STATE OF WASHINGTON
Booth Gardner, Governor

DEPARTMENT OF ECOLOGY
Andrea Beatty Riniker, Director

Water-Supply Bulletin 53

Water in the Lower Yakima River Basin, Washington

By Dee Molenaar

Prepared in cooperation with the

UNITED STATES GEOLOGICAL SURVEY

1985

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CONTENTS

ILLUSTRATIONS

TABLES

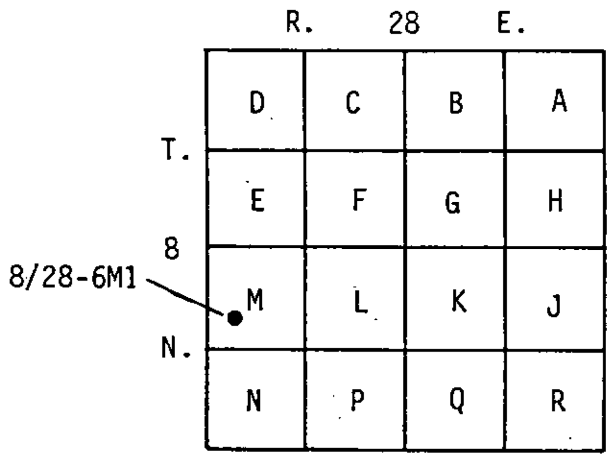
Page

CONVERSION TABLE

Multiply	By	To obtain
inch (in.)	25.4	millimeter (mm)
	2.54	centimeter (cm)
	0.0254	meter (m)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
square mile (mi^2)	2.590	square kilometer (km^2)
acre	4047.	square meter (m^2)
acre-foot (acre-ft)	1233.	cubic meter (m^3)
cubic foot per second (ft^3/s)	28.32	liter per second (L/s)
	0.02832	cubic meter per second (m^3/s)
gallon per minute (gal/min)	0.06309	liter per second (L/s)
gallon per minute per foot [(gal/min)/ft]	0.2070	liter per second per meter [(L/s)/m]
micromho per centimeter at 25° Celsius (umhos/cm at 25°C)	1.000	microsiemen per centimeter at 25° Celsius (uS/cm at 25°C)
ton, short	0.9072	megagram (Mg)
degree Celsius (°C)	F = 9/5°C + 32	degree Fahrenheit (°F)
degrees Fahrenheit (°F)	0.5559, after subtracting 32	degrees Celsius (°C)

WELL- AND LOCATION-NUMBERING SYSTEM

Wells inventoried during this study (table 32 at end of report) have been assigned numbers identifying them by location within township, range, and section. For example, in the symbol 8/28-6M1, the part preceding the hyphen indicates, successively, the township and range (T.8 N., R.28 E.) north and east of the Willamette base line and meridian. Because the study area lies entirely north and east of the base line and meridian, the letters indicating the directions north and east are omitted. The first number following the hyphen indicates the section (sec. 6), and the letter "M" gives the 40-acre subdivision of the section, as shown in the figure below. The numeral "1" indicates that this well is the first one inventoried within the subdivision.



Section 6

Locations of other sites and geographic features in the study area are similarly identified by this numbering system where necessary, but without the final numeral indicating sequence.

GLOSSARY

acre-foot - the volume of water required to cover 1 acre to a depth of 1 foot. Equivalent to 325,851 gallons.

alluvium - gravel, sand, silt, and clay that has been deposited by streams.

anticline - an upward fold in rock layer.

aquifer - water-saturated rock material capable of yielding water to wells and springs.

artesian (hydraulically synonymous with "confined") - in an artesian aquifer ground water is confined beneath an overlying stratum of lesser permeability, under sufficient pressure head to cause the water in a well to rise above the top of the aquifer tapped.

basalt - a generally dark, fine-grained extrusive igneous rock generally formed from a lava flow.

conglomerate - a sedimentary rock consisting of firmly cemented sand, gravel, and cobbles.

consolidated rock - earth materials such as gravel, sand, silt, and clay that have become firm and coherent rocks such as conglomerate, sandstone, siltstone, and claystone.

eolian deposit - fine-grained material (mostly silt) deposited by the wind.

glaciolacustrine deposit - material deposited by glacial meltwater streams into lakes along margins of glacier.

igneous rock - cooled and solidified rock formed from a melt (magma).

infiltration - the passage of water from the land surface into the ground.

lacustrine deposit - generally fine-grained material, such as silt and clay, deposited in a lake.

loess - fine-grained, dominantly silt-sized particles deposited by wind.

metamorphic rock - sedimentary or igneous rock altered by heat and pressure to attain a denser and generally more crystalline character.

moraine - glacial rock debris deposited by a glacier along its margins (lateral moraine) or at its terminus (terminal moraine).

outwash - rock material deposited by glacial meltwater streams, generally across a plain below the terminus of an advancing or receding glacier.

permeability - the relative ease with which water will flow through an aquifer.

physiographic province - a region or geographic entity of similar landform characteristics and climate, such as the Cascade Range, the Puget Trough, and the Columbia Plateau.

potentiometric surface - an imaginary surface joining the levels to which water rises in wells tapping an artesian (confined) aquifer.

porosity - the ratio of the total volume of openings (pore spaces) to the total volume of the material.

pumice - a highly cellular, light weight, light-colored material ejected from a volcano.

recharge - the process by which water is added to the aquifer, such as by percolation of precipitation and leakage from surface-water bodies and from overlying and underlying aquifers.

sedimentary rock - rock formed by deposition of rock particles or organic material by ice, water, or wind, and subsequent solidification through cementation or compression.

syncline - a downward fold in rock strata.

topography - the relief features or surface configuration of an area.

unconfined aquifer - an aquifer whose upper boundary is the water table, immediately above which the materials are similarly permeable but unsaturated.

water table - the surface of the saturated zone in an unconfined aquifer.

water year - The 12-month period beginning October 1 and ending September 30

WATER IN THE LOWER YAKIMA RIVER BASIN, WASHINGTON

By Dee Molenaar

INTRODUCTION

Purpose and Scope of the Study

This report presents a compilation and general interpretation of hydrologic data collected in the lower Yakima River basin, one of the major Water-Resource Inventory Areas of the State of Washington. The report is one of a series prepared in cooperation with the State of Washington Department of Ecology (DOE) for use by Federal, State, County, and municipal agencies involved in the use and management of the State's land and water resources. This report also may serve as a guide to individuals and private companies interested in the local availability of surface and ground water and in the quality of the water.

The study included the assembly, compilation, and interpretation of available hydrologic information on the area. Although considerable data are available, some dating back to the mid- to late 1800's, most of the interpretations are based on data covering the 1960-77 water years; some later data for the period through 1979 are included. The data include records of precipitation (as rain and snow), storage of water in lakes and reservoirs, records of discharges of streams, canals, and drains, and related water quality, records of wells, drillers' logs of materials penetrated and water-yielding characteristics of aquifers tapped (as determined from pumping tests), and analyses of ground-water quality. Evaluation also was made of data of surface- and ground-water use for municipal, industrial, and irrigation supplies. This report also makes use of data presented in existing reports and interpretations of those data where pertinent.

Previous Investigations and Reports

The lower Yakima River basin has been of interest to investigators for many years and is the subject of numerous reports covering evaluation of its water resources and land use. In particular, many studies have been made in recent years of irrigation practices and of the quality of irrigation return-water flow. A summary of reports resulting from previous hydrologic studies in the basin is presented in table 1, along with the types of information and analyses covered. For a more complete bibliography of these reports (complete title, publisher, and number of pages), the reader is referred to the bibliography (p. 75-84).

In addition to the specific studies covered by the summary in table 1, reports and maps resulting from general statewide hydrologic-data collection and interpretive studies have included the lower Yakima River basin. These include the State geologic map (Huntting and others, 1961) and reports covering generalizations of ground-water occurrence in the Columbia River Basalt Group in eastern Washington (Newcomb, 1958a, 1961, 1961a, 1965), sediment transport by streams in the upper Columbia River basin (Nelson, 1974), data on lakes in Washington (Wolcott, 1964; Dion, 1978; Dion and others, 1976a, 1976b, 1976c), flowing artesian wells statewide (Molenaar, 1961), floods in Washington in January 1974 (Longfield, 1974), flood-discharge interpretations (Hulsing and Kallio, 1964; Cummans and others, 1975), stream temperatures (Collings and Higgins, 1973; Higgins and Hill, 1973), drainage areas of eastern Washington streams (Williams, 1964), 5-year water-use summaries (Laird and Walters, 1967; Parker, 1971; Dion and Lum, 1977), and statewide ground-water-quality data (VanDenburgh and Santos, 1965). A map report describing principal aquifers and well yields in the State (Molenaar and others, 1980) includes the study area. In addition, annual basic-data summaries of stream discharges, temperatures, and water quality, and of ground-water levels and quality have been published by the U.S. Geological Survey since the late 1800's.

Acknowledgments

The author acknowledges the assistance of individuals and agencies who provided much of the data forming the basis of this report. Onni Perala and Fred Nacke of the Yakima office of the U.S. Bureau of Reclamation provided computer printouts covering many years of monthly mean discharges of streams, canals, and irrigation return flows. Don Weaver of the Wapato Irrigation District provided similar data on the canals and drains in the Yakima Indian Reservation. Wilbert G. Gerlitz, Benton County Extension Agent, provided information on irrigation in Benton County.

TABLE 1.--Reports covering previous geohydrologic studies in the lower Yakima River basin

Subject	General basinwide	Parts of basin
Streamflow-records evaluation	Kinnison, H.B., 1952	
Effects of hydraulic and geologic factors on streamflow	Kinnison, H.B., and Sceva, J.E., 1963	
Surface-water quality	U.S. Army Corps of Engineers, 1978	
Stream pollution	Washington Department of Health, 1936	
Irrigation	Kaatz, M.R., 1977 (effects of 1977 drought); U.S. Bureau of Reclamation, 1974	Benton County: Gerlitz, W.G., 1977
Irrigation return flows (Water Quality)	Environmental Protection Agency, 1978; Stansbury, M., and Milhous, R.T., 1975; Sylvester, R.O., and Seabloom., R.W., 1962; U.S. Army Corps of Engineers, Vol. II, 1978; Washington State University Agriculture Research Center, 1972	King, L.G., Wattenburger, P.L., and Janke, A.C., 1977 (Sulphur Creek basin) Washington State Univ. Agricultural Engineering Department, 1977 (Sulphur Creek basin)
Lakes		U.S.Bureau of Reclamation and Fish and Wildlife Service, 1976 (Bumping Lake enlargement)
Supplemental Storage	U.S. Bureau of Reclamation, 1951	
Water-quality assessment	CH_2M/Hill, 1977 (status report) McGaughy, D.M., and and Cunningham, R.K., 1973 Washington Department of Ecology, 1971, 1976	Fretwell, M.O., 1979 (Yakima Indian Reservation)
Sediment transport	Nelson, L.M., 1979 (irrigation return flows)	Boucher, P.R., 1975 (Yakima Indian Reservation irrigation return flows)
Geology and ground-water occurrence	Mundorff, M.J., 1953 U.S. Army Corps of Engineers, 1978 (vol. IV)	Foxworthy, B.O., 1962 (Antanum Creek basin) Newcomb, R.C., 1948 (Kennewick area) Smith, G.P., 1901, (Lower Naches, Cowiche, Antanum, Moxee basins)
Flowing artesian wells		
Test wells		
Soils		Gregg, D.O., and Lum, W.E., II, 1973 (Dry Creek Satus basin) Kocher and Strahan, 1919 (Benton Co.) U.S. Dept of Agriculture, 1958 (Yakima County) U.S. Dept of Agriculture, 1981 (Benton County) Pearson, H.E., 1977 (upper Satus basin) Hart, D.H., 1958 (Cold Creek basin) Newcomb, R.C., 1958 (Cold Creek basin)
General Water Resources	Flaherty, D.C., 1975 Pacific Northwest River Basins Commission, 1977 U.S. Army Corps of Engineers, 1975 (vol. I)	Gregg, D.O., and Laird, L.B., 1975 (Toppenish Creek basin) Molenaar, Dee, 1977 (Satus Creek basin) Mundorff, M.J., 1977 (Satus Creek basin) U.S. Geological Survey, 1975 (Toppenish Creek basin)
Water budget	U.S. Army Corps of Engineers, 1978, (vol III)	
Water-resource management and planning	Milhous, R.T., 1975	
Model development and systems analysis	Mar, B.W., and Butcher, W.R., 1974 (macro model simulation)	Report 17A
	Copp, H.D., and Higgins, D.T., 1974 (Hydraulics of surface-water runoff)	Report 17B
	Thompson, G.T., 1974 (Irrigated agriculture water use)	Report 17C
	Betchart, W.B., 1974 (Water-quality modeling)	Report 17D
	Fox, J.D., 1974 (Forest Hydrology model)	Report 17E
	Bell, M.C., and Mar, B.T., 1974 (Fisheries)	Report 17F
	Butcher, W.R., and Huettig, G.W., 1974 (Economic modeling)	Report 17G

DESCRIPTION OF THE AREA

Location and Extent

The lower Yakima River basin study area covers about 4,350 mi^2, about two-thirds of the entire Yakima River basin, in Yakima and Benton Counties in south-central Washington. As outlined in figure 1, the area includes all of Water Resources Inventory Areas (WRIA)[1] 37 and 38 and small areas in the eastern part of WRIA 31 and the southeastern part of WRIA 40. These areas in WRIA's 31 and 40 were included because of their close economic and cultural ties to the lower Yakima River basin.

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[1]In 1976 the Washington Department of Ecology divided the State into 62 Water Resource Inventory Areas, generally by river basins and subbasins or other geographic entities, for the purpose of designating areas for water-resources studies and water-management projections.

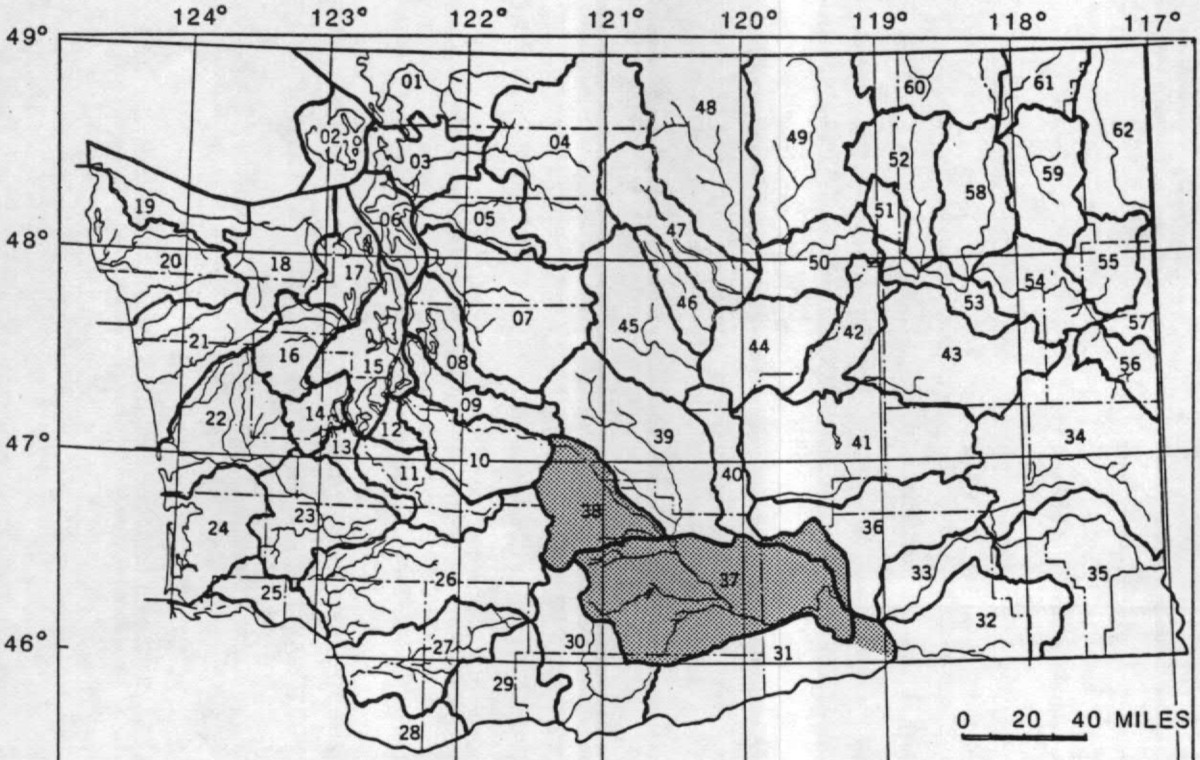


FIGURE 1.--Water Resources Inventory Areas of State and location of study area.

Topography and Drainage

The study area (fig. 1) is characterized by a diversity of landforms that range from the high, rugged glaciated peaks and deep valleys of the Cascade Range on the west to the low ridges and broad lowlands of the Columbia Plateau on the east. The basin ranges in altitude from 8,184 ft at Gilbert Peak in the Goat Rocks Wilderness Area in the Cascade Range to about 340 ft at the Columbia River (Lake Wallula).

Between the Cascade Range and the Columbia River, the area is separated into several broad valleys by prominent east-west trending anticlinal ridges that, from north to south, include (1) the Cleman Mountain-Yakima Ridge, (2) Ahtanum Ridge-Rattlesnake Hills, (3) Toppenish Ridge, and (4) Horse Heaven Hills. From north to south the intervening valleys between the ridges contain the drainages of (1) the lower Naches River and Cowiche and Ahtanum Creeks and Moxee Valley, (2) Toppenish Creek, and (3) Satus Creek. The floors of these valleys slope gently toward the Yakima River and rarely are deeply cut by their streams. A minor topographic feature in the lower part of the Yakima Valley is Snipes Mountain, a low ridge that extends 8 mi along the north side of the Yakima River between the towns of Granger and Sunnyside.

The headwater areas of the Naches and Tieton Rivers, near the Cascade Range crest, contain many lakes. Most are small cirque lakes near timberline, but Bumping Lake on the Bumping River and Rimrock Lake (Tieton Reservoir) and Clear Lakes on the Tieton River have been artificially enlarged as reservoirs for flood-control purposes and for storage of irrigation water.

The Yakima River enters the study area at Selah Gap and then flows south, cutting through the Ahtanum Ridge-Rattlesnake Hills complex at Union Gap before flowing generally southeasterly to the town of Kiona. From there the river makes an abrupt turn to the north, cutting through the eastern part of the Rattlesnake Hills for about 10 mi before again flowing southeasterly to the river's junction with the Columbia River near Richland. Along its entire course through the study area, no natural perennial tributaries enter the river from its north side.

The Naches River (drainage area of about 1,100 mi^2) flows southeasterly from its headwaters area near the Cascade Range crest to its confluence with the Yakima River, a distance of about 55 mi (fig. 2). Along its course, the Naches River is only 5 to 10 mi from its northeasterly drainage divide (the northern boundary of the study area), and only short tributaries enter the river from the north. Significant tributaries enter only from the south and drain a large area characterized by rugged ridges and peaks; above timberline these support small glaciers and snowfields. The principal tributaries and drainage areas, in downstream order, include Crow Creek (41 mi^2); Bumping River (194 mi^2), which includes the American River drainage of 79 mi^2; Rattlesnake Creek (134 mi^2); Tieton River (296 mi^2); and Cowiche Creek (120 mi^2). All these streams are perennial and are maintained through the summer and early fall by snowmelt runoff; meltwater from glaciers in the Goat Rocks Wilderness Area also contributes to the flow of the Tieton River.

Downstream from its confluence with the Naches River, the Yakima River is joined from the west and south by several streams that drain the lower eastern slope of the Cascade Range. In downstream order, these perennial tributaries are Ahtanum Creek (173 mi^2), Toppenish Creek (625 mi^2), and Satus Creek (612 mi^2).

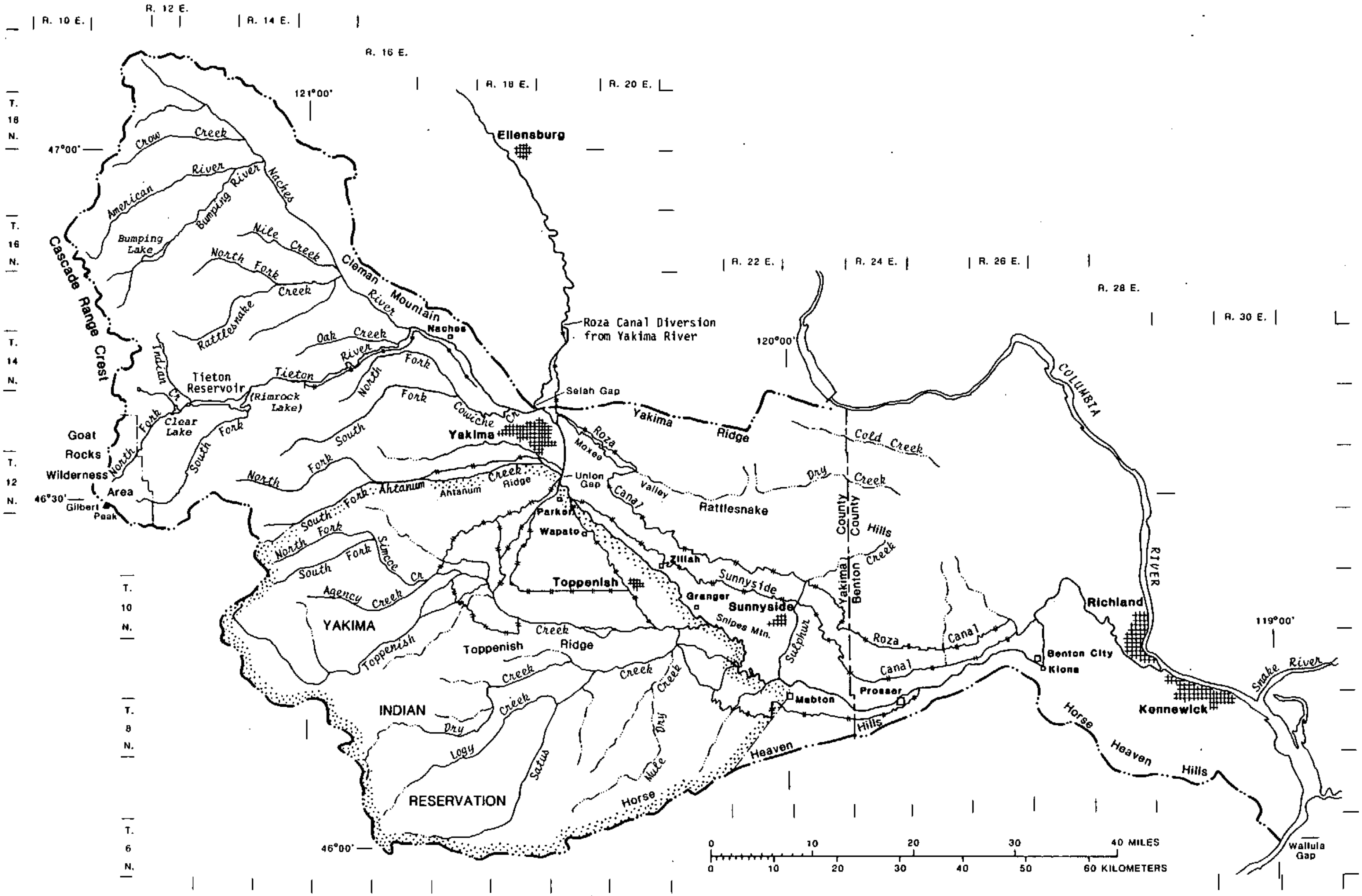


FIGURE 2.—Physiographic features, streams, and towns in study area.

Climate

Data on precipitation and temperature in the study area were obtained from annual and monthly summaries of the U.S. Weather Bureau (1920-65), U.S. Department of Commerce (1965-73), and the National Oceanic and Atmospheric Administration (1974-77). For purposes of this study, the period of the 1960-77 water years was used as the basis for evaluating the relation between the various hydrologic characteristics in the basin.

The study area has a temperate to arid climate, with cold winters and warm summers. According to the precipitation map of the U.S. Weather Bureau (1965), the mean annual precipitation during the period 1930-57 ranged from about 110 inches in the Goat Rocks Wilderness Area at the Cascade Range crest to less than 10 inches in the Richland-Kennewick area (fig. 3). Table 2 presents data for annual and mean annual precipitation at three weather stations in the study area; these were selected as representative of the western mountainous area (Rimrock-Tieton Dam, 2,730-ft altitude), the central lowland (Yakima Airport, 1,064-ft altitude), and the eastern lowland (Prosser 4NE, 903-ft altitude). The data are summarized below for the 1960-76 water years and are compared with the annual precipitation during the 1977 drought water year:

Station	Altitude (ft)	Precipitation	
		Water year 1960-76	Drought water year 1977
Rimrock-Tieton Dam	2,730	25.39	9.52
Yakima Airport	1,064	7.79	4.39
Prosser	903	7.51	4.88

Precipitation is greatest in the mountain station. Precipitation at Yakima is similar throughout the lower Yakima Valley (fig. 4). Precipitation varied widely from year to year (table 2 and fig. 5) for the stations at Rimrock-Tieton Dam and Yakima Airport during the 1960-77 water years. One of the greatest droughts in the State's history occurred during the 1977 water year. Some comparisons are made between the average values for 1960-76 and the values during 1977.

TABLE 2.--Annual precipitation at selected weather stations during 1960-77 water years, and maximum and minimum annual precipitation during 1910-77 water years

[Data from U.S. Weather Bureau, 1920-65; U.S. Department of Commerce, 1965-73; and (U.S.) National Oceanic and Atmospheric Administration, 1974-77.]

Water year	Inches of precipitation		
	Rimrock-Tieton Dam	Yakima Airport	Prosser 4NE
1960	19.17	6.15	5.99
61	29.08	10.47	12.47
62	22.87	6.80	7.28
63	25.80	8.47	8.58
64	21.10	4.69	5.24
1965	27.50	8.11	7.80
66	19.02	7.38	5.31
67	20.84	6.96	7.02
68	25.17	6.35	4.68
69	24.59	8.51	9.24
1970	17.68	7.40	7.37
71	26.78	8.36	8.11
72	42.47	7.87	8.12
73	14.04	4.55	4.73
74	33.99	12.88	11.72
1975	28.40	8.95	8.01
76	33.18	8.27	5.99
77	9.52	4.39	4.88
Average 1960-77	24.51	7.60	7.36
Maximum annual (1910-77)	44.22 (1934)	14.25 (1956)	12.76 (1941)
Minimum annual (1910-77)	9.52 (1977)	4.12 (1917)	4.04 (1931)

TABLE 3.--Mean monthly precipitation in the mountains and in the lowlands during 1960-77 water years, compared to monthly precipitation during 1977 drought water year

[Data from U.S. Department of Commerce (1960-70) and U.S. National Oceanic and Atmospheric Administration (1970-77)]

Month	Inches of Precipitation			
	Rimrock-Tieton Dam (altitude 2,730 ft)		Yakima Airport (altitude 1,064 ft)	
	1960-77	1977	1960-77	1977
October	1.89	0.61	0.55	0.07
November	3.91	.65	.97	0
December	4.50	1.27	1.30	.07
January	4.84	.22	1.24	.13
February	2.67	1.07	.69	.69
March	2.02	1.96	.64	.23
April	1.39	.24	.48	.01
May	.82	1.17	.43	.68
June	.70	.66	.44	.46
July	.36	.83	.16	(trace)
August	.80	.84	.42	1.16
September	.60	0	.27	.89
Total	24.50	9.52	7.59	4.39

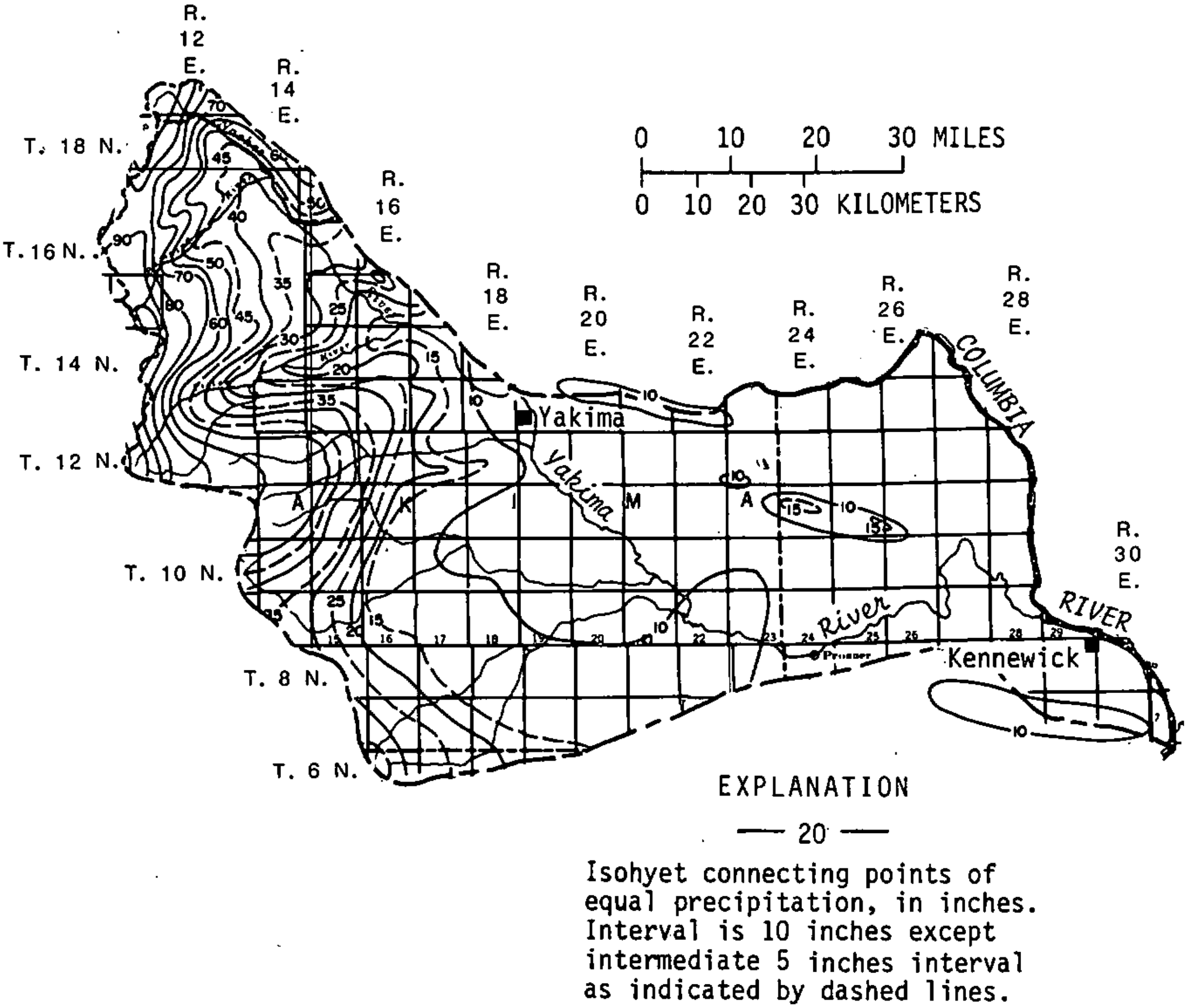
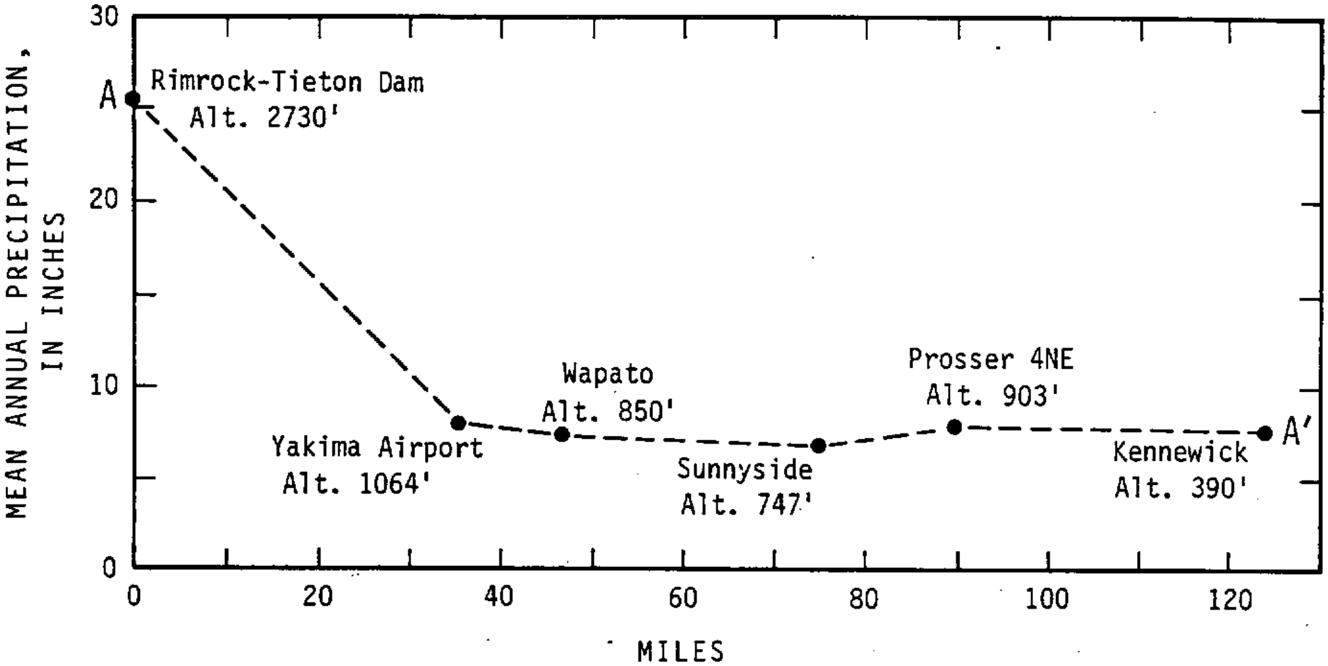


FIGURE 3.—Areal distribution of mean annual precipitation, 1930-57. (From U.S. Weather Bureau, 1960).



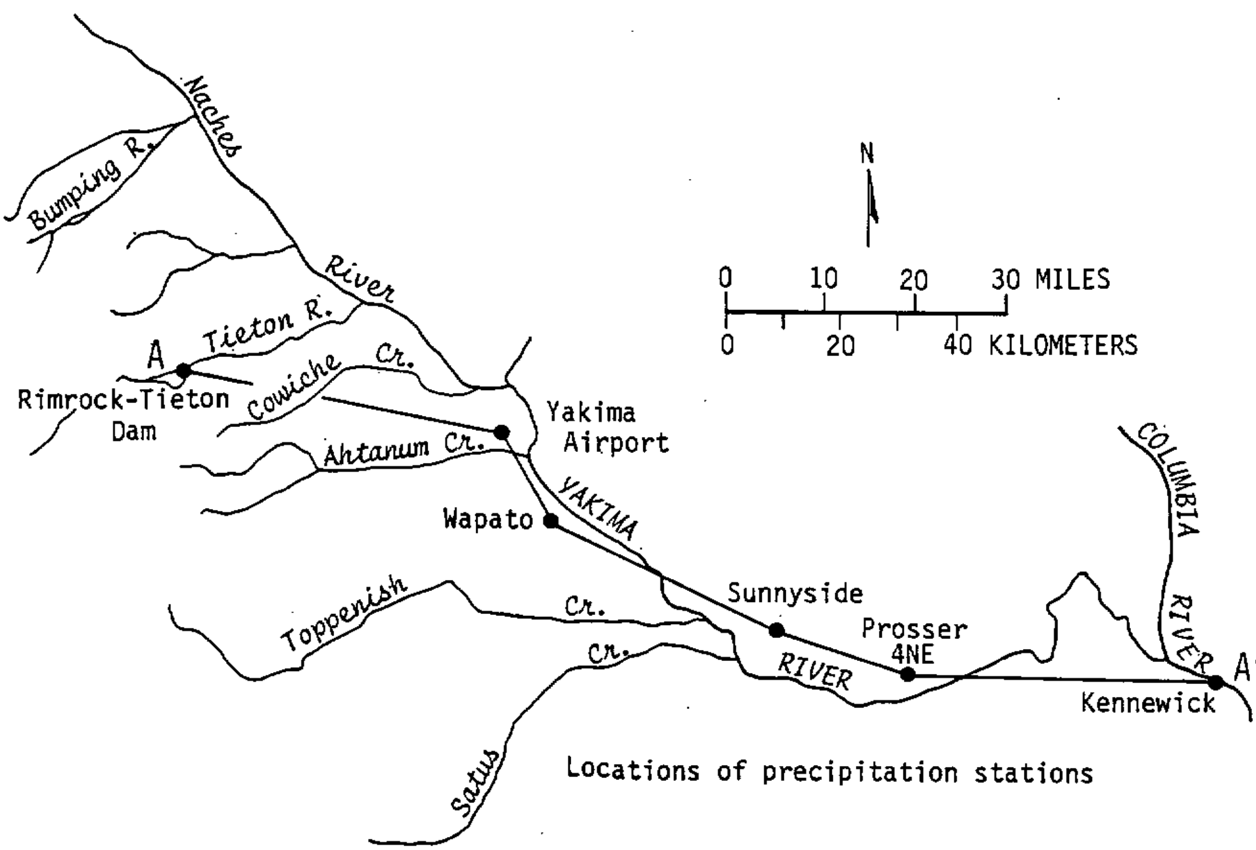


FIGURE 4.—Relation of mean annual precipitation to altitude at selected weather stations.

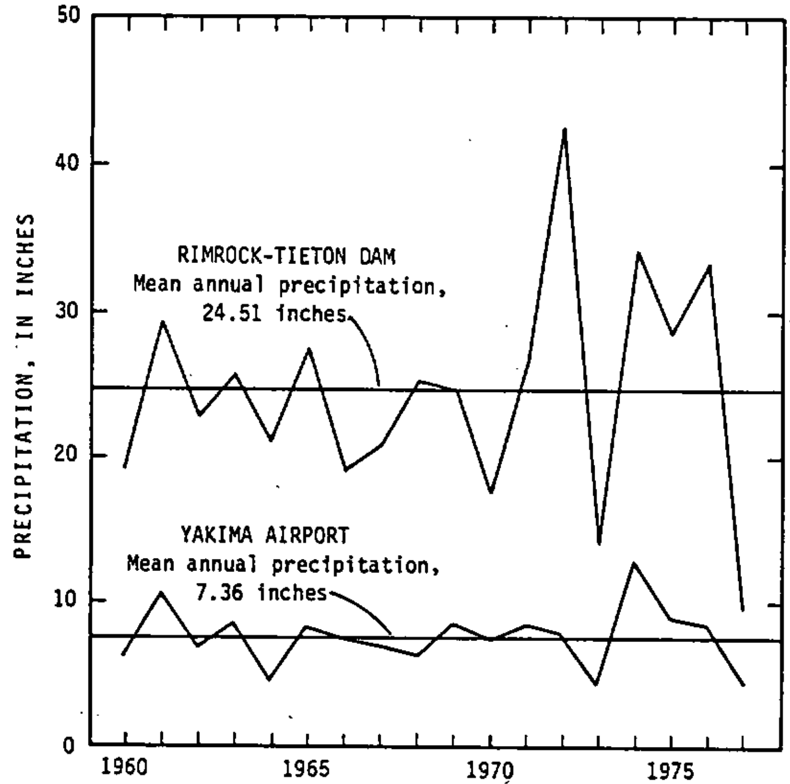


FIGURE 5.—Comparison of annual and mean annual precipitation at Rimrock-Tieton Dam and Yakima Airport, 1960-77 water years.

The distribution of mean monthly precipitation (table 3) is shown graphically in figure 6 for the weather stations at Rimrock-Tieton Dam and Yakima Airport, which represent mountain and lowland precipitation patterns, respectively. Also shown for comparison is the monthly precipitation at these stations during the 1977 drought water year. Conditions were particularly severe during October 1976 - February 1977, when precipitation at Yakima Airport totaled only 0.96 inch, compared with the normal during that 5-month period of 4.98 inches. However, during May, August, and September of 1977, precipitation was 0.68, 1.16, and 0.89 inch, well above the normal for those months.

Much of the precipitation occurs as snow at the higher elevations during the winter months. Snow-depth and water-equivalent measurements made at six snow courses during 1960-77 water years are given in table 28 (at end of report). As shown in figure 7, snowfall is generally greatest at Morse Lake, and, during the 1960-77 water years, the maximum annual snow depths measured there ranged between 236 inches in 1971 and 72 inches in 1977. At the lower altitude Ahtanum Ranger Station (U.S. Forest Service) the maximum annual snow depths measured during the 1960-77 water years ranged from 47 inches in 1969 to 1 inch in 1977.

Temperatures show wide ranges throughout the study area. Mean annual temperature in the mountains, as recorded at Rimrock-Tieton Dam, is 44.2°F; mean monthly temperatures range from 25.5°F in January to 62.8°F in July (table 4). Mean annual temperature at Yakima Airport is 49.8°F, with mean monthly temperatures ranging from 27.5°F in January to 70.7°F in July. Temperatures in the eastern part of the lowland, as recorded at Kennewick, are 3 or 4 degrees higher than at Yakima. Comparisons of the mean monthly temperatures at these three stations are shown in figure 8.

TABLE 4.--Mean monthly and annual air temperatures at selected weather stations during periods of record through 1976 water year

[Data from U.S. National Oceanic and Atmospheric Administration (1977). Data from Rimrock-Tieton Dam station are incomplete in 1977, hence, the values given are for the period through 1976]

Station name	Number of years of record	Degrees Fahrenheit												
		Jan	Feb	Mar	Apr	May	June	July	Aug.	Sept	Oct	Nov	Dec	Average
Rimrock-Tieton Dam	60	25.5	31.4	35.1	42.4	49.9	56.3	62.8	61.7	55.8	45.6	35.1	28.9	44.2
Yakima Airport	68	27.5	35.7	41.8	49.5	57.9	64.5	70.7	68.6	61.3	50.1	38.4	31.3	49.8
Wapato	57	30.4	40.2	45.6	52.8	60.3	67.2	75.6	73.6	65.7	54.4	41.9	37.0	54.0
Sunnyside	81	30.5	37.9	44.0	51.9	60.0	66.5	72.0	70.0	63.2	52.0	37.4	33.8	51.9
Prosser 4NE	52	30.0	37.5	43.2	50.6	58.3	64.7	70.4	68.9	62.6	51.6	40.2	33.5	51.0
Kennewick	69	32.2	39.6	46.0	54.0	62.1	68.7	74.8	72.3	64.6	53.3	42.0	35.8	53.8
Maximum		32.2	40.2	46.0	54.0	60.3	67.2	75.6	73.6	65.7	54.4	42.0	37.0	
Minimum		25.5	31.4	35.1	42.4	49.9	56.3	62.8	61.7	55.8	45.6	35.4	28.9	
Difference		6.7	8.8	10.9	11.6	10.4	10.9	12.8	11.9	9.9	8.8	6.6	8.1	

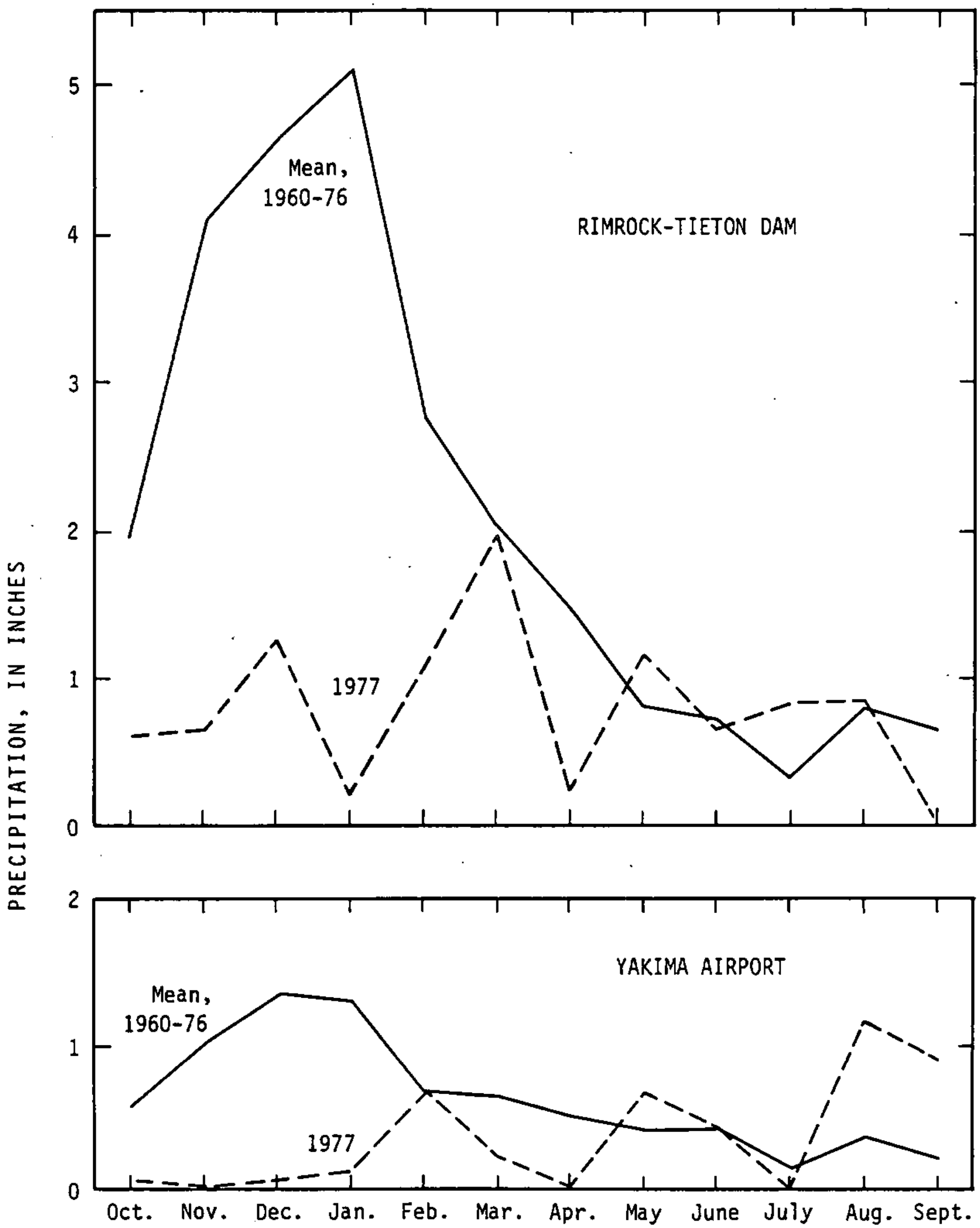


FIGURE 6.—Average monthly precipitation at Rimrock-Tieton Dam and Yakima Airport during 1960-77 water years compared to monthly precipitation during 1977 drought water year.

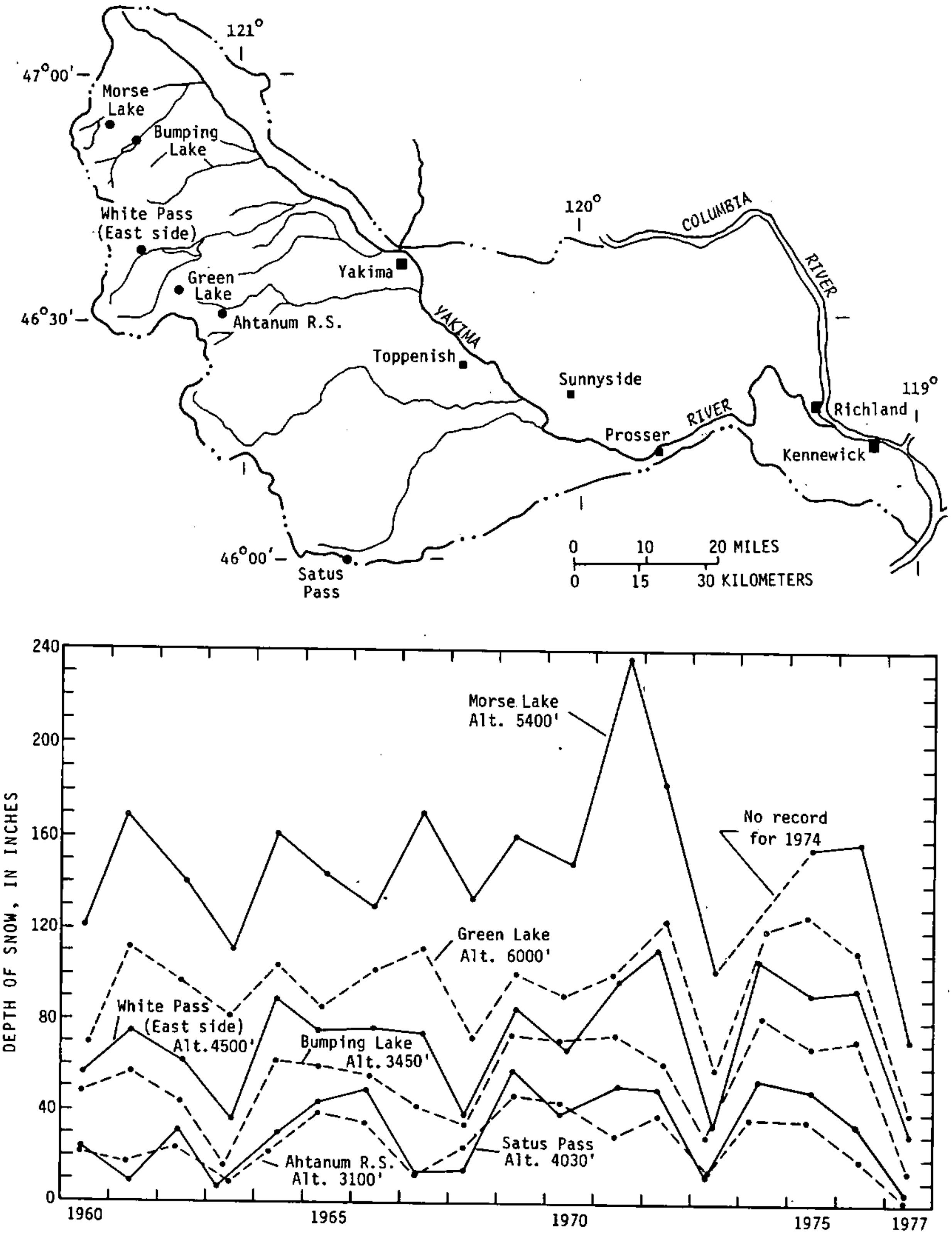


FIGURE 7.—Maximum snow depths recorded annually at selected snow courses, 1960-77 water years.

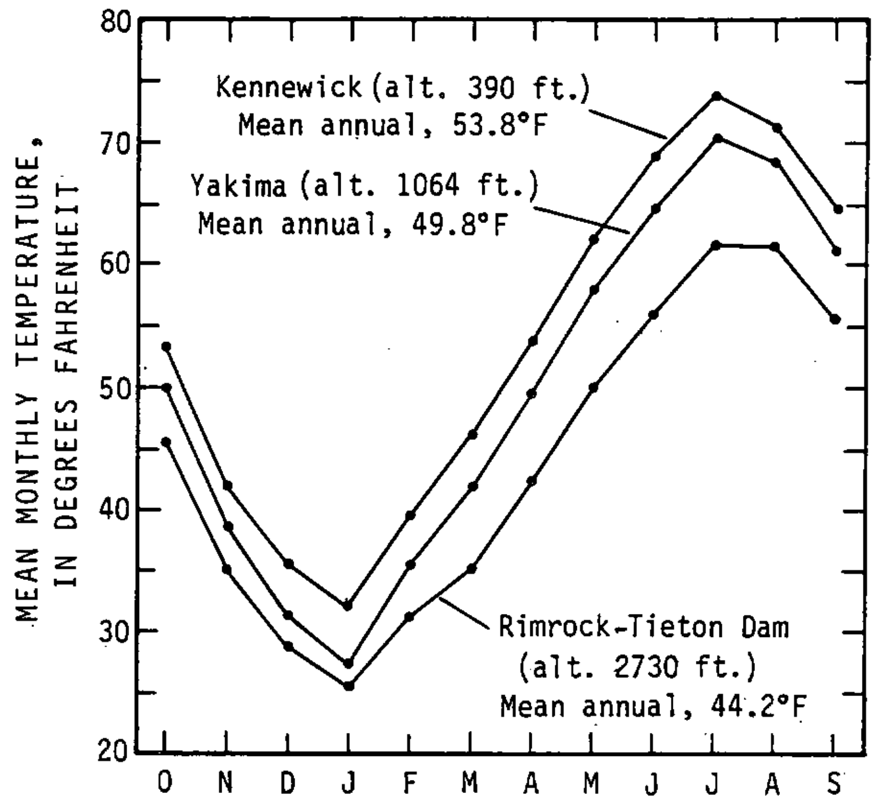


FIGURE 8.—Mean monthly air temperatures at selected weather stations.

Geologic Setting

The study area is underlain by a great variety of consolidated rocks that range in age from Precambrian to Tertiary as well as unconsolidated materials and volcanic rocks of Quaternary age. These include metamorphic, sedimentary, and intrusive and extrusive igneous, rocks in the basin's headwater areas in the Cascade Range, and basalt lava flows and some interbedded weakly consolidated sediments in the central and eastern parts of the basin. Unconsolidated valley-fill materials--lacustrine deposits and alluvium—underlie the basin lowlands, and some eolian deposits occur locally along lower valley sides. Lava flows of Quaternary age occur in the headwater areas of the Toppenish Creek and Satus Creek subbasins.

The basalt lava flows and the valley-fill deposits are important to the occurrence of ground water in the study area. The basalt consists of a series of flows of Miocene age (between about 25 and 10 million years ago) that erupted from fissures in the central part of the Columbia Plateau. Individual flows are a few feet to more than 100 ft thick, and the total thickness of the basalt series is probably greater than 10,000 ft in the central part of the plateau. In the western marginal parts of the plateau--which include the study area — some of the upper basalt flows are locally interbedded with sediments (mostly sand, gravel, silt, and clay) that were eroded from the rising Cascade Range on the west and from several east-west trending ridges that formed from buckling of the basalt sequence.

Erosion by glacial ice and transport of the material by glacial meltwater streams resulted in the widespread deposition in the basin lowland of a thick sequence of sand and gravel and some finer materials. Subsequent formation in late Pleistocene time of large ice-dammed glacial lakes across lower parts of the Columbia Plateau resulted in the deposition of silt and clay beds in much of the lowland of the study area. After the lakes drained, the exposed fine sediments were subjected to wind erosion, causing some of the material to be transported to become eolian deposits, particularly over the lower eastern parts of the study area.

Present-day geologic activities in the study area include the slow but continuing erosion of the mountains by streams and small glaciers, and the associated deposition of the materials along stream channels and flood plains and in lowland lakes. Also, the 1980 eruption of the Mount St. Helens volcano in the Cascade Range to the west resulted in deposition of some ash over large parts of the study area.

Population

An estimate of the population of the study area is based on the total 1979 population of Yakima and Benton Counties less estimates of the population in those parts of the counties outside the defined study area. Those parts excluded are (1) the upper Klickitat River basin, (2) the south slope of the Horse Heaven Hills, and (3) the Selah area.

On the basis of the forgoing, and on population data provided by the Washington Office of Program Planning and Fiscal Management (1977), the population of the study area is calculated as follows:

Yakima County	155,700
Benton County	85,400
Subtotal	241,100
Less county population outside the study area	- 4,300
Total	237,800

The total population of Yakima and Benton Counties has increased about 16 percent since 1960, when the population was about 207,200. About 60 percent of the population in the two counties is in incorporated areas, and the remainder is in unincorporated communities and on farms. The main population centers are the cities of Yakima (about 51,000 people in 1977) and the Richland-Kennewick areas (about 34,000 people in 1977). Other, smaller centers of population include Sunnyside, 7,600; Toppenish, 6,100; Grandview, 4,400; Prosser, 3,335; Wapato, 3,060; Union Gap, 2,630; Granger, 1,630; Zillah, 1,390; and Mabton, 1,108 (populations of 1977).

AGRICULTURE AND IRRIGATION DEVELOPMENT

The lower Yakima River basin is the most extensively irrigated area in Washington and one of the most important fruit-producing areas in the United States. The area irrigated in the study area is shown in figure 9. The study area ranks first in the nation in the production of hops. Other irrigated field crops include grapes, potatoes, corn, asparagus, mint, and alfalfa.

According to a historical summary by Flaherty (1975), the first irrigation began in 1867 with completion of the Nelson Ditch which diverted water from the lower Naches River a few miles west of its confluence with the Yakima River. The ditch still exists today as the Chapman-Nelson Canal, though carrying only a small amount of water.

Several larger canals were completed during the period 1880-1900. The Selah Valley Ditch Company's canal was the first of importance, carrying Naches River water from a point about 30 mi above its mouth. The Federal Reclamation Act of 1902 made possible the construction of Federal water-storage dams and canal systems and in 1905 Congress authorized the Yakima Federal Reclamation Project, to cover nearly one-half million acres in the Yakima River basin.

The first part of the basin to be covered by the reclamation project was the Sunnyside region, irrigated by the Sunnyside Canal completed in 1900. Additional facilities on the project were constructed later by the U.S. Bureau of Reclamation.

The area irrigated by the Tieton Irrigation Diversion Canal, completed in 1911, was the second to be covered under the Yakima Project. In 1927 the system's water supply was increased by completion of the Rimrock-Tieton Dam and reservoir. Included in the project is Clear Lake, also on the Tieton River, above Rimrock Reservoir; the lake's natural level was artificially raised by a low dam to provide a storage capacity of 5,300 acre-feet. The system now supplies water to about 27,000 acres of orchard land in the lower Cowiche Creek valley.

Bumping Lake on Bumping River, also artificially enlarged by an earthfill dam, has a storage capacity of 33,700 acre-feet. Studies are now (1981) underway to examine the feasibility of increasing the reservoir's capacity to about 460,000 acre-feet by construction of a higher dam downstream of the existing dam. Some of the advantages proposed include (1) fish and wildlife enhancement, (2) water for supplemental irrigation of Roza Division lands during periods of unusually low flow of the Yakima River, (3) additional storage capacity for flood control, and (4) additional recreational developments.

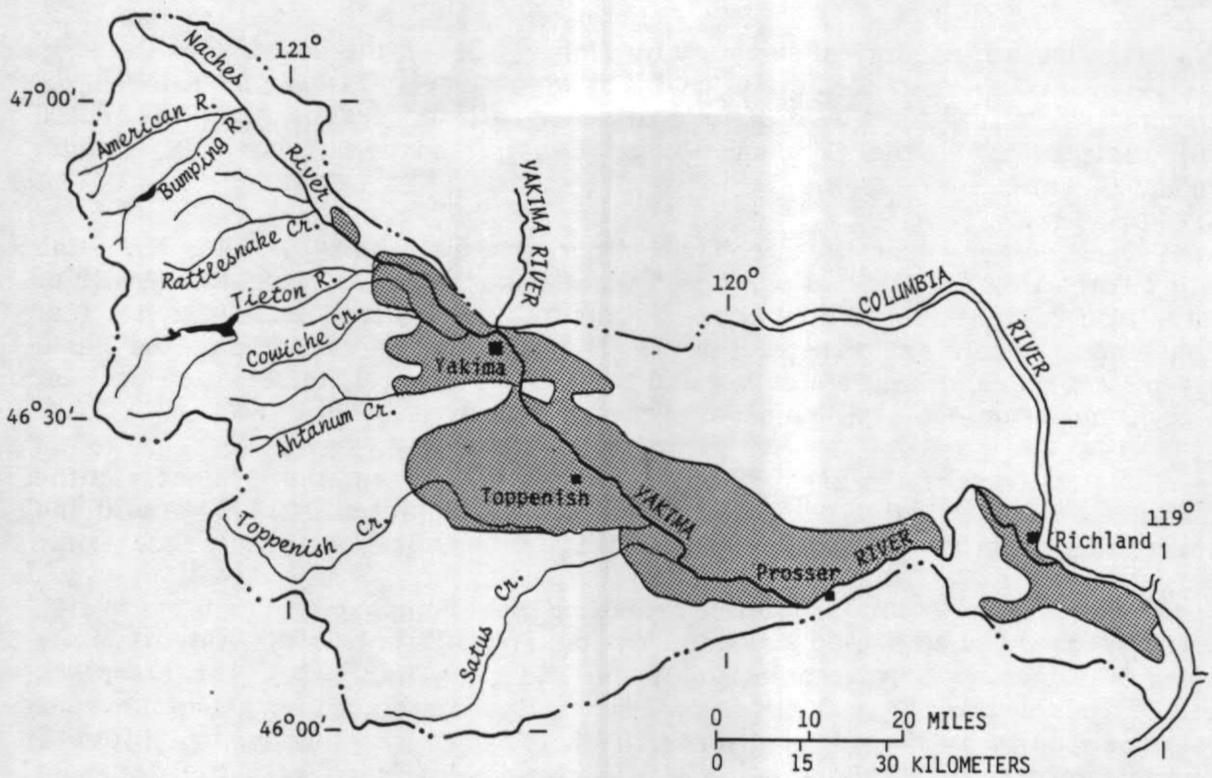


FIGURE 9.—Areas irrigated by canal systems.

The Wapato Irrigation Division diversion dam and canal system, developed to supply the Yakima Indian Reservation, were completed about 1908. The water is diverted from the Yakima River below Union Gap to the irrigation project. The Yakima Tribal Council is currently interested in constructing dams and reservoirs on Satus, Simcoe, and Toppenish Creeks for water to irrigate additional, higher land on the reservation.

An interesting aspect of the history of water use and treaty water rights on the Yakima Indian Reservation was the Ahtanum Creek case. In 1964, the U.S. Court of Appeals ruled that the Treaty of 1855 negotiated between Washington Territorial Governor Isaac Stevens and the Yakima Tribe took precedence over a later agreement entered into between the Indians and non-Indian farmers in Ahtanum Valley. The court held that any rights of the non-Indian farmers of the Ahtanum Irrigation District, in effect, the waters of Ahtanum Creek, were "subordinate to the rights held by the Indians on the Yakima Reservation." The court decreed that the Indians were to receive all the creek water after July 10 of each year. As a result, the non-Indian farmers on the north side of the creek (the channel center forming the northern reservation boundary) have drilled wells as a source of supplemental irrigation water.

The canal system of the Roza Irrigation Division was first put into operation in 1941 to provide for irrigation of about 72,000 acres above the Sunnyside Valley Canal, in an area extending 100 mi between Union Gap and Benton City. In the upstream reach of the Roza Canal near Yakima, some water is diverted for power generation.

Areas totaling nearly 20,000 acres in the eastern part of the study area, on the Kennewick slope (Kennewick east to the Columbia River), are irrigated by the Kennewick Canal. The water comes from the Chandler Power Canal at the powerhouse at Chandler; the power canal diverts water from the Yakima River at Prosser. Farther downstream, a few miles northwest of Richland, the Columbia and Richland Canals divert irrigation water from the river at the Horn Rapids diversion dam; these canals provide for irrigation of land along both sides of the lower reach of the Yakima River.

More than 30 smaller canals and irrigation districts exist throughout the study area, diverting directly from the several perennial streams. A few canals take water from larger canals for irrigation of small tracts of lower lands along the Yakima River.

THE HYDROLOGIC CYCLE

The hydrologic cycle is the pattern of water movement as it circulates through the natural system. It includes precipitation from the atmosphere to the earth, surface runoff and streamflow to lakes or the sea, percolation to ground-water bodies and seepage back to the surface, and evaporation and transpiration back to the atmosphere for continuation of the cycle. Figure 10 diagrammatically illustrates the hydrologic cycle as it applies to the lower Yakima River basin.

Precipitation as rain or snow is the source of all freshwater. A part of the precipitation on the land surface runs off rapidly to streams and lakes, a part soaks into the ground, and a part is evaporated directly back to the atmosphere from the soil and from streams, lakes, and plant surfaces. A part of the water entering the soil is drawn up by plants and returns to the atmosphere by transpiration from leaves; the combination of evaporation and transpiration is called evapotranspiration. A part of the water that enters the ground continues to percolate downward to a zone of saturation to become ground water. In turn, most of the ground water eventually returns to the surface by seepage to springs, lakes, streams, and the sea.

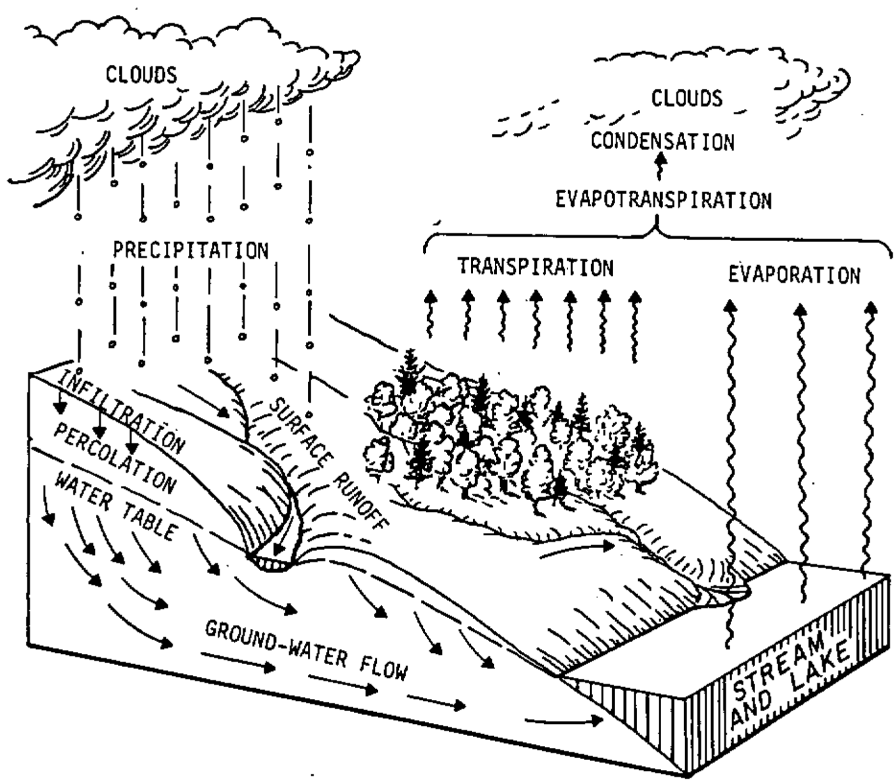


FIGURE 10.--The hydrologic cycle.

SURFACE-WATER RESOURCES

The Yakima River basin, though arid to semiarid in its agricultural lowland, is well endowed by the year-round availability of surface water in streams heading at snowfields and glaciers in the Cascade Range, principally the Yakima River, which enters the study area at Selah Gap, and the Naches River and its tributaries below the gap. The Yakima River's discharge is regulated upstream by storage dams and reservoirs in the upper Yakima River basin. Most of the discharge of the river from the upper basin to the lower basin is measured continuously at the stream-gaging station at Umtanum.

Glaciers

As shown in the map of figure 11, several glaciers exist in the study area, occupying cirques and upper slopes along the Cascade Range crest, all in the Goat Rocks Wilderness Area. Nearly all the glaciers are situated on the north and east sides of the crest, and their melt waters form the headwaters of the North and South forks of the Tieton River. As estimated from U.S. Geological Survey topographic maps (White Pass, 1962, 15-minute quadrangle, and Walupt Lake, 1970, 7-minute quadrangle), the glacier area encompassed during the dated surveys for those maps totaled about 1.3 mi^2.

The glaciers extend between altitudes of about 5,960 ft and 8,000 ft. According to the above-mentioned maps, supplemented by maps in a climbers guidebook to the southern Cascade Range (Beckey, 1973, p. 49), the glaciers include, from north to south, the McCall, Ives, Tieton, Conrad, and Meade Glaciers. According to the topographic maps noted above, these glaciers individually extend between the altitudes given below:

Glacier	Highest altitude (ft)	Lowest altitude (ft)	Approximate area (acres)	(mi^2)
McCall	7,600	6,440	120	(0.19)
Ives	7,600	6,000	180	(.28)
Tieton	7,720	6,400	80	(.13)
Conrad	7,600	6,400	140	(.22)
Meade	8,000	6,350	140	(.22)
Unnamed	—	—	160	(.25)
		Total	820	1.29

During early summer the glacier ice normally retains some snow cover, but most of this melts away before the next winter's snowfall. The amount of snowpack remaining through the summer and fall eventually becomes part of the glacier mass. The photograph in figure 12 shows two glaciers in the study area under early fall conditions (October 1, 1958), when there was little remaining of the previous winter's snowpack.

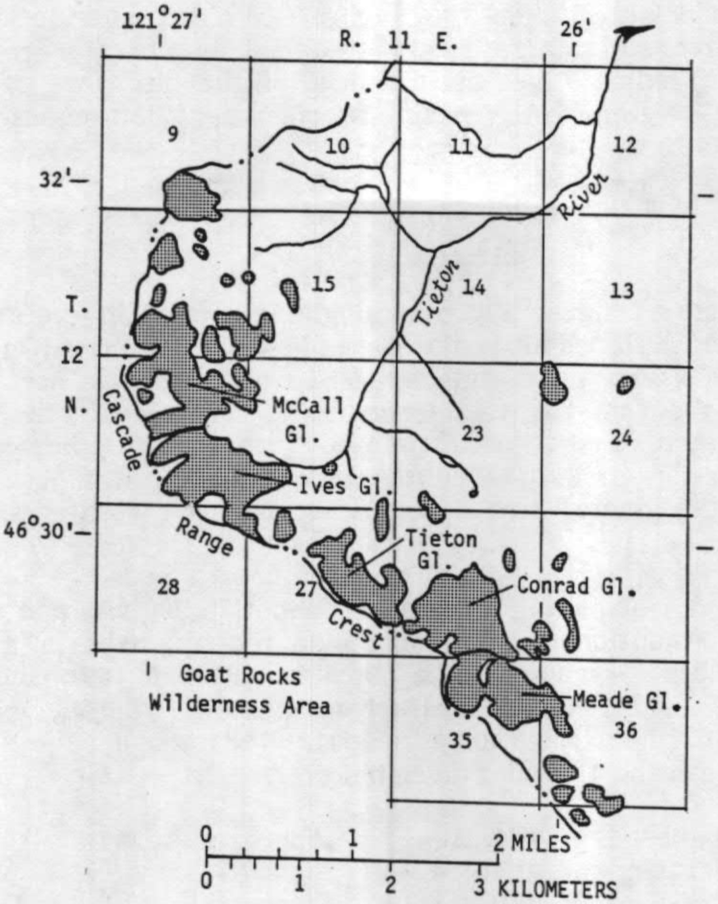


FIGURE 11.—Areas of glaciers and perennial snowfields.

FIGURE 12.—Conrad (left) and Tieton (right) Glaciers.

Lakes and Reservoirs

The study area contains a large number of lakes and several reservoirs. Most lakes in the high mountains occupy glacier-carved cirques and steep-walled valleys. Lakes in the forested lower mountains are generally along valley bottoms and include three that have been artificially enlarged to become the area's principal reservoirs—Rimrock, Bumping, and Clear Lakes (fig. 13). Most lakes along the flood plain of the lower Yakima River are "oxbow" lakes, which mark curved segments of earlier channel positions. Many lakes in the agricultural lowlands are products of man's activities—farm ponds and reservoirs and some areas under water due to waterlogging from heavy irrigation. Several lakes along the Columbia River between Kennewick and Wallula Gap exist in small elongate basins created between the bluffs and railroad-grade fills.

Natural (undammed) lakes in the study area range in size from less than an acre to more than 100 acres. According to data provided by Wolcott (1964), the largest natural lake is 104-acre Big Twin Sisters Lake, at the 5,100-ft altitude near the Cascade Range crest in the upper Bumping River drainage. Wolcott's data show that four other natural lakes near the Cascade Range crest exceed 50 acres in area (Cougar Lake, 82 acres; Dog Lake, 60 acres; and Dewey and Swamp Lakes, each 52 acres).

The flood plain of the lower Yakima River contains several large oxbow lakes formed in river meanders. The largest oxbow lake is Griffin Lake (105 acres, less an 8-acre island; Wolcott, 1964), situated on the north side of the Yakima River near Sunnyside.

Analysis of Wolcott's data, which generally cover lakes 1 acre or more in extent, shows that the study area has about 220 lakes (and reservoirs) of 1 to 5 acres, 40 between 5 and 10 acres, 20 between 10 and 50 acres, and 15 greater than 50 acres. Of these, 11 are noted as reservoirs of 1 to 5 acres, and 3 are reservoirs of more than 250 acres. The locations of lakes and reservoirs in the study area are shown in figure 14.

FIGURE 13.—Rimrock (top) and Bumping (bottom) Lakes, the principal storage reservoirs in the study area.

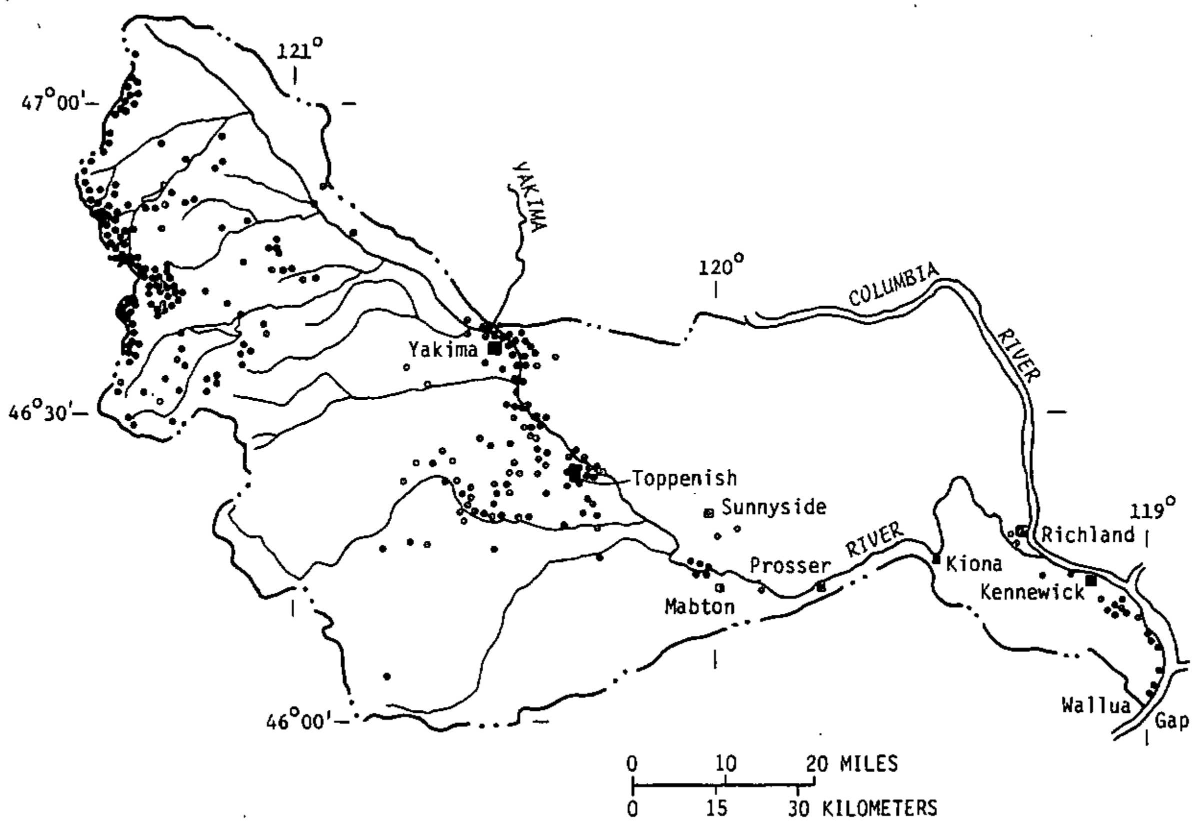


FIGURE 14.--Areal distribution of lakes and reservoirs.

Streamflow

Stream discharges in the study area have been recorded over many years at continuous-record, miscellaneous-record, and crest-stage-data sites; the periods and types of records are summarized in table 5. The streamflow data were compiled from annual summaries of the U.S. Geological Survey (1961-64, 1964a, 1965-74a, 1975, 1976, and 1977) and the Washington Division of Water Resources (1953, 1964), and from computer-printout compilations by the U.S. Bureau of Reclamation (written commun., 1979).

Continuous records of stream discharges during the 1960-77 water years are available for only 10 stations in the study area (fig. 15). These include discharge records of the Yakima River at Umtanum, which, although recording discharges that are upstream of the study area and subject to large diversions in the upper Yakima River basin (Pearson, written commun., 1979), represents most of the river's direct inflow to the lower basin. Of the 10 stations, only 2 are on natural-flowing streams—the American River near Nile (site 3) and the combined discharges of the North and South Forks Ahtanum Creek (site 7)—and only 2 others are above diversion canals. For the 1960-77 water years, the annual discharges of the Yakima River at Umtanum and of the 4 stations situated on streams upstream of diversions are given in table 6, and annual and mean monthly discharges at the stations are presented in table 7.

Despite the controlled nature of the streamflows in the lower Yakima River basin, variations in annual discharges do occur in response to annual and seasonal variations in precipitation. This is shown graphically in figure 16 for the 1960-77 water years. Also shown are the total annual irrigation diversions during the same period. (The annual discharges are totals of discharges at sites that represent unregulated streamflow —those above significant canal diversions.)

Seasonal variations in mean monthly precipitation, streamflow, end-of-month contents of Rimrock and Bumping Reservoirs (table 29), and mean monthly irrigation diversions during the 1960-77 water years are compared with monthly values for the 1977 drought water year in figure 17. Of the four variables compared, variations in reservoir storage appear to exhibit the least change during the drought year.

Discharges of undiverted streams during 1977 totaled 62 percent of the average during the 1960-77 water years (table 6). By comparison, the Yakima River at Kiona, the farthest downstream gaging station and where the river has been most affected by upstream diversions, had a total 1977 discharge that was only 35 percent of the long-term (1960-77) average.

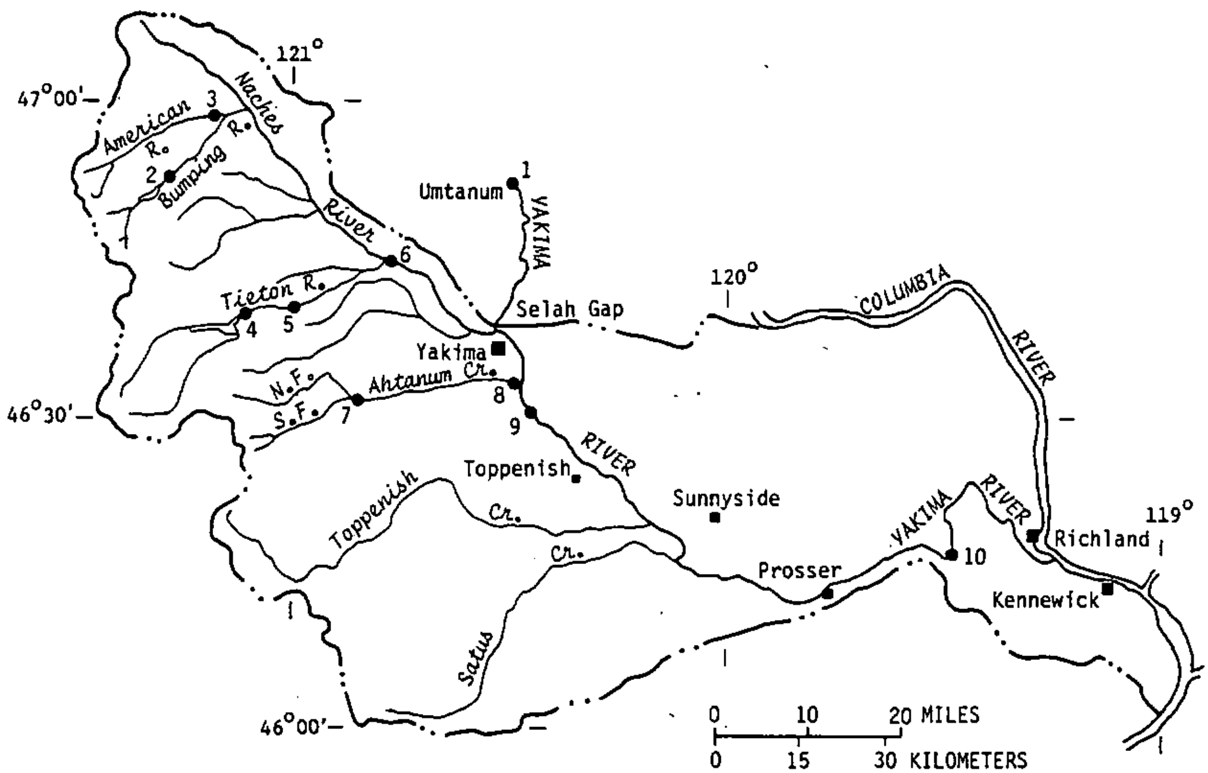
TABLE 5.--Discharge-measurement sites on streams and canals, and periods of record through 1977 water year

No. in fig. 15	Station name	Station No.	Period of record: Daily values, calendar years	Period of record: Annual peak flows, water years	Drainage area (mi^2)	Discharge (ft^3/s): Average	Discharge (ft^3/s): Maximum (date)	Discharge (ft^3/s): Minimum (date)
1	Yakima R at Umtanum	12484500	1906-	--	1,594	--	41,000 (11/15,16/06)	138 (10/3/15)
	McPherson Canyon Cr at Wymer	12484600	--	1952; 1955-	5.48	--	--	--
	Roza Cnl (Yak Rdg Cnl) nr Moxee City	12485000	1941- pub. with sta. 5050	--	1,802	--	--	--
	Selah-Moxee Cnl nr Selah (N Yakima)	12485500	1904-5; 1909-11	--	--	--	--	--
	Selah Creek:							
	Selah Cr tr nr Yakima	12485700	--	1955-74	.68	--	--	--
	Wenas Creek:							
	Pine Canyon nr Selah	12485900	--	1961-76	2.26	--	--	--
	Wenas Cr nr Selah	12486000	1909; 1910-12*	--	192	--	--	--
	Taylor Canal nr Selah	12486500	1905*; 1909-11	--	--	--	--	--
	Yakima R at Selah Gap nr N Yakima	12487000	1897; 1904; 1905* 1911-12	--	2,135	--	--	--
	Naches River:							
	Bumping River:							
	Deep Cr nr Goose Prairie	12487400	--	1966-75	12.7	--	--	--
	Bumping Lake nr Nile	12487500	1906; 1909-	--	69.3	--	--	--
2	Bumping R nr Nile	12488000	1906; 1909-	--	70.7	296	5,180 (12/29/17	0
	American R:							
	Parkey Cr nr Nile	12488200	--	1955-57	.71	--	--	--
	American R tr nr Nile	12488300	--	1955-74	1.10	--	--	--
3	American R nr Nile	12488500	1909-15; 1939-	--	78.9	246	3,340 (12/4/75)	20(11/22/40)
	Naches R at Anderson Ranch nr Nile	12489000	1909-14	--	394	--	--	--
	Naches R at Oak Flat nr Nile	12489500	1904-17	--	641	--	--	--
	Cty Yakima (Oak Flat) Divers. nr Naches	12489600	1929- pub with sta. 4940	--	--	--	--	--
	Selah Valley Canal nr Naches	12490000	1904; 1909-14; 1920- pub with sta 4940	--	--	--	--	--
	N.F. Tieton R blw Clear Cr nr Naches	12490500	1914-15	--	61.5	--	--	--
	Tieton River:							
	Rimrock Lk at Tieton Dam nr Naches	12491000	1925-	--	187	--	--	--
4	Tieton R at Tieton Dam nr Naches	12491500	1908-12; 1914; 1918-21; 1925-	--	187	507	8,450	0 (4/4-6/30)
	Hause Cr nr Rimrock	12491700	--	1955-	3.91	--	--	--
	Tieton Canal nr Naches	12492000	1910-	--	--	--	--	--
5	Tieton R at Hdwks T Cnl nr Naches	12492500	1906-	--	239	569	8,910 (12/22/33)	0 (several)
	Tieton R abv and blw Oak Cr nr Naches	12493000	1902-13	--	296	--	--	--
	Wapatox Canal nr Naches (N Yak)	12493500	1904; 1905*; 1909-14; 1916- pub with sta 4940	--	--	--	--	--
6	Naches R blw Tieton R nr Naches	12494000	1905; 1908-	--	941	--	--	--
	Naches Cnl Co. (Gleed) Cnl nr Naches	12494500	1904; 1905*; 1909-11	--	--	--	--	--
	Yakima Valley (congdon) cnl, Naches	12495000	1904; 1905*; 1909-11	--	--	--	--	--
	Naches-Cowiche canal nr N Yakima	12495500	1904; 1905*; 1909-11	--	--	--	--	--
	N. Yakima power cnl nr N Yakima	12496000	1904; 1905*; 1910	--	--	--	--	--
	Schanno canal nr N Yakima	12496500	1904; 1905*; 1909-11	--	--	--	--	--
	N Yakima power waste at N Yakima	12497000	1909-12	--	--	--	--	--
	N Yakima Milling Co waste at N Yakima	12497500	1909-12	--	--	--	--	--
	Old Union cnl nr N Yakima	12498000	1904; 1905*; 1909-11	--	--	--	--	--
	Naches Avenue Union cnl at N Yakima	12498500	1910	--	1,106	--	--	--
	Naches R nr N Yakima	12499000	1893-95*; 1896-1915	--	--	--	--	--

TABLE 5.--Discharge-measurement sites on streams and canals, and periods of record through 1977 water year--Continued

No. in fig. 15	Station name	Station No.	Period of record		Drainage area (mi²)	Discharge (ft³/s)		
			Daily values, calendar years	Annual peak flows, water years		Average	Maximum (date)	Minimum (date)
	Moxee Co. canals nr N Yakima	12499500	1904; 1905*; 1909-11	--	--	--	--	--
	Fowler canal nr N Yakima	12500000	1904; 1905*; 1909-11*	--	--	--	--	--
	Firewater Canyon nr Moxee City	12500400	--	1964-	7.30	--	--	--
	Yakima R abv Ahtanum Cr at Union Gap	12500450	1966-	--	3,479	--	28,200 (12/4/75)	565 (3/27/77)
7	N.F. Antanum Cr nr Tampico	12500500	1907-	--	68.9	69.9	1,580 (1/15/74)	3.1 (11/27/76)
	S.F. Ahtanum Cr at Conrad Ranch, Tampico	12501000	1915-	--	24.8	--	--	--
	S.F. Ahtanum Cr nr Tampico	12501500	1907*; 1908-14	--	28.5	19.9	1,230 (1/15/74)	2.4 (12/16/64)
	Ahtanum Cr at Narrows nr Tampico	12502000	1908-13; 1960-68	--	119	--	--	--
8	Ahtanum Cr at Union Gap nr Yakima	12502500	1904; 1907-08;	--	--	--	--	--
			1909*; 1910-14;	--	--	--	--	--
			1951-53; 1960-	--	173	--	3,100 (1/16/74)	0 (1904)
	Yakima R at Union Gap nr Yakima	12503000	(1893-94; 1895-96)*	--	--	--	--	--
			1896-1914; 1963-64	--	3,652	--	--	--
	New Reservation cnl nr(at) Parker (Yak)	12503500	1904- pub with sta. 5050	--	--	--	--	--
	Old Reservation cnl nr (at) Parker (WPT)	12504000	1904; 1905*; 1906- pub with sta 5050	--	--	--	--	--
	Sunnyside cnl nr Parker (Yakima WPT)	12504500	1904- pub with sta 5050	--	--	--	--	--
9	Yakima R nr Parker (Wapato)	12505000	1908-	--	3,660	--	65,000(12/23/33)	0.6 (4/22, 6/11/77)
	Reservation Drain at Alfalfa	12505500	1912-23	--	--	--	--	--
	Toppenish Cr nr Ft. Simcoe	12506000	1909-24	--	122	--	--	--
	Simcoe Cr blw Spring Cr nr Ft. Simcoe	12506500	1909-23	--	81.5	--	--	--
	Toppenish Cr nr White Swan (Wapato)	12507000	1909-11; 1912*	--	370	--	--	--
	Toppenish Cr tr nr Toppenish	12507300	--	1955-74	1.24	--	--	--
	Toppenish Cr at Alfalfa	12507500	1909-12	--	625	--	--	--
	Satus Creek:							
	Shinando Cr:							
	Shinando Cr tr nr Goldendale	12507600	--	1955-74	.38			
	Shinando Cr nr Goldendale	12507650	--	1953; 1955-59	7.94	--	--	--
	Satus Cr tr nr Toppenish	12507660	--	1953; 1956; 1961; 1963-	8.54	--	--	--
	Satus Cr nr Toppenish	12508000	1908-13	--	271	--	--	--
	Satus Cr blw Dry Cr nr Toppenish	12508500	1913-24	--	434	--	--	--
	Yakima R tr nr Sunnyside	12508800	--	1954-73	1.91	--	--	--
	Yakima River at Mabton	12508990	1970-	--	5,359	--	37,200 (1/17/74)	320 (3/25/77)
	Yakima R nr Mabton	12509000	1911-14		5,400	--	--	--
	Yakima R near Prosser	12509500	1904-6; 1913-33	--	5,453	--	--	--
	Kennewick Canal nr Chandler	12509600	1956- yrly div only with sta 5105		--	--	--	--
	Snipes Cr:							
	Snipes Cr tr nr Benton City	12509800	--	1967-	5.18	--	--	--
	Kiona Canal nr Kiona	12510000	1904; (1905; 1908-09)*; 1910-11	--	--	--	--	--
10	Yakima R at Kiona	12510500	1895*; 1896-1915; 1933-	--	5,615	--	67,000 (12/23/33)	105 (9/11/06)
	Webber Canyon Cr nr Kiona	12510600	--	1955-74	2.88	--	--	--
	Cold Creek:							
	Cold Cr tr nr Priest Rapids	12510620	--	1967-75	.89	--	--	--
	Yakima R tr nr Kiona	12510700	--	1955-74	3.35	--	--	--
	Kennewick Canal nr Kiona (Rchlnd-Knwk)	12511000	1904; 1905*; 1910-11	--	--	--	--	--
	Lower Yakima Canal nr Kiona	12511500	1905*; 1910-11	--	--	--	--	--
	Yakima R nr Richland	12512000	1906; 1907-8* 1909-11	--	6,155	--	--	--

*Gage heights, elevations, or gage heights and discharge measurements only.



Site No.	Station No.	Station name	Drainage area (mi^2)
1	12484500	Yakima River at Umtanum	1,594
2	12488000	Bumping River near Nile	70.7
3	12488500	American River near Nile	78.9
4	12491500	Tieton River at Tieton Dam near Naches	187
5	12492500	Tieton River at headworks, downstream from Tieton Canal near Naches	239
6	12494000	Naches River downstream from Tieton River near Naches	941
7	B12502550	Combined North and South Forks Ahtanum Creek upstream from diversions	93.7
8	12502500	Ahtanum Creek at Union Gap	173
9	12505000	Yakima River near Parker	3,660
10	12510500	Yakima River at Kiona	5,615

Note: Station numbers are all U.S. Geological Survey stations except that marked "B," indicating U.S. Bureau of Reclamation number.

FIGURE 15.—Locations of selected continuous-record streamflow-gaging stations.

TABLE 6.--Annual discharges of Yakima River at Umtanum and at principal stream sites within study area above diversion facilities, during 1960-77 water years

[Data from U.S. Bureau of Reclamation (written commun., 1979)]

Site No. in fig. 15	Station number	Station name and drainage area (mi^2)	Thousands of acre-feet							
			1960	1961	1962	1963	1964	1965	1966	1967
1	12484500	Yakima River at Umtanum (1,594)	2,242	2,035	1,616	1,662	1,472	2,080	1,288	1,580
2	12488000	Bumping River near Nile (69.3)	236	250	186	180	209	216	158	205
3	12488500	American River near Nile (78.9)	172	202	143	160	164	177	136	173
4	12491500	Tieton River near Tieton Dam (187.0)	466	397	272	410	264	454	278	345
7	12502550	Combined flows of North and South Forks Ahtanum Creek (93.7)	54	77	55	71	46	68	51	71
		Totals	3,170	2,961	2,272	2,483	2,155	2,995	1,911	2,374
		Percent of average for 1960-77	116	108	83	91	79	110	70	87

Site No. in fig. 15	Station number	Thousands of acre-feet											Percent ratio of 1977 discharge to average
		1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	Average[1]	
1	12484500	1,920	1,928	1,343	1,918	3,052	1,510	2,201	2,042	2,562	1,256	1,872	67
2	12488000	224	215	173	245	318	152	313	239	282	101	217	47
3	12488500	183	185	160	220	245	121	274	191	215	68	178	38
4	12491500	373	421	335	376	580	392	446	420	533	253	389	65
7	12502550	63	76	59	85	109	36	122	72	76	17	67	25
Totals		2,763	2,825	2,070	2,844	4,304	2,211	3,356	2,964	3,668	1,695	2,723	62
Percent of average for 1960-77		101	103	76	104	158	81	123	109	135	62	--	--

[1]Average may not agree with that in table 7 due to rounding.

TABLE 7.--Mean monthly and annual discharges of Yakima River at Umtanum and of principal streams within study area above diversion facilities, 1960-77 water years, compared to discharges during 1977 drought water years

[Data from U.S. Bureau of Reclamation (written commun., 1979). 1977 discharges are given in parentheses.]

Site No. in fig. 15	Station No.	Station name and drainage area (mi^2)	Thousands of acre-feet												
			Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Mean annual[1]
1	12484500	Yakima River at Umtanum (1,594)	79.8 (92.3)	58.1 (30.5)	102.6 (32.1)	118.5 (41.6)	115.1 (31.8)	139.6 (33.3)	200.00 (102.6)	258.2 (150.7)	241.0 (174.6)	211.2 (233.6)	207.1 (206.0)	141.4 (126.7)	1,872.6 (1,255.3)
2	12488000	Bumping River near Nile (70.7)	10.3 (8.3)	9.6 (5.7)	15.8 (4.4)	13.5 (5.3)	10.9 (.6)	9.8 (.2)	11.0 (.7)	28.8 (19.7)	45.8 (19.5)	29.5 (7.3)	18.2 (16.2)	13.7 (12.6)	216.9 (100.5)
3	12488500	American River near Nile (78.9)	4.4 (3.3)	7.6 (3.7)	10.8 (2.9)	10.2 (3.1)	9.0 (2.7)	9.2 (2.9)	14.5 (10.2)	37.1 (12.5)	43.8 (16.8)	20.1 (4.2)	6.7 (2.7)	3.8 (3.3)	177.2 (68.3)
4	12491500	Tieton River at Tieton Dam near Naches (187)	12.7 (24.5)	5.0 (2.6)	10.4 (3.5)	10.9 (.3)	8.7 (.2)	11.0 (.3)	31.7 (4.1)	42.6 (16.6)	49.5 (19.8)	66.5 (42.0)	76.2 (69.8)	64.6 (69.4)	389.8 (253.1)
7	12502550	Combined flow of North and South Forks Ahtanum Creek above diversions (93.7)	1.8 (2.0)	2.3 (1.8)	2.8 (1.5)	3.9 (1.1)	4.2 (1.3)	5.4 (1.3)	8.2 (2.1)	14.8 (2.2)	14.0 (1.7)	5.4 (.8)	2.5 (.7)	1.8 (.8)	67.1 (17.3)
		Totals	109.0 (130.4)	82.6 (44.3)	142.4 (44.4)	157.0 (51.4)	147.9 (36.6)	175.0 (38.0)	265.4 (119.7)	381.5 (201.7)	394.1 (232.4)	332.7 (287.9)	310.7 (295.4)	225.3 (212.8)	2,723.6 (1,694.5)
Percent that 1977 total was of 1960-77 average			119.6	53.6	31.2	32.7	24.7	21.7	45.1	52.9	59.0	86.5	95.1	94.5	62.2

[1]Mean annual discharges may not agree with that of table 6 due to rounding.

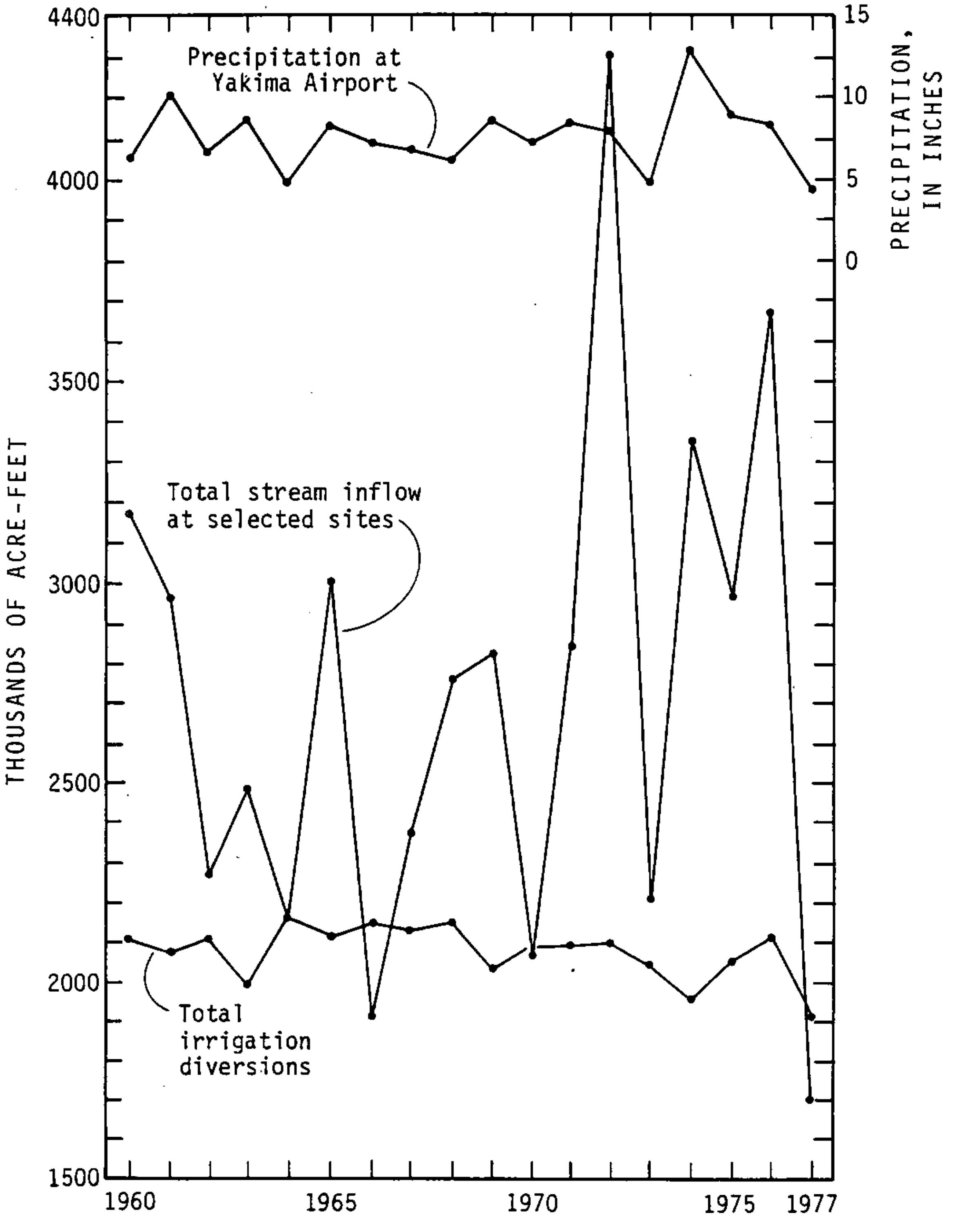


FIGURE 16.—Comparisons of annual precipitation at Yakima Airport, total stream inflow at selected sites, and total irrigation diversions during 1960-77 water years.

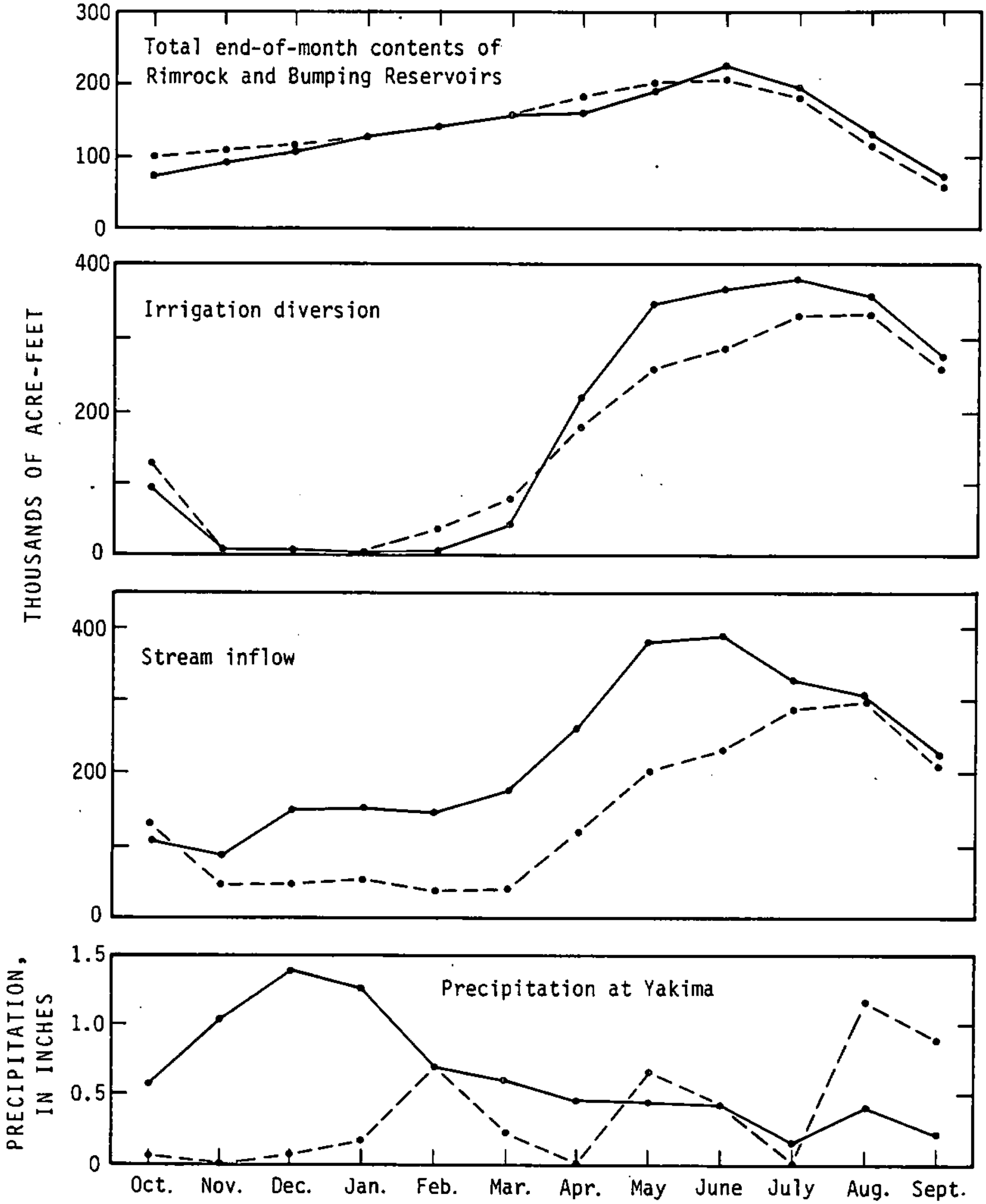


FIGURE 17.—Mean monthly values of precipitation at Yakima Airport, end-of-month contents of Rimrock and Bumping Reservoirs, total stream inflow at selected sites, and irrigation diversions during 1960-77 water years (solid lines), compared to monthly values during 1977 drought year (dashed lines).

Floods

Floods have occurred along the principal rivers periodically, the larger ones usually resulting from a combination of heavy rainfall and warming temperatures with an accompanying rapid melting of the mountain snowpack. Although dikes and levees protect some reaches of the principal rivers against overbank flooding, unusually high discharges occasionally top the banks and inundate the flood plains. Several reports by the U.S. Army Corps of Engineers (1968, 1970, 1972, 1975) include maps of reaches of the Naches and Yakima Rivers that are subject to flooding during a 100-year flood, a flood of magnitude that on the average will occur once in 100 years. Areas covered by water in the Toppenish Creek and Satus Creek basins during the flood of January 1974 were mapped by the U.S. Geological Survey (1975).

The above-noted areas subject to flooding in the study area are shown in figure 18. Such areas include those along the Naches River near Naches; along the Yakima River between Yakima and Union Gap, between Parker and Mabton, and in the West Richland-Richland area near the river's mouth; and along Toppenish and Satus Creeks.

The annual peak flows at selected long-term gaging stations, for the period 1960-77, are given below:

Station name and number	Thousands of cubic feet per second								
	1960	1961	1962	1963	1964	1965	1966	1967	1968
Yakima R. at Umtanum (12384500)	19.0	8.6	8.12	6.77	5.77	11.7	4.43	6.44	8.60
Bumping R. near Nile (12488000)	1.15	1.61	.863	1.10	1.68	.802	1.02	1.27	1.15
American R. near Nile (12488500)	1.08	1.84	.792	1.09	1.45	1.06	1.75	1.53	2.84
Tieton R. at Tieton Dam near Naches (12491500)	2.08	2.32	1.42	1.94	1.23	2.36	1.49	2.44	1.82
Naches R. below Tieton R. near Naches (12494000)	9.12	7.24	3.89	5.25	5.15	6.25	6.04	6.70	5.10
Ahtanum Cr. at Union Gap (12502500)	.025	.397	.303	1.34	.408	.798	.260	.386	.449
Yakima R. near Parker (12505000)	27.4	12.2	10.7	15.6	6.77	22.9	6.52	9.90	14.3
Yakima R. at Kiona (12510500)	18.7	13.0	11.3	13.5	8.68	22.4	6.82	10.5	15.2

Station name and number	Thousands of cubic feet per second								
	1969	1970	1971	1972	1973	1974	1975	1976	1977
Yakima R. at Umtanum (12384500)	7.99	4.20	9.11	11.7	5.05	10.9	8.44	16.6	4.13
Bumping R. near Nile (12488000)	1.18	1.55	1.09	2.24	.712	2.78	1.53	1.34	7.01
American R. near Nile (12488500)	1.65	2.10	1.43	2.05	1.77	3.24	1.91	3.34	.625
Tieton R. at Tieton Dam near Naches (12491500)	2.38	1.60	1.62	2.52	1.84	4.02	2.52	2.56	1.71
Naches R. below Tieton R. near Naches (12494000)	8.10	6.76	8.75	10.1	3.47	12.8	7.21	14.1	1.55
Ahtanum Cr. at Union Gap (12502500)	.460	.316	.448	.660	.240	.310	.452	.596	.050
Yakima R. near Parker (12505000)	12.6	5.86	14.2	20.2	8.94	28.0	11.3	26.7	3.23
Yakima R. at Kiona (12510500)	14.4	8.28	14.4	20.2	8.61	39.7	12.9	28.3	3.41

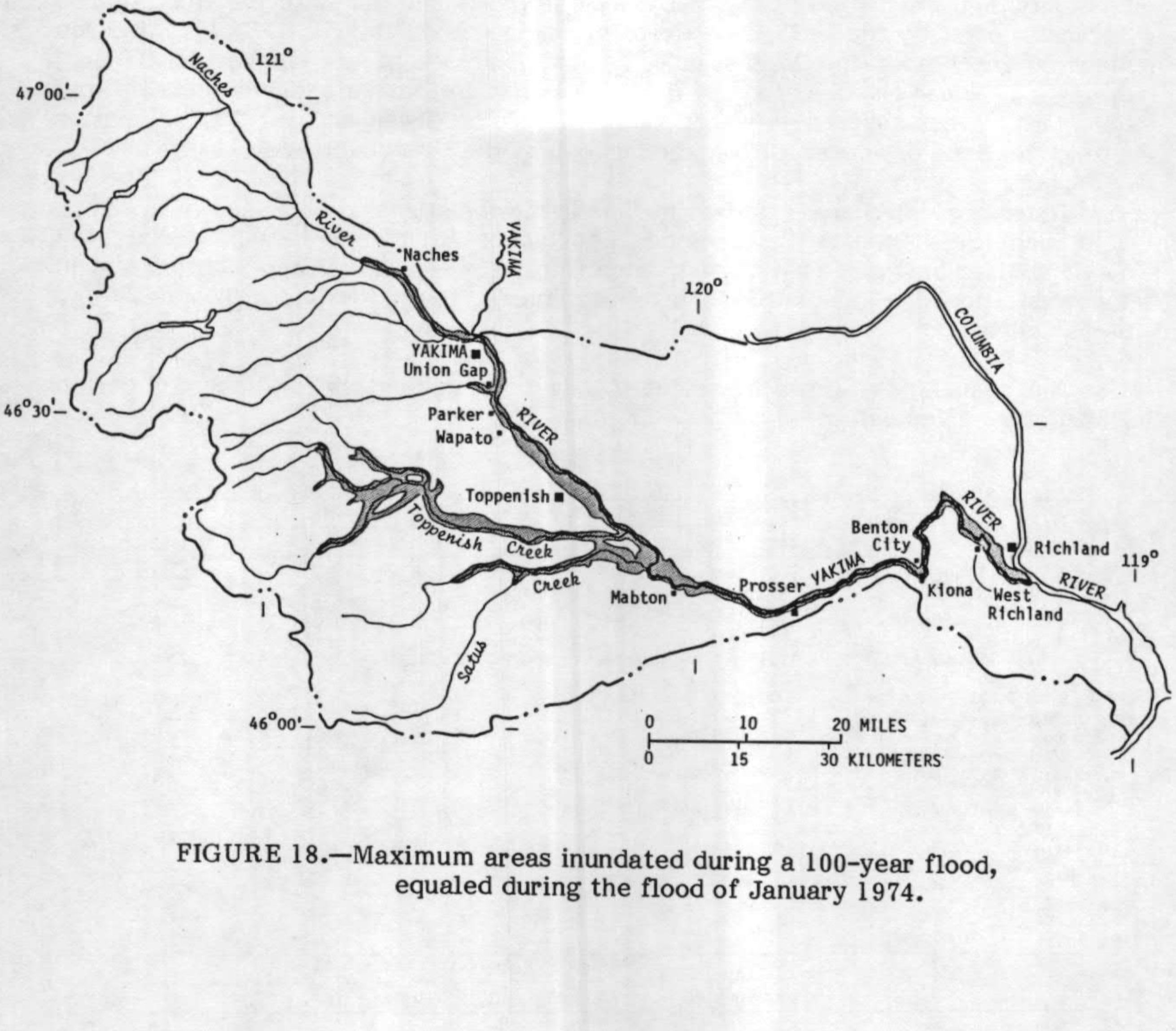


FIGURE 18.—Maximum areas inundated during a 100-year flood, equaled during the flood of January 1974.

Canal Diversions and Return Flows

The study-area lowland contains a complex system of streamflow diversion points, canals, and return-flow drains and wasteways. Most of the diversions are for irrigation, but a few are for electric-power generation and municipal and industrial supplies. The relative positions of all significant diversion points on the streams are shown diagrammatically in figure 19, and photographs of diversion points of selected canals are shown in figures 20-26. Diversion and discharge data collected by the U.S. Bureau of Reclamation and the Wapato Irrigation District (written commun., 1979) are presented in the basic-data tables at the end of the report. Included there are monthly and annual data covering the 1960-77 water years for municipal, industrial, and hydroelectric power diversions (table 30) and irrigation diversions (table 31).

The irrigation system includes canal diversions directly from the basin's streams and intercanal diversions—those made from the Roza, Sunnyside, and Reservation Canals to those serving small irrigation districts. The numbers of diversion points on the principal streams and the mean annual quantities diverted from each stream for irrigation, power generation, and municipal and industrial supplies are summarized in table 8.

TABLE 8.--Summary of available data on mean annual discharges at selected stream sites, and mean annual quantities and purposes of diversions from principal streams 1960-77 water years

[Data from U.S. Bureau of Reclamation (written commun., 1978). Values are rounded to three significant figures, except those less than 10]

Stream site	Thousands of acre-feet (rounded)				
	Mean annual discharge	Irrigation	Power	Municipal and industrial	Total diversions
Yakima River at Umtanum	[a]1,870	1,750	1,180	9.2	2,940
Naches River near Naches	[a]891	167	273	9.1	449
Tieton River near Tieton Dam	[a]390	102	--	--	102
North and South Forks Ahtanum Cr above diversions	.7	15.6	--	--	15.6
Simcoe Creek	--	3.4	--	--	3.4
Toppenish Creek	[b].6	574	--	--	574
Satus Creek	[b]1.1	21.5	--	--	21.5
Totals (rounded)	3,150	2,630	1,450	18.3	[c]4,110

[a]For period 1960-77.
[b]For period 1960-75.
[c]Totals of column and row do not match, due to rounding.

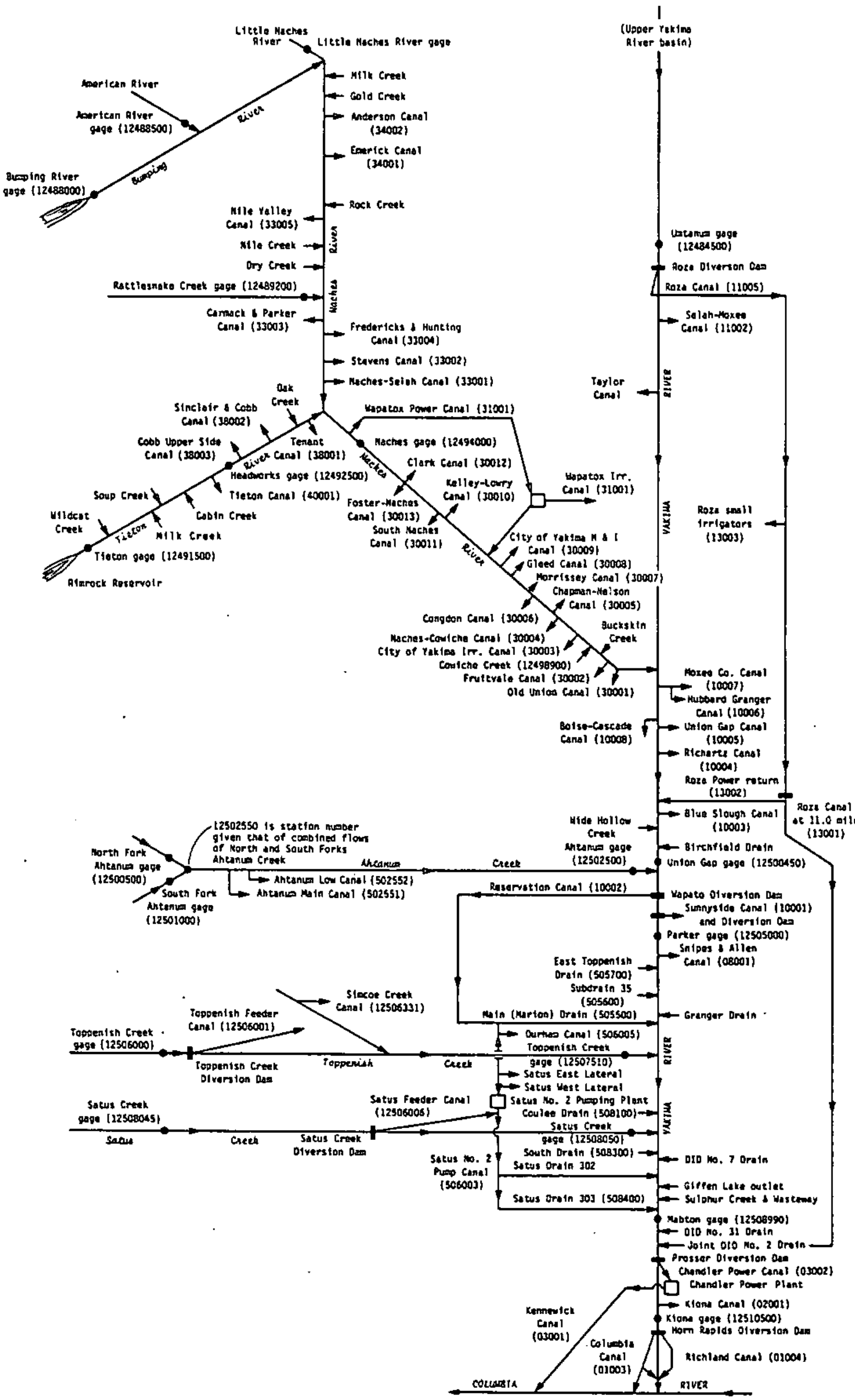


FIGURE 19.—Relative positions of streams, diversion canals, return-flow canals, and measuring sites.

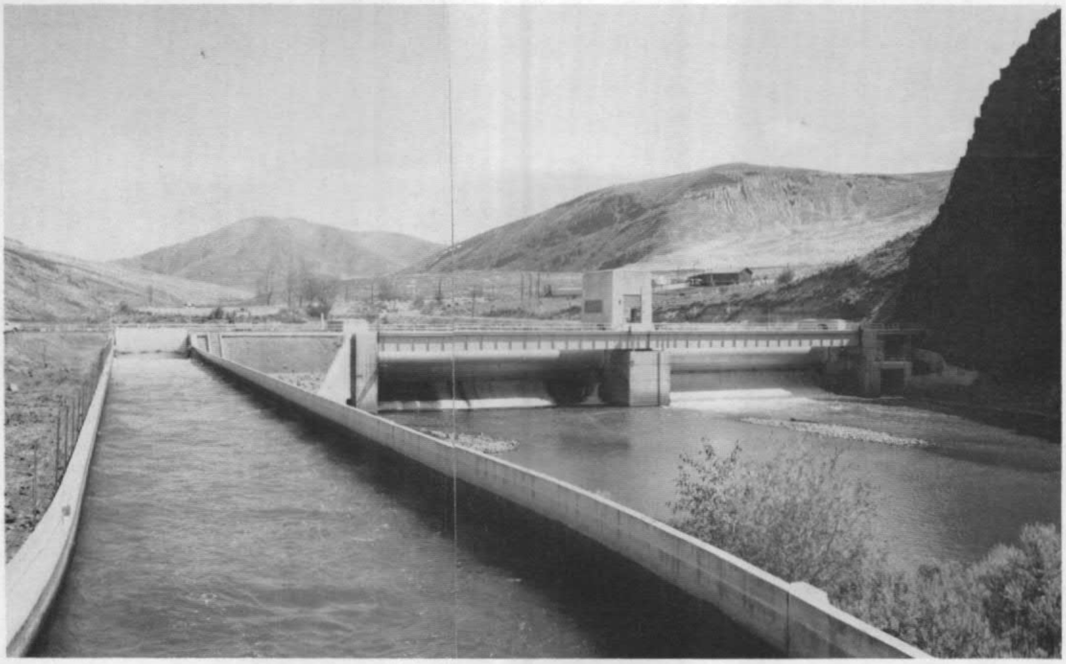


FIGURE 20.—Roza Canal diversion at Roza Dam on Yakima River.

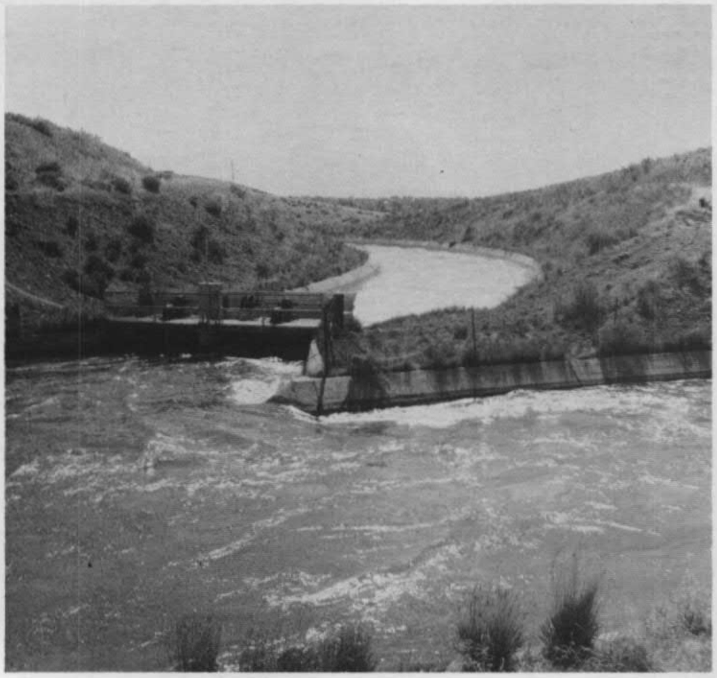


FIGURE 21.--Roza Canal.

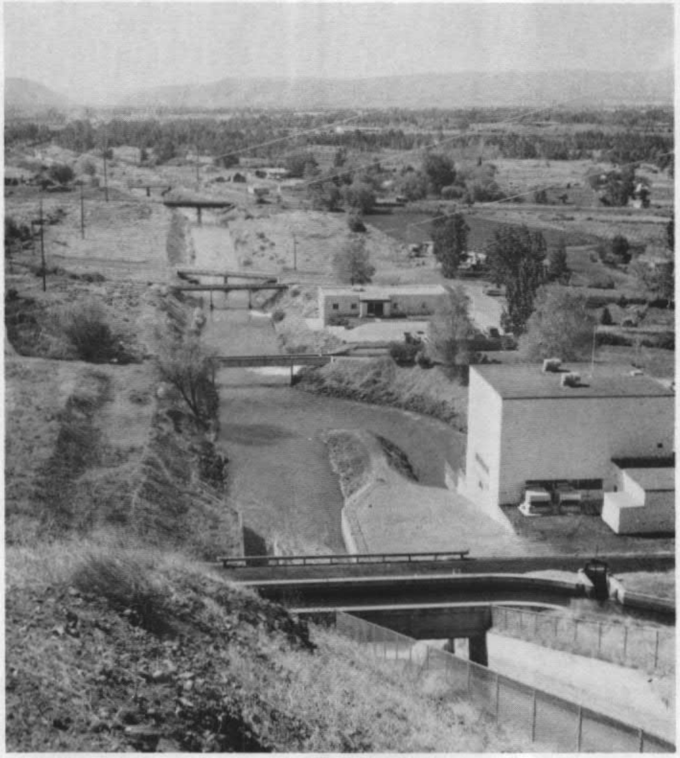


FIGURE 21.--Roza Canal--Continued

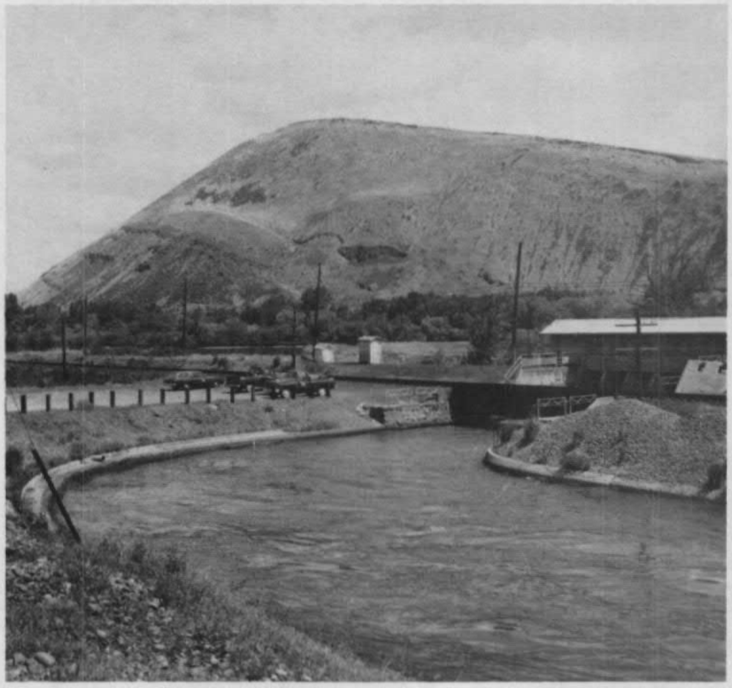


FIGURE 22.—Reservation Canal diversion from Yakima River below Union Gap.

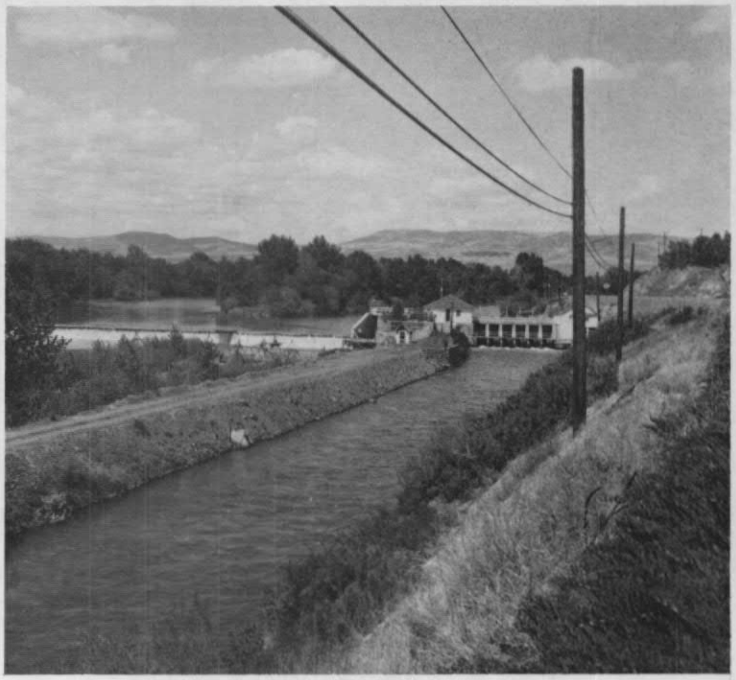


FIGURE 23.—Sunnyside Canal diversion from Yakima River near Parker.

FIGURE 24.—Satus No. 2 Pump Canal.

FIGURE 25.--Chandler Power Canal diversion from Yakima River at Prosser Diversion Dam.

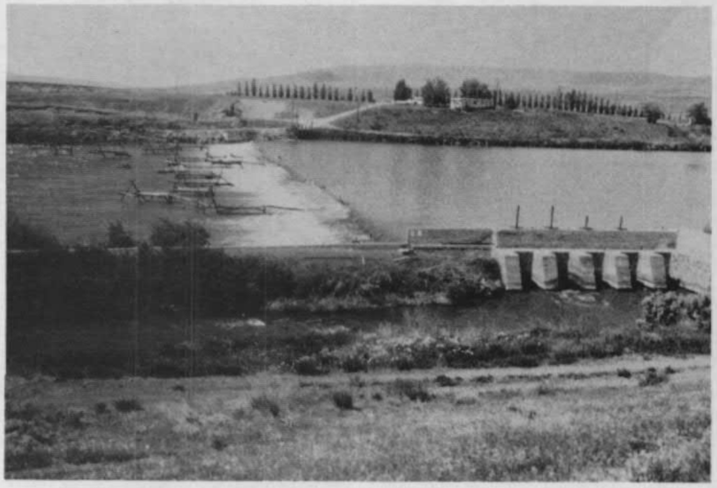


FIGURE 26.--Richland Canal diversion at Horn Rapids Diversion Dam.

A comparison was made of the relations between the mean annual precipitation at the Yakima Airport (table 2), stream inflow to the study area at selected sites (table 6), end-of-month reservoir contents (table 9), and diversions from the principal canals (table 10) during the period 1960-77 and during the 1977 drought water year. As given in table 10 and shown graphically in figure 17, the great variations in precipitation and stream inflow were not reflected by significant changes in irrigation diversions during the same years. Although total recorded streamflow during the 1977 drought water year was 62 percent of the average during the 1960-77 water years, the total irrigation diversion during 1977 was 91 percent of the average for the 1960-77 period.

Mean annual diversions by individual canals during the 1960-77 water years are compared with diversions during the 1977 drought water year in table 11.

TABLE 9.--Mean monthly end-of-month contents of Rimrock and Bumping Reservoirs during 1960-77 water years and monthly end-of-month contents during 1977 drought water year

[Data from U.S. Bureau of Reclamation (written commun., 1979). See table 29 at end of report.]

Reservoir and capacity	Period (water years)	End-of-month reservoir contents, in thousands of acre-feet											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
Rimrock (198,000 acre-ft)	1960-77	69.2	84.9	100.0	116.6	132.5	144.6	144.3	164.2	189.3	165.6	114.3	64.1
	1977	92.1	101.6	108.7	120.1	129.8	140.0	154.9	162.2	175.5	149.9	99.2	46.6
	Pct 1977 of 1960-77	133.1	119.7	108.7	103.0	98.0	96.8	107.3	98.8	92.7	90.5	86.8	72.7
Bumping (33,700 acre-ft)	1960-77	4.8	7.1	6.8	7.9	9.1	9.7	13.7	26.4	32.9	27.7	17.3	8.4
	1977	5.7	4.8	4.7	4.4	9.3	13.6	26.8	35.1	34.3	31.4	18.3	10.4
	Pct 1977 of 1960-77	118.8	67.6	69.1	55.7	102.2	140.2	195.6	133.0	104.3	113.4	105.8	123.8
Total of both reservoirs (231,700 acre-ft)	1960-77	74.0	92.0	106.8	124.5	141.6	154.3	158.0	190.6	222.2	193.3	121.6	72.5
	1977	97.8	106.4	113.4	124.5	139.1	153.6	181.7	197.3	209.8	181.3	117.5	57.0
	Pct 1977 of 1960-77	132.2	115.7	106.2	100	98.2	99.5	115.0	103.5	94.4	93.8	96.6	78.6

TABLE 10.--Stream inflow to study area at selected sites, and total recorded irrigation-canal diversions, 1960-77 water years

[Data from U.S. Bureau of Reclamation and Wapato Irrigation District (written commun., 1978)]

Water year	Thousands of acre-feet		Percentage of recorded diversions to recorded stream inflow (rounded to pct)
	Stream inflow	Irrigation-canal diversions	
1960	3,170	2,256	71
1961	2,961	2,219	75
1962	2,272	2,325	102
1963	2,483	2,138	86
1964	2,155	2,341	109
1965	2,995	2,296	77
1966	1,911	2,305	121
1967	2,374	2,297	97
1968	2,763	2,323	84
1969	2,825	2,179	77
1970	2,070	2,243	108
1971	2,844	2,226	78
1972	4,304	2,257	52
1973	2,211	2,218	100
1974	3,356	2,224	66
1975	2,964	2,206	74
1976	2,668	2,281	62
1977	1,995	2,245	113
Average	2,723	2,254	83

TABLE 11.--Mean annual diversions by irrigation canals during 1960-77 water years compared to diversions during 1977 drought water year

[Data from U.S. Bureau of Reclamation (written commun., 1979), except those covering Yakima Indian Reservation, which are from Wapato Irrigation District (written commun., 1979). Values are rounded to nearest 100 acre-ft.]

USBR station No. in figure 19	Canal name	Thousand of acre-feet[1] Average 1960-77	Thousand of acre-feet[1] 1977	1977 Percent of 1960-77
From Tieton River:				
40001	Tieton Canal	98.1	97.9	99.8
38003	Cobb Upper Side Canal	.5	.3	60.0
38002	Sinclair and Cobb Canal	.9	1.0	111.1
38001	Tenant Canal	2.0	2.0	100
From Naches River:				
34001	Emerick Canal	.5	.3	60.0
34002	Anderson Canal	1.6	1.4	87.5
33005	Nile Ditch Assn. Canal	4.2	3.8	90.5
33003	Carmack and Parker Canal	1.2	1.1	91.7
33004	Frederick and Hunting Canal	.8	.6	75.0
33002	Stevens Canal	2.6	2.6	100.0
33001	Naches-Selah Canal	45.1	51.4	114
31001	Wapatox Irrigation Canal	7.7	6.8	88.3
30013	Foster-Naches Canal	1.0	1.2	120.0
30012	Clark Canal	1.2	1.0	83.3
30011	South Naches Channel Canal	21.7	27.5	126.7
30010	Kelley and Lowry Canal	6.8	6.1	89.7
30008	Gleed Canal	17.7	14.7	83.1
30007	Morrissey Canal	1.7	.9	52.9
30006	Congdon Canal	16.5	18.1	110
30005	Chapman and Nelson Canal	4.7	.8	17.0
30004	Naches-Cowiche Canal	10.7	10.0	93.5
30003	City of Yakima Irrigation Canal	10.6	9.6	90.6
30002	Fruitvale Canal	15.7	12.4	79.0
30001	Old Union Canal	11.3	7.7	68.1
From Yakima River:				
13001	Roza Canal at 11.0 mile	356.5	274.8	77.1
11002	Selah-Moxee Canal	24.5	26.1	106.5
10007	Moxee Co. Canal	4.6	3.2	69.6
10006	Hubbard-Granger Canal	10.8	11.4	105.6
10005	Union Gap Canal	17.9	19.8	110.6
10004	Richartz Canal	5.4	3.6	66.7
10003	Blue Slough Canal	5.6	5.6	100.0
From Ahtanum Creek:				
502551	Ahtanum Main Canal	13.7	3.5	25.5
502552	Ahtanum Low Canal	1.9	.6	31.6
From Yakima River:				
10002	Reservation Canal (Old and New)	644.0	607.1	94.3
10001	Sunnyside Canal	441.7	402.7	91.2
08001	Snipes and Allen Canal	8.4	7.6	90.5
From Toppenish Creek:				
506001	Toppenish Feeder Canal	17.0	12.1	71.2
506002	Satus East Lateral Canal	45.5	42.2	92.7
506003	Satus 2 Pump Canal	96.5	109.2	113.2
506004	Satus West Lateral Canal	8.2	7.9	96.3
From Satus Creek:				
506006	Satus Feeder Canal	21.5	24.7	114.9
From Simcoe Creek:				
506331	Simcoe Creek Canal	3.4	1.0	29.4
From Yakima River:				
03001	Kennewick Canal (via Chandler Power Canal)	98.3	94.6	96.2
02001	Kiona Canal	12.9	12.5	96.9
01004	Richland Canal	32.3	31.3	96.9
01003	Columbia Canal	85.5	86.1	100.7
	Totals	2,240.9	2,066.8	92.2

[1]Rounded to one decimal point (100 acres).

Water Quality

Data Collection and Analyses

The quality of water in streams, irrigation canals, and return-flow drainage canals in the lower Yakima River basin, along with that in lakes and reservoirs in the area, has been the subject of much analysis and of many previous studies and reports (table 1). The most complete data—those covering the principal chemical constituents and daily water temperatures—have been collected from the Yakima River at Kiona (station 12510500) since the 1952 water year. Data from other sites on the Yakima River and its major tributaries were collected for various purposes and with increasing coverage, as summarized in table 12 for the 79 sites shown in figure 27.

Water-quality data collected through 1963 included those covering the principal chemical constituents, specific conductance, pH, and temperature, but in 1964 microbiological data were included from nine stations. A study of surface- and ground-water quality in the Yakima Indian Reservation in 1973-74 resulted in collection of similar data at 18 streams and canal sites on the reservation (Fretwell, 1979); a total of 38 stations in the study area provided chemical and microbiological data in the 1974 water year. In 1976 a study of water quality in the Sulphur Creek basin (P. R. Boucher, written commun, 1979) added data from 16 stations on major canals and drains.

Data collected during studies of suspended-sediment transport in the area include those in reports covering the upper Columbia River basin (Nelson, 1974), the study area in general (Nelson, 1979a), and the Yakima Indian Reservation (Boucher, 1975; Nelson, 1979b). The report on water quality in the Sulphur Creek basin by P. R. Boucher (written commun., 1977) includes suspended-sediment data collected from 3 sites in 1975, 34 sites in 1976, and 7 sites in 1977.

Data for pesticides analysis were collected at only 3 sites, and trace-element data were collected from 9 sites (table 12).

The physical, chemical, and biological quality of surface water in the lower Yakima River basin is altered significantly as it discharges from the mountainous upper reaches of the basin's streams and passes through the basin lowland to the Columbia River. As the water moves through the complex system of irrigation and return-flow canals, the heavy influence of man's agricultural activities—cultivation of the land, fertilizing of the crops, and spraying of pesticides—has its effects on water quality.

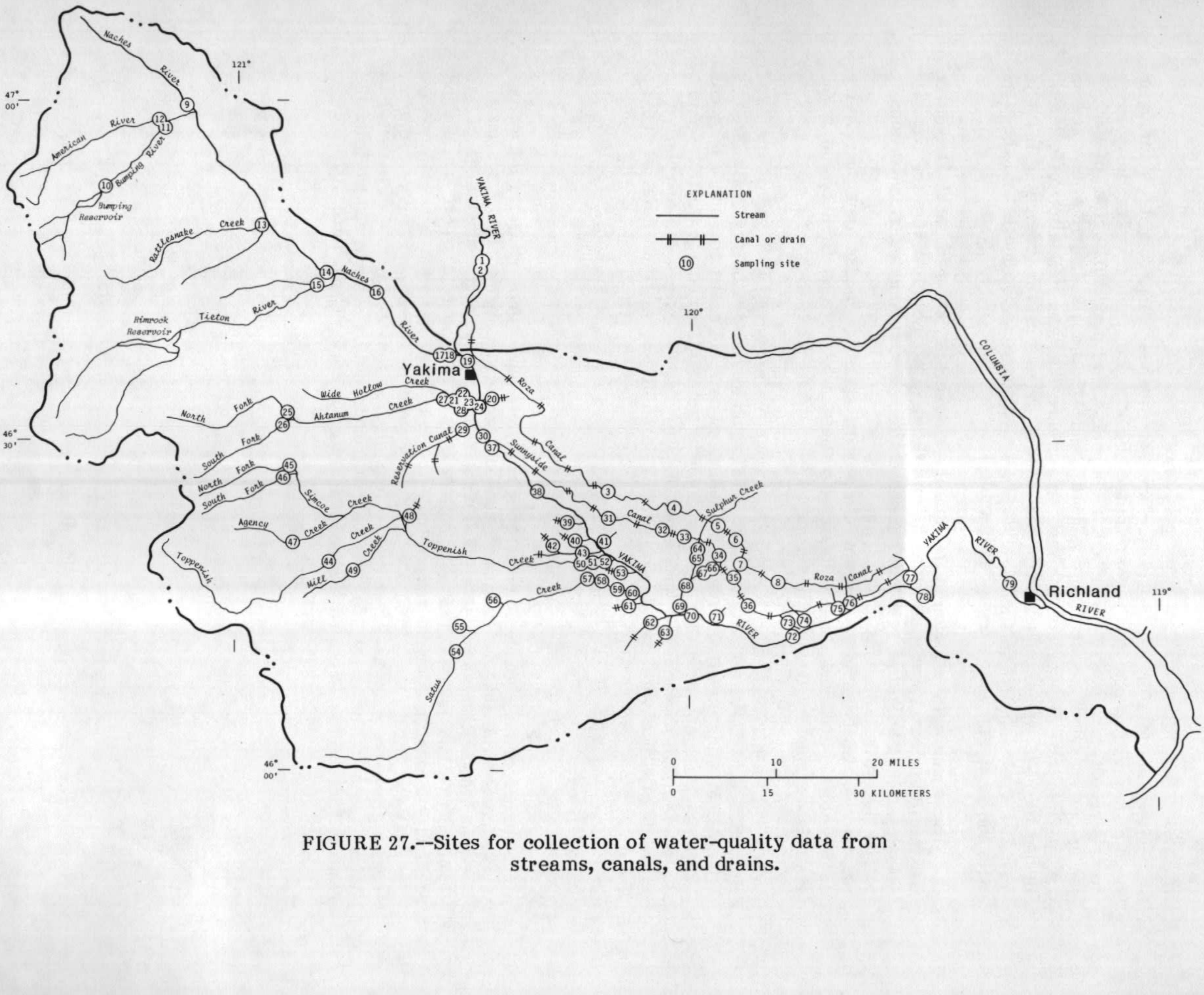


FIGURE 27.--Sites for collection of water-quality data from streams, canals, and drains.

Interpretations of water-quality changes throughout various parts of the basin have been given in previous reports (noted above and in table 1). For the purpose of this report, a summary of the minimum, mean, and maximum values of various water-quality data collected basinwide during the 1974 irrigation season (April-October)--the year of the most comprehensive data collection effort--and during the 1976 irrigation season in the Sulphur Creek basin is presented in table 13. The minimum and maximum values recorded for each parameter and the sites with the maximum values are given in table 14.

The changes in selected water-quality characteristics throughout the lower Yakima River basin were determined from the data collected at 36 sites (fig. 27) during the 1974 irrigation season. The properties selected include concentrations of nitrite plus nitrate, ammonia nitrogen, total phosphorus, dissolved orthophosphate phosphorus, and dissolved oxygen, along with specific conductance and water temperature. The downstream changes in these properties in the Yakima River mainstem are shown graphically in figure 28.

Water-quality data also were collected at the beginning and end of the 1974 irrigation season from streams, canals and drains in basins tributary to the Yakima River. Minimum, mean, and maximum values of data collected on a more frequent basis near the mouths of the tributaries—near points of discharge to the Yakima River—are shown graphically in figure 29. The data sites are shown relative to approximate discharge points along the Yakima River, in river miles above its mouth.

Suspended Sediment

Studies of suspended-sediment concentrations and yields in irrigation return flows during the 1975-76 irrigation seasons provided data from 10 sites on the Yakima Indian Reservation (Nelson, 1979b) and 21 sites in the remainder of the lowland (Nelson, 1979a). The data collected in 1976 (table 15) show that annual sediment discharge in drains ranged from 250 tons from the Wamba Drain (site 73, fig. 28) to 65,000 tons from the Sulphur Creek Wasteway (site 69). Sediment discharges in the Yakima River ranged from 89,000 tons at Union Gap (site 24) to 152,000 tons at Kiona (site 78). Discharges from tributary streams ranged from 400 tons in Wide Hollow Creek (site 23) to 10,000 tons in Spring Creek (site 75).

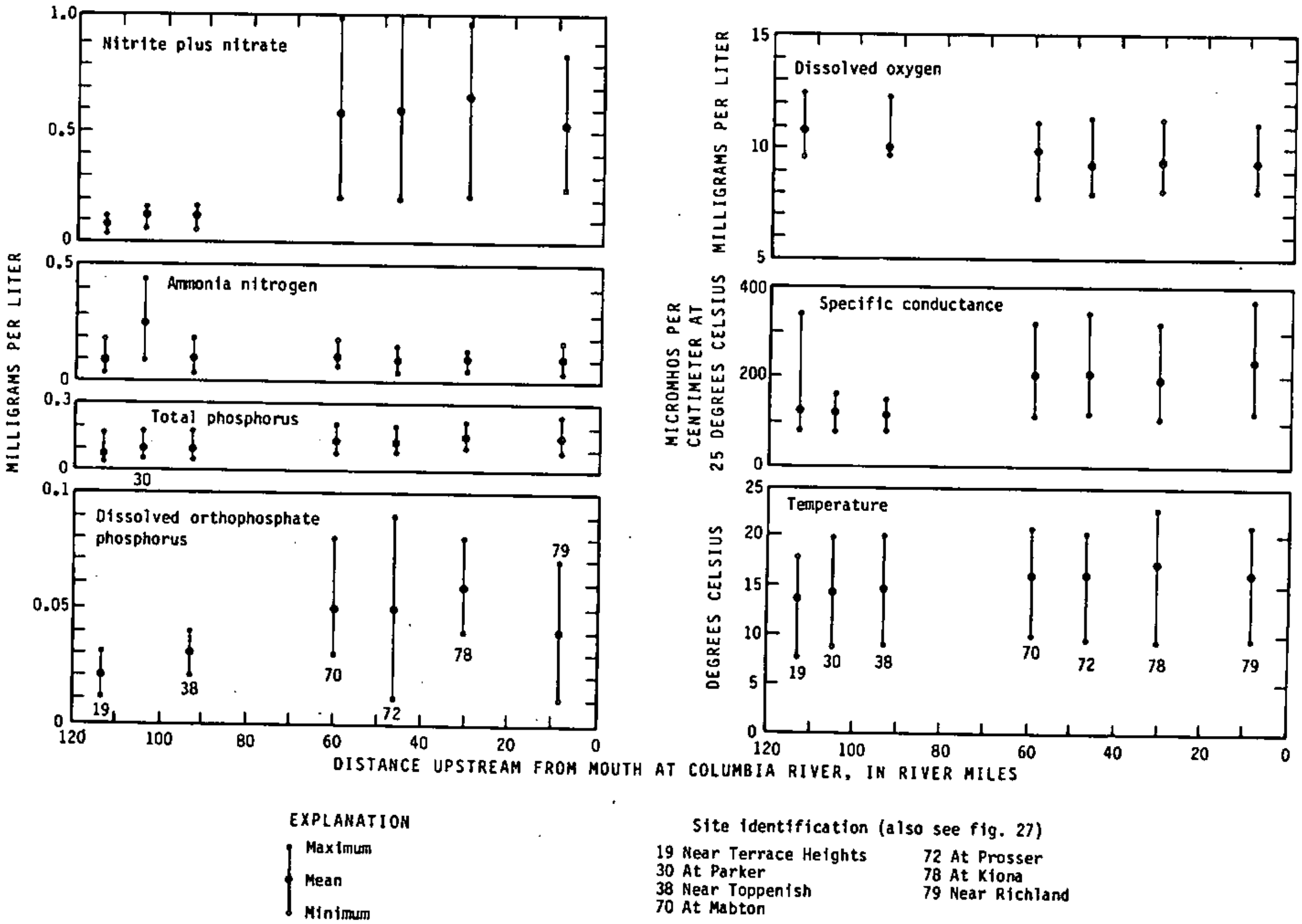


FIGURE 28.--Downstream changes in selected water-quality parameters, Yakima River.

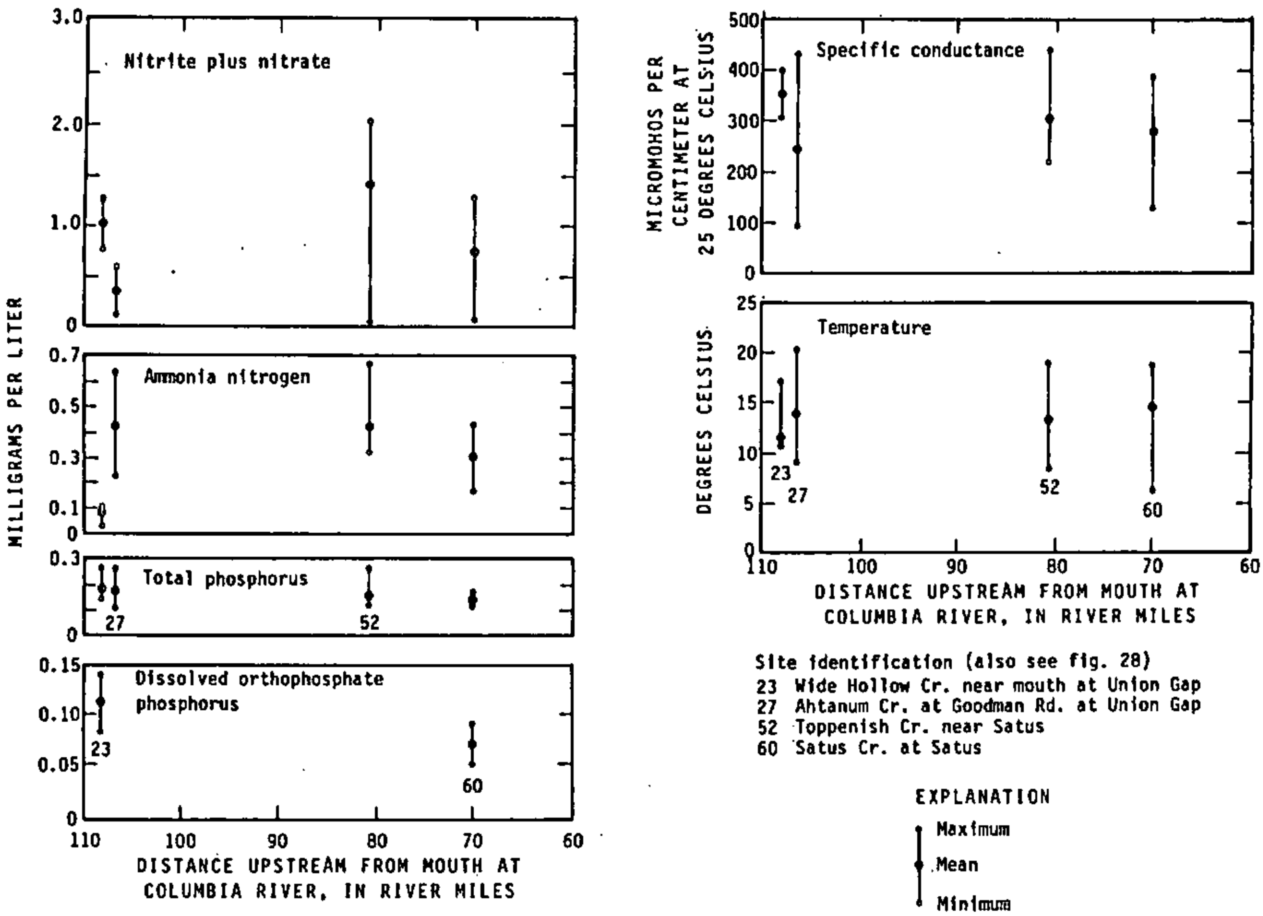


FIGURE 29.—Minimum, mean, and maximum values of selected water-quality parameters at sites near mouths of streams tributary to the Yakima River, 1974 irrigation season.

Pesticides

Data collected infrequently at only three sites indicated zero or low concentrations of most pesticides. The maximum concentrations of selected constituents (table 16) show that the water-quality criteria for maintenance of healthy aquatic life (table 21) were exceeded only in the concentration of DDT and lindane, at sites 64 (DID 18 Drain at Sunnyside) and 78 (Yakima River at Kiona).

Trace Elements

Sampling for concentrations of selected trace elements during the 1974-75 water years provided data from 14 sites (table 17, fig. 28). Water-quality criteria vary considerably among different species of aquatic life, however, and the reader is referred to the report by the U.S. Environmental Protection Agency (1977) for pertinent information.

Water-Quality Criteria

The water-quality data presented in tables 13, 14, 16, and 17 may be evaluated against criteria for drinking water supplies in table 18, for certain industrial uses in table 19, for irrigation in table 20,and for freshwater aquatic life in table 21.

Lake-Water Quality

Data collected for determining selected water-quality characteristics of nine lakes in the study area (fig. 30) are summarized in table 22. These data are from reports by Dion and others (1975a, 1976b) that resulted from a 1974 reconnaissance survey of lakes in Washington that evaluated existing conditions and provided a data base for studies of future changes in lake-water quality.

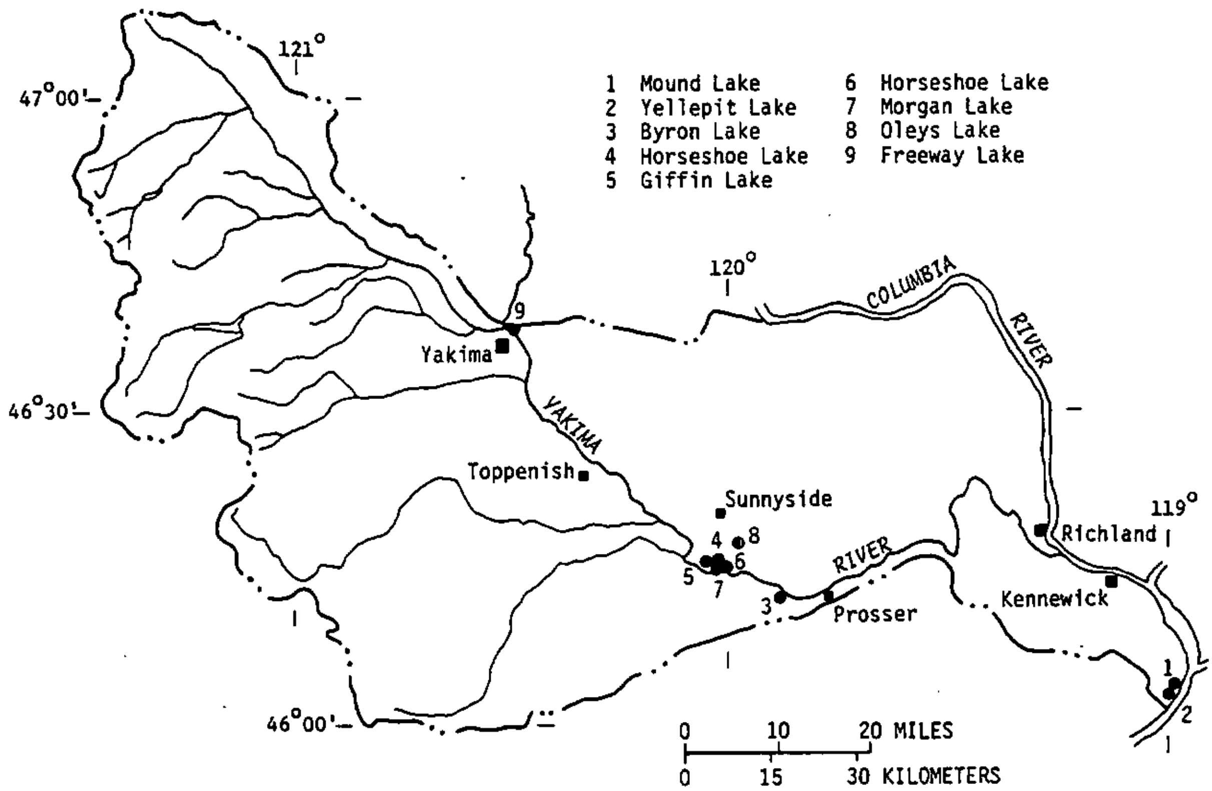


FIGURE 30.—Locations of lakes at which water-quality data were collected.

GROUND-WATER RESOURCES

Occurrence in Geologic Units

Ground water in the study area occurs principally in the (1) unconsolidated alluvial sand and gravel of Quaternary age, (2) partially consolidated sand, silt, and gravel, and consolidated sandstone, siltstone, and conglomerate of the Ellensburg Formation of middle and late Miocene age, and (3) basalt lava flows and associated sedimentary interbeds of the Columbia River Basalt Group of Miocene age. A fourth unit, composed mostly of andesitic lava flows of late Tertiary and early Quaternary age, may be an aquifer, but well data are too sparse to confirm the possibility.

The areal distribution of the geologic units in the study area is shown in figure 31, and examples of surface exposures of the Ellensburg Formation and basalt are shown in the photographs of figure 32. Included on the map are areas underlain by the poorly permeable and non-productive older bedrock and some younger volcanic rocks, in the Cascade Range in the western part of the area.

Alluvium

The alluvium of Quaternary age is composed of unconsolidated sedimentary material deposited by streams along their channels and flood plains. The predominant materials are sand, gravel, and cobbles, with minor admixtures of silt and some clay and marsh deposits. In the study area the deposits range in known thickness from a few feet to more than 150 ft. As shown in figure 31, the principal areas of occurrence are along the flood plains of (1) the Yakima River between Yakima and Union Gap, between Parker and Prosser, and in the West Richland-Richland area, (2) the lower Naches River between Naches and Yakima, and (3) the lower reaches of Ahtanum, Toppenish, and Satus Creeks.

The alluvium is generally permeable and contains ground water under unconfined (water-table) conditions, with the water table at or near the level of the adjacent stream. Shallow drilled or dug domestic and stock wells readily obtain water from layers of gravel and coarse sand in the alluvium. However, because few homes are situated directly on the alluvial flood plains, ground-water development from the alluvium is minimal. Also, the few wells drilled into these materials are commonly completed at greater depth, to tap the underlying coarser, partly consolidated sand and gravel of the Ellensburg Formation, or the deeper, more productive basalt aquifer. Pumping yields of most wells finished in sand and gravel units of the alluvium are 10 to 20 gal/min (gallons per minute), which is adequate for domestic and stock supplies.

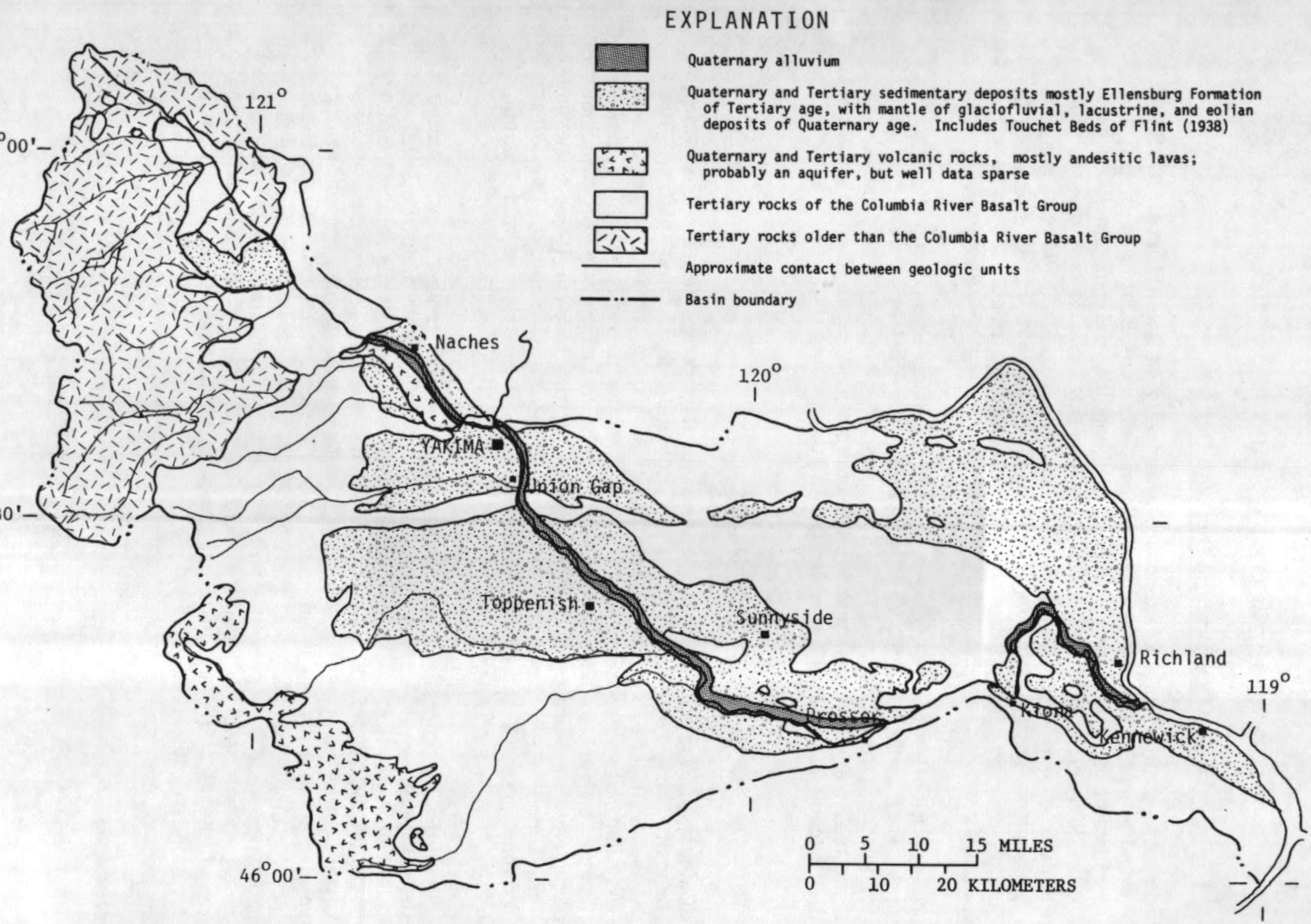
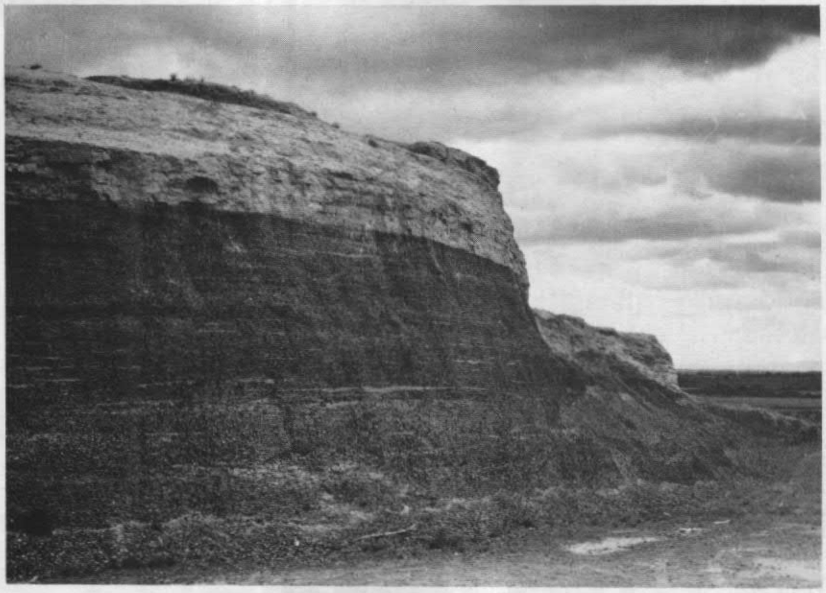
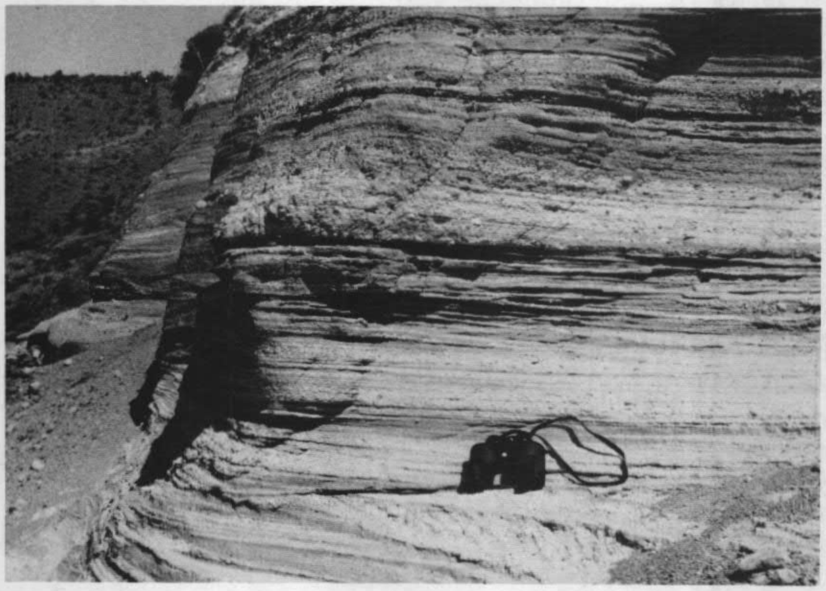


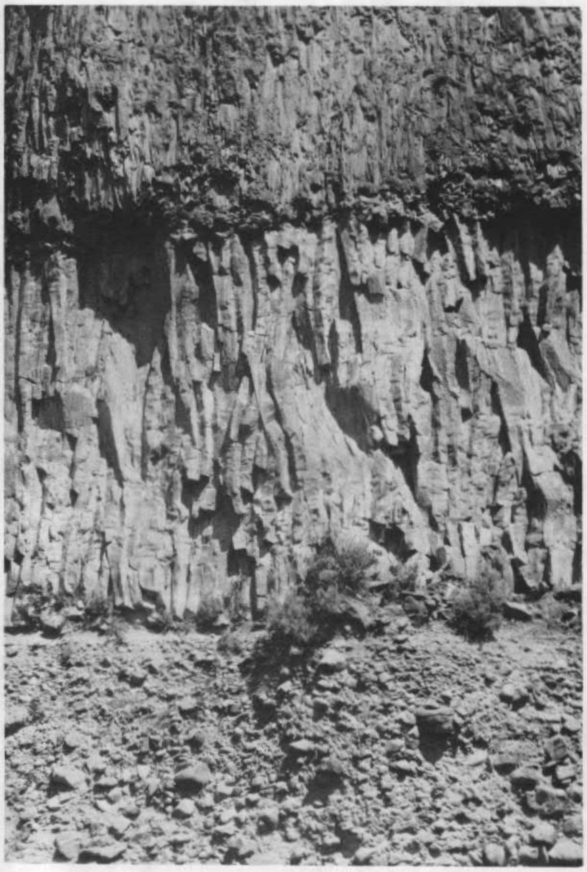
FIGURE 31.--Generalized geologic units.



Touchet Beds overlying Ellensburg Formation



Ellensburg Formation



Basalt of Columbia River
Basalt Group

FIGURE 32.--Exposures of principal geologic units in study area.

Ellensburg Formation

The Ellensburg Formation comprises partly-consolidated sand and gravel and consolidated sedimentary rocks, mostly sandstone and siltstone, with some conglomerate and claystone. Most of these rocks overlie the basalt flows, but some layers are interbedded with upper flows of the basalt. The Ellensburg Formation occurs at depths of 100 ft or more beneath the centers of the major lowland valleys and gradually rises to land surface at the valley margins. In basin centers the thickness of the formation ranges from a few feet to as much as 1,000 feet; well 11/19-15A1, owned by the city of Wapato, penetrates 975 ft of sedimentary materials, probably more than 800 ft being in the Ellensburg Formation. The top of the formation is not everywhere well defined; in some places it grades upward into similar deposits of alluvial sand and gravel.

The sand and gravel strata form the principal water-yielding materials in the Ellensburg Formation. In areas where these materials are within 50 ft of land surface--generally in the marginal parts of the synclinal valleys--the aquifer is under unconfined (water-table) conditions. In deeper zones beneath the central parts of the valleys and underlying finer-grained and more consolidated sand and silt units, the water occurs under confined conditions.

Yields of properly constructed wells tapping the more productive zones of the Ellensburg Formation are as much as 1,500 gal/min.

Columbia River Basalt Group

The basalt flows and associated sedimentary interbeds form the most productive aquifer system (herein referred to as the basalt aquifer) in the Yakima River basin. Ground water occurs principally in fracture and rubble zones (typically at the tops and bottoms of most flow units), in vesicular and scoriacous interflow zones, and in sand and gravel layers that occur between some flow units. Water-yielding zones range from a few feet to 50 ft or more in thickness and may extend laterally only short distances or several miles.

The basalt aquifer is the most heavily developed in the Toppenish Creek basin, where yields of basalt wells range from 50 to more than 2,200 gal/min or more; the larger yields generally come from several basalt units and (or) sedimentary interbeds within the sequence. Because the various valleys in the study area (Ahtanum-Moxee, Toppenish, Satus, and Mabton-Prosser) are structural basins formed in the basalt, ground water beneath the valley centers is generally under greater artesian pressure (potentiometric head) than beneath the valley sides.

Structural Control of Ground-Water Movement

The effects of geologic structures on the direction and rate of ground-water flow in the study area cannot be precisely determined from existing data. As shown in figure 33, several major east-west trending anticlines (upward folds) and synclines (downward folds) in the area have formed topographic subbasins. These may or may not have individual, nearly independent, ground-water systems, but existing ground-water data are not sufficiently refined to permit adequate interpretations of the geohydrologic relations among the individual topographic basins. However, interpretations by previous investigators in the study area, based primarily on water-level data from wells, provide general conclusions on the effects of these structures.

According to an early study of the geology and water resources of the lower Naches, Cowiche, Ahtanum, and Moxee Valleys (Smith, 1901), the occurrence of ground water under high artesian pressure in the lower Ahtanum-Moxee Valley is due largely to the basin's synclinal structure (fig. 33). The syncline occurs between the Yakima Ridge anticline on the north and the Ahtanum Ridge-Rattlesnake Ridge anticline on the south. The ground water there occurs in basalt fracture zones and interbedded sediments and is confined under pressure beneath less permeable strata of basalt or finer grained sediments such as clay or silt. A later study of the lower Ahtanum Valley by Foxworthy (1962) similarly interpreted the structural downwarp in the basalt as causing the artesian conditions in that area.

Studies of the water resources and geohydrology of the Yakima Indian Reservation by the U.S. Geological Survey indicate that ground-water movement is largely controlled by geologic structures. According to studies of the Toppenish Creek basin (U.S. Geological Survey, 1975) and Satus Creek basin (Mundorff, Mac Nish, and Cline, 1977), ground water in both shallow sedimentary aquifers and deeper basalt aquifers flows from the sides and heads of these structural subbasins toward their centers, and then toward the Yakima River.

According to a several-phase study of the Yakima River basin by the U.S. Army Corps of Engineers (1978d, plates 17 and 21), ground water in both the sedimentary aquifers (alluvium and Ellensburg Formation) and basalt aquifers flows generally toward the Yakima River from the adjacent valley sides (fig. 34). Ground water beneath the Ahtanum, Toppenish, and Satus Creek basins flows eastward to the river, and water beneath the Moxee Valley flows westward toward the river. Similarly, ground water beneath the lower Naches Valley flows toward the Naches River and southeasterly toward the Yakima River. Beneath the south slope of the Rattlesnake Hills (south limb of the Rattlesnake Ridge anticline of Newcomb, 1970), ground water moves southerly toward the Yakima River.

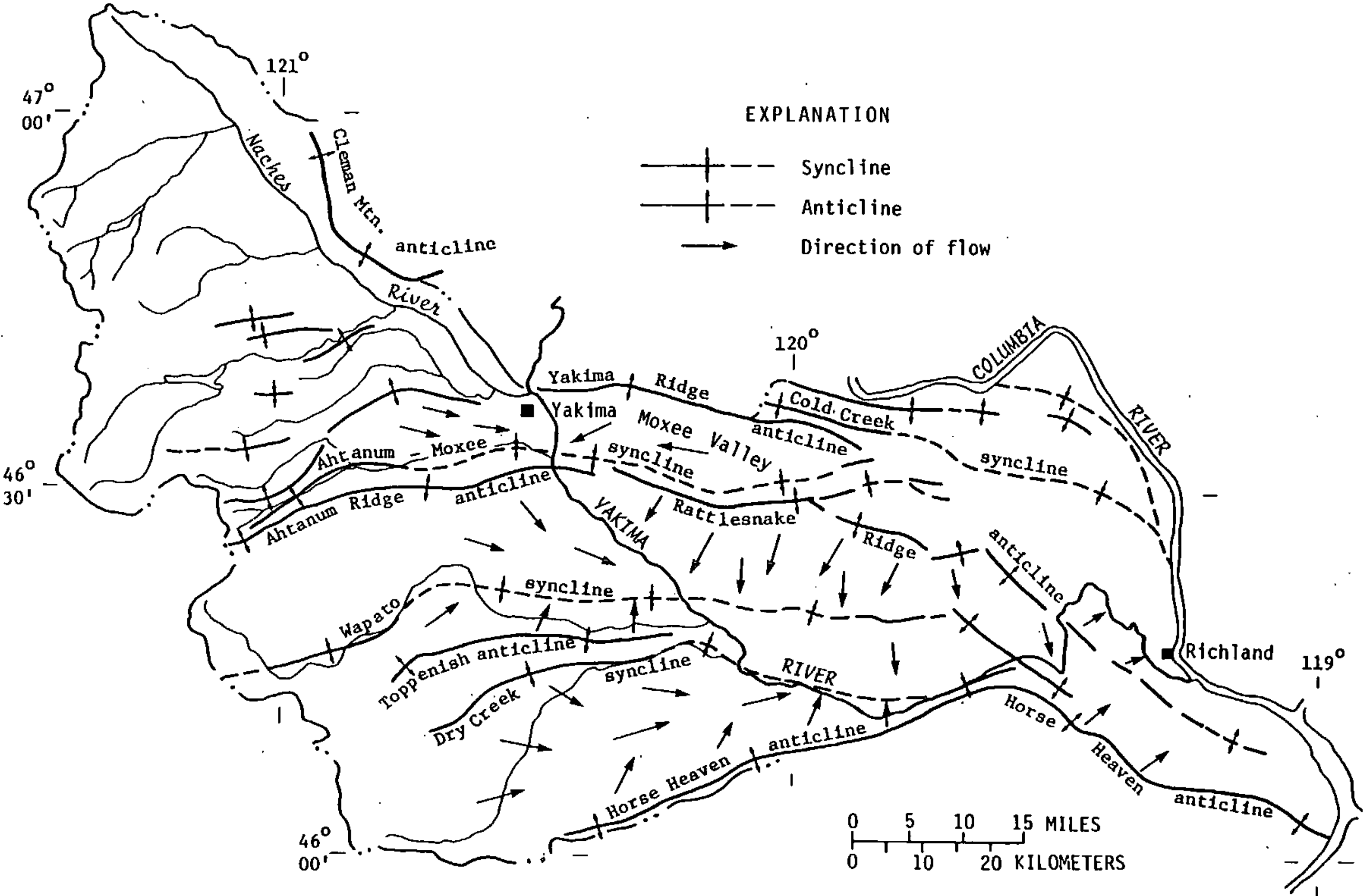


FIGURE 33.--Principal geologic structures and generalized directions of ground-water movement.

FIGURE 34.--Typical flowing artesian well in 1897.

Of particular interest in the study area are aquifers containing water under high artesian pressure; in some areas wells have large artesian flows. A notable characteristic of the water is the rather high temperatures (66° to 80° F). The two principal areas of flowing wells are the Moxee Valley near the town of Moxee, and the Cold Creek valley in northwestern Benton County. The areas are situated in valleys with synclinal structures in the underlying basalt. The Moxee Valley is formed between the Yakima Ridge anticline on the north and the Rattlesnake Hills anticline on the south, and the Cold Creek valley is formed between the Umtanum Ridge anticline on the north and Yakima Ridge anticline on the south. The photograph in figure 34, taken during the study of the Moxee Valley by Smith (1901) indicates the magnitude of flows of some of the more than 25 artesian wells in the area at that time. According to a statewide inventory of flowing artesian wells (Molenaar, 1961), several wells in and near the town of Moxee had reported flows ranging from 500 to 875 gal/min.

Four wells in the Cold Creek valley were drilled to depths ranging from 606 to 1,110 ft, and had artesian flows of 800 to 2,000 gal/min when recorded during the period 1942-55. The wells now are owned by the U.S. Department of Energy.

Many wells drilled to depths ranging from 50 to more than 1,200 ft in the Ahtanum Valley have produced artesian flows ranging from 20 to more than 1,500 gal/min. In the Toppenish Valley an oil test well (11/17-24D2), drilled in basalt to 2,760 ft, had a reported flow of 1,200 gal/min in 1957; the water temperature was 72° Fahrenheit.

A summary of pertinent data from artesian wells in the study area having recorded flows of 200 gal/min or more, or potentiometric heads of 5 ft or more above land surface, is presented in table 23.

Seasonal and Long-Term Water-Level Changes

Water levels in wells in eastern Washington normally are high during the late winter and early spring, as ground-water bodies are recharged by seasonal precipitation. The levels then decline during the summer and early fall, as precipitation and recharge decrease and water is withdrawn from wells for irrigation and other uses. Under natural conditions the water levels generally return each spring to their previous levels, with only annual variations in precipitation modifying the general pattern of similar high and low water levels from one year to the next.

Long-term and continual declines in water levels are generally due to long-term decreases in precipitation or, more commonly, to long-term withdrawals from wells at rates exceeding the rate of recharge. Water-level measurements have been made several times a year for many years at 11 wells in the study area. The highest and lowest water levels in these wells during the period 1965-79 are given in table 24. A graphical representation of seasonal and long-term water-level changes in 5 of the 11 water-level observation wells is shown in figure 35.

The hydrographs in figure 35 show that three of the five observation wells are used for irrigation supply and have had long-term, nearly continuous declines in water level from year to year; the municipal- and domestic-supply wells have had more nearly stable water levels over the years.

Ground-Water Quality

Chemical and physical analyses of ground-water samples from the study area (fig. 36) were made at widely separated times. During a statewide survey by Van Denburgh and Santos (1965), water-quality data covering the period 1939-61 in the study area were reported from 14 wells in Yakima County and 28 wells and 1 spring in Benton County. Copies of pertinent pages of the appendix tabulation in that report are presented in table 25. Subsequent chemical analyses were made of water from 71 wells, all in Benton County, during the period of April 1976-April 1977. The water was examined for many constituents and characteristics; these data are presented in table 26.

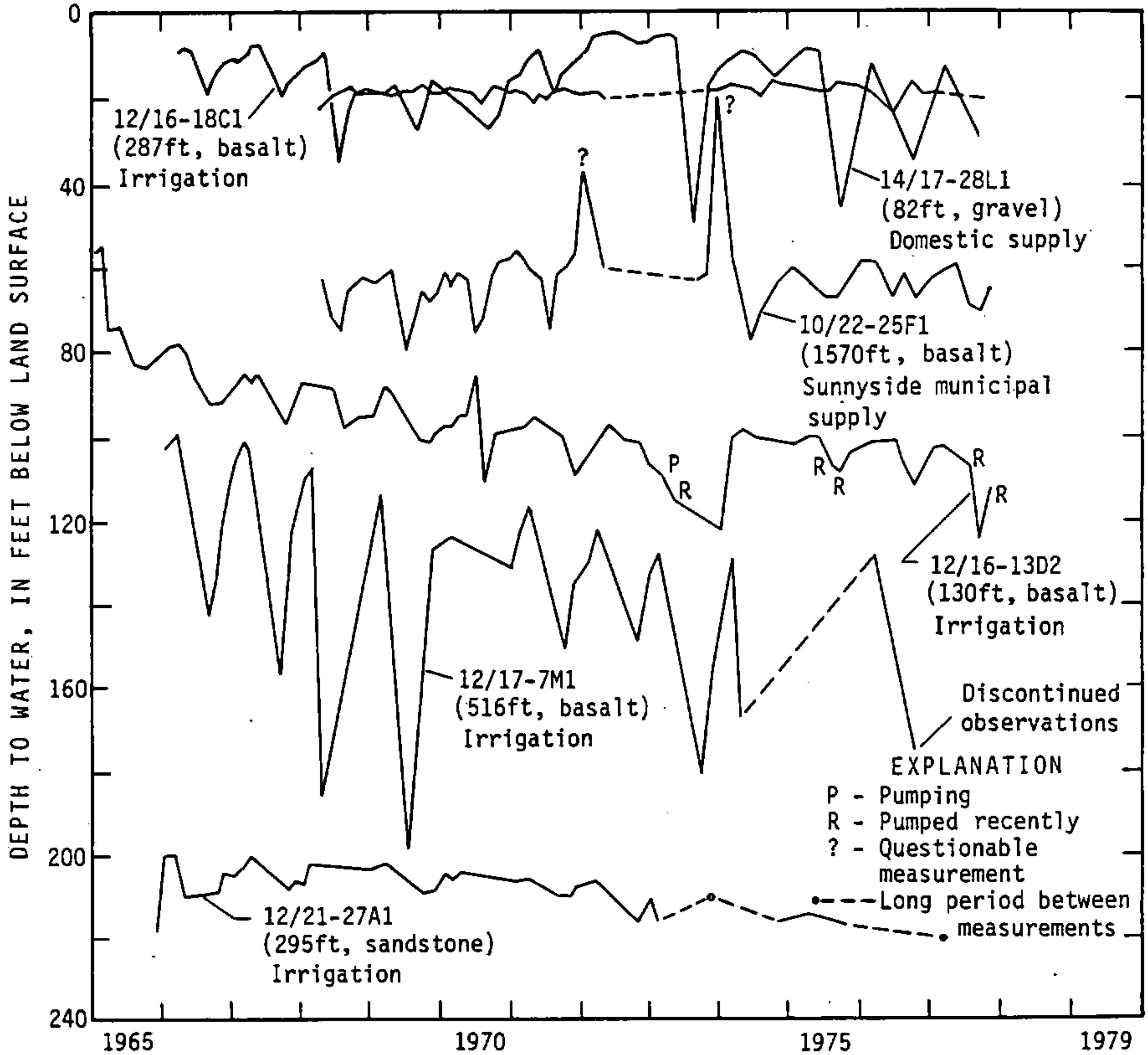


FIGURE 35.—Water-level fluctuations in selected wells, 1965-79.

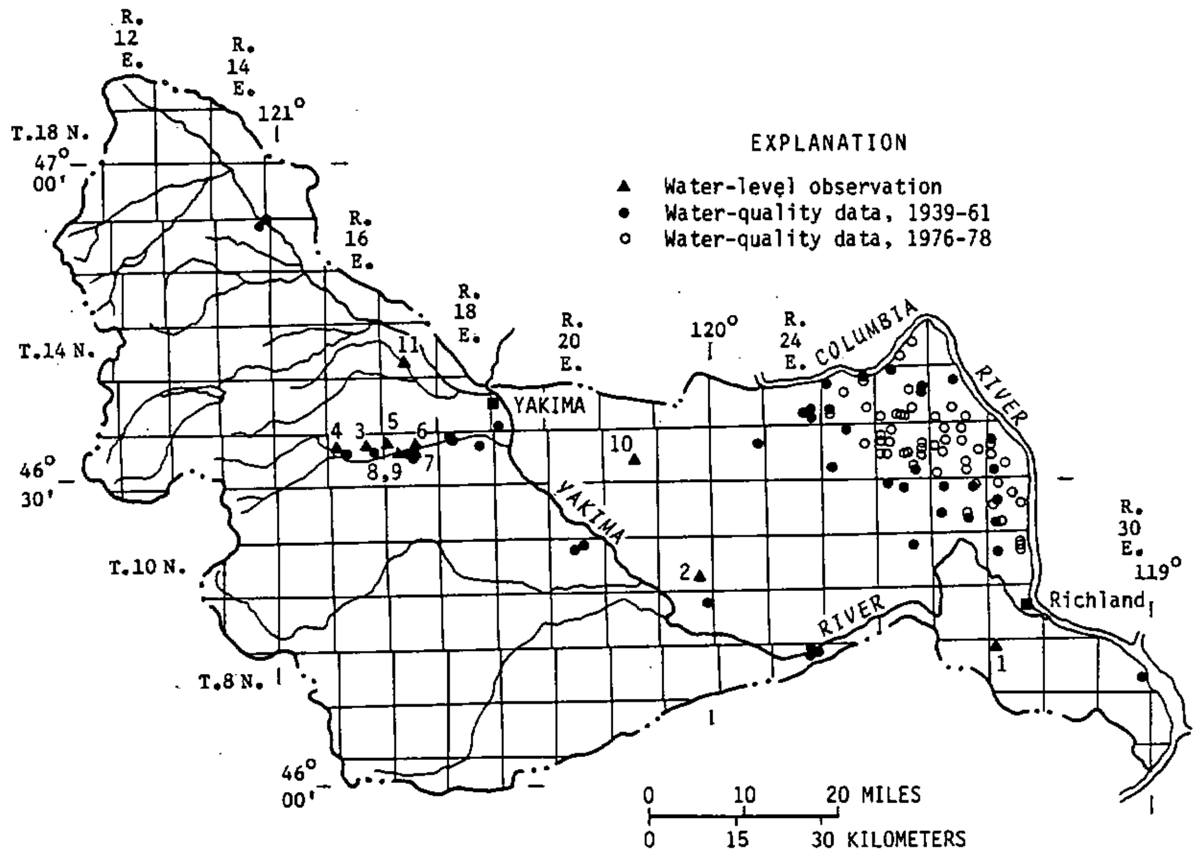


FIGURE 36.—Locations of wells providing water-level observations and water-quality data.

Areal Development of Ground Water

Data Available

Well records compiled over many years are maintained in files of the Washington Department of Ecology (DOE) and the U.S. Geological Survey. The records come from drillers' logs submitted to DOE as required by law for permits for ground-water withdrawals—mostly for irrigation, public-supply, and industrial-supply wells—or were obtained through personal contacts with drillers and well owners during local studies of ground-water availability. Domestic-supply wells far outnumber other wells in the area, but until recent years they have not been recorded to the same extent as high-capacity wells requiring water rights. Individual well records vary in the completeness of data obtained, however, and only sparse data are presented for some wells. Computerized records of more than 3,800 wells in the study area were analyzed for pertinent information. A condensed listing of data from 484 of those wells (table 32) was selected as providing a representative sampling of ground-water conditions throughout the study area.

The areal distribution of recorded wells in the study area is shown, according to townships, in figure 37. The summary data on well depths, pumping yields, use, and number of flowing wells are presented in table 27, according to the nine subareas outlined in figure 38 and briefly described below.

Naches Subarea

The subarea includes the Naches and Tieton River basins to the confluence of Naches River and Cowiche Creek, about 3 mi upstream from the Naches-Yakima River confluence. Most of the basin is in mountainous terrain, and the principal ground-water development is in the lowland along the Naches River between the Tieton River confluence with Cowiche Creek. The principal center of population is the town of Naches.

Much of the lowland is irrigated by canal diversions from the Naches River and only a few wells are used for irrigation. Most wells are used for household supplies and a few are used for public supplies, many of these latter serving U.S. Forest Service campgrounds in the mountainous area. Nearly all wells in the lowland are less than 500 ft deep and yield less than 500 gal/min.

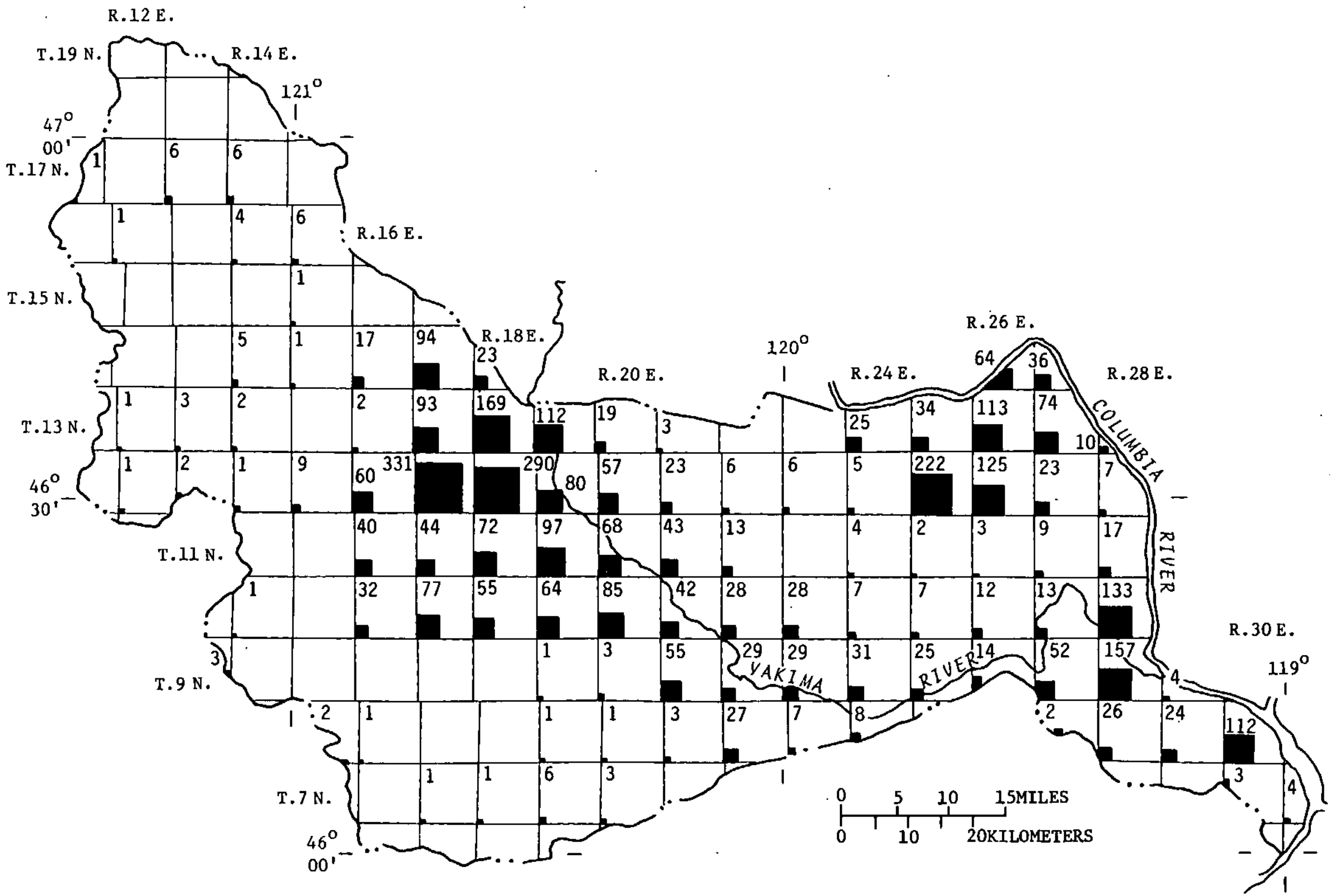


FIGURE 37.—Numbers of recorded wells by township.

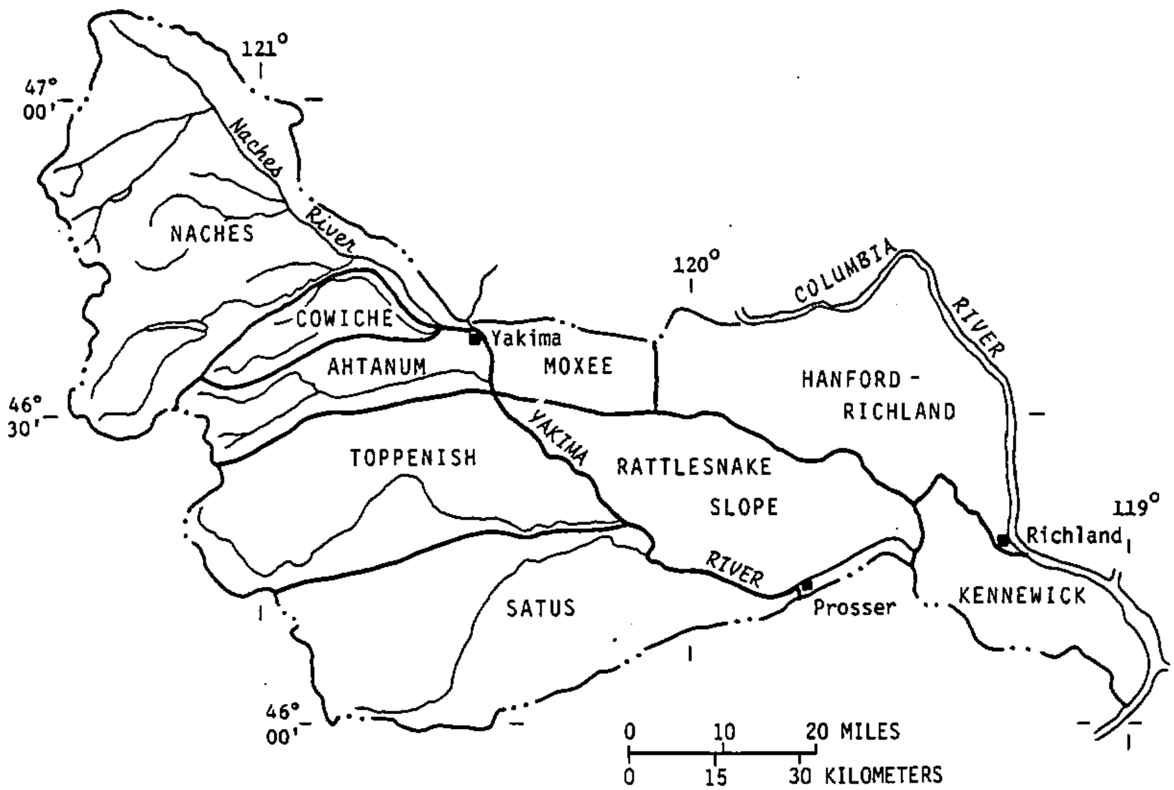


FIGURE 38.—Subareas of ground-water development.

Cowiche Subarea

The subarea covers the drainage basins of the North and South Forks Cowiche Creek, and nearly all wells are situated in the agriculturally developed lower parts of the two basins. This area, a large terrace formed by an andesitic lava flow of Quaternary age, is irrigated mostly by canal diversion from the Tieton River. Of 113 wells for which water-use information is recorded, nearly a third are used for irrigation and about 60 percent are for household supplies. More than half the wells are in the depth range of 100 to 500 feet and yield less than 100 gal/min.

Ahtanum Subarea

The subarea includes the drainage basins of the North and South Forks Ahtanum Creek and Wide Hollow Creek and the remaining lowland area west of the Yakima River, between Ahtanum Ridge on the south and the eastern end of Cleman Mountain on the north. Most agricultural development is in the lowland below the confluence of the North and South Forks Ahtanum Creek, with most irrigation supplies being diverted from the Tieton Canal and some from smaller canals diverting directly from Ahtanum Creek. Of 745 wells for which water-use information is available, about 70 percent are used for household supplies and 20 percent are for irrigation. The subarea has 12 flowing artesian wells.

Moxee Subarea

The subarea is bounded by the Yakima River on the west, Yakima Ridge on the north, Rattlesnake Hills on the south, and the Moxee Valley drainage divide on the east. The agriculturally developed lowland in the western part of the subarea is irrigated principally by several canals diverting from the Yakima River, but wells provide for irrigation of some areas, mostly upslope from the Roza Canal. Of 158 wells for which water-use information is recorded, about 42 percent are used for irrigation and about 53 percent are for household supplies. The subarea has the largest number of flowing artesian wells (27) of any of the subareas.

Toppenish Subarea

The subarea includes the drainage basins of Toppenish, Agency, and Simcoe Creeks and the south slope of Ahtanum Ridge, all bounded on the east by the Yakima River. The area is entirely within the Yakima Indian Reservation and the lowland is irrigated mostly by water from the Reservation Canal (Wapato Canal). Of 538 wells for which water-use information is recorded, only 18 percent are used for irrigation.

Data from 646 wells in the subarea show depths as great as 2,524 ft for wells tapping the underlying basalt aquifer and yields as much as 5,000 gal/min.

Satus Subarea

The subarea is mostly in the Yakima Indian Reservation and includes the drainage basins of Satus, Logy, Dry, and Mule Dry Creeks and other areas bounded by Toppenish Ridge on the north, Horse Heaven Hills on the south, Klickitat River basin on the west, and the Yakima River on the northeast. The agriculturally developed part of the subarea is rather small and limited mostly to the irrigated areas below the Satus Pump Canal, which diverts from Toppenish Creek on the north.

Of 94 wells for which water-use information is recorded, most are used for household supplies and only about 20 percent are for irrigation.

Rattlesnake Slope Subarea

The subarea extends from the crest of the Rattlesnake Hills on the north to the Yakima River on the south, between Union Gap and Prosser, and includes a small area on the north slope of Horse Heaven Hills between Prosser and Kiona. The southern half of the slope below the Roza and Sunnyside Canals is irrigated from the canals, but some irrigation by ground water occurs above the canals. Of 261 wells for which water-use information is recorded, more than half are used for household supplies and about a third are for irrigation.

Hanford-Richland Subarea

The subarea covers the broad, nearly flat area between the Columbia River on the north and east, Rattlesnake Hills and Yakima River on the south, and the heads of the Cold and Dry Creek basins on the west. The city of Richland, at the confluence of the Yakima and Columbia Rivers, is the principal area of ground-water development, along with the U.S. Department of Energy facilities in the Hanford area.

As shown in figure 37, more than 700 of the 1,047 wells in the subarea are in the Department of Energy facility; nearly all were drilled for examining geologic and geohydrologic conditions underlying the area, but the data provided from these wells are sparse. The major source of irrigation is the Richland Canal, which supplies water to farms along the Yakima River, and only 64 wells are reportedly used for irrigation—mostly in the Richland area (sprinkling of lawns and gardens). Several wells are also used for irrigation near the Columbia River in the northernmost part of the subarea and in the Cold Creek area.

Kennewick Subarea

The subarea extends between the crest of the Horse Heaven Hills on the south and the Yakima and Columbia Rivers on the west, north, and east, between Kiona and Wallula Gap. The city of Kennewick is the principal area of business and residential development, but a large area of agricultural land on the slopes above the town is irrigated from the Kennewick Canal. Of 241 wells for which water-use data are recorded, about 62 percent are used for household supplies and 28 percent are for irrigation.

WATER USE

Information on water use in the study area includes that provided in (1) U.S. Bureau of Reclamation tabulations, of monthly and annual irrigation-canal diversions (table 31) and power diversions during the period 1960-77 (table 30) and (2) the report by Dion and Lum (1977), which summarized municipal, industrial, and irrigation water use statewide during 1975. Modifications of the latter data were made to adjust for slight variations between the quantities calculated for the WRIA's and county areas covered in that study and those covered in the present study.

The data obtained from the foregoing sources are summarized below for the calculated water use during 1975, the year for which most data are available.

Purpose	Quantity of water used (thousands of acre-feet)	
	Ground water	Surface water
Municipal supply	16.9	24.4
Industrial supply	26.9	405
Irrigation	10.4	2,300
Totals	54.2	2,730

Total water use for individual household supplies, virtually all from ground-water sources, was calculated on the basis of 100 gal/day per person, for an estimated rural (non-municipally supplied) population of about 74,300 people, and found to be about 8.3 thousand acre-ft per year. Total water use based on the foregoing calculations is about 62.5 thousand acre-ft from ground-water sources and 2,730 acre-ft from surface-water sources.

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SUPPLEMENTAL DATA TABLES

TABLE 12.--Types and periods of record of water-quality analyses in study area

USGS No. in fig. 27	Station No.	Station name (with some abbreviations)	River mile upstream from main stream junction[a]	1960	1961	1962	1963
1	12484500	Yakima River at Umtanum		----	----	----	----
2	12484900	Yakima River at Roza Dam	127.9	----	----	----	----
3	12485005	Roza Canal at Beam Rd nr Zillah		----	----	----	----
4	12485010	Roza Canal at Scoon Rd nr Sunnyside		----	----	----	----
5	12485012	Roza Canal below Sulphur Cr Wasteway nr Sunnyside		----	----	----	----
6	12485014	Roza Canal at Black Canyon Cr nr Sunnyside		----	----	----	----
7	12485016	Roza Canal at Factory Rd nr Sunnyside		----	----	----	----
8	12485018	Roza Canal at Wilgus Rd nr Grandview		----	----	----	----
9	12487200	Middle Fork Naches R nr Cliffdell		----	----	----	C
10	12488000	Bumping River nr Nile		----	----	----	----
11	12488100	Bumping River at American River		----	----	----	C
12	12488500	American River nr Nile		----	----	----	C
13	12489300	Rattlesnake Creek nr Nile		----	----	----	C
14	12489500	Naches River nr Naches		----	----	----	C
15	12492500	Tieton River at Oak Cr Game Range nr Naches		----	----	----	C
16	12494400	Naches River at Naches		C	----	----	----
17	12498700	Naches River nr Yakima			C	C	C
18	12499000	Naches River at Yakima		----	----	----	----
19	12500010	Yakima River nr Terrace Heights	113.2	----	----	----	----
20	12500420	Moxee Drain at Birchfield Rd nr Union Gap		----	----	----	----
21	12500439	Wide Hollow Cr at Goodman Rd at Union Gap	2.8	----	----	----	----
22	12500440	Wide Hollow Creek at Union Gap	1.5	----	----	----	----
23	12500445	Wide Hollow Cr nr mouth at Union Gap	.6	----	----	----	----
24	12500450	Yakima River above Ahtanum Cr at Union Gap		----	----	----	----
25	12500600	North Fork Ahtanum Creek at Tampico	1.3	----	----	----	----
26	12501600	South Fork Ahtanum Creek at Tampica	.7	----	----	----	----
27	12502490	Ahtanum Creek at Goodman Rd at Union Gap	2.2	----	----	----	----
28	12502500	Ahtanum Creek at Union Gap		----	----	----	----
29	12503500	Reservation Canal near Parker	.3	----	----	----	----
30	12503950	Yakima River at Parker	104.6	----	----	----	----
31	12504505	Sunnyside Canal at Beam Rd nr Granger		----	----	----	----
32	12504510	Sunnyside Canal at Maple Grove Rd nr Sunnyside		----	----	----	----
33	12504512	Sunnyside Canal below Sulphur Cr Wasteway nr Sunnyside		----	----	----	----
34	12504514	Sunnyside Canal at Edison Rd nr Sunnyside		----	----	----	----
35	12504516	Sunnyside Canal at Bethnay Rd nr Grandview		----	----	----	----
36	12504518	Sunnyside Canal at Grandview		----	----	----	----
37	12505000	Yakima River nr Parker		----	CT	CT	CT
				----	----	----	----
38	12505300	Yakima River nr Toppenish (1.6 mi N of Toppenish)		CT	----	----	----

Types of data: C, general chemical and physical;
B, biological (plankton, periphyton, etc.);
T, daily temperature, or often;
Cd, daily specific conductance;
Tr, trace elements;
P, pesticides;
Mb, microbiological (coliform, etc.);
S, suspended sediment.

1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
---	---	---	---	---	TS	TS	TS	---	---	CMb	CMb	---	---
---	---	CBCdT	CCdT	CCdTMb	CMbCdT	CMbCdT	---	---	---	---	---	---	---
---	---	---	---	---	---	---	CMb	CMb	CMb	CMb	CdTS	---	---
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---	---	---	---	---	---	---	---	---	---	---	TS	CdTS	
CTrMb	CTrMb	---	---	---	---	---	---	---	---	---	---	---	---
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CTrMb	---	---	---	T	TS	TS	TS	---	---	---	---	---	---
CTrMb	---	---	---	---	---	---	---	---	---	---	---	---	---
CTrMb	CTrMb	CTrMb	---	---	---	---	---	---	---	---	---	---	---
CTrMb	CTrMb	CTrMb	---	---	---	---	---	---	---	---	---	---	---
---	---	---	---	CMb	TS	TS	TS	---	---	---	CMb	---	---
CTrMb	CTrMb	CTrMb	CTrMb	CMb	CTr	CMb	---	---	---	---	---	---	---
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---	---	---	---	---	---	---	---	---	---	CMb	CMbTS	CdTS	---
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---	---	---	---	---	---	---	---	---	---	CMbTr	---	---	
---	---	---	---	---	---	---	---	---	---	CMb	CMbTS	CdTS	---
---	---	---	---	---	---	---	---	---	---	CMbTr	---	---	---
---	---	---	---	---	---	---	CMb	CMb	CMb	CMb	CMbTr	CMb	CMb
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CTrCd TMb	CTrCd T	CMbCd T	CCdT	CMbCd T	CMbCd T	CMbCd T	---	---	CMbTr	CMb	CMb	CMb	---
							---	---	---	---	---	---	---
---	---	---	---	---	---	---	CMb	---	CMb	CMb	CMb	---	CMb (Sept)

TABLE 12.--Types and periods of record of water-quality analyses in study area--Continued

USGS No. in fig. 27	Station No.	Station name (with some abbreviations)	River mile upstream from main stream junction[a]	1960	1961	1962	1963
39	12505350	East Toppenish Drain at Wilson Rd nr Toppenish----------		------	------	------	------
40	12505410	Sub 35 Drain at Parton Rd nr Granger-------------------		------	------	------	------
41	12505450	Granger Drain at Granger-------------------------------		------	------	------	------
42	12505480	Wanity Slough at Rocky Ford Rd nr Toppenish------------		------	------	------	------
43	12505500	Marion Drain nr Granger--------------------------------		------	------	------	------
44	12506000	Toppenish Cr nr Ft Simcoe------------------------------		------	------	------	------
45	12506300	North Fork Simcoe Creek nr Ft Simcoe-------------------		------	------	------	------
46	12506330	South Fork Simcoe Creek nr Ft Simcoe-------------------		------	------	------	------
47	12506600	Agency Creek nr Ft Simcoe------------------------------		------	------	------	------
48	12507090	Mud Lake Drain nr Harrah-------------------------------	26.5	------	------	------	------
49	12507100	Mill Cr at Canyon Rd nr White Swan---------------------		------	------	------	------
50	12507500	Toppenish Cr at Alfalfa--------------------------------	3.4	------	------	------	------
51	12507508	Toppenish Cr at Indian Church Rd nr Granger------------	2.4	------	------	------	------
52	12507510	Toppenish Creek nr Satus-------------------------------		------	------	------	------
53	12507560	Coulee Drain at North Satus Rd nr Satus----------------		------	------	------	------
54	12507940	Satus Creek above Logy Creek nr Toppenish--------------	.16	------	------	------	------
55	12507950	Logy Creek nr Toppenish--------------------------------	.5	------	------	------	------
56	12508480	Dry Creek nr Toppenish---------------------------------	89.0	------	------	------	------
57	12508590	Satus Creek at Plank Rd nr Satus-----------------------	77.0	------	------	------	------
58	12508600	Satus Creek nr Satus-----------------------------------		------	------	------	------
59	12508610	Satus Creek at North Satus Rd at Satus-----------------		------	------	------	------
60	12508621	Satus Creek at Satus-----------------------------------	1.5	------	------	------	------
61	12508630	South Drain nr Satus-----------------------------------	1.0+	------	------	------	------
62	12508660	Satus Drain 302 at Hwy 22 nr Mabton--------------------	1.0±	------	------	------	------
63	12508690	Satus Drain 303 at Looney Rd nr Mabton-----------------	1.0±	------	------	------	------
64	12508790	DID 18 Drain at Sunnyside------------------------------		------	------	------	------
65	12508810	Washout Drain at Sunnyside-----------------------------		------	------	------	------
66	12508820	Black Cayon Creek at Waneta Rd nr Sunnyside------------		------	------	------	------
67	12508830	DID 9 Drain nr Sunnyside-------------------------------		------	------	------	------
68	12508840	DID 3 Drain nr Sunnyside-------------------------------		------	------	------	------
69	12508850	Sulphur Cr Wasteway nr Sunnyside (McGee Rd)------------	61.0	------	------	------	------
70	12508990	Yakima R at Mabton-------------------------------------	59.8	------	------	------	------
71	12508997	Grandview Drain at Chase Rd nr Sunnyside---------------		------	------	------	------
72	12509489	Yakima River at Prosser--------------------------------	47.4	------	------	------	------
73	12509492	Wamba Drain at Prosser---------------------------------	46+	------	------	------	------
74	12509496	Shelby Drain at Shelby Rd at Prosser-------------------	45±	------	------	------	------
75	12509700	Spring Creek at Hess Rd nr Prosser---------------------	41.8	------	------	------	------
76	12509820	Snipes Creek nr Prosser--------------------------------	41.8	------	------	------	------
77	12510200	Corral Canyon Creek nr Benton City---------------------	33.5	------	------	------	------
78	12510500	Yakima River at Kiona----------------------------------	29.9	CT	CT	CT	CT
				------	------	------	------
79	12511800	Yakima River at Van Griesan Bridge nr Richland---------	8.4	------	------	------	------

[a]River miles are estimated where not given in previous publications, which include U.S. Geological Survey annual streamflow summaries, and Columbia Basin Interagency Committee (1964).

Types of data: C, general chemical and physical; B, biological (plankton, periphyton, etc.); T, daily temperature, or often; Cd, daily specific conductance; Tr, trace elements; P, pesticides; Mb, microbiological (coliform, etc.); S, suspended sediment.

1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
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CTrCd TMb	CTrCdT	CMbCdT	CCdT	CMbCd TP	CMbCd CdTP	CMbP CdT	CMbT PCd	CMbP CdT	CMbT TrPCd	CMbTr PCdT	CMbTrB CdTS	CMbTr SPCdT	CMbTr PCdT
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TABLE 13.--Minimum, mean, and maximum values of selected water-quality characteristics at stream and canal sites in study area, 1974 irrigation season

[Data sources: CE, U.S. Army Corps of Engineers (1978); GS, U.S. Geological Survey (1975, 1976); F, Fretwell (1979); B, P.R. Boucher, M. O. Fretwell (written commun., 1979)]

Site No. in fig. 19	USGS No. [a]	Station name (abbreviated)	Source of data	Total nitrite plus nitrate (N) (mg/L)			Ammonia nitrogen (N) (mg/L)			Total phosphorus (P) (mg/L)			Dissolved orthophosphate phosphorus (P) (mg/L)		
				Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
1	484500	Yakima R at Umtanum	CE	7.9	0.09	0.14	0	0.02	0.04	0.02	0.02	0.09	0.01	0.02	0.03
19	500010	Yakima R nr Terrace Heights	GS	.04	.08	.12	.04	.09	.19	.02	.07	.17	.01	.02	.03
21	500439	Wide Hollow Cr at Goodman Rd at Union Gap	GS	.62	.97	1.50	.03	.10	.30	.11	.16	.22	.05	.11	.15
25	500600	N.F. Ahtanum Cr at Tampico	F	.01	(b)	.05	.09	(b)	.32	.05	(b)	.09	--	--	--
26	501600	S.F. Ahtanum Cr at Tampico	F	.01	(b)	.02	.11	(b)	.15	.06	(b)	.06	--	--	--
29	503500	Reservation (New, Main) Canal nr Parker	F	.09	.15	.35	.11	.52	2.20	.05	.09	.15	--	--	--
37	505000	Yakima R nr Parker	CE	--	--	--	.05	.09	.15	.06	.10	.14	.02	.03	.07
38	505300	Yakima R nr Toppenish	F	.06	.12	.16	.03	.10	.19	.05	.09	.18	.02	.03	.04
42	505480	Wanity Slough at Rocky Ford Rd nr Toppenish	F	.32	1.3	1.8	.25	.39	.53	.09	.10	.12	--	--	--
43	505500	Marion Drain nr Granger	F	.97	1.6	2.30	.31	.39	.46	.12	.15	.20	.07	.09	.11
44	506000	Toppenish Cr nr Ft. Simcoe	F	.01	(b)	.04	.11	(b)	.40	.06	(b)	.17	--	--	--
45	506300	N.F. Simcoe Cr nr Ft. Simcoe	F	.01	(b)	.05	.16	(b)	.31	.09	(b)	.09	--	--	--
46	506330	S.F. Simcoe Cr nr Ft. Simcoe	F	.03	(b)	.11	.18	(b)	.57	.09	(b)	.14	--	--	--
48	507090	Mud Lake Drain nr Harrah	F	.69	1.08	2.0	.37	.69	1.2	.20	.32	.55	--	--	--
52	507510	Toppenish Cr nr Satus	F	.07	1.4	2.06	.33	.46	.68	.11	.15	.27	--	--	--
54	507940	Satus Cr above Logy Cr nr Toppenish	F	.01	(b)	.01	.10	(b)	.11	.04	(b)	.05	--	--	--
55	507950	Logy Cr nr Toppenish	F	.01	(b)	.01	.14	(b)	.21	.05	(b)	.06	--	--	--
56	508480	Dry Cr nr Toppenish	F	.02	(b)	.14	.28	(b)	.33	.05	(b)	.05	--	--	--
60	508621	Satus Cr at Satus	F	.06	.76	1.3	.17	.30	.44	.11	.14	.17	.05	.07	.09
70	508990	Yakima R at Mabton	F	.20	.58	1.0	.07	.11	.19	.09	.14	.22	.03	.05	.08
72	509489	Yakima R at Prosser	GS	.20	.59	1.0	.04	.10	.16	.10	.13	.20	.01	.05	.09
78	510500	Yakima R at Kiona	GS	.21	.66	.96	.05	.10	.14	.11	.15	.22	.04	.06	.08
--	--	Yakima R at Granger	CE	.11	.31	.62	0	.02	.05	.08	.10	.14	.02	.05	.08
79	511800	Yakima R at Van Giesan Bridge nr Richland	GS	.25	.53	.84	.04	.10	.18	.01	.15	.25	.01	.04	.07
3	485005	Roza Canal at Beam Rd nr Zillah	CE	.03	.06	.10	0	.01	.03	.02	.04	.06	.01	.02	.02
18	499000	Naches R at Yakima	CE	.02	.04	.06	0	.02	.04	.01	.03	.06	0	.01	.03
20	500420	Moxee Drain at Birchfield Rd nr Union Gap	CE	.51	.80	1.02	.02	.04	.05	.24	.40	.69	.11	.16	.22
22	500440	Wide Hollow Cr at Union Gap	GS	.73	1.02	1.4	.03	.08	.12	.12	.18	.42	.07	.11	.14
23	500445	Wide Hollow Cr nr mouth at Union Gap	CE	.78	1.02	1.26	.03	.08	.10	.15	.18	.27	.08	.11	.14
28	502500	Ahtanum Cr at Union Gap	CE	.27	.41	.79	0	.01	.03	.11	.14	.23	.06	.09	.12
30	503950	Yakima R at Parker	F	.06	.12	.16	.09	.26	.44	.05	.09	.18	--	--	--
31	504505	Sunnyside Canal at Beam Rd nr Granger	CE	.02	.08	.15	0	.02	.02	.04	.06	.09	.02	.03	.04
41	505450	Granger Drain at Granger	CE	1.46	1.65	2.03	.01	.17	.40	.32	.54	.71	.16	.18	.22
75	509700	Spring Cr at Hess Rd nr Prosser	CE	.81	1.22	1.56	0	.01	.02	.12	.25	.38	.05	.06	.07
76	509820	Snipes Cr nr Prosser	CE	.19	.25	.38	0	.01	.01	.08	.16	.26	.02	.03	.09
69	508850	Sulphur Cr Wasteway at McGee Rd	CE	1.06	1.71	2.12	.01	.09	.16	.21	.29	.42	.09	.11	.14
27	502490	Ahtanum Cr at Goodman Rd at Union Gap	F	.11	.35	.16	.22	.42	.64	.10	.17	.26	--	--	--
24	500450	Yakima R above Ahtanum Cr at Union Gap	GS	--	--	--	--	--	--	--	--	--	--	--	--
61	508630	South Drain nr Satus	F	.50	1.2	1.7	.35	.76	2.0	.17	.24	.32	--	--	--
Sulphur Creek basin - 1976 Irrigation Season															
4	485010	Roza Canal at Scoon Rd nr Sunnyside	B	0	.10	.48	--	--	--	.07	.04	.12	--	--	--
5	485012	Roza Canal below Sulphur Cr Wasteway nr Sunnyside	--	.01	.08	.21	--	--	--	.02	.07	.10	--	--	--
6	485014	Roza Canal at Black Canyon Cr nr Sunnyside	--	0	.08	.22	--	--	--	.03	.08	.12	--	--	--
7	485016	Roza Canal at Factory Rd nr Sunnyside	--	0	.08	.28	--	--	--	.04	.09	.12	--	--	--
8	485018	Roza Canal at Wilgus Rd nr Grandview	--	0	.07	.26	--	--	--	.04	.09	.12	--	--	--
32	504510	Sunnyside Canal at Maple Grove Rd nr Sunnyside	--	.03	.11	.22	--	--	--	.05	.12	.20	--	--	--
33	504512	Sunnyside Canal below Sulphur Cr Wasteway nr Sunnyside	--	.05	.17	.73	--	--	--	.08	.14	.20	--	--	--
34	504514	Sunnyside Canal at Edison Rd nr Sunnyside	--	.06	.15	.28	--	--	--	.10	.15	.21	--	--	--
35	504516	Sunnyside Canal at Bethnay Rd nr Grandview	--	.06	.16	.27	--	--	--	.09	.15	.27	--	--	--
36	504518	Sunnyside Canal at Grandview	--	.09	.19	.32	--	--	--	.08	.17	.27	--	--	--
64	508790	DID 18 Drain at Sunnyside	--	2.9	3.6	4.7	--	--	--	.34	1.1	3.8	--	--	--
65	508810	Washout Drain at Sunnyside	--	1.6	2.5	3.5	--	--	--	.17	.57	1.2	--	--	--
66	508820	Black Canyon Cr at Waneta Rd nr Sunnyside	--	1.9	3.7	4.8	--	--	--	.18	.91	2.0	--	--	--
67	508830	DID 9 Drain nr Sunnyside	--	2.6	3.3	5.3	--	--	--	.17	.34	.53	--	--	--
68	508840	DID 3 Drain nr Sunnyside	--	1.9	2.8	5.8	--	--	--	.64	1.1	1.6	--	--	--
69	508850	Sulphur Cr Wasteway nr Sunnyside	--	.92	1.9	2.5	--	--	--	.18	.49	.84	--	--	--

TABLE 13.--Minimum, mean, and maximum values of selected water-quality characteristics at stream and canal sites in study area, 1974 irrigation season--Continued

Site No. in fig. 19	USGS No.[a]	Station name (abbreviated)	Source of data	Specific conductance (micromhos)			pH (units)			Temperature (°C)			Turbidity (JTU)		
				Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
1	484500	Yakima R at Umtanum	CE	83	97	103	7.4	7.6	7.6	7.9	11.1	17.2	2	4	13
19	500010	Yakima R nr Terrace Heights	GS	72	122	340	7.4	8.0	8.9	6.2	12.9	17.3	3	13	45
21	500439	Wide Hollow Cr at Goodman Rd at Union Gap	GS	81	322	410	7.4	7.9	8.2	7.5	13.6	17.3	4	11	30
25	500600	N.F. Ahtanum Cr at Tampico	F	63	(b)	71	--	--	--	6.6	(b)	13.1	2	(b)	20
26	501600	S.F. Ahtanum Cr at Tampico	F	66	(b)	84	--	--	--	6.7	(b)	13.4	3	(b)	4
29	503500	Reservation (New, Main) Canal nr Parker	F	78	102	130	--	--	--	8.7	12.3	18.6	1	11	30
37	505000	Yakima R nr Parker	CE	84	115	165	7.7	7.9	8.3	8.1	13.1	18	5	14	31
38	505300	Yakima R nr Toppenish	F	79	111	150	7.5	7.8	8.0	7.7	14.0	19.3	4	15	45
42	505480	Wanity Slough at Rocky Ford Rd nr Toppenish	F	138	183	205	--	--	--	10.2	16.1	20.2	4	8	20
43	505500	Marion Drain nr Granger	F	230	289	400	7.7	7.8	8.1	9.0	14	17.5	4	14	25
44	506000	Toppenish Cr nr Ft Simcoe	F	64	(b)	134	--	--	--	9.0	(b)	20.8	1	(b)	30
45	506300	N.F. Simcoe Cr nr Ft. Simcoe	F	84	(b)	150	--	--	--	10.1	(b)	17.5	2	(b)	10
46	506330	S.F. Simcoe Cr nr Ft. Simcoe	F	70	(b)	144	--	--	--	9.6	(b)	17.5	3	--	30
48	507090	Mud Lake Drain nr Harrah	F	258	307	350	--	--	--	10.6	16.9	22.4	20	48	100
52	507510	Toppenish Cr nr Satus	F	220	305	440	--	--	--	8.4	15.3	18.8	7	12	20
54	507940	Satus Cr above Logy Cr nr Toppenish	F	77	(b)	130	--	--	--	17.0	(b)	17.4	1	(b)	2
55	507950	Logy Cr nr Toppenish	F	80	(b)	100	--	--	--	15.4	(b)	15.9	1	(b)	3
56	508480	Dry Cr nr Toppenish	F	90	(b)	167	--	--	--	7.4	(b)	8.3	1	(b)	3
60	508621	Satus Cr at Satus	F	130	280	390	7.7	7.8	7.9	6.3	14.5	18.7	5	10	20
70	508990	Yakima R at Mabton	F	107	202	320	7.2	7.8	8.1	8.4	15.4	20.3	9	20	45
72	509489	Yakima R at Prosser	GS	114	206	340	7.6	7.9	8.3	8.2	15.4	19.8	5	17	45
78	510500	Yakima R at Kiona	GS	98	187	319	7.5	7.9	8.4	8.0	16.8	22.5	6	19	45
--	--	Yakima R at Granger	CE	109	157	228	7.3	7.7	8.3	9.5	14.1	17.8	8	9	12
79	511800	Yakima R at Van Giesan Bridge nr Richland	GS	116	231	370	7.3	8.0	9.0	8.1	15.7	20.7	6	18	40
3	485005	Roza Canal at Beam Rd nr Zillah	CE	90	101	116	6.9	7.5	7.9	10	13.7	19.5	1	4	9
18	499000	Naches R at Yakima	CE	50	78	98	7.2	7.7	8.1	8.4	12.5	15.5	1	4	12
20	500420	Moxee Drain at Birchfield Rd nr Union Gap	CE	266	352	410	7.4	7.7	8.0	9.5	16.8	22	11	30	50
22	500440	Wide Hollow Cr at Union Gap	GS	300	351	400	7.9	8.1	8.5	10.5	14.6	17.4	3	8	20
23	500445	Wide Hollow Cr nr mouth at Union Gap	CE	305	351	395	8.0	8.1	8.3	10.9	14.6	17	4	8	15
28	502500	Ahtanum Cr at Union Gap	CE	141	268	384	7.6	7.9	8.2	10.5	15.5	20	4	7	10
30	503950	Yakima R at Parker	F	79	118	160	--	--	--	7.7	13.4	19.3	4	14	45
31	504505	Sunnyside Canal at Beam Rd nr Granger	CE	84	109	141	7.0	7.6	8.2	11.1	15.2	17.8	2	6	10
41	505450	Granger Drain at Granger	CE	356	390	434	7.6	7.7	7.9	10.5	15	19	18	42	70
75	509700	Spring Cr at Hess Rd nr Prosser	CE	262	290	325	7.7	7.8	8.0	12	16.5	21	13	32	48
76	509820	Snipes Cr nr Prosser	CE	154	181	214	7.6	7.7	7.9	12	16.9	22	8	28	60
69	508850	Sulphur Cr Wasteway at McGee Rd	CE	211	310	359	7.4	7.7	7.9	11	14.3	18.2	14	25	48
27	502490	Ahtanum Cr at Goodman Rd at Union Gap	F	91	244	430	--	--	--	8.9	13.9	20.2	3	13	40
24	500450	Yakima R above Ahtanum Cr at Union Gap	GS	--	--	--	--	--	--	--	--	--	--	--	--
61	508630	South Drain nr Satus	F	235	367	610	--	--	--	12.2	18.7	23.8	10	24	30
		<u>Sulphur Creek basin - 1976 Irrigation Season</u>													
4	485010	Roza Canal at Scoon Rd nr Sunnyside	B	69	96	123	--	--	--	4.4	14	19.6	1	3.5	13
5	485012	Roza Canal below Sulphur Cr Wasteway nr Sunnyside	--	67	97	123	--	--	--	7.0	14.4	19.8	2	3.8	11
6	485014	Roza Canal at Black Canyon Cr nr Sunnyside	--	72	96	123	--	--	--	7.2	14.2	20.9	2	4.4	14
7	485016	Roza Canal at Factory Rd nr Sunnyside	--	58	96.1	123	--	--	--	6.8	14.9	21.3	2	5.5	15
8	485018	Roza Canal at Wilgus Rd nr Grandview	--	54	96.8	128	--	--	--	7.4	15.0	22.1	2	5.8	16
32	504510	Sunnyside Canal at Maple Grove Rd nr Sunnyside	--	66	103	160	--	--	--	8.0	14.5	20.8	3	6.4	18
33	504512	Sunnyside Canal below Sulphur Cr Wasteway nr Sunnyside	--	55	105	165	--	--	--	8.4	14.7	20.6	3	7.8	21
34	504514	Sunnyside Canal at Edison Rd nr Sunnyside	--	60	107	160	--	--	--	8.2	14.7	20.2	3	9.1	25
35	504516	Sunnyside Canal at Bethnay Rd nr Grandview	--	72	107	160	--	--	--	8.6	14.9	20.6	2	9.5	31
36	504518	Sunnyside Canal at Grandview	--	76	112	165	--	--	--	8.2	15.2	21.5	3	9.7	38
64	508790	DID 18 Drain at Sunnyside	--	365	487	680	--	--	--	10	16.6	23.2	16	48	200
65	508810	Washout Drain at Sunnyside	--	232	312	670	--	--	--	11	17.2	24.8	3	30	117
66	508820	Black Canyon Cr at Waneta Rd nr Sunnyside	--	285	414	600	--	--	--	10.5	16.7	24	12	43	184
67	508830	DID 9 Drain nr Sunnyside	--	345	462	670	--	--	--	10.1	16.0	23	2	12.3	62
68	508840	DID 3 Drain nr Sunnyside	--	337	481	680	--	--	--	11.1	17.1	25	5	19.3	88
69	508850	Sulphur Cr Wasteway nr Sunnyside	--	195	303	435	--	--	--	9.6	16.0	23.7	6.0	15.5	36

TABLE 13.--Minimum, mean, and maximum values of selected water-quality characteristics at stream and canal sites in study area, 1974 irrigation season--Continued

Site No. in fig. 19	USGS No.[a]	Station name (abbreviated)	Source of data	Dissolved oxygen (mg/L)			Fecal coliform (coliform per 100 mL)			Total coliform (colonies per 100 mL)		
				Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
1	484500	Yakima R at Umtanum	CE	--	--	--	1,00	1,950	2,800	--	--	--
19	500010	Yakima R nr Terrace Heights	GS	9.6	10.7	12.4	780	1,960	7,800	--	--	--
21	500439	Wide Hollow Cr at Goodman Rd at Union Gap	GS	9.0	10.3	12.9	3,100	12,260	28,000	--	--	--
25	500600	N.F. Ahtanum Cr at Tampico	F	--	--	--	12	(b)	13	--	--	--
26	501600	S.F. Ahtanum Cr at Tampico	F	--	--	--	20	(b)	88	--	--	--
29	503500	Reservation (New, Main) Canal nr Parker	F	--	--	--	11	284	1,000	--	--	--
37	505000	Yakima R nr Parker	CE	10.2	11.1	12.6	--	--	--	640	2,050	11,400
38	505300	Yakima R nr Toppenish	F	9.7	9.9	12.3	1,000	2,300	5,600	--	--	--
42	505480	Wanity Slough at Rocky Ford Rd nr Toppenish	F	--	--	--	280	1,500	3,000	--	--	--
43	505500	Marion Drain nr Granger	F	8.2	8.9	10.9	3,000	10,100	22,000	4,600	10,000	17,000
44	506000	Toppenish Cr nr Ft Simcoe	F	--	--	--	20	(b)	24	--	--	--
45	506300	N.F. Simcoe Cr nr Ft. Simcoe	F	--	--	--	2	--	15	--	--	--
46	506330	S.F. Simcoe Cr nr Ft. Simcoe	F	--	--	--	20	--	340	--	--	--
48	507090	Mud Lake Drain nr Harrah	F	--	--	--	250	1,117	3,000	--	--	--
52	507510	Toppenish Cr nr Satus	F	--	--	--	--	--	--	--	--	--
54	507940	Satus Cr above Logy Cr nr Toppenish	F	--	--	--	6	(b)	35	--	--	--
55	507950	Logy Cr nr Toppenish	F	--	--	--	86	(b)	720	--	--	--
56	508480	Dry Cr nr Toppenish	F	--	--	--	31	(b)	44	--	--	--
60	508621	Satus Cr at Satus	F	8.6	9.2	10.3	--	--	--	1,300	6,800	21,000
70	508990	Yakima R at Mabton	F	7.9	9.8	11.3	--	--	--	2,600	9,500	41,000
72	509489	Yakima R at Prosser	GS	7.9	9.3	11.4	--	--	--	2,400	10,500	46,000
78	510500	Yakima R at Kiona	GS	8.2	9.5	11.3	85	123	200	1,500	16,900	50,000
--	--	Yakima R at Granger	CE	--	--	--	--	--	--	--	--	--
79	511800	Yakima R at Van Giesan Bridge nr Richland	GS	8.2	9.4	11.2	--	--	--	1,100	12,600	37,000
3	485005	Roza Canal at Beam Rd nr Zillah	CE	9.2	9.8	10.2	--	--	--	--	--	--
18	499000	Naches R at Yakima	CE	--	--	--	--	--	--	--	--	--
20	500420	Moxee Drain at Birchfield Rd nr Union Gap	CE	--	--	--	--	--	--	--	--	--
22	500440	Wide Hollow Cr at Union Gap	GS	--	--	--	--	--	--	--	--	--
23	500445	Wide Hollow Cr nr mouth at Union Gap	CE	10.7	11.4	12.8	--	--	--	--	--	--
28	502500	Ahtanum Cr at Union Gap	CE	--	--	--	--	--	--	--	--	--
30	503950	Yakima R at Parker	F	--	--	--	--	--	--	--	--	--
31	504505	Sunnyside Canal at Beam Rd nr Granger	CE	8.9	9.4	9.9	--	--	--	--	--	--
41	505450	Granger Drain at Granger	CE	--	--	--	--	--	--	--	--	--
75	509700	Spring Cr at Hess Rd nr Prosser	CE	--	--	--	--	--	--	--	--	--
76	509820	Snipes Cr nr Prosser	CE	--	--	--	--	--	--	--	--	--
69	508850	Sulphur Cr Wasteway at McGee Rd	CE	--	--	--	--	--	--	--	--	--
27	502490	Ahtanum Cr at Goodman Rd at Union Gap	F	--	--	--	65	684	2,600	--	--	--
24	500450	Yakima R above Ahtanum Cr at Union Gap	GS	--	--	--	--	--	--	--	--	--
61	508630	South Drain nr Satus	F	--	--	--	11	554	1,400	--	--	--
		Sulphur Creek basin - 1976 Irrigation Season										
4	485010	Roza Canal at Scoon Rd nr Sunnyside	B	--	--	--	--	--	--	--	--	--
5	485012	Roza Canal below Sulphur Cr Wasteway nr Sunnyside	--	--	--	--	--	--	--	--	--	--
6	485014	Roza Canal at Black Canyon Cr nr Sunnyside	--	--	--	--	--	--	--	--	--	--
7	485016	Roza Canal at Factory Rd nr Sunnyside	--	--	--	--	--	--	--	--	--	--
8	485018	Roza Canal at Wilgus Rd nr Grandview	--	--	--	--	--	--	--	--	--	--
32	504510	Sunnyside Canal at Maple Grove Rd nr Sunnyside	--	--	--	--	--	--	--	--	--	--
33	504512	Sunnyside Canal below Sulphur Cr Wasteway nr Sunnyside	--	--	--	--	--	--	--	--	--	--
34	504514	Sunnyside Canal at Edison Rd nr Sunnyside	--	--	--	--	--	--	--	--	--	--
35	504516	Sunnyside Canal at Bethnay Rd nr Grandview	--	--	--	--	--	--	--	--	--	--
36	504518	Sunnyside Canal at Grandview	--	--	--	--	--	--	--	--	--	--
64	508790	DID 18 Drain at Sunnyside	--	--	--	--	--	--	--	--	--	--
65	508810	Washout Drain at Sunnyside	--	--	--	--	--	--	--	--	--	--
66	508820	Black Canyon Cr at Waneta Rd nr Sunnyside	--	--	--	--	--	--	--	--	--	--
67	508830	DID 9 Drain nr Sunnyside	--	--	--	--	--	--	--	--	--	--
68	508840	DID 3 Drain nr Sunnyside	--	--	--	--	--	--	--	--	--	--
69	508850	Sulphur Cr Wasteway nr Sunnyside	--									

TABLE 13.--Minimum, mean, and maximum values of selected water-quality characteristics at stream and canal sites in study area, 1974 irrigation season--Continued

Site No. in fig. 19	USGS No.[a]	Station name (abbreviated)	Source of data	Sodium adsorption ratio (SAR), From Fretwell (1979)			Chlorophyll a phytoplankton, uncorrected		
				Min	Mean	Max	Min	Mean	Max
1	484500	Yakima R at Umtanum	CE	--	--	--	--	--	--
19	500010	Yakima R nr Terrace Heights	GS	--	--	--	--	--	--
21	500439	Wide Hollow Cr at Goodman Rd at Union Gap	GS	--	--	--	--	--	--
25	500600	N.F. Ahtanum Cr at Tampico	F	0.3	(b)	0.3	0.4	(b)	1.6
26	501600	S.F. Ahtanum Cr at Tampico	F	.2	(b)	.3	--	--	--
29	503500	Reservation (New, Main) Canal nr Parker	F	.2	.3	.4	1.2	2.6	6.6
37	505000	Yakima R nr Parker	CE	--	--	--	--	--	--
38	505300	Yakima R nr Toppenish	F	--	--	--	--	--	--
42	505480	Wanity Slough at Rocky Ford Rd nr Toppenish	F	.3	.4	.4	3.5	4.7	7.4
43	505500	Marion Drain nr Granger	F	.5	.6	.7	1.2	3.2	5.9
44	506000	Toppenish Cr nr Ft. Simcoe	F	.3	(b)	.3	.8	(b)	2.2
45	506300	N.F. Simcoe Cr nr Ft. Simcoe	F	.3	(b)	.4	.6	--	3.2
46	506330	S.F. Simcoe Cr nr Ft. Simcoe	F	.2	(b)	.3	.7	(b)	3.3
48	507090	Mud Lake Drain nr Harrah	F	.8	.9	1.2	1.5	3.1	5.9
52	507510	Toppenish Cr nr Satus	F	.5	.7	.8	1.6	3.4	7.0
54	507940	Satus Cr above Logy Cr nr Toppenish	F	.3	(b)	.4	1.1	(b)	1.2
55	507950	Logy Cr nr Toppenish	F	.3	(b)	.3	.5	(b)	2.2
56	508480	Dry Cr nr Toppenish	F	.3	(b)	.4	.7	(b)	2.0
60	508621	Satus Cr at Satus	F	.4	.7	1.0	.1	3.2	7.0
70	508990	Yakima R at Mabton	F	--	--	--	--	--	--
72	509489	Yakima R at Prosser	GS	--	--	--	--	--	--
78	510500	Yakima R at Kiona	GS	--	--	--	--	--	--
--	--	Yakima R at Granger	CE	--	--	--	--	--	--
79	511800	Yakima R at Van Giesan Bridge nr Richland	GS	--	--	--	--	--	--
3	485005	Roza Canal at Beam Rd nr Zillah	CE	--	--	--	--	--	--
18	499000	Naches R at Yakima	CE	--	--	--	--	--	--
20	500420	Moxee Drain at Birchfield Rd nr Union Gap	CE	--	--	--	--	--	--
22	500440	Wide Hollow Cr at Union Gap	GS	--	--	--	--	--	--
23	500445	Wide Hollow Cr nr mouth at Union Gap	CE	--	--	--	--	--	--
28	502500	Ahtanum Cr at Union Gap	CE	--	--	--	--	--	--
30	503950	Yakima R at Parker	F	--	--	--	.8	3.1	9.0
31	504505	Sunnyside Canal at Beam Rd nr Granger	CE	--	--	--	--	--	--
41	505450	Granger Drain at Granger	CE	--	--	--	--	--	--
75	509700	Spring Cr at Hess Rd nr Prosser	CE	--	--	--	--	--	--
76	509820	Snipes Cr nr Prosser	CE	--	--	--	--	--	--
69	508850	Sulphur Cr Wasteway at McGee Rd	CE	--	--	--	--	--	--
27	502490	Ahtanum Cr at Goodman Rd at Union Gap	F	1.3	3.5	4.6	--	--	--
24	500450	Yakima R above Ahtanum Cr at Union Gap	GS	--	--	--	--	--	--
61	508630	South Drain nr Satus	F	.9	1.1	1.6	2.0	3.4	5.1
Sulphur Creek basin - 1976 Irrigation Season									
4	485010	Roza Canal at Scoon Rd nr Sunnyside	B	--	--	--	--	--	--
5	485012	Roza Canal below Sulphur Cr Wasteway nr Sunnyside	--	--	--	--	--	--	--
6	485014	Roza Canal at Black Canyon Cr nr Sunnyside	--	--	--	--	--	--	--
7	485016	Roza Canal at Factory Rd nr Sunnyside	--	--	--	--	--	--	--
8	485018	Roza Canal at Wilgus Rd nr Grandview	--	--	--	--	--	--	--
32	504510	Sunnyside Canal at Maple Grove Rd nr Sunnyside	--	--	--	--	--	--	--
33	504512	Sunnyside Canal below Sulphur Cr Wasteway nr Sunnyside	--	--	--	--	--	--	--
34	504514	Sunnyside Canal at Edison Rd nr Sunnyside	--	--	--	--	--	--	--
35	504516	Sunnyside Canal at Bethnay Rd nr Grandview	--	--	--	--	--	--	--
36	504518	Sunnyside Canal at Grandview	--	--	--	--	--	--	--
64	508790	DID 18 Drain at Sunnyside	--	--	--	--	--	--	--
65	508810	Washout Drain at Sunnyside	--	--	--	--	--	--	--
66	508820	Black Canyon Cr at Waneta Rd nr Sunnyside	--	--	--	--	--	--	--
67	508830	DID 9 Drain nr Sunnyside	--	--	--	--	--	--	--
68	508840	DID 3 Drain nr Sunnyside	--	--	--	--	--	--	--
69	508850	Sulphur Cr Wasteway nr Sunnyside	--	--	--	--	--	--	--

[a]Prefix "12" is omitted from all numbers.
[b]Mean value not given if only two values.

TABLE 14.--Range in values of selected water-quality characteristics recorded at sites on streams and canals, April-October 1974 and 1976

Characteristic	Value range	Site with maximum value[1]	
		No.	Name
Nitrite plus nitrate (NO_2 + NO_3), mg/L	0 - 5.8	68	DID 3 Drain near Sunnyside.
Ammonia nitrogen (N), mg/L	0 - 2.2	29	Reservation (Wapato) Canal near Parker.
Total phosphorus (P), mg/L	0.01 - 3.8	64	DID 18 Drain at Sunnyside.
Dissolved ortho-phosphate phosphorus (P), mg/L	0 - 0.22	20 41	Moxee Drain at Birchfield Road near Union Gap. Granger Drain at Granger.
Specific conductance, umho/cm	50 - 680	64 68	DID 18 Drain at Sunnyside. DID 3 Drain near Sunnyside.
pH units	6.9 - 9.0	79	Yakima R at VanGiesan Bridge near Richland.
Temperature, °C	6.2 - 25	68	DID 3 Drain near Sunnyside.
Turbidity, JTU	1 - 200	64	DID 18 Drain near Sunnyside.
Dissolved oxygen (DO), mg/L	7.2 - 12.9	69	Sulphur Cr Wasteway at McGee Rd (minimum value).
Fecal coliform, colonies/100 mL	2 - 28,000	21	Wide Hollow Cr at Goodman Road at Union Gap.
Total coliform, colonies/100 mL	640 - 76,000	52	Toppenish Cr near Satus.
Sodium adsorption ratio (SAR)	0.2 - 4.6	27	Ahtanum Cr at Goodman Road at Union Gap.
Chlorophyll *a* phytoplankton, mg/L	0.1 - 9.0	30	Yakima R at Parker.

[1]Except dissolved oxygen, for which minimum value is given.

TABLE 15.--Suspended-sediment concentrations and discharges at selected sites, 1976 irrigation season

[1975 irrigation-season data used for two sites as noted. Data from Nelson (1979a, 1979b)]

Site No. in fig. 27	USGS No.[1]	Station name (abbreviated)	Concentrations (mg/L)			Discharge (tons)
			Minimum	Mean	Maximum	
3	485005	Roza Canal at Beam Rd nr Zillah (1975)	4	35	126	--
4	485010	Roza Canal at Scoon Rd nr Sunnyside	1	36	108	12,000
5	485012	Roza Canal blw Sulphur Cr Wasteway nr Sunnyside	8	52	124	--
6	485014	Roza Canal at Black Canyon Cr nr Sunnyside	8	58	149	--
7	485016	Roza Canal at Factory Rd nr Sunnyside	10	83	216	--
8	485018	Roza Canal at Wilgus Rd nr Grandview	15	81	175	14,000
20	500420	Moxee Drain at Birchfield Rd nr Union Gap	74	507	1,320	16,000
23	500445	Wide Hollow Cr nr mouth at Union Gap	4	21	48	400
24	500450	Yakima River abv Ahtanum Cr at Union Gap	11	30	182	89,000
28	502500	Ahtanum Cr at Union Gap	4	53	319	3,500
32	504510	Sunnyside Canal at Maple Grove Rd nr Sunnyside	17	112	477	49,000
33	504512	Sunnyside Canal blw Sulphur Cr Wasteway nr Sunnyside	13	126	448	--
34	504514	Sunnyside Canal at Edison Rd nr Sunnyside	24	167	394	--
35	504516	Sunnyside Canal at Bethnay Rd nr Grandview	21	166	393	--
36	504518	Sunnyside Canal at Grandview	19	199	776	61,000
39	505350	E. Toppenish Drain at Wilson Rd nr Toppenish	16	50	555	1,000
40	505410	Sub 35 Drain at Parton Rd nr Granger	10	74	206	2,400
41	505450	Granger Drain at Granger	51	632	1,400	18,000
43	505500	Marion Drain at Granger (1975)	27	82	281	11,000
51	507508	Toppensh Cr at Indian Church Rd nr Granger	19	60	486	3,300
53	507560	Coulee Drain at N Satus Rd nr Satus	11	41	93	470
57	508590	Satus Cr at Plank Rd nr Satus	8	27	60	1,000
59	508610	Satus Cr at N Satus Rd at Satus	20	85	273	8,000
61	508630	South Drain nr Satus	40	140	295	6,200
62	508660	Satus Drain 302 at Hwy 22 nr Mabton	75	805	2,730	11,000
63	508690	Satus Drain 303 at Looney Rd nr Mabton	47	483	4,290	4,700
64	508790	DID 18 Drain at Sunnyside	297	1,236	4,030	--
65	508810	Washout Drain at Sunnyside	10	637	1,780	--
66	508820	Black Canyon Cr at Waneta Rd nr Sunnyside	84	1,238	2,960	--
67	508830	DID 9 Drain nr Sunnyside	66	444	769	--
68	508840	DID 3 Drain nr Sunnyside	115	580	1,570	--
69	508850	Sulphur Cr Wasteway nr Sunnyside	131	445	3,270	65,000
70	508990	Yakima River at Mabton	20	58	167	160,000
71	508997	Grandview Drain at Chase Rd nr Sunnyside	68	374	875	5,000
73	509492	Wamba Drain at Prosser	23	73	338	250
74	509496	Shelby Drain at Shelby Rd at Prosser	47	462	1,840	1,300
75	509700	Spring Cr at Hess Rd nr Prosser	110	425	871	10,000
76	509820	Snipes Creek nr Prosser	24	170	702	6,500
77	510200	Corral Canyon Cr nr Benton City	29	99	895	1,000
78	510500	Yakima River at Kiona	13	57	211	152,000

Summary: Concentrations (mg/L)
- Lowest minimum: 1 - Roza Canal at Scoon Rd (4)
- Highest minimum: 297 - DID 18 Drain (64)
- Lowest mean: 21 - Wide Hollow Creek (23)
- Highest mean: 1,238 - Black Canyon Cr (66)
- Lowest maximum: 48 - Wide Hollow Cr (23)
- Highest maximum: 4,290 - Satus Drain 303 (63)

Discharges: (tons/season)
- Lowest: 250 - Wamba Drain (73)
- Highest: 16,000 - Yakima River at Mabton (70)

[1]Prefix "12" is omitted from all numbers.

TABLE 16.--Maximum concentrations of selected pesticides recorded at three sites

[Underlined values indicate those exceeding water-quality criteria for freshwater aquatic life, according to U.S. Environmental Protection Agency, 1977b]

Site in fig. 27 (years of record)	Sample source	Micrograms per liter								
		DDD	DDE	DDT	Dieldrin	Lindane	2,4-D	2,4,5-T	Parathion	PCB
32 (1976)	Water	0	0	0	0	0	0.02 8-27-76	0	--	0
	Bottom sediments	--	--	--	--	--	--	--	--	--
64 (All recorded 8-27-76)	Water	15	.05	.10	.04	.01	--	--	--	0
	Bottom sediments	--	20	55	2.0	--	--	--	--	--
78 (1968-74, 1976-77)	Water	.02 7-18-68	.02 6-27-68 8-6-71	.04 5-19-69	--	--	.71 6-1-73	.01 5-25-70	0.02 3-30-73	.1 3-12-74
	Bottom sediments	15 12-3-72	26 12-27-73	24 12-27-73	--	--	--	--	--	--

Note: Zero concentrations were reported for all samplings for aldrin, endrin, heptachlor, and malathion.

TABLE 17.--Maximum concentrations of selected trace elements recorded during 1974-75 water years

Site No. in fig. 27	Station name (abbreviated)	Concentration, in micrograms per liter				
		Dissolved chromium (Cr)	Dissolved copper (Cr)	Dissolved lead (Pb)	Total mercury (Hg)	Dissolved Zinc (Zn)
25	N. F. Ahtanum Cr (11-6-73)	--	5	2	1.4	20
26	S. F. Ahtanum Cr (11-6-73)	--	3	3	.5	20
27	Ahtanum Cr at Goodman Rd (8-6-74)	--	4	4	.0	10
29	Reservation Canal (8-8-74)	--	3	3	3.3	10
30	Yakima R at Parker	<10	10	39	.2	30
42	Wanity Slough	--	5	5	.2	20
44	Toppenish Cr nr Ft Simcoe (8-6-74)	--	3	5	.1	10
45	N. F. Simcoe Cr (8-6-74)	--	1	0	.5	0
46	S. F. Simcoe Cr (8-6-74)	--	3	5	.2	10
48	Mud Lake Drain (12-4-73)	--	4	1	.1	10
54	Satus Cr (8-7-74)	--	2	5	.0	10
55	Logy Cr (8-8-74)	--	3	2	.0	10
61	South Drain (2-4-74)	--	6	4	.1	20
78	Yakima R at Kiona 1974 WY	0	13 (5-22-74)	20 (5-8-74)	4.1 (6-5-74)	30 (5-22-74)
	1975 WY	10 9-9-75	30 1-7-75	38 1-7-75	0.4 5-6-75	300 10-22-74

TABLE 18.--Quality criteria for drinking water, for constituents analyzed in surface waters in the study area

Constituent	Criteria	
	Primary drinking water[1]	Secondary drinking water[2]
pH (units)	--	6.5 - 8.5
Color (platinum - cobalt scale)	--	15
Coliform, fecal (colony per 100 mL)[3]	1	1
Sulfate		250 mg/L
Nitrate as N	10 mg/L	--
Arsenic	50 ug/L	--
Chromium	50 ug/L	--
Copper	--	1000 ug/L
Iron	--	300 ug/L
Lead	50 ug/L	--
Manganese	--	50 ug/L
Mercury	2 ug/L	--
Zinc	--	5000 ug/L
Endrin	.2 ug/L	--
Lindane	4.0 ug/L	--
Methoxychlor	100 ug/L	--
Toxaphene	5 ug/L	--
2, 4-D	100 ug/L	--
2, 4, 5-TP Silvex	10 ug/L	--

[1]Adapted from U.S. Environmental Protection Agency, 1977b

[2]Adapted from U.S. Environmental Protection Agency, 1977c.

[3]The maximum contaminant level depends upon the number of samples taken and the method of determination. For the purposes of this report, the presence of any fecal coliform bacteria was considered an indication of contamination. The lowest reporting unit is 1 col/100 mL.

TABLE 19.--Quality criteria for selected industrial uses of fresh water

[Adapted from U.S. Environmental Protection Agency, 1977a]

Constituent	Steam generation boiler makeup	Steam generation cooling	Textile mill products	Paper products	Chemical products	Petroleum products	Primary metals industries	Food canning	Bottled and soft drinks	Electric utilities	Copper mining
	Maximum allowable, in milligrams per liter unless otherwise noted										
Alkalinity as $CaCO^3$	350	500	500-200	75-150	500	500	200	300	85	--	--
Hardness as $CaCO^3$	--	--	120	475	1,000	900	1,000	--	--	5,000	--
Total dissolved solids	35,000	--	150	1,080	2,500	3,500	1,500	--	--	--	2,000
Color (cobalt-platinum units)	1,200	1,200	--	360	500	25	--	--	--	--	--

TABLE 20.--Water-quality criteria for irrigation, for constituents analyzed in the study area

[Adapted from U.S. Environmental Protection Agency, 1977a]

Constituent	Maximum recommended concentration (ug/L: micrograms per liter; mg/L: milligrams per liter)
Arsenic	100 ug/L
Boron	750 ug/L, for long-time irrigation of sensitive crops
Total dissolved solids	500 - 5,000 mg/L, depending on crop sensitivity
Sodium adsorption ratio (SAR)[1]	4 for general crops 8-18 for general crops and forage, depending on soil and crop type

[1]The degree to which calcium and magnesium in irrigation water is replaced by sodium from the soil.

TABLE 21.--Water-quality criteria for freshwater aquatic life, for constituents analyzed in the study area

[Adapted from U.S. Environmental Protection Agency, 1977a]

Constituent	Maximum recommended
pH	6.5 - 9.0
Temperature (°C)	Salmon: 18°C for growth; 24°C for short-term maximum in summer Trout: 19°C for growth; 24°C for short-term maximum in summer
Dissolved oxygen[1]	5.0 mg/L
Alkalinity as $CaCO_3$	20 mg/L
Phosphorus	0.10 ug/L
Chromium	100 ug/L
Copper	0.1 times a 96-hour LC_{50} (Lethal concentration that kills 50 percent of fish in 96 hours)
Iron	1.0 mg/L
Lead	0.01 times a 96-hour LC_{50}
Mercury	0.05 ug/L
Zinc	0.01 times a 96-hour LC_{50}
Aldrin/dieldren	0.003 ug/L
Chlordane	0.01 ug/L
DDT	0.001 ug/L
Endrin	0.004 ug/L
Heptachlor	0.001 ug/L
Lindane	0.01 ug/L
Malathion	0.1 ug/L
Methoxychlor	0.03 ug/L
Parathion	0.04 ug/L
Toxaphene	0.005 ug/L

[1]Minimum recommended

TABLE 22.--Water-quality data from selected lakes in the study area (from Dion and others, 1976a, 1976b)

Lake No. in fig. 30	Lake name and location (T/R-Sec)	Date of sampling	Depth of sampling	Milligrams per liter: Dis-solved oxygen	Total nitrate	Total nitrite	Total ammo-nia	Total organic nitrogen	Total phos-phorus	Total ortho-phos-phorus	Specific conduct-ance (micro-mhos)	Water tem-pera-ture (°C)	Color (plat-inum cobalt units)	Secchi disk visi-bility (ft)	Fecal-coliform bacteria: No. sam-ples	Colonies/100 mL: Max.	Min.	Mean
1	Mound Lake	5-17-74	3	11.6	0.00	0.01	0.06	0.32	0.080	0.007	180	12.2	15	4	3	80	1	27
	(6/31-5)		16	11.2	.00	.01	.07	.50	.093	.011	118	12.2	15					
2	Yellepit Lake	-do-	3	12.2	.01	.01	.05	.55	.069	.005	250	13.0	5	4	3	80	1	27
	(6/31-7)		21	10.5	.01	.01	.06	.48	.072	.008	260	12.0	10					
3	Byron Lake	5-16-74	2	9.9	.01	.01	.10	1.3	.18	.086	660	15.0	40	3	3	32	1	15
	(8/23-12)		3	10.0	.00	.01	.13	1.9	.23	.11	670	14.5	35					
4	Horseshoe Lake	-do-	0	10.5	.00	.02	.15	1.4	.54	.086	280	11.5	55	1	3	24	8	16
	(9/22-22)		1	10.5	.00	.02	.20	1.0	.42	.13	280	11.5	50					
5	Griffin Lake	-do-	2	10.0	.00	.02	.15	1.0	.29	.093	390	14.0	55	1	3	48	1	23
	(9/22-23)		3	10.0	.00	.02	.16	1.0	.28	.088	400	14.0	45					
6	Horseshoe Lake	-do-	2	9.7	.00	.01	.12	1.2	.28	.049	390	16.0	60	1	3	8	4	6
	(9/22-25)		3	10.0	.00	.01	.15	1.4	.28	.005	500	14.0	65					
7	Morgan Lake	-do-	1	9.8	.00	.01	.19	1.7	.17	.018	260	15.0	50	1	3	2	1	1
	(9/22-25)		3	10.0	.01	.01	.18	2.3	.18	.011	260	14.0	50					
8	Oleys Lake	-do-	1	9.4,9.5	.01	.01	.10	3.4	1.3	.027	550	17.0,16.5	35	1	2	68	1	34
	(9/23-7)																	
9	Freeway Lake	5-15-78	3	12.0	.01	.00	.04	.60	.065	.007	140	12.0	5	4	3	1	1	1
	(13/19-7)		13	10.4	.01	.00	.06	.53	.085	.005	140	11.3	5					

TABLE 23.--Artesian wells with large flowing discharges or potentiometric heads

[Discharges of 200 gal/min or more and/or heads 5 ft or more]

Well number	Depth (ft)	Depth to aquifer[1] (ft)	Aquifer material[2]	Discharge (gal/min)	Potentiometric head (ft)	Year
9/21-35H1	79	76	S	--	7.7	1973
-36E1	50	--	SR	--	5.0	1973
10/19-30R1	715	535(p)	SR	--	6.0	1972
10/20- 9A1	863	803(c)	SR	660	59.0	1959
10/21-22E1	252	--	SR	--	28.0	1968
10/22-36E1	1,057	1,010(w)	Bas	--	9.2	1974
11/17-16H1	765	405	Bas	--	13.0	1970
-23D1	--	--	--	--	105.0	1970
-24D1	2,760	1,700	--	1,200	--	1957
11/18-30H1	500	--	--	--	46.2	1925
11/20-22R1	528	490(w)	SR	60	13.9	1968
12/16-18K1	343	162(p) 320(w)	--	90	23.0	1946
12/17-16A2	868	495	--	1,300	--	--
-16D3	384	370(w)	Bas	640	58.0	1952
12/18-1M1	650	600	--	560	--	1939
12/19-1Q1	1,326	1,225(p)	--	875	16.0	1943
-2K1	285	264	S, GR	--	11.6	1961
12/20-3G1	314	--	--	300	26.0	1891
-4P1[a]	625	390	--	625	--	1901
-5D1[a]	636	475, 575, 636	--	254	--	1901
-5Q1[a]	689	525, 640, 686	--	491	--	1901
-5Q2[a]	736	588, 688, 736	--	900	--	1901
-6A1[a]	940	700	--	603	--	1901
-6B1[a]	818	620, 818	--	495	--	1901
-8A1[a]	525	515	--	515	--	1901
-8F2[a]	836	530, 820	SR	363	--	1900
-8J1[a]	902	702, 760, 790, 906	SR	443	--	1896
-8R1[a]	1,020	832, 1,020	--	214	--	1901
-9C1[a]	623	386, 623	--	407	--	1901
-9P1[a]	809	615, 752	--	290	--	1901
-10N1[a]	631	630	--	218	--	1901
13/17-4J1	519	440(w)	--	450	41.6	1969
-26J1	153	30	--	329	80.8	1975
13/18-24A2	--	74	--	210	--	--
-29Q1	1,267	800	--	336	--	1901
13/20-31L2	1,000	--	--	234	--	1901
13/24-25E1	777	625(w)	Bas	7,000-8,000	30.0	1955
-26G1	606	--	--	800	--	1942
-27K1	625	--	--	1,600	--	1955
13/25-30G1	1,110	680(w)	Bas	1,375	189.0	1943
14/18-20G1	1,065	753	--	3,000	821.0	1977

[1]Depth to aquifer(s) determined by depth to: p = top of first perforation or screen.
c = bottom of casing.
w = major water-yielding zone.

[2]Aquifer material: Bas, basalt; SR, sedimentary rock (sandstone, conglomerate); S, sand; GR, gravel

[a]Data from G. O. Smith (1901).

TABLE 24.--Highest and lowest static water levels recorded in observation wells in study area through 1977 water year

Well No. in fig. 36	Well No.	Period of record	Well depth (ft)	Material	Water level (feet below surface)			
					Highest	Date	Lowest	Date
1	8/28- 6M1	12/72-12/77	256	Basalt	128.2	12/ 6/77	147.7	4/ 9/73
2	10/22-25F1	5/68-12/77	1,570	--do--	19.7	1/ 2/74	122.0	7/31/73
3	12/16-13D2	3/51-11/77	130	--do--	50.37	6/15/51	124.7	9/ 9/77
4	-18C1	5/66-11/77	287	--do--	4.55	7/21/72	51.2	8/26/73
5	12/17- 7M1	6/66-10/76	516	--do--	98.28	4/ 7/66	198.1	6/11/69
6	- 9J3	1/53-12/77	479	--do--	66.28	7/20/53	180.8	8/28/70
7	-16A2	2/66- 3/77	868	--do--	+123.0	3/29/68	81.5	3/24/77
8	-17B1	5/63- 9/77	250	--do--	+2.0	2/24/66	83.19	9/26/73
9	-17C1	6/59- 9/77	243	--do--	+2.6	5/22/62	95.4	9/14/72
10	12/21-27A1	5/65- 9/77	295	Sandstone	200.0	1/15/66	220.5	3/21/77
11	14/17-28L5	5/68-12/77	82	Gravel	16.1	10/24/74	23.9	7/ 1/76

TABLE 25.--Water-quality data from selected wells in the study area, 1939-61

[From Van Denburgh and Santos (1965)]

EXPLANATION

Well location code: See page viii for description of location system. Location numbers followed by "s" denote springs.

Owner: U.S. Government agencies are abbreviated as follows: A.E.C., U.S. Atomic Energy Commission; B.P.A., Bonneville Power Administration; U.S.A., U.S. Army; U.S.A.F., U.S. Air Force; U.S.B.R., U.S. Bureau of Reclamation; U.S.F.W.S., U.S. Fish and Wildlife Service; U.S.F.S., U.S. Forest Service; U.S.N., U.S. Navy; U.S.N.F.S., U.S. National Park Service. In addition, A.F.B. indicates U.S. Air Force base.

Approximate altitude: Altitude of land-surface datum at well, from publications of the Washington State Department of Conservation or the U.S. Geological Survey, or from topographic maps of the U.S. Geological Survey.

Depth of water-bearing interval: Depth of interval or intervals below land surface, from publications of the Washington State Department of Conservation or the U.S. Geological Survey, or inferred from well logs on file with the above agencies.

Sample collection date: Analyses of waters reported by the sample collector to be chlorinated are indicated by "c" following collection date.

Iron: Total iron concentrations are followed by a "t". All other values represent iron in solution at the time of sample collection.

TABLE 25.--Water-quality data from selected wells in the study area, 1939-61--Continued

Well location code	Owner	Approx. altitude above sea level (in feet)	Well depth (in feet)	Depth of water-bearing interval (in feet)	Water-bearing material	Sample collection date	Temperature (°F)	Parts per million				
								Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)
BENTON COUNTY												
8/24-2J2	City of Prosser (well 2)	--	502	485-502?	Basalt	10/30/59 5/5/61	66 63	59 --	.05 --	14 --	5.1 --	43 --
8/24-2H	City of Prosser (well 3)	--	599	530-599	Basalt	10/30/59 5/23/60	63 60	50 --	0.12 --	17 --	6.1 --	54 --
8/24-2Q	City of Prosser (well 4)	--	744	720-744	Basalt	5/11/61	60	46	.06t	16	6.6	46
8/30-24N	Phillips Pacific Chemical Co.	--	41	18-39	Sand, gravel	10/30/59 5/23/60	54 58	25 --	.03 --	30 --	6.9 --	7.6 --
10/26-11D1	U. S. Government (A.E.C.)	1,320	420	338-420	Basalt	3/24/59	--	51	.68	38	21	13
10/28-17B1	U. S. Government (A.E.C., well 12)	458	228	220-224	Basalt	6/15/51	--	18	--	9.2	3.8	25
11/26-3G1	U. S. Government (A.E.C., well 3)	514	200	116-140	Gravel, sand	8/13/51	--	24	--	23	11	12
11/26-5B1	U. S. Government (A.E.C., well 4)	550	168	121-168	Gravel, sand	8/14/51	--	41	--	30	10	12
11/27-2Q1	U. S. Government (A.E.C., well 5)	520	200	143-168	Sand, gravel	6/14/51	--	22	--	37	8.3	17
11/27-5Q1	U. S. Government (A.E.C., well 2)	555	204	169-185	Gravel, sand	6/14/51	--	25	--	39	9.0	17
11/27-20M1	U. S. Government (A.E.C., well 7)	526	321	293-321	Basalt	6/15/51	--	46	--	36	9.9	17
11/27-26D1	U. S. Government (A.E.C., well 6)	506	148	116-135	Gravel, sand	5/16/51	--	31	--	39	11	29
11/28-17D1	U. S. Government (A.E.C., well 8)	475	148	107-141	Gravel, sand	5/15/51	--	31	--	36	10	16
11/28-29N1	U. S. Government (A.E.C., well 11)	433	110	69-108	Gravel, sand	9/12/51	--	24	--	29	7.6	20
12/25-3D2	U. S. Government (A.E.C.)	646	307	244-256	Silt, sand, gravel	2/5/53	--	4.3	.01	22	6.1	14
12/25-29 NE 1/4s	U. S. Government (A.E.C.) (Rattlesnake Spring)	--	--	--	--	9/12/60	--	36	.03	22	10	7.2
12/26-25Q1	U. S. Government (A.E.C.)	549	203	169-182	Sand, gravel	8/19/53	--	20	--	34	9.6	16
12/28-18D1	U. S. Government (A.E.C., well 10)	498	164	117-133	Sand, silt, gravel	9/12/51	--	10	--	28	8.8	17
12/28-31H1	U. S. Government (A.E.C.)	433	105	65-77	Sand, gravel	2/6/53 6/10/53	-- --	30 19	.02 --	42 47	10 9.5	13 14
13/24-25E1	U. S. Government (A.E.C.)	924	777	625-777	Basalt	11/30/51	75	65	.02t	19	12	27
13/24-26G1	U. S. Government (A.E.C.)	--	705	695-705	Basalt	12/1/51	68	60	.06t	20	12	27

Parts per million											Specific conductance (Micromhos at 25°C)	pH	Color	Sampling site number
Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids: Calculated	Dissolved solids: Residue on evap. at 180°C	Hardness (as $CaCO_3$)				
BENTON COUNTY														
12	187	0	4.8	6.5	.6	.2	.11	237	229	56	326	7.7	0	20
--	222	0	--	--	--	--	--	--	--	68	376	7.9	--	
9.8	221	0	0.1	11	0.9	0.2	0.08	258	248	68	388	7.5	0	21
--	214	0	--	--	--	--	--	--	--	67	370	7.8	--	
10	202	0	.6	9.5	.7	.1	.09	236	236	67	336	7.8	5	22
4.1	137	0	9.1	1.2	.2	.2	.16	151	159	103	238	7.9	0	23
--	111	0	--	--	--	--	--	--	--	91	217	7.7	--	
4.8	176	0	43	7.5	.2	4.5	--	270	262	182	397	7.7	5	24
4.8	58	16	2.1	10	1.0	.3	--	119	130	39	206	9.2	5	25
4.6	126	0	20	5.9	.4	1.8	--	168	165	103	258	8.0	20	26
4.6	143	0	22	4.5	.4	1.7	--	202	195	116	270	8.2	20	27
8.0	147	0	33	8.0	.2	5.8	--	212	203	126	321	7.9	5	28
6.1	151	0	40	6.5	.3	5.5	--	223	220	134	343	7.9	5	29
10	162	0	40	6.1	.3	.1	--	245	238	130	343	7.9	5	30
9.1	199	0	15	26	1.0	1.0	--	260	252	143	418	7.4	5	31
6.9	158	0	33	7.0	.4	4.3	--	222	224	131	338	7.5	5	32
7.2	136	0	32	6.0	.5	.8	--	194	187	104	281	8.0	5	33
3.9	80	0	31	11	.3	1.4	--	133	136	80	182	8.3	4	34
1.7	114	0	11	2.8	.3	4.5	--	152	154	96	221	7.8	5	35
6.8	150	0	32	7.2	.1	.8	--	200	194	124	318	8.2	5	36
7.7	145	0	20	6.8	.3	.3	--	170	164	106	284	7.8	5	37
4.8	149	0	35	8.4	.3	16	--	233	233	146	351	7.8	3	38
5.2	158	0	34	11	.3	14	--	232	244	156	374	7.6	0	
8.5	189	0	1.8	5.8	.5	.1	--	233	215	97	291	7.8	5	39
6.7	193	0	1.5	5.5	.5	.0	--	228	218	99	292	7.8	5	40

TABLE 25.--Water-quality data from selected wells in the study area, 1939-61--Continued

Well location code	Owner	Approx. altitude above sea level (in feet)	Well depth (in feet)	Depth of water-bearing interval (in feet)	Water-bearing material	Sample collection date	Temperature (°F)	Parts per million				
								Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)
BENTON COUNTY -- Continued												
13/24-36D1	U. S. Government (A.E.C.)	909	1,092	936- 1,092	Basalt	11/29/51	74	64	.03	18	11	29
13/25-1N2	U. S. Government (A.E.C.)	420	790	764-769	Basalt	9/21/53	--	39	--	19	11	22
13/25-7M1	U. S. Government (A.E.C.)	450	93	62-93	Gravel	9/2/53	60	25	.07t	26	6.7	3.5
13/25-30G1	U. S. Government (A.E.C.)	831	1,110	700- 1,110	Basalt	12/1/51	82	62	.02t	17	9.4	30
						9/2/53	87	64	.08	18	10	30
						10/28/54	84	67	.04	17	9.4	30
						10/24/56	70	62	.06	17	9.3	30
13/26-5D2	U. S. Government (A.E.C.)	465	170	126-139, 154-164	Gravel, sand	10/3/52	62	34	0.76t	31	9.7	9.3
13/26-13R1	U. S. Government (A.E.C.)	--	64	--	--	3/31/54	64	--	--	--	--	--
13/26-13R2	U. S. Government (A.E.C.)	420	68	33-63	Gravel	4/6/54	64	39	.05t	23	10	23
13/27-16G1	U. S. Government (A.E.C.)	405	84	53-75	Gravel	10/25/56	58	36	.05	77	20	34
YAKIMA COUNTY												
9/22-12H	A. C. Pride	--	100	96-100?	Gravel?	5/5/61	61	57	.01	48	14	17
10/20-3N2	City of Toppenish (well 2)	--	160	--	Gravel	1/26/39	57	32	.05	22	7.9	6.8
10/20-9A	City of Toppenish (well 6)	--	863	792-863	Sand, gravel	10/19/59	69	68	.08	13	2.2	19
						5/19/60	60	--	--	--	--	--
12/16-13D1	Herke Brothers	1,800	146	130-140	Basalt	8/30/51	--	54	.06	16	9.7	10
12/16-17J1	S. A. Mondor	2,050	11	--	Gravel	8/30/51	--	47	.11	10	5.8	5.6
12/17-16D3	Oral Brown	1,510	384	325-384	Basalt	10/21/59	60	53	.05	13	5.3	17
						5/19/60	--	--	--	--	--	--
12/17-16R1	B. S. Borton & Sons	1,550	1,078	1,035- 1,078	Basalt	4/18/52	63	38	.27	12	6.6	7.2
12/18-5G2	H. E. Anderson	1,190	10	3-10	Sand, gravel	8/29/51	--	52	.03	23	12	19
12/18-5J1	Joel Richwine	1,170	18	17-18	Sand	8/29/51	--	51	.02	24	14	16
12/18-11E1	S. H. Schreiner	1,170	213	205-213	Sand, gravel	8/30/51	--	61	.03	30	16	9.6
12/23-13B	Woodrow Wright	--	153	--	--	5/5/61	61	54	.20t	28	11	11
13/19-31J1	Yakima Farmers Supply Company	1,015	84	75-84?	Sand, gravel	8/29/51	--	39	.02	34	11	12
14/18-3N1s	H. E. Mulford (spring)	--	--	--	--	11/19/48	59	66	.05	32	19	13
14/18-12D	John Knopp	--	124	100-124?	Gravel	11/22/48	--	58	.26	42	19	23
14/18-13R2	B. Barnheart	--	60	--	--	11/19/48	--	53	.03	60	26	62

Parts per million											Specific conductance (Micromhos at 25°C)	pH	Color	Sampling site number
Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids: Calculated	Dissolved solids: Residue on evap. at 180°C	Hardness (as $CaCO_3$)				
BENTON COUNTY -- Continued														
6.7	184	0	1.8	5.4	.6	.1	--	227	213	90	277	7.7	5	41
11	143	0	23	8.0	.4	.0	--	203	216	93	296	7.6	0	42
1.8	100	0	15	1.5	.2	1.1	--	130	128	92	191	7.5	5	43
9.9	181	0	1.6	4.8	.6	.1	--	225	213	81	277	7.8	5	44
6.3	180	0	2.1	5.2	.7	.2	--	225	216	86	289	7.7	5	
7.7	178	0	2.1	5.1	.6	.0	--	227	214	81	291	7.4	5	
8.2	178	0	.4	4.8	.7	.2	--	221	207	81	286	8.0	0	
4.9	144	0	16	2.7	0.2	2.1	--	181	176	117	266	7.8	2	45
--	--	--	--	2.0	--	--	--	--	--	104	283	--	--	46
4.8	150	0	18	3.0	.5	4.5	--	200	202	98	292	8.2	0	47
6.6	239	0	113	22	.3	6.0	--	433	431	274	647	7.7	0	48
YAKIMA COUNTY														
7.4	190	0	44	11	.4	2.3	.07	295	315	179	425	7.9	5	543
1.9	113	0	5.1	2.7	.0	2.0	--	136	136	87	--	--	--	544
4.1	105	0	.3	1.0	.6	.2	--	160	158	42	171	7.8	0	545
--	105	0	--	--	--	--	--	--	--	42	173	7.7	--	
1.8	116	0	4.4	3.0	.2	1.6	--	158	155	80	194	7.7	5	546
3.7	74	0	2.4	.7	.2	1.0	--	113	111	49	--	7.3	10	547
3.2	113	0	.4	1.8	.5	.1	--	150	149	54	185	7.9	0	548
--	111	0	--	--	--	--	--	--	--	54	179	8.2	--	
3.1	85	0	4.4	1.2	.3	.2	--	115	114	57	136	7.9	8	549
5.3	160	0	8.0	11	.2	1.5	--	211	209	107	285	7.2	25	550
5.6	180	0	5.1	2.5	.3	1.8	--	209	205	117	284	7.2	25	551
3.2	133	0	29	18	.3	2.7	--	235	251	141	315	7.3	5	552
2.9	131	0	17	6.5	.6	4.1	.15	200	217	114	274	7.8	5	553
4.8	116	0	21	26	.3	6.0	--	211	221	130	320	7.3	15	554
5.8	193	0	18	9.1	.2	3.1	--	261	262	158	370	7.6	--	555
2.9	210	0	21	20	.4	16	--	306	309	183	437	8.3	--	556
4.8	442	0	20	5.2	.4	6.2	--	455	445	256	676	7.7	--	557

TABLE 25.--Water-quality data from selected wells in the study area, 1939-61--Continued

Well location code	Owner	Approx. altitude above sea level (in feet)	Well depth (in feet)	Depth of water-bearing interval (in feet)	Water-bearing material	Sample collection date	Temperature (°F)	Parts per million				
								Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)
YAKIMA COUNTY -- Continued												
14/19-19G	H. B. Larson	--	134	117-134?	Sand?	5/5/61	54	57	.00	84	31	58
14/19-28B?	U. S. Government (U.S.A.)	--	600?	--	Basalt	4/20/51	70	56	.04	15	11	19
						9/29/53	70	59	.15	16	11	19
						11/29/54	64	53	.06	16	11	19
						10/5/55	68	50	.08	16	9.4	19
						10/25/56	67	49	.06	15	11	19
						1/6/58	68	--	.03	16	10	18
						3/30/59	68	51	.05	17	11	18
						9/14/60	68	52	.04	15	11	19
14/19-28F?	U. S. Government (U.S.A.)	--	548	--	Basalt?	4/20/51	65	50	.05	35	19	32
						9/18/52	63	50	.12	25	15	27
						9/29/53	61	53	.20	36	18	32
						11/29/54	60	48	.12	33	17	31
						10/5/55	59	45	.08	34	17	30
14/19-28 NE 1/4	U. S. Government (U.S.A.)	--	590	--	Basalt	9/17/52	66	52	.11	17	10	22
						11/29/54	62	49	.86	17	10	21
						10/5/55	63	49	.27	17	9.3	20
15/17-13C1	G. E. Cameron	--	385	360-385?	Sand, basalt?	11/22/48	55	42	.13	12	7.3	23
15/18-33P1	R. H. Kershaw	--	400	--	Sand	11/22/48	--	59	.04	23	12	13
16/14-1J1	U. S. Government (U.S.F.S.)	--	200	--	Basalt	5/4/59	--	24	.79	84	10	45
16/14-1R1	U. S. Government (U.S.F.S.)	--	41	36-41	Sand, gravel	11/4/59	--	25	.03	26	5.2	7.9
16/17-19E1	G. S. Green	--	115	--	Sand	11/19/48	--	61	0.08	16	9.2	8.8
16/17-32J1s	Malotte (spring)	--	--	--	--	11/19/48	62	53	.06	12	6.6	17

Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids: Calculated	Dissolved solids: Residue on evap. at 180°C	Hardness (as $CaCO_3$)	Specific conductance (Micromhos at 25°C)	pH	Color	Sampling site number
Parts per million														
YAKIMA COUNTY -- Continued														
6.3	459	0	60	13	.6	7.0	.83	544	559	338	823	7.9	5	558
6.2	151	0	.7	4.1	.5	.0	--	187	179	83	235	8.0	4	559
3.6	149	0	.7	3.8	.5	.1	--	187	176	85	244	7.8	4	
3.6	148	0	1.8	4.4	.5	.7	--	183	172	85	235	7.6	7	
4.0	147	0	.2	3.5	.5	.0	--	175	173	79	238	8.1	0	
3.5	149	0	.7	4.0	.4	.2	--	176	174	83	234	7.8	0	
3.6	147	0	.3	4.0	.5	.0	--	--	171	81	236	7.8	0	
4.0	146	0	.5	3.5	.6	.3	--	178	174	87	239	7.8	5	
3.7	147	0	.8	4.0	.6	.2	--	178	174	82	220	7.9	0	
7.2	246	0	23	9.2	.6	2.0	--	299	284	165	429	7.7	3	560
4.1	198	0	12	6.4	.5	.5	--	238	231	124	344	7.6	2	
4.5	239	0	23	8.8	.6	3.8	--	297	293	164	441	7.5	8	
4.4	218	0	21	9.2	.5	8.5	--	280	272	152	425	7.3	6	
4.4	222	0	21	8.2	.6	8.1	--	277	280	155	432	7.7	0	
4.5	154	0	1.2	4.3	.5	.2	--	188	178	84	246	7.9	3	561
4.3	154	0	1.4	4.9	.5	.7	--	185	183	84	249	7.7	8	
4.6	151	0	.2	4.5	.5	.2	--	179	175	81	247	7.7	0	
5.0	124	0	9.8	2.0	.4	.1	--	163	167	60	213	7.2	--	562
4.0	146	0	10	5.2	.2	2.1	--	200	205	107	266	7.5	--	563
.7	200	0	17	106	.1	.0	--	386	416	250	701	7.1	10	564
1.3	98	0	18	3.5	.1	1.2	--	136	140	86	208	7.0	0	565
4.8	116	0	3.3	2.4	0.2	0.7	--	164	162	78	202	7.4	--	566
4.3	104	0	9.2	1.8	.4	.3	--	156	158	57	185	7.7	--	567

TABLE 26.--Water-quality data from selected wells, April 1976-April 1977

Benton County

Local identifier	Station number	Latitude	Longitude	Seq. No.	Date of sample	Time	Depth to top of water-bearing zone (ft)	Depth to bottom of sample interval (ft)	Depth to top of sample interval (ft)
10/28E-11C03	462224119162601	46 22 24	119 16 26	01	77-04-25	1130	--	70	25
10/28E-11F03	462206119162301	46 22 06	119 16 23	01	77-04-25	0945	--	--	--
10/28E-14D01	462126119164701	46 21 26	119 16 47	01	76-04-05	0930	42	79	59
11/27E-02Q01	462732119233501	46 27 32	119 23 35	01	76-04-05	1330	126	166	126
11/27E-26C01	462500119240101	46 25 00	119 24 01	01	77-04-25	1405	--	132	117
11/28E-09R01	462648119180701	46 26 48	119 18 07	01	77-04-25	1520	--	--	--
11/28E-23D01	462552119164101	46 25 52	119 16 41	01	76-04-05	1130	47	200	47
11/28E-29P01	462420119201201	46 24 20	119 20 12	01	77-04-25	1240	--	88	68
12/25E-11R01	463212119381301	46 32 12	119 38 13	01	77-04-28	1130	--	279	180
12/26E-04N01	463300119341401	46 33 00	119 34 14	01	77-04-27	1525	--	374	359
12/26E-07B01	463242119361901	46 32 42	119 36 19	01	76-04-08	1335	256	380	256
12/26E-07Q01	463207119361601	46 32 07	119 36 16	01	76-04-08	1230	240	320	255
12/26E-12H01	463228119294701	46 32 28	119 29 47	01	76-04-08	1020	286	495	286
12/26E-13A01	463200119293201	46 32 00	119 29 32	01	76-04-08	0910	136	--	--
12/26E-13H01	463146119293901	46 31 46	119 29 39	01	76-04-06	1530	112	119	112
					77-04-26	1505	--	119	109
12/26E-15C01	463155119325201	46 31 55	119 32 52	01	76-04-09	1020	312	440	315
					77-04-28	1010	--	440	315
12/26E-18E01	463143119364501	46 31 43	119 36 45	01	76-04-08	1130	210	485	210
12/26E-25Q01	462928119295101	46 29 28	119 29 51	01	77-04-28	1345	--	185	127
12/27E-03N01	462741119253101	46 27 41	119 25 31	01	76-04-07	1510	110	160	110
12/27E-05Q01	463301119273201	46 33 01	119 27 32	01	77-04-26	1330	--	185	115
12/27E-15G01	463138119244801	46 31 38	119 24 48	01	76-04-06	1220	116	169	116
					77-04-26	1205	--	169	111
12/27E-20P01	463019119273601	46 29 29	119 27 36	01	76-04-06	1345	121	164	129
12/27E-24M01	463035119230401	46 30 35	119 23 04	01	76-04-06	1050	45	150	45
12/27E-27R01	462937119242501	46 29 37	119 24 25	01	76-04-06	0930	105	155	105
12/27E-33J01	462856119255101	46 28 56	119 25 51	01	76-04-05	1605	123	150	123
12/28E-18D01	463152119215001	46 31 52	119 21 50	01	76-04-07	1205	116	135	120
12/28E-19F01	463049119213201	46 30 49	119 21 32	01	76-04-07	1045	73	145	80
					77-04-26	1030	--	145	80
12/28E-28Q01	462940119282501	46 29 40	119 18 25	01	77-04-26	0905	--	307	297
13/25E-11H01	463743119384401	46 37 43	119 38 44	01	77-04-27	1215	--	102	49
13/25E-30G01	463510119441301	46 35 10	119 44 13	01	77-04-27	1320	--	280	165
13/26E-31K01	463414119362501	46 34 14	119 36 25	01	77-04-27	1420	--	302	251
13/26E-34C01	463432119325001	46 34 32	119 32 50	01	76-04-08	1540	124	135	125
					77-04-27	0945	--	135	125
13/26E-34D01	463425119330901	46 34 25	119 33 09	01	76-04-08	1445	148	161	148
13/27E-31N01	463349119293601	46 33 49	119 29 36	01	77-04-28	1235	--	180	156
14/26E-28G01	464024119340001	46 40 24	119 34 00	01	77-04-27	1100	--	78	50

TABLE 26.--Water-quality data from selected wells, April 1976-April 1977--Continued

Benton County--Continued

Local identifier	Date of sample	Elev. of land surface datum (ft. above msl)	Pump or flow period prior to sampling (min)	Specific conductance (micromhos)	Ph (units)	Temperature (°C)	Color (platinum-cobalt units)	Turbidity (JTU)	Hardness (Ca, Mg) (mg/L)	Noncarbonate hardness (mg/L)
10/28E-11C03	77-04-25	375	30	330	8.0	15.9	2	0	110	28
10/28E-11F03	77-04-25	378	40	302	7.5	17.5	1	1	96	6
10/28E-14D01	76-04-05	388	30	395	7.8	16.7	0	0	150	0
11/27E-02Q01	76-04-05	522	25	436	8.0	18.4	5	10	150	29
11/27E-26C01	77-04-25	504	30	420	7.8	18.0	1	0	140	0
11/28E-09R01	77-04-25	440	30	352	8.0	17.0	1	0	140	17
11/28E-23D01	76-04-05	398	25	223	9.4	16.8	2	4	78	0
11/28E-29P01	77-04-25	435	30	395	7.9	17.3	2	2	150	25
12/25E-11R01	77-04-28	661	30	241	8.0	15.0	1	1	74	0
12/26E-04N01	77-04-27	748	30	405	7.7	21.4	1	0	170	30
12/26E-07B01	76-04-08	711	25	850	7.6	20.7	1	1	350	220
12/26E-07Q01	76-04-08	694	25	489	7.7	20.4	2	10	190	0
12/26E-12H01	76-04-08	690	25	367	8.0	21.0	0	2	95	0
12/26E-13A01	76-04-08	540	25	433	7.9	20.6	0	1	140	25
12/26E-13H01	76-04-06	516	30	425	7.9	19.6	5	5	110	0
	77-04-26	516	30	420	7.8	19.8	2	4	140	35
12/26E-15C01	76-04-09	717	25	416	7.8	21.7	4	4	150	0
	77-04-28	717	30	420	7.7	21.5	1	1	170	1
12/26E-18E01	76-04-08	668	25	297	7.8	20.5	10	28	120	5
12/26E-25Q01	77-04-28	573	30	380	7.8	18.1	1	0	150	46
12/27E-03N01	76-04-07	509	25	430	8.0	18.5	0	1	160	38
12/27E-05Q01	77-04-26	518	30	324	8.0	18.1	2	2	51	0
12/27E-15G01	76-04-06	518	25	515	8.0	18.2	1	1	190	73
	77-04-26	518	30	522	7.9	18.4	1	1	180	75
12/27E-20P01	76-04-06	524	25	455	7.9	19.4	0	0	170	36
12/27E-24M01	76-04-06	443	25	461	8.0	17.2	0	0	170	45
12/27E-27R01	76-04-06	506	25	460	7.9	17.5	0	0	180	62
12/27E-33J01	76-04-05	524	30	445	7.9	18.5	1	0	160	40
12/28E-18D01	76-04-07	500	25	362	8.0	17.3	0	1	140	8
12/28E-19F01	76-04-07	466	25	468	8.0	16.3	0	1	180	58
	77-04-26	466	30	485	7.8	16.5	1	0	190	72
12/28E-28Q01	77-04-26	467	30	298	8.0	19.3	1	1	130	12
13/25E-11H01	77-04-27	472	30	310	7.6	39.1	1	0	130	34
13/25E-30G01	77-04-27	837	30	285	8.0	26.8	1	0	80	0
13/26E-31K01	77-04-27	688	30	317	7.9	19.3	1	3	130	35
13/26E-34C01	76-04-08	530	25	580	8.2	17.0	3	4	190	99
	77-04-27	530	30	635	8.2	17.4	1	2	220	140
13/26E-34D01	76-04-08	553	25	927	7.6	16.4	1	0	320	200
13/27E-31N01	77-04-28	577	30	285	8.0	18.8	2	2	110	10
14/26E-28G01	77-04-27	458	30	194	7.9	20.7	1	0	87	25

TABLE 26.--Water-quality data from selected wells, April 1976-April 1977--Continued

Benton County--Continued

Local identifier	Date of sample	Dissolved calcium (Ca) (mg/L)	Dissolved magnesium (Mg) (mg/L)	Dissolved sodium (Na) (mg/L)	Dissolved potassium (K) (mg/L)	Bicarbonate (HCO_3) (mg/L)	Carbonate (CO_3) (mg/L)	Alkalinity as $CaCO_3$ (mg/L)	Carbon dioxide (CO_2) (mg/L)	Dissolved sulfate (SO_4) (mg/L)
10/28E-11C03	77-04-25	33	5.5	21	3.1	94	0	77	1.5	25
10/28E-11F03	77-04-25	29	5.8	22	3.9	110	0	90	5.6	27
10/28E-14D01	76-04-05	44	8.8	21	6.5	191	0	157	4.8	29
11/27E-02Q01	76-04-05	44	9.9	21	7.3	148	0	121	2.4	61
11/27E-26C01	77-04-25	41	9.8	32	7.6	200	0	160	5.1	12
11/28E-09R01	77-04-25	38	11	17	6.0	150	0	120	2.4	40
11/28E-23D01	76-04-05	26	3.1	17	7.0	53	23	82	.1	25
11/28E-29P01	77-04-25	43	9.8	23	5.6	150	0	120	3.0	43
12/25E-11R01	77-04-28	19	6.4	23	3.2	120	0	98	1.9	13
12/26E-04N01	77-04-27	43	15	17	5.3	170	0	140	5.4	39
12/26E-07B01	76-04-08	92	29	21	7.3	154	0	126	6.2	33
12/26E-07Q01	76-04-08	51	16	28	6.6	242	0	198	7.7	30
12/26E-12H01	76-04-08	25	7.9	41	8.4	184	0	151	2.9	45
12/26E-13A01	76-04-08	37	11	32	7.3	138	0	113	2.8	54
12/26E-13H01	76-04-06	38	2.9	29	7.0	143	0	117	2.9	52
	77-04-26	37	12	29	5.3	130	0	110	3.3	55
12/26E-15C01	76-04-09	41	12	25	6.1	209	0	171	5.3	41
	77-04-28	46	14	24	5.7	210	0	170	6.7	34
12/26E-18E01	76-04-08	28	12	16	4.3	140	0	115	3.6	27
12/26E-25Q01	77-04-28	43	11	18	5.7	130	0	110	3.3	67
12/27E-03N01	76-04-07	46	12	22	7.3	154	0	126	2.5	66
12/27E-05Q01	77-04-26	14	3.9	52	7.5	200	0	160	3.2	2.7
12/27E-15G01	76-04-06	53	13	29	7.2	138	0	113	2.2	65
	77-04-26	51	13	29	6.5	130	0	110	2.6	64
12/27E-20P01	76-04-06	47	13	25	7.6	164	0	135	3.3	67
12/27E-24M01	76-04-06	48	11	23	7.1	146	0	120	2.3	55
12/27E-27R01	76-04-06	53	11	20	8.0	141	0	116	2.8	53
12/27E-33J01	76-04-05	46	12	22	7.3	151	0	124	3.0	62
12/28E-18D01	76-04-07	40	9.5	19	5.5	160	0	131	2.6	33
12/28E-19F01	76-04-07	54	11	19	6.9	149	0	122	2.4	50
	77-04-26	55	12	20	6.3	140	0	110	3.6	52
12/28E-28Q01	77-04-26	35	9.5	13	5.9	140	0	110	2.2	24
13/25E-11H01	77-04-27	43	5.9	10	4.9	120	0	98	4.8	42
13/25E-30G01	77-04-27	17	9.2	29	7.8	170	0	140	2.7	1.4
13/26E-31K01	77-04-27	32	13	10	3.6	120	0	98	2.4	24
13/26E-34C01	76-04-08	57	12	39	10	113	0	93	1.1	150
	77-04-27	63	15	43	11	100	0	82	1.0	190
13/26E-34D01	76-04-08	85	25	53	9.7	138	0	113	5.5	99
13/27E-31N01	77-04-28	25	11	18	4.5	120	0	98	1.9	29
14/26E-28G01	77-04-27	27	4.6	2.9	2.4	75	0	62	1.5	16

TABLE 26.--Water-quality data from selected wells, April 1976-April 1977--Continued

Benton County--Continued

Local identifier	Date of sample	Dis-solved chlo-ride (Cl) (mg/L)	Dis-solved fluo-ride (F) (mg/L)	Bromide (Br) (mg/L)	Iodide (I) (mg/L)	Dis-solved silica (SiO_2) (mg/L)	Dis-solved solids (resi-due at 180°C) (mg/L)	Total filt-rable residue (mg/L)	Dis-solved solids (sum of consti-tuents) (mg/L)	Dis-solved solids (tons per ac-ft)
10/28E-11C03	77-04-25	31	0.5	0.1	0.00	13	190	270	179	0.26
10/28E-11F03	77-04-25	12	.9	7.0	.00	19	185	280	182	.25
10/28E-14D01	76-04-05	8.1	.4	.1	.00	35	259	430	247	.35
11/27E-02Q01	76-04-05	11	.4	.1	.00	35	284	430	263	.39
11/27E-26C01	77-04-25	22	1.3	.1	.00	38	255	440	263	.35
11/28E-09R01	77-04-25	7.1	.4	.1	.00	34	227	370	228	.31
11/28E-23D01	76-04-05	3.7	.5	.1	.00	31	174	280	163	.24
11/28E-29P01	77-04-25	18	.6	.2	.00	32	251	380	250	.34
12/25E-11R01	77-04-28	6.9	.5	.0	.00	36	161	280	168	.22
12/26E-04N01	77-04-27	8.3	.4	.1	.00	50	269	460	263	.37
12/26E-07B01	76-04-08	32	.4	.2	.01	47	614	1,100	338	.84
12/26E-07Q01	76-04-08	16	.4	.2	.01	39	317	640	307	.43
12/26E-12H01	76-04-08	3.6	.6	.0	.01	48	252	460	270	.34
12/26E-13A01	76-04-08	11	.7	.0	.00	42	297	540	263	.40
12/26E-13H01	76-04-06	11	.7	.0	.00	40	295	500	251	.40
	77-04-26	12	.7	.1	.00	39	278	450	255	.38
12/26E-15C01	76-04-09	7.3	.4	.0	.00	40	272	500	276	.37
	77-04-28	7.7	.5	.1	.00	44	274	490	281	.37
12/26E-18E01	76-04-08	16	.4	.1	.01	30	196	420	203	.27
12/26E-25Q01	77-04-28	6.9	.5	.1	.00	28	248	400	245	.34
12/27E-03N01	76-04-07	8.5	.4	.1	.00	35	291	530	273	.40
12/27E-05Q01	77-04-26	3.6	.9	.0	.01	45	221	370	229	.30
12/27E-15G01	76-04-06	17	.4	.0	.01	31	351	510	284	.48
	77-04-26	28	.4	.1	.00	31	339	480	288	.46
12/27E-20P01	76-04-06	9.2	.6	.1	.00	42	317	490	292	.43
12/27E-24M01	76-04-06	13	.4	.0	.00	36	319	480	266	.43
12/27E-27R01	76-04-06	14	.4	.1	.00	36	316	470	265	.43
12/27E-33J01	76-04-05	9.8	.5	.1	.00	36	299	460	270	.41
12/28E-18D01	76-04-07	8.7	.4	.1	.00	31	235	460	226	.32
12/28E-19F01	76-04-07	13	.3	.0	.00	34	314	550	262	.43
	77-04-26	12	.3	.1	.00	36	313	480	264	.43
12/28E-28Q01	77-04-26	6.4	.3	.1	.00	32	193	310	196	.26
13/25E-11H01	77-04-27	6.6	.2	.1	.00	46	221	360	219	.30
13/25E-30G01	77-04-27	4.5	.8	.1	.01	55	201	380	209	.27
13/26E-31K01	77-04-27	11	.5	.1	.00	39	208	370	193	.28
13/26E-34C01	76-04-08	23	.5	.4	.00	31	396	600	379	.54
	77-04-27	23	.5	.2	.00	32	433	600	428	.59
13/26E-34D01	76-04-08	9.2	.9	.1	.01	38	644	1,000	388	.88
13/27E-31N01	77-04-28	3.8	.6	.0	.00	47	200	350	199	.27
14/26E-28G01	77-04-27	2.5	.1	.0	.00	17	121	210	110	.16

TABLE 26.--Water-quality data from selected wells, April 1976-April 1977--Continued

Benton County--Continued

Local identifier	Date of sample	Total nitrate (N) (mg/L)	Total nitrite (N) (mg/L)	Total ammonia nitrogen (N) (mg/L)	Total phosphorus (P) (mg/L)	Dissolved aluminum (Al) (ug/L)	Dissolved arsenic (As) (ug/L)	Dissolved barium (Ba) (ug/L)	Dissolved beryllium (Be) (ug/L)	Dissolved bismuth (Bi) (ug/L)
10/28E-11C03	77-04-25	4.1	0.00	0.03	0.07	20	2	0	0	<450
10/28E-11F03	77-04-25	3.3	.01	.03	.08	20	1	0	0	<450
10/28E-14D01	76-04-05	3.2	.00	.01	.04	10	6	60	<2	<8
11/27E-02Q01	76-04-05	6.7	.00	.09	.04	20	8	40	<2	<8
11/27E-26C01	77-04-25	.96	.00	.02	.04	10	9	0	10	<450
11/28E-09R01	77-04-25	1.9	.00	.02	.02	10	7	0	10	<450
11/28E-23D01	76-04-05	3.1	.13	.11	.04	40	16	20	<1	<5
11/28E-29P01	77-04-25	1.9	.00	.04	.05	0	5	0	10	<450
12/25E-11R01	77-04-28	.24	.00	.04	.07	0	3	0	0	<450
12/26E-04N01	77-04-27	4.4	.00	.04	.02	0	2	0	0	<450
12/26E-07B01	76-04-08	58	.00	.04	.03	10	2	100	<4	<15
12/26E-07Q01	76-04-08	5.2	.00	.04	.05	10	1	50	<3	<10
12/26E-12H01	76-04-08	.21	.00	.04	.03	10	6	40	<2	<8
12/26E-13A01	76-04-08	10	.00	.04	.03	20	4	50	<2	<9
12/26E-13H01	76-04-06	7.8	.01	.08	.02	20	1	40	<2	<9
	77-04-26	7.1	.01	.05	.02	0	1	0	10	<450
12/26E-15C01	76-04-09	2.3	.00	.06	.03	10	2	70	<2	<9
	77-04-28	2.5	.00	.04	.03	0	2	100	0	<450
12/26E-18E01	76-04-08	1.2	.06	.32	.02	10	0	20	<2	<7
12/26E-25Q01	77-04-28	2.3	.00	.04	.02	0	2	0	0	<450
12/27E-03N01	76-04-07	5.2	.00	.04	.03	20	7	40	<2	<9
12/27E-05Q01	77-04-26	.01	.00	.04	.03	10	9	0	0	<450
12/27E-15G01	76-04-06	14	.00	.02	.02	10	2	50	<2	<10
	77-04-26	16	.00	.04	.02	0	3	100	0	<450
12/27E-20P01	76-04-06	6.2	.00	.02	.03	10	4	50	<2	<9
12/27E-24M01	76-04-06	8.9	.00	.02	.02	10	7	70	<2	<9
12/27E-27R01	76-04-06	12	.00	.02	.02	10	13	90	<2	<9
12/27E-33J01	76-04-05	6.6	.00	.01	.03	10	18	60	<2	<9
12/28E-18D01	76-04-07	4.4	.00	.02	.02	30	4	70	<1	<7
12/28E-19F01	76-04-07	13	.00	.02	.02	20	5	60	<2	<9
	77-04-26	13	.01	.04	.02	0	6	100	0	<450
12/28E-28Q01	77-04-26	2.5	.02	.05	.02	0	5	100	10	<450
13/25E-11H01	77-04-27	1.1	.00	.04	.02	0	2	0	0	<450
13/25E-30G01	77-04-27	.00	.00	.04	.01	0	0	0	0	<450
13/26E-31K01	77-04-27	5.1	.00	.04	.01	0	1	0	0	<450
13/26E-34C01	76-04-08	2.8	.01	.09	.02	10	4	40	<3	<10
	77-04-27	3.7	.01	.08	.01	0	3	100	10	<450
13/26E-34D01	76-04-08	61	.01	.04	.02	50	4	90	<3	<15
13/27E-31N01	77-04-28	3.3	.01	.04	.01	0	2	0	0	<450
14/26E-28G01	77-04-27	4.9	.00	.04	.06	0	2	0	10	<450

TABLE 26.--Water-quality data from selected wells, April 1976-April 1977--Continued

Benton County--Continued

Local identifier	Date of sample	Dis-solved boron (B) (ug/L)	Dis-solved cad-mium (Cd) (ug/L)	Dis-solved chro-mium (Cr) (ug/L)	Hexa-valent chro-mium (Cr_6) (ug/L)	Dis-solved cobalt (Co) (ug/L)	Dis-solved copper (Cu) (ug/L)	Dis-solved gallium (Ga) (ug/L)	Dis-solved ger-manium (Ge) (ug/L)	Dis-solved iron (Fe) (ug/L)
10/28E-11C03	77-04-25	20	0	0	0	0	1	<6	<10	30
10/28E-11F03	77-04-25	80	0	10	0	<2	1	10	<10	30
10/28E-14D01	76-04-05	30	1	<6	1	<6	0	<3	<6	10
11/27E-02Q01	76-04-05	20	0	6	6	6	0	<3	<6	10
11/27E-26C01	77-04-25	150	0	0	0	0	0	10	<10	20
11/28E-09R01	77-04-25	10	0	0	0	0	0	<6	<10	40
11/28E-23D01	76-04-05	20	0	<4	0	<4	0	<2	<4	20
11/28E-29P01	77-04-25	40	0	0	1	0	0	10	<10	20
12/25E-11R01	77-04-28	30	0	0	0	0	0	7	<10	30
12/26E-04N01	77-04-27	20	0	0	0	0	0	<6	<10	30
12/26E-07B01	76-04-08	20	0	<10	0	<10	0	<5	<10	10
12/26E-07Q01	76-04-08	20	0	<1	2	<8	1	<3	<8	10
12/26E-12H01	76-04-08	30	0	<6	0	<6	0	<3	<6	30
12/26E-13A01	76-04-08	30	1	<7	0	<7	2	<3	<7	30
12/26E-13H01	76-04-06	40	0	<6	0	<6	1	<3	<6	60
	77-04-26	30	0	0	0	0	0	<6	<10	120
12/26E-15C01	76-04-09	20	0	<7	1	<7	0	<3	<7	10
	77-04-28	20	0	0	0	0	0	7	<10	30
12/26E-18E01	76-04-08	20	0	<5	0	<5	0	<2	<5	140
12/26E-25Q01	77-04-28	10	0	0	0	0	0	9	<10	10
12/27E-03N01	76-04-07	30	0	<6	4	<6	0	<3	<6	10
12/27E-05Q01	77-04-26	30	0	0	0	0	2	<6	<10	170
12/27E-15G01	76-04-06	30	0	<7	3	<7	0	<3	<7	30
	77-04-26	20	0	0	0	<2	1	10	<10	30
12/27E-20P01	76-04-06	40	0	<7	4	<7	0	<3	<7	30
12/27E-24M01	76-04-06	30	0	<7	5	<7	0	<3	<7	10
12/27E-27R01	76-04-06	30	0	<7	4	<7	0	<3	<7	20
12/27E-33J01	76-04-05	30	0	<6	6	<6	0	<3	<6	20
12/28E-18D01	76-04-07	20	0	<6	3	<6	10	<2	<7	10
12/28E-19F01	76-04-07	20	0	<7	3	<7	0	<3	<7	10
	77-04-26	20	0	0	4	0	0	20	<10	20
12/28E-28Q01	77-04-26	10	1	0	0	0	1	10	<10	20
13/25E-11H01	77-04-27	10	0	10	15	0	0	9	<10	30
13/25E-30G01	77-04-27	20	0	0	0	0	0	0	<10	120
13/26E-31K01	77-04-27	9	0	0	2	0	0	<6	<10	10
13/26E-34C01	76-04-08	20	0	<8	0	<8	0	<3	<8	20
	77-04-27	20	0	0	0	0	0	10	<10	10
13/26E-34D01	76-04-08	30	1	14	0	<10	33	<5	<20	120
13/27E-31N01	77-04-28	9	0	0	0	0	0	<6	<10	10
14/26E-28G01	77-04-27	10	0	0	0	0	0	<6	<10	30

TABLE 26.--Water-quality data from selected wells, April 1976-April 1977--Continued

Benton County--Continued

Local identifier	Date of sample	Ferrous iron (Fe) (ug/L)	Dis-solved lead (Pb) (ug/L)	Dis-solved lithium (Li) (ug/L)	Dis-solved man-ganese (Mn) (ug/L)	Dis-solved molyb-denum (Mo) (ug/L)	Dis-solved nickel (Ni) (ug/L)	Dis-solved sele-nium (Se) (ug/L)	Dis-solved silver (Ag) (ug/L)	Dis-solved stron-tium (Sr) (ug/L)
10/28E-11C03	77-04-25	20	0	0	4	25	2	0	0	140
10/28E-11F03	77-04-25	20	2	0	4	6	3	2	0	160
10/28E-14D01	76-04-05	0	7	0	<4	6	<6	0	<1	200
11/27E-02Q01	76-04-05	10	<6	0	10	10	<6	1	<1	200
11/27E-26C01	77-04-25	20	0	0	20	5	2	1	0	210
11/28E-09R01	77-04-25	20	0	10	0	6	3	2	0	220
11/28E-23D01	76-04-05	0	3	0	<2	20	<4	1	<1	130
11/28E-29P01	77-04-25	20	0	0	0	4	3	2	0	210
12/25E-11R01	77-04-28	30	0	10	0	7	2	0	0	100
12/26E-04N01	77-04-27	30	0	10	0	7	3	1	0	210
12/26E-07B01	76-04-08	0	<10	10	≤7	5	<10	5	<2	380
12/26E-07Q01	76-04-08	10	<8	0	110	30	<8	5	<1	220
12/26E-12H01	76-04-08	10	<6	<20	100	30	<6	1	<1	210
12/26E-13A01	76-04-08	20	<7	0	50	30	<7	1	<1	170
12/26E-13H01	76-04-06	40	<6	0	<4	20	<6	1	<1	170
	77-04-26	20	0	10	40	9	2	1	0	200
12/26E-15C01	76-04-09	10	<7	10	<4	30	<7	12	<1	170
	77-04-28	20	0	10	0	12	2	2	0	240
12/26E-18E01	76-04-08	70	<5	10	<3	10	<5	3	<1	110
12/26E-25Q01	77-04-28	10	0	10	0	3	2	5	0	240
12/27E-03N01	76-04-07	10	<6	0	<4	10	<6	6	<1	190
12/27E-05Q01	77-04-26	170	0	20	50	3	3	0	0	160
12/27E-15G01	76-04-06	10	<7	0	20	10	<7	1	<1	260
	77-04-26	30	2	10	20	3	3	1	0	290
12/27E-20P01	76-04-06	10	<7	0	<4	30	<7	2	<1	210
12/27E-24M01	76-04-06	0	<7	0	<4	10	<7	1	<1	230
12/27E-27R01	76-04-06	10	<7	10	<4	6	<7	1	<1	220
12/27E-33J01	76-04-05	10	<6	10	<4	20	<6	2	<1	200
12/28E-18D01	76-04-07	10	<6	10	<4	10	<5	2	<1	210
12/28E-19F01	76-04-07	10	<7	0	20	4	<7	2	<1	240
	77-04-26	20	2	10	8	1	2	1	0	280
12/28E-28Q01	77-04-26	20	0	0	20	2	2	2	0	200
13/25E-11H01	77-04-27	20	0	10	4	2	2	1	0	220
13/25E-30G01	77-04-27	60	0	20	60	0	2	0	0	90
13/26E-31K01	77-04-27	20	0	10	0	7	3	1	0	170
13/26E-34C01	76-04-08	10	<8	10	70	55	<8	11	<1	270
	77-04-27	10	0	10	70	18	4	15	0	320
13/26E-34D01	76-04-08	30	<10	10	<7	20	<10	6	<1	390
13/27E-31N01	77-04-28	20	2	10	40	7	2	0	0	210
14/26E-28G01	77-04-27	20	2	0	0	0	3	0	0	140

TABLE 26.--Water-quality data from selected wells, April 1976-April 1977--Continued

Benton County--Continued

Local identifier	Date of sample	Dis-solved tin (Sn) (ug/L)	Dis-solved ti-tanium (Ti) (ug/L)	Dis-solved vana-dium (V) (ug/L)	Dis-solved zinc (Zn) (ug/L)	Dis-solved zir-conium (Zr) (ug/L)	Dis-solved gross alpha as U-Nat. (ug/L)	Dis-solved gross beta as Cs-137 (pc/L)
10/28E-11C03	77-04-25	<10	<2	2.2	20	<2	75	52
10/28E-11F03	77-04-25	<10	2	4.3	10	6	140	36
10/28E-14D01	76-04-05	<8	<3	8.0	10	<8	<5.0	7.3
11/27E-02Q01	76-04-05	<8	<3	10	120	<8	7.0	42
11/27E-26C01	77-04-25	<10	<2	10	8	6	<5.4	9.4
11/28E-09R01	77-04-25	<10	<2	10	10	<2	8.2	9.1
11/28E-23D01	76-04-05	<5	<2	30	0	<5	6.7	6.9
11/28E-29P01	77-04-25	<10	<2	10	70	2	8.5	7.7
12/25E-11R01	77-04-28	<10	<2	35	8	<2	80	21
12/26E-04N01	77-04-27	<10	<2	35	6	<2	<5.1	8.6
12/26E-07B01	76-04-08	<15	<5	16	20	<20	<15	370
12/26E-07Q01	76-04-08	<10	<3	20	40	<10	<9.6	83
12/26E-12H01	76-04-08	<8	<3	4.0	20	<8	<7.5	9.3
12/26E-13A01	76-04-08	<9	<3	20	20	<9	14	91
12/26E-13H01	76-04-06	<9	<3	8.0	10	<9	17	66
	77-04-26	<10	<2	8.6	10	<2	12	66
12/26E-15C01	76-04-09	<9	<3	20	110	<9	<6.1	10
	77-04-28	<10	<2	35	210	<2	11	9.5
12/26E-18E01	76-04-08	<7	<2	5.0	20	<7	<4.2	4.8
12/26E-25Q01	77-04-28	<10	<2	5.6	230	<2	6.9	8.3
12/27E-03N01	76-04-07	<9	<3	12	0	<9	11	43
12/27E-05Q01	77-04-26	<10	<2	.8	10	4	<5.0	10
12/27E-15G01	76-04-06	<10	<3	8.0	10	<10	8.6	210
	77-04-26	<10	<2	6.5	20	2	<6.8	240
12/27E-20P01	76-04-06	<9	<3	20	0	<9	7.4	48
12/27E-24M01	76-04-06	<9	<3	13	0	<9	<5.9	180
12/27E-27R01	76-04-06	<9	<3	14	30	<9	8.8	130
12/27E-33J01	76-04-05	<9	<3	15	0	<9	12	66
12/28E-18D01	76-04-07	<5	<3	10	30	<10	17	20
12/28E-19F01	76-04-07	<9	<3	10	60	<9	<9.3	170
	77-04-26	<10	<2	20	60	3	7.8	190
12/28E-28Q01	77-04-26	<10	3	18	8	<2	<7.9	9.1
13/25E-11H01	77-04-27	<10	<2	6.3	9	<2	<5.3	130
13/25E-30G01	77-04-27	<10	3	.0	3	4	<4.7	9.5
13/26E-31K01	77-04-27	<10	<2	35	8	<2	<4.9	3.9
13/26E-34C01	76-04-08	<10	<3	7.0	0	<10	<7.3	13
	77-04-27	<10	<2	7.8	10	2	<7.3	13
13/26E-34D01	76-04-08	<10	<5	10	70	<20	<16	2,900
13/27E-31N01	77-04-28	<10	<2	35	3	<2	<4.3	6.5
14/26E-28G01	77-04-27	<10	<2	7.8	8	<2	<2.3	290

TABLE 26.--Water quality data from selected wells, April 1976-April 1977--Continued

Benton County--Continued

Local identifier	Date of sample	Dis-solved gross beta as Sr90 /Y90 (pc/L)	Cesium 137 dis-solved (pc/L)	Dis-solved stron-tium 90 (pc/L)	Total tritium (pc/L)	Dis-solved cobalt 60 (pc/L)
10/28E-11C03	77-04-25	46	<1.0	<0.4	<480	<10
10/28E-11F03	77-04-25	30	<1.0	<.4	<480	<10
10/28E-14D01	76-04-05	5.8	<1.0	<.4	<480	<5
11/27E-02Q01	76-04-05	33	3.0	<.4	190,000	<5
11/27E-26C01	77-04-25	7.5	<1.0	<.4	<480	<10
11/28E-09R01	77-04-25	7.5	<1.0	<.4	<480	<10
11/28E-23D01	76-04-05	5.5	1.0	<.4	<480	<5
11/28E-29P01	77-04-25	6.4	<1.0	<.4	<480	<10
12/25E-11R01	77-04-28	18	<1.0	<.4	<480	<10
12/26E-04N01	77-04-27	6.9	<1.0	<.4	4,000	<10
12/26E-07B01	76-04-08	300	3.0	<.4	64,000	<5
12/26E-07Q01	76-04-08	71	24	<.4	8,900,000	<5
12/26E-12H01	76-04-08	7.4	1.0	<.4	7,900	<5
12/26E-13A01	76-04-08	75	2.0	<.4	1,000,000	6
12/26E-13H01	76-04-06	54	2.0	<.4	720,000	6
	77-04-26	53	<1.0	<.4	470,000	20
12/26E-15C01	76-04-09	8.2	<1.0	<.7	>480	<5
	77-04-28	7.7	<1.0	<.4	<480	<10
12/26E-18E01	76-04-08	3.8	<1.0	<.4	95,000	<5
12/26E-25Q01	77-04-28	7.0	<1.0	<.4	<480	10
12/27E-03N01	76-04-07	35	1.0	<.4	160,000	<5
12/27E-05Q01	77-04-26	8.2	<1.0	<.4	<480	<20
12/27E-15G01	76-04-06	170	3.0	<.4	1,400,000	7
	77-04-26	200	2.0	<.4	1,400,000	<10
12/27E-20P01	76-04-06	39	3.0	<.4	310,000	<5
12/27E-24M01	76-04-06	140	5.0	<.4	1,100,000	6
12/27E-27R01	76-04-06	110	2.0	<.4	770,000	6
12/27E-33J01	76-04-05	53	1.0	<.4	350,000	<5
12/28E-18D01	76-04-07	16	<1.0	<.4	90,000	<5
12/28E-19F01	76-04-07	140	2.0	<.4	1,000,000	7
	77-04-26	150	1.0	<.4	990,000	70
12/28E-28Q01	77-04-26	7.3	<1.0	<.4	<480	<10
13/25E-11H01	77-04-27	110	<1.0	42	2,300	10
13/25E-30G01	77-04-27	7.8	<1.0	<.4	<480	<10
13/26E-31K01	77-04-27	3.2	<1.0	<.4	<480	<10
13/26E-34C01	76-04-08	9.9	<1.0	<.4	<480	<5
	77-04-27	11	1.0	<.4	<480	20
13/26E-34D01	76-04-08	2,300	210	<.4	310,000	90
13/27E-31N01	77-04-28	5.3	<1.0	<.4	410,000	10
14/26E-28G01	77-04-27	230	1.0	12	53,000	130

TABLE 26.--Water-quality data from selected wells, April 1976-April 1977--Continued

Benton County--Continued

Local identifier	Station number	Latitude	Longitude	Seq. no.	Date of sample	Time	Depth of well, total (feet)	Depth to bottom of sample interval (ft)	Depth to top of sample interval (ft)
11/28E-05C01	462826119195901	46 28 26	119 19 59	01	78-04-19	0925	245	--	--
11/28E-18M01	462619119213701	46 26 19	119 21 37	01	78-04-19	0810	294	281	188
12/26E-08P01	463200119304701	46 32 11	119 35 17	01	78-04-18	1450	322	322	280
12/26E-13H01	463146119293901	46 31 46	119 29 39	01	78-04-20	1015	126	119	109
12/26E-14D01	463200119315001	46 32 00	119 31 50	01	78-04-20	1130	385	382	328
12/26E-15C01	463155119325201	46 31 55	119 32 52	01	78-04-20	1235	440	440	315
12/26E-18G01	463150119362001	46 31 44	119 36 23	01	78-04-18	1355	280	280	207
12/27E-15G01	463138119244801	46 31 38	119 24 48	01	78-04-19	1210	171	169	111
12/27E-16M02	463124119265601	46 31 24	119 26 56	01	78-04-19	1310	212	212	135
12/27E-19D02	463057119291401	46 30 57	119 29 14	01	78-04-19	1415	253	253	150
12/27E-31Q01	462844119284301	46 28 44	119 28 43	01	78-04-20	0910	160	160	110
12/28E-19F01	463049119213201	46 30 49	119 21 32	01	78-04-17	0930	80	80	67
13/25E-16J01	463644119372001	46 36 49	119 41 05	01	78-04-18	1130	160	147	95
13/25E-25B01	463531119374001	46 35 31	119 37 40	01	78-04-18	1245	192	192	141
13/26E-14B01	463710119391601	46 37 04	119 31 30	01	78-04-18	0900	125	125	55
13/26E-26B03	463528119312801	46 35 28	119 31 28	01	78-04-17	1320	60	59	35
13/26E-34C01	463432119325001	46 34 32	119 32 50	01	78-04-17	1440	149	135	125
13/27E-28Q01	463439119260801	46 34 39	119 26 08	01	78-04-19	1100	167	156	146
13/27E-34R01	463357119243001	46 33 57	119 24 30	01	78-04-17	1115	297	220	133
14/26E-14M03	464201119320801	46 42 00	119 31 55	01	78-04-18	1015	80	79	35

Local identifier	Date of sample	Elev. of land surface datum (ft. above NGVD)	Pump or flow period prior to sampling (min)	Specific conductance (micromhos)	Ph (units)	Temperature (°C)	Color (platinum-cobalt units)	Turbidity (JTU)	Hardness (mg/L as $CaCO_3$)	Hardness, noncarbonate (mg/L) $CaCO_3$)
11/28E-05C01	78-04-19	442.00	--	348	7.8	17.4	1	0	140	5
11/28E-18M01	78-04-19	547.00	10	390	8.0	18.2	1	0	150	23
12/26E-08P01	78-04-18	726.00	30	400	7.8	21.2	3	25	160	21
12/26E-13H01	78-04-20	516.00	30	415	7.9	19.7	4	2	150	34
12/26E-14D01	78-04-20	737.00	45	424	7.8	21.1	1	0	190	23
12/26E-15C01	78-04-20	717.00	30	430	7.8	21.2	4	4	180	3
12/26E-18G01	78-04-18	667.00	30	340	7.7	20.8	1	3	140	27
12/27E-15G01	78-04-19	518.00	30	526	7.9	18.4	2	2	190	81
12/27E-16M02	78-04-19	529.00	30	454	7.9	20.5	1	1	160	46
12/27E-19D02	78-04-19	559.00	--	418	7.9	19.2	1	1	160	25
12/27E-31Q01	78-04-20	515.00	30	300	7.8	19.0	5	2	130	0
12/28E-19F01	78-04-17	466.00	30	450	7.9	16.4	1	0	190	65
13/25E-16J01	78-04-18	510.00	30	320	7.8	17.4	1	1	140	20
13/25E-25B01	78-04-18	583.00	30	350	8.5	17.7	2	150	140	90
13/26E-14B01	78-04-18	467.00	30	272	8.0	17.7	1	1	100	0
13/26E-26B03	78-04-17	444.00	30	230	7.9	16.4	1	1	110	2
13/26E-34C01	78-04-17	530.00	45	612	9.4	17.6	2	20	190	130
13/27E-28Q01	78-04-19	537.00	30	290	7.8	19.2	1	1	120	0
13/27E-34R01	78-04-17	522.00	30	388	8.0	17.2	1	1	170	43
14/26E-14M03	78-04-18	449.00	30	320	7.8	32.5	2	2	140	74

TABLE 26.--Water-quality data from selected wells, April 1976-April 1977--Continued

Benton County--Continued

Local identifier	Date of sample	Calcium dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Sodium percent	Sodium adsorption ratio	Potassium, dissolved (mg/L as K)	Bicarbonate (mg/L as HCO_3)	Carbonate (mg/L as Co_3)	Alkalinity (mg/L as $CaCO_3$)
11/28E-05C01	78-04-19	33	13	22	25	.8	6.5	160	0	130
11/28E-18M01	78-04-19	42	12	22	23	.8	6.9	160	0	130
12/26E-08P01	78-04-18	43	13	20	21	.7	5.9	170	0	140
12/26E-13H01	78-04-20	38	13	29	29	1.0	6.4	140	0	110
12/26E-14D01	78-04-20	50	15	21	19	.7	5.9	200	0	160
12/26E-15C01	78-04-20	47	14	24	22	.8	6.0	210	0	170
12/26E-18G01	78-04-18	37	12	18	21	.7	4.5	140	0	110
12/27E-15G01	78-04-19	52	14	30	25	1.0	6.9	130	0	110
12/27E-16M02	78-04-19	43	13	30	28	1.0	7.2	140	0	110
12/27E-19D02	78-04-19	46	12	23	22	.8	6.7	170	0	140
12/27E-31Q01	78-04-20	34	11	17	21	.6	6.0	170	0	140
12/28E-19F01	78-04-17	54	13	20	18	.6	6.7	150	0	120
13/25E-16J01	78-04-18	36	13	11	14	.4	4.7	150	0	120
13/25E-25B01	78-04-18	41	8.1	14	18	.5	5.9	56	0	46
13/26E-14B01	78-04-18	26	9.2	19	27	.8	5.4	140	0	110
13/26E-26B03	78-04-17	29	8.8	6.0	10	.3	4.7	130	0	110
13/26E-34C01	78-04-17	62	7.7	44	32	1.4	12	59	5	57
13/27E-28Q01	78-04-19	31	11	22	27	.9	4.2	160	0	130
13/27E-34R01	78-04-17	40	16	21	21	.7	4.9	150	0	120
14/26E-14M03	78-04-18	46	6.9	5.2	7	.2	5.0	85	0	70

Local identifier	Date of sample	Carbon dioxide dissolved (mg/L as CO_2)	Sulfate dissolved (mg/L as SO_4)	Chloride, dissolved (mg/L as CL)	Fluoride, dissolved (mg/L as F)	Bromide dissolved (mg/L as Br)	Iodide, dissolved (mg/L as I)	Silica, dissolved (mg/L as SiO_2)	Solids, residue at 180 deg. C dissolved (mg/L)	Solids residue at 105 deg. C. dissolved (mg/L)
11/28E-05C01	78-04-19	4.1	34	7.7	0.4	0.1	0.00	36	225	280
11/28E-18M01	78-04-19	2.6	45	11	.4	.1	.01	37	251	370
12/26E-08P01	78-04-18	4.3	27	11	.4	.1	.01	38	256	360
12/26E-13H01	78-04-20	2.8	52	14	.7	.1	.00	39	273	370
12/26E-14D01	78-04-20	5.1	47	8.2	.5	.1	.00	40	278	380
12/26E-15C01	78-04-20	5.3	33	7.8	.5	.1	.00	42	261	380
12/26E-18G01	78-04-18	4.5	25	13	.5	.1	.01	43	223	330
12/27E-15G01	78-04-19	2.6	61	14	.4	.1	.01	30	325	430
12/27E-16M02	78-04-19	2.8	54	10	.7	.1	.00	42	299	400
12/27E-19D02	78-04-19	3.4	55	7.5	.5	.1	.01	35	267	360
12/27E-31Q01	78-04-20	4.3	20	4.2	.5	.1	.01	47	202	220
12/28E-19F01	78-04-17	3.0	49	11	.3	.1	.01	34	302	390
13/25E-16J01	78-04-18	3.8	28	9.1	.4	.1	.00	42	205	300
13/25E-25B01	78-04-18	.3	85	21	.4	.5	.01	8.8	206	260
13/26E-14B01	78-04-18	2.2	15	6.3	1.0	.1	.00	37	171	260
13/26E-26B03	78-04-17	2.6	12	2.7	.2	.1	.00	23	139	190
13/26E-34C01	78-04-17	.0	180	25	.5	.3	.00	29	381	480
13/27E-28Q01	78-04-19	4.1	28	8.4	.6	.1	.01	37	203	290
13/27E-34R01	78-04-17	2.4	54	12	.5	.1	.01	33	243	350
14/26E-14M03	78-04-18	2.2	51	11	.2	.1	.00	39	210	270

TABLE 26.--Water-quality data from selected wells, April 1976-April 1977--Continued

Benton County--Continued

Local identifier	Date of sample	Solids, sum of constituents, dissolved (mg/L)	Solids, dissolved (tons per ac-ft)	Nitrogen, nitrate total (mg/L as N)	Nitrogen, nitrite total (mg/L as N)	Nitrogen, ammonia total (mg/L as N)	Phosphorus, total (mg/L as P)	Arsenic dissolved (ug/L as As)	Chromium, hexavalent, dissolved (ug/L as Cr)	Copper, dissolved (ug/L as Cu)
11/28E-05C01	78-04-19	232	0.31	2.0	0.02	0.02	0.02	14	0	0
11/28E-18M01	78-04-19	255	.34	3.0	.00	.02	.03	8	7	0
12/26E-08P01	78-04-18	242	.35	5.6	.02	.17	.09	4	21	0
12/26E-13H01	78-04-20	261	.37	6.0	.01	.03	.03	6	3	0
12/26E-14D01	78-04-20	286	.38	2.4	.01	.04	.04	6	5	0
12/26E-15C01	78-04-20	278	.36	2.4	.01	.08	.04	6	6	0
12/26E-18G01	78-04-18	222	.30	4.2	.00	.02	.08	5	55	0
12/27E-15G01	78-04-19	273	.44	16	.00	.04	.02	5	5	0
12/27E-16M02	78-04-19	269	.41	11	.01	.02	.03	9	5	0
12/27E-19D02	78-04-19	270	.36	3.0	.00	.02	.03	7	3	0
12/27E-31Q01	78-04-20	224	.27	.00	.01	.04	.04	4	0	0
12/28E-19F01	78-04-17	262	.41	13	.00	.01	.02	9	9	0
13/25E-16J01	78-04-18	218	.28	1.3	.01	.01	.02	4	0	0
13/25E-25B01	78-04-18	212	.28	.37	.01	.44	.38	2	2	0
13/26E-14B01	78-04-18	188	.23	.32	.00	.02	.04	14	0	0
13/26E-26B03	78-04-17	151	.19	.16	.00	.02	.05	6	0	0
13/26E-34C01	78-04-17	395	.52	3.7	.03	.20	.06	11	0	0
13/27E-28Q01	78-04-19	221	.28	.72	.00	.04	.02	7	5	0
13/27E-34R01	78-04-17	255	.33	2.8	.00	.01	.02	5	0	0
14/26E-14M03	78-04-18	206	.29	3.3	.02	.08	.04	4	290	0

Local identifier	Date of sample	Iron, ferrous dissolved (ug/L as Fe)	Selenium, dissolved (ug/L as Se)	Gross alpha, dissolved (ug/L as U-Nat)	Gross beta, dissolved (PCI/L as CS-137)	Gross beta, dissolved (PCI/L as SR/YT-90d)	Cesium 137 dissolved (pCi/L)	Strontium 90 dissolved (pCi/L)	Tritium total (pCi/L)	Cyanide total (mg/L as Cn)
11/28E-05C01	78-04-19	10	1	11	8.1	7.1	<2.0	<0.4	170,000	0.00
11/28E-18M01	78-04-19	10	2	<4.1	16	13	<2.0	<.4	73,000	.00
12/26E-08P01	78-04-18	0	5	8.2	11	9.1	<2.0	<.4	800,000	.00
12/26E-13H01	78-04-20	10	2	14	41	35	<2.0	<.4	310,000	.01
12/26E-14D01	78-04-20	0	3	8.5	6.0	5.1	<2.0	<.4	<480	.00
12/26E-15C01	78-04-20	10	2	7.8	6.9	5.8	<2.0	<.4	<480	.00
12/26E-18G01	78-04-18	0	3	<3.9	6.9	5.9	<2.0	<.4	200,000	.00
12/27E-15G01	78-04-19	0	1	<5.1	160	130	2.0	<.4	1,400,000	.02
12/27E-16M02	78-04-19	0	1	5.8	62	52	<2.0	<.4	1,100,000	.01
12/27E-19D02	78-04-19	10	3	7.3	12	9.8	<2.0	<.4	13,000	.00
12/27E-31Q01	78-04-20	20	0	<1.4	4.4	3.8	<2.0	<.4	<480	.00
12/28E-19F01	78-04-17	0	2	<4.1	110	96	<2.0	<.4	1,000,000	.02
13/25E-16J01	78-04-18	10	1	<3.1	4.4	3.7	<2.0	<.4	<480	.00
13/25E-25B01	78-04-18	0	0	<2.1	5.6	5.0	<2.0	<.4	<480	.00
13/26E-14B01	78-04-18	10	0	<3.1	5.6	4.7	2.0	<.4	2 500	.00
13/26E-26B03	78-04-17	10	0	<1.7	5.2	4.5	<2.0	<.4	<480	.00
13/26E-34C01	78-04-17	--	12	<4.2	13	4.5	<2.0	<.4	<480	.00
13/27E-28Q01	78-04-19	10	1	4.9	4.6	3.9	<2.0	<.4	<480	.00
13/27E-34R01	78-04-17	30	2	7.3	7.5	6.4	<2.0	<.4	23,000	.00
14/26E-14M03	78-04-18	0	1	<3.1	270	13	<2.0	2.9	7,200	.00

TABLE 26.--Water-quality data from selected wells, April 1976-April 1977--Continued

Benton County--Continued

Analyses by inductively coupled plasma spectroscopy

Local identifier	Date of sample	Cobalt 60 dissolved (pCi/L)	Silver dissolved (mg/L as Ag)	Aluminum dissolved (mg/L as Al)	Boron dissolved (mg/L as B)	Barium dissolved (mg/L as Be)	Beryllium dissolved (mg/L as Be)	Bismuth dissolved (mg/L as Cd)	Cadmium dissolved (mg/L as Cd)	Cobalt dissolved (mg/L as Cd)
11/28E-05C01	78-04-19	<1	<0.010	0.070	0.030	0.050	<0.001	<1.0	0.003	<0.005
11/28E-18M01	78-04-19	6	<.010	.070	.030	.050	<.001	<1.0	.003	<.005
12/26E-08P01	78-04-18	<1	<.010	.070	.010	.030	<.001	<1.0	.001	<.005
12/26E-13H01	78-04-20	20	<.010	.070	.030	.030	<.001	<1.0	.003	<.005
12/26E-14D01	78-04-20	<1	<.010	.100	.030	.050	<.001	<1.0	.003	<.005
12/26E-15C01	78-04-20	<1	<.010	.070	.030	.070	<.001	<1.0	.003	<.005
12/26E-18G01	78-04-18	<1	<.010	.050	.010	.030	<.001	<1.0	.003	<.005
12/27E-15G01	78-04-19	70	<.010	.100	.030	.050	<.001	<1.0	.003	<.005
12/27E-16M02	78-04-19	30	<.010	.070	.030	.050	<.001	<1.0	.003	<.005
12/27E-19D02	78-04-19	1	<.010	.070	.030	.050	<.001	<1.0	.003	<.005
12/27E-31Q01	78-04-20	<1	<.010	.070	.030	.070	<.001	<1.0	.003	<.005
12/28E-19F01	78-04-17	60	<.010	.070	.030	.050	<.001	<1.0	.001	<.005
13/25E-16J01	78-04-18	<1	<.010	.070	.010	.010	<.001	<1.0	.003	<.005
13/25E-25B01	78-04-18	<1	<.010	.050	.010	.050	<.001	<1.0	.001	<.005
13/26E-14B01	78-04-18	<1	<.010	.070	.030	.010	<.001	<1.0	.003	<.005
13/26E-26B03	78-04-17	1	<.010	<.050	.010	.007	<.001	<1.0	.001	<.005
13/26E-34C01	78-04-17	<1	<.010	.100	.030	.030	<.001	<1.0	.001	<.005
13/27E-28Q01	78-04-19	<1	<.010	.070	.010	.050	<.001	<1.0	.003	<.005
13/27E-34R01	78-04-17	1	<.010	.070	.010	.050	<.001	<1.0	.003	<.005
14/26E-14M03	78-04-18	<1	<.010	.050	.007	.070	<.001	<1.0	.003	<.005

Local identifier	Date of sample	Chromium dissolved (mg/L as Cr)	Iron, ferric dissolved (mg/L as Fe^{3+}	Gallium dissolved (mg/L as Ga)	Germanium dissolved (mg/L as (Ge)	Lithium dissolved (mg/L as Li)	Manganese dissolved (mg/L as Mn)	Molybdenum dissolved (mg/L as Mo)	Nickel dissolved (mg/L as Ni)
11/28E-05C01	78-04-19	<0.050	<0.005	<0.030	0.050	0.010	0.001	0.010	<0.050
11/28E-18M01	78-04-19	<.050	<.005	<.030	.070	.010	.001	.010	<.050
12/26E-08P01	78-04-18	<.050	<.005	<.030	.070	.007	.030	.010	<.050
12/26E-13H01	78-04-20	<.050	.030	<.030	.070	.010	.010	.010	<.050
12/26E-14D01	78-04-20	<.050	.010	<.030	.070	.010	.003	.010	<.050
12/26E-15C01	78-04-20	<.050	.007	<.030	.070	.010	.003	.030	<.050
12/26E-18G01	78-04-18	<.050	.007	<.030	.050	.005	.003	.030	<.050
12/27E-15G01	78-04-19	<.050	.010	<.030	.070	.007	.005	.010	<.050
12/27E-16M02	78-04-19	<.050	.010	<.030	.070	.007	.003	.030	<.050
12/27E-19D02	78-04-19	<.050	.010	<.030	.070	.007	.001	.030	<.050
12/27E-31Q01	78-04-20	<.050	.050	<.030	.070	.010	.070	.010	<.050
12/28E-19F01	78-04-17	<.050	.010	<.030	.050	.010	.001	.010	<.050
13/25E-16J01	78-04-18	<.050	.010	<.030	.070	.007	.001	.010	<.050
13/25E-25B01	78-04-18	<.050	.005	<.030	.030	<.005	.100	.010	<.050
13/26E-14B01	78-04-18	<.050	.030	<.030	.050	.007	.001	.010	<.050
13/26E-26B03	78-04-17	<.050	<.005	<.030	.050	<.005	.001	<.010	<.050
13/26E-34C01	78-04-17	<.050	.007	<.030	.050	.007	.005	.030	<.050
13/27E-28Q01	78-04-19	<.050	<.005	<.030	.070	.010	.010	.030	<.050
13/27E-34R01	78-04-17	<.050	.010	<.030	.070	.010	.003	.010	<.050
14/26E014M03	78-04-18	.100	<.005	<.030	.030	<.005	.030	.010	<.050

TABLE 26.--Water-quality data from selected wells, April 1976-April 1977--Continued

Benton County--Continued

Analyses by inductively coupled plasma spectroscopy

Local identifier	Date of sample	Lead dissolved (mg/L as Pb)	Antimony dissolved (mg/L as Sb)	Tin dissolved (mg/L as Sn)	Strontium dissolved (mg/L as Sr)	Titanium dissolved (mg/L as Ti)	Vanadium dissolved (mg/L as V)	Zinc dissolved (mg/L as Zn)	Zircontium dissolved (mg/L as Zr)
11/28E-05C01	78-04-19	<0.030	<0.030	0.050	0.300	<0.005	0.010	<0.005	<0.005
11/28E-18M01	78-04-19	<.030	<.030	.070	.300	<.005	.010	<.005	<.005
12/26E-08P01	78-04-18	<.030	<.030	.050	.100	<.005	.030	<.005	<.005
12/26E-13H01	78-04-20	<.030	<.030	.070	.100	<.005	.030	<.005	<.005
12/26E-14D01	78-04-20	<.030	<.030	.100	.300	<.005	.030	<.005	<.005
12/26E-15C01	78-04-20	<.030	<.030	.100	.300	<.005	.030	.100	<.005
12/26E-18G01	78-04-18	<.030	<.030	.070	.100	<.005	.030	<.005	<.005
12/27E-15G01	78-04-19	<.030	<.030	.070	.300	<.005	.010	<.005	<.005
12/27E-16M02	78-04-19	<.030	<.030	.070	.300	<.005	.030	<.005	<.005
12/27E-19D02	78-04-19	<.030	<.030	.050	.300	<.005	.010	<.005	<.005
12/27E-31Q01	78-04-20	<.030	<.030	.070	.100	<.005	<.010	<.005	<.005
12/28E-19F01	78-04-17	<.030	<.030	.070	.300	<.005	.010	.030	<.005
13/25E-16J01	78-04-18	<.030	<.030	.070	.100	<.005	.030	<.005	<.005
13/25E-25B01	78-04-18	<.030	<.030	<.050	.100	<.005	<.010	<.005	<.005
13/26E-14B01	78-04-18	<.030	<.030	<.050	.100	<.005	.030	<.005	<.005
13/26E-26B03	78-04-17	<.030	<.030	<.050	.100	<.005	.010	<.005	<.005
13/26E-34C01	78-04-17	<.030	<.030	<.050	.300	<.005	.010	<.005	<.005
13/27E-28Q01	78-04-19	<.030	<.030	.070	.300	<.005	.030	.300	<.005
13/27E-34R01	78-04-17	<.030	<.030	.070	.300	<.005	.010	<.005	<.005
14/26E-14M03	78-04-18	<.030	<.030	.100	.300	<.005	<.010	<.005	<.005

All results are reported in mg/L. Results are rounded to the nearest reporting level. Reporting levels range from the detection limit in steps of 1, 3, 5, 7, and 10. Levels which are less than the detection limit are reported as < that value. Levels which are greater than the upper concentration limit are reported as > that value. For example, for an analysis of lead the result would be reported as one of the following concentrations in mg/L: <0.03, 0.05, 0.07, 0.1, 0.3, 0.5, 0.7, 1, 3, 5, 7, >10. Results are reported one significant figure only. Due to the rounding technique even one significant figure is an estimate. The precision is approximately plus or minus one step at the 68-percent confidence level (1 std. dev.) and two steps at 95-percent confidence level (2 std. dev.).

TABLE 27.--Summary of selected data from recorded wells, by subarea

[Use symbols: H, household supply (may include lawn and small garden irrigation); I, irrigation; N, industrial/commercial; P, public supply (includes some use for fire protection); S, stock water. In some cases, wells are used for two or more purposes]

T/R	Number of wells	Depth range (ft)				Pumping yield range (gal/min)				Use					Flowing wells
		1 to 99	100 to 499	500 to 999	1000 or more	1 to 99	100 to 499	500 to 999	1000 or more	H	I	N	P	S	
Naches subarea															
12/12	1	-	1	-	-	1	-	-	-	1	1	-	-	-	-
13/12	1	-	-	-	-	-	-	-	-	-	-	-	1	1	-
13/13	3	1	1	-	-	-	-	-	-	1	-	-	-	-	-
13/18	17	6	8	-	-	8	5	1	-	13	2	-	1	-	-
14/14	5	3	2	-	-	1	-	-	-	1	-	-	1	-	-
14/15	1	1	-	-	-	-	-	-	-	1	-	-	-	-	-
14/16	1	1	-	-	-	1	-	-	-	1	-	-	-	-	-
14/17	15	5	5	1	1	9	2	1	-	7	2	3	2	-	-
14/18	23	9	20	-	-	17	1	1	-	25	-	1	-	-	-
15/15	1	1	-	-	-	1	-	-	-	-	1	-	-	-	-
16/12	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16/14	4	2	1	-	-	1	-	-	-	-	-	-	3	-	-
16/15	6	4	2	-	-	4	1	-	-	6	1	-	-	-	-
17/11	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
17/13	6	1	1	-	-	1	-	-	-	2	-	-	3	-	-
17/14	6	3	-	-	-	2	-	-	-	3	1	-	1	-	-
TOTALS	92	37	41	1	1	46	9	3	-	61	8	4	13	1	-
Cowiche subarea															
13/14	2	2	-	-	-	2	-	-	-	2	-	-	-	-	-
13/17	10	2	6	2	-	3	3	1	-	4	3	2	-	-	2
13/18	14	2	5	5	1	7	-	-	1	8	3	1	1	-	-
14/16	16	1	11	4	-	10	4	-	-	11	5	-	-	1	-
14/17	79	20	43	15	-	41	17	-	-	44	25	4	-	-	2
TOTALS	121	27	65	26	1	63	24	1	1	69	36	7	1	1	4
Ahtanum subarea															
12/13	2	-	-	-	-	2	-	-	-	-	-	-	-	2	-
12/14	1	1	-	-	-	-	-	-	-	1	-	-	-	-	-
12/15	9	2	3	-	-	2	1	1	-	2	1	-	-	-	-
12/16	60	23	18	3	1	9	7	3	1	39	12	-	-	2	-
12/17	331	187	64	12	2	20	20	8	1	164	32	5	1	5	2
12/18	277	208	37	3	-	39	23	2	-	185	45	2	1	5	2
12/19	23	14	7	1	-	3	6	2	1	6	5	4	4	2	1
13/16	2	-	1	-	-	1	-	1	-	2	1	-	-	-	-
13/17	83	16	63	1	-	44	13	1	-	57	16	-	-	1	4
13/18	138	89	34	8	1	41	35	5	3	54	29	15	4	-	2
13/19	54	40	6	2	-	19	11	-	-	16	11	13	1	-	1
TOTALS	980	580	233	30	4	180	116	23	6	526	152	39	11	17	12
Moxee subarea															
12/19	18	7	8	1	1	8	2	1	-	10	3	-	1	1	2
12/20	51	8	13	27	2	12	17	1	-	17	26	-	-	-	18
12/21	23	1	13	3	5	5	9	2	1	9	15	-	-	-	-
12/22	3	-	2	-	1	-	-	-	-	1	-	-	-	-	-
13/19	58	21	28	3	-	29	19	2	1	34	11	2	4	1	1
13/20	19	1	5	11	2	9	4	-	1	10	8	-	-	-	6
13/21	3	-	-	1	2	-	-	-	-	2	3	-	-	-	-
TOTALS	175	38	69	46	13	63	51	6	3	83	66	2	5	2	27

TABLE 27.--Summary of selected data from recorded wells, by subareas--Continued

T/R	Number of wells	Depth range (ft) 1 to 99	100 to 499	500 to 999	1000 or more	Pumping yield range (gal/min) 1 to 99	100 to 499	500 to 999	1000 or more	Use H	I	N	P	S	Flowing wells
Toppenish subarea															
9/13	3	-	-	-	-	3	-	-	-	-	-	-	-	-	3
10/14	1	-	1	-	-	1	-	-	-	1	-	-	-	-	-
10/16	32	10	16	1	-	14	5	-	1	21	5	-	1	1	-
10/17	77	50	12	6	3	38	5	6	4	51	11	1	4	-	1
10/18	55	36	3	2	1	13	1	2	1	35	6	-	1	-	-
10/19	64	51	-	-	-	25	3	3	-	45	6	-	4	-	-
10/20	85	59	15	2	1	32	14	5	4	44	16	2	10	1	-
10/21	23	21	-	-	-	11	1	-	-	16	-	-	-	-	-
11/16	40	10	-	-	-	6	1	1	-	28	3	-	-	-	1
11/17	44	8	8	15	5	9	2	3	12	19	16	1	-	-	-
11/18	72	40	6	6	-	27	8	7	-	48	7	-	1	2	3
11/19	94	70	2	-	-	53	8	6	4	60	11	3	5	-	-
11/20	22	10	9	1	-	10	1	-	6	10	1	9	-	-	1
12/18	13	1	2	3	7	2	2	2	4	2	11	-	-	-	-
12/19	21	11	9	-	-	12	2	1	1	16	3	-	-	-	-
TOTALS	646	377	83	36	17	256	53	36	37	396	96	16	26	4	9
Satus subarea															
7/17	1	-	1	-	-	-	1	-	-	-	-	-	-	-	-
7/18	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7/19	6	-	1	1	-	2	-	-	-	-	-	-	-	-	1
7/20	3	-	-	-	-	-	-	-	-	-	-	-	-	-	1
8/15	2	-	-	-	-	2	-	-	-	-	-	-	-	-	2
8/16	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-
8/19	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
8/20	1	-	1	-	-	1	-	-	-	-	-	-	-	-	1
8/21	3	1	1	-	-	1	-	-	-	2	-	-	-	-	-
8/22	27	3	16	4	1	6	5	2	1	14	4	-	2	-	-
8/23	3	-	1	1	1	1	-	-	1	1	1	-	1	-	-
8/24	4	1	2	1	-	1	1	-	-	2	1	-	1	-	-
9/19	1	-	-	1	-	-	1	-	-	-	-	-	-	-	-
9/20	3	2	1	-	-	1	-	-	-	3	-	-	-	-	-
9/21	55	37	16	1	-	24	7	3	2	33	8	-	-	1	-
9/22	19	4	9	-	-	8	-	1	2	10	2	-	-	-	-
9/23	4	-	4	-	-	1	2	-	-	-	4	-	-	-	-
TOTALS	135	48	53	10	2	48	17	6	6	65	20	-	4	5	2
Rattlesnake Slope subarea															
8/24	4	2	2	-	-	1	2	-	-	1	2	-	-	-	-
9/22	10	6	3	-	-	3	1	-	-	5	3	-	1	-	-
9/23	29	8	16	1	3	8	5	3	-	10	1	-	6	-	1
9/24	31	12	15	3	-	11	1	2	3	14	9	-	-	-	-
9/25	25	5	10	5	2	8	1	-	-	9	5	-	-	-	-
9/26	14	1	12	1	-	5	6	1	-	12	2	-	-	-	-
9/27	12	4	7	-	-	4	3	-	-	8	2	-	2	-	-
10/21	19	8	8	2	-	4	5	-	1	7	3	-	4	-	-
10/22	28	16	8	1	2	10	1	-	3	7	3	-	2	-	1
10/23	28	8	11	5	4	8	3	1	1	10	9	1	-	-	1
10/24	7	1	4	1	-	3	-	2	-	4	2	-	1	-	-
10/25	7	-	1	5	-	1	-	-	-	-	3	-	-	-	-
10/26	11	1	7	3	-	4	1	2	-	6	5	-	-	-	-
11/19	3	2	-	-	-	-	2	-	-	-	-	-	-	-	-
11/20	46	12	19	10	2	11	7	6	5	21	12	1	6	-	-
11/21	43	-	20	16	3	10	8	4	2	18	17	-	1	-	-
11/22	13	-	7	3	3	3	-	-	-	4	3	-	-	-	-
11/24	3	-	2	-	-	-	-	-	-	-	-	-	1	-	-
11/25	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-
12/19	18	2	10	4	1	3	7	1	-	5	7	-	1	-	-
12/20	6	-	3	3	-	4	-	-	-	1	4	-	-	-	-
TOTALS	358	88	165	64	20	101	53	22	15	142	92	2	25	-	3

TABLE 27.--Summary of selected data from recorded wells, by subareas--continued

T/R	Number of wells	Depth range (ft) 1 to 99	100 to 499	500 to 999	1000 or more	Pumping yield range (gal/min) 1 to 99	100 to 499	500 to 999	1000 or more	Use H	I	N	P	S	Flowing wells
Hanford-Richland subarea															
9/28	112	43	41	7	1	39	7	5	5	38	30	1	5	1	-
9/29	1	1	-	-	-	-	1	-	-	-	1	-	-	-	-
10/26	1	-	1	-	-	1	-	-	-	-	-	-	1	-	-
10/28	128	77	31	-	-	8	8	11	11	9	7	1	14	-	-
11/24	1	-	1	-	-	-	-	-	-	-	-	-	-	1	-
11/25	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-
11/26	31	-	5	19	5	1	1	-	-	-	-	-	2	-	-
11/27	9	-	9	-	-	-	1	-	-	-	-	-	1	-	-
11/28	17	2	13	-	1	-	1	-	-	-	-	-	-	-	-
12/22	3	-	2	-	-	1	-	-	-	1	1	-	-	-	-
12/23	6	-	4	-	1	-	2	1	-	1	4	-	-	2	-
12/24	5	-	1	1	3	-	-	1	2	-	3	-	-	-	-
12/25	222	55	161	4	1	3	1	-	-	1	1	-	-	1	-
12/26	125	21	104	2	-	1	-	-	-	UNUSED					
12/27	23	-	21	1	-	-	-	-	-	UNUSED					
12/28	7	3	4	-	-	-	-	-	-	UNUSED					
13/24	25	3	3	11	1	1	2	6	3	1	1	-	2	-	2
13/25	34	17	13	3	1	1	2	1	1	2	2	1	-	1	1
13/26	113	20	85	-	-	1	-	3	1	1	-	2	1	1	-
13/27	74	48	15	3	1	1	4	7	5	5	3	2	4	1	-
13/28	10	10	-	-	-	-	-	1	1	1	1	-	1	-	-
14/26	64	58	5	-	-	-	2	1	-	3	7	1	-	3	-
14/27	36	29	6	-	-	-	2	-	-	4	3	-	6	-	-
TOTALS	1048	387	525	51	16	58	34	37	29	67	64	8	37	11	3
											187		7/8		
Kennewick subarea															
7/30	3	-	3	-	-	1	-	-	2	1	1	-	-	-	-
7/31	4	-	4	-	-	1	1	-	-	2	-	1	1	-	-
8/27	2	-	2	-	-	-	1	-	-	-	1	-	-	-	-
8/28	26	3	19	3	-	12	6	-	1	18	6	-	-	1	-
8/29	24	10	11	3	-	10	1	1	-	14	3	3	-	-	-
8/30	112	91	15	4	-	38	29	6	7	54	24	11	5	-	-
9/27	40	1	29	10	-	22	8	1	1	30	12	-	1	-	-
9/28	45	7	16	6	1	15	2	2	2	18	12	-	-	-	-
9/29	3	2	1	-	-	3	1	-	-	1	1	-	-	-	-
10/27	13	7	6	-	-	6	2	1	-	9	6	-	-	-	-
10/28	5	4	1	-	-	3	-	-	-	3	1	-	1	-	-
TOTALS	277	125	107	26	1	111	51	11	13	150	67	15	8	1	-
TOTAL OF ALL SUBAREAS:	3832	1707	1341	290	75	926	408	145	110	1559	601	93	130	42	61

TABLE 28.--Snow depths and water equivalents at selected snow courses, 1960-77 water years
[Data from U.S. Soil Conservation Service (written commun., 1979)]

Green Lake
21C10 elev. 6,000 ft. lat 46 deg 33 min long 121 deg 10 min
Record began 1941 sec. 03 T12N R13E
Number of sample points - 6
Measured by Department of Natural Resources
Parameters measured - snow course only
Remarks - snow course in open meadow in dense timber on SW slope

	February 1			March 1			April 1			May 1		
Year	Date	Snow depth (in.)	Water equiv. (in.)	Date	Snow depth (in.)	Water equiv. (in.)	Date	Snow depth (in.)	Water equiv. (in.)	Date	Snow depth (in.)	Water equiv. (in.)
1941							3/23	61	24.3			
1942							3/26	72	30.9			
1943				3/01	101	29.2						
1944							3/19	50	18.9			
1945				2/28	55	16.9	4/09	94	25.4			
1946				3/03	110	32.8						
1947				3/01	97	41.7						
1948				2/29	87	31.3						
1949							3/27	132	47.4			
1950				2/27	135	45.4						
1951				2/25	101	24.1						
1953				3/01	87	37.2	3/29	88	34.0			
1955				3/06	77	24.2	4/05	59	21.5			
1956				3/02	109	38.8	3/30	97	37.4			
1957				2/28	54	15.1	4/01	70	25.4			
1958				3/03	50	22.3	3/30	81	28.9			
1959				3/03	59	16.0	3/29	69	25.1			
1960				3/01	51	16.3	4/01	70	25.0			
1961				3/02	111	36.7	3/31	106	44.5			
1962				3/01	82	28.3	3/31	96	37.2			
1963				2/26	44	18.0	3/29	81	23.5			
1964				2/24	78	24.0	3/25	104	40.3			
1965				2/23	85	31.0	3/26	83	32.0			
1966				2/24	76	28.8	3/25	102	39.0			
1967				2/24	89	33.2	3/27	111	43.5			
1968	1/26	57	16.2	2/26	68	27.5	3/27	72	29.3			
1969				2/24	100	36.2	3/26	88	37.7			
1970				2/24	92	34.3	3/27	92	38.2			
1971				2/24	100	38.8						
1972				2/25	118	45.8	3/27	124	54.5			
1973	1/29	58	18.2	2/23	56	19.7	3/29	59	23.0			
1974	1/29	93	25.2	2/26	115	37.3	4/02	120	46.8			
1975	1/28	88	31.8	2/25	108	33.0	3/26	125	36.3			
1976	1/27	61	23.0	2/25	110	33.3	3/24	110	32.3			
1977	1/24	8	2.3	2/24	12	3.8	3/28	39	12.0			

Morse Lake
21C17 elev. 5,400 ft lat 46 deg 54 min long 121 deg 29 min
Record began 1956 sec. 06 T16N R11E
Number of sample points - 10
Measured by Soil Conservation Service
Parameters measured - snow course only
Remarks - snow course on protected lake shore in valley bottom

	February 1			March 1			April 1			May 1		
Year	Date	Snow depth (in.)	Water equiv. (in.)	Date	Snow depth (in.)	Water equiv. (in.)	Date	Snow depth (in.)	Water equiv. (in.)	Date	Snow depth (in.)	Water equiv. (in.)
1956	2/01	174	60.0				4/03	199	78.0	4/30	154	78.6
1957	1/28	71	20.0	3/03	108	39.4	4/02	142	54.6	5/01	117	52.4
1958	1/31	130	42.0	2/28	127	53.8	4/01	136	62.8	4/29	138	65.4
1959	1/29	121	35.2	3/04	140	50.0	4/03	153	55.6	5/04	120	72.4
1960	2/01	66	24.2	3/01	92	30.9	4/01	121	47.8	5/03	102	37.2
1961	2/01	110	41.0	2/28	169	45.6	3/30	166	67.1	4/28	156	78.0
1962	1/31	83	32.4	3/01	117	36.4	3/30	129	50.2	5/01	140	62.6
1963	1/28	62	20.6	2/25	76	28.0	3/28	97	32.4	4/29	109	44.2
1964	1/29	148	43.6	2.26	128	49.2	3/27	159	64.4	4/28	142	66.2
1965	1/30	131	45.6	2/24	140	54.4	3/30	145	65.6	4/30	118	55.2
1966	1/27	103	32.8	3/28	130	42.2	3/30	130	74.2	4/28	101	43.8
1967	1/30	148	51.8	3/02	150	58.8	3/30	171	76.6	5/02	167	84.4
1968	1/30	98	31.6	2/28	108	44.2	3/27	133	53.0	4/30	102	48.4
1969	1/29	140	50.8	2/27	158	63.4	3/27	146	68.2	4/29	137	65.6
1970	1/30	130	38.0	2/25	133	55.0	3/30	137	46.2	4/28	149	62.4
1971				2/25	158	56.0	3/30	236	94.4	4/29	207	102.4
1972	1/31	175	62.6				3/29	184	69.8	4/27	183	87.8
1973	1/29	91	33.2	2/26	94	36.4	3/29	102	42.8	4/30	79	41.2
1975	1/28	134	55.6	2/27	157	71.0	3/28	176	68.6	4/29	162	88.1
1976	1/28	97	36.7	3/04	149	47.4	3/31	158	57.6	4/26	152	59.5
1977	1/27	13	3.0	2/25	24	7.7	3/30	72	19.9	5/01	41	18.0

TABLE 28.--Snow depths and water equivalents at selected snow courses, 1960-77 water years--Continued

White Pass (E side)
21C28 elev. 4,500 ft lat 46 deg 38 min long 121 deg 23 min
Record began 1953 sec. 02 T13N R11E
Number of sample points - 7
Measured by U.S. Geological Survey
Parameters measured - snow course only
Remarks - snow course in dense timber at Pass

Year	February 1			March 1			April 1			May 1		
	Date	Snow depth (in.)	Water equiv. (in.)	Date	Snow depth (in.)	Water equiv. (in.)	Date	Snow depth (in.)	Water equiv. (in.)	Date	Snow depth (in.)	Water equiv. (in.)
1953	2/05	62	21.9									
1954	2/05	93	22.9									
1955	2/02	41	12.7									
1957	2/06	49	11.6							4/25	55	22.4
1958	2/05	67	22.3	3/06	65	22.6	4/03	72	27.0			
1959	2/06	45	13.1	3/06	53	17.4	4/03	64	22.7	4/30	47	19.3
1960	1/29	20	4.8	2/29	39	11.0	3/31	48	15.7	4/28	45	18.1
1961	2/01	39	13.1	3/01	68	18.4	3/30	69	28.0	4/28	66	28.5
1962	1/30	40	14.8	2/28	47	13.6	4/03	62	21.7	4/30	49	20.3
1963	1/30	20	6.7	2/27	23	9.0	3/28	31	9.7	4/29	33	14.5
1964	1/30	69	20.1	2/27	68	25.1	3/30	82	29.9	4/29	75	32.1
1965	1/28	75	24.3	2/26	68	26.0	3/30	70	29.4	4/30	45	22.4
1966	1/31	54	16.1	3/01	76	21.5	3/31	64	25.0	4/28	44	19.6
1967	1/31	49	15.6	2/27	60	20.9	3/29	74	24.6	5.02	73	28.4
1968	1/31	38	9.4	2/29	23	9.0	3/30	25	9.1	4/29	25	10.2
1969	1/30	77	23.4	2/27	85	30.9	3/28	76	30.4	4/30	58	29.0
1970	1/30	62	19.3	2/27	64	24.1	4/01	61	25.1	5/01	64	29.1
1971	1/29	82	29.9	3/02	80	32.3	4/01	97	41.7	4/30	85	40.1
1972	1/25	112	40.9	2/28	101	48.7	3/30	102	48.3	5/02	105	51.9
1973	1/30	29	9.1	2/26	29	10.1	3/28	34	11.9			
1974	2/05	88	27.7	2/28	106	35.9	4/02	98	36.9	4/29	96	45.3
1975	1/30	58	20.9	2/27	77	27.3	4/02	90	32.4	5/01	82	33.6
1976	1/29	40	12.7	3/01	89	24.4	3/29	93	28.4	4/28	73	29.7
1977	1/28	0	.0	2/28	8	1.4	3/30	30	7.4	5.01	0	.0

Year	February 15			March 15			April 15			May 15		
	Date	Snow depth (in.)	Water equiv. (in.)	Date	Snow depth (in.)	Water equiv. (in.)	Date	Snow depth (in.)	Water equiv. (in.)	Date	Snow depth (in.)	Water equiv. (in.)
1953				3/13	69	24.2	4/17	82	32.1	5/18	48	23.4
1954				3/12	97	37.6	4/15	101	42.7	5/17	69	33.4
1955				3/14	87	24.8	4/14	91	31.5	5/17	75	33.4
1956							4/18	116	56.7	5/09	100	49.0
1957				3/13	69	18.3						
1958							4/15	65	26.1	5/08	50	23.7
1959							4/15	58	21.7	5/15	37	15.2
1960				3/14	56	15.0	4/14	39	14.1	5/16	26	11.6
1961				3/15	75	26.4	4/14	65	26.1	5/15	56	26.1
1962	2/14	45	15.6	3/15	59	17.4	4/16	50	21.4	5/16	40	17.3
1963	2/14	22	9.7	3/14	28	9.4	4/15	36	13.6			
1964	2/14	65	23.1	3/13	89	28.9	4/14	78	31.1	5/14	64	28.4
1965	2/16	68	25.2	3/15	65	26.6	4/14	61	27.6	5/14	37	17.6
1966	2/15	60	19.9	3/15	69	24.7	4/18	50	22.7	5/13	28	14.1
1967	2/15	67	20.2	3/15	74	23.1	4/14	72	26.7	5/15	58	25.4
1968	2/15	30	9.9	3/18	25	9.1	4/16	31	10.3			
1969	2/19	84	30.0	3/13	83	30.9						
1970	2/13	61	21.7	3/13	67	25.4						
1971	2/17	68	30.0	3/18	96	37.7	4/14	94	41.6	5/17	67	31.6
1972	2/18	107	46.4	3/16	104	51.6	4/17	112	50.9	5/15	84	46.1
1973	2/14	32	9.3	3/15	34	11.1	4/13	25	10.2			
1974	2/13	85	27.7	3/18	105	39.7	4/16	102	45.4	5/16	84	38.1
1975	2/14	78	24.9	3/18	92	30.6	4/15	89	34.0	5/15	65	31.7
1976	2/17	64	17.1	3/16	75	24.1	4/15	74	28.9			
1977	2/15	0	.0	3/16	26	4.2	4/15	17	6.3			

TABLE 28.--Snow depths and water equivalents at selected snow courses, 1960-77 water years--Continued

White Pass (E side) -- Continued

Year	January 1 Date	Snow depth (in.)	Water equiv. (in.)	January 15 Date	Snow depth (in.)	Water equiv. (in.)	June 1 Date	Snow depth (in.)	Water equiv. (in.)	June 15 Date	Snow depth (in.)	Water equiv. (in.)
1961	12/30	37	9.6	1/13	38	12.1						
1963	12/31	20	6.2	1/15	20	7.5						
1964	12/30	32	9.1	1/14	48	12.2						
1965	1/06	64	18.1	1/15	58	18.7						
1966				1/11	48	13.4						
1967	1/05	39	7.9	1/17	37	11.7						
1968	1/02	11	3.9	1/16	20	6.4						
1969				1/15	70	20.1						
1970	1/02	31	6.7	1/20	48	14.1						
1971	1/05	54	15.4	1/16	69	20.4						
1972	12/30	57	17.3									
1973	1/04	22	5.7	1/17	27	8.1						
1974	1/03	70	19.6	1/18	64	21.3						
1975	12/30	37	9.6	1/16	65	18.9						
1976	12/31	23	6.6	1/15	54	14.0				6/15	21	9.8

Miscellaneous measurements

Year	Date	Snow depth (in.)	Water equiv. (in.)	Date	Snow depth (in.)	Water equiv. (in.)	Date	Snow depth (in.)	Water equiv. (in.)	Date	Snow depth (in.)	Water equiv. (in.)
1963	11/28	13	2.4	12/13	22	5.9						
1964	12/13	27	6.5									
1966	11/30	7	1.4									
1968	12/19	18	4.5									
1969	12/03	12	3.2	12/16	39	8.2						
1970	12/18	18	5.0									
1971	12/07	27	6.9	12/18	35	9.9						
1972	12/01	22	5.1	12/15	53	11.8						
1974	11/28	36	8.6	12/14	44	11.5						
1975	12/16	23	5.5									
1976	12/18	17	4.8									

Satus Pass

20D01 elev. 4,030 ft lat 45 deg 59 min long 120 deg 41 min
Record began 1958 sec.21 T06N R17E
Number of sample points - 10
Measured by Soil Conservation Service
Parameters measured - snow course only
Remarks - snow course along old logging road through timber S facing

Year	February 1 Date	Snow depth (in.)	Water equiv. (in.)	March 1 Date	Snow depth (in.)	Water equiv. (in.)	April 1 Date	Snow depth (in.)	Water equiv. (in.)	May 1 Date	Snow depth (in.)	Water equiv. (in.)
1957				2/26	15	4.9	3/28	23	8.9			
1958	2/03	30	9.6	3/03	24	8.8	4/01	22	7.7			
1959	2/02	3	1.0	3/04	13	5.2	4/02	11	4.7	5/04	0	0.0
1960	2/02	14	3.4	3/02	24	6.3	4/05	9	3.3	5/02	1	.2
1961	2/01	7	3.0	3/01	8	2.6	4/03	5	1.8	5/01	0	.0
1962	2/02	12	5.2	3/01	31	8.3	4.02	28	11.1	5/02	0	.0
1963	1/30	6	.5	2/28	0	.0	3/27	1	.2	4/29	0	.0
1964	2/03	28	9.5	2/27	25	10.3	3/30	30	11.9	4/28	10	4.7
1965	1/28	44	14.6	2/26	30	11.8	3/29	27	11.2	4/29	0	.0
1966	1/31	49	17.1	2/28	49	15.3	3/31	45	18.9	4/29	13	6.1
1967	1/31	13	4.3	2/27	13	4.6	3/30	8	2.7	4/28	0	.0
1968	1/31	13	4.3	2/28	0	.0	3/28	0	.0	4/29	0	.0
1969	2/01	58	14.9	2/27	57	14.4	3/27	41	18.0	4/29	6	2.5
1970	1/29	39	12.1	2/27	34	12.8	4/01	24	9.9	4/30	0	.0
1971	1/28	45	16.6	2/25	37	14.1	3/31	51	19.9	4/29	30	13.0
1972	1/27	50	13.8	2/28	35	15.8	3/30	17	8.3	4/28	0	.0
1973	1/31	12	3.1	2/28	0	.0	3/29	0	.0			
1974	1/30	35	12.0	2/28	54	13.7	3/28	44	16.2	4/30	16	7.8
1975	1/30	26	8.6	2/28	39	14.0	3/31	49	16.6	4/29	29	12.8
1976	1/30	7	1.8	2/27	34	7.8	3/31	30	10.4			
1977	1/28	0	.0	2/28	4	1.2	4/02	0	.0			

TABLE 28.--Snow depths and water equivalents at selected snow courses, 1960-77 water years--Continued

Bumping Lake
21C08 elev. 3,450 ft lat 46 deg 52 min long 121 deg 18 min
Record began 1915 sec. 23 T16N R12E
Number of sample points - 8
Measured by U.S. Bureau of Reclamation
Parameters measured - snow course only
Remarks - snow course scattered through campground in timber below dam

Year	February 1			March 1			April 1			May 1		
	Date	Snow depth (in.)	Water equiv. (in.)	Date	Snow depth (in.)	Water equiv. (in.)	Date	Snow depth (in.)	Water equiv. (in.)	Date	Snow depth (in.)	Water equiv. (in.)
1915	2/00	31	7.6	3/00	36	11.0	4/00	17	6.3			
1916										5/15	43	17.2
1917	2/00	41	11.7	3/00	42	11.3	4/00	48	13.4			
1918				3/00	34	8.3	4/00	30	9.6			
1919							4/00	42	13.0			
1921	2/00	53	15.2	3/00	48	17.1	4/00	44	17.5			
1922							4/00	50	14.5	4/20	38	13.9
1923	2/00	47	15.8	3/00	48	16.4	4/00	40	15.1			
1924				3/00	23	8.0	4/00	17	5.6	5/00	0	0.0
1925	2/00	37	11.6	3/00	43	14.5	4/00	31	11.2	5/00	0	.0
1926	2/00	23	4.8	3/00	27	7.4	4/00	0	.0	5/00	0	.0
1927	2/00	60	15.3	3/00	72	19.3	4/00	56	18.6	5/00	25	11.0
1929	2/00	51	10.4	3/00	40	11.6	4/00	26	10.4			
1930	2/00	35	9.4	3/00	34	10.3						
1931	2/00	32	9.7	3/00	37	10.3	4/00	27	8.6	5/00	0	.0
1932	2/00	45	10.5	3/00	34	12.0	4/00	27	10.7			
1933	2/00	55	12.6	3/00	69	17.6	4/00	62	23.2	5/00	33	12.5
1934	2/00	22	6.6	3/00	18	6.3	4/00	0	.0			
1935	2/00	42	12.6	3/00	45	14.2	4/00	48	15.5	5/00	21	8.0
1936	2/00	53	13.8	3/00	71	18.9	4/00	78	21/1	5/00	23	9.4
1937	2/01	27	5.5	2/28	46	13.2	4/01	34	13.3	4/30	12	4.6
1938	1/31	47	11.9	2/28	53	15.0	3/31	56	18.8	4/30	13	4.9
1939	1/31	33	6.6	2/28	43	10.9	3/31	33	10.7	5/01	0	.0
1940	1/31	23	5.8	2/29	41	10.8	3/30	20	6.9			
1941	1/31	29	7.2	2/28	30	8.4	3/28	13	4.4			
1942	1/31	26	6.2	2/28	39	10.0	3/31	23	8.3			
1943	1/31	68	18.2	2/28	61	22.4	3/31	61	21.4	4/30	24	10.7
1944	1/31	18	5.3	2/29	27	7.7	3/31	16	6.8			
1945	1/31	14	4.7	2/28	25	8.1	3/31	31	11.2	4/30	14	5.4
1946	1/31	73	20.4	2/28	77	26.4	3/31	64	26.2	4/30	35	15.8
1947	1/31	38	9.9	2/28	33	11.8	3/31	24	9.3	5/01	0	.0
1948	1/31	30	8.2	2/28	43	13.1	3/31	43	14.6	4/30	22	8.8
1949	1/31	62	19.3	3/02	86	31.1	3/31	72	32.5	4/30	30	15.2
1950	1/31	71	19.9	2/28	66	12.6	3/31	74	26.6	4/29	47	21.8
1951	1/31	50	14.9	2/28	62	24.2	3/30	53	20.2	4/30	17	9.1
1952	1/31	56	17.1	2/29	55	19.9	3/31	40	16.4	4/30	8	3.3
1953	1/30	40	12.9	2/27	39	15.1	3/31	35	14.0	4/30	22	8.7
1954	1/29	82	19.5	2/26	82	26.8	3/31	63	26.1	4/29	33	15.8
1955	1/31	23	6.6	2/27	32	9.8	3/31	46	14.6	4/29	37	12.5
1956	1/31	99	31.9	2/29	105	38.6	3/29	99	37.9	5/01	60	25.0
1957	1/30	15	3.4	2/27	26	8.1	3/29	35	14.0	4/30	4	2.1
1958	1/30	49	14.9	2/27	43	16.6	3/31	38	16.3	4/29	20	9.6
1959	1/29	31	10.8	2/26	42	13.5	3/31	39	15.0	5/01	5	2.1
1960	1/29	21	5.0	2/27	32	8.9	3/30	35	12.9	4/28	22	9.1
1961	1/30	37	10.8	2/27	52	14.7	3/30	46	15.1	4/29	22	9.2
1962	1/30	29	7.5	2/28	32	8.4	3/29	44	13.4	4/28	14	4.9
1963	1/29	9	2.9	2/26	12	5.6	3/28	10	3.4	4/29	4	1.5
1964	1/30	57	15.2	2/27	50	17.5	3/30	52	19.8	4/29	29	12.8
1965	1/28	57	17.9	2/25	47	17.6	3/30	41	16.3	4/29	12	4.4
1966	1/28	47	14.4	2/25	47	16.1	3/31	49	19.8	4/27	21	10.9
1967	1/29	30	10.2	2/28	35	12.1	3/30	37	13.2	5/01	31	11.6
1968	2/05	33	9.2	2/28	25	10.3	4/01	16	6.8	5/01	0	.0
1969	1/31	73	17.4	2/28	62	20.6	3/31	42	18.2	5/01	18	9.1
1970	1/31	71	22.2	3/02	60	25.2	3/31	50	22.2	4/29	41	19.2
1971	1/31	52	21.5	3/01	54	22.8	3/30	70	29.5	5/03	42	20.9
1972	1/31	57	18.9	3/01	61	20.4	3/31	49	20.5	5/01	32	16.2
1973	1/31	28	8.0	2/28	22	77.7	3/29	17	6.6	5/01	0	0
1974	2/04	71	20.2	3/01	79	26.0	4/01	72	28.2	4/30	46	19.9
1975	1/31	44	13.1	2/28	57	17.9	3/31	58	20.9	4/30	39	14.8
1976	1/31	28	8.7	2/29	71	15.9	3/31	57	18.9	4/30	28	11.4
1977	1/28	0	.0	2/28	0	.0	3/31	10	3.1	5/02	0	.0

TABLE 28.--Snow depths and water equivalents at selected snow courses, 1960-77 water years--Continued

Bumping Lake -- Continued

Year	February 15 Date	February 15 Snow depth (in.)	February 15 Water equiv. (in.)	March 15 Date	March 15 Snow depth (in.)	March 15 Water equiv. (in.)	April 15 Date	April 15 Snow depth (in.)	April 15 Water equiv. (in.)	May 15 Date	May 15 Snow depth (in.)	May 15 Water equiv. (in.)
1949							4/15	48	21.9	5/15	7	2.8
1950							4/15	60	23.8	5/15	26	12.8
1951							4/16	27	11.9	5/15	4	1.6
1952							4/15	25	10.8	5/15	0	.0
1953										5/15	0	.0
1954							4/15	53	24.4	5/14	15	7.2
1955										5/17	14	4.1
1956										5/17	39	18.1
1957				3/15	47	12.6	4/15	22	9.4			
1958				3/14	44	17.0	4/15	31	12.9	5/16	0	.0
1959				3/16	37	14.0	4/14	23	9.4			
1960				3/12	48	13.2	4/14	27	8.4	5/12	0	.0
1961	2/14	50	12.4	3/14	57	17.5	4/13	32	13.5	5/15	4	1.6
1962	2/14	33	9.4	3/15	42	13.0	4/14	25	9.0	5/16	0	.0
1963	2/14	16	5.8	3/14	12	4.3	4/13	11	4.0	5/15	0	.0
1964	2/14	54	15.0	3/14	62	18.2	4/14	39	16.1	5/14	9	4.2
1965	2/14	51	19.2	3/13	43	17.8	4/13	29	11.1	5/15	0	.0
1966	2/14	55	17.4	3/14	54	19.6	4/14	38	16.5	5/14	0	.0
1967	2/14	42	11.4	3/17	42	13.4	4/13	33	12.2			
1968	2/15	31	10.1	3/14	20	8.5	4/16	8	4.5	5/15	0	.0
1969	2/14	68	20.8	3/14	58	20.4						
1970	2/18	64	25.1	3/16	58	25.8						
1971	2/12	49	21.2	3/15	73	29.0	4/16	62	28.2	5/14	20	10.5
1972	2/16	53	20.6	3/15	56	22.6	4/14	45	19.5	5/14	8	4.4
1973	2/13	26	7.9	3/14	22	7.9	4/12	7	3.4			
1974	2/12	66	21.1	3/15	81	27.9	4/15	64	28.2	5/15	24	9.8
1975	2/13	59	18.0	3/21	68	21.6	4/14	51	20.4	5/15	11	5.0
1976	2/13	30	9.1	3/15	54	16.5	4/14	42	15.2	5/14	4	1.8
1977	2/15	0	.0	3/14	14	2.9	4/15	0	.0			

Year	January 1 Date	January 1 Snow depth (in.)	January 1 Water equiv. (in.)	January 15 Date	January 15 Snow depth (in.)	January 15 Water equiv. (in.)	June 1 Date	June 1 Snow depth (in.)	June 1 Water equiv. (in.)	June 15 Date	June 15 Snow depth (in.)	June 15 Water equiv. (in.)
1915	1/00	21	4.4									
1927	1/00	29	7.5									
1929	1/00	37	5.9									
1930	1/00	27	7.3									
1931	1/00	25	4.1									
1932	1/00	39	7.5									
1933	1/00	54	10.1									
1934	1/00	18	4.2									
1935	1/00	38	6.4									
1936	1/00	26	5.9									
1937	1/02	8	2.0									
1938	12/31	28	7.8									
1939	1/01	17	3.8									
1940	1/02	13	3.5									
1942	12/31	19	3.6									
1943	12/31	53	12.8									
1944	1/03	20	3.2									
1945	12/31	16	3.9									
1946	12/31	43	13.0									
1947	12/31	16	5.6									
1948	12/31	10	2.0									
1949	1/01	80	18.1									
1950	12/30	24	5.3									
1951	12/31	23	8.5									
1952	12/31	49	11.7									
1953	12/31	37	8.1									
1954	12/30	13	3.8									
1955	12/30	22	3.2									
1956	12/31	67	22.5									
1957	1/01	0	.0									
1958	12/30	30	8.1									
1959	12/30	19	6.1									
1960	12/30	10	2.8									
1961	12/29	32	6.6	1/14	32	10.9						
1962	12/28	37	10.2	1/13	28	7.6						
1963	12/27	10	2.9	1/12	8	2.6						

TABLE 28.--Snow depths and water equivalents at selected snow courses, 1960-77 water years--Continued

Bumping Lake -- Continued

Year	January 1 Date	January 1 Snow depth (in.)	January 1 Water equiv. (in.)	January 15 Date	January 15 Snow depth (in.)	January 15 Water equiv. (in.)	June 1 Date	June 1 Snow depth (in.)	June 1 Water equiv. (in.)	June 15 Date	June 15 Snow depth (in.)	June 15 Water equiv. (in.)
1964	12/30	20	4.8	1/14	36	8.4						
1965	12/29	53	9.9	1/15	52	15.4						
1966	12/29	47	6.4	1/14	49	14.2						
1967	12/29	12	3.8	1/12	18	4.7						
1968	1/02	11	3.5	1/17	27	8.2						
1969				1/13	58	14.7						
1970	1/02	29	8.9	1/15	42	12.0						
1971	12/31	54	14.1	1/18	55	18.9						
1972	1/03	34	9.2	1/14	49	14.6						
1973	1/02	13	3.6	1/18	21	6.6						
1974	1/02	56	14.4	1/20	57	16.8						
1975	12/31	27	5.9	1/15	48	11.9						
1976	12/31	14	3.7	1/18	31	7.6						
1977	12/29	0	.0									

Miscellaneous measurements

Year	Date	Snow depth (in.)	Water equiv. (in.)	Date	Snow depth (in.)	Water equiv. (in.)
1945	12/01	23	3.7			
1946	11/29	29	7.2			
1947	11/29	19	4.7			
1949	11/30	31	4.9			
1951	11/30	19	5.2			
1952	11/30	21	6.0			
1957	11/30	28	7.4			
1959	11/29	14	4.9			
1961	11/28	15	3.8	12/15	18	4.2
1962	12/04	18	3.8	12/14	21	3.9
1963	12/01	14	3.2	12/13	11	2.8
1964	11/29	0	.0	12/13	7	2.2
1965	11/28	21	2.4	12/17	20	3.8
1966	11/30	4	.6			
1967	12/15	14	3.3			
1968	12/01	5	.6	12/20	14	3.2
1969	12/02	2	.1	12/19	20	4.1
1970	12/18	21	4.2			
1971	12/01	22	3.9	12/16	41	9.0
1972	11/30	17	3.2	12/16	34	5.8
1974	11/30	29	7.5	12/13	37	9.1
1975	12/17	15	3.4			
1976	12/18	9	2.3			

TABLE 28.--Snow depths and water equivalents at selected snow courses, 1960-77 water years--Continued

Ahtanum River S.
21C11 elev. 3,100 ft lat 46 deg 31 min long 121 deg 01 min
Record began 1940 sec.26 T12N R14E
Number of sample points - 13
Measured by Department of Natural Resources
Parameters measured - snow course only
Remarks - snow course in open grass meadow behind ranger station

Year	February 1 Date	Snow depth (in.)	Water equiv. (in.)	March 1 Date	Snow depth (in.)	Water equiv. (in.)	April 1 Date	Snow depth (in.)	Water equiv. (in.)	May 1 Date	Snow depth (in.)	Water equiv. (in.)
1941	2/01	23	8.6	3/01	18	8.2						
1942	2/01	31	10.1	3.01	30	8.7	4/01	11	5.3			
1943	2/01	45	10.0	3/01	32	10.1						
1944	2/02	7	1.7	2/29	15	4.4						
1945	2/01	11	2.8	3/01	16	4.3	4/07	7	1.6			
1946	2/02	35	11.1	3/05	29	9.6						
1947	2/01	13	3.1	3/01	4	2.4						
1948	2.01	23	4.9	3/01	23	7.6	4/02	17	6.0			
1949	2/03	30	10.0	3/01	38	11.9	3/27	28	10.0			
1950	2/01	32	7.8				4/03	22	8.4			
1951	2/02	40	7.9	2/25	23	6.6						
1953	2/03	12	4.9									
1954	2/04	28	6.4									
1955	2/01	14	3.4	3/01	24	4.4	4/01	13	5.4	5/07	0	0.0
1956	2/01	60	16.6	2/29	57	18.1	4/01	40	16.4	5/01	0	.0
1957	2/02	10	2.0	3/01	8	2.3	4/01	7	2.3	5/01	0	.0
1958	2/04	25	9.0	3/03	18	5.0	3/31	13	3.8	4/28	0	.0
1959	2/01	12	3.6	3/04	22	6.4	3/30	18	4.0	5/01	0	.0
1960	2/01	16	3.1	2/29	21	4.8	4/01	7	2.2	5/01	0	.0
1961	2/01	17	4.8	2/27	17	5.0	4/01	0	.0	5/01	0	.0
1962	1/31	14	5.2	2/28	23	7.3	4/01	16	7.0	5/01	0	.0
1963	1/29	0	.0	2/27	0	.0	3/30	8	3.0	5/01	0	.0
1964	1/27	22	4.4	2/24	22	5.8	3/26	15	5.5	4/30	0	.0
1965	1/27	38	10.0	2/23	25	7.6	3/26	17	7.0	4/30	0	.0
1966	1/30	34	8.2	2/24	32	9.6	3/27	26	9.8	5/01	0	.0
1967	1/27	12	2.8	2/24	0	.0	3/27	0	.0	5/01	0	.0
1968	1/28	24	5.2	2/26	17	6.0	3/28	0	.0	4/30	0	.0
1969	1/27	40	10.2	2/24	47	13.2	3/26	31	13.0	5/01	0	.0
1970	1/27	43	8.2	2/24	31	11.2	3/27	22	8.2			
1971	1/27	27	8.7	2/24	19	7.1	3/26	29	10.3	4/26	0	.0
1972	1/27	38	10.7	2/25	31	11.8	3/27	10	4.3	5/01	0	.0
1973	1/26	12	4.0	2/23	13	3.2	3/29	0	.0			
1974	1/29	22	10.2	2/27	23	7.6	3/26	22	10.6	5/01	0	.0
1975	1/28	28	6.8	2/25	36	12.8	3/26	32	13.0			
1976	1/27	8	2.2	2/24	14	3.4	3/25	18	5.6	5/01	0	.0
1977	1/24	0	.0	2/24	1	.5	3/28	0	.0			

Year	January 1 Date	Snow depth (in.)	Water equiv. (in.)	January 15 Date	Snow depth (in.)	Water equiv. (in.)	June 1 Date	Snow depth (in.)	Water equiv. (in.)	June 15 Date	Snow depth (in.)	Water equiv. (in.)
1941	1/01	15	3.1									
1942				1/15	18	8.7						
1943	1/01	34	8.2									
1944	1/01	5	2.6									
1945	1/01	5	1.9									
1946	1/01	24	9.0									
1949	1/01	33	9.4									
1950	1/04	11	2.1									
1953	1/01	23	5.5									
1955	1/01	7	2.1									
1956	1/01	45	9.3									
1957	1/01	0	.0									
1958	1/01	0	.0									
1960	1/01	0	.0									
1961	12/31	16	3.8									
1962	12/31	17	5.0									
1963	12/28	0	.0									
1964	12/27	13	2.5									
1965	12/27	32	6.2									
1966	12/27	27	3.2									
1967	12/27	8	2.0									
1968	12/27	10	3.2									
1969	12/27	22	4.0									
1970	12/26	22	4.6									
1971	12/27	22	5.3									
1972	12/27	29	6.2									
1973	12/27	6	1.5									
1974	12/28	37	5.8									
1975	12/27	10	2.6									
1976	12/31	3	1.0									
1977	12/27	0	.0									

TABLE 29.--End-of-month contents of Bumping and Rimrock Reservoirs, 1960-77 water years

[Data from U.S. Bureau of Reclamation (written commun., 1978)]

12487500 BUMPING LAKE.-- Lat 46° 52' 25", long 121° 17' 57", in SW¼ sec. 14 (unsurveyed), T. 16 N., R. 12 E., Yakima County, Hydrologic Unit 17030002, Snoqualmie National Forest, at outlet of dam on Bumping River, 2.2 mi (3.5 km) southwest of Goose Prairie, 10 mi (16 km) southwest of town of American River, 19 mi (31 km) west of Nile, and at mile 17.0 (27.4 km). DRAINAGE AREA, 69.3 mi^2 (179.5 km^2). PERIOD OF RECORD, June to July 1906, April 1909 to current year. GAGE, water-stage recorder. Datum of gage is at mean sea level (Bureau of Reclamation benchmark). Prior to Nov. 23, 1966, nonrecording gage at same site and datum.

REMARKS.-- Reservoir is formed on natural lake by earth-fill dam completed in 1910; storage began Nov. 3, 1910. Usable capacity, 33,700 acre-ft (41.6 hm^3) between elevation 3,389.00 ft (1,032.967 m), invert of gate sill and 3,426.00 ft (1,044.245 m), spillway crest. Figures given herein represent usable contents. Water is used for irrigation.

COOPERATION.-- Records furnished by Bureau of Reclamation and reviewed by Geographical Survey.

EXTREMES FOR PERIOD OF RECORD.-- Maximum contents observed, 39,840 acre-ft (49.1 hm^3) June 21, 22, 1925, elevation, 3,430.55 ft (1,045.632 m); minimum observed, 1,130 acre-ft (1.39 hm^3) Feb. 5, 6, 7, 8, 9, 1949, elevation, 3,390.80 ft (1,033.516 m).

EXTREMES FOR CURRENT YEAR.-- Maximum contents, 35,590 acre-ft (43.9 hm^3) June 8, elevation, 3,427.43 ft (1,044.681 m); minimum, 4,100 acre-ft (5.06 hm^3) Jan. 16, elevation, 3,395.37 ft (1,034.909 m).

Station 487500 Bumping Reservoir End-of-Month Contents 100 AF Units

Year	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	
1960	78	181	100	57	74	144	189	310	354	165	98	49	1,799
1961	48	126	82	119	131	167	215	260	342	147	71	48	1,756
1962	54	64	93	75	119	141	318	344	360	240	56	45	1,909
1963	29	112	128	106	241	328	343	359	293	212	97	42	2,290
1964	29	41	41	75	37	33	46	200	335	351	171	57	1,416
1965	43	72	103	113	77	63	178	249	351	339	162	60	1,810
1966	45	32	33	32	31	43	82	196	243	289	137	42	1,205
1967	28	40	58	56	48	38	46	273	355	296	184	77	1,499
1968	74	38	57	165	282	166	158	232	341	259	167	97	2,036
1969	39	141	47	45	28	33	77	295	349	300	183	86	1,623
1970	42	63	47	91	72	72	76	298	342	251	177	119	1,650
1971	29	50	30	53	54	32	38	176	285	352	322	246	1,667
1972	91	59	42	51	96	90	64	318	322	309	268	145	1,855
1973	63	36	76	67	91	117	168	278	229	128	56	26	1,335
1974	29	53	62	106	46	58	84	170	370	349	252	86	1,665
1975	26	30	47	54	30	28	32	178	350	339	257	77	1,448
1976	54	96	139	113	84	53	82	257	366	344	269	99	1,956
1977	57	48	47	44	93	136	268	351	343	314	183	104	1,988
TOTAL	858	1,282	1,232	1,422	1,634	1,742	2,464	4,744	5,930	4,984	3,110	1,505	30,907
AVERAGE	48	71	68	79	91	97	137	264	329	277	173	84	1,717

12491000 RIMROCK LAKE.-- Lat 46° 39' 23", long 121° 07' 43", in NE¼ SW¼ sec. 31, T. 14 N., R. 14 E., Yakima County, Hydrologic Unit 17030002, Snoqualmie National Forest, on upstream spillway pier at Tieton dam on Tieton River at Rimrock, 0.6 mi (1.0 km) upstream from Wildcat Creek, 7.1 mi (11.4 km) upstream from headworks on Tieton Canal, 21 mi (34 km) west of Naches and at mile 21.3 (34.3 km). DRAINAGE AREA, 187 mi^2 (484 km^2). PERIOD OF RECORD, April 1925 to current year. Prior to October 1959, published as Tieton Reservoir. GAGE, water-stage recorder and low water staff gages. Datum of gage is at mean sea level (Bureau of Reclamation bench mark). Prior to March 14, 1967, nonrecording gage at same site and datum.

REMARKS.-- Reservoir is formed by earth-fill dam completed in 1925; storage began April 27, 1925. Usable capacity, 198,000 acre-ft (244 hm^3) between elevation 2,766.00 ft (843.077 m), invert of tunnel entrance, and 2,926.00 ft (891.845 m), crest of spillway gates. Figures given herein represent usable contents. Water is used for irrigation.

COOPERATION.-- Records furnished by Bureau of Reclamation and reviewed by Geological Survey.

EXTREMES FOR PERIOD OF RECORD.-- Maximum contents, 201,630 acre-ft (249 hm^3) June 18, 1974, elevation, 2,927.43 ft (892.281 m); minimum observed, 89 acre-ft (0.110 hm^3) Oct. 12, 1926, elevation, 2,766.77 ft (843.311 m).

EXTREMES FOR CURRENT YEAR.-- Maximum contents, 176,600 acre-ft (218 hm^3) June 25, 26, 27, elevation, 2,917.20 ft (889.163 m); minimum, 46,360 acre-ft (57.2 hm^3) Sept. 30, elevation, 2,843.40 ft (866.668 m).

Station 491000 Rimrock Reservoir End-of-Month Contents 100 AF Units

Year	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	
1960	946	1,058	1,274	1,347	1,531	1,765	1,877	1,807	1,961	1,422	671	232	15,891
1961	268	477	597	845	1,229	1,510	1,716	1,823	1,961	1,648	1,026	492	13,592
1962	511	626	805	1,103	1,285	1,423	1,893	1,865	1,990	1,822	1,694	1,049	16,066
1963	984	1,344	1,337	1,307	1,736	1,950	1,982	2,002	1,978	1,889	1,397	481	18,387
1964	375	508	653	842	958	1,020	792	949	1,622	1,919	1,563	1,069	12,270
1965	1,113	1,196	1,491	1,554	1,505	1,448	1,826	1,940	1,952	1,469	759	440	16,693
1966	495	625	735	824	845	923	1,196	1,645	1,777	1,475	794	343	11,677
1967	323	431	699	913	1,114	1,256	1,392	1,847	2,002	1,693	1,068	424	13,162
1968	536	777	1,010	1,307	1,765	1,864	1,649	1,686	1,960	1,519	710	370	15,153
1969	518	873	1,055	1,359	1,493	1,583	1,654	1,985	1,972	1,421	766	249	14,928
1970	326	453	551	761	892	1,103	1,192	1,574	1,988	1,518	845	326	11,529
1971	301	437	594	853	1,230	1,397	1,107	1,471	1,985	1,964	1,389	1,085	13,813
1972	1,183	1,302	1,384	1,463	1,407	1,462	635	1,312	1,861	1,907	1,406	1,049	16,371
1973	1,117	1,230	1,423	1,432	1,534	1,604	1,312	1,318	1,327	914	433	2	13,646
1974	76	284	519	1,124	1,323	1,514	1,440	1,489	2,000	1,960	1,670	1,210	14,609
1975	1,146	1,216	1,355	1,358	1,216	1,287	1,351	1,443	1,982	1,884	1,544	1,247	17,029
1976	1,317	1,427	1,424	1,398	1,483	1,510	1,414	1,772	1,996	1,883	1,847	1,003	18,474
1977	921	1,016	1,087	1,201	1,298	1,400	1,549	1,622	1,755	1,499	992	466	14,806
TOTALS	12,456	15,280	17,993	20,991	23,844	26,019	25,977	29,550	34,069	29,806	20,574	11,537	268,096
AVERAGE	692	849	1,000	1,166	1,325	1,446	1,443	1,642	1,893	1,656	1,143	641	14,894

TABLE 30.--Municipal, industrial, and hydroelectric-power diversions, 1960-77 water years

[Data from U.S. Bureau of Reclamation (written commun., 1978)]

33006 City of Yakima M & I Diversion -- Oak Flat Diversion — 1 AF Units

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Total
1960	760	560	540	550	500	530	550	660	640	810	770	750	7,620
1961	710	550	510	510	460	480	510	590	680	770	730	740	7,240
1962	720	640	550	580	470	550	580	610	660	760	780	760	7,660
1963	700	580	540	560	500	540	540	660	740	760	790	710	7,620
1964	770	660	640	650	610	660	640	730	730	820	760	780	8,450
1965	800	650	640	640	560	650	660	760	750	750	750	730	8,340
1966	750	640	700	700	640	630	690	770	750	760	790	760	8,580
1967	790	710	720	700	610	710	700	760	730	760	740	730	8,660
1968	760	740	740	760	690	740	730	770	700	730	690	600	8,650
1969	630	690	680	740	670	720	720	750	730	730	730	730	8,520
1970	730	700	720	680	570	740	740	780	760	820	800	720	8,760
1971	700	680	740	740	710	770	770	800	780	820	780	710	9,000
1972	750	720	730	730	700	580	730	760	390	360	370	330	7,150
1973	340	330	420	450	430	380	410	420	280	290	300	230	4,280
1974	220	210	300	270	160	250	210	330	410	530	450	370	3,710
1975	310	270	270	290	240	230	240	220	200	220	150	30	2,670
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	10,440	9,330	9,440	9,550	8,520	9,160	9,420	10,370	9,930	10,690	10,380	9,680	116,910
AVERAGE	580	518	524	531	473	509	523	576	552	594	577	538	6,495

30009 City of Yakima M & I -- Naches Pumping Plant — 1 AF Units

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Total
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	50	210	210	240	710
1972	270	210	200	170	200	260	330	410	690	750	810	700	5,000
1973	590	450	420	420	300	390	420	510	670	840	950	790	6,750
1974	670	480	480	540	540	470	500	550	400	0	0	640	5,270
1975	710	560	430	410	440	520	470	700	790	960	980	1,130	8,100
1976	980	760	730	700	650	750	760	960	970	1,130	1,140	1,180	10,710
1977	1,020	750	700	660	600	660	600	590	600	1,160	1,230	1,020	9,590
TOTAL	4,240	3,210	2,960	2,900	2,730	3,050	3,080	3,720	4,170	5,050	5,320	5,700	46,130
AVERAGE	236	178	164	161	152	169	171	207	232	281	296	317	2,563

10008 Boise-Cascade Log Ditch — 1 AF Units

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Total
1960	920	860	860	770	610	650	830	810	900	520	770	690	9,190
1961	920	860	860	770	610	650	830	810	900	520	770	690	9,190
1962	920	860	860	770	610	650	830	810	900	520	770	690	9,190
1963	920	860	860	770	610	650	830	810	900	520	770	690	9,190
1964	920	860	860	770	610	650	830	810	900	520	770	690	9,190
1965	920	860	860	770	610	650	830	810	900	520	770	690	9,190
1966	920	860	860	770	610	650	830	810	900	520	770	690	9,190
1967	920	860	860	770	610	650	830	810	900	520	770	690	9,190
1968	920	860	860	770	610	650	830	810	900	520	770	690	9,190
1969	920	860	860	770	610	650	830	810	900	520	770	690	9,190
1970	920	860	860	770	610	650	830	810	900	520	770	690	9,190
1971	920	860	860	770	610	650	830	810	900	520	770	690	9,190
1972	920	860	860	770	610	650	830	810	900	520	770	690	9,190
1973	920	860	860	770	610	650	830	810	900	520	770	690	9,190
1974	920	860	860	770	610	650	830	810	900	520	770	690	9,190
1975	920	860	860	770	610	650	830	810	900	520	770	690	9,190
1976	920	860	860	770	610	650	830	810	900	520	770	690	9,190
1977	920	860	860	770	610	650	830	810	900	520	770	690	9,190
TOTAL	16,560	15,480	15,480	13,860	10,980	11,700	14,940	14,580	16,200	9,360	13,860	12,420	165,420
AVERAGE	920	860	860	770	610	650	830	810	900	520	770	690	9,190

TABLE 30.--Municipal, industrial, and hydroelectric-power diversions, 1960-77 water year--Continued

13002 Roza Power — 1 AF Units

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Total
1960	53,100	49,800	67,200	65,000	36,500	37,800	61,700	69,100	61,000	61,400	60,800	62,500	685,900
1961	18,900	0	0	100	57,200	66,900	63,900	67,000	57,000	54,400	57,900	58,700	502,000
1962	24,500	200	1,000	40,600	56,200	23,500	52,300	57,200	54,900	54,700	58,900	62,400	486,400
1963	24,600	0	29,300	21,200	33,300	30,200	56,000	55,300	45,000	49,500	52,900	29,000	426,300
1964	9,000	0	300	17,800	28,800	50,400	60,100	60,900	55,400	53,800	59,000	55,900	451,400
1965	28,400	0	0	36,700	42,200	31,400	62,000	61,800	55,500	52,300	54,200	64,400	488,900
1966	36,400	2,000	14,300	3,400	6,700	23,300	48,300	53,300	52,500	60,500	52,700	59,800	413,200
1967	19,400	0	26,500	53,000	31,300	5,300	59,500	59,000	56,800	53,400	53,800	48,800	466,800
1968	12,700	4,000	34,600	61,600	55,300	47,900	47,300	50,700	51,300	50,400	53,800	59,800	529,400
1969	22,600	0	23,900	0	2,500	26,800	59,800	62,300	46,700	50,400	55,900	53,800	404,700
1970	24,700	12,100	26,200	9,600	40,000	26,900	55,300	57,800	35,200	46,100	51,700	57,500	443,100
1971	21,100	8,900	16,400	19,500	53,900	29,600	61,500	60,900	58,700	44,000	52,300	61,700	488,500
1972	50,000	47,200	49,100	60,500	32,300	34,400	62,400	63,100	56,800	49,500	49,900	57,500	612,700
1973	56,000	33,300	37,000	48,900	32,400	8,000	51,600	48,900	53,700	53,800	56,700	45,000	525,300
1974	14,800	27,400	47,300	24,200	44,800	42,400	62,200	63,300	50,300	50,600	49,700	58,800	535,800
1975	52,600	30,600	33,600	48,000	42,100	38,800	60,300	62,100	47,600	45,000	51,800	60,300	572,800
1976	47,940	40,650	62,750	65,780	42,190	38,450	62,140	59,150	48,380	26,320	53,000	60,500	607,250
1977	33,440	0	0	0	0	0	39,740	66,210	60,870	65,250	55,540	49,980	371,030
TOTAL	550,180	256,150	469,450	575,880	637,690	562,050	1,026,080	1,078,060	947,650	921,370	980,540	1,006,380	9,011,480
AVERAGE	30,566	14,231	26,081	31,993	35,427	31,225	57,004	59,892	52,647	51,187	54,474	55,910	500,638

31002 Wapatox Power Canal — 1 AF Units

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Total
1960	31,900	30,500	29,600	23,300	24,700	23,500	24,000	26,600	31,500	32,500	32,000	29,300	339,400
1961	19,400	16,800	16,600	24,100	25,400	28,800	22,000	25,600	30,400	32,200	33,100	32,300	306,700
1962	20,300	15,900	17,300	21,800	23,200	21,800	15,400	31,000	31,700	33,200	28,800	31,600	292,000
1963	30,100	27,400	28,700	22,000	21,700	29,900	19,800	22,400	28,900	28,900	29,400	31,100	320,300
1964	21,800	19,800	23,100	24,700	23,400	25,000	17,600	28,100	30,600	32,400	32,100	30,700	309,300
1965	15,500	20,800	21,600	25,500	26,300	30,700	26,600	30,300	31,400	32,100	31,000	25,800	317,600
1966	10,200	18,500	16,700	16,300	17,100	23,800	23,400	31,000	30,700	31,300	32,200	28,800	280,000
1967	20,200	18,500	28,100	26,300	25,100	23,900	19,400	27,600	30,200	31,900	29,900	27,000	308,100
1968	14,500	16,900	19,500	24,800	25,300	27,200	20,000	30,400	27,800	28,400	31,900	27,900	294,600
1969	16,300	23,500	26,300	9,800	13,800	23,600	20,800	27,400	27,100	27,400	30,800	28,300	275,100
1970	13,800	6,900	14,700	9,700	16,900	22,800	16,500	25,600	27,600	31,700	32,000	30,900	249,100
1971	18,300	11,300	21,900	22,500	22,000	26,400	14,500	25,600	26,600	29,200	25,000	24,300	267,600
1972	6,700	18,400	19,000	21,500	22,500	24,500	12,000	28,700	28,100	26,700	25,900	25,200	259,200
1973	11,100	18,700	23,100	24,300	18,300	22,600	17,400	29,500	28,200	29,300	27,700	24,500	274,700
1974	13,100	21,900	26,600	24,500	16,200	10,100	26,200	28,200	27,500	25,200	27,500	25,100	272,100
1975	5,900	8,600	13,300	21,900	15,600	14,500	13,400	25,200	24,700	24,800	19,300	19,600	206,800
1976	6,920	19,660	20,580	17,750	13,160	8,490	9,600	26,310	20,560	20,820	15,950	16,230	196,030
1977	10,090	2,960	490	350	0	390	14,600	19,810	18,040	20,450	26,260	22,150	135,590
TOTAL	286,110	317,020	367,170	361,100	350,660	387,980	333,200	489,320	501,600	518,470	510,810	480,780	4,904,220
AVERAGE	15,895	17,612	20,398	20,061	19,481	21,554	18,511	27,184	27,867	28,804	28,378	26,710	272,457

03002 Chandler Power and Pumping Canal — 1 AF Units

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Total
1960	5,800	4,200	34,200	2,500	82,600	55,000	78,700	80,300	70,100	57,600	61,800	64,300	597,100
1961	34,500	1,000	72,700	88,400	82,400	78,300	80,100	80,600	73,100	57,500	60,700	61,100	770,400
1962	27,500	0	58,600	51,700	36,500	6,700	66,800	64,300	65,400	58,500	59,100	57,400	552,500
1963	52,700	41,400	50,100	48,200	27,900	56,500	67,700	69,300	54,500	57,500	59,600	62,400	647,800
1964	49,000	67,700	86,700	83,500	79,300	39,400	50,400	60,500	61,200	32,100	31,100	35,500	676,400
1965	29,600	28,900	53,800	81,100	79,800	39,100	69,100	74,300	70,800	67,400	54,500	39,800	688,200
1966	19,000	18,900	86,800	90,300	61,100	24,700	64,600	68,800	63,400	63,800	62,400	58,600	682,400
1967	36,900	86,800	93,500	91,300	64,300	41,100	65,500	76,000	72,700	64,700	61,000	59,500	813,300
1968	29,800	600	38,200	91,300	67,100	36,900	64,500	62,100	58,400	49,500	48,800	61,100	608,300
1969	40,200	35,800	80,300	67,200	76,300	44,200	81,900	77,900	56,200	51,800	61,100	60,400	733,300
1970	33,300	75,100	83,800	86,600	58,500	83,100	77,200	77,300	69,600	58,600	60,100	60,700	823,900
1971	72,200	76,900	79,600	82,800	59,300	23,300	76,500	76,300	73,500	65,400	64,100	68,100	818,000
1972	76,600	79,500	82,800	83,500	66,300	43,300	76,300	79,600	72,400	68,100	67,400	64,600	860,400
1973	46,900	30,700	20,700	43,000	40,300	37,700	45,400	53,400	37,500	24,400	33,900	41,500	455,400
1974	64,300	77,600	79,600	18,500	70,700	76,300	65,900	62,000	58,600	57,600	53,200	51,100	735,400
1975	30,200	56,300	87,500	88,100	79,000	78,600	76,700	71,400	66,600	61,800	66,300	60,900	823,400
1976	20,020	51,650	85,780	90,900	82,540	72,610	41,270	42,930	43,420	39,030	40,280	42,410	652,840
1977	21,200	60,430	80,580	48,910	23,330	5,830	1,260	20,460	15,000	17,030	22,420	39,150	355,600
TOTAL	689,720	793,480	1,255,260	1,237,810	1,137,270	842,640	1,149,830	1,197,490	1,082,420	952,360	967,800	988,560	12,294,640
AVERAGE	38,318	44,082	69,737	68,767	63,182	46,813	63,879	66,527	60,134	52,909	53,767	54,920	683,036

TABLE 31.--Mean monthly irrigation-canal diversions from various streams, 1960-77 water years

[Data from U.S. Bureau of Reclamation (written commun., 1979) and Wapato Irrigation District (written commun., 1977). Values are rounded to three significant figures or two decimals]

USBR station No.	Canal name	Thousands of acre-feet												
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Total[1]
From Tieton River:														
40001	Tieton Canal	0.04	0.56	0.59	0.05	0.44	0.51	2.93	14.2	19.3	20.8	20.9	17.8	98.1
38003	Cobb Upper Side Canal	.02	0	0	0	0	<.01	.05	.10	.06	.10	.08	.06	.48
38002	Sinclair and Cobb Canal	.07	0	0	0	0	0	.08	.11	.12	.20	.19	.15	.92
38001	Tenant Canal	.29	.16	.06	0	0	0	.01	.03	.08	.34	.44	.54	1.95
	Totals	.42	.72	.65	.05	.44	.51	3.07	14.44	19.56	21.44	21.61	18.55	101.45
From Naches River:														
34001	Emerick Canal	.03	.02	.01	0	0	0	.04	.10	.11	.06	.10	.04	.50
34002	Anderson Canal	.06	.08	.02	0	0	.01	.14	.32	.26	.25	.30	.13	1.57
33005	Nile Ditch Assn. Canal	.33	.12	.07	.04	.03	.06	.29	.48	.60	.76	.81	.61	4.20
33004	Fredericks and Hunting Canal	.03	0	0	0	0	0	.11	.15	.15	.11	.13	.10	.78
33003	Carmack and Parker Canal	.10	.07	.05	.02	.03	.04	.10	.22	.22	.13	.15	.11	1.24
33002	Stevens Canal	.25	.09	.06	0	0	.09	.19	.28	.30	.38	.46	.48	2.58
33001	Naches-Selah Canal	2.61	.04	.27	.04	.33	.76	3.38	6.84	7.80	8.17	8.24	6.63	45.1
31001	Wapatox Irrigation Canal	.44	.02	<.01	<.01	0	<.01	.31	.87	1.46	1.79	1.65	1.19	7.72
30013	Foster-Naches Canal	.07	0	0	0	0	<.01	.06	.18	.23	.23	.14	.12	1.02
30012	Clark Canal	.09	.04	.03	.02	.01	.02	.14	.26	.18	.17	.16	.11	1.22
30011	South Naches Channel Canal	.57	.27	.21	.12	.33	.53	1.14	3.22	3.76	4.75	4.23	2.56	21.7
30010	Kelley and Lowry Canal	.15	.09	.02	.01	.01	.67	.32	1.01	1.43	1.34	1.19	.58	6.81
30008	Gleed Canal	1.61	.36	.23	.17	.05	.23	1.02	2.46	2.93	3.66	2.96	2.01	17.7
30007	Morrissey Canal	.14	.03	0	0	0	.03	.19	.30	.26	.26	.26	.20	1.67
30006	Congdon Canal	.63	0	0	0	0	.34	1.81	2.47	2.84	3.19	3.04	2.16	16.5
30005	Chapman and Nelson Canal	.41	0	0	0	0	0	.42	.69	.76	.79	.81	.78	4.66
30004	Naches Cowiche Canal	.27	0	0	0	0	.10	1.22	1.58	1.90	2.34	1.92	1.41	10.7
30003	City of Yakima Irrigation Canal	.71	0	0	0	0	.43	1.50	1.73	1.56	1.58	1.58	1.52	10.6
30002	Fruitvale Canal	.62	0	0	0	0	.10	1.84	2.61	2.90	2.89	2.67	2.03	15.7
30001	Old Union Canal	.61	.19	.08	.06	.03	.25	.97	1.72	1.85	2.00	1.87	1.64	11.3
	Totals	9.73	1.42	1.05	.48	.82	3.66	15.19	27.49	31.50	34.85	32.67	24.41	183.27
From Yakima River:														
13001	Roza Canal at 11.0 mile	18.8	0	0	0	0	10.7	33.7	53.6	62.1	68.1	65.3	44.1	356.
11002	Sehah-Moxee Canal	1.31	0	0	0	0	.57	2.46	3.73	4.08	4.60	4.37	3.35	24.5
10007	Moxee Co. Canal	.26	0	0	0	0	.01	.47	.78	.84	.93	.81	.50	4.58
10006	Hubbard-Granger Canal	.44	0	0	0	0	.02	.98	1.76	1.91	2.29	2.17	1.18	10.8
10005	Union Gap Canal	.41	0	0	0	0	.14	1.75	3.11	3.31	3.68	3.43	2.11	17.9
10004	Richartz Canal	.40	.30	.25	.18	.11	.12	.52	.72	.67	.78	.73	.58	5.35
10003	Blue Slough Canal	.55	.48	.43	.37	.28	.34	.56	.63	.49	.54	.49	.41	5.57
	Totals	22.17	.78	.68	.55	.39	11.90	40.44	64.33	73.40	80.92	77.30	52.23	424.70
From Ahtanum Creek:														
502551	Ahtanum Main Canal	.40	<.10	0	0	0	.10	1.20	3.20	3.40	2.60	1.80	1.20	13.7
502552	Ahtanum Low Canal	.10	0	0	0	0	<.10	.20	.40	.40	.40	.20	.20	1.90
	Totals	.50	.10	0	0	0	.10	1.40	3.60	3.80	3.00	2.00	1.40	15.60
From Yakima River:														
10002	Reservation Canal (Old and New)	22.1	2.36	2.79	1.55	2.78	11.9	65.9	111	115	118	109	82.3	644
10001	Sunnyside Canal	25.8	0	0	0	0	9.17	46.9	71.2	73.9	77.5	76.4	60.9	442
08001	Snipes and Allen Canal	.39	0	0	0	0	.01	.75	1.44	1.52	1.57	1.72	1.00	8.40
	Totals	48.29	2.36	2.79	1.55	2.78	21.08	113.55	183.64	190.42	197.07	187.12	144.20	1094.40
From Toppenish Creek:														
506001	Toppenish Feeder Canal	1.10	.90	.90	.80	.70	.90	2.00	3.20	2.70	1.70	1.20	1.10	17.00
506002	Satus East Lateral Canal	2.09	0	0	0	0	.17	4.88	7.63	7.49	9.04	8.40	5.80	45.52
506003	Satus 2 Pump Canal	.30	0	0	0	.01	.48	4.80	11.50	15.50	21.50	22.30	20.10	96.49
506004	Satus West Lateral Canal	.40	0	0	0	0	.04	.83	1.30	1.40	1.50	1.60	1.10	8.17
	Totals	3.89	.90	.90	.80	.70	1.59	12.51	23.63	26.09	33.74	33.50	28.10	167.18
From Satus Creek:														
506006	Satus Feeder Canal	0	0	0	0	.01	1.20	8.30	7.50	4.30	.30	0	0	21.5
From Simcoe Creek:														
506331	Simcoe Creek Canal	.05	0	0	0	0	.05	.50	1.20	.80	.30	.20	.10	3.40
From Yakima River:														
03001	Kennewick Canal (via Chandler Power Canal)	5.71	0	0	0	0	1.19	11.4	15.1	16.3	17.6	17.1	13.9	98.3
02001	Kiona Canal	1.07	0.07	0	0	0	.10	1.59	2.04	2.00	2.12	2.14	1.82	12.9
01004	Richland Canal	2.69	.91	.04	0	0	.79	5.43	5.17	4.41	4.90	4.30	3.65	32.3
01003	Columbia Canal	4.29	.05	0	0	0	.79	12.7	14.6	14.4	14.1	12.6	11.9	85.5
	Totals	13.76	1.03	.04	0	0	2.87	31.12	36.91	37.11	38.72	36.14	31.27	229.0
	TOTALS	98.81	7.31	6.11	3.43	5.14	42.96	226.08	362.74	386.98	410.34	390.54	300.26	2240.5

[1]Total columns do not necessarily equal sums of monthly values, due to rounding of individual items; "Less than" values (<) are not included in totals.

TABLE 32.--Records of selected wells

Lithology of principal aquifers: BSLT, basalt; SDGL, sand and gravel; SHLE, shale
Use of Water: C, commercial; D, dewater; F, fire; H, household supply (may include lawn and small garden irrigation)
I, irrigation; N, industrial/commercial; P, public supply (includes some use for fire protection)
S, stock water; U, unused; Z, other

LOCAL NUMBER	OWNER	ALTITUDE OF LAND SURFACE (FEET)	DEPTH OF WELL (FEET)	CASING DIAM-ETER (INCHES)	DEPTH CASED	DEPTH TO AQUIFER (FEET)	DEPTH TO FIRST OPENING (FEET)
07N/17E-07M01	YAKIMA NATION	3300	350	8	60	175	60
07N/30E-01P01	SIMPSON, ROGER	520	62	6	62	--	57
07N/30E-01Q01	HOWIE, AL	500	205	6	116	105	116
07N/30E-14Q01	HOWE 4, DEAN	390	118	16	118	--	82
08N/16E-28E01	YAKIMA NATION	3500	500	8	18	--	18
08N/23E-09R	ALEXANDER, GEORGE G	820	1128	10	369	347	--
08N/24E-02E01	WATKINS, KELLY	670	120	6	18	60	18
08N/24E-02J01	PROSSER 2, CITY OF	660	760	8	693	471	480
08N/24E-08F01	BLEYHL BROS	640	14	36	9	--	--
08N/24E-08H01	BLEYHL, CARL	655	192	--	--	186	--
08N/24E-10	SHAWVER, A E	659	95	6	84	56	84
08N/24E-11G01	TAGGARES, STANLEY	750	217	6	213	0	213
08N/24E-17G01	ELTERS ESTATE	850	405	8	258	258	258
08N/27E-01J01	DE BIT, R M	695	510	8	360	360	360
08N/28E-02K01	HANSON, RALPH A	570	65	6	65	--	--
08N/29E-02K02	HANSON, RALPH A	560	77	12	57	--	57
08N/28E-06H01	BAUDER, MILO	705	278	12	--	360	220
08N/28E-07	YAKIMA SHEEP CO	--	432	6	342	326	342
08N/28E-12C01	CLAYBROOK, GENE	591	113	6	113	50	--
08N/28E-14	MAXSON, DALE	570	106	6	105	--	--
08N/29E-02C01	SHELLCRAFT, R G	465	110	6	108	--	--
08N/29E-04F01	ALLEN, KEN	550	88	6	83	--	83
08N/29E-04F02	BANKER, ED	550	65	6	60	--	60
08N/29E-05N01	SCHLATER, EVERETT L	600	245	6	140	136	141
08N/29E-17	BRINKLEY, HAROLD	820	352	5	352	1	112
08N/29E-17G01	RIVES, ED	750	121	8	25	17	26
08N/29E-17Q01	TRI-CTY VIEW OR	697	800	10	20	5	20
08N/30E-06D03	KNW.STEAM LNDRY	350	87	8	87	--	--
08N/30E-06L02	PACIFIC POWER 2	385	555	10	339	330	339
08N/30E-10M02	BENTON CO	360	45	8	34	--	34
08N/30E-18C01	LAMPSON, NEIL F	370	37	8	18	39	18
08N/30E-18Q01	BLAIR 2, BEN	495	384	10	66	96	67
08N/30E-19B01	HAYS, KEN	500	100	6	79	--	79
08N/30E-21E01	CARLTON, HARVEY	360	143	6	143	96	--
08N/30E-23	CHEVRON CHEM	350	41	18	28	--	28
08N/30E-29 NE	HERRIN, EARL	465	95	6	--	--	--
08N/30E-29H01	GREGG, J C	480	309	8	309	30	244
08N/30E-30N01	SCHMELZER, ARNOLD	805	575	8	51	155	51
08N/30E-35E01	BROWN&MITCHELL, F.W.&A.P.	440	245	--	--	15	--
09N/22E-11G02	VAN DE GRAAF	697	180	10	166	--	--

TABLE 32.--Records of selected wells--Continued

LOCAL NUMBER	LITHOLOGY OF PRINCIPAL AQUIFER	WATER LEVEL (FEET)	DATE WATER LEVEL MEASURED	DISCHARGE (GALLONS PER MINUTE)	DRAW-DOWN (FEET)	PUMPING PERIOD (HOURS)	SPECIFIC CAPACITY (GPM/FT)	USE OF WATER
07N/17E-07M01	BSLT,BROKEN	115.80	08/02/1976	215	20	10.0	10.6	--
07N/30E-01P01	--	46.00	11/19/1975	7	--	--	--	H
07N/30E-01Q01	BSLT	39.00	04/15/1976	15	--	--	--	H
07N/30E-14Q01	--	50.00	02/11/1974	1300	45	4.0	28.9	I
08N/16E-28E01	--	423.00	08/16/1976	--	--	--	--	U
08N/23E-09R	BSLT	110.00	04/01/1975	1400	150	5.0	9.3	I
08N/24E-02E01	BSLT	7.00	06/25/1975	25	30	2.0	0.8	H
08N/24E-02J01	BSLT	--	--	1500	72	--	20.8	P
08N/24E-08F01	--	7.00	1958	300	2	--	150.0	--
08N/24E-08H01	BSLT	0.00	12/ /1969	192	104	7.0	1.8	I
08N/24E-10	BSLT	60.00	03/18/1974	20	20	1.0	1.0	H
08N/24E-11G01	BSLT	200.00	11/25/1963	20	5	4.0	4.0	H
08N/24E-17G01	BSLT	189.00	06/28/1969	--	--	--	--	H,I
08N/27E-01J01	BSLT	250.00	04/ /1974	220	75	4.0	2.9	I
08N/28E-02K01	--	34.50	10/11/1966	30	1	1.0	30.0	H
08N/28E-02K02	--	29.83	02/29/1968	350	25	3.0	14.3	I
08N/28E-06H01	BSLT	191.00	09/06/1968	400	30	19.0	13.3	I
08N/28E-07	BSLT	274.00	05/07/1952	360	5	3.0	72.0	S
08N/28E-12C01	BSLT	96.58	12/04/1973	14	1	1.0	14.0	H
08N/28E-14	--	72.33	11/23/1973	30	22	1.0	1.4	H
08N/29E-02C01	--	89.00	06/ /1943	--	--	--	--	H,N
08N/29E-04F01	--	76.00	06/16/1975	--	--	--	--	H
08N/29E-04F02	--	51.25	04/24/1975	30	3	1.5	10.0	H
08N/29E-05N01	BSLT	140.00	06/01/1963	15	0	1.0	15.0	H
08N/29E-17	BSLT	116.00	04/26/1974	8	209	2.0	0.0	H
08N/29E-17G01	BSLT	77.50	09/07/1973	1	--	--	--	H
08N/29E-17Q01	BSLT	299.00	05/27/1977	500	--	--	--	I
08N/30E-06D03	--	10.25	04/21/1948	--	--	--	--	N
08N/30E-06L02	BSLT	45.00	1945	1146	64	--	17.9	P
08N/30E-10M02	--	9.42	12/08/1969	123	4	1.3	30.8	H,I
08N/30E-18C01	BSLT	13.58	05/31/1968	105	2	1.5	46.7	H,I
08N/30E-18Q01	BSLT	28.50	04/15/1976	85	241	4.0	0.4	P
08N/30E-19B01	--	78.50	02/06/1974	14	0	1.0	14.0	H
08N/30E-21E01	BSLT	5.00	1947	--	--	--	--	H,S
08N/30E-23	--	22.08	03/16/1971	1660	5	6.0	321.1	N
08N/30E-29 NE	--	75.00	05/02/1974	20	0	2.0	20.0	H
08N/30E-29H01	BSLT	168.00	06/16/1977	100	--	1.0	--	H
08N/30E-30N01	BSLT	419.00	08/12/1976	4	--	--	--	H
08N/30E-35E01	BSLT	77.00	09/03/1968	350	19	4.0	18.4	H,I
09N/22E-11G02	--	17.00	06/17/1974	315	65	4.0	4.8	S

TABLE 32.--Records of selected wells--Continued

LOCAL NUMBER	OWNER	ALTITUDE OF LAND SURFACE (FEET)	DEPTH OF WELL (FEET)	CASING DIAMETER (INCHES)	DEPTH CASED	DEPTH TO AQUIFER (FEET)	DEPTH TO FIRST OPENING (FEET)
09N/23E-02B01	HAWORTH, THURMAN E	800	210	8	163	80	163
09N/23E-08D01	COX, CALVIN J	740	140	8	140	--	98
09N/23E-16L01	BURNS, HARRY J	740	105	6	95	--	--
09N/23E-19D01	OCHOA, FORTUNATO	695	95	6	90	--	--
09N/23E-22J01	GRANDVIEW 4, CITY OF	820	1632	16	750	305	750
09N/23E-22N01	GRANDVIEW, CITY OF	770	320	12	102	95	103
09N/23E-23G01	GRANDVIEW 3, CITY OF	805	1150	10	687	676	249
09N/23E-25G01	SCHULTZ, DAVID	820	118	6	31	--	.31
09N/23E-29N01	WANDLING, RAY	660	73	8	73	--	45
09N/23E-31F	JOHN HAAS,INC.	695	398	12	310	150	310
09N/24E-04H01	SCHINMANN, ELBERT B	1190	320	16	235	4	235
09N/24E-17A01	TERMAATEN 2, KENNETH	1002	425	10	200	200	200
09N/24E-26	MCMAHON, A R	799	125	6	28	--	28
09N/24E-28 NW	BEIERLE, FREDERICK P	835	60	6	20	19	20
09N/24E-31C01	BROWN	800	81	6	30	--	30
09N/25E-06K01	DOE,WSU	1080	1200	12.75	1200	700	730
09N/25E-10E01	USBR	950	55	6	18	15	18
09N/25E-16D01	MEYER, DARREL	1020	785	8	747	475	747
09N/25E-19B01	IRRIG EXP STA	863	533	10	504	503	504
09N/25E-29	O'BRIEN, THOMAS T	700	130	6	125	--	125
09N/25E-30A01	BALL, LENNAVERN	620	715	20	627	35	627
09N/26E-01M01	LETSCH, GEORGE	735	105	8	34	34	34
09N/26E-06P01	BROETJE, RALPH	1070	705	8	406	404	406
09N/26E-07E01	MOWERY,JR., MILGERT	1020	425	8	20	10	20
09N/26E-11G01	BARKER, FRED	630	305	8	45	3	45
09N/26E-12R01	PARK, S D	605	150	6	70	70	70
09N/26E-17P01	MCCALL, DONALD	550	200	6	20	0	20
09N/26E-20A01	PERRAULT, ESTHER	764	524	6	520	296	159
09N/27E-02C01	DEACY, NICHOLAS J	553	192	8	78	70	78
09N/27E-02C02	MAYOVSKY, DWAINE	544	255	8	60	55	60
09N/27E-02C03	BRADLEY, LEONARD	135	315	6	58	58	58
09N/27E-02J01	MACKAY&MCDONALD	540	94	6	94	62	--
09N/27E-03J01	SLIPPO, BARRY	520	360	8	93	3	93
09N/27E-05A01	UNKNOWN	800	600	6	360	325	360
09N/27E-07	CLINE, TOM	589	30	6	30	--	--
09N/27E-09K01	OLIVER, FRANKLIN B	710	447	10	33	291	34
09N/27E-17H01	STUCKLER, KENNETH	685	300	6	66	64	66
09N/27E-17N01	AXTMAN, DARL	682	155	6	18	18	18
09N/27E-18G01	YOHNER, DENNIS	481	47	6	47	--	--
09N/27E-21B01	HARRISON, TED	740	585	8	19	127	19

TABLE 32.--Records of selected wells--Continued

LOCAL NUMBER	LITHOLOGY OF PRINCIPAL AQUIFER	WATER LEVEL (FEET)	DATE WATER LEVEL MEASURED	DISCHARGE (GALLONS PER MINUTE)	DRAW-DOWN (FEET)	PUMPING PERIOD (HOURS)	SPECIFIC CAPACITY (GPM/FT)	USE OF WATER
09N/23E-02B01	BSLT	80.00	01/22/1968	15	12	2.0	1.3	H
09N/23E-08D01	--	4.00	03/20/1954	60	10	--	6.0	--
09N/23E-16L01	--	11.00	01/17/1975	28	30	4.0	0.7	H
09N/23E-19D01	--	20.00	02/19/1976	20	20	2.0	1.0	H
09N/23E-22J01	BSLT	173.00	12/01/1948	400	270	4.0	1.5	P
09N/23E-22N01	BSLT	29.50	01/23/1976	155	228	5.5	0.7	P
09N/23E-23G01	BSLT	127.00	05/ /1944	900	70	--	12.9	P
09N/23E-25G01	BSLT	11.00	01/02/1976	30	10	1.5	3.0	H
09N/23E-29N01	--	10.00	05/ /1953	310	0	--	310.0	--
09N/23E-31F	BSLT	34.00	06/22/1977	350	--	4.5	--	I
09N/24E-04H01	BSLT	135.00	08/22/1977	1500	54	8.0	27.8	I
09N/24E-17A01	BSLT	17.00	07/05/1974	200	54	4.0	3.7	I
09N/24E-26	--	28.00	06/15/1974	36	20	1.0	1.8	H
09N/24E-28 NW	BSLT	3.00	08/03/1974	48	15	1.0	3.2	H
09N/24E-31C01	--	19.00	04/20/1975	30	--	--	--	H
09N/25E-06K01	BSLT	532.00	07/16/1977	1500	26	6.5	57.7	I
09N/25E-10E01	BSLT	5.00	06/11/1957	75	7	1.5	11.4	H
09N/25E-16D01	BSLT	375.00	05/20/1977	500	--	--	--	I
09N/25E-19B01	BSLT	218.00	04/20/1954	150	128	--	1.2	--
09N/25E-29	--	95.00	11/03/1971	15	12	1.5	1.3	H
09N/25E-30A01	BSLT	F	04/16/1977	--	--	--	--	I
09N/26E-01M01	BSLT	12.00	01/07/1976	100	--	--	--	H
09N/26E-06P01	BSLT	499.00	03/15/1977	600	--	--	--	I
09N/26E-07E01	BSLT	99.00	04/03/1977	50	--	--	--	H
09N/26E-11G01	BSLT	102.50	09/10/1977	100	--	--	--	H
09N/26E-12R01	BSLT	59.00	09/12/1974	100	--	--	--	H
09N/26E-17P01	BSLT	79.00	09/13/1974	15	--	--	--	H
09N/26E-20A01	BSLT	250.00	03/11/1966	9	--	--	--	Z
09N/27E-02C01	BSLT	142.00	06/25/1975	36	--	--	--	H,I
09N/27E-02C02	BSLT	140.00	01/10/1976	300	--	--	--	H,I
09N/27E-02C03	BSLT	134.00	09/21/1976	60	--	--	--	H
09N/27E-02J01	BSLT	63.00	12/ /1974	20	7	1.0	2.9	H
09N/27E-03J01	BSLT	279.00	06/19/1977	25	--	4.0	--	H
09N/27E-05A01	BSLT	350.00	06/03/1976	30	--	--	--	H
09N/27E-07	--	7.00	04/19/1974	30	8	4.0	3.8	H
09N/27E-09K01	BSLT	218.50	05/ /1975	--	--	--	--	H,I
09N/27E-17H01	BSLT	149.00	03/15/1977	25	--	--	--	H
09N/27E-17N01	BSLT	79.00	09/16/1974	25	--	--	--	H
09N/27E-18G01	--	3.00	09/21/1974	60	--	--	--	H
09N/27E-21B01	BSLT	409.00	03/19/1977	300	--	--	--	H

TABLE 32.--Records of selected wells--Continued

LOCAL NUMBER	OWNER	ALTITUDE OF LAND SURFACE (FEET)	DEPTH OF WELL (FEET)	CASING DIAM-ETER (INCHES)	DEPTH CASED	DEPTH TO AQUIFER (FEET)	DEPTH TO FIRST OPENING (FEET)
09N/27E-21Q01	POTTETE, E K	686	490	6	456	1	54
09N/27E-29D01	HOUSLEY, JUANITA W	607	183	6	182	--	--
09N/27E-36D01	SIME, JAMES A	669	238	6	232	--	232
09N/27E-36H01	DNR	660	400	16	300	290	300
09N/28E-04F03	EVERETT, G M	370	21	42	--	--	--
09N/28E-04G01	SEIDEL, QUENTIN	377	314	6	180	178	180
09N/28E-05C01	WEST RICHLAND, CITY OF	385	572	12	200	340	77
09N/28E-06A02	MOLLER, RAY	412	90	6	76	--	76
09N/28E-07	BENTON CO	630	19	8	18	--	--
09N/28E-10G02	U S GOVT	403	178	20	178	84	145
09N/28E-10H01	U S GOVT	357	129	12	128	36	33
09N/28E-11Q01	U S GOVT	355	155	12	100	138	70
09N/28E-14 SW	ACME CONCRETE	340	65	8	48	--	48
09N/28E-15E01	BIBLE WAY	350	305	6	305	111	225
09N/28E-15N01	TYLER, DORE E	510	188	--	--	104	--
09N/28E-17H01	DAVIN LND&LVS 1	590	488	9	156	293	156
09N/28E-20E01	DAVIN LND&LVS 2	780	707	8	189	291	189
09N/28E-23R01	CLEAVENGER, WILLIAM J	355	345	6	20	8	20
09N/28E-26N01	STALLINGS, ROBERT	570	325	5	318	173	169
09N/28E-35Q01	WALKUP, PAUL C	900	230	5	211	5	211
09N/29E-30F01	OLSEN, WAREN	346	90	6	76	--	76
09N/29E-36N01	WA ST HWY	380	50	8	45	--	45
10N/14E-22J	ADRIAN	4600	248	6	248	--	--
10N/16E-03N	RAMSEY, KIP	1175	494	8	180	85	180
10N/16E-10J01	BRISBOIS, RAY	1140	98	6	98	--	--
10N/16E-11J	AMBROSE, PHILLIP	2000	119	6	113	--	113
10N/16E-15M01	KUNEKI, LEONARD	1290	125	6	40	44	40
10N/16E-15N01	MCLAVEY, LEROY	1290	318	8	58	30	58
10N/16E-19G01	FORT SIMCOE JC	1550	425	--	--	34	300
10N/16E-21D02	FORT SIMCOE	2800	158	10	158	--	45
10N/16E-23D02	LAWRENCE, CAROL	1180	131	6	84	84	84
10N/16E-24F01	WA.CONSTRUCTION	1160	216	6	117	130	118
10N/17E-02F01	MCKAY, ROSEMARY	880	120	6	120	--	--
10N/17E-05M03	NP RR	965	757	6	602	705	603
10N/17E-05N01	WHITE SWAN SCHL	977	18	60	18	--	--
10N/17E-06D01	BOISE CASCADE	1000	242	6	182	223	--
10N/17E-07R01	SMARTLOWIT, JOHN	1030	65	6	65	--	--
10N/17E-15M01	ANDY, AMOS	950	118	6	105	--	--
10N/17E-17L01	SUNDOWN M RANCH	1040	537	8	--	512	--
10N/17E-19E01	LAMB, ELMER&YVON	1040	343	6	155	150	155

TABLE 32.--Records of selected wells--Continued

LOCAL NUMBER	LITHOLOGY OF PRINCIPAL AQUIFER	WATER LEVEL (FEET)	DATE WATER LEVEL MEASURED	DISCHARGE (GALLONS PER MINUTE)	DRAW-DOWN (FEET)	PUMPING PERIOD (HOURS)	SPECIFIC CAPACITY (GPM/FT)	USE OF WATER
09N/27E-21Q01	BSLT	325.00	03/14/1975	43	--	--	--	H
09N/27E-29D01	--	168.00	04/04/1974	20	0	4.0	20.0	H
09N/27E-36D01	--	187.00	03/08/1963	183	10	3.0	18.3	H
09N/27E-36H01	BSLT	173.00	06/11/1973	1200	367	24.0	3.3	I
09N/28E-04F03	--	10.50	05/09/1960	60	2	--	30.0	--
09N/28E-04G01	BSLT	10.67	11/28/1966	30	154	1.0	0.2	H,I
09N/28E-05C01	BSLT	8.00	01/08/1957	697	40	--	17.4	P
09N/28E-06A02	--	68.58	06/14/1966	30	--	--	--	H,I
09N/28E-07	--	11.71	06/14/1974	90	--	--	--	I
09N/28E-10G02	--	43.31	01/11/1945	500	--	--	--	P
09N/28E-10H01	--	6.15	06/13/1943	350	82	21.0	4.3	U
09N/28E-11Q01	BSLT	14.18	05/31/1943	--	--	--	--	--
09N/28E-14 SW	--	17.83	10/16/1974	115	26	4.0	4.4	N,H
09N/28E-15E01	BSLT	--	--	400	--	--	--	I
09N/28E-15N01	BSLT	124.00	04/19/1963	40	39	2.0	1.0	H,I,S
09N/28E-17H01	BSLT	213.00	02/28/1976	5	20	4.0	0.3	H
09N/28E-20E01	BSLT	239.00	05/21/1976	5	2	4.0	2.5	H
09N/28E-23R01	BSLT	199.00	07/10/1977	35	--	--	--	H
09N/28E-26N01	BSLT	163.00	06/18/1975	17	67	1.5	0.3	H
09N/28E-35Q01	BSLT	159.00	10/23/1972	8	55	1.5	0.1	H
09N/29E-30F01	--	24.50	11/07/1975	37	45	1.0	0.8	H
09N/29E-36N01	--	24.00	04/01/1974	--	--	--	--	I
10N/14E-22J	--	70.00	07/28/1975	25	30	1.0	0.8	H
10N/16E-03N	BSLT	360.00	07/23/1977	100	129	1.0	0.8	H
10N/16E-10J01	--	--	--	10	--	--	--	H
10N/16E-11J	--	18.67	09/28/1973	15	39	2.5	0.4	H
10N/16E-15M01	BSLT	67.00	04/ /1972	15	--	4.0	--	H
10N/16E-15N01	BSLT	65.00	12/10/1954	240	119	3.0	2.0	I
10N/16E-19G01	BSLT,FRACTURED	26.00	07/ /1967	60	32	52.0	1.9	H
10N/16E-21D02	--	42.00	--	250	--	2.0	--	Z
10N/16E-23D02	BSLT	--	--	10	--	--	--	U
10N/16E-24F01	BSLT,FRACTURED	47.62	10/18/1972	60	--	--	--	H
10N/17E-02F01	--	--	--	10	--	--	--	H
10N/17E-05M03	BSLT	15.00	--	--	--	--	--	--
10N/17E-05N01	--	8.00	05/ /1970	500	--	--	--	F
10N/17E-06D01	BSLT	32.00	07/ /1970	80	--	--	--	H
10N/17E-07R01	--	24.00	04/ /1972	21	25	4.0	0.8	H
10N/17E-15M01	--	--	--	10	--	--	--	U
10N/17E-17L01	BSLT	--	--	--	--	--	--	H,I
10N/17E-19E01	BSLT	54.00	06/15/1974	150	286	1.0	0.5	H

TABLE 32.--Records of selected wells--Continued

LOCAL NUMBER	OWNER	ALTITUDE OF LAND SURFACE (FEET)	DEPTH OF WELL (FEET)	CASING DIAM-ETER (INCHES)	DEPTH CASED	DEPTH TO AQUIFER (FEET)	DEPTH TO FIRST OPENING (FEET)
10N/17E-20A01	WEASELTAIL, MARTHA	1010	43	6	43	--	--
10N/17E-23L01	DEKKER 2, HERT C	980.0	700	12	456	324	215
10N/17E-26R01	DEKKER 3, BERT C	1015	1000	6	956	405	510
10N/17E-28B01	DEKKER 4, BERT C	1045	860	12	160	135	160
10N/17E-35B01	SHELLENBERGER 1, NORMAN	1110.0	705	10	398	240	398
10N/17E-35B02	SHELLENBERGER 3, NORMAN	1109	803	20	--	803	320
10N/17E-36A01	ARQUETTE, LOUIS	1024.0	310	10	--	260	260
10N/18E-01D01	PEUGH 5, MAURICE	815	112	10	108	--	15
10N/18E-06R03	LOGIE, MINA	825	50	6	50	--	--
10N/18E-09M02	AFTERBUFFALO, LORRAINE	2400	81	6	76	--	76
10N/18E-23A01	OLNEY	790	41	--	--	--	--
10N/18E-23F01	SOCKZEHIGH, O	788	42	6	42	--	--
10N/18E-24A01	WOLF, MARIE	778	63	6	63	--	--
10N/18E-31N01	DEKKER 7, BERT C	1138	1044	8	610	603	610
10N/19E-12R02	WAMPAT, CHESTER	767	61	6	61	--	--
10N/19E-14C01	WESLEY, ALEX	777	71	6	71	--	--
10N/19E-22R01	HUBBARD, CARL	759	68	6	68	--	--
10N/19E-24A01	FRANK, JIM	757	50	6	50	--	--
10N/19E-30R01	ONEIL, VIOLA	788	715	10	--	--	535
10N/20E-01K01	JACK, LOUIS	735	50	6	50	--	--
10N/20E-04J01	TOPPENISH 5, CITY OF	764.0	291	8	291	--	55
10N/20E-09A01	TOPPENISH 6, CITY OF	757.0	863	24	783	--	803
10N/20E-19J01	SCHNEIDER, E W	743	60	6	60	--	--
10N/20E-19Q01	SCHNEIDER, E W	745	20	6	20	--	--
10N/20E-25P01	GEORGE, ENRICH	718	59	6	59	--	--
10N/20E-26F01	SHUSTER, ALLISON	725	40	--	--	--	--
10N/20E-29G01	JENSEN, STANLEY	738	65	6	65	--	--
10N/20E-34F01	JIM, JOHNNY	735	41	6	41	--	--
10N/20E-35F01	BENT BARREL GUN	718	120	6	--	--	--
10N/20E-36G01	UMTUCH, MARY	718	40	6	40	--	--
10N/20E-36G02	UMTUCH, MARY	718	48	6	43	--	43
10N/21E-03H	DUIM, GARRETT W	905	775	14	724	722	724
10N/21E-04E01	WHITE, JIM	830	144	6	145	--	--
10N/21E-08H01	WILSON, GERALD H	780	192	6	190	--	--
10N/21E-13R01	BREWER, NIKKI R	780	100	6	105	--	--
10N/21E-21H01	GRANGER, TOWN OF	731	220	8	180	--	64
10N/22E-12F01	HOSTETLER 2, MONT J	930	200	6	200	--	--
10N/22E-15C01	PAUL, CHARLES R	855	185	6	185	--	--
10N/22E-17C01	CHINN, JAMES	830	56	6	50	--	51
10N/22E-27J	ROSS, ALLEN L	760	127	6	127	--	--

TABLE 32.--Records of selected wells--Continued

LOCAL NUMBER	LITHOLOGY OF PRINCIPAL AQUIFER	WATER LEVEL (FEET)	DATE WATER LEVEL MEASURED	DISCHARGE (GALLONS PER MINUTE)	DRAW-DOWN (FEET)	PUMPING PERIOD (HOURS)	SPECIFIC CAPACITY (GPM/FT)	USE OF WATER
10N/17E-20A01	--	--	--	10	--	--	--	H
10N/17E-23L01	BSLT	95.00	1955	1600	45	4.0	35.6	I
10N/17E-26R01	BSLT	100.00	01/13/1958	919	6	--	153.2	I
10N/17E-28B01	BSLT	105.00	01/ /1958	1800	212	--	8.5	I
10N/17E-35B01	BSLT	169.00	04/ /1958	872	15	4.0	58.1	U
10N/17E-35B02	BSLT	246.90	06/ /1970	1700	4	4.0	425.0	I
10N/17E-36A01	BSLT	108.00	04/03/1954	200	155	--	1.3	U
10N/18E-01D01	--	15.00	04/15/1971	800	--	--	--	I
10N/18E-06R03	--	36.00	09/ /1963	10	--	--	--	H
10N/18E-09M02	--	36.00	05/01/1975	35	--	1.2	--	H
10N/18E-23A01	--	8.80	05/04/1971	--	--	--	--	H
10N/18E-23F01	--	16.00	09/ /1971	12	--	--	--	H
10N/18E-24A01	--	8.00	02/ /1967	10	17	1.0	0.6	H
10N/18E-31N01	BSLT	233.00	08/ /1963	388	33	--	11.8	I
10N/19E-12R02	--	10.00	02/ /1967	10	16	1.0	0.6	H
10N/19E-14C01	--	14.00	02/ /1967	10	8	1.0	1.3	H
10N/19E-22R01	--	7.00	02/ /1967	10	33	--	0.3	H
10N/19E-24A01	--	8.50	06/26/1975	40	3	0.5	13.3	H
10N/19E-30R01	--	6.00+	04/ /1972	440	--	--	--	H
10N/20E-01K01	--	12.00	10/ /1965	10	10	1.0	1.0	H
10N/20E-04J01	--	17.00	12/ /1951	1070	60	--	17.8	P
10N/20E-09A01	--	27.72+	12/ /1959	2000	--	10.0	--	P
10N/20E-19J01	--	11.00	02/ /1966	10	13	1.0	0.8	H
10N/20E-19Q01	--	--	--	--	--	--	--	H
10N/20E-25P01	--	12.00	02/ /1966	--	--	--	--	H
10N/20E-26F01	--	--	--	40	--	--	--	H
10N/20E-29G01	--	10.00	02/ /1966	10	8	1.0	1.3	H
10N/20E-34F01	--	11.00	09/ /1963	40	9	--	4.4	H
10N/20E-35F01	--	5.51	10/14/1971	--	--	--	--	H
10N/20E-36G01	--	3.00	--	--	--	--	--	H
10N/20E-36G02	--	6.67	07/24/1973	--	--	--	--	H
10N/21E-03H	BSLT	69.00	05/02/1977	--	--	--	--	I
10N/21E-04E01	--	65.00	10/13/1975	25	10	1.0	2.5	--
10N/21E-08H01	--	70.00	03/18/1975	24	5	1.0	4.8	H
10N/21E-13R01	--	21.00	10/14/1975	20	5	2.0	4.0	H
10N/21E-21H01	--	35.00	08/ /1973	175	45	4.0	3.9	P
10N/22E-12F01	--	65.00	01/28/1976	30	10	4.0	3.0	I
10N/22E-15C01	--	55.00	--	20	15	1.0	1.3	H
10N/22E-17C01	--	6.67	07/26/1973	15	1	1.0	12.8	H
10N/22E-27J	--	50.00	04/18/1965	14	12	--	1.2	H

TABLE 32.--Records of selected wells--Continued

LOCAL NUMBER	OWNER	ALTITUDE OF LAND SURFACE (FEET)	DEPTH OF WELL (FEET)	CASING DIAM- ETER (INCHES)	DEPTH CASED	DEPTH TO AQUIFER (FEET)	DEPTH TO FIRST OPENING (FEET)
10N/22E-30E01	UNR.SNIPES MTN.	826	885	12	771	766	771
10N/22E-34Q	NEWHOUSE, ALFRED	895	440	10	330	320	330
10N/22E-34R01	UPLAND WINERY	840	267	5	340	--	308
10N/22E-36E01	SUNNYSIDE 7, PORT DIST	720	1057	12	1026	818	887
10N/23E-03A01	ANDERSON, RICHARD	1300	530	6	168	145	168
10N/23E-14H	SUNNYSD.LND.GRP	1190	700	10	291	635	291
10N/23E-17B	STOUT, BUD	950	1182	14	432	755	432
10N/23E-21G01	KILLIAN, FREDERICK	850	135	6	134	--	--
10N/23E-25D	MARTIN, ROBERT J	1082	310	10	310	15	230
10N/23E-26R01	U S B R	1024	106	6	4	--	4
10N/23E-27C01	MILLER 4, DONALD D	925	60	6	60	--	--
10N/23E-32K01	SHACKLEY	738	155	6	149	--	149
10N/23E-34R	TIMMONS, BILL	936	320	16	220	20	220
10N/23E-35P	PITTILLO, ARTHUR L	970	492	12	227	200	227
10N/23E-35R	BROWN FRT	960	817	16	520	575	520
10N/23E-36A	EVANS, BILL	1210	1320	--	--	485	--
10N/24E-31A01	STRICKLAND, DAVID	1260	660	8	30	375	30
10N/24E-31F01	MCPHERSON 2, JAMES	1180	359	10	304	4	304
10N/24E-31G01	CONDIFF, RICHARD E	1180	405	8	20	350	20
10N/25E-25D01	NAKAMURA 2, HISASHI	1293	821	10	150	320	150
10N/25E-25N02	NAKAMURA 1, HISASHI	1446	629	10	387	360	387
10N/26E-25N01	IMMELE, ROBERT	900	340	8	20	3	20
10N/26E-28R02	SCHWENDIG, HARVEY	1100	135	6	19	6	19
10N/26E-32J01	USBR	960	144	6	129	--	130
10N/26E-33D01	CHAMPION ORCHRD	1235	838	12	520	830	380
10N/27E-04Q01	U S GOVT	423	33	12	35	--	14
10N/27E-11P01	JOHNSON, WILFRID E	503	74	10	69	--	69
10N/27E-14L02	MYERS, ED	428	60	6	55	--	55
10N/27E-14P01	MITCHELL, EDWARD A	398	111	12	59	59	45
10N/27E-23L01	BRUCE, KAYE	530	60	8	60	--	--
10N/27E-26L01	MACKAY&MCDONALD	368	150	6	98	--	98
10N/27E-29R01	RUPPERT, BERNARD L	502	226	6	36	36	36
10N/27E-30L01	RICE, L H	556	116	10	116	--	--
10N/27E-31R01	HAMILTON, JACK	600	42	8	32	--	--
10N/27E-32M01	SICOTTE, OMER	550	240	6	39	18	39
10N/27E-34M01	BUSCH, RAYMOND	560	326	10	52	52	52
10N/28E-11D03	U S GOVT	390	85	10	85	--	50
10N/28E-17B01	U S GOVT	460	228	8	225	--	93
10N/28E-20N01	NELSON, LYMAN	710	35	8	35	--	16
10N/28E-22J01	U S GOVT	404	89	20	90	--	55

TABLE 32.--Records of selected wells--Continued

LOCAL NUMBER	LITHOLOGY OF PRINCIPAL AQUIFER	WATER LEVEL (FEET)	DATE WATER LEVEL MEASURED	DISCHARGE (GALLONS PER MINUTE)	DRAW-DOWN (FEET)	PUMPING PERIOD (HOURS)	SPECIFIC CAPACITY (GPM/FT)	USE OF WATER
10N/22E-30E01	BSLT	29.08	06/02/1975	1450	36	--	39.9	I
10N/22E-34Q	BSLT	130.00	03/28/1977	30	0	--	30.0	I
10N/22E-34R01	--	138.00	05/ /1944	--	--	--	--	--
10N/22E-36E01	BSLT	9.24+	03/13/1974	458	300	8.0	1.5	P
10N/23E-03A01	BSLT	393.00	02/10/1975	12	10	1.0	1.2	H
10N/23E-14H	BSLT	140.00	--	--	--	--	--	I
10N/23E-17B	BSLT	--	--	2052	--	5.0	5.8	I
10N/23E-21G01	--	1.00	06/10/1975	15	50	2.0	0.3	H
10N/23E-25D	BSLT	63.50	05/10/1977	--	--	--	--	I
10N/23E-26R01	--	20.00	10/ /1950	13	42	--	0.3	H
10N/23E-27C01	--	F	09/18/1956	5 F	--	--	--	--
10N/23E-32K01	--	35.00	12/09/1974	20	30	1.0	0.7	--
10N/23E-34R	BSLT	60.00	05/02/1977	500	--	--	--	I
10N/23E-35P	BSLT	103.00	04/01/1977	300	--	--	--	I
10N/23E-35R	BSLT	166.00	03/27/1977	--	--	--	--	I
10N/23E-36A	BSLT	580.00	04/10/1977	--	--	--	--	I
10N/24E-31A01	BSLT	--	--	5	--	--	--	H
10N/24E-31F01	BSLT	211.00	08/15/1977	912	0	4.0	912.0	I
10N/24E-31G01	BSLT	139.00	04/16/1977	35	--	--	--	H
10N/25E-25D01	BSLT	--	--	--	--	--	--	U
10N/25E-25N02	BSLT	250.00	02/10/1972	40	--	--	--	I
10N/26E-25N01	BSLT	149.00	02/25/1976	50	--	--	--	H
10N/26E-28R02	BSLT	59.00	09/18/1974	80	--	--	--	H
10N/26E-32J01	--	87.00	08/11/1950	25	22	--	1.1	H
10N/26E-33D01	BSLT	449.00	05/20/1977	750	0	24.0	750.0	I
10N/27E-04Q01	--	9.00	06/16/1944	140	12	7.0	11.5	--
10N/27E-11P01	--	47.50	09/23/1971	90	10	2.0	9.0	H,I
10N/27E-14L02	--	40.50	03/05/1976	25	3	1.0	10.0	H
10N/27E-14P01	BSLT	35.00	05/24/1948	210	100	4.0	2.1	I
10N/27E-23L01	--	15.00	09/26/1975	100	20	1.5	5.0	I
10N/27E-26L01	--	35.00	07/ /1971	30	--	6.0	--	H
10N/27E-29R01	BSLT	180.00	03/15/1951	300	--	--	--	H
10N/27E-30L01	--	15.00	10/15/1965	50	98	4.0	0.5	H
10N/27E-31R01	--	0.00	08/26/1974	250	5	4.0	50.0	I
10N/27E-32M01	BSLT	49.00	04/21/1976	60	--	--	--	H
10N/27E-34M01	BSLT	175.00	11/06/1974	605	18	2.0	33.6	I
10N/28E-11D03	--	44.97	08/18/1943	250	0	8.8	250.0	--
10N/28E-17B01	--	83.57	09/26/1951	--	--	--	--	--
10N/28E-20N01	--	10.00	05/ /1973	100	0	0.5	100.0	H,I
10N/28E-22J01	--	54.18	03/29/1944	140	22	1.0	6.4	--

TABLE 32.--Records of selected wells--Continued

LOCAL NUMBER	OWNER	ALTITUDE OF LAND SURFACE (FEET)	DEPTH OF WELL (FEET)	CASING DIAM-ETER (INCHES)	DEPTH CASED	DEPTH TO AQUIFER (FEET)	DEPTH TO FIRST OPENING (FEET)
10N/28E-23L01	U S GOVT	408	131	12	131	28	55
10N/28E-26F01	RICHLAND, CITY OF	370	40	20	24	--	25
10N/28E-27D01	U S GOVT	367	100	6	93	--	55
10N/28E-31J01	PATTERSON, LYNN	530	34	6	34	--	30
10N/28E-31M01	GLENN, CHARLES E	422	146	8	109	99	109
10N/28E-33P01	RICHARDS, ALFRED C	390	210	6	210	190	--
10N/28E-34	PRIDE PAK FDS	383	37	16	24	--	24
10N/28E-34R01	NELSON, JACK L	362	12	36	12	--	8
10N/28E-35D02	U S GOVT	369	120	10	95	--	24
10N/28E-35J01	U S GOVT	376	81	6	75	--	54
10N/28E-36E01	HEWITT, G W	340	121	6	118	--	--
11N/16E-01A01	WHITE SWAN, FAIRGRNDS	1520	193	6	180	--	180
11N/16E-17E01	DANIELS, C	1530	142	6	--	13	--
11N/16E-25N01	HUBBARD, JIM	1100	72	6	67	--	--
11N/16E-25Q01	PACE 4, W B	1100	1100	6	1014	742	600
11N/16E-34K02	GOUDY, ALBERT	1190	457	5	150	21	--
11N/17E-01A01	WILCOX, ROBERT R	1137	1000	8	591	590	591
11N/17E-01Q01	WARVICK, MARTIN	983	180	6	118	--	118
11N/17E-12J01	WHEELER, DUANE	945	87	6	82	--	82
11N/17E-17P01	STEPHENSON 3, C&H	1062	995	20	330	331	330
11N/17E-20F01	ST HILAIRE, TIM	1070	725	10	641	398	402
11N/17E-21C01	ST HILAIRE, TIM	1009	670	10	513	510	0
11N/17E-24D01	CALIHAN	878	2760	20	--	--	--
11N/17E-27Q01	MOSES, NETTIE	871	110	6	40	--	--
11N/17E-30Q01	PACE 3, W B	1020	855	8	804	531	747
11N/17E-31L01	MILLER, JOE	990	75	6	75	--	--
11N/17E-32L02	LEWIS, MICHAEL	942	197	4	192	--	145
11N/17E-33A01	WATLAMATT, ANTON	885	48	6	48	--	--
11N/18E-01N01	CANAPOO, JAMES	889	98	6	93	--	93
11N/18E-08R01	CLEVELAND, NATTIE	880	83	6	78	--	--
11N/18E-10E01	SPEEDIS, ESTHER	900	75	6	59	--	--
11N/18E-17B01	HERT, CONRAD	880	625	6	212	212	212
11N/18E-18P01	PALMER, CARROLL	861	157	6	152	--	152
11N/18E-33D01	HENRY, GEORGE	810	54	6	54	--	--
11N/18E-34P01	ST MARX, CHARLES P	812	512	8	--	--	--
11N/18E-35N01	HAWK, EVA	817	64	6	64	--	--
11N/19E-01E01	MCDONALD, DANIEL A	849	18	--	--	--	--
11N/19E-09J01	JIM, ROSE	866	40	6	35	--	35
11N/19E-19C01	OLNEY, DOUG	852	82	6	77	--	77
11N/19E-22A04	SHIKE, JAMES	837	51	6	51	--	--

TABLE 32.--Records of selected wells--Continued

LOCAL NUMBER	LITHOLOGY OF PRINCIPAL AQUIFER	WATER LEVEL (FEET)	DATE WATER LEVEL MEASURED	DISCHARGE (GALLONS PER MINUTE)	DRAW-DOWN (FEET)	PUMPING PERIOD (HOURS)	SPECIFIC CAPACITY (GPM/FT)	USE OF WATER
10N/28E-23L01	--	48.27	11/10/1944	1125	5	16.0	247.3	--
10N/28E-26F01	--	12.00	11/29/1961	930	16	--	58.1	P
10N/28E-27D01	--	7.85	09/09/1944	--	--	--	--	U
10N/28E-31J01	--	6.00	05/09/1975	--	--	--	--	H
10N/28E-31M01	BSLT	48.00	1954	90	90	--	1.0	--
10N/28E-33P01	BSLT	--	--	--	--	--	--	H,I
10N/28E-34	--	19.67	07/05/1974	175	11	2.5	15.9	N
10N/28E-34R01	--	9.00	04/ /1971	200	2	8.0	100.0	I
10N/28E-35D02	--	--	--	985	--	5.0	246.3	--
10N/28E-35J01	--	36.00	05/15/1944	178	--	8.0	--	--
10N/28E-36E01	--	26.00	1957	25	48	--	0.5	--
11N/16E-01A01	BSLT	33.00	05/01/1975	35	--	--	--	H
11N/16E-17E01	BSLT	F	09/28/1972	10 F	--	--	--	H
11N/16E-25N01	--	48.70	04/26/1971	10	--	--	--	H
11N/16E-25Q01	BSLT	242.85	05/14/1970	100	126	1.5	0.8	I
11N/16E-34K02	BSLT	346.00	08/ /1972	15	--	--	--	I
11N/17E-01A01	BSLT	210.00	1960	1500	41	--	36.6	I
11N/17E-01Q01	--	30.00	03/ /1961	30	--	--	--	H
11N/17E-12J01	--	13.75	10/21/1973	8	70	1.5	0.1	H
11N/17E-17P01	BSLT	161.50	1963	--	--	--	--	I
11N/17E-20F01	BSLT	195.00	03/ /1967	2000	19	--	105.3	I
11N/17E-21C01	SDGL	65.00	09/ /1955	850	52	9.0	16.3	I
11N/17E-24D01	--	F	1952	1200	--	--	--	U
11N/17E-27Q01	--	14.00	03/ /1963	40	46	1.0	0.9	H
11N/17E-30Q01	BSLT	128.00	04/ /1965	5000	--	--	--	I
11N/17E-31L01	--	--	--	10	--	--	--	H
11N/17E-32L02	--	15.00	04/ /1972	15	17	4.0	0.9	H
11N/17E-33A01	--	--	--	10	--	--	--	H
11N/18E-01N01	--	17.50	05/01/1975	15	--	1.2	--	H
11N/18E-08R01	--	32.00	12/ /1965	10	10	--	1.0	H
11N/18E-10E01	--	11.00	1962	10	18	1.0	0.6	H
11N/18E-17B01	SDGL	F	--	500 F	--	--	--	H
11N/18E-18P01	--	19.00	05/01/1975	15	--	--	--	H
11N/18E-33D01	--	25.00	1963	12	--	--	--	H
11N/18E-34P01	--	--	--	--	--	--	--	I
11N/18E-35N01	--	17.00	04/ /1967	10	--	--	--	H
11N/19E-01E01	--	8.00	1962	300	6	--	54.5	--
11N/19E-09J01	--	5.00	08/02/1973	15	1	1.0	15.0	H
11N/19E-19C01	--	18.33	12/04/1973	15	1	1.0	15.0	H
11N/19E-22A04	--	--	--	10	--	1.0	--	H

TABLE 32.--Records of selected wells--Continued

LOCAL NUMBER	OWNER	ALTITUDE OF LAND SURFACE (FEET)	DEPTH OF WELL (FEET)	CASING DIAM-ETER (INCHES)	DEPTH CASED	DEPTH TO AQUIFER (FEET)	DEPTH TO FIRST OPENING (FEET)
11N/19E-35N02	U&I SUGAR	804	100	6	100	--	55
11N/20E-02H01	EVERTS&WALSH, JOHN&DON	1240	666	5	675	450	420
11N/20E-05R	BABCOCK,GREEN &	1020	625	10	505	475	505
11N/20E-11J	NARDUZZI, ERMANNO	1080	650	12	533	530	533
11N/20E-13D	WELCH, WAYNE	1120	940	6	940	910	--
11N/20E-14N01	CARLSON, HUGH A	920	184	5	184	--	--
11N/20E-22R01	BARBEE 1, LES	835	528	10	232	--	232
11N/20E-22R02	DAVIES, BILL	830	145	6	141	--	142
11N/20E-24D01	RUSSELL, LAWRENCE R	920	160	6	153	--	153
11N/20E-31E01	MILLER, MELVIN	790	50	6	50	--	--
11N/20E-36B02	LUDWIG	820	280	--	--	--	--
11N/21E-01R02	SPAULDING S, E E	1940	707	6	308	356	309
11N/21E-07C01	DE NIKE, DONALD M	1380	345	8	276	270	276
11N/21E-18R01	LEACH,MILLER &	1090	575	12	468	390	468
11N/21E-20A02	J.J.&G.INVESTMT	1190	795	10	706	748	707
11N/21E-20D02	BALDWIN, JOHN	1130	1026	8.63	936	910	936
11N/21E-21J	--	1200	605	14	453	170	453
11N/21E-22K	BEST, PETER C	1228	1087	6	822	--	562
11N/21E-32C01	GRENZ, HAROLD	885	158	6	158	--	--
11N/21E-36D	SLAVICK, FRANK	1040	404	8	400	400	400
11N/22E-26K	RATTLESNAKE RCH	1275	1166	20	620	602	620
11N/22E-29B	VAN GATTI, DWAIN	1390	884	6	782	827	312
11N/22E-29N01	U S B R	1140	408	6	396	--	396
11N/22E-34G01	U S B R	1100	369	6	298	259	298
11N/24E-15R01	STANDARD OIL CO	2868	486	18.50	589	0	589
11N/26E-01F01	U S GOVT	579	209	8	348	375	168
11N/26E-16N01	U S GOVT	1000	740	--	--	--	--
11N/26E-19A01	U S GOVT	1200	1507	--	--	795	--
11N/26E-20R01	U S GOVT	1227	1234	--	800	699	--
11N/26E-27D01	U S GOVT	1117	2212	--	--	699	--
11N/26E-34R01	U S GOVT	1200	1000	36	739	41	740
11N/27E-05Q01	U S GOVT 2	555	204	8	204	--	169
11N/27E-26D01	U S GOVT 6	504	148	8	148	--	121
11N/27E-29C01	U S GOVT 7	552	321	6	293	144	128
11N/28E-17D01	U S GOVT 8	495	144	8	147	--	106
11N/28E-18M01	U S GOVT	547	294	--	--	--	188
11N/28E-21L03	U S GOVT	440	461	8	322	--	322
11N/28E-29N01	U S GOVT 11	435	110	8	110	--	--
12N/12E-22C01	STAPLETON, MARGARET	5280	231	6	162	--	162
12N/15E-08N01	EASTWOOD&LUDWIG, C&M	3000	110	6	37	--	37

TABLE 32.--Records of selected wells--Continued

LOCAL NUMBER	LITHOLOGY OF PRINCIPAL AQUIFER	WATER LEVEL (FEET)		DATE WATER LEVEL MEASURED	DISCHARGE (GALLONS PER MINUTE)	DRAW-DOWN (FEET)	PUMPING PERIOD (HOURS)	SPECIFIC CAPACITY (GPM/FT)	USE OF WATER
11N/19E-35N02	--	9.00		--	100	--	--	--	N
11N/20E-02H01	BSLT	225.00		08/09/1971	37	--	--	--	H
11N/20E-05R	BSLT	154.00		--	1809	69	4.0	26.2	I
11N/20E-11J	BSLT	90.00		05/20/1977	600	200	9.0	3.0	I
11N/20E-13D	BSLT	218.00		07/29/1977	--	--	--	--	I
11N/20E-14N01	--	60.00		06/ /1953	2	20	--	0.1	--
11N/20E-22R01	--	13.86+		10/05/1968	1650	198	1.5	8.3	I
11N/20E-22R02	--	40.00		09/23/1975	20	20	1.0	1.0	H
11N/20E-24D01	--	65.00		04/18/1975	30	15	1.0	2.0	H
11N/20E-31E01	--	14.00		12/ /1965	10	4	1.0	2.5	H
11N/20E-36B02	--	112.00		--	200	--	--	--	--
11N/21E-01R02	BSLT	612.00		11/09/1965	5	--	2.0	--	U
11N/21E-07C01	BSLT	129.00		07/11/1967	600	210	4.0	2.9	I,H
11N/21E-18R01	BSLT	149.00		06/07/1977	1500	29	--	51.7	I
11N/21E-20A02	BSLT	320.00		05/25/1977	140	40	4.0	3.5	I
11N/21E-20D02	BSLT	268.50		09/12/1977	--	--	--	--	I
11N/21E-21J	BSLT	341.00		04/09/1977	440	20	4.0	22.0	I
11N/21E-22K	BSLT	358.42	S	11/29/1977	200	--	--	--	I
11N/21E-32C01	--	90.00		10/ /1961	15	6	1.0	2.5	H
11N/21E-36D	BSLT	169.00		05/24/1977	72	0	0.3	72.0	I
11N/22E-26K	BSLT	--		--	--	--	--	--	I
11N/22E-29B	BSLT	495.00		09/14/1968	--	--	--	--	I,H
11N/22E-29N01	--	365.00		07/ /1950	11	4	0.7	2.8	--
11N/22E-34G01	BSLT	344.00		09/ /1950	11	0	0.8	10.8	H
11N/24E-15R01	BSLT		D	04/02/1958	--	--	--	--	U
11N/26E-01F01	BSLT	180.50		08/16/1957	--	--	--	--	--
11N/26E-16N01	BSLT	--		--	--	--	--	--	--
11N/26E-19A01	BSLT		Z	--	--	--	--	--	--
11N/26E-20R01	BSLT	451.00	V	11/06/1950	--	--	--	--	U
11N/26E-27D01	BSLT	--		--	--	--	--	--	--
11N/26E-34R01	BSLT	800.00		1958	348	9	--	38.7	P
11N/27E-05Q01	--	170.65		09/06/1950	--	--	--	--	--
11N/27E-26D01	--	121.36		08/16/1950	--	--	--	--	--
11N/27E-29C01	BSLT	130.84		01/09/1951	--	--	--	--	--
11N/28E-17D01	--	105.11		08/24/1950	--	--	--	--	--
11N/28E-18M01	--	158.00		--	--	--	--	--	--
11N/28E-21L03	BSLT	45.10		05/07/1953	300	--	--	--	U
11N/28E-29N01	--	66.39		12/05/1950	--	--	--	--	U
12N/12E-22C01	--	150.00		04/30/1973	42	--	--	--	H,I
12N/15E-08N01	--	--		--	125	--	--	--	--

TABLE 32.--Records of selected wells--Continued

LOCAL NUMBER	OWNER	ALTITUDE OF LAND SURFACE (FEET)	DEPTH OF WELL (FEET)	CASING DIAMETER (INCHES)	DEPTH CASED	DEPTH TO AQUIFER (FEET)	DEPTH TO FIRST OPENING (FEET)
12N/15E-12B	CLARK, PATRICK	2280	383	6	21	9	21
12N/15E-13R01	MONDOR, WILLIAM	2200	329	16	50	52	50
12N/16E-03 SE	WINMILL, REED L	2240	165	6	106	95	107
12N/16E-03D01	WILLIAMS, JACK E	2200	63	5	24	21	25
12N/16E-04R02	OKONESKI, ROMAN	2115	278	8	73	18	73
12N/16E-09C	ZEER, VINCENT	2170	459	6	161	315	161
12N/16E-14C01	EVANS FRT	1980	806	12	302	--	302
12N/16E-15F01	HANSES, ARTHUR	1910	544	10	278	270	278
12N/16E-17J02	LARSON, MELVIN R	2021	277	6	56	53	56
12N/16E-18K01	HERKE BROS	2119	343	5	315	109	55
12N/16E-18L01	MONDER, WM	2115	18	36	18	--	--
12N/17E-02J02	WILLARD, FLOYD	1400	92	6	40	--	--
12N/17E-05N	GILBERT ORCHARD	1750	682	8	452	333	452
12N/17E-08L03	DAY, DONALD A	1600	20	2	20	--	--
12N/17E-08N03	DOVEL, LLOYD E	1600	420	8	104	86	85
12N/17E-11A21	W VALLEY SCHOOL	1399	230	6	230	--	105
12N/17E-12 NE	THOMAS, ELLSWORTH	1280	183	5	39	--	39
12N/17E-12G01	FINCH, DARWIN	1277	20	2	19	--	--
12N/17E-16D03	BROWN, ORAL	1520	384	10	312	325	312
12N/17E-16R01	BORTON, B S	1590	1078	6.62	940	706	940
12N/18E-01K01	ANDREWS, RAYMOND	1009	57	5	48	--	49
12N/18E-02E01	SCHREINER, LEROY	1066	405	6	376	--	46
12N/18E-04A01	HUNT, R M	1125	12	60	12	--	6
12N/18E-04F05	MARTIN, JAMES E	1139	96	5	42	--	42
12N/18E-07D04	SHOENQARTH, ROBERT	1260	131	5	42	--	42
12N/18E-07K01	FAIRBANKS, H B	1260	15	72	25	--	--
12N/18E-11E02	WESTBURG, FRED	1200	183	6	165	--	165
12N/18E-17A01	MORTON 2, CARRELL	1360	352	12	--	239	--
12N/18E-27H01	HANSEN FRUIT 1	1120	1020	10	777	375	375
12N/18E-27N01	CAFFREY, DENNIS	1135	600	--	--	--	--
12N/18E-31R01	ST CLAIR 2, RAY	1105	1573	8	1310	708	719
12N/18E-32H01	MT ADAMS SEED 2	1130	1176	16	691	691	691
12N/18E-33A01	NYBERG, HERBERT	1185	953	12	630	617	630
12N/18E-35H01	PATTERSON, DON	952	141	6	105	--	105
12N/19E-05M01	UNION GAP 1, CITY OF	990	215	10	215	--	159
12N/19E-06	PALMER, ROBERT E	988	20	2	20	--	--
12N/19E-06M04	VALLEY FEEDING	990	315	12	300	--	--
12N/19E-09J03	YBARRA, YGNACIO	990	91	5	58	--	58
12N/19E-10D01	EL PASO NAT GAS	981	30	6	30	--	--
12N/19E-16P01	DNR	1200	500	8	500	28	457

TABLE 32.--Records of selected wells--Continued

LOCAL NUMBER	LITHOLOGY OF PRINCIPAL AQUIFER	WATER LEVEL (FEET)	DATE WATER LEVEL MEASURED	DISCHARGE (GALLONS PER MINUTE)	DRAW-DOWN (FEET)	PUMPING PERIOD (HOURS)	SPECIFIC CAPACITY (GPM/FT)	USE OF WATER
12N/15E-12B	BSLT	170.00	08/22/1977	10	208	1.0	0.0	H
12N/15E-13R01	BSLT	F	07/10/1939	900	--	--	11.3	I
12N/16E-03 SE	BSLT	111.00	07/09/1975	37	--	--	--	H
12N/16E-03D01	BSLT	36.00	07/08/1975	7	--	--	--	H
12N/16E-04R02	BSLT	130.00	07/12/1963	214	41	2.5	5.2	--
12N/16E-09C	BSLT	132.00	11/26/1976	65	--	--	--	H
12N/16E-14C01	BSLT	117.50	05/29/1975	900	57	4.0	15.8	I
12N/16E-15F01	BSLT	73.00	09/12/1945	360	49	--	7.3	I
12N/16E-17J02	BSLT	37.00	08/20/1966	150	50	1.0	3.0	H,I
12N/16E-18K01	BSLT	23.50+	02/20/1946	225	139	4.0	1.6	I
12N/16E-18L01	--	3.00	--	--	--	--	--	H
12N/17E-02J02	--	55.64	07/06/1951	--	--	--	--	U
12N/17E-05N	BSLT	298.00	09/03/1974	120	--	--	--	H
12N/17E-08L03	--	11.00	10/28/1961	--	--	--	--	--
12N/17E-08N03	BSLT	32.00	02/23/1970	375	50	16.0	7.5	I
12N/17E-11A21	--	10.00	08/ /1966	90	77	5.0	1.2	H,I
12N/17E-12 NE	--	8.00	05/01/1974	30	--	--	--	H
12N/17E-12G01	--	6.00	04/12/1974	15	--	--	--	S
12N/17E-16D03	BSLT	57.80+	05/06/1952	650 F	--	--	--	I,S
12N/17E-16R01	BSLT	F	02/01/1945	450	--	--	--	I
12N/18E-01K01	--	4.83	01/30/1974	20	--	--	--	H
12N/18E-02E01	--	1.16+	07/26/1951	56 F	--	--	--	I
12N/18E-04A01	--	6.00	--	200	18	--	11.1	--
12N/18E-04F05	--	22.00	10/25/1974	25	--	--	--	H
12N/18E-07D04	--	22.00	10/16/1975	12	--	--	--	H
12N/18E-07K01	--	12.00	1938	--	--	--	--	I
12N/18E-11E02	--	105.00	07/25/1952	60	65	--	0.9	H
12N/18E-17A01	BSLT	117.00	02/ /1957	600	15	--	40.0	I
12N/18E-27H01	BSLT	230.00	03/ /1968	2100	310	7.0	6.8	I
12N/18E-27N01	BSLT	220.00	02/ /1956	360	78	5.0	4.6	I
12N/18E-31R01	BSLT	209.00	04/ /1965	1100	244	4.0	4.5	I
12N/18E-32H01	BSLT	216.00	02/ /1965	695	81	4.0	8.6	I
12N/18E-33A01	BSLT	209.00	04/ /1969	1400	126	4.0	11.1	I
12N/18E-35H01	--	31.10	09/18/1971	--	--	--	--	H
12N/19E-05M01	--	10.00	07/22/1949	450	10	--	45.0	P
12N/19E-06	--	8.33	05/18/1974	20	--	--	--	H
12N/19E-06M04	--	6.00	09/01/1966	570	170	8.0	3.4	C,H
12N/19E-09J03	--	28.00	09/11/1975	10	--	--	--	H
12N/19E-10D01	--	6.00	08/ /1971	50	4	4.0	12.5	H
12N/19E-16P01	BSLT	158.50	07/01/1974	600	79	13.5	7.6	I

TABLE 32.--Records of selected wells--Continued

LOCAL NUMBER	OWNER	ALTITUDE OF LAND SURFACE (FEET)	DEPTH OF WELL (FEET)	CASING DIAM-ETER (INCHES)	DEPTH CASED	DEPTH TO AQUIFER (FEET)	DEPTH TO FIRST OPENING (FEET)
12N/19E-21P01	STARK WEST ORCH	1000	360	8	65	119	65
12N/19E-26R01	FUCHS, VERN H	1060	534	10	455	--	455
12N/19E-34B01	DART, H J	812	14	48	12	--	6
12N/19E-36G02	EAKS, ARTHUR	1000	203	6	86	--	86
12N/19E-36K01	MONEY, HAROLD E	940	150	6	107	--	107
12N/20E-03G01	YAKIMA LAND 1	1166	314	--	--	--	--
12N/20E-04	YAKIMA LAND 4	1266	583	--	--	486	--
12N/20E-09C01	BRADFORD	1155	623	--	--	386	--
12N/20E-09P01	ALLWARDT, EMIL	1185	809	--	--	752	730
12N/20E-09P02	ALLWARDT 2, MONA&CARL	1160	965	8	920	920	920
12N/20E-10G01	HIEBERT, CLAVE H	1200	136	5	30	--	31
12N/20E-10H02	NIPPS, W F	1200	96	5	39	--	39
12N/20E-12A01	DURAND, LEONARD	1580	48	5	42	--	42
12N/20E-29D01	KUESTER, PAUL	1200	460	8	347	72	270
12N/21E-10H01	ESTAMO, ELSIE	2000	46	6	41	--	41
12N/21E-17P01	MARTINEZ LVST	1480	800	6	689	689	393
12N/21E-19H01	CROM, ORVILLE R	1410	1713	6.25	1138	1450	357
12N/21E-20P02	GRISWOLD 2	1420	1061	8	946	886	946
12N/21E-21C01	MONTGOMERY, TOM	1575	580	6	472	466	472
12N/21E-21L03	LAND DEVLPMT 2	1480	448	8	148	7	148
12N/21E-21P01	LAND DEVLPMT 1	1445	281	8	264	10	228
12N/21E-25D01	FINES, MERRITT	1640	755	8	480	167	480
12N/21E-27D01	GRISWOLD, P E	1480	375	12	221	12	221
12N/22E-15G01	CHRISTEN	2940	128	6	20	--	20
12N/22E-29B01	CHANGALA, STEVE	1800	1270	10	730	721	730
12N/23E-13G01	JOLLY, L E	1240	230	6	178	--	138
12N/23E-18E01	MARLEY 4, CHARLES L	1730	206	12	198	20	55
12N/23E-21N01	SPAULDING, ED	1800	1517	6	1146	1211	500
12N/24E-05A01	GRASSLAND SEED	1400	832	12	672	655	672
12N/24E-30A01	ROBERT 2, E.L.&V.E.	1080	1280	8	778	778	778
12N/25E-01A01	U S GOVT	708	287	6	287	105	250
12N/25E-01L12	U S GOVT	670	150	6	150	--	118
12N/25E-12H01	U S GOVT	694	302	6	302	111	268
12N/25E-15G01	COLD CRK DEVLP	630	600	10	548	--	--
12N/25E-23K01	U S GOVT	600	265	8	168	109	169
12N/25E-26M01	U S GOVT	610	2000	8	1314	547	100
12N/26E-03A13	U S GOVT	683	302	8	302	60	243
12N/26E-07D01	U S GOVT	704	75	--	--	--	--
12N/26E-07Q01	U S GOVT	692	325	8	324	--	295
12N/26E-19K01	U S GOVT	629	330	8	440	5	185

TABLE 32.--Records of selected wells--Continued

LOCAL NUMBER	LITHOLOGY OF PRINCIPAL AQUIFER	WATER LEVEL (FEET)	DATE WATER LEVEL MEASURED	DISCHARGE (GALLONS PER MINUTE)	DRAW-DOWN (FEET)	PUMPING PERIOD (HOURS)	SPECIFIC CAPACITY (GPM/FT)	USE OF WATER
12N/19E-21P01	BSLT	183.00	10/02/1968	660	87	4.0	7.6	I,H
12N/19E-26R01	--	230.00	06/04/1969	350	60	8.0	5.8	I
12N/19E-34B01	--	5.50	04/30/1955	200	6	--	33.3	--
12N/19E-36G02	--	118.00	05/05/1971	20	7	1.0	2.9	H,I
12N/19E-36K01	--	85.00	--	20	5	--	4.0	--
12N/20E-03G01	--	26.00+	1891	300 F	--	--	--	--
12N/20E-04	BSLT	80.00	1893	--	--	--	--	--
12N/20E-09C01	--	F	--	406 F	--	--	--	I
12N/20E-09P01	--	F	--	287 F	--	--	--	I
12N/20E-09P02	BSLT	1.00	11/15/1977	700	146	4.0	4.8	I
12N/20E-10G01	--	74.00	05/01/1974	25	--	--	--	H
12N/20E-10H02	--	50.00	09/24/1974	20	--	--	--	H
12N/20E-12A01	--	14.00	04/14/1976	30	--	--	--	H
12N/20E-29D01	BSLT	84.00	04/01/1966	60	13	2.0	4.6	I
12N/21E-10H01	--	8.58	08/15/1973	15	1	1.0	15.0	H
12N/21E-17P01	BSLT	210.00	05/15/1968	1040	--	4.0	7.4	I,H
12N/21E-19H01	BSLT	48.00	08/01/1948	300	170	4.0	1.8	I
12N/21E-20P02	BSLT	211.00	12/ /1968	600	125	4.0	4.8	I
12N/21E-21C01	BSLT	450.00	05/27/1977	12	125	1.0	0.1	I,H
12N/21E-21L03	BSLT	146.00	11/13/1975	250	85	3.5	2.9	I
12N/21E-21P01	BSLT	86.00	07/19/1974	100	121	4.0	0.8	I
12N/21E-25D01	BSLT	50.00	03/25/1966	--	--	--	--	I
12N/21E-27D01	BSLT	102.00	03/04/1965	250	88	3.0	2.8	I
12N/22E-15G01	--	92.00	04/15/1971	8	--	--	--	H
12N/22E-29B01	BSLT	263.00	09/30/1975	700	95	5.0	7.4	I
12N/23E-13G01	--	114.00	08/08/1968	--	--	--	--	H,I
12N/23E-18E01	BSLT	27.00	12/08/1967	400	124	3.0	3.2	I
12N/23E-21N01	BSLT	644.00	02/08/1967	195	111	8.0	1.8	I,S
12N/24E-05A01	BSLT	392.00	04/20/1974	2250	48	6.0	46.9	I
12N/24E-30A01	BSLT	116.00	12/18/1975	3350	106	24.0	31.7	I
12N/25E-01A01	--	285.00	08/30/1944	70	--	--	--	--
12N/25E-01L12	--	D	--	100	--	--	--	--
12N/25E-12H01	--	D	--	95	--	--	--	--
12N/25E-15G01	--	--	--	--	--	--	--	--
12N/25E-23K01	BSLT	188.00	10/20/1956	--	--	--	--	--
12N/25E-26M01	BSLT	109.75	09/30/1957	--	--	--	--	--
12N/26E-03A13	--	D	--	75	--	--	--	--
12N/26E-07D01	--	D	--	--	--	--	--	--
12N/26E-07Q01	--	289.00	09/08/1948	--	--	--	--	--
12N/26E-19K01	--	198.00	10/22/1956	--	--	--	--	U

TABLE 32.--Records of selected wells--Continued

LOCAL NUMBER	OWNER	ALTITUDE OF LAND SURFACE (FEET)	DEPTH OF WELL (FEET)	CASING DIAMETER (INCHES)	DEPTH CASED	DEPTH TO AQUIFER (FEET)	DEPTH TO FIRST OPENING (FEET)
12N/26E-22L01	U S GOVT	673	309	8	315	5	284
12N/26E-25Q01	U S GOVT 1	620	200	8	200	--	169
12N/27E-19D02	U S GOVT	559	253	--	--	--	150
12N/27E-31Q01	U S GOVT	515	160	--	--	--	110
13N/14E-29G01	HAUCK&VANFLECK	5000	65	6	54	--	--
13N/14E-30B01	MARSHAL, JOHN	4640	40	6	39	--	--
13N/16E-24H01	PYRAMID ORCH 1	1942	1466	10	920	540	558
13N/16E-34N01	HAMMOND, GARY	2240	145	6	20	1	20
13N/17E-01H01	WATKINS, HERBERT P	1670	429	8	63	51	63
13N/17E-04D01	HAAS INC	1710	201	8	200	51	12
13N/17E-04J01	HERKE, JOSEPH P	1700	519	12	338	338	338
13N/17E-10A01	BOGLE, ELZA	1600	158	6	22	--	23
13N/17E-19A01	PYRAMID ORCHARD	1750	800	6	800	--	208
13N/17E-20B01	MARLEY ORCHARDS	1650	375	8	224	--	224
13N/17E-20P01	MELTON JR	1600	145	8	120	--	120
13N/17E-22E01	RAINE, MERTON G	1600	347	6	123	123	123
13N/17E-24D01	MILLER	1400	114	5	27	21	27
13N/17E-24G03	LANGE, HAL	1360	130	5	58	--	58
13N/17E-26F02	JOHNSON, TED	1300	70	6	63	--	--
13N/17E-28E01	MTNVIEW SCHOOL	1600	314	6	314	--	279
13N/17E-31J02	CAMPBELL, ROY D	1740	176	5	25	--	25
13N/17E-31Q01	BIERLY, DONALD K	1720	400	8	319	--	110
13N/17E-32C01	MASTEL, MIKE	1600	345	8	151	--	50
13N/17E-32F01	BORUP, BRENT L	1720	245	5	53	--	53
13N/17E-36E01	BRUNDAGE, H F	1400	260	6	138	--	138
13N/18E-04K01	SUNTIDES	1200	225	8	83	--	83
13N/18E-04R01	BROWN TAYLR WTR	1445	320	8	220	30	220
13N/18E-05 NE	LIEN	1220	36	5	34	--	34
13N/18E-06B01	NICHOLLS, JERRY R	1328	65	5	39	--	39
13N/18E-09C01	WHORTON, ORVIL L	1100	20	2	20	--	--
13N/18E-09K02	CRABB, J R	1450	12	36	12	--	3
13N/18E-14H02	J HAAS INC	1100	400	10	319	348	319
13N/18E-18K01	NOB HILL WTR 3	1650	1051	12	554	442	432
13N/18E-19L01	DRUSE, WALLACE E	1400	186	8	119	--	119
13N/18E-20H01	J MARSHALL CNST	1320	56	5	30	--	31
13N/18E-22C01	ENGLEWOOD CHRCH	1292	310	8	200	--	110
13N/18E-24J02	YAKIMA 3, CITY OF	1059	527	6	526	--	60
13N/18E-25H01	DUMS&FOSSHAGE, H.C.&D.H.	1060	62	8	60	--	30
13N/18E-27N01	YAKIMA, CITY OF	1116	332	8	332	--	245
13N/18E-28A01	PACIFIC FRUIT	1160	95	8	93	--	--

TABLE 32.--Records of selected wells--Continued

LOCAL NUMBER	LITHOLOGY OF PRINCIPAL AQUIFER	WATER LEVEL (FEET)	DATE WATER LEVEL MEASURED	DISCHARGE (GALLONS PER MINUTE)	DRAW-DOWN (FEET)	PUMPING PERIOD (HOURS)	SPECIFIC CAPACITY (GPM/FT)	USE OF WATER
12N/26E-22L01	--	284.49	07/17/1948	--	--	--	--	--
12N/26E-25Q01	--	159.29	12/05/1950	--	--	--	--	--
12N/27E-19D02	--	159.00	--	--	--	--	--	--
12N/27E-31Q01	--	113.00	--	--	--	--	--	--
13N/14E-29G01	--	18.00	02/20/1974	12	27	0.5	0.4	H
13N/14E-30B01	--	18.00	06/25/1974	20	5	0.5	4.0	H
13N/16E-24H01	BSLT	142.00	06/03/1967	600	368	100.0	1.6	I,H
13N/16E-34N01	BSLT	33.00	08/01/1974	25	--	--	--	H
13N/17E-01H01	BSLT	263.00	07/29/1976	--	--	--	--	H
13N/17E-04D01	BSLT	0.00	--	500	52	--	9.6	--
13N/17E-04J01	BSLT	41.54+	04/30/1969	450 F	--	--	--	I,H
13N/17E-10A01	--	55.00	--	64	--	--	--	--
13N/17E-19A01	--	350.00	04/29/1968	90	--	24.0	--	I,H
13N/17E-20B01	--	248.00	03/22/1961	120	72	--	1.7	--
13N/17E-20P01	--	54.00	12/17/1968	158	58	2.0	2.7	I
13N/17E-22E01	BSLT	295.00	06/24/1971	11	4	1.0	2.8	H
13N/17E-24D01	BSLT	36.00	03/10/1975	9	--	--	--	H
13N/17E-24G03	--	76.25	02/13/1976	10	--	--	--	H
13N/17E-26F02	--	4.62+	09/10/1975	20 F	--	--	--	H
13N/17E-28E01	--	6.00	02/23/1950	75	40	4.0	1.9	H,I
13N/17E-31J02	--	116.00	03/16/1976	10	--	--	--	H
13N/17E-31Q01	--	119.50	01/15/1962	160	114	--	1.4	--
13N/17E-32C01	--	5.00	04/11/1967	175	133	10.0	1.3	I
13N/17E-32F01	--	167.00	02/02/1975	20	--	--	--	H
13N/17E-36E01	--	85.00	--	115	--	--	--	--
13N/18E-04K01	--	3.67	02/03/1966	580	130	4.0	4.5	--
13N/18E-04R01	BSLT	--	--	300	--	--	--	P
13N/18E-05 NE	--	10.00	04/17/1974	20	--	--	--	H
13N/18E-06B01	--	4.00	09/25/1975	50	--	--	--	H
13N/18E-09C01	--	6.00	05/14/1975	10	--	--	--	H
13N/18E-09K02	--	6.50	04/27/1959	70	3	--	23.3	--
13N/18E-14H02	BSLT	59.00	05/25/1969	40	69	12.0	0.6	N
13N/18E-18K01	BSLT	277.00	05/13/1969	2624	4	12.0	629.3	P
13N/18E-19L01	--	64.00	03/22/1968	--	--	--	--	P
13N/18E-20H01	--	7.00	08/04/1975	30	--	--	--	H
13N/18E-22C01	--	90.00	01/05/1965	100	60	3.0	1.7	Z
13N/18E-24J02	--	45.00	01/14/1966	325	25	5.5	13.0	N
13N/18E-25H01	--	22.00	06/15/1965	220	2	4.0	146.7	Z
13N/18E-27N01	--	16.00	09/26/1973	500	62	10.0	8.1	I
13N/18E-28A01	--	22.00	07/24/1959	200	10	--	20.0	--

TABLE 32.--Records of selected wells--Continued

LOCAL NUMBER	OWNER	ALTITUDE OF LAND SURFACE (FEET)	DEPTH OF WELL (FEET)	CASING DIAM-ETER (INCHES)	DEPTH CASED	DEPTH TO AQUIFER (FEET)	DEPTH TO FIRST OPENING (FEET)
13N/18E-29N01	FOWLER, DON	1200	90	5	30	--	30
13N/18E-30A01	OLSON, GEORGE E	1220	235	6	153	--	153
13N/18E-30C01	BEDDOE, EUGENE E	1300	137	5	32	--	33
13N/18E-31L01	JOHNSON, LEONARD	1300	140	6	61	--	61
13N/18E-33L01	HESS, RAYMOND A	1145	22	4	11	--	--
13N/18E-35F01	TRONTECH CORP 1	1049	290	8	218	--	218
13N/18E-36M02	NELOYON, HOWARD	1042	80	5	58	--	58
13N/19E-07	YOCHAM, CAROMEL L	1000	21	2	20	--	--
13N/19E-15L01	WOLFE, JACK A	1200	435	8	435	--	--
13N/19E-16C01	HARDY, DOROTHY M	1045	497	10	--	--	275
13N/19E-16F01	WILLIAMS, CLARENCE	1100	203	8	186	--	186
13N/19E-20D01	WA ST HWY	1020	145	8	121	--	46
13N/19E-22J01	R BURMAN CONSTR	1200	131	5	24	--	24
13N/19E-23	R BURMAN CONSTR	1200	116	5	25	--	25
13N/19E-24	CARPENTER, ROY	1360	350	6	196	--	196
13N/19E-24B01	YAKIMA SHEEP CO	1480	756	10	710	--	710
13N/19E-24F01	WARRIOR, FLOYD	1360	425	8	341	--	341
13N/19E-24M01	SCHMIDT, HARRY	1260	340	5	68	--	38
13N/19E-26 SW	WINGERTER, FELIX J	1050	77	5	35	--	35
13N/19E-26N01	BALHOLM, H L	1030	96	5	26	--	26
13N/19E-28B01	WA ST PRKS 1	1015	118	8	118	--	70
13N/19E-29R01	YAKIMA, CITY OF	1000	60	12	60	--	18
13N/19E-30R01	MEACHAM, O M	1025	31	2	31	--	--
13N/19E-31B03	HANSEN FRT	--	225	8	225	--	135
13N/19E-35H01	MOXEE SD90	1035	150	8	114	--	114
13N/20E-29D01	MOXEE SD90	1550	590	10	446	438	446
13N/20E-30	DILLEY, NEIL	1400	205	--	--	--	--
13N/20E-30 SE	MILHAM, GAROLD R	1350	300	5	41	--	41
13N/20E-30P02	LARSON, R L	1240	96	5	25	--	26
13N/21E-34H02	MARTENEZ LVSTK	--	1033	12	693	57	693
13N/24E-25E01	U S GOVT	900	777	10	625	625	625
13N/24E-27K02	FRITTS, DAVID A	1060	865	8	545	408	545
13N/24E-34 NE	TRAINOR, R C	1000	510	8	500	--	360
13N/24E-34R01	BURKE, DELHERT	960	87	8	83	--	--
13N/24E-36D01	U S GOVT	906	1092	6	963	963	963
13N/25E-30G01	MCGEE, CHESTER L	829	1110	8	--	680	--
13N/25E-33D01	U S GOVT	798	540	6	--	--	--
14N/14E-28H03	USFS	2500	55	8	54	--	40
14N/16E-03K01	GAME DEPT	2700	34	6	38	--	--
14N/16E-12H01	ALLAN, LESLIE T	2740	132	6	132	680	--

TABLE 32.--Records of selected wells--Continued

LOCAL NUMBER	LITHOLOGY OF PRINCIPAL AQUIFER	WATER LEVEL (FEET)	DATE WATER LEVEL MEASURED	DISCHARGE (GALLONS PER MINUTE)	DRAW-DOWN (FEET)	PUMPING PERIOD (HOURS)	SPECIFIC CAPACITY (GPM/FT)	USE OF WATER
13N/18E-29N01	--	8.25	06/12/1975	50	--	--	--	H
13N/18E-30A01	--	37.00	--	272	43	--	6.3	--
13N/18E-30C01	--	17.00	12/03/1973	28	--	--	--	H
13N/18E-31L01	--	84.00	05/23/1973	--	--	--	--	H
13N/18E-33L01	--	12.00	07/16/1947	100	8	4.0	12.5	H,I
13N/18E-35F01	--	32.00	07/01/1968	120	158	--	0.8	I
13N/18E-36M02	--	17.50	01/30/1976	20	--	--	--	H
13N/19E-07	--	3.00	03/20/1974	--	--	--	--	H
13N/19E-15L01	--	230.00	10/16/1965	300	50	4.0	6.0	I,H
13N/19E-16C01	--	224.00	04/03/1964	430	85	4.0	5.1	I
13N/19E-16F01	--	90.00	08/04/1966	168	73	2.5	2.3	H
13N/19E-20D01	--	11.00	02/04/1971	123	97	24.0	1.3	I
13N/19E-22J01	--	59.00	05/13/1975	15	--	--	--	H
13N/19E-23	--	65.00	06/28/1974	15	--	--	--	H
13N/19E-24	--	220.00	01/04/1968	60	--	1.0	--	H
13N/19E-24B01	--	374.00	02/18/1967	400	126	4.0	3.2	I
13N/19E-24F01	--	340.00	04/12/1965	30	45	2.0	0.7	H
13N/19E-24H01	--	279.00	09/10/1975	10	--	--	--	H
13N/19E-26 SW	--	4.17	12/20/1973	25	--	--	--	H
13N/19E-26N01	--	9.00	08/27/1974	40	--	--	--	H
13N/19E-28B01	--	5.00	01/18/1962	76	105	--	0.7	--
13N/19E-29R01	--	11.00	05/21/1965	240	30	6.0	8.0	P,N
13N/19E-30R01	--	18.00	04/05/1976	10	--	--	--	H
13N/19E-31B03	--	18.00	--	250	144	--	1.7	--
13N/19E-35H01	--	12.00	08/ /1956	100	84	--	1.2	--
13N/20E-29D01	BSLT	339.00	04/22/1970	275	165	9.0	1.7	I,H
13N/20E-30	--	175.00	10/01/1973	10	10	0.5	1.0	H
13N/20E-30 SE	--	238.00	03/18/1974	20	--	--	--	H
13N/20E-30P02	--	37.00	03/18/1976	10	--	--	--	H
13N/21E-34H02	BSLT	756.00	10/20/1971	--	--	--	--	I,H
13N/24E-25E01	BSLT	--	--	7500 F	--	--	--	--
13N/24E-27K02	SHLE	60.00	11/11/1963	--	--	--	--	H,I
13N/24E-34 NE	BSLT	220.00	07/26/1974	300	--	--	--	H,I
13N/24E-34R01	--	44.00	03/18/1975	15	27	4.0	0.6	H
13N/24E-36D01	BSLT	F	11/ /1922	--	--	--	--	Z
13N/25E-30G01	BSLT	212.52+	04/ /1927	1375 F	--	--	--	I,H,S
13N/25E-33D01	--	365.00	03/ /1943	--	--	--	--	U
14N/14E-28H03	--	13.00	12/15/1961	22	30	8.0	0.7	H
14N/16E-03K01	--	31.00	02/ /1949	20	--	4.0	--	H
14N/16E-12H01	BSLT	82.00	01/13/1972	35	--	--	--	H

TABLE 32.--Records of selected wells--Continued

LOCAL NUMBER	OWNER	ALTITUDE OF LAND SURFACE (FEET)	DEPTH OF WELL (FEET)	CASING DIAMETER (INCHES)	DEPTH CASED	DEPTH TO AQUIFER (FEET)	DEPTH TO FIRST OPENING (FEET)
14N/16E-13K01	KELLER, RICHARD	2010	490	8	490	380	--
14N/16E-14J01	KOEHKEL	2400	235	8	71	--	71
14N/16E-24	HUMPHREY	2140	652	6	45	147	45
14N/16E-24C01	LOECHOLT, HORST	2170	365	6	180	212	180
14N/16E-24K01	KELLER FRT	2105	870	8	270	250	270
14N/17E-03H01	RIGGLE, O D	1535	30	6	21	--	--
14N/17E-04H02	NACHES 2, CITY OF	1500	1000	8	746	739	746
14N/17E-07H01	BARNES, BEN	1960	324	6	20	13	20
14N/17E-11E01	ALLAN BROS	1400	148	10	143	--	45
14N/17E-16E01	ERICKSEN, J T	900	500	6	500	39	77
14N/17E-18A01	MILLER, HAROLD H	1930	82	6	65	--	65
14N/17E-20K03	KNUTSON, JOE	1900	96	5	55	--	56
14N/17E-27Q01	ADAMS, HAROLD	1725	175	6	71	34	71
14N/17E-28A01	TIETON, GEORGE	1810	140	10	30	--	30
14N/17E-28C01	CASTEEL, CARL	1700	160	6	124	--	110
14N/17E-28F02	ROWLAND	1702	57	--	--	--	--
14N/17E-29J01	HARGRAVE, HUGH C	1769	96	6	96	--	--
14N/17E-30K01	TJARNBERG BROS	2100	564	8	283	451	283
14N/17E-31D02	CHRISTENSEN, JAMES	2020	259	6	152	140	152
14N/17E-32G01	DETLOFF, WILLIAM	1760	210	6	100	--	100
14N/17E-32Q01	PIERCE, F L	1600	337	8	83	147	84
14N/18E-19F	FOSSOM ORCH I	1610	1009	10	645	641	645
14N/18E-19G01	ASHLEY, PAUL	1420	96	5	36	--	37
14N/18E-27L02	HOVDE, DAVE	1339	190	6	30	--	30
14N/18E-27P03	SAMMAR INC	1400	226	5	30	--	30
14N/18E-29	WEST, LELAND F	1317	160	5	80	--	81
14N/18E-29K01	CRAIG, RALPH	1400	56	5	42	--	42
14N/18E-29L01	E PURVIS CONSTR	1360	111	5	78	--	78
14N/18E-29Q01	STEVENSON, KAROL	1314	141	5	60	--	80
14N/18E-30H01	DALTON, CLARENCE W	1400	81	5	80	--	--
14N/18E-32 NE	CURTIS, GALE E	1300	35	5	34	--	--
15N/15E-11 NE	GORDON, E D	2125	61	8	61	--	42
15N/16E-34	YAKIMA 1, CITY OF	3600	72	4.50	72	--	--
15N/17E-31R02	RUSSELL, L	2900	31	6	30	--	--
15N/17E-33Q01	EWING, JAMES	1590	62	8	59	--	59
16N/14E-01J01	USFS	2240	200	6	42	--	42
16N/15E-06N01	ELTON, DON	4000	60	8	58	--	35
16N/15E-17K01	FALLON, CURTIS J	2125	127	6	22	15	23
16N/15E-28D01	BELCHER, DONALD	2400	60	6	58	--	--
16N/15E-34D01	KUNTZ, LEO R	1860	9	12	9	--	3
17N/13E-36B01	ORMISTON, ORVILLE	4800	160	6	100	--	101
17N/14E-23C01	HALL, GENE	2540	54	6	53	--	--
17N/14E-26K01	TRACEY 2, JOSEPH	2380	64	6	31	--	31
17N/14E-35	BOND, LARRY R	2360	10	6	--	--	--

TABLE 32.--Records of selected wells--Continued

LOCAL NUMBER	LITHOLOGY OF PRINCIPAL AQUIFER	WATER LEVEL (FEET)	DATE WATER LEVEL MEASURED	DISCHARGE (GALLONS PER MINUTE)	DRAW-DOWN (FEET)	PUMPING PERIOD (HOURS)	SPECIFIC CAPACITY (GPM/FT)	USE OF WATER
14N/16E-13K01	BSLT	240.00	08/19/1977	300	--	--	--	I
14N/16E-14J01	--	120.00	08/01/1954	60	80	4.0	0.8	H,I,S
14N/16E-24	BSLT	43.00	11/ /1947	15	217	--	0.1	--
14N/16E-24C01	BSLT	240.00	10/04/1977	45	--	--	--	H
14N/16E-24K01	BSLT	240.00	06/10/1977	125	--	--	--	I
14N/17E-03H01	--	0.00	03/18/1976	30	10	0.5	3.0	H
14N/17E-04H02	BSLT	53.63	02/20/1952	845	535	--	1.6	P
14N/17E-07H01	BSLT	244.00	06/07/1974	15	--	--	--	H
14N/17E-11E01	--	4.75	07/15/1964	250	119	2.5	2.1	N
14N/17E-16E01	BSLT	365.00	--	140	49	15.0	2.9	I,H
14N/17E-18A01	--	30.00	08/23/1952	200	40	4.0	5.0	I,H,S
14N/17E-20K03	--	20.00	10/01/1975	20	--	--	--	H
14N/17E-27Q01	BSLT	82.00	12/10/1968	45	--	2.5	--	H
14N/17E-28A01	--	F	02/07/1957	100	17	--	5.9	--
14N/17E-28C01	--	5.00	07/05/1973	150	--	--	--	I
14N/17E-28F02	--	11.00	05/03/1975	25	20	0.5	1.3	H
14N/17E-29J01	--	10.33	06/ /1953	60	4	--	13.6	--
14N/17E-30K01	BSLT	232.00	11/26/1969	65	160	1.0	0.4	I
14N/17E-31D02	BSLT	163.00	03/17/1976	75	92	--	0.8	Z
14N/17E-32G01	--	20.00	06/02/1962	200	130	--	1.5	--
14N/17E-32Q01	BSLT	36.00	11/11/1975	450	--	--	--	I
14N/18E-19F	BSLT	239.00	06/13/1977	600	95	3.6	6.3	I
14N/18E-19G01	--	69.00	09/23/1975	5	--	--	--	H
14N/18E-27L02	--	95.00	11/13/1973	10	1	1.0	10.0	H
14N/18E-27P03	--	160.00	07/29/1974	20	--	--	--	H
14N/18E-29	--	51.00	04/04/1974	30	--	--	--	H
14N/18E-29K01	--	25.00	11/20/1975	20	--	--	--	H
14N/18E-29L01	--	52.00	07/16/1975	20	--	--	--	H
14N/18E-29Q01	--	73.00	11/18/1975	10	--	--	--	H
14N/18E-30H01	--	60.00	06/02/1974	15	2	--	7.5	H
14N/18E-32 NE	--	22.00	05/01/1975	20	--	--	--	H
15N/15E-11 NE	--	15.00	10/30/1956	75	20	2.0	3.8	I
15N/16E-34	--	--	--	--	--	--	--	U
15N/17E-31R02	--	3.25	05/07/1959	60	12	--	5.1	--
15N/17E-33Q01	--	21.50	12/31/1975	30	23	--	1.3	H,Z,D
16N/14E-01J01	--	17.83	02/ /1948	20	148	15.0	0.1	P
16N/15E-06N01	--	4.00	06/01/1966	100	10	2.0	10.0	H
15N/15E-17K01	BSLT	16.00	04/22/1975	75	--	--	--	H
15N/15E-28Q01	--	34.00	08/25/1975	25	--	--	--	H
16N/15E-34D01	--	6.00	06/25/1966	75	1	1.0	75.0	H,I
17N/13E-36H01	--	100.00	03/20/1975	43	--	--	--	H
17N/14E-23C01	--	26.00	08/27/1975	20	--	--	--	H
17N/14E-26K01	--	7.00	08/27/1975	10	--	--	--	H
17N/14E-35	--	3.00	--	--	--	--	--	H,I