 N., R. 3 E.									
1B1	H. A. Hewett	H.	425	Dr	157	6	--	--	--
1B2	R. G. Knutsen	H.	430	Dr	157	6	157	150	7
1B3	Woodburn School	Up.	365	Dr	65(?)	6	--	--	--
1M1	Ray DeBoever	H.	510	Dr	110	6	--	70	40
3D1	Paul Rainey	S.	420	Dr	255	6	--	250	5
3M1	Ray Brown, et al	H.	710	Dr	798	6	385	--	--
4C1	Harry Brietbarth	Up.	295	Dr	220	8	220	140	35
4D1	Charles Farrell	Up.	285	Dg	15	48	--	--	--
4F1	Camas Dairy Farm	S.	360	Dg-Dr	225	6	--	--	--
4G1	John Schick	S.	370	Dg	25	48	--	--	--

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Gravel	33	--	J	1	D	Bailer test, 12-ft dd, L.
do.	53.2	10- 2-50	J	3/4	D	Cp.
Sand and gravel	60	--	J	--	D	Bailer test, 25 gpm, 15-ft dd, L.
Gravel	56	--	J	1/2	D	
--	--	--	J	--	D	Well deepened from 28 ft.
Gravel	20	--	P	1	D	Clay and sand to 110 ft, clay and gravel from 110 to 150 ft.
Rock (?)	--	--	J	3/4	Inst	Clay, pebbles, and "quicksand" to 60 ft, solid brown rock breaking in square pieces, from 60 to 80 ft.
Rock	--	--	Sc	3	D, S	Reported to yield 35 gpm.
do.	232.59	4-29-49	P	1/2	D	Cp.
Volcanic rock	500	--	P	5	D	Supplies three families, Cp, L.
Gravel	112	5- -53	T	20	Irr	Yield 550 gpm, 18-ft dd, L.
--	2.63	4-21-49	--	--	--	
Gravel, cemented	178.26	4-29-49	P	2	D,S	Rock ledge from 40 to 80 ft.
do.	20	--	N	D		

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thickness (feet)
	T. 1 N., R. 3 E.--Cont.								
4L1	L. Fischer	S.	395	Dr	225	6	--	--	--
4R1	E. J. Lewis	H.	725	Dg	20	96	--	--	--
5A1	Don Rainey	Up.	272	Dr	190	8	190	158	32
5C1	--Wabberly	Up.	290	Dr	--	6	--	--	--
5L1	A. L. Summers	Up.	325	Dr	55	6	--	--	--
5M1	K. L. Edwards	Up.	300	Dr	185	6	--	--	--
5Q1	Andy Baker	S.	480	Dr	392	6	--	--	--
5Q2	do.	S.	380	Dr	210	10	--	--	--
6G1	Emil Myer	Up.	270	Dr	95	4	--	--	--
6K1	Ray Arvidson	Up.	250	Dg	30	30	30	--	--
6L1	O. Arvidson	Up.	260	Dr	142	6	--	--	--
6M1	R. G. Tuttle	Up.	240	Dr	135	6-4	135	130	5
6M2	E. H. Colby	Up.	245	Dr	134	6	134	128	6
8B1	Walter Houston	H.	540	Dr	402	6	--	25	377
8B2	R. E. Johnston	H.	490	Dr	390(?)	--	--	--	--
8J1	Riverview School	S.	390	Dr	375	6	--	--	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Gravel, cemented	180	--	P	1	D	Water reported to come from cemented gravel below rock ledge.
Clay	9.17	4-20-49	P	1/4	D	
Gravel, cemented	50	1- -52	T	10	D,Irr	Pumped 125 gpm, 135-ft dd, L.
--	--	--	N	--	--	
Gravel	10	--	J	1/4	D	Encountered boulders.
--	--	--	J	3	D	
Rock	300	--	P	2	D,S	Encountered volcanic rock at 26 ft. Can be pumped dry.
Gravel, cemented	95	7- -54	P	2	D,S	Supplies 1 home and 30 head of stock.
--	86.40	4-28-49	J	3/4	D	
Sand and gravel	22	--	C	1/2	D	
Gravel	--	--	P	--	--	
do.	118	--	P	1	D	Hard cement gravel at 40 and 90 ft.
do.	120	--	--	--	D	Bailer test, 8-ft dd, L.
Rock	--	--	P	3	D	Clay from 0 to 25 ft, rock from 25 to 402 ft. Supplies 10 families
Rock	--	--	P	1	D	C.
do.	--	--	--	--	--	Clay from 0 to 10 ft, red-rock from 10 to 120 ft, gray rock from 120 to 375 ft.

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing Depth to top (feet)	Water-bearing Thickness (feet)
T. 1 N., R. 3 E.--Con.									
9C1	Roy Gordon	Up.	640	Dr	185	6	--	--	--
9D1	T. L. McDonough	H.	545	Dr	515	6	--	--	--
9D2	C. Hein	Up.	535	Dr	398	6	70	385	--
9F1	Pete Hansen	H.	505	Dr	225	6	--	--	--
10D2	W. G. Powell	H.	715	Dr	242	6	240	--	--
11J1	Crown-Zellerbach Paper Co.	T.	50	Dr	90	12	90	50	40
11J2	do.	T.	50	Dr	88	16	88(?)	53	27
11J3	do.	T.	50	Dr	91	16	90	43	39
11J4	do.	T.	50	Dr	88	18	88(?)	37	43
11J5	do.	T.	50	Dr	83+	18	83	45	--
11J6	do.	T.	50	Dr	90	18	90(?)	40	50
11J7	do.	T.	50	Dr	88	18	88(?)	36	52
11J8	do.	T.	40	Dr	140	18-12	140	--	--
12K1	Columbia Water Co.	T.	50	Dr	101	12	101(?)	33	61
12K2	do.	T.	50	Dr	101	12	101(?)	--	--
12M1	City of Camas	T.	50	Dr	80±	(?)	(?)	--	--
12M2	do.	T.	35	Dr	80(?)	12	--	--	--
12M3	do.	T.	35	Dr	78	14	78	47	23
12M4	Crown-Zellerbach Paper Co.	T.	35	Dr	66	18	66(?)	31	31

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Gravel, weathered	--	--	--	--	--	
"Sandstone"	125(?)	--	P	2	D	
Rock, creviced	385	10- -51	P	1 1/2	D	Bailed 20 gpm for 4 hr, no detectable dd, L.
"Clay"	163	4-21-49	P	--	D	
--	239	--	N	--	NU	L.
Gravel	32.5	5- 8-39	T	100	Ind	Pumped 1,700 gpm, 5-ft dd, L.
do.	44	11-19-39	T	125	Ind	Pumped 2,000 gpm, 4-ft dd, L.
do.	35	5-12-40	T	125	Ind	Pumped 2,300 gpm, 5-ft dd, L.
Gravel, some sand	40	2-28-46	T	150	Ind	Pumped 2,000 gpm, 9-ft dd, L.
Gravel	37	4-22-46	T	150	Ind	Pumped 2,600 gpm, 7-ft dd, .
do.	21	6-21-46	T	150	Ind	Pumped 2,400 gpm, 8-ft dd, L.
do.	36	11- 2-46	T	150	Ind	Pumped 2,400 gpm, 11-ft dd, L.
do.	47	--	--	--	Ind	Pumped 1,220 gpm, 7-ft dd, L.
Gravel and sand	33	7-10-47	T	50	PS	Pumped 1,000 gpm, 36-ft dd, L.
do.	--	--	--	--	PS	Pumped 1,200 gpm, 10-ft dd.
Gravel (?)	--	--	T	120?	PS	
do.	--	--	T	150?	PS	
Gravel	42	--	T	100	PS	Pumped 1,800 gpm, 7-ft dd, L.
Gravel and sand	6	3-25-46	N	--	De	Pumped 2,100 gpm, 23-ft dd. Reported to yield river water, L.

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thickness (feet)
T. 1 N., R. 3 E.--Con.									
12M5	Crown-Zellerbach Paper Co.	T.	35	Dr	131	18	122	--	--
T. 1 N., R. 4 E.									
2E1	H. J. Kyes	H.	775	Dg	50	36	50(?)	--	--
2E2	do.	H.	775	Dg	14	--	--	--	--
2M1	E. Bailey	H.	760	Dg	31	24	31(?)	--	--
3B1	J. B. Knight	H.	800	Dg	24	--	--	--	--
3C1	P. Murray	H.	750	Dg	38	48	38(?)	--	--
3K1	S. Brandt	H.	700	Dg	63	--	0	--	--
4F1	H. C. Young	H.	565	Dr	150	6	--	--	--
4N1	R. P. Sumner	S.	310	Dr	84	6	--	--	--
5E1	Richard Beaver	H.	440	Dr	122	6	24	98	24
6C1	J. S. Robson	Ub.	480	Dr	113	6	--	--	--
6D1	George Stewart	Ub.	480	Dg	19	36	19	--	--
7A1	Mike Wilsey	S.	150	Dr	72	6	--	--	--
8E1	S. Thrall	T.	53	Dg	24	30	24(?)	--	--
8K1	Columbia Water Co.	T.	90	Dr	142	12	142(?)	65	37
8K2	do.	T.	90	Dr	140	12-10	--	--	--
8K3	do.	T.	90	Dr	140	12	--	--	--
8K4	do.	T.	90	Dr	109	--	--	--	--
9E1	E. L. Eldridge	Ub.	240	Dr	180	10	180	165	15
9E1	L. Wilson	T.	130	Dr	90	6	85	80	10

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Gravel	--	--	--	--	Ind	Pumped 2,100 gpm, 4-ft dd, L.
Sand	23.6	7-20-49	N	--	--	
Sand, red	11	--	J	1/2	D	
Clay	23.7	7-20-49	J	1/4	D	Cp.
Rock	20.8	7-20-49	J	1/2	D	Pumped 36 hr, "no dd," Cp.
Clay	27.7	7-20-49	N	--	D	
do.	43.7	7-20-49	N	--	D	
Gravel	40	--	P	1	D	Pumped 3 hr at 16 gpm, 20-ft dd, Cp.
Rock	39	--	J	1/2	D	
Rock, hard	30	7- -52	T	5	Irr	Pumped 50 gpm, 85-ft dd, L.
Gravel, cemented	--	--	P	3/4	D	Report plenty of water
"Quicksand"	8.83	6- 1-49	--	--	D	Do.
Shale	10	--	J	1/3	D	Report soft blue shale from 35 to 72 ft.
Gravel	18.6	7-21-49	P	1/4	D	
do.	--	--	T	40	PS	Pumped 750 gpm, 5-ft dd, L.
do.	--	--	T	30	PS	
do.	--	--	T	40	PS	
do.	--	--	--	--	NU	Abandoned, not enough water, L.
Sand and gravel	110	--	T	15	Irr	Pumped 225 gpm, 40-ft dd, L.
Sand	51	--	J	1	D	Bailer test, "no dd," L.

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thickness (feet)
T. 1 N., R. 4 E.--Con.									
9L1	S. W. Coumans	T.	100	Dr	84	6	84	80	4
11H1	A. R. Hilton	H.	765	Dr	96	6	--	--	--
12A1	C. H. Byrum	H.	860	Dg	42	48(?)	--	--	--
14A1	A. Rasmor	H	570	Dg	80	(?)	--	--	--
14G1	G. L. Jensen	Ub.	506	Dg	45	(?)	--	--	--
14H1	C. H. Wright	Ub.	510	Dg	30	--	--	--	--
15H1	V. H. Keller	S.	300	Dr	151	6	--	--	--
16H1	T. Kerr	T.	45	Dr	41	6	40	39	2
24D1	Walter Nydegger	Fp.	45	Dr	67	6	--	64	3
24F1	H. Knight	Fp.	45	Dg	17	30	17	--	--
24G1	A. F. Moon	T.	95	Dr	94	6	14	--	--
T. 2 N., R. 1 W.									
12R1	Fred Niday	Fp.	20	Dr	272	6	272	--	--
T. 2 N., R 1 E.									
1A1	F. W. Hunter	Up.	275	Dg	38	12	--	--	--
1J1	L. L. Davenport	S.	275	Dg	26	30	--	--	--
1P1	H. R. Robinson	Up.	275	Dg	33	10	--	--	--
2A1	J. M. Roberts	Up.	220	Dg	26	--	--	--	--
2K1	R. Clauson	Up.	220	Dg	48	30	--	--	--
2M1	E. Nylander	Up.	230	Dg	31	--	--	--	--
2P1	Mrs. G. Hockinson	Up.	230	Dr	176	6	176	--	--
3D1	M. Resch	Up.	220	Dr	157	6	--	--	--
3E1	Orion W. Wiedman	Up.	220	Dr	154	6	154	154	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Gravel	46	--	J	1/2	D	Bailer test, "no dd," L.
--	56	--	P	1/3	D	
Sand	27.1	7-21-49	P	--	D	
Gravel, cemented	60	--	J	1/2	D	Cp.
do.	41.1	7-21-49	P	1/2	D	
do.	26.8	7-21-49	P	1/2	D	
Gravel	140	--	P	1	D	
Sand, black	4	--	--	--	D	Bailer test, "no dd," L.
do.	--	--	J	2	D	Cemented gravel from 20 to 64 ft, sand 64 to 67 ft.
Gravel	15.3	7-21-49	P	1/4	D	Pumped 1 hr, 1½-ft dd, Cp.
Gravel, cemented	--	--	J	1/2	D	
--	--	--	N	--	De	Abandoned; "quicksand," L.
Sand	18	--	C	--	D	
Gravel	15	--	C	1/4	D	Cp.
do.	19.4	4-20-49	C	1/2	D	
Sand	22	--	J	1/3	D	Cp.
do.	32	--	P	3/4	D	Cp.
do.	22	--	P	--	D	
Sand, black	130	--	--	--	--	Bailer test, "no dd," L.
Gravel	80(?)	--	P	1	D	
Sand	136	--	--	--	D,Irr	Bailer test, 12½ gpm, L.

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing Depth to top (feet)	Water-bearing Thickness (feet)
T. 2 N., R. 1 E.--Con									
3E2	Floyd W. Loomis	Up.	220	Dr	148	6	148	138	10
3G1	L. Andreason	Up.	190	Dr	200	6	--	--	--
3H1	Harry O. Anderson	Up.	225	Dg	25	36	25	10	15
3M1	L. Eaten	Up.	215	Dr	132	(?)	--	--	--
4F1	W. Stark	Up.	200	Dr	210	6	--	--	--
4F2	R. B. Jamison	Up.	210	Dr	214	6	209	209	5
4G1	L. Dietrich	Up.	215	Dr	180	6	--	--	--
4G2	Forest Chisholm	Up.	220	Dr	160	6	148(?)	148	12
9A1	W. E. Edmiston	Up.	160	Dr	130	6	--	--	--
9B1	H. Cross	S.	110	Dg	10	48	--	--	--
9F1	E. G. Keaton	T.	52	Dr	125	6	--	--	--
9F2	Fruit Valley Nursery	Fp.	45	Dr	112	6	112	35	77+
9Q1	C. L. Firestone	T.	35	Dg	37	6	--	--	--
10A1	T. Mortendyke	Up.	205	Dr	139	6	139	136	3
10B1	H. Hedin	Up.	190	Dn	25	1 (?)	--	--	--
10C1	O. Kellet	Up.	220	Dr	165	6	--	--	--
10K1	R. V. Rankin	T.	185	Dg	27	36	27	--	--
10K2	L. A. Hinkle	T.	170	Dr	123	6	123	115	8
10Q1	E. McCall	T.	170	Dr	185	6(?)	--	--	--
10Q2	J. Voeller	T.	180	Dr	168	6	165	154	14
11A1	J. H. Higgenbottom	Up.	238	Dg	36	36	--	--	--
11B1	S.W.Wash. Exp. Sta.	Up.	258	Dr	255	12	255	225	13
11C1	Clark County PUD 1	Up.	228	Dr	198	10	198(?)	147	47

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Gravel	136	--	--	--	D, Irr	Report "no dd," L.
--	70	--	P	--	D	
Sand	9	7-10-52	--	--	D, Irr	Yield 5 gpm, 6-ft dd.
Rock (?)	120	--	P	1	D	
Sand	180	--	P	2	D	
Gravel	168	--	T	3	D, Irr	Bailer test, "no dd," L.
do.	150	--	P	1	D	Cp.
Gravel, cemented	148	--	P	1/2	D	
Sand	100	--	P	1	D	Pumped 12 hr, "no dd."
do.	3	--	C	1/4	D	
Gravel	--	--	J	1/2	D	
Sand and gravel	40	10- -50	T	5	Irr	Pumped 80 gpm, 20-ft dd, L.
Sand	10	--	J	1/2	D	
Sand, black	123	--	J	5	D(?)	Bailer test, "no dd," L.
Sand	18	--	C	1/3	D	
do.	143	--	J	2	D	
do.	18	--	C	1/4	D	Cp
Gravel	105	--	J	--	D	Pumped 10 gpm, L.
do.	--	--	P	--	D	
Sand, black	123	--	J	1/3	D	Bailer test, 10-ft dd, L.
do.	24	--	J	1/3	D	
Sand and gravel	160.62	12-14-55	T	--	Irr	Pumped 625 gpm, 2-ft dd, L.
Gravel	119	--	T	--	PS	Pumped 380 gpm, 47-ft dd, C, L.

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thick-ness (feet)
T. 2 N., R. 1 E.--Con.									
11C2	Clark County PUD 1	Up.	225	Dr	211	10	211(?)	155	50
11C3	do.	Up.	228	Dr	223	10	223(?)	148	73
11C4	do.	Up.	235	Dr	221	16-12	220	190	30
11D1	H. Moor	Up.	210	Dg	272	4(?)	--	--	--
11E2	R. F. Mahan	Up.	320	Dr	211	6	209	204	7
11H1	S. M. Cummings	S.	260	Dg	53	18	--	--	--
12A1	C. F. Larson	Up.	280	Dg	50	48	--	--	--
12A2	F. Welch	Up.	280	Dg	37	6	--	19	18
12A3	Floyd Welch	Up.	270	Dr	45	6	45	22	23
12B1	M. J. Morse	Up.	270	Dr	46	8	46	--	--
12F1	C. A. Whitcomb	Up.	260	Dg	20	12	--	--	--
12G1	W. T. Sjostrand	Up.	275	Dg	24	36	--	--	--
12H1	C. Copeland	H.	280	Dg	46	6	--	--	--
12H3	Clarence Copelan	H.	285	Dg	30	36-12	30	15	15
12J1	C. S. Barker	H.	270	Dg	22	36-12	22	7	15
12J2	M. A. Curtin	H.	270	Dr	47	12-11	47	32	13
								45	2
13A1	R. W. Anderson	Up.	275	Dg	18	30	18	--	--
13K1	H. W. Brodes	S.	265	Dg	27	30	27	--	--
13P1	M. T. Seldy	Up.	240	Dg	26	36	--	--	--
13P2	D. H. Moreland	Up.	230	Dg	20	30	--	--	--
14C1	E. Osborn	S.	210	Dr	200	6	--	--	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Gravel	120	--	--	--	PS	Pumped 460 gpm, 19½ft dd, L.
do.	--	--	--	--	PS	Pumped 479 gpm, 45-ft dd, L.
Sand and gravel	134.60	4-13-56	--	--	--	Pumped about 1,000 gpm, with 48-ft dd, L.
Sand, black	7.1	5-25-49	J	1/3	D	Cp.
Gravel	191	--	--	--	D	Bailer test, "no dd," L.
--	35	--	J	3 1/2	D	Cp.
--	35	--	J	1/4	D	
Sand	19.0	7- 1-49	T	1/4	Irr	Operates 6-7.5 gpm sprinklers.
Sand, fine	22	--	--	--	Irr	Pumped 4 hr at 80 gpm, L.
--	16	--	J	3	Irr	L.
Sand	3.0	4- 8-49	C	2	(?)	
--	8	--	P	---	D	
Gravel	37	--	J	3/4	D	
Sand, black	15	--	C	3	Irr	Pumped 50 gpm, 6-ft dd, L.
do.	7	--	C	3	Irr	Pumped 50 gpm, 8-ft dd.
Sand, black Sand, red	8	--	--	--	Irr	Pumped 140 gpm, 12½-ft dd, L.
Gravel	9.8	4- 7-49	--	--	--	
do.	23	--	N	--	--	
--	16	--	P	--	D	
--	9.9	4- 6-49	N	--	--	
Gravel	138	--	J	2		Cp.

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thickness (feet)
T. 2 N., R. 1 E.--Con.									
14P1	-- Jarvis	S.	95	Dr	107	6	107	98	9
15G1	R. D. Spencer	S.	63	Dg	26	36	26	--	--
15Q1	City of Vancouver	T.	214	Dr	278	18	178	202	76
16B1	Fred Koerner	T.	70	Dr	142	6	142	139	3
16C1	John E. Duggan	T.	35	Dr	211	8	208	204	7
16K1	T. White	T.	40	Dr	67	6	67	63	4
16P1	Chester Nelson	T.	40	Dr	56	6	56	35	21
18P1	Aluminum Company of America, well 1	Fp.	28	Dr	134	12	134	114	11
18P2	do. well 6	Fp.	28	Dr	135	20	135	113	7
18P3	do. well 7	Fp.	28	Dr	137	20	137	109	9
18P4	do. well 10	Fp.	32.5	Dr	133	16	133	130	12
18P5	do. well 11	Fp.	32.7	Dr	133	15	133	130	11
18P6	do. well 16	Fp.	31.6	Dr	160	24	118	156	34
18P7	do.	Fp.	32	Dr	150	6	--	145	5
18R1	Bonneville Power Administration	Fp.	27	Dr	140	10	140	117	15
19A1	Aluminum Company of America, well 14	Fp.	344	Dr	119	16	119	103	16
19A2	do. well 15	Fp.	327	Dr	130	16	130	108	22

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Sand, black	82	--	--	--	--	Bailer test, "no dd," L.
Gravel	22.3	5-24-49	N	--	--	
Sand and gravel	204	--	T	--	PS	Pumped 2,000 gpm, 13-ft dd, L.
Gravel	57	--	J	1/2	D	Cp, L.
Sand, black	--	--	J	1	D,S	Bailer test, "no dd," L.
Gravel	42	--	J	1	D	Bailer test, 9-ft dd. L.
do.	33	--	--	--	--	Bailer test, 5-ft dd, L.
Gravel and sand	22	--	T	75	Ind	Pumped 1,200 gpm, 10-ft dd, L.
Gravel	26	--	T	300	Ind	Pumped 3,000 gpm, 20-ft dd. L.
do.	25	--	T	300	Ind	Pumped 3,000 gpm, 16-ft dd, L.
Sand and gravel	22	5- -50	T	--	Ind	Pumped 1,500 gpm, 5-ft dd, L.
do.	19	5- -50	T	--	Ind	Pumped 150 gpm, 3-ft dd, L.
do.	26	10- -54	T	--	Ind	Pumped 3,000 gpm, 3-ft dd, L.
do.	30	--	--	--	NU	Test well, "no dd" after pumping 1 hr at 30 gpm, L.
Gravel	21.4	9-16-40	T	--	Ind	Pumped 300 gpm, 4-ft dd, L.
Sand and gravel	19	5- -53	T	--	Ind	Pumped 1,500 gpm, 2½-ft dd, L.
do.	--	6- -53	T	--	Ind	Pumped 1,500 gpm, 2-ft dd, L.

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thickness (feet)
T. 2 N., R. 1 E.--Con.									
19B1	Aluminum Company of America, well 2	Fp.	30	Dr	136	12	136	120	8
19B2	do. well 3	Fp.	30	Dr	138	12	138	120	10
19B3	do. well 4	Fp.	28	Dr	111	12	111	91	20
19B4	do. well 5	Fp.	28	Dr	122	12	122	96	21
19B5	do. well 8	Fp.	30	Dr	114	19	114	91	16
19B6	do. well 9	Fp.	30	Dr	136	19-12	136	121	11
19B7	do. well 12	Fp.	31.6	Dr	116	12	116	98	18
19B8	do. well 13	Fp.	29.2	Dr	117	12	117	99	18
21A1	S.P. & S. R.R. (Roundhouse)	S.	65	Dr	130	18	130	111	19
21C1	Malcolm Johnson	T.	45	Dg-Dn	40	48-2	40	--	--
21C2	Federal Housing Authority	T.	48	Dr	151	12	151	71	56
21F1	do.	T.	48	Dr	128	12	128	50	78
21G1	Ervin J. Dell	T.	48	Dg-Dr	60	20-6	60	--	--
21N1	The Carborundum Co.	Fp.	33	Dr	95	18	71	67	28
21N2	do.	Fp.	33	Dr	105	18	105	84	21
21N3	S. P. & S. R.R.	Fp.	30	Dr	100	18(?)	--	--	--
23K1	Clark County Shop	T.	190	Dr	225	8(?)	--	--	--
23Q1	City of Vancouver	T.	175	Dr	250	16	250	188	32

in Clark County, Wash.--Continued

zone(s)	Water level		Pump		Use	Remarks
Character of material	Feet	Date	Type	H. P.		
Gravel	26	--	T	--	Ind	Pumped 1,100 gpm, 4-ft dd, C, L.
do.	28.5	--	T	60	Ind	Pumped 850 gpm, 9-ft dd, L.
do.	21	--	T	60?	Ind	Pumped 1,200 gpm, 3½-ft dd, C, L.
do.	25.5	--	T	50	Ind	Pumped 1,200 gpm, 5-ft dd, C, L.
Sand and gravel	--	--	--	--	--	Pumped 1,100 gpm, 7-ft dd.
do.	22	--	--	--	--	Pumped 1,100 gpm, 9-ft dd.
do.	20	4- -52	T	--	Ind	Pumped 1,100 gpm, 2-ft dd, L.
do.	19	4- -52	T	--	Ind	Pumped 1,100 gpm, 2-ft dd, L.
Gravel	60	--	T	40	Ind	Pumped 800 gpm, ½-ft dd, L.
do.	36.26	4- 6-49	N	--	NU	Dug 18.6 ft; driven point in bottom.
do.	35	--	T	50?	PS	Pumped 1,000 gpm, 34-ft dd, Cp, L.
do.	32	--	T	50	PS	Pumped 1,000 gpm, 8-ft dd, L.
do.	42.18	4- 8-49	N	--	NU	Hydrograph.
do.	29.5	--	T	--	Ind	Pumped 1,600 gpm, 1½-ft dd, L.
do.	22	--	T	--	Ind	Pumped 1,540 gpm, 1½-ft dd, L.
do.	--	--	T	20	Ind	
do.	--	--	T	7 1/2	Ind	Cp.
do.	168	1938	T	150	PS	Pumped 2,000 gpm, 4-ft dd, L.

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thickness (feet)
T. 2 N., R. 1 E.--Con.									
23Q2	City of Vancouver	S,	182	Dg-Dr	238	48-18	238(?)	--	--
23Q3	do.	S,	223	Dr	280	16	280	225	48
23Q4	do.	S,	185	Dr	243	18	243	190	44
23R1	do.	S,	185	Dr	240	14-10	240	192	40
24A1	T. G. Foster	Up,	240	Dg	28	36	28	--	--
24C2	R. Bowen	S,	215	Dr	139	6	135	--	--
24D1	Fred Clinski	S,	190	Dg	22	48	22	--	--
24G1	W. C. Goheen	S,	165	Dg	12	30	--	--	--
24K1	Vancouver School District 37	S,	170	Dr	167	10	167	129	38
26G1	City of Vancouver	T,	138	Dr	165	12	--	--	--
26G2	State Blind School	T,	160	Dr	220	12	--	--	--
27F1	County Court House	S,	70	Dr	111	8	111	--	--
27H1	Clark Co. PUD No 1	S,	95	Dr	144	10	144	119	21
27H2	do.	S,	95	Dr	137	10	137	120	13
27L1	Interstate Brewery Co.	Fp,	40	Dr	108	8(?)	108(?)	80	23
27L2	do.	Fp,	40	Dg-Dr	98	8(?)	98(?)	--	--
27M1	Columbia River Paper Mills well 6A	Fp,	25	Dr	70	16	70	--	--
27M2	do. well 2	Fp,	25	Dr	90	16	90	--	--
27M3	do. well 3	Fp,	25	Dr	90	16	90	--	--

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Gravel	--	--	T	75	PS	Dug to 160 ft. Drilled to 238 ft.
Gravel and sand	216	--	T	--	PS	Pumped 2,000 gpm, 4-ft dd, L.
do.	169	--	T	--	PS	Pumped 2,000 gpm, 4-ft dd, L.
do.	178	--	T	100	PS	Pumped 1,200 gpm, 3½-ft dd, L.
Sand	19	--	C	1 1/2	D, Irr	Irrigates ½ acre.
do.	89	--	P	1	--	
do.	10.7	4- 6- 49	J	3/4	--	
Gravel	6	--	C	3/4	--	
do.	71	11- -55	--	--	Irr	Pumped 300 gpm, 50-ft dd, L.
do.	--	--	N	--	(PS) Ds	formerly pumped 1,440 gpm.
do.	--	--	T	--	Inst	Cp.
do.	--	--	T	--	Inst	
Sand and gravel	98	9- -55	--	--	Ind	Pumped 600 gpm, 3.5-ft dd, L.
do.	91	9- -55	--	--	Ind	Pumped 650 gpm, 3-ft dd, L.
do.	35	--	T	50	Ind	C, L.
do.	--	--	T	38	Ind	C.
Gravel	--	--	T	75	Ind	
do.	--	--	T	75	Ind	
do.	--	--	T	75	Ind	

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thick-ness (feet)
T. 2 N., R. 1 E.--Con.									
27M4	Columbia River Paper Mills well 4	Fp.	25	Dr	90	16	90	--	--
27M5	do. well 5	Fp.	25	Dr	90	16	90	--	--
27M6	do. well 6	Fp.	25	Dr	75	12	75	--	--
27M7	do.	Fp.	28	Dr	150	26-20	150	4	109
27M8	do.	Fp.	28	Dr	137	26	137	50	62
28G1	Great Western Malting Co.	Fp.	28	Dr	105	10	105	--	--
28G2	do.	Fp.	28	Dr	119	12	119	60	58
28G3	Port of Vancouver Terminal 2	Fp.	28	Dr	80	18	--	--	--
28G4	Great Western Malting Co.	Fp.	30	Dr	115	18	114	40	65
28G5	Port of Vancouver	Fp.	28	Dr	110	18	--	--	--
28G6	do.	Fp.	28	Dr	100	18	--	--	--
28J1	Vancouver Ice & Cold Storage Co.	Fp.	20	Dr	82	6	--	--	--
28J2	Dubois Lumber Co.	Fp.	20	Dg	32	36	--	--	--

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Gravel	--	--	T	75	Ind	
do.	--	--	T	100?	Ind	
do.	--	--	T	--	Ind	
do.	22	--	T	200	Ind	Pumped 4,600 gpm, L.
do.	22	--	T	200	Ind	Do.
do.	26.53	3-16-49	T	20	--	
do.	30	--	T	75	--	Perforated from 70 to 116 ft. pumped 4 hr at 800+ gpm, "no dd."
do.	28	--	--	--	NU	Pumped 2,000 gpm, 8 3/4-ft dd, Cp, L.
do.	25	--	--	--	Ind	Pumped 900 gpm, 2-ft dd.
do.	--	--	T	--	Ind	Pumped 2,000 gpm.
do.	--	--	T	--	Ind	Pumped 2,000 gpm, Supplies Vancouver Plywood Co.
do.	20(?)	--	T	7 1/2	--	Pumped 150 gpm, "no dd." Water gets muddy in spring when river rises.
do.	--	--	--	--	--	Water level reported to rise and fall with river.

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing Depth to top (feet)	Water-bearing Thickness (feet)
T. 2 N., R. 1 E.--Con.									
35F1	Buffalo Electro-	Fp.	30	Dr	160	26	143	15	50
	Chemical Corp.							71	29
35F2	do.	Fp.	29.2	Dr	160	--	--	--	--
35F3	do.	Fp.	30	Dr	96	26	96	26	30
								63	33
35F4	do.	Fp.	30	Dr	85	26	85	25	29
								63	18
36B1	City of Vancouver	T.	48	Dr	132	12	132	45	87
	well 1								
36B2	do. well 2	T.	54	Dr	130	12	120	60	70
36B3	do. well 3	T.	52	Dr	128	12	128	80	48
36B4	do. well 4	T.	56	Dr	130	12	130	65	65
36B5	do. well 5	T.	50	Dr	124	12	124	69	55
36B6	do. well 6	T.	52	Dr	122	12	122	77	45
36B7	do. well 7	T.	45	Dr	129	12	126	84	42
36B8	do. well 8	T.	55	Dr	127	20	127	92	35
T. 2 N., R. 2 E.									
1D1	J. D. Tyler	Up.	278	Dg	37	6	37(?)	--	--
1F2	A. Germain	Up.	265	Dr	64	6	--	--	--
1G1	F. Leslie	Up.	258	Dg	24	6	--	--	--
1H1	Jack Unruh	Up.	255	Dr	31	6	--	--	--
1N1	S. C. Nielson	Up.	255	Dg	22	--	--	--	--
1R1	H. R. Siegburg	Up.	240	Dr	84	8	--	60	24
2A1	R. Massey	Up.	280	Dg	21	36	--	--	--

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Gravel and sand	25	---	--	--	Ind	Pumped 1,200 gpm, 90-ft dd, L.
do.	12	7- 4-51	--	--	--	Test well, L.
Sand and gravel	27	10-12-51	T	350	Ind	Pumped 8 hr at 4,000 gpm, 3-ft dd, L.
do.	27	11- 7-51	T	350	Ind	Pumped 8 hr at 4,000 gpm, 4-ft dd, L.
Gravel and sand	37	7-23-42	T	150	PS	Pumped 1,000 gpm, 17-ft dd, L.
do.	44	8- 2-42	T	150	PS	Pumped 1,000 gpm, 5-ft dd, L.
Gravel	44.5	8- 8-42	T	150	PS	Pumped 1,000 gpm, 4-ft dd, L.
Sand and gravel	49.34	3-29-49	T	150	PS	Pumped 1,000 gpm, 5-ft dd, L.
Gravel	39	8-24-43	T	100	PS	Pumped 1,000 gpm, 17-ft dd,L.
do.	50.92	4- 6-49	T	100	PS	Pumped 1,000 gpm, 18-ft dd,L.
do.	39.31	4- 6-49	T	100	PS	Pumped 1,000 gpm, 16-ft dd,L.
do.	53	--	T	--	PS	Pumped 1,000 gpm, 19-ft dd,L.
--	23.8	4-14-49	J	1/3	D	
Gravel	41	--	J	1/4	D	
do.	8	--	J	1/4	D	Cp.
do.	9	--	J	1/3	D,S	Irrigates garden
do.	17.4	4-14-49	C	1/4	D	Goes dry in September
Gravel and sand	13½	--	T	2	Irr	Pumped 37 gpm, 32-ft dd, L.
Gravel	16	--	P	1/4	--	

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thick-ness (feet)
T. 2 N., R. 2 E.--Con.									
2B1	R. L. & F. E. Divine	Up.	280	Dr	128	6	128	--	--
2C1	O. J. Lougheed	Up.	283	Dr	120	6	--	--	--
2F1	C. Sample	Up.	272	Dg	16	48	--	--	--
2J1	E. Skeeters	Up.	265	Dg	21	30	--	--	--
2Q1	C. L. Engle	Up.	252	Dr	73	6	73	71	2
2Q2	J. Norby	Up.	253	Dr	71	6	70	68	3
3A1	Earl Simpson	Up.	278	Dg	43	48	--	--	--
3B1	E. Anderson	Up.	270	Dg	70	24	--	--	--
3D1	C. V. Dunn	Up.	262	Dr	69	10	--	--	--
3E1	A. Barnes	Up.	262	Dr	96	3	--	--	--
3F1	W. Myers	Up.	264	Dr	142	6	142	138	4
3J1	H. Wilson	Up.	262	Dr	73	6	--	--	--
3N1	Vancouver Airport	Up.	250	Dr	129	6	129	120	9
3R1	H. S. Fenton	Up.	245	Dr	145	6	145	142	3
4D1	W. C. Schmidt	Uc.	218	Dr	89	6	--	--	--
4E1	Ed Drasler	Uc.	208	Dr	76	6	76	73	3
4G1	A. Martin	Up.	230	Dg	21	36	--	--	--
4G2	J. Kindsfather	Up.	232	Dr	87	6	87	85	2
4G3	Alvin Bunch	Up.	235	Dr	105	5	105	102	3
4M1	A. Koski	Uc.	205	Dg	30	32	--	--	--
4N1	E. Hilberg	Uc.	211	Dr	93	6	93	90	3
4Q1	O. Peters	Uc.	220	Dg	24	48	--	--	--
5E1	L. E. Nevill	Up.	250	Dg	18	36	--	--	--

in Clark County, Wash.--Continued

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Sand, black	58	--	J	1 1/2	D,Irr	Bailer test, 50-ft dd at 27 gpm, L.
Gravel	45	--	J	1	--	Cp.
do.	11.2	4-15-49	P	--	--	
--	14.6	4-14-49	J	1/3	--	Cp.
Sand, black	49	--	J	1/4	--	L.
do.	32	--	J	1/2	--	Bailer test, 13-ft dd, Cp, L.
Sand	40	--	P	--	--	
do.	66	--	J	1/3	--	
Gravel	59	--	J	--	--	Cp.
Sand	51	--	P	3/4	--	
Gravel	87	--	--	--	--	Bailer test, 20-ft dd, L.
do.	48	--	J	1/2	--	Cp.
do.	--	--	J	3/4	D	L.
Sand, black	78	--	J	3	--	Bailer test, 11-ft dd,L.
Gravel	65	--	J	3/4	--	
do.	26	--	J	1/4	D,S	Bailer test, "no dd," L.
do.	16.4	4-19-49	C	1/4	--	Cp.
do.	51	--	J	3/4	--	Bailer test, 19-ft dd, L.
do.	45	--	J	1/2	D	L.
do.	22	--	J	1/2	--	Cp.
Sand	50	--	P	1/2	--	Bailer test, 16-ft dd, Cp, L.
Gravel	19	--	J	1/3	--	
do	14	--	C	1/3	--	

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing Depth to top (feet)	Water-bearing Thick-ness (feet)
T 2 N., R. 2 E.--Con.									
5G1	C. Hilberg	S.	221	Dg	13	36	--	--	--
5G2	H.I. & J.L. Sneed	Up.	198	Dr	99	8-6	99	97	2
5H1	Helen C. Lloyd	Up.	202	Dg	27	36	27	25	2
5K1	E. A. Keranen	Up.	210	Dr	86	6	86	79	7
5P1	A. Menger	Uc.	252	Dr	100	6	--	--	--
5Q1	A. P. Bomber	Up.	238	Dr	143	6	143	115	29
6A1	Elmer Christiansen	Up.	242	Dg	22	12	22(?)	--	--
6C1	S. E. Heston	Up.	260	Dg	23	48	--	--	--
6E1	Mrs. B. Maxwell	Up.	270	Dg	32	10	32(?)	--	--
6G1	F. D. Frazer	Up.	265	Dr	135	6	--	--	--
6J1	P. Christiansen	Up.	260	Dr	133	6	130	130	3
6K1	W. Hamburg	Up.	260	Dr	156	6	156	142	14
7C1	G. S. Kelly	Up.	300	Dg	55	36	--	--	--
7D1	Nels Carlson	Up.	290	Dr	174	6	168	172	2
7D2	O. Brekke	Up.	288	Dr	174	6	173	169	5
7G1	W. White	Up.	305	Dg	49	36	--	--	--
7J1	Joe J. Shefchek	Up.	265	Dr	30	12	--	--	--
7J2	C. Shefchek	H.	301	Dr	90	12	--	--	--
7K1	O. R. Wood	Up.	265	Dg	20	30	--	--	--
7L1	G. E. Sellman	S.	290	Dg	32	30	--	--	--
7M1	W. A. Lindeman	H.	290	Dr	48	12	48	14	34
7N1	J. J. Fox	Up.	265	Dr	32	5	--	--	--

in Clark County, Wash.--Continued

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Sand, black	6	--	P	1/4	--	Cp.
Sand and gravel	38.6	9- -53	T	5	--	Pumped 60 gpm, 2.3-ft dd, L.
Sand	20	10- -53	--	--	--	Pumped 40 gpm, 5½-ft dd, L.
Gravel	51	--	J	1 1/2	D, Irr	Pumped 25 gpm, little dd.
do.	--	--	J	1/2	--	
do.	67	--	Sub	--	D, Irr	Pumped 50 gpm 48-ft dd, L.
Clay (?)	8	--	J	1/4	--	Pumped 10 gpm, "no dd."
Sand	8	--	P	1/4	--	Cp.
do.	8	--	C	1/4	--	
Sand, black	110	--	J	1 1/2	--	Cp.
Sand	101	4- -49	T	--	--	Bailer test, "no dd," L.
Sand and gravel	90	--	Sb	2	D, S, Irr	Irrigates 1½ acres. Pumped 25 gpm, 8-ft dd, Cp.
Sand	43	--	P	1/2	D	
Gravel	130	--	P	3/4	D	Bailer test, "no dd," L.
do.	137	--	P	1	D	Bailer test, "no dd," Cp, L.
Sand	40.7	4- 8-49	J	1/2	D	
Gravel	24	--	P	1/4	D	
Sand	60	--	J	1/2	D	
Gravel	16	--	P	1/3	D	
Sand	24	--	J	3/4	D	
do.	4	--	C	12	Irr	Pumped 145 gpm, 20-ft dd, L.
Gravel	14	--	P	1/4	D	

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thickness (feet)
T. 2 N., R. 2 E.--Con.									
7N2	J. A. Dennis	Up.	270	Dg	21	60-27	--	10	12
7R1	L. H. Runger	Up.	295	Dr	54	30	--	--	--
8A1	A. W. Farmer	Uc.	215	Dg	18	36	--	--	--
8A2	Kenneth Menger	Up.	225	Dr	168	6	168	166	2
8B1	E. Podhora	Up.	240	Dg	12	30	--	--	--
8B2	A. W. Clark	Up.	230	Dr	145	6	143	143	2
8B3	E. Podhora	Up.	245	Dr	133	6	--	--	--
8H1	H.E. & R.L. Schultz	Up.	225	Dr	126	6	126	85	41
8J1	Jack Klineline	Up.	255	Dg	33	8	--	--	--
8L1	G. E. English	Up.	275	Dr	210	6	--	--	--
8M1	W. V. Slothower	Up.	268	Dg	12	36	--	--	--
8N1	M. O. Elgin	Up.	292	Dr	49	8	--	--	--
8N2	Walnut Grove School	Up.	290	Dr	208	6	203	195	13
8Q1	C. L. Harris	Up.	275	Dg	40	30	--	--	--
9A1	W. G. Holzhauer	Uc.	220	Dg	38	32	--	--	--
9D1	J. B. Coffield	Uc.	213	Dr	117	6	--	108	9
9D2	T. Blair	Uc.	220	Dg	27	36	--	--	--
9D3	Frank Houn	Uc.	215	Dr	92	6	92	87	5
9E1	C. W. Deming	Uc.	225	Dr	151	6	--	--	--
9F1	B. L. Rushing	Uc.	215	Dr	140	6	--	--	--
9G1	Thomas Morton	Uc.	217	Dg	32	36	--	--	--
9G2	Ed Ferguson	Uc.	215	Dg	30	12	--	--	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Sand	15.54	4-24-51	C	--	D, Irr	Clay from 0 to 10 ft, sand from 10 to 22 ft, pumped 14 gpm, 6-ft dd.
Gravel and sand	36	4-24-51	J	1/2	D	
Sand	10	--	J	1/2	D	
Sand and gravel	48	--	T	7 1/2	Irr	Pumped 125 gpm, 64-ft dd, L.
Sand	9	--	P	--	D	
Sand, black	98(?)	--	J	1	D	Bailer test, 8-ft dd, L.
Gravel	53	--	J	1	D	
Sand and gravel	48	4- -55	T	7 1/2	Irr	Pumped 154 gpm, 32-ft dd, L.
--	16	--	J	1/2	D	
--	--	--	P	1	D	
Sand	9	--	P	1/4	D	
Gravel	37	--	J	1/2	D	
do.	135	--	--	--	Inst	Bailer test, 17-ft dd, L.
Sand	15	--	J	1	D	
Gravel	23	--	J	1	D	
do.	47	--	J	1	D	Cp, L.
do.	23	--	J	1/2	D	
do.	--	--	J	--	D	Bailer test, "no dd," L.
do.	63	--	J	1/2	D	
Sand	--	--	P	3/4	D	
Gravel	29	--	P	1/4	D	Cp.
do.	18	--	J	--	D	

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thick-ness (feet)
T. 2 N., R. 2 E.--Con.									
9J1	H. D. Peden	Uc,	220	Dr	60	6	60	56	4
9K1	M. Scherdnik	Uc,	225	Dg	35	30	--	--	--
9K2	H. C. Carter	Uc,	218	Dr	130	6	130	125	5
9K3	C. H. Cooper	Uc,	220	Dr	124	6	--	--	--
9M1	Jay Turbush	Up,	231	Dr	140	6	140	139	1
9N1	H. Rice	Up,	235	Dg	29	30	--	--	--
9P1	L. M. Smith	Up,	236	Dr	102	6	--	--	--
9Q1	W. T. Rhinehardt	Up,	232	Dg	78	30	--	--	--
9R1	Schlitz and Stotts	Uc,	220	Dr(?)	85	6(?)	--	--	--
9R2	C. L. Lewis	Uc,	220	Dr	76	6	76	--	--
9R3	Moyland C. Blair	Up,	225	Dr	88	6	88	65	23
10A1	W. J. Fleming	Up,	240	Dr	52	6	--	--	--
10B1	F. L. McElkest	Up,	245	Dr	97	6	--	--	--
10D1	L. V. Whatley	Uc,	221	Dr	94	6	94	82	12
10D2	R. Britzman	Uc,	215	Dg	29	48	--	--	--
10F1	R. E. Watzig	Uc,	217	Dr	81	6	81	75	6
10H1	Carl Leho	Uc,	222	Dg	16	6	--	--	--
10H2	E. Seastrom	Up,	225	Dn	65	36	--	--	--
10J1	M. L. Rogers	Uc,	209	Dr	57	6	57	--	--
10J2	John R. Harding	Uc,	215	Dg	14	48	--	9	7
10K1	W. E. Hanson	Uc,	215	Dg	25	36	--	--	--

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Gravel	30	--	J	1/3	D	Bailer test, 11-ft dd, L.
--	27.5	--	--	--	D	
Sand, black	65	--	J	1	D	Bailer test, 16-ft dd, L.
Sand	50	--	J	1/2	D	
Sand, black	70	--	J	1/2	--	Bailer test, 16-ft dd, Cp, L.
--	24.4	4-11-49	J	1/3	D	Cp.
Gravel	--	--	J	1/2	D	Cp.
do.	70	--	P	3/4	D	Cp.
Gravel (?)	--	--	J	3	PS	Well number refers to two identical wells 20 ft apart; water supply for Orchards.
Gravel	51	--	J	1	D	
do.	65	--	T	3 1/2	Irr	Pumped 50 gpm, "no dd," L.
Sand	40	--	J	1/2	D	
--	40	--	J	1/2	D	
Sand, black	58	--	J	1 1/2	--	Bailer test, "no dd," Cp, L.
Gravel	25	--	J	1/3	D	
Gravel (?)	59	--	J	1 1/2	D	Bailer test, "no dd."
Gravel	6	--	J	1/4	D Irr(?)	
Sand	55	--	J	1/2	D	Cp.
Gravel	47	--	J	1/2	D	
Gravel, fine	12	--	C	3	Irr	Pumped 100 gpm, little dd.
Gravel	16	--	P	1/4	D	

Well	Owner or tenant	Topog. and altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing Depth to top (feet)	Water-bearing Thickness (feet)
T. 2 N., R. 2 E.--Con.								
10K2	W. H. Joines	Uc, 215	Dr	78	6	78	--	--
10L1	Wilson Worley	Uc, 218	Dr	69	6	69	67	2
10L2	Chester A. Larson	Uc, 218	Dr	64	6	64	58	6
10L3	F. H. Baker	Uc, 218	Dr	63	6	62	58	5
10M2	O. H. Snyder	Uc, 220	Dr	66	6	66	63	3
10N1	John Feltz	Uc, 220	Dg	26	48	--	--	--
10P1	F. T. Munroe	Uc, 217	Dr	90	6	--	--	--
10P2	A. L. Edwards	Uc, 215	Dr	64	6	64	50	14
10R2	--Stuchini	Uc, 203	Dr	75	6	75	70	5
10R3	J. C. Harding	Uc, 205	Dg	10	48	--	3	7
10R4	Elmer Yielding	Uc, 205	Dg	44	36	44	40	4
11A1	Roy Purdham	Up, 245	Dr	120	6	--	--	--
11D1	Frank Johnston	Up, 230	Dg	60	30	--	--	--
11D2	G. Abernathy	Up, 242	Dr	80	4	--	--	--
11E1	R. H. DuPuis	Uc, 225	Dg	17	6	--	--	--
11E2	C. Holter	Up, 225	Dr	50	6	50	44	6
11H1	L. A. Webster	Up, 220	Dr	40	6	40	40	--
11J1	George Snyder	Uc, 220	Dr	39	6	39	--	--
11L1	Bill Price	Uc, 215	Dg	10	360 by 600 pit	--	--	--
11P1	C. J. Krout	Uc, 200	Dg	12	144 by 240 pit	--	--	--

zone(s)	Water level		Pump		Use	Remarks
Character of material	Feet	Date	Type	H. P.		
--	63	--	J	1/2	D	Bailer test, 15-ft dd.
Gravel	39	--	J	1/2	D	Bailer test, 10-ft dd. Supplies 5 families, 2 stores, L.
do.	50	--	J	1/2	D	Bailer test, "no dd," Cp, L.
Sand, black	51½	--	J	1	D	Bailer test, "no dd," L.
Gravel	53	--	J	1/3	D	Bailer test, "no dd," Cp, L.
do.	21.45	3-24-49	C	--	D	
do.	60	--	P	1/2	D	
do.	59	--	J	1/2	D	Bailer test, 7-ft dd, L.
Sand, black	45	--	J	1/3	D	Bailer test, "no dd,"L.
Gravel	6	--	C	5	Irr	Pumped 100 gpm, little dd.
Sand and gravel	33	1-20-53	--	2	Irr	Pumped 4 hr at 40 gpm, 3-ft dd, L.
Gravel	30(?)	--	C	--	D	
do.	43	--	J	1/4	D	
--	35	--	J	1/4	D	Cp.
Gravel	8	--	C	1/4	D	
Sand, black	26½	--	J	1/2	D	Bailer test, "no dd," L.
Sand	20	3- -54	--	--	D	Pumped 35 gpm, 5-ft dd.
Gravel	16.00	5- 4-49	J	1/2	D	Bailer test, "no dd."
do.	0.0	3-22-49	C	7 1/2	Irr	Irrigated 17 acres in 1948.
do.	--	--	C	7 1/2	Irr	

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thickness (feet)
T. 2 N., R. 2 E.--Con.									
12D1	George Sprague	Up.	252	Dr	57	6	57	--	--
12D2	Harold Crooker	Up.	252	Dr	53	6	53	--	--
12G1	George Snyder	Uc.	221	Dr	75	8	--	--	--
12H1	D. M. Shattuck	Uc.	220	Dr	91	8	91	76	15
12J1	Community Church	Uc.	215	Dr	38	6	35(?)	38	4
12N1	S. Hudlicky	Uc.	205	Dg	14	24	--	--	--
12P1	C. H. Deffenbaugh	Uc.	210	Dr	44	6	--	--	--
13D1	W. Kunze	Uc.	205	Dg	10	96	--	--	--
13D2	D. Kunze	Uc.	198	Dr	96	8	96	84	12
13F1	C. H. Deffenbaugh	Uc.	200	Dr	26	5	--	--	--
13K2	Stickney Dairy	Uc.	220	Dr	90	6	--	--	--
14D1	J. L. Frame	Uc.	195	Dr	55	6	55	45	10
14D2	do.	Uc.	195	Dg	12	144 by 168 pit	--	--	--
14F1	Charles Krout	Uc.	200	Dg	8	180 by 360 pit	--	--	--
15D1	Alfred Campbell	Uc.	215	Dg	14	--	--	--	--
15L1	C. W. Bristol	Uc.	210	Dg	10	12	--	--	--
15M1	Samual H. Wright	Uc.	205	Dr	97	6	97	--	--
15P1	Jacob Dietz	Up.	222	Dr	73	6	73	69	4

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Gravel	25	--	J	1/2	D	Report large supply
do.	33	--	J	1/4	D	Report large supply; water reported to be soft and to contain no iron.
--	27(?)	--	P	1 1/2	D,S	Cp.
Gravel, loose	--	--	T	5	Irr	Pumped 230 gpm, 64-ft dd, L.
Gravel	10.14	5- 4-49	--	--	Inst	Pumped 30 gpm, small dd, L.
do.	1.5	3-30-49	P	1/4	D	
do.	12	--	J	1/2	D	
do.	7	--	--	--	Irr(?)	
do.	39	--	T	5	--	Bailer test, 9-ft dd, Cp, L.
do.	8	--	J	1/2	D	
do.	45	--	J	1 1/2	D,S	Cp.
Sand	35	--	J	--	D	Bailer test, 3-ft dd, L.
Gravel	near surface		C	7 1/2	Irr	Reported to operate 13 sprinklers.
do.	do.		C	5	Irr	Reported to operate 20 sprinklers.
do.	13.20	3-24-49	P	--	D	Water temp 49° , Cp.
do.	4.78	3-24-49	J	--	D	Supplies 3 families.
do.	30	--	T	3	Irr	Pumped 40 gpm, 10-ft dd. Plans to irrigate 8 acres.
Sand, black	56.83	3-24-49	J	--	--	Bailer test, 8-ft dd, Cp, L.

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thickness (feet)
T. 2 N., R. 2 E.--Con.									
16E2	W. Beerbaum	Up.	235	Dg	20	7	--	--	--
16G1	D. R. Irving	Uc.	230	Dr	87	6	--	--	--
16G2	do.	Uc.	210	Dr	145	8	145	120	25
16H1	C. P. McMillan	Up.	200	Dr	86	6	87	58	28
16J1	M. M. Van Fleet & Clyde Parker	Up.	205	Dr	71	6	71	70	1
16M1	Evergreen Packing Co.	Uc.	220	Dr	149	6	--	--	--
16M2	R. W. Huffaker	Uc.	220	Dg	11	30	--	--	--
16N1	A. J. Kaufmann	Up.	263	Dr	200	8	200	--	--
16R1	C. K. Boesch, et al	Uc.	205	Dr	76	6	--	56	20
17B1	C. V. Decker	Up.	260	Dg	33	14	--	--	--
17C1	C. M. Elgin	Up.	265	Dg	40	10	--	--	--
17D1	M. McCarty	Up.	280	Dg	20	30	--	--	--
17E1	Joe Woody	Up.	265	Dg	24	12	--	--	--
17E2	E.G. & D.M. McIntosh	Up.	265	Dg	20	14	20	14	6
17F1	W. J. Gablehouse	Up.	255	Dg	20	48	--	--	--
17G1	M. S. Stivison	Up.	255	Dg	13	36	--	--	--
17H1	V. G. Stamper	Up.	235	Dg(?)	30	8	--	--	--
17M1	N. G. Nellis	Up.	262	Dg	28	12	28	--	--
18A1	Frank Lyle	Up.	290	Dg	30	36	--	--	--
18C1	R. O. Nelson	Up.	285	Dr	185	4	--	--	--
18D1	V. J. Faneuf	Up.	270	Dg	16	36	--	--	--
18G1	W. F. Kunze	B.	280	Dr	35	11	35	10	25

zone(s)	Water level		Pump		Use	Remarks
Character of material	Feet	Date	Type	H. P.		
Sand	15	--	P	--	D	
Gravel	62	--	J	2	--	Pumped 20 gpm, 5-ft dd.
Sand and gravel	31	--	T	10	Irr	Pumped 300 gpm, 41½-ft dd, L.
Gravel	43	5- -50	J	1	--	Pumped 30 gpm, 10-ft dd, L.
do.	40	1- -53	J	1 1/2	--	Pumped 23 gpm, 0-ft dd, L.
--	130(?)	--	T	5	Ind	
--	6.46	3-24-49	J	1/4	D	
Gravel	120	1954	T	10	Irr	Pumped 150 gpm, 8-ft dd, L.
do.	37.73	3-21-49	J	1 1/2	D	Supplies seven families.
Sand	18	4- 4-49	J	1/2	D	
do.	25	--	J	3/4	D	
do.	6	--	J	--	D	
Gravel	17	--	J	1/2	D	
Sand	--	--	C	3	Irr	Pumped 5 hr at 110 gpm, 8-ft dd.
--	12	--	J	1/4	D	Cp.
Sand	6.0	4-11-49	J	1/2	D	
do.	14	--	J	1/2	D	Cp
--	9	8- -52	--	--	--	Pumped 30 gpm, 1-ft dd.
Sand	24	--	P	1/2	D	Cp.
--	--	--	P	1/2	D	
--	7.1	4- 7-49	C	--	--	
Sand	15	8- -53	--	--	D Irr	Pumped 60 gpm, 4-ft dd, L.

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thick-ness (feet)
T. 2 N., R. 2 E.--Con.									
18J1	G. E. Gould	Up.	255	Dg	22	24	--	--	--
18J2	H. C. Schill	Up.	255	Dg	18	12	--	4	9
18J3	R. C. Washburn	Up.	232	Dg	28	30-8	--	27	1
18L1	E. E. Huckins	Up.	280	Dg	34	36	--	--	--
18L3	Otto Kunze	Up.	280	Dg	35	48	--	--	--
18N1	David Banning	Up.	265	Dg	5	30	--	--	--
18P1	G. A. Bouma	Up.	255	Dg	14	30	--	--	--
18Q1	H. B. Klineline	Up.	250	Dr	24	6	--	--	--
18Q3	Perry Casaw	Up.	258	Bd	25	--	--	--	--
19A1	W. M. Johnston	Up.	220	Dg	15	30	--	--	--
19B1	Harry Sevier	Up.	235	Dr	122	6	--	--	--
19D1	W. M. Aldrich	Up.	240	Dr	160	4	--	--	--
19F1	A-1 Dairy Farm	Up.	210	Dr	117	6	--	--	--
19F2	M. Rossiter	Uc.	185	Dr	90	6	--	--	--
19F3	H. H. Bolton	Uc.	185	Dr	64	6	64	58	6
19G2	E. M. Munson	Up.	190	Dg	20	36	--	--	--
19G3	John Yinger	Up.	205	Dr	80	6	64	71	9
19H1	A. F. Lippart	Up.	215	Dg	18	36	--	--	--
19H2	Mrs. E. L. Stout	Up.	215	Dr	93	6	--	--	--
19H3	John Shierman	Up.	215	Dr	88	6	87	84	4
19H4	Evergreen Concrete Products Co.	Up.	210	Dg	25	30	--	--	--
19J2	L. W. Sensiba	Uc.	215	Dr	80	6	80	78	2
19L1	J. W. Bolton	Uc.	185	Dr	68	6	68	65	3

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Gravel	10	--	J	1/3	D	
Sand	4½	6- -55	--	--	--	Pumped 50 gpm, 8-ft dd, L.
Gravel, fine	9.1	7-15-49	C	3	Irr	Pumped 75 gpm, 12-ft dd.
Gravel	29½	--	P	--	D	
Sand	30	--	J	1/2	D	Cp.
--	1.4	4- 6-49	C	1/4	D	Cp.
--	7.42	3-24-49	J	1/2	D	
Gravel	6	--	P	1/2	D	Cp.
Sand	18	--	J	1/4	D	Cp.
Gravel, cemented	8	--	P	1/4	D	
--	88.34	3-24-49	--	--	--	
Gravel	--	--	P	--	--	Cp.
--	--	--	T	5	D,S	
Sand	--	--	J	1	D	Cp.
Sand, black	34	--	J	--	D	Bailer test, 3-ft dd, L.
Sand	12	--	J	1/4	D	Cp.
Sand and gravel	52	--	--	--	D	Bailer test, 10-ft dd, L.
Gravel	1.64	3-18-49	J	3/4	D	
do.	--	--	--	--	D	Report plenty of water.
Sand, black	33	--	J	1/2	D	Bailer test, 5-ft dd, L.
--	8.78	3-23-49	J	1/2	D	
Gravel	45	--	J	--	D	Bailer test, 15-ft dd, L.
Sand	38	--	J	1/3	D	Do.

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thickness (feet)
T. 2 N., R. 2 E.--Con.									
19M1	Brookside Tile Co.	Uc,	180	Dg	18	36	18	--	--
19Q1	T. Ezetta	Uc,	193	Dr	102	6	--	--	--
19R1	do.	Uc,	170	Dg	11	60	--	--	--
20A1	Royal Oaks Country Club	Uc,	210	Dr	73	6	--	--	--
20A2	do.	Uc,	210	Dr	221	12-10	221	65	30
								172	44
20B2	A. C. Davis	Up,	220	Dn	10	3/4	10	--	--
20D1	M. K. Nagel	Up,	215	Dr	75	6	--	--	--
20D2	do.	Up,	220	Dr	147	10	147	81	66
20E1	C. Albrecht	Up,	207	Dr	59	6	58	58	1
20J1	B. F. Swift	Uc,	180	Dg	22	30	--	--	--
20M1	Fred Palena	Uc,	198	Dr	68	6	--	--	--
20N1	K. Ono	Uc,	170	Dg	12	36	12	--	--
20N2	Fred Palena	Uc,	170	Dg	15	36	--	--	--
20N3	Frank Beccaria	Uc,	170	Dg	15	36	15	--	--
20P1	Louie Molinari	Uc,	168	Dg	10	72	--	--	--
20P2	W. M. Scoville	Uc,	175	Dr	35	6	--	--	--
20P3	Frank Natta	Uc,	168	Dg	8	48 by 72	8	--	--
20Q1	W. M. Scoville	Uc,	170	Dg	10	48	--	--	--
21A1	L. C. Peterson	Uc,	202	Dr	100(?)	6	--	--	--
21G1	Seth Marion	Uc,	203	Dg	15	--	--	--	--

in Clark County, Wash.--Continued

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Gravel	10.62	3-18-49	J	2	Ind	Cp.
do.	28	--	--	--	D	
do.	4.56	3-23-49	C	10	Irr	
--	--	--	J	3/4	Inst	Use at club house.
Gravel	40.12	3-18-49	T	100	Irr	Pumped 1,000 gpm, 22-ft dd. C, L.
Sand	--	--	P	--	D	Water temp 48° .
--	--	--	J	1	D,S	
Sand and gravel	50	11- -51	T	20	--	Pumped 1,400 gpm, 54-ft dd, L.
Sand, black	47	--	--	--	--	Bailer test, "no dd," L.
Gravel	11.04	3-23-49	--	--	--	
Sand or gravel	40	--	J	--	D	
Gravel	3.1	3-18-49	C	7 1/2	Irr	Irrigates 12 acres.
do.	--	--	C	10	Irr	
do.	3	--	C	10	Irr	
do.	1.74	3-21-49	C	10	Irr	
--	7.62	3-21-49	J	1/2	D	Cp.
Gravel	1.3	3-21-49	C	10	Irr	Irrigates 22 acres.
--	--	--	N	--	--	Plan to use for irrigation in 1949.
--	--	--	J	1/2	D	
--	--	--	--	--	Irr	Infiltration trench; 50 ft by 25 ft. Pumped 250 gpm.

Table 15.--Records of representative wells

Well	Owner or tenant	* Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing Depth to top (feet)	Water-bearing Thickness (feet)
T. 2 N., R. 2 E.--Con.									
21J1	H. Passut	Uc.	202	Dr	33	6	33	--	--
21L1	Seth Marion	Uc.	198	Dr	65	6	--	55	10
21M1	S. Shanko	Uc.	185	Dr	30	6	--	--	--
21N1	R. A. Laws	S.	180	Dr	60	6	60	40	20
21P1	S. J. Marrion	S.	200	Dr	89	8	89	48	41
21R1	William Brown	Up.	250	Dg	42	36	--	--	--
22A1	George Fisher	Up.	240	Dr	114	6	58	99	15
22A2	do.	Up.	243	Dr	65	6	65	56	9
22B1	John Jasker	Up.	225	Dg	40	30	--	--	--
22E1	Alfred Adolfson	Uc.	208	Dg	15	30	--	--	--
22F1	W. E. Gamble	Uc.	222	Dg	20	30	--	--	--
22F2	George Waddle	Up.	215	Dg	18	30	--	--	--
22G1	L. A. Barrett	Up.	230	Dr	90	6	--	--	--
22J1	Dewey Kitchell	Up.	242	Dr	104	6	104	71	33
22L1	C. H. Carlson	Uc.	225	Dr	96	6	--	--	--
22M1	Fenton Black	Uc.	208	Dg	22	30	--	--	--
22M2	C. J. Atkins	Up.	235	Dg	25	30	--	--	--
22N1	John Kapitanovich	Up.	240	Bd	24	8	--	--	--
22Q1	W. F. Bennet	Up.	290	Dr	115	6	--	--	--
23B1	K. A. David	Up.	243	Dg-Dr	50	6	--	--	--
23D1	J. E. Bevins	Up.	242	Dg-Dr	57	36-9	--	--	--
23D2	E. M. Henderson	Up.	243	Dr	109	6(?)	--	--	--

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Gravel	--	--	N	--	NU	Report insufficient supply, L.
do.	35	--	T	--	D,S	
Gravel and boulders	20.7	6-13-49	N	--	NU	Report large supply.
Gravel	13	6- -55	T	5	Irr	Pumped 79 gpm, 10½-ft dd, L.
do.	47	11- -54	--	--	Irr	Pumped 428 gpm, 23-ft dd, L.
do.	39	--	J	1/2	D	
do.	84	--	J	1	D	Bailer test, 5-ft dd, L.
Sand	50	--	N	--	--	L.
Gravel	34	--	P	--	D	Water temp 49° .
do.	4.65	3-21-49	J	--	D	Cp.
do.	13.36	3-21-49	J	1/4	D	
do.	11	--	--	--	D	Report plenty of water.
do.	--	--	J	1	D	
do.	70	4- -50	T	5	Irr	Pumped 90 gpm, 25-ft dd, L.
do.	--	--	J	1 1/2	D	Report good supply.
do.	6.64	3-21-49	N	--	--	
do.	19.	--	J	1/2	D	Cp.
do.	19	--	C	1 1/2	D	
do.	91.0	3-29-49	J	1/2	D	Cp.
Sand	46	--	J	1/2	D	Reported to hold up under continuous pumping.
--	45.07	3-24-49	J	1/2	--	
Gravel	74	--	J	1	D	

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thickness (feet)
T. 2 N., R. 2 E.--Con.									
23D3	C. Timmel	Up.	244	Dr	103	6	103	101	2
23E1	H. W. Sherril	Up.	238	Dr	99	6	87	97	2
23F1	Ross Tatreau	Up.	230	Dg-Dr	45	36-12	--	--	--
23F2	Lester Courtney	Up.	236	Dr	78	6	--	70	8
23G1	R. L. Dewey	Up.	240	Dr	127	4	--	--	--
23G2	Mrs. Louise Olsen	Up.	248	Dr	128	8	128	105	15
23K1	Ross Tatreau	Up.	230	Dr	115	6	--	--	--
23M1	George Casteel	Up.	240	Dg	50	(?)	--	--	--
23N1	A. W. Nelson	Up.	300	Dr	160	5	--	--	--
23P1	Evergreen School	Up.	307	Dr	220	8	220	185	35
24E1	O. H. Stricker	Up.	235	Dr	54	6	--	--	--
24E2	W. C. Ireton	Up.	236	Dr	47	6	44	44	3
24F1	L. E. Frohm	Up.	245	--	40	4	--	--	--
24H1	Charles True	Up.	273	Dr	93	6	--	--	--
24M1	J. H. Rabbe	Up.	256	Dr	118	6	--	--	--
24N1	George Wright	Up.	295	Dr	113	6	--	--	--
24N2	G. B. Wright	Up.	296	Dr	172	6	172	160	12
24P1	Anna Rate	Up.	310	Dr	80	4	--	--	--
24R1	J. J. Young	Up.	285	Dr	91	6	--	--	--
24R2	Ted Miller	Up.	279	Dr	87	6	--	--	--
25G1	John Hart	Up.	295	Dr	165	6	--	--	--
25H1	Mrs. Esther Holtz	Up.	285	Dr	82	6	--	--	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Sand, black	75	--	J	1	D	Bailer test, 3-ft dd, L.
do.	74	--	J	--	D	Bailer test, "no dd," Cp, L.
Sand	35	--	--	3/4	--	
Gravel	16(?)	--	J	1/3	D	Report large supply, L.
--	67	--	P	--	D,S	
Gravel	90	7- -52	T	10	Irr	Pumped 4 hr at 125 gpm, 5-ft dd, L.
Sand	53	--	J	--	D,S	Report large supply.
Sand, coarse	47	--	J	3/4	D,S	
Gravel	--	--	P	1	D	
do.	151	--	T	20	Inst	Pumped 250 gpm, 32-ft dd, water temp 52° , L.
--	10	--	J	1/3	D	
Gravel	32	--	J	1/3	D	Bailer test, 9-ft dd, L.
do.	26	--	J	1/4	D	
do.	75	--	J	1	D	Bailer test, "no dd," Cp.
Sand, coarse	77.52	3-23-49	P	2 1/2	D,S	Report large supply.
Gravel	96	--	J	3/4	D	
do.	150	8- -55	--	--	--	Pumped 60 gpm, 0-ft dd, L.
do.	45	--	J	1	D	Cp.
Sand	77	--	J	--	D	
--	73	--	J	1 1/2	D	
Gravel	125	--	J	1	D	
--	--	--	J	3/4	D	Report plenty of water.

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thick-ness (feet)
T. 2 N., R. 2 E.--Con.									
25J1	Alfred Kern	Up.	285	Dr	150	6	148	148	2
25L1	G. J. Haagen	Up.	300	Dr	160	6	--	--	--
25R1	R. H. Johnson	Up.	295	Dr	197	8	197	152	45
26D1	T. W. Royston	Up.	305	Dr	101	6	--	--	--
27A1	George Borpasl	Up.	305	Dr	130	6	--	--	--
27D1	M. C. Timmerman	Up.	310	Dr	114	4	--	--	--
27H1	W. L. Tyler	Up.	305	Dr	95	5	--	--	--
27M1	L. C. Bybee	Up.	295	Dr	102	6	--	--	--
27N1	R. Rosen	Up.	300	Dr	170	6	--	--	--
27N2	J. L. Dyal	Up.	305	Dr	186	6	--	--	--
28A1	H. L. Drake	Up.	305	Dr	109	(?)	--	--	--
28C1	Seth Marion	Up.	298	Dr	178	6	--	--	--
28E1	C. P. Teske	Up.	260	Dr	142	6	142	140	2
28G1	J. T. Livingston	Up.	285	Dr	139	4	--	--	--
28H1	M. D. Nelson	Up.	305	Dr	120	6	--	--	--
28H2	M. G. Minton	Up.	305	Dr	178	4	--	--	--
28M1	H. Siemer	Up.	315	Dr	132	8	--	--	--
28M2	W. Preston	Up.	315	Dr	180	6	174	161	19
28N1	R. D. Boley	Up.	305	Dg	40(?)	30	--	--	--
28P1	Edger O. Gibson	Up.	310	Dr	178	6	--	--	--
28Q1	C. Brenna	Up.	305	Dr	130	6	--	--	--
28R1	--Knapp	Up.	305	Dr	115	3	--	--	--
29H1	John Coop	Up.	305	Dr	186	6	--	--	--
29K1	do.	Up.	305	Dr	176	6	--	--	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Sand, black	93	--	J	1	D	Bailer test, 16-ft dd, L.
--	140	--	J	2	D	
Sand and gravel	130	--	--	--	D,Irr	Pumped 150 gpm, 30-ft dd, L.
Sand	88	--	J	1/2	D	Cp.
do.	113	--	J	1/2	D	
Sand and gravel	100	--	J	3/4	D	
Gravel	87	--	J	3/4	D	
Sand and gravel	--	--	J	1/2	D	
Gravel	--	--	J	1	D	Cp.
--	--	--	P	3/4	D	Cp.
Gravel, fine	100.5	3-28-49	J	1/2	D	
--	118	--	P	--	D	
Sand, black	124	--	P	3/4	D	Bailer test, "no dd," L.
Gravel, cemented	103.15	3-25-49	P	3/4	D	
--	112	--	P	3/4	D	Cp.
--	150	--	J	1	D	Report plenty of water.
Gravel	126	--	P	3/4	D	
do.	174	--	P	2	D	Bailer test, "no dd," L.
do.	20.03	3-25-49	N	--	--	
do.	138	--	P	1	D	Cp.
do.	108	--	P	3/4	D	
do.	109	--	P	3/4	D	
--	169.55	3-25-49	P	--	D	Cp.
Sand, blue	--	--	P	1/2	--	

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing Depth to top (feet)	Water-bearing Thickness (feet)
T. 2 N., R. 2 E.--Con.									
29N1	Federal Housing Authority	Up.	300	Dr	174	6	174	--	--
30B1	Pete Caviale	Uc.	170	Dr	121	10	--	--	--
30B2	do.	Uc.	165	Dg	12	48	--	--	--
30C1	Federal Housing Authority	Uc.	185	Dr	300	12-10	300	69	3
								232	26
30D1	Robert Nieman	Uc.	170	Dg	22	30	22	22	--
30G1	Frank Natta	Up.	305	Dr	146	6	--	--	--
30J1	Alvin C. Shagren	Up.	300	Dr	206	6	--	--	--
30J2	Bert Anderson	Up.	305	Dr	211	6	--	--	--
30K1	Park Hill Cemetery	Up.	298	Dr	396	16	284	235	13
								260	15
30Q1	Federal Housing Authority	Up.	295	Dr	257	12	--	--	--
31D1	M. Mercer	S.	155	Dr	180	6	--	--	--
31J1	F. W. Shannon	S.	155	Dr	93	6	--	--	--
32E1	M. Carson	Up.	185	Dr	137	6	132	131	6
32F1	Edward Schwind	Up.	280	Dr	193	6	192	177	16
32F2	do.	Up.	280	Dr	187	6	187	--	--
32K1	C. D. Root	S.	260	Dg	20	30	--	--	--

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Sand	156	--	N	--	De (PS)	
--	4.98	3-23-49	P	7 1/2	Irr	Pumped 100 gpm, 60-ft dd. Not in use, 1949.
Gravel	6	--	C	10	Irr	Pumped 175 gpm, 4½-ft dd.
Gravel, cemented	108	--	--	25	NU (PS)	Pumped 275 gpm, 82-ft dd, L.
Gravel	12.85	3-23-49	C	5	Irr	Supplied 5-30 gpm sprayers.
--	--	--	P	--	--	Report "first water" found at 146 ft.
--	194.85	3-25-49	N	--	--	
--	171(?)	--	P	2	D	Report "first water" found at 140 ft.
Gravel	194	--	T	--	Irr	Pumped 1,000 gpm, 90-ft dd, L.
--	--	--	N	--	NU	Pumped 135 gpm.
Gravel	140	--	J	3	--	
do.	73	--	P	3/4	D	Cp.
Sand, black	122	--	J	1/2	D	Pumped 8 gpm, 5-ft dd, L.
Gravel	166	--	T	5	--	Pumped 38 gpm, 3-ft dd, Cp, L.
do.	164½	--	P	1 1/2	--	Bailer test, 3-ft dd, L.
do.	22.95	3-31-49	C	1/2	--	

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thickness (feet)
T 2 N., R. 2 E.--Con.									
32M1	Ralph Montag, et al	S.	150	Dg	30	12	30	--	--
32P1	Dr. H. Leiser	S.	135	Dr	100	6	--	--	--
32Q1	Ralph Hahn	S.	130	Dr	65	6(?)	--	--	--
32R1	W. P. Davis	S.	155	Dr	86	6	--	--	--
33B1	E. Kunnas	Up.	305	Dg-Dr	135	30-6	--	--	--
33H1	L. O. Matchett	Up.	300	Dr	125	4	--	--	--
33K1	T. Putnam	Up.	295	Dr	160	6	158	154	6
33R1	C. W. Barrone	S.	195	Dr	52	6	51	50	2
34B1	Allen F. Black	Up.	300	Dr	170	6	--	--	--
34C1	--Groth	Up.	310	Dr	171	4	--	--	--
34C2	M. Johnson	Up.	310	Dr	135	4	--	--	--
34E1	M. H. Simonds	Up.	303	Dr	122	4	--	--	--
34G1	Nick Stanke	Up.	300	Dr	164	6	--	--	--
34G2	O. C. Tangermann	Up.	300	Dr	175	6	--	--	--
34M1	August Meyer	Up.	295	Dr	145	6	--	--	--
34P1	Spencer Biddle	S.	242	Dr	78	6	76	72	6
35A1	M. C. Sampson	Up.	303	Dr	193	6	--	--	--
35C1	W. S. Olsen	Up.	305	Dr	170	6	170	161	9
35C2	W. H. Davis	Up.	305	Dr	185	6	--	--	--
35D1	N. Stein	Up.	308	Dr	180	6	--	--	--
35E1	C. L. Hopfe	Up.	310	Dr	98	6	--	--	--
35H1	W. C. DeLocey	Up.	303	Dr	188	6	--	--	--
35M1	R. O. Norelius	Up.	298	Dr	185	8	--	--	--
36B1	W. L. Moreland	Up.	295	Dr	153	6	--	107	46

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
--	--	1949	C	3	D,Ir	Pumped 120 gpm, 18-ft dd.
--	25	--	J	5	D	
Gravel	--	--	J	1 1/2	D	
do.	63	--	J	1 1/2	D	
do.	115	--	J	1	D	Dug to 50 ft.
do.	119	--	J	1	D	Cp.
do.	149(?)	--	P	1	D	Bailer test, "no dd," L.
Sand, black	15	--	J	3	D	Bailer test, "no dd," L.
Gravel	152½	1946	P	3/4	D	
--	162	--	T	2	D	
Gravel	--	--	P	1/2	--	Cp.
Sand and gravel	98	--	J	3/4	D	Supplies 2 families, Cp.
Sand	--	--	J	1 1/2	D	
--	160	--	P	3/4	D	Cp.
Gravel	--	--	P	1	D	Report plenty of water.
do.	48	--	P	3/4	D	Bailer test, "no dd," L.
do.	153	--	P	3/4	--	Cp.
do.	161	--	--	--	--	Bailer test, "no dd," L.
do.	165	--	J	1/2	D	Water temp 49°., Cp.
do.	173	--	P	2	D	
--	94	--	J	1		
do.	--	--	P	3	--	
Gravel, fine	155	--	T	3	--	Cp.
Gravel	140	--	J	1	D	Pumped 12 gpm, "no dd," L.

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing Depth to top (feet)	Water-bearing Thickness (feet)
T. 2 N., R. 2 E.--Con.									
36C1	Mill Plain High School	Up.	295	Dr	190	6	--	--	--
36H1	H. S. Whetzel	Up.	285	Dr	250	6	--	--	--
36P1	John McGillivray	Up.	285	Dr	238	8	238	232	6
36Q1	Ralph Starr	Up.	275	Dr	187	4	--	--	--
36R1	O. C. Tiffany	Up.	275	Dr	156	6-5	--	--	--
T. 2 N., R. 3 E.									
3D1	Camp Kilpack	H.	465	Dr	516	6	--	503	13
4D1	Ben Rapakko	S.	390	Dg	22	48	--	--	--
4E1	John Beall	S.	315	Dg	15	32	15	--	--
4K1	Joe Kaleta	S.	385	Dr	250	6	247	245	2
4L1	John Beall	S.	335	Dr	190	6	--	--	--
4Q1	Sten Nygren	S.	350	Dg	16	36	16	--	--
4Q2	Mrs. Marie Ubacz	S.	333	Dg	11	60	--	--	--
5P1	Smith V. Haagen	--	285	Dr	290	8	290	75	22
5R1	E. L. Bellamy	Up.	305	Dr	144	6	144	140	4
6E2	A. Grobli	Up.	265	Dg	17	30	17	--	--
6J1	L. E. Munson	Up.	283	Dr	77(?)	6	--	--	--
6K1	Carl Anderson	Up.	272	Dr	93	6	69	70	23
6Q1	Mrs. Alice Snyder	Up.	270	Dg	18	48	5	--	--

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Gravel	--	--	P	3	Inst	Cp.
--	--	--	P	--	D	Report adequate supply.
Gravel	158	--	T	5	D, Irr	Bailer test, 10-ft dd, Cp, L.
Sand	157	--	P	1 1/2	D	
Gravel	138	--	P	--	--	
Lava	126	7-15-43	T	5	Inst	Pumped 3 hr at 70 gpm, 30-ft dd, L.
Gravel	4	--	C	--	D	Well taps Troutdale formation, large supply reported.
do.	4	--	C	--	D	Do.
do.	175	--	J	3	D	Bailer test, 37-ft dd, Cp, L.
--	--	--	J	2(?)	--	
Clay and gravel	4.78	5- 4-49	P	1/2	D	Well taps Troutdale formation.
do.	5.24	5-16-49	J	--	D	Do.
--	58	2- 9-53	T	15	Irr	Pumped 8 hr at 300 gpm, 12-ft dd, L.
Sand and gravel	85	--	J	1/2	D	Report soft water, L.
Clay	9.24	5-16-49	J	1/2	D	
--	33(?)	--	J	1	--	
Rock(?)	68	--	J	1	D, Irr	Report large supply. Bailer test, 15-ft dd, C, L.
--	7.12	5-17-49	C	--	D	Report soft water.

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thickness (feet)
T. 2 N., R. 3 E.--Con.									
6R1	K. Jacobs	Up.	275	Dr	61	5	61	56	5
7A1	W. A. Soliday	Up.	270	Dr	47	6	46	42	5
7B1	P. C. Rothermel	Up.	260	Dr	77	6	--	--	--
7J1	James Higgins	Up.	256	Dr	110	6	100	80	30
7K1	E. E. Peppers	Up.	233	Dg	27	30-8	27	--	--
7L1	D. M. Shattuck	Uc.	218	Dr	62	6	59	56	6
7L2	Ed Karnath	Uc.	218	Dg	13	36	13	--	--
7R2	John Meisner	Up.	250	Dr	88	6	88	75	13
8E1	R. H. Paulson	Up.	251	Dr	88	6	82	83	5
8F1	John Vassel	Up.	280	Dg	20	24	20	--	--
8H1	H. W. Lange	Up.	303	Dg	15	36	15	--	--
8K1	M. W. Andrew	Up.	320	Dr	136	6	136	130	6
8M1	C. O. Wilson	Up.	263	Dr	111	6	99	70	2
8Q1	Walter R. Smith	Up.	320	Dr	130	6	130	115	15
9D1	Charles Oslund	S.	290	Dg	12	48	--	--	--
9G1	G. L. Oslund	S.	275	Dg	9	30	--	--	--
12G1	S. Rasmussen	H.	1,640	Dg	22	--	--	--	--
14N1	Myers Bros.	Up.	390	Dr	213	8	213	200	13
15E1	H. H. Ralliff	Up.	390	Dr	123	6-4	123	--	--
16B1	W. J. Matson	Up.	355	Dg	28	30	--	--	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Gravel	22	--	--	--	--	Bailer test, 18-ft dd, L.
Sand, black	27	--	J	1/2	D	Bailer test, 8-ft dd, L.
Gravel	62	--	J	--	D	
do.	41	--	--	2	D,Irr	Pumped 50 gpm, 75-ft dd, L.
--	24.60	5- 3-49	C	--	D	
Sand, black	32	--	J	1	D	Bailer test, "no dd," L.
--	3.21	5- 3-49	C	--	D	
Gravel	47½	--	J	3/4	D	Pumped 4 hr at 60 gpm, 20-ft dd, L.
do.	38	--	J	2	D	Cp, L.
Sand	7.40	5- 4-49	C	--	D	Water reported to contain iron.
--	4.28	5- 4-49	C	--	D,Irr	Do.
Sand and gravel(?)	91	--	J	1	D	Bailer test, 5-ft dd, L.
Gravel	48	--	J	2	D	Pumped 20 gpm, 18-ft dd, Cp, L.
do.	94.59	5-16-49	J	1	D	Pumped 20 gpm, "no dd," Cp, L.
Gravel, "cement"	8	--	C	1/4	D	Report good supply.
do.	6	--	--	--	D	Do.
Sand and gravel	13.2	7-26-49	N	--	--	
Gravel	25	6- -53	T	30	Irr	Pumped 240 gpm, 175-ft dd, L.
Sand and gravel	90	7-26-49	J	--	D,Irr	Pumped 18 gpm, 9-ft dd.
--	19	--	--	--	D	Cp.

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thick-ness (feet)
T. 2 N., R. 3 E.--Con.									
16C1	L. G. Munger	Up.	340	Dg	45	36	45	--	--
17D1	Roy Sutter	Up.	265	Dr	140	6	--	--	--
17Q1	Roy Baker	Up.	211	Dr	54	6	--	--	--
18A1	J. E. Sturgeon	S.	253	Dr	94	6	94	--	--
18B1	Alfred Anderson	Up.	200	Dg	9	20	none	6	3
18N1	K. W. McKenzie	Uc.	215	Dr	60	6	60	--	--
19D1	Miss Margaret Whipple	S.	230	Dr	87	6-4	--	--	--
19K1	Lester Strunk	Up.	230	Dr	17	48	--	--	--
20H1	A. F. and L. W. Lechtenberg	Uc.	205	Dr	60	8-6	60	--	--
20J1	F. L. Groth	Uc.	190	Dr	38	6	38	36	2
20R1	Lacamas Camp Ground	Uc.	190	Dr	29	6	--	--	--
21E1	A. F. Lechtenberg	S.	225	Dr	70	6	--	--	--
21J1	Adolph Paris	S.	352	Dr-Dg	100	18-6	100	--	--
21L1	M. F. Wolff	S.	240	Dg	24	30	24	--	--
21R1	C. B. Mays	S.	280	Dr	63	4	--	--	--
22G1	Roy King	Ub.	435	Dg	21	48	--	--	--

in Clark County, Wash.--Continued

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Sand	40	--	--	--	D	
--	--	--	P	1	D	Can by pumped dry.
Sand and gravel	20	--	J	--	D	
Gravel, coarse	49	--	J	--	D	Pumps 100 gpm. Water very muddy after 1949 earthquake, L.
Clay, hard, and gravel	4	9- -55	--	--	--	Pumped 500 gpm, 3½-ft dd, L.
Gravel	27.16	5- 9-49	J	1	D	
do.	35	--	P	3/4	--	Report large supply.
Clay and gravel	8.84	5- 9-49	P	--	--	
Gravel, "cement"	7	--	C	1	S,Irr	Pumped 24 hrs at 60 gpm, 4-ft dd.
Gravel	2.99	5- 9-49	P	1/4	D	Report large supply, L.
do.	10	--	C	1/3	Inst	
--	25	--	--	--	D,S	
Gravel	10.17	5-10-49	J	--	D	Pumped 1 hr at 30 gpm, 3-inch dd, Cp.
do.	0	Spring	--	--	D	Report large supply
	12	Autumn				
Sand and gravel	30	--	J	1/2	D,S	
--	7.98	5-10-49	P	1/4	--	Report adequate supply.

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thick-ness (feet)
T. 2 N., R. 3 E.--Con.									
22H1	Myers Bros. Turkey Farm	Ub.	414	Dr	142	6	142	128	14
22J1	Fern Prairie Church Of God	Ub.	429	Dr	55	6	30(?)	--	--
22J2	W. X. Wilson	Ub.	425	Dr	42	6	30(?)	--	--
22J3	Fern Prairie School	Ub.	430	Dr	155	6	--	--	--
22J4	E. A. Richards	Ub.	433	Dr	142	6	142	--	--
22M1	Nick Beres	S.	340	Dg	15	60	--	--	--
22M2	E. Wilson	S.	380	Dr	135	6	--	--	--
22N1	Frank DeTemple	S.	300	Dr	58	6	--	--	--
22R1	Ray Meyers	Ub.	415	Dg	10	--	--	--	--
23M1	R. Marple	Ub.	430	Dg	21	39	12	--	--
23Q1	Ivan Robison	S.	465	Dg	43	36	--	--	--
23R1	William Steuer	S.	470	Dr	58	6	40	--	--
24G1	G. F. Messick	H.	715	Dg	17	36	--	--	--
24L1	C. M. Howell	H.	700	Dg	29	--	--	--	--
24M1	R. L. Barnett	H.	656	Dg	40	36	--	--	--
24N1	Joe Wagoner	H.	650	Dg	30	36	6	--	--
24Q1	J.S. Harrigan	S.	460	Dg	22	72	22	--	--

in Clark County, Wash.--Continued

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Sand, black	87	--	P	1 1/2	D,S	Bailer test, 20-ft dd, L.
--	16.79	5-10-49	P	1/4	Inst	
Gravel	19	--	J	1/2	D	
--	--	--	P	1 1/2	D	
Gravel	43.70	5-10-49	P	3/4	D	Pumped 6 hrs at 20 gpm, 10-ft dd.
--	1.50	5- 3-49	C	1/4	D	Report water lowers 10 ft in autumn.
--	--	--	P	1/3	D	
--	--	--	P	--	D	Report well can't be pumped dry.
Gravel, cemented	--	--	--	--	Irr	Infiltration trench, 20-ft by 15 ft. Yield 25 gpm.
Clay and gravel	7.71	5-10-49	J	1/2	D,S	
Gravel	33.45	5-16-49	J	1/2	D	Cp.
Clay and gravel	38	--	J	1/2	D	
Gravel and clay	6.25	5-16-49	C	1/3	D	
Clay	22.5	7-25-49	P	1/2	D	
do.	28	--	J	1/4	D	Cp.
Clay and gravel	16.70	5-16-49	J	1/2	D	
Sand and gravel	7.2	7-26-49	J	1/2	D	Pumped 3 hr, 14-ft dd, Cp.

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing Depth to top (feet)	Thick-ness (feet)
T. 2 N., R. 3 E.--Con.									
25J1	E. Crowson	S,	310	Dg	52	--	--	--	--
25Q1	Harry Thornton	H,	410	Dr	115	6-5	--	112	3
25Q2	A. J. Rocheford	S,	370	Dr	145	6	99	99	46
25R1	J. B. Fields	S,	190	Dr	213	6	208	--	--
25R2	M. G. Dole	S,	208	Dr	208	6	203	203	5
26A1	Mrs. Nellie Stevenson	Ub,	440	Dr	155	6	--	--	--
26B1	Edger Webberly	Ub,	430	Dr	150	8	--	132	3
26G1	F. B. Platt	Ub,	425	Dr	150	8	--	--	--
26J1	Jack Hahn	Ub,	425	Dg	42	48	3	--	--
26K1	Grove Airport	Ub,	425	Dr	185	6	--	--	--
26L1	R. V. Brown	Ub,	404	Dr	150	6	145	--	--
26P1	William Pickett	S,	365	Dr	70	6	--	--	--
26Q1	H. W. Pepper	Ub,	420	Dr	165	6	112(?)	--	--
26Q2	do.	Ub,	418	Dg	21	54	--	--	--
26Q3	William Pickett	Ub,	400	Dr	115	(?)	--	115	--
27B1	Henry Myers	Ub,	420	Dg	27	60	--	--	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Gravel	40.8	7-25-49	J	2	D	
do.	98	--	J	1	D	Pumped 20 gpm, 20-ft dd, L.
Rock, volcanic	108	--	P	3/4	D	Bailer test, 8-ft dd, L.
do.	+46	--	--	--	D	Flows 1½ gpm into tank 25 ft above surface.
do.	+25	--	--	--	--	Flows 5 gpm, water temp 54°, L.
--	--	--	J	1	--	
Sand and gravel	132	--	J	--	D	Cemented gravel from 60 to 132 ft.
--	138	--	Sc	3	D,Ir	Irrigates garden.
--	18.98	6- 1-49	J	1/3	D	
--	100	--	J	1	--	
--	120	9-10-48	P	1	--	Water reported to be soft and to contain no iron.
Sand and gravel	58	--	J	1/2	--	Aquifer is fine black gravel and sand below 8 ft of cemented gravel. Pumped 20 gpm, "no dd."
Gravel	143	--	P	3/4	--	L.
--	7.08	6- 2-49	C	1/4	D,S	Water temp 49°.
Gravel	95	--	P	--	D	Report adequate supply.
--	13.09	6- 3-49	N	--	D	

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing Depth to top (feet)	Thickness (feet)
T. 2 N., R. 3 E.--Con.									
27L1	C. B. Roberts	Up.	280	Dg	22	30-8	17	16	--
27P1	Elite Hereford Ranch	S.	270	Dg- 75 Dr-400	400	8	130	371	29
29E1	H. W. Kramer	Up.	275	Dg	50	6	--	--	--
29L1	D. F. Strunk	Up.	255	Dg	16	30	--	--	--
29M1	Frank B. Marchbanks	Up.	284	Dr	114	4	--	--	--
29M2	R. S. Hitchcock	Up.	280	Dr	94	4	94	--	--
29N1	Ed Knobel	Up.	283	Dr	126	6	--	--	--
29P1	S. L. Strunk	Up.	252	Dr	180	8	180	105	75
29Q1	Fred Schick	Up.	245	Dr	89	6	89	86	3
29R1	S. Sterkson	S.	285	Dg	24	24-12	24	--	--
29R2	H. C. Quick	S.	295	Dr	50	6	50	49	1
30C1	Harry Friberg	Up.	285	Dr	110	6	--	--	--
30D1	Mrs. A. A. Smith	Up.	290	Dr	114	6	--	--	--

in Clark County, Wash.--Continued

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Gravel	13	--	J	5	Irr	Pumped 12 hr at 150 gpm, 3-ft dd.
Rock, hard, black and gray	39	4- -55	--	--	Irr	Pumped 73 gpm, 150-ft dd, L.
--	46	--	J	1/2	D	
Sand and gravel	8.28	4-27-49	--	--	D	
--	95	--	P	3/4	D	Report "first water" at 60 ft.
Sand	75	--	P	--	D	Report supply adequate, but not large. Well probably partially filled with sand.
Gravel	100	--	P	--	D	Bailer test, "no dd." Report loose gravel to about 85 ft, above cemented gravel, above coarse, sharp gravel.
Clay, sand, and gravel	80	6- -52	--	--	Irr	Pumped 220 gpm, 90-ft dd, L.
Gravel	59	--	--	--	D	Pumped 15 gpm, 14-ft dd, L.
--	9.21	4-27-49	J	--	D	
Gravel	42	--	J	1/2	--	Bailer test, "no dd," L.
--	30(?)	--	J	1	D	Report large supply.
--	--	--	P	1	D	

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thick-ness (feet)
T. 2 N., R. 3 E.--Con.									
30J1	Clark County Quarry	Up.	280	Dg	7	36	7	--	--
30J2	Ralph Mayhew	Up.	280	Dr	92	4(?)	--	--	--
30P1	F. E. English	Up.	288	Dr	135	6	135	105	30
31B1	Henry Shoenig	Up.	288	Dr	114	6	--	--	--
31C1	V. H. Davis	Up.	287	Dr	135	6	135	106	29
31D1	C. I. Baker	Up.	287	Dr	165	6	--	--	--
31D2	J. A. Ferguson	Up.	288	Dr	114	5	--	110	4
31G1	John J. Frost	Up.	280	Dr	180	4	--	--	--
31J1	C. R. Dickinson	Up.	275	Dr	65	6	--	--	--
31N1	D. B. Webster	Up.	276	Dr	148	4	--	--	--
31P1	Emil Myer	Up.	278	Dr	93	6	--	--	--
32A1	Richard Ochs	S.	270	Dr	94	6	--	--	--
32E1	W. W. Barger	Up.	279	Dr	133	6	--	--	--
32M1	P. E. Friberg	Up.	269	Dr	74	6	74	72	2
32N1	A. R. Myers	Up.	272	Dg-Dr	42	4	--	--	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Sand and gravel	73±	5- 9-49	C	3/4	D	Well is in bottom of 70±-ft gravel quarry. Water level 2.67 ft below top of curbing.
do.	--	--	P	1	D	Report plenty of water for garden and lawn.
Gravel, loose	110	--	T	3	D,Irr	Pumped 150 gpm, 10-ft dd. Water temp 52°, L.
--	--	--	P	--	D	
Sand and gravel	--	--	T	3	D,Irr	Pumped 50 gpm, little dd, L.
--	--	--	P	1	D	Water reported to be hard, Cp.
Gravel, cemented	84	--	J	--	D	
--	--	--	P	--	D	
--	45	--	J	1/2	D	Report adequate supply.
Gravel (?)	120	--	--	--	--	Report struck water at 118 ft.
Gravel	75.71	4-28-49	J	3/4	D	
--	--	--	J	--	D	Report plenty of water.
Gravel, coarse	100	--	J	--	D	Pumped 30 gpm, "no dd."
Sand and gravel	35	--	J	--	D	Penetrated loose gravel to 45 ft, and cemented gravel from 45 to 72 ft.
"Sandstone"	39.75	4-29-49	P	1/2	D	

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thick-ness (feet)
T. 2 N., R. 3 E.--Con.									
32P1	J. O. Foster	Up,	275	Dg	39	60	--	--	--
32Q1	J. T. Armstrong	Up,	272	Dr	143	6	140	142	1
33C1	R. D. O'Harra	S,	300	Dr-Bd	102	6	--	--	--
33C2	I. R. Nichols	S,	310	Dr	170	6	--	--	--
33Q1	Al Decker	S,	335	Dr	147	6	--	--	--
33R1	Farris Craner	S,	345	Dr	160	6	141	141	3
34M1	Lester Hunt	Up,	360	Dg	28	--	--	--	--
34N1	E. H. White	S,	388	Dg	36	120-48	--	--	--
34N2	do.	S,	390	Dr	112	8	112	105	7
35J1	V. W. Buttler	Ub,	395	Dr	401	6	28	350	--
35L1	John Turpin	S,	340	Dg	25	48	10	10	--
35R1	Carl Buhman	Ub,	395	Dg	49	36	--	--	--
36B1	Joe Embler	Ub,	420	Dr	75	6	--	--	--
36F1	Verner Smith	Ub,	440	Dg	30	36	--	--	--
36F2	Lewis Albert	Ub,	430	Dr	67	6	67	--	--
36L1	Melvin Clapp	Ub,	410	Dr	194	6-4	193	--	--
36Q1	Pat Monaghan	Ub,	385	Dr	60	6	--	--	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Sand and clay	9.28	4-20-49	J	1/2	D	Water level reported to drop 25 ft during summer.
Gravel	100	--	P	1	D	Bailer test, 21-ft dd, Cp, L.
Sand (?)	59	--	J	1	D	L.
--	--	--	--	--	--	
Sand and clay	--	--	P	1	D	L.
--	116.50	4-29-49	J	1 1/2	D	Same strata encountered as in well 33Q1.
Clay	16	--	C	1/2	D	Report plenty of water.
do.	9.70	4-29-49	J	--	D	
Clay and gravel	95	--	T	5	Irr	Pumped 63 gpm, 15-ft dd, L.
Basalt	--	--	P	1	D	Report small supply.
"Sandstone"	--	--	--	1/4	--	Report can be pumped dry.
do.	25.33	5-12-49	J	1/3	D	Reported never to have gone dry.
do.	--	--	J	3/4	D	Water reported to be slightly hard and to contain some iron.
Clay	15	--	--	--	D	Water level reported to be low in autumn.
Gravel	21.06	6- 2-49	P	--	D	
Sand, black	85.25	6- 1-49	N	--	NU	Bailer test, 11-ft dd, L.
Sand and gravel	19	--	J	1/2	D	Report large supply.

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing: Depth to top (feet)	Water-bearing: Thickness (feet)
T. 2 N., R. 4 E.								
13E1	J. A. Bateman	H, 1,100	Dg	24	--	--	--	--
18H1	G. Folsom	S, 750	Dg	35	--	--	--	--
18M1	H. Pauro	S, 725	Dg	30	--	--	--	--
19E1	W. R. Cotter	S, 375	Dg	14	33	--	--	--
23H1	A. M. Hannigan	H, 1,040	Dg	40	36	--	--	--
24G1	N. Hagenson	H, 1,130	Dg	18	42	--	--	--
25N1	Dr. Sheppard	S, 280	Dr	68	6	--	--	--
27Q1	C. L. Lynch	Fp, 195	Dr	220	6	120	--	--
29L1	O. G. Parfitt	S, 470	Dr	111	6	--	--	--
29G1	P. Krohn	S, 540	Dg	14	36	--	--	--
30F1	G. St. Clair	S, 438	Dg	24	60	--	--	--
30J1	C. Allen	S, 490	Dg	18	--	--	--	--
31A1	C. A. Chick	Ub, 320	Dg	20	--	--	--	--
31Q1	E. S. Borjesson	Ub, 440	Dr	181	6	178	--	--
32E1	E. Templer	Ub, 325	Dg	36	48	--	--	--
32E2	do.	Up, 352	Dr	310	6	80	--	--
32F1	E. J. Luthy	S, 150	Dr	94	6	62	--	--
32M1	E. Templer	S, 246	Dg	20	30	--	--	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Clay	6.4	7-15-49	P	--	D	
Clay and rock	22.3	7-26-49	N	--	--	
Clay	27.2	7-26-49	P	1/2	D	
Gravel	11.3	7-26-49	P	1/4	D	Cp.
Sand, black	32	--	C	1/2	D	Water reported to be oily.
Clay	8.2	7-15-49	J	1/2	D	Cp.
Gravel, cemented	30	--	J	1	D	
Gravel	9	--	J	1/2	D	Report pumped 9 gpm, 120-ft dd.
Basalt	21	--	J	1/2	D	Bailer test, "no dd."
Gravel	4	--	J	1/4	D	
Clay	19.1	7-25-49	P	1/3	D	Report 6 gpm with 5 ft dd after pumping 2 hr. Cp.
Gravel	12.2	7-25-49	J	1/4	D	
do.	16.6	7-25-49	--	--	D	
Gravel, cemented	162	--	P	1	D	Penetrated soil and sand to 71 ft, cemented gravel to bottom. Pumped 12 gpm, 6-ft dd.
do.	32.8	7-25-49	J	1	D	
--	103	8- -55	--	--	--	Not used due to poor yield.
Sand	38	--	P	3/4	D	Bailer test, 12-ft dd.
Clay	10	--	P	1/4	D	

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thick-ness (feet)
T. 2 N., R. 4 E.--Con.									
33A1	W. L. Croswell	Ub.	705	Dr	170	6	--	--	--
33C1	F. L. Young	Ub.	665	Dg	24	--	--	--	--
33Q1	V. A. Lommen	S.	630	Dg	40	48	--	--	--
35G1	H. C. Kendall	Ub.	1,000	Dr	80	6	--	--	--
36G1	H. A. Hutchinson	S.	300	Dg	14	36	--	--	--
T. 3 N., R. 1 W.									
1J1	A. Raz	S.	115	Dr	102	6	--	--	--
12H1	A. Mattler	T.	101	Dr	115	6	--	--	--
T. 3 N., R. 1 E.									
1A1	J. Lang	S.	265	Dr	96	6	--	--	--
1B1	R. Blake	S.	275	Dr	99	6	98	88	11
1C1	J. J. Hare	Up.	280	Dr	127	6	--	--	--
1C2	O. G. Beherns	Up.	293	Dr	161	6	161	150	11
1E1	J. C. Waltom	Up.	282	Dr	125	3	--	--	--
1M1	Mrs. C. M. Foster	Up.	287	Dr	130	6	130	110	20
2B1	L. Adkins	Up.	278	Dr	136	6	--	--	--
2B2	J. Scott	Up.	280	Dg	40	48	--	--	--
2E1	H. Jones	Up.	275	Dr	160	6	159	157	3
2F1	Harry S. Jones	Up.	290	Dr	154	5	154	--	--
2K1	A. M. Samuals	S.	290	Dr	123	6	123	112	11
2Q1	A. A. Stumpf	Up.	280	Dr	107	6	107	105	2

in Clark County, Wash.--Continued

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
--	--	--	J	1 1/2	D	Water reported to cause green coloration, Cp.
Clay	12.2	7-20-49	P	1/2	D	No apparent dd, Cp.
do.	15	--	J	1/2	D	Pumped 5 hr at 10 gpm, 1/5-ft dd.
Rock, volcanic	70	--	J	1 1/2	D	No apparent dd, Cp.
Sand and gravel	7	--	P	1/4	D	
Gravel	50	--	J	1	D	Cp.
do.	75	--	J	1 1/2	D	
Sand	65	--	J	1/2	D	
Sand, black	85	--	J	1	D	Bailer test, "no dd," L.
Gravel	89	--	J	2	D	
do.	94	--	--	--	D	Bailer test, 10-ft dd, L.
Sand	95	--	P	1	D	
Sand and gravel	95	--	J	1 1/2	D	Water reported to be moderately hard, L.
Gravel	96	--	J	1 1/2	D	
Sand	30	--	P	--	D	
Gravel	125	--	--	--	--	Bailer test, 13-ft dd, L.
--	68	--	T	5	D,Irr	Pumped 108 gpm, 28-ft dd, L.
Sand, black	101	--	P	3/4	D	Bailer test, 2-ft dd, L.
do.	--	--	J(?)	1 1/2	D	L.

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing Depth to top (feet)	Thickness (feet)
T. 3 N., R. 1 E.--Con.									
2R1	Kenneth Shores	S.	245	Dr	105	6	104	92	13
2R2	O. Shores	S.	245	Dr	90	6	90	85	5
3A1	T. Johnson	Up.	265	Dg	28	30	28	--	--
3H1	C. Reinseth	S.	225	Dg	16	10	16	--	--
3M1	E. Dollson	Up.	385	Dr	393	6	393	--	--
3N1	W. M. Hoffman	S.	320	Dr	117	6	117	113	4
4A1	Lambert School	S.	375	Dr	385	6	384	380	5
4A2	G. Rau	S.	370	Dr	365	6	--	--	--
4E1	L. W. Nieman	Up.	250	Dr	160	6	160	139	21
4F1	H. A. Herman	S.	333	Dr	192	6	192	189	3
4K1	O. Knutsen	H.	410	Dr	147	6	--	--	--
4M1	Jacob Ryt	S.	225	Dg	22	30	22	--	--
5D1	G. B. Baxter	S.	235	Dg	18	48	18	--	--
5E1	B. Sonney	Up.	238	Dr	185	6	185	165	20
5H1	L. Holley	Up.	250	Dr	160	6	160	158	2
5L1	C. J. Fitz	Up.	225	Dg	21	36	21	--	--
5Q1	W. P. Hilley	Up.	240	Dg	30	48	30	--	--
6E1	J. Roth	S.	155	Dr	122	6	122	121	1
6H1	--Nelson	S.	208	Dr	161	6	161	159	2
6K1	F. Walter	S.	205	Dg	22	36	--	--	--
6R1	W. Schleicher	Up.	190	Dg	22	48	--	--	--
7D1	F. A. Krieger	T.	115	Dr	127	6	--	--	--

zone(s)	Water level		Pump		Use	Remarks
Character of material	Feet	Date	Type	H. P.		
Sand and gravel	74	--	J	--	D	Bailer test, 14-ft dd, L.
Sand, black	70	--	--	--	D	Bailer test, 6-ft dd, L.
Gravel	16	--	J	1/3	D	Cp.
Sand	11	--	C	3/4	D	Cp.
Sand and gravel	--	--	P	15	D	Plugged at 320 ft, L.
Sand, black	39	--	J	1	D	Bailer test, "no dd," Cp, L.
do.	309	--	--	--	--	Bailer test, 11-ft dd, L.
Gravel	230	--	P	5	D,S	
Gravel and sand	132	10-10-51	T	5	Irr	Pumped 4 hr at 30 gpm, 25-ft dd, L.
Sand, black	167	--	P	3/4	D	Bailer test, 12½-ft dd, L.
Gravel	--	--	P	--	D	
Sand	5	--	C	1/4	D	
do.	6	--	C	1/4	D	
Gravel	166	--	J(?)	3	--	Bailer test, 4-ft dd, L.
Sand, black	80	--	P	1	D	Bailer test, 16-ft dd, L.
Sand	19	--	P	--	D	Cp.
do.	15	--	C	1/3	D	
Sand, black	64	--	Sc	3	--	Bailer test, 14-ft dd, L.
Sand and gravel	147	--	P	2	--	Bailer test, 3-ft dd, L.
Sand	12	--	P	--	D	
do.	6	--	C	1/4	D	
do.	87	--	P	1	D	

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thick-ness (feet)
T. 3 N., R. 1 E.--Con.									
7D2	Arnold Mettler	S.	115	Dr	471	10-8	450	123	5
								268	2
								363	14
								403	3
8F1	L. H. Sinclair	S.	185	Dr	155	6	--	--	--
8K1	J. S. England	S.	180	Dr	144	6	144	134	10
8K2	Ernest Brown	Up.	175	Dr	148	6	148	125	23
8L1	James and Nora McElligott	S.	183	Dr	298	10	258	110	145
8M1	L. R. Thurman	S.	165	Dg	28	48	--	--	--
8N1	E. J. Grant	S.	110	Dg	25	30	25	--	--
8Q2	Sara School Dist.	S.	155	Dr	150	6	--	--	--
8R1	E. T. Royle	Up.	180	Dr	370	8-6	--	--	--
9A1	L. Parmantier	S.	295	Dr	182	6	182	171	11
9A2	John Heidecker	S.	285	Dr	210	8	210	--	--
9H1	L. L. Oslin	S.	275	Dg	21	48	--	--	--
9K1	J. Gaul	S.	255	Dg	38	48	--	--	--
10A1	I. Jacobs	S.	240	Dg	30	36	--	--	--
10A2	Airld Flory	S.	263	Dr	100	6	100	97	3
10B1	--Thomsen	S.	295	Dr	166	6	167	150	17
10C2	C. H. & Amelia Reese	S.	305	Dr	168	8	168	137	31
10G1	R. Garrison	S.	310	Dr	156	6	--	--	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Gravel	100	--	T	25	Irr	Pumped 360 gpm, 26-ft dd, L.
Sand	150	--	P	3/4	D	
Gravel, cemented	137½	--	P	--	D	Bailer test, "no dd," L.
Gravel	120½	1953	--	--	Irr	Pumped 12 hr at 51 gpm, 23-ft dd, L.
Sand and gravel	122	7-15-53	--	--	--	Pumped 160 gpm, 33-ft dd, L.
Sand	18	--	C	1/2	D	Cp.
do.	1	--	C	1/4	D	Cp.
Sand and gravel	95	--	P	1	Inst	L.
--	--	--	--	--	Irr	
Gravel	132	--	P	2	--	Bailer test, 10-ft dd, Cp, L.
--	140	--	T	5	Irr	Pumped 30 gpm, 60-ft dd, L.
Sand and clay	16.8	5-16-49	C	1/3	D	Report large supply, Cp.
do.	22	--	J	1/3	D	
Gravel	5	--	C	1/4	D	Cp.
do.	63	--	J	1/3	D	Bailer test, 25-ft dd, L.
Gravel, cemented	109	--	P	1/2	D	Bailer test, 11-ft dd, L.
Gravel	125	--	T	7 1/2	D Irr	Pumped 30 gpm, 40-ft dd, L.
do.	141	--	P	3/4	D	Cp.

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing Depth to top (feet)	Thickness (feet)
T. 3 N., R. 1 E.--Con.									
10H1	L. H. Wilson	S.	290	Dr	132	6	132	120	12
10H2	J. H. Dooley	S.	300	Dr	164	6	163	162	2
10J1	George Prom	S.	300	Dr	173	6	173	166	7
10M1	--Schimmelpfenig	H.	336	Dr	178	6	178	145	33
10N2	H. F. Boutwell	H.	325	Dr	194	6	--	--	--
10P1	D. L. Belknap	H.	335	Dr	192	6	192	149	43
10R1	Baker School Dist	S.	300	Dr	134	6	133	126	8
11A1	H. L. Stuart	Up.	270	Dr	168	6	168	163	5
11B1	W. Worthington	Up.	290	Dr	100	6	--	--	--
11D1	F. R. Moudry	Up.	240	Dr	141	6	141	139	2
11F1	C. H. Rigsby	Up.	295	Dr	138	6	138	133	5
11M1	W. Brewster	S.	300	Dr	136	6	135	129	7
11N1	O. Grub	S.	280	Dr	130	4	--	--	--
11N2	J. H. Hubbard	S.	275	Dr	125	6	125	108	17
11Q1	H. Carpenter	S.	275	Dr	133	6	131	117	16
11Q2	John Soha	S.	275	Dr	117	6	117	110	7
12C1	L. Resleff	S.	280	Dr	139	6	--	--	--
12E1	J. V. Ramsey	S.	280	Dr	112	6	--	--	--
12N1	J. O. Dodson	S.	265	Dg	29	36	--	--	--
12R1	Oliver P. Stark	S.	260	Dr	215	8	215	196	13
13E1	J. A. Fields	Up.	272	Dg	14	30	--	--	--
14D1	P. F. Brown	Up.	280	Dr	150	6	--	--	--
14J1	H. P. Calvin	Up.	250	Dr	201	6-4	192(?)	168	33

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Gravel	100	--	J	1 1/2	D	Pumped 19 gpm, 12-ft dd, Cp, L.
Sand, black	94	--	P	3/4	D	Bailer test, 16-ft dd, L.
Gravel, loose	123	--	--	--	--	Bailer test, "no dd," L.
Gravel	163	--	J	2	D	Bailer test, 7-ft dd, L.
do.	175	--	P	3/4	D	Pumped 12 gpm, 10-ft dd, L.
do.	171	--	P	1	D	Bailer test, 5-ft dd, Cp, L.
Sand, black	88	--	--	--	--	Bailer test, 8-ft dd, L.
Sand and gravel	96	8- -54	--	--	--	Pumped 60 gpm, 16-ft dd, L.
Gravel	85	--	P	1/2	D	
Sand, black	61	--	J	3	D	Bailer test, 30-ft dd, L.
Gravel	111	--	P	3/4	D	Bailer test, "no dd," Cp, L.
Sand, black	88	--	P	1	D	Bailer test, 9-ft dd, L.
Gravel	70	--	P	3/4	D	
Sand and gravel	--	--	J	1 1/2	D	Bailer test, 6-ft dd, L.
do.	98	--	J	--	D	Bailer test, 3-ft dd, L.
Sand, black	77½	--	--	--	--	Bailer test, 8-ft dd, L.
Sand	78	--	P	1	D	
Gravel	80	--	J	1	D	
Sand	21.9	5-13-49	C	1	D	
Gravel	94	--	T	15	Irr	Pumped 150 gpm, 14-ft dd, L.
do.	6	--	J	1/3	D	
Sand	115	--	P	1 1/2	D	Cp.
Gravel	181	--	P	1/2	D	Bailer test, "no dd," Cp, L.

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing Depth to top (feet)	Water-bearing Thick-ness (feet)
T. 3 N., R. 1 E.--Con.									
15B1	W. F. Leichtnan	Up.	300	Dg	17	48	--	--	--
15H1	A. Moulton	Up.	294	Dr	170	6	--	--	--
15H2	do.	Up.	296	Dr	220	8	219	--	--
15P1	W. R. Chilveck	Up.	200	Dr	147	6	--	--	--
15R1	D. Bottemiller	S.	260	Dg	20	60	--	--	--
16C1	H. E. Davis	Up.	215	Dg	23	36	24	--	--
16H1	Chester Wrenn	H.	335	Dr	219	6-4	219	195	24
17F1	D. P. Piechioni	Up.	175	Dr	186	6	186	181	5
17K1	D. Coons	Up.	180	Dg	28	30	28	--	--
18D1	P. Nichols	Up.	79	Dr	94	6	--	--	--
18G2	M.W. Schimmelpfinnig	Up.	139	Dr	120	6	--	--	--
18H1	O. E. Devers	Up.	175	Dr	100	6	--	--	--
18H2	F. M. McWilliams	Up.	170	Dr	196	6-4	196	191	5
18J1	Valley Erwin	Up.	175	Dr	187	6	187	180	7
18J2	C. W. Hartman	Up.	160	Dr	181	6	181	174	7
18Q1	C. E. Grelle	Up.	130	Dr	302	10	302	255	47
19R1	Z. Herzog	Up.	171	Dr	165	6	165	162	3
20C1	A. G. Maki & C. O. Mickey	Up.	170	Dr	183	6	183	178	5
20F1	H. Engler	Up.	168	Dr	150	6	--	--	--
20G1	E. E. McIrvin	Up.	170	Dr	166	6	166	163	3
20J1	A. H. Sasse	S.	80	Dr	88	6	88	75	11
20P1	J. H. Ryan	S.	195	Dg	20	30	20	--	--

in Clark County, Wash.--Continued

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Clay	7	--	--	--	--	
do.	130	--	P	3	--	Cp.
--	130	--	T	15	Irr	Cp, L.
Gravel	135	--	P	1 1/2	D(?)	
Sand	10	--	C	1/3	D	
do.	10.3	5-16-49	C	1/4	D	Cp.
Gravel(?)	196	--	P	1	D	Bailer test, 6-ft dd, L.
Gravel	121	--	P	3/4	D	Bailer test, 54-ft dd, L.
Sand	16.1	5-12-49	J	1/2	D	
Gravel	66	--	J	2	D(?)	
do.	100	--	J	1	D(?)	
Sand	70	--	J	1	D	
Gravel	129	4- -52	--	--	--	Pumped 70 gpm, 24-ft dd, L.
Sand, black	146	--	P	1	D	Bailer test, 35-ft dd, L.
Gravel	119	--	P	1	D	Bailer test, 37-ft dd, L.
Gravel	112	--	T	25	Irr	Pumped 250 gpm, 58-ft dd, L.
do.	153	--	P	2 1/2	D	Pumped 12 gpm, "no dd," Cp, L.
Sand and gravel	143	--	T	7	D,Irr	Pumped 75 gpm, 30-ft dd, L.
Gravel	137	--	P	1/2	D	Cp.
do.	140	--	Sc	5	D,Irr	Operates 4 sprinklers plus 4 hoses, L.
do.	50	--	J	1	D	L.
Sand	16	--	C	3/4	D	Cp.

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing Depth to top (feet)	Water-bearing Thickness (feet)
T. 3 N., R. 1 E.--Con.									
21B1	M. H. Sunden	S.	165	Dg	25	30	25	--	--
21E1	A. E. Pauley	Up.	175	Dg	22	30	22	--	--
21G1	L. W. Ross	Up.	165	Dg	45	30	45	--	--
21Q1	W. E. Bliss	S.	170	Dr	172	6	172	--	--
21R1	George Kapitanovich	Up.	175	Dr	165	8	165	155	10
22D1	J. L. Bleth	Up.	165	Dg	33	48	--	--	--
22L1	W. Gueffroy	Up.	185	Dg	24	30	24	--	--
22P1	J. D. Sullivan	Up.	187	Dg	35	36	35	25	10+
22Q1	W. Bryant	Up.	192	Dg	20	6	--	--	--
23E1	J. A. Heidecker	Up.	205	Dr	175	6	175	95	22
								138	37
23J1	Dick Tompkins	H.	315	Dr	271	6	271	--	--
23J2	Lee Hixon	H.	310	Dg-Bd	111	36	97	85	9
23J3	Ray Ellis	H.	325	Dr	98	6	98	--	--
23M1	L. B. Hathaway	Up.	200	Dg	24	30	--	--	--
23M2	do.	Up.	205	Dr	171	8	171	156	15
23R1	John Schreiber	H.	290	Dr	268	6	268	--	--
24H2	J. Brougher	T.	155	Dr	108	6	108	104	4
24K1	R. H. Todd	Fp.	140	Dr	85	6	85	84	1
24K2	Roy J. Darling	--	125	Dr	90	12	58	69	21
24L1	do.	S.	155	Dr	748	12	70	78	7
24N1	Harley Mays	S.	205	Dr	205	6	205	203	2

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Sand	10	--	C	1/3	D	
do.	12.7	5-20-49	C	1/4	D	Cp.
do.	25.0	5-19-49	J	1/2	D	
Gravel	155	--	P	5	--	Report very large supply.
do.	150	--	T	--	Irr	Dd 10 ft at 220 gpm, L.
Sand	23	--	J	1/2	D	Report can be pumped dry.
Clay	12	--	J	1/4	D	
Sand	15	8- -54	--	--	--	Pumped 35 gpm, 10-ft dd, L.
do.	4	--	C	1/4	D	
Sand and gravel	120	6-10-52	--	--	D,Irr	Pumped 4 hr at 100 gpm, 40-ft dd, L.
Gravel	243	--	P	3	D	Water reported to be hard.
do.	--	--	J	1	D	Partial log.
Sand and gravel	84	--	J	1	D	Water reported to be soft.
Sand	18.6	5-19-49	J	1/3	D	
Gravel	128	--	T	15	Irr	Pumped 175 gpm, 25-ft dd, L.
Sand	231	--	--	--	--	Bailer test, report "no dd," L.
Sand, black	8	--	J	2	--	Bailer test, 38-ft dd, L.
Sand, red	Flows	--	C	1/2	D	Reported to flow 15 gpm, L.
"Shale"	1	2- -56	T	10	Irr	Pumped 170 gpm, 61-ft dd, L.
Sand and gravel	12	9- -52	T	7 1/2	D,Irr	Pumped 100 gpm, 43-ft dd, L.
Sand, coarse	150(?)	--	T	3	Irr	Pumped 4 hr at 40 gpm, 15-ft dd.

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing Depth to top (feet)	Water-bearing Thickness (feet)
T. 3 N., R. 1 E.--Con.									
24R1	F. Hannam	Up.	215	Dg	50	--	--	--	--
24R2	Earl R. Kadow	Up.	225	Dr	179	8	179	80	60
25A1	R. Mitchell	Up.	217	Dg	20	--	--	--	--
25G1	A. R. Smoole	Up.	217	Dr	92	6	92	75	17
25M1	L. A. Tesch	T.	105	Dr	64	6	--	57	7
25Q1	Jacob Schwann	S.	200	Dr	108	6	108	80	28
26B1	A. Neuman	S.	200	Dg	23	30	--	--	--
26C1	Frank L. Davies	Up.	195	Dr	169	6	169	140	29
27E1	C. T. Brandt	Up.	182	Dg	45	60	--	--	--
27F1	Mrs. M. W. Scott	Up.	190	Dg	27	24(?)	--	--	--
29F1	W. Fuestman	Up.	195	Dg	27	30	27	--	--
29K1	E. McErvin	Up.	215	Dg	45	30	45	--	--
29K2	F. W. Tripp	Up.	205	Dg	42	54-33	42	31	11
30A1	Z. Herzog	Up.	165	Dr	160	6	--	--	--
32A1	R. Hopfe	Up.	210	Dg	39	30	--	--	--
32J1	F. J. Erickson	Up.	207	Dg	50	48	--	--	--
32J2	Walter H. Yost	Up.	198	Dr	178	6	178	160	18
32K1	M. H. Anderson	S.	160	Dr	97	6	--	--	--
32R1	Clinton C. Warren	S.	50	Dr	187	8	80	185	2
33A1	D. Posey	S.	160	Dg	58	8	--	--	--
33D1	G. Van Volkenberg	Up.	215	Dr	198	6	186	193	5
33E1	C. E. Dabney	Up.	210	Dg	40	36	--	--	--

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Sand	38	--	J	1/2	D	Cp.
Gravel, cemented	78	7- -49	T	15	D,Irr	Pumped 4 hr at 365 gpm, 65-ft dd, L.
Sand	12	--	C	1/3	D	Cp.
Sand and gravel	65	11- -52	--	--	--	Pumped 40 gpm, 15-ft dd, L.
Gravel	--	--	--	--	--	Cp, L.
Sand and gravel	78	--	J	1 1/2	D	Bailer test, 10-ft dd, L .
Clay	12	--	C	1/3	D	
Sand and gravel	133.0	10-15-50	T	3	D	L.
Sand	30	--	J	1/4	D	Cp.
do.	12	--	C	1/3	D	
do.	25.7	5-20-49	J	1/3	D	
do.	32	--	J	1/3	D	
do.	28 3/4	--	--	--	Irr	Pumped 65 gpm, 4-ft dd.
Gravel	151	--	P	5	D,S	
Sand	35	--	J	1	D	
do.	45	--	P	--	D	
Gravel and sand	--	--	Sub	2 1/3	D	L.
Gravel	50	--	J	1/4	D	
Gravel and sand	12	--	Sc	3	D	Pumped 2 hr at 200 gpm, 68-ft dd, L.
Sand	46	--	J	1/3	D	Cp.
Gravel	150	--	P	1	D	Pumped 15 gpm, " no dd, " L.
Sand	36	--	J	1/3	D	

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing: Depth to top (feet)	Water-bearing: Thickness (feet)
T. 3 N., R. 1 E.--Con.									
33G1	E. Moran	Up.	225	Dg	36	30	--	--	--
33L1	A. M. Schultz	Up.	210	Dg	39	40	39	20	20
33M1	M. J. Seida	Up.	215	Dr	33	24-11	33	24	5
33M2	Ralph A. Garner	Up.	215	Dg	40	48	40	27	12
33P1	Alex Vernon	Up.	210	Dg	32	42-12	32	20	12
33Q1	Wil-Mar Dairy	Up.	210	Dg-Dr	48	60-8	48	28	20
33R1	W. E. Kennedy	Up.	225	Dr	245	8-6	245	212	33
34G1	F. Kluttenhoff	Up.	170	Dr	212	6	--	--	--
34G2	Paul Borchers	Up.	160	Dr	129	6	129	112	17
34M1	Rudolph Evans	Up.	185	Dg	19	60	19	--	--
34Q1	J. H. Swarner	Up.	205	Dg	50	--	--	--	--
34Q2	R. I. Chambers	Up.	190	Dg	35	48	--	--	--
34R1	Clark County PUD 1	Up.	195	Dr	275	12	275	135	20
35B1	J. Hannah	Fp.	90	Dr	46	6	--	--	--
35D1	T. Christiansen	S.	76	Dr	59	6	59	55	4
35L1	J. L. Nordstrom	Up.	160	Dr	106	6	--	--	--
35P1	Columbia Winery	S.	180	Dr	122	6	119	110	12
36A1	Arnold Ueltschi	Up.	250	Dr	200	8	200	150	45

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Sand	25	--	J	1/3	D	
Sand, coarse	19	--	C	5	Irr	Pumped 12 hr at 60 gpm, 16-ft dd.
Sand	14	--	C	5	Irr	Pumped 60 gpm, 15-ft dd.
Sand, black	28	--	C	3	D, Irr	Pumped 50 gpm, 5-ft dd, L.
Sand, coarse, black	18	--	C	3	Irr	Pumped 50 gpm, 7-ft dd.
Sand	36	--	C	5	Irr	Pump located 28 feet below surface. Irrigates 20 acres pasture, C.
Gravel	137	--	T	10	Irr	Pumped 160 gpm, 18-ft dd. Irrigates 18 acres, L.
do.	118	--	--	--	Irr	L.
do.	107	--	J	1	D	Bailer test, 11-ft dd, L.
--	10	--	C	5	Irr	Pumped 72 gpm, 7-ft dd.
Sand	35	--	J	1/3	D	
do.	29	--	J	1/3	D	
Sand and gravel	--	--	T	60	Ind	L.
Gravel	22	--	J	1/2	D	
Sand, black	43½	--	J	1/2	D	Bailer test, "no dd," L.
Sand	80	--	J	1	D	Cp.
Sand, black	77	--	T	3	Ind	Bailer test, 15-ft dd, L.
Sand and cemented gravel	87	3- -54	--	--	Irr	Pumped 225 gpm, 10-ft dd, L.

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thickness (feet)
T. 3 N., R. 1 E.--Con.									
36B1	J. J. and D. H. Herman	S.	210	Dr	97	6	97	--	--
36H1	Arnold Ueltschi	Up.	250	Dg	60	42	--	--	--
36P1	Adams & Johnson	Up.	300	Dr	168	6	--	--	--
36P2	W. L. Dillon	Up.	315	Dr	200	6	200	198	2
36R1	C. E. LaLonde	Up.	250	Dg	42	30	--	--	--
T. 3 N., R. 2 E.									
1C1	H. Simonson	S.	350	Dg	16	30	--	--	--
1J1	R. G. Hayes	Up.	285	Dr	101	8	--	--	--
1N1	E. Matson	Up.	275	Dg	25	34	--	--	--
1Q2	Thomas L. Roberts	Up.	275	Dr	59	6	59	52	7
2A1	Ed Parvi	Up.	300	Dg	35	30	--	--	--
2D1	Clark Co. Co-op	Up.	295	Dr	140	12-8(?)	--	136(?)	4(?)
2D2	do.	Up.	295	Dr	140	8	--	--	--
2D3	D. Primley	Up.	290	Dr	35	6	34	33	2
2F1	H. S. Gish	Up.	286	Dr	74	6	73	59	15
2L1	J. Kertis	Up.	284	Dr	78	6	--	--	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
--	40	--	--	3	D,Irr	Pumped 65 gpm, little dd, L.
Sand	50	--	J	1/3	D	Cp.
do.	--	--	P	3/4	D	
Gravel	149	--	P	5	D	Soil from 0 to 4 ft, sand from 4 to 98 ft. Bailer test, "no dd."
Sand	26	--	J	1/2	D	Cp.
Rock(?)	10	--	C	1/4	D	Cp.
Sand	51	--	P	2	D	Cp.
Gravel	10	--	J	1/2	D	Cp.
Gravel	22	4- 9-52	T	3	Irr	Pumped 10 hr at 41.5 gpm, 32-ft dd, L.
do.	4	--	J	1/3	D	
Sand and gravel	51	4- 6-49	T	--	PS	Water level measured 15 min after pumping stopped. Water temp 51.5°. Reported to use about 60,000 gal. per day. C.
do.	40	--	T	7 1/2	PS	
Sand, black	15	--	--	--	--	Bailer test, "no dd," L.
Gravel	38	--	J	1	D	Bailer test, 5-ft dd, L.
do.	60	--	J	1	D	

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing Depth to top (feet)	Thickness (feet)
T. 3 N., R. 2 E.--Con.									
3B1	Town of Battle Ground	Up.	284	Dr	144	8	144	95	20
3B2	do.	Up.	284	Dr	153	12	--	92	46
3B3	do.	Up.	284	Dr	152	12	144	105	47
3C1	Fred Vandermast	Up.	282	Dr	82	6	82	55	27
3E1	Clarence A. Remy	Up.	275	Dr	177	8	177	54	60
								114	25
3H1	J. H. Babcock	Up.	284	Dr	82	6	--	--	--
3H2	James H. Babcock	Up.	285	Dr	103	8	103	--	--
3L1	F. Condon	Up.	279	Dg	16	24	16	--	--
3R1	E. Anderson	Up.	275	Dr	63	6	50	--	--
4A1	P. Smith	Up.	270	Dr	88	6	--	--	--
4C1	L. Towle	Up.	260	Dr	125	6	--	--	--
4H2	Arthur Leggett	Up.	275	Dr	177	6	177	93	84
4J1	F. W. Hollenbeck	Up.	275	Dr	94	6	94	76	18
4J2	H. C. Sholund	Up.	270	Dr	126	6	126	82	44
4N1	M. Webber	Up.	285	Dr	106	6	--	--	--
4Q1	W. M. Meisner	Up.	279	Dg	25	30	--	--	--
5A1	Robert Laughlin	Up.	260	Dr	104	6	104	--	--
5D1	S. L. Dollar	Up.	218	Dr	199	6	198	--	--
5E1	Leonard Walther	Up.	220	Dr	70	6	--	23	8
								31	35
5M1	C. V. Hill	Up.	220	Dr	80	6	80	14(?)	66(?)
5P1	P. J. Meilicke	S.	245	Dr	59	6	--	--	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Sand and gravel	48.1	3- -54	T	30	D,Irr	Pumped 332 gpm, 42.2-ft dd, L.
Gravel	49.08	12-14-55	--	--	--	Well now abandoned.
Sand and gravel	54	9- -54	T	30	D,Irr	Pumped 400 gpm, 52-ft dd, L.
Gravel	42	5-20-49	J	1	D	Bailer test, 8-ft dd, L.
Gravel, cemented	47	--	T	5	Irr	Pumped 100 gpm, 88-ft dd, L.
Sand and gravel						
Gravel	45	--	J	3/4	D	Cp.
--	40	--	--	--	Irr	Pumped 175 gpm, 19-ft dd.
Sand	3	--	C	1/4	D	
do.	45	--	J	1	D	Pumped 10 gpm, "no dd," L.
Gravel	75	--	J	1	D	
do.	80	--	J	1	D	Cp.
Sand and gravel	46	2- -53	T	5	--	Pumped 56 gpm, 120-ft dd, L.
Gravel	59	--	J	1	D	Bailer test, 14-ft dd, L.
Sand and gravel	57	2- -53	--	--	--	Pumped 125 gpm, 12-ft dd, L.
Gravel	90	--	P	3/4	D	Cp.
Sand	12	--	C	1/2	D	Cp.
Sand and gravel	74	--	J	1	D	Pumped 20 gpm, 20-ft dd.
Gravel	121	--	J	1	D	Bailer test, 13-ft dd.
Sand	18	--	J	2	Irr	Pumped 38-gpm, 15-ft dd, L.
Gravel and sand						
Gravel	20	--	J	3/4	D	Bailer test, "no dd," L.
do.	24	--	J	3/4	D	

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thick-ness (feet)
T. 3 N., R. 2 E.--Con.									
5R1	M. M. Morgan	S.	365	Dr	400	6	--	390	10
6A1	M. C. Bradford	Up.	211	Dg	22	30	--	--	--
6B1	W. Hesley	Up.	200	Dr	68	6	--	--	--
6G1	A. P. and Martha McDaniel	Up.	200	Dr	217	8	217	208	4
6J1	E. McErvin	Up.	210	Dg	17	30	17	--	--
6J2	H. C. Dugger	Up.	205	Dr	74	6	74	17	57
6J3	P. W. Helphrey	--	210	Dr	82	7	82	--	--
6M1	G. Casteel	S.	268	Dr	103	6	--	--	--
6N1	O. Williams	S.	255	Dr	87	5	--	--	--
6Q1	L. E. Mason	Up.	190	Dg	12	30	--	--	--
7E1	A. Thompson	S.	250	Dr	163	6	163	--	--
7J1	H. Kielman	Up.	210	Dg	16	34	16	--	--
7Q1	G. A. Greenwood	Up.	195	Dg	14	30	14	--	--
8A1	R. B. Agard	T.	275	Dr	170	8	170	130	24
8D1	G. Homar	Up.	220	Dg	17	48	--	--	--
8D2	R. C. Chapman	Up.	220	Dr	127	10	127	100	25
8M1	J. R. Tappan	Up.	231	Dr	112	6	112	--	--
8N1	G. H. White	Up.	233	Dg	19	--	--	--	--
8P1	E. R. Williams	Up.	240	Dr	85	6	85	--	--
8P2	Claud A. DeWitt	Up.	240	Dr	128	6	128(?)	--	--
9A1	Clarence Larsen	Up.	280	Dr	150	10	150	85	65
9D1	L. A. Vallet	Up.	285	Dr	134	6	134	92	35

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Gravel	160	--	--	--	--	Report plenty of water, L.
do.	6	--	J	1/4	D	
do.	45	--	P	--	D	Cp.
Sand, blue, coarse	3	5- -54	--	--	--	Pumped 210 gpm, 18-ft dd, L.
Sand	9.0	4-29-49	P	1/4	D	
Gravel and sand	10	--	T	3	Irr	L.
--	12	3- 3-53	--	--	--	Pumped 80 gpm, 35-ft dd.
Sand	84	--	J	1/2	D	
Gravel	72	--	P	--	D	
Sand	8	--	J	1/3	D	Cp.
do.	98	--	J	1	D	Bailer test, 15-ft dd, Cp, L.
do.	8	--	P	1/4	D	
do.	7.55	4-28-49	J	1/2	D	Cp.
Sand and gravel	78	10- -54	T	10	Irr	Pumped 150 gpm, 28-ft dd, L.
Sand	3	--	P	--	D	Cp.
Gravel	36	9- -53	T	--	Irr	Pumped 255 gpm, 63-ft dd, L.
--	40	6- -55	T	--	Irr	Pumped 100 gpm, 58-ft dd, L.
Sand	15	--	P	--	D	
--	36	--	T	5	D,Irr	Pumped 70 gpm, little dd.
--	43	1953	--	1 1/2	D,Irr	Bailed 30 gpm without noticeable dd.
Sand and gravel	87	--	--	--	Irr	Pumped 85 gpm, 43-ft dd, L.
Gravel, cemented	92	10- -52	T	5	Irr	Pumped 40 gpm, 15-ft dd, L.

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing Depth to top (feet)	Water-bearing Thickness (feet)
T. 3 N., R. 2 E.--Con.									
9H1	Columbia Academy	Up.	285	Dr	195	10-8	169	55	25
								110	31
9H2	do.	Up.	285	Dr	121	6	121	--	--
9K1	L. A. Sittser	Up.	285	Dg	17	30	--	--	--
9Q1	A. E. Fleek	Up.	275	Dg	18	30	--	--	--
10B1	H. H. Pollock	Up.	285	Dg	22	30	--	--	--
10F1	E. Gassoway	Up.	291	Dr	95	6	90	85	10
10H1	Emil Wall	Up.	275	Dr	79	6	79	70	9
10L2	M. S. Smart	Up.	293	Dr	138	6	137	82	56
10M1	A. F. Gilham	Up.	282	Dr	117	6	117	113	4
10P1	G. A. Rouse	Up.	280	Dg	18	6	--	--	--
10Q1	G. J. Kavodias	Up.	284	Dr	99	6	99	90	9
10Q2	W. R. Wendt	Up.	285	Dr	150	10	150	130	15+
11C1	George Granlund	Up.	285	Dr	91	6	91	78	13
11D1	C. Dietrich	S.	275	Dr	90	6	--	--	--
11D2	do.	S.	285	Dr	83	6	78	78	5
11E1	J. W. Hill	S.	281	Dr	60	6	58	55	5
11G1	G. Green	Up.	285	Dr	93	6	--	--	--
11P1	A. W. Peter	Up.	265	Dr	86	6	85	62	24
12H1	E. Thorgeson	Up.	265	Dg	34	30	--	--	--
12R1	Earl McLavy	Up.	254	Dr	45	6	43	43	2
12R2	do.	Up.	260	Dg	19	36	19	--	--

in Clark County, Wash.--Continued

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Sand and gravel	93	--	T	7	Inst	Pumped 150 gpm, 34-ft dd, L.
Gravel	85	--	T	5	Inst	Pumped 24 gpm, 15-ft dd.
do.	7	--	C	1/4	D	Cp.
do.	12	--	J	1/3	D	Cp.
do.	9	--	J	1/3	D	
do.	75	--	J	3/4	D	Bailer test, 10-ft dd, L.
Sand	44	--	J	1	D	Bailer test, 25-ft dd, L.
Gravel	85	--	--	--	--	Bailer test, 12-ft dd, L.
do.	79	--	J	1/2	D	Bailer test, 8-ft dd, L.
Sand	6	--	P	--	D	Cp.
Gravel	74	--	J	3/4	D	Bailer test, 15-ft dd, L.
Sand and gravel	78	7- -55	--	--	Irr	Pumped 125 gpm, 20-ft dd, L.
Gravel	45	--	J	1	D	Bailer test, 22-ft dd, L.
do.	65(?)	--	J	1	D	
Sand, black	42	--	--	--	--	Bailer test, 5-ft dd, L.
Gravel	44	--	J	1/2	D	Bailer test, "no dd," L.
do.	40	--	J	1	D	
do.	35	--	J	1/2	D	Bailer test, 25-ft dd, Cp, L.
do.	7.3	4-22-49	C	1/2	D	Cp.
Sand, black	7.56	6- 6-49	P	--	N	Bailer test, 12-ft dd. Water reported to contain too much iron for use, L.
Gravel	3	--	J	1	D,S	

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thickness (feet)
T. 3 N., R. 2 E.--Con.									
13B1	Ray Kielman	Up.	270	Dr	89	6	89	86	3
13E1	W. Thorgeson	Up.	312	Dr	130	6	--	--	--
13J1	E. Mattila	Up.	275	Dg	18	30	--	--	--
13P1	L. Dietrich	Up.	288	Dr	133	6	133	130	3
14A1	R. J. Helms	Up.	280	Dr	108	6	108	105	3
14H1	P. Sample	Up.	308	Dg	20	30	--	--	--
14L1	M. D. Hance	Up.	295	Dg	30	12	--	--	--
14M1	W. Dethman	Up.	300	Dr	105	5	--	--	--
14P1	Arthur Tikka	Up.	302	Dr	215	8	180	139	2
								168	3
15G1	J. W. Pender	Fp.	255	Dg	26	22	26	--	--
15Q1	H. Dixon	Up.	284	Dr	93	6	--	--	--
16K1	M. B. DeSpain	Up.	270	Dg	19	24	19	--	--
16M1	C. Higdon	Up.	264	Dg	20	72	--	--	--
16M2	Clinton Higdon	Up.	270	Dr	157	8	157	112	6
								127	28
17B1	H. Piper	Up.	262	Dg	11	30	--	--	--
17D1	F. Thomas	Up.	230	Dr	65	6	64	63	2
17J1	W. M. Higdon	Up.	261	Dr	116	6	116	90	26
17K1	H. Eichmeier	Up.	255	Dg	19	36	19	--	--
17P1	D. B. Harris	Up.	245	Dg	19	48	--	--	--
17Q1	J. M. Morgan	Up.	250	Dr	304	8	304	299	2
18C1	B. Sellinger	Up.	200	Dr	52	6	52	46	6
18C2	do.	Up.	200	Dr	97	6	97	88	9

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Gravel	39	--	J	1/3	D	Bailer test, 15-ft dd, Cp, L.
do.	70	--	P	3/4	D	
do.	6.6	4-22-49	J	1/3	D	Cp.
Sand, black	63½	--	J	1	D	Bailer test, 8-ft dd, L.
do.	67½	--	J	1	D	Bailer test, 10-ft dd, L.
--	7	--	C	1/2	D	Cp.
Sand	9	--	J	1/3	D	
do.	92	--	J	1	D	
Gravel	67	--	T	7 1/2	Irr	Irrigates 12 acres. Pumped 4 hr at 60 gpm, 68-ft dd, L.
Gravel, "white"	16	--	P	1/2	D	
Gravel	64	--	J	1	D	
do.	12.0	4-28-49	P	--	D	
Sand	--	--	J	1	D	Cp.
Gravel	78	--	T	10	Irr	Pumped 100 gpm, 42-ft dd, L.
Sand	5.0	4-28-49	C	1/4	D	
Sand, black	30	--	J	1	D	Bailer test, 14-ft dd, L.
Gravel	86	--	T	1 1/2	D	Bailer test, 10-ft dd, Cp, L.
Sand	11.6	4-28-49	P	--	D	
--	9	--	J	1/3	D	Cp.
Gravel	78	4- -52	T	10	Irr	Pumped 140 gpm, 42-ft dd, L.
Sand, black	22	--	--	--	--	Bailer test, "no dd," L.
do.	37	--	--	--	--	Bailer test, "no dd," L.

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thick-ness (feet)
T. 3 N., R. 2 E.--Con.									
18D1	J. T. Pagel	Up.	205	Dr	220	8	190	42	5
								90	4
18H1	C. E. Rogers	Up.	220	Dg	18	30	18	--	--
18Q1	R. P. Marquette	Up.	200	Dr	45	6	--	--	--
19A1	Ernest Dunlap	S.	200	Dr	83	6	83	69	14
19B1	L. L. Demming	S.	210	Dr	66	6	66	58	8
19G1	H. L. McDowell	T.	170	Dr	31	6	20	28	3
19J1	A. Cummings	T.	210	Dg	36	36	36	--	--
19P1	W. S. Gilmore	Up.	255	Dr	119	6	119	--	--
19R1	C. Ramsden	Up.	205	Dr	80	6	80	--	--
20A1	K. Dubro	Up.	265	Dg	23	24-60	--	--	--
20C1	C. W. Parker	Up.	235	Dr	69	6	69	59	10
21A1	J. Shefek	Up.	290	Dr	143	6	--	143	--
21A2	W. Lane	S.	265	Dr	71	6	71	59	12
21A3	M. T. Radke	S.	265	Dr	139	6	139	120	19
21A4	S. E. Wellman	S.	265	Dr	148	8	148	128	20
21G1	L. Kanes	Up.	195	Dg	29	30	29	--	--
21K1	Fred Moore	Up.	290	Dr	290	12	290	253	37
21L1	G. W. Norene	Up.	280	Dr	145	6	--	--	--
22C1	Daly & Dickson	Up.	295	Dr	107	6	--	--	--
22F1	Andrew Erkkila	Up.	297	Dr	120	6	120	107	13

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Sand and gravel	--	----	T	5	Irr	Pumped 60 gpm, 20-ft dd, L.
Sand, coarse						
Sand, black	9	--	C	1/3	D	Cp.
Gravel	25	--	J	1/4	D	"Second water" at 45 ft.
Sand and gravel	30	9- -55	J	3	D	Pumped 60 gpm, dd not given, L.
Gravel	21	--	J	--	D	Bailer test, 31-ft dd, L.
Sand and gravel	13	--	C	1/3	D	Bailer test, "no dd," Cp, L.
Sand	28	--	J	1	D	Cp.
Gravel	61	--	--	--	--	Bailer test, 8-ft dd.
do.	15	--	J	1	D	Bailer test, 30-ft dd.
Sand	14	--	P	1/2	D	Cp.
Gravel	48	--	J	1/4	D	Bailer test, 20-gpm. Water reported to contain some iron. L.
do.	30	--	P	1 1/2	D	Cp, L.
do.	39	--	J	1/2	D	Bailer test, 24-ft dd, L.
Sand and gravel	74	5- -55	--	--	Irr	Pumped 115 gpm, 41-ft dd, L.
do.	77.2	6- -56	--	--	Irr	Pumped 75 gpm, 63-ft dd, L.
Sand	18.5	4-27-49	J	1/2	D	
Gravel	85	7- -55	--	--	--	Pumped 350 gpm, 13-ft dd, L.
do.	70	--	P	--	D	Cp.
do.	78	--	J	1	D	
do.	85	--	--	--	--	Bailer test, 11-ft dd, L.

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing Depth to top (feet)	Water-bearing Thickness (feet)
T. 3 N., R. 2 E.--Con.									
22G1	W. A. Ovall	Up.	298	Dg	22	30	22	--	--
22J1	Jacob Henkel	Up.	293	Dr	175	8	175	145	27
22N1	Ernest W. Krage	Up.	295	Dg	17	12	17	6	11
22N2	E. A. Erkkila	Up.	295	Dg	20	12	20	--	--
22Q1	J. N. Koski	Up.	297	Dg	17	48	--	--	--
23B1	J. Markkanen	Up.	300	Dg	45	30	45	--	--
23B2	Victor Denn	Up.	285	Dr	138	6	135	133	2
23D1	K. H. Halleck	Up.	292	Dr	93	6	--	--	--
23D2	W. F. Messner, Jr.	Up.	295	Dr	178	8	178	102	43
23F1	A. S. Kytola	Up.	295	Dg	13	30	--	--	--
23H1	Axel Pelto	Up.	295	Dr	194	8	193	186	8
23J1	E. Kreinbring	Up.	285	Dr	139	6	139	135	4
23J2	E. V. Kreinbring	Up.	295	Dr	195	10	195	135	5
23K1	F. H. Layman	Up.	295	Dr	120	6	--	--	--
24A1	H. Hosney	Up.	280	Dg	40	30	40	--	--
24D1	P. Uskoski	Up.	300	Dg	15	30	15	--	--
24L1	J. Bellcoft	Up.	285	Dg	16	30	16	--	--
24N1	W. F. Bennett	Up.	280	Dr	158	10	158	80	78
24R1	G. Hosney	Up.	275	Dg	17	30	17	--	--
25H1	Jack Bechill	Up.	261	Dr	111	6	111	65	46
25L1	Harry R. & Hilda E Hosney	Up.	275	Dr	305	8	295	106	42
								151	143
								294	11

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Sand	12.1	4-21-49	J	1/2	D	Cp.
Sand and gravel	70	4- -55	T	10	NU	Pumped 150 gpm, 140-ft dd, L.
Sand	6	--	--	--	Irr	Pumped 50 gpm, 7-ft dd.
--	9	--	C	2	Irr	Pumped 60 gpm, 10-ft dd.
Gravel	7	--	J	1/4	D	Cp
Sand	20	--	J	1/3	D	
Gravel	--	--	T	10	Irr	Irrigates 13 acres.
Sand	75	--	J	1/2	D	Cp.
Gravel, muddy	78	--	T	10	Irr	Pumped 128 gpm, 59-ft dd, L.
Sand	9	--	P	1/4	D	Cp.
Sand and gravel	62	7- -54	J	3	D,Irr	Pumped 200 gpm, 0-ft dd, L.
Sand, black	79	--	J	1	D	Bailer test, 20-ft dd, Cp, L.
Gravel	68	12- -54	T	10	Irr	Pumped 240 gpm, 85-ft dd, L.
do.	40	--	J	1 1/4	D	"No dd" after several weeks' pumping.
do.	19	--	P	1/2	D	
--	7.3	4-26-49	J	1/4	D	
Sand	4.9	4-22-49	P	1/4	D	Cp.
Sand and gravel	59	5- -52	T	30	Irr	Pumped 420 gpm, 73-ft dd, L.
Sand	6	--	J	1/4	D	Cp.
Gravel	51	--	T	1 1/4	--	Pumped 150 gpm, 40-ft dd, L.
Gravel, cemented	69	--	T	15	Irr	Pumped 300 gpm, 11-ft dd, L.
Sand, fine						
Sand, coarse						

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing Depth to top (feet)	Water-bearing Thickness (feet)
T. 3 N., R. 2 E.--Con.									
25M1	W. Rostich	Up.	276	Dg	12	30	12	--	--
26D1	J. L. Vall	Up.	290	Dg	12	30	12	--	--
26Q1	H. Cunningham	Up.	283	Dg	10	30	10	--	--
27E1	G. H. Benjamin	Up.	287	Dg	37	30	37(?)	--	--
27F1	W. D. Andrews	Up.	285	Dr	253	6	253	251	2
27F2	do.	Up.	285	Dr	295	12	295	258	21
27H1	V. S. Phipps	Up.	285	Dg	12	--	--	--	--
27J1	G. H. Billings	Up.	285	Dg	16	--	--	5	11
27Q1	W. M. Lahy	Up.	284	Dg	19	30	19	--	--
28A1	R. V. Somerell	Up.	286	Dr	164	6	163	150	14
28C1	A. Groth	Up.	290	Dr	160	6	--	--	--
28C2	Arthur A. Groth	Up.	285	Dr	247	8	247	212	33
28G1	George Jaglski	Up.	290	Dr	147	6	--	--	--
28G2	H. L. Grantham	Up.	285	Dr	160	6	160	155	5
28K1	T. Baker	Up.	287	Dr	134	6	134	--	--
28N1	M. Zimmerman	Uc.	215	Dr	70	4	--	--	--
28P1	J. Hebert	Uc.	257	Dr	170	6	170	169	1
28Q1	A. Adams	Up.	272	Dr	131	6	126	124	7
29A1	S. W. Femlen	Uc.	210	Dr	58	6	--	--	--
29B1	F. W. Fleming	S.	190	Dg	26	30-12	26	--	--
29D1	George Brown	Uc.	192	Dg	17	--	--	--	--
29G1	H. G. Folkerts	Uc.	210	Dg	14	12	--	4	10

in Clark County, Wash.--Continued

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Sand and gravel	9	--	C	1/4	D	Cp.
Sand	3	--	C	1/4	D	Cp.
--	6.55	4-18-49	P	--	D	
--	32	--	J	1/4	D	Cp.
Gravel	80	--	--	--	Irr	Pumped 4 hr at 170 gpm, 27-ft dd, L.
Sand and gravel	74	3- -53	T	50	Irr	Pumped 500 gpm, 52-ft dd, L.
Sand	5	--	J	1 1/2	--	
do.	3	--	C	5	Irr	Trench 30 ft by 50 ft, pumped 125 gpm, 7½-ft dd.
do.	13	--	J	1/4	D	Cp.
Gravel	84	--	J	1/2	D	Bailer test, 12-ft dd, L.
do.	50(?)	--	P	3/4	D	
Sand and gravel	82	--	--	--	Irr	Pumped 120 gpm, L.
Sand	87	--	J	3/4	D	
Gravel	--	--	P	1	D	Bailer test, "no dd," L.
do.	74	--	J	1	--	Bailer test, 20-ft dd.
--	9(?)	--	P	1	D	Cp.
Gravel	70	--	J	1/2	D	Bailer test, 10-ft dd, Cp, L.
Sand, black	86	--	J	1	D	Bailer test, 15-ft dd, L.
Gravel	17	--	C	1	D	
--	2	7- -54	C	2 1/2	D	Pumped 245 gpm, 15-ft dd, L.
Sand	11	--	P	1/3	D	Cp.
Sand, coarse	1	--	C	5	D,Irr	Pumped 100 gpm, 7-ft dd.

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing Depth to top (feet)	Water-bearing Thickness (feet)
T. 3 N., R. 2 E.--Con.									
29G2	H. G. Folkerts	Uc.	190	Dg	17	36	17	--	--
29H1	L. D. Flindt	Up.	195	Dg	23	36	23	19	4
29K1	H. G. Folkerts	Uc.	210	Dg	18	30	--	--	--
29M1	A. Naegeli	Up.	224	Dr	115	6	115	--	--
29Q1	John J. Birren	Uc.	195	Dg	21	36	--	--	--
30A1	H. E. Hallowell	Up.	210	Dg	12	--	--	--	--
30C1	C. M. Coffey	Up.	242	Dr	110	6	109	105	5
30K1	Evelyn Berger	Up.	240	Dr	107	6	107	100	7
30R1	R. M. Ward	Up.	243	Dg	25	30	25	--	--
31C1	I. B. Jones	Up.	255	Dg	22	6	22	--	--
31D1	D. Berger	Up.	236	Dr	52	8	52	--	--
31F1	A. M. Goetz	Up.	260	Dr	35	11	35	22	13
31J1	W. Schinn	Up.	247	Dg	18	30	18	--	--
31M1	J. L. Lee	Up.	255	Dr	35	6	35	15	20
31P1	N. B. Johnston	Up.	260	Dg	6	288 by 288 pit	--	--	--
32G1	C. Sodelund	Uc.	200	Dg	20	12	--	--	--
32H1	L. B. Slothower	Uc.	205	Dn	23	2	--	--	--
32K1	N. E. Humphreys	Uc.	200	Dg	10	36	--	--	--
32N1	A. Howard	Up.	247	Dg	14	10	--	--	--
32Q1	A. D. Schuller	Up.	204	Dg	15	16	15	--	--
33B1	Allan Cody	Up.	275	Dr	165	6	--	--	--
33K1	Homer Mosier	Uc.	222	Dr	107	6	107	103	4

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Gravel	5	--	J	1/2	D	Cp.
Sand, coarse	9	8- -53	C	3	Irr	Pumped 60 gpm, 5½-ft dd, L.
do.	7	--	C	3	Irr	Pumped 90 gpm, 2-ft dd.
Gravel	44	--	J	2	D	Bailer test, 28-ft dd, L.
--	--	--	--	--	Irr	
Sand	8	--	J	1/4	D	Cp.
Gravel	77(?)	--	J	1	D	Bailer test, 7-ft dd, L.
do.	40	--	J	3	Irr	Pumped 68 gpm, 55-ft dd, L.
Sand	5	--	J	1/3	D	Cp.
Gravel	15.5	4-20-49	N	--	--	
Sand	42	--	J	1/3	D	
do.	--	--	--	--	Irr	
Gravel	12	--	J	1/2	D	
Sand	12	--	J	2	D	Pumped 40-gpm, 24-ft dd, L.
--	--	--	C	10	Irr	
Sand	7.2	7-14-49	C	2	Irr	Pumped 3-hr at 60 gpm, 11-ft dd, Cp.
do.	14½	--	C	1/3	D	
--	6	--	C	5	Irr	Pumped 100 gpm, 1½-ft dd.
Gravel	9	--	C	1/3	D	Cp.
--	4	7- -53	--	--	Irr	Pumped 350 gpm, 4-ft dd.
Gravel	95	--	P	1	D	
Sand, black	38	--	J	1	D	Bailer test, 29-ft dd, Cp, L.

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thick-ness (feet)
T. 3 N., R. 2 E.--Con.									
33M1	J. M. Harrington	Uc.	213	Dr	87	5	--	--	--
33P2	J. Ingstrom	Uc.	220	Dr	77	6	77	75	2
33Q1	E. D. Andrew	Uc.	220	Dg	30	30	30	--	--
34D1	M. Chapman	Up.	283	Dr	132	6	--	--	--
34E1	H. H. Cady	Up.	275	Dr	122	6	--	--	--
34L1	R. O. Woster	Up.	260	Dr	135	6	134	126	9
34M1	J. H. Wells	Up.	265	Dr	129	6	--	--	--
34M2	H. E. Wheelock	Up.	265	Dr	120	6	120	--	--
34N1	Frank Campbell	Up.	260	Dr	128	6	128	116	12
34P1	R. T. Gould	Up.	252	Dr	146	6	126	124	22
34P2	Henry Thomas	Up.	270	Dr	135	6	133	130	5
35C1	Ed Lematta	Up.	283	Dr	77	4	--	--	--
35E1	Frank Leahy	Up.	275	Dg	18	30	18	--	--
35H1	E. F. Dunning, Jr.	Up.	270	Dg	8	--	--	5	3
36D1	C. Donaldson	Up.	280	Dg	42	33	42	--	--
36H1	Anna Savage	Up.	257	Dg	16	60	16	--	--
36R1	R. J. Davis	Up.	255	Dg	11	36	11	--	--
T. 3 N., R. 3 E.									
3A1	W. A. Thompson	S.	750	Dg	12	--	--	--	--
3Q1	F. Marini	S.	560	Dg	35	--	--	--	--

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Gravel	21	--	J	1/2	D	
do.	27	--	P	1/2	D	L.
do.	23	--	J	1/3	D	
do.	57	--	J	3/4	D	
do.	60	--	J	1	D	Cp.
Sand, black	79	--	--	--	--	Bailer test, 9-ft dd, L.
Sand	66	--	P	3/4	D	
do.	82	--	--	--	--	Bailer test, 7-ft dd.
Gravel	73	--	J	1 1/2	D	Bailer test, 30-ft dd, L.
Boulders and gravel	65	--	J	--	D	Bailer test, "no dd," L.
Sand, black	80	--	--	--	--	Bailer test, 15-ft dd, Cp, L.
Gravel	53	--	J	1/3	D	Cp.
do.	9	--	C	1/2	D	
do.	4½	--	C	--	Irr	Trench 30 ft by 15 ft, pumped 100 gpm, 1½-ft dd.
--	22	--	J	1	D	Water temp 49°, Cp.
Sand	8.5	4-15-49	J	1/2	D	
do.	4.10	6- 8-49	C	--	D,Irr	Encountered "hardpan" (cemented gravel?). Irrigates small garden, Cp.
Clay	8.3	7-29-49	P	1/4	D	
Rock	31.5	7-29-49	N	--	--	Cp.

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thickness (feet)
T. 3 N., R. 3 E.--Con.									
4A1	B. E. Elvestrom	S.	420	Dg	18	30	18	--	--
4M1	F. H. Getchell	S.	435	Dg	19	30	--	--	--
5K1	H. Handschin	S.	395	Dg	26	30	--	--	--
6G1	E. G. King	S.	480	Dg	28	--	--	--	--
7L1	Irving Matson	S.	315	Dr	160	6	--	--	--
8J1	W. P. Harris	Ub.	540	Dg	40	48	--	--	--
8L1	J. Miller	Ub.	530	Dg	31	60	--	--	--
8M1	H. Harlow	Ub.	550	Dg	46	60	--	--	--
8Q1	W. E. Weisenborn	Ub.	540	Dr	138	6	138	135	3
9K1	W. Arola	H.	650	Dg	63	--	--	--	--
16Q1	Hannes Eddy	S.	510	Dr	60	6	--	50	10
17L1	Z. S. Sakrison	Ub.	530	Dr	112	6	--	--	--
17N1	William Ahola	Ub.	530	Dr	102	6	102	93	9
18P1	Hockinson School	Up.	315	Dr	85	6	--	--	--
18R1	S. K. Bain	Ub.	498	Dr	108	6	103	100	8
19A1	Fred Laws	H.	480	Dr	167	10	145	--	--
19C1	Hockinson Co-op	Up.	295	Dg-Dr	142	6-4	142	--	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Rock	14.8	8- 1-49	J	1/2	D	
Clay	13.8	8- 1-49	N	--	--	Cp.
Sand and gravel	22.8	8- 1-49	J	1/3	D	
Gravel	24.6	8- 2-49	J	1/2	D	Cp.
--	--	--	P	1	D	Report can be pumped dry.
Sand	32.6	7-26-49	P	3/4	D	
Gravel	21.6	7-26-49	P	1/4	D	
do.	41.6	7-26-49	J	3/4	D	
Sand, black	110	--	J	1 1/2	D,Ind	Bailer test, 12-ft dd. Supplies 2 houses and sawmill, L.
Sand	41.2	7-26-49	J	--	D	
Rock, volcanic	--	--	J	1/2	D,S	Report plenty water for large dairy and chicken farm.
Rock(?)	62	--	J	--	D	Report large supply.
Sand	67	--	J	1	D	Bailer test, 26-ft dd, Cp, L.
--	31	--	P	10	Inst	Reported to have been pumped for long periods at 20 gpm.
Sand, black	75	--	J	1	D	Bailer test, 5-ft dd, L.
Gravel	47.6	3-18-52	--	--	--	L.
--	--	--	--	--	Ind	Report large supply, but turbid. Used for cooling.

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thick-ness (feet)
T. 3 N., R. 3 E.--Con.									
19D1	A. Schimpf	Up,	270	Dr	68	6	68	60	8
19F1	Charles Lindstrom	Up,	290	Dg	55	36	55	--	--
19J1	C. R. Whitlock	Ub,	468	Dr	192	6	--	--	--
19K1	Frank Crow	Up,	302	Dr	79	6	--	75	4
20B1	Earl Bruley	Ub,	525	Dg	27	48	--	--	--
20C1	Ivan Lucas	Ub,	525	Dg	30	36	30	--	--
20K1	Henry Schlichting	Ub,	505	Dg	32	10	32	--	--
21M1	John Huhtala	S,	527	Dr	94	6	94	85	9
28D1	Watt Colson	Ub,	484	Dr	160	8	50	50	--
29C1	Warren Powell	Ub,	470	Dg	31	48	--	--	--
31B1	Oliver Kivinen	S,	295	Dr	125	6	--	90	35
31D1	E. Matson	Up,	257	Dg	13	30	13	--	--
31G1	Matson Brothers	Up,	270	Dg	44	42	--	44	--
31H1	Henry Schrader	S,	375	Dg	22	48	--	--	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Gravel	21.60	6- 9-49	J	1/2	D	Water temp 53.5° . Pumped 18 gpm, 15-ft dd, L.
--	10	--	P	1/4	D	Report adequate supply which never fails.
Sand(?)	--	--	P	3/4	D	Report large supply.
Gravel	60	--	--	--	S,Irr	Yellow clay to 75 ft. Report water contains too much iron for drinking.
--	25.34	6- 7-49	J	1/2	D	
Gravel and clay	22	--	J	1/4	D,S	Pumped 5 gpm, 4-ft dd.
Sand(?)	20.96	6- 9-49	N	--	D	
Gravel, cemented	20	--	J	1	D	Pumped 15 gpm, 25-ft dd, L.
Rock, volcanic	9.14	6- 7-49	C	1/3	D,S	Pumped 4 hr, "no dd," Cp.
--	23.61	6- 9-49	C	1/4	D	Report good supply of soft water.
Gravel, hard(?)	--	--	J	1	D	Clay to 90 ft. Water reported to be soft, with no iron.
--	7.41	6- 8-49	--	--	D	Water reported to have poor taste. Report can be pumped dry. Cp.
Sand and gravel	6	--	N	--	--	Blue clay to 44 ft. Report very large supply.
--	19.13	6- 8-49	C	1/2	D	Water reported to be soft.

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thickness (feet)
T. 3 N., R. 3 E.--Con.									
31J2	Agda Pietila	S,	297	Dr	121	6	121	--	--
31J3	Andrew Cook	Up,	297	Dr	60	6	--	--	--
31K1	Winfred Matson	Up,	278	Dg	36	48	--	36	--
31P1	Harry Lawson	Up,	255	Dg	15	30	14	--	--
32A1	Andrew Hautala	Ub,	460	Dg	22	30	22	--	--
32D1	Nick Antila	S,	415	Dg	22	48-60	4	--	--
32H1	Cook Brothers	Ub,	440	Dg	20	48	--	20	--
32K1	Ray Hook	S,	430	Dg	26	48	8	--	--
32N1	C. R. Ellenwood I. M. Brown	Up,	275	Dr	66	6	66	62	4
32P1	E. E. Foreman	S,	310	Dg	15	600	--	--	--
33K1	G. Fimmel	S,	383	Dg	17	24	17	17	--
33M1	Cook Bros. Dairy	Ub,	460	Dg	18	48	--	--	--
T. 4 N., R. 1 W.									
12H1	H. D. Perry	S,	160	Dg	17	30	--	--	--
13J1	H. Hoord	S,	80	Dg	14	48	--	--	--
13Q1	N. P. R.R.	T,	40	Dr	109	12-10	109	105	4
T. 4 N., R. 1 E.									
1J1	I. D. Eagle	Up,	262	Dg	45	42	--	--	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Sand and gravel	60	--	J	1	D	Pumped 25 gpm, "no dd."
do.	40	--	J	1/2	D	Report plenty of water.
Sand	24	--	J	1	D	Soil from 0 to 8 ft; cemented gravel from 8 to 32 ft; sand from 32 to 36 ft.
Clay and gravel	9.30	6- 7-49	J	1/4	D	
--	9.44	6- 7-49	P	1/4	D	
--	14.75	6- 8-49	J	--	D	
Sand, black	9.60	6- 7-49	N	--	--	
Gravel, cemented	20	--	J	1/2	D	Layer of round boulders at 12 ft. Report good supply.
Sand, black	41.00	6- 7-49	J	1/2	D	Bailer test, "no dd," L.
--	2	--	C	1 1/2	Irr	Pumped 100 gpm, 4-ft dd.
Clay and gravel	15.35	5- 4-49	C	--	D	
do.	4.62	5- 4-49	P	--	S	
Gravel	15.2	9- 9-49	P	--	D	
do.	4.5	9- 9-49	J	1/2	D	
Gravel and sand	36	9- 9-49	T.	5	Ind	Pumped 154 gpm, 27-ft dd, L.
--	43.6	8-31-49	J	1/3	D	

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thick-ness (feet)
T. 4 N., R. 1 E.--Con.									
1Q1	William Beck	Ub.	235	Dr	55	6	--	--	--
2B1	K. E. Anderson	Ub.	300	Dr	212	8	212	--	--
2D1	T. V. Doizab	S.	140	Dg	28	36	--	--	--
2H1	H. R. Buckley	Ub.	178	Dg	54	30	--	--	--
3F2	N. A. Rashford	S.	90	Dg	18	36	--	--	--
4L1	E. D. Taylor	Up.	235	Dg	24	--	--	--	--
4N1	H. Stanley	Up.	267	Dr	325	6	--	--	--
5E1	L. R. Hussa	Up.	235	Dr	300	8	299	296	4
5H1	G. Huston	Up.	215	Dr	275	6	--	--	--
5Q1	D. Smith	S.	230	Dg	15	--	--	--	--
7H1	E. Johnson	Up.	252	Dr	359	6-4	359	--	--
7Q1	Arthur Whitler	Up.	200	Dr	550	6-4	459	--	--
7R1	J. O. Downing	Up.	255	Dr	203	6	203	188	15
8M1	Charles L. Fisher	Up.	255	Dr	406	6	406	--	--
8N1	W. Darr	Up.	243	Dr	257	6	--	--	--
9M1	A. L. Spencer	Up.	264	Dr	130	6	--	--	--
9R1	I. Winiger	Up.	280	Dg	45	--	--	--	--
10N1	N. Anderson	S.	200	Dg	18	42	--	--	--
11B1	O. P. Lewellen	S.	120	Dr	135	6	--	--	--
11B2	do.	S.	40	Dr	141	6	--	--	--
11G1	do.	Uc.	16	Dr	45	6(?)	--	--	--
12C1	W. E. Keys	S.	205	Dr	184	6	--	--	--
12G1	D. F. Shattuck	Up.	210	Dr	190	--	--	--	--
12G2	R. E. Jenkins	Up.	210	Dr	200	6	--	--	--
13J1	William C. Smith	Fp.	30	Dg	6	36	--	--	--

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Gravel	--	--	--	1/3	D	
--	160	2- -53	J	1 1/2	D	
--	21.3	8-30-49	J	1/3	D	
Clay	48.3	8-16-49	J	1	D	
--	14.6	9- 6-49	--	--	--	
Clay	17.3	9- 9-49	P	1/4	D	
Sand	--	--	P	3	D	
Gravel and sand	217	--	T	--	D	Cp, L.
"Clay," blue	150	--	P	1/2	D	
Gravel	8.5	9- 9-49	P	--	D	
do.	--	--	P	2	D	Bailer test, "no dd," L.
--	--	--	N	--	NU	Report 500 gallons a day. L.
Sand	--	--	P	3/4	D	Pumped 2½ gpm, L.
do.	235	--	P		D	Pumped 10-gpm, 15-ft dd, L.
Gravel	223(?)	--	P	3/4	D	Pumped 7 gpm, L.
Sand	50	--	P	1	D	
do.	42.2	9- 9-49	P	1/4	D	
Clay	13.2	9- 9-49	P	1/4	D	
--	--	--	--	--	--	Could not develop, L.
--	--	--	--	--	--	Do.
--	--	--	--	--	D	Bailed 2½ gpm, L.
Gravel	144	--	P	1 1/2	D	
--	--	--	T	1	D	
--	160	--	--	--	--	Water reported corrosive.
--	2½	--	--	--	Irr	Pumped at 364 gpm, 1½-ft dd.

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing: Depth to top (feet)	Water-bearing: Thickness (feet)
T. 4 N., R. 1 E.--Con.								
12R1	A. Weber	Up, 210	Dg	31	30	--	--	--
15E1	T. Richards	Up, 280	Dg	21	30	--	--	--
15P1	G. G. Pittman	Up, 285	Dr	360	6	--	--	--
16C1	A. W. Sundvick	Up, 272	Dr	274	6	274	258	14
16D1	H. Weston	Up, 265	Dr	277	6	277	256	14
16H1	S. D. Zimmerly	Up, 280	Dr	630	6-3	630	--	--
16Q1	E. Hardt	Up, 270	Dg	30	48	--	--	--
17E1	M. Starkey	Up, 260	Dg	17	--	--	--	--
17H1	C. B. Moffett	S, 225	Dr	660	6-5	660	--	--
17H2	do.	S, 225	Dr	209	6	209	190	19
17H3	do.	S, 200	Dr	200	12-6	200	173	27
17N1	D. G. Lane	Up, 265	Dg	11	36-60	--	--	--
17Q1	Paul and Marion Bellows	S, 210	Dr	360	6	360	190	170
18E1	O. J. Shirley	S, 135	Dg	40	--	--	--	--
19E1	Town of Ridgefield	S, 40	Dg	35	120	34	8	27
19E2	do.	S, 35	Dg	35	120	35	14	--
19E3	do.	S, 35	Dr	65	10	65	50	6
19K1	G. Benedict	S, 55	Dr	117	6	--	--	--
19R1	A. F. Frewing	S, 240	Dr	150	6	150	145	5
20C1	Pearl Talbert	Up, 260	Dr	343	6	343	310	25
20E1	E. R. Northup	Up, 220	Dg	32	48	--	--	--

in Clark County, Wash.--Continued

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Clay	30.8	8-31-49	J	1/3	D	
Sand	13.3	9- 9-49	J	1/3	D	
do.	230	--	P	2	D	
do.	250	--	P	1 1/2	D	Cp, L.
do.	250	--	P	3/4	D	L.
do.	190	--	P	--	D	Cp.
do.	12	--	C	1/3	D	
Gravel	15.6	9- 9-49	P	1/4	D	
--	--	--	N	--	NU	Report no water, L.
Sand	194	--	P	--	D	Pumped 30 gpm, L.
do.	173	--	P	5	D	Pumped 30 gpm, Cp, L.
do.	1.8	5-11-49	C	1/2	D	
Sand, fine	174	5- -53	T	10	D, Irr	Pumped 4 hr at 53 gpm, 141-ft dd.
Gravel, cemented	33.5	9- 9-49	J	1/3	D	
Gravel, coarse	22	--	T	20	PS	Pumped 4 hr at 250 gpm, 11-ft dd, Water temp 51° , Cp.
Gravel	--	--	C	45	PS	Pumped 12 hr at 250 gpm, 6-ft dd.
do.	38	5- -55	--	--	PS	Pumped 150 gpm, 16-ft dd, L.
do.	52	--	J	1/3	D	Cp.
Gravel and sand	122	9- -55	--	--	D	Pumped 36 gpm, 6-ft dd, L.
Sand	229	--	T	--	Irr	Pumped 60 gpm, 78-ft dd, L.
do.	21	--	C	3/4	D	Cp.

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thickness (feet)
T. 4 N., R. 1 E.--Con.									
20F1	C. Bramlett	Up.	248	Dg	9	36	--	--	--
20G1	John Ryf	Up.	260	Dr	227	6	227	--	--
21A1	A. Kapus	Up.	272	Dr	196	6	--	--	--
21E1	F. Forsberg	Up.	258	Dr	119	6	--	--	--
21J1	C. Greeley	Up.	283	Dr	210	6	--	--	--
21L1	H. Lahti	Up.	255	Dr	202	6	--	--	--
22A1	Jules Kercheart	Up.	280	Dr	601	8	601	--	--
22H1	F. Schweizer	Up.	290	Dr	571	4	--	--	--
22L1	J. Glarum	Up.	280	Dg	18	48	--	--	--
22N1	D. Hallowell	Up.	270	Dr	185	6	--	100	--
22N2	J. Timms	Up.	275	Dr	174	6	174	169	5
23A1	William McKee	Up.	300	Dr	340	8	340	312	11
23B1	L. Ogle	Up.	295	Dg	31	30	--	--	--
23D1	G. Coker	Up.	295	Dg	20	30	--	--	--
23H1	R. L. Deaver	Up.	295	Dg	18	48	--	--	--
23R1	R. E. Walden	Up.	285	Dg	18	36	--	--	--
25H1	M. W. Yankee	Up.	218	Dr	63	6	--	--	--
26C1	A. Senti	Up.	260	Dg	18	--	--	--	--
26H1	J. Lindvlon	Up.	275	Dr	155	6	--	--	--
26M1	C. A. Robinson	Up.	265	Dr	672	8	672	120	165

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Gravel	5.9	5-11-49	C	1/4	D	
Gravel, cemented	--	--	P	1 1/2	D	Pumped 10 gpm, L.
Sand	189	--	P	1	D	
Gravel	110	--	P	1	D	
Sand	180	--	P	3	D,S	
Gravel	174	--	P	1	D	Cp.
--	--	--	T	5	D,S	
Sand	250	--	T	5	D,S	Used for dairy, Cp.
do.	14	--	C	1/4	D	
Gravel	158	--	--	--	--	Cemented gravel from 85 to 185 ft. Pumped 1 hr at 30 gpm, 12-ft dd.
Sand and gravel	155	--	--	--	--	Bailer test, 4-ft dd, L.
Sand, coarse	275	--	T	6	Irr	Pumped 100 gpm, 10-ft dd, L.
Sand	17	--	C	1/3	D	Cp.
Clay	6.1	5-10-49	J	1/2	D	
Sand	5.5	--	P	1/4	D	Cp.
do.	15.3	5- 5-49	P	1/3	D	
Gravel	33	--	J	1/3	D	Cp.
Sand	13	--	C	1/4	D	Cp.
Gravel, cemented	120	--	J(?)	1	D	
Sand and gravel	96.70 102.95	4-23-51 12-13-55	Sub	5	Ind	Water reported to be high in iron and CO_2. Water temp 52° . Test pumped 2 hr at 150 gpm, L.

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thickness (feet)
T. 4 N., R. 1 E.--Con.									
27P1	Frank Bowles	Up.	257	Dr	106	6	106	82	24
27R1	J. H. Tucker	Up.	270	Dr	131	6	131	125	6
28D1	G. E. Moore	Up.	270	Dr	180	6	--	--	--
28F1	A. Mann	Up.	235	Dg	31	30	--	--	--
28M1	H. Wells	S.	210	Dg	16	30	--	--	--
28R1	J. H. Bloom	S.	225	Dr	134	6	134	124	10
29F1	J. E. Royle	S.	180	Dr	131	6	131	110	21
29G1	Fred Zink	Up.	258	Dr	142	6	142	125	17
29M1	D. F. Wells	Up.	285	Dr	228	8-6	228	189	4
								198	30
29N1	L. Groat	Up.	280	Dr	187	6	--	--	--
31B1	L. Anderson	Up.	260	Dg	5	60	--	--	--
32B1	B. Bartell	Up.	280	Dr	154	6	--	--	--
32J1	--Lytle	Up.	270	Dr	157	6	157	--	--
32L1	F. O. Hastings	Up.	275	Dg	12	48	--	--	--
32R1	E. C. Condon	Up.	265	Dr	155	6	--	--	--
32R2	A. Sandmann	Up.	275	Dr	160	6	157	155	5
33B1	Reuben Schwantes	Up.	228	Dg	25	48	--	--	--
33J1	A. W. Bottemiller	Up.	268	Dg	24	48	--	--	--
33J2	do.	Up.	262	Dr	133	6	133	130	3
33M1	E. Sylvester	Up.	275	Dr	125	6	--	--	--
34D1	E. L. VanVolkenberg	Up.	225	Dg	22	48	--	--	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Sand and gravel	82	6-3-49	T(?)	1 1/2	D	Bailer test, 4-ft dd, Cp, L.
Sand, black	73	--	J	1	D	Bailer test, 11-ft dd, Cp, L.
Gravel	120	5-10-49	P	2	--	Pumped 8 hr, "no dd."
Clay	6.6	5-10-49	P	--	D	
Gravel	6.2	5-10-49	C	1/3	D	
do.	94	--	J	1	D	Bailer test, 13-ft dd, L.
do.	71	--	P	2	D	Bailer test, 36-ft dd, L.
do.	113	--	P	1	D	Bailer test, 9-ft dd, Cp, L.
do. Sand and gravel	170	12- -53	--	--	--	Pumped 40 gpm, 46-ft dd, Well originally drilled to 308 ft, L.
Gravel	170	--	P	1	--	
Sand	0	--	C	1/2	D	Cp.
Gravel	137	--	P	3/4	D	Cp.
do.	141	--	P	1 1/2	D	Bailer test, 12-ft dd, L.
do.	3	--	C	1/2	D	
do.	146	--	J	1/2	D	
Sand, black	97	--	P	1	D	Bailer test, 12-ft dd, L.
Sand	19	--	C	1/2	D	
Clay, sandy	12	--	C	1/2	D	
Gravel	98	--	J	1 1/2	D	Bailer test, 19-ft dd, L.
do.	40	--	P	1	D	Cp.
do.	4	5-10-49	--	1/3	D	Cp.

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thick-ness (feet)
T. 4 N., R. 1 E.--Con.									
34F1	A. Bottemiller	Up.	260	Dg	15	30	--	--	--
34M1	E. Leopold	Up.	275	Dr	127	6	126	116	11
35H1	L. Edwards	Up.	283	Dr	115	6	--	--	--
35J1	S. J. Gurtle	Up.	281	Dr	129	6	--	--	--
35N1	Albert Ost	Up.	275	Dr	129	6	129	126	3
35R1	E. DeMaster	Up.	287	Dr	131	6	--	--	--
36B1	Mrs. Johnson	S.	230	Dr	127	8	115(?)	115	13
36C1	P. Armstrong	H.	240	Dg	6	--	--	--	--
36J1	H. A. Simonson	Up.	235	Dg	18	30	--	--	--
36L1	W. H. Eccleston	Up.	295	Dr	147	6	147	--	--
36M1	T. Engleking	Up.	285	Dr	135	6	133	130	5
36N1	V. Bales	Up.	292	Dr	145	6	143	140	5
T. 4 N., R. 2 E.									
2A1	F. Wayne	S.	486	Dg	24	30	--	--	--
4L1	H. L. Batchelder	Ub.	510	Dg	22	24	--	--	--
6L1	C. Abrahamson	S.	320	Dg	9	36	--	--	--
6N1	C. Ottinger	S.	400	Dg	18	--	--	--	--
7J1	C. C. Anderson	Up.	270	Dg	15	30-6	--	--	--
8K1	H. Jaster	S.	330	Dr	129	6	104	--	--
9E1	John Anderson	S.	430	Dr	495	6	--	--	--
9H1	D. D. Gross	S.	590	Dg	23	36	--	--	--
10R1	Gearhardt Person	S.	460	Dg	36	--	--	--	--
11A1	H. Hartlow	S.	380	Dg	16	--	--	--	--

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Sand	12.45	5-13-49	P	--	D	
Sand and gravel	98	--	--	--	--	Bailer test, 12-ft dd, L.
Gravel	55	--	J	1	D	
do.	90	--	J	1	D	Cp.
Gravel (?)	94	--	--	--	--	Bailer test, 3-ft dd, Cp, L.
Sand	91	--	P	3/4	D	Cp.
Gravel	62	--	T	7 1/2	Irr	Pumped 75 gpm, 46-ft dd, L.
--	0	--	P	1	--	
Sand	4.2	5- 5-49	J	1	D	Cp.
do.	127	--	J	2	D	Bailer test, 6-ft dd.
Sand, black	105	--	P	2	D	Bailer test, 12-ft dd, L.
do.	110	--	P	2	D	Bailer test, 16-ft dd, L.
--	14.2	8-22-49	P	1/4	D	
Clay	16.2	8-22-49	--	--	D	
Sand	0.5	8-31-49	--	--	D	
Gravel	14.2	8-31-49	P	1/4	D	
Sand	7.5	8-31-49	--	--	--	
do.	94	--	N	--	NU	Can be bailed dry, L.
--	--	--	N	--	De	Report very salty water at 294 ft. L.
Sand	19.6	8-22-49	J	3/4	D	
--	11.6	8-22-49	P	1/4	D	
Sand and gravel	12.1	8-22-49	P	--	D	

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thick-ness (feet)
T. 4 N., R. 2 E.--Con.									
11F1	R. Pender	S,	404	Dr	328	6	280	--	--
11H1	R. C. Baker	S,	425	Dg	31	30	--	--	--
12K1	C. Odem	S,	707	Dr	75	6	--	--	--
13G1	A. Blaker	S,	390	Dg	29	36	--	--	--
14A1	G. Shileika	S,	430	Dg	30	36	--	--	--
16B1	J. L. Hockinson	S,	335	Dr	153	6	--	--	--
16B2	do.	S,	335	Dr	196	6	--	--	--
16D1	Fred Prew	S,	290	Dr	125	6	125	116	9
16H1	K. Ritzau	S,	360	Dr	155	6	--	--	--
16P1	M. Besich	Up,	293	Dr	112	6	111	104	8
16R1	R. M. Brooks	Up,	315	Dr	75	6	--	--	--
17B1	A. B. Shell	Up,	296	Dr	119	6	--	--	--
17L1	A. H. Bridge	Up,	260	Dg	19	30	--	--	--
17N1	H. Ogden	Up,	215	Dg	75	30	--	--	--
17R1	Carl Wooldridge	Up,	281	Dr	105	6	--	--	--
18D1	H. Maxwell	Up,	230	Dr	183	6	--	--	--
18M1	W. C. Smith	Fp,	40	Dg	5	36	--	--	--
19B1	W. E. Ennis	Fp,	50	Dg	11	30	--	--	--
19C1	William C. Smith	Fp,	50	Dg	15	36	--	--	--
19J1	M. L. Amy	Fp,	67	Dg	11	30	--	--	--
20A1	Lloyd Webb	Up,	245	Dr	71	6	71	56	15
20C1	B. Norton	Up,	270	Dr	101	6	--	--	--
20Q1	C. H. Defrees	Fp,	90	Dr	68	6	--	--	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Clay, blue	66(?)	--	P	1/2	D	Pumped 250 gallons per day, L.
--	24.3	8-18-49	P	1/4	D	
Clay	45	--	J	1/2	--	
do.	25.5	8- 3-49	C(?)	1/2	D	Cp.
--	23.2	8-18-49	J	1/3	D	
Gravel	--	--	--	--	--	Report struck water at 101 ft; water drained out.
Sand	--	--	--	--	--	Report no water.
do.	95	--	P	--	--	Bailer test, 10-ft dd, L.
Gravel	142	--	T(?)	1 1/2	D	
do.	92	--	J	1	D	Bailer test, 8-ft dd, Cp, L.
Sand	65.2	5- 3-49	J	2	D	Cp.
do.	--	--	P	1/2	D	
Clay	13.5	8-22-49	P	1/4	D	
Gravel	69	--	J	3/4	D	
do.	80	--	J	3/4	D	
Sand	163(?)	--	P	1	D	Pumped 7½ gpm, L.
Gravel	1.7	8-31-49	J	1/3	D	
do.	7	--	C	1/4	D	
--	12	--	--	--	Irr	Pumped at 147 gpm.
Gravel	8.0	5- 3-49	J	1/4	D	Cp.
do.	39.0	10- 3-50	J	1/2	D,S	Bailer test, 7-ft dd, L.
do.	57	--	J	2	D	Cp.
do.	9	--	P	1	D	

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
							Depth to top (feet)	Thick-ness (feet)
T. 4 N., R. 2 E.--Con.								
21B1	L. Green	Up., 260	Dr	73	6	73	67	6
21C1	L. Wooldridge	Up., 250	Dr	55	6	55	51	4
22E1	H. M. Nelson	Up., 260	Dr	172	6	172	169	3
22H1	Lewisville Park	T., 165	Dr	48	10-14(?)	48	28(?)	10
23B1	L. C. Gulde	S., 475	Dr	137	6	--	--	--
23D1	E. Potter	S., 290	Dg	24	36	--	--	--
24Q1	H. Jaske	Ub., 600	Dr	87	6	24	--	--
24R1	Andy Hansen	S., 540	Dr	180	8	159	45	--
25K1	R. W. Linn	S., 420	Dr	61	6	59	59	2
25M1	F. Osban	S., 385	Dg	40	36	--	--	--
26A1	C. Kunz	S., 414	Dr	121	6	--	--	--
26F1	E. Meyer	S., 376	Dr	106	6	--	--	--
26K1	M. F. Adams	S., 385	Dr	107	6	--	--	--
26L1	W. A. Nelson	S., 384	Dr	114	5	112	112	2
26N1	L. Bodin and G. Caines	S., 340	Dr	139	6	139	--	--
26Q1	Lester Burkey	S., 360	Dr	56	6	--	46	10
26Q2	N. B. Edwards	S., 360	Dr	131	6	--	119	4
27Q1	--Brosseau	S., 314	Dr	107	6	--	--	--
28M1	H. Adam	Up., 230	Dr	83	6	--	--	--
28Q1	H. Meyers	Up., 250	Dr	89	6	--	--	--

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Sand, black	47	--	J	1/2	D	Bailer test, "no dd," L.
Gravel	25	--	--	--	--	Bailer test, 13-ft dd, L.
--.	160	--	J	3	D	Pumped 96 hr at 12½ gpm, "no dd," Cp, L.
Sand	22	--	T	5	Inst Irr	Pumped 130 gpm, 15-ft dd. Log of 240-ft test hole.
Gravel	107	--	J	3/4	D	
do.	4	--	J	1/2	D	Cp.
Lava	66	--	J	1/2	D	Bailer test, 6-ft dd, L.
Rock and cinders	33	3- -53	--	--	Irr	Pumped 420 gpm, 36-ft dd, L.
Sand, black	13	--	J	3/4	D	Bailer test, "no dd," Cp, L.
Gravel	28	--	J	1/4	D	Cp.
do.	96	--	P	3/4	D	Cp.
do.	92	--	P	1	D	Pumped 10 gpm, 3-ft dd, L .
Gravel (?)	80	--	P	--	D	
Gravel	88	--	--	--	D	Could not bail dry at 20 gpm, L.
Gravel (?)	99	--	T	3	D	Bailer test, "no dd."
Clay and gravel	10	--	J	1/2	D	Pumped 6½ gpm, L.
Gravel, fine	77	--	T	3	Irr	Pumped 48 gpm, 38-ft dd, L.
Sand	86	--	J	3/4	D	
do.	66	--	J	3/4	D	Cp.
do.	53	--	J	1	D	Cp.

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing Depth to top (feet)	Water-bearing Thickness (feet)
T. 4 N., R. 2 E.--Con.									
28Q2	C. Spicer	Up.	270	Dr	90	6	89	55(?)	35(?)
28R1	Robert Cresap	Up.	247	Dr	66	6	58	62	4
29A1	E. Cook	Fp.	100	Dg	20	30	--	--	--
29P1	R. Luekke	Up.	245	Dr	160	6	--	--	--
29R1	L. A. Ham	Up.	265	Dg	65	36	--	--	--
30A1	C. Jernigan	Up.	210	Dr	80	6	--	--	--
30C1	P. Yankee	Up.	195	Dr	245	6	--	--	--
30D1	--Force	Up.	210	Dr	66	6	--	--	--
30J1	G. Blake & R. Salt	Up.	230	Dr	80	4	--	--	--
30P1	J. T. Barnes	Up.	195	Dr	47	6	--	--	--
31A1	O. F. Brookshire	Up.	229	Dr	114	5	--	--	--
31J1	H. A. Burke	Up.	225	Dg	32	30	--	--	--
31K1	J. Lorentz	Uc.	200	Dg	26	30	--	--	--
32N1	S. L. Dollar	Up.	220	Dr	129	6	128	--	--
32P1	J. LeFors	Up.	230	Dr	72	5	--	--	--
33D1	L. Bates	Up.	269	Dg	18	--	--	--	--
33D2	M. E. Rengo	Up.	275	Dr	63	6	63	48	15
33E1	K. R. Deffenbaugh	Up.	267	Dr	84	6	83	78	6
33G1	Floyd Wickersham	Up.	276	Dr	122	6	122	113	9
33N1	J. Eves	Up.	258	Dr	94	6	91	--	--
34A1	H. Matson	S.	320	Dg	43	60	--	--	--
34D1	K. Sonntag	Up.	290	Dr	90	6	--	--	--
34D2	L. Sonntag	Up.	290	Dr	90	6	90	88	2
34M1	V. W. Milholland	Up.	280	Dr	78	6	--	--	--

zone(s)	Water level		Pump		Use	Remarks
Character of material	Feet	Date	Type	H. P.		
Gravel	71	--	P	1/3	D	Bailer test, 6-ft dd, L.
Sand, black	24	--	J	1	D	Bailer test, "no dd," L.
do.	15	--	C	1/2	D	
do.	110	--	J	2	--	
Clay	50	--	P	--	D	
Gravel	20	--	J	1	D	
Sand	15	--	J	1	D	
--	36	--	P	1/2	D	
Gravel	45	--	J	1/2	D	
do.	--	--	J	1/3	D	
do.	85	--	J	1	D	L.
--	17.7	5- 3-49	C	1/4	D	Cp.
Gravel	11	--	P	1/4	D	
Sand	77	--	J	1	D	Bailer test, 23-ft dd.
Gravel	12	--	J	1	D	Pumped 8 hr, 60-ft dd.
do.	10	--	P	1/3	D	Cp.
Gravel (?)	35	--	J	--	D	Bailer test, 10-ft dd, L.
Sand, black	56	--	P	3/4	D	Bailer test, 12-ft dd, L.
do.	92	--	--	--	--	Bailer test, "no dd," L.
Sand (?)	54	--	J	1	D	Pumped 10 gpm, 15-ft dd, L.
--	30.7	5- 2-49	P	1/2	D	Cp.
Gravel	90	--	J	1	D	
Sand, black	74	--	J	3/4	D	Bailer test, 4-ft dd, L.
Gravel	43	--	J	1 1/2	D	Cp.

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thick-ness (feet)
T. 4 N., R. 2 E.--Con.									
34M2	F. Haines	Up.	277	Dr	71	6	50	64	7
34R1	Battle Ground	Up.	295	Dr	301	12	180	98	15
	School							140	25
35E2	H. E. Reese	S.	308	Dr	100	6	96	92	8
35F1	R. Porter	S.	312	Dr	57	6	57	53	4
35G1	Daisy Bush	S.	312	Dr	57	6	--	55	2
35G2	--Chadwick	S.	312	Dr	56	6	50	52	4
35G3	Robert Cresap	S.	312	Dr	56	6	50	49	7
35H1	J. Scranton	S.	315	Dr	58	6	56	56	2
35H2	O. Foeh	S.	315	Dr	99	6	62	94	5
35L1	A. C. Zeller	S.	305	Dr	100	6	--	--	--
35N1	Henry Rieck	Up.	295	Dr	81	6	--	80	2
35P1	H. R. Morris	S.	295	Dr	56	6	55	49	7
35R1	A. Kalse	S.	360	Dr	118	6	92	91	27
36R1	A. Louto	S.	455	Dg	37	6	--	--	--
T. 4 N., R. 3 E.									
2M1	W. V. Schuller	Ba.	660	Dg	11	60	--	--	--
3K1	V. E. Miller	H.	1,040	Dg	11	30	--	--	--
5E1	W. Long	S.	1,100	Dg	28	--	--	--	--
7D1	R. Roberts	S.	900	Dg	14	--	--	--	--
8Q1	C. Reynolds	Fp.	400	Dr	58	5	57	57	1
10H1	I. F. Davies	H.	980	Dg	19	--	--	--	--
11A1	W. E. McCutcheon	Ba.	645	Dg	23	30	--	--	--
11E1	H. Teal	S.	790	Dg	9	30	--	--	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Gravel	46	--	J	1	D	Bailer test, 9-ft dd, L.
Gravel & boulders	--	--	T	10	Inst	Pumped 200 gpm, 70-ft dd, L.
Gravel						
Sand, black	75	--	J	1/2	D	Bailer test, "no dd," L.
do.	40	--	J	1/3	D	Do.
do.	27	--	P	--	D	Bailer test, 23-ft dd, L.
do.	33	--	--	--	--	Bailer test, "no dd," L.
do.	30	--	--	--	--	Bailer test, 12-ft dd, L.
do.	30	--	--	--	--	Bailer test, 6-ft dd, L.
Sand and gravel	68	--	J	1	D	Bailer test, 8-ft dd, L.
Gravel	60	--	P	1/2	D	
Sand and gravel	40	--	--	--	--	
Sand, black	28	--	P	1/2	D	Bailer test, 9-ft dd, L.
Lava	80	--	J	1	D	Bailer test, 7-ft dd, L.
Gravel	16	--	J	1/3	D	Cp.
Gravel, cemented	6.7	8- 8-49	P	--	D	
Gravel	7.3	8- 8-49	P	--	D	
Clay	16.9	8- 9-49	P	--	D	
Gravel	12.0	8- 8-49	P	--	D	Cp.
Sand, black	38	--	T(?)	1	D	Bailer test, report 6-ft dd, L.
Clay	14.9	8- 8-49	P	--	D	Cp.
Gravel, cemented	17.4	8- 8-49	C	3/4	D	Cp.
Gravel	6.2	8- 8-49	P	1/4	D	

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing Depth to top (feet)	Water-bearing Thickness (feet)
T. 4 N., R. 3 E.--Con.									
11H1	A. Rast	Ba.	625	Dg	9	--	--	--	--
12N1	S. B. Knox	S.	620	Dg	11	--	--	--	--
13G1	R. C. Place	Ba.	660	Dg	12	12	--	--	--
17D1	A. J. Gatska	Fp.	360	Dg	14	8	--	--	--
17D2	C. Johnson	Fp.	360	Dg	16	36	--	--	--
18N1	C. R. Horsch	S.	418	Dg	32	36	--	--	--
18N2	do.	S.	425	Dr	580	6	--	--	--
18N3	H. W. Heisson	S.	418	Dr	161	6	161	--	--
19F1	R. E. Toevoner	S.	440	Dr	48	6	--	--	--
19R1	Glenn Heagy	S.	450	Dr	45	6	--	--	--
20P1	Walter Ek	S.	550	Dr	228	6	41	40	188
28E1	G. S. Carson	S.	520	Dr	53	6	27	26	--
28P1	H. Halvorsen	S.	540	Dr	123	6	--	--	--
28R1	--Winston	Ub.	650	Dg	15	--	--	--	--
29B1	E. M. Koski	S.	510	Dr	140	8	53	140	--
29M1	O. E. Poteet	S.	550	Dr	250	6	--	--	--
29P1	K. Graham	S.	540	Dg	30	30	--	--	--
30B1	W. Adams	S.	455	Dr	65	6	--	--	--
30J1	A. Thom Estate	S.	510	Dr	200	6	170	165	5
30K1	G. P. Hale	S.	450	Dr	42	6	--	--	--
30Q1	Fred Duvall	S.	463	Dr	173	4	--	--	--
31G1	E. D. Jennison	Ub.	540	Dg	19	30	--	--	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Gravel	5.7	8- 8-49	P	1/4	D	Cp.
do.	8.4	7-30-49	P	--	D	
Gravel, cemented	6	--	P	--	D	Report well can't be pumped dry (hand pump).
Gravel	6.8	8- 2-49	P	1/4	D	Report no dd.
--	12.0	8- 2-49	J	1/3	D	Do.
Gravel (?)	27	--	P	1/4	D	Cp.
--	Flows	8- 2-49	N	--	--	Water flows over top of well, Cp.
--	15	--	N	--	NU	Report insufficient water, L.
Sand	--	--	J	1/2	D	Report small supply.
--	Flows	2- -55	--	--	D	Flows 9 gpm.
"Rock"	90	2- -55	T	5	Irr	Pumped 33 gpm, 40-ft dd, L.
Lava	38	--	P	1/2	D	L.
"Rock"	45	--	J	1	D	Report pumps dry rapidly.
Clay	11.6	8-11-49	P	--	D	
Gravel	56	--	--	--	Irr	Pumped 350 gpm, 10-ft dd, L.
Sand	--	--	P	1/2	D	
do.	25.6	8- 1-49	P	1/4	D	
--	45	--	J	1/2	D	
Sand	--	--	P	3/4	--	L.
"Ash, volcanic"	--	--	P	1/2	D	
--	--	--	--	--	--	L.
Sand	17	--	P	--	D	

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing Depth to top (feet)	Water-bearing Thickness (feet)
T. 4 N., R. 3 E.--Con.									
31Q1	W. Kangas	Ub,	515	Dg	12	--	--	--	--
32E1	Andy Schmid	Up,	600	Dg	12	48	--	--	--
33D1	H. J. Halverson, Jr.	S,	500	Dr	205	6	--	--	--
33J1	R. Casteel	S,	560	Dg	17	--	--	--	--
34A1	M. C. Macy	S,	960	Dg	6	--	--	--	--
T. 4 N., R. 4 E.									
32Q1	J. B. Williams	H,	970	Dg	14	--	--	--	--
T. 5 N., R. 1 E.									
8R1	F. Paterson	T,	32	Dr	55	6	--	--	--
9H1	F. M. Grieger	T,	45	Dr	149	6	149	140	9
10K1	R. L. Clark	S,	62	Dr	57	6	--	--	--
11N1	G. A. Derry	T,	180	Dr	152	--	--	--	--
12A1	G. Forbes	S,	100	Dr	155	6	--	--	--
12E1	J. H. Hadka	S,	52	Dr	70	6	--	--	--
12K1	G. Pellham	S,	360	Dr	166	6	88	148	18
14B1	Adventist Church	S,	232	Dr	--	6	--	--	--
14L1	F. Eversaul	Up,	190	Dg	29	30	--	--	--
15H1	I. Zumstein	Up,	210	Dg	28	--	--	--	--
16J1	C. Nehr	H,	460	Dg	45	30	--	--	--
17F1	W. Wheeler	S,	110	Dr	37	6	--	--	--
19C1	A. Keller	T,	40	Dr	55	6	--	--	--
21E1	J. L. Fleson	H,	800	Dg	27	--	--	--	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Clay	8.3	8- 1-49	C	1/4	D	
Gravel	4.23	2-18-55	C	--	Irr	
Lava	45	--	P	3/4	D	Rock and cinders to 200 ft; plastic clay to 205 ft. Cp.
do.	10.3	7-29-49	J	1/3	D	Pumped 1 hr, 4-ft dd.
Clay	0.5	7-29-49	P	1/4	D	
--	4.5	8- 5-49	P	--	D	Cp.
Gravel	42	--	J	1/4	D	
do.	40	--	P	1 1/2	D	Bailer test, "no dd." L.
do.	35	--	J	1 1/2	Irr	
--	98	--	P	1	--	
Lava	95	--	J	1	D	
Gravel, cemented	45	--	J	1/3	D	Bailer test, "no dd."
Lava	108	--	P	1	D	Pumped 4 gpm, 53-ft dd, L.
--	--	--	P	1	Inst	
Clay, blue	24.3	9- 6-49	N	--	--	
Sand	24.2	9- 6-49	J	1/3	D	
Rock	41.0	9- 6-49	J	1	D	Report encountered 8-inch cavity at 38 ft.
do.	15.6	9- 6-49	P	--	D	
Sand	15	--	N	--	--	
Gravel	22.4	9- 6-49	N	--	--	

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thick-ness (feet)
T. 5 N., R. 1 E.--Con.									
21F1	F. B. Goodwin	Ub,	630	Dg	38	48	--	--	--
21Q1	J. Shaver	Ub,	630	Dg	54	--	--	--	--
22A1	E. Pea	S,	430	Dg	32	--	--	--	--
22L1	F. Knowles	Ub,	640	Dg	24	--	--	--	--
23A1	Wesley Gettman	S,	720	Dr	180	6	107	--	--
23G1	R. Leadbetter	Ub,	700	Dg	44	48	--	--	--
24B1	Dan C. Hudson	Ub,	780	Dr	66	6	66	62	4
24D1	H. Frank	Ub,	760	Dg	41	36	--	--	--
24G1	M. Schillios	Ub,	760	Dg	36	36	--	--	--
26B1	A. Walson	Ub,	640	Dg	35	--	--	--	--
27J1	L. F. Farnsworth	Ub,	620	Dg	54	--	--	--	--
27M1	C. Howe	S,	260	Dg	15	36	--	--	--
28D1	W. Hendricks	Up,	650	Dg	54	48	--	--	--
33H1	D. Harmon	Up,	265	Dg	42	36	--	--	--
33L1	Cedar Lodge Nursing Home	Up,	250	Dr	129	6	--	--	--
33R1	L. Troxel	S,	140	Dr	96	6	--	--	--
34G2	Town of La Center	S,	390	Dr	231	8	229	220	7
								227	4
34G3	do.	S,	400	Dr	252	8	--	240	8
34P1	J. Larson	Up,	225	Dg	52	--	--	--	--

zone(s) Character of material	Water level Feet	Water level Date	Pump Type	Pump H. P.	Use	Remarks
Clay	33.6	9- 6-49	--	--	--	
Gravel	46.3	9- 6-49	--	--	--	
do.	20.8	9- 6-49	N	--	--	
do.	16.5	9- 1-49	J	1/3	D	
Clay	105	--	--	--	D	Pumped 1 gpm, L.
Rock	41.5	9- 1-49	J	1/3	D	
Sand and gravel	37.3	10- 3-50	P	3/4	D	Bailed dry at 2½ gpm, L.
--	35.5	9- 1-49	J	1/2	D	
Clay	29.3	8-30-49	J	1/4	D	
do.	31.4	9- 1-49	P	--	D	
do.	47.6	8-22-49	J	1/3	D	Pumped 2½ hr at 4 gpm, 5-ft dd.
Gravel	9.8	9- 6-49	C	1/2	D	
Clay	46.8	9- 6-49	J	1/4	D	
Gravel	38.4	9- 6-49	N	--	--	
do.	89	--	J	1 1/2	Inst	
Basalt	40	--	J	1/2	D	
Sand and gravel	--	--	--	--	--	Pumped 75 gpm, 85-ft dd, L.
Sand, coarse						
Gravel	115	12- -55	--	--	PS	Pumped 200 gpm. Water-level measurement by air pressure gage.
do.	27.8	9- 1-49	N	--	--	

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thick-ness (feet)
T. 5 N., R. 1 E.--Con.									
35K1	M. Fassler	S,	320	Dg	50	36	--	--	--
35P1	R. E. Dalin	S,	275	Dr	212	5	--	--	--
35R1	W. S. Gent	S,	335	Dg-Dr	40	36-6	--	--	--
35R2	C. A. Osborne	Ub,	325	Dr	200	8	197	--	--
T. 5 N., R. 2 E.									
5H1	L. Holm	S,	360	Dg	22	48	--	--	--
8D1	E. Eaton	H,	220	Dg	33	36	--	--	--
8L1	J. F. Sherer	Ub,	360	Dr	61	6	--	--	--
9J1	J. Sager	Ub,	595	Dg	40	30	--	--	--
14F1	W. Harrington	S,	473	Dg	23	--	--	--	--
15A1	B. Neal	S,	410	Dg	15	36	--	--	--
16J1	Paul Current	Ba,	810	Dg	16	36	--	--	--
18D1	H. Wik	S,	430	Dg	15	30	--	--	--
18J1	D. Johnson	H,	900	Dg	11	--	--	--	--
19C1	E. Christianson	H,	820	Dg	33	30	--	--	--
19E1	A. Augusta	S,	755	Dg	22	36	--	--	--
19R1	J. Loveless	S,	760	Dg	40	--	--	--	--
20C1	F. Johnson	S,	790	Dg	25	30	--	--	--
20R1	L. Breedlove	S,	805	Dg	35	--	--	--	--
21B1	C. Rich	Ba,	850	Dg	22	--	--	--	--
21E1	C. McGinnis	S,	830	Dg	27	36	--	--	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Gravel	41.2	8-26-49	P	1/3	D	
Sand	130	6-22-54	T	1 1/2	D	Bailed 1,000 gph, L.
Clay	20.0	8-23-49	J	1/3	D	
Sand	160	2- -54	P	1 1/2	NU	"Little" dd after 1 hr bailing 10 gpm.
Sand and gravel	18.3	8-25-49	P	1/4	D	
Clay	26.7	8-29-49	N	--	--	
Sand, white	6	--	J	1/2	D	Report no dd.
Gravel	35.3	8-23-49	P	1/4	D	
--	14.3	8-17-49	P	1/4	D	
Gravel	8.0	8-17-49	C	1/2	D	
do.	12.0	8-24-49	P	1/4	D	
Clay	12.0	8-29-49	C	1/4	D	
do.	3.5	8-25-49	J	1/2	D	Pumped 2 hr at 12 gpm, 6-ft dd.
do.	24.4	8-25-49	J	1/3	D	
Sandstone	15.2	8-30-49	P	1/4	D	Water reported to contain much iron and lime.
Clay, red	34.2	8-30-49	J	1/2	D	Cp.
Clay	13.6	8-25-49	N	--	--	
Sand	32.8	8-25-49	J	1/3	D	
Gravel	16.8	8-24-49	N	--	--	
Clay	22.8	8-25-49	P	3/4	D	

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
								Depth to top (feet)	Thick-ness (feet)
T. 5 N., R. 2 E.--Con.									
22G1	L. Grantham	Ub.	880	Dg	21	--	--	--	--
22Q1	F. Wendt	Ub.	800	Dg	29	60	--	--	--
23H1	T. Helser	S.	680	Dg	10	30	--	--	--
23M1	R. Olsen	Ub.	830	Dg	24	36	--	--	--
24A1	D. Wheeler	S.	930	Dg	21	30	--	--	--
25M1	E. Decker	Ub.	680	Dr	76	6	--	--	--
26A1	--Seeley	S.	690	Dr	164	6	--	--	--
26B1	Fargher Lake Grange	S.	690	Dr	80	6	80	64	--
27A1	H. Cooper	Ub.	800	Dg	30	--	--	--	--
27E1	J. McClellan	Ub.	800	Dg	33	--	--	--	--
27F1	H. L. Crawford	Ub.	730	Dg	26	--	--	--	--
28C1	A. Bennet	Ub.	825	Dg	21	48	--	--	--
28D1	F. M. Bremmer	Ub.	805	Dr	113	6	113	90	23
29A1	T. Wollam	Ub.	800	Dg	18	30	--	--	--
29D1	O. E. Wilson	Ub.	775	Dg	42	--	--	--	--
30A1	L. Brannfors	H.	735	Dg	30	60	--	--	--
31Q1	M. Steudler	S.	456	Dg	35	--	--	--	--
32L1	R. Skillings	Ub.	675	Dg	43	36	--	--	--
32M1	R. Stevens	Ub.	665	Dr	68	6	--	--	--
32R1	R. Carey	Ub.	640	Dg	24	--	--	--	--
33D1	M. I. Brouherd	Ub.	720	Dg	55	--	--	--	--
34A1	D. E. Hazen	Ba.	600	Dg	18	--	--	--	--
35C1	E. D. Hazen	Ub.	740	Dr	102	6	--	--	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Gravel	14.1	8-23-49	J	1/3	D	
do.	23.3	8-23-49	P	--	D	
Basalt	9.3	8-17-49	P	--	D	
Sand	22.6	8-23-49	--	--	--	
--	16.7	8-17-49	N	--	--	
Sand	--	--	J	3/4	D	
Gravel	30	--	P	1	D	
Gravel and sand	--	--	J	3/4	--	L.
Sand	22.3	8-23-49	J	1/3	D	
Gravel, cemented	25.3	8-23-49	J	1/3	D	
Gravel	12.6	8-22-49	P	1/2	D	
--	16.2	8-24-49	J	1/3	D	
Sand, black	88	--	--	--	--	Bailed 5 gpm, 20-ft dd, L.
Gravel	15.6	8-31-49	--	--	--	
Clay	37.6	8-31-49	N	--	--	
Clay and gravel	24.7	8-31-49	N	--	--	
Gravel	32.8	8-31-49	J	1/2	D	
do.	27.6	8-22-49	P	1 1/2	--	
--	26	--	J	1/3	D	
Gravel	18.4	8-22-49	N	--	--	
Clay	26.3	8-16-49	P	1/2	--	
Gravel, cemented	11.2	8-22-49	P	1/4	D	
Sand and gravel	Flows	8-22-49	J	1	D	Flows 1 gpm 0.5 ft above land surface.

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing	
							Depth to top (feet)	Thick-ness (feet)
T. 5 N., R. 3 E.								
1K1	C. Keenan	Ba, 600	Dg	17	30	--	--	--
8P1	M. Wright	S, 380	Dg	14	--	--	--	--
10P1	H. C. Abell	Ba, 420	Dg	15	48	--	--	--
11G1	C. Olstead	Ba, 476	Dr	48	--	--	--	--
11N1	G. Beebe	Ba, 465	Dg	16	36	--	--	--
12C1	E. E. Downing	S, 570	Dg	26	--	--	--	--
12K1	B. Welch	Ba, 515	Dg	32	30	--	--	--
12Q1	C. Ost	Ba, 502	Dr	35	6	--	--	--
13D1	W. J. Wisner	Ba, 484	Dg	15	30	--	--	--
14B1	F. W. Senter	Ba, 452	Dr	28	6	--	--	--
15G1	C. H. Brown	Ba, 435	Dg	17	30	--	--	--
15H1	A. Olstead	Ba, 440	Dg	14	30	--	--	--
16A1	C. Ashbaugh	Ba, 480	Dg	12	30	--	--	--
16F1	E. Moon	S, 460	Dg	23	--	--	--	--
16J1	L. George	Ba, 420	Dg	14	72	--	--	--
16L1	E. Moon	S, 460	Dg	23	30	--	--	--
17A1	M. Abramson	S, 430	Dg	12	36	--	--	--
17H1	L. T. Cummings	S, 400	Dg	8	60	--	--	--
17P1	C. A. Boehn	S, 440	Dg	19	36	--	--	--
18R1	W. H. Jones	S, 630	Dg	24	30	--	--	--
19R1	H. S. Zassett	S, 845	Dg	28	--	--	--	--
20A1	C. Hunter	S, 480	Dr	76	6(?)	--	--	--
20P1	R. V. Turner	H, 785	Dg	21	--	--	--	--

in Clark County, Wash.--Continued

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Gravel	14.2	8-16-49	P	--	D	
Clay	8.0	8-16-49	N	--	--	
do.	10.8	8-15-49	J	1/2	D	
--	38	--	J	1/4	D	Cp.
Sand	14.3	8-16-49	J	1/4	D	
Gravel	--	--	P	1/4	D	
do.	24.3	8-16-49	J	1/3	D	Cp.
do.	22	--	J	1/3	D	
Sand and gravel	5.8	8-16-49	J	1/4	D	
Gravel	10.7	8-16-49	C(?)	1/3	--	Pumped 40 gpm.
Clay	11.0	8-16-49	C	1/3	--	
Sand and gravel	7.5	8-16-49	J	1/2	D	Cp.
Clay	10.4	8-15-49	N	--	--	
Gravel, cemented	18.7	8-15-49	P	1/4	D	Cp.
Gravel	10.1	8-15-49	P	1/4	D	
Clay (?)	14.3	8-15-49	C(?)	1 1/2	--	Pumped 2 hr at 20 gpm, 9-ft dd.
Clay and gravel	8.7	8-16-49	C	1/4	--	
--	6.6	8-16-49	J	1/2	D	
Clay	11.3	8-17-49	P	1/4	D	
Gravel	11.9	8-17-49	J	1	--	
do.	24.3	8-17-49	P	1/4	D	
do.	45	7-15-49	J	3/4	D	Pumped 5 gpm, "no dd," Cp.
do.	16.8	8-15-49	J	1/3	D	

Table 15.--Records of representative wells

Well	Owner or tenant	Topog. and altitude (feet)		Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing Depth to top (feet)	Water-bearing Thickness (feet)
T. 5 N., R. 3 E.--Con.									
21G1	C. W. Burnett	S,	450	Dg	9	36	--	--	--
21M1	M. Weston	S,	500	Dg	50	--	--	--	--
21N1	L. Fudge	S,	600	Dg	17	30	--	--	--
21Q1	T. Quimby	S,	510	Dg	18	--	--	--	--
22P1	D. Koplin	S,	620	Dg	10	--	--	--	--
26P1	B. Raymond	H,	730	Dg	25	--	--	--	--
27H1	B. Weimer	H,	680	Dg	17	--	--	--	--
27M1	C. Wolff	S,	730	Dg	21	36	--	--	--
29F1	A. E. Jackson	H,	920	Dg	23	--	--	--	--
31A1	P. Krier	S,	820	Dg	25	--	--	--	--
33F1	B. A. Ovall	S,	1,000	Dg	29	--	--	--	--
34B1	O. Taude	Ba,	700	Dg	22	--	--	--	--
34N1	C. R. Miller	S,	890	Dr	--	6	--	--	--
T. 5 N., R. 4 E.									
7B1	L. Miller	Ba,	570	Dg	30	72	--	--	--
7F1	H. Manwell	Ba,	550	Dg	26	60	--	--	--
7M1	Harbor Plywood Co.	Ba,	520	Dr	598	12-6	553	73	--
								557	
T. 6 N., R. 4 E.									
31N1	W. Musa	S,	520	Dg	35	--	--	--	--

zone(s) Character of material	Water level Feet	Date	Pump Type	H. P.	Use	Remarks
Sand and gravel	8.0	8-15-49	P	--	D	
--	38.8	8-15-49	P	1/4	D	
Gravel	10.2	8-15-49	P	1/2	D	
Rock	2.4	8-15-49	P	--	D	Cp.
Gravel	6.8	8-15-49	P	--	D	
do.	21.8	8-15-49	P	--	D	
Sand	10.8	8-15-49	J	1/2	D	Cp.
Rock (?)	17.5	8-15-49	C	3/4	D	
Sand	17.6	8- 8-49	C	1/2	D	
Rock (?)	23.9	8- 9-49	P	--	D	
Sand	14.0	8- 8-49	P	--	D	
Gravel, cemented	18.2	8-15-49	P	--	D	Cp.
Sand	--	--	P	1	--	
--	23.8	8-16-49	P	--	D	Cp.
Gravel	17.2	8-16-49	J	1/3	D	
Gravel and sand Rock, black	68	--	--	--	Ind	Pumped 1 hr at 800 gpm, 60-ft dd, L.
Gravel	28.3	8-16-49	J	1/3	D	Cp.

Table 16.—Representative springs

Yield: e, estimated

Use: D, domestic; NU, not used; PS, public supply; S, stock

Spring	Owner or tenant	Altitude (feet)	Water-bearing material
T. 1 N., R. 2 E.			
2M1s	..	50	Sand
2Q1s	..	50	Sand and gravel
3D1s	John Emory	150	do.
3E1s	..	60	do.
3F1s	..	45	do.
3G1s	State Trout Hatchery	70	do.
3G2s	..	50	do.
3J1s	..	55	do.
3J2s	E. Wood and E. B. Wood	50	do.
4B1s	Felix Baranovich	100	do.
4B2s	Dr. Brougher	100	Sand

in Clark County, Wash.

Remarks: H, total hardness, and Cl, chloride, in parts per million; T, temperature °F.

Yield		Use	Remarks
Gpm	Date		
1,760	4-11-49	NU	Emerges at contact with underlying Troutdale formation.
675	4-11-49	NU	Do.
..	..	D	Emerges at contact with underlying Troutdale formation. Supplies nine families; H, 60; Cl, 6; T, 50.
e200	4-11-49	NU	Discharges at contact with underlying Troutdale formation.
610	4-11-49	NU	Do.
e 1,200-1,500	..	..	Used for fish hatchery. Discharges at contact with underlying Troutdale formation.
1,630	4-11-49	NU	Discharges at contact with underlying Troutdale formation.
1,657	4-11-49	NU	Do.
665	4-18-49	NU	Do.
1,330	4-11-49	..	Do.
200	4-11-49	..	Do.

Table 16.--Representative springs

Spring	Owner or tenant	Altitude (feet)	Water-bearing material
T. 1 N., R. 2 E.--Con.			
4D1s	..	100	Sand and gravel
5A1s	Clarence Jenkinson	95	do.
12B1s	Mrs. Emma Allen	120	Gravel
12C1s	..	100	Sand and gravel
12G1s	George M. Robie	120	do.
T. 1 N., R. 3 E.			
1C1s	N. E. Morris	330	Lava
4J1s	Ed Crisman	520	Gravel
7E1s	..	50	Sand and gravel
7F1s	..	60	do.
7F2s	..	60	do.
7G1s	..	60	do.
T. 2 N., R. 2 E.			
31J1s	..	150	do.
32Q1s	..	145	do.
33L1s, 33M1s, 33P1s	City of Vancouver, Ellsworth Springs	190	do.

Yield		Use	Remarks
Gpm	Date		
e75	4-15-49	..	Discharge at contact with underlying Troutdale formation.
2	4- 5-49	D	Do.
e225	4-11-49	D	Do.
280	4-11-49	NU	Do.
e40	4-14-49	D	Discharges at contact with underlying Troutdale formation. Supplies cabins and store.
..	..	D, S	Discharges at contact with underlying Troutdale formation. Dependable supply, used for dairy.
..	..	D	Seepage spring. Flow decreases during summer.
550	4-11-49	NU	Discharges at contact with underlying Troutdale formation.
e100	4-18-49	NU	Do.
185	4-18-49	NU	Do.
520	4-19-49	NU	Do.
e100	4-15-49	..	Discharges at contact with underlying Troutdale formation, T,51.
e 50	..	..	Discharges at contact with underlying Troutdale formation.
2,085	10-15-45	PS	Discharges at contact with underlying Troutdale formation. Discharge was measured by city.

Spring	Owner or tenant	Altitude (feet)	Water-bearing material
T. 2 N., R. 3 E.			
29B1s	L. W. Schnell	215	Sand and gravel
T. 3 N., R. 1 E.			
13J1s	B. W. Turnbull	225	Sand
16R1s	J. Huisman	200	Sand and silt
17A1s	W. T. Harold	170	Clay
25N1s	J. White	90	Sand
29P1s	H. Messner	110	do.
34D1s	V. C. Davis	90	do.
T. 3 N., R. 2 E.			
20K1s	S. Davis	220	..
T. 3 N., R. 3 E.			
3P1s	C. Strom	480	Sand
T. 4 N., R. 1 E.			
16N1s	H. Hardt	250	do.
24C1s	J. Ludzenberger	150	Gravel
T. 4 N., R. 2 E.			
25B1s	J. Shultz	550	Rock
25Q1s	G. P. Ebert, Poverty Creek Spring	370	Boring lava
27C1s	H. Foster	250	..
27M1s	J. F. O'Daniell	250	Boring lava
T. 4 N., R. 3 E.			
9N1s	G. Gasiway	400	Rock

Yield		Use	Remarks
Gpm	Date		
..	..	D	Seepage spring.
2.5	4-28-49	D	Seepage spring. H, 70; Cl, 3.
3	5-18-49	D	Seepage spring. H, 90; Cl, 3.
1	5-16-49	D	H, 75; Cl, 3.
3	5-23-49	D	
..	..	D, S	H, 85; Cl, 5.
3	5-20-49	D, S	H, 85; Cl, 3.
..	..	D, S	H, 90; Cl, 5.
..	..	D	
2	5-10-49	..	H, 70; Cl, 3.
2	5- 9-49	D, S	H, 65; Cl, 4.
1	5- 4-49	D, S	H, 45; Cl, 4.
400 1948-52	Avg. during dry season	..	Discharge reported to range from 35 to 2,000 cubic feet per minute. Used for fish hatchery. Discharges at base of lava flow.
2	..	..	H, 60; Cl, 4.
e400	..	D, S	Discharges at base of lava flow. H, 40; Cl, 3.
1	8- 2-49	D	

Table 16.--Representative springs

Spring	Owner or tenant	Altitude (feet)	Water-bearing materials
T. 4 N., R. 3 E.—Con.			
20M1s	B. Browning	460	Gravel
34Q1s	D. Nordquist	680	Rock
T. 5 N., R. 1 E.			
23B1s	W. J. Richards	400	Sand
T. 5 N., R. 2 E.			
2C1s	R. Ruestig	1,150	Sand(?)
11F1s	M. L. Carter	310	Rock
14Q1s	O. J. Brown	670	Gravel
T. 5 N., R. 3 E.			
7E1s	T. Henderson	500	Rock
28F1s	J. Hiatt	700	do.
32A1s	J. Buck	950	do.
33R1s	W. Newman	960	Gravel(?)

Yield		Use	Remarks
Gpm	Date		
2	8- 2-49	D	
3	do	D	
1	9- 6-49	D	
e$\frac{1}{4}$	8-17-49	D	
e12	8-16-49	D	
2	8-17-49	D, S	
4	8-16-49	D, S	H, 30; Cl, 4.
1	8-15-49	D	
1	8- 8-49	D	
1	7-25-49	D	

Table 17.--Materials penetrated by representative wells

(Tentative strategraphic designations by M. J. Mundorff)

1/2-1K1. Fisher Grange Hall. About 8 miles east of Vancouver and 0.6 mile north of Fisher. Altitude about 230 ft. Drilled by Hansen.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Sand and gravel.	90	90
Troutdale formation:		
Clay, yellow.	15	105
Gravel, cemented.	40	145

1/2-2B1. Charles E. Runyan. About 7 miles east of Vancouver on Bella Vista Road. Altitude about 260 ft. Drilled by Bert Abrams, 1948.

Pleistocene alluvial deposits:		
Gravel, loose, and boulders.	60	60
Troutdale formation:		
Gravel, packed.	28	88
Sand, loose, water-bearing.	--	88

Casing, 6-inch to 84 ft.

1/2-3E1. G. C. Dowd. About 6 miles east of Vancouver, near Ellsworth. Altitude about 34 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium:		
Soil	3	3
Clay	7	10
Sand	19	29
Troutdale formation:		
Clay, blue	7	36
Gravel	8	44
Sand, black	2	46

Casing, 6-inch, set to 46 ft.

1/2-3K1. S. Unander. About 6.5 miles east of Vancouver, across highway from State Trout Hatchery. Altitude about 44 ft. Drilled by A. C. Locey.

Recent alluvium:		
Soil	2	2
Clay, sandy	8	10
Boulders and gravel	16	26
Gravel, loose, water-bearing	29	55

Casing, 6-inch, set to 55 ft.

Table 17.--Materials penetrated by representative wells--continued

1/2-4A1. R. Roberts. West Mill Plain District. About 0.3 mile west of Ellsworth Road along Sohns Road. Altitude about 170 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Boulders	30	30
Troutdale formation:		
Gravel, cemented	22	52
Gravel, water-bearing	9	61

Casing, 6-inch, set to 61 ft.

1/2-4B3. Louis Cannell. About 5 miles east of Vancouver, near Ellsworth. Altitude about 115 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Soil	6	6
Gravel	12	18
Troutdale formation:		
Gravel, cemented	9	27
Clay	14	41
Gravel, loose	9	50
Sand, black	5	55

Casing, 6-inch, set to 53 ft.

1/2-4C1. H. B. Stapleton. About 5 miles east of Vancouver, near Ellsworth. Altitude about 110 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	6	6
Gravel	11	17
Troutdale formation:		
Gravel, cemented	7	24
Gravel, loose	8	32
Sand, black	2	34

Casing, 6-inch, set to 34 ft.

1/2-4C2. R. Farmer. About 5 miles east of Vancouver, near Ellsworth. Altitude about 100 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	8	8
Sand	20	28
Gravel	12	40
Troutdale formation:		
Clay	15	55
Boulders	6	61
Gravel	5	66

Casing, 6-inch, set to 55 ft.

Table 17.--Materials penetrated by representative wells--Continued

1/2-4D2. A. J. Witchell. About 5 miles east of Vancouver, near Ellsworth. Altitude about 92 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Topsoil and clay	6	6
Clay, and some gravel	4	10
Gravel and boulders with clay binder	24	34
Gravel, small caving	5	39
Gravel, cemented	14	53
Sand, coarse, with a little gravel	7	60
Gravel, cemented	35	95
Sand and gravel, water-bearing	11	106
Gravel with clay binder	8	114

Casing, 6-inch, set to 114 ft; perforated 75 to 105 ft.

1/3-3M1. Ray Brown, et al. On Prune Hill. Altitude about 710 ft. Drilled by Pete Hanson.

Troutdale formation:		
Clay	75	75
Gravel, cemented	320	395
Tertiary volcanics:		
Rock, gray with layers of red, green, and black rock	403	798

Casing, 6-inch, set to 385 ft.

1/3-4C1. Harry Breitbarth. About 2 miles northwest of Camas, south of County Road 119. Altitude about 295 ft. Drilled by J. E. Hansen, 1953.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil and clay	25	25
Troutdale formation:		
Boulders mixed with clay	75	100
Gravel, cemented	40	140
Gravel, water-bearing	35	175
Clay and rocks	18	193
Gravel and rocks, water-bearing	27	220

Casing, 8-inch, set to 220 ft; perforated from 155 to 175 ft, and 195 to 218 ft.

Table 17.--Materials penetrated by representative wells--Continued

1/3-5A1. Don Rainey, formerly owned by K. W. Brandstater. Camas, Wash.
Altitude about 272 ft. Drilled by Joe Hansen, 1952.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	3	3
Clay, yellow	22	25
Troutdale formation:		
Clay, yellow, and big rocks, mixed	38	63
Gravel, cemented	89	152
Rock, flat ledge	6	158
Gravel, cemented, water-bearing	32	190

Casing, 8-inch to 190 ft; perforated from 158 to 180 ft.

1/3-6M2. E. R. Colby. About 0.5 mile east of Fisher Grange. Altitude about 245 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	5	5
Boulders	32	37
Troutdale formation:		
Gravel, cemented	33	70
Gravel, loose	20	90
Boulders	9	99
Gravel, cemented	29	128
Gravel, water-bearing	6	134

Casing, 6-inch to 134 ft.

Table 17.--Materials penetrated by representative wells--Continued

1/3-10D2. W. G. Powell. River-view Drive, on Prune Hill. Altitude about 715 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Soil	6	6
Gravel	12	18
Boulders	20	38
Gravel, cemented	18	56
Gravel	20	76
Gravel, cemented	16	92
Boulders	13	105
Gravel	47	152
Boring lava (?)		
Rock, red volcanic	8	160
Troutdale formation:		
Gravel, cemented	11	171
Boulders	12	183
Gravel	28	211
Gravel, sandy	30	241
Sand, black	1	242

Casing, 6-inch, set to 240 ft.

1/3-11J1. Crown Zellerbach Paper Co. Company Well 1, in Camas. Altitude about 50 ft. Drilled by R. J. Strasser, 1939.

Materials	Thickness (feet)	Depth (feet)
Pleistocene Alluvial deposits:		
Gravel, loose, and boulders	8	8
Gravel, cemented(?) and gray boulders	42	50
Gravel, small, loose	15	65
Gravel, large, loose	10	75
Troutdale formation:		
Gravel, cemented	15	90

Casing, 12-inch, set to 90 ft; perforated 49 to 66 ft and 69 to 85 ft.

1/3-11J2. Crown Zellerbach Paper Co. Company well 2, in Camas. Altitude about 50 ft. Drilled by R. J. Strasser, 1939.

Pleistocene alluvial deposits:		
Gravel and large boulders	17	17
Gravel and boulders	36	53
Gravel, loose, water-bearing	27	80
Troutdale formation:		
Gravel, with clay binder	8	88

Casing, 18-inch, set to 88 ft.

1/3-11J3. Crown Zellerbach Paper Co. Company well 3, in Camas. Altitude about 50 ft. Drilled by R. J. Strasser, 1940.

Materials	Thickness (feet)	Depth (feet)
Fill	5	5
Pleistocene alluvial deposits:		
Topsoil and gravel	3	8
Gravel, cemented(?) and boulders	35	43
Gravel, loose, water-bearing	5	48
Gravel, water-bearing	15	63
Troutdale formation:		
Gravel, with clay binder	7	70
Gravel, loose	12	82
Gravel, with clay binder	9	91

Casing, 16-inch, set to 90 ft; perforated 48 to 55 ft, 56 to 63 ft and 72 to 85 ft.

Table 17.--Materials penetrated by representative wells--Continued

1/3-11J4. Crown Zellerbach Paper Co. Company well 4, in Camas. Altitude about 50 ft. Drilled by R. J. Strasser, 1946.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	4	4
Boulders and tight gravel	33	37
Gravel, loose, water-bearing at 40 ft	21	58
Gravel, with some sand	8	66
Gravel, no sand	14	80
Troutdale formation:		
Gravel, with clay binder	8	88

Casing, 18-inch, set to 88 ft(?); perforated 41 to 77 ft.

1/3-11J6. Crown Zellerbach Paper Co. Company well 6, in Camas. Altitude about 50 ft. Drilled by R. J. Strasser, 1946.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Gravel and boulders	24	24
Gravel, with clay binder	16	40
Gravel, small, water-bearing	20	60
Gravel, with binder	8	68
Sand, coarse, and gravel, water-bearing	22	90

Casing, 18-inch, set to 90 (?) ft; perforated 40 to 45 ft, 49 to 57 ft, 69 to 77 ft, and 79 to 85 ft.

1/3-11J7. Crown Zellerbach Paper Co. Company well 7, in Camas.
Altitude about 50 ft. Drilled by R. J. Strasser, 1946.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	2	2
Gravel and boulders	28	30
Gravel, large, water-bearing at 36 ft.	13	43
Boulders, large	5	48
Sand and gravel, water-bearing	15	63
Sand, coarse, and gravel	10	73
Sand and gravel	9	82
Gravel, large	6	88

Casing, 18-inch, set to 88 ft.

Table 17.--Materials penetrated by representative wells--Continued

1/3-11J8. Crown Zellerbach Corp., in Camas. Altitude about 40 ft. Drilled by R. J. Strasser, 1952.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Gravel, large, and boulders	9	9
Gravel, large	5	14
Gravel, boulders, and binder	37	51
Gravel, loose, water-bearing	22	73
Gravel, with binder	22	95
Gravel, large, with sand	13	108
Gravel, with binder	8	116
Gravel, loose, water-bearing	12	128
Troutdale formation:		
Clay, red	10	138
Rock, brown	2	140

Casing, 18-inch, set to 90 ft, 12-inch from 88 to 140 ft; perforated 50 to 57 ft, 60 to 68 ft. 69 to 84 ft, 115 to 119 ft, 119 to 128 ft.

Table 17.--Materials penetrated by representative wells-Continued

1/3-12K1. Columbia Water Co. Co. well 4, about 1 mile west of Washougal. Altitude about 50 ft. Drilled by R. J. Strasser, 1947.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil.	2	2
Gravel and large boulders.	12	14
Gravel, cemented.	19	33
Sand and gravel.	27	60
Sand, coarse, and gravel, water-bearing. . . .	34	94
Troutdale formation:		
Gravel, with clay binder.	4	98
Clay, blue.	3	101

Casing, 12-inch, to 101 ft.

1/3-12M3. City of Camas. Southeast of Washougal River, at Oak Park., Altitude about 35 ft. Drilled by R. J. Strasser, 1946.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	6	6
Gravel	9	15
Gravel and boulders	8	23
Gravel	8	31
Boulders and gravel	3	34
Sand and gravel	13	47
Gravel, water-bearing	23	70
Troutdale formation:		
Gravel, tight	8	78

Casing, 14-inch, set to 78 ft; perforated 50 to 70 ft.

1/3-12M4. Crown Zellerbach Paper Co. Southeast of Washougal River at Oak Park. Altitude about 35 ft. Drilled by R. J. Strasser, 1946.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Gravel and boulders	18	18
Gravel (without boulders)	5	23
Clay, blue	8	31
Gravel and sand, water-bearing	31	62
Troutdale formation:		
Clay, red	4	66

Casing, 18-inch, set to 66(?) ft; perforated 31 to 62 ft.

1/3-12M5. Crown Zellerbach Corp. In Camas. . Altitude about 35 ft. Drilled by R. J. Strasser, 1953.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Gravel, large, binder	94	94
Gravel, loose, small	16	110
Gravel, cemented	12	122
Troutdale formation:		
Rock, hard, gray	9	131

Casing, 18-inch, set to 86 ft, 12-inch from 86 to 122 ft; perforated 41 to 77 ft, 90 to 102 ft, 104 to 115 ft.

1/4-5E1. Richard Beaver. In Washougal . Altitude about 440 ft. Drilled by Joe Hansen, 1952.

Materials	Thickness (feet)	Depth (feet)
Older consolidated rocks:		
Rock and clay	24	24
Rock, hard, solid	98	122

Casing, 6-inch, set to 24 ft.

1/4-8K1. Columbia Water Co. Company well 1. At Washougal, on river bank north of school. Altitude about 90 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay and boulders	10	10
Gravel, cemented	10	20
Boulders	5	25
Gravel, cemented	40	65
Gravel, loose, water-bearing	18	83
Troutdale formation:		
Gravel, cemented	14	97
Gravel, loose	5	102
Gravel, cemented	12	114
Clay, sandy, yellow	5	119
Gravel, cemented	2	121
Sandstone, yellow	21	142

Casing, 12-inch, set to 142 (?) ft.

Table 17.--Materials penetrated by representative wells--Continued

1/4-8K4. Columbia Water Co. At Washougal, on bank of river, north of school. Altitude about 90 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay, sandy	4	4
Gravel and sand	5	9
Sand	2	11
Boulders and gravel	9	20
Gravel, cemented	26	46
Boulders	10	56
Gravel and sand	9	65
Gravel, loose, water-bearing	1	66
Gravel, cemented	12	78
Gravel, tight	3	81
Sand, coarse	2	83
Gravel, water-bearing	5	88
Troutdale formation:		
Gravel, cemented, no water	4	92
Gravel, cemented, water-bearing	4	96
Gravel, cemented, no water	13	109

1/4-9B1. E. L. Eldridge. About 2 miles northeast of Washougal.

Altitude about 240 ft. Drilled by B. L. Price, 1952.

Materials	Thickness (feet)	Depth (feet)
Topsoil	3	3
Troutdale formation:		
Clay	17	20
Clay and broken rock	20	40
Clay, blue, some boulders	30	70
Silt, brown, and sand	95	165
Sand and gravel	13	178
Sand	2	180

Casing, 10-inch to 180 ft.

Table 17.--Materials penetrated by representative wells--Continued

1/4-9E1. L. Wilson. About 1 mile northeast of Washougal, north of golf course. Altitude about 130 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	7	7
Sand	8	15
Gravel	28	43
Clay	7	50
Gravel	30	80
Sand	10	90

Casing, 6-inch, set to 85 ft.

1/4-9L1. S. W. Coumans. About 1 mile east of Washougal. Altitude about 100 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Sand	33	33
Clay	17	50
Sand, fine (quicksand)	30	80
Gravel, pea size	4	84

Casing, 6-inch, set to 84 ft.

1/4-16H1. T. Kerr. About 1.5 miles east of Washougal, south of U. S. Highway 830. Altitude about 45 ft. Drilled by A. C. Locey

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	2	2
Gravel	20	22
Boulders	13	35
Gravel	4	39
Sand, black	2	41

Casing, 6-inch, set to 40 ft.

2/1W-12R1. Fred Niday. Near Vancouver Lake on River Road. Altitude about 20 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Recent Alluvium:		
Soil	21	21
Sand, fine (quicksand)	17	38
Troutdale formation (?):		
Clay, blue	142	180
Sand, fine (quicksand)	92	272

Casing, 6-inch, set to 272 ft.

2/1-2P1. Gus Hockinson. Poor Farm Road near Totem Pole.

Altitude about 230 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	14	14
Sand	16	30
Sand, fine (quicksand)	32	62
Clay, blue	8	70
Clay, yellow	15	85
Clay, sandy	20	105
Sand	35	140
Troutdale formation:		
Gravel and sand	5	145
Gravel	13	158
Gravel, cemented	7	165
Gravel	8	173
Sand, black	3	176

Casing, 6-inch, set to 176 ft.

2/1-3E1. Orion W. Wiedman. About 4 miles north of Vancouver, 1 mile west of U. S. Highway 99. Altitude about 220 ft. Drilled by R. A. Jobes, 1949.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Sand	55	55
Sand, water-bearing	3	58
Clay	2	60
Sand, yellow	40	100
Troutdale formation:		
Sandstone	15	115
Sand and gravel, water-bearing	20	135
Gravel, cemented	5	140
Sand and gravel, water-bearing	14	154
Sand, white, water-bearing	5	159

Casing, 6-inch to 154 ft.

2/1-3E2. Floyd W. Loomis. About 4 miles north of Vancouver, 1 mile west of U. S. Highway 99. Altitude about 220 ft. Drilled by F. Wickersham, 1948.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	5	5
Sand, brown, and clay	85	90
Troutdale formation:		
Gravel, cemented	42	132
Sand, gray, dry	6	138
Gravel, loose, water-bearing	10	148

Casing, 6-inch to 148 ft.

2/1-4F2. R. B. Jamison. About 0.2 mile southwest of intersection of Lake and Hoyes Roads in Lake Shore District. Altitude about 210 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	25	25
Sand	50	75
Gravel	53	128
Clay	14	142
Sand	20	162
Clay	26	188
Troutdale formation:		
Gravel, cemented	20	208
Sand	1	209
Gravel	5	214

Casing, 6-inch, set to 209 ft.

2/1-9F2. Fruit Valley Nursery. About 3 miles north of Vancouver, near east edge of Vancouver Lake. Altitude about 45 ft. Drilled by Joe Hansen, 1950.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	15	15
Sand, dry	20	35
Sand, water-bearing	65	100
Sand and gravel, water-bearing	12	112

Casing, 6-inch, set to 112 ft.

2/1-10A1. F. Mortendyke. U. S. Highway 99, near Totem Pole Trailer Court. Altitude about 205 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil and sand	24	24
Clay, sandy	9	33
Sand, black	9	42
Clay	33	75
Sand	53	128
Troutdale formation:		
Gravel, cemented	8	136
Sand, black	3	139

Casing, 6-inch, set to 139 ft.

2/1-10K2. L. A. Hinkle. About 0.25 mile southeast of Hazeldell School. Altitude about 170 ft. Drilled by R. A. Jobes.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Sand	50	50
Clay	20	70
Sand	25	95
Troutdale formation:		
Gravel, cemented	20	115
Gravel, loose	8	123

Casing, 6-inch, set to 123 ft.

2/1-10Q2. J. Voeller. About 0.5 mile south of Ludlum Road on west side of U. S. Highway 99. Hazeldell District. Altitude about 180 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil and sand.	35	35
Clay.	83	118
Troutdale formation:		
Gravel.	12	130
Gravel, cemented.	20	150
Sand.	4	154
Sand, black.	14	168

Casing, 6-inch, set to 165 ft.

2/1-11B1. Southwest Washington Experiment Station. About 3.5 miles north of Vancouver. Altitude about 258 ft. Drilled by R. J. Strasser, 1955.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	4	4
Silt and clay	28	32
Sand, fine	41	73
Clay, blue	17	90
Clay and silt	27	117
Troutdale formation:		
Clay, sticky, yellow	9	126
Sand, hard-packed (sandstone)	53	179
Gravel, cemented	46	225
Gravel, loose, and sand, water-bearing	13	238
Gravel, hard, cemented	17	255

Casing, 12-inch, set to 255 ft.

2/1-11C1. Clark County. Public Utility District well 1. About 3.5 miles north of Vancouver and 0.5 mile east of U. S. Highway 99. Altitude about 228 ft. Drilled by Pacific Drilling Co.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil.	3	3
Clay, gray.	24	27
Sand, yellow (water 20 gpm+).	5	32
Clay, yellow.	8	40
(40 ft of 12-inch casing set to shut off water)		
Clay, sandy, yellow.	50	90
Clay, sandy, gray.	30	120
Sand, gray, wet.	20	140
Troutdale formation:		
Gravel, cemented.	7	147
Gravel, loose, and sand.	3	150
Gravel, loose.	3	153
Gravel, with small amount of sand and mica. . . .	39	192
Gravel and sand.	2	194
Sand, fine, black.	4	198

Casing, 10-inch, set to 198 (?) ft; perforated 183 to 194 ft.

2/1-11C2. Clark County. Public Utility District Well 2. About 3.5 miles north of Vancouver and 0.5 mile east of U. S. Highway 99. Altitude about 225 ft. Drilled by Pacific Drilling Co.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil.	2	2
Clay, brown.	17	19
Sand, yellow (water 15-20 gpm).	1	20
Clay, gray (40 ft of 12-inch casing set to shut off water).	20	40
Clay, sandy, yellow.	50	90
Clay, sandy, gray.	32	122
Sand, wet, gray.	19	141
Troutdale formation:		
Gravel, cemented.	6	147
Sand, gray, with some gravel.	8	155
Gravel.	50	205
Gravel and sand.	6	211

Casing, 10-inch, set to 211 (?) ft; perforated 194 to 209 ft.

2/1-11C3. Clark County. Public Utility District Well 3. About 3.5 miles north of Vancouver and 0.5 mile east of U. S. Highway 99. Altitude about 228 ft. Drilled by Pacific Drilling Co.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	3	3
Clay, gray	20	23
Sand, silty, yellow (water in excess of 20 gpm)	8	31
Clay, yellow (casing set to shut off water)	11	42
Clay, sandy, yellow	50	92
Clay, gray	31	123
Clay, sandy, gray	11	134
Sand, gray	9	143
Troutdale formation:		
Gravel, cemented	5	148
Gravel, loose	73	221
Sand	2	223

Casing, 10-inch (?) set to 223 (?) ft; perforated 180 to 190 ft, and 210 to 220 ft.

2/1-11C4. Clark County Public Utility District No. 1, About 3.5 miles north of Vancouver and 0.5 mile east of U. S. Highway 99. Altitude about 235 ft. Drilled by R. J. Strasser, 1956.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	10	10
Sand and silt	42	52
Sand with clay binder	23	75
Troutdale formation:		
Clay, yellow	16	91
Sand with clay binder	41	132
Sand, hard-packed, some tight gravel	17	149
Gravel, large, with clay binder	19	168
Gravel, cemented	23	191
Sand and gravel, water-bearing	27	218
Gravel, cemented, tight	3	221

Casing, 16-inch, set to 177 ft, 12-inch 174-221 ft; perforated from 191 to 220 ft.

2/1-11E2. R. F. Mahan. Ludlum Road in Totem Pole District.
Altitude about 320 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	6	6
Soil and sand	12	18
Sand	32	50
Sand, gravelly	33	83
Sand, fine (quicksand)	11	94
Sand	13	107
Troutdale formation:		
Clay, sandy	23	130
Sand	24	154
Clay, sandy	9	163
Sand	41	204
Gravel	7	211

Casing, 6-inch to 209 ft.

2/1-12A3. Floyd Welch. About 4 miles northeast of Vancouver, 2.5 miles east of U. S. Highway 99. Altitude about 270 ft. Drilled by Joe Hansen.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	10	10
Sand, dry	12	22
Sand, (quicksand)	23	45

Casing, 6-inch to 45 ft; perforated 24 to 45 ft.

2/1-12B1. Milford J. Morse, About 4 miles northeast of Vancouver. Altitude about 270 ft. Drilled by George Zent, 1953.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	2	2
Clay, sandy	13	15
Sand, with thin clay streaks, water-bearing	16	31
Sand, water-bearing	15	46

Casing, 8-inch to 46 ft; perforated 31 to 44 ft.

2/1-12H3. Clarence Copelan (?). About 4 miles north of Vancouver, 2.5 miles east of U. S. Highway 99. Altitude about 285 ft. Dug 1950.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	2	2
Sand and clay	13	15
Sand, black, water-bearing	15	30

Casing, 36-inch concrete to 15 ft, 12-inch galvanized to 30 ft.

2/1-12J2. M. A. Curtin. About 4 miles north of Vancouver, 2.5 miles east of U. S. Highway 99. Altitude about 270 ft. Drilled by George Zent, 1951.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	2	2
Clay, sandy	8	10
Sand, water-bearing	8	18
Clay	14	32
Sand, black, water-bearing	13	45
Sand, red, water-bearing	2	47

Casing, 12-inch to 10 ft, 11-inch to 47 ft, perforated from 25 to 45 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/1-14P1. Jarvis. Near Leverich Park, Vancouver. Altitude about 95 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	8	8
Sand	19	27
Troutdale formation (?):		
Gravel	22	49
Sand	18	67
Gravel	12	79
Boulders	11	90
Gravel	8	98
Sand, black	9	107

Casing, 6-inch, set to 107 ft.

2/1-15Q1. City of Vancouver. Near north edge of city, west of U. S. Highway 99. Altitude about 214 ft. Drilled by R. J. Strasser, 1945.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil.	3	3
Gravel, pea size.	59	62
Sand, very fine, packed.	140	202
Gravel, sand, water-bearing.	10	212
Sand, water-bearing.	12	224
Sand, coarse gravel, water-bearing.	16	240
Gravel, fine.	27	267
Troutdale formation:		
Gravel, with fine yellow silt binder.	11	278

Casing, 18-inch, set to 278 ft; perforated 232 to 240 ft, 245 to 260 ft.

2/1-16B1. Fred Koerner. About 0.25 mile south of end of Mills Avenue, east of railroad tracts, Hazeldell District. Altitude about 70 ft. Drilled by R. A. Jobes.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay and sand.	40	40
Sand, black (coarse quicksand).	40	80
Sand, fine (quicksand).	59	139
Gravel.	3	142

Casing, 6-inch, set to 142 ft.

2/1-16C1. John E. Duggan. About 0.5 mile north of western edge of Vancouver. Altitude about 35 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium and Pleistocene alluvial deposits:		
Soil, sandy	29	29
Sand	14	43
Gravel	2	45
Sand, black	15	60
Sand, fine (quicksand)	2	62
Sand, black	20	82
Sand, fine (quicksand)	91	173
Troutdale formation:		
Gravel, cemented	11	184
Gravel, loose	6	190
Gravel, large	2	192
Gravel, cemented	12	204
Sand, black	7	211

Casing, 8-inch, set to 208 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/1-16K1. T. White. About 0.5 mile northwest of Vancouver, and 0.06 mile west of railroad. Altitude about 40 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium and Pleistocene alluvail deposits:		
Soil	5	5
Sand	58	63
Gravel	4	67

Casing, 6-inch, set to 67 ft.

2/1-16P1. Chester Nelson. About 0.2 mile west of railroad, west end of 39th St. Altitude about 40 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium and Pleistocene alluvial deposits:		
Soil	5	5
Clay	20	25
Clay, sandy	10	35
Gravel, loose	21	56

Casing, 6-inch, set to 56 ft.

2/1-18P1. Aluminum Company of America, well 1. About 3 miles west of Vancouver, and 1,000 ft north of Columbia River. Altitude about 28 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium and Pleistocene alluvial deposits:		
Sand, dredged	5	5
Clay, blue, and silt	35	40
Silt, gravelly	5	45
Silt, blue, and sand	25	70
Clay, blue	5	75
Silt and sand	32	107
Troutdale formation:		
Gravel and boulders, cemented	3	110
Silt, sand, and gravel	4	114
Gravel, loose, and sand, water-bearing	11	125
Gravel, with clay binder	9	134

Casing, 12-inch, set to 134 ft; perforated from 118-128 ft.

2/1-18P2. Aluminum Company of America, well 6. About 3.0 miles west of Vancouver and 1,000 ft north of Columbia River. Altitude about 28 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium:		
Sand, dredged	5	5
Silt, yellow, and clay	23	28
Clay, blue, and silt	20	48
Sand, fine, and silt	21	69
Clay, hard	6	75
Sand, packed (open hole drilled through)	31	106
Troutdale formation:		
Gravel, cemented	7	113
Sand (quicksand), with gravel	7	120
Gravel, with clay binder	15	135

Casing, 20-inch, set to 135 ft; perforated from 114-130 ft.

2/1-18P3. Aluminum Company of America, well 7. About 3.0 miles west of Vancouver and 1,000 ft north of Columbia River. Altitude about 28 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium and Pleistocene alluvial deposits:		
Sand, dredged	8	8
Clay and silt	28	36
Sand, fine, and silt	55	91
Sand, coarse	11	102
Gravel, cemented	7	109
Sand (quicksand) with gravel	9	118
Troutdale formation:		
Gravel, with clay binder	19	137

Casing, 20-inch, set to 137 ft. Perforated 109 to 114 ft and 116 to 130 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/1-18P4. Aluminum Company of America. In Vancouver . Altitude is 32.5 ft. Drilled by R. J. Strasser, 1950.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium and Pleistocene alluvial deposits:		
Sand, dredge.	9	9
Clay.	7	16
Sand with yellow silt.	37	53
Silt, blue, and sand.	51	104
Troutdale formation:		
Gravel, cemented.	14	118
Sand, water-bearing, and gravel.	12	130
Gravel with binder.	3	133

Casing, 16-inch, set to 133 ft; perforated 119-130 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/1-18P5. Aluminum Company of America. In Vancouver. Altitude is 32.7 ft. Drilled by R. J. Strasser, 1950.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium and Pleistocene alluvial deposits:		
Sand, dredge.	11	11
Silt, yellow, and sand.	25	36
Sand, fine, blue.	13	49
Silt, yellow, and sand.	15	64
Sand, fine, blue.	15	79
Clay, hard.	6	85
Sand, blue, and silt.	17	102
Troutdale formation:		
Gravel, cemented.	17	119
Sand and gravel, water-bearing.	11	130
Gravel with binder.	3	133

Casing, 15 -inch, set to 133 ft; perforated 119-130 ft.

2/1-18P6. Aluminum Company of America. In Vancouver. Altitude is 31.6 ft. Drilled by R. J. Strasser, 1954.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium and Pleistocene alluvial deposits:		
Sand, dredged, fill	12	12
Sand, brown	3	15
Silt and mucky sand	20	35
Sand, dirty, with wood fragments	55	90
Sand, clean, medium size	6	96
Troutdale formation:		
Gravel, with binder	10	106
Gravel, coarse, with clay binder	12	118
Gravel, with binder, drilled ahead of casing	4	122
Gravel, water-bearing, and some sand	34	156
Gravel with binder	4	160

Casing, 24-inch, set to 160 ft.

2/1-18P7. Aluminum Company of America, Vancouver. Altitude about 32 ft. Drilled by A. M. Jannsen.

Recent alluvium and Pleistocene alluvial deposits:		
Fill, sandy	10	10
Clay, sandy, yellow	50	60
Sand, fine, blue	85	145
Troutdale formation:		
Sand, coarse, gray, and gravel, water-bearing	5	150

Casing, 6-inch.

2/1-18R1. Bonneville Power Administration, Alcoa Substation. About 0.5 mile north of Columbia River, 0.25 mile west of Lake Shillapoo. Altitude about 27 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium and Pleistocene alluvial deposits:		
Clay, yellow (filled)	10	10
Sand, gravelly, packed, yellow	20	30
Pleistocene alluvial deposits:		
Silt, packed, blue, with some gravel	58	88
Troutdale formation:		
Gravel, cemented	5	93
Sand, coarse, packed, with some gravel	24	117
Gravel, loose, water-bearing	6	123
Gravel, cemented	4	127
Gravel, loose, water-bearing	5	132
Gravel, cemented	8	140

Casing, 10-inch, set to 140 ft; perforated 118 to 133 ft.

2/1-19A1. Aluminum Company of America. In Vancouver. Altitude is 34.4 ft. Drilled by R. J. Strasser, 1953.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium and Pleistocene alluvial deposits:		
Sand, dredge.	4	4
Clay, sandy.	19	23
Sand.	11	34
Clay, sandy.	4	38
Sand, packed.	13	51
Silt and sand.	21	72
Sand, packed.	22	94
Troutdale formation:		
Gravel with clay binder.	9	103
Sand and gravel, water-bearing.	16	119

Casing, 24-inch 0-24 ft, 16-inch 0-119 ft; perforated 105 to 115 ft.

2/1-19A2. Aluminum Company of America, Vancouver, Wash. Altitude is 32.7 ft. Drilled by R. J. Strasser, 1953.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium and Pleistocene alluvial deposits:		
Sand, dredge.	7	7
Clay, sandy.	12	19
Sand and silt.	11	30
Sand, packed.	71	101
Troutdale formation:		
Gravel with sandy clay binder.	7	108
Gravel and sand, water-bearing.	22	130

Casing, 24-inch 0-24 ft, 16-inch 0-130 ft; perforated 117 to 127 ft.

2/1-19B1. Aluminum Company of America, well 2. About 0.25 mile north of Columbia River, 2.5 miles west of Vancouver. Altitude about 30 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium and Pleistocene alluvial deposits:		
Sand, dredge	10	10
Soil	3	13
Clay, yellow	24	37
Clay, blue, and silt	21	58
Pleistocene alluvial deposits:		
Sand, packed	34	92
Sand	5	97
Silt, blue	13	110
Troutdale formation:		
Gravel and sand, tight	10	120
Gravel, loose, water-bearing	8	128
Gravel, tight	8	136

Casing, 12-inch, set to 136 ft; perforated from 121-130 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/1-19B2. Aluminum Company of America. Well 3. About 0.25 mile north of Columbia River, 2.5 miles west of Vancouver. Altitude about 30 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium and Pleistocene alluvial deposits:		
Sand, dredged	10	10
Soil	4	14
Clay, yellow	25	39
Clay, blue, and silt	21	60
Pleistocene alluvial deposits:		
Sand, packed	33	93
Sand	7	100
Silt, blue	12	112
Troutdale formation:		
Sand, tight, and gravel with binder	8	120
Gravel, loose, water-bearing	10	130
Gravel with binder	8	138

Casing, 12-inch, set to 138 ft; perforated 121-132 ft.

2/1-19B3. Aluminum Company of America, well 4. About 0.25 mile north of Columbia River, 2.5 miles west of Vancouver. Altitude about 28 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium and Pleistocene alluvial deposits:		
Sand, dredged.	9	9
Soil.	4	13
Clay, sandy.	23	36
Silt and sand.	55	91
Sand, coarse, and gravel, water-bearing. . . .	20	111

Casing, 12-inch, set to 111 ft; perforated 96 to 106 ft.

2/1-19B4. Aluminum Company of America, well 5. About 0.25 mile north of Columbia River, 2.5 miles west of Vancouver. Altitude about 28 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium and Pleistocene alluvial deposits:		
Sand, dredged.	8	8
Soil.	6	14
Clay, sandy.	24	38
Silt, sandy.	58	96
Pleistocene alluvial deposits:		
Sand, coarse, and gravel, water-bearing. . . .	21	117
Troutdale formation:		
Gravel, with binder.	5	122

Casing, 12-inch, set to 122 ft; perforated 102 to 117 ft.

2/1-19B7. Aluminum Company of America, in Vancouver.

Altitude is 31.6 ft. Drilled by R. J. Strasser, 1952.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium and Pleistocene alluvial deposits:		
Sand, dredge	10	10
Silt, sandy	23	33
Sand, packed	14	47
Silt, sandy	12	59
Sand, packed	34	93
Troutdale formation:		
Gravel, cemented	5	98
Gravel, loose, and sand, water-bearing	18	116

Casing, 20-inch from 0 to 25 ft, 12-inch to 116 ft; perforated from 104 to 114 ft.

2/1-19B8. Aluminum Company of America, in Vancouver.

Altitude is 29.2 ft. Drilled by R. J. Strasser, 1952.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium and Pleistocene alluvial deposits:		
Sand, dredge	7	7
Clay, sandy	9	16
Silt, sandy	39	55
Sand, packed	37	92
Troutdale formation:		
Gravel, cemented	7	99
Gravel, loose, and sand, water-bearing	18	117

Casing, 20-inch from 0 to 30 ft, 12-inch from 0 to 117 ft.

2/1-21A1. Spokane, Portland and Seattle Railway Co. About 300 ft south of office, east of railroad, at roundhouse. Altitude about 65 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay	12	12
Sand, coarse	66	78
Sand, fine (quicksand)	3	81
Gravel and sand	22	103
Gravel, coarse, and sand, cemented	8	111
Gravel, coarse, with some sand, water-bearing	19	130

Casing, 18-inch, set to 130 ft; perforated from 114 to 124 ft.

2/1-21C2. Federal Housing Authority Well 11, Fruit Valley (operated by city). At intersection of LaFrambois Road and State Highway 1-T. Altitude about 48 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Soil and sand (?)	26	26
Recent alluvium and Pleistocene alluvial deposits:		
Gravel	48	74
Sand, fine, and gravel	22	96
Sand, coarse, loose, with some gravel	20	116
Sand, gray	5	121
Troutdale formation:		
Sand, fine, yellow		

Casing, 12-inch, set to 151 ft; perforated from 100 to 109 ft.

2/1-21F1. Federal Housing Authority Well 10, Fruit Valley (operated by city). South of LaFrambois Road, west of Vancouver. Altitude about 48 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium:		
Soil and silt	20	20
Pleistocene alluvial deposits:		
Sand, coarse, and gravel	30	50
Sand, coarse, and gravel, water-bearing	39	89
Gravel, water-bearing	39	128

Casing, 12-inch, set to 128 ft; perforated from 105 to 116 ft.

2/1-21N1. Carborundum Co., Vancouver. About 1,000 ft north of Columbia River, 1.0 mile west of Vancouver. Altitude about 33 ft. Drilled by H. Bottner.

Recent alluvium:		
Sand	21	21
Clay, blue	8	29
Pleistocene alluvial deposits:		
Sand	20	49
Gravel, cemented	15	64
Boulders	3	67
Gravel, water-bearing	28	95

Casing, 18-inch, set to 71 ft.

2/1-21N2. Carborundum Co., Vancouver. About 1,000 ft north of Columbia River, 1.0 mile west of Vancouver. Altitude about 33 ft. Drilled by H. Bottner.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium:		
Sand	18	18
Clay, blue	6	24
Clay, brown, with boulders	12	36
Pleistocene alluvial deposits:		
Sand	11	47
Gravel, cemented	31	78
Gravel, fine, sand, water-bearing	6	84
Gravel, coarse, water-bearing	21	105

Casing, 18-inch, set to 105 ft.

2/1-23Q1. City of Vancouver, well 1. Base of north side of ridge in eastern Vancouver, vicinity of Fourth Plain Road and E. Reserve St. Altitude about 175 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	4	4
Gravel, loose	36	40
Sand and silt	90	130
Gravel and sand	25	155
Gravel	5	160
Sand	28	188
Gravel, water-bearing	32	220
Troutdale formation (?):		
Gravel, coarse, with clay binder	16	236
Gravel, water-bearing	12	248
Gravel and clay	2	250

Casing, 16-inch, set to 250 ft.

2/1-23Q3. City of Vancouver, well 3. On northeastern nose of ridge in eastern Vancouver, vicinity of Fourth Plain Road and E. Reserve St. Altitude about 223 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay	5	5
Gravel, with binder of clay, yellow	90	95
Gravel, loose, with loose, black, sand	45	140
Gravel, cemented	58	198
Sand, packed, yellow	16	214
Sand, fine, and gravel	11	225
Sand, coarse	6	231
Gravel, water-bearing	7	238
Gravel	12	250
Sand, coarse	7	257
Gravel, fairly loose, water-bearing	14	271
Gravel, water-bearing	2	273
Troutdale formation:		
Gravel, cemented	7	280

Casing, 16-inch, set to 280 ft; perforated from 227 to 243 ft and from 251 to 265 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/1-23Q4. City of Vancouver, Well 4. Base of north side of ridge in eastern Vancouver, vicinity of Fourth Plain Road and E. Reserve St. Altitude about 185 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil.	2	2
Sand and silt.	43	45
Sand, coarse, and pea gravel	127	172
Sand, fine, with some gravel.	18	190
Sand and gravel, water-bearing.	44	234
Troutdale formation:		
Gravel, with clay binder.	9	243

Casing, 18-inch, set to 243 ft; perforated from 203 to 238 ft.

2/1-23R1. City of Vancouver, well 5. Base of north side of ridge in eastern Vancouver. Vicinity of Fourth Plain Road and E. Reserve St. Altitude about 185 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Gravel, pea, and sand	42	42
Gravel, loose	4	46
Gravel, pea, sand, and silt	94	140
Sand	47	187
Sand, with some gravel	5	192
Sand and gravel, water-bearing	40	232
Troutdale formation:		
Gravel, with clay binder	8	240

Casing, 14-inch to 205 ft, 10-inch from 202 to 240 ft; perforated from 205 to 214 ft, and 226 to 235 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/1-24K1. Vancouver School Dist. 37, 2223 Kauffman Ave., Vancouver, . Altitude about 170 ft. Drilled by H. I. Bottner, 1955.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil.	5	5
Gravel.	5	10
Sand, coarse, water-bearing.	10	20
Sand, fine, yellow, water-bearing	63	83
Sand and gravel.	12	95
Troutdale formation:		
Gravel, cemented.	34	129
Gravel, loose (water 50 to 75 gpm approximately)	9	138
Sand and gravel.	16	154
Gravel, loose, clean, water-bearing.	9	163
Sand and gravel.	4	167

Casing, 10-inch, 0-67 ft; perforated 154-158 ft.

2/1-27H1. Clark County Public Utility District No. 1. In Vancouver. Altitude about 95 ft. Drilled by R. J. Strasser, 1955.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Backfill of gravel and dirt	8	8
Gravel, loose, sand, and some clay	28	36
Clay, sandy, and gravel	6	42
Gravel, cemented	12	54
Sand, loose, and gravel	8	62
Clay, sandy	10	72
Clay, sandy, and gravel	28	100
Clay and gravel	5	105
Gravel, cemented	14	119
Sand, loose, and gravel, water-bearing	21	140
Sand, cemented, and gravel	4	144

Casing, 10-inch from 30 to 144 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/1-27H2. Clark County Public Utility District No. 1. In Vancouver. Altitude about 95 ft. Drilled by R. J. Strasser, 1955.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Fill of gravel and clay.	15	15
Clay, sandy, and gravel.	5	20
Clay, sandy.	43	63
Clay, sandy, and gravel.	2	65
Gravel, cemented.	22	87
Sand, brown.	16	103
Sand and gravel, clay binder.	17	120
Sand, loose, and gravel, water-bearing. . . .	13	133
Sand, loose, and gravel.	4	137

Casing, 10-inch to 137 ft; perforated 120 to 133 ft.

2/1-27L1. Interstate Brewery Co. Southern Vancouver. Altitude about 40 ft.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Gravel, coarse	10	10
Gravel, cemented	50	60
Sand, coarse, and gravel, water-bearing	10	70
Gravel, cemented	10	80
Sand, coarse, and gravel	23	103
Troutdale formation:		
Gravel, with binder of fine, yellow, silt	5	108

Casing, 12-inch; perforated 60 to 70 ft, and 80 to 103 ft.

2/1-27M7. Columbia River Paper Mills, Well 7. Southern Vancouver, near Columbia River. Altitude about 28 ft. Drilled by A. M. Jannsen.

Pleistocene alluvial deposits:		
Clay	4	4
Gravel, loose	92	96
Gravel, binder of clay	4	100
Gravel, loose	13	113
Troutdale formation:		
Gravel, cemented	37	150

Casing, 26-inch to 137 ft, 20-inch from 132 to 150 ft; perforated 22 to 125 ft.

2/1-27M8. Columbia River Paper Mills, well 8. Southern Vancouver, near Columbia River, at intersection of 6th and Ingalls Sts. Altitude about 28 ft. Drilled by A. M. Jannsen.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Gravel, cemented	50	50
Gravel, water-bearing	62	112
Troutdale formation:		
Gravel, cemented	22	134
Gravel, loose	3	137

2/1-28G3. Port of Vancouver, terminal 2. Near Junction of U. S. Highways 99 and 830. Altitude about 28 ft.

Recent alluvium:		
Sand, filled	5	5
Silt	40	45
Pleistocene alluvial deposits:		
Sand, coarse, and fine gravel	7	52
Gravel, water-bearing	25	77
Gravel, "dirty"	2	79
Gravel, water-bearing	1	80

Casing, 18-inch

2/1-35F1. Buffalo Electro-Chemical Co. In southeast Vancouver at shipyards. Altitude about 30 ft. Drilled by A. M. Jannsen, 1949.

Materials	Thickness (feet)	Depth (feet)
Fill	15	15
Pleistocene alluvial deposits:		
Gravel and sand, water-bearing	18	33
Boulders, small, and sand	2	35
Gravel	7	42
Gravel, fine, and sand	8	50
Boulders, small, and sand	3	53
Gravel and sand	12	65
Gravel, cemented	6	71
Gravel, small	3	74
Sand	3	77
Gravel, small, and boulders	11	88
Gravel, coarse	7	95
Gravel, pea-size	5	100
Sand, fine, gray, and silt	2	102
Gravel, large	1	103
Troutdale formation:		
Gravel, cemented	57	160

Casing, 26-inch to 143 ft, perforated from 30 to 69 ft, and 83 to 97 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/1-35F2. Buffalo Electro-Chemical Co. In southeast Vancouver at shipyard. Altitude 29.2 ft. Drilled by L. R. Gaudio, 1951.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Sand, fine, brown.	9	9
Gravel and sand; coarse.	9	18
Gravel, up to 4" to fine, with loose sand. . . .	32	50
Gravel, some sand, hardpacked.	10	60
Sand, fine, some loose gravel.	12	72
Sand and gravel, hardpacked.	8	80
Sand, fine to medium, and gravel	10	90
Sand.	3	93
Sand, fine, and some gravel.	9	102
Troutdale formation:		
Gravel, coarse, and cemented, brown sand. . . .	12	114
Sand, and some brownish gravel.	2	116
Gravel and sand, cemented, brownish clay. . . .	6	122
Sand, medium, and coarse brownish gravel	10	132
Gravel, cemented, and sand, sandy streaks. . . .	28	160

2/1-35F3. Buffalo Electro-Chemical Co., Inc. In southeast Vancouver at shipyards. Altitude about 30 ft. Drilled by R. J. Strasser, 1951.

Materials	Thickness (feet)	Depth (feet)
Sand, fill	12	12
Recent alluvium:		
Silt, blue	4	16
Pleistocene alluvial deposits:		
Gravel, clay binder	10	26
Gravel, loose, and sand, water-bearing	8	34
Gravel and sand, very loose, water-bearing	22	56
Gravel, cemented	7	63
Gravel, loose, and fine brown sand, water-bearing	16	79
Gravel and sand, cemented	17	96

Casing, 26-inch, set to 96 ft; perforated from 28 to 56 and 73 to 93 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/1-35F4. Buffalo Electro-Chemical Co., Inc. In southeast Vancouver, at shipyards. Altitude about 30 ft. Drilled by R. J. Strasser, 1951.

Materials	Thickness (feet)	Depth (feet)
Sand, fill.	13	13
Recent alluvium:		
Silt, blue.	2	15
Pleistocene alluvial deposits:		
Gravel, some clay binder.	10	25
Gravel and sand, loose, water-bearing at 34 ft	11	36
Gravel and sand, very loose, water-bearing. .	18	54
Gravel, cemented.	9	63
Gravel, loose, and very fine brown sand, water-bearing.	18	81
Gravel and sand, cemented	4	85

Casing, 26-inch, set to 85 ft; perforated from 30 to 67 ft.

2/1-36B1. City of Vancouver, well 1.

McLoughlin Heights, near U. S. Highway 830. Altitude about 48 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Gravel, fine, and clay	15	15
Gravel and sand	30	45
Gravel and sand, water-bearing	33	78
Gravel, water-bearing	54	132

Casing, 12-inch, set to 132 ft; perforated 100 to 110 ft and 112 to 122 ft.

2/1-36B2. City of Vancouver, well 2.

McLoughlin Heights, near U. S. Highway 830. Altitude about 54 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Gravel, fine, and clay	11	11
Gravel, sand, and clay	31	42
Gravel and sand	13	55
Gravel and sand, water-bearing	21	76
Gravel, water-bearing	54	130

Casing, 12-inch, set to 120 ft; perforated from 90 to 105 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/1-36B3. City of Vancouver, well 3. McLoughlin Heights, near U. S. Highway 830. Altitude about 52 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay.	2	2
Gravel, fine.	30	32
Gravel and sand.	48	80
Gravel, water-bearing.	48	128

Casing, 12-inch to 128 ft; perforated from 92 to 110 ft.

2/1-36B4. City of Vancouver, well 4. McLoughlin Heights, near U. S. Highway 83C. Altitude about 56 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay.	2	2
Gravel, fine.	28	30
Sand.	25	55
Sand and gravel	10	65
Sand and gravel, water-bearing	10	75
Sand and gravel	15	90
Gravel, water-bearing	40	130

Casing, 12-inch to 130 ft; perforated from 92 to 107 ft and from 109 to 120 ft.

2/1-36B5. City of Vancouver, well 5. McLoughlin Heights, near U. S. Highway 830. Altitude about 50 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay and gravel, fine	5	5
Gravel, sand, and clay	31	36
Gravel and sand	33	69
Gravel, water-bearing	55	124

Casing, 12-inch, set to 124 ft; perforated from 80 to 92 ft.

2/1-36B6. City of Vancouver, well 6. McLoughlin Heights, near U. S. Highway 830. Altitude about 52 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay and gravel, fine	9	9
Gravel, sand, and clay	32	41
Gravel and sand	36	77
Gravel, water-bearing	45	122

Casing, 12-inch, set to 122 ft; perforated from 83 to 115 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/1-36B7. City of Vancouver, well 7., . McLoughlin Heights, near U. S. Highway 830. Altitude about 45 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Gravel, sand, and clay.	26	26
Gravel and sand.	58	84
Sand, coarse.	32	116
Gravel (?), coarse.	13	129

Casing, 12-inch, set to 126 ft; perforated from 77 to 83 ft and from 84 to 100 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/1-36B8. City of Vancouver, well 8, McLoughlin Heights, near U. S. Highway 830. Altitude about 55 ft. Drilled by R. J. Strasser, 1952.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay, with some gravel	18	18
Gravel, with clay binder	13	31
Silt, sandy, some gravel	13	44
Sand, gravel, and clay	10	54
Sand, coarse, clay, some gravel; water-bearing	23	77
Gravel, sand, and clay	15	92
Sand and gravel, water-bearing	35	127

Casing, 20-inch to 127 ft; perforated 91 to 114 ft.

2/2-1R1. H. R. Siegburg. About 2.5 miles east of Orchards, 0.5 mile north of State Highway 8-A. Altitude about 240 ft. Drilled by P. J. Hansen, 1951.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil, some gravel	8	8
Gravel, coarse	14	22
Troutdale formation:		
"Hardpan," with clay and coarse rock	38	60
Gravel and sand, water-bearing	24	84

Casing, 8-inch.

2/2-2B1. Robert L. and Fern E. Divine. About 2 miles northeast of Orchards. Altitude about 280 ft. Drilled by G. A. Locey, 1947.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	6	6
Gravel	16	22
Clay	8	30
Sand	48	78
Sand (?)	10	88
Troutdale formation:		
Sand, yellow, "soupy"	17	105
Sand, red, "soupy"	2	107
Gravel, cemented	12	119
Gravel, loose	6	125
Gravel, cemented	1	126
Sand, red, water-bearing	1	127
Sand, black, water-bearing	1	128

Casing, 6-inch, set to 128 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/2-2Q1. C. L. Engle. Sifton. Clark Chapel Road, about 0.04 mile north of State Highway 8-A. — . Altitude about 252 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	3	3
Sand	7	10
Gravel	38	48
Boulders	6	54
Gravel	17	71
Sand, black	2	73

Casing, 6-inch, set to 73 ft.

2/2-2Q2. J. Norby. Sifton. On Clark Chapel Road, 0.05 mile north of State Highway 8-A. — . Altitude about 253 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	3	3
Gravel	45	48
Sand (quicksand)	14	62
Gravel	6	68
Sand, black	3	71

Casing, 6-inch, set to 70 ft.

2/2-3F1. W. Myers. Battle Ground Highway, about 1.3 miles north of State Highway 8-A. Altitude about 264 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	6	6
Sand	20	26
Gravel	13	39
Gravel, loose	49	88
Sand, fine (quicksand)	10	98
Troutdale formation:		
Clay, blue	19	117
Gravel	5	122
Gravel, cemented	6	128
Clay, yellow	10	138
Gravel, fine	4	142

Casing, 6-inch, set to 142 ft.

2/2-3N1. Vancouver Municipal Airport. Battle Ground Highway, about 0.9 mile north of State Highway 8-A. Altitude about 250 ft. Drilled by G. Zent.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Gravel	60	60
Sand, water-bearing	12	72
Sand	13	85
Troutdale formation:		
Clay, sandy	35	120
Gravel, water-bearing	9	129

Casing, 6-inch, set to 129 ft.

2/2-3R1. H. S. Fenton. Sifton. About 0.6 mile north of State Highway 8-A, and 0.75 mile east of Battle Ground Highway. Altitude about 245 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	5	5
Sand and gravel	23	28
Sand (quicksand)	17	45
Boulders	8	53
Clay, sandy	26	79
Sand	17	96
Troutdale formation:		
Clay, red	23	119
Sand	14	133
Gravel	9	142
Sand, black	3	145

Casing, 6-inch, set to 145 ft.

2/2-4E1. E. Drasler. Glenwood Road, about 0.7 mile north of Five-Corners, northwest of Orchards. Altitude about 208 ft. Drilled by R. A. Jobes.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Gravel	25	25
Sand (quicksand)	40	65
Troutdale formation:		
Sand, yellow, and gravel	8	73
Gravel, water-bearing	3	76

Casing, 6-inch, set to 76 ft.

2/2-4G2. J. Kindsfather. About 1.7 miles north of Orchards, 0.5 mile west of Battle Ground Highway. Altitude about 232 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	20	20
Gravel, water-bearing	20	40
Sand, coarse (quicksand)	20	60
Troutdale formation:		
Gravel, with clay binder	12	72
Gravel, cemented	10	82
Gravel, loose	3	85
Gravel, water-bearing	2	87

Casing, 6-inch, set to 87 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/2-4G3. Alvin Bunch. About 1.3 miles north of Orchards, on road 0.5 mile west of road from Orchards to Battle Ground. Altitude about 235 ft. Drilled by R. A. Jobes.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Gravel	50	50
Sand, black (quicksand)	15	65
Troutdale formation:		
Sand, yellow	37	102
Gravel	3	105

Casing, 5-inch, set to 105 ft.

2/2-4N1. E. Hilberg. About 0.2 mile northwest of Five-Corners, and 1.5 miles northwest of Orchards. Altitude about 211 ft. Drilled by A. C. Locey.

Open Pit	7	7
Pleistocene alluvial deposits:		
Sand	73	80
Troutdale formation:		
Gravel	10	90
Sand, water-bearing	3	93

Casing, 6-inch, set to 93 ft.

2/2-5G2. H. I. and J. L. Sneed. In Vancouver. Altitude about 198 ft. Drilled by R. A. Jobes, 1953.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Sand	3	3
Clay	5	8
Clay and sand, mixed	18	26
Sand	44	70
Troutdale formation:		
Sand and gravel mud	11	81
Gravel, light, and fine black sand	2	83
Gravel and sand	5	88
Gravel, fine, loose	3	91
Gravel, cemented	6	97
Sand, white, and gravel, water-bearing	2	99

Casing, 8-inch, set to 92 ft, Perforated 86 to 92 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/2-5H1. Helen C. Lloyd. In Vancouver. Altitude about 202 ft.
Dug by James C. Lloyd, 1953.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Dirt and gravel.	3	3
Gravel.	17	20
Sandstone.	3	23
"Quicksand".	2	25
Sand, coarse, water-bearing.	2	27
Clay, blue.		bottom

Casing, 36-inch to 27 ft; perforated 20 to 27 ft.

2/2-5Q1. A. P. Bomber. About 1.5 miles northwest of Orchards.
Altitude about 238 ft. Drilled by R. A. Jobes, 1944.

Pleistocene alluvial deposits:		
Clay, yellow.	18	18
Clay, muddy, yellow.	47	65
Sand, fine, yellow (quicksand).	50	115
Troutdale formation:		
Gravel, water-bearing.	29	144

Casing, 6-inch to 143 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/2-6J1. P. Christensen. About 2.7 miles east of U. S. Highway 99, along Tracy Road. Altitude about 260 ft. Drilled by A.C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil.	12	12
Sand.	52	64
Clay, sandy.	41	105
Troutdale formation:		
Gravel, cemented.	22	127
Gravel.	3	130
Sand, black.	3	133

Casing, 6-inch to 130 ft.

2/2-7D1. Nels Carlson. County Farm Road, about 0.4 mile east of Manor Highway. Altitude about 290 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil, sandy	45	45
Gravel, water-bearing	67	112
Clay	30	142
Sand	17	159
Troutdale formation:		
Sand and gravel	13	172
Gravel, water-bearing	2	174

Casing, 6-inch, set to 168 ft.

2/2-7D2. O. Brekke. County Farm Road, about 0.5 mile east of Manor Highway. Altitude about 288 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	48	48
Sand, water-bearing	12	60
Sand	48	108
Clay	34	142
Sand (quicksand)	12	154
Troutdale formation:		
Gravel	15	169
Gravel, loose	5	174

Casing, 6-inch to 173 ft.

2/2-7M1. W. A. Lindeman. About 4 miles northeast of Vancouver, 2 miles east of U. S. Highway 99. Altitude about 290 ft. Drilled, 1952.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	1	1
Clay	6	7
Clay, sandy	7	14
Sand, water-bearing	34	48

Casing, 12-inch to 48 ft; perforated 24 to 46 ft.

2/2-8A2. Kenneth Menger. In Vancouver. Altitude about 225 ft. Drilled by Joe Hansen, 1954.

Pleistocene alluvial deposits:		
Topsoil	7	7
Loam, sandy	18	25
Clay, blue, and yellow, mixed	35	60
Sand and clay, mixed	35	95
Sand, no gravel, water-bearing	71	166
Sand, light gravel, water-bearing	2	168

Casing, 6-inch to 168 ft.

2/2-8B2. A. W. Clark. Just south of County Farm Road, about 0.4 mile west of Five-Corners, northwest of Orchards. Altitude about 230 ft.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	8	8
Sand	12	20
Gravel	16	36
Clay	26	62
Gravel	7	69
Sand (quicksand)	23	92
Troutdale formation:		
Gravel	18	110
Boulders	21	131
Gravel	12	143
Sand, black	2	145

Casing, 6-inch, set to 143 feet.

2/2-8H1. H. E. and R. L. Schultz. About 5 miles northeast of Vancouver. Altitude about 225 ft. Drilled by Joe Hansen, 1955.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	4	4
Gravel, light, and sand	18	22
Sand, water-bearing	10	32
Clay, yellow	3	35
Sand, brown, and clay, mixed	50	85
Sand, water-bearing	30	115
Troutdale formation:		
Sand, water-bearing, and light gravel	11	126

Casing, 6-inch, to 126 ft.

2/2-8N2. Walnut Grove School. About 4.5 miles northeast of Vancouver, on County Road 69. Altitude about 290 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	2	2
Clay, sandy	8	10
Sand	60	70
Troutdale formation:		
Clay	25	95
Clay, sandy	95	190
Sand (quicksand)	5	195
Gravel, water-bearing	13	208

Casing, 6-inch, to 208 ft.

2/2-9D1. J. B. Coffield. About 1.2 miles northwest of Orchards, 0.1 mile east of Five-Corners. Altitude about 213 ft. Drilled by G. Zent.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Gravel	40	40
Sand, fine, white (quicksand).	68	108
Troutdale formation:		
Gravel	9	117

2/2-9D3. Frank Houn. Just off Glenwood Road, about 1.0 mile north of Five-Corners, northwest of Orchards. Altitude about 215 ft. Drilled by R. A. Jobes.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Gravel, loose.	47	47
Sand (quicksand).	40	87
Troutdale formation:		
Gravel.	5	92

Casing, 6-inch, set to 92 ft.

2/2-9J1. H. D. Peden. About 0.5 mile north of Orchards, on lane across from Ellsworth Road. Altitude about 220 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil, sandy	10	10
Gravel and sand	15	25
Gravel and boulders	15	40
Troutdale formation (?):		
Gravel	16	56
Gravel, water-bearing	4	60

Casing, 6-inch, set to 60 ft.

2/2-9K2. H. C. Carter. About 0.5 mile northwest of Orchards, on Fairlawn Road. Altitude about 218 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	4	4
Sand	12	16
Gravel	28	44
Troutdale formation (?):		
Clay	17	61
Boulders	8	69
Gravel	14	83
Sand	30	113
Gravel	12	125
Sand, black	5	130

Casing, 6-inch, set to 130 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/2-9M1. Jay Turbush. About 0.8 mile west of Orchards, on Glenwood Road. Altitude about 231 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	7	7
Sand	18	25
Gravel	20	45
Troutdale formation:		
Gravel, cemented	16	61
Clay	10	71
Sand (quicksand)	28	99
Gravel	16	115
Gravel, cemented	11	126
Gravel, sandy	13	139
Sand, black	1	140

Casing, 6-inch, set to 140 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/2-9R3. Moyland C. Blair. In Orchards. , Altitude about 225 ft. Drilled by Rupert Jobes, 1953.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Gravel	20	20
Sand, water-bearing	13	33
Sand, black, water-bearing	4	37
Clay, blue	9	46
Troutdale formation:		
Clay, yellow	4	50
Sand and gravel	15	65
Gravel, water-bearing	23	88
Sand, black	1	89

Casing, 6-inch to 38 ft; perforated 70 to 84 ft.

2/2-10D1. L. Whatley. County Farm Road, 0.2 mile west of Battle Ground Highway, northwest of Orchards. Altitude about 221 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Soil and sand	28	28
Gravel	29	57
Sand	7	64
Troutdale formation:		
Gravel, cemented	18	82
Sand, black	12	94

Casing, 6-inch, set to 94 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/2-10L1. W. Worley. In Orchards, at intersection of State Highways 1-U and 8-A. Altitude about 218 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil, gravelly	6	6
Sand	31	37
Troutdale formation:		
Clay, blue	6	43
Sand, black (quicksand)	10	53
Sand, yellow (quicksand)	14	67
Gravel, water-bearing	2	69

Casing, 6-inch, set to 69 ft.

2/2-10L2. Chester Larson. In Orchards, about 0.3 mile east of intersection of State Highways 1-U and 8-A. Altitude about 218 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Open pit	30	30
Sand and gravel	10	40
Troutdale formation:		
Gravel, cemented	18	58
Gravel, loose	6	64

Casing, 6-inch, set to 64 ft.

2/2-10L3. F. H. Baker. Near Orchards, about 0.2 mile east of intersection of State Highways 1-U and 8-A. Altitude about 218 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Gravel	8	8
Boulders	9	17
Gravel	15	32
Troutdale formation:		
Gravel and clay	6	38
Boulders	4	42
Gravel and clay	16	58
Sand, black	5	63

Casing, 6-inch, set to 62 ft.

2/2-10M2. O. H. Snyder. Battle Ground Highway, about 0.1 mile north of State Highway 8-A, near Orchards. Altitude about 220 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil and gravel	3	3
Gravel	17	20
Sand	22	42
Troutdale formation:		
Gravel, cemented	21	63
Gravel, water-bearing	3	66

Casing, 6-inch, set to 66 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/2-10P2. A. L. Edwards. In Orchards, on State Highway 8-A. Altitude about 215 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Gravel, coarse.	20	20
Sand.	15	35
Troutdale formation:		
Gravel, cemented.	5	40
Sand, black.	4	44
Gravel, cemented.	6	50
Gravel, loose.	14	64

Casing, 6-inch, set to 64 ft.

2/2-10R2. Stuchini. About 0.5 mile south of State Highway 8-A, 0.9 mile east of Orchards. Altitude about 203 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Soil.	9	9
Gravel.	11	20
Clay.	13	33
Sand.	11	44
Troutdale formation:		
Gravel, pea.	12	56
Clay.	8	64
Gravel.	6	70
Sand, black.	5	75

Casing, 6-inch, set to 75 ft.

2/2-10R4. Elmer Yielding. About 1 mile east of Orchards. Altitude about 205 ft. Dug by Jack Hollenback, 1953.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvail deposits:		
Topsoil.	4	4
Gravel and rock.	31	35
Sand and clay.	5	40
Sand and gravel.	4	44

Casing, 36-inch, set to 44 ft.

2/2-11E2. C. Holter. About 1.5 miles east of Orchard on State Highway 8-A. Altitude about 225 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil.	6	6
Sand.	31	37
Clay, blue.	7	44
Sand, black.	6	50

Casing, 6-inch, set to 50 ft.

2/2-12H1. D. M. Shattuck. About 1 mile northeast of Vancouver, 2 miles east of U. S. Highway 99. Altitude about 220 ft. Drilled by G. H. Locey, 1952.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil, gravelly	4	4
Gravel	14	18
Gravel, water-bearing	6	24
Troutdale formation:		
Clay	24	48
Gravel, cemented	5	53
Gravel, water-bearing	6	59
Gravel and clay	5	64
Gravel, water-bearing	4	68
Gravel and clay	5	73
Gravel, water-bearing	1	74
Gravel, cemented	2	76
Gravel, alternating layers of loose water-bearing gravel and cemented gravel	15	91

Casing, 8-inch to 90 ft; perforated 50 to 90 ft.

2/2-12J1. Preobstel Community Church. About 0.5 mile west of Proebstel Store, near State Highway 8-A, about 3.5 miles east of Orchards. Altitude about 215 ft. Drilled by G. Zent.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil.	4	4
Gravel.	34	38

2/2-13D2. D. Kunze. About 0.5 mile south of State Highway 8-A, 2.1 miles east of Orchard. Altitude about 198 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Soil and rock fragments, unclassified.	6	6
Troutdale formation:		
Gravel.	47	53
Clay (shale).	3	56
Clay and gravel.	28	84
Gravel, water-bearing.	12	96

Casing, 8-inch, set to 96 ft.

2/2-14D1. J. L. Frame. About 0.5 mile south of Sifton. Altitude about 195 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	5	5
Clay	5	10
Troutdale formation (?):		
Clay and boulders	35	45
Sand, water-bearing	10	55

Casing, 6-inch set to 55 ft.

2/2-15P1. Jacob Dietz. About 0.7 mile north of Burton School, 1.2 miles southeast of Orchards. Altitude about 222 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	16	16
Gravel	20	36
Troutdale formation:		
Clay	8	44
Sand (quicksand)	16	60
Gravel	9	69
Sand, black	4	73

Casing, 6-inch, set to 73 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/2-16G2. Donald R. Irving. About 0.5 mile southwest of Orchards.
Altitude about 210 ft.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Gravel	40	40
Sand, yellow	20	60
Troutdale formation:		
Sand and gravel, heaving	60	120
Sand, and gravel, coarse	20	140
Sand and gravel, water-bearing	5	145

Casing, 8-inch to 145 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/2-16H1. C. P. McMillan. About 6 miles northeast of Vancouver. Altitude about 200 ft. Drilled by G. L. Zent, 1950.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	2	2
Gravel and clay	8	10
Gravel, water-bearing	2	12
Clay	30	42
Troutdale formation:		
Clay, rocky	16	58
Gravel, water-bearing	28	86

Casing, 6-inch to 87 ft.

2/2-16J1. M. M. VanFleet and Clyde Parker. About 6 miles northeast of Vancouver. Altitude about 205 feet. Drilled by G. H. Locey, 1953.

Pleistocene alluvial deposits:		
Soil, gravelly	4	4
Gravel	14	18
Sand	4	22
Clay	20	42
Troutdale formation:		
Gravel and sand	8	50
Gravel and clay	4	54
Gravel and sand, water-bearing	16	70
Gravel, clean	1	71

Casing, 6-inch to 71 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/2-16N1. A. J. Kaufmann. About 5 miles northeast of Vancouver.
Altitude about 263 ft. Drilled in 1953.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
"Quicksand".	40	40
Troutdale formation:		
Gravel, cemented.	60	100
Gravel, water-bearing	50	150
No record.	50	200

Casing, 8-inch to 200 ft.

2/2-18G1. Waldo F. Kunze. About 3.5 miles northeast of Vancouver.
Altitude about 280 ft. Drilled by G. L. Zent, 1953.

Pleistocene alluvial deposits:		
Soil.	2	2
Clay, sandy.	8	10
Sand, water-bearing.	25	35

Casing, 24-inch to 13 ft, 11-inch from 0 to 35 ft.

2/2-18J2. H. C. Schill, 4225 NE Buena Vista Road, Vancouver,
Washington. Altitude about 255 ft. Dug well, 1955.

Pleistocene alluvial deposits:		
Loam, sandy, water-bearing at 4 ft.	7	7
Sand, water-bearing.	11	18

Casing, 12-inch to 18 ft; perforated 8 to 18 ft.

2/2-19F3. H. H. Bolton. Washington State Highway 8-A about 0.6 mile east of Clark County Road 69. Altitude about 185 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	2	2
Clay, sandy	18	20
Clay, blue	10	30
Sand, gray	15	45
Sand (quicksand)	5	50
Gravel, loose	8	58
Sand, black, water-bearing	6	64

Casing, 6-inch, set to 64 ft.

2/2-19G3. John Yinger. Battle Ground Highway near Andreson Road, about 1.8 miles east of Vancouver. Altitude about 205 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	12	12
Sand	8	20
Gravel	13	33
Clay	17	50
Gravel	8	58
Troutdale formation:		
Gravel, cemented	13	71
Gravel	8	79
Sand, black	1	80

Casing, 6-inch, set to 64. ft.

2/2-19H3. John Shierman. South of intersection of State Highways 1-U and 8-A. Altitude about 210 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	4	4
Gravel	31	35
Sand (quicksand)	5	40
Clay, blue	10	50
Sand (quicksand)	26	76
Troutdale formation:		
Gravel	8	84
Sand, black	4	88

Casing, 6-inch, set to 87 ft.

2/2-19J2. L. W. Sensiba. Andreson Road, about 0.4 mile south of State Highway 8-A. Altitude about 215 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Gravel	12	12
Sand	52	64
Gravel	2	66
Troutdale formation:		
Clay, sandy	12	78
Gravel, water-bearing	2	80

Casing, 6-inch, set to 80 ft.

2/2-19L1. J. W. Bolton. Andreson Road, off Fourth Plain Road.

Altitude about 185 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	5	5
Gravel, coarse	13	18
Sand, fine	23	41
Sand, blue	4	45
Clay, blue	17	62
Sand, fine	3	65
Sand, coarse	3	68

Casing, 6-inch, set to 68 ft.

2/2-20A2. Royal Oaks Country Club, Orchards. About 0.2 mile south of State Highway 8-A, about 1.6 miles southwest of Orchards. Altitude about 210 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	2	2
Gravel	6	8
Gravel and sand	12	20
Sand	7	27
Sand and gravel	16	43
Troutdale formation:		
Gravel, cemented	12	55
Gravel, with clay binder	10	65
Gravel and sand, water-bearing	30	95
Gravel, cemented	77	172
Gravel and sand, water-bearing	26	198
Gravel, water-bearing	18	216
Gravel, with clay binder	5	221

Casing, 12 and 10-inch, set to 221 ft; perforated from 65 to 96 ft, from 170 to 198 ft, and from 200 to 216 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/2-20D2. M. K. Nagel, 8104 NE 4th Plain Road, Vancouver.
Altitude about 220 ft. Drilled by B. L. Price, 1951.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil.	3	3
Silt.	18	21
Troutdale formation:		
Clay, sandy.	60	81
Sand and gravel.	66	147

Casing, 10-inch, 0-147 ft; perforated from 125 to 145 ft.

2/2-20E1. C. Albrecht. Intersection of Burton Road and
State Highway 1-U, about 1.5 miles south of Walnut Grove.
Altitude about 207 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil and gravel.	10	10
Gravel.	12	22
Troutdale formation:		
Clay.	8	30
Gravel, cemented.	19	49
Gravel, loose.	7	56
Gravel.	2	58
Sand, black.	1	59

Casing, 6-inch, set to 58 ft.

2/2-21J1. H. Passut. About 1.8 miles south of Orchards at end of Orchards Road. Altitude about 202 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil and gravel	10	10
Sand and gravel	17	27
Boulders	6	33

Casing, 6-inch, set to 33 ft.

2/2-21N1. R. A. Laws. About 4 miles east of Vancouver. Altitude about 180 ft. Drilled by J. E. Hanson, 1955.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	3	3
Gravel, heavy	15	18
Gravel, light, water-bearing	5	23
Clay, blue	4	27
Troutdale formation:		
Gravel, cemented	13	40
Gravel, cemented, water-bearing	10	50
Gravel, loose, water-bearing	10	60
Clay at 60 ft.		

Casing, 6-inch to 60 ft.

2/2-21P1. S. J. Marrion. About 5 miles east of Vancouver.

Altitude about 200 ft. Drilled by owner, 1954.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil.	4	4
Troutdale formation:		
Clay, yellow, and rock.	18	22
Clay, yellow, and rock, some gravel.	2	24
Gravel, cemented.	24	48
Gravel, cemented, water-bearing	7	55
Gravel, cemented, some black clay.	10	65
Gravel, washed, water-bearing.	24	89

Casing, 8-inch to 89 ft; perforated 75 to 89 ft.

2/2-22A1. George Fisher. About 1.6 miles southeast of Orchards, about 0.4 mile north of Clark County Road 109, on Clark County Road 111. Altitude about 240 ft. Drilled by A. C. Locey.

Dug well, no record.	56	56
Troutdale formation:		
Gravel, cemented.	19	75
Gravel and clay.	24	99
Gravel, water-bearing.	15	114

Casing, 6-inch, set to 58 ft.

2/2-22A2. George Fisher. About 1.5 miles southeast of Orchards, and 0.5 mile north of Clark County Road 109 on Clark County Road 111. Altitude about 243 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	20	20
Sand and gravel	27	47
Troutdale formation:		
Clay and gravel	9	56
Sand, water-bearing	9	65

Casing, 6-inch, set to 65 ft.

2/2-22J1. Dewey Kitchell. About 6.5 miles east of Vancouver. Altitude about 242 ft. Drilled in 1950.

Pleistocene alluvial deposits:		
Soil	40	40
Troutdale formation:		
"Hardpan"	31	71
Gravel, water-bearing	33	104

Casing, 6-inch to 104 ft.

2/2-23D3. C. Timmel. About 1.5 miles southeast of Orchards, at right-angle turn of County Road 111. Altitude about 244 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	11	11
Sand	20	31
Gravel	10	41
Sand (quicksand)	30	71
Troutdale formation:		
Gravel, cemented	26	97
Gravel	4	101
Sand, black	2	103

Casing, 6-inch, set to 103 ft.

2/2-23E1. H. W. Sherril. About 2 miles southeast of Orchards, on County Road 109, about 0.8 mile east of Burton School. Altitude about 238 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Soil	12	12
Sand	20	32
Gravel	9	41
Sand (quicksand)	29	70
Troutdale formation:		
Gravel, cemented	27	97
Sand, black	2	99

Casing, 6-inch set to 87 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/2-23F2. Lester Courtney. About 2 miles southeast of Orchards, on County Road 109, about 0.9 mile east of Burton School. Altitude about 236 ft. Drilled by B. Abrams.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Gravel	20	20
Sand	40	60
Troutdale formation (?):		
Clay	10	70
Gravel, water-bearing	8	78

2/2-23G2. Mrs. Louise E. Olsen. About 2.5 miles southeast of Orchards. Altitude about 248 ft. Drilled by J. E. Hansen, 1952.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil and clay	6	6
Gravel and boulders	39	45
Sand, water-bearing	35	80
Troutdale formation:		
Clay, yellow	15	95
Sand, water-bearing	10	105
Gravel, water-bearing	15	120
Gravel, mixed with clay	8	128

Casing, 8-inch, set to 128 ft; perforated from 112 to 120 ft.

2/2-23P1. Evergreen school. About 6.5 miles east of Vancouver, on Clark County Road 108, and about 1.5 miles east of Clark County Road 104. Altitude about 307 ft. Drilled by P. J. Hansen.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Sand and gravel.	122	122
Troutdale formation:		
"Hardpan" (gravel, cemented).	15	137
Sand, fine, and gravel.	48	185
Gravel, water-bearing.	35	220

Casing, 8-inch, set to 220 ft; perforated from 185 to 195 ft.

2/2-24E2. W. C. Ireton. About 7 miles east of Vancouver, on Clark County Road 109, about 0.3 miles west of intersection with Clark County Road 7. Altitude about 236 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Soil.	6	6
Gravel.	6	12
Gravel, coarse.	26	38
Troutdale formation:		
Gravel, cemented.	6	44
Gravel, with clay binder.	3	47

Casing, 6-inch, set to 44. ft.

Table 17.--Materials penetrated by representative wells--Continued

2/2-24N2. G. B. Wright. About 8 miles east of Vancouver. Altitude about 296 ft. Drilled by J. C. Hansen, 1955.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	3	3
Gravel, dry	67	70
Sand and gravel	15	85
Sand, water-bearing	37	122
Troutdale formation:		
Clay, yellow	18	140
Gravel, cemented	20	160
Gravel, loose, water-bearing	12	172

Casing, 6-inch to 172 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/2-25J1. Alfred Kern. About 1.3 miles southwest of Harmony School, about 7 miles east of Vancouver, on Fischer's Road near Mill Plain. Altitude about 285 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	4	4
Gravel	32	36
Boulders	16	52
Gravel, coarse	8	60
Sand	27	87
Troutdale formation:		
Gravel, cemented	13	100
Boulders	26	126
Gravel	12	138
Sand	10	148
Sand, black	2	150

Casing, 6-inch, set to 148 ft.

2/2-25R1. R. H. Johnson. About 8 miles east of Vancouver, 2.5 miles north of U. S. Highway 830.
Altitude about 295 ft. Drilled by Joe Hansen, 1953.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	3	3
Gravel, light	12	15
Rocks and gravel, mixed	35	50
Gravel, light, with sand	23	73
Clay	11	84
Clay and sand, mixed	11	95
Troutdale formation:		
Clay and big rocks	24	119
Sand and clay	33	152
Sand, water-bearing	27	179
Sand, very little gravel	14	193
Gravel and sand, water-bearing	4	197

Casing, 8-inch, set to 197 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/2-28E1. C. P. Teske. West Mill Plain District, about 0.5 mile south of County Road 109, and 0.9 mile west of County Road 104. Altitude about 260 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil.	7	7
Sand.	13	20
Gravel.	11	31
Sand.	16	47
Clay.	33	80
Sand (quicksand).	21	101
Troutdale formation:		
Gravel.	8	109
Boulders.	14	123
Gravel.	17	140
Sand, black	2	142

Casing, 6-inch, set to 142 ft.

2/2-28M2. W. Preston. West Mill Plain District, at end of Cushing Road, off County Road 2. . Altitude about 315 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	2	2
Gravel	43	45
Sand	10	55
Gravel	7	62
Sand	8	70
Sand and gravel	68	138
Troutdale formation:		
Clay, blue	4	142
Clay, yellow	19	161
Gravel	19	180

Casing, 6-inch, set to 174. ft.

Table 17.--Materials penetrated by representative wells--Continued

2/2-30C1. Federal Housing Authority. Ogden Meadows Well. At foot of escarpment about 0.3 mile north of Clark County Road 2, about 2.5 miles east of Vancouver. Altitude about 185 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	5	5
Sand	64	69
Troutdale formation:		
Gravel, cemented, water-bearing in upper 3 ft.	131	200
Gravel, cemented, and clay	32	232
Gravel, loose, water-bearing	13	245
Gravel, loose	13	258
Gravel, cemented	42	300

Casing, 12-inch, set to 300 ft, and 10-inch, set from 200 to 300 ft; perforated from 118 to 122 ft, from 124 to 130 ft, from 188 to 194 ft, from 204 to 215 ft, from 240 to 243 ft, and from 250 to 255 ft.

2/2-30K1. Park Hill Cemetary. About 0.1 mile west of Park Hill Cemetary. McLoughlin Heights, west of Vancouver. Altitude about 298 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	2	2
Gravel with binder	23	25
Sand, loose	7	32
Sand, dry, packed	68	100
Sand, heaved, water-bearing	20	120
Sand, dry	25	145
Gravel	5	150
Sand	12	162
Troutdale formation:		
Gravel and boulders, cemented	28	190
Gravel, cemented	45	235
Gravel and sand, water-bearing	13	248
Gravel, with some binder	12	260
Gravel, water-bearing	15	275
Gravel, cemented	24	299
Gravel and boulders, cemented	25	324
Gravel with binder	25	349
Gravel, cemented, hard	7	356
Sand, yellow	8	364
Gravel, cemented, hard	32	396

Casing, 16-inch, set to 284 ft; perforated from 239 to 255 ft and from 260 to 275 ft.

2/2-32E1. M. Carson. About 4 miles east of Vancouver along Morgan Road on escarpment. Altitude about 185 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	8	8
Sand	6	14
Troutdale formation:		
Gravel	10	24
Clay	26	50
Gravel	42	92
Gravel and clay	27	119
Gravel	12	131
Sand, black	6	137

Casing, 6-inch, set to 132 ft.

2/2-32F1. Edward Schwind. Intersection of MacArthur Blvd. and Lieser Road, just south of McLoughlin Heights. Altitude about 280 ft. Drilled by A. C. Locey.

Old Well, no record	130	130
Troutdale formation:		
Gravel and clay	16	146
Gravel, cemented	31	177
Gravel, water-bearing	16	193

Casing, 6-inch, set to 192 ft.

2/2-32F2. Edward Schwind. Intersection of MacArthur Blvd. and Lieser Road, just south of McLoughlin Heights. Altitude about 280 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene Alluvial deposits:		
Soil and sand.	30	30
Gravel.	45	75
Sand.	10	85
Troutdale formation:		
Clay	70	155
Gravel.	32	187

Casing, 6-inch to 187 ft.

2/2-33K1. T. Putnam. Between West Mill Plain District and Ellsworth. About 0.2 mile west of Ellsworth Road on Sohns Road. Altitude about 295 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Soil.	3	3
Gravel.	21	24
Gravel, hard.	3	27
"Dirt".	7	114
Gravel.	30	144
"Dirt".	2	146
Troutdale formation:		
Gravel, hard (cemented?).	8	154
Gravel, loose.	6	160

Casing, 6-inch, to 158 ft.

2/2-33R1. C. W. Barrone. On County Road 104, about 0.55 mile north of U. S. Highway 830, about 0.5 mile northwest of Ellsworth. Altitude about 195 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	5	5
Gravel	8	13
Sand	12	25
Gravel, coarse	14	39
Sand	11	50
Sand, black	2	52

Casing, 6-inch, set to 51 ft.

2/2-34P1. Spencer Biddle. About 0.5 mile northeast of Ellsworth, about 0.6 mile east of Clark County Road 104 along second street north of U. S. Highway 830. Altitude about 242 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Gravel and boulders	19	19
Gravel	17	36
Gravel and boulders	2	38
Gravel	19	57
Troutdale formation:		
Clay	15	72
Gravel	6	78

Casing, 6-inch, set to 76 ft.

2/2-35C1. W. S. Olsen. Mill Plain District, 7 miles east of Vancouver on Clark County Road 2. Altitude about 305 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Gravel	97	97
Troutdale formation:		
Clay	11	108
Clay, sandy	4	112
No record; water-bearing	1	113
Clay and boulders	12	125
Clay and gravel	36	161
Gravel, water-bearing	9	170

Casing, 6-inch, set to 170 ft.

2/2-36B1. W. L. Moreland. Across road from East Mill Plain School, about 0.3 mile north of intersection of County Roads 7 and 2. Altitude about 295 ft. Drilled by G. Zent.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	2	2
Sand and gravel	64	66
Troutdale formation:		
Clay	19	85
Boring lava (?):		
Rock and clay	22	107
Troutdale formation:		
Gravel	46	153

Table 17.--Materials penetrated by representative wells--Continued

2/2-36P1. John McGillivray. South of East Mill Plain, about 0.2 mile west of County Road 7 on Fisher Road. Altitude about 285 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	3	3
Clay and boulders	69	72
Boring lava (?):		
Rock	29	101
Troutdale formation:		
Sand and gravel	39	140
Sand, water-bearing	31	171
Sand and gravel, water-bearing	20	191
Gravel, loose	16	207
Gravel, cemented	25	232
Gravel, water-bearing	6	238

Casing, 8-inch, set to 238 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/3-3D1. Camp Kilpack, U. S. Army. About 0.4 mile northeast of west entrance on southwest flank of Camp Hill. Altitude about 465 ft. Drilled by A. M. Jannsen.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation: (Troutdale exposed)		
Old well, no record.	125	125
Clay, red and blue, and gravel.	75	200
Gravel.	90	290
Tertiary volcanics:		
Lava rock, red.	213	503
Lave rock, water-bearing.	13	516

2/3-4K1. Joe Kaleta. About 0.3 mile west of Camp Kilpack, just south of Pluss Road. Altitude about 385 ft. Drilled by G. Zent.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Upper member;		
Soil	10	10
Clay	20	30
Clay, sandy, and gravel	108	138
Gravel	7	145
Lower member;		
Clay	95	240
Sand	5	245
Gravel, water-bearing	2	247
Clay	3	250

Casing, 6-inch to 247 ft.

2/1-5P1. Smith V. Haagen. About 1.25 miles northeast of Proebstel. Altitude about 285 ft. Drilled by Floyd Wickersham, 1953.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits:		
Topsoil	5	5
Clay, yellow	13	18
Clay, blue	9	27
Troutdale formation:		
Upper member;		
Boulders, black	34	61
Sand, fine, black, water-bearing	14	75
Boulders and gravel, water-bearing	22	97
Gravel, cemented, water-bearing	104	201
Gravel, fine, water-bearing	25	226
Gravel, cemented, water-bearing	12	238
Sand, brown, water-bearing	15	253
Gravel, water-bearing	7	260
Lower member;		
Clay, blue	30	290

Casing, 8-inch to 177 ft, 6-inch from 177 to 290 ft; perforated 75 to 175 ft, 201 to 238 ft, and 253 to 270 ft.

2/3-5R1. E. L. Bellamy. About 1.2 miles west of Camp Kilpack, on County Road 96 and 0.2 mile west of County Road 91. Altitude about 305 ft. Drilled by G. Zent.

Materials	Thickness (feet)	Depth (feet)
Soil	3	3
Troutdale formation:		
Clay	17	20
Clay, rocky, and cemented, weathered gravel	106	126
Clay	14	140
Sand and gravel, water-bearing	4	144

Casing, 6-inch to 144 ft.

2/3-6K1. Carl Anderson. About 1.0 mile north of Camp Kilpack, on Rifle Range Road, at intersection with County Road 99. Altitude about 272 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Soil	3	3
Clay	29	32
Sand and gravel	14	46
Troutdale formation:		
Gravel, cemented	11	57
Boulders	13	70
Boring lava (?):		
Rock	23	93

Casing, 6-inch to 69 ft.

2/3-6R1. K. Jacobs. About 1 mile east of Orchards, 0.3 mile south of County Road 96. Altitude about 275 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits:		
Soil	8	8
Clay, water-bearing (?)	22	30
Clay, blue	14	44
Troutdale formation:		
Gravel, cemented	12	56
Gravel, loose, water-bearing	5	61

Casing, 5-inch to 61 ft.

2/3-7A1. W. A. Soliday. About 0.5 mile north of Proebstel, 0.5 mile east of Fifth Plain Creek. Altitude about 270 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits:		
Soil	8	8
Gravel, coarse	12	20
Troutdale formation:		
Gravel, cemented	22	42
Sand, black	5	47

Casing, 6-inch to 46 ft.

2/3-7J1. James Higgins. About 7 miles northwest of Camas, 0.25 mile east of Proebstel. Altitude about 256 ft. Drilled by George Kapitenorich, 1950.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits:		
Clay and gravel	40	40
Gravel, loose, water-bearing	10	50
Troutdale formation:		
Gravel, cemented	30	80
Gravel, water-bearing	30	110

Casing, 6-inch to 100 ft.

2/3-7L1. D. M. Shattuck. About 0.5 mile northwest of Proebstel, 0.3 mile east of Fifth Plain Creek. Altitude about 218 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits and Troutdale formation:		
Soil	3	3
Sand and gravel	16	19
Gravel, coarse	11	30
Boulders	14	44
Gravel	12	56
Sand, black	6	62

Casing, 6-inch to 59 ft.

2/3-7R2. John Meisner. In Proebstel, just north of State Highway 8-A, and 0.6 mile east of Lacamas Creek. Altitude about 250 ft. Drilled by Pete Hansen.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits:		
Clay	58	58
Troutdale formation:		
Sand, hard rock (?)	5	63
Gravel, cemented hard	5	68
Sand, water-bearing	7	75
Gravel, coarse, loose	13	88

Casing, 6-inch to 88 ft.

2/3-8E1. R. H. Paulson. About 0.5 mile northeast of Proebstel, on County Road 98. Altitude about 251 ft. Drilled by G. Zent.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits:		
Soil	2	2
Clay, sandy	16	18
Troutdale formation:		
Clay, rocky	10	28
Gravel	45	73
Sand, coarse	8	81
Clay, red	2	83
Gravel, water-bearing	5	88

Casing, 6-inch to 82 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/3-8K1. M. W. Andrew. About 0.7 mile east-northeast of Proebstel, off Manor Highway. Altitude about 320 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits:		
Clay, sandy	10	10
Sand (quicksand)	28	38
Sand, blue	47	85
Troutdale formation:		
Gravel, cemented	13	98
Gravel, water-bearing	3	101
Gravel	14	115
Clay, sandy	4	119
Gravel, cemented	11	130
Sand, black, water-bearing	2	132
No record; water-bearing	4	136

Casing, 6-inch to 136 ft.

2/3-8M1. C. O. Wilson. In Proebstel, about 0.4 mile west of State Highway 8-A on County Road 98. Altitude about 263 ft. Drilled by G. Zent.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits:		
Soil	2	2
Clay	60	62
Troutdale formation:		
Gravel and sand	3	65
Clay, rocky	5	70
Gravel	2	72
Clay, rocky	11	83
Gravel, water-bearing	22	105
Sand, water-bearing	6	111

Casing, 6-inch to 99 ft.

2/3-8Q1. Walter R. Smith. About 1 mile east of Proebstel on State Highway 8-A. Altitude about 320 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits:		
Soil	3	3
Sand	35	38
Troutdale formation:		
Gravel	23	61
Boring lava (?):		
Rock	14	75
Troutdale formation:		
Sand, hard	3	78
Boring lava (?):		
Rock	12	90
Troutdale formation:		
Boulders	7	97
"Hardpan"	10	107
Boring lava (?):		
Rock	8	115
Troutdale formation:		
Gravel	15	130

Casing, 6-inch to 130 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/3-14N1. Myers Bros. Camas. Altitude about 390 ft. Drilled by B. L. Price, 1953.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits:		
Topsoil	3	3
Clay	14	17
Troutdale formation:		
Boulders	6	23
Gravel	12	35
Shale	21	56
Gravel	9	65
Boring lava (?):		
Rock	31	96
Troutdale formation:		
Gravel	21	117
Boring lava (?):		
Rock	14	131
Troutdale formation:		
Gravel and sand	24	155
Sand, brown	10	165
Gravel, muddy	10	175
Gravel and sand	10	185
Gravel, cemented	15	200
Gravel, water-bearing	13	213

Casing, 8-inch to 213 ft; perforated 175 to 185 ft, and 200 to 204 ft.

2/3-18A1. J. E. Sturgeon. Southeast of Proebstel. Altitude about 253 ft. Drilled by Joe Hansen.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits (?):		
Clay	12	12
Sand, water-bearing	2	14
Troutdale formation:		
Gravel, cemented, water-bearing	66	80
Sand (quicksand)	2	82
Clay and gravel	8	90
Gravel, coarse, loose, water-bearing	4	94

Casing, 6-inch to 94 ft.

2/3-18B1. Alfred Anderson. Vancouver. Altitude about 200 ft. Dug by owner, 1955.

Pleistocene alluvial deposits:		
Clay	5	5
Clay, hard, and gravel	1	6
Gravel and boulders	3	9

2/3-20J1. F. L. Groth. On Fern Prairie, about 150 ft north of Lacamas Campground, near intersection of Lacamas Creek and County Road 116. Altitude about 190 ft. Drilled by B. Abrams.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Boulders, water-bearing.	20	20
Gravel, loose.	10	30
Clay and gravel.	6	36
Gravel, water-bearing.	2	38

Casing, 6-inch to 38 ft.

2/3-22H1. Myers Brothers. About 0.5 mile north of Fern Prairie, on State Highway 8-A. Altitude about 414 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Soil.	12	12
Gravel, loose.	76	88
Sand (quicksand).	10	98
Clay, blue.	19	117
Clay, yellow.	5	122
Gravel, cemented.	6	128
Sand, black	14	142

Casing, 6-inch to 142 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/3-25Q1. Harry Thornton. About 2 miles southeast of Fern Prairie, on Hathaway Road. Altitude about 410 ft. Drilled by B. Abrams.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Dug well, no record	34	34
Gravel, cemented	14	48
Boulders	3	51
Clay, hard	9	60
Gravel and boulders, packed	55	115

2/3-25Q2. A. J. Rocheford. About 2 miles southeast of Fern Prairie, on Hathaway Road. Altitude about 370 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Soil	12	12
Sand	20	32
Clay	33	65
Boulders	34	99
Boring lava (?) or Tertiary Volcanics (?):		
Rock, black, volcanic, hard	46	145

Casing, 6-inch to 99 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/3-25R2. M. G. Dole. About 2.25 miles southeast of Fern Prairie, on County Road 30. Altitude about 208 ft. Drilled by Hamilton Locey.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Gravel, stream.	40	40
Clay, sandy.	163	203
Tertiary volcanics:		
Rock, volcanic, and soft volcanic ash.	5	208

2/3-26Q1. H. W. Pepper. About 2.5 miles north of Camas, on State Highway 8-A, 0.2 mile west of junction with County Road 134. Altitude about 420 ft. Drilled by A. C. Locey.

Troutdale formation:		
Soil.	4	4
Clay.	45	49
Gravel.	11	60
Clay.	10	70
Gravel.	20	90
Rock.	11	101
Gravel.	9	110
Sand, black	2	112
(Boulders, clay, etc.; deepened from 112 to 165 ft)	(53)	(165)

Casing, 6-inch to 112 ft.

2/3-27P1. Elite Hereford Ranch. Camas. Altitude about 270 ft.

Drilled by F. L. Warner, 1953.

Materials	Thickness (feet)	Depth (feet)
Dug to 75 ft; no record	75	75
Troutdale formation:		
Clay, sand	52	127
Older consolidated rocks:		
Rock, lava	34	161
Clay, red	2	163
Rock, lava	19	182
Rock	2	184
Rock, brown, lava	22	206
Lava, red, and clay	4	210
Rock, lava	70	280
Clay, black	6	286
Lava, red	3	289
Rock	52	341
Lava, red, of soft rock	17	358
Rock, hard, black	13	371
Rock, hard, black and gray	29	400

Casing, 8-inch to 400 ft; perforated 71 to 75 ft.

2/3-29P1. S. Lorenzo Strunk. About 4 miles northwest of Camas.

Altitude about 252 ft. Drilled by Joe Hansen, 1952.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	3	3
Gravel, light	11	14
Gravel, heavy with clay	4	18
Gravel, water-bearing, with sand	7	25
Troutdale formation:		
Clay, yellow	5	30
Clay, with big rocks	50	80
Gravel, water-bearing	25	105
Clay with sand and rock	35	140
Sand, water-bearing	20	160
Sand and gravel, water-bearing	20	180

Casing, 8-inch to 80 ft; perforated 90 to 105 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/3-29Q1. Fred Schick. About 1 mile west of Lacamas Lake, 0.6 mile east of County Road 115 on County Road 2. Altitude about 245 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	25	25
Troutdale formation:		
Clay	5	30
Gravel, cemented	5	35
Clay, blue	7	42
Clay, blue, and gravel	15	57
Sand, black, and gravel	7	64
Sand and gravel	9	73
Sand	13	86
Gravel, water-bearing	3	89

Casing, 6-inch to 89 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/3-29R2. H. C. Quick. About 1.0 mile west of Lacamas Lake, 1 mile east of County Road 115. Altitude about 295 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil, sandy	15	15
Troutdale formation:		
Clay, water-bearing	9	24
Clay and sand	10	34
Sand and gravel	13	47
Sand, coarse	2	49
Gravel, water-bearing	1	50

Casing, 6-inch to 50 ft.

2/3-30P1. F. E. English. About 5 miles northwest of Camas, on county road. Altitude about 288 ft. Drilled by Hansen, 1948

Pleistocene alluvial deposits:		
Topsoil	2	2
Gravel and sand	73	75
Troutdale formation:		
Clay and gravel	30	105
Gravel, water-bearing	30	135

Casing, 6-inch to 135 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/3-31C1. V. H. Davis. About 5 miles northwest of Camas, on County Road 2. Altitude about 287 ft. Drilled by Joe Hansen.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
(not logged)	10	10
Gravel and boulders	60	70
Troutdale formation:		
Clay and gravel, mixed	10	80
Clay	8	88
Sand and clay	18	106
Sand and gravel, water-bearing	29	135

Casing, 6-inch to 135 ft.

2/3-32Q1. J. T. Armstrong. About 1.5 miles northwest of Prune Hill, and 0.6 mile west of County Road 122 on County Road 119. Altitude about 272 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Soil	2	2
Clay, sandy	15	17
Gravel	3	20
Clay	19	39
Troutdale formation:		
Clay and boulders	103	142
Gravel, loose, water-bearing	1	143

Casing, 6-inch to 140 ft.

Table 17.--Materials penetrated by representative wells--Continued

2/3-33C1. R. D. O'Harra. About 0.5 mile west of Lacamas Lake, 1.0 mile east of County Road 115, on County Road 2. Altitude about 300 ft. Drilled by Owner.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Grit, "rotten".	21	21
Sand, fine (quicksand).	16	37
Rock, "rotten," includes layer of chocolate clay, very sticky, about 26 to 28 inches thick .	61	98
Rock, black, soft.	4	102

2/3-33Q1. Al Decker. About 1 mile north of Prune Hill, 0.5 mile east of intersection of County Roads 119 and 122. Altitude about 335 ft. Drilled by Joe Hansen and owner.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Clay, yellow.	80	80
Ash, volcanic.	20	100
Clay.	37	137
Grit, yellow, water-bearing.	2	139
Clay.	8	147

2/3-34N2. E. H. White. About 2 miles northwest of Camas, on County Road 2. Altitude about 390 ft. Drilled by Joe Hansen, 1951.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Topsoil	2	2
Clay	23	25
Clay, some gravel, water-bearing	10	35
Clay, with boulders	60	95
Clay and sand, mixed	10	105
Clay, with some gravel, water-bearing (clay below the water strata)	7	112

Casing, 8-inch to 112 ft.

3/1-1B1. R. Blake. About 6 miles southeast of Ridgefield, 1.4 miles west of Dollar Corner on Battle Ground Road. Altitude about 275 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	3	3
Sand	14	17
Clay	18	35
Sand	43	78
Troutdale formation:		
Gravel, cemented	10	88
Sand, black	11	99

Casing, 6-inch to 98 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/1-1C2. O. G. Beherns. About 1.6 miles west of Dollar Corner, on Battle Ground Road. Altitude about 293 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Sand and clay.	98	98
Troutdale formation:		
Gravel.	12	110
Sand, (quicksand).	10	120
Gravel, cemented.	30	150
Gravel, water-bearing.	11	161

Casing, 6-inch to 161 ft.

3/1-1M1. Mrs. C. M. Foster. About 6 miles southeast of Ridgefield, at intersection of County Roads 61 and 62. Altitude about 287 ft. Drilled by R. A. Jobes.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Sand, with clayey layers.	90	90
Troutdale formation:		
Gravel, cemented, water-bearing.	15	105
Sand (quicksand).	5	110
Sand, with small amount of gravel.	20	130

Casing, 6-inch to 130 ft.

3/1-2E1. H. Jones. About 0.5 mile east of U. S. Highway 99 on Haggard Road. Altitude about 275 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	12	12
Sand	30	42
Troutdale formation:		
Gravel	23	65
Boulders	7	72
Gravel	33	105
Sand	28	133
Clay	24	157
Gravel	3	160

Casing, 6-inch to 159 ft.

3/1-2F1. Harry S. Jones. About 4.5 miles north of Salmon Creek. Altitude about 290 ft. Drilled by Locey, 1952.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil and clay	24	24
Sand and clay	66	90
Troutdale formation:		
Gravel, "solid" (cemented?)	12	102
Gravel, loose	19	121
Gravel, solid, and clay	16	137
Gravel, loose	9	146
Rock, lava, solid (?)	8	154

Casing, 5-inch to 154 ft.

3/1-2K1. A. M. Samuels. In Goodhope District, about 0.5 mile northwest of intersection of County Roads 61 and 64. Altitude about 290 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvail deposits:		
Soil and sand.	12	12
Troutdale formation:		
Sand and gravel.	40	52
Sand.	50	102
Sand, coarse.	8	110
Gravel, water-bearing.	2	112
Sand, black, water-bearing	11	123

Casing, 6-inch to 123 ft.

3/1-2Q1. A. A. Stumpf. About 1.5 miles west of Goodhope, 0.1 mile north of intersection of County Road 64 and Shreve Road. Altitude about 280 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Soil.	4	4
Clay.	10	14
Troutdale formation:		
Clay and boulders	18	32
Gravel.	17	49
Clay.	26	75
Sand.	23	98
Gravel.	7	105
Sand, black	2	107

Casing, 6-inch to 107 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/1-2R1. Kenneth Shores. About 1 mile west of Goodhope, 0.2 mile north of intersection of County Roads 64 and 61. Altitude about 245 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	3	3
Clay, yellow	32	35
Sand	35	70
Troutdale formation:		
Clay and gravel	8	78
Gravel	14	92
Sand, black, and gravel	13	105

Casing, 6-inch to 104 ft.

3/1-2R2. O. Shores. About 1 mile west of Goodhope, 0.1 mile northwest of intersection of County Roads 64 and 61. Altitude about 245 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Soil	10	10
Sand	30	40
Clay	5	45
Sand	19	64
Troutdale formation:		
Gravel	21	85
Sand, black	5	90

Casing, 6-inch to 90 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/1-3M1. E. Dollson. About 0.9 mile west of old U. S. Highway 99, on south side of County Road 19. Altitude about 315 ft. Drilled by H. J. Ferron, 1952.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Upper member;		
Clay	75	75
Gravel, cemented	103	178
Gravel, loose, water-bearing	15	193
Lower member;		
Clay	99	292
Sand, water-bearing	30	322
Clay	8	330
Sand, water-bearing	1	331
Clay	56	387
Sand, water-bearing	6	393

3/1-3N1. William Hoffman. About 5 miles southeast of Ridgefield, 0.8 mile west of U. S. Highway 99, on County Road 64. Altitude about 320 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Soil	15	15
Clay	5	20
Sand	5	25
Clay, blue	10	35
Clay, yellow	15	50
Gravel, cemented	55	105
Gravel, loose	8	113
Sand, black	4	117

Casing, 6-inch to 117 ft.

3/1-4A1. Lambert School. About 4 miles southeast of Ridgefield, on west side of County Road 19. Altitude about 375 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Upper member:		
Soil	12	12
Clay	63	75
Sand	30	105
Gravel and rock	45	150
Gravel	22	172
Lower member:		
Clay	34	206
Sand (quicksand)	2	208
Clay	82	290
Sand (quicksand)	30	320
Clay	60	380
Sand, black	5	385

Casing, 6-inch to 384 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/1-4E1. L. W. Nieman. About 0.5 miles southeast of Ridgefield, on State Highway 1T. Altitude about 250 ft. Drilled by G. H. Locey, 1951.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	18	18
Sand, water-bearing	4	22
Clay	45	67
Troutdale formation:		
Sand and gravel, with boulders, water-bearing	4	71
Gravel, cemented	68	139
Gravel and sand, water-bearing	1	140
Gravel, cemented	14	154
Gravel, water-bearing	1	155
Gravel, cemented	1	156
Gravel, water-bearing	4	160

Casing, 6-inch to 160 ft; perforated 138 to 160 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/1-4F1. H. A. Herman. About 4 miles southeast of Ridgefield, 0.3 mile east of eastern intersection of State Highway 1-T and Haggard Road (County Road 19). Altitude about 333 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	12	12
Sand	20	32
Troutdale formation:		
Gravel	13	45
Clay	46	91
Sand (quicksand)	78	169
Boulders	12	181
Gravel	8	189
Sand, black	3	192

Casing, 6-inch to 192 ft.

3/1-5E1. B. Sonney. About 3.5 miles southeast of Ridgefield, 0.3 mile west of State Highway 1-T, on County Road 15. Altitude about 238 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil.	2	2
Clay, sandy	6	8
Sand (quicksand) water-bearing.	22	30
Clay.	80	110
Sand.	28	138
Troutdale formation:		
Gravel.	27	165
Gravel, water-bearing.	20	185

Casing, 6-inch to 185 ft.

3/1-5H1. L. Holley. About 1.0 mile west of Lambert, 0.2 mile north of County Road 19 on State Highway 1-T. Altitude about 250 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil.	12	12
Clay.	63	75
Sand.	30	105
Troutdale formation:		
Gravel and rock.	35	140
Gravel, cemented.	11	151
Gravel, loose.	7	158
Sand, black.	2	160

Casing, 6-inch to 160 ft.

3/1-6E1. John Roth. About 2.3 miles northwest of Sara, on County Road 15. Altitude about 155 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	2	2
Sand	6	8
Clay	52	60
Sand	5	65
Troutdale formation:		
Gravel	34	99
Clay	4	103
Gravel	18	121
Sand, black	1	122

Casing, 6-inch to 122 ft.

3/1-6H1. Nelson. About 3.5 miles south of Ridgefield, 0.6 mile west of State Highway 1-T on County Road 15. Altitude about 208 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	12	12
Sand, yellow	33	45
Sand, blue	15	60
Clay, blue	40	100
Troutdale formation:		
Clay, yellow, and boulders	25	125
Gravel	12	137
Boulders	7	144
Gravel, cemented	15	159
Sand and gravel, water-bearing	2	161

Casing, 6-inch to 161 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/1-7D2. Arnold Mettler. About 4 miles south of Ridgefield, 3.5 miles west of U. S. Highway 99. Altitude about 115 ft. Drilled in 1952.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	1	1
Clay	26	27
Sand, fine, brown	18	45
Sand, fine	33	78
Clay, blue	7	85
Troutdale formation:		
Upper member:		
Gravel and clay	6	91
Gravel, cemented	19	110
Sand, brown, with a little gravel	5	115
Gravel, cemented	8	123
Gravel, water-bearing (bailer test approximately 40 gpm)	5	128
Gravel, cemented	4	132
Gravel and fine sand	3	135
Clay, white, very soft	12	147
Gravel, cemented	23	170
Gravel, with blue clay binder	25	195
Gravel, cemented	9	204
Lower member:		
Sand, very fine, gravel and clay	18	222

(Continued on next page)

Table 17.--Materials penetrated by representative wells--Continued

3/1-7D2.--Continued

Materials	Thickness (feet)	Depth (feet)
Troutdale formation; lower member--Continued		
Sand, very fine, and hard packed sand.	46	268
Gravel, water-bearing (bailer test approximately 60-70 gpm).	2	270
Clay, blue.	35	305
Shale.	7	312
Clay, blue, and sand.	49	361
Sand, very fine, blue clay binder.	1	362
Gravel.	1	363
Sand, scattered "rough" gravel.	14	377
Clay.	25	402
Sand.	1	403
Gravel.	3	406
Sand	42	448
Clay, blue.	15	463
Shale.	8	471

Casing, 10-inch to 120 ft, 8-inch to 450 ft. Bottom 21 ft of uncased hole filled with gravel; perforated 123 to 128 ft, 226 to 270 ft, 365 to 375 ft, 404 to 406 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/1-8K1. J. S. England. About 0.3 mile north of Sara School, on State Highway 1-T. Altitude about 180 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil and sand.	25	25
Clay, sandy.	9	34
Sand, (quicksand)	59	93
Troutdale formation:		
Gravel, cemented.	11	104
Clay, sandy.	15	119
Sand and gravel, cemented.	15	134
Gravel, cemented	10	144

Casing, 6-inch to 144 ft.

3/1-8K2. Ernest Brown. About 0.5 mile north of Whipple Creek, on State Highway 1-T. Altitude about 175 ft. Drilled by J. E. Hansen, 1953.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay.	19	19
Sand "quicksand," water-bearing.	28	47
Clay, blue, water-bearing.	71	118
Sand.	5	123
Sand and clay, water-bearing.	2	125
Troutdale formation:		
Gravel.	23	148

Casing, 6-inch to 148 ft; perforated 133 to 146 ft.

3/1-8L1. James M. and Nora L. McElligott. About 4.5 miles south of Ridgefield. Altitude about 183 ft. Drilled by H. I. Bottner Drilling Co.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil and clay	27	27
"Quicksand," brown	30	57
Clay, gray, and sand	40	97
Clay, blue	13	110
Troutdale formation:		
Upper member:		
Gravel, cemented	35	145
Gravel, water-bearing	5	150
Gravel, cemented	11	161
Gravel, water-bearing, and sand	14	175
Gravel, cemented	20	195
Gravel and sand	2	197
Gravel, cemented	53	250
Gravel, water-bearing, and sand	5	255
Lower member:		
Sandstone, fine, brown	15	270
Clay, blue	15	285
Sand, gray	13	298

Casing, 10-inch to 258 ft; perforated 145 to 150 ft, 161 to 175 ft. 8-inch perforated liner 194 to 198, and 249 to 254 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/1-8Q2. Sara School. In Sara, on State Highway 1-T. Altitude about 155 ft. Drilled by Pete Hansen.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Silt and clay	80	80
Clay	15	95
Troutdale formation:		
Gravel, loose sand, and cemented gravel	55	150

3/1-9A1. L. Parmantier. About 1 mile south-southwest of Lambert, 0.2 mile south of County Road 64. Altitude about 295 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Soil	21	21
Clay, sandy	26	47
Troutdale formation:		
Gravel, cemented	13	60
Boulders, "shot"	23	83
Gravel and sand	14	97
Gravel, cemented	33	130
Boulders and clay	24	154
Gravel, loose	17	171
Gravel	11	182

Casing, 6-inch to 182 ft.

3/1-10A2. Airld Flory. About 1 mile north of Baker, 0.2 mile east of intersection of U. S. Highway 99 and County Road 64. Altitude about 263 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil and clay	52	52
Troutdale formation:		
Gravel, cemented	16	68
Gravel and sand	29	97
Gravel, water-bearing	3	100

Casing, 6-inch to 100 ft.

3/1-10B1. Thomsen. About 1 mile northwest of Baker, 0.1 mile west of U. S. Highway 99 on road just south of County Road 64. Altitude about 295 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Soil	5	5
Soil, sandy	35	40
Sand (quicksand)	10	50
Troutdale formation:		
Clay	10	60
Sand	40	100
Gravel, loose	15	115
Gravel, cemented	10	125
Sand (quicksand)	25	150
Gravel, cemented	16	166

Casing, 6-inch to 167 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/1-10C2. C. H. and Amelia Reese. About 4 miles north of Salmon Creek, 0.5 mile west of U. S. Highway 99. Altitude about 305 ft. Drilled by F. L. Warner.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Clay	90	90
Gravel, cemented	47	137
Gravel	31	168

Casing, 8-inch to 168 ft; perforated 143 to 163 ft.

3/1-10H1. L. H. Wilson. About 0.5 mile north of intersection of U. S. Highway 99 and road from Baker to Sara. Altitude about 290 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Soil, sandy	15	15
Troutdale formation:		
Gravel, cemented	31	46
Clay, blue	41	87
Clay, sandy	7	94
Gravel, cemented	26	120
Gravel, water-bearing	12	132

Casing, 6-inch to 132 ft.

3/1-10H2. J. H. Dooley. About 1 mile north of Baker, 0.2 mile south of intersection of U. S. Highway 99 and County Road 64. Altitude about 300 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	18	18
Sand	25	43
Troutdale formation:		
Clay	79	122
Gravel	14	136
Gravel, cemented	26	162
Sand, black	2	164

Casing, 6-inch to 163 ft.

3/1-10J1. George Prom. On U. S. Highway 99, and 0.6 mile north of intersection with County Road connecting Baker and Sara. Altitude about 300 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Soil	6	6
Troutdale formation:		
Clay, yellow	34	40
Clay, sandy	93	133
Sand and gravel, water-bearing	15	148
Gravel, cemented	18	166
Gravel, loose, water-bearing	7	173

Casing, 6-inch to 173 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/1-10M1. Schimmelpfenig. About 0.8 mile west of State Highway 1-S, along first road north of road from Sara to Baker. Altitude about 336 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits (?):		
Soil.	10	10
Troutdale formation:		
Sand and clay	30	40
Clay and gravel.	23	63
Gravel, sandy	24	87
Sand, blue.	11	98
Gravel, sandy.	22	120
Gravel and clay	25	145
Gravel, water-bearing.	33	178

Casing, 6-inch to 178 ft.

3/1-10N2. H. F. Boutwell. About 0.9 mile west of old U. S. Highway 99, about 0.2 mile north of road from Baker to Sara. Altitude about 325 ft. Drilled by G. Zent.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Soil.	3	3
Clay.	22	25
Clay, sandy	55	80
Gravel, cemented.	114	194

3/1-10P1. D. L. Belknap. About 0.8 mile west of Baker along road from Baker to Sara. Altitude about 335 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Soil	5	5
Clay	16	21
Clay, sandy	13	34
Clay	40	74
Clay, sandy	5	79
Gravel, cemented	45	124
Gravel, loose	68	192

Casing, 6-inch to 192 ft.

3/1-10R1. Baker School District. About 0.5 mile north of intersection of U. S. Highway 99 and road from Baker to Sara. Altitude about 300 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Soil	20	20
Sand	68	88
Troutdale formation:		
Gravel	20	108
Gravel, cemented	18	126
Sand, black	8	134

Casing, 6-inch to 133 ft.

3/1-11A1. Howard Stuart. About 1.5 miles northeast of Baker. Altitude about 270 ft. Drilled by Joe Hansen, 1954.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	25	25
Sand, dry	70	95
Troutdale formation:		
Gravel, cemented	13	108
Sand, water-bearing	55	163
Sand, water-bearing, and very little gravel	5	168

Casing, 6-inch to 168 ft.

3/1-11D1. F. R. Moudry. About 0.8 mile north of intersection of old U. S. Highway 99 and road from Baker to Sara. Altitude about 240 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	2	2
Sand	8	10
Troutdale formation:		
Gravel	20	30
Clay	5	35
Gravel, loose	7	42
Sand (quicksand)	59	101
Gravel	38	139
Sand, black	2	141

Casing, 6-inch to 141 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/1-11F1. C. H. Rigsby. About 2 miles southeast of Lambert and 0.7 mile northeast of Baker. Altitude about 295 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	10	10
Clay, yellow	60	70
Sand	20	90
Troutdale formation:		
Gravel, loose	10	100
Sand	13	113
Gravel	10	123
Sand	10	133
Gravel, pea	5	138

Casing, 6-inch to 138 ft.

3/1-11M1. W. Brewster. About 0.3 mile north of road from Baker to Sara, along old U. S. Highway 99. Altitude about 300 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	20	20
Sand	73	93
Troutdale formation:		
Gravel, cemented	36	129
Sand, black	7	136

Casing, 6-inch to 135 ft.

3/1-11N2. J. H. Hubbard. Baker District, just north of intersection of old U. S. Highway 99 and road from Baker to Sara. Altitude about 275 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil and clay	24	24
Sand	21	45
Clay	3	48
Sand	57	105
Sand, water-bearing	3	108
Troutdale formation:		
Sand and gravel	17	125

Casing, 6-inch to 125 ft.

3/1-11Q1. H. Carpenter. About 0.6 mile east of old U. S. Highway 99 along road from Baker to Manor. Altitude about 275 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	10	10
Clay, yellow	35	45
Sand	52	97
Troutdale formation:		
Gravel, cemented	20	117
Gravel and sand	16	133

Casing, 6-inch to 131 ft.

3/1-11Q2. John Sohn. About 0.8 mile east of old U. S. Highway 99, along road from Baker to Manor. Altitude about 275 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	8	8
Sand	16	24
Clay	11	35
Clay, sandy	54	89
Troutdale formation:		
Sand and gravel	6	95
Gravel, cemented	6.5	101.5
Gravel, loose	8.5	110
Sand, black	7	117

Casing, 6-inch to 117 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/1-12R1. Oliver P. Stark. About 1.8 miles east of Baker.

Altitude about 260 ft. Drilled by H. J. Bottner, 1952.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay.	38	38
Sand, yellow, muddy.	37	75
Troutdale formation:		
Upper member:		
Gravel.	41	116
Sand, brown.	5	121
Gravel, water-bearing.	2	123
Sand, gray.	3	126
Gravel, cemented.	31	157
Clay.	33	190
Rock, broken, blue.	3	193
Sand, yellow.	2	195
Sand, coarse, brown, water-bearing.	1	196
Gravel, water-bearing.	13	209
Lower member:		
Sand, yellow.	3	212
Clay, yellow.	3	215

Casing, 8-inch to 215 ft; perforated 197 to 206 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/1-14J1. H. P. Calvin. About 1.1 miles southeast of Baker, 0.6 mile south of road from Baker to Manor, on County Road 61. Altitude about 250 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay and sand	32	32
Troutdale formation:		
Gravel, loose	39	71
Boulders	7	78
Gravel	40	118
Lava and boulders	18	136
Clay	32	168
Gravel, water-bearing	24	192

Casing, 6-inch to 192 ft.

3/1-15H2. A. S. Moulton. About 0.5 mile south of Baker. Altitude about 296 ft. Drilled by Steinman Bros., 1943.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay	10	10
Sand, water-bearing	13	23
Troutdale formation:		
Clay, soft and hard streaks, yellow	50	73
Gravel, cemented (water-bearing at 155 ft)	110	183
Gravel, loose, water-bearing	37	220

Casing, 8-inch to 219 ft; perforated 155 to 219 ft.

3/1-16H1. Chester Wrenn. About 1.1 miles southwest of Baker and 1.5 miles southeast of Sara. Altitude about 335 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	10	10
Troutdale formation:		
Sand and gravel	25	35
Gravel and clay	65	100
Sand	18	118
Boulders, "shot"	101	219

Casing, 6-inch and 4-inch to 219 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/1-17F1. D. P. Piechioni. About 0.5 mile southwest of Sara.
Altitude about 175 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil and clay	18	18
Sand	30	48
Clay, sandy	11	59
Sand	11	70
Powder polish (?)	40	110
Clay	6	116
Sand	10	126
Clay	10	136
Troutdale formation:		
Clay and gravel	7	143
Clay, water-bearing	7	150
Gravel	31	181
Gravel, water-bearing	5	186

Casing, 6-inch to 186 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/1-18H2. F. M. McWilliams. About 3.1 miles southwest of Baker.

Altitude about 170 ft. Drilled by H. I. Bottner, 1952.

Materials	Thickness (feet)	Depth (feet)
Old well.	164	164
Troutdale formation:		
Gravel, cemented.	27	191
Gravel, water-bearing.	5	196

Casing, 6- to 4-inch to 196 ft; perforated liner 161 to 196 ft.

3/1-18J1. Valley Erwin. About 0.8 mile wouthwest of Sara.

Altitude about 175 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Clay, sandy.	38	38
Sand, gray	37	75
Sand, blue	15	90
Clay, blue.	30	120
Sand, gray.	15	135
Clay, blue	7	142
Troutdale formation:		
Gravel, cemented.	38	180
Sand, black.	7	187

Casing, 6-inch to 187 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/1-18J2. C. W. Hartmen. About 0.8 mile west of State Highway 1-T on road about 0.6 mile south of Sara School. Altitude about 160 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil and sand.	41	41
Sand, water-bearing.	31	72
Clay, sandy.	36	108
Clay	12	120
Troutdale formation:		
Gravel, cemented	25	145
Light material (?).	22	167
Gravel and sand.	7	174
Gravel, water-bearing.	7	181

Casing, 6-inch to 181 ft.

3/1-18Q1. C. E. Grelle. About 2 miles northwest of Felida.

Altitude about 130 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Surface topsoil	2	2
Clay	53	55
Clay, sticky, blue, and silt	37	92
Clay, blue	8	100
Troutdale formation:		
Gravel, cemented	70	170
Gravel, water-bearing	15	185
Gravel, cemented	51	236
Clay, blue	19	255
Gravel, water-bearing	47	302

Casing, 10-inch and 8-inch to 302 ft.

3/1-19R1. Z. Herzog. About 0.2 mile east of Northern Pacific Railroad, 0.8 mile south of Salmon Creek. Altitude about 171 ft. Drilled by George Marshall.

Pleistocene alluvial deposits:		
Clay	104	104
Troutdale formation:		
Gravel, cemented	58	162
Gravel, water-bearing	3	165

Casing, 6-inch to 165 ft.

3/1-20C1. A. G. Maki and C. O. Mickey. About 2 miles north of Felida. Altitude about 170 ft. Drilled by R. A. Jobes, 1951.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Sand and yellow clay.	35	35
Sand, blue, water-bearing; with streaks of blue clay.	70	105
Troutdale formation:		
Gravel, cemented, water-bearing at 136 ft. . .	40	145
Sand and gravel, heaving.	33	178
Sand and gravel, quit heaving, water-bearing. .	5	183

Casing, 6-inch to 183 ft.

3/1-20G1. E. E. McIrvin. About 1.1 miles east of Northern Pacific Railroad, 0.4 mile north of Salmon Creek, on State Highway 1-T. Altitude about 170 ft. Drilled by George Marshall.

Pleistocene alluvial deposits:		
Silt.	25	25
Sand (quicksand).	65	90
Clay, blue.	10	100
Troutdale formation:		
Gravel, cemented.	35	135
Sand, fine (quicksand).	20	155
Gravel and sand	8	163
Gravel, coarse.	3	166

Casing, 6-inch to 166 ft.

Table 17.--Materials penetrated by representative wells--Continued.

3/1-20J1. Arthur H. Sasse. About 1.5 miles north of Felida.
Altitude about 80 ft. Drilled by A. M. Jannsen, 1949.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil and clay	35	35
Clay, sandy	30	65
Sand (quicksand)	10	75
Troutdale formation:		
Gravel, sandy, water-bearing	11	86
Rock	2	88

Casing, 6-inch to 88 ft.

3/1-21R1. George Kapitanorich. About 2.3 miles southwest of Baker.
Altitude about 175 ft. Drilled in 1951.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay	10	10
Beaver dam	35	45
Sand, blue	5	50
Clay, blue, and sand	40	90
Troutdale formation:		
Gravel, cemented	65	155
Gravel, loose, water-bearing	10	165

Casing, 8-inch to 165 ft.

3/1-22P1. Joseph D. Sullivan. About 2.1 miles south of Baker.

Altitude about 187 ft. Dug by J. E. Hollenbeck, 1954.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil.	2	2
Clay.	23	25
Sand.	10	35

Casing, 36-inch; perforated 25 to 35 ft.

3/1-23E1. John A. Heidecker. About 0.75 mile north of Salmon Creek School on U. S. Highway 99. Altitude about 205 ft. Drilled by J. E. Hansen, 1952.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil.	5	5
Clay, yellow.	30	35
Sand, water-bearing	30	65
Clay, blue.	30	95
Troutdale formation:		
Sand, heavy, with light gravel, mixed.	22	117
Gravel, cemented.	21	138
Gravel, cemented, with loose gravel and sand.	37	175

Casing, 6-inch to 175 ft; perforated 114 to 117, 142 to 147 ft, and 159 to 169 ft.

3/1-23J2. Lee Hixon. About 0.8 mile northeast of Salmon Creek School, and 0.5 mile east of old U. S. Highway 99. Altitude about 310 ft.

Troutdale formation:		
No record.	85	85
Gravel, coarse.	5	90
Gravel, fine, black.	4	94
Clay.	17	111

Casing, 36-inch to 97 ft.

3/1-23M2. L. B. Hathaway. About 1.5 miles north of Salmon Creek, 0.5 mile west of U. S. Highway 99. Altitude about 205 ft. Drilled by H. Bottner, 1951.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay	18	18
Sand	63	81
Clay, blue	6	87
Troutdale formation:		
Clay and gravel	14	101
Gravel, cemented	55	156
Gravel, water-bearing	15	171

Casing, 8-inch to 171 ft; perforated 156 to 168 ft.

3/1-23R1. John Schreiber. About 0.25 mile east of old U. S. Highway 99, and 0.5 mile northeast of Salmon Creek School. Altitude about 290 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	6	6
Troutdale formation:		
Clay	38	44
Gravel, cemented	78	122
Clay, blue	6	128
Clay, red	37	165
Sand, dry	33	198
Clay, blue	66	264
Sand	4	268

Casing, 6-inch to 268 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/1-24H2. J. Brougher. About 0.2 mile west of Salmon Creek School.

Altitude about 155 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium:		
Soil and sand	8	8
Troutdale formation:		
Upper member;		
Gravel and boulders	8	16
Sand, water-bearing	2	18
Gravel	10	28
No record; water-bearing	1	29
Gravel	15	44
Gravel, cemented	8	52
Gravel, loose	11	63
Lower member;		
Clay, yellow	9	72
Clay, gray	4	76
Clay, green	19	95
Sand, brown	9	104
Sand, black, water-bearing	4	108

Casing, 6-inch to 108 ft.

3/1-24K1. R. H. Todd. About 0.5 mile west of Pleasant Valley School at junction of Salmon Creek and Mill Creek. Altitude about 140 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium:		
Sand	5	5
Troutdale formation:		
Gravel	20	25
Clay, blue	40	65
Sand, black	19	84
Sand, red	1	85

Casing, 6-inch to 85 ft.

3/1-24K2. Roy J. Darling. About 2.4 mile southeast of Baker. Altitude about 125 ft. Drilled by George Zent, 1956.

Pleistocene alluvial deposits:		
Soil	2	2
Troutdale formation:		
Clay, sandy	3	5
Gravel, heavy, water-bearing	16	21
Clay, blue	48	69
Shale, hard, gray	6	75
Shale, soft, gray	10	85
Shale, hard, gray	5	90

Casing, 12-inch to 58 ft.

3/1-24L1. Roy J. Darling. About 2.3 mile southeast of Baker.

Altitude about 155 ft. Drilled by A. M. Jannsen, 1953.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay.	17	17
"Quicksand".	3	20
Troutdale formation		
Upper member;		
Clay.	58	78
Sand and gravel, water-bearing.	7	85
Lower member;		
Clay, vari-colored.	485	570
Sand.	178	748

Casing, 12-inch to 70 ft.

3/1-24R2. Earl R. Kadow. About 1.5 miles east of Salmon Creek School. Altitude about 225 ft. Drilled by Hansen, 1949.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	5	5
Clay and light sand	20	25
Sand, water-bearing	15	40
Pleistocene alluvial deposits and Troutdale formation:		
Clay, black and yellow	40	80
Troutdale formation:		
Gravel, cemented	60	140
Rocks, big, water-bearing, with clay	10	150
Sandstone rocks	28	178

Casing, 8-inch to 179 ft.

3/1-25G1. A. R. Smoole. About 2.9 miles southeast of Baker. Altitude about 217 ft. Drilled by J. E. Hansen, 1952.

Pleistocene alluvial deposits:		
Topsoil	5	5
Sand and clay	13	18
"Quicksand"	42	60
Clay, blue	15	75
Sand, water-bearing	10	85
Gravel, water-bearing	7	92

Casing, 6-inch to 92 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/1-25M1. L. A. Tesch. About 0.8 mile east of Salmon Creek School, 500 ft east of Salmon Creek. Altitude about 105 ft. Drilled by R. A. Jobes.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium:		
Gravel and boulders	14	14
Sand	5	19
Troutdale formation:		
Gravel and sand	3	22
Gravel, sandy	7	29
Gravel, cemented	2	31
Sand	3	34
Clay and gravel	17	51
Gravel	2	53
Sand	4	57
Gravel	7	64

Casing, 6-inch to 64 ft.

3/1-25Q1. Jacob Schwann. About 0.5 mile west of County Road 59, on County Road 6, near Salmon Creek. Altitude about 200 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil, sandy.	30	30
Troutdale formation:		
Sand and gravel.	20	50
Clay, blue.	30	80
Gravel, sandy.	28	108

Casing, 6-inch to 108 ft.

3/1-26C1. Frank L. Davies. About 6 miles north of Vancouver, just west of Salmon Creek School, on U. S. Highway 99. Altitude about 195 ft. Drilled by R. A. Jobes.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil, sandy, clayey, and coarse sand.	20	20
Sand (quicksand), water-bearing.	60	80
Clay, blue.	15	95
Troutdale formation:		
Gravel, cemented.	45	140
Sand and gravel, water-bearing.	29	169

Casing, 6-inch to 169 ft.

3/1-32J2. Walter H. Yost. About 1 mile northwest of Lake Shore School, 0.3 mile east of Northern Pacific Railroad. Altitude about 198 ft. Drilled by R. A. Jobes.

Materials	Thickness (feet)	Depth (feet)
Old hole, no record.	23	23
Pleistocene alluvial deposits:		
Clay.	20	43
Sand.	30	73
Troutdale formation:		
Gravel, cemented.	65	138
Sand	10	148
Sand, with some gravel, gravel proportion increasing with depth.	30	178

Casing, 6-inch to 178 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/1-33D1. G. Van Volkenberg. Near Felida, about 1 mile east of Northern Pacific Railroad, on County Road 14. Altitude about 215 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil.	35	35
Sand.	10	45
Clay.	33	78
Clay, sandy	7	85
Sand.	50	135
Troutdale formation:		
Gravel.	20	155
Sand (quicksand).	6	161
Gravel, cemented.	24	185
Boulders.	3	188
Clay.	5	193
Gravel.	5	198

Casing, 6-inch to 186 ft.

3/1-33M2. Ralph A Garner. About 5 miles northwest of Vancouver, 1 mile south of Felida. Altitude about 215 ft. Drilled by Almer and Brockway, 1950.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Sandy loam	6	6
Clay and sand	21	27
Sand, black	12	39
Sand, fine, black, and clay	1	40

Casing, 48-inch to 40 ft.

3/1-33R1. W. E. Kennedy. About 1.25 miles southeast of Felida. Altitude about 225 ft. Drilled by A. M. Jannsen, 1949.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil and clay	20	20
Sand	50	70
Clay, red	15	85
Sand	50	135
Troutdale formation:		
Gravel	75	210
Sand (quicksand)	2	212
Gravel, water-bearing	13	225
Gravel	20	245

Casing, 8-inch to 216 ft, 6-inch to 237 ft; perforated 216 to 237 ft.

3/1-34G1. F. Kluttenhoff. About 4 miles north of Vancouver and 0.2 mile south of County Road 14, on old U. S. Highway 99. Altitude about 170 ft. Drilled by Pete Hanson.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay and sand, mixed.	80	80
Troutdale formation:		
Gravel, cemented hard.	60	140
Sand and gravel.	20	160
Sand, with little gravel.	20	180
Gravel, cemented.	32	212

3/1-34G2. Paul Borchers. About 4 miles north of Vancouver, at intersection of old U. S. Highway 99 and County Road 14. Altitude about 160 ft. Drilled by A. C. Locey.

Soil.	4	4
Pleistocene alluvial deposits and Troutdale formation:		
Soil, sand, and gravel.	56	60
Troutdale formation:		
Boulders, "shot".	8	68
Sand, (quicksand).	4	72
Boulders.	8	80
Sand, cemented.	18	98
Boulders.	14	112
Gravel, water-bearing	17	129

Casing, 6-inch to 129 ft.

3/1-34R1. Clark County PUD 1. About 2.4 miles south of Baker.

Altitude about 195 ft. Drilled well.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	3	3
Clay, yellow	9	12
Sand, water-bearing	8	20
Clay, blue	40	60
Clay, brown	35	95
Clay, sandy	15	110
Troutdale formation:		
Gravel, cemented	25	135
Gravel and sand; water-bearing	20	155
Gravel and brown sand	14	169
Sand	7	176
Sand, coarse, and gravel	11	187
Sand and gravel, cemented	8	195
Sand and gravel, some clay	52	247
Clay, blue, with sand and gravel	11	258
Gravel, sandy	17	275

Casing, 12-inch to 275 ft; perforated 176 to 230 ft, 244 to 252 ft, 255 to 270 ft.

3/1-35D1. Thomas Christiansen. About 0.7 mile west of U. S. Highway 99, on old U. S. Highway 99, just south of Salmon Creek. Altitude about 76 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	6	6
Troutdale formation:		
Gravel	12	18
Rock	6	24
Gravel	12	36
Boulders	7	43
Gravel, coarse	8	51
Sand	4	55
Sand, black	4	59

Casing, 6-inch to 59 ft.

3/1-35P1. Columbia Winery. About 0.75 mile south of Salmon Creek, on east side of U. S. Highway 99. Altitude about 180 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil, sandy	32	32
Sand	10	42
Clay, blue	6	48
Clay, brown	2	50
Troutdale formation:		
Gravel, cemented	29	79
Sand	2	81
Gravel, cemented	9	90
Sand (quicksand)	10	100
Gravel	10	110
Sand, black	12	122

Casing, 6-inch to 119 ft.

3/1-36A1. Arnold Ueltschi. About 2.3 miles southeast of Baker.
Altitude about 250 ft. Drilled by Floyd Wickersham, 1954.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	5	5
Silt and sand	60	65
Silt and sand, brown, water-bearing	30	95
Clay, blue	23	118
Clay, yellow	9	127
Sand, brown, water-bearing	16	143
Troutdale formation:		
Gravel, cemented, water-bearing	30	173
Sand, fine, and boulders	6	179
Gravel, coarse, "free," water-bearing	16	195
Gravel, cemented	5	200

Casing, 8-inch to 200 ft; perforated 150 to 170 ft, 182 to 195 ft.

3/1-36B1. J. J. and D. H. Herman. About 6 miles northeast of Vancouver, 1 mile east of Salmon Creek. Altitude about 210 ft. Drilled by Floyd Wickersham, 1952.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	4	4
Clay, blue	11	15
Sand, blue	28	43
Troutdale formation:		
Clay, yellow	11	54
Gravel, cemented	28	82
Gravel, loose	15	97

Casing, 6-inch to 97 ft, 10 ft of 100 slot screen.

3/2-1Q2. Thomas L. Roberts. About 1.5 miles southeast of Battle Ground. Altitude about 275 ft. Drilled by Floyd Wickersham, 1952.

Pleistocene alluvial deposits:		
Soil	3	3
Clay, yellow	11	14
Sand, brown, water-bearing	21	35
Clay, blue	6	41
Troutdale formation:		
Gravel, cemented	11	52
Gravel, loose, water-bearing	7	59

Casing, 6-inch to 59 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/2-2D3. D. Primley. In Battle Ground, just southeast of intersection of State Highways 1-U and 1-S. Altitude about 290 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil.	8	8
Troutdale formation:		
Gravel, sandy	12	20
Boulders.	8	28
Gravel.	5	33
Sand, black	2	35

Casing, 6-inch to 34 ft.

3/2-2F1. H. S. Gish. About 0.4 mile south of intersection of County Roads 78 and 80. South of Battle Ground. Altitude about 286 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Soil.	2	2
Clay.	10	12
Troutdale formation:		
Clay and boulders.	20	32
Gravel.	19	51
Clay.	8	59
Gravel, water-bearing	15	74

Casing, 6-inch to 73 ft.

3/2-3B1. Town of Battle Ground, well 1. Altitude about 284 ft.

Drilled by H. I. Bottner, 1954.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Silt, loam, topsoil	5	5
Troutdale formation:		
Gravel, medium	6	11
Gravel, and large boulders	21	32
Sand, yellow, and clay	20	52
Gravel, cemented	15	67
Gravel, water-bearing	3	70
Gravel, cemented	22	92
Gravel, medium, water-bearing	3	95
Sand, yellow, water-bearing	2	97
Gravel, water-bearing, and coarse sand	20	117
Sand, water-bearing	2	119
Gravel, loose, medium, water-bearing	16	135
Gravel, loose, coarse, water-bearing	3	138
Sand, medium, black, water-bearing	4	142
Clay, yellow	2	144

Casing, 8-inch to 144 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/2-3B3. Town of Battle Ground. Altitude about 284 ft. Drilled by H. Bottner, 1954.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay, loam, topsoil.	2	2
Troutdale formation:		
Clay, brown, and gravel.	13	15
Boulders and clay.	10	25
Gravel, brown sand, and clay	20	45
Clay, brown, sand, and some gravel.	22	67
Sand and clay, gravelly, water-bearing	3	70
Gravel, sandy.	35	105
Sand, coarse, and gravel, water-bearing. . . .	7	112
Sand, coarse, black, and gravel, water-bearing	30	142
Clay, blue	10	152

Casing, 12-inch to 152 ft; perforated 105 to 112 ft.

3/2-3C1. Fred Vandermast. About 0.6 mile west of intersection of State Highways 1-U and 1-S, Battle Ground. Altitude about 282 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	4	4
Clay	10	14
Troutdale formation:		
Clay and boulders	18	32
Gravel	17	49
Clay	6	55
Gravel, water-bearing	27	82

Casing, 6-inch to 82 ft.

3/2-3E1. Clarence A. Remy. About 1 mile west of Battle Ground, 0.25 mile south of State Highway 1-S. Altitude about 275 ft. Drilled by Floyd Wickersham, 1950.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	6	6
Troutdale formation:		
Upper member;		
Clay, yellow	15	21
Clay, blue, and gravel	12	33
Clay, yellow, and boulders	21	54
Gravel, cemented, water-bearing	60	114
Sand and gravel, water-bearing	25	139
Lower member;		
Clay, blue	30	169
(Not logged)	8	177

Casing, 8-inch to 177 ft; perforated 65 to 120 ft.

3/2-3R1. E. Anderson. About 1.0 mile south of Battle Ground on State Highway 1-U, at Scotton Corner. Altitude about 275 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	2	2
Clay, yellow	12	14
Clay, blue	26	40
Troutdale formation:		
Gravel	18	58
Sand, black	5	63

Casing, 6-inch to 50 ft.

3/2-4H2. Arthur Leggett. About 1.6 miles southwest of Battle Ground. Altitude about 275 ft. Drilled by Floyd Wickersham, 1953.

Materials	Thickness (feet)	Depth (feet)
Unknown	93	93
Troutdale formation:		
Upper member;		
Gravel, cemented	18	111
Gravel and sand	3	114
Gravel, "free"	13	127
Lower member;		
Sand, brown	20	147
Clay, brown	12	159
Clay, blue	18	177

Casing, 6-inch to 177 ft; perforated 93 to 127 ft.

3/2-4J1. F. W. Hollenbeck. About 1 mile southwest of Battle Ground, 0.5 mile south of intersection of County Road 56 and State Highway 1-S. Altitude about 275 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	4	4
Clay, sandy	6	10
Sand (quicksand)	5	15
Clay, blue	10	25
Troutdale formation:		
Clay, rocky	10	35
Gravel, cemented	26	61
Clay	5	66
Gravel	10	76
Gravel, loose, water-bearing	18	94

Casing, 6-inch to 94 ft.

3/2-4J2. H. C. Sholund. About 1.7 miles southwest of Battle Ground.
Altitude about 270 ft. Drilled by Floyd Wickersham.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	5	5
Clay, brown, sandy	9	14
Sand, brown	13	27
Clay, blue	4	31
Troutdale formation:		
Clay and boulders	18	49
Gravel, cemented, water-bearing	12	61
Gravel, "free," and sand, water-bearing	18	79
Sand, gray, water-bearing	3	82
Sand and boulders, water-bearing	15	97
Gravel, "free," water-bearing	26	123
Gravel, cemented	3	126

Casing, 6-inch to 126 ft; perforated 102 to 123 ft.

3/2-5E1. Leonard Walther. About 3 miles west of Battle Ground, 0.5 mile south of State Highway 1-S. Altitude about 220 ft. Drilled by Floyd Wickersham, 1947.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	4	4
Clay, brown	11	15
Clay, blue	4	19
Troutdale formation:		
Boulders and yellow clay	4	23
Sand, water-bearing	8	31
Gravel and sand, water-bearing	35	66

Casing, 6-inch.

3/2-5M1. C. V. Hill. About 0.7 mile south of Dollar Corner, and 3 miles west-southwest of Battle Ground on County Road 3. Altitude about 220 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Clay, sandy	5	5
Clay, blue, sandy	9	14
Troutdale formation:		
Gravel, loose, water-bearing	66	80

Casing, 6-inch to 80 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/2-5R1. M. M. Morgan. About 1.3 miles southeast of Dollar Corner.

Altitude about 365 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Upper member;		
Soil.	20	20
Clay, with boulders near bottom.	50	70
Gravel, cemented.	40	110
Lower member;		
Sand, "river sand," dry, took water.	140	250
Sand (quicksand), wet.	140	390
"Shale," gravelly, blue, water-bearing	10	400
Clay, blue	--	400

3/2-6G1. A. P. and Martha McDaniel. About 3.9 miles west of Battle Ground. Altitude about 200 ft. Drilled by Floyd Wickersham, 1954.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	7	7
Silt	11	18
Troutdale formation		
Upper member;		
Boulders, sand, and gravel, water-bearing	12	30
Gravel, cemented	49	79
Sand, brown, water-bearing	13	92
Lower member;		
Clay, brown	8	100
Clay, blue	9	109
Clay, yellow	5	114
Sand, coarse, water-bearing	45	159
Clay, blue	49	208
Sand, coarse, blue, water-bearing	4	212
Clay, blue	5	217

Casing, 8-inch to 217 ft; perforated 45 to 79 ft.

3/2-6J2. H. C. Dugger. About 3 miles west of Battle Ground and 0.75 mile south of State Highway 1-S. Altitude about 205 ft. Drilled by Floyd Wickersham.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	4	4
Clay, yellow	13	17
Sand, blue, water-bearing	9	26
Troutdale formation:		
Gravel, coarse, water-bearing	15	41
Gravel, cemented, and sand, water-bearing	21	62
Gravel, loose, and sand, water-bearing	12	74

Casing, 6-inch to 74 ft.

3/2-7E1. A. Thompson. In Goodhope District, about 1.5 miles south of State Highway 1-S, on County Road 59. Altitude about 250 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	3	3
Sand (quicksand)	70	73
Sand, black	37	110
Troutdale formation:		
Gravel, loose	8	118
Sand, coarse, black	14	132
Sand, black	13	145
Sand, coarse	17	162
No record, water-bearing	1	163

Casing, 6-inch to 163 ft.

3/2-8A1. Robert B. Agard. About 3.1 miles southwest of Battle Ground. Altitude about 275 ft. Drilled by B. L. Price, 1953.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	5	5
Silt, brown	35	40
Silt, blue	35	75
Troutdale formation:		
Clay and gravel	10	85
Clay, blue	5	90
Sand and gravel	64	154
Sand and fine gravel	3	157
Sand, fine	13	170

Casing, 8-inch to 170 ft; perforated 130 to 154 ft.

3/2-8D2. Ralph C. Chapman. About 3.7 miles southwest of Battle Ground, 700 ft southeast of northwest cor. Altitude about 220 ft. Drilled by B. L. Price, 1953.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	3	3
Silt, blue	22	25
Troutdale formation:		
Gravel and sand	20	45
Gravel, fine, and sand	10	55
Gravel	10	65
Gravel and sand	15	80
Gravel and dirt	25	105
Gravel, clean	22	127

Casing, 10-inch to 127 ft; perforated 100 to 107 ft, and 115 to 125 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/2-8M1. J. R. Tappan. About 3.7 miles southwest of Battle Ground. Altitude about 231 ft. Drilled by F. Wickersham, 1955.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil.	3	3
Clay, yellow.	12	15
Clay, blue	12	27
Sand, gray.	32	59
Troutdale formation:		
Sand and gravel.	6	65
Gravel, cemented	15	80
Sand and gravel.	21	101
Gravel, "free".	11	112

Casing, 6-inch to 112 ft.

3/2-9A1. Clarence Larsen. About 1.5 miles southwest of Battle Ground, near Meadow Glade. Altitude about 280 ft. Drilled by B. L. Price, 1952.

Pleistocene alluvial deposits:		
Topsoil.	4	4
Silt, brown.	26	30
Silt, blue.	6	36
Mud, heavy, blue.	9	45
Troutdale formation:		
Clay, blue, and gravel.	20	65
Clay, brown, and gravel.	20	85
Sand and gravel, muddy.	65	150

Casing, 10-inch to 150 ft; perforated 130 to 145 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/2-9D1. L. A. Vallet. About 2.6 miles southwest of Battle Ground.

Altitude about 285 ft. Drilled by Rupert A. Jobes, 1952.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil.	1	1
Clay	2	3
Sand, yellow	9	12
Sand, blue, water-bearing.	32	44
Clay, blue	1	45
Troutdale formation:		
Sand and gravel.	30	75
Gravel, cemented, water-bearing from 92 ft down	52	127
Gravel	1	128
Clay, and gravel, no water.	6	134

Casing, 6-inch to 130 ft.

3/2-9H1. Columbia Academy. In Meadow Glade, about 0.2 mile north of intersection of County Roads 56 and 8. Altitude about 285 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil and clay.	10	10
Sand, yellow.	20	30
Silt, gray, and sand.	25	55
Troutdale formation:		
Upper member;		
Sand and gravel, water-bearing.	25	80
Gravel, cemented	11	91
Sand and gravel.	3	94
Gravel, cemented.	16	110
Sand and gravel, water-bearing	31	141
Sand, with small amount of gravel.	18	159
Lower member;		
Sand, yellow.	36	195

Casing, 10-inch to 169 ft; perforated 60 to 70 ft, 110 to 123 ft, and 124 to 142 ft.

3/2-10F1. E. Gassoway. About 1.5 miles south of Battle Ground, on State Highway 1-U near intersection with County Road 8. Altitude about 291 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	12	12
Sand (quicksand)	28	40
Clay, blue	10	50
Troutdale formation:		
Boulders	5	55
Clay	30	85
Gravel	10	95

Casing, 6-inch to 90 ft.

3/2-10H1. Emil Wall. About 1.3 miles south of Battle Ground, 0.4 mile south of Scotton Corner, and 0.4 mile east of State Highway 1-U. Altitude about 275 ft. Drilled by A.C. Locey.

Pleistocene alluvial deposits:		
Soil	20	20
Troutdale formation:		
Sand and gravel	20	40
Gravel, cemented	20	60
Gravel	10	70
Sand, water-bearing	9	79

Casing, 6-inch to 79 ft.

3/2-10L2. M. S. Smart. About 0.3 mile east of Meadow Glade, on County Road 8. Altitude about 293 ft. Drilled by A.C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	2	2
Clay, sandy	8	10
Sand (quicksand)	41	51
Troutdale formation:		
Clay, rocky	13	64
Boulders and gravel	18	82
Gravel, loose, water-bearing	56	138

Casing, 6-inch to 137 ft.

3/2-10M1. A. F. Gilham. Just east of Meadow Glade, on County Road 8. Altitude about 282 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	5	5
Sand (quicksand)	45	50
Clay	9	59
Troutdale formation:		
Clay, rocky	20	79
Gravel	34	113
Gravel, loose, water-bearing	4	117

Casing, 6-inch to 117 ft.

3/2-10Q1. G. J. Kavodias. About 0.7 mile southeast of Meadow Glade, 0.8 mile south of intersection of County Road 64 and State Highway 1-U. Altitude about 284 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil.	10	10
Soil and clay	40	50
Sand.	25	75
Troutdale formation:		
Gravel and clay.	15	90
Gravel, water-bearing	9	99

Casing, 6-inch to 99 ft.

3/2-10Q2. W. R. Wendt. About 2.1 miles southwest of Battle Ground, 700 ft north and 600 ft east of south¼ cor. Altitude about 285 ft. Drilled by B. L. Price, 1952.

Pleistocene alluvial deposits:		
Topsoil.	5	5
Silt.	40	45
Troutdale formation:		
Boulders.	5	50
Mud and sand.	50	100
Sand and small gravel.	50	150

Casing, 10-inch to 150 ft; perforated 130 to 145 ft.

3/2-11C1. George Granlund. About 1 mile south of Battle Ground, 0.2 mile west of intersection of County Roads 64 and 80. Altitude about 285 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	2	2
Clay	14	16
Troutdale formation:		
Boulders and clay	10	26
Clay, rocky	22	48
Gravel, cemented	30	78
Gravel, loose, water-bearing	13	91

Casing, 6-inch to 91 ft.

3/2-11D2. C. Dietrich. About 1 mile south of Battle Ground, and 0.1 mile east of Scotton Corner. Altitude about 285 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	8	8
Sand	13	21
Clay	24	45
Sand (quicksand)	9	54
Troutdale formation:		
Gravel, coarse	24	78
Sand, black	5	83

Casing, 6-inch to 78 ft.

3/2-11E1. J. W. Hill. About 1.4 miles south of intersection of State Highways 1-S and 1-U. Altitude about 281 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil, sandy loam	20	20
Sand (quicksand)	13	33
Troutdale formation:		
Clay and gravel	12	45
Boulders	2	47
Gravel, cemented	8	55
Gravel	5	60

Casing, 6-inch to 58 ft.

3/2-11P1. A. W. Peter. About 2 miles south of Battle Ground, and 0.2 mile north of Salmon Creek on County Road 80. Altitude about 265 ft. Drilled by A.C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil.	3	3
Clay, sandy	10	13
Sand (quicksand).	10	23
Clay.	15	38
Troutdale formation:		
Boulders.	2	40
Gravel and rock.	7	47
Clay.	7	54
Gravel and rock.	8	62
Gravel, loose, water-bearing.	24	86

Casing, 6-inch to 85 ft.

3/2-12R1. Earl McLavy. About 2.7 miles southeast of Battle Ground, 1.75 miles south of County Road 78, on County Road 81. Altitude about 254 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil.	12	12
Sand.	16	28
Clay, yellow.	8	36
Troutdale formation:		
Gravel.	7	43
Sand, black	2	45

Casing, 6-inch to 43 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/2-13B1. Ray Kielman. About 1.2 miles northwest of Hockinson, and 1 mile north of Hockinson Road, on County Road 81. Altitude about 270 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Sand, red.	28	28
Sand, blue	10	38
Clay, blue	10	48
Troutdale formation:		
Boulders.	2	50
Gravel, loose	9	59
Gravel, cemented.	27	86
Gravel, loose.	3	89

Casing, 6-inch to 89 ft.

3/2-13P1. L. Dietrich. About 1.1 miles west of Hockinson, on Hockinson Road. Altitude about 288 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	12	12
Sand	16	28
Clay	21	49
Troutdale formation:		
Gravel	17	66
Sand (quicksand)	28	94
Gravel	14	108
Clay	13	121
Gravel	9	130
Sand, black	3	133

Casing, 6-inch to 133 ft.

3/2-14A1. R. J. Helms. About 1.7 miles northwest of Hockinson, 0.8 mile north of Hockinson Road on Mill Road. Altitude about 280 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	11	11
Sand	13	24
Troutdale formation:		
Gravel	14	38
Sand	37	75
Clay, yellow	5	80
Gravel	22	102
Sand	3	105
Sand, black	3	108

Casing, 6-inch to 108 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/2-14P1. Arthur Tikka. About 2 miles west of Hockinson, on Hockinson Road. Altitude about 302 ft. Drilled by Hamilton-Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	4	4
Clay, water-bearing	14	18
Clay and sand, water-bearing	50	68
Troutdale formation:		
Upper member;		
Clay, sand, and gravel	17	85
Clay and gravel, water-bearing	1	86
Sand, gravel, and clay	15	101
Sand and gravel, with red water	2	103
Sand, clay, and gravel	5	108
Sand and gravel	2	110
Clay and gravel	4	114
Gravel and sand	2	116
Gravel and clay	5	121
Gravel	1	122
Gravel and clay	3	125
Clay and sand	1	126
Sand and gravel	1	127
Gravel, cemented	2	129
Sand and gravel	3	132

Continued next page

Table 17.--Materials penetrated by representative wells--Continued

3/2-14P1--Continued

Materials	Thickness (feet)	Depth (feet)
Troutdale formation; Upper member:--Continued		
Gravel.	7	139
Gravel, water-bearing	1	140
Gravel, cemented.	4	144
Sand and gravel	1	145
Gravel, cemented.	4	149
Gravel and sand.	1	150
Gravel, cemented.	6	156
Sand and gravel.	3	159
Gravel and clay.	4	163
Sand and gravel, water-bearing.	1	164
Gravel and clay.	3	167
Gravel, loose, and sand, with gray water. . . .	3	170
Lower member:		
Clay, red.	3	173
Clay, blue.	12	185
Clay, brown	10	195
Clay, blue, and gravel, water-bearing	1	196
"Shale," blue.	11	207
Gravel.	1	208
"Shale," blue to black.	7	215

Casing, 8-inch to 180 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/2-16M2. Clinton Higdon. About 1 mile southwest of Meadow Glade. Altitude about 270 ft. Drilled by H. I. Bottner, 1952.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	8	8
Sand	11	19
Sand, cemented, brown	9	28
Sand, dark brown	3	31
Sand, blue	40	71
Troutdale formation:		
Gravel, cemented	13	84
Gravel, large	28	112
Gravel, water-bearing	6	118
Sand, yellow, and gravel	8	126
Gravel, cemented	1	127
Gravel, water-bearing	28	155
Sand, brown	2	157

Casing, 8-inch to 157 ft; perforated 112 to 116 ft, 128 to 135 ft, and 140 to 152 ft.

3/2-17D1. F. Thomas. About 2.2 miles south of Battle Ground Road, and 1.6 miles northwest of Pleasant Valley School, on County Road 3. Altitude about 230 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	4	4
Sand	41	45
Clay, sandy	15	60
Troutdale formation:		
Gravel	3	63
Sand, black	2	65

Casing, 6-inch to 64 ft; perforated 139 to 141 ft, 167 to 170 ft.

3/2-17J1. W. M. Higdon. About 4 miles southwest of Battle Ground, 0.5 mile north of County Road 72 on Binner Road. Altitude about 261 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	15	15
Troutdale formation:		
Gravel and sand	60	75
Gravel, cemented	15	90
Gravel, water-bearing	26	116

Casing, 6-inch to 116 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/2-17Q1. J. M. Morgan. About 1.9 miles west of Brush Prairie. Altitude about 250 ft. Drilled by H. I. Bottner, 1952.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	8	8
Sand, dirty	48	56
Clay, blue	12	68
Troutdale formation:		
Gravel, cemented	45	113
Gravel, water-bearing	7	120
Clay, blue, and sand	25	145
Sand, brown	42	187
Clay and gravel	1	188
Gravel, water-bearing	2	190
Sand, brown	37	227
Clay	53	280
Sandstone	19	299
Gravel, water-bearing	2	301
Sandstone	3	304

Casing, 8-inch to 235 ft, 6-inch from 230 to 304 ft; perforated 113 to 119 ft, and 285 to 301 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/2-18C1. B. Sellinger. About 2 miles east of Baker, at intersection of Mill Creek and County Road 8. Altitude about 200 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	8	8
Clay	17	25
Troutdale formation:		
Gravel	11	36
Sand	10	46
Sand, black	6	52

Casing, 6-inch to 52 ft.

3/2-18C2. B. Sellinger. About 2 miles east of Baker, 0.2 mile southeast of intersection of Mill Creek and County Road 8. Altitude about 200 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Soil	12	12
Sand	16	28
Troutdale formation:		
Boulders	11	39
Gravel	20	59
Clay	18	77
Rock	11	88
Sand, black	9	97

Casing, 6-inch to 97 ft.

3/2-18D1. J. T. Pagel. About 5 miles southwest of Battle Ground, 500 ft south and 125 ft east of northwest cor. Altitude about 205 ft. Drilled by B. L. Price.

Materials	Thickness (feet)	Depth (feet)
Unknown.	43	43
Troutdale formation:		
Upper member:		
Gravel, water-bearing.	4	47
Sand with thin layers of gravel.	43	90
Gravel and sand, water-bearing.	8	98
Lower member:		
Clay, blue.	112	210

Casing, 8-inch; perforated 42 to 47 ft, and 90 to 94 ft.

3/2-19A1. Ernest Dunlap. About 2.3 miles west of Brush Prairie. Altitude about 200 ft. Drilled by Floyd Wickersham.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil.	4	4
Clay, yellow	14	18
Sand, blue, water-bearing.	5	23
Clay, blue.	18	41
Troutdale formation:		
Gravel, cemented, water-bearing.	28	69
Gravel, fine, and sand, water-bearing.	14	83

3/2-19B1. L. L. Demming. About 0.8 mile northeast of Pleasant Valley School, at intersection of Studer Road and County Road 65. Altitude about 210 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	2	2
Clay, sandy	22	24
Clay	10	34
Troutdale formation:		
Gravel, cemented	24	58
Gravel, loose, water-bearing	8	66

Casing, 6-inch to 66 ft.

3/2-19G1. H. L. McDowell. About 0.6 mile east of Pleasant Valley School on Studer Road. Altitude about 170 ft. Drilled by A. C. Locey.

Recent alluvium:		
Soil	6	6
Troutdale formation:		
Gravel	12	18
Rock	10	28
Gravel	2	30
Sand, black	1	31

Casing, 6-inch to 20 ft.

3/2-20C1. C. W. Parker. About 0.4 mile east of County Road 3, on County Road 72. About 0.5 mile north of Salmon Creek. Altitude about 235 ft. Drilled by R. A. Jobes.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay	49	49
Clay, blue	10	59
Troutdale formation:		
Gravel, probably with some blue sand and silt(?)	10	69

Casing, 6-inch to 69 ft.

3/2-21A1. J. Shefek. About 0.5 mile west of Brush Prairie, near intersection of County Road 72 and Bird Road. Altitude about 290 ft. Drilled by owner.

Pleistocene alluvial deposits:		
Sand, water-bearing	at	34
Troutdale formation:		
Hardpan (gravel, cemented?)	5	39
Sand, blue, water-bearing	at	45
Gravel, cemented	at	100
Gravel, sand, and boulders, water-bearing (sand comes in)	43	143
Gravel, water-bearing	at	143

3/2-21A2. W. Lane. About 0.7 mile northwest of Brush Prairie, 0.2 mile west of Birt Street, on County Road 72. Altitude about 265 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	10	10
Sand	12	22
Clay	22	44
Troutdale formation:		
Gravel	13	57
Sand (quicksand)	2	59
Gravel	12	71

Casing, 6-inch to 71 ft.

3/2-21A3. Melvin T. Radke. About 0.8 mile northwest of Brush Prairie. Altitude about 265 ft. Drilled by B. L. Price.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	4	4
Clay and sand	28	32
Clay, blue	6	38
Silt and sand	62	100
Troutdale formation:		
Sand and some gravel	20	120
Gravel and sand, water-bearing	19	139

Casing, 6-inch to 139 ft.

3/2-21A4. Stanley E. Wellman. About 0.8 mile northwest of Brush Prairie. Altitude about 265 ft. Drilled by Floyd Wickersham, 1954.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	3	3
Clay, yellow	6	9
Sand, brown	29	38
Sand, brown, water-bearing	25	63
Sand, blue	15	78
Clay, blue	5	83
Troutdale formation:		
Gravel, cemented	43	126
Sand, blue	2	128
Gravel, cemented, and sand, water-bearing	20	148

Casing, 8-inch to 148 ft; perforated 132 to 145 ft.

3/2-21K1. Fred Moore. About 0.9 mile west of Brush Prairie.

Altitude about 290 ft. Drilled by B. L. Price, 1953.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	3	3
Clay	15	18
Silt and sand	85	103
Troutdale formation:		
Sand and gravel	37	140
Gravel	25	165
Gravel, muddy	20	185
Clay, blue	20	205
Sand, brown	35	240
Gravel	7	247
Clay	6	253
Gravel	37	290

Casing, 12-inch to 290 ft; perforated 150 to 180 ft, and 270 to 290 ft.

3/2-22F1. Andrew Erkkila. In Brush Prairie, at intersection of State Highway 1-U and T. H. Adams Road. Altitude about 297 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	4	4
Clay, sandy	6	10
Sand (quicksand)	42	52
Clay	18	70
Sand	28	98
Troutdale formation:		
Gravel	4	102
Sand (quicksand)	5	107
Gravel, water-bearing	13	120

Casing, 6-inch to 120 ft.

3/2-22J1. Jacob Henkel. About 0.5 mile southeast of Brush Prairie. Altitude about 293 ft. Drilled by Floyd Wickersham, 1955.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	4	4
Sand, brown	4	8
Clay, yellow	24	32
Sand, clay binder	22	54
Sand, gray	40	94
Troutdale formation:		
Gravel, cemented, and sand	50	144
Gravel, large	3	147
Gravel, cemented	11	158
Gravel, large	3	161
Sand, gray	3	164
Gravel, cemented	8	172
Sand, brown	3	175

Casing, 8-inch to 175 ft; perforated 145 to 160 ft, and 165 to 172 ft.

3/2-23D2. W. F. Messner, Jr. About 0.8 mile northeast of Brush Prairie. Altitude about 295 ft. Drilled by B. L. Price, 1952.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	5	5
Mud, brown	30	35
Silt, blue	50	85
Troutdale formation:		
Gravel, mud	5	90
Mud, brown	12	102
Mud, brown, gravel	43	145
Sand, gravel, mud	33	178

Casing, 8-inch to 178 ft; perforated 152 to 172 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/2-23H1. Axel Pelto. About 1.5 miles east of Brush Prairie.

Altitude about 295 ft. Drilled by F. Wickersham, 1954.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	4	4
Sand, brown, and silt	14	18
Clay, blue	28	46
Sand, brown	19	65
Clay, blue	10	75
Clay, yellow	10	85
Sand, blue, water-bearing	16	101
Troutdale formation:		
Gravel, cemented	51	152
Sand, fine, water-bearing	30	182
Gravel, cemented	4	186
Sand, coarse, and gravel, water-bearing	8	194

Casing, 8-inch to 193 ft.

3/2-23J1. E. Kreinbring. About 1.5 miles east-southeast of Brush Prairie, at intersection of County Roads 92 and 93. Altitude about 285 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	4	4
Clay	41	45
Sand	15	60
Troutdale formation (?):		
Clay, yellow	15	75
Clay, blue	10	85
Sand, black	20	105
Troutdale formation:		
Gravel	25	130
Gravel, cemented	5	135
Sand, black	4	139

Casing, 6-inch to 139 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/2-23J2. Earl V. Kreinbring. About 1.5 miles east of Brush Prairie. Altitude about 295 ft. Drilled by G. T. Lane, 1954.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	2	2
Sand, brown, loam	1	3
Clay, yellow	7	10
Sand, red	8	18
Clay, blue	10	28
Clay, yellow	17	45
Sand, gray	29	74
Clay, yellow	3	77
Clay, blue	26	103
Sand, brown	2	105
Troutdale formation:		
Gravel, water-bearing, with sand	4	109
Gravel, cemented	26	135
Gravel, water-bearing	5	140
Gravel, cemented	8	148
Gravel, water-bearing	4	152
Gravel, cemented	6	158
Gravel, water-bearing	4	162
Gravel, cemented	9	171
Sand, coarse, brown, and gravel, water-bearing	24	195

Casing, 10-inch to 195 ft; perforated 135 to 140 ft.

3/2-24N1. W. F. Bennett. About 1.9 miles southeast of Brush Prairie. Altitude about 280 ft. Drilled by B. L. Price, 1953.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	3	3
Silt, brown	7	10
Mud, blue	25	35
Mud	5	40
Mud and sand	20	60
Clay, blue	20	80
Troutdale formation:		
Sand and gravel	78	158

Casing, 10-inch to 158 ft; perforated at 120, and 138 to 152 ft.

3/2-25H1. Jack Bechill. About 0.75 mile north of County Road 5, on A. J. Berg Road. Altitude about 261 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	7	7
Sand (quicksand)	4	11
Clay, blue	31	42
Troutdale formation:		
Boulders	23	65
Gravel, coarse	46	111

Casing, 6-inch to 111 ft.

3/2-25L1. Harry R. and Hilda E. Hoseney. About 2 miles southeast of Brush Prairie. Altitude about 275 ft. Drilled by Floyd Wickersham, 1953.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	3	3
Clay, red	3	6
Gravel, loose, and boulders	12	18
Clay, yellow	19	37
Shale, blue	5	42
Clay, yellow	34	76
Sand	13	89
Clay, blue	17	106
Troutdale formation:		
Upper member;		
Gravel and boulders, cemented, water-bearing	42	148
Lower member;		
Clay, yellow	3	151
Sand, fine, with mica, water-bearing	143	294
Sand, coarse, water-bearing	11	305

Casing, 8-inch to 295 ft; gravel plug from 283 to 305 ft; perforated.

3/2-27F1. W. D. Andrews. About 1.2 miles south of Brush Prairie, 0.1 mile north of intersection of Glenwood Heights Road and State Highway 1-U. Altitude about 285 ft. Drilled by G. H. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	14	14
Sand	7	21
Clay, sandy	42	63
Troutdale formation		
Upper member:		
Clay, sandy, and gravel	12	75
Gravel, cemented	7	82
Gravel, sandy, water-bearing	13	95
Clay, sandy, and gravel	27	122
Gravel, cemented	12	134
Gravel, sandy	2	136
Clay, sandy, and gravel	12	148
Gravel, loose	2	150
Gravel, cemented	3	153
Lower member:		
Clay, sandy	34	187
Gravel, sandy	2	189
Clay	16	205
Gravel, sandy, water-bearing	1	206
Clay, sandy	8	214
Sand, water-bearing	5	219
"Rock," white "floating" (pumice?)	24	243
Clay	8	251
Gravel, "volcanic"	2	253

Casing, 6-inch to 253 ft.

3/2-27F2. W. D. Andrews. About 1.2 miles south of Brush Prairie. Altitude about 285 ft. Drilled by R. J. Strasser, 1953.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	6	6
Clay, sandy	16	22
Sand	12	34
Clay, blue	19	53
Sand and silt	43	96
Troutdale formation:		
Sand and gravel, water-bearing	55	151
Gravel with clay binder	11	162
Clay, yellow	30	192
Clay, blue	22	214
Sand and gravel, water-bearing	28	242
Clay, brown	7	249
Gravel with clay binder	9	258
Gravel and sand, water-bearing	21	279
Gravel with clay binder	8	287
Clay, yellow	8	295

Casing, 12-inch to 279 ft; perforated 116 to 120 ft, 128 to 141 ft, 143 to 151 ft, 213 to 229 ft, and 250 to 275 ft.

3/2-28A1. R. V. Somerell. About 0.5 mile northwest of intersection of Glenwood Heights Road and State Highway 1-U. Altitude about 286 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	18	18
Sub soil	26	44
Sand	11	55
Clay, sandy	35	90
Troutdale formation:		
Gravel, sandy	31	121
Sand, dry	4	125
Gravel, sandy	20	145
Clay	5	150
Gravel	14	164

Casing, 6-inch to 163 ft.

3/2-28C2. Arthur A. Groth. About 1 mile southwest of Brush Prairie.

Altitude about 285 ft. Drilled by B. L. Price, 1951.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	5	5
Silt	25	30
Silt and sand	45	75
Sand, "heavy"	10	85
Sand, blue (quicksand)	10	95
Clay, blue	28	123
Troutdale formation:		
Upper member;		
Mud and gravel	67	190
Mud, blue	22	212
Lower member;		
Sand and gravel	33	245
Clay, blue	2	247

Casing, 8-inch to 247 ft; perforated 163 to 240 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/2-28G2. H. L. Grantham. About 0.1 mile south of Glenwood Heights Road, and 0.5 mile west of State Highway 1-U. Altitude about 285 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay, sandy	60	60
Clay, blue	20	80
Sand (quicksand), water-bearing	10	90
Troutdale formation:		
Clay, sandy	40	130
Sand (quicksand)	10	140
Gravel, loose	2	142
Gravel, cemented	13	155
Gravel, loose, water-bearing	5	160

Casing, 6-inch to 160 ft.

3/2-28P1. J. Hebert. About 1.0 mile northeast of Homan, 0.8 mile west of State Highway 1-U on County Road 6. Altitude about 257 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	3	3
Clay, sandy	12	15
Sand	48	63
Sand (quicksand)	5	68
Clay, sandy	23	91
Troutdale formation:		
Boulders	13	104
Gravel, cemented	65	169
Gravel, water-bearing	1	170

Casing, 6-inch to 170 ft.

3/2-28Q1. A. Adams. About 1 mile northeast of Homan, 0.6 mile west of State Highway 1-U, on County Road 6. Altitude about 272 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	8	8
Sand	18	26
Gravel	13	39
Clay	17	56
Troutdale formation:		
Gravel	12	68
Rock	7	75
Gravel	21	96
Clay	20	116
Gravel	8	124
Sand, black	7	131

Casing, 6-inch to 126 ft.

3/2-29B1. Fred W. Fleming. About 2.1 mile southwest of Brush Prairie. Altitude about 190 ft. Dug by N. C. Fleming, 1954.

Pleistocene alluvial deposits:		
Muck, black	3	3
"Quicksand"	23	26

Casing, 30-inch to 15 ft, and 12-inch from 15 to 26 ft.

3/2-29H1. L. D. Flindt. About 2.1 miles southwest of Brush Prairie. Altitude about 195 ft. Dug by C. M. Nye, 1953.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	3	3
Silt soil	10	13
Sand	6	19
Sand, coarse, water-bearing	4	23

Casing, 36-inch to 23 ft.

3/2-29M1. A. Naegeli. About 0.3 mile north of intersection of County Highways 3 and 6. Altitude about 224 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	14	14
Sand, coarse	26	40
Sand, water-bearing	41	81
Troutdale formation:		
Clay and gravel	8	89
Gravel	22	111
Gravel, water-bearing	4	115

Casing, 6-inch to 115 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/2-30C1. C. M. Coffey. Between Pleasant Valley and Glenwood, 0.6 mile west of intersection of County Roads 3 and 70. Altitude about 242 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	10	10
Sand (quicksand)	30	40
Clay, blue	20	60
Sand (quicksand)	2	62
Sand (quicksand) and clay	33	95
Sand and clay	10	105
Troutdale formation:		
Gravel	5	110

Casing, 6-inch to 109 ft.

3/2-30K1. Evelyn Berger. About 2 miles east of Salmon Creek. Altitude about 240 ft. Drilled by Courtney Bach, 1951.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil, sandy	20	20
Sand (quicksand)	80	100
Troutdale formation:		
Gravel	7	107

Casing, 6-inch to 107 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/2-31M1. John L. Lee. About 4.2 miles southwest of Brush Prairie. Altitude about 255 ft. Drilled by Joe Hansen.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	6	6
Clay, light, and sand	9	15
Sand, water-bearing	17	32
"Quicksand," with mixed clay	3	35

Casing, 6-inch to 35 ft; perforated 15 to 35 ft.

3/2-33K1. Homer Mosier. About 0.8 mile east of Homan, 1 mile southwest of intersection of County Road 6 and State Highway 1-U, at end of Miller Road. Altitude about 222 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	5	5
Soil, sandy	13	18
Sand, water-bearing	27	45
Sand (quicksand)	25	70
Troutdale formation:		
Clay, and gravel	21	91
Gravel	2	93
Clay and gravel	7	100
Boulders	3	103
Sand, black	4	107

Casing, 6-inch to 107 ft.

3/2-33P2. J. Ingstrom. About 0.8 mile southeast of Homan, 0.7 mile west of State Highway 1-U, on J. Bassil Road. Altitude about 220 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	12	12
Sand	20	32
Gravel	13	45
Boulders	17	62
Sand	6	68
Troutdale formation:		
Clay, yellow	7	75
Gravel	2	77

Casing, 6-inch to 77 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/2-34L1. R. O. Woster. About 0.9 mile southwest of Union School, 0.6 mile south of County Road 6, on State Highway 1-U. Altitude about 260 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	7	7
Sand	16	23
Sand (quicksand)	3	26
Boulders	2	28
Clay, sandy	23	51
Troutdale formation:		
Clay, red	30	81
Sand	18	99
Gravel	27	126
Sand, black	9	135

Casing, 6-inch to 134 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/2-34N1. Frank Campbell. About 1.3 miles southwest of Union School, at intersection of State Highway 1-U and Towle Road. Altitude about 260 ft. Drilled by A.C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	1	1
Gravel	9	10
Sand	97	107
Troutdale formation:		
Clay	9	116
Gravel	12	128

Casing, 6-inch to 128 ft.

3/2-34P1. R. T. Gould. About 1.2 miles southwest of Union School, 0.25 mile east of State Highway 1-U on Towle Road. Altitude about 252 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Gravel	35	35
Sand	25	60
Troutdale formation:		
Gravel	20	80
Clay	24	104
Sand (quicksand)	11	115
Sand and gravel	9	124
Boulders and gravel	22	146

Casing, 6-inch to 126 ft.

3/2-34P2. Henry Thomas. About 1.2 miles southwest of Union School, 0.2 mile north of intersection of State Highway 1-U and Towle Road. Altitude about 270 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	7	7
Sand	28	35
Sand (quicksand)	17	52
Boulders	10	62
Clay, sandy	28	90
Troutdale formation:		
Gravel	40	130
Sand, black	5	135

Casing, 6-inch to 133 ft.

3/3-8Q1. W. E. Weisenborn. About 2.5 miles northeast of Hockinson, 0.3 mile south of County Road 86 on County Road 88. Altitude about 540 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Soil	4	4
Clay, red, sandy	26	30
Clay, rocky	50	80
Sand (quicksand)	5	85
Gravel, cemented	5	90
Gravel, loose	11	101
Clay, yellow, very soft	27	128
Sand, fine, black	2	130
Gravel, loose	5	135
Sand, black, water-bearing	3	138

Casing, 6-inch to 138 ft.

3/3-17N1. William Ahola. About 0.7 mile northeast of Hockinson, 0.6 mile east of Clark County Road 89 on County Road 88. Altitude about 530 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Soil	2	2
Clay	34	36
Sand and gravel	57	93
Sand, water-bearing	9	102

Casing, 6-inch to 102 ft.

Table 17.--Materials penetrated by representative wells--Continued

3/3-18R1. S. K. Bain. About 0.45 mile east of Hockinson Center.

Altitude about 498 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Soil.	5	5
Sand.	28	33
Gravel.	55	88
Sand (quicksand).	6	94
Gravel.	6	100
Sand, black	8	108

Casing, 6-inch to 103 ft.

3/3-19A1. Fred Laws. About 0.5 mile east of Hockinson. Altitude about 480 ft. Drilled by Bill Price, 1952.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Clay, silt, some gravel	18	18
Gravel	2	20
Silt	33	53
Gravel	12	65
Clay	2	67
Gravel, water-bearing	20	87
Gravel, some clay	10	97
Gravel, clean, water-bearing	23	120
Sand, red, and gravel	6	126
Gravel, fine	4	130
Sand, gray	4	134
Gravel, fine	2	136
Sand	3	139
Gravel	6	145
Rock, black	10	155
Gravel, water-bearing	3	158
Gravel, hard	9	167

Casing, 10-inch to 145 ft; perforated 107 to 118 ft.

3/3-19D1. A. Schimpf. About 0.3 mile west of Hockinson Center. Altitude about 270 ft. Drilled by Floyd Wickersham.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	4	4
Clay, gray	5	9
Clay, yellow	11	20
Clay, yellow, and sand	15	35
Sand, yellow	15	50
Clay, blue-green	1	51
Troutdale formation:		
Clay, blue, and boulders, cemented	9	60
Gravel, loose	8	68

Casing, 6-inch to 68 ft.

3/3-21M1. John Huhtala. About 1.7 miles west of Mountain View School, 0.5 mile north of Griffils Road. Altitude about 527 ft. Drilled by Pete Hansen.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Clay, yellow, sticky	20	20
Sand (quicksand), yellow, with some mica	65	85
Gravel, cemented	9	94

Casing, 6-inch to 94 ft.

3/3-32N1. C. R. Ellenwood, and I. M. Brown. About 2.7 miles south-southeast of Hockinson, at intersection of Del Groso Road and Fifth Plain Creek. Altitude about 275 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Soil	4	4
Sand	23	27
Gravel	18	45
Sand (quicksand)	12	57
Gravel	5	62
Sand, black	4	66

Casing, 6-inch to 66 ft.

4/1W-13Q1. Northern Pacific Railroad. In Ridgefield, about 200 ft north of station. Altitude about 40 ft.

Materials	Thickness (feet)	Depth (feet)
Cinders	2	2
Troutdale formation:		
Sand, yellow, clayey, and cemented gravel	20	22
Gravel, cemented	16	38
Sand, coarse, with some clay, water-bearing	11	49
Sand, coarse, and fine gravel	14	63
Gravel, coarse, and sand	3	66
Gravel, with gray, clayey sand	12	78
Gravel, cemented	26	104
Clay, blue, soft	1	105
Gravel, coarse, and sand	4	109

Casing, 12- to 10-inch to 109 ft.

4/1-5E1. L. R. Hussa. About 2.5 miles west of La Center, on Pekin Ferry Road, 0.7 mile south of Lewis River, measured along road. Altitude about 235 ft. Drilled by A. M. Jannsen.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Upper member;		
Clay, brown	35	35
Gravel, cemented	20	55
Gravel	10	65
Gravel, cemented	64	129
Sand and rock	11	140
Lower member;		
Sand	50	190
Sand, dry	25	215
Sand	25	240
Sand (quicksand)	56	296
Gravel and sand	4	300

Casing, 8-inch to 299 ft.

4/1-7H1. E. Johnson. About 2 miles north-northeast of Ridgefield, at junction of Allen Canyon Road and County Road 24. Altitude about 252 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Soil	2	2
Sand and gravel	58	60
Gravel	30	90
Gravel and "shot" boulders	30	120
Boulders	12	132
Boulders and gravel	35	167
Gravel and sand	71	238
Sand	100	338
Gravel, water-bearing	21	359

Casing, 6- to 4-inch to 359 ft.

4/1-7Q1. Arthur Whitler. About 1.5 miles northeast of Ridgefield, 0.6 mile east of intersection of County Roads 21 and 22. Altitude about 200 ft. Drilled by A. C. Locey.

No record	400	400
Troutdale formation:		
Gravel, water-bearing	6	406
No record	94	500
Tertiary volcanics:		
Rock	50	550

Casing, 6-inch to 459 ft.

4/1-7R1. J. O. Downing. About 1.8 miles northeast of Ridgefield, 0.2 mile west of intersection of County Roads 21 and 24. Altitude about 255 ft. Drilled by R. A. Jobes.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation		
Upper member:		
Clay.	65	65
Gravel, cemented.	100	165
Lower member:		
Sand, dry	23	188
Sand, water-bearing.	15	203
Sand and blue clay, water-bearing.	--	203

Casing, 6-inch to 203 ft.

4/1-8M1. Charles L. Bisher. About 2 miles northeast of Ridgefield, 0.2 mile northeast of intersection of County Roads 21 and 24. Altitude about 255 ft. Drilled by R. A. Jobes.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Sand.	90	90
Troutdale formation:		
Upper member:		
Gravel, cemented.	50	140
Lower member:		
Sand.	266	406

Casing, 6-inch to 406 ft.

4/1-8N1. W. Darr. About 2 miles northeast of Ridgefield, near intersection of County Roads 21 and 24. Altitude about 243 ft. Drilled by R. A. Jobes.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Sand.	60	60
Troutdale formation:		
Upper member;		
Gravel, cemented.	90	150
Lower member;		
Sand.	107	257
Sand and clay	--	257

4/1-11B1. O. P. Lewellen. About 1.6 miles southeast of La Center. Altitude about 120 ft. Drilled by George Zent, 1954.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Upper member;		
Topsoil.	2	2
Clay, sandy.	20	22
Gravel, cemented	25	47
Lower member;		
Clay, sandy.	46	93
Sand and silt, water-bearing.	9	102
Clay, blue	23	125
Clay, gray.	10	135

Casing, 6-inch.

4/1-11B2. O. P. Lewellen. About 1.5 miles southeast of La Center.
Altitude about 40 ft. Drilled by George Zent.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium:		
Clay, rocky	12	12
Clay, sandy	7	19
Sand, water-bearing	2	21
Troutdale formation , lower member:		
Clay, blue	74	95
Clay, gray	3	98
Clay, blue	25	123
Clay, yellow	4	127
Clay, blue	14	141

Casing, 6-inch.

4/1-11G1. O. P. Lewellen. About 1.6 miles southeast of La Center.
Altitude about 16 ft. Drilled by George Zent.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium:		
Gravel	8	8
Clay, sandy	12	20
Sand, silt, water-bearing	2	22
Troutdale formation:		
Clay, yellow, rocky	3	25
Clay, blue	20	45

Casing, 6-inch; perforated 10 ft in middle.

Table 17.--Materials penetrated by representative wells--Continued

4/1-16C1. A. W. Sundviek. West Pioneer. At intersection of U. S. Highway 99 and County Road 28. Altitude about 272 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil and clay	5	5
Clay, yellow	48	53
Clay, yellow, with some sand	40	93
Troutdale formation:		
Upper member;		
Gravel, cemented	54	147
Gravel, loose, "caving"	7	154
Gravel, cemented	16	170
Lower member;		
Sand, dry	88	258
Sand, water-bearing	14	272
Sand, packed hard (sandstone?)	2	274

Casing, 6-inch to 274 ft.

Table 17.--Materials penetrated by representative wells--Continued

4/1-16D1. H. Weston. West Pioneer. At intersection of U. S. Highway 99 and County Road 28. Altitude about 265 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay, yellow, and topsoil	85	85
Troutdale formation:		
Upper member;		
Gravel, cemented	53	138
Sand	3	141
Gravel, cemented	39	180
Gravel, loose, dry	35	215
Lower member;		
Sand, dry	41	256
Sand, water-bearing	14	270
Sand, dry, hard	7	277

Casing, 6-inch to 277 ft; perforated and gravel-packed from 256 to 270 ft.

4/1-17H1. C. B. Moffett. About 2 miles northeast of Ridgefield, 0.1 mile west of intersection of County Roads 21 and 25. Altitude about 225 ft. Drilled by R. A. Jobes.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Upper member;		
Clay	30	30
Gravel, cemented	100	130
Lower member;		
Sand, coarse, yellow	80	210
Sand (quicksand), fine	450	660

Casing, 6-inch to 450 ft, 5-inch to 660 ft.

4/1-17H2. C. B. Moffett. About 2 miles northeast of Ridgefield, 0.1 mile west of intersection of County Roads 21 and 25. Altitude about 225 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Upper member;		
Topsoil	2	2
Clay, yellow	26	28
Conglomerate	79	107
Lower member;		
Clay, blue and yellow	83	190
Sand, water-bearing	19	209

Casing, 6-inch to 209 ft.

4/1-17H3. C. B. Moffett. About 2 miles northeast of Ridgefield, 0.3 mile west of intersection of County Roads 21 and 25. Altitude about 200 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Upper member;		
Topsoil.	2	2
Clay, yellow.	10	12
Conglomerate.	75	87
Lower member;		
Clay, blue and yellow.	86	173
Sand, water-bearing.	27	200

Casing, 12-inch to 200 ft.

4/1-19E3. Town of Ridgefield. Altitude about 35 ft. Drilled by R. J. Strasser, 1955.

Recent alluvium:		
Surface topsoil.	6	6
Boulders.	4	10
Troutdale formation:		
Gravel, cemented.	26	36
Gravel, water-bearing.	6	42
Gravel, cemented.	8	50
Sand and gravel, water-bearing.	6	56
Gravel, cemented.	9	65

Casing, 10-inch to 65 ft. Perforated.

4/1-19R1. A. F. Frewing. About 1.1 miles southeast of Ridgefield.

Altitude about 240 ft. Drilled by Hansen Drilling Co., 1955.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	3	3
Clay and sand	14	17
Clay, blue	8	25
Clay, yellow	55	80
Troutdale formation:		
Gravel, cemented	65	145
Gravel and sand, water-bearing	5	150

Casing, 6-inch to 150 ft.

4/1-20C1. Pearl Talbert. About 1.5 miles east of Ridgefield.

Altitude about 260 ft. Drilled by Joe Hansen, 1949.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil and yellow clay	10	10
Troutdale formation:		
Upper member:		
Clay, yellow, with small gravel	170	180
Lower member:		
Sand, dry	20	200
Sand, (quicksand), water-bearing	75	275
Clay, blue	35	310
Sand, water-bearing	25	335
Gravel, cemented, and sand	8	343

Casing, 6-inch to 343 ft.

4/1-20G1. John Ryf. About 1.7 miles east of Ridgefield, 1.3 miles west of U. S. Highway 99 on State Highway 1-T. Altitude about 260 ft. Drilled by R. A. Jobes.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay, with layers of sand	90	90
Troutdale formation:		
Gravel, cemented	137	227

Casing to 227 ft.

4/1-22N2. J. Timms. About 0.8 mile west of Pioneer. Altitude about 275 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay, red, sandy	20	20
Clay, yellow	30	50
Sand	30	80
Troutdale formation (?):		
Clay, sandy	21	101
Troutdale formation:		
Gravel	56	157
Boulders	3	160
Gravel	9	169
Sand, black, and loose gravel, water-bearing	5	174

Casing, 6-inch to 174 ft.

4/1-23A1. William McKee. About 4.9 mile east of Ridgefield.

Altitude about 300 ft. Drilled by Floyd Wickersham, 1953.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	5	5
Clay, yellow	12	17
Clay, brown	6	23
Clay, yellow	57	80
Clay, sandy, yellow	25	105
Troutdale formation:		
Gravel, cemented	102	207
Sand, fine, brown	105	312
Sand, coarse, water-bearing	11	323
Clay, blue	17	340

Casing, 8-inch to 340 ft.

4/1-26M1. C. A. Robinson. About 1 mile south of Pioneer on State Highway 1-S. Altitude about 265 ft. Drilled by H. J. Ferron.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Topsoil	3	3
Clay, hard, water-bearing	32	35
Clay, yellow	10	45
Clay, sandy, yellow	37	82
Troutdale formation:		
Upper member;		
Gravel, coarse, water-bearing	15	97
Sand and gravel	3	100
Gravel	2	102
Gravel, coarse, and sand	4	106
Sand, fine	14	120
Sand and gravel	13	133
Sand, fine, yellow	6	139
Sand and gravel	8	147
Sand, fine, yellow	10	157
Sand and gravel	5	162
Lower member;		
Clay	13	175
Sand, fine	35	210
Clay, blue	12	222
Sand, fine	11	233
Gravel	1	234

Continued next page

4/1-26M1.--Continued

Materials	Thickness (feet)	Depth (feet)
Troutdale formation, lower member: --Continued		
Sand, fine	18	252
Gravel	3	255
Sand, fine, yellow	18	273
Sand and coarse gravel	2	275
Sand	5	280
Clay, reddish	30	310
Sand, gray	2	312
Clay, brown	3	315
Sand, fine, gray	20	335
Sand, with a little gravel	5	340
Sand, 3 inches of clay at 553 ft. Small stringers of clay encountered, but not measurable. (Well started blowing at 650 ft)	332	672
Clay, hard, brown	1	673
Clay, sticky, blue	2	675
NOTE: Placed 40 ft of gravel in casing to hold back fine sand.		

Casing, 8-inch to 672 ft; perforated 120 to 285 ft.

Table 17.--Materials penetrated by representative wells--Continued

4/1-27P1. Frank Bowles. About 1.3 miles southwest of Pioneer, at intersection of U. S. Highway 99 and County Road 18. Altitude about 257 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Sand	40	40
Clay	20	60
Sand	22	82
Troutdale formation:		
Gravel and sand	24	106

Casing, 6-inch to 106 ft.

4/1-27R1. J. H. Tucker. About 1 mile south of Pioneer, at intersection of County Road 18 and State Highway 1-S (old U. S. Highway 99). Altitude about 270 ft.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	56	56
Clay	30	86
Sand	17	103
Troutdale formation:		
Sand and gravel	13	116
Gravel, loose	9	125
Sand, black	6	131

Casing, 6-inch to 131 ft.

4/1-28R1. J. H. Bloom. About 1 mile north of Lambert, at intersection of Gee Creek and County Road 18. Altitude about 225 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	12	12
Clay, yellow	10	22
Sand, soft	22	44
Clay	12	56
Sand, soft	19	75
Clay	5	80
Sand	5	85
Sand and clay	21	106
Troutdale formation:		
Boulders	2	108
Gravel and sand	16	124
Gravel, water-bearing	10	134

Casing, 6-inch to 134 ft.

4/1-29F1. John Royle. About 2 miles southeast of Ridgefield, and 0.1 mile northeast of Gee Creek. Altitude about 180 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	2	2
Sand	8	10
Clay	54	64
Sand	5	69
Troutdale formation:		
Gravel, water-bearing	37	106
Clay	4	110
Gravel, water-bearing	21	131

Casing, 6-inch to 131 ft.

4/1-29G1. Fred Zink. About 2.1 miles southeast of Ridgefield, 0.2 mile west of County Road 25, on Persinger Road. Altitude about 258 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Soil	2	2
Sand and clay	93	95
Troutdale formation:		
Gravel	30	125
Gravel, loose, water-bearing	17	142

Casing, 6-inch to 142 ft.

Table 17.--Materials penetrated by representative wells--Continued

4/1-29M1. Donald F. Wells. About 1.8 miles southeast of Ridgefield. Altitude about 285 ft. Drilled by H. I. Bottner, 1953.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay, yellow.	93	93
Troutdale formation:		
Upper member;		
Gravel, cemented.	96	189
Gravel, water-bearing, and very little sand, bailed test 7 gpm.	4	193
Sand.	5	198
Sand and gravel, bailed 25 gpm at 216 ft. . . .	11	209
Gravel with some sand, 2 ft water-bearing gravel	19	228
Lower member;		
Clay, blue.	80	308

Casing, 8-inch to 210 ft, 6-inch from 205 to 228 ft; perforated 180 to 185 ft, 6-inch liner perforated 205 to 228 ft.

4/1-32J1. Lytle. About 1.2 miles northwest of Lambert, 0.2 mile south of junction of Williams Road and State Highway 1-T. Altitude about 270 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Clay, yellow.	90	90
Troutdale formation:		
Gravel.	67	157

Casing, 6-inch to 157 ft.

Table 17.--Materials penetrated by representative wells--Continued

4/1-32R2. A. Sandmann. About 1.2 miles west-northwest of Lambert, 0.3 mile south of Williams Street on State Highway 1-T. Altitude about 275 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	35	35
Sand	10	45
Clay	33	78
Sand	57	135
Troutdale formation:		
Gravel, cemented	20	155
Sand, black	5	160

Casing, 6-inch to 157 ft.

4/1-33J2. A. W. Bottemiller. About 0.5 mile north of Lambert, on County Road 19. Altitude about 262 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Soil	4	4
Sand and clay	106	110
Sand, water-bearing	4	114
Troutdale formation:		
Sand and gravel	16	130
Gravel, water-bearing	3	133

Casing, 6-inch to 133 ft.

Table 17.--Materials penetrated by representative wells--Continued

4/1-34M1. E. Leopold. In Lambert District, .1 mile north of intersection of County Roads 15 and 19. Altitude about 275 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	22	22
Clay	20	42
Clay, sandy	32	74
Troutdale formation:		
Sand and gravel	36	110
Sand and gravel, water-bearing	1	111
Clay and gravel	5	116
Gravel and sand, water-bearing	11	127

Casing, 6-inch to 126 ft.

4/1-35N1. Albert Ost. About 0.2 mile north of Battle Ground Road, on old U. S. Highway 99. Altitude about 275 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Soil	14	14
Sand	4	18
Sand and clay	38	56
Sand	44	100
Troutdale formation:		
Sand and gravel	26	126
No record, water-bearing	3	129

Casing, 6-inch to 129 ft.

4/1-36B1. Mrs. Johnson. About 4.5 miles northwest of Battle Ground, 1.25 miles west of King Corner. Altitude about 230 ft. Drilled by F. L. Warner, 1952.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Clay	20	20
Sand, brown	8	28
Troutdale formation:		
Sand, black	13	41
Clay, blue, and gravel (water-bearing at 58 ft)	19	60
Sand, blue (quicksand)	9	69
Sand and gravel	11	80
Gravel	9	89
Sand and gravel	3	92
Sand	11	103
Gravel, cemented	11	114
Gravel, water-bearing (small amount of blue sand)	13	127

Casing, 8-inch to 115 ft.

4/1-36M1. T. Engleking. About 0.3 mile north of Battle Ground Road, on County Road 61. About 1.5 miles northwest of Goodhope. Altitude about 285 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	20	20
Clay	39	59
Sand	30	89
Troutdale formation:		
Gravel, cemented	16	105
Gravel	25	130
Sand, black	5	135

Casing, 6-inch to 133 ft.

4/1-36N1. V. Bales. About 1.5 miles northwest of Goodhope, 0.1 mile north of intersection of Battle Ground Road and County Road 61. Altitude about 292 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	22	22
Clay	43	65
Sand	30	95
Troutdale formation:		
Gravel, cemented	10	105
Gravel	35	140
Sand, black	5	145

Casing, 6-inch to 143 ft.

Table 17.--Materials penetrated by representative wells--Continued

4/2-8K1. H. Jaster. About 1 mile southwest of McFadden, along McFadden Road. Altitude about 330 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Upper member;		
Soil	5	5
Clay, yellow	15	20
Rock (?)	4	24
Rock and boulders	5	29
Gravel and boulders	5	34
Gravel and (clay?)	24	58
Lower member;		
Clay	22	80
Clay, sandy	27	107
Clay, (blue?)	7	114
Sand (quicksand)	15	129

Casing, 6-inch to 104 ft.

Table 17.--Materials penetrated by representative wells--Continued

4/2-9E1. John Anderson. About 1.8 miles north of Charter Oak, midway between two intersection of County Roads 3 and 48. Altitude about 430 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Glacial drift:		
Soil and boulders	3	3
Troutdale formation:		
Upper member;		
Clay and sand	22	25
Clay and gravel	60	85
Gravel	1	86
Clay, blue	8	94
"Shale"	1	95
Gravel	18	113
Lower member;		
Clay	19	132
Clay, gray	11	143
Clay, blue	44	187
Sand, red	107	294
Clay, blue	7	301
Sand (quicksand)	194	495

4/2-11F1. R. Pender. About 2.3 miles northeast of Charter Oak, 0.3 mile west of Rock Creek, on county road. Altitude about 404 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Glacial drift:		
Soil	2	2
Boulders	16	18
Troutdale formation:		
Upper member;		
Clay, rocky	11	29
Clay	6	35
Gravel, loose	10	45
Lower member;		
Clay	39	84
Sand	83	167
Clay, water-bearing	161	328

Casing, 6-inch to 280 ft.

4/2-16D1. Fred Prew. About 1.4 miles northwest of Charter Oak. Altitude about 290 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits:		
Soil	2	2
Clay, sandy	34	36
Troutdale formation:		
Upper member;		
Gravel, loose	16	52
Gravel and clay	28	80
Lower member;		
Clay	13	93
Clay, sandy	11	104
Clay, blue	12	116
Sand, water-bearing	9	125

Casing, 6-inch to 125 ft.

4/2-16P1. M. Besich. About 0.5 mile west of Charter Oak, 0.7 mile west of Harrison Road, on County Road 50. Altitude about 293 ft. Drilled by A. C. Locey.

Open hole, no record	44	44
Troutdale formation:		
Clay, rocky	33	77
Gravel, cemented	27	104
Gravel, loose	8	112

Casing, 6-inch to 111 ft.

4/2-18D1. H. J. Maxwell. About 3 miles northeast of Pioneer, 0.2 mile east of intersection of County Road 48 and Lewis River Bottom Road. Altitude about 230 ft. Drilled by R. A. Jobes.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Upper member;		
Gravel and clay.	80	80
Lower member;		
Sand, dry.	83	163
Sand, water-bearing.	20	183
Clay, blue	at	183

4/2-20A1. L. Webb. About 1.1 mile west-southwest of Charter Oak, 0.5 mile north of East Fork of Lewis River. Altitude about 245 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Soil.	4	4
Clay, sandy	24	28
Troutdale formation:		
Gravel, loose.	23	51
Gravel, cemented.	5	56
Gravel, loose	15	71

Casing, 6-inch to 71 ft.

Table 17.--Materials penetrated by representative wells--Continued

4/2-21B1. L. Green. In Charter Oak, about 0.3 mile west of road intersection. Altitude about 260 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil.	22	22
Troutdale formation:		
Gravel.	17	39
Sand.	19	58
Gravel, pea	9	67
Sand, black	6	73

Casing, 6-inch to 73 ft.

4/2-21C1. L. Wooldridge. About 0.7 mile west-southwest of road intersection in Charter Oak. Altitude about 250 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Soil.	21	21
Sand.	12	33
Sand, water-bearing	3	36
Troutdale formation:		
Sand and gravel	15	51
Gravel, water-bearing	4	55

Casing, 6-inch to 55 ft.

Table 17.--Materials penetrated by representative wells--Continued

4/2-22E1. H. M. Nelson. About 0.4 mile southeast of Charter Oak, at intersection of County Road 50 and Charles Johnson Road. Altitude about 260 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil.	8	8
Boulder, "shot".	1	9
Troutdale formation:		
Clay.	147	156
Sand, blue.	13	169
No record, water-bearing.	3	172

Casing, 6-inch to 172 ft.

4/2-22H1. Lewisville Park. About 1 mile east-southeast of Charter Oak, 0.3 mile northwest of East Fork of Lewis River. Altitude about 165 ft. Drilled by R. J. Strasser.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium:		
Sand.	2	2
Gravel, coarse.	4	6
Gravel and boulders	16	22
Troutdale formation:		
Upper member;		
Sand, light in color, water-bearing.	13	35
Boulders.	2	37
Lower member;		
"Sandstone," soft.	69	106
"Shale".	6	112
"Sandstone".	41	153
"Shale".	38	191
Sand, with clay binder.	5	196
"Shale"	44	240

Casing, 10-inch to 43 ft, 14-inch from 43 to 48 ft; perforated 28 to 38 ft. Gravel-packed.

4/2-24Q1. H. Jaske. About 0.6 mile northwest of Battle Ground Lake. Altitude about 600 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Boring lava:		
Boulders	24	24
Rock, "solid"	63	87

Casing, 6-inch to 24 ft.

4/2-24R1. Andy Hansen. About 2.6 miles northeast of Battle Ground. Altitude about 540 ft. Drilled by William Price, 1953.

Materials	Thickness (feet)	Depth (feet)
Topsoil	5	5
Boring lava:		
Clay and loose rock	40	45
Volcanic rock	100	145
Rock	4	149
Rock, shale, and cinders	20	169
Rock	6	175
Troutdale formation:		
Gravel	5	180

Casing, 8-inch to 159 ft; perforated 147 to 157 ft.

4/2-25K1. R. W. Linn. About 0.5 mile southwest of Battle Ground Lake, off State Highway 1-U. Altitude about 420 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits:		
Soil	3	3
Sand	8	11
Troutdale formation:		
Gravel	12	23
Boring lava:		
Rock, lava	16	39
Troutdale formation:		
Gravel	12	51
Rock	8	59
Sand, black	2	61

Casing, 6-inch to 59 ft.

4/2-26F1. E. Meyer. About 1.5 miles north of Battle Ground, 0.1 mile west of intersection of Boutelle and McCafferty Roads. Altitude about 376 ft. Drilled by R. A. Jobes.

Boring lava:		
Rock, lava	30	30
Rock, hard, blue	45	75
Troutdale formation:		
Clay, sand, and gravel (drilling stopped by boulders)	31	106

Table 17.--Materials penetrated by representative wells--Continued

4/2-26L1. W. A. Nelson. About 1.5 miles north of Battle Ground, at intersection of Oxford and McCafferty Roads. Altitude about 384 ft. Drilled by Bert Abrams.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	18	18
Boring lava:		
Rock, lava	47	65
Troutdale formation:		
Gravel and boulders, packed	47	112
Gravel and boulders, slightly looser, water-bearing	2	114

Casing, 5-inch to 112 ft.

4/2-26Q1. Lester Burkey. About 1.2 miles north-northwest of Tukes Mountain peak, Battle Ground, at end of Oxford Road. Altitude about 360 ft. Drilled by Bert Abrams.

Materials	Thickness (feet)	Depth (feet)
Boring lava:		
Soil and boulders	7	7
Rock, lava, blue-gray, hard (not basalt)	39	46
Troutdale formation:		
Gravel and clay	10	56

NOTE: Water at base of rock.

Table 17.--Materials penetrated by representative wells--Continued

4/2-26Q2. Ninion B. Edwards. About 2.6 miles northeast of Battle Ground. Altitude about 360 ft. Drilled by Floyd Wickersham, 1953.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits:		
Topsoil.	5	5
Boring lava:		
Lava rock.	110	115
Troutdale formation:		
Gravel, cemented.	4	119
Gravel, fine, water-bearing.	4	123
Clay, blue	8	131

Casing, 6-inch to 131 ft.

4/2-28Q2. C. Spicer. About 0.5 mile east of Cherry Grove, 1.6 miles east of intersection of County Roads 3 and 55. Altitude about 270 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Soil and clay.	24	24
Troutdale formation:		
Gravel.	26	50
Sand (quicksand).	5	55
Gravel	35	90

Casing, 6-inch to 89 ft.

4/2-28R1. Robert Cresap. About 1.3 miles northwest of Battle Ground, 0.2 mile northwest of intersection of County Roads 55 and 56. Altitude about 247 ft. Drilled by R. A. Jobes.

Materials	Thickness (feet)	Depth (feet)
Soil	8	8
Troutdale formation:		
Gravel	29	37
Boulders	9	46
Gravel, coarse	2	48
Gravel, cemented	10	58
Rock	4	62
Sand, black	4	66

Casing, 6-inch to 58 ft.

4/2-31A1. Otis Brookshire. About 0.9 mile north of Dollar Corner. Altitude about 229 ft.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation (?):		
Clay	20	20
Sand	70	90
Sand, yellow, and gravel	24	114

Table 17.--Materials penetrated by representative wells--Continued

4/2-33D2. M. E. Rengo. About 2 miles northeast of Battle Ground, 0.1 mile southeast of intersection of County Roads 55 and 57. Altitude about 275 ft. Drilled by R. A. Jobes.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial deposits:		
Soil	10	10
Troutdale formation:		
Sand and gravel	23	33
Gravel and clay	15	48
Gravel, water-bearing	12	60
No record, water-bearing	3	63

Casing, 6-inch to 63 ft.

4/2-33E1. K. R. Deffenbaugh. About 2 miles west of Battle Ground, 0.6 mile north of State Highway 1-S, on County Road 57. Altitude about 267 ft. Drilled by A. C. Locey.

Pleistocene alluvial deposits:		
Clay, yellow	16	16
Troutdale formation:		
Gravel	7	23
Clay and gravel	29	52
Gravel and sand	10	62
Sand (quicksand)	11	73
Gravel and sand	5	78
Sand, black	6	84

Casing, 6-inch to 83 ft.

4/2-33G1. Floyd Wickersham. About 1.5 miles northwest of Battle Ground. Altitude about 276 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits:		
Soil	30	30
Troutdale formation:		
Sand and gravel	15	45
Gravel	40	85
Boulders	28	113
Sand, black	9	122

Casing, 6-inch to 122 ft.

4/2-33N1. J. Eves. About 1 mile south of Cherry Grove, 0.2 mile north-northeast of intersection of State Highway 1-S and County Road 57. Altitude about 258 ft. Drilled by R. A. Jobes.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Clay and gravel	50	50
Gravel, cemented	44	94

Casing, 6-inch to 91 ft.

Table 17.--Materials penetrated by representative wells--Continued

4/2-34D2. L. Sonntag. About 1.5 miles northwest of Battle Ground, 1 mile north of State Highway 1-S on County Road 56 (Sonntag Road). Altitude about 290 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits:		
Soil	3	3
Troutdale formation:		
Gravel	20	23
Gravel, cemented	12	35
Boulders	23	58
Gravel	14	72
Sand (quicksand)	11	83
Gravel	5	88
Sand, black	2	90

Casing, 6-inch to 90 ft.

Table 17.--Materials penetrated by representative wells--Continued

4/2-34M2. F. Haines. About 1 mile northwest of Battle Ground, 0.3 mile north of State Highway 1-S on County Road 56. Altitude about 277 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits:		
Soil and clay	5	5
Clay	5	10
Troutdale formation:		
Gravel	1	11
Boulders	9	20
Gravel	2	22
Boulders	5	27
Gravel and clay	37	64
Gravel	7	71

Casing, 6-inch to 50 ft.

Table 17.--Materials penetrated by representative wells--Continued

4/2-34R1. Battle Ground School. At Battle Ground. Altitude about 295 ft. Drilled by A. M. Jannsen.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Upper member;		
Gravel, cemented, and large boulders.	6	6
Gravel, cemented.	9	15
Gravel and boulders, water-bearing below 100 ft	98	113
Gravel	27	140
Gravel, water-bearing.	25	165
Lower member;		
Clay, blue.	11	176
Clay, with a little gravel.	36	212
Clay, brown	53	265
Clay, hard, and soapstone.	36	301

Casing, 12-inch to 180 ft; perforated 100 to 120 ft, and 140 to 180 ft.

4/2-35F1. R. Porter. Near Battle Ground, 0.2 mile sorthwest of sharp turn in State Highway 1-S, northwest of Tukes Mountain. Altitude about 312 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits:		
Soil	8	8
Sand	14	22
Troutdale formation:		
Gravel	16	38
Clay	12	50
Gravel	3	53
Sand, black	4	57

Casing, 6-inch to 57 ft.

4/2-35G1. Daisy Bush. Near Battle Ground, at sharp turn in State Highway 1-S, northwest of Tukes Mountain. Altitude about 312 ft. Drilled by A. C. Locey.

Troutdale formation .		
Gravel	55	55
Sand, black, water-bearing	2	57

4/2-35G2. Chadwick. Near Battle Ground, 0.5 mile northwest of Tukes Mountain, on State Highway 1-S. Altitude about 312 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits:		
Soil	6	6
Sand	12	18
Troutdale formation:		
Gravel, coarse	21	39
Sand	8	47
Rock	5	52
Sand, black	4	56

Casing, 6-inch to 50 ft.

4/2-35G3. Robert Cresap. Near Battle Ground, 0.3 mile north of Tukes Mountain, on State Highway 1-S. Altitude about 312 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits:		
Soil	5	5
Troutdale formation:		
Gravel	8	13
Sand	20	33
Gravel and sand	16	49
Sand, black	7	56

Casing, 6-inch to 50 ft.

4/2-35H1. J. Scranton. Near Battle Ground, 0.3 mile north of Tukes Mountain, on State Highway 1-S. Altitude about 315 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits:		
Soil	16	16
Clay, blue	17	33
Troutdale formation:		
Gravel	8	41
Boring lava (?):		
"Slate" (?)	10	51
Troutdale formation:		
Gravel	5	56
Sand, black	2	58

Casing, 6-inch to 56 ft.

4/2-35H2. O. Foeh. Near Battle Ground, 0.3 mile north of Tukes Mountain, on State Highway 1-S. Altitude about 315 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits:		
Soil	17	17
Clay, blue	4	21
Troutdale formation:		
Gravel	29	50
Clay, blue	10	60
Boring lava (?):		
"Slate" (?), red	10	70
"Slate"	20	90
Rock	4	94
Troutdale formation:		
Gravel and sand	5	99

Casing, 6-inch to 62 ft.

4/2-35P1. H. R. Morris. In Battle Ground, 0.3 mile north of intersection of State Highway 1-S and County Road 80, west of Tukes Mountain. Altitude about 295 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits:		
Soil	5	5
Troutdale formation:		
Gravel	8	13
Sand	20	33
Gravel	16	49
Sand, black	7	56

Casing, 6-inch to 55 ft.

4/2-35R1. A. Kalse. Near Battle Ground. 0.8 mile east of intersection of State Highways 1-S and 1-U, on southwest Flank of Tukes Mountain. Altitude about 360 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Upper member;		
Old hole, no record	27	27
Clay, blue	5	32
Gravel and sand	3	35
Boulders	10	45
Lower member;		
Clay	46	91
Rock	27	118

Casing, 6-inch to 92 ft.

Table 17.--Materials penetrated by representative wells--Continued

4/3-8Q1. C. Reynolds. About 3 miles southwest of Yacolt, along Battle Ground Highway, about 1.7 miles east of State Highway 1-S. Altitude about 400 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Glacial drift:		
Soil.	4	4
Gravel.	8	12
Boulders.	27	39
Clay.	6	45
Boulders.	12	57
Sand, black	1	58

Casing, 5-inch to 57 ft.

4/3-18N3. H. W. Heisson. About 1.1 miles east of Heisson, 0.6 mile south of Battle Ground Highway, on State Highway 1-S. Altitude about 418 ft. Drilled by A. C. Locey.

Glacial drift:		
Soil.	10	10
Troutdale formation:		
Gravel and sand	20	30
Gravel.	40	70
Gravel and boulders	27	97
Clay and boulders	11	108
Boulders.	53	161

Casing, 6-inch to 161 ft.

4/3-20P1. Walter Ek. About 3.7 miles northeast of Battle Ground. Altitude about 550 ft. Drilled by Price, 1954.

Materials	Thickness (feet)	Depth (feet)
Glacial drift:		
Clay, soil, with rocks.	40	40
Older consolidated rock:		
Rock, solid, with seams.	188	228

Casing, 6-inch to 40 ft.

4/3-28E1. G. S. Carson. About 2 miles east of Battle Ground Lake, 0.2 mile south of County Road 75, on Spring Road. Altitude about 520 ft. Drilled by G. Zent.

Materials	Thickness (feet)	Depth (feet)
Glacial drift:		
Soil.	3	3
Clay.	14	17
Boring lava (?):		
Cinders.	10	27
Tertiary volcanics:		
Rock.	26	53

Casing, 6-inch to 27 ft.

Table 17.--Materials penetrated by representative wells--Continued

4/3-29B1. Eddie M. Koski. About 4 miles northeast of Battle Ground, 1 mile east of State Highway 1-S. Altitude about 510 ft.

Materials	Thickness (feet)	Depth (feet)
Glacial drift:		
Topsoil.	5	5
Clay, some broken "rock".	48	53
Boring lava:		
Rock, solid.	87	140
Troutdale formation:		
Gravel.	at	140

Casing, 8-inch to 53 ft.

4/3-30J1. A. Thom estate. About 0.7 mile east of Battle Ground Lake, on Burt Road. Altitude about 510 ft. Drilled by R. A. Jobes.

Troutdale formation:		
Upper member;		
Clay and gravel, water-bearing from 45 to 50 ft	50	50
Lower member;		
Clay, blue.	115	165
Sand, water-bearing	5	170
Clay and "shale".	30	200

Casing, 6-inch to 170 ft.

4/3-30Q1. F. Duvall. About 0.6 mile southeast of Battle Ground Lake. Altitude about 463 ft. Drilled by G. Zent.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits:		
Soil	3	3
Troutdale formation (?):		
Boulders and clay	3	6
Boring lava:		
Rock, black	9	15
Cinders, gray	9	24
Rock	29	53
Cinders, red	9	62
Rock	60	122
Rock, broken, and clay	28	150
Troutdale formation:		
Gravel	20	170
Clay	3	173

5/1-9H1. F. M. Grieger. About 4 miles northeast of Woodland, 1.2 miles west-northwest of intersection of County Roads 20 and 40. Altitude about 45 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium:		
Soil	2	2
Sand	38	40
Troutdale formation:		
Sand, volcanic	9	49
No record, water-bearing	3	52
Volcanic formation (?)	8	60
"Mud"	80	140
Gravel	8	148
No record, water-bearing	1	149

Casing, 6-inch to 149 ft.

5/1-12K1. G. Pellham. About 2.5 miles northeast of Pine Grove, 0.5 mile west of Dobler Hill Road, on Lynch Road. Altitude about 360 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Glacial drift:		
Soil.	6	6
Clay and boulders.	14	20
Clay and gravel	70	90
Boulders.	5	95
Tertiary volcanics:		
Rock, lava.	43	138
Lava and clay.	10	148
Rock, water-bearing	18	166

Casing, 6-inch to 88 ft.

5/1-23A1. Wesley Gettman. About 0.6 mile west of Highland, on northwestern edge of plateau. Altitude about 720 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Upper member;		
Soil.	2	2
Clay, sandy	43	45
Clay, red	48	93
Lower member;		
Clay.	87	180

Casing, 6-inch to 107 ft.

5/1-24B1. D. C. Hudson. About 0.2 mile northeast of Highland, on County Road 41. Altitude about 780 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Soil	3	3
Clay, red	27	30
Clay, yellow	15	45
Clay, sandy	17	62
Sand and pebbles	4	66

Casing, 6-inch to 66 ft.

5/1-34G2. Town of LaCenter. About 1 mile north of La Center. Altitude about 390 ft.

Materials	Thickness (feet)	Depth (feet)
Troutdale formation:		
Lower member (?);		
Clay	68	68
Clay and sand	29	97
Sand (quicksand), water-bearing	11	108
Sand (quicksand)	89	197
Sand (quicksand), some gravel	7	204
Sand (quicksand)	8	212
Sand, heavy	8	220
Sand, more gravel, water-bearing	7	227
Sand, coarse, water-bearing	4	231

Casing, 8-inch to 229 ft.

5/1-35P1. R. E. Dalin. About 0.9 mile northeast of La Center. Altitude about 275 ft. Drilled by McGhee, 1953.

Materials	Thickness (feet)	Depth (feet)
Pleistocene alluvial fan deposits (?):		
Clay	30	30
Troutdale formation:		
Gravel and clay	130	160
Sand	30	190
Clay, blue	22	212

Casing, 5-inch; perforated 160 to 170 ft.

5/2-26B1. Fargher Lake Grange, Fargher Lake. Altitude about 690 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Glacial drift:		
Gravel	22	22
Gravel, cemented	3	25
Boulders	3	28
Troutdale formation:		
Sand and gravel	9	37
Gravel, shaly	9	46
Sand, fine (quicksand)	14	60
Clay	4	64
Gravel and sand	10	74
Gravel	6	80

Casing, 6-inch to 80 ft.

5/2-28D1. F. M. Bremmer. About 2.5 miles west of Fargher Lake, on County Road 42, 0.2 mile southwest of intersection with County Road 43. Altitude about 805 ft. Drilled by A. C. Locey.

Materials	Thickness (feet)	Depth (feet)
Glacial drift:		
Clay	15	15
Clay and gravel	15	30
Boulders	5	35
Clay and gravel	5	40
Clay, gray	10	50
Boulders, "shot"	3	53
Troutdale formation:		
Clay	7	60
Clay and gravel	30	90
Sand, black	23	113

Casing, 6-inch to 113 ft.

Table 17.--Materials penetrated by representative wells--Continued

5/4-7M1. Harbor Plywood Corp. About 0.5 mile northeast of Chelatchie.
Altitude about 520 ft. Drilled by A. M. Jannsen, 1949.

Materials	Thickness (feet)	Depth (feet)
Glacial drift:		
Topsoil	9	9
Gravel and boulders	50	59
Gravel, muddy	14	73
Gravel, water-bearing	17	90
Sand and gravel	10	100
Sand (quicksand)	39	139
Clay	3	142
Gravel, water-bearing	8	150
Clay, sandy, small gravel	21	171
Sand, muddy, water-bearing	4	175
Gravel, water-bearing	23	198
Gravel, cemented	7	205
Sand and gravel, water-bearing	12	217
Tertiary rocks:		
Rock, sticky, black	2	219
Basalt	21	240
Shale, blue, "burnt"	52	292
Shale, red, "burnt"	15	307
Sandstone, hard, gray	20	327
Rock, red, broken	8	335
Rock, hard, gray	15	350

Continued next page

Table 17.--Materials penetrated by representative wells--Concluded

5/4-7M1--Continued

Materials	Thickness (feet)	Depth (feet)
Tertiary rocks--Continued		
Rock, soft, gray, white shells.	5	355
Rock, blue.	57	412
Shale, soft, gray.	62	474
Rock, hard, blue (water-bearing from 514 to 516 ft)	44	518
Shale, soft, red, "burnt" (water-bearing from 518 to 540 ft).	22	540
Shale, blue.	13	553
Rock, extremely hard, black (water-bearing at 577 and 594 ft.).	45	598

Casing, 12-inch to 189 ft, 10-inch to 217 ft, 8-inch to 475 ft, 6-inch to 553 ft; perforated 80 to 90 ft, 142 to 150 ft, 175 to 185 ft, 190 to 204 ft, 208 to 217 ft, and 514 to 552 ft.

Table 18.--Comprehensive chemical analyses of water from wells and one spring in Clark County, Wash.

(Analyst: CL, Charlton Laboratories, Portland, Oregon; AL, Aluminum Company of America; GS, U. S. Geological Survey; W, Wallerstein Laboratories, New York City)

Well	Depth (feet)	Date of collection	Analyst	Parts per million																	Sodium-adsorption ratio	Specific conductance (micromhos at 25°C)	Hydrogen-ion concentration (pH)
				Silica (SiO_2)	Aluminum (Al)	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)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness ($CaCO_3$)			
1/3-8B2	390	5-17-49	GS	44	..	.04	.00	13	9.0	6.6	2.8	88	..	4.9	6.9	0.1	8.4	0.01	144	[a]69	0.35	181	7.7
2/1-11C1	198	10- 7-50	CL	..	..	.06	..	..	..	..	..	150	..	18	9.2	.6	..	..	192	96	..	[a]305	7.6
2/1-19B1 -19B2	111 to 136	5-16-41	AL	45	.00	1.4	.69	35	17	[a]11		212	..	4.6	1.9	.4	..	..	238	[a]157	.37	[a]380	..
-19B3	111 to 136	10-13-43	AL	44	7.1	.35	1.1	37	8.4	[a]13		202	..	9.3	7.6	..	..	..	215	[a]127	.49	345±	8.0
2/1-27L1	108	3- 2-49	W	37	..	.1	..	26	5.0	..	..	53	..	9.7	1.5	..	..	..	138	[a]86	..	[a]220±	7.3
2/1-27L2	98	3- 2-49	W	22	..	.1	..	31	7.6	..	..	53	..	12	6.8	..	..	..	128	[a]109	..	[a]205±	7.4
City of Vancouver[c]	..	4-18-49	CL	44	.9	.3	.0	14	4.8	4.4		37	..	5.7	3.2	.0	..	..	129	[a]55	.26	[a]205	6.9
2/2-20A2	221	5-17-49	GS	36	..	..	.50	10	5.7	3.5	4.4	56	..	7.4	.4	.0	.3	.02	104	[a]48	.22	140	8.0
2/3-6K1	97	5-17-49	GS	58	..	[b].01	.00	14	7.5	5.7	4.0	78	..	.8	3.0	.2	5.4	.00	137	[a]66	.31	151	7.0
3/1-33Q1	48	5-23-49	GS	64	..	.01	.00	37	17	8.1	4.0	96	..	41	16	.4	44	.01	279	[a]162	.28	376	6.3
3/2-2D1	140	5-17-49	GS	44	..	.02	.00	22	8.4	9.3	3.6	126	..	2.7	4.0	.0	1.0	.01	157	[a]89	.43	206	7.7
2/2-33L1s	Spring	5-17-49	GS	50	..	.02	.00	15	5.2	4.2	5.6	64	..	11	2.9	.2	7.2	.00	133	[a]59	.24	140	7.6

a calculated

b in solution, clear when collected

c composite sample only

Table 19.--Field partial analyses of water from representative wells

Well	Depth (feet)	Chloride (Cl) (ppm)	Hardness as $CaCo_3$ (ppm)	Well	Depth (feet)	Chloride (Cl) (ppm)	Hardness as $CaCo_3$ (ppm)
1/2-1G2	243	4	60	2/2-9G1	32	5	70
-1L1	33	2	70	-9M1	141	4	65
-1Q1	142	3	80	-9N1	29.	7	100
-3G1	75	7	85	-9P1	102	7	90
-4D1	82	6	45	-9Q1	78	5	70
1/3-3D1	255	5	90	-10D1	94	3	80
-3M1	798	..	15	-10H2	65	6	75
				-10L2	64	3	60
1/4-2M1	31	2	65	-10M2	66	4	70
-3B1	24	2	30	-11D2	80	5	75
-4F1	150	1	55				
-14A1	80	3	45	-12G1	75	4	65
-24F1	17.	4	65	-13D2	96	2	45
				-13K2	90	6	55
2/1-1J1	26	4	70	-15D1	14	4	75
-2A1	26	15	150	-15P1	73	3	70
-2K1	48	4	70				
-4G1	180	6	115	-17F1	20	5	65
-10K1	27	6	95	-17H1	30	4	70
				-18A1	30	9	110
-11D1	272	3	80	-18L3	35	7	105
-11H1	53	5	80	-18N1	5.	6	65
-14C1	200	2	100				
-16B1	142	3	105	-18Q1	24	4	75
-21C2	151	10	105	-18Q3	25	7	80
				-19D1	160	6	70
-23K1	225	6	80	-19F2	90	5	60
-26G2	220	8	75	-19G2	20	9	105
-28G3	80	14	95				
				-19M1	18	6	55
2/2-1G1	24	3	55	-20P2	35	22	50
-2C1	120	3	50	-22E1	15.	6	50
-2J1	21.	2	45	-22M2	25	6	45
-2Q2	71	3	50	-22Q1	115.	6	75
-3D1	69	3	60				
				-23E1	99	4	75
-3J1	73	3	55	-24H1	93	4	80
-4G1	21	3	65	-24P1	80	3	70
-4M1	30	6	115	-26D1	101	6	110
-4N1	93	4	70	-27N1	170	4	70
-5G1	13	4	60				
				-27N2	186	3	70
-6C1	23	4	95	-28H1	120	3	75
-6G1	135	3	65	-28P1	178	3	65
-6K1	156	3	60	-29H1	186	2	65
-7D2	174	2	80	-31J1	93	6	75
-9D1	117	5	85				

Table 19.—Field partial analyses of water from representative wells—Con.

Well	Depth (feet)	Chloride (Cl) (ppm)	Hardness as $CaCO_3$ (ppm)
2/2-32F1	193	6	70
-33H1	125	6	75
-34C2	135	6	85
-34E1	122	4	75
-34G2	175	4	85
-35A1	193	6	75
-35C2	185	8	90
-35M1	185	4	75
-36C1	190	4	85
-36P1	238	6	65
2/3-4K1	250	..	50
-8E1	88	6	95
-8M1	111	2	35
-8Q1	130	3	55
-16B1	28	4	60
-21J1	100	2	35
-23Q1	43.5	3	25
-24M1	40	3	50
-24Q1	22	2	70
-31D1	165	6	70
-32Q1	143	2	85
2/4-19E1	14	3	75
-24G1	18	2	30
-30F1	24	6	30
-33A1	170	2	45
-33C1	24	2	50
-35G1	80	4	35
3/1W-1J1	102	4	115
3/1-3A1	28	4	115
-3H1	16	5	60
-3N1	117	3	85
-5L1	21	4	90
-8M1	28	2	55
-8N1	25	3	65
-9A1	182	3	115
-9H1	21.7	6	125
-10A1	30	5	65
-10G1	156	3	115
-10H1	132	3	135
-10P1	192	4	120
3/1-11F1	138	3	70
-14D1	150	3	150
-14J1	..	3	100
-15H1	170	3	105
-15H2	220	4	100
-15P1	147	3	105
-16C1	23	3	75
-19R1	165	4	120
-20F1	150	4	135
-20P1	20	4	90
-21E1	22	6	145
-24R1	50	5	85
-25A1	20	4	70
-25M1	64	3	85
-27E1	45	6	75
-33A1	58	5	90
-35L1	106	3	120
-36H1	60	5	55
-36R1	42	4	75
3/2-1C1	16	4	35
-1J1	101	3	65
-1N1	25	4	115
-3H1	82	4	80
-4C1	125	4	90
-4N1	106	4	70
-4Q1	25	7	105
-6B1	68	3	65
-6Q1	12	7	105
-7E1	163	4	65
-7Q1	14	8	105
-8D1	17	2	90
-9K1	17	3	65
-9Q1	18	6	85
-10P1	18	4	85
-11P1	86	2	80
-12H1	34	2	75
-13B1	89	3	80
-13J1	18	5	60
-14H1	20	9	65
-16M1	21	12	125
-17J1	116	2	90

Table 19.--Field partial analyses of water from representative wells--Con.

Well	Depth (feet)	Chloride (Cl) (ppm)	Hardness as CaCo3 (ppm)	Well	Depth (feet)	Chloride (Cl) (ppm)	Hardness as CaCo3 (ppm)
3/2-17P1	19	8	120	4/1-19E1	35	6	60
-18H1	18	4	75	-19K1	117	3	95
-19G1	31	4	80	-20E1	32	6	75
-19J1	36	2	40	-21L1	202	3	110
-20A1	23	16	170	-22H1	571	3	50
-21A1	143	3	90	-23B1	31	3	90
-21L1	145	2	100	-23H1	18	6	45
-22G1	22	3	45	-25H1	63	3	65
-22Q1	17	4	45	-26C1	18	3	40
-23D1	93	3	75	-27P1	106	3	95
-23F1	13	5	65	-27R1	131	2	90
-23J1	139	2	90	-29G1	131	3	55
-24L1	16	29	150	-31B1	5	6	130
-24R1	17	3	65	-32B1	154	6	130
-25M1	12	2	65	-33M1	125	3	110
-26D1	12	2	35	-34D1	22	8	115
-27E1	37	3	65	-35J1	129	4	80
-27Q1	19	2	45	-35R1	131	3	95
-28N1	70	3	60	-36J1	18	5	95
-28P1	170	2	80				
				4/2-13G1	29	4	25
-29D1	17	9	115	-16P1	112	7	125
-29G2	17	2	65	-16R1	75	2	50
-30A1	12	3	50	-19J1	11	4	60
-30R1	25	3	65	-20C1	101	3	70
-32G1	20	12	105				
				-22E1	172	3	55
-32N1	14	12	95	-23D1	24	4	50
-33K1	107	3	60	-25K1	61	17	95
-34E1	122	3	65	-25M1	40	3	90
-34P2	135	2	55	-26A1	121	6	75
-35C1	77	4	55				
				-28M1	83	5	70
-36D1	42	10	90	-28Q1	89	3	65
-36R1	11	4	60	-31J1	32	4	55
				-33D1	18	37	135
3/3-3Q1	35	4	25	-34A1	43	4	35
-4M1	19	5	35	-34M1	78	5	90
-6G1	28	8	20	-36R1	37	3	50
-17N1	102	3	25				
-28D1	160	3	70	4/3-7D1	14	4	30
-31D1	13	2	100	-10H1	19	4	25
				-11A1	23	4	25
4/1-5E1	300	8	80	-11H1	9	4	30
-16C1	274	6	85	-18N1	32	5	60
-16H1	630	24	85	-18N2	580	224	105
-17H3	200	6	70	-33D1	5	5	50

Table 19.--Field partial analyses of water from representative wells--Con.

Well	Depth (feet)	Chloride (Cl) (ppm)	Hardness as $CaCo_3$ (ppm)	Well	Depth (feet)	Chloride (Cl) (ppm)	Hardness as $CaCo_3$ (ppm)
4/4-32Q1	14	5	35				
5/2-19R1	40	4	25				
5/3-11G1	48	6	45				
-12K1	32	4	25				
-15H1	14	5	40				
-16F1	23	3	30				
-20A1	76	5	50				
-21Q1	18	5	25				
-27H1	17	4	20				
-34B1	22	12	50				
5/4-7B1	30	4	30				
6/4-31N1	35	..	40				