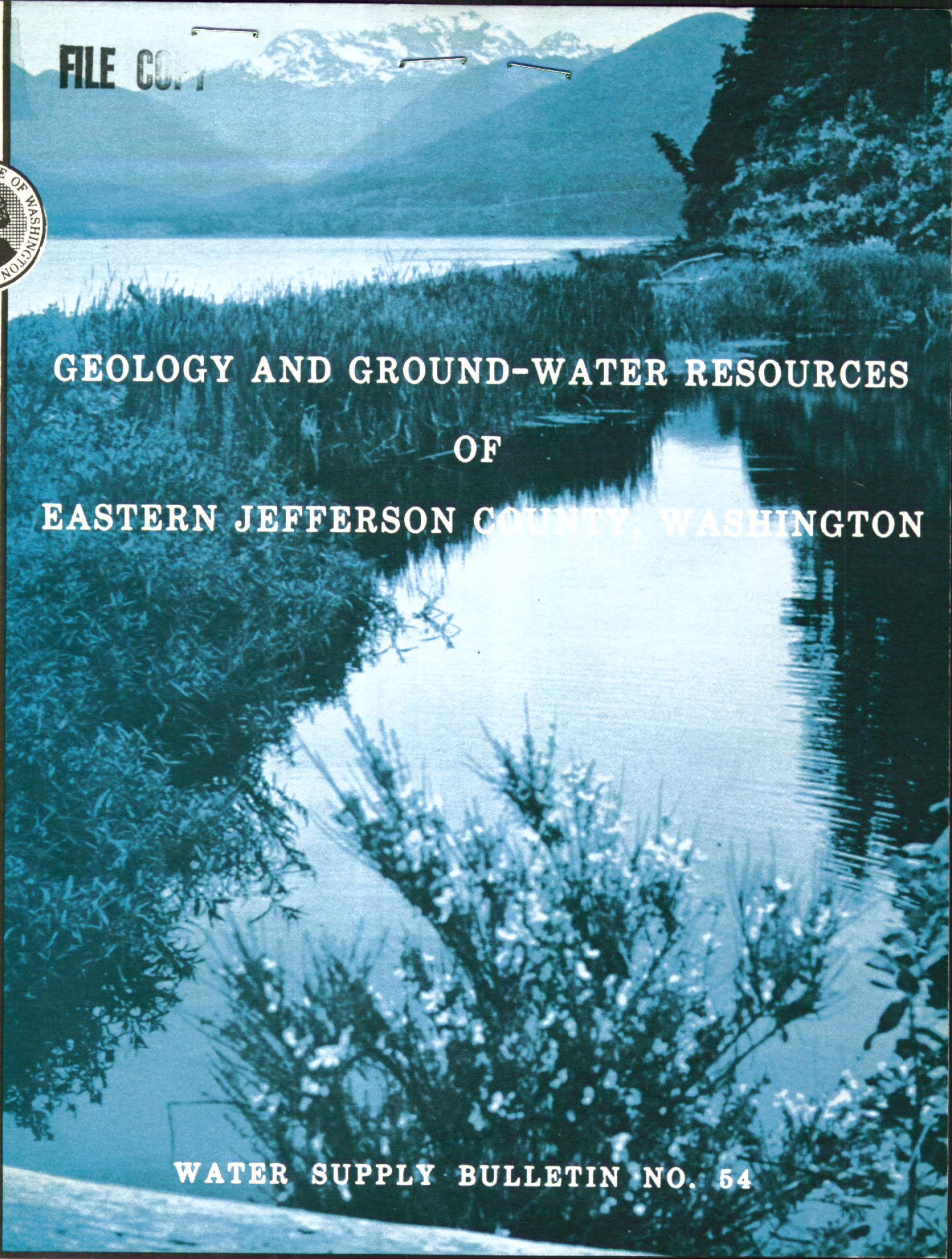

GEOLOGY AND GROUND-WATER RESOURCES OF EASTERN JEFFERSON COUNTY, WASHINGTON

WATER SUPPLY BULLETIN NO. 54

State of Washington
John Spellman
Governor

APRIL 1981

Department of Ecology
Donald W. Moos
Director

COVER

From the southern end of the Toandos Peninsula, one can look westward across the meeting of Dabob Bay with Hood Canal and up the Dosewallips Valley to Mount Constance (photo by R. J. Carson).

Water Supply Bulletin No. 54

GEOLOGY AND GROUND-WATER RESOURCES
of
EASTERN JEFFERSON COUNTY, WASHINGTON

by

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and

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In Cooperation with
Washington Department of Natural Resources
Division of Geology and Earth Resources
and
Jefferson County Public Utility District No. 1

State of Washington
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Donald W. Moos, Director

Olympia, Washington
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ABSTRACT

The northeastern Olympic Peninsula, including eastern Jefferson County and the easternmost part of Clallam County, is divided physiographically into Foothills of the Olympic Mountains, Bolton and Toandos Peninsulas, Chimacum Drift Plain, Quimper Peninsula and Protection Island, Miller Peninsula, and Indian and Marrowstone Islands. Mean annual precipitation ranges from less than 20 inches at the northern edge of the area to more than 60 inches at the southern end.

The bedrock is Eocene and Oligocene volcanics and clastic sedimentary rocks. The deposits of three glaciations by the Puget Lobe of the Cordilleran Ice Sheet are probably equivalent to Double Bluff, Possession, and Vashon Drifts on Whidbey Island. Other Pleistocene sediments present are a weathered pre-Fraser drift in the Brinnon area, Everson glaciomarine drift on Protection Island, and the interglacial Whidbey Formation. Holocene environments of deposition include floodplains, deltas, alluvial fans, beaches, lakes, marshes, swamps, and dunes.

Ground water is found throughout the area, but the amount available to properly constructed wells varies considerably and is dependent on holding capacities, transport capabilities, and amounts of recharge to the aquifers. Tertiary sedimentary rocks which lack porosity and permeability yield little or no water. Tertiary volcanic rocks are more productive, but depth to water and the amounts available are not readily predictable.

The best supplies of ground water are generally found in Vashon advance outwash, Vashon recessional drift, and Holocene flood plain alluvium. Generally there is an adequate amount of ground water available for the anticipated future growth of eastern Jefferson County when recharge over the entire area is considered. However, the likelihood of completing single wells with adequate production to satisfy large demands, even in areas underlain by Quaternary sediments, appears questionable. To date, high-volume wells have been completed near Chimacum, in the Eagle Creek

area of Miller Peninsula, and in sands and gravels in hydraulic continuity with nearby streams.

Although water quality studies were not conducted, the presence of iron, manganese, and nitrate has been noted in wells throughout the area.

INTRODUCTION

Purpose and Scope of the Investigation

The study was undertaken by the Water Resources Investigations Section of the Washington State Department of Ecology as part of an ongoing program to determine the geohydrology of the State of Washington. The choice of the area was dictated by the mounting demand for ground water resulting from the steady population increase in this portion of the Puget Sound area plus the added influx of people because of the U.S. Navy's Trident project. Data on ground-water availability are needed so that possible sources for future demands can be delineated. The purpose and scope of the report, therefore, is to identify the geologic units, to determine their areal extent and thickness, and to discuss their water-yielding characteristics.

Location and Extent of the Area

The 350-square-mile study area (Figures 1, 2, and 3) is the eastern portion of Jefferson County plus the Miller Peninsula in northeastern Clallam County. Most of the project area lies within the western Puget Lowland, except for the western portion which is situated in the foothills of the northeastern Olympic Mountains. The study area is bordered on the north, east, and south by the Strait of Juan de Fuca, Puget Sound, and Hood Canal.

Previous Investigations

The geology, the knowledge of which is important to the understanding of the occurrence of ground water, has been described in a number of reports. An early geologic investigation was made by Bretz (1913), who studied the glaciation of the Puget Lowland. The Pleistocene geology of Island County, just northeast of eastern Jefferson County, was studied by Easterbrook (1968). Sceva (1957), Molenaar (1965), and Deeter (1979) studied the geology and ground-water resources of the Kitsap Peninsula

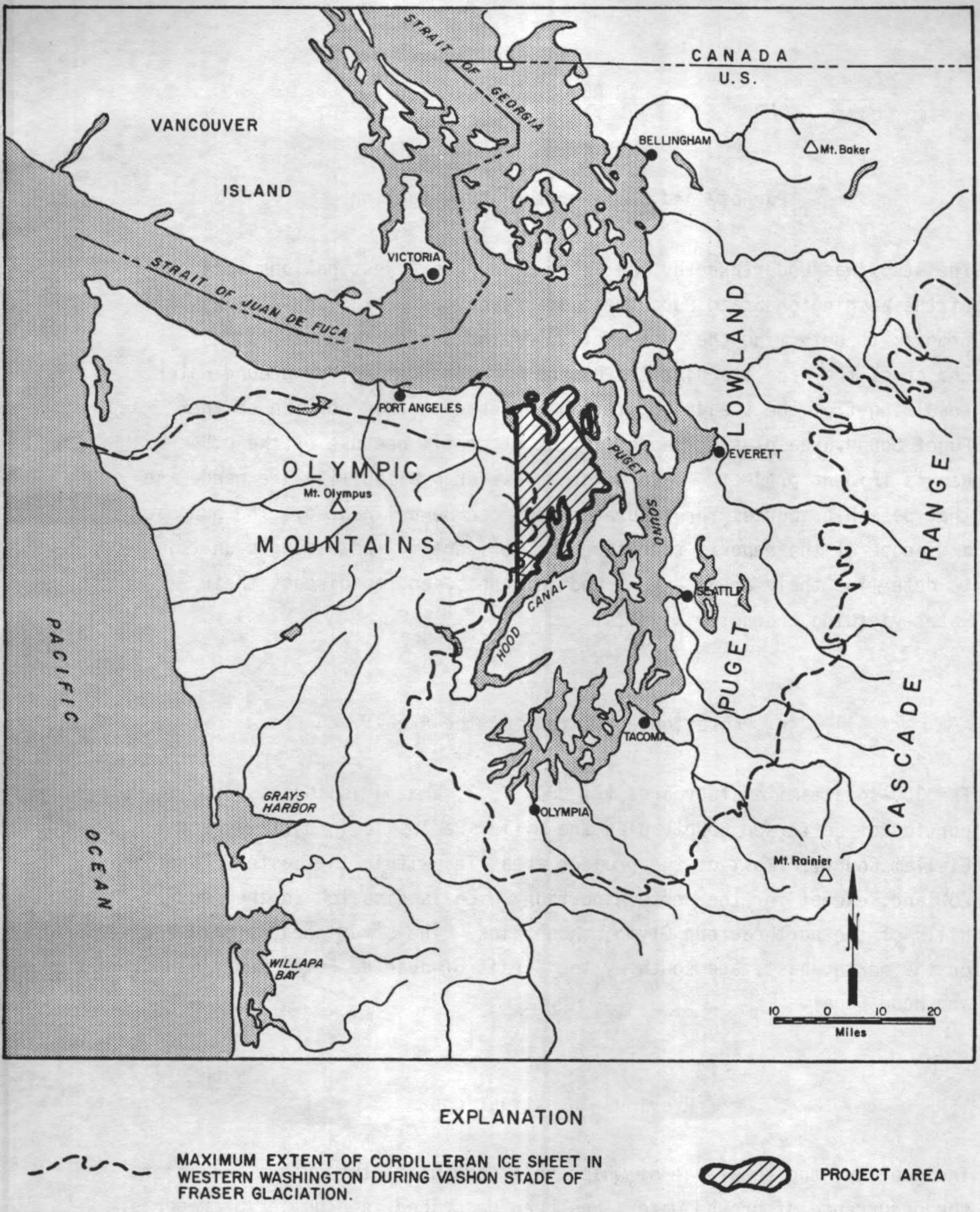


Figure 1. MAP OF NORTHWESTERN WASHINGTON (AFTER EASTERBROOK, 1969).

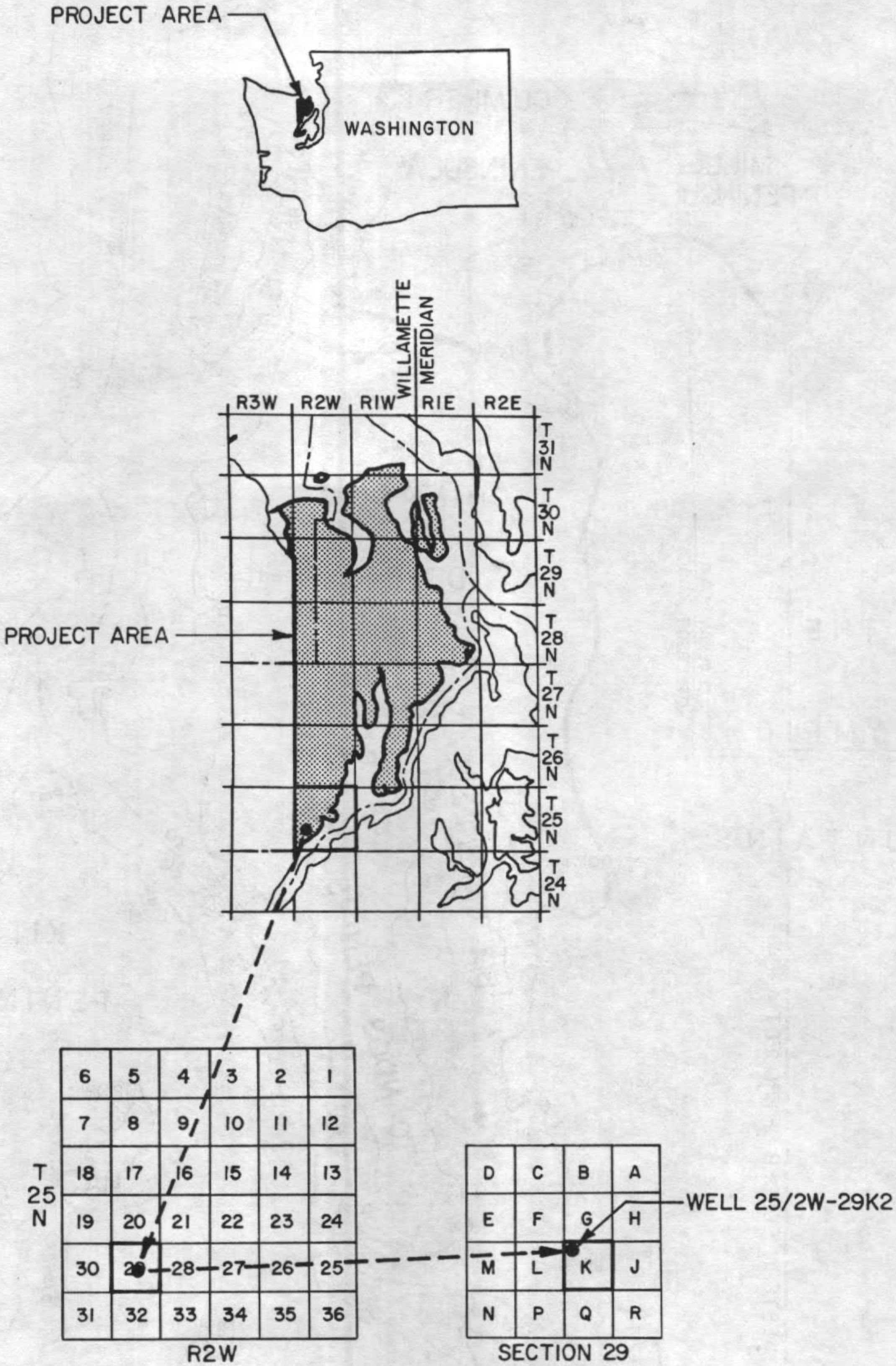


Figure 2. INDEX MAP OF PROJECT AREA AND DIAGRAM SHOWING WELL NUMBERING SYSTEM.

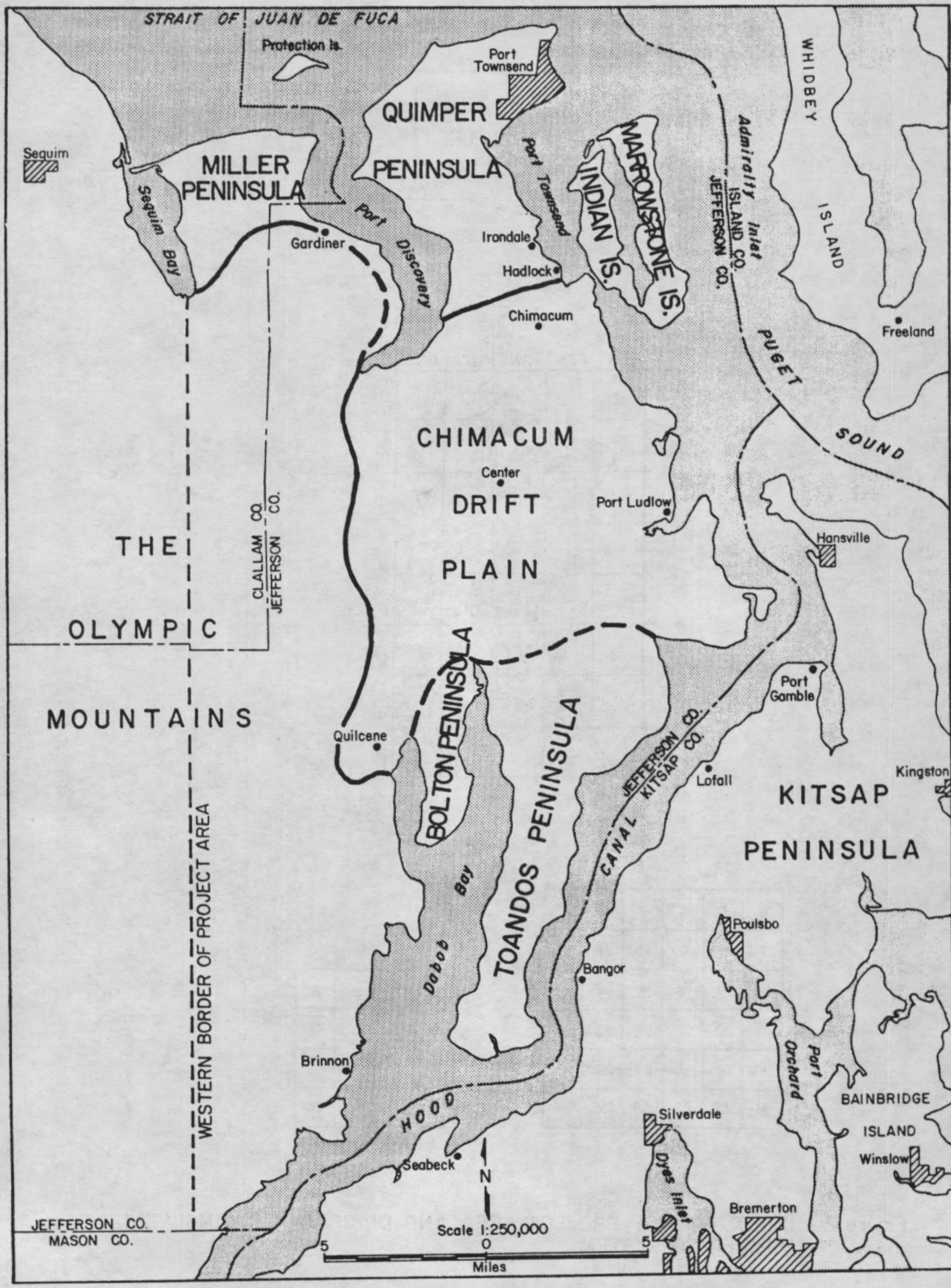


Figure 3. MAP OF N.E. CALLAM AND E. JEFFERSON COUNTIES.
(HEAVY LINES DIVIDE REGION INTO PHYSIOGRAPHIC AREAS)

which is across Hood Canal from eastern Jefferson County. The Quaternary geology of the eastern Olympic Peninsula has been mapped by Frisken (1965), Birdseye (1976), Carson (1976), Gayer (1977), and Hanson (1977). The bedrock geology of the Olympic Peninsula has been mapped recently by Tabor and Cady (1978). Their map does not include easternmost Jefferson County, but the geology of the Quimper Peninsula was studied by Durham (1944), Allison (1959), and Thoms (1959).

Although some pumping tests and ground-water evaluations have been made in the study area, there are no published data which pertain to the availability of ground water. Walters (1971) made a reconnaissance study of sea-water intrusion along the coast of Washington, including the inland waters of Jefferson and Clallam Counties.

Data on the physical, cultural, and water-quality conditions of the lakes in northwestern Washington have been presented by Bortleson and others (1976). A soil survey by McCreary (1975) includes maps of the various soil types as well as descriptions and properties of each. A summary of the natural vegetation of the area can be found in a work by Franklin and Dyrness (1973). Based on the palynological record, Heusser (1965, 1977) has interpreted the Quaternary climate of the Olympic Peninsula and the Puget Lowland.

Acknowledgments

The authors wish to thank all persons who permitted access to their wells and property and willingly offered information pertaining to them. The assistance of Mr. Mayberry of Hood Canal Drilling Company in locating certain wells is gratefully acknowledged. The able assistance of Richard Birdseye, Jerry Bolland, Marty Gayer, Kathryn Hanson, and Alex Williamson who worked on the project during the summers of 1975 and/or 1976 contributed substantially to the data gathering phase of the study. Funds for the publishing of this report provided by Jefferson County Public Utility District No. 1.

Well Numbering System

The numbering system used in this report is based on the rectangular method for subdivision of public land, which indicates township, range, section, and the 40-acre tract within the section. In the well number 25/2W-29K2 (Figure 2), the part preceding the hyphen indicates successively the township and range (T.25N., R.2W.) north and west of the Willamette meridian and base line. Because the report area lies entirely north of the Willamette base line, the letter N has been omitted. The first number following the hyphen (29) indicates the section, and the letter (K) designates the 40-acre subdivision within the section. The numeral "2" indicates that this is the second well inventoried within the subdivision.

TOPOGRAPHY AND GEOGRAPHIC SUBAREAS

With the exception of the foothills of the Olympic Mountains, the report area lies entirely within the Puget Lowland. It is characterized, in general, by wooded, rather gently rolling, elongated, northerly trending hills with steep valley sides resulting from fluvial and glacial erosion. Steep, wave-cut bluffs along the Strait of Juan de Fuca, Puget Sound, and Hood Canal are common and afford the best exposures of the area's lithology. Other exposures of bedrock and drift are found in road cuts and stream banks.

Most of the area is drained by small, generally intermittent streams which flow northward and eastward into the inland waters of western Washington. The Duckabush, Dosewallips, Quilcene, and Little Quilcene rivers head in the Olympic Mountains and empty into Hood Canal and Quilcene Bay.

For ease of discussion, the area has been subdivided into the Olympic Mountains, Miller Peninsula, Quimper Peninsula and Protection Island, Bolton and Toandos Peninsulas, Indian and Marrowstone Islands, and a relatively large area which makes up the remainder, the Chimacum Drift Plain (Figure 3).

CLIMATE

The climate of eastern Jefferson County is of the marine type; generally, the summers are cool and comparatively dry and the winters are rather mild and wet. During the winter season, low pressure storms originating offshore move northeastward and encounter the Olympic Mountains which force the moisture laden clouds upward. This rapid ascent results in a decrease in temperature and great quantities of precipitation fall on the windward side of the mountains. As the clouds descend on the leeward side, the temperatures increase and lesser amounts of moisture are released. This results in a rather small area of low precipitation referred to as the rain shadow of the Olympic Mountains. The average annual rainfall is more than 60 inches at the southern end of the report area near Brinnon near the eastern front of the Olympic Mountains, whereas farther away from the mountains at Port Townsend, it is less than 20 inches (Figure 4).

The six weather stations in the area have a similar pattern of precipitation and differ only in the amount which falls during the wet season. Precipitation during July, the month of lowest rainfall at the four stations to the north, and during August at the Brinnon and Duckabush stations, is markedly similar.

GEOLOGY

Volcanics exposed in the foothills of the Olympic Mountains and in road cuts and rock quarries extending from Port Discovery southeastward to Squamish Harbor (Plate I) are the oldest rocks (Eocene Epoch) in the report area. These interfinger with or are overlain by sedimentary rocks (Eocene-Oligocene). Unconformably overlying the older indurated rocks are unconsolidated sediments (Quaternary). The latter cover most of the lowland area, are related to or are the direct products of glaciation, and are of paramount interest to those seeking ground water.

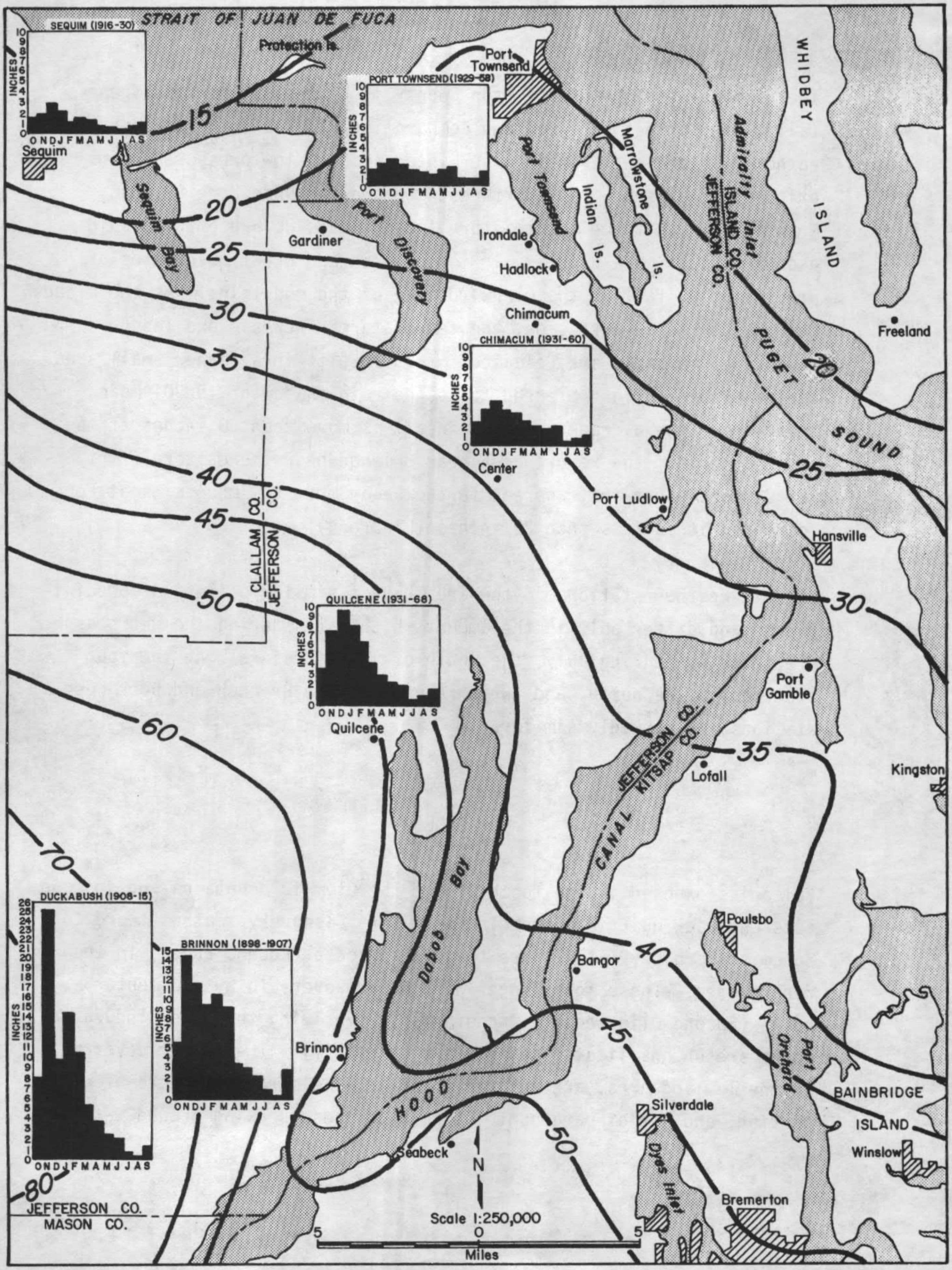


Figure 4. MEAN ANNUAL PRECIPITATION IN INCHES FOR EASTERN JEFFERSON COUNTY AND OUTLYING AREAS.

Geologic History

Tertiary Period

Most of the Tertiary rocks, which are widespread in the Olympic Mountains and scattered through the Puget Lowland, originated by volcanic and sedimentary processes on the floor of the Pacific Ocean. Compression between the continental crust of the North American plate and the oceanic crust beneath the Pacific Ocean resulted in the partial subduction of the sediments and volcanics beneath the western edge of North America. Tectonism during the Cenozoic caused the uplift of the Olympic and Cascade Ranges and considerable folding and thrust faulting of the rocks. The structural and topographic low called the Puget Trough, which developed between the Cascade and Olympic Mountains, was the site of Pleistocene deposition of glacial sands and gravels by the Cordilleran Ice Sheet. These sands and gravels yield most of the ground water produced in the study area.

Quaternary Period

Pleistocene Epoch

With the cooling of the climate and the attendant increase in snowfall, the large Cordilleran Ice Sheet originated in British Columbia and moved southward into Washington. The Puget Lobe advanced between the Olympics and the Cascades to the southern Puget Lowland, whereas the Juan de Fuca Lobe moved westward between the Olympics and Vancouver Island. Eastern Jefferson County is east of the divide between the two lobes (Long, 1975) and hence was buried by the Puget Lobe of the Cordilleran Ice Sheet. During the glaciations, alpine ice in the Olympic Mountains expanded, but within the project area only the Duckabush and Dosewallips Valleys were significantly affected by the Olympic glaciers.

Temperature fluctuations caused the glaciers to advance and withdraw at least four times during the Pleistocene (Crandell *et al.*, 1958). The established sequence for the Puget Lowland is shown in Table 1. During each glaciation, a complex assortment of till, outwash, ice-contact stratified drift, and glaciolacustrine and glaciomarine sediments were deposited. The dominant sediments representing the interglaciations are fine grained fluvial, lacustrine, and marine sediments (mostly sand and finer) and peat. The greatest extent of ice in western Washington occurred during a pre-Fraser glaciation (Carson, 1970). Except for a few areas above 3,000 feet in the southwestern part of the project area, eastern Jefferson County was entirely covered when the Cordilleran Ice Sheet occupied the Puget Lowland during the Fraser Glaciation about 14,000 years ago (Porter and Carson, 1971) (Figure 1). Most of the wells in the report area have been developed in glaciofluvial deposits of the Fraser Glaciation.

Significant to an interpretation of the geologic history of the northeastern Olympic Peninsula are Easterbrook's studies of the central and northern Puget Lowland (Easterbrook, 1963, 1968, 1969; Easterbrook *et al.*, 1967). The Pleistocene stratigraphy of southern Whidbey Island, just northeast of eastern Jefferson County, is shown in Table 2. The glacial and non-glacial units on Whidbey Island correlate well with those of the northeastern Olympic Peninsula with two exceptions. First, there is a pre-Fraser drift in the southernmost part of the project area (in the general vicinity of the Dosewallips and Duckabush Rivers) that is more weathered than Possession or Double Bluff Drift. Second, there are no sediments in eastern Jefferson County known to be equivalent to the Quadra Formation.

Evidence for the first known advance of the Puget Lobe of the Cordilleran Ice Sheet onto the northeastern Olympic Peninsula is found in sediments believed to be equivalent to Double Bluff Drift on Whidbey Island. During this glaciation, the Puget Lobe deposited till directly from the ice, and glaciomarine drift beneath floating ice. Meltwater deposited sand and gravel, probably as both advance and recessional outwash.

Table 1. Quaternary stratigraphy in western Washington (after Crandell *et al.*, 1958; Armstrong *et al.*, 1965; and others).

Epoch	Geologic - Climate Units		Approximate Radiocarbon Age, 10^3 years
Holocene			
Pleistocene	Fraser Glaciation	Sumas Stade	10
		Everson Interstade	11
		Vashon Stade	13
		Evans Creek Stade	16
	Olympia Nonglacial Interval		20
	Salmon Springs Glaciation	Late Stade	28
		Nonglacial Interval	72
		Early Stade	
	Puyallup Interglaciation		125?
	Stuck Glaciation		
	Alderton Interglaciation		
	Orting Glaciation		

Table 2. Correlation of Whidbey Island rock-stratigraphic units with the geologic-climate units of western Washington (after Easterbrook, 1976).

Rock-stratigraphic Units (Easterbrook, 1968)	Geologic-climate Units (see Table 1)	
Everson Glaciomarine Drift	Everson Interstade	Fraser Glaciation
Vashon Drift	Vashon Stade	
Quadra Formation	Olympia Nonglacial Interval	
Possession Drift	Salmon Springs Glaciation	
Whidbey Formation	Puyallup Interglaciation	
Double Bluff Drift	Stuck Glaciation	

The only prominent interglacial sediments found on the northeastern Olympic Peninsula are probably equivalent to the Whidbey Formation which was deposited between glaciations represented by the Double Bluff and Possession Drifts. These fine-grained, organic-rich sediments were deposited by meandering streams and in lakes and swamps on flood plains (Hansen and Mackin, 1949; Easterbrook *et al.,* 1967). Drainage in the Puget Lowland was probably to the north and west.

The next glaciation of eastern Jefferson County is recorded by outwash, till, and glaciomarine drift likely to be equivalent to the Possession Drift on Whidbey Island. Again, the Cordilleran Ice Sheet outgrew British Columbia and buried much of northwestern Washington, including almost all of the project area. Again meltwater in front of the advancing and retreating glacier deposited outwash sands and gravels.

The Olympia Nonglacial Interval is not well represented in eastern Jefferson County. Fluvial erosion probably was dominant after the deposition of Possession Drift and before the Fraser Glaciation. There are some peats associated with fine-grained sediments on the northeastern Olympic Peninsula that may record the Olympia Nonglacial Interval, but no finite radiocarbon dates have been obtained.

The Fraser Glaciation is the last and best known in western Washington. As the climate cooled during the Evans Creek Stade, the alpine glaciers of the Olympics and Cascades extended more or less to the edge of the mountains, reaching a maximum approximately 19,000 years ago (Porter, 1976). A limited amount of alpine drift is present in the lower valleys of the Duckabush and Dosewallips Rivers (Frisken, 1965), but farther north the Olympic glaciers did not reach the project area during the Fraser Glaciation (Long, 1974).

The much larger Cordilleran Ice Sheet had a slower response time to the cooling climate of the Fraser Glaciation; the Puget Lobe reached the project area about 16,000 years ago (Porter, 1970) during the Vashon Stade. In front of the ice sheet were meltwater streams depositing outwash sands and gravels. As the Puget Lobe moved south between the Olympics and the Cascades, it blocked the northerly drainage of the southern Puget Lowland. Ice-dammed lakes were created which drained southward and westward; in these lakes accumulated fine-grained glaciolacustrine sediments. While the active ice sheet covered the project area, lodgment till was deposited at its base.

As the climate warmed at the end of the Vashon Stade, the Puget Lobe retreated northward, leaving the project area about 13,000 years ago (Armstrong *et al.*, 1965). In places, the retreat was characterized by an active ice margin; the typical result is a thin layer of ablation till over the pre-existing lodgment till. Elsewhere the retreat of the Puget Lobe was marked by ice stagnation and the accumulation of ice-contact stratified drift; associated landforms in the project area are eskers (east of Cape George), kame terraces, kames and kettles. Meltwater streams deposited recessional outwash, and glaciolacustrine drift accumulated in ice-dammed lakes.

Erosion as well as deposition occurred during the Fraser and previous glaciations. While the Puget Lobe occupied the area, it eroded not only pre-existing sediments but also the bedrock. Many bedrock hills were rounded, and many preglacial and interglacial stream valleys were modified. Just before and after each passage of the Cordilleran Ice Sheet, channels were eroded by vigorous meltwater streams (e.g., Leland Lake) (Figure 5).

Figure 5. Leland Lake meltwater channel (photo by K.L. Hanson).

The weight of the Cordilleran Ice Sheet depressed the land during each glaciation. As the southern edge of the Puget Lobe retreated northward past the northeastern Olympic Peninsula, marine waters invaded the Puget Lowland, initiating the Everson Interstade (Armstrong *et al.*, 1965). Although sea level was lower than at present, the land was depressed, so marine waters floated the Puget Lobe, and glaciomarine drift was deposited about 12,000 years ago. Afterwards, isostatic rebound was greater than sea level rise, so the glaciomarine drift is exposed (Protection Island).

Holocene Epoch

The constructive and destructive processes which have been sculpturing the land since the retreat of the ice remain active today. Sea bluffs are being eroded and the detritus is being in part redeposited as beaches, barriers, tombolos, and spits. Streams are eroding valleys, transporting sediments downstream and depositing the sediments in flood plains along stream channels or carrying them into lakes or bays where deltas are formed (Dabob and Quilcene Bays). Organic material is collecting in ponds and lakes where peat is being formed (Crockett Lake). Surface weathering and soil formation continue.

Stratigraphic Units and Their General Water-Bearing Characteristics

Plates I and II show the surface outcrops of the units to be described and their subsurface occurrence and relationship as interpreted from surface mapping and well log data.

Tertiary Rocks

Volcanics (Tv)

The oldest exposed rocks in the project area are volcanics of the lower(?) and middle Eocene Crescent Formation (Tabor and Cady, 1978). These occur in the Olympic Mountains and in scattered outcrops extending from the southeastern side of Port Discovery to the northern shore of Squamish Harbor. In eastern Jefferson County the Crescent Formation (Figures 6 and 7) is dominated by basalt flows and mudflow breccias, but also contains basaltic conglomerate, breccia, and minor argillite (Tabor and Cady, 1978). The only other igneous rocks of much extent in the project area are volcanics and shallow intrusives in the middle and upper Eocene Lyre Formation; in the vicinity of Anderson and Gibbs Lakes are andesite flows, tuff, and breccia (Tabor and Cady, 1978).

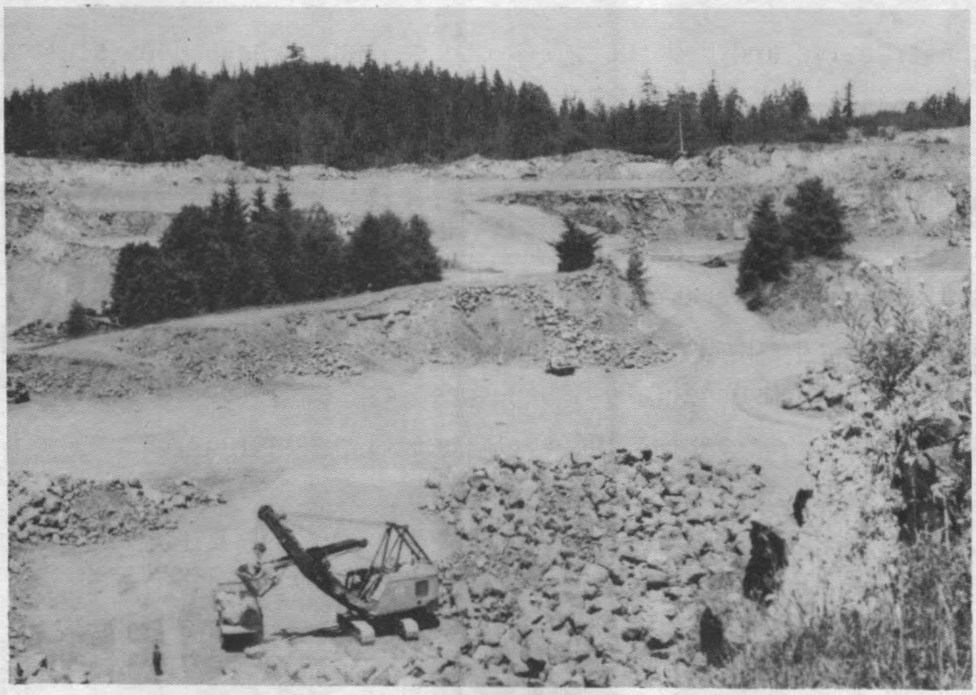


Figure 6. Eocene basalt in Mats Mats quarry (photo by K.L. Hanson).

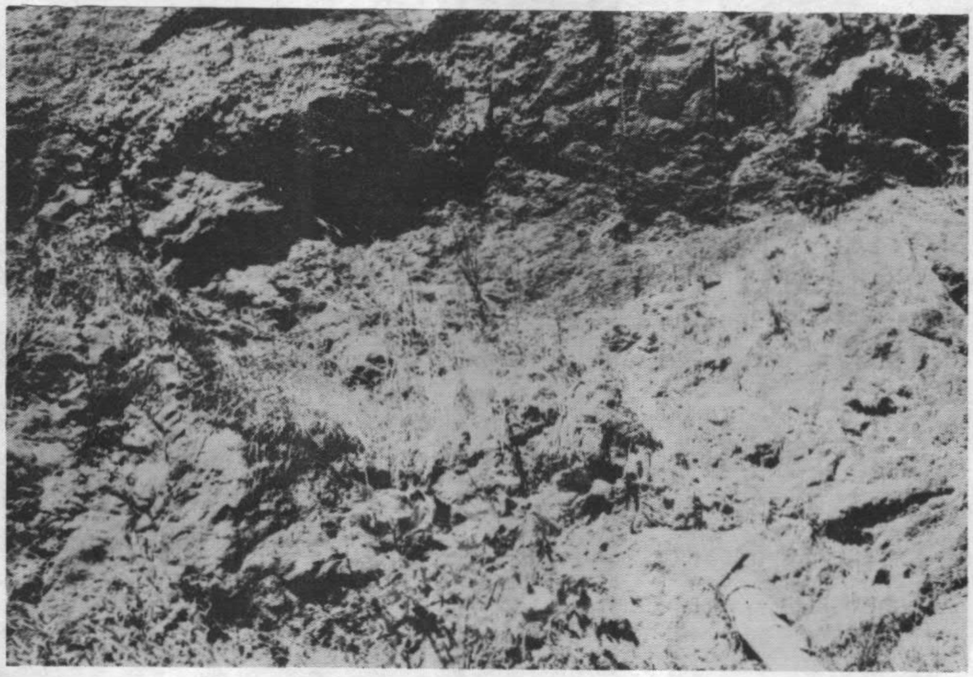


Figure 7. Basalt flow in Eocene Crescent Formation (photo by R.J. Carson).

Because the Eocene volcanics are lacking in primary porosity and permeability, water availability is dependent on jointing and fractures for the storage and transport of water. Where these are present below the saturated zone, water is producible; the quantity is dependent upon the interconnection of water-filled fractures penetrated by the well and recharge. Consequently, because of the random orientation of fractures, the yield of adjacent wells and the depth to water can vary greatly. Three wells used for domestic supply in Olympic-Canal Tracts (25/2W-21E1, F2 and F6) which are within 100 yards of each other and produce water from the volcanics, were drilled to 236 feet, 435 feet and 185 feet; water levels are below land surface at 32.5 feet, 207 feet, and above land surface (i.e., flowing well), respectively.

Generally, the volcanics are not significant producers of ground water. However, several artesian wells on Hood Canal near the boundary between Jefferson and Mason Counties supply a number of homes. Reportedly, one well (25/2W-31L1) was test pumped at 60 gallons per minute (duration of pumping unknown) and another (24/2W-6E1) was tested at 55 gallons per minute for 48 hours.

Sedimentary Rocks (Ts)

Interbedded with and overlying the volcanics in the project area are Eocene and Oligocene sedimentary rocks (Figure 8). The wide distribution of these clastic rocks is shown in Plate I. The formation names, ages, and lithologies are summarized in Table 3. The detrital sedimentary rocks are indurated and require secondary porosity and permeability to store and transmit water. The yield is low and wells dependent upon this source generally produce no more than 5 gallons per minute.

Table 3. Sedimentary rocks of eastern Jefferson County and easternmost Clallam County.

Formation	Age	Major Lithologies	Minor Lithologies	References
Marrowstone Shale	Middle Oligocene	Sandstone, siltstone, and shale		Allison, 1959
Quimper Sandstone	Lower Oligocene	Sandstone		Allison, 1959; Tabor and Cady, 1958
Twin River Formation	Upper Eocene (in project area)	Siltstone and mudstone	Sandstone	Sherman, 1960; Hamlin, 1962; Tabor and Cady, 1978
Lyre Formation	Middle and upper Eocene	Conglomerate and sandstone	Shale and siltstone	Allison, 1959; Tabor and Cady, 1978
Aldwell Formation	Middle and upper Eocene	Siltstone	Sandstone and conglomerate	Tabor and Cady, 1958
Scow Bay Formation	Early and middle Eocene	Sandstone, shale, and siltstone		Allison, 1959

Figure 8. Near-vertical beds of upper Eocene siltstone photo by R.J. Carson).

Quaternary Deposits

Except for the igneous and sedimentary bedrock, the report area is underlain by unconsolidated-to-poorly-consolidated clay, silt, sand, and gravel and lodgment till of Quaternary age. The maximum thickness of Quaternary sediments probably exceeds 2,000 feet beneath the northern shore of the Quimper Peninsula and the southeastern tip of the Toandos Peninsula (Hall and Othberg, 1974). A well drilled to a depth of 1,000 feet near the coast west of Diamond Point on the Miller Peninsula did not encounter bedrock.

The Quaternary sediments, ranging from the oldest to the youngest, have been divided into five units: Pleistocene deposits, undifferentiated (Qu); Vashon advance outwash (Qva); Vashon lodgment till (Qvt); Vashon recessional drift (Qvr); and Holocene deposits (Qal).

Pleistocene Deposits

Pleistocene Deposits, Undifferentiated (Qu)

Overlying the Tertiary bedrock and predating the advance outwash of the Vashon Stade of the Fraser Glaciation are glacial and nonglacial deposits, most of which correlate with the Double Bluff and Possession Drifts and the Whidbey Formation. In addition, a more weathered pre-Vashon drift (Figure 9) is exposed in the southernmost part of the project area (Frisken, 1965). This unit also includes early Vashon fine-grained sediments (sand, silt, and clay) deposited in relatively quiet environments. The most dominant characteristic of this unit is its variability in sorting, stratification, porosity, and permeability. It ranges from lodgment tills to fine-grained peaty sediments to glaciofluvial gravels.

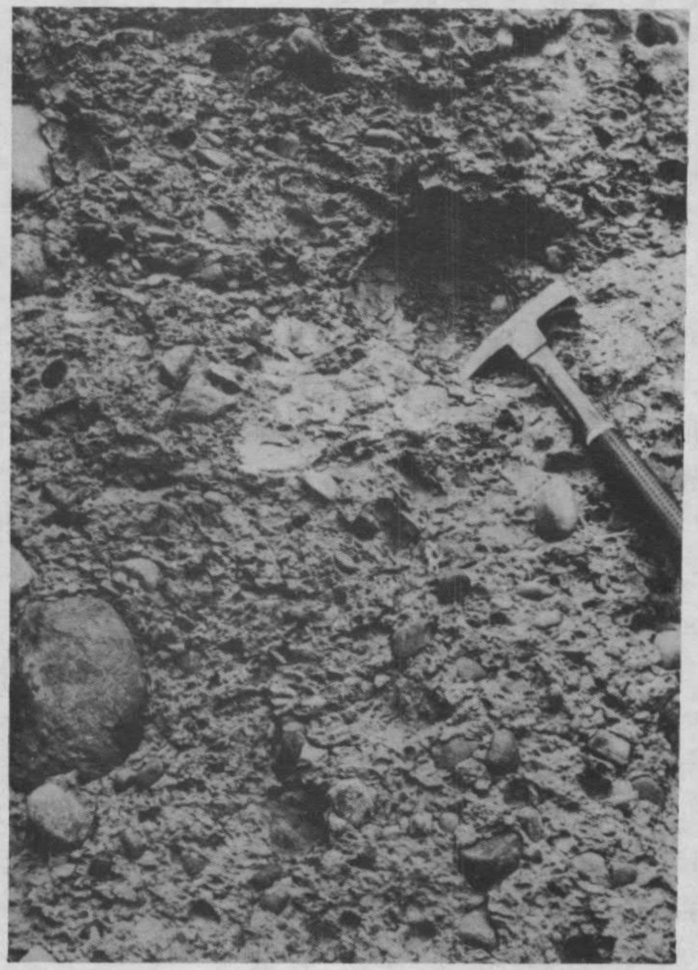


Figure 9. Weathered pre-Vashon till (photo by R.J. Carson).

This unit does not have much areal exposure, being almost everywhere buried by till and other drift of the Vashon Stade. It is commonly exposed in shoreline bluffs such as along the Strait of Juan de Fuca and Hood Canal. Characteristically, two diamictons (till and/or glaciomarine drift) are located within this unit; the upper one is interpreted as Possession Drift (Figure 10), and the lower one, near sea level, as Double Bluff Drift.

Figure 10. Possession till near Leland Lake (photo by K.L. Hanson).

The glacial diamictons are aquicludes, but just above or below each may be limited aquifers in outwash sands and gravels. The Whidbey Formation and other nonglacial sediments may provide some water where sands are more prevalent than silts, clays, and peat.

At the top of the Pleistocene Deposits, Undifferentiated unit is bedded to massive, brown-to-gray sand (Figure 11) with some thin beds of clay and lenses of gravel. This sand, exposed in many sea bluffs throughout the report area, is lithologically similar to and appears to occupy the same stratigraphic position as the Colvos (Molenaar, 1965), Esperance (Mullineaux *et al.*, 1965), and Quadra (Clague, 1976) sands mapped elsewhere in the Puget Lowland. The sand is productive throughout the project area where present, but high yielding wells are the exception rather than the rule.

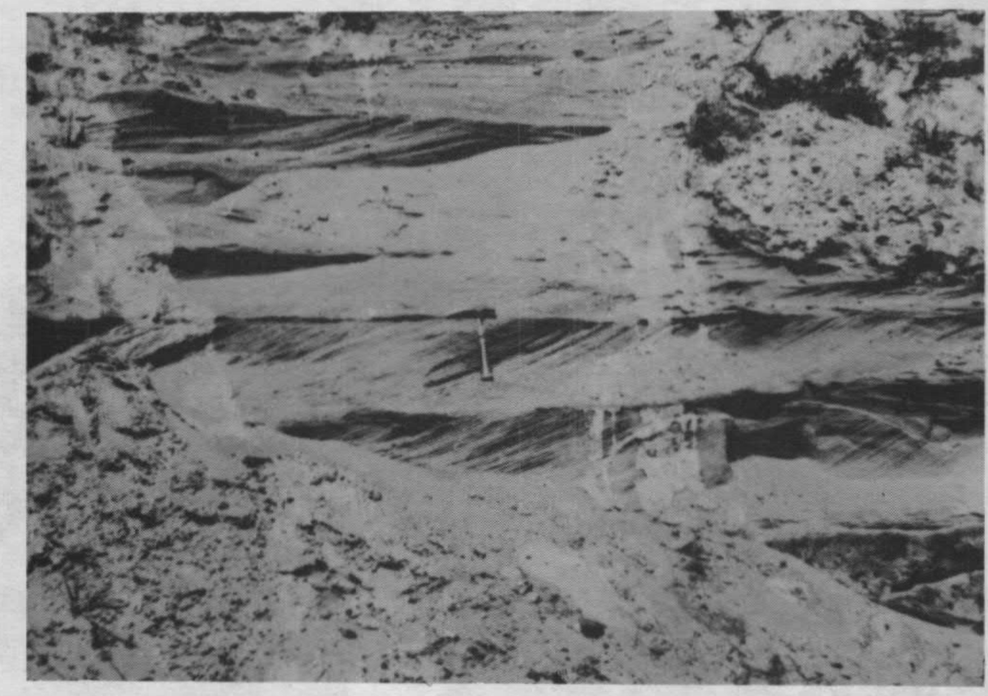


Figure 11. Cross-bedded sand on Marrowstone Island; interpreted to be Vashon advance outwash (photo by M.J. Gayer).

The areal extent and thickness of the preserved portion of the Pleistocene Deposits, Undifferentiated unit is conjectural. Most of the approximately 2,000-foot thickness of Quaternary sediments across the northern edge of the area from the Miller Peninsula to Marrowstone Island and at the southern end of Toandos Peninsula (Hall and Othberg, 1974) is below Vashon advance outwash. Wells drilled to 1,000 feet on the Miller Peninsula (near Diamond Point) and to 1,462 feet on Marrowstone Island (at Fort Flagler) did not encounter bedrock; field work suggests that the Vashon Drift is less than 200 feet thick near these two wells, so there is a considerable thickness of pre-Vashon deposits.

This unit is mostly a product of deposition, erosion, and reworking by several advances and retreats of the Cordilleran Ice Sheet. The depositional sequence is complicated by addition and removal of sediments by alpine glaciers and their meltwater originating in the Olympic Mountains. Further, fluvial and marine erosion and deposition occurred during nonglacial intervals. These types of processes result in the abrupt termination of lithologic units in the vertical and horizontal dimensions. Therefore, it is common to find coarse sand and open gravel which, if of sufficient thickness and/or areal extent, are capable of holding and transmitting large amounts of water, above, below, or adjacent to fine-grained sediments which will yield little or no water.

Encountering a water-bearing unit does not guarantee a long-term, high-yielding well, however, as yield is a function of recharge, the unit's storage capacity, and its transport capability. Keeping the geologic processes mentioned above in mind, it is understandable why wells drilled near one another to the same depth may have yield characteristics which are markedly different. In general, the water yield of the Undifferentiated sediments is low, and often is sufficient only for single-family use.

Vashon Drift

This drift was deposited during the advance and retreat of the Cordilleran Ice Sheet during the Vashon Stade of the Fraser Glaciation. Because the Cordilleran Ice Sheet originated in British Columbia and crossed crystalline rocks on its route southward, granitics, quartzite, and gneiss are common clasts in Vashon Drift. As the drift was deposited only about 14,000 years ago, it is generally weathered only a few feet.

Advance Outwash (Qva)

Outwash sands and gravels were deposited by meltwater in front of the advancing Cordilleran Ice Sheet. The gravels (Figure 12) are representative of a high-energy depositional environment near the front of the Puget Lobe, whereas the sands indicate slower moving streams which deposited their load farther away. Because of the subsequent movement of the ice over these unconsolidated sediments, advance outwash is missing in some places.

Figure 12. Stratified cobble to boulder gravel (Vashon advance outwash) overlain by Vashon lodgment till (photo by K.L. Hanson).

Outwash sands and gravels generally have good primary porosity and permeability. If they occur below the zone of saturation and recharge is adequate, large quantities of water are producible from this unit. In general, Vashon advance outwash is the best aquifer in the project area.

Lodgment Till (Qvt)

Lodgment till (Figure 13), commonly known as "hard pan", resembles concrete because it consists of compacted, unsorted, unstratified mixture of clay, silt, sand, pebbles, cobbles, and boulders. The Cordilleran Ice Sheet eroded existing bedrock and Pleistocene deposits and smeared the eroded materials at its base. The compactness is due to the pressure of the moving glacier on the fine-grained component of the lodgment till.

Figure 13. Vashon lodgment till (photo by M.J. Gayer).

Vashon till is near the surface over most of the project area, but is generally covered by at least a few feet of recessional drift or Holocene deposits. Outcrops of lodgment till are common, particularly near the top of sea bluffs; because the compact till is resistant to erosion, it protects the underlying unconsolidated sediments. A prominent outcrop is readily examined in the southeast facing bluff above the highway near the southern outskirts of Port Townsend (Figure 14).

Because of its compactness and impermeability, the till is not a significant water producer. It retards the downward movement of water and serves as a base to hold it in overlying sands and gravels where it may occur in sufficient amounts for domestic use. Many of the lakes in the area occupy depressions in the impermeable till. Because it slows the downward percolation, it limits the recharge of underlying units which may be capable of holding and transmitting water.

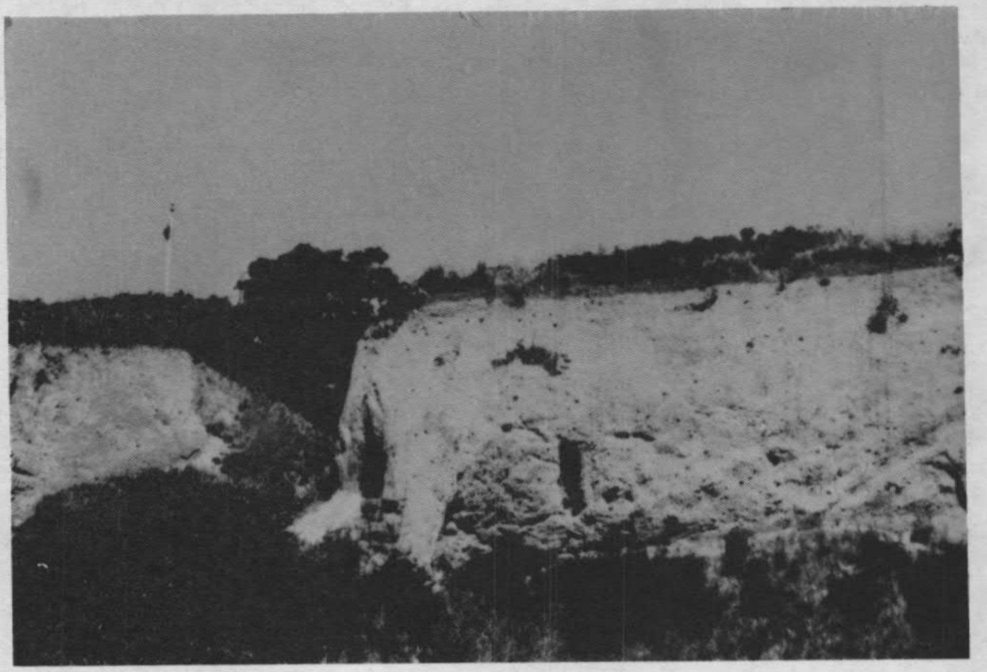


Figure 14. Bluff of Vashon lodgment till in Port Townsend (photo by M.J. Gayer).

Stratified sand and gravel are seen in scattered outcrops of the lodgment till, but the permeable layers and lenses of sediment make up only a small proportion of the total unit. They may, however, contain enough water for domestic supply.

The glaciomarine drift (Figure 15) of the Everson Interstade is included with Vashon lodgment till because it is unsorted, unstratified, and impermeable. The only significant amount of this unit is near the surface on Protection Island.

Recessional Drift (Qvr)

Vashon recessional drift is a unit which includes relatively porous and permeable sediments deposited during and just after the last retreat of

Figure 15. Everson Glaciomarine Drift on Protection Island (photo by M.J. Gayer).

the Puget Lobe from western Washington. It consists of ablation till, ice-contact stratified drift, and recessional outwash. The ablation till (Figure 16) is unstratified, poorly sorted, and relatively loose because it was deposited from within or from the surface of the retreating ice. The ice-contact stratified drift (Figure 17) was deposited by meltwater running on, within, or adjacent to stagnant ice, and composes eskers, kames, and kame terraces. It generally exhibits considerable variation in sorting, stratification, and grain size. Recessional outwash (Figure 18) is sorted and stratified sands and gravels deposited by meltwater in channels, deltas (e.g., near the mouths of Fulton Creek and the Dosewallips River), and alluvial fans. Because Vashon recessional drift is the last deposit left by the melting glacier, it is relatively undisturbed. It is generally lacking in clay and silt particles, has good porosity and permeability, and is capable of holding and transmitting large amounts of water if the unit occurs below the regional water table.

Figure 16. Vashon ablation till exposed in road cut near Port Ludlow (photo by K.L. Hanson).

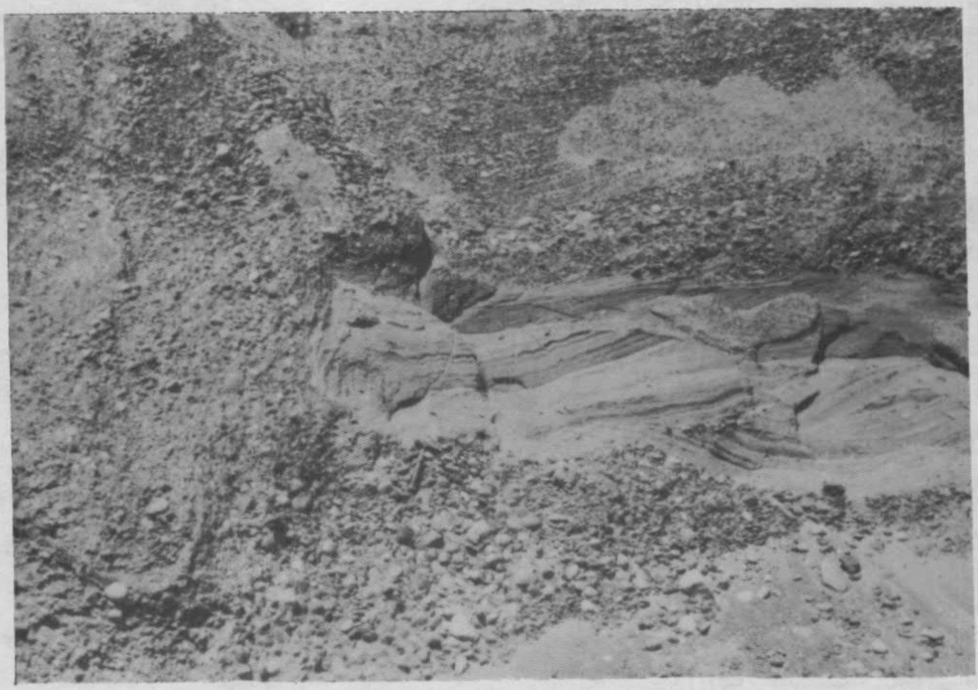


Figure 17. Vashon ice-contact stratified drift on the northwestern Quimper Peninsula (photo by M.J. Gayer).

Figure 18. Gravel pit in delta of Vashon recessional outwash - Chimacum Drift Plain (photo by K.L. Hanson).

Holocene Deposits (Qal)

This unit as shown on Plate I consists of a wide variety of unconsolidated sediments of Holocene age. Stream sediments include flood-plain alluvium and alluvial fan deposits of gravel, sand, and silt; if in hydraulic continuity with a perennial stream, the alluvium will yield large to moderate quantities of water to relatively shallow wells. Lake, marsh, swamp, and lagoon deposits are the products of a less vigorous depositional regime and, therefore, are finer grained and yield less water. Deltas (e.g., those of the Duckabush and Dosewallips Rivers) and beach sands and gravels are porous and water productive; however, because of their proximity to sea water, excessive pumping may lead to salt water intrusion. The sand dunes at Point Wilson are close to sea level, and those on top of Protection Island are above the water table.

GROUND WATER

Hydrologic Setting

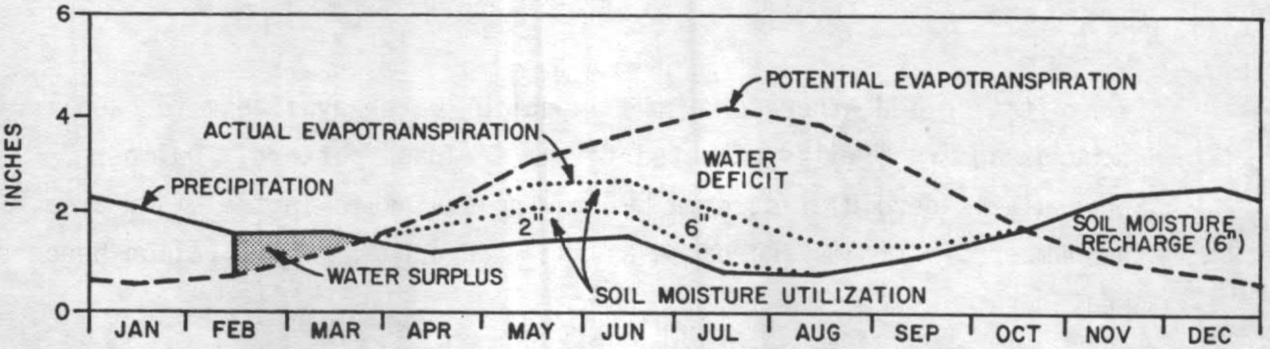
Recharge

Precipitation is the main source of aquifer recharge in the study area. The amount of precipitation varies annually, seasonally, with locale, and with altitude. Only a portion finds its way to the aquifers; some is lost to evapotranspiration, the process whereby water is returned to the atmosphere by evaporation from the earth's surface and by transpiration from plants; some is lost to surface runoff and some is retained as soil moisture. The remainder becomes ground water.

The mean annual water budgets for Port Townsend and Quilcene are graphically portrayed in Figure 19. The portions of the graphs labeled "water surplus" are of particular interest because these represent the water available for aquifer recharge and surface-water runoff. The solid lines on the graphs represent precipitation, the dashed lines potential evapotranspiration, and the dotted lines actual evapotranspiration for soils having water-holding capacities of two inches and six inches. Evapotranspiration rates are determined by the Thornthwaite method which applies an empirical formula based on temperature and latitude; therefore, the evapotranspiration curve closely resembles the temperature curve. With the advent of the rainy season in October, the curves for precipitation and evapotranspiration cross and the soil moisture which was depleted during the dry summer months is replenished. In the Quilcene area where the annual precipitation averages 50 inches, the replenishment is completed in November and a surplus of water available for surface runoff and aquifer recharge continues to build until the end of April when the lines of precipitation and evapotranspiration intersect again and soil moisture depletion begins.

PORT TOWNSEND

WATER HOLDING CAPACITY OF SOIL	2"	6"
PRECIPITATION	18.3	
POTENTIAL EVAPO-TRANSPIRATION	25.2	
ACTUAL EVAPO-TRANSPIRATION	14.4	17.7
WATER SURPLUS	3.9	0.6



QUILCENE 2 SW

WATER HOLDING CAPACITY OF SOIL	2"	6"
PRECIPITATION	50.0	
POTENTIAL EVAPO-TRANSPIRATION	25.1	
ACTUAL EVAPO-TRANSPIRATION	17.4	20.3
WATER SURPLUS	32.6	29.7

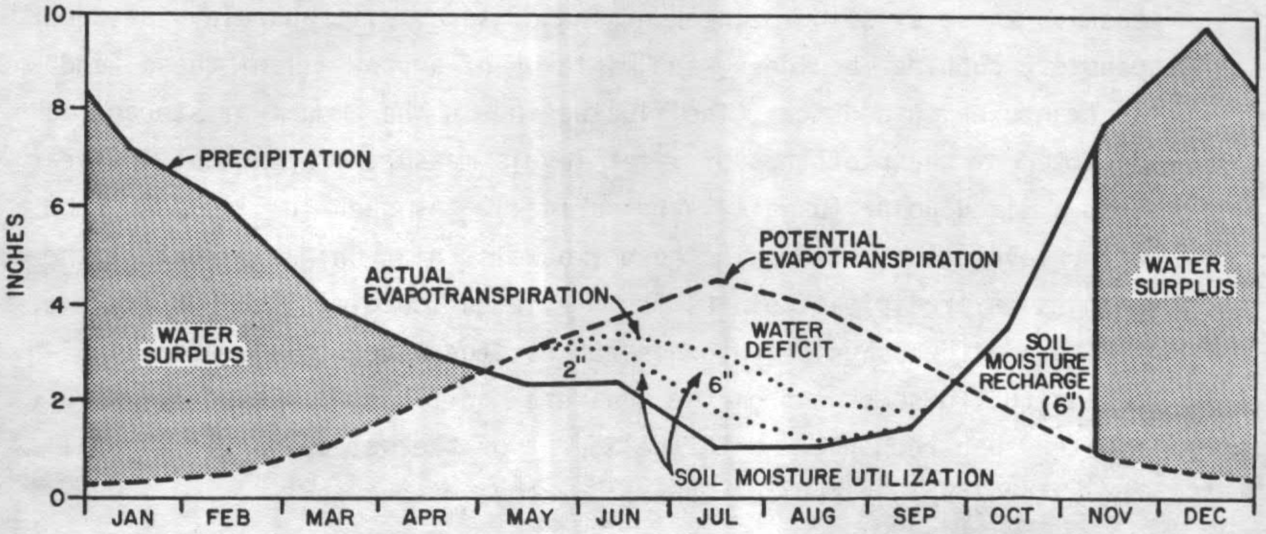


Figure 19. MEAN ANNUAL WATER BUDGETS.

At Port Townsend where the mean annual precipitation is much less (18.3 inches), recharge of soil moisture begins in October and continues until February when this demand has been satisfied. The amount available for runoff and aquifer recharge is insignificant (0.6 inch - 6 inch soil water-holding capacity) as compared with 29.7 inches in the Quilcene area.

Precipitation and, therefore, the amount of water available for aquifer recharge and runoff is reflected in the drainage pattern. Quimper Peninsula is devoid of streams but moving southward in the study area, the number of streams increases as the mean annual precipitation becomes greater.

Another factor affecting ground-water recharge is the underlying lithology. Where impermeable consolidated rocks (Tv, Ts) occur at land surface, much of the precipitation runs off. This is reflected in stream flow which fluctuates directly with changes in precipitation. In areas underlain by impermeable till (Qvt) which greatly impedes downward percolation, ponding with resultant evapotranspiration and runoff occur. In the more permeable units (Qva, Qvr, Qal), the movement of water to the ground water is more direct and less is lost to runoff and evapotranspiration.

The storage of water underground is dependent on interconnected openings such as those existing between grains of sand, silt and clay, between pebbles, cobbles, boulders, and mixtures of any or all of these, and on fractures in bedrock. The fluctuation in the amount of storage is depicted by the plottings of water levels measured throughout the year from a fixed point (usually land surface). As seen in Figure 20, the water level fluctuations in these two wells near Chimacum reflect the changes in precipitation. As the precipitation diminishes during the spring and the usage of water increases, the water levels drop, indicating that discharge from the aquifers monitored by the wells is greater than recharge. With the advent of the wet season in the fall, the water levels rise and recharge exceeds discharge.

The curves constructed by connecting points of maximum drawdown (dashed lines, Figure 20) for each well are similar and indicate a decrease in the amount of discharge in 1970 and 1971. This may be the result of an increase in the amount of precipitation or a more favorable distribution of precipitation so that withdrawals from the wells were less.

Discharge

The water that finds its way to the ground-water system moves slowly under the force of gravity to areas of discharge. Most of it escapes to streams, lakes, and marine waters. All of the perennial streams in the area are sustained entirely by ground water inflow during the drier part of the year except those originating in the high Olympic Mountains which are largely snow fed. Where aquifers are cut by valley sides, man-made cuts, and sea bluffs, discharges occur as springs. Another type of discharge results from the pumping of wells.

Ground-water Occurrence and Development

As already indicated, ground water generally is found throughout the report area; the quantity of available water and water depth, however, vary considerably. A total of 374 wells, listed in Table 1 and plotted on Plate III, was canvassed.

Water-level measurements were reported for 355 of the canvassed wells and a tabulation of depth to water measured from ground level indicates:

Depth to Water in Feet	Number of Wells	Percent
Above ground level	19	5
0 - 25	123	33
26 - 50	77	21
51 - 75	40	11
76 - 100	23	6
101 - 125	14	4
126 - 150	9	2
151 - 175	8	2
176 - 200	12	3
201 -	30	8
Unknown	19	5
	374	100%

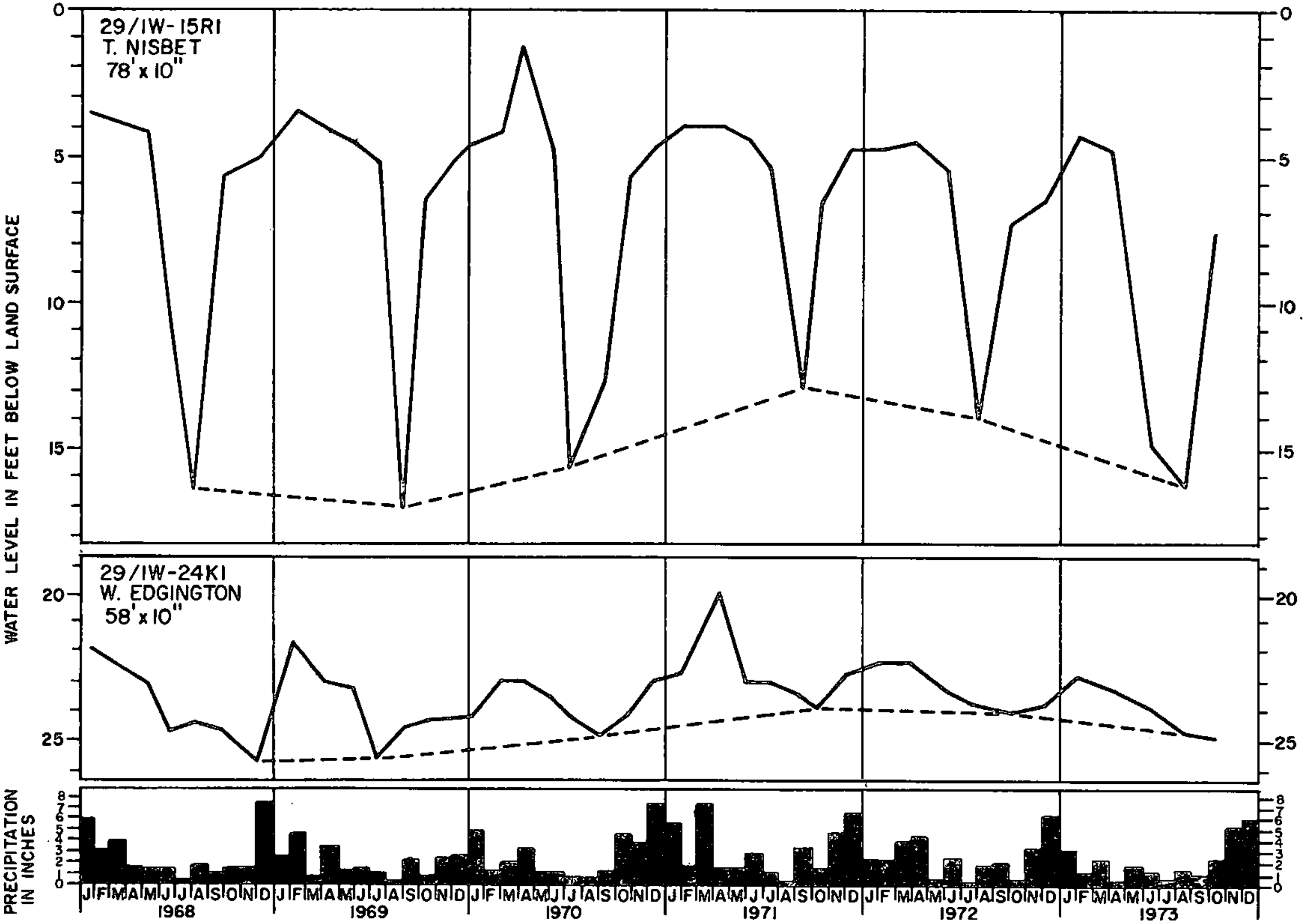


Figure 20. WATER-LEVEL FLUCTUATIONS IN OBSERVATION WELLS, AND PRECIPITATION AT CHIMACUM DURING THE PERIOD 1968-73.

Over 70 percent of the wells (Figure 21a) have water levels occurring at 100 feet or less and over 80 percent at 200 feet or less.

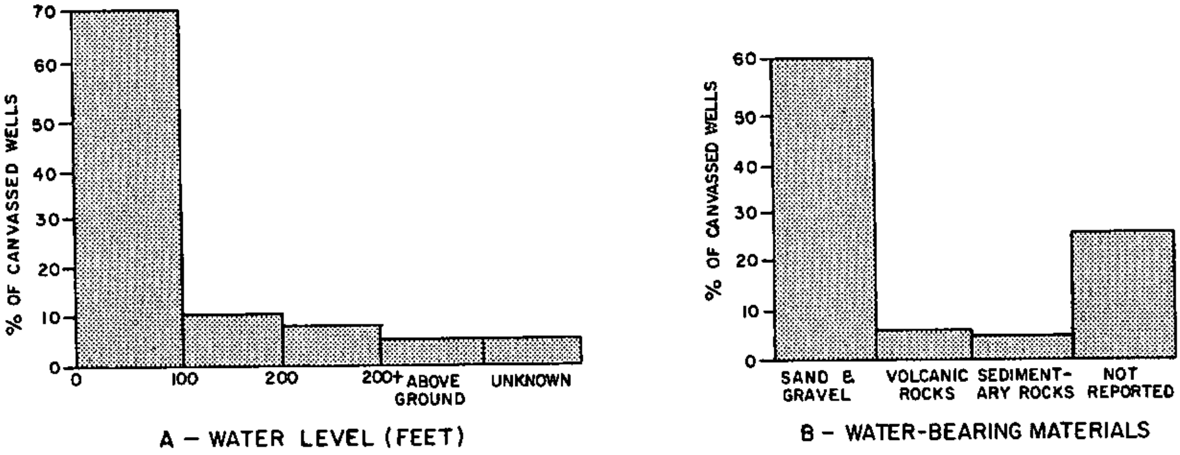


Figure 21. PERCENTAGE OF CANVASSED WELLS RELATIVE TO WATER LEVELS (A) AND TO WATER-BEARING MATERIALS (B).

Water-bearing zones consist of Quaternary sand and gravel in 228 wells, of Tertiary volcanics in 28, and of Tertiary sedimentary rocks in 18. The lithology of water-bearing zones was not described in 100 of the 374 canvassed wells (Figure 21b). In general, water productivity from the Quaternary sediments ranges from high to low whereas the quantity of water produced from Tertiary volcanics and sedimentary rocks is consistently low. Bailing tests of wells in the sedimentary rocks vary from 15 gallons per minute with a drawdown of 32 feet in 23 hours to 9 gallons per minute with a drawdown of 250 feet in 1 hour. Similar tests in Tertiary volcanic rocks range from 15 gallons per minute and no drawdown in 2 hours to 2 gallons per minute and 100 feet of drawdown in 2 hours.

Ground-water development in the subareas outlined on Figure 3 is discussed in the following sections.

Foothills of the Olympic Mountains

This is a heavily forested area and much of it is national or state forest lands. It is lightly populated and most of the inhabitants live near the salt water. With few exceptions, all appropriated ground water is for household use.

Some 60 wells, all of which are in or near the foothills, were located or measured in this subarea. Many of these are developed in the volcanics (Tv) or indurated sedimentary rocks (Ts), and with few exceptions are low yielding and adequate only for single family use. Wells drilled in sands and gravels in hydraulic continuity with perennial streams or in sands and gravels of glaciofluvial origin which extend below the water table produce water of varying amounts; several are used for group domestic supply.

Several wells with yields which are adequate for supplying a number of homes produce from volcanics. These are artesian and storage is in fractures and porous zones between lava flows. If a flow which is brecciated and vesicular at the top is overlain by one having a fractured base, and water is present, the resulting aquifer will be highly productive provided recharge is adequate. So far, few wells have found these productive zones and the quantity of water produced from basalt wells is limited.

The indurated sedimentary rocks (Ts) are fine grained, have little or no primary effective porosity, and the fractures necessary for the storage and transmittal of water are not well developed. Wells in this lithologic unit, as mentioned previously, are often dry or very poor producers.

Bolton and Toandos Peninsulas

The 15 wells located and examined in this subarea pump water from glaciofluvial deposits, but none have proven to be prolific producers. The only well drilled and completed for purposes of maximum production is the Jefferson County Water District Well #3 (26/1W-33J1) near Coyle on the Toandos Peninsula. It was pumped for 22 hours at an average rate of 135 gallons per minute (gpm) with a drawdown of 64 feet; this equates to a specific capacity of 2+ gpm per foot of drawdown. The recovery from maximum drawdown to static water level was almost immediate. The well is 322 feet deep, the static water level is 227 feet, and the elevation of the well is about 245 feet above mean sea level. If a drawdown equivalent to 2/3 of the water column in the well (60 feet) were allowed during production pumpage, a yield of 120 gpm is feasible. Withdrawal at the above rate would result in a pumping level of 42 feet below mean sea level. As the well is about one-half mile from Hood Canal and it is assumed that pumping will be intermittent, sea-water intrusion is not likely. However, if the well is pumped continuously and/or if more wells are added, monitoring for intrusion should be carried out.

Outcrops of Tertiary sedimentary rocks at the southern end and at two locations on the eastern side of Bolton Peninsula indicate that the thickness of Quaternary deposits is limited and the possibility of extensive water development is poor. As discussed earlier, the underlying Tertiary sedimentary rocks have proven to be tight and yield little, if any, water. Quaternary deposits in the central and southern parts of Toandos Peninsula are 1,000 to 2,000 feet or more in thickness and the probability of finding ground water there is greater.

Caution should be exercised when withdrawing water from wells located near salt water because of the possibility of sea-water intrusion. This problem can be lessened by placing the pump intake immediately above mean sea level and thus avoiding complete reversal of the ground-water gradient which might lead to sea water being drawn into the well.

Chimacum Drift Plain

This subarea extends from the foothills of the Olympics to Hood Canal and Puget Sound, and from the arbitrarily drawn northern boundaries of Toandos/Bolton Peninsulas to the southern boundary of Quimper Peninsula.

Although this portion of eastern Jefferson County is characterized by the presence of glacial and glaciofluvial deposits, numerous outcrops of Tertiary volcanic and sedimentary rocks occur throughout. Well yields based on the 130+ wells examined range from dry to some of the most productive in the report area.

As in the previously described subareas, most of the land is wooded and the dominant industry is logging. Farming is concentrated primarily in West and Chimacum Valleys, and although some irrigation pumpage is taking place, it is sporadic. Practically all of the ground water being withdrawn is for domestic supply. The residents of Quilcene rely on individual wells for their water needs. Chimacum is supplied by the City of Port Townsend which diverts water from the Quilcene River. The development at Port Ludlow is supplied by water from several wells located in the uplands west of Port Ludlow.

Of the wells examined, the more productive are:

> The Edgington Well (29/1W-24L1) which was test pumped in 1975 at the rate of 227 gpm for 72 hours. The maximum drawdown in the pumping well, 7 feet, was reached after 12 minutes and remained at this level for 72 hours. The specific capacity is ≈ 32 gpm per foot of drawdown. Bailer and brief pumping tests reported in drillers' logs of two nearby wells indicate comparable capacities. The artesian aquifer(s) consisting of sand and gravel deposits was probably laid down by a fast-flowing glacial stream which winnowed out the fines, leaving a porous and permeable unit capable of storing and transporting large quantities of water.
>
> An irrigation well drilled in West Valley (29/1W-22R1) reportedly was tested at 250 gpm with a resulting drawdown of 11 feet (specific capacity ≈ 24 gpm per foot of drawdown). To point out the unpredictability of drilling in this area, another well located less than one-half mile east of the above and at a lower altitude near Chimacum Creek, did not find water-bearing sands and gravels as anticipated but encountered Tertiary sedimentary rocks instead.

> The two wells (28/1E-8H1 and 8Q1) which supply the Pope and Talbot Port Ludlow development were test pumped about two hours each and had specific capacities of 2.2 gpm and 4.0 gpm per foot of drawdown, respectively.

To be highly productive, wells must be properly constructed and aquifers must have adequate porosity (storage), adequate permeability (able to transmit), and they must receive recharge. The buried sand/gravel aquifer(s) mentioned above which is so productive satisfies all of these requirements. The topographic basin (recharge area) for this portion of the Chimacum area is large when compared with others in eastern Jefferson County.

Quimper Peninsula and Protection Island

In this subarea are located the county seat, the largest concentration of people, and the largest industry in eastern Jefferson County. The water needs of Port Townsend, the Crown Zellerbach mill, and the towns of Irondale and Hadlock and vicinity are supplied by a pipeline from the Quilcene River. In addition to the surface water, ground water from two wells is added to the system. One of them (29/1W-3G), the highest yielding production well in the study area, was test pumped for about 24 hours. The rate of withdrawal averaged 500 gpm and the drawdown at this rate was about 4 feet (specific capacity = 125 gpm per foot of drawdown). An irrigation well (29/1W-3J1) located about one-half mile south of the above well reportedly was pumped at 400 gpm with a drawdown of one foot. These wells probably produce from the same aquifer, or one with similar properties, as the two wells with high production potential previously described in the Chimacum Drift Plain subarea.

Other wells which have been pumped for an extended period of time at a relatively high rate of discharge are: Cape George Colony Well #4 (30/1W-18G1), which has been pumped at 200 gpm with a drawdown of 7 feet (specific capacity ≃ 29 gpm per foot of drawdown) and the City of Port Townsend well south of Hadlock which has been pumped at 200 gpm and had

21 feet of drawdown (specific capacity ≈ 10 gpm per foot of drawdown). The latter well, which formerly belonged to the Jefferson County Public Utilities District (PUD), is connected to the city's Quilcene River pipeline.

There is no approved water source on Protection Island. A well was drilled in 1973 to provide property owners with water, but because of poor quality the system has not been approved. Reportedly, a pipeline from Diamond Point to the island is under consideration.

Miller Peninsula

This subarea is forest covered with a coastline consisting generally of steep bluffs which make beach access difficult, and this, plus the fact that much of the land belongs to the state, has slowed development. Water for the scattered year-round and vacation homes comes from individual wells or from wells which supply a number of homes.

All of the withdrawals examined are from glaciofluvial sands and/or gravels except for some artesian wells south and east of Gardiner which reportedly produce from Tertiary sedimentary rocks.

Two wells which have been used for a number of years for group domestic supply are: well 30/2W-21Q1 which was test pumped at a rate of 310 gpm for 10 hours with a maximum drawdown of 27 feet (specific capacity ≈ 11 gpm per foot of drawdown); well 30/2W-28M1 was pumped at a rate of 125 gpm and the water level dropped 22 feet after 4 hours (specific capacity ≈ 6 gpm per foot of drawdown).

The Gardiner No. 1 well drilled in early 1979 for Jefferson County PUD, was tested at 990 gpm with 7.65 feet of drawdown (specific capacity ≈ 129 gpm per foot of drawdown). This is an excellent well which apparently is developed in a buried glaciofluvial channel. The productive zone is interpreted to consist of 8 feet of sand and gravel. This is a relatively thin aquifer and points to the need for methodical exploratory work to detect the productive zones and, subsequently, accurate screen installation and careful development.

Several wells drilled near the beach in the Diamond Point area (30/2W-15N1 and 22M1) have been abandoned and one (15L1) was pumped cautiously because of sea-water intrusion problems. A test observation well drilled for the Department of Ecology (30/2W-17G1) produced sea water from zones 489 to 531 ft, 814 to 877 ft, and 970 to 1,000 ft., as measured from top of casing.

Indian and Marrowstone Islands

These two islands, like much of the study area, are forested and sparsely populated. The water used at Indian Island, a Naval reservation, is supplied by the City of Port Townsend system. At one time, Marrowstone Island had a number of farms, but most people presently living there work elsewhere or are retired. The inhabitants of Marrowstone Island, with the exception of those at Fort Flagler State Park, rely on ground water. The aquifers are primarily in glaciofluvial deposits where the static water levels are at or near sea level near the beach and somewhat higher farther inland. Wells on the peninsula west of Nordland produce small quantities of water from Tertiary sedimentary rocks. Efforts to drill adequately productive wells at Fort Flagler have failed and water is supplied from the City of Port Townsend Quilcene River source and comes from the mainland via a pipeline which extends northward on Indian Island and under Kilisut Harbor to the park. Reportedly, a well drilled to 1,462 feet at Fort Flagler encountered fresh water at 1,456 feet in Quaternary sediments but the quantity (3-4 gpm) was inadequate. Several wells in Section 20 of 30/1E on Marrowstone Island are reported to have been bailed at quantities of up to 30 gpm with no drawdown but extensive tests have not been run.

CONCLUSIONS

The City of Port Townsend system, which receives water from the Quilcene River, services the city, the Crown Zellerbach plant, the Chimacum-Irondale-Hadlock area, Indian Island, and Fort Flagler State Park.

Ground water in the amount of about 500 acre-feet annually from two wells supplements the river diversion. It is estimated that about 8,000 persons are served by this system and about 1,000 use water from springs, streams, and lakes. The remainder of the 14,000 persons living in the report area, or about 5,000, are supplied from wells. Assuming that a household of 2 to 3 persons uses 1 acre-foot of water per year, the total withdrawal is estimated to be 2,000 acre-feet plus 500 acre-feet being pumped into the City of Port Townsend system plus about 1,000 acre-feet for irrigation or 3,500 acre-feet per year for all consumptive uses from aquifers in eastern Jefferson County.

If one assumes an average normal precipitation of 30 inches over the 350 square miles of the report area (560,000 acre-feet), existing water usage of 3,500 acre-feet represents less than 1% of annual precipitation and the average recharge to the aquifers greatly exceeds this. Therefore, there is adequate recharge for satisfying future anticipated water demands from ground water when assessing it on the basis of the entire report area. However, in areas where Tertiary sedimentary rocks make up the aquifer host rock, ground-water availability is limited and often inadequate for single family use. In areas where Tertiary volcanic rocks must be relied upon, the possibilities are greater, but depth to water is an unknown and, in general, the wells are low yielding. In areas underlain by Quaternary sediments, a number of aquifers may exist because of the mode of deposition but, to date, on the basis of available data, the areas where one can predict high yielding wells (500 GPM) are limited to near Chimacum, to the Eagle Creek area on the Miller Peninsula, and to sand and gravel deposits in hydraulic continuity with streams. This does not mean that high-yield wells having Quaternary objectives will not be completed in other areas. The recently drilled Jefferson County PUD well on the Miller Peninsula which tested abundant water (800 gpm) from a thin producing interval (8+ feet) is a good example and points to the need for more sophisticated explorational, screening, and developmental procedures than may have been used in the past.

Although water quality studies were not conducted, it is of interest that the highly productive wells near Chimacum reportedly have excessive amounts of iron, and/or manganese and/or nitrate and nitrite. The Pope and Talbot wells which supply the Port Ludlow development are treated to remedy manganese and hydrogen sulfide problems. The Cape George Colony wells on Quimper Peninsula and the wells used for community domestic supply on the Miller Peninsula are not being treated.

Sea-water intrusion problems have been encountered in scattered wells along the shores of Miller Peninsula and eastern Jefferson County but, based on recently collected data, there has been no further deterioration in water quality because of sea-water intrusion since a study conducted in the late 1960's (Walters, 1971).

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GLOSSARY

GLOSSARY

Many scientific or engineering terms have more than one meaning. In this glossary is given the meaning as used in this report. Most definitions are adapted from *Glossary of Geology* (Gary *et al.*, 1974).

Ablation Till - loosely consolidated sediment, formerly contained by a glacier, that accumulated in place as the ice melted and evaporated.

Advance Outwash - sediments deposited by meltwater streams before the site was overrun by the glacier.

Alluvial Fan - low, outspread, gently sloping mass of stream-deposited sediments shaped like a segment of a cone.

Alluvium - sediments deposited by streams, as on flood plains, deltas, and alluvial fans; the sediments are generally sorted and stratified.

Andesite - fine-grained, volcanic rock of intermediate color, and with less calcium, iron, and magnesium and more silicon and sodium than basalt.

Aquiclude - body of relatively impermeable sediment or rock which functions as an upper or lower boundary of an aquifer and transmits little if any ground water.

Aquifer - a body of rock or sediments that contains sufficient saturated permeable material to conduct ground water and to yield economically significant quantities of ground water to wells and springs.

Argillite - compact rock, derived from a fine-grained clastic sedimentary rock, that has undergone a higher degree of induration than is present in a mudstone or shale.

Artesian Well - well tapping confined ground water so that water level in well rises above the aquifer.

Bailing Test - a method to approximate the yield of a well by bailing a known quantity of water in a given time.

Barrier - elongate offshore ridge of sand or gravel rising above high tide, generally parallel to the shore and built up by the action of waves and currents.

Basalt Flow - lava flow composed of dark-colored, fine-grained volcanic rock containing iron, magnesium, and calcium.

Bedrock - rock, usually solid, underlying soil, drift, or other unconsolidated superficial material.

Boulder - detached and somewhat rounded rock mass having a diameter greater than 256 mm.

Breccia - coarse-grained clastic rock composed of large, dominantly angular fragments that are held together by a finer-grained matrix.

Channel Fill - sediments deposited by a stream or meltwater in an elongated depression eroded by water.

Clastic - pertaining to or being a rock or sediment composed of broken fragments derived from pre-existing rocks.

Clay - rock or mineral fragment or detrital particle having a diameter less than 1/256 mm.

Cobble - somewhat rounded rock fragment having a diameter in the range of 64 to 256 mm.

Confined Aquifer - aquifer bounded above and below by impermeable beds.

Conglomerate - coarse-grained, clastic sedimentary rock composed of mostly rounded fragments larger than 2 mm in diameter set in a fine-grained matrix of sand, silt, mud, and/or cement.

Consolidation - processes whereby loosely aggregated or soft earth materials become firm and coherent rock.

Continental Crust - the upper 20 to 40 miles of the solid Earth, underlying the continents and having a specific gravity of about 2.7.

Delta - low, nearly flat land deposited at the mouth of a stream, resulting from the accumulation in a sea or lake of sediment supplied by the stream.

Detritus - loose rock and mineral matter removed directly by mechanical means.

Diamicton - nongenetic term for a nonsorted or poorly sorted sediment that contains a wide range of particle sizes.

Discharge - (1) rate of flow at a particular time, expressed as volume per unit of time; (2) an area in which subsurface water reaches the land surface or a body of surface water.

Drawdown - difference between the static water level and the water level after the removal of water.

Drift - all rock material transported and deposited by glacier ice or meltwater.

Eolian - pertaining to the wind.

Esker - long, low, narrow, sinuous, steep-sided ridge of irregularly stratified sediments deposited by a meltwater stream flowing in an ice tunnel in a stagnant glacier.

Evapotranspiration - loss of water through transpiration of plants and evaporation from open bodies of water and from soil surfaces.

Flood Plain - surface of relatively smooth land adjacent to a stream channel, constructed by the stream and partly or completely covered with water during floods.

Flowing Well - well that yields water at the land surface without pumping.

Fluvial - of or pertaining to rivers, streams, and creeks.

Formation - mappable body of rock or sediment generally characterized by some degree of internal lithologic homogeneity or distinctive lithologic features.

Geohydrology - the study of flow characteristics of subsurface waters.

Geologic - Climate Unit - inferred widespread climatic episode defined from a subdivision of Quaternary sediments.

Glaciation - (1) erosional and depositional processes by glacier ice and the effects of such actions on the Earth's surface; (2) climatic episode during which extensive glaciers developed, obtained a maximum extent, and receded.

Glaciofluvial - pertaining to meltwater streams flowing from wasting glacier ice, and to the deposits and landforms produced by such streams.

Glaciolacustrine Sediments - unconsolidated sediments, generally fine-grained, deposited in lakes dammed by or near a glacier.

Glaciomarine Drift - sediments which accumulated in the marine environment and which contain a significant proportion of material dropped by floating glaciers or icebergs.

Gneiss - banded rock formed deep in the Earth where temperature and pressure are high (but temperature was not high enough for melting to occur).

Gradient - slope; in an aquifer, the rate of change of pressure head per unit of distance of flow at a given point and in a given direction.

Granitic Rock - term loosely applied to any light-colored, coarse-grained igneous rock.

Gravel - loose accumulation of rounded rock fragments, consisting dominantly of particles larger than sand.

Ground Water - all subsurface water, as distinct from surface water.

Hydraulic Continuity - property whereby water moves from one unit to another such as from stream to aquifer.

Ice-contact Stratified Drift - sediments deposited by meltwater adjacent to glacier ice.

Ice Sheet - an existing or former glacier of considerable thickness and vast area, forming a continuous cover of ice and snow over a land surface, spreading outward in all directions, and not confined by the underlying topography.

Igneous - pertaining to rock solidified from molten or partly molten material, whether formed at or beneath the Earth's surface.

Induration - hardening of rock material by the action of heat, pressure, or the introduction of cement.

Intermittent Stream - stream or stream reach that flows only at certain times of year, as during the rainy season.

Interglaciation - climatic episode during which the climate was incompatible with the wide extent of glaciers that characterized a glaciation.

Interstade - climatic episode within a glaciation during which a secondary recession or a still stand of glaciers took place.

Intrusive - rock formed by emplacement of molten material in pre-existing rocks.

Isostatic Rebound - upward adjustment of the Earth's crust in response to a reduced load; e.g., the melting of glaciers.

Joint - surface of breakage in a rock, without displacement.

Kame - low, steep-sided hill composed of irregularly stratified sediments deposited by a meltwater stream against the margin of a stagnant glacier.

Kame Terrace - a long, narrow, relatively level surface bounded on one edge by a steeper descending slope and on the other edge by an ascending valley wall; composed of irregularly stratified sediments deposited by water between a melting glacier and the valley wall.

Kettle - a depression in drift which may contain a lake or swamp; formed by the melting of a large, detached block of stagnant ice that had been wholly or partially buried in the drift.

Lacustrine - pertaining to, or deposited in, a lake.

Lagoon - shallow stretch of water near or communicating with the sea and partly or completely separated from the sea by a barrier.

Lava Flow - solidified body of rock that was a surficial outpouring of molten material from within the Earth.

Lithology - physical character of a rock, including mineralogic composition, texture, and grain size.

Lodgment Till - compact unsorted and unstratified sediments deposited directly by and beneath a glacier.

Marsh - poorly drained area, intermittently or permanently water-covered, having aquatic or grasslike vegetation.

Matrix - Finer-grained continuous material enclosing, or filling the spaces between, the larger grains of a sediment or sedimentary rock.

Meandering Stream - stream having a pattern of successive windings.

Mudflow - mass of fine-grained earth material (water saturated while flowing) and debris (e.g., basaltic clasts) that possessed a high degree of fluidity during movement.

Mudstone - blocky or massive, fine-grained sedimentary rock consisting of clay and silt.

Oceanic Crust - the upper 5 to 10 miles of the solid Earth, underlying the ocean basins and having a specific gravity of about 3.0.

Outcrop - that part of a geologic unit or structure that appears at the surface of the Earth.

Outwash - stratified and sorted sediments deposited by glacial meltwater streams.

Palynology - the study of modern and fossil pollen and spores.

Peat - unconsolidated deposit of plant remains, generally in a water-saturated environment.

Pebble - somewhat rounded rock fragment having a diameter in the range of 4 to 64 mm.

Perched Water - unconfined water separated from an underlying body of ground water by relatively impermeable sediment or rock.

Percolation - flow of water, usually downward, through small openings within a porous material.

Perennial Stream - a stream or a reach of a stream that flows continuously throughout the year.

Permeability - property or capacity of porous rocks or sediments for transmitting fluids.

Porosity - the percentage of the bulk volume of a rock or sediment occupied by isolated or connected pore spaces.

Quartzite - rock formed when a sandstone rich in the mineral quartz (silicon dioxide) is subjected to relatively high temperature and pressure by deep burial within the Earth.

Radiocarbon Age - age calculated from the quantitative determination of the amount of radioactive carbon-14 remaining in an organic material.

Recessional Drift - sediments, including ablation till, ice-contact stratified drift, and outwash, deposited during the retreat of a glacier.

Recharge - processes involved in the absorption and addition of water to the zone of saturation.

Rock-stratigraphic Unit - subdivision of rocks or sedimented distinguished and delimited on the basis of lithologic characteristics observable in the field.

Runoff - that part of precipitation appearing in surface streams.

Sand - rock fragment or detrital particle having a diameter in the range of 1/16 to 2 mm.

Sandstone - clastic sedimentary rock composed mostly of sand-sized fragments, together with silt, clay, and/or cement.

Sea-water Intrusion - displacement of fresh surface or ground water by the advance of salt water in coastal areas.

Sedimentary Rocks - rocks resulting from the consolidation of loose sediment that accumulated in layers.

Silt - rock fragment or detrital particle having a diameter in the range of 1/256 to 1/16 mm.

Siltstone - clastic sedimentary rock composed mostly of silt-sized particles.

Sorted - said of sediment consisting of particles more or less uniform in size.

Specific Capacity - rate of discharge of a water well per unit of drawdown.

Spit - small point or finger-like extension of sand or gravel deposited by waves and currents and having one end attached to the mainland and the other end in open water.

Stade - climatic episode within a glaciation during which a secondary advance of glaciers took place.

Shale - fine-grained, indurated, detrital sedimentary rock formed by the consolidation of clay and/or silt and characterized by finely stratified structure.

Static Water Level - water level in a well that has not been affected by addition or removal of water.

Storage Capacity - the maximum amount of water that can be stored.

Stratification - formation, accumulation, or deposition of material in layers or beds.

Stratigraphy - geologic study of the form, arrangement, geographic distribution, correlation, and mutual relationships of rock strata and bodies.

Subduction - the process of one crustal block descending beneath another.

Swamp - poorly drained area, intermittently or permanently covered with water, having shrubs or trees.

Tectonism - all movement of the crust produced by Earth forces, including the formation of ocean basins, plateaus, and mountain ranges.

Thrust Fault - break along which rocks on either side are displaced; it has an initial dip of 45° or less and is characterized by horizontal compression.

Till - Unsorted and unstratified sediments deposited directly by a glacier.

Tombolo - sand or gravel bar that connects an island with the mainland or another island.

Tuff - compacted deposit of volcanic ash.

Unconfined Aquifer - aquifer having a water table.

Vadose Zone - zone of aeration.

Vesicular - pertaining to the texture of a rock characterized by abundant cavities formed as a result of the expansion of gases during the fluid stage of the lava.

Volcanics - finely crystalline rocks that solidified from molten or partly molten material, and that reached or nearly reached the Earth's surface before solidifying.

Water-holding Capacity - smallest value to which the water content of a soil can be reduced by gravity drainage.

Water table - surface between the zone of saturation and the zone of aeration.

Wave-cut Bluff - steep embankment caused by wave erosion of earth materials at the shore.

Weathering - destructive processes whereby rocks and sediments at or near the Earth's surface are mechanically and/or chemically changed in character, with little or no transport of the loosened or altered material.

Zone of Aeration - subsurface zone containing water and air, and lying below the land surface and above the water table (also called vadose zone).

Zone of Saturation - subsurface zone in which all spaces in the rocks and sediments are filled with water.

INDEX

Table 4

RECORDS OF WELLS

Table 4. -- Records of Wells.
Well Locations Shown on Plate 3

Explanation:

Well No.: See text for well-numbering system.

Alt.: Altitude of land surface above mean sea level, interpolated from topographic maps.

Type of Well: Dg, dug; Dn, driven; Dr, drilled.

Water-bearing Zone(s): aquifer(s) tapped by well; excludes aquifer(s) in which water lacks hydraulic continuity with water in well.

Water Level: Measurement in feet and decimal fractions were made by Department of Ecology; those in whole numbers were reported by owner, tenant, or driller.

Type of Pump: C, centrifugal; J, jet; S, submersible; T, turbine.

Use of Water: D, domestic; GD, group domestic; Ind., industrial; Irr., irrigation; A, abandoned; NU, not used; PS, public supply.

Remarks: ppm Cl, parts per million chloride; dd, drawdown; hr, hour(s); psi, pounds per square inch; gpm, gallons per minute.

		Well					Water-bearing Zone(s)		Water Level		Pump			
Well No.	Owner or Tenant	Altitude (feet)	Type	Diameter (inches)	Depth (feet)	Casing Depth (feet)	Material	Depth Interval (feet)	Below Land Surface (feet)	Date	Type	H.P.	Use of Water	Remarks
							T25N., R.1W.							
4K1	Ron Jones	200	Dr	6	201	201	Gravel	197-201	170	05/01/73	S	1.5	D	Bailed 20 gpm; dd 5 ft/-
4K2	Morris Johnson	180	Dr	6	150	150	Gravel	143-150	120	06/15/74	-	---	D	Bailed 10 gpm
4K3	Les Lambert	220	Dr	6	224	222	Sand	213-222	200 200.0	06/02/75 09/26/75	S	3	D	Bailed 30 gpm; dd 0 ft/3 hr
4P1	Jack Cunningham	200	Dg	30	10	10	Sand, gravel	0-10	2	05/01/72	C	.75	D	
							T.25N., R.2W.							
10J1	Dick Rasband	45	Dr	6	99	99	Sand, gravel	76-98	46 59.3	07/31/72 09/04/75	S	.5	D	Bailed 60 gpm; dd 20 ft/3 hr
10J2	Art Kehle	46	Dr	6	81	77	Sand, gravel	76-81	65.0 46.0	02/20/74 09/24/75	S	---	D	Bailed 20 gpm; dd 0 ft/1 hr
10R1	Richard Call	45	Dr	6	102	102	Gravel	94-99	48 44.6	06/05/68 09/04/75	S	.5	D	Bailed 17 gpm; dd 4 ft/2 hr
11D1	Sunnyslope Water Association	80	Dr	6	84	84	Sand, gravel	78-84	62 70.0	??/??/?? 09/04/75	J	1	GD	Bailed 10 gpm; dd 4 ft/-
15B1	Wood	30	Dr	6	70	70	Sand, gravel	---	30	??/??/??	-	---	D	
15C1	Durham	80	Dr	6	120	---	Sand, gravel	---	75.8	09/02/75	-	---	D	

15E1	Pleasant Tides	140	Dr	6	210	205	Gravel	198-210	118 130.6	11/02/74 09/03/75	S	3	GD	Pumped 41 gpm; dd 72 ft/4 hr
15H1	Link	45	Dr	6	63	---	Gravel	60-63	18 46.4	08/01/64 09/04/75	J	3	D	Bailed 15 gpm; dd 10 ft/1 hr
15H2	Virgil E. Sprague	50	Dr	6	100	100	Gravel	96-100	40	09/13/68	S	.75	D	Bailed 20 gpm; dd 10 ft/-
15J1	Mel Thompson	45±	Dr	8	---	---	Sand, gravel	---	34.4	09/04/75	-	---	D	
15Q1	American Campgrounds	160	Dr	8	270	212	Sand	215-230 255-270	135.7 135.4	07/12/72 09/03/75	-	---	GD	Pumped 250 gpm; dd 34.6 ft/3 hr Pumped 307 gpm; dd 43.8 ft/4 hr Recovered in 10 minutes
21D1	Al South	200±	Dr	6	210	30±	Basalt	---	93	09/05/75	S	.5	D	
21E1	D. L. Lucus	180	Dr	6	236	236	Basalt	7-236	45 32.5	07/15/72 09/02/75	S	.5	D	Bailed 8 gpm; dd 0 ft/1 hr
21F2	F. Constable	180	Dr	6	435	11	Basalt	396	20 207.6	10/02/69 09/02/75	S	1	D	Bailed 8 gphr; dd 0 ft/-
21F5	Alice Haggard	100±	Dr	6	172	---	--	---	7.6	09/05/75	S	.33	D	
21F6	Blackford	180	Dr	6	185	10	Basalt	---	Flow	09/02/75	J	1	D	
29K1	Paradise Cove Club, Inc.	9	Dr	8	28	28	Gravel, sand	---	6 5.0	05/??/56 10/01/75	C	5	GD	Pumped 46 gpm; dd 2 ft/25 hr
29K2	Jefferson County District No. 2	10	Dr	6	22	22	Gravel, sand	---	6.0	10/01/75	C	1.5	GD	Pumped 30 gpm; dd 5 ft/17 minutes
31F1	R. J. Pollock	60±	Dr	8	190	15±	Basalt	---	3±	09/02/75	C	1	D	
31L1	Triton Cove	10	Dr	6	120	?	Basalt	0-120	Flow	10/04/70	C	7.5	GD	60 gpm; 36 psi
T.26N., R.1W.														
7K1	Wash. Dept. of Fisheries	70	Dr	6	150	150	Gravel	98-114	40 39.5	06/19/52 09/04/75			Ind	Pumped 34 gpm
7N1	Al Janssen	260	Dr	6	58	58	Basalt	51	12	10/20/73	S	.33	D	Bailed 2 gpm; dd 46 ft/-
7Q1	Ced Lindsay	100	Dr	6	---	---	--	---	55.4	09/05/75	S	---	D	

Table 4. -- Records of Wells (Continued)

		Well					Water-bearing Zone(s)		Water Level		Pump			
Well No.	Owner or Tenant	Altitude (feet)	Type	Diameter (inches)	Depth (feet)	Casing Depth (feet)	Material	Depth Interval (feet)	Below Land Surface (feet)	Date	Type	H.P.	Use of Water	Remarks
							T.26N., R.1W. (Continued)							
18D1	Gaylord Hunter	270	Dr	6	110	110	Basalt	55 & 106	6	07/20/72	S	.33	D	Bailed 1 gpm; dd 0 ft/1 hr
18D2	John Sturm	260	Dr	6	142	60	Basalt	136-140	1 Flow	11/18/74 09/05/75	-	---	D	Bailed 2 gpm; dd 100 ft/2 hr
18M2	Melvin Q. McGuire	100	Dr	6	304	17	Basalt	---	65 87.62	10/05/70 09/21/77	S	.5	D	Bailed .5 gpm
29R1	U.S.N. Zelatched Point	183	Dr	--	300	---	--	---	190	09/29/64				
33J1	Jefferson County Water District #3	245	Dr	8	322	322	Gravel, sand	302-322	227	05/27/76	-	---	--	Pumped 135 gpm; dd 64 ft/22 hr
							T.26N., R.2W.							
13H1	Camp Parsons	20	--	--	---	---	--	---	24	08/14/68	-	---	NU	
24E1	Gertchel A. Griffin	30	Dr	6	44	44	Gravel	38-44	20	10/01/69	S	1	D	Pumped 30 gpm; dd 10 ft/hr
26A1	Ramona Durham	30	Dr	6	104	104	Basalt	100-104	25	06/01/72	-	---	D	Bailed 4 gpm
26J1	Vern Cox	15	Dg	28	40	---	--	---	2	??/??/??	-	---	D	
26J2	Michael Nealey	39	Dr	6	200	20	Basalt	---	20	04/01/74	-	---	D	Bailed 20 gpm; dd 200 ft/1 hr
34E1	Lazy C. Properties	60	Dr	6	27	27	Gravel	1-27	12	05/25/66	S	2	GD	
34J1	Richard Call	155	Dr	6	66	66	Gravel	49-53 60-66	38 23.9	06/26/73 04/08/77	S	.5	D	Bailed 20 gpm; dd 20 ft/1 hr
35L1	Rich Richardson	38	Dr	6	36	31	Sand and gravel	23-36	7 6	04/12/74 ??/??/76	-	---	Ind	Bailed 50 gpm

T.27N., R.1E.														
2C1	Quihovan, Inc.	155	Dr	6	187	182	Sand	172-187	155	??/??/??	-	---	GD	Bailed 14 gpm; dd 10 ft/-
4E1	Harold T. Dodge	55	Dr	6	154	149	Sand	120-155	40 45.4	08/12/70 09/04/75	S	.75	D	Bailed 20 gpm; dd 0 ft/2 hr
5H1	Louis Thomsen	60	Dr	6	92	88	Sand, gravel	85-92	18	04/16/74	-	---	D	Bailed 20 gpm; dd 25 ft/2 hr
16E2	C. E. Strand	10	Dr	6	92	---	--	---	9.4	09/04/75	C	---	D	301 ppm Cl
T.27N., R.1W.														
15P1	Gene Myers	520	Dr	6	254	249	Sand	228-254	206	04/27/71	S	1.5	D	Bailed 10 gpm; dd 0 ft/2 hr
15P2	David Paulson	520	Dr	6	483	470	Sandy Clay	---	283	04/19/73	S	1.5	D	Bailed 10 gpm; dd 180 ft/1 hr
18D1	Robert Brown	43	Dr	6	100	11	Shale	88	10 15.8	10/03/70 09/04/75	J	.75	D	Bailed 2 gpm
18D2	Mary Finely	40	Dr	6	125	14	Shale	9-125	12 10.3	04/??/72 08/04/76	S	1	D	Bailed 1 gpm
18D3	Robert Brown	70	Dr	6	42	37	Sand and gravel	32-42	10	11/03/73	-	---	D	Bailed 12 gpm; dd 2 ft/-
30Q1	R. D. Boyland	40	Dr	6	150	---	Sand	---	38.4	09/25/75	S	---	D	
36B1	F.E. & D.R. Naylor	30	Dr	6	177	177	Sand and gravel	163-177	40 45.9	06/10/63 09/03/75	J	1	D,Irr	Bailed 18 gpm
36B2	G. W. Collins	40	Dr	6	180	180	Sand and gravel	176-180	45	07/??/63	J	1	D,Irr	
36L1	Harley Hilton	55	Dr	6	116	116	Sand and gravel	112-116	50 68.4	04/26/74 09/04/75	-	---	D	Bailed 20 gpm; dd 3 ft/1 hr
T.27N., R.2W.														
2H1	Raleigh R. Lewis	110	Dr	6	82	26	Shale	61	10	10/16/70	S	.5	D	Bailed 4 gpm; 63°
2H2	Paul Miller	110	Dr	6	76	76	Shale	72	10 22.9	05/06/72 08/10/76	S	.5	D	Bailed 6 gpm

Table 4. -- Records of Wells (Continued)

		Well					Water-bearing Zone(s)		Water Level		Pump			
Well No.	Owner or Tenant	Altitude (feet)	Type	Diameter (inches)	Depth (feet)	Casing Depth (feet)	Material	Depth Interval (feet)	Below Land Surface (feet)	Date	Type	H.P.	Use of Water	Remarks
							T.27N., R.2W. (Continued)							
11B1	Albert Scholgs	180	Dr	6	44	37	Sand, gravel	30-42	20 19.7	05/29/74 08/10/76	-	---	D	Bailed 6 gpm; dd 16 ft/-
11G1	Oscar Mullins	155	Dr	6	72	72	Sand, gravel	69-72	60	11/05/70	J	.5	D	Bailed 15 gpm
11H1	Stan Pollards	170	Dr	6	---	---	--	---	62.4	08/04/76	-	---	NU	Bad taste
11H2	Stan Pollards	170	Dr	6	61	61	"Hardpan"	---	---	10/02/73	-	---	D	
11P1	Malvin Bennett	220	Dr	6	136	136	Gravel, sand	129-133	60	07/04/70	S	.5	D	Bailed 20 gpm; dd 4 ft/-
12J1	Eleanor Robb	140	Dr	6	52	---	--	---	12.4	08/27/75	S	---	D	Flows at surface in winter
13J1	Wilfred W. Roeder	20	Dr	6	27	20	Gravel	16-20	0	05/13/69	-	---	D	2 psi; bailed 10 gpm; dd 16 ft/-
13L1	Russel Cassette	60	Dr	6	27	27	Gravel	20-27	7	04/23/73	J	1	D	Bailed 20 gpm; dd 5 ft/-
13M1	Tony Scalzo	60	--	12	25	25	Gravel	25-26	12	01/14/43	J	.75	D	Sealed
13M2	Tony Scalzo	60	Dr	6	32	32	Gravel	27-32	10 13.6	06/12/69 08/04/76	J	.75	D	Bailed 50 gpm
13M3	Harold Prestwood	76	Dr	6	35	35	Gravel	27-35	14	07/27/73	J	.75	D	Bailed 40 gpm
13N1	George Jones	40	Dr	6	23	23	Gravel, sand	21-23	5	08/06/68	J	1	D	Bailed 10 gpm
13P1	Charles SMith	42	Dr	6	32	32	Gravel, sand	20-32	9	10/13/71	J	.75	D	Bailed 20 gpm
13P2	Zeke Allen	40	Dr	6	31	31	Gravel	25-31	10	07/27/71	-	---	D	Bailed 40 gpm
13P3	Bert Prestwood	39	Dr	6	32	32	Gravel	13-14	13	10/14/65	C	.5	D	Pumped 3 gpm
13R1	Herbert Beck	20	Dr	8	58	58	Gravel	56-58	20 5.8	03/04/64 08/10/76	J	1	Ind	Bailed 60 gpm; dd 4 ft/-

14A1	Pat Handley	100	Dr	6	36	36	Gravel	32-36	10	??/??/64	J	1	--	Bailed 40 gpm; dd 5 ft/-
14A2	Frank Hyde	105	Dr	6	63	63	Sand	55-63	20	??/??/60	S	1	D	Bailed 20 gpm; dd 20 ft/-
14A3	Frank Hyde	105	Dr	6	45	45	Gravel	40-45	12	??/??/69	J	.5	D	Bailed 20 gpm; dd 10 ft/-
14A4	Bud Ammeter	100	Dr	6	63	63	Gravel	59-63	9 7.6	11/12/69 08/10/76	J	.75	D	Bailed 30 gpm; dd 5 ft/-
14A5	Byron Reeves	40	Dr	6	30	30	Gravel	23-30	9	12/27/68	-	---	D	Pumped 20 gpm; dd 7 ft/1 hr
14B1	Richard Denham	130	Dr	6	55	55	Sand, gravel	48-55	30 30.1	6/19/70 08/10/76	S	.5	D	Bailed 20 gpm; dd 10 ft/1 hr
14J1	L. N. Lysen	70	Dr	6	30	30	Gravel	27-30	8 8.6	12/12/72 08/04/76	-	---	D	Bailed 30 gpm; dd 15 ft/-
14K1	Cliff Barley	100	Dr	6	34	34	Gravel	26-34	8	02/06/73	S	.5	D	Bailed 20 gpm
14Q1	Les Allen	100	Dr	6	86	81	Sand	70-85	30	07/??/73	S	.5	--	Bailed 5 gpm; dd 30 ft/-
14Q2	Pleines	100	Dr	6	76	76	Sand, gravel	71-76	35	06/05/74	-	---	D	Bailed 5 gpm; dd 41 ft/-
22P1	U.S. Fish and Wildlife Service	340	--	12	120	---	--	---	1.3+*	08/10/76	-	---	NU	Abandoned * = Above ground
23B1	Wally Peterson	122	Dr	6	56	56	Sand, gravel	53-56	48	04/22/74	-	---	D	Bailed 20 gpm
23B2	Tony Scalzo	118	Dg	36	52	52	Gravel	51-52	25 47.6	03/15/46 08/04/76	J	.75	D	
23F1	Roger Severn	150	Dr	6	318	110	Sand	95-115	92	07/03/72	S	1	D	Bailed 10 gpm
23G1	Cal Bolander	100	Dr	6	65	65	Gravel, sand	58-65	45 51.6	11/07/72 08/04/76	S	.5	D	Bailed 12 gpm
24C1	Mary Finely	55	Dr	6	38	38	Gravel	34-38	7.1	08/04/76	S	.5	D	Bailed 20 gpm
24C2	Gertrude Johnson	57	Dr	6	141	141	Gravel	138-141	30	05/18/70	S	1	D	Bailed 30 gpm; dd 8 ft/-

Table 4. -- Records of Wells (Continued)

		Well					Water-bearing Zone(s)		Water Level		Pump			
Well No.	Owner or Tenant	Altitude (feet)	Type	Diameter (inches)	Depth (feet)	Casing Depth (feet)	Material	Depth Interval (feet)	Below Land Surface (feet)	Date	Type	H.P.	Use of Water	Remarks
						T.27N., R.2W. (Continued)								
24C3	Wally Pederson	40	Dr	6	129	124	Sand	90-129	19 20.6	03/15/76 08/??/76	-	---	Ind	
24D1	Olympic National Forest	60	Dr	8	167	165	Sand, gravel	165-166	39	12/01/59	T	20	--	Yields 70 gpm; dd 85 ft/-
24D2	Masonic Lodge No. 184	70	Dr	6	40	40	Gravel	34-40	26	05/??/73	S	.33	D	Bailed 15 gpm
24F1	Maple Grove Motel	40	Dr	6	60	60	Sand	33-60	33 27.1	08/??/64 09/04/75	-	---	D	Bailed 5 gpm Pumped 5 gpm; dd 20 ft/3 hr - recovered in 40 minutes
24F2	H. A. Pope	45	Dr	6	30	25	Sand, gravel	22-25	10 5.8	05/30/73 08/04/76	J	.75	D	Bailed 50 gpm; dd 4 ft/-
24H1	Dan Newman	8	--	--	20	---	--	---	5	08/14/68	-	---	D	
24K1	Dale H. McCoy	18	Dg	30	10	0	Sand, gravel	4-10	2	09/01/51	-	---	--	Yields 119 gpm; dd 3 ft/-
25H1	Thomas McClanahan	10	Dr	6	35	29	Gravel	22-35	3	02/23/70	S	1.5	GD	
25J1	Port Commission	170	DR	6	178	173	Gravel	172-178	132 155?	09/24/71 08/04/76	S	2.5	D,Ind	Bailed 40 gpm
27B1	U.S. Fish and Wildlife Service	340	Dr	12	50	50	Sand, gravel	27-47	10	09/04/58	-	---	--	Pumped 300 gpm; dd 19 ft/-
27B2	U.S. Fish and Wildlife Service	340	Dr	8	40	40	Gravel, sand	7-40	10	09/15/64	-	---	D	Yields 50 gpm; dd 9 ft/-
						T.28N., R.1E.								
4B1	George W. Simpokes	40	Dr	6	88	?	Sand, gravel	12-88	40	08/16/60	S	.5	CD	Yields 350 gpm
4B2	Harold E. Lundberg	65	Dr	6	105	?	Basalt	58-105	60	??/??/??	J	.75	D	

4M1	Cyrus H. Hamblen	180	Dr	6	93	88	Sand, gravel	87-93	31 31.5	06/10/68 08/21/75	S	1	D	Yields 21 gpm; dd 11 ft/- Still recovering at time of measurement
4M2	C. H. Hamblen	160	Dr	6	126	126	Gravel, sand	120-123	15	10/05/72	-	---	D	Bailed 30 gpm; dd 33 ft/-
4P1	Robert L. Tuttle	25	Dr	6	36	36	Gravel, sand	32-36	8	09/08/72	S	.5	D	Bailed 5 gpm; dd 30 ft/1 hr
4P2	John Murry	20	Dr	6	102	102	Gravel, sand	97-102	1 Flow	10/08/72 08/21/75	S	.5	D	Bailed 30 gpm; dd 50 ft/2 hr
4P3	Lincoln Washburn	55	Dr	6	52	52	--	---	Flow Flow	12/02/74 08/21/75	S	---	D	Bailed 7 gpm; dd 45 ft/-
5H1	James L. Anderson	160	Dr	6	84	84	Gravel	60-84	20	07/13/60	J	2.5	D	Bailed 8 gpm; dd 30 ft/-
5P1	Richard Toepper	425	Dr	6	161	154	Sand	153-161	145	08/??/72	S	1	D	Bailed 20 gpm; dd 10 ft/3 hr
8G1	Roynold W. Koyonen	380	Dr	6	195	195	Sand, clay, gravel	185-195	135	07/??/68	S	.75	D	Bailed 15 gpm; dd 10 ft/-
8H1	Pope & Talbot Development Company #3	380	Dr	8	257	241	Sand, gravel	214-223 233-255	144 156.5	11/18/68 08/21/75	S	20	GD	Yields 88 gpm; dd 39 ft/1 hr Yields 104 gpm; dd 42.5 ft/-
8K1	John Werner	365	Dr	6	205	---	--	---	140.4	08/21/75	J	---	D	
8L1	Frank L. Woodruff	350	Dr	6	193	193	Sand, gravel	182-193	114	01/06/75	-	---	D	Bailed 20 gpm
8Q1	Pope & Talbot Development Company #2	300	Dr	8	236	---	--	---	69.2	08/21/75	S	20	GD	Pumped 160 gpm; dd 42 ft/-
9P1	Pope & Talbot Development Company #1	90	Dr	8	---	---	--	---	---	??/??/??	T	---	NU	Could not measure
15R1	Maurice B. Bryant	90	Dr	6	80	80	Sand	77-80	58	04/15/73	S	.75	D	Bailed 5 gpm; dd 15 ft/1 hr
15R2	Victor G. Roden	80	Dr	6	95	91	Sand, gravel	90-95	20	02/06/74	-	---	D	Bailed 20 gpm; dd 85 ft/1 hr

Table 4. -- Records of Wells (Continued)

		Well					Water-bearing Zone(s)		Water Level		Pump			
Well No.	Owner or Tenant	Altitude (feet)	Type	Diameter (inches)	Depth (feet)	Casing Depth (feet)	Material	Depth Interval (feet)	Below Land Surface (feet)	Date	Type	H.P.	Use of Water	Remarks
						T.28N., R.1E. (Continued)								
16M1	Eugene White	30	Dr	6	125	---	--	---	---	??/??/??	-	---	--	241 ppm Cl
16M2	H. P. Curtiss	35	Dr	6	165	---	Basalt	0-162	--- 31.7	??/??/?? 08/28/75	-	---	D	Not in use
16M3	Meydenbauer Bay Yacht Club	41	Dr	6	175	15	--	---	100	??/??/??	-	---	D	
16N1	Morrison Test Well	45	Dr	6	43	32	--	---	5.3	??/??/72	-	---	A	Yield less than 5 gpm
16P1	Morrison	35	Dr	6	32	32	--	---	22.0	??/??/72	S	---	GD	Pumped 12 gpm; dd 6 ft/- Serves 13 houses
16P2	Lincoln Washburn	5	Dr	6	52	52	Sand, gravel	50-52	Flow	12/02/74	-	---	D	Bailed 7 gpm; dd 45 ft/-
16P3	Lincoln Washburn	20	Dr	6	62	62	Sand, gravel	1-29	17	12/06/74	-	---	D	Bailed 12 gpm; dd 43 ft/-
16P4	Cecil Midkiff	35	Dr	6	100	---	--	---	---	??/??/??	-	---	--	66 ppm Cl
16Q1	Ray Garney	50	Dr	6	48	---	--	---	45	??/??/60	-	---	--	
16Q2	Peterson	50	Dr	6	83	---	--	---	45	??/??/62	-	---	--	
16Q3	Carl Pingrey	37	Dr	6	138	104	Sand	103-108	32	07/27/75	-	---	D	Bailed 7 gpm; dd 69 ft/1 hr
17Q1	Pacific Northwest Bell	50	Dr	6	130	---	--	---	--- 11.1	??/??/?? 09/03/75	S	---	Ind	Salt water at 160 ft Backfilled to 130 ft
18B1	Pope & Talbot Development Company, Port Ludlow #8	400	Dr	8	320	287	Sand	178-249	190 190.8	??/??/72 09/03/75	-	---	--	
20R1	Pope & Talbot Development Company, Port Ludlow #TH-1	138	Dr	8	118	118	Sand, gravel	40-50	30	??/??/70	-	---	NU	Pumped 22 gpm; dd 10 ft/-

20R2	Pope & Talbot Development Company, Port Ludlow #TH-11	133	Dr	8	68	68	Sand, gravel	47-56	16	??/??/72	-	---	A	Excessive iron
21C1	Pope & Talbot Development Company, Port Ludlow #6	125	Dr	8	81	81	--	---	--- 43.7	??/??/72 09/03/75	-	---	A	Insufficient water
21F1	Pope & Talbot Development Company, Port Ludlow #4A	155	Dr	8	43	43	Gravel	38-41	0 16.6*	??/??/72 09/03/75	S	---	GD	Pumped 23 gpm; dd 26 ft/- *Pumping
21F2	Pope & Talbot Development Company, Port Ludlow #5	180	Dr	8	134	134	Sand, gravel, clay	28-61	14.2 15.4	??/??/72 09/03/75	-	---	A	Pumped 10 gpm; dd 21 ft/-
21F3	Pope & Talbot Development Company, Port Ludlow #9	160	Dr	8	70	47	Sand, gravel	23-52	7.1 34.1*	10/18/72 09/03/75	S	---	GD	Pumped 46 gpm; dd 26 ft/- *Pumping
21L1	Pope & Talbot Development Company, Port Ludlow #TH-2	230	Dr	8	135	135	--	---	None	??/??/70	-	---	A	Dry hole
21N1	Pope & Talbot Development Company, Port Ludlow #TH-7	160	Dr	8	75	75	--	---	None	??/??/72	-	---	A	No water encountered
21R1	Pope & Talbot Development Company, Port Ludlow #TH-3	450	Dr	8	390	390	--	---	None	??/??/70	-	---	A	No water encountered
22B1	John D. Parker	80	Dr	6	92	92	Sand, gravel	88-92	35 30.4	09/16/65 09/03/75	-	---	D	Yield 17 gpm; dd 37 ft/- Water not usable
22B2	Kenneth Broden	80	Dr	6	240	238	Sand	237-238	78	03/07/73	S	.5	D	Bailed 34 gpm; dd 70 ft/-
22B3	Bob Sewell	80	Dr	6	324	318	Basalt	322-324	60	04/20/73	S	.33	D	Bailed 10 gpm; dd 150 ft/2 hr

Table 4. -- Records of Wells (Continued)

		Well					Water-bearing Zone(s)		Water Level		Pump			
Well No.	Owner or Tenant	Altitude (feet)	Type	Diameter (inches)	Depth (feet)	Casing Depth (feet)	Material	Depth Interval (feet)	Below Land Surface (feet)	Date	Type	H.P.	Use of Water	Remarks
							T.28N., R.1E. (Continued)							
22B4	Dan Petrenchak, Jr.	80	Dr	6	101	95	Sand	94-101	35 34.1	03/26/75 09/03/75	-	---	D	Bailed 6 gpm; dd 10 ft/-
22G1	Jack Plaskett	80	Dr	6	90	---	--	---	13 14.7	??/??/67 09/03/75	-	---	--	
22G2	L. E. Gales	100	Dr	6	44	44	Sand, gravel	43-44	12	09/15/73	J	.5	D	Bailed 3 gpm; dd 20 ft/-
22G3	E. T. Erickson	80	Dr	6	385	384	Basalt	188-385	65	10/03/73	-	---	D	Bailed 3 gpm; dd 100 ft/-
22R1	Jefferson County Water District #1	175	Dr	8	135	135	--	---	35	09/20/66	-	---	A	Bailed 5 gpm; dd 40 ft/1 hr
27A1	Leslie Perhacs	280	Dr	6	276	276	Gravel	270-276	175	08/20/69	S	.75	D	Bailed 15 gpm; dd 10 ft/2 hr
29A1	Pope & Talbot Development Company, Port Ludlow #TH-10	140	Dr	8	60	60	Sand, gravel	26-52	26.1	??/??/72	-	---	A	Excessive iron
29A2	Pope & Talbot Development Company, Port Ludlow #TH-12	135	Dr	8	43	43	Gravel	29-33	5.0	??/??/72	-	---	NU	Pumped 185 gpm; dd 16 ft/-
33M1	Olympic Land and Investment Company	125	Dr	6	167	165	Sand, silt, gravel	92-140 148-155	90? 70.5	??/??/?? 09/04/75	S	1	D	Bailed 10 gpm; dd 40 ft/3 hr
33M2	Olympic Land and Investment Company	60	Dr	6	200	150	Basalt	---	10 24.7	10/15/73 09/04/75	-	---	D	Bailed 3 gpm. 247 ft deep dry hole right next to this well.
33M3	Olympic Land and Investment Company	130	Dr	6	400	190	Basalt	283-285	50 69.3	06/20/74 09/04/75	-	---	GD	Pumped 60 gpm; dd 120 ft/4 hr
33P1	W. K. Merridith	30	Dr	6	73	72	Sand, silt	33-72	1 3.3	08/27/68 09/03/75	C	---	D	Flowing well. Had been pumping.

33Q1	Leroy Peterson	30	Dr	6	104	99	Sand	86-104	30 32.6	06/??/71 09/03/75	S	.33	D	Bailed 30 gpm
33Q2	M. J. Churchill	25	Dr	6	30	---	--	---	---	??/??/??	-	---	--	22 ppm Cl
33Q3	Kenneth Boyd	210	Dr	6	292	286	Gravel	191-193	186	05/01/69	-	---	D	Bailed 5 gpm
33R1	Robert A. Krutenat	125	Dr	6	130	---	Basalt	130	100	01/??/70	S	.5	D	Pumped 11 gpm; dd 15 ft/-
34P1	George Thomas	45	Dr	6	65	65	Gravel	64-65	40	??/??/69	J	---	D	45 ppm Cl. Bailed 10 gpm; dd 20 ft/1 hr
34Q1	B. A. Boyd	90	Dr	6	190	190	Basalt	105-190	95 88.8	11/01/72 09/03/75	S	.5	D	Bailed 3 gpm
34Q2	George L. Garten	82	Dr	6	127	127	Basalt	125-127	101	03/22/72	S	.5	D	Bailed 6 gpm; dd 10 ft/4 hr
T.28N., R.1W.														
2A1	Vaughn H. Webb	305	Dr	4	66	66	Sand	50-66	35 37.0	07/??/72 08/20/75	S	.75	D	Bailed 17 gpm; dd 6 ft/-
2A2	Donald Holmes	345	Dr	6	109	109	Sand	90-109	60 74.5	06/04/73 08/20/75	S	.5	D	Bailed 15 gpm; dd 0 ft/2 hr
2B1	Robert Kimhall	355	Dr	6	116	114	Sand	103-116	98 95.8	07/11/72 08/20/75	-	---	D	Bailed 4 gpm; dd 0 ft/4 hr
2C1	Leroy William	420	Dr	6	119	114	Sand	95-119	84	05/13/75	J	1.5	D	Bailed 12.5 gpm; dd 20 ft/2 hr
3N1	Ta Olsen	200	Dr	6	53	53	Gravel	51-53	36 10.9	02/26/75 08/15/75	J	---	D	Bailed 10 gpm; dd 10 ft/-
10Q1	Howard Carstensen	515	Dr	6	266	261	Sand	257-266	220 261.3	06/29/73 08/20/75	S	.75	D	Bailed 4 gpm; dd 0 ft/3 hr
11L1	Wes Hansen	505	Dr	6	225	225	Sand, gravel	208-225	208 203.8	05/14/73 08/20/75	S	.5	D	Bailed 10 gpm; dd 6 ft/1 hr
17H1	John Bletham	250	Dr	6	150	26	Shale	30-150	18 12.3	??/??/?? 09/02/75	S	.33	Irr	Slow recovery, cloudy, high mineral content
21M1	Gordon Bader	195	Dr	6	38	38	Sand, gravel	21-38	15	04/18/74	-	---	D	Bailed 20 gpm; dd 20 ft/1 hr

Table 4. -- Records of Wells (Continued)

		Well					Water-bearing Zone(s)		Water Level		Pump			
Well No.	Owner or Tenant	Altitude (feet)	Type	Diameter (inches)	Depth (feet)	Casing Depth (feet)	Material	Depth Interval (feet)	Below Land Surface (feet)	Date	Type	H.P.	Use of Water	Remarks
						T.28N., R.1W. (Continued)								
21M2	Tom Johnson	200	Dr	6	55	---	--	---	14 50.8	??/??/?? 09/02/75	S	---	D	Still recovering at time of measurement
29H1	B. D. Chapman	220	Dr	6	250	---	--	---	30 141.8	??/??/?? 09/02/75	S	---	D	Yield 700 gp day
31Q1	Endicott Realty	480	Dr	6	248	---	?	116	--- 49.1	??/??/?? 09/04/75	-	---	GD	
31Q2	Endicott Realty	480	Dr	6	248	---	?	116	--- 33.9	??/??/?? 09/04/75	-	---	GD	
32B1	R. D. Park	420	Dr	--	196	47	Sand, gravel	24-28	2 4.4	09/27/73 09/02/75	S	1	D	Bailed 15 gpm Iron plus variable salt
32C1	Roy Wickstrom	425	Dr	6	78	---	--	---	--- 3.8	??/??/?? 09/02/75	S	---	D	Sulphur; very soft water
32G1	Joseph Morris	440	Dr	6	130	54	Shale	38-130	30	09/20/73	-	---	D	Bailed 2 gpm; dd 30 ft/4 hr
32G2	Barry Canaday	430	Dr	6	162	31	Shale	---	19	11/11/74	-	---	D	Bailed 7 gpm
						T.28N., R.2W.								
23Q1	Lydell Clevenger	570	Dr	6	81	81	Gravel	78-81	2	10/15/72	J	1	D,Irr	Bailed 10 gpm; dd 10 ft/3 hr
25D1	Rosco Thomas	220	Dr	6	175	11	Shale	8-175	20 21.9	07/23/73 09/02/75	S	---	D	Bailed 1 gpm
25P1	Full Gospel Church	200	Dr	6	238	28	Shale	25-238	5.0 2.8	03/14/73 09/02/75	-	---	D	Bailed 1 gpm; dd 205 ft/0.5 hr Saltwater encountered at 250 ft, cemented to 238 ft, still salty
25P2	Full Gospel Church	215	Dr	6	65	---	--	---	20	??/??/??	J	---	D	Low yield

26H1	Jack Ralls	200	Dr	6	88	88	Sand and gravel	86-88	---	10/24/73	-	---	D	
T.29N., R.1E.														
4F1	L. W. Richards	125	Dr	6	---	---	--	---	67.1	09/19/75	J	---	D	
4G1	--	100	Dr	6	---	---	--	---	94.8	09/17/75	S	---	D	
7D1	Lyle Albrecht	30	Dr	6	60	---	--	---	40 27.1	??/??/68 08/26/75	S	---	D	Originally 125 ft - salty Completed at 60 ft
7D2	Terry Albrecht	50	Dr	6	50	---	--	---	13.6	08/26/75	S	---	D	Still recovering at time of measurement 3 previous holes dry, 75 ft, 80 ft, 120 ft
7E1	Mike Sedlack	25	Dr	6	22	---	--	---	Flow Flow	07/11/68 08/26/75	S	---	D	
7M2	M. V. Collins	20	Dr	6	30	---	--	---	17	07/10/68	-	---	D	
7M3	Schimbdell Water Association	30	Dg	36	24	---	--	---	16 15.0	07/10/68 08/26/75	S	---	GD	
7M4	Clogston	42	Dr	6	55	50	Gravel and sand	50-55	Flow Flow	07/14/64 07/10/68	-	---	--	Yield: 30 gpm; dd 40 ft/1 hr
8R2	Forrest Shumaker	58	Dr	8	167	160	Sand	160-167	57 56.55	02/22/66 09/17/75	J	1	D	Bailed 6 gpm; dd 60 ft/2 hr
8R3	James Zilliox	60	Dr	6	58	58	Sand, gravel	58-60	44	04/10/70	S	.5	D	Bailed 8 gpm; dd 14 ft/2 hr
8R4	Frank Aigner	60	Dr	6	---	---	Sand	---	43.4	09/07/75	S	---	D	
8R5	Flannery	65	Dr	6	163	---	Sand	---	65.6	09/17/75	S	---	D	
9D1	Gerhard S. Stavney	115	Dr	6	138	124	Sand	125-130	122 123.0	04/22/69 09/25/75	-	---	D	Bailed 15 gpm; dd 7 ft/-
9J2	Olof & Z. Ford	80	Dr	6	83	83	--	4-85	79 79.0	03/26/69 09/17/75	S	.25	D	
9P1	Maring	80	Dg	--	48	---	--	---	43.7	09/07/75	C	1	D	
18G1	Ann Savitch	110	Dr	6	58	---	--	---	--- 4.9	??/??/?? 08/26/75	J	.33	D	
19G1	Earl Amick	80	Dr	6	345	64	Basalt	300-345	30	06/20/74	-	---	D	Bailed 15 gpm; dd 0 ft/2 hr

Table 4. -- Records of Wells (Continued)

		Well					Water-bearing Zone(s)		Water Level		Pump			
Well No.	Owner or Tenant	Altitude (feet)	Type	Diameter (inches)	Depth (feet)	Casing Depth (feet)	Material	Depth Interval (feet)	Below Land Surface (feet)	Date	Type	H.P.	Use of Water	Remarks
						T.29N., R.1E. (Continued)								
19K1	Ben Peters	145	Dr	--	---	111	Sand	78-111	---	04/??/71	S	.5	D	Bailed 10 gpm; dd 0 ft/3 hr
19P1	Elmer Strom	260	Dr	6	92	87	Sand	88-92	50 55.4	06/12/69 08/26/75	S	.5	D	Bailed 20 gpm; dd 20 ft/2 hr
19P2	Lee Smith	275	Dr	6	212	212	Gravel	195-212	167 153.3	07/21/70 08/26/75	S	1	D	Bailed 10 gpm; dd 0 ft/2 hr
19P3	John Ogburn	240	Dr	6	134	134	Sand	132-134	114	11/28/72	S	.5	D	Bailed 6 gpm; dd 0 ft/1 hr
19P4	Earl James	335	Dr	6	234	234	Sand	221-234	165 211.2	08/19/74 08/26/75	S	.75	D	Bailed 10 gpm; dd 20 ft/3 hr
19P5	Robert Faslio	345	Dr	6	110	110	Sand	98-110	65 48.7	10/15/74 08/26/75	-	---	D	Pumped 4 gpm; dd 30 ft/3 hr
19P6	V. L. Brooks	260	Dr	6	260	199	Sand, gravel	182-184	160 150.0	07/16/75 08/27/75	S	---	D	Basalt below 199 ft, Bailed 2.5 gpm; dd 0 ft/5 hr
19Q1	Jim Finch	160	Dr	6	161	96	Basalt	95-161	61	09/03/73	S	.5	D	Bailed 8 gpm; dd 40 ft/2 hr
28N1	William C. Andrew	21	Dr	6	130	15	Basalt	119-130	3 7.8	06/01/66 08/27/75	J	1	GD	Yield 3 gpm; dd 77 ft/24 hr
28N2	William C. Andrew	17	Dr	6	46	31	Sand, gravel	31-46	4 3.4	09/20/67 08/27/75	J	1	D	Yield 12 gpm; dd 30 ft/26 hr
28N3	Kelso	18	Dr	6	42	40	Sand	36-40	8	12/28/74	J	.75	D	Bailed 8 gpm; dd 10 ft/2 hr
28P1	Harrier and Anderson	30	Dr	6	100	---	--	---	35	??/??/??	-	---	--	
28P2	Bob Smythe	20	Dr	6	91	91	Basalt	48-55	32	12/13/72	S	.33	D	Bailed 2 gpm; dd 0 ft/1 hr
29F1	Sid Spencer	45	Dr	6	35	---	--	---	23 25.8	07/10/68 08/27/75	-	---	NU	Reported saline

33E1	Charles Gainer	40	Dr	6	134	134	Basalt	125-134	5 Flow	05/29/70 08/27/75	-	---	D	Bailed 15 gpm; dd 90 ft/2 hr
33F1	R. Volkenburg, Jr.	40	Dg	36	22	22	--	---	7	10/22/75	-	---	D	
33F2	James Edgbert	40	Dr	6	235	235	Basalt	50-235	35	08/22/72	-	---	D	Bailed 15 gpm; dd 50 ft/1 hr
33M2	Charles Gainer	10	Dr	6	41	---	--	---	4	07/10/68	S	---	A	290 ppm Cl
33M3	Charles Gainer	22	Dr	6	117	---	Basalt	7-117	--- 19.4	??/??/?? 08/27/75	S	---	D	
33P1	Sam Humes	25	Dr	6	126	105	Sand	40-126	16	10/01/65	-	---	D	Bailed 4 gpm; dd 0 ft/1 hr

T.29N., R.1W.

1Q1	W. J. Wolfe	70	Dr	6	65	---	--	---	5 8.0	??/??/?? 08/26/75	-	---	D	Still recovering at at time of measurement
2C1	Ralph W. Leyda	118	Dr	6	200	---	--	---	82.3	08/01/75	S	---	D	Methane gas - will burn
2K1	Earl Green	122	Dr	--	91	81	Gravel, sand	80-91	65 73.6	06/01/74 08/01/75	S	5	D,Ind	Pump test 100 gpm; dd 10 ft/8 hr
2R1	E. A. Morrison	125	--	6	86	86	Gravel	70-86	70	02/15/69	J	.5	D	
2R2	Jefferson PUD	125	Dr	16	110	107	Gravel	76-110	71	06/06/72	-	---	PS	Pump test 200 gpm; dd 21 ft/168 hr
3G1	City of Port Townsend	120	Dr	12	184	184	Gravel	175-178	38	02/??/56	-	---	NU	Pump test 500 gpm; dd 4 ft/24 hr
3J1	Tom McAndrew	124	Dr	12	64	64	Gravel	16-64	45 42.3	12/23/53 08/01/75	T	---	Irr	Pump test 400 gpm; dd 1 ft/-
5Q1	Lyle Malsed	105	Dr	6	118	---	Gravel	114-118	106	01/13/69	-	---	D	Bailed 9 gpm; dd 0 ft/1 hr
8B1	Sahara Water Company	100	Dr	6	150	150	Sand	118-150	68	01/22/73	S	1	GD	Pump test 7 gpm; dd 70 ft/2 hr
8B2	Steve Corra	30	Dg	36	15	---	--	---	8.3	08/07/75	-	---	D	
8Q1	Carl Tuttle	35	Dr	6	60	---	--	---	29.5	08/01/75	C	1	D	
9N1	George Nakamo	330	--	6	250	133	Shale	131-133	60	01/07/73	S	.5	D	Little water

Table 4. -- Records of Wells (Continued)

		Well					Water-bearing Zone(s)		Water Level		Pump			
Well No.	Owner or Tenant	Altitude (feet)	Type	Diameter (inches)	Depth (feet)	Casing Depth (feet)	Material	Depth Interval (feet)	Below Land Surface (feet)	Date	Type	H.P.	Use of Water	Remarks
							T.29N., R.1W. (Continued)							
10Q1	Tage Rasmussen	130	Dr	6	45	45	Sand and gravel	28-45	22	12/31/74	-	---	D	Bailed 20 gpm; dd 2 ft/2 hr
11G1	Hadlock Playfield	105	Dr	8	---	---	--	---	22.6 23.4	08/03/76 07/10/79	-	---	NU	
11N1	Brookwood Glen	120	Dr	6	---	---	--	---	20.3	08/01/75	S	---	A	Abandoned because of iron
14H1	Dennis Shaw	210	Dr	6	180	180	Sand and gravel	157-180	50	07/28/72	S	1	D	Bailed 17 gpm; dd 0 ft/4 hr Buried
14L1	William Bishop	125	Dr	6	14	14	Gravel	13-14	2	01/10/70	C	5	--	Pump test 60 gpm; dd 2 ft/3 hr
14L2	D. G. Brown	110	Dr	6	---	---	--	---	8.2	08/20/75	-	---	NU	Potentially for irrigation
15A1	B. G. Brown	115	Dr	8	40	35	Gravel	32-40	24 22.9	11/05/73 08/20/75	-	---	Irr	Bailed 68 gpm; dd 0 ft/1 hr Pumped 400 gpm; dd 12 ft/3 hr
15R1	Annie Nisbet	125	Dr	10	78	78	Sand	68-78	4 11.6	01/07/54 08/20/75	J	---	Irr	Bailed 40 gpm
18E1	H. F. Barrett	40	--	--	58	---	--	---	43	10/01/68	-	---	A	390 ppm Cl - abandoned because of sea water intrusion
18E2	Randy Barrett	100	Dr	6	114	114	Sand, gravel	86-114	84 87.9	04/10/74 08/06/75	S	1	GD	Bailed 50 gpm; dd 3 ft/1 hr
22E1	Robert W. Scott	485	Dr	6	340	---	Sand	290-300	252.5 251.7	06/10/75 08/20/75	-	---	D	Bailed 8 gpm; dd 20 ft/2 hr
22F1	John Raney	470	Dr	6	250	245	Sand	240-250	235	11/16/73	S	.75	D	Bailed 10 gpm; dd 10 ft/24 hr
22F2	John Raney	450	Dr	6	383	343	Sand, gravel	343-384	268	03/19/70	S	---	D	Bailed 3 gpm; dd 54 ft/1 hr

22G1	M. L. Meacham	245	Dr	6	186	---	--	---	70 110.5	??/??/?? 08/15/75	S	---	D	Bailed 20 gpm; dd 0 ft/1 hr
22R1	Norris L. Short	125	Dr	12	105	105	Sand, gravel	50-105	Flow	08/28/56	-	15	Irr	Yield 250 gpm; dd 11 ft/-
23P1	Norris L. Short	120	Dr	6	340	68	Shale	269-340	Flow 0.0	08/28/56 08/24/75	-	---	A	
24K1	Edgington	160	Dr	10	58	21	Sand, gravel	13-51	24 24.65	05/25/60 09/15/77	T	15	D	Pumped 227 gpm; dd 7 ft/72 hr
24Q1	Jim Johnson	165	Dr	6	57	57	Sand, gravel	54-57	35 29.0	02/11/74 08/21/75	-	---	D	Bailed 60 gpm; dd 0 ft/1 hr
25J1	Arthur Swanson	170	Dr	6	75	75	--	---	24.6	08/21/75	J	1	D	Pump test 200 gpm; dd 1 ft/.5 hr
26Q1	Glen Gould	175	Dr	6	40	40	Sand	38-40	14	07/24/73	-	---	D	Bailed 10 gpm; dd 20 ft/ 3 hr
28J1	Earl Hughett	430	Dr	6	300	---	--	---	186.0	08/15/75	S	---	D	
31L1	Switzer	650	Dr	6	100	---	--	---	50.4	08/15/75	S	---	D	Still recovering at time of measurement
34E1	Ron Putus	310	Dr	6	201	201	Sand	95-199	128	11/19/73	S	1	D	Bailed 30 gpm; dd 0 ft/4 hr
34G1	Ed Erickson	200	--	--	---	---	--	---	---	07/30/54	-	---	--	Yield 180 gpm
34M1	Goehring	270	Dr	6	43	---	--	---	20.5	08/15/75	C	.5	D	Still recovering at time of measurement
35R1	Kenneth Huggins	325	Dr	6	96	91	Sand	80-96	60 60.7	01/24/74 08/20/75	-	---	D	Bailed 25 gpm; dd 5 ft/1 hr

T.29N., R.2W.

5M1	Loren C. Foster	300	Dr	6	266	266	Sand	180-266	150 152.5	02/27/74 08/19/75	-	---	D	Bailed 2 gpm
13A1	H. F. Barrett	235	Dr	6	304	304	Sand	292-305	216	01/16/69	-	---	GD	Bailed 16 gpm; dd 0 ft/3 hr
13J2	Raymond Broders	70	Dr	6	125	76	Sand, gravel	54-68	52	09/13/74	-	---	D	Bailed 10 gpm
13P1	Harold Hubert	40	Dr	6	60	---	--	---	---	??/??/??	-	---	--	
23J1	William Thomas	8	Dr	6	43	---	--	---	2	10/01/68	-	---	--	329 Cl

Table 4. -- Records of Wells (Continued)

		Well					Water-bearing Zone(s)		Water Level		Pump			
Well No.	Owner or Tenant	Altitude (feet)	Type	Diameter (inches)	Depth (feet)	Casing Depth (feet)	Material	Depth Interval (feet)	Below Land Surface (feet)	Date	Type	H.P.	Use of Water	Remarks
						T.29N., R.2W. (Continued)								
24D1	(5 cottages)	40	Dr	6	?	---	--	39	3.5	08/06/75	C	---	GD	
24H1	H. C. Reid	20	--	--	14	---	--	---	11	09/30/68	-	---	--	
24N1	Walter Moa	7	--	--	6	---	--	---	2	09/30/68	-	---	--	
25M1	U.S. Department of Interior	56.7	Dr	8	150	150	Sand, gravel	130-149	Flow	02/??/58	J	3	D	Bailed 60 gpm; dd 30 ft/.5 hr
						T.29N., R.3W.								
1H1	O. R. Draper, *et al.*	45	Dr	6	42	---	--	---	---	??/??/46	-	---	D	
1J1	Joseph H. Ferguson	40	Dr	6	96	85	Sand, gravel	82-85	42 34.3	07/25/71 08/19/75	S	.5	D,Irr	Pumped 15 gpm
1J2	Jerry Aurand	35	Dr	6	94	90	Sand, gravel	90-94	26 27.6	11/15/73 08/19/75	-	---	D	Bailed 20 gpm
2C1	Washington State Parks and Recreation	130	Dr	8	492	113	Shale, gravel	78-84 108-111	---	??/??/42	-	---	GD	
2K1	Rodney Erickson	110	Dr	6	150	---	--	---	69 21.3	07/22/68 08/19/75	-	---	A	150 ppm Cl Abandoned - not enough water
2Q1	Ray Olson	120	Dr	6	300	---	--	---	30	07/21/68	-	---	A	Abandoned - saline
12A1	Daniel Bellis	40	--	--	12	---	--	---	Flow	10/01/68	-	---	--	
12D1	Cascade Pole Company	15	Dr	6	25	---	--	---	---	??/??/??	-	---	--	
12E1	Peter Joppe	20	Dn	6	28	27	Gravel	26-27	26 16	??/??/68 03/19/71	J	.5	D	Pumped 3 gpm; dd 11 ft/1 hr

T.30N., R.1E.

17J1	Fort Flagler	100	Dr	10, 8, 6, 4	810	810	Gravel	145-175 667	312	02/13/64	-	---	A	Bailed 3-4 gpm. Saline at 240 ft Drilled to 1,462 ft Fresh water at 1,456 ft
20D1	Grace Lutheran Church	41	Dr	6	49	45	Sand	45-50	39 37.14	05/20/69 09/19/75	J	.75	D	Bailed 12 gpm; dd 2 ft/2 hr
20E1	S. W. Norman	18	Dr	6	30	23	Sand	21-30	17 16.1	06/24/75 09/19/75	-	---	D	Bailed 10 gpm; dd 1 ft/2 hr
20K1	Smithy F. Bedell	106	Dr	6	130	130	Sand	125-130	108 116.4 113.2	05/15/72 09/19/75 07/10/79	S	1	GD	Yield 10 gpm; dd 0 ft/2 hr
20P1	Harold Clough	80	Dr	6	75	69	Sand	69-75	60	03/01/73	-	---	--	Bailed 15 gpm; dd 0 ft/2 hr
20P2	Owen Mulkey	70	Dr	6	69	69	Sand	65-69	63	05/13/73	-	--	D	Pumped 30 gpm; dd 0 ft/.5 hr
28L1	Mrs. A. E. Kroon	40	Dr	6	60	---	--	---	35	??/??/??	-	---	--	
28L2	H. L. Johnson	55	Dr	6	63	---	--	---	55 54.68	??/??/67 09/18/75	-	---	--	
29A1	Ray Benton	100+	Dr	6	136	130	Sand	131-136	109	01/18/72	S	.33	D	Bailed 10 gpm
29C1	R. E. Lowrie	25	--	--	32	---	--	---	25	??/??/??	-	---	--	358 ppm Cl
29K1	Ida Tracy	45	Dr	6	60	52	Sand, gravel	55-60	47 47.4	10/09/73 09/19/75	-	---	D	Bailed 9 gpm; dd 0 ft/3 hr
32G1	L. E. Olmstead	25	DR	6	185	14	Sand	11-185	18	03/??/72	-	---	D	Bailed 1 gpm
32G2	Ed Schenkeveld	20	Dr	6	102	40	Shale	80	10 0.65*	08/08/74 09/19/75	-	---	D	Bailed 3 gpm *Above ground level
32J1	Nelson	45	Dr	6	---	---	Sandstone	---	18.8	09/19/75	S	---	D	Aquifer in Tertiary sandstone

T.30N., R.1W.

4R1	Richard D. Steinke	230	Dr	--	---	230	Sand	230-239	218	03/06/76	-	---	D	
5M1	Charles Broders	222	Dr	6	274	270	Sand	230-270	218 218.6	07/29/73 07/24/75	S	1	D	Bailed 10 gpm

Table 4. -- Records of Wells (Continued)

		Well					Water-bearing Zone(s)		Water Level		Pump			
Well No.	Owner or Tenant	Altitude (feet)	Type	Diameter (inches)	Depth (feet)	Casing Depth (feet)	Material	Depth Interval (feet)	Below Land Surface (feet)	Date	Type	H.P.	Use of Water	Remarks
							T.30N., R.1W. (Continued)							
7F1	Virgil See	175	Dr	6	197	197	Sand, gravel	145-197	105	03/12/74	-	---	D	Bailed 40 gpm; dd 10 ft/1 hr
7P1	Werrion	200	Dr	6	---	---	--	---	74.6	07/25/75	-	---	D	
8H1	R. Austin	185	Dr	6	243	240	Sand	240-243	184.6	07/24/75	S	6.5	D	Reportedly affected by tides
8L1	Camper Club	207	Dr	8	221+	---	--	---	220.4 220.0	07/24/75 07/10/79	S	---	NU	"Sump water"
9K1	R. Taylor	230	Dr	6	245	240	Sand	230-245	215	05/06/76	-	---	D	
16F1	Francis E. Ludwig	60	Dr	6	75	---	--	---	46.1	07/31/75	S	1	D	
16K1	Guy Whiteman	30	Dn	2	31	---	--	---	23	??/??/??	-	---	--	
16K2	Mike Burton	50	Dr	6	80	---	--	---	30	??/??/??	-	---	--	
16N1	W. W. Higdon	215	Dr	6	250	244	Sand	240-250	207.7	07/31/75	-	---	GD	Bailed 15 gpm; dd 4 ft/5.5 hr Originally drilled to 381 ft
17L1	John Taylor	230	Dr	6	247	247	Sand	240-247	221 220.6	09/11/72 07/25/75	S	1	D	Bailed 20 gpm; dd 0 ft/2 hr
17L2	C. Whitney	235	Dr	6	280	235	Sand	230-245	220	01/04/73	S	1	D	Bailed 10 gpm; dd 5 ft/2 hr
18B1	Clarence Lammers	195	Dr	6	85	85	Gravel	80-85	62	05/06/75	-	---	D	Bailed 25 gpm; dd 6 ft/-
18G1	H. Harvey	192	Dr	6	102	102	Sand	60-102	60 51.6	11/29/73 07/25/75	-	---	D	Bailed 35 gpm; dd 1 ft/3 hr
18M1	Cape George Village	401	Dr	8	300	290	Sand, gravel	288-300	259 256.7	02/11/69 07/24/75	S	20	GD	Pumped 200 gpm; dd 7 ft/-

20E1	Gary Provonsha	160	Dr	6	162	61	Gravel	40-50	5	06/03/74	-	---	D	Bailed 12 gpm; dd 25 ft/2 hr
20M1	Victor Kobetich	215	Dr	6	---	152	Sand, gravel	151-153	77	11/10/73	S	1.5	D	Bailed 20 gpm; dd 20 ft/3 hr
21E1	Victor Anderson	290	Dr	6	209	209	Sand, gravel	184-186	180	08/06/67	S	.5	D	Bailed 15 gpm; dd 3 ft/2 hr
21L1	Bulis	260	Dr	6	209+	---	--	---	208.6	07/25/75	-	---	D	
21M1	Robert Twiggs	290	Dr	6	270	---	--	---	176.5	07/25/75	-	---	D	
22Q1	Washington State Parks and Recreation	190	Dr	8	270	250	Sand	200-260	190 188.1	02/11/56 07/25/75	-	---	GD	Yield 11 gpm; dd 33 ft/39 hr
26N1	Kala Point Development	100	Dr	6	120	---	--	---	94.6	07/31/75	-	---	GD	Pumped 56 gpm
28D1	Myrl Hancock	240	Dr	6	149	149	Sand	140-149	125	04/22/69	J	1.5	D,Ind	Pumped 18 gpm; dd 3 ft/1.5 hr
28E1	Colan Swindell	220	Dr	6	95	95	Gravel	94-95	40 80.4	06/08/66 07/31/75	J	.75	D	Bailed 10 gpm
28L1	Jack Tice	220	Dr	6	72	72	Gravel	69-72	61	12/23/74	S	.75	D	Pumped 20 gpm; dd 8 ft/2 hr
29E1	Phillip Bailey	75	Dr	--	---	290	Gravel	249-260	70	??/??/??	T	---	Irr	Yield 200 gpm
29H1	John Martin	220	Dr	6	70	70	Gravel	69-70	30	06/29/72	J	---	--	Bailed 15 gpm; dd 0 ft/2 hr
29H2	John Martin	210	Dr	6	63	63	--	---	46	04/25/72	S	.33	D	
29N1	Allen Easton	100	Dr	--	---	54	Gravel	48-54	32	03/23/63	J	.75	D	Yield 13 gpm; dd 10 ft/2 hr
32J1	James Jensen	100	Dr	6	145	---	--	---	76.0	08/07/75	S	---	D	
32K1	R. E. Trautman	44	Dr	6	47	---	--	---	39.9	07/31/75	J	---	D	
32K2	F. & J. Simene	40	Dr	6	88	88	Sand, gravel	88	35	??/??/??	J	1.5	--	Test 30 gpm; dd 20 ft/2 hr
33H1	John Egelkrout	107	Dr	6	106	106	Sand	96-106	25 57.9	10/22/70 08/01/75	-	---	D	Bailed 30 gpm; dd 10 ft/2 hr
33N1	Bert Hill	137	Dr	6	105	---	Gravel	86-88	100 80.9	03/02/72 07/31/75	S	---	GD	Yield 30 gpm; dd 6 ft/1 hr

Table 4. -- Records of Wells (Continued)

		Well					Water-bearing Zone(s)		Water Level		Pump			
Well No.	Owner or Tenant	Altitude (feet)	Type	Diameter (inches)	Depth (feet)	Casing Depth (feet)	Material	Depth Interval (feet)	Below Land Surface (feet)	Date	Type	H.P.	Use of Water	Remarks
							T.30N., R.1W. (Continued)							
34J1	John Smithson	110	Dr	6	146	146	Sand, gravel	133-146	102 108*	03/??/71 07/31/75	S	.5	D	Pump test + 20 gpm; dd 24 ft/4 hr *Still recovering at time of measurement
34K1	Eugene Alexander	120	Dr	6	116	116	Gravel, sand	112-116	84 90*	09/10/72 07/31/75	S	.5	D	Bailed 10 gpm; dd 20 ft/2 hr *Still recovering at time of measurement
							T.30N., R.2W.							
12Q1	Cape George Land Company Well #1	200	Dr	6	213	203	Sand, gravel	184-213	--- 193.3	09/09/64 7/24/75	S	7.5	GD	Bailed 60 gpm; dd 7 ft/-
12Q2	Cape George Land Company Well #3	199	Dr	8	242	---	--	---	190.5	07/24/75	S	7.5	GD	
13J1	Cape George Village Well #2	340	Dr	6	315	311	Gravel, sand	311-315	250 276.6*	10/01/74 07/24/75	S	7.5	D	Bailed 60 gpm; dd 5 ft/- *Still recovering 20 minutes after pump shut off
15L1	Diamond Point	40	Dr	6	90	---	--	---	30 85.0	??/??/68 08/07/75	S	---	GD	145 ppm Cl, sometimes salty when pumped continuously for 4 weeks
15N1	Diamond Point	250	Dr	6	360	---	--	---	238.3	08/14/75	-	---	A	Abandoned due to initial salt
16K1	Sunshine Acres	285	Dr	8	421	---	--	---	---	??/??/??	S	---	GD	Tape hangs up
20K1	Northwest Tech-	405	Dr	6	500	---	--	---	368.1	08/27/75	S	---	Ind	
21A1	Sunshine Acres	325	Dr	6	400	---	--	---	---	??/??/??	S	---	A	Abandoned due to insufficient capacity

21B1	Helen Dent	370	Dr	6	365	356	Sand, gravel	329-365	297 345.8	06/14/74 08/08/75	-	---	D	Bailed 12 gpm; dd 13 ft/8 hr
21Q1	Diamond Point Water Company	270	Dr	8	393	373	Sand	373-393	266 271.1	06/06/75 08/27/75	S	---	GD	Pumped 310 gpm; dd 27 ft/10 hr
22M1	Diamond Point Water Company	245	Dr	6	262	262	--	262	246 244.5	09/19/74 08/08/75	-	---	A	Pumped 30 gpm; dd 4 ft/12 hr Abandoned due to salt
24A1	Balch Land Development Corporation	435	Dr	6	740	---	--	381-395	179	07/??/75	-	---	NU	
24K1	Balch Land Development Corporation	350	Dr	6	268	268	Sand, gravel	242-245	236 236	01/20/61 09/30/68	S	3	--	Yield 14 gpm
27M1	C. J. Messer	80	Dr	6	128	---	Sand, gravel	120-128	65	05/16/54	-	---	--	Yield 20 gpm
27P1	Helen Dent	75	Dr	6	---	---	--	---	69.0	08/07/75	S	---	D	
28M1	Sunshine Acres Well #5	115	Dr	6	122	113	Sand	100-120	67 66.6	06/03/75 08/07/75	-	---	GD	Pumped 125 gpm; dd 22 ft/4 hr
28M2	Sunshine Acres Well #4	125	Dr	6	92	---	--	---	84.6	08/14/75	-	---	GD	
28M3	Sunshine Acres	120	Dr	8	260	260	Sand Gravel and sand	102-118 218-226	---	??/??/??	-	---	A	Abandoned; casing problems 150 ft of casing left
28N1	Elmer Howe	140	Dr	6	33	33	Gravel	25-33	4	04/22/74	-	---	D	Bailed 30 gpm
29R1	Roy Schoenrock	138	Dr	6	129	125	Gravel	83-128	103 104.0*	04/27/74 08/08/75	-	---	D	Bailed 5 gpm *Still recovering at time of measurement
31H1	John S. Crandall	210	Dr	6	205	205	Sand, gravel	190-205	167	08/17/70	S	.75	D,Irr	Bailed 7.5 gpm; dd 25 ft/.5 hr
32G1	Jack Westerman	195	Dr	6	197	197	Sand, gravel	180-187	---	??/??/??	-	---	D	Bailed 14 gpm; dd 7 ft/8 hr
32K1	Bill Ott	230	Dr	6	258	255	Sand, gravel	251-258	207	01/10/74	-	---	D	Bailed 10 gpm
33D1	Neal Turnberg	150	Dr	6	61	61	Gravel	55-61	41	08/03/73	-	---	D	Bailed 15 gpm
33H1	J. W. Levine	310	Dr	6	67	63	Sand, gravel	53-67	39	11/20/73	-	---	D	Bailed 7 gpm

Table 4. -- Records of Wells (Continued)

		Well					Water-bearing Zone(s)		Water Level		Pump			
Well No.	Owner or Tenant	Altitude (feet)	Type	Diameter (inches)	Depth (feet)	Casing Depth (feet)	Material	Depth Interval (feet)	Below Land Surface (feet)	Date	Type	H.P.	Use of Water	Remarks
						T.30N., R.2W. (Continued)								
33H2	George Davis	290	Dr	6	141	141	Gravel	115-120	69	06/17/74	-	---	D	Bailed 5 gpm; dd 23 ft/3 hr
33H4	V. Reimer	310	Dn	6	30	---	--	---	10	01/29/69	-	---	D	
33M1	Leon Gee	345	Dr	6	163	163	Gravel	153-163	143	04/19/74	-	---	D	Bailed 10 gpm
33N1	Craig Jentile	350	Dr	6	356	356	Sand	334-356	312 306.8	03/13/75 08/14/75	-	---	D	Bailed 15 gpm
33N2	R. E. Holderby	345	Dr	6	---	---	--	---	8.5	08/14/75	-	---	D	Pumped 8 gpm
34C1	John Swarthout	25	--	6	77	72	Gravel	75-77	14 19	06/28/61 10/01/68	S	.5	--	Yield 10 gpm
34G1	C. M. Phipps	145	Dr	6	170	90	--	---	118.4	08/06/75	S	---	D	
34H1	H. L. Drake	155	Dr	6	400	---	--	---	Flow	10/01/68	-	---	--	70 ppm Cl
34K1	Herman Pearson	245	Dr	--	360	---	Shale	---	--- Flow Flow	01/01/63 10/01/68 08/07/75	S	1	GD	Bailed 9 gpm; dd 250 ft/1 hr 28 ppm Cl
35D1	Robert A. Carlson	85	Dr	6	50	---	--	---	35.0	08/07/75	S	---	D	
35E1	Chuck Wilson	130	Dr	6	175	---	--	---	Flow 96.6	10/01/68 08/06/75	S	---	D	665 ppm Cl Not potable
35F1	E. M. Flowers	105	Dr	6	180	80	Shale	13-180	Flow Flow	05/24/65 08/07/75	J	.75	D,Irr	14 psi
35F2	Orin Yates	105	Dr	6	50	50	Shale	25-50	12 27.8	03/15/72 08/06/75	S	.33	D	Bailed 7 gpm; dd 38 ft/-
35F3	Orin Yates	30	Dg	36	20	20	--	---	15.3	08/06/75	S	---	D	
35M1	American Campgrounds	225	--	7	235	---	--	---	Flow	06/17/71	S	1	--	3-4 psi
35M2	Paul K. Murphy	250	Dr	6	280	235	Sandstone	---	5 5.1	07/12/73 08/06/75	-	---	D	Bailed 7 gpm

35P1	American Campgrounds	270	Dr	6	150	26	Shale, sandstone	80-150	23 26.0*	06/27/72 08/06/75	-	---	D	Pump test 15 gpm; dd 32 ft/23 hr *Still recovering at time of measurement
36P1	Charles Gunstone	20	Dr	6	57	---	--	---	42	??/??/??	S	---	D	
36P2	Charles Gunstone	15	Dr	6	93	---	--	--	30	??/??/??	T	---	D	No access port 30 ppm Cl

T.30N., R.3W.

23H1	Langdon Simons, Jr.	40			107	---	--	---	30	??/??/68	-	---	--	
25C1	Chester Steeby	125	Dr	6	186	---	--	---	33.0	08/19/75	-	---	D	
25G1	P. A. Lynch	135	Dr	6	191	187	Sand	185-191	114	12/08/73	-	---	D	Bailed 8 gpm; dd 12 ft/10 hr
36F2	J. J. Burnett	95	Dr	6	110	---	--	---	76.5	08/19/75	S	---	D	

TABLE 5

DRILLERS' LOGS OF REPRESENTATIVE WELLS

Table 5. -- Drillers' Logs of Representative Wells

Material	Thickness (feet)	Depth (feet)
25/1W-4K3 Lambert, Les; drilled by Hood Canal, June, 1975		
Soil	3	3
"Hardpan", brown	61	64
"Hardpan", gravelly, brown	41	105
Clay, brown	17	122
"Hardpan", gravelly, brown	50	172
"Hardpan", gravelly, gray	18	190
Sand, brown, hard-packed	23	213
Sand, brown (water)	9	222
"Hardpan"	2	224
25/2W-10J2 Kehle, Art; drilled by Hood Canal, February, 1974		
"Hardpan" with boulders, brown	40	40
Gravel, sand and clay, hard-packed	33	73
Gravel and sand, water	8	81
25/2W-11D1 Sunnyslope Water Association; drilled by Webber, October, 1953		
"Hardpan" with boulders	40	40
Gravel, sand and clay	38	78
Sand and gravel, water	6	84
25/2W-15E1 Pleasant Tides; drilled by Hood Canal, November, 1974		
Soil, sandy	2	2
Clay and "hardpan", brown	128	130
Gravel	9	139
Sand, brown, fine	51	190
Clay and "hardpan", brown	8	198
Gravel, large, water	12	210
Clay and "hardpan", brown	4	214

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
25/2W-10J2 Kehle, Art; drilled by Hood Canal, February, 1974		
"Hardpan" with boulders, brown	40	40
Gravel, sand and clay, hard-packed	33	73
Gravel and sand (water)	8	81
25/2W-11D1 Sunnyslope Water Association; drilled by Webber, October, 1953		
"Hardpan" with boulders	40	40
Gravel, sand and clay	38	78
Sand and gravel (water)	6	84
25/2W-15E1 Pleasant Tides; drilled by Hood Canal, November, 1974		
Soil, sandy	2	2
Clay and "hardpan", brown	128	130
Gravel	9	139
Sand, brown, fine	51	190
Clay and "hardpan", brown	8	198
Gravel, large (water)	12	210
Clay and "hardpan", brown	4	214

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
25/2W-15Q1 American Campgrounds; drilled by Stoican, July, 1972		
"Hardpan"	29	29
Sand, brown	16	45
Gravel, brown	17	62
Sand and gravel, brown	7	69
"Hardpan", gravelly	26	95
Sand, brown, dry	43	138
Sand, brown, fine to medium, water	32	170
Sand, brown, medium	35	205
Sand, brown, medium to coarse	9	214
Sand, some gravel	4	218
Sand, medium to coarse - pebbles	6	224
Sand, coarse	3	227
Sand, medium to coarse	13	240
Sand, medium	14	254
Sand, coarse	4	258
Gravel and sand	4	262
Sand, medium to coarse	9	271
25/2W-21E1 Lucus, D.L.; drilled by Hood Canal, July, 1972		
Basalt, broken	7	7
Basalt	229	236
25/2W-21F2 Constable, F.; drilled by Hood Canal, October, 1969 and August, 1973		
Gravel and "hardpan", clayey	10	10
Basalt, gray	22	32
Basalt, lavender	1	33
Basalt, dark, hard	7	40
Basalt, green	21	61
Basalt, gray, hard	214	275
Basalt, blue green	50	325
Basalt, gray, medium hard	33	358
Basalt, medium hard	42	400
Clay, hard	2	402
Basalt, gray	23	425
Shale, gray	10	435

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
25/2W-29K1 Paradise Cove Club, Inc.; drilled by Bedell, May, 1956		
Sand, gravel, boulders	10	10
Gravel, cemented and lenses of clay	14	24
Gravel, large	4	28
25/2W-31L1 Triton Cove Estates; drilled by ?, October, 1970		
Basalt	170	170
26/1W-7K1 Wash. Dept. of FIsheries; drilled by Bedell, June, 1959		
Clay	11	11
"Hardpan"	69	80
Gravel, sand and some clay - water	4	84
Gravel, cemented - some water	6	90
Gravel - small amount of water	1	91
"Hardpan"	7	98
Gravel, cemented, water 98' to 114'	16	114
"Hardpan"	4	118
Clay and gravel, dry	8	126
Sand and gravel, some water	1	127
Sand and clay, dry	9	136
Clay, blue, sand, some water	14	150
26/1W-7M1 Janssen, Al; drilled by Hood Canal, October, 1973		
Soil, rocky	2	2
Basalt, broken	1	3
Basalt, solid	55	58
26/1W-18M2 McGuire, M.Q.; drilled by Hood Canal, October, 1970		
Soil, rocky; clay, brown	15	15
Basalt	289	304

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
26/1W-33J1		
Jefferson County Water Dist. #3; drilled by Burt, June, 1976		
Soil	3	3
"Hardpan", brown	94	97
Sand, gravel, water (10-15 gpm)	3	100
Clay, blue	1	101
"Hardpan", blue	23	124
Clay, gravelly, blue	12	136
Clay, blue	46	182
Silt, blue	6	188
Clay, blue	47	235
"Hardpan"	10	245
Gravel, large and sand (water level up 10 ft.)	6	251
Clay, sandy, blue	3	254
Gravel and sand (little water)	1	255
"Hardpan", gravelly, blue	12	267
Clay, blue	30	297
Sand, silty, gravelly	3	300
Gravel, silty, brown	4	304
Gravel and sand (water)	18	322
26/2W-24E1		
Griffin, G.A.; drilled by Hood Canal, September, 1969		
Soil, sandy	12	12
Gravel and sand	4	16
"Hardpan", gravelly and sand	14	30
Sand, brown, "soupy" (water)	8	38
Gravel (water)	6	44
"Hardpan"	--	44
26/2W-26J2		
Nealey, M.; drilled by Hood Canal, April, 1974		
"Hardpan", brown	8	8
Basalt, gray, red, green	192	200

Table 5. -- Drillers' Logs of Representative Wells -- Continued

Material	Thickness (feet)	Depth (feet)
26/2W-34J1 Call, R.; drilled by Hood Canal, June, 1973		
"Hardpan", brown	28	28
Boulders	5	33
Boulders and "hardpan"	16	49
Gravel (water)	4	53
"Hardpan"	7	60
Boulders, large (water)	6	66
26/2W-35L1 Richardson, R.; drilled by Hood Canal, April, 1974		
Gravel	4	4
Clay, brown	3	7
"Hardpan", brown	3	10
? - some water	3	13
"Hardpan", brown	10	23
Sand and gravel (water)	13	36
27/1E-2C1 Quihovan, Inc.; drilled by Stoican, June, 1967		
Soil, brown	6	6
Clay, silty, blue	62	68
"Hardpan", gray	6	74
Sand, gray	26	100
Sand, gray (wet)	25	125
Clay, blue	6	131
Sand and gravel, gray, cemented	6	137
Clay, silty, blue	18	155
"Hardpan", brown	2	157
Clay, gray	15	172
Sand (water-bearing)	7	179
Sand, clean (water-bearing)	3	182
27/1E-4E1 Dodge, H.T.; drilled by Hood Canal, August, 1970		
Top soil	2	2
"Hardpan"	52	54
Clay, sandy, gray	16	70
Clay, gummy	52	122
Sand, "heaving"	35	157

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
27/1W-18D1 Brown, R.; drilled by Hood Canal, October, 1970		
Soil and rocks	8	8
Shale, hard	92	100
27/1W-15P1 Myers, Gene; drilled by Hood Canal, April, 1971		
Soil	2	2
"Hardpan", rocky	6	8
Clay, sticky	3	11
"Hardpan", clayey	176	187
Clay, sandy	38	225
Sandstone	3	228
Sand (water)	26	254
"Hardpan"	?	254
27/1W-15P2 Paulson, David; drilled by Hood Canal, April, 1973		
Soil	2	2
"Hardpan", brown	28	30
Clay, sandy, brown	255	285
Clay, sandy, gray	62	347
Clay, blue	11	358
Clay, sandy, gray	9	367
Clay, blue	15	382
Clay, gray	3	385
Clay, blue	18	403
Clay, sandy, gray	2	405
Clay, blue	20	425
Clay, sandy, gray and sandstone	60	485
27/1W-36B1 Naylor, F.E. & D.R.; drilled by Stoican, June, 1963		
Gravel, cemented	15	15
Gravel, cemented, gray	8	23
Clay, blue, sticky	27	50
Clay, gray	5	55
Sand and clay, gravelly	3	58
Clay, gravelly, cemented	5	63
Gravel, loose (water-bearing, salt)	1	64
Clay, blue	19	83
Clay, brown and gray, organic matter	62	145
Gravel, fine	1	146
Clay, gray	17	163
Sand, "muddy", and gravel	9	172
Sand, medium and gravel	5	177

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
27/2W-2H1		
Lewis, R.R.; drilled by Hood Canal, October, 1970		
Soil	3	3
"Hardpan", rocky	20	23
Shale	59	82
27/2W-11G1		
Pollard, S.; drilled by Hood Canal, October, 1973		
Soil, brown	2	2
"Hardpan", rocky, brown	59	61
27/2W-13L1		
Cassette, R.; drilled by Hood Canal, April, 1973		
Soil	3	3
Clay, sandy	7	10
"Hardpan", brown	10	20
Gravel	7	27
27/2W-13M3		
Prestwood, H.; drilled by Hood Canal, July, 1973		
Soil	3	3
"Hardpan", rocky	5	8
Clay, gray	2	10
Sand, gravel, "hardpan"	17	27
Gravel, large (water)	8	35
27/2W-14A2		
Hyde, F.; drilled by Vanausdle, ?, 1960		
Soil	10	10
"Hardpan", clayey, gray	45	55
Sand (water)	8	63
"Hardpan"	?	63

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
27/2W-14B1 Denham, R.W.; drilled by Hood Canal, June, 1970		
Soil, clayey, brown	3	3
Gravel, boulders	27	30
Clay, brown with gravel	7	37
Gravel, pea-size and clay	5	42
Clay, sandy, brown	6	48
Sand (water)	5	53
Gravel, large, gray (water)	2	55
27/2W-14Q1 Allen, L.; drilled by Hood Canal, July, 1973		
Clay, sandy	30	30
Clay, sandy, brown	20	50
Sand, fine, brown	20	70
Sand (water)	16	86
27/2W-23B1 Peterson, W.; drilled by Hood Canal, April, 1974		
Soil, rocky, brown	4	4
"Hardpan", brown	49	53
Sand, brown and gravel	3	56
27/2W-24C1 Finelly, M.; drilled by Hood Canal, ?, 1968		
Soil, rocky	12	12
"Hardpan", rocky	22	34
Gravel (water)	4	38
27/2W-24C3 Pederson, W.; drilled by Hood Canal, March, 1976		
Gravel, large, boulders	36	36
Gravel (water)	4	40
"Hardpan", gravelly	15	55
Sand, brown, hard packed	35	90
Sand, brown (water)	39	129
Sand, gray, fine (heaves)	11	140

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
28/1E-4M2 Hamblen, C.H.; drilled by Hood Canal, October, 1972		
Soil	3	3
Clay, sandy and gravel	32	35
Clay, sandy, brown	19	54
"Hardpan", gravelly	14	68
Clay, gray and gravel	10	78
Clay, brown and "hardpan"	26	104
Gravel and sand, "hardpan"	16	120
Gravel and sand (water)	3	123
"Hardpan", clayey	3	126
28/1E-4P2 Murry, J.; drilled by Hood Canal, October, 1972		
Soil	4	4
"Hardpan", gravelly, brown	3	7
"Hardpan", gray	15	22
Clay, sandy, brown	28	50
"Hardpan", gray	47	97
Gravel and sand (water)	5	102
28/1E-5P1 Toepper, R.; drilled by Hood Canal, August, 1972		
Soil	2	2
"Hardpan", clayey, brown	27	29
Gravel, pea-size	1	30
Clay, brown and sand	40	70
Clay, blue, "gummy"	14	84
Clay, sandy, gray	6	90
Clay, blue	63	153
Sand, brown (water)	8	161

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
28/1E-8H1		
Pope and Talbot Development, Inc,; drilled by Gaudio, November, 1968		
"Hardpan"	34	34
Clay, sand, gravel	5	39
"Hardpan"	9	48
Clay, sand	9	57
"Hardpan"	23	80
Sand, gravel, some clay binder (small amount of water 80-82)	48	128
Clay, silt and sandy wet peat	14	142
Clay, silt	20	162
Clay, gravel, some sand	24	186
Clay, some gravel and peat	28	214
Sand, gravel (water)	9	223
Sand, some gravel, clay layer	12	235
Sand, gravel, cemented layer (water)	10	245
Sand, gravel (water)	10	255
Clay, blue gray	2	257
28/1E-8L1		
Woodruff, F.L.; drilled by Hood Canal, January, 1975		
"Hardpan", rocky	19	19
"Hardpan", sandy	31	50
Clay, sandy, brown	48	98
"Hardpan", gravelly, gray	12	110
Rock, hard	5	115
Clay, sandy, gray	67	182
Sand, brown (water)	5	187
Gravel, pea-size (water)	6	193
"Hardpan"	?	193
28/1E-15R2		
Roden, V.G.; drilled by Hood Canal, February, 1974		
Soil, sandy, rocky, brown	4	4
"Hardpan", brown, soft	8	12
"Hardpan", gray, soft	34	46
Clay, sandy, gray	3	49
"Hardpan", gray	6	55
Clay, sandy, gray and gravel	5	60
"Hardpan", gray, hard	24	84
Clay, gray, sandy	2	86
Sand, gray, gravel, clay chunks	5	91
Sand, gravel	4	95

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
28/1E-16P2 Washburn, L.; drilled by Van Ausdle, December, 1974		
Sand	10	10
Clay, brown, sand, gravel	8	18
Clay, blue, sand, gravel	27	45
Clay, blue	5	50
Sand, gravel	2	52
28/1E-16Q3 Pingrey, C.; drilled by Stoican, July, 1975		
Soil, rocky, brown	9	9
Clay, sandy, brown	28	37
Sand, fine (water)	28	65
Sand, brown, fine, gravel (water)	12	77
Sand, brown, fine, with clay	26	103
Sand, coarse to fine	9	112
Sand, brown, fine, with clay	26	138
28/1E-21F3 Port Ludlow #9; drilled by Story and Armstrong, October, 1972		
Sand, silty	23	23
Sand, silty with gravel	10	33
Sand, coarse and gravel	7	40
Gravel, granular with sand	11-1/2	51-1/2
Clay, gray	8-1/2	60
Clay, silty, gray	9	69
Basalt (Eocene)	1	70
28/1E-22B3 Sewell, B.; drilled by Hood Canal, April, 1973		
Soil	3	3
Clay, brown, gummy	18	21
Gravel and "hardpan", sandy, clayey	92	113
Clay, silt and sand with water	205	318
Basalt, gray	4	322
Basalt, broken (water)	2	324

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
28/1E-22G3 Erickson, E.T.; drilled by Hood Canal, October, 1973		
Soil	1	1
"Hardpan", sandy	18	19
Clay, gray	129	148
Clay, silty, gray	40	188
Basalt, broken	2	190
Basalt, hard	194	384
Basalt, fractured	1	385
28/1E-27A1 Perhacs, L.; drilled by Hood Canal, August, 1969		
Clay, sticky	60	60
"Hardpan", gray	5	65
Clay, sandy, gray	205	270
Gravel, pea-size (water)	6	276
28/1E-33M3 Olympic Land and Investments Co.; drilled by Hood Canal, January, 1974		
Clay, sandy, brown	20	20
Clay, sandy, gray	148	168
"Hardpan", gray and clay, brown	16	184
Basalt, very hard	15	199
Basalt, gray, hard	10	209
Basalt, gray, very hard	74	283
Basalt, red, soft (water)	2	285
Basalt, gray, hard	53	338
Basalt, banded	44	382
Basalt, lavender, soft	5	387
Basalt, light gray	7	394
Basalt, very hard	6	400
28/1E-33Q3 Boyd, K.; drilled by Hood Canal, May, 1969		
Gravel, sandy	50	50
"Hardpan", rocky	15	65
Clay, sandy	45	110
Clay, gray	78	188
"Hardpan"	3	191
Gravel (water)	2	193
"Hardpan"	16	209
Gravel (water-small amount)	1	210
"Hardpan", clayey	10	220
"Hardpan", gravelly	66	286
Basalt, red	6	292
Basalt, black	?	292

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
28/1E-34Q1		
Boyd, B.A.; drilled by Hood Canal, November, 1972		
Soil	5	5
Gravel, sandy, clay	5	10
"Hardpan", gray green	5	15
Clay, gray, gummy	16	31
Clay, sandy, gray	22	53
Peat, prown	12	65
Clay, gray, gummy	31	96
Gravel, "hardpan", sandy	9	105
Basalt, hard	85	190
28/1W-2B1		
Kimball, R.; drilled by Hood Canal, July, 1973		
Clay, sandy, gray	3	3
"Hardpan"	4	7
Clay, gray	96	103
Sand, fine (water)	13	116
28/1W-3N1		
Olsen, T.; drilled by Hood Canal, February, 1975		
Soil, rocky	8	8
"Hardpan", gray, rocky	25	33
Clay, sandy (some water)	1	34
"Hardpan", gray	17	51
Gravel (water)	2	53
28/1W-10Q1		
Carstensen, H.; drilled by Hood Canal, june, 1973		
Soil	3	3
"Hardpan", brown	26	29
"Hardpan", gray	95	124
Clay, sandy, brown	45	169
Clay, gummy	61	230
?	27	257
Sand, fine (water)	9	266
"Hardpan"	0	266

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
28/1W-11L1		
Hansen, W.; drilled by Hood Canal, May, 1973		
Soil	1	1
"Hardpan", brown	111	112
Sand, brown (dry)	24	136
Clay, sandy (wet)	9	145
Clay, sandy, brown	3	148
Clay, sandy, gray	16	164
"Hardpan", brown	14	178
Sand, brown (dry)	30	208
Sand and gravel	17	225
28/1W-17H1		
Bletham, J.; drilled by Hood Canal, ?, ?		
Soil	1	1
Clay, gravel and sand	11	12
Clay and "hardpan"	18	30
Shale	60	90
Shale, banded, hard	2	92
Shale	48	140
Shale, banded	8	148
Shale	2	150
28/1W-21M1		
Bader, G.; drilled by Bekkevar, April, 1974		
Soil	1	1
Clay, sandy	3	4
Clay, sandy, brown and "hardpan", rocky	17	21
Gravel, sand (water)	17	38
28/1W-32B1		
Park, R.D.; drilled by Hood Canal, September, 1973		
Soil, sandy, brown	16	16
Shale, gray	8	24
Sand and gravel	4	28
Shale, gray	14	42
Shale, brown	105	147
Shale, gray	19	156
Shale, brown	6	162
Shale, gray	19	181
Shale, brown	15	196

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
28/2W-23Q1 Clevanger, L.; drilled by Hood Canal, October, 1972		
Soil	3	3
Clay, gray, gummy	49	52
"Hardpan", gray	17	69
"Hardpan", brown	9	78
Gravel (water)	3	81
28/2W-25D1 Thomas, R.; drilled by Hood Canal, July, 1973		
Clay, gray, gummy	8	8
Shale	167	175
28/2W-25P1 Full Gospel Church; drilled by Hood Canal, March, 1973		
Soil	1	1
Clay	3	4
Clay, sandy	21	25
Shale, banded	213	238
28/2W-26H1 Ralls, J.; drilled by Hood Canal, October, 1973		
Soil, brown	2	2
Clay, brown	34	36
Clay, gray	12	48
Clay, gray, sandy, rocky	8	56
Clay, gray, rocky	30	86
Sand and gravel	2	88
29/1E-8R2 Shumaker, F.; drilled by Stoican, February, 1966		
Soil	2	2
"Hardpan", brown	16	18
Sand, brown, medium	29	47
Clay, blue	113	160
Sand, coarse	3	163
Sand, fine with some gravel, coarse	4	167

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
29/1E-9D1 Stavney, G.; drilled by Stoican, April, 1969		
Soil	2	2
Clay, gray and brown	8	10
Clay, brown	14	24
Clay, brown, sandy	7	31
Sand, brown, dry	87	118
Clay, gray, and gravel	2	120
Gravel, gray, and sand	5	125
Sand (water)	5	130
Gravel, brown, cemented	2	132
Sand, brown, and gravel (water)	4	136
Clay, blue	2	138
29/1E-18G1 Savitch, A.; drilled by Sedlak, July, 1975		
Soil	2	2
Clay, brown, gravel	6	8
Clay, gray, gravel	9	17
Sandstone, brown, soft	18	35
Sandstone, gray, medium	23	58
29/1E-19G1 Amick, E.; drilled by Hood Canal, June, 1974		
Clay and "hardpan"	30	30
Clay, sandy	26	56
Clay, sandy, coarse	4	60
Basalt, gray	240	300
Basalt, black (water)	25	325
Basalt, black	20	345
29/1E-19K1 Peters, B.; drilled by Hood Canal, ?, ?		
Sand, soft	22	22
"Hardpan", sandy	26	48
Rocks and sand	12	60
"Hardpan", rocky	18	78
Sand, fine	13	91
Sand, medium	20	111

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
29/1E-19P6 Brooks, V.L.; drilled by Hood Canal, July, 1975		
Sand, brown	8	8
"Hardpan", gray, rocky	39	47
Clay, gray	8	55
Clay, brown	1	56
Sand and gravel (water)	1	57
Sand, gray	6	63
Clay, gray	63	126
"Hardpan", gravelly	10	136
Clay and gravel	4	140
"Hardpan", brown green	26	166
Gravel, firmly packed	9	175
Clay, gray, sandy	3	178
Gravel, hard-packed (water)	4	182
Gravel, sandy (water - 2-1/2 gpm)	2	184
Gravel, hard packed	4	188
"Hardpan", clayey	9	197
Basalt, black	63	260
29/1E-19Q1 Finch, J.; drilled by Hood Canal, September, 1973		
Soil	1	1
Clay, brown	13	14
Gravel, gray and "hardpan"	11	25
Clay, blue	6	31
Clay, gray	55	86
Basalt, broken and clay, gray	9	95
Basalt, black, hard	66	161
29/1E-28N3 Kelso; drilled by Hood Canal, December, 1974		
Soil, brown	3	3
Clay, brown	9	12
"Hardpan", gray, rocky	24	36
Gravel, sandy (water)	2	38
Gravel (water)	2	40

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
29/1E-28P2 Smythe, B.; drilled by Hood Canal, December, 1972		
Basalt, weathered	6	6
Basalt	85	91
29/1E-33E1 Gainer, C.; drilled by Hood Canal, May, 1970		
Clay, brown	8	8
"Hardpan", gray, clayey	47	55
Clay, gray	1	56
Basalt	78	134
29/1E-33F2 Edgbert, J.; drilled by Hood Canal, August, 1972		
Soil	1	1
"Hardpan", brown	4	5
"Hardpan", gray, sandy	35	40
Clay, blue	2	42
Clay, brown, sandy	8	50
Basalt, gray	21	71
Basalt, red	12	83
Basalt, gray	152	235
29/1W-2K1 Green, E.A.; drilled by Hood Canal, June, 1974		
Sand and gravel	30	30
"Hardpan", gravelly	50	80
Gravel and sand (water)	11	91
"Hardpan"	--	91

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
29/1W-2R2 Jefferson Co. PUD; drilled by Hood Canal, June, 1972		
Soil, brown, sandy and clayey	8	8
"Hardpan", gravelly	46	54
Clay, brown	6	60
"Hardpan", brown	1	61
Clay, blue	2	63
Clay, blue and gravel	1	64
"Hardpan", brown, clayey	12	76
Gravel, hard-packed, clean (water)	13	89
Gravel, gray and "hardpan", clayey	5	94
"Hardpan", gravelly	1	95
Gravel, large (water)	9	104
"Hardpan", clayey	1	105
Gravel, large (water)	2	107
Clay, soft and gravel	3	110
29/1W-3G1 City of Port Townsend; drilled by Western Drilling, Tacoma, February 1956		
Soil with gravel, medium	6	6
"Hardpan", gravelly, coarse	11	17
"Hardpan", gravelly, coarse with boulders	23	40
"Hardpan", slightly softer with finer gravel	13	53
Sand, fine (small amount of water)	3	56
Sand, heaving	13	69
Sand, coarse (water)	1	70
Peat	2	72
Sand, heaving	2	74
Clay	1	75
Gravel, coarse (large amount of water)	4	79
Sand, heaving	8	87
Gravel, medium, sandy	8	95
Gravel, pea-size (water)	13	108
Gravel, medium, and sand with some clay-hard	6	114
Clay and gravel (water)	4	118
Sand, coarse and gravel	6	124
Clay, blue	22	146
Sand, coarse	2	148
Clay, blue	10	158
Sand, coarse and pea gravel	12	170
Clay and sand	5	175
Gravel and sand, coarse	3	178
Clay	6	184

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
29/1W-5Q1		
Malsed, L.; drilled by Hood Canal, January, 1969		
Soil	3	3
"Hardpan", brown, rocky	37	40
"Hardpan", gray, sandy, rocky	55	95
"Hardpan", sandy with pea gravel	11	106
Pea gravel and sand (water)	8	114
Gravel (water)	4	118
Clay, sandy	--	118
29/1W-8B1		
Sahara Water Co.; drilled by Hood Canal, January, 1973		
Gravel and sand	8	8
"Hardpan", brown	19	27
Clay, gray, sandy	11	38
Sandstone, gray	80	118
Sandstone, hard (water-about 1 gpm)	5	123
Sandstone (2 gpm)	2	125
Sandstone (7 gpm)	10	135
Sandstone	15	150
29/1W-10Q1		
Rasmussen, T.; drilled by Stoican, December, 1974		
Sand, brown, and gravel	12	12
Clay, brown, sandy	10	22
Sand and gravel (dry)	6	28
Sand and gravel, brown (water)	2	30
Sand and gravel, brown, cemented	3	33
Sand and gravel (water)	2	35
Sand and gravel, brown, cemented	1	36
Sand and gravel, gray (water) with clay layers	5	41
Sand and gravel, gray and clay	1	42
Sand and gravel (water)	3	45
29/1W-14H1		
Shaw, D.; drilled by Hood Canal, July, 1972		
Soil	3	3
Clay, blue, gummy	142	145
Sand, gray, clayey	12	157
Sand and gravel (water)	23	180

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
29/1W-15A1 Brown, B.G.; drilled by Hood Canal, November, 1973		
Gravel, brown, clayey	24	24
Clay, gray, gravelly	4	28
Clay, gray	4	32
Gravel, coarse (water)	8	40
"Hardpan", clayey	--	--
29/1W-18E2 Barrett, R.; drilled by Hood Canal, April, 1974		
"Hardpan", brown	86	86
Sand and gravel (water)	28	114
29/1W-22E1 Scott, R.W.; drilled by Stoican, June, 1975		
Soil	1	1
Clay, brown, gravelly	12	13
Clay, gray, gravelly	60	73
Clay, brown, sandy	23	96
Sand and gravel, brown (dry)	74	170
Sand, brown (dry)	58	228
Sand, brown, fine	41	269
Sand, brown, silty	2	271
Sand, gray	21	292
Sand, gray, fine, wood fragments	5	297
Sand, gray, silty, wood fragments	6	303
Sand, gray, fine, hard-packed	17	320
Sand, gray, fine	4	324
Shale with interbeds of sandstone	16	340
29/1W-22G1 Meacham, M.L.; drilled by Hood Canal, ?, ?		
Clay, gray, sandy	57	57
Clay, gray, gummy	110	167
Clay, gray, hard	19	186
"Hardpan"	--	--

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
29/1W-23P1 Short, N.L.; drilled by Western, ?, 1956(?)		
Soil	3	3
Peat	3	6
Gravel, hard-packed	34	40
Clay, hard	5	45
Shale, hard	25	70
Shale, broken	1	71
Shale, hard	269	340
29/1W-24Q1 Johnson, J.; drilled by Hood Canal, February, 1974		
Soil, brown	8	8
"Hardpan", brown, soft	26	34
Gravel, sand, brown, clay	9	43
Sand and gravel	2	45
Sand, brown, clay, gravel	9	54
Sand and gravel, coarse	3	57
29/1W-26Q1 Gould, G.; drilled by Hood Canal, July, 1973		
Soil, gray, clayey	7	7
Clay, gray	18	25
"Hardpan", gray	13	38
Sandstone	2	40
29/1W-34E1 Putus, R.; drilled by Hood Canal, November, 1973		
Soil, brown	3	3
"Hardpan", brown	25	28
Sand, brown	50	78
Sand, gray, clay layers	48	126
Clay, gray, silty	4	130
Clay, gray	63	193
Sand, gray, clay, banded	2	195
Sandstone, gray brown, clay and rock	4	199

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
29/1W-35R1 Huggins, K.; drilled by Hood Canal, January, 1974		
Soil, brown	2	2
"Hardpan", brown	31	33
Sand, brown with clay	47	80
Sand, gray	16	96
29/2W-5M1 Foster, L.C.; drilled by VanAusdle, February, 1974		
Clay, brown, gravel	38	38
Clay, blue, gravel	7	45
Clay, blue	42	87
Clay, blue, gravel	8	95
Clay, blue, sand	17	112
Clay, blue, sand, gravel	6	118
Clay, blue, sand	5	123
Clay, tan, gravel	7	130
Clay, blue	27	157
Clay, blue, sand	11	168
Clay, blue, sand, gravel	12	180
Clay, blue	30	210
Clay, blue, sandstone	5	215
Clay, blue	10	225
Clay, blue, sandstone	10	235
Clay, blue, sand	5	240
Clay, tan, sand	5	245
Clay, blue	23	268
Clay, blue, silt	32	300
29/2W-13A1 Barrett, H.F.; drilled by Hood Canal, January, 1969		
Clay, brown, sandy	33	33
Gravel, pea, clay, sandy	2	35
Gravel and clay	12	47
"Hardpan"	180	227
Gravel, sand (water - 1 gpm)	3	230
"Hardpan", gray, sandy	62	292
Sand (water)	13	305
Shale	--	305+

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
29/2W-13J2		
Broders, R.; drilled by VanAusdle, September, 1974		
Clay, brown, gravel	54	54
Sand, gravel	14	68
Clay, brown	2	70
Clay, blue, sandstone	55	125
29/2W-25M1		
Bonneville Power Adm.; drilled by ?, January, 1958		
Fill	4	4
Sand, fine and gravel with clay	8	12
Sand, fine and gravel with trace of clay at bottom	22	34
Clay, blue, firm	26	60
Clay, hard and small rocks	10	70
Boulder	2	72
Sand, cemented and gravel	14	86
Sand and gravel (water - 1 1/2 gpm)	3	89
Sand and gravel, hard-packed (some water)	3	92
Quicksand, saturated	8	100
Sand, very fine, and gravel (water)	8	108
Sand, hard-packed, and gravel	17	125
Sand, coarse, and gravel	25	150
29/3W-1J1		
Ferguson, J.H.; drilled by VanAusdle, August, 1971		
Soil, sandy	4	4
"Hardpan"	15	19
Sand, brown, clay	16	35
Sand, blue, gravel	17	52
Sand, blue, gravel, clay (some water)	14	66
Clay, blue	16	82
Sand, gravel	2	84
Sand, coarse	4	88
Sand, fine	8	96
30/1E-20E1		
Norman, S.W.; drilled by Stoican, June, 1975		
Clay, brown, hard and sand	8	8
Sand, brown and clay, pea gravel	8	16
Sand, fine with clay	5	21
Sand, brown (water)	9	30

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
30/1E-20K1 Bedell, S.F.; drilled by Hood Canal, May, 1972		
Soil, clayey	2	2
Hardpan, gray	48	50
Hardpan, brown	20	70
Clay, brown, sandy	40	110
Clay, sandy, sticky	13	123
Sand, gray (water)	7	130
30/1E-32G1 Olmstead, L.E.; drilled by Hood Canal, March, 1972		
Soil	2	2
Clay, gray, sandy	6	8
Clay, yellow, sandy	3	11
Sandstone, gray, soft	124	135
Sandstone, gray, hard	1	136
Sandstone, gray, soft	11	147
Sandstone, gray, hard	4	151
Sandstone, gray, soft	3	154
Sandstone, gray, hard	6	160
Sandstone, gray, soft		185
30/1W-4R1 Steinke, R.D.; drilled by VanAusdle, March, 1976		
Soil	2	2
Sand, brown	10	12
Sand and gravel, gray, cemented	20	32
Sand, gray	63	95
Sand, fine	20	115
Sand, very fine	10	125
Silt and clay, brown	8	133
Clay, blue	17	150
Clay, blue and silt	35	185
Sand, fine	34	219
Sand, coarse	1	220
Sand, fine	12	232
Sand, coarse	7	239

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
30/1W-5M1 Broders, C.; drilled by VanAusdle, July, 1973		
Sand and gravel	135	135
Clay and sand, brown	13	148
Clay, brown	17	165
Clay, blue	35	200
Clay, blue, sandy	30	230
Sand, fine	25	255
Sand	45	300
Clay, blue black	60	360
30/1W-7F1 See, V.; drilled by Hood Canal, March, 1974		
Soil	1	1
Clay, sandy	17	18
"Hardpan", brown	7	25
Sand, brown	35	60
Clay, gray, sandy	85	145
Sand, fine with pea gravel (some water)	44	189
Sand, coarse and gravel (water)	8	197
30/1W-9K1 Taylor, R.; drilled by Stoican, May, 1976		
Soil	2	2
Clay, brown, sandy	22	24
Clay, gray, sandy	31	55
Sand, brown and gravel, small	17	72
Sand, brown	14	86
Sand, brown and gravel, large	54	140
Clay, brown, sandy	9	149
Clay, gray, sandy	2	151
Clay, brown, sandy	14	165
Clay, gray, sandy	46	211
Sand, gray, fine (water)	7	218
Sand, gray, finer (water)	12	230
Sand, gray, coarse	2	232
Sand, gray, coarser	13	245

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
30/1W-17L2 Whitney, C.; drilled by Hood Canal, September, 1972		
"Hardpan", brown	9	9
Clay, brown, sandy, soft	83	92
"Hardpan", brown, rocky	70	162
Clay, gray	61	223
Clay, brown	7	230
Sand, brown, fine (water)	15	245
Clay, gray, gummy	35	280
30/1W-18M1 Cape George Village; drilled by Russell Drilling, Shelton, Wa., February 1969		
Gravel, cemented and clay	20	20
Gravel, cemented	75	95
Gravel, sand and clay	30	125
Sand and clay	15	140
Clay, blue	100	240
Sand, brown and clay	30	270
Sand (water)	18	288
Sand, coarse and gravel (water)	12	300
30/1W-20E1 Provonsha, G.; drilled by Stoican, June, 1974		
Soil, brown, sandy	9	9
Gravel, packed, boulders	14	23
Sand, gray, packed and gravel	5	28
Gravel (water)	2	30
Gravel, gray, packed	10	40
Gravel (water)	1/2	40-1/2
Gravel, packed and clay	8-1/2	49
Clay, gray, gravelly	11	60
Clay, gray	--	--
30/1W-21E1 Anderson, V.; drilled by Stoican, August 1967		
Sand, gray, cemented	120	120
Sand, gray, dry and gravel	64	184
Sand, gray and gravel (water)	2	186
Clay, blue	23	209

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
30/1W-22Q1 State Parks and Rec. Commission; drilled by Western Drilling, February, 1956		
Sand, fine and silt	6	6
Gravel	9	15
Gravel, hard packed, cemented	120	135
Clay	18	153
Sand, fine	11	164
Sand with clay	24	188
Clay	12	200
Sand	60	260
Clay	10	270
30/1W-28D1 Hancock, M.R.; drilled by Stoican, April, 1969		
Soil	1	1
Gravel, brown, cemented	20	21
Clay, blue	1	22
Clay, blue and brown	14	36
Clay, brown, sandy (water)	12	48
Sand, brown, dry	62	110
Clay, blue	30	140
Sand and gravel, brown (water)	3	143
Gravel, brown (water)	6	149
30/1W-29E1 Bailey, P.; drilled by Stoican, ?, ?		
Clay, brown (water at 9 feet)	35	35
Gravel and water	8	43
Till	29	72
Gravel, gray and silt (water)	10	82
Till	11	93
Gravel (water - 500-600 gpm)	6	99
Till	6	105
Clay, gray, silty	124	229
Sand, gray, coarse and gravel	20	249
Gravel, gray, coarse	11	260
Clay, blue, sticky	30	290

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
30/1W-29N1 Easton, A.E.; drilled by VanAusdle, March, 1963		
Sand, fine	48	48
Gravel (water)	6	54
30/1W-32K2 Simene, F & J; drilled by Sedlak, ?, ?		
Soil, sandy	19	19
Sand and clay	3	22
Clay, gray	29	51
Sand and clay	26	77
Gravel, sand, and clay	4	81
Sand and gravel, cemented	7	88
Sand and gravel	--	--
30/1W-33H1 Egelkrout, J.; drilled by Hood Canal, October, 1970		
Clay, sandy	23	23
Gravel and sand	27	50
"Hardpan"	15	65
Clay	30	95
Clay, gummy	1	96
Sand, coarse (water)	10	106
30/1W-34J1 Smithson, J.; drilled by Sedlak, March, 1971		
Soil, sandy	38	38
Sand, brown and clay	47	85
Clay, gray with sand	12	97
Clay	15	112
Clay, gravel	3	115
Sand, cemented	8	123
Sand, fine and clay	6	129
Gravel, cemented	2	131
Sand and clay	2	133
Sand, cemented	13	146
Sand and gravel	--	--

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
30/2W-12Q1 Cape George Land Co.; drilled by Russell, September, 1964		
Boulder and clay	2	2
Sand and clay	30	32
Gravel, cemented	5	37
Sand and gravel	2	39
Boulder	1	40
Gravel, cemented	8	48
Clay, blue	10	58
Clay and gravel	2	60
Sand	1	61
Clay	82	143
Boulder, granite	1	144
Clay, sand and gravel	4	148
Gravel, cemented	1	149
Boulder	1	150
Clay	28	178
Sand and clay	6	184
Sand and gravel	28	212
Clay and gravel	1	213
30/2W-13J1 Cape George Village; drilled by Russell, October, 1964		
Clay and rocks	3	3
Clay and sand	15	18
Gravel, cemented	6	24
Clay, gravel and sand	12	38
Boulders	2	40
Gravel, cemented and clay	16	56
Sand and gravel (dry)	30	86
Clay and sand	7	93
Sand and clay	52	145
Gravel, cemented	15	160
Sand and clay	50	210
Sand	18	228
Clay	12	240
Sand and gravel	6	246
Clay, blue	64	310
Gravel and sand	5	315
Clay	1	316

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
30/2W-21B1 Dent, H.; drilled by Stoican, June, 1974		
Soil	2	2
Clay, brown, sandy	10	12
Sand and clay, gravelly	38	50
Gravel, brown, coarse, some sand	8	58
Gravel, coarse, some clay	32	90
Clay, blue, silty	4	94
Sand, gray	11	105
Clay, gray, sandy	12	117
Gravel, brown and sand	17	134
Gravel, brown	32	166
Clay, brown, gravelly	11	177
Sand and gravel, small	29	206
Gravel, cemented	21	225
Sand, gray, fine	24	249
Gravel, brown, cemented	49	298
Clay, gray	10	308
Clay, gray, cemented and gravel	12	320
Sand and gravel, small	2	322
Gravel, coarse and sand (water)	7	329
Sand and gravel	36	365
30/2W-21Q1 Diamond Point Water Co.; drilled by Burt, June, 1975		
"Hardpan" and rocks	23	23
Sand and gravel	15	38
"Hardpan", blue	3	41
Clay, blue	80	121
Sand, brown (dry)	8	129
"Hardpan", brown, gravelly	35	164
Sand, brown (dry)	18	182
Clay, brown silty	6	188
Gravel, large and sand (dry)	38	226
Gravel, large, and sand (water)	17	243
Clay, brown	2	245
Clay, blue	8	253
Hardpan, blue, gravelly	18	271
Clay, blue	92	363
Sand, gray (water)	30	393
Sand, fine	--	--

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
30/2W-24A1 Balch Land Development Corp; drilled by Richardson, August, 1975		
Soil	3	3
Clay, silty	4	7
Sand and gravel, silty, compacted	73	80
Sand, gray, brown, medium	60	140
Sand and gravel	20	160
Sand, gray; some gravel (dry)	50	210
Sand and pea gravel (some water)	35	245
Till	23	268
Clay, blue	19	287
Till	14	301
Clay and gravel	26	327
Till with sand stringers	103	430
Clay, gray, silty	210	640
Clay, silty and gravel, compacted	100	740
30/2W-27M1 Messer, L.J.; drilled by Ausdale, May, 1954		
Sand and gravel	81	81
"Hardpan"	11	92
Sand	9	101
"Hardpan"	19	120
Sand and gravel	8	128
30/2W-28M1 Sunshine Acres; drilled by Stoican, June, 1975		
Soil, black, sandy	1	1
Sand, brown, gravelly	7	8
Gravel, brown, sandy (water)	3	11
Clay, brown, sandy	63	74
Sand, gray (water)	3	77
Clay, gray	1	78
Clay, gray, sandy, silty	22	100
Sand, gray, clean (water)	20	120
Clay, gray	2	122

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
30/2W-29R1 Schoenrock, R.; drilled by VanAusdle, April, 1974		
Clay, brown, and gravel	20	20
Sand and gravel	40	60
Clay, brown	23	83
Clay, brown and gravel	45	128
Clay, blue	1	129
30/2W-33H2 Davis, G.; drilled by Stoican, June, 1974		
Clay, brown and soil, boulders	14	14
Boulders, granite	4	18
Clay, brown, gravelly	7	25
Sand, brown and gravel (water)	7	32
Clay, gray with gravel	6	38
Clay, black, brown with gravel	6	44
Clay, brown, gravelly, hard, cemented and sand	52	96
Gravel, brown and sand (water)	2	98
Shale and gravel	1	99
Shale, brown and gravel (water)	2	101
Gravel, brown, packed (water)	10	111
Gravel, brown, cemented and shale	4	115
Gravel (water)	5	120
Gravel, brown, sandy and clay	3	123
Sand, brown, fine, packed (water)	11	134
Sand, gray blue, fine and clay	2	136
Clay, gray blue	10	146
Gravel, cemented; clay gray "shale" layers	1	147
30/2W-33M1 Gee, L.; drilled by VanAusdle, April, 1974		
Clay, brown and gravel	15	15
Clay, tan and gravel, cemented	33	48
Gravel	6	54
Clay, brown and sand	6	60
Sand and gravel	24	84
Sand	6	90
Sand and gravel	10	100
Clay, brown and sand and gravel	8	108
Clay, brown and sand, fine	9	117
Silt, brown	4	121
Clay, brown, and sand and gravel	32	153
Gravel	3	156
Sand	1	157
Gravel	6	163

Table 5. -- Drillers' Logs of Representative Wells - Continued

Material	Thickness (feet)	Depth (feet)
30/2W-34C1 Swarthout, J.D.; drilled by Stoican, June, 1960		
Soil	1	1
Sand, gravel, clay	7	8
Gravel, cemented	11	19
Gravel, hard	1	20
Gravel, clay	18	38
Gravel, packed (water)	2	40
Gravel, hard-packed, "muddy"	10	50
Sand (water, salty)	2	52
Gravel, hard-packed, "muddy"	18	70
Gravel (water)	1	71
Gravel, clay	4	75
Gravel (water - saltier)	2	77
30/2W-35F2 Yates, O.; drilled by Hood Canal, March, 1972		
Soil, brown and gravel	3	3
Boulder	1	4
Gravel and clay, brown	11	15
Boulder	1	16
Gravel, clay, brown and "hardpan"	4	20
"Hardpan", gray, sandy, hard	5	25
Shale, gray, hard, shattered	25	50
30/3W-25G1 Lynch, P.A.; drilled by Stoican, December, 1973		
Soil	3	3
Sand, brown and gravel	7	10
Clay, brown	14	24
Sand, brown, cemented and gravel	21	45
Clay, brown, sandy	10	55
Clay, brown	6	61
Clay, blue	22	83
Peat and clay (dry gas)	11	94
Clay, blue	47	141
Clay, sandy, "muddy"	3	144
Clay, brown	5	149
Clay, blue	35	184
Clay, brown	1	185
Sand, fine to coarse (water)	6	191

Table 6

FACTORS FOR CONVERTING PERTINENT ENGLISH UNITS TO METRIC UNITS

Multiply	By	To obtain
inches--------------------	0.0254	meters (m)
	2.54	centimeters (cm)
	25.4	millimeters (mm)
feet----------------------	30.48	centimeters (cm)
	.3048	meters (m)
miles (mi)----------------	1.609	kilometers (km)
acres---------------------	.004047	square kilometers (km^2)
square miles (mi^2)--------	2.590	square kilometers (km^2)
cubic feet (ft^3)----------	.02832	cubic meters (m^3)
	28.32	liters (L)
gallons (gal)-------------	3.785	liters (L)
	.003785	cubic meters (m^3)
acre-feet (acre-ft)-------	1233.	cubic meters (m^3)
feet per second (ft/s)----	30.48	centimeters per second (cm/s)
	.3048	meters per second (m/s)
cubic feet per second----- (ft^3/s)	.02832	cubic meters per second (m^3/s)
	28.32	liters per second (L/s)
gallons per minute-------- (gal/min)	.06309	liters per second (L/s)
gallons per minute per---- foot (gal/min)/ft)	.2070	liters per second per meter (L/s)/m)
degrees Fahrenheit (°F)---	Subtract 32, multiply remainder by 0.5556	degrees Celsius (°C)