Geology and Ground-Water Resources of Kitsap County Washington

By JACK E. SCEVA

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GEOLOGY AND GROUND-WATER RESOURCES OF KITSAP COUNTY, WASHINGTON

By Jack E. Sceva

ABSTRACT

Kitsap County, Wash., with a land area of about 402 square miles, occupies a peninsula and several islands in the Puget Sound waterways in the central part of western Washington. Its principal cities are Bremerton and Port Orchard.

Annual precipitation ranges from less than 30 inches in the northern part of the county to more than 70 inches in the western part. Most of this occurs during the late fall and winter months; the summers are relatively dry.

The land surface of the county consists principally of upland plateau remnants which were produced by stream and glacial erosion of Pleistocene fill in the Puget Sound basin. These upland areas, which generally rise to altitudes of 400 to 600 feet, are separated from one another by marine embayments and former glacial melt-water channels.

The oldest rocks that crop out in the county are a thick sequence of basaltic flows believed to be correlative with the so-called Metchosin volcanics of Canadian geologists. They are believed to be of Eocene age and are exposed in the Blue Hills area southwest of Bremerton. They may be capable of yielding some water from cracks and joints, but no wells are known that have produced water from them.

The Blakeley formation of Weaver, which is of Oligocene age, is composed of marine sandstone, shale, and conglomerate. It is exposed along the southern end of Bainbridge Island, and along the opposing shore of the peninsula. Several deep wells that penetrate into this formation indicate that it is usually unsatisfactory as a source of ground water, as to both quantity and quality of water available.

The oldest known Pleistocene deposit is called the Admiralty drift. It consists principally of hard blue clay and silt, containing some strata of sand, gravel, lignite, volcanic ash, and glacial till. A few wells obtain water from this formation, but many others have been abandoned because of generally low yields.

The Admiralty drift is unconformably overlain by a thick series of stream- and lake-deposited sedimentary materials. The oldest of these consists of a sequence of sand and gravel that occupies erosional valleys in the Admiralty drift. The material is 150 feet or more in total thickness and constitutes the lower part of the Orting gravel. Wells that penetrate the sand and gravel yield moderate to large quantities of water.

The lower part of the Orting gravel is conformably overlain by a sequence of laminated clay and silt, which in places is as much as 150 feet thick. Interbedded with these fine-grained materials are thinner strata of sand, gravel, lignite, and glacial till, a unit that is named the Kitsap clay member of the Orting gravel in

this report. It yields little or no ground water owing to its generally low permeability, but it generally serves as an aquiclude, which confines water in the sand and gravel beneath.

The Kitsap clay member is conformably overlain by as much as 300 feet of sand. This formation, which contains some clay and gravel strata, has been named the Puyallup sand. Much of its lies above the water table, but gravel and coarse sand strata in the part that lies below the water table yield small to moderate supplies of ground water. This formation is at present the most important source of ground water for domestic use in the county.

The deposition of the Puyallup sand was followed by a period of erosion which carved the ancestral valleys now occupied by the waterways of Puget Sound. This period of erosion was followed by the southward advance of ice during deposition of the Vashon drift in the Puget Sound basin. The ice greatly modified the former drainage system and deposited a mantle of till and outwash over most of the basin. In Kitsap County, the till and recessional outwash yield small supplies of perched ground water. The advance outwash materials generally lie above the water table, but where they are saturated they yield moderately large quantities of ground water.

Water levels in wells generally are within 100 feet of the land surface. Water levels are highest during the late spring months and are lowest in the late fall and early winter months. The ground water in the county is recharged entirely from precipitation falling on the immediate area; it is not influenced by the amount of snowfall on the Cascade and Olympic Mountains. The 19-year hydrograph of a well near Port Orchard indicates that the amount of ground water in storage is closely related to the amount of annual precipitation.

Present ground-water exploitation is principally for domestic and public supplies, but the large available supply of ground water probably will soon be developed on a substantial scale for irrigation.

Thirty comprehensive chemical analyses and a large number of hardness and chloride determinations indicate that the ground water of the county is of good quality. The water temperature is about 50° F. Descriptions of 1,146 wells and 221 drillers' logs are included in the tables.

INTRODUCTION

PURPOSE AND SCOPE OF THE INVESTIGATION

This investigation was made by the United States Geological Survey as part of a continuing program for the collection and interpretation of basic data concerning the ground-water supply of the State of Washington. It was made in cooperation with the Division of Water Resources of the Washington State Department of Conservation and Development for the purpose of providing an inventory of the ground-water resources of Kitsap County to aid in their development and administration.

The extensive use of ground water for domestic, municipal, and industrial supplies, and the rapidly expanding search for irrigation water, have resulted in the need for a thorough understanding of the ground-water hydrology and geology of Kitsap County.

An investigation was started in the Bremerton area in 1940 in cooperation with the city of Bremerton. J. E. Upson was in charge when the range lies west of the Willamette meridian. The first number following the hyphen indicates the section (sec. 20), and the letter (L) gives the 40-acre subdivision of the section, as shown in figure 1.

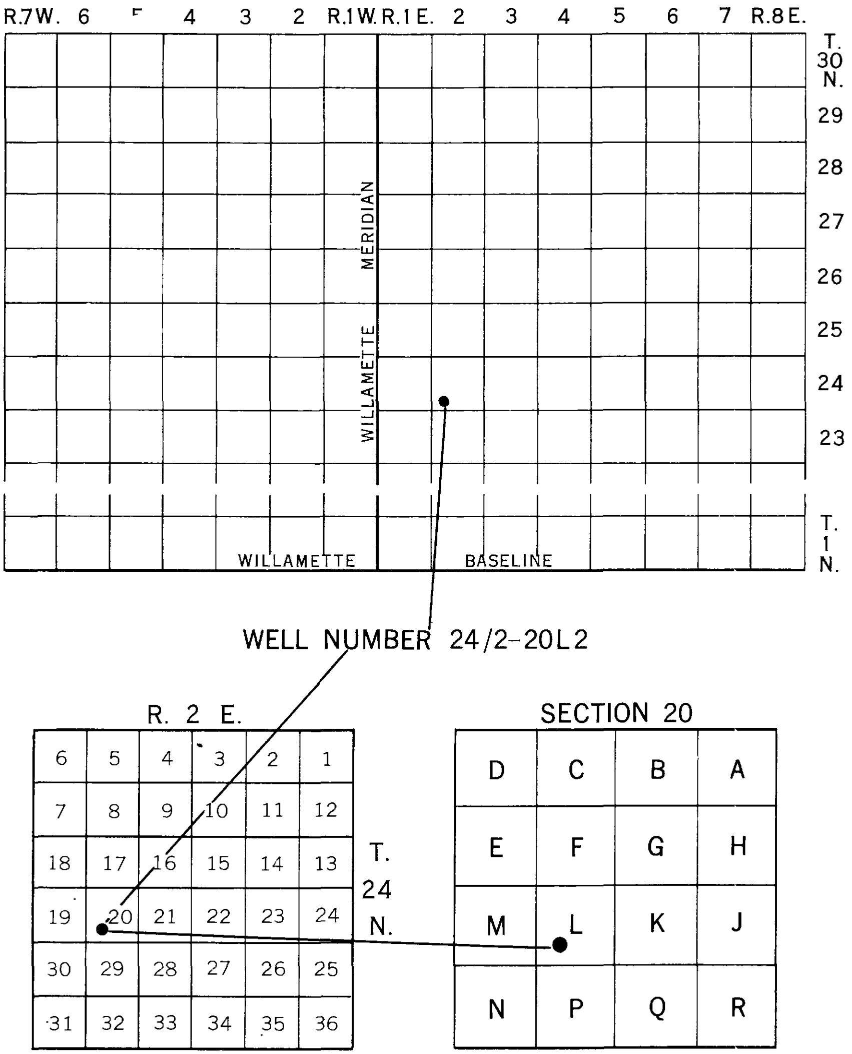

FIGURE 1.—Sketch showing well-numbering system.

The last number is the serial number of the well in the particular 40-acre tract. Thus, well 24/2–20L2 is in the NE¼SW¼ sec. 20, T. 24 N., R. 2 E., and is the second well in the tract to be listed.

of the investigation. Its purpose at that time was to determine the possibility of developing water supplies from wells for municipal and other uses. The investigation was carried to a report stage, but, owing to wartime conditions, the project was not completed. In 1949 the investigation was reopened and the area expanded to include the entire county.

The investigation included mapping and study of the geology, determination of the occurrence, quantity, and quality of the ground water, and an inventory of representative wells. Field work was done by the writer during 1949 and 1950. In the collection of hydrologic data he was assisted by D. B. Anderson during the 1949 field season and, successively, by G. P. Calkins, R. L. Washburn, R. C. Bligh, and D. N. Hodges during 1950. The investigation was under the general direction of A. N. Sayre, chief of the Ground Water Branch, and under the direct supervision of M. J. Mundorff, district geologist. The report was completed in 1954.

LOCATION AND EXTENT OF THE AREA

Kitsap County includes a peninsula and several islands in the Puget Sound waterways of the central part of western Washington. The land area of the county contains approximately 402 square miles in Tps. 22 to 28 N. and Rs. 3 W. to 3 E. of the Willamette base line and meridian.

The county is bounded on the west by Hood Canal, a marine embayment 70 miles long (fig. 2). To the north and east are the waters of Admiralty Inlet and Puget Sound proper. The county is adjoined by Pierce and Mason Counties on the south, Jefferson County on the west, and King County on the east.

Bainbridge Island, with an area of 28 square miles, and Blake Island, with an area of 1 square mile, are in Puget Sound—a few miles east of the peninsula along the eastern margin of the county. Bainbridge is populated but Blake Island is not.

Bremerton, which in 1950 had a population of 27,678, is the largest city in the county; Port Orchard is the county seat.

WELL-NUMBERING SYSTEM

In this report wells are designated by symbols that indicate their location according to the official rectangular public-land survey. For example, in the symbol 24/2–20L2, the part preceding the hyphen indicates successively the township and range (T. 24 N., R. 2 E.) north and east of the Willamette base line and meridian. Because the State lies almost entirely within the northeast quadrant of the Willamette base line and meridian, the letters indicating the directions, north and east, are omitted, but the letter "W" is included

ACKNOWLEDGMENTS

The writer wishes to acknowledge the assistance rendered by personnel of the U. S. Navy, the Bremerton Water Department, the Port Orchard Water Department, and other water departments and districts throughout the county in supplying information concerning wells and water-supply conditions.

Special acknowledgment is given to the well drillers and diggers whose information regarding wells and ground-water conditions aided greatly in the preparation of this report. The cooperation of the well owners and operators also is appreciated.

GEOGRAPHY

PHYSIOGRAPHY

GENERAL FEATURES

Kitsap County lies entirely within the Puget Trough section of the Pacific Border physiographic province (Fenneman, 1917, p. 95, pl. 1).[1] The Puget Trough is a long northward-trending lowland between the Cascade Mountains on the east and the Olympic Mountains and the Coast Range on the west, and it extends from the central part of western Oregon into Canada. Its northern section within the United States contains the marine embayments known collectively as Puget Sound, of which Puget Sound proper is a principal channel. These embayments occupy a drowned drainage system that has been greatly modified by glaciation.

Most of the land area of the Puget Sound region consists of remnants of an upland plateau. The surface is composed of generally flat-topped rolling hills and ridges separated from one another by valleys and marine embayments. These plateau remnants generally rise to altitudes of 400 to 600 feet and range in size from a few square miles to several hundred.

Kitsap County occupies the northern part of the Kitsap Peninsula, the largest peninsula in the Puget Sound area. Kitsap Peninsula is connected to the mainland at its southern end by a narrow strip of land that separates Hood Canal from Case Inlet (fig. 2). Bainbridge and Blake Islands are small plateau remnants separated from the Kitsap Peninsula by narrow marine channels.

Most of the slopes from the upland areas to Puget Sound are steep. Wave cutting at the foot of these slopes has in places produced sea cliffs which are several hundred feet high.

The Blue, or Wildcat, Hills are a rugged group of hills in the central part of the Kitsap Peninsula, in the western upland described below. They occur in an area of about 20 square miles and are composed of

[1] See page 71 for list of references cited.

volcanic rocks which rise as an "island" above the surrounding plateau surface to a maximum altitude of 1,761 feet. Their individual hills are separated by steep-walled canyons which have been eroded to depths as great as 1,000 feet.

AREA SUBDIVISIONS

Kitsap County includes five major upland plateau areas (fig. 2). For convenience of reference in this report, all these except Bainbridge Island have been given locational designations. The southern upland lies south of Port Orchard Bay and of its southwestward continuation, the Gorst Creek-Union River trough. The western upland, the largest in the county, lies west of Port Orchard Bay, Dyes Inlet, Liberty Bay, and the Lofall-Poulsbo trough. The central upland forms the Manette Peninsula. The northern upland occupies the area east and north of the Lofall-Poulsbo trough. Bainbridge Island is an area isolated from the present mainland, east of the Manette Peninsula.

SOUTHERN UPLAND

The southern upland is a large irregular-shaped rolling upland area that comprises about 125 square miles. Its surface ranges generally in altitude from 300 to 450 feet but rises to a maximum of 525 feet. Its chief land forms are broad, flat-topped hills and ridges.

The area is drained by many small streams, which are fed by springs whose flows are supplemented by direct surface runoff during the winter and spring months. Several of these streams occupy valleys formed during a preglacial period of erosion. Burley Creek, a southward-flowing stream in the southern part of the upland, is about 4 miles long and discharges into Burley Lagoon, a submarine continuation of its former valley. Olalla Creek, which occupies another former drainage channel in the southeast part of the upland, flows south and east and discharges into Colvos Passage. Blackjack Creek flows northward for about 7 miles in the north-central part of the upland and discharges into Port Orchard Bay. Other streams on the upland are smaller and occupy canyons and gullies cut since the glaciation of the region.

The southern upland contains several lakes and a large number of ponds. The largest, Long Lake, is in the east-central part of the upland and occupies part of a preglacial channel. Other lakes and ponds are above the regional water table and occupy depressions in the impermeable cover of glacial till that mantles most of the area.

WESTERN UPLAND

The western upland includes the whole western part of the county, an area of about 145 square miles of which 20 is in the Blue Hills.

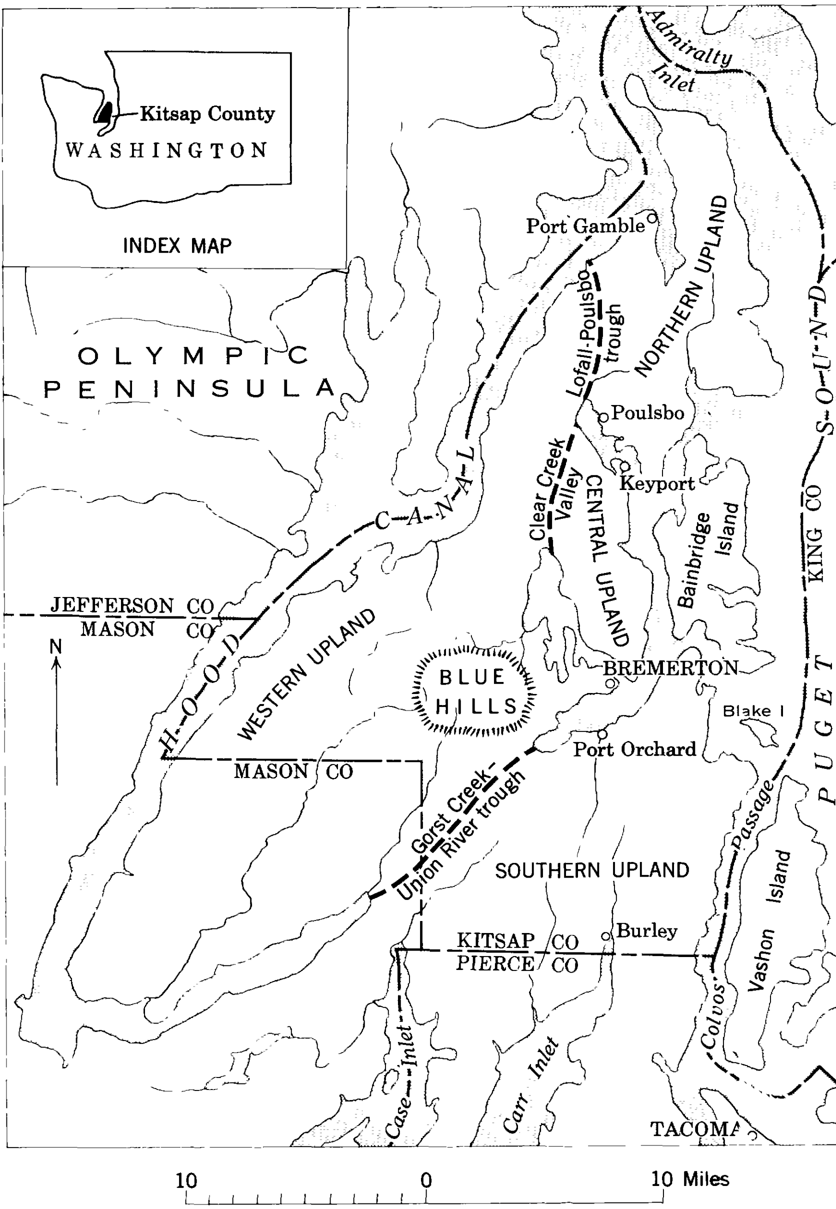

Figure 2.—Map showing the major upland plateaus of Kitsap County, Wash.

Excluding this mountainous area, the altitude of the surface generally ranges from 300 to 600 feet but has a maximum of about 740 feet; the land forms are similar to those on the southern upland.

Drainage is primarily by short streams that discharge into Hood Canal. Most of these streams occupy steep, narrow postglacial canyons and gullies.

The western upland is separated from the southern upland by a former glacial-outwash channel which connects Hood Canal with Port Orchard Bay. That trough is now drained by northeastward-flowing Gorst Creek and the southwestward-flowing Union River.

CENTRAL UPLAND

The central upland comprises the Manette Peninsula; it is separated from the western upland by the southwest-trending Clear Creek valley. The central upland includes an area of about 30 square miles and has a maximum altitude of about 480 feet. The upland is drained by short streams that discharge into the surrounding branches of Puget Sound.

NORTHERN UPLAND

The northern upland includes an area of about 65 square miles. It attains a maximum altitude of about 520 feet but most of the land area ranges from 200 to 400 feet. It is separated from the western upland by a narrow drainage channel which extends from Lofall to Liberty Bay at Poulsbo. Drainage of this area is similar to that of the central upland.

BAINBRIDGE ISLAND

Bainbridge Island is a roughly rectangular island about 10½ miles long and 3½ miles wide east of the central upland. Its area is about 26 square miles. The hilltop just east of Fort Ward, with an altitude of 425 feet, is the highest point on the island. The altitude of most of the island is 200 to 300 feet.

The principal land forms are broad glacially smoothed hills. Drainage is by small, short spring-fed streams. Several small ponds occupy depressions in the glacial till that mantles most of the island.

CLIMATE

Kitsap County has an equable, oceanic climate with generally mild temperatures and moderate to heavy precipitation. Precipitation records of the U. S. Weather Bureau are available for five weather stations in or adjacent to Kitsap County (figs. 3–5). Bremerton has an average annual precipitation of 36.54 inches for a 53-year period of record; Vashon, 41.62 inches for a 59-year period; Keyport, 33.10

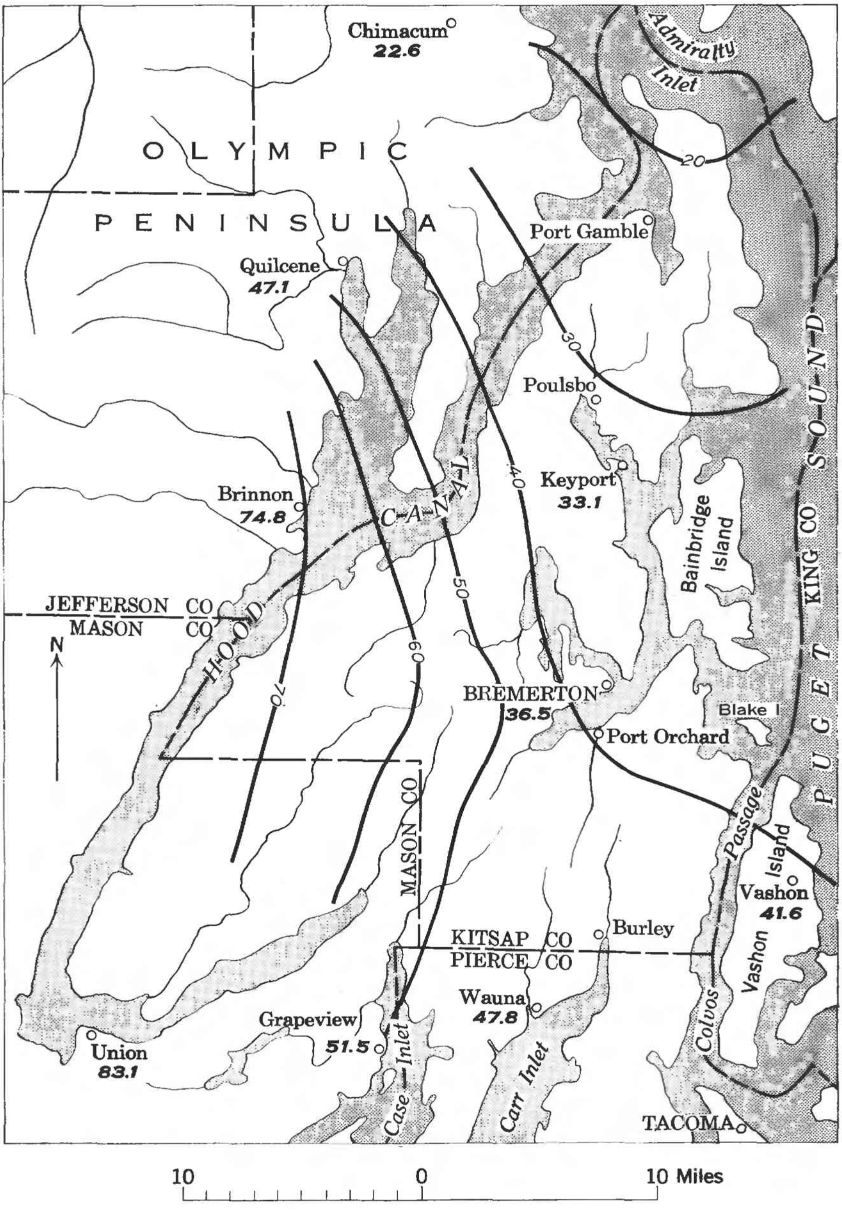

FIGURE 3.—Map showing location of past and present weather stations and the average annual precipitation recorded at these stations. Isohyetal lines show approximate distribution of precipitation.

inches for a 30-year period; Union, 83.13 inches for a 13-year period; and Brinnon, 74.81 inches for a 10-year period. Figure 3 is an isohyetal map based on the above data and on records of other nearby weather stations. Isohyetal lines show the approximate distribution of precipitation within the county. Figure 4 shows the annual precipitation recorded at Bremerton during the last 53 years.

The precipitation occurs largely as rain falling in the late autumn and winter months. The summer months are usually dry. July is the driest month and December is the wettest. Figure 5 shows the average, maximum, and minimum monthly precipitation at four weather stations.

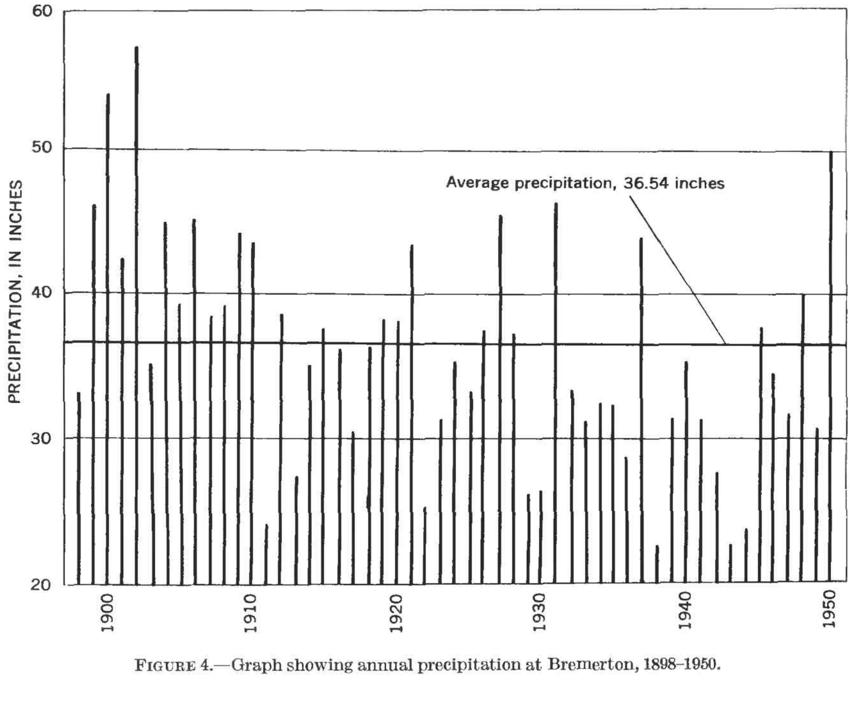

FIGURE 4.—Graph showing annual precipitation at Bremerton, 1898–1950.

Temperatures have not been recorded at the weather stations within the county. Vashon, the nearest weather station at which temperatures are recorded, has an average annual temperature of 50.5° F for a 51-year period of record. July is the hottest month, with an average monthly temperature of 62.9° F, and January and February are the coldest, both having an average of 39.2° F. The mean annual temperature in the county is about 50° F.

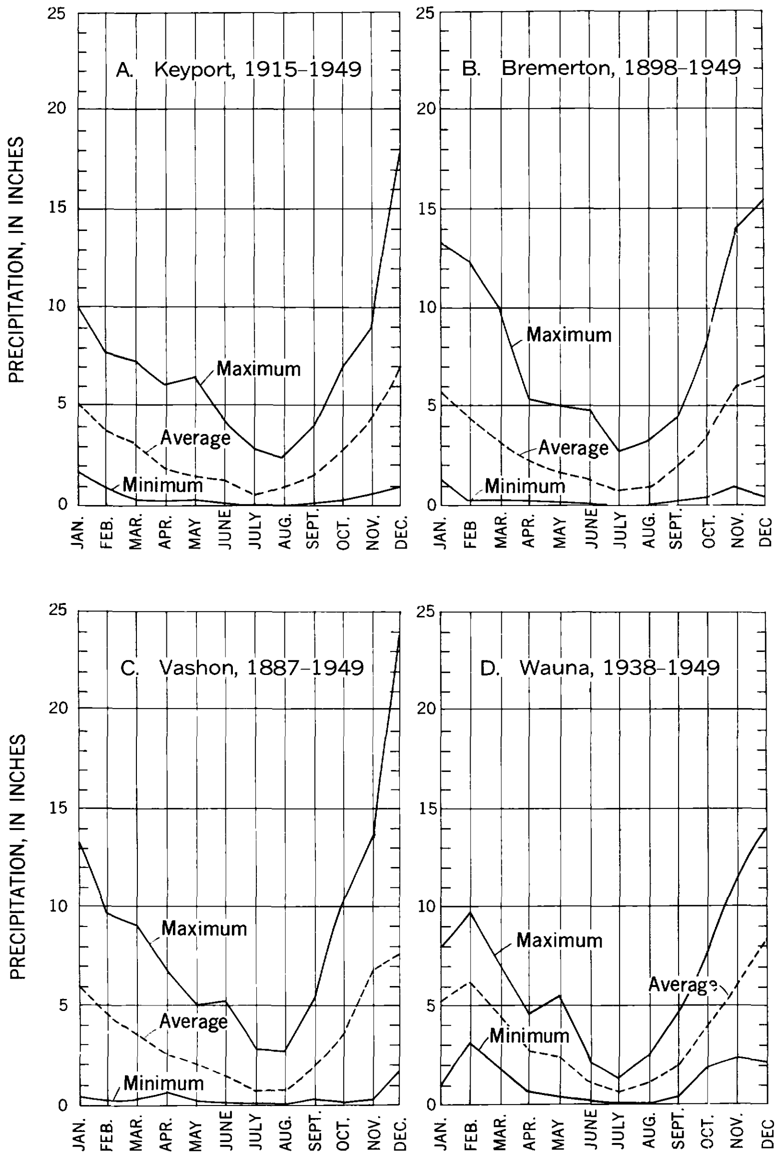

FIGURE 5.—Graph showing average, maximum, and minimum monthly precipitation recorded at four weather stations in and near Kitsap County, Wash.

CULTURE AND INDUSTRY

Formerly, lumbering and the processing of forest products were the major industries within the county; but most of the local virgin forests have been logged and the lumbering industries have diminished in importance. The Puget Sound Naval Shipyard at Bremerton is now the chief source of employment in the county.

Agriculture is becoming increasingly important. Dairying and the raising of stock food account for the largest part of the area under cultivation. Increasing acreage of strawberries is an example of increasingly important intensified farming. The tourist business and the fishing industry supply a means of livelihood to another large group of people within the county.

VEGETATION

When Kitsap County was first settled in the middle of the 19th century it was mantled with a thick cover of vegetation. Douglas fir, cedar, and hemlock were the predominant varieties of trees. These forests, which were accessible from the numerous waterways of Puget Sound, gave rise to a large lumbering industry at an early date. In time the virgin forests were almost completely removed, though now they are being replaced by a crop of second-growth timber. The forested and other uncultivated areas are mantled by thick growths of salal, huckleberry, and fern.

GEOLOGY

GENERAL SIGNIFICANCE

Because the source, occurrence, and movement of ground water and the quantity and quality of ground water available are directly related to the geology of the region, a study of the geology is an important part of a ground-water investigation.

The Puget Sound trough, in its northern section, is a large structural basin in consolidated rocks of Tertiary and earlier age. It has been partly filled by unconsolidated deposits of clay, silt, sand, gravel, and glacial till. These unconsolidated sedimentary materials were deposited by water and ice during the Pleistocene glacial epoch (Ice Age), but in some low-lying areas Recent alluvial deposits underlie the surface. The upper materials of this fill, except the Recent deposits, were deposited by ice and glacial melt-water streams during the latest glaciation of the area (Vashon glaciation). During that glaciation, a large tongue of ice moved southward from British Columbia and Vancouver Island and partly filled the Puget Sound basin (Bretz, 1913, p. 17).

DESCRIPTION OF THE ROCK UNITS

TERTIARY ROCKS

VOLCANIC ROCKS

The oldest rocks that crop out in the county are the thick sequence of basaltic flows that underlie the Blue Hills area. Correlative volcanic rocks on Vancouver Island, British Columbia, were first described and named the Metchosin volcanics by Clapp (1909). They have since been described on the Kitsap and the Olympic Peninsulas in Washington by Weaver (1937). They are believed to be of Eocene age.

In the Blue Hills area the flows consist principally of dark fine-grained basalt. Some of the flows originally contained many small "vesicles" or "bubble holes" produced by expanding gases near the tops of the flows. Those vesicles have since been filled with secondary minerals, producing what is called amygdaloidal texture in the basalt.

In the quarry in sec. 28, T. 24 N., R. 1 E. on Sinclair Inlet, where several flows are discernible, the maximum thickness of individual flows is about 30 feet (fig. 6).

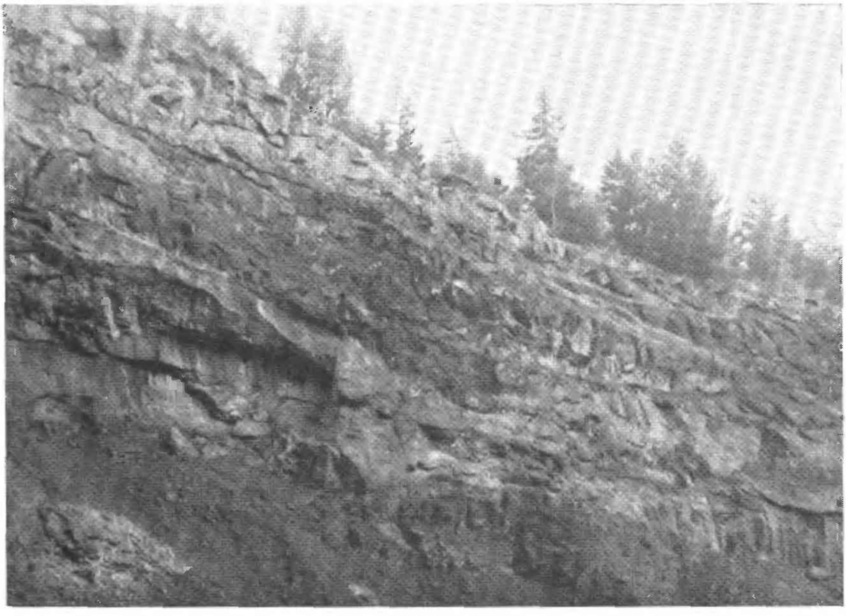

FIGURE 6.—View of basalt quarry along Sinclair Inlet, in sec. 28, T. 24 N., R. 1 E., showing character of the volcanic rocks. Several flows are discernible.

The total thickness of this volcanic formation is not known. In an oil-test well (22/1W-11J2), the drill entered these volcanic rocks at a depth of about 700 feet and had not passed through them at a depth of 6,688 feet.

SEDIMENTARY ROCKS

A thick sequence of marine sedimentary rocks crops out in the sea cliffs near the southern end of Bainbridge Island, and in the opposite shore of the Kitsap Peninsula from Waterman to Orchard Point.

Similar rocks are exposed also in the entrance to Dyes Inlet at the western end of the Port Washington Narrows (pl. 1). They consist of conglomerate, sandstone, and shale composed mainly of erosional products from a volcanic terrain. They were described and named the Blakeley formation by Weaver (1912, p. 10–22), who later assigned them an Oligocene age (1916, p. 166). The total measured and described thickness of this formation in Kitsap County is more than 8,500 feet (Weaver, 1937, p. 151), and its base and upper surface are not exposed.

The formation was folded and was later beveled by erosion in late Tertiary time. The strata, once practically horizontal, are now inclined at angles of 45° to nearly 90° (fig. 7). A marked angular unconformity exists between this formation and the overlying Pleistocene sedimentary materials.

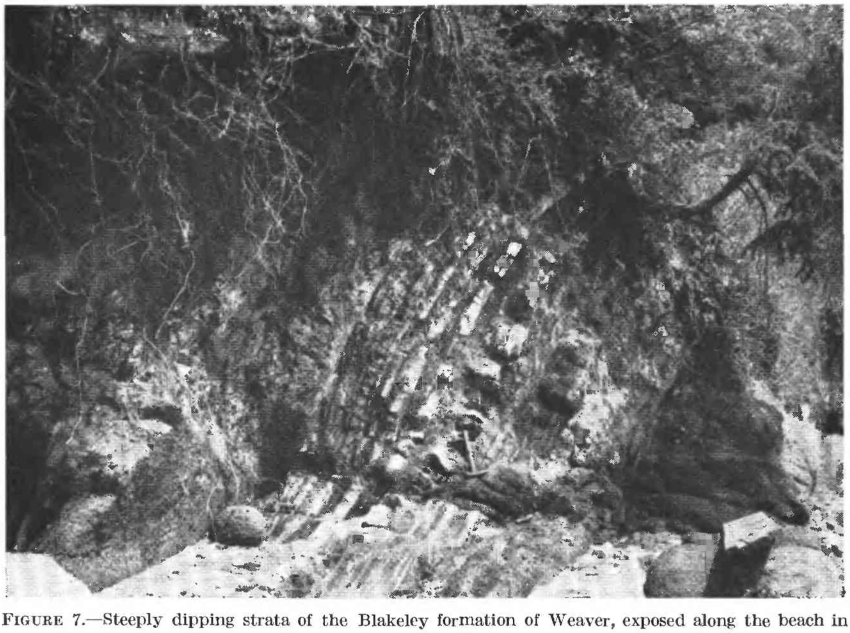

FIGURE 7.—Steeply dipping strata of the Blakeley formation of Weaver, exposed along the beach in sec. 8, T. 24 N., R. 2 E.

QUATERNARY ROCKS

ADMIRALTY DRIFT

The oldest known geologic unit of the Pleistocene series in the Puget Sound basin was named the Admiralty drift by Willis (1898). Where it is exposed it consists chiefly of blue-gray clay but contains strata of sand, gravel, and lignite, and a few thin beds of white volcanic ash. A few discontinuous pods or lenses of glacial till also have been found in the Admiralty (Willis, 1898, p. 153; Bretz, 1913, pp.

175–177). In Snohomish County, Wash., this formation has been called the Admiralty clay (Newcomb, 1953, p. 13).

The upper surface of the Admiralty drift is marked by an erosional unconformity which is below sea level in most places in Kitsap County but is exposed in a few places in the lower parts of sea cliffs.

The Admiralty drift crops out along the beach just south of Fragaria in southeast Kitsap County. There it consists of interbedded clay and sand. The clay is blue-gray and massive but contains some calcareous concretions. The sands are medium grained but in places are sufficiently clayey and impermeable to perch water in the overlying more permeable sands and gravels.

In the sea cliff at Point Southworth (sec. 1, T. 23 N., R. 2 E.) an exposure of the Admiralty drift is chiefly blue-gray silty clay. There individual strata have been greatly deformed, apparently by the subsequent overriding of the area by the Vashon glacier.

Because there are only a few outcrops where the Admiralty drift can be examined, its character is known mainly from well logs. In most well logs it is described as being composed of fine-grained materials, mainly clay and fine sand. Whether all the deeper unconsolidated materials described in well logs belong to the Admiralty drift, or to an older undifferentiated depositional unit is not known. In many drillers' logs it is impossible to separate soft sedimentary rocks of Tertiary age from the overlying Pleistocene materials because of the similarity of the rock descriptions. Many of the deeper wells in the county have been drilled through the Pleistocene materials and continued into the Tertiary sedimentary rocks without any observation by the drillers of a change in formation. Drilling speed, which might give an indication of that break in lithology, was generally not recorded, so that in many wells where the Pleistocene materials have been completely penetrated their thickness is not determinable from well logs.

ORTING GRAVEL

The Orting gravel, which consists chiefly of stream-deposited sand and gravel, rests unconformably upon the Admiralty drift. It was first described in the Orting area of Pierce County by Willis (1898).

In Kitsap County, the Orting gravel consists of sand and gravel but includes, at the top, fine-grained materials which were described by Willis (1899) as a part of the Orting and which in this report are named the Kitsap clay member.

LOWER MEMBER

The lower member of the Orting gravel is best exposed in road cuts along Olalla Creek in the southeast part of the county, where it consists of interbedded lenticular deposits of sand and gravel. The materials generally are slightly cemented and at places are rusty brown in color.

A 25-foot stratum of uniform medium gravel with a matrix of coarse sand is exposed in the abandoned county gravel pit located half a mile northwest of Olalla. These materials are sufficiently cemented as to stand with a vertical face. The gravel is composed predominantly of volcanic rocks, though granitic and metamorphic rock types are common. This stratum, which is at the top of the lower member, is underlain by cross-bedded sand and gravel and overlain by clay and lignite.

A stratigraphic section of the lower member, measured along the west side of Colvos Passage about 1¼ miles south of the Kitsap County line (p. 18), is 108 feet thick and consists of bedded sand and gravel, and an 18-foot stratum of laminated clay. As at Olalla, the individual strata are lenticular and pinch out in short distances.

Other good exposures of the lower member of the Orting gravel are in the sea cliff near La View on the northern end of Bainbridge Island, and in the sea cliff immediately north of Fletcher Bay along the west shore of that island. Several thin strata of clay and silt are interbedded with the sand and gravel in both of these exposures.

The lower member also crops out in the sea cliff half a mile east of Gilbertson (sec. 19, T. 25 N., R. 2 E.). Here coarse gravel strata containing cobbles up to 6 inches in diameter are interbedded with finer grained materials.

Because the lower member of the Orting gravel rests unconformably upon the Admiralty drift, its thickness is in large part controlled by the irregularities in the Admiralty surface. Thicknesses of 300 feet or more of sand and gravel of the lower member were deposited in valleys, while little or no material was deposited upon the hills of the Admiralty surface. The top of the lower member ranges from 100 feet above to 200 feet or more below sea level, being dependent upon the structure given to this unit by a subsequent deformation.

Well 24/1–25E2, located near Port Orchard, penetrated sand and gravel strata from about 225 to 540 feet below sea level. These strata are believed to belong to the lower member of the Orting. They probably were deposited near the center of a valley in the post-Admiralty erosion surface. As the configuration of the post-Admiralty erosion surface is not known, the extent and direction of the thicker and more productive water-bearing zones of the lower member are also unknown.

Well 27/2–17A1, located near Port Gamble in the northern part of the county, was drilled to a depth of 142 feet. This well penetrates 131 feet of clay that is believed to be the Kitsap clay member of the

Orting gravel, and 11 feet of sand and gravel that may be the lower member. The sand and gravel contains many marine shells, which may indicate that a marine embayment extended as far south as Kitsap County at the time the lower member of the Orting was being deposited. However, as the lower member of the Orting gravel does not crop out north of Bainbridge Island, its character in the northern part of the county can be inferred only from well logs.

KITSAP CLAY MEMBER

A geologic unit that consists chiefly of clay but contains strata of peat, sand, gravel, and glacial till overlies the lower member of the Orting gravel in Kitsap County and parts of Pierce County. On the basis of lithology, this unit is separated from the lower member of the Orting. It is proposed that the name Kitsap clay member be applied to this unit.

The type section of the Kitsap clay member, which shows its relation to the underlying lower member of the Orting and to the overlying Puyallup sand, is exposed in the sea cliff along Colvos Passage near Maplewood, in Pierce County south of the Kitsap County line (sec. 21, T. 22 N., R. 2 E.). The following sections were measured in barometric traverses up the sea cliff in this area.

Type sections, Kitsap clay member

Materia	Thickness (feet)	Altitude at top of stratum (feet)
Section 1, at Maplewood		
Till of Vashon age: Till, gray	6	261
Puyallup sand: Sand, brown	130	255
Orting gravel: Kitsap clay member:		
Clay, laminated	33	125
Peat	2	92
Clay, gray-brown, massive	15	90
Covered	75	75
Beach strand	----------	----------
Section 2, 500 feet north of section 1		
Puyallup sand: Sand and gravel	----------	----------
Orting gravel: Kitsap clay member:		
Clay, gray, laminated	40	95
Clay, gray-brown, massive	7	55
Peat	3	48
Clay, gray-brown	20	45
Peat	2	25
Covered	23	23
Beach strand	----------	----------

Type sections, Kitsap clay member—Continued

Material	Thickness (feet)	Altitude at top of stratum (feet)
Section 3, 2,400 feet south of section 1		
Puyallup sand: Sand, brown	----------	----------
Orting gravel: Kitsap clay member:		
Clay, laminated, contains several thin strata of peat	15	184
Till	7	169
Clay, sand, and some stratified gravel	15	162
Till	5	147
Clay, laminated; contains some sand strata	12	142
Till and laminated clay	8	130
Clay, laminated; contains some sand strata	12	122
Lower member:		
Sand and gravel, stratified	30	110
Clay, laminated	18	80
Gravel, medium, iron-stained	12	62
Sand, layered	12	50
Gravel, medium, iron-stained	18	38
Sand and gravel, cross-bedded	18	20
Admiralty drift:		
Clay, gray to blue; contains thin strata of peat and white volcanic ash	2	2
Beach strand	----------	----------

The beds of till in the Kitsap clay member in section 3 are only pods or lenses and are not part of a continuous till sheet. Two of the till strata pinch out within a few hundred feet north of this section. Where the Kitsap clay member is exposed on the sea cliff one-tenth of a mile south of the mouth of Fragaria Creek, in the southwest part of Kitsap County, it contains a lens of till interbedded with clay, silt, and peat.

Fragaria Creek has eroded a narrow canyon into the Kitsap clay member. Several thick, resistant strata of peat or lignite have given rise to small waterfalls along the stream. According to Bretz (1913, p. 180) several prospect tunnels were driven into these lignite strata in hope that back from the outcrop the equivalent unweathered material would be coal.

The Kitsap clay member is well exposed at many localities throughout Kitsap County, as along State Highway 14, between Port Orchard and Gorst; in the old clay pit at Harper (sec. 2, T. 23 N., R. 2 E.); in the sea cliff 1 mile south of Point Southworth (sec. 11, T. 23 N., R. 2 E.); and in the road cut along the highway to Holly (fig. 8).

The Kitsap clay member is well stratified. The clay strata are in most places finely laminated, and the sand and silt also are in thin layers. The thin and prominent stratification contrasts strongly with the thicker bedding of the Admiralty drift.

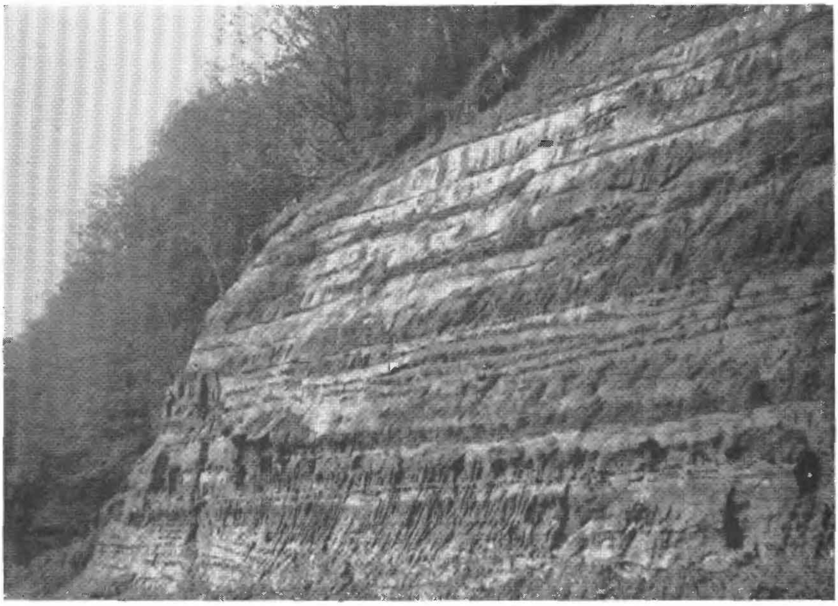

FIGURE 8.—Layered silt and clay in the Kitsap clay member of the Orting gravel in road cut, sec. 17, T. 24 N., R. 2 W.

The thickness of the Kitsap clay member changes from place to place, ranging from less than 30 feet to more than 200 feet. The top of the Kitsap clay member ranges from 50 feet or more below sea level to 200 feet above sea level, according to the structure imparted by subsequent deformation.

In areas where a high proportion of gravel is interbedded with the Kitsap, it could not be distinguished in detail from the lower member of the Orting gravel and, in part, was included with that gravel unit on the geologic map (pl. 1).

PUYALLUP SAND

The Puyallup sand comprises the major part of the pre-Vashon materials that are exposed in Kitsap County. This formation was first described in the Tacoma area by Willis (1898).

In Kitsap County the Puyallup sand consists of fine-grained, well-sorted sands deposited by streams or in lakes. Deposits range from finely laminated sand and silt to thick, massive strata of sand. Current and deltaic bedding are present in most places. Gravel lenses of small to medium-sized pebbles are common in the basal part of this formation.

The Puyallup sand rests conformably upon the Kitsap clay member of the Orting gravel but is overlain unconformably by glacial materials.

The thickness of the Puyallup sand differs greatly throughout the county, the maximum being about 300 feet.

Good exposures of the Puyallup sand can be seen at many places in the county, as along the highway just south of Illahee in sec. 7, T. 24 N., R. 2 E.; along the sea cliff at Venice in sec. 2, T. 25 N., R. 2 E.; and along the sea cliff 1 mile east of Indianola in sec. 14, T. 26 N., R. 2 E. The bluff just northwest of Kingston in sec. 25, T. 27 N., R. 2 E., shows the thick, massive character of some of the sand strata in this formation.

VASHON DRIFT

The name Vashon drift was given by Willis (1898) to the extensive till sheet and associated deposits that were deposited in the Puget Sound basin during the advance and retreat of an ice tongue from the north during the latest glacial epoch.

TILL

The glacial till of Vashon age is an unsorted mixture of clay, silt, sand, gravel, and boulders that was deposited principally as a basal till beneath the ice. Such a range in grain size, accompanied by the tremendous pressure produced by the weight of the ice during deposition, results in a hard, compact, impermeable rock having the appearance and some of the characteristics of concrete. The till in the Vashon drift is generally light gray. It is locally termed "hardpan" and is commonly so hard that blasting is required in the construction of dug wells. In many places the character of the till is a clue to the character of the underlying material; an excessively sandy till usually overlies sandy material, whereas an excessively clayey till usually overlies clayey material.

The basal till is commonly overlain by a few feet of superglacial till—the part of a glacier's rock load that is deposited as the glacier melts. It differs from the basal till in being less compact and better sorted, as many of the smaller particles have been washed away by melt water. In Kitsap County the superglacial till contains most of the large erratic boulders that are associated with the Vashon drift.

The front of a glacier advances when the rate of forward movement exceeds the rate of melting, and retreats when melting exceeds the forward movement. Changes in one, or both, of these factors can cause a change in rate or direction of movement of the ice front. The recession and readvance of an ice front may result in the deposition of two till sheets in the area of readvance. Such a twofold till of the Vashon drift occurs in the Port Orchard area. The intertill materials consist of sand and gravel ranging in thickness from a few feet to 30 feet. Other exposures of this twofold till occur on the southern end of Bainbridge Island, at the southern end of the

Manette Peninsula, and in the Bremerton area. In Kitsap County the north-south extent of the readvance is believed limited to a few miles.

Because on the uplands the Vashon glacier advanced chiefly over the Puyallup sand, the till and melt-water deposits there are distinctly sandy. The included boulders are of a great variety of rock types, though volcanic and granitic types predominate. Locally, as in areas south of the Blue Hills, the till contains many large fragments of basalt which were undoubtedly derived from the rock of those hills. Close to areas of outcrop of the Blakeley formation of Weaver, the larger fragments in the till are mainly of those sedimentary rocks.

FIGURE 9.—Wave-rounded blocks showing the typical hard, compact character of the till of the Vashon drift.

The weight and pressure of the ice on the underlying sedimentary materials resulted in their deformation in some places. Figures 11 and 12 show layered sand and clay of the Puyallup sand that were crumpled by ice pressure. At places, strata of the older Admiralty drift also have been deformed.

Cobbles and boulders that differ in composition from the local rock types are termed "glacial erratics." They range greatly in size and composition in Kitsap County and in many places form the boulder pavements that are common on the beaches of Puget Sound.

FIGURE 10.—Puyallup sand and advance outwash overlying Admiralty drift at Point Southworth.

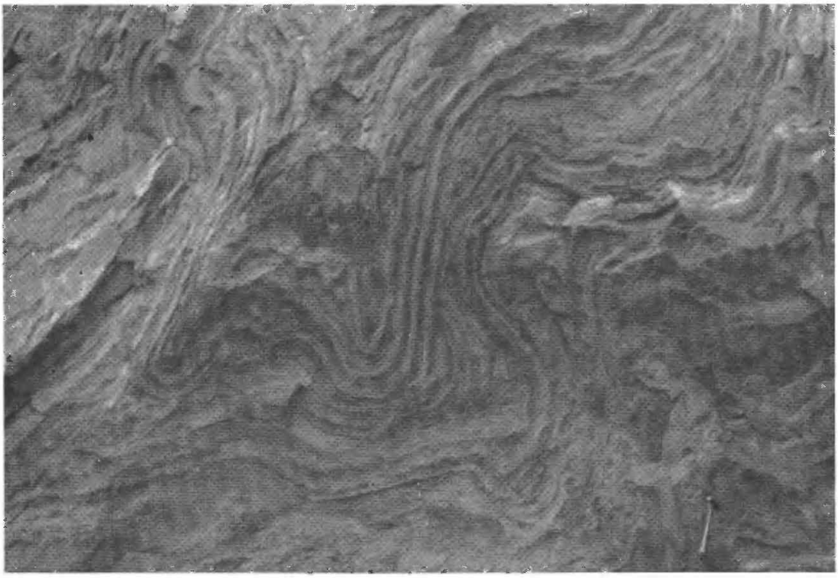

FIGURE 11.—Layered sand and silt in the Puyallup sand that have been greatly contorted by ice shove, exposed in sea cliff, sec. 18, T. 28 N., R. 2 W.

An extremely large erratic boulder of volcanic rock lies beside the highway leading north to Illahee in sec. 6, T. 24 N., R. 2 E. Rounded erratic rocks of cobble size near the summit of Green Mountain indicate that the surface of the glacier was at an altitude

FIGURE 12.—Clay that has been injected upward into the Puyallup sand by ice shove, exposed in sea cliff, sec. 18, T. 28 N., R. 2 E.

above 1,690 feet. As the base of the glacier is known to have been at depths of several hundred feet below sea level, the total thickness of the Vashon glacier in that vicinity at one time must have exceeded 2,000 feet.

Marine fossils were found in the till in the low sea cliff along Skunk Bay in the SE¼NE¼ sec. 18, T. 28 N., R. 2 E., in the northern part of the county. This is the only outcrop known in Kitsap County where fossil shells can be observed in Pleistocene deposits. At this locality the till overlies a fossiliferous sandy clay that is believed to be of pre-Vashon age. The fossils in the till probably were derived from the underlying stratum.

OUTWASH

Glacial outwash is material that was deposited beyond the ice front by glacial melt-water streams. Streams that issue from a glacier usually are heavily loaded with rock particles. Near the ice front, poorly sorted, rudely stratified sand and gravel are deposited. At greater distances from the ice, finer grained and more evenly stratified materials are generally deposited. Figures 13 and 14 show the typical character of the glacial outwash material found in Kitsap County.

Part of the glacial outwash deposits are older than the till of the Vashon glaciation and part are younger. Glacial outwash materials that are deposited as a glacier advances into an area are termed "advance outwash," and materials deposited during the recession are

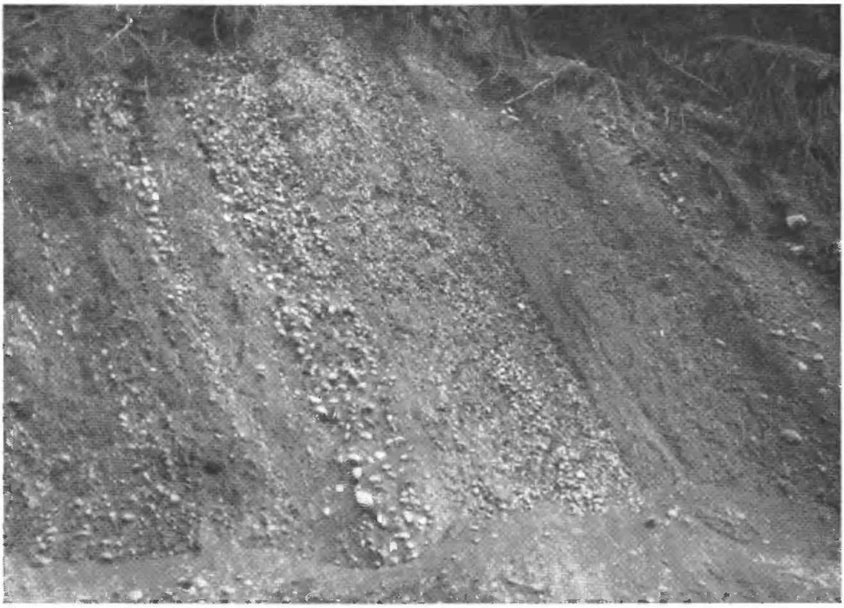

FIGURE 13.—Advance outwash gravels exposed in a 20-foot road cut along the slope of Hood Canal in sec. 9, T. 24 N., R. 2 W. These strata probably owe their tilt to deformation by ice.

FIGURE 14.—Recessional outwash gravel of the Vashon drift, in face of borrow pit, sec. 16, T. 24 N., R. 2 W., showing their poorly sorted character.

termed "recessional outwash." In Kitsap County these units are separated by the stratum of glacial till deposited when the area was covered with ice, except in small areas where the till was removed by erosion during the retreat of the ice.

Outwash from the Vashon glacier varies greatly in character, thickness, and extent throughout the county. The outwash gravel is composed of many types of rocks, volcanic and granitic types predominating. Individual particles range in shape from well rounded to subangular.

The advance outwash of the Vashon glacier is a difficult unit to show on a geologic map owing to its varying thickness and erratic occurrence, and was mapped with the Puyallup sand in order to differentiate it from the impermeable till.

Ice-marginal streams, flowing along the advancing ice lobes that pushed south into the valley areas, deposited outwash materials which now plaster some of the slopes leading to Puget Sound and the larger valleys. Such deposits of sand and gravel may obscure the character of the materials that form the cores of the plateau areas, and may lead to misconception as to the nature of the materials underlying these plateaus. In sec. 9, T. 24 N., R. 2 W., such a deposit of advance outwash was overridden and deformed by the advancing ice (fig. 13).

The recessional outwash of the Vashon glaciation is widely distributed in the county and consists mainly of a thin mantle of sand and gravel resting on the till. This thin mantle is not a mappable unit in most places and on plate 1 has not been separated from the till. The thicker deposits in melt-water channels and plains were mapped separately and are shown on plate 1.

A deposit of recessional outwash sand accumulated during the waning stages of the Vashon glaciation in the Gorst Creek–Union River trough. This sand is fine grained, and in many places it shows fine bedding planes where differential weathering on outcrops has brought them into relief. This unit is shown on plate 1 as the Gorst Creek outwash.

The sand of the Gorst Creek outwash accumulated in quiet water and buried many large ice blocks. Melting of these ice blocks resulted in the formation of kame and kettle topography and in the deformation of the strata. Similar sands were noted in the Blackjack and Burley Creek valleys, but there they were not differentiated from the underlying Puyallup sand.

Figure 15 is a summary of the depositional units of Pleistocene age in Kitsap County.

Designation in section	Depositional unit name		Character and extent	Thickness, in feet	Water-bearing properties
A	Vashon drift	Recessional outwash	Discontinuous bodies of unconsolidated silt, sand, and gravel. Deposited by meltwater of the Vashon glacier. Includes Gorst Creek outwash	0-100	May yield small to moderate supplies of ground water sufficient for domestic supply where the deposits have considerable thickness
B	Vashon drift	Till	Extensive till sheet which mantles most of the upland areas of the county. Till varies greatly in composition and compactness	0-80	Essentially impervious, but may yield small supplies of perched ground water
C	Vashon drift	Advance outwash	Discontinuous bodies of unconsolidated silt, sand, and gravel. Deposited by melt-water streams from the advancing Vashon glacier	0-50	Yields moderately large to large quantities of water where deposits extend below the water table
D	Puyallup sand		Principally stratified sand. Contains irregular lenses of fine gravel, and thin strata of clay and silt. Underlies the Vashon drift throughout most of the county	0-300	Much of formation lies above water table. Gravel lenses yield moderately large quantities of water. Sand yields small quantities
E	Kitsap clay member of Orting gravel		Principally laminated blue clay. May contain irregular lenses of medium gravel. In places contains peat and till strata	0-200+	Gravel lenses yield small to moderate quantities of water. Clay and till yield little or no ground water
F	Lower member of Orting gravel		Principally stratified sand and gravel. May be stained buff or orange colored in outcrop. Contains some clay strata	0-300+	Yields large quantities of water
G	Admiralty drift		Principally massive blue clay and silt; deformed in most places. Contains till, volcanic ash, peat or lignite, sand, and some gravel strata. Top of formation usually near or below sea level	0-400 or more	Clay, silt, and till strata yield little or no ground water. Gravel may yield small to moderate quantities of water. Successful wells in Admiralty drift are few in number

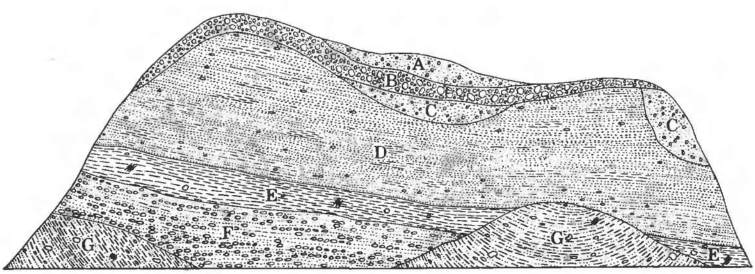

FIGURE 15.—Summary and diagrammatic cross section of Pleistocene depositional units, Kitsap County, Wash.

RECENT MATERIALS

Postglacial deposits of small extent exist in many areas throughout the county. Alluvium and peat have filled some of the postglacial ponds. Streams have formed numerous small deltas extending into Puget Sound, and a soil cover ranging from several inches to several feet in thickness now mantles most of the county.

GEOLOGIC HISTORY

A knowledge of the sequence of geologic events in an area, as interpreted from rock outcrops and well records, helps in understanding the extent and occurrence of the geologic units. These in turn aid in an understanding of the occurrence of ground water in the area.

TERTIARY PERIOD

During early Tertiary time a series of volcanic rocks spewed forth from fissures or cones and accumulated to thicknesses of many thousands of feet over a large part of the area that is now western Washington. Part of the rocks were erupted beneath the sea. In Kitsap County and the adjacent area a long period of quiescence followed the volcanic activity. During that time thousands of feet of marine sedimentary rocks accumulated above the volcanic rocks.

During late Miocene time these formations were deformed into large northwest-trending folds, which produced the ancestral Cascade Mountains. Erosion reduced these considerably in the following Pliocene epoch. Deformation occurred again near the close of the Tertiary period, producing a large north-trending arch that forms the present Cascade Mountains. The Puget Trough and the Olympic Mountains are believed to have been brought into existence during this deformation.

QUATERNARY PERIOD

The filling of the Puget Sound basin with sedimentary materials is believed to have started in late Tertiary or early Pleistocene time. The oldest known Pleistocene sedimentary materials are called the Admiralty drift. They are principally fine-grained materials that are believed to have accumulated in a fresh-water lake or lakes. Such a lake could have been formed by the impounding of a northward-flowing drainage system by a tongue of ice that originated in the present British Columbia and flowed south and west from the Puget Sound basin by way of the Straits of Juan de Fuca. The thin strata of volcanic ash found in this unit indicate that some volcanic activity was occurring in nearby areas during this time. The occurrence of glacial till in the Admiralty drift proves that an ice tongue or tongues occupied part of the Puget Sound basin during Admiralty time. Whether this till was deposited by coalescing glaciers that moved out from the Cascade and Olympic Mountains, by a lobe from a northern ice sheet, or by both is not known. Locally, woody material accumulated in shallow ponds or swamps and gave rise to the existing lenses of peat and lignite. Streams, and possibly lake currents, deposited trains of sand and gravel which occur as lenses of coarse material interbedded with those of finer texture.

In time the lake or lakes were drained, possibly as a result of recession of the ice lobe, and the area was subjected to a period of erosion which produced a surface of low to moderate relief. Some folding of

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the early Pleistocene sedimentary materials occurred at the time of their deposition or during the succeeding period of erosion.

The period of erosion was followed by one of deposition, caused by a rise in base level. Stream-deposited sand and gravel accumulated in the lowland areas on the eroded surface of the Admiralty drift to a thickness locally greater than 150 feet. They are known as the lower member of the Orting gravel. Their deposition was succeeded in Kitsap County and parts of Pierce County by the deposition of fine-grained sedimentary materials, which form a unit that has been called the Kitsap clay member of the Orting gravel in this report. The till that occurs in this unit indicates that glacial ice was again present in the Puget Sound area during part of the period of its deposition.

Deposition of the Kitsap clay member was succeeded by the accumulation of fine-grained stream and lake-deposited sedimentary materials named the Puyallup sand. The formation consists principally of sand but also contains some gravel and clay lenses. It accumulated to a thickness of several hundred feet and produced a broad, flat surface over most of the Puget Sound basin. The deposition was brought to a close by uplift of the area. This change in base level resulted in dissection of the uplifted plain by streams which carbed steep-sided valleys, as much as 600 or 700 feet deep. These valleys largely determine the present configuration of the waterways of Puget Sound. Broad warping of the previously deposited sedimentary materials occurred in the final stages of their deposition, or during the following period of erosion.

The period of canyon cutting was brought to a close by the advance of the Vashon ice sheet into the region. This ice sheet was part of a large glacier that formed in British Columbia and Vancouver Island. One lobe of the glacier pushed southward into the Puget Sound basin, whence advance ice tongues moved farther southward into the existing valleys and canyons. Drainage was diverted to the marginal areas of the ice tongues, resulting in the deposition of outwash materials on the valley slopes. As the ice moved farther south, the depth of ice increased in the occupied valleys, and marginal melt-water streams spilled over the lower divides and produced diversion channels across portions of the partially dissected uplands. Fine-grained materials were deposited in marginal lakes and ponds, and rudely sorted sands and gravels were deposited in channels and broad outwash plains on the uplands. The ice tongues later filled the valley areas and spread over the uplands, depositing a mantle of glacial till. Thus the ice tongues coalesced and eventually covered most of the Puget Sound basin. In Kitsap County the Vashon glacier is believed to have exceeded 2,000 feet in thickness. Melt water from this ice lobe drained southward, through the large channels north and west of the town of Gate in Thurston County, and out to the Pacific through what is now the lower Chehalis River valley.

Near the close of the Pleistocene epoch, the front of the Vashon ice lobe began melting back from the Puget Sound basin. The uplands and hills were the first areas free of ice. Melt-water streams flowed across some of the exposed areas, eroding some of the earlier deposits and depositing sand and gravel outwash materials in broad outwash channels. Deltas formed at many places where these streams terminated in lakes and ponds that were impounded by the ice tongues, which still occupied the valley areas. Foreset bedding of one such delta can be seen in the gravel pit along the Bremerton-Seabeck highway in sec. 7, T. 24 N., R. 1 E. With continued waning of the ice, melt-water streams shifted to channels located at progressively lower altitudes. With the complete removal of the ice from the Puget Sound basin, the drainage again resumed its general northward course.

Ice erosion during the advance of the Vashon glacier into the area, and during the subsequent retreat of the ice front, so greatly deepened and modified the pre-Vashon drainage system that its exact configuration can now be only inferred.

During postglacial time, large deltas have formed at the mouths of the larger streams that discharge into Puget Sound. Peat and silt deposits have accumulated in ponds that developed on the irregular glacial topography, and a relatively thin soil has developed throughout most of the area. Postglacial streams have eroded deep canyons in the uplands, and slumping and wave erosion have steepened many of the slopes extending from the uplands to the waterways of Puget Sound.

Following is a chronologic summary of the late geologic events that have occurred in Kitsap County and vicinity:

Tertiary:

A. Period of volcanism in which many thousands of feet of volcanic rocks were deposited over a large part of the area that is now western Washington.

B. Period of marine deposition in which many thousands of feet of sedimentary materials were deposited on the volcanic rocks.

C. Period of deformation that uplifted the Cascade and Olympic Mountains and produced the Puget Sound basin. Deposition in the Puget Sound basin probably began at this time.

Quaternary:

D. Partial filling of the basin with the Admiralty drift and possibly other unknown deposits. Glaciation of part or all of the basin occurred during this period of deposition. Some warping of the sedimentary rocks occurred during or shortly after their deposition.

E. Period of erosion producing a terrain of low or moderate relief on the earlier Pleistocene sedimentary rocks.

F. Period of deposition.

a. Deposition of stream-laid gravel, sand, and some clay strata called the lower member of the Orting gravel.

b. Deposition of lake and pond deposits, principally clay and peat called the Kitsap clay member of the Orting gravel. Isolated bodies of glacial till suggest glaciation of part of the basin.

c. Deposition of stream and lake deposits, principally sand, called the Puyallup sand.

G. Relative lowering of base level producing a period of canyon cutting The valleys that now form the waterways of Puget Sound were formed during this period. Some warping of the Pleistocene sedimentary materials probably occurred.

H. Advance of the Vashon ice sheet into the basin.

a. Deposition of associated glacial advance deposits, outwash, and lake sedimentary materials.

b. Deposition of a till sheet.

I. Recession of the Vashon ice sheet.

a. Deposition of associated glacial advance deposits; outwash and lake sedimentary materials.

b. Deposition of a till sheet.

J. Period of erosion and deposition; resulting in the Recent partial filling of the Pleistocene valleys and seaways and cutting of the post-Pleistocene valleys and canyons.

GROUND WATER

GENERAL FEATURES OF GROUND-WATER OCCURRENCE

DEFINITION OF GROUND WATER

The interstices or voids in rock materials below a certain depth are usually saturated with water under hydrostatic pressure. Water within this zone of saturation is termed "ground water," and water above the zone, but below the surface of the ground and not saturating the rock materials, is termed "vadose water."

In many places, an impermeable stratum may impede the downward movement of vadose water and cause it to accumulate to form a zone of saturation. Water in such a zone is termed "perched ground water."

An aquifer is a water-bearing formation, group of formations, or part of a formation that is capable of yielding water to a well or spring. Many rock materials, even though saturated, are incapable of yielding water because of their low permeability. Therefore, in an attempt to pierce an aquifer, it may be necessary to drill a considerable distance into the zone of saturation.

THE WATER TABLE

In permeable materials the top of the zone of saturation—the surface below which all interconnected voids are saturated—is the "water table." This is the level at which water will stand in a well sunk into the zone of saturation. The surface of a perched zone of saturation is termed a "perched water table."

The water table is generally a sloping surface, having a gradient in the direction of ground-water movement. Movement is from points or areas of recharge, where water is added to the ground-water body, to points or areas of discharge. The gradient of the water table is dependent upon the thickness and permeability of the rock materials below the water table and the amount of water moving through the materials. In materials of low permeability the gradient needed to move a given amount of water from a point of recharge to a point of discharge is greater than in materials of higher permeability. The presence of many different areas of recharge and discharge, and variable permeabilities of the rock materials, tend to make the water table an irregular surface.

The water table fluctuates, owing to changes in the amounts of recharge and discharge. A rise of the water table, generally accompanied by a steepening of the water-table gradient, occurs during periods of recharge; a lowering of the water table, accompanied by a reduction of the water-table gradient, occurs in periods of little or no recharge.

UNCONFINED AND CONFINED GROUND WATER

In an area where only permeable materials exist, there will be but one water table. All wells drilled in the area will encounter water when the water table is reached, and water levels in the wells will define that surface. Water occurring under water-table conditions is termed "unconfined" ground water.

Where ground water moves beneath some impermeable stratum and is confined there under pressure, it is termed "confined" or "artesian" ground water. If no saturated zone occurs above the impermeable stratum, a water table does not exist there, and well drills will not encounter water until they have passed through the impermeable stratum. The water then encountered rises in the casing to a height corresponding to the pressure head on the confined ground water.

Confined ground water has a pressure surface (piezometric surface) which is analogous to the water table but whose level may be greatly different from that of an overlying or adjacent water table. This is usually true when the recharge to the confined aquifer occurs some distance away and is not related to the local water table. The piezometric surface, like the water table, fluctuates in response to recharge and discharge.

Numerous impermeable and permeable zones may exist one above

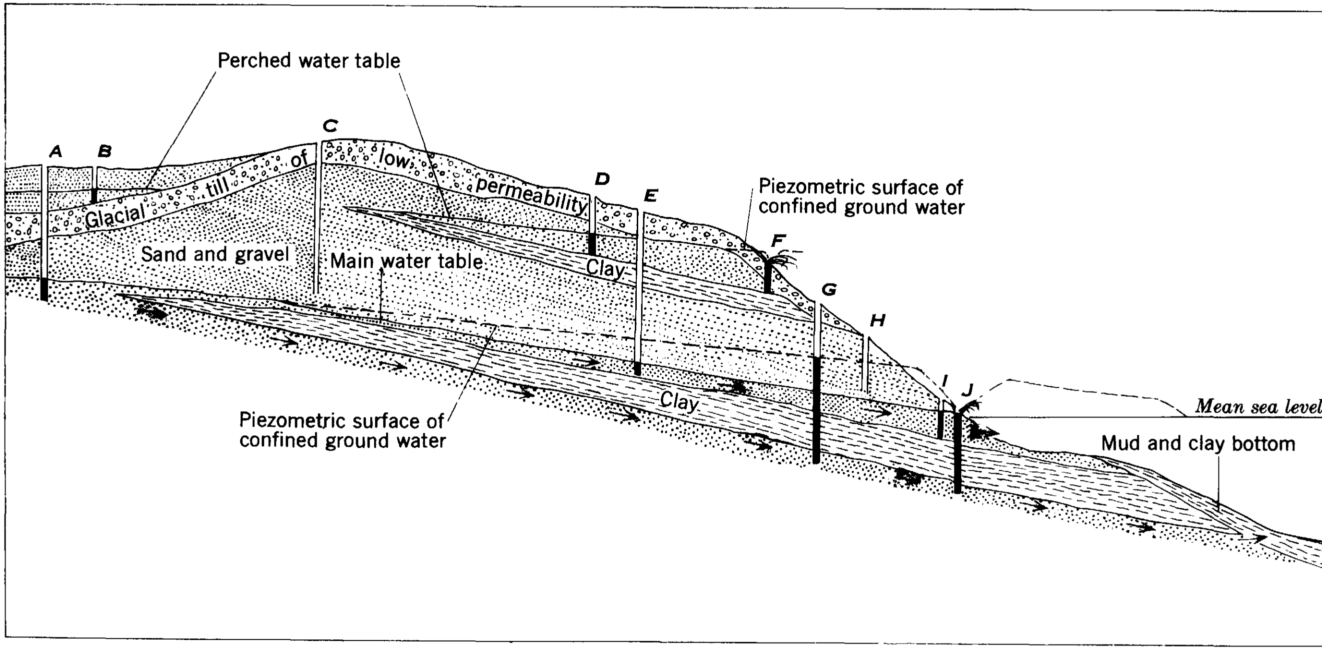

FIGURE 16.—Diagrammatic section showing various occurrences of ground water. Arrows indicate direction of ground-water movement. Well *A* yields unconfined water from below the water table; well *B* yields perched water from a water body perched on glacial till; at well *C* water was not encountered owing to insufficient depth; well *D* yields perched water from water body perched on clay zone; well E yields unconfined water from below the water table; well *F* yields confined perched ground water and flows because land surface is lower than the head developed on the water body as a result of the presence of the till cover; well *G* yields confined water from water body confined by clay zone; at well *H* water was not encountered owing to insufficient depth; well *I* yields unconfined water from below the water table; and well *J* yields confined ground water and flows because the land surface is below the piezometric surface.

the other. The water-pressure surface may be different for each of these permeable zones. Where the pressure is sufficient to raise the water above the adjacent land surface, a well will flow. Such a well is termed a "flowing artesian well."

Several occurrences of ground water are illustrated schematically in figure 16. All these are typical in Kitsap County.

GROUND-WATER RECHARGE

The chief source of ground-water recharge is precipitation. Part of the precipitation falling on an area will generally flow off as surface runoff, part will evaporate, and another part will percolate into the soil.

Precipitation that enters the soil will in part replace previously depleted soil moisture and be evaporated or drawn up by plants and transpired back into the atmosphere. The rest will continue to percolate downward and eventually reach the water table. Variations in soil and rock permeability, depth to the water table, topography and vegetation, and the amount and kind of precipitation all produce variations in the amount of ground-water recharge from time to time and place to place.

Often there is a noticeable lag in time between periods of high precipitation and the rise of the water table that reflects that precipitation. Such a lag is dependent upon the depth to the water table and the permeability of the intervening rock materials.

Some of the lakes and ponds in Kitsap County that are perched above the water table by the mantle of glacial till supply some recharge to the underlying water table. This recharge is effected by slow percolation through the lake bottom deposits and the underlying till.

Irrigation can be considered a form of artificial recharge, as a part of the water spread over the ground will generally reach the underlying aquifers.

GROUND-WATER DISCHARGE

Ground-water discharge is the exit of water from a ground-water body. It is accomplished by flow onto the surface or directly into the sea and by evaporation, transpiration, and pumping from wells.

Discharge to the surface usually occurs through springs or seeps where the land surface intersects a water-bearing zone. In many places such discharge will occur beneath the surface of streams, lakes, or marine water bodies where its presence is not discernible.

Evaporation occurs where the water table lies close enough to the surface of the ground so that water can be removed into the atmosphere.

Transpiration occurs where roots of plants reach the water table or the capillary fringe above it. Water is drawn up into the plants and is evaporated from them (transpired) into the atmosphere.

Pumping a well, or permitting a flowing artesian well to flow, is an artificial discharge. The discharge must be balanced eventually by an increase in recharge or a decrease in natural discharge, or water will continue to be withdrawn from storage. An increase in recharge may occur as a result of pumping in an area where recharge is rejected. Greater withdrawals in such an area will permit the aquifers to absorb larger quantities of water.

A persistent lowering of water levels in wells will occur when the total amount of discharge and withdrawals from an aquifer exceeds the recharge.

HYDRAULICS OF A WELL

When pumping of a well begins, the water level within the well drops from its static water level, the level of the undisturbed water table or piezometric surface, to a pumping level. The pumping level is such that the water movement induced in the surrounding water body is equal to the rate at which water is being pumped. An increase in the output of the pump necessitates a greater head to supply the additional water to the well, thus requiring a lowering of the pumping level. The difference between the static water level and the pumping water level is termed "drawdown."

The zone of water-level lowering around a well that is being pumped takes the form of an inverted cone (see fig. 17) called the "cone of depression." Its size and shape are dependent upon the permeability of the water-bearing material and the quantity of water being pumped. To supply equal amounts of water to a well, water-bearing materials that have high permeabilities require lower heads (flatter cones of depression) than do materials having lower permeabilities. The areal extent of the cone of depression may be termed the "area of influence." Water levels will be lowered in wells within the area of influence of a well that is being pumped.

The permeability of an aquifer is determined by the size, shape, and arrangement of the particles in unconsolidated rocks, and by the size, number, and interconnection of joints and other fractures in consolidated rocks. The permeability of unconsolidated materials adjacent to a well can often be increased by adequate well development, such as surging and cleaning, which removes much of the finer material. Various methods of measuring permeability of water-bearing materials have been described by Wenzel (1942).

The specific capacity of a well is measured in gallons per minute per foot of drawdown. It is dependent upon the permeability and extent of the aquifer and the effective diameter of the well. The effective diameter may be either larger than the actual diameter, as where the openings in the well casing are efficient, and the well has been thoroughly developed, or smaller, where the well openings are too small or inefficient.

An increase in the effective diameter of a well will increase its specific capacity by reducing the head required to force water into the well. Figure 17 shows the theoretical pumping levels in wells of different diameter that are pumping equal amounts of water. A well of larger effective diameter permits the water to enter at lower velocity, a highly desirable condition where sand may tend to enter the well.

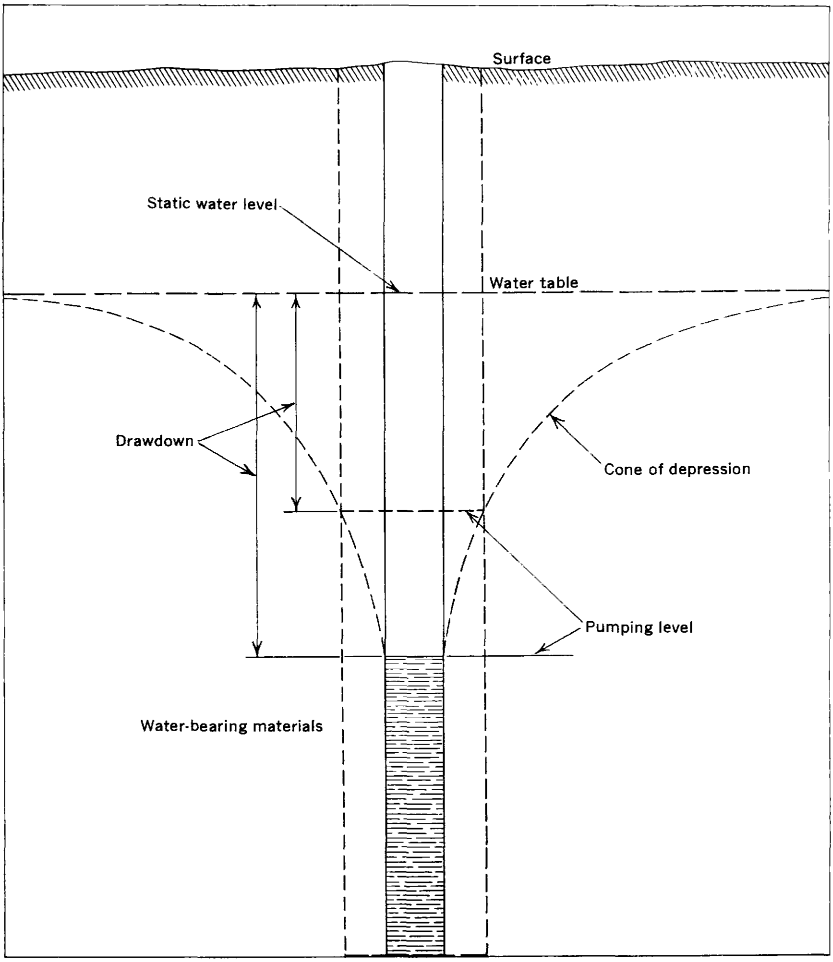

FIGURE 17.—Diagrammatic section through a pumping well that taps water occurring under water-table conditions. The dotted line shows the pumping level of a well of larger diameter (shown in dashed lines) that is pumping an equal amount of water. In the drawing it is assumed that there is no frictional loss of head as the water enters the well.

The character and number of openings that permit water to flow into the well can affect the pumping level by restricting passage of water into the well. Several types of openings are commonly used. In wells deriving water from unconsolidated materials, the most efficient type of well screen is one in which the size of openings is related to the particle size of the water-bearing material. Perforated casings are of somewhat lower efficiency than screens, and open-bottom casings are least efficient.

OCCURRENCE OF GROUND WATER IN THE ROCK UNITS OF KITSAP COUNTY

TERTIARY ROCKS

The volcanic rocks are not important as aquifers, though they probably would yield some water from joints and other fractures. No wells are known that develop water from these rocks in Kitsap County.

Many wells have been drilled into the sandstone, shale, and conglomerate of the Blakeley formation of Weaver. Most of these have been unsatisfactory as to the yield and quality of water obtained. Two deep wells were drilled by the U. S. Navy into this formation at the southern end of Bainbridge Island. Well 24/2–10R1, which was drilled to a depth of 1,700 feet, was reported to have yielded only small quantities of saline water and was abandoned. Well 25/2–36N2 was drilled to a depth of 1,403 feet and had a yield of less than 15 gallons per minute with several hundred feet of drawdown. The water was of poor quality, and because of this and the low yield the well was abandoned. The nearby Hoodenpyle well (25/2–36N1), which was drilled to a depth of 604 feet in this formation, produces a small supply of potable water and is used for domestic purposes.

Wells drilled into the Blakeley formation of Weaver near the Watouga Beach community at Point Glover have had similar results. Well 24/2–9G1, which was drilled to a depth of 400 feet, has a drawdown of more than 200 feet after 12 hours pumping at a rate of 2½ gallons per minute. Water from this well is unsuitable for domestic use owing to a high mineral content. Well 24/2–9L1 was drilled to a depth of 184 feet in this formation. It flows at the rate of several gallons per minute, but the water is brackish and unusable. Several wells in the Point Glover area produce supplies that are barely adequate for small domestic requirements; however, well 24/2–9M1, a 200-foot well drilled for its entire depth in this formation, produces water in sufficient quantity to supply several families.

The above examples, and a few others that are described in table 1, indicate that the consolidated rocks of Tertiary age are almost everywhere unsatisfactory as a source of ground water. Well construction in this formation can be justified only where other sources of supply are absent or have proved to be unsatisfactory.

ADMIRALTY DRIFT

The Admiralty drift is not an important source of ground water in Kitsap County because generally it has a low permeability. Most wells, many of them deep, that were drilled into the Admiralty drift produce only small supplies of water and several have been abandoned owing to insufficient production. The casings of several of the deep wells are perforated in so many horizons that it is uncertain whether water is being obtained from the Admiralty drift or from overlying aquifers.

Sand strata interbedded with clay and silt are the chief aquifers in the Admiralty; some are reported to occur as much as 1,000 feet below sea level. Wells developing water from these aquifers generally have low specific capacities; in many instances sand is troublesome.

As the vertical permeability through most strata of the Admiralty drift is very low, recharge to the aquifers in the Admiralty occurs principally in places where beveled edges of the aquifers are in contact with permeable zones of overlying formations. Much of the ground water obtained from the deeper aquifers in the Admiralty drift or older unconsolidated deposits may be connate water—water that was trapped in the sediments at the time of their deposition. This is concluded from the fact that several of the wells that were perforated in only the deeper horizons, as wells 24/1–25K1 and 36F1, yielded several hundred gallons per minute at the time of their construction, but their yields soon diminished to the extent that the wells were no longer usable.

Several wells located near the community of Burley in the extreme southern part of the county have been drilled to depths ranging from 200 to 375 feet below sea level. These wells, including 22/1–1N1, 11A1, and 12D2, obtain confined ground water from sand strata that are interbedded with very hard clay. The hard, massive character of the clay fragments taken from several of these wells indicate that the deeper aquifers in this area are in the Admiralty drift or some older undifferentiated deposits. Some of these wells flow at a rate of several hundred gallons per minute and have shut-in pressures as great as 49 pounds per square inch.

The construction of deep wells in the Admiralty drift entails considerable risk of failure as this formation is principally fine grained, the permeable strata are not continuous, and sustained production can be developed only in aquifers that have free access to aquifers in overlying formations. It is advisable to test thoroughly all overlying permeable materials as to yield, before any attempt to drill deep into the Admiralty drift is contemplated.

ORTING GRAVEL

LOWER MEMBER

The lower member of the Orting gravel is the most important potential source of large ground-water supplies in Kitsap County. At most places it is capable of yielding large quantities of confined ground water. The lower member is believed to be present under a large part of Kitsap County, being absent where hills and ridges in the post-Admiralty erosion surface prevented its deposition, or where it has been removed by subsequent erosion. As the top of the lower member ranges from 150 feet above sea level to 200 feet or more below sea level, deep wells would be required to reach this member beneath the higher parts of the uplands. However, as most of the towns and larger communities are located near tidewater, it serves as a valuable source of public and industrial water supply.

Most of the wells along the south shore of Sinclair Inlet, between Port Orchard and the Bremerton municipal wells located near Gorst, obtain water from this member. The aquifers are sand and gravel strata that lie below the Kitsap clay member; they are generally encountered within 250 feet of penetration below sea level. Yields as high as 1,700 gallons per minute have been obtained from wells in this area.

The deeper wells along Puget Sound between Manchester and South Colby obtain water from the lower member of the Orting gravel. At most places in this area wells will encounter gravel and sand aquifers between land surface and 100 feet below sea level. Well 24/2-22M1, a municipal well at Manchester that obtains water from a sand and gravel aquifer in this member, was reported to have a production of about 500 gallons per minute with a drawdown of 16 feet.

Well records show that the lower member of the Orting apparently is somewhat finer grained and less permeable in the northern third of the county. However, as sufficient information is not available to delineate the extent of the thicker and more permeable parts of this member, it is possible that they extend in undetected buried channels through that part of the county.

Recharge to aquifers in the lower member is chiefly by downward percolation from overlying materials, in areas where the Kitsap clay member is missing or where overlying strata are relatively permeable.

Most natural discharge is below sea level into Puget Sound. Because the sedimentary deposits on the floor of Puget Sound are less permeable than the sand and gravel in the lower member, artesian pressure is built up within the aquifers. Most of the wells in this unit that are near tidewater are flowing wells. Well 24/1–25E2, located near Port Orchard, is reported to have a natural flow of about 750 gallons per minute.

Water from the lower member commonly contains a small amount of hydrogen sulfide gas which gives it an unpleasant odor. The gas can be removed by aeration.

KITSAP CLAY MEMBER

The Kitsap clay member is relatively unimportant as an aquifer in Kitsap County; but it is important in that it forms a ground-water aquiclude which in most places confines water in the underlying gravel member of the Orting. The sand and gravel lenses in the Kitsap clay member are capable of yielding small to moderate supplies of confined ground water, which commonly has a slight odor of hydrogen sulfide. The fine-grained strata, which predominate in this member, yield little or no ground water.

In places the Kitsap clay member directly overlies the Admiralty drift, and in well logs it is usually impossible to differentiate the two units. Many of the unsuccessful wells drilled into the Kitsap clay member have extended into the underlying Admiralty or into other undifferentiated Pleistocene or Tertiary deposits without encountering the lower member of the Orting. As the configuration of the post-Admiralty erosion surface and the extent of the lower member of the Orting are not completely known, some risk is involved in constructing wells into the Kitsap clay member in search for the underlying Orting aquifers. Generally, however, if the lower member is present, it is usually encountered witin 75 to 150 feet below the top of the Kitsap clay member.

PUYALLUP SAND

The Puyallup sand is the most widely developed and important source of ground water for domestic supplies in Kitsap County. The aquifers are the coarser sand strata and the gravel lenses which generally occur in the basal part of the formation. Ground water in the Puyallup sand usually occurs under water-table conditions, but at some places interbedded clay and silt and the overlying till confine small bodies of ground water.

Well 23/1–14C5, located a few miles south of Port Orchard, can be considered typical of a domestic well that obtains water from the Puyallup sand. It is a 6-inch well, drilled to a depth of 145 feet, and obtains water from a sand and fine-gravel aquifer. This well, which was finished with an open-bottom casing, was bailed at a rate of 22 gallons per minute with 7 feet of drawdown.

Well 23/1–7D1, located a few miles southwest of Gorst, obtains water from a sand and gravel aquifer in the Puyallup sand. This well was screened from 199 to 219 feet, and during a short test, it produced about 110 gallons per minute with a drawdown of 28 feet.

Other small-diameter domestic wells that obtain water from the Puyallup sand have specific capacities up to 3 gallons per minute per foot of drawdown. However, as most of these wells are finished with open-bottom casings, the coarse-grained aquifers are believed to be capable of yielding slightly greater supplies to properly screened wells.

Recharge to the aquifers in the Puyallup sand is by the direct infiltration of precipitation in places where the generally overlying till is thin or absent, or by slow downward percolation from water bodies perched on the till. Natural discharge from the Puyallup sand is through springs in the valley areas or along the slopes to Puget Sound. The summer flow of many of the streams in the county is maintained by discharge from the Puyallup sand.

VASHON DRIFT

ADVANCE OUTWASH

The advance outwash of the Vashon glacier is highly permeable but generally lies above the regional water table and yields no ground water. Where these deposits have considerable thickness and extend to substantial depths below the water table, they are capable of yielding moderately large supplies of ground water. The advance outwash in Kitsap County is confined chiefly to irregular channels, so that, at present, its occurrence cannot be predicted in most places.

Well 23/1–21J2, located about 6 miles southwest of Port Orchard (pl. 2), was drilled through recessional outwash and till, and encountered permeable advance outwash gravel at a depth of 101 feet. This well, which obtains confined ground water from the advance outwash, was reported by the driller to have been bailed at 40 gallons per minute with no apparent drawdown.

Well 24/2–16K1, located about 1 mile north of Manchester, obtains water from permeable advance outwash gravels. This well, which was drilled to a depth of 136 feet, was pumped at 400 gallons per minute for 8 hours and had a drawdown of 33 feet.

In the till-mantled Clear Creek valley just north of the town of Silverdale, at the northern end of Dyes Inlet, several wells obtain confined ground water from the advance outwash. In this area the till forms the confining stratum.

TILL

The thicker sections of the till in the Vashon drift yield small supplies of perched ground water. The till is quite impermeable and restricts or greatly impedes the downward percolation of water.

Water is yielded mostly from cracks or more permeable sandy streaks and zones within the till. Also within the till, a few wells have encountered gravel lenses which yield sufficient water to supply several families. Wells in the till have a low water level, or are even dry, by early autumn of most years.

In many places the till confines ground water in underlying aquifers. This is especially true in areas where the till mantles the slopes leading to Puget Sound.

Most wells that develop water from the till are large-diameter dug wells that have large infiltration areas and storage capacities. The hard, compact character of the till often necessitates the use of blasting powder in the construction of such wells.

Within the county, the till cannot be considered as a possible source of water for irrigation, industrial, public, or other large demands.

RECESSIONAL OUTWASH

Considerable thicknesses of recessional outwash occur in some outwash channels on the uplands of the county. Such deposit of outwash may yield small to moderate supplies of ground water which, in most places, are perched on a stratum of till. Where the recessional outwash occurs in the lowland areas of the county it in places extends below the regional water table and is capable of yielding moderately large supplies of ground water. Water levels of the perched ground-water bodies have a marked seasonal fluctuation. During dry months the perched water table drops, owing to the fairly rapid depletion of this stored water. Discharge occurs as downward percolation to the regional water table and as spring outflow where the land surface intercepts the perched water table.

Most wells that obtain water from recessional outwash are shallow dug wells that yield small supplies for domestic use.

The fine-grained character of the Gorst Creek outwash prevents it from being a productive aquifer. Production suitable for small domestic supplies can probably be obtained from large-diameter wells drilled to penetrate the saturated portion of this member. The character and water-bearing properties of the materials that underlie the Gorst Creek outwash are not known.

AREAL OCCURRENCE OF GROUND WATER IN THE COUNTY

WATER IN THE SOUTHERN UPLAND

GENERAL

The southern upland is for the most part a rolling upland that contains several of the large drainage basins of the county. The population is concentrated chiefly in the eastern half of this upland. Most farmsteads are in the Burley, Blackjack, and Olalla Creek valleys. A few farms are located on the uplands, most of them organized for the cultivation of strawberries.

Present ground-water development is almost entirely for domestic purposes. The water table lies within 100 feet of the land surface, except in upland areas marginal to Puget Sound or deep valleys where natural discharge lowers the water table considerably. The aquifers are all Pleistocene sedimentary materials except in the Point Glover area (sec. 9, T. 24 N., R. 2 E.), where some very small yields are obtained from the Tertiary sedimentary rocks. The following sections describe the occurrence of ground water in various parts of this upland.

BLACKJACK VALLEY

One of the more important farming districts in the county is located a few miles south of Port Orchard in a small upland valley known as "Blackjack Valley." This valley, whose floor is at an elevation of about 190 feet and whose area is several square miles, has been developed principally for the cultivation of pasture grasses.

Drainage is by Blackjack Creek, a small stream that winds its way north along the broad valley floor and then flows through a narrow canyon to its mouth at Port Orchard. A hydrograph of Blackjack Creek is shown on figure 22.

Blackjack Valley is surrounded by till-mantled uplands that rise to as much as 200 feet above the valley floor. The valley floor and the lower parts of the surrounding slopes are underlain by Puyallup sand, and sandy outwash that is identical in appearance with the Gorst Creek outwash. As the outwash in the Blackjack valley is indistinguishable from the Puyallup sand in well logs, and as it has similar hydrologic properties, it has been included with the Puyallup sand on plate 1.

At this time, only well 23/1–10A2 is used as a source of ground water for irrigation in the valley. It is a small-diameter 114-foot drilled well that has sufficient capacity to irrigate a small pasture. The aquifer for this well is a sand and fine-gravel stratum in the basal part of the Puyallup sand.

Records of other wells indicate that permeable sand and gravel aquifers in the basal part of the Puyallup sand or in the lower member of the Orting gravel are commonly found within the first 200 feet below the valley floor. Properly constructed wells that extend into these aquifers probably could be developed to produce 50 to 100 or more gallons per minute, a supply sufficient for the irrigation of any of the average-sized farms in the area.

The water table lies slightly above creek level, a feature that results in shallow water levels beneath most of the valley floor. Depths to water beneath the slopes leading from the valley floor are greater because the slopes rise at a gradient somewhat steeper than the gradient of the underlying water table. Plate 3 shows a geologic cross section across the valley.

BURLEY CREEK VALLEY

The Burley Creek valley is a small southward-trending valley in the south-central part of the southern upland. This valley was formed in the pre-Vashon erosional period and was altered somewhat during the deposition of the Vashon drift. Part of the southward continuation of the valley is now occupied by the waters of Puget Sound.

In the downstream southern part of the valley, several large-capacity wells have been developed (22/1–1N1, –1P1, –11A1, –12D2, –12D3, and 12N1). These obtain high-pressure artesian water from sand and sand-and-gravel aquifers believed to belong to the Admiralty drift or some older undifferentiated deposit. If the aquifers supplying these wells are continuous throughout the lower valley, artesian flow can be expected in deep wells located below an altitude of 120 feet. Plate 3 shows the approximate altitude of the piezometric surface in the lower part of the valley. Artesian pressure will naturally be greater in wells drilled at lower altitudes. Aquifers tapped by the artesian wells are between depths of 200 and 375 feet below sea level. The water from these aquifers has an odor of hydrogen sulfide and a temperature of about 51° F.

The upper part of the Burley Creek valley is underlain by fine sand of the Puyallup sand, and sandy outwash similar to that found in the Blackjack Valley. As the hydrologic properties of the sandy outwash are similar to those of the Puyallup sand, it has not been differentiated from the Puyallup sand on plate 1.

Deep wells (200 to 400 feet) will probably be required in this area for the development of large ground-water supplies, however, small domestic supplies can usually be obtained at much shallower depths. Water levels are generally close to land surface in the valley but are greater beneath the slopes leading away from the valley.

OLALLA CREEK VALLEY AREA

Olalla Creek is a small south- to southeast-flowing stream which discharges into Colvos Passage near the small community of Olalla in the southeastern part of the county. The water table lies at shallow depths in the Orting gravel and outwash materials which underlie most of the valley.

Most of the residents of the valley obtain water for domestic requirements from numerous springs along the slope of the upland that lies immediately east of the Olalla Valley. These springs occur generally part way up the slope where impermeable strata of the

Kitsap clay member intercept the surface. Most of these springs are small, yielding but a few gallons per minute.

A train of glacial outwash lies in the upstream portion of the valley. At well 23/2–29G1, a shallow dug well in the valley, loose saturated sand and gravel of this unit was encountered just beneath the surface. Shallow wells located in this area should supply sufficient quantities of water to irrigate some of the drier lower slopes of the valley.

The water table beneath the central part of the upland north and east of the Olalla Valley lies, in general, between altitudes 250 and 350 feet. At greater altitudes many families obtain small quantities of perched ground water from shallow wells. The water is perched in or on the till and cannot be considered as a satisfactory source for large quantities of water.

PORT ORCHARD AREA

Many of the wells along the shore of Sinclair Inlet near Port Orchard are flowing wells that tap sand and gravel aquifers at less than 250 feet below the land surface. Some large-capacity industrial and municipal wells extend to greater depths and penetrate permeable aquifers yielding confined ground water. The water developed from most wells in this area contains some hydrogen sulfide.

One area where there is difficulty in developing ground-water supplies is about 1½ miles south of Port Orchard in sec. 35, T. 24 N., R. 1 E., and sec. 2, T. 23 N., R. 1 E., between State highway 14 and the canyon of Blackjack Creek. Three deep wells have been drilled in this area and permeable aquifers were encountered in none. Well 24/1–2A1 was drilled to a depth of 189 feet (bottom of well approximately 81 feet above sea level); principally clay, silt, and fine sand were penetrated. At this well a small supply was obtained at a depth of about 65 feet. Well 23/1–2H2 was drilled to a depth of 325 feet (bottom of well approximately 35 feet below sea level); mostly clay, silt, and fine sand were penetrated. Well 23/1–2J2 was drilled to a depth of 369 feet (bottom of well approximately 29 feet below sea level; fine sand and clay were encountered beneath the till. The fine silt and clay encountered in these wells belong to the Puyallup sand and to the Kitsap clay member of the Orting gravel, which are exposed in the Blackjack Creek canyon immediately west of this area. Probably permeable aquifers of the Orting gravel underlie this area. Deep wells extending from 100 to 200 feet below sea level will probably be required to tap these aquifers.

POINT GLOVER AREA

This point of land about 5 miles northeast of Port Orchard is a popular rural residential area where there is considerable difficulty in obtaining adequate domestic water supplies, owing to the occurrence of consolidated Tertiary sedimentary rocks. As mentioned in the section describing the occurrence of water in these rocks, they are generally unsuitable as a source of ground water, owing to their low permeabilities and the poor chemical quality of the water obtained. Small springs that drain the thin mantle of till and outwash that overlies the Tertiary rocks are utilized by a few families, but they have insufficient yield to serve as a source for a community supply.

Any community water system or other large water user in this area will have to import water from a distance of 1½ or more miles, as adequate supplies can only be obtained from permeable aquifers in the younger unconsolidated rocks. The 136-foot U. S. Navy well, 24/2–16K1, about 1½ miles south of Point Glover, obtains about 400 gallons per minute. The water from this well is of good chemical quality (see table 7), and is believed to be obtained from advance outwash gravel. Similar production could probably be obtained from other wells in this area.

WATER IN THE WESTERN UPLAND

GENERAL

Ground-water developments on the western upland are used chiefly for domestic purposes; but several large-capacity wells exist at the U. S. Naval Station near Bangor. All the developed aquifers in this upland are in the Pleistocene sedimentary formation.

Most of the wells are shallow dug wells that develop perched ground water from the till or overlying outwash materials. Most of the drilled wells pass through the till and obtain water from the underlying Puyallup sand or older formations.

The following sections describe the ground-water conditions existing in various parts of this upland.

CAMP UNION AREA

The Camp Union area is a small, sparsely populated district in the central part of the western upland (sec. 5, 6, and 7, T. 24 N., R. 1 W.). The land surface is underlain by a mantle of till which ranges generally from 30 to 40 feet in thickness. Existing drilled wells pass through the till and penetrate permeable sand and gravel aquifers of the Puyallup sand within 150 feet of the land surface. These aquifers now yield only domestic supplies but probably are capable of yielding larger supplies.

HOLLY AREA

Holly is a small community on the Hood Canal in the western part of the western upland. The data obtained concerning two deep wells indicate that there will be some difficulty in developing ground-water supplies in the area.

Well 24/2W–17R1 (see tables 5 and 6), in the Anderson Creek valley, at Holly, was drilled to a depth of 394 feet. It penetrated fine materials from a depth of 28 feet to the bottom of the well. The upper part of these fine materials belongs to the Kitsap clay member, which here may rest directly upon the Admiralty drift. This well was reported to yield only a small supply.

Well 24/2W–19A1 was drilled to a depth of 184 feet. It penetrated chiefly clay and fine sand. The fine-grained character of the water-bearing sand prevented the development of this well.

These tests indicate that other sources of supply should be considered before wells are drilled into the clays found at depth beneath this area.

Numerous small springs issue along the upper surface of the Kitsap clay member where it is intersected by valley slopes or the slope to the Hood Canal. Many of these could be developed to furnish satisfactory domestic supplies.

SEABECK—LONE ROCK AREA

This area is on Hood Canal in T. 25 N., R. 1 W. Ground-water developments are chiefly small-diameter drilled wells that yield domestic supplies.

The till sheet of the Vashon drift extends down the slope to Hood Canal. It can be seen along the beach in most of this area. Wells develop water from sand and gravel strata beneath the till. The aquifers are believed to belong to the Puyallup sand and yield ample quantities for domestic requirements. The wells generally "bottom" above an altitude of 60 feet below sea level. Several wells flow at the surface.

Well 25/1W–14F1, near Lone Rock, was drilled to a depth of 208 feet. It penetrated clay and fine sand for its entire depth and was abandoned owing to insufficient yield. Similar conditions may exist beneath the ridge that extends northeast from this well because exposures along the sea cliff show the ridge to be underlain by fine sand and clay.

SCANDIA AREA

The Scandia area is a small farming and residential area located along Liberty Bay in T. 26 N., R. 1 E. The area is mantled with till up to 60 feet thick. Ground-water developments are mostly shallow dug wells but a few deeper drilled wells produce water which is used for domestic purposes.

Logs of wells 26/1–27J2 and 34C2 (see table 6) show the till in this area to be underlain by as much as 138 feet of clay belonging to the Kitsap clay member. These wells develop water from gravel beneath the clay. Similar conditions were encountered in well 26/1–26A2 located across Liberty Bay from Scandia.

Plate 3 shows a geologic section across the western upland in this area.

WATER IN THE CENTRAL UPLAND

The central upland is a fairly thickly populated farming and residential area, a large part of which is supplied by municipal water systems (fig. 24).

The geologic structure that brings the Tertiary sedimentary rocks above sea level at Point Glover and in Bainbridge Island continues westward beneath the southern end of this upland. Tertiary sedimentary rocks crop out in sec. 3, T. 24 N., R. 1 E. (pl. 1). In drilling well 24/1–12E2 these rocks were encountered at a depth of 220 feet and 694 feet of them penetrated without obtaining water.[2] These facts indicate that large supplies of ground water cannot be found at great depth below the southern end of the central upland, owing to the presence of Tertiary rocks.

Records of wells on this upland indicate that the materials underlying the till are generally fine grained. Aquifers are mostly sand strata, though some gravel has been encountered (logs of wells 25/1–27N1, 24/1–12B1, 12F1).

Adequate screening or perforating and proper well development would be required in the development of irrigation or other large supplies from aquifers beneath this upland.

WATER IN THE NORTHERN UPLAND

Aquifers beneath the northern upland are all sand and gravel which have yielded only small to moderate supplies. Precipitation in this area is somewhat less than that in other parts of the county and may result in somewhat smaller recharge to the aquifers.

Wells in the vicinity of Foul Weather Bluff, which is at the extreme northern end of the county, obtain water from a sand and gravel aquifer, most commonly penetrated at altitudes close to sea level. In drilling a 1206-foot test well for gas in this area (28/2–17M1), mainly sand and clay were encountered, except for a gravelly zone from 740 to 772 feet (table 6). Many of the sand zones above the gravel zone were water bearing.

Water from most of the wells in this area is high in dissolved mineral matter, and some of it has an unpleasant taste.

In most of the deep wells in the Eglon area, which is on the east shore of this upland, in and near sec. 34, T. 28 N., R. 2 E., permeable sand and gravel were penetrated slightly above sea level. In general,

[2] This well when developed produced 25 gallons of water per minute from a sand and gravel stratum in the overlying Pleistocene materials.

the till and the underlying Kitsap clay member were penetrated before the permeable materials were encountered. Water levels are within 100 feet of the land surface in most places. Shallow dug wells in this area obtain small supplies from the till.

KINGSTON AREA

The Kingston area is a moderately populated farming district adjacent to the community of Kingston in the east-central part of the northern upland. Ground-water withdrawals are mainly for domestic use, chiefly from shallow wells that were dug into the till or underlying materials.

Well records and rock outcrops show the pre-till materials to be largely sand and clay. Well 27/2–26R2 was drilled to a depth of 339 feet and bottomed at an altitude of about 314 feet below sea level. It was reported to have been drilled through only sand and clay for its entire depth. Well 27/2–25N1 at the Kingston ferry dock was drilled to a depth of 298 feet in fine-grained materials. It obtains water from a 6-foot sand stratum between 266 and 272 feet. This well, which was finished with a 0.010-slot screen and tested at about 50 gallons per minute, shows the capabilities of one of the sand aquifers in this area.

The water table lies at shallow depth under all the lowland areas in and adjacent to Kingston, but it lies more than 100 feet beneath some of the adjacent uplands (27/2–23G1, 23K1, 29H1).

Recharge to the aquifers in this area comes from precipitation falling in the immediate area and on the adjacent upland hills. Precipitation probably averages slightly less than 30 inches per year in this area.

Several wells per farm may be required to obtain ground water in quantities suitable for irrigation in this area.

WATER ON BAINBRIDGE ISLAND

Most wells on Bainbridge Island yield small to moderate water supplies, which are used principally for domestic purposes. Many are shallow, large-diameter dug wells which obtain perched ground water from the till or the overlying outwash materials. In general, drilled wells are deeper and are finished with open-bottom or perforated casings. The aquifers of these wells are, in most places, the coarser sand strata and gravel lenses found in the Puyallup sand.

The southern end of Bainbridge Island is underlain by the Tertiary Blakeley formation of Weaver, which yields little or no ground water. A few wells in that area have yielded small supplies from thin deposits of glacial till and outwash that in places mantle the bedrock surface. Plate 3 includes a section across the island, showing the relation of this formation to the Pleistocene sedimentary materials. This formation, or some unknown formation of Tertiary age, may have been encountered at depth in some of the deeper wells in the central and northern part of the island, but the well logs were not conclusive in this regard.

The island, in most other places, is mantled with a fairly thick cover of glacial till. Well logs and sea-cliff exposures indicate that the till is generally underlain by fine-grained materials, largely sand and silt, though some gravel strata have been encountered. In general, the more permeable aquifers are found at altitudes of less than 200 feet below sea level. Several wells have yielded moderate to large supplies at greater depths, but the available stratigraphic data indicate that considerable risk is involved in attempting such development.

The level of water is shallow in most wells, generally within 100 feet of the land surface. The level of water in wells tapping confined ground water is about the same as the water table.

Most wells drilled in the Eagledale district (sec. 35, T. 25 N., R. 2 E.) obtain water from sand strata near sea level. Those strata are believed to belong to the Puyallup sand, and at present they yield supplies sufficient for domestic requirements. Whether those aquifers are capable of yielding supplies sufficient for irrigation or other large uses is not known. Depths to water in places exceed 100 feet.

Wells in the area around Winslow (sec. 26 and 27, T. 25 N., R. 2 E.) obtain water from sand, or sand and gravel—strata which are generally encountered at depths of less than 200 feet. Many of these aquifers are capable of furnishing small irrigation supplies.

Several wells on the upland in the Seabold district (sec. 33, T. 26 N., R. 2 E.) have failed to obtain sufficient supplies for domestic use owing to the fine grain of the materials encountered. However, as most of these unsuccessful wells bottomed at altitudes above sea level, the character and water-bearing properties of the materials lying below sea level is unknown. Many wells, located at low altitudes around the margin of this upland area, have obtained satisfactory supplies from sand and gravel strata within the first 100 feet below sea level. If the aquifers for these wells extend beneath the upland they could be tapped by deeper wells on the upland.

GROUND-WATER DEVELOPMENT AND POTENTIALITIES

DEEP WATER WELLS

Because of the generally fine-grained texture and low permeability of deeper deposits on the Puget Sound basin, deep wells have not been very successful. In several of the successful deep wells, the casings are perforated at so many horizons that the location of the chief aquifer or aquifers is not known.

In table 5, "Records of representative wells in Kitsap County," are described 28 water wells that were drilled to depths of 500 feet or more. The results obtained from these deep wells are summarized below.

TABLE 1.—*Summary of deep water wells, Kitsap County, Wash.*

No.	Well number	Depth (feet)	Penetration below sea level (feet)	Yield (gpm)	Results
1	24/1-12E2	914	654	25	Tertiary sedimentary rocks encountered at 220 feet. Well abandoned because of small yield.
2	-23B1	748	728	------	Well flowed several thousand gallons a day, aquifer unknown; well became clogged and was destroyed.
3	-23E1	2,000	1,970	1,500	Casing perforated from 160 to 1,315 feet; depth to chief aquifer not known. Well used for standby supply.
4	-25E2	1,133	1,098	1,700	Reported to have been backfilled with gravel to 600 feet; casing perforated from 437 to 1,111 feet. Well in use.
5	-25K1	962	872	------	Well was never put into production because of low yield.
6	-26K4	792	692	575	Casing perforated from 215 to 238 feet, and from 764 to 780 feet; depth to chief aquifer not known. Well in use.
7	-33K3	538	418	350	Well in use.
8	-33K5	587	487	760	Do.
9	-33K6	562	452	850	Drawdown reported to exceed 200 feet at 850 gpm. Well in use.
10	-33L1	622	597	875	Drawdown reported to exceed 66 feet at 875 gpm. Well in use.
11	24/1-36F1	1,101	921	------	Abandoned because of low yield.
12	24/2-10R1	1,700	1,685	------	Drilled in Tertiary sedimentary rock for entire depth. Abandoned because of low yield and poor quality of water obtained.
13	-17B1	620	605	------	Drilled in Tertiary sedimentary rock for entire depth. Abandoned because of low yield.
14	-31A1	1,006	646	325	Casing perforated from 459 to 575 feet, and 627 to 647 feet. Abandoned owing to inflow of sand into the well.
15	25/2-17C1	910	755	30	Reported drawdown of 45 feet while pumping 30 gpm. Well in use.
16	-26P1	761	751	300	Depth to the chief aquifer in this well is not known. Well in use.
17	-35H2	500	480	------	Yield reported to be small. Well not in use.
18	-35H3	813	803	------	Depth to chief aquifer is unknown. Well flows about 50 gpm and is in use.
19	-36N1	604	589	------	Furnishes small supply for domestic use.
20	-36N2	1,403	1,388	4	Abandoned because of small yield and poor quality of water.

TABLE 1.—*Summary of deep water wells, Kitsap County, Wash.*—Continued

No.	Well number	Depth (feet)	Penetration below sea level (feet)	Yield (gpm)	Results
21	26/1-23A1	1,000	800	------	Abandoned, well never developed.
22	-32K1	690	395	350	Reported drawdown of 82 feet at 350 gpm. Well in use.
23	-32M1	700	400	550	Casing perforated from 205 to 260, 280 to 320, and 350 to 570 feet; depth to chief aquifer unknown. Well in use.
24	-36P2	705	691	50	Depth to chief aquifer not known. Well in use.
25	-36P3	535	516	85	Do.
26	-36P4	1,036	1,015	1,750	Casing perforated from 179 to 222, 339 to 429, 584 to 630, 674 to 805, and 987 to 1,036 feet, and well gravel packed for entire depth; depth to chief aquifer not known. Well in use.
27	26/2-34L1	1,005	997	------	Depth to chief aquifer not known; well flows 25 gpm. Well used for domestic supply.
28	27/1-12H1	600	520	------	Depth to chief aquifer is not known. Well used for domestic supply.

Of these 28 wells, 10 have been abandoned owing to insufficient yield or excessive drawdown. In three of the abandoned wells, Tertiary sedimentary rocks are known to have been penetrated, and some of the others may have been also. Eighteen of the deep wells are in use. Of these, 8 are capable of yielding large supplies, 7 yield small to moderate supplies, and the yield of the remaining 3 is unknown.

It is inferred from the above data that considerable risk is involved in the construction of wells to great depths except in areas of known production from deep aquifers.

SPRINGS

Many springs and seeps exist throughout the county. They are the source of the base flow of all the surface streams, and through them a large part of the natural ground-water discharge takes place. Most of the springs are along the slopes to Puget Sound and the larger valleys at points or lines where the bases of permeable strata are intersected by the land surface, as along the Olalla Creek valley, where a spring line occurs along the top of the Kitsap clay member of the Orting gravel. Some springs are near the top of the valley slopes at the edge of the till sheet. These springs, which have a marked seasonal fluctuation, drain the thin mantle of soil and outwash that commonly overlies the till. Some springs are in the valley areas where confined water breaks through the confining stratum and discharges at the surface. The following tabulation gives a description of a few of the many springs in the county.

TABLE 2.—*Representative springs in Kitsap County*

[Topography and approximate altitude: S, slope to Puget Sound or major valley; V, valley. Use: D, domestic; N, none; Inst, institutional; PS, public-supply. Yield: All yields estimated.]

Spring number	Owner	Topography and approximate altitude (feet)	Occurrence of water	Yield (gpm)	Use	Remarks
22/1–11A2	R. Nieman	V 30	Discharge of confined ground water.	50	N	Water has hardness of 40 and chloride content of 4 ppm.
23/1W–11L1	Kitsap County	S 340	Drain from advance outwash and Puyallup sand.	100	D	Supplies Kitsap County Airport.
23/1–13J1	L. J. Harvey	V 240	do	50	D	
23/2–17D2	C. White	S 150	do	500	D	
23/2–20C1	J. R. Clarke	S 165	do	40	D	Temp of water, 48° F.
23/2–29J1	J. Grevstad	S 230	Drain from Puyallup sand	15	D	
24/1–2M1	Tracyton Water Dist	S 240	do		PS	Temp of water, 54° F.
24/1–5E1	Erlands Point Water Co	S 190	Drain from advance outwash and Puyallup sand.	50	PS	
24/2–10B3	U. S. Navy	S 140	Drain from till overlying Blakeley formation of Weaver.	7	Inst	Chemical analysis in table 7.
25/1–31R1	L. C. Strigel	S 100	Drain from Puyallup sand		PS	Supplies 15 families.
25/1W–20K1	Seabeck Christian Conference Grounds.	70	Drain from recessional outwash and underlying materials.	50	PS	

SALT WATER CONTAMINATION

A knowledge of the relation between fresh and salt water is important to the proper management of well-water supplies in areas close to marine waters in order to prevent the encroachment of salt water into the aquifers. Fresh water, being slightly lighter than salt water, tends to float upon salt water, and the contact between the two may be termed the interface. The depth to which fresh water extends below sea level is dependent upon the difference in density between fresh and salt water, and the head on the fresh-water body. Both fresh and salt water can coexist in an aquifer with little mixing except at the zone of contact, which is also called the zone of transition. The zone of transition generally occurs along a surface where the head on the overlying fresh water equals the head on the underlying salt water; that is, a surface at which a column of the overlying fresh water would balance a column of salt water extending upward from this surface to sea level.

In longshore areas, the depth to this interface can be calculated as follows:

$$h=\frac{t}{g-1}$$

where h=depth to the interface below sea level, in feet

t=head on the fresh water body, in feet above sea level

g=specific gravity of salt water

The specific gravity of the salt water in Puget Sound is about 1.022, which means that for every foot of head above sea level in this area there will be about 45 feet of fresh water below sea level.

In longshore areas where permeable materials extend to considerable depth, salt water will underlie the fresh water, and will extend downward from the interface to the base of the permeable materials. Where several confined aquifers are discharging into the sea, the position of the interface may be different for each aquifer because the heads may be different. Figure 18 is a diagrammatic section showing the relation between fresh water and salt water under water-table and confined ground-water conditions.

Under either water-table or confined conditions, encroachment of salt water will occur if the cone of depression or area of influence created by discharge of water from wells extends laterally over the zone of transition. The amount of encroachment in the Puget Sound area would be equivalent to about a 45-foot rise of the zone of transition for each foot of lowering of the fresh-water head.

Figure 19 shows how the discharge from a well can cause encroachment of salt water into a water-table and a confined aquifer. In both cases a ground-water divide develops between the pumped well and

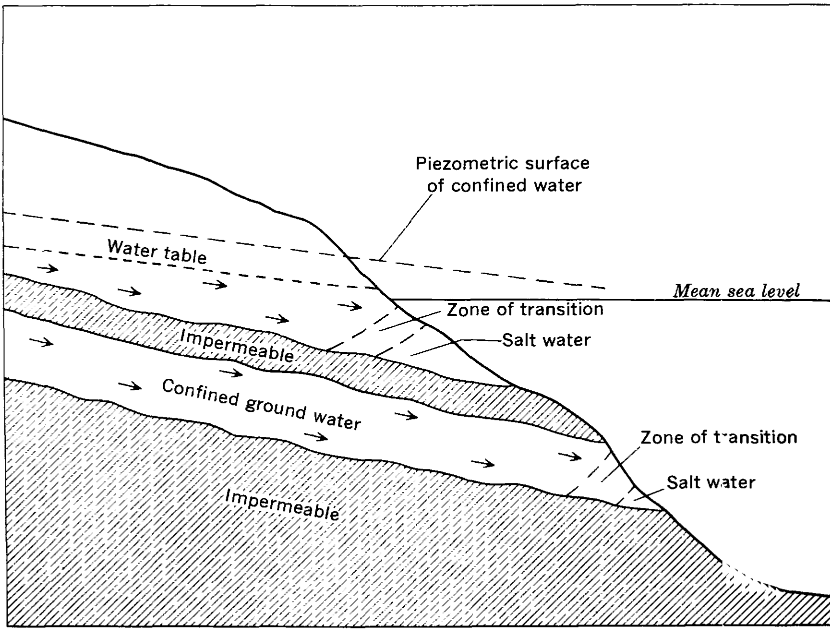

FIGURE 18.—Diagrammatic section showing relation of ground water to salt water under water-table and confined-ground-water conditions.

the sea. In the case of the water-table well, the lowering of the water table causes a rise in the interface, and a corresponding rise of salt water. Contamination could have been avoided by restricting pumping to a rate at which the fresh-water head in the aquifer at the well is sufficient to keep the salt water depressed below the bottom of the well. In the case of the confined aquifer, the head at the ground-water divide that develops between the well and the sea must be sufficient to keep the interface below the base of the aquifer. When the head of the ground-water divide is lowered sufficiently, salt water will move into the aquifer along its base. The rate of encroachment will then be dependent upon the hydraulic gradient between the ground-water divide and the pumped well.

However, even before the head of the ground-water divide is lowered sufficiently to permit free passage of salt water into the aquifer, there will be encroachment along the seaward side of the divide, and possible contamination of near-shore wells.

In either water-table or confined aquifers, encroachment of salt water and contamination of near-shore wells can be caused by a reduction of discharge from the aquifer, and a corresponding reduction of fresh-water head. The reduction in discharge could be caused either by a reduction in recharge, or withdrawals by wells.

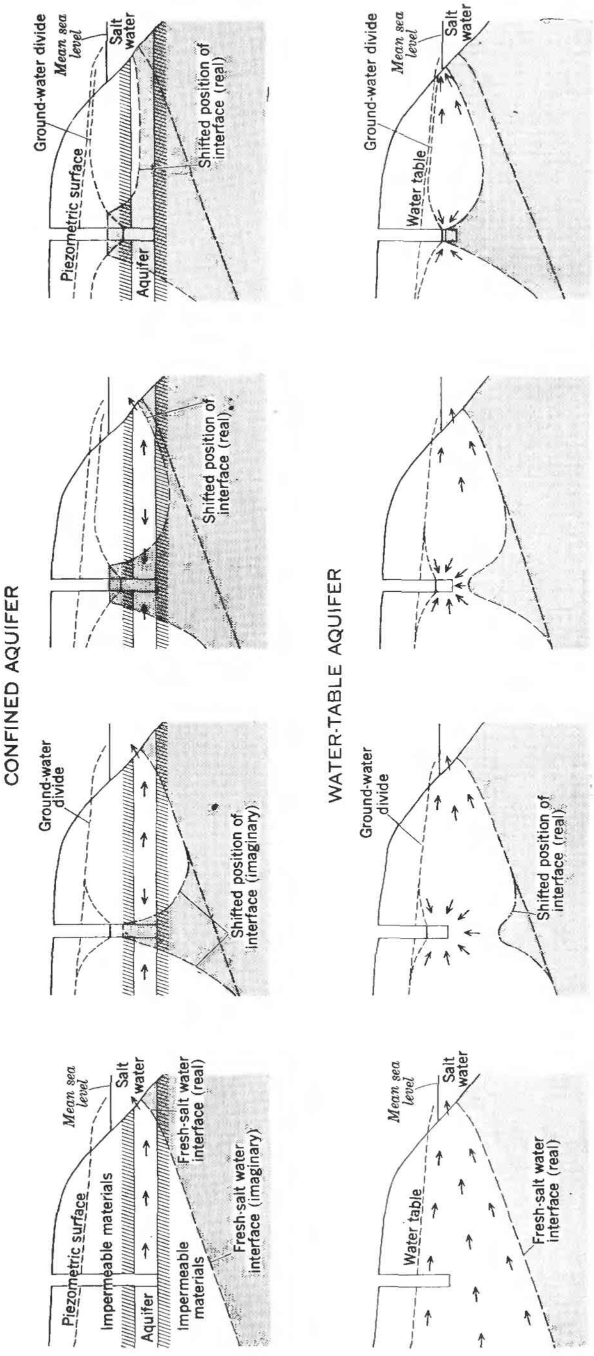

FIGURE 19.—Salt water encroachment induced by heavy pumping in a confined and in a water-table aquifer.

In Kitsap County, only two cases of salt-water contamination were noted. Those occurred in wells 25/2-26P2 and 25/2-35G1, on opposite sides of Eagle Harbor on Bainbridge Island. Vigilance is required in all large longshore ground-water developments to prevent further contamination, however.

WATER LEVELS

In most places in the county, the depth to water in wells is within 100 feet of the land surface at the well. Figure 20 is a graph on which

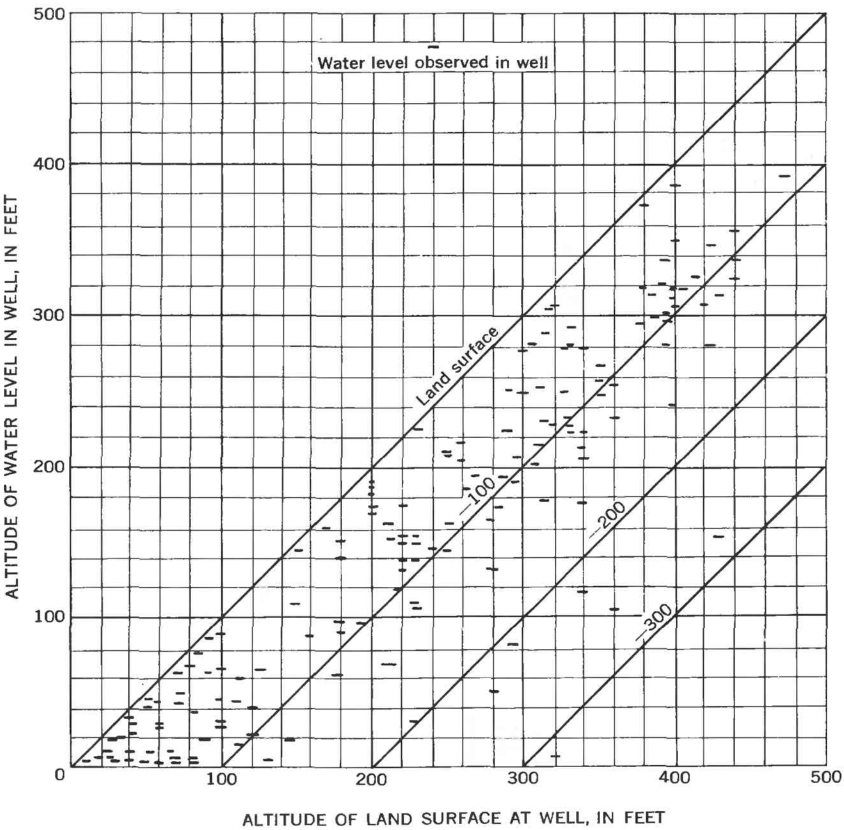

FIGURE 20.—Graph showing relation of water levels in the deeper wells (100 ft.+) to altitudes of land surface at the wells. Diagonal lines represent planes of equal depth below land surface.

known and reported water levels in nonflowing wells more than 100 feet deep have been plotted in respect to the altitude of land surface at the well. This figure shows that most of the water levels are between 50 and 100 feet in depth. Wells having greater depths to water are generally located near deep gullies or steep slopes to Puget Sound where natural ground-water discharge readily drains the shallower materials. Many of the wells that have depths to water less than 50 feet are located at low altitudes.

FLUCTUATION OF WATER LEVELS

As stated previously, the water table or the piezometric surface is not a static surface, but fluctuates because of changes in the amounts of recharge and discharge. Several wells were measured periodically during the course of this investigation to determine the trend and approximate annual range in fluctuation. The hydrographs of three of these are shown on figure 21. In these wells, the annual range in water-level fluctuation is from 10 to 15 feet.

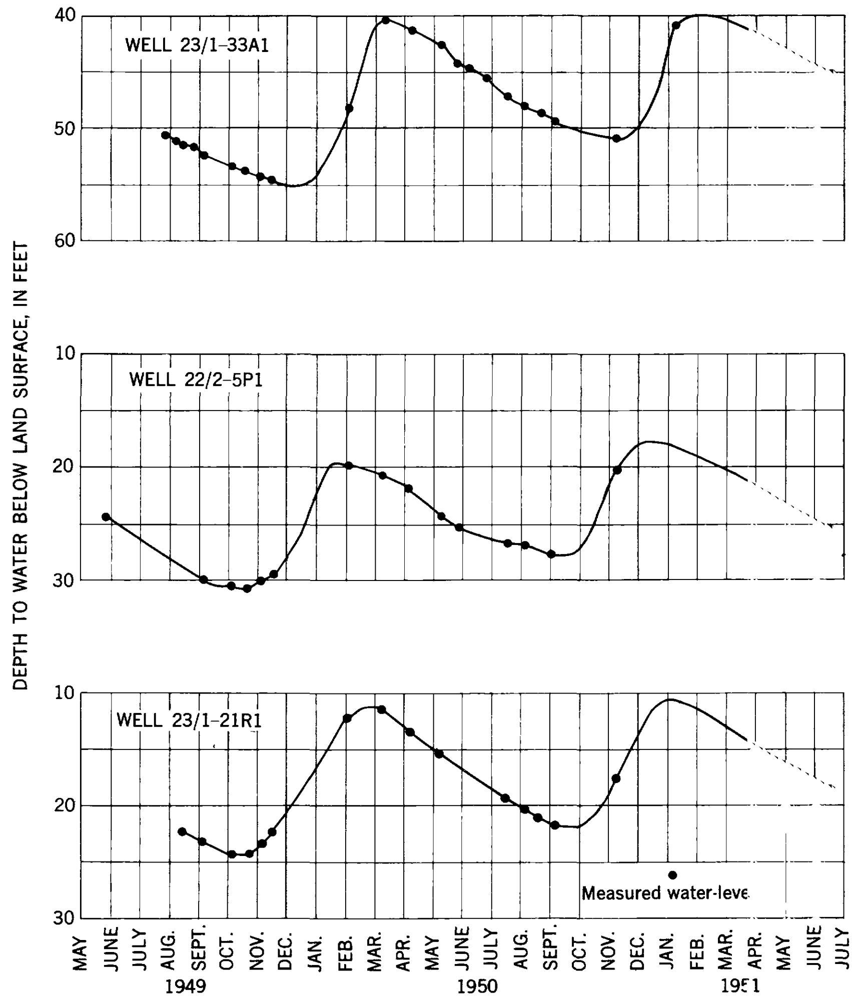

FIGURE 21.—Hydrographs of three wells, Kitsap County, Wash

The period of lowest water levels occurs in late autumn or early winter months. Many owners of dug wells reported that they have had to deepen their wells about the first of the year, as this was the time that water supplies were generally short, and the bottoms of the wells were most easily accessible. High water levels occur in late winter, spring, or early summer months, being dependent in part on the depth to the water table, and the permeability of the overlying materials. High and low water levels in shallow aquifers generally precede the highs and lows in deeper aquifers by periods as long as several months.

The period of low water levels in many wells corresponds in time to the accumulation of snow packs on the Cascade and Olympic Mountains, and the high water levels often correspond in time to the periods of greatest snowmelt and runoff in the mountains. This fact has given rise to a widespread misconception that the ground water in Kitsap County is derived from snowmelt on the Cascade and Olympic Mountains. The great depth of the surrounding waterways of Puget Sound, and the general movement of ground water toward these waterways within the county, preclude any recharge from these sources. All recharge comes from precipitation falling on the county, or on the adjacent parts of Pierce and Mason Counties to the south.

The hydrographs of a water-table well, a perched lake that lies in a closed depression, and a stream, are compared with the monthly distribution of precipitation on figure 22. Panther Lake, in sec. 31, T. 24 N., R. 1 W., and Blackjack Creek near Port Orchard show almost immediate response to the late autumn precipitation. The well however, does not respond until several months after the rains have commenced. The hydrograph of Panther Lake probably corresponds to fluctuations of shallow perched ground water; however, the magnitude of ground-water fluctuations would be somewhat greater.

The 19-year hydrograph of a 60½-foot water-table well is shown on figure 23. This hydrograph shows the annual range of fluctuation to vary from less than three to more than eight feet, with the average about five feet. The range of the long-term cycle of fluctuation shown on this figure is about 15 feet. A low water level occurred in the winter of 1945, and highs occurred in 1934 and 1950. The low water levels during 1949 and 1950 were higher than the high water levels of 1942 to 1945. The upper curve on this figure shows the cumulative departure from a progressive 5-year average of precipitation as recorded at Bremerton, which is only a few miles from this well. This curve closely corresponds to the long-term cycle of water-level fluctuation, and indicates that the long-term cycle in water-level fluctuations is a function of periods of excessive or deficient precipitation.

PERENNIAL YIELD

The perennial yield of an aquifer or ground-water basin may be defined as the rate at which ground water can be continuously withdrawn without detrimental effects. Withdrawals in excess of that rate will cause a lowering of the water table or piezometric surface to excessive depths, a reduction of base flow of surface streams, and, in some places, encroachment of water of inferior quality.

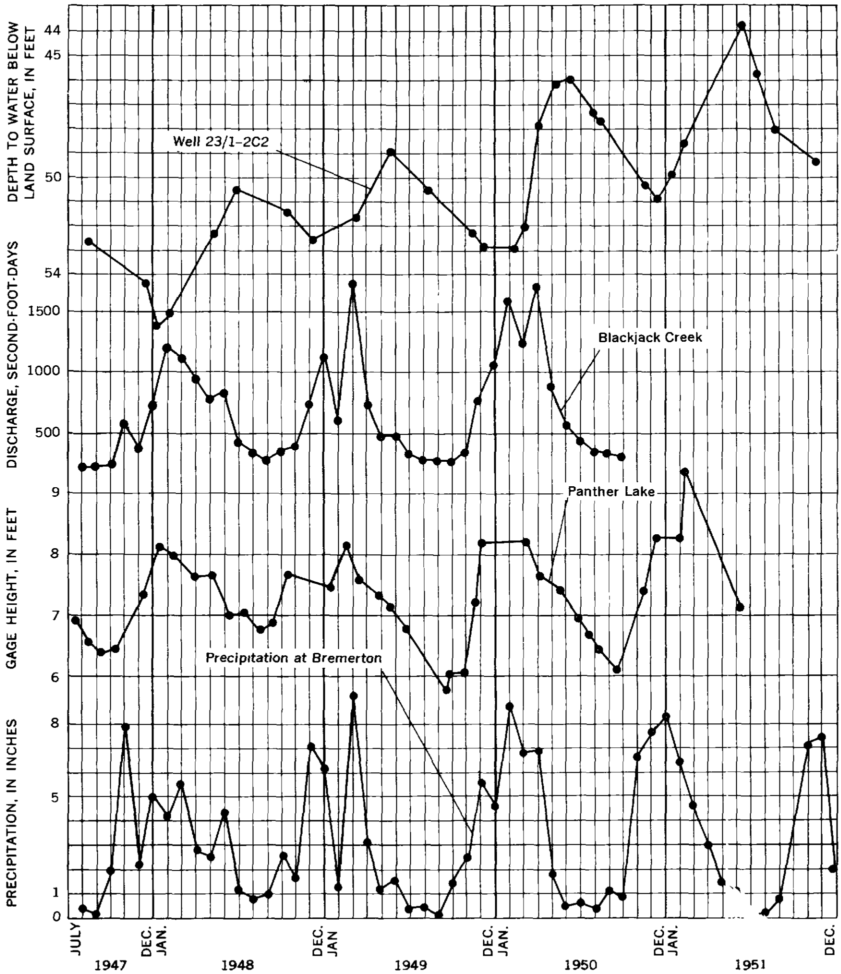

FIGURE 22.—Precipitation at Bremerton, Wash., and hydrographs of Panther Lake, Blackjack Creek, and well 23/1-2C2.

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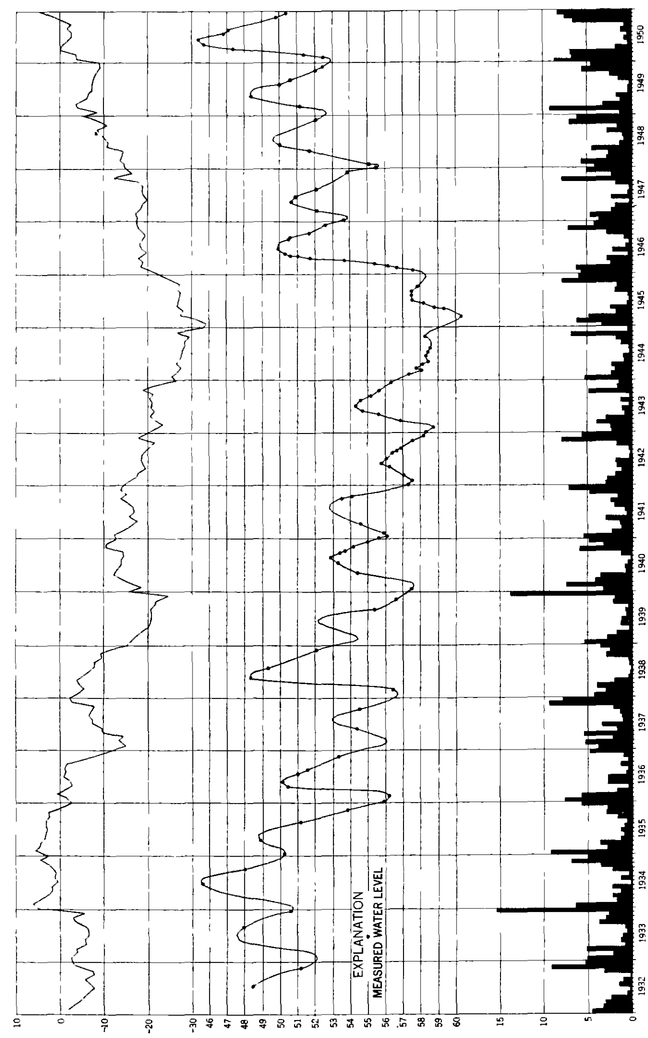

FIGURE 23. Monthly cumulative departure from progressive average (5-year) precipitation at Bremerton, Wash., a hydrograph of well 23/1-2C2 located neai Port Orchard, and monthly precipitation at Bremerton, 1932–50.

Figure 3 shows that the average annual precipitation in Kitsap County ranges from less than 20 inches in the northern part to more than 70 in the western part. Only a part of that precipitation reaches the water table, and only a part of that is available for ground-water withdrawal. On the basis of meager data the writer estimates that in areas having about 20 inches of precipitation, the perennial yield will be perhaps as much as ½ acre-foot per acre per year; in areas having 25 to 30 inches of precipitation, as much as 1 acre-foot per acre; in areas having 30 to 50 inches of precipitation, as much as 1 to 2 acre-feet per acre; and in areas having 50 to 70 inches of precipitation, as much as 2 to 3 acre-feet per acre. However, the local geological situation, especially the presence of relatively thick impervious capping layers, like the till, will reduce those estimates in many places.

At present, only a small portion of the available ground water is being withdrawn. The amount is likely to increase, however, and in a number of areas in the county the pumping might easily increase to or beyond the perennial yield. In order to provide a basis for proper administration by the State of the laws affecting the ground-water resources of the county, a minimum network of observation wells and precipitation and stream-gaging stations should be maintained. Data from these, together with data on ground-water withdrawals, will provide basis for more refined estimates of the perennial yield of specific areas.

GROUND-WATER UTILIZATION

DOMESTIC SUPPLIES

By far the greatest number of wells in Kitsap County develop water for domestic use. The domestic use of water includes both household and farmstead use, and can be supplied by small-capacity wells. The average daily consumption for this type of development is probably less than 500 gallons per well.

MUNICIPAL SUPPLIES

All the towns and most of the larger communities are supplied by public distribution systems (fig. 24). The city of Bremerton has the largest system in the county. It utilizes both surface and ground water. Surface water from Heins Creek, and other small streams flowing off the Blue Hills, is collected by Gorst Creek and diverted into the system. Part of the flow of the Union River is diverted in sec. 34, T. 24 N., R. 1 W. and utilized. Besides these surface streams, six wells located in sec. 33, T. 24 N., R. 1 E. and part of the flow of Anderson Creek, a very small spring-fed stream in this section, are utilized. As all the wells are flowing, their natural flow is used throughout the year, and the wells are pumped only when other supplies are

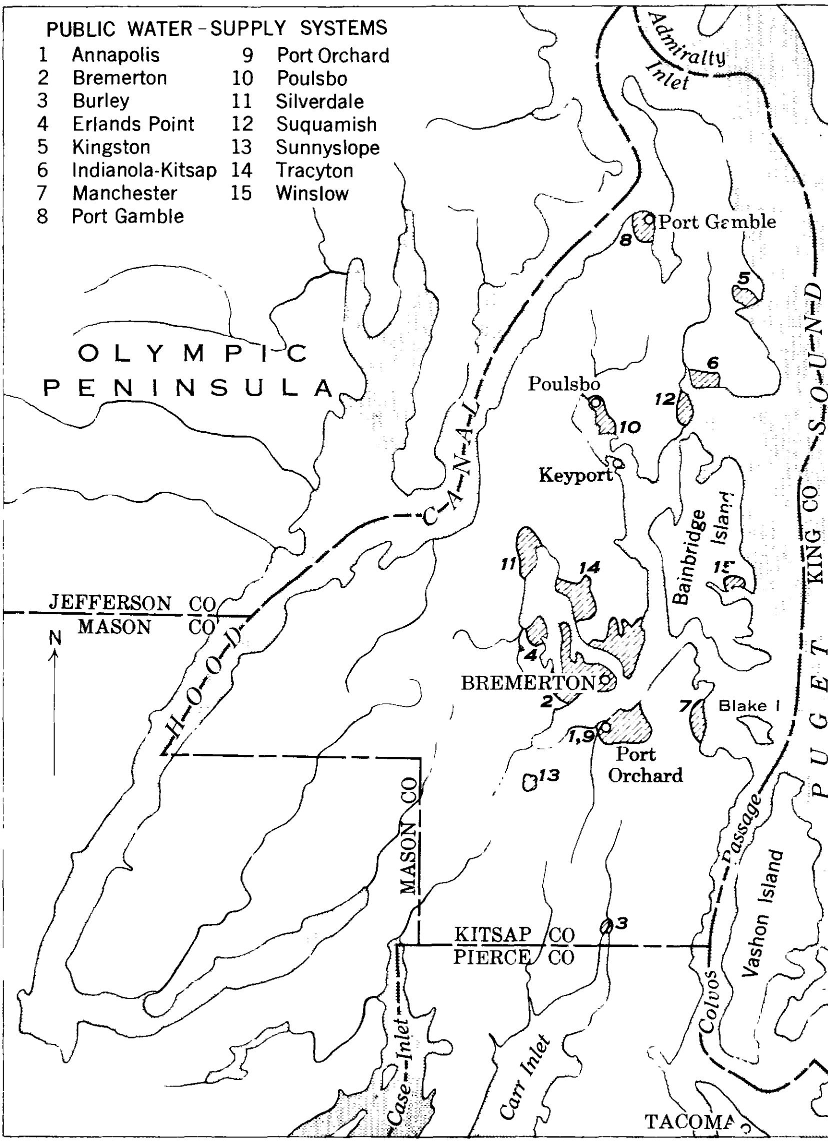

FIGURE 24.—Map of Kitsap County, Wash., showing areas supplied by the larger public water-supply systems.

short. Figure 25 shows the amount of ground water utilized by the Bremerton system during the years 1947–49. The diversion from Anderson Creek is included in the amounts shown on this figure, as the diversion from Anderson Creek represents essentially spring discharge.

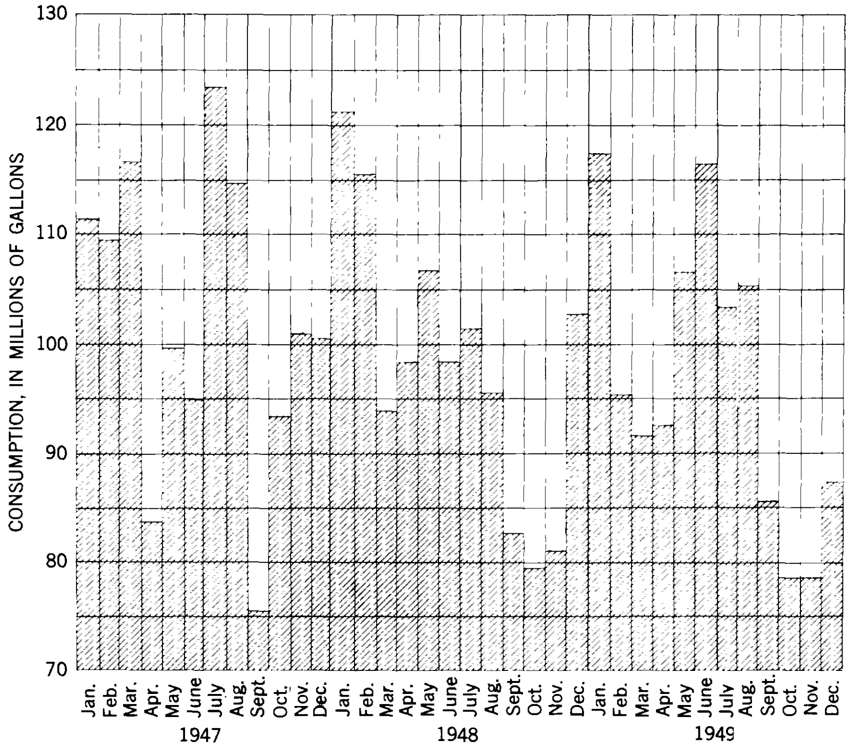

FIGURE 25.—Ground-water consumption by the city of Bremerton, Wash., 1947–49.

Information concerning many of the smaller water-distribution systems is tabulated below; the locations are shown on figure 24.

TABLE 3.—*Public water-supply systems*

[Data from State Department of Health, and water-district authorities]

Water-supply system	Source of water	Storage capacity (gallons)	Population served	Approximate average consumption (gallons per day)
Annapolis	Well	200, 000	1, 500	120, 000
Burley	Well	8, 500	60	
Erlands Point	Spring	125, 000	532	40, 000
Kingston	Wells	70, 000	343	15, 000
Indianola-Kitsap	Well, spring, stream	35, 000	700	
Manchester	Well	43, 000	450	30, 000
Port Gamble	Springs	400, 000	500	250, 000
Port Orchard	Wells	250, 000	3, 275	860, 000
Poulsbo	Springs	165, 000	1, 275	70, 000
Silverdale	Spring	80, 000	1, 500	70, 000
Suguamish	Wells	228, 000	825	35, 000
Sunnyslope	Well	25, 000	400	
Tracyton	Stream and spring	50, 000	400	25, 000
Winslow	Well		600	

INDUSTRIAL SUPPLIES

There is only limited utilization of ground water for industrial use in the county, as most industries rely on municipal supplies. The U. S. Navy, which operates several industrial installations in the county, is the largest industrial user of ground water. The installations of Manchester, Keyport, Bangor, and Bainbridge Island all utilize ground water. The Puget Sound Naval Shipyard obtains water from the city of Bremerton but has a large capacity well (24/1–23E1) for standby purposes.

Other industrial users of ground water include the Commercial Ship Repair Co. at Winslow (25/2–26P1), the West Coast Wood Preserving Co. at Creosote (25/2–35H2, H3), and the Callison's Evergreen Co. at Port Orchard (24/1–26K2). The overall use of ground water for industrial purposes in the county is small compared to domestic and municipal uses.

IRRIGATION SUPPLIES

It is the general opinion among agriculturalists that the proper addition of about a foot of water per year to areas in western Washington will at least double the yield of summer and fall crops and increase pasturage by an even greater amount. It has been estimated that under these conditions a minimum yield of about 5 gallons of water per minute per acre under irrigation should be available. The following table shows that the typical farm in Kitsap County ranges in size from 10 to 29 acres.

TABLE 4.—*Number and size of farms in Kitsap County, Wash.*

[Data from U. S. Census of Agriculture, v. 1, pt. 32, 1945]

Size of farms (acres)	Number of farms (1940)	Number of farms (1945)	All land in farms (acres) (1945)
Under 3	18	109	163
3 to 9	563	464	2, 596
10 to 29	1, 061	810	12, 425
30 to 49	278	203	7, 492
50 to 69	70	63	3, 546
70 to 99	62	63	5, 062
100 to 139	26	27	3, 062
140 to 179	13	9	1, 420
180 to 219	5	2	378
220 to 259	3	5	1, 195
260 to 379	3	3	823
380 to 499			
Total	2, 102	1, 758	38, 162

Such average-sized farms, if completely under cultivation, would require wells having minimum capacities of 50 to 145 gallons per minute. Larger farms would require proportionally greater amounts of water. At present there is very little irrigation with ground water in Kitsap County.

ECONOMIC FEASIBILITY OF IRRIGATION WITH GROUND WATER

The economic feasibility of developing irrigation water from ground-water sources is dependent upon many factors. Pumping cost, an important factor to be considered, will be dependent upon the depth to water and the specific capacity of the well. A well that is economically feasible to pump for the irrigation of an intensified crop may be uneconomical to pump for irrigation of a field crop. Often, though, irrigation may mean the difference between having and not having a crop.

METHODS OF DEVELOPMENT

One of the first sources of ground water for irrigation to be considered is the existing supply. It was found during the course of this investigation that practically none of the domestic wells had been adequately tested for capacity. Many of these might be satisfactory for the development of moderate irrigation supplies.

If irrigation is being considered and existing supplies are found to be unsuitable, a new well may be necessary. If a large yield is required it may be advisable to drill a small-diameter test well prior to the construction of a production well. To obtain the most data possible, the test well should be accurately logged as to depths and thickness of fine- and coarse-grained materials, and each promising aquifer should be tested. When it is known from what depths sufficient supplies can be developed, the test well can be enlarged to a larger diameter, or another well can be drilled nearby. A screen of proper slot size, or an adequately perforated liner, can then be installed in the water-bearing zone and the well adequately developed. If in the test well sufficient permeable materials are not encountered, the casing can be reclaimed and the owner will not lose the higher cost of an unsuccessful larger diameter well.

In some places several wells may be required to irrigate a given tract of land. The stratigraphic data indicate that in many places it may be wiser to develop several shallow wells each yielding 50 to 100 gallons per minute rather than attempt construction of one well to great depth in the hope of obtaining a larger supply.

CHEMICAL CHARACTER OF THE GROUND WATER

Precipitation consists of water distilled by nature. It generally is low in dissolved mineral matter, usually having absorbed only small quantities from the air. Precipitation that flows over or enters the ground dissolves mineral matter from the soil and rocks with which it is in contact. The amount and kind of dissolved minerals determine the water's hardness, alkalinity, corrosiveness, scale-forming properties, and other chemical characteristics.

In general, most of the ground water in Kitsap County is low in dissolved minerals and is satisfactory for domestic, irrigation, and most industrial uses.

A number of 4-ounce water samples were collected, of which 383 were tested for hardness and 390 for chloride content. The results of these tests are given with the records of representative wells in table 5. Thirty comprehensive chemical analyses of ground water are given in table 7. Analyses were made by the U. S. Geological Survey, U. S. Navy, and commercial laboratories.

HARDNESS

The soap-consuming property of water is known as hardness. It is the calcium carbonate ($CaCO_3$) equivalent of calcium, magnesium, and other individually determined cations having similar soap-consuming and encrusting properties. The following table shows the hardness scale that is generally used by the Geological Survey.

Hardness scale in use by the U. S. Geological Survey

Hardness as $CaCO_3$ (ppm)	Degree of hardness
0–60	Soft
61–120	Slightly hard
121–200	Hard
Above 200	Very hard

A total of 383 ground-water samples from Kitsap County were tested for hardness by the soap or the versenate method. Of these, 248 had a hardness of less than 60 parts per million and were classified as soft, 119 were slightly hard, 9 were hard, and 7 were very hard. Of the 30 additional samples listed in table 7, 7 were soft, 19 were slightly hard, 2 were hard, and 2 were very hard.

Six of the eleven samples that were classified as very hard were from wells in the extreme northern part of the county. The hardness of the ground water reflects the relative abundance of calcareous and magnesian minerals in the Pleistocene sediments in that area.

It should be noted that most of the comprehensive chemical analyses (table 7) were made of samples taken from deep industrial and municipal wells, whereas the other hardness determinations were chiefly from shallower domestic wells. The difference in the proportion between the soft and slightly hard waters of these two groups seems to indicate that there is some increase in hardness with depth.

CHLORIDE

Practically all ground water contains a certain amount of chloride because most of the chloride salts are readily soluble. Chloride tests were made on 390 ground-water samples collected throughout the county. Of these, 340 had a chloride content of 10 parts per million or less, and only 5 had more than 100.

The recommended limit of the Public Health Service (1946) for chloride in drinking water is 250 parts per million. However, water having a higher chloride content is widely used in areas of the country where better water is not available. According to Scofield (1933), the chloride content of irrigation water should not exceed 355 parts per million, as a greater concentration may be injurious to most crops.

IRON AND MANGANESE

Ordinarily, iron occurs in ground water in low concentrations. It remains in solution and the water is clear until exposed to the oxygen in the air, whereupon the iron is oxidized to the ferric state and precipitated as the hydroxide ($Fe(OH)_3$) or oxide (Fe_2O_3). This precipitate causes the brownish or reddish stains that occur on porcelain fixtures, laundry, and other materials with which the water comes in contact.

The United States Public Health Service recommends that the concentration of iron (or iron and managnese together) be kept under 0.3 part per million. Water having a greater concentration is not injurious to health but will generally be unsatisfactory, owing to staining.

Of the 30 samples for which iron was determined (table 7), 11 had concentrations greater than the amount recommended for satisfactory domestic use. This appears to be a much higher proportion than apparently occurs in the shallower domestic wells of the county, on the basis of reports of water users.

Manganese when present in water in even small concentrations has staining characteristics similar to those of iron except that the stain is black. Of the 14 manganese determinations given, half showed zero concentrations and half showed at least a trace; of the latter, 4 were high enough to cause staining.

Most iron- and manganese-bearing waters can be treated so that they will become satisfactory for domestic use. This is usually accomplished by aeration and filtration. Aeration exposes the water to the oxygen of the air, and the iron and manganese are largely precipitated. The water is then passed through a filter, commonly sand or charcoal, where the precipitate is removed.

Iron-bearing waters can become contaminated with colonies of iron-depositing bacteria. Their accumulation and decomposition may result in clogging of water pipes and in giving the water a bad taste and odor. Such contamination may necessitate the removal of iron before the water enters the distribution system.

FLUORIDE

According to Dean (1936), if water that has a fluoride content in excess of 1 part per million is used for drinking during periods of tooth development, chalkiness or brown mottling of the tooth enamel may result. However, if small concentrations of fluoride are used at such times, the teeth tend to become permanently resistant to decay (Dean, 1938). Use of water containing fluoride after the permanent teeth are formed is believed to have comparatively little effect on teeth. Nine fluoride determinations are given in table 7. These ranged from 0.0 to 0.3 part per million.

GASEOUS IMPURITIES

Many of the deeper wells of the county yield water that has a noticeable odor of hydrogen sulfide gas (H_2S), commonly called "rotten-egg gas." The source of this gas probably is the peaty materials that occur in some zones of the older Pleistocene sedimentary materials. Simple aeration of the water is an effective method of removing hydrogen sulfide.

A few wells were reported to have produced small quantities of gas during their construction. Methane (CH_4), or marsh gas, and other gases are commonly produced by decomposing peat or woody materials, and persons digging or constructing wells should take precautions to prevent accidents that might be caused by accumulation of gas in unventilated places.

OTHER DETERMINATIONS

The acidity or alkalinity of water is expressed as the pH factor, which is the logarithm of the reciprocal of the hydrogen-ion concentration and indicates the relative concentration of the hydrogen ion (H^+) and the hydroxyl ion (OH^-). The pH scale theoretically starts at 0, at which a solution would be a strong acid containing 1 gram per liter of ionized hydrogen, and extends to 14, at which it would be a strong alkali containing 17 grams per liter of the hydroxyl ion. Water having a pH of 7 is neutral. Water having a low pH is corrosive to tanks and pipes. Most water having a high pH is scale forming.

The pH was determined for 27 of the water samples listed in table 7.

Of these, 25 had a pH above 7 and thus were slightly alkaline. Two had a pH slightly below 7.

The amount of dissolved mineral matter present in water can be indicated in several ways. These include the measurement of the electrical conductivity of the water, the determination of the total equivalents of anions (negative ions) or cations (positive ions) present, or the gravimetric measurement of the dissolved solids.

The United States Public Health Service recommend 500 parts per million as the maximum permissible limit of "total dissolved solids" in satisfactory drinking water (1,000 permitted if better water is not available). Concentrations of dissolved solids are reported for 29 samples in table 7. Of these, 24 are below 200 parts per million, and only 1 sample of slightly brackish water from well 28/2–22B1 exceeded 1,000 parts per million.

Silica is present in small amounts in practically all ground water. When present in the higher concentrations it may contribute to the formation of hard boiler scale. The amounts of silica listed in table 7 range from 13 to 50 parts per million. These higher concentrations may indicate a tendency to form boiler scale.

SUITABILITY FOR IRRIGATION

A diagram for classifying irrigation water as to quality (see fig. 26) from the standpoint of percentage of sodium and dissolved solids was devised by Wilcox (1948). The percentage of sodium plotted against the concentration of dissolved solids on this diagram indicates the suitability of the water for irrigation purposes, so far as those characteristics are concerned.

The percentage of sodium is calculated from the sodium, potassium, calcium, and magnesium contents, expressed in equivalents per million, according to the formula $\frac{100\ Na}{Na+K+Ca+Mg}$=percent sodium.

To convert parts per million to equivalents per million for the constituents, divide sodium by 23, potassium by 39.1, calcium by 20, and magnesium by 12.2.

Twenty analyses of ground water from Kitsap County have been plotted on this diagram. They all fall within the "excellent" classification except the sample from well 28/2–22B1, which falls in the "permissible to doubtful" category. As most of the sodium contents were computed rather than determined, they include the sodium equivalent of the small amounts of potassium that doubtless were present in the samples. Thus, the actual percentage of sodium is slightly lower than the calculated percentage indicated.

The water classified as doubtful (28/2–22B1) might safely be used in areas of well-drained permeable soil that receive large amounts of

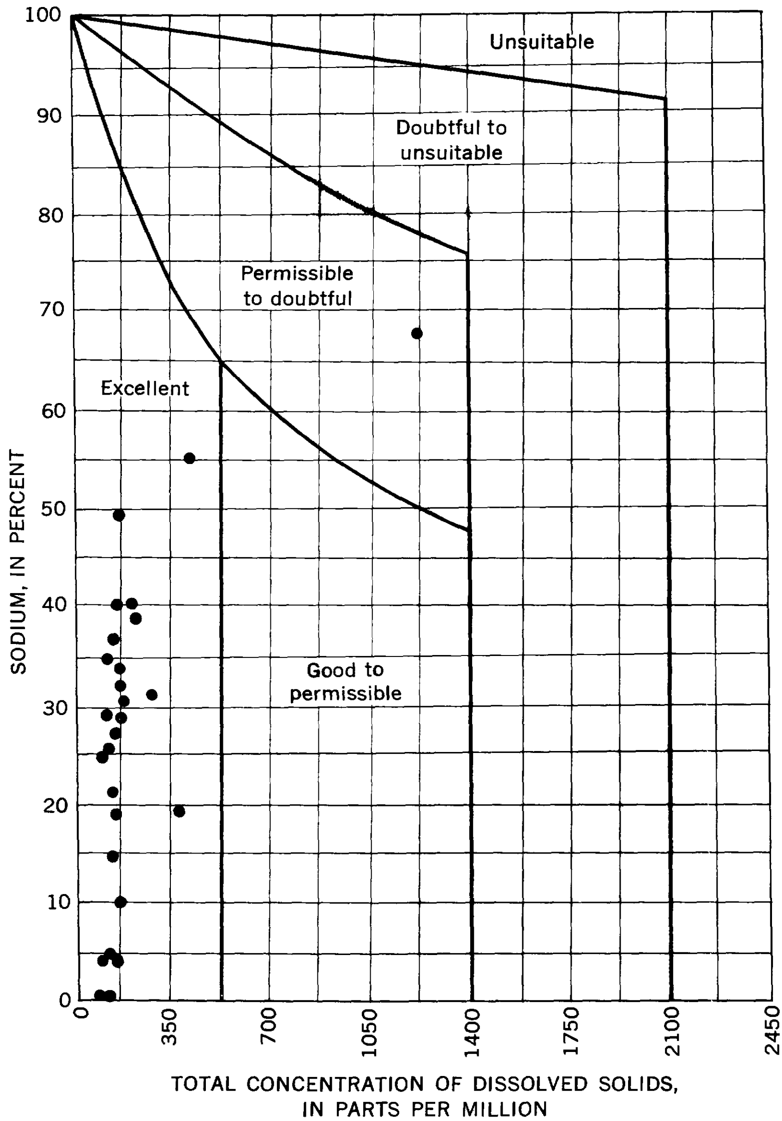

Figure 26.—Diagram for classifying irrigation water as to quality from chemical analysis (after Wilcox). Points indicate quality of tested ground-water samples from Kitsap County, Wash.

seasonal precipitation. Such precipitation would tend to dissolve and flush out the soluble salts that accumulate during season when irrigation is required.

Boron (B) is another constituent of ground water that is required by plants in very small quantities, but is toxic and injurious to plants in concentrations even slightly above the optimum (Wilcox, 1948).

A concentration of boron as low as 1 part per million in irrigation water may be injurious to the boron-sensitive crops. No boron determinations have been made of ground-water samples collected in Kitsap County, but no boron damage is known to have occurred in irrigated crops and gardens.

TEMPERATURE

Ground water has a nearly constant temperature, which in the first 200 feet below the land surface closely approximates the mean annual air temperature. Water that occurs at depths usually shows an increase in temperature that corresponds to the increase in earth temperature with depth. The measured range of ground-water temperatures in Kitsap County was 48°–52°F.

TABULATED WELL DATA

During the course of this investigation, more than 1,200 wells were examined. Information concerning 1,146 of these is listed in table 5. Of these, 565 were dug, 570 were drilled, 5 were jetted, 2 were bored, and 1 was driven. Three deep oil test wells also are listed.

The dug wells in the county greatly exceed in number those constructed by other methods. More attention was given to the collection of data concerning drilled wells, hence a higher proportion of the drilled wells is described. The shallowest water well described is a 5.4-foot dug well (22/1–12D1), and the deepest is a 2,000-foot drilled well (24/1–23E1).

The average depth of the dug wells described is 29 feet, of the drilled wells, 177 feet, and of the jetted wells, 332 feet. The great average depth for the jetted wells, of which there are only a few, is due to the depth of the jetted wells in the Burley artesian basin.

Logs of 221 wells are given in table 6. These were collected from well drillers, diggers, owners, and operators.

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TABLE 5.—*Records of representative wells in Kitsap County, Wash.*

[Well: Location shown on plate 2.
Topography and approximate altitude: S, slope to major drainage valleys or to Puget Sound; U, rolling upland; V, valley. 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; J, jetted.
Depth and water level: Measurements expressed in feet and decimal fractions of feet were made by the Geological Survey; those in whole feet or common fractions of feet were reported by owner, tenant, or driller. 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: A, air-lift; B, bucket; C, large capacity centrifugal; F, flow; G, gravity; J, deep-well jet; N, none; P, deep-well piston; S, suction; Sc, screw; T, turbine.
Use of water: D, domestic; F, fire-protection; Ind, industrial; Inst, institutional; Irr, irrigation; PS, public supply; S, stock; NU, not in use; De, destroyed.
Remarks: dd, drawdown; gpm, gallons per minute; temp., temperature; L, log in table 6; A, analysis in table 7; H_2S, hydrogen sulfide gas]

Well No.	Owner or tenant	Topography	Approximate altitude above sea level (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing zone(s)			Water level		Pump		Use of water	Quality of water		Remarks
								Depth to top (feet)	Thickness (feet)	Character of material	Below land-surface (feet)	Date of measurement	Type	Horsepower		Chloride (parts per million)	Hardness, as $CaCO_3$ (parts per million)	
T. 22 N., R. 1 W.																		
11J1	Union Oil Co.	U	390	Dr	352	6	352	285	5	Sand and gravel	116	9- -49	N	----	NU (Ind)	4	30	Dd 1 ft pumping 16 gpm; L.
11J2	do	U	390	Dr	6,700	----	----	----	----	----	----	----	----	----	----	----	----	Oil test; 700 ft of unconsolidated material above Tertiary volcanic rock.
12H1	W. Nearhoff	U	340	Dg	67	72	6	----	----	----	54	4- -49	P	----	D, S	6	45	
T. 22 N., R. 1 E.																		
1B1	A. W. Pierson	U	220	Dg	15.8	30	15.8	----	----	----	9.56	7-30-49	S	1/4	D, S	5	30	
1E1	G. N. Shattuck.	V	65	Dg	7.2	30	7.2	----	----	----	3.51	7-16-49	S	1/3	D, S	4	50	
1M1	E. W. Larsen	V	30	Dg	8.5	40	8.5	----	----	Sand	2.41	7-15-49	S	1/4	D	5	55	
1M2	E. P. Eberle	V	40	Dr	62	6	62	55	7	Sand and gravel	Flows	7-15-49	S	3/4	D, S	5	50	L.
1N1	T. L. Ferguson.	V	25	J	402	2	200	396	6	Sand, fine	+113	7- -49	F	----	D	3	50	Water reported to have slight odor of H_2S; L.

TABLE 5.—*Records of representative wells in Kitsap County, Wash.*—Continued

Well No.	Owner or tenant	Topography	Approximate altitude above sea level (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing zone(s): Depth to top (feet)	Water-bearing zone(s): Thickness (feet)	Water-bearing zone(s): Character of material	Water level: Below land-surface (feet)	Water level: Date of measurement	Pump: Type	Pump: Horsepower	Use of water	Quality of water: Chloride (parts per million)	Quality of water: Hardness, as $CaCO_3$ (parts per million)	Remarks
T. 22 N., R. 1 E.—Continued																		
1N2	S. Foster	V	25	Dg	8	30	8	3	3.5	Gravel	3.0	7-14-49	S	¼	D	8	80	Sand below aquifer.
1P1	B. Flanders	V	80	J	337	2	337				Flows		F		D, S			Water reported to have slight odor of H_2S.
2A1	D. Shattuck	V	85	Dg	8.6	30	8.6			Sand	6.2	7-16-49	S	¼	D	4	70	
2B1	D. L. Lake	V	125	Dg	17.9	48		15	2	Sand and gravel	14.1	8-31-49	S	¼	D	6	50	
2B2	R. Hearm	V	130	Dg	12.8	30	12.8				10.2		S	¼	D, S	13	65	
2D1	L. S. Gross	U	300	Dr	66	6	60	52	14	Gravel, fine	28.6	5-15-50	J		D			L.
2J1	Mrs. A. C. Allen.	V	40	Dg	10	48				Sand	4		S	¼	D	8	60	
2Q1	G. Delmendo	S	80	Dr	144	6	144				49	6-25-50						
2R1	R. Stevens	V	30	Dr	387	2	200			Sand, fine	+94	12-14-49	F		D	4	45	Water reported to have slight odor of H_2S.
3L1	Mrs. Ida Miller.	U	350	Dg	18	48	18			Sand	13		S		D	5	35	Reported to be low in summer.
3L2	G. P. Lund	U	360	Dg	9.8	48					9.1	8-30-49	S		D	5	35	
3R1	W. H. Hall	U	235	Dg	22	36				Gravel and sand	18.8	8-31-49	J	¼	D, S	13	70	
3R2	E. Rivard	U	240	Dg	14.5	48	4	14	.5	Sand, fine	12		S		D	6	45	
3R3	W. H. Hall	U	235	Dr	108	8	108	96	12	Gravel	30	1952	J	5	D, Irr			Dd 50 ft after 12 hours pumping 70 gpm; L.
4B1		U	305	Dg	30.8					Sand, fine	27.9	9- 1-49	P		D			
4D1	G. Carter	U	350	Dg	55.3	48		49	5.3	Sand	48.4	9- 2-49	J	½	D			46 ft of till above aquifer.
4E1	E. Jones	U	340	Dg	51.2	42				Sand, fine	48.0	9- 1-49	J	½	D, S	5	25	
4M1	A. Crawford	U	340	Dr	99	6					74	1946	J	1	D			
4M2	A. C. Green	U	350	Dr	98	6	98				44	1943	J	1	D, S	4	35	
4N1	— Curtis	U	340	Dr	432	6	432						N		De			Permeable materials not encountered.
4N2	do	U	300	Dr	93	6	90	90	3	Gravel and sand	43	7- -49	P	3	D, S	4	50	Screened from 90 to 93 ft.

4N3	do	U	300	Dr	229	6		90	1	do	43	7- -49	N		NU(D)			Originally 91 ft deep, damaged by earthquake and deepened to 229 ft; permeable materials not encountered.
4Q1	G. C. McNulty.	U	245	Dg	12.9	30	12.9				10.8	9- 2-49	S	1/4	D			
5B1	J. E. Edholm	U	340	Dg	24	60				Gravel	11.1	9- 7-49	S		D	4	25	
5J1	H. Miner	U	305	Dr	74	6	74			Gravel, fine	24		J	3/4	D, S			
6R1	R. M. Smith	U	440	Dg	18.3	48					16	9-9-49	S		D, S			
7K1	A. F. Myers	U	370	Dg	23	36	5			Sand	21.3	9- 7-49	S	1/4	D, S			
8A1	M. J. Hunter	U	290	Dg	31	31	36			do	26	1944	J	1/6	D, S	11	100	
8H1	W. M. Nearhoff.	U	305	Dg, Dr	100	6	80	80	20	Sand and gravel			J	1/2	D			Screened from 80 to 100 ft. L.
8J1	G. R. Mortenson.	U	290	Dr	229	6	229	220	9	Gravel			J	2	D, S	5	45	
9C1	A. Ward	U	310	Dg	22	48				Gravel and sand	14.4	9- 1-49	N		D	5	20	Supply reported to be inadequate in late summer.
9D1	Mrs. L. Gilson	U	305	Dg	18	36	18			Sand	16		J	1/3	D			
9E1	L. V. Raymond.	U	305	Dg	62.8	36				do	57.5	9- 1-49	J	1/2	D	5	40	
9G1	C. C. Bleam	U	245	Dg	24					Gravel, coarse	18	9- 1-49	J	1/3	D	4	45	
9M1	—Hoy and —Stow.	U	300	Dr	183	6	183			Gravel	60	1943	J	1	D, S	6	40	
9N1	H. H. Newman.	U	240	Dg	14.6	30				do	12.3	9- 1-49			D	6	50	
10B1	Mrs. B. Kast	U	290	Dg	12	36					7.8	8-19-49	S	1/4	D	5	65	
10F1	Mrs. P. Rasmussen.	U	280	Dg	18					Gravel	12	9- -49	S	1/4	D, S	4	25	
10H1	M. D. Smith	U	265	Dg	20					Sand	19.0	8-30-49	J	1/3	D	4	40	
10M1	V. H. Raymond.	U	340	Dg	47	36	12	41	6	Sand	43.5	8-30-49	J	1/3	D	5	55	
10M2	V. Kieffer	U	335	Dg, Dr	123	6	123			Gravel, coarse	78		J	1	D	5	55	Dug to 52 ft; L.
10N1	W. H. Franke	U	315	Dg, Dr	112	6	112			Gravel and sand	63.5	8-30-49	J	1/2	D	6	50	Dug to 54 ft.
10P1	I. Ostrom	U	280	Dr	200	6	200			Gravel	20	10-17-44	J	3/4	D	6	45	
10Q1	W. P. McConnell.	U	270	Dr	79	6	79			Gravel and sand	8	10-17-44	J	1	D	6	45	
11A1	Burley Improvement Club.	V	50	J	404	2	404				+89	1947	F		PS	3	45	Supplies 18 families.
11F1	O. Cummins	S	170	Dg	39					Sand	34	1945	J	1/2	D	5	50	
11G1	T. Emery	S	120	Dg	33.5	40					29.0	8-31-49	J	3/4	D	6	60	
11H1	G. W. McKelvy.	S	85	Dg	13	36					9.9	8-31-49	S	1/4	D	5	50	
11Q1	Mrs. R. J. Valley.	S	100	Dg	8	48				Sand	3		G		D	6	55	
11Q2	W. C. Novum	S	130	Dg	15					Gravel and sand	1		S	1/4	D, S			
12D1	J. E. Truax	V	30	Dg	5.4	33					4.4	7-13-49	S	1/4	D	4	75	
12D2	E. Knapp	V	25	J	353	2	343	343	20	Sand	+105		F		D, S	3	40	Water temp. 51° F.; has faint odor of H_2S; L.
12D3	E. C. Hatch	V	25	Dr	485	6		385		do	+89	4-10-50	F		D, S	3	45	Water reported to have faint odor of H_2S.

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TABLE 5.—*Records of representative wells in Kitsap County, Wash.*—Continued

Well No.	Owner or tenant	Topography	Approximate altitude above sea level (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing zone(s): Depth to top (feet)	Water-bearing zone(s): Thickness (feet)	Water-bearing zone(s): Character of material	Water level: Below land-surface (feet)	Water level: Date of measurement	Pump: Type	Pump: Horsepower	Use of water	Quality of water: Chloride (parts per million)	Quality of water: Hardness, as $CaCO_3$ (parts per million)	Remarks
T. 22 N., R. 1 E.—Continued																		
12J1	S. Coltrell	U	180	Dg	16.9					Till	12.3	7-16-49	S	¼	D	4	20	
12K1	E. Bendix	U	180	Dg	6.5	51	6.5			Gravel and sand	1.0	7-16-49	G		NU(D)	4	50	
12N1	E. Black	S	20	Dr	220	6	220			Sand	+101	1944	F		D			Reported to flow 600 gpm; water reported to have faint odor of H_2S.
12Q1	C. C. Colony	U	140	Dg	23.8	30	23.8			Gravel	16.9	7-16-49	S	¼	D	5	65	
12R1	do	S	105	Dg	19.5	48	19.5			Sand and gravel	10	7-16-49	S	¼	D, S	10	65	
12R2	A. Stiner	S	120	Dg	18	30	18	8	10+	Sand and gravel	9	7-16-49	S	¼	D	9	70	L.
T. 22 N., R. 2 E.																		
3D1	M. S. Beeman	S	355	Dg	26.2	30				Sand and gravel	17.2	7-26-49	S		D, S	4	25	
3D2		U	365	Dg	26.2	30					Dry	9-9-49	N		NU(D)			
3E1	O. L. Willingham.	S	320	Dg	8.5					Sand and gravel	6.4	7-26-49	S	⅙	D	5	45	
3F1	J. Thompson	S	300	Dg	9					do	2		S		D	4	30	
3L1	C. Pfundt	S	75	Dg	34.7	38					17.1	7-26-49	P	¼	Irr	5		Irrigates small garden.
3M1	A. Hansen	V	15	Dg	8	36				Sand and gravel	4	7-26-49	S	¼	D	6	80	
3N1	C. F. Nelson	S	55	Dg	45	36				do	41		P	¼	D	7	85	Clay above aquifer.
3N2	P. B. Johnson	S	60	Dg	65	32				Gravel	59		P	½	D	8	50	Clay and sand above aquifer.
4A1		S	320	Dg	14.9	72	14.9			Sand	10.2	7-26-49			D			
4B1	E. V. Carlson	S	110	Dg	16.6	30					14.3	7-27-49	J	¼	D	7	50	
4C1	H. Ohman	S	145	Dg	13.5	42					9.8	7-28-49	G		D, S	5	25	
4C2	do	S	160	Dg	10.4	36	10.4				8.4	7-28-49	G		D, S	5	20	
4C3	M. H. Dale	S	100	Dg	15.6	48					9.4	7-28-49			D			
4C4	A. Lunde	S	120	Dg	9						6.1	7-28-49	S	¼	D			
4E1	A. Johnson	S	100	Dg	15.8	84	14.8	10	5.8	Sand	10.3	7-29-49	S	½	D, S	6	45	

4H1	L. B. Hintain	S	90	Dg	9	120				Gravel	2		G		D	7	45	
4J1	C. N. Herd	S	20	Dg	7.2	36	6			Sand and gravel	4.5	7-27-49	S	1/2	D, Ind	7	45	Supplies Evergreen processing plant.
4K1	E. Winslow	S	60	Dg	6.6	72				do	5.2	7-20-49	S	1/6	D, S	4	55	
4K2	H. E. Winslow.	S	60	Dg	10.7			8	2.7	Sand	7.3	7-20-49	S	1/4	D	4	65	
4M1	L. Hire	S	200	Dg	11.8	30					9.0	7-28-49	S	1/4	D	9	55	
4N1	N. Chekmaroff.	U	270	Dg	31.4	30							P	1/2	D, S	5	45	
4R1	L. L. Coan	U	135	Dg	15.1	36	3				10.3	7-20-49	N		NU(D)	6	45	Supply reported inadequate.
4R2	do	S	120	Dg	13.8	30	13			Sand	9.9	7-20-49	S	1/4	D	6	55	
5B1	G. F. Stratton	S	115	Dg	22.6	30	22.6			do	17.3	7-29-49	S	1/4	D	4	50	
5D1	H. Hedberg	U	290	Dg	6.1	30				do	1.1	7-29-49	S	1/4	D	6	55	
5E1	L. Blackman	U	315	Dg	16.5						8.8	7-29-49	S		D			
5F1	W. Smith	U	315	Dg	13	24	13				7.8	7-29-49	N		NU(D)	5	70	
5G1	E. Melander	S	240	Dg	21.5	30		14	7.5+	Sand	16.1	7-29-49			D	6	60	
5G2	do	S	280	Dg	8.9	30	8.9	6	2.95+	do	.6	7-29-49	N		NU(D)	9	60	
5J1	I. Erickson	U	250	Dg	18.6	30	5	18	.6+	do	15.5	7-28-49	P		D	6	40	
5K1	L. Olsen	U	310	Dg	23.4	60	3	10	13.4+	do	12.8	7-29-50	S	1/4	D	5	35	10 ft of soil and till above aquifer.
5K2	L. Grevstad	U	310	Dg	26	36	4			Till(?)	19	1949	S	1/4	D	16	70	
5L1	G. Blandford	U	320	Dg	16.0	48	5			Gravel	12.6	7-29-49	S		D	6	45	Soil and till above aquifer.
5P1	Mrs. Abersol	U	325	Dg	35.4	36					24.4	7-29-49	N		NU(D)	5	20	
6B1	H. G. Chrisman.	U	325	Dg	34.8	30	19	12	12	Gravel, coarse	5.4	7-29-49	G		D	5	60	
6C1	J. Pederson	U	290	Dg	22.9	36	22.9				18.6	7-30-49	S	1/4	D	7	40	
6M1	S. Roberts	S	330	Dg	20	36				Sand	11.2	7-12-49	S	3/4	D, S	3	55	Reported to go dry in December of some years.
7E1	M. S. Cady	S	150	Dg	17.5	30				do	9.2	7-16-49	S	1/4	D	4	45	
7E2	J. Khal	S	200	Dg	22.6	32	22.6				9.8	7-18-49	S		D	2	60	
7H1	M. Strong	U	350	Dg	87					Sand	59.8	7-18-49	P	3/4	D	7	45	Sand reported for entire depth.
7H2	G. R. Mobley	U	370	Dg	68.1					do	65.7	7-18-49			D	4	40	
8A1	L. Heger	U	280	Dg	27.2	30	8				25.7	7-19-50	J	1/8	D	5	50	Till above aquifer.
8C1	A. Doserich	U	330	Dg	50.0	32		34	16	Sand	38.7	7-19-50	P		D	4	30	16 ft sand and gravel and 18 ft of till reported above aquifer.
8C2	W. Berdan	U	340	Dg	65	60					43.5	7-19-50	P		D	4	25	Till near surface.
8D1	R. N. Hart	U	350	Dg	55					Gravel and sand	44.6	7-18-49	J	1/8	D	22	130	
8E1	M. R. Mercer	U	365	Dg	82	30		81	1	Gravel	79	11- -49			D			L.
8M1	A. Jessen	U	390	Dg	56	36		40.5	15.5	Sand	57		P	2	D, S	5	35	L.
8M2	A. B. Cattleman.	U	385	Dg	27.8			11	16.8	Gravel, coarse	25.9	7-19-49	N		D	5	30	11 ft of sand above aquifer reported.
9C1	L. Harrell	U	275	Dg	26.6	36		26	.3	Gravel seam in till.	20.2	7-20-49	P	3/4	D	5	35	
9E1	C. Nelson	U	295	Dg	14.3	24					6.7	7-20-49	S	1/6	NU(D)	7	115	
9E2	G. Wright	U	270	Dg	18.3	60	3			Till	11.7	7-21-49	S	1/6	D	6	40	Till for entire depth.
9F1	E. Stacklin	U	250	Dg	16.9	36				Till(?)	11.2	7-21-49	P		D	5	25	
9G1	L. Heyer	U	200	Dg	77.3	48	1.5				74.2	7-25-49	N		NU(D)			
9H1		S	90	Dg	16.7	60					Dry	7-21-49	N		NU(D)			
9M1	D. Balduzzi	U	290	Dg	11.6					Sand and gravel	7.1	7-12-49	S	1/4	D	5	55	
9M2	M. Grevsted	U	270	Dg	17.8	48				Sand	10.4	7-21-49	S	1/6	D, S	5	40	

TABLE 5.—*Records of representative wells in Kitsap County, Wash.*—Continued

Well No.	Owner or tenant	Topography	Approximate altitude above sea level (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing zone(s): Depth to top (feet)	Water-bearing zone(s): Thickness (feet)	Water-bearing zone(s): Character of material	Water level: Below land-surface (feet)	Water level: Date of measurement	Pump: Type	Pump: Horsepower	Use of water	Quality of water: Chloride (parts per million)	Quality of water: Hardness, as $CaCO_3$ (parts per million)	Remarks
T. 22 N., R. 2 E.—Continued																		
9P1	F. Hoidal	U	260	Dg	19.1	36				Till	13.6	7-25-49	S		D			
9P2	C. Sholund	U	270	Dg	13.5	30				Till	10.3	7-25-49	N		NU(D)	5	60	Water reported to contain iron.
10D1	J. B. Starr	S	80	Dg	23.8						23.0	7-20-49	N		NU(D)	8	40	Supply reported inadequate in late summer.
10D2	P. A. Tramontin.	S	55	Dr	68	6	68			Sand	54	7-25-49	J	¼	D	5	45	
10D3	do	S	50	Dr	60.6	6	60.6			do	45.5	7-25-49	N		NU(D)			
T. 23 N., R. 1 W.																		
1P1	Rodeo Inc	U	420	Dr	151	6	151	145	5	Sand	90	5- -49	J	3	D			L.
1Q1	Mrs. G. Mattera.	U	390	Dg	28.8						26.7	3-28-40			NU(D)			Supply reported inadequate in late summer.
2D1	Mrs. M. Alkire	U	275	Dg	14.8					Sand	10.8		S	¼	D			
3A1	L. L. Jones	V	225	Dg	7.8						2.6	4- 9-40	J	¼	D			
3F1	G. S. Minard	V	205	Dg	8.6						5.3	7-19-50	S	¼	D			
3L1	J. F. Hampton.	V	175	Dg	9.4	30				Gravel	6.9	7-25-50	S	¼	D			
10D1	B. M. Short	S	160	Dr	116	6	116	106	10	Sand, coarse	17	Spring '50	N		D			New well, not yet in use; L.
10E1	H. R. Dittman.	V	135	Dr	146	6	145	145	1	Sand	27	8- -48	N		NU(D)			Abandoned owing to heaving sand; L.
11J1	Kitsap Co. Airport.	U	430	Dg	150	48		85	27	Gravel	115	3-18-40	N		NU(D)			Reported dd of 0.5 ft after 14 hr pumping 75 gpm; well abandoned after water supply from a spring was developed; L.

11K1	Unknown	U	440	Dg	20						Dry	4-18-40	N		NU(D)			
12C1	H. Earl	U	435	Dg	140	48	140	137	3	Sand and gravel	118	1941	J	1	D			L.
12D1	Bremerton Trap and Skeet Club.	U	430	Dg, Dr	163	6	163	131	9	Gravel	100	1939	P		D			L.
12Q1	D. Steele	U	480	Dg	15.4	36				Sand	12.1	9-14-49	S		D			Till above aquifer.
14P1		U	470	Dg		48					31.7	9-13-49	N		NU(D)			Till near surface.
15K1	H. A. Green	U	360	Dr	223	6				Sand	90	1947	P		D, S			Till near surface; screen installed at bottom.
15P1		U	310	Dg	14	60				Till	Dry	9-13-49			D			Reported to go dry in July; till at 4 ft.
25R1		U	340	Dg	17.4	60	2.5			Sand	14.5	9- 8-49	S		NU(D)			

T. 23 N., R. 1 E.

1B1	Young	U	330	Dr	62	6	62			do	36	1950			D			Dd 12 ft while bailing 30 gpm.
1E1	R. S. Frees	U	330	Dr	136	6	136	134	2+	Sand and gravel	27	9- 2-47			D			Supplies three families; L.
1E2	Shey	U	310	Dr	156	6				do	70	9- -50			D			
1G1	R. D. Russel	U	330	Dg	34	36				Sand and fine gravel.	21.7	5- 2-40	P	¼	D			Dd 0.5 ft reported after pumping 5 gpm for 24 hr.
1M1	R. L De La-Grange.	U	335	Dr	120	6	120			Sand	40	8- -49	J	½	D			
2A1	Ranch Restaurant.	U	270	Dr	189	6									D			Reported to yield small supply from about 65 ft; L.
2C1	R. Kline	U	300	Dg	60					do	48	7- -39	P	¾	D			
2C2	W. A. Hiersch	U	280	Dg	60.6	36	60			do	54.4	5- 2-40	J	½	D			
2C3	H. T. Marvin	U	300	Dr	370	6	370			do			P	2	D			
2C4	V. Thomas	U	280	Dg	54	36				do	40	9- -49	J	1	D			
2D1	E. Howe	U	305	Dr	388	6	388			Gravel			P	2	PS			Supplies 10 families.
2D2	W. F. Flein	U	280	Dg	22.1					Sand	17.4	5- 1-40	N		NU(D)			
2E1	E. Fischer	U	270	Dr	293	6				do	90		P	¾	D			L.
2E2	E. M. Schlenker.	U	280	Dg	30					do	14.1	5- 1-40	J	⅓	D			Till above aquifer.
2F1	F. P. Stewart	U	260	Dr	202	6				do			J	½	D			Supplies three families.
2G1	A. M. Pauker	S	300	Dg	13.1					Sand	3.9	5-18-50	S	¼	D			
2H1	A. Tabafunda	U	314	Dg	24.5	30					12.1	5-18-50	P	⅓	D			
2H2	K. Alderman	U	290	Dr	325	8	292	292	1	Sand, fine	175(?)	11- 7-50	N		NU(D)			Sand and clay above aquifer, and blue clay below; abandoned owing to fine sand.
2J1	O. Ramsey	U	315	Dr	76	6	76	71	5	Gravel	20	1949	J		D			L.
2J2	L. Ramsey	U	340	Dr	369	6					83.6	8-22-49	N		NU(D)			Permeable materials not encountered.
2M1	H. D. Baucom	U	280	Dr	206					do			N		NU(D)			Reported sand entered well; L.
2M2	Mrs. B. Bollman.	U	290	Dr	390	6	390			do	115	1949	P	¾	D			
2N1	O. T. Honey	U	200	Dr	100	3							P	½	D			

TABLE 5.—*Records of representative wells in Kitsap County, Wash.*—Continued

Well No.	Owner or tenant	Topography	Approximate altitude above sea level (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing zone(s): Depth to top (feet)	Water-bearing zone(s): Thickness (feet)	Water-bearing zone(s): Character of material	Water level: Below land-surface (feet)	Water level: Date of measurement	Pump: Type	Pump: Horsepower	Use of water	Quality of water: Chloride (parts per million)	Quality of water: Hardness, as $CaCO_3$ (parts per million)	Remarks
T. 23 N., R. 1 E.—Continued																		
2N2	L. L. Stetson	U	215	Dg	110	36	110	100	10	Sand and gravel	103	9- -49	P	1	D			Till near surface.
3E1	H. C. White	U	320	Dg, Dr	171	6	171	161	10	do	147	10- -49	J	3/4	D			Dug to 124 ft; L.
3F1	O. Brunstad	U	240	Dg	24.6	43	24.65	12	3	Sand	9.7	6-24-50	J	1	S			
3J1	Mrs. T. L. Griffith.	U	220	Dr	95	6	95	90	5	do	50	1946	J	1/2	D,S			Supplies two families.
3K1	L. Stack	U	220	Dg, Dr	85	6	85	85		Gravel					D			L.
3L1	L. R. Smelser.	U	240	Dg	37		37			Sand			J	1/4	D			
3Q1	A. O. Reite	U	220	Dg, Dr	85	6				Sand and gravel			J	1/2	D,S			Dug to 55 ft.
3R1	A. E. Brine	U	230	Dg	67.6	36				Sand	63.7	9-16-49	P		D,S			Reported to have gone dry in November of some years.
3R2	A. A. Judd	U	220	Dr	130	6	130			Gravel	70	1946	P	1/3	D			
3R3	E. C. Rimple	U	220	Dr	102	6	102	101	1+	Gravel, fine	67	9- -49	P	1/2	D			
4H1	Mrs. S. A. Mann.	U	330	Dg	29.4	54	24			Sand	11.4	4-29-40	P	1/3	D			
4J1	J. Ecker	U	400	Dg	41.5					do	37.6	3-28-40	N		De			Till to near bottom; well now filled.
4J2	L. Eley	U	350	Dg, Dr	163	6	163	160	3	Gravel	102	6- -49	J	1 1/2	D			L.
5N1	G. Barrows	U	530	Dg	16.3					Sand	8.8	5-20-50	S	1/4	D			
5N2	E. Marxer	U	525	Dg	14.3	35					5.7	6-24-50	S	1/4	D			
6C1	H. Weeden	U	360	Dg	58.3	30				Gravel	48.7	3-28-40	J	1/2	D			Till above aquifer.
6E1	H. L. Christie	U	410	Dg	28.5	30				Sand	19.8	5-19-50	J	1/4	D			
6E2	J. E. Personett.	U	445	Dg	16.8					do	9.8	5-19-50	S	1/4	D			
6G1	C. Morris	U	410	Dg	17.6					Gravel	14.2	5-18-50	P		D			
6K1	D. Jones	U	440	Dg	35.7					Sand	20.4	5-19-50	P		D			
6L1	S. Doskon	U	455	Dg	26.4					Sand and gravel	16.5	5-19-50	J	1/4	D			5 ft of till near surface.
6N1	N. Wunder	U	455	Dg	52					Till(?)	45	5-19-50	J	1/4	D			

6P1	F. H. Timmerman.	U	370	Dg	11.1	48				Sand	4.4	5-19-50	J	½	D			Supply reported inadequate.
7D1	Sunny Slope Water Development.	U	470	Dr	219	8	219	180	39	Gravel and sand	142	9-24-52			PS			Dd 28 ft after 1 hr and 40 min pumping 110 gpm; L.
7E1	M. E. Terryll	U	460	Dg	10.0	48					3.5	5-19-50	S	¼	D			
7F1	J. J. Justice	U	475	Dg	20.8	48					9.7	4- 8-40	S	¼	D			
7F2	Sunny Slope Improvement Assoc.	U	470	Dg	27.4	48	4				23.9	9-13-49	S		D			Till at 4 ft.
7P1	J. Lyman	U	470	Dg	14.4	48				Sand	12.7	9-13-49	J	¼	D			Till above aquifer.
10A1	Mrs. Silvernail	U	215	Dr	184	8	184	174	10+	Gravel	62	1948	J	¾	D,S			L.
10A2	L. Younger	U	200	Dr	114	6	114			Sand and gravel, fine.	49	1944	J	¾	D,S Irr			Water temp. 47° F.: for sprinklers to irrigate pasture.
10F1	R. Root	U	200	Dg	48	36	48			Gravel	15	1945	J	¼	D,S			
10H1	A. C. Asplund	V	185	Dr	55.8	6				do	5.8	5-20-50	S	¼	D,S			
10H2	C. Johnson	V	190	Dr	127	6	127	123	4	Gravel, fine	18	1944	T	1½	D,S	5	45	Supplies two families.
10K1	L. Petronelli	U	220	Dg	15.7						6.5	9- 2-49	S		D	4	30	
10P1	L. B. Leonard	U	325	Dg	28.8	48	7			Sand	24.7	9- 2-49	P	½	D,S	4	16	Till near surface.
11E1	— Gross	V	180	Dr	61½	6	61½	61	½	Gravel	12	8- -50	J		D			L.
11F1	J. F. Riebli	U	190	Dr	160	6				Sand			J	½	D	5	65	
11J1	H. W. York	U	280	Dr	122	6	122	106	16	Sand and gravel	97	7- -49	J	1½	D			
11K1	F. D. Fevate	U	270	Dr	219	6	219	218	1	do	104	1942	P	1	D,S	5	45	Sand to 218 ft.
11K2	W. Eaton	U	220	Dr	82	6	82				52	1-31-46			D			Dd 0.5 ft after 12 hr pumping 20 gpm.
11L1	H. W. Thralls	V	210	Dg	29.9					Sand	28.8	3-27-40		N	NU (D)			
11L2	B. P. Crouse	V	200	Dg	10.6	48					4	8-26-49			D,S			
11M1	G. Granquist	V	185	Dg	22	30				Sand	15.5	8-25-49	S	¼	D,S			
11M2	L. Riebli	V	185	Dr	120	6		120		Gravel, fine	8.3	8-25-49	J	1	D,S	5	45	L.
11N1	P. E. Peterson.	V	190	Dg	20.3	30	20.3			Sand	3.6	5- 1-40		N	NU (D)			Sand for entire depth.
11Q1	C. O. Zirkle	U	220	Dr	67.5	6				do			J	½	D			
11R1	W. McColgan	U	290	Dr	154	6	154	151	3	Gravel	100	8- -49	J	1	D,S			Tested at 100 gpm.
12C1	C. Lane	U	315	Dg	15.6	30					6.1	6-20-50	S	⅓	D			
12E1	G. L. Bohnstedt.	U	310	Dr	318	6	318			Sand	25	1946	J	½	D			L.
12J1	E. Johnson	U	240	Dg	14.1					Sand and gravel	11.0	8-17-49	S	¼	D	5	45	Till at 3½ feet.
12L1	A. R. Estep	U	340	Dr	60	6	60			Sand, coarse	18	1949	J	1	D,S	5	40	
12M1	O. L. Boatwright.	U	300	Dg	32.5					Sand	27.8	8-24-50		J	D	19	110	
12N1	Bethel Community Club.	U	310	Dg	68.2						53.9	3-27-40	P	½	D			
12N2	Bethel Community Water System.	U	320	Dr	97	6	97			Sand and gravel, fine.	37	6- -49	J	1	PS	5	35	Supplies 15 families.
12N3	G. W. Sherman.	U	320	Dr	196	6	196			Gravel, fine	17		J	1½	D	6	40	
12P1	W. R. Hoover	U	340	Dg, Dr	97	6	97	91	6	Sand	60	5- -49	J	1	D	4	30	
12R1	W. L. Bushnell.	U	275	Dg	12	36	12			Sand and gravel.	3	8-19-49	S	¼	D			

TABLE 5.—*Records of representative wells in Kitsap County, Wash.*—Continued

Well No.	Owner or tenant	Topography	Approximate altitude above sea level (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing zone(s): Depth to top (feet)	Water-bearing zone(s): Thickness (feet)	Water-bearing zone(s): Character of material	Water level: Below land-surface (feet)	Water level: Date of measurement	Pump: Type	Pump: Horsepower	Use of water	Quality of water: Chloride (parts per million)	Quality of water: Hardness, as $CaCO_3$ (parts per million)	Remarks
										T. 23 N., R. 1 E.—Continued								
13B1	M. L. Hamilton.	U	360	Dr	115	8	115				90	1945	J		D	5	35	
13B2	G. Purdy	U	375	Dr	268	6	268				143		P	1½	D	5	40	Supplies two families.
13C1	W. Higdon	U	345	Dr	112	6	112			Gravel, fine	72	1945	J	1½	D	3	35	
13C2	W. B. Hayes	U	370	Dg	27	48	27			Gravel	22	8- -49	P	¼	D	5	45	
13C3	F. Behrle	U	365	Dg		24x48									D			New well, not yet completed; log to 42 ft.
13D1	W. Van Skiver.	U	305	Dg	120	40		115	1	Gravel	113	1929	P		D,S			
13D2	A. L. Nichelson.	U	315	Dr	197	6	197	188	9	do	100		J		D			L.
13G1	H. Nelson	U	370	Dg	20.3	60	15			do	17.5	8-19-49	S		D	4	40	
13M1	F. Sherwood	U	265	Dg, Dr	110	6	110	80	30+	Sand and gravel.	56	5- 5-50			D			Dug to 56 ft sand from 56 to 80 ft.
13P1	P. B. Cohen	U	280	Dg, Dr	55	6	55	44	11+	Gravel	36		J	1	D,S	5	40	Dug to 47 ft.
14A1	H. Nelson	U	285	Dg, Dr	132	6	132	130		Gravel, fine	101		P	½	D	7	45	130 ft of sand above aquifer.
14A2	C. Sowa	U	275	Dr	100	6				Sand and silt	87	10- -50	N		NU (D)	5	40	Drilled to 200 ft: casing pulled and well filled to 100 ft: abandoned owing to insufficient yield.
14A3	Mrs. P. H. Hart.	V	245	Dr	88								J	1	D	5	40	
14A4	S. Cameron	U	245	Dg, Dr	80	6	80				7.1	8-27-49	P	½	D	5	60	Dug to 40 ft.
14A5	C. Sowa	U	280	Dr	145	6	145	141	4	Sand and fine gravel.	93	10- -50	J	1	D			Dd 7 ft while bailing 22 gpm; L.
14B1	A. A. Hall	U	220	Dg	31.7	36	31.7	30.5	1.2+	Sand and silt	22.5	8-26-49	J	⅓	D,S	5	30	
14B2	F. O. Snader	U	225	Dg	53	36	53	35	18+	do	43.9	8-26-49	J	¼	D,S	7	65	
14C1	P. B. Kellogg	V	200	Dg	10.7	60				Sand and silt	8.5	8-24-49	J	⅓	D			

14C2	M. C. Dunham.	V	195	Dr	105	6	105	92	13	Gravel	5	10- -50			D			Dd 55 ft after 7 hr pumping 15 gpm; L.
14D1	E. Jones	U	230	Dg	12.7	36	8	8	4.7+	Till	5.6	8-25-49	S	¼	D			
14F1	A. Riebli	V	215	Dr	103	8	103			Sand and gravel, fine.	3.9	8-25-49	J	1	D,S	5	40	Supplies two families.
14H1	J. Schultz	V	250	Dg	12					Sand	2				D	3	70	
14J1	C. M. Saling	U	270	Dr	100½	6	100½	94	6½	Gravel	80	5- 1-50	J	1	D	4	32	L.
14K1	S. E. Winkler	V	210	Dg	15	60	15			Sand	11	1949	S	¼	D,S	4	35	
14M1	C. Mills	U	280	Dg	20	60	6			Till	14.6	8-26-49	S	¼	D	5	35	Till at 6 ft.
14R1	S. W. Ness	V	200	Dg	9.8	30				Sand	7.3	5- 2-40	S	½	D			
15A1	J. P. Cooper	U	340	Dg	17	48					16.5	8-25-49	S	½	D	5	35	Supply reported inadequate in late summer.
15B1	W. F. Frone	U	360	Dg	11.7					Till(?)	1.3	5 1-40			D			
15E1	P. D. Cathey	U	340	Dr	250								J	3	D,S			Supplies two families.
15J1	W. Ames	U	305	Dr	109	6					57.3	8-26-49	J	1	D			
15M1	P. W. Corser	U	330	Dr	78	6				Gravel	18	8- -49	J	1	D	4	40	
15M2	A. Bates	U	340	Dg	35.4	48				Sand and gravel	27.1	9- 2-49	P	¼	D			Till at 5 ft.
15N1	M. T. Backert	U	345	Dg	18.3	36	36			Till	13.5	6-20-50	S	¼	D			Supply reported inadequate.
18C1	L. M. Shaw	U	495	Dg	21.4					Till(?)	7.1	4-16-40	S		D			
18D1	Dr. Wilson	U	485	Dg	15.2	36				do	13.5	9-13-49	N		NU(D)			
19P1	L. E. Goodrich.	U	380	Dg	30.0						23.6	9- 8-49	N		NU(D)			
20B1		U	480	Dg	33	48				Till(?)	32.3	9- 8-49	N		NU(D)			
20J1	W. Blankenbiller.	U	490	Dg, Dr	126	6	126	94	32	Gravel	100	9- 8-49	J	1½	D,S	8	40	Supplies 4,000 chickens.
20L1		U	430	Dg	48.3	48					45.3	9- 8-49	N		NU(D)			Till to 28 ft.
21A1	F. Wilkeson	U	355	Dg	8					Gravel	4	8-31-49	S	¼	D,S	5	45	Supply reported inadequate.
21J1		U	390	Dg	21.8						19.6	5- 1-40	S					
21J2	H. L. Lamberton.	U	390	Dr	101	6	101	101		Gravel	6		J	1½	D	5	40	Bailed at 40 gpm with no apparent dd; L.
21R1	State of Washington.	U	410	Dg	26.8	24	26.8				22.6	9-16-49	N		NU(D)			
22A1	L. Mosher	U	240	Dg	14	36	14			Gravel	3	1949	G		D	6	50	
22Q1	J. E. Halverson.	U	360	Dg	7	30				do	2	1948	S	½	D			
23A1	J. E. Boston	U	265	Dg	16	42				do			S	½	D	6	50	
23J1	Q. M. Baker	U	235	Dg, Dr	143	6	143	137	6	do			J	1	D	4	35	Dug to 73 ft in sand.
23J2	G. Baker	U	210	Dr	52	6	52			Sand and gravel, fine.	40	1948	J	¾	D			
24A1	A. McConnaughey.	U	300	Dg	27	48	27			Gravel	4	1946	J	¼	D,S	5	35	Till from 7 to 13 ft.
24D1	A. L. Brown	U	180	Dg	15					Sand			S	¼	D,S			
24F1	H. O. Rambo	U	210	Dr	125	6	125			Gravel	40		J	1	D,S	5	55	
24G1	E. M. Mullenix.	U	295	Dg	23	36	23			Till(?)	19.7	8-18-49	S	¼	D	10	75	
24K1	L. R. Page	U	320	Dg	9.7	35	8.5			Gravel(?)	6.6	8-18-49	S	¼	D,S	4	25	
25F1	M. R. Wilson	V	200	Dg	17.1	36	17.1	16	1	Clay, sandy	14.4	8- 2-49	S		D	6	55	
25L1	H. W. Hoak	V	175	Dr	247	6	247				11.7	8- 2-49	J	¾	D,S Ind	4	50	Supplies three families and a dairy.
25M1	do	V	160	Dr	245	6				Gravel	6	8- 3-49	J	1	D	5	40	Supplies four families.
26D1	P. Smith	U	360	Dg	22	60					Dry	8-27-49	S		NU(D)			
26E1	G. Wilson	U	350	Dg, Dn	67	40-1½				Sand and gravel	65	1948	P		D	5	40	Dug to 60 feet.

TABLE 5.—*Records of representative wells in Kitsap County, Wash.*—Continued

Well No.	Owner or tenant	Topography	Approximate altitude above sea level (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing zone(s): Depth to top (feet)	Water-bearing zone(s): Thickness (feet)	Water-bearing zone(s): Character of material	Water level: Below land-surface (feet)	Water level: Date of measurement	Pump: Type	Pump: Horsepower	Use of water	Quality of water: Chloride (parts per million)	Quality of water: Hardness, as $CaCO_3$ (parts per million)	Remarks
T. 23 N., R. 1 E.—Continued																		
26H1	A. W. Fessler	V	190	Dr	155	8	155			Gravel	10	8-1-49	P	¼	D,Ind	5	40	Supplies service station.
26H2	W. F. Moffitt	V	190	Dr	90	8	90			do	12	8-1-49	J	1	D,S	5	35	
26H3	A. McDonald	V	190	J	165	2	165			Sand								
26H4	do	V	190	Dr	70	6	70	55	15	Gravel	15	9-1-50	J	½	D			Dd about 35 ft while bailing 23 gpm; L.
27A1	E. Keas	U	390	Dg, Dr	115	6	115				84.6	8-27-49	P		D	5	40	
27B1	A. Earthfield	U	365	Dg	46.1	48	46.1			Gravel	8.2	8-27-49	J	⅓	D	5	70	Supply reported inadequate.
27G1	G. H. Graham.	U	400	Dg	18.5	52	14			Sand	7.2	8-27-49	J	¼	D	6	50	Till from 5 to 11 ft.
27K1	L. Standlea	U	425	Dg	13	48				Till	10	1949	N		NU(D)			Supply reported inadequate.
27N1	J. S. Cole	U	425	Dr	60	6	60	58	2+	Gravel	40	1944	J	⅓	D	7	45	Till at 3 ft.
27N2	L. L. Knight	U	435	Dr	85	6	80			do			P		D			
27Q1	Mrs. E. R. Stevens.	U	430	Dg, Dr	100	6	100			do	82	1946	J	½	D,S	5	35	Dug to 38 ft; supplies three families; L.
28J1	H. M. Roberts	U	410	Dg	38.5	60	5			Sand(?)	28.7	8-29-49	N		NU(D)	5	25	
28K1	E. Coles	U	390	Dg	11.5	30	11.5			Sand and gravel	7.8	9-2-49	S	¼	D,S			
29L1	E. Soderman	U	440	Dg	25.9	60		13	12+	Sand	15.4	9-2-49	B		D	4	16	Sand and gravel for 8 ft and till for 5 ft above gravel.
30L1	J. T. Fitzgerald.	U	350	Dg	16	54				do	7	9-8-49	S		D,S	3	26	
30M1	I. W. Coale	U	360	Dg	33.3	48	3				27.1	9-8-49	J	¼	D	4	28	
32Q1	G. Nerdin	U	345	Dg	25	36					18.0	9-7-49	P		D,S	10	28	
33A1	G. Anderson	U	405	Dg	57.4	42				Sand	51.0	8-29-49	N		NU(D)	6	40	
33C1	R. A. Udean	U	380	Dg	18.3	48	2			Till	15.8	9-6-49	S		D			
33F1	J. F. Murphy	U	385	Dg	40.2	36	2			do	34.2	9-2-49	S		NU(D)			Till at 2 ft; supply reported inadequate.

33L1	G. K. Newland.	U	425	Dr	109	6	109	98	11	Sand	87	8- -50			D			L.
34B1	C. M. Bricker	U	445	Dr	110	6							P	1	D	4	45	
34C1	W. Flood	U	450	Dr	90					Sand(?)			P	1/4	D	5	40	
34D1	C. M. Church	U	450	Dr	105	6					87.7	8-29-49	J	1	D,S	7	40	Pumping at time of water level measurement.
34K1	D&D Flying Service.	U	385	Dg	17.3	30	17.3			Gravel	14.5	9- 6-49	J	1/3	D,Ind	4	35	
36E1	K. Price	V	135	Dr	197	8				Sand and gravel	+11	8- 1-49	C	5	D,Ind			Supplies dairy.
36M1	do	V	155	Dg	8.6	36	8.6			Sand	5.5	8- 3-49	S	1/4	D	5	70	Reported inadequate supply.
36M2	do	V	130	Dg, Dr	205	6	205	198	2	Gravel, fine	Flows	4-24-50	J		D	5	52	New well, reported dd to 95 ft, bailing 15 gpm; L.
36N1	O. C. Norris	V	160	Dg	20.4	30	20.4			Sand, coarse	16.5	8- 3-49	S	1/4	D	8	75	Supplies two families.
										T. 23 N., R. 2 E.								
1D1	R. S. Taylor	S	50	Dr	50	6	50			Gravel			J	1/4	D			Water reported to contain some iron.
1E1	C. H. Davis	S	10	Dr	49	6	49						J	1/2	D	8	116	Reported to have flowed at exceptionally high tides.
2A1	R. Lawrence, Jr.	S	60	Dr	90	6	90						J	3/4	D			Water reported to contain some iron.
2B1	H. L. Lammers.	S	20	Dg, Dr	65					Sand	20	10- 6-49	P	1/3	D			
2C1	C. L. Williamson.	S	15	Dr	130	6		78	2	Sand, fine	15	1940	N		De			Well never used; reported to have pumped sand; water said to contain H_2S; L.
2C2	U. S. Army	S	40	Dr	297	10				Sand and gravel					D			Bailed 30 gpm; L.
2G1	H. Rodstal	S	65	Dg	32	30	32			Sand	21.8	5-26-50	P	1/2	D			
2H1	E. Morrow	U	85	Dr	74	6	74			Sand seams in till.	60	11-15-50	J		D, S			L.
2H2		U	90	Dr	90	6	90	85	5	Sand and gravel	65	1950	J		D			L.
2L1	— Cameron	S	90	Dr	75	6	75				48.6	5-26-50	J	1/4	D	6	26	
2M1	O. Nyhus	U	150	Dr	117					Gravel	100	1928						Dd about 2½ ft after 3 h pumping 8 gpm.
2P1	C. B. Safsten	U	225	Dg	18.3	36					8.9	4-26-50	S		D			Water reported to contain iron.
3A1	H. S. Quilliam.	U	180	Dr	200								N		De			Permeable material not encountered; abandoned.
3D1	L. W. Mallory	S	110	Dr	118	5	118	98	20	Sand and clay	71.3	4-26-50	J	3/4	D	5	72	Supply reported small; L.
3E1	G. Bodle	U	180	Dg	16.5	40					12.3	4-28-50	S	1/4	D			Supply reported inadequate.
3H1	C. Strickler	U	190	Dg	23					Sand and gravel (?).	16	1942	S	1/4	D	10	140	
3M1	L. A. Anderson.	U	305	Dg	35.6	23				Clay, sandy	17.9	4-28-50	S	3/4	D			Supply reported inadequate.
4A1	J. Shelton	U	130	Dg	29.1	36				Till(?)	4.7	4-28-50	J	1/2	D			

TABLE 5.—*Records of representative wells in Kitsap County, Wash.*—Continued

Well No.	Owner or tenant	Topography	Approximate altitude above sea level (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing zone(s): Depth to top (feet)	Water-bearing zone(s): Thickness (feet)	Water-bearing zone(s): Character of material	Water level: Below land-surface (feet)	Water level: Date of measurement	Pump: Type	Pump: Horsepower	Use of water	Quality of water: Chloride (parts per million)	Quality of water: Hardness, as $CaCO_3$ (parts per million)	Remarks
								T. 23 N., R. 2 E.—Continued										
4B1	F. C. Shelton	U	170	Dg	36.6	36					17.3	4-28-50	J	1/4	D			
4C1	H. F. Bunkhart.	U	210	Dg	38.4	30				Sand	25.4	5-1-50	J	1/4	D			Supply reported inadequate.
4H1	L. P. Wilz	U	130	Dg	23.6	36				Till(?)	7.2	4-28-50	S	1/6	D			Supply reported inadequate in late summer.
4M1	Mrs. C. Enslow.	V	110	Dg	15	36	15				9	1949	S	1/4	D			Do.
4P1	S. Eastgard	U	345	Dg	40	36		38	2+	Sand and gravel	28.5	5-26-50	P	3/4	D			30 ft of till and 8 ft of sand above aquifer.
5J1	E. C. Reynolds.	U	170	Dg	12	36	12			Sand			J	1/4	D			
5P1	W. B. Goodwin.	U	250	Dg	12	36	12			do	10	11-2-49	N		NU(S)			
6H1	— Byers	V	200	Dg	17.8	48					6.4	4-28-50	S		D			
6H2	R. Theroux	V	230	Dg	9.1	24				Sand	.5	5-1-50	S	1/4	D			
6L1	W. J. Chaussee.	U	320	Dg	13.7	36		13	.7+	Sand and gravel	2.4	3-29-40	S		D			4 ft of soil and gravel and 9 ft of till above aquifer.
6R1	H. Halford	U	315	Dg	51.8	48				Sand	41.2	4-28-50	J	1/2	D, S			Till near surface.
7B1	S. Tyree	S	270	Dg	13.3	48	5			do	2.5	4-28-50	S	1/4	D			
7G1	W. Paul	V	190	Dr	117	6				Gravel			J	1/2	D, S			
7N1	H. Goertz	U	290	Dg	38.9	48				Sand(?)	29.5	8-19-49	P	1/4	D	7	60	
8G1	H. G. Huebert.	V	140	Dg	13.7	36	12			Sand	6.8	4-28-50	S	1/4	D			
8L1	J. Moilanen	V	130	Dg	11	74	11				6	8-12-49	N		NU(D)			
8M1	M. W. Moilanen.	V	135	Dg	12.0	48	12				9.6	8-12-49	S	1/4	D	8	55	
8N1	C. E. LaDuke	V	145	Dg	12.1	36	12.1			Sand	10.1	8-11-49	S	1/4	D, S	8	55	
9A1	P. Anderson	U	360	Dg	48	48				do	42	10-4-49	J	1/2	D			
9A2	Anne Briland	U	360	Dg	53.6						32.2	5-26-50	P	3/4	D			Till at 6 ft.
9C1	M. Mikelsen	U	255	Dg	33	48	7	25	1	Sand in clay	4	5-26-50	J	1/2	D	7	62	Till near surface.

9G1	E. Ellingson	U	355	Dg	8.5	30	8.5			Sand and gravel	4.4	8-15-49	S	⅓	D	5	45	
9J1	E. E. Senn	U	360	Dg	27	36	27			Sand	23	8-15-49			D			Soil and till to 5 ft, sand from 5 ft to bottom.
9L1	Mrs. A. King	U	365	Dg	42.9	30	42.9			do	38.7	8-13-49			D	4	55	
10B1	R. Murray	U	320	Dr	180	6	180	160	20+	Gravel	120	1943	J		D			15 ft of till and 145 ft of sand above aquifer.
10D1	E. D. Madison.	U	345	Dg	12.4	36				Sand	2.8	5- 5-40			D			
10G1	J. Peterson	U	330	Dg	9.3	36	9.3			do	4.1	4-26-50	S	¼	D			
10M1	W. B. Mills	U	355	Dg	20.2	30	20.2			do	11.9	8-13-49	S	¼	D	5	50	
10N1	E. H. Foster	U	370	Dg	16	30	16			do	8	8-13-49	J	½	D, S	3	35	
11D1	H. Riksheim	U	220	Dg	18	84	18			Sand and gravel	10	4-26-50	S		D	5	30	Till above aquifer.
11G1	W. L. Sischo	U	255	Dg	25.5	30				Gravel	16.0	8-16-49	P	½	D, S	5	60	
14E1	F. Patton	S	150	Dg	12					Sand	7.0	8-15-49	S		D	6	60	Supply reported to be small.
15D1	C. F. Flinn	U	375	Dg	18.8	48	18.8			Sand and gravel	14.2	8-13-49	S	⅓	D,S	7	45	
15D2	V. A. Taylor	U	365	Dg	39.5	63	8			Sand	32.3	8-13-49	P	½	D,S	5	35	
15L1	L. E. Anderson.	U	335	Dg	23.8	44	21			Till	16.5	8-15-49	S	¼	D	6	95	Supplies two families.
17D1	Mrs. R. Nervik.	S	135	Dg	20.5	30				Sand and gravel	19.3	8-11-49	J	⅓	D	5	55	Do
17N1	W. B. Buffem	S	130	Dg	9.5	64	9.5			do	5.1	8-11-49	S	¼	D	5	50	Supplies nine cabins.
17N2	L. Draper	S	120	Dr	369	6				"Quicksand"			N		De			Abandoned owing to sand.
18D1	H. Goertz	U	315	Dg	80.0	36					71.2	8-19-49	P		D	5	45	
18M1	L. Mayo	U	305	Dr	79.0	6				Sand	45.5	8-17-49	J	1	D	5	30	
19P1	F. Rubow	U	320	Dg	9.8	30				do	9.5	8- 3-49	S		D	6	25	
20A1	W. L. Grayson.	U	300	Dg	19.6	40					14.6	8-12-49	J	1	D,S	5	25	
20J1	J. Gagnon	S	220	Dg	14.0	60	3			Till	13.6	8-10-49	G		D	5	30	Till at 9 ft.
20R1	H. Remick	S	240	Dg	9.0	48	9			Sand	4.8	8- 9-49	G		D,S	6	45	
21D1	R. West	U	340	Dg	74	36	74			do	67.8	8-12-49	J	½	D,S	5	40	Till from 2 to 15 ft.
21F1	D. Melgard	U	405	Dg,Dr	150	6	150			Gravel, fine	105.3	8-12-49	P	½	D,S	5	30	Dug to 108 ft.
21H1	C. Roberts	U	400	Dg,Dr	100	8	100			Gravel			J	1	D	6	45	Dug to 30 ft; till at 4 ft.
21J1	E. Richardson.	U	345	Dg,Dr	300	8							P	¾	D	4	45	
21L1	C. C. Crocker	U	395	Dg	23	48	3				13.8	8-13-49	J	½	D,S	6	50	Till at 5 ft.
21P1	N. Cabalo	U	320	Dr	110	8	110				50	8- 9-49	J	1	D,S	4	50	Supplies four families.
22A1	D. McIlvain	S	30	Dg	14					Sand	12	8-15-49	S		D	23	90	
22E1	J. C. Reed	U	350	Dg	19	30	19			Sand and gravel	16	8-13-49	S	⅙	D	6	45	Till near surface.
22E2	T. Bowman	U	380	Dg	19	72	6			do	13	8-13-49	S	¼	D	7	80	Till at 6 ft.
22N1	I. G. Munson	U	170	Dg	54	30	54			Sand	48.0	8- 9-49	P	⅓	D	6	45	
22Q1	Z. J. Gonsecki	S	40	Dg,Bd	72	30	72			Clay					D			Dug to 41 ft; L.
27B1	H. O. Thompson.	S	200	Dg	7.7	36	7.7			Sand(?)	4.6	8- 4-49	S	¼	D	5	55	
27N1	M. S. MacIntyre.	U	325	Dg,Bd	48	36					Dry	8- 3-49	N		N U(D)			In sand for entire depth; saturated materials not encountered.
28B1	K. L. Fordham.	U	325	Dr	74	6				Sand(?)	66	8- 4-49	P	⅓	D,S	6	35	
28C1	E. M. Williams.	U	370	Dr	126	3	126			Sand			J	½	D,S	5	35	
28J1	G. B. Bruer	U	270	Dg	19.6	48				do	14.1	8- 9-49	S		D	5	45	

TABLE 5.—*Records of representative wells in Kitsap County, Wash.*—Continued

Well No.	Owner or tenant	Topography	Approximate altitude above sea level (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing zone(s): Depth to top (feet)	Water-bearing zone(s): Thickness (feet)	Water-bearing zone(s): Character of material	Water level: Below land-surface (feet)	Water level: Date of measurement	Pump: Type	Pump: Horsepower	Use of water	Quality of water: Chloride (parts per million)	Quality of water: Hardness, as $CaCO_3$ (parts per million)	Remarks
										T. 23 N., R. 2 E.—Continued								
28K1	J. C. Cunningham.	U	315	Dg	25.2	60	5			Till(?)	10.2	8-4-49	J	1/4	D	5	60	
28K2	W. R. Holt	U	345	Dr	242	6	242			Gravel, fine	91.9	8-4-49	J	2	D	6	35	Till, sand, and clay above aquifer.
28K3	F. Eaton	U	340	Dr	98	6	98			Gravel	58	8-4-49	J	1/4	D	5	30	Supplies several families.
28P1	E. G. Ratko	U	340	Dr	87	6	87			Sand	67	8-3-49	J	1/4	D	4	35	
29G1	J. G. Johnson	V	150	Dg	6.1	52	5.5			Gravel	2.1	8-10-49	S	1/4	D	5	45	
31K1	E. Rickets	U	345	Dg	8	30				Sand	1	7-30-49	S	3	D	7	60	
31Q1	W. J. Bronow	U	280	Dg	11.0	70				do	8.3	7-30-49	S	1/4	D	5	40	
32D1	R. W. Hovgaard.	S	170	Dg	16.5	30	16.5				8.8	8-10-49	S	1/4	D	5	50	Till near surface.
32K1	E. J. Haeringer.	S	120	Dg	9	30	9			Sand	3.6	8-10-49	G		D,S			
32P1	H. Habermar	S	150	Dg	20	36	20			Gravel	8	8-10-49	S		D	4	50	
33C1	J. A. Rehn	U	290	Dg	15.5					Sand(?)	9.7	8-4-49	S	1/8	D	4	55	
33D1	J. Karganilla	U	415	Dg	90	48	90			Sand	Dry	8-4-49	N		NU(D)			Till near surface.
33D2	L. B. Fuller	U	390	Dg	35.7	48	3	17	15+	do	30.3	8-4-49	J	1/4	D,S	6	30	3 ft of soil and 14 ft of till above aquifer.
33F1	F. E. Pierce	U	380	Dg	17		17				10.2	8-4-49	S	1/4	D,S	5	45	
33P1	S. Lawyer	U	325	Dg	14.0	168	14			Sand	9.0	8-4-49	G		D	6	50	
34M1	F. C. Wenzel	U	340	Dg	17.7	36	4			Till(?)	12.4	8-3-49	S		D	6	30	
34N1	L. C. Wilcox	U	385	Dg	48	30	48			do	36	7-26-48	J	1/4	D,S	13	100	

T. 24 N., R. 1 W.

1A1	U. S. Marine Corps.	U	420	Dg,Dr	350	8-6	350			Sand and gravel	276	5- 9-49	P	2	Inst			Auxiliary well; L.
1A2	do	U	400	Dr	371	12-10-8	363	362	9+	Sand and gravel, fine.	258	1939	T	7½	Inst			Screen installed from 363 to 371 ft; dd 60 ft at 32 gpm; L.
2C1	C. H. Free-grove.	U	430	Dr	98	6	98			Sand and gravel			J	¼	D	10	48	Supplies two families; L.
2D1	— Monroe	U	410	Dg	34.1	48				Till(?)	26.3	7-18-50	J	1½	D	6	86	
2D2	J. Hendry	U	395	Dr	66½	6	66½						J	⅛	D			L.
2E1	M. Snyder	U	385	Dg	15	30		10	5+	Sand and gravel	5	5- -50	S	¼	D			Till above aquifer.
2G1	J. J. Snapp	U	395	Dr	69	6		68	1	Sand			J	½	D	8	70	L.
2G2	W. S. Lake	U	390	Dr	77	6	77	73	4+	Gravel			P	1	D	9	46	L.
2G3	D. Wilson	U	400	Dg,Dr	77	6				do			J	¼	D			L.
2K1	Camp Long-fellow.	U	390	Dg,Dr	45	8	39			do			J	1	D			Supplies summer resort; L.
2L1	K. Labisson-iere.	U	390	Dg	14.6	30				Sand and gravel	11.3	7-14-50	J	¼	D			
2Q1	F. Harden-brook.	U	390	Dg	16.2	48				Till(?)	10.9	7-18-50	J	¼	D			Supplies several cabins.
2R1	H. Schlehuber	U	400	Dg	11	48				Sand	4.0	7-14-50	S	¼	D			
4K1	E. S. Fenwick	U	375	Dg	12	48		10	2+	Sand and gravel	6	7-18-50	S	¼	D			Supplies two families.
6H1	W. L. Blakley	U	470	Dg	12	48				Till	9.2	6- 2-50	B		D			Supply reported inadequate in late summer.
6H2	M. Grover	U	460	Dr	123	6	123	121	2+	Gravel			J	1½	D	5		L.
6J1	R. L. Ames	U	460	Dg,Dr	82	6	82	81	1+	do			J	¼	D			Dug to 30 ft; L.
6J2	W. R. Pells	U	470	Dr	134	6				Sand				¾	D	4		
6R1	W. Dodge	U	425	Dg	15.4	60	6			Till	5.73	6- 2-50	S	¼	D			
7C1	W. Lewis	U	500	Dr	140	6		137	3+	Gravel			P	¾	D	5		L.
7C2	S. Kingman	U	500	Dg,Dr		6												
7N1	N. Just	U	435	Dg	16					Sand			S	⅛	D			
29Q1	H. Stockton	U	525	Dr	85	6	85	15	13	Gravel			S	½	D			L.
29R1	— Culver	U	525	Dr	22	6	22	20	2+	Sand and gravel			S		D	6	36	L.
32H1	C. G. Mums-terman.	U	530	Dr	70	6							J	½	D	6	34	
35P1	J. S. Selly	U	330	Dg,Dr	87½	6	87½	74	5	Sand, fine	52	1947	J	1	D	24	50	Gravel-packed; L.

T. 24 N., R. 2 W.

10E1		U	475	Dg	24.3	48				Till	13.0	8- 1-50	N		NU(D)			
12A1	L. Rostad	U	440	Dg	17.5	48				do	9.1	6- 1-50	B		D	4		
13C1	H. Steves	U	515	Dg	18.1	72				Till(?)	7	6- 1-50	B		D			
13L1	E. Johnson	U	450	Dg	18.6					Till	7.5	6-24-50	J	½	D			
17R1	A. Olson	V	60	Dr	394	6				Sand			J	2	D	6		Reported to have flowed at one time; L.
19A1	— Fisk	S	145	Dr	183.8	6	183.8			do	140	8- 1-50	N		NU(D)			Never developed owing to fine sand; L.

TABLE 5.—*Records of representative wells in Kitsap County, Wash.*—Continued

Well No.	Owner or tenant	Topography	Approximate altitude above sea level (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing zone(s): Depth to top (feet)	Water-bearing zone(s): Thickness (feet)	Water-bearing zone(s): Character of material	Water level: Below land-surface (feet)	Water level: Date of measurement	Pump: Type	Pump: Horsepower	Use of water	Quality of water: Chloride (parts per million)	Quality of water: Hardness, as $CaCO_3$ (parts per million)	Remarks
T. 24 N., R. 2 W.—Continued																		
23B1	L. Jenkins	U	490	Dg	24.8	48				Gravel, fine	3.5	6-1-50	S	1/2	D			Supply reported inadequate.
24A1	J. Hansen	U	465	Dg	9.6						8.6	8-1-50	S	5	D,S			
24D1	J. H. Nelson	U	510	Dg	16.1	48				Sand(?)	9.8	8-1-50	S	1/3	D			Supplies two families.
24L1	F. Drumul	U	570	Dg	15					Sand	6.7	6-24-50	P		D,S			
T. 24 N., R. 1 E.																		
1C1	G. M. Smith	U	420	Dg	25.0	36				Sand	19.3	8-31-50	S	1/4	D			
1R1	— Cooleen	U	325	Dr	150	6				Sand and gravel	10	8-29-50	J	1	Irr			Supplies water for nursery
2A1	E. C. Enhelder.	U	330	Dg,Dr	333	6				Sand			P	1	D	8	30	Supplies two families; L.
2A2	C. Hoyt	U	290	Dg,Dr	125	6	125						N		De			Furnished inadequate supply; L.
2B1	M. M. David	U	325	Dg	78						30	6-22-50	J	1	D,S			
2C1	C. L. Ferrin	U	310	Dg,Dr	200	5	200	195	5+	Sand			N		NU(D)			L.
2F1		U	275	Dg,Dr	165	5	141	90	15	Sand, coarse					D			L.
2G1	J. Navone	U	265	Dg	75	36	60			Sand			P		NU(D)			
2G2	do	U	260	Dg	60.8	48	60.8			Sand and gravel	41	6-21-50	J		D,S			
2J1	P. H. Conklin	U	290	Dr	140	6	140	133	7	Sand and fine gravel					D			Dug to 76 ft; L.
2N1	Dickenson & Wilson.	U	265	Dg	32.2	60				Sand in clay	23.8	8-29-50	J	1/4	D,S			Till near surface.
3A1	E. A. Wehr	S	105	Dr	70	6							J	1/4	D			
3R1	H. Burton	U	220	Dg,Dr	100	6	100	95	5+	Sandstone	10	7-6-50	S	1/4	D	9	64	Possible penetration into Tertiary sedimentary rock; L.
4C1	C. E. Westlin	S	25	Dg	26					Gravel	12	5- -50	S	1/4	D			Till penetrated.

4D1	L. J. Miemeyer.	S	30	Dr	87	6							S	1/3	D	7	112	
4E1	H. Towen	S	25	Dg	28	40				Gravel			P	1/4	Irr			Till penetrated; water used for garden.
4E2	F. Rowe	S	30	Dg	20					Sand			S	1/4	D			
5A1	R. Yount	S	20	Dr	365	6							J		D	160		Supplies two families.
5D1	A. O. Olson	S	40	Dr		6					Flows	7-26-50	F		PS	7	46	Oil test, drilled to 1,840 ft; supplies 8 families with water.
5G1	H. R. Johnson.	S	25	Dg	18					Gravel			S		D			
5K1	M. O. Vea	S	35	Dg	24.7	36				do	22.2	8- 4-50		1/3	D,S			
5K2	N. D. Miller	S	45	Dg	35	36				do	33.2	7-30-50	N		NU (D)			
5M1	C. L. Maxwell	S	60	Dr	85	6				do	35	9- -48	J	1	D	6	40	Supplies three families.
5M2	G. R. Berg	S	60	Dr	96	6				Gravel(?)	15	1940	J	1/3	D	8	48	
5N1	D. C. Rockwell.	S	65	Dr	127	6					Flows	7-26-50	J	1 1/2	D	10	42	Supplies two families.
5Q1	M. Peters	S	40	Dr	160	6	160	14	36	Sand and gravel			N		NU (D)			Supply reported inadequate; L.
6M1	E. M. Mimiers	U	420	Dg	120	96	120			Gravel	92.6	7-14-50	P	1/2	D			Supplies five families; till to 15 feet.
7G1	M. D. Hall	S	160	Dg	10.5	36				Sand and gravel	4.1	7-14-50	S	1/2	D			Supplies two families.
7R1	R. F. Stratton.	V	190	Dr	340	6				Sand			J	1	D			
8D1	C. H. Stroberger.	V	100	Dg	38	36	15			Gravel	35	7- -49	J	1/4	D			
8D2	E. B. Deyo	V	90	Dg	35.6	48				do	32.3	7-25-50	J	1/4	D			Supplies two families.
8E1	P. Tilley	V	90	Dg	20.5	48				Sand and gravel	18.7	5-27-50	S	1/4	NU			
8E2	W. T. Burga	U	170	Dg	23.2	48					10.8	7-26-50	S	1/3				
8L1	J. Carter	U	240	Dg	31.7		31			Gravel, fine	24.2	7-14-50	P	1/4	D			
8P1	— Todd	U	210	Dr	65	6							N		De			Filled in; water supply now from water system.
8Q1	W. Hampton	U	280	Dg	47.8	40				Sand	41.0	7-31-50	J	1/2	D			Pumped for 72 hr at 5 gpm.
9N1		U	250	Dr	92.7	6				Gravel, coarse	126	3-18-40				11	76	
10K1	H. J. Metzler	S	90	Dg	49.1	36	12	47	2+	Sand	34.1	4-11-40						12 feet of till near surface.
11D1	A. Kalil	S	120	Dg	23.6	30				Sand in clay	7.9	6-21-50	S	1/4	D			Supply reported inadequate.
11E1	L. Schuyler	S	80	Dr	292								N		NU (D)			L.
12B1	H. F. Johnson	U	310	Dr	84	3	84			Sand and gravel			P	3/4	D	9	64	L.
12E1	W. C. Banks	U	246	Dg	51.4	36	40	50	1.4+	do	39.9	4-24-40	N		D, De			Now filled in; L.
12E2	City of Bremerton.	U	260	Dr	914	8		192	10	do	73.3	11-30-42	N		NU (PS)			Formerly Bremerton Housing Authority well; water temp. 48°F., well will yield about 25 gpm; Tertiary sedimentary rocks at 220 ft; L, A.
12F1	Consolidated School Dist. No. 306.	U	365	Dr	129	8	122								NU (Inst)			Pumped at 5 gpm; L.
13N1	Arden Farms	S	50	Dg, Dr	65			50	15+	Sand			N		NU (Ind)			Penetrated through till; pumped 25 gpm.

TABLE 5.—*Records of representative wells in Kitsap County, Wash.*—Continued

Well No.	Owner or tenant	Topography	Approximate altitude above sea level (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing zone(s): Depth to top (feet)	Water-bearing zone(s): Thickness (feet)	Water-bearing zone(s): Character of material	Water level: Below land-surface (feet)	Water level: Date of measurement	Pump: Type	Pump: Horsepower	Use of water	Quality of water: Chloride (parts per million)	Quality of water: Hardness, as $CaCO_3$ (parts per million)	Remarks
										T. 24 N., R. 1 E.—Continued								
14F1	F. C. Schricker.	U	135	Dg	135	48	135	135		Gravel, coarse	126	3-18-40				11	76	
16D1	R. Larsen	S	140	Dg	36	48	30			Gravel	29.5	7-25-50	J	¼	D			Supplies two families, penetrated till.
16J1	F. W. Ryan	S	15	Dg	18.8	36				Sand and gravel	14.7	7-11-50	S	¼	D			
16J2	P. F. Schmickrath.	S	90	Dr	80	6				do	65	8- -35	P		D	8		Tested at about 15 gpm; L.
16L1	L. M. Lewis	U	110	Dr	290	8	268	30	20	Gravel			N		NU(D)			L.
16L2	do	U	100	Dr	113	6							T	3	D, Irr	10	74	
16L3	M. Reynolds	S	90	Dg	92	44	82	82	10	do	78.7	3-3-40	T	7½	Irr			Supplies cemetery; L.
17A1	J. F. Carpenter.	U	200	Dg	41	48				Gravel	20	1948	S	⅓	D			Supplies four families.
17B1	Harlow and Burke.	U	170	Dr	363	6					90	1941	T	5	PS	5	70	Dd reported to be 20 ft while pumping 50 gpm; supplies 20 families.
17B2	do	U	180	Dr	187					Sand			J	½	PS			Auxiliary supply.
17L1	J. H. Haddon	U	180	Dg,Dr	163	6	151			do			J	½	D	10	500	Dug to 8 ft.; L.
22L1	H. Lillie	S	160	Dr	151	6	151	145	6	Sand and gravel	120	1949	T	3	Ind	15	74	Supplies water for ice arena; pumped at 17 gpm throughout summer; L.
23B1	U. S. Navy	S	20	Dr	748	6-4½				Sand	Flows		N		De			L.
23E1	do	S	30	Dr	2,000	26-12	1,315						T		Ind			Casing perforated from 160 to 1,315 ft; dd 50 ft while pumping 1,500 gpm; L, A.
25C1	—Smith	S	10	Dr	160	3	30	160		Gravel	Flows	6-20-50	P	⅓	NU(D)	8	78	Water reported to have slight odor of H_2S.

25E1	Silver Springs Brewing Co.	S	10	Dr	314	6	314			Sand	Flows		C	15	PS			Flow of about 130 gpm; leased by Port Orchard Water Dept.; water reported to have slight odor of H_2S; L, A.
25E2	Annapolis Water Dist.	S	35	Dr	1,133	12-10				Gravel	+3	10- -49	T	50	PS			Formerly Port Orchard Housing Authority well 7; water reported to have slight odor of H_2S; reported to have been backfilled with gravel to 600 ft; dd of 55 ft after 45 hr pumping 1,700 gpm; flows 750 gpm.
25K1	do	V	90	Dr	962	20-8	926	885	30	Sand	27	7-15-43	N		NU			Formerly Port Orchard Housing Authority well 1; abandoned owing to sand and low yield; L.
26K1	City of Port Orchard.	S	17	Dr	422	6	422	257	10	Gravel and sand	Flows		C	25	PS			City well 3; pumped by two 25-HP centrifugal pumps; L, A.
26K2	Callison's Evergreen Co.	S	10	Dr	285	4	272	278	7+	Sand	+30	3-23-40	P	1½	Ind			Water reported to have faint odor of H_2S; water temp 49°F; L.
26K3	City of Port Orchard.	S	17	Dr											PS			City well 1; A.
26K4	do	S	100	Dr	792	10-5	780	764	16	Gravel	35	2- -42	T	50	PS			City well 5; dd 42 ft after 6 hr pumping 620 gpm; water temp 49°F; L, A.
26K5	J. W. Huth	S	10	Dr	88	4	88	80	8+	Sand and gravel	Flows	3- 4-40	F		Ind	5	60	
26L1	City of Port Orchard.	S	90	Dr	441	10-8		400	41	Gravel	35		T	20	PS			City well 4; water temp 48.5°F; L, A.
26N1	Wilkins Dist. Co.	S	20	Dr	197	3	197	188	2.5	do	Flows	6-20-50	C	¼	Ind	7	62	Water reported to have faint odor of H_2S; L.
26P1	E. Curfman	S	10	Dr	150	1½		150		Sand	Flows	6-20-50			D	6	66	
27J1	J. H. Gibbs	S	10	Dr	156	1½				Gravel	Flows	6-20-50	S	¼	D	7	62	
27J2	R. M. Stevenson.	S	10	Dr	118	1½	25	96	2	do	Flows	8- -39	S	¼	D	7	46	Flows about 5 gpm.
27R1	W. L. Wheeler.	S	15	Dr	150	3-2				do	Flows	6-20-50	S	½	D			Supplies several families.
27R2	D. B. Rodepouch.	S	15	Dr	165	1½		145		Sand	Flows	10- -39	S	¼	D	7	74	
32F1	T. A. Westman.	V	40	Dg	9.1	36				Sand and gravel	7.3	7-25-50	S	⅙	D			
32J1	G. M. Dickenson.	S	30	Dr	400	6				Sand	Flows		S	¼	D	9	64	
32J2	E. Frone	S	25	Dr	110	6	110	95	15+	Sand and gravel				1	D			Supplies 3 families; L.
32K1	P. L. Hudson	V	15	Dr	206	6	206	202	5+	Gravel	Flows	12- -39	C	1	PS			
33H1	A. Van Hee	S	10	Dr	76					Sand and gravel	Flows	4-16-40	S	¼	D			L.
33H2	H. Cohen	S	10	Dr	73	3		73		Gravel	Flows	5-19-50	J	⅓	D			Supplies two families.
33H3	E. Johnson	S	10	Dr	65	3	65	65		Sand	Flows	5-19-50	J	¼	D			Supplies two families.
33H4	C. M. Richards.	S	10	Dr	80	3	80	80		do	Flows	5-20-50	S	½	D			

TABLE 5.—*Records of representative wells in Kitsap County, Wash.*—Continued

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T. 24 N., R. 1 E.—Continued																		
33H5	R. E. Gormely.	S	10	Dr	67	2½					Flows	5-19-50	J	½	D			Supplies three families.
33K1	City of Bremerton.	S	45	Dr	275	8-6	275	190	85	Sand and gravel	+73	9- -41	N					City well 1; test well; L.
33K2	do	S	45	Dr	245	30-22	245	160	80	do	Flows	1949	T	60	PS	8	48	City well 2; dd about 128 ft at 1,400 gpm; L, A.
33K3	do	S	55	Dr	538	16-8	538			do	Flows	1949	T	25	PS	7	64	City well 3. Dd about 101 ft at 750 gpm; A.
33K4	do	S	60	Dr	401	12-8	401			do	Flows	1949	N		PS			City well 4; L.
33K5	do	S	35	Dr	587	16	589			do	+50	1949	T	60	PS	7	50	City well 5; dd about 245 ft at 500 gpm.
33K6	do	S	45	Dr	562	12	562	492	60	do	Flows	1949			PS	7	48	City well 6; water temp. 52° F; dd of 200+ ft at 850 gpm during test.
33L1	do	S	25	Dr	622	16	622	542	80	Gravel	Flows	1949	T		PS			City well 7; dd exceeds 66 ft at 875 gpm; L, A.
33R1	W. G. Pendergrass.	U	260	Dg	20.5	30				Sand	6.7	5-20-50	S	½	D			Supplies two families.
35L1	C. J. Craswell	U	225	Dg	52	24				do	21.2	5-20-50	P		NU (D)			
35L2	G. E. Lockwood.	U	215	Dg	18	48	18			do	4.3	5-20-50	P	1	D,S			
35R1	W. H. Lundberg.	U	250	Dg	15.8	32	3			Gravel	4.5	5-18-50	S	¼	D			
35R2	R. Rice	U	230	Dg	21.45	48				Sand	10.9	6-21-50	S	¼	D			
36D1	J. W. Gruber	U	160	Dg	100.5					do	Dry	5-20-50			D			
36F1	Annapolis Water District.	U	200	Dr	1,101	22-12	1,096	1,018	78	do			N		NU (PS)			Formerly Port Orchard Housing Authority well 2; abandoned because of insufficient yield; L.

36N1	E. S. Brown	U	300	Dg	13.2	36				do	2.60	3-29-40	S	1/4	D			
36N2	F. Nelson	U	275	Dg	17.1						6.78	6-21-50	S	1/4	D			
										T. 24 N., R. 2 E.								
2R1	C. L. Foss	S	20	Dg	26.6	72	12			Sand	18.4	5-24-50	J		D			Supply reported inadequate.
3C1	L. I. Nudean	U	260	Dr	84.1	6				Gravel	13.7	5-24-50	J	1/4	D			Do.
3E1	K. M. Rabber	S	40	Dg	24.8	48					20.0	5-26-50	S	1/6	D	13		
3K1	O. Brockmier	S	85	Dg	19.2	60				Till	15.4	5-24-50	S	1/4	D			Supply reported inadequate.
3L1	E. Christenson.	S	65	Dg	35					Till(?)	1	5- -50	J	1/3	D			Do.
4A1	— Sydnor	S	25	Dg	17.5	60				Sand and gravel	11.5	5-25-50	S	1	D			Pumping at time of measurement.
4C1	S. Johnson	S	40	Dg	12.6					Sand	2.1	5-26-50	S		D			
4F1	A. M. Christensen.	S	60	Dg	11.5	48				do	7.9	5-26-50	S	1/6	D			Supply reported inadequate.
4L1	J. P. Hember	S	40	Dg	13.0					Sand	4.3	5-26-50	S	1	D			
5Q1	K. Woods	S	40	Dg	28.0						11.5	5-26-50	S	1/4	D			Supply reported inadequate.
8A1	R. A len	S	25	Dg	17.5					Sand	11.1	5-26-50	S	1/4	D			Till above aquifer; supply reported inadequate.
9B1	E. H. Smith	S	30	Dg	18	48	12						N		NU (D)			Tertiary sedimentary rock at 18 ft; small amount of water obtained above was lost at 18 ft.
9C1	do	S	55	Dg	53	42	12			Shale	49.6	11-16-49	J	1/2	D			Tertiary sedimentary rock at 10 ft.
9F1	Watauga Beach Community.	S	90	Dg	150	42	10						P	3/4	PS			Tertiary sedimentary rock at shallow depth.
9G1	do	S	55	Dr	400	6	6	100			2	1940	P	5	NU (PS)			Tertiary sedimentary rock for entire depth; dd to bottom of pump column at 230 ft after 12 hr pumping 2½ gpm; water reported unsatisfactory for household use.
9H1	M. L. Swanberg.	S	15	Dr	135	6-5	125	129	6	Shale					D			Reported to yield about 15 gph; L.
9J1	M. P. Storey	S	15	Dr	51	6	51	50	1+	do	8	1946	P		D			Reported to yield about 1 gpm; L.
9L1	Watauga Beach Community.	S	35	Dr	184	12					Flows	11-16-49	N		NU (PS)	897	226	Tertiary sedimentary rock at shallow depth.
9M1	W. J. Taylor	S	30	Dr	200	8					9	1944			D			In Tertiary sedimentary rocks for entire depth, supplies several families.
9P1	A. Sandstorm	U	90	Dg	24	60	5			Till	22	9- -49	S	1/4	D			L.

TABLE 5.—*Records of representative wells in Kitsap County, Wash.*—Continued

Well No.	Owner or tenant	Topography	Approximate altitude above sea level (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing zone(s): Depth to top (feet)	Water-bearing zone(s): Thickness (feet)	Water-bearing zone(s): Character of material	Water level: Below land-surface (feet)	Water level: Date of measurement	Pump: Type	Pump: Horsepower	Use of water	Quality of water: Chloride (parts per million)	Quality of water: Hardness, as $CaCO_3$ (parts per million)	Remarks
T. 24 N., R. 2 E—Continued																		
10B1	U. S. Navy	S	166	Dr	98	12-8		45	40	Sand and gravel	35	1948	T	2	Inst			Reported to pump sand; L, A.
10C1	F. P. Westerlind.	S	15	Dg	22.8	30					14.8	5-24-50	S	¼	D			
10R1	U. S. Navy	S	15	Dr	1,700								N		NU (Inst)			In Tertiary sedimentary rock for entire depth, water reported saline.
11G1	Y. Hanson	U	260	Dg	15.5		15.5			Sand and gravel	9.6	5-22-50	S	⅓	D			
11H1	A. Haveen	U	290	Dg	14.9	72				Clay(?)	5.7	5-22-50	S	¼	D			Supply reported inadequate.
14A1	J. R. Combs	S	20	Dr	96.6	6					17.7	5-24-50	J	1	D			
15N1	U. S. Navy	S	92	Dr	305	12	295				79	1944	T	10	Ind			Dd 52 ft after 8 hr pumping 60 gpm; L, A.
15P1	U. S. Navy	S	63	Dr	353	8	353	218	8	Sand and gravel	53	5-22-50	T	30	Ind			Dd to 110 ft after 8 hr pumping 200 gpm; L, A.
16E1	O. E. Gaither	U	105	Dr	89	6	89						J		D, S	4	96	Tested at 8 gpm; L.
16K1	U. S. Navy	S	25	Dr	136	18	136	50	80	Gravel	5	1945	T		Ind			Dd 33 ft after 8 hr pumping 400 gpm; L, A.
17B1	R. Edman	S	20	Dr	620	6							N		NU			Tertiary sedimentary rock for entire depth; reported to yield some gas, but no water.
17B2	—Van Dyke	S	15	Dr	103	6					Flows	5-11-50	S	¼	D	4	58	Water reported to have slight H_2S odor.
17B3	G. N. Worden	U	55	Dg	35						4.9	3-26-40			D			Supplies several families.
17F1	—Waterman	S	30	Dg	30	30					10	5-6-50	J	¼	D			
17M1	L. R. Cowan	S	15	Dr	290	6-4	290			Gravel, fine	+34	1935			D	5	66	Water reported to have slight odor of H_2S.
19B1	H. Toton	S	30	Dr	320	8					9	1949	T	3	PS	4	76	Supplies 7 families.

19L1	F. Wilson	S	20	Dr	257	6					Flows	5-11-50	J	1/3	D	4	106	
20A1	Lutheran Church.	U	270	Dg	34.6	30				Sand	25.6	5-10-50	P	1/4	D			
20B1	—Emerson	U	330	Dr	182	6		180	2+	do	60	1946	J	1/2	D	6	86	Till for 40 ft, and sand and clay for 120 ft above aquifer.
20D1	J. W. Sayers	U	320	Dg	16.9	24				do	9.0	5-11-50	S	1/3	D, S	7	50	
20E1	W. H. Watkins	U	250	Dg	15.5	44				Sand	5.7	5-11-50	S	1/4	D	4	84	
20H1	J. Linquist	U	300	Dg	25.5	30	25.5			Sand and gravel	17.6	5-10-50	S	1/4	D			Till above aquifer; supply reported inadequate.
20P1	J. M. Nighbert	U	370	Dg	32					Sand			P	1/4	D			Till above aquifer.
21B1	N. Gasfield	U	180	Dr	108	6					90	1949	J	1	D	5	68	
21B2	W. Faulkner	U	185	Dr	111	6	111			Sand and gravel	93	1949	J	1	D, S	8	72	Supplies about 1,300 chickens.
21E1	U. L. Lucas	S	140	Dg	16.7					Sand	12.2	5-10-50	J	2	D			
21K1	S. Ferguson	U	290	Dg	26.6	30				do	15.6	5-12-50	J	1/4	D			Till above aquifer.
21L1	M. E. Larson	U	330	Dg	22.8					do	15.1	5-12-50	S	1/4	D			Do.
22M1	Town of Manchester.	S	45	Dr	117	10	117			Sand and gravel	10	1947	T	20	PS			Well 1; Blue clay above aquifer; dd less than 16 ft at 500 gpm.
22M2	do	S	25	Dr	100	10	100			do	Flows	10-6-49	N		PS			Well 2; not yet in use.
27M1	G. M. Sullivan	S	30	Dr	65	6	65	62	3+	Gravel	Flows	12-2-49	P		D			Flows at high tide.
27M2	N. Arrington	S	80	Dr	120	6	120			Sand and gravel	50	9-20-44	J	1/2	D			
27M3	B. A. Linvog	S	20	Dr		6					Flows	5-10-50	S	1/4	D	4	62	
27M4	P. M. Jensen	S	40	Dr	100	6				Sand and gravel	Flows	12-5-49	P	1/2	D			Reported dd of 25 ft pumping 48 gpm.
27M5	D. Duncan	S	40	Dr	66	6					Flows	12-5-49			D			
27N1	E. O. Weaver	S	50	Dr	91	6	91				7	9-25-44	J		D			
28D1	Mrs. C. Wood	U	300	Dg	29.8					Gravel	22.1	5-9-50	S		NU (D)			Supply reported inadequate.
28H1	J. Kragesth	U	215	Dg	52	30				Sand	44	5-10-50	J	1/2	D, S			
28P1	J. Herdman	U	285	Dr	138	6							J		Irr			Water used to irrigate garden.
28R1	G. C. Anderson.	U	190	Dg	18.8	30	18.8			Sand	2.5	5-1-50	S	1/4	D			Inadequate supply reported.
29D1	R. C. Campbell.	U	360	Dg	19.2	30	19			Gravel	7.3	5-9-50	S		D	6	50	Till above aquifer.
29J1	C. Tiderman	U	290	Dg	15.5	45				Sand	9.6	5-10-50	B		D			
29M1	O. Brose	U	375	Dg	24.5	40				Till	5.5	5-9-50	J	1/2	D	5	62	
29M2	O. L. Jones	U	360	Dg	35.5	48				do	8.5	5-9-50	J	1/4	D			
29N1	M. Flumb	U	330	Dg	18.7	48	4	17	1.7+	Sand	6.1	5-9-50	S	1/4	D			Till above aquifer.
29R1	T. E. Stockley	U	305	Dr	285	6									D			
30A1	W. S. Dawson	U	315	Dg	15.4	36				Sand	6.0	5-9-50	J	1/4	D			
30A2	Mrs. R. Midding.	U	280	Dg	25.3	30				Sand and gravel	17.1	5-9-50	S	1/4	D			Inadequate supply reported.
30F1	A. W. Fessler	U	200	Dg	12.2	36				Sand	2.5	5-9-50			D	11	88	
30M1	— Wolf	U	170	Dr	120					do			J	1 1/2	D, S	5	51	
30M2	H. Thomas	U	180	Dg	37	36				do	31.3	5-9-50	P		D			Sand for entire depth.
30N1	W. S. Wiley	U	230	Dr	100	12							J	3/4	D	5	52	
30Q1	G. Bouchers	U	340	Dg	30.7	36				Sand	24.6	5-9-50	P	1/2	D			
30Q2	L. H. Thompson.	U	385	Dg, Dr	91	6	91	87	4+	Sand and gravel			J	1/4	D	5	54	Dug to 51 ft; L.
30Q3	H. Hatlem	U	380	Dr	92	6	92	82	10+	do			J	1	D	7	52	L.

TABLE 5.—*Records of representative wells in Kitsap County, Wash.*—Continued

Well No.	Owner or tenant	Topography	Approximate altitude above sea level (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing zone(s)			Water level		Pump		Use of water	Quality of water		Remarks
								Depth to top (feet)	Thickness (feet)	Character of material	Below land-surface (feet)	Date of measurement	Type	Horsepower		Chloride (parts per million)	Hardness, as $CaCO_3$ (parts per million)	
T. 24 N., R. 2 E.—Continued																		
30R1	A. Johnson	U	350	Dg	20.1	36	20			Sand	14.8	5- 4-50	J	1/3	D			
31A1	Annapolis Water Dist.	U	350	Dr	1006	22-16	657				223	8- -43			NU (PS)			Formerly Port Orchard Housing Authority well 3; reported to have had a dd of 91 ft after 4 hr pumping 325 gpm; L.
31A2	B. Eger	U	345	Dg	40.4	42				Sand and gravel	35.1	3-29-40	J	1/4	D			
32A1	E. A. Witt	U	295	Dg	55					Sand	37	5- 1-50	P	1/2	D			Till above aquifer.
32A2	T. F. Endsely	U	285	Dg	18.2	48	18			do	15.1	5- 4-50	P	1/4	D			
32B1	E. S. Howe	U	215	Dr	120	6							J	3/4	S			
32D1	J. Keakes	U	305	Dg	21.7	72				Sand	8.9	5- 4-50	S	1/4	D			
32F1	W. Ferguson	V	210	Dg	24	36	24			do	10	5- 1-50	S	1/4	D			
32G1	W. Cunningham.	V	210	Dg	15		15			do	6	5- 1-50	S	1/4	D			
32H1	F. M. Reese	U	265	Dg	45.2	48				do	30.6	5- 1-50	P		D			Till above aquifer.
32H2	L. Morris	U	275	Dg	40	48				do	31.0	5- 1-50	J	1/2	D			Do.
33C1	L. W. Cole	U	210	Dr	70	6	70			do	Flows	5- 1-50	J	1/2	D	7	30	
33C2	H. Schweigert	U	240	Dg	23.7	48				do	9.5	5- 1-50	S	1/4	D			Till above aquifer.
33C3	J. Reccheo	U	265	Dg	51.3	36	51			do	23.8	5- 4-50	J	1/4	D	6	76	Do.
33C4	R. R. Leurgin	U	245	Dr	127	6				do	40	1949	J	3/4	D			
33D1	M. C. Buck	U	265	Dg	35.2	48					20.9	5- 1-50	J	1/4	D			
33G1	— Altizer	S	180	Dg	30		30			Sand	15	5- 1-50	S	1/4	D			
33H1	L. Cheney	S	20	Dr	134			133	1	Sand and gravel	+28	1952			D			Flows 400 gpm; L.
33Q1	L. L. Locker	U	185	Dg	60					Sand	50	5- 2-50	J	1/4	D			
34N1	H. Mikelsen	S	65	Dr	152	6		145	7+	Gravel	8	3- -40	J		D			L.

34N2	E. R. Mort	S	35	Dr	155	4					4.8	7-5-50	P		D	5	112	
34N3	R. Wilkens	S	30	Dr	40	6	40			Sand	Flows	4-26-50	J	1/3	D			Till above aquifer.
34P1	J. R. Anderson.	S	20	Dr	141	6	141	138	3	Gravel				1/2	D			L.
35N1	N. Johnson	S	20	Dr	230	6	230	60		Sand	12.6	10-5-49	N		NU(D)			Reported to produce som gas.
35N2	do	S	25	Dg	26					Sand and gravel					D			Till above aquifer.
35N3	T. Foshal	S	20	Dr	92			87	5+	Gravel and sand			N		De			Water reported to have odor of H_2S; L.
								T. 25 N., R. 1 W.										
1A1	R. M. Ilich	U	220	Dg	17.1	84				Sand	6.6	8-12-50		2	D			Till above aquifer.
1G1	W. H. Wahlstrom.	S	185	Dr	140	6							J	2	D	5	40	
1K1	H. Gorman	S	70	Dr	86	6	86	84	2+	Sand and gravel					D	9	75	L.
12L1	M. Lynch	S	40	Dr	134	6					2	1950	J	1½	D	8	55	Supplies two families.
14E1	O. Wilkowski	S	55	Dr	72	6	72			Gravel	36	1945	J	1	D			Till above aquifer.
14E2	W. W. Wade	S	40	Dr	199	6	199	196	3+	do	Flows	7-12-50	J	3	D,S	11	62	
14E3	G. E. Parsons	S	45	Dr	77	6					40	1948	J	1½	D	12	66	
14E4	G. E. Quinan	S	30	Dr	54	6	54	53	1+	Gravel	8	7-12-50	J	3	D			Reported to flow at high tide.
14F1	A. Apostel	S	60	Dr	208	5					55.5	5-28-50	N		NU(D)			Abandoned owing to insufficient water; L.
14M1	E. J. Greer	S	65	Dg, Dr	69	6	69	69			39	5- -48	J	1½	D	7	47	L.
15H1	— Foster	S	15	Dr	55	6	55			Sand and gravel	Flows	6-28-50	J	1½	D	9	60	L.
15H2	— McKenzy	S	15	Dg, Dr	57	6	57			do	Flows	7-12-50	J	1½	D	9	78	Reported to flow only at high tide; L.
15J1	J. A. Prohaska	S	10	Dr	57	6	46				2	1947	J	1	D			
15K1	F. Crosier	S	50	Dr	79	6	79			Gravel			J	1/2	D	7	92	L.
15N1	V. S. Conradson.	S	40	Dr	53	6	53	52	1	Sand	37	10- -50			D			L.
15P1	W. J. Demick	S	90	Dr	101	6				Gravel	85	1945	J	1½	D			
15Q1	C. Holiday	S	120	Dg, Dr	117.5	6	117.5	95	22.5	do	45	6- -49	J	1½	D	11	60	L.
15Q2	L. J. Robertson.	S	130	Dr	122.5	6		119	3½	Sand, coarse	2	1947	J	1½	D	10	60	L.
16R1	A. Frost	S	50	Dr	120	6							J	1/2	D			
17N1	Miami Beach Resort.	S	10	Dr	190	6				Gravel	Flows	8-2-50	J	1	D			Supplies 20 cabins.
17P1	— Berg	S	40	Dr	72	6	72	69	3	Sand	37	9- -50			D			L.
18R1	F. A. Durar	S	40	Dg	30	40				Gravel	26.0	8-2-50	J	1	D			
19F1	F. Bpenheven	S	40	Dg	12						5.0	8-2-50	S	1/4	D			Supplies 10 families.
19F2	G. F. Schroeder.	S	30	Dr	37	6	65			Gravel			P	1/3	D			L.
19M1	O. M. Ruehle	S	40	Dg	54.6					do	52.8	8-2-50	J	1/4	D			Water level reported to fluctuate with tide.
20J1	R. E. Hadley	S	20	Dr	68	6	68	63	5	Sand and gravel	+20	7-12-50	N		D	7	62	L.
20M1	C. L. Keeler	S	40	Dg	18.9	40				Till	14.0	8-2-50	S	1/4	D			
21E1	R. E. West	S	40	Dr	46	6	46			Clay, sandy	4	8- -48	J	1/2	D	5	56	L.
21E2	L. Boyce	S	40	Dr	14	6		12	2	Sand	Flows	8-2-50	S	1/4	D			L.
21M1	B. Bennick	S	40	Dr	53	6	52				Flows	8-2-50	S	1/2	D			L.

TABLE 5.—*Records of representative wells in Kitsap County, Wash.*—Continued

Well No.	Owner or tenant	Topography	Approximate altitude above sea level (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing zone(s): Depth to top (feet)	Water-bearing zone(s): Thickness (feet)	Water-bearing zone(s): Character of material	Water level: Below land-surface (feet)	Water level: Date of measurement	Pump: Type	Pump: Horsepower	Use of water	Quality of water: Chloride (parts per million)	Quality of water: Hardness, as $CaCO_3$ (parts per million)	Remarks
T. 25 N., R. 1 W.—Continued																		
22B1	E. Emel	S	180	Dr	200	6				Gravel	100	12- -41	P	3/4	D,S			
22K1	P. Emel	U	250	Dg	22.7	48				Sand and gravel	18.3	8- 2-50	S	1/4	D			Till above aquifer.
22L1	C. Williams	U	270	Dg	10.7	36				Sand (?)	6.6	8- 2-50	P		D			
23D1	C. Brobeck	U	180	Dg	30	36	21	29	1	Gravel	23	7-10-50	J	3/4	D			Till above aquifer.
25B1	J. J. Davis	U	380	Dg	8.9	48				Sand	2.6	7-31-50	S		S			
25F1	L. Swoffand	U	340	Dg	49.1	60					26.6	7-13-50	N		NU(S)			Till near surface.
29C1	B. E. Hughes	S	20	Dg	14.3	30					10.0	8- 3-50	S	1/4	D			
30F1	C. J. McCann	U	150	Dg	28.8	48					16.3	8- 3-50	P		NU(D)			Till near surface. Supply reported inadequate.
35J1	F. Jacobs	U	425	Dg	63.5					Gravel	57	1950	P	1/4	D			
35R1	Mrs. Edwards	U	390	Dg	23.2	48				Till	17.6	7-15-50	P		D			Supply reported inadequate.
35R2	L. A. Schank	U	390	Dg	14.5	48	14			Sand and gravel	10.0	7-15-50	S	1/4	D			
36N1	J. L. Sutherland.	U	380	Dg	17.2	60				do	8.2	7-13-50	S	1/4	D			
36P1	J. Cameron	U	380	Dg	16.7	30				Sand	9.2	7-13-50	S	1/4	D,S			
T. 25 N., R. 2 W.																		
27Q1	R. Canedy	S	10	Dg	10	36		9	1+	Gravel	5.2	8- 3-50	S		D			
34K1	A. L. Gehri	S	50	Dr	46.4	6				Sand	39.7	3- -50	P	1 1/2	D,S			Till above aquifer.

T. 25 N., R. 1 E.

1C1	E. H. Harrison.	U	140	Dg	16.5	36				Sand	10.6	9-7-50	S	1/4	D			
1E1	Mrs. W. F. Nicholson.	U	180	Dg	19.6	48				Till	13.9	9-7-50	S	1/4	D			Supply reported inadequate.
2F1	Olympic Nursery.	U	325	Dg	16.3	36				Sand	13.1	8-22-50	S		D			Till above aquifer.
3C1	C. W. Carlson	U	330	Dg	16.5	40				do	4.7	8-21-50	S	1/3	D			
3H1	A. S. Hawk	U	310	Dg	30.7	48				do	24.7	8-22-50	J	1/2	D,S			Supply reported inadequate.
3H2	A. Silver	U	310	Dg	10.8	89				Sand and gravel	7.4	8-22-50	S	1/3	D			
4M1	V. J. St. Cyr	V	110	Dr	130	6				do			J	3	D	10	45	Supplies two families and 9,000 chickens; pumps 22 gpm.
5A1	A. G. Holt	U	280	Dr	75	6							J	1/2	D	8	50	
5B1	A. W. Berry	U	250	Dr	70	6				Sand	52	7- -43	J	1	D,S			
5H1	A. R. Ward	U	270	Dg	52	36				Sand and gravel	49	8-8-50	S		D,S			
5R1	J. Riley	U	210	Dg	54	36				Sand	48	8-9-50	J	1/4	D			
6D1	U. S. Navy	U	320	Dr	207	8	207			do	127	1948		35	Inst			N. A. D. Bangor well 3; dd of 15 ft at 35 gpm; L, A.
6D2	do	U	320	Dg, Dr	286	6							N		NU (Inst)			N. A. D. Bangor well 4; L.
6P1	C. A. Doerr	U	300	Dr	200	6							J	1 1/2	D			Supplies two families.
6P2	W. N. Gingery.	U	300	Dg	27.7	48				Gravel	22.1	8-14-50	J	1/4	D,S			
7G1		U	300	Dg	100	48				Sand and gravel	94	11- -43	N		De			
7G2	F. W. Morris	U	310	Dg	90	48				do	78	6- -50	J	2 1/2	D			
7H1	C. Van Keuven.	U	290	Dg	90					Sand			P		D			
7H2	C. Marsh	U	275	Dr	130	6				do			P	3/4	D,S	5	65	
7H3	G. Harris	U	280	Dr	100	8				Gravel	83	1947	J	1	D,S	8	60	
8G1	V. Bind	S	200	Dg	9.4	36				Sand	5.1	8-11-50	S	1/2	D,S			
8L1	T. Plumau	U	260	Dg	35.5	48				Sand and gravel	18.6	8-11-50	P	1/3	D,S			Till above aquifer.
8R1	L. Wallworth	S	150	Dg	26.2	48				Sand	1.3	8-7-50	P	1/4	D			Do.
9D1	G. Peterson	V	75	Dr	392	6				Gravel	25	1947	J	3 1/2	S	5	50	
9F1	I. Lampe	V	55	Dg	12.8	24				Sand(?)	10.7	7-8-50	S	1/3	D			
9G1	L. O. Fairfield.	V	80	Dr	164	6		135	5	Gravel			J	2	D,S	5	65	Supplies a dairy; L.
9L1	P. E. Potter	V	50	Dg	12.2	72				Sand and gravel	7.4	8-7-50	J	1/4	D			Till above aquifer.
9L2	K. R. Aldrich.	V	55	Dr	45	6				Sand	7	5- -50	J	1/4	D			Do.
9M1	H. H. Compton.	V	90	Dg	9.4	36				do	5.3	8-9-50	S	1/4	D			Do.
9N1	J. Kikkent	V	50	Dr	90	6				do	6	8-16-50			D			Supplies two families.
10A1	J. T. Bartek	U	290	Dr	208	6				Gravel			J	1 1/2	D	8	70	
10A2	D. B. Taylor	U	340	Dg	44.3	60				Sand	36.4	8-23-50	J	1/2	D			Till above aquifer; supplies two families.
10C1	Island Lake Bible Camp.	U	225	Dg	31.1	30				do	20.5	8-18-50	J		D	6	55	Supply reported inadequate.

TABLE 5.—*Records of representative wells in Kitsap County, Wash.*—Continued

Well No.	Owner or tenant	Topography	Approximate altitude above sea level (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing zone(s): Depth to top (feet)	Water-bearing zone(s): Thickness (feet)	Water-bearing zone(s): Character of material	Water level: Below land-surface (feet)	Water level: Date of measurement	Pump: Type	Pump: Horsepower	Use of water	Quality of water: Chloride (parts per million)	Quality of water: Hardness, as $CaCO_3$ (parts per million)	Remarks
T. 25 N., R. 1 E.—Continued																		
10J1	O. Ringness	U	245	Dg, Dr	225	6	225	222	3	Sand	60	11-7-50	J	3/4	D,S			Temp. 50° F; L.
10K1	R. Lindberry	U	210	Dg	33.9					Sand	26.9	8-23-50	P	1/3	D			
10R1	J. Iverson	U	210	Dg	17.6	48				Till	12.1	8-23-50	B		D			
11E1	L. H. Larson	U	270	Dg	19.2	46				Sand	11.6	8-23-50	S	1/4	D			
11N1	B. Magenus	U	220	Dg	37.6	60				do	16.6	8-23-50	J	1/2	D			Till above aquifer.
11P1	C. Kellogg	U	180	Dg	32.8	60				do	26.5	8-23-50	P	1/3	D,S			Do.
11P2	do	U	150	Dg	47.8	48				do	35.3	8-23-50	J	1/2	D,S			Do.
11P3	E. Sunderland.	U	130	Dg	32.6	48				do	28.0	8-23-50	P	1/4	D			Do.
11Q1	E. L. Walker	U	110	Dg	20.0	72				Gravel	13.8	8-24-50	P	1/4	D			Do.
12C1	O. Howen	U	210	Dg	82.1	48				Sand	72.1	9-7-50	P	1	D			
12D1	Mrs. N. Liaseet.	U	180	Dg	34.1	36				Gravel	20.3	8-24-50	P	1/2	D			
12P1	R. E. Peterson.	U	260	Dg	89.9	48				Sand	88.3	8-24-50	P		D			
13B1	M. O. Beck	U	150	Dr	120	6							J	1/4	D	10	49	
13C1	R. I. Reed	U	210	Dg	53.7	30				do	45.1	8-23-50	J	1/3	D			
13K1	L. A. Huff	U	100	Dr	70	6				Gravel	54	8-1-50	J	1/3	D			
13K2	do	U	100	Dg	48.3	48		40	8+	do	37.1	9-1-50	J		D			Till above aquifer.
13L1	Crystal Grange	U	120	Dr	80	6							P	3/4	D	8	75	
13M1	W. Gamet	S	160	Dr	149	6				Gravel			P	1/2	D	5	75	
13M2	N. B. Hollingesworth.	S	150	Dr	139	6				do			J	3/4	D,S	6	75	
13P1	E. Wester	S	30	Dg	22	36				Sand	20.3	8-24-50	P	1/4	D			
14D1	E. W. Corb	U	170	Dg	11.2					do	7.8	8-23-50	S	1/4	D			Till above aquifer.
14G1	F. Womac	V	90	Dg	9.3	36				Sand	7.8	8-22-50	S	1/4	D			
14J1	C. A. Ward	S	100	Dg	41.8	48				do	30.4	8-23-50	P	1/3	D			
14M1	L. R. Swanson	U	100	Dg	18.9	72				Sand and gravel	15.6	8-22-50	S	1/4	D			
14N1	do	U	80	Dg	25.8	38		20	5.8+	Gravel	8.4	8-22-50	S	1/2	D, S			

14Q1	A. Childres	V	80	Dg	30	36				Sand and gravel	25	8- 8-50	J	1/4	D			Supply reported inadequate.
15B1	T. S. Stone	U	150	Dg	12.8	36				do	7.1	8-22-50	S	1/4	D			
15J1	N. A. Vradenburg	U	150	Dg	18.9	48					12.4	8-22-50	S	1/6	D			
16C1	C. D. Ticher	V	60	Dr	67	6							J	1/2	D			
16E1	M. Lane	V	60	Dg	16.6	36				Sand	5.9	7- 8-50	S	1/4	D			
16F1	P. G. Peterson	V	40	Dg	20.9	48					12.9	8- 7-50	J	1/3	D			
16G1	G. Simonson	V	50	Dr	188	6	188				6	1950	J	1/4	D	8	58	L.
16M1	L. C. Greaves	V	45	Dg	31.9	48				Sand	13.8	8- 7-50	P	1/6	D			
16N1	F. R. Gerjets	V	25	Dr	52	6				Sand and gravel	Flows	8- 7-50	S	1/4	D	6	66	
16P1	S. A. Sangsland.	V	50	Dr	69	10							P	1/3	D, S			Reported to flow during winter.
17B1	A. Horsley	S	130	Dr	32.0	6					0.0	8- 9-50			D, S	9	35	
17C1	E. J. Huening	U	190	Dg	12.5	48				Till	10.0	8-11-50	J	1/3	D			Supply reported inadequate.
17F1	J. Davis	U	160	Dg	11.6	36				Sand and gravel	7.6	8-11-50	S	1/4	D			
17J1	Mrs. Watson	S	65	Dr		6					+17	8- 7-50	F		D	5	70	
17L1	N. Fuller	U	160	Dg	49	40		45	4+	Gravel	30	4- -50	J	1/3	D			Till from 3 to 45 ft.
17P1	P. W. Torpey	S	120	Dg	18	36				Sand	9	7- -48	P	1/2	D			
17R1	L. A. Smith	V	35	Dr	56½	6	56½	56	½+	Gravel	Flows	10- 2-50			D			L.
17R2	B. W. Hanberg	V	40	Dr	62	6		61	1	do	Flows	10- 5-50	P	1/2	D			
18D1	G. Weaver	U	430	Dr	128	6				Sand and gravel			J	1/2	D, S	10	50	
18G1	W. B. Proper	U	290	Dg	37	36				Gravel	29.6	8- 8-50	J	1/4	D			Till above aquifer.
18J1	R. H. Durley	U	280	Dg	23.5	36					19.2	8- 8-50	B		D, S			Yields small supply.
18J2	C. M. Zimmerman.	U	260	Dg, Dr	156	6							J	1/2	D	9	45	Dug to 45 ft.
18K1	R. Walker	U	300	Dg	20.8	48				Sand	11.7	8- 8-50	S	1/4	D			Till above aquifer.
19J1	O. E. Ramirez	U	330	Dg	46.4	60				do	39.5	8- 8-50	J	1/4	D			Supply reported inadequate.
20M1	J. H. Liter	U	220	Dg	39.7	40				Sand(?)	26.7	8- 8-50	J	1/4	D			
21A1	A. R. Hoppe	S	160	Dr	75	6				Sand and gravel	59	8- -47	J	1/2	D	8	96	
21B1	——McKaeg	S	100	Dr	91	6	91	85	6+	do	31	6- -48	J	1/2	NU(D)	11	90	L.
21B2	E. McEveen	S	60	Dr	66	6							J	1/2	D			
21C1	H. S. Bartlett	S	25	Dr	65	6					+3	8- 4-50			D	5	86	Flows about 1 gpm.
21C2	E. Vetter	S	15	Dr	43	6				Gravel	+8.3	8- 7-50	F		D	9	62	Water reported to have slight odor H_2S.
21G1	M. Cleven	S	40	Dr	66	6					18.3	8-23-50	J	1/2	D			
21R1	L. Erickson	S	15	Dr	28	8				Sand, coarse	1.4	7- 6-50	S	3	PS	7	66	Supplies 11 families.
22C1	C. J. Zaluskey	U	100	Dg	25	60	25			Gravel	3.6	7- 1-50	S	3/4	D, S			Supplies three families.
23H1	H. R. Hansen	U	120	Dg	16.4	40				do	13.7	8-25-50	S	1/4	D			
23K1	B. Bitle	U	190	Dg, Dr	48	6				Sand	32	6- -49	J	1/3	D	9	78	Dug to 30 ft; L.
23Q1	R. I. Short	U	220	Dg	32.3					do	22.1	7- 8-50	J	1/4	D			
24D1	H. L. Mayfield	U	120	Dg	23.3	36				do	19.6	8-25-50	S	1/2	D			Supply reported inadequate.
24F1	L. Nyholm	U	250	Dr	114.4	6				do	94.1	8-24-50	N		NU(D)			
24N1	R. E. Powell	U	220	Dg	40.8	36				Gravel	34.9	8-25-50	J	3/4	D			
24N2	do	U	220	Dr	250	6				Sand and clay			N		NU(D)			Supply reported inadequate.
25D1	S. Boroughs	U	215	Dg	12.3	36				Sand	7.0	8-25-50	S	1/4	D			Do.
25N1	F. Stenerros	U	230	Dg	17					Sand and gravel	12	8- -48	S		D			Till above aquifer.
26G1	R. Tempf	U	210	Dg	27.6	48				Sand	20.0	8-28-50	J	3/4	D			

TABLE 5.—*Records of representative wells in Kitsap County, Wash.*—Continued

Well No.	Owner or tenant	Topography	Approximate altitude above sea level (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing zone(s): Depth to top (feet)	Water-bearing zone(s): Thickness (feet)	Water-bearing zone(s): Character of material	Water level: Below land-surface (feet)	Water level: Date of measurement	Pump: Type	Pump: Horsepower	Use of water	Quality of water: Chloride (parts per million)	Quality of water: Hardness, as $CaCO_3$ (parts per million)	Remarks
										T. 25 N., R. 1 E.—Continued								
26H1	—— Heidman	U	180	Dg	12.6	36				Sand and gravel	3.9	8-24-50	J	1	PS	11	85	Supplies 12 families with well 26H2.
26H2	do	U	180	Dg	12	36				do	3.3	8-24-50	J	1	PS			
26R1	F. R. Gearhart.	U	260	Dg	13.3					Sand	7.3	8-28-50	S	1/4	D, S			
27D1	R. B. Callison	S	130	Dg	40	30				do	32.8	7- 8-50			D			
27E1	do	S	130	Dg	43	36				do	33.5	7- 8-50	J	1/4	D			Water temp. 48° F; Supply reported inadequate.
27H1	J. Paharnm	U	200	Dg	19.6	60				Gravel	14.6	8-29-50	S	1/4	D			
27K1	L. S. Orrfelt	U	190	Dg	15.5	38				Sand	9.5	8-29-50	S	3/4	D			
27N1	O. I. Helms	S	80	Dg, Dr	83½	6	83.5	64	19½	Sand and gravel	60	8-28-50	J	3/4	Irr			Water contains H_2S; L.
28J1	Dr. Kint	S	60	Dr	98	6				Sand (?)	23	6- -50	J	2	Irr			L.
30D1	A. Hankamer	U	410	Dg	27.1	48				Till (?)	20.0	7-31-50	B		D			
32N1	F. B. Bell	S	45	Dg	10.0	48				Sand	8.0	7-26-50	S	1/3	D	8	40	
32N2	A. Reeve	S	40	Dr	52	6				do			J	1/4	D	9	38	Supplies seven families.
33N1	J. H. Akers	S	25	Dg	26.1	48				Gravel	9.8	6-28-50	P	1/4	D			
35A1	B. Dahl	U	280	Dg	68.2	36				do	59.4	8-28-50	J	1/2	D			
35A2	M. Forsythe	U	290	Dr	128	6							P	3/4	D	8	70	
35C1	F. F. Corey	U	240	Dr	65	6				Sand			J	1/3	D	10	58	Supplies eight families.
35E1	O. S. Keen	U	150	Dg	15.5	36				do	6.5	8-28-50	S	1/3	D			
35H1	R. H. Kettenling.	U	270	Dg	72.4	30				Sand	64.5	8-28-50	J	1/2	D, S			
35M1	O. Johnson	U	340	Dg, Dr	212	6		40	18	Sand	37	1950			D			L.
										T. 25 N., R. 2 E.								
4A1	H. M. Dagg	S	40	Dg	55	48				Sand	.8	12-11-50			D			Blue clay at 55 ft.
5H1	T. Berg	S	65	Dr	98					Sand and gravel	35	1950			D			
6A1	T. S. Fisher	U	80	Dr	252	6	252	250	2	do	65	1946	P		D			Till and blue clay above aquifer.
9D1	— Cove	S	20	Dr	60	4½		56	2	Gravel					D			L.

9E1	Lodin and Bergstrom.	S	10	Dr	168	8				Sand, fine	Flows				PS			New well, not yet in use; brown clay above aquifer.
11N1	G. Wilkinson	U	305	Dg	110	36					80.6	12-13-50	P		D			
14A1	Hill Naval Academy.	S	30	Dr	338	6					28.9	11-29-50	J	3	Inst			L.
14A2	do	S	90	Dr	131	8							J	3	Inst			L.
14P1	Mrs. Webster	S	40	Dr	106	6	20	20		Sand	15		J		D			L.
17C1	U. S. Navy	U	155	Dr	910	6-5		90.2	8	do	100				Inst			Reported dd of 45 ft after 8 hr pumping 30 gpm; L, A.
17C2	do	U	150	Dr	264										Inst			L, A.
19N1	F. Jorstad	S	140	Dg	20	36			9	Sand	5	8-31-50	S	¼	D			Till from 6 to 11 ft.
19Q1	I. Neilson	S	55	Dg	28	48				do	23.0	8-31-50	S	¾	D			Supplies two families.
20D1	— Hendricks	S	70	Dg	70	48				Gravel (?)	60.7	12-14-50	J	¼	D	26	98	
20G1	T. A. Bright	S	30	Dr	46	6	46	36	10	Sand and gravel			S	¼	D			
20K1	Bainbridge Island School Dist.	S	70	Dr	62			55	4	Gravel	52				D			L.
20L1	A. Becker	S	20	Dr	46	6				do			J	½	D	11	124	
20L2	A. S. Heilbrom.	S	40	Dr	72	6				do			J	1	D			
21F1	A. Hoff	U	165	Dr	86	6	86	70	16	do	61	7-21-45			D			L.
22G1	K. Reeder	U	180	Dg, Dr	93	6				Gravel and sand	67	11-15-50	J	1	D	12	76	Dug to about 45 ft.
22Q1	Bainbridge Island School Dist.	U	225	Dr	170					Sand			P	5	Inst			Pumps 30 gpm.
23E1	A. Amdahl	U	160	Dr	72	6		52	20	Gravel	42	6-22-45	J	¼	D			L.
23F1	L. Sweetmans	S	155	Dr	122	6		118	4	do	113	3- -45	J	½	D			L.
23J1	W. Keys	S	70	Dr	105	6				Sand	80	1948	P	½	D	11	112	
23K1	— Sweetin	U	160	Dg	30	72					15.1	1-11-54	N		D			
23N1	— Duffy	U	200	Dr	110	6		100	10	Gravel	45	1949	P	¼	D	5		
23R1	— Furleigh	S	180	Dr	138	6				Sand and gravel	30				D			
23R2	Yemalt Lodge.	S	165	Dr	198	6				do	60				D	12	82	
25C1	Y. W. C. A.	S	100	Dr	109	8							P		D			L.
25D1	J. Touhy	S	110	Dr	136	6				Sand and gravel	40		P		D			
25E1	L. E. Duncan	U	110	Dr	110	6				Sand			N		De			L.
25L1	J. Wade	S	105	Dr	225	8					102	5-20-50	P	3	Irr			Pumps 20 gpm.
25L2	do	S	95	Dr	131	6	127						P	1	D			L.
25M1	M. Anthony, Jr.	S	70	Dr	89	6							N		NU(D)			L.
25N1	— Taft	S	10	Dr	85	6		82	6	Sand	Flows	9- 8-45			D			L.
26A1	U. S. Army	U	160	Dr	206	10-6					71	8-20-52	P	3	D			L.
26B1	R. Geniola	U	110	Dg	50					Sand			P		D			
26D1	D. H. Bucsit	U	200	Dr	98	6				Gravel, fine	30	1949	J	1	D			
26E1	O. J. Selland	U	180	Dr	76										D			L.
26E2	E. Callaham	U	170	Dr	73			62	11	Sand and gravel			N		NU			L.
26G1	A. B. Cooper	U	120	Dg	69	48					63.3	5-23-50	J	½	D			Reported inadequate supply.
26G2	B. W. Buchanan.	U	130	Dr	175	6				Sand			P	½	D	5		L.

TABLE 5.—*Records of representative wells in Kitsap County, Wash.*—Continued

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T. 25 N., R. 2 E.—Continued																		
26H1	Mrs. M. Antoncich.	S	115	Dg	26	96					15.7	5-23-50			PS			Used for emergency supply.
26H2	----do	S	125	Dr	168					Sand			P	1¼	PS			Supplies 50 families.
26K1	J. Uglesich	S	20	Dr	72	6				Sand and gravel			P	¾	D			L.
26K2	A. N. Whitenberg.	S	120	Dr	92	6		91	1	Gravel	67	1930	P	½	D			L.
26L1	J. Sauers	S	80	Dr	90	6	90	88	2	----do	45	3-23-45						L.
26M1	E. L. McNavity.	S	110	Dr	78	8	78	68	10	Sand and gravel			P	1	D	7		L.
26M2	J. Camarada	S	70	Dr	95	6	95	88	7	Gravel			J		D			L.
26N1	Federal Housing Authority.	S	20	Dr	125								N		NU (PS)			Reported to have become brackish.
26N2	H. W. Allen	S	40	Dr	105	6							J	1	PS			
26P1	Commercial Ship Repair.	S	10	Dr	761	8-4½					Flows	11-4-49	T	15	Ind	9		Reported to pump 300 gpm; well has been plugged at a depth of 580 ft; L.
26P2	Federal Housing Authority.	S	40	Dr	163			152	11	Gravel	30	5-23-50	T	15	NU (PS)			Reported to have become brackish; L.
27A1	B. O. Ihlands	U	220	Dg	34	36				Sand	24.0	5-23-50	J	½	D			
27B1	F. M. Furukawa.	U	145	Dg	39.2						8.1	5-26-50	P	¼	D			
27D1	J. R. Book	U	170	Dr	108	6				Sand	43.4	5-24-50	J		D			Till above aquifer.
27L1	----do	S	10	Dr	103	8	103			Gravel	Flows	5-23-50	T	5	Ind			L.
27L2	----do	S	15	Dr	101	6				Sand	2.8	5-24-50	N		NU (Ind)			L.

27M1	W. Walberg	S	10	Dr	55	6				Gravel	Flows	11-21-50			D	10	110	Flows about 1 gpm.
27M2	J. R. Book	S	20	Dr	40	6					Flows	5-24-50	S	½	D			Supplies two families.
27N1	K. Hahnu	U	130	Dg	49.6	40				Sand	46.3	5-25-50	J	½	D,S			
28Q1	W. J. Bergstrom.	U	170	Dg	55.3	30				do	47.4	5-25-50	J		D			
30B1	D. Solie	S	120	Dg	68	48				do	62.1	8-31-50	J	½	D			
30K1	W. O. Wesseler	S	100	Dr	465	6	465	202	5	do	20	1946	A	3	D			Supplies three families; L.
30N1	Desert Park Water System Inc.	U	340	Dr	154	8												Reported to have encountered only impermeable materials.
30N2	do	U	340	Dg	43	72				Sand	27	9- 1-50	T	5	PS	8	68	Supplies sixteen families.
31F1		U	250	Dg	45	48				do	45.8	9- 1-50	J		D			
31P1	S. L. Kerr	S	60	Dr	180	4½	180				55.6	9- 1-50	N		NU(D)			L.
31P2	R. Schutt	S	80	Dr	278	6	278	275	3	Gravel	Flows	9- 1-50		1	D	9	36	
33G1	L. E Gustafson.	U	160	Dg	21.5	30				Sand	11.0	5-25-50	P	¼	D			
33N1	L. Cunningham.	U	280	Dg	60	42					Dry							
34M1	C. Johnson	U	250	Dg	45.6	60				Sand	33.2	5-24-50	B		D			
35E1	M.J. Svorinich	U	150	Dr	174	4	174			do	124	3- -50	P	¾	D			
35F1	M. Mirkovitch	S	25	Dr	56	6							J	¾	D			
35F2	S. Mirkovitch	S	90	Dr	130	6		123	7	Sand and gravel			J	¾	D			L.
35F3	— Simpson	S	80	Dr	93	6		76	17	do			J	½	D			L.
35G1	West Coast Wood Preserving Co.	S	15	Dg	25	30							N		NU (IND)			Well "D"; reported to have become brackish.
35H1	do	S	20	Dg	30								N		NU			Well "A"; used by U. S. Navy during World War II; A.
35H2	do	S	20	Dr	500						Flows		N					Well "B"; A.
35H3	do	S	10	Dr	813	10-8		697	83	Sand	Flows				Ind			Well "C"; L. A.
35K1	D. Clark	U	185	Dr	198	6		191	7	do	173				D			L.
35K2	K. Dyste	U	160	Dr	165	6		158	7	do			P	1	D			L.
35K3	A. Towey	U	135	Dr	132	8		120	12	Sand and gravel	112		J	½	D			L.
35K4	R. Sergeant	U	160	Dr	185	6					155	8- -52	P	¾	D			
35L1	E. Love	U	160	Dr	209	6		200	9	Sand	149		P	1	D	12	84	L.
35M1	H. M. Selvar	U	200	Dr	99	6		94	5	do	74		J	¾	D	10	146	L.
35M2	H. I. Foss	U	260	Dr	148	6	148			Sand and gravel	132	1930	P		D			L.
35M3	D. Chuka	U	170	Dr	42	6		31	11	do			P	½	D			L.
35P1	L. Wade	S	135	Dr	280	6							N		NU(D)			Permeable material not encountered.
35Q1	E. Eldridge	U	160	Dr	150	6					65	10- -53	P	1	D			
35Q2	W. Warrick	U	130	Dr	155	6							J	½	D			L.
35Q3	E. Rollins	U	130	Dr	165	6					135		P	½	D			
36N1	— Hoodenpyle	S	15	Dr	604	6		530	74	Sand	Flows			½	D			L.
36N2	U. S. Navy	S	15	Dr	1403	18-8					Flows		N		NU (Inst)			Yields 4 to 15 gpm; water of poor quality; L.

TABLE 5.—*Records of representative wells in Kitsap County, Wash.*—Continued

Well No.	Owner or tenant	Topography	Approximate altitude above sea level (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing zone(s): Depth to top (feet)	Water-bearing zone(s): Thickness (feet)	Water-bearing zone(s): Character of material	Water level: Below land-surface (feet)	Water level: Date of measurement	Pump: Type	Pump: Horsepower	Use of water	Quality of water: Chloride (parts per million)	Quality of water: Hardness, as $CaCO_3$ (parts per million)	Remarks
T. 26 N., R. 1 W.																		
25J1	M. T. Shaver	S	230	Dg	36	36				Sand	20	8-16-50	J	½	D,S			
25J2	R. Myer	S	200	Dg	13.5	36				do	6.7	8-16-50	J	½	D			Supplies two families.
36R1	O. Wahlstrand	S	230	Dg	11.5	48				do	4.8	8-17-50	S	½	D,S			
T. 26 N., R. 1 E.																		
1C1	C. Lather	U	445	Dr	281	6	281			Sand and gravel	254.0	10-15-50	P	1	D			
9C1	R. Pamaguay	U	275	Dr	80	6	80				65	7- -50	J	¾	D,S			
9G1	H. O. Svenson	U	380	Dr	82	5	82	81	1	Gravel	70		P		D			L.
9G2	A. Edje	U	385	Dg, Dr	130	5				do	112	1940	P	1	D			
9J1		U	350	Dg, Dr	75.7	6					59.7	11- 9-50	N		NU(D)			Till at 3 feet.
9K1	A. Bruland	U	390	Dg, Dr	105	5	105			Gravel	80		P		D			
10A1	G. E. Park	U	230	Dg	61.9	36	5.5			Sand(?)	59.1	10-20-50	N		NU(D)			
10N1	T. Ellison	U	250	Dr	101	6		99	2	Gravel	91	1945	P	½	D			
11B1	W. Rudolph	V	65	Dg	12.6	36					7	10- 9-50	S	⅓	D			
11F1	F. A. Fred-erickson.	V	115	Dg	16	36	16			Till	8		S	¼	D			
12C1	R. Foss	U	250	Dr	115	6	115			Gravel, fine	25	1948	J	1	Ind			Supplies slaughter house.
12P1	R. Kindell	U	355	Dr	215	6		212	3	Gravel	80	1936	P	¾	D,S			L.
12Q1	T. Selbo	U	360	Dr	169	6					113.1	10-18-50	P	¾	D,S			
13A1	A. M. Stanley	U	355	Dr	157	6	157			Gravel, fine	137	10- -48	J	1½	D,S			
13F1	C. Smith	U	385	Dr	155	6	155	154	1	Gravel	100	1946	P	1	D			L.
13J1	E. Bowman	U	310	Dr	144	6	144	130	14	Gravel, fine	104	1949	P	1	D,S	10	40	
13M1	E. Eliazon	U	300	Dr	74	6	74	73	1	Gravel	39	1942	P	¾	D			
13M2	G. Alness	U	355	Dr	145	6	145			do	115	1944	P	3	D,S			
13N1	C. C. Caldart	U	305	Dr	120	6	120			Sand(?)	66.8		J	¾	D			
13P1	L. Langaunet	U	365	Dr	180	6	180			Sand	115		P	¾	D	8	98	
15B1	O. Torgeson	U	95	Dr	60	6	60	59	1	Gravel	20	1944	J	1	D			Supplies four families.

15B2	do	U	70	Dr	60	8-6	60			Sand	Flows(?)		J	1	D			
15C1	A. Smaaladen	U	230	Dr	123	6	123						P		D			
15F1	A. J. Hansen	U	125	Dr	104	6	97			Sand and gravel	10	9- -50	P		D			
15P1	N. Torennis	S	25	Dg	11.5					do	3.1	8-21-40	P	1½	D			
16D1	C. Dahl	U	420	Dr	126	6	126	118	8	do	101	1944	P	¾	D,S	8	40	L.
16N1	C. Scott	U	440	Dg, Dr	120	6							P	¾	D,S	10	60	
16N2	Mrs. E. Madison.	U	425	Dr	130	6				Gravel			J		D,S	8	35	
20R1	T. E. Brown	U	440	Dg	54.0	36				do	50.0	8-10-50	J		D			Supply inadequate in early winter.
21E1	O. Evjen	U	440	Dr	130	6				Sand and gravel			P	½	D,S	7	55	
21L1	R. A. Lampe	U	420	Dg	25.6	36				Sand	19.9	8-10-50	P	¼	D			
22C1	L. Johnson	S	90	Dr	68	6	68						J	½	D	6	50	
22F1	G. L. Olson	S	25	Dr	67	6	67			Sand and gravel	Flows		J	½	D	5	50	
22M1	R. Brown	S	90	Dr	67	6	67	60	7	Gravel	12	1- -48	J	⅓	D			Penetrated 50 ft of till and 10 ft of sandy clay above aquifer.
23A1	City of Paulsbo.	U	200	Dr	1,000	8							N		NU (PS)			Test for artesian flow, well abandoned without development.
24D1	O.M.Sorenson	U	300	Dr	120	5	120			Gravel	60		P	1	D,S			
24E1	J. Sagdahl	U	300	Dr	139	6	139			Sand	99	1949	P	¾	D			
24F1	Mrs. G. Simonson	U	310	Dr	317	6	287						N		NU(D)			Permeable materials. not encountered.
25C1	A.F.Johanson	U	200	Dr	155	6	155	154	1	Gravel			J	1	D,S			L.
25F1	Mrs. F. Westerlund.	S	80	Dr	300	6				Sand	60.6	10-18-50	P	¾	D			Well developed at about 90 ft.
25F2	— Hood	S	100	Dr	179	6							N		NU(D)			Permeable materials not encountered.
25L1	J. H. Anderson.	S	20	Dr	65	6	65			Sand	5	5- -50	J	1½	D			
25M1	A. Kellogg	S	65	Dr	101	6	101			Gravel	60.6		T	1	D,Irr			
25M2	C. Allen	S	55	Dr	205	6	190				50	1- -46	J	1	D			Stratum containing marine shells reported encountered.
25N1	A. Lovos	S	65	Dr	67	6	67			Sand and gravel	27		J	½	D			
25N2	D. Hendel	S	25	Dg	52	25	52						J	¾	D			
25N3	C. S. Conk	S	35	Dr	57	6	57	47	10	Sand and gravel	33	1946	J	¾	D			L.
26A1	A. M. Anderson.	S	55	Dr	120	6	120			Gravel(?)	32.4	10-18-50	J	1	D	11	110	
26A2	C. W. Higby	S	40	Dr	107	6	107	100	7	Gravel	Flows		J	1	D			L.
26A3	W. W. Scott	S	40	Dr	96	8	96	92	4	Sand	Flows		J	1	D,Ind			
26N1	W. King	S	40	Dr	162	6				Gravel			P	1	D	7	98	Supplies two families.
26N2	H. D. Hagstrom.	S	15	Dr	120	6				Gravel(?)			P		D	9	107	Supplies five families.
27G1	J. Smeigh	S	80	Dr	155	6				Sand	12	1950	P	½	D	5	85	
27J1	G. L. McDonald.	S	20	Dg	26.7	36					15.9	8-21-50	S	¼	D			
27J2	Mrs. S. Smith	S	45	Dr	152	6	152	146	6	Gravel	40	9-26-50	J	½	D			L.
27Q1	K. D. Sodenberg.	V	50	Dr	85	6				Sand			J	½	S	8	80	

TABLE 5.—*Records of representative wells in Kitsap County, Wash.*—Continued

Well No.	Owner or tenant	Topography	Approximate altitude above sea level (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing zone(s): Depth to top (feet)	Water-bearing zone(s): Thickness (feet)	Water-bearing zone(s): Character of material	Water level: Below land-surface (feet)	Water level: Date of measurement	Pump: Type	Pump: Horsepower	Use of water	Quality of water: Chloride (parts per million)	Quality of water: Hardness, as $CaCO_3$ (parts per million)	Remarks
T. 26 N., R. 1 E.—Continued																		
28N1	A. Witte	U	400	Dr	179	6				Gravel			P	3/4	D	5	35	
29H1	J. W. Wooland	U	430	Dr	250	6							P	1/2	D	9	40	
29J1	C. Aschenbrener.	U	425	Dr	207	5				Sand and gravel			P	1/2	D,S	8	50	Reported to yield small supply.
32K1	U. S. Navy	U	295	Dr	690	18-8	685	627	48	Sand, coarse	228	9- -44	T		Ind			Bangor well 1; dd 82 ft at 350 gpm.
32L1	do	U	295	Dr	165	8		125	33	Sand and gravel	129	2- -49			Ind			Bangor well 2; dd of 2 ft at 30 gpm; L.
32M1	do	U	300	Dr	700	10	570								Ind			Bangor well 5; pumps 550 gpm; L.
32Q1	W. M. Morris	U	255	Dg	21.8	60				Sand and gravel	10.0	8-11-50	P	1/3	D,S			Till above aquifer.
32Q2	H. Walton	U	260	Dg	18.5	48				do	8 1	8-17-50	P	1/2	D			Till above aquifer; A.
33M1	O. Bjork	U	290	Dr	105	6	105						J	1/2	D	10	35	
33Q1	C. H. Oliphant.	U	230	Dg	50	36				Sand	40.1	8-21-50	J		D,S			
33R1	G. W. Price	U	320	Dr	121	6				Gravel, fine			P	1/2	D	5	65	
34C1	T. S. Scupholm.	U	125	Dg	10.4	36				Sand	4.3	8-18-50	S	1/2	D			
34C2	— Schmeil	U	165	Dr	196	6	196	190	6	Gravel	121	10- 3-50	P	1	D			L.
34F1	G. E. Carlson	U	160	Dr	123	6				Sand			J	1/2	D			
34Q1	G. Tosthrude.	U	300	Dg	30	48				do	28	8-22-50	P	1/4	D			Reported to yield small supply.
35E1	O. E. Maurer	S	85	Dr	115	6		110	5	Gravel			J	1/2	D,S	8	108	Blue clay above aquifer.
35F1	C. H. Bennett	S	25	Dg	36.7	48				Sand	15.8	9- 7-50	J	1/2	D			
35L1	R. C. Lunde	S	25	Dr	46	6		36	10	Sand and gravel	5	9- -50	J	1/2	D	8	90	
36P1	U. S. Navy	S	14	Dr	380	6-4	355				Flows		A		Ind			Keyport well 1; yields about 50 gpm; L, A.
36P2	do	S	14	Dr	705	6-4					Flows		A		Ind			Keyport well 2; yields about 50 gpm; L, A.

36P3	do	S	19	Dr	535	8					Flows		A		Ind			Keyport well 3; yields about 85 gpm; L, A.
36P4	do	S	21	Dr	1,036	22–12	1,036				Flows		A		Ind			Keyport well 4; yields about 300 gpm; L, A. Report dd to 50 ft at 1,750 gpm during test.

T. 26 N., R. 2 E.

1B1	J. D. McCartney.	S	65	Dr	202	6	202						N		NU (D)			Permeable materials not encountered: L.
1B2	J. A. Lund	S	80	Dr	150	6	150			Gravel(?)			J	½	D			
1B3	J. D. McCartney.	S	120	Dr	78	6	78	72	3	Sand	53	10-3-50	P	¾	D			Dd of 6 ft after 2 hr pumping 5 gpm; L.
1B4	R. Nordquist	S	140	Dg	18	36	18	17	1	Gravel	16	10- -45	P	¼	D, S			
1B5	C. G. McCain	S	65	Dg	24	62	24	23½	½	Sand and gravel	17		S	⅓	D			
1L1	V. Rollins	U	160	Dr	56	46	56	44	12	Gravel, fine	30	8- -49	J	¾	D, S Irr	11	82	
1R1	C. H. Elbert	S	10	Dr	44	6	44	39	5	Gravel	3		P	½	D			
2J1	J. Eddie	U	275	Dg	16.5	48				Sand	11.3	10-3-50	P	⅓	D, S	9	40	
2J2	do	U	265	Dg	41	36				Sand and gravel (?).	30.2	10-3-50	S		D			Reported small supply.
6Q1	—Parker	U	290	Dg, Dr	118	6	118	90	28	Sand	78	1942	J	¾	D			Dug to 90 ft.
7N1	D. Stottlemyer.	U	370	Dr	278	6	278	277	1	Gravel	138	1946	P	¼	D	8	68	
7P1	E. B. Mellseth	U	300	Dg	23	60	4			Till	21	10- -47	S	¼	D			Reported small supply.
7R1	R. D. Paulson	U	380	Dg	49.4	36		45	4 4	Sand and gravel	43.[illegible]	10-12-50			D			Till above aquifer.
8E1	M. E. Swan	U	390	Dr	146	6	146						J	1	D, S	12	52	
9R1	E. Hannum	S	60	Dg	45½	36					Dry		N		De			
10K1	W. G. Hall	U	190	Dg, Dr	60	4	32	32	23	Sand					D			L.
10Q1	O. C. Gray	U	125	Dr	260	8	260	254	6	Sand and gravel	90	9-22-48	Sc	5	PS			Dd of 30 ft after 4 hr pumping 24 gpm; L.
16P1	Suquamish Improvement Co.	U	90	Dr	150	8	150	140	10	do	10		T	3	PS			Suquamish well 1.
16P2	do	U	90	Dr	147½	12	147½	142	5½	do	7½	5-10-46	P	5	PS	10	102	Suquamish well 2; 1
18D1	H. E. McMahill.	U	365	Dr	268	6	268	267	1	Gravel	139(?)	1946	P	1	D, S			L.
18E1	S. S. Kieski	U	360	Dr	178	6	178	174	4	Gravel			P	1	D, S			
28B1	E. Peterson	S	20	Dg	33	48	30			do	5	1954	D	¼	D			
28M1	A. H. Rohlfs	S	30	Dr	50	6	50	45	5	Sand and fine gravel.	20	1946	J	½	D			L.
32R1	W. Pettit	S	25	Dr	107	6				Sand					D			Well screened.
33K1	B. Peterson	U	145	Dr	110	6	110								NU (D)			Impermeable material for entire depth; well abandoned.
33L1	L. A. Knutson	U	190	Dr	168								N		NU			Impermeable material for entire depth; destroyed; L.
33M1	J. D. Brownell.	S	60	Dr	120	6	120	110	10	Gravel			J	¾	D			L.

TABLE 5.—*Records of representative wells in Kitsap County, Wash.*—Continued

Well No.	Owner or tenant	Topography	Approximate altitude above sea level (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing zone(s): Depth to top (feet)	Water-bearing zone(s): Thickness (feet)	Water-bearing zone(s): Character of material	Water level: Below land-surface (feet)	Water level: Date of measurement	Pump: Type	Pump: Horsepower	Use of water	Quality of water: Chloride (parts per million)	Quality of water: Hardness, as $CaCO_3$ (parts per million)	Remarks
T. 26 N., R. 2 E.—Continued																		
33N1	G. Harvey	U	150	Dr	70	6	70			Sand and gravel	25	1949	J	1½	D			
34E1	K. Skogan	S	90	Dr	91	6	82	45	7	Gravel	4.9	12-12-50	J		D	10	104	
34K1	R. D. Junge	S	60	Dr	145	6					19		N		NU(D)			
34L1	O. B. Harlan	S	8	Dr	1,005					Sand	Flows		F		D			Flows about 25 gpm; flow reported to fluctuate with the tide; L.
34L2		S	20	Dr	102	6	81			Sand streak in clay.	20	11- -31						L.
34M1	W. R. Grubb	S	50	Dr	68	6	68			Sand and gravel	48	9-17-45			D			L.
35C1	H. Kuchenbecker.	S	70	Dr	186	6					35		J		D	14	266	
T. 26 N., R. 3 E.																		
7D1	C. H. Elbert	S	100	Dg	55 1	42	4			Sand(?)	51.1	10- 2-50	P		D			Reported to yield small supply.
7D2	Puget Sound Power & Light Co.	S	80	Dg, Dr	103	6	103	99	4	Gravel	78		P	¾	D	12	142	
7D3	A. H. Swift—Peterson	S	40	Dr	83	6	83	81	2	do	43		J	1	D			
7D4	E. H. Senn	S	50	Dr	110	6	110	107½	2½	do			P	2½	D			
7D5	H. Brevick	S	45	Dr	95	6	95	89	6	do			J	½	D			
7E1	J.C. Crockett	S	40	Dg	25	48	10				14		S	¼	D			
7E2	R. Lopez	S	40	Dr	73	6	73				56		J	½	D			
7E3	C. L. Robertson.	S	80	Dr	85	6	85			Gravel			J	1	D			

7E4	H. A. Paul	S	80	Dr	83	6	83			do			J	½	D			
7M1	U. S. Navy	S	110	Dr	136	10-6	136	128	8	do			P	2	D			L, A.
										T. 27 N., R. 1 E.								
1R1	J. Olson	S	20	Dr	240	6	240			Gravel(?)			J	1	D			
12H1	Mrs. E. Johnson.	U	80	Dr	600	6	600			Sand and gravel			P	1	D			
22N1	J. Jensen	S	40	Dr	74	6	74			Gravel	15	1947	J	⅓	D			Till above aquifer.
22Q1	J. A. Brix	S	60	Dg	108	36	22	102	6	Sand, red	35.1	11- 9-50	J	1	D			
34H1	S. J. Spiry	U	290	Dr	170	6	170						P	1½	D, S			
34K1	F. Swope	U	325	Dr	253	6	253			Sand and gravel	213	1948	J	3	D, S	9	49	
										T. 27 N., R. 2 E.								
2L1	G. Hokanson	U	90	Dr	96	6	96			Sand			N		NU(D)			Abandoned owing to sand.
2L2	do	U	90	Dg	15	30	15				10	1944	S	¼	D, S			
2P1	R. Peterson	S	35	Dg	11.3	72	8			Gravel	5.0	10- 4 50	S	¼	D			
2P2	R Peterson	S	50	Dg	24.1	60	11			Gravel	6.6	10- 4-50	G		D,S			
3A1	N. D. Floyd	U	70	Dg	16	36	16	15½	½	do	8.5	10- 4-50	J	½	D,S			
14N1	H. Wyant	U	320	Dg	15	36	15	13	2	Sand and gravel	10	1948	J	⅓	D			
15D1	V. Almojera	U	320	Dr	155	6	155	150	5	do	95	1949	J	2	D			
15G1	G. Hulsebus	U	305	Dg	50	48	43	47	3	Sand	47		P	¼	D,S	10	70	
15G2	A. H. Adams	U	300	Dg	46.1	48	12			do	38.7	9-26-50	P	½	D,S			
15H1	J. D. Pickles	U	310	Dg	55.6	45	18			Sandy clay	47.2	9-26-30	P	½	D	13	78	
15J1	S. Navalto	U	300	Dg	25	36	8			Sand	20	5- -48	P	⅓	D,S			
15M1	J. L. LeNir	U	265	Dg	20.2	54				Till	15.8	9-20-50	S	¼	D,S			
15N1	E. Carlson	U	260	Dg	70	36					67		P		D,S			
16J1	B. Crabtree	U	265	Dg	72	30		70	2	Sand	70		N		De			Abandoned owing to caving.
17A1	R. Walgram	S	45	Dr	142	6	142	131	11	Gravel and sand			N		D			New well, not yet in use; water reported to be of poor quality; L.
17J1	D. Williams	S	25	Dr	66	6	66	57	9	Sand, coarse	22	9-20-50	S		D			L.
21A1	W. H. King	U	255	Dg	56	48	56				52		P	¾	D,S			
21A2	J. W. Halstead	U	245	Dg	50	48	4			Sand	47		J	¼	D			
22C1	D. W. Alldredge.	U	170	Dg	17.0	36				Till	8.9	9-20-50	S	¼	S			
22Q1	H. P. Lehrman	U	95	Dg	35.7	24	35.7			Gravel	29.8	9-26-50	P	2	D			
22Q2	P. W. Waldron	U	100	Dr	140	6	140	138	2	do	27	1944	J	⅓	D,S	11	70	L.
22R1	E. Nordberg	U	60	Dg	33	36	33	28	5	do	28	1945	J	¼	D			
23G1	E. Neske	U	390	Dr	170	6	170			Sand	162	7- -48	P		D			Supply reported inadequate.
23K1	Mrs. H. Simon	U	340	Dr	365	6	365	155	15	Sand	110	1946	T	3	D,S Irr	11	64	Gravel reported at 365 ft, but loss of drilling equipment in well prevented development of this aquifer.

TABLE 5.—*Records of representative wells in Kitsap County, Wash.*—Continued

Well No.	Owner or tenant	Topography	Approximate altitude above sea level (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing zone(s): Depth to top (feet)	Water-bearing zone(s): Thickness (feet)	Water-bearing zone(s): Character of material	Water level: Below land-surface (feet)	Water level: Date of measurement	Pump: Type	Pump: Horsepower	Use of water	Quality of water: Chloride (parts per million)	Quality of water: Hardness, as $CaCO_3$ (parts per million)	Remarks
										T. 27 N., R. 2 E.—Continued								
24N1	R. M. Soderberg.	U	390	Dg	31.1	60	14			Till(?)	21.6	9-28-50	J	1	D	17	112	
25F1	D. J. Kingrey	U	330	Dg,Dr	300	6	300			Sand			N		NU(D)			Abandoned owing to sand; L.
25L1	Mrs. M. Hiller	U	200	Dg	70	36	67			do	61.7	9-27-50	J	1/2	D			
25N1	State of Washington.	S	5	Dr	298	8	271			do			J		Ind			Tested about 50 gpm; L.
26J1	A. Carlson	U	95	Dg,Dr	98	6	98			Gravel(?)			J		D			Dug to 57 ft.
26J2	F. M. Eddy	U	110	Dg	12.1	36	12.1			do	3.4	9-27-50	S	1/4	D			
26J3	R. Peele	U	115	Dr	95	5-3.5	95	83	12	Gravel	89		P	1/4	D	12	88	
26K1	J. H. Burns	S	35	Dr	52	6	52			do			J	1/3	D			
26K2	E. Kasdorf	S	40	Dr	115	6	115			do			T	1	D			
26L1	R. Thorson	U	50	Dr	65	6	65				30	1944	P	1/2	D,S			
26R1	E. J. Hall	S	50	Dr	60	6	60	49	1/2	Gravel			J	3	D	13	98	Supplies several cabins.
26R2	do	S	50	Dr	339	6-5	339				17	1947	N		NU(D)			
27B1	H. P. Lehrman.	U	110	Dg	47.7	60	9	45	2.7	Gravel	44.0	9-26-50	P	3/4	D			
27E1	T. King	U	80	Dg	20	36	20	17	3	do	12		S	1/3	D,S			
27N1	M. Van Keuven.	U	75	Dr	85	6	85				40		J	1 1/2	D			
27N2	R. J. Forsyth	U	100	Dr	150	6	150	149	1	Gravel	70	1948	P	1	D,S	16	76	
27N3	K. Risberg	U	65	Dr	72	6	72	52	10	Sand and gravel	31	1946	J		D,S	8	92	Till above aquifer.
27Q1	— Warren	U	85	Dr	125	4							N		NU(D)			Never used.
28B1	K. O. Joyce	U	80	Dg	41	48				Till(?)	27		P	1/4	D			
28B2	W. W. Mills	U	120	Dg	39.3	48	39			Sand and gravel (?)	30.7	10-10-50	J	1/2	D			
28B3	G. L. Rounds	U	145	Dg	28.4	36	28				24.7	10-10-50	S	1/4	D			
28C1	E. Foster	U	165	Dg	16	60				Till	14.5		S		D			Reported to yield small supply.

28E1	E. Skiller	U	190	Dr	165	6	165	163	2	Gravel			J	1	D,S			Sand and blue clay above aquifer.
28G1	E. C. Fall	U	165	Dr	134½	6	134½	128	6½	do	99.3	10-10-50	P	½	D	9	46	Till to 75 ft.
28H1	V. W. Mattson	U	80	Dg	32	72	6			do	26		J	¾	D			Till above aquifer.
28L1	I. Jennings	U	205	Dr	160	6	160			Gravel			J	1½	D			
28M1	C. T. Howard	U	280	Dr	252	6	252			Sand and gravel	198.9				D			Well not yet in use.
28M2	do	U	280	Dr	225	6	225						N		NU(D)			Permeable materials not encountered.
28M3	W. F. Nickum	U	210	Dr	252	6	252						P	¾	D			
29G1	Mrs. L. Streibel.	U	115	Dr	323	6	323			Sand			P	¾	D,S	9	66	
29G2	J. W. McClelland.	U	175	Dr	137	6	137			Gravel	77		P	1	D			
29H1	A. Anderson	U	180	Dr	135	6	135				120.1	10-11-50	P	¾	D	11	74	
32C1	T. Portman	U	55	Dr	250	6	250				3.3	10-11-50	S	⅙	D,S			
33B1	D. Miller	U	150	Dg	37.5	36	37.5			Sand(?)	26.9	10-10-50	J	¾	D			
33B2	C. H. Johnson	U	120	Dg,Dr	130	6	55						P		D,S			Blue clay from 55 to 130 ft.
33C1	O. B. Anderson.	U	195	Dg	27	66	6	26	1	Gravel and sand	13		J	½	D			
33E1	B. Anderson	U	145	Dg	60	48		58	2	do			P		NU(D)			
34B1	J. Atwood	U	85	Dg	27.6	48	5			Sand	23.0	10- 6-50	B		D			
34F1	C. Johnson	V	45	Dg	16	60	8			do	10		S	¼	D			
34F2	C. Zeller	U	40	Dg	28	36				Gravel	19		J	¼	D,S			
35G1	R. Ziebarth	S	45	Dg	32	36	32			Gravel	29		P	⅓	D	11	84	
35G2	do	S	45	Dr	46	6	46			do			J	½	D			
35H1	F. Harvey	S	60	Dg	53.8	36				do	41.7	9-28-50	J	½	D,S			
35H2	R. Bird	S	60	Dr	110	6	80	80		do			J	1	D	11	104	
36Q1	S. Rice	S	35	Dr	75	6	75	65½	½	Sand	30	1947	J	½	D	12	126	Aquifer contains small amount of pea gravel.
36Q2	R. Sandal	S	35	Dr	95	6	66	65½	½	do			J	½	D	14	134	Do.
36Q3	do	S	35	Dr	57	6	57						N		NU (D)			Drilled chiefly in blue clay.
36Q4	T. Wangberg	S	35	Dr	67	6	67			Sand			J	½	D			Aquifer only a few inches thick; contains some pea gravel.
										T. 28 N., R. 1 E.								
12G1	W. E. Nyberg	S	110	Dr	200	6	200	196	4	Gravel, coarse	75	1949	P		D	25	24	Till and blue clay above aquifer.
12R1	E. Purcell	S	75	Dr	99	6	99	85	14	Gravel, fine	35	1948	J	½	D	250	318	Sixty feet of till and 25 ft of clay above aquifer.
13A1	J. E. Mooney	U	70	Dr	117	6	117			do	69.3	6-14-50	J	1	D	690	522	
13A2	E. Mathison	U	65	Dr	107	6	107	104	3	Gravel			J	¾	D			
13B1	A. S. Kincaid	S	60	Dr	85	6	85	82	3	Gravel, coarse	57.1	6-14-50			D			New well, not yet in use.

TABLE 5.—*Records of representative wells in Kitsap County, Wash.*—Continued

Well No.	Owner or tenant	Topography	Approximate altitude above sea level (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing zone(s): Depth to top (feet)	Water-bearing zone(s): Thickness (feet)	Water-bearing zone(s): Character of material	Water level: Below land-surface (feet)	Water level: Date of measurement	Pump: Type	Pump: Horsepower	Use of water	Quality of water: Chloride (parts per million)	Quality of water: Hardness, as $CaCO_3$ (parts per million)	Remarks
T. 28 N., R. 2 E.																		
7M1	C. L. Hofmann	S	15	Dg	20	36	20			Gravel, coarse	14	9– -50	J	½	D	25	172	
7M2	F. E. Stubbs	S	15	Dr	169	6	169	25	144	Sand			J	⅓	D	98	224	Well produces small showing of gas; L.
7P1	R. T. Severin	S	25	Dr	63	6	63	56	7	Sand and gravel.	23	8– -50	J	1	D			
16K1	F. White	S	10	Dr	121	8	121	119	2	Gravel	4	9– -50	J	1½	D			
16K2		S	10	Dr	120	6	120	116	4	Gravel			J	¾	D	212	204	
16K3	E. A. Erickson.	S	10	Dr	126	6	126	121	5	do	5.4	9-25-50	J	½	D			
16L1	B. Van Mavern.	S	15	Dr	50	6	50	47	3	do			J	¾	D			
16L2	N. R. Owen	S	35	Dr	67	6	67	62	5	Sand	30	7– -47	J	½	D	16	132	
16L3	M. Mattson	S	80	Dg	18	48		14	4	do	14	9– -50	P	½	D,S	11	46	Fifty-five feet of till above aquifer.
16M1	J. Jacobsen	S	45	Dg	15.9	36	15			do	9.4	9-25-50	P	¼	D	13	82	
17M1	Evergreen Gas & Oil Co.	S	65	Dr	1206								N		NU(D)			Oil and gas test well; L.
18B1	D. C. Thaanum.	S	15	Dr	50	6	50	45	5	Sand and gravel.	15	5– -49	J	½	D	19	112	
18C1	M. L. Camp	S	20	Dr	73	6	73	66	7	do	20	8– -50	J	½	D			
18H1	B. L. Kerns	S	50	Dg	34½	48	34½			Gravel	18½	1943	J	1	D			
18J1	Mrs. Pace	S	60	Dr	206										De			Formerly Puget Mill Co. test well, yielded some gas; L.
20D1	J. O. Lashar	S	25	Dr	110	6	110	80	10	Sand and gravel.	18.3	11- 8-50			D			New well, not yet in use; L.
20N1	R. Lewis	S	25	Dr	47	6	47			Sand, coarse	22	7– -50	J		D			
21B1	J. E. Lewis	U	125	Dg	29.7	60	8				13.7	9-22-50	B		D	9	44	

21C1	O. G. Fredericks.	U	155	Dr	113		8	113	100	13	Sand	98	1938	J	1	D			
21C2	J. Fredericks	U	165	Dg	60		36	5	56	4	Gravel and sand.	55.7	9-22-50	P	⅓	D,S			
22B1	U. S. Coast Guard.	S	80	Dr	109		6	109	78	31	Sand	76(?)	8- -48	J		F			Yields about 50 gpm; L., A.
22M1	A. Erickson	U	145	Dr	160		6	160	154	6	do	138	5- -47	J	1½	D,S	13	166	
22P1	C. Lundgren	U	180	Dg	8.8		48	8.8	4	4.8	do	3.3	9-21-50	J	¼	D,S			
27D1	G. Hemming	U	210	Dg	14		48	14	12	2	Gravel	6		S		D			
33J1	J. M. Eyer	U	240	Dg	18.1		48				Till	11.1	9-21-50	S	¼	D			
34K1	H. Ingala	U	180	Dg	22		72	6			do	15	9-20-50	S	⅓	D,S			
34N1	I. Johnson	U	230	Dg	12.1		36	12	10	2.1	Gravel	8.7	9-21-50	S	¼	D			
34P1	J. G. Johnson	U	230	Dg	17.1		36	17			Till	7.5	9-20-50	J	¼	D			
35E1	G. Hedlund	U	210	Dg	43		42	7	42	1	Gravel	21		B		D			
35E2	Mrs. Sokolich	U	200	Dr	127		7	127			do			P		D			
35M1	R. E. Dryer	U	145	Dr	105		6	105			do			J	1½	D	11	70	
35M2	E. D. Byer	U	150	Dr	107		6	107	103	4	Gravel, fine	85	10- 4-50	J	1	D	11	82	L.
34M3	J. G. Shackman.	U	200	Dr	300		8	274						N		N			Small yield, abandoned; L.
35N1	C. Norheim	U	125	Dr	160		6	160			Gravel	80.6	9-20-50	P		D,S			

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*

Well-numbering system explained in text (p. 3). Tentative stratigraphic designations by J. E. Seeva

Materials	Thickness (feet)	Depth (feet)
Well 22/1W-11J1		
Union Oil Co. Altitude about 390 feet. Drilled by L. B. Richardson, 1949.		
Vashon drift:		
Till:		
"Hardpan"	23	23
Clay, yellow, and gravel	45	68
Puyallup sand:		
Clay, sandy	14	82
Sand, 12 ft. of water	8	90
Clay, sandy, dry	36	126
Sand, gravel, and clay, dry	4	130
Clay, sandy, yellow	8	138
Sand, gravel, and clay	12	150
Clay, sandy, yellow	8	158
Orting gravel:		
Kitsap clay member:		
Gravel, cemented	10	168
"Hardpan"	20	188
Clay, sand, and gravel	12	200
"Hardpan"	5	205
Clay, sandy red	19	224
Clay, sandy, gray	21	245
Sand, coarse, and gravel	2	247
Clay, sandy, brown, and gravel	13	260
"Hardpan"	18	278
Clay, yellow, and gravel	7	285
Lower member:		
Sand, coarse, and gravel	3	288
Gravel	2	290
Clay, sandy	7	297
Clay, sand and gravel	55	352

Casing, 6-inch, set to 352 feet; perforated from 280 to 290 feet.

Materials	Thickness (feet)	Depth (feet)
Well 22/1-1M2		
E. P. Berle. Altitude about 40 feet. Drilled by Tacoma Pump Co., 1942.		
Soil and alluvium	10	10
Puyallup sand:		
Sand and clay	20	30
Clay (?), hard	25	55
Sand and gravel, heaving	7	62

Casing, 6-inch, set to 62 feet.

Materials	Thickness (feet)	Depth (feet)
Well 22/1-1N1		
T. L. Ferguson. Altitude about 25 feet. Jetted by T. L. Ferguson, 1946.		
Recent alluvium:		
Soil	1	1
Clay, yellow	1	2
Clay, blue	4	6
Clay, blue, with sand	6	12
Sand and pea gravel, water-bearing	4	16
Orting gravel:		
Kitsap clay member:		
Clay, blue	16	32
Lower member:		
Sand and gravel, water-bearing, artesian flow under 3 pounds pressure	24	56
Gravel, coarse, and blue clay	4	60
Admiralty drift:		
Clay, blue	110	170
Clay, hard	3	173
Clay, blue, with fine sand	206	379
Sand, fine, hard	6	385
Clay, hard	11	396
Sand, water-bearing, artesian flow under 49 pounds pressure	6	402

Casing, 2-inch, set to 200 feet.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 22/1-2D1		
L. S. Gross. Altitude about 300 feet. Drilled by L. Stoican, 1950.		
Vashon drift:		
Till:		
"Hardpan"	18	18
Advance outwash:		
Sand and gravel	10	28
Rock	2	30
Gravel, coarse	10	40
Sand, coarse	12	52
Gravel, fine	14	66
Casing, 6-inch, set to 66 feet.		
Well 22/1-3R3		
W. H. Hall. Altitude above 235 feet. Drilled by Service Hardware Co.		
Vashon drift and Puyallup sand:		
Soil	15	15
Sand	25	40
Sand and fine gravel	16	56
Clay and sand	40	96
Gravel, coarse	12	108
Casing, 8-inch, perforated from 99 to 108 feet.		
Well 22/1-8H1		
W. M. Nearhoff. Altitude about 305 feet. Drilled by T. G. Philpott, 1948.		
Dug, no record	61	61
Puyallup sand:		
Sand, fine	19	80
Sand, coarse, and gravel	10	90
Sand, fine	10	100
Casing, 6-inch, set to 80 feet; screen below.		
Well 22/1-10M2		
V. Kieffer. Altitude about 335 feet. Drilled by L. B. Richardson.		
Soil and alluvium	6	6
Vashon drift:		
Sand	2	8
Till:		
"Hardpan"	18	26
Puyallup sand:		
Sand	37	63
	60	123
Casing, 6-inch, set to 123 feet.		
Well 22/1-12D2		
E. Knapp. Altitude about 25 feet. Jetted by T. L. Ferguson.		
Recent alluvium:		
Soil	2	2
Clay, blue	5	7
Sand and gravel, water-bearing	30	37
Clay, blue, and gravel	9	46
Orting gravel:		
Kitsap clay member:		
Clay, blue	13	59

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Well 22/1-12D2—Continued

Materials	Thickness (feet)	Depth (feet)
Orting gravel—Continued		
Lower member:		
Gravel and sand, water-bearing, artesian flow under 3 pounds pressure	2	61
Clay, blue, hard	11	72
Gravel, fine, water-bearing, artesian flow under 7 pounds pressure	6	78
Gravel, with sand and clay	19	97
Sand, fine, with soft clay	95	192
Admiralty drift:		
Clay, blue, hard	80	272
Sand, muddy	23	295
Sand, gray, fine, hard	3	298
Clay, blue, hard	45	343
Admiralty drift:		
Sand, water-bearing, artesian flow under 46 pounds pressure	10	353

Casing, 2-inch, set to 343 feet.

Well 22/1-12R2

A. Stiner. Altitude about 120 feet. 1934.

Materials	Thickness (feet)	Depth (feet)
Soil	1	1
Vashon drift:		
Sand	3	4
Till:		
"Hardpan"	4	8
Advance outwash:		
Sand and gravel	10	18

Casing, 30-inch, set to 18 feet.

Well 22/2-6B1

H. G. Chrisman. Altitude about 325 feet.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium and Vashon drift:		
Soil and alluvium	6	6
Recessional outwash:		
Clay, sandy	6	12
Gravel, coarse	12	24
Till:		
"Hardpan"	11	35

Casing, 30-inch, set to 19 feet.

Well 22/2-8E1

M. R. Mercer. Altitude about 365 feet. Dug by owner. 1949.

Materials	Thickness (feet)	Depth (feet)
Vashon drift:		
Soil, sandy	4	4
Till:		
"Hardpan"	4	8
Advance outwash:		
Gravel	6	14
Puyallup sand:		
Sand	67	81
Gravel, water-bearing	1	82

Casing, 30-inch.

Table 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Well 22/2-8M1

A. Jessen. Altitude about 390 feet.

Materials	Thickness (feet)	Depth (feet)
Vashon drift:		
Soil, sandy	4	4
Till:		
"Hardpan"	31	35
Advance outwash:		
Gravel, coarse	5	40
Puyallup sand:		
Clay (?), hard	½	40½
Sand, fine	15½	56

Casing, 48- to 36-inch.

Well 23/1W-1P1

Rodeo Inc. Altitude about 400 feet. Drilled by A. L. Nicholson, 1949.

Vashon drift:		
Recessional outwash:		
Sand and gravel	5	5
Till (?):		
"Hardpan"	85	90
Puyallup sand:		
Sand, water-bearing	60	150
Clay, yellow	1	151

Well 23/1W-10D1

B. M. Short. Altitude about 160 feet. Drilled by T. G. Philpott, 1949.

Soil	1	1
Vashon drift:		
Gorst Creek outwash:		
Clay and sand, with some gravel	45	46
Clay, blue	10	56
Sand, fine, water-bearing	12	68
Clay, blue	1	69
"Quicksand"	15	84
Sand, with some gravel	22	106
Sand, medium to coarse	10	116

Casing, 6-inch, set to 116 feet.

Well 23/1W-10E1

H. R. Dittman. Altitude about 135 feet. Drilled by T. G. Philpott, 1948.

Soil	4	4
Vashon drift:		
Gorst Creek outwash:		
Clay, yellow	40	44
Sand, fine	21	65
Sand, blue, fine	19	84
Gravel, water-bearing	6	90
"Quicksand"	55	145
Sand, water-bearing	1	146

Casing, 6-inch, set to 145 feet.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 23/1W-11J1		
Kitsap County Airport. Altitude about 430 feet. Dug by E. Kirkland, 1938.		
Vashon drift:		
Recessional outwash:		
Gravel and boulders	45	45
Puyallup sand:		
Sand, gray, hard	40	85
Gravel, water-bearing	27	112
Sand, hard, some pebbles	18	130
Gravel and sand	15	145
Sand, fine	5	150
Casing, 48-inch.		
Well 23/1W-12C1		
H. Earl. Altitude about 435 feet. Dug by owner, 1941.		
Puyallup sand:		
Sand and gravel	137	137
Gravel, cemented	½	137½
Sand and gravel, water-bearing	2½	140
Casing, 48-inch, set to 140 feet.		
Well 23/1W-12D1		
Bremerton Trap and Skeet Club. Altitude about 430 feet. Drilled by N. C. Jannsen, 1939.		
Dug, no record	40	40
Puyallup sand:		
Gravel and sand	35	75
Sand, tight	15	90
Sand, loose	17	107
Gravel, dry	5	112
Gravel, water-bearing	4	116
Sand	15	131
Gravel, water-bearing	9	140
Clay, sand, and gravel	23	163
Casing, 6-inch, set to 163 feet.		
Well 23/1-1E1		
R. S. Frees. Altitude about 330 feet. Drilled by H. Osborn, 1947.		
Vashon drift:		
Recessional outwash:		
Clay	15	15
Sand	5	20
Till:		
"Hardpan" and cemented gravel	84	104
Puyallup sand:		
Sand, fine	8	112
Clay, blue	22	134
Sand and gravel	2	136
Casing, 6-inch, set to 136 feet		
Well 23/1-2A1		
Ranch Restaurant. Altitude about 270 feet. Drilled by L. Stoican.		
Vashon drift:		
Soil	10	10
Till:		
"Hardpan"	45	55
Orting gravel:		
Kitsap clay member:		
Clay, blue, silty	39	94
Sand, fine, silty	95	189
Casing, 6-inch, dynamited at 65 feet.		

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 23/1-2E1		
F. Fischer. Altitude about 270 feet. Drilled by A. L. Nicholson.		
Vashon drift:		
Recessional outwash:		
Sand and gravel	30	30
Till:		
"Hardpan"	50	80
Puyallup sand:		
Clay, blue	10	90
Sand, fine	203	293
Casing, 6-inch, set to 293 feet.		
Well 23/1-2J1		
O. Ramsey. Altitude about 315 feet. Drilled by A. L. Nicholson, 1949.		
Vashon drift:		
Recessional outwash:		
Sand and gravel	20	20
Till:		
"Hardpan"	46	66
Clay	5	71
Advance outwash:		
Gravel	5	76
Casing, 6-inch, set to 76 feet.		
Well 23/1-2M1		
H. D. Baucom. Altitude about 280 feet. Drilled by O. E. Erdman.		
Vashon drift:		
Till and outwash:		
Sand and gravel	50	50
Puyallup sand:		
Sand, fine	54	104
Orting gravel:		
Kitsap clay member:		
Clay, blue	102	206
Well 23/1-3E1		
H. C. White. Altitude about 320 feet. Drilled by T. G. Philpott. 1949.		
Vashon drift:		
Outwash:		
Soil and sand	18	18
Puyallup sand:		
Sand and gravel	12	30
Sand and layered clay	85	115
Sand and silt	46	161
Sand and gravel	10	171
Casing, 6-inch; well dug to 124 feet.		
Well 23/1-3K1		
L. Stack. Altitude about 220 feet. Drilled by A. L. Nicholson, 1945.		
Vashon drift:		
Recessional outwash:		
Sand	40	40
Till:		
"Hardpan"	45	85
Advance outwash:		
Gravel, water-bearing	85	----------
Casing, 6-inch, set to 85 feet.		

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Well 23/1–4J2

L. Eley. Altitude about 350 feet. Drilled by A. L. Nicholson.

Materials	Thickness (feet)	Depth (feet)
Soil	2	2
Vashon drift:		
Till:		
"Hardpan"	11	13
Puyallup sand:		
Sand and gravel	135	148
Clay, blue	12	160
Gravel, water-bearing	3	163

Casing, 6-inch, set to 163 feet.

Well 23/1–7D1

Sunny Slope Water Development. Altitude about 470 feet. Drilled by A. L. Nicholson, 1942.

Materials	Thickness (feet)	Depth (feet)
Soil	2	2
Vashon drift:		
Till:		
"Hardpan"	22	24
"Hardpan", sandy, some water	2	26
"Hardpan"	24	50
Advance outwash:		
Sand, water-bearing, 2 gpm	3	53
Clay and "hardpan"	17	70
"Hardpan", rocky	25	95
Puyallup sand:		
Sand, water-bearing, 8 gpm	7	102
Clay, yellow	10	112
Sand	23	135
Clay, yellow to blue	25	160
Clay, sandy	20	180
Gravel and sand, water-bearing	39	219

Casing, 8-inch, set to 199 feet; no 14 screen from 199 to 214 feet and no. 30 screen from 214 to 219 feet.

Well 23/1–10A1

Mrs. Silvernail. Altitude about 215 feet. Drilled by H. Osborn, 1948.

Materials	Thickness (feet)	Depth (feet)
Soil and ?	10	10
Puyallup sand and Pleistocene deposits, undifferentiated:		
Sand	20	30
"Hardpan"?	30	60
Sand	24	84
Orting gravel:		
Kitsap clay member:		
Clay, blue	32	116
Lower member:		
Sand	58	174
Gravel	10	184

Casing, 8-inch, set to 184 feet.

Well 23/1–11E1

—Gross. Altitude about 180 feet. Drilled by T. G. Philpott, 1950.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium and Puyallup sand:		
Clay and gravel	39	39
Sand, water bearing	2	41
Clay and gravel	4	45
Clay, blue, and gravel	3	48
Clay, soft, and gravel	8	56
Sand, water-bearing	2	58
Clay, blue, and gravel	1	59
Sand, water-bearing	1	60
Clay, blue, and gravel	1	61
Gravel	½	61½

Casing, 6-inch, set to 61½ feet.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 23/1-11M2		
L. Riebli. Altitude about 185 feet. Drilled by A. L. Nicholson, 1948.		
Recent alluvium, Puyallup sand, and Pleistocene deposits, undifferentiated:		
Clay	30	30
"Quicksand"	35	65
Clay, with gravel	37	102
Gravel, fine, and sand	1	103
Clay, with gravel	17	120
Gravel, fine		
Well 23/1-12E1		
G. L. Bohnstedt. Altitude about 310 feet. Drilled by A. L. Nicholson, 1946.		
Puyallup sand:		
Sand	83	83
Clay, yellow	2	85
Sand, water-bearing	105	190
Orting gravel:		
Kitsap clay member:		
Clay, blue	127	317
Lower member:		
Sand, black, water-bearing	1	318

Casing, 6-inch, set to 318 feet.

Materials	Thickness (feet)	Depth (feet)
Well 23/1-13C3		
F. Behrle. Altitude about 365 feet. Dug by owner, 1950.		
Soil	3	3
Vashon drift:		
Till:		
"Hardpan"	5	8
Advance outwash:		
Sand and gravel, dry	7	15
Clay, sand:		
Clay, brown	7	22
Sand, layered, brown	20	42
Well 23/1-13D2		
A. L. Nicholson. Altitude about 315 feet. Drilled by owner.		
Puyallup sand:		
Sand and gravel, loose	115	115
Orting gravel:		
Kitsap clay member:		
Clay, blue	73	188
Lower member:		
Gravel, water-bearing	9	197

Casing, 5-inch, set to 197 feet.

Materials	Thickness (feet)	Depth (feet)
Well 23/1-14A5		
C. Sowa. Altitude about 280 feet. Drilled by A. L. Nicholson.		
Puyallup sand:		
Sand	10	10
Sand, hard	20	30
Silt	47	75
Clay, yellow	5	80
Sand and clay	10	90
Sand	51	141
Sand and fine gravel	4	145

Casing, 6-inch, set to 145 feet.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)

Well 23/1-14C2

M. C. Dunham. Altitude about 195 feet. Drilled by L. Stoican, 1950.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium, Puyallup, sand, and Pleistocene deposits, undifferentiated:		
"Quicksand"	80	80
Sand and gravel	5	85
"Hardpan"	7	92
Gravel, hard	13	105

Casing, 6-inch, set to 105 feet.

Well 23/1-14J1

C. M. Saling. Altitude about 270 feet. Drilled by owner, 1949.

Materials	Thickness (feet)	Depth (feet)
Soil	3	3
Puyallup Sand:		
Sand	32	35
Sand and gravel	54	89
Gravel, water-bearing	3	92
Sand	2	94
Gravel, water-bearing	6½	100½

Casing, 6-inch, set to 100 feet.

Well 23/1-21J2

H. L. Lamberton. Altitude about 390 feet. Drilled by A. L. Nicholson.

Materials	Thickness (feet)	Depth (feet)
Vashon drift:		
Recessional outwash:		
Sand and gravel	15	15
Till:		
"Hardpan"	86	101
Advance outwash:		
Gravel		

Casing, 6-inch, set to 101 feet.

Well 23/1-26H4

A. McDonald. Altitude about 190 feet. Drilled by L. Stoican, 1950.

Materials	Thickness (feet)	Depth (feet)
Puyallup sand:		
Sand, gray	30	30
Sand, blue	20	50
Gravel	3	53
"Hardpan"	2	55
Gravel, coarse	15	70

Casing, 6-inch, set to 70 feet.

Well 23/1-27Q1

E. R. Stevens. Altitude about 430 feet. Drilled by Tacoma Pump Co., 1946.

Materials	Thickness (feet)	Depth (feet)
Soil	4½	4½
Vashon drift:		
Till:		
"Hardpan"	27½	32
Advance outwash:		
Gravel and sand, stratified	68	100

Casing, 6-inch, set to 100 feet.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 23/1-33L1		
G. K. Newland. Altitude about 425 feet. Drilled by T. G. Philpott, 1950.		
Soil	4	4
Vashon drift:		
Till:		
Clay and gravel	54	58
"Hardpan"	21	79
Puyallup sand:		
Sand, hard, and clay and gravel	19	98
Sand, water-bearing	11	109

Casing, 6-inch set to 109 feet.

Materials	Thickness (feet)	Depth (feet)
Well 23/1-36M2		
K. Price. Altitude about 130 feet. Drilled by A. L. Nicholson, 1950.		
Dug, no record	9	9
Puyallup sand:		
Sand, brown, fine	41	50
Sand, gray, fine	148	198
Gravel, fine, water-bearing	2	200
Clay, with sand and gravel	5	205

Casing, 6-Inch.

Materials	Thickness (feet)	Depth (feet)
Well 23/2-2C1		
C. L. Williamson. Altitude about 15 feet. Drilled by J. J. Bell & Son, 1940.		
Vashon drift:		
Till:		
"Hardpan"	78	78
Orting gravel:		
Kitsap clay member:		
Sand, fine	2	80
Clay, blue	50	130

Casing, 6-inch.

Materials	Thickness (feet)	Depth (feet)
Well 23/2-2C2		
U. S. Army. Altitude about 40 feet. Drilled by L. Stoican, 1952.		
Puyallup sand:		
Sand, silty	28	28
Orting gravel:		
Kitsap clay member and Admiralty drift, undifferentiated:		
Clay, blue	157	185
Sand and silt, water-bearing	1	186
Clay, blue, wood and gas	7	193
Clay, blue	14	207
"Quicksand", silty	16	223
Clay, blue	17	240
Clay, blue, with silty "quicksand"	25	265
"Quicksand", blue, and fine silt	6	271
Clay, silt, and fine sand	4	275
Clay, blue, with silty sand	17	292
Sand, water-bearing	6	298

Casing, 6-inch, set to 290 feet; screened from 290 to 296 ft.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Well 23/2–2H1

E. Morrow. Altitude about 85 feet. Drilled by A. L. Nicholson, 1950.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium:		
Soil	1	1
Vashon drift:		
Recessional outwash:		
Sand	4	5
Till:		
"Hardpan"	55	60
"Hardpan" with seams of water-bearing sand	14	74
Puyallup sand:		
Sand	------	------

Casing, 6-inch, set to 74 feet.

Well 23/2–2H2

Altitude about 90 feet. Drilled by A. L. Nicholson.

Materials	Thickness (feet)	Depth (feet)
Vashon drift:		
Till:		
"Hardpan"	65	65
Puyallup sand:		
Sand	20	85
Sand and gravel	5	90

Casing, 6-inch, set to 90 feet.

Well 23/2–3D1

L. W. Mallory. Altitude about 110 feet. Drilled by A. L. Nicholson, 1948.

Materials	Thickness (feet)	Depth (feet)
Vashon drift:		
Recessional outwash:		
Sand	15	15
Till:		
"Hardpan"	83	98
Orting gravel:		
Kitsap clay member:		
Sand and clay	20	118

Casing, 5-inch, set to 118 feet.

Well 23/2–22Q1

Z. J. Gonsecki. Altitude about 40 feet. Dug and augered by Pichette and Morris, 1949.

Materials	Thickness (feet)	Depth (feet)
Puyallup sand:		
Clay, sandy	20	20
Orting gravel:		
Kitsap clay member:		
Clay, blue	16½	36½
Till, blue	2	38½
Clay, blue	33½	72

Casing, 30-inch.

Well 24/1W–1A1

U. S. Marine Corps. Altitude about 420 feet. Drilled by N. C. Jannsen, 1933.

Materials	Thickness (feet)	Depth (feet)
Dug, no record	12	12
Outwash of Vashon drift and Puyallup sand:		
Gravel	42	54
Sand	19	73
Sand and gravel	32	105
"Hardpan"	5	110
Gravel	22	132

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 24/1W-1A1—Continnued		
Outwash of Vashon drift and Puyallup sand—Continued		
Sand and gravel	10	142
Gravel	10	152
Sand and gravel	31	183
Gravel	84	267
Sand and gravel, water at 280 ft	18	285
Sand	20	305
Sand and gravel	15	320
Sand, coarse, and gravel	5	325
Sand and gravel	21	346
Sand, coarse, and gravel	4	350

Casing, 8-inch, set to 306 feet; 6-inch, to 350 feet.

Well 24/1W-1A2

U. S. Marine Corps. Altitude about 400 feet. Drilled in 1939

Vashon drift:		
Outwash:		
Gravel, coarse, sand, and small rocks	38	38
Gravel, fine, and sand	38	76
Puyallup sand:		
Sand, some gravel	5	81
Clay, blue	1	82
Sand and gravel, with some clay	8	90
Gravel, fine	1	91
Sand and gravel	34	125
Gravel, coarse, small amount of sand	5	130
Sand and gravel, small amount of clay	59	189
Sand, with some gravel	6	195
Sand and gravel	53	248
Sand, with small amount of gravel	22	270
Sand, fine, with small amount of gravel	31	301
Orting gravel:		
Kitsap clay member:		
Clay	7	316
Clay, blue	12	328
Clay, blue, with sand	4	332
Clay, blue	30	362
Lower member:		
Sand, fine, with gravel, water-bearing	9	371

Casing, 12-inch, set to 82 feet; 10-inch, from 62 to 217 feet; 8-inch, from 197 to 363 feet; screened from 363 to 371 feet.

Well 24/1W-2C1

C. H. Freegrove. Altitude about 430 feet. Drilled by T. G. Philpott.

Vashon drift:		
Till:		
Soil and "Hardpan"	14	14
Outwash and till:		
Sand and gravel	29	43
Sand and clay	15	58
"Hardpan"	11	69
Puyallup sand:		
Sand and gravel, water-bearing	26	95
Sand, yellow	3	98

Casing, 6-inch, set to 98 feet.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Well 24/1W-2D2

J. Hendry. Altitude about 395 feet. Drilled by T. G. Philpott, 1949.

Materials	Thickness (feet)	Depth (feet)
Soil	2	2
Vashon drift:		
Till:		
Gravel and "Hardpan"	16	18
Advance outwash:		
Gravel, water-bearing	5	23
Puyallup sand:		
Clay, with gravel and coarse sand, water-bearing	43½	66½

Casing, 6-inch, set to 66½ feet.

Well 24/1W-2G1

J. J. Snapp. Altitude about 395 feet. Drilled by T. G. Philpott, 1949.

Materials	Thickness (feet)	Depth (feet)
Soil	3	3
Vashon drift:		
Till:		
"Hardpan"	27	30
Puyallup sand:		
Sand, hard	8	38
Gravel and clay	3	41
Sand, hard	27	68
Sand, water-bearing	1	69

Casing, 6-inch, set to 69 feet.

Well 24/1W-2G2

W. S. Lake. Altitude about 390 feet. Drilled by N. C. Jannsen, 1932.

Materials	Thickness (feet)	Depth (feet)
Gravel, loose	2	2
Vashon drift:		
Till:		
Gravel, cemented	40	42
Vashon(?) deposits, undifferentiated:		
Boulders, large	2	44
Gravel, hard	16	60
Gravel	17	77

Casing, 6-inch, set to 77 feet.

Well 24/1W-2G3

D. Wilson. Altitude about 400 feet. Drilled by N. C. Jannsen, 1932.

Materials	Thickness (feet)	Depth (feet)
Dug, no record	20	20
Vashon drift:		
Till:		
Gravel, cemented	31	51
Gravel, hard	26	77

Casing, 6-inch, set to 77 feet.

Well 24/1W-2K1

Camp Longfellow. Altitude about 390 feet. Drilled by N. C. Jannsen, 1932.

Materials	Thickness (feet)	Depth (feet)
Dug, no record	5	5
Vashon drift:		
Till:		
Gravel, cemented	8	13
Advance outwash:		
Sand, loose	12	25
Gravel, water-bearing	2	27
Gravel, loose with boulders	8	35
Gravel, loose, water-bearing	7	42
Gravel, fine	3	45

Casing, 8-inch.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 24/1W-6H2		
M. Grover. Altitude about 460 feet. Drilled by T. G. Philpott, 1949.		
Soil	4	4
Vashon drift:		
Till:		
"Hardpan"	36	40
Puyallup sand:		
Gravel and sand, hard	18	58
Gravel and sand, with yellow clay	27	85
Clay, yellow, sandy	36	121
Gravel, water-bearing	2	123
Casing, 6-inch.		
Well 24/1W-6J1		
R. L. Ames. Altitude about 460 feet. Drilled by T. G. Philpott, 1946.		
Vashon drift:		
Till:		
"Hardpan"	30	30
Puyallup sand:		
Sand and gravel	42	72
Gravel and clay, water-bearing	10	82
Casing, 6-inch, set to 82 feet.		
Well 24/1W-7C1		
W. Lewis. Altitude about 500 feet. Drilled by T. G. Philpott, 1946.		
Soil	5	5
Vashon drift:		
Till:		
"Hardpan"	23	28
Advance outwash:		
Gravel, loose, with some sand	21	49
"Hardpan"	1	50
Puyallup sand:		
Sand, hard	9	59
Sand and gravel	39	98
Sand, fine, blue, with charred log	14	112
Clay, blue	18	130
Sand, water-bearing	7	137
Gravel, yellow, water-bearing	3	140
Casing, 6-inch, set to 140 feet.		
Well 24/1W-29Q1		
H. Stockton. Altitude about 525 feet. Drilled by T. G. Philpott, 1949.		
Soil	2	2
Vashon drift:		
Recessional outwash:		
Gravel, water-bearing	26	28
Puyallup sand:		
Clay, yellow, with some sand	37	65
Sand, hard	20	85
Casing, 6-inch, perforated from 15 to 25 feet.		
Well 24/1W-29R1		
— Culver. Altitude about 525 feet. Drilled by T. G. Phillpott, 1949.		
Soil	4	4
Vashon drift:		
Recessional outwash:		
Gravel and sand	16	20
Sand and gravel, water-bearing	2	22
Casing, 6-inch.		

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 24/1W-35P1		
J. S. Selly. Altitude about 330 feet. Drilled by T. G. Philpott, 1947.		
Dug, no record	40	40
Vashon drift:		
Gorst Creek outwash:		
Gravel	5	45
Sand, fine	5	50
Sand, water-bearing	10	60
Sand and clay	14	74
Sand, fine, water-bearing	5	79
Sand and clay	8½	87½

Casing, 6-inch, set to 87½ feet.

Materials	Thickness (feet)	Depth (feet)
Well 24/2W-17R1		
A. Olson. Altitude about 60 feet. Drilled by T. G. Philpott, 1946.		
Soil and clay	5	5
Puyallup sand:		
Gravel	6	11
Sand and gravel	17	28
Orting gravel:		
Kitsap clay member and Admiralty drift, undifferentiated:		
Clay, blue	28	56
Clay, with small amount of water	19	75
Clay, blue	65	140
Clay and sand, water-bearing	45	185
Clay, blue	60	245
"Hardpan"	11	256
Sand, fine	26	282
Sand, hard, blue, water-bearing	112	394

Casing, 6-inch, set to 394 feet.

Materials	Thickness (feet)	Depth (feet)
Well 24/2W-19A1		
— Fisk. Altitude about 145 feet. Drilled by T. G. Philpott, 1950.		
Soil	2	2
Orting gravel:		
Kitsap clay member and Admiralty drift, undifferentiated:		
Clay, yellow, with some gravel	8	10
Clay, blue with layered sand	50	60
Sand, clay and gravel	6	66
Sand and gravel, small amount of water	2	68
"Hardpan"	6	74
Sand and gravel, small amount of water	2	76
"Hardpan"	2	78
Sand and gravel, small amount of water	5	83
Sand, fine, dry	67	150
Sand, fine, small amount of water	17	167
Sand, fine, heaving	2	169
Clay, blue	2	171
Sand, fine, water-bearing	7	178
Sand, fine, water-bearing, with layers of impermeable clay	6	184

Casing, 6-inch.

Materials	Thickness (feet)	Depth (feet)
Well 24/1-2A1		
E. C. Enhelder. Altitude about 330 feet. Drilled by A. L. Nicholson, 1945.		
Dug, no record	95	95
Puyallup sand:		
Sand	2	97
Clay, blue, and fine sand	236	333

Casing, 6-inch.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Well 24/1-2A2

C. Hoyt. Altitude about 290 feet. Drilled by T. G. Philpott, 1947.

Materials	Thickness (feet)	Depth (feet)
Dug, no record	45	45
Puyallup sand:		
Sand and clay	15	60
Sand, water-bearing	10	70
Sand, hard	20	90
Sand, fine	4	94
Sand, fine, with clay	31	125

Casing, 6-inch, set to 125 feet.

Well 24/1-2C1

C. L. Ferrin. Altitude about 310 feet. Drilled by T. G. Philpott, 1947.

Materials	Thickness (feet)	Depth (feet)
Dug, no record	13	13
Puyallup sand:		
Sand and clay	25	38
Sand and gravel	22	60
Sand, hard	7	67
Boulders	6	73
Sand, hard	11	84
Sand and gravel	18	102
"Hardpan" and sand, dry	33	135
Clay, sandy	36	171
Sand, small amount of water	7	178
Sand, mucky, small amount of water	17	195
Sand, gray, water-bearing	5	200

Casing, 6-inch, set to 200 feet.

Well 24/1-2F1

Altitude about 275 feet. Drilled by T. G. Philpott, 1948.

Materials	Thickness (feet)	Depth (feet)
Dug, no record	58	58
Puyallup sand:		
Sand	8	66
Sand, water-bearing	20	86
Sand and clay	4	90
Sand, coarse	25	115
Sand, blue, fine, dry	8	123
Sand, hard	15	138
Orting gravel:		
Kitsap clay member:		
Shale, brown	1	139
Clay	26	165

Casing, 6-inch, set to 141 feet; perforated from 90 to 115 feet.

Well 24/1-2J1

P. H. Conklin. Altitude about 290 feet. Drilled by T. G. Philpott, 1946.

Materials	Thickness (feet)	Depth (feet)
Dug well, no record	76	76
Puyallup sand:		
Sand, black	6	82
Sand and dark clay	8	90
Clay, dark	43	133
Sand, coarse, and fine gravel	7	140

Casing, 6-inch, set to 140 feet.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 24/1-3R1		
H. Burton. Altitude about 220 feet. Drilled by T. G. Philpott.		
Dug, no record	15	15
Puyallup sand and Tertiary sedimentary rock(?):		
Clay and sand	68	83
Clay, hard, with some sand	12	95
Sand, water-bearing	5	100

Casing, 6-inch, set to 100 feet.

Materials	Thickness (feet)	Depth (feet)
Well 24/1-5Q1		
M. Peters. Altitude about 40 feet. Drilled by T. G. Philpott, 1949.		
Soil	6	6
Vashon drift:		
Till:		
"Hardpan"	2	8
Puyallup sand:		
Sand and gravel, water-bearing	42	50
Orting gravel:		
Kitsap clay member:		
Clay, blue	110	160

Casing, 6-inch, set to 160 feet.

Materials	Thickness (feet)	Depth (feet)
Well 24/1-11E1		
L. Schuyler. Altitude about 80 feet. Drilled by N. C. Jannsen, 1931.		
Vashon drift:		
Till(?):		
Clay, yellow, with some gravel	17	17
Advance outwash and Tertiary sedimentary rock:		
Gravel and boulders	10	27
Clay, brown	39	66
Boulders and gravel	2	68
Gravel, then brown clay	12	80
Clay, yellow, and boulders	14	94
Clay, brown, and boulders	16	110
Clay, brown	40	150
(no record)	1	151
Clay, brown, and some boulders	10	161
Clay, light brown, sticky	51	212
Sand and grayish clay	11	223
Clay, blue	10	233
Clay, brown	59	292

Materials	Thickness (feet)	Depth (feet)
Well 24/1-12B1		
H. F. Johnson. Altitude about 310 feet. Drilled by N. C. Jannsen, 1932.		
Vashon drift:		
Sand	20	20
Till:		
Gravel, cemented, with sand and boulders	41	61
Advance outwash and Puyallup sand, undifferentiated:		
Sand and gravel, water at 75 feet	14	75
Gravel, loose	8	83
Sand and gravel	1	84

Casing, 3-inch, set to 84 feet.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 24/1-12E2		
City of Bremerton. Altitude about 260 feet. Drilled by International Water Supply Ltd., 1942.		
Vashon drift:		
Till(?):		
Sand, clay and gravel	13	13
Pleistocene deposits, undifferentiated:		
Clay, blue	92	105
Clay, blue, with boulders	27	132
Clay, blue, with sand and boulders	60	192
Sand, coarse, and gravel, water-bearing	10	202
Sand, fine	18	220
Tertiary sedimentary rocks, undifferentiated:		
Sand and shale	30	250
Shale, blue, hard, sandy	374	624
Shale, gray	89	713
Shale, gray, and boulder	32	742
Not recorded	172	914

Casing, 8-inch, set to 914 feet.

Materials	Thickness (feet)	Depth (feet)
Well 24/1-12F1		
Consolidated School Dist. 306. Altitude about 365 feet. Drilled by N. C. Jannsen, 1932.		
Vashon drift:		
Till:		
"Hardpan"	7	7
Puyallup sand:		
Clay, sandy, seep of water at 33 feet	38	45
Sand and gravel, loose	10	55
Clay, sandy	25	80
Sand, loose	1	81
Clay, sandy	24	105
Gravel, coarse, water-bearing	8	113
Clay, sandy	16	129

Casing, 8-inch, set to 129 feet.

Materials	Thickness (feet)	Depth (feet)
Well 24/1-16J2		
P. F. Schmickroth. Altitude about 90 feet. Drilled by N. C. Jannsen, 1935.		
Vashon drift:		
Gravel, loose	1	1
Till:		
Gravel, hard cemented	9	10
Advance outwash and Puyallup sand, undifferentiated:		
Gravel, loose, coarse	46	56
Sand and fine gravel	7	63
Sand, coarse, and fine gravel, water-bearing	17	80
Well 24/1-16L1		
L. M. Lewis. Altitude about 110 feet. Drilled by N. C. Jannsen, 1933.		
Vashon drift:		
Till and outwash:		
Sand and gravel	30	30
Gravel, water-bearing	20	50
Gravel, hard	7	57
Pleistocene deposits, undifferentiated:		
Clay, blue	23	80
"Hardpan", brown	17	97
"Hardpan"	33	130
Sand	15	145
Clay	55	200
Shale(silt?)	90	290

Casing, 8-inch, set to 268 feet; perforated from 26 to 36 feet and 42 to 53 feet.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 24/1-16L3		
M. Reynolds. Altitude about 90 feet. 1939.		
Vashon drift:		
Till:		
"Hardpan"	40	40
Pleistocene deposits, undifferentiated:		
Sand and gravel	10	50
Clay, blue	32	82
Gravel	10	92
Well 24/1-17L1		
J. H. Haddon. Altitude about 180 feet. Drilled by T. G. Philpott, 1948.		
Dug, no record	8	8
Vashon drift:		
Till:		
Gravel and "Hardpan"	32	40
Puyallup sand:		
Clay, blue	25	65
Sand, fine, water-bearing	22	87
Sand and clay	17	104
Clay, blue	15	119
Clay and sand, water-bearing	44	163
Casing, 6-inch, set to 151 feet.		
Well 24/1-22L1		
H. Lillie. Altitude about 160 feet. Drilled by T. G. Philpott, 1947.		
Soil	5	5
Vashon drift:		
Till:		
Gravel and "Hardpan"	30	35
Puyallup sand and Pleistocene deposits, undifferentiated:		
Sand loose	5	40
Clay, yellow	33	73
Clay, yellow, and sand	22	95
Gravel	10	105
Gravel, cemented	3	108
Clay and gravel	3	111
Sand, fine	16	127
Sand and gravel	18	145
Sand, coarse, and gravel	6	151
Casing, 6-inch, set to 151 feet.		
Well 24/1-23B1		
U. S. Navy. Altitude about 20 feet. Drilled by Joslyn & Gibson, 1895.		
No record	300	300
Pleistocene deposits undifferentiated:		
Sand, fine, black	253	553
Sand, hard, and clay	14	567
Gravel, cemented	10	577
Sand, fine, black, water-bearing	171	748
Casing, 6-inch, set to 650 feet; 4½-inch in lower part.		

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 24/1-23E1		
U. S. Navy. Altitude about 30 feet. Drilled by Roscoe Moss & Co., 1942.		
Pleistocene deposits, undifferentiated:		
Sand and gravel	20	20
Gravel, fine, and sand	10	30
Sand and gravel	70	100
Clay and gravel	45	145
Sand, fine	5	150
Sand and clay	75	225
Clay and gravel	35	260
Clay, sandy	105	365
Sand and gravel, cemented	135	500
Sand, cemented	40	540
Sand and gravel	70	610
Clay and gravel	45	655
Clay, sandy gravel, and wood	20	675
Clay, sandy	45	720
Clay, sandy gravel, and wood	50	770
Sand, with clay and gravel	70	840
Tertiary(?) sedimentary rock:		
Sand, with clay and gravel	56	896
Gravel, sand, and clay	114	1,010
Sand, with clay and gravel	10	1,020
Gravel	10	1,030
Sand, gravel, and clay, cemented	15	1,045
"Rock"	50	1,095
Sand and some gravel	25	1,120
Soil	10	1,130
Clay, blue	40	1,170
Sand, gravel, and clay	100	1,270
Clay, brown, with sand and gravel	15	1,285
Clay, blue	35	1,320
Clay, red and blue, cemented	130	1,450
Sand, gravel, and clay	90	1,540
Clay, blue, and sand	80	1,620
Clay, blue and gravel	70	1,690
Clay, red	30	1,720
Clay, blue and gravel	45	1,765
Clay, brown	10	1,775
Clay, brown, and gravel	35	1,810
Clay, blue, and gravel	40	1,850
Clay, blue, and rock	150	2,000

Casing, 26-inch, set to 120 feet; 14-inch, to 396 feet; 12-inch, to 1,515 feet; perforated from 160 to 1,315 feet.

Materials	Thickness (feet)	Depth (feet)
Well 24/1-25E1		
Silver Springs Brewing Co. Altitude about 10 feet. Drilled by M. Scott, 1935.		
Fill	7	7
Puyallup sand:		
Sand	18	25
Gravel	5	30
Orting gravel:		
Kitsap clay member:		
Clay, blue, hard	65	95
Sand, some water	8	103
Clay, laminated, with sand	66	169
Lower member and Pleistocene deposits, undifferentiated:		
Sand and gravel, fine, gray	6	175
Sand, fine, gray	35	210
Sand, coarse, artesian flow	79	289
Clay, blue	1	290
Gravel, coarse, water-bearing	8	298
Sand, coarse, water-bearing	16	314

Casing, 6-inch, set to 314 feet; perforated from 290 to 310 feet and 304 to 314 feet.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Well 24/1-25E2

Annapolis Water Dist. Altitude about 35 feet. Drilled by N. C. Jannsen, 1945.

Materials	Thickness (feet)	Depth (feet)
Puyallup sand:		
Sand	30	30
Orting gravel:		
Kitsap clay member:		
Clay, sandy	230	260
Lower member:		
Sand	17	277
Sand, fine	18	295
Sand, coarse	60	355
Sand	65	420
Sand and gravel	114	534
Sand and gravel, coarse	41	575
Pleistocene and Tertiary(?) rocks, undifferentiated:		
Clay, blue	46	621
Clay, blue, and gravel	29	650
Clay, blue, and sand	16	666
Sand and gravel	80	746
Gravel, cemented	179	925
Sand	65	990
Sand, clay, and gravel	30	1,020
Sand and gravel	53	1,073
Sand and clay	19	1,092
Gravel, cemented	41	1,133

Casing, 12-inch, set to 157 feet; 10-inch, to 1133 feet; perforated from 437 to 548 feet, 668 to 984 feet, and 1,035 to 1,111 feet.

Well 24/1-25K1

Annapolis Water Dist. Altitude about 90 feet. Drilled by A. A. Durand, 1943.

Materials	Thickness (feet)	Depth (feet)
No record	27	27
Orting gravel:		
Kitsap clay member and Pleistocene and Tertiary(?) deposits, undifferentiated:		
Clay, blue	43	70
Clay, blue, laminated with sand	10	80
Clay, blue	91	171
Clay, blue, sandy	24	195
Shale(?) rotten	3	198
Clay, blue, sandy	6	204
Clay, blue	6	210
Sand	3	213
Clay, blue	2	215
Shale(?), rotten	5	220
Sand	19	239
Clay, blue	42	281
Shale(?), dark, hard	4	285
Clay, blue	39	324
Rock, black	15	339
Shale, black, hard	20	359
Shale, blue, sticky	32	391
Clay, blue	62	453
Sand and clay	3	456
Clay, blue	32	488
Sand, gray	9	497
Sand and clay	8	505
Clay, blue	25	530
Clay, blue, with sand	38	568
Shale, sandy	7	575
Clay, blue, hard	12	587
Clay, sandy	15	602
Clay, blue	56	658
Clay, gray, sandy	14	672
Clay, very sandy	28	700
Clay, gray, sticky	15	715
Clay, light blue	17	732
Clay, blue	153	885
Sand, water-bearing	30	915
Clay, gray, sandy	5	920
Sand, fine, hard	11	931
Shale, sandy	31	962

Casing, 20-inch, set to 352 feet; 16-inch, to 382 feet; 12-inch, to 789 feet; 8-inch to 926 feet.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 24/1-26K1		
City of Port Orchard. Altitude about 17 feet. Drilled by O. E. Erdman, 1930.		
Puyallup sand:		
Clay and sand	12	12
Gravel	2	14
Orting gravel:		
Kitsap clay member:		
Clay, water at 108 feet	94	108
Lower member:		
Sand and gravel	32	140
Gravel and sand, water at 232 ft	102	242
Clay	15	257
Gravel and sand, water at 257 ft	10	267
Pleistocene deposits, undifferentiated:		
Clay	20	287
Gravel and sand	2	289
Clay, water at 300 ft	11	300
Sand, hard-packed	30	330
Sand, loose	30	360
Sand, showing of clay	25	385
Sand	21	406
Clay	11	417
Sand	5	422
Casing, 6-inch, set to 422 feet; perforated from 232 to 242 feet, 257 to 267 feet, and 300 to 302 feet.		
Well 24/1-26K2		
Callison's Evergreen Co. Altitude about 10 feet. Drilled by O. E. Erdman, 1940.		
Orting gravel:		
Kitsap clay member:		
Clay and gravel, hard	80	80
Pleistocene deposits, undifferentiated:		
Sand	162	242
Clay	36	278
Sand, water-bearing	7	285
Casing, 4-inch, set to 272 feet.		
Well 24/1-26K4		
City of Port Orchard. Altitude about 100 feet. Drilled by O. E. Erdman, 1946.		
Orting gravel:		
Kitsap clay member:		
Clay, blue	96	96
Clay, brown	6	102
Lower member:		
Sand and gravel	40	142
Clay, sandy	38	180
"Hardpan"	5	185
Sand and gravel	30	215
Gravel, fine	23	238
Pleistocene deposits, undifferentiated:		
Clay, sandy	270	508
Sand, fine	128	636
Clay, blue	12	648
Sand, fine	116	764
Gravel, coarse, water-bearing	16	780
Sand, fine	12	792
Casing, 10- to 5-inch, set to 780 feet; perforated from 215 to 238 feet and 764 to 780 feet.		

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TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Well 24/1–26L1

City of Port Orchard. Altitude about 90 feet. Drilled by N. C. Jannsen.

Materials	Thickness (feet)	Depth (feet)
Pleistocene deposits, undifferentiated:		
Rock and gravel	8	8
Gravel, sandy	37	45
Gravel, and clay	25	70
Gravel, water-bearing	10	80
Gravel and clay	20	100
Sand and gravel	20	120
"Hardpan"	28	148
Rock and clay	2	150
Sand and gravel	10	160
Gravel, cemented	41	201
Clay	15	216
Sand and gravel, water-bearing	31	247
Clay and gravel	33	280
Sand and gravel	10	290
Sand and gravel, water-bearing	95	385
Boulders	11	396
"Hardpan"	4	400
Boulders and gravel, water-bearing	41	441

Casing, 10- to 8-inch.

Well 24/1–26N1

Wilkins Dist. Co. Altitude about 20 feet.

Materials	Thickness (feet)	Depth (feet)
Pleistocene deposits, undifferentiated:		
Gravel and sand	30	30
"Quicksand"	40	70
Sand	29	99
Gravel, water-bearing	2	101
Sand	85	186
Clay, white	2	188
Gravel, water-bearing	9	197

Casing, 3-inch, set to 197 feet.

Well 24/1–32J2

E. Frone. Altitude about 25 feet. Drilled by T. G. Philpott.

Materials	Thickness (feet)	Depth (feet)
Puyallup sand:		
Sand and gravel	20	20
"Quicksand"	75	95
Gravel and sand	15	110

Casing, 6-inch, set to 110 feet.

Well 24/1–33H1

A. Van Hee. Altitude about 10 feet. Drilled by owner, 1915.

Materials	Thickness (feet)	Depth (feet)
Orting gravel:		
Kitsap clay member:		
Clay	55	55
"Quicksand"	1	56
Clay, blue	1	57
Lower member:		
Sand, coarse, and gravel	19	76

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Well 24/1-33K1

City of Bremerton. Altitude about 45 feet. Drilled by O. E. Erdman, 1940.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium:		
Gravel, sand and silt	20	20
Orting gravel:		
Kitsap clay member:		
Silt, gray-blue	5	25
Clay, sticky	5	30
Silt, gray-blue	15	45
Clay, sticky, gray-blue	10	55
Silt, gray-blue	5	60
Sand and silt, some clay	5	65
Clay, gray-blue, contains pebbles	5	70
Clay, gray-blue, sticky	10	80
Silt, gray-blue	10	90
Silt and sand, gray-blue, fine	5	95
Silt and clay, gray-blue	45	140
Clay, gray, blue, stiff	10	150
Silt, gray-blue	15	165
Silt and clay, blue-gray, sticky	5	170
Silt and clay, blue-gray	5	175
Silt, gray-blue	5	180
Clay, blue-gray, sticky	10	190
Lower member:		
Gravel, coarse, with sand	85	275

Casing, 8-inch, set to 188 feet; 6-inch, to 275 feet.

Well 24/1-33K2

City of Bremerton. Altitude about 45 feet. Drilled by O. E. Erdman, 1941.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium and Pleistocene deposits, undifferentiated:		
Clay and boulders	40	40
Gravel, fine	10	50
Orting gravel:		
Kitsap clay member:		
Clay	10	60
Gravel, fine	2	62
Clay	58	120
Shale (?)	40	160
Lower member:		
Gravel, coarse	20	180
Gravel, medium	15	195
Gravel, fine, with sand	25	220
Gravel, coarse	25	245

Casing, 30-inch, set to 100 feet; 22-inch, to 240 feet.

Well 24/1-33K4

City of Bremerton. Altitude about 60 feet. Drilled by city, 1947.

Materials	Thickness (feet)	Depth (feet)
Orting gravel:		
Kitsap clay member:		
Clay	38½	38½
Clay and sand	10½	49
Clay, sandy	86	135
Lower member:		
Sand coarse	266	401

Casing, 12-inch, set to 280 feet; 8-inch, to 401 feet.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 24/1-33K6		
City of Bremerton. Altitude about 45 feet. Drilled by R. J. Strasser, 1944.		
Soil and alluvium	5	5
Orting gravel:		
Kitsap clay member and Pleistocene deposits, undifferentiated:		
Clay and gravel	7	12
Clay and boulders	4	16
Clay, blue, and gravel	9	25
Shale (clay?), blue	95	120
Clay, sandy	50	170
Shale (clay?)	30	200
Shale (clay?), hard	30	230
Sand, clay, and gravel	10	240
Shale (clay?), hard	25	265
Clay, sand, and some gravel	15	280
Shale (clay?), sticky	5	285
Clay and sand	20	305
Clay and sand, very little gravel	10	315
Clay and sand	35	350
Clay and sand, silty	30	380
Clay and sand, little fine gravel	5	385
Sand, coarse	10	395
Clay, with sand	30	425
Clay, sand, and peat	20	445
Sand, coarse	23	468
Sand and gravel, water started to flow	24	492
Gravel, fine	70	562

Casing, 12-inch.

Materials	Thickness (feet)	Depth (feet)
Well 24/1-33L1		
City of Bremerton. Altitude about 25 feet. Drilled by N. C. Jannsen, 1945.		
Orting gravel:		
Kitsap clay member:		
Clay, blue	103	103
Lower member and Pleistocene deposits, undifferentiated:		
Gravel, coarse	13	116
Clay, sandy	19	135
Sand, fine	13	148
Sand and clay, some gravel	92	240
Clay and gravel	30	270
Sand	34	304
Gravel, cemented	30	334
Clay, sandy	71	405
Sand and gravel	25	430
Sand	70	500
Sand, coarse at bottom	42	542
Gravel	18	560
Gravel, up to 1½ inches in diameter	62	622

Casing, 16-inch.

Materials	Thickness (feet)	Depth (feet)
Well 24/1-36F1		
Annapolis Water District. Altitude about 200 feet. Drilled by A. A. Durand, 1943.		
Vashon drift:		
Soil and ?	12	12
Sand and gravel, brown	18	30
Sand and coarse gravel	7	37
Puyallup sand:		
Clay, blue	1	38
Silt, sand, and gravel	8	46
Silt, sand, and blue clay	9	55
Sand and gravel	10	65
Gravel, coarse	4	69
Sand and gravel	3	72
Gravel	8	80
Gravel and blue clay	10	90
Gravel, coarse, and sand	10	100

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 24/1-36F1—Continued		
Puyallup sand—Continued		
Clay, blue, and sand	53	153
Gravel, water-bearing	1	154
Gravel, coarse	6	160
Gravel, fine, and sand	11	171
Orting gravel:		
Kitsap clay member:		
Clay and wood	19	190
Clay, blue, and sand	10	200
Clay, blue, and gravel	10	210
Clay, blue	21	231
Clay, blue, and gravel	6	237
Clay, blue	8	245
Lower member and Pleistocene and Tertiary deposits, undifferentiated:		
Gravel, coarse, and clay, blue	7	252
Clay, blue, and gravel	18	270
Clay, blue, and sand	10	280
"Quicksand"	10	290
Clay, blue, and sand	10	300
Clay and sand	10	310
Sand, gray	10	320
Sand	15	335
Sand, gray	11	346
Sand and blue clay	11	357
Sand	30	387
Sand and blue clay	71	458
Shale, blue, and sand	12	470
Sand and blue clay	10	480
Clay, blue	15	495
Sand and blue clay	21	516
Sand, fine, and shale	6	522
Sand and clay	16	538
Clay, blue	29	567
Clay, blue, and sand	10	577
Clay, blue	10	587
Clay, blue, sandy	15	602
Sand, compacted	3	605
Clay, blue	12	617
Clay, blue, and sand	11	628
Sand, compacted	4	632
Clay, blue	18	650
Clay, blue, with compacted sand	10	660
Sand, compacted	5	665
Clay, blue, and compacted sand	10	675
Clay, blue	27	702
Sand, with little blue clay	3	705
Clay, blue	5	710
Clay, blue, sandy	115	825
Clay, blue	35	860
Sand, dark, some clay	15	875
Clay, blue	125	1,000
Sand, water-bearing	15	1,015
Clay, blue	3	1,018
Sand, water-bearing	78	1,096
Not recorded	5	1,101

Casing, 22-inch, set to 50 feet; 20-inch, to 390 feet; 16-inch, to 713 feet; 12-inch, to 1,096 feet; perforated from 1,000 to 1,015 feet and 1,033 to 1,096 feet.

Well 24/2-9H1

M. L. Swanberg. Altitude about 15 feet. Drilled by owner, 1948.

Materials	Thickness (feet)	Depth (feet)
Blakeley formation of Weaver:		
"Hardpan", gray	28	28
"Hardpan", gray, some water	2	30
Gravel, fine, with sand, with brackish water	2½	32½
"Hardpan", gray, very hard	24½	57
"Hardpan", gray, some water at 128 ft	71	128
Shale, brown, hard	1	129
Shale, blue, hard	6	135

Casing, 6- to 5-inch, set to 125 feet.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Well 24/2-9J1

M. P. Storey. Altitude about 15 feet. 1946.

Materials	Thickness (feet)	Depth (feet)
Blakeley formation of Weaver:		
Clay, brown	6	6
Clay, blue	16	22
Clay, brown	9	31
Shale, blue, and sandstone, some water	5	36
Shale, hard	4	40
Clay, blue	7	47
Sand and shale, blue	3	50
Shale, blue, hard, some water	1	51

Casing, 6-inch, set to 51 feet.

Well 24/2-9P1

A. Sandstrom. Altitude about 90 feet. Dug by owner, 1909.

Materials	Thickness (feet)	Depth (feet)
Soil	2	2
Clay, red	8	10
Vashon drift:		
Till:		
"Hardpan"	14	24
Blakeley formation of Weaver:		
Bedrock		

Casing, 6-inch.

Well 24/2-10B1

U. S. Navy. Altitude about 166 feet. Drilled by N. C. Jannsen, 1948.

Materials	Thickness (feet)	Depth (feet)
Vashon drift:		
Till:		
Clay, yellow, and rock	20	20
Sand, hard, and "hardpan"	15	35
Clay, blue	10	45
Pleistocene deposits, undifferentiated:		
Sand and gravel, fine, water-bearing	40	85
Clay	13	98

Casing, 12-inch, set to 21½ feet; 8-inch, to 92½ feet.

Well 24/2-15N1

U. S. Navy. Altitude about 92 feet. Drilled by J. J. Bell & Son, 1942.

Materials	Thickness (feet)	Depth (feet)
Puyallup sand:		
Sand, brown, hard	20	20
Sand, brown	30	50
Pleistocene and Tertiary(?) rocks, undifferentiated:		
Clay, brown, sandy	58	108
Clay, green, sandy	14	122
Clay, brown, with sand and gravel	29	151
"Hardpan", gray	82	233
Shale(?), with sand and gravel	22	255
Gravel, cemented	50	305

Casing, 12-inch, set to 295 feet; screened from 295 to 305 feet; perforated from 155 to 160 and 255 to 260 feet.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 24/2-15P1		
U. S. Navy. Altitude about 63 feet. Drilled by J. J. Bell & Son, 1942.		
Pleistocene and Tertiary(?) rocks, undifferentiated:		
Clay, brown, sandy	40	40
Sand, brown, with sandy clay and gravel	178	218
Sand and gravel	8	226
Gravel, green, cemented	11	237
Sandstone, black	4	241
Clay, blue	29	270
Clay, blue, sandy, some gravel	83	353
Casing, 8-inch, set to 353 feet; perforated from 220 to 226 feet.		
Well 24/2-16E1		
O. E. Gaither. Altitude about 105 feet. Drilled by T. G. Philpott, 1948.		
Soil and gravel	8	8
Vashon drift:		
Till:		
"Hardpan" and gravel	32	40
Pleistocene(?) deposits, undifferentiated:		
Sand and blue clay	42	82
"Hardpan," water-bearing	7	89
Casing, 6-inch, set to 86 feet.		
Well 24/2-16K1		
U. S. Navy. Altitude about 25 feet. Drilled by N. C. Jannsen, 1944.		
Vashon drift:		
Till(?):		
Soil and ?	10	10
Advance outwash:		
Sand	10	20
Sand and gravel, water-bearing	30	50
Gravel, coarse	10	60
Gravel	70	130
Pleistocene(?) deposits undifferentiated:		
Gravel and clay, hard	6	136
Casing, 18-inch, set to 136 feet.		
Well 24/2-30Q2		
L. H. Thompson. Altitude about 385 feet. Drilled by T. G. Philpott, 1949.		
Dug, no record	51½	51½
Puyallup sand:		
Sand and gravel, hard	35½	87
Sand and gravel, water-bearing	4	91
Casing, 6-inch.		
Well 24/2-30Q3		
H. Hatlem. Altitude about 380 feet. Drilled by T. G. Philpott, 1948.		
Soil	3	3
Vashon drift:		
Till:		
"Hardpan"	37	40
Puyallup sand:		
Sand	12	52
Sand, hard	10	62
Sand, yellow, and clay	20	82
Sand and gravel, water-bearing	10	92
Casing, 6-inch, set to 92 feet.		

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Well 24/2-31A1

Annapolis Water District. Altitude about 350 feet. Drilled by N. C. Jannsen, 1943.

Materials	Thickness (feet)	Depth (feet)
Vashon drift:		
Sand	37	37
Sand and gravel, hard	25	62
Puyallup sand:		
Clay	45	107
Gravel	16	123
Clay	64	187
Clay, sandy	86	273
Gravel	8	281
Sand	38	319
Gravel, hard	6	325
Orting gravel:		
Kitsap clay member:		
Clay	17	342
Sand and clay	101	443
Lower member:		
Sand	15	458
Sand and gravel	118	576
Pleistocene or Tertiary(?) deposits, undifferentiated:		
Clay	49	625
Sand	22	647
Clay	47	694
Sand	33	727
Clay	18	745
Sand	24	769
Clay and gravel	105	874
Clay, sandy	132	1,006

Casing, 22 to 16-inch; perforated from 459 to 575 and 627 to 647 feet.

Well 24/2-33H1

L. Cheney. Altitude about 20 feet. Drilled by L. Stoican, 1952.

Materials	Thickness (feet)	Depth (feet)
Orting gravel:		
Kitsap clay member:		
Clay, blue	98	98
Sand, silty	3	101
Clay, blue	32	133
Lower member:		
Sand and gravel	1	134

Well 24/2-34N1

H. Mikelsen. Altitude about 65 feet. Drilled by M. Scott, 1940.

Materials	Thickness (feet)	Depth (feet)
Puyallup sand:		
Sand	20	20
Orting gravel:		
Kitsap clay member:		
Clay, some gravel near 50 feet	102	122
Lower member:		
Sand, fine	23	145
Gravel	7	152

Casing, 6-inch.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 24/2-35N3		
T. Foshal. Altitude about 20 feet Drilled by N. C. Jannsen, 1931.		
Vashon drift:		
Till:		
Gravel, cemented	23	23
Puyallup sand:		
Sand, fine	26	49
Orting gravel:		
Kitsap clay member:		
Clay, blue	11	60
Clay and sand	15	75
Sand and clay, blue	12	87
Lower member:		
Gravel and sand, coarse, water-bearing	5	92
Well 24/2-34P1		
J. R. Anderson. Altitude about 20 feet. Drilled by L. Stoican, 1951.		
Open hole, no record	50	50
Orting gravel:		
Kitsap clay member:		
Clay, blue	46	96
Sand, fine	16	112
Clay, blue	22	132
"Hardpan"	6	138
Lower member:		
Gravel, coarse	3	141
Casing, 6-inch, set to 141 feet; perforated from 133 to 141 feet.		
Well 25/1W-1K1		
H. Gorman. Altitude about 70 feet. Drilled by T. G. Philpott, 1947.		
Soil and gravel	8	8
Vashon drift:		
Till:		
"Hardpan"	4	12
Clay and gravel	2	14
"Hardpan"	14	28
Pleistocene deposits; undifferentiated:		
Sand and clay, hard	7	35
Sand and clay, soft	20	55
Gravel and "hardpan"	13	68
"Hardpan"	16	84
Sand and gravel	2	86
Casing, 6-inch, set to 86 feet.		
Well 25/1W-14F1		
A. Apostel. Altitude about 60 feet. Drilled by T. G. Philpott, 1949.		
Vashon drift:		
Till:		
Soil and clay	6	6
Orting gravels:		
Kitsap clay member:		
Clay, blue	66	72
Clay, blue, with fine sand	136	208
Casing, 5-inch.		

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 25/1W-14M1		
E. J. Greer. Altitude about 65 feet. Drilled by T. G. Philpott, 1948.		
Dug, no record	22	22
Vashon drift:		
Till:		
"Hardpan"	3	25
Gravel, clay, and "hardpan"	20	45
Puyallup sand:		
Sand, yellow, coarse	10	55
Clay, sand, and gravel	13	68
Gravel and sand, water-bearing	1	69
Casing, 6-inch, set to 69 feet.		
Well 25/1W-15H1		
— Foster. Altitude about 15 feet. Drilled by T. G. Philpott, 1946.		
Recent alluvium and Vashon drift:		
Soil and gravel	10	10
Vashon drift:		
Till:		
Gravel and "hardpan"	6	16
Puyallup sand:		
Gravel, water-bearing	4	20
Sand	10	30
Sand, gravel, and clay	20	50
Sand, yellow, and gravel	5	55
Casing, 6-inch, set to 55 feet.		
Well 25/1W-15H2		
— McKenzy. Altitude about 15 feet. Drilled by T. G. Philpott, 1946.		
Dug, no record	14	14
Puyallup sand:		
Sand, coarse, yellow, with fine gravel	17	31
Gravel and sand	18	49
Gravel and sand, water-bearing	8	57
Casing, 6-inch, set to 57 feet.		
Well 25/1W-15K1		
F. Crosier. Altitude about 50 feet. Drilled by T. G. Philpott, 1948.		
No record	55	55
Vashon drift:		
Advance outwash(?):		
Gravel, coarse	10	65
Gravel, hard, water-bearing	14	79
Casing, 6-inch, set to 79 feet.		
Well 25/1W-15N1		
V. S. Conradson. Altitude about 40 feet. Drilled by T. G. Philpott, 1950.		
Vashon drift:		
Till:		
Clay and gravel	41	41
Puyallup sand(?):		
Sand, hard, and clay	11	52
Sand, hard, water-bearing	1	52
Casing, 6-inch, set to 53 feet.		

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 25/1W-15Q1		
C. Holiday. Altitude about 120 feet. Drilled by T. G. Philpott, 1949.		
Dug, no record	14	14
Vashon drift:		
Till:		
"Hardpan"	21	35
Advance outwash and Puyallup sand, undifferentiated:		
Gravel	7	42
Clay and gravel	53	95
Gravel, water-bearing	22½	117½
Casing, 6-inch, set to 117½ feet.		
Well 25/1W-15Q2		
L. J. Robertson. Altitude about 130 feet. Drilled by T. G. Philpott, 1949.		
Soil	2	2
Vashon drift:		
Till:		
Sand, clay, and gravel	60	62
"Hardpan" and clay, yellow	6	68
Puyallup sand(?):		
Sand and clay, yellow	22	90
Clay, sandy, water-bearing	29	119
Sand, coarse, water-bearing	3½	122½
Casing, 2-inch.		
Well 25/1W-17P1		
— Berg. Altitude about 40 feet. Drilled by T. G. Philpott, 1950.		
Vashon drift:		
Till:		
Clay, gravel, and "hardpan"	61	61
Puyallup sand(?):		
Sand, water-bearing	7	68
Clay and gravel	1	69
Sand, water-bearing	3	72
Casing, 6-inch, set to 72 feet.		
Well 25/1W-19F2		
G. F. Schroeder. Altitude about 30 feet. Drilled by N. C. Jannsen, 1934.		
Vashon drift:		
Till:		
"Hardpan"	4	4
Till and outwash:		
Boulders	12	16
Gravel, cemented	25	41
Gravel and sand, cemented	26	67
Casing, 6-inch, set to 65 feet; perforated from 47 to 65 feet.		
Well 25/1W-20J1		
R. E. Hadley. Altitude about 20 feet. Drilled by T. G. Philpott, 1948.		
Soil and gravel	4	4
Vashon drift:		
Till:		
"Hardpan"	11	15
Advance outwash:		
Gravel, with some water	2	17
Gravel, cemented	28	45
Gravel, with some water	6	51
Gravel, cemented	12	63
Sand and gravel, water-bearing	5	68
Casing, 6-inch, set to 68 feet.		

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Well 25/1W–21E1

R. E. West. Altitude about 40 feet. Drilled by T. G. Philpott, 1948.

Materials	Thickness (feet)	Depth (feet)
Recent alluvium and Vashon drift:		
Soil and gravel	4	4
Gravel	10	14
Till:		
Clay	5	19
"Hardpan"	11	30
Advance outwash:		
Gravel, hard	7	37
Puyallup sand(?):		
Clay, sandy, water-bearing	9	46

Casing, 6-inch, set to 46 feet.

Well 25/1W–21E2

L. Boyce. Altitude about 40 feet. Drilled by T. G. Philpott, 1950.

Materials	Thickness (feet)	Depth (feet)
Soil	1	1
Vashon drift:		
Till:		
"Hardpan" and gravel	11	12
Puyallup sand(?):		
Sand, water-bearing	2	14

Casing, 6-inch.

Well 25/1W–21M1

B. Bennick. Altitude about 40 feet. Drilled by T. G. Philpott, 1949.

Materials	Thickness (feet)	Depth (feet)
Vashon drift:		
Recessional outwash:		
Gravel	16	16
Till:		
Clay	7	23
Clay, hard, and gravel	10	33
Puyallup sand(?):		
Clay, sand, and gravel, water-bearing	18	51
Clay, with some sand	2	53

Casing, 6-inch, set to 53 feet.

Well 25/1–6D1

U. S. Navy. Altitude about 320 feet. Drilled by N. C. Jannsen, 1948.

Materials	Thickness (feet)	Depth (feet)
Vashon drift:		
Outwash and Puyallup sand, undifferentiated:		
Sand	15	15
Gravel, loose, and sand	62	77
Sand, hard	3	80
Sand and gravel, hard	90	170
Sand, water-bearing	32	202
Sand and clay	5	207

Casing, 8-inch, perforated from 167 to 207 feet.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 25/1-6D2		
U. S. Navy. Altitude about 320 feet. Drilled by T. G. Philpott, 1947.		
Dug, no record	36	36
Vashon drift:		
Till:		
"Hardpan"	21	57
Advance outwash and Puyallup sand, undifferentiated:		
Gravel, cemented	23	80
Sand and gravel	14	94
Gravel, loose	51	145
Sand, fine	55	200
Clay, blue	35	235
Gravel, cemented	5	240
Gravel and clay	46	286
Well 25/1-9G1		
L. O. Fairfield. Altitude about 80 feet. Drilled by T. G. Philpott, 1947.		
Soil	2	2
Vashon drift:		
Till:		
"Hardpan"	47	49
Puyallup sand:		
Sand, hard, and gravel	26	75
"Quicksand"	5	80
Clay, blue	40	120
Sand, fine, water-bearing	15	135
Gravel, water-bearing	5	140
Sand, fine	20	160
Clay, hard, and sand	4	164
Casing, 6-inch.		
Well 25/1-10J1		
O. Ringness. Altitude about 245 feet. Drilled by T. G. Philpott, 1950.		
Vashon drift:		
Till:		
Dug, "hardpan" and sand	50	50
Puyallup sand:		
Sand, water-bearing	11	61
Clay, blue	8	69
Clay and some sand and gravel	9	78
Sand, water-bearing	78	156
Sand and gravel, cemented, hard (till?)	66	222
Sand, water-bearing	3	225
Casing, 6-inch.		
Well 25/1-16G1		
G. Simonson. Altitude about 50 feet. Drilled by T. G. Philpott.		
Vashon drift:		
Till and outwash:		
Soil and gravel	22	22
Clay, blue, and sand	50	72
Puyallup sand(?):		
Clay, blue	63	135
Sand and fine gravel	45	180
Clay, blue	8	188
Casing, 6-inch, perforated from 50 to 65 feet.		

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Well 25/1-17R1

L. A. Smith. Altitude about 35 feet. Drilled by A. L. Nicholson, 1950.

Materials	Thickness (feet)	Depth (feet)
Soil and ?	6	6
Vashon drift:		
Till:		
"Hardpan"	49	55
Clay	1	56
Advance outwash:		
Gravel, water-bearing	$\frac{1}{2}$	56$\frac{1}{2}$

Casing, 6-inch.

Well 25/1-21B1

— McKaeg. Altitude about 100 feet. Drilled by T. G. Philpott, 1948.

Materials	Thickness (feet)	Depth (feet)
Soil	2	2
Vashon drift:		
Till:		
"Hardpan"	8	10
Advance outwash and Puyallup sand, undifferentiated:		
Gravel, loose, water-bearing	5	15
Cla , sandy	23	38
Gravel, water-bearing	8	46
Sand, fine, with some gravel	9	55
Sand, coarse, with gravel, water-bearing	20	75
Sand, coarse	5	80
Sand	5	85
Gravel, fine, water-bearing	3	88
Sand, water-bearing	3	91

Casing, 6-inch.

Well 25/1-23K1

B. Bitle. Altitude about 190 feet. Drilled by T. G. Philpott, 1949.

Materials	Thickness (feet)	Depth (feet)
Dug, no record	30	30
Puyallup sand:		
Sand, fine, water-bearing	8	38
Clay, blue, with some sand	10	48

Casing, 6-inch, set to 48 feet; perforated at 40 feet.

Well 25/1-27N1

O. I. Helms. Altitude about 80 feet. Drilled by T. G. Philpott, 1948.

Materials	Thickness (feet)	Depth (feet)
Dug, no record	19	19
Puyallup sand:		
Clay and gravel	8	27
Gravel	7	34
Sand, water-bearing	13	47
Gravel, water-bearing	11	58
Sand, dark, hard	6	64
Gravel, fine, and sand, water-bearing	19$\frac{1}{2}$	83$\frac{1}{2}$

Casing, 6-inch, set to 83$\frac{1}{2}$ feet.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 25/1-28J1		
Dr. Kint. Altitude about 60 feet. Drilled by T. G. Philpott, 1946.		
Vashon drift:		
Till:		
Gravel and "hardpan"	20	20
Puyallup sand:		
Sand and gravel	13	33
Gravel, hard	5	38
Sand and gravel	6	44
"Quicksand"	6	50
Sand, water-bearing	27½	77½
No record	20½	98

Casing, 8-inch.

Materials	Thickness (feet)	Depth (feet)
Well 25/1-35M1		
O. Johnson. Altitude about 340 feet. Drilled by T. G. Philpott, 1950.		
Old well, no record	40	40
Puyallup sand:		
Sand, water-bearing	18	58
Clay, with some sand	32	90
Clay, with fine sand	20	110
Clay, blue	25	135
Clay, dry	22	157
"Hardpan"	10	167
Sand, coarse, dry	16	183
Sand, gravel, and clay, dry	22	205
Sand, dry	7	212

Casing, 6-inch, perforated from about 40 to 50 feet.

Materials	Thickness (feet)	Depth (feet)
Well 25/2-9D1		
— Cove. Altitude about 20 feet. Drilled by N. C. Jannsen, 1931.		
Vashon drift:		
Till:		
"Hardpan"	11	11
Advance outwash:		
Gravel	4	15
Pleistocene deposits, undifferentiated:		
Sand, loose	10	25
"Hardpan"	10	35
Clay with sand streaks	10	45
Gravel	2	47
Clay, sandy	9	56
Gravel, water-bearing	2	58
Clay, sandy	2	60

Casing, 4½-inch.

Materials	Thickness (feet)	Depth (feet)
Well 25/2-14A1		
Hill Naval Academy. Altitude about 30 feet. Drilled by N. C. Jannsen, 1934.		
Vashon drift:		
Till:		
Gravel, cemented	25	25
Boulders	17	42
Pleistocene deposits, undifferentiated:		
No record	10	52
Boulders and fine gravel	5	57
Gravel, fine	9	66
Gravel, fine, and boulders	27	93
Boulders and sand	51	144
Sand	71	215
Sand and clay	123	338

Casing, 6-inch.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Well 25/2-14A2

Hill Naval Academy. Altitude about 90 feet. Drilled by H. O. Meyer.

Materials	Thickness (feet)	Depth (feet)
Vashon drift:		
Till:		
Soil and gravel	15	15
"Hardpan"	15	30
"Hardpan" and sand	10	40
Pleistocene deposits, undifferentiated:		
Sand and gravel	4	44
—	31	75
Clay and sand	15	90
Sand, clay, and gravel, water	15	105
Gravel, water-bearing	1	106
Clay and sand	4	110
Gravel, water-bearing	8	118
Gravel, coarse	5	123
Sand and fine gravel	1	124
Sand, some gravel	4	128
Gravel and sand	3	131

Casing, 8-inch.

Well 25/2-14P1

Webster. Altitude about 40 feet. Drilled by N. C. Jannsen, 1932.

Materials	Thickness (feet)	Depth (feet)
Puyallup sand:		
Clay, sandy	20	20
Sand, water-bearing	20	40
Sand, fine, water-bearing	19	59
Sand	26	85
Clay, blue	21	106

Casing, 6-inch, set to 20 feet.

Well 25/2-17C1

U. S. Navy. Altitude about 155 feet. Drilled by J. J. Bell & Son.

Materials	Thickness (feet)	Depth (feet)
Soil	1½	1½
Puyallup sand:		
Silt	80½	82
Sand, blue	19	101
Clay, blue, sandy	106	207
Sand, fine	6	213
Orting gravel:		
Kitsap clay member:		
Sand and clay, blue, hard	3	216
Sand, silt, and shale (clay?), brown, hard	30	246
Shale (clay?), hard	2	248
Sand and clay, brown	14	262
Sandstone, hard	14	276
Clay, blue, and sand	9½	285½
Pleistocene and Tertiary(?) deposits, undifferentiated:		
Sand, coarse, and gravel, fine brown	4½	290
Clay, blue, and shale, with some sandstone	85	375
Clay, and shale, sandy, some fine gravel	100	475
Clay, blue	175	650
Clay, with clam shells	31	681
Clay, silty, hard	4	685
Clay, silty, and gravel	10	695
Clay and gravel	48	743
Clay and sand	13	756
Clay, sand, and gravel	21	777
Clay, hard, and sand	43	820
Clay, hard, sand and gravel	82	902
Sand, coarse, water-bearing	8	910

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Well 25/2-17C2

U. S. Navy. Altitude about 150 feet.

Materials	Thickness (feet)	Depth (feet)
Puyallup sand and Pleistocene deposits, undifferentiated:		
Gravel, sandy	40	40
Clay	60	100
"Quicksand"	6	106
Clay	40	146
Clay, blue	27	173
Sland and clay	17	190
Sand	20	210
Sand, fine, and clay	27	237
Sand, hard	2	239
Clay, blue	4	243
Clay, blue, sandy	7	250
Sand, fine, with clay	14	264

Well 25/2-20K1

Bainbridge Island School Dist., Altitude about 70 feet. Drilled by H. O. Meyer.

Materials	Thickness (feet)	Depth (feet)
Vashon drift:		
Dirt and gravel	15	15
Clay	7	22
"Hardpan"	23	45
Pleistocene deposits, undifferentiated:		
Clay, gray	10	55
Gravel, water-bearing	4	59
Clay and brown sand	3	62

Well 25/2-21F1

A. Hoff. Altitude about 165 feet. Drilled by H. O. Meyer.

Materials	Thickness (feet)	Depth (feet)
Vashon drift:		
Till:		
Soil and gravel	10	10
Gravel and clay	15	25
"Hardpan" and gravel	27	52
Pleistocene deposits, undifferentiated:		
Clay and gravel, some water	18	70
Gravel	5	75
Gravel, water-bearing	11	86

Casing, 6-inch, set to 86 feet; perforated.

Well 25/2-23E1

A. Amdahl. Altitude about 160 feet. Drilled by H. O. Meyer, 1945.

Materials	Thickness (feet)	Depth (feet)
Vashon drift:		
Till:		
"Hardpan"	25	25
Clay and sand	4	29
"Hardpan" and clay	27	46
Puyallup sand:		
Sand	6	52
Gravel, water-bearing	20	72

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Well 25/2-23F1

L. Sweetmans. Altitude about 155. Drilled by H. O. Meyer, 1945

Materials	Thickness (feet)	Depth (feet)
Vashon drift:		
Till:		
Soil and gravel	11	11
"Hardpan"	14	25
Puyallup sand:		
Clay	26	51
Gravel	2	53
Sand and clay	2	55
Sand and gravel	12	67
Gravel and some clay	5	72
Sand, hard	33	105
Gravel, water-bearing	3	108
Sand	10	118
Gravel	4	122

Well 25/2-25C1

Y. W. C. A. Altitude about 100 feet. Drilled by N. C. Jannsen, 1928.

Materials	Thickness (feet)	Depth (feet)
Vashon drift:		
Till:		
Gravel, sandy	15	15
"Hardpan"	5	20
Orting gravel:		
Kitsap clay member:		
Clay, hard	15	35
Clay, blue and boulders	13	48
Clay, a little water at 52 ft	10	58
Clay and gravel	2	60
Gravel, cemented	10	70
Clay, sandy	15	85
Sand, fine, some water at 93 ft	24	109

Casing, 8-inch, set to 109 feet.

Well 25/2-25E1

L. E. Duncan. Altitude about 110 feet. Drilled by N. C. Jannsen, 1930.

Materials	Thickness (feet)	Depth (feet)
Vashon drift:		
Till:		
Clay and gravel	46	46
Advance outwash and Puyallup sand:		
Gravel and sand	29	75
Gravel, cemented	3	78
Gravel	5	83
Sand	2	85
Gravel	25	110

Casing, 6-inch.

Well 25/2-25L2

J. Wade. Altitude about 95 feet. Drilled by N. C. Jannsen, 1930.

Materials	Thickness (feet)	Depth (feet)
Old well, no record	80	80
Puyallup sand and Pleistocene deposits, undifferentiated:		
Sand and clay	15	95
?	10	105
"Hardpan"	20	125
?	6	131

Casing, 6-inch, set to 127 feet.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 25/2-2M1		
M. Anthony, Jr. Altitude about 70 feet. Drilled by N. C. Jannsen, 1930.		
Vashon drift:		
Till:		
Sand, clay, and gravel	40	40
Puyallup sand:		
Sand, fine	6	46
Orting gravel:		
Kitsap clay member:		
Clay and sand	39	85
Sand	2	87
"Hardpan"	1	88
Sand, water-bearing	1	89
Casing, 6-inch.		
Well 25/2-25N1		
—Taft. Altitude about 10 feet. Drilled by H. O. Meyer, 1945.		
Vashon drift:		
Till:		
"Hardpan"	10	10
Orting gravel:		
Kitsap clay member:		
Clay, sand, and water	28	38
Clay	27	65
Clay, sand, and water	9	74
Sand, fine	1	75
Clay, some sand	7	82
Sand, coarse, and water	4	86
Sand and pebbles	2	88
Well 25/2-26A1		
U. S. Army. Altitude about 160 feet. Drilled by Service Hardware Co., 1952.		
Vashon drift and Pleistocene deposits undifferentiated:		
Sand	15	15
Sand, loose	20	35
Sand and clay	3	38
Clay, blue	12	50
Clay blue, large boulder at 54 feet	5	55
Clay, hard, and gravel	16	71
Clay, hard, and fine gravel	36	107
Sand, clay, and gravel	28	135
Clay, sand, and gravel	14	149
Clay and gravel	8	157
Sand and gravel	1	158
Sand and small gravel, water-bearing	2	160
Gravel and coarse sand	7	167
Gravel and clay	29	196
Gravel	7	203
Sand and pebbles	3	206
Well 25/2-26E1		
O. U. Selland. Altitude about 180 feet. Drilled by H. O. Meyer.		
Vashon drift:		
Till:		
Clay and gravel	10	10
Advance outwash and Puyallup sand:		
Sand and gravel	50	60
Sand and gravel, water-bearing	16	76

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 25/2-26E2		
E. Callaham. Altitude about 170 feet. Drilled by H. O. Meyer, 1944.		
Vashon drift and Puyallup sand:		
Gravel	10	10
Sand	52	62
Sand and gravel, water-bearing	11	73
Well 25/2-26G2		
D. C. Buchanan. Altitude about 130 feet. Drilled by N. C. Jannsen, 1930.		
Old well, no record	67	67
Puyallup sand:		
Sand	28	95
Sand, brown	2	97
Orting gravel:		
Kitsap clay member:		
Shale (clay or silt) blue, sandy	40	137
Shale (clay or silt), blue	4	141
Clay, blue, sandy	14	155
Sand, black, fine	4	159
Sand, black, fine	12	171
Sand, water-bearing	4	175
Casing, 6-inch.		
Well 25/2-26K1		
J. Uglesich. Altitude about 20 feet. Drilled by N. C. Jannsen, 1931.		
Old well, no record	34	34
Pleistocene deposits, undifferentiated:		
Gravel, cemented	4	38
Gravel, loose	11	49
Gravel, cemented, and sand	7	56
Sand, loose	2	58
Gravel, loose	14	72
Casing, 6-inch.		
Well 25/2-26K2		
Mrs. A. N. Whitenberg. Altitude about 120 feet. Drilled by N. C. Jannsen, 1930.		
Vashon drift:		
Till:		
Clay, yellow and boulders	10	10
Clay, yellow, sandy, some boulders and gravel	18	28
Clay and gravel	8	36
Pleistocene deposits, undifferentiated:		
Gravel	9	45
Gravel and sand	17	62
Gravel	10	72
Sand	2	74
Gravel, cemented	9	83
Gravel and sand	8	91
Gravel, water-bearing	1	92
Casing, 6-inch.		
Well 25/2-26L1		
J. Sauers. Altitude about 80 feet. Drilled by H. O. Meyer.		
Vashon drift:		
Till:		
"Hardpan" with clay	55	55
Puyallup sand:		
Sand, fine	6	61
Gravel, water-bearing	9	70
Clay, soft, with fine gravel	18	88
Gravel, water-bearing	2	90

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 25/2-26M1		
E. L. McNarity. Altitude about 110 feet. Drilled by N. C. Jannsen, 1932.		
Vashon drift:		
Old well, no record	58	58
Till:		
"Hardpan"	10	68
Luyallup sand:		
Gravel, water-bearing	3	71
Sand, water-bearing	3	74
Sand and gravel	4	78
Casing, 8-inch, set to 78 feet; perforated from 68 to 73 feet.		
Well 25/2-26M2		
J. Camarada. Altitude about 70 feet. Drilled by H. O. Meyer, 1945.		
Soil	3	3
Vashon drift:		
Till:		
"Hardpan"	16	19
Boulders	2	21
"Hardpan"	9	30
Pleistocene deposits, undifferentiated:		
"Hardpan" and gravel	29	59
"Hardpan" and sand, water-bearing	12	71
Clay	4	75
Gravel, water-bearing	1	76
Clay and gravel	12	88
Gravel, water-bearing	7	95
Casing, 6-inch, screened from 90 to 95 feet.		
Well 25/2-26P1		
Commercial Ship Repair. Altitude about 10 feet. Drilled by N. C. Jannsen, 1933.		
Vashon drift:		
Till:		
"Hardpan" and boulders	17	17
Boulders	5	22
Pleistocene and Tertiary (?) deposits, undifferentiated:		
Gravel, cemented	18	40
Gravel, hard	43	83
Boulders	17	100
Shale	55	155
Clay, blue	95	250
"Hardpan", white	20	270
Clay, tough	15	285
Clay, blue	60	345
Silt and boulders	35	380
Boulders, hard	22	402
Clay, blue, and boulders	73	475
Shale, gray	43	518
Shale, gray with boulders	38	556
Shale, gray, water at 570 ft	49	605
Clay, boulders at 632 ft	38	643
Gravel, loose	6	649
Shale	33	682
Clay, blue, with boulders	20	702
Gravel, fine	14	716
Sand, rock, and gravel	11	727
Gravel, and coarse sand, water-bearing	34	761
Casing.		

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Well 25/2-26P2

Federal Housing Project. Altitude about 40 feet. Drilled by N. C. Jannsen, 1946.

Materials	Thickness (feet)	Depth (feet)
Vashon drift:		
Till:		
"Hardpan"	20	20
Orting gravel:		
Kitsap clay member:		
Shale, gray	6	26
Sand	2	28
Shale, blue, with shells	18	46
Shale, gray	10	56
Sand and gravel, fine	17	73
Sand and clay	8	81
Shale, blue, and gravel	33	114
Shale, blue	38	152
Lower member:		
Gravel, water-bearing	11	163

Casing, 16-inch.

Well 25/2-27L1

J. R. Book. Altitude about 10 feet. Drilled by N. C. Jannsen, 1931.

Materials	Thickness (feet)	Depth (feet)
Vashon drift:		
Till:		
Clay, and rocks	9	9
Pleistocene deposits, undifferentiated:		
Gravel	9	18
Sand	2	20
Gravel, cemented	3	23
Gravel	12	35
Gravel and sand	46	81
Gravel	22	103

Casing, 8-inch, set to 103 feet; perforated from 43 to 47 feet and 93 to 103 feet.

Well 25/2-27L2

J. R. Book. Altitude about 15 feet. Drilled by N. C. Jannsen, 1936.

Materials	Thickness (feet)	Depth (feet)
Vashon drift:		
Till:		
Gravel, cemented	6	6
Pleistocene deposits, undifferentiated:		
Gravel, loose	32	38
Gravel, coarse to fine, loose	10	48
Gravel, water at 60 feet	12	60
Gravel, and sand, loose	14	74
Sand	3	77
No record	24	101

Casing, 6-inch.

Well 25/2-30K1

W. O. Wesseler. Altitude about 100 feet. Drilled by A. L. Nicholson, 1946.

Materials	Thickness (feet)	Depth (feet)
Pleistocene deposits, undifferentiated:		
"Hardpan"	93	93
Clay, yellow	109	202
Sand, water-bearing	178	380
Clay, blue	65	445
Muck, blue, stinking	20	465

Casing, 6-inch.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 25/2-31P1		
S. L. Kerr. Altitude about 60 feet. Drilled by J. J. Bell & Son.		
Puyallup sand:		
Soil and sand	21	21
Clay	2	23
"Quicksand"	3	26
Clay, blue	4	30
"Quicksand"	25	55
Orting gravel:		
Kitsap clay member:		
Clay, blue	125	180

Casing, 4½-inch, set to 180 feet.

Materials	Thickness (feet)	Depth (feet)
Well 25/2-35F2		
S. Mirkovich. Altitude about 90 feet. Drilled by H. O. Meyer.		
Vashon drift and Puyallup sand:		
Sand and clay	10	10
Clay and a little sand	75	85
Sand, water-bearing	2	87
Sand	36	123
Sand, and gravel, water-bearing	7	130
Well 25/2-35F3		
Simpson. Altitude about 80 feet. Drilled by H. O. Meyer.		
Vashon drift:		
Till:		
Sand and gravel	10	10
"Hardpan"	15	25
Puyallup sand:		
Sand	51	76
Sand and gravel, water-bearing	17	93
Well 25/2-35H3		
West Coast Wood Preserving Co. Altitude about 10 feet. Drilled by N. C. Jannsen, 1942.		
Pleistocene and Tertiary(?) deposits, undifferentiated:		
Clay and gravel	98	98
Gravel, loose	40	138
Clay and boulders	50	188
Clay and gravel	42	230
Gravel, sandy	20	250
Sand, brown, packed	50	300
Sand and boulders	52	352
Clay and boulders	9	361
Clay, blue	84	445
Sand and boulders, packed	59	504
Sand and gravel	4	508
Boulders	27	535
Clay	162	697
Sand, water-bearing	83	780
Clay	33	813

Casing, 10- to 8-inch, perforated from 90 to 105 feet and at bottom, gravel-packed.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 25/2-35K1		
Clark. Altitude about 185 feet. Drilled by B. Strom.		
Puyallup sand:		
Soil and sand	6	6
Sand and clay	185	191
Sand, fine, water-bearing	7	198
Well 25/2-35K2		
K. Dyste. Altitude about 160 feet. Drilled by Strom.		
Puyallup sand:		
Soil and sand	8	8
Sand	150	158
Sand, water-bearing	7	165
Casing, 6-inch.		
Well 25/2-35K3		
A. Towey. Altitude about 185 feet. Drilled by H. O. Meyer.		
Vashon drift and Pleistocene deposits, undifferentiated:		
Gravel	10	10
Sand and clay	85	95
Clay, blue	10	105
Sand, water-bearing	15	120
Sand and gravel, water-bearing	12	132
Well 25/2-35L1		
E. Love. Altitude about 160 feet. Drilled by B. Strom, 1947.		
Soil	6	6
Pleistocene deposits, undifferentiated:		
Sand, fine, and clay	194	200
Sand, water-bearing	9	209
Casing, 6-inch.		
Well 25/2-35M1		
H. M. Selvar. Altitude about 200 feet. Drilled by B. Strom.		
Pleistocene deposits, undifferentiated:		
Clay, brown	20	20
Clay and sand	74	94
Sand, water-bearing	5	99
Casing 6-inch.		
Well 25/2-35M2		
H. I. Foss. Altitude about 260 feet. Drilled by N. O. Jannsen, 1930.		
Dug, no record	46	46
Puyallup sand:		
Sand	42	88
Gravel	30	118
Gravel, very hard	4	122
Gravel	17	139
Gravel, fine, and sand	3	142
Sand, coarse, and gravel, water at 143 feet	6	148

Casing, 6-inch, set to 148 feet.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 25/2-35M3		
D. Chuka. Altitude about 170 feet. Drilled by H. O. Meyer.		
Vashon drift:		
Till:		
Sand and gravel	5	5
"Hardpan" and clay	7	12
Puyallup sand:		
Clay	19	31
Sand and gravel, water-bearing	11	42
Well 25/2-36N1		
Hoodenpyle. Altitude about 15 feet. Drilled by N. C. Jannsen.		
Blakeley formation of Weaver:		
Clay, yellow, and rock	8	8
Clay, blue	13	21
Shale, blue	63	84
Clay	281	365
Shale	23	388
Shale, some gravel	6	394
Clay, blue	20	414
Clay, and shale	13	427
Shale, with some sand	18	445
Sand, white, fine	15	460
Clay, sandy, soft	24	484
Clay, blue, with sand	19	503
Sand and clay	16	519
Sand and shale	11	530
Sand, fine, water-bearing at 565 feet	58	588
Sand	16	604
Casing, 6-inch.		
Well 25/2-35Q2		
W. Warrick. Altitude about 130 feet. Drilled by H. O. Meyer, 1945.		
Vashon drift:		
Till:		
Soil and gravel	12	12
Clay, blue	44	56
Puyallup sand:		
Clay and sand	32	88
Sand and clay	57	145
Clay	10	155
Well 25/2-36N2		
U. S. Navy. Altitude about 15 feet. Drilled by N. C. Jannsen, 1941.		
Berkeley formation of Weaver:		
Clay (shale), blue, hard	154	154
Clay (shale), rock, and gravel	16	170
Sandstone	5	175
Sand and gravel, fine	5	180
Sandstone, and rock	5	185
Clay (shale), blue, and gravel	1	186
Clay (shale), blue	8	194
Limestone	6	200
Sand, gray	7	207
Gravel	5	212
Sand, gravel, and blue clay (shale)	16	228
Gravel	4	232
Sand and clay (shale), blue	8	240
Sand and gravel	15	255
Clay (shale), sandy	4	259
Sand and gravel, fine	16	275
Clay (shale), blue, and fine gravel	81	356
Gravel, coarse	4	360

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 25/2-36N2—Continued		
Berkeley formation of Weaver—Continued		
Sand and gravel	7	367
Gravel with some clay (shale)	24	391
Sand, gravel, and clay shale	18	409
Sand and gravel	58	467
Gravel, small amount of sand	9	476
Gravel	6	482
Sand and gravel, coarse	7	489
Sand, gravel, and clay (shale), blue	48	537
Sand and gravel	8	545
Sand, gravel, and shale	34	579
Sand and gravel	18	597
Sand, gravel, and clay (shale) blue	40	637
Clay (shale), blue, and gravel	133	770
Clay (shale), blue	44	814
Clay (shale), blue, and gravel	29	843
Clay (shale), blue	17	860
Clay (shale), blue, and sand	74	934
Clay (shale), blue, and petrified wood	8	942
Shale, blue	4	946
Clay (shale), blue, sandy	149	1,095
Clay (shale), blue	20	1,115
Clay (shale), blue-black with fine gravel	25	1,140
Clay (shale), blue, with gravel	118	1,258
Clay (shale)	12	1,270
Clay (shale), blue, with gravel	31	1,301
Clay (shale), blue	102	1,403

Well 26/1-9G1

H. O. Svenson. Altitude about 380 feet. Drilled by owner.

Sand and soil	4	4
Vashon drift:		
Till:		
"Hardpan"	5	9
Puyallup sand:		
Sand	72	81
Gravel	1	82

Casing, 5-inch, set to 82 feet.

Well 26/1-12P1

R. Kindall. Altitude about 355 feet. Drilled by O. E. Erdman, 1936.

Soil	5	5
Vashon drift:		
Till:		
"Hardpan"	50	55
Puyallup sand:		
Sand and clay	130	185
"Quicksand"	27	212
Gravel	3	215

Casing, 6 inch.

Well 26/1-13F1

C. Smith. Altitude about 385 feet. Drilled by V. Sjolseth, 1946.

Soil	2	2
Vashon drift:		
Till:		
"Hardpan"	10	12
Puyallup sand:		
Sand	142	154
Gravel	1	155

Casing, 6-inch, set to 155 feet.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 26/1-16D1		
C. Dahl. Altitude about 420 feet. Drilled by N. C. Jannsen, 1944.		
Vashon drift:		
Till:		
"Hardpan"	56	56
Puyallup sand:		
Sand, dry	28	84
Clay, blue	12	96
Sand and gravel, dry	16	112
Clay, brown, sandy	6	118
Sand and gravel, water-bearing	8	126
Clay, blue	----------	----------
Casing, 6-inch, set to 126 feet.		
Well 26/1-25C1		
A. E. Johanson. Altitude about 200 feet. Drilled by C. Ruby, 1946.		
Soil and (?)	8	8
Pleistocene deposits, undifferentiated:		
Clay, blue	146	154
Gravel, water-bearing	1	155
Casing, 6-inch, set to 155 feet.		
Well 26/1-26A2		
C. W. Higby. Altitude about 40 feet. Drilled by W. W. Wade, 1946.		
Soil	1½	1½
Vashon drift:		
Till:		
"Hardpan"	5½	7
Pleistocene deposits, undifferentiated:		
Clay, blue	93	100
Gravel	7	107
Casing, 6-inch, set to 107 feet.		
Well 26/1-27J2		
Mrs. S. Smith. Altitude about 45 feet. Drilled by W. W. Wade, 1950.		
Soil	6	6
Vashon drift:		
Till:		
"Hardpan"	30	36
Pleistocene deposits, undifferentiated:		
Clay, blue, with sand streaks	110	146
Gravel, water-bearing	6	152
Casing, 6-inch.		
Well 26/1-32K1		
U. S. Navy. Altitude about 295 feet. Drilled by N. C. Jannsen, 1944.		
Soil	4	4
Vashon drift:		
Till:		
"Hardpan"	5	9
Advance outwash:		
Sand and gravel	41	50
Gravel, and boulders	3	53
Puyallup sand:		
Sand, with some fine gravel	90	143

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 26/1-32K1—Continued		
Orting gravel:		
Kitsap clay member:		
Clay, blue	67	210
Gravel, black, hard	65	275
Clay, sandy	35	310
Gravel, sandy, hard	55	365
Sand, water-bearing	5	370
Gravel, hard	15	385
Pleistocene deposits, undifferentiated:		
Clay, blue, sandy	70	455
Sand, hard, and gravel	83	538
Clay and gravel	4	542
Gravel and sand, hard	14	556
Clay, sandy	14	570
Sand, hard, and gravel	15	585
Clay, gray-blue	24	609
Sand, hard, with gravel	18	627
Sand, coarse, loose	48	675
Sand and boulders	10	685
Clay, hard, sandy	5	690

Casing, 18- to 10- to 8-inch, set to 685 feet.

Well 26/1-32L1

U. S. Navy. Altitude about 295 feet. Drilled by N. C. Jannsen, 1945.

Materials	Thickness (feet)	Depth (feet)
Sand	4	4
Vashon drift:		
Till:		
"Hardpan"	36	40
Advance outwash and Puyallup sand:		
Rock and gravel	10	50
Gravel, cemented	20	70
Sand and gravel, loose	55	125
Sand and gravel	33	158
Sand, water-bearing	7	165

Casing, perforated from 124 to 145 feet.

Well 26/1-32M1

U. S. Navy. Altitude about 300 feet. Drilled by N. C. Jannsen.

Materials	Thickness (feet)	Depth (feet)
Vashon drift:		
Till and outwash:		
Sand, loose	30	30
Sand, hard	30	60
Gravel, coarse	20	80
Puyallup sand:		
Sand and gravel	30	110
Sand	35	145
Orting gravel and Pleistocene deposits, undifferentiated:		
Clay	60	205
Sand, black, coarse, water-bearing	5	210
Gravel, fine, water.bearing	15	225
Clay, hard	10	235
Rock, broken	25	260
Sand and clay	20	280
Sand and gravel, water-bearing	40	320
Sand, clay, and gravel	10	330
Clay, blue	20	350
Sand, coarse, gravel and boulders, water-bearing	220	570
Clay, blue	130	700

Casing, 24- to 10-inch, set to 570 feet; perforated from 205 to 260 feet, 280 to 320 feet, and 350 to 570 feet.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 26/1-34C2		
— Schmeil. Altitude about 165 feet. Drilled by C. Ruby, 1950.		
Soil	3	3
Vashon drift:		
Till:		
"Hardpan"	52	55
Orting gravel:		
Kitsap clay member:		
Clay, blue	137	189
Clay, sandy	1	190
Lower member:		
Gravel	6	196

Casing, 6-inch, set to 196 feet.

Materials	Thickness (feet)	Depth (feet)
Well 26/1-36P1		
U. S. Navy. Altitude about 14 feet. 1920.		
Vashon drift:		
Till:		
Clay	5	5
"Hardpan"	5	10
Advance outwash:		
Boulders, loose, and sand	30	40
Puyallup sand and Pleistocene deposits, undifferentiated:		
Sand and gravel, water-bearing	5	45
Gravel, water-bearing	14	59
Sand, blue, and gravel	2	61
Sand, blue, with gravel and clay	5	66
Sand, blue, with gravel, water-bearing	5	71
"Quicksand"	9	80
Clay, blue	7	87
Gravel, coarse, with sand, water-bearing	5	92
Clay, blue	19	111
Sand and clay	4	115
Clay, brown	20	135
Boulders, pebbles, and sand	190	325
Clay, dark blue	31	356
Sand	11	367
Sand, coarse, with gravel	13	380

Casing, 6- to 4-inch, set to 355 feet; screened from 355 to 360 feet.

Materials	Thickness (feet)	Depth (feet)
Well 26/1-36P2		
U. S. Navy. Altitude about 14 feet. Drilled by Swenson.		
Vashon drift:		
Till:		
"Hardpan"	35	35
Pleistocene deposits, undifferentiated:		
Gravel	65	100
Sand, fine, and gravel	100	200
Gravel, coarse	55	255
Sand	5	260
Gravel, coarse	35	295
Sand, coarse	45	340
Boulders	10	350
Sand, fine	10	360
Clay	5	365
Gravel	43	408
Clay, blue	32	440
Sand	150	590
Rocks	13	603
Sand	64	667
Clay	10	677
Sand	8	685
Gravel	5	690
Clay	15	705

Casing, 6- to 4-inch.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 26/1-36P3		
Altitude about 19 feet. Drilled by Swenson, 1926.		
Vashon drift:		
Till:		
Clay, yellow	5	5
"Hardpan"	20	25
Gravel and clay	15	40
Advance outwash(?):		
Sand and gravel	15	55
Orting gravel:		
Kitsap clay member:		
Clay, blue	35	90
Clay, brown	30	120
Mud, brown	20	140
Lower member and Pleistocene deposits, undifferentiated:		
Sand and gravel	15	155
Gravel	25	180
Sand, gravel, and boulders	20	200
Sand	15	215
"Quicksand", blue, and gravel	53	268
Clay, blue	7	275
Clay, blue, sand, and fine gravel	113	388
Gravel, coarse	12	400
Sand and mud	15	415
Clay, blue	10	425
Gravel, fine, with sand and clay	7	432
Clay, blue	18	450
Sand and gravel, with blue clay	15	465
Clay, brown	30	495
Clay, blue	40	535

Casing, 8-inch.

Materials	Thickness (feet)	Depth (feet)
Well 26/1-36P4		
U. S. Navy. Altitude about 21 feet. Drilled by N. C. Jannsen, 1940.		
Soil, sandy, and gravel	12	12
Vashon drift:		
Till:		
"Hardpan", and small rock	9	21
Advance outwash(?):		
Gravel, fine, and sand	4	25
Orting gravel:		
Kitsap clay member:		
Clay, blue, and gravel	11	36
Clay, brown	9	45
Clay, blue, and gravel, 2-foot log at 70 feet	37	82
Sand and gravel, hard, log at 90 feet	10	92
Clay and fine gravel	4	96
Clay, blue, and gravel	4	100
Clay, brown	12	112
Clay, brown, with boulders	27	139
Lower member and Pleistocene and Tertiary deposits, undifferentiated:		
Sand and gravel	9	148
Clay, blue, and boulders	10	158
Clay, blue, and gravel	7	165
Sand, gravel, with some blue clay	25	190
Clay	20	210
Gravel, fine, water-bearing	4	214
Gravel, coarse, water-bearing	16	230
Sand, gray-green	16	246
Clay and gravel	26	272
Gravel, cemented	16	288
Clay, blue	37	325
Sand	31	356
Boulders and gravel	7	363
Sand and gravel, cemented	4	367

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 26/1-36P4—Continued		
Orting gravel—Continued		
Lower member and Pleistocene and Tertiary deposits, undifferentiated:—Con.		
Gravel, and boulders, water-bearing	20	387
Sand, hard, gray	7	394
Sand, gray	14	408
Gravel, water-bearing	8	416
Clay and boulders	82	498
Gravel and clay	48	546
Boulders	5	551
Gravel, and boulders	14	565
Gravel and sand	8	573
Gravel and clay	24	397
Boulders and clay	9	606
Clay and gravel, cemented	7	613
Clay, sandy, with gravel, water-bearing	53	666
Clay, sticky	7	673
Clay and boulders	12	685
Sand and gravel, water-bearing	16	701
Boulders, with gravel, cemented	16	717
Gravel, water-bearing	8	725
Sand, with clay and gravel	5	730
Boulders and gravel, water-bearing	16	746
Clay and gravel	6	752
Boulders and gravel, water-bearing	74	826
Clay, sandy	24	850
Gravel and clay	41	891
Boulders	1	892
Gravel and clay	58	950
Clay, blue, sticky	68	1,018
Sand, water-bearing	4	1,022
Boulders	14	1,036

Casing, 22-inch set to 101 feet; 12-inch, 1,036 feet; perforated from 179 to 222 feet, 339 to 429 feet, 584 to 630 feet, 674 to 805 feet, 987 to 1,036 feet; gravel-packed for entire depth.

Well 26/2-1B1

J. C. McCartney. Altitude about 65 feet. Drilled by C. Ruby, 1950.

Materials	Thickness (feet)	Depth (feet)
Vashon drift:		
Till:		
"Hardpan" and sand	100	100
Orting gravel:		
Kitsap clay member:		
Sand, fine, small amount of water	2	102
Clay, blue	100	202

Casing, 6-inch.

Well 26/2-1B3

J. C. McCartney. Altitude about 120 feet. Drilled by C. Ruby, 1950.

Materials	Thickness (feet)	Depth (feet)
Soil	1	1
Vashon drift:		
Till:		
"Hardpan"	51	52
Orting gravel:		
Kitsap clay member:		
Clay, blue	20	72
Sand	6	78

Casing, 6-inch, set to 78 feet.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Well 26/2-10K1

W. G. Hall. Altitude about 190 feet. Drilled by V. Sjolseth, 1950.

Materials	Thickness (feet)	Depth (feet)
Dug, no record	18	18
Vashon drift:		
Recessional outwash:		
Sand	7	25
Till:		
"Hardpan"	7	32
Puyallup sand:		
Sand	23	55
Clay, blue	5	60

Casing, 4-inch, set to 32 feet.

Well 26/2-10Q1

O. C. Gray. Altitude about 125 feet. Drilled by C. Ruby, 1948.

Materials	Thickness (feet)	Depth (feet)
Soil	6	6
Vashon drift:		
Outwash and Pleistocene deposits, undifferentiated:		
Sand	27	33
Clay, blue	80	113
Sand, water-bearing	30	143
Clay, blue	79	222
Sand, water-bearing	28	250
"Hardpan"	4	254
Sand and gravel, water-bearing	6	260

Casing, 8-inch, set to 260 feet.

Well 26/2-16P2

Suguamish Improvement Co. Altitude about 90 feet. Drilled by Osborn Drilling Co., 1946.

Materials	Thickness (feet)	Depth (feet)
Vashon drift and Pleistocene deposits, undifferentiated:		
Sand and silt	30	30
Gravel	5	35
Sand, silt, and clay	95	130
Gravel, some water	5	135
Shale, light colored, hard	7	142
Sand and gravel, coarse	5½	147½

Casing, 12-inch, perforated from 137 to 147 feet.

Well 26/2-18D1

H. E. McMahill. Altitude about 365 feet. Drilled by V. Sjolseth, 1946.

Materials	Thickness (feet)	Depth (feet)
Soil	2½	2½
Vashon drift:		
Till:		
"Hardpan"	82½	85
Orting gravel:		
Kitsap clay member:		
Clay, blue	182	267
Lower member:		
Gravel	1	268

Casing, 6-inch, set to 268 feet.

Well 26/2-28M1

A. H. Rohlfs. Altitude about 30 feet, 1946.

Materials	Thickness (feet)	Depth (feet)
Vashon drift:		
Till:		
"Hardpan"	20	20
Pleistocene deposits, undifferentiated:		
Clay, blue	25	45
Sand, blue, and fine gravel	5	50

Casing, 6-inch, set to 50 feet.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 25/2-33L1		
L. A. Knutson. Altitude about 190 feet. Drilled by H. O. Meyer, 1942.		
Vashon drift: and Pleistocene deposits, undifferentiated:		
Sand and gravel	20	20
Gravel	5	25
Clay, blue	120	145
Sand, a little water	20	165
Clay, blue	3	168
Well 26/2-33M1		
J. D. Brownell. Altitude about 60 feet. Drilled by B. Strom, 1947.		
Vashon drift:		
Till:		
"Hardpan"	20	20
Orting gravel:		
Kitsap clay member:		
Clay, blue	90	110
Lower member:		
Gravel	10	120

Casing, 6-inch, set to 120 feet.

Materials	Thickness (feet)	Depth (feet)
Well 26/2-34L1		
O. B. Harlan. Altitude about 8 feet. Drilled by N. C. Jannsen, 1932.		
Vashon drift:		
Till:		
Gravel, cemented	19	19
Pleistocene and Tertiary(?) deposits, undifferentiated:		
Sand, gray	4	23
Sand, hard	3	26
Clay	1	27
Gravel, and sand	18	45
Sand and clay	53	98
Clay	45	143
Gravel and clay	50	193
Clay, blue	77	270
Clay and gravel	33	303
Gravel, sand, and clay	51	354
Clay, blue, and boulder	54	408
Clay and gravel	43	451
Clay, gravel, and sand	55	506
Clay, blue, and sand	55	561
Rock and gravel	11	572
Clay, blue, and sand	22	594
Clay, sandy	16	610
Boulders, gravel, and sand	22	632
Sand, hard	7	639
Sand, fine	82	721
Sand	136	857
Gravel	3	860
Sand, water-bearing	23	883
Sand, hard, and shale	15	898
Sand with shale layers, water-bearing	97	995
Shale	10	1,005

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)

Well 26/2-34L2

Altitude about 20 feet. Drilled by N. C. Janssen, 1931.

Materials	Thickness (feet)	Depth (feet)
Soil	2	2
Vashon drift:		
Till:		
Gravel, cemented	5	7
"Hardpan"	7	14
Pleistocene deposits, undifferentiated:		
Clay, blue	16	30
Gravel and sand, saline water at 32 feet	10	40
Clay, sandy	12	52
Clay, blue, fresh water at 80 feet	50	102

Casing, 6-inch, set to 81 feet.

Well 26/2-34M1

W. R. Grubb. Altitude about 50 feet. Drilled by H. O. Meyer, 1945.

Materials	Thickness (feet)	Depth (feet)
Vashon drift:		
Till:		
Soil, rocks, boulders, and clay	18	18
"Hardpan," brown	12	30
Pleistocene deposits, undifferentiated:		
Clay, "hardpan," and sand	7	37
Clay, some sand	13	50
Clay, sand, and gravel, water	18	68

Casing, 6;inch, set to 68 feet.

Well 26/3-7M1

U. S. Navy. Altitude about 110 feet. Drilled by J. J. Bell & Son, 1942.

Materials	Thickness (feet)	Depth (feet)
Soil	3	3
Vashon drift:		
Till:		
"Hardpan," and small boulders	38	41
Puyallup sand:		
Clay, blue, hard, sandy, with fine gravel	34	75
Sand and gravel	53	128
Gravel, cemented	8	136

Well 27/2-17A1

R. Walgram. Altitude about 45 feet. Drilled by C. Ruby, 1950.

Materials	Thickness (feet)	Depth (feet)
Orting gravel:		
Kitsap clay member:		
Clay, brown	30	30
Clay, blue	101	131
Pleistocene deposits, undifferentiated:		
Sand and gravel, contains many clam shells	11	142

Casing, 6-inch, set to 142 feet.

Well 27/2-17J1

D. Williams. Altitude about 25 feet. Drilled by C. Ruby, 1950.

Materials	Thickness (feet)	Depth (feet)
Orting gravel:		
Kitsap clay member:		
Clay, sandy	25	25
Clay, blue	32	57
Sand, coarse	9	66

Casing, 6-inch, set to 66 feet.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 27/2–22Q2		
P. W. Waldron. Altitude about 100 feet. Drilled by C. Ruby, 1944.		
Vashon drift:		
Till:		
"Hardpan"	30	30
Puyallup sand:		
Sand, water-bearing	108	138
Gravel, water-bearing	2	140
Casing, 6-inch, set to 140 feet.		
Well 27/2–25F1		
D. J. Kingrey. Altitude about 330 feet. Drilled by C. Ruby, 1943.		
Dug, no record	80	80
Puyallup sand:		
Sand, fine, water-bearing	190	270
Orting gravel:		
Kitsap clay member:		
Clay, blue	30	300
Casing, 6-inch, set to 300 feet.		
Well 27/2–25N1		
State of Washington. Altitude about 5 feet. Drilled by L. R. Gaudio, 1953.		
Fill and beach alluvium:		
Sand	12	12
Puyallup sand:		
Sand, brown	13	25
Sand, very little gravel	40	65
Orting gravel:		
Kitsap clay member:		
Clay, blue, sandy	2	67
Sand, fine, and silt, blue	34	101
Sand, fine, silt, and blue clay	32	133
Clay, blue, sandy	21	154
Clay, blue, sticky	25	179
Sand, fine, silty, with some clay	87	266
Sand	6	272
Clay, blue, sticky	26	298
Casing, 12-inch, set from 0 to 43 feet; 8-inch, from 43 to 265; 0.010-slot screen from 265 to 271 feet.		
Well 28/2–7M2		
F. E. Stubbs. Altitude about 15 feet. Drilled by M. F. Ragsdale.		
Orting gravel:		
Kitsap clay member:		
Sand and peat	25	25
Sand and clay, water-bearing, yields some gas	144	169
Clay, hard	----	----
Casing, 6-inch, set to 169 ft.		
Well 28/2–17M1		
Evergreen Gas & Oil Co. Altitude about 65 feet. Drilled in 1940.		
Pleistocene deposits, undifferentiated:		
Sand	10	10
Clay	2	12
Sand, water-bearing	21	33
Clay	2	35
Sand, water-bearing	133	168
Clay	4	172

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 28/2-17M1—Continued		
Pleistocene deposits, undifferentiated—Continued		
Clay, some sand	26	198
Sand and "Clay shale"	38	236
(?)	2	238
Sand, water-bearing	35	273
Clay	15	288
Sand, coarse, water-bearing	14	302
(?)	10	312
Clay, black to blue	172	484
Sand, water-bearing	12	496
Clay	26	522
Sand, and clay, water-bearing	18	540
Clay, light gray	11	551
(?) water-bearing	12	563
Clay, gray	145	708
Sand, heaved 500 feet	17	725
Clay, gravel, and wood	15	740
Sand and gravel, water-bearing	32	772
Clay and sand, water-bearing	13	785
Clay	54	839
Sand and clay, water-bearing	21	860
Sand	45	905
Sand, water-bearing, trace of oil and gas	27	932
Sand, water-bearing	2	934
"Hardpan", gravel and clay	19	953
Clay, sandy, some gas	23	976
Sand	2	978
Sand, water-bearing	13	991
Clay	1	992
"Hardpan"	3	995
Clay, blue-gray	41	1,036
(?)	69	1,105
Pre-Pleistocene deposits:		
Shale, thin sandstone, layers at top	62	1,167
Shale, sandy	2	1,169
Shale, blue-gray	37	1,206

Well 28/2-18J1

Mrs. Pace. Altitude about 60 feet.

Materials	Thickness (feet)	Depth (feet)
Pleistocene deposits, undifferentiated:		
Clay, buff, sandy	15	15
Sand, gray-buff, clayey	40	55
Clay, gray, sandy, water reported at base	12½	67½
Clay, gray, slightly sandy	8½	76
Sand, gray, fine to coarse, gravel at base	50½	126½
Clay, gray, silty to sandy	31	157½
Gravel and gray clay	16½	174
Clay, gray, silty, hard, some gravel at 180 feet	16	190
Clay, gray, silty, soft, yields some gas	13	203
Clay, gray, silty	3	206

Well 28/2-20D1

J. O. Lasher. Altitude about 25 feet. Drilled by T. G. Philpott, 1950.

Materials	Thickness (feet)	Depth (feet)
Puyallup sand:		
Clay and soil	2	2
Sand and gravel, and clay	23	25
Clay, blue	5	30
Sand, fine	48	78
Sand, coarse	2	80
Sand, coarse, and fine gravel	10	90
Sand	10	100
Sand and clay	10	110

Casing, 6-inch, set to 110 feet; perforated from 82 to 86 feet.

TABLE 6.—*Materials penetrated in representative wells in Kitsap County, Wash.*—Continued

Materials	Thickness (feet)	Depth (feet)
Well 28/2-22B1		
U. S. Coast Guard. Altitude about 80 feet. Drilled by M. F. Ragsdale, 1948.		
Vashon drift:		
Till:		
"Hardpan" and boulders	12	12
Puyallup sand:		
Gravel, cemented	15	27
Clay, blue	2	29
Gravel, cemented	5	34
Clay, blue	44	78
Sand, gray, water-bearing	31	109
Casing, 6-inch, set to 109 feet.		
Well 28/2-35M2		
E. D. Byer. Altitude about 150 feet. Drilled by T. G. Philpott, 1950.		
Vashon drift:		
Till:		
Clay and gravel	17	17
Orting gravel:		
Kitsap clay member:		
Clay, blue, and sand	86	103
Sand	4	107
Casing, 6-inch, set to 107 feet.		
Well 28/2-35M3		
J. G. Shackman. Altitude about 200 feet. Drilled by T. G. Philpott, 1953.		
Soil	1	1
Vashon drift:		
Till:		
Clay, yellow, and gravel	3	4
"Hardpan"	22	26
Puyallup sand:		
Clay, yellow, and sand	16	50
Sand, clay, and gravel, dry	14	64
Sand	15	79
Sand, gravel, and clay	28	107
Sand and gravel, dry	5	112
Sand, gravel, and clay	14	126
Sand and gravel, a little clay, some water	5	131
Orting gravel:		
Kitsap clay member:		
Clay, blue	36	167
Clay, blue, sand, and a little water	22	189
Sand, blue, clay, and more water	11	200
Sand, fine, water-bearing	9	209
Clay, blue	5	214
Sand, fine, water-bearing	6	220
Clay, blue	9	229
Silt, sand, clay, and water	11	240
Clay, blue	4	244
Clay, brown and peat	4	248
Clay, blue and silt, a little water	16	264
Sand, fine to coarse, some gravel and water	8	272
Clay, blue	2	274
Silt, sand and clay, some water	26	300

TABLE 7.—*Analyses of ground water from Kitsap County, Wash.*

[USN, United States Navy; C, commercial laboratory; USGS, United States Geological Survey; <less than; tr, trace]

Well number	Analyst	Date of collection	Silica (SiO₂)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na+K as Na)	Bicarbonate (HCO₃)	Sulfate (SO₄)	Chloride (Cl)	Fluoride (F)	Nitrate (NO₃)	Dissolved solids	Total hardness (CaCO₃)	Percent sodium	Specific conductance (micromhos at 25° C)	Hydrogen-ion concentration (pH)	Depth of well (feet)
			Parts per million																	
24/1-12E2	C	2-16-43	22		0.7		21	9.3	17		4.1	5.1			152	96	29		7.8	914
23E1	USN	9-24-46	50	0.94	.38	tr	67	17	26	89	48	97			403	240	19		8.2	2,000
25E1	C	8-20-47	40	<.1	<.1		17	4.9	1.2	90	.5	1.8	0.3	0.0	123	62	4		8.2	314
26K1	C	8-20-47	36	<.1	<.1		17	4.6	.1	79	4.0	3.6	.1	.0	118	60	.3		8.2	422
26K3	C	8-20-47	38	<.1	<.1		17	4.7	.1	87	4.0	1.8	.1	.0	123	61	.3		8.1	
26K4	C	8-20-47	37	<.1	<.1		17	4.2	.1	79	4.0	3.6	.2	.0	112	59	.3		8.2	792
26L1	C	8-20-47	32	.1	.1		17	4.3	1.1	76	4.0	3.6	.2	.0	116	60	4		8.2	441
33K2	C	7- 5-51	31		.14		12	5.1	13	79	4.4	7.1	.0	.0	106	51	35		8.2	245
33K3	USGS	11-15-44	23		.01		12	4.4	9.6+1.2	69	6.3	2.0	.1	.0	92.6	48	30	126		[1] 316
33K6	USGS	11-15-44	30		.08		15	3.0	8.3+1.6	72	4.6	1.8	.0	.0	100	50	26	137		562
33L1	C	7- 5-51	30		.05		19	4.0	12	78	.8	.17	.0	.0	114	64	29		8.1	622
24/2-10B1	USN	8-17-47	35	1.3	.15	0.0	20	14	22	159	23.8	5.0			169	106	31		7.2	98
10B3	USN	1-23-47	22	.08	.05	.0	14	9.8	10	90	11	8		1	135	75	22		6.8	
15N1	USN	9-20-48	28	0.74	0.49	0.35	17	11	9.1	119	5.8	2.8		0.0	139	88	19		7.6	305
15P1	USN	9-20-48	13	.12	.54	.60	23	16	6.5	156	7.1	2.5		.0	154	124	10		7.8	63
16K1	USN	9-20-48	37	1.1	.43	.20	14	11	14	116	6.3	5.3		0.0	148	80	27		7.8	136
25/1-6D1	USN	4- 5-49	37	.95	.44	tr	29	8.1	0	127	1.6	0			125	106	0		7.4	207
25/2-17C1	USN	12-22-49	26	.54	.11	.0	21	5.1	20	134	.8	3.5		0.0	141	83	37		8.0	910
17C2	USN	12-22-49	13	.37	.32	.0	22	15	2.2	143	3.5	1.0		.0	130	118	4		8.0	264
35H1	USN	7-24-46	28	.1	1.4	.1	17	10	26	62	22	35			187	85	40		7.0	30
35H2	USN	5-13-46	26	.79	.01	.0	26	26	98	129	102	132			432	173	55		7.4	500
35H3	USN	5- 6-46	27	1.1	.04	.0	19	15	23	106	14	58			252	111	31		7.2	813
26/1-32K1	USN	10- 7-47	23	.9	.02	.0	22	4.7	5.8	99	3.0	1.0			111	73	15		8.0	690
32Q2	USN	3- 3-44	16	0.0	.4		11	7.1	5.5	27	26	10		4.4		56	18			18½
36P1	USN	5-20-48	36	0.74	.77		24	7.3	19	137	.3	13			162	89	32		8.0	380
36P2	USN	5-20-48	40	1.21	.89		27	7.4	29	140	.2	33			201	99	38		8.0	705
36P3	USN	5-20-48	32	0.53	.75		22	8.0	20	137	.0	12			150	88	33		8.0	535
36P4	USN	5-20-48	31	0.53	.65		23	3.7	32	137	.0	18			166	72	49		8.3	1,036
26/3-7M1	USN	6-13-44	32	0.46	.17	.2	18	12	29	152	.4	8.5			152	95	40		8.5	136
28/2-22B1	C	6- 3-49	42	tr	tr		56	48	283	317	1.0	489			1,228	335	65		6.8	109

[1] Well has been deepened to 538 feet since analysis was made.

INDEX


EXPLANATION
Qal
Alluvium
In places includes beach deposits of sand and gravel in the zone between the shoreline (line of mean high tide) and the upper edge of the beach, which is a short distance inland from the shoreline. The beach deposits do not yield potable water
Recent
Qvo
Qvo₁
Qvt
Vashon drift
Puyallup sand
Qp
Orting gravel
Qok
Qol
Admiralty drift
Qa
Pleistocene
QUATERNARY
Blakeley formation (of Weaver)
Tb
Marine sandstone, shale, and conglomerate exceeding 8500 feet in thickness. Yields little or no ground water
Oligocene
Volcanic rocks
Tv
Eocene
TERTIARY
Contact, dashed where approximately located
T. 28 N.
T. 27 N.
T. 26 N.
T. 25 N.
T. 24 N.
T. 23 N.
T. 22 N.
R. 1 E.
R. 2 E.
R. 1 W.
R. 2 W.
R. 3 W.
122°52'30"
47°45'
47°37'30"
47°30'
122°45'
122°37'30"
122°30'
HOOD CANAL
PORT MADISON
PORT ORCHARD
SINCLAIR INLET
COLVOS PASSAGE
KITSAP CO
PIERCE CO
Qal
Qvo
Qvt
Qp
Qok
Tv
R. 2 E.
Geology by J. E. Upson, 1940
and J. E. Sceva, 1949–1950
GEOLOGIC MAP
OF
KITSAP COUNTY, WASHINGTON
Scale 1:48,000
1 0 5 Miles

EXPLANATION

R1 Representative well

E1 Representative spring

Spring

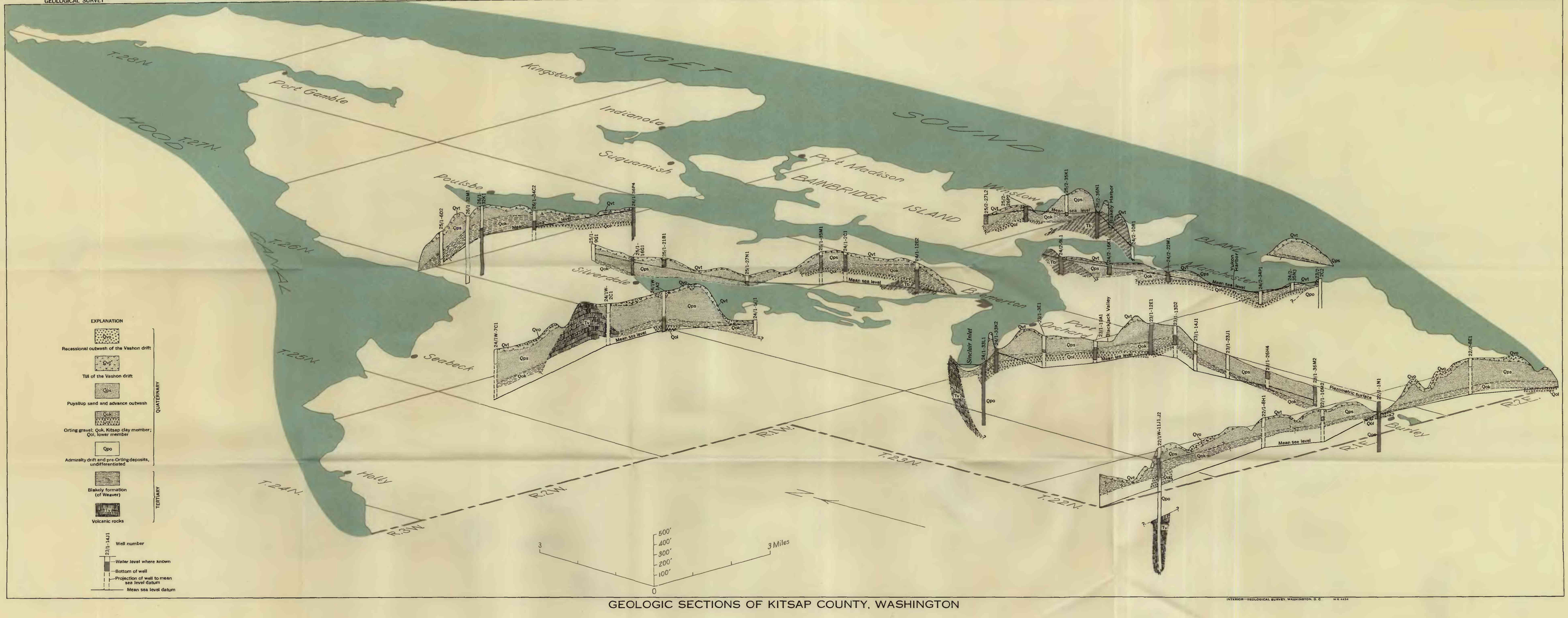
300 / 275 Contours showing approximate altitude of regional water table. Contour interval 25 feet. Datum is mean sea level

Base from maps of U. S. Geological Survey, including Gig Harbor NE, NW; Allen NE, Port Orchard NE, SE, SW, NW; Point Misery NE, SE, SW, NW; Edmonds SW, Port Gamble NE, SE, SW; The Brothers, and maps of the U. S. Corps of Engineers including the Shilshole Bay and Duwamish Head quadrangles

MAP OF KITSAP COUNTY, WASHINGTON, SHOWING LOCATION OF REPRESENTATIVE WELLS AND SPRINGS, AND CONTOURS INDICATING APPROXIMATE ALTITUDE OF REGIONAL WATER TABLE

Scale 1:48,000

1 0 5 Miles



GEOLOGIC SECTIONS OF KITSAP COUNTY, WASHINGTON

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D.C.