STATE OF WASHINGTON

Daniel J. Evans, Governor

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Water Supply Bulletin No. 30

PRELIMINARY INVESTIGATION OF THE GEOLOGY AND GROUND-WATER RESOURCES OF THE LOWER CHEHALIS RIVER VALLEY AND ADJACENT AREAS, GRAYS HARBOR COUNTY, WASHINGTON

By

Paul A. Eddy

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FOREWORD

For sometime, geologists with the Division of Water Resources have felt that the unconsolidated sand and gravel materials which underlie the Chehalis River valley were a source for potential development of moderate to large supplies of high quality ground water. However, insufficient geohydrologic information was available to accurately prove or disprove this opinion.

The Chehalis River valley is scheduled for a water resources inventory as a part of the Division of Water Resources-U. S. Geological Survey state-wide water resources program. However, it was felt that information needed by a major industry about the availability of a large water supply would not be obtained in time and for that reason the Division of Water Resources initiated the preliminary geohydrologic study of the project area.

The Lower Chehalis River valley and Grays Harbor compose an area destined for major industrial and economic growth. However, to reach its maximum potential, the area will need to develop additional major sources of municipal and industrial water. To assist the Cities of Aberdeen and Hoquiam in planning for future expansion, it was agreed that the ground water potential of the Lower Chehalis River valley would be studied and evaluated.

Water Supply Bulletin No. 30 is presented with the thought that it will answer some questions about potential water sources and will assist those charged with the responsibility of planning and programming the economic and industrial development of the Lower Chehalis River valley-Grays Harbor area.

-Robert H. Russell, Chief
Planning and Development Section
Division of Water Resources

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PRELIMINARY INVESTIGATION OF THE GEOLOGY AND GROUND-WATER RESOURCES OF THE LOWER CHEHALIS RIVER VALLEY AND ADJACENT AREAS, GRAYS HARBOR COUNTY, WASHINGTON

By

Paul A. Eddy

ABSTRACT

The lower Chehalis River valley and adjacent areas lie in the southern part of Grays Harbor County in western Washington. The area encompassed in this report covers 468 square miles and contains most of the county's population and virtually all of its ground-water development. The area is drained by six rivers--the Chehalis, Satsop, Wynoochee, Hoquiam, Wishkah, and Humptulips Rivers.

The oldest rocks known in the area are basalt and basaltic sediments of the Crescent(?) Formation of Eocene age that are exposed in the eastern part of the report area. Above this sequence lie several Tertiary rock units ranging in age from Oligocene to Pliocene. All Tertiary rocks of this area are unimportant as aquifers and are classified as "bedrock" in this report. Overlying the bedrock are several units of Quaternary sands and gravels.

Alluvial deposits of Quaternary age are the major sources of ground water in the study area. Present development of these aquifers can be increased substantially without danger of overdraft.

The principal uses of ground water are for domestic, irrigation, and municipal supplies. Chemical tests of the water indicate that in most cases the water is satisfactory for the intended uses.

INTRODUCTION

Purpose and Scope of the Investigation

This investigation was made by the Division of Water Resources of the Department of Conservation as part of a continuing program of collecting and interpreting basic data concerning the ground-water supplies of the State of Washington.

The investigation was made under the general direction of Murray G. Walker, Supervisor of the Division of Water Resources, and under the direct supervision of Robert H. Russell, Assistant Supervisor. Field work on the project was started in June and completed in October, 1965. The project included reconnaissance geologic mapping of the area, interpretation of hydrologic records and well drillers' logs, and an evaluation of the potential for large withdrawals of ground water for future industrial purposes. In presenting the material, an attempt was made to resolve the following:

1. Geologic identification and water-bearing characteristics of major aquifers.
2. Quantitative and qualitative evaluation of the area's ground-water supply.

Location and Extent of Area

The lower Chehalis River basin lies in Grays Harbor County in west central Washington State. The report area covers approximately 468 square miles, extending from the Pacific Ocean on the west to the town of Elma on the east. The area lies within Townships 17 and 18 North and Ranges 6 through 12 West of the Willamette base line and meridian, respectively.

The largest city in the area is Aberdeen which in 1960 had a population of 19,000 (Schmid, 1965). Aberdeen is 47 miles west of Olympia and is served by U. S. Highways 410 and 101.

Previous Investigations

Several studies of interest have been conducted in the report area. An unpublished report by J. W. Robinson and Hans Norbisrath discusses the results of test drilling for a ground-water supply in the lower Chehalis River valley and is the only previous study concerned with ground water.

Geologic studies of varying objectives have been made in and adjacent to the area of investigation. An oil and gas investigation of the Doty-Minot Peak area was conducted by M. H. Pease, Jr. and Linn Hoover (1957); the resulting report briefly describes the Tertiary rocks underlying the Quaternary sediments in the eastern part of the report area. Mapping of the geology in the Montesano quadrangle by H. D. Gower and M. H. Pease, Jr. (1965) also describes the Tertiary rocks and the terrace deposits of the Chehalis River valley.

The coastal part of the study area north of Grays Harbor is included in a report by J. L. Moore. The paper was written in 1965 as a Master's thesis, University of Washington, and describes the surficial geology of the southwestern Olympic Peninsula.

A few well records and miscellaneous well data were available through water rights recorded with the Division of Water Resources, but the majority of the well data were collected by a field canvass by the writer during the summer of 1965.

Acknowledgments

The cooperation of many well drillers, well owners, and tenants who supplied information and allowed access to the wells is gratefully acknowledged. The author is also grateful for procedural suggestions offered by R. H. Russell, Dee Molenaar and other members of the Division of Water Resources.

Well and Location-Numbering System

In this report, as shown in figure 1, wells and locations are designated by symbols that indicate their location according to the rectangular system for subdivision of public lands, indicating township, range, section and 40-acre tracts within the section. For example, in the symbol 17/7-4D1, the portion preceding the hyphen indicates successively the township and range (Township 17 North, Range 7 West) north and west of the Willamette base line and meridian. Because the area lies entirely within the northwest quadrant of the Willamette base line and meridian, the letters indicating the directions north and west are omitted. The first number following the hyphen indicates the section (Section 4) and the letter "D" indicates the 40-acre subdivision of the section, as shown in the accompanying diagram. The last number (1) in the symbol indicates that it is the first well recorded in this particular 40-acre tract.

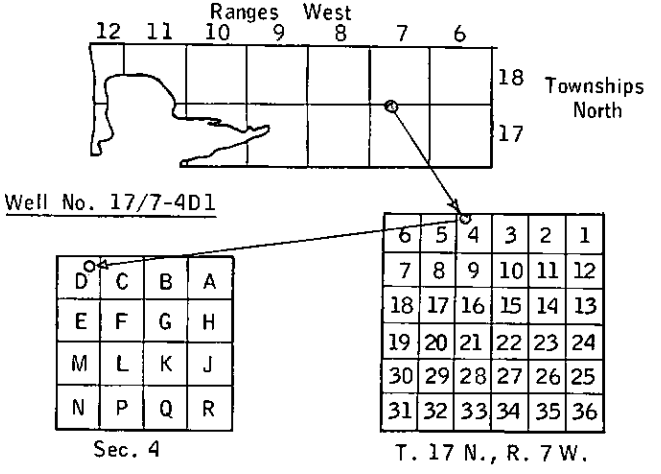

Figure 1.--Well-numbering system

GEOGRAPHY

Topography and Drainage

The Chehalis River occupies a broad, low-gradient valley that extends from east to west across the study area. The mature river valley is bordered by low hills composed of Tertiary bedrock. These hills are extensions of the Willapa Hills from the south and the Olympic Mountain foothills from the north. Only short, small tributaries drain into the Chehalis from the south, but several large rivers flow into Chehalis River and Grays Harbor from the north. From east to west, these include the East, Middle and West Forks of Satsop River, joining the Chehalis River at the town of Satsop; the Wynoochee River, entering the Chehalis River 2 miles west of Montesano; the Wishkah River, joining the Chehalis River at its entrance into Grays Harbor at Aberdeen; the East, Middle and West Forks of the Hoquiam River, entering Grays Harbor at the city of Hoquiam; and the Humptulips River, entering Grays Harbor at North Bay, between Hoquiam and the Pacific Ocean.

The northern margin of the Chehalis valley and the slopes above the tributary valleys are characterized by one or more older river terraces which have been dissected by present-day streams.

The Chehalis River follows a meandering course to Grays Harbor and numerous oxbow lakes and depressions occur in its floodplain. The lower reach of the river from Montesano to the harbor is affected by tidal fluctuations.

The western part of the study area, enclosing the west and north sides of North Bay, is of low altitude and relief. Offshore currents have produced the long sand spit which extends south from Ocean City to Point Brown. North of the narrow peninsula and east about 8 miles is a low area characterized by swamps and floodplain marshes of the Humptulips River.

Climate

At Aberdeen the weather station reports a mean annual precipitation of 84.54 inches; December with 14.50 inches is the wettest month, and July with 1.51 inches is the driest. Average temperatures range from a mean low temperature of 39.7°F in January, to a mean high temperature of 60.6°F in August, with a mean annual temperature of 50.3°F. The lowest temperature of record was 6°F in January, 1950, and the highest temperature of record was 104°F in July, 1942. All weather data are based on records for the 30-year period 1931-1962 inclusive (U. S. Weather Bureau, 1962).

Economy of the Area

The population of the report area is concentrated predominantly within the incorporated cities and towns which serve the commercial interests of surrounding lumbering and shipping activities. In 1960 the combined population of the incorporated cities and towns was 31,318 as compared with 54,084 for the county as a whole. Aberdeen, with a population of 19,000 is the largest city. Hoquiam is

second with 10,800, Montesano third with 2,641 and Elma fourth with 2,064. (Washington State Census Board, as of April, 1965.)

Lumbering, shipping, tourist trade and, to a lesser extent, farming, cattle ranching, and fishing constitute the major industries in the area. Of these, lumbering has been and still is the most important industry to the economy of the area. The ocean beaches and ocean sport fishing attract a high tourist trade to the area and must be considered as important to the present and future economy. Much of the land, especially at low and intermediate altitudes, has been logged off and is used for agricultural purposes. The chief agricultural products include livestock, dairy products, hay, and grain.

Grays Harbor is a large natural harbor, but it must be continually dredged to allow entrance of ocean-going vessels. Large shipments of lumber and pulp products are exported to foreign ports from this harbor, making it one of the important ports of the state of Washington.

GEOLOGY

Geologic History

The nature of the occurrence of ground water within rocks and sedimentary materials underlying the report area is dependent upon their permeability, structure, thickness, and extent. As these factors are determined by the method of deposition of the rock materials, a knowledge of the sequence of geologic events that formed the rocks provides a basis for evaluating the possibilities of ground-water occurrence within any part of the study area. As the oldest rocks found in the study area are of Tertiary age, the following discussion will cover only the sequence of geologic events of the Tertiary through Quaternary Periods.

Tertiary Period

During early and middle Eocene time large quantities of basalt and basaltic sediments were deposited across a broad, northwest-southeast trending piedmont plain that occupied most of what is now western and southwestern Washington. A fluctuating sea level and shoreline at that time caused portions of the plain to lie alternately above and below sea level, resulting in deposition of some of the lavas in marine waters. Stream sediments derived from the volcanic rocks and from adjacent highlands were also deposited across the area, some forming interbeds between lava flows. By late Eocene time the volcanic activity had decreased considerably and a period of quiescence followed. During this time and extending through the Oligocene and early Miocene Epochs, thousands of feet of marine sedimentary rocks accumulated on top of the volcanic rocks.

During late Miocene time the volcanic and sedimentary formations were deformed into large northwest-southeast trending anticlinal and synclinal folds, producing the ancestral Cascade and Olympic Mountains. Erosion during early to middle Pliocene time reduced these mountains considerably. At the close of the Tertiary Period, during the late Pliocene Epoch, a north-south uplift produced the present Cascade and Olympic Mountains, with an accompanying downwarp between,

forming the present Puget Trough (Weaver, 1916). These uplifts declined in elevation southward and in the report area the Chehalis River, as an antecedent stream, was able to maintain its ancestral course to the Pacific Ocean through a gap of lower elevations between the Olympic Mountains and Willapa Hills.

During the late Pliocene and early Pleistocene Epochs what is now the lowlands bordering Grays Harbor was the site of deposition of sedimentary materials. These sediments consist principally of stream-laid gravel and coarse sand derived from the Olympic Mountains and, to a lesser extent, from the Willapa Hills. Finer sediments and organic materials accumulated locally in shallow lakes and swamps, resulting in lenses of peat and wood fragments within the coarser detritus.

Quaternary Period

Pleistocene Epoch

During the Pleistocene "Ice Age" large valley glaciers developed in the Olympic Mountains and vast ice sheets originating in the mountains of British Columbia pushed southward into the Puget Sound lowland. A fluctuating climate caused these glaciers to alternately grow and advance, and melt and "retreat", several times during the Pleistocene Epoch. The last ice disappeared from the Puget lowland approximately 14,000 years ago and a corresponding decline reduced the size of the Olympic valley glaciers.

During the periods of glacial activity, large streams issued from the fronts of the ice and carried great loads of sand and gravel across the countryside and down the valleys. Material from the Olympic Mountains glaciers was deposited in great thicknesses in the foothill valleys and in the Chehalis valley to the south. Derived from Olympic Mountains rocks, these sediments are composed chiefly of coarse basaltic sand and gravel, with minor quantities of sandstone and shale pebbles. In the eastern part of the study area, glacial outwash from the Puget lobe was carried into the Chehalis drainage by several streams that "spilled" through low gaps in the Black Hills and around the north and south flanks of these hills. The major channels carrying the outwash during this time were, from north to south, the Satsop, Cloquallum, Mox Chehalis and Black River valleys. In contrast to the chiefly basaltic rocks derived entirely from the Olympic Mountains, the sediments from the Puget lobe glaciers are composed not only of rocks from the southeastern part of the Olympics, but include granitic pebbles and rocks derived from the northern Cascade Range and mountains of British Columbia.

Recent Epoch

The thick gravel and sand deposits that filled tributary valleys in late Pleistocene time were deeply incised by Recent streams, leaving gravel terraces as remnants of the more extensive valley deposits. The reworked materials were carried to the Chehalis valley to become incorporated with the larger stream's sediments and to be deposited as alluvium. The Chehalis and Hoquiam River sediments partially filled the marine embayment at their mouths while longshore ocean currents

produced the long sand spits that today nearly enclose the western entrance to Grays Harbor. These processes of erosion and deposition continue through the present day. Peat deposits continue to accumulate in oxbow lakes and marshy areas in major river valleys and small landslides occur locally near the base of steeper hillsides undercut by streams.

Stratigraphy

Tertiary Rocks

Crescent(?) Formation

The oldest rocks exposed in the report area form the Crescent(?) Formation of middle Eocene to early late Eocene age (Pease and Hoover, 1957). These rocks are composed of a sequence of lava flows, pyroclastics and sedimentary materials that are exposed only in the southeastern part of the study area, at 17/6-34Q.

Lincoln Formation

The Lincoln Formation was named by Weaver (1912, 1937) and applied to a sequence of tuffaceous sandstone and siltstone beds of middle Oligocene age which are exposed at several localities in the southern part of the area. In a road cut at 17/8-23J the light olive-gray to dark greenish-gray siltstone and sandstone are exposed.

Astoria(?) Formation

Rocks herein referred to as the Astoria(?) Formation are tentatively correlated with the sediments of Miocene age mapped by Etherington (1931) as the Astoria Formation and the lower part of the Montesano Formation (Pease and Hoover, 1957). In the report area this is a thinly bedded, friable basaltic feldspathic sandstone with siltstone and pebble conglomerate beds. The Astoria(?) Formation is exposed at several localities along the south side of the Chehalis River valley west of South Montesano.

Montesano Formation

The Montesano Formation (Weaver, 1912) is upper Miocene in age. Lithologically similar to the underlying Astoria(?) Formation, the two units are differentiated on the basis of their fossil content. The Montesano Formation is exposed in a roadcut southeast of Cosmopolis at 17/9-24.

Pliocene-Pleistocene Sediments

These sediments are composed predominantly of sand and pebble gravel with local interbeds of coarse gravel and silt. The pebbles within the gravel are often weathered to clay, and iron-oxide and associated manganese oxide give a rusty color to the deposits. The slightly deformed sedimentary unit is exposed along State Highway 109 west of Hoquiam at 17/10-4 and 5. These gravels appear to be lithologically similar to the Logan Hill Formation in Lewis County as defined by Mundorff and others (1958, p. 6).

Quaternary Sediments

Pleistocene Terrace Deposits

The sediments forming the terraces along the sides of the Chehalis River valley west of Satsop and along the Wynoochee and Wishkah valleys consist of poorly sorted semiconsolidated silt, sand and gravel with some cross-bedding present. These deposits of glaciofluvial outwash were derived from Olympic Mountains streams. The terrace deposits in the vicinity of Satsop are excellent examples of this glaciofluvial outwash.

The terrace deposits lining the lower Satsop River valley, and the Chehalis valley east of Satsop, are composed of outwash gravel which were to a great extent derived from the Puget lobe glaciers. The resulting terrace deposits stand as much as 20 feet above the river valley and are up to 1.5 miles in width. The gravel is composed of volcanic, coarse-grained igneous and metamorphic pebbles, with granite and quartz pebbles also present. The gravel is well-rounded and in a matrix of poorly sorted sand. Bedding is poor but crossbedding and foreset bedding are visible.

Recent Deposits

Alluvial deposits are found beneath and adjacent to the larger streams and rivers within the mapped area. These deposits range in thickness from a few feet in the tributary valleys to as much as 200 feet in the Chehalis River valley. The deposits are composed of sand, gravel and silt. Associated with the alluvial silts are Recent swamp and marsh deposits. Slumps and landslides along the base of hillsides south of the Chehalis River are composed of Tertiary and Pleistocene rocks. Along the coast, beaches, dunes and spits are composed of sand derived from basaltic and sedimentary rocks.

Occurrence Within Stratigraphic Units

Tertiary Rocks

Volcanic Rocks

Owing to their dense and extremely impermeable character the volcanic rocks are not important as aquifers and no wells in the report area are known to develop adequate supplies of ground water from these rocks.

Sedimentary Rocks

Few wells have been drilled into the sandstone, shale and conglomerate of the Tertiary rock units in this area. Well 18/7-1A, 159 feet deep, is the only one believed to obtain water from the Tertiary rocks. This well was bailed at 30 gpm (gallons per minute) and is used for domestic supply. The water either percolated down through fracture zones or is connate water originating in the interstices of the sandstone at the time of deposition.

Pliocene-Pleistocene Gravel

All wells in the northwestern part of the area (Twps. 17 and 18, Rges. 10 and 11) derive their water from the Pliocene-Pleistocene sediments. Wells in 17/10-5 are drilled to depths of 150 to 180 feet and yield 30 to 70 gpm. Wells to the north in 18/10 and 11, although only 30 to 90 feet deep, produce yields up to 216 gpm. Shallow dug wells in the Pliocene-Pleistocene rocks yield water of poor quality but the deeper wells yield water of satisfactory quality for domestic supplies.

Quaternary Sediments

Pleistocene Terrace Deposits

The outwash material which forms the terraces is highly permeable but usually occur above the regional water table. Where these materials occur in considerable thickness, and extend some distance below the water table, moderate supplies (40-100 gpm) of ground water may be obtained.

Recent Deposits

Sand and gravel alluvium in the Chehalis River valley generally yield larger quantities of ground water than does the alluvium of the tributary valleys. According to yield studies made by Robinson and Norbisrath (1965), some wells

tapping Chehalis River valley alluvium are capable of producing up to 3,000 gpm continuously with very little drawdown. The alluvium yields ground water to many irrigation, industrial and municipal wells in the valley. The cities of Elma and Montesano both obtain ground water from the valley alluvium and a large wood-products industry is developing wells of large capacity for use in a pulp mill.

Areal Occurrence of Ground Water

Plate 2 shows locations of wells in the Chehalis River valley and adjacent areas for which information on well yields and water levels has been obtained from drillers' logs and the well canvass of the area.

As noted on plate 2, there are large areas for which well information is not available. These areas are either (1) largely unpopulated, (2) served by shallow dug wells which supply only the minimum domestic needs, (3) supplied by surface springs or streams, (4) served by large community water systems, or (5) have no ground water available.

The following discussion describes the general areal distribution and availability of ground-water supplies in the various provinces of the report area.

Chehalis River Valley--Wells obtain ground water from two distinct aquifers within the valley alluvium. The upper aquifer, which generally extends to a depth of 100 feet, supplies adequate water, although it is reportedly high in iron content and locally requires treatment for human consumption. The lower aquifer, generally below a depth of 100 feet, supplies large quantities of water of excellent quality. Yields range from 200 to 3,000 gpm.

Tributary Valleys--Ground water is obtained primarily from one aquifer within the valleys tributary to the Chehalis River valley. The aquifer occurs in shallow reworked gravels in alluvium. Yields are not as great as those from the Chehalis valley aquifers but in places quantities up to 200 gpm have been obtained.

Lowlands northwest of Grays Harbor--Wells in this area produce adequately for domestic needs and in a few places produce sufficiently for some irrigation. Generally, the quantities obtained are from 20 to 60 gpm and the quality is acceptable for human consumption.

Ocean Beaches--Two aquifers are evidently present along the coastline, both of which produce sufficient quantities of water for community domestic supplies; however, the upper aquifer contains organic material which discolors and produces a strange taste to the water. The lower aquifer produces water with high mineral content. A more detailed study will be required to define the water-quality problems that exist.

Tertiary Foothills--The Tertiary foothills consist of consolidated rock which, except for one well, have proved unproductive as a source of ground water.

Chemical Quality of Ground Water

All naturally-occurring waters contain certain impurities in the form of dissolved minerals and chemical constituents. The concentrations of most constituents are measured in ppm (parts per million) and are important in determining the accept-

ability of water for various uses. The standards for drinking water, as established by the U. S. Public Health Service, list maximum concentrations for five of the most common constituents. These are shown in Table 1.

Table 1.--Recommended standards for drinking water for five constituents. 1/

Constituent	Recommended Maximum Allowable Concentration in ppm
Iron (Fe)	0.30
Sulfate (SO_4)	250
Chloride (Cl)	250
Nitrate (NO_3)	45
Dissolved solids	500

1/ Data after U. S. Public Health Service, 1962, p. 7.

The hardness of water is an important factor when considering water for industrial and household use. The term hardness is applied generally to the ability of water to consume soap. "Hard water" will also cause the formation of carbonate incrustrations inside plumbing fixtures and on utensils. The U. S. Geological Survey has classified hardness by the following criteria:

Hardness (ppm)	Rating	Usability
Less than 61	Soft	Suitable for many uses without further softening.
61-120	Moderately hard	Usable except in some industrial applications.
121-180	Hard	Softening required by laundries and some other industries.
More than 180	Very hard	Softening desirable for most purposes.

Partial chemical analyses of 8 wells in the study area were made by the U. S. Geological Survey and are included in Division of Water Resources Water Supply Bulletin No. 24 (1965). Table 2 lists analyses of wells in the report area; these have been abstracted from the bulletin and include several wells not otherwise recorded in the present investigation.

Table 2.--Partial chemical analyses of ground-water. 2/

Well Number	Owner or Tenant	PARTS PER MILLION						Well Depth
		Hardness ($CaCO_3$)	Iron (Fe)	Sulfate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Dissolved Solids	
17/6-1C1	Chris Wheeler	22	0.04	4.4	3.0	3.5	67	76
17/6-4D1	City of Elma	24	0.00	2.1	4.0	1.9	58	40
17/7-7P1	Weyerhaeuser Timber Company	92	1.20	-	37.0	-	-	201
17/7-8Q1	"	60	0.50	-	11.0	-	-	141
17/7-9N1	"	51	0.30	-	20.0	-	-	160
17/7-9N2	"	50-54	0.03-0.11	-	9.5-12	-	-	102
17/7-9P1	"	50	0.20	-	11.0	-	-	153
17/7-11B1	Earl Richart	62	2.40	0.6	2.8	0.7	106	50(?)
17/7-11E1	Robert Smith	76	0.73	0.6	3.2	0.2	119	36
17/7-11H1	Milton Larson	52	0.19	4.2	3.5	3.5	93	10
17/7-11K1	G. W. Stretter	58	0.29	4.0	4.0	0.6	108	51
17/8-13P1	Weyerhaeuser Timber Company	54	0.6-1.7	-	1.2	-	-	188
17/8-14K1	"	50	0.30	-	12-16	-	-	180
18/6-31H1	Erling Olson	52	0.33	2.6	3.5	0.1	100	98
18/12-27F1	Frank Minard	26	0.33	2.9	11.0	0.1	127	358

2/ Data from State of Washington Water-Supply Bulletin No. 24, 1965, p. 54-57, and Robinson and Roberts and Associates, Inc., "Test Drilling", 1965, p. 19-25.

Records of Wells

Table 3 presents basic information on 334 wells which were recorded during the course of the investigation. The locations and numbers of all wells recorded are shown on plate 2. For 151 of these wells (shown by solid dot) more detailed data on drillers' logs are presented in table 4.

The information was obtained both from a field canvass of wells on a spot-check basis and from drillers' records, some of which are on file with the Division of Water Resources in conjunction with processing of ground-water rights. Many areas, as shown on plate 2, are relatively barren of well development and little information is available on ground-water conditions.

Ground-Water Development

Areas with Surplus of Ground-Water Supply

The most productive ground-water area is the Chehalis River valley. Here relatively shallow wells (20-80 feet in depth) are capable of producing large quantities of water available for future use. As some of this shallow ground water is high in iron content, it is not satisfactory for human consumption without treatment but is of adequate quality for irrigation and other uses. The deeper aquifers yield large quantities of good quality water. This water is presently used for municipal and industrial supplies and could be further developed if future demands warrant utilization.

An area of possible future ground-water development is the lowlands lying northwest of Grays Harbor. This area is relatively undeveloped, with second-growth timber and slash cuts characterizing the major part of the land. Little is known about the ground-water conditions in this area, but it is believed that domestic supplies can be obtained from aquifers in the Pliocene-Pleistocene sand and gravel.

Areas Deficient in Ground-Water Supply

Large upland areas on both sides of the Chehalis River valley are underlain by the impermeable Tertiary rocks and are relatively undeveloped by rural homesteads as ground-water supplies are undoubtedly sparse or unreliable. Small springs, intermittent streams or shallow wells may provide some water, but transport of water from outside will be necessary to serve any rural growth on these uplands.

Along the northern margin of the report area, terrace deposits thin and disappear as Tertiary bedrock approaches the land surface, and the major tributary valleys became restricted between hillsides of Tertiary rock. Here ground-water supplies are limited to that obtainable from sands and gravels immediately adjacent to the narrow river channels.

Present and Proposed Uses and Withdrawals of Ground Water

At present, in order of importance, the major uses of ground water in the area are for domestic, irrigation and industrial supplies.

The domestic supplies are generally obtained from shallow wells, pumped in quantities of 5 to 10 gpm. As precipitation satisfies most agricultural needs in the study area, only a few wells have developed ground water for irrigation purposes, generally in quantities of 100 to 200 gpm.

Industry does not use large amounts of ground water at the present time; however, development of large capacity wells is planned in the near future. Quantities of approximately 3,000 gpm per well are anticipated and appear to be available.

Perennial Yield

The perennial yield of an aquifer is defined as the rate at which ground water can be withdrawn without depleting the aquifer beyond the point of its being annually recharged. Withdrawals in excess of that rate will cause a lowering of the water table and, consequently, a reduction of the base flow of surface streams and, in places, encroachment of water of inferior quality.

As discussed earlier, the annual precipitation in the report area is 84.5 inches. However, as only a part of the precipitation reaches the water table, only a part of this becomes available for ground-water withdrawal. Sceva (1957) estimates that in areas having 50-70 inches of precipitation the perennial yield will be 2 to 3 acre-feet per acre per year. However, local geologic conditions, especially in areas underlain by relatively impervious bedrock, will cause a reduction in estimated perennial yields to some extent.

At present, only a small part of the available ground water is being withdrawn in the Chehalis River valley. However, the rapidly increasing development of the area and the adjacent lands along the coast will undoubtedly be paralleled by an increase in ground-water withdrawal through both individual domestic wells and community-supply wells. Accordingly, in some areas pumping may eventually exceed perennial yield and will result in a gradual lowering of the water table and, in some coastline areas, possible encroachment of saline waters.

CONCLUSIONS

It is concluded that the ground-water supply in the lower Chehalis River valley is obtained generally from two aquifers within the valley alluvium. The upper aquifer tapping the alluvium has a depth generally to 100 feet and although high in iron content, yields adequate supplies of ground water. The deeper aquifer, usually below 100 feet, supplies large quantities of water which are of good quality for industry and domestic supply.

Good-quality ground water is obtained in the tributary valleys chiefly from sand and gravel aquifers within the alluvium. Quantities obtained from these materials are usually less than that from aquifers underlying the Chehalis River valley, although locally some wells are capable of producing 100 to 200 gpm.

The Pliocene-Pleistocene gravels underlying the lowlands to the northwest of Grays Harbor produce good-quality ground water adequate for domestic supplies and in a few places sufficient for irrigation purposes. Generally, quantities of 20 to 60 gpm are obtained.

There appear to be two aquifers present along the coastline, both of which produce sufficient quantities for community domestic supplies, but the quality of this water is questionable. Both aquifers apparently consist of beach-deposited sands.

The quality of water is generally good in the study area; however, several wells have been condemned. The condemnation of these wells is generally based on an excess of nitrates (NO_3) resulting from percolation of organically contaminated surface waters into the aquifers. As table 1 indicates, the quality of water obtained from most wells is good.

The aquifers underlying the Chehalis River valley are capable of producing many times the quantity presently being withdrawn and future development of ground water in this area appears to offer no problems. Ground-water development in the tributary valleys and the uplands along the Chehalis River valley is approaching the perennial yield and ground-water supplies for irrigation are limited. The lowlands to the northwest of Grays Harbor appear to have sufficient quantities of ground water available for utilization in the future.

EXPLANATION OF PLATES AND TABLES

Detailed information on ground water and wells is provided in tables 1-4. All wells listed in table 3 are located on plate 2. The geohydrologic data contained in tables 3 and 4 and the geologic map were used as the basis for construction of the geologic sections shown in plate 1.

Table 1 (p. 11) lists the recommended standards for drinking water as established by the U. S. Public Health Service.

Table 2 (p. 12) contains the results of chemical analyses of ground water collected from several wells in the area as outlined in the Division of Water Resources Water Supply Bulletin No. 24 and by the private work done by Robinson and Roberts and Associates, Inc. These data form the basis for an evaluation of the quality of ground water in the study area.

Table 3 (p. 18) lists the pertinent data on representative wells in the study area. The selection of wells was not limited by size and depth and includes dug, driven, and drilled wells.

Table 4 (p. 41) contains the drillers' logs of the wells in the study area. These logs present general geologic and ground-water data for each well. The drillers' records facilitate an interpretation of subsurface conditions as they exist within the area. As the drillers' terminology is at times inconsistent with geologic definitions, they have been modified accordingly.

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Aquiclude. A formation which, although porous and capable of absorbing water slowly, will not transmit it fast enough to furnish an appreciable supply for a well or spring.

Aquifer. A formation, group of formations, or part of a formation that is water bearing.

Artesian well. One in which the water level rises above the top of the aquifer, whether or not the water flows at the surface.

Base flow. The discharge entering stream channels from ground water or other delayed sources.

Discharge, ground-water. Discharge of water from an aquifer, either by natural means such as evapotranspiration and flow from seeps and springs, or by artificial means such as pumping from wells.

Drawdown. Lowering of the water level in a well as a result of withdrawal of water.

Ground water. That part of the subsurface water in the zone of saturation.

Permeability. The capacity of aquifer materials to transmit water under pressure. In general the larger the connected pore spaces or other openings in the materials, the greater the permeability.

Piezometric surface. An imaginary surface that everywhere coincides with the static level of the water in the aquifer.

Porosity. The ratio of the volume of openings to the total volume of rock or soil. A high porosity does not necessarily indicate a high permeability.

Runoff. The quantity of water discharged by surface streams, expressed usually in units of volume, such as gallons, cubic feet, or acre-feet.

Semiperched ground water. Ground water is semiperched if it has a greater pressure head than an underlying body of ground water, from which it is, however, not separated by any unsaturated rock.

Specific capacity. The discharge of a well expressed as a rate of yield per unit of drawdown, generally expressed in gallons per minute per foot of drawdown.

Water table. The upper surface of the zone of saturation, except where that surface is formed by impermeable material.

Table 3.--Records of wells.
Well locations shown on Plate 2.

Explanation:
Well No.: See Figure 1 for well-numbering system.
Alt.: Altitude of land surface above mean sea level, interpolated from topographic maps.
Type of well: B, bored; Dg, dug; Dn, driven; Dr, drilled.
Water level: Measurements in feet and decimal fractions were made by Division of Water Resources or U. S. Geological Survey; those in whole numbers were reported by owner, tenant, or driller.
Type of pump: C, centrifugal; H, handpump; J, jet; N, none; P, piston; S, submersible; T, turbine.
Use of water: D, domestic; Ind, industrial; Irr, irrigation; NU, not used; PS, public supply; S, stock; T, test well.
Remarks: ac, acres irrigated; Cert, certificate of water right; C, chemical analysis in Table 3; Cp, partial chemical analysis in Table 1; dd, drawdown; gpm, gallons per minute; L, driller's log in Table 14; Obs, observation well; perf, perforations.

Well No.	Owner or tenant	Well					Water-bearing zone(s)		Water level		Pump		Use of water	Remarks
		Alt. (feet)	Type	Diam. (inches)	Depth (feet)	Casing depth (feet)	Material	Depth interval (feet)	Below land surface (feet)	Date	Type	H.P.		
T. 17 N., R. 6 W.														
1J1	Howard Bunn	45	Dr	8	76	76	Gravel	-	19	8-14-50	-	-	Irr	Yield 100 gpm; Cert 1063; Irr 12 ac; L.
3E1	Olive Martin	20	Dr	4	21.5	None	Sand, gravel	-	20.5	10-7-52	-	-	Irr, S	Yield 160 gpm; Cert 1617; Irr 20 ac; L.
4D1	Town of Elma	20	Dr	20	40	40	Sand, gravel	-	14.5	9-18-45	T	85	PS	Yield 700 gpm, dd 21 ft; Cert 17; Cp, L.
4D2	Town of Elma	20	Dr	16	29.9	-	-	-	14.9	7-28-65	T	60	PS	Yield 750 gpm, dd 5 ft.
4Q1	Unknown	18	Dg	-	25.8	-	-	-	21.5	11-18-65	-	-	D	
5M1	Unknown	20	Dr	10	51.2	-	-	-	6.1	10-18-65	-	-	D	
6D1	E. Petitt	22	Dr	6	174	-	-	-	106	7-1-65	S	½	D	
6G1	J. Friend	20	Dg	120	32	-	-	-	10	-	C	7½	Irr	Cert 2946; Irr 50 ac.

6G2	Charles Baney	20	Dr	8	40	40	Gravel	-	-	-	-	-	Irr	Cancelled; L.
6H1	Unknown	20	Dr	12	49.7	-	-	-	4.6	7-1-65	-	-	Irr	
6J1	Will Goeres	20	Dr	12	55	55	Sand, gravel	-	14.5	9-18-45	-	-	Irr	Yield 1100 gpm, dd 9 ft; Cert 263; Irr 12 ac; L.
6K1	E. Schweitzer	120	Dr	8	165	-	-	-	113	7-1-65	-	-	D	
8E1	M. Fuller	18	Dr	6	175	-	"Pea gravel"	8-14	50	6-1-65	-	1	D	Yield 20 gpm; L.
10A1	Union Pacific Railroad Co.	60	Dg	84	50	35	-	-	20	1910	C	10	Irr	Cert 478-D; Irr 7.08 ac.
11G1	Oscar Ostrom	20	Dr	6	33	-	-	-	3.4	11-18-65	P	½	D	
11H1	Phill Rodinick	22	Dg,Dr	6	31	31	Blue shale	-	10	11-18-65	-	-	D	L.
12H1	William Cnossem	40	Dr	10	40.2	-	Gravel	-	7	5-13-60	-	-	D	Yield 200 gpm, dd 3 ft; Cert 3676-A.
12Q1	Richard Cabe	18	Dr	6	60	-	-	-	-	-	-	-	D	
12Q2	Richard Cabe	18	Dg	36	30	-	-	-	-	-	None	-	D	
18B1	Wilder	130	Dr	-	-	-	-	-	-	-	-	-	D	
24B1	Alvin Ostogard	165	Dg	48	19.3	-	-	-	13.1	11-18-65	P	¼	D	
24B2	Floyd Taylor	140	Dg	24	18	-	-	-	-	-	P	½	D	
24B3	Floyd Searey	135	Dg	24	12	-	-	-	6	11-18-65	J	½	D	
24H1	Ellson	160	Dn	1.25	-	-	-	-	-	-	J	-	D	
							T. 17 N., R. 7 W.							
1B1	G. W. Lynn	22	Dr	6	26	-	Sand, gravel	-	-	-	-	-	D	Yield 30 gpm; L.

Table 3.--Records of wells--Continued

Well No.	Owner or tenant	Well					Water-bearing zone(s)		Water level		Pump		Use of water	Remarks
		Alt. (feet)	Type	Diam. (inches)	Depth (feet)	Casing depth (feet)	Material	Depth interval (feet)	Below land surface (feet)	Date	Type	H.P.		
T. 17 N., R. 7 W. (continued)														
1C1	D. H. Mustard	25	Dr	10	38	-	Gravel	-	16	7-21-62	C	15	Irr	Yield 200 gpm, dd 1 ft 3 inches; L.
1C2	Seibert Larson	25	Dr	8	43	-	Gravel	10	-	-	-	-	Irr	Yield 500 gpm; L.
1H1	W. J. Wharton	20	Dr	8	35	35	Gravel	-	5	6-16-49	-	-	Irr	Yield 200 gpm, dd 10 ft; Cert 840-A; Irr 40 ac; L.
1L1	Fred Bohren	20	Dr	10	31	-	Gravel	-	10	5-10-51	-	-	Irr	Yield 130 gpm, dd 1 ft; Cert 1125; Irr 30 ac; L.
1Q1	G. C. Collett	22	Dr	8	32	32	Gravel	10	10	4-10-50	-	-	Irr	Yield 100 gpm, dd 1 ft; Cert 1767; Irr 15 ac; L.
1R1	G. A. Collett	22	Dr	8	42	42	Sand, gravel	-	14.5	7-28-56	C	7½	Irr	Yield 180 gpm; Cert 2999; Irr 36 ac
2A1	H. E. Rosenbach	33	Dg,Dr	6	33	33	-	-	9.51	11-20-63	C	3/4	D	Yield 6 gpm, dd 0.4 ft.
2A2	H. E. Rosenbach	23	Dg	36	23	-	-	-	18.39	11-20-63	C	½	D	Yield 3.5 gpm, dd 0.05 ft.
2A3	H. E. Rosenbach	30	Dr	10	33	-	Gravel	-	7.42	11-20-63	C	7½	Irr	Yield 240 gpm, dd 2.5 ft; L.
2B1	Victor Thomason	37	Dr	6	115	-	-	-	20	8-10-65	C	1	D	
2D1	Jack Kugan	38	Dr	6	23	-	-	-	22.5	8-10-65	J	-	D	
2D2	Ivar Ford	40	Dn	1	20.5	-	-	-	13.8	8-10-65	C	¼	D	

2D3	Ivar Ford	40	Dn	2.5	24	-	-	-	-	-	C	¼	D	
2D4	S. Smith	43	Dg	30	25.8	-	-	-	16.5	8-10-65	J	1	D	
2F1	Glen	20	Dr	8	50	-	Gravel	9	12.8	9- -65	C	10	Irr	Yield 270 gpm, dd 3.2 ft.
2F2	Glen	20	Dn	1.25	34	-	-	-	-	-	-	-	D	
2G1	A. H. Jaaska	22	Dg,Dn	-	36	-	-	-	20	9- -65	C	1	D	
2G2	B. Goers	20	Dg,Dr	4	50	-	-	-	20	9- -65	-	-	D	
2H1	Yorke	20	Dr	8	34	-	-	-	8	9- -65	-	-	D, Irr	
2L1	Glen	25	Dg,Dr	2	32	-	-	-	-	9- -65	-	-	D, S	
3A1	W. M. Gunter	65	Dg	-	16	-	-	-	Dry	8-10-65	-	-	D	
3C1	Burt Smith	50	Dg	36	10-13	-	-	-	3	8-10-65	C	¼	D	
3D1	Zillyette	65	Dg	36	12.1	-	-	-	6.6	8-11-65	C	½	D	
3G1	Vaughan	20	Dr	6	68.5	-	-	-	10.6	9- -65	P	-	Irr	
3G2	Vaughan	20	Dg	36	14.5	-	-	-	11.6	9- -65	-	-	D	
3L1	Highways	35½	Dr	-	11	-	Silty gravel	-	8.5	-	-	-	-	Test well; L.
3M1	Highways	34	Dr	-	10	-	Silty gravel	-	5.0	-	-	-	-	Test well; L.
3Q1	Troy Yest	25	Dr	8	48	-	-	-	26	8-11-65	C	3/4	D	
4C1	R. Davidson	62	Dr	4	52	-	-	-	15	8-11-65	-	½	D, S	
4D1	Southern	75	Dr	4	65	-	-	-	14	8-11-65	-	½	D	
4F1	Ellison, Jr.	42	Dr	6	67	-	-	-	12	8-11-65	J	-	D	
4H1	Marv Chadwick	35	Dr	6	72	-	-	-	9.4	8-11-65	-	-	D	

Table 3.--Records of wells--Continued

Well No.	Owner or tenant	Well					Water-bearing zone(s)		Water level		Pump		Use of water	Remarks
		Alt. (feet)	Type	Diam. (inches)	Depth (feet)	Casing depth (feet)	Material	Depth interval (feet)	Below land surface (feet)	Date	Type	H.P.		
T. 17 N., R. 7 W. (continued)														
4J1	Highways	32½	Dr	-	9.3	-	-	-	-	-	-	-	-	Test well; L.
4J2	Highways	34½	Dr	-	13	-	Gravel	-	2.5	-	-	-	-	Test well; L.
4M1	Ted Bakker	35	Dr	6	47	47	Gravel	-	22	2-9-65	-	-	-	Yield 15 gpm, dd 5 ft; L.
4N1	Highways	16	Dr	-	23.5	-	-	-	Flowing	-	-	-	-	Test well; L.
4N2	Highways	23	Dr	-	4.5	-	Gravel	-	1.5	-	-	-	-	Test well; L.
4N3	Highways	24	Dr	-	3.0	-	Gravel	-	0.7	-	-	-	-	Test well; L.
4N4	Ellis Newcomb	10	Dg	54	21	-	-	-	3.0	1- -65	C	1	D	L.
4P1	Highways	17	Dr	-	15	-	-	-	-	-	-	-	-	Test well; L.
4P2	Highways	25	Dr	-	4.2	-	-	-	1.7	-	-	-	-	Test well; L.
4Q1	Highways	20	Dr	-	24.5	-	-	-	-	-	-	-	-	Test well; L.
4Q2	Highways	29	Dr	-	4.6	-	-	-	-	-	-	-	-	Test well; L.
5H1	C. H. Lund	75	Dr	9	153	-	-	-	-	-	-	1	D	
5J1	G. Waters	70	Dn	1.25	35	-	-	-	-	-	J	½	D, S	
5J2	E. Alstrom	60	Dr	-	52	-	-	-	-	-	C	½	D	
5R1	Highways	17	Dr	-	5	-	-	-	2	-	-	-	-	Test well; L.

7F1	Highways	11	Dr	-	32	-	-	-	1.5	-	-	-	-	Test well; L.
7G1	Highways	10	Dr	-	36	-	-	-	-	-	-	-	-	Test well; L.
7G2	Highways	6	Dr	-	14	-	-	-	-	-	-	-	-	Test well; L.
7H1	Highways	8	Dr	-	19	-	-	-	-	-	-	-	-	Test well; L.
7H2	Highways	5	Dr	-	59.6	-	-	-	-	-	-	-	-	Test well; L.
7M1	Highways	12	Dr	-	29.5	-	-	-	0.5	-	-	-	-	Test well; L.
7M2	Highways	11	Dr	-	29	-	-	-	0.5	-	-	-	-	Test well; L.
7P1	Weyerhaeuser	10	Dr	8	209	-	-	-	-	-	-	-	-	Capped; L.
8AH1	Albert Vetter	10	Dr	10	37	37	Gravel	-	7	4-30-55	-	15	Irr	Yield 400 gpm, dd 10 ft; Cert 3261; Irr 40 ac; L.
8B1	Highways	7½	Dr	-	3.5	-	-	-	-	-	-	-	-	Test well; L.
8B2	Highways	7	Dr	-	5	-	-	-	-	-	-	-	-	Test well; L.
8B3	Highways	7½	Dr	-	6.5	-	-	-	-	-	-	-	-	Test well; L.
8B4	Highways	9	Dr	-	8.5	-	-	-	-	-	-	-	-	Test well; L.
8C1	Highways	11	Dr	-	4.5	-	-	-	-	-	-	-	-	Test well; L.
8C2	Highways	9	Dr	-	5.7	-	-	-	-	-	-	-	-	Test well; L.
8C3	Highways	8½	Dr	-	5.5	-	-	-	-	-	-	-	-	Test well; L.
8C4	Highways	9½	Dr	-	45	-	-	-	2.5	-	-	-	-	Test well; L.
8D1	Highways	8½	Dr	-	15	-	-	-	0.5	-	-	-	-	Test well; L.
8E1	Highways	5	Dr	-	24.5	-	-	-	-	-	-	-	-	Test well; L.
8Q1	Weyerhaeuser	10	Dr	8	185.5	-	-	-	14	-	-	-	Ind	Test well; L.

Table 3.--Records of wells--Continued

Well No.	Owner or tenant	Well					Water-bearing zone(s)		Water level		Pump		Use of water	Remarks
		Alt. (feet)	Type	Diam. (inches)	Depth (feet)	Casing depth (feet)	Material	Depth interval (feet)	Below land surface (feet)	Date	Type	H.P.		
T. 17 N., R. 7 W. (continued)														
9D1	Ellis Newcomb	10	Dr	8	46	39	Sand, gravel	-	8.5	4-4-60	-	10	Irr	Yield 150 gpm, dd 15 ft; Cert 5312; Irr 37 ac; L.
9N1	Weyerhaeuser	10	Dr	8	163.5	-	-	-	12.5	2-11-65	-	-	Ind	Test well; L.
9N2	Weyerhaeuser	10	Dr	16	102	-	-	-	10	2-10-65	-	-	Ind	Test well; L.
9N3	Al Lukin	12	Dg	-	26	-	-	-	18	7- -65	-	-	D	
9P1	Weyerhaeuser	10	Dr	8	174	-	-	-	-	-	-	-	Ind	Test well; L.
10G1	John Murphy	10	Dr	10	37.5	-	-	-	5.7	7- -65	-	-	S	Yield 500 gpm; L.
10P1	Alfred Witner	8	Dr	10	42	-	-	-	14.7	7- -65	-	-	Irr	L.
11A1	A. H. Jaaska	10	Dr	12	40	-	-	-	10	7- -65	-	-	Irr	
11A2	A. H. Jaaska	10	Dr	8	50-60	-	-	-	10	7- -65	-	-	Irr	
11K1	G. W. Stretter	20	Dr	10	51	-	Gravel	-	9	4- -53	-	-	Irr	Yield 220 gpm, dd 27.5 ft; Cert 2710; Irr 20 ac; Cp, L.
11K2	Don Foote	20	Dr	12	51.6	-	-	-	12.5	10- -65	C	3/4	D	
11L1	Val Meyer	15	Dr	10	40	-	Gravel	-	5	8-31-61	C	5	Irr	Yield 150 gpm, dd 2 ft; Cert 4419; Irr 30 ac; L.
11L2	Bob Meyer	10	Dr	6	24.9	-	-	-	13.6	10- -65	C	3/4	D	

12AB1	Ralph Willis	25	Dr	10	46.5	-	Gravel	-	4	7- -60	C	15	Irr	Yield 250 gpm, dd 18 ft; Cert 4426; Irr 80 ac; L.
12F1	Dale Willis	15	Dr	10	31	31	Gravel	-	2	2-29-52	-	-	Irr	Yield 500 gpm, dd 2 ft; Cert 1387; Irr 40 ac; L.
12H1	C. C. Willis	15	Dr	10	27	27	Gravel	-	6	11-20-52	-	-	Irr	Yield 200 gpm, dd 18 ft; Cert 2262; Irr 50 ac; L.
12P1	Willis Brothers	20	Dr	-	39	38	Sand, gravel	-	8	8-22-65	C	15	Irr	Yield 300 gpm, dd 3 ft; Cert 5294; Irr 148 ac; L.
13A1	Burlingtine	135	Dr	4	183	-	-	-	-	-	S	½	D	
17C1	Robert White	85	Dg	36	17.5	-	-	-	13.6	7- -65	C	3/4	D	
17G1	Robertson	85	Dg	24	12	12	-	-	3	7- -65	-	-	D	
							T. 17 N., R. 8 W.							
2H1	Whitney	4	Dg,Dn	1.25	18	-	-	-	16	8-12-65	C	-	D	
2P1	Frye	8	Dg	36	4	-	-	-	0.5	8-13-65	-	½	D	
8E1	Grays Harbor Water Dist. #2	170	Dr	12	35	-	Clayey gravel	-	-	-	-	-	-	Yield 15 gpm; test well; L.
8G1	Jack Reynvaan and Ed Dahlstrom	190	Dr	6	152	110	Gravel	15	95	2-14-59	T	7½	PS	Yield 200 gpm, dd 21 ft; L.
8G2	Grays Harbor Water Dist. #2	190	Dr	8	48	48	Gravel	-	25	5-2-58	T	15	PS	Yield 210 gpm, dd 12 ft; L.
8H1	Oscar Martinson	160	Dr	6	122	-	Sand, gravel	-	19.8	9-7-65	-	-	D	Yield 6 gpm; L.
8H2	Grays Harbor Water Dist. #2	170	Dr	-	49	-	-	-	-	-	-	-	-	Test well, very little water; L.

Table 3.--Records of wells--Continued

Well No.	Owner or tenant	Well					Water-bearing zone(s)		Water level		Pump		Use of water	Remarks
		Alt. (feet)	Type	Diam. (inches)	Depth (feet)	Casing depth (feet)	Material	Depth interval (feet)	Below land surface (feet)	Date	Type	H.P.		
T. 17 N., R. 8 W. (continued)														
8J1	Grays Harbor Water Dist. #2	95	Dr	10	55	-	Sand, gravel	7	-	-	-	-	-	Bailed 35 gpm; test well; L.
8J2	Grays Harbor Water Dist. #2	95	Dr	12	48	-	-	-	35	9-7-65	-	-	-	L.
8J3	Grays Harbor Water Dist. #2	95	Dr	6	50	-	-	-	24.7	9-7-65	-	-	-	Yield 200 gpm; L.
8K1	J. H. Sandstrom	95	Dr	6	60	-	-	-	19	9-7-65	-	-	D	L.
8M1	Grays Harbor Water Dist. #2	100	Dr	12	62	-	Fine sand	1	-	-	-	-	-	Test well, little water; L.
8Q1	Grays Harbor Water Dist. #2	80	Dr	12	24	-	Gravel	1	-	-	-	-	-	Test well, little water; L.
9F1	Glen Cooper	180	Dg	96	8	-	-	-	-	-	-	-	-	
9F2	O. T. Taylor	165	Dr	6	129	-	Sand, gravel	-	100	9-7-65	-	-	-	Yield 3 gpm; L.
9F3	Grays Harbor Water Dist. #2	95	Dr	-	54	-	-	-	-	-	-	-	-	Test well.
9L1	Grays Harbor Water Dist. #2	85	Dr	12	59	-	-	-	-	-	-	-	-	Test well; L.
9L2	Grays Harbor Water Dist. #2	85	Dr	12	44	-	-	-	-	-	-	-	-	Test well; L.

9L3	Joe Louise	85	Dr	-	69	-	Sand, gravel	-	39.9	9-7-65	-	-	D	Yield 6 gpm.
9L4	Grays Harbor Water Dist. #2	85	Dr	-	74	-	-	-	10	9-7-65	-	-	-	Test well; L.
9M1	Grays Harbor Water Dist. #2	85	Dr	-	49	-	Sand, gravel	17.5	10	9-7-65	-	-	-	Test well; L.
9M2	Grays Harbor Water Dist. #2	85	Dr	-	49	-	Gravel, clay	-	-	-	-	-	-	Test well, very little water; L.
10H1	State of Wash.	100	Dr	6	86	6	-	-	22	6- -63	C	1¼	D, FP	
10H2	Monte View Estates	100	Dr	8	68.2	-	-	-	60.8	9-7-65	-	-	D	
10R1	Walter Krueyer, Jr.	85	Dr	6	55	-	-	-	-	-	C	-	D, S	
10R2	Walter Krueyer, Jr.	85	Dg	96	32	-	-	-	28	9-7-65	-	-	D, S	
11A1	Edward Valentine	25	Dr	10	25	25	Gravel	-	8	4-16-53	-	-	Irr	Yield 300 gpm, dd 2 ft; Cert 1522; Irr 40 ac; L.
11C1	Mrs. Baltimore	20	Dg	-	20.2	-	-	-	12.6	8-13-65	C	1/3	D	
11D1	Arlo Beck	100	Dr	6	92	-	-	-	-	-	-	-	D	
11G1	F. R. Erickson	20	Dg	60	19	-	Gravel	-	17	9-7-65	-	½	D	
11G2	C. W. Cody	25	Dr	6	19.2	-	-	-	2.6	9-7-65	-	-	D	
11H1	C. Heikkinen	15	Dg	24	12	-	Gravel	-	10	9-7-65	P	-	D	
11H2	C. Heikkinen	15	Dg	24	22	-	-	-	-	-	-	-	D	Goes dry when pumped.
11K1	A. Brandvik	25	Dg	36	32	32	-	-	29.5	7- -65	-	-	D	
11K2	A. Iverson	25	Dg	48	22	-	-	-	16.4	7- -65	-	-	D	
11P1	Messegee	15	Dr	6	80	-	-	-	-	-	-	-	D	

Table 3.--Records of wells--Continued

Well No.	Owner or tenant	Well					Water-bearing zone(s)		Water level		Pump		Use of water	Remarks
		Alt. (feet)	Type	Diam. (inches)	Depth (feet)	Casing depth (feet)	Material	Depth interval (feet)	Below land surface (feet)	Date	Type	H.P.		
T. 17 N., R. 8 W. (continued)														
11Q1	Doolittle	90	Dr	6	59	-	-	-	-	-	-	-	D, S	
12F1	Highways	28	Dr	-	3.5	-	-	-	-	-	-	-	-	Test hole; L.
12F2	Highways	30	Dr	-	5.5	-	-	-	-	-	-	-	-	Test hole; L.
12G1	Highways	45	Dr	-	20	-	-	-	-	-	-	-	-	Test hole; L.
12G2	Highways	60	Dr	-	9.5	-	-	-	-	-	-	-	-	Test hole; L.
12G3	Highways	41½	Dr	-	14.0	-	-	-	10	-	-	-	-	Test hole; L.
12G4	Highways	40	Dr	-	6.2	-	-	-	-	-	-	-	-	Test hole; L.
12H1	Highways	11	Dr	-	28	-	-	-	-	-	-	-	-	Test hole; L.
12H2	Highways	10½	Dr	-	49.6	-	-	-	0.3	-	-	-	-	Test hole; L.
12H3	Highways	11	Dr	-	48.5	-	-	-	0.5	-	-	-	-	Test hole; L.
12H4	Highways	11	Dr	-	36	-	-	-	2.0	-	-	-	-	Test hole; L.
12L1	City of Montesano	10	Dr	10	150	136.5	Sand, cobbles	11	12.35	5-24-65	-	-	PS	Yield 410 gpm, dd 8.6 ft; permit for 960 acre-feet annually; L.
12Q1	C. F. Brittain	12	Dr	8	75	75	Sand, gravel	6	16	7-17-48	-	-	Irr	Yield 120 gpm, dd 11 ft; Cert 995; Irr 12 ac; L.

13C1	R. H. Arland	12	Dg	36	18	18	-	-	Flowing	1-1-65	-	-	D	
13C2	R. H. Arland	12	Dr	6	22	-	-	-	11	7-17-65	S	-	S	
13G1	R. H. Arland	12	Dr	12	60	60	-	-	11	7-17-65	C	20	Irr	Yield 475 gpm.
13L1	Oswald	12	Dn	1.25	48	48	-	-	Flowing	1-1-65	-	½	D	L.
13L2	Oswald	12	Dn	1.25	48	48	Gravel	-	Flowing	1-1-65	-	½	D	L.
13P1	Weyerhaeuser	8	Dr	8	188.5	-	Sand, gravel	42	13.2	11- -64	-	-	Ind	L.
14B1	George Fritts	8	Dr	6	70	-	-	-	-	-	C	¼	D	
14K1	Weyerhaeuser	8	Dr	8	180.5	-	Sand, gravel	38	3.8	12-10-64	-	-	Ind	L.
15D1	Grays Harbor Water Dist. #2	8	Dr	10	100	100	Sand, gravel	5	10.93	9-7-65	T	60	PS	L.
16B1	Grays Harbor Water Dist. #2	8	Dr	8	43	-	Sand, gravel	-	7	9-7-65	-	-	-	Casing pulled; L.
18C1	Country Club Golf Course	35	Dr	8	22	-	-	-	14.8	9-7-65	C	-	Irr	
24F1	Hampelton	45	Dr	8	50	-	-	-	15	9-7-65	J	-	D	

T. 17 N., R. 10 W.

5J1	Paul Raybe	185	Dr	6	194	194	-	-	-	-	-	-	D	L.
5L1	Don Skolroad	190	Dr	6	185	185	-	-	-	-	-	-	D	L.
5L2	James Damron	140	Dr	6	132	132	-	-	-	-	-	-	D	L.
5N1	Jack Reynvoan	145	Dr	6	200	200	-	-	-	-	-	-	D	L.
5N2	Richard Sterling	80	Dr	6	173	173	-	-	-	-	-	-	D	L.

Table 3.--Records of wells--Continued

Well No.	Owner or tenant	Well					Water-bearing zone(s)		Water level		Pump		Use of water	Remarks
		Alt. (feet)	Type	Diam. (inches)	Depth (feet)	Casing depth (feet)	Material	Depth interval (feet)	Below land surface (feet)	Date	Type	H.P.		
T. 17 N., R. 10 W. (continued)														
5P1	Jack Boursaw	75	Dr	6	94	82.5	-	-	-	-	-	-	D	L.
6A1	Jack Hartough	25	Dr	6	79	79	"Pea gravel"	3	-	-	-	-	D	Yield 26 gpm; L.
6A2	Stan Johanson	45	Dr	6	94	94	"Pea gravel"	3	-	-	-	-	D	L.
11L1	Al Shnell	fill	Dr	6	137	137	Coarse sand and "pea gravel"	-	-	-	-	-	Ind	Yield 70 gpm.
T. 17 N., R. 12 W.														
3R1	Grays Harbor Water Dist. #3		Dr	10	512	492	Coarse gravel and sand	10	12	10-1-65	T	30	PS	Yield 942 gpm, dd 88 ft; L.
T. 18 N., R. 6 W.														
1H1	Chandler	210	Dg	-	-	-	Gravel	-	-	-	C	½	D	Spring
1J1	Unknown	210	Dg	24	4	4	-	-	Flowing	11-18-65	-	-	D	
6F1	B. Williams	28	Dn	1.25	40	40	-	-	20	8-3-65	-	-	D	
6G1	R. Painter	28	Dr	6	40	-	-	-	20	8-3-65	-	½	D, S	
6N1	Schmitz	85	Dn	1.25	12	12	-	-	10	8-9-65	P	-	D, S, Irr	

6N2	Schmitz, Jr.	85	Dn	1.25	12	10	-	-	-	-	-	-	D, S, Irr	
12R1	McMillan	180	Dr	6	40	-	-	-	11.4	11-18-65	C	½	D	
12R2	Haire	180	Dr	6	-	-	-	-	-	-	-	-	D	
16N1	C. Clark	80	Dr	4	17.4	-	-	-	8.4	7-29-65	C	1	D	
15M1	C. Clark	140	Dr	6	20	-	-	-	Flowing	7-29-65	C	1	D, S, Irr	
16M2	C. Clark	150	Dr	8	29.4	-	-	-	21.1	7-29-65	C	¼	Irr	
24R1	P. Williamson	82	Dr	-	90+	-	-	-	15	11-18-65	C	1	D	
26C1	C. Boley	360	Dg	36	21.6	-	-	-	18	7-28-65	-	-	D, S	
26K1	Ricarte	290	Dg	36	8.5	-	-	-	3	7-28-65	J	½	D	
26L1	McFarland	280	Dr	6	100	-	-	-	-	-	-	½	D	
26M1	J. Bosler	285	Dg	60	32	-	-	-	20	7-28-65	J	½	D	
27P1	Town of Elma	80	Dr	20	100	98	Sand, gravel	-	41	2-24-61	T	60	PS	Yield 620 gpm, dd 27 ft; 560 acre-feet annually; L.
28F1	W. Meister	250	Dg	48	25.7	-	-	-	10.2	7-29-65	-	-	D	
28P1	L. Simon	50	Dg	36	30	-	-	-	24	-	-	2	D	Cert 3554; Irr 6 ac.
28Q1	Birdwell	60	Dr	6	68.4	-	-	-	30.1	7-29-65	J	3/4	D	
29F1	Gano	60	Dn	1.25	62	-	-	-	2	8-2-65	-	-	D	
29G1	J. Troyer	60	Dn	1.25	69.2	-	-	-	57	5- -65	J	½	D	
29J1	B. Smith	80	Dn	2	60	-	-	-	-	-	-	½	D, Irr	

Table 3.--Records of wells--Continued

Well No.	Owner or tenant	Well					Water-bearing zone(s)		Water level		Pump		Use of water	Remarks
		Alt. (feet)	Type	Diam. (inches)	Depth (feet)	Casing depth (feet)	Material	Depth interval (feet)	Below land surface (feet)	Date	Type	H.P.		
T. 18 N., R. 6 W. (continued)														
29K1	C. Mitchell	60	Dn	2	62	-	-	-	18	7-18-65	-	½	D	
29L1	Bests	60	Dr	8	208	-	-	-	-	-	J	3/4	D, Irr	
29L2	Unknown	60	Dn	2	60	-	-	-	-	-	-	-	D	
30G1	D. Twedt	60	Dr	8	75.2	-	-	-	10.2	8-2-65	J	½	D	
30J1	Unknown	62	Dg	48	-	-	-	-	-	-	-	½	D, S	
30L1	R. Bindreiff	60	Dr	8	57	-	-	-	15	8-2-65	-	1	D, S	
30P1	G. Berry	55	Dr	6	90	-	-	-	8	5- -64	-	1	D	
31A1	D. Doherty	38	Dr	10	56	56	-	-	13	2-8-46	-	-	-	Yield 200 gpm, dd 11 ft; Cert 274; Irr 30 ac; L.
31C1	G. Berry	45	Dr	6	60	-	-	-	40	5- -64	C	5	Irr	
31F1	J. Nachall	42	Dr	10	60	-	-	-	20	8-3-65	C	3	Irr	
31F2	E. Hoskins	42	Dr	8	55	-	-	-	-	-	-	-	Irr	Yield 60 gpm; Cert 1598; Irr 6 ac and fire control.
31F3	Co-op	42	Dn	1.25	23	23	-	-	15	7- -65	J	1/3	D	
31G1	J. Metcalfe	40	Dn	1.25	25	25	-	-	-	-	J	½	D	
31G2	J. Metcalfe	40	Dr	12	51.6	-	-	-	13.6	7- -65	C	7½	Irr	

31G3	P. Rasaman	40	Dr	6	42	-	-	-	15	8-3-65	J	½	D	
31G4	Comfort & Ortquist	40	Dr	12	48	48	Gravel	-	16	1-14-48	-	-	Irr	Yield 400 gpm, dd 18 ft; L.
31H1	F. Christensen	35	Dr	8	98	96	Sand, gravel	-	12	6-4-55	-	-	-	Cert 2332; Irr 20 ac.
31L1	F. Rasaman	22	Dn	1.25	22	-	-	-	15	7- -65	J	½	D	
32A1	Pomrenk	30	Dg	36	22	-	-	-	Flowing 15	2- -65 7- -65	P	¼	D, Irr	
32C1	McDonnald	41	Dr	6	66.2	18.6	-	-	48	8-2-65	-	-	D, S, Irr	
32C2	Luhn	42	Dr	10	34.4	-	-	-	18.3	8-2-65	-	-	D, Irr	
32C3	F. Mooney	41	Dr	8	91.8	-	-	-	4.2	8-2-65	J	-	D, Irr	
32C4	J. Fields	31	Dn	2	20	20	-	-	16	7- -65	J	½	D, Irr	
32C5	R. Livingston	30	Dg	36	22.2	-	-	-	16.2	8-2-65	-	3	Irr	
32E1	J. Martin	38	Dr	6	100	100	-	-	13.5	1947	-	-	Irr	Yield 100 gpm, dd 25 ft; Cert 169; Irr 15 ac, domestic supply and stock water; L.
32F1	Mouncer Bros.	30	Dr	6	39	-	-	-	10	8-3-65	-	½	D, S, Irr	Four homes on system.
32F2	Mouncer Bros.	22	Dr	8	30	-	Sand, gravel	-	6	5-27-57	C	10	Irr	Yield 230 gpm, dd 14 ft; Cert 2923; Irr 40 ac; L.
32J1	C. Metzger	40	Dr	8	30	30	Sand, gravel	-	4	12-7-50	-	-	Irr	Yield 100 gpm, dd 1 ft; Cert 1408; Irr 20 ac; L.
33B1	S. Harrah	60	Dr	6	65	-	-	-	-	-	J	½	D, S, Irr	

Table 3.--Records of wells--Continued

Well No.	Owner or tenant	Well					Water-bearing zone(s)		Water level		Pump		Use of water	Remarks
		Alt. (feet)	Type	Diam. (inches)	Depth (feet)	Casing depth (feet)	Material	Depth interval (feet)	Below land surface (feet)	Date	Type	H.P.		
T. 18 N., R. 6 W. (continued)														
33N1	D. Mustard	22	Dr	6	29	29	Gravel	-	14	7-19-47	-	-	Irr	Yield 50 gpm, dd 0 ft; L.
34K1	J. Callesen	38	Dr	8	30	-	Gravel	-	10	10- -45	-	-	Irr	Yield 200 gpm, dd 5 ft; Cert 13; Irr 10 ac; L.
34P1	J. Callesen & Sons	30	Dr	10	56	56	Sand, gravel	-	13	5-17-51	-	-	Irr	Yield 300 gpm, dd 7 ft; Cert 917; Irr 37 ac; L.
36D1	J. Moore	80	Dr	6	37	-	-	-	17	7-28-65	J	3/4	D, Irr	
36L1	K. Martin	70	Dr	6	80	59	Sand	3	32	7-28-65	S	½	D	Bailed 30 gpm; L.
36L2	H. VanOrman	65	Dr	6	50	-	Gravel	-	-	-	-	-	D	Yield 20 gpm; L.
T. 18 N., R. 7 W.														
1A1	Brunslick	160	Dr	6	159	-	"Shale"	-	20	8-9-65	J	1	D	Bailed 30 gpm; L.
1R1	Butterfield	120	Dr	6	43	-	-	-	20	8-9-65	-	-	D, S	
11J1	C. Schafer	135	Dr	6	60-90	-	-	-	-	-	J	-	D	
12A1	G. Studer	80	Dg	24	13	13	-	-	11	8-9-65	-	-	D, S	
12F1	G. Studer	80	Dg	36	9.6	9.6	-	-	8.9	8-9-65	-	1/3	S	
14R1	C. Borden	70	Dg	3.5	17	-	-	-	14	8-3-65	-	1/3	D, S	

23A1	C. Borden	70	Dg	12	16.5	16.5	-	-	13.5	8-3-65	-	-	D, S	
23B1	C. Snidesang	70	Dr	8	125	-	-	-	25	8-3-65	J	-	D	
25F1	W. Hiles	120	Dn	6	185	-	-	-	-	-	S	-	D	Serves 2 houses.
25G1	Brandnich	150	Dr	6	107	-	-	-	30	8-3-65	S	-	D, S, Irr	Serves 2 houses.
25P1	B. Skok	82	Dn	2	35	35	-	-	10	8-9-65	J	½	D	
25Q1	Conover	120	Dr	6	150	-	-	-	100	8-3-65	S	-	D	
26G1	E. Gleason	95	Dr	12	40	-	-	-	10	8-9-65	C	Gas	Irr	
34N1	G. Klinger	80	Dr	6	300	-	-	-	58	8-10-65	J	2	Irr	
34N2	R. Dierrick	80	Dr	6	72	72	Gravel	-	15	11-17-65	J	½	D	Bailed 15 gpm; L.
34R1	D. Galyean	85	Dr	6	62	-	-	-	-	-	J	1/3	D	
34R2	Frafjord	80	Dr	6	68	-	-	-	-	-	J	½	D	
35J1	T. Glesson	85	Dr	6	33	-	-	-	10	8- -65	S	-	D	
35L1	E. Richards	90	Dr	4	65	-	-	-	55	8-10-65	J	½	D	
35M1	A. Richards	90	Dr	6	35	-	-	-	-	-	J	½	D	
35P1	B. Castleton	85	Dg	30	28	-	-	-	25	8-10-65	J	½	D	
35R1	Baker's Food Market	82	Dr	6	77.8	-	-	-	18.5	9- -65	-	3/4	D	
36G1	M. McGraw	45	Dr	8	39	-	Sand, gravel	-	14.4	6-11-57	C	10	Irr	Yield 200 gpm, dd 1.7 ft; Cert 3124; Irr 40 ac; L.
36K1	G. Whittaker	40	Dr	6	34	-	Sand, gravel	-	-	-	-	-	D	Bailed 30 gpm; L.

Table 3.--Records of wells--Continued

Well No.	Owner or tenant	Well					Water-bearing zone(s)		Water level		Pump		Use of water	Remarks
		Alt. (feet)	Type	Diam. (inches)	Depth (feet)	Casing depth (feet)	Material	Depth interval (feet)	Below land surface (feet)	Date	Type	H.P.		
T. 18 N., R. 7 W. (continued)														
36L1	D. Hall	37	Dr	8	38	38	Gravel	21	10	2-27-53	-	-	Irr	Yield 50 gpm, dd 4 ft; Cert 1837; Irr 4 ac; L.
36N1	H. Wharford	80	Dg	-	19.6	-	-	-	18.8	8-10-65	J	1/3	D	
36Q1	E. Mock	35	Dn	10	42	-	Gravel	-	7	4- -44	C	7½	D, Irr	Yield 150 gpm, dd 7 ft; Cert 125; Irr 20 ac; L.
T. 18 N., R. 8 W.														
5A1	Wincewicz	120	Dr	8	24	-	-	-	8	8-11-65	C	7½	S, Irr	
5A2	Wincewicz	80	Dr	6	36	-	-	-	8	8-11-65	-	3/4	D, S	
16D1	A. Rasmussen	85	Dn	1.25	60	-	-	-	-	-	-	-	D	
16F1	A. Rasmussen	60	Dg	12	14	-	-	-	11	8-11-65	-	1	D, Irr	
16F2	A. Rasmussen	120	Dr	6	79.6	-	-	-	66.2	8-11-65	-	-	Irr	
16R1	G. Kron	60	Dr	6	37	-	-	-	8	8-11-65	-	½	D, S, Irr	
21C1	V. Valentine	70	Dr	6	20	-	-	-	8	8-11-65	-	½	S, Irr	
21F1	E. Firrier	120	Dn	1.25	-	-	-	-	-	-	-	½	D	
21P1	R. Taylor	70	Dr	8	26	26	Gravel	-	10	5- -56	C	5	Irr, D	Yield 150 gpm, dd 2 ft; Cert 2858; Irr 15 ac; L.

21P2	L. Hughes	70	Dr	8	23.3	-	-	-	3.3	8-12-65	C	10	Irr, D, S	
23G1	D. Rice	70	Dg	-	18	-	-	-	-	-	-	-	Irr, D, S	
28J1	Cody	70	Dr	6	26.6	-	-	-	8.3	8-12-65	-	-	-	
29A1	C. Carlson	80	Dg	-	12	-	-	-	8	8-13-65	J	¼	D	
33A1	H. Hughes	45	Dg	6	16.5	16.5	Gravel	-	-	-	-	-	-	L.
33G1	T. Bialkoski	80	Dg	42	13	-	-	-	1.5	8-13-65	J	½	D	
34A1	C. Valentine	40	Dr	-	23	-	-	-	17.4	8-13-65	T	10	D, Irr	
34C1	D. Schmidt	42	Dg	-	18	-	-	-	-	-	-	-	D	
35D1	A. Schmidt	30	Dg	36	17	-	-	-	0.2	8-12-65	J	1	D,S	
35F1	F. Whearton	65	Dg	60	9	-	-	-	-	-	-	-	D	
35F2	H. Brunfield	40	Dr	6	100	-	-	-	-	-	J	½	D	
35P1	R. Whannell	38	Dr	8	32.5	-	-	-	14.2	8-12-65	J	1/3	D, Irr	Reported by owner to be 80 ft deep.
35Q1	R. Wilkie	38	Dr	8	34	34	Gravel	-	12	8-19-48	-	-	Irr	Yield 150 gpm, dd 1 ft; Cert 357; Irr 20 ac; L.
							T. 18 N., R. 9 W.							
5H1	Robinson	42	Dr	6	32	-	-	-	22.2	9-28-65	J	½	D	Poor water; L.
8F1	D. Lashance	40	Dg	65	13.2	-	Gravel	-	10.8	9-28-65	J	½	D	L.
15E1	Johnson	30	Dg	48	20.4	-	-	-	10.1	9-28-65	J	¼	D	Poor water.

Table 3.--Records of wells--Continued

Well No.	Owner or tenant	Well					Water-bearing zone(s)		Water level		Pump		Use of water	Remarks
		Alt. (feet)	Type	Diam. (inches)	Depth (feet)	Casing depth (feet)	Material	Depth interval (feet)	Below land surface (feet)	Date	Type	H.P.		
T. 18 N., R. 10 W.														
8Q1	M. Flory	130	Dr	6	30	-	-	-	-	-	J	½	D	
8Q2	M. Flory	130	Dg	24.7	9	-	-	-	-	-	J	½	Irr	
13J1	Unknown	20	Dg	48	13.5	13.5	-	-	11	8-29-65	-	-	-	
13J2	Steed	20	Dg	-	5.5	-	-	-	3.4	8-29-65	-	-	D	
17D1	K. Walker	160	Dg	24	-	-	-	-	-	-	J	½	D	
18D1	Williamson	180	Dg	36	15	15	Gravel	-	4	8-29-65	J	1	D	L.
18H1	R. Warne	160	Dr	6	50	-	Sand, gravel	-	-	-	-	-	-	Yield 18 gpm
18H2	Pyburn	160	Dg	24	20	-	"Pea gravel"	-	6	8-29-65	J	½	D	L.
24B1	Unknown	40	Dg	-	23	-	-	-	21	8-9-65	J	½	D	
24G1	R. Embree	38	Dg	10	22	-	Gravel	-	20	8-29-65	P	½	D	L.
24K1	G. Chilman	35	Dr	6	22	-	-	-	-	-	J	½	D, Irr	Yield 17 gpm, dd 0 ft.
25G1	V. Pellerro	20	Dg	24	8.2	-	Clay	-	3.8	8-9-65	J	½	D	L.
T. 18 N., R. 11 W.														
4G1	B. Daieen	18	Dr	6	118	-	Gravel	-	13	11-18-65	J	2	D	Yield 30 gpm; L.
12P1	R. Seward	60	Dr	6	85	-	Gravel	-	Flowing	11-18-65	-	-	D, S	Yield 60 gpm, dd 20 ft; L.

12P2	R. Seward	60	Dg	24	20	-	Clay	-	-	-	-	-	D, S	No good; L.
13A	A. Cappin	140	Dg	36	30	-	-	-	20.4	11-18-65	-	-	D	
17E1	M. Timmens	20	B	3	20	-	-	-	6.1	8- -65	P	1/3	D	
17E2	Aanderud	20	Dr	4	150	-	-	-	Unknown	-	J	½	D	
17L1	C. Lovelace	10	Dg	120	16	-	Gravel	-	-	-	-	-	Irr	Yield 1,100 gpm; Cert 993; Irr 5 ac; L.
17L2	C. Fredrick	10	-	-	16	-	Sand, gravel	-	-	-	-	-	Irr	Cert 304; frost and sunburn control; L.
17M	Coppin	22	Dr	8	20	-	-	-	8	8- -65	J	½	D	
17P1	T. Stearns	10	Dr	6	62	58	"Mud"	-	4	1-20-61	-	-	Irr	Cert 3894; Irr 4.9 ac; L.
17P2	T. Stearns	10	Dr	6	71	-	Sand, gravel and silt	-	-	-	-	-	Irr	Yield 125 gpm; Cert 3894; Irr 4.9 ac; L.
17P3	T. Stearns	6	Dr	6	60	-	Sand, gravel and silt	-	0.3	6-23-60	-	-	Irr	Yield 125 gpm, dd 16 ft. Cert 3894; Irr 4.9 ac; L.
17P4	T. Stearns	10	Dr	6	70	-	Sand, gravel and silt	-	4	6-20-60	-	-	Irr	Yield 150 gpm, dd 20 ft. Cert 3894; Irr 4.9 ac; L.
17P5	T. Stearns	6	Dr	6	70	-	Sand, gravel and silt	-	0.3	6- -60	-	-	Irr	Yield 125 gpm, dd 26 ft. Cert 3894; Irr 4.9 ac; L.
17P6	R. Krebs	8	Dg	48	48	45	-	-	2	4-20-55	-	-	Irr	Yield 216 gpm, dd 8 ft; Cert 2441; Irr 5 ac; L.
17P7	T. Stearns	10	Dr	6	70	-	Sand, gravel	-	4	1-20-60	-	-	Irr	Yield 75 gpm, dd 15 ft; Cert 3894; Irr 4.9 ac; L.
22H	Unknown	11	Dr	6	93	-	Gravel	-	-	-	-	-	D	Saltwater at 93 ft; L.
26R	Baker	10	Dr	6	86	-	-	-	56	8- -64	J	½	D, S	

Table 3.--Records of wells--Continued

Well No.	Owner or tenant	Well					Water-bearing zone(s)		Water level		Pump		Use of water	Remarks
		Alt. (feet)	Type	Diam. (inches)	Depth (feet)	Casing depth (feet)	Material	Depth interval (feet)	Below land surface (feet)	Date	Type	H.P.		
T. 18 N., R. 12 W.														
3D	H. Haugland	12	Dr	6	135	135	-	-	5	8-4-65	J	1½	PS	
3F	T. Bushnell	12	Dn	1.25	75	75	-	-	5	8-4-65	-	2	PS	
3L1	S. Jacobsen	12	Dr	6	153	-	-	-	Flowing	8-4-65	-	1	PS	
3L2	H. Wells	12	B	3	32	-	-	-	10	7- -65	P	½	-	
3P1	Ocean City Elem. School (S. D. #26)	21	Dr	8	109.4	-	-	-	36.5	8-4-65	-	-	PS	
3P2	W. Anable	12	B	2	380	-	"Blue rock"	-	8	8-5-65	J	1	PS	Back filled to 62 ft.
10C	Nina's	12	Dn	4	60	-	-	-	-	-	-	-	D	
10F	H. Holmes	12	Dr	2	47	-	Blue gravel	-	-	-	J	½	PS	L.
27F1	R. Minard	8	Dr	6	358	358	Gravel	-	Flowing	5-19-58	J	5	PS	Yield 50 gpm, dd 120 ft; Cp.
27F2	R. Minard	8	Dr	-	1120	-	-	-	-	-	-	-	-	L.
34C	Gitche Gumee Motel	8	Dr	6	253	-	Gravel	-	10	8- -65	-	-	-	L.

Table 4.--Drillers' logs of representative wells.

Materials	Thickness (feet)	Depth (feet)
Well 17/6-1J1		
H. A. Bunn. Drilled by Erdman, August, 1950.		
Soil	20	20
Sand	40	60
Gravel	16	76
Casing perforated 60-76 ft.		
Well 17/6-3E1		
O. S. Martin. Drilled by Martin, August, 1952.		
Earth, black	1	1
Gravel, brown	4	5
Sand and gravel, gray	16.5	21.5
Well 17/6-4D1		
Town of Elma. Drilled March 1912.		
Sand and gravel	40	40
Casing perforated 24-40 ft.		
Well 17/6-6G2		
Charles Baney. Drilled by Erdman, April, 1946.		
Soil	14	14
Gravel	26	40
Casing perforated 20-40 ft.		
Well 17/6-6J1		
Will Goeres. Drilled by Erdman, April, 1946.		
Topsoil and clay	15	15
Sand and gravel	40	55
Casing perforated 18-54 ft.		
Well 17/6-8E1		
M. Fuller. Drilled by Taylor, December 1963.		
Sandstone, blue	175	175
Sand, coarse, "pea gravel"		175

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 17/6-11H 1		
Phill Rodinick. Drilled by Williams, July, 1965.		
Dug	0	17
Gravel and clay, cemented	13	30
Shale, blue	1	31
Casing perforated 10-31 ft.		
Well 17/6-12H1		
William Cnossen. Drilled by Frye, May, 1962.		
Gravel, coarse to fine, some sand and silt	40	40
Casing perforated 26-36 ft.		
Well 17/7-1B1		
G. W. Lynn. Drilled by Williams, 1965.		
Topsoil	2	2
Sandy loam	19	21
Gravel and coarse sand	5	26
Well 17/7-1C1		
D. H. Mustard. Drilled by Frye, October, 1962.		
Soil	12	12
Sand and gravel	4	16
Gravel, medium to coarse	22	38
Casing perforated 24-34 ft.		
Well 17/7-1C2		
S. L. Larson. Drilled by Williams.		
Sandy loam	17	17
Clay, blue	4	21
Sandy gravel	22	43
Casing perforated 33-43 ft.		
Well 17/7-1L1		
Fred Bohren. Drilled by Taylor, May, 1951.		
Soil	10	10

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 17/7-1L 1--Continued		
"Hardpan"	13	23
Gravel	8	31
Well 17/7-1H 1		
W. J. Wharton. Drilled by Erdman, June, 1949.		
Clay	5	5
Gravel	30	35
Casing perforated 17-34 ft.		
Well 17/7-1Q 1		
G. C. Collett. Drilled by Taylor, April, 1952.		
Soil	6	6
Clay	20	26
Gravel	6	32
Casing perforated 22-32 ft.		
Well 17/7-1R 1		
G. A. Collette. Drilled by Bedell, July, 1956.		
Soil	10	10
Clay	15	25
Clay and sand, blue	4	29
Clay, sand and gravel	2	31
Sand and gravel	10	41
Casing perforated 34-42 ft.		
Well 17/7-2A3		
H. E. Rosenbach. Drilled by Taylor, August, 1963.		
Silt	20	20
Gravel, washed	13	33
Well 17/7-3L 1		
State Department of Highways. Drilled by Highways, 1964.		
Forest duff	0.5	0.5
Silt, dark brown	1.0	1.5
Gravel, brown, sandy, silty	4.5	6.0
Silt, brown, sandy	1.0	7.0
Silt, gray, sandy	1.0	8.0
Gravel, gray, sandy, silty	3.0	11.0

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 17/7-3M1		
State Department of Highways. Drilled by Highways, 1964.		
Forest duff	0.5	0.5
Silt, dark brown	1.5	2.0
Gravel, brown, sandy, silty	3.5	5.5
Silt, gray, clayey	1.5	7.0
Gravel, gray, sandy, silty	3.0	10.0
Well 17/7-4J1		
State Department of Highways. Drilled by Highways, 1964.		
Forest duff	1.3	1.3
Silty, dark brown, sandy, organic	1.0	2.3
Silt, brown, sandy	2.0	4.3
Gravel, brown, silty, sandy	5.0	9.3
Well 17/7-4J2		
State Department of Highways. Drilled by Highways, 1964.		
Roadway fill	2	2
Gravel, brown, silty, sandy	8	10
Gravel, gray, silty, sandy	3	13
Well 17/7-4M1		
Ted Bakker. Drilled by Russell, February, 1965.		
Dirt, fill	3	3
Soil	3	6
Gravel, cemented	4	10
Clay, gravel, hard	10	20
Well 17/7-4N1		
State Department of Highways. Drilled by Highways, 1964.		
Silt, brown, organic	7.5	7.5
Silt, gray, clayey	0.5	8.0
Silt, brown, organic	5.0	13.0
Sand, green, silty	1.0	14.0
Silt, blue, gray, sandy (siltstone)	9.5	23.5
Well 17/7-4N2		
State Department of Highways. Drilled by Highways, 1964.		
Sod	0.5	0.5
Gravel, brown, silty, sandy	3.0	3.5
Gravel, brown, sandy	1.0	4.5

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 17/7-4N3		
State Department of Highways. Drilled by Highways, 1964.		
Sod	0.5	0.5
Gravel, brown, sandy, silty	2.5	3.0
Well 17/7-4N4		
Ellis Newcomb. Dug by owner.		
Sand and gravel, brown	4	4
Gravel, clayey	13	17
Sandstone, gray	4	21
Well 17/7-4P1		
State Department of Highways. Drilled by Highways, 1964.		
Peat, black	2.0	2.0
Gravel, brown, silty, sandy	4.5	6.5
Silt, brown, sandy	4.5	9.0
Silt, gray, blue, sandy (siltstone)	6.0	15.0
Well 17/7-4P2		
State Department of Highways. Drilled by Highways, 1964.		
Sod	0.25	0.25
Silt, brown, silty, gravelly	1.00	1.25
Sand, brown, silty	0.50	1.75
Sand, brown	3.50	4.25
Sandstone	-	-
Well 17/7-4Q1		
State Department of Highways. Drilled by Highways, 1964.		
Silt, brown	2	2
Clay, brown, silty	3	5
Silt, gray, clayey	5	10
Silt, gray, gravelly	4.5	14.5
Silt, blue, gray, sandy (siltstone)	10	24.5
Well 17/7-4Q2		
State Department of Highways. Drilled by Highways, 1964.		
Forest duff	0.6	0.6
Silt, brown, sandy	1.5	2.1
Gravel, brown, silty, sandy	2.5	4.6

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 17/7-5R 1		
State Department of Highways. Drilled by Highways, 1964.		
Sod	0.5	0.5
Silt, dark brown	1.5	2.0
Sand, brown, silty	1.5	3.5
Silt, brown, sandy	0.5	4.0
Clay, brown and gray, silty	1.0	5.0
Well 17/7-7F 1		
State Department of Highways. Drilled by Highways, 1964.		
Sod	0.5	0.5
Silt, brown	2.5	3.0
Silt, brown, clayey	2.0	5.0
Silt, gray, clayey	3.0	8.0
Silt, gray, sandy	2.0	10.0
Silt, gray, clayey (organic)	5.0	15.0
Clay, gray, silty	3.0	18.0
Silty, gray, sandy	5.0	23.0
Sand, gray	6.0	29.0
Gravel, gray, silty, sandy	3.0	32.0
Well 17/7-7G1		
State Department of Highways. Drilled by Highways, 1964.		
Silt, brown	2	2
Silt, brown, clayey	1	3
Silt, gray, clayey	5	8
Silt, gray, sandy	1	9
Peat, brown, pulpy	5	14
Silt, gray, clayey	1	15
Silt, gray	2	17
Clay, gray, silty	3	20
Silt, gray	6	26
Silt, gray, sandy	3	29
Sand, gray	3	32
Gravel, gray, sandy, silty	4	36
Well 17/7-7G2		
State Department of Highways. Drilled by Highways, 1964.		
Organic material	0.5	0.5
Sand, gray	0.5	1.0
Peat, brown	2.0	3.0
Clay, gray and brown, organic	4.0	7.0
Peat, brown	1.0	8.0
Clay, grayish green, organic, soft	6.0	14.0

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 17/7-7H1		
State Department of Highways. Drilled by Highways, 1964.		
Peat, brown, clayey	5	5
Clay, brown, soft	2	7
Clay, brown, organic	2	9
Peat, brown, clayey, pulpy	2	11
Clay, brown, organic	3	15
Clay, gray	3.9	18.9
Sand, fine	0.1	19
Well 17/7-7H2		
State Department of Highways. Drilled by Highways, 1964.		
Sawdust and debris	7.5	7.5
Clay, gray, brown, organic	11.2	18.7
Clay, green, gray, organic	8.5	27.2
Clay, green, gray, silty	4.6	31.8
Sand, green, fine	27.8	59.6
Well 17/7-7M1		
State Department of Highways. Drilled by Highways, 1964.		
Sod	0.5	0.5
Silt, brown	2.5	3.0
Silt, gray, clayey	5.0	8.0
Silt, gray	4.0	12.0
Clay, gray, silty	6.0	18.0
Silt, gray, sandy	5.0	23.0
Sand, gray, silty	3.5	26.5
Gravel, gray, silty, sandy	3.0	29.5
Well 17/7-7M2		
State Department of Highways. Drilled by Highways, 1964.		
Sod	0.5	0.5
Silt, brown	3.5	4.0
Silt, gray, clayey	4.0	8.0
Clay, gray, silty	5.0	13.0
Silt, gray, sandy	10.0	23.0
Sand, gray	3.0	26.0
Gravel, gray, silty, sandy	3.0	29.0
Well 17/7-7P1		
Weyerhaeuser Timber Company. Drilled by Taylor, December, 1964.		
Silt, brown and gray	12	12
Sand and gravel, brownish gray, fine	18	30

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 17/7-7P1--Continued		
Sand and gravel, greenish gray	21	51
Sand and gravel with wood pieces, greenish gray	6	57
Sand and gravel, greenish gray, some cobbles	54	111
Sand and gravel with faint brownish color	13.5	124.5
Sand and gravel, brownish gray, some cobbles	39	163.5
Clay, sandy, gravelly	1.5	165
Sand and gravel, brownish gray, cobbles, loose	40	205
Siltstone, gray (bedrock)	4	209
Well 17/7-8AH1		
Albert Vetter. Drilled by Taylor, April, 1955.		
Soil	10	10
Sand	12	22
Gravel	15	37
Casing perforated 27-37 ft.		
Well 17/7-8B1		
State Department of Highways. Drilled by Highways, 1964.		
Peat, brown, clayey	3	3
Clay, brownish, gray, gravelly	0.5	3.5
Well 17/7-8B2		
State Department of Highways. Drilled by Highways, 1964.		
Clay, black, silty	4	4
Sand, silty (siltstone)	1	5
Well 17/7-8B3		
State Department of Highways. Drilled by Highways, 1964.		
Sod	0.5	0.5
Clay, gray, silty	5.5	6.0
Sand, silty (siltstone)	0.5	6.5
Well 17/7-8B4		
State Department of Highways. Drilled by Highways, 1964.		
Sand and gravel, fill	1.5	1.5
Peat	1.0	2.5
Clay, green, gray, silty	5.0	7.5
Sand, green, gray, blue	1.0	8.5

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 17/7-8BC1		
State Department of Highways. Drilled by Highways, 1964.		
Clay, silty, organic	3.5	3.5
Siltstone	1.0	4.5
Well 17/7-8C2		
State Department of Highways. Drilled by Highways, 1964.		
Clay, brown, silty, organic	3.2	3.2
Clay, silty	1.5	4.7
Siltstone	1.0	5.7
Well 17/7-8C3		
State Department of Highways. Drilled by Highways, 1964.		
Clay, silty, organic	2	2
Silt, sandy	3	5
Siltstone	0.5	5.5
Well 17/7-8C4		
State Department of Highways. Drilled by Highways, 1964.		
Gravel, brown, sandy, silty	0.5	0.5
Silt, black, clayey	12.0	12.5
Clay, black, gray, silty (siltstone)	33.0	45.5
Well 17/7-8D1		
State Department of Highways. Drilled by Highways, 1964.		
Silt, black	2	2
Silt, brown, clayey	2	4
Silt, brown, sandy	2	6
Silt, gray, sandy (siltstone)	9	15
Well 17/7-8E1		
State Department of Highways. Drilled by Highways, 1964.		
Peat, brown	2	2
Clay, gray, organic	4.8	6.8
Peat, brown	2.2	9
Clay, gray	13.5	22.5
Silt, green, gray, clayey (siltstone)	2.0	24.5

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 17/7-8Q1		
Weyerhaeuser Timber Company. Drilled by Taylor, December, 1964.		
Silt, brown	15	15
Sand and gravel	8	23
"Hardpan" and clay, sandy and gravelly	4	27
Sand, greenish gray, medium grained	6	33
Sand and gravel, greenish gray	12	45
Sand and gravel with cobbles, brown stained	42	87
"Hardpan" and clay, sandy and gravelly	3	90
Gravel and "Hardpan" layers, tight and sandy	17	107
Sand and gravel, some cobbles	31	138
Gravel and clay, tight packed	2	140
Sand and gravel, loose, brownish gray	7	147
Sand and gravel with clay beds, tight packed	6.5	153.5
Sand and gravel, some cobbles, brownish gray	10	163.5
Sand and gravel with clay, tight packed	2	165.5
Sand and gravel, some cobbles, brownish gray	17	182.5
Shale, gray, silty (bedrock)	3.5	186
Casing perforated 159-180 ft.		
Well 17/7-9D1		
Ellis Newcomb. Drilled by King, April, 1957.		
Topsoil and clay	6	6
Sand, clay and wood mixture	32	38
Sand and gravel	8	46
Casing perforated 40-46 ft.		
Well 17/7-9N1		
Weyerhaeuser Timber Company. Drilled by Stanfill, December, 1964.		
Sand and clay, silty, brown	24	24
Clay, hard packed with gravel beds	19	43
Gravel and silty clay, dark gray	6	49
Sand and gravel, loose, brownish gray	8	57
Gravel and clay, sandy, hard packed	5	62
Sand and gravel, loose, brown stained	7	69
Sand and gravel, tight	3	72
Sand and gravel, loose, brown stained, some cobbles	28	100
Clay with sand and gravel, hard packed	8.5	108.5
Sand and gravel, dirty, clay layers, brown stained	15.5	124
Sand and gravel, loose, brown stained	7	131
"Hardpan", sand and clay, gravelly	1.5	132.5
Sand and gravel with cobbles, dirty, brown stained	23.5	156
"Hardpan", sand and clay, gravelly	2	158
Sand and gravel, brown stained	5.5	163.5
Shale, gray, silty (bedrock)	1.5	165

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 17/7-9N2		
Weyerhaeuser Timber Company. Drilled by Taylor, January, 1965.		
Silt, tan, brown, sandy	17	17
Sand and fine gravel, dirty, greenish gray	17	34
Sand and fine gravel, greenish gray	16	50
Sand and gravel, brown stained, loose	5	55
Sand and fine gravel, greenish gray	4	59
Sand and fine gravel, hard packed	1	60
Sand and gravel, brown stained	8	68
Sand and gravel, some cobbles, dirty, gray	6	74
Sand and gravel, some cobbles, brown stained	61.5	151
Sand and gravel, fine, brownish gray, heaves readily	19.5	170.5
Shale, gray, silty, sandy (bedrock)	3.5	174
Well 17/7-10G1		
John Murphy. Drilled by Williams, July, 1965.		
Loam, sandy	2	2
Clay, blue	14	16
Gravel	21	37
Casing perforated 27-37 ft.		
Well 17/7-10P1		
Alfred Witner. Drilled by Taylor, July, 1965.		
Loam, sandy	18	18
Clay, blue	7	25
Gravel	15	40
Well 17/7-11K1		
G. W. Stretter. Drilled by Richardson, April, 1953.		
Clay, brown	28	28
Clay, blue, sandy	6	34
Clay, sand and gravel	3	37
Sand and gravel with stains of clay	14	51
Casing perforated 37-48 ft.		
Well 17/7-11L1		
Val Myer. Drilled by King, August, 1961.		
Loam, clayey, silty	5	5
Clay, blue, heavy, impervious	25	30
Gravel	5	35
Sand and "pea gravel"	5	40

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 17/7-12AB1		
B. O. Willis. Drilled by Evergreen, July, 1960.		
Clay, brownish	20	20
Clay and gravel	5	25
Gravel	21.5	46.5
Casing perforated 35-45 ft.		
Well 17/7-12F1		
Dale Willis. Drilled by Erdman, February, 1952.		
Clay	14	14
Gravel	17	31
Casing perforated 14-29 ft.		
Well 17/7-12H1		
C. C. Willis. Drilled by Taylor, November, 1952.		
Soil	10	10
"Hardpan"	9	19
Gravel	8	27
Casing perforated 17-27 ft.		
Well 17/7-12P1		
Willis Brothers. Drilled by Frye, May, 1963.		
Dirt, brown	16	16
Sand and gravel, brown and gray	23	39
Casing perforated 28-38 ft.		
Well 17/8-8E1		
Grays Harbor Water District No. 2. Drilled by Tronson.		
Topsoil, black	2	2
Clay, brown, organic	12	14
"Hardpan"	12	26
Gravel, clayey	2	28
Clay, blue	7	35

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 17/8-8G1		
Ed Dahlstrom and Jack Reynvaan. Drilled by Taylor, February, 1959.		
Soil	6	6
Clay	74	80
Gravel	15	95
Sandstone, gray	57	152
Well 17/8-8G2		
Grays Harbor Water District No. 2. Drilled by Taylor, May, 1958.		
Clay	17	17
"Hardpan"	15	32
"Pea gravel"	3	35
Gravel	13	48
Casing perforated 36-48 ft.		
Well 17/8-8H1		
Oscar Martinson. Drilled by Taylor, 1947.		
"Hardpan"	30	30
Clay, blue	89	119
Gravel	0.2	119.2
Sand	2.8	122
Well 17/8-8H2		
Grays Harbor Water District No. 2. Drilled by Tronson.		
Clay, brown, moist	20	20
Gravel and clay	1	21
Clay, brown	4	25
Clay and gravel	3	28
Clay, blue [siltstone(?)]	21	49
Well 17/8-8J1		
Grays Harbor Water District No. 2. Drilled by Tronson.		
Topsoil	2	2
Clay, yellow	16	18
Clay, sand and gravel, yellow	23	41
Sand and gravel, fine and coarse	7	48
Clay, blue, silty [Siltstone(?)]	7	55

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 17/8-8J2		
Grays Harbor Water District No. 2. Drilled by Tronson, September, 1962.		
Topsoil	1	1
Silt, organic	10	11
Clay, reddish	4	15
Sand, reddish, silty	2	17
Sand and clay, red, sticky	19	36
Clay, iron colored	12	48
Clay, blue [siltstone(?)]	-	48
Well 17/8-8J3		
Grays Harbor Water District No. 2. Drilled by Taylor, 1957.		
Silt, organic	10	10
Clay, silty	5	15
Silt, fine, sandy	2	17
Gravel, silty, clayey	15	32
Sand, coarse	6	38
Gravel, coarse	12	50
Silt, organic	-	50
Well 17/8-8K1		
J. H. Sundstrom. Drilled by Erdman.		
Soil	25	25
Clay	26	51
Sand and gravel	9	60
Shale	-	60
Well 17/8-8M1		
Grays Harbor Water District No. 2. Drilled by Tronson.		
Topsoil	1	1
Clay, brown, organic	16	17
Clay, reddish, organic	15	32
Sand, fine	1	33
Clay, blue [siltstone(?)]	29	62
Well 17/8-8Q1		
Grays Harbor Water District No. 2. Drilled by Tronson.		
Clay, dark brown	10	10
Gravel	1	11
Shale, gray [bedrock(?)]	13	24

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 17/8-9F2		
O. T. Taylor. Drilled by Taylor, 1948.		
Clay	100	100
Peat, black	2	102
Sand and gravel	27	129
Well 17/8-9L1		
Grays Harbor Water District No. 2.		
Clay, dark brown	5	5
Clay, tan	3	8
Clay, tan, some rocks	3	11
Clay, brown	10	21
Clay, brown	13	34
Clay, blue [siltstone(?)]	25	59
Well 17/8-9L2		
Joe Louise. Drilled by Taylor, July, 1949.		
"Hardpan"	35	35
Sand, blue, fine grading to gravel	34	69
Well 17/8-9L4		
Grays Harbor Water District No. 2. Drilled by Permela.		
Clay, brown	7	7
Clay, some gravel	7	14
"Pea gravel" and clay, brown	5	19
Gravel and clay beds	8.5	27.5
Sand and clay	4.5	32
Clay, gray with vegetation	42	74
Well 17/8-9M1		
Grays Harbor Water District No. 2.		
Clay, brown, silty	5.5	5.5
"Pea gravel" and clay	2.0	7.5
Clay, brown	7	14.5
Gravel	7.5	19
Sand	10	32
Shale, gray [siltstone(?)]	17	49
Well 17/8-9M2		
Grays Harbor Water District No. 2		
Clay, brown	20	20

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 17/8-9M2--Continued		
Gravel and clay	1	21
Clay, brown	4	25
Gravel and clay	3	28
Clay, blue [siltstone(?)]	21	49
Well 17/8-11A1		
Edward Valentine. Drilled by Taylor, April, 1953.		
Soil	8	8
Clay, blue	4	12
Gravel	13	25
Casing perforated 13-25 ft.		
Well 17/8-12F1		
State Department of Highways. Drilled by Highways.		
Mat and top rock	1	1
Gravel (satsop), reddish brown, silty, sandy	1	2
Gravel, brown, sandy, silty	1.5	3.5
Well 17/8-12F2		
State Department of Highways. Drilled by Highways.		
Silt, dark brown, gravelly	1.2	1.2
Silt, dark brown	1.3	2.5
Silt, brown	2.0	4.5
Gravel, brown, sandy, silty	1.0	5.5
Well 17/8-12G1		
State Department of Highways. Drilled by Highways.		
Sod	0.5	0.5
Silt, dark brown	1.5	2.0
Silt, brown	4.0	6
Gravel, brown, sandy, silty	2.0	8
Gravel, brown, sandy	8.0	16
Gravel, brown, sandy, silty	4.0	20
Well 17/8-12G2		
State Department of Highways. Drilled by Highways.		
Silt, light brown, clayey	4.5	4.5
Siltstone, gray	4.5	9.0

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 17/8-12G3		
State Department of Highways. Drilled by Highways.		
Sod	0.5	0.5
Silt, dark brown	1.5	2.0
Gravel, brown, sandy, silty	3.0	5.5
"Satsop"	4.0	9.5
Gravel, brown, sandy, silty	3.5	13.0
Silt, brown	1.0	14.0
Well 17/8-12G4		
State Department of Highways. Drilled by Highways.		
Sod	1.2	1.2
Silt, dark brown	1.5	2.7
Silt, brown	1.8	4.2
Gravel, brown, sandy, silty	2.0	6.2
Well 17/8-12H1		
State Department of Highways. Drilled by Highways.		
Peat	7	7
Gravel, brown, and clay, peaty	14	21
Sand and gravel in layers	6	27
Siltstone	1	28
Well 17/8-12H2		
State Department of Highways. Drilled by Highways.		
Peat, brown	0.1	0.1
Clay, gray, silty, soft	4.9	5.0
Silt, gray, clayey	8	13
Silt, gray, sandy	15	28
Silt and peat in lenses	15	43
Sand, gray, dirty	5.1	48.1
Clay, mottled, sandy	1.5	49.6
Well 17/8-12H3		
State Department of Highways. Drilled by Highways.		
Sod	0.5	0.5
Silt, brown, clayey	25	25.5
Silt, brown, clayey, organic	7	32.5
Silt, gray, clayey	4	36.5
Silt, gray, sandy	9	45.5
Gravel, gray, sandy	3	48.5

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 17/8-12H4		
State Department of Highways. Drilled by Highways.		
Sod	0.5	0.5
Silt, brown, sandy	3.0	3.5
Silt, gray, clayey	4.5	8.0
Silt, gray, sandy	7.0	15.0
Clay, gray, silty	5	20
Silt, gray, clayey	2	22
Sand, gray	11	33
Gravel, gray, silty, sandy	3	36
Well 17/8-12L1		
City of Montesano. Drilled by Stanfill, May, 1965.		
Silt, brown and gray	15	15
Silt, gray	13	28
Silt and fine gravel, gray	10	38
Sand and gravel, dark green-gray	44.5	82.5
Silt, gray	1.5	84
Sand and gravel, dark green-gray	6.5	90.5
Silt and gravel, interbeds	9.5	100
Silt, gray, grading down to silty clay	12	112
Silt, gray with "fine" pebbles	14	126
Sand and gravel, loose, some wood	9	135
Sand and cobbles, loose	11	146
Silt, sandy [siltstone(?)]	4	150
Casing perforated 135.5-145.5 ft.		
Well 17/8-12Q		
C. F. Brittain. Drilled by Erdman, August, 1948.		
Soil	24	24
Sand and gravel	6	30
Clay, blue, sandy	18	48
Clay, sandy	27	75
Casing perforated 24-30 ft.		
Well 17/8-13L1 and 2		
Oswald. Driven by owner, June, 1935.		
Mud, blue	10	10
Gravel	38	48

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 17/8-13P1		
Weyerhaeuser Timber Company. Drilled by Stanfill, December, 1964.		
Silt	9	9
Silt and clay, gray	15	24
Sand and gravel, gray	24	48
Sand and gravel, reddish	15	63
Clay, sand and gravel, brownish gray	5	68
Sand and gravel, brownish gray, dirty, some cobbles	6	74
Gravel, fine, and coarse sand, brown stained cobbles	16	90
Clay, sand and gravel, gray	2	92
Sand and gravel, gray	8	100
Clay, sand and gravel, gray	2.5	102.5
Sand and gravel, gray	8.5	111
Sand and gravel, gray, loose, some cobbles	15	126
Sand and gravel, gray tight	9	135.5
Sand and gravel, gray, loose, some cobbles	15.5	151
Sand and gravel, fine to medium, loose	13	164
Gravel, fine and coarse sand, some cobbles	22	186
Clay and sand	1.5	187.5
Shale, bedrock, dark gray	1.5	188.5
Casing perforated 135.5-177 ft.		
Well 17/8-14K1		
Weyerhaeuser Timber Company. Drilled by Stanfill, November, 1964.		
Clay, silty, brown and brownish gray	15	15
Clay, silty, dark gray	21.5	36.5
Gravel, fine and coarse sand, dark gray	13.5	50
Clay, silty, dark gray	2	52
Sand and gravel, dark gray	13	65
Sand and gravel, brownish gray, loose, water-bearing	52	117
Sand and gravel, gray, tight	12	129
Sand grading to sand and gravel, gray, dirty	7	136
Sand and gravel, gray, loose	17	153
Sand and gravel, tight	4	157
Gravel and coarse sand with cemented beds	10	167
Gravel, coarse, cobbles, sand, loose	10	177
Clay, sand and gravel (hardpan)	2	179
Shale, gray	1.5	180.5
Casing perforated 139-177 ft.		
Well 17/8-15D1		
Grays Harbor Water District No. 2. Drilled by Stanfill, 1965.		
Silt, clay, mucky, organic	53	53
Sand, very fine, silt	7	60
Sand and gravel, with sandy peat	7	67

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 17/8-15D1--Continued		
Sand and gravel, blue-black	4	71
"Hardpan", gray	4	75
Sand and gravel, blue-black	14	89
Sand and gravel, brown	4	93
Sand and gravel, blue	3	96
Sand and gravel, brown	4	100
Shale, sticky, micaceous	-	-
Casing screened 95-100 ft.		
Well 17/8-16B1		
Grays Harbor Water District No. 2. Drilled by Stanfill, 1965.		
Silt, peat, muck, and brown peat	15	15
"Hardpan", blue	3	18
Gravel and clay	4	22
Sand, clay and silt, blue	5	27
Gravel, some shells	14	41
Shale	2	43
Casing pulled.		
Well 17/10-5J1		
Paul Raybe. Drilled by Williams.		
Clay, yellow	54	54
Clay, blue	31	85
Clay, yellow	25	110
Clay, yellow, cemented	20	130
Clay, dark yellow, cemented	13	143
Clay, yellow	25	168
Clay, blue	12	180
Clay, yellow, cemented	12	192
"Hardpan", light yellow	2	194
Well 17/10-5L1		
Don Skolrood. Drilled by Williams, 1964.		
Clay, yellow	54	54
Clay, blue	31	85
Clay, yellow	25	110
Clay, yellow, cemented	20	130
Clay, dark yellow, cemented	13	143
Clay, yellow	25	168
Clay, blue	12	180
Clay, yellow, cemented	5	185
"Hardpan", light yellow	-	185

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 17/10-5L2		
James Damrom. Drilled by Taylor, fall, 1965.		
Clay	73	73
"Hardpan", gravel	59	132
Gravel, water-bearing	-	132
Well 17/10-5N1		
Jack Reynvoan. Drilled by Williams, November, 1965.		
Clay, yellow	95	95
Clay, blue	10	105
Clay, yellow	40	145
Clay, blue	10	150
Gravel, yellow, cemented	25	175
Sand and gravel, yellow, cemented, tight	10	185
Sand and gravel, water-bearing	2	187
Sand, fine, water-bearing	1	188
Sand and pea gravel, water-bearing	4	192
Well 17/10-5N2		
Richard Sterling. Drilled by Williams.		
Clay, yellow	30	30
Clay, blue	10	40
Clay, yellow	40	80
Clay, blue	5	85
Gravel, yellow, cemented	25	110
Sand and gravel, yellow, cemented tight	10	120
Sand and gravel, water-bearing	7	127
Well 17/10-5P1		
Jack Boursaw. Drilled by Williams, 1964.		
Topsoil	1	1
Clay, yellow	49	50
Shale, brown	5	55
Clay, yellow and packing gravel	22	77
Clay, yellow	6.5	83.5
Clay, blueballs	0.5	84
Rock, blue, solid	10	94
Well 17/10-6A1		
Jack Hartough. Drilled by Williams, 1965.		
Clay, yellow	53	53
Clay, blue	10	63
Sand and gravel	13	76
"Pea" gravel	3	79

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 17/12-3R1		
Grays Harbor Water District No. 3. Drilled by Richardson, 1965.		
Sand, fine brown	115	115
Sand, coarse and fine, and gravel	74	189
Sand, silt and clay, gray, dry	16	205
Coarse sand and gravel, fine sand, water-bearing	11	216
Sand, fine and coarse, some gravel and clay	24	240
Clay, gray, and sand, fine	67	307
Sand and gravel, water-bearing	3	310
Sand, fine	35	345
Clay, gray	39	384
Sand, some gravel and clay	11	395
Clay, gray, and sand, gray, fine	11	406
Sand, fine	35	441
Clay, brown	53	494
Sand, coarse to fine, and gravel	19	513
Screen installed 492-512 ft.		
Well 17/10-6A2		
Stan Johanson. Drilled by Taylor, 1965.		
Clay, yellow	68	68
Clay, blue	10	78
Sand and gravel	13	91
"Pea" gravel	3	94
Well 18/6-27P1		
Town of Elma. Drilled by Frye, October, 1960.		
Clay, blue	3	3
Clay, yellow	4	7
"Hardpan", clay, sand and gravel	36	43
Gravel, fine	2	45
Sand and silt, gray	8	53
"Pea gravel", and coarser	17	70
Gravel, fine to coarse	30	100
Casing perforated 66-96 ft.		
Well 18/6-31A1		
Don Doherty. Drilled by Erdman, February, 1946.		
Gravel	56	56
Casing perforated 48-56 ft.		

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 18/6-31H2		
Fred Christensen. Drilled by Peterson, June, 1955.		
Clay and sand	14	14
Sand and gravel, clay	17	31
Sand and gravel	11	42
Sand	24	66
Sand and gravel	6	72
Sand	18	90
Sand and gravel	7	97
Clay, sand and gravel	1	98
Well 18/6-32E 1		
John Martin. Drilled by owner, 1947.		
Soil	13.5	13.5
Sand and gravel	86.5	100
Well 18/6-32F2		
Monncer Brothers. Drilled by Frye, May, 1957.		
Sand and gravel	30	30
Casing perforated 18-32 ft.		
Well 18/6-31G4		
Confort and Ortquist. Drilled by Erdman, January, 1948.		
Gravel	48	48
Casing perforated 28-48 ft.		
Well 18/6-32J1		
Carl Metzger. Drilled by Erdman, December, 1950.		
Gravel	18	18
Sand and gravel, water-bearing	12	30
Casing perforated 12-28 ft.		
Well 18/6-33N1		
D. H. Mustard. Drilled by Erdman, July, 1947.		
Clay	16	16
Gravel	13	29
Casing perforated 21-27 ft.		

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 18/6-34K1		
J. P. Callesen. Drilled by Erdman, October, 1945.		
Soil	2	2
Gravel	28	30
Well 18/6-34P1		
John Callesen & Sons. Drilled by Erdman, May, 1951.		
Soil	11	11
"Hardpan"	9	20
Sand and gravel	36	56
Casing perforated 21-54 ft.		
Well 18/6-36L1		
Ken Martin. Drilled by Williams, March, 1965.		
Gravel; cemented	32	32
Sand, coarse, water-bearing	3	35
Gravel, blue, cemented	20	55
Clay, blue	4	59
Sandstone, blue	21	80
Casing perforated 32-35 ft.		
Well 18/6-36L2		
Harold VanOrman. Drilled by Williams, September, 1964.		
Gravel, cemented	32	32
Gravel, slightly cemented	8	40
Gravel, water-bearing	10	50
Well 18/7-1A1		
Brunnslick. Drilled by Williams, fall, 1964.		
Gravel	4	4
Sandstone	154	158
Shale, blue	5	163
Well 18/7-34N2		
Robert Dierrick. Drilled by Williams, April, 1965.		
Clay, yellow	20	20
Clay, blue	6	26
"Hardpan", brown	2	28

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 18/7-34N2--Continued		
Clay, brown, sandy	8	36
Mud, blue and brown	4	40
Mud, blue	6	46
Gravel and clay, cemented	25	71
Gravel, water-bearing	1	72
Well 18/7-36G1		
M. D. McGraw. Drilled by Frye, June, 1957.		
Sand, silt	12	12
Sand and gravel, hard packed	18	30
Sand and gravel, coarse	6	36
Gravel, coarse	3	39
Well 18/7-36K1		
Glen Wittaker. Drilled by Williams, March, 1965.		
Gravel, cemented	22	22
Sand	5	27
Sand, coarse	3	30
Sand and gravel	4	34
Well 18/7-36L1		
Dave Hall. Drilled by Webber, February, 1953.		
Surface dirt	11	11
Gravel and clay	10	21
Gravel, loose, water	14	35
Gravel, cemented	3	38
Casing perforated 29-35 ft.		
Well 18/7-36Q1		
Ernest Mock. Driven by owner, 1945.		
Soil	9	9
"Pea gravel"	12	21
Gravel, coarse	21	42
Well 18/8-21P1		
R. L. Taylor. Drilled by Taylor, May, 1956.		
Soil	17	17
Gravel, water-bearing	9	26
Casing perforated 14-26 ft.		

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 18/8-33A1		
Howard Hughes. Drilled by owner, February, 1948.		
Loam, silt	4	4
Clay, blue, some red gravel	2	6
Clay, blue	9	15
Gravel, coarse, water-bearing	1+	16+
Well 18/8-35Q1		
R. E. Wilkie. Drilled by Erdman, August, 1948.		
Clay	14	14
Gravel	20	34
Casing perforated 14-32 ft.		
Well 18/9-5H1		
Robinson.		
Gravel	6	6
Clay, water-bearing	16	22
Well 18/9-8E1		
D. E. Lashance.		
Soil	5.7	5.7
Gravel	7.8	13.5
Well 18/10-18D1		
I. S. Williamson. Dug by owner.		
Gravel	15	15
Well 18/10-18H1		
Ron Warne. Drilled by Williams, August, 1964.		
Clay, yellow	27	27
"Hardpan"	1	28
Clay, yellow	14	42
Sand, gravel and clay	8	50
Well 18/10-18H2		
Pyburn. Dug by owner.		
Gravel, red	20	20

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 18/10-24G1		
R. Embree. Dug by owner.		
Clay, blue, gravel lenses	20	20
Gravel	2	22
Well 18/10-25G1		
V. Pellervo. Dug by owner.		
Clay	8.2	8.2
Well 18/11-4G1		
Bill Daieen. Drilled by Taylor, 1965.		
Soil	5	5
Silt	40	45
Gravel, blue, iron	10	55
Mud, blue	55	110
Gravel, brown, water-bearing	8	118
Well 18/11-12P1		
R. L. Seward. Drilled by Taylor.		
Soil	20	20
Gravel	5	25
Clay	50	75
Gravel	8	83
Well 18/11-12P2		
R. L. Seward. Dug by owner.		
Soil, clay	20	20
Well 18/11-17L1		
C. L. Lovelace. Dug by Allan & Walkowski, August, 1948.		
Clay, red	10	10
Clay, blue	2	12
"Hardpan"	2	14
Gravel	2	16

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 18/11-17L2		
Carl Fredrick. Drilled by Allan, August, 1948.		
Clay, red	6	6
Clay, blue	3	9
Sand and gravel, blue	2	11
"Hardpan"	0.5	11.5
Sand and gravel, blue	4.5	16
Well 18/11-17P1		
T. E. Stearns. Drilled by Frye, June, 1960.		
Sand	0.3	0.3
Peat	1.7	2
Slough mud	18	20
"Hardpan"	25	45
Slough mud	16	61
Casing perforated 42-58 ft.		
Well 18/11-17P2		
T. E. Steans. Drilled by Frye, June, 1960.		
Sand	0.4	0.4
Peat	1.6	2
Muck	18	20
"Hardpan"	15	35
Slough mud	15	50
Sand, gravel and silt	21	71
Casing perforated 49-67 ft.		
Well 18/11-17P3		
T. E. Stearns. Drilled by Frye, June, 1960.		
Sand	0.4	0.4
Peat	1.6	2
Muck	18	20
"Hardpan"	14	34
Slough mud	16	50
Sand, gravel and silt	10	60
Casing perforated 44-60 ft.		

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 18/11-17P4		
T. E. Stearns. Drilled by Frye, June, 1960.		
Sand	0.4	0.4
Peat	1.6	2
Muck	18	20
"Hardpan"	13	33
Slough mud	20	53
Gravel, sand and silt	17	70
Well 18/11-17P5		
T. E. Stearns. Drilled by Frye, June, 1960.		
Sand	0.4	0.4
Peat	1.6	2
Muck	18	20
"Hardpan", red gravel	13	33
Slough mud	20	53
Gravel, sand and silt	17	70
Casing perforated 49-66 ft.		
Well 18/11-17P6		
D. R. Krebs. Drilled by owner, April, 1955.		
Peat	7	7
Clay, blue	7	14
Gravel and clay	6	20
Gravel, red	22	42
Gravel, black	3	45
Well 18/11-17P7		
T. E. Stearns. Drilled by Frye, June, 1960.		
Sand	0.4	0.4
Peat	1.6	2
Slough mud	18	20
"Hardpan"	25	45
Slough mud	7	52
Sand and gravel	18	70
Casing perforated 48-66 ft.		
Well 18/11-22H1		
Unknown. Drilled by Taylor, 1964.		
Clay	80	80
"Hardpan"	10	90
Gravel, blue, salt water	3	93

Table 4.--Drillers' logs of representative wells.--Continued

Materials	Thickness (feet)	Depth (feet)
Well 18/12-10F1		
H. Holmes. Drilled by Taylor, 1959.		
Gravel, water-bearing layers at 35 and 45 ft	47	47
Well 18/12-27F1		
Ralph Minard. Drilled by owner, May, 1958.		
Sand	42	42
Gravel	18	60
Sand, coarse	10	70
Clay, sandy	70	140
Gravel	3	143
Clay	162	305
Sand	23	328
Clay	22	350
Gravel, water-bearing	8	358
Well 18/12-27F2		
Ralph Minard. Drilled by owner, April, 1957.		
Sand, light gray, fine, angular to subangular, unconsolidated	150	150
Gravel, granule size, varicolored, loose, rounded	30	180
Gravel, coarse, vericolored, loose, rounded	180	360
No sample	30	390
Gravel, coarse, vericolored, loose, rounded	40	430
Sand, gray, fine to coarse, black, green and red grains	30	460
Gravel, loose, fine subrounded	60	520
Sand, gray, coarse grained, loose, black, green and red grains	60	580
No sample	30	610
Gravel, loose, some gray clay	390	1000
Clay, gray, soft, gummy, silty, sandy and gravel	70	1070
Gravel, loose, pebble size	40	1100
Sandstone, gray, very fine grained, soft, glauconitic, very shaley, coarse, micaceoas, lignitic, some soft bentonitic shale; numerous pebbles	20	1120
Well 18/12-34C1		
Gitche Gumee Motel. Drilled by Taylor, August, 1965.		
Sand	50	50
Mud	37	87
Gravel	18	105
Mud	40	145
Gravel	10	155
Clay, yellow, sandy	15	170
Clay, blue, sandy	55	225