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Getchell Plateau Groundwater Investigation

March 2006

Snohomish County
Public Works
Surface Water Management

Working together for people, streams & fish.

Getchell Plateau Groundwater Investigation

Prepared by

Jeffrey A. Kirtland, L.H.G.
Snohomish County Public Works
Surface Water Management Division

Prepared for

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Department of Ecology
Olympia Washington

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Snohomish County Public Works
Surface Water Management Division
3000 Rockefeller Avenue
Everett, Washington 98201

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Steven Thomsen, P.E., Public Works Director

Surface Water Management Division

Joan M. Lee, P.E., Surface Water Management Director

Contributing Staff (Current and Former)

Cami Apfelbeck
Adam Bailey
Shannon Britton
Jalyn Cummings, L.H.G.
Jennifer Glass
Deborah Haynes
William T. Leif, P.E.
Emilio Mayorga
Leah Strong
Erin Thatcher

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NOTE REGARDING COMPREHENSIVE PLAN INFORMATION

Revisions to the Snohomish County Comprehensive Plan were adopted in early 2006, after the text for this report had been prepared. As a consequence, Chapter 6 of this report refers to various alternatives that were being considered in the planning process. Land use for the Getchell Plateau in the adopted Comprehensive Plan is similar to Alternative 2 as discussed in this report. Since the adopted plan will have little effect on groundwater resources in the Getchell Plateau, project staff decided to publish the report as written as opposed to delaying publication with further revisions.

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GETCHELL PLATEAU

GROUNDWATER INVESTIGATION

EXECUTIVE SUMMARY

The Getchell Plateau groundwater investigation examined a single Snohomish County groundwater system. This investigation:

- assessed groundwater availability as both a source of potable water and as source of discharge to lakes, streams, and wetlands;
- examined both current and future groundwater availability.
- developed a picture of the current groundwater quality; and
- assessed future groundwater quality as urban a rural development continues.

The Getchell Plateau was selected because:

- the population is projected to increase 35%, from 64,400 to over 87,000, during the coming decades;
- the residents of the Getchell Plateau are highly dependent on groundwater for potable water;
- the plateau has much undeveloped land relative to existing zoning; and
- the groundwater systems beneath the Getchell Plateau are also representative of other Snohomish County groundwater systems.

The Getchell Plateau groundwater investigation was based on data collected by the Snohomish Health District, the US Geological Survey, Washington State Department of Ecology, and Washington State Department of Health. To characterize the current water quantity and quality conditions and to develop a data set for comparison with previously collected data, the project team sampled 58 wells during 2002 and 2003.

Previous studies of Snohomish County's groundwater systems have focused their examination on the coarse-grained aquifers, the alluvium, the recessional outwash, and the advance outwash. This study examined these aquifers as well as other important water-bearing materials, all of which supply roughly 20% of the well water to Getchell Plateau residents.

Advances in digital database technology allowed the project team to process far more data with fewer resources than were available in the early 1990's, when Snohomish County's groundwater resources were last studied. Water well reports on file with the Washington State Department of Ecology indicate that there are nearly 2,600 wells on the Getchell Plateau.

Current and future groundwater consumption by the Getchell Plateau residents is generally considered to be sustainable, although is not possible to measure the actual impact of groundwater consumption on streamflows. Sustainable use of groundwater on the Getchell Plateau depends on the current pattern of use. Less than 20% of the water consumed by the Getchell Plateau residents comes from aquifers beneath the Getchell Plateau. The remaining 80% of the Getchell Plateau residents receive their water from municipal water systems, which import water from off the plateau.

Municipal systems serving the Getchell Plateau rely on water imported from surface water sources and centralized wastewater treatment facilities that discharge the treated effluent to surface water body located off the plateau. In effect, the municipal systems import and re-export all of the water used.

No widespread groundwater quality problems were identified by the project team. Groundwater quality beneath the Getchell Plateau is generally good. There is little evidence of widespread groundwater problems arising from potential sources of groundwater contamination on the plateau, agriculture, or residential septic systems.

While Getchell Plateau groundwater quality is generally good, some specific groundwater quality problems were identified. For the most part the groundwater quality issues are attributed to natural causes, but a few can be traced to human causes.

The occurrence of arsenic, barium, iron, manganese in the groundwater beneath the Getchell Plateau, although above the MCL, is considered to be natural. Arsenic in groundwater was more widespread and

prevalent than previously thought. The Getchell Plateau groundwater investigation also found coliform bacteria that can be attributed to poor animal waste management practices.

Large amounts of groundwater quantity and quality data were available to Snohomish County Public Works at the start of the Getchell Plateau groundwater investigation, but these data were not compiled into a single usable format. Previous synoptic studies of groundwater quality and quantity found healthy groundwater systems. However, the increasing population of the County and the accompanying increasing demand for groundwater means that the availability and health of the groundwater resources could change. These increased pressures on the groundwater resource increase the need to establish a comprehensive groundwater monitoring system for Snohomish County. In addition, area-specific studies such as the Getchell Plateau Groundwater Investigation can and should inform decisions regarding land use and water resource management.

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CHAPTER 1. INTRODUCTION

1.1 Introduction

This report describes an investigation of the groundwater resources beneath the Getchell Plateau. The Getchell Plateau is located in the central portion of the Snohomish County Groundwater Management Area (Figure 1-1).

A rapidly growing population has increased the demand for water in both urban and rural Snohomish County. Groundwater is an important source of domestic, municipal, and industrial water and its use is projected to grow. Groundwater supplies the daily needs of roughly one-third of all Snohomish County residents and a higher percentage of the County's rural residents (Thomas et al., 1997).

In 1999, Snohomish County convened an advisory committee to investigate the County's groundwater resources and to publish the *Snohomish County Ground Water Management Plan* (Golder Associates, 1999). The study of a single aquifer system was one of the recommendations contained in the management plan. This investigation was funded by a Centennial Clean Water Act grant and Snohomish County.

This investigation was designed to develop a detailed understanding of the Getchell Plateau aquifers by:

- describing the hydrogeologic units (aquifers and aquitards);
- quantifying water use and availability by developing a water budget;
- relating existing groundwater quality conditions to land uses and development densities; and
- projecting how future land uses could impact groundwater availability and groundwater quality.

The Getchell Plateau was chosen for more intensive study because it is an area:

- that will receive an estimated 35 percent increase in population over the coming decade;
- that is highly dependent on groundwater as a source of drinking water;
- with data available from nearly 2,600 wells (Appendix A);
- with water chemistry data available from 460 wells (Appendix B);
- that is not fully built out, and therefore represents an ideal place to establish a baseline for future investigations; and
- that is representative of groundwater systems beneath Snohomish County's other plateaus.

During 2002-2003, groundwater data were collected and analyzed by Snohomish County Public Works Surface Water Management to improve the understanding of existing conditions of the Getchell Plateau aquifers and to identify future groundwater problems.

1.2 Area Characterization

1.2.1 Location and Physiography

The Getchell Plateau Groundwater Investigation area covers roughly 84 square miles. The Cities of Snohomish, Marysville, Arlington, and Granite Falls are at the south, west, north, and east boundaries of the plateau, respectively (Figure 1-2). The investigation area is bordered by the Snohomish River valley to the southwest, the Marysville Trough on the west, the South Fork Stillaguamish River valley to the north and northeast, and the Little Pilchuck River to the southeast. The northeastern and western sides of the plateau are bounded by steep escarpments. The generally flat plateau top is mantled by the erosion-resistant glacial till. This topography is a result of glacial and fluvial activity that worked to shape the landscape of the Puget Lowland over the last two million years.

1.2.2 Population and Growth

The population of the Getchell Plateau was 64,400 in 2000 (US Census Bureau, 2001 and 2004) and is anticipated to reach 87,000 by the year 2020 (Puget Sound Regional Council, 2001). For comparison, the total population of the County (including incorporated areas) was 606,000 in the year 2000, and is anticipated to exceed 900,000 people by the year 2025 (PDS, 2004).

The majority of the Getchell Plateau lies outside of areas designated Urban Growth Areas (UGAs) by the County's Comprehensive Plan (Snohomish County, 2000); however, growth will be greatest in the Lake

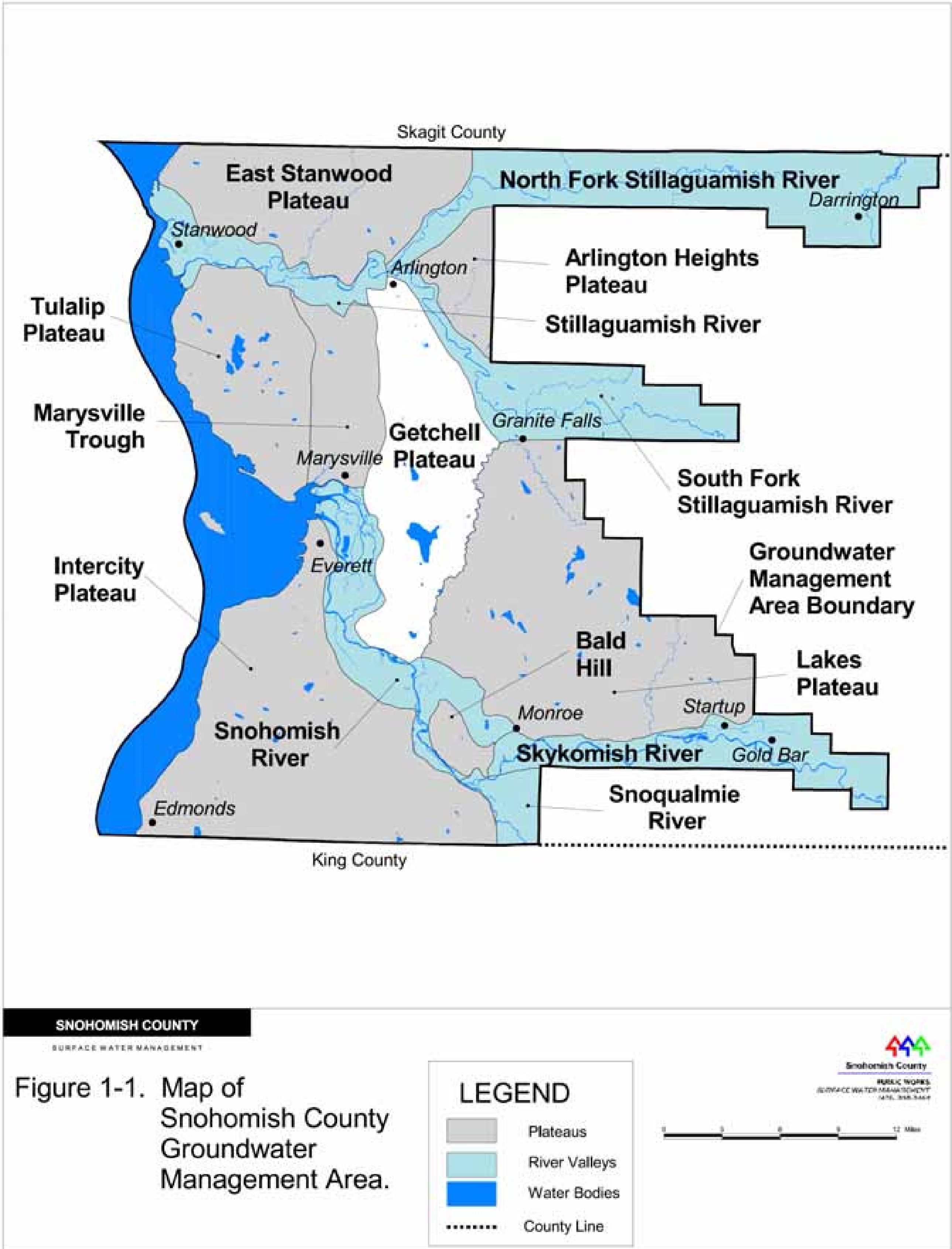

Figure 1-1. Map of Snohomish County Groundwater Management Area.

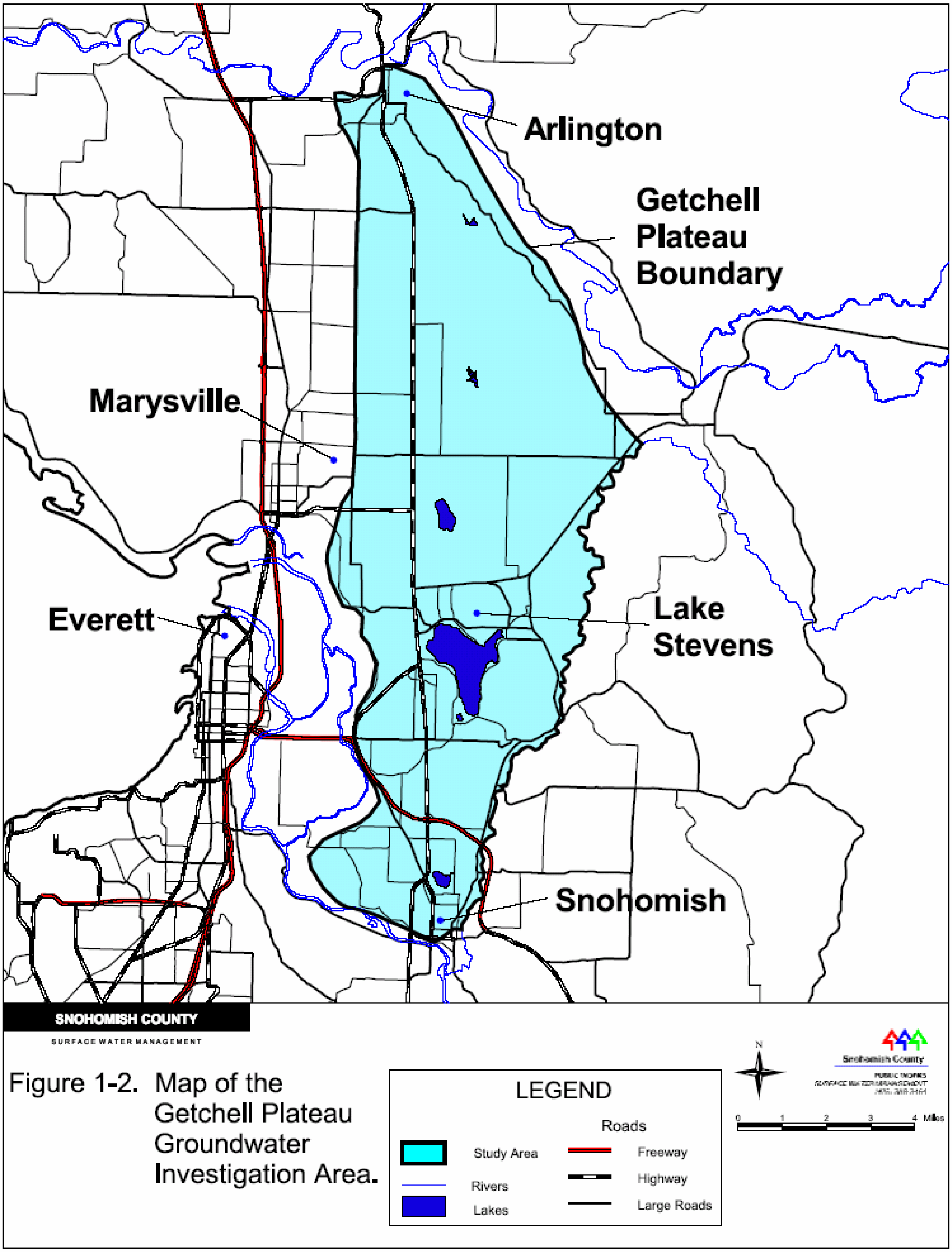

Figure 1-2. Map of the Getchell Plateau Groundwater Investigation Area.

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Stevens and Arlington UGAs. Even though the growth will be concentrated in the UGAs, development densities in rural areas are anticipated to increase as well. The population increase will be accommodated by converting existing small farms and low-density rural residential developments to low-density to medium-density residential developments.

1.2.3 Getchell Plateau History

The modern history of the Getchell Plateau began with the founding of the Getchell Ranch in 1873 by Olive and Martin Getchell (Figure 1-3). The original ranch had a small orchard, and the Getchells raised pigs, beef and dairy cattle. Today, the ranch is on the Washington State Historical Record and is managed by the Getchells' descendents. The tradition of the Getchell name is carried on by the Getchell Fire Department, Snohomish County Fire Protection District #22.

Figure 1-3. Olive and Martin Getchell ca. 1918 (Snohomish County, 2004).

1.2.4 Climate

The Getchell Plateau has a temperate marine climate with cool wet winters and warm dry summers. Both winter and summer temperatures are moderated by the Pacific Ocean and Puget Sound, which provide ample moisture during the wet fall, winter, and spring months. Annual precipitation in Snohomish County increases dramatically from 30 in/yr (800 mm/yr) along the Puget Sound shore to over 140 in/yr (3,500 mm/yr) per year at the crest of the Cascade Mountains.

Rainfall on the Getchell Plateau averages 44 in/yr (1,100 mm/yr) delivering roughly 193,000 acre-feet of water to the plateau (Daly and Taylor, 1989). Rainfall on the plateau ranges from a low of 40 in/yr (1,000 mm/yr) in the west to 50 in/yr (1,250 mm/yr) in the east. The rainfall distribution across the Getchell Plateau is illustrated in Figure 1-4.

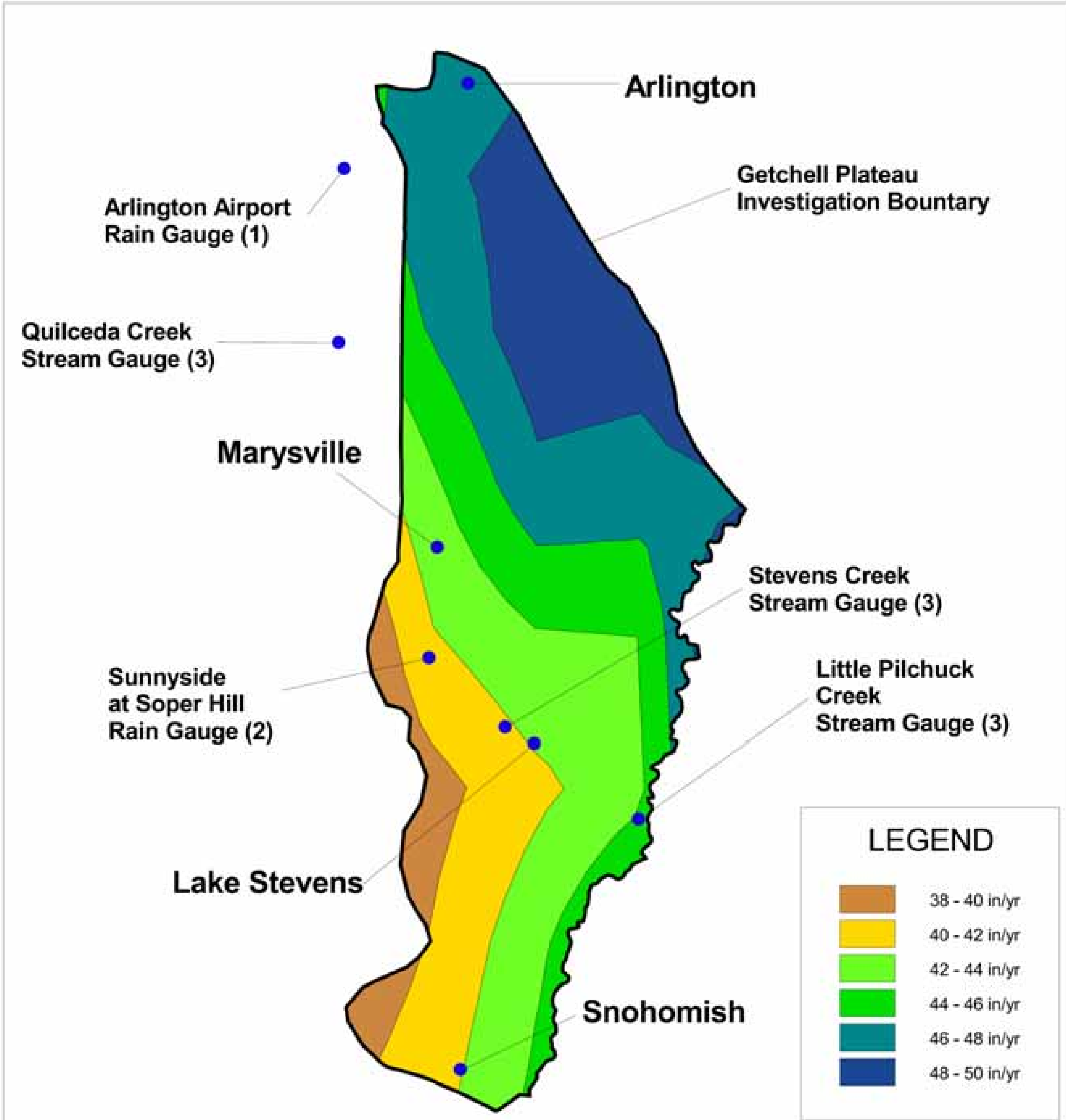
There are two rain gauges on or adjacent to the Getchell Plateau, one at the Arlington Airport and the other at Soper Hill (Figure 1-4). The average monthly precipitation recorded at the Arlington Airport is summarized in Table 1-1 and the annual precipitation recorded at Soper Hill is presented in Table 1-2. These monthly precipitation records show that just over 30 in (750 mm) of rain fell on the Getchell Plateau between June 2002 and June 2003, delivering roughly 133,000 acre-feet of water (Table 1-2).

Precipitation varies throughout the year (Figure 1-5). The dry summer months—June through September—are dominated by a stable high-pressure system located in the northern Pacific. The wet winter months are characterized by marine flow from the southwest.

The average high temperature in July is 75°F (24°C), and the average low temperature in January is 30°F (-1°C). The moderate temperatures mean that very little precipitation falls as snow (Thomas et al., 1997).

Figure 1-6 illustrates how the seasonal variations in precipitation and temperature determine the potential for evaporation. During the winter months, precipitation exceeds the potential for evaporation, thus a substantial portion of streamflow during the winter is supported by either direct runoff following a rain event or relatively rapid discharge from shallow groundwater. Water not evaporated or converted to streamflow recharges the Getchell Plateau aquifer systems. During the summer months, however, the potential for evaporation exceeds precipitation, and streamflow and lake levels are maintained by groundwater discharge (Larson and Marti, 1996; Sinclair and Pitz, 1999).

The Getchell Plateau aquifer system sits above the surrounding valleys so groundwater recharge from aquifer systems off the plateau is minimal. Groundwater recharge on the Getchell Plateau occurs primarily through infiltration of water that has fallen as rain or snow. Groundwater from the Getchell Plateau aquifers discharges along the plateau margins to the South Fork Stillaguamish River, Snohomish River, Pilchuck River, Allen Creek, and Quilceda Creek.



SNOHOMISH COUNTY
SURFACE WATER MANAGEMENT

Figure 1-4. Rainfall Distribution on the Getchell Plateau.

(1) Rain gauge operated by NOAA.
(2) Rain gauge operated by Snohomish County Public Works, Surface Water Management.
(3) Stream gauges operated by the US Geological Survey.

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Table 1-1. Average Monthly Climate Data at Arlington Airport, Washington.[1]

Month	Average Maximum Temperature		Average Minimum Temperature		Average Total Precipitation	
	°F	°C	°F	°C	in	cm
October	60.7	15.9	50.2	10.1	4.3	10.9
November	53.0	11.7	33.9	1.1	6.0	15.3
December	45.2	7.3	32.1	0.1	6.2	15.7
January	43.3	6.3	27.9	-2.3	5.7	14.5
February	54.6	12.6	35.1	1.7	4.3	10.8
March	ND[2]	ND[2]	ND[2]	ND[2]	4.3	11.0
April	62.2	16.8	38.8	3.8	3.8	9.5
May	62.4	16.9	42.4	5.8	3.3	8.3
June	69.2	20.7	46.2	7.9	2.7	6.7
July	73.6	23.1	50.7	10.4	1.6	4.1
August	71.7	22.1	51.6	10.9	1.7	4.2
September	47.2	8.4	ND[2]	ND[2]	2.6	6.6
Annual Total					46.3	117.6

(1) The period of record is June 1948 to September 2004.

(2) ND = No Data.

Table 1-2. Annual Precipitation at Sunnyside at Soper Hill, Unincorporated Snohomish County, Washington.

Year	Precipitation	Volume
	in/yr	ac-ft/yr
1992	31.8	136,475
1993	32.6	139,865
1994	34.2	146,901
1995	38.3	164,148
1996	53.6	229,833
1997	46.9	201,173
1998	42.4	181,849
1999	48.4	207,523
2000	31.6	135,738
2001	40.8	174,874
2002	29.7	127,337
2003	37.1	159,300

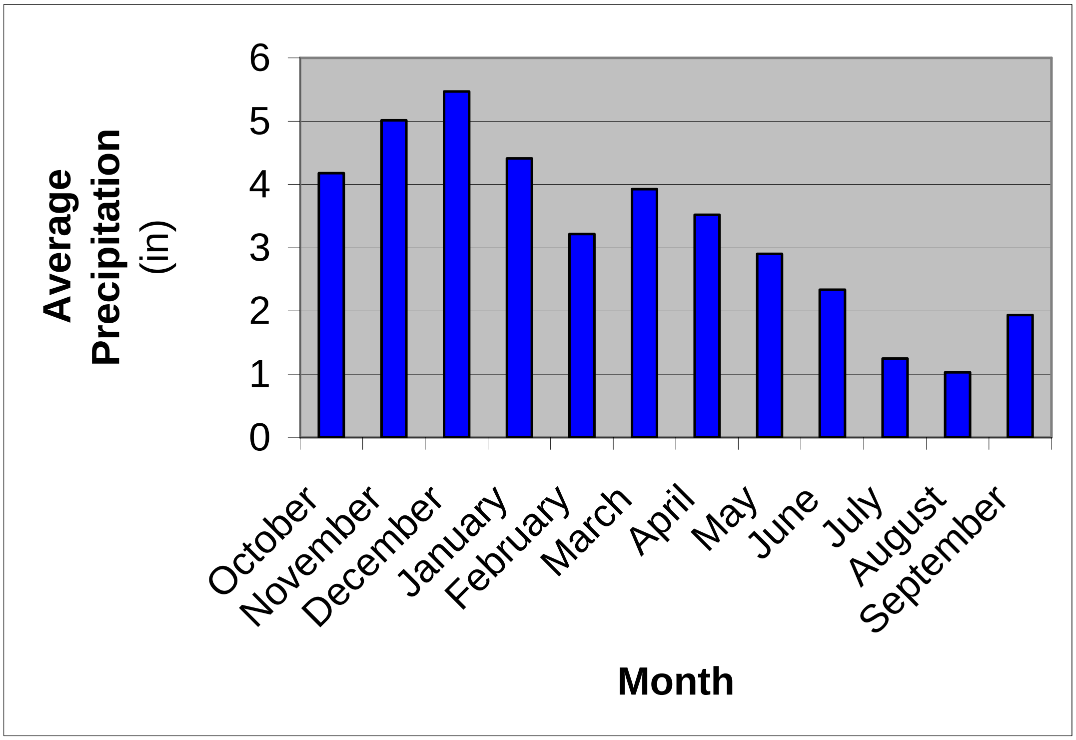


Figure 1-5. Histogram of Monthly Rainfall Values at Sunnyside at Soper Hill rain gauge.

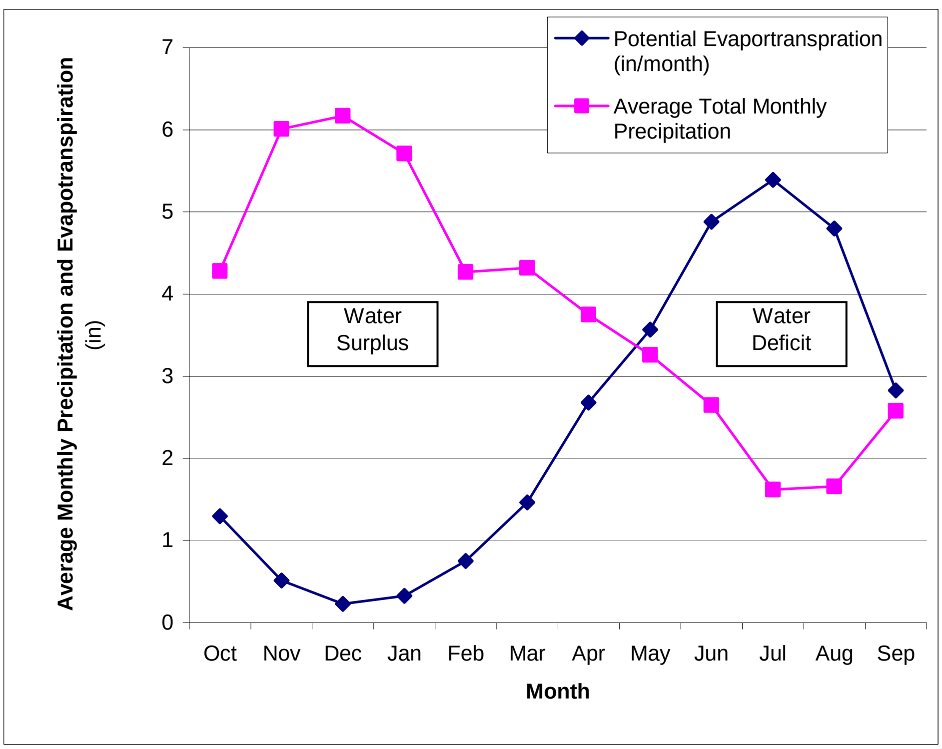


Figure 1-6. Graph of Rainfall and Potential Evapotranspiration for Arlington Airport, Washington.

1.2.5 Streams, Lakes, and Wetlands of the Getchell Plateau

Streams

The Getchell Plateau is drained by over 170 miles (275 km) of stream channels. The streams follow a general northwest to southeast trend, a legacy of the plateau's glacial history. The stream density on the Getchell Plateau is 2.1 mi/mi^2 (13 km/km^2). In spite of their numbers, only a small number of the streams on the Getchell Plateau are named.

Two stream gauges were active on the Getchell Plateau streams between 1946 and 1970, one gauge on Little Pilchuck Creek near Lake Stevens (USGS gauge #12153000) and the other gauge on Stevens Creek at Lake Stevens (USGS gauge #12154000). The location of gauges is shown in Figure 1-4. In addition to the stream gauges on the plateau surface, the gauge at Quilceda Creek near Marysville (USGS gauge 12157000) records streamflow from the Getchell Plateau. Approximately 50% of the drainage above this stream gauge comes from the Getchell Plateau. The history of these stream gauges is presented in Table 1-3.

Larson and Marti (1996) and Sinclair and Pitz (1999) estimated the percentage groundwater contribution to total flow in streams draining the Getchell Plateau. Larson and Marti (1996) used seepage runs, which measure the amount of water input to and output from a stream between two fixed points in order to determine the groundwater contribution to the stream. They found that the groundwater contribution to the mainstem of Quilceda Creek ranges from 8% to 33%, whereas the groundwater contribution to the streamflow of the Middle Fork of the Quilceda Creek ranges from 67% to 83%.

Sinclair and Pitz (1999) separated the hydrographs from most of Washington's streams and rivers into their two basic components, surface runoff and baseflow. Sinclair and Pitz (1999) used a technique developed by Sloto and Crouse (1996) called hydrograph separation. The baseflow component is assumed to be 100% groundwater discharge. Sinclair and Pitz (1999) estimated that the groundwater contribution to the streamflow of Quilceda Creek was lowest in November at 71% and highest of August at 91% in (Table 1-4). The estimated groundwater contribution to the streamflow of Little Pilchuck Creek was lowest in October at 66% and highest in August at 83%. The estimated groundwater contribution to the streamflow of Stevens Creek was lowest in October at 86% and highest in August at 100%. The findings of Larson and Marti (1996) and Sinclair and Pitz (1999) indicate that the streams draining the Getchell Plateau are highly dependent on groundwater discharge throughout the year.

Lakes

There are seven named and 123 unnamed lakes and water bodies on the Getchell Plateau. The total lake area covers nearly five square miles, or almost six percent, of the plateau area (Table 1-5). Since 1992, the three largest lakes, Lake Stevens, Lake Cassidy, and Blackmans Lake, have been monitored by Snohomish County Public Works (Public Works) staff and a team of volunteers.

With respect to groundwater, there are two types of lakes on the Getchell Plateau. The first is formed when water is perched in or on an impermeable layer, such as glacial till, and is exemplified by Blackmans Lake and Lake Cassidy. The second type of lake extends below the impermeable layer and into an

Table 1-3. Stream gauge record for the Getchell Plateau.

Drainage and Stream Gauge Name	Area	Area On Plateau	Years Active	Years of Data	Mean Annual Flow	Mean Annual Baseflow	Median 7-day Low Flow
	mi^2	mi^2			cfs[(1)]	cfs	cfs
Little Pilchuck Creek	17.0	17.0	1946-70	22	33	22	1.30
Stevens Creek	15.3	15.3	1946-70	4	27	24	0.22
Quilceda Creek	15.4	8.0	1946-69; 1975-77	23	27	21	0.33

[(1)] cfs = cubic feet per second.

Table 1-4. Steam base-flow data at three Getchell Plateau stream gauges (Sinclair and Pitz, 1999).

Month	Little Pilchuck Creek			Stevens Creek			Quilceda Creek		
	Mean Base-flow	Mean Stream-flow	Percent Base-flow	Mean Base-flow	Mean Stream-flow	Percent Base-flow	Mean Base-flow	Mean Stream-flow	Percent Base-flow
	cfs[1]	cfs		cfs	cfs		cfs	cfs	
October	7.9	12	66	6	7	86	9.1	12	76
November	29	44	66	23	26	88	22	31	71
December	46	68	68	53	56	95	37	50	74
January	46	69	67	49	53	92	37	51	73
February	46	65	71	52	59	88	37	50	74
March	34	44	77	48	54	89	30	37	81
April	25	32	78	34	36	94	22	26	85
May	13	18	72	22	24	92	14	17	82
June	7.6	11	69	13	14	93	9.7	12	81
July	3	4.2	71	4.8	5.2	92	6.6	7.3	90
August	1.9	2.3	83	1.6	1.6	100	4.8	5.3	91
September	2.3	3	77	0.81	0.93	87	5.2	6	87

(1) cfs = cubic feet per second.

Table 1-5. The Lakes of the Getchell Plateau.

Lake	Area	Maximum Depth	Volume	Shoreline Density	Watershed Developed
	ac	ft	ac-ft	# of homes per 1000 ft	percent
Lake Stevens	1002.8	155	65,000	9.3	55
Cassidy	123	20	1,300	1.9	18
Blackman	60.9	29	800	5.1	50
Olson	21.6				
Little Martha	13.0				
Stitch	9.2				
Connor	8.6				
Unnamed Lakes[1]	38.4				

(1) Nine Lakes

underlying aquifer, and is exemplified by Lake Stevens. Lakes, whether they are perched or extend into the deeper aquifers, represent places where the land surface intersects the water table.

The health and quality of the water in a lake is a function of the land uses in the watershed surrounding the lake. An overabundance of nutrients, such as fertilizers, septic waste, and pet and animal waste, can cause algal blooms, decrease water clarity, deplete oxygen, clog pipes, and foul docks (Reynolds and Williams, 2003).

<u>Blackmans Lake</u>

Blackmans Lake is perched on the glacial till at the northern edge of the City of Snohomish at the very southern edge of the Plateau. Blackmans Lake is fed by Grass Bottom Creek and drains into the Pilchuck and Snohomish rivers via Swifty Creek. Land use in the Blackmans Lake watershed has changed dramatically since the 1970s, when 70% of the watershed was agricultural land. By the mid-1990s, 50% of the watershed had been converted to residential uses. The high level of development surrounding Blackmans Lake has resulted in moderate water clarity, moderate to high phosphorous, moderate oxygen depletion, and frequent algae blooms (Reynolds and Williams, 2003).

Lake Cassidy

Lake Cassidy is perched on glacial till and is located three miles east of Marysville. Lake Cassidy drains to the Pilchuck River via Catherine Creek. Residential development surrounding the lake has increased dramatically over the last 25 years. The increased development has led to low water clarity, low dissolved oxygen, abundant blue-green algae and dense aquatic plants (Reynolds and Williams, 2003).

Lake Stevens

Lake Stevens penetrates the glacial till and is fed in part by groundwater discharge and is the largest and deepest lake in Snohomish County. Lake Stevens is located six miles east of Everett and in the City of Lake Stevens. From the surface, Lake Stevens is fed by Lundeen Creek, Kokanee Creek, Stevens Creek, and Stitch Creek, and drains into the Pilchuck River via Catherine Creek. The residential development surrounding Lake Stevens increased from 20% in 1972 to 55% by 1990. In general, Lake Stevens has good water clarity, low phosphorous concentrations, but has frequent blue-green algae blooms. Heavy shoreline development has likely played a role in Lake Stevens' increased algal productivity. Abundant phosphorous release from the bottom sediments prompted installation of the world's largest hypolymnetic aeration system in 1994. The aeration system chemically alters the phosphorous, making it unavailable to algae, bacteria, or plants. It is unclear whether the aeration system will be able to keep pace with increasing nutrient influx from future development (Reynolds and Williams, 2003).

Wetlands

Wetlands play a very important role in storing water for release to streams and for groundwater recharge. Wetlands are also important to water quality because they filter excess nutrients and other contaminants from surface water.

In terms of groundwater, there are two different types of wetlands on the Getchell Plateau: bogs and fens. Bogs are typically underlain by glacial till, which perches the water table near the surface just as it does with the perched lakes. Bogs are located on the upland of the Getchell Plateau and include extensive wetlands surrounding the main lakes. Fens, in contrast, form where aquifers are exposed at the surface and discharge groundwater making them good examples of how groundwater and surface water interact. Fens are located near Quilceda Creek and Allen Creek and along the western slopes of the Getchell Plateau. The existing bogs and fens are some of the last relatively pristine wetlands left within the investigation area (Carroll, 2004, pers. comm.).

There are approximately 3,000 acres (4.5 mi^2) of wetlands on the Getchell Plateau, and approximately 5,000 acres (7.5 mi^2) of hydric soils that were likely wetlands at one time. Inclusion of the hydric soils in this assessment implies that 40% of the area's wetlands have been lost to filling, draining, and other encroachment (Debose and Klungland, 1983; PDS, 1986). Some remaining wetlands receive high concentrations of bacteria and nutrients from agricultural lands, and residential developments may contribute chemicals, bacteria, and nutrients from failing septic systems, lawn fertilizers, and other urban activities (Carroll and Thornburgh, 1995 and Carroll, 1999).

1.3 Basic Concepts of Groundwater Hydrology

1.3.1 Origins of Groundwater

As stated previously, nearly all of the groundwater beneath the Getchell Plateau comes from precipitation that falls on the plateau and percolates into the ground, eventually reaching and recharging aquifers (Figure 1-7). However, not all of the water that falls on Getchell Plateau infiltrates and becomes groundwater. Some of the water returns to the atmosphere via evaporation and transpiration by plants, collectively known as evapotranspiration. Some of the water runs directly off the land surface, supplying streams, lakes, and wetlands. The process of accounting for precipitation, groundwater recharge, evapotranspiration, and runoff is known as a water budget. A water budget was developed for this investigation and is presented in Chapter 4. The amount of incoming precipitation that recharges the aquifer depends on the type of soil at the surface, the amount and type of vegetation growing in the soil, the season, the type of sediments at depth, the depth to the water table, and the amount of urban development.

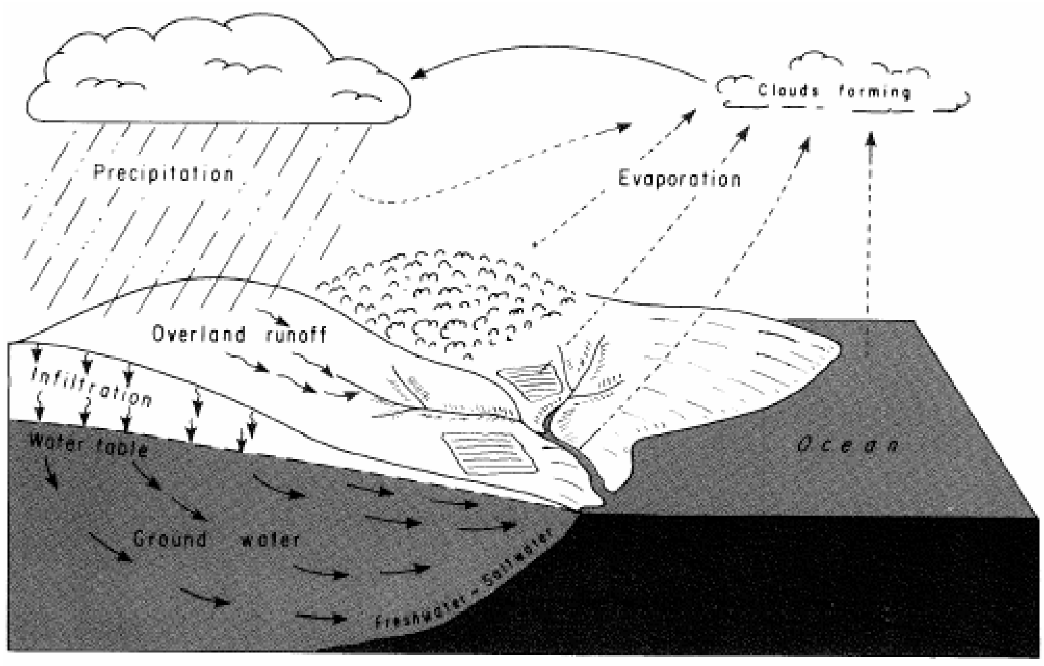


Figure 1-7. Schematic diagram illustrating a typical water cycle (after Heath, 1989).

1.3.2 The Unsaturated Zone

The unsaturated zone is in the soil above the saturated zone, and has pore spaces filled with air (Figure 1-8). Water percolating downward must move through the unsaturated zone to reach the saturated zone. Figure 1-9 illustrates the relationship between the saturated and unsaturated zones.

1.3.3 The Saturated Zone

Soil and rock are often thought of as solid but are actually composed of particles separated by small spaces known as pores (Figure 1-8). The saturated zone is formed when these pores become filled with water that has percolated down through the soil and is prevented from draining away by an underlying impermeable layer, such as bedrock (Figures 1-9 and 1-10). The typical sediment has between 25% and 50% pore space. By contrast, bedrock will often have less than one percent pore space or fractures in which to store water.

1.3.4 The Water Table

The water table marks that transition from unfilled and partially filled pores to completely filled pores (Figure 1-9). The water table also marks the upper surface of an aquifer. The unsaturated and saturated zones are separated by the capillary fringe (Figure 1-9). Water in the capillary fringe is held in pore spaces against the pull of gravity by the surface tension of water.

1.3.5 Aquifers and Aquitards

Aquifers are soils, sediments, or bedrock that are filled with water and are capable of yielding usable volumes of water to a well. Aquifers in loose sediments, such

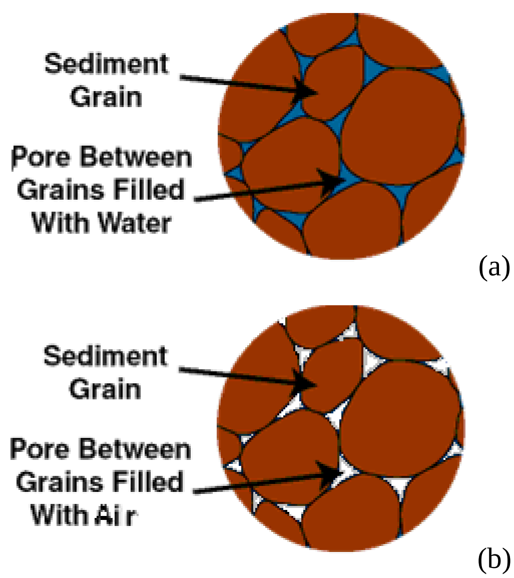


Figure 1-8. Diagrams illustrating saturated and unsaturated pore spaces (modified from USGS, 2005a).

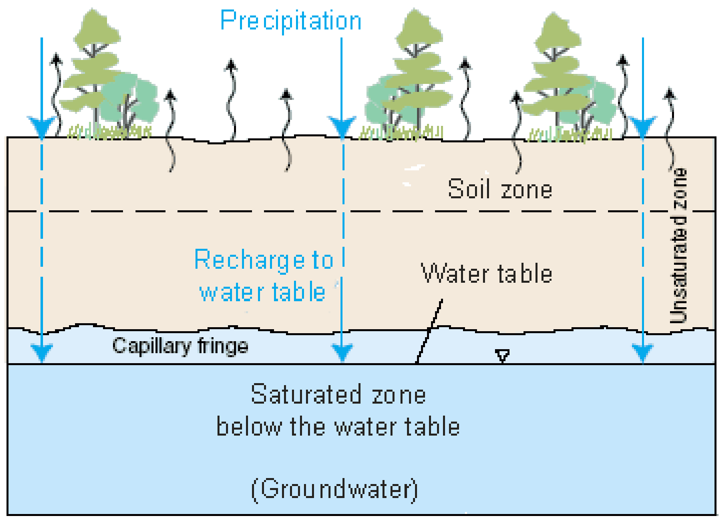


Figure 1-9. Diagram illustrating the process of rain water infiltration (after USGS, 2005b).

as glacial outwash or river alluvium readily yield large volumes of water at a relatively rapid rate. Aquifers in dense material, such as glacial till and bedrock, generally do not yield very much water and therefore, in a strict sense, are not aquifers, although they are often located below the water table.

Aquitards are layers of soil or bedrock that are relatively impermeable to groundwater and thus do not yield water at a usable rate or volume. Aquitards can block groundwater moving downward when located below an aquifer and block groundwater from moving upward when located above an aquifer. When an aquitard blocks the upward movement of groundwater the aquifer is said to be confined.

1.3.6 Porosity

The volume of water stored in an aquifer is a function of how much pore space there is in the soil, sediment, or bedrock. The measure of the pore space volume is called porosity. The more pore space there is available, the more water that can be held in storage. Coarse materials, such as sand and gravel, have larger pore spaces than fine materials, such as silt and clay. Mixtures of coarse and fine materials can have effectively very small pore spaces because the finer grains fill the pores between the larger grains.

1.3.7 Permeability

Permeability is a measure of how easily water is able to move from one pore to another. Permeability is an extremely important property of an aquifer since it controls the rate at which water moves within the aquifer or does not move in an aquitard. Coarse-grained materials, such as sand and gravel, have higher permeability than fine-grained materials, such as silt and clay. Mixtures of coarse-grained and fine-grained materials can have the lowest permeabilities since the fine grains block the connections between pores formed between the larger grains. Bedrock often has a very low permeability because the cement that holds the grains together also blocks the connections between pores.

Permeability is a physical property of the aquifer and is a measure of how rapidly water moves through an aquifer. As a physical property of the aquifer, permeability can be measured. These measures are known as the hydraulic conductivity and transmissivity.

Hydraulic conductivity is most frequently used when discussing an aquifer's productivity and is expressed in units of length per time, typically in feet per day. However, hydraulic conductivity is difficult to measure directly. Transmissivity, which can be measured directly, is the hydraulic conductivity multiplied by the aquifer thickness, and thus is expressed in length squared per time, typically in square feet per day. Hydraulic conductivity and transmissivity are explained Chapter 2.

Hydraulic conductively values are low for fine grained and dense aquifer media such as glacial till. Groundwater in glacial till moves from a high of 1 ft/day, just fast enough to yield usable quantities of water to a well, to a low of 1/1,000,000 ft/day.

Hydraulic conductively values are higher for coarse grained and loose aquifer media such as alluvium and glacial outwash. Groundwater in glacial outwash moves from a high of 5,000 ft/day to a low of 1 ft/day (Heath, 1989).

Hydraulic conductivity and transmissivity measure the rate with which water moves through and aquifer but do not measure of the volume of water available to a well. That measurement known as specific yield is generally used to indicate the volume of water available for pumping. Specific yield is easily illustrated using a sponge. Fill a sponge with water and lift it up. The water that drains out without squeezing the sponge represents the specific yield. The water that is yielded by squeezing the sponge is the water that is held in the sponge by capillary action.

1.3.8 Unconfined or Water-Table Aquifers

An unconfined aquifer is one in which the upper surface is the boundary between unsaturated soil and the saturated aquifer material (Figures 1-9 and 1-10). Unconfined aquifers are often called water-table aquifers. The surface of an unconfined aquifer is free to fluctuate under atmospheric pressure and is directly influenced by the rate of groundwater recharge or groundwater pumping from a well. Unconfined aquifers on the Getchell Plateau can be found in sediments near the surface, such as the alluvium, recessional outwash, and glacial till.

1.3.9 Confined or Artesian Aquifers

Water moving through an aquifer can become trapped beneath an aquitard or confining layer. Once trapped, the water is prevented from rising to the surface allowing pressure within the aquifer to build. The water in a well that taps an aquifer confined beneath an aquitard will rise in the well because of the pressure within the aquifer (Figure 1-11). The height to which water rises in the well forms an equal pressure surface that is known as the piezometric surface. If the piezometric surface is above ground level, the well will flow without pumping. This rise or flow is known as artesian pressure. It is common to think that all artesian wells flow without pumping. Many do, but any well in which the water rises above the surface of the aquifer is an artesian well (Figure 1-11).

1.3.10 Groundwater Recharge

Water that percolates deep enough to reach an aquifer replenishes or recharges the aquifer. Without groundwater recharge, the water pumped from aquifers would not be replenished.

Groundwater recharge occurs in any area where there is sufficient water available to reach the aquifer. In the Puget Lowland, there is sufficient water available for groundwater recharge to occur nearly everywhere, but recharge occurs more slowly through the dense glacial till than through the looser glacial outwash and alluvium. Figure 1-12 illustrates the example of groundwater recharge to an unconfined aquifer. There is evidence on the Getchell Plateau that groundwater recharge occurs nearly everywhere, including areas very near wells, so groundwater is widely available. Unfortunately, this also increases the area in which surface pollutants could contaminate groundwater.

1.3.11 Groundwater Flow and Discharge

As noted above, groundwater is a major source of water for springs, streams, lakes, and wetlands on and surrounding the Getchell Plateau. Under natural conditions, groundwater moves in three dimensions along flow paths from areas of high pressure to areas of lower pressure. The effect is that water moves from areas of recharge to areas of discharge. Water entering at the top of a plateau is discharged along the plateau margins as well as in low areas such as lakes, wetland, and streams (Figure 1-13).

A picture of groundwater flow can be obtained by drawing groundwater contour maps. The depth to the water table or pressure surface is determined by installing wells that penetrate the top of the saturated zone just far enough to hold standing water. The depth to water can be measured at a number of locations, and referenced to a common datum, such as sea level, so that contour lines of the water table can be drawn.

The direction of groundwater movement is shown on these maps since water always travels perpendicular to water-table contours (Hubbert, 1940). Water-table contour maps have been created for each of the Getchell Plateau aquifers and are presented in Chapter 3.

A water-table contour map shows the horizontal movement of groundwater and hints at the vertical movement. The flow lines on Figures 1-11 to 1-13 show horizontal flow of water from recharge areas to discharge areas, as well as the downward movement of water from the surface to an aquifer, and upward movement of groundwater from an aquifer to a stream.

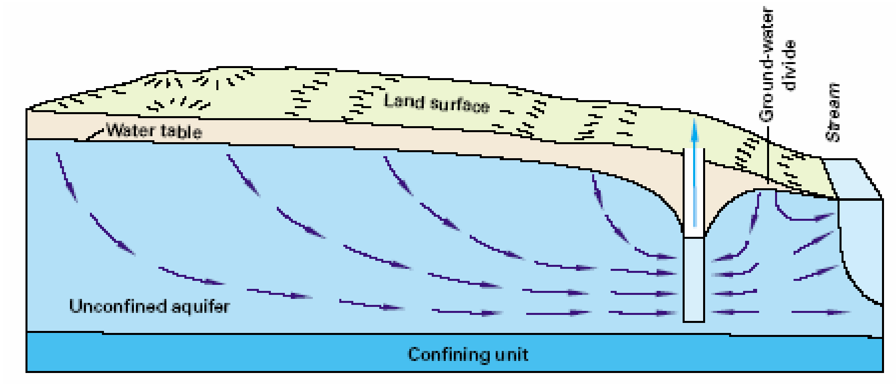


Figure 1-10. Diagram illustrating an unconfined or water-table aquifer (after Heath, 1989).

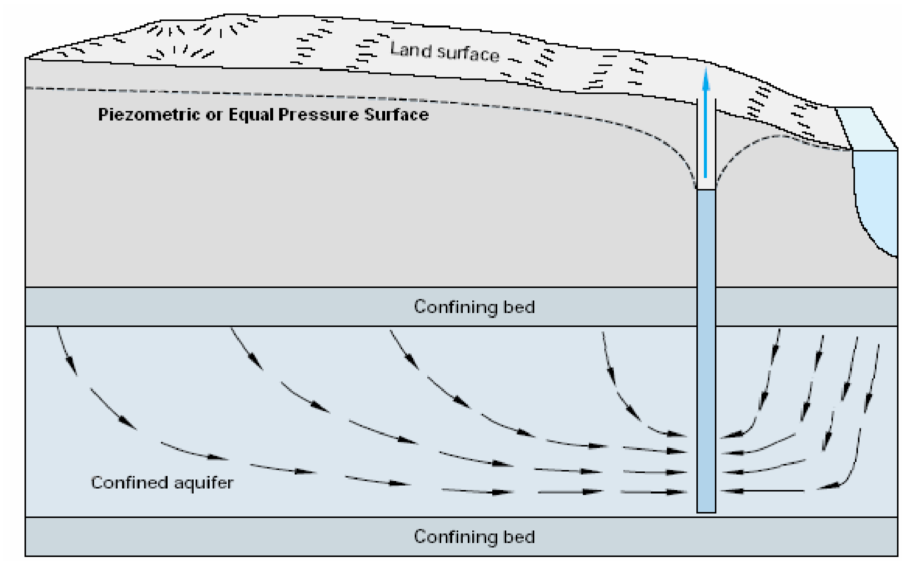


Figure 1-11. Diagram illustrating a confined or artisan aquifer (modified from Heath, 1989).

The vertical flow of groundwater is measured directly by determining the water level in a series of progressively deeper wells in or near the same location (e.g. Figure 1-12). Upward groundwater flow or groundwater discharge is indicated when the deepest wells have the shallowest depths to groundwater. Downward groundwater flow or groundwater discharge is indicated when the deepest wells have the deepest depths to groundwater. Groundwater flows from recharge areas to points of discharge along flow lines of various lengths. Figures 1-12 and 1-13 illustrate that, the deeper the well, the longer the flow path is from the surface (recharge area) to the well, and the larger the recharge area for the well.

Groundwater flow is commonly divided into local and regional systems (Hubbert, 1940). Local flow systems have short flow paths, involve shallow aquifers, and are controlled chiefly by local topography (Figure 1-13). In contrast, regional flow systems have long flow paths, involve deep aquifers, and are controlled chiefly by large scale topographic or geologic features (Figure 1-13).

The boundaries of the regional system on the Getchell Plateau are the edge of the plateau, bedrock, the water table, streams, and lakes. The lower boundary is the top of the relatively impermeable bedrock surface. Most of the inflow is from precipitation, which soaks

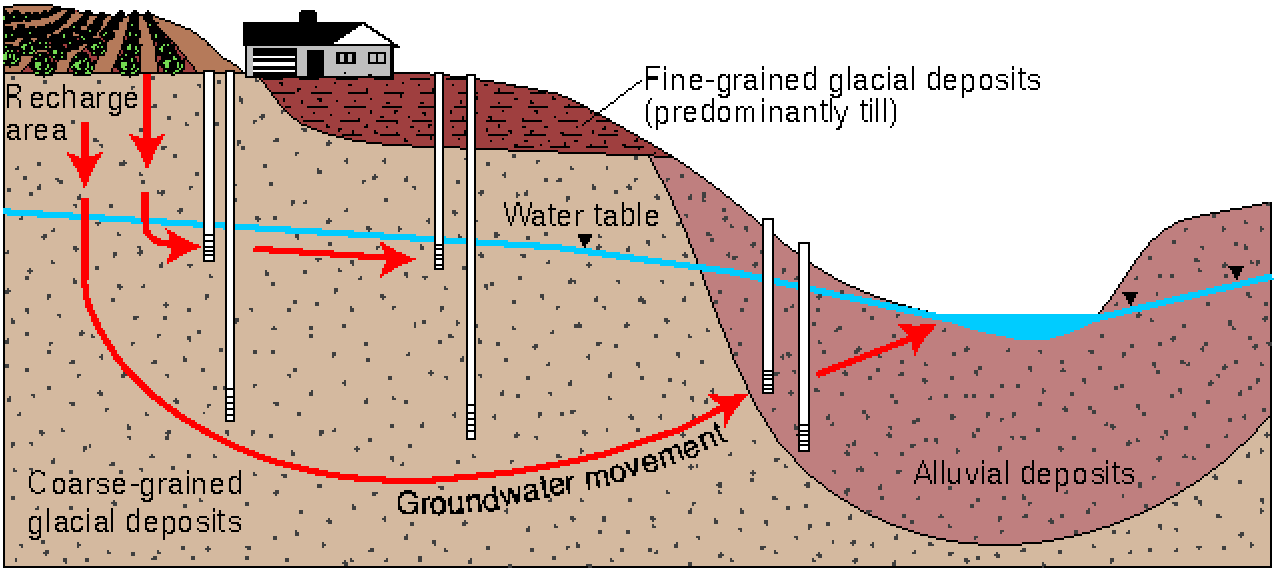


Figure 1-12. Diagram illustrating groundwater recharge typical of the Puget Lowland (modified from Erwin and Tesoriero, 1997).

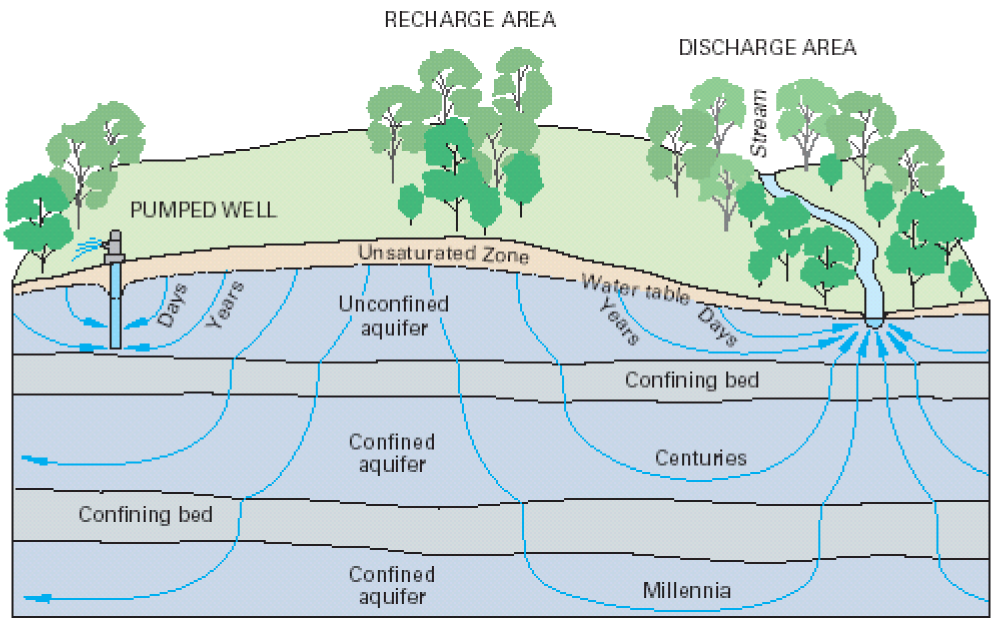


Figure 1-13. Diagram showing groundwater flow path lengths through a typical Puget Lowland series of aquifers (USGS, 2005a).

in through the glacial till to replenish the outwash aquifer, which in turn replenishes the deeper aquifers.

1.3.12 The Modern Water Well

Modern wells are drilled by truck-mounted cable-tool or rotary (air or hydraulic) drill rigs. Even the modern dug well is "dug" using a drill rig. Traditional hand-dug wells are relatively rare, although dug wells are still being drilled and used in Snohomish County today. The modern well consists of steel or PVC casing that has been installed to keep the well bore open. Some wells have an open casing at the bottom to allow water into the casing for pumping to the surface, but more often stainless steel or PVC well screens are being installed to prevent the inflow of sediment. Well screens, although expensive, increase the life of the well pump by decreasing the amount of silt and sand in the well, and keep the well bore open. The well driller is required by State law to seal the casing to prevent contamination from surface reaching the groundwater (Figure 1-14). Following construction of the well, the driller will bail or air sparge the well, to clear the well bore and surrounding formation of fine sediment. The driller will also use bailing or air sparging to test the well's productive capacity. In both cases, the driller measures the volume of water removed over a fixed period of time, typically one hour. Washington State requires each domestic water well to produce a minimum of 400 gals/day (Chapter 173-160 WAC) for potable water supply. The results of the well productivity tests are discussed in Chapter 4 and presented in Appendix A.

Following the well production test, water is drawn to test the potability of the water. The samples are submitted to and reviewed by a registered sanitarian at the Snohomish Health District. Water sampling results for the study area are discussed in Chapter 4 and presented in Appendix B.

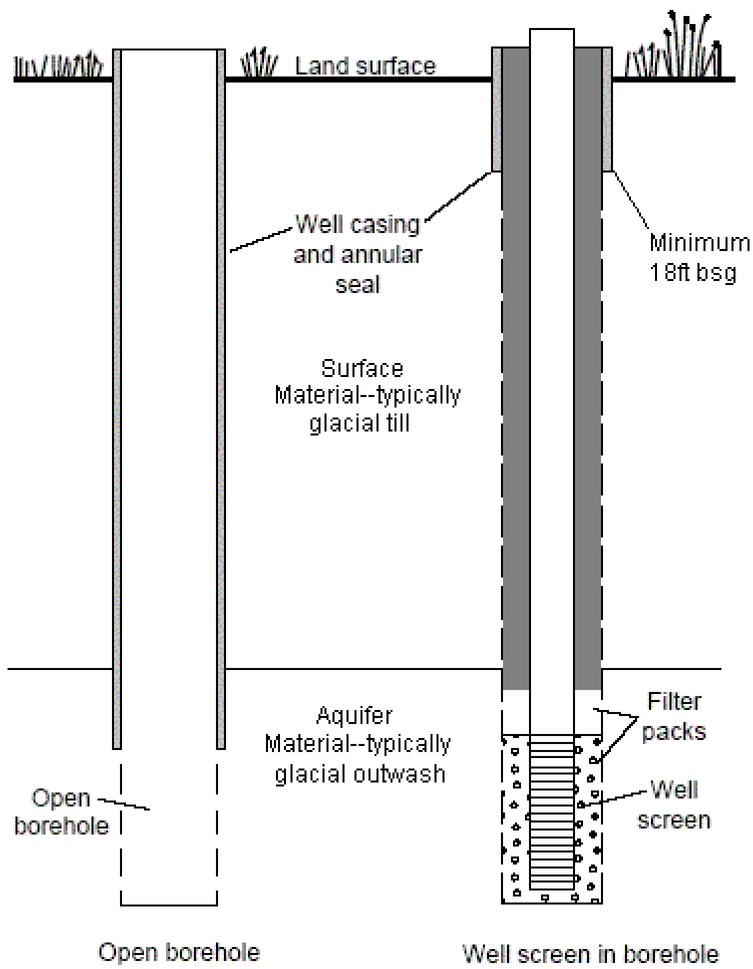


Figure 1-14. Schematics of typical Getchell Plateau water wells (modified from Lapham et al., 1995).

2.1 Previous Groundwater Investigations

2.1.1 Groundwater Resources of Snohomish County, Washington (1952)

The groundwater resources of Snohomish County, including the Getchell Plateau, were first studied in earnest by the US Geological Survey (USGS) in 1952 (Newcomb, 1952). Newcomb (1952) compiled the first geologic map of Snohomish County and wrote the earliest description of the County's aquifers. Newcomb also directed the first effort to canvass Snohomish County well owners and was the first to publish data on the County's groundwater quality. Newcomb found the County's groundwater to be generally good and to be low in dissolved constituents, moderately soft, of good color, and free of odor.

2.1.2 Geology and Groundwater Resources of the Arlington Heights aquifer, Snohomish County, Washington (1971)

In 1971, Ecology completed a very general assessment of the Arlington Heights aquifer, located just north of the investigation area (Eddy, 1971). Eddy (1971) estimated aquifer yield using what are best described as back-of-the-envelope techniques. Eddy (1971) estimated that the Arlington Heights aquifer could sustain a population of roughly 4,000 individuals. This simple estimate of aquifer yield has yet to be tested, since the current population of Arlington Heights is less than 2,000 (Public Works, 2001).

2.1.3 Geology and Groundwater Resources of the Lake McMurray aquifer, Snohomish and Skagit Counties, Washington (1971)

In 1971, Ecology completed a more sophisticated study of the Lake McMurray aquifer (Grimstad, 1971). The Lake McMurray aquifer is an artesian aquifer located in northwestern Snohomish County. Grimstad (1971) reduced the data from two multi-well pump tests using the Jacob modification of the Theis non-equilibrium method. Details of this method are discussed below. The well tests yielded an estimate of aquifer transmissivity (*T*) of $3.4*10^5$ gals/day/ft and an aquifer storage coefficient (*S*) of $3.9*10^{-3}$ (dimensionless).

2.1.4 Water Resources of the Tulalip Reservation, Snohomish County, Washington (1983)

In 1983, the USGS published an assessment of the surface water and groundwater resources on the Tulalip Reservation, an aquifer system similar to that of the Getchell Plateau (Drost, 1983). Drost (1983) found the groundwater quality and quantity of the Tulalip Plateau to be generally good and to have adequate supply to meet both domestic and the proposed fisheries needs at that time. Drost (1983) identified some localized problems with coliform bacteria in shallow wells and naturally elevated concentrations of iron and manganese in shallow and deep wells. Using schematic geologic sections, Drost (1983) found that the wells with the highest yields tend to occur along the eastern plateau margin where the aquifer is confined by glacial till. The USGS released a new report detailing the groundwater resources of the Tulalip Plateau in late 2004 (Frans and Kresch, 2004).

2.1.5 Seasonal Variation of Arsenic in Groundwater, Snohomish County, Washington (1991)

A series of arsenic-related illnesses were reported near Granite Falls in the mid-1980s. These illnesses were eventually traced to naturally occurring arsenic in groundwater. The Snohomish Health District, the Washington State Department of Health (DOH), the Washington Department of Ecology (Ecology) and the US Environmental Protection Agency (USEPA) investigated the source of these illnesses in 1988 and 1989. That investigation was designed to evaluate the extent of the arsenic in groundwater, determine the seasonal variability of arsenic concentrations, determine the impact on local human health, and to identify treatment or control options (Davies et al., 1991).

Over 700 public and private wells, 195 of which were within the five-mile radius of Granite Falls, were tested for arsenic in central Snohomish County. These wells included many wells in the eastern portion of the Getchell Plateau groundwater investigation area. Arsenic levels above the former Maximum

Contaminant Level (MCL) of 0.05 mg/l were found in 47 wells near Granite Falls. In 2002, the MCL for arsenic was reduced to 0.01 mg/l by the USEPA. It is not possible to determine the number of wells sampled in 1988 and 1989 that do not meet the current MCL using the data contained in Davies et al. (1991).

Arsenic concentrations are known to vary seasonally, so there was a concern that seasonal variability in arsenic concentrations might lead to a situation where wells that tapped groundwater with arsenic below the MCL one season would contain arsenic above the MCL in another season. Therefore, Davies et al. (1991) designed a study to examine this issue. Twenty-six wells within five miles of Granite Falls were selected for monthly arsenic sampling. The selected wells represented a wide area, a variety of well types, and several different aquifer units (e.g. alluvium, glacial sediments, or bedrock). Arsenic concentrations in these wells ranged from less than the detection limit of 0.01 mg/l to 33 mg/l (note: the standard detection limit for arsenic in water was reduced to 0.001 mg/l in 2002). Four wells were found to have less than 0.05 mg/l arsenic in one month and more than 0.05 mg/l in subsequent months. Although Davies et al. (1991) observed some seasonally variability in arsenic concentrations, they were unable to correlate this with the time of year; however, Davies et al. (1991) noted that the magnitude of the variation between seasons appears to increase with higher arsenic concentrations. In conclusion Davies et al. (1991) stated that arsenic occurs naturally in the aquifer materials examined and therefore did not develop a list of cleanup or treatment options.

2.1.6 Snohomish County Groundwater Characterization Study (1991)

In 1991, Economic and Engineering Services, Inc., with the assistance of Sweet-Edwards EMCON, Inc., published the Snohomish County Groundwater Characterization Study (Economic Engineering Services, Inc., 1991). This Characterization Study reinterpreted the groundwater resources of Snohomish County and presented the first aquifer specific estimate of aquifer yields (i.e. specific yield), but did not present any new data on groundwater quality (Table 2-1). The Characterization Study also developed a very broad ranking of potential aquifer sensitivity to contamination.

2.1.7 USGS Western Snohomish County Groundwater System and Groundwater Quality Study (1997)

In 1997, the USGS published a new study of the County's groundwater resources (Thomas et al., 1997) that compiled geologic and hydrostratigraphic data in a similar way to the Characterization Study. Thomas et al. (1997) made a significant contribution to the understanding of Snohomish County groundwater resources by compiling an inventory of over 1,300 wells distributed over 850 square miles of western Snohomish County. During 1992 and 1993 the USGS collected new depth-to-groundwater measurements and new water quality samples from nearly 300 wells.

Thomas et al. (1997) compared the new depth-to-groundwater measurements with measurements made by Newcomb (1952) and by well drillers to determine if water-table elevations had changed over time (Table 2-2). A declining water table would indicate a loss of water, while a rising water table would indicate an increase in available groundwater. The USGS water level analysis found no widespread changes water-table elevations although small changes were noted. There appeared to be no discernable reduction in groundwater availability in both urban and rural areas due to increased groundwater use or increased development densities.

The water quality analysis conducted by the USGS revealed that Snohomish County's groundwater generally met Washington State's MCLs for drinking water (Chapter 246-290-310 WAC; Tables 2-3 and 2-4), but the MCLs were locally exceeded for the naturally occurring constituents of arsenic, iron, and manganese. The standards were also exceeded for fecal coliforms, mercury, and nitrate; these exceedances could be attributable to human sources.

2.1.8 Geohydrology Memorandum (1996) and the Snohomish County Groundwater Management Plan (1999)

In response to requirements in the State Growth Management Act, Snohomish County established a Groundwater Management Area. Snohomish County Planning and Development Services (PDS) contracted with Golder Associates to take the 1997 USGS study and develop a Geohydrology Memorandum (Golder Associates, 1996). The Geohydrology Memorandum

Table 2-1. Aquifer Characteristics of the Getchell Plateau Groundwater Investigation Area (Economics and Environment, 1991).

Aquifer	Aquifer Significance	Regional Aquifer System Depth[1]	Hydrogeologic Unit	Depth to Ground Water	Potential Well Yield	Potential Aquifer Yield	Natural Recharge Potential
				ft	gpm[2]	MGD[3]	
Marysville Trough	Local	Shallow	Recessional Marine	20-100	200-300	5	high
Getchell Plateau	Regional	Intermediate	Advance Outwash	50-250	1,200	4-8	low
Deep Regional	Limited	Deep	Olympia Inter-glacial	100-400	200-300	unknown	low

(1) Aquifer system depth denotes relative stratigraphic position.

(2) gpm = gallons per minute.

(3) MGD = million gallons per day.

Table 2-2. Summary of water level differences in wells with multiple measurements (Thomas et al, 1997).

Aquifer	Location	Number of wells sampled	Depth to Groundwater		
			Median	25th percentile	75th percentile
			ft bgs[1]	ft bgs	ft bgs
Alluvium	Entire County	21	-1	-3	2
Recessional Outwash	Entire County	16	2	-2	5
Vashon Till	Entire County	29	0	-2	2
Advance Outwash	Entire County	93	1	-3	5
	Tulalip Plateau	10	-2	-18	1
	Getchell Plateau	16	1	-3	9
	Lakes Plateau	21	-1	-8	3
	Intercity Plateau	36	0	-3	6
Upper Coarse[2]	Entire County	10	0	-26	4
Lower Coarse[3]	Entire County	23	2	0	8
Sedimentary (Bedrock)	Entire County	16	0	-18	24

(1) ft bgs = feet below ground surface.

(2) Equivalent to the USGS's Transitional Beds.

(3) Equivalent to the USGS's Undifferentiated Glacial and Non-Glacial Sediments.

Table 2-3. Washington State Drinking Water Standards (Chapter 246-290-310 WAC).

Analyte	MCL[1] mg/l[2]
Primary Drinking Water Parameters[3]	
Antimony (Sb)	0.006
Arsenic (As)	0.01
Asbestos	7[4]
Barium (Ba)	2
Beryllium (Be)	0.004
Cadmium (Cd)	0.005
Chromium (Cr)	0.1
Copper (Cu)	[5]
Cyanide (HCN)	0.2
Fluoride (F)	4
Lead (Pb)	[5]
Mercury (Pb)	0.002
Nickel (Ni)	0.1
Nitrate (as N)	10
Nitrite (as N)	1
Selenium (Se)	0.05
Sodium (Na)	[5]
Thallium (Tl)	0.002
Secondary Drinking Water Parameters[6]	
Chloride (Cl)	0
Fluoride (F)	2
Iron (Fe)	0.3
Manganese (Mn)	0.05
Silver (Ag)	0.1
Sulfate ($S0_4$)	0
Zinc (Zn)	5
Physical Characteristics	
Color	15 Color Units
Specific Conductivity	700 μmhos/cm
Total Dissolved Solids	500 mg/l
Biological Constituents[7]	
Total Coliform	1/100 ml

(1) MCL = Maximum Contaminant Level.

(2) mg/l = ppm or parts per million.

(3) Primary standards means standards based on chronic, nonacute, or acute human health effects.

(4) Units = million fibers per liter (longer than 10 microns).

(5) MCL not established. Although the state board of health has not established MCLs for copper, lead, and sodium, there is sufficient public health significance connected with copper, lead, and sodium levels to require inclusion in inorganic chemical and physical source monitoring.

(6) Secondary standards means standards based on factors other than health effects.

(7) MCL exceeded if coliform presence is detected.

was the supporting technical document used to develop Snohomish County's Groundwater Management Plan. The Geohydrology Memorandum was developed to identify potential impacts of urban and rural land uses on groundwater resources. The Geohydrology Memorandum used published data and unpublished data to project impacts of increasing population on groundwater utilization and sensitivity of the resource to contamination. All of the impact projections were based on surface watersheds, not aquifer units, and the projected 2012 population (Figure 2-1).

Groundwater Utilization

The Geohydrology Memorandum developed estimated future groundwater needs of the County's residents, including the Getchell Plateau's residents. The future supply of groundwater for the Getchell Plateau was estimated as the groundwater recharge potential from precipitation, minus development impacts and groundwater consumption. The Allen Creek, Quilceda Creek, Burn Hill Road Drainage, and Arlington Junction South watersheds were estimated to require between 5 and 10% of the available groundwater recharge. The Portage Creek watershed was projected to require between 15 and 20% of the available groundwater recharge.

Augmenting Groundwater Recharge

The idea of infiltrating stormwater and wastewater to reduce storm and surface runoff and to increase groundwater recharge was explored. The Getchell Plateau was generally deemed unsuitable for stormwater and wastewater infiltration because roughly 70% of the plateau is underlain by low permeability glacial till. Areas not underlain by the till could be used; however, much of these areas occur along the steep plateau margins where groundwater is actively discharging from the aquifers.

Using the County's aquifers to store surface runoff from the wetter winter months for use during the drier summer months was explored as well. The process involves collecting surface water or groundwater and injecting it directly into an aquifer. The aquifer beneath the central portion of the investigation area was believed to be suitable for groundwater injection and storage (Golder Associates, 1996). Snohomish County government is not a water purveyor, so therefore is not directly involved in using aquifers to

Table 2-4. Mean Water Quality Data for the Getchell Plateau (Thomas et al., 1997).

Analyte	Units	Number of Samples	Mean Constituent Concentration	Number of Samples Exceeding MCL[(1)]
Specific conductance, field	μmohs/cm	50	211	
Specific conductance, lab	μmohs/cm	50	209	
pH, field		50	7.8	
pH, lab		50	7.8	
Temperature, water	°C	50	12	
Oxygen[(2)]	mg/l[(3)]	50	3	
Fecal-coliform bacteria	colonies/100ml	50	NA	
Hardness, total	mg/l CaCO3	50	76	
Calcium[(2)]	mg/l	50	17	
Magnesium[(2)]	mg/l	50	8	
Sodium[(2)]	mg/l	50	13	
Sodium, percent		50	23	
Sodium adsorption ratio		50	1	
Potassium[(2)]	mg/l	50	2	
Bicarbonate, field	mg/l	50	130	
Carbonate, field	mg/l	50	3	
Alkalinity, field	mg/l	50	110	
Alkalinity, lab	mg/l	50	95	
Sulfate[(2)]	mg/l	50	6	
Chloride[(2)]	mg/l	50	5	
Fluoride[(2)]	mg/l	50	0.2	
Silica[(2)]	mg/l	50	28	
Total dissolved solids	mg/l	50	135	
Total nitrate nitrogen	mg/l	50	1	
Nitrate nitrogen[(2)]	mg/l N	50	0.25	
Nitrite nitrogen[(2)]	mg/l N	50	0.07	
Nitrite plus nitrate nitrogen[(2)]	mg/l N	50	1	
Ammonia nitrogen[(2)]	mg/l N	50	0.3	
Ammonia nitrogen[(2)]	mg/l NH_4	50	0.4	
Phosphorus, ortho[(2)]	mg/l	50	0.2	
Phosphate, ortho[(2)]	mg/l	50	1	
Arsenic[(2)]	mg/l	50	13	9
Barium[(2)]	mg/l	50	25	
Boron[(2)]	mg/l	50	20	
Cadmium[(2)]	mg/l	50	NA	
Chromium[(2)]	mg/l	50	3	
Copper[(2)]	mg/l	50	27	
Iron[(2)]	mg/l	50	285	10
Lead[(2)]	mg/l	50	1	
Manganese[(2)]	mg/l	50	95	19
Mercury[(2)]	mg/l	50	3	1
Selenium[(2)]	mg/l	50	NA	
Silver[(2)]	mg/l	50	NA	
Zinc[(2)]	mg/l	50	61	
Carbon, organic[(2)]	mg/l	50	0.4	
Methylene-blue	mg/l	50	NA	

(1) Blank field indicates constituent less than MCL on date sample collected.
(2) USGS analyzed for dissolved metal concentrations.
(3) mg/l = ppm or parts per million.

SNOHOMISH COUNTY
SURFACE WATER MANAGEMENT

Figure 2-1. Geohydrology Memorandum Watershed Boundaries.

LEGEND

Surface Watershed Boundaries

N

0 2 4 6 Miles

store water; however, Ecology permits the practice of using aquifers to store water for later municipal and commercial uses.

Groundwater Sensitivity to Contamination

The potential for groundwater contamination originating from specific sources such as storm runoff, chemical spills along highways and railways, and domestic and agricultural herbicide and pesticide use were also considered. Golder Associates (1996) did not find a risk to the County-wide groundwater resource; however, Golder Associates (1996) stated that local risks to the groundwater resource exist. For example, there is a potential risk of groundwater contamination in the investigation area occurring from agricultural use of herbicides and pesticides. These and other potential risks are discussed in more detail in Chapter 6.

The potential for general or widespread groundwater contamination resulting from non-specific sources was assessed by estimating nitrate loading from septic systems effluent, lawn and agricultural fertilizers, and animal wastes. Golder Associates (1996) used a loading and mixing analysis to estimate the concentration of nitrate in groundwater for the 2012 population.

The loading and mixing analysis projected that all of the watersheds draining the Getchell Plateau will have nitrate concentrations in groundwater less than 5 mg/l, with most watersheds expected to have concentrations less than 2.5 mg/l. These projected concentrations are all below the 10 mg/l MCL for nitrate (Table 2-3). Water quality sampling on the Getchell Plateau revealed that nitrate concentrations average 0.34 mg/l and are as high as 7.2 mg/l.

The Groundwater Management Plan Preferred Alternatives

The Groundwater Advisory Committee, using the findings and analysis from the Geohydrology Memorandum, developed a list of over 80 actions that would, if implemented, improve or protect the County's groundwater resources. Ultimately, the Groundwater Advisory Committee shortened the list to 41 preferred alternatives (Golder and Associates, 1999).

2.2 Groundwater Sampling

The Getchell Plateau was chosen for this investigation because it has similarities to other plateau aquifer systems found in Snohomish County, it is an area that is growing rapidly but has not yet reached full build-out, and there are sufficient data available (Figure 1-2).

To assess the current quantity and quality of the groundwater beneath the Getchell Plateau, the project team obtained 112 new water levels and water quality samples (Figure 2-2). The new water levels and water quality samples were collected in accordance with the sampling procedures detailed in the Getchell Plateau Groundwater Investigation Quality Assurance Project Plan (QAPP; Public Works, 2002).

Snohomish County Public Works staff (hereafter referred to as the project team) focused their water quality sampling on Washington State's drinking water standards (Table 2-3). Targeting these parameters allowed a comparison between this investigation's results and historic water quality data. Furthermore, examination of previous sampling events (Table 2-4; Thomas et al., 1997; Tesoriero and Voss, 1997; Ebbert et al., 2000) and an analysis of Getchell Plateau land uses revealed a low potential for contamination from chemical constituents such as volatile organic or chlorinated organic compounds.

2.2.1 Sample Distribution

All of the water level and water quality data collected for this investigation are dependent on the location of the well sampled. The project team chose the wells for sampling using the criteria listed below. Data from previous sampling events included in the analysis were selected using these same criteria.

- spatial distribution—wells were selected so that all areas of the Getchell Plateau were represented (Figures 2-2 and 2-3);
- hydrogeologic distribution—wells were selected so that each aquifer was represented;
- advance outwash aquifer—more wells were selected to represent the advance outwash aquifer since a majority of the wells on the plateau penetrate this aquifer;
- land use distribution—wells were selected so that a range of land uses and densities were represented;
- previous sampling—since this investigation was designed to build on previous studies, priority was given to sampling wells that had been sampled previously;

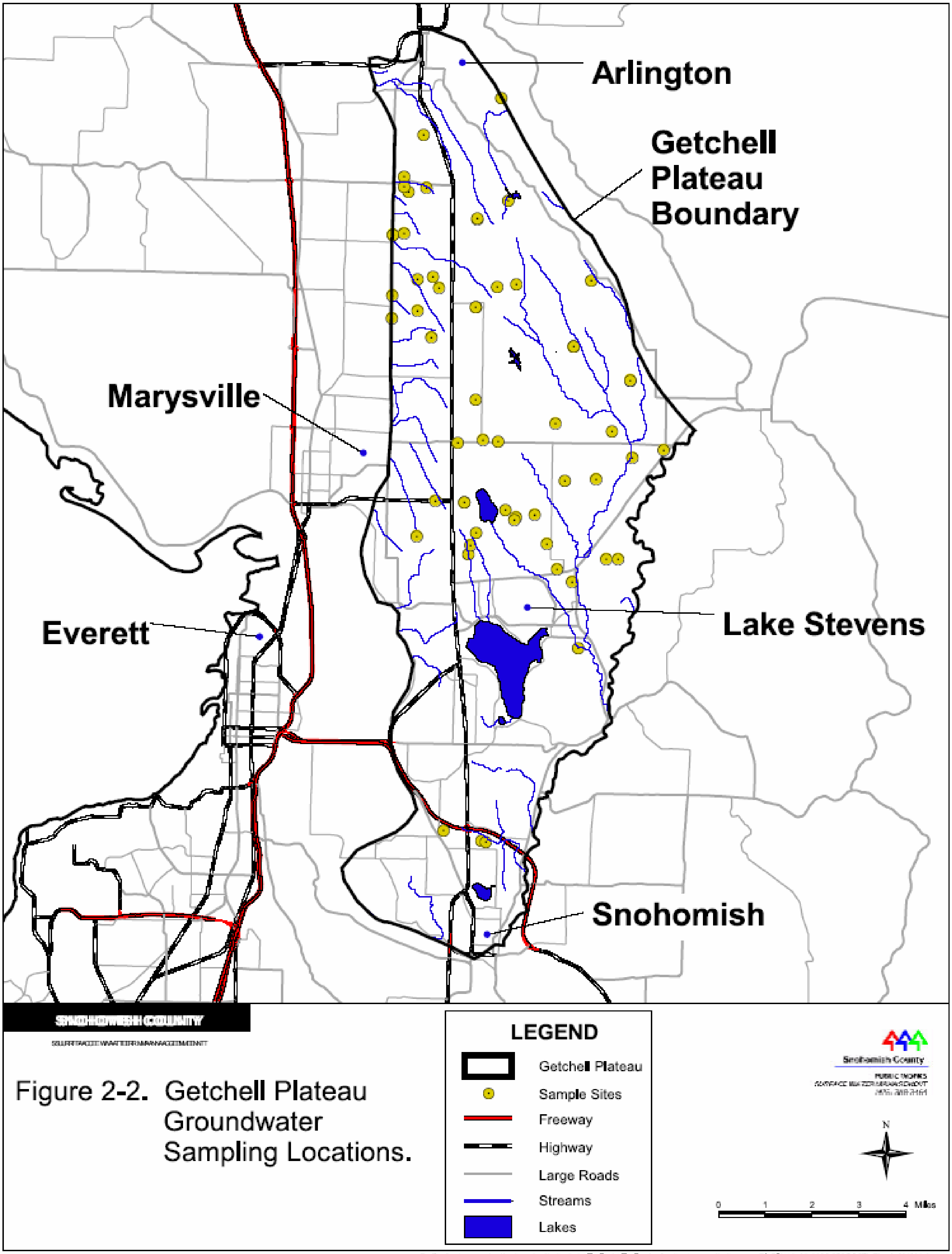
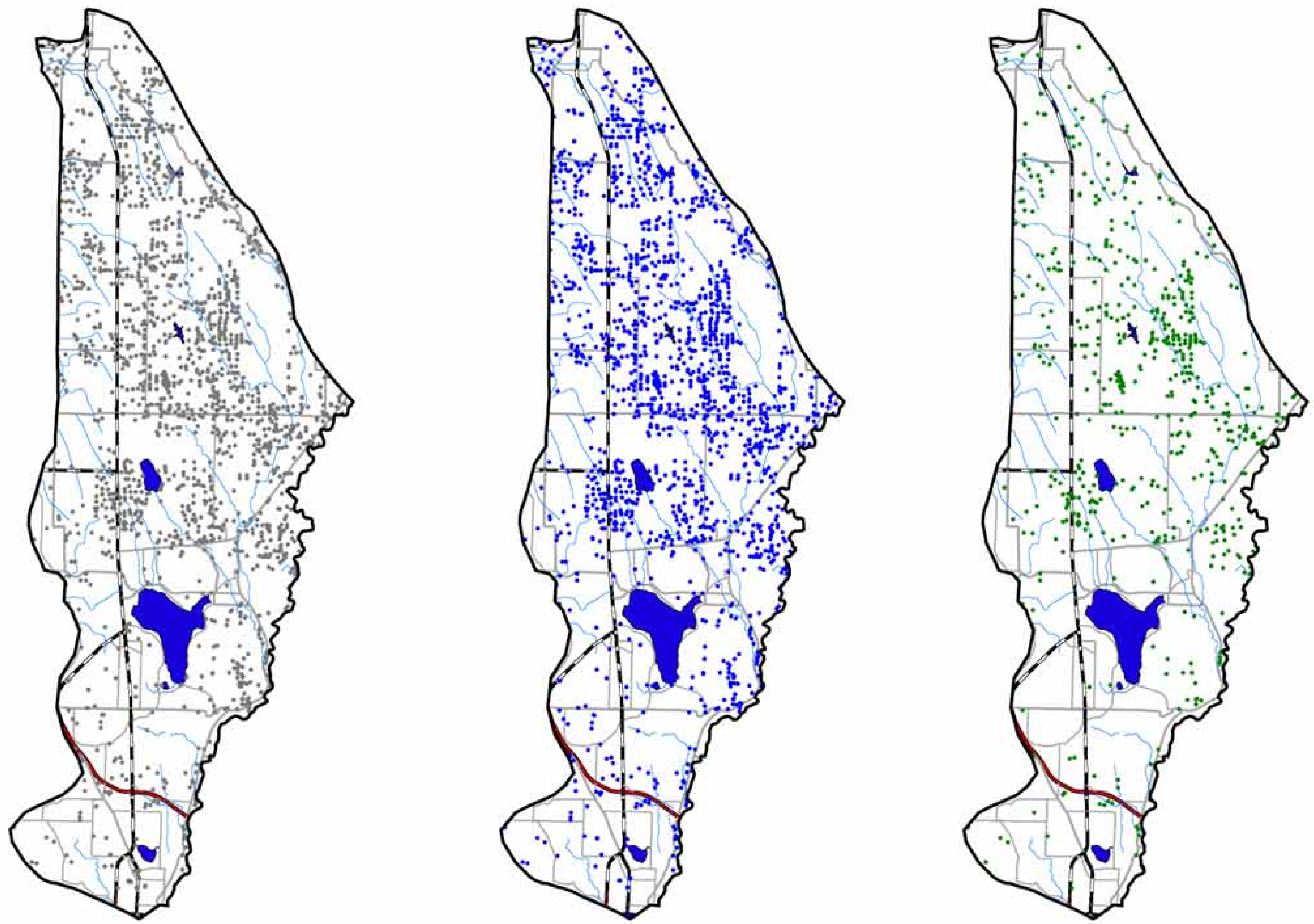


Figure 2-2. Getchell Plateau Groundwater Sampling Locations.

SNOHOMISH COUNTY
SURFACE WATER MANAGEMENT



(a) All wells with detail data. (b) All wells with water level data. (c) All wells with water quality data.

Figure 2-3. Getchell Plateau Well Locations.

LEGEND

- Getchell Plateau
- Sample Sites
- Freeway
- Highway
- Large Roads
- Streams
- Lakes

N

Snohomish County
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SURFACE WATER MANAGEMENT
(425) 388-3464

Project name: x:\wq\groundwater\getchell\getchell_arcview\get_samp_sites.apr Plot date: May 3, 2005; Figure2_3 jak

- new sampling—priority was given to areas of the plateau that had not been previously sampled;
- old sample locations—data were utilized when the location of the well was known to within 10 acres;
- basic well data—wells were selected only if there was a water well report available; and
- water quality samples—wells were selected only if the well's dominant use is to supply domestic drinking water.

The two exceptions to the above criteria were that a well known to contain arsenic was sampled even though a water well report was not available, and another well was sampled even though it used to irrigate a small nursery.

2.2.2 Sample Timing

The project team timed the sampling events to coincide with the annual low water table (summer 2002) and the annual high water table (winter 2003). Sampling the wells at different water levels allowed a limited analysis of changes in water chemistry resulting from seasonal fluctuations water-table elevation.

Fifty-eight domestic wells were sampled in the summer of 2002 and 54 of these wells were sampled in the winter of 2003 (Figure 2-2). Fifty-three of the wells sampled in 2003 were sampled in 2002 with one new well added in an area of low sample coverage.

2.2.3 Parameter Selection

This investigation focused on sampling wells used primarily for domestic water supply. Therefore, the project team chose to sample for analytes on Washington State's drinking water standards list (Table 2-3). The project team collected unfiltered samples since the State's drinking water standards are based on total metals, and because well water quality samples submitted to the Snohomish Health District are unfiltered.

The analyte list was reviewed following the completion of the summer 2002 sampling event. The results of water quality samples from the USGS, the Snohomish Health District, and DOH were also reviewed. This review revealed that cyanide, fecal coliforms, mercury, and total dissolved solids were either not detected or were well below the MCLs, so these analytes were not included on the 2003 analyte list. Also, the laboratory measurement for conductivity was not included, because this parameter was measured in the field. Mercury was returned to the 2003 analyte list following a review of the first laboratory reports submitted to project team in 2003. The 2002 analyte list is presented in Table 2-5 and the 2003 analyte list is presented in Table 2-6.

2.2.4 Field Procedures

All water quality sampling was carried out in accordance with the project's QAPP (Public Works, 2002). The QAPP addressed all aspects of water sample collections and handling, field measurements, instrument calibration, analytical procedures, external and laboratory control, and data management.

Water Level Measurements

The depth to groundwater in a well was measured when the project team arrived at the well, measured again a short time later to determine if the water level was recovering from recent pumping, and measured a third time following sample collection to determine the drawdown that occurred during well purging. All measurements were made to the nearest 0.01 of a foot from an identifiable reference point at the wellhead, typically the top of the well casing, using with an electronic well probe (Figure 2-4). The ground surface elevation of the reference point was derived by plotting the reference point location on a digital elevation model for the Getchell Plateau. The well casing stickup (if any) was subtracted from the depth-to-water measurement to obtain the actual water-table elevation.

Field Measurements Of Water Quality

Field measurements of water quality were obtained using a HydroLab™ (Figure 2-5) fitted with a flow cell. To prevent over-pressurization of the flow cell, a flow splitter or sampling tee was attached to the tap (Figure 2-6). Discharge from the pressure relief side of the sampling tee was directed into a container so that the purge volume could be monitored. The sampling tee allowed continuous collection of field measurements, continuous purge volume monitoring, and an uninterrupted purge.

Well Purging

The well casing of each well was purged the equivalent of three to five casing volumes prior to sample collection. The well casing volume was calculated using the depth of the well, the depth to water, and the well diameter. The depth of the well and the well diameter were taken from the Ecology

Table 2-5. 2002 Analytes--Washington State Department of Health Laboratory.

Analyte	Reporting Limit	Units	Method
Antimony	0.002	mg/l[(1)]	EPA 200.8
Arsenic	0.002	mg/l	SM 3113 B
Barium	0.05	mg/l	EPA 200.8
Beryllium	0.002	mg/l	EPA 200.8
Cadmium	0.001	mg/l	EPA 200.8
Chloride	20	mg/l	EPA 300.0 A
Chromium	0.002	mg/l	EPA 200.8
Color	5	color units	SM 2120 B
Conductance	10	µmohos/cm	SM 2510 B
Copper	0.2	mg/l	EPA 200.8
Cyanide	0.05	mg/l	SM 4500 CN-F
Fecal Coliforms	1	col/100ml	
Fluoride	0.2	mg/l	EPA 300.0 A
Hardness	10	mg/l	EPA 200.7
Iron	0.1	mg/l	EPA 200.7
Lead	0.002	mg/l	EPA 200.8
Manganese	0.01	mg/l	EPA 200.8
Mercury	0.0005	mg/l	EPA 245.1
Nickel	0.002	mg/l	EPA 200.8
Nitrate	0.05	mg/l	EPA 300.0 A
Nitrite	0.2	mg/l	EPA 300.0 A
Selenium	0.005	mg/l	EPA 200.8
Silver	0.005	mg/l	EPA 200.8
Sodium	5	mg/l	EPA 200.7
Sulfate	10	mg/l	EPA 200.7
Total Dissolved Solids (TDS)	150	mg/l	SM 2540 B
Thallium	0.001	mg/l	EPA 200.8
Total Nitrate Nitrogen (TNN)	0.05	mg/l	EPA 300.0 A
Total coliforms	1	col/100ml	
Turbidity	0.1	NTU	SM 2130 B
Zinc	0.2	mg/l	EPA 200.8

(1) mg/l = ppm or parts per million.

water well report (unless otherwise indicated on the field data sheet). The volume of water pumped from the well was measured using a bucket of known volume and a stopwatch.

To ensure that the water sample collected was representative of the aquifer and not the water in the well casing, temperature, dissolved oxygen, conductivity, and pH were monitored using the HydroLab™. The above field parameters were recorded on the field data sheet after each casing volume had been removed. Water was purged until all field measurements stabilized to within ±10% of the previous value.

Sample Collection

The project team sampled domestic wells, so it was possible to obtain a sample from a tap utilizing the down-hole electric pump. The tap located closest to the wellhead was utilized. The samples were collected before the extracted water had passed through a storage tank, water softening equipment, filtration equipment, or a pressurized water distribution system.

Table 2-6. 2003 Analytes--North Creek Analytical Laboratory.

Analyte	Reporting Limit	Units	Method
Antimony	0.001	mg/l[(1)]	EPA 200.8
Arsenic	0.002	mg/l	SM 3113 B
Barium	0.05	mg/l	EPA 200.8
Beryllium	0.002	mg/l	EPA 200.8
Cadmium	0.001	mg/l	EPA 200.8
Chloride	20	mg/l	EPA 300.0 A
Chromium	0.002	mg/l	EPA 200.8
Color	5	Color Units	SM 2120 B
Conductance	10	μmohos/cm	SM 2510 B
Copper	0.2	mg/l	EPA 200.8
Cyanide	0.05	mg/l	SM 4500 CN-F
Fecal Coliforms	1	col/100ml	
Fluoride	0.2	mg/l	EPA 300.0 A
Hardness	10	mg/l	EPA 200.7
Iron	0.1	mg/l	EPA 200.7
Lead	0.002	mg/l	EPA 200.8
Manganese	0.01	mg/l	EPA 200.8
Mercury	0.0005	mg/l	EPA 245.1
Nickel	0.002	mg/l	EPA 200.8
Nitrate	0.05	mg/l	EPA 300.0 A
Nitrite	0.2	mg/l	EPA 300.0 A
Selenium	0.005	mg/l	EPA 200.8
Silver	0.005	mg/l	EPA 200.8
Sodium	5	mg/l	EPA 200.7
Sulfate	10	mg/l	EPA 200.7
Total Dissolved Solids (TDS)	150	mg/l	SM 2540 B
Thallium	0.001	mg/l	EPA 200.8
Total Nitrate Nitrogen (TNN)	0.05	mg/l	EPA 300.0 A
Total coliforms	1	col/100ml	
Turbidity	0.1	NTU	SM 2130 B
Zinc	0.2	mg/l	EPA 200.8

(1) mg/l = ppm or parts per million.

Several samples were collected immediately after the pressurized water pressure tank. To prevent backflow from the pressure tank, the pump was running at the time of sample collection.

Sample collection began by halting the well purge just long enough to disconnect the sampling tee. Following the removal of the sampling tee, the tap was turned on and allowed to run for the duration of the sample collection. The bacteria sample container was filled first, followed by the metals and inorganics containers. As required by the QAPP, all water samples were placed directly in containers with the appropriate preservatives provided by the analytical laboratory (Table C-2).

As noted above, the water quality samples were not field filtered since the project team sampled for total metals (Public Works, 2002). The results of the sample analysis were compared with groundwater criteria based on total metals.

Figure 2-4. Typical water level measurement point. Note the electronic well probe is visible just below the wellhead.

Figure 2-5 Photograph of the HydroLab™.

Figure 2-6 Photograph of a typical sample collection site. The photograph was taken before removing the sampling tee.

Quality Control Samples

Field duplicates, laboratory splits, field blanks, and matrix spikes samples were collected to test the field, sample transport, and laboratory procedures. The quality control sampling schedule is detailed in Table C-3. The quality control sampling procedures and results are presented in Appendix C.

2.2.5 Data from Outside Sources

To meet the goals and objective of this investigation, the project team incorporated data collected by Ecology from well drillers, the USGS, the Snohomish Health District, and DOH in the water quantity and quality analysis. For the most part, water level measurements and water quality data were collected by a third party and submitted to Ecology, the Snohomish Health District, and DOH. Only the USGS collected data under an approved Quality Assurance Project Plan (Thomas. 1993). A general assessment of these data is presented below.

Department of Ecology Water Well Report Data

The water well reports submitted to Ecology by the well driller contained data on the details of the well. The data on the water well reports were used to:

- locate and map the wells (Figure 2-3);
- determine the geologic materials at the surface;
- determine the geologic materials of the aquifer;
- determine the confinement condition of the aquifer;
- document the depth to water at the time the well was drilled; document the well productivity at the time well was drilled;
- locate the wells with water quality data submitted to the USGS and the Snohomish Health District; and
- select the wells sampled by the project team (Figure 2-2).

Aquifer Test Data and Analysis

The project team estimated the aquifer properties, hydraulic conductivity, and transmissivity for 682 wells utilized data detailed on the Ecology water well report. The information collected by the driller to "prove" the capacity of the well was used to calculate the hydraulic conductivity and transmissivity of Getchell Plateau aquifers. The results of the hydraulic conductivity and transmissivity analysis are presented in Chapter 3 and Table A-1.

Different equations are used to calculate the hydraulic conductivity of an open bore-hole well, such as the one on the left in Figure 1-15, and for wells with a screen, such as the one on the right in Figure 1-15. Different equations are used because the open borehole well draws water over essentially zero thickness, and the screen well draws water over a specific, known thickness.

Bear (1969) developed a direct estimate the hydraulic conductivity from aquifers penetrated by unscreened wells using the following equation:

$$K = \frac{Q}{4\pi s r} \qquad (2\text{-}1)$$

where

K = the hydraulic conductivity (ft/day);
Q = the well discharge or pumping rate (ft^3/day);
s = the drawdown (ft); and
r = the radius of the well (ft).

Estimating the hydraulic conductivity of screened wells begins by estimating the transmissivity using the modified Theis equation (Ferris et al., 1962):

$$T = \frac{Q}{4\pi s} \ln \frac{2.25Tt}{r^2 S} \qquad (2\text{-}2)$$

where

T = the transmissivity (ft^2/day);
t = the length of time the well was pumped (days); and
S = storage coefficient (dimensionless).

A different storage coefficient is used in the Theis equation for unconfined and confined aquifers. A storage coefficient of 0.10 was used for all unconfined wells and 0.001 was used for all confined wells (Heath, 1989). These average values were used because the driller's water well reports lack the detailed information needed to determine storage coefficients for each aquifer condition and unit.

The modified Theis equation cannot be solved directly since transmissivity (*T*) occurs on both sides of the equation. The Theis equation is solved using Newton's iterative method (Carnahan et al., 1969). The iterative method starts by solving Equation 2-2 using an estimated value for the transmissivity (*T*). The results from Equation 2-2 are then compared with the estimated value. Following the comparison, Equation 2-2 is solved again using a second estimated value, chosen to produce a smaller difference between the estimated value and the result. This process is repeated until the estimated value and the results are the same value to three decimal places. Computer spreadsheets allowed the modified Theis equation to be solved quickly.

The resulting transmissivity values are easily converted to hydraulic conductivity by dividing by the aquifer thickness. Since the aquifer thickness is rarely known at a well, and since the water drawn into a screened well occurs largely over the screened interval, the screen length was substituted for the aquifer thickness:

$$K = \frac{T}{b} \qquad (2\text{-}3)$$

where

b = the well screen length, a surrogate for aquifer thickness.

The transmissivity (*T*) and the hydraulic conductivity (*K*) values were determined for a total of 682 wells representing all of the aquifer units beneath the Getchell Plateau. As noted above, groundwater moves in both horizontal and vertical directions. The above equations estimate the horizontal hydraulic conductivity only. The aquifer materials in Snohomish County are not homogeneous. The vertical hydraulic conductivity is generally quite small compared to the horizontal hydraulic conductivity and therefore can be ignored (Thomas et al., 1997).

Water Quality Data Submitted to the Snohomish Health District

Current Snohomish County regulations require proof of a potable water source as a condition of issuing a building permit. Snohomish County PDS contracts with the Snohomish Health District to evaluate the potablity of a water supply based on water quality samples collected by the building permit applicant. The Snohomish Health District has data from 347 samples on file from the Getchell Plateau. These samples were collected between May 1987 and the start of this project's sampling in the summer of 2003. The Snohomish Health District sample results are presented in Table 2-7 and Table B-1a.

Water Quality Data Submitted to the Washington Department of Health

Each community water system in the County has a water quality monitoring plan. The monitoring plans use approved are unique to each water system and can include quarterly or annual sampling and analysis for over 250 constituents, although the typical constituent list is substantially shorter. The water quality samples are collected using approved protocols. The sample results are smutted to DOH. Unfortunately, the samples are typically collected at the point of use so the results frequently represent multiple sources. This is important, since many of the larger systems rely on water from multiple wells or a mixture of surface water and groundwater sources.

The project team did not include DOH data in its analysis of groundwater quality beneath the Getchell Plateau; however, the DOH data were used to select the final parameter list and to modify the parameter list between the 2002 and 2003 sampling events.

2.3 Data Quality Review

To ensure that the project objectives were met, the quality of the data was measured at each stage of data collection and analysis. The data quality measures used and the results of the data quality analysis are discussed in detail in Appendix C.

Data were accepted without qualifiers if the analytical reports met the quality assurance guidelines detailed in the QAPP. Before attaching any qualifiers, every effort was made to correct the error. All data were reported, regardless of the qualifiers attached.

2.3.1 Field Measurement Review

The project team encountered two problems when attempting to obtain evenly distributed water quality samples in 2002 and 2003. First, the project team relied on well owner permission to sample. Second, wells are drilled only in places were there is no municipal supply and potable groundwater is available. Figure 2-2 reveals that the project team found few wells south of Lake Stevens to sample. The gap in sample locations was partially closed by incorporating outside data into the water quality analysis (Figure 2-3).

All of the field data met the standards set by the QAPP and were accepted without qualification (Table B-1c).

2.3.2 Laboratory Measurement Review

The groundwater samples collected during the summer of 2002 were submitted to the Washington State Department of Health Laboratory. The spring 2003 samples were submitted to North Creek Analytical Services. The project team changed laboratories because the Washington State Department of Health Laboratory did not meet the sample reporting requirements established by the QAPP. Specifically,

Table 2-7. Summary of the Snohomish Health District's Water Quality Data.

Analyte	Average Result mg/l[1]	Maximum Result mg/l	Number of Non-Detects
Arsenic	0.018	0.350	129
Barium	0.002	0.200	169
Cadmium	0.000012	0.002	171
Chromium	0.0012	0.073	163
Fluoride	0.0058	0.600	169
Lead	0.00070	0.013	144
Mercury	0.00002	0.0017	168
Nitrate	0.38	3.90	121
Selenium	0.00034	0.015	166
Sodium	15	190	22
Silver	0	0	172

(1) mg/l = ppm or parts per million.

the Washington State Department of Health Laboratory did not meet the holding times or provide the required quality control sampling data.

2.3.3 Review Of Outside Data

Ecology Data

All of the well inventory data used by the project team were originally recorded by the well drillers and submitted to Ecology. The data collected by Ecology from well drillers were evaluated on a water well report by water well report basis. Data from the water well reports was not used in the analysis unless each well could be associated with a single tax parcel. The project team was able to use data from 75% of the nearly 2,600 wells identified to be on the Getchell Plateau (Table A-1).

Aquifer Test Results

The project team compared the aquifer testing results it calculated with known values published by Freeze and Cherry (1979), and found its analysis to be comparable to the published data. The project team also compared its results to those calculated by Thomas et al. (1997) for the same well, and found that the results did not agree roughly 15% of the time. After reviewing the water well reports, USGS data, and the project team assumptions, the project team chose to report its values over the USGS's values because the project team had a high degree of confidence in the method it used to calculate the aquifer property values.

Snohomish Health District and DOH Data

Data from the Snohomish Health District was accepted only if it could be tied to a specific well with a known location. As noted above, DOH data could not be tied to a specific well so these data were not used in the analysis.

USGS Data

Data collected by the USGS were accepted without qualification. The total metals values obtained by the project team were qualitatively compared with the dissolved metals values obtained by the USGS (Thomas et al., 1997). In addition, the project team examined the impact of averaging the USGS samples along with the Snohomish Health and Snohomish County samples. Including or excluding the small number of available USGS values in the analysis did not appreciably alter the final averages. The data collected by the USGS, the Snohomish Health District, and the project team are presented in full in Tables B-1a, B-1b, and B-1c, respectively.

2.3.4 Data Quality Conclusions

Access to water quality data collected under controlled conditions was hard to come by. Analysis of all aspects of the data collection and analysis revealed shortcomings in data source control and the inability of one analytical laboratory to meet its contractual obligations. Therefore, the resulting analysis, while presenting a comprehensive and spatially diverse picture of the water level and water quality of the Getchell Plateau aquifers, falls just short of being quantitatively robust. The resulting analysis should be viewed in qualitative terms; however, the project team built on the previous quantitatively robust sampling effort completed by the USGS in Thomas et al. (1997). The well inventory data, all of the field data collected by the project team, and the 2003 water quality sampling results are quantitatively robust and therefore will be useful for future groundwater investigations with Snohomish County and other similar environments found in the Puget Lowland of western Washington State.

3.1 Introduction

In the investigation area, glaciers sculpted the roughly north-south trending hills and valleys and deposited the major geologic units that hold the most productive quantities of groundwater (Newcomb, 1952; Thomson et al., 1997). Many of the unconsolidated glacial and non-glacial sediments that predate the most recent glaciation, including older sandstone and shale units, contain productive quantities of groundwater as well; however, these units contain less usable water than is found in the most recent glacial deposits.

Nearly one half of the precipitation that falls on the Getchell Plateau percolates into ground, recharging the aquifers (Thomas et al., 1997 and this investigation). The groundwater beneath the Getchell Plateau supplies drinking water to over 27,000 people, and feeds large lake systems such as Lake Stevens and Lake Cassidy. In addition, groundwater beneath the Getchell Plateau supplies much of the flow in Upper Quilceda Creek, Catherine Creek, Little Pilchuck Creek, and other local waterways.

3.2 Geology

3.2.1 Geologic History

The geologic history of the Getchell Plateau began over 25 million years ago as tectonic forces uplifted the Olympic Mountains and Cascade Range and also caused the subsidence that is the Puget Sound Trough.

Glaciers advanced and retreated into the Puget Sound Trough and over Snohomish County at least four and possibly six times during the past two million years (Table 3-1; Willis 1898; Bretz, 1913; Mullineaux et al., 1965; Armstrong, 1969; Clague et al., 1980; Easterbrook, 1994; Booth et al., 2003). The glacier that once covered the Coast Ranges of British Columbia and the Cascade Range of Washington State is named the Cordilleran Ice Sheet. As the Cordilleran Ice Sheet moved south of the US-Canada border it split into two lobes, the Juan de Fuca and the Puget. The Juan de Fuca Lobe dammed the Strait of Juan de Fuca, creating a body of freshwater that filled the Puget Lowland from the San Juan Islands to the City of Tenino, south of Olympia. J. Harlen Bretz named this body of water Lake Russell after Israel Cook Russell, one of the first geologists to visit the Puget Sound (Bretz, 1913; Thorson, 1980).

The advance of the Puget Lobe of the Cordilleran Ice Sheet marks a period known as the Vashon Glaciation, named after glacial outcrops on Vashon Island first identified by Bailey Willis, before the turn of the 20th Century (Willis, 1898; Crandell et al., 1965). This report uses the convention of referring to the Puget Lobe as the Vashon glacier.

The Vashon glacier crossed the U.S.-Canada border roughly 18,000 years ago, retreated north of Snohomish County by about 13,500 years ago, and was completely gone by 12,500 years ago (Kovanen and Easterbrook, 2001). A thick sequence of “lacustrine” (lake) fine silt and clay was deposited in the quiet waters of Lake Russell some distance in front of Vashon glacier. This fine silt and clay, locally known as the Lawton clay, is a barrier to vertical movement of groundwater and is a very extensive and effective aquitard. The Lawton clay and correlated beds are also called the transitional beds because they mark the transition between non-glacial and glacial times. The Lawton clay can be seen at the base of many Snohomish County’s bluffs (Figures 3-1 and 3-2; Mullineaux et al., 1965).

The low-energy environment of Lake Russell eventually gave way to a high-energy lake, and then to a braided stream environment, as the Vashon glacier advanced southward. The volume and caliber of sediment deposited in front of the advancing Vashon glacier increased as sediment transport energy increased. A thick sequence of gravelly sand, locally known as the Esperance sand (Newcomb, 1952; Mullineaux et al., 1965) was deposited on top of the Lawton clay. The Esperance sand, also known as the Vashon advance outwash, is the most productive water-bearing geologic unit, or aquifer, underlying the Getchell Plateau (Newcomb, 1952; Thomas et al., 1997).

A relatively thin and extremely dense layer of gravelly sand (glacial till) was deposited on top of Snohomish County’s plateaus as the Vashon glacier advanced southward. The glacial till is extremely dense and compact because it was deposited in direct contact

Table 3-1. Stratigraphy of the Puget Lowland (modified from Woodard et al, 1995).

Geologic Period and Age (age range given in years before present)				**Puget Lowland** (Willis, 1898; Bretz, 1913)	**Island County** (Easterbrook, 1968)	**Snohomish County** (Newcomb, 1952)	**NW King County** (Luizer, 1969)	**SW King County** (Luiser, 1969)	**Pierce County** (Walters and Krimmel, 1968)	**Kitsap Peninsula** (Garling et al., 1965)	**Mason County** (Molenaar and Noble, 1965)	**Thurston County** (Wallace and Molenaar, 1961)	**Jefferson County** (Griamstad and Carson, 1981)	**Seattle** (Stark and Mullineaux , 1950)	**Snohomish County** (Thomas et al., 1997)	**Puget Lowland** (Booth et al., 2003)
Quaternary	**Holocene**	0-10,000				Younger and Older Alluvium	Alluvium and Peat	Alluvium and Peat	Alluvium and Peat	Alluvium	Alluvium	Alluvium			Bog, March, and Peat Deposits / Alluvium	
	Pleistocene	10,000-23,000	Fraser Glaciation	Vashon Glaciation	Glacial-marine drift, Recessional Outwash Till Advance Outwash Esperance Sand	Marysville Sand: Arlington Gravel; Stillaguamish Sand Members of the Vashon Drift Till Advance Outwash Esperance Sand	Recessional and Delta Outwash Till Advance Outwash / ?	Recessional Outwash Till Ice-marginal Deposits Advance Outwash	All phase of Vashon Drift (Recessional Outwash, Advance Outwash, Till)	Recessional Outwash Till Esperance Sand Advance Outwash	Recessional Outwash Till Advance Outwash	Recessional Outwash Till Advance Outwash	Recessional Outwash Till Advance Outwash	Till Advance Outwash	Recessional Outwash Till Advance Outwash	Till (Sumas), Glacial-marine drift, Till, Advance Outwash, Esperance Sand, Lawton Clay
		23,000-60,000	Olympia Interglacial	Puyallup Interglacial	Quada Formation	Pilchuck Clay Member	Unnamed Sand: Upper Clay	Salmon Springs Drift	?	Colvos Sand	Kitsap Formation	Kitsap Formation	Undifferentiated	Lawton Formation	Transitional Beds	Olympia Beds >45-13.5 ka pb(1)
		60,000-80,000	Possession Glaciation	?	Possession Drift	Undifferentiated Till	Unnamed Sand: Unnamed gravel		Colvos Salmon Springs Drift					Klinker Till, Beacon Till, Duwamish Formation	Undifferentiated	Possession Drift
		80,000->100,000	Whidbey Interglacial	Admiralty Glaciation	Whidbey Formation	Admiralty Clay	Lower Clay	Puyallup Formation	Kitsap Formation, Puyallup Formation	Kitsap Formation						Whidbey Formation
		>100,000	Double Bluffs Glaciation		Double Bluffs Drift			Intermediate Drift	Stuck Drift (?)	Salmon Springs Drift	Salmon Springs Drift	Salmon Springs Drift				Salmon Springs, Double Bluff, Stuck Drift
Tertiary	**Eocene**	>35,000,000	Sandstone, Mudstone, Siltstone, Coal													

(1) ka pb - thousands of years before present.

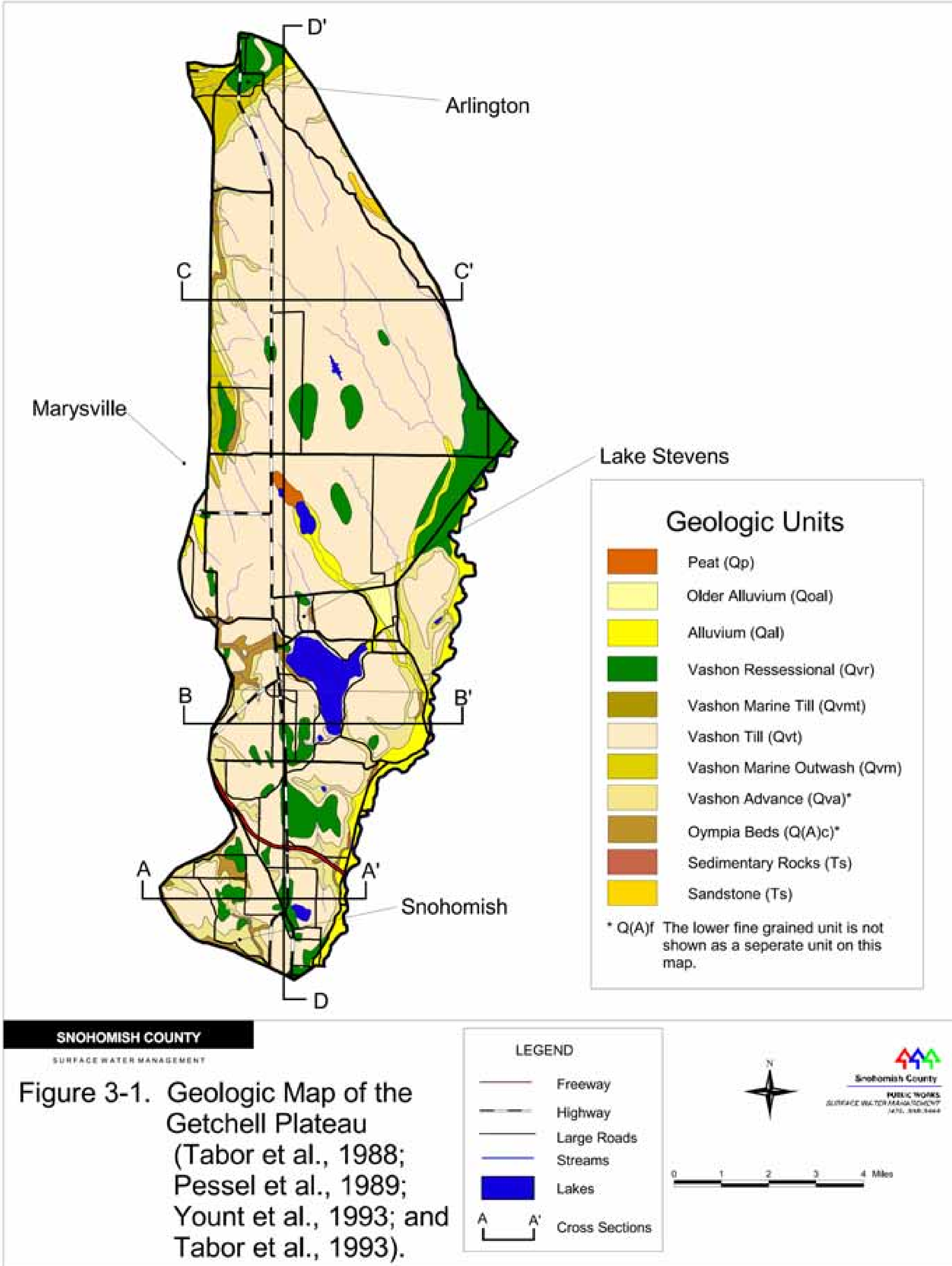

Figure 3-1. Geologic Map of the Getchell Plateau (Tabor et al., 1988; Pessel et al., 1989; Yount et al., 1993; and Tabor et al., 1993).

Project name: x:\wq\groundwater\arcview\get_geol.apr Plot date: Oct 20, 2004; Figure 3-1 jak

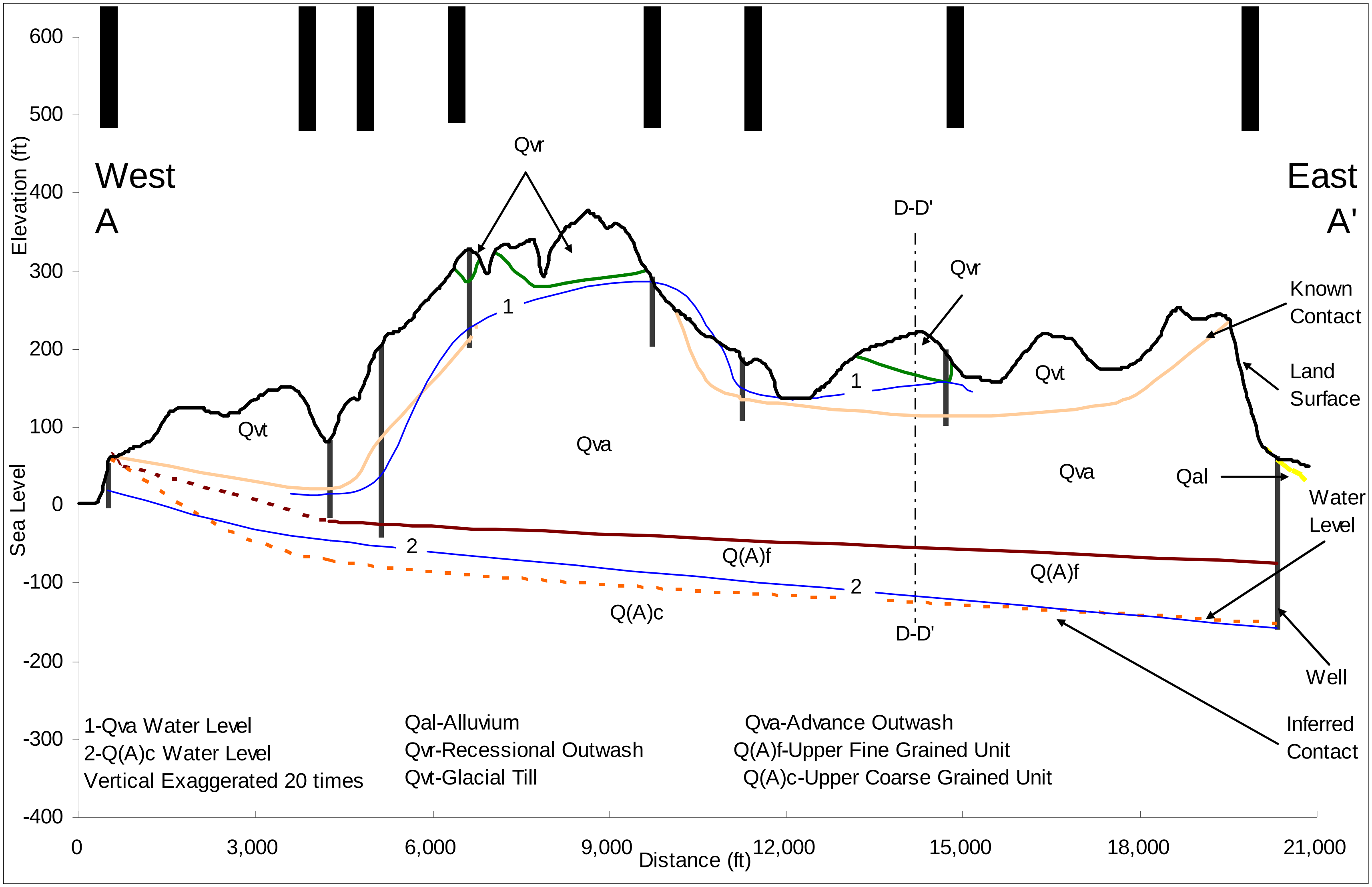

Figure 3-2a. Geologic Cross Section showing the subsurface just north of the City of Snohomish.

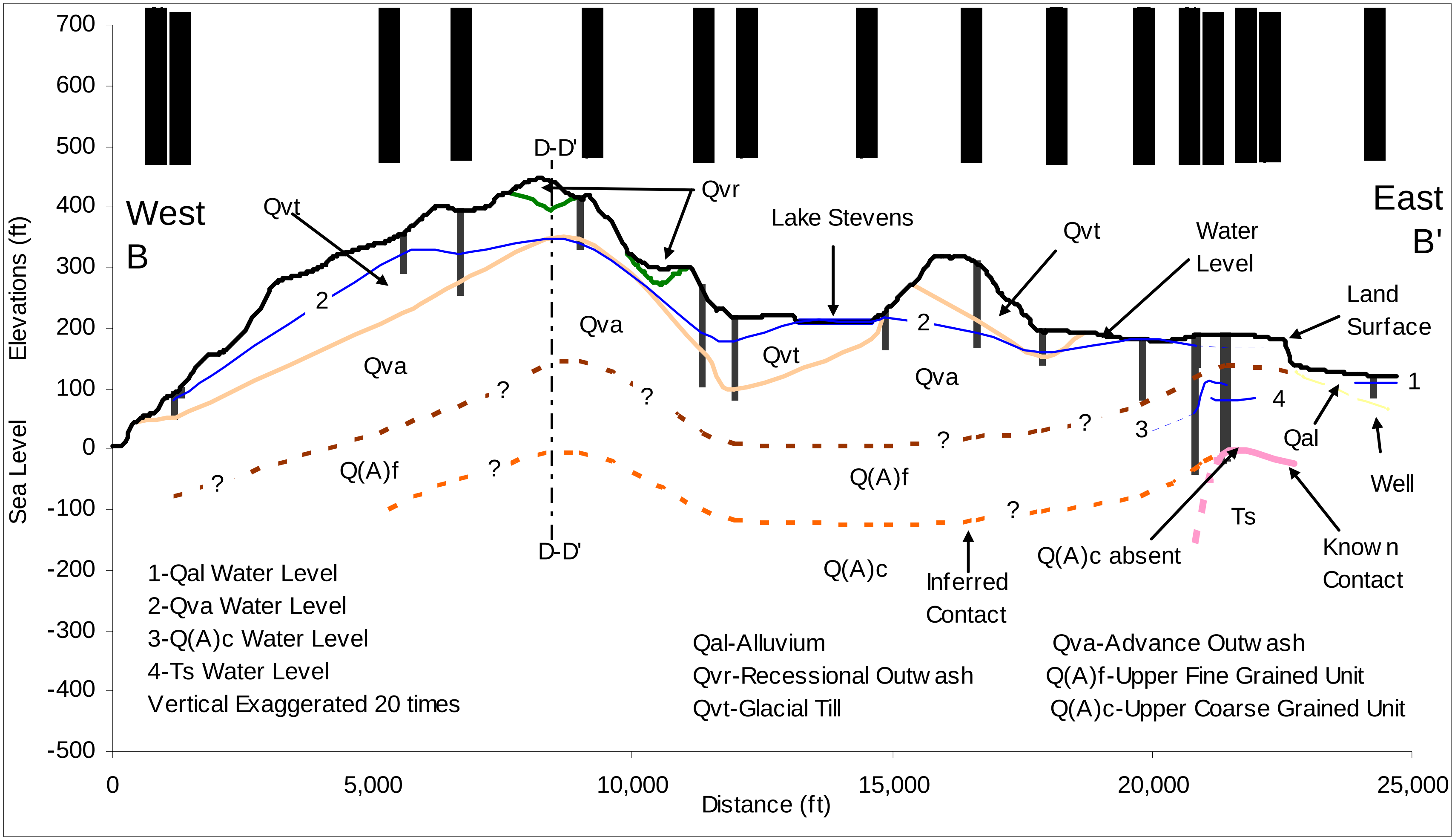

Figure 3-2b. Geologic cross section showing the subsurface at the southern end of Lake Stevens.

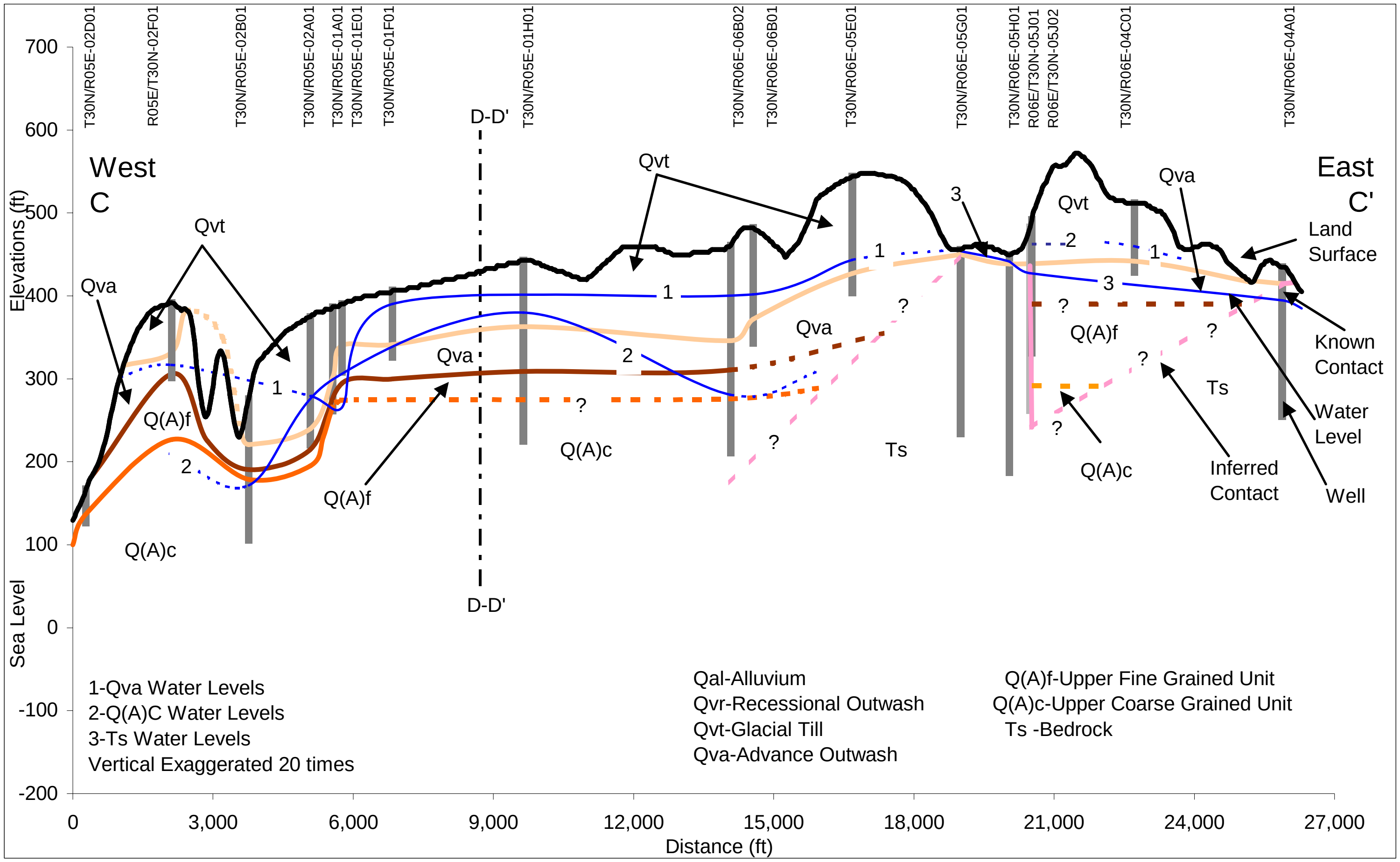

Figure 3-2c. Geologic cross section showing the subsurface at Sisco Heights.

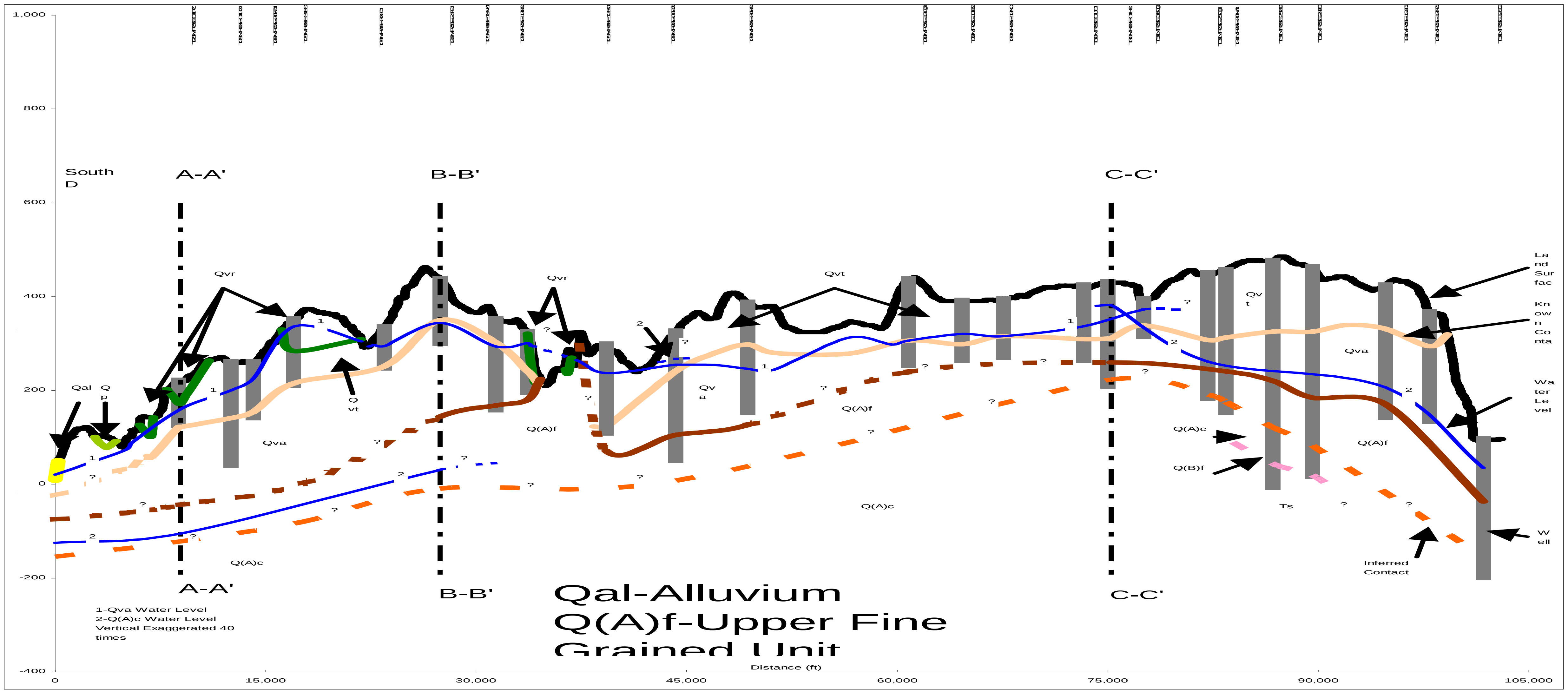

Figure 3-2d. Geologic cross section showing the subsurface along the north-south axis of the Getchell Plateau.

Figure 3-3. Photograph of the Vashon till at Wade Road.

with the ice. This compact deposit has a very low permeability and is called the Vashon till (Willis 1898; Bretz, 1913). Well drillers often refer to the till as hard pan or sometimes blue clay (Figure 3-3). The Vashon till is found on top of the Getchell Plateau and in isolated deposits along valley walls and bottoms (Figures 3-1 and 3-2; Willis, 1897; Bretz, 1913; Newcomb, 1952; Minard, 1985(a, e)**;** Pessl et al., 1989). The low permeability of the Vashon till makes it an effective a barrier to vertical movement of groundwater. In fact, Vashon till is the most extensive and effective aquitard in Snohomish County. Since the Vashon till occurs so near the surface and covers so much of the Getchell Plateau, it exerts a strong influence on groundwater recharge and therefore the availability of groundwater (Newcomb, 1952; Thomas et al., 1997).

Around 15,000 years ago the Vashon glacier reached its maximum southern extent, and by 13,000 years ago the Vashon glacier had retreated north of the Strait of Juan de Fuca (Thorson, 1980). The Vashon glacier's rapid retreat occurred by a process of melting and iceberg calving, first into a freshwater lake, and then into a marine embayment after the ice retreated north of the Strait of Juan de Fuca (Bretz, 1913; Thorson, 1980). The major north-south trending valleys in Snohomish County, which began to form beneath the Vashon glacier, were deepened and widened by large volumes of meltwater coming from the retreating glacier (Booth and Hallet, 1993).

Isolated and discontinuous deposits of freshwater gravelly sand and marine sand, known as the Vashon recessional outwash, were deposited throughout Snohomish County as the Vashon glacier retreated (Newcomb, 1952; Minard, 1985 (a, b, c, d, e, f)**;** Pessl et al., 1989). The fresh water gravelly sand is found on top of and along the margins of the Getchell Plateau as well as in Pilchuck River drainage west of Granite Falls (Figure 3-1). The marine sands were deposited in a broad marine embayment that once occupied the Marysville Trough, west of the Getchell Plateau and just south of the City of Arlington (Figures 3-1 and 3-2). Large volumes of potable groundwater are found in these deposits but this aquifer is only tapped by roughly five percent of the domestic wells on the Getchell Plateau.

Deposition of the major aquifers and aquitards during several periods of glacial advance and retreat produces a simple layer-cake picture with homogeneous and continuous aquifers separated by homogeneous and continuous aquitards. Overall, the layer-cake model works very well (Figure 3-2); however, the true picture is far more complex, especially when looking at specific areas such as the Getchell Plateau. Local groundwater conditions are strongly influenced by isolated deposits of fine sediment, known as silt lenses, in productive aquifers such as the Vashon advance outwash. The opposite situation is also true: as many as nearly 220 homeowners have found productive quantities of water in isolated lenses of coarse sediment within the Lawton clay and the Vashon till.

Local groundwater conditions are also strongly influenced by both the surface and subsurface topography. It is the glacial geology that has enabled groundwater to be found almost everywhere beneath the Getchell Plateau, and elsewhere in Snohomish County, but it is often the local topography that controls the depth to groundwater and the direction and rate of groundwater flow (Figures 1-13 and 1-14). The contact between the aquifers and aquitards is often very irregular because the land surface was eroded between glacial periods and reworked by each advancing glacier.

3.3 Stratigraphy

The section below follows the convention of discussing the youngest, shallowest geologic units first and proceeding to the older, deeper units.

3.3.1 Nomenclature

Table 3-2 below details the stratigraphy of the aquifers and aquitards that occur beneath the Getchell Plateau. The abbreviations or symbols detailed below will be used through the text and on the maps:

- **Q** is used symbolize all deposits of Quaternary age (everything less than 1.8 million years old); and
- **T** is used to symbolize all deposits of Tertiary age (everything between 1.8 to 65 million years old).

Letters following the Q or T indicate the type of deposit:

- **al** is used to designate deposits of alluvium;
- **p** is used to designate deposits of peat;
- **s** is used to designate sedimentary (mainly sandstone) rocks; and
- **v** is used to designate all sediments deposited by the Vashon glacier (mainly deposits 18,000 to 12,500 years old). The deposits of the Vashon glacier are further subdivided:
  - **t** is used to designate till;
  - **a** is used to designate advance outwash; and
  - **r** is used to designate recessional outwash.
- **tb** is used to designate the Lawton clay or transitional beds.

A slightly different nomenclature is used for the deeper aquifers and aquitards, where the drilling logs lack the detailed information required to assign a specific unit name. The deeper aquifers are all Quaternary age deposits and are separated into upper deposits and lower deposits:

- **(A)c** is used to designate deposits of the upper coarse-grained aquifer;
- **(A)f** is used to designate deposits of the upper fine-grained aquitards, almost always the Lawton clay;
- **(B)c** is used to designate deposits of the lower coarse-grained aquifer; and
- **(B)f** is used to designate deposits of the lower fine-grained aquitard.

The nomenclature for the aquifers and aquitards lacking a specific unit name was adapted from Woodward et al. (1995).

3.3.2 Aquifers and Aquitards

The principal aquifers in the investigation area are the alluvium, Vashon recessional outwash, and Vashon advance outwash. The principal aquitards in the investigation area are Vashon till, transitional beds, and bedrock, although all of the aquitards contain lenses of coarse-grained material or fracture systems that can yield usable quantities of drinking water. This latter statement is important to remember, because locally, aquitards are an important source of potable water for some the of the County's residents. The advance outwash aquifer is the most extensive and the most used.

Alluvium—Qal

The alluvium was deposited in the stream valleys during the past 13,500 years (Figures 3-1 and 3-2). Most of the alluvium was deposited in the last few hundred to thousand years. The alluvial deposits are typically composed of stratified sand and gravel with layers of floodplain fine sand, silt, clay and organic-rich sediment (Figure 3-4). The coarser materials are typically found beneath the finer-grained flood-deposited sand, silt, and clay. The coarse materials were deposited as the river channel migrated across the floodplain.

Figure 3-4. Photograph showing a typical coarse-grained alluvial deposit along the South Fork of the Stillaguamish River.

Deposits of older alluvium, identified by its reddish-brown oxidized gravels, were deposited in alluvial terraces adjacent to the major river systems in Snohomish County and in the investigation area along the eastern margin of the Marysville Trough (Figure 3-1; Minard, 1985e).

The alluvial deposits, which occur along active rivers and creeks, are subject to seasonal flooding because the water table is very near the surface. In the investigation area the alluvial aquifers are unconfined and occur along the Quilceda, Catherine, and Little Pilchuck creeks and Pilchuck River (Figures 3-1 and 3-2). Alluvium covers five square miles or roughly six percent of the investigation area. The alluvial deposits range in thickness from several feet up to 45 feet, with a median thickness of 20 feet (Table 3-2). The 32 domestic wells on the Getchell Plateau that tap the alluvium are concentrated long the Little Pilchuck River west of Lake Stevens and Snohomish. These wells are very shallow, averaging less than 30 feet deep.

The alluvial aquifer is very productive, having an average hydraulic conductivity of 34 ft/day (Table 3-3); however, the aquifer is rarely tapped because shallow wells are subject to seasonal drying and are easily contaminated by septic or animal wastes. Depth to groundwater averages 10 feet below the ground surface (bgs) (Table 3-3). The alluvial aquifer water table fluctuates up to seven feet between a low water level near 13 ft bgs in June to a high near six ft bgs in March (Table 3-4 and Figure 3-5a). Very little change in the average depth to water was noted in water levels taken since the 1970s (Table 3-4 and Figure 3-6a). Multiple water level measurements are available from three wells completed in the alluvial aquifer. These water levels indicate a possible three-foot decline over the past four years (Table 3-4). This decline probably represents the below average annual precipitation of the past few recent years.

Groundwater flow in the alluvial aquifer is parallel to the streams that deposited the alluvium. One notable exception is a narrow terrace of older alluvium along the western margin of the Getchell Plateau just north of Marysville (Figures 3-1, 3-2, and 3-7a). Groundwater flow in the older alluvium is downslope towards the Marysville Trough.

<u>Peat—Qp</u>

Peat was deposited in the complex of bogs that extending northeast of Lake Cassidy all the way to State Route 9 (Figure 3-1). The peat is composed of decomposed organic mater that is mixed with silt, sand, and clay (Pessl et al., 1989). Peat covers less than one square mile, which is only a quarter of one percent of the investigation area. No wells are known to draw water from the peat deposits. Wells that fully penetrate the peat indicate a thickness of up to 25 feet (Table 3-2).

<u>Vashon Recessional Outwash—Qvr</u>

The recessional outwash was deposited during the retreat of the Vashon glacier. The majority of the outwash is composed of well-drained, moderate-to-well-sorted, stratified sand and gravel deposited by glacial meltwater streams that flowed over the area as the glacier receded. The recessional outwash on the Getchell Plateau, which mainly fills shallow depressions in the underlying glacial till, covers nearly eight square miles or roughly ten percent of the investigation area (Figures 3-1 and 3-2; Minard, 1985e; Yount et al., 1993; Pessl et al., 1989). There is an extensive deposit of the recessional outwash found within the investigation area east of Granite Falls, but that deposit is an exception to the general pattern.

A small sliver of marine recessional outwash occurs along the western margin of the Getchell Plateau just north of Marysville (Figure 3-1). This outwash was deposited in marine waters that once occupied the Marysville Trough. The marine outwash is a fossil-bearing, stony silt, sand, and clay that cover two square miles or roughly two percent of the investigation area.

The typical coarse grain and loose structure means that the recessional outwash is very well drained. In fact, rain falling on recessional outwash would drain completely away were it not for the underlying glacial till or other low permeability sediment. Groundwater occurring in the recessional outwash is unconfined and exists as discontinuous perched aquifers (Figure 3-7b). The recessional outwash deposits are as thick as 75 feet with a median thickness of 20 feet (Table 3-2).

The coarse recessional material is very productive, having an average hydraulic conductivity of 90 ft/day (Table 3-3); however, the recessional outwash aquifer is tapped by relatively few wells because of its limited aerial extent and lack of an overlying aquitard to protect water quality. Depth to groundwater averages 12 ft bgs (Table 3-3). The water table fluctuates up to 18 feet between a low water near 29 ft bgs in June to a high water level near 11 ft bgs in November (Table 3-4 and Figure 3-5b). Comparison of water levels taken since the 1970s shows a decline of just over four feet in average depth to water (Table 3-4 and Figure 3-6b). Multiple water level measurements are available from five wells completed in the recessional outwash aquifers. These water levels indicate a possible two-foot to four-foot decline in water-table elevation since the 1970s (Table 3-4).

Groundwater flow in the recessional outwash along the margins of the Getchell Plateau is driven by topography. In the outwash near Arlington groundwater flows to the northwest towards the Stillaguamish River. In the Granite Falls area groundwater flows mainly to the south towards the Pilchuck River and Little Pilchuck Creek, although

Table 3-2. Stratigraphy of the Getchell Plateau.

Period	Epoch	Hydrogeologic Unit	Alternate Name	Symbol	Median Thickness ft	Maximum Thickness ft	Lithologic characteristics	Hydrologic characteristics
Quaternary	Holocene	Peat	NA	Qp	NA	25	Fibrous and woody peat layers interbedded with organic-rich mud.	Not an aquifer or a confining bed. Too thin and discontinuous.
		Alluvium	NA	Qal	20	45	Fine sand with lenses of silt and clay overlying coarser sand and gravel.	Unconfined aquifer.
	Pleistocene	Recessional Outwash	Vashon Recessional Outwash	Qvr	20	75	Gray to brown moderate- to well-sorted sand (top) and gravel (bottom). Some silt lenses.	Unconfined and perched aquifer.
		Till	Vashon Till	Qvt	75	155	Compact, gray unsorted mixture of sand, pebbles, cobbles and boulders in a silt and clay matrix.	Confining bed, but yields usable amounts of water from lenses of sand and gravel.
		Advance Outwash	Esperance Sand	Qva	70	170	Brown to gray pebbly sand (finer at bottom, coarser and contains gravel at top). Some silt lenses.	Principal aquifer is terms of use. Generally confined.
		Transitional Beds (Upper Fine)	Lawton Clay	Q(A)f	75	240	Gray, laminated, silty clay (bottom) grading to clayey sand (top).	Confining bed, but yields usable amounts of water.
		Upper Coarse	NA	Q(A)c	50	NA	Fluvial sandy gravel. Some silt and peat lenses.	Mostly an aquifer, but includes some confining beds. Most water is confined.
		Lower Fine	Possession Drift	Q(B)f	85	180	Compact, gray, unsorted, sandy hardpan till.	Confining bed.
		Lower Coarse	Whidbey Formation	Q(B)c	100	NA	Cross-bedded, compact, commonly oxidized, medium-to-coarse grained sand with interbeds of fine-grained sand and silty sand.	Aquifer.
Tertiary	**Eocene**	Bedrock	Sedimentary rock	Tb	65	200	Conglomerate, sandstone, siltstone, shale, coal beds.	Confining bed, but can yield usable amounts of water in fractures and joints.

Table 3-3. Depth to Water Data for all Getchell Plateau Wells.

Aquifer Unit	Minimum Depth to Water Measurement	25th Percentile	Average	Median	75th Percentile	Maximum Depth to Water Measurement	Number of Water Level Measurements	Hydraulic Conductivity
	ft bgs[1]	ft bgs	ft bgs	ft bgs	ft bgs	ft bgs		ft/day
Alluvium	0	8	9	9	11	18	45	34
Vashon Recessional Outwash	3	8	15	12	18	85	108	90
Vashon Till	0	10	24	15	29	95	204	32
Vashon Advance Outwash	-12	29	61	53	82	265	1,398	80
Upper Fine Grained Unit	0	8	34	17	35	130	10	No data
Upper Course Grained Unit	-2	136	127	143	162	175	6	35
Lower Course Grained Unit	-2	57	112	100	163	317	213	35
Sedimentary Rock	-4	13	68	48	87	292	144	13

[1] ft bgs = feet below ground surface.

Table 3-4. Depth to groundwater by decade and month for each aquifer.

Aquifer	Depth to Water				
	Average	**Minimum**	**Maximum**	**25th percentile**	**75th percentile**
	ft bgs[(1)]	ft bgs	ft bgs	ft bgs	ft bgs
Alluvium (Average Well Depth 30 ft bgs)					
All Data	9.0	1.0	15.0	7.5	11.0
Decade					
1970	8.5	7.0	10.0	7.8	9.3
1980	8.8	0.0	15.0	8.3	10.8
1990	9.6	1.0	18.0	7.0	12.0
2000	8.4	7.0	11.0	8.0	8.3
Month					
October	9.5	8.0	11.0	8.8	10.3
November	8.5	7.0	10.0	7.8	9.3
December	10.0	8.0	12.0	9.0	11.0
January	13.0	13.0	13.0	13.0	13.0
February	7.3	4.0	8.0	7.5	8.0
March	5.7	1.0	10.0	3.5	8.0
April	8.4	5.0	15.0	5.0	10.0
May	11.9	9.0	15.0	10.0	13.8
June	12.0	12.0	12.0	12.0	12.0
July	13.0	13.0	13.0	13.0	13.0
August	9.6	8.5	11.0	8.9	10.3
September	8.5	7.0	10.0	7.8	9.3
Recessional Outwash (Average Well Depth 45 ft bgs)					
All Data	15.3	3.0	85.0	8.0	17.9
Decade					
1970	8.5	9.0	25.0	10.0	20.0
1980	14.5	8.0	29.0	10.0	17.8
1990	14.7	3.0	85.0	7.4	16.0
2000	18.7	4.0	47.0	11.0	26.5
Month					
October	12.7	3.0	37.0	6.3	16.8
November	10.6	4.0	21.0	8.8	12.0
December	20.3	10.0	28.0	13.3	26.9
January	13.5	8.0	20.0	10.6	15.8
February	27.8	17.0	49.5	17.0	33.2
March	14.6	5.0	28.0	6.8	20.0
April	19.0	4.0	47.0	7.0	28.0
May	12.3	4.0	29.0	8.0	14.0
June	29.2	16.0	85.0	16.0	22.5
July	16.3	5.0	80.0	8.5	14.0
August	14.1	5.0	28.0	10.0	15.3
September	12.2	4.0	20.0	8.0	17.0

[(1)] ft bgs = feet below ground surface.

Table 3-4 (cont.). Depth to groundwater by decade and month for each aquifer.

Aquifer	Depth to Water				
	Average	Minimum	Maximum	25th percentile	75th percentile
	ft bgs[(1)]	ft bgs	ft bgs	ft bgs	ft bgs
Glacial Till (Average Well Depth 45 ft bgs)					
All Data	21.0	0.0	95.0	10.0	27.5
Decade					
1940	14.0	8.8	18.0	12.0	16.6
1970	31.9	2.0	95.0	11.5	43.8
1980	20.7	0.0	79.0	12.0	22.0
1990	21.3	0.0	71.4	9.6	30.0
2000	18.9	0.0	69.7	7.6	21.6
Month					
October	21.6	6.0	68.0	13.5	23.3
November	18.6	0.0	79.0	6.8	16.0
December	28.6	8.0	64.0	12.3	38.3
January	18.8	5.0	42.0	12.0	25.0
February	18.2	1.0	52.0	10.0	26.0
March	17.2	1.3	69.7	7.8	18.0
April	22.6	1.0	125.0	5.8	26.4
May	27.0	2.0	95.0	7.5	40.0
June	17.5	6.0	42.0	11.0	16.0
July	24.7	0.0	71.4	12.0	29.0
August	18.0	0.0	69.4	8.4	19.0
September	25.1	0.0	70.0	8.3	38.5
Advance Outwash (Average Well Depth 105 ft bgs)					
All Data	60.7	-11.6	265.0	29.0	82.0
Decade					
1930	56.0	56.0	56.0	56.0	56.0
1940	81.7	60.0	112.5	66.3	92.5
1950	72.0	72.0	72.0	72.0	72.0
1970	64.7	0.0	243.0	32.0	95.8
1980	53.4	-1.0	226.0	26.0	74.0
1990	63.3	-11.6	265.0	29.0	85.0
2000	61.8	0.0	224.6	30.5	83.5
Month					
October	64.5	0.0	253.0	30.0	84.3
November	56.1	0.0	243.0	20.0	79.0
December	70.1	13.0	208.0	50.0	82.0
January	64.4	0.0	205.0	30.0	86.3
February	59.6	0.0	212.5	29.0	81.0
March	57.2	-11.6	224.6	25.0	76.6
April	57.6	0.0	220.0	22.0	78.0
May	61.3	0.0	224.0	34.0	80.0
June	58.3	0.0	250.0	27.3	84.3
July	59.3	0.0	265.0	28.0	82.0
August	61.8	-1.0	249.9	25.0	81.4
September	62.2	0.0	252.0	32.0	84.3

(1) ft bgs = feet below ground surface.

Table 3-4 (cont.). Depth to groundwater by decade and month for each aquifer.

Aquifer	Depth to Water				
	Average	Minimum	Maximum	25th percentile	75th percentile
	ft bgs[(1)]	ft bgs	ft bgs	ft bgs	ft bgs
Upper Coarse Grained Unit (Average Well Depth 215 ft bgs)					
All Data	112.5	-2.0	317.0	57.1	163.6
Decade					
1960	84.0	57.0	132.0	60.0	97.5
1970	120.1	4.0	261.0	72.5	169.5
1980	134.6	1.0	317.0	82.0	205.0
1990	110.2	0.0	311.0	60.0	150.0
2000	87.7	-2.0	225.1	31.0	125.5
Month					
October	124.8	27.0	230.0	84.0	186.8
November	137.9	19.0	311.0	49.5	215.0
December	120.5	4.0	215.0	70.0	181.5
January	101.3	7.4	212.0	59.0	141.0
February	105.9	1.0	271.0	46.9	144.5
March	86.7	-2.0	248.0	49.3	112.0
April	126.9	18.0	284.0	55.3	194.6
May	103.0	0.0	200.0	28.3	175.0
June	114.1	16.0	250.0	72.5	144.4
July	123.1	13.0	317.0	69.9	152.1
August	98.3	0.0	225.1	42.5	143.8
September	117.8	0.0	284.0	52.9	184.5
Lower Coarse Grained Unit (Average Well Depth 310 ft bgs)					
All Data	126.7	-2.0	175.0	136.3	161.5
Decade					
1970	175.0	175.0	175.0	175.0	175.0
1980	136.0	136.0	136.0	136.0	136.0
1990	94.3	-2.0	148.0	67.5	142.5
2000	166.0	166.0	166.0	166.0	166.0
Month--No Data					
Sedimentary (Average Well Depth 210 ft bgs)					
All Data	67.8	-4.3	292.0	13.0	87.0
Decade					
1970	89.4	0.0	260.0	44.5	109.0
1980	66.3	8.0	235.0	20.0	75.0
1990	64.4	0.0	292.0	12.8	80.5
2000	80.8	-4.3	230.0	25.0	121.5
Month					
October	57.0	0.0	197.0	6.8	78.5
November	74.5	2.0	292.0	13.0	75.5
December	25.0	0.0	69.0	3.0	37.5
January	80.0	8.0	260.0	8.8	97.3
February	58.5	11.0	185.0	26.5	71.0
March	75.3	4.0	287.0	22.0	62.8
April	78.0	-4.3	220.0	30.5	103.0
May	68.3	12.0	225.0	22.3	87.6
June	49.3	1.0	174.0	10.0	55.0
July	75.4	3.0	180.0	24.0	106.6
August	73.6	5.0	271.6	20.0	98.5
September	83.6	10.2	192.0	31.0	129.0

(1) ft bgs = feet below ground surface.

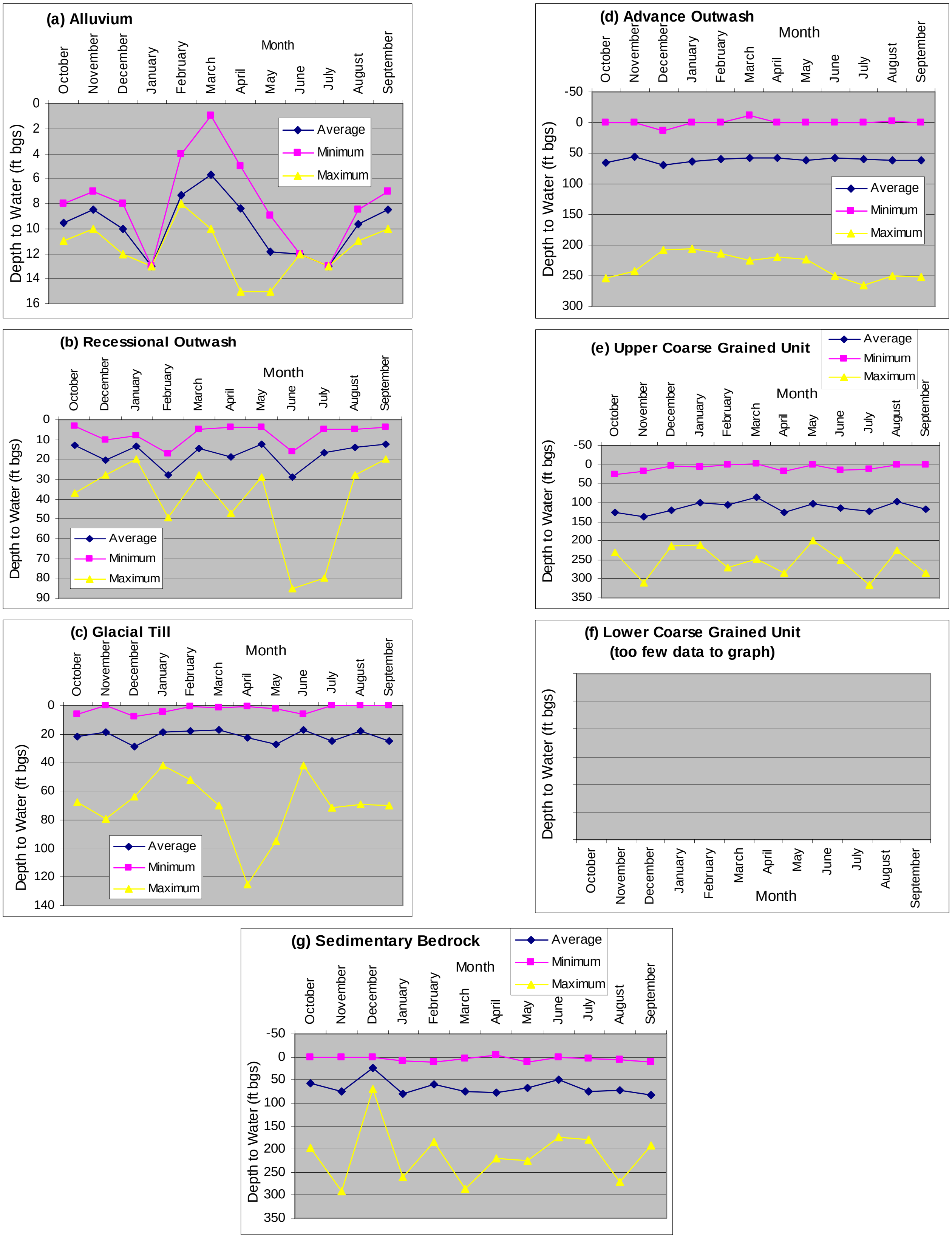

Figure 3-5. Graphs showing the depth to water variations by month

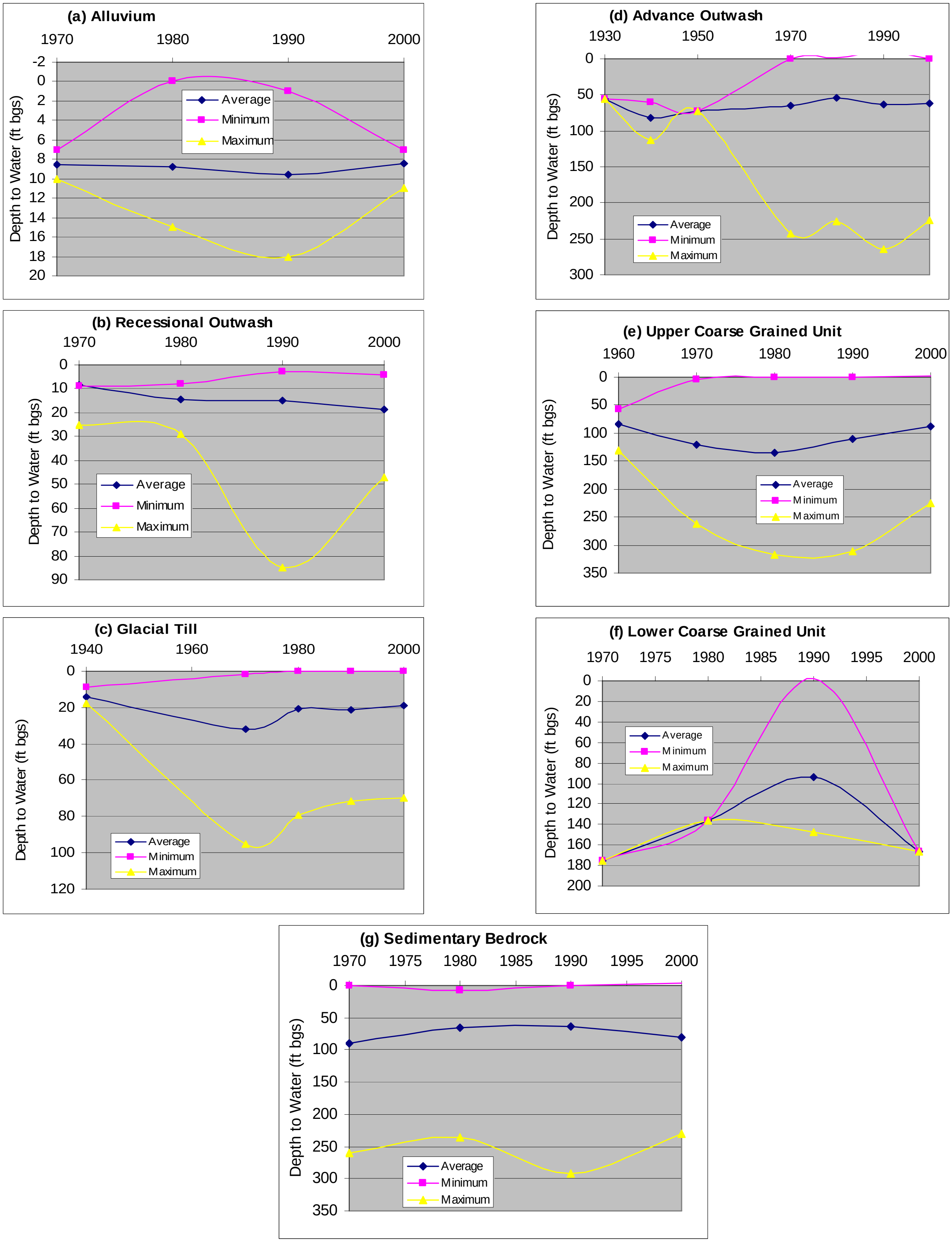

Figure 3-6. Graphs showing the depth to water variations by decade

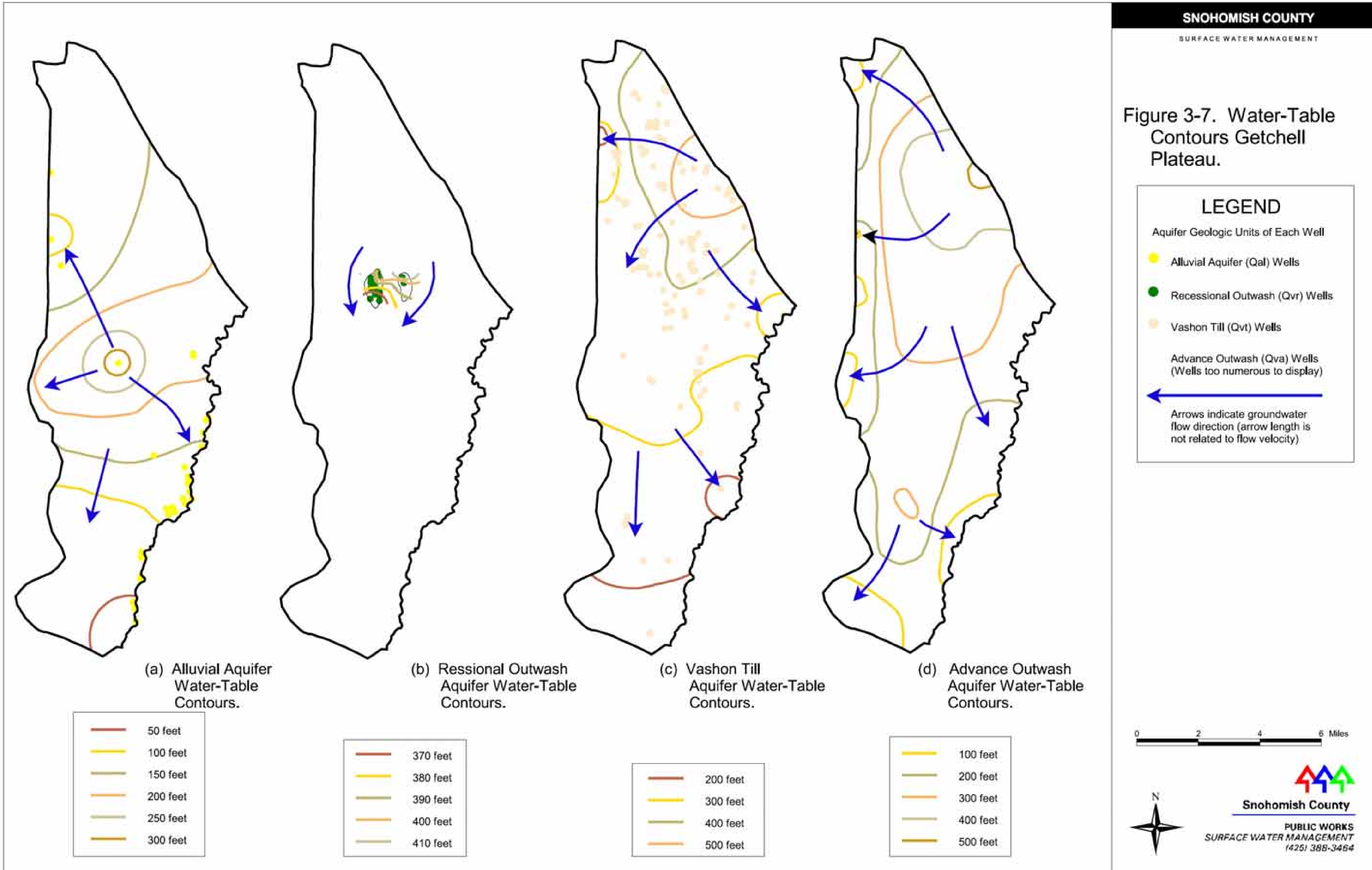

Figure 3-7. Water-Table Contours Getchell Plateau.

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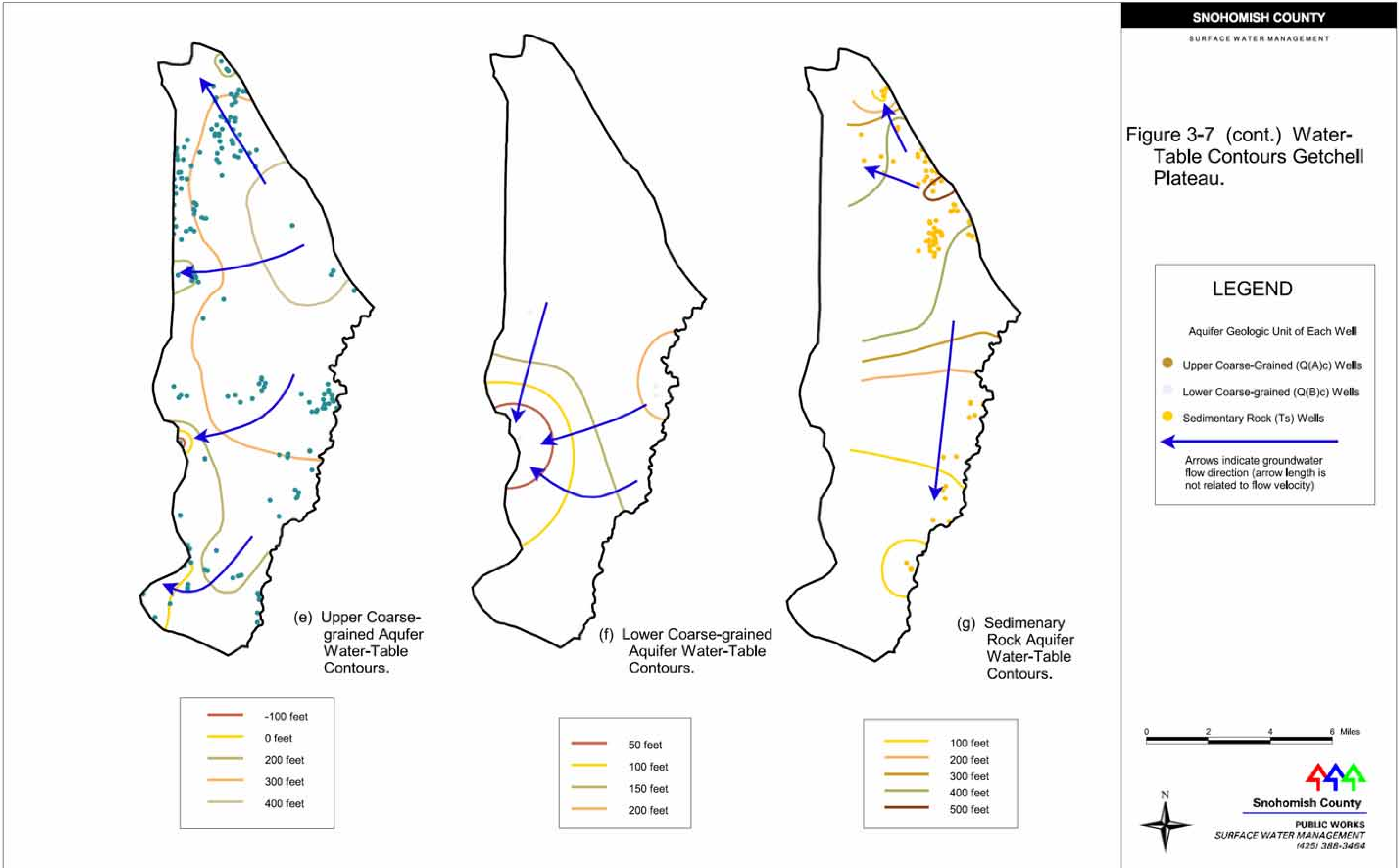

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some groundwater flows north into the South Fork Stillaguamish River drainage. Groundwater flow in the recessional outwash on the plateau top (Figures 3-2 and 3-7b) is generally to the southeast, but also includes a downward flow trend or groundwater recharge.

Vashon till—Qvt

Glacial till was deposited at the base of the Vashon glacier between 13,500 and 18,500 years ago (Armstrong et al., 1965). The till deposits found on the Getchell Plateau probably date from between 13,500 years ago and 14,500 years ago. The till is an unsorted mixture of clay, silt, sand, gravel and boulders. Located within the glacial till are stratified lenses of sand, found typically near the base of the unit (Minard, 1985e). The great weight of the Vashon glacier, at times more that 4,000 feet (1,300 meters) thick, compressed the unsorted material into a very dense deposit. The till mantles the upland surface of the Getchell Plateau, covering 58 square miles, or 70%, of the investigation area. Outcrops of the till can be found along Wade Road and Burns Road (Figure 3-3).

The dense and compact structure of the till means that it yields little water to wells, making it an aquitard. In the northeastern section of the investigation area, till is known to confine groundwater and thus create artesian conditions in the underlying aquifer. Artesian conditions are also present beneath fingers of till, which extend and out under the Marysville Trough.

The dense till retards drainage, perching water near the surface, especially during the wetter times of the year. The perched water-table within the till can create on-site waste disposal problems for residences on the Getchell Plateau. Mounded septic drainfields are a common sight within the investigation area. The perched water-table does have a positive benefit, creating ideal conditions for lake and wetland formation on upland surfaces.

The glacial till can be as thick as 155 feet and has a median thickness of 75 feet (Table 3-2). Many of the thicker till measurements were obtained from drilling logs that lack detail; therefore, these records may include more than one till layer, overestimating the thickness.

The glacial till is not homogenous; meaning that there are areas of deep weathering or relatively loose sand lenses that will yield sufficient quantities of groundwater to meet the need of individual well owners. These groundwater bodies occur as unconfined and discontinuous perched aquifers. Wells that tap the glacial till have an average hydraulic conductivity of 32 ft/day (Table 3-3), which is well above typical glacial till conductivities (Freeze and Cherry, 1979). Groundwater in the glacial till is tapped by 191 domestic wells. The comparatively large number of wells, relative to the typical low productivity of the glacial till, is due to its large aerial extent (Figures 3-1 and 3-2) and the low cost of drilling a shallow well.

The median depth to groundwater in the till is 15 ft bgs (Table 3-3). The water table fluctuates up to eight feet between a low water near 20 ft bgs in September to a high water level near 12 ft bgs in May (Table 3-4 and Figure 3-5c). A comparison of water levels taken since the 1940s shows almost no change; however, the water table in the early 2000s appears to be close to five feet higher than was recorded in the 1990s (Table 3-4 and Figure 3-6c). There is insufficient detail in the data to determine the significance of this water level change. Multiple water level measurements are available from 16 wells completed in the glacial till aquifers. These water levels indicate a possible three-foot decline in water-table elevation since the 1970s (Table 3-6).

Groundwater flow in the till follows the surface topography of the Getchell Plateau and the topography of the base of the till (Figures 3-2 and 3-7c) in the northern portion the investigation area is generally west to southwest towards the Marysville Trough. Groundwater flow in the till in the southern portion the investigation area is generally south toward the City of Snohomish (Figures 3-2 and 3-7c).

Groundwater flow in the Granite Falls area is mainly to the south toward the Pilchuck River and Little Pilchuck Creek. Some groundwater flows north into the South Fork Stillaguamish River drainage. Groundwater flow in the till on the plateau top (Figures 3-2 and 3-7c) is generally to the southeast. The water levels indicate downward flow or groundwater recharge. Analysis of the groundwater flow patterns from the till aquifer does not yield any obvious or discrete areas of groundwater recharge; however, the groundwater flow patterns indicate a

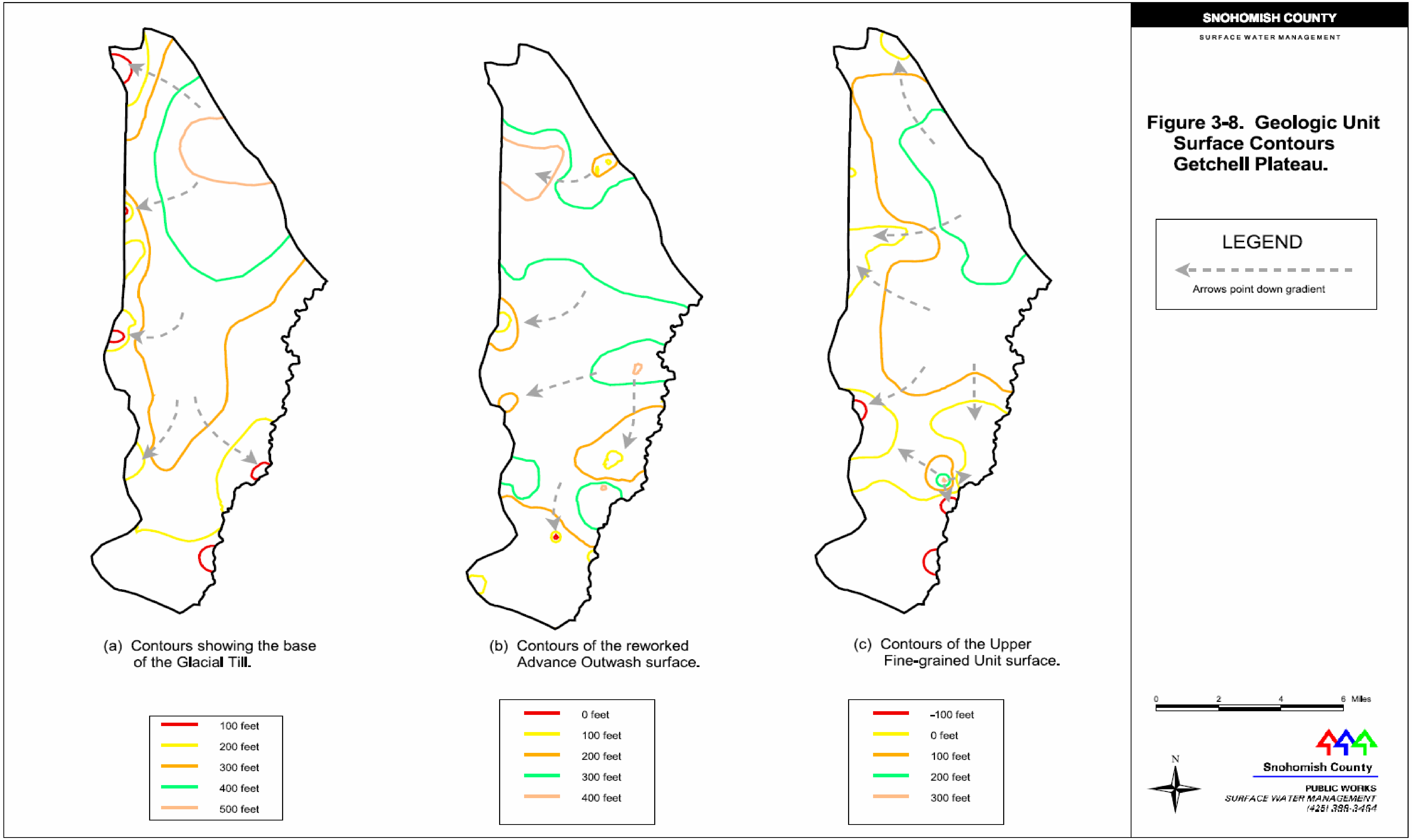

Figure 3-8. Geologic Unit Surface Contours Getchell Plateau.

Project name: x:\wq\groundwater\arcview\getchell\contours.apr Plot date: Oct 21, 2004; Figure 3-6 (pt 1) jak

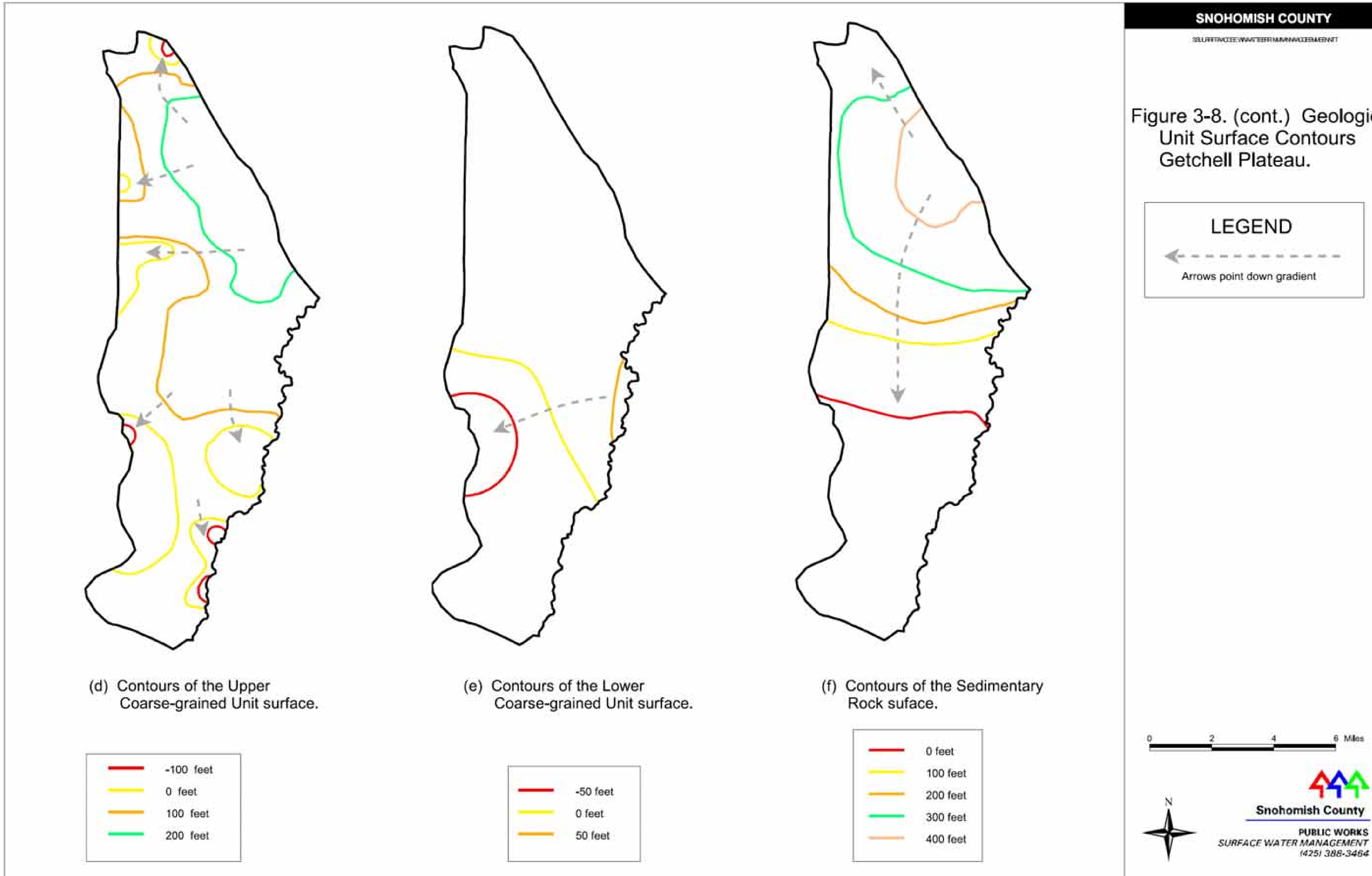

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Table 3-5. Summary of water level differences in wells with multiple measurements.

	Water-level difference (ft)					Seasonal Variation		Time Between	
	Number of Wells	25th Percentile	Average	Median	75th Percentile	Average Wet to Dry	Number of Wells	Average	Range
Alluvium (Qal)									
All	3	-3	-3	-3	-2	2	1	4	3
Vashon recessional outwash (Qvr)									
<5 yrs	3	-4	-2	-4	-1	2	3	3	2
>5 yrs	4	-4	-2	-2	-1	All dry season		6	2
Vashon till (Qvt)									
<5 yrs	6	-3	-2	-1	2	2	3	3	4
>5 yrs	10	0	0	2	4	1	6	13	44
Vashon advance outwash (Qva)									
<5 yrs	34	-2	-2	-1	1	5	16	2	4
>5 yrs	63	-6	-1	-1	2	1	32	13	50
Pre-Fraser, Upper fine (Q(A)f)									
All	1	0	0	0	0	Too few wells		5	0
Pre-Fraser, Upper coarse (Q(A)c)[1]									
<5 yrs	9	-3	-2	0	3	5	4	2	4
>5 yrs	18	0	17	7	24	24	12	10	12
Pre-Fraser, Lower coarse (Q(B)c)									
All	1	-1	-1	-1	-1	Too few wells		6	0
Sedimentary (Ts)									
<5 yrs	7	-1	4	3	14	5	6	2	3
>5 yrs	2	-40	-27	-27	-14	All dry season		15	3

(1) Dry well, no water level data available.

region of groundwater discharge into the Marysville Trough southeast of Arlington (Figure 3-7c).

Vashon Advance Outwash—Qva

The Vashon advance outwash was deposited by the between 18,000 years ago and 14,500 years ago (Mullineaux et al., 1965). The advance outwash is composed of well-stratified, clean, gray, pebbly sand deposited by braided streams and deltas that once occupied Lake Russell. The outwash sediment size increases from a silty sand at the base, to coarser gravelly sand near the contact with the overlying Vashon till (Minard, 1985e). Internal structures include thick sand layers, lenses of silt, sand and gravel, and extensive cross stratification (Minard, 1985e).

The advance outwash aquifer underlies nearly the entire Getchell Plateau, making it the most extensive aquifer in the investigation area. The clean sands of the advance outwash deposits also make it a very productive aquifer. The advance outwash aquifer is also the thickest aquifer beneath the Getchell Plateau, which can be as thick as 170 feet, and averages 70 feet thick (Table 3-2). Wells rarely penetrate the advance outwash aquifer fully, so the aquifer thickness is likely underestimated.

The advance outwash outcrops over just six square miles or seven percent of the of the investigation area. Outcroppings of the advance outwash can be found along the western edge of the Getchell Plateau where the plateau slopes into the Marysville Trough. The advance outwash also outcrops in the hillslopes above the Snohomish River west and south of the City of Snohomish (Figures 3-1 and 3-2).

The advance outwash contains the most productive quantities of groundwater underlying the Getchell Plateau, as well as the other Snohomish County plateaus (Newcomb, 1952; Economics and Engineering Services, 1991; Thomas et al., 1997). Nearly 1,300 domestic wells tap the advance outwash aquifer in the investigation area. The average hydraulic conductivity for the advance outwash is 80 ft/day (Table 3-3), a value typical of clean sand to fine sand (Freeze and Cherry, 1979).

The advance outwash aquifer is confined over much of its extent, especially in the northeastern portion of the investigation area. Typically the advance outwash aquifer is confined by the overlying glacial till; however, there is a mixture of confined and unconfined conditions distributed unevenly throughout the investigation area. The variability in aquifer confinement is explained by the lack of homogeneity in the glacial sediments. Drillers' logs confirm this by documenting areas of aquifer confinement unrelated to the glacial till. The evidence suggests that these confined areas are caused by silt lenses within the advance outwash itself. The drillers' logs also document unconfined conditions in some areas because the advance outwash is not saturated immediately below the glacial till. The lack of localized confined conditions is expected since the contact between the till and advance outwash is very irregular (Figure 3-7b). This irregular surface is typical of a deposit that has been reworked by an advancing glacier.

The median depth to groundwater in the advance outwash is 53 ft bgs (Table 3-3). The water table fluctuates up to 25 feet between a low water level near 70 ft bgs in December to a high water level near 45 ft bgs in April (Table 3-4 and Figure 3-5d). A comparison of water levels taken since the 1930s indicates a possible relative decline of five feet, with the lowest water levels occurring in the 1940s and 1950s (Table 3-4 and Figure 3-6d). Multiple water level measurements are available from 97 wells completed in the advance outwash aquifer. These water levels indicate a possible two-foot to six-foot decline in water-table elevation since the 1940s (Table 3-6d). A two-tailed Student's t-test was used to assess the significance of the decline. The results of the t-test indicate that the decline can not be distinguished from no decline at the 95% confidence interval.

Groundwater flow in the advance outwash aquifer is driven by topography. Groundwater flow in the northeastern portion the investigation area radiates to the north, west, and east from a major groundwater recharge area. The recharge area is bounded by an outcropping of sedimentary rocks that forms the northeastern limit of the Getchell Plateau (Figures 3-1, 3-2, and 3-7d). The groundwater flow pattern indicates a major groundwater discharge area along the western edge of the Getchell Plateau where it meets the Marysville Trough. This discharge area corresponds with the most extensive outcroppings of the advance outwash deposits in the investigation area. This discharge area also corresponds with the headwaters of the mainstem Quilceda Creek. Groundwater flow in the southern portion of the plateau radiates west and east from the top of the

Getchell Plateau (Figures 3-1, 3-2, and 3-7d). Groundwater flow beneath the City of Snohomish at the southern extreme of the Getchell Plateau is south toward the advance outwash outcrops above the Snohomish River (Figures 3-1, 3-2, and 3-7d). The groundwater flow pattern within the advance outwash is generally downward at the highest elevations of the plateau, indicating groundwater recharge. This flow pattern suggests that groundwater recharge occurs through the glacial till and is derived exclusively from precipitation. Additionally there is very little, if any, groundwater recharge that occurs from the underlying aquifers.

Upper Fine-grained unit—Q(A)f

The upper fine-grained unit was deposited by the advancing Vashon glacier between 18,000 years ago and 14,500 years ago, the same period of time as the Vashon advance outwash (Mullineaux et al., 1965; Porter and Swanson, 1998). The upper fine-grained deposits are composed of thick beds of gray clay, silt, and sand at the base, and lenses of medium-to-coarse sand, and silty-to-clayey sand with sparse pebbles are common in the upper section (Minard, 1985e). The upper fine-grained unit has been mapped and described by a number of geologists over the last half century (Table 3-1).

These beds mark the transition from an interglacial environment to a glacial environment. The fine-grained base sediment was deposited in Lake Russell some distance from the ice front. These sediments also contain lenses of pebbly material dropped from melting icebergs that calved into and plied Lake Russell, which filled the Puget Lowland in front of the glacier.

The upper fine-grained unit has an average thickness of 75 feet but can be as thick as 240 feet (Figure 3-2 and Table 3-2). The upper fine-grained unit is the aquitard that directly underlies the Vashon advance outwash aquifer. No wells are known to draw useable quantities water from the upper fine-grained unit. Outcrops of the upper fine-grained unit can be found along Wade Road, near the old Sisco landfill (Figure 3-9). The upper fine-grained unit was mapped as part of the Vashon advance outwash (Thomas et al., 1997) so it is not possible to determine the extent of its surface exposures. There are 181 domestic wells that penetrate the upper fine-grained unit to tap the underlying aquifers. These wells indicate that it is present beneath nearly all of the Getchell Plateau, although the upper fine-grained unit appears to be absent northeast of Lake Stevens and appears to be very thin over the underlying sedimentary rocks (Figures 3-1 and 3-2).

Figure 3-9. Photograph of the Upper Fine Grained Unit or Lawton clay.

Upper Coarse-Grained Unit—Q(A)c

The upper coarse-grained unit represents a purely hydrogeologic unit that cannot be correlated with a single geologic unit based on the available information. The upper coarse-grained unit is non-glacial, having been deposited during one of two interglacial periods that occurred between 13,500 years (Easterbrook et al., 1982) and 100,000 years ago (Troost, 1999; Borden and Troost, 2001). The upper coarse-grained unit is typically composed of compact, stratified, alluvial sand, pebbles and gravel with minor thin silt-clay beds (Minard, 1983; Minard and Booth, 1988). These sediments were deposited in a setting of shallow lakes, swamps, and floodplains, when a cool and moist climate prevailed in the Puget Lowland at that time (Armstrong, 1965). The upper coarse-grained unit is distinguished from the overlying younger sediments by notations of wood and peat on a driller's log.

The coarse sands of the upper coarse-grained unit can yield sufficient quantities of groundwater for domestic use. The wells that tap the upper coarse-grained unit have an average hydraulic conductivity of 35 ft/day (Table 3-3). Groundwater in the upper coarse-grained unit is tapped by 194 domestic wells, 90% of which are confined. No wells are known to fully penetrate the upper coarse-grained unit under the Getchell Plateau so the average thickness of 50 feet is taken from Woodard et al. (1995). Ecology water well reports for the Getchell Plateau do indicate that the upper coarse-grained unit is encountered at a median depth of 195 ft bgs. The maximum depth to the top of the upper coarse-grained unit is near 400 ft bgs. The upper coarse-grained unit outcrops in several small slivers above the Marysville Trough and the Snohomish River along the western margin of the plateau (Figures 3-1 and 3-2).

The median depth to groundwater in the upper coarse-grained unit is100 ft bgs (Table 3-3). The water table fluctuates up to 75 feet between a low water level near 136 ft bgs in December to a high water level near 61 ft bgs in March (Table 3-4 and Figure 3-5e). A comparison of water levels taken since the 1970s shows a roughly 30-foot increase in water-table elevation (Table 3-4 and Figure 3-6e). There is insufficient detail in the data to determine the significance of this water level change. Multiple water level measurements are available from 27 wells completed in the upper coarse-grained unit aquifer. These water levels indicate a possible three-foot decline to a 17-foot increase in water-table elevation since the 1970s (Table 3-6e).

Groundwater in the upper coarse-grained unit shows flow patterns that are comparable to the overlying Vashon advance aquifer (Figures 3-2 and 3-7e) and generally follow the topography of the unit surface (Figure 3-8e). The groundwater flow patterns indicate a major groundwater recharge area in the north with groundwater discharge occurring along the western plateau margin towards the Marysville Trough and along the southeastern plateau margin towards Little Pilchuck Creek.

Lower Fine-grained Unit—Q(B)f

The lower fine-grained unit is glacial sediment that was deposited around 80,000 years ago, during the Possession glaciation. These deposits are composed of compact, gray, unsorted, sandy glacial till, that resembles the Vashon till, as well as outwash sand and gravel and glaciomarine drift (Easterbrook et al., 1967; Easterbrook et al., 1982; Minard, 1983).

The fine sediment and compact structure of the fine-grained unit make it an effective aquitard. The lack of wells completed in the lower fine-grained unit supports this hypothesis. The lower fine-grained unit lies an average of 160 ft bgs along the southeastern limit of the Getchell Plateau (beneath Little Pilchuck Creek) and in the northeast (beneath the Olsen Lake area). There are no known outcrops of the lower-fine grained unit in the investigation area. The 22 domestic wells that penetrate this aquitard show an average thickness of 85 feet, but that it can be as thick as 180 feet (Thomas et al., 1997).

Lower Coarse-Grained Unit—Q(B)c

The lower coarse-grained unit is the Whidbey Formation of Easterbrook et al. (1967) and is distinguished from the upper coarse-grained unit by its stratigraphic position (Table 3-1). The lower coarse-grained unit is non-glacial sediment deposited between 60,000 and 130,000 years ago between the Possession glaciation and Double Bluff glaciation (Table 3-1). These deposits are composed of cross-bedded, compact, commonly oxidized (reddish), medium-to-coarse grained sand with interbeds of fine-grained sand and silty sand (Minard, 1983; Minard, 1985b).

Seven wells in the investigation area draw water from the lower coarse-grained unit, which averages 280 feet below ground surface. No wells that draw water from the lower coarse-grained unit penetrate it, but published data indicates that this unit averages 100 feet thick (Easterbrook et al., 1967 and Thomas et al., 1997). There are no known outcrops of the lower coarse-grained unit in the investigation area.

The lower coarse-grained unit is a moderately productive aquifer with an average hydraulic conductivity of 35 ft/day (Table 3-3). The median depth to groundwater is 140 ft bgs (Table 3-3). Water levels taken since the 1970s indicate almost no change in the water table's elevation (Table 3-4 and Figure 3-6g). Water levels from the three wells that were drilled in the 1990s have water levels that are nearly 50 feet shallower than the average (Table 3-4 and Figure 3-6g). There are too few measurements from the lower coarse-grained unit to assess apparent decline in water levels between the 1970s and the 1990s.

Groundwater flow in the lower coarse-grained aquifer is driven by the general southwestward slope of the Whidbey Formation itself (Figure 3-8e), which means that groundwater flow is to the southwest (Figure 3-7f). Groundwater recharge to the lower coarse-grained unit appears to be in the Lake Stevens areas with groundwater discharge to the Snohomish River valley.

Tertiary Bedrock—(Ts)

The Tertiary bedrock consists of sedimentary rocks that are composed of medium-hard yellowish sandstone, dark conglomerates and light-colored shale, and are more than 35-million years old (Table 3-1). The sedimentary rocks in the field area correlate to the Blakely Formation to the south and the Bulson Creek Formation to the north (Minard, 1985d). These rocks were most likely deposited in shallow marine and estuarine waters, although some the deposits were deposited by meandering rivers (Minard, 1985d). Coal interbedded in the sedimentary rock is noted on several drilling logs and was once mined from the on the left bank of the South Fork Stillaguamish River (Newcomb, 1952).

The sedimentary rocks are typically found at very great depths below the Getchell Plateau, except for an outcropping of marine sandstone and siltstone that form the northeastern limit of the plateau above the South Fork Stillaguamish River (Figures 3-1 and 3-2). The sedimentary rocks, principally sandstone, outcrop over an area of less than one square mile inside the investigation area.

For the most part, the tight structure of the sandstone and presence of fine-grained siltstone, mudstone, and coal layers make the sedimentary rocks an effective aquitard; however, 149 domestic wells draw useable volumes of water from the bedrock. Many of these wells tap water held in the more porous sandstone, while other wells draw water from naturally occurring fractures in the shale. In the absence of naturally occurring fractures, some home owners "hydrofracture" the bedrock creating artificial pathways for groundwater movement as well as creating artificial groundwater storage areas. The sedimentary rocks have an average hydraulic conductivity of 13 ft/day (Table 3-3), a value typical of semi-consolidated sandstone (Freeze and Cherry, 1979). The wells that tap the sedimentary rocks are located in a wide band were the sedimentary rocks underlie nearly the entire eastern edge of the Getchell Plateau. The pattern of wells indicates a surface that slopes gently northward toward the City of Arlington and gently southward beneath Little Pilchuck Creek (Figures 3-2 and 3-8f).

No wells penetrate the entire thickness of the bedrock within the investigation area. Published data indicates that these sedimentary rocks average 65 feet thick with a maximum thickness of 200 feet (Newcomb, 1952; Thomas et al., 1997). The median depth to groundwater is 48 ft bgs (Table 3-3). A comparison of water levels taken since the 1970s shows a nearly 10-foot increase in the average water-table elevation (Table 3-4 and Figure 3-6g). The water levels from the three wells drilled in the 1980s and 1990s have water levels nearly 15 feet shallower than the average (Table 3-4 and Figure 3-6g). Multiple water level measurements are available from nine wells completed in sandstone. These water levels indicate a possible 27-foot decline to a three-foot increase in water-table elevation since the 1970s (Table 3-6g). Very few multiple water levels are from the same well, and the 27-foot decline represents measurements taken during the dry summer months.

Groundwater flow in the sedimentary aquifer corresponds to the slope of the bedrock surface, i.e., groundwater flows northeast toward the City of Arlington and south towards City of Snohomish (Figure 3-7g). Groundwater flow in the sedimentary aquifer is generally downward indicating that it is being recharged from the overlying aquifers and is not a source of groundwater recharge for the Getchell Plateau. The later point is important because this conclusion refutes the suggestion by some workers in that the lowland aquifers are recharged, in part, by groundwater originating in the Cascade Range. Groundwater recharge appears to be concentrated in the northeast with groundwater discharge occurring in near the City of Arlington and the City of Snohomish County.

4.1 Introduction

Previous studies of Snohomish County's groundwater focused on the advance outwash aquifer, so little is known about the shallow and deeper aquifers. Also, previous groundwater quality studies have relied on a relatively small number of samples over a large area. This investigation differs because the project team compiled water level data from nearly 2,600 wells, and analyzed 15,800 individual water quality measurements collected from 460 wells. These data include water level and water quality measurements taken by Snohomish County from about 60 wells in 2002 and 2003.

Precipitation delivers an average of 44.2 in (1,120 mm) or nearly 200,000 acre-feet of water per year (ac-ft/yr) to the Getchell Plateau (Godwin and Moore, 1996). This is nearly 65 billion gallons of water. If entirely consumed, this is enough water to meet the annual needs of over 2.2 million people, each consuming 80 gallons per day (gpd). However, not all of the precipitation that falls on the plateau is available for consumption.

The aquifers of the Getchell Plateau discharge an estimated 19.2 in (490 mm) or over 85,600 ac-ft/yr of water directly to the streams that drain the plateau. Streamflow measurements show that discharge to streams draining the plateau top, such as Stevens Creek and Little Pilchuck Creek, is greater than the discharge to streams that drain the advance outwash along the plateau margins, such as Quilceda Creek. This pattern suggests that discharge from the shallow or water-table aquifers exceeds the discharge from the deeper aquifers. Also, the discharge from the shallow aquifers drains to the southeast, and discharge from the deeper aquifers drains to the west.

4.2 Assessing Groundwater Availability—The Water Budget

4.2.1 Water Budget Basics

A water budget quantifies the major components of the hydrologic cycle in an attempt to assess the volume of water available for consumptive use. Large groundwater systems, such as the one found on the Getchell Plateau, usually achieve equilibrium between water input, changes in water storage, and water outflow when viewed over a period of decades or centuries. A large withdrawal in one year typically has no measurable impact on the resource (e.g. no change in storage) so long as it is balanced by an increase in input or decrease in output the following year; however, the timing and source of water consumptively used is an important consideration. Water levels in wells tapping a shallow water-table aquifer may decline during a single year of reduced precipitation, whereas water levels in wells tapping a deeper confined aquifer may not decline even after several years or even decades of reduced precipitation or overconsumption.

A typical assumption in a water budget is that the volume of water delivered to the system, that is, the entire groundwater recharge volume, is available for consumptive use (Bredehoeft et al., 1982; Bredehoeft, 2002); however, the premise that 100% of the groundwater recharge is available for consumptive use on a sustainable basis is rarely true. Research by Theis (1940), Bredehoeft et al. (1982), and Bredehoeft (2002) has shown that the water available for sustainable use must be balanced against the volume of water discharged from the system. Therefore, the water available for sustainable use is independent of the recharge volume, but is dependent on the response of the aquifer system to the volume of water withdrawn (Bredehoeft et al., 1982; Bredehoeft, 2002). Computer models developed to examine groundwater use in the Puget Lowland have shown that groundwater withdrawals are often balanced by reduced spring production and reduced streamflow (Morgan and Jones, 1999).

4.2.2 The Water Budget Expression

The components of the water budget, input, output and changes in storage can be expressed mathematically. If the system is in equilibrium the water budget can be expressed in its simplest form by the mass balance equation:

$$\mathbf{O = I \pm \Delta S} \qquad (4\text{-}1)$$

where

- **O** = water output or discharge;
- **I** = the water input or precipitation; and
- **S** = water storage, specifically the change in storage (**ΔS**).

I—Input

Rainfall

Rainfall makes up 100% of the water input to the Getchell Plateau system, since no major river systems traverse or otherwise deliver water to the Getchell Plateau. Groundwater recharge from the adjacent aquifers is thought to be negligible, since the groundwater systems beneath the Getchell Plateau are elevated above the surrounding systems and because there is an extensive aquitard system blocking potential groundwater flow from the higher elevation Cascade foothills to the east.

While no major river systems deliver water to the investigation area, the cities of Arlington, Lake Stevens, Marysville, and Snohomish are net importers of potable water to the Getchell Plateau (DOH, 2004a). The exact figures for the volume of water imported by the major cities are not available; however, these cities have the capacity to import an estimated 16,000 ac-ft/yr, which is enough water to supply nearly 180,000 people (DOH, 2004a).

The Snohomish County Public Utility District (PUD), which supplies the City of Lake Stevens and the City of Marysville, has wells that tap water beneath the plateau. These wells are maintained for supplemental supply and are rarely used (Wood, 2004, pers. comm.; PUD, 2004, pers. comm.). The City of Arlington has three wells located just outside of the investigation area boundary. The City of Arlington wells are located on a terrace near the northern boundary of the plateau and draw much of their water from the South Fork Stillaguamish River.

A more detailed examination of water use and importation by the Getchell Plateau cities is presented in Chapter 5.

Groundwater Recharge

Groundwater recharge values for the Getchell Plateau were initially estimated using published data. The first estimate of 21.5 in/yr (550 mm) of recharge was derived graphically using the Snohomish County groundwater study by Thomas et al. (1997). The graph in that study was developed using recharge-to-precipitation relationships derived from an application of the deep percolation model, or DPM (Bauer and Mastin, 1997; Bauer and Vaccaro, 1987), that was applied to South King County (Woodward et al., 1995). A second recharge estimate was developed using the mathematical relationships developed from the DPM by Woodward et al. (1995) and displayed graphically by Thomas et al. (1997). The Woodward et al. (1995) expressions give a slightly lower recharge rate of 20.5 in/yr (520 mm/yr).

The DPM uses a daily water budget approach to calculate the rate of groundwater recharge (Bauer and Vaccaro, 1987; Bauer and Mastin, 1997). While the DPM is conceptually very simple, it is difficult to measure all the required input and output parameters. It is also necessary to calibrate the DPM using measured values for groundwater infiltration. The DPM typically relies on groundwater dating techniques (e.g. chloride ion or tritium concentration measurements) to establish the groundwater infiltration rate without direct measurements (Bradbury, 1991; Eriksson and Khunakasem, 1969).

Groundwater recharge estimates based on the DPM suggest that groundwater recharge through glacial till may be as low as two to six in/yr (50 to 150 mm/yr; Bauer and Mastin, 1997; Orr et al., 2002). These low values are difficult to reconcile with actual observations and estimates by Woodard et al. (1995) and Thomas et al. (1997). The low DPM estimates may represent the rate at which water percolates though homogeneous and unfractured till. The higher published values contained in Woodard et al. (1995) and Thomas et al. (1997) most likely represent a more realistic scenario where recharge occurs through an inhomogeneous and fractured till.

Wolock (2003a, b), in support of the USGS's National Water-Quality Assessment program, advanced the idea that, over the long term, groundwater recharge is equal to the discharge to streams, and that the discharge to streams is equal to the average stream baseflow. This assumption is applicable to groundwater systems that receive little input from the outside and lack strong evidence of significant subsurface discharge.

The Getchell Plateau appears to meet the basic assumptions of Wolock (2003a, b), so it is possible to estimate groundwater recharge if the stream baseflow can be determined. Using the USGS hydrograph separation software HYSEP, developed by Sloto and Crouse (1996), Sinclair and Pitz (1999) determined stream baseflow for all unregulated streams and rivers in Washington, including Little Pilchuck Creek, Stevens Creek, and Quilceda Creek, which drain the Getchell Plateau. The HYSEP results for analysis of these streams yielded an average annual baseflow of

19.2 in/yr (490 mm/yr). This value is in good agreement with Thomas et al. (1997) and Woodward et al. (1995) estimates of groundwater recharge through glacial till, so this is the value selected for use in the water budget.

Applying the assumptions of Wolock (2003a, b) to a water budget also yields an estimate of effective groundwater recharge, which is the volume of recharge volume that already accounts for consumptive water uses.

S—Storage

Changes in aquifer storage are reflected in water-table elevation changes for unconfined aquifers and the piezometric surface elevation for confined aquifers. Changes in aquifer storage are also reflected in changes in spring production and stream flow. The term ‘water table’ is used to represent changes in elevation for both the unconfined and confined aquifers in the discussion below.

Changes in spring production and stream flow are very difficult to measure and even more difficult to tie to specific causes (e.g. overuse). Changes in water-table elevation, on the other hand, can be determined if there are sufficient data available. As noted above, water level measurements are available from nearly 2,600 wells on the plateau. Therefore, while changes in groundwater storage cannot be estimated in absolute terms, it is possible to determine if there are any declines that would indicate a loss of storage, or increases that would indicate an increase in storage, by examining changes in water-table elevation.

Thomas et al. (1997) reported a median increase of one foot for the water-table elevation of the advance outwash aquifer beneath the Getchell Plateau; however, they did not test the statistical significance of their observations, so there is no way of knowing if this an actual or apparent increase. This investigation, with a larger number of samples, found a decline of one to two feet for the median elevation of the water table in the advance outwash aquifer (Table 3-4).

This investigation found that the median water-table elevation changes ranged from a seven-foot increase in the upper coarse-grained aquifer to a three-foot decline in the alluvial aquifer. Two measurements in the sedimentary bedrock aquifer indicated a 27-foot decline in the median water-table elevation, but the statistical significance of this result can not be tested.

Multiple water level elevation measurements taken at the same well are relatively rare. There are only 163 wells on the Getchell Plateau where the water level was measured more than once. This represents fewer than six percent of the nearly 2,600 wells with a recorded water level. There are, however, sufficient measurements to test the statistical significance of the water-table elevation changes in the advance outwash aquifer. The statistical test (detailed in Chapter 3) determined that the observed changes could not be distinguished from no change in water-table elevation. This means that there are no observed changes in groundwater storage beneath the Getchell Plateau. Unfortunately, there are insufficient data to test the statistical significance of the water-table elevation changes in the other aquifers.

O—Output

The discussion of output portion of the Getchell Plateau water budget is divided into direct surface runoff or stormflow, groundwater discharge, evapotranspiration, and groundwater consumption.

<u>Surface Runoff</u>

Surface runoff is the volume of water that runs directly off the land surface into streams without infiltrating into the groundwater system. The surface runoff leaving the Getchell Plateau was estimated to be 5.8 in/yr (150 mm/yr) by subtracting stream baseflow (assumed to be 100% groundwater discharge) from the mean annual streamflow. The mean annual stream flow values were obtained from Sinclair and Pitz (1999).

<u>Groundwater Discharge</u>

As noted above, groundwater discharge was assumed to be equal to the groundwater recharge, which was assumed to be equal to the stream baseflow. Stream baseflow was estimated to be 19.2 in/yr (490 mm/yr) (Table 4-1; Sinclair and Pitz, 1999).

<u>Evapotranspiration</u>

Evapotranspiration (ET) is the combined effect of evaporation from wet surfaces and transpiration from plants. Unlike runoff, baseflow, and groundwater discharge, there are no published data that can be used to directly estimate ET. The ET estimate method used in this investigation, developed by the USGS, relies on both measured and estimated data. The USGS method is relatively straightforward but requires a number of

Table 4-1. Getchell Plateau Water Budget.

Getchell Plateau Land Area	
Acre	**mi²**
53,612	84

Component	Quantity			Quantity		
	in/yr	ac-ft/yr	percent	in/yr	ac-ft/yr	**percent**
Precipitation	44.2	197,500	100			
<u>Fate of Precipitation</u>						
Total Stream Flow	24.9	111,400	56			
Runoff	5.8	25,800	13			
Groundwater Recharge	19.2	85,600	43			
Evapotranspiration	19.0	84,900	43			
<u>Fate of Recharge</u>						
Discharge to Streams	19.2	85,600	43			
Groundwater Outflow	0.3	1,200	1			
Withdrawals from wells	**Lowest Consumption Estimate**			**Highest Consumption Estimate**		
Group A	0.05	240	24.6	0.11	480	22.5
Group B	0.01	35	3.6	0.06	250	11.7
Private Domestic	0.16	700	71.8	0.31	1,400	65.7
Total Well Consumption	0.22	975	100.0	0.48	2,130	100.0
Water Right Allocation (Groundwater)	2.55	11,400				
Water Right Allocation (Surface Water)	0.78	3,500				
Water System Import Capacity	3.58	16,000				
Future Well Water Consumption Estimate	0.30	1,300		0.65	2,900	

steps, so the explanation is lengthy. ET was estimated for this investigation using the procedures detailed in Bauer and Mastin (1997) and Frans and Kresch (2004).

Water must be present at the surface, in the soil column, or available to plants before it can be evaporated or transpired. More water may be available for ET than the energy available to evaporate or transpire it. This is typical of the wet winter months in the Puget Lowland (Figure 1-6). Alternatively, more energy may be available for ET than the water available to be evaporated or transpired. This is typical of the dry summer months. Therefore, ET can be separated into potential evapotranspiration (PET) and actual evapotranspiration (AET).

PET can be related to the incoming solar radiation (energy) using a Priestly-Taylor-type equation (Jensen et al., 1990):

$$E_{\max} = \alpha\left(\frac{s}{s+\gamma}\right)\frac{R_n - G}{\lambda\rho_w} \qquad (4\text{-}2)$$

where

- E_{max} = potential evapotranspiration (in/yr);
- α = shortwave reflectance coefficient (dimensionless);
- s = the saturation vapor pressure-temperature curve (kPa/°C);
- γ = psychometric constant (kPa/°C);
- R_n = net solar radiation (MJ/m^2day);
- G = heat flux density to the ground (MJ/m^2day);
- λ = latent heat of vaporization of water (MJ/kg); and
- ρ_w = density of water (kg/m^3).

The Priestly-Taylor equation above is a simplification that assumes that the surface is wet and that the aerodynamic component (wind) of ET can be neglected. The shortwave reflectance coefficient (α) is obtained by calibrating the equation to local conditions. A value of 1.26 is generally used for wet surfaces or humid condition (Jensen et al., 1990). This value overestimates ET because, even though the Puget Lowland is humid and has wet surfaces for much of the year, there are periods when the surfaces are dry, reducing evaporation to zero. Therefore, the coefficient needs to be reduced to account for the moisture transfer occurring via plant transpiration only. Literature reviews conducted by the USGS found that a coefficient of 0.73 is appropriate for conifer forests (Bauer and Mastin, 1997; Frans and Kresch, 2004).

The slope of the saturation vapor pressure curve is determined by first estimating the saturation vapor pressure using the following equation developed by Tetens (1930) and Murray (1967):

$$e^{o} = \exp\left[\frac{16.78T - 116.9}{T + 237.3}\right] \qquad (4\text{-}3)$$

where

- T = temperature (°C); and
- $e°$ = the saturation vapor pressure (kPa).

Tetens (1930) and Murray (1967) estimate the slope of the vapor pressure curve using the following equation:

$$s = \frac{4098e^{o}}{(T + 237.3)^2} \qquad (4\text{-}4)$$

The psychometric constant used in the Priestly-Taylor equation is determined using the following equation:

$$\gamma = \frac{c_p P}{0.622\lambda} \qquad (4\text{-}5)$$

where

- c_p = specific heat at constant pressure (kJ/kg°C); and
- P = atmosphere pressure (kPa).

Specific heat does not vary much under humid conditions and therefore was assumed to be a constant 1.013 kJ/kg. Atmosphere pressure, although variable, was assumed to be a constant 96 kPa.

The energy input required to convert a liquid to a vapor, at a constant temperature, is called the latent heat of vaporization of water. The latent heat of vaporization does not change with changes in atmospheric pressure, but it does change with temperature (Jensen et al., 1990). Latent heat of vaporization was determined using the following equation developed by Harrison (1963):

$$\lambda = 2.501 - 2.361 * 10^{-3}T \qquad (4\text{-}6)$$

Net solar radiation is a function of solar radiation received at the earth's surface and the daytime net longwave radiation. Only the daytime values are used because transpiration is assumed fall to zero when the sun is not shining. Net solar radiation was estimated using the following equation:

$$R_n = (1 - a)R_s + R_{nl} \qquad (4\text{-}7)$$

where

a = albedo of the canopy (dimensionless);

R_s = solar radiation received at the earth's surface on a horizontal plane (MJ/m^{2}day or kW/m^2); and

R_{nl} = daytime net longwave radiation (MJ/m^{2}day).

The canopy albedo was assumed to be 0.12 (Jarvis et al., 1976). The daytime net longwave radiation was estimated using the following equation:

$$R_{nl} = \left(c + d \frac{R_s}{R_{s_{max}}} \right) \varepsilon_v (\varepsilon_a - 1) \sigma T^4 \qquad (4\text{-}8)$$

where

c = empirical constant (dimensionless);

d = empirical coefficient (dimensionless);

$R_{s_{max}}$ = maximum clear sky solar radiation (MJ/m^{2}day);

ε_v = longwave emissivity of the vegetation (dimensionless);

ε_a = effective longwave emissivity of the sky (dimensionless).

σ = Stephan-Boltzmann constant (5.675 *10^{-8} MJ/m^{2}dayT^4 or 4.903*10^{-9} kW/m^{2}T^4); and

T = average temperature of the daylight hours (°K).

Estimates for small values of net longwave radiation can be improved by using the empirical constant c and the empirical coefficient d. The constant c and the coefficient d sum to equal one. This investigation uses the values for c and d used by the USGS for a groundwater study completed on the Tulalip Reservation (Frans and Kresch, 2004).

The maximum clear sky solar radiation ($R_{s_{max}}$) is a fraction of the extraterrestrial radiation that reaches the earth's surface. The initial value for $R_{s_{max}}$ was obtained by direct measurement. There are no solar radiation gauges on or near the Getchell Plateau, so the project team used the closest permanent gauge, which is located on the roof of the University of Washington's Atmospheric Science building in Seattle. Bauer and Mastin (1997) adjusted their $R_{s_{max}}$ values by applying a month-dependent multiplier that they calculated for the Puget Lowland. This investigation applied the Bauer and Mastin (1997) multiplier to the measured $R_{s_{max}}$ values, which was also used by Frans and Kresch (2004).

Extraterrestrial radiation (R_a) is the radiation that would reach the earth's surface if there was no atmosphere present to filter the incoming radiation. Extraterrestrial radiation is a function of the date and latitude and is determined using the following equation:

$$R_a = \frac{24(60)}{\pi} G_{sc} d_r * \begin{bmatrix} \omega_s \sin(\varphi)\sin(\delta) \\ + \cos(\varphi)\cos(\delta)\sin(\omega_s) \end{bmatrix} \qquad (4\text{-}9)$$

where

R_a = extraterrestrial solar radiation received on a horizontal plane (MJ/m^{2}day);

G_{sc} = solar constant of 0.820 MJ/m^{2}min;

d_r = relative distance of the earth from the sun (dimensionless);

ω_s = sunset hour angle (radians);

φ = latitude (radians); and

δ = solar declination (radians).

The relative distance to the sun is determined using the following equation:

$$d_r = 1 + \cos\left(\frac{2\pi J}{365} \right) \qquad (4\text{-}10)$$

where

J = numerical day of the year (January 1 = 1).

The sunset hour angle is determined using the following equation:

$$\omega_s = \arccos(-\tan(\phi)\tan(\delta))$$

The solar declination was determined using the following equation:

$$\delta = 0.4093 \sin\left(\frac{2\pi(284 + J)}{365} \right) \qquad (4\text{-}11)$$

The longwave emissivity (ε_v) of the vegetation is considered to be constant. This investigation used an ε_v of 0.96, the same value used by Frans and Kresch (2004).

The effective longwave emissivity of the sky was determined using the following equation:

$$\varepsilon_a = 1 - 0.261e^{-0.00077T^2} \qquad (4\text{-}12)$$

The effective longwave emissivity of the sky is a function of the average daily temperature, which is determined using the equation developed by Idso and Jackson (1969):

$$T = \frac{(2T_{max} + T_{min})}{3} \qquad (4\text{-}13)$$

The application of the Priestly-Taylor equation detailed above computes daily PET. The annual AET for this investigation was determined by compiling daily PET values into monthly PET values. PET was calculated for the months between January 2002 and December 2004. Annual PET was estimated to be 26.9 in (690 mm), 29.9 in (760 mm), and 29.4 in (745 mm) for 2002, 2003, and 2004, respectively (Table 4-2). The small variation between the years is typical of the Priestly-Taylor results because solar radiation varies little between years (USGS, 2005, pers. comm.).

PET values calculate for each month were compared to the monthly precipitation averages at Arlington Airport to determine AET. The actual AET at Arlington Airport was estimated to be 10.5 in (265 mm), 11.5 in (290 mm), and 11.5 in (290 mm 2002, 2003, and 2004, respectively (Table 4-2). These AET values need to be viewed in the context of several successive years of below average precipitation. The annual precipitation at Arlington Airport was 24 in (610 mm), 29.6 in (750 mm), and 22.4 in (570 mm) 2002, 2003, and 2004, respectively (Table 4-2). These precipitation values are significantly below the average annual precipitation of 44.2 in (1,120 mm) for the Getchell Plateau and 46.3 in (1,180 mm) for Arlington Airport.

The water budget for the Getchell Plateau groundwater investigation is designed to assess the groundwater recharge, discharge, and use over the long term, not during a few dry years. Utilization of AET values estimated for dry years would create the false assumption that the Getchell Plateau is discharging more water to adjacent aquifers than it actually is. The Getchell Plateau aquifers are discharging to the adjacent aquifers, but water level and groundwater flow data do not support the hypothesis that 35,000 to 40,000 ac-ft (40 to 44%) of the total groundwater recharge is being transferred to the adjacent aquifers.

To correct for the dry years, the project team re-calculated AET using the long-term average monthly precipitation at Arlington Airport. The recalculated AET is 19 in/yr (480 mm/yr) or 84,900 ac-ft/yr. An AET value of 19 in/yr is comparable to values derived for other water budgets in the Puget Lowland (Turney et al., 1995, Woodard et al., 1995, Thomas et al., 1997).

Groundwater Consumption

The water budget developed for this investigation differentiates between water use and water consumption. Water use includes all water utilized regardless of the ultimate fate of that water. Water consumption refers only to water that is removed from the surface watershed or groundwater basin and thus is no longer available for future use.

The water budget developed for this investigation used an estimate of effective groundwater discharge, which accounts for the consumptive use of groundwater. The purpose of the water budget is to estimate the volume of water that could be available to future Getchell Plateau residents. An estimate of groundwater consumption is all that is needed to complete the calculation of output component of the water budget. The components of output, surface runoff, groundwater discharge, and evapotranspiration were estimated above.

There are no direct measurements of water consumption available for the Getchell Plateau, so minimum and maximum estimates were developed. The estimates of future water consumption were developed assuming a linear increase based on the projected 35% rise in population.

The following assumptions were made in developing the water use estimate listed in the water budget (Table 4-1).

1. The typical household was assumed to use 230 gpd. This assumption means that the average person uses 60 gpd for a four person household or 80 gpd per person for a 2.8 person household. The lower number of persons per household is based on US Census Bureau (2001) data and is the

Table 4-2. Precipitation, AET, and PET values at Arlington Airport.

	Annual Precipitation		PET		AET		AET[1]	
	in	ac-ft/yr	in	ac-ft/yr	in	ac-ft/yr	in	ac-ft/yr
2002	24.0	107,224	26.9	120,180	10.5	46,911		
2003	29.6	132,243	29.6	132,243	11.5	51,378		
2004	22.4	100,076	29.4	131,349	11.5	51,378		
Long-term							19.0	85,064

[1] AET calculation based on long-term average preciptation values.

household size used by the USGS (Frans and Kresch, 2004). This investigation assumed a 2.8 person household as well.

2. Each household using a well was also assumed to use a septic system for waste water treatment.
3. The minimum water consumption estimate was derived assuming that 70% of water used (i.e. withdrawn from the ground) is returned to an aquifer via the septic system. The 30% consumption value was derived from studies that examined the volume of water returned after it was pumped from a well (Sapik et al., 1988; Thomas et al., 1999 as cited in Frans and Kresch, 2004).
4. The maximum water consumption estimate assumed that 100% of water used (i.e. withdrawn from the ground) is consumed.
5. The Group A and B well water consumption estimates were based on the number of connections (households) and that each connection used 230 gpd. Any Group A well systems without data on the number of connections were assumed to have the minimum number of connections. A Group A classification requires a minimum of 15 connections. Group B well systems without data on the number of connections were assumed to have a minimum of two connections and a maximum of 14 connections.
6. Group A and B households in rural areas of the plateau were also assumed to utilize septic systems.
7. Where the number of connections was known, the minimum value for water consumption assumed that 70% of the water used was returned to an aquifer. The maximum value assumed that 100% of the water used was consumed.

Data for the Getchell Plateau suggest that the residents, commercial enterprises, and municipalities on the Getchell Plateau have water rights to withdraw an estimated 11,400 ac-ft/yr of groundwater (Ecology, 2004a). These water rights are dominated by four municipal water systems that claim over 6,600 ac-ft/yr of groundwater and three corporations that claim over 1,200 ac-ft/yr of groundwater for heat exchangers. These water rights do not appear to be fully exercised at this time, so the water claimed exceeds the water used (DOH, 2004a; Wood, 2004, pers. comm.; PUD, 2004, pers. comm.). The groundwater right allocations are listed in Table 4-1 for comparison purposes.

Data for the Getchell Plateau suggest that the residents, commercial enterprises and municipalities on the Getchell Plateau have water rights to withdraw an estimated 160 ac-ft/yr of surface water. The surface water claims are largely agricultural and not dominated by a few single users like the groundwater rights (DOH, 2004a).

The water budget data discussed above indicate that there is 19.2 in (1,120 mm) or 85,600 ac-ft of water potentially available for capture. An evaluation of all water consumption shows that the 64,000 residents of the Getchell Plateau utilize 1,700 ac-ft/yr (0.4 in/yr) of water per year to a maximum of over 5,800 ac-ft/yr (1.3 in/yr) of water per year. Well water consumption on the Getchell Plateau is estimated to supply 13,900 residents with between 975 ac-ft/yr (0.2 in/yr) and of 2,130 ac-ft/yr (0.5 in/yr) of water (Table 4-1).

Over 87,000 people are projected to live on the Getchell Plateau by the year 2020. Future water consumption is estimated to be between 2,300 ac-ft/yr (0.5 in/yr) of water to a maximum of 8,000 ac-ft/yr (1.8 in/yr) of water. Future well water consumption on the Getchell Plateau is estimated to supply 18,800 residents with between 1,300 ac-ft/yr (0.3 in/yr) and 2,900 ac-ft/yr (0.7 in/yr) of water (Table 4-1).

Currently, wells on the Getchell Plateau use the equivalent of the groundwater discharge to Quilceda Creek (minimum estimate). The projected population increase will push the minimum groundwater demand to the equivalent of the entire Quilceda Creek discharge (i.e. surface runoff plus groundwater discharge). The projected population increase could push the maximum groundwater demand to the equivalent of the combined discharge of Little Pilchuck Creek, Stevens Creek, and Quilceda Creek.

Sustainable Groundwater Consumption

The current water consumption pattern on the Getchell Plateau, a pattern that returns 70% of the water pumped from an aquifer, is most likely sustainable without substantial adverse impacts. The projected population, so long as it is the same type of rural to semi-rural population that recycles its water, will continue consuming groundwater on a sustainable basis.

Water demands from high density urban developments, especially those connected to municipal wastewater treatment systems, have the potential to consume groundwater unsustainably. Developments that withdrawal water from the Getchell Plateau and remove it from the system via the municipal wastewater treatment system could create an imbalance in the water budget.

Groundwater Availability Issues

Aquifer test data on the drillers' logs indicate a small area of low aquifer productivity in the extreme northwestern corner of the investigation area near Arlington. The typical residents in this area are drawing water from wells that rarely yield more than three gallons per minute. The low yielding wells appear to correspond to a sequence of glacial sediments that were deposited in a marine environment. The lack of alluvial or outwash may explain the low productivity of these wells. There appears to be sufficient aquifer capacity to meet the current demand, but future demand may exceed the aquifer capacity.

4.3 Groundwater Recharge and Discharge Patterns

Water-table elevation data that date back to 1937 were compiled for this investigation from nearly 2,600 wells. The majority of the data were collected since 1972, when Washington State required well drillers to submit water well reports.

In general, vertical groundwater movement is downward from upper aquifers to the lower aquifers. The horizontal groundwater movement is driven by topography, thus groundwater flows downward from the higher elevation northeast and central areas to the lower elevation eastern and southern flanks (Figure 3-7). Both the vertical and horizontal groundwater movement patterns support the hypothesis that groundwater recharge is derived from precipitation.

4.3.1 Shallow Aquifers

There are two major types of shallow aquifers on the Getchell Plateau: those that are perched in the near-surface or water-table aquifers, and those that are adjacent to streams.

The perched aquifers occur within the extensive exposures of alluvium, recessional outwash, and glacial till that cover 71 square miles, or 85%, of the plateau. Groundwater recharge to the perched aquifers is local, recharging via short travel paths between a recharge area and an aquifer discharge point, typically a stream or a well. Although groundwater recharge is local, it occurs over virtually the entire exposed extent of the shallow aquifers. The numerous water-table lakes, wetlands, shallow wells, and mounded septic systems on the Getchell Plateau are evidence of these aquifers.

The stream-adjacent aquifers are directly connected to streams, so groundwater flows towards the river during periods of high water tables and towards the aquifer during periods of high streamflow. The volume of recharge and discharge from the stream-adjacent aquifers is dominated by surface water to groundwater interaction; however, precipitation-driven groundwater recharge is still important. The streams adjacent to aquifers are located in the shallow alluvial and recessional outwash aquifers near Little Pilchuck Creek, South Fork Stillaguamish River, and Pilchuck River.

Water level data indicate that groundwater movement in glacial till is strongly downward in the northeast section of the investigation area, indicating a region of groundwater recharge to the underlying aquifers. Conversely, water level data from wells in the glacial till show strongly upward groundwater movement adjacent to the Marysville Trough, indicating a region of groundwater discharge. In addition to discharging water to the underlying aquifers and the Marysville Trough, the aquifers perched in the glacial till also feed numerous lakes, streams, and wetlands. Streams draining alluvium, recessional outwash, and glacial till are highly dependent on groundwater discharge, which accounts for 65 to 85% of streamflows in October to November and 80 to 100% of streamflow in August (Sinclair and Pitz, 1999). Streamflow measurements indicate that groundwater discharge to the streams draining the surface of the Plateau is greater than the discharge from the underlying aquifers to the headwaters of Quilceda Creeks. Since streams drain the surface of the Getchell Plateau southeastward, much of the groundwater discharged from perched aquifers finds its way into the Snohomish River via the Pilchuck River.

4.3.2 The Vashon Advance Outwash Aquifer

The extensive aquifer in the Vashon advance outwash deposits is the principal aquifer of the Getchell Plateau groundwater system. It is discontinuously confined by the overlying glacial till (Figure 3-2). Groundwater recharge to the advance outwash is on an intermediate scale, meaning that the flow paths between the recharge area and the aquifer discharge point can be long but are still located within a single system (Figure 1-13). In fact, there is little evidence to suggest that any of the Getchell Plateau aquifers receive measurable volumes of recharge via regional flow paths.

Depth-to-groundwater measurements indicate that groundwater recharge occurs by precipitation filtering down throughout the full extent of the overlying glacial till. The dominant recharge area appears to be near the northeastern limit of the Getchell Plateau. A second area of groundwater recharge appears to be located along the north-south plateau axis, extending southward to the City of Snohomish from north of Lake Stevens (Figure 3-7d). Recharge of the advance outwash aquifer beneath recessional outwash deposits located west of Granite Falls occurs by precipitation filtering down through the overlying recessional outwash.

Water level data show a general correlation between areas of upward groundwater flow (groundwater discharge) and the exposures of the advance outwash (Figure 3-1, 3-2, and 3-7d). The six square miles of advance outwash outcrops in the investigation area are concentrated along the Marysville Trough and above both the Snohomish and Pilchuck rivers (Figure 3-1). Discharge from the advance outwash is aided by the roughly two square miles of fine-grained beds exposed beneath the advance outwash. These fine-grained beds are an aquitard that forms a barrier to the downward movement of groundwater and force it to move laterally towards the plateau edge. Springs located along the perimeter of the plateau are evidence of this lateral flow. Streams intersecting the advance outwash are highly dependent on groundwater discharge, which accounts for 70% of the November streamflow and 90% of the August streamflow (Sinclair and Pitz, 1999).

4.3.3 Deeper Unconsolidated Aquifers

A group of deep aquifers and aquitards are present beneath the Getchell Plateau. Drilling logs indicate that the uppermost deep unconsolidated aquifer is found beneath the entire Getchell Plateau, and the lowest deep unconsolidated aquifer occurs only in a belt along the eastern margin of the plateau (Figures 3-7e, and 3-7d). Water level data indicate that groundwater movement within the deep unconsolidated aquifers is downward, although there is some upward groundwater flow in the upper unconsolidated aquifer near the City of Arlington and in the lower unconsolidated aquifer near the City of Granite Falls. The general downward groundwater flow indicates that the deep unconsolidated aquifers are a source of recharge for the underlying sedimentary rock aquifer. The downward movement of groundwater also indicates that the deep unconsolidated aquifers are recharged by water originating in the overlying aquifers and percolating downward through the aquitards.

Outcrops of the deep unconsolidated aquifers materials in the investigation area are rare. The lack of outcrops and the general downward flow of groundwater indicate that these aquifers are a minor source of water to streams and lakes within the investigation area. There are insufficient data to measure the magnitude of discharge of groundwater from the deeper unconsolidated aquifers.

4.3.4 Bedrock Aquifers

An interbedded sequence of sandstone, shale, mudstone, and coal bedrock outcrops along the high-elevation northeastern corner of the Getchell Plateau. Groundwater occurs throughout all of the bedrock sequence, but usable quantities of groundwater are only found in the sandstone.

Water level data taken from wells in the bedrock indicate downward groundwater flow (groundwater recharge) along the northeastern plateau boundary and in the south near the City of Snohomish, and upward groundwater flow (groundwater discharge) near the cities of Granite Falls and Arlington. There are insufficient data from the bedrock to draw reliable conclusions with regard to flow path distance. The lack of data makes it difficult to determine conclusively whether groundwater recharge or discharge are occurring on local or regional scales; however, the dominance of downward groundwater flow in the highest elevation portions of the bedrock and discharge from the lowest elevation portions of the bedrock strongly suggest that groundwater recharge and discharge are local.

4.3.5 Aquifer Boundaries

The most significant and obvious boundaries to the Getchell Plateau aquifers are the limits of the plateau itself. The majority of the shallow aquifers and the advance outwash aquifer occur at an elevation above the surrounding valleys. The lower boundary for the shallow aquifer systems is the glacial till. The low permeability of the Vashon till inhibits the upward flow of groundwater in the advance outwash aquifer, creating confined conditions. The lower boundary for the advance outwash aquifer system is the underlying fine-grained or transitional beds. The combination of confining layers, basal aquitards and outcropping aquifer materials means that shallow aquifers and advance outwash aquifers discharge along the plateau boundaries, especially to the Marysville Trough above the Snohomish River and Pilchuck River.

The bedrock and the fine-grained components of the deeper sediments form an aquifer recharge/discharge boundary along the eastern limit of the Getchell Plateau. This boundary occurs at depth and is evident in the drilling logs, water level data, and groundwater flow data. This belt of low-permeability sediments and bedrock has the effect of forcing groundwater flow in the deeper aquifers westward towards the Maryville Trough and the Snohomish River. The downward flow of groundwater within this unit also appears to prevent groundwater recharge from the rivers adjacent to the Getchell Plateau and the Cascade Mountains to the east.

4.4 Groundwater Quality

The discussion of groundwater quality beneath the Getchell Plateau in the following section addresses individual domestic wells and a small number of the Group A and Group B wells. This investigation compiled groundwater quality data from 460 wells with more than 15,800 individual measurements. The data were collected by federal, state, county, and local agencies (Table 4-3). The detailed results from all water quality samples are presented in Appendix B.

The USGS collected samples from nearly 300 wells in Snohomish County, including 50 wells on the Getchell Plateau, during the early 1990s (Thomas et al., 1997). The USGS focused on domestic wells and constituents that can impact human health (Table 4-4).

The Washington State Department of Health (DOH) collects samples from 25 Group A wells on the plateau. The DOH requires Group A water system owners to sample for a large array of constituents that can impact human health (Table 4-5).

The Snohomish Health District processes water quality data from samples collected by the well driller or homeowner to assess the potability of water from newly completed wells. The Snohomish Health District requires the drillers or homeowner to sample for a subset of the parameters on Washington State's

Table 4-3. Water Quality Sample Sources.

Agency	Number of Wells	Number of Measurements	Start Date	End Date	Number of Events
US Geological Survey	50	1,540	1992	1993	single and multiple
Washington Department of Health	25 (Group A)	694	1997	2001	multiple
The Snohomish Health District	423	4,577	1991	2004	1
Snohomish County Public Works	58/54	2,119	2002	2003	2

Table 4-4. US Geological Survey Analytes.

Inorganic and Metals	Physical
Ammonia	Alkalinity
Arsenic	Conductance
Barium	Do (mg/l)
Bicarbonate	Fecal
Boron	Foaming agents
Cadmium	Hardness
Carbonate	pH
Chloride	Sodium Adsorption
Chromium	Sodium Percent
Copper	Temperature
Fluoride	Total Dissolved Solids (TDS)
Iron	
Lead	
Magnesium	
Manganese	
Mercury	
Nitrate	
Nitrite	
Organic Carbon	
Orthophosphate	
Orthophosphorus	
Potassium	
Selenium	
Silica	
Silver	
Sodium	
Sulfide	
TNN	
Total Nitrogen	
Zinc	

drinking water standards list (Table 4-6; Chapter 246-290-310 WAC).

The project team collected samples for this investigation and analyzed them for constituents listed on Washington State's drinking water standards list as well (Tables 2-3 and 4-7).

Groundwater quality has been monitored at the closed Sisco and Lake Stevens Landfills, dry cleaners, gas stations, and the Bonneville Power Substation in Snohomish. These data include quarterly and periodic sampling events. These results are associated with specific sites and are discussed individually.

4.4.1 General Chemistry

Inorganic Compounds

Arsenic

Arsenic occurs naturally in the environment and is found in groundwater throughout the US, including the Puget Lowland (Davies, et al., 1991; Thomas et al., 1997; Focazio, et al., 2000). Arsenic can occur as a free element, but it most commonly found as arsenopyrite (FeSAs) or as one of several acids such as $HAsO_3$ (Saxena et al., 2004). Arsenic concentrations average 580 micrograms per liter (μg/l) in the earth's crust, 0.01 μg/l in streams, and 4 μg/l in humans (Webelements, 2004). Arsenic is principally used as a poison and in semiconductors.

The current MCL for arsenic is 10 μg/l (Table 2-3). Acute exposure to arsenic above the MCL can produce disease in the respiratory, gastrointestinal, cardiovascular, nervous, and hematopoietic (blood cell production) systems. Chronic exposure has been assessed by a downward extrapolation from risks associated with higher arsenic doses. This extrapolation suggests that chronic exposure to arsenic in drinking water can lead to cancers of the lung, skin, and hematopoietic system (IPCS, 2004).

Arsenic occurs naturally in groundwater as a result of geothermal activity and dissolution of iron oxides and sulfide minerals (Table 4-8; Welch et al., 1999). In Snohomish County, dissolution of iron oxides and sulfide minerals is the most likely source of arsenic in groundwater. The concentrations of naturally occurring arsenic in groundwater can vary widely.

Focazio et al. (2000) collected groundwater samples from public water supply systems across the US and found arsenic concentrations of 1, 2, 5, 10, 20, and 50 μg/l were exceeded in 36, 25, 14, 8, 3, and 1% of the samples, respectively. This means that the new MCL of 10 μg/l could be exceeded in roughly eight percent of the water supplies in the U.S. The Sisco Landfill (now closed) is the only documented non-natural source of arsenic in the investigation area (DOH, 1999).

Complex chemical reactions and biological activity can alter immobile forms of arsenic and cause them to dissolve into groundwater. Table 4-8 and Figure 4-1 present some of the reactions and conditions that can cause arsenic to dissolve and become mobile, or

Table 4-5. Washington State Department of Health Analytes.

Inorganic and Metals	Physical	Organic Compounds		
Aluminum	Hardness	1,1 dichloropropene	Bromodichloromethane	Lindane
Antimony	pH	1,1,1,2-tetrachloroe	Bromoform	Malathion
Arsenic	TDS	1,1,1-trichloroethan	Bromomethane	Methiocarb
Barium	TNN	1,1,2,2 - tetrachlor	Butachlor	Methomyl
Beryllium	Turbidity	1,1,2-trichloroethan	Carbaryl	Methoxychlor
Cadmium		1,1-dichloroethane	Carbofuran	Methylene chloride
Calcium		1,1-dichloroethylene	Carbon tetrachloride	Metolachlor
Chloride		1,2,0 dichloroethane	Chloramben	Metribuzin
Chromium		1,2,3 - trichloroben	Chlordane	Naphthalene
Copper		1,2,3-trichloropropa	Chlorobenzene	N-butylbenzene
Cyanide		1,2,4, - trimethylbe	Chloroethane	N-propylbenzene
Fluorene		1,2,4-trichlorobenze	Chloroform	O-chlorotoluene
Iron		1,2-dichloropropane	Chloromethane	o-dichlorobenzene
Lead		1,3 - dichloropropen	Chrysene	Oxamyl (Vydate)
Magnesium		1,3,5, trimethylbenz	cis-1,2-dichloroet	PAHs
Manganese		1,3-dichloropropane	cis-1,3-dichloroprop	Parathion
Mercury		2,2 dichloropropane	Cyanzine	PCBs
Nickel		2,4 DB	Dalapon	P-chlorotoluene
Nitrate		2,4,5 T	DBCP	Pentachlorophenol
Nitrite		2,4,5-TP (Silvex)	Di adipate	Phenanthrene
Selenium		2,4-D	Di phthalate	Picloram
Silver		3,5-dichlorbenzoic a	Dibenzo(a,h)anthrace	P-isopropyltoluene
Sodium		3-hydroxycarbofuran	Dibromochloromethane	Prometon
Sulfate		4,4 DDD	Dibromomethane	Propachlor
Thallium		4,4 DDE	Dicamba	Pyrene
Zinc		4,4 DDT	Dichlorodifluorometh	Sec - butylbenzene
		Acenaphthene	Dieldrin	Silver
		Acifluorfen	Diethyl phthalate	Simazin
		Alachlor	Dimethyl phthalate	Styrene
		Aldicarb	Di-N-butyl phthalate	Terbacil
		Aldicarb sulfone	Dinoseb	Tert-butylbenzene
		Aldicarb sulfoxide	Disulfoton	Tetrachloroethylene
		Aldrin	Endosulfan 1	Thallium
		Anthracene	Endrin	Toluene
		Atrazine	Ethylbenzene	Total trihalomethane
		Bentazon	Ethylene dibromide	Toxaphene
		Benzene	Fluoranthene	trans-1,2-dichloroet
		Benzo(a)anthracene	Heptachlor epoxide	Trichloroethylene
		Benzo(b)fluoroanthen	Hexachlorobenzene	Trichlorofluorometha
		Benzo(g,h,i)perylene	Hexachlorobutadiene	Trifluralin
		Benzo(k)fluoranthene	Hexachlorocyclopenta	Vinyl chloride
		Benzyl butyl phthala	Indeno(1,2,3-cd)pyre	Xylenes
		Bromochloromethane	Isopropyl benzene	

Table 4-6. The Snohomish Heath District Analytes.

Inorganic and Metals	Physical
Antimony	Color
Arsenic	E Coli
Barium	Hardness
Beryllium	Tannins
Cadmium	Temperature
Chloride	Total coliforms
Chromium	Turbidity
Copper	
Cyanide	
Fluoride	
Iron	
Lead	
Manganese	
Mercury	
Nickel	
Nitrate	
Nitrite	
Orthophosphorus	
Selenium	
Silver	
Sodium	
Sulfate	
Thallium	
Total Dissolved Solids (TDS)	
Total Nitrate Nitrogen (TNN)	
Zinc	

Table 4-7. Snohomish County Analytes.

Inorganic and Metals	Physical
Antimony	Color
Arsenic	Conductance
Barium	Do (mg/l)
Beryllium	Fecal
Cadmium	pH
Chloride	Temperature
Chromium	Total coliforms
Copper	Total Dissolved Solids (TDS)
Cyanide	Turbidity
Fluoride	
Hardness	
Iron	
Lead	
Manganese	
Mercury	
Nickel	
Nitrate	
Nitrite	
NO2-NO3	
Selenium	
Silver	
Sodium	
Sulfate	
Thallium	
Total Nitrate Nitrogen (TNN)	
Zinc	

Table 4-8. Principal Chemical Reactions Affecting Inorganic As Concentration in Groundwater (after Welch et al, 2000).

Redox Condition	Important Phases	Important Reactions	Conditions that affect Arsenic Mobility	References
Oxic (DO present)	Fe-Oxides	Adsorption/ desorption	pH; presence of competing adsorbent: Oxygen and Fe^{3+} concentrations	Peryea and Kammereck, 1997
		Precipitation		Welch et al, 1988
	Sulfide minerals	Sulfide oxidation	pH and microbial activity; oxygen and NO_3 transport	Appelo and Postma, 1993
Post-oxic (DO and SO_4 not present)	Fe-Oxides	Adsorption/ desorption and precipitation	Oxidation state of As; also see discussion Oxic (above)	Dzombak and Morel, 1990
		Dissolution	Presence of organic carbon	Nagorski and Moore, 1999
	Sulfide minerals	(see Oxic discussion)		
Sulfides (sulfide present)	Sulfide minerals	Precipitation	Sulfide, iron, and As concentrations	Moore et al, 1988; McRae, 1995; Rittle et al, 1995; Huerta-Diaz et al, 1998

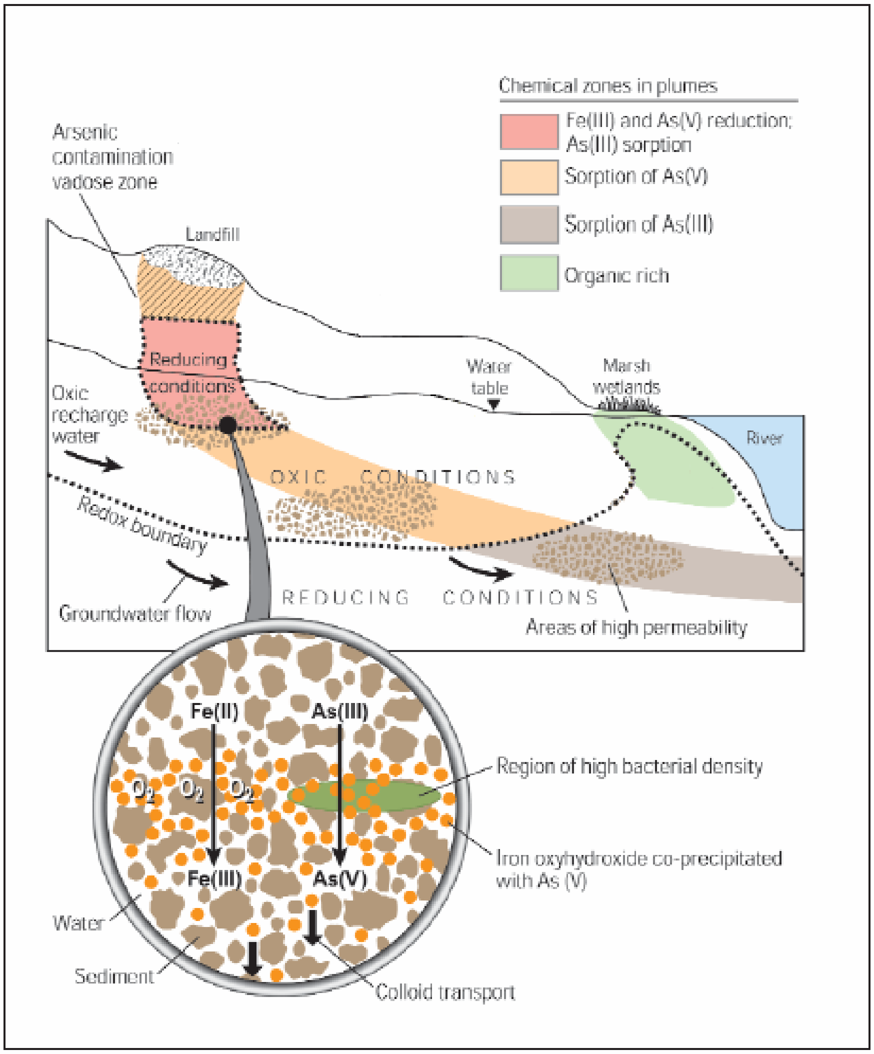


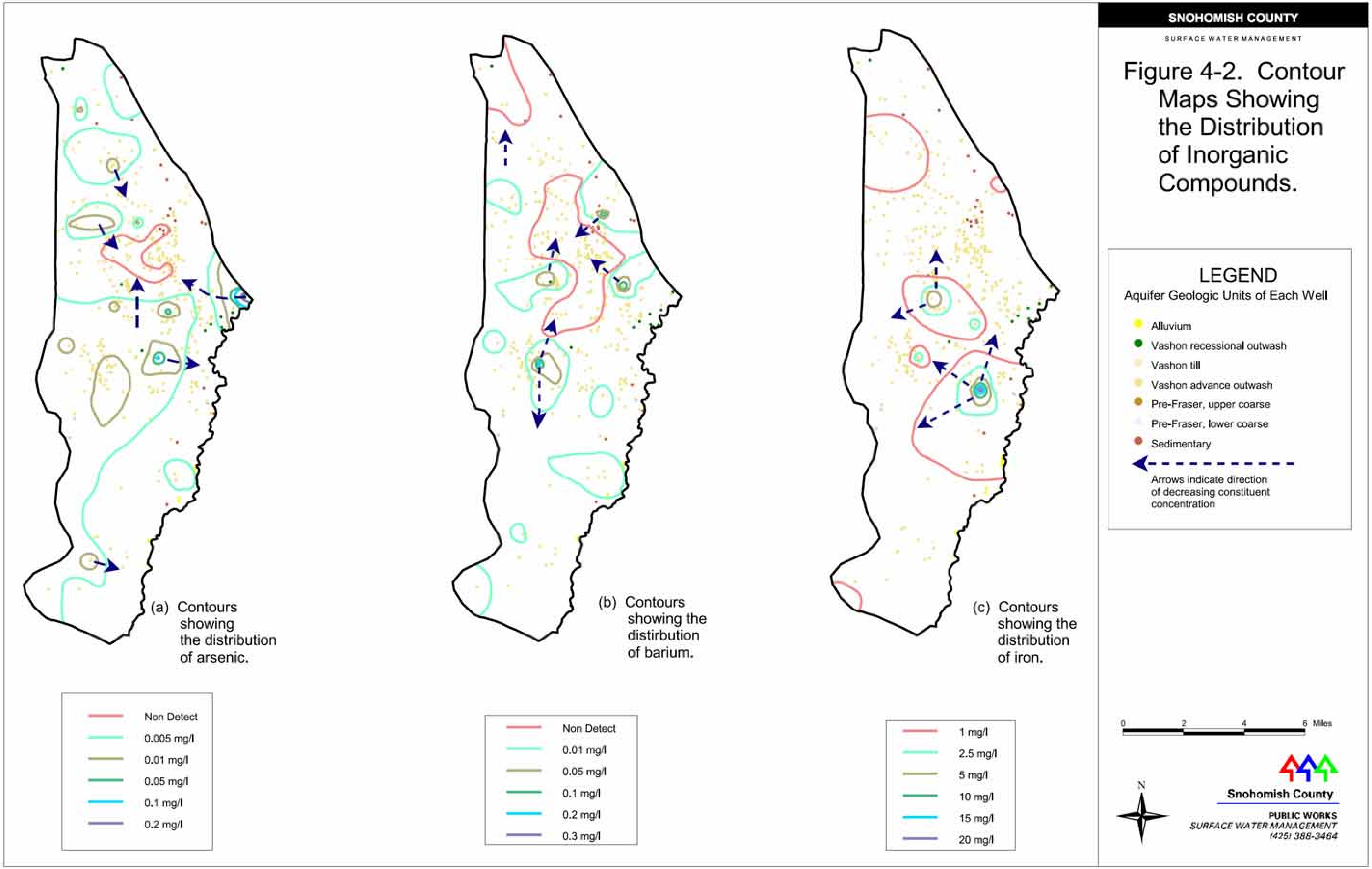
Figure 4-1. Schematic diagram illustrating the complexity of arsenic mobility (modified from Davis et al., 2004).

precipitate and become immobile. Chemical reactions involving iron oxides and sulfide minerals appear to influence the mobility of arsenic. The adsorption of arsenic to iron oxydroxides is strongly influenced by pH, oxidation/reduction (redox) potential, and the presence of competing ions (Table 4-8; Stollenwerk, 2003).

An increase in pH can cause arsenic to dissolve into groundwater. Changes in redox potential can change the number of available adsorption sites, reducing or increasing the amount of arsenic in groundwater. Microbial action can promote the release of arsenic into groundwater (Cummings et al., 1999; Roller et al., 2003). Conversion of sulfides to sulfates by introducing oxygen into an aquifer system can release of arsenic into groundwater (Johnson and Schreiber, 2004).

Given the complexity of arsenic geochemistry, it is not surprising that arsenic is found randomly distributed throughout the Getchell Plateau aquifers (Figure 4-2a). Arsenic was detected in nearly 160 wells. Arsenic was detected in 40% of the water quality samples collected, which is above the national average. Arsenic concentrations ranged from below the detection limit to 280 µg/l, and averaged 6 µg/l.

Arsenic concentrations were as high as 31 µg/l and averaged 6 µg/l. There was no detectable difference between the samples collected during the summer sampling event and the early spring sampling event


SNOHOMISH COUNTY
SURFACE WATER MANAGEMENT
Figure 4-2. Contour Maps Showing the Distribution of Inorganic Compounds.
(a) Contours showing the distribution of arsenic.
(b) Contours showing the distirbution of barium.
(c) Contours showing the distribution of iron.
Non Detect
0.005 mg/l
0.01 mg/l
0.05 mg/l
0.1 mg/l
0.2 mg/l
Non Detect
0.01 mg/l
0.05 mg/l
0.1 mg/l
0.2 mg/l
0.3 mg/l
1 mg/l
2.5 mg/l
5 mg/l
10 mg/l
15 mg/l
20 mg/l
LEGEND
Aquifer Geologic Units of Each Well
Alluvium
Vashon recessional outwash
Vashon till
Vashon advance outwash
Pre-Fraser, upper coarse
Pre-Fraser, lower coarse
Sedimentary
Arrows indicate direction of decreasing constituent concentration
0 2 4 6 Miles
N
Snohomish County
PUBLIC WORKS
SURFACE WATER MANAGEMENT
(425) 388-3464
Project name: x:\wq\groundwater\arcview\getchell\contours.apr Plot date: Oct 21, 2004; Figure 3-6 (pt 1) jak

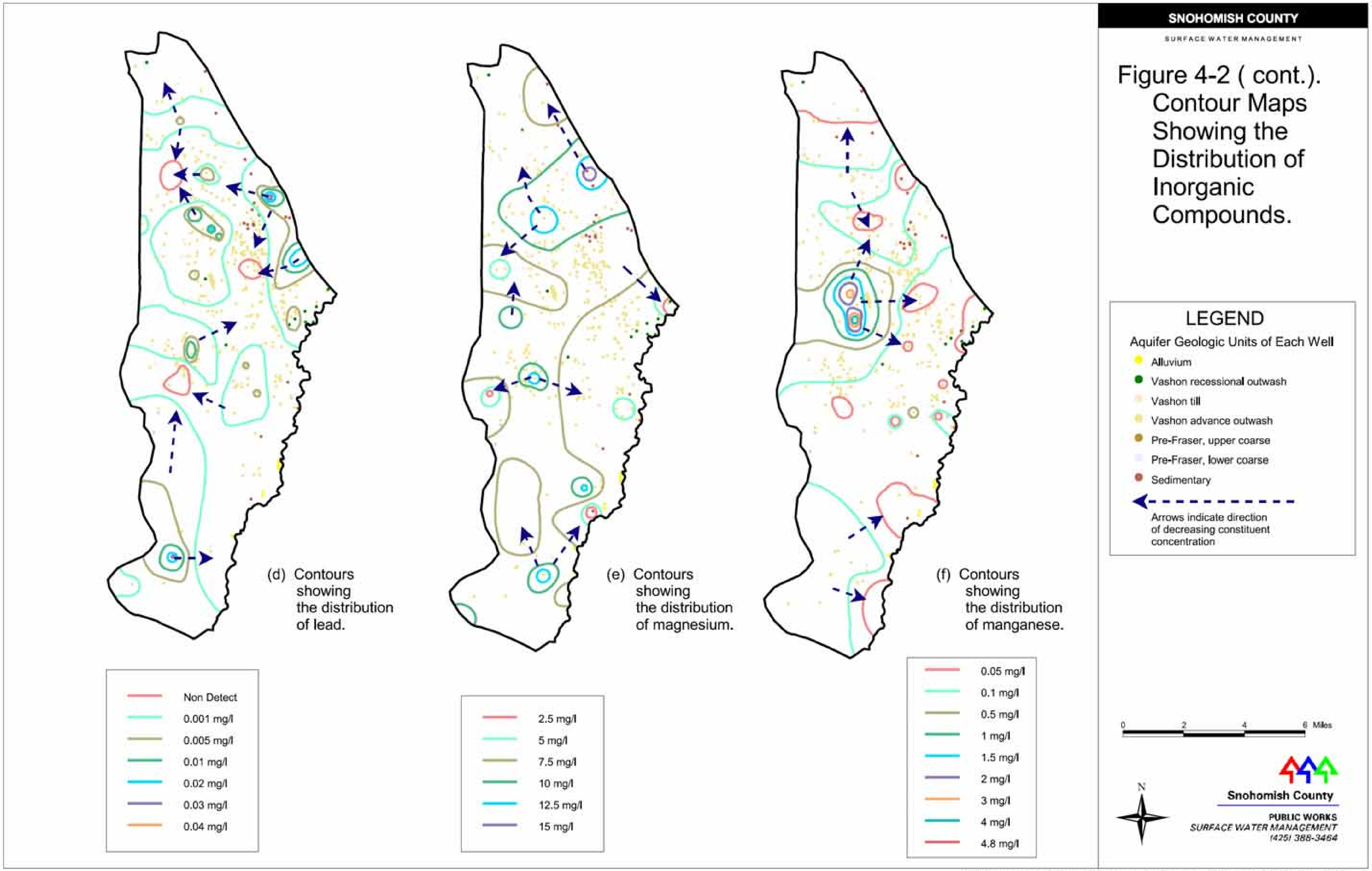


Figure 4-2 (cont.). Contour Maps Showing the Distribution of Inorganic Compounds.

Project name: x:\wq\groundwater\arcview\getchell\contours.apr Plot date: Oct 21, 2004; Figure 3-6 (pt 1) jak

Figure 4-2 (cont.). Contour Maps Showing The Distribution of Inorganic Compounds.

Project name: x:\wq\groundwater\arcview\getchell\contours.apr Plot date: Oct 21, 2004; Figure 3-6 (pt 1) jak

(Appendix B).

Analysis of the arsenic samples collected since 1987 revealed that the highest concentrations of arsenic, averaging 171 μg/l, were detected before 1990. This is to be expected since the pre-1990 sampling focused on wells associated with arsenic poisoning cases (Table 4-9; Davies et al., 1991). The MCL was exceeded in 94 samples from 87 wells (Table 4-9).

The highest arsenic concentrations were not generally associated with rural residential land uses (Table 4-10) or with the advance outwash aquifer (Table 4-11). A low number of samples collected from land zoned rural commercial indicated an average concentration above the MCL (Table 4-10). Likewise, the arsenic average concentration was above the MCL for a low number of samples from the recessional outwash aquifer (Table 4-11). There were too few samples too determine if arsenic concentrations was related to land use or aquifer type. These results warrant further investigation.

Barium

Barium occurs naturally in the environment but is never found in elemental form. It occurs most commonly in a barium sulfide called barite ($BaSO_4$) and less frequently as witherite ($BaCO_3$). Barium averages 51,000 μg/l in the earth's crust, 0.2 μg/l in streams, and 14 μg/l in humans (Webelements, 2004). Barium is used in paint, glassmaking, and in X-ray diagnostic work.

Barium performs no known biological function. Acute exposure to barium above the MCL can cause gastrointestinal disturbances and muscular weakness. Chronic exposure above the MCL can cause high blood pressure. There is no evidence that long-term exposure to barium causes cancer (USEPA, 2004). Barium is recognized as a poison (Webelements, 2004).

Barium occurs naturally in groundwater, and its concentration can vary widely. The natural concentration of barium in groundwater varies from 100 to 100,000 μg/l (Todd, 1980). The MCL for barium is 2,000 μg/l (Table 2-3). Barium occurs in a few widely scattered locations in the groundwater beneath the Getchell Plateau (Figure 4-2b). Barium was detected in 56 wells. Barium was detected in 14% of the water quality samples collected. Barium concentrations ranged from not detected to 600 μg/l and averaged 7 μg/l. Barium had the highest average concentration of 29 μg/l from 18 samples collected between 1990 and 1995 (Appendix B). Two samples exceeded the 2,000 μg/l MCL for barium (Table 4-9).

Groundwater sampling by the project team confirmed the random distribution of barium. Barium was detected in 31 of 58 wells and in 53% of the samples (Appendix B).

The highest barium concentrations were not generally associated with rural residential land uses (Table 4-10) or with the advance outwash aquifer (Table 4-11). The occurrence and distribution of barium was within established norms, and was therefore considered to be naturally occurring.

Iron

Iron is the fourth most common element in the earth's crust but is never found in elemental form. Iron occurs most commonly as hematite (Fe_20_3). Iron averages 23,000,000 μg/l in the earth's crust, 12 μg/l in streams, and 6,700 μg/l in humans (Webelements, 2004). Iron is used in steel and is an important component of blood. The oxygen-carrying capacity of iron in hemoglobin is essential to life.

Iron is an aesthetic concern for drinking water, because it causes staining of fixtures and clothing, and may impart an unpleasant taste and color. The secondary MCL for iron is 300 μg/l.
Iron occurs naturally in groundwater, and concentrations can vary widely. Fully aerated water with a pH less than 8 can contain iron concentrations up to 10,000 μg/l and even as high as 50,000 μg/l (Todd, 1980).

As would be expected, iron occurs throughout the groundwater beneath the Getchell Plateau (Figure 4-2c). Iron was detected in 115 wells. Iron was found to exceed the Secondary MCL in 54 wells. Groundwater sampling for this investigation confirmed the wide distribution of iron in the Getchell Plateau groundwater. Iron was detected in 31 of the 58 wells, in 80% of the water quality samples collected. Iron concentrations are infrequently measured since it is only of aesthetic concern. Iron concentrations are as high as 20,700 μg/l and average 680 μg/l (Table 4-9 and Appendix B).

The highest iron concentrations were not generally associated with rural residential land uses (Table 4-10) or with the advance outwash aquifer (Table 4-11). A

Table 4-9. Summary of groundwater chemistry by constituent.

Constituent	Average Concentration	Highest Concentration	Number of Detects	Non-detects	MCL Exceedances[1]		Start Date	End Date
	µg/l[2]	µg/l			Number of Samples	Number of Wells		
Inorganic Compounds								
Arsenic	171	280	4	0	94	87	pre-1990	
	2		166	140			1996	2000
	4.5		305	118			2001	2004
Barium	29	600	18	4	0	0	1990	1995
	12		164	162			1996	2000
	6		300	258			2001	2004
Iron	1600	20,700	15	15	71	54	pre-1990	
	208		46	1			1990	1995
	818		143	66			2001	2004
Lead	ND			4	(2)		pre-1990	
	5		63	48			1990	1995
	3		248	193			1996	2000
	1	41	261	195			2001	2004
Magnesium	8	16	49	0	(2)		1993	
Manganese	86	5,010	49	0	108	74	1993	
	11		46	2			1990	1995
	154		139	51			2001	2004
Nitrate	350	10,700	7	4	1	1	1990	1995
	413		163	111			1996	2000
	500		300	207			2001	2004
Nitrite	1.5	7,200	46	45	12	11	1990	1995
	294		136	112			2001	2004
Sodium	12,000	190,000	58	4	(2)		1990	1995
	16,000		189	6			1996	2000
	11,000		306	8			2001	2004
Pathogen Indicator								
Coliform Bacteria	ND		0	42	18	16	pre 2000	
	2 col/100 ml	240 col/100 ml	18	279			2001	2004
Field and Aesthetic								
Conductivity	0.21 µmhos/cm	0.76 µmhos/cm	92		(2)		1993	
	0.19 µmhos/cm		339				2000	
	0.19 µmhos/cm		58/54				2002	2003
Dissolved Oxygen	1.5 mg/l[3]	11.8 mg/l	45		(2)		1993	
	2.6 mg/l		321				post 2000	
	2.5 mg/l		58/54				2002	2003
Hardness	73 mg/l	187 mg/l	49		(2, 4)		1990	1995
	75 mg/l		5				1996	2000
	73 mg/l		144				2001	2004
pH	7.74	5.64 (lowest)	46		11 (low)[4]		1993	
	7.75	11.98 (highest)	341		4 (high)		post 2000	

(1) Washington State Drinking Water Standards (Chapter 246-290-310 WAC).

(2) µg/l = ppb or parts per billion.

(3) mg/l = ppm or parts per million.

(4) Washington Groundwater Water Criteria (Chapter 173-200-040 WAC).

Table 4-10. Summary of groundwater chemistry by land use.

Constituent	Land Use	Average Concentration µg/l[1]	Number of Samples
Inorganic Compounds			
Arsenic	rural commercial	16	7
	rural residential	6	457
	rural vacant	1	30
Barium	rural commercial	7	1
	rural residential	5	421
	timber	<1	5
Iron	rural commercial	12,700	3
	rural residential	580	195
	rural (vacant)	8	2
Lead	rural (vacant)	17	60
	rural residential	1	435
	rural open space	<1	11
Magnesium	rural residential	8,300	41
	rural (vacant)	<1	100
Manganese	rural (vacant)	1	2
	rural commercial	490	3
	rural residential	132	174
Nitrate	rural residential	1,200	6
	rural agriculture	ND[2]	7
Nitrite	rural residential	230	171
	rural agriculture	ND[2]	7
Sodium	rural non-residential	44,300	2
	rural residential	12,300	448
	rural open space	4,500	10
Pathogen Indicator			
Coliform Bacteria	rural vacant	10 col/100 ml	3
	rural residential	2 col/100 ml	291
	rural agriculture	ND[2]	25
Field and Aesthetic			
Conductivity	rural commercial	0.37 mmhos/cm	8
	rural residential	0.19 mmhos/cm	463
	rural vacant	0.15 mmhos/cm	4
Dissolved Oxygen	rural vacant	3.3 mg/l[3]	1
	rural residential	2.5 mg/l	353
	rural open space	0.09 mg/l	6
Hardness	rural utility	80.8 mg/l	1
	rural residential	72.7 mg/l	148
	rural non-residential	51.8 mg/l	4
pH	rural commercial	6.8	7
	rural residential	7.3	416
	rural vacant	8.2	2

[1] µg/l = ppb or parts per billion.

[2] ND means constituent not detected.

[3] mg/l = ppm or parts per million.

Table 4-11. Summary of groundwater chemistry by aquifer.

Constituent	Aquifer	Average Concentration µg/l[1]	Number of samples
Inorganic Compounds			
Arsenic	alluvial	<1	9
	advance outwash	1	355
	recessional outwash	49	13
Barium	alluvial	<1	9
	advance outwash	6	331
	upper coarse-grained	9	62
Iron	sedimentary rock	80	4
	advance outwash	440	116
	alluvium	880	4
Lead	alluvium	<1	7
	advance outwash	15	449
	upper coarse	17	62
Magnesium	sedimentary rock	4,000	2
	advance outwash	8,700	23
	glacial till	11,000	6
Manganese	alluvial	7	2
	advance outwash	160	116
Nitrate	sedimentary rock	60	21
	advance outwash	480	327
	recessional outwash	1650	12
Nitrite	alluvial	nd	3
	advance outwash	250	114
	recessional outwash	1330	3
Sodium	recessional outwash	842	14
	advance outwash	926	349
	sedimentary rock	60,000	12
Pathogen Indicator			
Coliform Bacteria	recessional outwash	ND[2]	8
	advance outwash	<1 col/100 ml	230
	glacial till	9 col/100 ml	28
Field and Aesthetic			
Conductivity	advance outwash	0.19 mmohs/cm	270
	sedimentary rock	0.25 mmohs/cm	7
Dissolved Oxygen	sedimentary rock	1.5 mg/l[3]	5
	advance outwash	2.5 mg/l	232
	recessional outwash	5.2 mg/l	5
Hardness	sedimentary rock	68 mg/l	4
	advance outwash	70 mg/l	118
	upper coarse-grained	78 mg/l	32
pH	alluvial	6.5	2
	advance outwash	7.3	248
	sedimentary rock	8.3	5

(1) µg/l = ppb or parts per billion.
(2) ND means constituent not detected.
(3) mg/l = ppm or parts per million.

low number of samples collected from land zoned for rural-commercial development indicated an average concentration above the secondary MCL (Table 4-10).

Lead

Lead occurs naturally in the environment but is rarely found in elemental form. Lead occurs most commonly as galena ($PbS0_4$). Lead averages 1,000 µg/l in the earth's crust, 0.01 µg/l in streams, and 50 µg/l in humans (Webelements, 2004). Lead is currently used in glass making and battery cells, and was formerly used as an anti-knock gasoline additive and in paint manufacturing.

Lead is a well-documented environmental contaminant. No drink water standard has been established for lead (Table 2-3); however, Washington State has established a groundwater standard for lead of 50 µg/l (Chapter 173-200-040 WAC). Acute exposure to lead above 50 µg/l can interfere with blood cell chemistry, delay physical and mental development in children and increase blood pressure in adults. Chronic exposure above 50 µg/l can cause stroke, kidney disease, and cancer.

The natural concentration of lead in groundwater varies from 0.1 µg/ to 100 µg/l (Todd, 1980). The closed Sisco Landfill (now closed) is the only documented non-natural source of lead in the investigation area (DOH, 1999).

The USGS and the Snohomish Health District found lead concentrations between 1 µg/l and 5 µg/l randomly distributed in the groundwater beneath the Getchell Plateau (Figure 4-2d). Lead was detected in 96 wells. Lead was detected in 25% of the water quality samples collected. Lead concentrations were as high as 41 µg/l and averaged 1 µg/l. No lead was detected in the 16 samples collected prior to 1990 (Table 4-9).

Groundwater sampling for this investigation confirmed the random distribution of lead in the Getchell Plateau groundwater. Lead was detected in 16 of the 58 wells, and in 28% of the samples. Lead concentrations were as high as 41 µg/l and averaged 11 µg/l (Appendix B). The highest lead concentrations are not generally associated with rural residential land uses (Table 4-10) or with the advance outwash aquifer (Table 4-11). The distribution and concentrations of lead are within established norms and are considered to be naturally occurring.

Magnesium

Magnesium is very abundant in sea water and is the eighth most common element in the earth's crust but is never found in elemental form. Magnesium occurs most commonly as magnesite ($MgCO_3$) or dolomite ($CaMg(CO_3)_2$). Magnesium averages 25,000,000 µg/l in the earth's crust, 170 µg/l in streams, and 7,000 µg/l in humans (Webelements, 2004). Magnesium is used in flares and pyrotechnics, aircraft, milk of magnesia, and Epsom salts.

Magnesium occurs naturally in groundwater, and concentrations can vary widely. The natural concentration of magnesium in groundwater varies from 0.1 µg/l to 100 µg/l (Todd, 1980).

Although there is no drinking water standards for magnesium it is an important aesthetic consideration for well owners, since magnesium is an element of hardness in water (discussed below). Magnesium is present throughout the groundwaters of the Getchell Plateau (Figure 4-2e). The highest levels of magnesium were found in a few wells near the northeastern investigation boundary. Magnesium was detected in all 47 wells sampled of magnesium (Appendix B). Magnesium concentrations were as high as 16 µg/l and averaged 8 µg/l (Table 4-9).

The highest magnesium concentrations were associated with rural residential land uses (Table 4-10). The highest magnesium concentrations were not associated with the advance outwash aquifer (Table 4-11).

Although magnesium concentrations were high, especially in the principal aquifer, magnesium was within established norms and considered to be naturally occurring. The project team did not sample for magnesium in this investigation

Manganese

Manganese occurs naturally in the environment but is never found in elemental form. Manganese occurs most commonly as oxides, silicates, and carbonates. Manganese averages 420,000 µg/l in the earth's crust is, 0.09 µg/l in streams, and 23 µg/l in humans (Webelements, 2004). Manganese is used an important alloy in steel manufacturing.

Manganese occurs naturally in groundwater, and the concentration varies from 10 to 10,000 µg/l (Todd, 1980). While manganese is an essential nutrient, it can impart an unpleasant taste to water and stain laundry and plumbing fixtures. It is one of the elements that can contribute to hardness, and is considered undesirable in an industrial water supply. For these reasons, a secondary MCL for manganese has been established at 50 μg/l (Table 2-3). The Sisco Landfill (now closed) is the only documented non-natural source of manganese in the study area (DOH, 1999).

Manganese is present in groundwater beneath the Getchell Plateau (Figure 4-2f). The highest levels of manganese were found in a few wells east of Marysville and northeast of Lake Stevens. Manganese was detected in 92 wells. Manganese was detected in 81% of the water quality samples collected. Manganese concentrations were as high as 5,000 μg/l and averaged 19 μg/l. Seventy-four wells were found to exceed the 50 μg/l MCL for manganese (Table 4-9).

Recent groundwater sampling confirmed the wide distribution and high concentrations of manganese in the Getchell Plateau groundwater. Manganese was detected in 38 of the 58 wells, or 66% of the samples. This investigation found 34 samples that exceeded the MCL during the summer, and 29 samples that exceeded the MCL during the spring (Appendix B).

The highest manganese concentrations were not generally associated with rural residential land uses (Table 4-10), but were associated with the advance outwash aquifer (Table 4-11). Although elevated relative to the MCL, the concentration of manganese is considered to be naturally occurring. The Sisco Landfill (now closed) is the only documented non-natural source of manganese in the investigation area (DOH, 1999).

Nitrate and Nitrite

Nitrogen occurs in the natural environment in many forms. The oxidized species nitrate (NO_3) and nitrite (NO_2) are naturally present in groundwater in and rocks at very low levels, and they can also enter surface water and groundwater at concentrations of concern from a variety of human sources, including manure storage, fertilizer use, human sewage and septage, and atmospheric deposition. More than 3.2 million tons (2.9 million metric tons) of nitrogen-related compounds are deposited on the earth's surface from the atmosphere each year. Atmospheric deposition of these compounds is generally less than one-ton per square-mile (350 kg per square-kilometer) in the Puget Lowland (Mueller and Helsel, 1996). The ambient concentration of nitrate in the environment is typically less than 10,000 μg/l.

The MCL for nitrate is 10,000 μg/l and the MCL for nitrite is 1,000 μg/l (Table 2-3). Acute exposure to nitrate in drinking water interferes with the oxygen carrying-capacity of blood in children. This is a very serious condition, which can lead to death and is known as "blue baby syndrome", which develops as a result of the body converting nitrate to nitrite. Chronic exposure can cause excessive urination and hemorrhaging of the spleen (USEPA, 2004).

Nitrate and nitrite levels in surface waters adjacent to the Getchell Plateau rarely exceed 2,500 μg/l and are typically less than 1,500 μg/l (Thornburgh, 2004, pers. comm.). Tesoriero and Voss (1997) found ambient levels of nitrate in the groundwaters of Puget Sound to be less than 3,000 μg/l. Mueller and Helsel (1996) reported that the ambient levels of nitrate in the groundwater should be less than 2,000 μg/l.

Nitrate and nitrite are present in groundwater beneath the Getchell Plateau (Figures 4-2g-h). The highest concentrations were located in a few wells in the center of the plateau east of Marysville. Nitrate was detected in 136 wells. Nitrate was detected in 36% of the water quality samples collected. Nitrate concentrations were as high as 10,700 μg/l and averaged 600 μg/l (Appendix B). Only one well was found to exceed the 10,000 μg/l MCL for nitrate (Table 4-9). Nitrite was detected in 22 wells. Nitrite was detected in 21% of the water quality samples collected. Nitrite concentrations were as high as 7,200 μg/l and averaged 340 μg/l. Eleven wells were found to exceed the 1,000 MCL for Nitrite μg/l (Table 4-9)

Groundwater sampling for this investigation confirmed the wide distribution and the probable anthropogenic cause of the observed nitrate/nitrite concentrations in the Getchell Plateau groundwater. Nitrate was detected in 21 of the 58 wells, and in 36% of the samples. Nitrate concentrations were as high as 10,700 μg/l and averaged 2,000 μg/l. Nitrite was detected in 18 of the 58 wells, and in 30% of the samples (Table 4-9). Nitrite concentrations were as high as 7,200 μg/l and averaged 1,500 μg/l (Appendix B).

The highest nitrate and nitrite concentrations were associated with rural residential land uses (Table 4-10). The highest concentrations of nitrate and nitrite were not associated with the advance outwash aquifer (Table 4-11). The distribution and concentration of nitrate and nitrite was consistent with anthropogenic sources; however, the concentrations only exceeded the MCL in isolated locations on the plateau.

Sodium

Sodium is the sixth most abundant element in the earth's crust but it is never found in elemental form. Sodium generally occurs as sodium chloride (NaCl), commonly sold as table salt or rock salt. Sodium concentrations average 21,000,000 μg/l in the earth's crust, 350 μg/l in streams, and 380,000 μg/l in humans (Webelements, 2004). In addition to commercial uses of sodium salts, sodium used in sodium vapor street lights.

Sodium is a vital nutrient and is important for nerve function. There are no drinking water criteria for sodium.

Sodium occurs naturally in groundwater with concentrations that vary from 10 to 10,000 μg/l (Todd, 1980). Sodium concentrations can be very high in areas of saltwater intrusion. The closed Sisco Landfill is the only documented non-natural source of sodium in the investigation area (DOH, 1999).

Sodium is present throughout the groundwater beneath the Getchell Plateau (Figure 4-2i). The highest levels of sodium were generally below 25,000 μg/l. There were slightly higher concentrations of sodium along the western boundary of the investigation area. Sodium was detected in 415 wells. Sodium was detected in 100% of the samples. Sodium concentrations were as high as 190,000 μg/l and averaged 14,000 μg/l.

Groundwater sampling for this investigation confirmed the wide distribution and high concretions of sodium in the Getchell Plateau groundwater. Sodium concentrations were as high as 59,000 μg/l and averaged 9,500 μg/l (Appendix B).

The highest sodium concentrations were not associated with rural residential land uses (Table 4-10) or with the advance outwash aquifer (Table 4-11). The distribution of sodium was consistent with a natural source.

Organic Compounds

Organic compounds are infrequently used or stored above the Getchell Plateau groundwater systems (Ecology, 2004d, f, g). While organic compounds have been found in the groundwater beneath the Getchell Plateau, they are associated with widely dispersed sites that, with one exception, have not contributed to direct contamination of wells used as potable water sources.

Petroleum products have contaminated groundwater beneath the Getchell Plateau. In general, these leaks occurred in areas served by municipal water supplies, so no domestic wells have become contaminated. The effective impact of leaking underground storage tanks on the Getchell Plateau groundwater resources is considered to be low.

Pentachlorophenol (PCP), tannins, and ligands have been documented in the groundwater beneath the closed Sisco Landfill (DOH, 1999). PCP and dissolved metals have been documented in domestic drinking water wells downgradient of the landfill, causing several homeowners to have to use bottled water or to drill deeper wells.

More than 50 different organic chemicals were detected in the groundwater beneath the Lake Stevens Landfill (Snohomish County Solid Waste, 2004a). The Lake Stevens Landfill is located within the City of Lake Stevens water system service area, so no domestic wells are impacted. The movement and concentrations of these organic chemicals is being monitored by Snohomish County Public Works.

Polychlorinated biphenyls (PCBs) have been detected in the groundwater beneath the closed Sisco and Lake Stevens Landfills, and the Bonneville Power Administration Substation in the City of Snohomish. The Bonneville Power Administration Substation is located within the City of Snohomish water system service area, so no domestic wells are impacted. The movement of the PCBs beneath the substation site is being monitored by the Bonneville Power Administration.

Nonhalogenated solvents have been detected in the groundwater at five sites along the margins of the Getchell Plateau, but have not been documented to reach any drinking water systems.

Pathogen Indicators

Coliform Bacteria

Colonies of coliform bacteria live in the intestines of all warm-blooded animals. The ubiquity and harmless nature of coliform bacteria make them an ideal indicator of a connection between a groundwater and other potentially harmful pathogens in animal wastes.

Coliform bacteria are not the direct cause of disease, but the occurrence of coliform bacteria can indicate the presence of disease-causing organisms. The MCL for coliforms is one colony per 100 ml (Table 2-3).

Surface water samples show that coliform bacteria concentrations are highly variable in the natural environment. Streams located in rural areas can have average bacteria levels less than 100 colonies per 100 ml, streams in urban areas can have average bacteria levels between 100 and 500 colonies per 100 ml, and streams in agricultural areas can have average bacteria levels greater than 500 colonies per 100 ml (Thornburgh, 2004, pers. comm.)

Coliform bacteria are present in the Getchell Plateau groundwater wherever there is sufficient animal waste present. The highest coliform bacteria counts were located southeast of Lake Stevens and along an east-to-west trending line that bisects Sisco Heights (Figure 4-3).

Coliform bacteria were detected in 11 of 247 wells, and in 5% of the samples. Coliform bacteria counts ranged from less than the detection limit to 240 colonies per 100 ml and averaged 1.9 colonies per 100 ml (Appendix B). Coliform bacteria were detected in 8 of 58 wells, and in 13% of the samples. Eleven wells were found to exceed the MCL for coliform bacteria (Table 4-9).

Snohomish County Public Works has record of only 36 coliform samples prior to 2000. No sample prior to 2000 showed the presence of coliforms. Since 2000, 297 coliform samples have been collected and average 2 colonies per 100 ml. Coliform bacteria were not detected in 279 samples.

The highest coliform bacteria concentrations were not associated with rural residential land uses (Table 4-10) or with the advance outwash aquifer (Table 4-11).

Other water quality parameters

<u>Conductivity</u>

Conductivity is a measure of water's ability to transmit an electrical current, which is a function of the concentration and type of ions in solution. Distilled water has a conductivity of 0.001 mmhos/cm, whereas sea water has a conductivity of 50 mmhos/cm. The secondary MCL for conductivity is 0.7 mmhos/cm (Table 2-3).

Conductivity of the groundwater beneath the Getchell Plateau varies widely (Figure 4-4a). The highest conductivities were measured from a few wells along the eastern edge of the plateau. The lowest conductivities were measured from wells in the central portion of the plateau.

Conductivity measurements from all samples ranged from 0.063 mmhos/cm to 0.68 mmhos/cm and averaged 0.19 mmhos/cm (Table 4-9). Sampling for this investigation found that conductivity ranged from 0.063 mmhos/cm to 0.56 mmhos/cm and averaged 0.19 mmhos/cm. (Appendix B). No wells were found to exceed the 0.7 mmhos/cm MCL for conductivity.

The highest conductivities were associated with rural commercial land uses (Table 4-10) and with the sedimentary rock aquifer (Table 4-11). There were too few samples to establish a cause and effect relationship between conductivity and land use. The observed conductivities were within established norms for potable groundwater.

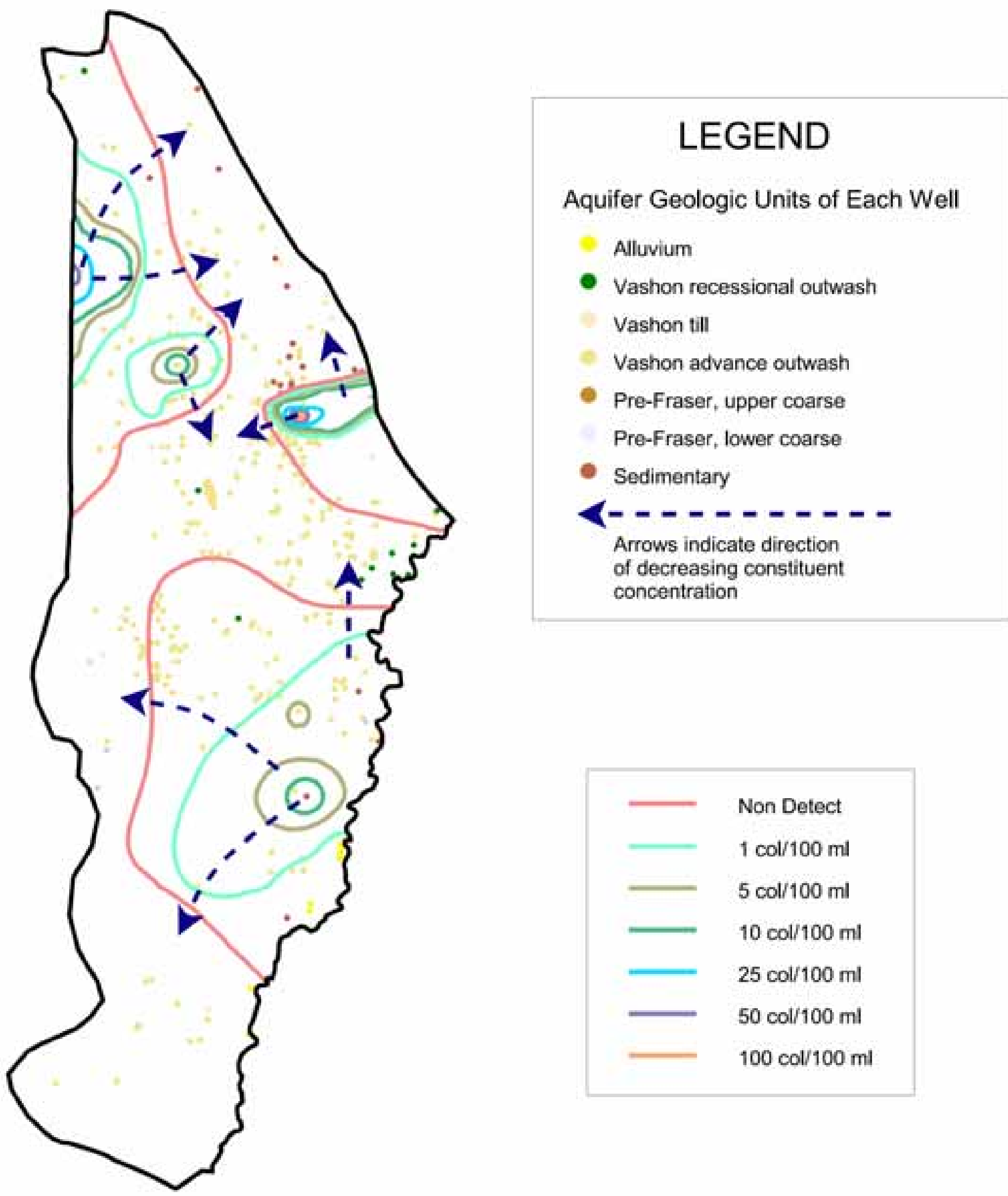
<u>Dissolved Oxygen</u>

Oxygen naturally dissolves in water. Washington State surface water quality criteria (Chapter 173-201A WAC) require oxygen concentrations between 8 mg/l and 9.5 mg/l. These criteria are set based on the needs of aquatic organisms. The saturation concentration of oxygen decreases with increased temperature, and oxygen is removed by some biological activity such as bacterial degradation and cellular respiration of algae.

Groundwater, since it is not in contact with the atmosphere and does not move by turbulent flow, has a comparatively low dissolved oxygen content. There so there is no standard for dissolved oxygen in groundwater even though dissolved oxygen levels can influence bacteria concentrations and contaminant mobility.

The highest concentrations of dissolved oxygen occur along the western margin of the plateau, north of Marysville (Figure 4-4b). Dissolved oxygen from all samples ranged from 0.1 mg/l to 11.8 mg/l and averaged 2.7 mg/l. Sampling performed for this investigation found dissolved oxygen concentrations ranging from 0.07 to 9.9 mg/l and averaging 2.7 mg/l. (Appendix B).

The highest dissolved oxygen concentrations were associated with undeveloped rural land (Table 4-10) and with the recessional outwash aquifer (Table 4-11).



SNOHOMISH COUNTY
SURFACE WATER MANAGEMENT

Figure 4-3. Contour Map Showing the Distribution of Total Coliform Bacteria.

N

0 1 2 3 4 Miles

Snohomish County
PUBLIC WORKS
SURFACE WATER MANAGEMENT

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Hardness

Hardness is defined as the combined concentration of polyvalent cations, i.e., ions that have a positive charge of two or more. The most common elements contributing to hardness in drinking water are calcium, magnesium, iron, and manganese. Since hardness is often removed by precipitation of metal carbonates, its concentration is expressed in terms of mg $CaCO_3$/l. Water with a hardness of 0 to 60 mg/l as $CaCO_3$ is considered ‘soft.’ Moderately hard water has 61 to 120 mg/l as $CaCO_3$. Hard water has 121 and 180 mg/l as $CaCO_3$. Very hard water has greater than 180 mg/l as dissolved $CaCO_3$.

As noted above, hard water can cause mineral deposits on plumbing fixtures, and can reduce the effectiveness of soap by the interaction of dissolved magnesium in hard water with the components of the soap. It can also interfere with the action of soaps, dyes, and other chemicals in commercial processes, and can cause scale deposits in cooling towers and boilers, thus it is a significant concern to industry. In contrast, soft water is corrosive to metal pipes and fixtures, and is of particular concern to water purveyors, and water treatment plants often add chemicals to the water supply to prevent corrosion in the system.

Although there is no water quality standard for hardness, the typical homeowner will test a new well for hardness since it can impact the life of plumbing and interferes with the ability to do laundry, wash dishes, or bathe. Samples for hardness are infrequently collected for groundwater investigations. Hardness was not analyzed in the samples collected for this investigation.

The hardest groundwater beneath the Getchell Plateau is located just east of Lake Stevens (Figure 4-4c). There are other are areas of hard water scattered throughout the Getchell Plateau. Hardness from all 106 samples ranged from 24 to 187 mg/l as $CaCO_3$ and averaged 78 mg/l as $CaCO_3$. Ten wells had hard water and one well had very hard water (Appendix B). The hardest water was associated with the land zoned for rural utility use (Table 4-10) and with the sedimentary rock aquifer (Table 4-11). On average, there was not much variation in water hardness among the Getchell Plateau aquifers (Table 4-11).

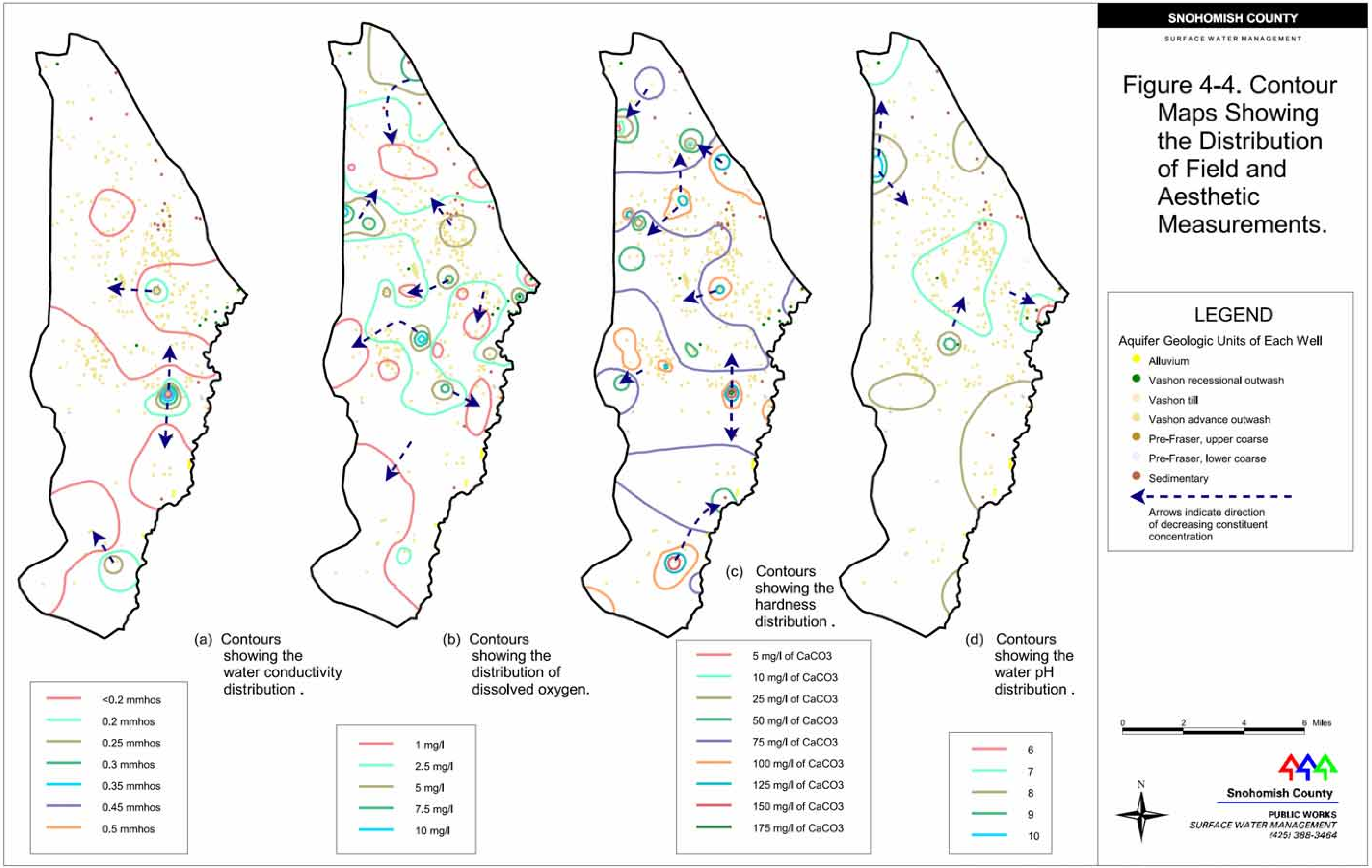
pH

The measure of the hydrogen ion concentration of water is called pH. The pH scale ranges from zero for very acidic water to 14 for very basic or alkaline water. A pH of 7 is neutral. The pH scale is logarithmic, so a drop from a pH of 6 to 5 represents a 10-fold increase in acidity. Groundwater with a low pH can indicate high concentrations of dissolved iron and other metals. The Washington State groundwater quality criteria for pH is between 6.5 and 8.5. Water with a high pH will have slippery feel and a soda taste. Water with a low pH will have a bitter or metallic taste and can be corrosive (USEPA, 2004).

The pH of the groundwater beneath the Getchell Plateau is fairly stable with an average between 7 and 8 (Figure 4-4d). The most acidic pH was recorded in a single well just off the Pilchuck River near Granite Falls. The most alkaline pH was measured in a well with high hydrogen sulfide concentrations located near the western plateau boundary north of Marysville. The pH from all 102 samples ranged from 5.7 to 11.9 and averaged 7.6. Groundwater sampling for this investigation found pH to range from 5.6 to 11.9 with an average of 7.2 (Appendix B).

Samples from several wells had pH concentrations that exceeded the MCL. These exceedances were traced to naturally occurring constituents in the groundwater, and therefore are considered to be natural.

The highest pH values were associated with vacant rural land (Table 4-10) and the sedimentary rock aquifer (Table 4-11). The lowest pH values were associated with rural commercial land use (Table 4-10) and the alluvial aquifer (Table 4-11).



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5.1 Groundwater Supply

Twenty percent of the Getchell Plateau residents depend on the Getchell aquifers for their daily drinking water needs. Nearly all of these residents live outside of the major urban areas and obtain their water from individual domestic wells or community well-based water systems. The residents of the Getchell Plateau consume between 975 ac-ft and 2,130 ac-ft of groundwater per year (Table 4-1). This is the equivalent of 0.22 in (6 mm) to 0.48 in (12 mm) of rainfall, respectively. If water consumption increases at the same rate as the population, water consumption in the year 2020 will be between 1,300 ac-ft and 2,900 ac-ft of groundwater per year. This is the equivalent of 0.30 in (8 mm) to 0.65 in (17 mm) of rainfall, respectively.

Groundwater consumption, groundwater discharge (i.e. stream base flow), and groundwater recharge currently appear to be in balance. Future increases in the groundwater-dependent population will force these groundwater systems to seek a new equilibrium. This new equilibrium will be achieved by a lowering the groundwater discharge to streams (creating lower streamflows), or by decreasing the water-table elevation (reducing the volume of stored groundwater).

The Getchell Plateau residents who live in the more urban areas obtain their water from municipal systems that import water to the plateau (Figure 5-1). Several municipal systems, discussed below, maintain wells on the Getchell Plateau, but these wells are used as a backup water supply during dry years. These municipal systems have the capacity to import more than 16,000 ac-ft/yr to the Getchell Plateau, or nearly four times the volume of water currently used by the urban and rural residents.

5.2 Water Services

5.2.1 Cities (Large Group A Water Systems)

The cities on and in the vicinity of the Getchell Plateau receive their water from various sources. Most of the cities maintain their own wells or reservoirs as water supplies, and purchase the rest of their water from the City of Everett.

City of Everett

The City of Everett's water supply comes from Spada Lake located at the headwaters of the Sultan River, about 30 miles east of Everett. The reservoir was created in 1965 by the construction of the Culmback Dam. It holds more that 150,000 ac-ft or 50 billion gallons of water. From Spada Lake, the water flows through about seven miles of pipelines to the Chaplain Reservoir, where it is treated at the City of Everett water treatment facility before the water is distributed throughout Snohomish County.

City of Arlington

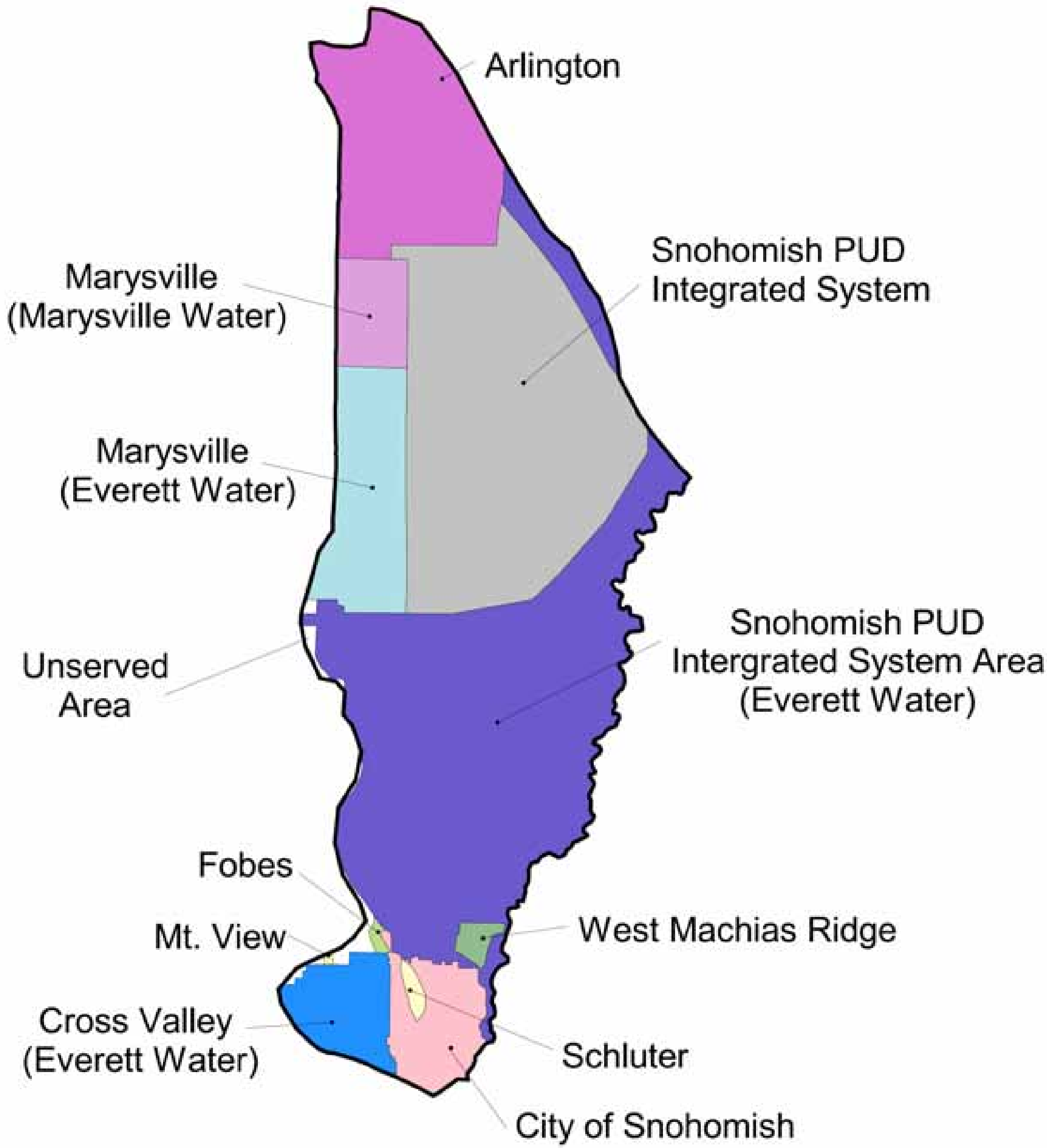
The City of Arlington draws its water from several wells, three of which are located along the margin of the Getchell Plateau, near the Stillaguamish River. Arlington also purchases water from Snohomish County Public Utilities District (PUD), which purchases water from the City of Everett, and from the City of Marysville. The water purchased from Marysville is used in the Island Crossing Service Area (Figure 5-1; City of Arlington, 2003).

The City of Arlington wells are located just outside of the investigation area and draw their water from the Stillaguamish alluvium. These wells are located close enough to the river to capture river water. The wells are also situated in a groundwater discharge area of the Getchell Plateau.

Arlington has a population of about 9,200, and provides 900,000 gallons of water per day (1,000 ac-ft/yr) to approximately 4,200 connections inside the City of Arlington (Smith, 2004 pers. comm.; DOH, 2004a). Between 1.0 and 1.1 million gallons of wastewater per day of wastewater are treated by the City of Arlington (City of Arlington Public Works, 2004, pers. comm.). The treated wastewater is discharged to the Stillaguamish River.

City of Lake Stevens

The City of Lake Steven receives all of its water from the Snohomish County PUD, which purchases water from the City of Everett and the City of Marysville, principally from Edward Springs (DOH, 2004a). The water purchased by Lake Stevens comes from a surface source.



SNOHOMISH COUNTY
SURFACE WATER MANAGEMENT

Figure 5-1. Getchell Plateau
Water System Service Areas.

N

0 1 2 3 4 Miles

Snohomish County
PUBLIC WORKS

Note: Data are from the City of Everett.

Project name: x:\wq\groundwater\getchell\getchell_arcview\waterdistricts.apr Plot date: Dec 29, 2004; Figure 4-1 jak

The PUD maintains two emergency wells within the city limits of Lake Stevens on the Getchell Plateau (City of Lake Stevens, no date).

The PUD provides the greater Lake Stevens area with four to five million gallons of water per day, or 4,500 to 5,600 ac-ft/yr (PUD, 2004, pers. comm.). There are 13,800 connections serving a population of 31,740 in the City of Lake Stevens water service area (DOH, 2004a).

The City of Lake Stevens treats 2.5 million gallons of wastewater each day (Lake Stevens Sewer District, 2004). The wastewater is discharged to the Snohomish River.

City of Granite Falls

The City of Granite Falls extends a short distance into the investigation area. Granite Falls receives water from wells located outside of the investigation area, and purchases four to five million gallons of water per day from the PUD (PUD, 2004, pers. comm.).

City of Marysville

The City of Marysville receives water from the City of Everett, Edward Springs, and the Stillaguamish Ranney collector. A Ranney collector is a well with horizontal well screen instead of the traditional vertical well screen. The Stillaguamish Ranney collector is designed to capture water from the Stillaguamish River (City of Marysville, 2003). The City of Marysville also has a water right on Lake Goodwin (DOH, 2004a). Seventeen percent of Marysville's drinking water comes from Edwards Springs or the Ranney collector (DOH, 2004a).

The City of Marysville maintains two wells on the Getchell Plateau as a backup water supply for dry periods. These wells are used for energy water supply and are pumped twice a year to test their function and obtain water quality samples. These wells have not been used to supply water to Marysville residents since at least 2001 in spite of the relative dry years (Wood, 2004, pers. comm.)

The City of Marysville has a population of 28,370 and provides 6.5 million gallons of water per day (7,300 ac-ft/yr) to over 16,400 connections inside the city. Five-million gallons of wastewater are treated by the City of Marysville each day (DOH, 2004a). The wastewater is discharged to the Snohomish River.

City of Snohomish

The City of Snohomish receives all of its water from surface sources: 52% from a City of Snohomish dam on the Pilchuck River and 48% purchased from the City of Everett (City of Snohomish, 2004). DOH (2004a) records show that the City of Snohomish has two wells located on the Getchell Plateau. Very little is known about these wells other than their existence, and they are not mentioned in a history of the City of Snohomish water system available online (City of Snohomish, 2002).

The City of Snohomish has a population of 8,320 and provides 982,000 gallons of water per day (1,100 ac-ft/yr) to approximately 2,800 connections inside the City of Snohomish (Wilkins, 2004, pers. comm.; DOH, 2004a). The City of Snohomish treats one million gallons of wastewater each day (Wilkins 2004, pers. comm.). The wastewater is discharged to the Snohomish River.

5.3 Community Water Systems

5.3.1 Small Group A Water Systems

Small Group A water systems have more than 15 connections and serve at least 25 persons for more than 60 consecutive days during the year. There are 53 Group A water systems drawing water from wells and serving the residents of the Getchell Plateau. This discussion excludes the larger Group A municipal water systems that supply water to the major urban centers that were discussed above (e.g. City of Snohomish).

It is estimated that all Group A water systems on the Getchell Plateau deliver 240 to 480 ac-ft/yr to about 1,000 persons.

5.3.2 Group B Well Systems

Group B water systems have 2 to 14 connections and serve fewer than 25 persons. There are 64 Group B water systems drawing their water from wells and serving the residents of the Getchell Plateau.

It is estimated that the Group B water systems on the Getchell Plateau deliver 35 to 245 ac-ft of water per year to about 520 to 3,640 persons, depending on the number of connections.

5.4 Water Use from Individual Domestic Wells

Snohomish County Public Works has record of nearly

2,300 domestic water wells on the Getchell Plateau. The Snohomish Health District records show that at least 151 of these wells are shared by two properties and are not recorded as Group B wells. These individuals consume an estimated 700 to 1,400 ac-ft/yr. Wastewater is typically handled via on-site septic systems, which return 70% of the water withdrawn to an aquifer (Sapik et al, 1988; Thomas et al., 1999, as cited in Frans and Kresch, 2004).

The estimate of individual domestic well use is based on the number of wells that have been recorded by Ecology and are on file with Snohomish County Public Works. The general lack of data on wells makes it difficult to estimate the number of unrecorded wells on the Getchell Plateau. Snohomish County Assessor's Office records show that there are 6,100 occupied rural residential parcels on the Getchell Plateau. In addition to the occupied parcels, the Assessor's records show 3,700 unoccupied rural residential parcels on the plateau.

A high percentage of the rural residential parcels are served by wells. This analysis suggests that the possibility that only one-third of the wells on Getchell Plateau have been recorded. If this is the case, domestic wells could be providing between 1,850 and 3,700 ac-ft/yr. Development of the remaining parcels would increase individual groundwater consumption to between 3,000 and 6,000 ac-ft/yr.

5.5 Future Water Demand

The population of the Getchell Plateau is expected grow by 35% by 2020. Currently, 20% of the Getchell Plateau residents receive their water from a groundwater source. This proportion is anticipated to remain unchanged as the population increases. As the population increases, water demand from all sources will grow to an estimated 2,300 to 7,800 ac-ft/yr with groundwater from the Getchell Plateau supplying an estimated 1,300 to and 2,900 ac-ft/yr. The analysis of occupied parcels indicates that the actual water consumption may be even higher.

Cities with larger municipal water systems on the Getchell Plateau currently meet their water demand by importing water. The municipal water systems collectively have capacity to import 16,000 ac-ft of water per year (DOH, 2004a). It is likely that the water demand in the urban areas brought about by the projected 35% increase in population will be met by importing water, although the municipal systems have water rights to meet their demand from the Getchell Plateau aquifer system.

5.6 Water Rights Allocation

The analysis above addressed actual water consumption and did not address water rights. Water rights establish a right to a specific volume of water, either groundwater or surface water. Individual domestic wells are granted the right to withdraw 5,000 gal/day without being required to submit an application for a specific water right to Ecology. Anyone who uses more than 5,000 gal/day must obtain a water right. Ecology has records for 536 groundwater rights and 307 surface water rights on the Getchell Plateau (Ecology, 2004a). It is possible to develop an estimate of the water volume associated with these rights because Ecology records an annual water yield for some water rights and an instantaneous water right for others. The available data suggest that there are groundwater rights to withdraw up to 11,400 ac-ft/yr, and surface water rights to withdraw up to 3,500 ac-ft/yr.

The groundwater rights are dominated by a few large municipal wells, which claim 6,600 ac-ft/yr for municipal water supply. Individual or small group systems claim 3,200 ac-ft/yr for domestic uses. In addition, 1,230 ac-ft/yr are claimed for heat exchange. The remaining 280 ac-ft/yr groundwater rights are allocated to crop irrigation and stock watering.

The surface water rights are dominated by irrigation and stock watering. A small portion of the surface water rights have been allocated to domestic use and fish propagation.

The estimated combined groundwater and surface water rights exceed the current and future water needs of the Getchell Plateau residents. The excess in available water rights relative to the water demand means that there several thousand ac-ft/yr of water may be available for export. A more precise estimate of the water export capacity is not available because the export capacity of the existing water systems is not known.

CHAPTER 6. LAND USE IMPACTS ON GROUNDWATER

6.1 Introduction

Land used above the Getchell Plateau aquifers can, and frequently does, impact the availability and the potablity of groundwater. Water quantity and quality were discussed in Chapter 4. The observed and potential groundwater quantity and quantity impacts were discussed in Chapter 5. This chapter discusses land-use specific issues such as the potential of land use to cause groundwater contamination.

Most people think that the main sources of groundwater contamination are leachate from landfills, chemical spills along highways, and chemical spills at commercial facilities. There are landfills, highways, and commercial facilities on the Getchell Plateau, but as discussed previously, there is little evidence to suggest that these activities have contributed to groundwater contamination that affects the general availability of groundwater for domestic use. In fact, poorly functioning septic systems and poor animal waste management are the source of most actual and potential groundwater quality problems related to land use on the Getchell Plateau. Well water sampling conducted by the USGS and the project team identified few localized water quality issues, many of which can be traced to homeowners. Unfortunately these homeowners are frequently unaware that they are the source of a water quality problem that impacts the water they use.

The schematic in Figure 6-1 shows how contaminants can migrate downward through the unsaturated zone to an aquifer. The geologic materials that underlie a given land use can determine whether a given chemical will reach an aquifer in concentrations that could cause a measurable impact on water quality. The speed at which these chemicals move downward depends on physical properties of the aquifer and aquitard, the properties of the contaminant, and volume of the contaminant released. Slow movement of contaminants through a dense material, such as glacial till, provides an opportunity for the chemicals to disperse or break down before reaching an aquifer. On the other hand, rapid movement of contaminants through loose materials, such as alluvium and glacial outwash, provides little time for the chemicals to disperse or break down before reaching an aquifer.

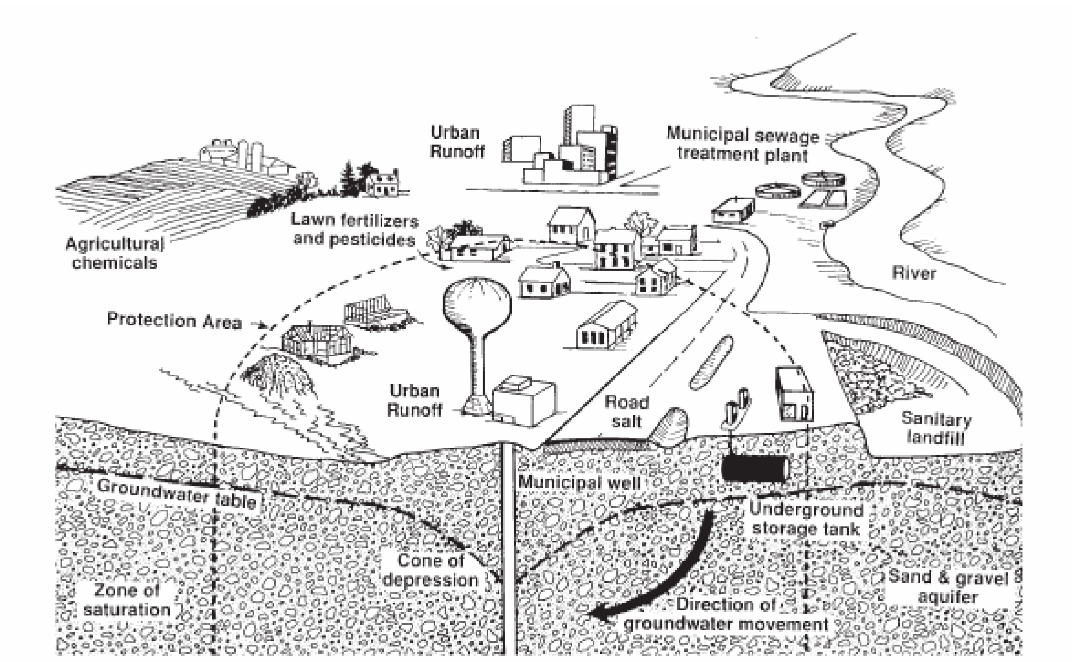


Figure 6-1. Schematic diagram showing the potential land use impacts on groundwater.

This land use discussion is broken into several sections:

- an assessment of the actual or existing land uses on the Getchell Plateau as they have been derived from the Snohomish County Assessor's records;
- an assessment of future land-use planning based on the comprehensive planning process;
- an assessment of groundwater protection by cities as they are addressed in their comprehensive plans of charters; and
- an assessment of specific land-use issues.

6.2 Existing Land Use

The Assessor records show that roughly 61 mi^2, or over 75%, of the Getchell Plateau is currently in rural land uses, nearly two-thirds of which is residential (Figure 6-2 and Table 6-1). Roughly 18 mi^2, or 22%, of the Getchell Plateau is in urban land uses. The remainder of the plateau is either lakes, rights-of-way, or parcels unclassified by the Assessor.

6.2.1 Rural Land Uses

Residential

Rural development on the Getchell Plateau is supplanting the historic timber and agriculture land uses. Most homes are located on 5-acre or 10-acre lots, although 1-acre lots have become more common.

Nearly 36 mi^2, or 48%, of the Getchell Plateau are occupied with single-family rural residences (Table 6-1). The Assessor records 6,100 occupied rural residential parcels. These residences range in scale from vacation cabins to large multi-building estates. The typical rural residence is modest and would fit comfortably in any of the Getchell Plateau's urban centers.

Over 16 mi^2, or 16%, of the Getchell Plateau are unoccupied parcels designated for single-family rural residential development (Table 6-1). The Assessor records show 3,700 unoccupied residential parcels.

The typical rural resident relies on a well for drinking water and a septic system for wastewater treatment and disposal. The availability of water does not appear to be an issue for residences of the Getchell Plateau, although some residents have replaced dug wells because of low water during the dry summer months. As noted in Chapter 4, arsenic, iron, and manganese can occur naturally at relatively high levels, sometimes in excess of the MCLs. Human-caused water quality problems from coliform bacteria and nitrate can be traced to improper pet and livestock waste-management practices (Table 6-2).

Fuel oil tanks (tanks less than 1,100 gal) for farm machinery and heating oil are common, but the more recently constructed homes rely on electric or propane heat. Livestock such as poultry, horses, cows, goats, and llamas are common.

Non-Residential Structures

The Assessor records show 1,033 acres or 1.6% of the Getchell Plateau as having non-residential structures (Table 6-1). Not much is known about these structures. A visual survey of the plateau found numerous parcels with barns and sheds and no residence. There are numerous orphaned barns and coops on former large-scale poultry farms scattered throughout the plateau as well.

Agriculture

As noted above, the land use on the Getchell Plateau appears to be shifting from agriculture to rural residential. The Assessor records show nearly 2,185 or 3.4% of the plateau is in active agricultural use (Table 6-1). A visual survey of the plateau reveals hay farming or pasturage as the dominant agricultural use today (Figure 6-3).

Groundwater quality sampling conducted during this investigation and by the USGS did not find evidence that the agricultural practices on the Getchell Plateau have contributed to groundwater quality problems (Chapter 4 and Appendix B).

Poultry Production

Anecdotal evidence suggests that the Getchell Plateau was once a major poultry production center. Hints of the poultry farming history are still present. The Assessor records show 50 acres, or 0.1%, of the Getchell Plateau are currently occupied by poultry operations (Table 6-1).

Airports and Flying Fields

There is a private airfield in the northeastern portion of the Getchell Plateau. The airfield is surrounded by single-family residences on five-acre lots. The airfield covers 110 acres, or 0.2%, of the Getchell Plateau (Table 6-1).

The airfield residents do not have a permit to store aviation fuel on site, so the groundwater issues near

Table 6-1. Current Land Use.

Landuse	Area			Parcels	
	Acres	Mi^2	Percent	Number	Percent
Summary Groupings					
All Rural Landuses	**39,327**	**61.4**	**75.1**	**9,271**	**15.8**
Rural Agriculture (including timber)	5,951	9.3	11.4	397	0.7
Rural Commercial	132	0.2	0.3	15	0.0
Rural Open Space	1,707	2.7	3.3	213	0.4
Rural Residential	30,462	47.6	58.2	8,319	14.1
All Urban Landuses	**11,639**	**18.2**	**22.2**	**20,113**	**34.2**
Urban Commercial/Industrial	1,204	1.9	2.3	486	1.7
Urban Residential	8,230	12.9	15.7	18,662	31.7
Urban Undeveloped	1,843	2.9	3.5	840	1.4
All Landuses					
Airports & Flying Fields	4	0.0	0.0	2	0.0
Cemetery	46	0.1	0.1	17	0.0
Rural Agriculture	2,185	3.4	4.2	216	0.0
Rural Commercial	71	0.1	0.1	13	0.0
Rural Commercial--Quarry	60	0.1	0.1	1	0.0
Rural Commercial--Manufacturing	1	0.0	0.0	1	0.0
Rural misc.--Non Residential Structure	1,033	1.6	2.0	293	0.0
Rural misc.--Private Roads	14	0.0	0.0	21	0.0
Open Space	1,707	2.7	3.3	213	0.0
Rural Residential	19,974	31.2	38.2	6,104	0.2
Rural Utility	24	0.0	0.0	11	0.0
Rural Vacant	10,488	16.4	20.0	2,215	0.1
Timber	3,767	5.9	7.2	181	0.0
Urban Commercial	953	1.5	1.8	390	0.0
Urban Commercial--Automotive repair	38	0.1	0.1	33	0.0
Urban Commercial--Gasoline Service Stations	10	0.0	0.0	11	0.0
Urban Commercial/Industrial	204	0.3	0.4	52	0.0
Urban Misc.--ROW, Parking Lots	28	0.0	0.1	52	0.0
Urban Residential	7,054	11.0	13.5	17,839	0.6
Urban Residential--Vacant	1,176	1.8	2.2	823	0.0
Urban Vacant	1,843	2.9	3.5	840	0.0
Urban Utility	32	0.0	0.1	19	0.0
Urban Utility--Landfill	45	0.1	0.1	2	0.0
Urban Utility--Natural Gas Pipeline	20	0.0	0.0	26	0.0
Urban Utility--Power Line	238	0.4	0.5	26	0.0
Water	1,336	2.1	2.6	2	0.0

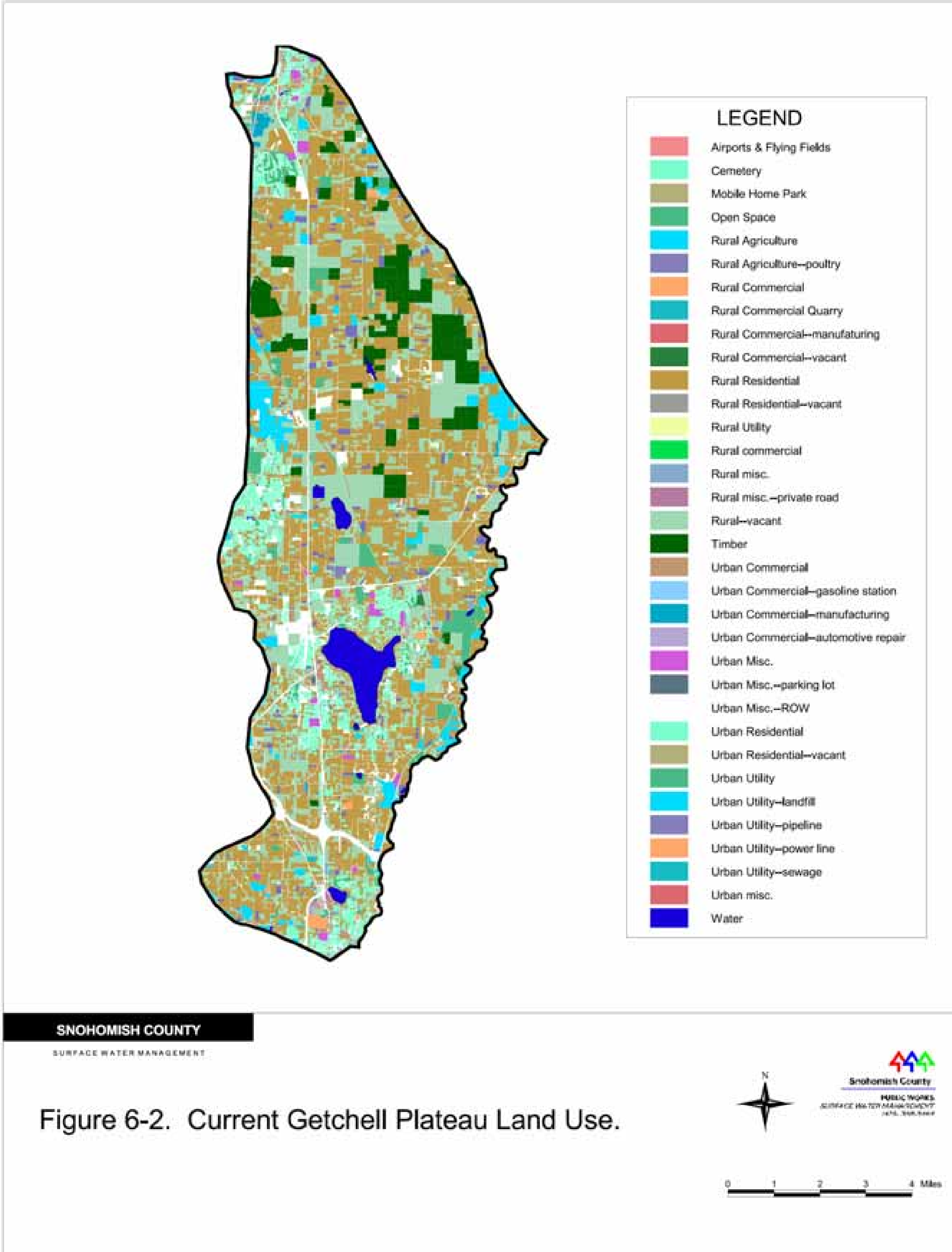


Figure 6-2. Current Getchell Plateau Land Use.

Project name: k:\wq\groundwater\getchell\getchell_arcview\land_use.apr Plot date: Nov 15, 2004; Figure 6-2 jak

Table 6-2. Potential land use contributions to groundwater quality and quantity problems.

Landuse	Activity	Water Quality	Water Quantity
Agriculture			
	Food crops	Pesticides, fertilizers, petroleum storage	irrigation
	Livestock	Livestock waste, nitrates, phosphates, chloride, chemical sprays and dips, coliform bacteria, viruses	irrigation and stock watering
	Timber	Pesticides, fertilizers	altered hydrology
Commercial			
	Rural airport	Fuels, batteries, solvents, heating oil	altered hydrology
	Automotive repair	Paints, solvents, miscellaneous chemicals, metals, oil and grease	general water use
	Car washes in unsewered areas	Soaps, detergents, waxes	general water use
	Dry cleaning	Solvents, spotting chemicals, ammonia, rust removers	
	Gasoline stations	Gasoline, oil and grease, solvents, MTBE	
	Laundromats in unsewered areas	Detergents, bleaches, fabric dyes	
	Scrap/junkyard	Oil, gasoline, antifreeze, PCB contaminated soils, batteries	
	Parking lots	Spills, oil and grease, zinc, other metals	
Industrial			
	Gravel and sand pits	Spills, miscellaneous chemicals, bacteria	dewatering
	Manufacturing	Metals, acids, minerals, sulfides, chemicals, sludge, chlorine, solvents	general water use
Municipal			
	Landfills	Nutrients, miscellaneous chemicals, metals	altered hydrology
	Road right of ways	Spills, oil and grease, zinc, other metals, fertilizers and herbicides	altered hydrology
Residential			
	Fuel storage tanks	Heating Oil	general water use
	Active water wells	Potential conduit for pollutants to enter groundwater	
	Inactive or orphaned water wells	Failed seals are a potential conduit for pollutants to enter groundwater	
	Lawns and landscaping	Fertilizers and herbicides	irrigation
	Septic systems	Septage, bacteria, viruses, nitrates, metals, synthetic detergents, cooking and motor oil, bleach, pesticides, paints, paint thinner, septic tank cleaner chemicals, sulfate, calcium, magnesium, potassium, phosphate	

Modified from Ohm, 2002.

Figure 6-3. Typical Getchell Plateau Farm.

the airfield are the same as those faced by other rural residents. Initially, each lot adjacent to the airfield was supplied by a single well, but these are giving way to more shared wells, typically one well serving two homes (Snohomish Health District, 2004a). In general, shared wells are becoming more common (Snohomish Health District, 2004a).

Timber

A visual survey of the Getchell Plateau reveals that much of the area was once managed for timber harvest. Many of the home sites visited by the project team have old-growth and second-growth stumps on the property. Recent aerial photographs show several large tracts that are still managed for timber (Figure 6-2). The Assessor records show 3,451 acres, or 5.4%, of the Getchell Plateau are managed for timber (Table 6-1).

Removing the forest cover alters the hydrology, increasing surface runoff and decreasing evapotranspiration. Pesticides and fertilizers, commonly used to manage pests and increase tree growth, can contribute to water quality problems; however, sampling conducted for this investigation and by the USGS did not find evidence that silvacultural practices on the Getchell Plateau have contributed to such water quantity or quality problems (Chapter 4 and Appendix B).

Gravel Quarries

The Assessor records show 60 acres, or 0.1%, of the Getchell Plateau are managed as sand and gravel quarries. There are 1 to 2 active quarry sites and 2 to 3 inactive quarry sites on the plateau.

Gravel operations alter the surface hydrology and can expose an aquifer when the mining reaches below the water table. Gravel mining can introduce petroleum products into an aquifer via spills. Bacteria and other chemicals can be introduced by wildlife, pets, and livestock into an aquifer when mining below the water table.

Dewatering of a mine pit poses the largest, albeit temporary, potential impact on the availability of groundwater by lowering the water table. Depending on the aquifer materials present, the dewatering may be local or extensive. Extensive water table depression is a possibility with dewatering of gravel quarries because the material being mined typically has a high hydraulic conductivity. Aggregate washing at gravel operations can also cause a water table decline if the water is not recycled (Table 6-3). There is no evidence that gravel mining on the Getchell Plateau has cause widespread groundwater quality or quantity problems.

6.2.2 Urban Land Uses

Single-Family and Multifamily Residential

Over 7,054 acres, or 13.5%, of the Getchell Plateau are occupied with single-family urban residences and a few multifamily residences (Table 6-1). The Assessor records 17,839 occupied urban parcels.

Urban residential development on the Getchell Plateau is supplanting low-density rural residential land uses as well as some of the timber and agriculture land uses. While many of the lots in urban residential area are still one or more acres, the trend is to convert these parcels to medium-density developments with four to five dwellings per acre, and high-density developments with 12 to 24 dwellings per acre.

Many of the homes in the urban residential areas on larger lots still rely on wells and septic systems, although these homes are being encouraged to convert to municipal water supply and municipal wastewater treatment as the utilities extend their service areas. Municipal water supply and wastewater treatment are the norm for urban areas where the dwelling densities are greater than one home per acre.

Urban residential areas contain a wide variety of sources of water pollutants. Metals and toxic organic compounds are released from motor vehicles, metal construction materials, paints, pesticides, and improper use and disposal of many household chemicals.

Table 6-3. Snohomish County GMA Comprehensive Plan or General Policy Plan (GPP) Land Use Classifications.

Designation	Current-Alt 1			
	ac	mi^2	percent	ac
Incorporated City	7,554	11.80	14.1	
Lake (Presently Only Lake Stevens)	993	1.55	1.9	
Local Commercial Farmland	397	0.62	0.7	
Open Space (Snohomish UGA Only)	2	0.00	0.0	
Other Land Uses (See Sub-area or UGA Plans)	0	0.00	0.0	
Public/Institutional Use	14	0.02	0.0	
Parks/Open Space (Arlington UGA Only)	1	0.00	0.0	
Public Use (Lake Stevens UGA Only)	112	0.17	0.2	
Riverway Commercial Farmland	806	1.26	1.5	
Rural Industrial	98	0.15	0.2	
Right of Way	267	0.42	0.5	271
Rural Residential-10 (1DU/10 Acres)	716	1.12	1.3	
Rural Residential-5 (1 DU/5 Acres)	14,818	23.15	27.6	
Rural Residential (1 DU/5 Acres Basic)	20,329	31.76	37.9	
Urban Commercial/Business Park (Snohomish UGA Only)	87	0.14	0.2	
Urban Commercial	199	0.31	0.4	45
Urban High Density Residential (12 to 24 DU/Acre)	205	0.32	0.4	
Urban Industrial	182	0.28	0.3	
Urban Low Density Residential (4 - 5 DU/Acre for Marysville)	657	1.03	1.2	
Urban Low Density Residential (4 - 6 DU/Acre)	1,134	1.77	2.1	1200
Urban Low Density Residential (4 DU/Acres for Lake Stevens UGA)	1,548	2.42	2.9	
Urban Low Density Residential (5 - 6 DU/Acre for Marysville)	322	0.50	0.6	
Urban Low Density Residential (6 DU/Acre for Lake Stevens UGA)	2,263	3.54	4.2	
Urban Medium Density Residential (6 - 12 DU/Acre)	907	1.42	1.7	968

-

Bacteria come from animal manure, failing septic systems, and sanitary sewer leakage. Nitrogen and phosphorous are generated from these sources as well as use of fertilizers. These pollutants enter surface water bodies via surface runoff, and can enter groundwater through improperly functioning septic systems, leaking underground tanks, infiltration of contaminated surface water, and failing well seals (Table 6-2).

The availability of potable water does not appear to be an issue for urban residents of the Getchell Plateau because much of the water is imported to the plateau. As the density of homes increases, residents that have relied on wells, especially those using shallow dug wells, may face groundwater quantity and quality issues.

Utilities

Utilities supply electricity, deliver natural gas or petroleum products through underground pipelines, dispose of wastewater, and landfill solid waste. These activities may introduce nutrients, chemicals, herbicides, pesticides, and metals, with the potential to contaminate groundwater.

A major power transmission line traverses the Getchell Plateau from north to south. The Bonneville Power Administration (BPA) maintains a 230-acre power substation in the City of Snohomish. Vegetation management via herbicides use is the greatest groundwater quality issue related to power transmission lines. Potential contaminants at the BPA substation include metals, PCBs, and PAHs. Based on historical uses, Ecology suspects that PCBs and PAHs have been released at the BPA site (Ecology, 2004d, e).

The Assessor records show a natural gas pipeline occupying 20 acres of the plateau, 20 acres being used for sewage disposal, and 18 acres being used for large-scale septic systems. No groundwater contamination is documented to have occurred at these facilities.

Commercial Activities

Nearly 1,204 acres, or 1.9%, of the Getchell Plateau lies in urban areas. Assessor records show 486 commercial parcels on the plateau. Potential contaminants include metals, pesticides, and petroleum products (Table 6-3). In general, commercial land use in urban areas relies on municipal water supply and wastewater treatment.

The Assessor records show 11 automobile repair shops and 33 gasoline service stations sites on the Getchell Plateau. Automobile repair shops and gasoline service stations occupy less than 50 acres, or roughly 0.1%, of the plateau. The water quality issues related to gasoline service stations are discussed in the section on underground storage tanks below.

Commercial manufacturing and industrial facilities occupy 204 acres or 0.3% of the Getchell Plateau. Manufacturing operations on the plateau include saw and planing mills, millworks, and plastics manufacture. USGS and Ecology data do not indicate that these operations have caused measurable groundwater quality problems.

6.3 Proposed Land Use and Development Trends

The following discussion of proposed land use and development trends is based on programmatic planning documents. While the previous section looked at land use at the parcel scale, this section examines land use and development at the county and city scale, so the data presented in Sections 6.2 and 6.3 are not always directly comparable.

This section begins with a discussion of the land use planning process at the State, County, and City level. The discussion relates to the influence of the growth management process on groundwater issues. At the end of this section there is a brief discussion of the land use alternatives proposed in the Draft Environmental Impact Statement (DEIS) being prepared in support of Snohomish County's 10-year Comprehensive Plan Update (PDS, 2004).

6.3.1 Plans and Policies Effecting Land Use (Growth Management Act—GMA, Chapter 36.70A RCW)

The State Growth Management Act (GMA) passed in 1990 mandates the development of comprehensive plans and development regulations. These plans and regulations take their place among other plans and regulations relating to resource management, environmental protection, and the regulation of land use, utilities, and public facilities. Washington State has found that uncoordinated and unplanned growth, together with a lack of common goals expressing the public's interest in the conservation and the wise use of our lands, pose a threat to the environment, sustainable economic development, and the health, safety, and high quality of life enjoyed by citizens of this state. It is in the public interest that citizens, communities, local governments, and the private sector cooperate and coordinate with one another in comprehensive land use planning. Further, Washington State finds that it is in the public interest that economic development programs be shared with communities experiencing insufficient economic growth (Chapter 365-195-700 WAC).

With respect to groundwater, the GMA requires all of Washington's jurisdictions under to define Critical Aquifer Recharge Areas (CARAs) and pass ordinances to protect them. The GMA provides for the inclusion of "protection of the quality and quantity of groundwater used for public water supplies" in county growth management plans.

6.3.2 Snohomish County Comprehensive Plan and General Policy Plan

Groundwater issues are described in the Natural Environment element of Snohomish County's General Policy Plan (GPP), which is part of the County's Comprehensive Plan. The current GPP addresses groundwater by providing programs and ordinances for the protection of aquatic ecosystems and aquifers. The GPP specifically encourages educational programs on groundwater contamination and education on best management practices. The GPP requires that groundwater quality and quantity protection will be addressed in future amendments to the Snohomish County Comprehensive Plan (see below). The GPP also addresses the coordination of aquifer planning and monitoring with other affected governments and tribes, specifically to minimize groundwater pollution.

The Comprehensive Plan is revised annually and thoroughly updated every 10 years. The purpose of the Comprehensive Plan update is to extend the planning horizon from 2012 to 2025. In the fall of 2004 Snohomish County, completed a DEIS that evaluated three alterative growth management strategies that will appear in the updated GPP. For the first time, the 10-year Comprehensive Plan update will incorporate a groundwater chapter in the DEIS.

The DEIS reviewed three land use alternatives. The alternatives are:

1. No Action/Current Plan;
2. Interim Range Growth; and
3. High Range Growth.

These alternatives may affect groundwater, and information about impacts to groundwater resources disclosed in the DEIS will be available to decision makers for planning.

Current Snohomish County General Policy Plan

The current GPP designates 70% of the Getchell Plateau for rural land uses. Nearly 36,000 acres or 67% of the plateau are set aside for rural residential development. Currently, only 64% of the area designated for rural residential development is occupied. Given the projected population increase of 35%, 85% of the rural residential area will be occupied by the year 2025. This will leave only 5,100 acres of rural residential land undeveloped. This analysis assumes that current dwelling density, listed in Table 6-3, will not change significantly. The current GPP places just over 30% of the Getchell Plateau in a UGA (Table 6-3 and Figure 6-4).

The no-change alternative would leave the current Comprehensive Plan's projected land uses in place. Therefore, the projected 35% population increase would be concentrated in the existing UGAs by converting low-density residential areas to high-density residential areas. The Assessor record shows very little undeveloped land inside the incorporated cities or UGAs.

Draft Environmental Impact Statement for Snohomish County GMA Comprehensive Plan 10-Year Update

A Draft Environmental Impact Statement (DEIS) was completed as part of the development of the Comprehensive Plan update. The DEIS compared the effects in 2025 of two alternative scenarios of land use designations at full build-out to the effects in 2025 of full build-out under the current GPP (known as Alternative 1). Alternatives 2 and 3 would allow expansion of the total UGA area and greater development densities in the UGAs and in the rural areas.

Expansion of the UGA boundaries would reduce area set aside for rural residential development by 4.1% under Alternative 2 and by 7.4% under Alternative 3 (Table 6-3 and Figure 6-4). Alternative 3 would also increase the one dwelling per five acre land use by 300 acres.

<u>DEIS Assessment of Groundwater Impacts</u>

The groundwater chapter in the DEIS evaluated the three alternatives for four potential impacts on groundwater:

- decreased groundwater quality;
- increased water consumption;
- decreased groundwater recharge, and
- net groundwater effect.

Nitrate loading was used as a surrogate for a potential decrease in groundwater quality. The increase in the population dependent on groundwater for drinking water was used as a surrogate for potential increased consumption. Changes in land cover (mainly increases in impervious surface) were used as a surrogate for potential loss of groundwater recharge. The values for increased groundwater consumption and loss of recharge were combined to yield a net groundwater effect, based on the assumption that areas with the largest population increase and highest development rates would have the greatest impacts on groundwater quality and quantity (PDS, 2004).

The DEIS used surface watersheds to analyze impacts on groundwater resources within the County's Groundwater Management Area. These watersheds do not correspond directly with the boundaries of the study area (Figure 6-5). There are 63 watersheds in the Groundwater Management Area, and 11 of them are partially within the Getchell Plateau study area. For each category of groundwater impact, the DEIS listed the five watersheds that would be most affected by Alternatives 2 and 3. Watersheds that drain the Getchell Plateau with the greatest projected impacts are discussed below.

Decreased Groundwater Quality As Indicated By Nitrate Loading

Under Alternative 2, nitrate loading in groundwater was projected increase more than 13% (ranked 2nd) in the Quilceda watershed and 7% (ranked 5th) in the Burn Hill Road Drainages. Under Alternative 3,

Table 6-4. Draft Environmental Impact Statement for Snohomish County GMA Comprehensive Plan 10-Year Update Land Use Alternatives.

Designation	Alt 1-Current			Alt 2			Alt 3		
	ac	mi^2	percent	ac	mi^2	percent	ac	mi^2	percent
Incorporated City	7,554	11.80	14.1						
Lake (Presently Only Lake Stevens)	993	1.55	1.9						
Local Commercial Farmland	397	0.62	0.7						
Open Space (Snohomish UGA Only)	2	0.00	0.0						
Other Land Uses (See Sub-area or UGA Plans)	0	0.00	0.0						
Public/Institutional Use	14	0.02	0.0						
Parks/Open Space (Arlington UGA Only)	1	0.00	0.0						
Public Use (Lake Stevens UGA Only)	112	0.17	0.2				122	0.19	0.2
Riverway Commercial Farmland	806	1.26	1.5						
Rural Industrial	98	0.15	0.2						
Right of Way	267	0.42	0.5	271	0.42	0.5			
Rural Residential-10 (1DU/10 Acres)	716	1.12	1.3						
Rural Residential-5 (1 DU/5 Acres)	14,818	23.15	27.6						
Rural Residential (1 DU/5 Acres Basic)	20,329	31.76	37.9				20,625	32.23	38.5
Urban Commercial/Business Park (Snohomish UGA Only)	87	0.14	0.2						
Urban Commercial	199	0.31	0.4	45	0.07	0.1	259	0.40	0.5
Urban High Density Residential (12 to 24 DU/Acre)	205	0.32	0.4				209	0.33	0.4
Urban Industrial	182	0.28	0.3						
Urban Low Density Residential (4 - 5 DU/Acre for Marysville)	657	1.03	1.2						
Urban Low Density Residential (4 - 6 DU/Acre)	1,134	1.77	2.1	1200	1.87	2.2	2,292	3.58	4.3
Urban Low Density Residential (4 DU/Acres for Lake Stevens UGA)	1,548	2.42	2.9						
Urban Low Density Residential (5 - 6 DU/Acre for Marysville)	322	0.50	0.6						
Urban Low Density Residential (6 DU/Acre for Lake Stevens UGA)	2,263	3.54	4.2						
Urban Medium Density Residential (6 - 12 DU/Acre)	907	1.42	1.7	968	1.51	1.8	1,159	1.81	2.2


SNOHOMISH COUNTY
SURFACE WATER MANAGEMENT
Figure 6-4. Land Use Alternatives Getchell Plateau.
Legend
Incorp. City
Lake Stevens
Local Commecial Farm
Open Space (Snohomish)
Other Landuse
Public
Parks (Arlington)
Public (Lake Stevens
Riverway Farm
Rural Industrial
Right of Way
Rural Residential (10ac)
Rural Residential (5ac)
Rural Residential Basice (5ac)
Urban Commercial (Snohomish)
Urban Commercial
Urban Residential (High Density)
Urban Industrial
Urban Residential (4 to 5/ac)
Urban Residential (4 to 6/ac)
Urban Residential (4/ac)
Urban Residential (5 to 6/ac)
Urban Residential (6/ac)
Urban Residential (6 to 12/ac)
0
2
4 Miles
N
Snohomish County
PUBLIC WORKS
SURFACE WATER MANAGEMENT
(425) 388-3464
(a) Alternative 1
No change/current plan.
(b) Alternitive 2
Interim range growth.
(c) Alternative 3
High range growth.
Project name: x:\wq\groundwater\getchell\getchell_arcview\land_use.apr Plot date: Oct 19, 2004; Landuse jak

nitrate loading in groundwater was projected to increase over 41% (ranked 3rd) in the Arlington Junction South watershed, over 31% (ranked 4th) in the Quilceda watershed, and nearly 24% (ranked 5th) in the Sunnyside Ravines.

Increased Water Consumption As Indicated By Increased Groundwater-Dependent Population

Under Alternative 2, water consumption was projected to increase by one percent (ranked 5th) in the Burn Hill Road Drainages. Under Alternative 3, water consumption was projected to increase over nine percent (ranked 2nd) in the Arlington Junction South watershed and by nearly six percent (ranked 4th) in the Sunnyside Ravines.

Deceased Groundwater Recharge As Indicated By Land Cover Changes

Under Alternative 2, groundwater recharge was protected to decrease by 0.3% (ranked 5th) in the Allen Creek watershed. Under Alternative 3, groundwater recharge was projected to decrease over two percent in the Quilceda watershed (ranked 4th) and over two percent Sunnyside Drainages (ranked 5th).

Net Groundwater Effect

No Getchell Plateau watershed was listed in the top five most-affected watersheds for net effect on groundwater under Alternative 2. Under Alternative 3, the net groundwater effect was projected to be over 11% (ranked 2nd) in the Arlington Junction South watershed and 8% (ranked 5th) in the Sunnyside Ravines.

6.3.3 City Comprehensive Plans and City Charters

The cities on the Getchell Plateau have adopted or are developing or updating their comprehensive plans under the State of Washington's Growth Management Act (RCW 36.70A). None of the four incorporated cities on the Getchell Plateau have reached the EIS stage. In lieu of a comprehensive plan, city charters were used to discuss the protection of groundwater resources.

City of Arlington

The City of Arlington is in the process of updating its comprehensive plan (Blake, 2004, pers. comm.). The City of Arlington addresses groundwater protection in part through its definition of Best Management Practices (BMPs). The BMPs require the use of accepted practices to prevent contamination from reaching the water table and to minimize impacts to groundwater flow and to the physical, and chemical, and biological characteristics of the critical areas (Chapter 20.08.010 City of Arlington Land use Code).

The City of Arlington land use code includes aquifer recharge areas in its list of environmentally critical areas (Chapter 20.88 Part IX). The protection of aquifer recharge areas is achieved through the land use permitting process and consists of requiring hydrogeologic site evaluations (Chapter 20.88.930), the application of BMPs (Chapter 20.88.940), and Mitigation Plans (Chapter 20.88.950). These codes are specifically targeted at land uses that involve underground storage tanks; hazardous substance handlers; wastewater handling, generation, or disposal; petroleum pipelines; solid-waste facilities; and other developments as defined that can impact aquifer recharge.

City of Lake Stevens

The comprehensive plan for the City of Lake Stevens does not mention groundwater protection (City of Lake Stevens, No Date).

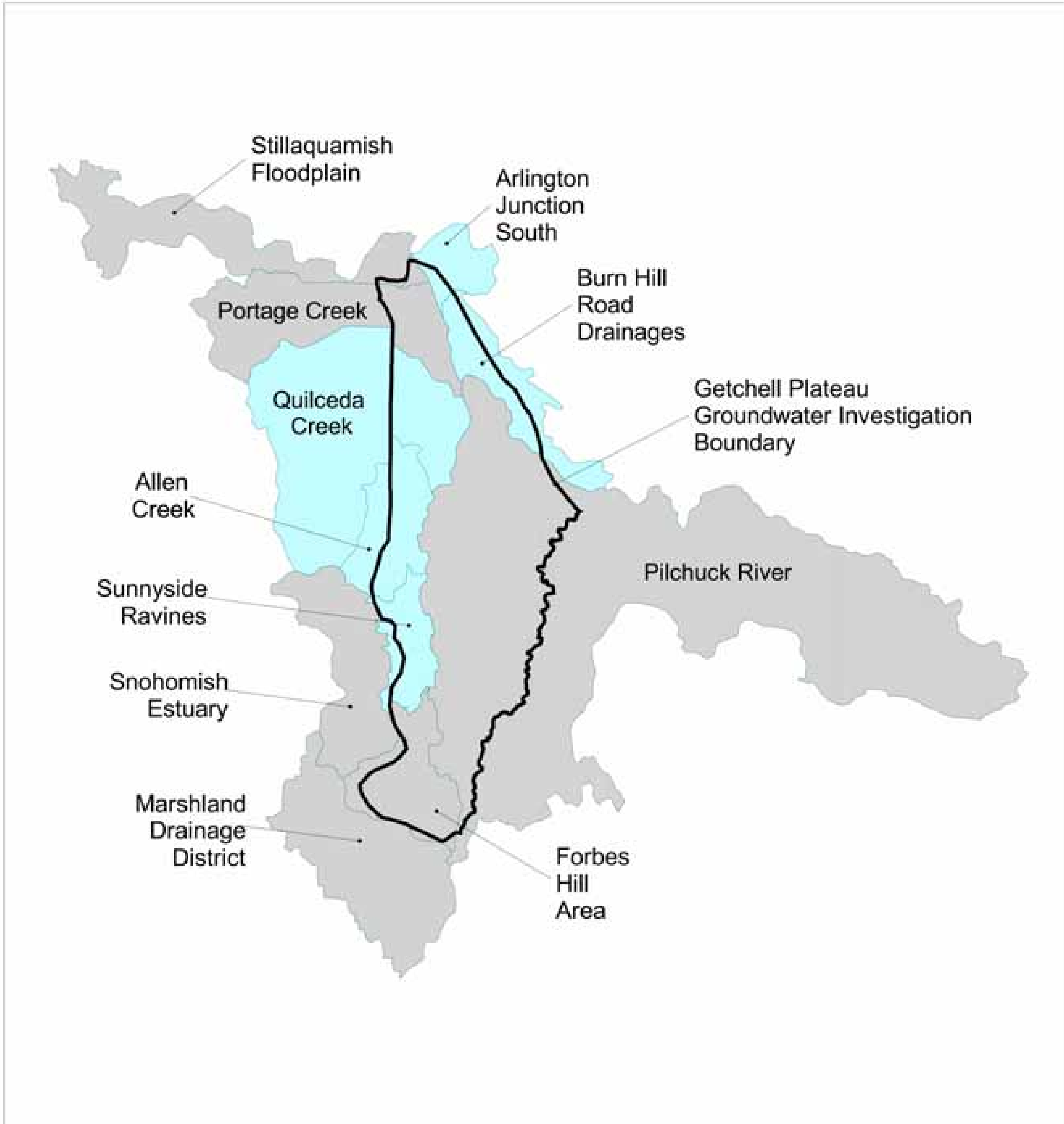
Chapter 14.88, Environmentally Sensitive Areas, of the City of Lake Stevens land use code includes aquifer recharge areas in its list of critical areas. The City of Lake Stevens addresses groundwater protection through its definition of BMPs. The BMPs are designed to minimize the impact to groundwater flow and to the physical, and chemical, and biological characteristics of the critical areas (Chapter 14.88.100).

City of Marysville

The Marysville municipal code, Chapter 14.15, includes groundwater protection language. The purpose of Chapter 14.15 is to insure the use of sound development and construction practices that will protect groundwater quantities, location, and flow patterns.

City of Snohomish

The City of Snohomish comprehensive plan concludes that there are no critical aquifer resources within the Snohomish UGA (City of Snohomish, 1995). The City of Snohomish Municipal Code for drainage basin protection (Chapter 14.51) finds that recharging groundwater benefits the City of Snohomish residents by contributing to the biological and physical function



SNOHOMISH COUNTY
SURFACE WATER MANAGEMENT

Figure 6-5. DEIS watershed boundaries.

Project name: x:\wq\groundwater\getchell\getchell_arcview\land_use.apr Plot date: Nov 18, 2004; Figure 6-5 jak of wetlands, streams, rivers, and lands.

6.4 Specific Land Use Issues

The previous sections in this chapter examine potential impacts that land use can have on groundwater quality and quantity. This section addresses the source of specific problems.

6.4.1 Septic Systems

The Snohomish County Assessor records 8,313 occupied residential parcels in the rural areas of the Getchell Plateau. This number indicates that there are between 7,000 and 10,000 septic systems on the Getchell Plateau. Properly functioning and sized septic systems effectively treat domestic wastewater. Improperly functioning septic systems are a potential source of groundwater contamination, notably nitrate and bacteria. Septic systems are a source of sodium, potassium, sulfate, ammonia, phosphorous, dissolved organic carbon, detergents, and chloride as well (Canter and Knox, 1985).

Since 1997, Snohomish County Public Works has received 14 complaints of failed septic systems on the Getchell Plateau. These complaints were based on noticeable contamination of surface waters (Britsch, 2004, pers. comm.). Public Works staff forwarded the most serious complaints to the Snohomish Health District for further investigation.

While complaints of failed septic systems causing surface water contamination are a good indication of surface water quality problems, groundwater may already be impacted by the time that surface water pollution is noticeable.

Water quality sampling by the USGS, the Snohomish Health District, and this investigation did not reveal evidence of widespread groundwater contamination from septic systems; however, water quality samples found nitrate in groundwater, suggesting that nutrients from human activities are reaching groundwater in measurable amounts. Many of the samples used in this study are from areas that were recently farmed, so there is a possibility that the observed nitrate levels are related to historical agricultural practices. Additional work is needed to identify the source of the nutrients reaching groundwater.

6.4.2 Wastewater

Each of the cities on the Getchell Plateau operates a wastewater treatment facility to handle its domestic, commercial, and industrial wastewater. These wastewater treatment facilities serve the densely populated UGAs (Figure 6-4). The municipal wastewater treatment facilities operating on the plateau discharge their treated effluent to surface water. Municipal wastewater treatment facilities can effectively treat and remove domestic, commercial, and industrial wastewater as potential sources of groundwater contamination.

Since 1997, Snohomish County Public Works staff have received three complaints of sewage leaks from the Getchell Plateau. These leaks have led to contamination of surface waters (Britsch, 2004, pers. comm.). There have been no reports that these leaks have caused groundwater contamination.

6.4.3 Stormwater

Uncontrolled rainwater running off driveways, roofs, parking lots, and roads can cause flooding and erosion (Dunne and Leopold, 1978). To control runoff, Snohomish County and the cities on the Getchell Plateau have adopted drainage rules requiring developers to infiltrate stormwater or reduce the rate at which it runs off.

Stormwater could potentially contain pollutants that could contaminate groundwater. For this reason, current stormwater codes require treatment of stormwater before infiltration, and consider the ability of the native soil to remove pollution. Studies have shown that stormwater pollutants in properly-constructed facilities become bound in the top several inches of soil or accumulated sediment, and have a low potential to contaminate groundwater (Leif, 2005, pers. comm.).

Since 1997, Snohomish County Public Works staff have responded to nine complaints of stormwater pollution in the Getchell Plateau. These complaints were based on noticeable contamination of surface waters (Britsch, 2004, pers. comm.) While stormwater could be a potential source of groundwater contamination, there is no evidence that these specific problems have caused groundwater contamination.

6.4.4 Landfills

Landfills can be a significant and long-term source of groundwater contamination, since they are the final resting place for household wastes, domestic chemicals, discarded herbicides and pesticides, and, in some cases, commercial and industrial wastes.

Groundwater contamination from landfills has been documented in every county in Washington State (Ecology, 2004f).

Thirty years ago, there was no solid waste system in Snohomish County. Residents and businesses threw their garbage into dumps, wetlands and Puget Sound. Today, all of Snohomish County's garbage is shipped to the Roosevelt Landfill in Klickitat County via transfer stations, one of which, the North County Recycling and Transfer Station, is located on Getchell Plateau within the City of Arlington (Public Works, 2004a, b).

There are two inactive landfills on the Getchell Plateau: the Lake Stevens Landfill and the Sisco Landfill.

Lake Stevens Landfill

The Lake Stevens Landfill operated southeast of Lake Stevens until it was closed in1986. The age of the landfill suggests that it may be unlined. Unlined landfills pose a special risk to groundwater contamination since nutrients, chemicals, and other contaminants can leach directly into groundwater.

The Lake Stevens Landfill was listed as a USEPA Superfund Site (#WAD980511612) from May 1980 until it was moved to the "No Further Action Required List" in March 1988 (USEPA, 2004).

Currently, Snohomish County Public Works, Solid Waste Division, is monitoring the groundwater beneath the Lake Stevens Landfill on a quarterly basis. Over 500 hundred groundwater samples have been collect from 28 monitoring wells and analyzed for 161 constituents since 1992. Water quality monitoring has confirmed that leachate has reached groundwater. A total of 64 parameters have been detected in the groundwater beneath the landfill. Chemicals detected include the metals, nutrients, organic chemicals, volatile organic compounds, and carcinogens (Public Works, 2004c).

In the fall of 2003, several residences located downgradient of the landfill were connected to the municipal water supply because of the future possibility that nitrate, volatile organic compounds, and dissolved metal would reach their wells (Schonhard, 2004, pers. comm.).

To further protect groundwater, landfill leachate is trucked to the former Snohomish County regional landfill at the Cathchart Landfill for treatment and disposal since there is no treatment facility at the Lake Stevens Landfill (Schonhard, 2004, pers. comm.).

Sisco Landfill

The Sisco Landfill is located between Upper Quilceda Creek and the Middle Fork of Quilceda Creek, in the northwestern part of the Getchell Plateau. The Sisco Landfill began accepting wood waste and building debris in 1978 on a conditional use permit from the Snohomish Health District. Unauthorized metal waste, such as automobile bodies and engine parts, were accepted in 1979. Since 1980, leachate and runoff have been collected and sprayed onto the gravel pit above the landfill in an effort to prevent accidental releases from the site. Unfortunately, excess leachate and runoff have often overflowed into residential areas downslope of the landfill.

Between 1981 and 1983, an unknown volume of incinerator ash, which may have contained cadmium in high enough concentrations to be classified as dangerous waste, were disposed of in the Sisco Landfill. The Snohomish Health District shut the landfill down in 1984; however, leachate and runoff overflows continue to occur (DOH, 1999).

The Sisco Landfill was listed as a USEPA Superfund Site (#WAD980833727) from May 1982 until it was moved to the "Achieved Site" list in November 2000 (USEPA, 2004). The USEPA currently lists the Sisco Landfill as "Other Clean Up Activities" with the State of Washington as the lead agency.

The Sisco Landfill is situated on Vashon advance outwash, creating a very short contaminant transport pathway between the leachate and principal Getchell Plateau aquifer (Figure 6-6). Leachate has reached the local groundwater, and the resulting plume of contaminated groundwater has reached seven drinking water wells southeast of the landfill (DOH, 1999). Sampling of domestic wells in 1985 showed the presence of iron and manganese, but below the secondary MCLs. Additional sampling in 1993 found wood-waste leachates, such as such as tannins and lignins (DOH, 1999). Samples from residential wells taken between June 1993 and April 1996 showed levels of arsenic, benzene, cadmium, chromium, lead, manganese, mercury, pentachlorophenol (PCP), and sodium. Chromium was detected above the MCL. Based on these data, DOH determined that a public health hazard exists on the site (DOH, 1999).

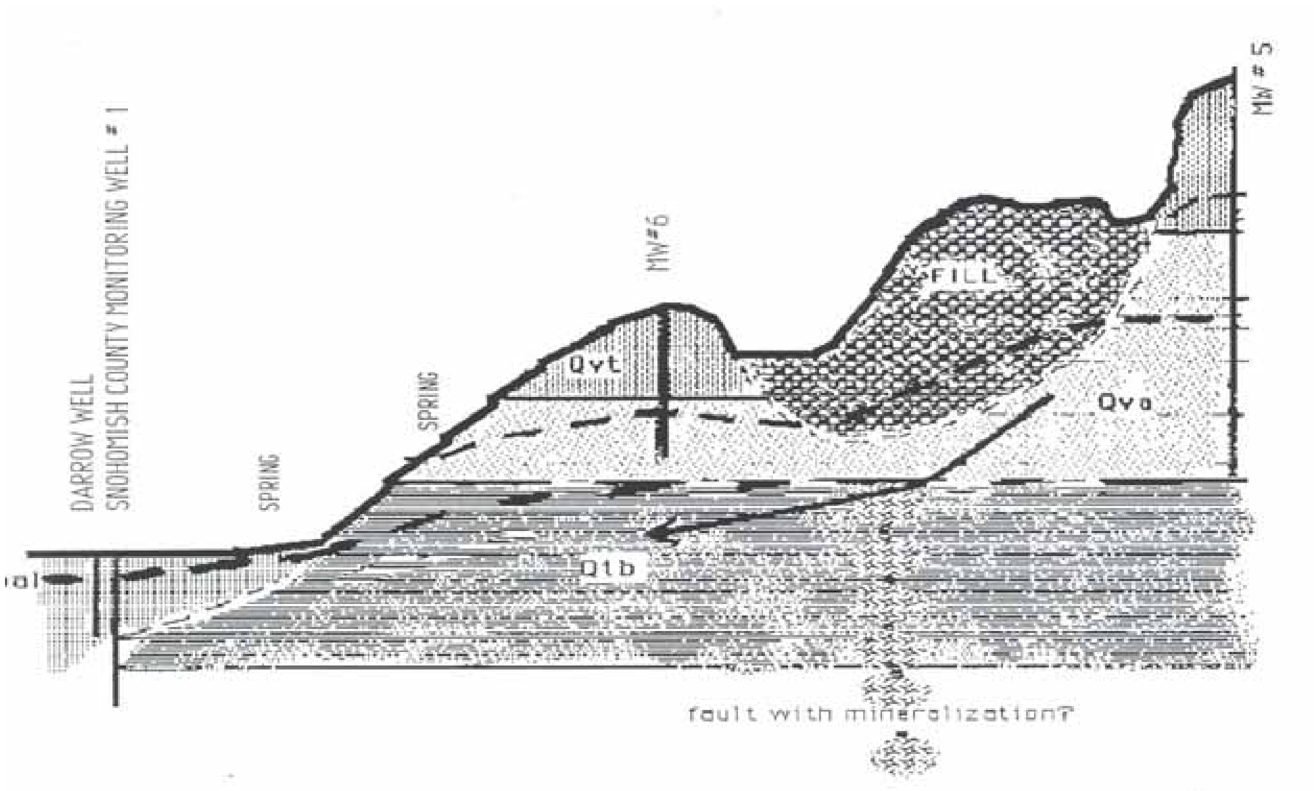


Figure 6-6. Cross Section of the Sisco Landfill (Landau Associates, 1993).

Efforts to close the landfill have stalled due to a lack of funds. The ongoing problems prompted one resident to construct a deeper well and the others to drink bottled water (DOH, 1999). In 2004 only two residents downgradient of the Sisco Landfill continued to use their wells. The Snohomish Health District samples these wells twice yearly. Elevated levels of arsenic continue to be present. The arsenic levels are constant with naturally occurring arsenic found elsewhere in Snohomish County; however, it is not possible to rule out leachate altering the soil geochemistry and mobilizing the arsenic (Snohomish Health District, 2004b and Chapter 4).

6.4.5 Hazardous Waste

Ecology lists 41 active hazardous waste handlers on the Getchell Plateau (Table 6-5). These facilities include automotive repair shops, dry cleaners, gas stations, manufacturing facilities, railroads, drug stores, and schools (Ecology 2004d, g). Of these facilities, 15 are in the city limits of Snohomish, 15 are in Arlington, 3 are in Lake Stevens, 4 are in Everett, and 1 is in Marysville. These sites all store hazardous materials, but none have a recorded spill (Ecology, 2004d, g); however, Ecology records indicate a number hazardous waste spills have occurred at other locations on the plateau (Ecology, 2004e and Table 6-6). Since 1997, Snohomish County Public Works has logged eight complaints of hazardous waste spills from four businesses and four homes. These spills have led to noticeable contamination of surface waters but it is unknown if groundwater contamination has occurred (Britsch, 2004, pers. comm.).

With the exception of the facilities located in Lake Stevens and the Sisco Landfill, the hazardous waste handlers and spills are located on the periphery of the plateau. Groundwater flow in these areas is, in general, away from the plateau groundwater resource, so these facilities have a lower potential to affect the Getchell Plateau; however, spills on the periphery of the plateau can reach adjacent aquifer systems.

6.4.6 Underground Storage Tanks

Underground Storage Tanks (USTs) typically contain petroleum and other chemicals that are classified as hazardous substances. USTs can pose a special risk because liquids leaking from them can rapidly reach groundwater, and they are also very common. USTs are found at every gas station, on farms to fuel machinery, and at homes to store domestic heating oil.

Table 6-5. Getchell Plateau Hazardous Waste Spills by Facility[1]

Type of Facility	Number of Faculties	Notes
Automotive	8	Engine and Body Repair, Dealerships
Cleaners	4	3 active and 1 former
Commercial	3	Retail and Drugstores
Construction	1	Roofing
Manufacturing	9	Aerospace, Millworks, Metal works, Composites, and Polymers
Municipal/Automotive	6	City and County road and vehicle maintenance facilities
Other/Unknown	4	Golf Course and Unknown
Rail	1	Fuel and chemical storage
School	3	fuel and lab supplies
Electrical Substation Power	2	Transformer fluids

[1]Ecology, 2004e

Properly maintained and monitored, USTs generally do not pose a significant risk to groundwater. Unfortunately, faulty UST components, improper installation, and poor facility management are frequent, resulting in the release of petroleum or other chemicals. Many USTs, because they are buried, are simply forgotten.

Petroleum products are the most common fluids stored in USTs on the Getchell Plateau (Table 6-7). Ecology records 328 sites with USTs on the plateau. Ecology's records show that 51% of the tanks have been removed and that 32% are operational (Ecology 2004b, c; Table 6-7). There are no data on the remaining 17%. Over half of the sites are in Snohomish, a quarter are in Arlington, and the remainder are in Lake Stevens (Ecology, 2004b, c; Table 6-7). Ecology's records indicate that 44 USTs have leaked on the Getchell Plateau (Table 6-8). Seventy percent of these sites have caused contaminated soil only and 30% have contaminated groundwater (Ecology, 2004).

The USTs sites, especially the leaking USTs, tend to be located along the periphery of the plateau or in areas served by municipal water systems. Therefore, the potential for leaking USTs to contaminate groundwater actively used for drinking water is relatively small.

6.4.7 Petroleum Spills

Since 1997, there have been 21 complaints of petroleum and oil pollution in the Getchell Plateau leading to noticeable pollution of surface waters. It is unknown if groundwater contamination occurred (Britsch, 2004, pers. comm.). No large spills have been documented in the Getchell Plateau by the Washington State Department of Transportation (DOT, 2004).

6.4.8 Sand and Gravel Quarries and Mines

Sand and gravel mining above the water table with no other associated activities is of low risk to groundwater; however, removal of material above an aquifer decreases the thickness of the natural buffer, increasing the likelihood that contaminants will reach the aquifer if released in the quarry pit (Mead, 1995). Groundwater contamination at sand and gravel mining sites is usually related to petroleum leaks from vehicle maintenance and refueling. Runoff and leaks from excavation equipment can be potential sources of contamination as well (Golder Associates, 1996).

Sand and gravel mining that extends below the water table can create additional risks. Mining below the water table can increase turbidity, provide an animal waste pathway, and add oxygen to the groundwater,

Table 6-6. Getchell Plateau Hazardous Waste Spills by Constituent Occurrence.[1]

Faculty type	City	Affected Media	Conventional Organics	Conventional Inorganics	Base/Neutral/Acid	Halogenated Organic Compounds	Priority Metals and Cyanide	Other Metals	PCBs	Pesticides	Petroleum	Phenolic Compounds	Solvents	Polynuclear Aromatic Hydrocarbons
Auto Body Shop	Arlington	Drinking Water				S	S				S			
		Groundwater				S	S				S			
		Soil					C				C			
Sisco Landfill	Arlington	Drinking Water	S	C			C	S				S		
		Groundwater	S	C	S	S	C	S	S	S	S	S	S	S
		Soil	S	S	S	S	C	S		S	C	S	S	S
		Surface Water	S	C			C	S		S		S		
Bulk Petroleum	Arlington	Groundwater					S	S			C		C	
		Soil					S	S			C		C	
Auto Body Shop	Lake Stevens	Groundwater					S				S			
		Soil					S				C			
		Surface Water					S				S			
Dry Cleaners	Lake Stevens	Groundwater				C								
		Soil				C								
Lake Stevens Landfill	Lake Stevens	Drinking Water	S	S		S	C	C			S		S	
		Groundwater	C	C		S	C	C	S		S		S	
		Soil	C	C		S	C	C			S		S	
		Surface Water	S	S		S	S	S			S		S	
Substation	Snohomish	Groundwater					C		S		C			S
		Soil					C		S		C			C
		Surface Water							S		S			S
Bulk Petroleum	Snohomish	Groundwater									S		S	
		Soil									C		C	

S--Suspected
C--Confirmed
[1]Ecology, 2004e.

Table 6-7. Underground Storage Tanks.

Operational Status	Removed	51%	169
	Operational	32%	105
	Closed in place	8%	25
	Exempt	5%	15
	In process of closure, temporarily closed or unknown	4%	13
Item Being Stored	Unleaded gasoline (gas station)	50%	122
	Leaded gasoline (gas station)	27%	66
	Used/ waste oil (gas station)	9%	22
	Diesel (gas station)	7%	17
	Heating fuel	6%	15
	Kerosene	2%	6
Location	Snohomish	~75%	--
	Arlington	~25%	--
	Lake Stevens	~20%	--
	Everett, Granite Falls, Marysville	~5%	--

Table 6-8. LUST General Information.

Contamination Extent	Soil	70%	30
	Groundwater	30%	14
Clean-Up Status	Clean-Up Started	65%	9
	Being monitored	20%	3
	Awaiting clean-up	15%	2

changing the geochemistry of the aquifer. Depending on the geochemistry of the aquifer, the introduction of oxygen may alter the chemical speciation of arsenic compound in the groundwater or bound to the aquifer materials, influencing their mobility and toxicity (King County 2005). Well drilling may also introduce oxygen to an aquifer. Mining below the water table may also cause water levels to drop when the pit is dewatered (Mead, 1995).

The largest gravel mine on the Getchell Plateau, located at the eastern edge of the plateau, opened in 1987. This mine serves Snohomish County and parts of Camano Island. The mine taps a channel of Vashon recessional outwash. The outwash gravels are dredged from beneath the water table to a depth of 60 to 80 feet from one of two basins. The mine operation has created two lakes with a total area of 130 acres. Water quality samples are collected from the lakes quarterly. Arsenic was detected until the lake depth approached the contact of the underlying glacial till. Recent samples have found arsenic concentrations between 1 μg/l to 3 μg/l (Coats, 2004, pers comm.), well below the current MCLs of 10 μg/l for groundwater and 190 μg/l (acute exposure) for surface water.

6.4.9 Agriculture

The poorly-drained soils formed in the glacial till on the surface of the Getchell Plateau are less desirable as farmland than the deep well-drained alluvial soils found in Snohomish County's major river valleys. There are 1,700 acres of irrigated farmland on the Getchell Plateau. Of these, only 100 acres are irrigated from a groundwater source (Ecology, 2004a). Most of the farms in the Getchell Plateau are less than 10 acres and consist of dairy, berry and beef operations, as well as horse pastures. The area farmed is becoming smaller as land is developed for single family residences (Lindemulder, 2004, pers. comm.; Roney, 2004, pers. comm.).

Fertilizers, animal waste, fecal coliform and pesticides are generally the most significant source of groundwater contamination originating from farms. An egg producer near Lake Stevens released poultry and human waste into the surrounding area (Roney, 2004, pers. comm.). This is the only recorded release in the past ten years to result in a code violation.

This investigation detected nitrate concentrations below the MCL in a few samples obtained near former agricultural operations; however, there is little evidence of widespread groundwater contamination originating from agricultural activities on the plateau. The detection of nitrate in groundwater indicates a need for continued monitoring of groundwater quality near active and former agricultural operations.

6.4.10 Herbicide/Fertilizer/Animal Waste

Herbicides are used to manage unwanted trees, brush and weeds in the residential setting. Of the many herbicides available to homeowners, Crossbow™ and Weedmaster™ contain active ingredients that can leach into groundwater (Golder Associates, 1996).

The most commonly used agricultural herbicides that can leach into groundwater are Crossbow™, Super Trimec™, and Casoron™. Under normal conditions and with proper use, these herbicides will biodegrade or disperse in the soil before reaching groundwater. In areas of rapid infiltration and shallow wells, the travel time between the surface and the aquifer may not allow sufficient time for these herbicides to biodegrade completely. In areas underlain by glacial till, infiltration is slower, allowing more time for biodegradation to occur. There is a significant economic incentive to use herbicides, although a growing minority of small Snohomish County farmers are using organic farming practices, avoiding pesticide and herbicide use all together. Of the 69,000 acres of active agricultural land in Snohomish County, there are currently 578 acres using organic methods, and 16 farms that have been certified as organic (Henri, 2004).

Well-tended lawns are a common sight on the Getchell Plateau. Correctly applied, fertilizer should match the nutrient demands of the grass leaving little to runoff into streams or leach into groundwater. Research has shown that excess urban lawn fertilizers use might contribute as much nitrate to groundwater as septic systems (Porter, 1980). As stated above, nitrate below the MCL was detected in several samples collected by the project team. Additional work is required to determine the source.

As noted above, animal waste is common in the rural setting. Animal waste contains urea, ammonia, organic nitrogen, organic phosphorus, chloride, and bacteria (Bary et al., 2000). Improper storage or disposal of animal waste or allowing livestock unrestricted access to surface waters can lead to contamination (Thornburgh, 2004, pers. comm.) Since 1997, there have been thirteen complaints of manure pollution on the Getchell Plateau leading to noticeable pollution of surface waters (Britsch, 2004, pers. comm.)

Groundwater sampling by USGS and for this investigation indicated that there was no widespread groundwater contamination from animal waste, although the sampling identified a small number of wells with elevated levels of nutrients and bacteria. In most cases, the source of the nutrients and bacteria was on the same parcel as the well. Periodic sampling of domestic wells would help homeowners identify and modify the land use practices that may contaminate their wells.

6.4.11 Well Construction and Decommissioning

A well connects the land surface to an aquifer. This connection can be exploited by contaminants released near the well. The contaminants can travel directly from the surface into the aquifer via the same bore hole used to draw water from the aquifer. Wells can also connect aquifers across aquitards, allowing contaminants from one aquifer to reach another.

Seals on unused, orphaned, and improperly abandoned wells can deteriorate over time, creating a connection from the surface to the aquifer. Unused wells can become an important contaminant pathway.

Washington State has enacted strict regulations concerning the construction of proper well seals at the surface and between aquifers so that contaminants can not reach the aquifer via well bores (Chapter 173-160-221 to 301 WAC). Since 1972, well drillers in Washington State are required to file a detailed report each time a well is drilled (Chapter 173-160 WAC). Washington State well drillers are also required to adhere to strict standards for well decommissioning (Chapter 173-160-381 WAC), and are required to file a detailed report.

Records on file with Ecology and Snohomish County Public Works indicate that there are nearly 2,600 domestic wells on the Getchell Plateau. As noted in Chapter 5, these wells may represent a third of the wells serving residential parcels on the plateau. In contrast, the same records contain only 16 well decommissioning reports. An additional 59 decommissioned wells are reported by the USGS (Thomas et al., 1997). While the lack of a reporting requirement before 1972 can explain some of this discrepancy, the huge difference between the number of wells and the number of well decommissioning reports suggests that many wells may not have been properly decommissioned. This is a particular problem with older wells, since they are more likely to have failing well seals.

More data on the number of wells and the number of unused wells on the Getchell Plateau are needed. Education concerning the risks of unused wells is also needed as well as a program to assist homeowners with the costs of well decommissioning.

7.1 Introduction

This investigation was designed to develop a detailed understanding of the Getchell Plateau aquifers by:

- describing the hydrogeologic units (aquifers and aquitards);
- quantifying water use and availability by developing a water budget;
- relating existing groundwater quality conditions to land uses and development densities; and
- projecting how future land uses could impact groundwater availability and groundwater quality.

The Getchell Plateau was selected because:

- the population is projected to increase 35%, from 64,400 to over 87,000, during the coming decades;
- the residents of the Getchell Plateau are highly dependent on groundwater for potable water;
- the plateau has yet to reach full build out; and
- the groundwater systems beneath the Getchell Plateau are also representative of other Snohomish County groundwater systems.

The Getchell Plateau groundwater investigation is based on data collected by the USGS, Ecology Snohomish Health District, and DOH. To characterize the current water quantity and quality conditions and to develop a data set for comparison with previously collected data, the project team sampled 58 wells during 2002 and 2003.

Previous studies of Snohomish County's groundwater systems have focused their examination on the coarse-grained aquifers, the alluvium, the recessional outwash, and the advance outwash. This study examined these aquifers as well as other important water-bearing materials. This study found the glacial till, a unit normally considered an aquitard, is the primary source of water for 191 wells. Over 190 wells draw their water from the upper coarse-grained aquifer, which underlies the advance outwash aquifer, and 49 wells draw their water from the sandstone bedrock. These wells supply roughly 20% of the well water to Getchell Plateau residents.

Advances in digital database technology allowed the project team to process more data with fewer resources than were available in the early 1990's, when the County's groundwater resources were last studied. Water-well reports on file with the Ecology indicate that there are nearly 2,600 wells on the Getchell Plateau.

7.2 Groundwater Availability and Use

Precipitation delivers an average of 44.2 in (1,120 mm) or nearly 200,000 acre-ft of water per year. One-hundred percent of the 19.0 in (480 mm) of groundwater recharge on the Getchell Plateau originates as precipitation. The remaining water runs off in streams or fills the plateaus, lakes and wetlands, or is returned to the atmosphere via evaporation and plant transpiration.

Analysis of Getchell Plateau streamflows revealed that the streams are highly dependent on groundwater discharge. Further examination of the streamflow data found groundwater discharge from the shallow aquifers to exceed groundwater discharge from the deeper aquifers.

Analysis of water-level data collected on the Getchell Plateau since the 1930's, indicated that current land uses have not impacted the availability of groundwater via over consumption or the interruption of groundwater recharge. It is estimated that the current residents of the Getchell Plateau consume 5,700 ac-ft of water per year and 975 ac-ft of groundwater per year. It is estimated that the future residents of the Getchell Plateau will consume 7,600 ac-ft of water per year and 1,300 ac-ft of groundwater per year.

Current and future groundwater consumption by the Getchell Plateau residents is generally considered to be sustainable, although is not possible to measure the actual impact of groundwater consumption on streamflows. Sustainable use of groundwater on the Getchell Plateau is dependent on the current pattern of use. Less than 20% of the water consumed by the Getchell Plateau residents comes from aquifers beneath the Getchell Plateau. The remaining 80% of the Getchell Plateau residents receive their water from municipal water systems, which import water from off the plateau.

The current pattern of rural residents relying on wells and urban residents relying on surface water has important implications for maintaining a balance between water input and output. In general, the rural resident has a single well for water supply and a septic system for wastewater treatment and disposal. This combination means that 70% of the water removed from an aquifer is allowed to reinfiltrate, recharging the shallow aquifer. Municipal systems serving the Getchell Plateau rely on centralized wastewater treatment facilities that discharge the effluent to surface water body located off the plateau. In effect, the municipal systems import and export the water they consume.

Two municipal and several commercial water-systems on the plateau have water rights to 6,600 ac-ft of groundwater per year. Analysis of water use indicated that these water rights are currently not fully exercised. Water rights for groundwater total more that six times the current groundwater use and more than five times that projected future use. The project team did not have sufficient data to directly evaluate the sustainability of the groundwater rights should they be fully exercised. Given the projected land use pattern, it is likely that full use of the existing water rights could lead to a net exporting of groundwater from the Getchell Plateau, a situation that currently does not exist.

7.3 Groundwater Quality

No widespread groundwater quality problems were identified by the project team. Groundwater quality beneath the Getchell Plateau is generally good. There was little evidence of widespread groundwater problems arising from potential sources of groundwater contamination on the plateau, agriculture, and residential septic systems.

On the other hand, local groundwater quality problems related to land use exist. This investigation identified two landfills that have contaminated groundwater, forcing several well owners to abandon or deepen their wells. Groundwater contamination was identified at several gas stations and at a regional electrical substation site. Although groundwater contamination was found at these sites, no wells used for domestic water are known to have become contaminated.

While it is possible to conclude that the Getchell Plateau groundwater quality is generally good, some specific groundwater quality problems were identified. Arsenic in groundwater was found to be more widespread and prevalent than previously thought. Arsenic was found above the MCL in 94 samples collected from 87 wells. This report recommends that all well owners on the Getchell Plateau collect samples for arsenic periodically, regardless arsenic concentrations in previous samples. Wells known to contain arsenic should be sampled more frequently.

Barium was found to occur in 56 wells. Iron was found to occur in 115 wells and to exceed the Secondary MCL in 45 wells. Manganese was found to occur in all wells sampled for manganese. Manganese exceeded the MCL in 74 wells. Nitrate was found to occur in 136 wells and to exceed the MCL in one well.

The occurrence of arsenic, barium, iron, manganese in the groundwater beneath the Getchell Plateau is considered to be natural. This investigation found one area beneath the Sisco Landfill with elevated levels of arsenic, and iron that are not naturally occurring. Contaminated leachate and changes to groundwater geochemistry downgradient of the Sisco landfill could be mobilized by the above contaminants. The single nitrate sample over the MCL was attributed poor animal waste management practices.

Total coliform bacteria were detected and therefore exceeded the MCL in eleven wells. While coliform bacteria are naturally present in the environment, the occurrence of coliform bacteria in the Getchell Plateau groundwater is considered to have a human origin. Each case of coliform bacteria identified by the project team could be traced to poor animal waste management. The project team did not find fecal coliform bacteria, an indicator of a connection to human waste, in the 58 samples collected in March 2002.

7.4 Investigation Outcomes

The methods and tools developed for the Getchell Plateau groundwater investigation are now part of the collective Snohomish County knowledge base. Large volumes of groundwater quantity and quality data were available to project team at the start investigation, but these data were not compiled into a usable format. The project team developed a comprehensive groundwater database at the start of this investigation, a database that was used to develop an assessment of water-table and piezometric-surface elevation and groundwater quality.

Now that the groundwater data have been gathered into a central location, it will be relatively cost effective to develop assessments of other groundwater resources in Snohomish County. In fact, the database proved so useful to the current investigation, that future aquifer investigations could be initiated without the need to collect costly new depth to groundwater and groundwater chemistry data. Developing aquifer system assessments without collecting new data is a cost effective method to supplement, but not supplant, a modest groundwater monitoring program.

7.5 Unanswered Questions

The Getchell Plateau groundwater investigation, although extensive was not able to answer several very important questions. There is a need to develop a clear idea of the volume of actual volume of water consumed by residents relying on wells for drinking water and septic systems for wastewater treatment and disposal. There is a need to look at how potential groundwater exports from the Getchell Plateau would impact groundwater availability and streamflows.

Important human health questions remain unanswered as well, especially as it relates to elevated levels of arsenic. Many of the wells on the Getchell Plateau have not been sampled for arsenic since the new MCL of 10 ppb was adopted. Arsenic occurrence was found to be both natural and random; so many residents could be consuming groundwater with arsenic greater than the current MCL. All resident of Snohomish County should be encouraged to sample their wells for arsenic and these data should be made available to Snohomish County Public Works for analysis. Snohomish County Public Works should also explore initiating a groundwater investigation aimed at developing and understanding of the relationship between aquifer geochemistry and arsenic mobility.

The Getchell Plateau groundwater investigation found nitrates in a number of wells. These nitrate, while still at levels below the MCL, indicate the land use has the potential contaminate groundwater. The levels found suggest the need to track changes in nitrate concentration by encouraging residents to sample their wells.

The Getchell Plateau groundwater investigation found coliform bacteria at a sufficient number of sites to warrant a further investigation. The majority of the coliform data used in this investigation were obtained at the time the wells were drilled; a time when the property was undeveloped. The few samples that have been collected from developed sites confirm the presence of coliform bacteria, so many residents may be consuming contaminated water and not know it. Coliform bacteria contamination issues are easily resolved by eliminating the bacteria source, increasing the separation between the well and the active pasture or switching to composed fertilizing materials, but the homeowner needs to be aware of the problem to correct it.

Starting with Newcomb in the late 1940's Snohomish County has taken at least three synaptic looks at groundwater quantity and quality. Each of these synopses found healthy groundwater systems; however, the increasing population of the County and the accompanying increasing demand for groundwater means that the availability and health of the groundwater resources could change. These increased pressures on the groundwater resource increases the need to establish a comprehensive groundwater monitoring system for Snohomish County.

GLOSSARY

A

Accuracy – is an estimate of how close a measured value is to the actual or true value.

Acid – water that has a *pH* of less than 7.0.

Acre-foot (acre-ft.) – the volume of water needed to cover an acre of land to a depth of one foot; equivalent to 43,560 cubic feet, 325,851 gallons, or 0.5 *cfs* of discharge for one day.

Advance outwash – the unsorted *sediment* deposited in front of an advancing *glacier*.

Alkaline – has a *pH* greater than 7.

Alluvial aquifer – a water-bearing deposit of unconsolidated material (sand and gravel) left behind by a river or other flowing water.

Alluvium – a general term for *sediments* of gravel, sand, silt, clay, or other particulate rock material deposited by flowing water, usually in the beds of rivers and streams, on a floodplain, on a delta, or at the base of a mountain.

Anthropogenic – having to do with or caused by humans.

Aquifer – a geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to *springs* and wells.

Aquifer yield – is defined as the maximum rate of withdrawal that can be sustained by an *aquifer* without causing an unacceptable decline in the *hydraulic head* in the *aquifer*.

Aquitard – a saturated body of *sediment* or rock that is incapable of transmitting significant quantities of water to wells and *springs*.

Artesian – pertaining to *groundwater* under sufficient pressure to rise above the *aquifer* containing it.

Artificial recharge – augmentation of natural replenishment of *groundwater* storage by some method of construction, spreading of water, or by pumping water directly into an *aquifer*.

B

Background concentration – a concentration of a substance in a particular environment that is indicative of minimal influence by human (see *anthropogenic*) sources.

Baseflow – the sustained low flow of a stream, usually *groundwater* inflow to the stream channel.

Basic – the opposite of acidic; water that has a *pH* of greater than 7.0 (*see* alkaline).

Best management practice (BMP) – a practice that has been determined to be an effective, practical means of preventing or reducing nonpoint-source pollution.

bgs – below ground surface measured in feet.

Blue-baby syndrome – a condition most common in young infants and certain elderly people that can be caused by ingestion of high amounts of nitrate, which results in the blood losing its ability to effectively carry oxygen.

C

Capillary fringe – the zone above the *water table* in which water is held by surface tension. Water in the capillary fringe is under a pressure less than atmospheric.

Concentration – the ratio of the quantity of any substance present in a sample of a given volume or a given weight compared to the volume or weight of the sample.

Conductivity – see *specific conductance*.

Cone of depression – the depression of *heads* around a pumping well caused by withdrawal of water.

Confined aquifer (artesian aquifer) – An *aquifer* that is completely filled with water under pressure and that is overlain by material that restricts the upward movement of that water.

Confining layer – a body of impermeable or distinctly less permeable (see *permeability*) material stratigraphically adjacent to one or more *aquifers* that restricts the movement of water into and out of the *aquifers*.

Consumptive use – the quantity of water that is not available for immediate reuse because it has been evaporated, transpired, or incorporated into products, plant tissue, animal tissue, or removed from the basin. Also referred to as water consumption.

Contamination – degradation of water quality compared to original or natural conditions due to human activity.

Cubic foot per second (ft^3/s, or cfs) – rate of water discharge representing a volume of 1 cubic foot passing a given point during 1 second, equivalent to approximately 7.48 gallons per second or 448.8 gallons per minute or 0.02832 cubic meter per second. In a stream channel, a discharge of 1 cubic foot per second is equal to the discharge at a rectangular cross section, 1 foot wide and 1 foot deep, flowing at an average velocity of 1 foot per second.

D

Datum – a horizontal plane to which ground elevations or water surface elevations are referenced.

Detection limit – the concentration of a constituent or analyte below which a particular analytical method cannot determine, with a high degree of certainty, the concentration.

Discharge – the volume of fluid passing a point per unit of time, commonly expressed in *cfs*, million gallons per day, or gallons per minute.

Discharge area (groundwater) – area where subsurface water is discharged to the land surface, to surface water, or to the atmosphere.

Dissolved oxygen – oxygen dissolved in water; one of the most important indicators of the condition of a water body. Dissolved oxygen is necessary for the life of fish and most other aquatic organisms.

Dissolved solids – minerals and organic matter dissolved in water.

Drainage basin – the land area drained by a river or stream.

Drawdown – the difference between the *water level* in a well before pumping and the *water level* in the well during pumping. Also, for flowing wells, the reduction of the pressure head as a result of the discharge of water.

Drinking-water standard or guideline – a threshold concentration for a constituent or compound in a public drinking-water supply, designed to protect human health. As defined here, standards are *USEPA* regulations that specify the maximum contamination levels for public water systems required to protect the public welfare; guidelines have no regulatory status and are issued in an advisory capacity.

Duplicate Sample – one of two identical samples collected to test accuracy of laboratory methods and equipment.

E

Ecology – Washington State Department of Ecology

Evaporation – the process by which water is changed to gas or vapor; occurs directly from water surfaces and from the soil.

Evapotranspiration – the process by which water is discharged to the atmosphere as a result of *evaporation* from the soil, surface-water bodies, and transpiration by plants.

F

Fecal bacteria – microscopic single-celled organisms (primarily fecal coliforms and fecal streptococci) found in the wastes of warm-blooded animals. Their presence in water is used to assess the sanitary quality of water for body-contact recreation or for consumption. Their presence indicates contamination by the wastes of warm-blooded animals and the possible presence of pathogenic (disease producing) organisms.

Fecal coliform – see *fecal bacteria*.

Flow path – An underground route for *groundwater* movement, extending from a recharge (intake) zone to a discharge (output) zone such as a shallow stream.

Fluvial – pertaining to a river or stream.

Fluvial deposit – a sedimentary deposit consisting of material transported by suspension or deposited by a river or stream.

G

Gauging station – a particular site on a stream, canal, lake, or reservoir where systematic observations of hydrologic data are obtained.

Glacial – of or relating to the presence and activities of ice or *glaciers*.

Glacial outwash – stratified detritus (chiefly sand and gravel) "washed out" from a glacier by meltwater streams and deposited in front of or beyond the end moraine or the margin of an active glacier.

Glacier- a large body of ice formed on land by compaction and re-crystallization of snow, creeping downslope under the influence of gravity.

Groundwater – in the broadest sense, all subsurface water; more commonly that part of the subsurface water in the *saturated zone*.

Groundwater basin – a basin described by the extent of an *aquifer* system.

Groundwater flow system – the underground pathway by which *groundwater* moves from areas of recharge to areas of discharge.

H

Hardness – a property of water that causes the formation of an insoluble residue when the water is used with soap and a scale in vessels in which water has been allowed to evaporate. It is due primarily to the presence of ions of calcium and magnesium. Generally expressed as milligrams per liter as calcium carbonate ($CaCO_3$). A general hardness scale follows:

Description	Milligrams per liter as $CaCO_3$
Soft	0-60
Moderately hard	61-120
Hard	121-180
Very hard	more than 180

Hardpan – a relatively hard, impervious, and usually clayey layer of soil lying at or just below land surface; produced as a result of cementation by precipitation of insoluble minerals.

Hydraulic conductivity – the capacity of a rock or *sediments* to transmit water expressed as the volume of water that will move in unit time under a unit *hydraulic gradient* through a unit area measured at right angles to the direction of flow.

Hydraulic gradient – the change of hydraulic head per unit of distance in a given direction.

Hydric soil – soil that is wet long enough to periodically produce anaerobic conditions, influencing the growth of plants.

Hydrofracture – process of using water under very high pressures to open fractures in bedrock to allow *groundwater* to flow to a well.

Hydrograph – graph showing variation of water elevation, velocity, streamflow, or other property of water with respect to time.

Hydrologic cycle – the circulation of water from the sea, through the atmosphere, to the land, and thence back to the sea by overland and subterranean routes.

Hydrology – the science that deals with water as it occurs in the atmosphere, on the surface of the ground, and underground.

Hydrogeology – the science that deals with subsurface waters and with related geologic aspects of surface waters.

Hydrostatic pressure – the pressure exerted by the water at any given point in a body of water at rest.

I

Impermeable – the incapacity of a material, *sediment* or rock to transmit a fluid.
Impervious – impermeable.
Infiltration – the downward movement of water from the atmosphere into soil or porous rock.

K

Kettle – a steep-sided hole or depression, commonly without surface drainage, formed by the melting of a large detached block of stagnant ice that had been buried in the *glacial* drift.
Kettle lake – a body of water occupying a *kettle*, as in a pitted *outwash* plain or in a *kettle* moraine (e.g. Lake Martha).

L

Lacustrine – pertaining to, produced by, or formed in a lake.
Leachate – a liquid that has percolated through soil containing soluble substances and that contains certain amounts of these substances in solution.

M

Matrix Spike – a sample prepared by adding a known mass of a target analyte to a specified amount of matrix sample for which an independent estimate of the target analyte *concentration* is available. Spiked samples are used, for example, to determine the effect of the matrix on a method's recovery efficiency.
Maximum contaminant level (MCL) – maximum permissible level of a *contaminant* in water that is delivered to any user of a public water system. MCLs are enforceable standards established by the *USEPA*.
Mean – the arithmetic average of a set of observations, unless otherwise specified.
Median – the middle or central value in a distribution of data ranked in order of magnitude.
Method detection limit (MCL) – the minimum *concentration* of a substance that can be accurately identified and measured with current laboratory technologies.
Micrograms per liter (µg/L) – a unit expressing the *concentration* of constituents in solution as weight (micrograms) of solute per unit volume (liter) of water; equivalent to one part per billion in most streamwater and groundwater. One thousand micrograms per liter equals one milligram per liter.
Milligram (mg) – a mass equal to 10^{-3} grams.
Milligrams per liter (mg/l) – a unit expressing the *concentration* of chemical constituents in solution as weight (milligrams) of solute per unit volume (liter) of water; equivalent to one part per million in most streamwater and groundwater.
Minimum reporting level (MRL) – the smallest measured *concentration* of a constituent that may be reliably reported using a given analytical method. In many cases, the MRL is used when documentation for the method detection limit is not available.
Monitoring – repeated observation, measurement, or sampling at a site, on a scheduled or event basis, for a particular purpose.
Monitoring well – a well designed for measuring *water levels* and testing *groundwater* quality.

N

Nitrate – an ion consisting of nitrogen and oxygen (NO_3^-). Nitrate is a plant nutrient and is very mobile in soils.
Nitrite – an ion consisting of nitrogen and oxygen (NO_2^{2-}) or a compound containing it, such as a salt or an ester of nitrous acid.
Nutrient – any inorganic or organic compound needed to sustain plant life.

O

Organic – containing carbon, but possibly also containing hydrogen, oxygen, chlorine, nitrogen, and other elements.

Outwash – soil material washed down a hillside by rainwater and deposited upon more gently sloping land.

P

Part per million (ppm) – unit of *concentration* equal to one milligram per kilogram or one milligram per liter.

Pathogen – any living organism that causes disease.

Peat – a highly organic soil, composed of partially decomposed vegetable matter.

Perched groundwater – *unconfined groundwater* separated from an underlying main body of *groundwater* by an unsaturated zone.

Percolation – the movement, under *hydrostatic pressure*, of water through interstices of a rock or soil (except the movement through large openings such as caves).

Permeability – the capacity of a rock for transmitting a fluid; a measure of the relative ease with which a porous medium can transmit a liquid.

Piezometric surface – see *Potentiometric surface.*

pH – a measure of the *acidity* (less than 7.0) or *alkalinity* (greater than 7.0) of a solution; a value of 7 is considered neutral.

Pollutant – any substance that, when present in a *hydrologic* system at sufficient *concentration*, degrades water quality in ways that are or could become harmful to human and/or ecological health or that impair the use of water for recreation, agriculture, industry, commerce, or domestic purposes.

Porosity – the ratio of the volume of voids in a rock or soil to the total volume.

Potable water – water that is safe and palatable for human consumption.

Potential evapotranspiration – the amount of moisture which, if available, would be removed from a given land area by *evapotranspiration*; expressed in units of water depth.

Potentiometric surface – an imaginary surface that represents the total head in an aquifer. It represents the height above a *datum* at which the *water level* stands in tightly cased wells that penetrate the aquifer.

Precipitation – any or all forms of water particles that fall from the atmosphere, such as rain, snow, hail, and sleet.

Precision – precision is a measure of how close the computed value is to the same quantity measured several times.

Q

Quality assurance – evaluation of quality-control data to allow quantitative determination of the quality of chemical data collected during a study. Techniques used to collect, process, and analyze water samples are evaluated.

R

Recessional Outwash – *sediment* that is deposited by a retreating glacier.

Recharge (groundwater) – the process involved in the absorption and addition of water to the zone of saturation; also, the amount of water added.

Recharge area (groundwater) – an area within which water infiltrates the ground and reaches the zone of *saturation.*

Runoff – that part of *precipitation* or snowmelt that appears in streams or surface-water bodies.

S

Saline water – water that is considered unsuitable for human consumption or for irrigation because of its high content of *dissolved solids*; generally expressed in *mg/l* of *dissolved solids*; seawater is generally considered to contain more than 35,000 *mg/l* of *dissolved solids*.

Saturated zone – a subsurface zone in which all the interstices or voids are filled with water under pressure greater than that of the atmosphere (see *water table*).
Sea water – *see* saline water.
Secondary maximum contaminant level (SMCL) – The maximum level of a *contaminant* or undesirable constituent in public water systems that, in the judgment of the *USEPA*, is required to protect the public welfare. SMCLs are secondary (non-enforceable) drinking water regulations established by the *USEPA* for *contaminants* that may adversely affect the odor or appearance of such water.
Sediment – Particles, derived from rocks or biological materials, that have been transported by a fluid or other natural process, suspended or settled in water.
Sedimentary rocks – Rocks formed by the consolidation of loose *sediment* that has accumulated in layers.
Shale – A fine-grained *sedimentary rock* formed by the consolidation of clay, silt, or mud.
Siltstone – a cemented silt having the texture and composition of shale but lacking its fine lamination.
Soil – the layer of material at the land surface that supports plant growth.
Soil moisture – water occurring in the pore spaces between the soil particles in the unsaturated zone from which water is discharged by the transpiration of plants or by evaporation from the soil.
Sole-source aquifer – as defined by the *USEPA*, an *aquifer* that supplies 50 percent or more of the drinking water of an area.
Solution – formed when a solid, gas, or another liquid in contact with a liquid becomes dispersed homogeneously throughout the liquid. The substance, called a solute, is said to dissolve. The liquid is called the solvent.
Specific capacity (of a well) – the yield of a well per unit of *drawdown*.
Specific conductance – a measure of the ability of a liquid to conduct an electrical current.
Specific yield – the ratio of the volume of water that will drain under the influence of gravity to the volume of saturated rock.
Split sample – a sample prepared by dividing it into two or more equal volumes, so that each volume is considered a separate sample but representative of the entire sample.
Spring – place where a concentrated discharge of *groundwater* flows at the ground surface.
Standard deviation – statistical measure of the dispersion or scatter of a series of values. It is the square root of the variance, which is calculated as the sum of the squares of the deviations from the arithmetic mean, divided by the number of values in the series minus 1.
Surface runoff – runoff that travels over the land surface to the nearest stream channel.
SWM – Snohomish County Public Works Surface Water Management.

T

Till – predominantly unsorted and unstratified drift, deposited directly by and underneath a *glacier* without subsequent reworking by meltwater, and consisting of a heterogeneous mixture of clay, silt, sand, gravel, and boulders.
Transmissivity – the rate at which water is transmitted through a unit width of an *aquifer* under a unit *hydraulic gradient*. It equals the *hydraulic conductivity* multiplied by the *aquifer* thickness.
Transpiration – the process, by which water passes through living organisms, primarily plants, into the atmosphere (see *evapotranspiration*).
Turbidity – the state, condition, or quality of opaqueness or reduced clarity of a fluid due to the presence of suspended matter.

U

Unconfined aquifer – an aquifer whose upper surface is a water table free to fluctuate under atmospheric pressure.
Unconsolidated deposit – deposit of loosely bound *sediment* that typically fills topographically low areas.
Unsaturated zone – a subsurface zone above the *water table* in which the pore spaces may contain a combination of air and water.

Up-gradient – of or pertaining to the place(s) from which *groundwater* originated or traveled through before reaching a given point in an aquifer.

USEPA – US Environmental Protection Agency.

USGS – US Geological Survey

V

Vadose Zone – unsaturated zone above the *water table*.

Vashon glaciation – a period of colder temperatures and glaciation experienced in the Puget Lowland between 10,000 and 23,000 years before present.

W

Water budget – an accounting of the inflow to, outflow from, and storage changes of water in a hydrologic unit.

Water level – elevation of the *water table*.

Water rights – legal rights to the use of water.

Watershed – see *drainage basin*.

Water table – the top water surface of an unconfined aquifer at atmospheric pressure.

Water year – a continuous 12-month period selected to present data relative to hydrologic or meteorological phenomena during which a complete annual hydrologic cycle normally occurs. The water year used by the *USGS* runs from October 1 through September 30, and is designated by the year in which it ends.

Y

Yield – the mass of material or constituent transported by a river in a specified time period divided by the drainage area of the river basin.

REFERENCES

Appelo, C.A.J., and Postma, D., 1993, Geochemistry, Groundwater and Pollution, Balkema Publishers, 536 pp. Rotterdam.

Armstrong, J.E., Crandell, D.R., Easterbrook, D.J., and Noble, J.B., 1965, Late Pleistocene stratigraphy and chronology in southwestern British Columbia and northwestern Washington: Geological Society of America Bulletin, v. 76, p. 321-330.

Bary, A., Cogger, C., Sullivan, D.M., 2000, Fertilizing with Manure. Washington State University Cooperative Extension, 16p. Pullman Washington.

Bauer, H.H. and Mastin, M.C., 1997, Recharge from precipitation in three small glacial-till-mantled catchments in the Puget Lowland, Washington: US Geological Survey Water-Resources Investigations Report 96-4219, 119p.

Bauer, H.H. and Vaccaro, J.J, 1987, Documentation of a deep percolation model for estimating ground-water recharge: US Geological Survey Open-File Report 86-536, 180p.

Blake, B., 2004, Personal Communication, City of Arlington Public Works, November 12, 2004.

Booth and Hallet, 1993, Channel networks carved by subglacial water: Observations and reconstruction in the eastern Puget Lowland of Washington, Geological Society of America Bulletin, v. 105, p. 671-683.

Booth, D.B., Troost, K.G., Clague, J.J., Waitt, R.B., 2003, Chapter 3 The Cordilleran Ice Sheet: *in* A. R. Gillespie, S. C. Porter, B. F. Atwater, eds., The Quaternary Period in the United States: Developments in Quaternary Science—Developments in Quaternary Science Series; International Union for Quaternary Research Elsevier Science Pub Co, p. 17,-43. New York, New York.

Borden, R. K., and Troost, K. G., 2001, Late Pleistocene Stratigraphy in the south-central Puget Lowland, West-Central Pierce County, Washington: Olympia, Washington State Department of Natural Resources, Report of Investigations 33, 33p.

Bradbury, K.R. 1991, Tritium as an indicator of ground-water age in central Wisconsin: Ground Water, v. 29, n. 3, p. 398-404.

Bredehoeft, J.D, 2002, The Water Budget Myth Revisited: Why Hydrogeologists Model Ground Water Abstracts v. 40 n. 4.

Bredehoeft, J.D., Papadopolous, S.S., and Cooper, H.H., 1982, Groundwater: the Water-budget myth: *in* Studies in Geophysics, Scientific Basis of Water Resource Management; National Academy Press, p. 51-57.

Bretz, H.J., 1913, Glaciation of the Puget Sound region: Washington Division of Mines and Geology Bulletin 8, 244p.

Britsch, S., 2004, Personal Communication; Snohomish County Public Works, Surface Water Management. Everett, Washington, September 27, 2004.

Carroll, J., and Thornburgh, K., 1995, Quilceda/Allen Watershed Characterization: Snohomish County Public Works Surface Water Management, pagination varies. Everett Washington.,

Carroll, J., 1999, Quilceda/Allen Watershed Management Plan: Snohomish County Public Works Surface Water Management, pagination varies. Everett Washington.

Carroll, J., 2004, Personal Communication; Snohomish County Public Works, Surface Water Management. Everett, Washington.

Canter, L.W., and Knox R.C., 1985, Septic tank system effects on ground water quality: Lewis Publishers, 336p. Chelsea, Michigan.

City of Arlington Public Works, 2004, Personal Communication City of Arlington Wastewater Plant personnel, September 27, 2004.

City of Arlington, 2003, City of Arlington Drinking Water Quality Report, City of Arlington Public Works; www.ci.arlington.wa.us.

City of Lake Stevens, no date, City of Lake Stevens comprehensive plan, pagination varies. Lake Stevens, Washington. www.ci.lake-stevens.wa.us/Planning/2004%20Comp%20Plan%20 Update/compplanhome.html.

City of Marysville, 2003, City of Marysville Drinking Water Quality Annual Report, 2003; www.ci.marysville.wa.us.

City of Snohomish, 1995 (revised 2001), City of Snohomish Comprehensive Plan, 170 p. Snohomish Washington.

City of Snohomish, 2002, City of Snohomish water—a short history: City Manager's Friday Newsletter, 2p.; www.ci.snohomish.wa.us/PDFs/News081602.pdf.

City of Snohomish, 2004, City of Snohomish Water Quality Report, 4p. Snohomish Washington; www.ci.snohomish.wa.us/pdfs/ConsumerConfidence.pdf.

Clague, J.J., Armstrong, J.E., and Mathews, W.H., 1980, Advance of the late Wisconsin Cordilleran Ice Sheet in southern British Columbia since 22,000 yr. B.P.: Quaternary Research, v. 13, p. 322-326.

Coats, K., 2004, Personal Communication; August 6, 2004; Concrete Nor'West; August 6, 2004, Granite Falls, Washington.

Crandall, D.R., Mullineaux, D.R., and Wodron, H.H., 1965, Age ad origin of the Puget Sound trough in Western Washington: US Geological Survey Professional Paper 525-B, P B132-B136.

Cummings, D.E., Caccavo, R., Fendorf, S., and Rosenzweig, 1999, Arsenic mobilization by the dissimilatory Fe(III)-reducing bacterium Shewanella alga BrY: Evironmental Science and Technology, v. 33 n. 5, p. 723-729.

Daly, C. and Taylor, G., 1989, Washington Average Monthly or Annual Precipitation, 1961-90: Water and Climate Center of the Natural Resources Conservation Service. Portland, Oregon.

Davies, J., Davies, R., Frank, D., Frost, Garland, D., Milham, S., Pierson, K., Raasina, B., Safiloes, S., and Woodruff, 1991, Seasonal study of arsenic in ground water, Snohomish County, Washington, unpublished report: Snohomish Health District and Washington State Department of Health, 18p. Olympia, Washington.

Davis, J.A., Yabusaki, S.B., Steefel, C.I., Zachara, J.M., Curtis, G.P., Redden, G.D., Criscenti, L.J., and Honeyman, B.D., 2004, Assessing conceptual models for subsurface reactive transport of inorganic contaminants: EOS, V. 85, n. 44, p. 449 and 455.

Debose, A, and Klungland, M.W., 1983, Soil Survey of Snohomish County Area, Washington, US Department of Agriculture, Soil Conservation Service, pagination varies; www.or.nrcs.usda.gov/pnw_soil/washington/wa661.html.

DOE See Washington State Department of Ecology.

DOH See Washington State Department of Health.

DOT See Washington State Department of Transpiration.

Drost, B.W., 1983, Water resources of the Tulalip Indian Reservation, Washington: US Geological Survey Water-Resources Investigations Open-File Report 82-648, 153p.

Dunne, T, and Leopold, L.B., 1978, Water in environmental planning: W.H. Freeman and Company, 818p. New York, New York.

Dzombak, D.D., and Morel, F.M.M., 1990, Surface complex modeling: John Wiley and Sons p.393. New York, New York.

Easterbrook, D.J., 1968, Pleistocene stratigraphy of Island County, Washington: Washington Department of Water Resources Water-Supply Bulletin, n. 23, Part I, 34p.

Easterbrook, D.J., Crandell, D.R., and Leopold, E.B., 1967, Pre-Olympia Pleistocene Stratigraphy of the Central Puget Lowland, Washington: Geological Society of America Bulletin, v. 78, p. 13-20.

Easterbrook, D.J., Blunt, D.J., and Rutter, N.A., 1982, Pleistocene glacial and interglacial chronology in western Washington: Geological Society of America Abstracts with program, v. 14, p. 161. Bolder, Colorado.

Easterbrook, D.J., 1994, Stratigraphy and chronology of early to late Pleistocene glacial and interglacial sediments in the Puget Lowland, Washington: *in* Swanson, D.A., and Haugerud, R.A., (eds.), Geological Field Trips in the Pacific Northwest, Department of Geological Sciences, University of Washington in conjunction with the Annual Meeting of the Geological Society of America, Seattle, Washington, v. 1., p. IJ 1-38.

Ebbert, J.C., Embrey, S.S., Black, R.W., Tesoriero, A.J., Hagglan, A.L., 2000, Water quality in the Puget Sound Basin, Washington and British Columbia, 1996-98, US Geological Survey Circular 1216, 31p.

Ecology See Washington State Department of Ecology.

Economic Engineering Services, Inc., 1991, Snohomish County ground water characterization study: Economic Engineering Services, Inc., pagination varies. Olympia, Washington.

Eddy, P.A., 1971, Geology and ground water resources Arlington Heights, Snohomish County Washington, Department of Ecology, 8p. Olympia, Washington.

Eriksson, E. and Khunakasem, V., 1969, Chloride concentration in groundwater, recharge rate and rate of deposition in the Israel coastal plain: Journal of Hydrology, v. 7, p. 178-197.

Erwin, M.L., and Tesoriero, A.J., 1997, Predicting ground-water vulnerability to nitrate in the Puget Sound basin: US Geological Survey Fact Sheet 061-97, 1sheet.

Ferris, J.G., Knowles, D.B., Brown, R.H., Stallman, R.W., 1962, Theory of aquifer tests: US Geological Survey Water Quality Paper 1536-E, 174p.

Focazio, M.J, Welch, A.H., Watkins, S.A., Helsel, D.R., and Horn, M.A., 2000, A retrospective analysis on the occurrence of arsenic in ground-water resources of the United States and limitations in drinking-water-supply characterizations: US Geological Survey Water-Resources Investigations Report 99-4279, 21p.

Frans, L.M., and Kresch, D.L., 2004, Water resources of the Tulalip Indian Reservation and adjacent area, Snohomish County, Washington, 2001-03: US Geological Survey Scientific Investigations Report 2004-5166, 86p.

Freeze, R.A. and Cherry, J.A., 1979, Groundwater: Prentice-Hall, Inc., 604p. Englewood, Cliffs New Jersey.

Garling, M.E., Molenaar, D., van Denburgh, A.S., Fiedler, G.H., Bailey, E., 1965, Water Resources and geology of the Kitsap Peninsula and certain adjacent islands: Washington Division of Water Resources Water-Supply Bulletin 18, 309p. Olympia, Washington.

Griamstad, P., and Carson, R.J., 1981, Geology and ground-water resources of eastern Jefferson County, Washington: Washington Department of Ecology Water-Supply Bulliten 54, 125p. Olympia, Washington.

Grimstad, P., 1971, Geology and ground water resources Lake McMurray area, Snohomish and Skagit Counties, Washington, Department of Ecology, 24p. Olympia, Washington.

Golder and Associates, Inc., 1996, Geohydrology memorandum: Snohomish County ground water management plan, Golder and Associates, Inc., pagination varies. Redmond, Washington.

Godwin, D. and Moore, J.A. 1996, Manure Management in Small Farm Livestock Operations: Protecting surface and groundwater; Oregon State University Extension Service, 8p. Corvallis, Oregon

Harrison, L.P., 1963, Fundamental concepts and definitions relating to humidity: in Wexler, A., *ed*. Humidity and Moisture, v. 3, p. 3-70, Reinhold Publishing Co. New York, New York.

Heath, R.C., 1989, Basic Ground-Water Hydrology: US Geologic Survey Water-Supply Paper 2220, 84p.

Henri, C, 2004, Snohomish County agriculture: An industry in transition; Snohomish County Focus on Farming Conference; Evergreen State Fairgrounds; Monroe, Washington. 11p.

Hubbert, M.K., 1940, The theory of ground-water motion: Journal of Geology, v. 48, no. 8, pt. 1, p. 785-944.

Huerta-Diaz, M.A., Tessier, A., Carignan, R, 1998, Geochemistry of trace elements associated with reduced sulfur in freshwater sediments: Applied Geochemistry, v. 13 p. 21-233.

Idso, S.B., and Jackson, R.D, 1969, Thermal radiation from the atmosphere: Journal of Geophysics Research, v. 74, p. 5397-5403.

International Programme on Chemical Safety, 2004, Environmental health criteria 18, Arsenic, International programme on chemical safety; www.inchem.org/documents/ehc/ehc/ehc018.htm#SubSectionNumber:1.1.2.

IPCS see International Programme on Chemical Safety

Jarvis, M.E., James, G.B., and Landsberg, J.J., 1976, Coniferous forest: in Montieth, J.L., Vegetation and the atmosphere, v. 2, Case Studies, p. 171-240. Academic Press, New York, New York.

Jenson et al, Burman, R.D., and Allen, R.G., 1990, Evapotranspiration and irrigation water requirements: ASCE Manuals and Reports on Engineering Practices No. 70, 332p. New York, New York.

Johnson, J.A., and Schreiber, M., 2004, Arsenic: Perspective regarding a new environmental concern: The Processional Geologist. V. 41 n. 3, p. 41-44.

King County, 2005, Stormwater management practices for business and residential properties: King County Department of Natural Resources and Parks, Land and Water Resources Division, Stormwater Section. Pagination varies. Seattle, Washington.

Kovanen, D.J. and Easterbrook, D.J., 2001, Lake Pleistocene, post Vashon, alpine glaciation of the Nooksack drainage, North Cascades, Washington, Geological Society of America Bulletin, v. 113, p. 274-288.

Lake Stevens Sewer District, 2004, Unpublished data; www.lkstevenssewer.org.

Lapham, W.W., Wilde, F.D., and Koterba, M.T., 1995, Ground-water data-collection protocols and procedures for the national water-quality assessment program: selection, installation and documentation of wells, and collection of related data: US Geological Survey Open-File Report 95-398, 70p.

Larson, A.G., and Marti, P.B., 1996, Relationship between ground water and surface water in the Quilceda creek watershed, Department of Ecology Publication 96-333, 33p.

Leif, B., 2005, Personal Communication; Snohomish County Public Works, Surface Water Management. Everett, Washington, June 21, 2005.

Lindemulder, B., 2004, Personal Communication; Snohomish Conservation District. Lake Stevens, Washington.

Lombard, S.M., and Kirchmer, C.J., 2001, Guidelines for preparing quality assurance project plans for environmental studies: Washington Department of Ecology Publication Number 01-03-003, 37p. Olympia, Washington.

Luizer, J.E., 1969, Geology and ground-water resources of southwestern King County, Washington: State of Washington Department of Water Resources Water-Supply Bulletin 28, 260p. Olympia, Washington.

Mead, R.D., 1995, The direct and cumulative effects of gravel mining on groundwater within Thurston County, Washington: Unpublished report Thurston County Public Health and Social Services Department, Groundwater Management Program. Olympia, Washington

McRae, C.M, 1995, Geochemistry and origin of arsenic-rich pyrite in the Uphapee Creek, Macon County, Alabama: MS thesis, Department of Geology, Auburn University, 116p. Auburn Alabama.

Minard, J.P., 1983, Geologic map of the Edmonds east and part of the Edmonds west quadrangles, Washington: US Geological Survey Miscellaneous Field Studies Map MF-1541, 5p.

Minard, J.P., 1985 (a), Distribution and description of the geologic units in the Marysville quadrangle, Washington: US Geological Survey Open-File Report 80-464, 5p.

Minard, J.P., 1985 (b), Distribution and description of the geologic units in the Tulalip quadrangle, Washington: US Geological Survey Open-File Report 80-465, 6p.

Minard, J.P., 1985 (c), Distribution and description of the geologic units in the Arlington West quadrangle, Washington: US Geological Survey Open-File Report 80-461, 7p.

Minard, J.P., 1985 (d), Distribution and description of the geologic units in the Arlington East quadrangle, Washington: US Geological Survey Open-File Report 80-460, 7p.

Minard, J.P., 1985 (e), Distribution and description of the geologic units in the Lake Stevens quadrangle, Washington: US Geological Survey Open-File Report 80-463, 6p.

Minard, J.P., 1985 (f), Distribution and description of the geologic units in the Snohomish quadrangle, Washington: US Geological Survey Open-File Report 80-2013, 7p.

Minard, J. P. and Booth, D. B., 1988, Geologic map of the Redmond quadrangle, King and Snohomish Counties, Washington: US Geological Survey Miscellaneous Field Investigations Map MF-2016, scale 1:24,000.

Molenaar, D., and Noble, J.B., 1970, Geology and related ground-water occurrence, southeastern Mason County, Washington: Washington Department of Water Resources Water-Supply Bulletin 29, 145p. Olympia, Washington.

Moore, J.N., Ficklin, W.H., and Johns, C., 1988, Partitioning of arsenic and metals in reducing sulfidic sediments: Environmental Science and Technology, v. 22, p. 432-437.

Morgan, D.S., and Jones, J.L., 1999, Numerical model analysis of the effects of ground-water withdrawals on discharge to streams and springs in small basins typical of the Puget Sound Lowland, Washington: US Geological Survey Water-Supply Paper 2492, 73 p.

Mueller, D.K. and Helsel, D.R., 1996, Nutrients in the Nation's Waters—Too Much of a Good Thing? National Water-Quality Assessment Program: U.S. Geological Survey Circular 1136.

Mullineaux, D.R., Waldron, H.H., and Rubin, M., 1965, Stratigraphy and chronology of late interglacial and early Vashon time in the Seattle area, Washington: US Geologic Survey Bulletin 1194-O, 10 p.

Murray, F.W., 1967, On the computation of saturation vapor pressure: Journal of Applied Meteorology, v. 6 p. 203-204.

Nagorski, S.A. and Moore, J.M., 1999, Arsenic mobilization in the hyporheic zone of a contaminated stream: Water Resources Research, v. 35, n. 11, p. 3441-3450.

Newcomb, R.C., 1952, Ground water resources of Snohomish County, Washington: US Geological Survey Water-Supply Paper 1135, 133p.

PDS See Snohomish County Planning and Development Services.

Peryea, F.J. and Kammereck, 1997, Phosphate-enhanced movement of arsenic out of lead arsenate-contaminated topsoil and through uncontaminated subsoil: Water, Air and Soil Pollution, v. 93, n. 1-4, p. 243-254.

Pessel, F., Dethier, D.P., Booth, D.B., and Minard, J.P., 1989, Surficial geologic map of the Port Townsend 30-by 60-minute quadrangle, Puget Sound Region, Washington, US Geologic Survey Miscellaneous Investigation Series Map I-1189-F, 13p.

Porter, K.S., 1980, An evaluation of sources of nitrogen as causes of groundwater contamination in Nassau County Long Island: Ground Water, v. 18, n. 6, p. 617-625.

Porter, S. C., and Swanson, T. W., 1998, Radiocarbon age constraints on rates of advance and retreat of the Puget Lobe of the Cordilleran Ice Sheet during the last glaciation. Quaternary Research 50, 205-213.

Public Works See Snohomish County Public Works.

PUD see Snohomish County Public Utility District.

Puget Sound Regional Council, 2001, Puget Sound population projections; www.psrc.org.

Ohm, B., 2002, Planning for Natural Resource: A Guide to Including Natural Resources in Local Comprehensive Planning; Department of Urban and Regional Planning, University of Wisconsin–Madison/Extension and Wisconsin Department of Natural Resources, 85 p. Madison, Wisconsin.

Orr L., Bauer, H.H., and Wayenberg, J.A., 2002, Estimates of ground-water recharge from precipitation to glacial-deposit and bedrock aquifers on Lopez, San Juan, Orcas, and Shaw Islands, San Juan County, Washington: US Geological Survey Water-Resources Investigations Report 02-4114, 113p.

Reynolds, H. and Williams, G., 2003, Snohomish County State of the lakes report: Snohomish County Public Works Surface Water Management, pagination varies. Everett, Washington.

Rittle, K.A., Drever, J.I., and Colberg, P.J.S., 1995, Precipitation of arsenic during bacterial sulfate reduction: Geomicrobiology Journal, v. 13, n. 1, p. 1-11.

Roller, J., Schreiber, M., Tadanier, C., Widdowson, M., and Johnson, J.A., 2003, Arsenic release due to dissimilatory reduction of iron oxides in petroleum-contaminated aquifers: Proceedings of the 2003 Virginia Water Resources Research Symposium. P. 129-132.

Roney, J., 2004, Personal Communication; Snohomish County Focus on Farming. Everett, Washington.

Sapik, D.B., Bortleson, G.C., Drost, B.W., Jones, M.A., and Prych, E.A., 1988, Ground-water resources and simulation of flow in aquifers containing freshwater and seawater, Island County, Washington: US Geological Survey Water-Resources Investigations Report 87-4182, 67 p.

Saxena, V.K., Kumar, S., Singh, V.S., 2004, Occurrence, behavior and speciation of arsenic in groundwater: Current Science, v. 86, n. 2, p. 281-284.

Schonard, D., 2004, Personal Communication: Snohomish County Public Works; Solid Waste Management, July 22, 2004. Everett, Washington.

Sinclair, K.A., and Pitz, C.F., 1999, Estimated baseflow characteristics of selected Washington rivers and streams: Water Supply Bulletin No. 60, pagination varies. Olympia, Washington.

Sloto, R.A., and Crouse, M.Y., 1996, HYSEP: A compute program for streamflow hydrograph separation and analysis, US Geological Survey Water-Resources Investigation Report 96-4040, 46p.

Smith, D, 2004, Personal Communication: City of Arlington Public Works; September 28, 2004.

Snohomish County, 2004, History of the Getchell Ranch; www.co.snohomish.wa.us/pds/910-Historic/100yrfarm/Getchell.htm.

Snohomish County Planning and Development Services, 1986, Snohomish County Wetlands Survey: 1:4,800.

Snohomish County Planning and Development Services, 2004, Draft EIS for Snohomish County GMA Comprehensive Plan Ten Year Update, pagination varies. Everett, Washington.

Snohomish County Public Works, 2000, The state of the waters: Water Quality in Snohomish County's Rives, Streams, and Lakes; 2000 Assessment; Snohomish County Public Works, 144p. Everett, Washington.

Snohomish County Public Works, 2001, Unpublished Data.

Snohomish County Public Works, 2002, Quality Assurance Project Plan (QAPP) Getchell Plateau Ground Water Investigation, 42p. Everett, Washington.

Snohomish County PUD, 2004, Personal communication with the Public Utilities District personnel, September 27, 2004.

Snohomish County Public Works, 2002, Getchell Plateau Ground Water Investigation Quality Assurance Project Plan: Snohomish County Public Works Surface Water Management, 42p. Everett, Washington.

Snohomish County Public Works Solid Waste Division, 2004c, Unpublished data on the Lake Stevens Landfill. Everett, Washington.

Snohomish Health District (The), 2004a, unpublished water chemistry data. Everett, Washington.

Snohomish Health District (The), 2004b, unpublished Sisco Landfill data. Everett, Washington.

Solid Waste See Snohomish County Public Works Solid Waste Division.

Stark, W.J., and Mullineaux, D.R., 1950, The glacial geology of the city of Seattle, Washington: MS Thesis, Department of Geology, University of Washington, 89p. Seattle, Washington.

Stollenwork, K., 2003, Geochemical processes controlling transport of arsenic in groundwater: A review of adsorption; *in* Welch, A. and Stollenwork, K., *eds.* Arsenic in Groundwater, Kluwer Academic Publishers, p. 67-100. Boston, Massachusetts

Straughn, B., 2004, Personal Communication; Snohomish Health District; Environmental Health. Everett, Washington.

Tabor, R.W., Booth, D.B., Vance, J.A, Ford, A.B., and Ort, M.H., 1988, Preliminary geologic map of the Sauk River 30'x 60' quadrangle, Washington, US Geological Survey Open File Map 88-692, 51p.

Tabor, R.W., Frizzel, V.A., Booth, D.B., Waitt, R.B., Whetten, J.T., and Zartman, R.E., 1993, Geologic map of the Skykomish River 30- by 60-minute quadrangle, Washington, US Geological Survey Miscellaneous Investigation Series Map I-1963, 42p.

Tetens, O., 1930, Uber einige meteorologische Begriffe: Zeitschrift fuer Geophysik, v. 6, p. 297-309.

Tesoriero, A.J., and Voss, F.D., 1997, Predicting the probability of elevated nitrate concentrations in the Puget Sound Basin: Implications for aquifer susceptibly and vulnerability, Ground Water, v. 35, n. 6, p. 1029-1039.

Theis, C.V., 1940, The source of water derived from wells, essential factors controlling the response of an aquifer to development: Civil Engineering, v. 10, n. 5, p. 277-280.

Thomas, B.E., 1993, Quality assurance plan (QAP) for western Snohomish County, Washington ground-water management area (GWMA) study: unpublished US Geological Survey documents, 30p. Tacoma, Washington.

Thomas, B.E., Wilkinson, J.M, Embrey, S.S., 1997, The ground water system and ground water quality in western Snohomish County, Washington, US Geological Survey Water-Resources Investigations Report 96-4312, p. 218.

Thomas, B.E., Goodman, L.A., and Olsen, T.D., 1999, Hydrogeologic assessment of the Sequim-Dungeness area, Clallam County, Washington: US Geological Survey Water-Resources Investigations Report 99-4048, 165 p. (as cited in Frans and Kresch, 2004).

Thornburgh, K., 2004, Personal Communication; Snohomish County Public Works; Solid Waste Management. Everett, Washington.

Thorson, D.M., 1980, Ice sheet glaciation the Puget Lowland, Washington, during the Vashon stade: Quaternary Research v. 13, p. 303-321.

Todd, D.K., 1980, Groundwater Hydrology 2nd ed.: John Wiley, 535 pp. New York, New York.

Troost, K.G., 1999, The Olympia nonglacial interval in the south-central Puget Lowland, Washington: MS Thesis University of Washington, 123p. Seattle, Washington.

Turney, G.L., Kahle, S.C., and Dion, N.P., 1995, Geohydrology and ground-water quality of east King County, Washington: US Geological Survey Water-Resources Investigations Report 94-4082, 123p.

US Census Bureau, 2001, Demographic Profile; www.census.gov/Press-Release/www/2001/demoprofile.html.

US Census Bureau, 2004, Table 1: Annual Estimates of the Population for Counties of Washington: April 1, 2000 to July 1, 2003 (CO-EST2003-01-53); http://www.census.gov/popest/counties/tables/CO-EST2003-01-53.xls.

USEPA See US Environmental Protection Agency.

US Environmental Protection Agency, 1997, Manual for the certification of laboratory analyzing drinking water: Criteria and Procedures Quality Assurance, Fourth Edition, US EPA Document 815-B-97-001, pagination varies. Washington, DC.

US Environmental Protection Agency, 2004, Unpublished Super Fund Site Data; cfpub.epa.gov/supercpad/cursites/srchsites.cfm.

USGS See US Geological Survey.

US Geological Survey, 1997, Unpublished field notes.

US Geological Survey, 2005a, The water cycle: US Geological Survey Water Science Basics. http://ga.water.usgs.gov/edu/watercycle.html.

US Geological Survey, 2005b, Pore Water: US Geological Survey Toxics Program. http://toxics.usgs.gov/definitions/pore_water.html.

Wallace, E.F., and Molenaar, D., 1961, Geology and ground-water resources of Thurston County, Washington, v1: Washington Division of Water Resources Water-Supply Bulletin 10, 254p. Olympia, Washington.

Walters, K.L. and Krimmel, G.E., 1968, Ground-water occurrence and stratigraphy of unconsolidated deposit, central Piece County, Washington: Washington Department of Water Resources Water-Supply Bulletin 26, 428p. Olympia, Washington.

Washington State Department of Ecology (Ecology), 2004a, Unpublished water rights data. Olympia, Washington.

Washington State Department of Ecology (Ecology), 2004b, Unpublished underground storage tank (UST) data; www.ecy.wa.gov/programs/tcp/ust-lust/ust-lst2.html. Olympia, Washington

Washington State Department of Ecology (Ecology), 2004c, Unpublished leaking underground storage tank (LUST) data water rights data, www.ecy.wa.gov/programs/tcp/ust-lust/ust-lst2.html. Olympia, Washington.

Washington State Department of Ecology (Ecology), 2004d, Unpublished hazardous waste handlers data, www.ecy.wa.gov/programs/hwtr/foia/Active_Handlers_20030904.xls. Olympia, Washington.

Washington State Department of Ecology (Ecology), 2004e, Unpublished hazardous waste spills data; www.ecy.wa.gov/programs/tcp/cscs/CSCSpage.HTM. Olympia, Washington.

Washington State Department of Ecology (Ecology), 2004f, Unpublished data on solid waste facilities in the State of Washington; www.ecy.wa.gov/programs/swfa/solidwastedata/.

Washington State Department of Ecology (Ecology), 2004g, Unpublished data on hazardous waste facilities in the State of Washington; www.ecy.wa.gov/programs/hwtr/foia/Active_Handlers_20030904.xls.

Washington State Department of Health (DOH), 1999, Heath consultation: Sisco Landfill, Washington; Unpublished Report 13p. Olympia, Washington.

Washington State Department of Health (DOH), 2004a, Unpublished water supply system data. Olympia, Washington.

Washington State Department of Health (DOH), 2004b, unpublished water chemistry data. Olympia, Washington.

Washington State Department of Transportation (WDOT), 2004, unpublished highway spills data. Olympia, Washington.

Webelements, 2004, WebElements Periodic Table: Professional Edition; The University of Sheffield and WebElements Ltd, UK; www.webelements.com.

Welch, A.H., Lico, M.S., Hughes, J.L., 1988, Arsenic in ground water of the western United States: Ground Water, v. 26, n. 3, p. 333-347.

Welch, A.H., Helsel, D.R., Focazio, M.J., and Watkins, S.A., 1999, Arsenic in ground water supplies of the United States, *in*:, W.R. Chappell, C.O. Abernathy and R.L. Calderon, *Eds*., Elsevier Science, pp. 9-17. New York, New York.

Welch, A.H., Westjohn, D.B., Helsel, D.R., and Wanty, R.B., 2000, Arsenic in ground water of the United States—occurrence and geochemistry: Ground Water, v.38 n.4, p. 589-604.

Wilkins, E., 2004, Personal Communication: City of Snohomish Public Works; September 27, 2004.

Willis, B., 1898, Drift phenomena of Puget Sound: Geological Society of America Bulletin, v. 9, p. 111-162.

Wolock, D.M., 2003a, Flow characteristics at US Geological Survey stream gages in the conterminous United States: US Geological Survey Open-File Report 03-146, digital dataset; water.usgs.gov.lookup/getspatial?qsitesdd.

Wolock, D.M., 2003b, Base-flow index grid for the conterminous United States: US Geological Survey Open-File Report 0.-263, digital dataset; water.usgs.gov.lookup/getspatial?bfi48grd.

Wood, B., 2004, Personal Communication: City of Marysville Public Works; December13, 2004

Woodward, D.G., Packard, F.A., Dion, N.P., Sumioka, S.S.,1995, Occurrence and quality of ground water in southwestern King County, Washington: US Geological Survey Water-Resources Investigations Report 92-4098, 69p.

Yount, J.C., Minard, J.P., Dembroff, G.R., 1993. Geologic map of Surficial deposits in the Seattle 30’x60’ quadrangle, Washington, US Geologic Survey Open File Report 93-233.

Appendix A.
Table A-1. Well Details and Water Levels.

					Well Details							Surface		Confining			Aquifer			Aquifer Properties						Water Level Data					
SnoCo ID	Completion Date	Legal	Well Type	Land Use	Elevation	Drilling Method	Drill Depth	Casing Depth	Casing Diameter	Screen (Y or N)	Screen Top Depth	Geologic Unit	Unit Bottom	Geologic Unit	Unit Top	Unit Bottom	Geologic Unit	Unit Top	Confined Unconfined	Yield	Drawdown	Time	Conductivity (K)	Transmissivity (T)	USGS Aquifer Sensitivity	Date	Depth to Water	Date	Depth to Water	Date	Depth to Water
							(ft)	(ft)	(in)		(ft)		(ft)		(ft)	(ft)		(ft)		(gpm)	(ft)	(hr)	(ft/d)	(ft^2/d)			(ft)		(ft)		(ft)
Mainstem Stillaguamish Watershed																															
109-050	8/14/1998	T31N/R05E-11B01	RP (SB)	U	112	HSA	15	0	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
109-053	1/2/1998	T31N/R05E-11M01	RP	U	98	HSA	35	25	2	Y	25	Qal	--	ND	--	--	ND	--	C	--	--	--	--	--	M	1/2/1998	27				
109-036	7/12/1993	T31N/R05E-10R01	D (D)	U	112	ND	50	50	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
109-088	8/31/1995	T31N/R05E-13E01	D (D)	RR/5 ac	403	ND	45	45	48	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
190-012	6/10/2003	T31N/R05E-12E01	D (D)	U	177	CT	52	30	24	ND	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	6/10/2003	3				
112-109	11/30/1998	T31N/R05E-24L01	D (D)	RR/5 ac	420	AR	220	220	6	N	--	Qvt	90	Q(A)f	185	--	ND	--	C	--	--	--	--	--	L	--	ND				
108-037	6/25/1992	T31N/R05E-10J01	D	U	66	AR	211	211	6	N	--	Qvr	--	ND	--	--	ND	--	C	0.8	210	1	--	--	M	--	ND				
109-034	6/3/1980	T31N/R05E-10J02	D	U	66	AR	73	65	6	Y	65	Qvr	--	ND	--	--	ND	--	C	13	60	1	3	16	M	6/3/1980	10				
110-005	2/12/1995	T31N/R05E-13P01	D	RR/5 ac	400	CT	223	213	6	Y	213	Qvt	--	ND	--	--	ND	--	C	5	20	1	4	19	L	2/12/1995	187				
110-006	11/17/1994	T31N/R05E-13P02	D	RR/5 ac	420	CT	209	204	6	Y	204	Qvt	--	ND	--	--	ND	--	C	10	10	1	30	160	L	11/17/1994	194				
112-080	10/12/1989	T31N/R05E-24D01	D	U	426	CT	289	283	6	Y	183	Qvt	--	ND	--	--	ND	--	C	10	60	1	2	12	L	10/12/1989	202				
112-100	9/23/1999	T31N/R05E-24R01	D	RR/5 ac	440	AR	276	241	4	Y	241	Qvt	--	ND	--	--	ND	--	C	1	0	2	--	--	L	9/23/1999	100				
134-033	11/14/1978	T31N/R05E-14D01	D	U	115	D	23.5	23.5	36	ND	--	Qvr	--	ND	--	--	Qvr	0	C	--	--	--	--	--	M	11/14/1978	9				
158-058	12/1/1939	T31N/R05E-10J03	D	U	89	CT	120	120	6	ND	--	Qvr	--	ND	--	--	ND	--	C	10	60	4	--	17	M	12/1/1940	33	2/10/1993	26		
112-054	11/19/1991	T31N/R05E-24A01	D	RR/5 ac	443	AR	340	230	4.5	Y	200	Qvt	70	Q(B)f	155	206	Q(A)c	206	C	4	230	4	--	--	L	11/19/1991	215				
112-062	6/17/1996	T31N/R05E-24H01	D	RR/5 ac	492	CT	305	300	6	Y	300	Qvt	80	Q(B)f	195	301	Q(A)c	301	C	10	4	1	70	340	L	6/17/1996	238				
087-055	12/5/1979	T31N/R05E-24B01	D	RR/5 ac	456	CT	236	232	6	Y	232	Qvt	101	Q(A)f	222	231	Q(A)c	231	C	9	6	2	50	180	L	12/5/1979	215				
109-087	9/10/1982	T31N/R05E-13C01	D	RR/5 ac	420	AR	402	402	6	N	--	Qvt	110	Q(A)f	205	395	Q(A)c	395	C	--	--	--	--	--	L	--	ND				
109-090	9/4/1997	T31N/R05E-13D01	D	RR/5 ac	358	AR	273	263	4	Y	263	Qvt	120	Q(A)f	200	258	Q(A)c	258	C	11	20	6	8	80	L	9/4/1997	219				
110-004	1/16/1995	T31N/R05E-13P03	D	RR/5 ac	423	CT	233	226	6	Y	226	Qvt	80	Q(A)f	207	227	Q(A)c	227	C	6	20	1	5	30	L	1/16/1995	205				
110-011	9/13/1988	T31N/R05E-13L01	D	RR/5 ac	420	ND	340	335	6	Y	335	Qvt	70	Q(A)f	190	335	Q(A)c	335	C	11	--	--	--	--	L	9/13/1988	200				
148-065	10/31/2000	T31N/R05E-14Q01	D	U	325	AR	180	168	6	Y	168	Qvt	116	ND	--	277	Qva	116	C	30	40	1	--	--	L	10/31/2000	121				
112-074	5/18/1995	T31N/R05E-24G01	D	RR/5 ac	459	AR	263	253	6	Y	253	Qvt	72	Q(A)f	233	269	Q(A)c	296	C	30	240	1	--	--	L	5/18/1995	190				
112-083	9/14/1989	T31N/R05E-24D02	D	U	426	AR	300	300	6	N	--	Qvt	110	Q(A)f	229	--	ND	--	C	--	--	--	--	--	L	--	ND				
112-085	4/20/1990	T31N/R05E-24F01	D	RR/5 ac	443	AR	340	340	4.5	Y	127	Qvt	117	Q(A)f	237	327	Q(A)c	327	C	1	0	2	--	--	L	4/20/1990	284				
112-098	6/23/1994	T31N/R05E-24R02	D	RR/5 ac	469	AR	280	170	6	Y	270	Qvt	64	Q(A)f	170	270	Q(A)c	270	C	15	280	1	--	--	L	6/23/1994	150				
112-103	7/8/1980	T31N/R05E-24L02	D	RR/5 ac	462	AR	391	386	6	Y	386	Qvt	--	Q(A)f	235	385	Q(A)c	385	C	8	70	1	2	8	L	7/8/1980	317				
112-106	11/23/1980	T31N/R05E-24L03	D	RR/5 ac	420	AR	290	285	6	Y	285	Qvt	69	Q(A)f	187	285	Q(A)c	285	C	8	70	1	2	8	L	11/23/1980	215				
112-107	3/20/1998	T31N/R05E-24L04	D	RR/5 ac	469	AR	360	235	6	Y	235	Qvt	124	Q(A)f	225	249	Q(A)c	249	C	7	40	2	1	16	L	3/20/1998	170				
112-110	5/4/1975	T31N/R05E-24P01	D	RR/5 ac	482	CT	277	277	6	Y	272	Qvt	95	Q(A)f	190	271	Q(A)c	271	C	15	15	1	20	110	L	5/4/1975	118				
112-113	3/15/1975	T31N/R05E-25H01	D	RR/5 ac	492	AR	288	275	6	Y	275	Qvt	115	Q(A)f	150	190	Q(A)c	190	C	10	3	1	140	430	L	3/15/1975	240				
116-008	2/4/2000	T31N/R05E-24E01	D	RR/5 ac	377	AR	290	258	4	Y	258	Qvt	--	Q(A)f	175	248	Q(A)c	248	C	20	30	4	2	70	L	2/4/2000	156				
112-075	1/20/1998	T31N/R05E-24C01	D	RR/5 ac	433	AR	243	238.5	6	Y	238	Qvt	76	Q(A)f	225	258	Q(A)c	258	C	5	20	1	4	20	L	1/20/1998	212				
112-108	12/11/1998	T31N/R05E-24L05	D	RR/5 ac	420	AR	360	350	6	Y	350	Qvt	85	Q(A)f	183	238	Q(A)c	238	C	10	40	2	3	30	L	11/21/1998	311				
112-099	8/2/1999	T31N/R05E-24R03	D	RR/5 ac	436	AR	276	241	6	Y	241	Qvt	99	Q(A)f	190	266	Q(A)c	266	C	0.3	80	1	--	--	L	8/2/1999	179				
189-008	5/14/2003	T31N/R05E-13F01	D	RR/5 ac	403	AR	300	280	4	Y	280	Qvt	--	Q(A)f	215	285	Q(A)c	285	C	1	90	1	--	0.4	L	5/19/2003	200				
112-067	8/3/1991	T31N/R05E-24J01	D	RR/5 ac	495	AR	443	280	6	N	--	Qvt	134	Ts	380	--	ND	--	C	--	--	--	--	--	L	--	ND				
112-114	6/10/1991	T31N/R05E-25A01	D	RR/5 ac	492	AR	246	226	4.5	Y	226	Qvt	--	Ts	204	--	Ts	204	C	6	30	2	1	20	L	6/10/1991	174				
171-037	3/4/2001	T31N/R06E-30M01	D	RR/5 ac	499	AR	260	240	6	Y	240	Qvt	143	Ts	143	--	Ts	143	C	10	--	2	--	--	L	3/4/2001	230				
108-075	3/20/1985	T31N/R05E-24G02	D	RR/5 ac	440	D	55	55	36	Y	50	Qvt	--	Qvt	3	--	Qvt	18	C	30	30	1	6	30	L	3/20/1985	20				
109-035	11/22/1983	T31N/R05E-10Q01	D	U	85	CT	79	79	6	N	--	Qvr	20	Qvt	20	62	Qva	62	C	50	15	1	210	--	M	11/22/1983	30				
110-054	6/6/1980	T31N/R05E-10Q02	D	ULDR4-6	112	CT	85	80	6	Y	80	Qvr	8	Qvt	8	50	Qva	50	C	12	20	1	12	60	M	3/3/1988	50				
112-060	9/25/1990	T31N/R05E-24C02	D	RR/5 ac	400	AR	195	190	6	Y	190	Qvt	55	Qvt	0	55	Qva	55	C	6	10	1	11	60	L	9/25/1990	175				
112-063	8/9/1996	T31N/R05E-24H02	D	RR/5 ac	492	CT	58	53	6	Y	53	Qvt	53	Qvt	0	53	Qva	53	C	3	8	1	6	30	L	8/9/1996	43				
151-020	8/14/2001	T31N/R05E-24F02	D	RR/5 ac	397	AR	190	180	6	Y	180	Qvt	80	Qvt	31	51	Ts	80	C	10	0	2	--	--	L	8/14/2001	160				
179-068	5/8/2001	T31N/R05E-25J01	D	RR/5 ac	479	AR	60	55	6	Y	55	Qvt	44	Qvt	0	44	Qva	44	C	40	20	1.5	--	--	L	5/8/2001	33				
113-027	8/22/1991	T31N/R05E-25J02	D	RR/5 ac	508	AR	90	90	6	N	--	Qvt	85	Qvt	0	85	Qva	85	C	7	--	--	--	--	L	8/22/1991	69				
114-078	6/29/1983	T31N/R05E-15A01	D	U	121	CT	80	80	6	N	--	Qvr	30	Qvt	30	68	Qva	68	C	50	5	1	550	--	M	6/29/1983	46				
114-091	2/27/2000	T31N/R06E-30M02	D	RR/5 ac	499	AR	120	100	4	Y	100	Qvt	105	Qvt	0	105	Qva	105	C	7	20	2	2	40	L	2/27/2000	85				
120-062	4/1/1975	T31N/R06E-30P01	D	RR/5 ac	508	AR	136	130	6	Y	130	Qvt	130	Qvt	0	130	Qva	130	C	10	11	2	20	100	L	4/1/1975	109				
120-066	10/7/1988	T31N/R06E-30P02	D	RR/5 ac	505	AR	160	160	6	N	--	Qvt	105	Qvt	0	105	Qva	105	C	15	120	2	--	--	L	10/7/1988	49	8/26/1992	75		
114-088	7/30/1999	T31N/R06E-30M03	D	RR/5 ac	515	AR	60	30	4	Y	30	Qvt	35	Qvt	0	35	Qva	35	C	3	20	4	1	20	L	7/30/1999	10				
168-077	1/8/2003	T31N/R05E-25J03	D	RR/5 ac	479	AR	60	55	6	Y	55	Qvt	26	Qvt	0	26	Qva	26	C	40	60	1.5	--	--	L	1/8/2003	21				
110-009	7/26/1995	T31N/R05E-13P04	D	RR/5 ac	403	CT	230	219	6	Y	219	Qvt	--	ND	--	--	ND	--	C	2	11	1	2	10	L	7/26/1995	197				
112-051	10/9/1991	T31N/R05E-24A02	D	RR/5 ac	440	CT	268	265	6	Y	256	Qvt	--	ND	--	--	ND	--	C	4	50	1	0.5	5	L	10/9/1991	206				
109-047	9/2/1998	T31N/R05E-11B02	RP (SB)	U	112	HSA	15	0	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
109-048	8/14/1998	T31N/R05E-11B03	RP (SB)	U	112	HSA	18	0	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
109-049	8/14/1998	T31N/R05E-11B04	RP (SB)	U	112	HSA	15	0	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
150-075	7/9/2001	T31N/R05E-11Q01	RP (SB)	U	121	P	20	0	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
150-076	7/9/2001	T31N/R05E-11Q02	RP (SB)	U	121	P	20	0	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
150-077	7/9/2001	T31N/R05E-11Q03	RP (SB)	U	121	P	20	0	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
150-078	7/9/2001	T31N/R05E-11Q04	RP (SB)	U	121	P	20	0	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
150-079	7/9/2001	T31N/R05E-11Q05	RP (SB)	U	121	P	20	0	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
164-045	7/24/2002	T31N/R05E-11F01	RP (SB)	U	102	P	16	0	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
164-046	7/23/2002	T31N/R05E-11F02	RP (SB)	U	102	P	15.5	0	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
164-047	7/24/2002	T31N/R05E-11F03	RP (SB)	U	105	P	17	0	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
164-048	7/24/2002	T31N/R05E-11F04	RP (SB)	U	102	P	17	0	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
164-049	7/24/2002	T31N/R05E-11F05	RP (SB)	U	105	P	17	0	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
164-050	7/24/2002	T31N/R05E-11F06	RP (SB)	U	102	P	17	0	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
164-051	7/24/2002	T31N/R05E-11F07	RP (SB)	U	102	P	17	0	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
164-052	7/24/2002	T31N/R05E-11F08	RP (SB)	U	102	P	16	0	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
164-053	7/23/2002	T31N/R05E-11B05	RP (SB)	U	108	P	21	0	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
164-054	7/23/2002	T31N/R05E-11B06	RP (SB)	U	112	P	21	0	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
164-055	7/24/2002	T31N/R05E-11B07	RP (SB)	U	112	HSA	17	0	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
158-059	12/15/1954	T31N/R05E-15A02	I	U	118	D	77	77	36	Y	77	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	M	2/12/1993	49.5				
106-025	4/1/1998	T31N/R05E-24R04	D	RR/5 ac	499	D	34	34	48	ND	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	4/1/1998	3				
108-099	1/13/1988	T31N/R05E-13E02	D	RR/5 ac	400	D	24	24	36	Y	22	Qvt	--	ND	--	--	Qvt	0	UC	80	10	0.2	--	--	L	1/13/1988	14				
109-017	3/30/1984	T31N/R05E-10R02	D	U	108	D	35	33	36	Y	33	Qvr	--	ND	--	--	Qvr	0	UC	50	8	1	230	460	M	3/30/1984	20				
109-033	5/3/1988	T31N/R05E-10G01	D	RFC	62	AR	30	20	5	Y	20	Qvr	--	ND	--	--	Qvr	0	UC	10	--	--	--	--	M	5/3/1988	8				
109-089	11/8/1995	T31N/R05E-13D02	D	RR/5 ac	285	AR	172	162	6	Y	162	Qvt	19	ND	--	--	Qva	19	UC	25	160	1	--	--	M	11/8/1995	130				
109-097	10/18/1989	T31N/R05E-13K04	D	RR/5 ac	433	AR	260	255	6	Y	255	Qvt	70	ND	--	--	Qva	70	UC	10	250	1	--	--	L	10/18/1989	190	8/14/1992	200		
109-098	5/12/1988	T31N/R05E-13K05	D	RR/5 ac	440	CT	260	250	6	Y	250	Qvt	108	ND	--	--	Qva	108	UC	15	20	1	15	80	L	5/12/1988	224				
109-100	10/26/1986	T31N/R05E-13K06	D	RR/5 ac	459	CT	240	235	6	Y	235	Qvt	72	ND	--	--	Qva	72	UC	10	6	2	12	60	L	10/26/1986	214				
109-102	3/5/1986	T31N/R05E-13L03	D	RR/5 ac	420	D	28	26	36	Y	26	Qvt	--	ND	--	--	Qvt	0	UC	50	8	0.5	180	350	L	3/5/1986	12				
110-008	9/4/1997	T31N/R05E-13P05	D	RR/5 ac	400	AR	197	192.5	6	Y	192.5	Qvt	65	ND	--	--	Qva	65	UC	3	200	1	--	--	L	9/4/1997	188				
110-010	3/17/1995	T31N/R05E-13P06	D	RR/5 ac	407	AR	232	225	6	Y	225	Qvt	70	ND	--	--	Qva	70	UC	5	10	1	10	50	L	3/17/1995	205				
110-016	6/6/1989	T31N/R05E-13E03	D	RR/5 ac	403	D	25	23	36	Y	23	Qvt	--	ND	--	--	Qvt	0	UC	40	6	0.3	150	300	L	6/6/1989	16				
110-027	7/5/1999	T31N/R05E-14Q02	D	U	318	AR	136	127	6	Y	127	Qvt	109	ND	--	--	Qva	109	UC	--	--	--	--	--	L	7/5/1999	107	8/29/2002	112		
112-046	10/5/1989	T31N/R05E-24B02	D	RR/5 ac	440	CT	228	218	6	Y	218	Qvt	100	ND	--	--	Q(A)c	219	UC	6	3	2	8	80	L	10/5/1989	213				
112-057	10/25/1988	T31N/R05E-24B03	D	RR/5 ac	440	AR	251	246	6	Y	246	Qvt	76	ND	160	233	Q(A)c	233	UC	10	240	1	--	--	L	10/25/1988	230				
112-058	3/1/1980	T31N/R05E-24B04	D	RR/5 ac	446	CT	230	226	6	ND	226	Qvt	108	ND	--	--	Qva	108	UC	7	3	1	20	70	L	3/1/1980	214				
112-059	6/28/1991	T31N/R05E-24C04	D	RR/5 ac	420	AR	218	213	6	Y	213	Qvt	105	ND	--	--	Qva	105	UC	2	10	1	5	15	L	6/28/1991	198				
112-061	12/13/1996	T31N/R05E-24B05	D	RR/5 ac	443	AR	225	220	6	Y	220	Qvt	105	ND	--	--	Qva	105	UC	7	220	1	--	--	L	12/13/1996	208				
112-064	7/11/1996	T31N/R05E-24H03	D	RR/5 ac	492	AR	80	79	6	N	--	Qvt	66	ND	--	--	Qva	66	UC	--	--	--	--	--	L	7/11/1996	65				
112-066	8/6/1988	T31N/R05E-24H04	D	RR/5 ac	485	CT	252	247	6	Y	247	Qvt	140	ND	--	--	Qva	140	UC	10	4	1	16	80	L	8/6/1988	226				
112-071	7/13/1990	T31N/R05E-24H05	D	RR/5 ac	472	AR	70	68	6	N	--	Qvt	68	ND	--	--	Qva	68	UC	10	60	1	--	--	L	7/13/1990	56	8/18/1992	55		
112-077	9/6/1990	T31N/R05E-24C05	D	RR/5 ac	417	CT	203	196	6	Y	196	Qvt	79	ND	--	--	Qva	79	UC	16	15	2	6	30	L	9/6/1990	172				
112-078	10/3/1987	T31N/R05E-24B06	D	RR/5 ac	443	CT	222	217	6	Y	217	Qvt	100	ND	--	--	Qva	100	UC	10	8	1	30	130	L	10/3/1987	205				
112-082	10/18/1989	T31N/R05E-24D03	D	RR/5 ac	413	AR	236	231	6	Y	231	Qvt	85	ND	--	--	Qva	85	UC	2	--	--	--	--	L	10/18/1989	184				
112-086	10/30/1999	T31N/R05E-24G03	D	RR/5 ac	449	D	28	28	36	Y	26	Qvt	--	ND	--	--	Qvt	0	UC	40	12	1	--	--	L	10/30/1999	14				
112-087	10/30/1999	T31N/R05E-24G04	D	RR/5 ac	449	D	28	28	36	Y	26	Qvt	--	ND	--	--	Qvt	0	UC	40	12	1	--	--	L	10/30/1999	14				
112-088	1/3/1991	T31N/R05E-24D04	D	RR/5 ac	377	CT	180	175	6	Y	175	Qvt	ND	ND	--	--	Qva	ND	UC	10	3	1	20	100	L	3/1/1991	152				
112-097	11/13/1973	T31N/R05E-24R05	D	RR/5 ac	472	CT	266	263	6	Y	263	Qvt	70	ND	--	--	Qva	70	UC	10	3	1	40	120	L	11/13/1973	243	8/18/1992	250		
112-101	7/20/1993	T31N/R05E-24G05	D	RR/5 ac	449	D	32.5	32.5	36	Y	30	Qvt	--	ND	--	--	Qvt	0	UC	15	10	1	--	--	L	7/20/1993	19				
112-102	6/12/1994	T31N/R05E-24G06	D	RR/5 ac	449	D	32.5	32.5	36	Y	30	Qvt	--	ND	--	--	Qvt	0	UC	15	10	1	--	--	L	6/12/1994	11				
112-104	3/12/1991	T31N/R05E-24F03	D	RR/5 ac	423	CT	221	215	6	Y	215	Qvt	98	ND	--	--	Qva	98	UC	11	8	1	30	150	L	3/12/1991	186	8/19/1992	185		
113-006	6/9/1994	T31N/R05E-25H02	D	RR/5 ac	492	AR	78	73	6	N	--	Qvt	60	ND	--	--	Qva	60	UC	5	80	1	--	--	L	6/9/1994	54				
113-028	4/1/1993	T31N/R05E-25G01	D	RR/5 ac	482	AR	70	70	6	N	--	Qvt	54	ND	--	--	Qva	54	UC	18	70	1	--	--	L	4/1/1993	44				
115-070	2/18/1997	T31N/R05E-24F04	D	RR/5 ac	456	AR	239	235	6	Y	234	Qvt	120	ND	--	--	Qva	120	UC	12	3	1	30	150	L	2/18/1997	212.5				
116-013	10/30/1999	T31N/R05E-24G07	D	RR/5 ac	449	D	28	28	36	Y	26	Qvt	--	ND	--	--	Qvt	0	UC	40	12	1	100	200	L	10/30/1999	14				
116-014	10/30/1999	T31N/R05E-24G08	D	RR/5 ac	449	D	28	28	36	Y	26	Qvt	--	ND	--	--	Qvt	0	UC	40	12	1	100	200	L	10/30/1999	14				
120-018	5/15/1982	T31N/R06E-30D01	D	RR/5 ac	515	CT	94	82	5	Y	82	Qvt	85	Qvt	0	85	Qva	85	UC	7	1	2	100	500	L	5/15/1982	79				
120-024	3/18/1992	T31N/R06E-30E01	D	RR/5 ac	512	CT	305	300	6	Y	300	Qvt	116	ND	--	--	Q(A)c	257	UC	10	30	2	6	30	L	3/18/1992	248				
120-027	10/13/1978	T31N/R06E-30E02	D	RR/5 ac	522	AR	102.5	102.5	6	N	--	Qvt	85	ND	--	--	Qva	85	UC	30	--	--	--	--	L	10/13/1978	78				
120-064	12/4/1993	T31N/R06E-30M04	D	RR/5 ac	525	AR	100	96	6	N	--	Qvt	87	ND	--	--	Qva	87	UC	14	100	1	--	--	L	12/4/1993	82				
113-009	2/2/1999	T31N/R05E-25G02	D	RR/5 ac	499	AR	90	70	4	Y	70	Qvt	75	Qvt	0	75	Qva	75	UC	8	10	2	2	30	L	2/2/1999	65				
163-018	7/24/2003	T31N/R05E-11M02	D	U	95	CT	56	51	6	Y	51	Qvr	--	ND	--	--	Qvr	0	UC	24	4	1	60	300	M	7/24/2002	16				
163-019	7/18/2002	T31N/R05E-11M03	D	U	95	CT	60	53	2	Y	53	Qvr	--	ND	--	--	Qvr	0	UC	24	5	1	80	400	M	7/16/2002	14				
163-020	7/20/2002	T31N/R05E-11M04	D	U	95	CT	57	52	6	Y	52	Qvr	--	ND	--	--	Qvr	0	UC	24	5	1	40	200	M	7/19/2002	14				
Snohomish Watershed																															
156-055	--	T30N/R06E-18Q01	ND	RR/5 ac	403	ND	--	--	--	ND	--	--	--	ND	--	--	--	--	C	--	--	--	--	--	L	--	ND				
193-002	8/8/2003	T29N/R05E-25D01	ND	ULDR6-LKST	276	ND	--	--	--	ND	41	ND	--	--	--	--	--	0	C	--	--	--	--	--	L	--	ND				
173-082	1/24/2004	T30N/R06E-08M01	D	RR/5 ac	417	AR	98	93	6	Y	98	ND	--	--	--	--	--	--	C	20	--	1	--	--	L	1/27/2004	83				
112-039	4/18/1994	T31N/R05E-23L01	I	U	328	HSA	265	255	6	Y	255	Qvt	--	ND	--	--	ND	--	C	50	90	2.5	6	60	L	4/18/1994	160				
063-097	6/30/1989	T29N/R06E-29C01	I	ULDR6-LKST	397	AR	120	100	4.5	Y	100	Qvt	62	Q(A)f	62	85	Ts	85	C	14	15	4	7	130	L	6/30/1989	39				
121-090	11/6/1978	T31N/R06E-31G01	D	RR/5 ac	525	AR	137	137	6	N	--	Qvt	110	ND	--	--	Qva	110	C	30	30	0.5	--	--	L	11/6/1978	80	4/7/1993	105		
035-161	12/19/1995	T28N/R06E-07M01	RP (D)	U	151	ND	28.5	--	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
036-001	6/10/1998	T28N/R06E-07M02	RP (D)	U	128	ND	30	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
036-003	10/28/1994	T28N/R05E-12R01	RP (D)	U	108	HSA	16	6	2	Y	6	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	L	10/27/2004	4				
036-004	10/28/1994	T28N/R05E-12R02	RP (D)	U	108	HSA	18	8	2	Y	8	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	L	10/27/2004	4				
150-019	8/7/2001	T28N/R06E-07N01	RP (D)	U	115	HSA	25	5	4	Y	5	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	8/7/2001	3				
150-020	8/7/2001	T28N/R06E-07N02	RP (D)	U	115	HSA	18	3	2	Y	3	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
150-021	8/7/2001	T28N/R06E-07N03	RP (D)	U	115	HSA	18	3	2	Y	3	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
150-022	8/8/2001	T28N/R06E-07N04	RP (D)	U	115	HSA	18	1	2	Y	3	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	8/8/2001	5				
036-020	1/12/1994	T28N/R05E-12R03	RP (D)	U	98	HSA	14.4	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
036-021	1/12/1994	T28N/R05E-12R04	RP (D)	U	98	HSA	18	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
036-022	1/12/1994	T28N/R05E-12R05	RP (D)	U	98	HSA	13	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
036-023	1/12/1994	T28N/R05E-12R06	RP (D)	U	98	HSA	13	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
039-045	9/7/1994	T28N/R06E-07M03	RP (D)	U	151	ND	29	--	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
039-046	9/18/1992	T28N/R06E-07M04	RP (D)	U	151	HSA	28	29	4	Y	13	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
039-047	9/18/1992	T28N/R06E-07M05	RP (D)	U	151	HSA	30	14	6	Y	14	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
176-010	4/25/2001	T28N/R06E-07N05	RP (D)	U	82	P	19	--	6	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
168-068	4/13/2001	T29N/R05E-11H01	RP (D)	RR/5 ac	236	MR	80	0	0	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
152-020	9/13/2001	T29N/R05E-23J01	RP (D)	ULDR6-LKST	276	ND	25	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	9/13/2001	8				
168-072	9/12/2000	T30N/R06E-23M01	RP (D)	RR/5 ac	262	P	8	--	0	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
168-073	9/12/2000	T30N/R06E-23M02	RP (D)	RR/5 ac	262	P	10	--	0	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
168-074	9/12/2000	T30N/R06E-23M03	RP (D)	RR/5 ac	262	P	10	--	0	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
168-075	9/12/2000	T30N/R06E-23M04	RP (D)	RR/5 ac	262	P	5	--	0	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
168-076	9/12/2000	T30N/R06E-23M05	RP (D)	RR/5 ac	262	P	5	--	0	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
109-051	1/10/1997	T29N/R05E-13B04	RP (D)	UCOM	341	HSA	24	4	8	Y	4	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
036-006	12/1/1993	T28N/R06E-07M06	RP (D)	U	125	HSA	44	24	2	Y	24	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
161-074	8/27/2002	T28N/R06E-07M07	RP (D)	U	125	HSA	27.2	27.2	2	Y	17.2	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
161-075	8/27/2002	T28N/R06E-07M08	RP (D)	U	128	AR	26	ND	2	Y	16	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
161-076	8/27/2002	T28N/R06E-07M09	RP (D)	U	125	AR	40	25	2	Y	25	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
163-093	7/15/2002	T29N/R05E-13G01	RP (D)	UCOM	341	HSA	31	31	2	Y	21	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
163-094	7/15/2002	T29N/R05E-13G02	RP (D)	UCOM	344	HSA	31	21	2	Y	21	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
163-095	8/12/2002	T29N/R05E-13G03	RP (D)	UCOM	344	HSA	27	22	1	Y	22	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
163-096	7/17/2002	T29N/R05E-13G04	RP (D)	UCOM	341	HSA	31	21	2	Y	21	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
163-097	7/18/2002	T29N/R05E-13G05	RP (D)	UCOM	341	HSA	30	20	2	Y	20	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
163-098	7/18/2002	T29N/R05E-13G06	RP (D)	UCOM	344	HSA	28	22	1	Y	22	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
163-099	7/18/2002	T29N/R05E-13G07	RP (D)	UCOM	341	HSA	34	29	1	Y	29	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
163-100	7/15/2002	T29N/R05E-13G08	RP (D)	UCOM	344	HSA	46	44	2	Y	44	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
164-001	7/15/2002	T29N/R05E-13G09	RP (D)	UCOM	344	HSA	50	48	2	Y	48	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
164-002	7/16/2002	T29N/R05E-13G10	RP (D)	UCOM	344	HSA	47	45	2	Y	45	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	7/16/2002	38				
164-003	7/16/2002	T29N/R05E-13G11	RP (D)	UCOM	344	HSA	46	44	2	Y	44	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	7/16/2002	38				
164-004	7/16/2002	T29N/R05E-13G12	RP (D)	UCOM	341	HSA	47	45	2	Y	45	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	7/16/2002	38				
164-005	7/16/2002	T29N/R05E-13G13	RP (D)	UCOM	341	HSA	47	25	2	Y	45	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	7/16/2002	38				
164-006	7/16/2002	T29N/R05E-13G14	RP (D)	UCOM	341	HSA	47	45	2	Y	45	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	7/16/2002	38				
164-007	7/16/2002	T29N/R05E-13G15	RP (D)	UCOM	344	HSA	47	45	2	Y	45	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	7/16/2002	38				
169-040	12/17/2002	T28N/R05E-12J01	RP (D)	U	121	HSA	80	25	2	Y	25	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
169-041	12/17/2002	T28N/R05E-12J02	RP (D)	U	118	HSA	20	5	2	Y	5	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
169-042	12/17/2002	T28N/R05E-12J03	RP (D)	U	118	HSA	80	30	2	Y	30	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
152-004	8/22/2001	T28N/R05E-12H01	RP (D)	U	144	HSA	35	25	2	Y	25	Qvr	--	--	ND	--	Qvr	0	C	--	--	--	--	--	M	--	ND				
153-034	9/27/2001	T28N/R06E-18M01	RP (D)	U	56	HSA	15	13	2	Y	13	Qvr	--	Qvr	0	51	Qvr	0	C	--	--	--	--	--	M	9/27/2002	4				
035-149	3/25/1989	T28N/R05E-10H01	D (D)	RR/5 ac	112	D	18	--	30	ND	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	3/25/1989	2				
049-067	7/3/1993	T29N/R05E-01C01	D (D)	RR/5 ac	318	ND	36	36	36	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				

Appendix A.
Table A-1. Well Details and Water Levels.

SnoCo ID	Completion Date	Legal	Well Type	Land Use	Elevation	Drilling Method	Drill Depth	Casing Depth	Casing Diameter	Screen (Y or N)	Screen Top Depth	Geologic Unit	Unit Bottom	Geologic Unit	Unit Top	Unit Bottom	Geologic Unit	Unit Top	Confined Unconfined	Yield	Drawdown	Time	Conductivity (K)	Transmissivity (T)	USGS Aquifer Sensitivity	Date	Depth to Water	Date	Depth to Water	Date	Depth to Water
							Well Details					Surface		Confining			Aquifer			Aquifer Properties						Water Level Data					
							(ft)	(ft)	(in)		(ft)		(ft)		(ft)	(ft)		(ft)		(gpm)	(ft)	(hr)	(ft/d)	(ft^2/d)			(ft)		(ft)		(ft)
051-050	4/22/1993	T29N/R05E-01E01	D (D)	RR/5 ac	377	AR	120	120	6	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	4/22/1993	105				
051-051	6/21/1997	T29N/R05E-01E02	D (D)	RR/5 ac	377	ND	22	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
054-129	4/6/1989	T29N/R05E-25P01	D (D)	RR/5 ac	223	ND	21	21	40	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	4/6/1989	10				
168-069	5/23/2001	T29N/R06E-04R01	D (D)	RR/5 ac	230	ND	83	0	0	N	--	Qva	--	ND	--	--	ND	--	C	--	--	--	--	--	M	5/23/2001	62				
060-094	5/30/1996	T29N/R06E-16D01	D (D)	RR/5 ac	226	ND	38	38	36	N	--	Qal	--	ND	--	--	ND	--	C	--	--	--	--	--	H	5/30/1996	23				
061-022	9/28/2000	T29N/R06E-17C01	D (D)	U	226	D	9	9	36	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	DRY				
061-102	1/19/1998	T29N/R06E-21P01	D (D)	RR/5 ac	108	ND	50	50	6	N	--	Qal	--	ND	--	--	ND	--	C	--	--	--	--	--	H	--	ND				
070-085	9/10/1989	T30N/R05E-01A03	D (D)	RR/5 ac	410	ND	22	22	6	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	9/10/1989	6				
070-090	11/21/1997	T30N/R05E-01L01	D (D)	RR/5 ac	403	D	20	20	36	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	11/21/1997	9				
070-091	11/21/1997	T30N/R05E-01L02	D (D)	RR/5 ac	403	D	23	23	36	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	11/21/1997	8				
074-069	9/6/2000	T30N/R05E-12P01	D (D)	RR/5 ac	397	ND	19	36	36	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	9/6/2000	6				
077-027	5/24/1990	T30N/R05E-23J01	D (D)	U	328	D	38	38	78	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	5/24/1990	10				
084-045	2/13/1997	T30N/R06E-05K01	D (D)	RR/5 ac	499	CT	134	0	6	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	2/13/1997	23				
089-099	9/10/1994	T30N/R06E-14B01	D (D)	RR/5 ac	184	D	60	60	36	N	--	Qva	--	ND	--	--	ND	--	C	--	--	--	--	--	M	9/10/1994	40				
090-065	10/1/1997	T30N/R06E-29B01	D (D)	RR/5 ac	354	ND	25	25	36	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	10/1/1997	10				
092-038	5/5/2000	T30N/R06E-23E01	D (D)	LCF	272	D	17	--	36	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	5/5/2000	8				
092-039	5/5/2000	T30N/R06E-23E02	D (D)	LCF	272	D	17	--	36	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	5/5/2000	8				
092-040	9/23/1992	T30N/R06E-23E03	D (D)	LCF	272	D	24	--	20	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	5/5/2000	8				
092-043	2/12/1996	T30N/R06E-23E04	D (D)	RR/5 ac	259	AR	140	140	6	Y	0	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	2/12/1996	3				
092-109	9/12/1995	T30N/R06E-27N01	D (D)	RR/5 ac	236	ND	25	--	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
094-092	9/28/1996	T30N/R06E-33G01	D (D)	RR/5 ac	223	ND	--	--	--	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
158-023	1/1/2002	T29N/R05E-11F01	D (D)	RR/5 ac	43	D	62.7	48	48	N	--	Q(A)f	--	ND	--	--	ND	--	C	60	--	--	--	--	L	8/22/1944	39.8				
158-083	1/1/1959	T29N/R06E-07D01	D (D)	UCOM	223	ND	100	100	6	ND	--	Qvt	--	ND	--	--	ND	--	C	9	2	3.5	280	700	L	7/1/1945	7.5				
158-084	1/1/1950	T29N/R06E-08L01	D (D)	U	220	ND	120	120	6	ND	--	Qal	--	ND	--	--	ND	--	C	5	2	--	--	--	M	6/1/1945	2				
160-032	10/9/1998	T29N/R06E-06J01	D (D)	U	430	AR	17	--	6	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	10/9/1998	8				
160-033	9/16/1998	T29N/R06E-08H01	D (D)	U	216	ND	50	50	6	Y	0	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	9/16/1998	30				
161-025	8/2/2002	T30N/R06E-06N01	D (D)	RR/5 ac	446	D	50	50	6	ND	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	8/1/2002	10				
156-100	2/27/2002	T29N/R06E-21L01	D (D)	RR/5 ac	118	ND	11	--	--	N	--	Qal	--	ND	--	--	ND	0	C	--	--	--	--	--	H	--	0				
166-024	10/28/2002	T30N/R06E-27D01	D (D)	RR/5 ac	253	ND	21	21	36	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	10/28/2002	12				
166-025	9/18/2002	T30N/R06E-28R01	D (D)	RR/5 ac	233	ND	35	35	6	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	9/18/2002	8				
054-118	8/18/1986	T29N/R05E-14K01	D (D)	RR/5 ac	49	AR	240	98	6	N	--	Qva	100	Q(A)f	100	--	ND	--	C	--	--	--	--	--	M	--	DRY				
054-128	3/15/1977	T29N/R05E-35R01	D (D)	RR/5 ac	128	ND	325	0	5	N	--	Qvr	18	Q(A)f	18	--	ND	--	C	--	--	--	--	--	M	--	ND				
092-048	2/25/1985	T30N/R06E-22J01	D (D)	RR/5 ac	243	CT	123	120	6	Y	120	Qvr	13	Qvt	13	105	Qva	105	C	7	110	2	1	4	M	2/25/1985	1				
040-020	11/5/1993	T30N/R06E-22E01	D	RR/5 ac	276	CT	60	55	4.5	Y	55	Qal	10	Qal	0	10	Qvr	10	C	5	25	2	4	20	H	11/8/1993	8				
035-068	9/20/1976	T30N/R06E-27N02	D (D)	RR/5 ac	239	AR	81	80	6	N	--	Qvr	--	ND	--	--	ND	--	C	50	--	--	--	--	M	--	ND				
150-090	7/9/2001	T28N/R05E-12H01	D	ULDR4-6	92	CT	60	55	6	Y	55	Qva	--	ND	--	--	Qva	0	C	--	--	--	--	--	M	7/9/2001	26				
039-063	2/21/1994	T28N/R06E-05C01	D (D)	RFC	62	HSA	26	--	--	N	--	Qal	--	ND	--	--	ND	--	C	--	--	--	--	--	H	--	ND				
051-057	12/17/1997	T29N/R05E-01L01	D	RR/5 ac	377	ND	13	13	24	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	12/17/1997	12				
051-063	5/11/1995	T29N/R05E-02A01	D (D)	ULDR5-6MV	302	D	14	14	36	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
051-066	4/24/1994	T29N/R05E-03A01	D	U	92	D	4	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
052-144	10/1/1993	T29N/R05E-11C01	D	RR/5 ac	56	D	14	14	36	N	--	Q(A)f	--	ND	--	--	ND	--	C	--	--	--	--	--	L	10/1/1993	8				
149-029	12/5/2000	T30N/R05E-36F01	D	RR/5 ac	436	AR	165.5	159.5	6	Y	159.5	ND	--	ND	--	--	ND	--	C	6	160	1	--	--	L	12/5/2000	137				
056-022	6/26/1977	T29N/R05E-36L01	D	RR/5 ac	262	ND	8	8	30	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
056-098	5/4/1991	T29N/R06E-04A01	D	RR/5 ac	374	AR	115	115	4.5	Y	105	Qvt	110	ND	--	--	Qva	110	C	3	--	--	--	--	L	--	ND				
149-031	10/7/2000	T29N/R06E-04C03	D	RR/5 ac	285	AR	160	160	6	N	--	Qva	80	ND	--	--	Q(A)c	135	C	30	15	2	--	--	M	10/7/2000	121				
057-027	11/27/1989	T29N/R06E-05B01	D	RR/5 ac	279	HSA	145	145	6	ND	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
057-063	5/23/1999	T29N/R06E-06B01	D	RR/5 ac	358	AR	18	18	6	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
060-093	2/28/1991	T29N/R06E-16G01	D	RR/5 ac	157	CT	95	95	6	Y	83	Qal	--	ND	--	--	ND	--	C	30	5	1	60	700	H	2/28/1991	30				
060-101	5/24/1984	T29N/R05E-13B02	D	UCOM	331	AR	33	28	6	Y	28	Qvt	--	ND	--	--	ND	--	C	20	12	2	40	210	L	5/24/1984	8				
178-057	4/19/2001	T29N/R06E-21P02	D	RFC	102	CT	61	50	6	Y	50	Qal	12	ND	--	--	ND	--	C	20	8	1	30	310	H	--	ND				
071-047	9/15/1975	T30N/R05E-02N01	D	RR/5 ac	295	CT	168	163	6	Y	163	Qvt	--	ND	--	--	ND	--	C	15	15	1	20	110	L	--	ND				
074-015	11/5/1976	T30N/R05E-11F01	D	RR/5 ac	256	AR	92	89	6	N	--	Qvt	--	ND	--	--	ND	--	C	70	20	4	200	--	L	11/5/1976	2				
074-030	7/26/1990	T30N/R05E-11L01	D	RR/10 ac	89	D	17	17	36	N	--	Qal	--	ND	--	--	ND	--	C	--	--	--	--	--	H	7/26/1990	3				
077-029	10/15/1977	T30N/R05E-25M01	D	U	380	AR	186	183.5	6	N	--	Qvt	--	ND	--	--	ND	--	C	8	70	2	7	--	L	10/15/1977	100	7/14/1992	110		
077-040	7/13/1990	T30N/R05E-13N01	D	RR/5 ac	367	CT	87	87	6	ND	83	Qvt	76	ND	--	--	Qva	76	C	16	8	4	70	290	L	--	ND				
077-085	10/30/1996	T29N/R06E-19H02	D	ULDR4-LKST	223	ND	62	62	36	ND	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	H	--	ND				
081-094	11/18/1987	T30N/R05E-36P01	D (D)	RR/5 ac	390	D	30	27	24	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
082-031	5/10/1991	T30N/R05E-36K01	D	RR/5 ac	410	CT	179	172	6	ND	172	Qvt	--	ND	--	--	ND	--	C	3	60	1	0.5	3	L	5/10/1991	123				
082-032	8/1/1967	T30N/R05E-36R01	D	RR/5 ac	361	CT	102	96	6	Y	96	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	8/1/1967	40				
084-009	7/13/1992	T29N/R06E-05J01	D	U	249	CT	85	85	6	Y	10	Qal	--	ND	--	--	ND	--	C	--	--	--	--	--	H	7/13/1992	75				
084-010	7/13/1992	T29N/R06E-05J02	D (D)	U	249	D	20	20	--	N	--	Qal	--	ND	--	--	ND	--	C	--	--	--	--	--	H	7/13/1992	8				
084-020	7/22/1999	T30N/R06E-05Q01	D	RR/5 ac	443	CT	260	260	6	N	--	Qvt	--	ND	--	--	Ts	--	C	--	--	--	--	--	L	--	ND				
084-021	7/22/1999	T30N/R06E-05Q02	D	RR/5 ac	446	CT	260	260	6	N	--	Qvt	--	ND	--	--	Ts	--	C	--	--	--	--	--	L	--	ND				
084-022	7/22/1999	T30N/R06E-05Q03	D	RR/5 ac	446	CT	260	260	6	N	--	Qvt	--	ND	--	--	Ts	--	C	--	--	--	--	--	L	--	ND				
084-023	7/22/1999	T30N/R06E-05Q04	D	RR/5 ac	446	CT	260	260	6	N	--	Qvt	--	ND	--	--	Ts	--	C	--	--	--	--	--	L	--	ND				
084-062	3/19/1981	T30N/R06E-06B09	D	RR/5 ac	489	AR	134	130	6	N	--	Qvt	--	ND	--	--	ND	--	C	15	50	1	--	--	L	3/19/1981	81	9/4/2002	85		
084-079	4/11/1994	T30N/R06E-06B03	D	RR/5 ac	456	AR	175	170	6	Y	170	Qvt	--	ND	--	--	ND	--	C	15	170	1	--	--	L	4/11/1994	152				
084-091	8/11/1989	T30N/R06E-06M01	D	RR/5 ac	449	CT	117	112	6	N	--	Qvt	--	ND	--	--	ND	--	C	8	10	4	50	--	L	8/11/1989	67				
085-030	6/26/1992	T30N/R06E-07J01	D	RR/5 ac	423	AR	45	43	6	N	--	Qvt	--	ND	--	--	ND	--	C	25	40	1	--	--	L	6/26/1992	10				
085-053	7/27/1999	T30N/R06E-08B01	D	RR/5 ac	453	CT	102	95	6	Y	95	Qvr	--	ND	--	--	ND	--	C	7	12	1	12	60	M	7/27/1999	83				
085-071	5/2/1997	T30N/R06E-05P01	D	RR/5 ac	472	CT	66	60	6	Y	60	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	5/2/1997	42				
086-010	8/26/2000	T30N/R06E-08R01	D	RR/5 ac	462	CT	186	175	6	Y	175	ND	--	ND	--	--	ND	--	C	9	40	1	3	20	L	8/26/2000	132				
086-011	7/21/2000	T30N/R06E-08R02	D	RR/5 ac	466	CT	182	172	6	Y	172	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	7/21/2000	146				
086-017	1/31/2000	T30N/R06E-08Q01	D	RR/5 ac	420	CT	127	122	6	Y	122	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	1/31/2000	84				
086-018	1/21/2000	T30N/R06E-08Q02	D	RR/5 ac	417	CT	117	112	6	Y	112	ND	--	ND	--	--	ND	--	C	10	30	1	6	30	L	1/21/2000	83				
088-031	1/20/1988	T30N/R06E-15N01	D	RR/5 ac	338	ND	--	--	--	ND	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	1/20/1988	14				
088-074	12/17/1993	T30N/R06E-17M01	D	RR/5 ac	420	AR	114	109	6	Y	109	Qvr	--	ND	--	--	ND	--	C	15	110	1	--	--	M	--	ND				
088-079	1/5/1981	T30N/R06E-17K01	D	RR/5 ac	407	AR	99	96	6	N	--	Qvt	--	ND	--	--	ND	--	C	10	15	1	--	--	L	1/5/1981	78				
089-003	2/28/1991	T30N/R06E-17N01	D	RR/5 ac	417	ND	103	100	6	Y	100	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	2/28/1991	75				
090-056	6/21/1989	T30N/R06E-20J01	D	RR/5 ac	348	AR	60	60	6	N	--	Qvt	--	ND	--	--	ND	--	C	35	50	1	--	--	L	6/21/1989	13	7/30/1992	16		
090-060	11/26/1986	T30N/R06E-20H01	D	RR/5 ac	361	AR	77.5	77.5	6	N	--	Qvt	65	ND	--	--	Qva	65	C	20	--	--	--	--	L	11/26/1986	20				
090-076	6/3/1999	T30N/R06E-20Q01	D	RR/5 ac	354	AR	60	60	6	Y	60	Qvt	--	ND	--	--	ND	--	C	0.5	50	1	--	--	L	6/3/1999	10				
090-080	5/26/1989	T30N/R06E-20L01	D	RR/5 ac	390	CT	85	85	6	N	--	Qvt	--	ND	--	--	ND	--	C	9	3	4	180	--	L	5/24/1989	60				
090-082	12/17/1993	T30N/R06E-20K01	D	RR/5 ac	387	CT	80	76	6	Y	74	Qvt	--	ND	--	--	ND	--	C	20	10	1	40	210	L	12/17/1993	50				
090-083	12/18/1993	T30N/R06E-20N01	D	RR/5 ac	358	AR	78	78	6	ND	70	Qvt	--	ND	--	--	ND	--	C	9	6	4	30	210	L	12/18/1993	37				
090-101	9/3/1992	T30N/R06E-21G01	D	RR/5 ac	338	AR	133	123	4.5	Y	123	Qvt	129	ND	--	--	Qva	129	C	8	15	4	7	70	L	9/3/1992	165				
091-033	3/11/1997	T30N/R06E-21R01	D	RR/5 ac	312	AR	190	170	6	Y	170	Qvt	--	ND	--	--	ND	--	C	10	0	4	--	--	L	3/11/1997	150				
091-054	4/6/1987	T30N/R06E-22N01	D	RR/5 ac	256	D	27	27	36	N	--	Qal	--	ND	--	--	ND	--	C	--	--	--	--	--	H	4/6/1987	15				
091-055	4/6/1987	T30N/R06E-22N02	D	RR/5 ac	256	D	35	35	36	N	--	Qal	--	ND	--	--	ND	--	C	--	--	--	--	--	H	4/6/1987	15				
093-014	7/31/1972	T30N/R06E-28B01	D	RR/5 ac	318	D	27	27	36	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	L	7/31/1972	2				
093-024	10/21/1979	T30N/R06E-28C01	D	RR/5 ac	295	AR	84	84	6	N	--	Qvt	53	ND	--	--	Qva	53	C	15	--	1	--	--	L	--	ND				
152-064	9/13/2001	T30N/R06E-29A01	D	RR/5 ac	328	AR	60	58	6	N	--	Qvt	45	ND	--	--	Qva	45	C	--	--	--	--	--	L	9/13/2001	3				
093-076	7/1/1990	T30N/R06E-18N01	D	RR/5 ac	380	CT	64	64	6	N	--	Qvr	--	ND	--	--	ND	--	C	10	--	--	--	--	M	--	ND				
093-093	12/2/1994	T29N/R06E-18M02	D	ULDR6-LKST	298	AR	185	158	8	Y	158	Qvt	--	ND	--	--	ND	--	C	25	1	0.5	130	3,500	L	12/2/1994	58				
094-032	10/15/1999	T30N/R06E-32F01	D	RR/5 ac	325	AR	100	80	4	Y	80	Qvt	--	ND	--	--	ND	--	C	5	60	2	0.4	7	L	10/15/1999	6				
094-042	6/20/1994	T30N/R06E-32D01	D	RR/5 ac	380	AR	111	107	6	Y	107	Qvt	105	ND	--	--	Qva	105	C	20	100	1	--	--	L	--	ND				
094-059	4/24/2000	T30N/R06E-32R01	D	RR/5 ac	213	AR	80	72.5	6	Y	72.5	ND	--	ND	--	--	ND	--	C	20	3	1	190	940	L	2/24/2000	21				
094-072	12/24/1992	T30N/R06E-32L01	D	RR/5 ac	312	CT	79	79	6	N	--	Qvt	--	ND	--	--	ND	--	C	9	40	1	16	--	L	12/24/1992	29				
094-090	3/2/1990	T30N/R06E-33N01	D	RR/5 ac	210	CT	47	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
112-023	12/20/1991	T31N/R05E-23D01	D	U	148	AR	145	145	6	Y	0	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
112-032	9/30/1973	T31N/R05E-23R01	D	U	377	D	23	23	48	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	9/30/1973	10				
112-047	5/7/1987	T30N/R05E-14M01	D	RR/10 ac	72	AR	260	260	6	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	H	--	DRY				
112-079	11/21/1987	T31N/R06E-30R01	D	RR/5 ac	515	CT	192	182	6	Y	182	Qvt	--	ND	--	--	ND	--	C	9	10	1	18	90	L	11/21/1987	167				
113-061	9/29/1983	T31N/R05E-26C01	D	RR/5 ac	308	AR	177	172	6	Y	172	Qvt	115	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
120-071	1/1/1966	T31N/R06E-31C01	D	RR/5 ac	518	CT	130	130	6	ND	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	8/18/1992	117	3/9/1993	107		
120-079	8/8/1979	T31N/R06E-31G02	D	RR/5 ac	512	AR	140	140	6	N	--	Qvt	103	ND	--	--	Qva	103	C	30	--	2	--	--	L	--	ND				
146-025	11/10/1982	T31N/R05E-35R01	D	RR/5 ac	358	AR	52	52	6	N	--	Qvt	40	ND	--	--	Qva	40	C	30	0	0.5	--	--	L	11/10/1982	31.5				
120-103	6/29/1999	T31N/R06E-31M01	D	RR/5 ac	453	AR	107	97	4	Y	97	Qvt	100	ND	--	--	Qva	100	C	20	10	2	30	290	L	6/29/1997	46				
121-011	2/18/1999	T31N/R06E-32G01	D	RR/5 ac	567	AR	184	173	4	Y	173	Qvt	134	ND	--	--	Ts	134	C	2	165	1	0.01	0.2	L	2/16/1999	56				
064-003	3/24/1981	T29N/R05E-31K01	D	RR/5 ac	239	AR	56	56	6	N	--	Qvt	--	ND	--	--	Qvt	0	C	50	20	1	--	--	L	3/24/1981	31				
088-088	1/15/1998	T30N/R06E-17J01	D	RR/5 ac	380	CT	98	78	6	Y	78	Qvt	--	ND	--	--	ND	--	C	22	10	1	60	270	L	1/15/1998	51				
088-089	2/4/1998	T30N/R06E-17J02	D	RR/5 ac	377	CT	99	94	6	Y	94	Qvt	--	ND	--	--	ND	--	C	22	7	1	80	400	L	2/4/1998	65				
165-099	--	T30N/R06E-33R01	D	RR/5 ac	374	ND	198	198	6	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	9/5/2002	118.5	3/12/2003	117.5		
158-081	1/6/1979	T29N/R06E-05P01	D	U	243	ND	57	57	6	N	--	Qal	--	ND	--	--	ND	--	C	60	46	1	--	--	M	1/6/1979	4				
161-016	8/27/2002	T29N/R05E-01C02	D (D)	RR/5 ac	321	AR	65	65	6	Y	0	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	8/27/2002	45				
093-094	12/2/1994	T29N/R06E-18M01	D	ULDR6-LKST	302	AR	190	158	8	Y	158	Qvt	--	ND	--	--	ND	--	C	25	1	0.5	130	3,500	L	10/2/1994	57.5				
169-074	--	T30N/R06E-22F01	D	RR/5 ac	272	ND	--	--	--	ND	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
179-059	5/13/2003	T30N/R06E-08H01	D	RR/5 ac	426	ND	--	--	6	ND	--	ND	--	ND	--	--	ND	--	C	6	75	4	--	7	L	4/22/2003	58				
150-072	12/12/2003	T31N/R06E-29N01	D	RR/5 ac	512	AR	119	110	6	Y	110	Qvt	29	ND	--	--	Qvt	29	C	25	100	1	--	--	L	12/12/2003	63				
039-079	6/15/1978	T28N/R05E-02G01	D	RR/5 ac	239	CT	22	22	2	Y	7	Q(A)f	--	Q(A)f	0	--	ND	--	C	--	--	--	--	--	L	--	ND				
056-044	6/14/1988	T29N/R06E-28C01	D	RFC	102	CT	178	170	6	Y	170	Qal	50	Q(B)f	110	152	Ts	152	C	10	165	1	0.6	4	H	6/14/1988	20				
056-090	5/23/1989	T29N/R06E-03M01	RP (WQ)	RR/5 ac	243	AR	210	210	6	N	--	Qva	14	Q(B)f	14	--	Q(B)c	203	C	60	--	--	--	--	M	5/23/1989	0				
056-093	4/30/1993	T29N/R06E-03M02	D	RR/5 ac	269	AR	315	315	6	N	--	Qva	25	Q(B)f	170	300	Ts	300	C	50	300	1	--	--	L	4/30/1993	54				
056-096	4/7/1992	T29N/R06E-04A02	D	RR/5 ac	374	AR	382	382	6	N	--	Qvt	--	Q(B)f	315	379	Q(B)c	379	C	50	370	1	--	--	L	4/7/1992	148				
056-097	5/20/1978	T29N/R06E-04H01	D	RR/5 ac	341	CT	294	294	6	Y	290	Qvt	130	Q(B)f	210	290	Q(B)c	290	C	20	--	--	--	--	L	5/20/1978	175				
056-099	10/31/1991	T29N/R06E-04A03	D	RR/5 ac	374	AR	243	243	6	N	--	Qvt	85	Q(B)f	85	195	Q(A)c	195	C	10	240	1	--	--	L	10/31/1991	190	5/5/1992	186		
056-100	2/7/1997	T29N/R06E-04A04	D	RR/5 ac	364	CT	271	261	6	N	--	Qvt	--	Q(B)f	180	261	Ts	261	C	12	10	1	80	--	L	2/7/1997	185				
056-102	7/6/1991	T29N/R06E-04A05	D	RR/5 ac	361	AR	203	203	4.5	Y	193	Qvt	67	Q(B)f	146	150	Ts	150	C	7	40	2	2	20	L	7/6/1991	78				
056-103	7/18/1978	T29N/R06E-04J01	D	RR/5 ac	325	AR	350	170	6	N	--	Qvt	140	Q(B)f	140	162	Q(A)c	162	C	4	160	2	2	--	L	7/18/1978	70				
056-107	5/1/1991	T29N/R06E-04J02	D	RR/5 ac	256	AR	350	350	6	N	--	Qvt	65	Q(B)f	290	340	Ts	340	C	50	350	2	--	--	L	5/1/1991	225				
057-008	9/19/1980	T29N/R06E-04J03	D	RR/5 ac	338	AR	342	342	6	N	--	Qvt	120	Q(B)f	195	341	Q(B)c	341	C	100	--	--	--	--	L	9/19/1980	105				
058-025	10/17/1991	T29N/R06E-10E01	D	RR/5 ac	167	ND	199	194	6	Y	194	Qal	14	Q(B)f	100	190	Q(B)c	190	C	20	60	2	7	30	H	10/17/1991	Artesia				
061-012	7/19/1991	T29N/R06E-16N01	D	RR/5 ac	197	AR	208.5	208	6	N	--	Qvt	75	Q(B)f	172	207	Ts	207	C	15	200	1	--	--	L	7/19/1991	112				
061-087	6/30/1978	T29N/R06E-21D03	D	RR/5 ac	213	AR	266	263	6	N	--	Qvt	125	Q(B)f	125	246	Ts	246	C	30	--	--	--	--	L	6/30/1978	124				
077-026	7/9/1986	T30N/R05E-23J02	D	U	328	AR	320	315	6	Y	315	Qvt	110	Q(B)f	210	300	Q(B)c	300	C	30	--	1	--	--	L	7/9/1986	136	7/13/1992	137		
154-011	11/28/2001	T30N/R06E-08R03	D	RR/5 ac	466	CT	194	184	6	Y	184	ND	--	Q(B)f	171	256	ND	--	C	20	4	1	70	680	L	11/28/2001	141				
001-088	3/26/1990	T29N/R06E-32M01	D	RR/5 ac	102	AR	262	262	6	Y	202	Ts	25	Q(A)f	90	175	Ts	175	C	5	260	1	--	--	L	3/26/1990	56				
035-071	1/22/1980	T28N/R05E-02G02	D	RR/5 ac	167	CT	204	196	6	Y	196	Q(A)f	--	Q(A)f	0	184	Q(A)c	184	C	15	10	1	--	--	L	1/21/1980	153				
035-073	1/11/1982	T28N/R05E-02G03	D	RR/5 ac	207	ND	240	--	6	N	--	Q(A)f	135	Q(A)f	0	135	Q(A)c	135	C	26	--	--	--	--	L	1/11/1982	190				
035-079	4/29/1978	T28N/R05E-02G04	D	RR/5 ac	246	CT	232	232	6	N	--	Q(A)f	189	Q(A)f	189	222	Q(A)c	222	C	10	6	1	100	--	L	7/29/1978	198	4/9/1992	190		
035-082	8/22/1991	T28N/R05E-02N01	D	RR/5 ac	190	AR	188	181	6	Y	181	Qvt	120	Q(A)f	120	186	Q(A)c	186	C	5	181	1	--	--	L	8/22/1991	167				
035-150	6/19/1990	T28N/R05E-10G01	D	RR/5 ac	105	ND	153	148	6	Y	148	Qvt	79	Q(A)f	79	141	Q(A)c	141	C	10	2	4	160	800	L	6/27/1990	125	5/20/1992	122		
039-023	4/28/1977	T28N/R06E-05N01	D	RI	62	ND	218	218	6	N	--	Qal	2	Q(A)f	134	212	Q(A)c	212	C	20	32	2.5	40	--	H	4/28/1977	90	6/25/1992	30		
051-043	11/28/1987	T30N/R06E-05J02	D	RR/5 ac	449	AR	120	215	6	Y	215	Qvt	105	Q(A)f	125	200	Q(A)c	200	C	30	40	1	--	--	L	11/28/1987	55				
051-045	9/11/1989	T29N/R05E-01A01	D	RR/5 ac	325	AR	210	205	6	Y	205	Qvt	81	Q(A)f	81	205	Q(A)c	205	C	20	77	2	5	30	L	9/11/1989	43				
052-152	4/15/1992	T29N/R05E-35B01	D	RR/5 ac	59	AR	131	123	6	Y	118	Qva	57	Q(A)f	57	90	Q(A)c	90	C	20	1	1	640	3,200	M	4/15/1992	27.6				
056-004	10/25/1991	T29N/R05E-35B02	D	RR/5 ac	59	AR	100	92	6	Y	92	Qva	52	Q(A)f	52	97	Q(A)c	97	C	30	90	1	--	--	M	10/25/1991	27				
056-005	11/15/1993	T29N/R05E-35B03	D	RR/5 ac	43	AR	125	115	4	Y	115	Qvt	96	Q(A)f	96	121	Q(A)c	121	C	18	0	2	--	--	L	11/15/1993	30				
056-012	2/8/1976	T29N/R05E-35J01	D	RR/5 ac	85	CT	143	138	6	Y	138	Qvt	94	Q(A)f	94	132	Q(A)c	132	C	15	30	2	11	50	L	2/8/1976	70	3/25/1993	49		
056-014	9/9/1983	T29N/R05E-36P05	D	RR/5 ac	200	CT	242	242	8	Y	237	Qvt	35	Q(A)f	168	238	Q(A)c	238	C	30	140	5	4	20	L	9/9/1983	90				
056-015	4/6/1998	T29N/R05E-36B01	D	RR/5 ac	321	AR	383	371	6	Y	371	Qvt	13	Q(A)f	137	368	Q(A)c	368	C	30	374	1	--	--	L	4/6/1998	115				
056-031	1/25/1994	T29N/R05E-36P02	D	RR/5 ac	197	ND	114	114	6	Y	109	Qvt	72	Q(A)f	95	109	Q(A)c	109	C	9	30	1	5	30	L	1/25/1994	72				
056-063	3/23/1992	T29N/R06E-04K01	D	RR/5 ac	305	AR	365	345	6	Y	345	Qvt	120	Q(A)f	120	360	Q(A)c	360	C	6	345	1	--	--	L	3/23/1992	77				
056-082	9/20/1997	T29N/R06E-03E01	D	RR/5 ac	259	AR	153	153	6	Y	148	Qva	25	Q(A)f	25	149	Q(A)c	149	C	12	12	1	20	100	M	9/20/1997	82.5				
056-083	9/10/1990	T29N/R06E-03D01	D	RR/5 ac	305	AR	175	171	6	N	--	Qva	23	Q(A)f	23	166	Q(A)c	166	C	170	170	1	--	--	M	9/10/1990	85				
056-084	2/22/1991	T29N/R06E-03D02	D	RR/5 ac	344	CT	123	123	6	N	--	Qvt	10	Q(A)f	10	100	Q(A)c	100	C	12	10	2	80	--	L	2/22/1991	83				
056-086	6/7/1999	T29N/R06E-03E02	D	RR/5 ac	331	AR	203	200	6	N	--	Qvt	25	Q(A)f	120	193	Q(A)c	193	C	40	198	1	--	--	L	6/7/1999	105				
056-095	7/22/1983	T29N/R06E-04H02	D	RR/5 ac	358	AR	273	273	6	N	--	Qvt	14	Q(A)f	170	267	Q(A)c	267	C	20	70	--	--	--	L	7/22/1983	174				
056-105	8/8/1978	T29N/R06E-04J04	D	RR/5 ac	312	AR	185	185	6	N	--	Qvt	130	Q(A)f	130	170	Q(A)c	170	C	5	140	2	2	--	L	8/8/1978	120				
057-004	10/20/1999	T29N/R06E-04J05	D	RR/5 ac	338	AR	179	179	6	Y	169	Qvt	--	Q(A)f	--	149	Q(A)c	149	C	15	56	1	4	20	L	10/20/1999	107				
057-005	10/20/1999	T29N/R06E-04J06	D	RR/5 ac	338	AR	60	174	6	Y	169	Qvt	--	Q(A)f	--	149	Q(A)c	149	C	15	56	1	4	20	L	10/20/1999	107				
057-009	5/20/1978	T29N/R06E-04H03	D	RR/5 ac	341	CT	294	294	6	Y	290	Qvt	97	Q(A)f	158	290	Q(A)c	290	C	20	0	1	--	--	L	5/20/1978	175				
057-011	5/21/1990	T29N/R06E-04K02	D	RR/5 ac	302	AR	178	178	6	N	--	Qvt	85	Q(A)f	145	174	Q(A)c	174	C	20	175	1	--	--	L	5/21/1990	95				
057-013	10/14/1993	T29N/R06E-04K03	D	RR/5 ac	302	AR	178	173	6	Y	173	Qvt	84	Q(A)f	121	167	Q(A)c	167	C	15	59	2	5	20	L	10/14/1993	90				
057-014	7/30/1985	T29N/R06E-04K04	D	RR/5 ac	318	AR	340	320	6	N	--	Qvt	138	Q(A)f	260	320	Q(A)c	320	C	20	--	--	--	--	L	7/30/1985	225	4/9/1992	145		
057-038	12/10/1976	T29N/R06E-20L01	D	ULDR6-LKST	256	ND	87.5	88	6	N	--	Qva	20	Q(A)f	20	80	Q(A)c	80	C	15	45	--	20	--	M	12/10/1976	34				
149-032	11/8/2000	T29N/R06E-05F01	D	RR/5 ac	276	AR	50	30	4	Y	30	Qal	25	Qvt	80	135	Qva	135	C	5	20	2	2	30	H	11/7/2000	6				
057-079	11/24/1984	T29N/R06E-06B02	D	RR/5 ac	367	CT	295	295	6	N	--	Qvt	105	Q(A)f	110	295	Q(A)c	295	C	4	175	2	1	--	L	11/24/1984	99				
057-082	4/14/1998	T29N/R06E-06F01	D	RR/5 ac	338	AR	200	200	6	N	--	Qvt	115	Q(A)f	115	192	Q(A)c	192	C	60	190	1.5	--	--	L	4/14/1998	28				
057-101	10/24/1997	T29N/R06E-09Q01	D	RR/5 ac	177	AR	196	195	6	N	--	Qva	80	Q(A)f	161	191	Q(A)c	191	C	75	190	1	--	--	M	10/24/1997	42				
057-102	5/26/1990	T29N/R06E-09Q02	D	RR/5 ac	177	AR	215	215	4.5	Y	195	Qva	136	Q(A)f	136	213	Ts	213	C	12	5	2	20	340	M	5/26/1990	52				
057-103	10/22/1997	T29N/R06E-09Q03	D	RR/5 ac	177	AR	195	195	6	N	--	Qva	80	Q(A)f	160	190	Q(A)c	190	C	75	190	1	--	--	M	10/22/1997	43				
149-045	12/5/2000	T29N/R06E-16Q01	D	RR/5 ac	134	AR	40	17	6	Y	17	Qal	--	ND	--	--	Qal	0	C	15	0	4	--	--	H	12/5/2000	8				
061-013	10/1/1966	T29N/R06E-17A01	D	ULDR6-LKST	223	CT	164	164	6	N	--	Qvt	120	Q(A)f	120	162	Q(A)c	162	C	7	50	2	9	--	L	10/1/1966	63				
061-018	8/9/1989	T29N/R06E-17A02	D	ULDR6-LKST	226	AR	224	224	6	N	--	Qvt	50	Q(A)f	156	219	Q(A)c	219	C	10	--	1	--	--	L	8/9/1989	119				
061-064	5/22/1979	T29N/R06E-20R01	D	RR/5 ac	102	CT	211	211	6	N	--	Qal	9	Q(A)f	9	201	Ts	201	C	10	2	2	310	--	H	5/3/1979	12				
061-074	6/14/1997	T29N/R06E-21D02	D	RR/5 ac	197	AR	225	225	6	N	--	Qvt	142	Q(A)f	142	220	Q(A)c	220	C	25	220	1	--	--	L	6/14/1997	127				

Appendix A.
Table A-1. Well Details and Water Levels.

							Well Details					Surface		Confining			Aquifer			Aquifer Properties						Water Level Data					
SnoCo ID	Completion Date	Legal	Well Type	Land Use	Elevation	Drilling Method	Drill Depth	Casing Depth	Casing Diameter	Screen (Y or N)	Screen Top Depth	Geologic Unit	Unit Bottom	Geologic Unit	Unit Top	Unit Bottom	Geologic Unit	Unit Top	Confined Unconfined	Yield	Drawdown	Time	Conductivity (K)	Transmissivity (T)	USGS Aquifer Sensitivity	Date	Depth to Water	Date	Depth to Water	Date	Depth to Water
							(ft)	(ft)	(in)		(ft)		(ft)		(ft)	(ft)		(ft)		(gpm)	(ft)	(hr)	(ft/d)	(ft^2/d)			(ft)		(ft)		(ft)
061-080	3/22/1989	T29N/R06E-21E01	D	RR/5 ac	180	AR	119	119	6	N	--	Qva	40	Q(A)f	40	112	Q(A)c	112	C	50	84	1	--	--	M	3/22/1989	66				
061-082	2/13/1975	T29N/R06E-21E03	D	RR/5 ac	190	CT	204	200	6	Y	199	Qva	96	Q(A)f	96	202	Q(A)c	202	C	10	15	2	15	80	M	2/13/1975	80				
061-088	7/12/1978	T29N/R06E-21E02	D	RR/5 ac	187	AR	208	206	6	N	--	Qva	42	Q(A)f	42	198	Ts	198	C	80	--	--	--	--	M	7/12/1978	105				
061-113	7/24/1995	T29N/R06E-17B01	D	U	236	AR	275	271	6	N	--	Qvt	127	Q(A)f	127	271	Q(A)c	271	C	30	275	2	--	--	L	7/24/1995	110				
063-102	4/2/1978	T29N/R06E-29P01	D	RR/5 ac	82	AR	261	260	8	N	--	Qal	58	Q(A)f	58	255	Q(A)c	255	C	300	--	--	--	--	H	4/2/1978	Artesia				
064-012	3/28/1980	T29N/R06E-31P01	D	RR/5 ac	144	CT	180	161	6	Y	61	Qva	62	Q(A)f	62	144	Q(A)c	144	C	15	124	0.5	2	7	M	3/28/1980	36				
070-108	8/10/1989	T31N/R05E-35D01	D	RR/10 ac	118	AR	113	108	6	Y	108	Qvr	8	Q(A)f	71	102	Q(A)c	102	C	10	95	1	--	--	H	8/10/1989	91	8/28/2002	20	3/5/2003	50
071-003	4/8/1980	T30N/R05E-01E01	D	RR/5 ac	387	CT	125	120	6	Y	120	Qvt	50	Q(A)f	96	119	Q(A)c	119	C	20	37	1	10	50	L	4/8/1980	82				
071-020	4/24/1990	T30N/R05E-02K01	D	RR/5 ac	390	P	200	66	4.5	Y	66	Qvt	68	Q(A)f	77	195	Q(A)c	195	C	12	4	2	50	450	L	4/24/1990	61	8/28/2002	57		
071-023	2/3/1996	T30N/R05E-02B01	D	RR/5 ac	289	AR	260	170	6	Y	170	Qvt	75	Q(A)f	91	170	Q(A)c	170	C	15	40	2	1	40	L	2/3/1997	110				
071-026	6/11/1990	T30N/R05E-02B02	D	RR/5 ac	318	AR	237	232	6	Y	232	Qvt	77	Q(A)f	122	192	Q(A)c	192	C	12	237	1	--	--	L	6/11/1990	12	6/16/1992	125		
071-030	2/29/1980	T30N/R05E-02H01	D	RR/5 ac	374	CT	127	122	6	Y	122	Qvt	75	Q(A)f	96	119	Q(A)c	119	C	10	26	1	7	30	L	3/18/1980	86	6/17/1992	82		
071-035	2/11/1997	T30N/R05E-02E01	D	RR/5 ac	171	P	40	30	4	Y	30	Q(A)f	30	Q(A)f	0	30	Q(A)c	30	C	20	6	2	50	510	L	2/11/1997	6	8/29/2002	1		
071-036	9/20/2000	T30N/R05E-02K02	D	RR/5 ac	377	AR	202	192	6	Y	192	Qvt	65	Q(A)f	138	191	Q(A)c	191	C	40	190	1	--	--	L	9/20/2000	123				
071-040	6/7/1989	T30N/R05E-02L01	D	RR/5 ac	371	AR	200	195	6	Y	195	Qvt	57	Q(A)f	122	190	Q(A)c	190	C	25	180	1	--	--	L	6/9/1989	135	6/16/1992	148		
071-049	12/4/1995	T30N/R05E-02M01	D	RR/5 ac	194	AR	50	40	6	Y	40	Qva	14	Q(A)f	14	38	Q(A)c	38	C	15	17	1	--	--	M	12/4/1995	16				
071-050	3/3/1990	T30N/R05E-02P01	D	RR/5 ac	302	AR	158	154	6	Y	153	Qvt	87	Q(A)f	99	140	Q(A)c	140	C	15	24	1	12	60	L	3/3/1990	91				
074-025	10/1/1991	T30N/R05E-14B02	D	RR/5 ac	194	AR	208	200	6	Y	200	Qva	130	Q(A)f	130	195	Q(A)c	195	C	20	195	1	--	--	M	10/1/1991	177				
074-027	3/16/1990	T30N/R05E-11Q01	D	RR/5 ac	213	AR	215	211	6	N	--	Qvt	74	Q(A)f	96	209	Q(A)c	209	C	30	205	0.5	--	--	L	3/16/1990	46	7/7/1992	60		
074-028	3/14/1990	T30N/R05E-11Q02	D	RR/5 ac	174	AR	255	251	6	N	--	Qva	169	Q(A)f	169	250	Q(A)c	250	C	30	205	0.5	--	--	M	3/14/1990	60	6/30/1992	69		
075-015	1/31/1988	T30N/R05E-14B03	D	RR/5 ac	164	CT	275	250	6	N	--	Qva	147	Q(A)f	190	263	Q(A)c	263	C	30	30	1	60	--	M	1/13/1988	10	7/8/1992	68		
075-016	6/5/1993	T30N/R05E-14B04	D	RR/5 ac	118	AR	228	208	4	Y	208	Qva	93	Q(A)f	93	220	Q(A)c	220	C	4	0	2	--	--	L	6/5/1993	32				
075-017	7/26/1996	T30N/R05E-14A01	D	RR/5 ac	233	AR	205	185	4	Y	185	Qva	83	Q(A)f	83	191	Q(A)c	191	C	20	0	2	--	--	M	7/26/1996	75				
075-023	8/6/1977	T30N/R05E-14G01	D	RR/5 ac	138	CT	135	130	6	Y	130	Q(A)f	116	Q(A)f	0	116	Q(A)c	116	C	10	5	1	50	240	L	8/6/1977	116				
075-026	10/25/1989	T30N/R05E-14H01	D	RR/5 ac	282	CT	225	215	6	Y	215	Qvt	68	Q(A)f	135	185	Q(A)c	185	C	13	30	1	4	40	L	10/25/1989	50				
075-027	10/19/1989	T30N/R05E-14A02	D	RR/5 ac	272	CT	127	117	6	Y	117	Qvt	65	Q(A)f	65	105	Q(A)c	105	C	20	30	1	7	70	L	10/19/1989	78				
075-028	7/18/1996	T30N/R05E-14B05	D	RR/5 ac	180	CT	373	366	4	Y	366	Q(A)f	243	Q(A)f	243	371	Q(A)c	371	C	12	183	2	1	6	L	7/18/1996	13				
075-031	9/20/1994	T30N/R05E-14D01	D	RR/10 ac	72	AR	162	150	8	Y	150	Qvr	10	Q(A)f	95	135	Q(A)c	135	C	200	150	1	--	--	H	9/20/1994	0				
077-051	9/25/1986	T30N/R05E-24M01	D	ULDR4-6	351	CT	303	298	6	Y	298	Qvt	110	Q(A)f	155	295	Q(A)c	295	C	10	40	2	5	20	L	9/22/1986	138	7/14/1992	141		
149-073	11/24/2000	T30N/R06E-07F01	D	RR/5 ac	440	AR	80	78	6	N	--	Qvt	62	Qvt	171	223	Qva	62	C	25	75	1	--	--	L	12/4/2000	42				
088-005	12/1/1993	T30N/R06E-15D01	D	RR/5 ac	449	AR	185	180	6	Y	180	Qvt	43	Q(A)f	123	180	Q(A)c	180	C	40	185	1	--	--	L	12/1/1993	127	8/27/2002	126		
088-007	8/23/1979	T30N/R06E-15D02	D	RR/5 ac	436	AR	198	193	6	Y	193	Qvt	68	Q(A)f	84	188	Q(A)c	188	C	10	28	1	6	30	L	8/23/1979	140				
088-008	3/19/1986	T30N/R06E-15D03	D	RR/5 ac	440	AR	198	198	6	Y	195	Qvt	97	Q(A)f	130	195	Q(A)c	195	C	600	--	--	--	--	L	3/19/1986	100				
088-013	4/21/1992	T30N/R06E-15J01	D	LCF	292	CT	163	159	6	Y	158	Qvr	39	Q(A)f	98	160	Q(A)c	160	C	7	70	3	2	10	M	4/21/1992	18				
151-013	6/23/2001	T30N/R06E-18A01	D	RR/5 ac	430	AR	60	60	6	N	--	Qvr	31	Qvt	51	215	Qva	51	C	25	18	1.5	--	--	M	6/23/2001	29				
094-005	6/20/1987	T29N/R05E-13D01	D	ULDR6-LKST	233	CT	265	265	6	N	--	Qva	13	Q(A)f	134	263	Q(A)c	263	C	10	119	2	5	--	M	6/20/1987	70				
094-019	10/24/1986	T30N/R06E-31J01	D	RR/5 ac	325	AR	226	226	6	N	--	Qvt	88	Q(A)f	88	221	Q(A)c	221	C	15	100	--	--	--	L	10/24/1986	90	7/14/1992	75		
094-020	3/26/1980	T30N/R06E-31J02	D	RR/5 ac	338	CT	190	190	6	N	--	Qvt	120	Q(A)f	140	190	Q(A)c	190	C	10	75	2	8	--	L	3/27/1980	50				
094-024	4/24/1994	T30N/R06E-31R01	D	RR/5 ac	325	AR	177	172	6	N	--	Qvt	53	Q(A)f	84	171	Q(A)c	171	C	7	1	--	--	--	L	4/24/1994	60				
094-045	4/23/1979	T30N/R06E-31J03	D	RR/5 ac	338	AR	209	205	6	N	--	Qvt	112	Q(A)f	140	204	Q(A)c	204	C	9	--	1	--	--	L	4/23/1979	37				
094-078	5/16/1991	T30N/R06E-32N01	D	RR/5 ac	325	AR	200	160	4.5	Y	160	Qvt	75	Q(A)f	135	180	Q(A)c	180	C	10	200	1	--	--	L	5/16/1991	81				
094-080	6/10/1994	T30N/R06E-32M01	D	RR/5 ac	331	CT	234	232	6	N	--	Qvt	113	Q(A)f	142	232	Q(A)c	232	C	10	57	2	11	--	L	6/10/1994	90				
095-022	3/16/1992	T30N/R06E-34N01	D	RR/5 ac	367	AR	191	190	6	N	--	Qvt	143	Q(A)f	150	178	Q(A)c	178	C	12	185	1	--	--	L	3/16/1992	130	7/6/1992	130		
095-023	10/11/1980	T30N/R06E-34M01	D	RR/5 ac	344	AR	321	321	4	Y	316	Qvt	--	Q(A)f	205	307	Q(A)c	307	C	30	80	1	--	--	L	10/11/1980	135				
095-025	11/15/1982	T30N/R06E-34N02	D	RR/5 ac	371	AR	195	195	6	N	--	Qvt	102	Q(A)f	170	193	Q(A)c	193	C	23	--	--	--	--	L	1/18/1982	125	7/19/1992	125		
112-042	6/23/1983	T31N/R05E-23P01	D	U	292	CT	200	195	6	Y	195	Qva	154	Q(A)f	154	194	Q(A)c	194	C	15	10	1	30	160	L	6/23/1983	162	8/20/1992	163		
113-004	9/1/1990	T31N/R05E-25B01	D	RR/5 ac	479	AR	480	480	6	N	--	Qvt	100	Q(A)f	240	305	Q(A)c	305	C	25	189	1	8	--	L	9/1/1991	271				
113-019	9/20/1989	T31N/R05E-25F01	D	RR/5 ac	433	AR	260	255	6	Y	255	Qvt	87	Q(A)f	170	245	Q(A)c	245	C	20	255	1	--	--	L	9/20/1989	205	8/18/1992	189		
113-035	6/17/1991	T31N/R05E-25Q02	D	RR/5 ac	446	CT	265	260	6	Y	260	Qvt	142	Q(A)f	205	258	Q(A)c	258	C	15	10	1	30	170	L	6/17/1991	185				
113-064	1/18/1985	T31N/R05E-26C02	D	RR/5 ac	276	AR	137	134	6	N	--	Qvt	18	Q(A)f	78	114	Q(A)c	114	C	10	3	1	200	--	L	1/18/1985	88				
113-066	6/12/1986	T31N/R05E-26D01	D	RR/5 ac	138	AR	97	90.5	6	Y	90.5	Q(A)f	--	Q(A)f	0	90	Q(A)c	90	C	7	68	1.5	1	7	L	6/12/1986	16				
113-071	6/26/1989	T31N/R05E-26D02	D	RR/5 ac	141	AR	140	135	6	Y	135	Q(A)f	118	Q(A)f	0	118	Q(A)c	118	C	12	110	1	--	--	L	6/26/1989	80				
113-072	4/22/1981	T31N/R05E-26K01	D	RR/5 ac	358	CT	285	280	6	Y	280	Qvt	45	Q(A)f	172	272	Q(A)c	272	C	15	44	1	6	30	L	4/22/1981	210				
113-074	9/21/1995	T31N/R05E-26D03	D	RR/5 ac	138	AR	98	93	6	ND	93	Q(A)f	90	Q(A)f	0	90	Q(A)c	90	C	20	98	1	--	--	L	9/21/1995	20				
113-075	1/20/1997	T31N/R05E-26E01	D	RR/5 ac	187	AR	121	116	6	Y	116	Q(A)f	111	Q(A)f	0	111	Q(A)c	111	C	40	120	1	--	--	L	1/20/1997	20				
113-076	4/12/1978	T31N/R05E-26F01	D	RR/5 ac	256	CT	243	238	6	Y	238	Qvt	50	Q(A)f	159	232	Q(A)c	232	C	30	15	1	50	240	L	4/12/1978	153				
113-087	10/22/1975	T31N/R05E-26E02	D	RR/5 ac	171	AR	95	92	6	N	--	Qva	47	Q(A)f	47	88	Q(A)c	88	C	12	3	2	240	--	M	10/22/1975	82				
115-083	7/16/1993	T31N/R05E-35C01	D	RR/5 ac	246	AR	145	124	4	Y	124	Qvt	38	Q(A)f	38	112	Q(A)c	112	C	9	100	8	0.5	10	L	7/16/1993	80	3/4/2003	40		
115-084	8/25/1998	T31N/R05E-35D02	D	RR/10 ac	118	AR	45	35	4	Y	35	Qvr	12	Q(A)f	12	--	Q(A)c	12	C	14	0	2	--	--	H	8/25/1998	8	3/4/2003	8		
115-110	9/22/1987	T31N/R05E-35E01	D	RR/10 ac	125	AR	80	75	6	ND	75	Qal	63	Q(A)f	63	--	Q(A)c	63	C	100	61	1	--	--	H	9/22/1987	0				
115-111	4/26/1990	T31N/R05E-35F01	D	RR/5 ac	154	AR	100	95	6	Y	95	Q(A)f	94	Q(A)f	0	94	Q(A)c	94	C	20	90	1	--	--	L	5/1/1990	19	9/2/1992	23		
115-128	12/28/1994	T31N/R05E-35Q01	D	RR/5 ac	325	CT	235	230	6	Y	230	Qvt	115	Q(A)f	153	228	Q(A)c	228	C	5	81	1	0.6	3	L	12/28/1994	146				
115-129	1/18/1995	T31N/R05E-35Q02	D	RR/5 ac	335	AR	255	255	6	N	--	Qvt	93	Q(A)f	173	246	Q(A)c	246	C	35	150	1	--	--	L	1/18/1995	150				
116-001	8/24/1998	T31N/R05E-35N01	D	RR/5 ac	148	AR	112	76	4	Y	76	Qal	15	Q(A)f	15	76	Q(A)c	76	C	18	10	1	11	240	L	8/24/1998	0				
116-002	12/18/1979	T31N/R05E-35M01	D	RR/10 ac	128	CT	327	281	6	N	--	Qal	40	Q(A)f	40	212	Q(A)c	212	C	--	--	--	--	--	H	12/18/1979	4				
154-028	10/30/2001	T31N/R05E-35Q03	D	RR/5 ac	246	AR	195	20	6	Y	--	Qvt	52	Qvt	52	222	Qva	52	C	5	170	0.5	--	--	L	11/2/2001	18				
120-060	4/30/1991	T31N/R06E-30K01	D	RR/5 ac	561	AR	358	358	6	N	--	Qvt	60	Q(A)f	250	330	Q(A)c	330	C	7	260	1	--	--	L	4/30/1991	278				
120-100	7/30/1987	T29N/R06E-16K01	D	RR/5 ac	239	AR	177	177	6	N	--	Q(A)f	173	Q(A)f	0	173	Q(A)c	173	C	12	15	--	--	--	H	7/30/1987	155				
154-099	2/6/1997	T31N/R06E-31E01	D	RR/5 ac	518	AR	100	80	6	Y	80	Qvt	--	ND	--	217	Qvt	0	C	0.4	48	20	0.03	0.6	L	2/6/1997	52				
056-106	4/17/1998	T29N/R06E-04G01	D	RR/5 ac	351	AR	208	198	6	Y	198	Qvt	112	Q(A)f	165	197	Q(A)c	197	C	12	205	1.5	--	--	L	4/17/1998	151				
074-034	2/18/1998	T30N/R05E-11Q03	D	RR/5 ac	131	AR	225	225	6	N	--	Qal	17	Q(A)f	136	215	Q(A)c	215	C	--	--	--	--	--	M	2/18/1998	62				
074-032	1/30/1998	T30N/R05E-11Q04	D	RR/5 ac	108	AR	242	242	6	N	--	Qal	16	Q(A)f	110	218	Q(A)c	218	C	--	--	--	--	--	H	1/30/1998	61				
075-009	6/5/1998	T30N/R05E-13Q01	D	RR/5 ac	436	AR	181	164	4	Y	164	Qvt	130	Q(A)f	130	190	Q(A)c	190	C	7	10	1	8	80	L	6/11/1998	130				
075-018	7/29/1996	T30N/R05E-14B06	D	RR/5 ac	171	AR	200	180	4	Y	180	Q(A)f	186	Q(A)f	0	186	Q(A)c	186	C	20	10	2	15	290	L	7/29/1996	65				
113-045	3/22/1999	T31N/R05E-26A01	D	RR/5 ac	384	AR	250	206	6	Y	206	Qvt	81	Q(A)f	155	206	Q(A)c	206	C	13	9	2	4	170	L	3/22/1999	150				
113-094	2/26/1993	T31N/R05E-26N01	D	RR/5 ac	164	AR	58	53	6	Y	53	Q(A)f	52	Q(A)f	0	52	Q(A)c	52	C	--	--	--	--	--	L	2/26/1993	41.8				
113-093	2/26/1993	T31N/R05E-26N02	D	RR/5 ac	216	AR	140.5	135.5	6	Y	135.5	Qva	39	Q(A)f	39	115	Q(A)c	115	C	20	0	1	--	--	M	2/26/1993	95				
115-082	9/26/1996	T31N/R05E-35C02	D	RR/5 ac	315	AR	181	175	6	N	--	Qvt	45	Q(A)f	110	154	Q(A)c	154	C	45	175	1	--	--	L	9/26/1996	119				
158-050	8/8/1985	T30N/R05E-35N01	D	U	246	AR	240	235	6	Y	235	Qvt	90	Q(A)f	125	234	Q(A)c	234	C	25	75	--	--	--	L	8/8/1985	155	7/16/1992	144		
160-029	5/30/2002	T29N/R05E-11L01	D	RR/5 ac	13	AR	200	190	4	Y	190	Qvt	32	Q(A)f	152	182	Q(A)c	182	C	20	10	2	30	290	L	5/30/2002	145				
162-095	6/11/2002	T29N/R05E-26C01	D	ULDR4-LKST	203	AR	140	134	6	Y	134	Qva	58	Q(A)f	58	130	Q(A)c	130	C	25	130	1.5	--	--	M	6/11/2002	92				
162-096	5/31/2002	T29N/R06E-03L01	D	RR/5 ac	187	AR	180	180	6	N	--	Qal	18	Q(A)f	18	165	Q(A)c	165	C	100	170	1.5	--	--	H	5/31/2002	0				
167-080	12/11/2002	T31N/R05E-25L01	D	RR/5 ac	443	AR	240	236	6	Y	236	Qvt	68	Q(A)f	122	235	Q(A)c	235	C	10	240	1.5	--	--	L	12/11/2002	189				
167-082	11/21/2002	T31N/R05E-35R02	D	RR/5 ac	344	AR	288	283	6	Y	283	Qvt	72	Q(A)f	225	260	Q(A)c	260	C	15	280	1.5	--	--	L	12/6/2002	179				
168-085	12/13/2002	T29N/R05E-35K01	D	RFC	3	CT	98	81	6	Y	81	Q(A)f	90	Q(A)f	0	90	Q(A)c	90	C	22	40	1	3	50	L	12/13/2002	37				
058-006	8/5/1976	T29N/R06E-09N01	D	ULDR4-LKST	220	CT	248	248	6	N	--	Qal	28	Ts	221	242	Ts	242	C	20	20	1	60	--	H	8/5/1976	75	5/7/1992	128		
064-015	11/13/1989	T29N/R06E-32M02	D	RR/5 ac	102	AR	340	340	4.5	Y	200	Ts	174	Ts	0	174	Ts	174	C	3	340	1	--	--	L	11/13/1989	70				
064-018	3/17/1994	T29N/R06E-32E01	D	RR/5 ac	249	AR	242	242	4.5	Y	202	Qvt	18	Ts	217	225	Ts	225	C	5	240	1	--	--	L	3/17/1994	47				
064-019	3/15/1990	T29N/R06E-32M03	D	RR/5 ac	98	CT	280	280	4.5	Y	260	Ts	25	Ts	180	215	Ts	215	C	6	180	2	0.1	2	L	3/16/1990	40	8/12/1992	68		
064-020	2/16/1990	T29N/R06E-32M04	D	RR/5 ac	98	CT	62	55	4.5	Y	55	Ts	30	Ts	0	30	Ts	30	C	5	35	1	2	11	L	2/20/1990	15	8/12/1992	13		
064-021	8/1/1996	T29N/R06E-32M05	D	RR/5 ac	102	CT	153	153	4.5	Y	75	Ts	121	Ts	0	121	Ts	121	C	3	117	1	0.01	0.9	L	8/1/1996	42				
083-092	6/29/1997	T30N/R06E-05K02	D	RR/5 ac	449	CT	220	220	6	Y	40	Qvt	33	Ts	33	--	Ts	33	C	5	157	1		1	L	6/29/1997	9				
083-093	3/10/1997	T30N/R06E-05K03	D	RR/5 ac	502	CT	195	195	6	Y	180	Qvt	65	Ts	0	65	Ts	65	C	6	120	1	0.3	3	L	3/10/1997	32				
083-094	10/20/1997	T30N/R06E-05Q05	D	RR/5 ac	446	CT	262	262	4.5	Y	40	Qvt	34	Ts	34	--	Ts	34	C	45	180	1	0.1	20	L	10/20/1997	11				
083-096	8/12/1999	T30N/R06E-05G03	D	RR/5 ac	449	CT	212	200	4.5	Y	200	Qvt	16	Ts	0	16	Ts	16	C	11	172	1	0.4	4	L	8/12/1999	5				
084-001	10/8/1998	T30N/R06E-05G02	D	RR/5 ac	456	CT	75	75	4.5	Y	35	Qvt	19	Ts	19	--	Ts	19	C	3	50	1	0.2	3	L	10/8/1998	1				
084-002	10/4/1998	T30N/R06E-05G01	D	RR/5 ac	456	CT	222	222	6	Y	20	Qvt	6	Ts	6	--	Ts	6	C	0.5	98	1	--	--	L	10/4/1998	2				
084-004	11/13/1999	T30N/R06E-05J02	D	RR/5 ac	462	CT	71	67	6	Y	67	Qvt	65	Ts	65	--	Ts	65	C	3	47	1	0.8	3	L	11/13/1999	13				
084-007	6/1/2000	T30N/R06E-05J01	D	RR/5 ac	449	CT	164	90	6	Y	90	Qvt	64	Ts	64	--	Ts	64	C	--	--	--	--	--	L	6/1/2000	29				
084-008	5/3/2000	T30N/R06E-05J04	D	RR/5 ac	449	CT	194	82	4.5	Y	82	Qvt	79	Ts	0	79	Ts	79	C	--	--	--	--	--	L	5/3/2000	29				
084-012	11/30/1998	T30N/R06E-05K04	D	RR/5 ac	449	CT	123	123	4.5	Y	60	Qvt	6	Ts	6	--	Ts	6	C	11	39	1	0.6	30	L	11/30/1998	2				
084-013	1/25/1999	T30N/R06E-05K05	D	RR/5 ac	449	CT	175	175	4.5	Y	105	Qvt	17	Ts	0	17	Ts	17	C	6	150	1	0.03	2	L	1/25/1999	9				
084-016	5/28/1996	T30N/R06E-05Q06	D	RR/5 ac	443	CT	145	145	6	N	--	Qvt	12	Ts	12	--	Ts	12	C	2	95	1	1	--	L	5/28/1996	38				
084-024	5/24/2000	T30N/R06E-05J05	D	RR/5 ac	492	CT	203	203	6	Y	90	Qvt	84	Ts	84	--	Ts	84	C	0.5	40	1	--	--	L	5/24/2000	73				
084-031	10/6/1998	T30N/R06E-05Q07	D	RR/5 ac	492	AR	360	330	4	Y	170	Qvt	33	Ts	33	--	Ts	33	C	14	355	1	--	--	L	10/6/1998	60				
084-033	8/31/1999	T30N/R06E-05Q08	D	RR/5 ac	436	AR	260	19	4.5	N	--	Qvt	9	Ts	9	--	Ts	9	C	0.5	255	1	--	--	L	8/31/1999	71				
084-034	8/31/1999	T30N/R06E-05Q09	D	RR/5 ac	440	AR	260	19	4.5	N	--	Qvt	9	Ts	9	--	Ts	9	C	0.5	255	1	--	--	L	8/31/1999	71				
084-035	8/31/1999	T30N/R06E-05Q10	D	RR/5 ac	436	AR	260	19	4.5	N	--	Qvt	9	Ts	9	--	Ts	9	C	0.5	255	1	--	--	L	8/31/1999	71				
084-036	8/31/1999	T30N/R06E-05Q11	D	RR/5 ac	440	AR	260	19	4.5	N	--	Qvt	9	Ts	9	--	Ts	9	C	0.5	255	1	--	--	L	8/31/1999	71				
084-037	8/31/1999	T30N/R06E-05Q12	D	RR/5 ac	440	AR	260	19	4.5	N	--	Qvt	9	Ts	9	--	Ts	9	C	0.5	255	1	--	--	L	8/31/1999	71				
085-055	6/14/1995	T30N/R06E-05Q13	D	RR/5 ac	485	CT	132	49	6	Y	--	Qvt	32	Ts	0	32	Ts	32	C	22	25	1	--	90	L	6/14/1995	11				
085-057	8/25/1995	T30N/R06E-08B02	D	RR/5 ac	476	CT	125	48	6	Y	48	Qvt	43	Ts	43	--	Ts	43	C	30	100	2	0.4	30	L	8/25/1995	10				
085-058	3/7/1995	T30N/R06E-08B03	D	RR/5 ac	443	CT	80	36	6	N	--	Qvt	31	Ts	31	--	Ts	31	C	0.5	72	1	0.4	--	L	3/7/1995	9				
085-078	2/13/1997	T30N/R06E-08D01	D	RR/5 ac	413	CT	51	36	6	Y	36	Qvt	41	Ts	41	--	Ts	41	C	15	15	1	20	110	L	2/13/1997	11				
086-005	10/6/1987	T29N/R06E-31E02	D	RR/5 ac	397	AR	262	262	4.5	Y	70	Qvt	71	Ts	71	--	Ts	71	C	5	--	--	--	--	M	10/6/1987	12				
086-015	3/30/1999	T30N/R06E-08B04	D	RR/5 ac	453	AR	260	250	4.5	ND	250	Qvr	43	Ts	43	--	Ts	43	C	1	260	1	--	--	M	3/30/1999	83				
086-020	11/26/1997	T30N/R06E-08G01	D	RR/5 ac	436	CT	265	265	4.5	N	--	Qvt	104	Ts	104	--	Ts	104	C	10	120	1	7	--	L	11/26/1997	81				
100-048	4/27/1990	T31N/R05E-32D01	D	RR/5 ac	541	CT	225	213	6	Y	30	Qvt	32	Ts	220	--	Ts	220	C	1	10	1	1	6	L	4/27/1990	86				
110-030	8/16/1979	T31N/R05E-14P01	D	U	239	AR	162	162	6	N	--	Qva	62	Ts	62	--	Ts	62	C	80	62	1	--	--	M	8/16/1979	100	8/14/1992	100		
113-018	6/12/1992	T31N/R05E-25F02	D	RR/5 ac	433	AR	195	185	4.5	Y	185	Qvt	131	Ts	192	--	Ts	192	C	4	--	--	--	--	L	6/12/1992	143				
121-013	12/6/1993	T31N/R06E-32D02	D	RR/5 ac	531	AR	140	140	6	N	--	Qvt	90	ND	--	--	Qva	90	C	13	135	1	--	--	L	12/6/1993	110				
121-058	3/15/1995	T31N/R06E-33N01	D	RR/5 ac	531	AR	139	135	6	Y	134	Qvt	87	Qvt	87	--	Qva	87	C	32	13	2	70	350	L	3/15/1995	38				
083-095	7/26/1999	T30N/R06E-05H01	D	RR/5 ac	449	CT	262	262	4.5	Y	40	Qvt	11	Ts	11	--	Ts	11	C	8	146	10	0.04	6	L	7/26/1999	6				
084-019	4/22/1999	T30N/R06E-05Q14	D	RR/5 ac	436	AR	264	244	4.5	Y	244	Qvt	38	Ts	38	--	Ts	38	C	1	240	1	--	--	L	4/22/1999	153				
179-035	8/11/2000	T30N/R05E-36F02	D	RR/5 ac	390	ND	325	133	4	Y	305	Qvt	26	Ts	26	--	Ts	26	C	5	120	2	0.2	3	L	8/11/2000	83				
160-034	4/19/2002	T29N/R06E-10C01	D	RR/5 ac	171	AR	179	176.5	6	N	--	Qal	20	Ts	170	--	Ts	170	C	100	175	1	--	--	H	4/19/2002	Artesia				
167-036	9/14/2002	T28N/R06E-06D01	D	RR/5 ac	246	AR	120	115	6	Y	115	Qvt	103	Ts	0	103	Ts	103	C	27	100	1	--	--	L	9/14/2002	68				
167-038	10/9/2002	T29N/R06E-03C01	D	RR/5 ac	190	AR	42	37	6	Y	37	Qal	37	Ts	37	--	Ts	37	C	10	25	1	7	40	H	10/9/2002	12				
167-070	11/20/2002	T29N/R05E-11B01	D	RR/5 ac	243	AR	305	292	6	Y	292	Qvt	85	Ts	85	--	Ts	85	C	6	45	2	1	11	L	11/20/2002	188				
188-012	4/7/2003	T30N/R06E-05Q15	D	RR/5 ac	440	AR	152	140	6	Y	96	Qvt	97	Ts	97	--	Ts	97	C	2	86	1	0.1	0.3	L	4/7/2003	21				
063-104	8/6/1980	T29N/R06E-31K02	D	RR/5 ac	213	AR	80	75	6	Y	75	Qva	--	Qva	--	--	Qva	0	C	20	70	1	5	20	M	8/6/1980	Artesia				
075-013	2/12/1991	T30N/R05E-14G02	D	RR/5 ac	243	CT	60	56	6	Y	50	Qva	--	Qva	0	--	Qva	0	C	36	9	1	50	520	M	2/12/1991	0				
077-044	11/8/1996	T28N/R05E-01N01	D	RR/5 ac	292	AR	71	61	4	Y	61	Qva	--	Qva	0	--	Qva	0	C	5	57	2	1	8	M	11/8/1996	4				
113-034	3/8/1991	T31N/R05E-25Q01	D	RR/5 ac	446	CT	265	260	6	Y	260	Qvt	142	Qva	142	--	ND	--	C	15	10	1	30	170	L	3/8/1991	188	8/24/1992	208		
083-098	8/7/1997	T30N/R06E-05P02	D	RR/5 ac	482	CT	245	245	6	Y	--	Qvt	32	Qva	32	105	Ts	105	C	4	245	1	--	--	L	8/7/1997	74				
088-034	6/20/1999	T30N/R06E-15N02	D	RR/5 ac	374	AR	197	192	6	Y	192	Qvt	135	Qva	0	135	Qva	135	C	192	1	--	--	--	L	6/20/1999	58				
088-035	7/25/1999	T30N/R06E-15N03	D	RR/5 ac	380	AR	178	174	6	Y	174	Qvt	129	Qva	0	129	Qva	129	C	50	175	1	--	--	L	7/25/1999	86				
075-033	10/9/1984	T30N/R05E-14M02	D	RR/10 ac	85	AR	97	97	6	N	--	Qvr	15	Qvr	0	15	Qva	15	C	15	45	--	--	--	H	10/9/1984	37				
075-038	8/10/1996	T30N/R05E-14N01	D	RR/10 ac	62	CT	145	140	6	Y	140	Qvr	60	Qvt	60	140	Qva	140	C	10	32	1	5	30	H	8/10/1996	Artesia				
091-059	4/8/1988	T30N/R06E-22A01	D	LCF	285	CT	62	61	6	Y	55	Qvr	49	Qvr	0	49	Qva	49	C	20	15	1	30	150	M	4/8/1988	24				
001-078	7/21/1985	T30N/R05E-13A01	D	RR/5 ac	397	CT	74	69	6	Y	69	Qvr	30	Qvt	30	55	Qva	55	C	10	10	1	20	100	M	7/21/1985	40				
035-081	5/27/1992	T30N/R05E-26M01	D	U	121	CT	53	44	6	Y	45	Qvt	132	Qvt	0	132	Qva	132	C	2	43	1	0.3	2	L	5/27/1992	9				
154-053	4/26/2001	T28N/R05E-03L01	D	RR/5 ac	33	CT	62	49	6	Y	54	Q(A)c	--	Qvt	0	52	Q(A)c	0	C	15	6	4	30	150	L	4/26/2001	41				
039-024	5/26/1982	T28N/R06E-05M01	D	RFC	59	AR	100.5	96.5	6	Y	96.5	Qal	28	Qvt	28	89	Q(A)c	89	C	11	--	--	--	--	H	5/26/1982	18	5/6/1992	28		
043-048	11/14/1986	T29N/R06E-05L01	D	U	289	CT	145	134	6	Y	134	Qal	3	Qvt	3	109	Qva	109	C	10	20	2	5	50	L	11/14/1986	75				
043-049	12/6/1986	T29N/R06E-05L02	D	U	289	CT	132	132	6	N	--	Qvt	120	Qvt	0	120	Qva	120	C	10	20	2	30	--	L	12/6/1986	60				
045-040	2/25/1993	T29N/R06E-19F01	D	ULDR4-LKST	216	CT	132	132	6	ND	--	Qvt	120	Qvt	0	120	Qva	120	C	15	8	1	--	220	H	2/25/1993	40				
051-044	8/22/1985	T29N/R05E-01B01	D	RR/5 ac	341	AR	120	100	6	N	--	Qvt	100	Qvt	0	100	Qva	100	C	10	--	--	--	--	L	8/26/1985	40				
051-046	7/23/1990	T29N/R05E-01A02	D	RR/5 ac	308	CT	63	61	6	Y	56	Qvt	58	Qvt	0	58	Qva	58	C	8	13	4	14	70	L	7/23/1990	16				
051-048	9/3/1982	T29N/R05E-01E03	D	RR/5 ac	377	CT	71	66	6	Y	61	Qvt	43	Qvt	0	43	Qva	43	C	20	38	0.5	9	40	L	8/29/1982	0				
051-052	12/21/1982	T28N/R05E-01R01	D	ULDR4-6	197	CT	93	93	6	N	--	Qvr	40	Qvt	40	87	Qva	87	C	15	30	1	30	--	M	12/21/1982	40				
051-053	8/6/1973	T29N/R05E-01M01	D	RR/5 ac	367	ND	150	150	6	N	--	Qvt	127	Qvt	0	127	Qva	127	C	30	2	2	920	--	L	8/6/1973	128				
054-078	12/31/1997	T30N/R06E-21K01	D	RR/5 ac	361	AR	143	136	6	N	--	Qvt	123	Qvt	0	123	Qva	123	C	30	134	2	--	--	L	12/31/1997	56				
056-013	9/15/1987	T29N/R05E-36B02	D	RR/5 ac	220	AR	120	115	6	Y	115	Qvt	98	Qvt	0	98	Qva	98	C	15	30	4	12	60	L	9/16/1987	1	5/7/1992	2		
056-017	1/18/1990	T29N/R05E-36C01	D	RR/5 ac	184	AR	112	108	6	Y	108	Qvt	96	Qvt	0	96	Qva	96	C	40	100	1	--	--	L	1/18/1990	Artesia	3/25/1993	Artesia		
056-104	8/17/1979	T29N/R06E-04J07	D	RR/5 ac	338	AR	127	127	6	N	--	Qvt	118	Qvt	0	118	Qva	118	C	4	--	--	--	--	L	8/17/1979	88				
056-108	1/15/1985	T29N/R06E-04K05	D	RR/5 ac	302	AR	149	149	6	N	--	Qvt	148	Qvt	0	148	Qva	148	C	10	90	1	7	--	L	1/15/1985	45				
057-016	3/29/1994	T29N/R06E-04R02	D	RR/5 ac	236	AR	110	110	6	Y	90	Qvt	105	Qvt	0	105	Qva	105	C	12	20	2	3	70	L	3/29/1994	52				
057-017	10/3/1994	T29N/R06E-04R03	D	RR/5 ac	220	AR	82	82	4	N	--	Qva	51	Qvt	0	51	Qva	51	C	8	23	1	30	--	M	10/3/1994	37				
057-024	12/20/1973	T29N/R06E-04L01	D	RR/5 ac	321	CT	175	175	6	Y	170	Qvt	145	Qvt	0	145	Qva	145	C	10	10	1	20	100	L	12/20/1973	131				
057-028	11/16/1995	T29N/R06E-04Q01	D	RR/5 ac	269	P	87	87	6	Y	77	Qvt	60	Qvt	0	60	Qva	60	C	6	70	1	0.5	5	L	11/16/1995	5				
178-054	5/23/2001	T29N/R06E-05G01	D	RR/5 ac	279	AR	109	84	4	Y	84	Qal	32	Qvt	32	77	Qva	77	C	3	78	1	0.3	3	H	--	ND				
057-031	7/10/1992	T29N/R06E-05G02	D	RR/5 ac	276	AR	80	80	6	N	--	Qal	11	Qvt	11	76	Qva	76	C	15	--	1	--	--	M	7/10/1992	27	3/17/2003	9		
057-033	8/10/1993	T29N/R06E-05D01	D	RR/5 ac	318	CT	86	86	6	N	--	Qvt	70	Qvt	0	70	Qva	70	C	15	50	1	18	--	L	8/10/1993	25				
057-035	9/12/1995	T29N/R06E-06H01	D	RR/5 ac	384	AR	175	175	6	N	--	Qvt	126	Qvt	0	126	Qva	126	C	15	170	2	5	--	L	9/12/1995	65				
057-036	9/7/1995	T29N/R06E-05E01	D	RR/5 ac	312	AR	65	65	6	N	--	Qal	22	Qvt	22	63	Qva	63	C	30	65	2	--	--	H	9/7/1995	21				
057-037	9/15/1985	T29N/R06E-05E02	D	RR/5 ac	305	AR	65	65	6	N	--	Qal	--	Qvt	--	47	Qva	47	C	65	--	--	--	--	H	9/15/1985	20				
057-040	2/28/1992	T29N/R06E-07C01	D	ULDR6-LKST	253	AR	40	40	6	N	--	Qvt	32	Qvt	0	32	Qva	32	C	40	40	1	--	--	L	2/28/1992	0				
057-044	6/15/1999	T29N/R06E-05F02	D	RR/5 ac	292	AR	45	25	4	Y	25	Qal	2	Qvt	2	28	Qva	28	C	3	25	2	0.6	12	H	6/15/1999	4				
057-045	10/13/1979	T29N/R06E-06A01	D	RR/5 ac	315	AR	57	57	6	N	--	Qal	15	Qvt	15	45	Qva	45	C	60	--	--	--	--	H	10/13/1979	5				
057-046	10/17/1979	T29N/R06E-06A02	D	RR/5 ac	315	AR	60	56	6	ND	56	Qal	3	Qvt	3	40	Qva	40	C	40	--	--	--	--	H	10/12/1979	15	3/23/1993	3		
057-047	3/17/1983	T29N/R06E-05E03	D	RR/5 ac	298	CT	74	74	6	N	--	Qal	3	Qvt	3	58	Qva	58	C	30	30	1	60	--	H	3/17/1983	17				
057-057	4/27/1978	T29N/R06E-17Q01	D	RR/5 ac	243	CT	31	31	6	N	--	Qvt	31	Qvt	0	31	Qva	31	C	30	12	2	150	--	L	4/27/1978	0				
057-058	9/21/1979	T29N/R06E-06F02	D	RR/5 ac	351	CT	177	177	6	Y	167	Qvt	75	Qvt	0	75	Qva	75	C	45	30	1	20	170	L	9/21/1979	35				
057-060	1/25/1996	T29N/R06E-05E04	D	RR/5 ac	298	AR	95	95	6	Y	90	Qal	8	Qvt	8	55	Qva	55	C	15	95	2	--	--	H	1/25/1996	26				
057-061	4/19/1999	T29N/R06E-06B03	D	RR/5 ac	364	ND	160	160	6	N	--	Qvt	124	Qvt	0	124	Qva	124	C	40	160	1.5	--	--	L	4/19/1999	59				
057-064	12/16/1991	T29N/R06E-06A03	D	RR/5 ac	315	AR	80	80	6	N	--	Qal	45	Qvt	45	75	Qva	75	C	35	75	1	--	--	H	12/16/1991	13				

Appendix A.
Table A-1. Well Details and Water Levels.

							Well Details					Surface		Confining			Aquifer			Aquifer Properties						Water Level Data					
SnoCo ID	Completion Date	Legal	Well Type	Land Use	Elevation	Drilling Method	Drill Depth	Casing Depth	Casing Diameter	Screen (Y or N)	Screen Top Depth	Geologic Unit	Unit Bottom	Geologic Unit	Unit Top	Unit Bottom	Geologic Unit	Unit Top	Confined Unconfined	Yield	Drawdown	Time	Conductivity (K)	Transmissivity (T)	USGS Aquifer Sensitivity	Date	Depth to Water	Date	Depth to Water	Date	Depth to Water
							(ft)	(ft)	(in)		(ft)		(ft)		(ft)	(ft)		(ft)		(gpm)	(ft)	(hr)	(ft/d)	(ft^2/d)			(ft)		(ft)		(ft)
057-066	12/16/1991	T29N/R06E-06A04	D	RR/5 ac	315	AR	80	80	6	N	--	Qal	45	Qvt	45	75	Qva	75	C	35	75	1	--	--	H	12/16/1991	13				
057-069	2/25/1996	T29N/R06E-06H02	D	RR/5 ac	354	AR	180	180	6	Y	173.5	Qvt	125	Qvt	0	125	Qva	125	C	60	175	1.5	--	--	L	2/25/1996	67				
057-071	10/10/1986	T29N/R06E-06A05	D	RR/5 ac	315	AR	162	162	6	N	--	Qal	26	Qvt	26	120	Qva	120	C	30	--	--	--	--	H	10/10/1986	80				
057-072	10/7/1986	T29N/R06E-06G01	D	RR/5 ac	387	AR	153	153	6	N	--	Qvt	23	Qvt	23	145	Qva	145	C	20	--	--	--	--	L	10/7/1986	90				
057-073	10/7/1986	T29N/R06E-06G02	D	RR/5 ac	384	AR	158	154	6	Y	154	Qvt	25	Qvt	24	146	Qva	146	C	10	--	--	--	--	L	10/7/1986	50				
057-074	10/6/1978	T29N/R06E-06A06	D	RR/5 ac	315	AR	159	159	6	N	--	Qal	2	Qvt	6	142	Qva	142	C	29	17	2	100	--	H	10/6/1978	30	5/5/1992	13		
057-075	12/27/1995	T29N/R06E-06F03	D	RR/5 ac	364	AR	123	123	4	Y	103	Qvt	107	Qvt	0	107	Qva	107	C	5	60	4	0.4	8	L	12/27/1995	45				
057-076	8/22/1988	T29N/R06E-06A07	D	RR/5 ac	318	AR	109	109	6	N	--	Qal	8	Qvt	8	100	Qva	100	C	40	100	1	--	--	H	8/22/1988	50				
057-077	2/9/1991	T29N/R06E-06G03	D	U	394	ND	125	118	6	Y	118	Qvt	105	Qvt	0	105	Qva	105	C	3	13	3	4	18	L	2/9/1991	103				
057-078	8/2/1978	T29N/R06E-13H01	D	UMDR6-12	348	AR	176	176	6	N	--	Qvt	64	Qvt	0	64	Qva	64	C	22	66	2	20	--	L	8/2/1978	22				
057-083	5/15/1991	T29N/R06E-06C01	D	RR/5 ac	348	CT	142	142	6	N	--	Qvt	138	Qvt	0	138	Qva	138	C	10	10	2	60	--	L	5/15/1991	80				
149-033	2/2/2001	T29N/R05E-09Q04	D	RR/5 ac	177	AR	310	305	6	Y	305	Qva	77	Qvt	25	35	Q(A)c	305	C	60	280	4	--	--	M	2/2/2001	31				
059-086	12/21/1997	T30N/R05E-26L01	D	U	180	AR	141	135	6	N	--	Qvt	128	Qvt	0	158	Qva	128	C	15	134	1	--	--	L	12/21/1997	106				
060-061	8/25/1983	T29N/R06E-03P01	D	RR/5 ac	177	AR	152	152	6	N	--	Qal	20	Qvt	20	147	Qva	147	C	60	--	--	--	--	H	8/25/1983	1	8/4/1992	38		
060-097	9/20/1984	T29N/R06E-16G02	D	RR/5 ac	157	CT	59	59	6	ND	--	Qal	4	Qvt	4	39	Qva	39	C	15	0	0.5	--	--	H	9/20/1984	26				
061-050	12/14/1996	T29N/R06E-17K01	D	RR/5 ac	233	AR	155	130	4.5	Y	130	Qvt	118	Qvt	0	118	Qva	118	C	5	150	1	--	--	L	12/14/1996	25				
061-052	12/13/1979	T29N/R06E-17R01	D	RR/5 ac	236	AR	120	120	6	N	--	Qvt	110	Qvt	0	110	Qva	110	C	12	50	1	15	--	L	12/13/1979	70				
061-072	7/11/1989	T29N/R06E-21D01	D	RR/5 ac	197	CT	50	50	6	N	--	Qvt	48	Qvt	0	48	Qva	48	C	10	6	1	100	--	L	7/11/1989	16				
061-083	4/3/1978	T29N/R06E-20D01	D	RR/5 ac	200	AR	98	98	6	N	--	Qvt	76	Qvt	0	76	Qva	76	C	50	--	--	--	--	L	4/3/1978	0				
061-097	12/1/1982	T29N/R06E-21K01	D	RFC	118	CT	138	138	6	N	--	Qal	60	Qvt	60	138	Qva	138	C	10	20	1	60	--	H	12/1/1982	60				
061-104	7/28/1977	T29N/R06E-21P03	D	RR/5 ac	108	CT	60	60	6	Y	53	Qal	19	Qvt	19	38	Qva	38	C	30	1	1	1,250	5,000	H	7/28/1977	3				
061-120	5/22/1995	T28N/R05E-12C01	D	ULDR4-6	141	CT	162	158	6	Y	158	Qvt	105	Qvt	0	105	Qva	105	C	15	13	1	30	120	L	5/22/1995	97				
063-089	8/9/1988	T29N/R06E-16N02	D	RR/5 ac	233	AR	88	88	6	N	--	Qvt	82	Qvt	0	82	Qva	82	C	15	85	--	--	--	L	8/9/1988	38	8/11/1992	19		
064-006	2/18/1997	T30N/R06E-32N02	D	RR/5 ac	321	AR	94	90	6	N	--	Qvt	65	Qvt	0	65	Qva	65	C	23	90	1.5	--	--	L	2/18/1997	26				
064-023	3/8/1976	T30N/R06E-32N03	D	RR/5 ac	321	CT	80	60	6	N	--	Qvt	61	Qvt	0	61	Qva	61	C	10	6	2	100	--	L	3/8/1976	8				
178-065	5/2/2001	T30N/R06E-31A01	D	RR/5 ac	374	AR	83	78	6	Y	78	Qvt	70	Qvt	0	70	Qva	70	C	40	76	1	--	--	L	5/2/2001	44				
067-039	10/30/1980	T29N/R05E-24F01	D	UMDR6-12	394	CT	135	130	6	Y	130	Qvt	120	Qvt	0	120	Qva	120	C	30	10	1	70	350	L	10/30/1980	99				
070-083	7/20/1987	T30N/R05E-01G01	D	RR/5 ac	423	CT	60	60	6	N	--	Qvt	38	Qvt	0	38	Qva	38	C	30	5	1	370	--	L	7/20/1987	27				
070-084	7/10/1989	T30N/R05E-01A02	D	RR/5 ac	410	AR	82	82	6	N	--	Qvt	63	Qvt	0	63	Qva	63	C	20	60	1	--	--	L	7/10/1989	35				
070-087	5/9/1994	T30N/R05E-01A04	D	RR/5 ac	403	CT	98	94	6	Y	94	Qvt	84	Qvt	0	84	Qva	84	C	13	0	1	--	--	L	5/9/1994	53				
070-089	8/10/2000	T30N/R05E-01C01	D	RR/5 ac	407	AR	57	52.5	6	Y	52.5	Qvt	47	Qvt	0	47	Qva	47	C	17	3	1	160	800	L	8/28/2000	9.1				
070-093	5/8/1998	T30N/R05E-01E02	D	RR/5 ac	394	AR	79	79	4	Y	62	Qvt	60	Qvt	0	60	Qva	60	C	28	45	2	5	80	L	5/8/1998	2				
070-100	8/12/1988	T30N/R05E-01G02	D	RR/5 ac	417	AR	60	58	6	N	--	Qvt	39	Qvt	0	39	Qva	39	C	30	20	2	90	--	L	8/12/1988	32				
070-101	7/13/1984	T30N/R05E-01H03	D	RR/5 ac	440	ND	60	60	6	N	--	Qvt	58	Qvt	0	58	Qva	58	C	10	0	0.5	--	--	L	7/13/1984	40				
070-102	3/21/1988	T30N/R05E-01G03	D	RR/5 ac	423	AR	60	60	6	N	--	Qvt	50	Qvt	0	50	Qva	50	C	30	60	0.5	--	--	L	3/21/1988	15	6/16/1992	40		
070-104	9/16/1978	T30N/R06E-06F01	D	RR/5 ac	456	AR	97	97	6	N	--	Qvt	77	Qvt	0	77	Qva	77	C	20	--	--	--	--	L	9/16/1978	74				
070-105	6/9/1993	T30N/R05E-01F05	D	RR/5 ac	407	CT	63	58	6	Y	58	Qvt	56	Qvt	0	56	Qva	56	C	10	10	1	20	100	L	6/9/1993	9				
070-106	6/9/1993	T30N/R05E-01F02	D	RR/5 ac	407	CT	63	58	6	Y	58	Qvt	56	Qvt	0	56	Qva	56	C	10	10	1	20	100	L	6/9/1993	9				
070-107	10/4/1998	T30N/R05E-01F03	D	RR/5 ac	413	AR	52	52	6	Y	32	Qvt	32	Qvt	0	32	Qva	32	C	14	7	1	12	240	L	10/4/1998	22				
071-002	11/16/1989	T30N/R05E-01F04	D	RR/5 ac	403	AR	60	60	6	N	--	Qvt	45	Qvt	0	45	Qva	45	C	30	60	1	--	--	L	11/16/1989	28				
071-004	11/18/1998	T30N/R05E-01F01	D	RR/5 ac	403	AR	80	80	6	Y	75.5	Qvt	65	Qvt	0	65	Qva	65	C	60	80	1.5	--	--	L	11/18/1998	16				
071-005	10/3/1989	T30N/R05E-01R01	D	RR/5 ac	440	AR	100	100	6	N	--	Qvt	58	Qvt	0	58	Qva	58	C	25	--	--	--	--	L	10/3/1989	60				
071-006	4/14/1994	T30N/R05E-01J05	D	RR/5 ac	436	AR	72	70	6	N	--	Qvt	64	Qvt	0	64	Qva	64	C	30	65	1	--	--	L	4/14/1994	54	8/22/2002	51		
071-007	6/16/1994	T30N/R05E-01J02	D	RR/5 ac	433	AR	80	77	6	N	--	Qvt	63	Qvt	0	63	Qva	63	C	50	75	1	--	--	L	6/16/1994	50				
071-008	4/11/1994	T30N/R05E-01J03	D	RR/5 ac	440	AR	66	66	6	N	--	Qvt	60	Qvt	0	60	Qva	60	C	8	65	1	--	--	L	4/11/1994	45				
071-010	2/22/1995	T30N/R05E-01J04	D	RR/5 ac	440	AR	80	78	6	N	--	Qvt	63	Qvt	0	63	Qva	63	C	35	75	1	--	--	L	2/22/1995	47				
071-012	10/22/1987	T30N/R05E-01M01	D	RR/5 ac	374	AR	40	35	6	Y	35	Qvt	35	Qvt	0	35	Qva	35	C	12	--	--	--	--	L	10/22/1987	12				
071-019	10/30/1990	T30N/R05E-01A07	D	RR/5 ac	443	AR	100	100	6	N	--	Qvt	95	Qvt	0	95	Qva	95	C	5	90	1	--	--	L	10/30/1990	63				
071-024	6/4/1999	T30N/R05E-02H02	D	RR/5 ac	367	CT	135	129	6	Y	129	Qvt	90	Qvt	0	90	Qva	90	C	12	10	1	30	130	L	6/4/1999	85				
071-031	3/28/1980	T30N/R05E-02H03	D	RR/5 ac	341	AR	56	56	6	Y	51	Qvt	45	Qvt	0	45	Qva	45	C	10	32	1	--	--	L	3/28/1980	14				
071-032	10/18/1998	T30N/R05E-02H04	D	RR/5 ac	289	CT	99	94	6	Y	94	Qvt	74	Qvt	0	74	Qva	74	C	15	12	1	30	130	L	10/18/1998	70				
071-034	8/15/1996	T30N/R05E-02N02	D	RR/5 ac	102	P	61	61	6	N	--	Qal	25	Qvt	25	54	Q(A)c	54	C	4	--	1	--	--	H	8/15/1996	32	9/3/2002	9		
071-041	4/19/1995	T29N/R05E-03G01	D	ULDR4-6MV	52	CT	83	76	6	Y	76	Qvt	66	Qvt	0	66	Qva	66	C	12	10	1	30	130	L	4/19/1995	56				
071-048	6/23/1989	T30N/R05E-02L02	D	RR/5 ac	348	AR	130	125	6	Y	125	Qvt	63	Qvt	0	63	Qva	63	C	7	18	1	8	30	L	6/23/1989	95				
071-051	9/26/1998	T30N/R05E-02K03	D	RR/5 ac	403	CT	74	67.5	6	Y	67.5	Qvt	66	Qvt	0	66	Qva	66	C	8	7	1	17	120	L	9/26/1998	60				
072-036	3/22/1999	T30N/R05E-36R02	D	RR/5 ac	367	AR	90	90	6	N	--	Qvt	85	Qvt	0	85	Qva	85	C	10	90	1	--	--	L	4/14/1988	65				
072-089	7/28/1983	T29N/R06E-08L02	D	U	246	AR	88	88	6	N	--	Qvt	80	Qvt	0	80	Qva	80	C	15	8	--	--	--	L	7/28/1993	7				
074-007	6/27/1990	T30N/R05E-12L01	D	RR/5 ac	380	AR	80	80	6	N	--	Qvt	60	Qvt	0	60	Qva	60	C	20	75	--	--	--	L	6/27/1990	50	7/1/1992	50		
074-008	5/5/1988	T29N/R06E-07J01	D	U	315	AR	115	115	6	N	--	Qvt	105	Qvt	0	105	Qva	105	C	15	20	--	--	--	L	5/5/1988	85				
074-013	8/7/1987	T30N/R05E-11H01	D	RR/5 ac	384	AR	103	100	6	Y	100	Qvt	95	Qvt	0	95	Qva	95	C	12	--	--	--	--	L	8/7/1987	60				
074-014	8/31/1988	T30N/R05E-34A01	D	U	69	AR	119	119	6	N	--	Qvt	58	Qvt	58	117	Qva	117	C	20	--	--	--	--	M	8/31/1988	71				
074-018	10/2/1978	T30N/R05E-20Q01	D	RR/5 ac	200	AR	100	100	6	N	--	Qva	95	Qvt	0	95	Qva	95	C	28	15	2	110	--	M	10/2/1978	0				
074-020	6/14/1990	T30N/R05E-11J01	D	RR/5 ac	358	CT	104	99	6	Y	99	Qvt	67	Qvt	0	67	Qva	67	C	10	55	1	3	14	L	6/14/1990	40				
074-022	8/15/1986	T30N/R05E-12N01	D	RR/5 ac	377	AR	82	78	6	Y	78	Qvt	60	Qvt	0	60	Qva	60	C	20	--	--	--	--	L	8/18/1986	45	7/6/1992	51		
155-007	4/24/2001	T30N/R05E-11R01	D	RR/5 ac	302	AR	100	95	6	Y	95	Qvt	93	Qvt	0	95	Qva	93	C	60	10	1.5	--	--	L	4/24/2001	2				
074-031	11/2/1995	T30N/R05E-11Q05	D	RR/5 ac	108	AR	176	171	6	Y	171	Qal	12	Qvt	12	155	Qva	115	C	25	170	1	--	--	H	11/2/1995	0				
074-036	9/2/1980	T30N/R05E-12A03	D	RR/5 ac	433	AR	60	60	6	Y	60	Qvt	40	Qvt	0	40	Qva	40	C	1200	--	--	--	--	L	9/2/1980	30				
074-037	10/19/1995	T30N/R05E-12M01	D	RR/5 ac	377	AR	135	135	6	N	--	Qvt	109	Qvt	0	109	Qva	109	C	40	130	1.5	--	--	L	10/19/1995	53				
074-039	10/27/1998	T30N/R05E-12A02	D	RR/5 ac	423	AR	80	60	4	Y	60	Qvt	68	Qvt	0	68	Qva	68	C	22	3	2	60	1,200	L	10/27/1998	34				
179-003	4/30/2001	T30N/R05E-12B01	D	RR/5 ac	413	AR	80	75	6	Y	75	Qvt	55	Qvt	0	55	Qva	55	C	30	18	1.5	--	--	L	--	ND				
074-048	3/15/1985	T30N/R05E-12J01	D	RR/5 ac	426	CT	58	53	6	Y	53	Qvt	40	Qvt	0	40	Qva	40	C	20	12	2	40	210	L	3/15/1985	27				
074-049	10/11/1989	T30N/R05E-12J02	D	RR/5 ac	423	AR	60	60	6	N	--	Qvt	40	Qvt	0	40	Qva	40	C	30	60	1	--	--	L	10/11/1989	24				
074-051	1/30/1980	T30N/R05E-12J03	D	RR/5 ac	426	AR	60	58	6	Y	58	Qvt	58	Qvt	0	58	Qva	58	C	15	7	2	140	270	L	1/30/1980	38				
074-054	3/15/1982	T30N/R06E-19M01	D	RR/5 ac	361	CT	113	113	6	N	--	Qvt	96	Qvt	0	96	Qva	96	C	30	8	1	230	--	L	3/15/1982	39				
074-055	7/5/1990	T30N/R05E-12J04	D	RR/5 ac	407	AR	60	60	6	N	--	Qvt	35	Qvt	0	35	Qva	35	C	30	55	1.5	--	--	L	7/5/1990	27				
074-056	6/7/1990	T30N/R05E-12R01	D	RR/5 ac	420	AR	55	55	6	N	--	Qvt	48	Qvt	0	48	Qva	48	C	25	--	--	--	--	L	6/7/1990	8	7/6/1992	29		
074-057	9/24/1991	T30N/R05E-12R02	D	RR/5 ac	420	AR	60	60	6	N	--	Qvt	42	Qvt	0	42	Qva	42	C	30	60	1	--	--	L	9/24/1991	28				
074-067	9/7/2000	T30N/R05E-12L02	D	RR/5 ac	377	AR	100	98	6	N	--	Qvt	72	Qvt	0	72	Qva	72	C	20	30	1	--	--	L	9/7/2000	49				
074-070	10/30/1978	T30N/R05E-12P02	D	RR/5 ac	397	CT	45	45	6	N	--	Qvt	40	Qvt	0	40	Qva	40	C	15	6	1	150	--	L	10/30/1978	18				
074-072	7/28/1981	T30N/R05E-12P03	D	RR/5 ac	384	AR	78	78	6	N	--	Qvt	73	Qvt	0	73	Qva	73	C	10	38	1	16	--	L	7/28/1981	30				
074-077	3/4/1982	T30N/R05E-12Q01	D	RR/5 ac	390	CT	60	60	6	Y	48	Qvt	47	Qvt	0	47	Qva	47	C	20	20	1	18	100	L	3/4/1982	18				
074-094	12/21/1987	T30N/R05E-13C01	D	RR/5 ac	397	AR	120	120	6	N	--	Qvt	95	Qvt	0	95	Qva	95	C	10	40	3	--	--	L	12/21/1987	65	7/7/1992	85		
074-096	5/9/1990	T30N/R05E-13E01	D	RR/5 ac	407	AR	80	75	6	Y	75	Qvt	65	Qvt	0	65	Qva	65	C	30	80	4.2	--	--	L	5/9/1990	27				
074-097	9/5/1986	T30N/R05E-13C02	D	RR/5 ac	403	AR	65	60	6	Y	60	Qvt	56	Qvt	0	56	Qva	56	C	15	25	--	--	--	L	9/5/1986	39	7/7/1992	36		
075-001	12/19/1994	T30N/R05E-13E02	D	RR/5 ac	417	CT	141	135	6	Y	135	Qvt	72	Qvt	0	72	Qva	72	C	15	10	1	30	160	L	12/19/1994	106				
075-004	8/5/1994	T30N/R05E-25K01	D	RR/5 ac	351	AR	94	94	6	N	--	Qvt	85	Qvt	0	85	Qva	85	C	40	35	1	--	--	L	8/5/1994	51				
075-007	7/27/1996	T30N/R05E-13R01	D	RR/5 ac	397	CT	93	93	6	N	--	Qvt	87	Qvt	0	87	Qva	87	C	9	19	1	30	--	L	7/27/1996	60				
075-008	5/24/1985	T30N/R05E-13R02	D	RR/5 ac	380	AR	87	85	6	N	--	Qvr	10	Qvt	10	64	Qva	64	C	35	--	--	--	--	M	5/24/1985	50				
075-019	8/4/1994	T30N/R05E-14C01	D	RR/10 ac	85	AR	100	100	6	N	--	Qvr	4	Qvt	4	80	Qva	80	C	12	90	1	--	--	H	8/4/1994	12				
075-032	2/24/1984	T30N/R05E-14M03	D	RR/10 ac	102	AR	120	120	6	N	--	Qvt	115	Qvt	0	115	Qva	115	C	50	24	--	130	--	L	2/24/1984	55	7/8/1992	62		
076-023	6/26/1992	T30N/R05E-13A02	D	RR/5 ac	413	ND	60	54.5	6	N	--	Qvt	37	Qvt	0	37	Qva	37	C	10	25	1	--	--	L	6/26/1992	22				
077-032	2/2/1994	T30N/R05E-13R03	D	RR/5 ac	374	AR	80	78	6	N	--	Qvt	69	Qvt	0	69	Qva	69	C	60	82	1	--	--	M	2/2/1994	39				
077-033	2/1/1984	T29N/R06E-19F02	D	ULDR4-LKST	262	CT	163	163	6	N	--	Qvt	105	Qvt	0	105	Qva	105	C	30	20	1	90	--	L	2/1/1984	74				
077-035	2/27/1990	T30N/R05E-24A01	D	RR/5 ac	380	CT	165	165	6	N	--	Qvt	128	Qvt	0	128	Qva	128	C	20	20	1	60	--	L	2/27/1990	85				
077-036	5/22/1986	T30N/R06E-19F01	D	RR/5 ac	371	AR	47	47	6	N	--	Qvt	42	Qvt	0	42	Qva	42	C	12	20	--	--	--	L	5/22/1986	20				
077-039	11/10/1998	T30N/R05E-24B01	D	RR/5 ac	371	AR	140	130	4	Y	130	Qvt	135	Qvt	0	135	Qva	135	C	25	0	2	--	--	L	11/10/1998	50				
077-041	5/21/1982	T30N/R05E-24F01	D	RR/5 ac	374	CT	104	99	6	Y	99	Qvt	98	Qvt	0	98	Qva	98	C	5	26	2	3	17	L	5/21/1982	64	9/4/2002	93		
077-042	8/19/1980	T29N/R06E-06N01	D	ULDR4-LKST	223	CT	86	82	6	Y	82	Qvt	72	Qvt	0	72	Qva	72	C	9	4	2.5	70	270	L	8/19/1980	64				
077-043	1/17/1996	T30N/R05E-24J01	D	RR/5 ac	344	CT	117	117	6	Y	112	Qvt	111	Qvt	0	111	Qva	111	C	13	5	1	60	300	L	1/17/1996	30				
077-045	8/9/1975	T30N/R05E-24H01	D	RR/5 ac	387	CT	118	113	6	Y	113	Qvt	105	Qvt	0	105	Qva	105	C	6	40	2	3	13	L	8/9/1975	69				
077-052	7/1/1976	T30N/R05E-25E01	D	ULDR4-6	420	CT	172	168	6	Y	168	Qvt	149	Qvt	0	149	Qva	149	C	10	20	1	12	50	L	7/1/1976	138	7/14/1992	136		
077-053	9/5/1986	T30N/R05E-25Q01	D	RR/5 ac	374	CT	155	150	6	Y	150	Qvt	138	Qvt	0	138	Qva	138	C	20	7	2	70	350	L	9/5/1986	133				
077-056	5/1/1991	T30N/R05E-25K02	D	RR/5 ac	335	AR	95	95	6	N	--	Qvt	85	Qvt	0	85	Qva	85	C	40	90	1	--	--	L	5/1/1991	58				
077-058	2/15/1992	T30N/R05E-25R01	D	RR/5 ac	348	AR	60	55	6	Y	55	Qvt	53	Qvt	0	53	Qva	53	C	5	10	4	12	60	L	2/17/1992	42				
077-061	10/13/1981	T30N/R05E-25Q02	D	RR/5 ac	413	AR	160	160	6	N	--	Qvt	125	Qvt	0	125	Qva	125	C	30	25	--	--	--	L	10/13/1981	121				
077-063	6/22/1990	T30N/R05E-25Q03	D	RR/5 ac	364	CT	96	91	6	Y	91	Qvt	90	Qvt	0	90	Qva	90	C	10	8	1	30	130	L	6/17/1990	69				
077-064	2/26/1993	T30N/R05E-25Q04	D	RR/5 ac	377	AR	101	96	6	Y	96	Qvt	103	Qvt	0	103	Qva	103	C	20	100	1	--	--	L	2/26/1993	72	8/20/2002	73		
077-065	11/2/1988	T30N/R05E-25R02	D	RR/5 ac	380	AR	120	120	6	N	--	Qvt	110	Qvt	0	110	Qva	110	C	25	95	1	--	--	L	11/2/1988	85				
077-066	4/7/1976	T30N/R05E-25Q05	D	RR/5 ac	443	CT	184	184	6	N	--	Qvt	ND	Qvt	0	ND	Qva	ND	C	15	20	1	50	--	L	4/7/1976	142				
077-068	11/20/1988	T30N/R05E-25N01	D	U	387	AR	125	125	6	N	--	Qvt	105	Qvt	0	105	Qva	105	C	20	125	1	--	--	L	11/20/1989	95	7/15/1992	92		
077-069	3/23/1987	T30N/R05E-25M02	D	U	387	AR	190	185	6	Y	185	Qvt	110	Qvt	0	110	Qva	110	C	40	--	--	--	--	L	3/23/1987	90				
077-071	4/24/1979	T30N/R06E-19E01	D	RR/5 ac	358	CT	53	53	6	N	--	Qvt	42	Qvt	0	42	Qva	42	C	10	8	1	--	--	L	4/24/1979	1				
077-072	10/8/1979	T30N/R06E-19E02	D	RR/5 ac	358	CT	73	73	6	N	--	Qvt	56	Qvt	0	56	Qva	56	C	20	50	1	20	--	L	10/8/1979	12				
077-075	12/21/1980	T30N/R05E-25N02	D	RR/5 ac	377	AR	120	118	6	N	--	Qvt	96	Qvt	0	96	Qva	96	C	8	45	1	--	--	L	12/21/1980	72				
077-084	3/16/1978	T30N/R05E-26P01	D	U	226	CT	157	146	6	N	--	Qvt	142	Qvt	0	142	Qva	142	C	15	22	1	40	--	L	3/16/1978	118	7/17/1992	119		
077-090	3/8/1999	T30N/R05E-25F01	D	ULDR4-6	338	AR	76	72	6	N	--	Qvt	67	Qvt	0	67	Qva	67	C	6	67	--	--	--	L	5/22/1989	61				
081-077	1/17/1990	T30N/R05E-35H01	D	ULDR5-6MV	374	AR	100	100	6	N	--	Qvt	90	Qvt	0	90	Qva	90	C	20	100	1	--	--	L	1/16/1990	75	7/16/1992	76		
081-083	4/18/1985	T30N/R05E-34A04	D	ULDR5-6MV	358	CT	111	111	6	N	--	Qvt	89	Qvt	0	89	Qva	89	C	20	20	4	60	--	L	4/18/1985	78				
081-085	9/23/1991	T30N/R05E-35J01	D	ULDR5-6MV	377	ND	137	137	6	N	--	Qvt	114	Qvt	0	114	Qva	114	C	35	132	1	--	--	L	9/23/1991	76				
081-086	5/22/1992	T30N/R05E-01J01	D	RR/5 ac	436	AR	156	151	6	Y	151	Qvt	131	Qvt	0	131	Qva	131	C	10	155	1	--	--	L	5/22/1992	100	8/22/2002	97		
081-090	8/30/1979	T30N/R05E-35L01	D	U	295	CT	133	133	6	N	--	Qvt	124	Qvt	0	124	Qva	124	C	15	20	1	50	--	L	8/30/1979	50				
081-092	8/28/1994	T30N/R05E-35R01	D	ULDR4-5MV	328	AR	144	144	6	N	--	Qvt	140	Qvt	0	140	Qva	140	C	10	140	2	--	--	L	8/28/1994	80				
081-093	6/27/1983	T30N/R05E-35Q01	D	ULDR5-6MV	305	ND	150	150	6	N	--	Qvt	142	Qvt	142	142	Qva	142	C	10	12	1	50	--	L	6/27/1983	120				
081-095	9/3/1987	T30N/R05E-36F03	D	RR/5 ac	443	CT	156	151	6	Y	151	Qvt	141	Qvt	0	141	Qva	141	C	15	0	2	--	--	L	9/3/1987	136				
081-099	6/14/1995	T30N/R05E-36B04	D	RR/5 ac	443	CT	158	152	6	Y	152	Qvt	149	Qvt	0	149	Qva	149	C	12	4	2	70	400	L	6/14/1995	134				
081-100	4/9/1998	T30N/R05E-36D01	D	RR/5 ac	407	AR	131	131	6	N	--	Qvt	110	Qvt	0	110	Qva	110	C	20	120	1	--	--	L	4/9/1998	98				
081-101	12/8/1993	T30N/R05E-36G01	D	RR/5 ac	374	CT	164	159	6	Y	159	Qvt	124	Qvt	0	124	Qva	124	C	15	21	4	18	90	L	12/8/1993	122				
081-108	2/26/1980	T30N/R05E-36H01	D	RR/5 ac	384	CT	171	171	6	Y	142	Qvt	100	Qvt	0	100	Qva	100	C	25	45	1	4	50	L	2/26/1980	78				
081-109	3/20/1992	T30N/R05E-36H02	D	RR/5 ac	400	AR	180	180	6	N	--	Qvt	ND	Qvt	0	ND	Qva	ND	C	10		1	--	--	L	3/20/1992	120	8/19/2002	81		
082-001	2/4/1994	T30N/R05E-36H03	D	RR/5 ac	380	AR	158	158	6	N	--	Qvt	141	Qvt	0	141	Qva	141	C	15	140	1	--	--	L	2/4/1994	92				
082-005	1/19/1994	T30N/R05E-36G02	D	RR/5 ac	410	AR	163	158	6	N	--	Qvt	140	Qvt	0	140	Qva	140	C	30	160	1	--	--	L	1/19/1994	122				
082-008	1/12/1992	T30N/R05E-25N03	D	RR/5 ac	400	CT	100	95	6	Y	95	Qvt	85	Qvt	0	85	Qva	85	C	13	15	4	20	110	L	1/12/1992	75				
082-013	6/7/1990	T30N/R05E-36K02	D	RR/5 ac	371	AR	174	174	6	N	--	Qvt	95	Qvt	0	95	Qva	95	C	15	170	1	--	--	L	6/7/1990	122				
082-014	10/9/1990	T30N/R05E-36K03	D	RR/5 ac	371	AR	175	170	6	Y	170	Qvt	134	Qvt	0	134	Qva	134	C	15	170	1	--	--	L	10/9/1990	90				
082-015	3/9/1991	T30N/R05E-36K04	D	RR/5 ac	371	AR	82	77	6	Y	77	Qvt	78	Qvt	0	78	Qva	78	C	7	80	2	--	--	L	3/9/1991	35				
082-016	2/25/1975	T30N/R05E-36F04	D	RR/5 ac	443	CT	121	121	6	N	--	Qvt	114	Qvt	0	114	Qva	114	C	10	15	1	40	--	L	2/25/1975	81				
082-021	3/9/1999	T30N/R05E-36K05	D	RR/5 ac	371	AR	82	82	6	Y	--	Qvt	78	Qvt	0	78	Qva	78	C	7	80	2	--	--	L	3/9/1999	35				
082-022	9/22/1986	T30N/R05E-36J01	D	RR/5 ac	358	AR	58	58	6	N	--	Qvt	56	Qvt	0	56	Qvt	56	C	12	--	--	--	--	L	9/22/1986	39	7/16/1992	31		
082-023	9/22/1986	T30N/R05E-36J02	D	RR/5 ac	361	AR	66	66	6	N	--	Qvt	64	Qvt	0	64	Qva	64	C	20	--	--	--	--	L	8/4/1986	37				
082-024	8/24/1993	T30N/R05E-36L01	D	RR/5 ac	423	CT	180	175	6	Y	175	Qvt	95	Qvt	0	95	Qva	95	C	10	30	4	7	40	L	8/24/1993	140				
082-026	7/8/1998	T30N/R05E-36Q01	D	RR/5 ac	354	AR	160	159	6	N	--	Qvt	110	Qvt	0	110	Qva	110	C	20	155	1.2	--	--	L	7/8/1998	91				
082-027	3/3/1997	T30N/R05E-36F05	D	RR/5 ac	407	AR	141	136	6	Y	136	Qvt	125	Qvt	0	--	Qva	125	C	20	25	1	--	--	L	3/3/1997	109				
082-033	6/16/1982	T30N/R05E-36K06	D	RR/5 ac	371	CT	152	152	6	N	--	Qvt	144	Qvt	0	144	Qva	144	C	8	50	1	10	--	L	6/16/1982	90				
082-036	3/2/1994	T30N/R05E-36F06	D	RR/5 ac	430	AR	160	155	6	Y	155	Qvt	125	Qvt	0	125	Qva	125	C	50	150	1	--	--	L	3/2/1994	125				
082-037	9/30/1994	T30N/R05E-36F07	D	RR/5 ac	433	AR	167	162	6	Y	162	Qvt	139	Qvt	0	139	Qva	139	C	15	160	1	--	--	L	9/30/1994	125				
082-039	7/30/1997	T30N/R05E-36R03	D	RR/5 ac	338	AR	138	135	6	N	--	Qvt	99	Qvt	0	99	Qva	99	C	10	135	1	--	--	L	7/30/1997	82	9/4/2002	90		
082-042	2/9/1978	T30N/R05E-36K07	D	RR/5 ac	403	CT	156	156	6	N	--	Qvt	138	Qvt	0	138	Qva	138	C	15	30	1	--	--	L	8/2/1974	110				
082-044	2/6/1980	T30N/R05E-36Q02	D	RR/5 ac	400	CT	159	159	6	N	--	Qvt	150	Qvt	0	150	Qva	150	C	10	41	1	15	--	L	2/6/1980	103				
082-045	5/27/1982	T30N/R05E-36L02	D	RR/5 ac	433	CT	166	166	6	N	--	Qvt	100	Qvt	0	100	Qva	100	C	15	10	1	90	--	L	5/27/1982	119				
082-052	11/8/1988	T30N/R05E-36B02	D	RR/5 ac	410	AR	160	160	6	N	--	Qvt	155	Qvt	0	155	Qva	155	C	25	15	--	--	--	L	11/8/1988	135				
167-058	6/20/2001	T30N/R06E-33Q01	D	RR/5 ac	338	ND	119	114	6	Y	114	Qvt	102	Qvt	0	102	Qva	102	C	40	113	1	--	--	L	6/20/2001	70				
083-085	7/26/1999	T30N/R06E-05Q16	D	RR/5 ac	453	AR	100	85	6	N	--	Qvt	80	Qvt	0	80	Qva	80	C	20	25	1.5	--	--	L	7/26/1999	33				
083-086	12/17/1999	T30N/R06E-05H02	D	RR/5 ac	479	CT	120	109	6	Y	109	Qvt	72	Qvt	0	72	Qva	72	C	4	36	1	0.8	8	L	12/17/1999	67				
083-090	6/14/2000	T30N/R06E-05H03	D	RR/5 ac	466	CT	125	115	6	Y	115	Qvt	94	Qvt	0	94	Qva	96	C	--	--	--	--	--	L	6/14/2000	83				
083-091	6/30/2000	T30N/R06E-05H04	D	RR/5 ac	453	CT	134	124	6	Y	124	Qvt	115	Qvt	0	115	Qva	115	C	15	3	1	70	680	L	6/30/2000	77				
084-014	8/3/1999	T30N/R06E-05Q17	D	RR/5 ac	440	CT	74	68	6	Y	68	Qvt	45	Qvt	0	45	Qva	45	C	2	40	1	0.5	3	L	8/3/1999	23				
084-015	7/19/2000	T30N/R06E-05H05	D	RR/5 ac	453	CT	133	123	6	Y	123	Qvt	124	Qvt	0	124	Qva	124	C	15	20	1	8	80	L	7/19/2000	93				
084-025	5/18/2000	T30N/R06E-05R01	D	RR/5 ac	512	CT	122	110	6	Y	110	Qvt	95	Qvt	0	95	Qva	95	C	15	50	1	3	30	L	5/18/2000	29				
084-026	4/10/2000	T30N/R06E-05R02	D	RR/5 ac	525	CT	129	118	6	Y	118	Qvt	117	Qvt	0	117	Qva	117	C	9	50	1	1	14	L	4/10/2000	47				
084-050	6/4/1998	T30N/R06E-05K06	D	RR/5 ac	502	AR	93	83	4	Y	83	Qvt	85	Qvt	0	85	Qva	85	C	9	55	2	1	16	L	6/5/1998	25				
084-054	10/4/1986	T30N/R06E-06D01	D	RR/5 ac	423	ND	75	70	6	Y	70	Qvt	58	Qvt	0	58	Qva	58	C	30	8	2	100	500	L	10/4/1986	36				
084-055	8/8/1986	T30N/R06E-06A01	D	RR/5 ac	456	CT	95	90	6	Y	90	Qvt	83	Qvt	0	83	Qva	83	C	10	19	2	11	60	L	8/8/1986	62				
084-056	12/20/1987	T31N/R06E-31N01	D	RR/5 ac	449	CT	102	97	6	Y	97	Qvt	90	Qvt	0	90	Qva	90	C	15	8	1	40	200	L	12/20/1987	84				
084-057	8/14/1984	T30N/R06E-06D02	D	RR/5 ac	443	CT	115	108	6	Y	108	Qvt	61	Qvt	0	61	Qva	61	C	10	16	2	14	70	L	8/14/1984	75				
084-058	9/19/1986	T30N/R06E-06D03	D	RR/5 ac	443	CT	76	76	6	Y	71	Qvt	58	Qvt	0	58	Qva	58	C	30	9	2	90	450	L	9/18/1986	35				
084-060	6/26/1988	T30N/R06E-07A01	D	RR/5 ac	423	AR	48	40	6	Y	40	Qvt	34	Qvt	0	34	Qva	34	C	20	16	1	30	130	L	6/26/1988	14				
084-061	12/2/1992	T30N/R06E-06B01	D	RR/5 ac	485	AR	139	137	6	N	--	Qvt	120	Qvt	0	120	Qva	120	C	40	130	1	--	--	L	12/2/1992	80				
084-063	2/21/1989	T30N/R06E-06E01	D	RR/5 ac	433	CT	70	70	6	N	--	Qvt	66	Qvt	0	66	Qva	66	C	20	20	1	60	--	L	2/21/1989	25				
084-065	11/21/1989	T29N/R06E-06A08	D	RR/5 ac	318	AR	90	90	6	N	--	Qvt	85	Qvt	0	85	Qva	85	C	30	90	1	--	--	L	11/21/1989	20				
084-068	11/5/1987	T30N/R06E-06G01	D	RR/5 ac	453	AR	85	85	6	N	--	Qvt	78	Qvt	0	78	Qva	78	C	20	20	--	--	--	L	11/5/1987	53				
084-069	5/28/1993	T30N/R06E-06G02	D	RR/5 ac	453	AR	86	86	6	N	--	Qvt	70	Qvt	0	70	Qva	70	C	15	80	1	--	--	L	5/28/1993	52				
084-075	9/6/1991	T30N/R06E-06E02	D	RR/5 ac	440	CT	74	74	6	N	--	Qvt	74	Qvt	0	74	Qva	74	C	10	21	1	30	--	L	9/6/1991	42				
084-076	9/6/1991	T30N/R06E-06E03	D	RR/5 ac	440	CT	74	74	6	N	--	Qvt	66	Qvt	0	66	Qva	66	C	10	21	1	30	--	L	9/6/1991	42				
084-077	9/20/1988	T30N/R06E-06C01	D	RR/5 ac	449	AR	82	80	6	N	--	Qvt	76	Qvt	0	76	Qva	76	C	20	14	1	90	--	L	9/20/1988	32				
084-078	8/6/1991	T30N/R06E-06C02	D	RR/5 ac	449	AR	87	87	6	N	--	Qvt	74	Qvt	0	74	Qva	74	C	8	82	1	--	--	L	8/6/1991	57				
084-081	10/8/1986	T30N/R06E-20B01	D	RR/5 ac	384	CT	80	80	6	N	--	Qvt	73	Qvt	0	73	Qva	73	C	20	5	1	240	--	L	10/8/1986	57				
084-086	5/15/1988	T30N/R06E-06E04	D	RR/5 ac	436	CT	79	79	6	N	82	Qvt	65	Qvt	0	65	Qva	65	C	10	6	4	100	--	L	5/18/1988	45	7/16/1992	47		

Appendix A.
Table A-1. Well Details and Water Levels.

SnoCo ID	Completion Date	Legal	Well Type	Land Use	Elevation	Drilling Method	Drill Depth	Casing Depth	Casing Diameter	Screen (Y or N)	Screen Top Depth	Surface: Geologic Unit	Surface: Unit Bottom	Confining: Geologic Unit	Confining: Unit Top	Confining: Unit Bottom	Aquifer: Geologic Unit	Aquifer: Unit Top	Confined Unconfined	Yield	Drawdown	Time	Conductivity (K)	Transmissivity (T)	USGS Aquifer Sensitivity	Water Level Data: Date	Depth to Water	Date	Depth to Water	Date	Depth to Water
							(ft)	(ft)	(in)		(ft)		(ft)		(ft)	(ft)		(ft)		(gpm)	(ft)	(hr)	(ft/d)	(ft^2/d)			(ft)		(ft)		(ft)
084-087	10/11/1989	T30N/R06E-06L01	D	RR/5 ac	443	AR	80	80	6	N	--	Qvt	75	Qvt	0	75	Qva	75	C	10	75	1	--	--	L	10/11/1989	42				
084-088	7/7/1997	T30N/R06E-06J01	D	RR/5 ac	436	AR	58	55	6	Y	55	Qvt	45	Qvt	0	45	Qva	45	C	15	58	1	--	--	L	7/7/1997	28				
084-093	7/31/2000	T30N/R06E-06H01	D	RR/5 ac	459	AR	104	104	4	Y	77	Qvt	94	Qvt	0	94	Qva	94	C	16	10	1	7	200	L	7/31/2000	40				
084-102	9/27/2000	T30N/R06E-06L02	D	RR/5 ac	440	ND	100	90	6	Y	90	Qvt	84	Qvt	0	84	Qva	84	C	5	--	1.5	--	--	L	9/27/2000	58				
085-002	5/14/1987	T30N/R06E-16M01	D	RR/5 ac	400	CT	82	82	6	N	--	Qvt	81	Qvt	0	81	Qva	81	C	10	4	2	150	--	L	5/14/1987	58				
085-004	8/26/1991	T30N/R06E-06N02	D	RR/5 ac	446	CT	80	75	6	Y	175	Qvt	75	Qvt	0	75	Qva	75	C	10	10	1	20	100	L	8/26/1991	59				
085-007	6/14/1977	T30N/R06E-06N03	D	RR/5 ac	440	CT	76	76	6	N	--	Qvt	70	Qvt	0	70	Qva	70	C	10	10	1	60	--	L	6/14/1977	47				
085-009	5/5/1988	T29N/R06E-08R01	D	U	239	AR	110	105	6	Y	105	Qvt	89	Qvt	0	89	Qva	89	C	8	30	1	4	20	L	5/5/1988	72				
085-010	7/28/1980	T30N/R06E-07M01	D	RR/5 ac	433	CT	55	55	6	N	--	Qvt	49	Qvt	0	49	Qva	49	C	10	10	1	60	--	L	7/28/1980	37				
085-011	9/15/1990	T30N/R06E-07A02	D	RR/5 ac	423	ND	37	35	6	Y	--	Qvt	29	Qvt	0	29	Qva	29	C	5	7	1	--	70	L	--	ND				
085-012	10/23/1990	T30N/R06E-07A03	D	RR/5 ac	426	CT	49	44	6	Y	44	Qvt	45	Qvt	0	45	Qva	45	C	20	19	1	20	110	L	10/23/1990	19				
085-013	10/28/1987	T30N/R06E-07A04	D	RR/5 ac	426	AR	60	60	6	N	--	Qvt	52	Qvt	0	52	Qva	52	C	15	20	1	--	--	L	10/28/1987	29				
085-014	2/13/1997	T30N/R06E-07B01	D	RR/5 ac	430	CT	70	60	6	Y	60	Qvt	55	Qvt	0	55	Qva	55	C	20	4	1	120	600	L	2/13/1997	18				
085-015	9/4/1992	T30N/R06E-07A05	D	RR/5 ac	420	AR	60	38	6	Y	38	Qvt	33	Qvt	0	33	Qva	33	C	8	45	2	0.8	16	L	9/4/1992	11				
085-022	6/15/1993	T30N/R06E-07C01	D	RR/5 ac	440	AR	90	70	4.5	Y	70	Qvt	72	Qvt	0	72	Qva	72	C	18	24	2	5	90	L	6/15/1993	20				
085-023	7/4/1990	T30N/R06E-07C02	D	RR/5 ac	436	AR	82	82	6	N	--	Qvt	73	Qvt	0	73	Qva	73	C	200	70	1	--	--	L	7/4/1990	41				
085-025	4/6/1995	T30N/R06E-07E01	D	RR/5 ac	436	AR	60	60	6	N	--	Qvt	42	Qvt	0	42	Qva	42	C	18	60	2	--	--	L	4/6/1995	31				
085-028	2/25/1998	T30N/R06E-07E02	D	RR/5 ac	440	AR	75	70	6	Y	70	Qvt	68	Qvt	0	68	Qva	68	C	40	75	1	--	--	L	2/25/1998	47				
149-074	10/10/2000	T30N/R06E-07E03	D	RR/5 ac	436	AR	60	60	6	N	--	Qvt	28	Qvt	0	62	Qva	28	C	17	12	2	--	--	L	10/10/2000	37				
085-048	5/1/1997	T30N/R06E-07P01	D	RR/5 ac	436	AR	58	38	6	Y	38	Qvt	39	Qvt	0	39	Qva	39	C	12	8	2	9	170	L	5/1/1997	28				
085-052	5/4/1994	T30N/R06E-08A01	D	RR/5 ac	413	AR	210	210	4	Y	18	Qvt	145	Qvt	0	145	Ts	145	C	0.8	--	2	--	--	L	5/4/1994	15				
085-054	4/17/2000	T30N/R06E-08A02	D	RR/5 ac	479	CT	63	51	6	Y	51	Qvt	44	Qvt	0	44	Qva	44	C	12	34	1	3	30	L	4/17/2000	12				
085-059	5/3/1996	T30N/R06E-05K07	D	RR/5 ac	502	CT	106	100	6	Y	100	Qvt	101	Qvt	0	101	Qva	101	C	9	19	1	8	40	L	5/3/1996	79				
085-060	7/15/1992	T30N/R06E-08H02	D	RR/5 ac	426	AR	103	103	6	N	--	Qvt	97	Qvt	0	97	Qva	97	C	10	95	1	--	--	L	7/15/1992	68	8/22/2002	78		
085-062	3/10/2000	T30N/R06E-08H03	D	RR/5 ac	397	CT	121	110	6	Y	110	Qvt	116	Qvt	0	116	Qva	116	C	10	23	1	4	40	L	3/10/2000	79				
085-063	1/28/1987	T30N/R06E-08G02	D	RR/5 ac	453	CT	64	59	6	Y	59	Qvt	58	Qvt	0	58	Qva	58	C	20	5	1	100	500	L	2/7/1987	31	3/10/1993	44		
085-065	2/7/1997	T30N/R06E-08F01	D	RR/5 ac	413	ND	125	125	6	Y	--	Qvt	122	Qvt	0	122	Qva	122	C	--	--	--	--	--	L	2/7/1997	82				
085-077	4/8/1996	T30N/R06E-08F02	D	RR/5 ac	443	CT	62	57	5	Y	57	Qvt	45	Qvt	0	45	Qva	45	C	20	18	1	30	130	L	4/8/1996	18				
085-084	11/8/1994	T30N/R06E-08G03	D	RR/5 ac	462	CT	81	74	6	Y	--	Qvt	62	Qvt	0	62	Qva	62	C	15	5	1	--	380	L	11/8/1994	55				
086-001	3/11/1994	T31N/R05E-23D02	D	U	148	AR	120	120	6	N	--	Qvt	112	Qvt	0	112	Qva	112	C	11	120	2	--	--	M	3/11/1994	56				
086-002	10/13/1991	T30N/R06E-08G04	D	RR/5 ac	459	CT	73	65.5	6	Y	68.5	Qvt	68	Qvt	0	68	Qva	68	C	20	0	1	--	--	L	10/13/1991	50				
086-003	12/17/1987	T30N/R06E-08G05	D	RR/5 ac	453	CT	63	63	6	N	--	Qvt	50	Qvt	0	50	Qva	50	C	12	3	1	240	--	L	12/17/1987	49				
086-009	6/2/1995	T30N/R06E-08K01	D	RR/5 ac	433	CT	147	140	6	Y	141	Qvt	132	Qvt	0	132	Qva	132	C	12	18	1	13	70	L	6/2/1995	116				
086-013	8/4/2000	T30N/R06E-08R04	D	RR/5 ac	466	CT	191	181	6	Y	181	Qvt	84	Qvt	0	84	Qva	84	C	--	--	--	--	--	L	8/4/2000	132				
086-019	1/10/2000	T30N/R06E-08Q03	D	RR/5 ac	413	CT	106	106	6	Y	--	Qvt	85	Qvt	0	85	Qva	85	C	--	--	--	--	--	L	1/10/2000	71				
086-021	12/9/1997	T30N/R06E-08B05	D	RR/5 ac	472	CT	97	91	6	Y	--	Qvr	25	Qvt	25	95	Qva	95	C	15	13	1	--	120	M	12/9/1997	66				
155-019	2/23/2001	T30N/R06E-08P01	D	RR/5 ac	413	AR	100	94	6	Y	94	Qvt	68	Qvt	0	75	Qva	68	C	20	90	1	--	--	L	2/23/2001	72				
152-070	9/15/2001	T30N/R06E-08L01	D	RR/5 ac	413	AR	101	95	6	Y	95	Qvt	60	Qvt	0	45	Qva	60	C	12	95	1	--	--	L	9/15/2001	76				
086-027	6/8/1999	T30N/R06E-09M01	D	RR/5 ac	400	CT	104	99	6	Y	99	Qvt	91	Qvt	0	91	Qva	91	C	15	22	1	13	70	L	6/8/1999	59				
086-035	12/29/1999	T30N/R06E-09N01	D	RR/5 ac	390	CT	121	115	6	Y	115	Qvt	101	Qvt	0	101	Qva	101	C	7	33	1	3	17	L	12/29/1999	71				
086-071	11/16/1989	T30N/R06E-10M01	D	RR/5 ac	440	AR	96	91	6	Y	91	Qvt	90	Qvt	0	90	Qva	90	C	8	90	1	--	--	L	11/16/1989	77				
087-109	11/21/1993	T30N/R06E-15R01	D	RR/5 ac	289	CT	70	65	6	Y	--	Qvr	22	Qvt	22	60	Qva	60	C	15	15	1	--	12	M	11/21/1993	30				
088-009	5/29/1979	T30N/R06E-15E01	D	RR/5 ac	358	ND	59	59	6	N	--	Qvt	55	Qvt	0	55	Qva	55	C	30	10	1	180	--	L	5/29/1979	20				
088-017	6/21/1999	T30N/R06E-15C01	D	LCF	298	AR	60	56	6	N	--	Qvr	6	Qvt	6	50	Qva	50	C	10	25	1.5	30	--	L	6/21/1999	5				
088-032	12/2/1992	T30N/R06E-15N04	D	RR/5 ac	367	ND	133	128	6	Y	126	Qvt	126	Qvt	0	126	Qva	126	C	8	64	1	1	9	L	12/2/1992	62				
088-036	7/30/1985	T30N/R06E-17N02	D	RR/5 ac	420	AR	135	135	6	N	--	Qvr	28	Qvt	28	130	Qva	130	C	20	15	1	80	--	M	7/30/1985	96				
088-037	3/13/1989	T30N/R06E-18N02	D	RR/5 ac	377	CT	60	60	6	N	--	Qvr	27	Qvt	27	57	Qva	57	C	12	6	1	120	--	M	3/15/1989	35	7/14/1992	38		
088-040	10/18/1999	T30N/R06E-16P01	D	RR/5 ac	377	AR	78	78	6	N	--	Qvt	97	Qvt	0	97	Qva	55	C	18	0.4	1.5	2,800	--	L	10/18/1999	30.4				
088-041	10/18/1999	T30N/R06E-16P02	D	RR/5 ac	377	AR	78	78	6	N	--	Qvt	55	Qvt	0	55	Qva	55	C	20	1	1	1,200	--	L	10/18/1999	30				
088-042	7/10/1990	T30N/R06E-16N01	D	RR/5 ac	403	AR	100	98	6	N	--	Qvt	93	Qvt	0	93	Qva	93	C	40	85	1	--	--	L	7/10/1990	71				
088-064	4/12/1989	T30N/R06E-17L01	D	RR/5 ac	400	AR	77	72	6	Y	72	Qvt	70	Qvt	0	70	Qva	70	C	8	--	--	--	--	L	4/12/1989	60				
088-065	4/9/1994	T30N/R06E-17C01	D	RR/5 ac	417	CT	104	95	6	Y	95	Qvt	90	Qvt	0	90	Qva	90	C	18	20	1	18	90	L	4/9/1994	65				
088-068	9/6/1989	T30N/R06E-17D01	D	RR/5 ac	420	AR	120	120	6	N	--	Qvt	85	Qvt	0	85	Qva	85	C	25	100	1	--	--	L	9/6/1989	82				
088-081	7/29/1986	T30N/R06E-20C01	D	RR/5 ac	397	AR	80	80	6	N	--	Qvt	72	Qvt	0	72	Qva	72	C	12	8	--	--	--	L	7/29/1986	60				
088-082	9/21/1988	T30N/R06E-17R01	D	RR/5 ac	400	CT	90	85	6	Y	85	Qvt	80	Qvt	0	80	Qva	80	C	12	3	1	100	500	L	9/21/1988	67				
088-095	6/5/1980	T30N/R06E-18R01	D	RR/5 ac	420	AR	132	131	6	N	--	Qvr	12	Qvt	12	127	Qva	127	C	50	30	1	--	--	M	6/5/1980	90				
088-096	5/5/1988	T30N/R06E-17N03	D	RR/5 ac	420	ND	135	135	6	Y	--	Qvr	12	Qvt	12	127	Qva	127	C	--	--	--	--	--	M	--	ND				
088-099	5/17/1991	T30N/R06E-17L02	D	RR/5 ac	413	AR	98	98	6	N	--	Qvt	90	Qvt	0	90	Qva	90	C	20	80	1	--	--	L	5/17/1991	72				
088-100	8/7/1991	T30N/R06E-17P01	D	RR/5 ac	407	AR	102	100	6	N	--	Qvt	90	Qvt	0	90	Qva	90	C	11	97	11	--	--	L	8/7/1991	80				
088-101	1/18/1989	T30N/R06E-17L03	D	RR/5 ac	410	AR	91	88	6	N	--	Qvt	86	Qvt	0	86	Qva	86	C	10	--	--	--	--	L	1/18/1989	78				
089-001	1/20/1989	T30N/R06E-17L04	D	RR/5 ac	410	AR	91	88	6	N	--	Qvt	87	Qvt	0	87	Qva	87	C	19	--	--	--	--	L	1/20/1989	72				
089-002	1/20/1989	T30N/R06E-17L05	D	RR/5 ac	410	AR	88	88	6	N	--	Qvt	85	Qvt	0	85	Qva	85	C	12	--	--	--	--	L	1/20/1989	76				
089-008	4/24/1989	T30N/R06E-17P02	D	RR/5 ac	397	AR	96	96	6	N	--	Qvt	80	Qvt	0	80	Qva	80	C	12	76	1	--	--	L	4/24/1989	66				
089-009	5/30/1988	T29N/R06E-08E01	D	U	331	CT	108	108	6	N	--	Qvt	98	Qvt	0	98	Qva	98	C	8	12	4	40	--	L	5/30/1988	78				
089-011	2/23/1998	T30N/R06E-18G01	D	RR/5 ac	417	AR	65	58	4	Y	43	Qvt	40	Qvt	0	40	Qva	40	C	16	10	2	15	220	L	2/23/1998	15				
089-015	7/11/1990	T30N/R06E-17N04	D	RR/5 ac	420	AR	120	95	6	Y	95	Qvr	35	Qvt	35	93	Qva	93	C	7	100	1	--	--	M	4/11/1990	88				
089-020	5/22/1990	T30N/R06E-18H01	D	RR/5 ac	433	AR	75	50	4.5	Y	50	Qvr	4	Qvt	4	54	Qva	54	C	12	2	2	90	900	M	5/22/1990	18				
089-030	5/19/1996	T30N/R06E-18K01	D	RR/5 ac	403	AR	50	50	4	Y	40	Qvt	43	Qvt	0	43	Qva	43	C	6	25	2	2	20	L	5/19/1996	4				
089-038	10/9/1996	T30N/R06E-18Q02	D	RR/5 ac	397	AR	87	77	4	Y	77	Qvt	79	Qvt	0	79	Qva	97	C	18	0	2	--	--	L	10/9/1996	54				
089-055	5/19/1995	T30N/R06E-19J01	D	RR/5 ac	377	AR	73	68	6	Y	68	Qvt	74	Qvt	0	74	Qva	74	C	20	68	1	--	--	L	5/19/1995	27				
089-057	6/15/1983	T30N/R06E-19A01	D	RR/5 ac	410	AR	119.5	119.5	6	N	--	Qvt	90	Qvt	0	90	Qva	90	C	33	--	--	--	--	L	6/15/1983	76				
089-058	12/2/1993	T30N/R06E-19H01	D	RR/5 ac	400	AR	146	126	4	Y	126	Qvt	126	Qvt	0	126	Qva	126	C	9	50	6	1	20	L	12/2/1993	58				
089-061	5/11/1992	T30N/R06E-19F02	D	RR/5 ac	367	CT	54	49	6	Y	49	Qvt	--	Qvt	0	--	Qvt	48	C	10	25	2	8	40	L	5/11/1992	15				
089-064	7/24/1980	T30N/R05E-24H02	D	RR/5 ac	374	AR	126	121	6	Y	121	Qvt	116	Qvt	0	116	Qva	116	C	25	83	1	--	--	L	7/24/1980	38				
089-065	6/12/1984	T30N/R06E-19H02	D	RR/5 ac	400	AR	80	80	6	N	--	Qvt	70	Qvt	0	70	Qva	70	C	20	7	--	--	--	L	6/12/1984	60				
089-066	7/16/1999	T30N/R06E-19Q01	D	RR/5 ac	358	AR	73	60	4	Y	60	Qvt	56	Qvt	0	56	Qva	56	C	7	70	2	--	--	L	7/16/1999	15				
089-067	11/6/1988	T30N/R06E-19G01	D	RR/5 ac	380	ND	98	98	6	N	--	Qvt	90	Qvt	90	90	Qva	90	C	100	90	1	--	--	L	11/6/1988	41				
089-070	10/17/1992	T30N/R06E-19G02	D	RR/5 ac	377	AR	80	60	4.5	Y	60	Qvt	67	Qvt	0	67	Qva	67	C	10	0	2	--	--	L	10/17/1992	34				
089-073	3/11/1977	T30N/R06E-19C01	D	RR/5 ac	374	CT	65	65	6	N	--	Qvt	50	Qvt	0	50	Qva	50	C	20	15	1.5	80	--	L	3/11/1977	15				
089-077	1/30/1985	T30N/R06E-19C02	D	RR/5 ac	374	AR	57	54	6	N	--	Qvt	51	Qvt	0	51	Qva	51	C	35	--	--	--	--	L	1/30/1985	16				
089-080	11/2/1999	T30N/R06E-19C03	D	RR/5 ac	387	AR	150	130	4	Y	--	Qvt	135	Qvt	0	135	Qva	135	C	10	0	2	--	--	L	11/2/1999	70				
089-083	10/18/1991	T30N/R06E-19C04	D	RR/5 ac	384	AR	60	40	4.5	Y	40	Qvt	42	Qvt	0	42	Qva	42	C	60	7	1	70	1,300	L	--	ND				
089-087	8/29/1991	T30N/R06E-19E03	D	RR/5 ac	361	AR	80	80	6	N	--	Qvt	60	Qvt	0	60	Qva	60	C	20	80	1	--	--	L	8/29/1991	27				
089-089	1/20/1989	T30N/R06E-19G03	D	RR/5 ac	374	AR	80	80	6	N	--	Qvt	70	Qvt	0	70	Qva	70	C	306	30	--	--	--	L	1/20/1989	30				
089-090	2/29/1992	T30N/R06E-19E04	D	RR/5 ac	364	CT	82	77	6	Y	77	Qvt	62	Qvt	0	62	Qva	62	C	24	15	1	40	180	L	2/29/1992	14				
089-091	8/20/1987	T30N/R06E-19F03	D	RR/5 ac	361	AR	40	40	6	N	--	Qvt	30	Qvt	0	30	Qva	30	C	40	5	--	--	--	L	8/20/1987	15				
089-092	9/14/1976	T30N/R06E-19F04	D	RR/5 ac	361	CT	49	44	6	Y	44	Qvt	40	Qvt	0	40	Qva	40	C	50	20	1	60	300	L	9/14/1976	9				
089-093	3/22/1992	T30N/R06E-19F05	D	RR/5 ac	367	CT	78	70	6	Y	--	Qvt	61	Qvt	0	61	Qva	61	C	24	15	1	--	180	L	3/22/1992	14				
089-098	6/4/1979	T30N/R06E-19E05	D	RR/5 ac	367	AR	101	101	6	N	--	Qvt	90	Qvt	0	90	Qva	90	C	3600	--	--	--	--	L	6/4/1979	60	8/27/2002	28		
089-102	1/15/1981	T30N/R06E-19J02	D	RR/5 ac	367	AR	60	58	6	N	--	Qvt	60	Qvt	0	60	Qva	60	C	10	23	1	--	--	L	1/15/1981	32				
090-001	6/15/1985	T30N/R06E-19K01	D	RR/5 ac	364	CT	70	65	6	Y	65	Qvt	65	Qvt	0	65	Qva	65	C	30	23	1	30	140	L	6/15/1985	21				
090-002	9/13/1979	T29N/R05E-23R01	D	ULDR6-LKST	279	AR	118	115	6	ND	115	Qvt	113	Qvt	0	113	Qva	113	C	25	--	--	--	--	L	9/13/1979	90				
090-003	2/28/1990	T30N/R06E-19Q02	D	RR/5 ac	371	AR	60	60	6	N	--	Qvt	48	Qvt	0	48	Qva	48	C	20	50	1	--	--	L	2/28/1990	39				
090-004	8/24/1981	T30N/R06E-19F06	D	RR/5 ac	361	CT	55	55	6	N	--	Qvt	53	Qvt	0	53	Qva	53	C	40	8	1	310	--	L	8/24/1981	9				
090-005	7/15/1999	T30N/R06E-19Q03	D	RR/5 ac	358	AR	76	63	4	Y	63	Qvt	70	Qvt	0	70	Qva	70	C	5	10	1	4	60	L	7/15/1999	37				
090-006	6/15/1978	T30N/R06E-19J03	D	RR/5 ac	390	AR	78	78	6	N	--	Qvt	70	Qvt	0	70	Qva	70	C	30	--	--	--	--	L	6/15/1978	52				
090-008	4/17/1999	T30N/R06E-19L01	D	RR/5 ac	358	AR	105	85	6	Y	85	Qvt	85	Qvt	0	85	Qva	85	C	20	0	2	--	--	L	4/17/1999	25				
090-009	7/27/1998	T30N/R06E-19P03	D	RR/5 ac	344	AR	109	99	6	Y	99	Qvt	101	Qvt	0	101	Qva	101	C	22	2	2	180	1,800	L	7/27/1998	22				
090-010	7/28/1998	T30N/R06E-19P02	D	RR/5 ac	344	AR	109	99	4	Y	99	Qvt	98	Qvt	0	98	Qva	98	C	20	4	2	80	800	L	7/28/1998	24				
090-011	11/11/1998	T30N/R06E-19P01	D	RR/5 ac	344	AR	122	112	4	Y	112	Qvt	114	Qvt	0	114	Qva	144	C	10	20	2	6	60	L	11/11/1998	32				
090-012	4/7/1999	T30N/R06E-19P04	D	RR/5 ac	344	AR	80	80	4	Y	70	Qvt	72	Qvt	0	72	Qva	72	C	22	2	2	190	1,900	L	4/7/1999	12				
090-013	5/13/1999	T30N/R06E-19P05	D	RR/5 ac	351	AR	63	60	6	Y	60	Qvt	55	Qvt	0	55	Qva	55	C	35	--	1.5	--	--	L	5/13/1999	16				
090-015	9/14/1999	T30N/R06E-19L02	D	RR/5 ac	348	AR	130	130	4	Y	120	Qvt	126	Qvt	0	126	Qva	126	C	20	5	2	60	600	L	9/14/1999	55				
090-016	9/15/1999	T30N/R06E-19P06	D	RR/5 ac	344	AR	118	108	4	Y	108	Qvt	114	Qvt	0	114	Qva	114	C	20	5	2	60	600	L	9/15/1999	52				
090-017	1/28/2000	T30N/R06E-19P07	D	RR/5 ac	344	AR	106	96	4	Y	96	Qvt	97	Qvt	0	97	Qva	97	C	22	4	2	90	900	L	1/28/2000	12				
149-077	10/14/2000	T30N/R06E-19P08	D	RR/5 ac	354	AR	63	60	6	Y	60	Qvt	38	Qvt	0	52	Qvt	38	C	20	60	4	--	--	L	10/14/2000	21				
090-023	12/15/1993	T30N/R06E-19Q04	D	RR/5 ac	358	AR	66	66	6	N	--	Qvt	58	Qvt	0	58	Qva	58	C	20	--	1	--	--	L	12/15/1993	45				
090-025	8/5/1994	T30N/R06E-19N01	D	RR/5 ac	341	AR	71	66	6	Y	66	Qvt	52	Qvt	0	52	Qva	52	C	20	65	1	--	--	L	8/5/1994	23				
090-032	8/30/1991	T30N/R06E-20J02	D	RR/5 ac	358	AR	60	60	6	N	--	Qvt	31	Qvt	0	31	Qva	31	C	40	60	1	--	--	L	8/30/1991	16				
090-034	4/20/1991	T30N/R06E-19J04	D	RR/5 ac	367	AR	68	64	6	N	--	Qvt	63	Qvt	0	63	Qva	63	C	11	60	1	--	--	L	4/20/1991	32				
090-035	2/22/1991	T30N/R06E-20B02	D	RR/5 ac	387	CT	87	82	6	Y	82	Qvt	54	Qvt	0	54	Qva	54	C	10	10	1	20	100	L	2/22/1991	42	8/21/2002	51		
090-036	10/11/1988	T30N/R06E-20B03	D	RR/5 ac	371	AR	60	60	6	N	--	Qvt	50	Qvt	0	50	Qva	50	C	15	50	1	--	--	L	10/11/1988	40				
090-038	8/15/1973	T30N/R06E-20B04	D	RR/5 ac	387	CT	75	75	6	N	--	Qvt	65	Qvt	0	65	Qva	65	C	15	10	2	90	--	L	8/15/1973	50				
090-039	3/31/1975	T30N/R06E-20B05	D	RR/5 ac	387	CT	165	63	6	N	--	Qvt	52	Qvt	0	52	Qva	52	C	10	6	1	100	--	L	3/31/1975	46				
090-040	11/9/1990	T30N/R06E-20H02	D	RR/5 ac	358	AR	60	60	6	N	--	Qvt	53	Qvt	0	53	Qva	53	C	40	60	1	--	--	L	11/9/1990	24				
090-041	10/11/1989	T30N/R06E-20G01	D	RR/5 ac	367	AR	60	60	6	N	--	Qvt	35	Qvt	0	35	Qva	35	C	30	60	1	--	--	L	10/11/1989	30				
090-043	8/1/1988	T30N/R06E-20G02	D	RR/5 ac	387	ND	110	90	5	Y	90	Qvt	71	Qvt	0	71	Qva	71	C	20	0	2	--	--	L	8/1/1988	52				
090-045	1/18/1979	T30N/R06E-20F01	D	RR/5 ac	403	AR	90	90	6	N	--	Qvt	76	Qvt	0	76	Qva	76	C	13	6	2	130	--	L	1/18/1979	37				
090-046	9/14/1985	T30N/R06E-20C02	D	RR/5 ac	394	CT	94	94	6	N	--	Qvt	85	Qvt	0	85	Qva	85	C	20	5	1	240	--	L	9/14/1985	67				
090-047	9/13/1999	T30N/R06E-20C03	D	RR/5 ac	400	AR	85	75	4	Y	75	Qvt	81	Qvt	0	81	Qva	81	C	12	5	2	40	350	L	9/13/1999	53				
090-048	12/20/1999	T30N/R06E-20C04	D	RR/5 ac	397	AR	110	100	4	Y	100	Qvt	100	Qvt	0	100	Qva	100	C	20	0	2	--	--	L	12/20/1999	60				
090-049	10/30/1987	T30N/R06E-20F02	D	RR/5 ac	397	AR	93	93	6	N	--	Qvt	80	Qvt	0	80	Qva	80	C	30	9	1	--	--	L	10/30/1987	65				
090-054	1/23/1990	T30N/R06E-20F03	D	RR/5 ac	403	AR	100	100	6	N	--	Qvt	95	Qvt	0	95	Qva	95	C	25	80	--	--	--	L	1/23/1990	61	7/29/1992	66		
090-057	7/24/1991	T30N/R06E-20J03	D	RR/5 ac	354	AR	60	60	6	N	--	Qvt	56	Qvt	0	56	Qva	56	C	40	60	1	--	--	L	7/24/1991	13				
090-058	11/11/1991	T30N/R06E-20J04	D	RR/5 ac	354	AR	55	55	6	N	--	Qvt	30	Qvt	0	30	Qva	30	C	30	50	1	40	--	L	11/11/1991	14				
090-059	11/11/1991	T30N/R06E-20J05	D	RR/5 ac	354	AR	35	35	6	N	--	Qvt	30	Qvt	0	30	Qva	30	C	30	50	1	--	--	L	11/11/1991	14				
090-062	10/21/1986	T30N/R06E-20G03	D	RR/5 ac	387	CT	91	91	6	N	--	Qvt	64	Qvt	0	64	Qva	64	C	20	10	1	120	--	L	10/21/1986	50				
090-066	5/26/1989	T30N/R06E-20P01	D	RR/5 ac	387	AR	80	80	6	N	--	Qvt	62	Qvt	0	62	Qva	62	C	15	62	1	--	--	L	5/26/1989	21				
090-067	7/10/1986	T30N/R06E-20J06	D	RR/5 ac	341	AR	50	50	6	N	--	Qvt	46	Qvt	0	46	Qva	46	C	30	--	--	--	--	L	7/10/1986	6				
090-072	10/29/1994	T30N/R06E-20Q02	D	RR/5 ac	377	AR	99	98	6	N	--	Qvt	75	Qvt	0	75	Qva	75	C	20	85	1	--	--	L	10/29/1994	50				
090-079	10/1/1974	T30N/R06E-20L02	D	RR/5 ac	390	CT	75	73	6	Y	72	Qvt	62	Qvt	0	62	Qva	62	C	20	10	1	70	220	L	10/1/1974	50				
090-081	2/24/1983	T30N/R06E-20Q03	D	RR/5 ac	371	CT	80	80	6	N	--	Qvt	74	Qvt	0	74	Qva	74	C	20	80	1	--	--	L	2/24/1983	40				
090-085	1/16/1995	T30N/R06E-20M01	D	RR/5 ac	384	AR	115	101	4	Y	101	Qvt	98	Qvt	0	98	Qva	98	C	14	12	1	14	140	L	1/16/1995	61				
090-088	6/26/1997	T30N/R06E-21A01	D	RR/5 ac	276	AR	59	57.5	6	N	--	Qvt	44	Qvt	0	44	Qva	44	C	10	54	2	11	--	L	6/26/1997	0				
090-092	4/23/1991	T30N/R06E-21C01	D	RR/5 ac	371	CT	108	108	6	N	--	Qvt	105	Qvt	0	105	Qva	105	C	30	0	1	--	--	L	4/23/1991	12				
090-093	12/7/1987	T30N/R06E-21H01	D	RR/5 ac	321	AR	127	127	6	N	--	Qvt	96	Qvt	0	96	Qva	96	C	5	62	2	5	--	L	12/7/1987	55				
090-094	2/23/1989	T30N/R06E-21H02	D	RR/5 ac	325	AR	140	140	6	N	--	Qvt	120	Qvt	0	120	Qva	120	C	40	40	2	60	--	L	2/23/1989	30				
090-095	11/23/1987	T30N/R06E-21H03	D	RR/5 ac	295	AR	87	81	6	Y	81	Qvt	79	Qvt	0	79	Qva	79	C	12	50	--	--	--	L	11/23/1987	25	8/24/1992	5		
090-097	7/22/1993	T30N/R06E-21G02	D	RR/5 ac	364	CT	115	115	6	N	--	Qvt	110	Qvt	0	110	Qva	110	C	15	30	1	30	--	L	7/22/1993	62				
090-099	11/15/1993	T30N/R06E-21E01	D	RR/5 ac	377	CT	114	89	8	Y	89	Qvt	109	Qvt	0	109	Qva	109	C	90	7	1	70	1,750	L	11/15/1993	32				
090-100	7/22/1992	T30N/R06E-21G03	D	RR/5 ac	348	AR	122	112	4.5	Y	112	Qvt	117	Qvt	0	117	Qva	117	C	7	64	3	1	10	L	7/22/1992	20				
090-102	8/7/1991	T30N/R06E-21G04	D	RR/5 ac	348	CT	128	123	6	Y	123	Qvt	118	Qvt	0	118	Qva	118	C	10	96	4	2	10	L	8/7/1991	25				
091-001	10/18/1994	T30N/R06E-21G05	D	RR/5 ac	335	AR	70	60	4	Y	60	Qvt	62	Qvt	0	62	Qva	62	C	8	7	2	15	150	L	10/18/1994	23	8/21/2002	22		
091-002	4/1/2000	T30N/R06E-21G06	D	RR/5 ac	344	AR	155	135	6	Y	135	Qvt	140	Qvt	0	140	Qva	140	C	5	0	4	--	--	L	4/1/2000	100				
091-003	2/8/1988	T30N/R06E-21E02	D	RR/5 ac	358	CT	69	69	6	N	--	Qvt	58	Qvt	0	58	Qva	58	C	12	10	1	70	--	L	2/8/1988	30				
091-004	2/27/1988	T30N/R06E-21E03	D	RR/5 ac	358	CT	73	73	6	N	--	Qvt	58	Qvt	0	58	Qva	58	C	11	39	1	17	--	L	2/27/1988	28				
091-007	9/11/1998	T30N/R06E-21H04	D	RR/5 ac	325	AR	145	145	6	N	--	Qvt	137	Qvt	0	137	Qva	137	C	20	145	1.5	--	--	L	9/11/1998	39				
091-009	7/14/1987	T30N/R06E-21D01	D	RR/5 ac	380	CT	101	101	6	N	--	Qvt	96	Qvt	0	96	Qva	96	C	20	10	1	120	--	L	7/14/1987	49				
091-012	9/23/1983	T30N/R06E-21D02	D	RR/5 ac	387	CT	86	86	6	N	--	Qvt	79	Qvt	0	79	Qva	79	C	15	20	1	50	--	L	9/23/1983	43				
091-014	8/16/1988	T30N/R06E-21F01	D	RR/5 ac	371	AR	139	139	6	N	--	Qvt	134	Qvt	0	134	Qva	134	C	5	134	--	--	--	L	8/16/1988	34	8/25/1992	73		
091-017	8/27/1997	T30N/R06E-21K02	D	RR/5 ac	348	AR	99	94	6	Y	94	Qvt	94	Qvt	0	94	Qva	94	C	45	95	1.5	--	--	L	8/27/1997	57				
091-022	7/2/1990	T30N/R06E-21J01	D	RR/5 ac	321	AR	140	135	6	Y	135	Qvt	134	Qvt	0	134	Qva	134	C	45	130	1	--	--	L	7/2/1990	56				
091-023	11/3/1988	T30N/R06E-21J02	D	RR/5 ac	321	AR	93	93	6	N	--	Qvt	84	Qvt	0	84	Qva	84	C	30	62	1	--	--	L	11/3/1988	50				
091-024	11/23/1987	T30N/R06E-21M01	D	RR/5 ac	348	AR	70	70	6	N	--	Qvt	58	Qvt	0	58	Qva	58	C	20	30	--	--	--	L	11/23/1987	24				
091-025	12/17/1988	T30N/R06E-21R02	D	RR/5 ac	318	ND	140	135	6	Y	135	Qvt	120	Qvt	0	120	Qva	120	C	20	64	1	5	30	L	12/17/1988	56				
091-027	10/14/1981	T30N/R06E-22M01	D	RR/5 ac	256	AR	98	98	6	N	--	Qal	12	Qvt	12	70	Qva	70	C	60	15	--	240	--	H	10/14/1981	0				
091-028	5/26/1999	T30N/R06E-21J03	D	RR/5 ac	328	AR	65	61.5	6	Y	61	Qvt	55	Qvt	0	55	Qva	55	C	25	15	1.5	--	--	L	5/26/1999	42				
091-029	8/19/1979	T30N/R06E-21R03	D	RR/5 ac	312	AR	155	150	6	Y	150	Qvt	141	Qvt	0	141	Qva	141	C	20	36	1	11	50	L	8/19/1979	39				
091-030	7/14/1992	T30N/R06E-21N01	D	RR/5 ac	321	AR	60	60	6	N	--	Qvt	48	Qvt	0	48	Qva	48	C	50	60	1	--	--	L	7/14/1992	0				
091-032	3/11/1997	T30N/R06E-21R04	D	RR/5 ac	312	AR	122	102	6	Y	102	Qvt	110	Qvt	0	110	Qva	110	C	5	35	5	1	14	L	3/11/1997	37				
091-034	4/22/1997	T30N/R06E-21R05	D	RR/5 ac	305	AR	108	88	6	Y	88	Qvt	100	Qvt	0	100	Qva	100	C	5	40	5	0.6	12	L	4/22/1997	40				
091-035	5/6/1997	T30N/R06E-21R06	D	RR/5 ac	305	AR	130	110	6	Y	110	Qvt	115	Qvt	0	115	Qva	115	C	5	20	4	1	30	L	5/6/1997	80				
091-037	11/30/1988	T30N/R06E-28A01	D	RR/5 ac	282	AR	120	115	6	Y	115	Qvt	100	Qvt	0	100	Qva	100	C	60	120	1	--	--	L	11/30/1988	0				
091-038	1/7/1989	T30N/R06E-28B02	D	RR/5 ac	308	CT	163	157	6	Y	157	Qvt	141	Qvt	0	141	Qva	141	C	12	68	1	3	13	L	1/7/1988	50	7/30/1992	52		
091-039	4/26/1974	T30N/R06E-21R07	D	RR/5 ac	305	CT	130	125	6	N	--	Qvt	126	Qvt	0	126	Qva	126	C	40	25	1	100	--	L	4/26/1974	50				
091-040	9/29/1987	T30N/R06E-21R08	D	RR/5 ac	315	AR	152	152	6	N	--	Qvt	140	Qvt	0	140	Qva	140	C	60	--	--	--	--	L	9/29/1987	40				
091-042	6/28/1986	T30N/R06E-21Q01	D	RR/5 ac	331	AR	125	120	6	Y	120	Qvt	120	Qvt	0	120	Qva	120	C	40	--	--	--	--	L	6/28/1986	40				
091-043	7/3/1996	T30N/R06E-21L01	D	RR/5 ac	364	CT	141	135	6	Y	135	Qvt	88	Qvt	0	88	Qva	88	C	20	10	1	50	240	L	7/3/1996	75				
091-044	10/27/1994	T30N/R06E-21L02	D	RR/5 ac	364	CT	95	89	6	Y	89	Qvt	88	Qvt	0	88	Qva	88	C	4	38	1	1	7	L	10/27/1994	51				
091-046	4/16/1981	T30N/R06E-21M02	D	RR/5 ac	351	CT	75	75	6	N	--	Qvt	66	Qvt	0	66	Qva	66	C	25	20	1	80	--	L	4/16/1981	14				
091-047	10/29/1991	T30N/R06E-21N02	D	RR/5 ac	321	AR	117	117	6	N	--	Qvt	67	Qvt	0	67	Qva	67	C	16	115	1	--	--	L	10/29/1991	56				
091-048	8/10/1995	T30N/R06E-21Q02	D	RR/5 ac	331	AR	134	132	6	N	--	Qvt	110	Qvt	0	110	Qva	110	C	60	130	2	--	--	L	8/10/1995	68				
091-049	7/15/1995	T30N/R06E-21L03	D	RR/5 ac	364	AR	134	129	6	N	--	Qvt	118	Qvt	0	118	Qva	118	C	20	130	1	--	--	L	7/15/1995	73				
091-050	4/4/1989	T30N/R06E-28C02	D	RR/5 ac	312	AR	109	109	6	N	--	Qvt	98	Qvt	0	98	Qva	98	C	10	31	2	20	--	L	4/4/1989	67				
169-067	5/9/2001	T30N/R06E-22N03	D	RR/5 ac	256	AR	60	55	6	Y	55	Qal	15	Qvt	15	51	Qva	51	C	35	27	1.5	--	--	H	5/9/2001	5				
091-086	2/2/1993	T30N/R06E-22D01	D	RR/5 ac	335	CT	130	125	6	Y	125	Qvt	124	Qvt	0	124	Qva	12	C	13	57	1	4	18	L	2/2/1993	55				
091-088	11/22/1989	T30N/R06E-22F02	D	RR/5 ac	295	AR	95	95	6	N	--	Qvt	18	Qvt	18	85	Qva	85	C	25	90	1	--	--	L	11/22/1989	14				

Appendix A.
Table A-1. Well Details and Water Levels.

SnoCo ID	Completion Date	Legal	Well Type	Land Use	Elevation	Drilling Method	Well Details: Drill Depth (ft)	Casing Depth (ft)	Casing Diameter (in)	Screen (Y or N)	Screen Top Depth (ft)	Surface: Geologic Unit	Unit Bottom (ft)	Confining: Geologic Unit	Unit Top (ft)	Unit Bottom (ft)	Aquifer: Geologic Unit	Unit Top (ft)	Confined Unconfined	Aquifer Properties: Yield (gpm)	Drawdown (ft)	Time (hr)	Conductivity (K) (ft/d)	Transmissivity (T) (ft^2/d)	USGS Aquifer Sensitivity	Water Level Data: Date	Depth to Water (ft)	Date	Depth to Water (ft)	Date	Depth to Water (ft)
091-090	4/6/1990	T30N/R06E-22N04	D	RR/5 ac	256	AR	80	80	6	Y	58	Qvr	13	Qvt	13	66	Qva	66	C	3	1	--	--	--	M	4/6/1990	8				
091-097	4/19/1989	T30N/R06E-22E02	D	RR/5 ac	272	AR	68	63	6	Y	63	Qal	55	Qvt	55	63	Qva	63	C	30	--	--	--	--	H	4/19/1989	0				
091-098	7/7/1986	T30N/R06E-21K03	D	RR/5 ac	341	CT	159	159	6	N	--	Qvt	96	Qvt	0	96	Qva	96	C	10	67	1	9	--	L	7/8/1986	63				
091-100	7/24/1985	T30N/R06E-22N05	D	RR/5 ac	259	AR	128	128	6	N	--	Qal	125	Qvt	0	125	Qva	125	C	30	30	--	--	--	H	7/24/1985	1				
092-003	11/6/1981	T30N/R06E-22L01	D	RR/5 ac	259	AR	110	110	6	N	--	Qvr	23	Qvt	23	105	Qva	105	C	15	--	--	--	--	M	11/6/1981	0				
092-014	9/3/1986	T29N/R06E-30C01	D	UHDR12-24	305	AR	85	84	6	N	--	Qvt	83	Qvt	0	83	Qva	83	C	15	--	--	--	--	L	9/3/1986	0				
092-015	1/19/1987	T30N/R06E-22N06	D	RR/5 ac	253	CT	77	72	6	Y	72	Qvt	61	Qvt	0	61	Qva	61	C	30	10	2	80	400	M	1/19/1987	1	8/4/1992	4		
092-016	9/2/1993	T30N/R06E-22N07	D	RR/5 ac	253	AR	67	62	6	Y	62	Qal	18	Qvt	18	55	Qva	55	C	8	65	1	--	--	H	9/2/1993	20	8/20/2002	5		
092-020	1/14/1995	T29N/R05E-23F01	D	UCOM	121	AR	40	39	6	N	--	Qvt	21	Qvt	0	21	Qva	21	C	25	38	1	--	--	L	1/14/1995	12				
092-021	3/14/1988	T30N/R06E-22N08	D	RR/5 ac	266	CT	123	120	6	Y	120	Qal	25	Qvt	25	115	Qva	115	C	60	100	0.5	--	--	M	3/14/1988	Artesia				
092-023	4/16/1995	T29N/R05E-23F02	D	UCOM	108	AR	40	39	6	N	--	Qvt	39	Qvt	0	39	Qva	39	C	25	38	1	--	--	L	4/16/1995	12				
092-024	4/16/1995	T29N/R05E-23F03	D	UCOM	108	AR	40	39	6	N	--	Qvt	39	Qvt	0	39	Qva	39	C	25	38	1	--	--	L	4/16/1995	12				
092-027	2/12/1986	T30N/R06E-23E05	D	LCF	276	ND	76	67	6	Y	67	Qvr	6	Qvt	6	65	Qva	65	C	11	32	1	6	30	M	2/12/1986	17				
092-033	4/8/1993	T30N/R06E-23C01	D	RR/5 ac	285	CT	56	50	6	Y	50	Qvr	34	Qvt	34	53	Qva	53	C	7	20	1	6	30	M	4/8/1993	24				
092-042	12/23/1993	T30N/R06E-23C02	D	RR/5 ac	282	AR	59	57	6	N	--	Qvr	8	Qvt	8	55	Qva	55	C	9	57	1	--	--	M	12/23/1993	20				
092-047	10/28/1981	T30N/R06E-22J02	D	RR/5 ac	246	AR	126	123	6	N	--	Qvr	13	Qvt	13	105	Qva	105	C	50	76	1	--	--	M	10/28/1981	4				
092-077	8/16/1989	T30N/R06E-28F01	D	RR/5 ac	282	AR	120	120	6	N	--	Qvt	65	Qvt	0	65	Qva	65	C	30	100	1	--	--	L	4/10/1998	18				
092-108	9/14/1998	T30N/R06E-28A02	D	RR/5 ac	239	AR	106	100.4	6	Y	100.4	Qal	10	Qvr	10	95	Qvt	95	C	4	97	1	--	--	H	9/14/1998	7				
093-001	12/4/1985	T29N/R05E-12B01	D	ULDR6-LKST	361	CT	126	121	6	Y	121	Qvt	114	Qvt	0	114	Qva	114	C	20	8	1	60	300	L	12/4/1985	60				
093-007	10/11/1991	T30N/R06E-28A03	D	RR/5 ac	249	AR	108	100	6	Y	100	Qvr	18	Qvt	18	100	Qva	100	C	10	95	1	--	--	M	10/11/1991	53				
093-011	8/5/1981	T30N/R06E-28B03	D	RR/5 ac	302	AR	127	120.8	6	N	--	Qvt	100	Qvt	0	100	Qva	100	C	10	--	--	--	--	L	8/5/1981	40				
093-012	10/25/1978	T30N/R06E-28B04	D	RR/5 ac	302	CT	164	164	6	N	--	Qvt	ND	Qvt	0	ND	Qva	ND	C	20	8	1	150	--	L	10/26/1978	46	7/27/1992	49		
093-015	11/3/1989	T30N/R06E-28K01	D	RR/5 ac	253	CT	107	97	6	Y	97	Qvr	12	Qvt	12	97	Qva	97	C	4	82	2	0.6	3	M	11/3/1989	15	7/17/1992	22		
093-016	8/14/1981	T30N/R06E-28G01	D	RR/5 ac	289	AR	137	136	6	N	--	Qvt	93	Qvt	0	93	Qva	93	C	12	83	1	--	--	L	8/14/1981	44				
093-020	11/13/1980	T29N/R05E-24D01	D	ULDR6-LKST	351	AR	61.5	61.5	6	N	--	Qvt	58	Qvt	0	58	Qva	58	C	7	--	--	--	--	L	11/13/1980	31				
093-021	11/20/1980	T30N/R06E-28C03	D	RR/5 ac	308	CT	72	72	6	N	--	Qvt	68	Qvt	0	68	Qva	68	C	10	--	--	--	--	L	11/20/1980	50				
093-022	11/20/1980	T30N/R06E-28C04	D	RR/5 ac	308	CT	72	72	6	N	--	Qvt	68	Qvt	0	68	Qva	68	C	10	22	1	30	--	L	11/20/1980	50				
093-025	11/21/1990	T30N/R06E-28C05	D	RR/5 ac	298	AR	82	82	6	N	--	Qvt	78	Qvt	0	78	Qva	78	C	7	80	1	--	--	L	11/21/1990	52				
093-029	3/11/1986	T30N/R06E-28F02	D	RR/5 ac	282	AR	140	140	6	N	--	Qvt	100	Qvt	0	100	Qva	100	C	15	80	1	11	--	L	3/11/1986	25	9/5/2002	30		
093-037	5/10/1999	T30N/R06E-28B05	D	RR/5 ac	289	AR	100	100	6	N	--	Qvt	50	Qvt	0	50	Qva	50	C	15	--	2	--	--	L	5/10/1999	33				
155-018	2/28/2001	T30N/R06E-28P01	D	RR/5 ac	239	AR	100	100	6	N	--	Qvt	75	Qvt	0	62	Qva	75	C	100	0	2	--	--	M	2/28/2001	Artesia				
093-041	9/16/1993	T30N/R06E-28B06	D	RR/5 ac	315	AR	149	149	6	N	--	Qvt	145	Qvt	0	145	Qva	145	C	20	82	1	--	--	L	9/16/1993	58				
093-043	3/27/1990	T30N/R06E-28R02	D	RR/5 ac	233	AR	40	35	6	Y	35	Qal	18	Qvt	18	27	Qva	27	C	30	40	1	--	--	H	3/22/1990	5				
093-044	9/8/1984	T30N/R06E-28F03	D	RR/5 ac	256	AR	140	140	6	N	--	Qvt	125	Qvt	0	125	Qva	125	C	10	1	1	610	--	L	9/8/1984	130				
093-045	8/8/1980	T30N/R06E-28K02	D	RR/5 ac	243	AR	87	81	6	Y	82	Qvr	3	Qvt	3	75	Qva	75	C	25	80	1	--	--	M	8/8/1980	0				
093-046	7/12/1990	T30N/R06E-28L01	D	RR/5 ac	249	AR	60	56	6	N	--	Qvt	56	Qvt	0	56	Qva	56	C	5	60	1	--	--	L	7/12/1990	0				
093-051	2/14/1988	T30N/R06E-28G02	D	RR/5 ac	272	CT	93	93	6	N	--	Qvr	13	Qvt	13	83	Qva	83	C	12	50	1	15	--	L	2/14/1988	25				
093-056	8/9/1980	T30N/R06E-28N01	D	RR/5 ac	259	CT	72	66	6	Y	66	Qvt	30	Qvt	30	68	Qva	68	C	12	36	2	7	30	L	8/9/1980	23				
093-057	8/15/1989	T30N/R06E-28L02	D	RR/5 ac	249	AR	120	120	6	N	--	Qvt	17	Qvt	17	110	Qva	110	C	30	120	1	--	--	L	8/15/1989	0				
093-058	5/30/1996	T30N/R06E-28N02	D	RR/5 ac	256	AR	120	120	6	N	--	Qvt	38	Qvt	38	115	Qva	115	C	60	120	1	--	--	L	5/30/1996	10				
093-059	7/10/1996	T30N/R06E-28L03	D	RR/5 ac	253	AR	60	60	55	Y	55	Qvt	48	Qvt	0	48	Qva	48	C	--	--	--	--	--	L	07/10/96	0				
093-061	5/11/1994	T30N/R06E-28N03	D	RR/5 ac	233	AR	100	100	6	N	--	Qvt	72	Qvt	0	72	Qva	72	C	250	100	1	--	--	L	5/11/1994	0				
093-062	7/25/1995	T30N/R06E-28N04	D	RR/5 ac	256	AR	96	96	6	N	--	Qvt	92	Qvt	0	92	Qva	92	C	60	95	2	--	--	L	7/25/1995	0				
093-064	9/10/1980	T30N/R06E-28N05	D	RR/5 ac	233	CT	81	81	6	N	--	Qvt	80	Qvt	0	80	Qva	80	C	7	68	4	6	--	L	9/10/1980	0				
093-066	6/1/1982	T30N/R06E-29G01	D	RR/5 ac	344	AR	62	62	6	N	--	Qvt	56	Qvt	0	56	Qva	56	C	15	2	2	460	--	L	6/1/1982	7				
093-067	10/18/1991	T30N/R06E-29B02	D	RR/5 ac	354	AR	67	67	6	N	--	Qvt	55	Qvt	0	55	Qva	55	C	30	60	1	--	--	L	10/18/1991	39				
093-068	11/20/1990	T30N/R06E-29A02	D	RR/5 ac	318	AR	42	40	6	N	--	Qvt	28	Qvt	0	28	Qva	28	C	50	40	1	--	--	L	11/20/1990	0				
093-072	7/1/1986	T30N/R06E-29H01	D	RR/5 ac	328	AR	45	45	6	N	--	Qvt	38	Qvt	0	38	Qva	38	C	50	12	1	--	--	L	7/1/1986	8	8/21/2002	7		
093-073	10/7/1985	T30N/R06E-29H02	D	RR/5 ac	318	AR	58	58	6	N	--	Qvt	38	Qvt	0	38	Qva	38	C	50	--	0.5	--	--	L	10/7/1985	5				
093-077	2/10/1983	T30N/R06E-20B06	D	RR/5 ac	384	CT	54	54	6	N	--	Qvt	18	Qvt	0	18	Qva	18	C	30	37	1	50	--	L	2/10/1983	2				
093-078	4/28/1980	T30N/R06E-29L01	D	RR/5 ac	312	AR	70	65	6	Y	65	Qvt	54	Qvt	0	54	Qva	54	C	50	60	1	--	--	L	4/28/1980	2	7/28/1992	9		
093-079	10/15/1980	T30N/R06E-28N06	D	RR/5 ac	239	AR	114	112	6	N	--	Qvt	99	Qvt	0	99	Qva	99	C	15	100	1	--	--	L	10/15/1980	10	7/28/1992	8		
093-081	11/27/1989	T30N/R06E-29M01	D	RR/5 ac	371	AR	78.5	78.5	6	N	--	Qvt	74	Qvt	0	74	Qva	74	C	30	79	1	--	--	L	11/27/1989	52				
093-088	4/4/1989	T29N/R06E-04K06	D	RR/5 ac	295	AR	109	109	6	N	--	Qvt	98	Qvt	0	98	Qva	98	C	10	104	--	--	--	L	4/4/1989	67				
093-091	5/23/1980	T30N/R06E-30J01	D	RR/5 ac	403	AR	69	68	6	N	--	Qvr	3	Qvt	3	60	Qva	60	C	15	14	1	--	--	M	5/23/1980	55				
093-095	10/5/1987	T30N/R06E-32D02	D	RR/5 ac	358	AR	80	80	6	N	--	Qvt	68	Qvt	0	68	Qva	68	C	30	15	--	--	--	L	10/5/1987	55				
093-097	8/29/1994	T30N/R06E-30R01	D	RR/5 ac	387	AR	80	80	6	N	--	Qvt	75	Qvt	0	75	Qva	75	C	20	80	1	--	--	L	8/29/1994	53				
093-098	8/18/1998	T30N/R06E-30R02	D	RR/5 ac	390	AR	108	98	4	Y	98	Qvt	50	Qvt	50	98	Qva	98	C	7	4	1	20	230	M	8/18/1998	62				
093-099	4/1/1982	T30N/R06E-30Q01	D	RR/5 ac	361	AR	82	82	6	N	--	Qvt	62	Qvt	0	62	Qva	62	C	50	40	--	--	--	L	4/1/1982	20				
093-100	7/1/1987	T30N/R06E-30P01	D	RR/5 ac	344	AR	58	58	6	N	--	Qvt	35	Qvt	0	35	Qva	35	C	60	--	--	--	--	L	6/25/1987	4	7/29/1992	6	3/12/2003	7
093-101	3/10/1992	T30N/R06E-30P02	D	RR/5 ac	344	AR	60	55	6	Y	55	Qvt	54	Qvt	0	54	Qva	54	C	25	55	1	--	--	L	3/10/1992	20				
093-102	1/10/1984	T30N/R06E-31D01	D	RR/5 ac	321	AR	120	120	6	N	--	Qal	22	Qvt	22	116	Qva	116	C	10	99	1	6	--	H	1/10/1984	11				
093-104	6/19/1980	T30N/R06E-31B01	D	RR/5 ac	348	AR	58	53	6	Y	53	Qvt	41	Qvt	0	41	Qva	41	C	13	40	1	--	--	L	6/19/1980	18	3/12/2003	20		
094-001	9/5/1990	T30N/R06E-31B02	D	RR/5 ac	361	AR	60	50	4.5	Y	50	Qvt	53	Qvt	0	53	Qva	53	C	12	3	2	60	600	L	9/5/1990	23	7/16/1992	28	3/13/2003	31
094-003	3/8/1990	T30N/R06E-31E01	D	RR/5 ac	331	CT	58	53	6	Y	53	Qvt	53	Qvt	0	53	Qva	53	C	20	43	1	9	40	L	3/8/1990	0				
094-007	7/17/1979	T30N/R06E-30P03	D	RR/5 ac	321	CT	36	32	6	Y	32	Qal	8	Qvt	8	31	Qva	31	C	8	2	1	80	400	H	7/17/1979	0				
094-008	8/9/1993	T30N/R06E-31C01	D	RR/5 ac	321	AR	40	40	4	Y	30	Qal	9	Qvt	9	32	Qva	32	C	20	10	2	30	290	H	8/9/1993	1				
094-010	3/2/2000	T30N/R06E-31C02	D	RR/5 ac	321	AR	30	25	6	Y	25	Qal	7	Qvt	7	22	Qva	22	C	5	16	1	5	30	H	3/2/2000	9				
094-014	6/5/1976	T30N/R06E-31F01	D	RR/5 ac	318	ND	65	65	6	N	--	Qal	16	Qvt	16	47	Qva	47	C	20	10	1.3	120	--	H	6/4/1976	8				
094-015	9/23/1980	T30N/R06E-31E02	D	RR/5 ac	377	AR	88	83	6	Y	83	Qvt	79	Qvt	0	79	Qva	79	C	12	17	1	14	70	L	9/23/1980	55				
094-018	7/11/1995	T30N/R06E-31J04	D	RR/5 ac	325	CT	105	100	6	Y	100	Qvt	100	Qvt	0	100	Qva	100	C	10	63	1	2	12	L	7/11/1995	12				
094-021	4/1/1993	T30N/R06E-31J05	D	RR/5 ac	331	AR	130	125	6	Y	125	Qvt	110	Qvt	0	110	Qva	110	C	15	25	2	13	70	L	4/1/1993	40				
094-023	10/26/1993	T30N/R06E-31R02	D	RR/5 ac	321	CT	147	147	6	Y	143	Qvt	130	Qvt	0	130	Qva	130	C	15	20	1	19	80	L	10/26/1993	100				
094-027	5/10/1999	T30N/R06E-32Q01	D	RR/5 ac	272	AR	144	144	6	N	--	Qvt	130	Qvt	0	130	Qva	130	C	10	25	2	20	--	L	5/10/1999	49				
094-029	7/7/1983	T30N/R06E-20P02	D	RR/5 ac	384	CT	80	80	6	N	--	Qvt	41	Qvt	0	71	Qva	71	C	15	0	1	--	--	L	7/7/1983	65				
094-031	11/2/1989	T30N/R06E-32G01	D	RR/5 ac	295	AR	140	135	6	Y	135	Qvt	131	Qvt	0	131	Qva	131	C	20	135	1	--	--	L	11/2/1989	30	7/6/1992	26		
094-035	4/17/1978	T30N/R06E-32C01	D	RR/5 ac	331	AR	60	60	6	N	--	Qvt	40	Qvt	0	40	Qva	40	C	50	14	--	220	--	L	4/17/1978	32				
094-036	10/6/1997	T29N/R06E-17B02	D	U	256	AR	151	151	4	Y	141	Qvt	141	Qvt	0	141	Qva	141	C	5	35	2	1.4	14	L	10/6/1997	4				
094-039	12/12/1989	T30N/R06E-32E01	D	RR/5 ac	358	AR	66	66	6	N	--	Qvt	62	Qvt	0	62	Qva	62	C	13	60	1	--	--	L	12/12/1989	38				
094-041	6/14/1977	T30N/R06E-32D03	D	RR/5 ac	374	CT	76	76	6	N	--	Qvt	65	Qvt	0	65	Qva	65	C	10	12	1	50	--	L	6/14/1977	40	8/26/2002	43		
094-043	11/2/1978	T30N/R06E-31J06	D	RR/5 ac	335	AR	114	114	6	N	--	Qvt	114	Qvt	0	114	Qva	114	C	7	80	1	5	--	L	11/2/1978	21	7/15/1992	38		
094-044	4/10/1981	T30N/R06E-32E02	D	RR/5 ac	338	AR	209	50	6	N	--	Qvt	38	Qvt	0	38	Qva	38	C	20	--	--	--	--	L	4/10/1981	17	7/9/1992	24		
094-054	7/19/1976	T30N/R06E-32R02	D	RR/5 ac	256	CT	79	74	6	Y	74	Qvt	65	Qvt	0	65	Qva	65	C	20	10	1	50	240	L	7/19/1976	52				
094-055	3/25/1983	T30N/R06E-32L02	D	RR/5 ac	305	AR	82	82	6	N	--	Qvt	75	Qvt	0	75	Qva	75	C	5	10	1	30	--	L	3/25/1983	32				
094-060	2/26/1998	T30N/R06E-32K01	D	RR/5 ac	282	CT	86	79	6	Y	81	Qvt	63	Qvt	0	63	Qva	63	C	6	45	1	2	9	L	2/26/1998	14				
094-061	11/28/1983	T30N/R06E-32Q02	D	RR/5 ac	289	CT	95	86	6	ND	86	Qvt	82	Qvt	0	82	Qva	82	C	12	38	1	5	30	L	11/28/1983	10				
094-064	5/4/1986	T30N/R06E-32Q03	D	RR/5 ac	289	CT	105	95	6	Y	95	Qvt	90	Qvt	0	90	Qva	90	C	30	37	2	20	90	L	5/4/1986	7				
094-066	1/16/1995	T30N/R06E-32Q04	D	RR/5 ac	272	AR	115	100	6	N	--	Qvt	94	Qvt	0	94	Qva	94	C	60	100	1	--	--	L	1/16/1995	30				
094-069	8/7/1989	T30N/R06E-32N04	D	RR/5 ac	328	AR	119	119	6	N	--	Qvt	105	Qvt	0	105	Qva	105	C	10	--	--	--	--	L	8/7/1989	63				
094-075	10/14/1980	T30N/R06E-32P01	D	RR/5 ac	292	AR	57	52	6	Y	52	Qvt	45	Qvt	0	45	Qva	45	C	10	15	1	13	70	L	10/14/1980	8				
094-076	6/12/1983	T30N/R06E-32P02	D	RR/5 ac	292	CT	64	59	6	Y	59	Qvt	45	Qvt	0	45	Qva	45	C	18	39	2	10	50	L	6/12/1983	9				
094-077	8/24/1981	T30N/R06E-32P03	D	RR/5 ac	298	ND	82	75	6	Y	75	Qvt	49	Qvt	0	49	Qva	49	C	16	39	2	14	40	L	8/24/1981	12				
094-079	12/2/1988	T30N/R06E-32N05	D	RR/5 ac	325	CT	91	91	6	N	--	Qvt	73	Qvt	0	73	Qva	73	C	4	54	1	5	--	L	12/2/1988	29				
094-085	8/10/1987	T30N/R05E-01H02	D	RR/5 ac	443	AR	75	75	6	N	--	Qvt	66	Qvt	0	66	Qva	66	C	30	13	--	--	--	L	8/10/1987	52				
094-089	8/16/1991	T30N/R06E-33J01	D	RR/5 ac	318	AR	92	82	6	Y	82	Qvt	86	Qvt	0	86	Qva	86	C	14	0	2	--	--	L	8/16/1991	44				
094-095	11/12/1987	T30N/R06E-33Q02	D	RR/5 ac	335	AR	116	116	6	N	--	Qvt	105	Qvt	0	105	Qva	105	C	40	26	1	--	--	L	11/12/1987	80	7/8/1992	70	9/3/2002	71
094-096	6/28/1974	T30N/R06E-33R02	D	RR/5 ac	374	AR	132	131	6	N	--	Qvt	128	Qvt	0	128	Qva	128	C	10	20	1	30	--	L	6/28/1974	96				
094-099	12/7/1988	T30N/R06E-33Q03	D	RR/5 ac	328	CT	90	85	6	Y	85	Qvt	80	Qvt	0	80	Qva	80	C	9	10	3	20	110	L	12/7/1988	60				
095-002	3/19/1990	T30N/R06E-33N02	D	RR/5 ac	210	AR	98	98	6	N	--	Qvt	71	Qvt	0	71	Qva	71	C	75	92	0.5	--	--	L	3/19/1990	16				
095-003	5/25/1990	T30N/R06E-33P01	D	RR/5 ac	210	AR	58	58	6	N	--	Qal	2	Qvt	2	50	Qva	50	C	40	50	0.5	--	--	H	5/25/1990	16				
095-007	6/7/1989	T30N/R06E-34M02	D	RR/5 ac	233	AR	161	158	6	Y	15	Qvr	21	Qvt	21	114	Qva	114	C	10	1	0.5	--	1,100	M	6/7/1989	4				
095-024	12/18/1980	T30N/R06E-34N03	D	RR/5 ac	361	AR	131	129	6	N	--	Qvt	121	Qvt	0	121	Qva	121	C	12	30	1	--	--	L	1/18/1980	95				
095-077	10/3/1985	T30N/R05E-36D02	D	RR/5 ac	417	AR	160	160	6	N	--	Qvt	150	Qvt	0	150	Qva	150	C	20	12	--	--	--	L	10/3/1985	134	7/7/1992	133		
103-095	7/10/1972	T29N/R06E-06B04	D	RR/5 ac	354	CT	102	94	6	ND	94	Qvt	95	Qvt	0	95	Qva	95	C	12	--	--	--	--	L	7/10/1972	90				
112-043	5/27/1989	T31N/R05E-23P02	D	U	253	AR	80	75	6	Y	75	Qvt	70	Qvt	0	70	Qva	70	C	10	--	--	--	--	L	5/27/1989	52				
112-044	10/12/1987	T31N/R05E-23N01	D	U	154	AR	40	35	6	Y	35	Qvt	18	Qvt	0	18	Qva	18	C	10	13	1.5	16	80	L	10/12/1987	12				
113-008	10/3/1998	T31N/R05E-25P01	D	RR/5 ac	446	AR	85	64	4	Y	64	Qvt	74	Qvt	0	74	Qva	74	C	6	30	2	--	--	L	10/3/1998	44				
113-010	3/15/1999	T31N/R05E-25C01	D	RR/5 ac	436	AR	137	127	4	Y	127	Qvt	134	Qvt	0	134	Qva	134	C	5	3	2	20	230	L	3/15/1999	126				
113-021	10/26/1993	T31N/R06E-31N02	D	RR/5 ac	446	CT	50	45	6	Y	45	Qvt	43	Qvt	0	43	Qva	43	C	10	4	1	60	310	L	10/26/1993	26				
113-022	3/27/1979	T31N/R05E-25F03	D	RR/5 ac	430	AR	80	75	6	Y	75	Qvt	72	Qvt	0	72	Qva	72	C	5	10	1	10	50	L	3/27/1979	65				
113-023	3/20/1980	T31N/R05E-25J04	D	RR/5 ac	508	AR	138	133	6	Y	133	Qvt	130	Qvt	0	130	Qva	130	C	15	33	1	--	--	L	3/20/1980	105	9/3/2002	105		
113-024	2/23/1994	T31N/R05E-25R01	D	RR/5 ac	515	AR	132	132	6	N	--	Qvt	111	Qvt	0	111	Qva	111	C	18	130	1	--	--	L	2/23/1994	107				
113-026	12/6/1996	T31N/R05E-25K01	D	RR/5 ac	456	CT	87	78	6	Y	78	Qvt	87	Qvt	0	87	Qva	87	C	7	32	1	2	17	L	12/6/1996	39				
113-031	7/12/1996	T31N/R05E-25R02	D	RR/5 ac	482	AR	98	98	6	N	--	Qvt	76	Qvt	0	76	Qva	76	C	30	95	1	--	--	L	7/12/1996	65				
113-033	6/25/1981	T31N/R05E-25Q03	D	RR/5 ac	453	CT	91	82	6	Y	82	Qvt	76	Qvt	0	76	Qva	76	C	30	13	2	80	300	L	6/25/1981	45				
113-040	7/10/1990	T31N/R05E-25P02	D	RR/5 ac	436	AR	79	61	4	Y	61	Qvt	52	Qvt	0	52	Qva	52	C	5	15	2	30	30	L	7/10/1990	29				
113-047	1/21/1993	T31N/R05E-26B01	D	RR/5 ac	285	AR	106	101	6	Y	101	Qva	96	Qvt	0	96	Qva	96	C	10	103	1	--	--	M	1/21/1993	86				
113-048	3/11/1992	T31N/R05E-26A02	D	RR/5 ac	380	AR	181	176	6	Y	176	Qvt	95	Qvt	0	95	Qva	95	C	10	176	1	--	--	L	3/11/1992	155	8/24/1992	152		
113-049	10/29/1990	T31N/R05E-26B02	D	RR/5 ac	338	AR	120	115	6	Y	115	Qvt	115	Qvt	0	115	Qva	115	C	15	115	1	--	--	L	10/29/1990	100	9/5/2002	100		
113-065	4/4/1989	T31N/R05E-26D04	D	RR/5 ac	230	AR	60	55	6	Y	55	Qvt	40	Qvt	0	40	Qva	40	C	30	--	--	--	--	L	4/4/1989	35				
113-081	4/14/1992	T31N/R05E-26K02	D	RR/5 ac	364	AR	53	35	4.5	Y	35	Qvt	58	Qvt	0	58	Qva	58	C	10	53	2	2	19	L	4/14/1992	26				
113-082	8/9/1995	T31N/R05E-26J01	D	RR/5 ac	380	AR	64	54	4	Y	54	Qvt	50	Qvt	0	50	Qva	50	C	7	20	2	4	40	L	8/9/1995	12				
115-079	10/31/1984	T31N/R05E-35B01	D	RR/5 ac	328	AR	180	175	6	Y	175	Qvt	130	Qvt	0	130	Qva	130	C	13	--	--	--	--	L	10/31/1984	100				
115-107	1/9/1995	T31N/R05E-35Q04	D	RR/5 ac	325	CT	54	54	6	N	--	Qvt	54	Qvt	0	54	Qva	54	C	13	34	1	20	--	L	1/9/1995	5				
120-057	3/11/1992	T31N/R06E-30K02	D	RR/5 ac	541	AR	107	102	6	N	--	Qvt	100	Qvt	0	100	Qva	100	C	7	105	1	--	--	L	3/11/1992	92				
120-065	7/18/1989	T31N/R06E-30P03	D	RR/5 ac	518	AR	50	45	6	Y	45	Qvt	50	Qvt	0	50	Qva	50	C	10	--	--	--	--	L	7/18/1989	18	8/10/1992	19		
120-082	11/17/1979	T31N/R06E-31F01	D	RR/5 ac	495	AR	143	138	6	N	--	Qvt	135	Qvt	0	135	Qva	135	C	35	--	1	--	--	L	11/17/1979	90				
120-084	5/28/1992	T31N/R06E-31P01	D	RR/5 ac	453	AR	77	74	6	ND	72	Qvt	72	Qvt	0	72	Qva	72	C	20	72	1	--	--	L	5/28/1992	43				
120-086	9/23/1989	T31N/R06E-31E02	D	RR/5 ac	479	AR	94	74	4	Y	74	Qvt	75	Qvt	0	75	Qva	75	C	17	22	6	6	110	L	9/22/1995	58				
120-087	10/6/1995	T31N/R06E-31E03	D	RR/5 ac	479	AR	75	65	4	Y	65	Qvt	--	Qvt	0	--	Qvt	0	C	2	10	1.5	2	20	L	10/6/1995	45				
120-090	10/6/1995	T31N/R06E-31E04	D	RR/5 ac	518	AR	104	84	4	Y	84	Qvt	81	Qvt	0	81	Qva	81	C	17	22	6	6	110	L	10/6/1995	45				
120-091	8/21/1996	T31N/R06E-31E05	D	RR/5 ac	459	AR	102	82	4	Y	82	Qvt	81	Qvt	0	81	Qva	81	C	7	20	1	2	40	L	8/21/1996	57				
120-095	4/9/1980	T30N/R06E-06B04	D	RR/5 ac	492	AR	140	137	6	N	--	Qvt	117	Qvt	0	117	Qva	117	C	15	45	1	20	--	L	4/9/1980	85				
120-097	3/25/1987	T31N/R06E-31Q01	D	RR/5 ac	502	AR	120	115	6	Y	115	Qvt	110	Qvt	0	110	Qva	110	C	15	--	--	--	--	L	3/25/1987	50				
120-105	12/6/1996	T31N/R06E-31P02	D	RR/5 ac	453	AR	200	195	6	Y	195	Qvt	118	Qvt	0	100	Qva	118	C	20	195	1	--	--	L	12/6/1996	161				
121-002	8/30/1982	T31N/R06E-31N03	D	RR/5 ac	443	AR	82	82	6	N	--	Qvt	78	Qvt	0	118	Qva	78	C	8	10	2	50	--	L	8/30/1982	54				
121-059	8/19/1980	T30N/R06E-04D01	D	RR/5 ac	495	AR	99	94	6	Y	94	Qvt	93	Qvt	0	87	Qva	93	C	15	31	1	--	--	L	8/19/1980	58	9/2/1992	33		
155-004	8/2/2001	T30N/R06E-08N01	D	RR/5 ac	420	AR	40	33	6	Y	33	Qvt	--	Qvt	0	39	Qvt	0	C	30	35	1	--	--	L	8/2/2001	13				
155-011	12/14/2001	T30N/R06E-21Q03	D	RR/5 ac	348	AR	120	112	6	Y	--	Qvt	110	Qvt	0	93	Qva	110	C	22	18	1.5	--	--	L	12/14/2001	68				
155-012	2/6/2002	T30N/R06E-08P02	D	RR/5 ac	410	AR	97	91	6	Y	91	Qvt	62	Qvt	0	110	Qva	62	C	18	90	4	--	--	L	2/6/2002	70				
155-015	1/17/2002	T30N/R06E-08Q04	D	RR/5 ac	440	CT	186	176	6	Y	181	Qvt	134	Qvt	0	70	Qva	134	C	20	15	1	20	110	L	1/17/2002	139				
155-017	12/20/2001	T30N/R05E-01B01	D	RR/5 ac	433	AR	79	72.5	6	Y	72.5	Qvt	62	Qvt	0	67	Qva	62	C	5	1	0.5	80	400	L	12/20/2001	40				
056-101	5/8/1996	T29N/R06E-04G02	D	RR/5 ac	305	AR	70	65	6	Y	65	Qvt	59	Qvt	0	59	Qva	59	C	15	60	1	--	--	L	5/8/1996	40				
057-032	6/2/1998	T29N/R06E-05C01	D	RR/5 ac	289	AR	60	50	4	Y	50	Qvt	--	Qvt	0	--	Qvt	0	C	5	20	2	3	30	L	6/2/1998	6				
057-043	3/7/1998	T29N/R06E-05C02	D	RR/5 ac	302	AR	100	90	6	Y	90	Qvt	90	Qvt	0	90	Qva	90	C	5	70	2	0.5	5	L	3/7/1998	15				
057-041	2/12/1998	T29N/R06E-05F03	D	RR/5 ac	305	AR	60	30	6	Y	40	Qal	2	Qvt	2	45	Qva	45	C	3	40	4	0.3	6	H	2/12/1998	6				
084-070	5/8/1998	T30N/R06E-06A02	D	RR/5 ac	485	AR	123	118	6	Y	118	Qvt	105	Qvt	0	105	Qva	105	C	15	120	1.5	--	--	L	5/8/1998	93				
084-089	11/4/1997	T30N/R06E-06K01	D	RR/5 ac	449	AR	100	60	4	Y	63	Qvt	60	Qvt	0	60	Qva	60	C	17	8	2	10	300	L	11/5/1997	42				
085-018	6/8/1998	T30N/R06E-07G01	D	RR/5 ac	433	AR	67	57	4	Y	57	Qvt	61	Qvt	0	61	Qva	61	C	25	2	2	220	2,200	L	6/8/1998	18				
085-019	5/10/1997	T30N/R06E-07F02	D	RR/5 ac	440	AR	85	84	6	N	--	Qvt	77	Qvt	0	77	Qva	77	C	30	83	1	--	--	L	5/10/1997	40				
085-051	11/4/1997	T30N/R06E-08A03	D	RR/5 ac	417	CT	94	89	6	Y	89	Qvt	93	Qvt	0	93	Qva	93	C	7	16	1	8	40	L	11/4/1997	72				
085-080	8/20/1998	T30N/R06E-08E01	D	RR/5 ac	413	CT	131	131	6	N	--	Qvt	128	Qvt	0	128	Qva	128	C	12	9	1	80	--	L	09/11/98	93				
084-018	6/23/1998	T30N/R06E-08F03	D	RR/5 ac	413	AR	140	12.5	6	N	--	Qvt	105	Qvt	0	105	Qva	105	C	30	120	1.5	--	--	L	6/23/1998	84				
085-064	12/19/1997	T30N/R06E-08D02	D	RR/5 ac	413	CT	131	125	6	Y	125	Qvt	130	Qvt	0	130	Qva	130	C	10	20	1	9	50	L	12/19/1997	98				
074-038	2/28/1998	T30N/R05E-12B02	D	RR/5 ac	417	CT	63	58	6	Y	58	Qvt	55	Qvt	0	55	Qva	55	C	10	2	1	100	500	L	2/28/1998	27				
074-060	4/16/1999	T30N/R05E-12Q02	D	RR/5 ac	390	AR	40	38.5	6	N	--	Qvt	35	Qvt	0	35	Qva	35	C	10	37	1	--	--	L	4/16/1999	15				
074-059	8/21/1997	T30N/R05E-12Q03	D	RR/5 ac	390	AR	51	46	6	Y	46	Qvt	38	Qvt	0	38	Qva	38	C	20	50	1.5	--	--	L	8/21/1997	12				
074-066	8/19/1989	T30N/R05E-12K03	D	RR/5 ac	400	AR	106	104	6	N	--	Qvt	98	Qvt	0	98	Qva	98	C	15	102	2	--	--	L	8/19/1998	62				
074-090	5/13/1998	T30N/R05E-13B01	D	RR/5 ac	390	AR	125	115	6	Y	115	Qvt	122	Qvt	0	122	Qva	122	C	16	0	2	--	--	L	5/13/1998	70				
088-039	1/7/1992	T30N/R06E-16Q01	D	RR/5 ac	341	CT	105	105	6	N	--	Qvt	55	Qvt	0	55	Qva	97	C	15	70	1.5	13	--	L	1/7/1992	7				
088-071	10/15/1999	T30N/R06E-17D02	D	RR/5 ac	420	AR	53	48	6	Y	48	Qvt	45	Qvt	0	45	Qva	45	C	20	55	1	6	30	L	10/15/1999	9.8				
088-077	7/25/1995	T30N/R06E-17K02	D	RR/5 ac	397	AR	100	100	6	N	--	Qvt	90	Qvt	0	90	Qva	90	C	20	95	1	--	--	L	7/25/1995	60				
090-014	8/31/1999	T30N/R06E-19P09	D	RR/5 ac	344	AR	114	94	4	Y	94	Qvt	97	Qvt	0	97	Qva	97	C	22	0	2	--	--	L	8/31/1999	15				
093-092	8/11/1999	T30N/R06E-21M03	D	RR/5 ac	354	AR	58	53	6	Y	53	Qvt	56	Qvt	0	56	Qva	56	C	50	21	1	--	--	L	8/11/1999	6				
091-006	11/26/1997	T30N/R06E-21H05	D	RR/5 ac	328	AR	80	80	6	N	--	Qvt	75	Qvt	0	75	Qva	75	C	30	80	1.5	--	--	L	11/26/1997	40.3				
091-018	9/8/1998	T30N/R06E-21F02	D	RR/5 ac	371	AR	120	120	6	N	--	Qvt	110	Qvt	0	110	Qva	110	C	--	--	--	--	--	L	9/8/1998	75				
091-011	12/20/1999	T30N/R06E-21D03	D	RR/5 ac	384	AR	80	78	6	N	--	Qvt	61	Qvt	0	61	Qva	61	C	20	75	1	--	--	L	12/20/1999	51				
091-092	3/18/1999	T30N/R06E-22E03	D	RR/5 ac	272	AR	45	40	6	Y	40	Qvt	36	Qvt	0	36	Qva	36	C	60	20	1	--	--	L	3/18/1999	0				
092-030	2/20/1989	T30N/R06E-23E06	D	RR/5 ac	259	D	46	40	36	Y	40	Qvr	16	Qvt	16	--	Qvt	16	C	40	28	0.6	--	--	M	2/20/1989	11				
113-032	8/24/1998	T31N/R05E-25R03	D	RR/5 ac	499	AR	120	118	6	N	--	Qvt	111	Qvt	0	111	Qva	111	C	30	115	1	--	--	L	8/24/1998	82				
093-034	6/6/1989	T30N/R06E-28G03	D	RR/5 ac	266	CT	87	77	1	Y	71	Qvt	72	Qvt	0	72	Qva	72	C	2	60	1	0.5	3	L	6/6/1989	24				
093-052	4/29/1999	T30N/R06E-28K03	D	RR/5 ac	249	AR	73	63.5	6	Y	63.5	Qvr	21	Qvt	21	63	Qva	63	C	--	--	--	--	--	M	--	ND				
093-049	3/30/1999	T30N/R06E-28Q01	D	RR/5 ac	230	AR	40	35	6	Y	35	Qvr	14	Qvt	14	45	Qva	45	C	60	40	1	--	--	M	3/30/1990	5				
092-074	4/10/1998	T30N/R06E-29G02	D	RR/5 ac	341	AR	50	30	6	Y	30	Qvt	35	Qvt	0	35	Qva	35	C	15	5	2	20	410	L	4/10/1998	15				
120-054	1/27/2000	T31N/R06E-30R02	D	RR/5 ac	518	AR	75	65	4	Y	65	Qvt	--	Qvt	0	--	Qvt	0	C	3	20	2	1.5	15	L	1/27/2000	42				
094-016	2/22/2000	T30N/R06E-31E03	D	RR/5 ac	341	AR	180	180	6	N	--	Qvt	63	Qvt	0	63	Qva	63	C	60	175	1	--	--	L	2/22/2000	58				
120-092	6/25/1979	T31N/R06E-31E06	D	RR/5 ac	525	AR	62	20	4	Y	20	Qvt	80	Qvt	0	80	Qva	80	C	3	60	1	--	--	L	6/25/1999	20				

Appendix A.
Table A-1. Well Details and Water Levels.

SnoCo ID	Completion Date	Legal	Well Type	Land Use	Elevation	Drilling Method	Well Details: Drill Depth	Casing Depth	Casing Diameter	Screen (Y or N)	Screen Top Depth	Surface: Geologic Unit	Unit Bottom	Confining: Geologic Unit	Unit Top	Unit Bottom	Aquifer: Geologic Unit	Unit Top	Confined Unconfined	Aquifer Properties: Yield	Drawdown	Time	Conductivity (K)	Transmissivity (T)	USGS Aquifer Sensitivity	Water Level Data: Date	Depth to Water	Date	Depth to Water	Date	Depth to Water
							(ft)	(ft)	(in)		(ft)		(ft)		(ft)	(ft)		(ft)		(gpm)	(ft)	(hr)	(ft/d)	(ft^2/d)			(ft)		(ft)		(ft)
094-026	3/23/1999	T30N/R06E-32Q05	D	RR/5 ac	282	AR	110	108	6	N	--	Qvt	73	Qvt	0	73	Qva	73	C	15	110	1.5	--	--	L	3/23/1999	41				
094-093	4/22/1999	T30N/R06E-33Q04	D	RR/5 ac	298	AR	60	55	6	Y	55	Qvt	50	Qvt	0	50	Qva	50	C	30	53	1	--	--	L	4/22/1999	38				
116-006	7/21/1998	T31N/R05E-36Q01	D	RR/5 ac	397	AR	76	66	6	Y	66	Qvt	55	Qvt	0	55	Qva	55	C	15	40	1	30	30	L	7/21/1998	21				
089-082	10/18/1991	T30N/R06E-19C05	D	RR/5 ac	384	AR	60	60	4.5	Y	40	Qvt	42	Qvt	0	42	Qva	42	C	7	60	1	0.5	9	L	10/18/1991	39				
087-087	11/7/1998	T30N/R06E-19E06	D	RR/5 ac	364	AR	90	80	4	Y	80	Qvt	80	Qvt	0	80	Qva	80	C	10	0	2	--	--	L	11/8/1998	40				
093-009	8/21/1998	T30N/R06E-28A04	D	RR/5 ac	272	AR	55	45	6	Y	45	Qvr	8	Qvt	8	44	Qva	44	C	--	--	--	--	--	M	8/21/1998	1				
081-102	4/19/1999	T30N/R05E-36A01	D	RR/5 ac	380	AR	148	145.3	6	N	--	Qvt	135	Qvt	0	135	Qva	135	C	12	28	1	30	--	L	4/12/1999	99				
082-046	9/20/1988	T30N/R05E-36E01	D	RR/5 ac	433	AR	140	140	6	N	--	Qvt	90	Qvt	0	90	Qva	90	C	8	140	1.5	--	--	L	9/20/1988	80				
082-004	2/28/1997	T30N/R05E-36G03	D	RR/5 ac	384	AR	141	139	6	N	--	Qvt	134	Qvt	0	134	Qva	134	C	20	140	1	--	--	L	2/28/1997	103				
082-011	7/12/1997	T30N/R05E-36F08	D	RR/5 ac	440	AR	170	150	4	Y	150	Qvt	120	Qvt	0	120	Qva	120	C	10	0	2	--	--	L	7/14/1997	145				
079-031	7/10/1998	T30N/R05E-36J03	D	RR/5 ac	361	AR	158	150	6	Y	150	Qvt	142	Qvt	0	142	Qva	142	C	10	150	1.5	--	--	L	7/10/1998	83				
094-002	8/26/1999	T30N/R05E-36H04	D	RR/5 ac	403	AR	99	94	6	Y	94	Qvt	90	Qvt	0	90	Qva	90	C	15	20	1.5	--	--	L	8/26/1999	50				
064-004	4/8/1982	T29N/R06E-31K03	D	RR/5 ac	262	ND	60	54	6	ND	54	Qvt	51	Qvt	0	51	Qva	51	C	50	--	--	--	--	L	4/8/1982	25				
085-036	2/16/1998	T30N/R06E-07P02	D	RR/5 ac	440	CT	74	67	6	Y	67	Qvt	58	Qvt	0	58	Qva	58	C	22	20	1	20	120	L	2/16/1998	32				
085-042	9/17/1997	T30N/R06E-07P03	D	RR/5 ac	440	CT	64	59	6	Y	59	Qvt	48	Qvt	0	48	Qva	48	C	15	11	1	30	150	L	9/17/1997	31				
090-075	6/3/1999	T30N/R06E-20Q04	D	RR/5 ac	354	AR	74	69	6	Y	69	Qvt	55	Qvt	0	55	Qva	55	C	25	30	1.5	--	--	L	6/3/1999	33				
090-071	9/28/1998	T30N/R06E-20R01	D	RR/5 ac	331	AR	55	50	6	Y	50	Qvt	35	Qvt	0	35	Qva	35	C	40	55	1	--	--	L	9/28/1998	18				
090-069	5/27/1999	T30N/R06E-20R02	D	RR/5 ac	328	AR	60	55	6	Y	55	Qvt	60	Qvt	0	60	Qva	60	C	28	30	1.5	--	--	L	5/27/1999	7.5				
090-074	9/29/1997	T30N/R06E-20Q05	D	RR/5 ac	358	AR	64	60	6	Y	60	Qvt	33	Qvt	0	33	Qva	33	C	30	60	1	--	--	L	9/29/1997	26				
090-073	9/27/1997	T30N/R06E-20Q06	D	RR/5 ac	367	AR	64	60	6	Y	60	Qvt	35	Qvt	0	35	Qva	35	C	30	60	1	--	--	L	9/26/1997	34				
088-076	1/23/1998	T30N/R06E-17J03	D	RR/5 ac	374	ND	110	90	4	Y	90	Qvt	95	Qvt	0	95	Qva	95	C	20	0	2	--	--	L	1/23/1998	65				
088-044	2/28/1999	T30N/R06E-17D03	D	RR/5 ac	420	CT	165	160	6	Y	160	Qvt	131	Qvt	0	131	Qva	131	C	15	20	1	15	80	L	2/28/1999	126				
088-061	4/29/1999	T30N/R06E-17H01	D	RR/5 ac	397	CT	125	120	6	Y	120	Qvt	97	Qvt	0	97	Qva	97	C	7	40	1	3	13	L	4/29/1999	76				
088-060	4/15/1999	T30N/R06E-17H02	D	RR/5 ac	384	CT	125	120	6	Y	120	Qvt	108	Qvt	0	108	Qva	108	C	15	14	1	20	120	L	4/15/1999	78				
088-062	5/3/1999	T30N/R06E-17H03	D	RR/5 ac	417	CT	151	141	6	Y	141	Qvt	129	Qvt	0	129	Qva	129	C	7	40	1	1	13	L	5/3/1999	98				
088-055	3/16/1999	T30N/R06E-17A01	D	RR/5 ac	423	CT	157	152	6	Y	152	Qvt	121	Qvt	0	121	Qva	121	C	20	27	1	15	80	L	3/16/1999	110				
088-057	5/18/1999	T30N/R06E-17B01	D	RR/5 ac	423	CT	136	131	6	Y	131	Qvt	96	Qvt	0	96	Qva	96	C	15	15	1	20	110	L	5/18/1999	101				
088-058	5/27/1999	T30N/R06E-17B02	D	RR/5 ac	407	CT	107	102	6	Y	102	Qvt	95	Qvt	0	95	Qva	95	C	10	30	1	--	--	L	5/27/1999	67				
179-047	4/15/1969	T29N/R06E-04B01	D	RR/5 ac	344	CT	122	117	8	Y	117	Qvt	114	Qvt	0	114	Qva	114	C	--	--	--	40	200	L	4/15/1969	76				
057-093	8/12/1975	T29N/R06E-08R02	D	U	243	ND	69	60.5	6	ND	60.5	Qvt	63	Qvt	0	63	Qva	63	C	8	16	2	6	60	L	8/12/1975	25	5/7/1992	37		
160-030	5/14/2002	T29N/R05E-11B02	D	RR/5 ac	246	AR	73	53	4	Y	53	Qvt	52	Qvt	0	52	Qva	52	C	2	12	2	0.9	17	L	5/14/2002	42				
160-031	5/20/2002	T29N/R05E-11B03	D	RR/5 ac	246	AR	80	50	4	Y	50	Qvt	58	Qvt	0	58	Qva	58	C	2	22	2	0.4	8	L	5/20/2002	41				
160-048	6/8/2002	T30N/R05E-36L03	D	RR/5 ac	420	CT	170	165	6	Y	165	Qvt	70	Qvt	0	70	Qva	70	C	10	8	1	30	130	L	6/8/2002	126				
160-057	3/13/2002	T30N/R06E-17E01	D	RR/5 ac	423	AR	130	103	4	Y	103	Qvt	45	Qvt	45	102	Qva	102	C	20	35	2	3	70	M	3/18/2002	69				
169-065	5/6/2002	T30N/R06E-28F04	D	RR/5 ac	279	AR	118	118	6	N	--	Qvt	105	Qvt	0	105	Qva	105	C	20	117	1	--	--	L	5/6/2002	36				
161-015	7/10/2002	T30N/R05E-01A03	D	RR/5 ac	295	AR	70	70	4	Y	50	Qvt	55	Qvt	0	55	Qva	55	C	5	40	2	--	--	L	7/12/2002	5				
161-023	7/29/2002	T30N/R05E-25K03	D	RR/5 ac	341	AR	81.5	76.5	6	Y	76.5	Qvt	70	Qvt	0	70	Qva	70	C	30	73	1	--	--	L	7/29/2002	44.5				
161-024	8/14/2002	T30N/R05E-36L04	D	RR/5 ac	413	AR	160	155	6	Y	155	Qvt	127	Qvt	0	127	Qva	127	C	17	160	1.5	--	--	L	8/14/2002	107				
161-027	7/30/2002	T30N/R06E-08P03	D	RR/5 ac	410	AR	119	112	6	Y	112	Qvt	110	Qvt	0	110	Qva	110	C	18	112	1	--	--	L	7/27/2002	68				
161-032	6/25/2002	T30N/R06E-19Q05	D	RR/5 ac	354	AR	94	77	4	Y	77	Qvt	71	Qvt	0	71	Qva	71	C	4	35	2	1	9	L	6/26/2002	39				
161-040	7/24/2002	T31N/R06E-31N04	D	RR/5 ac	446	AR	80	75	6	Y	75	Qvt	68	Qvt	0	68	Qva	68	C	38	75	1.5	--	--	L	7/24/2002	48				
163-007	7/17/2002	T30N/R06E-09N02	D	RR/5 ac	449	CT	185	175	6	Y	175	Qvt	69	Qvt	0	69	Qva	69	C	20	4	1	60	600	L	7/17/2002	141				
163-008	6/26/2002	T30N/R06E-21C02	D	RR/5 ac	377	AR	80	80	6	N	--	Qvt	60	Qvt	0	60	Qva	60	C	--	--	--	--	--	L	6/26/2002	31				
165-011	9/10/2002	T30N/R05E-36A02	D	RR/5 ac	354	AR	130	120	4	Y	120	Qvt	123	Qvt	0	123	Qva	123	C	20	2	2	170	1,650	L	9/10/2002	62				
165-017	9/10/2002	T30N/R06E-21H06	D	RR/5 ac	335	AR	100	51	6	ND	51	Qvt	56	Qvt	0	56	Qva	56	C	10	55	1.5	--	--	L	9/10/2002	44				
166-013	8/16/2002	T29N/R06E-31F01	D	RR/5 ac	321	AR	120	115	6	Y	115	Qvr	31	Qvt	31	114	Qva	114	C	30	116	1	--	--	M	8/16/2002	88				
166-016	10/24/2002	T30N/R05E-13Q02	D	RR/5 ac	413	AR	135	124	6	Y	124	Qvt	113	Qvt	0	113	Qva	113	C	30	125	1.5	--	--	L	10/24/2002	98				
166-021	10/30/2002	T30N/R06E-18Q03	D	RR/5 ac	410	CT	117	107	6	Y	107	Qvt	116	Qvt	0	116	Qva	116	C	15	5	1	40	350	L	10/30/2002	74				
166-022	11/4/2002	T30N/R06E-21C03	D	RR/5 ac	374	AR	112	96	4	Y	96	Qvt	89	Qvt	0	89	Qva	89	C	10	80	2	1.2	12	L	11/4/2002	51				
166-023	10/1/2002	T30N/R06E-21R09	D	RR/5 ac	289	AR	82	58	6	ND	58	Qvr	20	Qvt	20	--	Qvt	20	C	6	60	1	--	--	M	10/1/2002	11				
167-042	9/27/2002	T30N/R06E-09N03	D	RR/5 ac	430	CT	187	177	6	Y	177	Qvt	119	Qvt	0	119	Qva	119	C	15	15	1	11	110	L	9/27/2002	124				
167-069	11/29/2002	T30N/R06E-36Q03	D	RR/5 ac	377	AR	138	118	6	Y	118	Qvt	122	Qvt	0	122	Qva	122	C	8	130	1	--	--	L	11/29/2002	20				
167-077	9/9/2002	T30N/R06E-32C02	D	RR/5 ac	305	AR	80	45	4	Y	45	Qvt	42	Qvt	0	42	Qva	42	C	17	12	8	11	220	L	9/9/2002	18				
168-091	11/4/2002	T30N/R06E-18P01	D	RR/5 ac	394	AR	98	92.5	6	Y	92.5	Qvt	82	Qvt	0	82	Qva	82	C	30	95	1.5	--	--	L	11/4/2002	69				
168-094	9/14/2002	T30N/R06E-20M02	D	RR/5 ac	403	AR	96	96	6	N	--	Qvt	80	Qvt	0	80	Qva	80	C	10	15	1.5	40	--	L	9/14/2002	45				
169-088	12/13/2002	T30N/R06E-16N02	D	RR/5 ac	413	AR	99	99	6	N	--	Qvt	83	Qvt	0	83	Qva	83	C	40	96	1	--	--	L	12/13/2002	70				
170-003	2/5/2003	T30N/R06E-36Q04	D	RR/5 ac	371	ND	164	155	6	Y	155	Qvt	110	Qvt	0	110	Qva	110	C	15	152	1	--	--	L	2/5/2003	88				
170-012	2/7/2003	T30N/R06E-22H01	D	LCF	276	AR	84	78	6	Y	78	Qvr	30	Qvt	30	78	Qva	78	C	40	80	1	--	--	M	2/7/2003	24				
170-017	2/5/2003	T30N/R06E-08L02	D	RR/5 ac	413	AR	135	135	6	Y	129	Qvt	90	Qvt	0	90	Qva	90	C	35	130	1	--	--	L	2/5/2003	80				
170-018	2/5/2003	T30N/R06E-08L03	D	RR/5 ac	420	AR	135	129	6	Y	129	Qvt	90	Qvt	0	90	Qva	90	C	35	130	1	--	--	L	2/5/2003	80				
179-075	4/25/2003	T30N/R06E-29N01	D	RR/5 ac	374	CT	101	91	6	Y	91	Qvt	85	Qvt	0	85	Qva	85	C	20	10	1	20	240	L	4/25/2003	46				
179-081	5/6/2003	T30N/R06E-18P02	D	RR/5 ac	394	AR	80	75	6	Y	75	Qvt	55	Qvt	0	55	Qva	55	C	35	80	1.5	--	--	L	5/6/2003	31				
179-083	5/7/2003	T30N/R06E-18P03	D	RR/5 ac	397	AR	85	80	6	Y	80	Qvt	70	Qvt	0	70	Qva	70	C	20	85	1.5	--	--	L	5/7/2003	34				
179-084	5/6/2003	T30N/R06E-18P04	D	RR/5 ac	394	AR	80	75	6	Y	75	Qvt	55	Qvt	0	55	Qva	55	C	35	80	1.5	--	--	L	5/6/2003	31				
179-093	4/29/2003	T31N/R05E-25R04	D	RR/5 ac	515	AR	140	138	6	N	--	Qvt	114	Qvt	0	114	Qva	114	C	19	7	1	170	--	L	4/29/2003	108				
180-033	6/15/2003	T30N/R06E-08M02	D	RR/5 ac	420	AR	119	114	6	Y	114	Qvt	97	Qvt	0	97	Qva	97	C	18	114	1	--	--	L	6/15/2003	91				
180-039	3/4/2003	T30N/R06E-08F04	D	RR/5 ac	413	AR	125	120	6	Y	120	Qvt	90	Qvt	0	90	Qva	90	C	17	1	1.5	560	2,800	L	3/4/2003	71				
180-048	7/11/2003	T30N/R06E-18L01	D	RR/5 ac	400	AR	100	94.5	6	Y	94.5	Qvt	78	Qvt	0	78	Qva	78	C	26	99	1.5	--	--	L	7/11/2003	69				
180-049	7/14/2003	T30N/R06E-18L02	D	RR/5 ac	403	AR	100	95	6	Y	95	Qvt	86	Qvt	0	86	Qva	86	C	23	95	1.5	--	--	L	7/14/2003	73				
180-050	7/10/2003	T30N/R06E-18L03	D	RR/5 ac	403	AR	100	93.5	6	Y	93.5	Qvt	75	Qvt	0	75	Qva	75	C	22	95	1.5	--	--	L	7/10/2003	74				
180-051	7/3/2003	T30N/R06E-18L04	D	RR/5 ac	403	AR	100	95	6	Y	95	Qvt	87	Qvt	0	87	Qva	87	C	22	95	1.5	--	--	L	7/3/2003	76				
180-052	6/11/2003	T30N/R06E-18L05	D	RR/5 ac	400	AR	100	95	6	Y	95	Qvt	85	Qvt	0	85	Qva	85	C	30	95	1.5	--	--	L	6/11/2003	70				
180-053	6/6/2003	T30N/R06E-18L06	D	RR/5 ac	400	AR	100	100	6	Y	95	Qvt	87	Qvt	0	87	Qva	87	C	25	100	1.5	--	--	L	6/6/2003	72				
180-055	5/22/2003	T30N/R06E-21D04	D	RR/5 ac	380	AR	112	4	6	Y	98	Qvt	94	Qvt	0	94	Qva	94	C	30	105	2	--	--	L	5/22/2003	51				
180-060	7/17/2003	T30N/R06E-08N02	D	RR/5 ac	417	AR	113	113	6	Y	113	Qvt	111	Qvt	0	111	Qva	111	C	18	113	1	--	--	L	7/17/2003	92				
180-066	4/11/2003	T30N/R06E-36Q05	D	RR/5 ac	380	AR	160	150	6	Y	150	Qvt	122	Qvt	0	122	Qva	122	C	8	84	1	--	--	L	4/11/2003	76				
191-037	7/8/2003	T30N/R06E-30L01	D	RR/5 ac	348	AR	63	58	6	N	--	Qvt	56	Qvt	0	56	Qva	56	C	35	50	1	--	--	L	7/8/2003	21				
190-002	5/27/2003	T30N/R05E-01A05	D	RR/5 ac	426	CT	84	79	6	Y	79	Qvt	54	Qvt	0	54	Qva	54	C	15	15	1	20	110	L	5/27/2003	40				
190-013	5/2/2003	T30N/R05E-12A01	D	RR/5 ac	433	AR	80	73	6	Y	73	Qvt	73	Qvt	0	73	Qva	73	C	45	75	1.5	--	--	L	5/2/2003	37				
191-004	7/9/2003	T30N/R06E-30L02	D	RR/5 ac	344	AR	62	58	6	N	--	Qvt	56	Qvt	0	56	Qva	56	C	30	50	1	--	--	L	7/7/2003	21				
191-090	7/24/2003	T31N/R05E-32D03	D	RR/5 ac	518	AR	145	137	6	Y	137	Qvt	105	Qvt	0	105	Qva	105	C	10	140	0.5	--	--	L	7/24/2003	119				
191-004	5/3/2003	T31N/R05E-31P03	D	RR/5 ac	453	AR	80	80	6	N	--	Qvt	61	Qvt	0	61	Qva	61	C	30	75	1	--	--	L	5/3/2003	37				
191-042	7/3/2003	T30N/R06E-18L07	D	RR/5 ac	403	AR	100	95	6	Y	95	Qvt	87	Qvt	0	87	Qva	87	C	22	95	1.5	--	--	L	7/3/2003	76				
191-027	6/20/2003	T30N/R05E-36N01	D	RR/5 ac	361	AR	170	150	4	Y	150	Qvt	148	Qvt	0	148	Qva	148	C	8	20	4	3	50	L	6/20/2003	138				
193-011	9/13/2003	T30N/R06E-08M03	D	RR/5 ac	420	AR	109	103	6	Y	103	Qvt	108	Qvt	0	108	Qva	108	C	22	100	1	--	--	L	9/18/2003	83.5				
193-016	9/26/2003	T31N/R06E-31G03	D	RR/5 ac	505	AR	94	89	6	ND	89	Qvt	88	Qvt	0	88	Qva	88	C	18	88	1	--	--	L	9/26/2003	69				
193-045	11/6/2003	T30N/R06E-32G02	D	RR/5 ac	259	AR	125	120	6	N	--	Qvt	74	Qvt	0	74	Qva	74	C	80	120	1.5	--	--	L	11/6/2003	32				
195-058	9/4/2003	T30N/R06E-32G03	D	RR/5 ac	259	AR	130	34	4	Y	34	Qvt	129	Qvt	0	129	Qva	129	C	15	100	1	--	--	L	9/4/2003	21				
193-044	10/30/2003	T30N/R06E-28P02	D	RR/5 ac	226	AR	100	100	6	N	--	Qvr	20	Qvt	20	91	Qva	91	C	60	100	1.5	--	--	M	10/30/2003	0				
193-043	9/30/2003	T29N/R06E-20R02	D	RR/5 ac	102	AR	190	180	6	N	--	Qal	35	Qvt	35	111	Qva	111	C	30	180	1.5	--	--	H	9/30/2003	17				
193-030	11/2/2003	T30N/R05E-13R04	D	RR/5 ac	380	AR	95	81	4	Y	81	Qvr	23	Qvt	23	81	Qva	81	C	16	--	2	--	--	L	11/2/2003	61				
194-075	9/24/2003	T30N/R05E-01H01	D	RR/5 ac	443	AR	218	155	6	ND	155	Qvt	80	Qvt	0	80	Qva	80	C	11	100	1	--	--	L	9/24/2003	63				
194-081	10/6/2003	T31N/R06E-31E07	D	RR/5 ac	518	AR	123	118	6	Y	118	Qvt	117	Qvt	0	117	Qva	117	C	--	--	--	--	--	L	10/6/2003	72				
195-007	9/12/2003	T30N/R05E-02A01	D	RR/5 ac	374	AR	154	136	4	Y	146	Qvt	135	Qvt	0	135	Qva	135	C	16	39	1	--	40	L	9/12/2003	95				
158-097	12/16/2003	T31N/R06E-29N02	D	RR/5 ac	512	ND	119	114	6	ND	114	Qvt	89	Qvt	0	89	Qva	89	C	15	100	1	--	11	L	12/16/2003	62				
170-048	1/30/2004	T30N/R06E-36C01	D	RR/5 ac	394	AR	122	109	6	Y	109	Qvt	106	Qvt	106	--	Qva	106	C	11	24	1	4	40	L	1/30/2004	87				
061-110	4/12/1997	T29N/R06E-21N01	D	RR/5 ac	108	AR	40	40	6	N	--	ND	--	--	--	--	ND	--	C	25	35	1	40	--	H	4/12/1997	7				
190-016	6/11/2003	T30N/R06E-18P05	D	RR/5 ac	397	ND	100	--	6	ND	--	--	--	--	--	--	--	--	C	--	--	--	--	--	L	--	ND				
179-052	2/18/2004	T30N/R05E-13G01	D	RR/5 ac	397	AR	100	95	6	Y	95	Qvt	26	--	--	--	Qva	114	C	18	95	1.5	--	--	L	2/18/2004	77				
075-020	7/27/1995	T30N/R05E-14B07	D (R)	RR/10 ac	89	AR	127	127	6	N	--	Qvr	0	ND	--	--	Qva	0	C	80	120	1	--	--	H	7/27/1995	80				
092-046	4/16/1985	T30N/R06E-22J03	D (R)	RR/5 ac	243	CT	116	116	5	N	--	Qvr	--	ND	--	--	ND	--	C	--	--	--	--	--	M	4/16/1985	1				
094-011	11/13/1979	T30N/R06E-31A02	D (R)	RR/5 ac	374	D	70	30	--	N	--	Qvt	--	ND	--	--	ND	--	C	5	--	--	--	--	L	--	ND				
112-040	4/18/1994	T31N/R05E-23N02	D (R)	U	203	ND	288	283.5	6	ND	283	Qvt	--	ND	--	--	ND	--	C	57	4	3	500	2,650	L	4/21/1994	163				
113-036	6/14/1983	T31N/R05E-25C02	D (R)	RR/5 ac	449	ND	398	393	6	Y	393	Qvt	--	ND	--	--	ND	--	C	17	6	4	80	420	L	6/14/1983	326				
113-011	4/23/1999	T31N/R05E-25C03	D (R)	RR/5 ac	436	ND	324	304	4	Y	304	Qvt	134	Q(A)f	186	313	Q(A)c	313	C	7	20	2	2	40	L	4/23/1999	226				
051-062	12/14/1985	T29N/R05E-02B01	M	ULDR5-6MV	269	CT	162	148	6	Y	148	Qvt	47	Q(A)f	47	146	Q(A)c	146	C	49	51	6	--	--	L	12/24/1985	88				
158-016	1/14/1965	T29N/R05E-02C01	M	U	266	CT	338	318	ND	Y	318	Qvt	42	Q(A)f	136	236	Q(A)c	236	C	1220	40	4	430	--	L	1/13/1965	132				
115-085	5/18/1993	T31N/R05E-35K01	RP (P)	RR/5 ac	321	HSA	7	7	1	ND	4	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	5/19/1993	0				
115-086	5/18/1993	T31N/R05E-35K02	RP (WQ)	RR/5 ac	321	HSA	5	3.2	1	Y	3.2	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	5/20/1993	16				
115-087	5/14/1993	T31N/R05E-35K03	RP (WQ)	RR/5 ac	321	HSA	52	42	2	Y	42	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
115-088	5/12/1993	T31N/R05E-35K04	RP (WQ)	RR/5 ac	321	HSA	65	50	2	Y	55	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
115-089	5/11/1993	T31N/R05E-35K05	RP (WQ)	RR/5 ac	321	HSA	35	30	2	Y	30	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	5/11/1993	12				
115-090	5/13/1993	T31N/R05E-35K06	RP (WQ)	RR/5 ac	321	HSA	80	70	2	Y	70	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	5/13/1992	72				
115-091	5/17/1993	T31N/R05E-35K07	RP (P)	RR/5 ac	321	HSA	4	1	1	ND	0	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	5/19/1993	0				
115-092	5/17/1993	T31N/R05E-35K08	RP (P)	RR/5 ac	321	HSA	7.6	4.5	1	ND	0	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	5/17/1993	4				
115-093	5/19/1993	T31N/R05E-35K09	RP (P)	RR/5 ac	321	HSA	7	4	1	ND	0	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	5/19/1993	3				
115-094	5/18/1993	T31N/R05E-35K10	RP (WQ)	RR/5 ac	321	CT	146	139	2	Y	139	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	5/18/1994	109				
115-095	5/18/1993	T31N/R05E-35K11	RP (WQ)	RR/5 ac	321	CT	146	139	2	Y	139	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	12/25/2000	109				
115-096	5/18/1993	T31N/R05E-35K12	RP (P)	RR/5 ac	321	HSA	7	4	1	ND	4	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	12/25/2000	0				
115-097	5/11/1993	T31N/R05E-35K13	RP (P)	RR/5 ac	321	HSA	7	7	1	ND	4	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	5/19/1993	3				
115-098	5/10/1993	T31N/R05E-35K14	RP (P)	RR/5 ac	321	HSA	7.6	4.5	1	ND	4.5	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	5/19/1993	4				
115-099	5/18/1993	T31N/R05E-35K15	RP (P)	RR/5 ac	321	HSA	5	3.2	1	Y	3.2	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	5/19/1993	0				
115-100	5/17/1993	T31N/R05E-35K16	RP (P)	RR/5 ac	321	HSA	4	1	1	ND	1	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	5/19/1993	0				
115-103	5/11/1993	T31N/R05E-35K17	RP (WQ)	RR/5 ac	321	HSA	35	30	2	Y	30	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	5/11/1993	12				
115-104	5/12/1993	T31N/R05E-35K18	RP (WQ)	RR/5 ac	321	HSA	65	55	2	Y	55	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
115-105	5/14/1993	T31N/R05E-35K19	RP (WQ)	RR/5 ac	321	HSA	52	42	2	Y	42	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
115-106	5/13/1992	T31N/R05E-35K20	RP (WQ)	RR/5 ac	321	HSA	80	70	2	Y	70	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	5/13/1992	72				
155-044	1/18/2002	T28N/R05E-12F02	RP (P)	ULDR4-6	79	HSA	25	15	1	Y	15	Qva	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
158-015	1/4/1965	T29N/R06E-06D01	O	RR/5 ac	328	CT	272	260	6	Y	260	Qvt	78	Q(A)f	145	244	Q(A)c	244	C	30	53	1	--	--	L	1/13/1965	57				
039-051	10/15/1997	T28N/R06E-07M10	RP (D)	U	125	ND	55	35	4	Y	35	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	11/17/1993	45				
039-052	10/15/1997	T28N/R06E-07M11	RP (D)	U	128	ND	40	10	4	Y	10	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
039-053	10/15/1997	T28N/R06E-07M12	RP (D)	U	125	ND	25	10	4	Y	10	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
049-051	10/15/1997	T28N/R06E-07M13	RP (D)	U	128	ND	27.5	10	4	Y	10	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
049-052	10/15/1997	T28N/R06E-07M14	RP (D)	U	128	ND	40	10	4	Y	10	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
049-053	10/15/1997	T28N/R06E-07M15	RP (D)	U	125	ND	40	10	4	Y	10	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
163-092	6/28/2002	T29N/R05E-13G16	RP (D)	UCOM	341	ND	60	0	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
091-073	11/16/1992	T30N/R06E-22C01	RP (D)	RR/5 ac	295	HSA	43	43	1	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
091-079	11/16/1992	T30N/R06E-22C02	RP (D)	RR/5 ac	295	HSA	14.5	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
109-052	1/7/1997	T29N/R05E-13B03	RP (SB)	UCOM	341	HSA	29	9	8	Y	9	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
166-076	9/16/2002	T29N/R06E-09N02	RP (SB)	ULDR4-LKST	187	MR	115	0	0	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	H	--	ND				
166-077	9/17/2002	T29N/R06E-16D02	RP (SB)	RR/5 ac	220	MR	90	0	0	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
166-078	9/17/2002	T29N/R06E-16D03	RP (SB)	RR/5 ac	220	MR	90	0	0	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
166-079	9/19/2002	T29N/R06E-16M01	RP (SB)	RR/5 ac	207	MR	120	0	0	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
189-089	5/20/2003	T29N/R06E-06G04	RP (D)	U	394	ND	120	0	0	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
189-021	4/28/2003	T28N/R06E-07M16	RP (SB)	U	125	HSA	20	0	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
189-022	4/28/2003	T28N/R06E-07M17	RP (SB)	U	125	HSA	15	0	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
189-023	4/28/2003	T28N/R06E-07M18	RP (SB)	U	128	HSA	40	0	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
189-024	4/28/2003	T28N/R06E-07M19	RP (SB)	U	128	HSA	40	0	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
190-086	5/15/2003	T29N/R06E-31P02	RP (D)	RR/5 ac	282	ND	74	74	6	Y	0	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
160-047	5/8/2002	T30N/R05E-24G01	RP (SB)	RR/5 ac	364	AR	115	10	6	Y	101	Qvt	98	Qvt	0	98	Qva	98	C	6	100	15	--	--	L	5/8/2002	56				
160-059	6/2/2002	T30N/R06E-22N11	RP (SB)	RR/5 ac	269	AR	72	67	6	Y	67	Qvr	30	Qvt	30	65	Qva	65	C	20	70	1	--	--	M	6/2/2002	2				
160-062	5/19/2002	T30N/R06E-29L02	RP (SB)	RR/5 ac	341	AR	81	68	6	Y	68	Qvt	60	Qvt	0	60	Qva	60	C	60	80	1	--	--	L	5/19/2002	18				
166-087	9/23/2002	T30N/R06E-32A01	RP (SB)	RR/5 ac	246	MR	80	0	0	N	--	Qvt	103	Qvt	0	103	Qva	103	C	--	--	--	--	--	L	--	ND				
191-087	8/8/2003	T30N/R06E-31C03	RP (D)	RR/5 ac	321	D	10	10	6	ND	--	--	--	--	--	--	--	--	C	--	--	--	--	--	H	8/8/2003	1				
036-018	9/17/1993	T28N/R05E-12R07	RP (SB)	U	98	HSA	12	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
036-019	9/17/1993	T28N/R05E-12R08	RP (SB)	U	98	HSA	3	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
175-088	4/24/2001	T28N/R06E-07N06	RP (SB)	U	82	P	20	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
175-089	4/24/2001	T28N/R06E-07N07	RP (SB)	U	82	P	20	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
175-090	4/24/2001	T28N/R06E-07N08	RP (SB)	U	82	P	20	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
175-091	4/24/2001	T28N/R06E-07N09	RP (SB)	U	82	P	20	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
175-092	4/24/2001	T28N/R06E-07N10	RP (SB)	U	82	P	20	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
175-093	4/24/2001	T28N/R06E-07N11	RP (SB)	U	82	P	10	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
175-094	4/30/2001	T28N/R06E-07N12	RP (SB)	U	82	P	10	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
175-095	4/30/2001	T28N/R06E-07N13	RP (SB)	U	82	P	7	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
175-096	4/30/2001	T28N/R06E-07N14	RP (SB)	U	82	P	7	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
175-097	4/30/2001	T28N/R06E-07N15	RP (SB)	U	82	P	12	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
175-098	4/30/2001	T28N/R06E-07N16	RP (SB)	U	82	P	12	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
175-099	4/30/2001	T28N/R06E-07N17	RP (SB)	U	82	P	12	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
175-100	4/30/2001	T28N/R06E-07N18	RP (SB)	U	82	P	12	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
176-001	4/30/2001	T28N/R06E-07N19	RP (SB)	U	82	P	12	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
176-002	4/30/2001	T28N/R06E-07N20	RP (SB)	U	82	P	12	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
176-003	4/30/2001	T28N/R06E-07N21	RP (SB)	U	82	P	25	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
176-004	4/30/2001	T28N/R06E-07N22	RP (SB)	U	82	P	25	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
176-005	4/30/2001	T28N/R06E-07N23	RP (SB)	U	82	P	11	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
176-006	4/30/2001	T28N/R06E-07N24	RP (SB)	U	82	P	20	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
176-007	4/30/2001	T28N/R06E-07N25	RP (SB)	U	82	P	17	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
176-008	4/30/2001	T28N/R06E-07N26	RP (SB)	U	82	P	23.5	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				

Appendix A.
Table A-1. Well Details and Water Levels.

							Well Details					Surface		Confining			Aquifer			Aquifer Properties						Water Level Data					
SnoCo ID	Completion Date	Legal	Well Type	Land Use	Elevation	Drilling Method	Drill Depth	Casing Depth	Casing Diameter	Screen (Y or N)	Screen Top Depth	Geologic Unit	Unit Bottom	Geologic Unit	Unit Top	Unit Bottom	Geologic Unit	Unit Top	Confined Unconfined	Yield	Drawdown	Time	Conductivity (K)	Transmissivity (T)	USGS Aquifer Sensitivity	Date	Depth to Water	Date	Depth to Water	Date	Depth to Water
							(ft)	(ft)	(in)		(ft)		(ft)		(ft)	(ft)		(ft)		(gpm)	(ft)	(hr)	(ft/d)	(ft^2/d)			(ft)		(ft)		(ft)
176-009	4/24/2001	T28N/R06E-07N27	RP (SB)	U	82	P	20	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
177-002	4/13/2001	T29N/R05E-11B04	RP (SB)	RR/5 ac	197	MR	5	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
159-077	4/25/2002	T29N/R05E-13G17	RP (SB)	UCOM	344	HSA	15	0	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
159-078	4/25/2002	T29N/R05E-13G18	RP (SB)	UCOM	341	HSA	30	0	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
159-079	4/26/2002	T29N/R05E-13G19	RP (SB)	UCOM	344	HSA	35	0	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
159-080	4/25/2002	T29N/R05E-13G20	RP (SB)	UCOM	341	HSA	25	0	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
159-081	4/25/2002	T29N/R05E-13G21	RP (SB)	UCOM	344	AR	25	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
166-088	9/27/2002	T30N/R06E-33M01	RP (SB)	RR/5 ac	210	MR	80	0	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
189-020	4/28/2003	T28N/R06E-07M20	RP (SB)	U	125	HSA	17	0	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
158-005	7/4/1949	T28N/R05E-12R09	D (U)	U	95	D	150	105	10	Y	105	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
054-131	9/13/1974	T29N/R05E-26C02	D (U)	RR/5 ac	236	ND	130	124.5	6	Y	124.5	Qva	32	Q(A)f	32	98	Q(A)c	98	C	4	53	2	1	6	M	9/13/1974	57				
061-051	12/15/1979	T29N/R05E-26G01	D (U)	RR/5 ac	239	AR	126	126	6	N	--	Qvt	121	Qvt	0	121	Qva	121	C	25	70	1	20	--	L	12/15/1979	50				
120-085	3/22/1991	T31N/R06E-31N06	D (U)	RR/5 ac	446	CT	124	119	5	Y	119	Qvt	100	Qvt	0	100	Qva	100	C	9	44	1	3	17	L	3/20/1991	65	12/22/1992	71		
158-003	2/3/1942	T28N/R05E-11G01	D (U)	RR/5 ac	289	ND	99	97	6	ND	--	Qvr	--	Qvt	--	96	Qva	96	C	--	--	--	--	--	M	--	ND				
158-004	5/24/1949	T28N/R05E-12R10	D (U)	U	92	ND	150	112	10	ND	112	Qvt	104	Qvt	0	104	Qva	104	C	380	13	12	180	5,500	L	7/1/1949	72.5				
152-005	8/21/2001	T28N/R05E-12H02	RP (D)	U	144	HSA	35	25	2	Y	25	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	M	--	ND				
036-005	12/1/1993	T28N/R06E-07M21	RP (D)	U	125	HSA	44	24	2	Y	24	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	--	ND				
150-018	8/7/2001	T28N/R06E-07N28	RP (D)	U	115	HSA	18	3	2	Y	3	Qvt	--	ND	--	--	ND	--	UC	--	--	--	--	--	L	--	ND				
039-026	5/26/1994	T28N/R06E-05N02	RP (D)	RI	62	HSA	15	5	2	Y	5	Qal	--	ND	--	--	Qal	0	UC	--	--	--	--	--	H	5/26/1994	10				
039-027	5/26/1994	T28N/R06E-05N03	RP (D)	RI	62	HSA	17	7	2	Y	7	Qal	--	ND	--	--	Qal	0	UC	--	--	--	--	--	H	5/26/1994	10				
039-028	5/26/2002	T28N/R06E-05N04	RP (D)	RI	62	HSA	22	12	2	Y	12	Qal	--	ND	--	--	Qal	0	UC	--	--	--	--	--	H	5/26/1994	15				
039-048	5/26/1994	T28N/R06E-07M22	RP (D)	U	125	HSA	45	15	4	Y	15	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	--	ND				
039-050	2/17/1999	T28N/R06E-07M23	RP (D)	U	128	HSA	30	10	2	Y	10	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	--	ND				
040-039	3/11/1996	T28N/R06E-18M02	RP (D)	U	56	HSA	18.5	5	2	Y	5	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	M	3/11/1996	7.5				
040-040	3/11/1996	T28N/R06E-18M03	RP (D)	U	56	HSA	19	5	2	Y	5	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	M	7/24/2002	8.5				
040-041	3/11/1996	T28N/R06E-18M04	RP (D)	U	56	HSA	18.5	5	2	Y	5	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	M	3/11/1996	6				
040-045	4/29/1998	T28N/R06E-18M05	RP (D)	U	56	HSA	17	17	2	Y	5	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	M	4/29/1998	4				
040-046	4/29/1998	T28N/R06E-18M06	RP (D)	U	56	HSA	14	2	2	Y	2	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	M	4/29/1998	4				
153-035	9/27/2001	T28N/R06E-18M07	RP (D)	U	56	HSA	14.5	4.5	2	Y	4.5	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	M	9/27/2002	8				
153-036	9/27/2001	T28N/R06E-18M08	RP (D)	U	56	HSA	20	5	2	Y	5	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	M	9/27/2002	8				
152-019	9/13/2001	T29N/R05E-23J02	RP (D)	ULDR6-LKST	276	ND	11	--	--	N	--	Qvt	--	ND	--	--	ND	--	UC	--	--	--	--	--	L	9/13/2001	7				
056-024	9/27/1991	T29N/R05E-36M01	RP (D)	UC/BP-SNO	187	ND	24	--	--	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	--	ND				
056-026	9/27/1991	T29N/R05E-36M02	RP (D)	UC/BP-SNO	187	HSA	23	--	--	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	--	ND				
056-027	9/27/1991	T29N/R05E-36M03	RP (D)	UC/BP-SNO	187	HSA	14	--	--	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	--	ND				
063-103	8/14/2000	T29N/R06E-30E01	RP (D)	ULDR6-LKST	226	ND	12	12.5	36	Y	0	Qva	--	ND	--	--	ND	--	UC	--	--	--	--	--	M	--	ND				
150-074	7/27/2001	T29N/R05E-01M03	RP (D)	RR/5 ac	348	ND	90	--	--	N	--	Qvt	--	ND	--	--	ND	--	UC	--	--	--	--	--	L	--	ND				
091-067	11/12/1992	T30N/R06E-22C03	RP (D)	RR/5 ac	295	HSA	42	41	1	Y	39	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	--	ND				
091-068	11/12/1992	T30N/R06E-22C04	RP (D)	RR/5 ac	295	HSA	54	51	1	Y	49	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	11/12/1992	6.5				
091-069	11/12/1992	T30N/R06E-22C05	RP (D)	RR/5 ac	295	HSA	45	39	1	Y	37	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	11/12/1992	4				
091-070	11/16/1992	T30N/R06E-22C06	RP (D)	RR/5 ac	292	HSA	61	60.5	1	Y	58.5	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	11/12/1992	9.7				
091-071	11/16/1992	T30N/R06E-22C07	RP (D)	RR/5 ac	295	HSA	59	41	59	Y	57	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	11/12/1992	10				
091-072	11/16/1992	T30N/R06E-22C08	RP (D)	RR/5 ac	295	HSA	43	43	1	Y	40	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	11/12/1992	13				
171-050	12/8/2000	T31N/R05E-15H01	RP (D)	U	128	AR	28	25	--	N	26.5	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	M	12/8/2000	26.5				
171-051	12/8/2000	T31N/R05E-15H02	RP (D)	U	128	AR	29	26	--	N	26	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	M	12/8/2000	26.5				
171-052	12/8/2000	T31N/R05E-15H03	RP (D)	U	128	AR	31	28	--	N	28	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	M	12/8/2000	28				
171-053	12/8/2000	T31N/R05E-15H04	RP (D)	U	128	AR	30	27	--	N	27	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	M	12/8/2000	28				
159-052	6/4/2002	T28N/R06E-07N29	RP (D)	U	115	HSA	14.2	5	2	Y	4	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	--	ND				
159-053	6/14/2002	T28N/R06E-07N30	RP (D)	U	115	HSA	14.2	5	2	Y	4	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	--	ND				
159-054	6/14/2002	T28N/R06E-07N31	RP (D)	U	115	HSA	20.2	5	2	Y	5	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	--	ND				
156-091	2/7/2002	T29N/R06E-21H01	RP (D)	RFC	121	ND	13	8	2	Y	8	Qal	--	ND	--	--	Qal	0	UC	--	--	--	--	--	H	2/7/2002	8				
156-092	2/7/2002	T29N/R06E-21H02	RP (D)	RFC	121	ND	13	8	2	Y	8	Qal	--	ND	--	--	Qal	0	UC	--	--	--	--	--	H	2/7/2002	8				
156-089	2/7/2002	T29N/R06E-21H03	RP (D)	RFC	121	ND	13	8	2	Y	8	Qal	--	ND	--	--	Qal	0	UC	--	--	--	--	--	H	2/7/2002	8				
156-090	2/7/2002	T29N/R06E-21H04	RP (D)	RFC	121	ND	13	8	2	Y	8	Qal	--	ND	--	--	Qal	0	UC	--	--	--	--	--	H	2/7/2002	8				
168-004	11/19/2002	T29N/R05E-35K02	RP (D)	RFC	3	HSA	25	15	2	Y	15	Q(A)f	--	ND	--	--	Q(A)c	0	UC	--	--	--	--	--	L	11/19/2002	17				
168-005	11/19/2002	T29N/R05E-35K03	RP (D)	RFC	3	HSA	25	15	2	Y	15	Q(A)f	--	ND	--	--	Q(A)c	0	UC	--	--	--	--	--	L	11/19/2002	17				
168-006	11/19/2002	T29N/R05E-35K04	RP (D)	RFC	3	HSA	35	25	2	Y	25	Q(A)f	--	ND	--	--	Q(A)c	0	UC	--	--	--	--	--	L	11/19/2002	30				
192-063	8/13/2003	T28N/R05E-12R11	RP (D)	U	108	HSA	15	5	2	Y	5	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	8/13/2003	7				
192-064	8/13/2003	T28N/R05E-12R12	RP (D)	U	108	HSA	15	5	2	Y	5	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	8/13/2003	7				
149-022	10/4/2000	T28N/R05E-12A01	D (D)	ULDR4-6	164	ND	31	31	36	N	--	Qvr	--	ND	--	--	ND	--	UC	--	--	--	--	--	M	10/4/2000	10				
057-010	4/21/1995	T29N/R06E-04R04	D (D)	RR/5 ac	220	ND	24	24	36	N	--	Qva	--	ND	--	--	Qva	0	UC	--	--	--	--	--	M	4/21/1995	8				
057-062	5/25/1999	T29N/R06E-06B05	D (D)	RR/5 ac	358	AR	105	105	6	N	--	Qvt	102	ND	--	--	ND	--	UC	--	--	--	--	--	L	--	ND				
061-002	9/10/1999	T29N/R06E-16Q02	D (D)	RR/5 ac	134	DR	13	13	2	N	--	Qal	--	ND	--	--	Qal	0	UC	--	--	--	--	--	H	9/10/1999	10				
113-057	8/6/1993	T31N/R05E-26G01	D (D)	RR/5 ac	358	AR	35	24	4.5	Y	24	Qvt	--	ND	--	--	Qvt	0	UC	12	35	2	4	40	L	8/6/1993	14				
158-082	1/1/1959	T29N/R06E-07D02	D (D)	UCOM	223	D	40	40	48	ND	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	--	ND				
159-004	9/11/1945	T30N/R06E-20M03	D (D)	RR/5 ac	400	D	24	24	24	ND	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	9/10/1945	15				
167-076	12/12/2002	T30N/R06E-23D03	D (D)	LCF	282	D	18.5	0	0	N	--	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	M	12/11/2002	11				
001-080	6/7/1985	T30N/R05E-12J05	D	RR/5 ac	423	CT	62	62	6	N	--	Qvt	58	ND	--	--	Qva	58	UC	20	10	1	120	--	L	6/7/1985	32				
149-062	1/16/2001	T30N/R05E-13A03	D	RR/5 ac	397	AR	60	53	6	N	--	Qvr	24	ND	--	--	Qva	55	UC	25	12	1.5	--	--	M	1/16/2001	11				
011-039	6/18/1979	T31N/R06E-31Q02	D	RR/5 ac	508	CT	80	75	6	Y	75	Qvt	67	ND	--	--	Qva	67	UC	10	14	2	3	13	L	6/18/1979	52				
035-067	9/17/1976	T28N/R06E-06C01	D	RR/5 ac	223	AR	72	70	6	N	--	Qva	--	ND	--	--	Qva	0	UC	12	10	1	70	--	M	9/17/1976	50	5/20/1992	49		
035-078	9/27/1994	T28N/R05E-11F01	D	RR/5 ac	312	CT	123.5	118.2	6	Y	118.2	Qvr	42	ND	42	115	Qva	115	UC	17	4	2	60	300	M	9/27/1994	102				
154-054	5/9/2001	T28N/R05E-03L02	D	RR/5 ac	36	CT	51	41	6	Y	46	Q(A)c	--	ND	--	--	Q(A)c	0	UC	15	2	4	120	600	L	5/9/2001	13				
175-032	5/11/2001	T28N/R05E-03L03	D	RR/5 ac	36	CT	53	47	6	Y	43	Q(A)f	--	ND	--	--	Q(A)c	0	UC	15	2	1	50	500	L	--	ND				
035-083	7/21/1981	T28N/R05E-03R01	D	RR/5 ac	79	AR	96	96	6	N	--	Qvt	60	ND	--	--	Qva	30	UC	20	27	1	--	--	L	7/21/1981	59	5/20/1992	60		
039-020	5/1/1986	T28N/R06E-05D01	D	RFC	59	AR	39	38	6	N	--	Qal	--	ND	--	--	Qal	0	UC	70	--	0.5	--	--	H	5/1/1986	9				
039-030	2/17/1982	T28N/R06E-06J01	D	RFC	56	AR	60.5	55.5	6	Y	55.5	Qal	50	ND	--	--	Q(A)c	50	UC	--	--	--	--	--	H	2/17/1982	1	1/12/1993	7		
039-036	7/29/1998	T28N/R06E-06D02	D	RR/5 ac	243	AR	102	94	6	Y	94	Qvt	38	ND	--	--	Q(A)c	93	UC	30	--	1	--	--	L	7/29/1998	60				
039-041	8/30/1995	T28N/R06E-07J01	D	RFC	49	AR	40	36	6	N	--	Qal	8	ND	--	--	Q(A)c	8	UC	40	35	1	--	--	H	8/30/1995	14				
039-042	8/29/1995	T28N/R06E-07J02	D	RFC	49	AR	40	35	6	N	--	Qal	7	ND	--	--	Q(A)c	16	UC	40	35	1	--	--	H	8/29/1995	14				
153-098	8/11/2001	T28N/R06E-07A01	D	RFC	49	AR	80	78	6	N	--	Qal	56	ND	--	--	Q(A)c	56	UC	20	75	1	--	--	H	8/11/2001	46				
039-054	8/7/1992	T28N/R06E-08D01	D	RFC	49	AR	40	35	6	N	--	Qal	36	ND	--	--	Qal	0	UC	50	35	1	--	--	H	8/7/1992	9				
039-055	8/26/1987	T28N/R06E-08E01	D	RFC	39	AR	37	37	6	N	--	Qal	--	ND	--	--	Qal	0	UC	60	--	--	--	--	H	8/26/1987	10	5/6/1992	13		
039-064	6/5/1991	T28N/R06E-05C02	D	RFC	62	HSA	55	50	6	Y	50	Qal	10	ND	--	--	Qva	50	UC	10	1	2	120	600	H	6/5/1991	2				
039-068	2/23/1994	T28N/R06E-05C03	D	RFC	62	AR	55	49.3	6	Y	49.3	Qal	35	ND	--	--	Qva	50	UC	20	0.5	1	720	3,600	H	2/23/1994	2				
051-049	4/23/1993	T29N/R05E-01B02	D	RR/5 ac	358	AR	120	115	6	Y	115	Qvt	25	ND	--	--	Qva	25	UC	15	115	4	--	--	L	4/23/1993	68				
051-054	10/13/1987	T30N/R05E-35H02	D	ULDR5-6MV	367	AR	120	120	6	N	--	Qvt	95	ND	--	--	Qvt	95	UC	30	21	1	--	--	L	10/13/1987	85				
051-064	5/29/1991	T29N/R05E-02P01	D	ULDR5-6MV	200	AR	55	55	4.5	Y	45	Qvt	52	ND	--	--	Qva	52	UC	11	0	2	--	--	L	5/29/1991	41				
051-065	11/18/1994	T29N/R05E-02P02	D	ULDR5-6MV	200	AR	95	95	4	Y	75	Qvt	82	ND	--	--	Qva	82	UC	15	3	2	20	400	L	11/18/1994	68				
154-003	10/4/2001	T29N/R05E-11Q01	D	RR/5 ac	167	AR	400	288	6	Y	288	Qvt	41	ND	--	--	Q(B)c	256	UC	11	71	2	1	13	L	10/11/2001	166				
053-018	8/1/1936	T29N/R06E-13L01	D	UMDR6-12	364	D	66	66	6	N	--	Qvt	58	ND	--	--	Qva	58	UC	8	2	3	310	--	L	1/1/1937	56	5/5/1992	59		
056-016	9/6/1978	T28N/R05E-01P01	D	ULDR4-6	200	AR	57	57.5	6	N	--	Qvt	56	ND	--	--	Qva	56	UC	10	--	--	--	--	L	9/6/1978	43				
056-019	5/2/1996	T29N/R05E-36G01	D	RR/5 ac	328	AR	80	80	6	N	--	Qvt	58	ND	--	--	Qva	58	UC	25	75	1	--	--	L	5/2/1996	39				
056-021	9/7/1978	T28N/R05E-01P02	D	ULDR4-6	197	AR	78	78	6	N	--	Qvt	53	ND	--	--	Qva	53	UC	25	--	--	--	--	L	9/7/1978	45				
056-030	10/22/1984	T29N/R05E-36P03	D	RR/5 ac	213	AR	80	80	6	N	--	Qvt	75	ND	--	--	Qva	75	UC	8	--	--	--	--	L	10/23/1984	35	3/25/1992	35		
056-032	2/11/1998	T29N/R05E-36P04	D	RR/5 ac	200	AR	65	45	4	Y	55	Qvt	60	ND	--	--	Qva	60	UC	15	0	2	--	--	L	2/11/1998	50				
056-089	12/2/1991	T29N/R06E-03M03	D	RR/5 ac	259	AR	93	73	4.5	Y	73	Qvt	52	ND	--	--	Qva	52	UC	3	--	--	--	--	L	12/2/1991	72	4/9/1992	53		
056-091	4/24/1994	T29N/R06E-03P04	D	RR/5 ac	177	D	15	15	36	Y	12.5	Qal	--	ND	--	--	Qal	--	UC	20	3	1	--	--	H	4/24/1994	10				
151-003	8/4/2001	T29N/R06E-04F01	D	RR/5 ac	298	AR	248	171	4	Y	171	Qvt	28	ND	--	--	Q(A)c	215	UC	23	10	2	20	340	L	8/4/2001	117				
056-109	11/8/1973	T29N/R06E-04B03	D	RR/5 ac	295	CT	127	127	6	Y	122	Qvt	124	ND	--	--	Qva	124	UC	8	0	2	--	--	L	11/8/1973	115				
056-111	9/24/1975	T29N/R06E-04F02	D	RR/5 ac	298	CT	165	165	6	Y	99	Qvt	101	ND	--	--	Qva	101	UC	11	0	2	--	--	L	9/24/1975	99				
057-002	12/15/1993	T29N/R06E-04M01	D	RR/5 ac	207	AR	60	60	6	Y	55	Qva	--	ND	--	--	Qva	0	UC	60	55	1	--	--	M	12/15/1993	18				
057-003	7/17/1996	T29N/R06E-04M02	D	RR/5 ac	203	AR	60	60	6	N	--	Qal	22	ND	--	--	Qva	22	UC	--	--	--	--	--	H	7/17/1996	10				
057-012	5/9/1979	T29N/R06E-04K07	D	RR/5 ac	295	AR	140	140	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	20	48	1	30	--	L	5/9/1979	95				
057-018	1/11/1978	T29N/R06E-04F03	D	RR/5 ac	308	CT	141	141	6	Y	136	Qvt	127	ND	--	--	Qva	127	UC	13	2	2	90	450	L	1/11/1978	119				
057-020	1/16/1981	T29N/R06E-04B04	D	RR/5 ac	295	AR	135	135	6	Y	130	Qvt	90	ND	--	--	Qva	90	UC	8	--	--	--	--	L	1/16/1981	82				
057-021	11/23/1982	T30N/R06E-28B07	D	RR/5 ac	305	AR	160	160	6	N	--	Qvt	120	ND	--	--	Qva	120	UC	7	--	--	--	--	L	11/23/1982	95				
057-022	11/1/1999	T29N/R06E-04B05	D	RR/5 ac	295	AR	133	133	6	N	--	Qvt	76	ND	--	--	Qva	76	UC	12	12	1.5	--	--	L	11/11/1999	108				
057-023	11/1/1999	T29N/R06E-04B06	D	RR/5 ac	295	AR	133	133	6	N	--	Qvt	76	ND	--	--	Qva	76	UC	13	12	1.5	--	--	L	11/11/1999	108				
057-025	12/15/1975	T29N/R06E-04M03	D	RR/5 ac	262	ND	96	88.9	6	Y	88.9	Qva	--	ND	--	--	Qva	0	UC	12	0	2	--	--	M	12/15/1975	81				
057-029	9/7/1978	T29N/R06E-24J01	D	UMDR6-12	426	CT	86	83	6	Y	83	Qvt	30	ND	--	--	Qva	70	UC	7	2	1	50	140	M	9/7/1978	75				
057-030	5/20/1991	T29N/R06E-05H01	D	UI	239	CT	66	66	6	Y	--	Qvt	36	ND	--	--	Qva	36	UC	22	1	1	--	1,750	L	5/20/1991	29				
057-050	8/16/1984	T29N/R06E-05J03	D	U	246	CT	103	91	6	Y	91	Qvt	78	ND	--	--	Qva	78	UC	85	14	4	50	500	L	8/13/1984	65.5	5/5/1992	63	8/20/2002	66
057-065	9/2/1981	T29N/R06E-06B06	D	RR/5 ac	354	AR	105	105	6	N	--	Qvt	64	ND	--	--	Qva	64	UC	20	53	1	--	--	L	9/2/1981	42				
057-067	6/15/2000	T29N/R06E-06B07	D	RR/5 ac	358	AR	148	148	6	Y	143	Qvt	70	ND	--	--	Qva	70	UC	5	74	1	--	--	L	6/15/2000	14				
057-080	12/11/1996	T29N/R06E-06L01	D	UMDR6-12	328	AR	70	70	4	Y	50	Qvt	56	ND	--	--	Qva	56	UC	10	0	3	--	--	L	12/11/1996	30				
057-084	9/19/1991	T29N/R06E-06J02	D	U	420	AR	60	60	6	N	--	Qvt	50	ND	--	--	Qva	50	UC	30	50	1	--	--	L	9/19/1991	27				
057-088	2/28/1991	T29N/R06E-06J03	D	U	417	AR	60	60	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	40	55	1	--	--	L	7/25/1988	29	5/5/1992	26		
057-089	9/20/1991	T29N/R06E-06J04	D	U	420	AR	60	57	6	N	--	Qvt	58	ND	--	--	Qva	58	UC	20	50	1	--	--	L	9/20/1991	35				
057-095	2/22/1995	T29N/R06E-04K08	D	RR/5 ac	321	ND	14	14	36	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	2/22/1995	4				
057-098	1/11/1990	T29N/R06E-10N01	D	RR/5 ac	154	AR	40	40	6	N	--	Qal	--	ND	--	--	Qal	0	UC	30	35	1	--	--	H	1/11/1990	13				
057-099	5/22/1992	T29N/R06E-10E02	D	RR/5 ac	174	D	23	23	36	Y	--	Qal	--	ND	--	--	Qal	0	UC	40	10	0.5	--	220	H	5/22/1992	14				
057-104	6/13/1996	T29N/R06E-09Q05	D	RR/5 ac	177	AR	80	80	6	N	--	Qva	44	ND	--	--	Qva	0	UC	30	75	1	--	--	M	6/13/1996	51				
057-105	6/15/1996	T29N/R06E-09Q06	D	RR/5 ac	177	AR	80	80	6	N	--	Qva	44	ND	--	--	Qva	0	UC	30	75	1	--	--	M	6/15/1996	49				
058-003	10/23/1978	T29N/R06E-09M01	D	U	194	AR	53	53	6	N	--	Qvt	39	ND	--	--	Qva	39	UC	60	--	--	--	--	L	10/23/1978	40				
058-005	4/7/1987	T29N/R06E-09N03	D	ULDR4-LKST	197	AR	48	44	6	Y	44	Qvt	35	ND	--	--	Qva	35	UC	15	--	--	--	--	L	4/7/1987	20				
058-037	11/7/1996	T29N/R06E-10N02	D	RR/5 ac	157	AR	59	59	4	Y	39	Qal	7	ND	--	--	Qva	42	UC	20	4	2	20	400	H	11/7/1996	14				
059-073	4/19/1990	T29N/R06E-32F01	D	RFC	66	AR	29	29	6	N	--	Qal	--	ND	--	--	Qal	0	UC	30	33	1	--	--	H	4/19/1990	5				
059-077	7/17/1984	T29N/R05E-13B01	D	UCOM	341	AR	125	120	6	N	--	Qvt	82	ND	--	--	Qva	82	UC	2	2	2	60	--	L	--	ND				
060-092	3/26/1994	T29N/R06E-16G03	D	RR/5 ac	154	CT	44	44	6	Y	38	Qal	--	ND	--	--	Qal	0	UC	15	0	1	--	--	H	3/26/1994	1				
060-099	8/23/1979	T29N/R06E-19H01	D	ULDR4-LKST	230	AR	58	58	6	N	--	Qva	--	ND	--	--	Qva	0	UC	25	--	--	--	--	M	8/23/1979	10				
061-001	8/25/1979	T29N/R06E-16K02	D	RR/5 ac	138	AR	58	58	6	N	--	Qal	--	ND	--	--	Qal	0	UC	50	--	--	--	--	H	8/25/1979	10				
061-003	9/7/1999	T29N/R06E-16Q03	D	RR/5 ac	134	AR	60	60	6	N	--	Qal	--	ND	--	--	Qal	0	UC	60	10	2	--	--	H	9/7/1999	9				
061-004	7/4/1981	T29N/R06E-16B01	D	RR/5 ac	164	D	45	42	42	Y	42	Qva	--	ND	--	--	Qva	0	UC	50	7	1	--	--	M	7/4/1981	30				
061-009	7/10/1978	T29N/R06E-16P01	D	RR/5 ac	210	AR	137	137	6	N	--	Qva	--	ND	--	--	Qva	0	UC	50	2	2	1,500	--	M	7/10/1978	106				
061-010	12/11/1990	T29N/R06E-21N02	D	RR/5 ac	108	AR	100	98	6	N	--	Qal	35	ND	--	--	Qva	40	UC	37	98	1	--	--	H	12/11/1990	73				
061-060	8/24/1987	T29N/R06E-20B02	D	RR/5 ac	223	CT	25	25	6	Y	20	Qvt	14	Qvt	0	--	Qva	14	UC	30	1	2	540	2,700	L	8/24/1987	13				
061-061	6/30/1988	T29N/R06E-20B01	D	RR/5 ac	213	AR	55	50	6	Y	50	Qvt	41	ND	--	--	Qva	41	UC	15	5	1	20	100	L	7/2/1988	37				
061-066	4/4/1983	T29N/R06E-21E05	D	RR/5 ac	177	AR	50	50	6	N	--	Qva	--	ND	--	--	Qva	0	UC	45	0	0.5	--	--	M	--	ND				
061-067	4/9/1986	T29N/R06E-21G01	D	RFC	118	AR	46	46	6	N	--	Qal	--	ND	--	--	Qal	0	UC	10	15	1	40	--	H	4/9/1986	15				
061-073	1/4/1991	T29N/R06E-21D06	D	RR/5 ac	194	ND	32	32	36	Y	30	Qvt	--	ND	--	--	Qvt	0	UC	40	8	1	--	--	L	1/4/1991	22				
061-076	2/1/1988	T29N/R06E-21F02	D	RR/5 ac	184	AR	98	98	6	N	--	Qva	--	ND	--	--	Qva	0	UC	15	20	0.5	--	--	M	2/1/1988	74				
061-081	9/18/1992	T29N/R06E-21D07	D	RR/5 ac	213	CT	40	35	6	Y	35	Qvt	23	ND	--	--	Qva	23	UC	15	0	1	--	--	L	9/18/1992	24				
061-091	2/1/1988	T29N/R06E-21F03	D	RR/5 ac	184	AR	98	98	6	N	--	Qva	--	ND	--	--	Qva	0	UC	15	20	0.5	--	--	M	2/1/1988	74				
061-093	8/24/1994	T29N/R06E-21E06	D	RR/5 ac	187	AR	49	49	6	Y	45	Qva	--	ND	--	--	Qva	0	UC	16	49	1	--	--	M	8/24/1994	24				
061-095	10/20/1987	T29N/R06E-21M01	D	RR/5 ac	115	AR	58	58	6	N	--	Qal	0	ND	--	--	Qal	0	UC	60	--	--	--	--	H	10/20/1987	8	8/5/1992	10		
061-099	11/12/1995	T29N/R06E-21K02	D	RFC	118	AR	40	40	6	N	--	Qal	--	ND	--	--	Qal	0	UC	40	35	1	--	--	H	11/12/1995	10				
061-101	11/28/1979	T29N/R06E-17B03	D	U	236	AR	38	38	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	60	--	--	--	--	L	11/28/1979	7				
061-103	6/25/1993	T29N/R06E-21P05	D	RR/5 ac	105	AR	42	38	6	N	--	Qal	--	ND	--	--	Qal	0	UC	18	35	1	--	--	H	6/25/1993	12				
061-105	3/29/1991	T29N/R06E-21E07	D	RR/5 ac	184	AR	50	45	6	Y	45	Qva	--	ND	--	--	Qva	0	UC	20	50	2	--	--	M	3/29/1991	28				
061-106	9/12/1986	T29N/R06E-21N03	D	RR/5 ac	115	AR	38	38	6	N	--	Qal	--	ND	--	--	Qal	0	UC	15	--	--	--	--	H	9/12/1986	11				
061-108	7/30/1992	T29N/R06E-21M02	D	RR/5 ac	141	AR	60	60	6	N	--	Qva	--	ND	--	--	Qva	0	UC	30	60	1	--	--	M	7/30/1992	37				
061-111	3/21/1985	T29N/R06E-21N04	D	RR/5 ac	112	AR	32	32	6	N	--	Qal	--	ND	--	--	Qal	0	UC	15	--	--	--	--	H	3/21/1985	6				
061-112	11/28/1990	T29N/R06E-21B01	D	RR/5 ac	121	ND	34	29	6	Y	29	Qal	--	ND	--	--	Qal	0	UC	7	8	2	2	11	H	12/1/1990	12				
063-024	9/8/1987	T29N/R06E-29B01	D	RR/5 ac	180	AR	129	129	6	N	--	Qva	95	ND	--	--	Q(A)c	95	UC	10	4	4	150	--	M	9/8/1987	104				
064-017	8/6/1997	T29N/R06E-32F02	D	RFC	72	AR	23	20	6	Y	18	Qal	--	ND	--	--	Qal	0	UC	12	2	1	2	11	H	8/6/1997	12				
064-024	3/18/1986	T29N/R06E-32M06	D	RFC	105	D	15	15	36	Y	12	Qva	--	ND	--	--	Qva	0	UC	50	3	0.3	--	--	M	3/18/1986	11				
064-025	5/1/1979	T29N/R06E-29P02	D	RR/5 ac	79	AR	59	59	6	N	--	Qal	50	ND	--	--	Qva	50	UC	60	0	0.5	--	--	H	5/1/1979	13				
070-086	7/22/1980	T30N/R05E-01A06	D	RR/5 ac	413	AR	56	51	6	Y	51	Qvt	40	ND	--	--	Qva	40	UC	10	18	1	--	--	L	7/22/1980	28				
070-094	11/5/1997	T30N/R05E-01L03	D	RR/5 ac	403	AR	60	55	6	Y	55	Qvt	26	ND	--	--	Qva	26	UC	40	60	1	--	--	L	11/5/1997	28				
071-001	6/24/1989	T30N/R05E-01A01	D	RR/5 ac	384	AR	125	120	6	Y	120	Qvt	85	ND	--	--	Qva	85	UC	22	115	1	--	--	L	6/24/1989	87	6/16/1992	88	9/4/2002	40
071-011	2/21/1994	T30N/R05E-01J06	D	RR/5 ac	456	AR	80	80	6	N	--	Qvt	65	ND	--	--	Qva	65	UC	18	80	2	--	--	L	2/21/1994	65				
071-013	8/10/1987	T30N/R05E-01E03	D	RR/5 ac	384	AR	118	118	6	N	--	Qvt	73	ND	--	--	Q(A)c	100	UC	11	--	--	--	--	L	8/10/1987	75				
071-014	7/13/1994	T30N/R05E-01L04	D	RR/5 ac	390	AR	60	60	6	N	--	Qvt	35	ND	--	--	Qva	35	UC	60	60	1	--	--	L	7/13/1994	31				
071-028	1/10/1996	T30N/R05E-02B03	D	RR/5 ac	285	P	97	92	6	Y	92	Qvt	65	ND	--	--	Qva	65	UC	40	95	1	--	--	L	1/10/1996	71	8/28/2002	68		
071-029	10/3/1991	T30N/R05E-02B04	D	RR/5 ac	292	AR	170	168.5	6	N	--	Qvt	55	ND	--	--	Q(A)c	97	UC	50	160	1	--	--	L	10/3/1991	104				
071-033	3/30/2000	T30N/R05E-02L03	D	RR/5 ac	390	ND	85	69	6	Y	69	Qvt	53	ND	--	--	Qva	53	UC	15	6	1	7	70	L	3/30/2000	60				
149-097	7/4/2001	T30N/R05E-02F01	D	RR/5 ac	380	CT	80	66	6	Y	66	Qvt	63	ND	--	--	Qvt	63	UC	15	7	1	6	60	L	7/3/2001	64				
071-038	7/28/1981	T30N/R05E-02M02	D	RR/5 ac	233	AR	137	137	6	N	--	Qva	--	ND	--	--	Qva	0	UC	50	--	--	--	--	L	7/28/1981	90				
071-043	9/10/1993	T30N/R05E-02N03	D	RR/5 ac	102	AR	155	150	6	Y	150	Qva	74	ND	--	--	Qva	74	UC	11	155	1	--	--	H	9/10/1993	124				
071-045	7/26/1991	T30N/R05E-02K04	D	RR/5 ac	390	AR	78	78	6	N	--	Qvt	50	ND	--	--	Qva	50	UC	14	73	1	--	--	L	7/26/1991	60				
071-052	8/4/1992	T30N/R05E-02N04	D	RR/10 ac	95	D	18	18	36	ND	--	Qal	4	ND	--	--	Qva	4	UC	3	4	2	--	30	H	8/4/1992	18				
071-101	11/30/1990	T30N/R05E-35J02	D	ULDR5-6MV	380	AR	212	209	6	N	--	Qvt	105	ND	--	--	Qva	105	UC	20	208	1	--	--	L	11/30/1990	110				
158-040	4/9/2001	T30N/R06E-06K02	D	RR/5 ac	443	AR	50	40	4	Y	40	Qvt	40	ND	--	--	Qva	40	UC	15	0	2	--	--	L	4/9/2001	35				
074-005	6/10/1997	T30N/R05E-11A01	D	RR/5 ac	390	P	116	106	4	Y	106	Qvt	56	ND	--	--	Qva	56	UC	20	0	2	--	--	L	6/10/1997	66	8/27/2002	67		
074-012	5/1/1987	T30N/R05E-11J03	D	RR/5 ac	377	AR	134	130	6	Y	--	Qvt	75	ND	--	--	Qva	75	UC	20	--	--	--	--	L	5/1/1987	90				
074-041	7/19/1980	T30N/R05E-12G01	D	RR/5 ac	400	CT	36	30	6	ND	30	Qvt	--	ND	--	--	Qvt	0	UC	14	16	2	2	11	L	7/19/1980	10				
074-042	9/17/1987	T30N/R05E-12G02	D	RR/5 ac	400	AR	38	33	6	ND	35	Qvt	--	ND	--	--	Qvt	0	UC	20	10	1	--	--	L	9/17/1987	21				

Appendix A.
Table A-1. Well Details and Water Levels.

SnoCo ID	Completion Date	Legal	Well Type	Land Use	Elevation	Drilling Method	Well Details					Surface		Confining			Aquifer		Confined Unconfined	Aquifer Properties					USGS Aquifer Sensitivity	Water Level Data					
							Drill Depth	Casing Depth	Casing Diameter	Screen (Y or N)	Screen Top Depth	Geologic Unit	Unit Bottom	Geologic Unit	Unit Top	Unit Bottom	Geologic Unit	Unit Top		Yield	Drawdown	Time	Conductivity (K)	Transmissivity (T)		Date	Depth to Water	Date	Depth to Water	Date	Depth to Water
							(ft)	(ft)	(in)		(ft)		(ft)		(ft)	(ft)		(ft)		(gpm)	(ft)	(hr)	(ft/d)	(ft^2/d)			(ft)		(ft)		(ft)
074-043	2/19/1996	T30N/R05E-12K02	D	RR/5 ac	390	CT	34	29	6	Y	29	Qvt	--	ND	--	--	Qvt	0	UC	12	4	1	20	100	L	2/19/1996	1				
074-045	7/18/1994	T30N/R05E-12F01	D	RR/5 ac	384	AR	37	15	4.5	Y	15	Qvt	--	ND	--	--	Qvt	0	UC	14	10	2	3	70	L	7/18/1994	14				
074-052	9/27/1994	T30N/R05E-12J06	D	RR/5 ac	410	AR	63	63	6	N	--	Qvt	35	ND	--	--	Qva	35	UC	10	60	1	--	--	L	9/27/1994	30				
074-058	5/31/1983	T30N/R05E-12R03	D	RR/5 ac	413	CT	115	115	6	N	--	Qvt	86	ND	--	--	Qva	86	UC	30	5	1	370	--	L	5/31/1983	90				
074-074	5/29/1981	T30N/R05E-12P05	D	RR/5 ac	390	AR	38	38	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	10	21	1	--	--	L	5/29/1981	7				
074-076	8/3/1988	T30N/R05E-12N02	D	RR/5 ac	400	AR	40	35	6	Y	35	Qvt	--	ND	--	--	Qvt	0	UC	15	--	--	--	--	L	8/3/1988	12				
074-079	4/10/1998	T30N/R05E-12N03	D	RR/5 ac	384	ND	77	64	6	Y	64	Qvt	55	ND	--	--	Qva	55	UC	25	7	25	30	370	L	4/10/1998	55				
074-081	11/3/1979	T30N/R05E-12R04	D	RR/5 ac	420	AR	53	52	6	N	--	Qvt	47	ND	--	--	Qva	47	UC	6	10	1	--	--	L	11/3/1979	27				
074-083	9/25/1991	T30N/R05E-13E03	D	RR/5 ac	443	AR	140	140	6	N	--	Qvt	100	ND	--	--	Qva	100	UC	9	130	1	--	--	L	9/25/1991	118				
074-089	7/6/1990	T30N/R05E-13C03	D	RR/5 ac	403	AR	47	50	6	N	--	Qvt	37	ND	--	--	Qva	37	UC	15	35	1	--	--	L	7/6/1990	37				
074-092	9/13/1978	T30N/R05E-13H01	D	RR/5 ac	403	AR	40	35	6	Y	35	Qvr	--	ND	--	--	Qvr	0	UC	15	10	--	--	--	M	9/13/1978	20				
074-093	1/29/1986	T30N/R05E-13A04	D	RR/5 ac	390	ND	40	37	6	ND	37	Qvr	--	ND	--	--	Qvr	0	UC	600	--	1	--	--	L	1/29/1986	12				
075-002	12/13/1988	T30N/R05E-13R05	D	RR/5 ac	380	ND	21	21	36	N	--	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	M	12/13/1988	10				
075-003	10/26/1998	T30N/R05E-13J01	D	RR/5 ac	394	AR	52	47	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	20	47	1	--	--	M	10/26/1998	6				
075-006	2/24/1993	T30N/R05E-13R06	D	RR/5 ac	384	CT	76	71	6	Y	71	Qvr	4	ND	--	--	Qva	52	UC	10	6	1	5	20	M	2/24/1993	52				
075-010	8/31/1989	T30N/R05E-13H02	D	RR/5 ac	400	AR	40	40	6	Y	35	Qvr	--	ND	--	--	Qvr	0	UC	30	40	1	--	--	M	8/31/1989	12				
075-011	3/18/1994	T30N/R05E-13J02	D	RR/5 ac	390	ND	80	80	6	N	--	Qvr	38	ND	--	--	Qva	60	UC	30	80	1	--	--	M	3/18/1994	56	9/4/2002	56		
076-015	5/10/1993	T30N/R06E-18M01	D	RR/5 ac	394	AR	80	80	6	N	--	Qvt	45	ND	--	--	Qva	45	UC	40	20	1	120	--	M	5/10/1993	54				
076-016	4/14/1989	T30N/R06E-18N03	D	RR/5 ac	377	AR	33	33	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	40	--	--	--	--	M	4/14/1989	10				
076-017	4/13/1989	T30N/R06E-18M02	D	RR/5 ac	397	AR	36	36	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	35	--	--	--	--	M	4/13/1989	12				
076-020	6/21/1977	T30N/R06E-22H02	D	LCF	282	D	30	30	36	Y	27.5	Qvr	--	ND	--	--	Qvr	0	UC	40	12	0.8	--	--	M	10/5/1990	18				
077-055	8/2/1991	T30N/R05E-25E02	D	ULDR4-6	344	AR	260	160	6	N	--	Qvt	95	ND	--	--	Qva	95	UC	20	250	--	--	--	L	8/2/1991	97	7/15/1992	87		
077-059	10/10/1990	T30N/R05E-36A03	D	RR/5 ac	377	CT	126	117	6	Y	117	Qvt	81	ND	--	--	Qva	81	UC	19	7	2	30	130	L	10/10/1990	96				
149-066	2/22/2001	T30N/R05E-25K04	D	RR/5 ac	354	AR	90	80	6	Y	80	Qvt	45	ND	--	--	Qva	45	UC	20	83	0.5	--	--	L	2/22/2001	58				
077-073	5/12/1995	T30N/R05E-25M03	D	U	361	CT	141	133	6	Y	133	Qvt	104	Qvt	0	104	Qva	104	UC	11	25	1	8	40	L	5/12/1995	102				
077-074	7/21/1983	T30N/R05E-25P01	D	RR/5 ac	420	AR	155	155	6	N	--	Qvt	90	ND	--	--	Qva	90	UC	15	10	--	--	--	L	7/21/1983	135				
077-086	10/18/1985	T30N/R05E-26R01	D	U	354	ND	80	80	54	N	--	Qvt	--	ND	--	--	Qvt	0	UC	50	10	0.5	30	--	L	10/18/1985	68				
081-082	7/31/1988	T30N/R05E-35J03	D	ULDR5-6MV	377	AR	180	170	6	Y	170	Qvt	101	Qvt	0	101	Qva	101	UC	10	41	2	11	--	L	7/13/1988	118	7/16/1992	85		
081-087	6/11/1994	T30N/R05E-35K01	D	ULDR5-6MV	298	AR	58	52	6	Y	52	Qvt	--	ND	--	--	Qvt	0	UC	10	55	1	--	--	L	--	ND	3/17/2003	7		
081-096	4/24/1992	T30N/R05E-36A04	D	RR/5 ac	358	AR	85	80	6	N	--	Qvt	65	ND	--	--	Qva	65	UC	10	80	0.5	--	--	L	4/24/1992	60				
081-104	8/2/1991	T30N/R05E-36B03	D	RR/5 ac	413	CT	175	175.5	6	ND	170	Qvt	135	ND	--	--	Qva	135	UC	15	1	1	200	1,000	L	8/2/1991	127				
081-106	5/8/1996	T30N/R05E-36B01	D	RR/5 ac	446	CT	190	185	6	Y	185	Qvt	122	ND	--	--	Qva	122	UC	30	10	1	20	110	L	5/8/1996	140				
082-010	8/6/1999	T30N/R05E-25Q06	D	RR/5 ac	377	AR	118	113	6	Y	113	Qvt	82	ND	--	--	Qva	82	UC	18	--	1	--	--	L	8/6/1999	85	3/17/2003	94		
082-012	5/14/1999	T30N/R05E-36F09	D	RR/5 ac	420	AR	198	198	6	Y	180	Qvt	138	ND	--	--	Qva	138	UC	--	--	--	--	--	L	5/14/1999	125				
082-017	8/11/1988	T30N/R05E-36E02	D	RR/5 ac	410	AR	190	190	6	N	--	Qvt	76	ND	--	--	Qva	76	UC	15	145	1	30	--	L	8/11/1988	137	7/15/1992	132		
082-035	6/20/1992	T30N/R05E-36J04	D	RR/5 ac	358	AR	77	72	6	Y	72	Qvt	--	ND	--	--	Qvt	0	UC	8	75	1	--	--	L	6/20/1992	42				
149-067	2/14/2001	T30N/R05E-36H05	D	RR/5 ac	380	AR	144	144	6	N	--	Qvt	54	ND	--	--	Qva	54	UC	30	36	1.5	--	--	L	2/14/2001	81				
082-047	2/14/2001	T30N/R05E-36E03	D	RR/5 ac	433	AR	177	172	6	Y	172	Qvt	71	ND	--	--	Qva	71	UC	25	180	1.5	--	--	L	2/14/2001	151				
082-048	2/13/1998	T30N/R05E-36M01	D	RR/5 ac	390	CT	137	137	6	N	--	Qvt	101	ND	--	--	Qva	101	UC	10	10	1	60	--	L	2/13/1998	101				
082-049	8/11/1989	T30N/R05E-36M02	D	RR/5 ac	387	AR	140	140	6	N	--	Qvt	76	ND	--	--	Qva	76	UC	10	--	1	--	--	L	8/11/1989	100				
082-050	8/25/1997	T30N/R05E-36P02	D	RR/5 ac	358	AR	100	95	6	Y	95	Qvt	73	ND	--	--	Qva	73	UC	--	--	--	--	--	L	8/25/1997	75				
082-054	3/19/1980	T30N/R05E-36N02	D	RR/5 ac	344	CT	95	95	6	N	--	Qvt	47	ND	--	--	Qva	27	UC	10	10	1	60	--	L	3/19/1980	55				
082-059	8/6/1999	T30N/R05E-36E04	D	RR/5 ac	410	AR	118	113	6	Y	113	Qvt	82	ND	--	--	Qva	82	UC	18	--	1	--	--	L	8/6/1999	85				
082-060	8/6/1999	T30N/R05E-36E05	D	RR/5 ac	413	AR	118	113	6	Y	113	Qvt	82	ND	--	--	Qva	82	UC	18	--	1	--	--	L	8/6/1999	85				
082-075	7/6/1993	T31N/R05E-25F04	D	RR/5 ac	456	AR	65	40	6	Y	23	Qvt	--	ND	--	--	Qvt	0	UC	0.8	65	1	--	--	L	07/06/93	12				
149-072	6/20/2000	T30N/R06E-05J06	D	RR/5 ac	499	CT	267	167	6	N	167	Qvt	109	ND	--	--	Q(A)c	223	UC	3	100	1	0.3	1	L	7/1/2000	131				
084-030	2/28/1997	T30N/R06E-08H05	D	RR/5 ac	403	AR	115	112	6	N	--	Qvt	72	ND	--	--	Qva	72	UC	30	115	1.5	--	--	L	2/28/1997	74				
084-066	4/14/1987	T30N/R06E-06B02	D	RR/5 ac	472	AR	250	245	6	Y	245	Qvt	125	Qvt	0	125	Qva	125	UC	10	--	--	--	--	L	4/14/1987	180				
084-067	11/17/1980	T30N/R06E-06A03	D	RR/5 ac	459	AR	96	94	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	8	14	1	--	--	L	11/17/1980	79				
084-072	11/16/1999	T30N/R06E-06B06	D	RR/5 ac	466	AR	200	200	6	Y	190	Qvt	95	ND	--	--	Qva	95	UC	13	22	1	--	--	L	11/16/1999	161				
084-073	9/1/1979	T30N/R06E-06C03	D	RR/5 ac	459	AR	93	92	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	12	13	1	--	--	L	9/1/1979	70	8/26/2002	69		
084-074	9/1/1993	T30N/R06E-06N05	D	RR/5 ac	443	AR	65	65	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	15	13	1	--	--	L	9/1/1993	50				
084-082	7/5/1990	T30N/R06E-06F02	D	RR/5 ac	443	AR	80	80	6	N	--	Qvt	60	Qvt	0	60	Qva	60	UC	25	70	1	--	--	L	7/5/1990	59				
084-096	9/16/1988	T30N/R06E-06L03	D	RR/5 ac	446	AR	80	80	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	35	80	1	--	--	L	9/16/1988	20				
084-097	3/31/1997	T30N/R06E-08D03	D	RR/5 ac	426	AR	40	36	6	Y	36	Qvt	--	ND	--	--	Qvt	0	UC	20	40	1.5	--	--	L	3/31/1997	8				
084-098	8/11/1997	T30N/R06E-08D04	D	RR/5 ac	430	AR	45	36	6	Y	36	Qvt	--	ND	--	--	Qvt	0	UC	20	40	1.5	--	--	L	8/11/1997	16				
084-099	8/12/1997	T30N/R06E-08D05	D	RR/5 ac	440	AR	129	125	6	N	--	Qvt	80	ND	--	--	Qva	80	UC	9	125	1.5	--	--	L	8/12/1997	112				
084-101	8/28/1997	T30N/R06E-08D06	D	RR/5 ac	430	AR	46	40	6	Y	40	Qvt	--	ND	--	--	Qvt	0	UC	40	40	1	--	--	L	8/28/1997	18				
085-003	8/29/1997	T30N/R06E-08D07	D	RR/5 ac	417	AR	28	23	6	Y	23	Qvt	--	ND	--	--	Qvt	0	UC	6	25	1	--	--	L	8/29/1997	5				
085-024	2/25/1989	T30N/R06E-18D01	D	RR/5 ac	420	ND	40	40	36	Y	38	Qvr	--	ND	--	--	Qvr	0	UC	4	20	1	--	--	M	2/25/1989	17				
085-032	6/30/1992	T30N/R06E-07R01	D	RR/5 ac	423	AR	99.6	99.6	6	N	--	Qvt	61	ND	--	--	Qva	61	UC	12	100	1	--	--	L	6/30/1992	85				
085-033	4/11/1984	T30N/R06E-07M03	D	RR/5 ac	433	CT	60	60	6	N	--	Qvt	30	ND	--	--	Qva	30	UC	15	18	1	50	--	L	4/11/1984	29				
149-075	10/11/2000	T30N/R06E-07E05	D	RR/5 ac	436	AR	60	55	6	Y	55	Qvt	27	ND	--	--	Qva	27	UC	22	14	2	--	--	L	10/11/2000	38				
085-040	7/28/1980	T30N/R06E-07M04	D	RR/5 ac	433	CT	55	55	6	N	--	Qvt	49	ND	--	--	Qva	49	UC	10	10	1	60	--	L	7/28/1980	37				
085-041	9/25/1978	T30N/R06E-07E06	D	RR/5 ac	433	CT	58	58	6	N	--	Qvt	37	ND	--	--	Qva	37	UC	10	6	1	100	--	L	9/25/1978	37				
085-068	4/10/1995	T30N/R06E-08G06	D	RR/5 ac	440	CT	53	47	6	Y	47	Qvt	--	ND	--	--	Qvt	0	UC	33	5	1	60	300	L	4/10/1995	34				
085-070	1/19/1990	T30N/R06E-08K02	D	RR/5 ac	462	AR	200	200	6	N	--	Qvt	85	ND	--	--	Qva	85	UC	30	180	--	--	--	L	1/19/1990	142				
085-079	11/24/1997	T30N/R06E-08D08	D	RR/5 ac	420	AR	40	40	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	15	38	1	--	--	L	11/24/1997	12				
085-101	8/20/1997	T30N/R06E-08G07	D	RR/5 ac	453	CT	246	246	6	Y	33	Qvt	118	ND	180	235	Ts	235	UC	30	15	1	4	50	L	8/20/1997	22				
085-103	1/5/1990	T30N/R06E-08K03	D	RR/5 ac	440	AR	55	55	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	20	30	1	--	--	L	1/5/1990	30				
086-004	8/5/1996	T30N/R06E-08K04	D	RR/5 ac	436	CT	171	165	6	Y	165	Qvt	100	ND	--	--	Qva	100	UC	21	1	1	300	1,500	L	8/5/1996	132				
086-006	8/17/1992	T30N/R06E-08K05	D	RR/5 ac	466	AR	84	74	4.5	Y	74	Qvt	--	ND	--	--	Qvt	0	UC	15	0	2	--	--	L	8/17/1992	52				
086-007	7/19/1990	T30N/R06E-08K06	D	RR/5 ac	456	AR	140	138	6	N	--	Qvt	85	ND	--	--	Qva	85	UC	8	135	2	--	--	L	7/19/1990	98				
086-012	8/2/2000	T30N/R06E-08R05	D	RR/5 ac	459	CT	171	161	6	Y	161	Qvt	102	ND	--	--	Qva	102	UC	20	30	4	2	20	L	8/2/2000	115				
086-016	2/18/2000	T30N/R06E-08Q05	D	RR/5 ac	436	CT	167	157	6	Y	157	Qvt	89	ND	--	--	Qva	89	UC	--	--	--	--	--	L	2/18/2000	124				
086-057	8/23/1997	T30N/R06E-10E01	D	RR/5 ac	371	AR	63	58	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	30	55	1	--	--	L	8/23/1997	22				
087-049	2/1/1991	T30N/R06E-22C09	D	RR/5 ac	292	HSA	74	74	6	N	74	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	--	ND				
088-001	3/10/1994	T30N/R06E-15R02	D	RR/5 ac	289	AR	48	43	6	Y	43	Qvr	--	ND	--	--	Qvr	0	UC	20	5	1	30	160	M	3/10/1994	28				
088-010	12/2/1997	T30N/R06E-15E02	D	RR/5 ac	351	AR	48	28	4	Y	28	Qvt	--	ND	--	--	Qvt	0	UC	7	4	2	5	100	L	12/2/1997	16				
088-011	12/17/1976	T30N/R06E-15J02	D	LCF	292	AR	145	140.5	6	Y	140.5	Qvr	30	Qvt	0	103	Qva	103	UC	15	90	--	--	--	M	12/17/1976	100				
088-015	10/26/1998	T30N/R06E-15K01	D	LCF	292	AR	60	58	6	N	--	Qvr	38	ND	--	--	Qva	38	UC	30	57	1	--	--	M	10/26/1998	29				
088-018	12/4/1974	T30N/R06E-15M01	D	RR/5 ac	364	CT	142	141	6	N	--	Qvt	75	ND	--	--	Qva	75	UC	7	45	2	10	--	L	12/4/1974	82				
088-038	3/20/1989	T30N/R06E-18N04	D	RR/5 ac	377	CT	63	63	6	N	--	Qvr	40	ND	40	57	Qva	57	UC	12	6	1	120	--	M	3/20/1989	35				
088-046	6/5/1996	T30N/R06E-17G01	D	RR/5 ac	410	CT	101	96	6	Y	96	Qvt	75	ND	--	--	Qva	75	UC	22	4	1	60	300	L	6/5/1996	72				
088-059	12/22/1999	T30N/R06E-17A02	D	RR/5 ac	446	AR	118	118	6	Y	72	Qvt	110	ND	--	--	Qvt	0	UC	10	72	1	--	--	L	12/22/1999	64				
088-063	10/10/1989	T30N/R06E-17D04	D	RR/5 ac	420	AR	40	40	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	30	40	1	--	--	L	10/10/1989	18	7/17/1992	16		
088-066	5/18/1999	T30N/R06E-17M02	D	RR/5 ac	420	AR	124	124	6	Y	119	Qvr	28	ND	--	--	Qva	74	UC	28	--	1.5	--	--	M	5/18/1999	90				
088-073	12/20/1988	T30N/R06E-17F01	D	RR/5 ac	417	AR	30	30	6	Y	25	Qvt	--	ND	--	--	Qvt	0	UC	18	5	1	30	150	L	12/20/1988	13				
088-075	7/26/1976	T30N/R06E-17M03	D	RR/5 ac	420	AR	106	101	6	Y	101	Qvr	23	ND	--	--	Qva	56	UC	20	105	1	--	--	M	7/26/1976	81				
088-078	2/20/1991	T30N/R06E-17L06	D	RR/5 ac	413	AR	98	97.5	6	N	--	Qvt	87	ND	--	--	Qva	87	UC	30	95	1	--	--	L	2/20/1991	76				
088-080	6/8/1992	T30N/R06E-17K04	D	RR/5 ac	410	AR	99.5	99.5	6	N	--	Qvt	81	ND	--	--	Qva	81	UC	25	100	1	--	--	L	6/8/1992	76				
088-083	11/15/1986	T30N/R06E-21C04	D	RR/5 ac	371	D	25	25	36	N	--	Qvt	--	ND	--	--	Qvt	0	UC	2	--	--	--	--	L	11/15/1986	3				
088-084	11/26/1986	T30N/R06E-21C05	D	RR/5 ac	371	D	45	45	36	N	--	Qvt	--	ND	--	--	Qvt	0	UC	0.5	--	--	--	--	L	11/26/1986	10				
088-090	7/14/1978	T30N/R06E-17R03	D	RR/5 ac	410	CT	96	91	6	Y	91	Qvt	50	ND	--	--	Qva	50	UC	20	5	1	30	170	L	7/14/1978	70				
088-091	4/21/1998	T30N/R06E-17R04	D	RR/5 ac	407	AR	85	62	4	Y	62	Qvt	65	ND	--	--	Qva	65	UC	9	12	2	1	30	L	4/21/1998	60				
088-092	10/5/1995	T30N/R06E-17R05	D	RR/5 ac	407	AR	94	92	6	N	--	Qvt	68	ND	--	--	Qva	68	UC	15	90	2	--	--	L	10/5/1995	73				
088-097	5/5/1988	T30N/R06E-17L07	D	RR/5 ac	407	AR	87	82	6	N	--	Qvt	53	ND	--	--	Qva	53	UC	10	--	--	--	--	L	5/5/1988	74				
089-004	7/23/1979	T30N/R06E-17M04	D	RR/5 ac	420	AR	118	118	6	N	--	Qvr	15	ND	--	--	Qva	65	UC	12	1	0.5	--	--	M	7/23/1979	94				
089-007	5/6/1988	T30N/R06E-17P03	D	RR/5 ac	397	AR	81	81	6	N	--	Qvt	75	ND	--	--	Qva	75	UC	11	--	--	--	--	L	5/6/1988	68				
089-010	6/19/1987	T30N/R06E-17P04	D	RR/5 ac	400	AR	78	78	6	N	--	Qvt	33	ND	--	--	Qva	33	UC	10	--	--	--	--	L	6/19/1987	68				
089-012	5/18/1988	T30N/R06E-17P05	D	RR/5 ac	400	AR	86	86	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	10	--	--	--	--	L	5/18/1988	72				
089-013	5/18/1988	T30N/R06E-17P06	D	RR/5 ac	403	AR	88	88	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	17	--	--	--	--	L	5/18/1988	69	7/27/1992	71		
089-016	7/30/1973	T30N/R06E-18A02	D	RR/5 ac	430	AR	125	125	6	N	--	Qvr	13	ND	13	79	Qva	79	UC	10	10	1	60	--	L	7/30/1973	103				
089-017	5/20/1991	T30N/R06E-18A03	D	RR/5 ac	430	AR	40	40	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	30	40	1	--	--	M	5/20/1991	12				
089-018	8/2/1993	T30N/R06E-18M03	D	RR/5 ac	394	AR	40	40	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	20	40	1	--	--	M	8/2/1993	5				
089-021	5/19/1980	T30N/R06E-18H02	D	RR/5 ac	426	AR	56	55	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	10	--	--	--	--	M	5/19/1980	29				
089-022	5/2/1998	T30N/R06E-18H03	D	RR/5 ac	420	AR	70	46	4	Y	46	Qvt	--	ND	--	--	Qvt	0	UC	20	38	4	1	30	L	5/2/1998	2				
089-024	10/1/1990	T30N/R06E-18D02	D	RR/5 ac	420	CT	60	5	6	Y	55	Qvr	--	ND	--	--	Qvr	0	UC	10	5	1	10	50	L	10/1/1990	37				
089-025	8/8/1994	T30N/R05E-13A05	D	RR/5 ac	400	AR	55	53	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	20	53	1	--	--	M	8/8/1994	16				
089-026	11/24/1987	T30N/R06E-18E01	D	RR/5 ac	400	AR	40	40	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	20	--	--	--	--	M	11/24/1987	10				
089-027	9/19/1979	T30N/R06E-18G02	D	RR/5 ac	436	AR	52	50	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	20	--	--	--	--	L	9/19/1979	35				
089-031	7/1/1972	T30N/R06E-22J04	D	RR/5 ac	266	CT	36	36	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	--	6	3	--	--	M	7/1/1972	25				
089-035	4/23/1990	T30N/R06E-18Q04	D	RR/5 ac	394	AR	72	72	4.5	Y	--	Qvt	--	ND	--	--	Qvt	0	UC	10	0	2	--	--	L	4/23/1990	48				
089-039	12/7/1993	T30N/R06E-15D04	D	RR/5 ac	446	AR	40	40	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	35	40	1	--	--	L	12/7/1993	8	8/27/2002	10		
089-044	3/6/1989	T30N/R06E-18N05	D	RR/5 ac	387	AR	80	80	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	20	--	--	--	--	M	3/6/1989	20				
089-045	1/12/1989	T30N/R06E-18N06	D	RR/5 ac	390	AR	80	60	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	20	60	1	--	--	M	1/12/2002	20				
089-047	4/6/1990	T30N/R06E-18M04	D	RR/5 ac	394	AR	80	80	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	15	80	1	--	--	M	4/6/1990	32				
089-048	11/20/1990	T30N/R06E-18M05	D	RR/5 ac	394	AR	40	35	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	30	35	1	--	--	M	11/20/1990	9	7/15/1992	7		
089-050	5/21/1998	T30N/R06E-19C06	D	RR/5 ac	371	AR	60	60	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	50	60	1.5	--	--	L	5/21/1998	8				
089-059	5/16/1995	T30N/R06E-19J05	D	RR/5 ac	380	AR	72	66	6	Y	66	Qvt	--	ND	--	--	Qvt	0	UC	20	65	1	--	--	L	5/16/1995	26				
089-062	7/18/1990	T30N/R06E-19H03	D	RR/5 ac	394	AR	62	60	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	15	60	2	--	--	L	7/18/1990	40				
089-069	6/19/1990	T30N/R06E-19H04	D	RR/5 ac	374	AR	60	55	6	Y	55	Qvt	35	ND	--	--	Qva	35	UC	15	60	1	--	--	L	6/19/1990	37				
149-076	10/20/2000	T30N/R06E-19G04	D	RR/5 ac	367	AR	64	53	6	Y	53	Qvt	52	ND	--	--	Qva	52	UC	15	--	2	--	--	L	10/20/2000	22				
089-074	8/12/1993	T30N/R06E-19C07	D	RR/5 ac	380	AR	60	59	6	N	--	Qvt	26	ND	--	--	Qva	26	UC	60	64	1	--	--	L	8/12/1993	26				
089-097	5/22/2000	T30N/R06E-19F08	D	RR/5 ac	361	AR	40	40	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	30	38	1	--	--	L	5/22/2000	9	8/21/2002	12		
090-007	8/3/1988	T30N/R06E-19F09	D	RR/5 ac	364	AR	38	20	5	Y	20	Qvt	21	ND	--	--	Qva	21	UC	2	--	--	--	--	L	8/3/1988	20				
090-018	6/27/2000	T30N/R06E-19P10	D	RR/5 ac	351	AR	138	128	6	Y	128	Qvt	95	Qvt	0	95	Qva	95	UC	22	2	2	80	750	L	6/27/2000	18				
180-054	6/10/1991	T30N/R06E-19N02	D	RR/5 ac	341	CT	63	50	5	N	--	Qvt	--	ND	--	--	Qvt	0	UC	8	20	2	30	--	L	--	ND				
090-051	10/19/1997	T30N/R06E-20F04	D	RR/5 ac	397	AR	78	77	6	N	--	Qvt	49	ND	--	--	Qva	49	UC	18	77	1	--	--	L	10/19/1997	51				
090-052	1/22/1990	T30N/R06E-20E01	D	RR/5 ac	403	AR	100	100	6	N	--	Qvt	26	ND	--	--	Qva	26	UC	25	--	1	--	--	L	1/22/1990	67				
090-053	1/22/1990	T30N/R06E-20E02	D	RR/5 ac	403	AR	100	100	6	N	--	Qvt	26	ND	--	--	Qva	26	UC	25	--	--	--	--	L	1/22/1990	67				
090-055	1/23/1990	T30N/R06E-20F05	D	RR/5 ac	403	AR	100	100	6	N	--	Qvt	24	ND	--	--	Qva	24	UC	30	96	1	--	--	L	1/23/1990	70				
090-064	2/29/1996	T30N/R06E-20G04	D	RR/5 ac	384	AR	68	68	6	N	--	Qvt	32	ND	--	--	Qva	32	UC	15	68	2	--	--	L	2/29/1996	39				
090-086	7/25/1991	T30N/R06E-20G05	D	RR/5 ac	377	AR	71	71	6	N	--	Qvt	25	ND	--	--	Qva	25	UC	20	70	1	--	--	L	7/25/1991	38				
091-008	3/1/1986	T30N/R05E-01G04	D	RR/5 ac	417	CT	60	60	6	N	--	Qvt	38	Qvt	0	38	Qva	38	UC	30	10	1	180	--	L	3/1/1986	36				
091-045	1/31/1994	T30N/R06E-21L04	D	RR/5 ac	361	AR	47	47	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	15	45	1	--	--	L	1/31/1994	26				
091-056	12/3/1992	T30N/R06E-08H06	D	RR/5 ac	426	HSA	38	34	6	Y	34	Qvt	--	ND	--	--	Qvt	0	UC	0.5	7	1	1	4	L	12/3/1992	30	8/22/2002	27		
091-058	6/6/1990	T30N/R06E-22A02	D	LCF	285	AR	42	42	6	Y	37	Qvr	--	ND	--	--	Qvr	0	UC	25	32	1	--	--	M	6/6/1990	24				
091-060	6/4/1990	T30N/R06E-22A03	D	LCF	285	AR	42	37	6	Y	37	Qvr	--	ND	--	--	Qvr	0	UC	30	40	1	--	--	M	6/4/1990	16				
091-082	6/20/1995	T30N/R06E-22J05	D	RR/5 ac	259	AR	40	40	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	40	40	2	--	--	M	6/20/1995	18	9/5/2002	17	9/5/2002	17
091-091	5/18/1989	T30N/R06E-22F03	D	RR/5 ac	279	AR	60	60	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	68	60	1	--	--	M	5/18/1989	16				
091-102	11/10/1988	T30N/R06E-22P04	D	RR/5 ac	256	D	30	30	36	Y	--	Qvr	--	ND	--	--	Qvr	0	UC	40	3	1	--	--	M	11/10/1988	21				
092-001	8/21/1993	T30N/R06E-22Q01	D	RR/5 ac	246	D	18	18	36	Y	15.5	Qvr	--	ND	--	--	Qvr	0	UC	40	1	1	--	--	M	8/21/1993	14				
092-004	6/22/1987	T30N/R06E-22P05	D	RR/5 ac	259	D	27	27	36	N	--	Qvr	--	ND	--	--	Qvr	0	UC	12	2	--	60	--	M	6/22/1987	16				
092-029	5/23/1990	T30N/R06E-23E07	D	LCF	276	D	17	17	36	Y	--	Qvr	--	ND	--	--	Qvr	0	UC	40	6	0.5	--	--	M	5/23/1990	9				
092-032	3/30/1990	T30N/R06E-23C04	D	RR/5 ac	285	CT	35	28	6	Y	28	Qvr	--	ND	--	--	Qvr	0	UC	9	10	--	--	--	M	3/29/1990	16				
092-037	11/24/1997	T30N/R06E-22H03	D	LCF	279	AR	40	35	6	Y	35	Qvr	--	ND	--	--	Qvr	0	UC	50	40	1	--	--	M	11/24/1997	17				
092-044	8/24/1990	T30N/R06E-23F02	D	RR/5 ac	259	CT	42	36	6	Y	18	Qvr	--	ND	--	--	Qvr	0	UC	20	1	2	450	1,800	H	8/24/1990	10				
092-050	1/26/1988	T30N/R06E-23E08	D	LCF	279	D	20	20	36	N	--	Qvr	--	ND	--	--	Qvr	0	UC	12	4	2	30	--	M	1/20/1988	8	7/29/1992	13		
092-078	7/9/1990	T30N/R06E-28J01	D	RR/5 ac	233	AR	40	35	6	Y	35	Qvr	--	ND	--	--	Qvr	0	UC	40	40	1	--	--	H	7/9/1990	5				
092-079	7/9/1990	T30N/R06E-28J02	D	RR/5 ac	233	AR	40	19	6	Y	19	Qal	--	ND	--	--	Qal	0	UC	30	40	1	--	--	H	7/9/1990	5	7/29/1992	8		
092-095	5/11/1987	T30N/R06E-27B04	D	RR/5 ac	239	D	14	12	36	Y	12	Qvr	--	ND	--	--	Qvr	0	UC	75	--	--	--	--	M	5/8/1987	8	8/3/1992	15		
092-096	8/24/1988	T30N/R06E-27B05	D	RR/5 ac	239	ND	40	18	6	Y	18	Qvr	--	ND	--	--	Qvr	0	UC	5	--	--	--	--	M	8/24/1988	10				
092-099	6/24/1984	T30N/R06E-27E01	D	RR/5 ac	246	CT	36	36	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	16	0	0.5	--	--	M	6/24/1984	16				
092-100	12/12/1988	T30N/R06E-27D02	D	RR/5 ac	249	CT	42	29	6	Y	29	Qal	32	ND	--	--	Qvr	32	UC	20	2	1.5	140	700	M	12/12/1988	14				
092-101	10/11/1987	T30N/R06E-28R03	D	RR/5 ac	230	D	19	19	36	Y	17	Qvr	--	ND	--	--	Qvr	0	UC	50	4	1	--	--	M	10/11/1987	13				
092-102	2/21/1992	T30N/R06E-21D05	D	RR/5 ac	400	AR	80	80	6	N	--	Qvt	43	ND	--	--	Qva	43	UC	20	80	1	--	--	L	2/21/1992	59	7/28/1992	61		
092-104	8/6/1990	T30N/R06E-27A01	D	RR/5 ac	236	CT	32	25	6	Y	25	Qal	20	ND	--	--	Qvr	20	UC	2	15	1	1	6	H	8/6/1990	10				
092-105	11/4/1991	T30N/R06E-27C02	D	RR/5 ac	243	D	18	18	36	Y	16	Qvr	--	ND	--	--	Qvr	0	UC	20	25	1	--	--	M	11/4/1991	12				
093-003	11/18/1974	T30N/R06E-27N05	D	RR/5 ac	236	D	21.5	21.5	36	Y	19	Qvr	--	ND	--	--	Qvr	0	UC	37	--	--	--	--	M	11/18/1974	10				
093-006	9/15/1978	T29N/R05E-36K01	D	RR/5 ac	295	AR	28	28	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	15	0	2	--	--	L	9/15/1978	15				
093-010	9/15/1978	T30N/R06E-22J06	D	RR/5 ac	266	AR	26	26	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	14	0	2	--	--	M	9/15/1978	17				
093-018	9/29/1997	T30N/R06E-28R04	D	RR/5 ac	233	AR	60	56	6	Y	56	Qvr	20	ND	--	--	Qva	20	UC	60	60	1	--	--	M	9/29/1997	8.6				
093-042	7/20/1991	T30N/R06E-28R05	D	RR/5 ac	233	AR	20	20	6	N	--	Qal	--	ND	--	--	Qal	0	UC	17	20	1	--	--	H	7/20/1991	6				
093-069	5/17/1990	T30N/R06E-29B03	D	RR/5 ac	354	AR	60	60	6	N	--	Qvt	41	ND	--	--	Qva	41	UC	15	50	1	--	--	L	5/17/1990	37				
093-084	5/19/1989	T30N/R06E-29M02	D	RR/5 ac	380	AR	60	60	6	N	--	Qvt	25	ND	--	--	Qva	25	UC	22	60	1	--	--	L	5/19/1989	29				
093-085	5/22/1991	T30N/R06E-29P01	D	RR/5 ac	308	ND	31	26	6	Y	26	Qvt	--	ND	--	--	Qvt	0	UC	9	26	2	7	40	L	5/22/1991	4				
093-086	7/14/1998	T30N/R06E-29P02	D	RR/5 ac	312	AR	44	42.2	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	15	40	1.5	--	--	L	7/14/1998	0				
093-087	8/24/1994	T30N/R06E-29N02	D	RR/5 ac	387	AR	81	81	6	N	--	Qvt	57	ND	--	--	Qva	57	UC	25	70	1	--	--	L	8/24/1994	55				
094-006	7/1/1988	T30N/R06E-31C04	D	RR/5 ac	321	AR	40	40	6	N	--	Qal	--	ND	--	--	Qal	0	UC	60	30	1	--	--	H	7/1/1988	0				
094-012	9/24/1996	T30N/R06E-21D06	D	RR/5 ac	397	AR	80	80	6	N	--	Qvt	35	ND	--	--	Qva	35	UC	12	80	1.5	--	--	L	9/24/1996	69				
094-034	9/14/1992	T30N/R06E-32C03	D	RR/5 ac	302	AR	40	30	4.5	Y	30	Qvt	35	ND	--	--	Qvt	35	UC	15	10	2	8	75	L	9/14/1992	3				
094-037	5/30/1995	T29N/R06E-17B04	D	U	253	AR	36	36	4	Y	26	Qvt	--	ND	--	--	Qvt	0	UC	17	6	2	20	190	L	5/30/1995	4				
094-056	3/17/1989	T30N/R06E-32F02	D	RR/5 ac	325	D	28	28	36	N	--	Qvt	--	ND	--	--	Qvt	0	UC	4	8	2	5	--	L	3/17/1985	14				
094-057	3/17/1989	T30N/R06E-32F03	D	RR/5 ac	331	D	28	28	36	N	--	Qvt	--	ND	--	--	Qvt	0	UC	4	8	2	5	--	L	3/17/1989	14				
094-058	3/17/1989	T30N/R06E-32F04	D	RR/5 ac	315	D	32	32	36	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	3/17/1989	16				
094-067	10/14/1994	T30N/R06E-32Q06	D	RR/5 ac	285	D	17.5	17.5	36	Y	15	Qvt	--	ND	--	--	Qvt	0	UC	5	3	1	30	75	L	10/14/1994	12				

Appendix A.
Table A-1. Well Details and Water Levels.

							Well Details					Surface		Confining			Aquifer			Aquifer Properties						Water Level Data					
SnoCo ID	Completion Date	Legal	Well Type	Land Use	Elevation	Drilling Method	Drill Depth	Casing Depth	Casing Diameter	Screen (Y or N)	Screen Top Depth	Geologic Unit	Unit Bottom	Geologic Unit	Unit Top	Unit Bottom	Geologic Unit	Unit Top	Confined Unconfined	Yield	Drawdown	Time	Conductivity (K)	Transmissivity (T)	USGS Aquifer Sensitivity	Date	Depth to Water	Date	Depth to Water	Date	Depth to Water
							(ft)	(ft)	(in)		(ft)		(ft)		(ft)	(ft)		(ft)		(gpm)	(ft)	(hr)	(ft/d)	(ft^2/d)			(ft)		(ft)		(ft)
094-068	11/22/1978	T29N/R06E-04P02	D	RR/5 ac	256	ND	21.5	21.5	36	Y	19	Qva	--	ND	--	--	Qva	0	UC	30	--	--	--	--	M	11/22/1978	12				
094-073	3/28/1997	T30N/R06E-32L04	D	RR/5 ac	305	AR	48	28	4	Y	28	Qvt	--	ND	--	--	Qvt	0	UC	5	6	2	2	40	L	3/28/1997	15	9/4/2002	18		
094-088	8/30/1989	T30N/R06E-33J02	D	RR/5 ac	325	AR	90	83	6	Y	83	Qvt	40	ND	--	--	Qva	40	UC	20	85	1	--	--	L	8/30/1989	50	7/8/1992	56		
094-091	9/11/1979	T30N/R06E-33K01	D	RR/5 ac	246	AR	80	78	6	ND	78	Qva	40	ND	--	--	Qva	40	UC	30	--	--	--	--	M	9/11/1979	45				
094-097	7/23/1987	T30N/R06E-33A02	D	RR/5 ac	223	D	18	18	36	N	--	Qvr	--	ND	--	--	Qvr	0	UC	12	4	2	30	--	M	7/22/1987	8	7/7/1992	9		
094-100	2/19/1991	T30N/R06E-33P03	D	RR/5 ac	256	CT	62	62	6	N	--	Qva	--	ND	--	--	Qva	0	UC	30	3	1	610	--	M	2/19/1991	12				
095-010	1/8/1982	T30N/R06E-34M03	D	RR/5 ac	220	D	15	15	36	Y	--	Qal	--	ND	--	--	Qal	0	UC	--	--	--	--	--	M	--	ND				
095-011	7/2/1991	T30N/R06E-34D01	D	RR/5 ac	220	D	20	20	36	Y	17.5	Qvr	--	ND	--	--	Qvr	0	UC	40	1	1	--	--	M	7/2/1991	10				
095-017	8/23/1996	T29N/R05E-01B03	D	RR/5 ac	354	AR	60	40	4	Y	40	Qvt	42	Qvt	0	42	Qva	42	UC	10	0	2	--	--	L	8/23/1996	40				
152-078	9/24/2001	T30N/R06E-21E04	D	RR/5 ac	358	CT	76	71	6	Y	71	Qvt	51	ND	--	--	Qva	51	UC	10	10	1	20	100	L	9/24/2001	44				
098-036	9/8/1987	T30N/R06E-23C05	D	RR/5 ac	276	D	23	23	36	Y	21	Qvr	--	ND	--	--	Qvr	0	UC	15	12	2	--	--	M	9/8/1987	10				
085-020	11/11/1997	T30N/R06E-07F03	D	RR/5 ac	440	AR	88	88	6	N	--	Qvt	76	ND	--	--	Qva	76	UC	30	85	1	--	--	L	11/11/1997	49				
106-055	1/4/1984	T29N/R06E-20Q02	D	RR/5 ac	230	AR	129.5	126.5	6	N	--	Qva	--	ND	--	--	Qva	0	UC	20	--	--	--	--	M	1/4/1984	104				
106-066	9/27/1989	T31N/R05E-26B03	D	RR/5 ac	335	AR	120	115	6	Y	115	Qva	--	ND	--	--	Qva	0	UC	10	90	1	--	--	L	9/27/1989	85				
107-059	5/4/1988	T29N/R06E-19R01	D	ULDR6-LKST	430	AR	227	222	6	N	--	Qvt	75	ND	--	--	Qva	75	UC	15	222	1	--	--	L	--	ND				
108-022	8/12/1998	T31N/R05E-35Q05	D	RR/5 ac	285	AR	74	70	6	Y	70	Qvt	67	ND	--	--	Qva	67	UC	10	74	1.5	--	--	L	8/12/1998	62				
110-028	1/29/2000	T31N/R05E-14P02	D	U	298	AR	97	92	6	Y	92	Qvt	82	ND	--	--	Qva	82	UC	18	15	1	--	--	L	1/29/2000	80				
111-087	5/22/1993	T31N/R05E-26K04	D	RR/5 ac	374	AR	50	40	4	Y	40	Qvt	--	ND	--	--	Qvt	0	UC	27	50	2	2	17	L	5/22/1993	5.8				
112-020	7/9/1996	T31N/R05E-23L02	D	U	328	AR	138	123	8	Y	123	Qvt	94	ND	--	--	Qva	94	UC	90	2	1	230	3,500	L	7/9/1996	101				
112-031	3/23/1991	T31N/R05E-23R02	D	U	374	CT	157	145	6	Y	145	Qvt	50	ND	--	--	Qva	50	UC	15	2	4	40	500	L	3/22/1991	122	8/18/1992	122		
112-033	6/30/1993	T31N/R05E-23R03	D	U	377	AR	170	162	6	Y	165	Qvt	40	ND	--	--	Qva	40	UC	25	160	1	--	--	L	6/30/1993	130				
112-034	7/1/1973	T31N/R05E-23R04	D	U	377	CT	167	162	6	Y	162	Qvt	60	ND	--	--	Qva	60	UC	15	15	1	20	100	L	7/1/1973	139				
112-038	6/14/1997	T31N/R05E-23N03	D	U	190	AR	43	38.5	6	Y	38.5	Qvt	--	ND	--	--	Qvt	0	UC	25	40	1	--	--	M	6/14/1997	11	8/29/2002	11		
112-041	6/21/1989	T31N/R05E-23M01	D	U	141	AR	40	35	6	Y	35	Qva	--	ND	--	--	Qva	0	UC	6	--	--	--	--	M	6/21/1989	0				
112-096	8/18/1989	T30N/R05E-01A09	D	RR/5 ac	410	CT	69	64	6	Y	64	Qvt	60	ND	--	--	Qva	60	UC	10	3	1	30	130	L	8/18/1989	37				
113-003	1/12/1988	T31N/R05E-25B03	D	RR/5 ac	476	D	30	28.5	36	Y	28.5	Qvt	--	ND	--	--	Qvt	0	UC	2	--	--	--	--	L	1/11/1988	8	8/24/1992	214		
113-015	3/22/1992	T31N/R05E-25C04	D	RR/5 ac	449	D	42.5	42.5	36	Y	40	Qvt	--	ND	--	--	Qvt	0	UC	10	20	4	--	--	L	3/22/1992	5				
113-020	7/15/1981	T31N/R05E-25F05	D	RR/5 ac	446	D	20	20	--	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	--	ND				
113-038	9/26/1994	T31N/R05E-25M01	D	RR/5 ac	426	AR	60	58	6	N	--	Qvt	38	ND	--	--	Qva	38	UC	20	58	1	--	--	L	9/26/1994	37				
113-039	8/14/1985	T31N/R05E-25L02	D	RR/5 ac	456	AR	79	79	6	N	--	Qvt	60	ND	--	--	Qva	60	UC	30	--	--	--	--	L	8/14/1985	41	8/19/1992	43		
113-044	5/26/1995	T31N/R05E-26A03	D	RR/5 ac	354	AR	155	135	4	Y	135	Qvt	120	ND	--	--	Qva	120	UC	22	0	2	--	--	L	5/26/1995	132				
113-046	11/3/1987	T31N/R05E-26B04	D	RR/5 ac	351	AR	140	130	6	Y	130	Qvt	62	ND	--	--	Qva	62	UC	8	8	--	--	--	L	11/3/1987	115				
113-058	7/21/1993	T31N/R05E-26G02	D	RR/5 ac	361	AR	44	34	4.5	Y	34	Qvt	--	ND	--	--	Qvt	0	UC	9	44	5	0.4	4	L	7/21/1993	12				
113-059	5/5/1993	T31N/R05E-26G03	D	RR/5 ac	354	AR	37	24	4.5	Y	24	Qvt	--	ND	--	--	Qvt	0	UC	20	30	2	--	--	L	5/5/1993	12				
113-060	4/17/1993	T31N/R05E-26G04	D	RR/5 ac	364	AR	52	32	4.5	Y	32	Qvt	--	ND	--	--	Qvt	0	UC	18	52	2	4	40	L	4/17/1993	15				
113-062	3/30/1983	T31N/R05E-26C03	D	RR/5 ac	335	AR	120	115	6	Y	115	Qvt	103	ND	--	--	Qva	103	UC	20	2	2	2	5	L	3/30/1983	98	8/20/1992	100		
113-067	6/12/1990	T31N/R05E-26B05	D	RR/5 ac	351	AR	35	30	6	Y	30	Qvt	62	ND	--	--	Qva	62	UC	20	35	1	--	--	L	6/26/1996	119	8/20/1992	3		
113-069	9/30/1986	T31N/R05E-26D05	D	RR/5 ac	230	AR	67	63	6	Y	63	Qvt	40	ND	--	--	Qva	40	UC	15	1	0.5	160	700	L	9/30/1986	38				
113-073	9/15/1986	T31N/R05E-26D06	D	RR/5 ac	230	CT	63	59	6	Y	59	Qvt	48	ND	--	--	Qva	18	UC	10	--	--	--	--	L	9/15/1986	38	8/29/2002	40		
113-078	9/18/1995	T31N/R05E-26C04	D	RR/5 ac	289	AR	100	95	6	Y	95	Qvt	85	ND	--	--	Qva	85	UC	10	15	1	--	--	L	9/18/1995	77	8/28/2002	86		
113-085	5/12/1993	T31N/R05E-26Q02	D	RR/5 ac	325	AR	160	130	4	Y	130	Qvt	107	ND	--	--	Qva	107	UC	4	160	3	0.1	2	L	5/12/1993	135				
113-086	8/12/1981	T31N/R05E-26K05	D	RR/5 ac	367	AR	185	179	6	Y	179	Qvt	100	ND	--	--	Qva	100	UC	18	34	1	10	50	L	8/12/1981	120				
113-090	1/31/1996	T31N/R05E-26L01	D	RR/5 ac	203	AR	117	117	4.5	Y	--	Qvt	99	ND	--	--	Qva	99	UC	12	115	1	--	--	M	1/31/1996	97				
115-080	5/20/1993	T31N/R05E-35B02	D	RR/5 ac	335	AR	175	145	4	Y	155	Qvt	115	Qvt	0	145	Qva	145	UC	9	135	3	0.3	6	L	5/20/1993	135				
115-081	5/14/1993	T31N/R05E-35B03	D	RR/5 ac	298	AR	45	35	4	Y	35	Qvt	--	ND	--	--	Qvt	0	UC	8	45	2	2	18	L	5/14/1993	35				
115-112	10/5/1977	T31N/R05E-35K21	D	RR/5 ac	318	CT	108	105	6	Y	102	Qvt	79	ND	--	--	Qva	79	UC	30	10	1	18	110	L	10/5/1977	82				
115-115	11/17/1979	T31N/R05E-35K22	D	RR/5 ac	328	AR	118	113	6	Y	113	Qvt	103	ND	--	--	Qva	103	UC	10	10	1	20	100	L	11/17/1979	97				
115-117	2/29/1992	T31N/R05E-35J01	D	RR/5 ac	341	ND	130	130	6	N	--	Qvt	35	ND	--	--	Qva	35	UC	15	130	1	--	--	L	2/29/1992	100				
115-118	3/4/1980	T31N/R05E-35R03	D	RR/5 ac	351	AR	52	50	6	N	--	Qvt	18	ND	--	--	Qva	18	UC	12	27	1	--	--	L	3/4/1980	25				
115-119	12/10/1980	T31N/R05E-35R04	D	RR/5 ac	367	AR	107	102	6	Y	102	Qvt	27	ND	--	--	Qva	27	UC	5	14	1	5	30	L	12/10/1980	91	8/28/2002	2		
115-120	7/19/1994	T31N/R05E-35R05	D	RR/5 ac	354	AR	232	227	6	Y	227	Qvt	113	ND	--	--	Qva	113	UC	40	100	1	--	--	L	7/19/1994	117				
115-121	10/22/1980	T31N/R05E-35R06	D	RR/5 ac	354	AR	56	55	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	9	18	1	--	--	L	10/22/1980	38				
115-122	2/12/1992	T31N/R05E-35R07	D	RR/5 ac	358	AR	60	60	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	20	58	1	--	--	L	2/12/1992	30	4/13/1992	34		
115-123	3/18/1981	T31N/R05E-35R08	D	RR/5 ac	361	AR	57	56	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	60	30	1	--	--	L	3/18/1981	16				
115-125	6/7/1993	T31N/R05E-35Q06	D	RR/5 ac	328	AR	45	40	6	Y	40	Qvt	--	ND	--	--	Qvt	0	UC	30	40	1	--	--	L	6/7/1993	12				
116-007	4/2/1980	T31N/R05E-35R09	D	RR/5 ac	364	CT	60	58	6	Y	58	Qvt	--	ND	--	--	Qvt	0	UC	10	12	2	7	14	L	4/2/1980	24				
117-073	2/1/1991	T31N/R06E-32D04	D	RR/5 ac	558	AR	158	158	6	N	--	Qvt	68	ND	--	--	Qva	68	UC	15	155	1	--	--	L	2/1/1991	131	8/26/1992	131		
120-034	8/18/1993	T31N/R05E-25J05	D	RR/5 ac	512	CT	55	50	6	Y	50	Qvt	--	ND	--	--	Qvt	0	UC	5	24	1	3	16	L	8/18/1993	26	3/6/2003	22		
120-055	7/29/1991	T31N/R06E-30R03	D	RR/5 ac	525	AR	130	130	6	N	--	Qvt	125	ND	--	--	Qva	125	UC	10	120	1	--	--	L	7/29/1991	100	8/31/1992	100		
120-072	1/7/1996	T31N/R06E-31E08	D	RR/5 ac	535	ND	25	13	2	Y	13	Qvt	--	ND	--	--	Qvt	0	UC	6	12	2	6	30	L	1/7/1996	14				
120-074	4/22/1981	T31N/R06E-31A01	D	RR/5 ac	518	CT	102	98	6	Y	98	Qvt	93	ND	--	--	Qva	93	UC	8	2	1	40	150	L	4/22/1981	88				
120-075	1/4/1994	T31N/R06E-31G06	D	RR/5 ac	502	AR	98	93	6	Y	93	Qvt	91	ND	--	--	Qva	91	UC	14	92	2	--	--	L	1/4/1994	74				
120-083	9/15/1994	T31N/R06E-31F02	D	RR/5 ac	518	AR	130	129	6	N	--	Qvt	110	Qvt	0	110	Qva	110	UC	13	130	1	--	--	L	9/15/1994	108				
120-088	10/6/1995	T31N/R06E-31E09	D	RR/5 ac	479	AR	75	65	4	Y	65	Qvt	--	ND	--	--	Qvt	0	UC	1	15	6.8	1	7	L	10/6/1995	45				
120-094	7/15/1994	T31N/R06E-31K01	D	RR/5 ac	518	AR	160	130	4	Y	130	Qvt	94	ND	--	--	Qva	94	UC	14	20	1	0.3	10	L	7/15/1994	93				
121-001	10/15/1978	T31N/R06E-31F03	D	RR/5 ac	522	AR	121	117	6	Y	117	Qvt	86	ND	--	--	Qva	118	UC	5	9	1	13	50	L	10/15/1978	109				
121-052	3/6/1987	T30N/R06E-08H07	D	RR/5 ac	426	AR	84	84	6	N	--	Qvt	73	ND	--	--	Qva	73	UC	40	30	--	--	--	L	3/6/1987	30	8/26/2002	33		
121-094	5/22/1986	T31N/R06E-30K03	D	RR/5 ac	525	D	40	38	36	Y	38	Qvt	--	ND	--	--	Qvt	0	UC	50	25	1	--	--	L	5/30/1986	12	8/6/1992	18		
127-003	8/24/1972	T30N/R05E-35N02	D	U	213	ND	195	188	6	Y	188	Qvt	--	ND	--	--	ND	--	UC	12	29	3	--	50	L	8/24/1972	151				
139-093	9/20/1999	T31N/R06E-31F04	D	RR/5 ac	495	D	10	10	36	N	--	Qvt	--	ND	--	--	ND	--	UC	--	--	--	--	--	L	9/20/1999	3				
146-031	6/21/1998	T30N/R06E-22P06	D (D)	RR/5 ac	259	D	27	0	36	N	--	Qvr	--	ND	--	--	ND	--	UC	--	--	--	--	--	M	6/29/1998	17				
154-096	2/29/2000	T30N/R06E-08Q06	D	RR/5 ac	420	CT	129	123	1	Y	124	Qvt	86	ND	--	--	Qva	86	UC	10	32	1	4	20	L	2/29/2000	86				
154-097	11/2/2000	T29N/R06E-21E08	D	RR/5 ac	180	CT	229	229	6	N	--	Qva	90	ND	--	--	Q(A)c	217	UC	20	30	2	40	--	M	11/2/2000	99				
155-002	8/20/1999	T30N/R05E-12H01	D	RR/5 ac	426	AR	60	39	4	Y	39	Qvt	39	ND	--	--	Qva	39	UC	18	12	4	12	230	L	8/20/1999	33				
155-006	7/27/2001	T30N/R06E-08K07	D	RR/5 ac	430	AR	105	105	4	Y	95	Qvt	95	ND	--	--	Qva	95	UC	10	0	2	--	--	L	7/27/2001	90				
155-013	12/17/2001	T30N/R06E-06B07	D	RR/5 ac	485	AR	80	73.6	6	Y	73.6	Qvt	70	ND	--	--	Qva	70	UC	25	13	1.5	--	--	L	12/17/2001	58.5				
155-016	12/6/2001	T30N/R05E-01A08	D	RR/5 ac	420	AR	82.5	77.5	6	Y	77.5	Qvt	67	ND	--	--	Qva	67	UC	15	5	1	80	380	L	12/6/2001	50				
084-051	3/18/1998	T30N/R06E-05P04	D	RR/5 ac	482	AR	62	42	6	Y	42	Qvt	--	Qvt	0	--	Qvt	0	UC	10	4	2	6	120	L	3/18/1998	38				
084-003	7/22/1999	T30N/R06E-05E01	D	RR/5 ac	538	AR	140	135	6	Y	135	Qvt	117	Qvt	0	117	Qva	117	UC	35	134	1	--	--	L	7/22/1999	101				
084-017	3/20/1998	T30N/R06E-05P05	D	RR/5 ac	466	AR	65	45	4	Y	45	Qvt	48	ND	--	--	Qva	48	UC	10	0	2	--	--	L	3/20/1998	45				
039-035	3/6/1998	T28N/R06E-06C02	D	RR/5 ac	157	AR	75	18.5	6	Y	65	Qva	61	ND	--	--	Q(A)c	61	UC	8	3	2	13	130	M	3/7/1998	61				
039-031	7/4/1998	T28N/R06E-06C03	D	RR/5 ac	102	AR	81	74	6	Y	74	Qva	--	ND	--	--	Qva	0	UC	5	79	1	--	--	M	7/7/1998	42				
084-071	11/16/1999	T30N/R06E-06B08	D	RR/5 ac	462	AR	200	190	6	Y	190	Qvt	95	ND	--	--	Qva	95	UC	13	22	1	--	--	L	11/16/1999	161				
084-100	8/13/1997	T30N/R06E-08E02	D	RR/5 ac	417	AR	28	23	6	Y	23.75	Qvt	--	ND	--	--	Qvt	0	UC	25	25	1.5	--	--	L	8/13/1997	4.5				
057-097	4/16/1999	T29N/R06E-09Q07	D	RR/5 ac	200	AR	180	175	6	Y	175	Qva	50	ND	--	--	Qva	50	UC	15	180	1.5	--	--	M	4/16/1999	60				
058-020	11/19/1999	T29N/R06E-10D01	D	RR/5 ac	213	D	15	15	36	N	--	Qva	--	ND	--	--	Qva	0	UC	15	4	1	40	--	H	11/19/1999	4				
074-006	8/21/1985	T30N/R05E-11G01	D	RR/5 ac	384	AR	182	179	6	Y	179	Qvt	52	ND	--	--	Qva	52	UC	30	25	4.2	20	60	L	8/21/1985	89				
074-062	4/17/1999	T30N/R05E-12Q04	D	RR/5 ac	387	AR	38.5	38.5	6	N	--	Qvt	--	Qvt	0	--	Qvt	0	UC	20	37	1	--	--	L	4/17/1999	6				
074-061	4/17/1999	T30N/R05E-12Q05	D	RR/5 ac	390	AR	38.5	38.5	6	N	--	Qvt	--	Qvt	0	--	Qvt	0	UC	10	37	1	--	--	L	4/17/1999	6				
087-108	5/24/1995	T30N/R06E-14M01	D	LCF	295	AR	40	40	6	N	--	Qvr	4	ND	--	--	Qva	4	UC	40	40	1.5	--	--	M	5/24/1995	26				
061-008	7/19/1999	T29N/R06E-16Q04	D	RR/5 ac	131	AR	40	38	6	N	--	Qal	--	ND	--	--	Qal	0	UC	30	35	1	--	--	H	7/19/1999	11				
089-028	5/22/2000	T30N/R06E-18J01	D	RR/5 ac	417	AR	123	119	6	N	--	Qvt	90	ND	--	--	Qva	90	UC	30	115	1	--	--	L	10/27/1999	90				
091-005	6/11/1996	T30N/R06E-21C06	D	RR/5 ac	377	AR	63	43	4	Y	43	Qvt	28	ND	--	--	Qva	28	UC	14	20	2	1	30	L	6/11/1996	32				
092-034	8/17/1989	T30N/R06E-23C06	D	RR/5 ac	289	CT	42	35	5	Y	--	Qvr	--	ND	--	--	Qvr	0	UC	15	10	1	--	40	M	8/17/1989	28				
077-057	7/22/1998	T30N/R05E-25K05	D	RR/5 ac	354	AR	78.5	73.5	6	Y	73.5	Qvt	55	ND	--	--	Qva	55	UC	25	72	1	--	--	L	7/22/1998	50				
113-037	1/11/1999	T31N/R05E-25L03	D	RR/5 ac	449	AR	58.5	58.5	6	N	--	Qvt	52	ND	--	--	Qva	52	UC	18	56	1	--	--	L	1/5/1999	38.6				
119-012	8/21/1998	T31N/R05E-26D07	D	RR/5 ac	216	AR	79	74	6	Y	74	Qva	82	ND	--	--	Qva	0	UC	8	73	1	--	--	M	8/21/1998	62				
120-076	2/9/1998	T31N/R06E-31B01	D	RR/5 ac	499	AR	74	64	4	Y	64	Qvt	66	ND	--	--	Qva	66	UC	4	3	2	7	70	L	2/9/1998	60				
094-038	7/14/1998	T30N/R06E-32C04	D	RR/5 ac	341	AR	61	57	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	15	56	1.5	--	--	L	7/7/1998	34				
058-024	8/8/1997	T29N/R06E-10E03	D	RR/5 ac	171	AR	97	92	6	Y	92	Qal	85	ND	--	--	Qva	85	UC	40	95	1.5	--	--	H	8/8/1997	25				
056-092	2/4/1997	T29N/R06E-03P05	D	RR/5 ac	177	D	12	13	36	Y	10	Qal	13	ND	--	--	Qal	0	UC	40	3	1	--	--	H	2/4/1997	7				
092-013	9/30/1997	T30N/R06E-22P07	D	RR/5 ac	249	AR	38	28	4	Y	28	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	M	9/30/1997	17				
092-002	2/20/1998	T30N/R06E-22P08	D	RR/5 ac	259	CT	38	30	6	Y	30	Qvr	--	ND	--	--	Qvr	0	UC	20	5	1	30	170	M	2/20/1998	17				
092-107	9/30/1987	T30N/R06E-27B06	D	RR/5 ac	243	D	40	40	6	N	0	Qvr	--	ND	--	--	Qvr	0	UC	60	--	--	--	--	M	9/30/1987	8	7/28/1992	11		
082-009	8/6/1999	T30N/R05E-36E06	D	RR/5 ac	413	AR	118	113	6	Y	113	Qvt	82	ND	--	--	Qva	82	UC	18	--	1	--	--	L	8/6/1999	85				
082-043	8/4/1997	T30N/R05E-36Q06	D	RR/5 ac	384	AR	160	158	6	N	--	Qvt	138	Qvt	0	138	Qva	138	UC	12	155	1	--	--	L	8/4/1997	127				
039-034	4/30/1986	T29N/R06E-31E01	D	RR/5 ac	361	AR	140	138	6	N	--	Qvr	65	ND	--	--	Qva	136	UC	20	--	0.5	--	--	M	4/30/1986	104	5/6/1992	102		
085-049	10/28/1998	T30N/R06E-07P05	D	RR/5 ac	440	AR	60	54	6	Y	54	Qvt	48	ND	--	--	Qva	48	UC	15	60	1.5	--	--	L	10/28/1998	34				
088-043	2/12/1999	T30N/R06E-17H05	D	RR/5 ac	430	CT	127	120	6	Y	120	Qvt	103	ND	--	--	Qva	103	UC	15	20	1	15	80	L	2/12/1999	90				
158-034	1/1/1940	T29N/R05E-25N01	D	RR/5 ac	184	ND	150	130	6	ND	--	Qvt	50	ND	--	--	Qva	50	UC	--	--	--	--	--	L	1/1/1940	60				
159-003	1/1/1901	T30N/R06E-15D05	D	RR/5 ac	374	D	21	21	60	ND	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	3/9/1993	1				
159-005	3/23/1990	T30N/R06E-28J03	D	RR/5 ac	233	AR	40	20	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	15	20	1	--	--	M	3/23/1990	5	7/19/1992	9		
160-035	3/15/2002	T29N/R06E-16Q05	D	RR/5 ac	128	CT	40	40	6	N	--	Qal	--	ND	--	--	Qal	0	UC	15	10	1	90	--	H	3/15/2002	10				
160-043	3/3/2002	T30N/R05E-13P01	D	RR/5 ac	374	CT	117	91	6	Y	91	Qvt	57	ND	--	--	Qva	57	UC	12	26	1	4	40	L	3/1/2002	65				
160-050	3/22/2002	T30N/R06E-08P04	D	RR/5 ac	413	AR	79	78.5	6	N	--	Qvt	32	ND	--	--	Qva	32	UC	18	72	1	--	--	L	3/22/2002	65.5				
160-051	4/19/2002	T30N/R06E-08Q07	D	RR/5 ac	440	AR	180	170	6	Y	170	Qvt	109	ND	--	--	Qva	109	UC	20	3	1	30	300	L	4/19/2002	142				
160-052	4/5/2002	T30N/R06E-08R06	D	RR/5 ac	459	CT	180	170	6	Y	170	Qvt	96	ND	--	--	Qva	96	UC	15	10	1	16	160	L	4/5/2002	140				
160-053	5/3/2002	T30N/R06E-08Q08	D	RR/5 ac	433	CT	171	161	6	Y	161	Qvt	106	ND	--	--	Qva	106	UC	15	20	1	8	75	L	5/3/2002	130				
160-055	5/16/2002	T30N/R06E-09N04	D	RR/5 ac	423	CT	170	165	6	Y	165	Qvt	107	ND	--	--	Qva	107	UC	15	20	1	15	80	L	5/16/2002	136				
160-063	4/8/2002	T30N/R06E-30R03	D	RR/5 ac	390	AR	78	72	6	Y	72	Qvr	--	ND	--	--	Qvr	0	UC	13	2	1	60	300	M	4/16/2002	47				
160-074	5/25/2002	T31N/R05E-14P03	D	U	282	AR	82	75	6	Y	75	Qvt	46	ND	--	--	Qva	46	UC	15	75	1	--	--	L	5/24/2002	65				
161-026	7/3/2002	T30N/R06E-08E03	D	RR/5 ac	417	AR	48	43	6	Y	43	Qvt	--	ND	--	--	Qvt	0	UC	50	45	1.5	--	--	L	7/3/2002	23				
161-030	8/7/2002	T30N/R06E-17A03	D	RR/5 ac	446	CT	190	180	6	Y	180	Qvt	129	ND	--	--	Qva	129	UC	15	3	1	30	250	L	7/31/2002	143				
162-097	7/11/2002	T30N/R06E-08A04	D	RR/5 ac	413	AR	98	93	6	Y	93	Qvt	65	ND	--	--	Qva	65	UC	3	95	15	--	--	L	7/11/2002	75				
163-004	7/11/2002	T30N/R06E-08A05	D	RR/5 ac	413	AR	93	93	6	Y	93	Qvt	65	ND	--	--	Qva	65	UC	3	95	1.5	--	--	L	7/11/2002	75				
163-005	7/10/2002	T30N/R06E-08R07	D	RR/5 ac	456	CT	178	168	6	Y	168	Qvt	94	ND	--	--	Qva	94	UC	11	5	1	5	50	L	7/10/2002	125				
165-005	9/11/2002	T29N/R05E-36P01	D	RR/5 ac	216	AR	115	107	6	Y	107	Qvt	46	ND	--	--	Qva	46	UC	10	110	1.5	--	--	L	9/11/2002	74				
165-014	3/20/2002	T30N/R06E-08P05	D	RR/5 ac	407	AR	98	98	6	N	--	Qvt	70	ND	--	--	Qva	70	UC	18	98	1	--	--	L	3/20/2002	74				
165-015	8/24/2002	T30N/R06E-09N05	D	RR/5 ac	413	CT	119	109	6	Y	109	Qvt	48	ND	--	--	Qva	48	UC	15	7	1	5	50	L	8/24/2002	73				
165-016	9/13/2002	T30N/R06E-17A04	D	RR/5 ac	456	CT	200	190	6	Y	190	Qvt	119	ND	--	--	Qva	119	UC	15	18	1	9	90	L	9/13/2002	148				
165-018	9/4/2002	T30N/R06E-27D03	D	RR/5 ac	253	AR	50	40.5	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	40	40	1.5	--	--	M	9/4/2002	18				
165-027	9/18/2002	T31N/R05E-26N03	D	RR/10 ac	125	AR	40	18	4	Y	18	Qal	--	ND	--	--	Qal	0	UC	19	20	1	--	--	H	9/18/2002	8.5				
166-011	10/15/2002	T29N/R06E-03N01	D	RR/5 ac	184	AR	22	17	6	ND	17	Qal	--	ND	--	--	Qal	0	UC	3	19	1	--	--	H	10/15/2002	11				
166-031	10/23/2002	T31N/R05E-25B04	D	RR/5 ac	472	CT	70	60	6	Y	60	Qvt	--	ND	--	--	Qvt	0	UC	15	15	1	10	100	L	10/23/2002	30				
167-071	12/4/2002	T29N/R06E-04C04	D	RR/5 ac	210	AR	60	58	6	N	--	Qal	19	ND	--	--	Qva	19	UC	30	55	1	--	--	H	12/4/2004	21				
167-072	11/8/2002	T29N/R06E-06B08	D	RR/5 ac	338	AR	62	56	6	Y	56	Qal	80	ND	--	--	Qva	0	UC	5	56	1	--	--	L	11/8/2002	19				
167-073	11/1/2002	T30N/R06E-18P06	D	RR/5 ac	390	AR	80	80	6	Y	80	Qvt	60	ND	--	--	Qva	60	UC	17	85	1.5	--	--	L	11/1/2002	61				
167-074	10/25/2002	T30N/R06E-18P07	D	RR/5 ac	387	AR	80	75	6	Y	75	Qvt	45	ND	--	--	Qva	45	UC	30	80	1.5	--	--	L	10/25/2002	47				
167-075	10/22/2002	T30N/R06E-18P08	D	RR/5 ac	390	AR	80	75	6	Y	75	Qvt	45	ND	--	--	Qva	45	UC	20	80	1.5	--	--	L	10/22/2002	49				
168-089	10/15/2002	T30N/R06E-09N06	D	RR/5 ac	440	CT	181	170	6	Y	170	Qvt	76	ND	--	--	Qva	76	UC	20	10	4	12	120	L	10/15/2002	124				
168-090	10/31/2002	T30N/R06E-18P09	D	RR/5 ac	394	AR	81	76	6	Y	76	Qvt	65	ND	--	--	Qva	65	UC	15	81	1.5	--	--	L	10/31/2002	63.5				
168-092	10/23/2002	T30N/R06E-18P10	D	RR/5 ac	390	AR	80	75	6	Y	75	Qvt	47	ND	--	--	Qva	47	UC	30	80	1.5	--	--	L	10/23/2002	49				
168-093	10/29/2002	T30N/R06E-18P11	D	RR/5 ac	390	AR	85	80	6	Y	80	Qvt	51	ND	--	--	Qva	51	UC	15	80	1.5	--	--	L	10/29/2002	63				
169-082	4/9/2003	T30N/R06E-08N03	D	RR/5 ac	417	AR	38	33	6	Y	33	Qvt	--	ND	--	--	Qvt	0	UC	25	33	1	--	--	L	4/9/2003	9				
170-008	2/26/2003	T29N/R06E-32C01	D	RR/5 ac	72	AR	43	37	6	N	--	Qal	--	ND	--	--	Qal	0	UC	60	35	1	--	--	H	2/26/2003	8				
170-014	2/14/2003	T30N/R05E-25P02	D	RR/5 ac	453	AR	165	160	6	Y	160	Qvt	85	ND	--	--	Qva	85	UC	15	165	1.5	--	--	L	2/14/2003	131				
170-015	2/3/2003	T30N/R06E-08N04	D	RR/5 ac	417	ND	38	33	6	Y	33	Qvt	--	ND	--	--	Qvt	0	UC	10	30	1	--	--	L	2/3/2003	10				
170-016	2/3/2003	T30N/R06E-08N05	D	RR/5 ac	417	ND	38	33	6	Y	33	Qvt	--	ND	--	--	Qvt	0	UC	10	30	1	--	--	L	2/3/2003	10				
179-078	5/15/2003	T30N/R05E-36D03	D	RR/5 ac	403	CT	147	142	6	Y	142	Qvt	50	ND	--	--	Qva	50	UC	15	12	1	30	130	L	5/15/2003	105				
179-092	4/20/2003	T29N/R06E-32P01	D	RFC	66	AR	36	27	6	Y	27	Qal	--	ND	--	--	Qal	0	UC	50	32	1	--	--	H	4/20/2003	7				
090-022	6/10/1991	T30N/R06E-19N03	D	RR/5 ac	341	AR	50	50	5	N	--	Qvt	--	ND	--	--	Qvt	0	UC	8	20	2	30	--	L	6/10/1991	35				
180-040	6/4/2003	T30N/R06E-08N06	D	RR/5 ac	417	AR	119	114	6	Y	114	Qvt	75	ND	--	--	Qva	75	UC	18	110	1	--	--	L	6/4/2003	80				
180-058	6/5/2003	T30N/R05E-02K05	D	RR/5 ac	377	AR	200	193	6	Y	193	Qvt	75	ND	--	--	Qva	75	UC	20	22	1.5	20	100	L	6/5/2003	127				
180-059	7/28/2003	T30N/R06E-07D01	D	RR/5 ac	440	AR	79	74	6	Y	74	Qvt	52	ND	--	--	Qva	52	UC	20	74	1	--	--	L	7/23/2003	50				
180-061	8/1/2003	T30N/R06E-08N07	D	RR/5 ac	420	AR	120	115	6	Y	115	Qvt	62	ND	--	--	Qva	62	UC	18	115	1	--	--	L	8/1/2003	88				
190-080	6/9/2003	T29N/R05E-01E04	D	RR/5 ac	377	CT	145	135	6	Y	135	Qvt	73	ND	--	--	Qva	73	UC	18	3	1	16	300	L	6/9/2003	101				
189-099	5/29/2003	T30N/R06E-08N08	D	RR/5 ac	420	AR	120	115	6	Y	115	Qvt	90	ND	--	--	Qva	90	UC	25	115	1.5	--	--	L	5/28/2003	87				
191-094	7/22/2003	T29N/R06E-04C02	D	RR/5 ac	295	AR	78.5	73.5	6	Y	73.5	Qvt	42	ND	--	--	Qva	42	UC	30	75	1.5	--	--	L	7/22/2003	49				
191-092	8/5/2003	T30N/R06E-18D03	D	RR/5 ac	413	AR	61.5	56.5	6	Y	56.5	Qvr	62	ND	--	--	Qvr	0	UC	13	60	1.5	--	--	M	8/5/2003	23.8				
189-007	5/19/2003	T30N/R06E-29K01	D	RR/5 ac	318	CT	38	26	6	Y	26	Qvt	--	ND	--	--	Qvt	0	UC	25	2	2	200	1,000	L	5/19/2003	4				
193-001	8/6/2003	T29N/R05E-25D02	D	ULDR6-LKST	279	AR	50	39.5	6	Y	39.6	Qvt	--	ND	--	--	Qvt	0	UC	70	40	1.5	--	--	L	8/6/2003	0				
193-025	9/22/2003	T29N/R05E-25D03	D	ULDR6-LKST	276	AR	42	37	6	Y	37	Qvt	--	ND	--	--	Qvt	0	UC	45	40	1.5	--	--	L	9/22/2003	0				
196-022	9/4/2003	T28N/R05E-01D01	D	RR/5 ac	190	CT	157	147	6	Y	147	Qvt	58	ND	--	--	Qva	58	UC	20	2	1	50	500	L	9/4/2003	119				
195-073	8/13/2003	T29N/R06E-03P06	D	RR/5 ac	180	AR	73	20	4	Y	20	Qal	22	ND	--	--	Qva	22	UC	18	28	1	--	--	H	8/13/2003	7				
193-047	10/30/2003	T29N/R05E-25E01	D	RR/5 ac	249	AR	47	37	4	Y	37	Qvt	--	ND	--	--	Qvt	0	UC	3	22	2	1	11	L	10/30/2003	15				
193-048	10/28/2003	T29N/R05E-25E02	D	RR/5 ac	239	AR	53	33	4	Y	33	Qvt	--	ND	--	--	Qvt	0	UC	2	25	2	1	7	L	10/28/2003	10				
195-004	9/17/2003	T30N/R05E-12K01	D	RR/5 ac	397	AR	121	121	6	N	--	Qvt	78	ND	--	--	Qva	78	UC	30	120	1	15	--	L	9/17/2003	78				
158-100	12/11/2003	T30N/R06E-18C01	D	RR/5 ac	413	CT	133	128	6	Y	128	Qvt	90	ND	--	--	Qva	90	UC	24	24	1	20	110	L	12/11/2003	93				
173-090	2/25/2004	T30N/R05E-13G02	D	RR/5 ac	394	AR	105	100	6	Y	100	Qvt	75	ND	--	--	Qva	75	UC	17	100	1.5	--	--	L	2/25/2004	77				
178-058	2/19/2004	T30N/R05E-13G03	D	RR/5 ac	407	AR	100	95	6	Y	95	Qvt	76	ND	--	--	Qva	76	UC	15	95	1.5	--	--	L	2/19/2004	95				
179-045	2/24/2004	T30N/R05E-13G04	D	RR/5 ac	397	AR	105	100	6	Y	100	Qvt	76	ND	--	--	Qva	76	UC	15	100	1.5	--	--	L	2/24/2004	81				
071-017	10/27/1986	T30N/R05E-01L05	D (R)	RR/5 ac	390	ND	24	24	36	Y	22	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	10/27/1986	20				
071-018	10/27/1986	T30N/R05E-01L06	D (R)	RR/5 ac	403	ND	20	20	36	Y	18	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	10/27/1986	16				
076-003	10/20/1997	T30N/R06E-16N03	D (R)	RR/5 ac	413	D	24	24	36	Y	22	Qvt	--	ND	--	--	Qvt	0	UC	20	80	2	120	--	L	10/13/1997	5				
082-074	10/30/1993	T31N/R05E-25F06	D (R)	RR/5 ac	456	ND	65	40	6	Y	23	Qvt	--	ND	--	--	Qvt	0	UC	0.8	65	1	--	--	L	7/5/1983	12				
115-101	5/19/1993	T31N/R05E-35K23	RP (WQ)	RR/5 ac	321	CT	0	139	2	Y	139	Qvt	16	ND	--	--	Qva	16	UC	--	--	--	--	--	L	5/19/1993	109				
115-102	5/19/1993	T31N/R05E-35K24	RP (WQ)	RR/5 ac	321	CT	0	139	2	Y	139	Qvt	16	ND	--	--	Qva	16	UC	--	--	--	--	--	L	5/19/1993	109				

Appendix A.
Table A-1. Well Details and Water Levels.

							Well Details					Surface		Confining			Aquifer			Aquifer Properties						Water Level Data					
SnoCo ID	Completion Date	Legal	Well Type	Land Use	Elevation	Drilling Method	Drill Depth	Casing Depth	Casing Diameter	Screen (Y or N)	Screen Top Depth	Geologic Unit	Unit Bottom	Geologic Unit	Unit Top	Unit Bottom	Geologic Unit	Unit Top	Confined Unconfined	Yield	Drawdown	Time	Conductivity (K)	Transmissivity (T)	USGS Aquifer Sensitivity	Date	Depth to Water	Date	Depth to Water	Date	Depth to Water
							(ft)	(ft)	(in)		(ft)		(ft)		(ft)	(ft)		(ft)		(gpm)	(ft)	(hr)	(ft/d)	(ft^2/d)			(ft)		(ft)		(ft)
036-009	9/10/1996	T28N/R05E-12R13	RP (NA)	U	98	HSA	30	20	2	Y	20	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	--	ND				
036-010	9/10/1996	T28N/R05E-12R14	RP (NA)	U	98	HSA	15	5	2	Y	5	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	--	ND				
036-011	7/8/1996	T28N/R05E-12R15	RP (NA)	U	98	HSA	15	5	2	Y	5	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	7/8/1996	7				
036-012	7/8/1996	T28N/R05E-12R16	RP (NA)	U	98	HSA	15	5	2	Y	5	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	7/8/1996	7				
036-013	7/8/1996	T28N/R05E-12R17	RP (NA)	U	98	HSA	15	5	2	Y	5	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	7/8/1996	7				
036-014	7/8/1996	T28N/R05E-12R18	RP (NA)	U	98	HSA	15	5	2	Y	5	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	7/8/1996	7				
036-015	7/8/1996	T28N/R05E-12R19	RP (NA)	U	98	HSA	15	5	4	Y	5	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	7/8/1996	7				
036-016	7/8/1996	T28N/R05E-12R20	RP (NA)	U	98	HSA	15	5	4	Y	5	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	7/8/1996	7				
036-017	7/8/1996	T28N/R05E-12R21	RP (NA)	U	98	HSA	15	5	4	Y	5	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	7/8/1996	7				
040-038	3/11/1996	T28N/R06E-18M09	RP (WQ)	U	56	HSA	17.5	5	2	Y	5	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	M	--	ND				
056-025	9/27/1991	T29N/R05E-36M04	RP (WQ)	UC/BP-SNO	187	HSA	11	--	--	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	--	ND				
168-070	2/3/2000	T29N/R06E-17K02	RP (D)	RR/5 ac	253	HSA	19	0	0	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	2/11/2000	0.5				
087-048	1/29/1991	T30N/R06E-22C10	RP (D)	RR/5 ac	295	HSA	75	75	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	--	ND				
088-023	2/1/1991	T30N/R06E-22C11	RP (WQ)	RR/5 ac	295	HSA	63	36	1	Y	36	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	--	ND				
091-061	10/17/1990	T30N/R06E-22C12	RP (D)	RR/5 ac	292	HSA	81.5	0	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	10/17/1990	8				
091-062	10/17/1990	T30N/R06E-22C13	RP (D)	RR/5 ac	295	HSA	59.5	0	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	10/17/1990	7				
091-063	10/17/1990	T30N/R06E-22C14	RP (D)	RR/5 ac	295	HSA	29.5	0	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	10/17/1990	6				
091-064	10/17/1990	T30N/R06E-22C15	RP (D)	RR/5 ac	295	HSA	64	0	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	10/16/1990	3				
091-065	10/17/1990	T30N/R06E-22C16	RP (D)	RR/5 ac	295	HSA	31.5	0	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	10/16/1990	8				
091-066	10/17/1990	T30N/R06E-22C17	RP (D)	RR/5 ac	295	HSA	29	0	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	10/16/1990	21				
091-074	11/16/1992	T30N/R06E-22C18	RP (D)	RR/5 ac	292	HSA	60	60	--	N	--	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	11/12/1992	12				
091-075	11/16/1992	T30N/R06E-22C19	RP (D)	RR/5 ac	295	HSA	65	65	--	N	--	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	11/12/1992	13				
091-076	11/16/1992	T30N/R06E-22C20	RP (D)	RR/5 ac	292	HSA	46	46	--	N	--	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	11/12/1992	7.8				
091-077	11/16/1992	T30N/R06E-22C21	RP (D)	RR/5 ac	295	HSA	23	23	--	N	--	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	11/12/1992	8.8				
091-078	11/16/1992	T30N/R06E-22C22	RP (D)	RR/5 ac	292	HSA	24.5	24.5	--	N	--	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	11/12/1992	7.8				
160-054	5/28/2002	T29N/R06E-09D01	RP (SB)	U	220	CT	180	170	6	Y	170	Qvt	127	ND	--	--	Qva	127	UC	20	10	1	--	--	L	5/28/2002	126				
160-058	4/9/2002	T30N/R06E-18D04	RP (SB)	RR/5 ac	413	AR	60	51	6	Y	51	Qvr	37	ND	--	--	Qvt	37	UC	40	15	1.5	--	--	M	4/9/2002	13				
156-099	8/2/2001	T29N/R06E-21N05	RP (SB)	RR/5 ac	105	AR	30	30	18	ND	5	Qal	--	ND	--	--	Qal	0	UC	--	--	--	--	--	H	8/2/2001	8	7/1/1949	73		
192-065	8/13/2003	T28N/R05E-12R22	RP (SB)	U	108	HSA	15	5	2	Y	5	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	8/13/2003	7				
192-066	8/13/2003	T28N/R05E-12R23	RP (SB)	U	108	HSA	15	5	2	Y	5	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	8/13/2003	7				
152-007	8/21/2001	T28N/R05E-12H03	RP (SB)	U	144	HSA	30	30	--	N	--	Qvr	--	ND	--	--	Qvr	--	UC	--	--	--	--	--	M	--	ND				
155-024	4/11/2002	T30N/R06E-08N09	RP (SB)	RR/5 ac	417	P	14	0	--	N	--	Qvt	--	ND	--	--	ND	--	UC	--	--	--	--	--	L	--	ND				
074-009	4/19/1998	T30N/R05E-11P01	TW	RR/5 ac	118	D	15	17	36	N	--	Qal	--	ND	--	--	Qal	0	UC	--	--	--	--	--	H	4/19/1998	5				
074-010	4/20/1998	T30N/R05E-11P02	TW	RR/5 ac	118	D	ND	17	36	N	--	Qal	--	ND	--	--	Qal	0	UC	40	9	15	--	--	H	4/18/1998	7				
088-021	1/29/1991	T30N/R06E-22C23	TW	RR/5 ac	295	HSA	46	44	1	Y	44	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	1/29/1991	18				
088-022	1/30/1991	T30N/R06E-22C24	TW	RR/5 ac	295	HSA	60	58	1	Y	58	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	1/31/1991	11				
088-024	1/30/1991	T30N/R06E-22C25	TW	RR/5 ac	295	ND	66	--	--	ND	--	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	--	ND				
088-025	1/31/1991	T30N/R06E-22C26	TW	RR/5 ac	295	HSA	68	60	1	Y	60	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	--	ND				
088-027	1/31/1991	T30N/R06E-22C27	TW	RR/5 ac	295	ND	71	--	--	N	--	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	--	ND				
088-029	1/30/1991	T30N/R06E-22C28	TW	RR/5 ac	292	HSA	74	72	1	Y	72	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	1/30/1991	14				
088-030	1/30/1991	T30N/R06E-22C29	TW	RR/5 ac	295	HSA	75.5	72	6	Y	72	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	1/30/1991	14				
088-028	2/1/1991	T30N/R06E-22C30	TW	RR/5 ac	295	ND	71	71	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	L	--	ND				
061-063	3/16/1987	T29N/R06E-20F01	D (U)	ULDR6-LKST	305	AR	137	137	6	N	--	Qvt	94	ND	--	--	Qva	94	UC	20	--	--	--	--	L	3/16/1987	115				
100-047	4/27/1990	T31N/R06E-29P01	D (U)	RR/5 ac	548	CT	100	96	96	Y	35	Qvt	96	Qvt	0	96	Qva	96	UC	1	10	1	0.5	--	L	4/27/1990	86				
158-006	1/29/1957	T28N/R05E-12R24	D (U)	U	92	D	235	150	10	Y	150	Qvt	--	ND	--	--	Qva	--	UC	230	8	6	200	2,800	L	5/25/1954	72				
158-017	2/3/1956	T29N/R05E-02C02	D (U)	U	272	ND	267	221	10	ND	221	Qvt	120	ND	--	--	Q(A)c	218	UC	450	10	--	--	--	L	11/20/1958	130				
158-018	1/1/1940	T29N/R05E-02F01	D (U)	ULDR5-6MV	272	D	115	115	48	N	--	Qvt	74	ND	--	--	Qva	74	UC	--	--	--	--	--	L	3/24/1993	112	8/21/1944	113		
158-033	7/8/1974	T29N/R05E-23R02	D (U)	ULDR6-LKST	266	D	20.5	20	36	Y	--	Qvt	--	ND	--	--	Qva	0	UC	40	10	1	150	250	L	7/8/2004	12	3/25/1993	1		
South Fork Stillaguamish Watershed																															
109-068	6/21/1999	T31N/R05E-12J01	D (D)	RR/5 ac	312	ND	415	400	6	N	--	Qva	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
109-069	6/21/1999	T31N/R05E-12J02	D (D)	RR/5 ac	312	ND	328	0	6	N	--	Qva	--	ND	--	--	ND	--	C	--	--	--	--	--	M	--	ND				
120-032	1/6/1999	T31N/R06E-30C01	D (D)	RR/5 ac	499	ND	160	160	6	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	1/6/1999	62				
109-083	2/23/1988	T31N/R05E-13A01	D (D)	RR/5 ac	390	AR	410	397	6	N	--	Qvt	--	Q(A)f	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
109-081	6/7/1994	T31N/R05E-12R02	D (D)	RR/5 ac	371	ND	404	404	6	N	--	Qvt	--	Ts	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
118-055	12/14/1995	T31N/R06E-19F01	D (D)	RR/5 ac	512	CT	264	185	6	N	--	Qvt	62	Ts	187	--	ND	--	C	--	--	--	--	--	L	--	ND				
083-079	11/5/1981	T30N/R06E-04J01	D	RR/5 ac	466	ND	30	30	36	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
109-085	10/21/1999	T31N/R05E-13H01	D	RR/5 ac	407	AR	420	420	6	Y	40	Qvt	75	ND	--	--	ND	--	C	--	--	--	--	--	L	4/26/2000	22				
148-063	11/17/2000	T31N/R05E-13H02	D	RR/5 ac	420	AR	238	230.8	6	Y	230.8	Qvt	67	ND	--	--	Q(A)c	225	C	5	21	1.5	4	20	L	11/21/2000	211				
154-021	10/31/2001	T31N/R05E-13J04	D	RR/5 ac	410	AR	257.5	252.5	6	Y	252.5	Qvt	67	ND	--	--	Q(A)c	222	C	5	39	4	2	12	L	11/6/2001	206				
118-042	5/22/2000	T31N/R06E-19C01	D	RR/5 ac	492	CT	127	20	6	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
120-003	5/6/1994	T31N/R06E-29R01	D	RR/5 ac	443	AR	70	60	4	Y	60	Qvt	7	ND	--	--	Ts	7	C	0.8	--	2	--	--	L	--	ND				
120-044	4/2/1997	T31N/R06E-30F01	D	RR/5 ac	505	CT	274	269	6	Y	269	Qvt	--	ND	--	--	ND	--	C	10	3	1	90	430	L	4/2/1997	252				
121-043	10/11/1996	T31N/R06E-33F01	D	RR/5 ac	459	AR	60	40	6	Y	40	Qvt	--	ND	--	--	Qvt	0	C	3	10	2	1.2	20	L	10/11/1996	32				
120-013	7/10/1998	T31N/R06E-29P02	D	RR/5 ac	561	AR	139	137.9	6	N	--	Qvt	--	ND	--	--	ND	--	C	15	10	2	90	--	L	7/10/1998	124				
159-014	2/1/1982	T31N/R06E-29Q01	D	RR/5 ac	472	ND	230	100	6	ND	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
112-069	10/11/1984	T31N/R05E-24H06	D	RR/5 ac	472	AR	300	240	6	N	--	Qvt	83	Q(B)f	240	--	ND	--	C	--	--	--	--	--	L	--	ND				
109-057	8/10/1991	T31N/R05E-12G01	D	RR/5 ac	213	AR	175	160	6	N	--	Qvr	13	Q(A)f	13	--	ND	--	C	--	--	--	--	--	M	--	ND				
109-061	10/24/1992	T31N/R05E-12G02	D	RR/5 ac	220	AR	280	275	6	Y	275	Qvr	--	Q(A)f	160	260	Q(A)c	260	C	15	75	4	4	20	M	10/24/1992	135				
109-063	4/27/1992	T31N/R05E-12C01	D	ULDR4-6	144	AR	292	284	6	Y	284	Qal	12	Q(A)f	132	251	Q(A)c	251	C	30	280	1	--	--	M	4/27/1992	60				
109-065	1/4/1999	T31N/R05E-12J03	D	RR/5 ac	312	AR	328	271	4	Y	271	Qva	35	Q(A)f	270	--	ND	--	C	--	--	--	--	--	M	1/4/1999	0				
109-066	2/18/1999	T31N/R05E-12J04	D	RR/5 ac	312	AR	415	20	6	N	--	Qva	61	Q(A)f	--	--	ND	--	C	--	--	--	--	--	M	--	DRY				
109-072	5/20/1994	T31N/R05E-12K01	D	RR/5 ac	223	CT	284	272	6	ND	272	Qva	--	Q(A)f	--	247	Q(A)c	247	C	8	54	2	1	12	M	5/20/1994	179				
109-073	11/9/1994	T31N/R05E-12R01	D	RR/5 ac	361	CT	230	210	6	N	--	Qvt	133	Q(A)f	164	211	ND	211	C	--	--	--	--	--	L	--	ND				
109-086	8/21/1990	T31N/R05E-13H03	D	RR/5 ac	436	AR	280	255	4.5	Y	255	Qvt	--	Q(A)f	194	270	Q(A)c	270	C	4	0	2	--	--	L	8/21/1990	136				
109-107	9/6/1989	T31N/R05E-13R01	D (D)	RR/5 ac	417	AR	300	300	6	N	--	Qvt	45	Q(A)f	195	--	ND	--	C	--	--	--	--	--	L	--	ND				
112-048	4/1/1994	T31N/R05E-24A03	D	RR/5 ac	459	AR	230	225	6	Y	225	Qvt	90	Q(A)f	153	225	Q(A)c	225	C	10	230	1	--	--	L	4/1/1994	185				
112-052	10/4/1991	T31N/R05E-24A04	D	RR/5 ac	436	CT	227	209	6	Y	209	Qvt	72	Q(A)f	143	205	Q(A)c	205	C	5	8	1	12	60	L	10/4/1991	205				
117-024	9/16/1987	T31N/R06E-18D01	D	RR/5 ac	380	AR	346	346	6	N	--	Qvt	79	Q(A)f	--	338	Q(A)c	338	C	12	50	--	--	--	L	9/16/1987	284				
118-020	6/30/1980	T31N/R06E-18D02	D	RR/5 ac	348	AR	296	292	6	Y	249	Qvt	--	Q(A)f	--	265	Q(A)c	265	C	11	46	1	0.5	19	L	6/30/1980	250				
118-060	2/21/1987	T31N/R06E-19M01	D	RR/5 ac	505	CT	334	330	6	Y	330	Qvt	130	Q(A)f	262	325	Q(A)c	325	C	2	50	2	0.5	2	L	2/21/1987	271				
119-093	6/10/1997	T31N/R06E-29D01	D	RR/5 ac	495	AR	180	18.5	6	N	--	Qvt	91	Q(A)f	160	--	ND	--	C	--	--	--	--	--	L	6/10/1997	105				
119-094	6/26/1997	T31N/R06E-29D02	D	RR/5 ac	472	AR	160	18.5	6	N	--	Ts	93	Q(A)f	150	--	ND	--	C	--	--	--	--	--	L	6/26/1997	130				
118-017	2/16/1987	T31N/R06E-18C01	D	RR/5 ac	312	AR	440	249	4.5	Y	249.33	Qvt	35	Q(A)f	180	238	Q(A)c	238	C	3	--	--	--	--	L	2/16/1987	215				
163-016	11/6/2001	T31N/R05E-13H04	D	RR/5 ac	407	AR	420	416	4	Y	416	Qvt	120	Q(A)f	225	332	Q(A)c	332	C	3	385	1	0.02	0	L	11/6/2001	19				
083-068	5/12/1988	T31N/R06E-33P01	D	RR/5 ac	485	AR	360	55	6	N	--	Qvt	55	Ts	55	--	Ts	55	C	1	300	0.5	--	--	L	5/12/1988	20				
083-073	7/30/1993	T31N/R06E-33L01	D	RR/5 ac	502	AR	100	62	6	Y	50	Qvt	60	Ts	0	60	Ts	60	C	3	60	1	--	--	L	7/30/1993	3				
083-076	11/2/1982	T30N/R06E-04H01	D	RR/5 ac	436	AR	200	20	6	N	--	Qvt	11	Ts	11	--	Ts	11	C	5	--	0.5	--	--	L	11/2/1982	10				
083-081	10/2/1980	T30N/R06E-04J02	D	RR/5 ac	466	AR	530	530	4	Y	140	Qvt	133	Ts	133	--	Ts	133	C	1	360	1	--	--	L	10/2/1980	170				
086-048	8/18/1988	T30N/R06E-03N01	D	RR/5 ac	367	AR	200	92	6	N	--	Qvt	86	Ts	86	--	Ts	86	C	1	200	1	--	--	L	8/18/1988	20				
109-070	3/12/1993	T31N/R05E-13A02	D	RR/5 ac	371	AR	300	280	4.5	Y	280	Qvt	124	Ts	184	--	Ts	184	C	5	7	2	4	90	L	3/12/1993	287				
109-104	5/24/1981	T31N/R05E-13J03	D	RR/5 ac	417	D	32	32	36	N	--	Qvt	32	Ts	32	--	ND	--	C	--	--	--	--	--	L	--	ND				
118-035	6/21/1988	T31N/R06E-19B01	D (D)	RR/5 ac	436	AR	425	100	6	N	--	Qvt	58	Ts	153	--	ND	--	C	--	--	--	--	--	L	--	ND				
118-043	1/6/1975	T31N/R06E-19C02	D	RR/5 ac	495	CT	490	490	6	N	--	Qvt	53	Ts	203	--	Ts	203	C	3	200	0.8	0.9	--	L	1/6/1975	260				
118-052	12/14/1995	T31N/R06E-19F02	D (D)	RR/5 ac	522	CT	264	185	6	N	--	Qvt	87	Ts	187	--	ND	--	C	--	--	--	--	--	L	--	ND				
118-070	10/3/1979	T31N/R06E-20P01	D	RR/5 ac	492	AR	55	51	6	N	--	Qvt	41	Ts	41	--	Ts	41	C	8	31	1	--	--	L	10/3/1979	19				
118-097	11/30/1992	T31N/R06E-20P02	D	RR/5 ac	492	AR	152	142	4	Y	142	Qvt	15	Ts	15	--	Ts	15	C	20	150	1	--	--	L	11/30/1992	65				
119-069	4/13/1992	T31N/R06E-29F01	D	RR/5 ac	436	AR	140	130	4.5	Y	130	Ts	--	Ts	0	--	Ts	0	C	2	0	2	--	--	L	4/13/1992	6				
119-078	10/17/1991	T31N/R06E-29G01	D	RR/5 ac	472	AR	141	60	4.5	Y	60	Ts	--	Ts	0	--	Ts	0	C	20	141	2.5	--	--	L	10/17/1991	60	8/3/1992	52		
119-089	1/18/1996	T31N/R06E-29D03	D	RR/5 ac	485	AR	96	96	6	Y	70	Ts	--	Ts	0	--	Ts	0	C	2	90	1	--	--	L	1/18/1996	43				
119-090	2/10/1997	T31N/R06E-29L01	D	RR/5 ac	476	AR	240	220	4	ND	220	Qvt	63	Ts	63	--	Ts	63	C	6	140	1	0.2	3	L	2/10/1997	80				
119-097	6/5/1990	T31N/R06E-29Q02	D	RR/5 ac	482	AR	287	34	6	N	--	Qvt	28	Ts	28	--	Ts	28	C	2	280	1	--	--	L	6/5/1990	20				
119-099	9/24/1993	T31N/R06E-29J01	D	RR/5 ac	430	AR	180	180	4.5	Y	100	Qvt	18	Ts	18	--	Ts	18	C	1	180	1	--	--	L	9/24/1993	26				
120-002	10/4/1988	T31N/R06E-29R02	D	RR/5 ac	479	AR	300	100	6	N	--	Qvt	46	Ts	46	--	Ts	46	C	4	260	1	--	--	L	10/4/1988	80	8/27/1992	102		
120-005	6/15/1990	T31N/R06E-29K01	D	RR/5 ac	443	D	22.5	20	36	Y	20	Qvt	16	Ts	16	--	Ts	16	C	40	17	0.5	--	--	L	6/15/1990	4	8/12/1992	8		
120-009	8/6/1993	T31N/R06E-29Q03	D	RR/5 ac	482	AR	362	352	6	Y	352	Qvt	40	Ts	40	--	Ts	40	C	3	355	1	--	--	L	8/6/1993	20				
120-011	8/6/1993	T31N/R06E-29Q04	D	RR/5 ac	479	AR	362	352	6	Y	352	Qvt	40	Ts	40	--	Ts	40	C	3	355	1	--	--	L	8/6/1993	20				
120-023	2/28/1992	T31N/R06E-29P03	D	RR/5 ac	548	CT	349	161	6	N	--	Qvt	131	Ts	161	--	Ts	161	C	1	234	2	0.3	--	L	2/28/1992	115				
120-040	10/8/1994	T31N/R06E-30F02	D	RR/5 ac	502	AR	120	110	4	Y	110	Qvt	92	Ts	92	--	Ts	92	C	5	6	2	10	100	L	10/8/1994	78				
121-012	7/12/1995	T31N/R06E-32B01	D	RR/5 ac	508	CT	193	193	4	Y	159	Qvt	139	Ts	134	--	Ts	139	C	0.8	163	1	--	--	L	7/12/1995	30				
121-050	10/13/1987	T31N/R06E-33L02	D	RR/5 ac	436	D	10	10	36	Y	8	Qvt	--	Qvt	0	--	Qvt	0	C	5	1	0.3	--	--	L	--	ND				
121-054	6/28/1991	T31N/R06E-33P02	D	RR/5 ac	499	CT	175	159	4.5	Y	159	Qvt	41	Ts	84	--	Ts	41	C	2	120	1	0.02	0	L	6/28/1991	48				
121-055	6/11/1991	T31N/R06E-33P03	D	RR/5 ac	499	CT	63	39	4	Y	39	Qvt	44	Ts	41	--	Ts	44	C	2	37	1	0.4	2	L	6/11/1991	1				
121-056	2/21/1991	T30N/R06E-04A01	D	RR/5 ac	436	AR	180	140	4	Y	140	Qvt	20	Ts	44	--	Ts	20	C	1	175	1	--	--	L	2/21/1991	40				
083-080	6/5/1998	T30N/R06E-04J03	D	RR/5 ac	397	AR	225	55	6	N	--	Qvt	50	Ts	50	--	Ts	50	C	2	220	1	--	--	L	6/5/1998	60				
117-025	4/2/1998	T31N/R06E-07N01	D	RR/5 ac	351	AR	295	275	4	Y	275	Qvt	82	Ts	132	--	Ts	132	C	5	15	2	2	40	L	8/2/1998	263				
118-051	9/10/1996	T31N/R06E-19F03	D	RR/5 ac	508	CT	300	178	6	N	--	Qvt	61	Ts	176	--	Ts	176	C	0.3	108	1	0.2	--	L	9/10/1996	192				
120-010	8/22/1997	T31N/R06E-29P04	D	RR/5 ac	499	AR	247	245	4.5	N	--	Qvt	96	Ts	96	--	Ts	96	C	6	240	2	--	--	L	8/22/1997	97				
109-084	11/13/1998	T31N/R05E-13J02	D	RR/5 ac	410	AR	278	267.5	6	Y	267.5	Qvt	--	Qva	--	--	Qva	--	C	10	267	1	--	--	L	11/13/1998	217				
083-074	7/30/1993	T31N/R06E-33L03	D	RR/5 ac	502	AR	100	62	6	Y	50	Qvt	45	Qvt	45	60	Qva	45	C	3	60	1	--	--	L	7/30/1993	3				
083-075	7/21/1987	T31N/R06E-32H01	D	RR/5 ac	564	AR	131	131	6	N	--	Qvt	126	Qvt	0	126	Qva	126	C	10	65	--	--	--	L	7/21/1987	64	7/16/1992	53		
083-077	10/31/1981	T31N/R06E-33P04	D	RR/5 ac	489	D	43	41	36	Y	41	Qvt	--	Qvt	0	--	Qvt	0	C	50	17	1	90	180	L	10/31/1987	17	7/16/1992	11		
083-083	11/9/1995	T30N/R06E-04C02	D	RR/5 ac	518	CT	84	79	6	Y	79	Qvt	74	Qvt	0	74	Qva	74	C	13	18	1	14	70	L	11/9/1995	15	8/26/2002	21		
084-083	5/30/1997	T30N/R06E-04C01	D	RR/5 ac	518	AR	83	80	0	Y	80	Qvt	70	Qvt	0	70	Qva	70	C	18	80	1.5	--	--	L	5/30/1997	52				
085-017	6/10/1988	T31N/R06E-30D02	D	RR/5 ac	515	ND	60	55	6	Y	55	Qvt	35	Qvt	0	35	Qva	35	C	35	--	--	--	--	L	6/10/1988	25				
109-078	6/17/1994	T31N/R05E-12R03	D	RR/5 ac	371	AR	124	46	6	Y	46	Qvt	75	Qvt	0	75	Qva	75	C	1	86	1	--	--	L	6/17/1994	45				
113-007	3/8/1997	T31N/R06E-30F03	D	RR/5 ac	512	ND	70	70	6	N	--	Qvt	70	Qvt	0	70	Qva	70	C	15	70	1	--	--	L	3/8/1997	52	9/3/2002	52		
117-070	10/13/1994	T31N/R06E-32H02	D	RR/5 ac	522	AR	50	50	6	N	--	Qvt	42	Qvt	0	42	Qva	42	C	60	48	1	80	--	L	10/13/1994	7				
118-031	8/30/1991	T31N/R05E-13R02	D	RR/5 ac	417	AR	70	68	6	N	--	Qvt	69	Qvt	0	69	Qva	69	C	7	65	1	--	--	L	8/30/1991	53				
119-087	3/27/1996	T31N/R06E-29D04	D	RR/5 ac	485	AR	108	88	6	Y	88	Qvt	92	Qvt	--	--	Qva	92	C	3	12	2	1.2	20	L	3/27/1996	60				
119-092	11/13/1996	T31N/R06E-29F02	D	RR/5 ac	479	AR	97	87	4	Y	87	Qvt	91	Qvt	0	91	Qva	91	C	3	4	3	8	80	L	11/13/1996	79				
120-008	8/27/1991	T31N/R06E-29P05	D	RR/5 ac	531	AR	139	139	6	N	--	Qvt	98	Qvt	0	98	Qva	98	C	20	140	1	--	--	L	8/27/1991	83				
120-017	11/4/1995	T31N/R06E-29L02	D	RR/5 ac	482	AR	112	92	4	Y	92	Qvt	109	Qvt	0	109	Qva	109	C	0.8	0	2	--	--	L	11/4/1995	9				
120-037	4/15/1993	T31N/R06E-30G01	D	RR/5 ac	495	CT	104	99	6	Y	99	Qvt	98	Qvt	0	98	Qva	98	C	10	10	1	20	100	L	4/15/1993	80				
121-008	11/17/1993	T31N/R06E-29P06	D	RR/5 ac	544	AR	140	135	6	Y	135	Qvt	130	Qvt	0	--	Qva	130	C	10	4	1	14	70	L	11/17/1993	120				
121-010	7/20/1994	T31N/R06E-33M01	D	RR/5 ac	518	AR	60	55	6	Y	55	Qvt	--	Qvt	0	123	ND	--	C	20	55	1	--	--	L	7/20/1994	18				
121-048	11/15/1990	T31N/R06E-29B01	D	RR/5 ac	482	AR	160	140	4.5	Y	140	Ts	--	Qvt	0	82	Ts	0	C	15	160	1	--	--	L	11/15/1990	60	9/2/1992	10		
121-053	9/8/1992	T31N/R06E-33N02	D	RR/5 ac	522	AR	380	380	4.5	N	--	Qvt	62	Qvt	0	73	Ts	84	C	1	340	1	--	--	L	9/8/1992	63				
121-060	5/1/1981	T31N/R06E-33N03	D	RR/5 ac	515	AR	100	93	6	N	--	Qvt	--	Qvt	0	93	ND	--	C	20	60	1	--	--	L	5/1/1981	27				
086-055	5/10/1996	T30N/R06E-10E02	D (R)	RR/5 ac	413	CT	172	169	6	Y	169	Qvt	--	ND	--	--	ND	--	C	10	90	2	3	9	L	5/10/1996	73				
109-080	5/25/1992	T31N/R05E-12R04	D (R)	RR/5 ac	371	ND	132	40	6	N	--	Qvt	--	Qvt	0	--	ND	--	C	--	--	--	--	--	L	--	ND				
109-082	2/22/1988	T31N/R05E-13A04	D (U)	RR/5 ac	390	AR	385	385	6	N	--	Qvt	--	Q(A)f	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
109-079	11/21/1990	T31N/R05E-13A05	D (U)	RR/5 ac	390	AR	435	330	4.5	Y	310	Qvt	122	Ts	205	--	Ts	205	C	0.2	--	--	--	--	L	11/21/1990	292	8/25/1992	272		
118-047	10/22/1979	T31N/R06E-19D01	D (U)	RR/5 ac	492	AR	250	203	6	N	--	Qvt	74	Ts	205	--	ND	--	C	--	--	--	--	--	L	8/4/1992	187				
118-045	8/13/1997	T31N/R06E-19E01	D (D)	RR/5 ac	430	ND	36	36	48	ND	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	--	ND				
063-101	8/16/1993	T31N/R06E-29L03	D	RR/5 ac	482	AR	73	73	6	Y	68	Qvt	55	ND	--	--	Qva	55	UC	20	73	1	--	--	L	8/16/1993	51				
083-072	9/15/1986	T30N/R06E-04J04	D	RR/5 ac	466	ND	30	30	36	N	--	Qvt	--	ND	--	--	Qvt	0	UC	1	--	--	--	--	L	9/15/1986	6				
087-047	8/26/1994	T31N/R06E-29D05	D	RR/5 ac	476	D	15	15	36	Y	12.5	Ts	--	ND	--	--	Ts	0	UC	10	6	1	30	75	L	8/26/1994	7				
087-052	10/1/1990	T31N/R06E-19E02	D	RR/5 ac	512	D	25	25	36	Y	22.5	Qvt	--	ND	--	--	Qvt	0	UC	40	12	0.5	60	150	L	10/1/1990	12				
087-096	3/30/1982	T31N/R06E-19R01	D	RR/5 ac	489	CT	80	80	6	N	--	Qvt	72	Qvt	0	72	Qva	72	UC	30	8	1	230	--	L	3/30/1982	36				
090-026	10/6/1999	T31N/R06E-30D03	D	RR/5 ac	518	CT	80	76.5	6	N	--	Qvt	44	ND	--	--	Qva	44	UC	5	0.5	1	610	--	L	10/6/1999	74				
090-027	10/6/1999	T31N/R06E-30D04	D	RR/5 ac	518	CT	80	78	6	N	--	Qvt	44	ND	--	--	Qva	44	UC	5	0.5	1	610	--	L	10/6/1999	74				
090-028	10/6/1999	T31N/R06E-30D05	D	RR/5 ac	518	CT	80	76.5	6	N	--	Qvt	44	ND	--	--	Qva	44	UC	5	0.5	1	610	--	L	10/6/1999	74				
095-004	7/12/1992	T31N/R06E-32H03	D	RR/5 ac	551	D	17.5	17.5	36	Y	15	Qvt	--	ND	--	--	Qvt	0	UC	40	7	0.3	--	--	L	7/12/1992	11				
106-021	6/24/1986	T31N/R05E-24H07	D	RR/5 ac	479	AR	73	68	6	Y	68	Qvt	58	ND	--	--	Qva	58	UC	20	10	1	10	50	L	6/24/1986	50				
108-122	1/19/1991	T31N/R05E-12C02	D	ULDR4-6	167	D	25	25	36	Y	22.5	Qvr	--	ND	--	--	Qvr	0	UC	40	13	1	--	--	M	1/19/1991	10				
148-064	8/29/2000	T31N/R05E-13J01	D	RR/5 ac	443	AR	320	269	6	Y	269	Qvt	85	ND	--	--	Q(A)c	277	UC	9	43	2	2	19	L	8/29/2000	225.1				
110-013	6/24/1987	T31N/R05E-13J05	D	RR/5 ac	417	D	42	42	36	Y	35	Qvt	--	ND	--	--	Qvt	0	UC	50	7	0.1	--	--	L	6/24/1987	30				
111-057	7/7/2000	T31N/R06E-19E03	D	RR/5 ac	512	CT	204	200	6	Y	200	Qvt	65	Qvt	0	65	Qva	65	UC	15	0	1	--	--	L	10/12/1978	183				
112-065	7/1/1996	T31N/R05E-24H08	D	RR/5 ac	456	AR	220	215	6	Y	215	Qvt	72	ND	--	--	Qva	72	UC	9	2	1	40	200	L	7/1/1996	206				
112-070	5/29/1986	T31N/R05E-24H09	D	RR/5 ac	479	CT	66	61	6	Y	61	Qvt	--	ND	--	--	Qvt	0	UC	10	2	1	50	250	L	5/29/1986	45				
112-072	8/15/1985	T31N/R05E-24H10	D	RR/5 ac	472	CT	60	60	6	N	--	Qvt	45	ND	--	--	Qva	45	UC	8	6	1	80	--	L	8/15/1985	46				
112-081	6/22/1981	T31N/R05E-24H11	D	RR/5 ac	472	D	30	36	36	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	6/22/1981	16				
112-089	2/8/1994	T31N/R05E-24A05	D	RR/5 ac	433	AR	260	260	6	Y	160	Qvt	73	ND	--	--	Qva	73	UC	5	250	1	--	--	L	2/8/1994	201				
118-016	3/8/1993	T31N/R06E-18C02	D	RR/5 ac	328	CT	261	255	6	Y	255	Qvt	100	ND	--	--	Qva	100	UC	10	15	1	13	70	L	3/8/1993	223	8/29/2002	224		
118-026	1/30/1986	T31N/R06E-18D03	D	RR/5 ac	367	D	25	25	36	Y	22	Qvt	--	ND	--	--	Qvt	0	UC	30	10	0.3	--	--	L	1/30/1986	12				
118-028	11/12/1990	T31N/R06E-18P01	D	RR/5 ac	400	CT	153	144	6	Y	144	Qvt	75	ND	--	--	Qva	75	UC	4	6	2	15	80	L	11/12/1990	139				
118-046	10/18/1993	T31N/R06E-19M02	D	RR/5 ac	508	CT	310	305	6	Y	305	Qvt	107	ND	--	--	Qva	107	UC	10	12	1	16	80	L	10/18/1993	253				
118-048	11/1/1979	T31N/R06E-19D02	D	RR/5 ac	502	AR	196	191	6	Y	191	Qvt	128	ND	--	--	Qva	128	UC	5	8	1	--	--	L	11/1/1979	175				
118-049	1/16/1994	T31N/R06E-19C03	D	RR/5 ac	508	CT	220	213	6	Y	213	Qvt	128	ND	--	--	Qva	128	UC	12	15	1	16	80	L	1/16/1994	185				
118-056	7/19/1990	T31N/R06E-19E04	D	RR/5 ac	449	AR	80	72	6	Y	72	Qvt	73	ND	--	--	Qva	73	UC	10	65	1	--	--	L	7/19/1990	61				
118-062	8/19/1997	T31N/R06E-19N01	D	RR/5 ac	518	CT	85	85	6	N	--	Qvt	78	ND	--	--	Qva	78	UC	15	4	1	230	--	L	8/19/1997	70				
118-063	4/5/1978	T31N/R06E-19N02	D	RR/5 ac	518	AR	165	165	6	N	--	Qvt	65	ND	--	--	Qva	65	UC	10	10	--	60	--	L	4/5/1978	150				
118-064	7/26/1988	T31N/R06E-19N03	D	RR/5 ac	512	D	50	48	36	Y	48	Qvt	--	ND	--	--	Qvt	0	UC	40	5	0.2	--	--	L	7/26/1988	22				
118-067	8/22/1997	T31N/R06E-19N04	D	RR/5 ac	512	AR	277	272	6	Y	272	Qvt	80	ND	--	--	ND	80	UC	8	2	1	30	150	L	8/22/1997	257				
119-072	9/7/1992	T31N/R06E-30B01	D	RR/5 ac	492	AR	280	277	6	N	--	Qvt	90	ND	--	--	Qva	90	UC	4	275	1	--	--	L	9/7/1992	252				
119-082	9/25/1990	T31N/R06E-29Q05	D	RR/5 ac	466	D	17	17	36	N	--	Qvt	--	ND	--	--	Qvt	0	UC	0.3	--	--	--	--	L	9/25/1990	4				
120-026	6/13/1994	T31N/R06E-30C02	D	RR/5 ac	502	AR	90	80	4	Y	80	Qvt	83	ND	--	--	Qva	83	UC	12	0	2	--	--	L	6/13/1994	72				

Appendix A.
Table A-1. Well Details and Water Levels.

							Well Details					Surface		Confining			Aquifer			Aquifer Properties						Water Level Data					
SnoCo ID	Completion Date	Legal	Well Type	Land Use	Elevation	Drilling Method	Drill Depth	Casing Depth	Casing Diameter	Screen (Y or N)	Screen Top Depth	Geologic Unit	Unit Bottom	Geologic Unit	Unit Top	Unit Bottom	Geologic Unit	Unit Top	Confined Unconfined	Yield	Drawdown	Time	Conductivity (K)	Transmissivity (T)	USGS Aquifer Sensitivity	Date	Depth to Water	Date	Depth to Water	Date	Depth to Water
							(ft)	(ft)	(in)		(ft)		(ft)		(ft)	(ft)		(ft)		(gpm)	(ft)	(hr)	(ft/d)	(ft^2/d)			(ft)		(ft)		(ft)
120-028	6/28/1993	T31N/R06E-30D06	D	RR/5 ac	515	AR	97	95.5	6	N	--	Qvt	55	ND	--	--	Qva	55	UC	5	93	1	--	--	L	6/28/1993	78				
120-029	12/11/1989	T31N/R06E-30D07	D	RR/5 ac	512	CT	90	89	6	N	--	Qvt	83	ND	--	--	Qva	83	UC	15	4	2	230	--	L	8/1/1994	74				
120-033	11/23/1984	T31N/R06E-30C03	D	RR/5 ac	499	CT	265	261	6	Y	261	Qvt	77	ND	--	--	Q(A)c	245	UC	7	10	2	20	80	L	11/23/1984	231				
120-035	2/17/1992	T31N/R06E-30C04	D	RR/5 ac	499	AR	160	160	6	Y	96	Qvt	84	ND	--	--	Qva	84	UC	2	100	1	--	--	L	2/17/1992	81				
120-036	4/23/1994	T31N/R06E-30F04	D	RR/5 ac	495	CT	311	306	6	Y	305	Qvt	130	ND	--	--	Qva	130	UC	12	10	1	20	130	L	4/23/1994	220				
120-038	3/13/1993	T31N/R06E-30F05	D	RR/5 ac	505	AR	105	85	4.5	Y	85	Qvt	58	ND	--	--	Qva	70	UC	8	105	3	0.4	7	L	3/13/1993	64				
120-039	12/18/1989	T31N/R06E-30C05	D	RR/5 ac	495	AR	300	138	6	Y	138	Qvt	139	ND	--	--	Qva	139	UC	2	240	1	--	--	L	12/18/1989	149				
120-043	5/10/1991	T31N/R06E-30F06	D	RR/5 ac	512	AR	100	100	6	N	--	Qvt	60	ND	--	--	Qva	60	UC	30	100	1	--	--	L	5/10/1991	67				
120-048	2/2/1993	T31N/R06E-30C06	D	RR/5 ac	499	AR	85	80	6	Y	80	Qvt	85	ND	--	--	Qva	85	UC	11	80	1.5	--	--	L	2/2/1993	67				
120-050	6/7/1994	T31N/R06E-30K04	D	RR/5 ac	515	CT	275	271	6	Y	270	Qvt	ND	ND	--	--	Qva	ND	UC	10	12	1	16	80	L	6/7/1994	250				
121-009	5/12/1986	T31N/R06E-32H04	D	RR/5 ac	581	AR	150	148	6	N	--	Qvt	123	Qvt	0	130	Qva	123	UC	25	16	1	--	--	L	5/12/1986	60				
121-019	7/30/1984	T31N/R06E-29Q06	D	RR/5 ac	476	D	41	39	36	Y	39	Qvt	--	ND	--	--	Qvt	0	UC	40	10	0.3	60	--	L	7/30/1989	22				
121-042	6/6/1988	T31N/R06E-33P05	D	RR/5 ac	499	AR	89	83	6	Y	83	Qvt	--	ND	--	--	ND	--	UC	7	63	1	1.2	7	L	6/6/1988	9				
121-044	7/4/1984	T31N/R06E-33L04	D	RR/5 ac	482	D	27.5	27	36	Y	25	Qvt	--	ND	--	--	Qvt	0	UC	5	12	2.5	--	--	L	7/4/1984	10				
121-047	5/27/1988	T31N/R06E-33M02	D	RR/5 ac	502	AR	88	88	6	N	--	Qvt	82	ND	--	--	Qva	82	UC	20	30	--	--	--	L	5/27/1988	45				
121-051	10/11/1987	T31N/R06E-33L05	D	RR/5 ac	436	D	12.5	12.5	36	Y	10	Qvt	--	ND	--	--	Qvt	0	UC	50	6	0.2	--	--	L	10/11/1987	6				
119-091	11/14/1996	T31N/R06E-29E01	D	RR/5 ac	492	AR	60	50	6	Y	50	Qvt	43	ND	--	--	Qva	43	UC	10	0	2	--	--	L	11/14/1996	46				
120-019	4/16/1999	T31N/R06E-30B02	D	RR/5 ac	495	AR	273	239	4	Y	239	Qvt	91	ND	--	--	Q(A)c	210	UC	0.8	20	1	0.1	2	L	4/16/1999	247				
120-021	7/13/1999	T31N/R06E-30G02	D	RR/5 ac	502	CT	290	283	6	Y	283	Qvt	100	ND	--	--	Q(A)c	190	UC	7	10	2	15	80	L	7/13/1999	265				
120-031	2/17/1977	T31N/R06E-30D08	D	RR/5 ac	515	CT	299	287	6	Y	287	Qvt	78	ND	--	--	Q(A)c	282	UC	15	5	1	9	110	L	2/17/1977	261				
090-029	10/6/1999	T31N/R06E-30D09	D	RR/5 ac	518	CT	80	76.5	6	N	--	Qvt	44	ND	--	--	Qva	44	UC	5	0.5	1	610	--	L	10/6/1999	74				
121-045	5/18/1985	T31N/R06E-33L06	D	RR/5 ac	499	D	27.5	27.5	36	Y	25	Qvt	--	ND	--	--	Qvt	0	UC	5	12	2.5	--	--	L	5/18/1985	12				
159-002	1/1/1944	T30N/R06E-04A02	D	RR/5 ac	443	D	27.9	28	36	ND	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	8/15/1944	18				
159-009	2/14/1990	T31N/R06E-18E02	D	RR/5 ac	367	D	42	38	36	Y	38	Qvt	--	ND	--	--	Qvt	0	UC	40	10	0.3	--	--	L	2/14/1990	25				
121-036	4/15/1986	T31N/R06E-33M03	D (R)	RR/5 ac	505	D	30	30	36	Y	28	Qvt	--	ND	--	--	Qvt	0	UC	50	30	1.5	--	--	L	4/15/1986	1				
159-013	1/1/1944	T31N/R06E-19E05	D (U)	RR/5 ac	508	D	54	54	30	ND	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	8/15/1944	8.8	2/10/1993	30		
Unmapped Wells																															
South Fork Stillaguamish Watershed																															
085-073	8/17/1988	T30N/R06E-08D09	M	--	--	AR	120	118	6	Y	75	Qvt	94	Ts	94	--	Ts	94	C	--	--	--	--	--	--	8/17/1988	62				
085-074	8/18/1988	T30N/R06E-08D10	M	--	--	AR	80	80	6	N	--	Qvt	63	Ts	63	--	ND	--	C	--	--	--	--	--	--	--	DRY				
085-075	8/19/1988	T30N/R06E-08D11	M	--	--	AR	90	90	6	N	--	Qvt	86	Qvt	0	86	Qva	86	C	7	85	--	--	--	--	8/19/1988	64				
109-075	12/17/1996	T31N/R05E-12N01	RP (SB)	--	--	HSA	10	0	8	Y	0	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
109-076	12/17/1996	T31N/R05E-12N02	RP (SB)	--	--	HSA	7	0	8	Y	0	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
109-037	5/7/1997	T31N/R05E-10Q03	RP (DW)	--	--	HSA	38	18	8	Y	18	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
109-038	5/7/1997	T31N/R05E-10Q04	RP (DW)	--	--	HSA	28	10	8	Y	10	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
109-039	3/7/1997	T31N/R05E-10Q05	RP (DW)	--	--	HSA	23	3	8	Y	3	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
109-041	3/7/1997	T31N/R05E-10Q06	RP (DW)	--	--	HSA	38	18	8	Y	18	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
155-049	2/4/2002	T28N/R05E-13H01	RP (D)	--	--	HSA	20	5	2	Y	5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	M	2/4/2002	7.5				
155-050	2/4/2002	T28N/R05E-13H02	RP (D)	--	--	HSA	15	5	2	Y	5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	L	2/4/2002	5				
113-051	3/10/1999	T27N/R08E-10C01	RP (D)	--	--	HSA	20	15	1	Y	15	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	3/10/1999	3				
110-044	2/26/1996	T31N/R05E-15H05	RP (D)	--	--	HSA	50	--	--	ND	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	2/26/2003	40				
110-045	2/26/1996	T31N/R05E-15H06	RP (D)	--	--	HSA	55	45	2	Y	45	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	2/26/1996	46				
110-018	1/10/1995	T31N/R05E-14D02	RP (WQ)	--	--	HSA	60	53	2	Y	53	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
110-019	1/10/1995	T31N/R05E-14D03	RP (WQ)	--	--	HSA	45	35	2	Y	35	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
152-036	9/25/2001	T31N/R05E-13N01	RP (D)	--	--	ND	25	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	9/25/2001	11				
109-054	1/23/1998	T31N/R05E-11M05	RP (WQ)	--	--	HSA	35	15	2	Y	15	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
108-046	2/8/1994	T31N/R05E-02K01	RP (WQ)	--	--	HSA	17.5	5	2	Y	5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
036-032	11/15/1993	T28N/R05E-13F01	RP (WQ)	--	--	HSA	41.5	14.5	1	Y	0	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
051-047	3/31/1994	T29N/R05E-01A04	RP (D)	--	--	HSA	39	29	2	Y	29	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	3/31/1994	9				
051-060	11/24/1997	T29N/R05E-02A02	RP (WQ)	--	--	HSA	10	5	1	Y	5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
052-147	6/26/1991	T29N/R05E-12D01	RP (WQ)	--	--	HSA	12.5	2.5	2	Y	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
052-151	5/8/1995	T29N/R05E-13?01	RP (D)	--	--	HSA	48	38	2	Y	38	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	5/8/1995	40				
052-153	6/14/1991	T29N/R05E-13A01	RP (WQ)	--	--	HSA	20	10	2	Y	10	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
052-154	6/14/1991	T29N/R05E-13A02	RP (WQ)	--	--	HSA	20	10	2	Y	10	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
052-155	8/14/1991	T29N/R05E-13A03	RP (WQ)	--	--	HSA	20	10	2	Y	10	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
052-156	7/21/1995	T29N/R05E-13A04	RP (WQ)	--	--	HSA	53	43	2	Y	43	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	7/21/1995	45				
052-157	7/24/1995	T29N/R05E-13A05	RP (D)	--	--	HSA	--	47	2	Y	47	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	7/24/1995	45				
052-158	7/6/1995	T29N/R05E-13A06	RP (D)	--	--	HSA	57	37	2	Y	37	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	7/6/1995	47				
052-159	7/7/1995	T29N/R05E-13A07	RP (D)	--	--	HSA	52	32	2	Y	32	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	7/7/1995	39				
052-160	10/2/1991	T29N/R05E-13B05	RP (U)	--	360	ND	ND	--	--	ND	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	8/16/1994	14				
052-161	10/2/1991	T29N/R05E-13B06	RP (WQ)	--	--	HSA	25	10	2	Y	10	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
052-162	10/2/1991	T29N/R05E-13B07	RP (WQ)	--	--	HSA	25	10	2	Y	10	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
052-163	10/2/1991	T29N/R05E-13B08	RP (WQ)	--	--	HSA	25	10	2	Y	10	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
052-164	10/1/2001	T29N/R05E-13B09	RP (WQ)	--	--	HSA	27	12	2	Y	12	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
052-165	10/1/1991	T29N/R05E-13B10	RP (WQ)	--	--	HSA	27	12	2	Y	12	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
052-166	3/23/1995	T29N/R05E-13B11	RP (WQ)	--	--	HSA	55	5	2	Y	5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
052-167	3/23/1995	T29N/R05E-13B12	RP (WQ)	--	--	HSA	50	5	2	Y	5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
052-168	3/23/1995	T29N/R05E-13B13	RP (WQ)	--	--	HSA	45	5	2	Y	5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	3/23/1995	50				
052-169	3/23/1995	T29N/R05E-13B14	RP (WQ)	--	--	HSA	50	5	2	Y	5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	3/23/1995	47				
052-170	3/23/1995	T29N/R05E-13B15	RP (WQ)	--	--	HSA	45	5	2	Y	5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	3/23/1995	40				
052-171	3/23/1995	T29N/R05E-13B16	RP (WQ)	--	--	HSA	45	5	2	Y	5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	3/23/1995	40				
052-172	4/25/1996	T29N/R05E-13B17	RP (WQ)	--	--	HSA	29	9	2	Y	9	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
052-174	8/11/1995	T29N/R05E-13B18	RP (D)	--	--	HSA	85	75	2	Y	75	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	8/11/1995	43				
052-175	10/2/1991	T29N/R05E-13B19	RP (D)	--	--	HSA	25	15	2	Y	15	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	10/2/1991	16				
053-004	4/15/1996	T29N/R05E-13G22	RP (D)	--	--	HSA	40	30	2	Y	30	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	4/15/1996	32.5				
053-005	4/15/1996	T29N/R05E-13G23	RP (WQ)	--	--	HSA	55	45	2	Y	45	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
053-006	4/12/1996	T29N/R05E-13G24	RP (WQ)	--	--	HSA	40	30	2	Y	30	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
053-007	5/30/1997	T29N/R05E-13G25	RP (WQ)	--	--	HSA	45	35	2	Y	35	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
053-008	9/25/1996	T29N/R05E-13G26	RP (WQ)	--	--	HSA	25	10	2	Y	10	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
053-009	9/25/1996	T29N/R05E-13G27	RP (WQ)	--	--	HSA	30	20	2	Y	20	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
053-010	8/22/1997	T29N/R05E-13G28	RP (WQ)	--	--	HSA	30	5	2	Y	5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
053-011	8/22/1997	T29N/R05E-13G29	RP (WQ)	--	--	HSA	30	5	2	Y	5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
053-012	8/22/1997	T29N/R05E-13G30	RP (WQ)	--	--	HSA	30	5	2	Y	5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
053-013	1/19/1996	T29N/R05E-13G31	RP (D)	--	--	HSA	20	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
053-014	1/19/1996	T29N/R05E-13G32	RP (D)	--	--	HSA	35	--	--	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
053-015	1/17/1996	T29N/R05E-13G33	RP (WQ)	--	--	HSA	42	32	2	Y	32	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
053-016	1/19/1996	T29N/R05E-13G34	RP (WQ)	--	--	HSA	38	30	2	Y	30	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
053-017	1/19/1996	T29N/R05E-13G35	RP (WQ)	--	--	HSA	38	28	2	Y	28	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
153-015	10/3/2001	T29N/R05E-13G36	RP (WQ)	--	--	HSA	47	29	2	Y	29	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	10/3/2001	36				
153-016	10/3/2001	T29N/R05E-13G37	RP (WQ)	--	--	HSA	52	21	2	Y	21	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	10/3/2001	36				
153-017	10/5/2001	T29N/R05E-13G38	RP (D)	--	--	HSA	45	30	2	Y	30	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	10/5/2001	36				
153-018	10/5/2001	T29N/R05E-13G39	RP (D)	--	--	HSA	45	30	2	Y	30	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	10/5/2001	36				
153-019	10/2/2001	T29N/R05E-13G40	RP (D)	--	--	HSA	55	30	2	Y	30	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	10/5/2001	44				
054-123	9/30/1991	T29N/R05E-24J02	RP (P)	--	--	HSA	25	15	1	Y	15	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
054-124	9/30/1991	T29N/R05E-24J02	RP (P)	--	--	HSA	25	15	1	Y	15	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
054-125	9/30/1991	T29N/R05E-24J04	RP (P)	--	--	HSA	25	15	1	Y	15	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
054-127	9/30/1991	T29N/R05E-24Q01	RP (P)	--	--	HSA	15.5	7.5	1	Y	7.5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	6/13/1989	4				
056-020	3/30/1994	T29N/R05E-36R01	RP (WQ)	--	--	HSA	148	138	2	Y	138	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
058-022	4/14/1998	T29N/R06E-10D02	RP (SB)	ROW	--	HSA	31.5	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
058-023	4/15/1998	T29N/R06E-10D03	RP (SB)	ROW	--	HSA	41.5	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
061-034	9/7/1994	T29N/R06E-17J01	RP (WQ)	--	--	P	139	126	2	Y	126	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
061-035	9/9/1994	T29N/R06E-17J02	RP (D)	--	--	P	51	40	2	Y	40	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	10/28/1994	24.8	5/19/1999	20.9	5/6/2004	21.7
061-036	9/6/1994	T29N/R06E-17J03	RP (WQ)	--	--	P	140	--	--	ND	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
061-046	9/9/1994	T29N/R06E-17J04	RP (WQ)	--	--	P	55	40	2	Y	40	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
061-054	1/21/1993	T29N/R06E-18L01	RP (WQ)	--	--	HSA	21	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
061-055	1/21/1993	T29N/R06E-18L02	RP (WQ)	--	--	HSA	18	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
061-057	1/19/1995	T29N/R06E-19C01	RP (P)	--	--	HSA	39	7	1	Y	7	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
063-086	11/6/1991	T29N/R06E-28D01	RP (WQ)	--	--	HSA	39	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
064-007	6/14/1992	T29N/R06E-31R01	RP (WQ)	--	--	HSA	30	15	2	Y	15	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
064-008	6/14/1992	T29N/R06E-31R02	RP (WQ)	--	--	HSA	30	15	2	Y	15	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
064-009	6/14/1992	T29N/R06E-31R03	RP (WQ)	--	--	HSA	30	15	2	Y	15	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
064-010	6/14/1992	T29N/R06E-31R04	RP (WQ)	--	--	HSA	30	15	2	Y	15	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
075-034	11/22/1994	T30N/R05E-14K01	RP (D)	--	--	HSA	30	5	2	Y	5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
075-035	11/22/1994	T30N/R05E-14K02	RP (WQ)	--	--	HSA	30	5	2	Y	5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
077-083	6/23/2000	T30N/R05E-26Q01	U (D)	--	--	ND	117	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	6/23/2000	7				
077-094	8/6/1990	T30N/R05E-26R02	RP (SB)	--	--	HSA	15	5	4	Y	5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
077-095	7/31/2002	T30N/R05E-26R03	RP (SB)	--	--	HSA	15	5	4	Y	5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
077-096	8/6/1990	T30N/R05E-26R04	RP (SB)	--	--	HSA	15	5	4	Y	5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
077-097	8/6/1990	T30N/R05E-26R05	RP (SB)	--	--	HSA	15	5	4	Y	5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
081-071	9/26/1991	T30N/R05E-34A02	RP (WQ)	--	--	HSA	20	4	4	Y	4	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
081-072	9/26/1991	T30N/R05E-34A03	RP (WQ)	--	--	HSA	20	4	4	Y	4	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
081-107	3/25/1994	T30N/R05E-36B05	RP (D)	--	--	HSA	177	167	2	Y	167	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
086-023	3/17/2000	T30N/R06E-08P06	RP (D)	--	--	ND	152	151	6	Y	5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
086-033	6/24/1995	T30N/R06E-09P01	RP (WQ)	--	--	MR	125	115	2	Y	115	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
086-034	7/21/1995	T30N/R06E-09P02	RP (WQ)	--	--	MR	58	53	2	Y	53	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
154-067	7/4/2001	T30N/R06E-09P03	RP (D)	--	--	HSA	71	66	3	Y	66	ND	--	ND	--	--	ND	--	C	10	69	1	--	--	--	7/4/2001	62.3				
087-073	9/17/1982	T30N/R06E-14A01	D	--	--	CT	150	55	6	Y	55	Qvt	100	ND	--	--	Qvt	0	C	--	--	--	--	--	--	--	ND				
087-074	12/17/1979	T30N/R06E-14A02	D	--	--	AR	300	217	6	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	12/17/1979	300				
087-075	7/5/1995	T30N/R06E-14H01	D (D)	--	--	ND	14	14	36	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	7/5/1995	9				
087-086	4/20/1995	T30N/R06E-14D01	D	--	--	D	35	35	36	Y	32.5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	4/20/1995	20				
087-107	3/26/1990	T30N/R06E-14L01	D	--	--	CT	87	81	6	Y	81	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	3/26/1990	32				
087-111	3/14/1979	T30N/R06E-14P01	D	--	--	AR	100	100	6	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	3/14/1979	36				
087-112	12/3/1981	T30N/R06E-14P02	D	--	--	D	37	37	36	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	12/3/1981	29				
087-113	7/22/1983	T30N/R06E-14P03	D	--	--	CT	53	41	6	Y	41	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	7/22/1983	18				
087-114	9/28/1978	T30N/R06E-14N01	D	--	--	D	28.5	28.5	36	Y	26.5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	9/28/1978	20				
092-025	11/15/1974	T30N/R06E-23B01	D	--	--	CT	84	84	6	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	11/15/1974	21				
092-028	9/29/1989	T30N/R06E-23D02	D (D)	--	--	ND	40	40	6	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	9/29/1989	10				
092-045	5/5/1994	T30N/R06E-23M09	D	--	--	CT	36	36	10	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	5/5/1994	20				
193-051	10/3/2003	T30N/R06E-19M02	D	RR/5 ac	358	AR	90	88.5	6	N	--	Qvt	86	Qvt	0	86	Qva	86	C	20	85	1	--	--	M	10/3/2003	25				
051-061	4/19/1973	T29N/R05E-02B02	D	--	--	CT	115	107.5	6	Y	107.5	Qvt	103	Qvt	0	103	Qva	103	C	--	--	--	--	--	--	4/19/1973	72				
087-079	11/10/1982	T30N/R06E-14G01	D	--	--	ND	120	110	6	N	--	Qvt	103	Qvt	0	103	Qva	103	C	--	--	--	--	--	--	11/10/1982	55				
155-001	3/22/2001	T30N/R05E-02Q01	D	RR/5 ac	344	AR	80	59	4	ND	59	Qvt	55	--	--	--	none	--	C	17	18	6	--	--	L	3/22/2001	38				
195-059	9/6/2003	T30N/R06E-21C07	D	CF	371	AR	121	111	6	Y	111	--	--	--	--	--	--	--	C	--	--	--	--	--	L	9/6/2003	21				
155-048	12/19/2001	T28N/R05E-12L01	RP (P)	--	--	HSA	20	10	1	Y	10	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
155-045	1/19/2002	T28N/R05E-12L02	RP (P)	--	--	HSA	25	15	1	Y	15	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
155-046	1/19/2002	T28N/R05E-12L03	RP (P)	--	--	HSA	25	15	1	Y	15	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
155-047	12/19/2001	T28N/R05E-12L04	RP (P)	--	--	HSA	33	22	1	Y	23	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
148-016	5/7/2001	T28N/R06E-07N32	RP (P)	--	--	HSA	15	5	1	Y	5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
148-018	6/25/2001	T29N/R05E-14J01	RP (P)	--	--	HSA	30	20	1	Y	20	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
148-019	6/25/2001	T29N/R05E-14J02	RP (P)	--	--	HSA	43	33	1	Y	33	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
152-025	8/20/2001	T29N/R06E-21H05	RP (P)	--	--	MR	30	20	1	Y	20	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
081-059	5/20/1998	T30N/R05E-34?01	RP (P)	--	--	ND	19	14	1	Y	14	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	5/20/1998	6				
081-060	5/20/1998	T30N/R05E-34?02	RP (P)	--	--	HSA	19	14	1	Y	14	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	5/20/1998	6				
081-061	5/20/1998	T30N/R05E-34?03	RP (P)	--	--	ND	19	14	1	Y	14	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	5/20/1998	6				
081-062	5/20/2002	T30N/R05E-34?04	RP (P)	--	--	ND	19	14	1	Y	14	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	5/20/1998	6				
081-063	5/20/1998	T30N/R05E-34?05	RP (P)	--	--	ND	18	12	1	Y	12	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	5/20/1998	6				
081-064	5/20/1998	T30N/R05E-34?06	RP (P)	--	--	ND	18	12	1	Y	12	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	5/21/1998	6				
081-065	5/21/1998	T30N/R05E-34?07	RP (P)	--	--	ND	15	10	1	Y	10	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	5/21/1998	6				
081-066	5/22/1998	T30N/R05E-34?08	RP (P)	--	--	ND	8	5	1	Y	5	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	5/22/1998	6				
081-067	5/21/1998	T30N/R05E-34?09	RP (P)	--	--	ND	14	9	1	Y	9	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	5/21/1998	6				
081-068	5/22/1998	T30N/R05E-34?10	RP (P)	--	--	ND	14	9	1	Y	9	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	5/22/1998	6				
081-069	5/22/1998	T30N/R05E-34?11	RP (P)	--	--	ND	14	9	1	Y	9	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	5/22/1998	6				
081-070	5/22/1998	T30N/R05E-34?12	RP (P)	--	--	ND	14	9	1	Y	9	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	5/22/1998	6				
051-059	3/16/1989	T29N/R05E-02A03	O	--	--	AR	50	50	6	N	--	Qvt	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
039-043	3/17/1989	T28N/R06E-07G01	O	--	--	AR	50	3	6	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
113-012	5/24/1989	T31N/R05E-25D01	RP (SB)	--	--	AR	100	100	6	N	--	Qvt	75	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
052-148	11/4/1998	T29N/R05E-12J01	RP (SB)	--	--	HSA	60	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
052-149	11/4/1998	T29N/R05E-12J02	RP (SB)	--	--	HSA	80	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
052-150	11/4/1998	T29N/R05E-12J03	RP (SB)	--	--	HSA	80	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
052-177	2/18/1997	T29N/R05E-13G41	RP (SB)	--	--	HSA	28	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
052-178	2/18/1997	T29N/R05E-13G42	RP (SB)	--	--	HSA	30	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
052-179	2/18/1997	T29N/R05E-13G43	RP (SB)	--	--	HSA	35	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
052-180	2/18/1997	T29N/R05E-13G44	RP (SB)	--	--	HSA	35	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
053-001	4/10/1997	T29N/R05E-13G45	RP (SB)	--	--	ND	40	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
053-002	9/18/1996	T29N/R05E-13G46	RP (SB)	--	--	HSA	34	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
054-120	5/13/1996	T29N/R05E-24G01	RP (SB)	--	--	HSA	17	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
054-121	5/13/1996	T29N/R05E-24G02	RP (SB)	--	--	HSA	15	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				

Appendix A.
Table A-1. Well Details and Water Levels.

SnoCo ID	Completion Date	Legal	Well Type	Land Use	Elevation	Drilling Method	Well Details: Drill Depth	Casing Depth	Casing Diameter	Screen (Y or N)	Screen Top Depth	Surface: Geologic Unit	Unit Bottom	Confining: Geologic Unit	Unit Top	Unit Bottom	Aquifer: Geologic Unit	Unit Top	Confined Unconfined	Aquifer Properties: Yield	Drawdown	Time	Conductivity (K)	Transmissivity (T)	USGS Aquifer Sensitivity	Water Level Data: Date	Depth to Water	Date	Depth to Water	Date	Depth to Water
							(ft)	(ft)	(in)		(ft)		(ft)		(ft)	(ft)		(ft)		(gpm)	(ft)	(hr)	(ft/d)	(ft^2/d)			(ft)		(ft)		(ft)
056-023	2/10/1995	T29N/R05E-36L02	RP (SB)	--	--	HSA	15	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
056-034	11/6/1997	T29N/R05E-36N01	RP (SB)	--	--	HSA	7	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
056-035	11/6/1997	T29N/R05E-36N02	RP (SB)	--	--	HSA	9	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
119-081	6/6/1990	T31N/R06E-29D06	RP (SB)	--	--	AR	200	115	6	N	--	Qvt	85	Ts	115	--	Ts	115	C	--	--	--	--	--	M	--	ND				
120-077	4/7/1983	T31N/R06E-31H01	TW	--	--	AR	255	248	8	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	L	--	ND				
153-037	10/1/2001	T29N/R05E-13G47	RP (SB)	--	--	HSA	60	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
153-038	10/2/2001	T29N/R05E-13G48	RP (SB)	--	--	HSA	50	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
153-039	10/5/2001	T29N/R05E-13G49	RP (SB)	--	--	HSA	40	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
152-024	8/30/2001	T29N/R06E-21H06	RP (SB)	--	--	MR	60	--	--	N	--	ND	--	ND	--	--	ND	--	C	--	--	--	--	--	--	--	ND				
056-028	2/10/1995	T29N/R05E-36L03	RP (D)	--	--	HSA	20	5	4	Y	5	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	2/10/1995	15				
056-029	2/10/1995	T29N/R05E-36L04	RP (D)	--	--	HSA	24	19	2	Y	19	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	2/10/1995	15				
087-081	9/12/1996	T30N/R06E-14G02	D	--	--	AR	57	52	6	Y	52	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	9/12/1996	46				
087-082	9/12/1996	T30N/R06E-14G03	D	--	--	AR	57	52	6	Y	52	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	9/12/1996	46				
087-099	2/11/1991	T30N/R06E-14K01	D	--	--	CT	58	51	6	Y	51	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	2/11/1991	27				
Mainstem Sillaguamish Watershed																															
110-033	4/6/1993	T31N/R05E-14N01	RP (SB)	--	--	HSA	28	--	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
110-034	4/6/1993	T31N/R05E-14N02	RP (SB)	--	--	HSA	28	--	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
110-035	4/6/1993	T31N/R05E-14N03	RP (SB)	--	--	HSA	23	--	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
110-036	4/6/1993	T31N/R05E-14N04	RP (SB)	--	--	HSA	23	--	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
110-037	4/6/1993	T31N/R05E-14N05	RP (SB)	--	--	HSA	23	--	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
110-038	4/6/1993	T31N/R05E-14N06	RP (P)	--	--	HSA	28	14	1	Y	15	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
110-039	4/5/1993	T31N/R05E-14N07	RP (P)	--	--	HSA	23	22	1	Y	22	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
110-040	4/5/1993	T31N/R05E-14N08	RP (P)	--	--	HSA	21	22	1	Y	22	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
110-041	4/5/1993	T31N/R05E-14N09	RP (P)	--	--	HSA	23	20	1	Y	20	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
110-020	9/25/1991	T31N/R05E-14E01	RP (D)	--	--	HSA	25	--	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
110-021	9/25/1991	T31N/R05E-14E02	RP (D)	--	--	HSA	25	--	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
110-022	9/25/1991	T31N/R05E-14E03	RP (D)	--	--	HSA	15	--	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
110-023	9/25/1991	T31N/R05E-14E04	RP (D)	--	--	HSA	15	--	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
109-040	3/28/1997	T31N/R05E-10Q07	RP (P)	--	--	HSA	40	40	1	Y	29	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
108-045	4/11/1994	T31N/R05E-02K02	RP (D)	--	--	HSA	38	--	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
108-038	4/11/1994	T31N/R05E-02K03	RP (D)	--	--	HSA	29	--	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
108-039	4/11/1994	T31N/R05E-02K04	RP (D)	--	--	HSA	34	--	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
108-040	4/11/1994	T31N/R05E-02K05	RP (D)	--	--	HSA	60	--	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
108-041	4/11/1994	T31N/R05E-02K06	RP (D)	--	--	HSA	34	--	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
108-042	4/11/1994	T31N/R05E-02K07	RP (D)	--	--	HSA	44	--	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
108-043	4/11/1994	T31N/R05E-02K08	RP (D)	--	--	HSA	35	--	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
108-044	4/11/1994	T31N/R05E-02K09	RP (D)	--	--	HSA	34	--	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
Unknown Watershed																															
035-072	9/3/1998	T28N/R05E-02H01	RP (P)	--	--	HSA	15	15	1	Y	10	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
035-160	3/13/1997	T28N/R05E-12D01	RP (WQ)	--	--	HSA	17	5	2	Y	5	Qvr	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	3/13/1997	5				
176-089	3/5/1998	T29N/R05E-13G50	RP (D)	--	--	HSA	30	--	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
077-023	6/27/1995	T30N/R05E-23F01	RP (D)	--	--	D	4.5	--	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/27/1995	2				
077-024	6/27/1995	T30N/R05E-23F02	RP (D)	--	--	D	4	--	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/27/1995	2				
086-032	--	T30N/R06E-09P04	RP (D)	--	--	ND	ND	--	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
035-159	2/14/1989	T28N/R05E-12D02	D (D)	--	--	D	21	--	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	2/14/1989	14				
036-025	9/3/1999	T28N/R05E-13B01	D (D)	--	--	ND	60	60	6	Y	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
036-026	9/3/1999	T28N/R05E-13B02	D (D)	--	--	ND	46	46	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
036-027	9/3/1999	T28N/R05E-13B03	D (D)	--	--	ND	58	58	6	Y	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
039-029	12/30/1995	T28N/R06E-06A01	D (D)	--	--	D	14	14	30	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	12/30/1995	6				
121-014	7/8/1994	T31N/R06E-32D05	D	--	--	AR	157	137	6	Y	137	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	L	7/8/1994	112				
120-096	9/19/1991	T31N/R06E-31R01	D	--	--	AR	165	165	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	L	9/19/1991	133				
120-099	2/15/1979	T31N/R06E-31Q03	D	--	--	ND	137	137	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	L	2/15/1979	112				
120-061	8/28/1979	T31N/R06E-30L01	D	--	--	AR	382	300	4	Y	300	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	H	8/28/1979	265				
120-042	2/19/1991	T31N/R06E-30E03	D	--	--	AR	299	294	6	Y	294	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	L	2/19/1991	264				
120-049	8/9/1991	T31N/R06E-30K05	D	--	--	CT	105	105	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	L	8/9/1991	76				
120-053	11/29/1990	T31N/R06E-30R04	D	--	--	AR	120	120	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	L	11/29/1990	93				
119-095	7/9/1993	T31N/R06E-29?01	D	--	--	AR	58	43	4.5	Y	43	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	L	7/9/1993	21				
119-096	5/6/1992	T31N/R06E-29R03	D	--	--	D	50	47	36	Y	47.5	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	L	5/6/1992	36				
118-057	1/18/1983	T31N/R06E-19Q01	D	--	--	AR	220	200	6	Y	200	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	M	1/18/1983	188				
118-058	9/23/1984	T31N/R06E-19?01	D	--	--	AR	320	320	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	M	9/23/1984	245				
118-061	6/30/1987	T31N/R06E-19M03	D	--	--	CT	280	280	6	Y	280	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	M	6/30/1987	256				
118-065	10/21/1992	T31N/R06E-19N05	D	--	--	AR	280	260	4	Y	260	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	M	--	ND				
118-029	6/2/1995	T31N/R06E-18P02	D	--	--	CT	147	128	6	Y	128	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/2/1995	101				
118-030	5/9/1994	T31N/R06E-18P03	D	--	--	AR	222	212	6	Y	212	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
118-033	10/21/1974	T31N/R06E-19H01	D	--	--	CT	154	149	6	Y	149	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	10/21/1974	128				
118-037	4/21/1990	T31N/R06E-19C04	D (D)	--	--	CT	178	178	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
118-038	4/30/1990	T31N/R06E-19C05	D	--	--	CT	215	205	6	Y	205	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	4/30/1990	182				
118-018	3/19/1994	T31N/R06E-18C03	D	--	--	AR	122	102	6	Y	102	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	3/19/1994	63				
118-019	10/15/1991	T31N/R06E-18D04	D	--	--	AR	262	252	6	Y	252	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	10/15/1991	228				
118-027	1/20/1995	T31N/R06E-18L01	D	--	--	AR	140	135	6	Y	135	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	1/20/1995	122				
116-004	5/6/1980	T31N/R05E-36J01	D	--	--	AR	90	88	6	Y	88	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	5/6/1980	45				
115-124	5/15/1975	T31N/R05E-35Q07	D	--	--	CT	68	68	6	Y	25	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	5/15/1975	22				
115-109	4/14/1990	T31N/R05E-35E02	D	--	--	AR	200	195	6	Y	195	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	4/14/1990	3				
115-114	8/16/1983	T31N/R05E-35K25	D	--	--	AR	143	140	6	Y	140	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
115-116	12/30/1977	T31N/R05E-35R10	D	--	--	AR	56	56	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	12/30/1977	40				
113-095	7/15/1973	T31N/R05E-26N04	D	--	--	CT	58	55	6	Y	55	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/15/1973	38				
113-080	3/1/1996	T31N/R05E-26K06	D	--	--	CT	67	62	6	Y	62	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	3/1/1996	3				
113-088	5/4/1993	T31N/R05E-26Q03	D	--	--	AR	165	135	4	Y	135	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	5/4/1993	130				
113-089	8/29/1977	T31N/R05E-26Q04	D	--	--	CT	182	172	6	Y	172	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	8/29/1977	113				
113-091	2/12/1979	T31N/R05E-26P02	D	--	--	AR	173	173	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	2/12/1979	111				
113-092	3/1/1993	T31N/R05E-26N05	D	--	--	AR	143	138	6	Y	138	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	3/1/1993	94				
113-068	6/12/1990	T31N/R05E-26D08	D	--	--	AR	35	30	6	Y	30	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/12/1990	2				
113-077	10/22/1975	T31N/R05E-26F04	D	--	--	ND	77	77	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	10/22/1975	53				
113-079	5/13/1983	T31N/R05E-26K07	D	--	--	AR	195	195	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	5/13/1983	150				
113-050	10/24/1990	T31N/R05E-26B06	D	--	--	AR	180	175	6	Y	175	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	10/24/1990	145				
113-063	10/22/1995	T31N/R05E-26C05	D	--	--	AR	77	77	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
113-005	10/24/1991	T31N/R05E-25B05	D	--	--	AR	245	235	6	Y	235	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	10/24/1991	202				
113-013	8/18/1989	T31N/R05E-25D02	D	--	--	AR	236	231	6	Y	231	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	8/18/1989	169				
112-105	2/20/1991	T31N/R05E-24L06	D	--	--	CT	229	221	6	Y	221	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	2/20/1991	190				
113-002	11/17/1988	T31N/R05E-25B06	D	--	--	AR	272	267	6	Y	267	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	11/17/1988	240	8/19/1992	16		
112-093	7/15/1994	T31N/R05E-24R06	D	--	--	AR	49	49	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/15/1994	33				
112-084	5/11/1995	T31N/R05E-24F05	D	--	--	CT	242	236	6	Y	236	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	5/11/1995	210				
112-068	6/22/1988	T31N/R05E-24H12	D	--	--	CT	217	212	6	Y	212	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/22/1988	196				
112-045	12/6/1989	T31N/R05E-23N04	D	--	--	AR	40	35	6	Y	35	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	12/6/1989	0				
112-056	5/24/1990	T31N/R05E-24B07	D	--	--	AR	220	210	6	Y	210	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	5/24/1990	205				
112-029	11/14/1980	T31N/R05E-23J01	D	--	--	AR	270	260	6	Y	260	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	11/14/1980	169				
112-030	11/6/1980	T31N/R05E-23J02	D (R)	--	--	AR	300	290	6	Y	290	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	11/6/1980	188				
112-021	11/3/1980	T31N/R05E-23C01	D	--	--	AR	240	230	6	Y	230	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	11/3/1980	160				
112-026	11/6/1980	T31N/R05E-23F01	D	--	--	AR	260	250	6	Y	250	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	11/6/1980	170				
112-027	8/15/1980	T31N/R05E-23E01	D	--	--	AR	100	85	6	Y	85	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	8/15/1980	12				
112-028	10/4/1980	T31N/R05E-23E02	D	--	--	AR	217	207	6	Y	207	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	10/4/1980	122				
110-032	5/7/1986	T31N/R05E-14N10	D	--	--	AR	76	76	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	5/7/1986	34				
110-042	3/6/1992	T31N/R05E-15A03	D (D)	--	--	D	56	56	36	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	3/6/1992	46				
110-043	5/6/1992	T31N/R05E-15A04	D (D)	--	--	D	74	74	36	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	5/6/1992	46				
110-017	10/26/1998	T31N/R05E-14G01	D (D)	--	--	ND	176	--	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
110-024	10/26/1998	T31N/R05E-14J01	D (D)	--	--	ND	25	--	36	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
110-025	10/26/1998	T31N/R05E-14J02	D (D)	--	--	ND	25	--	36	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
110-007	8/10/1994	T31N/R05E-13P07	D	--	--	CT	231	215	6	Y	215	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	8/10/1994	195				
110-015	11/25/1991	T31N/R05E-14A01	D (D)	--	--	ND	17	--	48	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	11/25/1991	10				
109-099	1/20/1978	T31N/R05E-13K07	D	--	--	CT	220	115	6	Y	115	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	1/20/1978	125				
109-109	7/17/1995	T31N/R05E-13Q01	D	--	--	CT	219	213	6	Y	213	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/17/1995	191				
110-003	6/23/1995	T31N/R05E-13Q02	D	--	--	CT	224	218	6	Y	218	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/23/1995	191				
109-091	7/19/1994	T31N/R05E-13F03	D	--	--	AR	236	228	6	Y	228	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/19/1994	202				
109-092	11/18/1991	T31N/R05E-13F04	D	--	--	AR	120	120	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
109-093	9/9/1999	T31N/R05E-13J06	D	--	--	AR	285	275	6	Y	275	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	9/9/1999	230				
109-077	1/18/1983	T31N/R05E-13A06	D	--	--	D	50	25	42	Y	25	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	1/18/1983	25				
109-058	4/7/1992	T31N/R05E-12G03	D	--	--	AR	50	45	6	Y	45	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	4/7/1992	22				
109-059	1/30/1992	T31N/R05E-12G04	D	--	--	AR	114	109	6	Y	109	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	1/30/1992	84				
109-060	1/30/1992	T31N/R05E-12G05	D	--	--	AR	114	109	6	Y	109	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	1/30/1992	84				
109-064	10/11/1990	T31N/R05E-12C03	D	--	--	AR	95	91	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	10/11/1990	74				
109-067	10/11/1990	T31N/R05E-12C04	D	--	--	AR	95	91	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	10/11/1990	74				
109-071	11/18/1979	T31N/R05E-12K02	D	--	--	AR	296	291	6	Y	291	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	11/18/1979	205				
109-055	2/5/1992	T31N/R05E-12G06	D	--	--	AR	50	46	6	Y	46	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	2/5/1992	26				
109-056	9/8/1979	T31N/R05E-12G07	D	--	--	AR	236	229	6	Y	229	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	9/8/1979	87				
035-075	6/24/1976	T28N/R05E-02G05	D	--	--	CT	214	207	6	ND	207	ND	--	ND	--	--	ND	--	ND	13	102	2	--	--	--	6/24/1976	196	4/9/1992	190		
035-084	9/17/1992	T28N/R05E-03R02	D	--	200	CT	110	110	6	N	--	ND	--	ND	--	--	Qva	39	ND	20	0	1	--	--	--	9/17/1992	65				
039-032	3/30/1992	T28N/R06E-06H01	D	--	--	AR	25	20	6	Y	20	ND	--	ND	--	--	ND	--	ND	40	7	1	--	--	--	3/30/1992	7				
039-037	5/3/1996	T28N/R06E-07H01	D	--	--	AR	36	36	6	N	--	ND	--	ND	--	--	ND	--	ND	40	35	1	--	--	--	5/3/1996	11				
039-038	5/4/1996	T28N/R06E-07H02	D	--	--	AR	36	36	6	N	--	ND	--	ND	--	--	ND	--	ND	40	35	1	--	--	--	5/4/1996	11				
039-039	1/3/1996	T28N/R06E-07H03	D	--	--	AR	40	36	6	N	--	ND	--	ND	--	--	ND	--	ND	40	35	1	--	--	--	1/3/1996	14				
039-040	12/27/1995	T28N/R06E-07H04	D	--	--	AR	40	36	6	N	--	ND	--	ND	--	--	ND	--	ND	40	35	1	--	--	--	12/27/1995	14				
039-059	5/6/1994	T28N/R06E-08E02	D	--	--	AR	40	37	6	N	--	ND	--	ND	--	--	ND	--	ND	20	2	2	--	--	--	5/6/1994	11				
051-058	12/17/1997	T29N/R05E-01M05	D (D)	--	--	ND	--	--	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	12/17/1997	2				
054-122	1/27/1997	T29N/R05E-24D02	D (D)	--	--	D	38	38	54	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	01/20/97	2.5				
056-033	10/2/1979	T29N/R05E-36N03	D	--	--	AR	460	460	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	10/2/1979	180				
056-110	10/1/1996	T29N/R06E-04C05	D	--	--	AR	37	32	6	Y	32	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	10/1/1996	23				
057-001	3/4/1983	T29N/R06E-04F04	D	--	--	AR	169	169	6	N	--	Qvt	25	ND	--	--	ND	--	ND	--	--	--	--	--	--	3/4/1983	55				
057-034	3/25/1997	T29N/R06E-05D02	D (D)	--	--	ND	200	200	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	3/25/1997	92				
057-049	8/28/1999	T29N/R06E-05E05	D (D)	--	--	ND	--	--	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
057-051	9/22/1997	T29N/R06E-05K01	D (D)	--	--	ND	17	17	36	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	9/22/1997	13				
057-052	9/22/1997	T29N/R06E-05K02	D (D)	--	--	ND	23	23	36	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	9/22/1997	15				
057-053	3/12/1998	T29N/R06E-05K03	D (D)	--	--	ND	69	69	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	3/12/1998	0				
057-056	10/5/1997	T29N/R06E-05L03	D (D)	--	--	ND	30	30	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	10/5/1997	6				
060-098	9/16/1992	T29N/R06E-16K03	D	--	--	AR	40	40	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	9/16/1992	9				
060-100	11/2/1988	T29N/R06E-16K04	D	--	--	CT	56	56	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	11/2/1988	10				
061-007	10/15/1988	T29N/R06E-16Q06	D	--	--	CT	92	92	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	10/15/1988	37				
061-014	7/8/1978	T29N/R06E-17H01	D	--	--	AR	157	157	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/8/1978	60				
061-015	7/7/1978	T29N/R06E-17H02	D	--	--	AR	174	174	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/7/1978	35				
061-016	7/18/1978	T29N/R06E-17H03	D	--	--	AR	218	218	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/18/1978	32				
061-017	7/14/1978	T29N/R06E-17H04	D	--	--	AR	218	218	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/14/1978	69				
061-019	7/11/1978	T29N/R06E-17H05	D	--	--	AR	157	157	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/11/1978	63				
061-021	4/12/1978	T29N/R06E-17G01	D	--	--	ND	157	157	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	4/12/1978	54				
061-069	7/14/1978	T29N/R06E-21B02	D	--	--	AR	57	57	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/14/1978	10				
061-071	1/3/1977	T29N/R06E-21C02	D	--	--	AR	86	86	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	1/3/1977	70				
061-075	5/30/1991	T29N/R06E-21D08	D	--	--	AR	198	193	6	Y	193	Qvt	150	ND	--	--	ND	--	ND	--	--	--	--	--	--	5/30/1991	98				
061-085	6/9/1982	T29N/R06E-21E09	D	--	--	AR	27	24	6	Y	24	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/9/1982	12				
061-090	11/10/1976	T29N/R06E-21E10	D	--	--	AR	94	94	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	11/10/1976	75				
061-092	10/11/1987	T29N/R06E-21E11	D	--	--	CT	73	73	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	10/11/1987	0				
061-094	4/7/1976	T29N/R06E-21E12	D	--	--	AR	98	98	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	4/7/1976	24				
061-096	5/6/1988	T29N/R06E-21J01	D	--	--	AR	40	40	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	5/6/1988	15				
061-107	8/15/1979	T29N/R06E-21N06	D	--	--	CT	68	58	6	Y	58	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	8/15/1979	15				
061-109	8/27/1979	T29N/R06E-21N07	D	--	--	ND	48	44	6	Y	44	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	8/27/1979	10				
063-092	10/25/1985	T29N/R06E-29G01	D	--	--	CT	47	47	8	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	10/25/1985	25				
063-098	4/8/1991	T29N/R06E-29K02	D	--	--	AR	130	32	4.5	Y	32	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	4/8/1991	16				
063-099	7/17/1982	T29N/R06E-29L01	D	--	--	CT	41	20	6	Y	20	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/17/1982	17				
064-016	9/21/1987	T29N/R06E-32?01	D	--	--	AR	45	45	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	9/21/1987	8				
070-092	7/29/1992	T30N/R05E-01B02	D	--	--	ND	102	72	6	Y	72	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/29/1992	43				
070-096	5/3/1999	T30N/R05E-01B04	D	--	--	AR	60	53	6	Y	53	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	5/3/1999	24				
070-097	4/26/1999	T30N/R05E-01B05	D	--	--	AR	60	54.3	6	Y	54.3	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	4/26/1999	28				
070-098	4/26/1999	T30N/R05E-01B06	D	--	--	AR	60	52.5	6	Y	52.5	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	4/26/1999	33				
070-099	4/28/1999	T30N/R05E-01B07	D	--	--	AR	50	53	6	Y	53	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	4/28/1999	36				
071-037	11/2/1993	T30N/R05E-02E02	D	--	--	AR	98	93	6	Y	93	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	11/2/1993	73				
071-054	7/5/1994	T30N/R05E-02N05	D	--	--	AR	80	70	6	Y	70	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/5/1994	62				
071-055	7/7/1993	T30N/R05E-02N06	D	--	--	AR	110	90	6	Y	90	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/7/1993	73				
074-016	10/27/1995	T30N/R05E-11K01	D	--	--	AR	180	180	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
074-017	6/1/1989	T30N/R05E-11K02	D	--	--	AR	136	136	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/1/1989	64				
074-023	8/3/1988	T30N/R05E-11R02	D	--	--	AR	131	127	6	Y	127	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	8/3/1988	53				

Appendix A.
Table A-1. Well Details and Water Levels.

							Well Details					Surface		Confining			Aquifer			Aquifer Properties						Water Level Data					
SnoCo ID	Completion Date	Legal	Well Type	Land Use	Elevation	Drilling Method	Drill Depth	Casing Depth	Casing Diameter	Screen (Y or N)	Screen Top Depth	Geologic Unit	Unit Bottom	Geologic Unit	Unit Top	Unit Bottom	Geologic Unit	Unit Top	Confined Unconfined	Yield	Drawdown	Time	Conductivity (K)	Transmissivity (T)	USGS Aquifer Sensitivity	Date	Depth to Water	Date	Depth to Water	Date	Depth to Water
							(ft)	(ft)	(in)		(ft)		(ft)		(ft)	(ft)		(ft)		(gpm)	(ft)	(hr)	(ft/d)	(ft^2/d)			(ft)		(ft)		(ft)
074-026	8/30/1990	T30N/R05E-11Q07	D	--	--	AR	250	230	4.5	Y	230	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	8/30/1990	38				
074-029	4/25/1990	T30N/R05E-11L03	D	--	--	AR	100	95	6	Y	95	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	4/25/1990	9				
074-047	10/21/1986	T30N/R05E-12E01	D	--	--	AR	98	98	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	10/21/1986	57				
074-064	12/8/1994	T30N/R05E-12L03	D	--	--	CT	83	77	6	Y	77	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	12/8/1994	41				
074-065	12/7/1994	T30N/R05E-12L04	D	--	--	CT	85	80	6	Y	80	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	12/7/1994	43				
074-073	3/12/1990	T30N/R05E-12P06	D	--	--	ND	38	38	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	3/12/1990	20				
074-087	7/7/1980	T30N/R05E-13B02	D	--	--	CT	37	33	6	Y	33	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/7/1980	17				
074-088	8/22/1980	T30N/R05E-13B03	D	--	--	CT	48	44	6	Y	44	Qvt	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	8/22/1980	18				
075-005	2/20/1981	T30N/R05E-13K01	D	--	--	CT	185	180	6	Y	180	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	2/20/1981	59				
075-021	7/5/1977	T30N/R05E-14B08	D	--	--	CT	188	183	6	Y	183	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/5/1977	78				
075-025	9/25/1991	T30N/R05E-14H02	D	--	--	AR	140	135	6	Y	135	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	9/25/1991	67				
077-021	5/19/1998	T30N/R05E-23G01	D	--	--	D	48	48	36	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
077-022	9/5/1995	T30N/R05E-23F03	D (D)	--	--	ND	60	60	6	Y	ND	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
077-028	7/1/1998	T30N/R05E-23K01	D (D)	--	--	ND	289	284	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/1/1998	120				
077-037	3/6/1976	T30N/R05E-24?02	D	--	--	CT	315	306	6	Y	306	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	3/6/1976	141				
077-047	7/29/1975	T30N/R05E-24R01	D	--	--	CT	188	188	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/29/1975	110				
077-050	6/19/1986	T30N/R05E-24Q01	D	--	--	CT	104	91	6	Y	91	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/19/1986	32				
077-079	9/12/1991	T30N/R05E-26A01	D (D)	--	--	D	20	20	36	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	9/12/1991	12				
081-076	8/28/1991	T30N/R05E-34A05	D	--	--	AR	99	99	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	8/28/1991	68				
081-081	10/19/1984	T30N/R05E-35E01	D (R)	--	--	ND	62	51	8	Y	50	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	10/19/1984	0				
081-088	6/16/1977	T30N/R05E-35K02	D	--	--	CT	131	127	6	Y	127	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/16/1977	79				
151-009	8/16/2001	T30N/R05E-36A05	D	--	--	AR	60	50	6	Y	50	Qvt	40	ND	--	--	ND	--	ND	7	55	1.5	--	--	--	8/16/2001	46				
081-103	3/5/1990	T30N/R05E-36B06	D	--	--	AR	200	200	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	3/5/1990	158				
082-003	7/15/1988	T30N/R05E-36G04	D	--	--	CT	161	158	6	Y	156	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/15/1988	141				
082-007	12/7/1990	T30N/R05E-36D04	D	--	--	CT	121	114	6	Y	115	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	12/7/1990	57				
082-028	9/5/1973	T30N/R05E-36K08	D	--	--	ND	143	143	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	9/5/1973	80				
082-029	9/5/1973	T30N/R05E-36K09	D	--	--	ND	144	144	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	9/5/1973	80				
082-038	8/5/1986	T30N/R05E-36R05	D	--	--	AR	96	96	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	8/5/1986	53				
083-065	6/12/1992	T30N/R06E-03N02	D (D)	--	--	ND	--	400	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
083-066	5/16/1989	T30N/R06E-03N03	D	--	--	CT	186	181	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	5/16/1989	150				
083-069	3/1/1993	T30N/R06E-04H03	D	--	--	AR	260	18.5	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
083-078	4/18/1974	T30N/R06E-04E01	D	--	--	CT	84	79	6	Y	79	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	4/14/1974	34				
083-082	3/20/1981	T30N/R06E-04L01	D	--	--	D	28	28	36	N	--	Qvt	--	ND	--	--	Qvt	0	ND	--	--	--	--	--	--	--	ND				
084-006	6/6/2000	T30N/R06E-05J07	D	--	--	CT	86	81	6	Y	81	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/6/2000	27				
084-038	7/24/1997	T30N/R06E-05L01	D	--	--	CT	89	84	6	Y	84	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/24/1997	4				
084-039	8/7/1997	T30N/R06E-05L02	D	--	--	CT	99	94	6	Y	94	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	8/7/1997	32				
084-040	4/1/1997	T30N/R06E-05L03	D	--	--	CT	238	229	6	Y	229	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	4/1/1997	210				
084-080	7/10/1993	T30N/R06E-06F03	D	--	--	AR	199	199	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/10/1993	159				
085-029	6/26/1992	T30N/R06E-07?01	D	--	--	AR	42	42	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/26/1992	9				
085-031	6/4/1992	T30N/R06E-07?02	D	--	--	AR	50	50	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/4/1992	13				
085-034	9/1/1995	T30N/R06E-07R02	D	--	--	CT	61	54	6	Y	54	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	9/1/1995	30				
085-038	7/20/1990	T30N/R06E-07L01	D	--	--	AR	60	55	6	Y	55	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/20/1990	25				
085-039	7/20/1990	T30N/R06E-07L02	D	--	--	AR	60	56	6	Y	56	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/20/1990	25				
085-045	1/17/1995	T30N/R06E-07P06	D	--	--	AR	60	60	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	1/17/1995	23				
085-050	7/22/1999	T30N/R06E-07N02	D	--	--	AR	58	53	6	Y	53	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/22/1999	35				
085-056	3/2/1995	T30N/R06E-08B06	D	--	--	CT	91	76	6	N	--	ND	--	ND	--	--	Ts	--	ND	--	--	--	--	--	--	3/2/1995	34				
085-066	10/30/1996	T30N/R06E-08G08	D	--	--	CT	130	124	6	Y	124	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	10/30/1996	93				
085-067	2/28/1995	T30N/R06E-08G09	D (R)	--	--	CT	73	58	6	Y	58	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	2/28/1995	34				
085-082	5/27/1993	T30N/R06E-08J01	D	--	--	AR	198	185	6	Y	183.5	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	5/27/1993	57				
085-083	5/12/1993	T30N/R06E-08J02	D	--	--	AR	243	238.9	6	Y	238	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	5/12/1993	142				
085-085	9/24/1996	T30N/R06E-08J03	D	--	--	AR	205	200	6	Y	200	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	9/24/1996	152				
086-022	4/12/2000	T30N/R06E-08P07	D	--	--	AR	102	96	6	Y	96	ND	--	ND	--	--	ND	--	ND	25	25	1	--	--	--	4/12/2000	75				
086-031	5/3/1993	T30N/R06E-09P05	D	--	--	AR	221	186	6	Y	186	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	5/3/1993	65				
086-050	7/12/1994	T30N/R06E-10D01	D	--	--	D	45	45	30	N	--	Qvt	90	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
088-004	10/27/1979	T30N/R06E-15D06	D	--	--	AR	216	212	6	Y	209	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	10/27/1979	148				
088-012	3/17/1975	T30N/R06E-15J03	D	--	--	D	45	45	30	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	3/17/1975	20				
088-026	5/17/1991	T30N/R06E-15P01	D	--	--	AR	40	40	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	5/17/1991	13				
088-033	10/18/1983	T30N/R06E-15N05	D	--	--	D	32	32	36	Y	19	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	10/18/1983	19				
088-045	3/29/1995	T30N/R06E-17B03	D	--	--	CT	109	104	6	Y	104	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	3/29/1995	73				
088-047	6/4/1992	T30N/R06E-17B04	D	--	--	AR	119	119	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/4/1992	74				
088-048	6/3/1992	T30N/R06E-17B05	D	--	--	AR	98	98	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/3/1992	79				
088-049	6/2/1992	T30N/R06E-17B06	D	--	--	AR	99	99	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/2/1992	83				
088-054	6/6/1996	T30N/R06E-17B07	D	--	--	CT	96	91	6	Y	91	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/6/1996	64				
088-067	4/10/1992	T30N/R06E-17D05	D	--	--	AR	99	99	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	4/10/1992	66				
088-069	1/24/1992	T30N/R06E-17D06	D	--	--	AR	100	100	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	1/24/1992	66				
088-085	8/22/1997	T30N/R06E-17R06	D	--	--	AR	115	101	6	Y	101	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	8/22/1997	65				
088-087	8/13/1997	T30N/R06E-17R07	D	--	--	CT	115	110	6	Y	110	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	8/13/1997	71				
088-093	9/22/1992	T30N/R06E-17R08	D	--	--	AR	119	119	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	9/22/1992	74				
088-094	9/18/1992	T30N/R06E-17R09	D	--	--	AR	119	119	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	9/18/1992	76				
089-005	4/9/1986	T30N/R06E-17M05	D	--	--	AR	100	96	6	Y	96	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	4/9/1986	75				
089-019	7/11/1992	T30N/R06E-18B01	D	--	--	AR	60	60	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/11/1992	28				
089-029	12/6/1979	T30N/R06E-18K02	D	--	--	AR	77	77	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	12/6/1979	45				
089-032	8/19/1998	T30N/R06E-18R02	D	--	--	CT	118	113	6	Y	113	ND	--	ND	--	--	ND	--	ND	10	5	1	--	--	--	8/19/1998	80				
089-033	10/17/1974	T30N/R06E-18R03	D	--	--	AR	58	58	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	10/17/1974	30				
089-036	8/21/1992	T30N/R06E-18Q05	D	--	--	CT	80	75	6	Y	75	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	8/21/1992	62				
089-040	6/29/1993	T30N/R06E-18L08	D	--	--	AR	157	147	6	Y	147	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/29/1993	59				
089-042	6/23/1993	T30N/R06E-18L09	D	--	--	AR	60	55	6	Y	55	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/23/1993	40				
089-043	10/15/1985	T30N/R06E-18M06	D	--	--	AR	50	50	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	10/15/1985	16				
089-046	1/23/1990	T30N/R06E-18N07	D	--	--	AR	35	32	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	1/23/1990	7				
089-051	3/7/1974	T30N/R06E-19?01	D	--	--	CT	42	42	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	3/7/1974	20				
089-052	11/20/1976	T30N/R06E-19?02	D	--	--	CT	52	52	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	11/20/1976	27				
089-053	1/23/1976	T30N/R06E-19?03	D	--	--	CT	51	51	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	1/23/1976	1				
089-068	7/24/1979	T30N/R06E-19G05	D	--	--	AR	64	64	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/24/1979	45				
089-088	9/5/1990	T30N/R06E-19D01	D	--	--	AR	40	35	6	Y	35	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	9/5/1990	8				
089-094	7/24/1979	T30N/R06E-19F10	D	--	--	AR	54	54	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/24/1979	12				
089-096	5/22/2000	T30N/R06E-19F11	D	--	--	AR	40	40	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	5/22/2000	6				
089-100	6/14/1996	T30N/R06E-19J06	D	--	--	AR	60	60	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/14/1996	33				
089-103	9/18/1974	T30N/R06E-19J07	D	--	--	AR	49	49	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	9/18/1974	30				
090-019	9/28/1978	T30N/R06E-19L03	D	--	--	AR	65	60	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	9/28/1978	48				
090-020	7/10/1990	T30N/R06E-19L04	D	--	--	AR	65	60	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/10/1990	23				
090-021	6/3/1991	T30N/R06E-19M03	D	--	--	AR	83	78	6	Y	78	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/3/1991	35				
090-033	9/1/1980	T30N/R06E-20A01	D	--	--	AR	78	73	6	Y	71	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	9/1/1980	57				
090-068	6/11/1993	T30N/R06E-20R03	D	--	--	AR	100	100	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/11/1993	30				
090-078	5/19/1976	T30N/R06E-20L03	D	--	--	AR	78	78	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	5/19/1976	48				
090-091	9/24/1991	T30N/R06E-21H07	D	--	--	AR	160	160	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	9/24/1991	36				
091-020	2/3/1989	T30N/R06E-21E05	D	--	--	D	21	21	36	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	2/3/1989	7				
091-031	7/11/1990	T30N/R06E-21R10	D	--	--	AR	53	48	6	Y	48	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/11/1990	7				
091-080	5/6/1987	T30N/R06E-22H04	D	--	--	D	35	35	36	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	5/6/1987	16				
091-083	6/1/1990	T30N/R06E-22H05	D	--	--	AR	200	200	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
091-084	3/30/1989	T30N/R06E-22H06	D	--	--	CT	55	48	6	Y	48	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	3/30/1989	16				
091-085	6/12/1995	T30N/R06E-22H07	D	--	--	AR	60	60	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/12/1995	19				
091-089	11/24/1989	T30N/R06E-22F04	D	--	--	AR	40	40	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	11/24/1989	7				
091-101	11/7/1990	T30N/R06E-22K01	D	--	--	D	18	18	36	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
091-103	2/6/1987	T30N/R06E-22Q02	D	--	--	D	30	30	--	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	2/6/1987	24				
092-005	3/1/1990	T30N/R06E-22L02	D	--	--	AR	106	101	6	Y	101	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	3/1/1990	2				
092-006	1/30/1990	T30N/R06E-22L03	D	--	--	AR	109	104	6	Y	104	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	1/30/1990	2				
092-007	8/18/1992	T30N/R06E-22M02	D	--	--	AR	78	65	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	8/18/1992	0				
092-008	8/18/1990	T30N/R06E-22M03	D	--	--	AR	43	43	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	8/18/1990	12				
092-009	4/9/1993	T30N/R06E-22M04	D	--	--	AR	60	50	4.5	Y	50	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	4/9/1993	0				
092-011	6/1/1969	T30N/R06E-22P09	D	--	--	D	20	20	36	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/1/1969	20				
092-012	9/20/1984	T30N/R06E-22P10	D	--	--	AR	118	118	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	9/20/1984	19				
092-017	7/10/1986	T30N/R06E-22N12	D	--	--	D	27	27	36	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/10/1986	17				
092-019	1/23/1988	T30N/R06E-22N13	D	--	--	D	30	30	36	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	1/23/1988	24				
092-091	6/24/1986	T30N/R06E-27A02	D	--	--	ND	100	95	6	Y	95	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/24/1986	20				
092-094	12/10/1992	T30N/R06E-27B07	D	--	--	CT	49	39	6	Y	39	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	12/10/1992	12				
092-097	8/30/1975	T30N/R06E-27C03	D	--	--	CT	41	41	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	8/30/1975	19				
092-103	6/29/1991	T30N/R06E-27D04	D	--	--	D	27	27	36	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	6/29/1991	20				
093-002	7/5/1973	T30N/R06E-27L01	D	--	--	CT	40	36	6	Y	36	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/5/1973	18				
093-019	8/6/1993	T30N/R06E-28C06	D	--	--	AR	80	80	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	8/6/1993	48				
093-027	1/22/1981	T30N/R06E-28D01	D	--	--	ND	25	25	36	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
093-028	11/9/1979	T30N/R06E-28D02	D	--	--	D	30	30	36	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
093-036	5/4/1990	T30N/R06E-28F05	D	--	--	CT	48	43	6	Y	43	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	5/4/1990	8				
093-065	7/21/1982	T30N/R06E-29?01	D	--	--	AR	58	58	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/21/1982	6				
093-080	12/20/1980	T30N/R06E-29Q01	D	--	--	CT	38	34	6	Y	34	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	12/20/1980	6				
093-090	12/14/1981	T30N/R06E-30J02	D	--	--	AR	80	76.5	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
094-004	5/5/1980	T30N/R06E-31G01	D	--	--	AR	55	53	6	Y	53	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	5/5/1980	15				
094-009	8/6/1979	T30N/R06E-31C05	D	--	--	CT	37	32	6	Y	32	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	8/6/1979	2				
094-017	3/15/1979	T30N/R06E-31J07	D	--	--	AR	216	216	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	3/15/1979	119				
094-022	6/24/1991	T30N/R06E-31M01	D (D)	--	--	AR	340	294	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
094-046	12/11/1990	T30N/R06E-32E03	D	--	--	AR	48	48	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	12/11/1990	14				
094-070	12/12/1979	T30N/R06E-32L05	D	--	--	AR	100	96.5	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	12/12/1979	20				
094-071	10/19/1973	T30N/R06E-32L06	D	--	--	CT	51	51	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	10/19/1973	12				
094-082	9/26/1992	T30N/R06E-32N07	D	--	--	CT	81	75	6	Y	76	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	9/26/1992	16				
094-084	7/10/1983	T30N/R06E-33A01	D	--	--	ND	32	32	42	Y	30	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/10/1983	19				
094-086	10/6/1992	T30N/R06E-33D01	D	--	--	D	17	17	36	Y	15	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	10/6/1992	8				
094-098	5/9/1990	T30N/R06E-33Q05	D	--	--	ND	92	87	6	Y	87	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	5/9/1990	76				
095-001	9/22/1993	T30N/R06E-33P04	D	--	--	AR	40	18.5	4	Y	20	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	9/22/1993	11				
095-008	12/7/1986	T30N/R06E-34?01	D	--	--	CT	171	171	6	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	12/7/1986	11				
095-013	7/30/1999	T30N/R06E-34J01	D	--	--	AR	232	227	6	Y	227	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	7/30/1999	190				
095-018	10/1/1970	T30N/R06E-34L01	D	--	--	ND	18	18	36	N	--	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	10/1/1970	12				
095-021	9/10/1990	T30N/R06E-34N04	D	--	--	CT	195	195	6	Y	188	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	9/10/1990	145				
112-022	8/12/1980	T31N/R05E-23D04	M	--	--	AR	200	191	6	Y	191	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	8/12/1980	100				
035-080	8/31/1998	T28N/R05E-02J01	RP (P)	--	--	HSA	40	--	1	Y	35	ND	--	ND	--	--	ND	--	ND	--	--	--	--	--	--	--	ND				
154-068	7/3/2001	T30N/R06E-09P06	TW	--	--	AR	220	190	6	Y	190	ND	--	ND	--	--	ND	--	ND	10	6	0.5	--	--	--	7/3/2001	61				
165-013	2/28/2002	T30N/R06E-05J08	D	--	--	ND	380	380	4.5	Y	161	Qvt	63	Ts	113	--	Ts	113	C	--	--	--	--	--	M	2/28/2002	112				
056-094	10/11/1979	T29N/R06E-03N02	D	--	--	AR	162	162	6	N	--	Qvt	40	Q(B)f	40	160	Ts	160	C	--	--	--	--	--	--	10/11/1979	0				
057-059	9/17/1991	T29N/R06E-06A09	D	--	--	AR	300	300	6	Y	ND	Qvt	63	Q(B)f	116	296	Ts	296	C	--	--	--	--	--	--	9/17/1991	190				
061-089	4/9/1976	T29N/R06E-21E13	D	--	--	AR	278	278	6	N	--	Qvt	40	Q(B)f	--	258	Ts	258	C	--	--	--	--	--	--	4/9/1976	111				
112-094	1/27/1986	T31N/R05E-24R07	D	--	--	AR	400	340	6	N	--	Qvt	133	Q(A)f	260	--	ND	--	C	--	--	--	--	--	--	--	ND				
112-076	11/1/1991	T31N/R05E-24C06	D	--	--	AR	270	265	6	Y	265	Qvt	118	Q(A)f	214	262	Q(A)c	262	C	--	--	--	--	--	--	11/1/1991	220				
112-050	10/24/1977	T31N/R05E-24A06	D	--	--	CT	237	232	6	Y	232	Qvt	40	Q(A)f	184	230	Q(A)c	230	C	--	--	--	--	--	--	10/24/1977	215				
056-081	5/7/1976	T29N/R06E-03?01	D	--	--	CT	200	195	6	Y	195	Qvt	55	Q(A)f	106	193	Q(A)c	193	C	--	--	--	--	--	--	5/7/1976	100				
056-085	5/16/1979	T29N/R06E-03E03	D	--	--	AR	370	370	6	N	--	Qvt	76	Q(A)f	142	276	Q(A)c	276	C	--	--	--	--	--	--	5/16/1979	81				
056-088	10/21/1991	T29N/R06E-03M04	D	--	--	CT	320	314	6	Y	314	Qvt	17	Q(A)f	132	306	Q(A)c	306	C	--	--	--	--	--	--	10/21/1991	114				
058-004	11/15/1976	T29N/R06E-09N04	D	--	--	CT	227	221	6	Y	221	Qvt	104	Q(A)f	190	220	Q(A)c	220	C	--	--	--	--	--	--	11/15/1976	44				
058-035	10/29/1999	T29N/R06E-10P01	D	--	--	AR	212	192	4	Y	192	Qvt	95	Q(A)f	95	195	Ts	195	C	--	--	--	--	--	--	10/29/1999	197				
061-065	8/17/1977	T29N/R06E-20L02	D	--	--	AR	213	213	6	N	--	ND	--	Q(A)f	94	213	Ts	213	C	--	--	--	--	--	--	8/17/1977	70				
061-086	6/17/1992	T29N/R06E-21E14	D	--	--	AR	220	220	6	N	--	Qva	--	Q(A)f	--	210	Q(A)c	210	C	--	--	--	--	--	--	6/17/1992	80				
086-026	5/24/1993	T30N/R06E-09E01	D	--	--	AR	322	290	6	N	--	Qvt	120	Q(A)f	120	240	Ts	240	C	--	--	--	--	--	--	5/24/1993	100				
121-061	10/11/1995	T31N/R06E-33N04	D	--	--	AR	25	23	6	Y	23	Qvt	127	Ts	127	--	Ts	127	C	--	--	--	--	--	L	10/11/1995	7				
121-049	7/5/1988	T31N/R06E-33R01	D	--	--	AR	300	20	6	N	--	Qvt	20	Ts	20	--	Ts	20	C	--	--	--	--	--	M	7/5/1988	180				
121-032	3/19/1990	T31N/R06E-33C01	D	--	--	AR	260	260	4.5	N	--	Qvt	16	Ts	16	--	Ts	16	C	--	--	--	--	--	M	3/19/1990	4				
121-033	2/16/1988	T31N/R06E-33C02	D	--	--	AR	200	46	6	Y	39	Qvt	35	Ts	35	45	Ts	45	C	--	--	--	--	--	L	2/16/1988	40				
121-037	1/4/1999	T31N/R06E-33D01	D	--	--	AR	505	482	6	N	--	Qvt	13	Ts	13	--	Ts	13	C	--	--	--	--	--	H	--	ND				
121-041	2/23/1991	T31N/R06E-33F02	D	--	--	AR	160	160	4.5	Y	115	Qvt	10	Ts	10	--	Ts	10	C	--	--	--	--	--	L	2/23/1991	22				
121-017	12/10/1996	T31N/R06E-32J01	D	--	--	ND	170	170	6	ND	--	Qvt	130	Ts	130	--	Ts	130	C	--	--	--	--	--	M	12/10/1996	6				
120-007	1/17/1989	T31N/R06E-29Q07	D	--	--	ND	42	42	36	N	--	Qvt	12	Ts	12	--	Ts	12	C	--	--	--	--	--	L	1/17/1989	8				
119-080	8/23/1993	T31N/R06E-29D07	D	--	--	AR	140	130	4	Y	130	Ts	--	Ts	0	--	Ts	0	C	--	--	--	--	--	L	8/23/1993	63				
119-070	6/14/1991	T31N/R06E-29A01	D	--	--	CT	90	90	6	N	--	Qvt	55	Ts	55	--	Ts	55	C	--	--	--	--	--	M	6/14/1991	50				
119-074	2/28/1995	T31N/R06E-29B02	D	--	--	AR	148	138	5	Y	138	Qvt	23	Ts	24	--	Ts	24	C	--	--	--	--	--	L	2/28/1995	68				
119-075	3/28/1994	T31N/R06E-29B03	D	--	--	AR	100	100	6	Y	60	Qvt	12	Ts	12	--	Ts	12	C	--	--	--	--	--	L	3/28/1994	19				
119-076	2/9/1988	T31N/R06E-29H01	D	--	--	AR	100	20	6	N	--	Qvt	18	Ts	18	--	Ts	18	C	--	--	--	--	--	L	--	ND				
119-077	5/19/1995	T31N/R06E-29H02	D	--	--	AR	100	80	6	Y	80	Qvt	36	Ts	36	--	Ts	36	C	--	--	--	--	--	M	5/19/1995	36				
119-079	5/19/1990	T31N/R06E-29C01	D	--	--	AR	120	110	6	Y	110	Ts	--	Ts	0	--	Ts	0	C	--	--	--	--	--	M	5/19/1990	51				
118-050	11/20/1991	T31N/R06E-19F04	D	--	--	AR	220	196	6	N	--	Qvt	72	Ts	192	--	ND	--	C	--	--	--	--	--	--	--	ND				
118-053	3/10/1987	T31N/R06E-19F05	D	--	--	AR	383	257	6	Y	243	Qvt	56	Ts	258	--	Ts	258	C	--	--	--	--	--	--	3/10/1987	235				
118-054	7/15/1995	T31N/R06E-19F06	D	--	--	AR	300	18.5	6	N	--	Qvt	65	Ts	245	--	ND	--	C	--	--	--	--	--	--	--	ND				

Appendix A.
Table A-1. Well Details and Water Levels.

SnoCo ID	Completion Date	Legal	Well Type	Land Use	Elevation	Drilling Method	Well Details: Drill Depth	Casing Depth	Casing Diameter	Screen (Y or N)	Screen Top Depth	Surface: Geologic Unit	Unit Bottom	Confining: Geologic Unit	Unit Top	Unit Bottom	Aquifer: Geologic Unit	Unit Top	Confined Unconfined	Aquifer Properties: Yield	Drawdown	Time	Conductivity (K)	Transmissivity (T)	USGS Aquifer Sensitivity	Water Level Data: Date	Depth to Water	Date	Depth to Water	Date	Depth to Water
							(ft)	(ft)	(in)		(ft)		(ft)		(ft)	(ft)		(ft)		(gpm)	(ft)	(hr)	(ft/d)	(ft^2/d)			(ft)		(ft)		(ft)
118-039	4/21/1990	T31N/R06E-19C06	D	--	--	CT	350	178	6	N	--	Qvt	--	Ts	0	53	ND	173	C	--	--	--	--	--	--	--	ND				
112-053	5/7/1998	T31N/R05E-24A07	D	--	--	AR	425	280	6	Y	200	Qvt	85	Ts	85	275	Ts	275	C	--	--	--	--	--	--	5/7/1998	200				
039-057	6/7/1993	T28N/R06E-08D02	D	--	--	AR	220	69	6	N	--	ND	--	Ts	--	--	Ts	--	C	80	59	1	--	--	--	6/7/1993	7				
054-130	2/20/1991	T29N/R05E-26B01	D	--	--	AR	375	--	8	N	--	Qvt	100	Ts	100	--	ND	--	C	--	--	--	--	--	--	--	ND				
063-091	10/2/1991	T29N/R06E-29G02	D	--	--	AR	205	205	4.5	Y	185	ND	--	Ts	13	194	Ts	194	C	--	--	--	--	--	--	10/2/1991	6				
064-005	4/16/1991	T29N/R06E-31R05	D	--	--	AR	340	340	6	Y	120	Qvt	110	Ts	110	275	Ts	275	C	--	--	--	--	--	--	4/16/1991	220				
064-022	4/12/1993	T29N/R06E-32M07	D	--	--	AR	302	282	6	Y	282	Ts	36	Ts	227	269	Ts	269	C	--	--	--	--	--	--	4/12/1993	40				
071-022	8/29/1979	T30N/R05E-02A02	D	--	--	AR	155	152	6	N	--	Qvt	133	Ts	133	150	Ts	150	C	--	--	--	--	--	--	8/29/1979	107				
083-067	2/25/1987	T30N/R06E-04B01	D	--	--	AR	120	63	6	N	--	Qvt	--	Ts	--	--	Ts	--	C	--	--	--	--	--	--	2/25/1987	28				
083-070	4/19/1993	T30N/R06E-04H04	D	--	--	AR	225	215	4.5	Y	215	Qvt	8	Ts	8	--	Ts	8	C	--	--	--	--	--	--	4/19/1993	76				
083-071	3/19/1993	T30N/R06E-04H05	D	--	--	AR	430	430	4	Y	130	Qvt	8	Ts	8	--	Ts	8	C	--	--	--	--	--	--	3/19/1993	56				
084-005	11/13/1999	T30N/R06E-05J09	D	--	--	ND	71	71	6	ND	--	Qvt	65	Ts	65	--	Ts	65	C	--	--	--	--	--	--	11/13/1999	13				
084-011	5/15/1998	T30N/R06E-05K08	D	--	--	CT	187	20	6	N	--	Qvt	17	Ts	17	--	Ts	17	C	--	--	--	--	--	--	5/15/1998	13				
084-027	2/17/1995	T30N/R06E-05Q18	D	--	--	CT	130	38	6	N	--	Qvt	34	Ts	34	--	Ts	34	C	--	--	--	--	--	--	2/17/1995	42				
084-028	3/28/1995	T30N/R06E-05Q19	D	--	--	CT	125	38	6	N	--	Qvt	38	Ts	0	38	Ts	38	C	--	--	--	--	--	--	--	ND				
084-029	3/1/1998	T30N/R06E-05Q20	D	--	--	CT	192	174	6	N	--	Qvt	38	Ts	0	38	Ts	38	C	--	--	--	--	--	--	3/1/1998	44				
084-032	12/9/1997	T30N/R06E-05Q21	D	--	--	AR	63	38	6	N	--	Qvt	34	Ts	34	--	Ts	34	C	--	--	--	--	--	--	12/9/1997	0				
084-043	3/22/1995	T30N/R06E-05L04	D	--	--	CT	116	54	6	N	--	Qvt	9	Ts	9	--	Ts	9	C	--	--	--	--	--	--	3/22/1995	23				
084-046	4/23/1997	T30N/R06E-05L05	D	--	--	CT	135	132	6	N	--	Qvt	131	Ts	131	--	Ts	131	C	--	--	--	--	--	--	4/23/1997	95				
084-052	9/10/1996	T30N/R06E-05N01	D	--	--	AR	300	300	4.5	Y	260	Qvt	45	Ts	58	--	Ts	58	C	--	--	--	--	--	--	9/10/1996	36				
085-069	11/17/1990	T30N/R06E-08C01	D	--	--	CT	140	47	6	Y	48	Qvt	80	Ts	80	--	Ts	80	C	--	--	--	--	--	--	11/17/1990	25				
085-076	3/27/1996	T30N/R06E-08D12	D	--	--	CT	282	115	6	Y	21	Qvt	113	Ts	113	--	Ts	113	C	--	--	--	--	--	--	3/27/1996	6				
085-081	7/19/1993	T30N/R06E-08J04	D	--	--	AR	162	143	6	N	--	Qvt	142	Ts	142	--	Ts	142	C	--	--	--	--	--	--	7/19/1993	90				
159-033	9/26/2003	T30N/R06E-19M04	D	--	--	AR	80	79	6	N	--	Qvt	78	Qvt	0	78	Qva	78	C	30	75	1	--	--	L	9/26/2003	25				
193-053	9/30/2003	T30N/R06E-19M05	D	--	--	AR	95	95	6	N	--	Qvt	86	Qvt	0	86	Qva	86	C	30	90	1	--	--	L	9/30/2003	28				
193-054	10/1/2003	T30N/R06E-19M06	D	--	--	AR	90	89	6	N	--	Qvt	83	Qvt	0	83	Qva	83	C	30	85	1	--	--	M	10/1/2003	28				
193-055	9/28/2003	T30N/R06E-19M07	D	--	--	AR	80	79	6	N	--	Qvt	79	Qvt	0	79	Qva	79	C	30	75	1	--	--	H	9/28/2003	27				
193-056	9/27/2003	T30N/R06E-19M08	D	--	--	AR	80	79	6	N	--	Qvt	79	Qvt	0	79	Qva	79	C	30	75	1	--	--	M	9/27/2003	26				
193-057	9/25/2003	T30N/R06E-19M09	D	--	--	AR	80	79	6	N	--	Qvt	78	Qvt	0	78	Qva	78	C	30	75	1	--	--	M	9/25/2003	24				
193-050	10/4/2003	T30N/R06E-19M10	D	--	--	AR	80	79	6	N	--	Qvt	74	Qvt	0	74	Qva	74	C	20	75	1	--	--	M	10/4/2003	26				
193-052	10/2/2003	T30N/R06E-19M11	D	--	--	AR	90	87	6	N	--	Qvt	86	Qvt	0	86	Qva	86	C	20	85	1	--	--	M	10/4/2003	24				
193-049	10/5/2003	T30N/R06E-19M12	D	--	--	AR	80	79	6	N	--	Qvt	74	Qvt	0	74	Qva	74	C	20	75	1	--	--	M	10/5/2003	26				
121-057	9/29/1993	T31N/R06E-33N05	D	--	--	AR	123	119	6	N	--	Qvt	117	Qvt	0	117	Qva	117	C	--	--	--	--	--	L	9/29/1993	60				
121-016	11/10/1980	T31N/R06E-32J02	D	--	--	CT	127	127	6	N	--	Qvt	121	Qvt	0	121	Qva	121	C	--	--	--	--	--	H	11/10/1980	75				
121-018	9/1/1994	T31N/R06E-32N01	D	--	--	CT	121	119	6	N	--	Qvt	118	Qvt	0	118	Qva	118	C	--	--	--	--	--	L	9/1/1994	110				
120-102	6/4/1997	T31N/R06E-31M02	D	--	--	AR	120	98	6	Y	98	Qvt	95	Qvt	0	95	Qva	95	C	--	--	--	--	--	L	6/4/1997	43				
121-003	3/17/1975	T31N/R06E-31N07	D	--	--	CT	83	83	6	N	--	Qvt	81	Qvt	0	81	Qva	81	C	--	--	--	--	--	H	3/17/1975	43				
121-004	9/4/1995	T31N/R06E-32A01	D	--	--	AR	76	71	6	Y	71	Qvt	75	Qvt	0	75	Qva	75	C	--	--	--	--	--	L	9/4/1995	40				
120-101	6/3/1997	T31N/R06E-31M03	D	--	--	AR	120	94	6	Y	94	Qvt	91	Qvt	0	91	Qva	91	C	--	--	--	--	--	L	6/3/1997	39				
120-078	4/7/1978	T31N/R06E-31G07	D	--	--	AR	139	139	6	N	--	Qvt	125	Qvt	0	125	Qva	125	C	--	--	--	--	--	M	4/7/1978	112				
120-080	4/12/1999	T31N/R06E-31C02	D	--	--	AR	115	95	4	Y	95	Qvt	97	Qvt	0	97	Qva	97	C	--	--	--	--	--	M	4/12/1999	70				
120-081	5/6/1987	T31N/R06E-31F05	D	--	--	AR	80	80	6	N	--	Qvt	75	Qvt	0	75	Qva	75	C	--	--	--	--	--	M	5/6/1987	54				
120-058	5/20/1991	T31N/R06E-30Q01	D	--	--	AR	120	120	6	N	--	Qvt	116	Qvt	0	116	Qva	116	C	--	--	--	--	--	M	5/20/1991	75				
120-059	5/21/1991	T31N/R06E-30Q02	D	--	--	AR	120	120	6	N	--	Qvt	110	Qvt	0	110	Qva	110	C	--	--	--	--	--	M	5/21/1991	70				
120-067	6/7/1979	T31N/R06E-30P04	D	--	--	AR	136	136	6	N	--	Qvt	115	Qvt	0	115	Qva	115	C	--	--	--	--	--	H	6/7/1979	96				
120-068	8/1/1973	T31N/R06E-30N01	D	--	--	AR	115	115	6	N	--	Qvt	115	Qvt	0	115	Qva	115	C	--	--	--	--	--	L	8/1/1973	46				
120-069	5/12/1984	T31N/R06E-31?01	D	--	--	AR	114	114	6	N	--	Qvt	103	Qvt	0	103	Qva	103	C	--	--	--	--	--	L	5/12/1984	89				
120-070	8/6/1975	T31N/R06E-31?02	D	--	--	CT	84	84	6	N	--	Qvt	78	Qvt	0	78	Qva	78	C	--	--	--	--	--	L	8/6/1975	50				
119-083	12/22/1994	T31N/R06E-29F03	D	--	--	AR	95	85	6	Y	85	Qvt	86	Qvt	0	86	Qva	86	C	--	--	--	--	--	M	12/22/1994	77				
119-084	3/28/1995	T31N/R06E-29F04	D	--	--	AR	100	80	4	Y	80	Qvt	82	Qvt	0	82	Qva	82	C	--	--	--	--	--	M	3/28/1995	55				
119-085	3/24/1995	T31N/R06E-29F05	D	--	--	AR	95	75	6	Y	75	Qvt	61	Qvt	0	61	Qva	61	C	--	--	--	--	--	M	3/24/1995	53				
119-086	3/22/1996	T31N/R06E-29F06	D	--	--	AR	120	110	6	Y	110	Qvt	106	Qvt	0	106	Qva	106	C	--	--	--	--	--	L	3/22/1996	92				
115-127	7/10/1974	T31N/R05E-35Q08	D	--	--	D	23	23	36	N	--	Qvt	18	Qvt	0	18	Qva	18	C	--	--	--	--	--	--	7/10/1974	21				
115-108	10/5/1989	T31N/R05E-35E03	D	--	--	AR	80	80	6	N	--	Qvt	72	Qvt	0	72	Qva	72	C	--	--	--	--	--	--	--	ND				
113-083	1/27/1976	T31N/R05E-26K08	D	--	--	CT	50	10	6	Y	42	Qvt	40	Qvt	0	40	Qva	40	C	--	--	--	--	--	--	1/27/1976	8				
113-041	9/10/1973	T31N/R05E-25N01	D	--	--	CT	63	60	6	Y	60	Qvt	58	Qvt	0	58	Qva	58	C	--	--	--	--	--	--	--	ND				
113-042	9/17/1973	T31N/R05E-25N02	D	--	--	CT	64	60	6	Y	59	Qvt	58	Qvt	0	58	Qva	58	C	--	--	--	--	--	--	9/17/1973	32				
113-025	7/20/1978	T31N/R05E-25J06	D	--	--	AR	141	141	6	N	--	Qvt	138	Qvt	0	138	Qva	138	C	--	--	--	--	--	--	7/20/1978	105				
113-029	9/4/1975	T31N/R05E-25K02	D	--	--	AR	121	121	6	N	--	Qvt	117	Qvt	0	117	Qva	117	C	--	--	--	--	--	--	9/4/1975	100				
112-111	8/13/1992	T31N/R05E-25A02	D	--	--	CT	130	11	4.5	Y	110	Qvt	124	Qvt	0	124	Qva	124	C	--	--	--	--	--	--	8/13/1992	74				
112-115	6/17/1979	T31N/R05E-25A03	D	--	--	CT	60	60	6	N	--	Qvt	57	Qvt	0	57	Qva	57	C	--	--	--	--	--	--	6/17/1979	37				
110-031	8/24/1993	T31N/R05E-14P04	D	--	--	AR	100	95	6	Y	95	Qvt	56	Qvt	0	56	Qva	56	C	--	--	--	--	--	--	8/24/1993	56				
110-029	8/14/1979	T31N/R05E-14P05	D	--	--	AR	115	110	6	N	--	Qvt	103	Qvt	0	103	Qva	103	C	--	--	--	--	--	--	8/14/1979	45				
110-001	8/22/1991	T31N/R05E-13Q03	D	--	--	AR	80	80	6	N	--	Qvt	71	Qvt	0	71	Qva	71	C	--	--	--	--	--	--	8/22/1991	56				
036-024	4/15/1999	T28N/R06E-13B04	D	--	--	AR	60	50	6	Y	50	Qvt	60	Qvt	0	60	Qva	60	C	1	55	1	--	--	--	4/15/1999	22				
056-018	8/10/1987	T29N/R05E-36J01	D	--	--	ND	146	146	6	N	--	Qvt	87	Qvt	0	87	Qva	87	C	--	--	--	--	--	--	8/10/1987	100				
057-015	9/9/1994	T29N/R06E-04R05	D	--	--	AR	80	80	6	N	--	Qvt	77	Qvt	0	77	Qva	77	C	--	--	--	--	--	--	9/9/1994	48				
057-048	11/17/1993	T29N/R06E-05E06	D	--	--	AR	80	70	4	Y	70	Qvt	76	Qvt	0	76	Qva	76	C	--	--	--	--	--	--	11/17/1993	15				
057-068	4/11/1996	T29N/R06E-06H03	D	--	--	AR	177	177	6	N	--	Qvt	95	Qvt	0	95	Qva	95	C	--	--	--	--	--	--	4/11/1996	62				
057-081	11/8/1995	T29N/R06E-06F04	D	--	--	AR	142	137	6	Y	137	Qvt	134	Qvt	0	134	Qva	134	C	--	--	--	--	--	--	11/8/1995	40				
057-106	10/15/1979	T29N/R06E-09L01	D	--	--	ND	73	69	6	Y	69	Qvt	47	Qvt	0	47	Qva	47	C	--	--	--	--	--	--	10/15/1979	32				
058-001	4/17/1980	T29N/R06E-09L02	D	--	--	CT	44	40	6	Y	40	Qvt	39	Qvt	0	39	Qva	39	C	--	--	--	--	--	--	4/17/1980	22				
061-011	5/15/1986	T29N/R06E-16L01	D	--	--	CT	132	132	6	N	--	Qvt	120	Qvt	0	120	Qva	120	C	--	--	--	--	--	--	5/15/1986	101				
061-056	10/10/1986	T29N/R06E-18M03	D	--	--	CT	96	96	6	N	--	Qvt	86	Qvt	0	86	Qva	86	C	--	--	--	--	--	--	10/10/1986	0				
061-059	12/1/1976	T29N/R06E-20B03	D	--	--	CT	91	91	6	N	--	Qvt	80	Qvt	0	80	Qva	80	C	--	--	--	--	--	--	12/1/1976	62				
061-062	11/7/1976	T29N/R06E-20C01	D	--	--	AR	101	101	6	N	--	Qvt	100	Qvt	0	100	Qva	100	C	--	--	--	--	--	--	11/7/1976	58				
061-077	7/19/1991	T29N/R06E-21F04	D	--	--	AR	91	81	4.5	Y	81	Qvt	87	Qvt	0	87	Qva	87	C	--	--	--	--	--	--	7/19/1991	28				
061-079	4/26/1979	T29N/R06E-21F05	D	--	--	AR	100	100	6	N	--	Qvt	80	Qvt	0	80	Qva	80	C	--	--	--	--	--	--	4/26/1979	50				
061-084	3/30/1978	T29N/R06E-21E15	D	--	--	AR	97	97	6	N	--	Qvt	88	Qvt	0	88	Qva	88	C	--	--	--	--	--	--	3/30/1978	75				
063-100	9/24/1973	T29N/R06E-29L02	D	--	--	CT	163	163	6	N	--	Qvt	79	Qvt	0	79	Qva	79	C	--	--	--	--	--	--	9/24/1973	40				
064-001	5/18/1992	T29N/R06E-31C01	D	--	--	AR	70	70	6	N	--	Qvt	61	Qvt	0	61	Qva	61	C	--	--	--	--	--	--	5/18/1992	46				
064-011	5/6/1979	T29N/R06E-31Q01	D	--	--	AR	80	75	6	Y	75	Qvt	76	Qvt	0	76	Qva	76	C	--	--	--	--	--	--	5/6/1979	14				
070-088	7/11/1989	T30N/R05E-01A10	D	--	--	AR	82	82	6	N	--	Qvt	63	Qvt	0	63	Qva	63	C	--	--	--	--	--	--	7/11/1989	35				
070-103	2/3/1993	T30N/R05E-01D01	D	--	--	AR	60	60	6	N	--	Qvt	41	Qvt	0	41	Qva	41	C	--	--	--	--	--	--	2/3/1993	29				
071-009	4/8/1986	T30N/R05E-01R02	D	--	--	AR	60	60	6	N	--	Qvt	50	Qvt	0	50	Qva	50	C	--	--	--	--	--	--	4/8/1986	35				
071-015	7/12/1994	T30N/R05E-01M02	D	--	--	AR	60	60	6	N	--	Qvt	50	Qvt	0	50	Qva	50	C	--	--	--	--	--	--	7/12/1994	32				
071-021	4/12/1985	T30N/R05E-02?01	D	--	--	CT	75	75	6	Y	--	Qvt	45	Qvt	0	45	Qva	45	C	--	--	--	--	--	--	4/12/1985	21				
071-027	8/31/1988	T30N/R05E-02B05	D	--	--	AR	78	78	6	N	--	Qvt	74	Qvt	0	74	Qva	74	C	--	--	--	--	--	--	8/31/1988	52				
071-042	9/13/1993	T30N/R05E-02K06	D	--	--	AR	115	110	6	N	--	Qvt	105	Qvt	0	105	Qva	105	C	--	--	--	--	--	--	9/13/1993	57				
071-044	10/26/1998	T30N/R05E-02K07	D	--	--	AR	95	85	4	Y	85	Qvt	85	Qvt	0	85	Qva	85	C	--	--	--	--	--	--	10/26/1998	65				
074-011	4/15/1987	T30N/R05E-11J04	D	--	--	AR	134	114	6	Y	114	Qvt	76	Qvt	0	76	Qva	76	C	--	--	--	--	--	--	4/15/1987	45				
074-019	6/3/1987	T30N/R05E-11R03	D	--	--	CT	141	136	6	Y	136	Qvt	52	Qvt	0	52	Qva	52	C	--	--	--	--	--	--	6/3/1987	70				
074-021	5/6/1980	T30N/R05E-11R04	D	--	--	AR	138	133	6	Y	131	Qvt	123	Qvt	0	123	Qva	123	C	--	--	--	--	--	--	5/6/1980	70				
074-024	8/6/1987	T30N/R05E-11R05	D	--	--	AR	150	140	6	N	--	Qvt	130	Qvt	0	130	Qva	130	C	--	--	--	--	--	--	8/6/1987	80				
074-035	2/27/1980	T30N/R05E-12A04	D	--	--	CT	79	79	6	N	--	Qvt	68	Qvt	0	68	Qva	68	C	--	--	--	--	--	--	2/27/1980	50				
074-040	5/16/1995	T30N/R05E-12H02	D	--	--	AR	60	60	6	N	--	Qvt	48	Qvt	0	48	Qva	48	C	--	--	--	--	--	--	5/16/1995	42				
074-050	9/7/1982	T30N/R05E-12J07	D	--	--	AR	60	60	6	N	--	Qvt	50	Qvt	0	50	Qva	50	C	--	--	--	--	--	--	9/7/1982	32				
074-063	2/6/1989	T30N/R05E-12L05	D	--	--	CT	93	88	6	Y	88	Qvt	86	Qvt	0	86	Qva	86	C	--	--	--	--	--	--	2/6/1989	53				
074-071	7/24/1980	T30N/R05E-12P07	D	--	--	AR	70	70	6	N	--	Qvt	60	Qvt	0	60	Qva	60	C	--	--	--	--	--	--	7/24/1980	54				
074-075	8/20/1980	T30N/R05E-12P08	D	--	--	AR	53	48	6	Y	48	Qvt	32	Qvt	0	32	Qva	32	C	--	--	--	--	--	--	8/20/1980	18				
074-078	7/19/1989	T30N/R05E-12N04	D	--	--	AR	75	75	6	N	--	Qp	2	Qvt	2	60	Qva	60	C	--	--	--	--	--	--	7/19/1989	38				
074-080	4/20/1988	T30N/R05E-12N05	D	--	--	CT	124	102	6	Y	102	Qvt	89	Qvt	0	89	Qva	89	C	--	--	--	--	--	--	4/20/1988	50				
074-084	7/21/1980	T30N/R05E-13B04	D	--	--	CT	121	117	6	Y	117	Qvt	112	Qvt	0	112	Qva	112	C	--	--	--	--	--	--	7/21/1980	30				
074-085	8/12/1980	T30N/R05E-13B05	D	--	--	CT	136	132	6	Y	132	Qvt	131	Qvt	0	131	Qva	131	C	--	--	--	--	--	--	8/12/1980	24				
074-086	8/4/1980	T30N/R05E-13B06	D	--	--	CT	150	146	6	Y	146	Qvt	144	Qvt	0	144	Qva	144	C	--	--	--	--	--	--	8/4/1980	100				
075-029	11/12/1984	T30N/R05E-14G03	D	--	--	CT	259	259	6	N	--	Qvt	114	Qvt	0	114	Qva	115	C	--	--	--	--	--	--	11/12/1984	90				
075-030	8/2/1994	T30N/R05E-14G04	D	--	--	AR	70	60	4	Y	60	Qvt	62	Qvt	0	62	Qva	62	C	--	--	--	--	--	--	8/2/1994	58				
077-031	3/3/1995	T30N/R05E-24?01	D	--	--	CT	111	106	6	Y	106	Qvt	104	Qvt	0	104	Qva	111	C	--	--	--	--	--	--	3/3/1995	55				
077-034	2/17/1984	T30N/R05E-24A02	D	--	--	CT	153	153	6	N	--	Qvt	100	Qvt	0	100	Qva	100	C	--	--	--	--	--	--	2/17/1984	70				
077-070	9/24/1973	T30N/R05E-25M04	D	--	--	CT	191	191	6	N	--	Qvt	135	Qvt	0	135	Qva	135	C	--	--	--	--	--	--	9/24/1973	92				
077-078	1/17/1979	T30N/R05E-26A02	D	--	--	CT	128	124	6	Y	124	Qvt	124	Qvt	0	124	Qva	124	C	--	--	--	--	--	--	1/17/1979	105				
077-081	11/2/1981	T30N/R05E-26E01	D	--	--	CT	77	77	6	N	--	Qvt	73	Qvt	0	73	Qva	73	C	--	--	--	--	--	--	11/2/1981	3				
077-082	3/10/1984	T30N/R05E-26Q02	D	--	--	CT	167	167	6	N	--	Qvt	124	Qvt	0	124	Qva	124	C	--	--	--	--	--	--	3/10/1984	120				
081-078	6/6/1986	T30N/R05E-35G01	D	--	--	AR	120	120	6	N	--	Qvt	105	Qvt	0	105	Qva	105	C	--	--	--	--	--	--	6/6/1986	90				
081-079	11/30/1973	T30N/R05E-35D01	D	--	--	CT	124	124	6	N	--	Qvt	122	Qvt	0	122	Qva	122	C	--	--	--	--	--	--	11/30/1973	25				
081-080	5/14/1982	T30N/R05E-35F01	D	--	--	CT	108	105	6	Y	104	Qvt	102	Qvt	0	102	Qva	102	C	--	--	--	--	--	--	5/14/1982	75				
081-084	4/16/1993	T30N/R05E-35J04	D	--	--	AR	127	117	4.5	Y	117	Qvt	122	Qvt	0	122	Qva	122	C	--	--	--	--	--	--	4/16/1993	80				
081-091	6/20/1975	T30N/R05E-35Q02	D	--	--	CT	148	143	6	Y	143	Qvt	140	Qvt	0	140	Qva	140	C	--	--	--	--	--	--	6/20/1975	47				
081-105	7/12/1995	T30N/R05E-36B07	D	--	--	AR	123	103	4	Y	103	Qvt	104	Qvt	0	104	Qva	104	C	--	--	--	--	--	--	7/12/1995	97				
082-006	1/3/1994	T30N/R05E-36G05	D	--	--	AR	160	158	6	N	--	Qvt	143	Qvt	0	143	Qva	143	C	--	--	--	--	--	--	1/3/1994	119				
082-019	6/2/1976	T30N/R05E-36E07	D	--	--	CT	143	138	6	Y	138	Qvt	130	Qvt	0	130	Qva	130	C	--	--	--	--	--	--	6/2/1976	120				
082-020	6/26/1973	T30N/R05E-36E08	D	--	--	ND	98	98	6	N	--	Qvt	92	Qvt	0	92	Qva	92	C	--	--	--	--	--	--	6/26/1973	80				
082-030	8/10/1989	T30N/R05E-36K10	D	--	--	AR	160	157	6	N	--	Qvt	140	Qvt	0	140	Qva	140	C	--	--	--	--	--	--	8/10/1989	11				
082-034	8/4/1978	T30N/R05E-36K11	D	--	--	AR	168	168	6	N	--	Qvt	123	Qvt	0	123	Qva	123	C	--	--	--	--	--	--	8/4/1978	107				
082-040	8/2/1974	T30N/R05E-36R06	D	--	--	AR	95	90	6	N	--	Qvt	85	Qvt	0	85	Qva	85	C	--	--	--	--	--	--	8/2/1974	50				
082-051	11/26/1991	T30N/R05E-36N03	D	--	--	CT	158	153	6	Y	153	Qvt	115	Qvt	0	115	Qva	115	C	--	--	--	--	--	--	11/26/1991	98				
083-087	12/3/1999	T30N/R06E-05H06	D	--	--	CT	123	117	6	Y	117	Qvt	96	Qvt	0	96	Qva	96	C	4	39	1	--	--	--	12/3/1999	69				
083-088	12/17/1999	T30N/R06E-05H07	D	--	--	ND	119	119	6	ND	--	Qvt	72	Qvt	0	72	Qva	72	C	--	--	--	--	--	--	12/17/1999	67				
083-089	12/3/1999	T30N/R06E-05H08	D	--	--	ND	123	123	6	ND	--	Qvt	96	Qvt	0	96	Ts	96	C	12	22	1	--	--	--	12/3/1999	69				
083-099	4/20/1993	T30N/R06E-05D01	D	--	--	AR	143	133	6	Y	133	Qvt	117	Qvt	0	117	Qva	117	C	--	--	--	--	--	--	4/20/1993	63				
083-100	4/26/1993	T30N/R06E-05D02	D	--	--	AR	160	134	6	Y	134	Qvt	133	Qvt	0	133	Qva	133	C	--	--	--	--	--	--	4/26/1993	86				
084-042	2/25/1997	T30N/R06E-05L06	D	--	--	CT	89	84	6	Y	--	Qvt	80	Qvt	0	80	Qva	80	C	--	--	--	--	--	--	2/25/1997	21				
084-047	9/4/1997	T30N/R06E-05L07	D	--	--	AR	89	79	6	Y	79	Qvt	81	Qvt	0	81	Qva	81	C	--	--	--	--	--	--	9/4/1997	42				
084-049	5/20/1998	T30N/R06E-05L08	D	--	--	AR	75	60	6	Y	60	Qvt	63	Qvt	0	63	Qva	63	C	--	--	--	--	--	--	5/20/1998	30				
084-053	12/2/1976	T30N/R06E-06?01	D	--	--	CT	85	85	6	N	--	Qvt	80	Qvt	0	80	Qva	80	C	--	--	--	--	--	--	12/2/1976	65				
084-064	6/28/1995	T30N/R06E-06A04	D	--	--	AR	120	110	6	Y	110	Qvt	105	Qvt	0	105	Qva	105	C	--	--	--	--	--	--	6/28/1995	100				
084-084	10/7/1997	T30N/R06E-06F04	D	--	--	AR	83	80	6	Y	80	Qvt	65	Qvt	0	65	Qva	65	C	--	--	--	--	--	--	10/7/1997	57				
084-085	10/8/1974	T30N/R06E-06E06	D	--	--	CT	86	81	6	Y	81	Qvt	80	Qvt	0	80	Qva	80	C	--	--	--	--	--	--	10/8/1974	59				
084-095	10/12/1989	T30N/R06E-06Q01	D	--	--	AR	60	60	6	N	--	Qvt	60	Qvt	0	60	Qva	60	C	--	--	--	--	--	--	10/12/1989	30				
085-001	3/15/1988	T30N/R06E-06M02	D	--	--	AR	83	83	6	N	--	Qvt	75	Qvt	0	75	Qva	75	C	--	--	--	--	--	--	3/15/1988	30				
085-026	5/10/1992	T30N/R06E-07D02	D	--	--	ND	80	80	6	N	--	Qvt	57	Qvt	0	57	Qva	57	C	--	--	--	--	--	--	5/10/1992	47				
085-035	6/27/1997	T30N/R06E-07R03	D	--	--	CT	71	66	6	Y	66	Qvt	56	Qvt	0	56	Qva	56	C	--	--	--	--	--	--	6/27/1997	28				
085-037	7/11/1996	T30N/R06E-07Q01	D	--	--	CT	59	53	6	Y	53	Qvt	46	Qvt	0	46	Qva	46	C	--	--	--	--	--	--	7/11/1996	29				
085-043	7/30/1997	T30N/R06E-07P07	D	--	--	ND	70	64	6	Y	64	Qvt	51	Qvt	0	51	Qva	51	C	--	--	--	--	--	--	7/30/1997	27				
086-014	9/8/1987	T30N/R06E-08Q09	D	--	--	CT	105	95	6	Y	95	Qvt	91	Qvt	0	91	Qva	91	C	--	--	--	--	--	--	9/8/1987	78				
086-028	6/18/1999	T30N/R06E-09R01	D	--	--	CT	106	101	6	Y	101	Qvt	86	Qvt	0	86	Qva	86	C	--	--	--	--	--	--	6/18/1999	60				
086-029	6/29/1999	T30N/R06E-09R02	D	--	--	CT	136	131	6	Y	131	Qvt	112	Qvt	0	112	Qva	112	C	--	--	--	--	--	--	6/29/1999	87				
088-003	7/5/1991	T30N/R06E-15G01	D	--	--	CT	118	113	6	Y	113	Qvt	112	Qvt	0	112	Qva	112	C	--	--	--	--	--	--	7/5/1991	79				
088-019	12/16/1986	T30N/R06E-15M02	D	--	--	AR	126	126	6	N	--	Qvt	95	Qvt	0	95	Qva	95	C	--	--	--	--	--	--	12/16/1986	60				
088-020	7/28/1995	T30N/R06E-15M03	D	--	--	AR	120	11	4	Y	110	Qvt	114	Qvt	0	114	Qva	114	C	--	--	--	--	--	--	7/28/1995	60				
088-050	9/22/1995	T30N/R06E-17B08	D	--	--	CT	128	122	6	Y	122	Qvt	90	Qvt	0	90	Qva	90	C	--	--	--	--	--	--	9/22/1995	92				
088-051	5/17/1996	T30N/R06E-17B09	D	--	--	CT	105	99	6	Y	100	Qvt	101	Qvt	0	101	Qva	101	C	--	--	--	--	--	--	5/17/1996	79				
088-052	5/9/1996	T30N/R06E-17B10	D	--	--	CT	109	102	6	Y	102	Qvt	98	Qvt	0	98	Qva	98	C	--	--	--	--	--	--	5/9/1996	78				
088-056	4/7/1999	T30N/R06E-17B11	D	--	--	CT	169	164	6	Y	164	Qvt	141	Qvt	0	141	Qva	141	C	--	--	--	--	--	--	4/7/1999	131				
088-072	6/30/1976	T30N/R06E-17F02	D	--	--	CT	179	179	6	N	--	Qvt	114	Qvt	0	114	Qva	114	C	--	--	--	--	--	--	6/30/1976	95				
088-086	9/3/1997	T30N/R06E-17R10	D	--	--	CT	114	108	6	Y	108	Qvt	113	Qvt	0	113	Qva	113	C	--	--	--	--	--	--	9/3/1997	71				
089-037	3/11/1994	T30N/R06E-18Q06	D	--	--	AR	116	106	4	Y	106	Qvt	109	Qvt	0	109	Qva	109	C	--	--	--	--	--	--	3/11/1994	68				
089-056	4/30/1980	T30N/R06E-19A02	D	--	--	AR	97	97	6	N	--	Qvt	80	Qvt	0	80	Qva	80	C	--	--	--	--	--	--	4/30/1980	75				
089-071	7/12/1984	T30N/R06E-19?04	D	--	--	AR	60	60	6	N	--	Qvt	40	Qvt	0	40	Qva	40	C	--	--	--	--	--	--	7/12/1984	20				
089-072	4/20/1977	T30N/R06E-19C08	D	--	--	CT	57	52	6	Y	52	Qvt	50	Qvt	0	50	Qva	50	C	--	--	--	--	--	--	4/20/1977	23				
089-075	10/18/1973	T30N/R06E-19C09	D	--	--	AR	45	45	6	N	--	Qvt	39	Qvt	0	39	Qva	39	C	--	--	--	--	--	--	10/18/1973	32				
089-076	4/10/1992	T30N/R06E-19C10	D	--	--	AR	61	61	6	N	--	Qvt	34	Qvt	0	34	Qva	34	C	--	--	--	--	--	--	4/10/1992	19				
089-078	11/2/1999	T30N/R06E-19C11	D	--	--	AR	150	130	4	Y	130	Qvt	135	Qvt	0	135	Qva	135	C	10	0	2	--	--	--	11/2/1999	70				
089-079	10/29/1999	T30N/R06E-19C12	D	--	--	AR	145	125	4	Y	125	Qvt	130	Qvt	0	130	Qva	130	C	10	0	2	--	--	--	10/29/1999	70				
089-081	10/29/1999	T30N/R06E-19C13	D	--	--	ND	145	145	6	ND	--	Qvt	130	Qvt	0	130	Qva	130	C	--	--	--	--	--	--	10/29/1999	70				
089-084	7/22/1991	T30N/R06E-19D02	D	--	--	AR	64	60	6	Y	60	Qvt	53	Qvt	0	53	Qva	53	C	--	--	--	--	--	--	7/22/1991	39				
089-085	6/1/1978	T30N/R06E-19D03	D	--	--	ND	84	80	6	Y	80	Qvt	80	Qvt	0	80	Qva	80	C	--	--	--	--	--	--	6/1/1978	30				
089-095	7/23/1979	T30N/R06E-19F12	D	--	--	AR	57	57	6	N	--	Qvt	51	Qvt	0	51	Qva	51	C	--	--	--	--	--	--	7/23/1979	12				
089-104	7/16/1980	T30N/R06E-19J08	D	--	--	AR	78	78	6	N	--	Qvt	42	Qvt	0	42	Qva	42	C	--	--	--	--	--	--	7/16/1980	58				
090-024	7/12/1976	T30N/R06E-19N04	D	--	--	AR	78	78	6	N	--	Qvt	74	Qvt	0	74	Qva	74	C	--	--	--	--	--	--	7/12/1976	18				
090-061	10/16/1996	T30N/R06E-20R04	D	--	--	CT	64	59	6	Y	59	Qvt	52	Qvt	0	52	Qva	52	C	--	--	--	--	--	--	10/16/1996	38				
090-063	6/11/1993	T30N/R06E-20R05	D	--	--	AR	100	100	6	N	--	Qvt	58	Qvt	0	58	Qva	58	C	--	--	--	--	--	--	6/11/1993	30				
090-084	11/5/1982	T30N/R06E-20P03	D	--	--	CT	78	78	6	N	--	Qvt	65	Qvt	0	65	Qva	65	C	--	--	--	--	--	--	11/5/1982	62				
090-087	10/25/1979	T30N/R06E-20N03	D	--	--	CT	86	81	6	Y	81	Qvt	75	Qvt	0	75	Qva	75	C	--	--	--	--	--	--	10/25/1979	43				
090-089	8/12/1991	T30N/R06E-21B01	D	--	--	AR	122	120	6	N	--	Qvt	106	Qvt	0	106	Qva	106	C	--	--	--	--	--	--	8/12/1991	11				
090-090	4/7/1994	T30N/R06E-21B02	D	--	--	AR	121	121	6	N	--	Qvt	75	Qvt	0	75	Qva	75	C	--	--	--	--	--	--	4/7/1994	0				
090-096	11/15/1991	T30N/R06E-21G08	D	--	--	AR	133	123	6	Y	123	Qvt	128	Qvt	0	128	Qva	128	C	--	--	--	--	--	--	11/15/1991	36				

Appendix A.
Table A-1. Well Details and Water Levels.

							Well Details					Surface		Confining			Aquifer			Aquifer Properties						Water Level Data					
SnoCo ID	Completion Date	Legal	Well Type	Land Use	Elevation	Drilling Method	Drill Depth (ft)	Casing Depth (ft)	Casing Diameter (in)	Screen (Y or N)	Screen Top Depth (ft)	Geologic Unit	Unit Bottom (ft)	Geologic Unit	Unit Top (ft)	Unit Bottom (ft)	Geologic Unit	Unit Top (ft)	Confined Unconfined	Yield (gpm)	Drawdown (ft)	Time (hr)	Conductivity (K) (ft/d)	Transmissivity (T) (ft^2/d)	USGS Aquifer Sensitivity	Date	Depth to Water (ft)	Date	Depth to Water (ft)	Date	Depth to Water (ft)
090-098	10/19/1992	T30N/R06E-21G09	D	--	--	AR	155	148	6	Y	--	Qvt	80	Qvt	0	80	Qva	80	C	--	--	--	--	--	--	10/19/1992	48				
091-010	4/22/1994	T30N/R06E-21D07	D	--	--	CT	97	93	6	Y	93	Qvt	88	Qvt	0	88	Qva	88	C	--	--	--	--	--	--	4/22/1994	63				
091-016	7/17/1994	T30N/R06E-21F03	D	--	--	AR	62	52	6	Y	52	Qvt	57	Qvt	0	57	Qva	57	C	--	--	--	--	--	--	7/17/1994	40				
091-019	1/4/1996	T30N/R06E-21E06	D	--	--	CT	89	83	6	Y	83	Qvt	65	Qvt	0	65	Qva	65	C	--	--	--	--	--	--	1/4/1996	57				
091-021	5/30/1992	T30N/R06E-21?01	D	--	--	CT	126	121	6	Y	121	Qvt	120	Qvt	0	120	Qva	120	C	--	--	--	--	--	--	5/30/1992	70				
091-036	3/15/1998	T30N/R06E-21Q04	D	--	--	AR	136	132	6	Y	132	Qvt	130	Qvt	0	130	Qva	130	C	--	--	--	--	--	--	3/15/1998	21				
091-051	5/26/1988	T30N/R06E-21N03	D	--	--	AR	100	95	6	Y	95	Qvt	93	Qvt	0	93	Qva	93	C	--	--	--	--	--	--	5/26/1988	72				
091-052	2/12/1991	T30N/R06E-21N04	D	--	--	AR	80	80	6	N	--	Qvt	70	Qvt	0	70	Qva	70	C	--	--	--	--	--	--	2/12/1991	0				
091-081	11/7/1973	T30N/R06E-22H08	D	--	--	CT	84	84	6	N	--	Qvt	81	Qvt	0	81	Qva	81	C	--	--	--	--	--	--	11/7/1973	17				
091-087	9/29/1988	T30N/R06E-22D02	D	--	--	AR	60	60	6	N	--	Qvt	55	Qvt	0	55	Qva	55	C	--	--	--	--	--	--	9/29/1988	0				
091-093	4/25/1985	T30N/R06E-22E04	D	--	--	AR	51	51	6	N	--	Qvt	35	Qvt	0	35	Qva	35	C	--	--	--	--	--	--	4/25/1985	8				
091-094	4/26/1985	T30N/R06E-22E05	D	--	--	AR	58	58	6	N	--	Qvt	54	Qvt	0	54	Qva	54	C	--	--	--	--	--	--	4/26/1985	7				
091-096	2/12/1988	T30N/R06E-22E06	D	--	--	AR	80	77	6	Y	77	Qvt	75	Qvt	0	75	Qva	75	C	--	--	--	--	--	--	2/12/1988	6				
092-022	9/21/1996	T30N/R06E-22N14	D	--	--	AR	60	55	6	Y	55	Qvt	55	Qvt	0	55	Qva	55	C	--	--	--	--	--	--	9/21/1996	0				
093-026	8/6/1993	T30N/R06E-28C07	D	--	--	AR	80	80	6	N	--	Qvt	75	Qvt	0	75	Qva	75	C	--	--	--	--	--	--	8/6/1993	48				
093-032	11/9/1993	T30N/R06E-28F06	D	--	--	AR	112	112	6	N	--	Qvt	87	Qvt	0	87	Qva	87	C	--	--	--	--	--	--	11/9/1993	30				
093-033	11/8/1993	T30N/R06E-28F07	D	--	--	AR	71	66	6	Y	66	Qvt	62	Qvt	0	62	Qva	62	C	--	--	--	--	--	--	11/8/1993	28				
093-035	8/13/1980	T30N/R06E-28F08	D	--	--	CT	82	82	6	N	--	Qvt	68	Qvt	0	68	Qva	68	C	--	--	--	--	--	--	8/13/1980	21				
093-071	3/28/1985	T30N/R06E-29H03	D	--	--	AR	40	40	6	N	--	Qvt	35	Qvt	0	35	Qva	35	C	--	--	--	--	--	--	3/28/1985	5				
093-074	6/6/1994	T30N/R06E-29G04	D	--	--	AR	42	32	4	Y	32	Qvt	21	Qvt	0	21	Qva	21	C	--	--	--	--	--	--	6/6/1994	2				
093-075	1/6/1979	T30N/R06E-29F01	D	--	--	ND	38	38	6	N	--	Qvt	35	Qvt	0	35	Qva	35	C	--	--	--	--	--	--	1/6/1979	2				
093-083	7/16/1981	T30N/R06E-29M03	D	--	--	AR	70	69	6	N	--	Qvt	60	Qvt	0	60	Qva	60	C	--	--	--	--	--	--	7/16/1981	34				
094-033	11/12/1983	T30N/R06E-32?01	D	--	--	ND	69	65	6	Y	65	Qvt	56	Qvt	0	56	Qva	56	C	--	--	--	--	--	--	11/12/1983	10				
094-074	3/28/1994	T30N/R06E-32M02	D	--	--	AR	108	108	6	N	--	Qvt	105	Qvt	0	105	Qva	105	C	--	--	--	--	--	--	3/28/1994	41				
094-081	11/20/1984	T30N/R06E-32N08	D	--	--	CT	148	148	6	N	--	Qvt	100	Qvt	0	100	Qva	100	C	--	--	--	--	--	--	11/20/1984	35				
094-087	9/14/1978	T30N/R06E-33J03	D	--	--	AR	80	80	6	N	--	Qvt	70	Qvt	0	70	Qva	70	C	--	--	--	--	--	--	9/14/1978	55				
095-020	10/22/1986	T30N/R06E-34M04	D	--	--	AR	97	97	6	N	--	Qvt	75	Qvt	0	75	Qva	75	C	--	--	--	--	--	--	10/22/1986	80				
120-104	8/5/1991	T31N/R06E-31P04	D	--	--	AR	200	195	6	Y	195	ND	95	--	--	--	ND	--	C	20	195	1	--	--	L	8/5/1991	98				
085-072	8/16/1988	T30N/R06E-08D13	M	--	--	AR	100	70	6	Y	37	Qvt	68	Ts	68	--	ND	--	C	--	--	--	--	--	--	--	ND				
035-070	12/24/1985	T28N/R05E-02B01	M	--	--	CT	162	148	6	Y	148	--	--	--	--	--	ND	--	C	--	--	--	--	--	--	12/24/1985	88				
121-015	1/30/1982	T31N/R06E-32F01	D	--	--	D	30	30	36	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	1/30/1982	14				
121-007	11/15/1995	T31N/R06E-32B02	D	--	--	D	42	42	36	Y	40	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	11/15/1995	8				
120-098	9/7/1979	T31N/R06E-31Q04	D	--	--	AR	141	138	6	N	--	Qvt	100	Qvt	0	100	Qva	100	UC	--	--	--	--	--	H	9/7/1979	100				
120-041	12/20/1999	T31N/R06E-30F07	D	--	--	AR	55	45	6	Y	45	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	12/20/1999	25				
120-045	8/30/1992	T31N/R06E-30E04	D	--	--	AR	120	80	6	Y	80	Qvt	60	ND	--	--	Qva	60	UC	--	--	--	--	--	L	8/30/1992	72				
120-047	10/2/1986	T31N/R06E-30J01	D	--	--	AR	163	160	6	Y	160	Qvt	115	ND	--	--	Qva	115	UC	--	--	--	--	--	L	10/2/1986	140				
120-051	1/16/1995	T31N/R06E-30R05	D	--	--	CT	109	102	6	Y	102	Qvt	74	ND	--	--	Qva	74	UC	--	--	--	--	--	M	1/16/1995	87				
120-052	12/30/1994	T31N/R06E-30R06	D	--	--	CT	110	104	6	Y	104	Qvt	80	ND	--	--	Qva	80	UC	--	--	--	--	--	M	12/30/1994	88				
120-030	5/11/1987	T31N/R06E-30D10	D	--	--	AR	159	154	6	N	--	Qvt	75	ND	--	--	Qva	75	UC	--	--	--	--	--	L	5/11/1987	115				
119-098	10/26/1991	T31N/R06E-29R04	D	--	--	D	27	27	36	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	10/26/1991	18				
120-004	5/6/1992	T31N/R06E-29R05	D	--	--	D	53	50	36	Y	47	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	H	--	ND				
119-088	4/1/1996	T31N/R06E-29F07	D	--	--	AR	80	60	4	Y	60	Qvt	55	ND	--	--	Qva	55	UC	--	--	--	--	--	L	4/1/1996	54				
118-101	6/28/1993	T31N/R06E-20N01	D	--	--	D	12	12	36	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	L	6/28/1993	9				
118-059	1/5/1981	T31N/R06E-19M04	D	--	--	D	27	27	36	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	M	--	ND				
118-066	10/18/1992	T31N/R06E-19N06	D	--	--	AR	90	60	4.5	Y	60	Qvt	68	ND	--	--	Qva	68	UC	--	--	--	--	--	--	10/18/1992	59				
118-032	9/17/1998	T31N/R06E-19A01	D	--	--	D	43	42	36	Y	43	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	9/17/1998	37				
118-036	7/2/1991	T31N/R06E-19C07	D	--	--	D	34	34	48	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	7/2/1991	12				
118-040	5/7/1991	T31N/R06E-19C08	D	--	--	AR	215	210	6	Y	198	Qvt	68	ND	--	--	Qva	68	UC	--	--	--	--	--	--	5/7/1991	195				
118-041	4/12/1994	T31N/R06E-19C09	D	--	--	HSA	33	33	36	Y	13	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	4/12/1994	5				
117-007	8/28/1975	T31N/R06E-07?01	D	--	--	D	20	20	36	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	8/28/1975	12				
113-070	11/25/1996	T31N/R05E-26D09	D	--	--	AR	25	5	10	Y	5	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	11/25/1996	9				
113-056	4/5/1983	T31N/R05E-26G06	D	--	--	CT	162	157	6	Y	157	Qvt	94	ND	--	--	Qvt	94	UC	--	--	--	--	--	--	4/5/1983	125				
113-043	7/16/1990	T31N/R05E-26A04	D	--	--	AR	151	146	6	Y	146	Qvt	117	ND	--	--	Qva	117	UC	--	--	--	--	--	--	7/16/1990	117				
113-001	7/6/1982	T31N/R05E-25A04	D	--	--	D	25	22.5	42	Y	22.5	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	7/6/1982	15				
112-090	10/29/1984	T31N/R05E-24R08	D	--	--	D	57	57	36	Y	55	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	10/29/1984	18				
112-091	8/13/1992	T31N/R05E-24R09	D	--	--	AR	260	255	6	Y	255	Qvt	65	ND	--	--	Qva	65	UC	--	--	--	--	--	--	8/13/1992	230				
112-092	7/18/1994	T31N/R05E-24R10	D	--	--	AR	40	40	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	7/18/1994	29				
112-095	4/16/1990	T31N/R05E-24R11	D	--	--	D	30	30	36	Y	28	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	4/16/1990	22				
112-036	3/27/1976	T31N/R05E-23Q01	D	--	--	CT	120	115	6	Y	115	Qvt	35	ND	--	--	Qva	35	UC	--	--	--	--	--	--	3/27/1976	85				
112-018	8/10/1982	T31N/R05E-23?01	D	--	--	D	50	50	42	Y	47.5	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	8/10/1982	30				
112-019	1/19/1996	T31N/R05E-23H01	D (D)	--	--	D	28	28	36	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	1/19/1996	5				
110-014	6/10/1989	T31N/R05E-14A02	D	--	--	D	22.5	22.5	36	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	6/10/1989	16				
109-101	4/1/1994	T31N/R05E-13R03	D	--	--	CT	207	207	6	Y	198	Qvt	90	ND	--	--	Qva	90	UC	--	--	--	--	--	--	4/1/1994	179				
109-105	7/10/1993	T31N/R05E-13R04	D	--	--	CT	218	218	6	Y	211	Qvt	88	ND	--	--	Qva	88	UC	--	--	--	--	--	--	7/10/1993	180				
109-106	10/22/1993	T31N/R05E-13R05	D	--	--	CT	217	217	6	Y	210	Qvt	60	ND	--	--	Qva	60	UC	--	--	--	--	--	--	10/22/1993	180				
109-108	8/6/1997	T31N/R05E-13R06	D	--	--	AR	218	188	6	Y	188	Qvt	82	ND	--	--	Qva	82	UC	--	--	--	--	--	--	8/6/1997	197				
035-066	11/3/1976	T28N/R05E-01?01	D	--	--	CT	192	192	6	N	--	Qp	12	ND	--	--	Qva	158	UC	10	7	2	--	--	--	11/3/1976	170				
035-158	6/3/1992	T28N/R05E-12B01	D	--	200	CT	91	91	6	N	--	Qvt	39	ND	--	--	none	--	UC	15	2	1	--	--	--	6/30/1992	58				
049-057	4/1/1972	T29N/R05E-01?01	D	--	--	CT	34	34	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	7	28	1	--	--	--	4/1/1972	2				
051-055	12/5/1974	T29N/R05E-1M04	D	--	--	AR	188	179	6	Y	181	Qvt	85	ND	--	--	Qva	85	UC	6	--	4	--	--	--	12/5/1974	168				
052-145	8/11/1976	T29N/R05E-11E01	D	--	--	CT	29	29	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	8/11/1976	16				
057-054	9/6/1980	T29N/R06E-05L04	D	--	--	AR	38	37	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	9/6/1980	4				
057-085	9/20/1991	T29N/R06E-06J05	D	--	--	AR	57	57	6	N	--	Qvt	58	ND	--	--	Qva	58	UC	--	--	--	--	--	--	9/20/1991	35				
057-086	2/28/1991	T29N/R06E-06J06	D	--	--	AR	60	57	6	N	--	Qvt	50	ND	--	--	Qva	50	UC	--	--	--	--	--	--	2/28/1991	29				
057-087	2/28/1991	T29N/R06E-06J07	D	--	--	AR	60	60	6	N	--	Qvt	38	ND	--	--	Qva	38	UC	--	--	--	--	--	--	2/28/1991	29				
057-090	12/24/1976	T29N/R06E-06J08	D	--	--	D	28	28	36	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	12/24/1976	10				
057-092	1/9/1984	T29N/R06E-06Q01	D	--	--	CT	38	38	6	Y	33	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	1/9/1984	12				
057-096	6/11/1989	T29N/R06E-09E01	D	--	--	AR	30	30	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	6/11/1989	9				
060-091	9/13/1986	T29N/R06E-16G04	D	--	--	AR	112	107	6	Y	107	Qvt	80	ND	--	--	Qva	80	UC	--	--	--	--	--	--	9/13/1986	54				
061-053	11/8/1987	T29N/R06E-18L03	D	--	--	CT	34	34	6	N	--	Qvt	--	Qvt	0	--	Qvt	0	UC	--	--	--	--	--	--	11/8/1987	0				
061-078	7/5/1978	T29N/R06E-21F06	D	--	--	AR	105	105	6	N	--	Qvt	95	ND	--	--	Qva	95	UC	--	--	--	--	--	--	7/5/1978	81				
063-085	9/23/1996	T29N/R06E-28D02	D	--	--	AR	60	60	6	N	--	Qvt	20	ND	--	--	Qva	20	UC	--	--	--	--	--	--	9/23/1996	11				
071-053	2/26/1994	T30N/R05E-02N07	D	--	--	AR	23	19	6	Y	19	Qal	--	ND	--	--	Qal	0	UC	--	--	--	--	--	--	2/26/1994	4				
074-004	11/25/1991	T30N/R05E-11A02	D (D)	--	--	ND	55	40	42	Y	40	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	11/25/1991	28				
074-044	7/7/1988	T30N/R05E-12F02	D	--	--	CT	83	78	6	Y	78	Qvt	73	Qvt	0	73	Qvt	73	UC	--	--	--	--	--	--	7/7/1988	61				
074-046	10/30/1986	T30N/R05E-12E02	D	--	--	AR	78	78	6	N	--	Qvt	42	ND	--	--	Qva	42	UC	--	--	--	--	--	--	10/30/1986	52				
074-068	8/14/1987	T30N/R05E-12M02	D	--	--	AR	78	78	6	N	--	Qvt	50	Qvt	0	50	Qva	50	UC	--	--	--	--	--	--	8/14/1987	55				
074-095	1/20/1992	T30N/R05E-13C04	D	--	--	AR	39	39	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	1/20/1992	19				
074-099	6/8/1990	T30N/R05E-13F01	D	--	--	AR	63	58	6	Y	58	Qvt	56	ND	--	--	Qva	56	UC	--	--	--	--	--	--	6/8/1990	22				
075-012	3/28/1990	T30N/R05E-14A03	D	--	--	AR	60	55	6	Y	55	Qvt	25	ND	--	--	Qva	25	UC	--	--	--	--	--	--	3/28/1990	40				
077-030	1/31/1979	T30N/R05E-23Q01	D	--	--	CT	189	184	6	Y	184	Qvt	115	ND	--	--	Qva	115	UC	--	--	--	--	--	--	1/31/1979	135				
081-097	6/5/1990	T30N/R05E-36A06	D	--	--	AR	200	200	6	N	--	Qvt	90	ND	--	--	Qva	90	UC	--	--	--	--	--	--	6/5/1990	90				
082-018	7/24/1974	T30N/R05E-36E09	D	--	--	CT	168	163	6	Y	163	Qvt	88	ND	--	--	Qva	88	UC	--	--	--	--	--	--	7/24/1974	126				
082-025	9/27/1989	T30N/R05E-36J05	D	--	--	AR	166	164	6	N	--	Qvt	62	ND	--	--	Qva	62	UC	--	--	--	--	--	--	9/27/1989	96				
082-053	11/22/1990	T30N/R05E-36N04	D	--	--	AR	120	166	6	Y	116	Qvt	78	ND	--	--	Qva	78	UC	--	--	--	--	--	--	11/22/1990	90				
085-008	7/28/1981	T30N/R06E-06N06	D	--	--	D	20	20	36	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	7/28/1981	10				
085-021	3/6/1992	T30N/R06E-07C03	D	--	--	CT	65	60	6	Y	60	Qvt	50	ND	--	--	Qva	50	UC	--	--	--	--	--	--	3/6/1992	25				
085-027	7/7/1997	T30N/R06E-07E07	D	--	--	AR	59	51.5	6	Y	51.5	Qvt	46	ND	--	--	Qva	46	UC	--	--	--	--	--	--	7/7/1997	46				
085-061	12/13/1996	T30N/R06E-08H08	D	--	--	AR	146	126	4	Y	126	Qvt	100	ND	--	--	Qva	100	UC	--	--	--	--	--	--	12/13/1996	98				
085-086	9/26/1996	T30N/R06E-08J05	D	--	--	AR	185	180	6	Y	180	Qvt	62	ND	--	--	Qva	62	UC	--	--	--	--	--	--	9/26/1996	135				
085-087	9/27/1996	T30N/R06E-08J06	D	--	--	AR	180	175	6	Y	175	Qvt	62	ND	--	--	Qva	62	UC	--	--	--	--	--	--	9/27/1996	125				
085-088	9/30/1996	T30N/R06E-08J07	D	--	--	AR	184	179	6	Y	179	Qvt	95	ND	--	--	Qva	95	UC	--	--	--	--	--	--	9/30/1996	134				
085-089	10/1/1996	T30N/R06E-08J08	D	--	--	AR	180	175	6	Y	175	Qvt	90	ND	--	--	Qva	90	UC	--	--	--	--	--	--	10/1/1996	130				
085-090	10/2/1996	T30N/R06E-08J09	D	--	--	AR	177	172	6	Y	172	Qvt	91	ND	--	--	Qva	91	UC	--	--	--	--	--	--	10/2/1996	138				
085-091	10/3/1996	T30N/R06E-08J10	D	--	--	AR	184	179	6	Y	179	Qvt	91	ND	--	--	Qva	91	UC	--	--	--	--	--	--	10/3/1996	128				
085-092	10/10/1996	T30N/R06E-08J11	D	--	--	AR	185	ND	6	Y	--	Qvt	114	ND	--	--	Qva	114	UC	--	--	--	--	--	--	10/10/1996	134				
085-093	10/7/1996	T30N/R06E-08J12	D	--	--	AR	186	181	6	Y	181	Qvt	106	ND	--	--	Qva	106	UC	--	--	--	--	--	--	10/7/1996	132				
085-094	10/8/1996	T30N/R06E-08J13	D	--	--	AR	185	180	6	Y	180	Qvt	96	ND	--	--	Qva	96	UC	--	--	--	--	--	--	10/8/1996	135				
085-095	10/17/1996	T30N/R06E-08J14	D	--	--	AR	185	180	6	Y	180	Qvt	90	ND	--	--	Qva	90	UC	--	--	--	--	--	--	10/17/1996	135				
085-096	10/22/1996	T30N/R06E-08J15	D	--	--	AR	186	181	6	Y	181	Qvt	91	ND	--	--	Qva	91	UC	--	--	--	--	--	--	10/22/1996	130				
085-097	10/23/1996	T30N/R06E-08J16	D	--	--	AR	186	181	6	Y	181	Qvt	92	ND	--	--	Qva	92	UC	--	--	--	--	--	--	10/23/1996	131				
085-098	10/24/1996	T30N/R06E-08J17	D	--	--	AR	186	181	6	Y	181	Qvt	89	ND	--	--	Qva	89	UC	--	--	--	--	--	--	10/24/1996	131				
085-099	10/25/1996	T30N/R06E-08J18	D	--	--	AR	184	179	6	Y	179	Qvt	89	ND	--	--	Qva	89	UC	--	--	--	--	--	--	10/25/1996	131				
085-100	9/25/1996	T30N/R06E-08J19	D	--	--	AR	185	180	6	Y	180	Qvt	110	ND	--	--	Qva	110	UC	--	--	--	--	--	--	9/25/1996	135				
085-102	4/7/1988	T30N/R06E-08K08	D	--	--	CT	65	65	6	Y	33	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	4/7/1988	15				
086-008	4/26/1993	T30N/R06E-08K09	D	--	--	AR	188	188	6	N	--	Qvt	93	ND	--	--	Qva	93	UC	--	--	--	--	--	--	4/26/1993	130				
086-030	7/12/1999	T30N/R06E-09R03	D	--	--	CT	87	82	6	Y	82	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	7/12/1999	57				
088-053	5/28/1996	T30N/R06E-17B12	D	--	--	CT	103	98	6	Y	98	Qvt	80	ND	--	--	Qva	80	UC	--	--	--	--	--	--	5/28/1996	77				
088-098	6/20/1987	T30N/R06E-17L08	D	--	--	AR	94	94	6	N	--	Qvt	75	ND	--	--	Qva	75	UC	--	--	--	--	--	--	6/20/1987	76				
089-049	12/18/1989	T30N/R06E-18N08	D	--	--	AR	35	35	6	N	--	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	--	12/18/1989	18				
089-063	1/29/1987	T30N/R06E-19H05	D	--	--	AR	82	82	6	N	--	Qvt	--	ND	--	--	Qvt	0	UC	--	--	--	--	--	--	1/29/1987	33				
090-030	10/12/1988	T30N/R06E-20A02	D	--	--	AR	82	78	6	Y	78	Qvt	70	Qvt	0	70	Qva	70	UC	--	--	--	--	--	--	10/12/1988	30				
090-031	4/11/1989	T30N/R06E-20A03	D	--	--	AR	80	80	6	N	--	Qvt	58	Qvt	0	58	Qva	58	UC	--	--	--	--	--	--	4/11/1989	52				
092-106	8/30/1988	T30N/R06E-27D05	D	--	--	D	32	32.9	36	N	--	Qvr	--	ND	--	--	Qvr	0	UC	--	--	--	--	--	--	8/30/1988	12				
093-023	7/14/1987	T30N/R06E-28C08	D	--	--	CT	150	145	6	Y	70	Qvt	55	ND	--	--	Qva	55	UC	--	--	--	--	--	--	7/14/1987	60				
093-070	5/16/1990	T30N/R06E-29B04	D	--	--	AR	60	60	6	N	--	Qvt	41	ND	--	--	Qva	41	UC	--	--	--	--	--	--	5/16/1990	37				
093-082	11/27/1989	T30N/R06E-29L03	D	--	--	AR	59	59	6	N	--	Qvt	42	ND	--	--	Qva	42	UC	--	--	--	--	--	--	11/27/1989	47				
093-096	11/6/1995	T30N/R06E-30R04	D	--	--	AR	215	212	6	N	--	Qvt	50	ND	--	--	Qva	50	UC	--	--	--	--	--	--	11/6/1995	138				
152-095	9/21/2001	T31N/R05E-01P01	M	--	--	ND	42	31	10	Y	31	Qvt	--	ND	--	--	Qvt	0	UC	60	2	3	--	--	--	9/21/2001	21.5				

Table A-1 notes

Legal Description

See Legal_figure.doc

All Columns

--	No data or information available
ND	No Data

Well Type

D	Domestic
D (D)	Domestic (Decommissioned)
D (R)	Domestic (Reconditioned)
D (U)	Domestic (Unused)
I	Irrigation
M	Municipal
O	Other
RP (D)	Resource Protection (Decommissioned)
RP (DW)	Resource Protection (Dewatering)
RP (NA)	Resource Protection (Not Available)
RP (SB)	Resource Protection (Soil Boring)
RP (U)	Resource Protection (Unknown)
RP (WQ)	Resource Protection (Water Quality Monitoring)
TW	Test Well (Yype Unspecified)
U (D)	Unknown (Decommissioned)

Land Use

CF	Commercial Farmland
LCF	Local Commercial Farmland
RCF	Riverway Commercial Farmland
RI	Rural Industrial
ROW	Right of Way
RR/5 ac	Rural Residential 1 Dwelling Unit per 5 acres
RR/10 ac	Rural Residential 1 Dwelling Unit per 10 acres
UC/BP-Sno	Urban Commercial Business Park Snohomish Urban Growth Area
UCOM	Urban Commercial
UHDR 12-24	Urban High Density Residential 12 to 24 Dwelling Units per acre
UI	Urban Industrial
ULDR 4-5MV	Urban Low Density 4 to 5 Dwelling Units per acre
ULDR 4-6	Urban Low Density 4 to 6 Dwelling Units per acre
ULDR 4-LKST	Urban Low Density 4 Dwelling Units per acre Lake Stevens Urban Growth Area
ULDR 5-6MV	Urban Low Density 5 to 6 Dwelling Units per acre Marysville Urban Growth Area
ULDR 6-LKST	Urban Low Density 6 Dwelling Units per acre Lake Stevens Urban Growth Area
UMDR 6-12	Urban Medium Density Residential 6 to 12 Dwelling Units per acre

U	Urban unspecified

Land Use Symbols:

RR/5ac	Rural Residential/5ac

Drilling Method:

AR	Air Rotary
CT	Cable Tool
D	Dug
DR	Driven
HSA	Hollow Stem Auger
P	Probe
U	Unknown

Completion Date:
The decommissioning date (D) is listed for all decommissioned wells.

Screen Type:

Y	Screen
N	No Screen
ND	No Data

Geologic Unit:

Qal	Alluvium (Quaternary Age)
Qp	Peat (Quaternary Age)
Qvr	Recessional Outwash (Vashon Glaciation)
Qvt	Till (Vashon Glaciation)
Qva	Advance Outwash (Vashon Glaciation)
Q(A)f	Upper Fine Grained Unit
Q(A)c	Upper Course Grained Unit
Q(B)f	Lower Fine Grained Unit
Q(B)c	Lower Course Grained Unit
Ts	Sedimentary Rock (Tertiary Age)

Aquifer Confinement

C	Confined
UC	Unconfined

USGS Aquifer Sensitivity:

L	Low
M	Moderate
H	High

Appendix B.
Table B-1a. Water Quality Results Summary for Samples Submitted to the Snohomish Health District.

SnoCo ID	Legal	Hydrogeologic Unit		Date	Arsenic	Barium	Cadmium	Chromium	Fluoride	Iron	Lead	Manganese	Mercury	Nitrate	Selenium	Silver	Sodium	Total coliforms
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100 ml
039-031	T28N/R06E-06C03	Vashon advance outwash	Qva	07/22/98	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	9.5	--
039-034	T29N/R06E-31E01	Vashon advance outwash	Qva	03/27/98	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	7.4	--
039-035	T28N/R06E-06C02	Upper course grained unit	Q(A)c	03/09/98	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	15.8	--
054-078	T30N/R06E-21K01	Vashon advance outwash	Qva	01/06/98	0.015	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	12.7	--
056-005	T29N/R05E-35B03	Upper course grained unit	Q(A)c	05/04/99	0.016	0.1	ND	ND	ND	--	0.007	--	ND	ND	ND	ND	65	--
056-013	T29N/R05E-36B02	Vashon advance outwash	Qva	04/08/98	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	11.3	--
056-030	T29N/R05E-36P03	Vashon advance outwash	Qva	10/23/84	--	--	--	--	--	0.09	--	--	--	--	--	--	--	--
056-089	T29N/R06E-03M03	Vashon advance outwash	Qva	05/20/98	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	8.4	--
056-092	T29N/R06E-03P05	Alluvium	Qal	04/01/98	ND	ND	ND	ND	ND	--	ND	--	ND	0.7	ND	ND	2.2	--
056-100	T29N/R06E-04A04	Sedimentary	Ts	02/06/97	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	18	ND
056-101	T29N/R06E-04G02	Vashon advance outwash	Qva	07/12/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	6.5	--
056-106	T29N/R06E-04G01	Vashon advance outwash	Qva	04/20/98	0.011	ND	ND	ND	ND	--	0.002	--	ND	ND	ND	ND	64	--
057-022	T29N/R06E-04B05	Vashon advance outwash	Qva	11/07/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	11	ND
057-032	T29N/R06E-05C01	Vashon till	Qvt	06/02/98	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	7.5	--
057-041	T29N/R06E-05F03	Vashon advance outwash	Qva	01/30/98	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	6.7	--
057-043	T29N/R06E-05C02	Vashon advance outwash	Qva	03/09/98	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	7.7	--
057-097	T29N/R06E-09Q07	Vashon advance outwash	Qva	04/15/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	5	--
058-020	T29N/R06E-10D01	Vashon advance outwash	Qva	11/16/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	3.7	--
058-024	T29N/R06E-10E03	Vashon advance outwash	Qva	08/13/97	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	57.5	--
061-008	T29N/R06E-16Q04	Alluvium	Qal	07/19/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	4.5	--
061-074	T29N/R06E-21D02	Upper course grained unit	Q(A)c	06/23/97	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	35.1	--
061-110	T29N/R06E-21N01	No Data	ND	04/13/97	ND	ND	ND	ND	ND	--	ND	--	ND	1.2	ND	ND	4.7	ND
061-111	T29N/R06E-21N04	Alluvium	Qal	03/21/85	--	--	--	--	--	0.5	--	--	--	--	--	--	--	--
064-003	T29N/R06E-31K01	Vashon till	Qvt	09/09/99	0.031	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	90	--
070-089	T30N/R05E-01C01	Vashon advance outwash	Qva	08/28/00	ND	ND	ND	ND	ND	0.093	ND	0.009	ND	2.1	ND	ND	4.3	ND
071-023	T30N/R05E-02B01	Upper course grained unit	Q(A)c	02/03/97	0.025	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	5.2	ND
071-036	T30N/R05E-02K02	Upper course grained unit	Q(A)c	10/10/00	0.022	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	3.12	ND
071-043	T30N/R05E-02N03	Vashon advance outwash	Qva	06/20/01	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	3.5	ND
074-032	T30N/R05E-11Q04	Upper course grained unit	Q(A)c	02/19/98	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	47	--
074-034	T30N/R05E-11Q03	Upper course grained unit	Q(A)c	02/19/98	ND	ND	ND	ND	ND	--	0.006	--	ND	ND	ND	ND	46	--
074-038	T30N/R05E-12B02	Vashon advance outwash	Qva	02/26/98	ND	ND	ND	ND	ND	--	ND	--	ND	0.8	ND	ND	5.4	--
074-039	T30N/R05E-12A02	Vashon advance outwash	Qva	10/27/98	--	--	--	--	--	--	--	--	--	--	--	--	--	ND
074-059	T30N/R05E-12Q03	Vashon advance outwash	Qva	08/22/97	ND	ND	ND	0.021	ND	--	ND	--	ND	0.8	ND	ND	40.4	--
074-060	T30N/R05E-12Q02	Vashon advance outwash	Qva	05/12/99	ND	ND	ND	ND	ND	--	ND	--	ND	1.5	ND	ND	7.7	--
074-061	T30N/R05E-12Q05	Vashon till	Qvt	05/12/99	0.014	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	3.7	--
074-062	T30N/R05E-12Q04	Vashon till	Qvt	05/12/99	ND	ND	ND	ND	ND	--	0.002	--	ND	ND	ND	ND	36	--
074-066	T30N/R05E-12K03	Vashon advance outwash	Qva	08/17/98	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	9.9	--
074-090	T30N/R05E-13B01	Vashon advance outwash	Qva	05/13/98	ND	ND	ND	ND	ND	--	ND	--	ND	0.6	ND	ND	8.2	--
075-009	T30N/R05E-13Q01	Upper course grained unit	Q(A)c	06/11/98	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	11	--
075-018	T30N/R05E-14B06	Upper course grained unit	Q(A)c	07/30/96	ND	ND	ND	ND	ND	--	ND	--	ND	0.8	ND	ND	62	--
077-044	T28N/R05E-01N01	Vashon advance outwash	Qva	11/11/96	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	10.6	ND
077-057	T30N/R05E-25K05	Vashon advance outwash	Qva	07/29/98	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	5.9	--
079-031	T30N/R05E-36J03	Vashon advance outwash	Qva	07/13/98	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	83	--
081-102	T30N/R05E-36A01	Vashon advance outwash	Qva	04/19/99	0.015	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	22	--
082-004	T30N/R05E-36G03	Vashon advance outwash	Qva	03/09/97	ND	ND	ND	0.018	ND	--	ND	--	ND	2	ND	ND	6	--
082-010	T30N/R05E-25Q06	Vashon advance outwash	Qva	08/09/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	6	--
082-011	T30N/R05E-36F08	Vashon advance outwash	Qva	07/14/97	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	12.6	--
082-012	T30N/R05E-36F09	Vashon advance outwash	Qva	05/17/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	31	--
082-027	T30N/R05E-36F05	Vashon advance outwash	Qva	03/06/97	ND	ND	ND	ND	ND	0.06	ND	--	ND	ND	ND	ND	7.2	ND
082-043	T30N/R05E-36Q06	Vashon advance outwash	Qva	08/17/97	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	13.1	--
082-047	T30N/R05E-36E03	Vashon advance outwash	Qva	02/13/98	ND	ND	ND	ND	ND	--	0.002	--	ND	ND	ND	ND	22.8	--
082-050	T30N/R05E-36P02	Vashon advance outwash	Qva	08/28/97	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	6.3	--
083-080	T30N/R06E-04J03	Sedimentary	Ts	06/09/98	0.011	ND	ND	ND	ND	--	0.009	--	ND	0.6	ND	ND	165	--

SnoCo ID	Legal	Hydrogeologic Unit		Date	Arsenic	Barium	Cadmium	Chromium	Fluoride	Iron	Lead	Manganese	Mercury	Nitrate	Selenium	Silver	Sodium	Total coliforms
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100 ml
083-085	T30N/R06E-05Q16	Vashon advance outwash	Qva	08/03/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	21	ND
083-086	T30N/R06E-05H02	Vashon advance outwash	Qva	03/20/00	0.013	ND	ND	ND	ND	--	0.002	--	ND	ND	ND	ND	10	ND
083-087	T30N/R06E-05H06	Vashon advance outwash	Qva	12/22/99	ND	ND	ND	ND	ND	--	0.003	--	ND	ND	ND	ND	8.6	ND
083-090	T30N/R06E-05H03	Vashon advance outwash	Qva	08/01/00	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	7.4	ND
083-091	T30N/R06E-05H04	Vashon advance outwash	Qva	08/01/00	ND	0.116	ND	ND	ND	--	ND	--	ND	ND	ND	ND	12	ND
083-095	T30N/R06E-05H01	Sedimentary	Ts	07/29/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	71	--
083-096	T30N/R06E-05G03	Sedimentary	Ts	12/23/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	110	ND
083-098	T30N/R06E-05P02	Sedimentary	Ts	08/13/97	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	33.7	--
084-003	T30N/R06E-05E01	Vashon advance outwash	Qva	08/03/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	3.7	--
084-004	T30N/R06E-05J02	Sedimentary	Ts	11/29/99	0.012	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	13	ND
084-006	T30N/R06E-05J07	No Data	ND	06/13/00	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	15	ND
084-007	T30N/R06E-05J01	Sedimentary	Ts	06/16/00	ND	ND	ND	ND	ND	--	0.002	--	ND	ND	ND	ND	66	ND
084-008	T30N/R06E-05J04	Sedimentary	Ts	06/16/00	ND	ND	ND	ND	ND	--	0.009	--	ND	ND	ND	ND	58	ND
084-014	T30N/R06E-05Q17	Vashon advance outwash	Qva	08/25/99	ND	ND	ND	ND	ND	--	0.002	--	ND	ND	ND	ND	25	ND
084-015	T30N/R06E-05H05	Vashon advance outwash	Qva	08/02/00	ND	0.126	ND	ND	ND	--	ND	--	ND	ND	ND	ND	12	ND
084-017	T30N/R06E-05P05	Vashon advance outwash	Qva	03/23/98	ND	ND	ND	0.01	ND	--	ND	--	0.0008	1.2	ND	ND	13.2	--
084-018	T30N/R06E-08F03	Vashon advance outwash	Qva	06/25/98	ND	ND	ND	ND	ND	--	ND	--	ND	0.6	ND	ND	3.8	--
084-019	T30N/R06E-05Q14	Sedimentary	Ts	03/05/96	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	190.4	--
084-025	T30N/R06E-05R01	Vashon advance outwash	Qva	06/15/00	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	25	ND
084-026	T30N/R06E-05R02	Vashon advance outwash	Qva	05/25/00	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	7.3	ND
084-030	T30N/R06E-08H05	Vashon advance outwash	Qva	03/17/99	ND	ND	ND	ND	ND	--	0.003	--	ND	ND	ND	ND	3.4	ND
084-033	T30N/R06E-05Q08	Sedimentary	Ts	04/30/03	0.002	ND	ND	ND	0.15	--	0.004	--	ND	ND	ND	ND	12	ND
084-037	T30N/R06E-05Q12	Sedimentary	Ts	07/29/01	ND	ND	ND	ND	ND	--	0.003	--	ND	ND	ND	ND	92	ND
084-038	T30N/R06E-05L01	No Data	ND	07/25/97	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	4.6	ND
084-039	T30N/R06E-05L02	No Data	ND	08/08/97	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	5.9	ND
084-050	T30N/R06E-05K06	Vashon advance outwash	Qva	03/28/02	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	8.8	ND
084-051	T30N/R06E-05P04	Vashon till	Qvt	03/18/98	ND	ND	ND	0.01	ND	--	ND	--	0.0006	0.8	0.014	ND	34.7	--
084-070	T30N/R06E-06A02	Vashon advance outwash	Qva	05/11/98	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	17.6	--
084-071	T30N/R06E-06B08	Vashon advance outwash	Qva	11/24/99	ND	ND	ND	ND	ND	--	ND	--	ND	0.6	0.005	ND	51	--
084-080	T30N/R06E-06F03	No Data	ND	04/19/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	3.1	ND
084-089	T30N/R06E-06K01	Vashon advance outwash	Qva	11/05/97	ND	ND	ND	0.046	ND	--	ND	--	ND	ND	ND	ND	6.4	--
084-100	T30N/R06E-08E02	Vashon till	Qvt	08/14/97	ND	ND	ND	ND	ND	--	0.002	--	ND	0.6	ND	ND	27.6	--
084-102	T30N/R06E-06L02	Vashon advance outwash	Qva	03/07/01	ND	ND	ND	ND	--	ND	0.003	--	ND	ND	ND	ND	110	ND
085-014	T30N/R06E-07B01	Vashon advance outwash	Qva	02/13/97	ND	ND	ND	ND	ND	--	ND	--	ND	2.3	ND	ND	5.7	ND
085-018	T30N/R06E-07G01	Vashon advance outwash	Qva	06/08/98	ND	ND	ND	ND	ND	--	0.013	--	ND	ND	ND	ND	11.7	--
085-019	T30N/R06E-07F02	Vashon advance outwash	Qva	05/15/97	ND	ND	ND	0.09	ND	--	ND	--	ND	0.5	ND	ND	6.4	ND
085-020	T30N/R06E-07F03	Vashon advance outwash	Qva	11/11/97	ND	ND	ND	ND	ND	--	ND	--	ND	2	ND	ND	4.9	--
085-022	T30N/R06E-07C01	Vashon advance outwash	Qva	12/18/00	ND	ND	ND	ND	--	0.013	0.024	--	ND	ND	ND	ND	5.7	ND
085-036	T30N/R06E-07P02	Vashon advance outwash	Qva	02/26/98	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	3.8	--
085-042	T30N/R06E-07P03	Vashon advance outwash	Qva	09/18/97	ND	ND	ND	ND	ND	--	0.003	--	ND	ND	ND	ND	3.5	--
085-048	T30N/R06E-07P01	Vashon advance outwash	Qva	05/08/97	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	8.6	ND
085-049	T30N/R06E-07P05	Vashon advance outwash	Qva	10/30/98	ND	ND	ND	ND	ND	--	ND	--	ND	2.1	ND	ND	5	--
085-051	T30N/R06E-08A03	Vashon advance outwash	Qva	11/10/97	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	8.2	--
085-054	T30N/R06E-08A02	Vashon advance outwash	Qva	06/13/00	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	5.9	ND
085-055	T30N/R06E-05Q13	Sedimentary	Ts	06/16/95	ND	ND	ND	ND	ND	--	ND	--	ND	ND	0.007	ND	51.2	ND
085-057	T30N/R06E-08B02	Sedimentary	Ts	08/26/02	ND	ND	ND	ND	0.17	--	0.003	--	ND	ND	ND	ND	50	ND
085-062	T30N/R06E-08H03	Vashon advance outwash	Qva	03/28/00	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	4	ND
085-064	T30N/R06E-08D02	Vashon advance outwash	Qva	12/22/97	ND	ND	ND	ND	ND	--	0.005	--	ND	ND	ND	ND	4.5	--
085-065	T30N/R06E-08F01	Vashon advance outwash	Qva	02/11/97	ND	ND	ND	ND	ND	--	ND	--	ND	0.7	ND	ND	4.6	ND
085-071	T30N/R06E-05P01	No Data	ND	05/05/97	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	10.4	--
085-078	T30N/R06E-08D01	Sedimentary	Ts	02/17/97	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	4.6	ND
085-080	T30N/R06E-08E01	Vashon advance outwash	Qva	09/14/98	ND	ND	ND	0.013	ND	--	ND	--	ND	ND	ND	ND	5.6	--
086-010	T30N/R06E-08R01	No Data	ND	08/30/00	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	3.9	ND
086-011	T30N/R06E-08R02	No Data	ND	08/04/00	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	5.5	ND
086-012	T30N/R06E-08R05	Vashon advance outwash	Qva	08/14/00	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	4.2	ND
086-013	T30N/R06E-08R04	Vashon advance outwash	Qva	08/25/00	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	5.1	ND
086-016	T30N/R06E-08Q05	Vashon advance outwash	Qva	03/21/00	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	4.8	ND
086-017	T30N/R06E-08Q01	No Data	ND	03/21/00	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	4.2	ND

SnoCo ID	Legal	Hydrogeologic Unit		Date	Arsenic	Barium	Cadmium	Chromium	Fluoride	Iron	Lead	Manganese	Mercury	Nitrate	Selenium	Silver	Sodium	Total coliforms
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100 ml
086-018	T30N/R06E-08Q02	No Data	ND	03/21/00	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	4.5	ND
086-019	T30N/R06E-08Q03	Vashon advance outwash	Qva	03/20/00	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	3.9	ND
086-022	T30N/R06E-08P07	No Data	ND	04/20/00	ND	ND	ND	0.066	ND	--	ND	--	ND	0.69	ND	ND	4.9	ND
086-035	T30N/R06E-09N01	Vashon advance outwash	Qva	06/15/00	ND	ND	ND	ND	ND	--	0.005	--	ND	ND	ND	ND	7.6	ND
087-087	T30N/R06E-19E06	Vashon advance outwash	Qva	11/10/98	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	4.3	--
087-108	T30N/R06E-14M01	Vashon advance outwash	Qva	03/10/99	ND	ND	ND	ND	ND	--	0.003	--	ND	ND	ND	ND	ND	--
088-034	T30N/R06E-15N02	Vashon advance outwash	Qva	06/24/99	0.01	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	8	--
088-035	T30N/R06E-15N03	Vashon advance outwash	Qva	07/28/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	5.5	--
088-039	T30N/R06E-16Q01	Vashon advance outwash	Qva	01/08/92	ND	0.2	ND	ND	ND	--	0.009	--	ND	ND	ND	ND	7.8	--
088-040	T30N/R06E-16P01	Vashon advance outwash	Qva	11/23/99	ND	ND	ND	ND	ND	--	0.002	--	ND	2.34	ND	ND	4.2	ND
088-043	T30N/R06E-17H05	Vashon advance outwash	Qva	02/17/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	4.2	--
088-044	T30N/R06E-17D03	Vashon advance outwash	Qva	03/09/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	3.7	--
088-046	T30N/R06E-17G01	Vashon advance outwash	Qva	06/11/96	ND	ND	ND	ND	ND	--	ND	--	ND	0.72	ND	ND	4.9	ND
088-055	T30N/R06E-17A01	Vashon advance outwash	Qva	03/18/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	4.1	--
088-057	T30N/R06E-17B01	Vashon advance outwash	Qva	06/04/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	3.9	--
088-058	T30N/R06E-17B02	Vashon advance outwash	Qva	06/09/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	4.6	--
088-060	T30N/R06E-17H02	Vashon advance outwash	Qva	04/26/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	4	--
088-061	T30N/R06E-17H01	Vashon advance outwash	Qva	05/14/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	3.5	--
088-062	T30N/R06E-17H03	Vashon advance outwash	Qva	05/27/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	5.4	--
088-071	T30N/R06E-17D02	Vashon till	Qvt	02/18/99	ND	ND	ND	ND	ND	--	ND	--	ND	1.5	ND	ND	11.5	--
088-076	T30N/R06E-17J03	Vashon advance outwash	Qva	02/23/98	ND	ND	ND	ND	ND	--	ND	--	ND	0.6	ND	ND	4.3	--
088-077	T30N/R06E-17K02	Vashon advance outwash	Qva	08/09/95	ND	ND	ND	ND	ND	--	ND	--	ND	0.6	ND	ND	4.4	--
088-088	T30N/R06E-17J01	No Data	ND	01/19/98	ND	ND	ND	ND	ND	--	ND	--	ND	0.9	ND	ND	4.1	--
088-089	T30N/R06E-17J02	No Data	ND	02/10/98	ND	ND	ND	ND	ND	--	ND	--	ND	0.5	ND	ND	4.5	--
089-022	T30N/R06E-18H03	Vashon till	Qvt	06/02/98	ND	ND	ND	ND	--	ND	0.002	--	ND	--	ND	ND	7.7	ND
089-028	T30N/R06E-18J01	Vashon advance outwash	Qva	10/27/99	ND	ND	ND	ND	ND	--	ND	--	ND	2.5	ND	ND	5.5	--
089-032	T30N/R06E-18R02	No Data	ND	09/25/00	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	5.3	ND
089-066	T30N/R06E-19Q01	Vashon advance outwash	Qva	07/21/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	3.3	ND
089-078	T30N/R06E-19C11	Vashon advance outwash	Qva	11/18/99	ND	ND	ND	ND	ND	--	ND	--	ND	0.63	ND	ND	4.4	ND
089-082	T30N/R06E-19C05	Vashon advance outwash	Qva	08/18/97	ND	ND	0.002	ND	ND	--	0.005	--	ND	1.3	0.005	ND	3	--
090-014	T30N/R06E-19P09	Vashon advance outwash	Qva	08/31/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	13	--
090-018	T30N/R06E-19P10	Vashon advance outwash	Qva	06/27/00	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	10	ND
090-029	T31N/R06E-30D09	Vashon advance outwash	Qva	10/11/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	9.2	--
090-038	T30N/R06E-20B04	Vashon advance outwash	Qva	07/22/02	ND	ND	ND	ND	ND	--	ND	--	ND	8.76	ND	ND	6	ND
090-048	T30N/R06E-20C04	Vashon advance outwash	Qva	01/31/00	ND	ND	ND	ND	ND	--	ND	--	ND	9.34	ND	ND	7.78	ND
090-057	T30N/R06E-20J03	Vashon advance outwash	Qva	10/09/91	0.075	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	ND	--
090-069	T30N/R06E-20R02	Vashon advance outwash	Qva	06/03/99	ND	ND	ND	ND	ND	--	ND	--	ND	1.2	ND	ND	5	--
090-071	T30N/R06E-20R01	Vashon advance outwash	Qva	06/03/99	ND	ND	ND	ND	ND	--	ND	--	ND	1.3	ND	ND	5.1	--
090-073	T30N/R06E-20Q06	Vashon advance outwash	Qva	11/05/97	ND	ND	ND	ND	ND	--	ND	--	ND	0.9	ND	ND	9.9	--
090-074	T30N/R06E-20Q05	Vashon advance outwash	Qva	11/05/97	ND	ND	ND	ND	ND	--	ND	--	ND	2.5	ND	ND	9.5	--
090-075	T30N/R06E-20Q04	Vashon advance outwash	Qva	06/03/99	ND	ND	ND	ND	ND	--	ND	--	ND	1.2	ND	ND	5	--
091-002	T30N/R06E-21G06	Vashon advance outwash	Qva	04/30/00	ND	ND	ND	ND	ND	--	0.002	--	ND	ND	ND	ND	8.6	ND
091-005	T30N/R06E-21C06	Vashon advance outwash	Qva	06/17/96	0.011	ND	ND	ND	ND	--	ND	--	ND	3.9	ND	ND	7	--
091-006	T30N/R06E-21H05	Vashon advance outwash	Qva	12/01/97	ND	ND	ND	ND	ND	--	0.004	--	ND	ND	ND	ND	26.6	--
091-011	T30N/R06E-21D03	Vashon advance outwash	Qva	12/20/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	5	--
091-018	T30N/R06E-21F02	Vashon advance outwash	Qva	09/14/98	0.045	ND	ND	ND	0.6	--	0.002	--	ND	ND	0.013	ND	12.5	--
091-028	T30N/R06E-21J03	Vashon advance outwash	Qva	05/26/99	ND	ND	ND	ND	ND	--	ND	--	ND	1.2	ND	ND	6.6	ND
091-032	T30N/R06E-21R04	Vashon advance outwash	Qva	03/12/97	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	3.6	ND
091-035	T30N/R06E-21R06	Vashon advance outwash	Qva	05/07/97	ND	ND	ND	ND	ND	--	ND	--	ND	0.54	ND	ND	8.4	ND
091-092	T30N/R06E-22E03	Vashon advance outwash	Qva	03/15/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	4.3	--
092-002	T30N/R06E-22P08	Vashon recessional outwash	Qvr	02/18/98	ND	ND	ND	ND	ND	--	ND	--	ND	1.8	ND	ND	4.2	--
092-013	T30N/R06E-22P07	Vashon recessional outwash	Qvr	09/30/97	ND	ND	ND	0.01	ND	--	ND	--	ND	1.8	ND	ND	9.2	--
092-030	T30N/R06E-23E06	Vashon till	Qvt	07/09/87	0.101	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	ND	--
092-033	T30N/R06E-23C01	Vashon advance outwash	Qva	01/26/89	0.25	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	ND	--
092-034	T30N/R06E-23C06	Vashon recessional outwash	Qvr	01/26/89	0.17	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	ND	--
092-074	T30N/R06E-29G02	Vashon advance outwash	Qva	04/13/98	ND	ND	ND	ND	ND	--	ND	--	ND	2.1	ND	ND	7.4	--
092-104	T30N/R06E-27A01	Vashon recessional outwash	Qvr	07/13/88	0.163	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	ND	--
092-108	T30N/R06E-28A02	Vashon recessional outwash	Qvr	09/14/98	0.015	ND	ND	ND	ND	--	0.006	--	ND	ND	ND	ND	19	ND

SnoCo ID	Legal	Hydrogeologic Unit		Date	Arsenic	Barium	Cadmium	Chromium	Fluoride	Iron	Lead	Manganese	Mercury	Nitrate	Selenium	Silver	Sodium	Total coliforms
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100 ml
093-009	T30N/R06E-28A04	Vashon advance outwash	Qva	08/24/98	0.014	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	12.6	--
093-034	T30N/R06E-28G03	Vashon advance outwash	Qva	06/04/98	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	7.2	--
093-049	T30N/R06E-28Q01	Vashon advance outwash	Qva	04/01/99	ND	ND	ND	ND	ND	--	0.002	--	ND	1.8	ND	ND	8.1	--
093-052	T30N/R06E-28K03	Vashon advance outwash	Qva	05/02/99	0.011	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	10	--
093-059	T30N/R06E-28L03	Vashon advance outwash	Qva	06/24/98	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	6.7	--
093-092	T30N/R06E-21M03	Vashon advance outwash	Qva	08/08/99	0.013	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	6	ND
094-002	T30N/R05E-36H04	Vashon advance outwash	Qva	08/26/99	0.01	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	6	--
094-016	T30N/R06E-31E03	Vashon advance outwash	Qva	02/22/00	0.018	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	11	--
094-026	T30N/R06E-32Q05	Vashon advance outwash	Qva	03/25/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	25	--
094-038	T30N/R06E-32C04	Vashon till	Qvt	07/14/98	ND	ND	ND	ND	ND	--	ND	--	ND	0.5	ND	ND	5.1	--
094-059	T30N/R06E-32R01	No Data	ND	04/25/00	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	7	ND
094-060	T30N/R06E-32K01	Vashon advance outwash	Qva	02/26/98	ND	ND	ND	ND	ND	--	0.007	--	ND	ND	ND	ND	5.7	--
094-093	T30N/R06E-33Q04	Vashon advance outwash	Qva	04/28/99	ND	ND	ND	ND	ND	--	ND	--	ND	1.9	ND	ND	4.8	--
109-084	T31N/R05E-13J02	Vashon advance outwash	Qva	11/30/98	0.01	ND	ND	ND	0.3	--	ND	--	ND	0.2	ND	ND	6.9	--
110-008	T31N/R05E-13P05	Vashon advance outwash	Qva	09/04/97	ND	ND	ND	ND	ND	--	ND	--	ND	1.1	ND	ND	22.1	ND
110-027	T31N/R05E-14Q02	Vashon advance outwash	Qva	07/07/99	ND	ND	ND	ND	ND	--	ND	--	ND	2.6	ND	ND	3.1	ND
110-028	T31N/R05E-14P02	Vashon advance outwash	Qva	02/03/00	ND	ND	ND	ND	ND	--	ND	--	ND	1.04	ND	ND	3.8	ND
112-052	T31N/R05E-24A04	Upper course grained unit	Q(A)c	10/18/91	ND	ND	ND	ND	ND	--	ND	--	ND	1.6	ND	ND	10	ND
112-075	T31N/R05E-24C01	Upper course grained unit	Q(A)c	01/20/98	ND	ND	ND	ND	ND	--	0.003	--	ND	0.6	ND	ND	9.2	--
112-099	T31N/R05E-24R03	Upper course grained unit	Q(A)c	08/02/99	ND	ND	ND	0.012	ND	--	0.003	--	ND	ND	ND	ND	19	--
112-108	T31N/R05E-24L05	Upper course grained unit	Q(A)c	12/18/98	0.021	0.1	ND	ND	ND	--	0.009	--	ND	ND	ND	ND	17.8	--
113-009	T31N/R05E-25G02	Vashon advance outwash	Qva	02/03/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	7	--
113-032	T31N/R05E-25R03	Vashon advance outwash	Qva	08/24/98	0.01	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	6.4	--
113-037	T31N/R05E-25L03	Vashon advance outwash	Qva	01/11/99	ND	ND	ND	ND	ND	--	ND	--	ND	3.8	ND	ND	6.7	--
113-045	T31N/R05E-26A01	Upper course grained unit	Q(A)c	03/23/99	0.018	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	15	--
113-093	T31N/R05E-26N02	Upper course grained unit	Q(A)c	09/02/97	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	5.6	--
113-094	T31N/R05E-26N01	Upper course grained unit	Q(A)c	09/02/97	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	5	--
114-088	T31N/R06E-30M03	Vashon advance outwash	Qva	06/14/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	6.3	--
115-082	T31N/R05E-35C02	Upper course grained unit	Q(A)c	10/11/96	ND	ND	ND	ND	0.1	--	ND	--	ND	ND	ND	ND	6	--
115-083	T31N/R05E-35C01	Upper course grained unit	Q(A)c	04/21/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	4.8	--
116-006	T31N/R05E-36Q01	Vashon advance outwash	Qva	07/23/98	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	4.7	--
116-008	T31N/R05E-24E01	Upper course grained unit	Q(A)c	02/09/00	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	6.4	--
117-025	T31N/R06E-07N01	Sedimentary	Ts	04/02/98	0.012	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	7.3	--
118-017	T31N/R06E-18C01	Upper course grained unit	Q(A)c	10/27/98	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	ND	--
118-042	T31N/R06E-19C01	No Aquifer Encountered	none	05/22/00	--	ND	ND	ND	ND	--	ND	--	ND	4.87	ND	ND	85	ND
118-051	T31N/R06E-19F03	Sedimentary	Ts	03/17/97	ND	ND	ND	ND	ND	--	0.002	--	ND	ND	ND	ND	113	--
119-012	T31N/R05E-26D07	Vashon advance outwash	Qva	08/23/98	ND	ND	ND	ND	ND	--	0.002	--	ND	0.7	ND	ND	5	--
119-091	T31N/R06E-29E01	Vashon advance outwash	Qva	11/14/96	ND	ND	ND	ND	ND	--	ND	--	ND	0.6	ND	ND	11.3	--
119-092	T31N/R06E-29F02	Vashon advance outwash	Qva	11/14/96	ND	ND	ND	ND	ND	--	0.003	--	ND	1.5	ND	ND	12.8	ND
120-010	T31N/R06E-29P04	Sedimentary	Ts	09/04/97	ND	ND	ND	ND	ND	--	ND	--	ND	0.7	ND	ND	13.4	--
120-013	T31N/R06E-29P02	No Data	ND	07/20/98	0.018	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	5	--
120-019	T31N/R06E-30B02	Upper course grained unit	Q(A)c	04/19/99	0.03	ND	ND	ND	ND	--	0.004	--	ND	ND	ND	ND	12	--
120-021	T31N/R06E-30G02	Vashon advance outwash	Qva	08/11/99	0.026	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	7.2	--
120-024	T31N/R06E-30E01	Upper course grained unit	Q(A)c	10/20/99	ND	ND	ND	ND	ND	--	0.002	--	ND	ND	ND	ND	6.2	ND
120-054	T31N/R06E-30R02	Vashon till	Qvt	01/27/00	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	39	--
120-076	T31N/R06E-31B01	Vashon advance outwash	Qva	02/10/98	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	6.2	--
120-092	T31N/R06E-31E06	Vashon advance outwash	Qva	06/28/99	ND	ND	ND	0.073	ND	--	0.005	--	0.0017	1.6	0.015	ND	60	--
120-103	T31N/R06E-31M01	Vashon advance outwash	Qva	06/29/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	4.8	--
120-105	T31N/R06E-31P02	Vashon advance outwash	Qva	12/10/96	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	3.9	ND
121-011	T31N/R06E-32G01	Sedimentary	Ts	02/17/99	ND	ND	ND	ND	ND	--	0.002	--	ND	ND	ND	ND	103	--
121-043	T31N/R06E-33F01	Vashon till	Qvt	10/14/96	ND	ND	ND	ND	0.6	--	ND	--	ND	ND	ND	ND	4.4	ND
121-045	T31N/R06E-33L06	Vashon till	Qvt	07/09/99	ND	ND	ND	ND	ND	--	ND	--	ND	0.9	ND	ND	2.8	--
148-065	T31N/R05E-14Q01	Vashon advance outwash	Qva	10/06/00	0.011	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	--	ND
149-029	T30N/R05E-36F01	No Data	ND	12/12/00	ND	ND	ND	ND	ND	ND	ND	--	ND	ND	ND	ND	7	ND
149-031	T29N/R06E-04C03	Upper course grained unit	Q(A)c	10/25/00	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	4.5	ND
149-032	T29N/R06E-05F01	Vashon advance outwash	Qva	11/10/00	ND	ND	ND	0.01	ND	--	0.002	--	ND	ND	ND	ND	27	ND
149-045	T29N/R06E-16Q01	Alluvium	Qal	12/06/00	ND	ND	ND	ND	ND	--	ND	--	ND	0.69	ND	ND	92	ND
149-062	T30N/R05E-13A03	Vashon advance outwash	Qva	01/17/01	ND	ND	ND	ND	ND	--	ND	--	ND	1.33	ND	ND	20	ND

SnoCo ID	Legal	Hydrogeologic Unit		Date	Arsenic	Barium	Cadmium	Chromium	Fluoride	Iron	Lead	Manganese	Mercury	Nitrate	Selenium	Silver	Sodium	Total coliforms
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100 ml
149-066	T30N/R05E-25K04	Vashon advance outwash	Qva	02/23/01	0.008	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	7	ND
149-067	T30N/R05E-36H05	Vashon advance outwash	Qva	02/14/01	0.015	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	19	ND
149-072	T30N/R06E-05J06	Vashon advance outwash	Qva	08/14/00	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	99	ND
149-073	T30N/R06E-07F01	Vashon advance outwash	Qva	01/26/00	ND	ND	ND	ND	ND	--	ND	--	ND	0.58	ND	ND	4	ND
149-074	T30N/R06E-07E03	Vashon advance outwash	Qva	10/11/00	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	19	ND
149-075	T30N/R06E-07E05	Vashon advance outwash	Qva	10/11/00	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	22	ND
149-077	T30N/R06E-19P08	Vashon till	Qvt	10/18/00	ND	ND	ND	ND	ND	--	ND	--	ND	0.52	ND	ND	3.4	ND
149-097	T30N/R05E-02F01	Vashon till	Qvt	07/16/01	ND	ND	ND	ND	ND	--	ND	--	ND	1.11	ND	ND	5.5	ND
151-003	T29N/R06E-04F01	Upper course grained unit	Q(A)c	08/14/01	0.002	0.015	ND	ND	ND	0.812	ND	0.158	0.002	ND	ND	ND	85	ND
151-013	T30N/R06E-18A01	Vashon advance outwash	Qva	06/20/01	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	4.4	ND
151-020	T31N/R05E-24F02	Sedimentary	Ts	08/14/01	0.01	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	8.8	ND
152-064	T30N/R06E-29A01	Vashon advance outwash	Qva	09/14/01	ND	ND	ND	ND	ND	--	ND	--	ND	1.36	ND	ND	3.6	ND
152-070	T30N/R06E-08L01	Vashon advance outwash	Qva	09/16/01	ND	ND	ND	ND	ND	--	ND	--	ND	0.78	ND	ND	3.4	ND
152-078	T30N/R06E-21E04	Vashon advance outwash	Qva	09/25/01	ND	ND	ND	0.012	ND	--	ND	--	ND	1.75	ND	ND	14	ND
153-098	T28N/R06E-07A01	Upper course grained unit	Q(A)c	08/09/01	0.011	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	6.2	ND
154-003	T29N/R05E-11Q01	Lower course grained unit	Q(B)c	10/06/01	0.015	ND	ND	ND	0.23	--	ND	--	ND	ND	ND	ND	13	ND
154-011	T30N/R06E-08R03	No Data	ND	12/03/01	ND	ND	ND	ND	0.22	--	ND	--	ND	ND	ND	ND	5.5	ND
154-053	T28N/R05E-03L01	Upper course grained unit	Q(A)c	04/30/01	ND	ND	ND	ND	ND	--	ND	--	ND	1.25	ND	ND	4.5	ND
154-054	T28N/R05E-03L02	Upper course grained unit	Q(A)c	02/12/03	0.006	ND	ND	ND	0.11	--	ND	--	ND	8	ND	ND	4	ND
154-096	T30N/R06E-08Q06	Vashon advance outwash	Qva	03/21/00	ND	ND	ND	ND	ND	--	0.003	--	ND	ND	ND	ND	4.9	ND
154-097	T29N/R06E-21E08	Upper course grained unit	Q(A)c	11/02/00	0.013	ND	ND	ND	ND	--	0.002	--	ND	ND	ND	ND	23	ND
154-099	T31N/R06E-31E01	Vashon till	Qvt	02/06/97	ND	ND	ND	ND	ND	--	0.002	--	ND	ND	ND	ND	8.2	ND
155-001	T30N/R05E-02Q01	Uninterpreted	--	03/20/01	ND	ND	ND	ND	ND	--	0.005	--	ND	0.73	ND	ND	43	ND
155-002	T30N/R05E-12H01	Vashon advance outwash	Qva	08/18/99	ND	ND	ND	ND	ND	--	ND	--	ND	0.65	ND	ND	6.5	ND
155-004	T30N/R06E-08N01	Vashon till	Qvt	08/06/01	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	4.6	ND
155-006	T30N/R06E-08K07	Vashon advance outwash	Qva	08/03/01	ND	ND	ND	ND	ND	--	0.002	--	ND	ND	ND	ND	5	ND
155-007	T30N/R05E-11R01	Vashon advance outwash	Qva	05/10/01	0.007	ND	ND	ND	ND	--	0.002	--	ND	ND	ND	ND	10	ND
155-011	T30N/R06E-21Q03	Vashon advance outwash	Qva	12/19/01	0.009	ND	ND	ND	ND	--	0.002	--	ND	ND	ND	ND	6	ND
155-012	T30N/R06E-08P02	Vashon advance outwash	Qva	02/11/02	ND	ND	ND	ND	0.12	--	ND	--	ND	ND	ND	ND	4	ND
155-013	T30N/R06E-06B07	Vashon advance outwash	Qva	12/18/01	ND	ND	ND	ND	ND	--	0.003	--	ND	ND	ND	ND	3.9	ND
155-015	T30N/R06E-08Q04	Vashon advance outwash	Qva	01/24/02	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	4.3	ND
155-016	T30N/R05E-01A08	Vashon advance outwash	Qva	01/28/02	0.005	ND	ND	ND	ND	--	ND	--	ND	0.65	ND	ND	4.1	ND
155-017	T30N/R05E-01B01	Vashon advance outwash	Qva	01/28/02	0.005	ND	ND	ND	ND	--	ND	--	ND	0.73	ND	ND	4.4	ND
155-018	T30N/R06E-28P01	Vashon advance outwash	Qva	03/01/01	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	9.5	ND
155-019	T30N/R06E-08P01	Vashon advance outwash	Qva	02/26/01	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	4.4	ND
158-040	T30N/R06E-06K02	Vashon advance outwash	Qva	04/10/01	0.012	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	2.7	ND
160-029	T29N/R05E-11L01	Upper course grained unit	Q(A)c	06/03/02	0.02	ND	ND	ND	0.16	--	0.002	--	ND	ND	ND	ND	26	ND
160-030	T29N/R05E-11B02	Vashon advance outwash	Qva	05/16/02	0.01	ND	ND	ND	0.12	--	ND	--	ND	1.15	ND	ND	11	ND
160-034	T29N/R06E-10C01	Sedimentary	Ts	04/22/02	ND	0.144	ND	ND	ND	0.113	ND	0.055	ND	ND	ND	ND	60	ND
160-035	T29N/R06E-16Q05	Alluvium	Qal	03/19/02	ND	ND	ND	ND	ND	--	0.002	--	ND	ND	ND	ND	3.7	ND
160-048	T30N/R05E-36L03	Vashon advance outwash	Qva	06/07/02	0.002	ND	ND	ND	0.3	--	ND	--	ND	ND	ND	ND	8.1	ND
160-050	T30N/R06E-08P04	Vashon advance outwash	Qva	03/24/02	ND	ND	ND	ND	ND	--	ND	--	ND	0.11	ND	ND	4.7	ND
160-051	T30N/R06E-08Q07	Vashon advance outwash	Qva	04/23/02	ND	ND	ND	ND	0.21	--	0.009	--	ND	ND	ND	ND	4.2	ND
160-052	T30N/R06E-08R06	Vashon advance outwash	Qva	04/10/02	ND	ND	ND	ND	0.23	--	ND	--	ND	ND	ND	ND	5.6	ND
160-053	T30N/R06E-08Q08	Vashon advance outwash	Qva	05/21/02	ND	ND	ND	ND	0.15	--	ND	--	ND	ND	ND	ND	5.1	ND
160-055	T30N/R06E-09N04	Vashon advance outwash	Qva	05/17/02	ND	ND	ND	ND	0.17	--	ND	--	ND	ND	ND	ND	6.5	ND
160-057	T30N/R06E-17E01	Vashon advance outwash	Qva	03/18/02	ND	ND	ND	ND	ND	--	ND	--	ND	0.78	ND	ND	75	ND
160-063	T30N/R06E-30R03	Vashon recessional outwash	Qvr	04/16/02	ND	ND	ND	ND	ND	0.329	0.002	0.026	ND	5.6	ND	ND	4.4	ND
161-015	T29N/R05E-01A03	Vashon advance outwash	Qva	08/05/02	0.02	0.02	ND	ND	0.15	ND	ND	0.04	ND	ND	ND	ND	0.3	ND
161-023	T30N/R05E-25K03	Vashon advance outwash	Qva	08/01/02	0.011	ND	ND	ND	0.15	ND	ND	--	ND	ND	ND	ND	4.6	ND
161-024	T30N/R05E-36L04	Vashon advance outwash	Qva	08/14/02	0.003	ND	ND	ND	0.25	--	ND	--	ND	ND	ND	ND	5.6	ND
161-026	T30N/R06E-08E03	Vashon till	Qvt	07/10/02	ND	ND	ND	ND	ND	--	ND	--	ND	0.96	ND	ND	4.3	ND
161-027	T30N/R06E-08P03	Vashon advance outwash	Qva	08/01/02	0.002	ND	ND	ND	0.16	--	0.002	--	ND	ND	ND	ND	3.8	ND
161-030	T30N/R06E-17A03	Vashon advance outwash	Qva	08/02/02	ND	ND	ND	ND	0.1	--	ND	--	ND	ND	ND	ND	3.4	ND
161-032	T30N/R06E-19Q05	Vashon advance outwash	Qva	07/14/02	0.002	ND	ND	ND	0.15	--	ND	--	ND	0.18	ND	ND	4.2	ND
161-040	T31N/R06E-31N04	Vashon advance outwash	Qva	07/23/02	0.006	ND	ND	ND	0.11	--	ND	--	ND	ND	ND	ND	7.7	ND
162-095	T29N/R05E-26C01	Upper course grained unit	Q(A)c	06/25/02	0.012	ND	ND	ND	0.17	--	0.005	--	ND	ND	ND	ND	4.3	ND
163-005	T30N/R06E-08R07	Vashon advance outwash	Qva	07/18/02	ND	ND	ND	ND	0.19	--	ND	--	ND	ND	ND	ND	4.9	ND

SnoCo ID	Legal	Hydrogeologic Unit		Date	Arsenic	Barium	Cadmium	Chromium	Fluoride	Iron	Lead	Manganese	Mercury	Nitrate	Selenium	Silver	Sodium	Total coliforms
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100 ml
163-007	T30N/R06E-09N02	Vashon advance outwash	Qva	07/18/02	0.006	ND	ND	ND	0.22	--	0.002	--	ND	ND	ND	ND	9.8	ND
163-008	T30N/R06E-21C02	Vashon advance outwash	Qva	08/19/02	0.008	ND	ND	ND	0.21	--	ND	--	ND	ND	ND	ND	4.1	ND
163-018	T31N/R05E-11M02	Vashon recessional outwash	Qvr	07/18/02	ND	ND	ND	ND	ND	--	ND	--	ND	1.76	ND	ND	5.3	ND
163-019	T31N/R05E-11M03	Vashon recessional outwash	Qvr	07/25/02	ND	ND	ND	ND	ND	--	ND	--	ND	3.56	ND	ND	5.1	ND
163-020	T31N/R05E-11M04	Vashon recessional outwash	Qvr	07/25/02	ND	ND	ND	ND	ND	--	ND	--	ND	1.95	ND	ND	2.9	ND
165-005	T29N/R05E-36P01	Vashon advance outwash	Qva	09/15/02	0.039	ND	ND	ND	0.13	--	ND	--	ND	ND	ND	ND	10	ND
165-011	T30N/R05E-36A02	Vashon advance outwash	Qva	09/06/02	ND	ND	ND	ND	0.16	--	ND	--	ND	ND	ND	ND	6.7	ND
165-014	T30N/R06E-08P05	Vashon advance outwash	Qva	03/24/02	ND	ND	ND	0.01	ND	--	ND	--	ND	0.11	ND	ND	4.9	ND
165-015	T30N/R06E-09N05	Vashon advance outwash	Qva	09/26/02	0.002	ND	ND	ND	0.22	--	ND	--	ND	0.11	ND	ND	5.6	ND
165-016	T30N/R06E-17A04	Vashon advance outwash	Qva	09/26/02	ND	ND	ND	ND	0.12	--	ND	--	ND	ND	ND	ND	3.9	ND
165-017	T30N/R06E-21H06	Vashon advance outwash	Qva	09/16/02	0.002	ND	ND	ND	ND	--	ND	--	ND	0.89	ND	ND	6.1	ND
165-018	T30N/R06E-27D03	Vashon recessional outwash	Qvr	09/16/02	ND	ND	ND	ND	ND	--	ND	--	ND	3.32	ND	ND	6.2	ND
166-021	T30N/R06E-18Q03	Vashon advance outwash	Qva	11/06/02	ND	ND	ND	ND	ND	--	ND	--	ND	1.64	ND	ND	4.8	ND
166-022	T30N/R06E-21C03	Vashon advance outwash	Qva	11/12/02	0.004	ND	ND	ND	0.2	--	ND	--	ND	ND	ND	ND	26	ND
166-031	T31N/R05E-25B04	Vashon till	Qvt	10/23/02	ND	ND	ND	ND	ND	--	ND	--	ND	1.22	ND	ND	3.4	ND
167-042	T30N/R06E-09N03	Vashon advance outwash	Qva	11/19/02	ND	ND	ND	ND	0.1	--	ND	--	ND	ND	ND	ND	4.2	ND
167-058	T30N/R06E-33Q01	Vashon advance outwash	Qva	06/20/01	0.005	ND	ND	ND	ND	0.0022	0.002	--	ND	ND	ND	ND	4.1	ND
167-069	T30N/R05E-36Q03	Vashon advance outwash	Qva	12/02/02	0.003	ND	ND	ND	0.38	--	ND	--	ND	ND	ND	ND	14	ND
167-070	T29N/R05E-11B01	Sedimentary	Ts	11/24/02	0.038	ND	ND	ND	0.24	--	0.006	--	ND	0.12	ND	ND	8.4	ND
167-073	T30N/R06E-18P06	Vashon advance outwash	Qva	11/24/02	ND	ND	ND	ND	ND	--	0.002	--	ND	0.64	ND	ND	3.2	ND
167-074	T30N/R06E-18P07	Vashon advance outwash	Qva	10/30/02	ND	ND	ND	ND	ND	--	ND	--	ND	0.65	ND	ND	3	ND
167-075	T30N/R06E-18P08	Vashon advance outwash	Qva	10/30/02	ND	ND	ND	ND	ND	--	ND	--	ND	1.7	ND	ND	6.2	ND
167-077	T30N/R06E-32C02	Vashon advance outwash	Qva	09/09/02	0.114	ND	ND	ND	ND	--	ND	--	ND	0.61	ND	ND	6.8	ND
168-077	T31N/R05E-25J03	Vashon advance outwash	Qva	01/12/03	0.009	ND	ND	ND	0.14	--	ND	--	ND	1.54	ND	ND	17	ND
168-085	T29N/R05E-35K01	Upper fine grained unit	Qtb	12/31/02	0.022	ND	ND	ND	0.0066	--	ND	--	ND	0.18	ND	ND	7	ND
168-089	T30N/R06E-09N06	Vashon advance outwash	Qva	11/19/02	ND	ND	ND	ND	ND	--	ND	--	ND	0.37	ND	ND	3.5	ND
168-090	T30N/R06E-18P09	Vashon advance outwash	Qva	11/24/02	ND	ND	ND	0.014	ND	--	0.002	--	ND	0.08	ND	ND	3.6	ND
168-091	T30N/R06E-18P01	Vashon advance outwash	Qva	11/24/02	ND	ND	ND	ND	ND	--	ND	--	ND	0.73	ND	ND	3.6	ND
168-092	T30N/R06E-18P10	Vashon advance outwash	Qva	11/24/02	ND	ND	ND	ND	ND	--	0.002	--	ND	0.77	ND	ND	3.6	ND
168-094	T30N/R06E-20M02	Vashon advance outwash	Qva	09/25/02	ND	ND	ND	ND	ND	--	ND	--	ND	3.8	ND	ND	7	ND
169-065	T30N/R06E-28F04	Vashon advance outwash	Qva	05/09/02	ND	ND	ND	ND	0.17	--	ND	--	ND	ND	ND	ND	7.1	ND
169-067	T30N/R06E-22N03	Vashon advance outwash	Qva	05/10/01	0.006	ND	ND	ND	ND	--	0.003	--	ND	ND	ND	ND	4.8	ND
169-074	T30N/R06E-22F01	No Data	ND	08/13/02	0.006	ND	ND	ND	0.11	--	ND	--	ND	ND	ND	ND	3.3	ND
169-082	T30N/R06E-08N03	Vashon till	Qvt	04/09/03	ND	ND	ND	ND	ND	--	ND	--	ND	0.74	ND	ND	5.2	ND
169-088	T30N/R06E-16N02	Vashon advance outwash	Qva	12/17/02	ND	ND	ND	ND	ND	--	ND	--	ND	1.09	ND	ND	3.5	ND
170-003	T30N/R05E-36Q04	Vashon advance outwash	Qva	02/19/03	0.028	ND	ND	ND	1.07	--	ND	--	ND	ND	ND	ND	30	ND
170-008	T29N/R06E-32C01	Alluvium	Qal	02/26/03	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	6.7	ND
170-012	T30N/R06E-22H01	Vashon advance outwash	Qva	02/10/03	ND	ND	ND	ND	ND	--	ND	--	ND	3.08	ND	ND	4.5	ND
170-014	T30N/R05E-25P02	Vashon advance outwash	Qva	02/17/03	0.002	ND	ND	ND	0.18	--	ND	--	ND	0.65	ND	ND	4.7	ND
170-016	T30N/R06E-08N05	Vashon till	Qvt	02/13/03	ND	ND	ND	0.01	ND	--	0.003	--	ND	0.39	ND	ND	3.3	ND
170-017	T30N/R06E-08L02	Vashon advance outwash	Qva	02/13/03	ND	ND	ND	0.011	ND	--	ND	--	ND	1.46	ND	ND	4	ND
170-018	T30N/R06E-08L03	Vashon advance outwash	Qva	02/13/03	ND	ND	ND	0.011	ND	--	ND	--	ND	1.46	ND	ND	4	ND
179-035	T30N/R05E-36F02	Sedimentary	Ts	09/02/99	ND	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	8	--
179-059	T30N/R06E-08H01	No Data	ND	04/15/03	ND	ND	ND	ND	0.13	--	ND	--	ND	ND	ND	ND	8	ND
179-075	T30N/R06E-29N01	Vashon advance outwash	Qva	04/28/03	ND	0.013	ND	ND	0.055	--	ND	--	ND	0.003	ND	ND	4.85	ND
179-078	T30N/R05E-36D03	Vashon advance outwash	Qva	05/09/03	ND	ND	ND	ND	0.2	--	0.004	--	ND	ND	ND	ND	4.8	ND
179-081	T30N/R06E-18P02	Vashon advance outwash	Qva	06/03/03	0.002	ND	ND	ND	0.12	--	ND	--	ND	1.41	ND	ND	3	ND
179-083	T30N/R06E-18P03	Vashon advance outwash	Qva	06/03/03	ND	ND	ND	0.025	0.13	--	0.003	--	ND	0.82	ND	ND	6	ND
179-092	T29N/R06E-32P01	Alluvium	Qal	04/17/03	ND	ND	ND	ND	ND	--	ND	--	ND	0.27	ND	ND	3.2	ND
179-093	T31N/R05E-25R04	Vashon advance outwash	Qva	06/01/03	0.02	ND	ND	ND	0.21	--	ND	--	ND	ND	ND	ND	6.6	ND
180-033	T30N/R06E-08M02	Vashon advance outwash	Qva	06/22/03	ND	ND	ND	ND	ND	--	ND	--	ND	0.91	ND	ND	15	ND
180-039	T30N/R06E-08F04	Vashon advance outwash	Qva	03/12/03	ND	ND	ND	ND	ND	--	ND	--	ND	1.39	ND	ND	3.3	ND
180-040	T30N/R06E-08N06	Vashon advance outwash	Qva	06/04/03	ND	ND	ND	ND	0.13	--	0.002	--	ND	0.59	ND	ND	4.4	ND
180-048	T30N/R06E-18L01	Vashon advance outwash	Qva	07/16/03	ND	0.211	ND	0.025	ND	--	0.003	--	ND	0.69	ND	ND	3.9	ND
180-049	T30N/R06E-18L02	Vashon advance outwash	Qva	07/16/03	ND	ND	ND	ND	ND	--	ND	--	ND	0.62	ND	ND	3.6	ND
180-050	T30N/R06E-18L03	Vashon advance outwash	Qva	07/16/03	ND	0.127	ND	0.016	ND	--	0.003	--	ND	0.84	ND	ND	3.8	ND
180-051	T30N/R06E-18L04	Vashon advance outwash	Qva	07/16/03	ND	ND	ND	ND	ND	--	ND	--	ND	0.74	ND	ND	4.1	ND
180-052	T30N/R06E-18L05	Vashon advance outwash	Qva	7/9/2003	ND	ND	ND	ND	0.11	--	0.002	--	ND	0.68	ND	ND	3.8	ND

SnoCo ID	Legal	Hydrogeologic Unit		Date	Arsenic	Barium	Cadmium	Chromium	Fluoride	Iron	Lead	Manganese	Mercury	Nitrate	Selenium	Silver	Sodium	Total coliforms
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100 ml
180-053	T30N/R06E-18L06	Vashon advance outwash	Qva	07/09/03	ND	ND	ND	0.015	0.11	--	0.002	--	ND	0.67	ND	ND	3.6	ND
180-055	T30N/R06E-21D04	Vashon advance outwash	Qva	05/22/03	ND	ND	ND	ND	0.12	--	ND	--	ND	0.81	ND	ND	120	ND
180-058	T30N/R05E-02K05	Vashon advance outwash	Qva	07/10/03	0.016	ND	ND	ND	0.17	0.001	ND	0.3	ND	ND	ND	ND	3.4	ND
180-059	T30N/R06E-07D01	Vashon advance outwash	Qva	07/28/03	ND	ND	ND	0.04	ND	--	ND	--	ND	1.1	ND	ND	6.2	ND
180-060	T30N/R06E-08N02	Vashon advance outwash	Qva	07/28/03	ND	ND	ND	0.01	ND	--	ND	--	ND	0.6	ND	ND	6.6	ND
180-061	T30N/R06E-08N07	Vashon advance outwash	Qva	08/04/03	ND	ND	ND	ND	0.1	--	ND	--	ND	1.05	ND	ND	4.8	ND
180-066	T30N/R05E-36Q05	Vashon advance outwash	Qva	04/13/03	0.012	ND	ND	ND	0.52	--	ND	--	ND	ND	ND	ND	14	ND
190-013	T30N/R05E-12A01	Vashon advance outwash	Qva	05/06/03	ND	ND	ND	ND	ND	--	ND	--	ND	1.59	ND	ND	4.7	ND

Appendix B.

Table B-1b. Water Quality Results Summary for Samples Collected by the US Geologic Survey.

					Metals & Inorganics																															Microorganisms					Physical						
SnoCo ID	Legal	Date	Hydrogeologic Unit		Alkalinity Field	Ammonia	Arsenic	Barium	Bicarbonate	Boron	Cadmium	Carbonate	Chloride	Chromium	Copper	Fluoride	Foaming agents	Iron	Lead	Magnesium	Manganese	Mercury	Nitrate	Nitrite	Orthophosphate	Potassium	Selenium	Silica	Silver	Sodium	Sodium Adsorption	Sodium Percent	Sulfide	TDS	TNN	Zinc	Fecal	Ammonia as N	Organic Carbon	Orthophosphorus	Total Nitrogen	Alkalinity	Conductance, Field	DO	Hardness	ph, field	ph, Lab	Temperature
				symbol	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	%	mg/l	mg/l	mg/l	mg/l	CFU/100 ml	mg/l	mg/l	mg/l	mg/l	mg/l	mS/cm	mg/l	mg/l			deg C
035-067	T28N/R06E-06C01	8/18/93	Vashon advance outwash	Qva	--	--	0.002	--	--	0.02	0.025	--	6.2	--	--	ND	ND	0.025	--	14	ND	--	--	ND	0.06	1.4	--	27	--	6.9	0.3	11	20	170	1	--	ND	ND	0.2	0.02	1	109	0.553	2.4	120	7.4	7.5	11.5
035-075	T28N/R05E-02G05	9/1/93	No Data	ND	116	2.7	0.019	--	142	--	0.02	ND	2.1	--	--	0.2	--	3.5	--	8.4	0.21	--	--	ND	1.9	0.2	--	34	--	10	0.5	20	ND	--	ND	--	ND	2.1	--	0.61	--	116	0.457	ND	85	7.3	7.2	12
035-083	T28N/R05E-03R01	8/16/93	Vashon advance outwash	Qva	91	0.97	0.007	0.021	112	0.02	0.016	ND	4	ND	ND	0.2	ND	0.88	ND	7.9	0.17	ND	--	ND	0.95	2.5	ND	39	ND	6.4	0.3	16	0.3	134	ND	0.086	ND	0.75	1.1	0.31	--	91	0.373	0.2	73	7.7	7.5	12
035-150	T28N/R05E-10G01	8/19/93	Upper coarse grained unit	Q(A)c	143	1.7	0.02	--	174	--	0.028	ND	3.8	--	--	0.2	--	1.4	--	11	0.29	--	--	ND	1.2	4.2	--	41	--	8.1	0.3	13	ND	--	ND	--	ND	1.3	--	0.4	--	145	0.568	ND	120	7.5	7.5	13.5
039-023	T28N/R06E-05N01	8/18/93	Upper coarse grained unit	Q(A)c	67	0.05	0.001	--	80	--	0.015	1	3.1	--	--	0.1	--	0.11	--	5.8	0.14	--	--	ND	0.12	1.4	--	18	--	4.8	0.3	14	5.5	94	ND	--	ND	0.04	--	0.04	--	68	0.302	0.1	61	8.4	7.9	11.5
039-034	T29N/R06E-31E01	8/13/93	Vashon advance outwash	Qva	81	0.14	ND	--	--	--	0.014	--	2.4	--	--	0.2	--	0.14	--	7.2	0.2	--	--	ND	0.86	0.2	--	36	--	6.8	0.4	19	0.5	117	ND	--	ND	0.11	--	0.28	--	--	0.327	ND	65	8.1	8	10.5
039-055	T28N/R06E-08E01	9/1/93	Alluvium	Qal	--	0.01	ND	--	--	--	0.017	--	6.3	--	--	0.1	--	0.007	--	8.7	0.003	--	--	ND	--	1	--	20	--	7.5	0.4	17	10	124	2.8	--	ND	0.01	--	ND	2.8	69	0.391	1.2	78	6.3	6.6	11
051-044	T29N/R05E-01B01	8/5/93	Vashon advance outwash	Qva	105	0.23	0.019	--	128	--	0.018	1	2.3	--	--	0.2	--	0.064	--	8.6	0.038	--	--	ND	1.1	6	--	39	--	11	0.5	21	4.8	155	ND	--	ND	0.18	--	0.37	--	107	0.441	ND	80	8.4	8.2	12
056-017	T29N/R05E-36C01	8/6/93	Vashon advance outwash	Qva	82	1.2	0.007	0.024	--	--	0.018	--	3.1	ND	ND	0.1	--	0.27	ND	5.9	0.21	ND	--	ND	1	2.3	ND	40	ND	5.7	0.3	15	ND	--	ND	0.026	ND	0.94	--	0.33	--	--	0.336	ND	69	7.2	7.8	10.5
056-030	T29N/R05E-36P03	8/5/93	Vashon advance outwash	Qva	86	0.3	0.006	--	--	0.02	0.02	--	4.4	--	--	ND	ND	0.007	--	8.6	0.1	--	--	ND	0.67	2	--	27	--	7.2	0.3	15	12	134	ND	--	ND	0.23	0.7	0.22	--	--	0.413	0.1	85	8	7.8	17.5
057-014	T29N/R06E-04K04	8/18/93	Upper coarse grained unit	Q(A)c	145	0.12	0.006	0.089	--	0.02	0.015	--	2.3	0.002	ND	ND	--	0.035	ND	3.9	0.026	ND	--	ND	0.92	0.7	ND	12	ND	43	3	63	0.3	165	ND	0.009	ND	0.09	--	0.3	--	136	0.554	0.2	54	8.6	8.3	12
057-093	T29N/R06E-08R02	8/10/93	Vashon advance outwash	Qva	82	0.31	0.003	--	--	0.01	0.018	--	2.6	--	--	0.2	ND	0.049	--	6.7	0.081	--	--	ND	0.77	2.3	--	36	--	5.3	0.3	13	2.5	124	ND	--	ND	0.24	0.6	0.25	--	--	0.347	0.1	73	8.3	8	13.5
058-006	T29N/R06E-09N01	8/10/93	Sedimentary	Ts	153	0.55	ND	--	187	--	0.015	2	1.9	--	--	ND	--	0.16	--	5.7	0.025	--	--	ND	0.92	1.5	--	15	--	42	2	59	ND	--	ND	--	ND	0.43	--	0.3	--	157	0.587	0.3	61	8.4	8	11
061-061	T29N/R06E-20B01	8/11/93	Vashon advance outwash	Qva	86	--	0.002	--	--	--	0.011	--	2.4	--	--	0.1	--	0.009	--	13	0.004	--	--	ND	0.12	2.2	--	32	--	5.8	0.3	13	7.2	126	0.24	--	ND	0.01	--	0.04	0.24	--	0.375	2.4	81	7.1	7.3	16.5
061-064	T29N/R06E-20R01	8/13/93	Sedimentary	Ts	164	0.13	0.011	--	195	--	0.0061	3	1.4	--	--	0.2	--	0.055	--	2.3	0.01	--	--	ND	1.9	1.8	--	12	--	59	5	83	0.2	184	ND	--	ND	0.1	--	0.63	--	164	0.612	ND	25	8.4	8.3	10.5
061-095	T29N/R06E-21M01	8/12/93	Alluvium	Qal	58	--	ND	--	--	--	0.013	--	3.8	--	--	ND	--	0.014	--	7	0.011	--	--	ND	0.06	1.2	--	21	--	4.9	0.3	15	10	97	0.29	--	ND	0.01	--	0.02	0.29	--	0.302	2.8	61	6.7	7	11
063-089	T29N/R06E-16N02	8/10/93	Vashon advance outwash	Qva	82	0.09	0.008	0.014	--	0.02	0.019	--	1.8	ND	ND	0.2	ND	0.13	ND	6.9	0.055	ND	--	ND	0.58	3.9	ND	34	ND	6.4	0.3	15	5.8	128	ND	ND	ND	0.07	0.3	0.19	--	--	0.356	0.1	76	8.3	8.1	12
074-027	T30N/R05E-11Q01	8/3/93	Upper coarse grained unit	Q(A)c	93	0.85	0.001	0.028	--	--	0.0053	--	2	ND	ND	ND	--	0.36	ND	4.1	0.036	ND	--	ND	3.4	3	ND	32	ND	31	2	67	ND	--	ND	0.11	ND	0.66	--	1.1	--	--	0.388	ND	30	7.5	8.2	13
076-015	T30N/R06E-18M01	8/11/93	Vashon advance outwash	Qva	50	0.01	0.002	--	--	--	0.0078	--	2.6	--	--	0.1	--	0.008	--	6.2	0.012	--	--	ND	0.21	1.2	--	29	--	4.6	0.3	18	3.4	88	0.57	--	ND	0.01	--	0.07	0.57	--	0.232	2	45	7.1	7.4	10.5
077-051	T30N/R05E-24M01	8/5/93	Upper coarse grained unit	Q(A)c	111	0.18	0.007	--	--	--	0.019	--	2	--	--	0.2	--	0.5	--	11	0.22	--	--	ND	0.52	2.1	--	38	--	6.7	0.3	13	1.4	148	ND	--	ND	0.14	--	0.17	--	--	0.434	ND	93	8.2	7.9	11
077-068	T30N/R05E-25N01	8/11/93	Vashon advance outwash	Qva	106	0.18	ND	--	--	--	0.02	--	2.3	--	--	0.3	--	0.068	--	9.1	0.15	--	--	ND	0.09	2.1	--	22	--	7.8	0.4	16	0.8	128	ND	--	ND	0.14	--	0.03	--	--	0.425	ND	87	8	8.1	12
077-084	T30N/R05E-26P01	8/6/93	Vashon advance outwash	Qva	131	1.1	0.016	0.02	159	--	0.028	ND	2.4	ND	ND	0.3	--	0.89	ND	9.2	0.53	ND	--	ND	2.6	2.9	ND	34	ND	11	0.5	18	ND	--	ND	0.058	ND	0.85	--	0.86	--	130	0.514	ND	110	7.7	7.4	11.5
082-022	T30N/R05E-36J01	8/4/93	Vashon till	Qvt	118	0.03	0.003	--	--	ND	0.024	--	4.6	--	--	0.1	ND	0.007	--	14	0.001	--	--	ND	0.15	3	--	38	--	7.6	0.3	12	17	181	0.46	--	ND	0.02	0.2	0.05	0.46	--	0.544	0.6	120	7.3	7.5	13.5
083-077	T31N/R06E-33P04	7/30/93	Vashon till	Qvt	164	0.54	0.009	--	206	--	0.034	ND	3.1	--	--	0.2	--	1.5	--	10	0.39	--	--	ND	1.5	4.3	--	37	--	17	0.7	22	3.5	214	ND	--	ND	0.42	--	0.48	--	169	0.657	ND	130	7.6	7.6	11
084-086	T30N/R06E-06E04	8/11/93	Vashon advance outwash	Qva	103	0.01	0.002	--	--	--	0.015	--	4	--	--	ND	--	0.007	--	15	0.001	--	--	ND	0.12	1.7	--	34	--	7.5	0.3	14	5.5	151	1.4	--	ND	0.01	--	0.04	1.4	--	0.461	1.9	99	7.8	7.7	12.5
085-002	T30N/R06E-16M01	8/11/93	Vashon advance outwash	Qva	103	0.04	0.004	--	--	--	0.021	--	2	--	--	ND	--	0.007	--	10	0.001	--	--	ND	0.12	1.7	--	32	--	5.4	0.2	11	5.6	141	0.42	--	ND	0.03	--	0.04	0.42	--	0.43	3.3	94	8.1	7.9	10
085-063	T30N/R06E-08G02	8/24/93	Vashon advance outwash	Qva	66	0.03	ND	--	--	--	0.011	--	1.7	--	--	ND	--	0.008	--	8.1	0.003	--	--	ND	0.03	0.9	--	23	--	4.2	0.2	13	2.1	92	0.39	--	ND	0.02	--	0.01	0.39	--	0.274	6.4	61	6.7	7.1	11
089-048	T30N/R06E-18M05	7/15/92	Vashon recessional outwash	Qvr	--	--	--	--	--	--	ND	--	--	ND	--	ND	--	--	ND	--	--	ND	ND	--	--	--	ND	--	ND	4.6	--	--	--	--	--	--	ND	--	--	--	--	--	--	--	--	--	--	--
090-056	T30N/R06E-20J01	8/11/93	No Data	ND	74	--	0.001	--	--	0.01	0.016	--	4.4	--	--	0.1	ND	0.016	--	7.2	0.16	--	0.25	0.07	0.28	0.9	--	22	--	6	0.3	16	4.4	107	0.32	--	ND	ND	0.1	0.09	0.25	--	0.337	0.1	70	7.4	7.7	11
092-015	T30N/R06E-22N06	8/9/93	Vashon advance outwash	Qva	101	0.05	0.005	0.011	--	--	0.026	--	3	ND	ND	ND	--	0.038	ND	9.7	0.094	ND	--	ND	0.15	1.9	ND	23	ND	7.2	0.3	13	14	146	ND	0.02	ND	0.04	--	0.05	--	--	0.457	0.3	100	8.3	8.2	10.5
092-032	T30N/R06E-23C04	8/10/93	Vashon recessional outwash	Qvr	105	0.19	0.28	--	125	--	0.022	2	22	--	--	0.3	--	0.027	--	2	0.036	--	--	ND	0.77	2.3	--	30	--	37	2	55	6.8	187	ND	--	ND	0.15	--	0.25	--	105	0.584	ND	63	8.4	8.6	12
092-107	T30N/R06E-27B06	8/19/93	Vashon recessional outwash	Qvr	60	0.03	0.011	--	--	0.04	0.021	--	25	--	--	ND	ND	0.011	--	9.2	0.001	--	--	ND	--	1.1	--	25	--	14	0.6	25	11	161	4.3	--	ND	0.02	0.2	ND	4.3	--	0.516	3.6	90	6.4	6.8	14.5
093-079	T30N/R06E-28N06	8/13/93	Vashon advance outwash	Qva	67	--	0.008	--	--	--	0.015	--	1.8	--	--	0.2	--	0.1	--	5	0.22	--	--	ND	0.58	1.9	--	21	--	6.2	0.4	18	4.2	96	ND	--	ND	ND	--	0.19	--	--	0.295	ND	58	7.9	7.5	12.5
093-100	T30N/R06E-30P01	8/19/93	Vashon advance outwash	Qva	57	--	0.002	--	49	0.02	0.0075	7	2.1	--	--	0.1	ND	0.004	--	7.1	0.019	--	--	ND	0.06	0.9	--	18	--	4.5	0.3	17	4.6	76	ND	--	ND	ND	0.2	0.02	--	52	0.241	ND	48	9.3	9.1	12
094-020	T30N/R06E-31J02	9/15/93	Upper coarse grained unit	Q(A)c	175	0.88	0.002	0.061	--	--	0.011	--	2.8	ND	ND	ND	--	0.19	ND	7	0.072	ND	--	ND	2.2	4.5	ND	34	ND	53	3	65	0.2	221	ND	0.034	ND	0.68	--	0.73	--	--	0.681	ND	56	8.1	8.1	11
094-088	T30N/R06E-33J02	8/16/93	Vashon advance outwash	Qva	44	0.03	ND	--	--	--	0.012	--	4.5	--	--	ND	--	0.013	--	7.7	0.002	--	--	ND	--	0.9	--	26	--	5.1	0.3	15	4.8	109	4.9	--	ND	0.02	--	ND	4.9	--	0.311	7.2	62	6.6	7.4	11
109-035	T31N/R05E-10Q01	7/27/93	Vashon advance outwash	Qva	41	0.01	ND	--	--	--	0.01	--	3.5	--	--	ND	--	0.01	--	7.3	0.003	--	--	ND	--	0.9	--	21	--	4.1	0.2	14	15	96	2.2	--	ND	0.01	--	ND	2.2	--	0.281	5	55	6.5	7	11.5
110-016	T31N/R05E-13E03	7/27/93	Vashon till	Qvt	83	0.03	0.002	0.01	--	0.01	0.023	--	4.1	0.005	0.05	ND	ND	0.007	ND	8.8	0.002	ND	--	ND	--	1.9	ND	26	ND	5.7	0.3	11	14	146	2.8	0.006	ND	0.02	0.5	ND	2.8	--	0.449	5.5	94	7.3	7.5	12.5
112-103	T31N/R05E-24L02	7/28/93	Upper coarse grained unit	Q(A)c	138	1.2	0.011	0.023	--	--	0.014	--	7.1	ND	0.003	0.2	--	0.49	0.001	6.6	0.044	ND	--	ND	1.4	2.9	ND	43	ND	34	2	53	0.2	195	0.12	0.25	ND	0.93	--	0.47	0.12	--	0.561	ND	62	8	8.2	11.5
113-039	T31N/R05E-25L02	7/27/93	Vashon advance outwash	Qva	71	0.04	0.004	--	--	ND	0.01	--	3.2	--	--	0.1	ND	0.23	--	10	0.084	--	--	ND	0.18	2	--	38	--	5.9	0.3	16	9.4	122	ND	--	ND	0.03	0.2	0.06	--	--	0.329	ND	66	8	7.7	11.5
115-111	T31N/R05E-35F01	8/3/93	Upper coarse grained unit	Q(A)c	75	0.31	ND	0.014	--	--	0.015	--	2.2	0.001	ND	0.1	--	0.19	ND	7.2	0.11	ND	--	ND	0.95	1.7	ND	34	ND	5.4	0.3	15	0.5	113	ND	0.004	ND	0.24	--	0.31	--	--	0.307	ND	67	8	7.9	12
115-122	T31N/R05E-35R07	7/27/93	Vashon till	Qvt	105	0.04	0.003	--	--	--	0.024	--	5.1	--	--	ND	--	0.006	--	11	0.002	--	--	ND	0.06	2.3	--	33	--	6.3	0.3	11	5.9	158	1.6	--	ND	0.03	--	0.02	1.6	--	0.472	3	110	7.9	7.6	11.5
118-017	T31N/R06E-18C01	7/29/93	Upper coarse grained unit	Q(A)c	52	0.01	0.002	--	--	--	0.014	--	28	--	--	ND	--	0.017	--	5.9	0.001	--	--	ND	0.06	11	--	26	--	17	1	34	6.1	150	2.5	--	ND	0.01	--	0.02	2.5	--	0.443	7.4	59	7.6	7.7	11
120-065	T31N/R06E-30P03	7/30/93	Vashon advance outwash	Qva	77	0.7	0.003	--	94	--	0.016	ND	2.2	--	--	ND	--	0.64	--	8.9	0.23	--	--	ND	0.09	1.7	--	21	--	4.9	0.2	12	7.4	110	ND	--	ND	0.54	--	0.03	--	77	0.345	0.2	77	7.6	7.3	10
120-079	T31N/R06E-31G02	7/29/93	Vashon advance outwash	Qva	68	0.06	0.006	--	--	--	0.014	--	2.7	--	--	ND	--	0.15	--	7.5	0.092	--	--	ND	--	2.2	--	27	--	4.7	0.3	13	9.8	109	ND	--	ND	0.05	--	ND	--	--	0.323	ND	66	8	7.9	10.5
121-019	T31N/R06E-29Q06	7/29/93	Vashon till	Qvt	154	0.03	0.011	--	--	--	0.029	--	3.1	--	--	ND	--	ND	--	16	ND	--	--	ND	0.34	3.6	--	24	--	7.9	0.3	11	9.6	186	0.05	--	ND	0.02	--	0.11	0.053	--	0.622	2.4	140	8.2	8.2	10
158-015	T29N/R06E-06D01	8/31/81	Upper coarse grained unit	Q(A)c	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.215	--	--	8	--	10.6
158-016	T29N/R05E-02C01	8/25/93	Upper coarse grained unit	Q(A)c	29	0.01	0.002	0.003	34	--	0.0064	ND	4.9	ND	ND	0.8	--	0.009	ND	1.9	0.001	ND	--	ND	0.18	0.5	ND	7	ND	6.6	0.6	37	4.4	50	0.08	ND	ND	0.01	--	0.06	0.079	28	0.16	--	24	8.2	8.2	11
158-050	T30N/R05E-35N01	8/5/93	Upper coarse grained unit	Q(A)c	83	0.08	0.002	0.003	--	--	0.014	--	2.5	ND	ND	0.2	--	0.72	ND	9.6	0.065	ND	--	ND	0.21	1.2	ND	22	ND	6.5	0.3	16	4.8	112	ND	0.066	ND	0.06	--	0.07	--	--	0.349	ND	75	7.9	7.8	11.5
158-081	T29N/R06E-05P01	9/2/93	No Data	ND	96	0.22	ND	--	--	0.03	0.017	--	2	--	--	0.2	ND	0.052	--	7.9	0.044	--	--	ND	1	3	--	34	--	8.4	0.4	19	0.4	132	0.05	--	ND	0.17	0.8	0.33	0.054	--	0.381	8.8	75	8.1	8	13.5

Appendix B.

Table B-1c. Water Quality Results Summary for Samples Collected by Snohomish County Public Works Surface Water Management.

						Metals & Inorganics																										Microorganisms		Physical						
SnoCo ID	Legal	Hydrogeologic Unit		Date and Time	Sample Number	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chloride	Chromium	Copper	Cyanide	Fluoride	Iron	Lead	Manganese	Mercury	Nickel	Nitrate	Nitrite	NO2-NO3	Selenium	Silver	Sodium	Sulfate	TDS	Thallium	TNN	Zinc	Fecal	Total coliforms	Color	Conductance, Field	Conductance, Lab	DO	Hardness	ph, field	Temperature	Turbidity
			symbol			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	ug/L	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	CFU/100 ml	CFU/100 ml	cu	mS/cm	mS/cm	mg/l	mg/l		deg C	NTU
035-067	T28N/R06E-06C01	Vashon advance outwash	Qva	6/12/2002 1:30:00 PM	280606C1	ND	0.002	ND	ND	ND	7.9	ND	ND	ND	ND	0.19	ND	ND	ND	0.003	ND	0.7	--	ND	ND	7	23.8	200	ND	0.7	0.05	ND	ND	5	0.20	0.29	3.777	145	7.12	11.32	1.7
				Duplicate	280606C2	ND	0.002	ND	ND	ND	7.8	ND	ND	ND	ND	0.21	ND	ND	ND	0.003	ND	0.7	--	ND	ND	7	23.7	200	ND	0.7	0.05	ND	ND	10	--	--	--	147	--	--	0.6
				3/18/2003 11:00:00 AM	031803	ND	0.0017	ND	ND	ND	7.92	ND	0.0011	--	ND	0.323	ND	ND	ND	ND	0.73	ND	775	ND	ND	7.24	25	--	ND	--	0.0466	--	ND	5	0.35	--	2.29	150	6.99	10	2.1
				Duplicate	031801	ND	0.0017	ND	ND	ND	7.88	ND	ND	--	ND	0.435	ND	ND	ND	ND	0.74	ND	774	ND	ND	7.48	25	--	ND	--	0.0437	--	ND	10	--	--	--	152	--	--	4.3
039-036	T28N/R06E-06D02	Upper coarse grained unit	Q(A)c	8/19/2002 12:03:00 PM	2866	ND	0.005	ND	ND	ND	5.8	ND	ND	ND	ND	0.18	ND	0.16	ND	0.003	ND	ND	--	ND	ND	8	20.5	200	ND	ND	0.02	ND	ND	10	0.30	0.27	--	132	7.52	11.81	0.6
				3/18/2003 10:05:00 AM	031801	ND	0.0023	0.0288	ND	ND	4.78	ND	0.019	--	ND	0.255	0.001	0.146	ND	ND	ND	ND	ND	ND	ND	7.36	13.2	--	ND	--	ND	--	ND	10	0.34	--	0.173	140	7.72	10.35	ND
Blank				3/18/2003 10:15:00 AM	031801 (B)	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	ND	--	ND	ND	--	--	--	ND	--	--	ND
056-032	T29N/R05E-36P04	Vashon advance outwash	Qva	8/19/2002 10:35:00 AM	36295	ND	0.012	ND	ND	ND	2.9	0.003	0.3	ND	ND	0.28	0.041	0.099	ND	0.006	ND	0.4	--	ND	ND	6	1.3	130	ND	0.4	0.63	ND	ND	15	0.18	0.17	--	81	7.40	18.39	1.1
057-031	T29N/R06E-05G02	Vashon advance outwash	Qva	8/19/2002 1:45:00 PM	5296	ND	0.016	ND	ND	ND	1.5	ND	ND	ND	0.4	1.7	0.003	0.37	ND	ND	ND	ND	--	ND	ND	8	2	120	ND	ND	0.05	ND	ND	25	0.15	0.14	--	55	7.01	11.79	2.7
				Duplicate	5296-1	ND	0.015	ND	ND	ND	1.5	ND	ND	ND	0.4	1.7	0.002	0.37	ND	ND	ND	ND	--	ND	ND	8	2	120	ND	ND	0.04	ND	ND	25	--	0.14	--	55	--	--	2.7
				3/17/2003 2:50:00 PM	031705	ND	0.014	0.0102	ND	ND	1.42	ND	ND	--	0.489	1.62	ND	0.31	ND	ND	ND	ND	ND	ND	ND	8.26	1.78	--	ND	--	ND	--	ND	30	0.15	--	0.36	56	7.08	10.88	3.1
057-050	T29N/R06E-05J03	Vashon advance outwash	Qva	8/20/2002 10:20:00 AM	5296	ND	0.006	ND	ND	ND	19	ND	ND	ND	ND	16.9	0.003	0.65	ND	0.002	ND	ND	--	ND	ND	8	5.9	220	ND	ND	0.14	ND	ND	70	0.40	0.34	--	163	6.60	11.49	101
				3/18/2003 12:25:00 PM	031801	ND	0.0045	0.0437	ND	ND	24.2	ND	0.0094	--	ND	20.7	0.006	0.684	ND	ND	ND	ND	ND	ND	ND	8.23	4.65	--	ND	--	0.653	--	9	240	0.50	--	1.85	187	6.59	9.94	180
058-006	T29N/R06E-09N01	Sedimentary	Ts	6/12/2002 3:21:00 PM	290609N2	ND	ND	ND	ND	ND	2.2	0.004	ND	ND	ND	ND	ND	0.19	ND	ND	ND	ND	--	ND	ND	41	ND	180	ND	ND	ND	ND	14	10	0.18	0.27	2.5	62	8.13	11.1	0.3
070-108	T31N/R05E-35D01	Upper coarse grained unit	Q(A)c	8/28/2002 11:30:00 AM	11305	ND	0.006	ND	ND	ND	2.1	ND	ND	ND	ND	0.13	0.002	0.015	ND	ND	ND	ND	--	ND	ND	5	4.8	120	ND	ND	0.031	ND	110	5	0.16	0.16	4.1	74	7.66	10.47	0.1
				Duplicate	11305-1	ND	0.006	ND	ND	ND	2.1	ND	ND	ND	ND	0.12	ND	0.015	ND	ND	ND	ND	--	ND	ND	5	4.7	120	ND	ND	0.022	ND	130	5	--	0.16	--	74	--	--	0.2
				3/5/2003 2:30:00 PM	030505	ND	0.0055	0.0238	ND	ND	1.92	ND	0.0023	--	ND	ND	ND	0.0139	ND	ND	ND	ND	ND	ND	ND	5.11	4.98	--	ND	--	ND	--	ND	5	0.16	--	2.55	73.3	7.71	9.76	ND
071-001	T30N/R05E-01A01	Vashon advance outwash	Qva	9/4/2002 9:55:00 AM	212305	ND	0.006	ND	ND	ND	2.5	0.003	ND	ND	ND	ND	ND	0.1	ND	ND	ND	0.3	--	ND	ND	5	5.3	120	ND	0.3	0.024	ND	ND	5	0.15	0.14	2.46	66	7.45	10.1	0.7
				3/5/2003 3:45:00 PM	030506	ND	ND	0.0207	ND	ND	2.26	ND	0.0075	--	ND	ND	ND	0.174	ND	ND	ND	ND	ND	ND	ND	5.58	2.54	--	ND	--	0.13	--	ND	5	0.17	--	0.22	71.8	7.62	9.09	ND
071-006	T30N/R05E-01J05	Vashon advance outwash	Qva	8/22/2002 10:30:00 AM	41305	ND	0.004	ND	ND	ND	7.1	0.003	0.19	ND	ND	ND	0.012	ND	ND	0.029	ND	0.6	--	ND	ND	6	6.5	160	ND	0.6	0.15	ND	ND	5	0.24	0.23	2.82	109	6.62	10.83	0.1
				3/5/2003 4:45:00 PM	030507	ND	0.031	0.0126	ND	ND	6.12	0.0025	0.0082	--	ND	0.728	ND	ND	ND	ND	0.74	ND	867	ND	ND	7.02	6.78	--	ND	--	0.0706	--	ND	5	0.24	--	3.18	105	6.83	7.85	2.8
071-020	T30N/R05E-02K01	Upper coarse grained unit	Q(A)c	8/28/2002 4:00:00 PM	42305	ND	0.002	ND	ND	ND	3.5	0.003	0.053	ND	ND	ND	ND	ND	ND	0.005	ND	0.4	--	ND	ND	9	6.2	200	ND	0.4	0.42	ND	ND	5	0.34	0.3	3.19	153	6.23	11.88	0.01
				3/5/2003 11:50:00 AM	030502	ND	0.001	ND	ND	ND	3.32	0.0016	0.0462	--	ND	ND	ND	ND	ND	0.0038	0.89	ND	1,010	ND	ND	8.5	22.2	--	ND	--	0.0414	--	ND	ND	0.30	--	7.82	126	6.12	10.99	ND
				Duplicate	030503	ND	0.0012	ND	ND	ND	3.25	0.0017	0.0345	--	ND	ND	0.0024	ND	ND	0.0039	0.9	ND	1,040	ND	ND	8.93	22.6	--	ND	--	0.0417	--	ND	ND	--	--	--	134	--	--	ND
071-028	T30N/R05E-02B03	Vashon advance outwash	Qva	8/28/2002 1:40:00 PM	22305	ND	ND	ND	ND	ND	2.7	ND	ND	ND	ND	ND	ND	0.12	ND	ND	ND	ND	--	ND	ND	5	7.1	140	ND	ND	ND	ND	ND	5	0.18	0.18	0.09	82	7.73	9.94	0.2
				3/4/2003 2:30:00 PM	030406	ND	ND	0.023	ND	ND	2.23	ND	0.0045	--	ND	0.238	ND	0.11	ND	ND	ND	ND	ND	ND	ND	5.51	4.54	--	ND	--	ND	--	ND	5	0.16	--	0.11	72	7.94	9.45	ND
071-034	T30N/R05E-02N02	Upper coarse grained unit	Q(A)c	9/3/2002 9:50:00 AM	12305	ND	0.003	ND	ND	ND	1.7	ND	ND	ND	ND	0.22	ND	0.1	ND	ND	ND	ND	--	ND	ND	6	ND	120	ND	ND	ND	ND	ND	10	0.14	0.14	0.09	60	7.92	11.49	0.6
				3/5/2003 2:55:00 PM	030504	ND	0.0013	ND	ND	ND	4.23	ND	0.0019	--	ND	ND	ND	ND	ND	ND	1.34	ND	1,520	ND	ND	5.87	10.5	--	ND	--	0.0476	--	2	5	0.18	--	11.07	79.9	7.28	7.62	ND
071-035	T30N/R05E-02E01	Upper coarse grained unit	Q(A)c	8/29/2002 10:50:00 AM	12305	ND	ND	ND	ND	ND	1.8	ND	0.026	ND	ND	ND	0.002	0.1	ND	0.003	ND	ND	--	ND	ND	5	1.3	110	ND	ND	0.012	ND	8	10	0.13	0.13	0.21	59	7.71	10.43	0.2
				3/5/2003 10:15:00 AM	030501	ND	ND	ND	ND	ND	1.69	ND	0.0022	--	ND	ND	ND	0.0895	ND	ND	ND	ND	ND	ND	ND	4.89	1.11	--	ND	--	ND	--	ND	5	0.13	--	0.09	54.3	7.84	9.27	ND
074-005	T30N/R05E-11A01	Vashon advance outwash	Qva	8/27/2002 9:45:00 AM	211305	ND	0.004	ND	ND	ND	2.9	ND	0.086	ND	ND	ND	0.003	0.44	ND	0.004	ND	0.2	--	ND	ND	5	6.5	110	ND	0.2	0.1	ND	ND	5	0.14	0.13	0.76	61	7.22	9.72	0.1
				3/6/2003 10:10:00 AM	030601	ND	0.0043	0.0126	ND	ND	2.66	ND	0.0075	--	ND	ND	ND	0.391	ND	ND	0.23	ND	186	ND	ND	5.82	6.47	--	ND	--	ND	--	ND	ND	0.13	--	0.11	55.8	7.16	9.18	ND
075-011	T30N/R05E-13J02	Vashon advance outwash	Qva	9/4/2002 12:10:00 PM	313305	ND	0.001	ND	ND	ND	5.7	ND	0.07	ND	ND	0.39	0.009	3.4	ND	ND	ND	ND	--	ND	ND	4	3.9	140	ND	ND	0.065	ND	ND	20	0.18	0.17	0.18	79	6.29	11.2	0.7
				3/10/2003 11:15:00 AM	031002	ND	0.0011	0.0264	ND	ND	5.79	0.001	0.0022	--	ND	0.857	ND	3.37	ND	0.0079	ND	ND	ND	ND	ND	4.07	4.12	--	ND	--	0.0615	--	ND	25	0.17	--	0.13	78.9	6.29	9.15	4.1
077-041	T30N/R05E-24F01	Vashon advance outwash	Qva	9/4/2002 2:25:00 PM	324305	ND	ND	ND	ND	ND	2.4	ND	ND	ND	ND	0.2	ND	0.13	ND	ND	ND	ND	--	ND	ND	6	1.5	130	ND	ND	ND	ND	ND	5	0.17	0.17	5.04	78	7.33	11.74	0.5
				3/10/2003 3:15:00 PM	031007	ND	0.0011	0.0135	ND	ND	2.32	ND	ND	--	ND	0.215	ND	0.1	ND	ND	ND	ND	34.8	ND	ND	6.64	1.54	--	ND	--	ND	--	ND	5	0.17	--	1.97	80.8	7.39	10.85	1.6
077-064	T30N/R05E-25Q04	Vashon advance outwash	Qva	8/20/2002 11:51:00 AM	25305	ND	0.003	ND	ND	ND	3	0.003	0.071	ND	ND	0.55	0.015	0.07	ND	ND	ND	0.5	--	ND	ND	5	9.2	130	ND	0.5	0.1	ND	ND	10	0.18	0.18	--	86	7.25	10.19	1.6
				3/13/2003 11:15:00 AM	031302	ND	0.0034	ND	ND	ND	2.72	0.0015	0.003	--	ND	0.228	0.0016	0.0462	ND	ND	0.38	ND	356	ND	ND	5.73	9.54	--	ND	--	0.0736	--	ND	ND	0.20	--	2.803	84.3	7.00	9.93	ND
077-068	T30N/R05E-25N01	Vashon advance outwash	Qva	6/12/2002 10:05:00 AM	300525M02	ND	0.001	ND	ND	ND	2.6	0.003	ND	ND	0.2	0.13	ND	0.16	ND	ND	ND	ND	--	ND	ND	8	ND	140	ND	ND	0.06	ND	ND	10	0.13	0.2	4	92	7.26	11.09	0.7
				3/13/2003 10:25:00 AM	031301	ND	0.001	0.0126	ND	ND	2.25	ND	0.0017	--	0.276	0.159	ND	0.138	ND	ND	ND	ND	ND	ND	ND	8.51	0.969	--	ND	--	0.0494	--	ND	ND	0.22	--	0.17	96.1	7.13	10.17	ND
081-086	T30N/R05E-01J01	Vashon advance outwash	Qva	8/22/2002 12:14:00 PM	435305	ND	0.009	ND	ND	ND	2.9	ND	0.043	ND	0.2	0.1	0.008	0.32	ND	ND	ND	ND	--	ND	ND	8	6.8	140	ND	ND	0.068	ND	30	5	0.21	0.21	0.1	94	7.53	10.31	0.3
				3/17/2003 1:15:00 PM	031703	ND	0.0087	0.0108	ND	ND	2.83	ND	ND	--	0.206	ND	ND	0.274	ND	ND	ND	ND	ND	ND	ND	8.55	6.48	--	ND	--	0.0546	--	ND	5	0.22	--	0.02	95.3	7.49	9.89	ND
				Duplicate	031704	ND	0.0087	0.0107	ND	ND	2.75	ND	0.0011	--	0.203	ND	ND	0.265	ND	ND	ND	ND	ND	ND	ND	8.41	6.29	--	ND	--	0.0503	--	ND	ND	--	--	--	96.2	--	--	ND
081-087	T30N/R05E-35K01	Vashon till	Qvt	3/17/2003 11:40:00 AM	031702	ND	0.0038	0.0155	ND	ND	7.66	ND	ND	--	ND	0.0205	ND	0.18	ND	ND	ND	ND	ND	ND	ND	7.08	15.6	--	ND	--	0.0172	--	ND	5	0.28	--	0.09	121	7.63	10.36	ND
081-109	T30N/R05E-36H02	Vashon advance outwash	Qva	8/19/2002 3:45:00 PM	3635	ND	0.021	0.06	ND	ND	2.7	0.003	ND	ND	0.3	4.1	0.015	0.21	ND	0.002	ND	ND	--	ND	ND	24	6.3	190	ND	ND	0.93	ND	ND	10	0.27	0.26	--	84	7.40	10.81	0.3
				3/17/2003 4:05:00 PM	031706	ND	0.0172	0.035	ND	ND	2.31	ND	0.0048	--	0.386	3.5	0.002	0.201	ND	ND	ND	ND	ND	ND	ND	22.8	6.48	--	ND	--	0.154	--	ND	45	0.27	--	1.36	81.2	7.45	10.7	20
082-010	T30N/R05E-25Q06	Vashon advance outwash	Qva	8/20/2002 1:50:00 PM	30536	ND	0.002	ND	ND	ND	5.8	ND	0.087	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	ND	45	16.6	140	ND	ND	0.015	ND	ND	5	0.56	0.19	0.28	ND	7.19	14.22	0.3
				Duplicate	305361	ND	0.002	ND	ND	ND	5.8	ND	0.086	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	ND	45	16.7	140	ND	ND	ND	ND	ND	5	--	0.19	--	ND	--	--	0.3
				3/17/2003 10:40:00 AM	031701	ND	0.0013	ND	ND	ND	7.66	ND	0.0649	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	44.3	16	--	ND	--	ND	--	ND	ND	0.21	--	0.15	ND	7.14	11.72	ND
082-022	T30N/R05E-36J01	Vashon till	Qvt	6/12/2002 4:45:00 PM	300536J01	ND	0.004	ND	ND	ND	5.2	0.003	ND	ND	ND	ND	ND	ND	ND	0.002	ND	0.4	--	ND	ND	8	17.2	180	ND	0.4	0.017	ND	ND	5	0.18	0.27	1.99	136	7.01	12.23	0.4
082-039	T30N/R05E-36R03	Vashon advance outwash	Qva	9/4/2002 2:50:00 PM	436305	ND	0.01	ND	ND	ND	2.5	ND	ND	ND	0.3	1.18	ND	0.1	ND	ND	ND	ND	--	ND	ND	13	3.9	150	ND	ND	2.6	ND	ND	15	0.24	0.23	0.07	85	7.57	11.33	4
				3/13/2003 3:15:00 PM	031306	ND	0.0148	0.0188	ND	ND	2.24	ND	ND	--	0.334	ND	ND	0.0715	ND	ND	ND	ND	ND	ND	ND	13.2	3.88	--	ND	--	0.066	--	ND	5	0.25	--	0.02	83	7.61	10.43	ND
Blank				3/13/2003 3:20:00 PM	031307	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	ND	--	ND	ND	--	--	--	ND	--	--	ND
083-083	T30N/R06E-04C02	Vashon advance outwash	Qva	8/26/2002 12:00:00 PM	34306	ND	0.009	ND	ND	ND	1.7	ND	0.43	ND	ND	0.22	0.036	0.041	ND	0.004	ND	ND	--	ND	ND	6	4.2	120	ND	ND	0.19	ND	ND	5	0.19	0.18	0.21	87	7.33	10.16	0.4
				3/6/2003 3:55:00 PM	030606	ND	0.0078	0.0165	ND	ND	1.59	ND	0.0012	--	ND	ND	ND	0.0371	ND	ND	ND	ND	ND	ND	ND	6.14	4.68	--	ND	--	0.0112	--	ND	5	0.20	--	0.09	84.4	7.39	9.83	ND
084-062	T30N/R06E-06B09	No Data	ND	9/4/2002 1:20:00 PM	26306	ND	0.006	ND	ND	ND	2.7	ND	0.026	ND	ND	0.4	ND	0.046	ND	ND	ND	0.2	--	ND	ND	5	7.7	120	ND	0.2	0.032	ND	ND	10	0.17	0.17	0.41	79	7.67	9.88	3
				3/6/2003 12:05:00 PM	030603	ND	0.0071	0.0124	ND	ND	2.3	ND	0.0016	--	ND	0.952	ND	0.0448	ND	ND	ND	ND	28.3	ND	ND	6.5	9.98	--	ND	--	0.0218	--	ND	20	0.18	--	0.11	76.3	7.84	9.52	11
Blank				3/6/2003 12:10:00 PM	030604	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	ND	--	ND	ND	--	--	--	ND	--	--	ND
084-073	T30N/R06E-06C03	Vashon till	Qvt	8/26/2002 3:30:00 PM	16306	ND	ND	ND	ND	ND	8.8	0.003	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.7	--	ND	ND	9	11.1	210	ND	3.7	ND	ND	ND	5	0.34	0.31	2	149	6.33	11.39	0.1
				3/6/2003 10:55 AM	030602	ND	ND	0.0107	ND	ND	9.86	0.0017	0.0239	--	ND	ND	ND	ND	ND	0.0026	4.8	ND	4,320	ND	ND	10.6	10.9	--	ND	--	0.0118	--	ND	ND	0.35	--	2.18	152	6.41	10.83	ND
085-060	T30N/R06E-08H02	Vashon advance outwash	Qva	8/22/2002 1:45:00 PM	28306	ND	0.001	ND	ND	ND	2	ND	ND	ND	ND	ND	ND	0.32	ND	ND	ND	ND	--	ND	ND	4	6.5	110	ND	ND	0.02	ND	ND	5	0.14	0.14	0.14	65	7.29	11.16	0.3
				3/10/2003 9:55:00 AM	031001	ND	ND	0.0129	ND	ND	2.08	ND	ND	--	ND	0.186	ND	0.272	ND	ND	ND	ND	ND	ND	ND	4.08	6.59	--	ND	--	0.0569	--	ND	ND	0.15	--	0.26	71.8	7.45	10.55	ND
088-005	T30N/R06E-15D01	Upper coarse grained unit	Q(A)c	8/27/2002 10:47:00 AM	115306	ND	0.011	ND	ND	ND	1.9	ND	0.43	ND	ND	ND	0.036	0.08	ND	0.002	ND	ND	--	ND	ND	6	17.8	190	ND	ND	0.053	ND	2	5	0.30	0.27	0.21	138	7.73	10.2	0.3
				3/11/2003 10:35:00 AM	031101	ND	0.0156	0.0138	ND	ND	1.77	ND	ND	--	ND	ND	ND	0.0703	ND	ND	ND	ND	ND	ND	ND	5.99	17.5	--	ND	--	0.0337	--	ND	ND	0.28	--	0.08	138	7.81	9.54	ND
089-039	T30N/R06E-15D04	Vashon till	Qvt	8/27/2002 12:50:00 PM	318306	ND	0.003	ND	ND	ND	2.4	0.004	0.057	ND	ND	0.32	0.004	0.023	ND	0.003	ND	0.8	--	ND	ND	5	3.3	100	ND	0.8	0.088	ND	ND	5	0.11	0.1	5.07	48	7.17	9.84	1.2
				3/10/2003 12:15:00 PM	031003	ND	0.0025	ND	ND	ND	2.28	0.0028	0.0096	--	ND	0.363	ND	ND	ND	ND	0.89	ND	931	ND	ND	4.74	3.38	--	ND	--	0.0538	--	ND	5	0.11	--	4.43	48.4	7.18	9.08	2
				Duplicate	031004	ND	0.0026	ND	ND	ND	2.32	0.0028	0.0094	--	ND	0.327	ND	ND	ND	ND	0.89	ND	936	ND	ND	4.79	3.37	--	ND	--	0.0545	--	ND	5	--	--	--	47.8	--	--	2.1
089-097	T30N/R06E-19F08	Vashon till	Qvt	8/21/2002 2:25:00 PM	NW19306-1	ND	0.016	ND	ND	ND	8.4	ND	ND	ND	ND	8.1	ND	0.41	ND	ND	ND	ND	--	ND	ND	4	3.9	120	ND	ND	ND	ND	ND	70	0.15	0.12	0.2	51	6.41	11.18	30
				Duplicate	NW19306	ND	0.015	ND	ND	ND	8.4	ND	ND	ND	ND	8.3	0.003	0.42	ND	ND	ND	ND	--	ND	ND	4	3.9	140	ND	ND	ND	ND	ND	70	--	0.12	--	52	--	--	25.1
				3/10/2003 1:10:00 PM	031005	ND	0.0147	0.0193	ND	ND	9.72	ND	ND	--	ND	8.76	ND	0.388	ND	ND	ND	ND	ND	ND	ND	4.6	4.49	--	ND	--	0.0166	--	ND	70	0.15	--	0.1	53.8	6.48	11.32	30
089-098	T30N/R06E-19E05	Vashon advance outwash	Qva	8/27/2002 2:15:00 PM	119306	ND	0.017	ND	ND	ND	2.6	ND	ND	ND	ND	1.04	ND	0.2	ND	ND	ND	ND	--	ND	ND	5	1.5	120	ND	ND	0.1	ND	ND	10	0.12	0.12	0.09	55	7.36	10.44	2.7
				3/10/2003 2:25:00 PM	031006	ND	0.0188	ND	ND	ND	2.58	ND	ND	--	ND	0.156	ND	5.01	ND	ND	ND	ND	ND	ND	ND	ND	1.25	--	ND	--	ND	--	ND	ND	0.12	--	0.04	54.2	7.42	10.15	ND
090-035	T30N/R06E-20B02	Vashon advance outwash	Qva	8/21/2002 11:45:00 AM	20306	ND	ND	ND	ND	ND	8.1	0.002	ND	ND	ND	0.3	ND	ND	ND	ND	ND	7.2	--	ND	ND	7	5.6	170	ND	7.2	0.031	ND	ND	5	0.27	0.26	7.92	118	6.76	10.22	0.5
				3/11/2003 3:05:00 PM	031105	ND	0.0019	ND	ND	ND	9.85	0.0016	0.0152	--	ND	0.634	0.0025	ND	ND	ND	10.7	ND	11,600	ND	ND	7.61	6.74	--	ND	--	0.0622	--	ND	5	0.31	--	8	133	6.84	10.08	1.3
091-001	T30N/R06E-21G05	Vashon advance outwash	Qva	8/21/2002 10:35:00 AM	21306	ND	0.008	ND	ND	ND	2.8	ND	ND	ND	ND	ND	0.004	0.08	ND	ND	ND	ND	--	ND	ND	6	7.2	130	ND	ND	0.011	ND	ND	5	0.17	0.17	0.18	75	7.69	10.43	0.1
				3/11/2003 12:30:00 PM	031103	ND	0.0082	ND	ND	ND	2.6	ND	ND	--	0.205	0.209	ND	0.0741	ND	ND	ND	ND	ND	ND	ND	6.2	7.37	--	ND	--	ND	--	ND	ND	0.18	--	0.1	78.5	7.70	9.52	ND
091-056	T30N/R06E-08H06	Vashon till	Qvt	8/22/2002 3:15:00 PM	122306	ND	ND	ND	ND	ND	2.7	ND	0.12	ND	ND	ND	ND	ND	ND	ND	ND	1.7	--	ND	ND	4	4.5	70	ND	1.7	0.039	ND	240	5	0.07	0.08	7.1	28	5.75	11.27	0.1
				3/11/2003 11:30:00 AM	031102	ND	ND	ND	ND	ND	4.96	ND	0.138	--	ND	ND	ND	ND	ND	0.0012	5.79	ND	5,740	ND	ND	6.29	5.92	--	ND	--	0.0442	--	1	ND	0.14	--	7.54	53.2	5.80	10.47	ND
091-082	T30N/R06E-22J05	Vashon recessional outwash	Qvr	9/5/2002 12:05:00 PM	122306	ND	ND	ND	ND	ND	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4	--	ND	ND	6	8.6	100	ND	4	0.017	ND	ND	5	0.14	0.14	6.7	57	5.64	10.79	0.2

						Metals & Inorganics																										Microorganisms		Physical							
SnoCo ID	Legal	Hydrogeologic Unit		Date and Time	Sample Number	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chloride	Chromium	Copper	Cyanide	Fluoride	Iron	Lead	Manganese	Mercury	Nickel	Nitrate	Nitrite	NO2-NO3	Selenium	Silver	Sodium	Sulfate	TDS	Thallium	TNN	Zinc	Fecal	Total coliforms	Color	Conductance, Field	Conductance, Lab	DO	Hardness	ph, field	Temperature	Turbidity
			symbol			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	ug/L	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	CFU/100 ml	CFU/100 ml	cu	mS/cm	mS/cm	mg/l	mg/l		deg C	NTU
092-016	T30N/R06E-22N07	Vashon advance outwash	Qva	8/20/2002 3:00:00 PM	22306	ND	0.006	ND	ND	ND	3.1	ND	0.085	ND	ND	0.44	0.016	0.09	ND	0.004	ND	ND	--	ND	ND	8	12.8	150	ND	ND	0.14	ND	ND	10	0.22	0.22	0.26	104	7.70	10.81	1.7
				3/11/2003 1:35:00 PM	031104	ND	0.0056	0.0135	ND	ND	3.2	ND	0.0348	--	ND	0.454	0.0089	0.081	ND	0.0015	ND	ND	ND	ND	ND	8.44	12.9	--	ND	--	0.0471	--	ND	15	0.23	--	0.9	106	7.96	10.46	14
093-029	T30N/R06E-28F02	Vashon advance outwash	Qva	9/5/2002 11:05:00 AM	228306	ND	0.004	ND	ND	ND	2.6	ND	0.29	ND	ND	ND	ND	0.19	ND	ND	ND	ND	--	ND	ND	7	6.5	100	ND	ND	0.044	ND	ND	5	0.16	0.16	0.13	72	7.48	10	0.3
				3/12/2003 1:30:00 PM	031203	ND	0.0033	0.0143	ND	ND	2.36	ND	ND	--	0.28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.34	6.82	--	ND	--	0.0403	--	ND	ND	0.21	--	0.023	ND	7.59	9.62	ND
				Duplicate	031204	ND	0.0033	ND	ND	ND	2.39	ND	ND	--	0.28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.341	6.82	--	ND	--	0.0345	--	ND	ND	--	--	--	ND	--	--	ND
093-072	T30N/R06E-29H01	Vashon advance outwash	Qva	8/21/2002 1:10:00 PM	29306	ND	ND	ND	ND	ND	4.2	ND	ND	ND	ND	ND	0.003	ND	ND	ND	ND	2.5	--	ND	ND	7	2.5	140	ND	2.5	ND	ND	ND	5	0.20	0.19	3.69	90	6.32	10.51	0.2
				3/11/2003 4:00:00 PM	031106	ND	ND	ND	ND	ND	4.32	ND	0.0072	--	ND	3.18	0.0045	0.0296	ND	0.0012	2.98	ND	3,180	ND	ND	7.24	2.34	--	ND	--	0.0192	--	ND	30	0.20	--	3.38	89.1	6.38	10.08	18
Blank				3/11/2003 4:10:00 PM	031107	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	ND	--	ND	5	--	--	--	ND	--	--	ND
093-100	T30N/R06E-30P01	Vashon advance outwash	Qva	6/12/2002 5:10:00 PM	300630Q01	ND	0.002	ND	ND	ND	2.2	ND	ND	ND	ND	0.17	ND	0.01	ND	ND	ND	0.8	--	ND	ND	5	5	80	ND	0.8	0.019	ND	ND	10	0.06	0.1	4.55	43	7.51	10.3	2.2
				3/12/2003 4:35:00 PM	031207	ND	0.0016	ND	ND	ND	2.12	ND	0.0022	--	ND	0.231	0.0014	0.198	ND	ND	0.87	ND	986	ND	ND	4.58	5.02	--	ND	--	0.0423	--	1	5	0.10	--	4.87	40.6	7.33	9.67	ND
093-104	T30N/R06E-31B01	Vashon advance outwash	Qva	9/5/2002 2:10:00 PM	131306	ND	ND	ND	ND	ND	3.3	ND	ND	ND	ND	ND	ND	ND	ND	0.004	ND	2.3	--	ND	ND	4	2.8	70	ND	2.3	ND	ND	ND	5	0.08	0.09	8.56	38	5.99	12.06	0.1
				Duplicate	131306-1	ND	ND	ND	ND	ND	3.6	ND	ND	ND	ND	ND	ND	ND	ND	0.004	ND	2.3	--	ND	ND	4	2.8	70	ND	2.3	ND	ND	ND	5	--	0.09	--	37	--	--	0.1
				3/12/2003 3:35:00 PM	031206	ND	ND	ND	ND	ND	2.89	ND	0.0063	--	ND	ND	ND	ND	ND	0.0042	2.08	ND	2,300	ND	ND	4.39	3.29	--	ND	--	ND	--	ND	ND	0.10	--	8.53	38.3	6.08	10.48	3
094-001	T30N/R06E-31B02	Vashon advance outwash	Qva	9/5/2002 3:05:00 PM	323105	ND	ND	ND	ND	ND	3.4	ND	0.92	ND	ND	ND	ND	ND	ND	ND	ND	2.4	--	ND	ND	5	4.3	90	ND	2.4	ND	ND	ND	5	0.12	0.12	9.99	50	6.01	11.73	0.1
				3/13/2003 12:25:00 PM	031303	ND	ND	ND	ND	ND	2.54	ND	0.142	--	ND	ND	ND	ND	ND	ND	2.14	ND	2,590	ND	ND	5.6	3.64	--	ND	--	ND	--	ND	ND	0.12	--	9.47	45.3	6.24	10.78	ND
094-041	T30N/R06E-32D03	Vashon advance outwash	Qva	8/26/2002 1:55:00 PM	132306	ND	0.001	ND	ND	ND	5.6	ND	ND	ND	ND	0.34	ND	0.14	ND	ND	ND	ND	--	ND	ND	6	3.4	90	ND	ND	0.02	ND	ND	10	0.13	0.13	0.13	58	7.25	11.18	0.6
				Duplicate	132306-1	ND	0.002	ND	ND	ND	5.8	ND	ND	ND	ND	0.31	ND	0.13	ND	ND	ND	ND	--	ND	ND	5	3.5	90	ND	ND	0.014	ND	ND	10	--	0.13	--	55	--	--	0.5
				3/12/2003 3:00:00 PM	031205	ND	0.0012	ND	ND	ND	12.8	ND	0.0012	--	ND	0.595	ND	0.13	ND	ND	ND	ND	ND	ND	ND	6.15	8.1	--	ND	--	0.0273	--	ND	10	0.18	--	0.02	73.9	7.24	10.36	3
094-073	T30N/R06E-32L04	Vashon till	Qvt	9/4/2002 10:55:00 AM	432306	ND	0.005	ND	ND	ND	4.6	ND	ND	ND	ND	0.43	ND	0.16	ND	0.01	ND	ND	--	ND	ND	6	2.8	150	ND	ND	0.03	ND	ND	10	0.22	0.21	0.36	101	7.41	12.33	2
				3/13/2003 1:55:00 PM	031304	ND	0.0046	0.0201	ND	ND	5.5	0.0011	0.0137	--	ND	0.731	ND	0.179	ND	0.0011	ND	ND	ND	ND	ND	7.2	3.06	--	ND	--	0.0127	--	ND	10	0.24	--	3.87	110	7.59	11.64	5.3
Blank				3/13/2003 2:00:00 PM	031305	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	ND	--	ND	ND	--	--	--	ND	--	--	ND
094-095	T30N/R06E-33Q02	Vashon advance outwash	Qva	9/3/2002 2:20:00 PM	433306	ND	0.005	ND	ND	ND	3.2	ND	ND	ND	ND	ND	ND	0.079	ND	ND	ND	ND	--	ND	ND	5	11.8	120	ND	ND	0.016	ND	4	5	0.16	0.16	0.08	73	7.90	10.69	0.2
				3/12/2003 10:35:00 AM	031201	ND	0.0045	ND	ND	ND	3.11	ND	ND	--	ND	ND	ND	0.0648	ND	ND	ND	ND	ND	ND	ND	5.25	11.7	--	ND	--	0.015	--	3	ND	0.17	--	1	72.2	7.89	9.97	ND
110-027	T31N/R05E-14Q02	Vashon advance outwash	Qva	8/29/2002 3:20:00 PM	414315	ND	ND	ND	ND	ND	5.9	0.003	ND	ND	ND	ND	0.002	ND	ND	0.002	ND	1.4	--	ND	ND	4	5.7	90	ND	1.4	ND	ND	ND	5	0.11	0.1	9.12	48	6.45	8.23	0.2
				3/3/2003 10:27:00 AM	030301	ND	ND	ND	ND	ND	7.6	0.0031	0.004	--	ND	0.317	0.0015	0.0108	ND	0.0027	1.11	ND	1,170	ND	ND	4.14	9.33	--	ND	--	ND	--	ND	ND	0.11	--	8.65	51.4	6.50	8.07	1.5
112-038	T31N/R05E-23N03	Vashon till	Qvt	8/29/2002 5:00:00 PM	323105	ND	0.005	ND	ND	ND	5.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	ND	54	11.4	190	ND	ND	ND	ND	ND	10	0.24	0.23	0.31	ND	6.97	12.65	0.2
				3/3/2003 4:00:00 PM	030305	ND	0.0049	ND	ND	ND	6.86	ND	0.0018	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	59.4	12.7	--	ND	--	0.0102	--	ND	ND	0.25	--	0.03	ND	6.98	10.33	ND
113-007	T31N/R06E-30F03	Vashon advance outwash	Qva	9/3/2002 12:47:00 PM	225315	ND	0.01	ND	ND	ND	2.8	ND	ND	ND	ND	0.24	ND	ND	ND	ND	ND	ND	--	ND	ND	46	11.1	170	ND	ND	0.02	ND	ND	5	0.20	0.19	0.14	ND	8.06	12.45	1.6
				3/4/2003 11:15:00 AM	030402	ND	ND	0.0108	ND	ND	2.58	ND	0.0078	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	49.2	11.3	--	ND	--	0.0149	--	ND	ND	0.20	--	4.42	ND	7.97	9.44	ND
113-023	T31N/R05E-25J04	Vashon advance outwash	Qva	9/3/2002 10:55:00 AM	425315	ND	0.015	ND	ND	ND	2.4	ND	ND	ND	ND	0.18	ND	ND	ND	ND	ND	ND	--	ND	ND	6	10	150	ND	ND	0.087	ND	ND	5	0.19	0.18	0.26	86	7.83	10.03	0.7
				3/3/2003 12:25:00 PM	030302	ND	0.0153	0.0264	ND	ND	2.14	ND	ND	--	ND	ND	ND	0.0362	ND	ND	ND	ND	ND	ND	ND	7.35	10.1	--	ND	--	0.0248	--	ND	ND	0.19	--	0.12	85	7.72	9.76	ND
113-049	T31N/R05E-26B02	Vashon advance outwash	Qva	9/5/2002 1:00:00 PM	126315	ND	0.008	ND	ND	ND	2.2	0.003	ND	ND	ND	1.37	0.003	0.029	ND	0.002	ND	ND	--	ND	ND	6	9.4	130	ND	ND	0.059	ND	ND	10	0.20	0.19	1.31	91	7.17	10.28	1
				8/29/2002 1:50:00 PM	218316	ND	0.002	ND	ND	ND	5.9	0.008	0.038	ND	ND	0.11	0.002	ND	ND	0.003	ND	ND	--	ND	ND	6	3.7	140	ND	ND	0.031	ND	17	5	0.19	0.18	7.16	82	6.81	10.58	0.2
113-073	T31N/R05E-26D06	Vashon advance outwash	Qva	8/29/2002 2:00:00 PM	218316-1	ND	0.002	ND	ND	ND	5.6	ND	0.038	ND	ND	0.13	0.003	ND	ND	0.002	ND	2.5	--	ND	ND	6	3.7	140	ND	2.5	0.031	ND	2	5	--	0.18	--	82	--	--	0.2
				3/3/2003 1:50:00 PM	030303	ND	0.002	ND	ND	ND	5.14	0.0078	0.0351	--	ND	ND	ND	ND	ND	ND	2.94	ND	2,840	ND	ND	6.56	3.55	--	ND	--	0.0428	--	5	ND	0.17	--	6.87	75	6.69	10.41	ND
				Duplicate	030304	ND	0.0022	ND	ND	ND	5.21	0.0847	0.052	--	ND	ND	ND	ND	ND	0.001	2.98	ND	2,690	ND	ND	6.49	3.57	--	ND	--	0.0729	--	9	ND	--	--	--	72.5	--	--	ND
113-078	T31N/R05E-26C04	Vashon advance outwash	Qva	8/28/2002 2:35:00 PM	126315	ND	0.006	ND	ND	ND	1.8	ND	0.15	ND	0.2	2.5	ND	0.22	ND	ND	ND	ND	--	ND	ND	6	ND	130	ND	ND	ND	ND	ND	15	0.17	0.16	0.1	75	7.51	11.91	6
				3/19/2003 10:30:00 AM	031801	ND	0.0064	ND	ND	ND	1.67	0.0033	0.0062	--	0.204	ND	0.0011	ND	ND	0.0017	ND	ND	ND	ND	ND	39.1	ND	--	ND	--	ND	--	ND	5	0.17	--	0.1	ND	7.43	9.72	ND
115-083	T31N/R05E-35C01	Upper coarse grained unit	Q(A)c	8/28/2002 3:55:00 PM	135315B	ND	ND	ND	ND	ND	1.8	ND	ND	ND	ND	ND	ND	0.23	ND	ND	ND	ND	--	ND	ND	5	ND	130	ND	ND	ND	ND	ND	5	0.15	0.15	0.13	72	7.61	10.49	0.2
				3/4/2003 12:51:00 PM	030403	ND	ND	0.0217	ND	ND	1.75	ND	ND	--	ND	ND	ND	0.216	ND	ND	ND	ND	ND	ND	ND	5.48	ND	--	ND	--	ND	--	ND	5	0.15	--	0.1	70.9	7.60	9.54	ND
Blank				3/4/2003 1:00:00 PM	030404	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	ND	--	ND	ND	--	--	--	ND	--	--	ND
115-084	T31N/R05E-35D02	Pre-Fraser, Upper fine (Qtb)	Qtb	8/28/2002 10:05:00 AM	135315A	ND	ND	ND	ND	ND	2	ND	ND	ND	ND	0.63	ND	0.1	ND	ND	ND	ND	--	ND	ND	5	ND	140	ND	ND	ND	ND	ND	10	0.16	0.16	7.26	75	6.98	11.11	1
				3/4/2003 1:45:00 PM	030405	ND	0.0016	0.0612	ND	ND	1.79	0.0027	0.0192	--	ND	5.23	ND	0.595	ND	ND	ND	ND	ND	ND	ND	5.71	ND	--	ND	--	ND	--	ND	30	0.15	--	8.39	72.6	7.10	10.35	5.3
115-119	T31N/R05E-35R04	Vashon advance outwash	Qva	8/28/2002 1:50:00 PM	435315	ND	0.002	ND	ND	ND	4.3	ND	ND	ND	ND	0.86	ND	0.16	ND	0.004	ND	0.2	--	ND	ND	6	5.6	140	ND	0.2	ND	ND	ND	10	0.20	0.19	1.8	90	6.77	11.79	5
				3/4/2003 3:05:00 PM	030407	ND	ND	0.017	ND	ND	4.12	ND	0.0037	--	ND	0.773	ND	0.0849	ND	0.0015	ND	ND	74.6	ND	ND	6.02	4.5	--	ND	--	ND	--	ND	20	0.17	--	1.95	75.7	6.91	9.14	10
118-016	T31N/R06E-18C02	Vashon advance outwash	Qva	8/29/2002 12:02:00 PM	118316	ND	0.003	ND	ND	ND	2.5	0.006	ND	ND	ND	ND	ND	ND	ND	0.002	ND	2.3	--	ND	ND	4	4	100	ND	2.3	0.1	ND	ND	5	0.12	0.12	9.92	49	7.32	9.66	0.3
				3/4/2003 10:10:00 AM	030401	ND	0.0032	ND	ND	ND	2.45	0.0052	0.0224	--	ND	0.458	0.0022	ND	ND	ND	2.56	ND	2,290	ND	ND	4.46	3.85	--	ND	--	0.123	--	ND	5	0.12	--	8.94	49.5	7.36	8.97	2
120-034	T31N/R05E-25J05	Vashon till	Qvt	9/3/2002 12:10:00 PM	17306	ND	0.008	ND	ND	ND	2.8	ND	ND	ND	ND	3.9	ND	0.7	ND	0.003	ND	ND	--	ND	ND	4	ND	160	ND	ND	0.1	ND	ND	30	0.20	0.18	0.11	92	7.09	9.85	13
				3/6/2003 2:35:00 PM	030605	ND	0.0021	0.0138	ND	ND	2.14	ND	ND	--	ND	0.28	ND	0.206	ND	ND	ND	ND	ND	ND	ND	16.8	1.04	--	ND	--	0.156	--	ND	10	0.20	--	0.01	71.7	7.22	9.53	ND
121-052	T30N/R06E-08H07	Vashon advance outwash	Qva	8/26/2002 10:45:00 AM	333316	ND	0.008	ND	ND	ND	1.9	ND	0.04	ND	ND	0.28	0.008	0.07	ND	ND	ND	ND	--	ND	ND	5	7.1	130	ND	ND	0.13	ND	ND	5	0.19	0.18	7.6	91	11.85	--	0.2
				3/18/2003 2:00:00 PM	031801	ND	0.0085	0.0202	ND	ND	1.8	ND	0.002	--	ND	0.255	ND	0.0518	ND	ND	ND	ND	ND	ND	ND	4.95	7.22	--	ND	--	ND	--	ND	10	0.20	--	0.08	86.9	7.74	9.75	ND
165-099	T30N/R06E-33R01	No Data	ND	9/5/2002 4:05:00 PM	433306	ND	0.013	ND	ND	ND	2.1	ND	ND	ND	0.2	ND	ND	0.27	ND	0.003	ND	ND	--	ND	ND	15	10.1	160	ND	ND	0.024	ND	ND	5	0.28	0.26	0.69	110	7.94	13.97	0.3
				3/12/2003 11:20:00 AM	031202	ND	0.0112	0.0143	ND	ND	1.76	ND	ND	--	0.28	ND	ND	0.0228	ND	ND	ND	ND	ND	ND	ND	15.2	9.99	--	ND	--	0.113	--	6	ND	0.28	--	0.04	106	8.05	10.11	ND

APPENDIX C. DATA QUALITY OBJECTIVES AND ANALYSIS

C.1 Introduction

The following details the field and analytical laboratory procedures used by the project team to collect and process the field, laboratory, and outside data for the Getchell Plateau Groundwater Investigation. A discussion of the data review, verification, and validation procedures applied to the collected and complied data is included in this Appendix as well. All of the data collected, and analyzed for this investigation were processed in accordance the Getchell Plateau Groundwater Investigation Quality Assurance Project Plan (QAPP; SWM, 2002).

Data collected for this investigation is separated into three categories:

- water level measurements,
- water quality sampling, and
- compilation of published and unpublished water level and water quality data.

C.2 Sample Design

C2.1 Sample Distribution

All of the data collected for this investigation is location dependent, so high quality information on the location of each well is required prior to sampling and data analysis. The wells chosen for sampling by the project team and the data from previous sampling events were selected based on the following criteria.

1. Spatial distribution—the data location points (wells) were selected so that all areas of the Getchell Plateau are represented (Figures 2-2 and 2-3).
2. Hydrogeologic distribution—wells were selected so that each aquifer was represented by at least one well.
3. The advance outwash aquifer—more wells were selected to represent the advance outwash aquifer since a majority of the Getchell Plateau wells penetrate this aquifer.
4. Land use distribution—wells were selected so that a range of landuses and densities were represented.
5. Previous sampling—since this investigation was designed to build on previous studies, priority was be given to sampling wells that had been sampled previously.
6. New sampling—preference was given, when selecting wells for first-time sampling in during 2002 and 2003, to areas of the plateau that had not been previously sampled.
7. Well location—data were utilized where the location of the well was known to within 10 acres. The location of the wells sample by the project team in 2002 and 2003 were located with a GPS device.
8. Well elevation—the elevation at each wellhead was determined using the well's location and digital elevation data.
9. Basic well data—wells where selected only if there was a water well report is on file with Ecology or in the Snohomish County water well log database.
10. Water quality samples—wells with water quality data where utilized only if the well's dominant use is to supply domestic drinking water.

C.2.2 Measurements and Well Sampling Procedure

The following discussion of the measurements and well sampling procedures pertains to the samples collected by the project team during 2002 and 2003.

C.2.2.1 Water-Level Measurement

Depth to groundwater was measured from a reference point of known elevation prior. All depth measurements were determined to the nearest 0.01 foot using an electronic well probe. The elevation of the reference point was established by adding wellhead stickup distance to the surface elevation derived from the digital elevation data.

The reference point was permanently marked using a method suitable to the construction of the well casing. The depth to groundwater was measured when the field personnel first arrive at the well, repeated a short time later to determine if the water level is recovering from recent pumping, and following sample collection to determine the drawdown that occurred during well purging.

C.2.2.2 Well Preparation and Sampling

The project team collected samples from domestic wells only, so it was possible to obtain a sample from a tap utilizing the down-hole electric pump. The tap closest to the wellhead was used at each well. To prevent backflow from the pressure tank, the pump was running at the time each sample was collected.

Equipment Calibration

All water quality data collected in the field—conductivity, dissolved oxygen, pH, and temperature—were collected using a multi-parameter HydroLab™ water quality probe (Figure 2-5). The HydroLab™ was calibrated according to the instrument manufacture's instructions according to the schedule listed in Table C-1. The project team calibrated the field equipment at the start and end of each day. The calibration results were recorded in the instrument calibration log. The project team periodically checked the field equipment to ensure that it is working properly so that any deviations in calibration are noted and corrected quickly.

Field Measurements

Field measurements were obtained from a sampling tee secured to the tap selected for sampling (Figure 2-6). One side of the sampling tee was fitted with a flow chamber connected to the HydroLab™. The other side of the sampling tee was used for overflow and pressure relief. Discharge from the pressure relief was directed into a container so that the purge volume could be monitored. The sampling tee allowed continuous collection of field measurements, continuous purge volume monitoring, and an uninterrupted purge.

Well Purging

To collect a representative sample of the aquifer and not the water in the well casing, each well was purged three to five casing volumes prior to sample collection. The well casing volume was calculated using the depth of the well, the depth to water, and the well diameter. The depth of the well and the well diameter were taken from the Ecology water well report (unless otherwise indicated on the field data sheet). The volume of water pumped from the well was measured using a bucket of known volume and a stopwatch.

Temperature, dissolved oxygen, conductivity, and pH were monitored while the well was purged. The above field parameters were recorded on the field data sheet after each casing volume has been removed. Water was purged from the well continued until the field measurements stabilized to within ±10 percent of the previous value.

Sample Collection

The water quality samples were collected once the field parameters had stabilized. The samples were collected directly from the tap used purge the well. Following the removal of the sampling tee, the tap was turned on and allowed to run for the duration of the sample collection. The bacteria sample container was filled first followed by the filling of the metals and inorganics containers. As required by the QAPP, all water samples were placed directly in containers with the appropriate preservatives provided by the analytical laboratory (Table C-2).

Quality Control Sampling

Quality control was maintained and checked throughout the investigation by collecting field duplicates, laboratory splits, field blanks, and matrix spikes. The quality control sampling schedule is detailed in Table C-3.

Sample Identification

Each sample bottle was labeled with a unique sample identification number, project name, date, time the sample was taken, analytical suite, preservatives type (if any), and samplers name(s). The full sample container was transferred to the transport container. The samples were packed on ice or cold packs for transport to the laboratory.

Field Equipment Decontamination Procedures

The electronic water level probe was decontaminated after each use with a non-phosphatic soap and de-ionized water solution, rinsed three times with de-ionized water, rinsed with a 1:1 methanol to de-ionized water rinse, and rinsed again with de-ionized water, before being allowed to air dry. Any material adhering to the well probe was removed prior to cleaning with a clean paper towel.

Each water quality sample was collected directly from a tap following the removal of the sampling tee. Therefore, since the sampling tee and the attached tubing were not used to collect the sample, it was cleaned by flushing with large volumes of clean well water. The equipment was inspected at the start and end of each day and after each use to determine if any material from transport or the pervious well had

Table C-1. HydroLab™ Calibration.

Meter	Calibration	Frequency
Conductivity	Calibrate to known standards within the range of expected conductance	As needed—at least twice per day, including end of day instrument check
Dissolved oxygen	Calibrate to known standards	As needed—at least twice per day, including end of day instrument check
pH	Calibrate to pH 7, 4 (acidic samples) or 10 (basic samples)	As needed—at least twice per day, including end of day instrument check

Table C-3. Quality Control Sample Schedule.

Control Sample		Inorganic Constituents	Microbiology
Field	Duplicate	1 per 10 samples or every other sampling day	1 per 10 samples or every other sampling day
	Blank	1 per 10 samples or every other sampling day	1 per 10 samples or every other sampling day
Laboratory	Method Blank	2 per 20 samples	2 per 20 samples
	Spike	1 per batch	1 per batch
	Martix Spike	1 per sampling round (minimum)	1 per sampling round (minimum)
	Split	1 per batch	1 per batch
	Check Standard	1 per batch	1 per batch

adhered to the equipment. Any material adhering to the sampling tee or tubing was removed by flushing with water or wiping with a clean paper towel wipe. The sampling tee connector was rinsed with de-ionized water prior to being connected to tap used for purging and sampling.

Sample Transport and Chain-of-Custody

All samples were transported to the analytical laboratory in a cooler and chilled on ice or ice packs to 4°C. Samples were delivered to the analytical laboratory by the project team at the end of each day.

Table C-2. Analytical Method, Sample Container Type, and Perservative.

Analysis	Minimum quantity required	Container	Holding Time	Preservative[1]	EPA Method Number
Primary Drinking Water Parameters					
Antimony	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	3113 B[4]
Arsenic	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	3113 B[4]
Barium	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	200.7
Beryllium	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	200.7
Cadmium	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	3113 B[4]
Chromium	125 ml	poly	24 hours	Cool to 4°C	200.7
Copper	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	200.7
Cyanide	500 ml	glass or poly	14 days	0.6 g asorbic acid; cool to 4°C	4500 CN-F[4]
Fluoride	500 ml	amber n/m poly	28 days	HNO_3 to pH<2; cool to 4°C	300.0 A
Lead	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	3113 B[4]
Mercury	500 ml	poly	28 days	HNO_3 to pH<2; cool to 4°C	245.1
Nickel	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	200.7
Nitrate	125 ml	brown poly	28 days	H_2SO_4 to pH<2; cool to 4°C	300.0
Nitrite	125 ml	brown poly	28 days	H_2SO_4 to pH<2; cool to 4°C	300.0
Selenium	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	200.9
Sodium	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	200.7
Thallium	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	200.9
Secondary Drinking Water Parameters					
Chloride	100 ml	500 ml w/m poly	28 days	Cool to 4°C	300.0
Iron	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	200.7
Manganese	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	200.7
Silver	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	200.7
Sulfate	100 ml	500 ml w/m poly[2]	28 days	Cool to 4°C	200.7
Zinc	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	200.7
Microbiology					
Total coliform	250 ml	250 ml ploy bag[3]	24 hours	Cool to 4°C	
Physical Characteristics					
Color	50 ml	125 ml HDPE	48 hours	Cool to 4°C	2120 B[4]
Specific conductance	300 ml	500 ml w/m poly	28 days	Cool to 4°C	2510 B[4]
Total dissolved solids	250 ml	500 ml w/m poly	7 days	Cool to 4°C	2540 B[4]

[1]Container is sent by lab with preservative in it.

[2]May be able to analyze several general chemistry parameters from the same container.

[3]If chlorine is suspected in sample, then request bottle with thiosulfate preservative in it.

[4]Standard Methods for the Examination of Water and Wastewater method number.

Prior to leaving each site, the samples were checked to ensure that the correct number of bottles has been filled and the labels have been properly completed. Analysis request and chain of custody forms were completed for each shipment.

C.2.3 Parameter Selection

This investigation focused on sampling wells used primarily for domestic water supply. Therefore, the project team chose to sample for analytes on the State primary and secondary drinking water standards list (Table 2-4). The project team collected unfiltered samples since the primary and secondary drinking water standards are based on total metals. In addition to the State drinking water standards, the water quality samples submitted to the Snohomish Health District are unfiltered as well. The total metals values obtained by the project team were qualitatively compared with the dissolved metals values obtained by the USGS (Table 4-4; Thomas et al., 1997).

C.2.4 Aquifer Property Testing

The project team estimated the aquifer properties, hydraulic conductivity and transmissivity, for 540 wells utilized data recorded by the well driller and detailed on the Ecology water well report. The project team applied the methods detailed in Chapter 3; Hydrogeology, to all of the available data. Two test of accuracy were applied to the results. First, the results were comparison with values known for comparable aquifer materials (Freeze and Cherry, 1982). The calculated hydraulic conductivities and transmissivities were considered reprehensive if they were within an order of magnitude of the publish values. Second, hydraulic conductivities and transmissivities were recalculated for the wells where these values had previously been determined by the USGS (Thomas et al., 1996). The second set of hydraulic conductivities and transmissivities were considered reprehensive if they agreed with the original values. Unfortunate, the agreement was not consistent. This inconstancy is discussed below.

C.3 Data Validation Process and Methods

All data were reviewed for completeness at each stage of the project.

C.3.1 Field Data Validation

The field data sheets were reviewed for completeness by the project team before dismantling the sampling equipment at each sample location. Any missing data were added to the field sampling data sheet prior to leaving the sample site. The field data sampling sheets were reviewed again for completeness when photocopied at the end of each field day.

The field data, depth to groundwater, temperature, dissolved oxygen, conductivity, and pH, were entered into the Snohomish County groundwater quality database at the end of each sampling round. The project team crosschecked at least 20 percent of recent database entries against randomly selected field data sheets.

C.3.1.1 Corrective Action

The project team took corrective action whenever a deficiency was noted in an instrument reading or on a field data sheet sample result or analytical report was noted. All corrective actions taken were noted in the instrument calibration log or on the appropriate field data sheet.

C.3.2 Laboratory Data Validation

C.3.2.1 Laboratory Data Reports

Project personnel reviewed all incoming analytical laboratory reports. The analytical reports were reviewed for completeness by comparing the results with the analytical request submitted with the samples. The analytical laboratory reports received an initial scan to detect anomalous results, contaminated blanks, or other potential problems. The project team reported any missing data, anomalous results, or potentially contaminated samples to the analytical laboratory immediately. Archive, project, and working copies of the analytical laboratory reports were made following the initial review of the analytical reports.

The laboratory sampling data were entered into the Snohomish County groundwater quality database shortly after the data were received. The project team crosschecked at least 20 percent of recent database entries against randomly selected analytical laboratory reports.

Corrective Action

The project team took corrective action whenever a deficiency in an analytical report was noted.

C.3.2.2 Analytical Methods

The analytical methods used by the contract laboratory were cited in the laboratory’s approved Quality Assurance Plan, and corresponded to the methods cited in Table C-4. The reference methods, detection limits, and acceptable ranges for bias, precision, and accuracy are presented in Table C-4, and were negotiated as contractual requirements between Snohomish County Public Works and the analytical laboratory. Both laboratories used to process samples from this study are accredited by Ecology.

C.3.2.3 Statistical Tests

Results from the laboratory method blank, spike, split, and control standard samples were evaluated statistically to ensure the results meet the accuracy standards established in Table C-4. All statistical calculation of this study was performed using statistical routines available in standard electronic spreadsheets.

Precision

Precision is a measure of how close the computed value is to the same quantity measured several times. Precision was evaluated using field and laboratory duplicate sample analysis. The field duplicate samples indicate the degree of imprecision imparted from the field sampling procedures. The laboratory duplicate samples indicate the degree imparted from the analytical methods and laboratory procedures.

Measurement precision was determined by calculating the relative standard deviation (RSD) expressed as a percent. RSD is the standard deviation divided by the mean and expressed as a percent. The acceptable sample precision for each chemical constituent is listed in Table C-4. In general, a precision of 10 percent is considered acceptable for this investigation.

Precision for this investigation is represented as the relative standard deviation (RSD). RSD was calculated the using one of the two methods to used to compute standard deviation. The method selected to calculate the standard deviation was depend on the number of replicate and split samples available for each analyte.

The standard deviation between two samples was calculated using the following equation:

$$s = \frac{|D|}{\sqrt{2}} \qquad \text{(C-1)}$$

where

s = the standard deviation; and

D = the difference between the results.

The standard deviation between multiple samples was calculated using the following equation:

$$S_p = \sqrt{\frac{\sum v_i s_i^2}{\sum v_i}} \qquad \text{(C-2)}$$

where

S_p = the pooled standard deviation;

s_i = the standard deviation for each sample pair; and

v_i = the degrees of freedom, typically v = n-1 (n is the number of samples).

Equation C-2 simplifies to:

$$S_p = \sqrt{\frac{\sum D^2}{2m}} \qquad \text{(C-3)}$$

where

m = the number of data points; and

D = the difference between the results.

Bias

Bias is the difference between the true value and an infinite number of replicate measurements. Bias is extremely difficult to quantify because both random and systematic errors influence the determination of bias. Bias for this investigation was minimized by implementing established protocols. The acceptable sample bias for each chemical analyte is listed in Table C-4. In general, a systematic bias of 10 percent was considered acceptable for this study.

Bias was calculated using the following equation and is expressed as a percent:

$$B(\%) = \frac{\bar{x} - T}{T} 100 \qquad \text{(C-4)}$$

where

B = the bias expressed a percent;

x = the mean analyte concentration of ten check standard replicate analyses; and

T = the true concentration of the standard.

Table C-4. Getchell Plateau Groundwater Investigation Data Quality Objectives.

Analyte	Units	Accuracy[2] (% unless otherwise indicated)	Precision (%RSD)	Bias	WA Drinking Water Standards	Lowest Level of Interest[5]	Reporting Limit[6]
Field Parameters							
Conductivity	m mohs/cm	5	5	NA[3]	NA		
Temperature	°C	± 0.1°C	± 0.1°C	NA	NA		
Dissolved oxygen	mg/l	± 0.2 mg/l	± 0.2 mg/l	NA	0.5		
pH	standard units	± 0.1 unit	± 0.1 unit	NA	6.5 to 8.5		
Laboratory Parameters-Primary Drinking Water Standards							
Antimony[7]	mg/l	30	10	10	0.006	0.006	0.001 [9]
Arsenic[7]	mg/l	30	10	10	0.01	0.01	0.001
Barium[7]	mg/l	30	10	10	1	1	0.1
Beryllium[7]	mg/l	30	10	10	0.004	0.004	0.004
Cadmium[7]	mg/l	30	10	10	0.005	0.005	0.001
Chromium[7]	mg/l	30	10	10	0.1	0.1	0.01
Copper[7, 8]	mg/l	30	10	10	[6]		0.02
Cyanide[7]	mg/l	30	10	10	0.2	0.2	0.2 [9]
Lead[7, 8]	mg/l	30	10	10	[6]		0.1
Mercury[7]	mg/l	30	10	10	0.002	0.002	0.0002
Nickel[7]	mg/l	30	10	10	0.1	0.1	0.01
Nitrate	mg/l N	30	10	10	10	10	1
Nitrite	mg/l N	30	10	10	1	1	0.2
Selenium[7]	mg/l	30	10	10	0.05	0.05	0.005
Sodium[7]	mg/l	30	10	10	[6]		0.01
Thallium[7]	mg/l	30	10	10	0.002	0.002	0.0005 [9]
Laboratory Parameters-Secondary Drinking Water Standards							
Chloride	mg/l	30	10	10	250	250	25
Fluoride	mg/l	30	10	10	2	2	0.2
Iron[7]	mg/l	30	10	10	0.3	0.3	0.07 [9]
Manganese[7]	mg/l	30	10	10	0.05	0.05	0.005
Silver[7]	mg/l	30	10	10	0.1	0.1	0.01
Sulfate	mg/l	30	10	10	250	250	25
Zinc[7]	mg/l	30	10	10	5	5	0.5

[1] Table based upon best available data.
[2] Accuracy is defined as 2*precision + bias
[3] NA, not applicable
[4] NS, no standard
[5] Lowest level of interest is based on the Washington State's water quality standards (see Table 2-4).
[6] State reporting limit: indicates the minimum reporting level required by the Washington Department of Health (DOH).
[7] Total Metals
[8] Indicates a parameter with no established MCL.
[9] Required reporting limit set as the method detection limit.

Accuracy

Accuracy is an estimate of how close a measured value is to the actual or true value, which is comprises of both the random error (precision), and the random and systematic error (bias). To be accurate, a result must be both precise and unbiased. Therefore, the project team calculated accuracy as two times the precision plus the bias as recommended by Lombard and Kirchmer (2001).

Statistical Test Assumption Verification

The statistical assumptions were verified by determining the confidence with which precision and bias are known. The project team employed the students t statistic at the 95 percent confidence interval as the test of statistical significance.

C.3.3 Acceptance Criteria for Existing Data

Data were accepted without qualifiers if the analytical reports meet the quality assurance guidelines detailed in the QAPP. Before attaching any qualifiers, every effort was made to correct the error. All data were reported, regardless of the qualifiers attached.

C.3.4 Validation of Outside Data

The project team was able to sample a very small number of wells compared with the number of wells available. In addition, several areas of the Getchell Plateau were not represented in the wells sampled by the project team. Therefore, the project team collected water level and water quantity data from outside sources.

The project team compiled data from the USGS collected during 1992 and 1993, data submitted to the Snohomish Health District between 1992 and the end of the project, and data submitted to DOH between 1997 and 2001. Only the USGS collected samples under an approved QAPP (Thomas, 1993). The standard laboratory quality assurance and quality sample results that accompanied the above samples, including those collected by the USGS, were not made available to the project team.

The project team did verify the location of the data compiled from the USGS, and the Snohomish Health District. Validation of the DOH data was difficult since the samples were often collected at the point of use rather than a tap near the source well. Only those data that could be traced to an individual well were used.

C.4 Sampling Procedure Review

The sampling procedures were reviewed several times during the project. Originally, the project team had anticipated obtaining the water quality sample after the water had flowed through the flow cell attached to the HydroLab™. It was clear to the project team that sampling from the tubing attached to the flow cell increased the likelihood of cross contamination of samples even if the decontamination were followed. Therefore, the project team elected to collect all the samples, not just the bacteriological sample, directly from the tap located closes to the well. This was the only significant change in the sampling protocol detailed in the approved QAPP implemented by the project during the project.

C.4.1 Review of Sample Distribution

The project team encountered two problems when attempting to obtain evenly distributed water quality samples in 2002 and 2003. The project team encountered similar problems when trying to locate evenly distributed historical data. Problem 1, the project team encountered problems gaining permission to assess private wells. Problem 2, wells are drilled only in places were there is no municipal supply and potable water is available.

Examination of Figure 2-2 reveals several sample clusters in the wells sampled during 2002 and 2003. This investigation depended on voluntary participation, so the project team chose to sample as many wells as possible even though some location bias resulted.

Figures 2-2 and 2-3 reveals a general lack of wells south of Lake Stevens because a large portion of this area is served by municipal water systems (Figure 5-1). There are relatively few wells located near SR 9 just south of Arlington because these aquifer materials are relatively thin and unproductive (Figure 4-3d). The area near the headwaters of Little Pilchuck has few wells because this area remains in timber production; therefore, there are no homes or wells (Figure 2-3). This means that some areas of the advance outwash aquifer are under represented in the data analysis presented in Chapter 4, Groundwater Systems.

Groundwater is generally available from the advance outwash aquifer within 150 ft of the ground surface. Therefore, the there are relatively few wells which penetrate this unit to tap the deeper and older aquifers. The deeper aquifers are under represented in the data analysis presented in Chapter 4, Groundwater Systems.

With the exception of one well, all wells to be sampled will had an Ecology water well report on file with Snohomish County. All of the wells sampled were visually inspected and were found to be properly constructed. Readily available information, such as well casing type, well diameter, and recorded depth to water information recorded in the field was compared to the Ecology water report was to assess whether the project team was sampling the correct well and if the water well report was accurate. A review of the field data sheet and project team's notes indicates that no anomalies were encounter.

One well was sampled by the project team that does not have a water well report on file with Ecology or Snohomish County. This well was sampled at the request of home owner to confirm a suspected water quality problem.

C.4.2 Measurements and Well Sampling Procedure

C.4.2.1 Water-Level Measurement

The project team encountered few problems obtaining water levels during 2002 and 2003. A sealed wellhead prevented the project team from measuring one water level in 2002. The water level probe cable became temporarily lodged in one well during 2002, so no water level was taken from that well in 2003. Pump torque arresters prevented the project team from obtaining a water level from one well during the 2003. The purge volume for these wells was calculated based on the water level recorded on the water well report.

The USGS and the project team measured the depth to water to the nearest 0.01 of a foot. The USGS used a steal tape and water finding paste and the project team used an electronic well probe. The USGS and the project team corrected for elevation by subtracting the wellhead stickup, also measured to the nearest 0.01 of a foot. Well drillers, however, measure the depth to the water to the near foot and it is not known if the drillers are subtracting the wellhead stickup. The differences in measurement precision are unlikely to influence the results since analysis of multiple water levels measurements take from a single well indicates that the true mean depth to groundwater is accurate to within several feet (Chapter 3, Hydrogeology).

C4.2.2 Well Preparation and Sampling

Equipment Calibration

A review of the calibration log reveals that the HydroLab™ calibrated to within ±10 percent of the pervious days values.

Field Measurement

The field team correctly recorded percent dissolved oxygen at the first well sampled during the 2002 sampling event. This error was corrected at the next well.

A review of the field data sheets reveals that all the QAPP required data were collected. No anomalies, flags or corrected data were reported on the field data sheets.

Well Purging

The project team only encountered one problem purging a well during the 2002 or 2003 sampling round. This well was purged dry shortly before the second pore volume was evacuated. This well was allowed to recover before the water quality sample was collected.

One well owner did report excessive sediment discharge following the sampling visit in 2002. The project team did not observe any sediment in that sample, but did purge the well at a reduced rate in 2003 to prevent mobilizing sediment in well casing.

Sample Collection

The project team encountered no difficulty obtaining the water quality samples directly from the tap located closest to the well using the down-hole electric pump. A review of the field data sheet reveals no mention of sampling anomalies.

Quality Control Sampling in the Field

A review of the laboratory reports and the Quality Control Sampling Schedule listed in Table C-3 reveals the project team collected the correct number of required number of blank and duplicate samples. No rinse samples were collected since the sample containers were filled directly from an existing tap and did not come in contact with the sampling tee or tubing.

Field Equipment Decontamination Procedures

The equipment cleaning and decontamination procedures detailed in the QAPP were followed by the project team. No anomalies regarding were revealed in a review of the field data sheets and the project team's notes.

Sample Transport and Chain-of-Custody

The project team delivered the samples to the analytical laboratory within eight hours of sample collection. A review of the project team's notes and the laboratory analysis request sheets reveals that chain-of-custody was maintained thought the project.

The first set of samples delivered to North Creek Analytical following the first day of sampling in 2003 arrived in at cooler at 5°C instead of the QAPP specified 4°C. The slightly elevated sample temperature is not believed to have altered the final results. The project team delivered future samples at correct temperature by packing the samples loosely on an increased volume of ice.

Missing or Damaged Samples

The project team delivered every sample to the analytical laboratory undamaged. No reports of damages or missing samples were recorded by the project team or reported by an analytical laboratory.

Water from the melting ice and/or condensation from ice packs did buildup in the transport containers on several occasions. In general, this was not an issue; however, several of the sample labels became wet making difficult to read the sampling identification number. The lack of identification did not result in the loss of a sample because the project team frequently wrote the sample number directly on the container with an indelible marker. In cases were the project team did not write on the container it was always possible to obtain the correct sample identification number by comparing the sample collection time to the time recorded on the chain-of-custody document.

C.4.3 Parameter Selection

Two changes were made in the list of analytes following the 2002 sampling event. These changes were made, in part, to meet budgetary considerations that arose when the project team changed analytical laboratories. The reasoning behind the laboratory change is detailed below.

Following the completion of the 2002 sampling event the analyte list was reviewed to determine if any analytes could be dropped. The results of water quality samples from other agencies—the USGS, the Snohomish Health District, and DOH—were also reviewed. This review revealed that cyanide, fecal coliforms, mercury, and total dissolved solids were either not detected or were well below the MCL, so these analytes were not included on the 2003 analyte list. The laboratory measurement for conductivity was not included as well, because this parameter was measured in the field. Mercury was returned to the 2003 analyte list following a review of the first laboratory reports submitted to project team by North Creek Analytical.

In addition to the above, the project team examined the impact of averaging the USGS samples along with the Snohomish Health and Snohomish County samples. Including or excluding the small number of available USGS values in the analysis did not appreciably alter the final averages.

C.5 Data Quality Review

C.5.1 Field Data

All of the field data were found to have met the standards set forth in QAPP, so all of these data were accepted without qualifier. The sole exception to the above are the dissolve oxygen recorded in percent and not mg/l. The percent dissolve oxygen values are not reported in Table B-1c because these data were not included in the analysis presented in Chapter 4, Groundwater Systems. The cross check of 20 percent of the field data revealed a small number of data entry errors and no systematic data entry problems.

C.5.2 Laboratory Data

C.5.2.1 Missed Laboratory Measurements or Data

Both the contracted analytical laboratories preformed all the requested analysis. The project team did not make any requests for data corrections or for amended reports. The cross check of 20 percent of the laboratory data revealed a small number of data entry errors and no uncorrectable systematic data entry problems. The cross check revealed that some of the USGS and Snohomish Health District data were recorded in µg/l when the project team collect these same data in mg/l. The units were rectified prior to data analysis.

Although both analytical laboratories completed the required analyte analysis, the Washington Department of Health laboratory failed to supply the required quality control or quality assurance samples. The investigation's project manager made multiple attempts to obtain the required data. The lack of quality control or quality assurance samples was one of the reasons the project team chose a different analytical laboratory for the 2003 sampling event.

The lack of quality control or quality assurance samples from the Washington State Department of Health laboratory means that all of these data have been accepted with qualification. The project team chose to used these data in it analysis of the Getchell Plateau groundwater quality with the full knowledge the final analysis will be qualitative and not quantitative.

C.5.2.2 Missed Holding Times

The Washington Department of Health laboratory repeatedly exceeded the sample extraction and sampling holding times for the metal and inorganic samples. Extraction and analysis times were missed by as little as 2 days to as many as 60 days. In addition to missing the holding times, the Washington Department of Health laboratory failed to submit the laboratory reports on time.

The project team made several unsuccessful attempts to get the Washington Department of Health laboratory to meet it's contractual agreements and the QAPP requirements. The project team elected to change analytical laboratories as a result of the Washington Department of Health laboratory's failure to meet the sample extraction and analysis times. Again, the project team chose to used these data in it analysis of the Getchell Plateau groundwater quality with the full knowledge the final analysis will be qualitative and not quantitative.

C.5.2.3 Statistical Tests

The results of the statistical tests for precision, bias, and accuracy are presented in Table C-5. As noted above the project team was unable to compute bias and therefore could not complete the determination of accuracy for samples collected in 2002.

The project team found that, at least the case of the 2003 sample results, the data are statistically valid and therefore are accepted without qualification. Unfortunately, the 2002 sample results analysis is incomplete, so these data are accepted with qualification (see above).

C.5.3 Outside Data

The project team relied heavily on data collected by or submitted to other agencies. As noted above, the project team utilized data collected by the USGS under an approved Quality Assurance Project Plan, well driller, Ecology, the Snohomish Health District, and DOH. A general assessment of these data follows immediately with specific issues addressed after that.

Data collected by the USGS are accepted without qualification. The data collected by DOH, Ecology, the Snohomish Health District, and well drillers are accepted with qualification. Since the data analysis performed by the project team included data from all sources the final results are qualitative. The project team chose to analyze data from all sources in an effort to develop a more complete, albeit generalized, picture of the groundwater quality beneath the Getchell Plateau. The project team adopted this approach for the simple reason that the too few samples were collected for too few analytes in 2002 and 2003 to complete a more in depth analysis.

5.3.1 Aquifer Testing Data

The project team compared the aquifer testing results it calculated with known values published in Freeze and Cherry (1979). The project team found its analysis to be comparable to the publish data. The project team also compared its results to those calculated by Thomas et al. (1996) for the same wells. The Thomas et al. (1996) results differed from the project teams results roughly 15 percent of the time. Close examination of the aquifer testing values reveals that in a small number of cases the project team considered an aquifer confined when the USGS considered it unconfined. The opposite case is also true. The project team re-examine the water well reports for each discrepancy and chose to report the value that best represented the aquifer condition regardless of whose calculation was correct. All corrections were entered into the database and in Table A-1.

Roughly 10 percent of the values did not agree even after the discrepancies had been investigated. The project team chose to report its values over the USGS's values because the project team has a high degree of confidence in the method it used to calculate the aquifer property values.

C.5.3.2 Comparability

Comparability measures the confidence that one set of data can be compared with another. The sampling methods, locations, and chemical constituents are similar to and consistent with other groundwater investigations performed in Snohomish County specifically and with glaciated terrains in general. This means data collected during the course of this investigation can be compared to and analyzed with data collected in the previous studies listed previously.

Water levels and groundwater quality was assessed by coupling newly collected data with existing data. All data was analyzed utilizing the procedures documented in the QAPP. As discussed above, appropriate data qualifiers and documentation have been used to identify data collected under methods and conditions that are not comparable.

C.5.3.3 Representativeness

Representativeness is a measure of how accurately and precisely the sample population captures the true population. Groundwater systems by their nature are heterogeneous systems. Representative sampling was achieved by selecting sample locations that are spatially distributed over the groundwater system and by withdrawing the sample from discrete and known depths below the ground surface. Drawing the sample off the well supply system prior to any filtration along with the well purging and field parameter measurements were designed to ensure that the water placed in the sample containers is representative of the water in the aquifer and not the well pump, well casing, or annular space. In addition, the sample preservation and handling procedures also ensured the samples are representative.

C.6 Data Quality Conclusions

Access to water quality data collected under controlled conditions was hard to come by so the quality of data collected for Getchell Plateau groundwater investigation was measured at each stage of the project to ensure that the project objectives were met, the data quality remained high.

The project team found the limited availability of groundwater quality data to be a significant barrier in assessing changes in water quality over time. Limited information on aquifer properties also constrained the project teams' ability to interpret the water quality and water level sampling results in the context of aquifer function. The project team also found no available pump test data. Therefore, it was not possible to precisely determine, aquifer-boundary conditions or to full quantify physical properties of each aquifer.

Analysis of all aspects of the data collection and analysis revealed shortcomings in data source control and the inability of one analytical laboratory to meet its obligations. Therefore, the resulting analysis, while presenting a comprehensive and spatially diverse picture of the water level and water quality of the Getchell Plateau aquifers, falls just short of being quantitatively robust. The resulting analysis should be viewed in qualitative terms, however, the project team did build on the previous quantitatively robust sampling effort completed by the USGS in Thomas et al. (1996). The data collection and analysis completed by the project team are quantitatively robust and therefore will be useful for future groundwater investigations with Snohomish County and other similar environments found in the Puget Lowland of western Washington State.

Table C-5. Statistical Analysis Results.

	Accuracy[1]		Precision (%RSD)[2]		Bias	
	2002	2003	2002	2003	2002	2003
Antimony	0.00	-1.88	0.00	0.00		-1.89
Arsenic	0.01	-4.06	0.01	0.00		-4.06
Barium	0.05	1.18	0.03	0.01		1.16
Beryllium	0.00	-4.36	0.00	0.00		-4.36
Cadmium	0.00	-5.67	0.00	0.00		-5.68
Chloride	10.60	8.49	5.30	3.97		0.55
Chromium	0.00	-9.47	0.00	0.01		-9.49
Copper	0.18	-8.59	0.09	0.05		-8.69
Cyanide	0.05	0.00	0.03			
Lead	0.00	-7.77	0.00	0.00		-7.78
Mercury	0.00	-6.74	0.00	0.00		-6.74
Nickel	0.00	-8.92	0.00	0.00		-8.92
Nitrate	0.20	2.53	0.10	0.95		0.64
Nitrite	0.60	0.33	0.30	0.10		0.13
Selenium	0.01	-0.27	0.00	0.01		-0.28
Sodium	23.00	11.46	11.50	6.03		-0.60
Thallium	0.00	-14.60	0.00	0.00		-14.60
Fluoride	0.29	0.53	0.14	0.15		0.24
Iron	3.06	3.50	1.53	0.17		3.16
Manganese	0.27	-6.20	0.14	0.05		-6.30
Silver	0.01	-8.89	0.00	0.01		-8.90
Sulfate	16.63	23.85	8.31	11.26		1.33
Zinc	0.05	1.86	0.03	0.05		1.76

[1] Accuracy is defined as 2*precision + bias

[2] Non detects assumed to be one-half the reporting limit.

Table C-1. HydroLab™ Calibration.

Meter	Calibration	Frequency
Conductivity	Calibrate to known standards within the range of expected conductance	As needed—at least twice per day, including end of day instrument check
Dissolved oxygen	Calibrate to known standards	As needed—at least twice per day, including end of day instrument check
pH	Calibrate to pH 7, 4 (acidic samples) or 10 (basic samples)	As needed—at least twice per day, including end of day instrument check

Table C-2. Analytical Methods, Sample Container Types, and Perservatives.

Analysis	Minimum quantity required	Container	Holding Time	Preservative[1]	EPA Method Number
Primary Drinking Water Parameters					
Antimony	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	3113 B[4]
Arsenic	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	3113 B[4]
Barium	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	200.7
Beryllium	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	200.7
Cadmium	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	3113 B[4]
Chromium	125 ml	poly	24 hours	Cool to 4°C	200.7
Copper	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	200.7
Cyanide	500 ml	glass or poly	14 days	0.6 g asorbic acid; cool to 4°C	4500 CN-F[4]
Fluoride	500 ml	amber n/m poly	28 days	HNO_3 to pH<2; cool to 4°C	300.0 A
Lead	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	3113 B[4]
Mercury	500 ml	poly	28 days	HNO_3 to pH<2; cool to 4°C	245.1
Nickel	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	200.7
Nitrate	125 ml	brown poly	28 days	H_2SO_4 to pH<2; cool to 4°C	300.0
Nitrite	125 ml	brown poly	28 days	H_2SO_4 to pH<2; cool to 4°C	300.0
Selenium	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	200.9
Sodium	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	200.7
Thallium	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	200.9
Secondary Drinking Water Parameters					
Chloride	100 ml	500 ml w/m poly	28 days	Cool to 4°C	300.0
Iron	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	200.7
Manganese	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	200.7
Silver	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	200.7
Sulfate	100 ml	500 ml w/m poly[2]	28 days	Cool to 4°C	200.7
Zinc	500 ml	poly	6 months	HNO_3 to pH<2; cool to 4°C	200.7
Microbiology					
Total coliform	250 ml	250 ml ploy bag[3]	24 hours	Cool to 4°C	
Physical Characteristics					
Color	50 ml	125 ml HDPE	48 hours	Cool to 4°C	2120 B[4]
Specific conductance	300 ml	500 ml w/m poly	28 days	Cool to 4°C	2510 B[4]
Total dissolved solids	250 ml	500 ml w/m poly	7 days	Cool to 4°C	2540 B[4]

[1]Container is sent by lab with preservative in it.

[2]May be able to analyze several general chemistry parameters from the same container.

[3]If chlorine is suspected in sample, then request bottle with thiosulfate preservative in it.

[4]Standard Methods for the Examination of Water and Wastewater method number.

Table C-3. Quality Control Sample Schedule.

Control Sample		Inorganic Constituents	Microbiology
Field	Duplicate	1 per 10 samples or every other sampling day	1 per 10 samples or every other sampling day
	Blank	1 per 10 samples or every other sampling day	1 per 10 samples or every other sampling day
Laboratory	Method Blank	2 per 20 samples	2 per 20 samples
	Spike	1 per batch	1 per batch
	Martix Spike	1 per sampling round (minimum)	1 per sampling round (minimum)
	Split	1 per batch	1 per batch
	Check Standard	1 per batch	1 per batch

Table C Getchell Plateau Groundwater Investigation Data Quality Objectives.

Analyte	Units	Accuracy[2] (% unless otherwise indicated)	Precision (%RSD)	Bias	WA Drinking Water Standards	Lowest Level of Interest[5]	Reporting Limit[6]
Field Parameters							
Conductivity	m mohs/cm	5	5	NA[3]	NA		
Temperature	°C	± 0.1°C	± 0.1°C	NA	NA		
Dissolved oxygen	mg/l	± 0.2 mg/l	± 0.2 mg/l	NA	0.5		
pH	standard units	± 0.1 unit	± 0.1 unit	NA	6.5 to 8.5		
Laboratory Parameters-Primary Drinking Water Standards							
Antimony[7]	mg/l	30	10	10	0.006	0.006	0.001 [9]
Arsenic[7]	mg/l	30	10	10	0.01	0.01	0.001
Barium[7]	mg/l	30	10	10	1	1	0.1
Beryllium[7]	mg/l	30	10	10	0.004	0.004	0.004
Cadmium[7]	mg/l	30	10	10	0.005	0.005	0.001
Chromium[7]	mg/l	30	10	10	0.1	0.1	0.01
Copper[7, 8]	mg/l	30	10	10	[6]		0.02
Cyanide[7]	mg/l	30	10	10	0.2	0.2	0.2 [9]
Lead[7, 8]	mg/l	30	10	10	[6]		0.1
Mercury[7]	mg/l	30	10	10	0.002	0.002	0.0002
Nickel[7]	mg/l	30	10	10	0.1	0.1	0.01
Nitrate	mg/l N	30	10	10	10	10	1
Nitrite	mg/l N	30	10	10	1	1	0.2
Selenium[7]	mg/l	30	10	10	0.05	0.05	0.005
Sodium[7]	mg/l	30	10	10	[6]		0.01
Thallium[7]	mg/l	30	10	10	0.002	0.002	0.0005 [9]
Laboratory Parameters-Secondary Drinking Water Standards							
Chloride	mg/l	30	10	10	250	250	25
Fluoride	mg/l	30	10	10	2	2	0.2
Iron[7]	mg/l	30	10	10	0.3	0.3	0.07 [9]
Manganese[7]	mg/l	30	10	10	0.05	0.05	0.005
Silver[7]	mg/l	30	10	10	0.1	0.1	0.01
Sulfate	mg/l	30	10	10	250	250	25
Zinc[7]	mg/l	30	10	10	5	5	0.5

[1] Table based upon best available data.

[2] Accuracy is defined as 2*precision + bias

[3] NA, not applicable

[4] NS, no standard

[5] Lowest level of interest is based on the State water quality standard (see Table 2-4).

[6] State reporting limit: indicates the minimum reporting level required by the Washington Department of Health (DOH).

[7] Total Metals

[8] Indicates a parameter with no established MCL.

[9] Required reporting limit set as the method detection limit.

Table C-5. Statistical Analysis Results.

	Accuracy[1]		Precision (%RSD)[2]		Bias	
	2002	2003	2002	2003	2002	2003
Antimony	0.00	-1.88	0.00	0.00		-1.89
Arsenic	0.01	-4.06	0.01	0.00		-4.06
Barium	0.05	1.18	0.03	0.01		1.16
Beryllium	0.00	-4.36	0.00	0.00		-4.36
Cadmium	0.00	-5.67	0.00	0.00		-5.68
Chloride	10.60	8.49	5.30	3.97		0.55
Chromium	0.00	-9.47	0.00	0.01		-9.49
Copper	0.18	-8.59	0.09	0.05		-8.69
Cyanide	0.05	0.00	0.03			
Lead	0.00	-7.77	0.00	0.00		-7.78
Mercury	0.00	-6.74	0.00	0.00		-6.74
Nickel	0.00	-8.92	0.00	0.00		-8.92
Nitrate	0.20	2.53	0.10	0.95		0.64
Nitrite	0.60	0.33	0.30	0.10		0.13
Selenium	0.01	-0.27	0.00	0.01		-0.28
Sodium	23.00	11.46	11.50	6.03		-0.60
Thallium	0.00	-14.60	0.00	0.00		-14.60
Fluoride	0.29	0.53	0.14	0.15		0.24
Iron	3.06	3.50	1.53	0.17		3.16
Manganese	0.27	-6.20	0.14	0.05		-6.30
Silver	0.01	-8.89	0.00	0.01		-8.90
Sulfate	16.63	23.85	8.31	11.26		1.33
Zinc	0.05	1.86	0.03	0.05		1.76

(1) Accuracy is defined as 2*precision + bias

(2) Non detects assumed to be one-half the reporting limit.