Prepared in cooperation with
IDAHO DEPARTMENT OF WATER RESOURCES and
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Abstract

The Spokane Valley–Rathdrum Prairie aquifer is the sole source of drinking water for residents in a rapidly growing area in Spokane County, Washington, and Bonner and Kootenai Counties, Idaho. In 2004, the U.S. Geological Survey, Washington State Department of Ecology, and Idaho Department of Water Resources developed a comprehensive study of the ground- and surface-water resources in the Spokane Valley–Rathdrum Prairie area. As a part of the study, the U.S. Geological Survey used water levels measured in 268 wells in September 2004 to construct a map of ground-water levels in the aquifer. Water-level data indicate that in late summer ground water flows generally southward from Hoodoo Valley to Coeur d'Alene and then westward toward Spokane. Water-table gradients ranged from 96 to 8 feet per mile.

Introduction

The Spokane Valley–Rathdrum Prairie (SVRP) aquifer is the sole source of drinking water for more than 400,000 residents in Spokane County, Washington, and Bonner and Kootenai Counties, Idaho. The area includes the rapidly growing cities of Spokane, Washington, and Coeur d'Alene and Post Falls, Idaho. Recent and projected urban, suburban, and industrial/commercial growth has raised concerns about potential future effects on water resources in the area. Water-resource concerns include growing demands on ground water, low streamflow in reaches of the Spokane and Little Spokane Rivers, and water-quality problems associated with land-use activities.

The SVRP aquifer consists primarily of thick layers of coarse-grained sediments—gravels, cobbles, and boulders—deposited during a series of floods resulting from repeated collapse of the ice dam that impounded ancient glacial Lake Missoula (Bretz, 1930). Sources of recharge to the aquifer include infiltration from precipitation and irrigation water, leakage from the Spokane and Little Spokane Rivers and adjacent lakes, and surface- and ground-water inflow from adjoining highlands. The aquifer discharges into the Spokane and Little Spokane Rivers and Long Lake (Lake Spokane) and through withdrawals from wells. The aquifer was designated a "Sole Source Aquifer" by the Environmental Protection Agency (USEPA) in 1978 (under the provisions of the Federal Safe Drinking Water Act of 1974) in response to local concerns about the vulnerability of the aquifer to water-quality degradation. The USEPA defines such an aquifer as one that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer (U.S. Environmental Protection Agency, 2000). Generally, populations served by a sole-source aquifer do not have a viable alternative drinking-water source.

Water-management issues in this rapidly growing bi-State area have increasingly become regional in nature. In response, several groups have initiated a comprehensive, regional study of the SVRP aquifer to serve as a scientific basis for addressing regional water concerns. In 2004, the Washington State Department of Ecology (WADOE), the Idaho Department of Water Resources (IDWR), and the U.S. Geological Survey (USGS), in consultation with local stakeholders, developed a comprehensive plan of study to gain a better understanding of surface- and ground-water resources in the SVRP study area. The initial study objective is the development of an extensive data set to provide an improved scientific basis for water management of the SVRP aquifer. These data will allow construction of a numerical ground-water flow model to support the management of ground and surface water in the SVRP area. As part of the study, the USGS used water levels measured in 268 wells in the SVRP in September 2004 to construct a map of ground-water levels in the aquifer during late summer.

The purpose of this report is to present the map of ground-water levels in the SVRP for September 2004, the water-level data collected at the 268 wells, and a brief summary of ground-water flow and water-table gradients in late summer.

Acknowledgments

This report would not have been possible without the cooperation of the well owners that allowed access to their property and wells, and of the concerted effort by dedicated personnel of many local, State, and Federal agencies. Special thanks to the Idaho Department of Water Resources, Washington State Department of Ecology, Spokane County, the water districts represented by the Spokane Aquifer Joint Board, and Kootenai and Bonner Counties. The following individuals contributed significantly to the review of this report: James R. Bartolino, U.S. Geological Survey, Idaho; Rodney R. Caldwell, U.S. Geological Survey, Montana; John Covert, Washington State Department of Ecology; and Sue C. Kahle, U.S. Geological Survey, Washington.

Description of Study Area

The approximately 370-square-mile (mi^2) SVRP aquifer underlies a relatively flat, alluvium-covered valley surrounded by bedrock highlands. The roughly L-shaped aquifer extends south from Lake Pend Oreille to Coeur d'Alene Lake and westward across the Washington-Idaho state line to near Nine Mile Falls northwest of the city of Spokane. Land-surface altitudes in the valley range from about 1,500 feet (ft) near Long Lake to nearly 2,600 ft near Athol. Several lakes are located along the margins of the aquifer, the largest of which are Coeur d'Alene Lake and Lake Pend Oreille in Idaho. With the exception of the Spokane and Little Spokane Rivers, surface drainage generally is lacking because of the high permeability of valley-bottom soils.

Ground-water use in the area primarily is public supply, domestic, irrigation, and industrial. Land use in the area overlying the aquifer generally is agriculture and urban. Cities overlying and supplied by the aquifer include the Spokane metropolitan area in Washington and Coeur d'Alene and Post Falls in Idaho. The upland areas surrounding the aquifer area are mostly coniferous forests or residential housing.

The areal extent of the SVRP aquifer has been defined differently by successive authors over time. Many recent aquifer-related documents have used a modified version of the original Spokane Valley–Rathdrum Prairie Sole Source Aquifer boundary that was designated by the USEPA in 1978. On the basis of recently completed surficial-geology maps, S.C. Kahle (U.S. Geological Survey, written commun., 2005) redefined the aquifer boundary to include additional unconsolidated coarse-grained deposits.

The thickness of the SVRP aquifer generally is unknown except along its margins where wells have penetrated its entire thickness. Because many wells completed in the SVRP aquifer are extremely productive, very few extend more than 100 ft into the saturated zone.[1]

The SVRP aquifer is underlain and laterally bounded by units of relatively low permeability, including the Columbia River Basalt, the Latah Formation, and Precambrian to Tertiary metasedimentary and igneous rocks exposed in the highlands surrounding the aquifer. The Columbia River Basalts and associated Latah Formation interbeds can produce adequate quantities of water for domestic use, but are discontinuous in nature and are not considered major aquifers within the SVRP study area. The crystalline structure of the metamorphic and intrusive igneous rocks generally inhibits their ability to store and transmit water, however, weathered or fractured zones within these rocks can transmit useable amounts of ground water.

Ground-Water Levels in the Spokane Valley–Rathdum Prairie Aquifer, September 2004

Water levels in 268 wells within and surrounding the SVRP study area were measured by personnel from IDWR, WADOE, and the USGS during September 13-20, 2004 (table 1). Most measurements were made using either steel tapes or calibrated electric tapes, but a limited number of measurements were taken from wells (primarily for municipal supply) equipped with a calibrated airline.

Most of the wells included in the September 2004 synoptic water-level measurement were revisited in October 2004 to determine land-surface altitude using a differential global positioning system (GPS). For those wells that were not surveyed with a differential GPS, elevations were determined from levels surveyed from benchmarks or were estimated from 1:24,000-scale topographic maps.

Water levels measured during the study were used to constuct a map of ground-water levels in the aquifer during late summer. Water-level contours were drawn using static water levels measured in wells that were completed in outwash deposits (112OTSH) and had land-surface altitudes with accuracies of ± 0.01–5.0 ft. Wells with less-accurate land-surface altitudes (±10.0 ft) were given less weight in mapping water levels. Water levels that were measured in wells completed in basalt (122CBRV), granite (210CRCS), or slate (400PRCD), or completed in multiple aquifers were not used. The map was constucted using contour intervals of 20 ft except for contours greater than 2,060 ft, which have 40-ft intervals.

Water-level measurements in September 2004 indicate that depth to water in the SVRP aquifer ranges from near land surface, to the west near Spokane along the Spokane and Little Spokane Rivers, to more than 540 ft below land surface in northern Rathdrum Prairie near Athol (table 1). The water-level contours demonstrate that the water table in the SVRP aquifer generally reflects the land-surface topography and slopes from Hoodoo Valley and Lake Pend Oreille, Idaho to Nine Mile Falls, Washington. Ground water generally flows in a southward direction from the Hoodoo Valley area (water-level altitude of about 2,160 ft), towards the city of Coeur d'Alene, and then westward towards the city of Spokane (altitude of about 1,540 ft near the Little Spokane River).

The water-table gradient ranges from relatively flat in the central Rathdrum Prairie and Spokane Valley areas to steep along the margins of the aquifer. The water-table gradient in the Rathdrum Prairie area in the northern part of the aquifer is about 22 feet per mile (ft/mi), whereas the gradient in the main body of the aquifer from Hayden, Idaho, to Spokane, Washington, is about 8 ft/mi. Gradients are steeper elsewhere in the aquifer: 77 ft/mi in the Chilco Channel, 61 ft/mi in the Bayview area, 40 ft/mi in Spirit Valley, 22 ft/mi in the Hillyard area, 17 ft/mi along the Spokane River west of Five Mile Prairie, and ranging from about 69 to 96 ft/mi near Newman, Hayden, and Hauser Lakes.

References Cited

Bretz, J H., 1930, Lake Missoula and the Spokane floods [abs.]: Geological Society of America Bulletin, v. 41, p. 92-93.

U.S. Environmental Protection Agency, 2000, Sole source aquifer protection program overview: U.S. Environmental Protection Agency data available on the Web, accessed June 6, 2001, at http://www.epa.gov/ogwdw/swp/ssa.html

[1] Known depths of wells measured in September 2004 ranged from 22 ft to 700 ft below land surface.

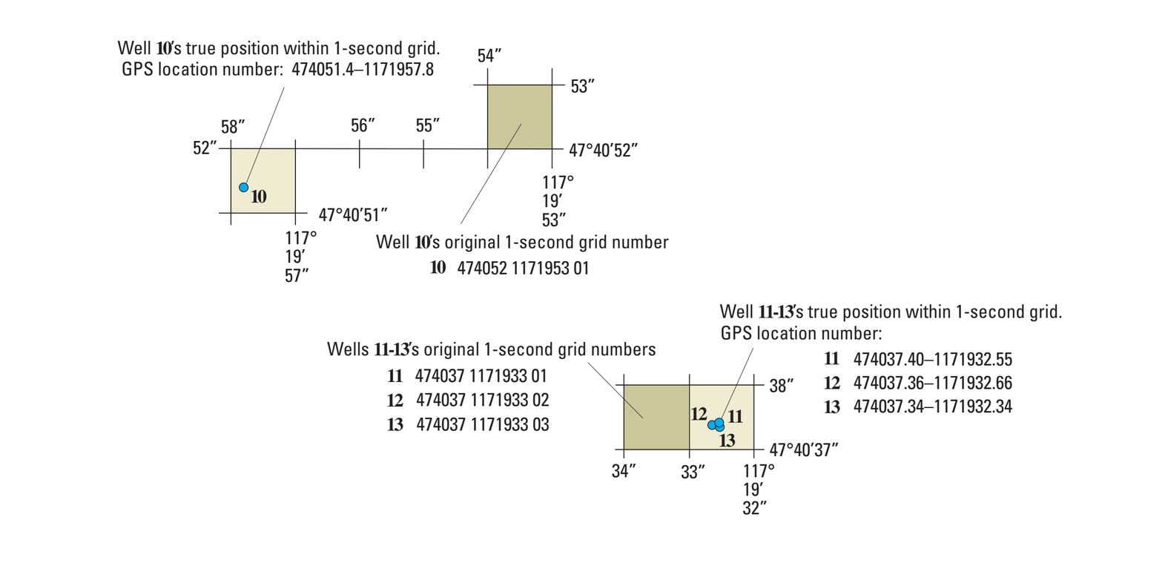
Table 1. Water-level information for wells measured in the Spokane Valley–Rathdrum Prairie study area, September 2004.

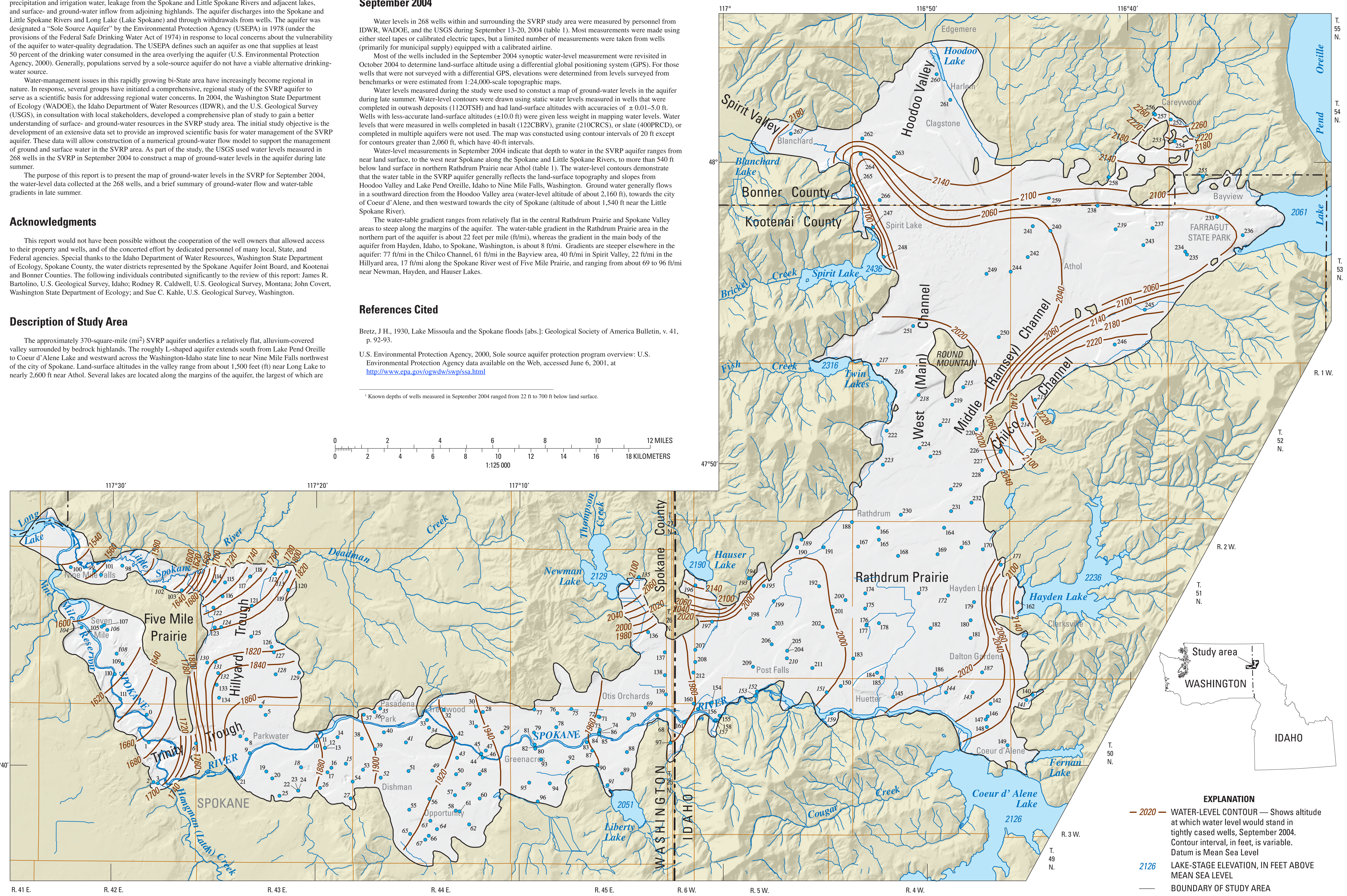
[Wells in *italics* either were of lesser importance in determining water-level contours or, if completed in multiple aquifer units, were not used. **Method used to derive land-surface altitude:** D, differential global positioning system; L, survey level; M, topographic map. **Aquifer unit in which well completed**: 112OTSH, outwash deposits; 122CBRV, basalt; 210CRCS, granite; 400PRCS, slate; Multiple, multiple aquifer units. **Well status:** P, pumping; R, recently pumped; S, nearby pumping; T, nearby recently pumped; V, foreign substance; –, static. **Method of water-level measurement:** A, airline; C, calibrated airline: G, pressure gage; S, steel tape; T, electric tape; V, calibrated electric tape. *Italicized* informaton indicates less than ideal conditions. **Abbreviations:** NAVD 88, North American Vertical Datum of 1988]

Map identification No.	Well-site identification No.	Altitude of land surface (in feet above NAVD 88)	Accuracy of land-surface altitude (feet)	Method used to derive land-surface altitude	Aquifer unit in which well completed	Water level (in feet above NAVD 88)	Depth of water (in feet below land surface)	Well status	Method of water-level measurement
0	474142117281801	1,701.20	0.1	D	112OTSH	1,654.22	46.98	–	V
1	474047117280601	1,689.65	.1	D	112OTSH	1,668.81	20.84	–	V
2	473928117275001	1,804.00	10	M	112OTSH	1,698.10	105.90	–	S
3	473924117273701	1,735.39	.01	L	112OTSH	1,695.56	39.83	–	V
4	474200117223901	2,051.32	.1	D	112OTSH	1,860.32	191	–	V
5	474143117222801	2,043.34	.1	D	112OTSH	1,862.88	180.46	–	V
6	474045117255201	1,904.00	10	M	112OTSH	1,759.55	144.45	–	V
7	474100117233601	1,950.25	.01	D	112OTSH	1,861.94	88.31	–	V
8	474054117232401	1,948.42	.1	D	112OTSH	1,863.45	84.97	–	V
9	474026117231401	1,887.61	.1	D	112OTSH	1,866.17	21.44	–	V
10	474052117195301	1,910.22	.1	D	112OTSH	1,875.76	34.46	–	V
11	474037117193301	1,952.00	2.5	M	112OTSH	1,883.03	68.97	–	V
12	474037117193302	1,952.00	2.5	M	112OTSH	1,882.50	69.50	–	V
13	474037117193303	1,952.00	2.5	M	112OTSH	1,882.16	69.84	–	V
14	474059117185601	1,951.52	.1	D	112OTSH	1,889.91	61.61	–	V
15	474005117182601	1,950.96	.1	D	112OTSH	1,891.94	59.02	–	A
16	473958117185801	1,943.34	.1	D	112OTSH	1,887.53	55.81	–	V
17	473958117113401	1,944.00	5	M	112OTSH	1,887.79	56.21	–	V
18	473955117204201	1,934.00	20	M	112OTSH	1,867.35	66.65	–	V
19	473950117222501	1,925.59	.1	D	112OTSH	1,870.38	55.21	–	V
20	473931117220301	1,937.83	.1	D	112OTSH	1,871.94	65.89	–	V
21	473938117234701	1,880.63	.1	D	112OTSH	1,868.45	12.18	–	V
22	473912117205101	1,932.00	2.5	M	112OTSH	1,878.57	53.43	–	V
23	473912117205102	1,932.00	2.5	M	112OTSH	1,878.60	53.40	–	V
24	473912117205103	1,932.00	2.5	M	112OTSH	1,878.68	53.32	–	V
25	473902117214601	1,919.63	.1	L	112OTSH	1,874.98	44.65	–	V
26	473920117194502	1,939.00	5	M	unknown	1,875.93	63.07	–	V
27	473900117185201	2,030.00	20	M	112OTSH	1,894.95	135.05	–	V
28	474150117114701	2,055.37	.1	D	112OTSH	1,941.29	114.08	–	V
29	474110117104701	2,021.92	.1	D	112OTSH	1,947.34	74.58	–	V
30	474152117120801	2,041.97	.1	D	112OTSH	1,937.52	104.45	–	V
31	474121117120701	2,017.45	.1	D	112OTSH	1,937.01	80.44	–	V
32	474152117133801	1,993.45	.1	D	112OTSH	1,931.42	62.03	–	V
33	474134117143202	1,983.22	.1	D	112OTSH	1,908.63	74.59	–	A
34	474117117142401	1,993.01	.1	D	112OTSH	1,910.96	82.05	R	V
35	474155117164801	1,998.83	.1	D	112OTSH	1,893.53	105.30	–	A
36	474346117154101	1,986.10	1.0	D	112OTSH	1,901.10	85.00	–	A
37	474141117174101	1,966.14	.1	D	112OTSH	1,902.00	64.14	–	V
38	474057117174101	1,958.90	.1	D	112OTSH	1,897.22	61.68	–	V
39	474034117170001	1,979.63	.1	D	112OTSH	1,900.69	78.94	–	V
40	474106117165101	1,950.22	.1	D	112OTSH	1,903.97	46.25	–	V
41	474039117153201	1,980.33	.1	D	112OTSH	1,894.73	85.60	–	A
42	474058117130601	1,977.90	.1	D	112OTSH	1,925.70	52.20	–	V
43	474020117125903	1,995.40	.1	D	112OTSH	1,917.40	78.00	S	A
44	474026117115301	1,965.90	.1	D	112OTSH	1,930.87	35.03	–	V
45	474027117115201	1,967.20	.1	D	112OTSH	1,931.21	35.99	–	V
46	474019117114801	1,987.40	.1	D	112OTSH	1,932.02	55.38	–	V
47	474040117114001	1,994.66	.1	D	112OTSH	1,938.12	56.54	–	V
48	473945117115301	2,043.26	.1	D	112OTSH	1,934.55	108.71	–	V
49	473953117141601	2,052.28	.1	D	112OTSH	1,921.84	130.44	T	V
50	473945117130401	2,055.21	.1	D	112OTSH	1,928.65	126.56	–	V
51	473954117152101	2,014.99	0.1	D	112OTSH	1,913.11	101.88	–	T
52	473939117164401	2,002.15	.1	D	112OTSH	1,904.75	97.40	R	V
53	473952117173401	1,967.28	.1	D	112OTSH	1,895.55	71.73	–	V
54	473931117180101	1,966.08	.1	D	112OTSH	1,892.35	73.73	–	V
55	473835117152001	2,084.73	.1	D	112OTSH	1,917.83	166.90	–	V
56	473857117142201	2,026.06	.1	D	112OTSH	1,921.95	104.11	–	V
57	473904117130902	2,017.12	.1	D	112OTSH	1,926.84	90.28	–	V
58	473839117131101	2,082.59	.1	D	112OTSH	1,926.53	156.06	–	V
59	473918117124201	2,019.93	.1	D	unknown	1,929.50	90.43	–	V
60	473852117115301	2,046.42	.1	D	112OTSH	1,931.19	115.23	–	V
61	473831117125201	2,085.33	.1	D	112OTSH	1,926.92	158.41	–	V
62	473805117122501	2,066.66	.1	D	112OTSH	1,927.45	139.21	R	V
63	473813117141701	2,065.64	.1	D	112OTSH	1,920.64	145	–	V
64	473800117135801	2,017.02	.1	D	112OTSH	1,921.90	95.12	R	V
65	473747117151801	2,034.14	.1	D	112OTSH	1,919.14	115	–	V
66	473742117142502	2,033.97	.1	D	112OTSH	1,922.17	111.80	–	V
67	473728117143801	2,034.42	.1	D	112OTSH	1,921.42	113	R	V
68	474144117031401	2,049.56	.1	D	112OTSH	1,969.11	80.45	–	V
69	474159117034801	2,081.99	.1	D	112OTSH	1,967.79	114.20	–	V
70	474136117043702	2,070.33	.1	D	112OTSH	1,965.13	105.20	–	A
71	474140117060401	2,056.37	.1	D	112OTSH	1,961.55	94.82	–	V
72	474145117060502	2,055.81	.1	D	112OTSH	1,957.11	98.70	–	A
73	474115117060301	2,043.99	.1	D	112OTSH	1,961.50	82.49	–	V
74	474110117060601	2,036.91	.1	D	112OTSH	1,961.84	75.07	–	V
75	474156117072802	2,062.96	.1	D	112OTSH	1,956.96	106.00	–	A
76	474150117080701	2,054.70	.1	D	112OTSH	1,956.73	97.97	–	V
77	474156117091601	2,049.36	.1	D	112OTSH	1,953.77	95.59	–	V
78	474116117080301	2,028.09	.1	D	112OTSH	1,954.77	73.32	–	V
79	474109117091701	2,025.36	.1	D	112OTSH	1,951.84	73.52	–	V
80	474046117091501	2,004.72	.1	D	112OTSH	1,951.07	53.65	–	V
81	474038117091201	2,021.23	.1	D	112OTSH	1,951.19	70.04	–	V
82	474037117091301	2,022.35	.1	D	112OTSH	1,950.93	71.42	–	V
83	474050117064201	2,024.07	.1	D	112OTSH	1,959.62	64.45	–	V
84	474106117060501	2,034.34	.1	D	112OTSH	1,990.20	44.14	–	V
85	474107117060501	2,040.32	.1	D	112OTSH	1,983.27	57.05	–	V
86	474107117060502	2,034.20	.1	D	112OTSH	1,961.20	73.00	–	V
87	474033117062501	2,041.70	.1	D	112OTSH	1,959.70	82.00	–	V
88	474032117044401	2,112.63	.1	D	112OTSH	1,962.23	150.40	–	V
89	473944117045001	2,142.88	.1	D	112OTSH	1,965.88	177.00	V	S
90	474010117060601	2,085.91	.1	D	112OTSH	1,959.59	126.32	–	V
91	473925117053201	2,072.46	.1	D	112OTSH	1,950.70	121.76	P	V
92	474011117072901	2,059.70	.01	L	112OTSH	1,955.20	104.50	–	V
93	474016117085601	2,035.60	.5	D	112OTSH	1,948.11	87.49	–	V
94	473928117083001	2,047.74	.1	D	112OTSH	1,951.43	96.31	–	S
95	473929117092603	2,043.00	1.0	D	112OTSH	1,947.70	95.30	S	A
96	473855117090602	2,104.67	.1	D	112OTSH	1,986.89	117.78	–	V
97	474049117023501	2,178.13	.1	D	112OTSH	1,980.28	197.85	–	S
98	474643117291401	1,705.24	.1	D	112OTSH	1,568.87	136.37	–	V
99	474629117305101	1,729.00	10	M	112OTSH	1,556.19	172.81	–	V
100	474623117320301	1,742.13	.1	D	112OTSH	1,545.21	196.92	–	V
101	474619117303601	1,733.51	.1	D	112OTSH	1,576.41	157.10	–	V
102	474551117273801	1,614.00	10	M	112OTSH	1,580.71	33.29	–	A
103	474550117253001	1,714.00	1.0	L	112OTSH	1,611.20	102.80	–	A
104	474427117312101	1,634.00	10	M	112OTSH	1,614.56	19.44	–	V
105	474434117301301	1,680.19	.1	D	112OTSH	1,607.79	72.40	–	V
106	474434117301201	1,680.00	10	M	112OTSH	1,606.16	73.84	–	V
107	474434117303201	1,668.48	.1	D	112OTSH	1,607.92	60.56	–	V
108	474334117284501	1,682.47	.1	D	122CBRV	1,613.88	68.59	–	V
109	474323117292801	1,692.83	.1	D	112OTSH	1,619.13	73.70	–	V
110	474302117294901	1,629.20	.1	D	112OTSH	1,611.03	18.17	–	V
111	474213117293301	1,646.90	.1	D	112OTSH	1,631.47	15.43	–	V
112	474623117220001	1,867.00	10	M	112OTSH	1,750.44	116.56	–	V
113	474628117213201	1,895.32	.1	D	112OTSH	1,854.22	41.10	–	A
114	474610117245401	1,818.89	.1	D	112OTSH	1,710.16	108.73	–	V
115	474604117242901	1,788.03	.1	D	112OTSH	1,692.10	95.93	–	V
116	474538117243601	1,774.67	.1	D	112OTSH	1,743.46	31.21	–	V
117	474618117231501	1,825.39	.1	D	112OTSH	1,750.40	74.99	–	V
118	474618117231601	1,825.39	.1	D	112OTSH	1,750.20	75.19	–	V
119	474552117211801	1,905.61	.1	D	112OTSH	1,820.75	84.86	–	V
120	474549117211401	1,905.61	.1	D	112OTSH	1,819.70	85.91	–	V
121	474519117231001	1,942.02	.1	D	112OTSH	1,779.10	162.92	–	V
122	474516117250801	1,924.00	20	M	112OTSH	1,761.44	162.56	–	V
123	474436117245901	1,938.23	.1	D	112OTSH	1,799.57	138.66	–	V
124	474437117243501	1,949.99	.1	D	112OTSH	1,790.89	159.10	–	A
125	474418117231001	1,995.27	.1	D	112OTSH	1,810.36	184.91	–	V
126	474355117221101	2,001.99	.1	D	112OTSH	1,813.41	188.58	–	V
127	474352117215101	2,019.00	20	M	112OTSH	1,835.31	183.69	–	V
128	474303117215901	2,034.00	10	M	112OTSH	1,846.28	187.72	–	V
129	474307117204601	2,009.00	10	M	unknown	1,861.61	147.39	–	S
130	474326117244901	2,054.00	10	M	112OTSH	1,848.70	205.30	–	C
131	474325117251701	2,048.66	.1	D	112OTSH	1,835.66	213	–	V
132	474305117244401	2,079.00	20	M	112OTSH	1,844.54	234.46	–	V
133	474242117244901	2,068.45	.1	D	112OTSH	1,847.02	221.43	–	V
134	474216117244501	2,063.14	.1	D	112OTSH	1,854.75	208.39	–	V
135	474619117040801	2,160.42	.1	D	210CRCS	2,054.45	105.97	–	V
136	474419117033901	2,186.00	.1	L	112OTSH	1,978.19	207.81	–	V
137	474349117025201	2,107.97	.1	D	112OTSH	1,976.80	131.17	–	V
138	474304117025201	2,084.17	.1	D	112OTSH	1,975.11	109.06	–	V
139	474226117024801	2,094.02	.1	D	112OTSH	1,973.84	120.18	–	V
140	474226116444101	2,220.91	.1	D	112OTSH	2,086.12	134.79	–	S
141	474213116450601	2,219.55	.1	D	400PRCD	2,057.47	162.08	–	V
142	474208116465001	2,242.01	.1	D	112OTSH	2,051.95	190.06	–	V
143	474229116474501	2,224.00	10	M	112OTSH	2,019.50	204.50	–	V
144	474229116490301	2,204.00	20	M	112OTSH	2,021.52	182.48	–	V
145	474221116513801	2,179.18	.01	L	112OTSH	2,019.20	159.98	–	V
146	474142116470101	2,227.11	.1	D	112OTSH	2,056.68	170.43	–	V
147	474134116470001	2,226.35	.1	D	112OTSH	2,057.50	168.85	–	V
148	474115116470101	2,224.43	.01	L	112OTSH	2,058.68	165.75	–	V
149	474043116460201	2,184.81	.1	D	112OTSH	2,064.89	119.92	–	V
150	474242116540301	2,197.43	.1	D	112OTSH	2,001.54	195.89	–	S
151	474230116544901	2,197.90	.01	L	112OTSH	2,003.80	194.10	R	V
152	474232116582001	2,144.00	20	M	112OTSH	2,005.90	138.10	–	V
153	474223116582501	2,111.00	20	M	112OTSH	2,008.10	102.90	–	V
154	474209117003401	2,114.49	.1	D	112OTSH	1,983.69	130.80	–	V
155	474145117000701	2,068.83	.1	D	112OTSH	1,981.67	87.16	–	S
156	474156117011501	2,092.05	.01	L	unknown	1,980.89	111.16	–	S
157	474134117002201	2,073.32	.1	D	112OTSH	2,008.95	64.37	–	V
158	474134117002202	2,073.54	.1	D	112OTSH	2,038.01	35.53	–	V
159	474147116544001	2,134.00	20	M	112OTSH	2,019.43	114.57	R	S
160	474208117012301	2,114.65	.01	L	112OTSH	1,978.67	135.98	–	V
161	474130117015401	2,073.29	.1	D	112OTSH	1,978.89	94.40	–	V
162	474529116452601	2,296.77	.01	L	112OTSH	2,149.37	147.40	–	V
163	474718116481701	2,321.00	5.0	D	112OTSH	2,007.00	314.00	–	G
164	474757116492701	2,311.77	.1	D	112OTSH	2,006.69	305.08	–	V
165	474732116521701	2,275.35	.1	D	112OTSH	2,004.74	270.61	–	V
166	474755116521901	2,246.56	.1	D	112OTSH	2,004.26	242.30	R	V
167	474720116532101	2,240.47	.1	D	112OTSH	2,004.07	236.40	–	V
168	474659116511901	2,275.20	.01	L	112OTSH	2,005.57	269.63	V	S
169	474704116495001	2,300.31	.01	L	112OTSH	2,004.66	295.65	V	S
170	474714116471301	2,314.00	5	M	112OTSH	2,008.76	305.24	–	V
171	474643116461901	2,308.78	1.0	D	122CBRV	2,112.89	195.89	–	S
172	474542116485701	2,302.16	.1	D	112OTSH	2,004.52	297.64	S	V
173	474547116501701	2,279.85	.1	D	112OTSH	2,003.25	276.60	V	S
174	474547116524801	2,255.78	.01	L	112OTSH	2,003.07	252.71	V	S
175	474512116525801	2,238.04	.1	D	112OTSH	2,001.44	236.60	V	S
176	474444116525701	2,253.18	.1	D	112OTSH	2,001.04	252.14	V	S
177	474443116525701	2,252.61	.1	D	112OTSH	2,001.16	251.45	R	V
178	474445116521601	2,249.18	.1	D	112OTSH	2,001.82	247.36	–	S
179	474529116474001	2,290.26	.1	D	112OTSH	2,010.66	279.60	–	S
180	474453116474501	2,277.94	.1	D	112OTSH	2,013.56	264.38	–	V
181	474417116475001	2,278.06	.1	D	112OTSH	2,012.56	265.50	–	V
182	474437116494801	2,283.81	.1	D	112OTSH	2,003.03	280.78	–	V
183	474337116533201	2,211.51	.1	D	112OTSH	2,000.63	210.88	–	V
184	474308116522101	2,346.70	.01	L	112OTSH	1,997.52	349.18	V	S
185	474259116521201	2,301.33	.1	D	112OTSH	2,001.68	299.65	–	S
186	474306116493601	2,257.49	.1	D	112OTSH	2,013.86	243.63	–	V
187	474309116471601	2,239.95	.1	D	Multiple	2,037.38	202.57	–	V
188	474808116534001	2,203.41	.1	D	112OTSH	1,999.48	203.93	–	V
189	474733116560801	2,184.00	20	M	210CRCS	2,021.50	162.50	P	V
190	474718116562201	2,151.13	.1	D	112OTSH	2,002.94	148.19	–	V
191	474718116545901	2,178.93	.1	D	112OTSH	2,001.03	177.90	–	V
192	474601116551301	2,221.78	.01	L	112OTSH	1,999.12	222.66	–	S
193	474618116583501	2,166.90	.1	D	210CRCS	2,107.60	59.30	–	V
194	474617116584101	2,165.00	20	D	210CRCS	2,032.85	132.15	–	V
195	474559116574901	2,144.77	.1	D	112OTSH	1,994.21	150.56	V	S
196	474603117010301	2,204.00	20	M	112OTSH	2,142.02	61.98	–	V
197	474450117003301	2,126.80	.1	D	112OTSH	1,988.06	138.74	R	V
198	474458116583701	2,146.45	.1	D	112OTSH	1,987.70	158.75	–	S
199	474532116572701	2,166.68	.1	D	112OTSH	2,014.03	152.65	S	A
200	474533116535601	2,239.99	.1	D	unknown	2,001.98	238.01	–	S
201	474520116543701	2,220.75	.1	D	112OTSH	2,000.98	219.77	V	S
202	474440116545801	2,232.79	.01	L	112OTSH	1,997.11	235.68	–	S
203	474439116572601	2,146.98	0.01	L	112OTSH	1,993.93	153.05	–	V
204	474353116565101	2,240.64	1	D	112OTSH	2,005.29	235.35	–	V
205	474352116565201	2,240.64	1.0	D	112OTSH	2,004.72	235.92	–	V
206	474407116573301	2,157.24	.1	D	112OTSH	2,007.29	149.95	–	A
207	474355117012201	2,114.00	5.0	M	112OTSH	1,983.28	130.72	–	V
208	474329117011601	2,109.26	.01	L	112OTSH	1,982.54	126.72	–	V
209	474329116582801	2,145.42	.01	L	112OTSH	1,989.18	156.24	–	S
210	474337116564801	2,217.47	.01	L	112OTSH	1,992.95	224.52	–	V
211	474318116553401	2,192.75	.01	L	112OTSH	1,996.10	196.65	–	V
212	474309117012301	2,103.17	.01	L	112OTSH	1,981.93	121.24	–	S
213	475211116443801	2,313.98	.1	D	112OTSH	2,226.59	87.39	–	V
214	475132116451501	2,304.09	.1	D	210CRCS	2,207.61	96.48	–	V
215	475237116480601	2,346.18	.1	D	Multiple	1,994.89	351.29	–	S
216	475317116510301	2,444.00	10	M	112OTSH	2,010.05	433.95	–	S
217	475322116522201	2,416.00	10	M	112OTSH	2,017.64	398.36	–	S
218	475221116502201	2,364.00	10	M	112OTSH	2,014.21	349.79	–	V
219	475202116484301	2,311.71	.1	D	112OTSH	2,010.30	301.41	–	S
220	475110116474201	2,296.41	.1	D	112OTSH	2,115.34	181.07	–	S
221	475121116491801	2,321.69	.1	D	Multiple	2,010.33	311.36	–	V
222	475110116515701	2,326.67	.1	D	112OTSH	2,009.98	316.69	–	V
223	475002116521101	2,270.56	.05	L	Multiple	2,043.33	227.23	–	V
224	475036116502001	2,289.00	5.0	M	112OTSH	2,001.74	287.26	–	V
225	475019116494701	2,284.41	.1	D	112OTSH	2,009.39	275.02	–	S
226	475030116461401	2,300.80	.1	D	112OTSH	2,053.31	247.49	–	V
227	475025116462301	2,305.04	0.1	D	112OTSH	2,051.14	253.90	–	V
228	474953116470801	2,288.09	.1	D	112OTSH	2,010.44	277.65	–	V
229	474906116484801	2,263.85	2.5	D	112OTSH	2,000.67	263.18	R	S
230	474823116511601	2,264.00	5.0	M	112OTSH	2,010.09	253.91	–	V
231	474829116484801	2,313.25	.1	D	112OTSH	2,007.35	305.90	–	V
232	474847116474701	2,314.52	.1	D	112OTSH	2,006.07	308.45	–	V
233	475816116353301	2,293.89	.01	L	112OTSH	2,058.19	235.70	–	V
234	475705116371201	2,441.61	.1	D	112OTSH	2,057.16	384.45	–	S
235	475659116370701	2,457.82	.1	D	112OTSH	2,057.31	400.51	–	V
236	475736116341701	2,294.83	.1	D	112OTSH	2,062.22	232.61	–	S
237	475752116384801	2,440.55	5	D	112OTSH	2,050.69	389.86	–	V
238	475838116412101	2,407.26	.1	D	112OTSH	2,051.51	355.75	–	S
239	475750116403801	2,374.00	10	M	112OTSH	2,055.72	318.28	–	S
240	475747116435101	2,516.16	.1	D	112OTSH	2,040.33	475.83	–	V
241	475756116444101	2,508.72	.1	D	112OTSH	2,035.86	472.86	–	V
242	475655116445801	2,490.50	.1	D	112OTSH	2,039.45	451.05	–	V
243	475717116391601	2,454.09	.1	D	112OTSH	2,053.63	400.46	–	V
244	475627116454501	2,491.44	.01	L	112OTSH	2,024.20	467.24	–	V
245	475510116391201	2,457.37	.1	D	112OTSH	2,177.93	279.44	–	S
246	475400116404201	2,460.25	.1	D	112OTSH	2,237.99	222.26	–	S
247	475754116523502	2,457.92	.01	L	112OTSH	2,163.92	294.00	–	V
248	475656116520401	2,548.30	.1	D	112OTSH	2,095.94	452.36	R	S
249	475622116470101	2,505.01	.1	D	112OTSH	2,029.02	475.99	–	S
250	475416116462401	2,416.33	.1	D	112OTSH	2,022.78	393.55	–	V
251	475439116503401	2,432.26	0.1	D	112OTSH	2,019.41	412.85	–	S
252	480128116375301	2,320.43	.1	D	112OTSH	2,277.68	42.75	–	V
253	480046116373601	2,344.00	10	M	112OTSH	2,232.46	111.54	–	V
254	480046116373401	2,341.49	.1	D	112OTSH	2,231.79	109.70	–	V
255	475935116361901	2,359.01	.1	D	210CRCS	2,288.03	70.98	–	V
256	480140116384301	2,283.12	.1	D	112OTSH	2,265.13	17.99	R	V
257	480137116383901	2,287.70	.1	D	112OTSH	2,266.37	21.33	–	V
258	475935116405001	2,177.63	.1	D	112OTSH	2,108.56	69.07	–	V
259	475852116435501	2,338.50	.1	D	112OTSH	2,082.76	255.74	–	V
260	480300116492401	2,233.50	.1	D	112OTSH	2,148.52	84.98	R	S
261	480209116484201	2,184.21	.1	D	112OTSH	2,147.45	36.76	–	V
262	480051116532101	2,303.53	.1	D	112OTSH	2,158.17	145.36	–	S
263	480015116512901	2,429.00	5	M	112OTSH	2,148.31	280.69	–	V
264	480021116531201	2,401.34	.1	D	112OTSH	2,044.18	357.16	–	V
265	475913116531101	2,346.90	.1	D	112OTSH	2,132.16	214.74	–	V
266	475849116521601	2,577.18	.1	D	112OTSH	2,035.78	541.40	–	V
267	480101116563601	2,317.17	.1	D	112OTSH	2,172.19	144.98	–	S

Well- and miscellaneous site-numbering system

The well- and miscellaneous site-numbering system of the U.S. Geological Survey is based on latitude and longitude. A unique 15-digit number is assigned for each site: the first six digits denote degrees, minutes, and seconds of latitude, the next seven digits denote degrees, minutes, and seconds of longitude, and the last two digits (assigned sequentially) identify the wells within a 1-second grid. Datums are either the North American Datum of 1927 or the North American Datum of 1983, depending on when the site was established; recently assigned site-identification numbers use North American Datum of 1983. Although the USGS site-identification number was established from geographic coordinates, it should not be used to locate a site because the unique site number is permanent and does not change if a more accurate location is determined at a later time.





Base from U.S. Geological Survey digital data, 1:500,000, 1983
Universal Transverse Mercator Projection, Zone 11

EXPLANATION

2020 — WATER-LEVEL CONTOUR — Shows altitude at which water level would stand in tightly cased wells, September 2004. Contour interval, in feet, is variable. Datum is Mean Sea Level

2126 LAKE-STAGE ELEVATION, IN FEET ABOVE MEAN SEA LEVEL

BOUNDARY OF STUDY AREA

146 WELL AND MAP IDENTIFICATION NO.

Ground-Water Levels in the Spokane Valley – Rathdrum Prairie Aquifer, Spokane County, Washington, and Bonner and Kootenai Counties, Idaho, September 2004

By Annette M. Campbell

2005