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Reappraisal of Hydrogeology of the Little Bitterroot Valley, Northwestern Montana

MBMG 350

Submitted to:
Eastern Sanders County Conservation District

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PREFACE

Groundwater is a major resource in the Little Bitterroot valley and is used to supply domestic, stock, and irrigation needs. Competition for groundwater supplies has caused conflicts and water rights problems since the first wells were drilled in the early 1900s. Groundwater quantity and quality information obtained in this investigation is compared to hydrogeologic information obtained in a previous Montana Bureau of Mines and Geology study performed in the late 1970s to the early 1980s. This report, therefore, contains hydrogeologic information that spans close to 20 years and provides an invaluable guide to further groundwater development.

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The residents of the Little Bitterroot valley were very helpful in providing information regarding their wells and discussing groundwater concerns. The field work for this report could not have been done without access to their property and wells. Special thanks to Dawn Bras who provided field assistance and insight into groundwater issues in the valley.

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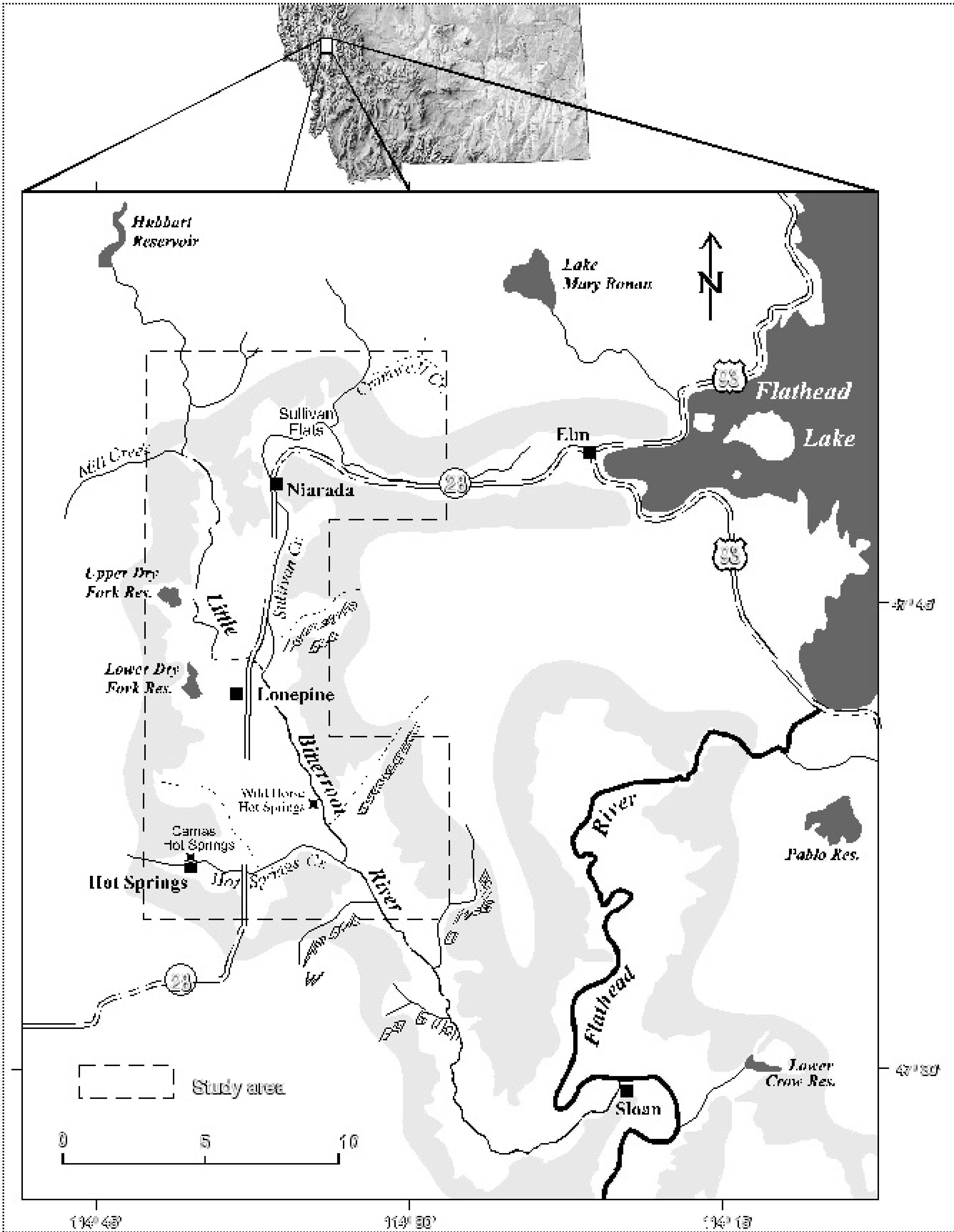

Figure 1. Location and geographic setting of the study area.

INTRODUCTION

Location of the study area

The Little Bitterroot valley is located in northwestern Montana, approximately 13 miles west of Flathead Lake and 73 miles northwest of Missoula. The portion of the valley included in this study is shown in figure 1. The area lies within the Flathead Indian Reservation. The valley trends north-northwest and is part of the Clark Fork River drainage. The towns of Hot Springs and Lonepine are located within the study area. Little Bitterroot Lake, located approximately 23 miles north of the study area, is the headwaters for the Little Bitterroot River. The entire length of the river is approximately 63 miles; about 22 miles flow through the study area and join the Flathead River near Sloan, Montana. Runoff from snowmelt replenishes the Little Bitterroot River. North of Hot Springs Creek, the valley is 3.0–4.5 miles wide; south of the creek, it narrows to 2.0–3.5 miles.

The valley is bounded by the Salish Mountains to the east and north, which reach elevations of approximately 5,700 feet above sea level. The mountainous area to the west is part of the Lolo National Forest and reaches an elevation of approximately 7,500 feet above sea level. Perennial tributaries to the Little Bitterroot River within the study area include Sullivan Creek, Mill Creek, Hot Springs Creek, and Wilks Gulch.

Two geothermal areas are located in the study area, one in the central part of the valley known as Wild Horse Hot Springs (formerly Camp Aqua) and the other in the town of Hot Springs (figure 1). Geothermal waters discharging in the vicinity of Wild Horse Hot Springs issue from flowing wells that are completed in gravels overlying bedrock. The geothermal water originates from bedrock along a north-northwest trending fault system that runs along the length of the valley. The original Camp Aqua was built as a bathhouse and was sold in 1994 to new proprietors. The artesian warm water at Wild Horse Hot Springs issues from a well drilled in 1913. Temperatures of the warmest groundwater in this area range between 41° and 48°C (106° and 118°F).

In the town of Hot Springs, the geothermal waters issue from bedrock wells that were developed near springs (Camas Hot Springs); groundwater temperature is approximately 45°C (113°F). The Camas Hot Springs were used as early as 1910, when the first settlers came to the area (Hot Springs Historical Society 1976). Since then, several bathhouses have been built on the site. Today, the present bath house, built in 1948-1949, is owned by the Salish Kootenai Tribe and was abandoned in 1981. Three artesian wells that tap into the geothermal water supply small open-air pools in which visitors can soak today.

Project Objectives

Groundwater and surface water are critical resources that support the agricultural economy of the Little Bitterroot valley. Water rights and supply questions have been documented as far back as the early 1900s. The Lonepine aquifer is the main source of domestic, stock, and irrigation water in the valley. In the late 1970s to early 1980s, the Montana Bureau of Mines and Geology characterized the hydrogeology of the valley and determined that more groundwater was being withdrawn from the Lonepine aquifer than recharged. This resulted in a proposed project to artificially recharge the aquifer to increase the quantity of groundwater available for domestic, stock, and irrigation purposes (Donovan 1985a). However, since that time, several free flowing wells have been capped, which may have increased the potentiometric head in the Lonepine aquifer.

The objectives of the research described in this report were to characterize the present hydrogeological conditions of the Little Bitterroot valley and to determine if any changes have occurred in the hydrogeologic regime of the Lonepine aquifer since it was characterized by Donovan (1985). Therefore, data were collected to assess water quantity and quality changes between 1980 and 1994. A groundwater monitoring network was reestablished and 44 wells were sampled. An inventory also was performed on wells drilled after 1980 particularly on those completed in the Lonepine aquifer.

Previous Investigations

As early as 1913, Meinzer (1916) examined the quantity and quality of artesian groundwater in the Little Bitterroot valley to assess the extent that it could be used for irrigation. He presented a romantic description of the geologic and physiographic setting of the valley along with a history of groundwater development. The first wells were drilled in 1911, and by 1915, forty artesian wells had been drilled. Meinzer noted that well-interference problems arose soon after the first wells were drilled. Even in the early days of groundwater development in the valley, he saw the need for water conservation and discussed the importance of casing wells properly and plugging abandoned ones.

More recently, Boettcher (1982) studied the groundwater resources of the Flathead Indian Reservation to determine aquifer characteristics and water quality. He noted a seasonal and long-term decline in water levels due to irrigation. Iron and manganese concentrations in groundwater were higher in the Little Bitterroot valley than on the rest of the reservation. Gary (1982) investigated the geothermal resources in the Camas Hot Springs area. His geophysical investigation on the depth to the aquifer and subsurface structure were inconclusive. He determined ‘warm spot’ areas based on a near-surface temperature survey and underlying bedrock-aquifer characteristics.

The most thorough investigation of the hydrogeology and geothermal resources of the Little Bitterroot valley was conducted by Donovan (1985). His study determined aquifer characteristics, groundwater flow direction, and documented the Lonepine aquifer’s potentiometric responses to irrigation. Groundwater chemistry was

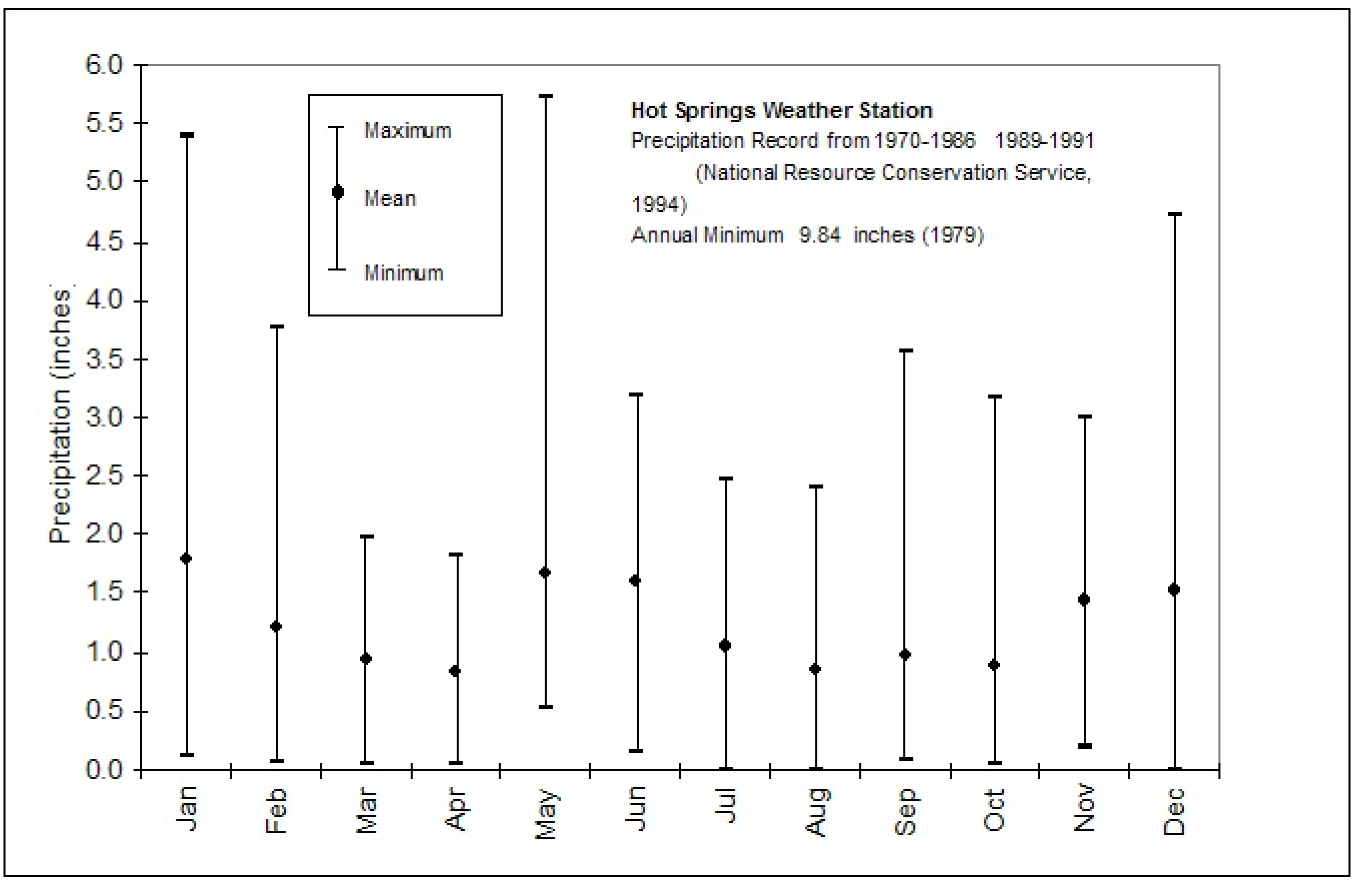

Figure 2. Precipitation data from the Hot Springs, Montana weather station.

characterized and evaluated with respect to the geothermal aspects of the system. The potential sources of recharge to the Lonepine aquifer were identified and a numerical model was created to simulate the aquifer flow system. The numerical model indicated that increases in aquifer withdrawals over those during a typical irrigation season will result in more drawdown in the southern part of the valley. The general shape of the potentiometric surface did not change.

Briar (1987) performed a detailed hydrogeologic investigation of the Sullivan Flats area (north of Niarada, figure 1) to assess water quantity and quality in the subsurface outwash that he identified as the Sullivan Flats aquifer. He concluded that groundwater in the Sullivan Flats and Big Draw areas are hydrogeologically isolated from groundwater in the Little Bitterroot valley.

Slagle (1988) investigated the potential for groundwater development on the Flathead Indian Reservation. He reported high yield wells in the Little Bitterroot valley with pronounced water-level declines because of large volumes of water withdrawn for irrigation. Groundwater flow followed the trend of the valley, with the presence of geothermal water indicating deep, probably regional groundwater circulation.

Hydrometrics (1990) conducted a 32-day aquifer test in the Sullivan Flats area and compared the field data to the numerical model compiled by Briar (1987). Hydrometrics concluded that the aquifer test provided a more reliable estimation of the impact of groundwater withdrawal from the aquifer than the results obtained from Briar’s numerical model.

Slagle (1992) determined that leakage from unlined irrigation canals occurred at select sites on the Flathead Indian Reservation. Two sites, one at Lonepine and the other at Niarada, were located within the present study area.

Climate

The Little Bitterroot valley is one of the most arid parts of northwest Montana with an average annual rainfall of 14.60 inches, based on data collected at the weather station located in Hot Springs, Montana (1970–1985, 1988–1990). The driest year on record was 1979 with precipitation totaling 9.84 inches (figure 2); 1980, during the wettest year, precipitation totaled 20.10 inches. March, April, July, and August are typically the driest months; May, December, and January are the wettest months. Precipitation varies throughout the valley as a result of orographic effects from the surrounding upland areas. The upland areas are cooler and receive as much as 20–30 inches of annual precipitation (Natural Resource Conservation Service 1975). Average seasonal snowfall in the valley ranges from 25 to 50 inches, with from 100 to 300 inches average snowfall occurring in the uplands (Natural Resource Conservation Service 1975). Mean average annual temperatures range from 7° to 10°C (45° to 50°F) , with monthly average temperatures in the summer of 21°C (70°F) (Donovan 1985).

Location Numbering System

Well locations in this report are denoted using the land subdivision of township, range, section, and tract (figure 3). The first three characters specify the township and its position north or south of the Montana Base Line. The next three characters specify the range and its position west of the Montana Principal Meridian. Townships are square areas of land six miles on a side. Each township has 36 sections; the section number follows the township and range designation. Sections are further subdivided into quarter (160-acre tract), quarter-quarter (40-acre tract), quarter-quarter-quarter (10-acre tract), and quarter-quarter-quarter-quarter (2.5-acre tract) tracts using the letters A, B, C, and D, respectively. The letters are assigned in a counterclockwise direction, beginning with the letter A in the northeast quarter. Therefore, a location designation of 22N23W20CDDD refers to a well located in Township 22 North, Range 23 West, Section 20, and a quarter tract sequence of CDDD. The order of quarter-tract designations is exactly reversed from that commonly used by surveyors; here, the order

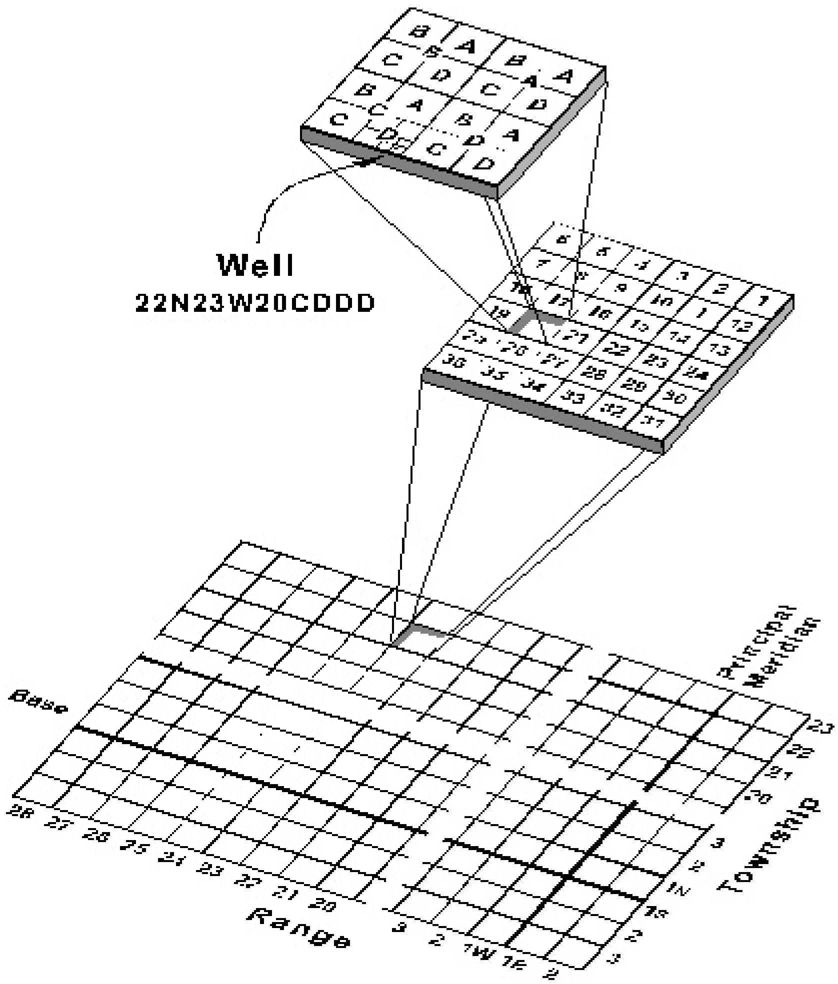

Figure 3. Location reference system illustrating township, range, section, and tract.

begins with the largest quarter and progresses to the smallest. Thus in figure 3, the designation 22N23W20CDDD identifies a well in the SE¼ SE¼ SE¼ SW¼ Sec 20, T. 22 N., R. 23 W.

The well numbers 1-240, shown on plate 1, correspond to the same wells presented in Donovan's (1985) report. Wells inventoried during this study are numbered from 241 to 301. Well information is presented in appendix A.

Water Use

Wells drilled in the early 1900s typically were constructed with 3- to 4 inch-diameter steel casing and were completed several feet into the Lonepine aquifer. Few wells even today penetrate the full thickness of the aquifer. The Lonepine aquifer consists of sand and gravel that is confined by several hundred feet of clay. Flowing wells are located close to the Little Bitterroot River, predominantly south of Lonepine (plate 1). Irrigation is essential for sustaining agriculture in the valley and is the primary use of groundwater. The Little Bitterroot valley is most heavily irrigated along the 16-mile portion north of Oliver Gulch (Donovan 1985). Intense use of groundwater in this semi-arid region has led to conflicts over water use dating back to the early 1900s. Unfortunately, during the dry years, when more intense irrigation is necessary, aquifer pressures are the lowest (Donovan 1985).

Groundwater from flowing wells is used for flood irrigation, filling of private irrigation reservoirs, and providing water for stock and domestic use.

The relative uses of groundwater throughout the valley, based on the Department of Natural Resources and Conservation (DNRC) (1994) appropriation data, are presented in figure 4. Approximately 74% of the total groundwater appropriated is used for irrigation, 7% for stock, 3% for domestic use, and the remainder for fish/wildlife and other uses. Groundwater appropriated from the Lonepine aquifer for irrigation and other purposes is approximately 90 acre-feet/day; and during the non-irrigating part of the year, 37 acre-feet/day. The actual amount of water used for irrigation depends on weather conditions. More groundwater is used for irrigation during drier years, therefore, withdrawals vary annually. Groundwater from the Lonepine aquifer has been appropriated to irrigate approximately 5,075 acres. Appropriations for stock and domestic use are approximately 1.6 acre feet/day and 1.0 acre-feet/day, respectively.

Surface water also is used for irrigation. Water from the Little Bitterroot River is appropriated through the DNRC or by a canal system operated by the Flathead Irrigation Project. DNRC surface water appropriations total approximately 43 acre-feet/day to irrigate 7,500 acres.

The Flathead Irrigation Project was started in 1928 and is owned and operated by the Bureau of Indian Affairs. Water for the system is obtained from runoff that is stored in Little Bitterroot Lake (capacity 26,400 acre-ft) and the Hubbart Reservoir (capacity 12,125 acre-ft). Water from the Hubbart Reservoir, which feeds the Little Bitterroot River, is diverted from the river via a canal system to fill the Lower Dry Fork reservoir near Lonepine (capacity 3,856 acre-ft). The Upper Dry Fork Reservoir (capacity 2814 acre-ft), located approximately two miles above the Lower Dry Fork Reservoir, is fed by runoff from Alder Creek, a tributary to the Little Thompson River. The water is gravity fed to ranches via a canal system; the quotas are set at an annual users' meeting. Quotas are based on water volume requested and the amount of water in storage for a given year. The project water is used to irrigate approximately 13,000 acres. In 1994, 10,442 acre-ft of water were delivered to ranchers.

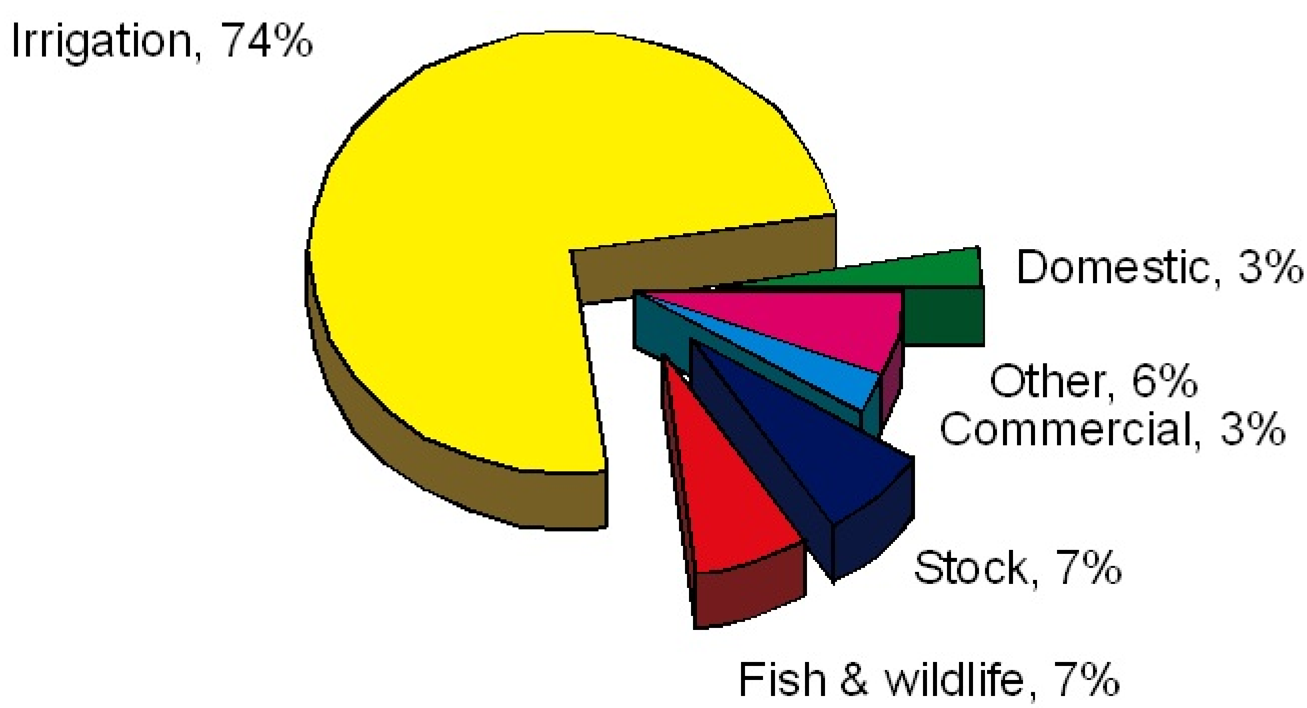

Figure 4. Groundwater appropriations within the study area (DNRC, 1994).

GEOLOGY

Precambrian Bedrock

The bedrock hills surrounding the Little Bitterroot valley and underlying the valley-fill sediments consist of the Precambrian Belt Supergroup and Tertiary volcanics (figure 5). The Belt Supergroup comprises low-rank metasedimentary rocks such as siltites, argillites, and quartzites. These rocks were originally deposited as sediment over 600 million years ago in a great basin that extended into Canada, Idaho, eastern Washington, and western Montana. The area was inundated by a large shallow sea as the basin subsided and was gradually filled by sediments 50,000 feet thick. Regional metamorphism subsequently transformed the sediment into low-rank metamorphic rocks. The Spokane, Revett, and Burke formations are the lower formations of the Belt Supergroup and are exposed in the upland areas to the north and east of the valley (Harrison *et al.* 1986). The Pritchard Formation, which is the basal and thickest formation, is present in the upland areas to the west and south.

During the early Tertiary, compressional thrusting carried Precambrian bedrock eastward into the region as part of the Montana Overthrust Belt. The study area falls within the southern part of the Rocky Mountain trench that formed during the Late Tertiary and extends from northern Montana northward through Canada and into Alaska. During this period, northwest-trending horst and graben faults were formed (Johns *et al.* 1963). The Big Draw fault (figure 5), in the northern part of the study area, trends east-west through Big Draw and offsets the Rocky Mountain trench by about five miles of right-lateral movement (Harrison *et al.* 1986). Block faulting occurred in the very late Tertiary to late Quaternary (Slagle, 1988). Faulting and fracturing of the rocks has led to more permeable zones that transmit appreciable quantities of deeply circulating geothermal water (Donovan 1985). Precambrian sills, consisting of dioritic to gabbroic rocks, have intruded the Belt Supergroup to the west and south of the town of Hot Springs (figure 5) (Harrison *et al.* 1986).

Bouger gravity anomaly maps compiled by Dresser (1979) and Boettcher (1982) indicate a bedrock depression in the center of the valley. This depression trends northwest–southeast and extends north of Lonepine and west of Wild Horse Hot Springs (figure 1). It probably represents a Tertiary channel cut into the Precambrian bedrock (Donovan 1985). In the vicinity of Wild Horse Hot Springs, there is a bedrock high. Geothermal activity occurs in this area. The thickness of the valley fill ranges from approximately 206 to 264 feet, based on data from three wells (plate 1) that penetrate to bedrock (well 78, 22N23W28ABCC; well 88, 22N23W29BADD; and well 180, 22N24W36BBBB).

Tertiary Volcanic Rocks

The Hog Heaven volcanic field, which covers approximately 30 square miles, is located to the north and west of Niarada (figure 1). Its southern part is exposed in the northern part of the Little Bitterroot valley (figure 5) and in the Sullivan Creek drainage (Sullivan Flats). The volcanic field consists of Tertiary ash-flow tuffs, dacite, rhyolite, and volcaniclastic rocks associated with volcanic domes and flows (Lange and Zehner 1992). Lange and Zehner identify this field as possibly the northernmost site of basin and range volcanism that occurred over 40 million years ago. The volcanic deposits host large amounts of silver, gold and lead ores that were once targeted by the Flathead and West Flathead mines. These mines are no longer in operation.

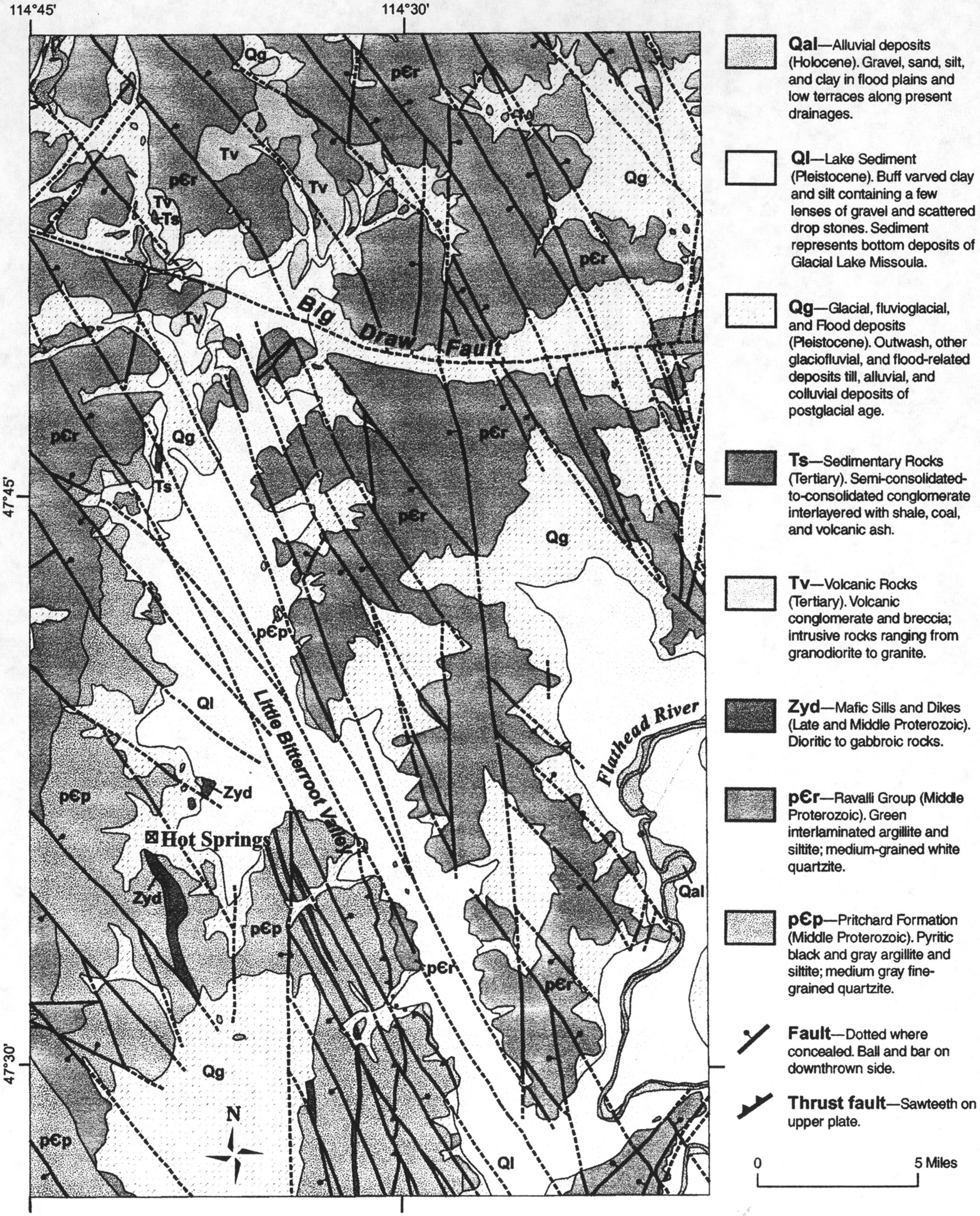

Figure 5. Geology of the Little Bitterroot valley and vicinity (modified from Harrison et al., 1986).

Tertiary Sediment

Overlying the Precambrian bedrock throughout most of the valley are beds of loosely cemented, fine-grained, gray sandstone, clay, and siltstone. Organic matter and low-grade coal also have been identified in several drill holes that penetrate through the valley fill. These deposits, which have not been dated, are believed to have originated as lake bed sediment (Alden 1953) of Tertiary age (Slagle 1988)—the same period when volcanism was occurring. In areas where bedrock is close to the surface, Tertiary sediment may be absent.

Pleistocene Sand and Gravel

A sand and gravel layer informally known as the Lonepine aquifer (Donovan 1985) overlies the Tertiary sediment, and in some parts of the valley directly overlies the Precambrian bedrock. Donovan tentatively assigned a Pleistocene age to this deposit. The Pleistocene comprises a period when multiple glaciations occurred from 2.5 to 3 million years ago and lasted until about 10,000 years ago. Meinzer (1916) suggested that the sand and gravel of the Lonepine aquifer were deposited when the ancestral (preglacial) Flathead River flowed through the valley. Smith (1977) proposed that the sands and gravels in Sullivan Flats and the Little Bitterroot valley are part of an outwash sequence that discharged down Big Draw when the Elmo Lobe of the Flathead Glacier occupied the Big Draw valley. The Elmo moraine, located approximately 1.5 miles west of Elmo, is evidence of this ice advance (Smith 1977).

Drill cuttings from the Lonepine Community Hall (well 293, 23N24W35DCDD) indicate that the gravel portion of the Lonepine aquifer consists of rounded to very well-rounded gravels ranging from approximately 0.05 to 2.0 inches (1 to 5 cm) in diameter. The gravel is composed dominantly of red, green, and gray siltite, and quartzite of the Belt Supergroup. The aquifer extends as far north as Niarada and as far south as the Flathead River.

In the Sullivan Flats area, the major sand and gravel beds are approximately 20–110 feet thick based on well logs presented in Briar (1987). Farther east, toward Big Draw and closer to the source of the outwash, the sand and gravel layers increase in number and are closer to the surface.

Pleistocene Lake Sediment

Glacial Lake Missoula sediment overlies the sand and gravel. They consist mostly of light tan silt and clay and reach a maximum thickness of approximately 350 feet. In the lower part, there is a moderately transmissive zone of interbedded fine sand and rare thin gravel seams (Donovan 1985). Glacial Lake Missoula formed during the Pleistocene when a lobe of glacial ice moved down the Purcell trench in Idaho and dammed the Clark Fork River drainage near the present site of the Lake Pend Oreille. The lake existed for multiple periods periodically filling and draining. It last existed about 12,700 years ago. Based on evidence of shorelines that mark the mountain sides in the Little Bitterroot valley, it reached an elevation of approximately 3,800 feet.

Pleistocene Terrace Deposits

Two or possibly three terraces are present east of the Little Bitterroot River. The terraces are located in the northern part of the valley above 2,780 feet. The terrace deposits are exposed on the surface (to a depth of approximately 35 feet) in a gravel pit just west of well 183, 23N24W02BDDA (plate 1). The log from well 288 (23N24W11ABBB) indicates that these deposits are at least 98 feet thick and consist primarily of silty sand to boulder-size sediments. Donovan concluded that the terrace deposits are post Glacial Lake Missoula in age because Glacial Lake Missoula sediment does not overlie the terraces. He also postulated that the terrace deposits do not correlate with the Lonepine aquifer south of there but may overlie older gravels that are hydrogeologically connected to the Lonepine aquifer.

METHODOLOGY

Sixty-one wells that have been drilled since 1980 were visited within the study area. Well construction information and well locations are presented in appendix A. Field parameter data (water levels, estimated yield, pH, specific conductance, and groundwater temperature) are presented in appendix B. Of the wells inventoried during this study, 20 are completed in the Lonepine aquifer. Five of the wells are used for irrigation, the rest are used for stock and/or domestic purposes. The limited number of wells drilled for irrigation is probably due to the objection of current water users to new groundwater development. Sixteen of the inventoried wells are completed in bedrock and also are used primarily for domestic purposes. These wells are located mainly in Hot Springs and along the valley margin. Thirteen of the wells inventoried are used for groundwater monitoring at the Hot Springs substation, which is owned by the Bonneville Power Company. These wells were installed in response to elevated concentrations of several volatile compounds in the substation water-supply well (Tetra Tech 1993). The remaining wells are located in the Sullivan Flats drainage.

Water levels in 26 wells were measured monthly for one year. These wells were chosen because they also were monitored from 1979 to 1981 as part of Donovan's (1985) study. Specific conductance, pH and temperature also were measured monthly for one year on the flowing wells. Field parameter data and water-level information for the monitoring wells are included in appendix B. Water elevations from the monitoring network were used to determine short- and long-term potentiometric trends. Continuous water-level recorders installed during the 1980s on wells 98 (22N23W32DBBB), 144 (22N24W15ABAD), and 196 (23N24W12CCCB) were repaired. In addition, a recorder was installed on well 159 (22N24W23CDCC) as part of the present study. Data from these wells were added to the Groundwater Information Center (GWIC) data base; maintained by the Montana Bureau of Mines and Geology. Well 211 (23N24W34ADAA), located near Lonepine, is a monitoring well that has been maintained by the U.S. Geological Survey (USGS) since 1969. Data from this well also was used to assess long-term groundwater level trends.

Water-quality samples were collected from 44 wells, 32 of which had been previously sampled between 1976 and 1980. This allowed water quality comparisons over a period of almost 20 years (1975–1994). Limited streamflow gaging of the Little Bitterroot River was performed on several occasions in the northern part of the valley. The streamflow measurements were used to assess whether water from the Little Bitterroot River is a source of recharge to the groundwater.

HYDROGEOLOGY

The Lonepine aquifer consists of sand and gravel outwash that underlies most of the valley. It is the main source of water for domestic, stock, and irrigation uses. Wells completed in the aquifer are typically cased through the overlying Glacial Lake Missoula sediment and completed a few feet into the Lonepine gravel. Therefore, information on aquifer thickness is limited. Based on data from 7 wells, aquifer thickness varies from approximately 7 to 60 feet. It is thinnest just south of Niarada Gap (well 237, 24N24W25DDBB; plate 1), increases to approximately 60 feet near Lonepine, and generally thins southward to about 20 feet (well 24, 21N23W23AADB). Local variation in aquifer thickness is probably due to differences in depositional regimes of the fluvial-glaciofluvial sediment. Based on elevation data for the top of the aquifer compiled by Donovan (1985), the aquifer dips approximately eight feet/mile to the south throughout the study area.

Plate 2 is a contour map that shows the depth to the Lonepine aquifer. This map can be useful when siting and drilling wells in the area. The contour map reflects channel morphology associated with deposition and erosion regimes and is influenced by the present day topography. The linear troughs probably represent the paleo–Little Bitterroot River channel. Depth to the aquifer is greatest just south of Niarada Gap and near the Lower Dry Fork Reservoir and is shallowest along the valley margins. Near the town of Hot Springs, the aquifer depth is less than 100 feet. In several wells (*i.e.,* well 284, 22N24W15CBBB; well 290, 23N24W33ABAA) the sand and gravel are missing and the Glacial Lake Missoula sediment directly overlies bedrock.

Aquifer Characteristics

The productivity of a well is usually measured by the specific capacity, which is the well yield per unit of drawdown (gpm/foot). Drillers' data were used to calculate specific capacities for wells completed in the Lonepine, bedrock, and alluvial aquifers. Minimum, maximum, and average values are presented table 1.

Table 1. Specific Capacity of the Lonepine, bedrock, and alluvial aquifers.

Aquifer	Minimum (gpm/foot)	Maximum (gpm/foot)	Average (gpm/foot)
Lonepine (n=27)	0.08	60.0	9.1
Bedrock (n=21)	0.02	22.0	2.0
Alluvial (n=10)	0.35	7.0	2.2

The data in table 1 indicate that the average productivity of the alluvial and bedrock aquifers are similar. The Lonepine aquifer is the most productive formation with an average specific capacity of 9.1 gpm/feet. Many wells completed in the Lonepine aquifer yield over 500 gpm.

Specific capacity is roughly proportional to transmissivity and indicates the rate that water will move through an aquifer. Based on a method presented by Theis (1963), specific capacity values from the wells completed in the Lonepine aquifer were used to estimate transmissivity. The estimated transmissivity values ranged from 13 to 17,900 feet^2/day with an average value of 2,400 feet^2/day. There is probably some error associated with these values because not all the assumptions of the method were met. The method assumes a 100% efficient well and that the well taps the full aquifer thickness. However, the average transmissivity and reported yields indicates that overall the Lonepine is a productive aquifer with adequate yields for irrigation and most other purposes.

Water-level recovery data from well 98 (22N23W32DBBB) also were used to calculate transmissivity in the Lonepine aquifer. The recovery data were obtained when well 76 (22N23W20DCDB), located approximately 1.7 miles away from well 98, was sealed in December 1986. Figure 6 is a plot showing water-level recovery in well 98 over time. Based on the Cooper-Jacob straight line method (Cooper and Jacob 1946), transmissivity was calculated to be 19,000 feet^2/day. This value is higher than the maximum transmissivity value estimated from the specific capacity data but is probably more accurate. Transmissivity estimates from the specific capacity data are probably not as accurate due to the limitations of the technique and the data from the drillers' logs.

The storage coefficient is another important aquifer characteristic and indicates how much water can be removed by pumping. The storage coefficient was calculated using the recovery data from well 98 and was calculated at 10^{-4}. The storage coefficient also was estimated using a technique by Lohman (1979) that is based on water level response to changes in barometric pressure. Using continuous water-level data from well 98 (22N23W32DBBB) and barometric pressure data from a weather station in Kalispell, Montana, this method

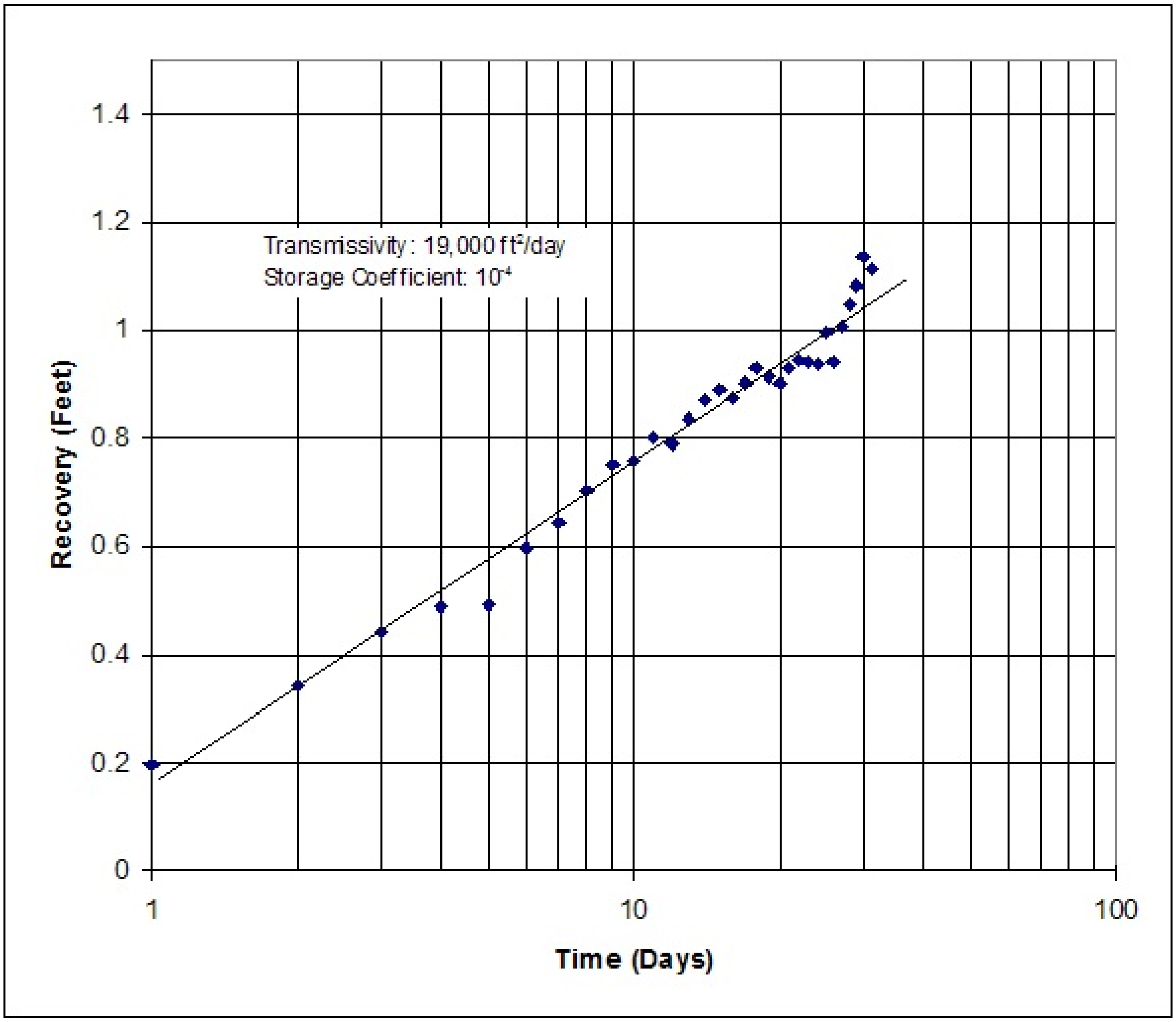

Figure 6. Time recovery data from well 98 (22N23W32DBBB) as a result of sealing well 76 (22N23W20DCDB).

yielded a storage coefficient of 10^{-5}. These values fall within the 10^{-3} and 10^{-5} range that is typical for a confined aquifer (Driscoll 1986).

The aquifer characteristics determined for this study and those obtained by previous investigators are summarized in table 2. The transmissivity value of 19,000 feet^2/day determined from well 98 falls in the lower end of the range presented by Donovan (1985). The average transmissivity of 2,400 feet^2/day estimated from the specific capacity data is closer to the value calculated by Slagle (1988) who conducted an aquifer test on well 237. The lower transmissivity in well 237 is probably due to the decrease in thickness of the Lonepine aquifer at that location (7 feet total thickness). The storage coefficient estimates, 10^{-4} and 10^{-5}, from the current study agree well with those calculated by Donovan (1985).

The data from the bedrock aquifers show that the transmissivity is much higher in the Ravalli Formation than in the Pritchard Formation (table 2). The high transmissivity from an aquifer test in well 88 (22N23W29BADD), completed in the Ravalli Formation, was derived from the bedrock fracture zone. Observation well data from this test also illustrated the hydraulic continuity of the bedrock in this area to the Lonepine aquifer. Although fractures were encountered during the drilling of the test wells 34 and 35 completed in the Prichard Formation, water yields were lower than those encountered in well 88. This is reflected in the transmissivity estimates for both aquifers. Transmissivity is lower in the Pritchard Formation than in the alluvium. The lowest transmissivity

Table 2. Summary of aquifer characterisitics.

Aquifer/Location	Transmissivity	Storage Coefficient	Method	Source
Pritchard Formation Well 34, 21N24W03BBCA Well 35, 21N24W03BBCB	720-1270 ft^2/day	not determined	Jacob Step Drawdown (Lennox, 1966)	Gary (1982)
Lonepine aquifer Well 11,12 21N23W11CACC 21N23W11CBCC Well 88, 22N23W29BADD Well 84, 22N23W29ACAB Well 84, 88 22N23W29ACAB 22N23W29BADD	16,700-80,000 ft^2/day	10^{-4}-10^{-5}	Jacob Straight Line (Jacob and Lohman, 1952)	Donovan (1985)
Well 237, 24N24W25DDBB	2,200 ft^2/day	not determined	Unspecified	Slagle (1988)
Selected wells in Appendix A (27 total wells)	13,000-17,900 ft^2/day	not applicable	Theis (1963)	Present Investigation
Well 76, 22N23W20DCDB	19,000 ft^2/day	10^{-4}	Cooper Jacob Straight Line (Cooper and Jacob, 1946)	Present Investigation
Well 76, 22N23W20DCDB	not applicable	10^{-5}	Lohman (1979)	Present Investigation
Alluvium Well 1,21N22W07DCAA Well 54, 22N23W15DCDC	4,500-7,900 ft^2/day	not determined	Unspecified	Slagle (1988)
Tertiary Sediments Well 238, 24N24W27ABDB	4 ft^2/day	not determined	Unspecified	Slagle (1988)
Sullivan Flats aquifer Well 295, 24N23W17BCDD Well 297, 24N23W21DCBB Well 300, 24N24W24DDBB 24N23W08AAAB 24N23W09BADA 24N23W13AABB	9,000-65,000 ft^2/day	10^{-4}-10^{-6}	Theis Solution (Theis, 1935) Jacob Straight Line (Jacob and Lohman, 1952)	Briar (1987)
Well 226, 24N23W16BCBB	12,000-111,359 ft^2/day	10^{-3}-10^{-4}	Theis Solution (Theis, 1935) Cooper Jacob Straight Line (Cooper and Jacob, 1946)	Hydrometrics (1990)

value is found in a well completed in the Tertiary sediment (4 $feet^2$/day). The transmissivity values for the Sullivan Flats aquifer are similar to those estimated for the Lonepine aquifer; storage coefficients indicate that the aquifer is confined.

Potentiometric Fluctuations

Water levels in wells are controlled by hydrostatic pressures in aquifers. The water levels are known as ‘potentiometric levels’ because they reflect the hydraulic potential for groundwater to flow from one place to another. Short-term hydrographs (figure 7) for three wells, located in the north (well 196, 23N24W12CCCB), central (well 211, 23N24W34ADAA), and southern (well 98, 22N23W32DBBB) parts of the study area illustrate seasonal potentiometric fluctuations in the Lonepine aquifer. The potentiometric surface begins to decline in mid-April in response to the start of the irrigation season (electric power is supplied to non-flowing wells from April 15th to October 15th). Water levels steadily decline until mid-summer and are lowest in July and August, the

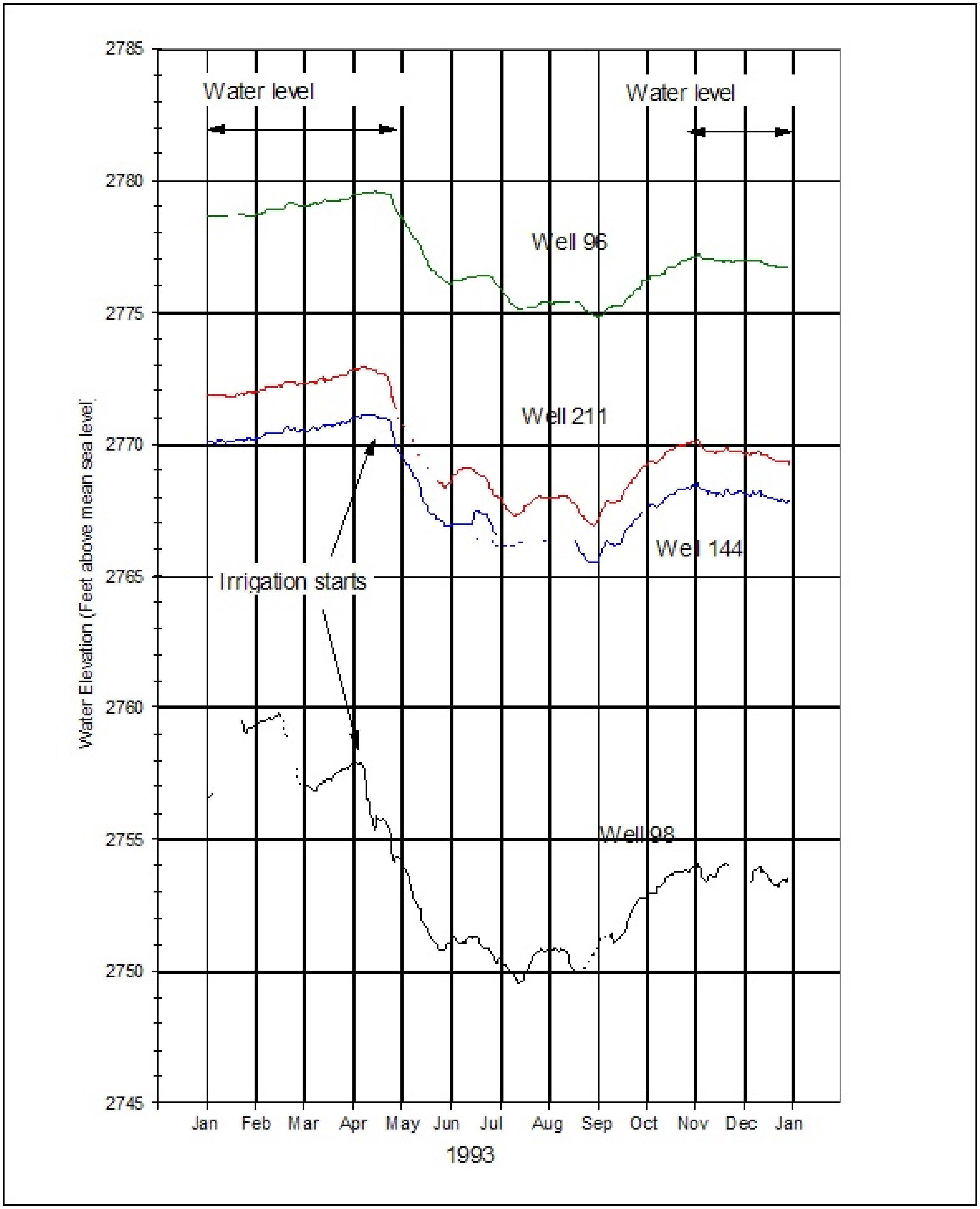

Figure 7. Groundwater hydrographs showing seasonal potentiometric level fluctuations.

height of the irrigation season. The aquifer begins to recover in September at the end of the irrigation season. Recovery continues until the early spring when the irrigation season begins and the cycle starts again. Unfortunately, at the end of most cycles the water levels have not recovered to those at the beginning. The amount that the potentiometric surface fluctuates depends on how much water is withdrawn from the aquifer. This is related to precipitation. During wetter years, less groundwater is utilized for irrigation, so the decline in the potentiometric surface is not as great.

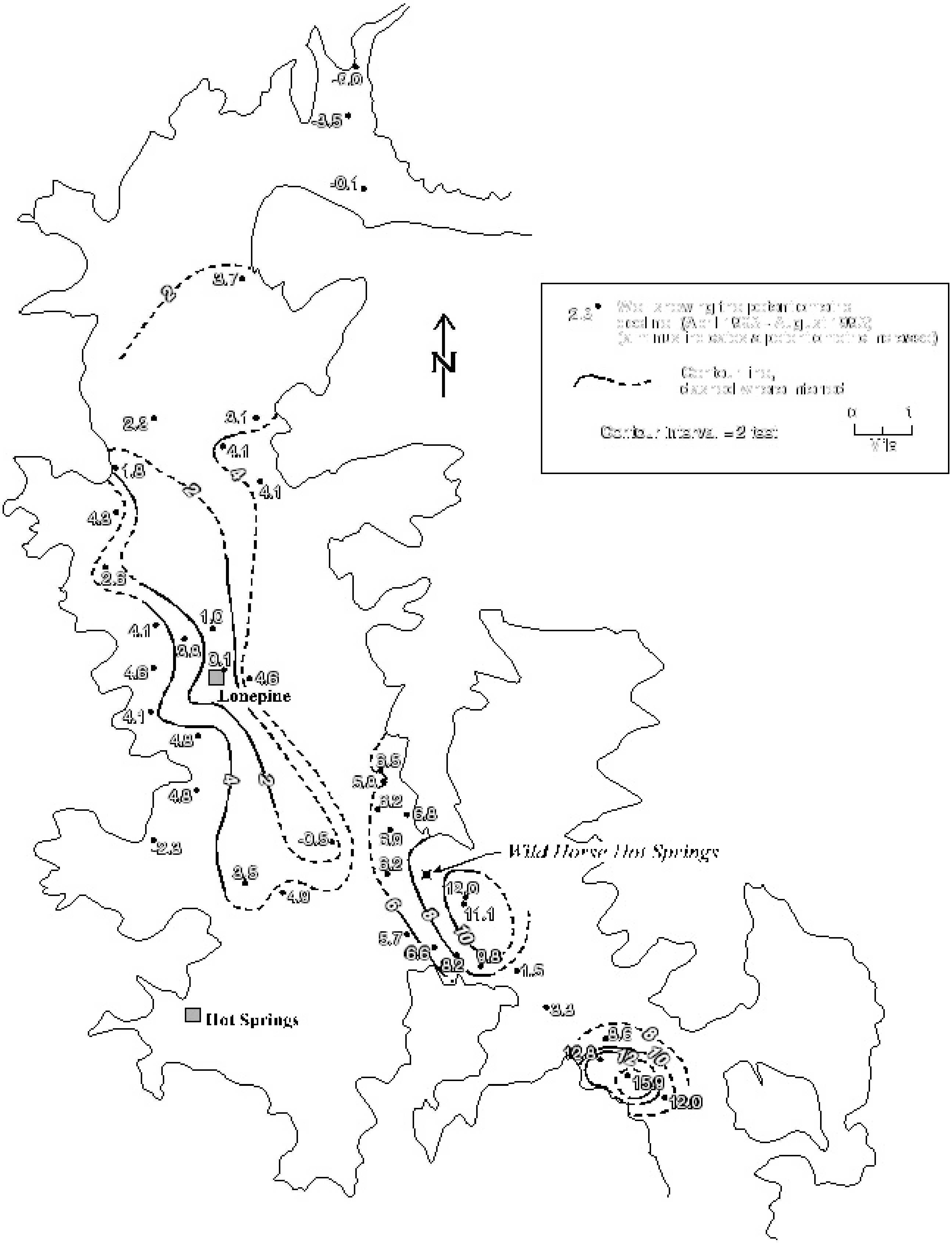

Figure 8. Potentiometric drawdowns during the 1993 irrigation season.

Of the hydrographs in figure 7, the greatest seasonal water-level fluctuation occurs in well 98 (22N23W32DBBB), located in the southern part of the study area, where irrigation is the heaviest. Seasonal drawdowns in this area are also likely due to cumulative effects from irrigation withdrawals in the northern part of the aquifer. Figure 8 is a map contouring the drawdown in the potentiometric surface at the height of the irrigation season (August 1993). During this time period, the greatest drawdown was approximately 16 feet (figure 8) in the southern part of the valley. In addition to increased groundwater withdrawals in this area, the valley narrows, and the aquifer thins to approximately 25 feet. Figure 8 shows that around Lonepine, drawdown varies from about five feet to an unexplainable net increase in water levels. Geophysical studies (Dresser 1979) show that the valley fill is thickest through the central part of the valley where drawdown is the least. Increases in drawdown towards the edge of the valley probably result from the cone of depression, created by pumping wells intercepting less transmissive bedrock/sediment.

Long-term hydrographs for wells 98, 211, and 196 are shown in Figure 9. These hydrographs show annual water-level fluctuations and a general but inconsistent decline. During the periods from 1971 to 1977, 1982 to 1985, and from 1992 to 1995, the potentiometric surface declined. Increases in potentiometric levels occurred from 1978 to 1981 and 1985 to 1988. Potentiometric levels were somewhat steady from 1989 to 1991. Precipitation data from the Hot Springs weather station also are plotted on figure 9 as a three-month moving average. Unfortunately, data were unavailable from mid-1986 to mid-1988 and from mid-1991 to 1995. Because of varying amounts of precipitation throughout the valley and at higher elevations, data from the Hot Springs weather station may not be representative of the entire watershed. However, some correlations can be made between precipitation and potentiometric levels. The wettest year on record, 1980, does correspond to the highest peak on the hydrographs. The decline in precipitation from 1981 through 1985 also is reflected in the potentiometric levels. Potentiometric levels in the summers of 1994 and 1995 are the lowest on record.

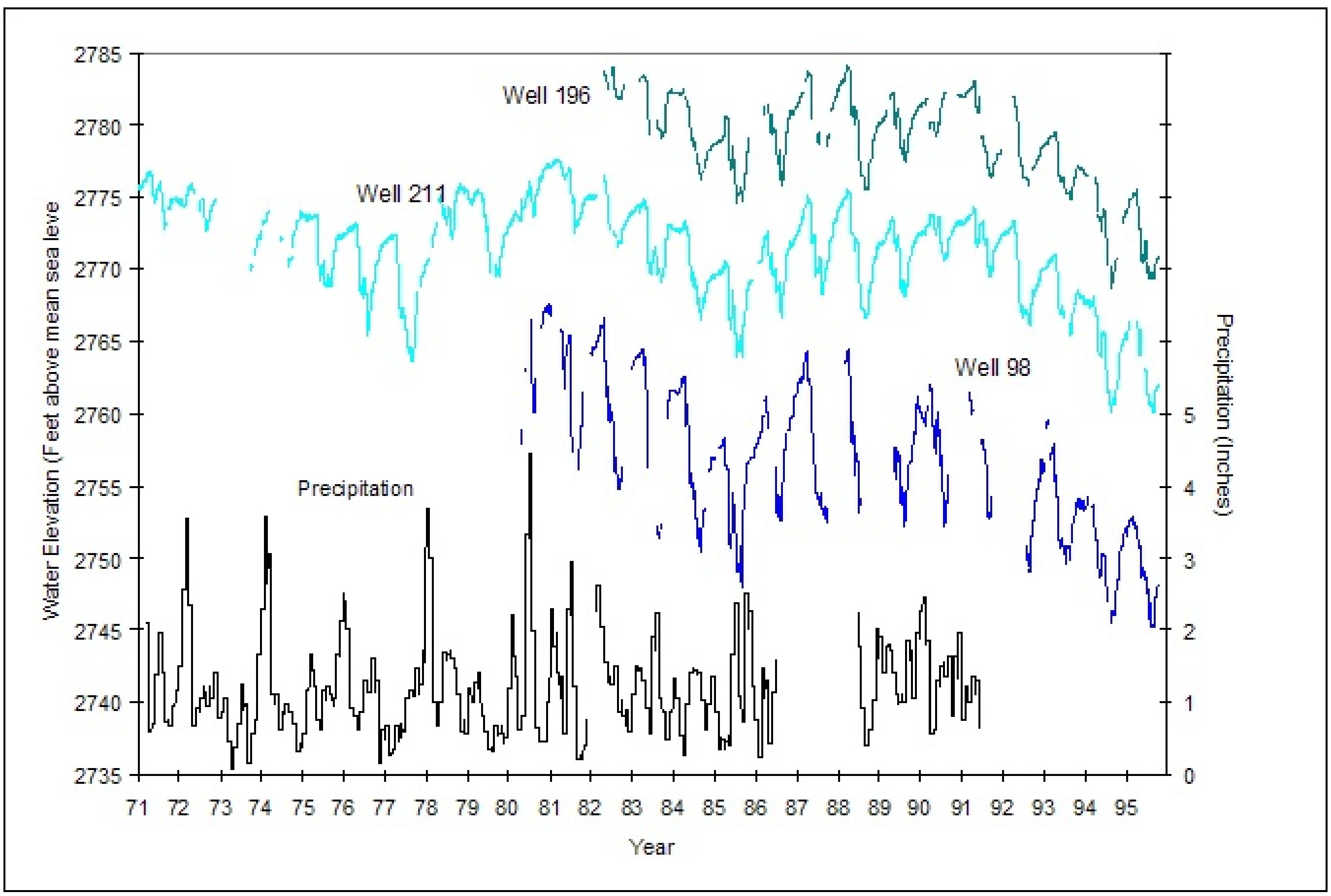

Figure 9. Groundwater hydrographs showing long-term trends in potentiometric levels and 3-month moving average rates.

Precipitation records from Round Butte and Kerr Dam (near Polson, Montana) show that over a 25-year span, precipitation amounts were lowest in 1994. The correlation between water levels and precipitation (figure 9) probably relate water use to precipitation rather than recharge to precipitation. In drier years, the lack of precipitation necessitates increases in groundwater withdrawals for irrigation—this probably controls the groundwater trends.

Fluctuations in bedrock groundwater levels are not as great as in the Lonepine aquifer. Eight water-level measurements on well 77 (22N24W34CCDC), located in the town of Hot Springs, showed that fluctuations due to seasonal variability did not exceed 1.1 feet. Groundwater fluctuated 3.47 feet in well 78 (22N23W28ABCC), a bedrock well located in the east central part of the valley, from measurements made in April 1994 and August 1994. During this same period well 80 (22N23W28CBDB), located approximately 0.5 miles from well 78 and completed in the Lonepine aquifer, showed a potentiometric difference of 9.9 feet. Bedrock groundwater levels in the central part of the valley may be responding to withdrawals in the Lonepine aquifer to demonstrate the interconnection between the two aquifers systems.

Seasonal groundwater fluctuations are artificially induced by irrigation withdrawals and probably date back to when the first irrigation wells were drilled. The general long-term decline in the Lonepine aquifer will persist as long as groundwater withdrawals occur in excess of recharge. In addition to depleting groundwater resources, the long-term decline lowers the potentiometric surface and may lead to a loss of flowing wells.

Impact of Uncontrolled Artesian Flow on Groundwater Levels

Donovan (1985) estimated that approximately 700–1,200 gpm were wasted from ‘runaway’ wells in which flow could not be controlled. ‘Runaway’ wells are far more damaging to potentiometric levels than the cyclic discharging irrigation wells. The continuous discharge and pressure losses can deplete groundwater storage. Since 1985, two runaway wells (wells 24, 21N23W23AADB and 76, 22N23W20DCDB) that contributed the major portion of this water have been sealed and no longer flow. The date of sealing well 24 is unknown. Well 76 was sealed on December 4, 1986, according to a memorandum dated December 5, 1986, to the DNRC from the MBMG (Donovan 1986). This memorandum stated that the well had been flowing uncontrolled at about 300–500 gallons per minute. Water-level data obtained from monitoring wells 98, 196, and 211 before and after the plugging of well 76 (figure 10) indicate a positive impact to the hydrogeologic system sealing this well. Well 98 (22N23W32DBBB), located approximately 1.7 miles south of well 76, shows the most significant response. Data from this well indicate that the water level rose 1.5 feet about a month after well 76 was sealed. Water levels also rose in wells 211 (23N24W34ADAA) and 196 (23N24W12CCCB), located approximately 6.0 and 8.5 miles northwest of well 76, respectively although the increase was not as obvious as in well 196. Water levels increased by about 0.8–1.2 feet in well 211 and 0.7–1.0 in well 196. Plugging of well 24 probably had a similar beneficial impact on water levels.

The time recovery water-level data obtained from monitoring well 98 in response to sealing well 76 were used to extrapolate the effect of a discharging well on the hydrogeologic system. Although there are no known wells that presently flow uncontrolled, information obtained from sealing well 76 can be used as an example to estimate the effects of groundwater wastage in the area. Wells have been observed to flow unnecessarily when no cattle are present to water or under the auspices of preventing a well from freezing. Groundwater also is lost from the system through leaky valves and corroded casings. Groundwater wastage at a single well has been observed to range between less than a gallon per minute to 50 gallons per minute.

Theoretically, the water level recovery at any time after the end of the discharging period is identical to the drawdown for the same time during the discharging period (Driscoll 1986). A technique presented by Lohman (1979), which assumes a constant discharge and variable drawdown, was used to estimate the effects of discharge on drawdown as a function of distance from the discharging well (in this case well 76). Transmissivity is estimated at 19,000 feet^2/day and storativity is about 0.0004 at an approximate discharge rate of 400 gallons per minute.

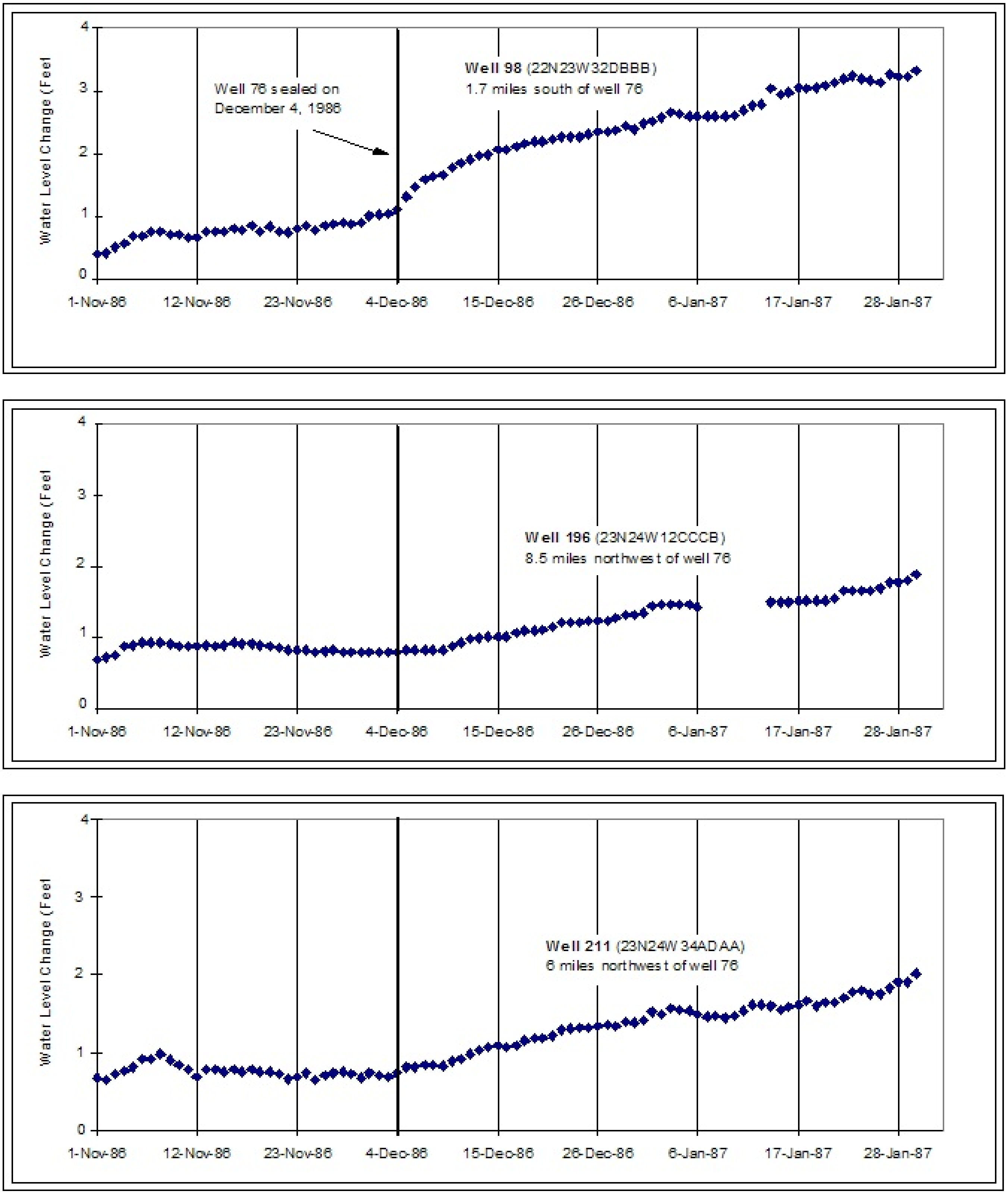

Figure 10. Water level responses in wells 98, 211, and 196 to sealng well 76 on December 4, 1986.

Figure 11 shows drawdown at various distances from well 76 at different discharge rates. This effect is estimated at 1, 5, 10, and 15 years. These graphs show that at a given point in time and a constant discharge rate, drawdown is always greatest closest to the discharging well. Drawdown is proportional to the discharge rate, therefore, if discharge doubles so does the drawdown. The greatest amount of drawdown occurs when the well is discharging at 500 gallons per minute for 15 years. Figure 11 also shows that the distance influenced by the cone of depression extends with time. At some point in time, the difference in drawdown at a constant discharge rate between time periods becomes minimal; for example, there is little difference in drawdown between 10 and 15 years.

Figure 11 can also be used as an indication of the effects of groundwater conservation on the hydrogeologic system. For example, the figure indicates that after a 10-year period, conserving 200 grams per minute of groundwater would result in a pressure savings increase of the potentiometric surface of about 2.5 feet, two miles from the well. Given the direct relationship between discharge and drawdown, any conservation of groundwater will conserve pressures; the doubling of one will double the other.

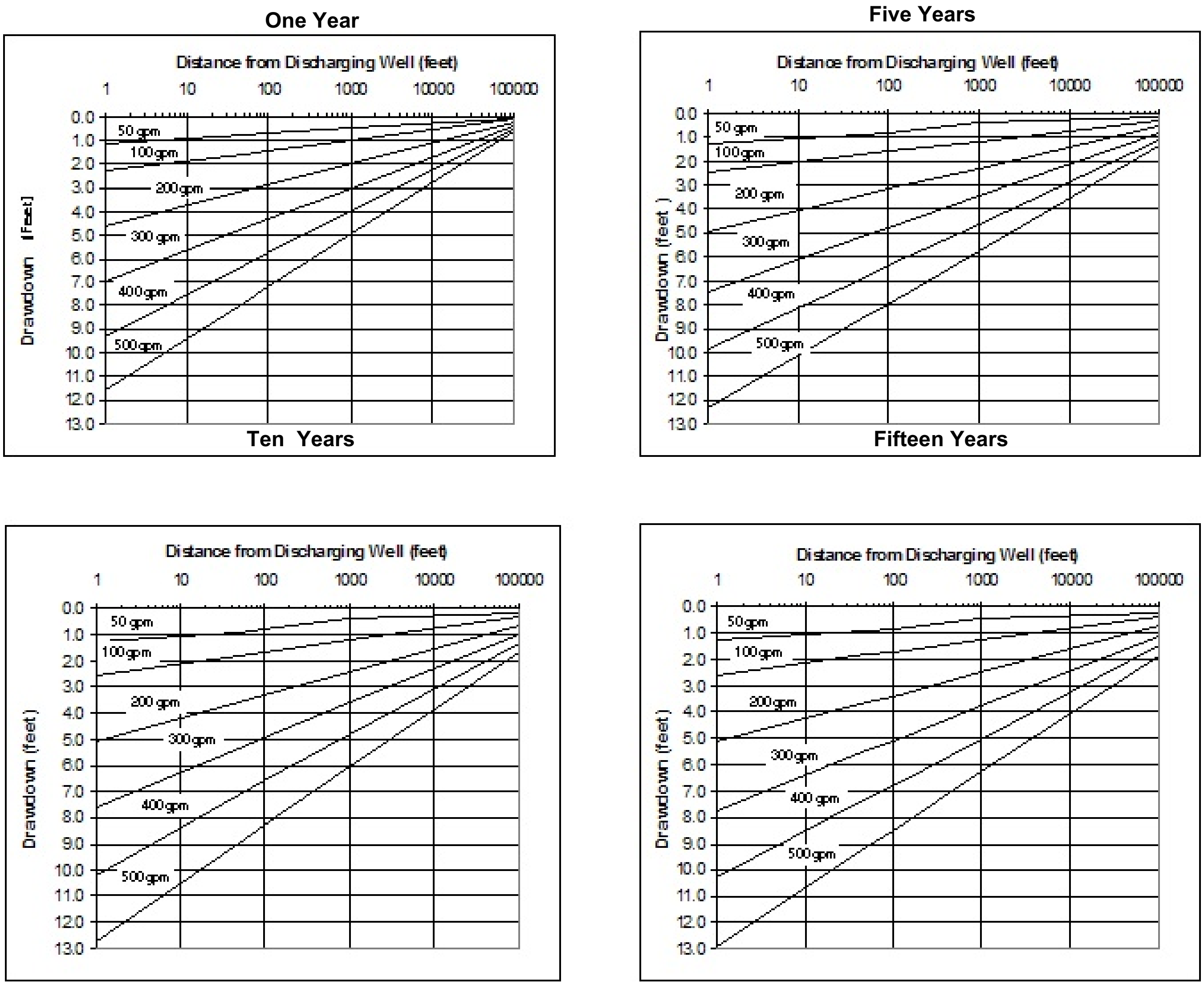

Figure 11. The effects of varying groundwater discharge rates on drawdown at different distances after one, five, ten, and fi years.

Groundwater Flow in the Lonepine Aquifer

A potentiometric contour map created from water levels measured during April 1994 is presented in figure 12. Groundwater flows from the north to the south-southeast, with a component of flow from the western margin of the valley towards the east. The flow component to the east is probably from recharge that occurs from the bedrock. The potentiometric map (Figure 11) shows a local groundwater depression west of the town of Lonepine, near the Lower Dry Fork reservoir. The Lonepine aquifer is deepest in this area (plate 2). The reason for this low is uncertain; however, a groundwater depression in this area also is evident on the potentiometric maps constructed by Boettcher (1982) and Slagle (1988). A groundwater mound occurs further south, just west of Wild Horse Hot Springs. The hydrostatic pressure in this area may be high because of underlying bedrock fractures. These fractures could act as conduits for groundwater flow from the bedrock upwards to the overlying gravels.

The groundwater gradient is relatively flat in the north-central part of the valley averaging about 0.0002 (feet/feet) and increasing to 0.002 (feet/feet) farther south. The average groundwater flow rate was calculated for these areas using the following equation:

$$V = \frac{KI}{\eta}$$

(Driscoll 1986)

where V_a = groundwater flow velocity (feet/day)
K = hydraulic conductivity (feet/day)
I = hydraulic gradient (feet/feet)
• = porosity (dimensionless)

In the north-central part of the study area, the hydraulic conductivity was calculated at about 1,400 feet/day based on transmissivity of 80,000 feet^2/day (Donovan 1985) and an aquifer thickness of 56 feet. Using a porosity of 0.25 and a hydraulic gradient of 0.0002 feet/feet the approximate groundwater flow velocity was calculated at 1.1 feet/day. Farther south, a hydraulic conductivity of about 1,100 feet/day was calculated using a transmissivity value of 26,600 feet/day (Donovan 1985) and an aquifer thickness of 24 feet. The groundwater flow velocity was calculated at 8.8 feet/day assuming a porosity of 0.25 and a hydraulic gradient of 0.002 feet/feet. The higher groundwater flow velocity in the southern part of the study area is a result of moving groundwater through an aquifer that decreases in thickness and is more laterally constricted.

Recharge to the Lonepine Aquifer

Recharge may enter the Lonepine aquifer by seepage from sands and gravels present in the tributary valleys to the Little Bitterroot valley. As discussed above, bedrock along the valley margins also is a source of recharge to the Lonepine aquifer, especially along the western margin of the valley where the high mountains receive abundant precipitation. Groundwater moves directly into the Lonepine aquifer where the sand and gravel is in contact with the bedrock. It is likely that there is some component of flow from the bedrock that forms the Salish Mountains on the eastern margin of the valley; however, there are little data in this area. The Salish Mountains are at a lower elevation than the mountainous area to the west. Therefore, they do not accumulate as much snow pack.

The predominantly northwest-trending structure of the area (figure 5) results in preferential groundwater movement along faults and fractures from the uplands into the valley. Warm groundwater from wells completed in the Lonepine aquifer also indicate a component of bedrock recharge. The warm water most likely flows through fractures in the bedrock along the northwest-trending faults shown on figure 5.

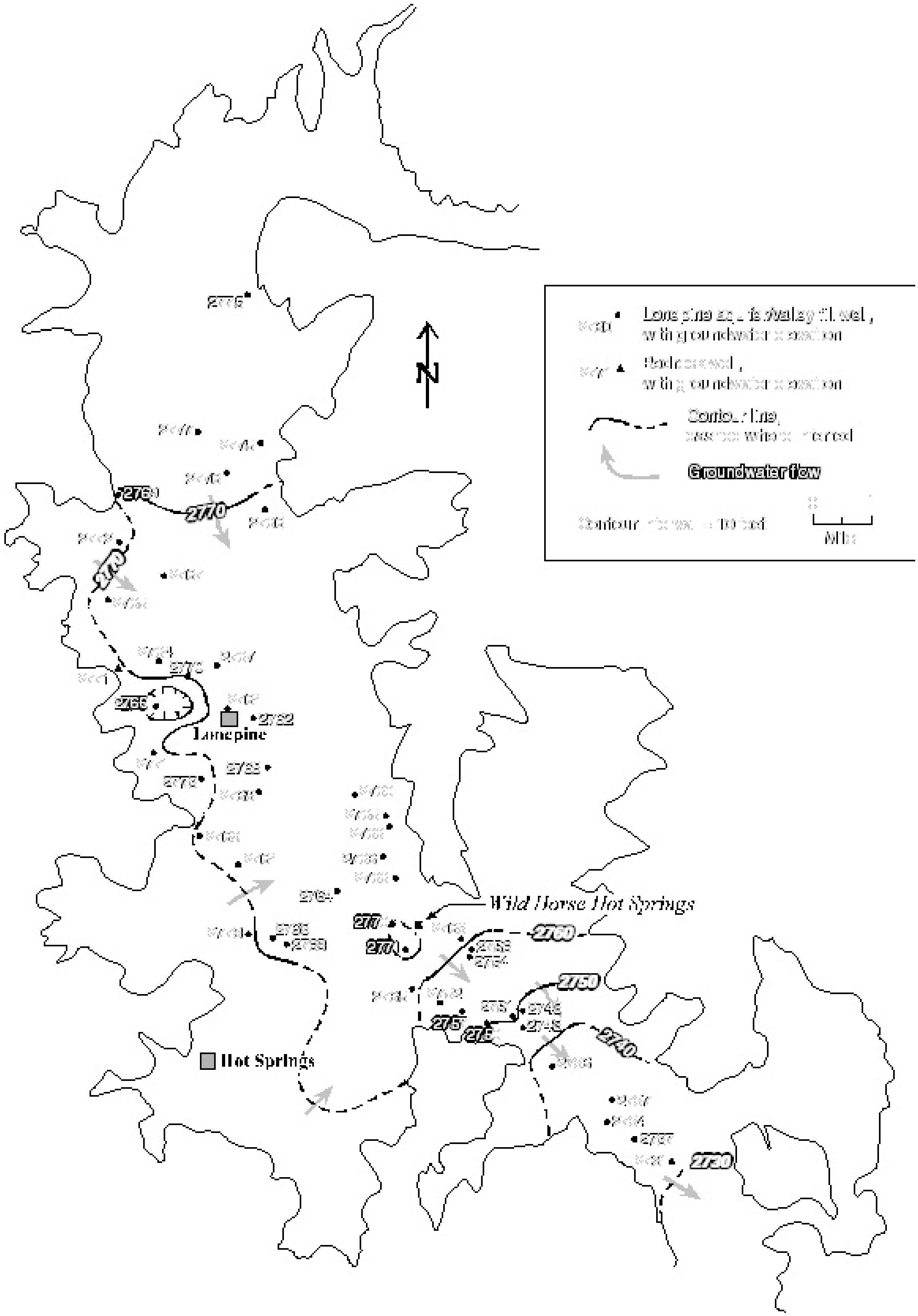

Figure 12. Potentiometric contour map of the Lonepine Aquifer (April 1994).

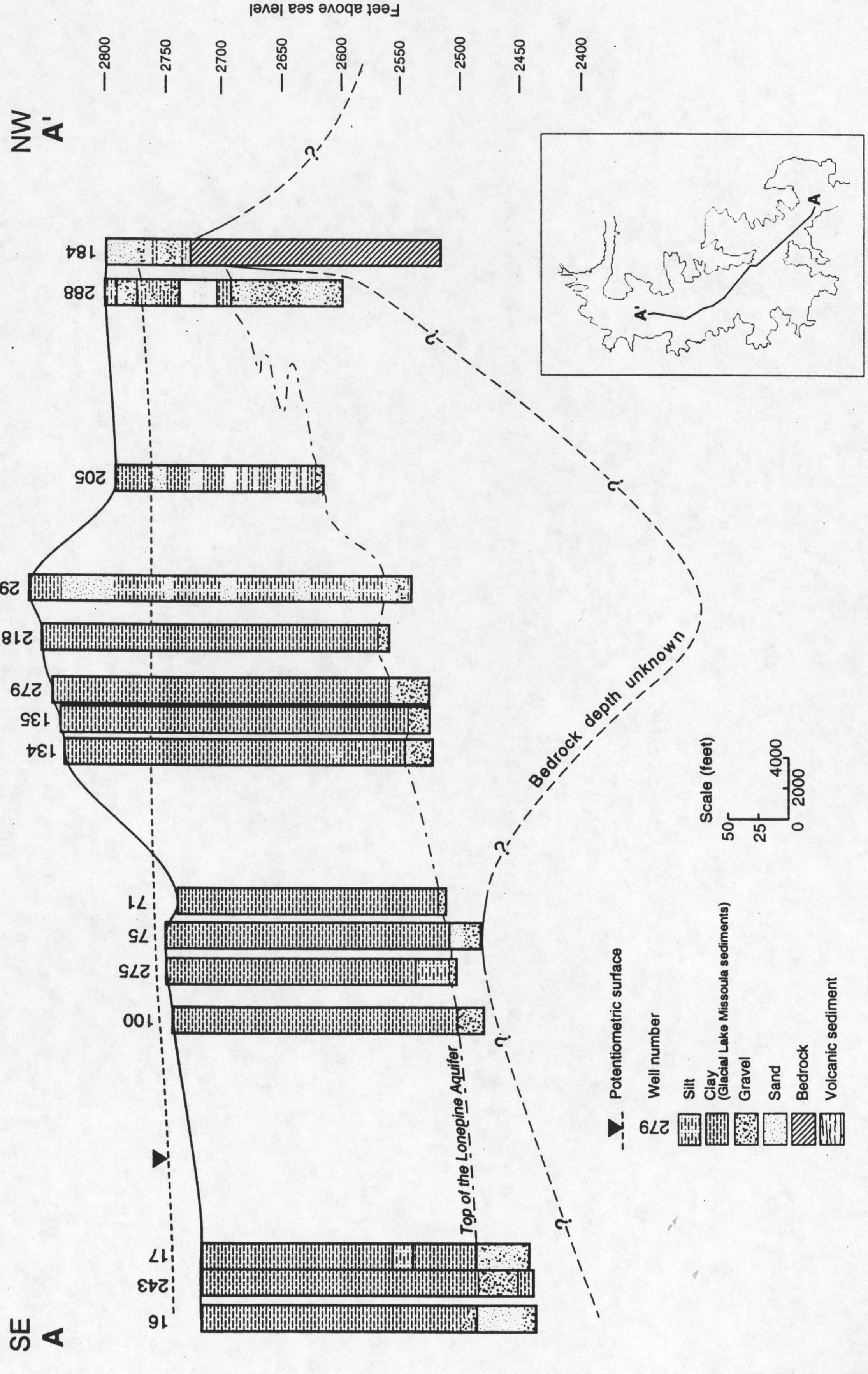

Figure 13. Cross section along the Little Bitterroot valley.

There also is evidence that recharge to the Lonepine aquifer occurs through the terrace gravels that are located in the northern part of the valley. In this area, the Glacial Lake Missoula sediment thins and the Lonepine aquifer approaches unconfined conditions. Donovan (1985) presents three observations to support this hypothesis:

a. After recovery from stress, the potentiometric surface of the aquifer approaches, but never exceeds, a steady-state elevation equivalent to that of the water table elevation in the terrace gravels near well 185 (23N24W02CBC, 2783 feet). Plate 1 shows the well location.

b. Early potentiometric levels reported by Meinzer (1916) do not exceed 2,783 feet.

c. Coarse, bouldery sand is logged in well 184 (23N24W02BDDD, plate 1) to at least 72 feet. This deposit has a water table that appears to be connected to the Little Bitterroot River.

Donovan (1985) postulated that the terrace gravels may not correlate with the Lonepine aquifer but may overlie older gravels that are hydrogeologically connected to the Lonepine aquifer. Well 288 (23N24W11ABBB), located about half a mile south of well 184, was drilled in 1984, after completion of Donovan's report. The lithologic relationship of wells 184 and 288 to the Lonepine aquifer is shown in figure 13. The lithology in well 288 supports Donovan's hypothesis. Boulders, sand, and gravel are present from 2 to 28 feet beneath the land surface. These horizons most likely correspond to the terrace deposits identified to the north (vicinity of well 183/184). Underlying these beds, are approximately 85 feet of sands interbedded with clays; reflective of water level fluctuations of Glacial Lake Missoula. Beneath these sands and clays, gravels extend to at least 200 feet (the total depth of the well). This gravel sequence is most likely continuous with the Lonepine aquifer.

Surface-water/Groundwater Relationships

Surface water in the northern part of the valley is a potential source of recharge to the Lonepine aquifer. Surface water and groundwater elevations were plotted along a north-south cross section through the valley (figure 14) to illustrate the surface-water/groundwater relationship. Surface-water elevations are those of the Little Bitterroot River and were obtained from 7.5-min. topographic maps. The profile shown on figure 14

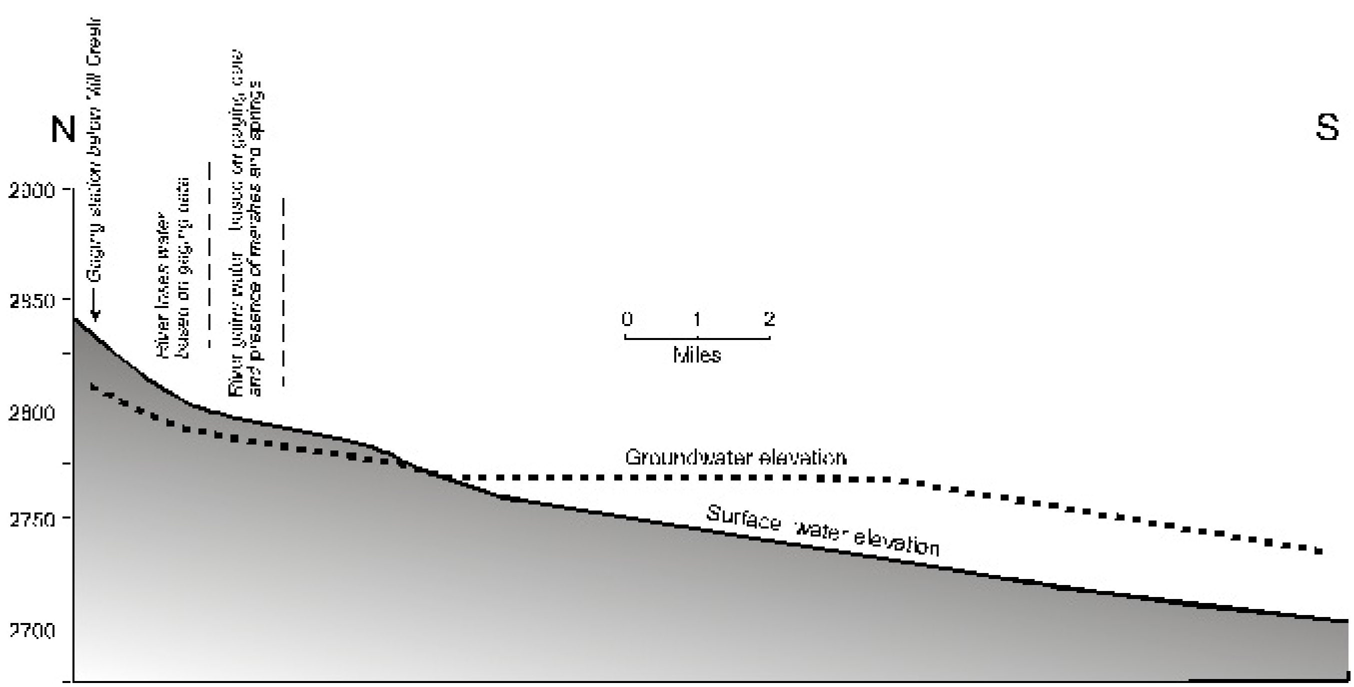

Figure 14. Relationship between surface water (Little Bitterroot River) and groundwater (Lonepine aquifer).

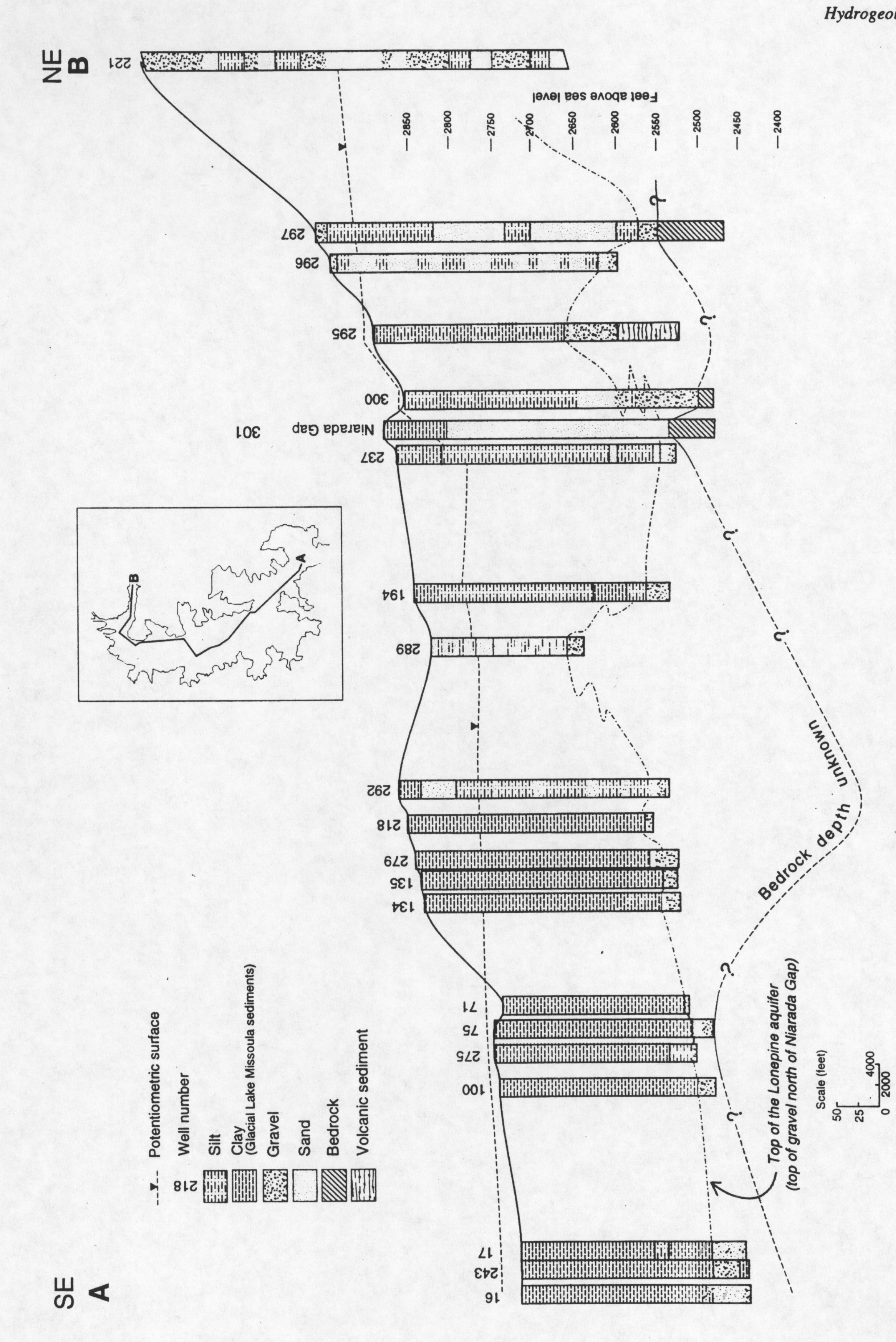

Figure 15. Cross section through the Little Bitterroot valley and Sullivan Flats.

indicates that surface water is at a higher elevation than groundwater in the northern part of the valley to create the potential for downward infiltration into the groundwater. The surface-water/groundwater relationship was further examined by gaging the Little Bitterroot River in this area. During November 1993 and April 1994, the Little Bitterroot River was losing water between the gaging station below Mill Creek and where the river flows into the Little Bitterroot valley (approximately 2 miles downstream). Potential recharge to the Lonepine aquifer, based on the measured streamflow loss is about 2.0 to 4.6 cubic feet per second (900 to 2,065 gallons per minute). The gaging data shows that from where the Little Bitterroot River enters the valley to about 1.2 miles downstream (farthest downstream point gaged in this area), the river gained water during these same time periods. The presence of seeps and springs, especially along the west bank of the river, and a marsh area along this reach also suggests that this is a groundwater discharge area, or gaining reach for the river. This is not supported by the surface-water elevations shown on figure 14 which indicates that the Little Bitterroot River is still losing water in this reach. However, the gaging data and field observations are more accurate and surface-water and groundwater runoff probably moves through the terrace gravels discharging into the Little Bitterroot River.

Relation of the Sullivan Flats Aquifer to the Lonepine Aquife

Groundwater in the Sullivan Flats area, located north of Niarada Gap (figure 1) was examined because of its potential as a source of recharge to the Lonepine aquifer. A geologic cross section through Sullivan Flats extending into the Little Bitterroot valley is shown on figure 15. In the Sullivan Flats drainage, like the Little Bitterroot valley, sands and gravels are overlain by finer sediment that represent Glacial Lake Missoula sediment. Further up Big Draw (to the east), coarser material is closer to the surface (well 221, 24N22W30BCCC) (figure 15).

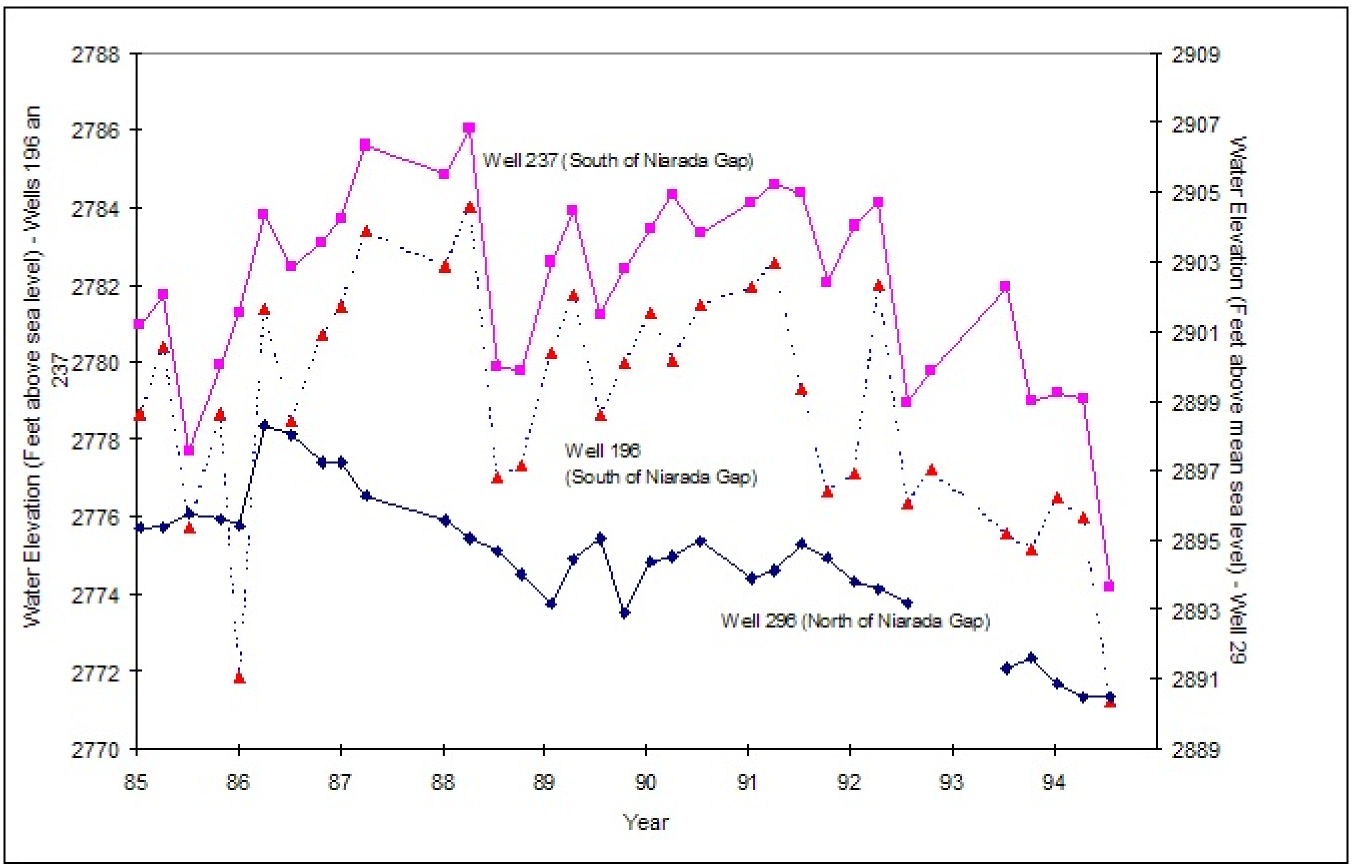

Figure 16. Groundwater hydrographs for wells south of Niarada Gap (wells 196 [23N24W12CCCB] and 237 [24N24W25DDBB]) and north of the gap (well 296 [24N23W21BCDA]). Note different elevation scale for well 296 prior to 1987 water elevatons are from well 231, 24N23W21BCDB).

Precipitation/snowmelt most likely infiltrates through this area and is a source of recharge to the Sullivan Flats aquifer. Groundwater in Sullivan Flats moves to the west and then south toward Niarada Gap, where groundwater is at its lowest elevation.

Potentiometric data show water levels are over a hundred feet higher north of the gap than south of it. An examination of water levels in wells north of the gap to those south of the gap show a difference in seasonal fluctuations. Figure 16 shows water elevations in wells 196 (23N24W12CCCB) and 237 (24N24W25DDBB), both completed in the Lonepine aquifer, and well 296 (24N23W21BCDA), completed in the Sullivan Flats alluvium. As mentioned previously, in the Little Bitterroot valley, groundwater levels are highest in the winter and early spring and lowest in the summer irrigation season. Water levels in Sullivan Flats area are generally highest in the summer months and lowest in the winter and early spring. This response is affected primarily by infiltration of surface runoff, with higher water levels resulting from increased streamflow in the late spring and throughout the summer (Slagle 1988). Although the seasonal response in water-level fluctuations vary north and south of the gap, Figure 16 shows that long-term trends are similar, generally decreasing over the span of record.

Previous researchers are in disagreement with regards to the connection between the groundwater in Sullivan Flats to the Little Bitterroot valley. Based on aquifer test data, Briar (1987) concluded that the Sullivan Flats aquifer is not connected to the Lonepine aquifer. However, Spratt and Associates (1991) use Briar's (1987) data and potentiometric gradients north and south of the gap to suggest that there is water movement through the gap.

In any case, the steep groundwater gradient across the gap suggests lower transmissivity and/or a decrease in the cross sectional area in which groundwater flows. It also may indicate that groundwater in the Little Bitterroot valley and Sullivan Flats area are two separate flow systems with little or no interconnection. If groundwater does flow through the gap, its contribution as a source of recharge to the Lonepine aquifer is probably minor.

GROUNDWATER CHEMISTRY

The results of 46 water-quality analyses performed as part of this study, along with data obtained from previous investigations, are presented in appendix C.

Summary statistics for constituents analyzed during this study are presented in table 3. The trace elements, aluminum, beryl, cadmium, cobalt, lead, molybdenum, nickel, selenium, silver, titanium, and zirconium were below or near the instrument detection limits (appendix C) and are not presented in this table. In general, groundwater in wells completed in the Lonepine aquifer had higher concentrations of calcium, magnesium, sodium, manganese, bicarbonate, chloride, barium, boron, fluoride, arsenic, and specific conductance than groundwater from the bedrock wells. Groundwater from the bedrock wells, on average, contained more silica, sulfate, zinc, and has a higher pH. Potassium, lithium, strontium, and total dissolved solids had similar average concentrations in the bedrock and Lonepine aquifer. The average concentration of iron in bedrock wells (table 3) is skewed due to an anomalously high concentration (15.6 mg/L) in well 187 (23N24W03BABB); excluding this value the average is 0.58 mg/L.

Groundwater near the Wild Horse Hot Springs area, in the central part of the valley, reaches temperatures as high as 48°C (118°F). The distribution of groundwater temperature in the Lonepine aquifer is presented in figure 17. The groundwater temperature contours follows a northwest-southeast trend that is similar to the structural pattern. This trend suggests that the geothermal groundwater moves upward to the Lonepine aquifer through faults/fractures in the underlying bedrock. The downgradient extent of the geothermal plume away from Wild Horse Hot Springs is more restricted than the upgradient extent. This may be due to an influx of cooler groundwater from the Hot Springs and Garceau Gulch drainages, or perhaps the faults/fractures are less connected to the geothermal source and not as conducive to groundwater flow in this area. Faults/fractures near the town of Hot Springs also provide conduits for geothermal flow. The warmest groundwater in the town of Hot Springs is approximately 45°C (113°F), but the geothermal plume from this source is relatively restricted.

Table 3. Summary statistics for groundwater in the Lonepine aquifer and bedrock wells sampled during this study.

	Recommended Levels**			Summary Statisitics for the Lonepine Aquifer (n = 38)					Summary Statisitics for Bedrock Groundwater (n = 9)				
	Drinking Water	Stock Water	Irrigation Water	Minimum	Maximum	Average	Median	Standard Deviation	Minimum	Maximum	Average	Median	Standard Deviation
Calcium (mg/l)	---	---	---	2.4	65.7	18.1	9.6	15.4	0.8	41.1	11.5	11.1	13.5
(mg/l)	---	2000.0	---	0.1	18.1	4.8	2.4	4.8	<0.1	13.3	3.7	2.0	4.3
Sodium (mg/l)	---	2000.0	b	19.3	156.0	83.0	88.5	44.6	13.4	126.0	66.6	86.8	38.2
Potassium (mg/l)	---	---	---	0.8	6.5	2.2	2.0	1.1	0.8	3.9	2.5	3.1	1.3
Iron (mg/l)	0.3[a]	---	---	<0.003	1.3	0.3	0.1	0.4	<0.003	15.6	2.2	0.1	5.1
(mg/l)	0.05[a]	---	2	<0.002	0.9	0.2	0.1	0.2	<0.002	0.3	0.1	0.0	0.1
Silica (mg/l)	---	---	---	11.5	44.5	24.1	21.0	9.3	29.8	70.9	46.4	38.7	16.6
(mg/l)	---	---	---	105.0	359.5	254.8	250.0	55.0	91.7	326.0	157.9	117.0	82.4
Chloride (mg/l)	250.0[a]	1500.0	---	1.7	35.6	14.5	10.0	10.7	2.6	32.6	10.9	8.1	10.9
Sulfate (mg/l)	250.0[a]	1500.0	c	<0.7	40.0	7.2	5.9	7.2	<1.0	36.1	13.8	10.6	11.4
Nitrate (mg/l)	10.000	100.0	---	<0.04	1.9	0.2	0.03	0.4	<0.04	0.1	+	+	+
Fluoride (mg/l)	4.000	2.0	---	0.4	7.5	3.9	3.7	2.4	0.6	5.9	3.4	3.3	2.2
Arsenic(ug/l)	50.000	50.0	100	<1.0	110.0	21.8	9.8	27.8	<1.0	59.5	7.3	0.5	19.6
Boron (ug/l)	---	---	d	<30.0	810.0	381.1	353.0	278.7	<30.0	460.0	219.4	3.0	159.1
Barium (ug/l)	1,000.000	---	---	10.4	1675.0	417.7	262.0	422.4	<2.0	108.0	23.0	5.5	35.5
Lithium (ug/l)	---	---	2500	<6.0	93.0	29.8	16.0	31.3	10.0	86.0	35.8	36.0	22.4
Strontium (ug/l)		---	---	14.0	294.0	106.9	107.0	62.5	<6.0	289.0	100.3	91.0	94.9
Zinc (ug/l)	5000.0[a]	24000.0	2000	<2.0	104.9	12.6	8.0	19.8	<2.0	331.0	72.4	5.0	120.6
SDC	500.0[a]	5000.0	2000.0[e]	176.0	602.0	286.7	266.6	75.5	215.0	543.0	254.5	270.5	70.5
Field pH	6.5-8.5[a]	---	4.5-9.0	6.71	8.8	*	8.1	0.3	6.7	9.7	*	8.10	1.1
Field SC	---	---	---	275.0	723.0	452.0	429.0	16.0	214.4	379.8	342.0	360.9	74.9
Temperature	---	---	---	9.0	47.9	19.1	16.4	8.3	14.0	44.7	24.9	15.9	12.6

** U. S. EPA CFR 40 Sections 141.11 and 143.3
* Averages were not calculated for pH since it is computed on a log scale
+ Seven out of nine samples were below the detection limit
SDC = Sum of dissolved solids (mg/l)
SC = Specific conductance (microsiemens/cm @ 25 degrees Celsius)

a = This standard is based on aesthetic quality of water (i.e. odor, color, etc.) and is not a health standard.
b = High concentrations of sodium may restrict calcium uptake by crops
c = High concnentrations of sulfate may restict calcium uptake by crops.
d = Toxic to plants above the optimum range of 300 to 4000 ug/l (varies on plant type).
e = Varies with crop; should be less than 2000 mg/l.

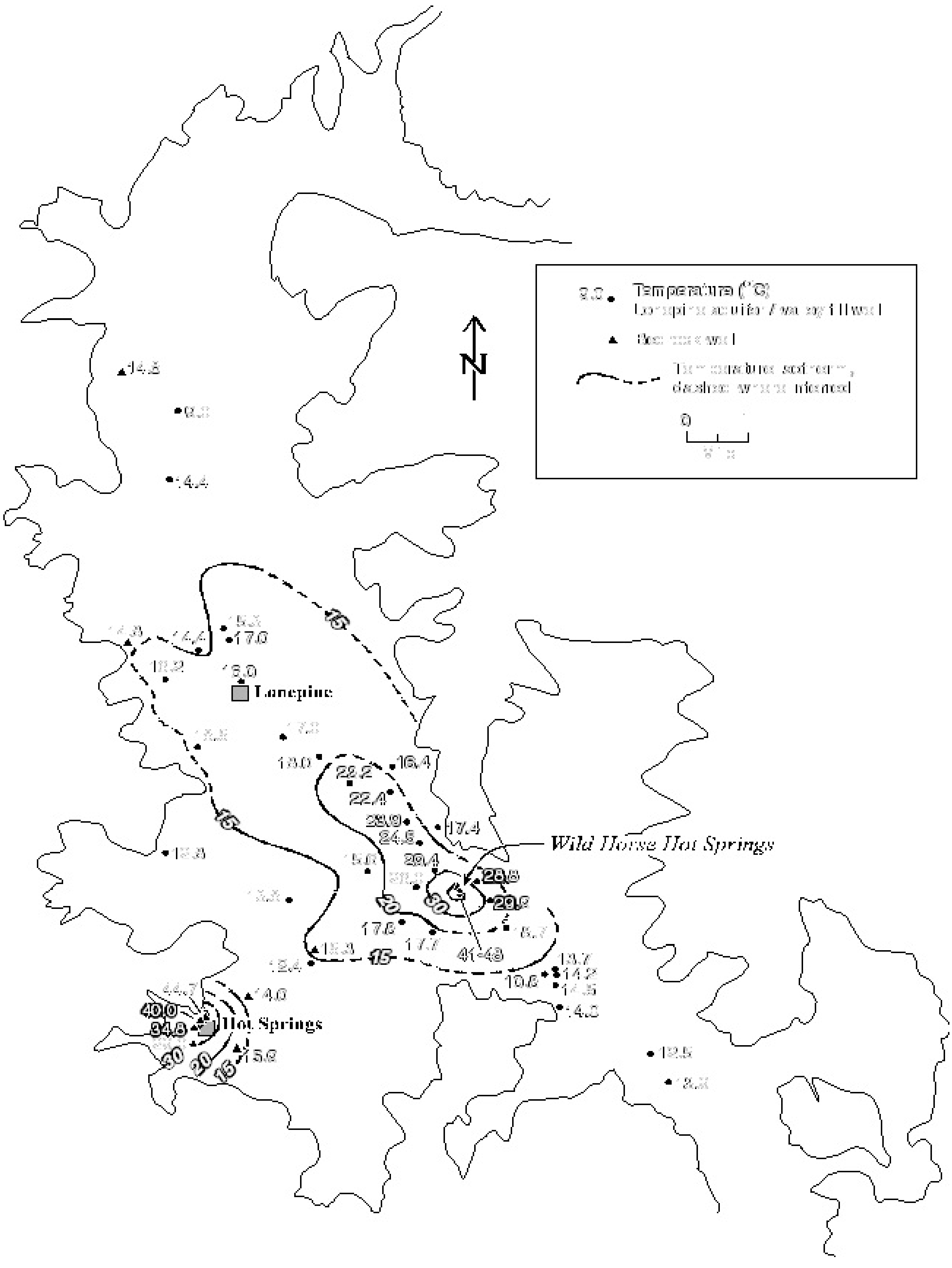

Figure 17. The distribution of groundwater temperatures (°C).

Specific conductance is a measure of the water's capacity to conduct an electric current and varies with the concentration of dissolved solids in the water. Specific conductance values follow a northwest trending pattern in the Lonepine aquifer. Higher values (greater than 600 microsiemens/cm) are found in the Wild Horse Hot Springs area where groundwater is the warmest. Along the valley margin, away from the zone of geothermal influence, specific conductance ranges between 200 and 300 microsiemens/cm. The specific conductance of groundwater in the town of Hot Springs ranges between 400 and 420 microsiemens/cm. Concentrations of boron, lithium, and chloride also follow a northwest-southeast trend and in general, are highest where groundwater is the warmest. Donovan (1985) noted a similar distribution of these constituents.

Figure 18 shows the distribution of the sum of dissolved solids in groundwater. In this report sum of dissolved solids will be referred to as total dissolved solids (TDS). Concentrations are lowest (less than 200 mg/L) at the valley margin and increase towards the central part of the valley. The low TDS water along the valley margin probably reflects recharge from the adjacent mountains. As groundwater flows downgradient and/or is influenced by geothermal mechanisms the dissolved constituents increase. The highest dissolved solids concentrations coincide with the warmest temperatures. Elevated dissolved solids (greater than 400 mg/L) southwest of Wild Horse Hot Springs indicates that there may be some groundwater leakage from bedrock that is influenced by the geothermal system. Although groundwater temperatures were measured at 12.4 and 15.3°C (54 and 60°F) in this area, the predominant cations and anions are similar to the geothermal water (plate 3) (further discussion of groundwater type is found in section 5.1). The contour pattern shown on figure 18 is oblong south of Wild Horse Hot Springs. The transport of higher dissolved solids in groundwater south eastward from Wild Horse Hot Springs, appears limited by the cone of depression in this vicinity (figure 18).

Recommended levels established for drinking water by state and federal guidelines are included in table 3. These recommended levels are referred to as primary and secondary maximum contaminant levels (MCLs) (EPA 1992). An exceedance of a primary MCL poses a health hazard if the water is consumed while secondary MCLs do not pose a health hazard but are unpleasant aesthetically (may impart a bitter taste or stain fixtures). The secondary MCLs for iron, manganese, fluoride, and pH and the primary MCLs for arsenic and fluoride were exceeded in several of the samples. Iron MCLs were exceeded in 14 of the 48 wells sampled and manganese MCLs were exceeded in 30 of the 48 wells. Iron and manganese are derived from soils and rocks; iron also may be derived from pipes, pumps and other equipment. High levels of iron and manganese may cause an unpleasant taste to the water and cause a reddish brown to black stain but do not endanger health. The secondary MCL for fluoride was exceeded in 6 wells and 23 wells exceeded the primary MCL. Elevated concentrations of fluoride can result in dental problems especially in young children and bone disorders in adults. Arsenic can be toxic in humans; concentrations exceeded MCLs in 5 of the 48 wells sampled.

Groundwater Types

Groundwater type refers to the major cations and anions present in solution. There are two groundwater types in the study area (plate 3) that reflect a geothermal and non-geothermal influence. Groundwater that is geothermally influenced is a sodium-bicarbonate type water and is present in the central part of the valley and in the town of Hot Springs. The non-geothermal groundwater is mainly a calcium-sodium-bicarbonate type or a sodium-calcium-bicarbonate water and is found in the Sullivan Flats drainage and in the Lonepine aquifer in the north, west, and south parts of the study area (plate 3).

Groundwater from some bedrock wells (*i.e.,* wells 287, 22N24W34DDBA, and 290, 23N24W33ABAA) are a sodium-bicarbonate/sodium-calcium-bicarbonate water type. However, they contain a higher percentage of calcium and lower sum of dissolved constituents then the geothermal water.

Downgradient flow of the geothermal groundwater (sodium-bicarbonate) is restricted by the strong potentiometric depression southeast of Wild Horse Hot Springs. In addition to this restriction, mixing of groundwater from Oliver and Wilks Gulch, which has higher calcium and magnesium contents, results in water at

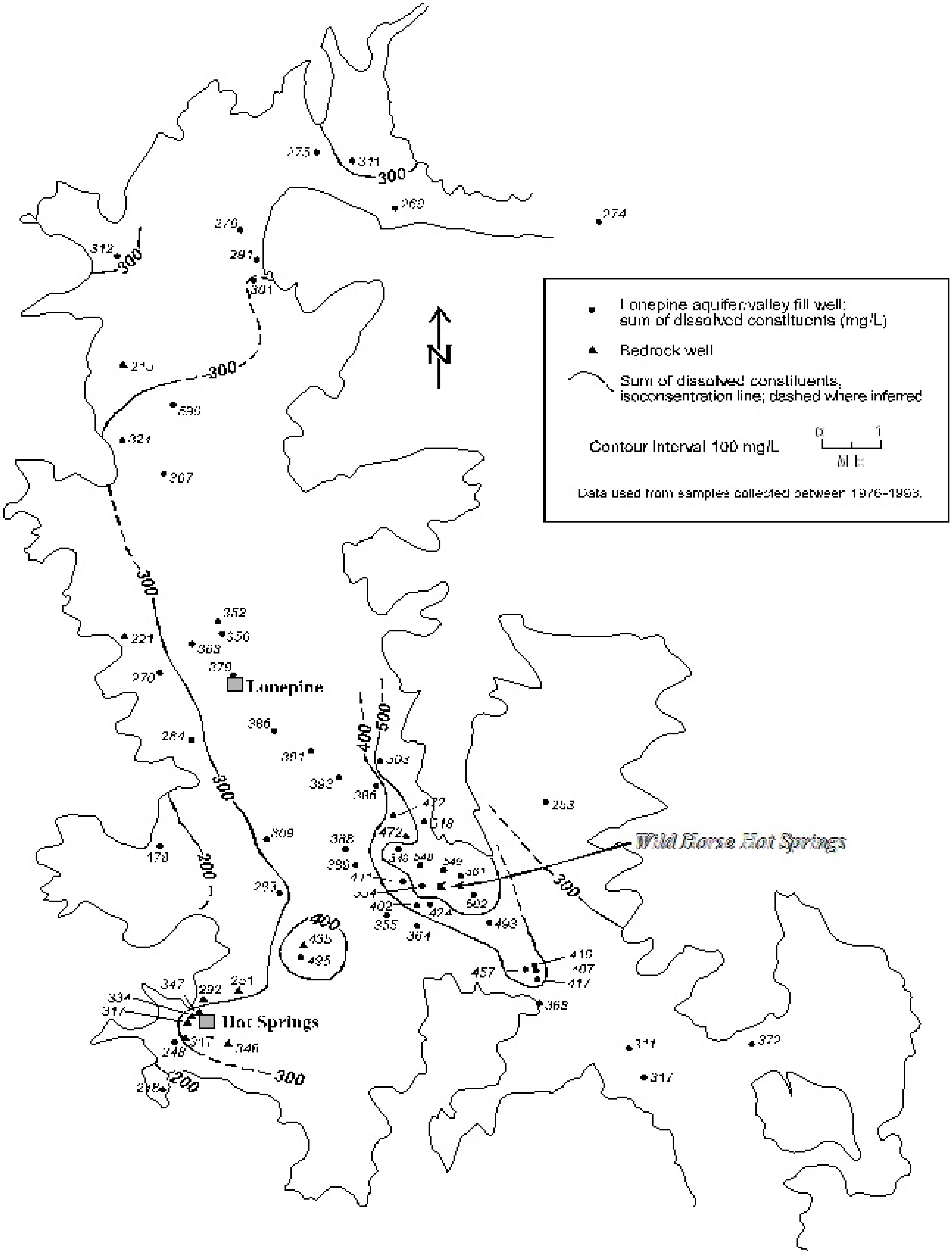

Figure 18. Distribution of the sum of constituents.

the southeast end of the study area that is reduced in sodium. The calcium enriched groundwater in this area is evident in wells 11 (21N23W11CACC) and 17 (21N23W04ACAB) (plate 3).

Water Chemistry in the Hot Springs and Wild Horse Hot Springs Areas

Ratios of selected constituents were examined to determine if the chemistry of the geothermal groundwater in Hot Springs is significantly different than the geothermal groundwater in the vicinity of Wild Horse Hot Springs. Groundwater was examined from wells that were warmer than 15°C (59°F) and exhibited a sodium-bicarbonate type water, which indicates that the groundwater chemistry is influenced by the geothermal system. Although water from both areas is a sodium-bicarbonate type there were differences in the water chemistry as indicated by the ionic ratios. The Na/Mg, Na/Ca, Ca/Fl, Cl/Fl, and Cl/SO_4 ratios showed the most difference (Table 4). The smaller Cl/SO_4 ratio in Hot Springs reflects the lower chloride and higher sulfate concentrations in this area. Calcium and magnesium are also lower in Hot Springs groundwater resulting in higher Na/Ca and Na/Mg. Fluoride concentrations in both areas are similar and the lower Cl/Fl and Ca/Fl ratios in the Hot Springs area are due to the lower concentrations of chloride and calcium. Lithium, boron, barium, bicarbonate, and total dissolved solids generally are present in lower concentrations in groundwater in the town of Hot Springs. Carbonate concentrations are higher in Hot Springs groundwater due to a higher pH (9.06 to 9.46) in this area which increases the activity of the carbonate species at the expense of bicarbonate (Drever 1982).

Table 4. Ratios of selected constituents in meq/L.

Groundwater in the Town of Hot Springs

Temp °C	Well Number	Cl/SO_4	Cl/Fl	Na/Ca	Na/Mg	Ca/Fl	
15.9	39	2.02	0.89	73.78	984.29	0.20	
29.0	42	0.94	0.81	94.58	917.68	0.14	
34.8	41	0.66	0.79	95.13	922.97	0.13	
44.7	35	0.35	0.25	95.89	930.37	0.13	
		0.99	0.69	89.85	938.83	0.15	(average)

Groundwater in the vicinity of Wild Horse Hot Springs

Temp °C	Well Number	Cl/SO_4	Cl/Fl	Na/Ca	Na/Mg	Ca/Fl	
15.6	67	2.58	0.79	16.93	44.49	0.73	
16.4	52	6.70	1.60	14.76	51.64	1.23	
17.4	72	67.75	2.52	21.88	54.08	0.94	
17.7	91	4.92	1.15	11.41	29.40	1.00	
18.5	94	1.42	1.02	33.67	490.03	0.49	
18.7	101	13.50	2.09	16.05	51.64	1.03	
22.4	59	1.33	1.07	7.21	51.98	2.71	
23.2	60	1.32	1.13	11.49	56.50	1.98	
23.9	62	6.17	1.53	35.15	220.26	0.48	
24.5	74	8.54	1.69	33.02	220.26	0.52	
26.0	276	5.85	1.22	31.60	306.60	0.42	
28.8	83	15.77	2.60	42.42	257.26	0.47	
29.4	75	81.30	2.40	30.95	187.66	0.57	
29.9	79	18.61	3.91	26.33	79.82	0.98	
41.0	88	94.85	5.23	9.90	33.30	3.15	
44.2	85	16.52	3.65	50.37	412.32	0.49	
47.9	84	14.15	3.64	46.89	274.88	0.53	
		21.25	2.19	25.88	166.01	1.04	(average)

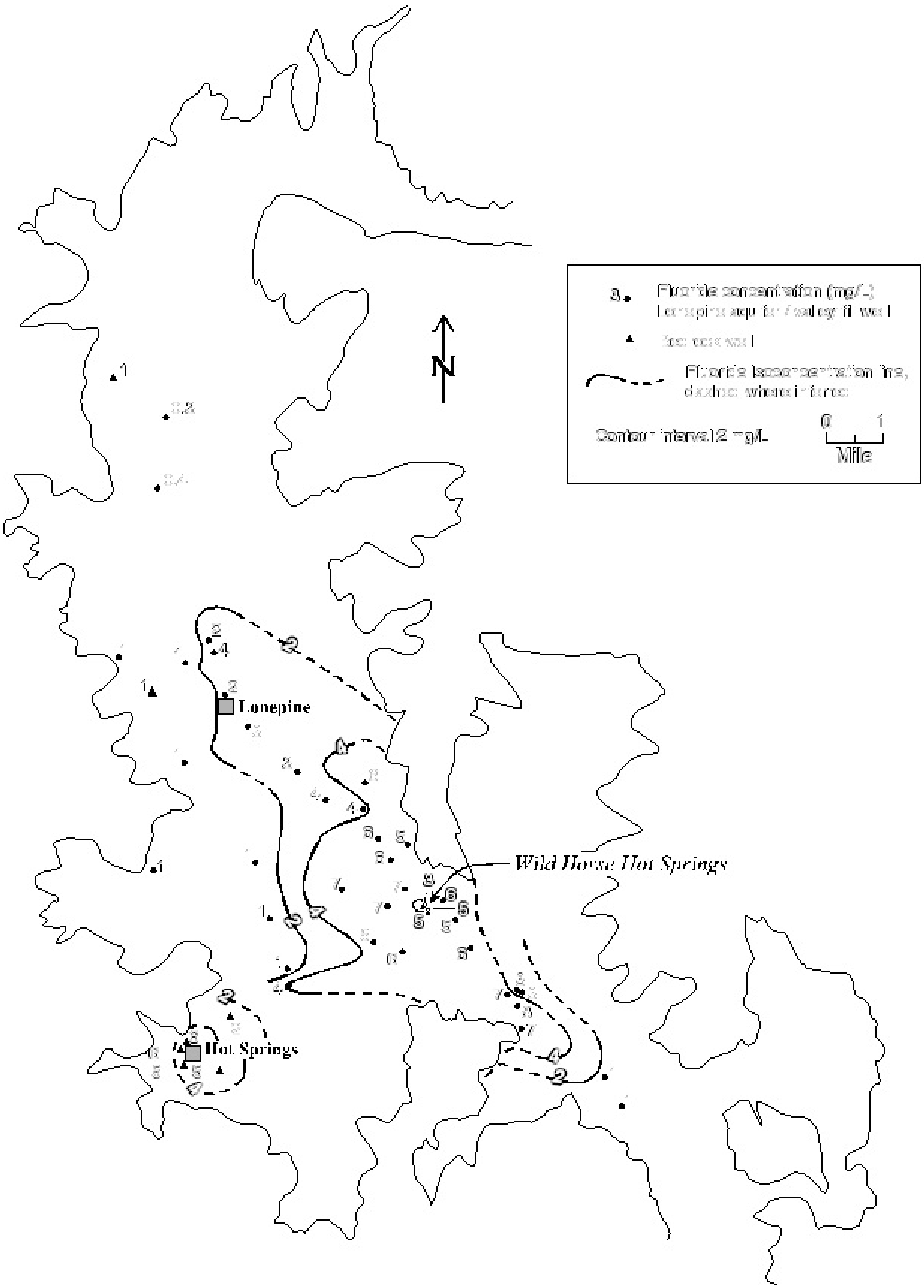

Figure 19. The distribution of fluoride in groundwater.

Differences in groundwater chemistry between the two geothermal areas, are probably due to different bedrock sources. In both areas, geothermal flow moves through the Belt Supergroup. However, geothermal groundwater from the Hot Springs area issues directly from the Pritchard Formation while in the central part of the valley the bedrock source is the underlying Ravalli Formation. The difference in bedrock mineralogy probably accounts for the difference in water chemistry between the geothermal areas.

Distributions of Fluoride, Barium, and Arsenic in Groundwater

The areas that are influenced by geothermal groundwater have higher fluoride concentrations (figure 19). The geothermal control on fluoride is evident by the relationship between fluoride and sodium (figure 20). Fluoride concentrations greater than 4.0 mg/L generally correspond to groundwater that is has a high sodium content. Where sodium comprises 80 to 100 percent of the cations, fluoride concentrations are greater than 4.0 mg/L. Fluoride concentrations between 2.0 and 4.0 mg/L are present in the mixing zone between the geothermal and cooler groundwater. Groundwater in the mixing zone contains less sodium and more calcium and magnesium than the geothermally influenced groundwater.

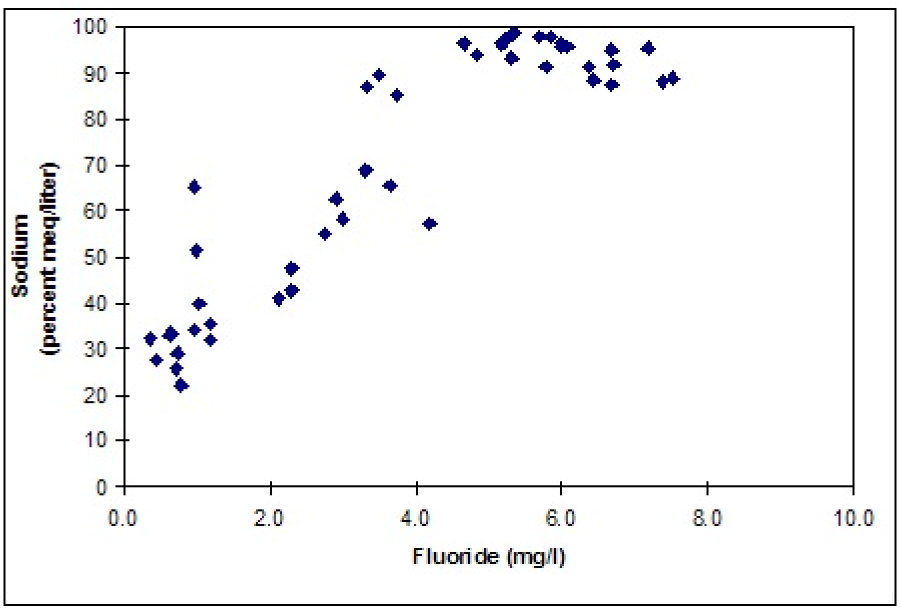

Figure 20. The relationship between sodium and fluoride in groundwater.

Although barium concentrations do not exceed the recommended limit (2,000.0 µg/L), concentrations are elevated in groundwater in the Lonepine aquifer, ranging from less than 2 to 1,675 µg/L For comparative purposes, Hem (1986) reports a median concentration of barium in public groundwater supplies at 43 µg/L. Barium concentrations are below the detection limit in bedrock groundwater in the town of Hot Springs and below 40 µg/L near Wild Horse Hot Springs where there is a bedrock high and groundwater temperatures are warmest. They are highest in groundwater located on the fringes of the geothermal area and may be controlled by geochemical reactions related to the mixing of cooler groundwater. The low concentration from the bedrock groundwater indicates that the Tertiary and Pleistocene sediment that overlies the bedrock may be the source of barium.

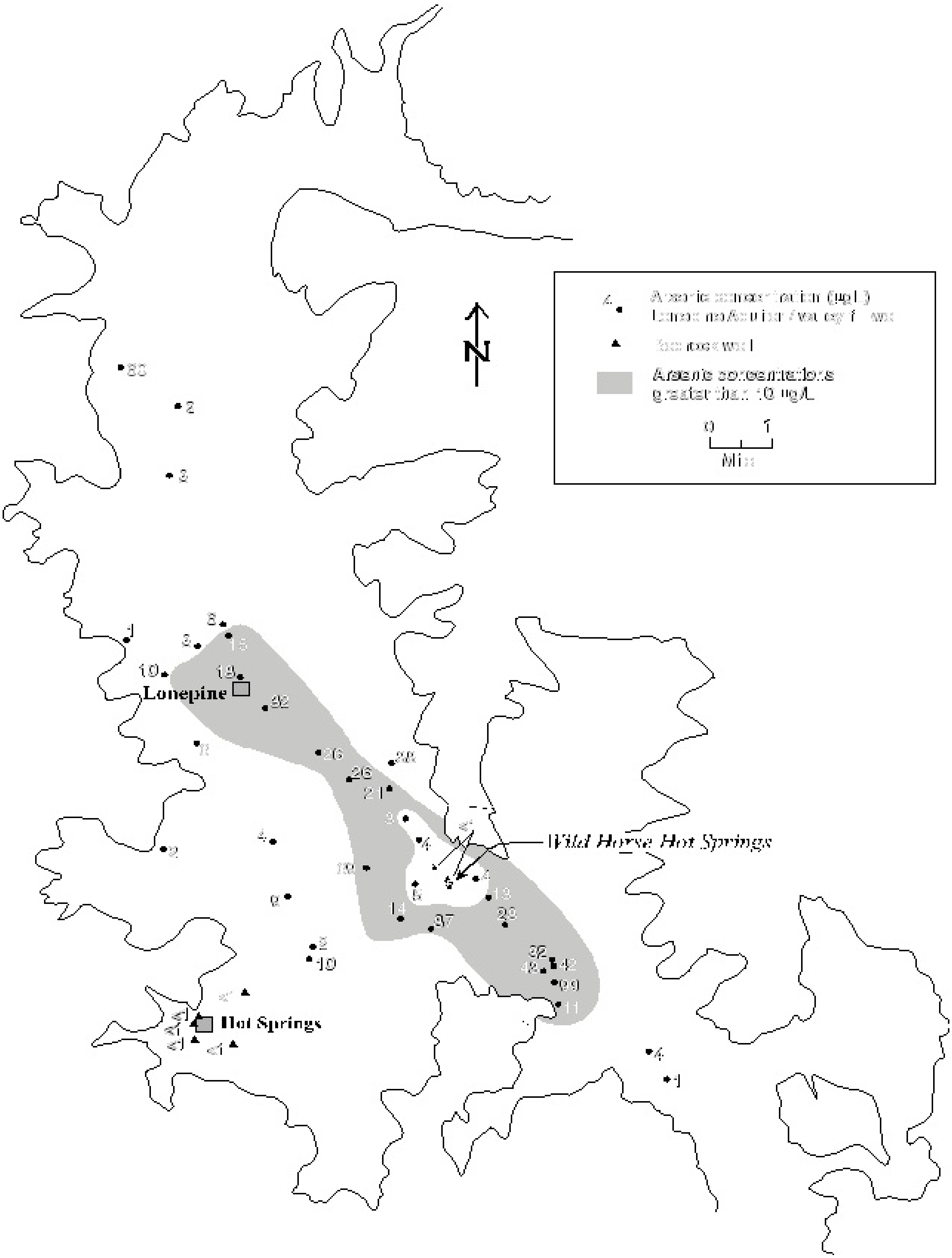

Figure 21. The distribution of arsenic in groundwater.

Arsenic is a common constituent of geothermal water and concentrations are above 10 µg/L in 19 of the 48 wells sampled. The distribution of arsenic is shown in figure 21. Well 187, which is located outside the geothermal area (23N24W03BABB), has an arsenic concentration of 60.0 µg/L and also has anomalously high concentrations of iron (15.5 mg/L) and manganese (0.27 mg/L). The sources of these constituents are unknown. Elevated concentrations of arsenic in the central part of the valley correspond to areas having fluoride concentrations above 2.0 mg/L. The exception to this is in the Wild Horse Hot Springs area and in the town of Hot Springs where groundwater is the warmest. Unlike other geothermal areas, the arsenic in the study area is lowest in the warmest wells (below the instrument detection limit). Arsenic concentrations between 30.0 and 50.0 µg/L are found in groundwater peripheral to the warm water south and west of Wild Horse Hot Springs. Concentrations above 50.0 µg/L were found in wells 4 (21N23W04AADA), 6 (21N23W04DAAC), and 67 (22N23W19CBCD), which are completed in the Lonepine aquifer. Although the groundwater in these wells is relatively cool (14–18°C/57–64°F), the sodium-bicarbonate water type (plate 3) indicates that this area is influenced by the geothermal system. The reason for the low arsenic in the warmest wells and higher concentrations in the cooler groundwater is unknown. However, higher pH and more oxidizing conditions such as those found in the warmest wells tends to decrease arsenic in solution.

The low arsenic concentrations correspond to areas where bedrock is closer to the surface and possibly where the Tertiary sediment is missing. Although the distribution and chemistry of the Tertiary sediment are not well documented, they may be the source of arsenic to the groundwater.

Comparison of Water Chemistry

The concentrations of constituents obtained during this study were examined in relation to those reported by Donovan (1985) (data collected from 1976 to 1980). Figure 22 shows plots of the data. Regression analyses were performed to examine if there have been any changes in water quality between the two time periods. Ideally, a regression line with a slope of one and y-intercept of zero indicates no significant changes ($y = x$). If the ideal slope and y-intercept fell within 2 standard errors of the calculated values, it was concluded that there were no significant changes. The regression lines and correlation coefficients are presented in figure 22.

Calcium, sodium, magnesium, chloride, arsenic, fluoride, silica, total dissolved solids, pH, and specific conductance showed no significant changes in concentrations from data obtained during the two time periods. The regression analyses described above indicates that overall, lithium concentrations were higher in the present study by approximately 4 µg/L. However, this amount is relatively small and may not be significant. Boron concentrations were higher in the 1976–1980 groundwater samples by approximately 30–325 µg/L. Manganese concentrations were higher in samples collected from 1976 to 1980 however, the correlation between these two data sets is low (0.55) and the regression model may not be valid. The regression analyses suggests an overall increase of approximately 0.6 mg/L for potassium and 30 mg/L for bicarbonate from groundwater analyzed in the 1993–1994 samples. Temperatures were higher in the 1993–1994 period for those samples below approximately 22°C (72°F) and lower in the groundwater samples greater than 22°C (72°F).

Correlation coefficients were greater than 0.90 for all parameters except fluoride (0.88), lab pH (0.78) and manganese (0.55). The correlation coefficients for iron and sulfate were less than 0.50, therefore, the regression analyses described above were not applied to these constituents. The concentrations of iron and sulfate in several samples were significantly different. These constituents, along with manganese, may be affected by bacterial activity that can be a factor in oxidation/reduction rates and, therefore, can affect concentrations of these constituents in solution (Hem 1985).

Overall, the concentrations of the majority of constituents did not change. Where differences were observed, changes in instrumentation, analytical methods, protocols, calibration techniques, instrument bias for a particular element, and different operators also may have caused concentration differences between the two time periods.

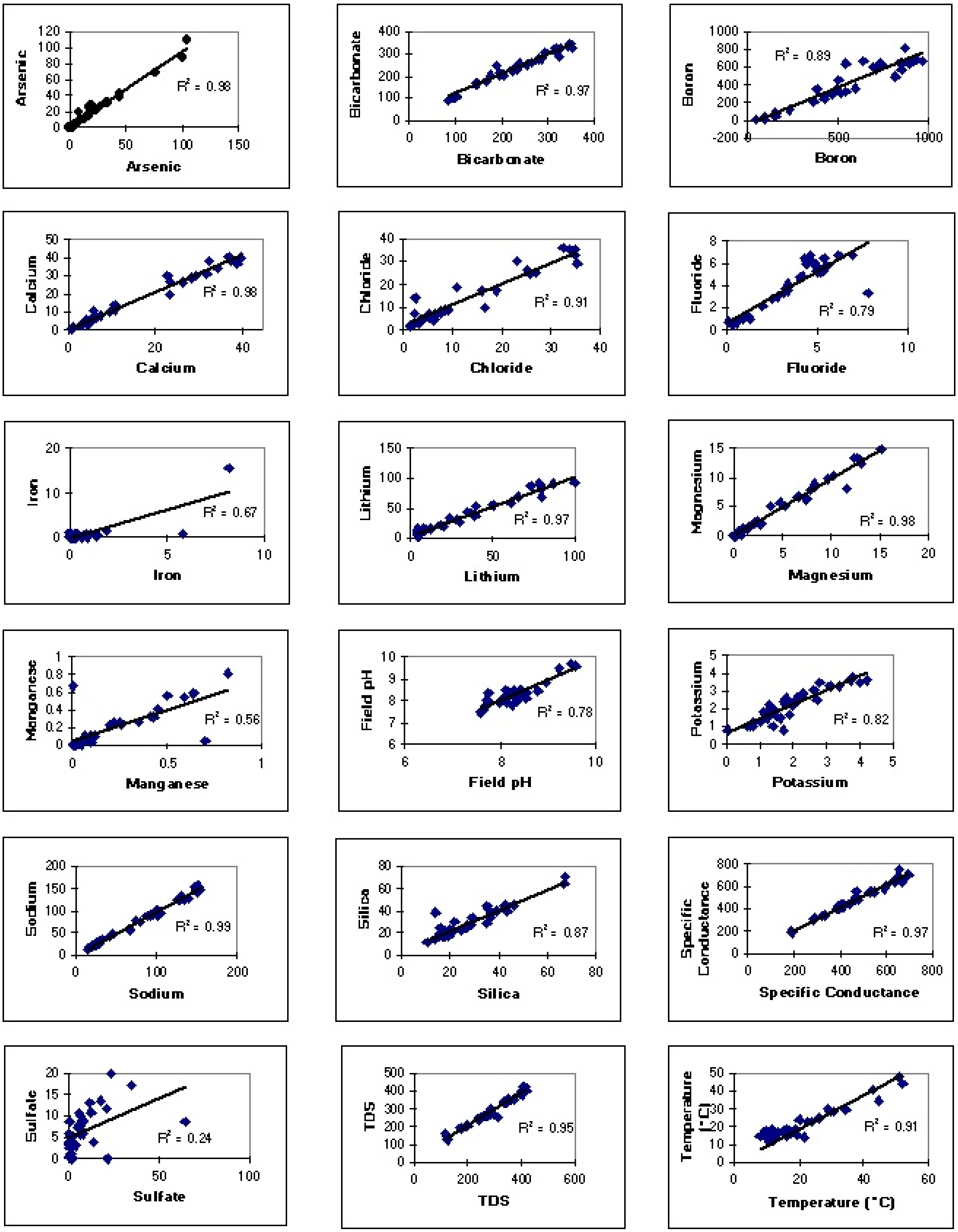

Figure 22. Water quality comparisons between the 1976 to 1980 and 1993 to 1994 analyses (1976–1980 data are plotted on the x axis and the 1993–1994 data are plotted on the y axis).

GEOTHERMOMETRY

Reservoir temperatures were calculated from the silica (chalcedony) (Fournier and Rowe 1966), and Na/Ca/K (corrected for magnesium) (Fournier and Truesdell 1973) geothermometers for groundwater warmer than 17°C (63°F) sampled during this study. These temperatures are presented in table 5 along with temperatures calculated using concentrations from Donovan's (1985) study. A regression analyses on these two data sets indicates that in spite of the present lower potentiometric surface in 1993–1994 compared to 1976–1980, subsurface temperatures have not changed significantly.

Table 5. Reservoir temperatures (°C) based on the chalcedoney and Na-K-Ca geothermometers calculated from 1976-1980 and 1993-1994 analytical data. Ratios of selected constituents in meq/L.

Well	Chalcedony		Na-K-Ca	
Number	1976-1980	1993-1994	1976-1980	1993-1994
41	87.52	90.31	51.10	47.95
42	87.19	84.88	51.42	45.73
59	33.28	33.47	77.55	69.46
60	30.38	28.36	60.70	70.75
62	46.00	44.17	83.08	95.67
74	47.04	54.37	90.72	95.64
75	56.80	54.37	97.95	115.90
83	65.15	60.46	99.61	117.75
84	64.71	65.48	119.23	117.99
85	61.05	66.14	118.27	123.99
88	57.18	58.54	75.25	82.26
101	54.89	46.29	79.21	80.27

SUMMARY

The Lonepine aquifer consists of a very transmissive sand and gravel sequence that underlies most of the Little Bitterroot valley. This aquifer is the main groundwater source for domestic, stock, and irrigation purposes. The aquifer thickness varies from approximately 7 feet near the Niarada Gap to 60 feet near the town of Lonepine. The aquifer is deepest near the Lower Dry Fork reservoir and is shallower near the valley margins. Groundwater from bedrock recharges the aquifer from the mountainous uplands that border the valley and from upward flow along faults and fractures to the overlying valley fill. Recharge from bedrock appears to be greatest along the western side of the valley. Recharge also is induced from the Little Bitterroot River in the northern part of the valley and from sand and gravel that dip toward the Lonepine aquifer in the tributary valleys.

Short-term changes in water levels are influenced by irrigation withdrawals. Differences in pre-irrigation and irrigation water levels can range up to at least 16 feet over the growing season. A general long-term decreasing trend in water levels has occurred for the period of record (1971–1995). This overall decline is interrupted with periods of from two to five years of stable or increasing water levels. The latest interval of water level declines

(1992–1995) has the lowest potentiometric levels on record (1994). In spite of temporary periods of recovery, about 10 feet of hydrostatic head has been lost where monitored since 1971. The long-term decline in water levels indicates withdrawal of groundwater in excess of recharge. The hydrogeologic regime is driven by climate—in years of less precipitation, more water is withdrawn from the aquifer for irrigation, and less water recharges the aquifer.

Groundwater wastage occurs in the valley when flowing wells are left open to discharge freely. This has been observed when no cattle are present to water and/or during the winter months to help prevent the wellhead from freezing. Groundwater also is lost from the system through leaky valves and corroded casing. Conserving groundwater by applying better management practices can have a positive impact on the hydrogeologic system.

The effect of capping well 76, which flowed uncontrolled between 300 and 500 grams per minute, illustrates the benefit of groundwater conservation efforts. Increases in the potentiometric surface of 1.0–1.5 feet were noted as far as two miles away from the plugged well. Theoretical increases after 10 years at this distance were estimated between 4.0 and 5.0 feet assuming flow had continued at 400 grams per minute. Although climate and irrigation withdrawals are the primary controls on water levels in the aquifer, benefits can be derived from restricting free flowing wells. Overall declining groundwater trends would certainly be greater if well 76 was not sealed. As a general rule for the Lonepine aquifer, conservation of 100 grams per minute of flow will save at least one foot of potentiometric surface within 1,000 feet of a well. The relationship is proportional, therefore, as an example conservation of 500 gpm would save five feet of pressure head.

In general, groundwater chemistry is not significantly different between the samples collected from 1976 to 1980 and those collected during this study. The geothermal flow systems near the town of Hot Springs and in the central part of the valley impart distinct chemical signatures to the groundwater. The geothermally influenced groundwater is a sodium bicarbonate water type, while calcium and magnesium is more prevalent outside these areas. The geothermal circulation pattern of block faulting through the region. Patterns of groundwater temperatures and the distribution of constituents, such as boron, lithium, and chloride, reflect the circulating pattern and the structural trend. Elevated arsenic concentrations exhibited by several wells in the central part of the valley most likely result from chemical reactions that occur away from the geothermal halo as groundwater moves through the Tertiary sediment.

The water chemistry in the geothermal water at the town of Hot Springs is significantly different than the water chemistry in the Wild Horse Hot Springs area. Geothermal water in the town of Hot Springs contains lower sodium, calcium, lithium, chloride, boron, and bicarbonate, and higher sulfate concentrations then geothermal water in the central part of the valley. The difference in bedrock mineralogy probably accounts for the difference in water chemistry between the two areas.

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APPENDIX A
WELL INVENTORY DATA

Information obtained from drillers logs	Aquifer Codes	
Elevation: Feet above mean sea level	112LONE = Lonepine Aquifer (Pleistocene)	120SDMS = Sediments (Tertiary)
F = Flowing	112LKML = Lake Missoula Sediments (Pleistoc	120VOLC = Volcanic Rocks (Tertiary)
+ = Calculated shut-in water level, in feet of water above g	112ALVM = Alluvium (Quaternary)	400RVLL = Ravalli Group (Proterozoic)
GPM = gallons per minute	112OTSH = Glacial Outwash (Pleistocene)	400PRCD = Pritchard Group (Proterozoic)

Location	Map Number	GWIC No.	Elevation (Feet)	Total Depth (Feet)	Perf Interval (Feet)	Casing Diameter (In)	PWL (Feet)	SWL (Feet)	Yield (gpm)	Aquifer	Water Use	Completion Date
21N22W07DCAA	1	M:6142	2800	186	140-170	6		27.42	64	112ALVM	RESEARCH	28-Sep-84
21N22W18BADB	241	M:76108	2787	340		6			2	400RVLL	ABANDONED	17-Feb-87
21N23W03CDCD	9	M:150579	2714			4		+52.2		400PRCD	DOMESTIC/STOCK	
21N23W02DBB	2	M:151974	2770							112LONE	UNUSED	
21N23W03DBB	3		2730			4				112LONE	IRRIGATION/STOCK	
21N23W04AADA	4	M:76119	2735	240		4			700	112LONE	DOMESTIC/STOCK	1-Jan-61
21N23W04BABB	5	M:76121	2731	287		4				112LONE	IRRIGATION/STOCK	1-Jan-15
21N23W04DAAC	6	M:6144	2718	250		4			75	112LONE	STOCK	
21N23W10AABC	7	M:150580	2735			4				112LONE	IRRIGATION	
21N23W10ABAA	8	M:76122	2738	240					200	112LONE	IRRIGATION	
21N23W10DDBB	10	M:76123	2718	200		4			1	112LONE	DOMESTIC	1-Oct-31
21N23W11CACC	11	M:76129	2740						700	112LONE	IRRIGATION	1-Jan-21
21N23W11CBCC	12	M:76127	2728			4			700	112LONE	IRRIGATION	1-Jan-29
21N23W11CDBA	13	M:76125	2732	235		4		+41.58		112LONE	IRRIGATION/STOCK	1-Jan-20
21N23W11CDBD	14	M:76128	2728	235		4		+41.58		112LONE	HEAT/STOCK	1-Jan-20
21N23W13CACC	15	M:76132	2725	282		4			90	112LONE	STOCK	1-Jan-23
21N23W13CCAB	16	M:76131	2720	270		6	10	9.5	40	112LONE	IRRIGATION/STOCK	18-Aug-64
21N23W13CCDA	242	M:134159	2720	300	258-271	6		+16.2	450	112LONE	IRRIGATION	1-Mar-93
21N23W14ACAB	17	M:131952	2720	267		6	264	0	200	112LONE	IRRIGATION	18-Sep-74
21N23W14ACBA	18	M:76134	2720	286		4			85	112LONE	DOMESTIC/IRRIGATION	1-Jan-21
21N23W14ACCD	19	M:76133	2722	283		6			92	112LONE	IRRIGATION	1-Jan-45
21N23W14ACDD	243	M:76135	2720	275	240-260	6		+11.6	700	112LONE	IRRIGATION	21-Feb-89
21N23W14BABB	20	M:151340	2718			3				112LONE	IRRIGATION/STOCK	1-Jan-20
21N23W14BBAD	21	M:76136	2710	235		4		+41.58		112LONE	DOMESTIC/STOCK/IRRIGATION	1-Jan-20
21N23W14DCAB	22	M:76137	2710	260		6			150	112LONE	ABANDONED	1-Jan-32
21N23W14DDDB	23	M:76138	2709	286		5			95	112LONE	STOCK	1-Jan-46
21N23W21AABD	244	M:148513	3680	404	364-404	6		259	0.8	400PRCD	STOCK	27-Sep-94
21N23W23AADB	24	M:76130	2725	310	258-272	6		+34.65	200	112LONE	IRRIGATION	22-Jun-65
21N24W01ABBC	25	M:150578	2759	100						112LONE	COMMERCIAL	
21N24W01BCBB	26	M:76141	2770	189		4			40	112LONE	COMMERCIAL	1-Aug-60

Location	Map Number	GWIC No.	Elevation (Feet)	Total Depth (Feet)	Perf Interval (Feet)	Casing Diameter (In)	PWL (Feet)	SWL (Feet)	Yield (gpm)	Aquifer	Water Use	Completion Date
21N24W01CADD	27	M:76142	2765	200		4			50	112LONE	DOMESTIC/STOCK	1-Jan-11
21N24W01CBBB	245	M:76143	2769	130		6		F	75	112LONE	DOMESTIC	3-May-83
21N24W01DBCC	246	M:150581	2760	147		6		F	150	112LONE	DOMESTIC	3-Apr-94
21N24W02ACCC	247	M:76145	2808	740		6		145	2	400PRCD	DOMESTIC	24-Aug-87
21N24W02ADA	28	M:76152	2770	82		6				112LONE	DOMESTIC	8-Dec-62
21N24W02ADC	29	M:76150	2780	141		6	136	10	10	112LONE	COMMERCIAL	25-May-72
21N24W02BCCC	30	M:76153	2792	103		6	15		25	112LONE	DOMESTIC/STOCK	14-Oct-71
21N24W02BCDD	31	M:76155	2786	220		6	50	14	18	112ALVM	DOMESTIC/STOCK	16-Sep-71
21N24W02DAAA	32	M:76146	2772	132		8		132	18	112ALVM	DOMESTIC	1-Jan-52
21N24W03ABBB	248	M:76168	2795	400		6	400	20	2	400PRCD	DOMESTIC	27-Jan-84
21N24W03ACBB	33	M:76167	2800	67		6	6		20	112ALVM	DOMESTIC	13-Jul-60
21N24W03BBAC	249	M:125832	2850	150	50-60	8	100	30	30	400PRCD	RECREATION/TEST WELL	8-Apr-91
21N24W03BBCA	34	M:76174	2860	100		8	60	+11.55	150	400PRCD	RECREATION	7-Aug-82
21N24W03BBCB	35	M:76173	2860	100	60-100	8	60	+11.55	20	400PRCD	RECREATION	5-Aug-82
21N24W03BDBB 01	250	M:76179	2817	64		6	61	+9.24	50	112ALVM	DOMESTIC/UNUSED	19-Jan-84
21N24W03BDBB 02	251	M:76178	2817	440		6	300	F	18	400PRCD	DOMESTIC	21-Jul-87

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Location	Map Number	GWIC No.	Elevation (Feet)	Total Depth (Feet)	Perf Interval (Feet)	Casing Diameter (In)	PWL (Feet)	SWL (Feet)	Yield (gpm)	Aquifer	Water Use	Completion Date
21N24W03BDDD	252	M:131975	2786	66.5		6	55	15	35	112ALVM	DOMESTIC	6-Jul-92
21N24W03CACC 01	36	M:150577	2832	40	36-39	4	35	10	15	112ALVM	DOMESTIC	27-Nov-72
21N24W03CACC 02	37	M:150576	2835	300		6	31	F	8	400PRCD	DOMESTIC	13-Nov-69
21N24W03DABAC	253	M:76186	2792	382		6				400PRCD	DOMESTIC	1-Aug-88
21N24W03DBAB	38	M:150575	2801	347	240-260	4	260	+2.31	4	400PRCD	DOMESTIC	10-Dec-74
21N24W03DCBB	39	M:76185	2805	103		6		F	30	400PRCD	DOMESTIC	3-Jun-72
21N24W04ACAC	40	M:76194	2925	253	113-253	6	250	76	45	400PRCD	DOMESTIC	13-Jul-87
21N24W04ADAB	41	M:6152	2850	370		6	300	+11.56	50	400PRCD	DOMESTIC	13-May-75
21N24W04DABD	42	M:6153	2952	420		6		F	90	400PRCD	DOMESTIC	12-Sep-77
21N24W04DBBD	254	M:76198	2895	200	160-200	6	150	97	40	400PRCD	DOMESTIC	25-Apr-88
21N24W04DBDA	43	M:6155	2875	383	195-198	10	99	9	340	112ALVM	PUBLIC WATER SUPPLY	19-Aug-63
					240-248							
21N24W09ABC	44	M:76202	3000	54	49-52	6	28	14	30	112ALVM	DOMESTIC	9-Apr-71
21N24W09BADA	255	M:76204		122	82-102	6	80	22	15	400PRCD	DOMESTIC	15-May-84
21N24W09CABC	256	M:6157	3010	46	15-19	6	16	11	20	112ALVM	DOMESTIC	11-Oct-72
21N24W10BBAB	257	M:76184	3000	142		6	135	+9.24	90	400PRCD	DOMESTIC/UNKNOWN	31-Oct-80
21N24W11BBBC	258	M:76207	2805	424	364-404	6		+2.31	15	400PRCD	DOMESTIC/STOCK	20-Oct-88
21N24W11DDDD	259	M:76211	2858	88		6	60	2	30	400PRCD	DOMESTIC	19-Sep-73
21N24W12AAD	46	M:76212	2775	52		4		F	7	112LKML	IRRIGATION/STOCK	1-Jan-11

Location	Map Number	GWIC No.	Elevation (Feet)	Total Depth (Feet)	Perf Interval (Feet)	Casing Diameter (In)	PWL (Feet)	SWL (Feet)	Yield (gpm)	Aquifer	Water Use	Completion Date
21N24W12BBBB	47	M:150574	2770	132		6	21.5	0	10	112LKML	DOMESTIC	26-Jul-68
21N24W12CCCC	48	M:150573	2810	430		6		F	2	400PRCD	DOMESTIC	30-Oct-73
21N24W13BCCD 01	259	M:121758	2779.3	41	29-39	4				112LKML	MONITORING	21-Mar-90
21N24W13BCCD 02	260	M:121760	2778.5	100	90-100	2				112OTSH	MONITORING	27-Mar-90
					85-100	6						
					135-145							
21N24W13BCCD 03	261	M:142590	2778.5	150	135-145	2				112LKML	MONITORING	14-Mar-90
21N24W13BDAA	262	M:148514	2818	122		6		30	15	400PRCD	DOMESTIC/IRRIGATION/STOCK	24-Sep-94
21N24W14DAA	263	M:150646		177	137-177	6	171	32	4	400PRCD	MONITORING	3-May-95
21N24W14DAAA	264	M:121761	2799	21		4				112LKML	MONITORING	19-Mar-90
21N24W14DAAB	265	M:121762	2806.4	70	50-70	2				400PRCD	MONITORING	21-Mar-90
21N24W14DAAD	266	M:121757	2804.1	33	12-33	4				112LKML	MONITORING	14-Mar-90
21N24W14DABA	267	M:121759	2827.3	30	10-30	4				112LKML	MONITORING	27-Mar-90
21N24W14DACD	268	M:121754	2849.7	40	20-40	4				112LKML	MONITORING	20-Oct-90
21N24W14DADB	269	M:121756	2810.4	40	20-40	4				112LKML	MONITORING	13-Mar-90
21N24W14DADD	270	M:121755	2809	24	12-24	4				112LKML	MONITORING	15-Mar-90
21N24W16ABBC	271	M:76217	3235	216	196-216	6		+2.31	12	400PRCD	DOMESTIC	22-Aug-88
21N24W24BACB	49	M:150572	2920	57	53-57	6	25	6	18	400PRCD	DOMESTIC	21-Apr-71
21N24W35DCCB	272	M:77292	2774	158		6	157		25	112LONE	DOMESTIC/STOCK	24-Aug-79
22N23W07BBDB	50	M:77125	2765	245.8	200-217	8	189	+12.82	550	112LKML	IRRIGATION/STOCK	5-Mar-74
22N23W07CBBB	51	M:77126	2824	305		4		45	20	112LONE	STOCK/DOMESTIC	1-Jan-10
22N23W07DBDB	52	M:6216	2738	229		6		+39.3	665	112ALVM	IRRIGATION	
22N23W07DBCC	273	M:153819	2740	246		6		+34.6	650	112LONE	IRRIGATION/STOCK	15-Feb-94
22N23W08CCCB	274	M:148575	2760	257		6	100	+23.1	300	112LONE	DOMESTIC	7-Feb-95
22N23W15CDDD	53	M:128074	2833	240						112SDMS	ABANDONED/RESEARCH	29-Sep-84
22N23W15DCDC	54	M:6217	2835	92	60-80	6			24	112ALVM	RESEARCH	29-Sep-84
22N23W17BBCB	55	M:77129	2745	226		4		F	340	112LONE	IRRIGATION/STOCK	1-Jan-18
22N23W17BCB	56	M:703343	2750	235		4				112LONE	IRRIGATION/STOCK	
22N23W17CBBB	57	M:703344	2735	230		4	F	F	11	112LONE	IRRIGATION/STOCK	
22N23W17CDB	58	M:703345	2745	233		4			238	112LONE	DOMESTIC/IRRIGATION	1-Jan-16
22N23W18ACAA	59	M:77128	2740	230		4		F	340	112LONE	IRRIGATION/STOCK	1-Jan-18
22N23W18BBBB	60	M:77131	2814	290		4		50	15	112LONE	DOMESTIC/STOCK	1-Jan-25
22N23W18CCCC	61	M:77132	2814	300				300	40	112LONE	ABANDONED	1-Jan-47
22N23W18DDAD	62	M:77133	2740	232		4		F	500	112LONE	IRRIGATION/STOCK	1-Jan-16
22N23W19ADDA	63	M:150568	2785			4				112LONE	ABANDONED	1-Jan-45
22N23W19BBCC	64	M:83635	2815	300		4				112LONE	UNUSED	1-Jan-35
22N23W19BBDA	65	M:150569	2810	293		4			5	112LONE	DOMESTIC	

Location | Map Number | GWIC No. | Elevation (Feet) | Total Depth (Feet) | Perf Interval (Feet) | Casing Diameter (In) | PWL (Feet) | SWL (Feet) | Yield (gpm) | Aquifer | Water Use | Completion Date

Location	Map Number	GWIC No.	Elevation (Feet)	Total Depth (Feet)	Perf Interval (Feet)	Casing Diameter (In)	PWL (Feet)	SWL (Feet)	Yield (gpm)	Aquifer	Water Use	Completion Date
22N23W19CACC	66	M:77134	2819	300		4			2	112LONE	DOMESTIC/STOCK	1-Jan-35
22N23W19CBCD	67	M:83636	2815	310		4				112LONE	DOMESTIC	1-Jan-25
22N23W19CCC	68	M:77136		297		6	39	13	15	112LONE	DOMESTIC/STOCK	3-Jul-68
22N23W19DAAA	69	M:6222	2760	240		4		F	480	112LONE	STOCK	1-Jan-20
22N23W19DCCA	70	M:77139	2802	297		3		35	8	112LONE	DOMESTIC	1-Jul-35
22N23W20ACCB	71	M:77141	2740	224		4		F	340	112LONE	IRRIGATION/STOCK	1-Nov-48
22N23W20BAAD	72	M:6223	2740			4			360	112LONE	DOMESTIC/STOCK	
22N23W20BBCD	73	M:150570	2755	250		3				112LONE	STOCK	1-Jan-20
22N23W20BCCB	74	M:6224	2750	240		4		F		112LONE	IRRIGATION/STOCK	1-Jan-13
22N23W20CDBC	75	M:77143	2750	262		4				112LONE	DOMESTIC/HEAT/IRRIGATION	14-Sep-79
22N23W20DCDB	76	M:6226	2728	250		4			400	112LONE	ABANDONED	
22N23W20DDCC	77	M:77144	2732	232		4				112LONE	IRRIGATION	1-Jan-13
22N23W28ABCC	78	M:77148	2798	339		6	80	28	30	400RVLL	STOCK	11-Dec-67
22N23W28ADCC	275	M:77147	2750	243		6		+57.8	250	112LONE	DOMESTIC/UNKNOWN	1-Aug-80
22N23W28CBBB	79	M:6227	2744	230	230	4		F	300	112LONE	IRRIGATION	1-Jan-15
22N23W28CBDB	80	M:77151	2740	230		4		F		112LONE	IRRIGATION/STOCK	11-Apr-58
22N23W28CCAA	81	M:77153	2739	234		4				112LONE	DOMESTIC/IRRIGATION	28-Oct-19
22N23W28CCAC	82	M:77152	2736	234		4			275	112LONE	IRRIGATION\HEAT\STOCK	24-Mar-33
22N23W29AADB	83	M:6228	2740	240		4		F	200	112LONE	DOMESTIC/IRRIGATION/STOCK	1-Jan-18
22N23W29ACAB	84	M:6229	2754	261	241-251	10	F	F	1100	112LONE	UNUSED	1-Jan-82
22N23W29ACBB	85	M:6231	2753	240		4	F	F	300	112LONE	COMMERCIAL/HEAT	1-Apr-13
22N23W29ACD	86	M:150571	2754	257		6	F	F	175	112LONE	RESEARCH	26-Jan-82
22N23W29BAAC	87	M:6234	2740	230		4	F	F		112LONE	DOMESTIC/IRRIGATION	1-Jan-16
22N23W29BADD	88	M:6237	2753	1002	261-1002	8/6/2.4		-23.6	500	400RVLL	RESEARCH	21-Jan-81
22N23W29CACA	89	M:77158	2760	260		4		0	100	112LONE	IRRIGATION/STOCK	1-Jan-15
22N23W29CBBC	90	M:121328	2776	280		3				112LONE	STOCK	1-Jan-14
22N23W29CCCC	91	M:121339	2796	303		4		35		112LONE	DOMESTIC/STOCK	1-Jan-17
22N23W30AAAD	276	M:77161	2773	250		6		+34.7		112LONE	STOCK	18-Oct-85
22N23W30CADD	93	M:77163	2805	302		4		25	30	112LONE	DOMESTIC/STOCK	1-Jan-21
22N23W30BABB	92	M:77162	2815	315		4		20	5	112LONE	DOMESTIC	1-Jan-13
22N23W30DBCD	94	M:77164	2805	305		4		27	30	112LONE	DOMESTIC/STOCK	1-Jan-38
22N23W30DDCB	95	M:122900	2803	308		4				112LONE	STOCK	1-Jan-36
22N23W32ABAA	96	M:122899	2755			4				112LONE	DOMESTIC	1-Jan-36
22N23W32BCBC	97	M:77166	2800	289		4			13	112LONE	DOMESTIC	1-Jan-20
22N23W32DBBB	98	M:77168	2785			8				112LONE	MONITORING	1-Jan-54
22N23W32DDBA	99	M:77167	2756			4				112LONE	IRRIGATION	1-Jan-52
22N23W33BABA	100	M:77173	2746	258	242-258	6		F	30	112LONE	DOMESTIC	26-Jul-68
22N23W33BABB	101	M:77175	2736	249		6		F	200	112LONE	IRRIGATION/STOCK	25-Sep-73
22N23W33BDAB	102	M:77177	2730	250		4		+18	50	112LONE	IRRIGATION	1-Jan-44

Location	Map Number	GWIC No.	Elevation (Feet)	Total Depth (Feet)	Perf Interval (Feet)	Casing Diameter (In)	PWL (Feet)	SWL (Feet)	Yield (gpm)	Aquifer	Water Use	Completion Date
22N23W33DADB	103	M:77180	2740	242		4		F	30	112LONE	IRRIGATION/STOCK	1-Jan-14
22N23W33DADD	277	M:77181	2743	243		4		F	40	112LONE	DOMESTIC	1-Jan-14
22N23W33DDAD	104	M:77182	2740			4		F	500	112LONE	IRRIGATION	1-Jan-12
22N23W33DDCC	105	M:77183	2735			4		F	200	112LONE	DOMESTIC/STOCK	1-Jan-20
22N23W34AAA	106	M:151976	2805	97						112ALVM	STOCK	1-Jan-74
22N24W01BBAB	107	M:77187	2840	323		4		55	4	112LONE	DOMESTIC/STOCK	1-Jan-33
22N24W01CAB	108	M:77186	2840	305		4		58	7	112LONE	DOMESTIC	1-Jan-18
22N24W01CBDC	109	M:77188	2840	309		6	64	62	60	112LONE	DOMESTIC	20-Jul-60
22N24W02AADD	110	M:122686	2840			6				112LONE	DOMESTIC	1-Jan-68
22N24W02ABBB	111	M:153307	2857	300		6	97	85	10	112LONE	DOMESTIC	16-Jul-68
22N24W02BAAA	278	M:77191	2855	298.5		6	298	79	100	112LONE	DOMESTIC	18-Oct-85
22N24W02BAAB	112	M:151700	2857							112LONE	UNKNOWN	
22N24W02BABA	113	M:77190	2856	300		4		40	9	112LONE	DOMESTIC/STOCK	1-Jan-30
22N24W02BCBC	114	M:151699	2850			4				112LONE	DOMESTIC/STOCK	
22N24W02DAAB	115	M:77195	2843	306		4		60	15	112LONE	DOMESTIC/STOCK	1-Jan-32
22N24W02DABA	279	M:77196	2843	315.5		6	100	74	100	112LONE	DOMESTIC	21-Feb-86
22N24W02DBBA	116	M:77197	2845	300		4			9	112LONE	DOMESTIC	1-Jan-37
22N24W03ACCB	117	M:77199	2832	331		6	100	60	60	112LONE	DOMESTIC	5-Mar-77

Location	Map Number	GWIC No.	Elevation (Feet)	Total Depth (Feet)	Perf Interval (Feet)	Casing Diameter (In)	PWL (Feet)	SWL (Feet)	Yield (gpm)	Aquifer	Water Use	Completion Date
22N24W03BCCC	118	M:120647	2835			4				112LONE	UNUSED	
22N24W03DABA	119	M:77198	2846	330				54	50	112LONE	DOMESTIC	23-Oct-59
22N24W03DDCDD	280	M:127157	2840	321		6		64.8	50	112LONE	DOMESTIC/STOCK	20-Nov-91
22N24W03DDCD	120	M:150566	2842	330		4				112LONE	DOMESTIC	1-Jan-35
22N24W04ADAA	121	M:151698	2840	330		4				112LONE	DOMESTIC/STOCK	1-Jan-30
22N24W04CADD	122	M:150565	2890							112ALVM	UNKNOWN	
22N24W09ACAB	123	M:77202	2880					6	15	112ALVM	DOMESTIC	1-Jan-23
22N24W10AABD	124	M:151697	2844	320						112LONE	DOMESTIC	1-Jan-35
22N24W10ABBA	125	M:77204	2840	315		4		50	20	112LONE	STOCK/DOMESTIC	1-Jan-35
22N24W10ACBA	126	M:151978	2822							112LONE	STOCK	
22N24W10BBBB	127	M:77206	2838	278		5		60	5.5	112LONE	DOMESTIC	1-Jan-14
22N24W10DDA	128	M:151982	2820	316						112LONE	UNKNOWN	
22N24W11ADCC	129	M:77208	2827	300		3			30	112LONE	ABANDONED	1-Jan-30
22N24W11ADCD	281	M:77209	2835	300		6	300	51	150	112LONE	DOMESTIC	16-Nov-82
22N24W11BBBB	130	M:77210	2835	315		4		50	20	112LONE	DOMESTIC	1-Jan-35
22N24W11BCCC	131	M:77211	2830	316		6	55	55	20	112LONE	DOMESTIC	5-Jul-62
22N24W11CBBB	132	M:77212	2833	312		6		65	50	112LONE	DOMESTIC	1-Oct-35
22N24W11DADC	133	M:150564	2827	314		6	47	47	10	112LONE	DOMESTIC	18-Oct-71

Location	Map Number	GWIC No.	Elevation (Feet)	Total Depth (Feet)	Perf Interval (Feet)	Casing Diameter (In)	PWL (Feet)	SWL (Feet)	Yield (gpm)	Aquifer	Water Use	Completion Date
22N24W12ACCC	134	M:77214	2834	308.5		6	300	63	100	112LONE	DOMESTIC/STOCK	27-Aug-79
22N24W12BBBB 01	135	M:153306	2835	300		4		55	9	112LONE	UNUSED	1-Jan-12
22N24W12BBBB 02	282	M:77216	2835	299.5		6		64	100	112LONE	DOMESTIC	10-May-88
22N24W12BDCC	136	M:77217	2830	299		4		40	10	112LONE	DOMESTIC	1-Jan-16
22N24W13BCBB	137	M:151696	2815							112LONE	DOMESTIC	
22N24W13DADD	138	M:77219	2808			4		39	6	112LONE	DOMESTIC/STOCK	1-Jan-48
22N24W13DBDC	139	M:151695	2810	304		4				112LONE	DOMESTIC/STOCK	1-Jan-40
22N24W14BBBB	140	M:77221	2810	303		4		35	2	112LONE	DOMESTIC/STOCK	1-Jun-48
22N24W14CABA	141	M:77222	2824	326		6	46	46	100	112LONE	DOMESTIC	22-Jun-61
22N24W14CACC	283	M:77223	2817	320		6	60	51	75	112LONE	DOMESTIC/STOCK	25-Jun-87
22N24W14CDDD	142	M:77224	2814	300		4		40	13	112LONE	DOMESTIC/STOCK	1-Jan-40
22N24W14DDAB	143	M:150563	2822			4				112LONE	DOMESTIC	
22N24W15ABAD	144	M:77225	2825	300		4		50		112LONE	MONITORING	1-Jan-20
22N24W15ADDD	145	M:77231	2821	317		4		40	10	112LONE	ABANDONED	1-Jan-17
22N24W15CABA	146	M:77228	2819	156		4		30	10	112LONE	DOMESTIC/STOCK	1-Jun-49
22N24W15CBBA	147	M:77230	2842	40		4		30	2	112LONE	DOMESTIC/STOCK	1-Jan-47
22N24W15CBBB	284	M:76216	2841	125		6	125	27	12	400PRCD	DOMESTIC	10-Nov-83
22N24W15DBAB	148	M:151694	2817	200		6				112LONE	STOCK	
22N24W15DCDD	149	M:77232	2808	317		4		13	15	112LONE	DOMESTIC	1-Jan-25
22N24W16DDCD	150	M:77233	2835			4	F	F	4	112ALVM	STOCK	1-Jan-20
22N24W21AABB	151	M:77235	2830					F	1	112ALVM	DOMESTIC/STOCK	
22N24W21ACDC	152	M:150562	2832	99.5		6	80	33	20	112ALVM	DOMESTIC	17-Dec-59
22N24W21DAAA	153	M:77237	2823	158		4		40	20	112ALVM	DOMESTIC/STOCK	1-Apr-36
22N24W22CABB	154	M:77239	2816	184		4		40	10	112LONE	DOMESTIC	1-Jan-36
22N24W23AAAD	155	M:77241	2815	310		4		270	1.0	112LONE	DOMESTIC/STOCK	1-Jan-15
22N24W23ABAB	156	M:6256	2814	315		4				112LONE	DOMESTIC	
22N24W23ADAA	157	M:77242	2809	300		6		270	1	112LONE	DOMESTIC/STOCK	1-Jan-35
22N24W23BABA	158	M:77243	2806	300					4	112LONE	DOMESTIC/STOCK	1-Jan-47
22N24W23CDCC	159	M:121292	2800	184		4				112LONE	UNUSED	1-Jan-36
22N24W23DDAA	160	M:77247	2790	350				350	50	112LONE	DOMESTIC/STOCK	
22N24W24AABB	161	M:77248	2810	246		4	24	8	0.3	112LONE	ABANDONED	1-Jan-20
22N24W24ABBD	162	M:6257	2810	295		4				112LONE	DOMESTIC	1-Jan-34
22N24W24ADAD	163	M:77250	2810	306		6		6.5		112LONE	DOMESTIC	21-Aug-76
22N24W24BBBB	164	M:77252	2819	305		3			30	112LONE	ABANDONED	1-Jan-12
22N24W24BDDC	165	M:77253	2802	270						112LONE	DOMESTIC	1-Jan-30
22N24W24DDCC	166	M:77255	2805	300		3			10	112LONE	DOMESTIC	1-Jan-36
22N24W25AAAD	167	M:77256	2808	300		4			5	112LONE	ABANDONED	1-Jan-11
22N24W25ADAD	168	M:77257	2790	37		4			100	112LONE	DOMESTIC/STOCK	1-Jan-07
22N24W25CCCC	169	M:77258	2772	169		4		6	2	112LONE	DOMESTIC	1-Jan-43

Total Perf Casing

Location	Map Number	GWIC No.	Elevation (Feet)	Total Depth (Feet)	Perf Interval (Feet)	Casing Diameter (In)	PWL (Feet)	SWL (Feet)	Yield (gpm)	Aquifer	Water Use	Completion Date
Location	Map Number	GWIC No.	Elevation (Feet)	Depth (Feet)	Interval (Feet)	Diameter (In)	PWL (Feet)	SWL (Feet)	Yield (gpm)	Aquifer	Water Use	Completion Date
22N24W25DCAB	170	M:77259	2765	300		4			5	112LONE	STOCK	1-Apr-12
22N24W26AADD	171	M:77260	2795	290		4			1000	112LONE	DOMESTIC/STOCK	1-Sep-47
22N24W26ABAA	172	M:82513	2800	300		6			10	112LONE	DOMESTIC/STOCK	1-Jan-70
22N24W26ADDA	173	M:77266	2790	280		4				112LONE	STOCK	1-Jan-15
22N24W26BBCC	174	M:77263	2800	20		36				112ALVM	DOMESTIC	1-Jan-50
22N24W26BCCC	285	M:77264	2800	200	90-200	6	200	+2.31	50	400PRCD	DOMESTIC	14-Jan-86
22N24W26DCBA	175	M:77267	2796	62		6	7	F	18	112ALVM	STOCK	15-Oct-71
22N24W27BBAA	176	M:77269	2835	60		4		0	1	112ALVM	DOMESTIC/STOCK	1-Jan-47
22N24W34CCDC	177	M:151977	2870	300						400PRCD	RESEARCH	1-Apr-75
22N24W34CDBBA	286	M:77272	2940	225		6	175	30	60	400PRCD	DOMESTIC	27-Apr-82
22N24W34DDBA	287	M:77279	2840	286		6	80	F	60	400PRCD	DOMESTIC	16-Jul-88
22N24W35AADA	178	M:6259	2775	198		4			10	112LONE	DOMESTIC	1-Jan-45
22N24W35ADDD	179	M:77291	2773	202		4		F	2	112LONE	DOMESTIC/STOCK	1-Jan-42
22N24W36BBBB	180	M:77293	2771	229		6	40		40	400PRCD	COMMERCIAL	15-Nov-73
23N23W06CDBB	181	M:78672	2845	308	295-308	6	63	43	7	112ALVM	DOMESTIC	27-Jun-68
23N23W20BCBB	182	M:128075	2832	570					5	112SDMS	RESEARCH	2-Oct-84
23N24W02BDDA	183	M:77964	2800	108		8	60			112ALVM	DOMESTIC	
23N24W02BDDD	184	M:77963	2796	280	52-72	8	100	30	500	112ALVM	IRRIGATION	1-Nov-76
23N24W02CBC	185	M:151979	2786	8		72		2		112ALVM	IRRIGATION	1-Jan-79
23N24W02CCD	186	M:151981	2800							112ALVM	DOMESTIC	1-Jan-75
23N24W03BABB	187	M:6278	2850	240			200	85	12	400PRCD	DOMESTIC	1-Nov-73
23N24W10ADAC	188	M:150544	2850	245		6				112LONE	STOCK	1-Jan-20
23N24W10BCDA	189	M:6280	2780	38		6		10.26	40	112LONE	DOMESTIC/STOCK	4-May-73
23N24W10CBCD	190	M:150561	2805	132	76-77	6	57	30	6	120SDMS	DOMESTIC	1-Jan-68
					85-87							
23N24W10CCDC	191	M:150543	2785	245		6				112LONE	DOMESTIC	1-Jan-75
23N24W11ABBB	288	M:77969	2795	198	115-123	14	65	20	900	112OTSH	STOCK	23-Oct-84
					133-150	8					IRRIGATION	
					158-164							
23N24W11CACA	192	M:77970	2830	250		5		50	10	112LONE	DOMESTIC	1-Jan-18
23N24W11DCCA	193	M:150560	2930	1175		11				400RVLL	ABANDONED	24-Jul-53
23N24W12ACDB	194	M:150557	2841	295		8	65	62	100	112LONE	UNUSED	23-Feb-73
23N24W12ACDC	195	M:150556	2870	280		6	77	72	20	112LONE	DOMESTIC	17-Apr-71
23N24W12CCCB	196	M:45118	2884			4				112LONE	MONITORING	1-Jan-17
23N24W13AABA	197	M:150545	2830			4				112LONE	DOMESTIC/STOCK	
23N24W13DBBA	289	M:77976	2823	178		6	60	45	50	112LONE	STOCK	19-Dec-80
23N24W15AABA	198	M:6281	2830	270		6		61		112LONE	DOMESTIC	1-Jan-35

Location	Map Number	GWIC No.	Elevation (Feet)	Total Depth (Feet)	Perf Interval (Feet)	Casing Diameter (In)	PWL (Feet)	SWL (Feet)	Yield (gpm)	Aquifer	Water Use	Completion Date
23N24W15BBAA	199	M:150555	2772	6		48				112LONE	DOMESTIC	
23N24W15CBCC	200	M:77977	2800	252		6	14	14	100	112LONE	DOMESTIC	4-May-62
23N24W15DCAA	201	M:150554	2792	258		4				112LONE	DOMESTIC	
23N24W21ADCC	202	M:77979	2795	234		4				112LONE	DOMESTIC	1-Jan-51
23N24W21DCAA 01	203	M:150559	2921			4				112LONE	ABANDONED	1-Jan-35
23N24W21DCAA 02	204	M:77980	2921	364		6	360	147	50	112LONE	DOMESTIC	31-Oct-78
23N24W22ACDD	205	M:77982	2790	174		6	140	21	30	112LONE	STOCK	16-Dec-80
23N24W24CAC	206	M:151983	2820							112LONE	ABANDONED	
23N24W25DDAD	207	M:77987	2785	88		6				112LONE	UNUSED	1-Jan-40
23N24W25DDCA	208	M:77989	2795	117		4				112LKML	DOMESTIC/STOCK	1-Jan-40
23N24W26CDCD	209	M:140370	2765							112LONE	IRRIGATION/STOCK	
23N24W27CDDD	210	M:45335	2800			4				112LONE	ABANDONED	6-Jun-80
23N24W33ABAA	290	M:141772	2880	375	75-375	6	550	97	25	400PRCD	DOMESTIC	
23N24W34ADAA	211	M:6283	2884	531	312-368	18				112LONE	DOMESTIC/MONITORING	1-Jan-41
23N24W34BDCC	212	M:77993	2866	420				80	5	112LONE	DOMESTIC	1-Jan-20
23N24W34CBDD	213	M:6284	2862	369		6	108.5	98.5	20	112LONE	COMMERCIAL/DOMESTIC	
23N24W34DADD	214	M:150553	2867	306	302-306	6	120	76	5.5	112LONE	DOMESTIC/STOCK	1-Jan-68
23N24W34DCD	215	M:77996	2865	310		4		80		112LONE	DOMESTIC/STOCK	1-Jan-30
23N24W34DCDD	291	M:148614	2860	327		6		102	100	112LONE	DOMESTIC	22-Sep-94
23N24W35ACCB	216	M:77998	2862	310		3		100		112LONE	DOMESTIC/STOCK	1-Jan-35

Location	Map Number	GWIC No.	Elevation (Feet)	Total Depth (Feet)	Perf Interval (Feet)	Casing Diameter (In)	PWL (Feet)	SWL (Feet)	Yield (gpm)	Aquifer	Water Use	Completion Date
23N24W35BADA	292	M:150549	2860	319	312-317	6	92	90		112LONE	DOMESTIC	17-Jul-86
23N24W35DBBA	217	M:78000	2863	310		3		100		112LONE	DOMESTIC	1-Jan-35
23N24W35DCCC	218	M:6285	2852	297		6	295	79	100	112LONE	DOMESTIC	29-Mar-79
23N24W35DCDD	293	M:141507	2860	304		6	200	88	150	112LONE	DOMESTIC	9-Mar-94
23N24W35DDDC	219	M:150552	2840	315		6				112LONE	DOMESTIC	19-Oct-76
23N24W36CAAD	220	M:78004	2845	300		3		80	10	112LONE	DOMESTIC/STOCK	1-Jan-16
24N22W30BCCC	221	M:128076	3153	460	436-445			80-100	6.7	112OTSH	RESEARCH	17-Oct-84
24N23W08DADD	223	M:78678	2920	212		6			350	112OTSH	DOMESTIC	27-Dec-63
24N23W09ABBB	224	M:78679	2960	165		6			500	112ALVM	UNUSED	1-Jan-40
24N23W09CCDC	294	M:78680	2920	182		8	160	12	100	112OTSH	DOMESTIC/STOCK	12-Feb-88
24N23W16ABBA	225	M:150558	2922							112OTSH	DOMESTIC	
24N23W16BCBB	226	M:78682	2916	283	170-185	8	270	24	300	112OTSH	RESEARCH	24-Apr-84
					228-233							
					267-274							
24N23W16CBBB 02	227	M:150551	2922	200		3				112OTSH	UNUSED	1-Jan-40
24N23W17BABA	228	M:150550	2920	39	12-19	6	30	27	12	112VOLC	DOMESTIC	1-Jan-68

Location	Map Number	GWIC No.	Elevation (Feet)	Total Depth (Feet)	Perf Interval (Feet)	Casing Diameter (In)	PWL (Feet)	SWL (Feet)	Yield (gpm)	Aquifer	Water Use	Completion Date
					37-39							
24N23W17BCDD	295	M:155133	2880	303	275-295	6		+16.2	470	112OTSH	RESEARCH	1-Oct-85
24N23W17DACD	229	M:6317	2922	250		3				112OTSH	DOMESTIC	
24N23W20AABB	230	M:78684	2920	279		3			20	112OTSH	STOCK	1-Jan-30
24N23W21BCDA	296	M:78685	2935	327		6	110	36	400	112OTSH	DOMESTIC	3-Nov-87
24N23W21BCDB	231	M:150548	2928	77		4				112OTSH	UNUSED	
24N23W21DCBB	297	M:155132	2955	395	377-386	6				112OTSH	RESEARCH	1-Sep-85
24N23W31BCBC	232	M:78687	2852	230		4		150	20	112OTSH	DOMESTIC/STOCK	1-Jan-48
24N23W32ADCC	233	M:128077	2905				100			112SDMS	ABANDONED/RESEARCH	6-Oct-84
24N24W13BBAB	234	M:150547	2950	5		48				112ALVM	DOMESTIC	
24N24W14DDDD	235	M:78690	2900	50		6		20	250	120SDMS	STOCK	1-Dec-58
24N24W23BDAD	236	M:78691	2998	185		6		90	200	112SDMS	DOMESTIC/STOCK	1-Jan-50
24N24W24ABBB 01	298	M:133928	2880	69				6.5		112ALVM	MONITORING	1-Aug-83
24N24W24ABBB 01	299	M:133930	2880	14				7.1		112ALVM	MONITORING	1-Aug-83
24N24W24DDBB	300	M:155134	2861	373	320-340	6		+1.4	225	112OTSH	RESEARCH	1-Oct-85
24N24W25AAAC	301	M:78692	2874	400		6	330	15	25	400RVTT	DOMESTIC	28-Mar-85
24N24W25DDBB	237	M:6320	2854	328	319-326	6	81	78	51	112OTSH	RESEARCH	5-Oct-84
24N24W27ABDB	238	M:6321	2840	217	157-177	6				120SDMS	RESEARCH	7-Oct-84
24N24W34ACDD	239	M:78696	2838	90		4		90		112OTSH	DOMESTIC	2-Jan-00
24N24W35CDCA	240	M:150546	2825	108		6	60			112ALVM	DOMESTIC	1-Jan-62
25N23W26CCC	222	M:78676	3160	120	46-48	6	50	11	6	400RVLL	DOMESTIC	24-Jun-68
					103-108							

APPENDIX B
FIELD PARAMETER DATA

Location	Map Number	GWIC No.	Inventory Date	Agency	Static Water Level (feet below ground)	Yield (gpm)	Water Temperature (° C)	Specific Conductance (microsiemens per cm @ 25° C)	Field pH
21N22W07DCAA	1	M:6142	12-Oct-84	USGS	27.44	65	10.0	430	7.90
			1-Jan-85	USGS	28.47				
			18-Apr-85	USGS	23.74				
			17-Jul-85	USGS	29.51				
			28-Oct-85	USGS	32.08				
21N22W18BADB	241	M:76108		MBMG					
21N23W02DBB	2	M:151974	30-Jul-74	USGS	11		12.0	190	
21N23W03DBB	3		1-Dec-79	MBMG	+28.4	20	12.3	379	
21N23W03CDCD	9	M:150579	2-Sep-79	MBMG	+53.2		11.2	440	
			8-Oct-79	MBMG			10.4	449	
			24-Feb-80	MBMG	+44.81		10.2	450	
			24-Mar-80	MBMG	+44.12		10.1	501	
			30-Apr-80	MBMG	+35.57		10.3	440	
			7-Jun-80	MBMG	+46.55		10.0	474	
			16-Oct-80	MBMG	+50.82		11.1	509	
			2-Dec-80	MBMG	+52.21		9.4	459	
			13-Jan-81	MBMG	+49.67		10.0	513	
			14-Apr-81	MBMG			10.5	462	
			2-Feb-82	MBMG	+46.89		7.1	473	
			19-Aug-92	MBMG	+20.1		15.8	499	8.48
			25-Sep-92	MBMG	+22.06		12.0	460	8.33
			21-Oct-92	MBMG	+22.87		12.8	504	8.19
			30-Nov-92	MBMG	+23.56		12.2	508	8.43
			18-Dec-92	MBMG	+23.45		10.7	493	7.70
			19-Jan-93	MBMG	+23.79		11.1	474	8.58
			3-Mar-93	MBMG	+24.49		12.5	502	7.67
			5-Apr-93	MBMG	+24.26		13.5	486	8.30
			20-May-93	MBMG	+21.71		13.8	464	8.46
			3-Jun-93	MBMG	+21.71		9.4	460	8.35
			15-Jul-93	MBMG	+20.67		13.2	453	8.35
			16-Aug-93	MBMG	+21.02		15.0	519	
			6-Nov-93	MBMG	+23.33		12.4	538	8.30
			6-Jan-94	MBMG	+22.87		11.3	485	7.85
			5-Apr-94	MBMG	+22.29		11.9	563	8.52
			28-Nov-94	MBMG	+21.95		12.8	534	8.83
21N23W04AADA	4	M:76119	30-Nov-79	MBMG		50			
			5-Apr-93	MBMG	+9.00				
			19-Aug-93	MBMG	+7.50				
			5-Apr-94	MBMG	+7.84				
21N23W04BABB	5	M:76121	8-Jul-79	MBMG	84	350	15.2	462	
			8-Oct-79	MBMG	+26.76		16.0	447	
			30-Nov-79	MBMG			12.3	462	
			10-Jan-80	MBMG	+36		13.2	463	
			24-Feb-80	MBMG	+36.93		13.4	447	
			24-Mar-80	MBMG	+37.73		14.1	493	
			30-Apr-80	MBMG	+30		8.1	440	
			7-Jun-80	MBMG	+37.97		13.9	485	
			17-Jul-80	MBMG	+45.24		12.5	470	
			16-Oct-80	MBMG	+43.16		12.9	536	
			2-Dec-80	MBMG	+44.09		14.2	469	
			13-Jan-81	MBMG	+42.24		14.0	513	
			14-Apr-81	MBMG	+38.08		14.9	485	
			2-Feb-82	MBMG			14.3	488	
			19-Aug-92	MBMG			15.5	503	8.27
			25-Sep-92	MBMG	+19.14		14.5	508	8.30
			21-Oct-92	MBMG	+21.1		15.1	492	8.16
			30-Nov-92	MBMG	+23.64		14.0	498	8.39
			18-Dec-92	MBMG			13.5	478	8.14
			19-Jan-93	MBMG	+24.22		14.5	496	8.03
			3-Mar-93	MBMG	+18.33		15.5	498	8.14
			5-Apr-93	MBMG	+26.07		14.7	469	8.20
			20-May-93	MBMG	+17.75		18.8	467	8.17
			3-Jun-93	MBMG	+17.64		16.4	471	8.22
			15-Jul-93	MBMG	+14.98		16.8	455	8.22
			16-Aug-93	MBMG	+16.25		17.2	505	
			9-Sep-93	MBMG	+17.64		16.3	517	8.25
			6-Nov-93	MBMG	+21.22		14.8	509	8.25
			6-Jan-94	MBMG	+21.1		14.1	510	7.99
			5-Apr-94	MBMG	+18.91		14.2	525	8.59
			25-Aug-94	MBMG			16.7	557	9.38
21N23W04DAAC	6	M:6144	30-Nov-79	MBMG		75	12.9	454	

Location	Map Number	GWIC No.	Inventory Date	Agency	Static Water Level (feet below ground)	Yield (gpm)	Water Temperature (° C)	Conductance (microsiemens per cm @ 25° C)	Field pH
21N23W10AABC	7	M:150580	2-Sep-79	MBMG		100			
21N23W10ABAA	8	M:76122	2-Sep-79	MBMG	+12.6	100	13.2	321	
21N23W10DDBB	10	M:76123	8-Jun-80	MBMG			12.8	603	
			5-Apr-93	MBMG	0.28				
21N23W11CACC	11	M:76129	2-Sep-79	MBMG	+26.6	250	12.3	310	
			30-Nov-79	MBMG	+24.33		12.3	310	
			10-Jan-80	MBMG	+26.64		12.3	337	
			24-Feb-80	MBMG	+26.64		12.6	336	
			24-Mar-80	MBMG	+23.87		12.5	334	
			7-Jun-80	MBMG	+26.29		14.4	319	
			19-Aug-92	MBMG	+1.21		17.0	319	7.88
			25-Sep-92	MBMG	+6.54		16.0	311	8.05
			21-Oct-92	MBMG	+7.93		13.5	389	7.94
			30-Nov-92	MBMG	+10.7		12.4	343	7.41
			18-Dec-92	MBMG	+11.16		10.5	337	7.32
			19-Jan-93	MBMG	+11.95		12.6	347	7.82
			20-May-93	MBMG	+3.31		16.9	463	8.00
			15-Jul-93	MBMG	+1.58		14.6	349	8.23
			16-Aug-93	MBMG	+1.97		15.1	403	
			6-Nov-93	MBMG	+9.09		12.5	370	7.98
			28-Nov-94	MBMG			12.6	378	8.65
21N23W11CBCC	12	M:76127	2-Sep-79	MBMG		250	12.2	334	
21N23W11CDBA	13	M:76125	27-Mar-80	MBMG	+20.9	50	12.2	318	
			30-Apr-80	MBMG	+11.69		13.1	289	
			7-Jun-80	MBMG	+24.97		12.8	319	
			17-Jul-80	MBMG	+31.79		14.5	304	
			16-Oct-80	MBMG	+29.02				
			2-Dec-80	MBMG	+29.94		11.9	315	
			13-Jan-81	MBMG	+27.86		11.9	335	
			2-Feb-82	MBMG	+25.55		12.0	322	
			5-Apr-93	MBMG	+6.61				
			19-Aug-93	MBMG	+0.42				
			5-Apr-94	MBMG	+4.65				
21N23W11CDBD	14	M:76128	27-Mar-80	MBMG	+25.3	25	13.1	375	
21N23W13CACC	15	M:76132	30-May-80	MBMG	+31.6		14.6	335	
			5-Apr-93	MBMG	+18.94				
			19-Aug-93	MBMG	+8.31				
			5-Apr-94	MBMG	+15.82				
21N23W13CCAB	16	M:76131	30-May-80	MBMG					
21N23W13CCDA	242	M:134159	8-Aug-95	MBMG			16.0	270	8.65
21N23W14ACAB	17	M:131952	10-Jun-80	MBMG		250	13.2	319	
			4-Jun-93	MBMG			13.9	325	8.16
21N23W14ACBA	18	M:76134	10-Jun-80	MBMG					
21N23W14ACCD	19	M:76133	10-Jun-80	MBMG			13.2	314	
21N23W14ACDD	243	M:76135	4-Aug-93	MBMG	+24.95	700	16.1	362	6.57
			8-Apr-93	MBMG	+24.15				
			19-Aug-93	MBMG	+8.21				
			5-Apr-94	MBMG	+17.33				
21N23W14BABB	20	M:151340	27-Mar-80	MBMG			12.8	475	
21N23W14BBAD	21	M:76136	27-Mar-80	MBMG	+40.6	100	12.8	561	
			30-Apr-80	MBMG	+33.12		12.0	475	
			7-Jun-80	MBMG	+45.13		12.2	554	
			17-Jul-80	MBMG	+52.75		14.9	526	
			16-Oct-80	MBMG	+50.21				
			2-Dec-80	MBMG	+50.9		12.5	542	
			13-Jan-81	MBMG	+48.36		12.8	567	
			14-Apr-81	MBMG	+44.67		14.1	521	
			2-Feb-82	MBMG			10.3	542	
			5-Apr-93	MBMG	+28.74				
			19-Aug-93	MBMG	+15.94				
			5-Apr-94	MBMG	+23.68				
21N23W14DCAB	22	M:76137	30-May-80	MBMG		1	12.9	383	
21N23W14DDDB	23	M:76138							
21N23W21AABD	244	M:148513	8-Aug-95	MBMG	117.55				
21N23W23AADB	24	M:76130	30-May-80	MBMG		250	12.0	356	
21N24W01ABBC	25	M:150578	14-Jul-75	USGS	0.2		12.5	730	
21N24W01BCBB	26	M:76141							
21N24W01CADD	27	M:76142	14-Jul-75	USGS	+17		15.0	530	
21N24W01CBBB	245	M:76143		MBMG				557	7.86
21N24W01DBCC	246	M:150581	7-Aug-95	MBMG			15.9	635	7.90
21N24W02ACCC	247	M:76145							
21N24W02ADA	28	M:76152							
21N24W02ADC	29	M:76150	14-Jul-75	USGS	6.7		13.0	640	
21N24W02BCCC	30	M:76153							
21N24W02BCDD	31	M:76155							
21N24W02DAAA	32	M:76146							
			13-Aug-93	MBMG	1.9				

Location	Map Number	GWIC No.	Inventory Date	Agency	Static Water Level (feet below ground)	Yield (gpm)	Water Temperature (° C)	Conductance (microsiemens per cm @ 25° C)	Field pH
			8-Apr-94	MBMG	2.43				
21N24W03ABBB	248	M:76168		MBMG	+0.23	20			
21N24W03ACBB	33	M:76167							
21N24W03BBAC	249	M:125832	18-Aug-93	MBMG	3.84		26.0	435	9.47
			18-Aug-93	MBMG	+9.3				
			6-Apr-94	MBMG	+10.11				
21N24W03BBCA	34	M:76174	18-Aug-93	MBMG	+8.60				
			6-Apr-94	MBMG	+8.40				
21N24W03BBCB	35	M:76173	9-Apr-93	MBMG			42.0		9.26
			6-Jun-93	MBMG	+2.77		44.7	377	9.28
			19-Jun-93	MBMG	+1.85		45.2	393	9.39
			18-Aug-93	MBMG	+2.82		43.1	417	9.16
			7-Jan-94	MBMG	+3.23		45.0	408	9.47
			6-Apr-94	MBMG	+3.12		44.7	446	9.54
21N24W03BDBB 01	250	M:76179	21-Jul-93	MBMG			17.2	384	
21N24W03BDBB 02	251	M:76178	21-Jul-93	MBMG		18	18.3	390	
21N24W03BDDD	252	M:131975	14-Aug-93	MBMG			16.3	296	6.99
21N24W03CACC 01	36	M:150577	8-Oct-79	MBMG			10.8	180	
21N24W03CACC 02	37	M:150576	8-Oct-79	MBMG	+2		12.1		
21N24W03DABAC	253	M:76186	20-Jul-93	MBMG			15.6	361	
21N24W03DBAB	38	M:150575	1-Oct-79	MBMG					
21N24W03DCBB	39	M:76185	4-Dec-79	MBMG	+35.2	20	15.8	432	
			14-Aug-93	MBMG	+20.87				
			9-Apr-94	MBMG	+22.48				
21N24W04ACAC	40	M:76194							
21N24W04ADAB	41	M:6152	3-Dec-79	MBMG	+22		44.8	383	
21N24W04DABD	42	M:6153	3-Dec-79	MBMG	+57.3		29.8	363	
21N24W04DBBD	254	M:76198	21-Jul-93	MBMG			16.0	247	
21N24W04DBDA	43	M:6155	14-Jul-75	USGS	9		22.5	280	
21N24W09ABC	44	M:76202							
21N24W09BADA	255	M:76204	21-Jul-93	MBMG					
21N24W09CABC	45	M:6157							
21N24W10BBAB	256	M:76184	20-Jul-93	MBMG			13.0	305	8.44
21N24W11BBBC	257	M:76207	8-Aug-95	MBMG			14.5	252	8.10
			17-Aug-93	MBMG	5.59				
21N24W11DDDD	258	M:76211	17-Aug-93	MBMG			12.5	263	7.14
21N24W12AAD	46	M:76212	8-Aug-74	USGS			15.0	320	
21N24W12BBBB	47	M:150574							
21N24W12CCCC	48	M:150573	14-Jul-75	USGS	+1.4		11.5	335	
21N24W13BCCD 01	259	M:121758	12-Aug-93	MBMG	0.15				
21N24W13BCCD 02	260	M:121760	12-Aug-93	MBMG	1.09				
21N24W13BCCD 03	261	M:142590	12-Aug-93	MBMG	0.84				
21N24W13BDAA	262	M:148514	8-Aug-95	MBMG	1.7		13.0	363	8.70
21N24W14DAA	263	M:150646							
21N24W14DAAA	264	M:121761	12-Aug-93	MBMG	12.86				
21N24W14DAAB	265	M:121762	12-Aug-93	MBMG	21.02				
21N24W14DAAD	266	M:121757	12-Aug-93	MBMG	10.4				
21N24W14DABA	267	M:121759	12-Aug-93	MBMG	8.3				
21N24W14DACD	268	M:121754	12-Aug-93	MBMG	20.5				
21N24W14DADB	269	M:121756	12-Aug-93	MBMG	7.79				
21N24W14DADD	270	M:121755	12-Aug-93	MBMG	10.69				
21N24W16ABBC	271	M:76217	21-Jul-93	MBMG			11.9	147	
21N24W24BACB	49	M:150572	14-Jul-75	USGS	5.8		11.5	225	
			13-Aug-93	MBMG	6.44				
21N24W35DCCB	272	M:77292	19-Jul-93	MBMG	8.11		17.4	353	8.11
22N23W07BBDB	50	M:77125	9-Jul-79	MBMG		10	15.6	622	
22N23W07CBBB	51	M:77126	9-Oct-79	MBMG		10	13.9	464	
22N23W07DBDB	52	M:6216	30-Nov-79	MBMG		500	17.3	533	
22N23W07DBCC	273	M:153819	8-Nov-93	MBMG			16.4	599	8.02
			8-Apr-94	MBMG	+20.17				
22N23W08CCCB	274	M:148575	8-Aug-95	MBMG			14.0	579	8.40
22N23W15CDDD	53	M:128074	15-Jan-85	USGS					
			7-Apr-93	MBMG	59.59				
22N23W15DCDC	54	M:6217	11-Oct-84	USGS	47.82	24	10.0	285	
			15-Jan-85	USGS	47.68				
			11-Apr-85	USGS	43.69				
			15-Jul-85	USGS	37.51				
			28-Oct-85	USGS	52.36				
22N23W17BBCB	55	M:77129	8-Oct-79	MBMG	+25.66		15.0	501	
			30-Nov-79	MBMG	+29.7	200	15.2	520	
			10-Jan-80	MBMG	+31.44		16.9	569	
			24-Feb-80	MBMG	+30.17		15.0	515	
			24-Mar-80	MBMG	+31.44		15.8	524	
			25-Sep-92	MBMG	+21.5		15.2		8.47
			21-Oct-92	MBMG	+22.08		18.5	489	8.29

Location	Map Number	GWIC No.	Inventory Date	Agency	Static Water Level (feet below ground)	Yield (gpm)	Water Temperature (° C)	Conductance (microsiemens per cm @ 25° C)	Field pH
			30-Nov-92	MBMG	+25.2		15.3	512	6.74
			18-Dec-92	MBMG	+24.74		15.1	499	8.27
			19-Jan-93	MBMG	+24.97		15.7	539	8.41
			3-Mar-93	MBMG	+26.35		16.0	491	8.65
			5-Apr-93	MBMG	+25.89		15.2	434	7.83
			20-May-93	MBMG	+19.77		17.4	495	8.27
			3-Jun-93	MBMG	+20.23		15.6	472	8.32
			15-Jul-93	MBMG	+18.27		16.7	482	8.29
			16-Aug-93	MBMG	+19.42		17.7	547	8.03
			6-Nov-93	MBMG	+21.97		14.5	586	8.41
			6-Jan-94	MBMG	+21.27		15.1	646	8.39
			5-Apr-94	MBMG	+20.35		15.0	549	8.44
			25-Aug-94	MBMG	+13.42		14.6	594	9.63
			28-Nov-94	MBMG	+19.66		14.9	592	9.16
			14-Apr-95	MBMG	+20.93				
			15-Jul-95	MBMG	+14.8				
22N23W17BCB	56	M:703343	8-Oct-79	MBMG	+19.64		18.0	447	
			2-Dec-79	MBMG	+23.91	250	16.9	503	
			10-Jan-80	MBMG	+24.23		18.5	491	
			24-Feb-80	MBMG	+25.53		17.5	468	
			24-Mar-80	MBMG	+25.18		17.4	498	
			30-Apr-80	MBMG	+24.95		17.3	500	
			7-Jun-80	MBMG	+27.26		17.2	509	
			17-Jul-80	MBMG	+28.64		15.8	491	
			16-Oct-80	MBMG	+29.57		17.2	572	
			2-Dec-80	MBMG	+30.95		16.9	505	
			13-Jan-81	MBMG	+28.18		17.7	539	
			25-Sep-92	MBMG	+20.1		16.0	485	8.34
			21-Oct-92	MBMG	+18.25		18.4	486	8.42
			30-Nov-92	MBMG	+19.64		16.0	456	6.57
			18-Dec-92	MBMG	+20.1		15.8	497	7.97
			19-Jan-93	MBMG	+19.87		15.9	479	6.49
			3-Mar-93	MBMG	+20.67		17.8	477	8.70
			5-Apr-93	MBMG	+20.56		17.3		8.31
			20-May-93	MBMG	+16.17		18.7	473	8.33
			3-Jun-93	MBMG	+16.17		17.2	471	8.23
			15-Jul-93	MBMG	+14.09		17.7	455	8.40
			16-Aug-93	MBMG	+14.78		18.7	533	8.06
			6-Nov-93	MBMG	+17.33		17.2	549	8.44
			6-Jan-94	MBMG	+16.4		16.0	522	8.47
			5-Apr-94	MBMG	+16.17		17.4	512	8.46
			28-Nov-94	MBMG	+15.25		16.8	533	8.33
22N23W17CBBB	57	M:703344	1-Jan-74	USGS					
			28-Sep-78	MBMG	+40.1	300	17.2	555	
			8-Oct-79	MBMG	+30.84		15.9	478	
			30-Nov-79	MBMG	+35.35		16.9	542	
			10-Jan-80	MBMG	+34.54		18.5	491	
			24-Feb-80	MBMG	+35.23		17.3	500	
			24-Mar-80	MBMG	+37.08		17.1	531	
			30-Apr-80	MBMG	+36.62		16.9	517	
			7-Jun-80	MBMG	+38.47		17.0	553	
			17-Jul-80	MBMG	+40.08		18.2	521	
			16-Oct-80	MBMG	+40.78		17.2	555	
			2-Dec-80	MBMG	+41.93		16.7	599	
			13-Jan-81	MBMG	+39.62		17.2	578	
			2-Feb-82	MBMG	+37.08		16.5	531	
			25-Sep-92	MBMG	+29.23		17.5	492	8.61
			21-Oct-92	MBMG	+29		18.5	534	8.57
			30-Nov-92	MBMG	+31.12		16.3	399	7.20
			18-Dec-92	MBMG	+31.56		15.8	529	8.05
			19-Jan-93	MBMG	+31.07		16.8	522	8.46
			3-Mar-93	MBMG	+26.57		17.9	515	8.99
			5-Apr-93	MBMG	+32.23		17.6	510	8.38
			20-May-93	MBMG	+26.45		18.0	509	8.66
			3-Jun-93	MBMG	+26.92		16.6	500	8.61
			15-Jul-93	MBMG	+24.26		17.2	480	8.67
			16-Aug-93	MBMG	+25.3		18.3	565	8.52
22N23W17CDB	58	M:703345	1-Jan-74	USGS					
			27-Sep-79	MBMG		300	18.0	568	
22N23W18ACAA	59	M:77128	27-Sep-79	MBMG	+37.9	360	22.8	461	
			30-Nov-79	MBMG	+31.44		22.3	448	
			10-Jan-80	MBMG	+29.59		18.0	499	
			24-Feb-80	MBMG	+34.09		20.8	425	
			24-Mar-80	MBMG	+32.82		22.1	423	
			30-Apr-80	MBMG	+32.59		22.3	434	
			7-Jun-80	MBMG	+34.44		21.8	442	
			17-Jul-80	MBMG	+35.36		20.4	430	

Location	Map Number	GWIC No.	Inventory Date	Agency	Static Water Level (feet below ground)	Yield (gpm)	Water Temperature (° C)	Conductance (microsiemens per cm @ 25° C)	Field pH
			16-Oct-80	MBMG	+36.98		22.4	485	
			2-Dec-80	MBMG	+38.14		25.1	435	
			13-Jan-81	MBMG	+36.06		22.2	553	
			14-Apr-81	MBMG	+35.36		25.0	447	
			2-Feb-82	MBMG	+33.75		21.1	396	
			25-Sep-92	MBMG	+26.12		20.0	419	8.18
			21-Oct-92	MBMG	+24.97		23.2	423	8.07
			30-Nov-92	MBMG	+22.66		20.9	471	7.36
			18-Dec-92	MBMG	+24.04		21.0	433	7.91
			19-Jan-93	MBMG			20.3	434	6.76
			3-Mar-93	MBMG	+19.08		21.8	412	8.45
			5-Apr-93	MBMG	+20.58		21.9	443	8.13
			20-May-93	MBMG	+17.35		22.3	416	7.93
			3-Jun-93	MBMG	+17.81		21.9	417	8.09
			15-Jul-93	MBMG	+16.19		21.8	406	8.07
			16-Aug-93	MBMG	+18.5		22.4	468	7.94
			9-Sep-93	MBMG	+19.52		16.9	544	7.54
			6-Nov-93	MBMG	+12.15		21.3	469	8.27
			6-Jan-94	MBMG	+11.34		20.9	454	8.20
			5-Apr-94	MBMG	+13.65		20.7	471	8.08
			28-Nov-94	MBMG	+13.42		22.1	503	8.88
22N23W18BBBB	60	M:77131	9-Oct-79	MBMG	45.5		17.8	436	
22N23W18CCCC	61	M:77132	7-Sep-79	MBMG					
22N23W18DDAD	62	M:77133	30-Nov-79	MBMG	+34.6		20.3	495	
			3-Dec-79	MBMG	+38.2		25.6	571	
			10-Jan-80	MBMG	+33.68		23.2	498	
			24-Feb-80	MBMG	+35.29		25.8	503	
			24-Mar-80	MBMG	+35.75		24.5	515	
			30-Apr-80	MBMG	+35.52		20.7	491	
			7-Jun-80	MBMG	+37.02		24.6	547	
			17-Jul-80	MBMG	+36.22		19.5	508	
			16-Oct-80	MBMG	+39.45		24.4		
			2-Dec-80	MBMG	+41.07		21.9	551	
			13-Jan-81	MBMG	+38.76		25.6	571	
			14-Apr-81	MBMG	+37.37		23.2	506	
			2-Feb-82	MBMG	+36.45			542	
			19-Aug-92	MBMG	+25.13		22.5	505	8.80
			25-Sep-92	MBMG	+30.21		23.0	537	8.74
			21-Oct-92	MBMG	+28.13		25.1	535	8.44
			30-Nov-92	MBMG	+29.75		23.7	526	8.87
			18-Dec-92	MBMG	+30.67		24.2	515	8.48
			19-Jan-93	MBMG	+29.29		24.3	518	8.07
			3-Mar-93	MBMG	+30.56		24.8	511	8.95
			5-Apr-93	MBMG	+30.9		24.8	516	8.55
			20-May-93	MBMG	+25.59		25.3	495	8.54
			3-Jun-93	MBMG	+26.17		24.0	506	8.72
			15-Jul-93	MBMG	+24.2		25.8	523	8.66
			16-Aug-93	MBMG	+24.67		25.0	493	8.51
			6-Nov-93	MBMG	+27.9		23.4	500	8.71
			6-Jan-94	MBMG	+26.75		22.2	516	8.63
			5-Apr-94	MBMG	+26.17		24.8	485	8.77
			28-Nov-94	MBMG	+25.36		24.5	583	9.33
22N23W19ADDA	63	M:150568							
22N23W19BBCC	64	M:83635	9-Jul-79	MBMG	37.9		17.2	701	
			10-Jan-80	MBMG	40.92				
			24-Feb-80	MBMG	40.4				
			24-Mar-80	MBMG	39.79				
			17-Jul-80	MBMG	38.5				
			13-Jan-81	MBMG	36.67				
			14-Apr-81	MBMG	36.23				
			2-Feb-82	MBMG	39.1				
22N23W19BBDA	65	M:150569	8-Sep-78	MBMG			19.8	600	
22N23W19CACC	66	M:77134	12-Jul-79	MBMG			15.7	481	
22N23W19CBCD	67	M:83636	12-Jul-79	MBMG	43.3		13.8	456	
			8-Nov-93	MBMG			15.6	479	8.31
22N23W19CCC	68	M:77136	3-Sep-78	MBMG			13.6	320	
			12-Aug-93	MBMG	48				
22N23W19DAAA	69	M:6222	12-Jul-79	MBMG		2.2	26.4	639	
22N23W19DCCA	70	M:77139	9-Jul-79	MBMG			15.8	499	
22N23W20ACCB	71	M:77141	4-Dec-79	MBMG	+34.3	200	18.1	574	
22N23W20BAAD	72	M:6223	5-Sep-78	MBMG	+38.8	250	17.0	566	
			8-Oct-79	MBMG			18.0	547	
			24-Feb-80	MBMG	+35.22		17.1	557	
			24-Mar-80	MBMG	+36.37		17.0	566	
			30-Apr-80	MBMG	+35.22		16.8	548	
			7-Jun-80	MBMG	+37.18		16.5	610	
			17-Jul-80	MBMG	+39.03		20.0	600	

Location	Map Number	GWIC No.	Inventory Date	Agency	Static Water Level (feet below ground)	Yield (gpm)	Water Temperature (° C)	Conductance (microsiemens per cm @ 25° C)	Field pH
			16-Oct-80	MBMG	+39.61				
			2-Dec-80	MBMG	+40.99		17.4	593	
			13-Jan-81	MBMG	+38.91		17.0	614	
			14-Apr-81	MBMG	+37.3		18.0	554	
			2-Feb-82	MBMG	+36.14		12.8	548	
			19-Aug-92	MBMG	+24.36		19.2	566	8.41
			25-Sep-92	MBMG	+28.98		15.8	593	8.38
			21-Oct-92	MBMG	+28.52		18.2	590	8.20
			30-Nov-92	MBMG	+30.71		16.1	609	8.51
			18-Dec-92	MBMG	+30.6		15.1	578	8.05
			19-Jan-93	MBMG	+30.37		15.7	582	8.07
			3-Mar-93	MBMG	+30.6		16.3	603	8.64
			5-Apr-93	MBMG	+30.94		16.4	580	8.20
			20-May-93	MBMG	+25.75		18.2	573	8.33
			3-Jun-93	MBMG	+25.75		16.8	574	8.38
			15-Jul-93	MBMG	+22.63		17.2	575	8.36
			16-Aug-93	MBMG	+24.13		18.1	558	8.05
			6-Nov-93	MBMG	+27.06		15.8	653	8.41
			6-Jan-94	MBMG	+27.36		15.1	591	8.26
22N23W20BBCD	73	M:150570	6-Sep-78	MBMG	+0.4	2	18.7	677	
22N23W20BCCB	74	M:6224	6-Sep-78	MBMG	+27.4	200	25.6	531	
			8-Oct-79	MBMG	+18.61		23.0	509	
			30-Nov-79	MBMG	+21.85		25.2	463	
			10-Jan-80	MBMG	+23.93		23.5	535	
			24-Feb-80	MBMG	+25.08		25.8	506	
			24-Mar-80	MBMG	+26.24		25.6	538	
			30-Apr-80	MBMG	+25.08		25.4	522	
			7-Jun-80	MBMG	+26.7		25.6	537	
			17-Jul-80	MBMG	+28.09		18.0	560	
			16-Oct-80	MBMG	+29.47		25.5		
			2-Dec-80	MBMG	+30.86		25.6	583	
			13-Jan-81	MBMG	+28.32		25.9	568	
			14-Apr-81	MBMG	+26.93		24.0	617	
			2-Feb-82	MBMG	+26.93			528	
			19-Aug-92	MBMG	+13.65		26.4	520	8.72
			25-Sep-92	MBMG	+19.08		24.5	520	8.64
			21-Oct-92	MBMG	+18.04		25.1	529	8.48
			30-Nov-92	MBMG	+19.54		24.6	451	8.82
			18-Dec-92	MBMG	+20		24.6	519	8.23
			3-Mar-93	MBMG	+20.35		24.5	511	8.42
			5-Apr-93	MBMG	+21.16		23.0	518	8.63
			20-May-93	MBMG	+15.61		25.5	505	8.53
			3-Jun-93	MBMG	+15.96		24.0	524	8.60
			15-Jul-93	MBMG	+14.34		25.6	537	8.40
			16-Aug-93	MBMG	+14.23		24.0	505	8.32
			6-Nov-93	MBMG	+18.15		23.2	510	8.67
			6-Jan-94	MBMG	+19.31		21.8	520	8.54
			5-Apr-94	MBMG	+15.61		25.4	513	9.30
			28-Nov-94	MBMG	+15.15		25.1	590	9.22
22N23W20DCDB	75	M:77143	7-Sep-78	MBMG		20	34.4	490	
22N23W20DDCC	76	M:6226	8-Jul-79	MBMG		400	32.0	642	
	77	M:77144	8-Jul-79	MBMG	+42	300	29.4	711	
			8-Oct-79	MBMG	+27.91		30.0	667	
			30-Nov-79	MBMG	+36.22			617	
			10-Jan-80	MBMG	+35.99		26.0	643	
			24-Feb-80	MBMG	+39.69		27.0	680	
			24-Mar-80	MBMG	+41.77		29.0	711	
			30-Apr-80	MBMG	+39.69		26.4	636	
			7-Jun-80	MBMG	+42.23		29.7	681	
			17-Jul-80	MBMG	+44.08		28.0	725	
			16-Oct-80	MBMG	+44.77				
			2-Dec-80	MBMG	+45.92		28.6	763	
			13-Jan-81	MBMG	+42.92		29.8	674	
			14-Apr-81	MBMG	+39.23		25.4	640	
			2-Feb-82	MBMG	+39.69		24.0	704	
			25-Sep-92	MBMG	+34.03		17.7	579	8.53
			21-Oct-92	MBMG	+34.26		25.0	596	8.38
			30-Nov-92	MBMG			23.5	644	8.67
			18-Dec-92	MBMG	+37.38		18.2	565	8.24
			19-Jan-93	MBMG			18.0	587	8.23
			3-Mar-93	MBMG	+35.3		24.7	588	8.37
			5-Apr-93	MBMG	+37.84		23.9	598	8.38
			20-May-93	MBMG	+31.95		23.9	594	8.27
			3-Jun-93	MBMG	+31.95		23.9	593	8.45
			15-Jul-93	MBMG	+30.22		22.7	564	8.55
22N23W28ABCC	78	M:77148	7-Sep-78	MBMG			14.8	316	
			25-Aug-94	MBMG	47.93				

Location	Map Number	GWIC No.	Inventory Date	Agency	Static Water Level (feet below ground)	Yield (gpm)	Water Temperature (° C)	Conductance (microsiemens per cm @ 25° C)	Field pH
			2-Dec-94	MBMG	44.46				
22N23W28ADCC	275	M:77147	19-Jul-95	MBMG			18.4	574	8.44
22N23W28CBBB	79	M:6227	8-Jul-79	MBMG	+31.8	300	28.8	674	
			8-Oct-79	MBMG	+29.34		27.5	688	
			30-Nov-79	MBMG	+27.95		28.8	634	
			10-Jan-80	MBMG	+19.64		26.5	646	
			24-Mar-80	MBMG			27.1	732	
			16-Aug-93	MBMG	+19.66				
			8-Apr-94	MBMG	+23.80				
22N23W28CBDB	80	M:77151	9-Jul-79	MBMG	+41.8	250	16.2	640	
			8-Oct-79	MBMG	+25.38		15.0	700	
			30-Nov-79	MBMG	+31.61		15.9	640	
			10-Jan-80	MBMG	+32.31			663	
			24-Feb-80	MBMG	=33.69		16.2	643	
			24-Mar-80	MBMG	+36.93		16.1	644	
			30-Apr-80	MBMG	+31.61		12.1	659	
			7-Jun-80	MBMG	+37.62		16.0	701	
			17-Jul-80	MBMG	+41.31		12.7	685	
			16-Oct-80	MBMG	+42.01		15.0	602	
			2-Dec-80	MBMG	+42.7		12.8	635	
			13-Jan-81	MBMG	+40.62		16.0	602	
			14-Apr-81	MBMG	+34.38		17.0	500	
			2-Feb-82	MBMG	+35.54			503	
			19-Aug-92	MBMG	+13.59		17.8	649	8.17
			25-Sep-92	MBMG	+15.21		16.7	629	8.37
			21-Oct-92	MBMG	+20.29		17.6	602	8.31
			30-Nov-92	MBMG	+22.26		16.2	644	8.43
			18-Dec-92	MBMG	+23.07		15.1	597	8.17
			19-Jan-93	MBMG	+21.91		16.6	614	8.46
			5-Apr-93	MBMG	+23.76		16.8	614	8.45
			20-May-93	MBMG	+13.02		17.5	613	8.26
			3-Jun-93	MBMG	+11.75		17.8	613	8.33
			15-Jul-93	MBMG	+13.83		17.3	610	8.37
			16-Aug-93	MBMG	+11.75		18.7	617	8.06
			6-Nov-93	MBMG	+19.02		19.8	547	8.34
			6-Jan-94	MBMG	+19.02		16.7	630	8.27
			5-Apr-94	MBMG	+15.79		18.4	608	8.32
			28-Nov-94	MBMG	+17.06		17.2	688	8.83
22N23W28CCAA	81	M:77153	9-Jul-79	MBMG		100	15.0	496	
22N23W28CCAC	82	M:77152	9-Jul-79	MBMG	+41	150	29.2	668	
			30-Nov-79	MBMG				603	
			10-Jan-80	MBMG	+32.88		24.0	705	
			24-Feb-80	MBMG	+34.03		27.0	739	
			24-Mar-80	MBMG	+36.57		23.9	719	
			30-Apr-80	MBMG	+31.72		21.9	698	
			7-Jun-80	MBMG	+37.84		28.7	682	
			17-Jul-80	MBMG	+41.89		24.8	723	
			16-Oct-80	MBMG	+40.96		26.0	758	
			2-Dec-80	MBMG	+41.43		23.1	707	
			13-Jan-81	MBMG	+40.5		25.0	700	
			14-Apr-81	MBMG	+33.34		28.8	729	
			2-Feb-82	MBMG	+35.88		20.1	644	
			19-Aug-92	MBMG	+14.17		31.5	659	8.41
			25-Sep-92	MBMG	+17.4		24.9	627	8.45
			21-Oct-92	MBMG	+22.02		28.0	624	8.37
			30-Nov-92	MBMG	+23.87		26.9	592	8.20
			18-Dec-92	MBMG	+25.23		26.5	609	8.31
			19-Jan-93	MBMG	+23.29		27.6	571	8.52
			3-Mar-93	MBMG	+25.49		28.1	666	8.33
			5-Apr-93	MBMG	+25.49		28.0	644	8.34
			20-May-93	MBMG			30.7	523	8.31
			3-Jun-93	MBMG	+14.28		29.2	647	8.31
			15-Jul-93	MBMG	+15.78		26.4	633	8.36
			16-Aug-93	MBMG	+14.4		30.2	617	8.02
			6-Nov-93	MBMG	+20.75		26.9	608	8.40
			6-Jan-94	MBMG	+20.64		26.5	566	8.51
			5-Apr-94	MBMG	+18.09		28.3	626	8.40
			28-Nov-94	MBMG	+18.56		27.3	751	8.84
22N23W29AADB	83	M:6228	9-Jul-79	MBMG	+41.8	100	32.4	700	
			30-Nov-79	MBMG	+24.49		30.6	636	
			10-Jan-80	MBMG	+20.56		28.5	654	
			24-Feb-80	MBMG	+36.73		29.5	738	
			24-Mar-80	MBMG	+39.5		29.6	700	
			30-Apr-80	MBMG	+36.73		25.8	681	
			7-Jun-80	MBMG	+39.73		30.3	718	
			17-Jul-80	MBMG	+41.12		28.0	744	
			16-Oct-80	MBMG	+41.35		29.2		

Location	Map Number	GWIC No.	Inventory Date	Agency	Static Water Level (feet below ground)	Yield (gpm)	Water Temperature (° C)	Conductance (microsiemens per cm @ 25° C)	Field pH
			2-Dec-80	MBMG	+32.34		28.4	732	
			13-Jan-81	MBMG			29.8	720	
22N23W29ACAB	84	M:6229	22-Mar-83	MBMG	+23.2	820	51.0	645	
			26-May-93	MBMG	+16.17				
22N23W29ACBB	85	M:6231	12-Sep-78	MBMG	+25.5	150	51.6	703	
			8-Oct-79	MBMG	+22.41		49.5	731	
			30-Nov-79	MBMG	+28.18		51.2		
			24-Feb-80	MBMG	+28.76			887	
			24-Mar-80	MBMG	+32.11		51.6	713	
			30-Apr-80	MBMG	+28.64			680	
			7-Jun-80	MBMG	+24.02		25.9	703	
			17-Jul-80	MBMG	+35.57			730	
			16-Oct-80	MBMG	+33.5		36.0	798	
			2-Dec-80	MBMG	+35.11		50.7	698	
			13-Jan-81	MBMG	+32.57		50.9	719	
			2-Feb-82	MBMG	+29.34			667	
			19-Aug-92	MBMG			45.0		8.70
			25-Sep-92	MBMG	+22.18		45.0		8.60
			21-Oct-92	MBMG	+21.95		44.5	673	8.50
			30-Nov-92	MBMG	+24.14		44.5	1148	8.86
			18-Dec-92	MBMG	+24.49		45.2	625	8.45
			19-Jan-93	MBMG	+23.89		45.0	656	8.88
			3-Mar-93	MBMG	+25.41		44.0	683	8.50
			20-May-93	MBMG	+20.33		44.2	579	8.46
			15-Jul-93	MBMG	+19.29		43.5	567	8.71
22N23W29ACD	86	M:150571	2-Mar-83	MBMG			44.0		
22N23W29BAAC	87	M:6234	6-Sep-78	MBMG			37.5	590	
22N23W29BADD	88	M:6237	12-Jan-80	MBMG	+25	550	49.3	694	
			17-Sep-74	USGS	+23				
22N23W29CACA	89	M:77158	13-Jul-79	MBMG	+19.2	95	33.3	484	
			8-Oct-79	MBMG			32.5	438	
			30-Nov-79	MBMG			32.6	439	
			10-Jan-80	MBMG	+19.86		29.0	472	
			24-Feb-80	MBMG	+20.32		27.8	486	
			24-Mar-80	MBMG	+20.67		32.8	480	
			30-Apr-80	MBMG	+20.09		29.9	517	
			17-Jul-80	MBMG	+25.4			481	
			16-Oct-80	MBMG	+25.17		33.3	566	
			2-Dec-80	MBMG	+26.56		32.4	484	
			13-Jan-81	MBMG	+23.79		33.2	484	
			14-Apr-81	MBMG	+23.56		26.5	474	
			2-Feb-82	MBMG	+21.71		26.6	442	
22N23W29CBBC	90	M:121328	7-Jul-79	MBMG		40	25.7	461	
			10-Jan-80	MBMG			27.0	438	
			24-Feb-80	MBMG			24.4	483	
			24-Mar-80	MBMG	+0.2		25.6	450	
			30-Apr-80	MBMG	0.3		24.8	439	
			7-Jun-80	MBMG	0.9		25.9	456	
			17-Jul-80	MBMG				466	
			16-Oct-80	MBMG	1.1		25.8	461	
			2-Dec-80	MBMG	1.8		25.6	441	
			13-Jan-81	MBMG	0.8		25.7	460	
			14-Apr-81	MBMG	1		26.5	442	
			2-Feb-82	MBMG	+0.4		24.8	458	
			25-Sep-92	MBMG	3.84				
			21-Oct-92	MBMG	2.92				
			30-Nov-92	MBMG	+				
			18-Dec-92	MBMG	+				
			19-Jan-93	MBMG	+				
			3-Mar-93	MBMG	+		25.5	447	8.87
			5-Apr-93	MBMG	+		24.5	422	8.63
			20-May-93	MBMG	5.56				
			3-Jun-93	MBMG	5.44				
			15-Jul-93	MBMG	7.08				
			16-Aug-93	MBMG	6				
			9-Sep-93	MBMG	5.86				
			6-Nov-93	MBMG	3.48				
			6-Jan-94	MBMG	4.3				
			8-Mar-94	MBMG	4.24				
			5-Apr-94	MBMG	5.38				
			25-Aug-94	MBMG	12.43				
			28-Nov-94	MBMG	6.21				
			14-Apr-95	MBMG	4.84				
			15-Jul-95	MBMG	9.9				
22N23W29CCCC	91	M:121339	7-Jul-79	MBMG		15	15.2	465	
22N23W30AAAD	276	M:77161	25-Sep-92	MBMG	+2.31		27.5		8.78
			21-Oct-92	MBMG	+5.91		25.9	493	8.65

Location	Map Number	GWIC No.	Inventory Date	Agency	Static Water Level (feet below ground)	Yield (gpm)	Water Temperature (° C)	Conductance (microsiemens per cm @ 25° C)	Field pH
			30-Nov-92	MBMG	+7.88		23.8	409	8.51
			18-Dec-92	MBMG	+8.57		24.5	481	8.34
			19-Jan-93	MBMG	+8.68		27.3	476	7.23
			3-Mar-93	MBMG	+9.26		28.5	493	8.65
			5-Apr-93	MBMG	+9.49		27.4	487	8.56
			20-May-93	MBMG	+4.53		26.0	491	8.36
			3-Jun-93	MBMG	+4.76		26.4	349	8.67
			15-Jul-93	MBMG	+3.72				
			16-Aug-93	MBMG	+3.26		24.8	525	8.51
			6-Nov-93	MBMG	+5.1		23.0	472	8.74
			6-Jan-94	MBMG	+5.54		22.2	535	8.79
			5-Apr-94	MBMG	+4.64		25.1	519	8.76
22N23W30CADD	93	M:77163	7-Sep-78	MBMG			18.2	386	
22N23W30BABB	92	M:77162							
22N23W30DBCD	94	M:77164	7-Sep-78	MBMG			15.0	382	
22N23W30DDCB	95	M:122900	7-Sep-78	MBMG	28.9	15	12.9	379	
22N23W32ABAA	96	M:122899	7-Sep-78	MBMG		10	18.2	378	
22N23W32BCBC	97	M:77166	12-Jul-79	MBMG			13.9	499	
			6-Apr-93	MBMG	30.8				
			17-Aug-93	MBMG	36.48				
			9-Apr-94	MBMG	35.47				
22N23W32DBBB	98	M:77168	27-Mar-80	MBMG	19.62				
			6-Apr-93	MBMG	27.17				
			5-Apr-94	MBMG	32.94				
22N23W32DDBA	99	M:77167	27-Mar-80	MBMG		250	16.4	500	
			6-Apr-93	MBMG	+6.29				
			19-Aug-93	MBMG	1.27				
			5-Apr-94	MBMG	+1.04				
22N23W33BABA	100	M:77173	30-Jul-79	MBMG					
22N23W33BABB	101	M:77175	8-Jul-79	MBMG			17.3	562	
22N23W33BDAB	102	M:77177	10-Aug-75	USGS			13.5	510	
22N23W33DADB	103	M:77180	8-Jul-79	MBMG		75	11.9	497	
22N23W33DADD	277	M:77181	6-Jun-93	MBMG			13.7	430	7.99
22N23W33DDAD	104	M:77182	8-Jul-79	MBMG	+29	250	12.4	464	
			8-Oct-79	MBMG	+11.21		12.0	426	
			30-Nov-79	MBMG	+17.44		12.3	436	
			10-Jan-80	MBMG	+19.98		12.0	477	
			24-Feb-80	MBMG	+21.02		11.2	461	
			24-Mar-80	MBMG	+19.06		12.3	467	
			30-Apr-80	MBMG	+12.59				
			7-Jun-80	MBMG	+21.83		12.2	454	
			17-Jul-80	MBMG	+29.66		12.5	542	
			16-Oct-80	MBMG	+25.99		12.4	464	
			2-Dec-80	MBMG	+27.38		12.2	422	
			13-Jan-81	MBMG	+24.72		12.7	474	
			14-Apr-81	MBMG	+21.37		13.1	424	
			2-Feb-82	MBMG	+21.83		10.9	468	
			25-Sep-92	MBMG	+0.81		13.0	464	8.04
			21-Oct-92	MBMG	+3.12		14.2	402	7.87
			30-Nov-92	MBMG	+6.01		11.0	463	7.10
			18-Dec-92	MBMG	+6.12		11.9	466	7.50
			19-Jan-93	MBMG	+6.58		12.5	457	7.85
			3-Mar-93	MBMG	+3.58		12.5	467	7.81
			5-Apr-93	MBMG	+8.32		13.5	494	7.98
			20-May-93	MBMG			15.3	466	8.00
			3-Jun-93	MBMG			14.2	430	8.15
			6-Nov-93	MBMG	+3.35		14.7	532	8.05
			6-Jan-94	MBMG	+4.04		11.7	518	7.99
			5-Apr-94	MBMG	+.70		13.3	515	8.22
			28-Nov-94	MBMG	+1.50		12.6	524	8.67
22N23W33DDCC	105	M:77183	9-Jul-79	MBMG			11.2	581	
			6-Jun-93	MBMG					
			5-Apr-94	MBMG	+16.28				
22N23W34AAA	106	M:151976	1-Aug-75	USGS	45.2		13.0	240	
22N24W01BBAB	107	M:77187	10-Oct-79	MBMG			12.7	576	
22N24W01CAB	108	M:77186							
22N24W01CBDC	109	M:77188	10-Jan-80	MBMG	28.27		13.5	414	
			24-Feb-80	MBMG	27.94				
			30-Apr-80	MBMG	28.51				
			17-Jul-80	MBMG	25.75				
			16-Oct-80	MBMG	28.9				
			2-Dec-80	MBMG	29.91				
			13-Jan-81	MBMG	28.27				
			14-Apr-81	MBMG	27.85				
			2-Feb-82	MBMG	30.42				
22N24W02AADD	110	M:122686	10-Oct-79	MBMG	69.15		15.2	388	
			24-Mar-80	MBMG	72.38				

Location	Map Number	GWIC No.	Inventory Date	Agency	Static Water Level (feet below ground)	Yield (gpm)	Water Temperature (° C)	Conductance (microsiemens per cm @ 25° C)	Field pH
			30-Apr-80	MBMG	71.39				
			7-Jun-80	MBMG	69.87				
			17-Jul-80	MBMG	69.65				
			16-Oct-80	MBMG	68.35				
			2-Dec-80	MBMG	67.37				
			13-Jan-81	MBMG	67.96				
			14-Apr-81	MBMG	67.38				
			2-Feb-82	MBMG	69.54				
			19-Aug-92	MBMG	78.23				
			25-Sep-92	MBMG	76.14				
			21-Oct-92	MBMG	75.99				
			30-Nov-92	MBMG	75.13				
			18-Dec-92	MBMG	74.43				
			19-Jan-93	MBMG	74.32				
			3-Mar-93	MBMG	74.02				
			5-Apr-93	MBMG	73.51				
			20-May-93	MBMG	77.45				
			3-Jun-93	MBMG	77.31				
			15-Jul-93	MBMG	78.68				
			16-Aug-93	MBMG	78.14				
			6-Nov-93	MBMG	76.3				
			6-Jan-94	MBMG	76.79				
			8-Mar-94	MBMG	78.2				
			5-Apr-94	MBMG	77.84				
22N24W02ABBB	111	M:153307	10-Oct-79	MBMG	81.9		15.3	402	
22N24W02BAAA	278	M:77191	5-Mar-93	MBMG	79.72				
			8-Apr-93	MBMG	76.53				
22N24W02BAAB	112	M:151700	11-Jul-77	MBMG			16.5	445	
			18-Oct-95	MBMG	28.6	8		917	9.80
22N24W02BABA	113	M:77190	12-Jul-79	MBMG			13.4	415	
22N24W02BCBC	114	M:151699	30-Jul-79	MBMG			12.8	342	
22N24W02DAAB	115	M:77195	30-Jul-79	MBMG			13.9	388	
22N24W02DABA	279	M:77196	7-Jun-93	MBMG	77.01		15.9	388	8.08
22N24W02DBBA	116	M:77197	23-Jul-79	MBMG	65		14.0	378	
22N24W03ACCB	117	M:77199	30-Jul-79	MBMG			14.9	326	
22N24W03BCCC	118	M:120647	29-Jul-79	MBMG	61.98		11.8	279	
			10-Jan-80	MBMG	59.61				
			24-Feb-80	MBMG	59.19				
			30-Apr-80	MBMG	59.2				
			7-Jun-80	MBMG	57.74				
			17-Jul-80	MBMG	57.31				
			16-Oct-80	MBMG	56.04				
			13-Jan-81	MBMG	55.66				
			14-Apr-81	MBMG	55.49				
			2-Feb-82	MBMG	57.71				
			21-Oct-92	MBMG	63.19				
			30-Nov-92	MBMG	62.62				
			18-Dec-92	MBMG	62.13				
			19-Jan-93	MBMG	61.7				
			3-Mar-93	MBMG	61.53				
			5-Apr-93	MBMG	61				
			20-May-93	MBMG	63.91				
			3-Jun-93	MBMG	64.24				
			15-Jul-93	MBMG	65.22				
			16-Aug-93	MBMG	65.14				
			9-Sep-93	MBMG	65.51				
			6-Nov-93	MBMG	63.44				
			6-Jan-94	MBMG	64.12				
			8-Mar-94	MBMG	64.46				
			5-Apr-94	MBMG	64.29				
			25-Aug-94	MBMG	70.77				
			28-Nov-94	MBMG	67.49				
			3-Jan-95	MBMG	66.62				
			1-Mar-95	MBMG	65.66				
			14-Apr-95	MBMG	65.34				
			15-Jul-95	MBMG	69.4				
22N24W03DABA	119	M:77198							
22N24W03DDCDD	280	M:127157	3-Apr-93	MBMG			15.9	300	7.78
22N24W03DDCD	120	M:150566	11-Jul-79	MBMG			311.0	12	
22N24W04CADD	122	M:150565	11-Jul-77	MBMG			11.0	128	
22N24W04ADAA	121	M:151698	11-Jul-79	MBMG			13.5	335	
22N24W09ACAB	123	M:77202	11-Jul-77	MBMG			12.3	260	
22N24W10AABD	124	M:151697	20-Jul-79	MBMG					
			5-Apr-93	MBMG	68.44				
			17-Aug-93	MBMG	73.22				
			7-Apr-94	MBMG	70.6				
22N24W10ABBA	125	M:77204	11-Jul-79	MBMG			13.3	292	

Location	Map Number	GWIC No.	Inventory Date	Agency	Static Water Level (feet below ground)	Yield (gpm)	Water Temperature (° C)	Conductance (microsiemens per cm @ 25° C)	Field pH
22N24W10ACBA	126	M:151978	29-Jul-79	MBMG		10	15.2	414	
22N24W10BBBB	127	M:77206	11-Jul-79	MBMG			10.4	294	
22N24W10DDA	128	M:151982	17-Jul-75	USGS	53.9				
22N24W11ADCC	129	M:77208	29-Jul-79	MBMG					
22N24W11ADCD	281	M:77209	20-Apr-93	MBMG	63.85				
22N24W11BBBB	130	M:77210	29-Jul-79	MBMG			13.8	241	
22N24W11BCCC	131	M:77211							
22N24W11CBBB	132	M:77212	11-Jul-79	MBMG			13.2	357	
22N24W11DADC	133	M:150564	17-Jul-75	USGS	59.3		13.5	405	
22N24W12ACCC	134	M:77214	9-Oct-79	MBMG	54		13.2	394	
			30-Nov-79	MBMG	61.7		10.0	390	
			10-Jan-80	MBMG	56.95				
			24-Feb-80	MBMG	56.19				
			24-Mar-80	MBMG	55.43				
			30-Apr-80	MBMG	57.17				
			7-Jun-80	MBMG	55.18				
			17-Jul-80	MBMG	55.13				
			16-Oct-80	MBMG	57.05				
			2-Dec-80	MBMG	52.61				
			13-Jan-81	MBMG	56.05				
			2-Feb-82	MBMG	58.03				
22N24W12BBBB 01	135	M:153306	30-Jul-79	MBMG			17.4	376	
			13-Aug-93	MBMG	66.94				
			8-Apr-94	MBMG	66.7				
22N24W12BBBB 02	282	M:77216	20-Apr-93	MBMG	54.12				
			18-Aug-93	MBMG	58.63				
			8-Apr-94	MBMG	57.13				
22N24W12BDCC	136	M:77217	2-Oct-79	MBMG			14.0	392	
22N24W13BCBB	137	M:151696	17-Jul-75	USGS	47.8		14.5	405	
			30-Jul-79	MBMG			13.4	356	
22N24W13DADD	138	M:77219	5-May-80	MBMG	41.23		28.8	415	
22N24W13DBDC	139	M:151695	11-Jul-77	USGS	45.1		26.5	470	
22N24W14BBBB	140	M:77221	8-Oct-79	MBMG			12.8	329	
22N24W14CABA	141	M:77222	4-Oct-79	MBMG					
22N24W14CACC	283	M:77223	19-Jul-93	MBMG	53.82		14.2		7.95
			13-Aug-93	MBMG	53.39				
			6-Apr-94	MBMG	52.6				
22N24W14CDDD	142	M:77224	10-Jul-79	MBMG			10.6	326	
22N24W14DDAB	143	M:150563	11-Oct-79	MBMG	52.57		11.8	324	
22N24W15ABAD	144	M:77225	20-Jul-79	MBMG	51.78				
			5-Apr-93	MBMG	52.19				
			5-Apr-94	MBMG	56.22				
22N24W15ADDD	145	M:77231	20-Jul-79	MBMG					
22N24W15CABA	146	M:77228	11-Jul-79	MBMG	18.4		12.3	216	
22N24W15CBBA	147	M:77230	20-Jul-79	MBMG					
22N24W15CBBB	284	M:76216	1-Aug-92	MBMG	32.99				
22N24W15DBAB	148	M:151694	11-Jul-79	MBMG			11.7	309	
22N24W15DCDD	149	M:77232	10-Jul-79	MBMG			9.9	322	
22N24W16DDCD	150	M:77233	10-Jul-79	MBMG	+8.0	1.5	11.6	196	
			10-Jan-80	MBMG			11.1	183	
			24-Feb-80	MBMG	+14.36		9.9	174	
			24-Mar-80	MBMG	+16.21				
			30-Apr-80	MBMG	+15.74		11.2	158	
			7-Jun-80	MBMG	+15.28		11.0	185	
			17-Jul-80	MBMG	+17.13				
			16-Oct-80	MBMG	+17.13				
			2-Dec-80	MBMG	+17.82		9.6	192	
			13-Jan-81	MBMG	+15.05		10.0	193	
			2-Feb-82	MBMG	+14.59		9.5	174	
			19-Aug-92	MBMG			15.5	189	8.90
			25-Sep-92	MBMG	+15.05		16.0	184	8.75
			21-Oct-92	MBMG	+15.74		13.2	183	8.71
			30-Nov-92	MBMG	+14.03		10.0	186	7.89
			18-Dec-92	MBMG	+14.01		9.6	184	8.66
			19-Jan-93	MBMG	+13.64		8.8	184	8.40
			3-Mar-93	MBMG	+12.16		12.0	187	8.65
			5-Apr-93	MBMG	+12.97		11.0	152	8.75
			20-May-93	MBMG	+13.66		13.9	185	8.24
			3-Jun-93	MBMG	+14.82				
			15-Jul-93	MBMG	+15.28		13.4	172	8.84
			16-Aug-93	MBMG	+15.28		16.4	197	8.51
			9-Sep-93	MBMG	+14.59		14.1	201	8.75
			6-Nov-93	MBMG	+14.24		11.0	214	8.87
			6-Jan-94	MBMG	+13.66		8.3	210	8.88
			5-Apr-94	MBMG	+13.09		14.3	233	8.16
			25-Aug-94	MBMG	+16.21				
			28-Nov-94	MBMG	+13.09				

Location	Map Number	GWIC No.	Inventory Date	Agency	Static Water Level (feet below ground)	Yield (gpm)	Water Temperature (° C)	Conductance (microsiemens per cm @ 25° C)	Field pH
			14-Apr-95	MBMG	+12.74				
			15-Jul-95	MBMG	+14.13				
22N24W21AABB	151	M:77235	10-Jul-79	MBMG			12.0	256	
22N24W21ACDC	152	M:150562	18-Jul-75	USGS	37.6		11.5	275	
22N24W21DAAA	153	M:77237	10-Jul-79	MBMG			12.8	310	
22N24W22CABB	154	M:77239	18-Jul-75	MBMG	34.6		11.0	305	
22N24W23AAAD	155	M:77241	9-Oct-79	MBMG	46.1		13.7	311	
22N24W23ABAB	156	M:6256	10-Jul-79	MBMG	20		12.5	352	
			5-Jun-93	MBMG			14.8	314	8.19
22N24W23ADAA	157	M:77242	9-Oct-79	MBMG	44.5		14.0	323	
22N24W23BABA	158	M:77243	10-Jul-79	MBMG			11.1	320	
22N24W23CDCC	159	M:121292	9-Oct-79	MBMG	16.92		11.2	256	
			5-Apr-93	MBMG	18.56				
			16-Aug-93	MBMG	22.04				
			5-Apr-94	MBMG	22.42				
22N24W23DDAA	160	M:77247	9-Oct-79	MBMG	22.5	10	11.8	303	
22N24W24AABB	161	M:77248	8-Sep-78	MBMG					
22N24W24ABBD	162	M:6257	8-Sep-78	MBMG			17.4	380	
22N24W24ADAD	163	M:77250	9-Jul-79	MBMG	44.5		16.7	507	
			7-Apr-93	MBMG	42.08				
			13-Aug-93	MBMG	41.59				
			8-Apr-94	MBMG	46.26				
22N24W24BBBB	164	M:77252	1-Oct-79	MBMG					
22N24W24BDDC	165	M:77253	5-Sep-78	MBMG					
22N24W24DDCC	166	M:77255							
22N24W25AAAD	167	M:77256	8-Sep-79	MBMG	19.01				
22N24W25ADAD	168	M:77257	5-Sep-78	MBMG	12.5		13.2	376	
22N24W25CCCC	169	M:77258							
22N24W25DCAB	170	M:77259	13-Jul-79	MBMG	+7	4	14.5	401	
22N24W26AADD	171	M:77260	9-Oct-79	MBMG	28.1		11.2	315	
			7-Apr-93	MBMG	28.6				
			19-Aug-93	MBMG	33.52				
			6-Apr-94	MBMG	32.3				
22N24W26ABAA	172	M:82513	9-Oct-79	MBMG	29.59	10	13.9	295	
			10-Jan-80	MBMG	36.82				
			30-Apr-80	MBMG	38.4				
			7-Jun-80	MBMG	41.23				
			16-Oct-80	MBMG	33.24				
			2-Dec-80	MBMG	34.49				
			13-Jan-81	MBMG	32.37				
			14-Apr-81	MBMG	32.98				
			2-Feb-82	MBMG	38.47				
			7-Apr-93	MBMG	31.38				
			6-Apr-94	MBMG	37.58				
22N24W26ADDA	173	M:77266	9-Oct-79	MBMG	16.57		10.8	288	
			7-Apr-93	MBMG	15.11				
22N24W26BBCC	174	M:77263	6-Sep-79	MBMG			12.5	195	
22N24W26BCCC	285	M:77264	19-Jul-93	MBMG			12.5	281	7.34
22N24W26DCBA	175	M:77267							
22N24W27BBAA	176	M:77269	5-Sep-79	MBMG					
22N24W34CCDC	177	M:151977	7-Jan-94	MBMG	29.03				
			9-Mar-94	MBMG	29.47				
			6-Apr-94	MBMG	29.18				
			29-Nov-94	MBMG	30.11				
			3-Dec-94	MBMG	29.86				
			4-Jan-95	MBMG	29.48				
			13-Apr-95	MBMG	29.56				
			15-Jul-95	MBMG	29.22				
22N24W34CDBBA	286	M:77272	17-Aug-93	MBMG			17.7	291	6.37
22N24W34DDBA	287	M:77279	8-Nov-93	MBMG			15.8	267	8.18
22N24W35AADA	178	M:6259	8-Oct-79	MBMG	+2		13.8	518	
22N24W35ADDD	179	M:77291	8-Oct-79	MBMG			14.1	447	
			6-Apr-94	MBMG	+8.43				
22N24W36BBBB	180	M:77293	12-Oct-76	USGS			19.5	472	
23N23W06CDBB	181	M:78672	11-Oct-79	MBMG			12.8	342	
			11-Oct-79	MBMG	43	7	12.8	342	
			18-Aug-93	MBMG	63.32				
23N23W20BCBB	182	M:128075	1-Oct-84	USGS					
23N24W02BDDA	183	M:77964	3-May-80	MBMG					
23N24W02BDDD	184	M:77963	3-May-80	MBMG					
			18-Aug-93	MBMG	33.16				
			7-Apr-94	MBMG	31.96				
23N24W02CBC	185	M:151979	2-Aug-79	MBMG	2		13.0	364	
			8-Apr-93	MBMG	7.15				
			18-Aug-93	MBMG	7.23				
23N24W02CCD	186	M:151981	23-Jul-75	USGS	6.3		13.0	355	
			29-Nov-94	MBMG			9.0	723	6.71

Location	Map Number	GWIC No.	Inventory Date	Agency	Static Water Level (feet below ground)	Yield (gpm)	Water Temperature (° C)	Conductance (microsiemens per cm @ 25° C)	Field pH
23N24W03BABB	187	M:6278	22-Jul-75	USGS	63.8		10.5	315	
			8-Apr-93	MBMG	79.77				
23N24W10ADAC	188	M:150544	23-Jul-75	USGS	63.6		12.0	400	
			8-Apr-93	MBMG	65.63				
			18-Aug-93	MBMG	67.96				
23N24W10BCDA	189	M:6280	3-May-80	MBMG	8.05		12.1	349	
23N24W10CBCD	190	M:150561	4-May-80	MBMG			10.6	220	
23N24W10CCDC	191	M:150543	4-May-80	MBMG	10.77		12.6	235	
			8-Apr-93	MBMG	13.92				
			18-Aug-93	MBMG	15.76				
			6-Apr-94	MBMG	15.82				
23N24W11ABBB	288	M:77969	22-Apr-93	MBMG	16.12				
			18-Aug-93	MBMG	20.06				
			7-Apr-94	MBMG	18.17				
23N24W11CACA	192	M:77970	30-Sep-79	MBMG	48.3		11.8	364	
23N24W11DCCA	193	M:150560	1-Aug-79	MBMG					
23N24W12ACDB	194	M:150557							
			8-Apr-93	MBMG	62.8				
			18-Aug-93	MBMG	65.83				
			7-Apr-94	MBMG	66				
23N24W12ACDC	195	M:150556							
23N24W12CCCB	196	M:45118	2-Aug-79	MBMG	105.68		10.0	207	
			8-Apr-93	MBMG	104.53				
			5-Apr-94	MBMG	107.65				
23N24W13AABA	197	M:150545	10-Oct-79	MBMG	51.6		10.2	796	
23N24W13DBBA	289	M:77976	3-Mar-93	MBMG	54.65				
			8-Apr-93	MBMG	52.92				
			15-Aug-93	MBMG	57.06				
			7-Apr-94	MBMG	56.57				
23N24W15AABA	198	M:6281	31-Jul-79	MBMG			14.8	357	
			4-Jun-93	MBMG					
23N24W15BBAA	199	M:150555	4-May-80	MBMG	2.29		8.2	318	
23N24W15CBCC	200	M:77977	4-May-80	MBMG	21.83		12.0	349	
			8-Apr-93	MBMG	24.62				
			13-Aug-93	MBMG	28.9				
			7-Apr-94	MBMG	27.75				
23N24W15DCAA	201	M:150554	31-Jul-79	MBMG	39.7		14.9	351	
23N24W21ADCC	202	M:77979	4-May-80	MBMG	19.05		10.2	381	
23N24W21DCAA 01	203	M:150559	9-Jun-80	MBMG					
23N24W21DCAA 02	204	M:77980	9-Jun-80	MBMG			13.2	415	
			8-Apr-93	MBMG	151.94				
			13-Aug-93	MBMG	154.5				
			6-Apr-94	MBMG	155.5				
23N24W22ACDD	205	M:77982							
			8-Apr-93	MBMG	23.55				
			18-Aug-93	MBMG	28.17				
			7-Apr-94	MBMG	27.23				
23N24W24CAC	206	M:151983	4-Sep-74	USGS					
23N24W25DDAD	207	M:77987	11-Oct-79	MBMG	11.38		9.9	387	
23N24W25DDCA	208	M:77989	11-Oct-79	MBMG			12.3	288	
			8-Apr-93	MBMG	24				
			16-Aug-93	MBMG	28.11				
23N24W26CDCD	209	M:140370	7-Jun-93	MBMG			15.3	382	7.96
			16-Aug-93	MBMG	12.65				
23N24W27CDDD	210	M:45335	6-Jun-80	MBMG	24.52				
			7-Apr-93	MBMG	28.72				
			13-Aug-93	MBMG	32.86				
			6-Apr-94	MBMG	32.14				
23N24W33ABAA	290	M:141772	4-May-94	MBMG	115.74		14.8	280	7.20
			6-Apr-94	MBMG	113.45				
23N24W34ADAA	211	M:6283	2-Mar-43	USGS					
			31-Jul-79	MBMG	104.69	5	14.1	374	
			2-Jun-93	MBMG	114.12				
			7-Apr-93	MBMG	109.9				
			13-Aug-93	MBMG	113.02				
			6-Apr-94	MBMG	112.27				
23N24W34BDCC	212	M:77993	9-Jun-80	MBMG			16.6	338	
23N24W34CBDD	213	M:6284	24-Jun-80	MBMG	101.25		11.2	355	
			7-Jun-80	MBMG	99.26				
			16-Oct-80	MBMG	97.7				
			2-Dec-80	MBMG	96.69				
			13-Jan-81	MBMG	96.85				
			14-Apr-81	MBMG	97.25				
			2-Feb-82	MBMG	101.79				
			19-Aug-92	MBMG	107.72				
			25-Sep-92	MBMG	105.73				
			21-Oct-92	MBMG	105.55				

Location	Map Number	GWIC No.	Inventory Date	Agency	Static Water Level (feet below ground)	Yield (gpm)	Water Temperature (° C)	Conductance (microsiemens per cm @ 25° C)	Field pH
			30-Nov-92	MBMG	104.73				
			18-Dec-92	MBMG	104.08				
			19-Jan-93	MBMG	104.03				
			3-Mar-93	MBMG	103.65				
			5-Apr-93	MBMG	103.15				
			20-May-93	MBMG	106.96				
			3-Jun-93	MBMG	106.83				
			15-Jul-93	MBMG	108.2				
			16-Aug-93	MBMG	107.76				
			6-Nov-93	MBMG	105.9				
			6-Jan-94	MBMG	106.38				
			5-Apr-94	MBMG	106.9				
			25-Aug-94	MBMG	113.81				
			28-Nov-94	MBMG	109.4				
			14-Apr-95	MBMG	107.26				
			15-Jul-95	MBMG	132.52				
23N24W34DADD	214	M:150553	31-Jul-79	MBMG			14.2	357	
23N24W34DCD	215	M:77996	21-Jul-75	USGS	94.5		14.0	400	
23N24W34DCDD	291	M:148614	8-Aug-95	MBMG			17.5	415	8.10
23N24W35ACCB	216	M:77998	12-Jul-79	MBMG			14.5	415	
23N24W35BADA	292	M:150549	3-Jun-93	MBMG	92.51		17.0	384	8.07
			8-Apr-93	MBMG	92.51				
			16-Aug-93	MBMG	93.51				
			9-Apr-94	MBMG	92.7				
23N24W35DBBA	217	M:78000	12-Jul-79	MBMG			13.9	473	
23N24W35DCCC	218	M:6285	6-Dec-79	MBMG	84.27		13.3	411	
			7-Jun-80	MBMG	78.64				
			17-Jul-80	MBMG	78.32				
			16-Oct-80	MBMG	77.77				
			2-Dec-80	MBMG	76.66				
			13-Jan-81	MBMG	77.4				
			14-Apr-81	MBMG	76.13				
			2-Feb-82	MBMG	78.27				
			19-Aug-92	MBMG	88.02				
			25-Sep-92	MBMG	87.44				
			21-Oct-92	MBMG	85.32				
			30-Nov-92	MBMG	84.54				
			18-Dec-92	MBMG	84.02				
			19-Jan-93	MBMG	83.83				
			3-Mar-93	MBMG	86.11				
			5-Apr-93	MBMG	87.27				
			20-May-93	MBMG	89.56				
			3-Jun-93	MBMG	93.17				
			15-Jul-93	MBMG	92.65				
			16-Aug-93	MBMG	87.38				
			6-Nov-93	MBMG	88.83				
			6-Jan-94	MBMG	85.98				
			8-Mar-94	MBMG	90.33				
			5-Apr-94	MBMG	87.67				
			28-Nov-94	MBMG	89.21				
23N24W35DCDD	293	M:141507	8-Aug-95	MBMG				417	7.80
23N24W35DDDC	219	M:150552	10-Oct-79	MBMG	70.08		15.9	543	
23N24W36CAAD	220	M:78004	10-Oct-79	MBMG	70.8		13.9	369	
24N22W30BCCC	221	M:128076	6-Nov-84	USGS	245.84	6.7			
24N23W08DADD	223	M:78678	9-Jun-80	MBMG	11.83		10.5	420	
24N23W09ABBB	224	M:78679	9-Jun-80	MBMG	9.8		7.5	307	
			8-Apr-93	MBMG	46.34				
			16-Aug-93	MBMG	37.33				
			7-Apr-94	MBMG	41.69				
24N23W09CCDC	294	M:78680	20-Apr-93	MBMG	21.11				
			16-Aug-93	MBMG	17.61				
24N23W16ABBA	225	M:150558							
24N23W16BCBB	226	M:78682	9-Jun-80	MBMG			10.4	316	
24N23W16CBBB 02	227	M:150551	9-Jun-80	MBMG			10.4	316	
24N23W17BABA	228	M:150550	9-Jun-80	MBMG	24.46		12.2	491	
24N23W17BCDD	295								
24N23W17DACD	229	M:6317	24-Jul-75	USGS	41.65				
			9-Jun-80	MBMG			13.2	324	
24N23W20AABB	230	M:78684	9-Jun-80	MBMG			13.4	274	
24N23W21BCDA	296	M:78685	4-Jul-93	MBMG	38.71				
			7-Apr-93	MBMG	38.71				
			16-Aug-93	MBMG	38.57				
24N23W21BCDB	231	M:150548	7-Jun-80	MBMG	32.93				
24N23W21DCBB	297								
24N23W31BCBC	232	M:78687	8-Jun-80	MBMG			13.4	335	
24N23W32ADCC	233	M:128077							
24N24W13BBAB	234	M:150547	11-Oct-79	MBMG	1		12.5	283	

Location	Map Number	GWIC No.	Inventory Date	Agency	Static Water Level (feet below ground)	Yield (gpm)	Water Temperature (° C)	Conductance (microsiemens per cm @ 25° C)	Field pH
24N24W14DDDD	235	M:78690	9-Jun-80	MBMG	21.43		10.8	232	
24N24W23BDAD	236	M:78691	9-Jun-80	MBMG			10.8	257	
24N24W24ABBB 01	298	M:133928	5-Oct-83	USGS	6.54				
			7-Apr-93	MBMG	8.59				
			15-Aug-93	MBMG	8.74				
			7-Apr-94	MBMG	8.05				
24N24W24ABBB 01	299	M:133930	5-Oct-83	USGS	7.07				
			7-Apr-93	MBMG	8.75				
			15-Aug-93	MBMG	8.84				
			7-Apr-94	MBMG	7.99				
24N24W24DDBB	300								
24N24W25AAAC	301	M:78692	18-Aug-93	MBMG	11.6		19.4	400	
24N24W25DDBB	237	M:6320	10-Oct-84	USGS		51	13.0	335	
			15-Jan-85	USGS	77.05				
			10-Apr-85	USGS	76.29				
			10-Jul-85	USGS	80.27				
			28-Oct-85	USGS	78.09				
			8-Apr-93	MBMG	75.97				
			15-Aug-93	MBMG	79.7				
			7-Apr-94	MBMG	78.93				
24N24W27ABDB	238	M:6321	10-Oct-84	USGS	3.07	8.5	11.0	380	
			8-Apr-93	MBMG	30.5				
			7-Apr-94	MBMG	30.21				
24N24W34ACDD	239	M:78696	3-May-80	MBMG			10.2	211	
24N24W35CDCA	240	M:150546	3-May-80	MBMG	27.3		10.7	175	
25N23W26CCCC	222	M:78676	22-Aug-96	MBMG	8.05		11.3	428	6.70

APPENDIX C
WATER QUALITY ANALYSES

Map No.	Lab No.	Date Sampled	Location	GWIC No.	Calcium (mg/l)	Magnesium (mg/l)	Sodium (mg/l)	Potassium (mg/l)	Iron (mg/l)	Manganese (mg/l)	Silica (mg/l)	Carbonate (mg/l)	Bi-carbonate (mg/l)
1	85Q0049	12-Oct-84	21N22W07DCAA	M:6142	44.3	13.8	24.4	1.6	0.02	0.00	25.6	0.0	237
4	93Q0718	4-Jun-93	21N23W04AADA	M:76119	7.6	2.2	107.0	1.6	0.35	0.29	12.2	5.7	244
6	79Q3755	28-Nov-79	21N23W04DAAC	M:6144	7.3	2.1	99.9	1.1	0.45	0.20	10.5	0.0	232
6	93Q0723	4-Jun-93	21N23W04DAAC	M:6144	7.9	2.2	98.6	1.8	0.44	0.23	11.5	0.0	228
11	79Q3752	28-Nov-79	21N23W11CACC	M:76129	31.9	9.6	26.6	0.8	0.58	0.64	19.7	0.0	195
11	94Q0856	7-Nov-93	21N23W11CACC	M:76129	30.7	9.8	30.0	1.3	0.11	0.59	20.5	0.0	202
17	76Q0139	4-Mar-76	21N23W14ACAB	M:131952	32.3	13.0	19.9	1.4	<.01	0.50	16.2	0.0	197
17	93Q0717	4-Jun-93	21N23W04ACAB	M:131952	37.9	12.4	19.3	1.0	0.12	0.56	18.8	0.0	212
35	93Q0766	6-Jun-93	21N24W04BBCB	M:76173	0.8	<0.1	88.0	1.5	<.003	<.002	68.1	31.7	138
39	79Q3747	3-Dec-79	21N24W03DCBB	M:76185	1.2	0.1	95.0	0.6	0.10	<.01	46.2	29.5	148
39	93Q0755	7-Jun-93	21N24W03DCBB	M:76185	1.1	<0.1	93.1	1.0	<.003	<.002	44.5	21.8	167
41	79Q3745	3-Dec-79	21N24W04ADAB	M:6152	0.9	<0.1	87.8	1.2	0.90	<.01	67.4	31.2	100
41	93Q0761	6-Jun-93	21N24W04ADAB	M:6152	0.8	<0.1	87.3	1.5	<.003	0.01	70.9	41.7	100
42	79Q3764	3-Dec-79	21N24W04DABD	M:6153	0.9	<0.1	92.3	<0.1	0.61	<.01	67.0	49.8	85
42	93Q0764		21N24W04DABD	M:6153	0.8	<0.1	86.8	0.8	<.003	<.002	64.2	47.5	92
43	75Q1307	27-Aug-75	21N24W04DBDA	M:6155	15.2	3.6	33.0	3.0	0.17	<.01	22.0	0.0	128
43	84Q0803	31-May-84	21N24W04DBDA	M:6155	17.2	4.0	32.0	3.1	0.07	0.02	28.1	0.0	149
45	83Q1015	22-Sep-83	21N24W09CABC	M:6157	18.0	5.6	9.3	2.7	<.002	0.00	30.6	0.0	90
52	79Q3760	30-Nov-79	22N23W07DBDB	M:6216	6.7	1.0	130.0	1.4	0.22	0.10	20.2	0.0	314
52	94Q0854	8-Nov-93	22N23W07DBDB	M:6216	7.5	1.3	127.0	2.0	0.21	0.11	21.9	0.0	316
54	85Q0046	11-Oct-84	22N23W15DCDC	M:6217	26.9	9.3	17.2	1.4	0.04	0.01	27.2	0.0	158
59	79Q0873	8-Sep-78	22N3W18ACAA	M:77128	5.8	0.7	101.0	2.3	0.20	0.07	21.0	36.0	188
59	93Q0541	26-May-93	22N23W18ACAA	M:77128	10.7	0.9	88.5	2.8	0.11	0.11	21.1	0.0	245
60	79Q3753	30-Nov-79	22N23W18BBBB	M:77131	5.7	0.7	105.0	1.3	0.17	0.05	19.5	0.0	255
60	93Q0550	25-May-93	22N23W18BBBB	M:77131	7.3	0.9	96.2	2.2	0.17	0.07	18.5	0.0	249
62	79Q3741	2-Dec-79	22N23W18DDAD	M:77133	3.3	0.4	134.0	1.7	0.09	0.03	28.6	8.9	287
62	93Q0546	26-May-93	22N23W18DDAD	M:77133	3.1	0.3	125.0	2.4	0.01	0.03	27.4	9.6	277
67	79Q3766	5-Dec-79	22N23W19CBCD	M:83636	5.6	1.3	102.0	1.0	0.74	0.07	13.5	0.0	232
67	94Q0853	8-Nov-93	22N23W19CBCD	M:83636	5.2	1.2	101.0	1.3	0.18	0.07	13.6	0.0	245
69	76Q0748	2-Jul-76	22N23W19DAAA	M:6222	5.7	0.6	139.0	3.7	0.11	0.07	32.9	0.0	332
72	79Q3757	2-Dec-79	22N23W20BAAD	M:6223	5.5	1.4	131.0	1.3	0.27	0.06	24.9	0.0	318
72	93Q0542	26-May-93	22N23W20BAAD	M:6223	5.3	1.3	133.0	1.9	0.11	0.06	22.7	0.0	323
74	79Q0872	6-Sep-78	22N23W20BCCB	M:6224	4.6	0.7	127.0	2.7	0.03	0.04	29.3	18.2	280
74	93Q0545	26-May-93	22N23W20BCCB	M:6224	3.3	0.3	125.0	2.5	0.05	0.03	34.6	6.2	275
75	79Q0871	7-Sep-78	22N23W20CDBC	M:77143	3.6	0.6	150.0	3.4	0.02	0.02	36.5	9.6	326
75	79Q3744	5-Dec-79	22N23W28CDBC	M:77143	4.0	0.7	147.7	2.8	0.26	0.70	34.9	0.0	348
75	93Q0544	25-May-93	22N23W20CDBC	M:77143	4.0	0.4	142.0	3.3	0.03	0.02	34.6	8.4	318
76	79Q3754	2-Dec-79	22N23W20DCDB	M:6226	4.4	0.4	142.0	2.1	0.12	0.02	36.6	0.0	328
79	93Q0515	24-May-93	22N23W28CBBB	M:6227	5.0	1.0	151.0	3.5	0.03	0.06	43.7	6.7	348
83	79Q3756	2-Dec-79	22N23W29AADB	M:6228	3.3	0.4	154.4	2.6	0.13	0.03	43.6	0.0	354
83	93Q0517	24-May-93	22N23W29AADB	M:6228	3.0	0.3	146.0	3.1	0.02	0.02	39.5	8.4	323
84	82Q0355	4-Jun-82	22N23W29ACAB	M:6229	2.9	0.2	152.0	3.1	<.002	0.01	43.2	11.0	327
84	93Q0540	26-May-93	22N23W29ACAB	M:6229	2.9	0.3	156.0	3.3	<.003	0.01	43.9	16.8	326
85	75Q1491	15-Sep-75	22N23W29ACAB	M:6231	2.8	0.3	150.0	3.4	<.01	<.01	40.0	0.0	352
85	80Q2722	22-Oct-80	22N23W29ACBB	M:6231	2.8	0.2	153.0	3.6	0.02	0.01	42.4		
85	80Q2723	22-Oct-80	22N23W29ACBB	M:6231	3.2	0.3	152.0	4.0	0.17	0.01	42.2	9.6	342

Map No.	Lab No.	Date Sampled	Location	GWIC No.	Calcium (mg/l)	Magnesium (mg/l)	Sodium (mg/l)	Potassium (mg/l)	Iron (mg/l)	Manganese (mg/l)	Silica (mg/l)	Carbonate (mg/l)	Bi-carbonate (mg/l)
94	79Q3739	5-Dec-79	22N23W30DBCD	M:77164	4.4	0.1	102.0	1.7	0.11	0.02	26.8	12.7	176
94	93Q0543	4-Dec-79	22N23W30DBCD	M:77164	2.4	0.1	92.7	0.8	0.03	0.02	24.6	9.6	202
101	79Q3742	4-Dec-79	22N23W33BABB	M:77175	5.5	1.0	139.0	2.1	0.28	0.07	35.0	0.0	324
101	93Q0548	27-May-93	22N23W33BABB	M:77175	6.9	1.3	127.0	2.6	0.11	0.08	28.8	6.8	290
104	79Q3758	29-Nov-79	22N23W33DDDA	M:77182	23.4	7.4	75.2	1.5	1.40	0.43	19.3	0.0	265
104	93Q0765	6-Jun-93	22N23W33DDDA	M:77182	19.9	6.2	77.9	1.6	0.25	0.33	17.4	0.0	263
105	94Q0851	9-Nov-93	22N23W33DDCC	M:77183	8.5	2.4	114.0	1.7	0.48	0.23	17.2	0.0	281
115	79Q3743	6-Dec-79	22N24W02DAAB	M:77195	23.3	4.7	66.1	1.8	0.84	0.25	17.4	0.0	239
115	93Q0757	7-Jun-93	22N24W02DAAB	M:77195	27.0	5.6	60.0	2.5	0.68	0.26	16.7	0.0	255
125	79Q3750	6-Dec-79	22N24W10ABBA	M:77204	28.4	7.8	23.6	2.2	0.30	0.41	15.9	0.0	164
125	93Q0756	5-Jun-93	22N24W10ABBA	M:77204	29.0	8.0	23.3	2.7	0.17	0.33	24.5	0.0	178
134	79Q3746	30-Nov-79	22N24W12ACCC	M:77214	22.8	3.8	67.3	2.3	1.08	0.22	18.0	0.0	240
134	93Q0715	3-Jun-93	22N24W12ACCC	M:77214	30.0	5.0	56.2	2.9	0.83	0.26	17.4	0.0	250
150	79Q3748	6-Dec-79	22N24W16DDCD	M:77233	9.7	2.4	29.9	0.7	0.12	0.03	19.2	4.2	98
150	93Q0758	5-Jun-93	22N24W16DDCD	M:77233	9.6	2.5	30.4	1.0	0.01	0.02	19.0	0.0	105
156	79Q3751	6-Dec-79	22N24W23ABAB	M:6256	34.3	8.3	27.1	1.0	0.28	0.26	19.7	0.0	203
156	93Q0767	5-Jun-93	22N24W23ABAB	M:6256	34.5	9.0	23.3	1.3	0.87	0.24	20.4	0.0	205
162	79Q3740	5-Dec-79	22N24W24ABBD	M:6257	6.0	0.9	97.9	1.4	0.48	0.10	20.9	0.0	244
172	94Q0857	8-Nov-93	22N24W26ABAA	M:82513	34.0	8.4	19.3	1.3	1.09	0.91	21.0	0.0	179
177	76Q0278	23-Apr-76	22N24W34CCDC	M:151977	16.4	5.2	43.2	5.6	0.07	0.04	32.8	0.0	101
178	79Q3749	6-Dec-79	22N24W35AADA	M:6259	26.3	12.7	78.9	1.8	0.22	0.82	39.2	0.0	294
178	93Q0760	4-Jun-93	22N24W35AADA	M:6259	26.0	13.3	76.0	2.6	0.12	0.82	39.7	0.0	303
180	76Q1035	17-Aug-76	22N24W36BBBB	M:77293	37.0	11.9	46.0	3.9	5.80	0.10	21.9	0.0	265
180	83Q0400	2-Jun-83	22N24W36BBBB	M:77293	37.9	12.3	46.7	3.7	3.36	0.08	27.7	0.0	268
180	93Q0762	7-Jun-93	24N24W36BBBB	M:77293	41.1	13.3	49.2	3.6	0.75	0.04	29.8	0.0	264
185	95Q0347	29-Nov-94	23N24W02CCDB	M:151979	65.7	18.1	54.2	6.5	0.01	0.01	34.2	0.0	360
187	76Q0137	4-Mar-76	23N24W03BABB	M:6278	10.6	5.2	14.8	4.2	8.20	0.35	14.3	0.0	104
187	93Q0719	3-Jun-93	23N24W03BABB	M:6278	13.8	5.0	13.4	3.6	15.58	0.27	38.7	0.0	111
189	83Q1221	24-Oct-84	23N24W10BCDA	M:6280	34.7	11.6	20.8	1.0	0.05	0.00	36.2	0.0	210
198	79Q3762	6-Dec-79	23N24W15AABA	M:6281	38.9	15.1	28.8	2.0	0.12	<.01	27.3	0.0	233
198	93Q0754	4-Jun-93	23N24W15AABA	M:6281	37.1	14.8	27.5	2.2	<.003	<.002	26.8	0.0	240
209	93Q0768	7-Jun-93	23N24W26CDCD	M:140370	31.2	8.2	46.7	1.2	<.003	0.42	17.9	0.0	229
211	76Q0138	4-Mar-76	22N24W34ADAA	M:6283	39.8	11.6	32.8	1.7	<.01	<.01	18.2	0.0	236
211	83Q0399	2-Jun-83	23N24W34ADAA	M:6283	40.0	10.2	32.4	1.6	<.002	0.14	19.4	0.0	231
211	93Q0720	2-Jun-93	23N24W34ADAA	M:6283	39.9	10.4	34.4	1.5	1.01	0.66	21.0	0.0	238
213	79Q3765	6-Dec-79	23N24W34CACC	M:6284	29.4	6.6	24.0	0.8	0.27	0.59	20.8	0.0	144
213	93Q0769	8-Jun-93	23N24W34CACC	M:6284	30.4	6.6	24.0	1.0	0.49	0.55	19.9	0.0	164
218	79Q3763	6-Dec-79	23N24W35DCCC	M:6285	37.2	8.3	42.6	1.8	1.89	0.45	17.3	0.0	238
218	93Q0759	4-Jun-93	23N24W35DCCC	M:6285	38.4	8.4	42.2	2.3	1.30	0.42	16.8	0.0	252
221	85Q1178	30-Jul-85	24N22W30BCCC	M:128076	27.7	16.5	14.8	1.3	<.002	0.00	17.6	0.0	182
229	76Q0135	4-Mar-76	24N23W17DACD	M:6317	33.6	13.8	17.5	2.7	<.01	<.01	32.9	0.0	171
229	83Q0398	2-Jun-83	24N23W17DACD	M:6317	35.2	12.4	17.4	2.7	<.002	<.002	39.0	0.0	171
237	85Q0045	10-Oct-84	24N24W25DDBB	M:6320	30.3	12.9	19.8	1.8	0.06	0.01	22.4	0.0	196
238	85Q0044	10-Oct-84	24N24W27ABDB	M:6321	27.5	10.1	34.2	5.8	0.07	0.06	8.8	0.0	197
276	93Q0519	24-May-93	22N23W30AAAD	M:77161	3.2	0.2	116.0	2.6	<.003	0.03	29.3	9.6	253
277	93Q0763	6-Jun-93	22N23W33DADB	M:77180	23.6	7.3	70.3	1.4	0.95	0.38	18.8	0.0	270
287	94Q0855	8-Nov-93	22N24W34DDBA	M:77279	22.3	5.7	28.7	3.1	0.08	0.04	31.7	0.0	117
290	94Q0982	4-May-94	23N24W33ABAA	M:141772	11.3	5.4	27.2	3.9	3.70	0.26	32.0	0.0	106
292	93Q0721	3-Jun-93	23N24W35BADA	M:150549	20.0	5.7	65.4	1.6	0.19	0.28	17.1	0.0	227
295	W4-4-87*	20-Apr-87	24N23W17BCDD	M:155133	25.2	10.8	18.9	3.3	0.63	0.03	37.2		152
297	W1-7-86-2*	30-Jul-86	24N23W21DCBB	M:155132	28.5	12.1	18.3	1.7	0.04	<0.02	17.3		184
300	W6-4-87*	19-Apr-87	24N24W24DDBB	M:155134	29.8	12.5	21.1	2.5	0.35	0.06	4.0		185
301	W8-4-87*	20-Apr-87	24N24W25AAAC	M:78692	35.0	8.1	24.6	3.3	1.42	0.21	8.5		208

Map No.	Lab No.	Chloride (mg/l)	Sulfate (mg/l)	Nitrate (mg/l)	Fluoride (mg/l)	Ortho-Phosphate (mg/l)	Aluminum (µg/l)	Arsenic (µg/l)	Beryll (µg/l)	Boron (µg/l)	Barium (µg/l)	Bromide (µg/l)	Cadmium (µg/l)	Chromium (µg/l)
1	85Q0049	9.6	15.1	0.74	0.2	<.1	<30.			40		100	<2.0	<2.0
4	93Q0718	28.1	<0.7	0.04	7.5	0.67	<100.	98.5	<2.0	760	506	263.0	<2.0	<2.0
6	79Q3755	25.7	6.4	0.10	6.2		<118.	105.0		732				
6	93Q0723	24.9	5.9	0.06	6.7	0.45	<100.	110.0	<2.0	655	611	235.0	<2.0	<2.0
11	79Q3752	5.2	6.4	0.30	1.0		<118.	5.9		151				
11	94Q0856	6.6	8.4	0.27	1.2	<.15	<30.	4.4	<2.0	75	650	<100.0	<2.0	<2.0
17	76Q0139	6.0	8.1	0.26	0.6									
17	93Q0717	4.4	8.7	0.81	0.8	<.02	<100.	0.8	<2.0	<30.	839	50.0	<2.0	<2.0
35	93Q0766	2.7	10.6	<.05	5.9	<.15	<100.	<1.	<2.0	315	<2.0	<100.0	<2.0	<2.0
39	79Q3747	8.6	7.9	0.20	5.0		<118.	<.1		487				
39	93Q0755	8.8	5.9	<.05	5.3	<.15	<100.	<1.	<2.0	345	<2.0	<100.0	<2.0	<2.0
41	79Q3745	9.0	34.7	0.07	5.0		<118.	<.1		511				
41	93Q0761	8.4	17.3	<.05	5.7	<.15	<100.	<1.	<2.0	305	<2.0	<100.0	<2.0	<2.0
42	79Q3764	7.8	21.2	0.10	5.2		<118.	<.1		460				
42	93Q0764	8.1	11.7	0.08	5.3	<.15	<100.	<1.	<2.0	295	<2.0	<100.0	<2.0	<2.0
43	75Q1307	2.2	12.1	0.25	1.6									
43	84Q0803	3.1	10.7	0.11	0.2	<.1	<30.			70		<100.0	<2.0	<2.0
45	83Q1015	1.3	17.5	0.03	0.3		<30.			50			<2.0	<2.0
52	79Q3760	19.0	0.6	0.40	5.5		<118.	44.8		744				
52	94Q0854	17.3	3.5	<.05	5.8	0.19	<80.	37.7	<2.0	618	508	<100.0	<2.0	<2.0
54	85Q0046	5.6	7.8	1.06	0.2	0.10	<30.			60		100	<2.0	<2.0
59	79Q0873	2.2	6.9	1.03	3.2		100.0	23.0		540				
59	93Q0541	7.5	7.6	<.04	3.7	0.09	<30.	21.2	<2.0	322	814	70.0	<2.0	<2.0
60	79Q3753	7.8	5.8	1.20	3.4		<118.	27.7		511				
60	93Q0550	7.4	7.6	<.04	3.5	0.11	<30.	26.2	<2.0	310	490	71.0	<2.0	<2.0
62	79Q3741	19.0	2.1	1.00	4.8		<118.	4.2		849				
62	93Q0546	17.3	3.8	0.05	6.1	0.09	<30.	2.9	<2.0	570	96	143.0	<2.0	<2.0
67	79Q3766	16.5	2.7	1.00	7.0		<118.	76.1		851				
67	94Q0853	9.9	5.2	0.09	6.7	<.15	<30.	68.7	<2.0	646	232	<100.0	<2.0	<2.0
69	76Q0748	28.3	1.2	<.023	6.1									
72	79Q3757	25.8	<.1	0.10	5.3		<118.	16.3		893				
72	93Q0542	25.0	<1.0	<.04	5.3	0.28	<30.	14.5	<2.0	640	177	205.0	<2.0	<2.0
74	79Q0872	10.9	1.8	1.16	4.4		100.0	6.7		710				
74	93Q0545	18.9	3.0	0.05	6.0	0.08	<30.	4.2	<2.0	570	262	161.0	<2.0	<2.0
75	79Q0871	23.1	2.1	1.13	4.6		150.0	1.0		870				
75	79Q3744	34.8	0.6	1.10	4.2		<118.	14.6		968				
75	93Q0544	30.0	<1.	0.06	6.7	<.02	<100.	<1.	<2.0	810	63	242.0	<2.0	<2.0
76	79Q3754	30.9	0.6	1.00	5.0		<118.	3.3		885				
79	93Q0515	35.3	2.6	<.04	4.8	0.13	<30.	12.5	<2.0	670	173	269.0	<2.0	<8.
83	79Q3756	35.5	0.6	0.20	4.5		<118.	5.6		934				
83	93Q0517	29.1	2.5	0.07	6.0	0.09	<30.	3.5	<2.0	680	136	225.0	<2.0	<2.0
84	82Q0355	34.0	0.6	0.05	5.0		<30.	0.2		540			<2.0	<2.0
84	93Q0540	35.3	3.4	<.04	5.2	<.02	<30.	<1.	<2.0	645	26	270.0	<2.0	<2.0
85	75Q1491	33.8	1.7	0.02	5.2									
85	80Q2722						60.0			640			<2.0	5.0
85	80Q2723	32.5	4.1	0.01	3.9		90.0			640			<2.0	6.0

Map No.	Lab No.	Chloride (mg/l)	Sulfate (mg/l)	Nitrate (mg/l)	Fluoride (mg/l)	Ortho-Phosphate (mg/l)	Aluminum (µg/l)	Arsenic (µg/l)	Beryll (µg/l)	Boron (µg/l)	Barium (µg/l)	Bromide (µg/l)	Cadmium (µg/l)	Chromium (µg/l)
94	79Q3739	9.0	64.4	0.20	4.1		<118.	17.1		815				
94	93Q0543	8.9	8.5	0.05	4.7	0.30	<30.	14.2	<2.0	490	105	98.0	<2.0	<2.0
101	79Q3742	27.0	1.4	0.20	4.3		<118.	19.5		844				
101	93Q0548	24.9	2.5	<.04	6.4	0.32	<30.	28.2	<2.0	660	168	<50.0	<2.0	<2.0
104	79Q3758	16.0	1.3	0.75	7.8		<118.	43.9		381				
104	93Q0765	17.1	<2.5	0.06	3.3	0.36	<100.	42.2	<2.0	353	323	176.0	<2.0	<2.0
105	94Q0851	23.5	<1.	<.05	7.4	0.56	<30.	43.0	<2.0	788	198	<100.0	<2.0	<2.0
115	79Q3743	6.6	5.8	1.30	2.8		<118.	33.5		423				
115	93Q0757	6.9	8.0	<.05	3.0	<.15	<100.	31.8	<2.0	240	1470	<100.0	<2.0	<2.0
125	79Q3750	2.1	12.0	0.10	1.2		<118.	7.0		91				
125	93Q0756	2.6	13.1	<.05	1.2	<.15	<100.	6.3	<2.0	40	355	<100.0	<2.0	<2.0
134	79Q3746	5.8	7.9	1.50	2.5		<118.	18.4		363				
134	93Q0715	5.9	9.3	<.04	2.7	<.02	<100.	25.5	<2.0	210	1675	66.0	<2.0	<2.0
150	79Q3748	1.4	5.0	0.20	1.3		<118.	3.8		<90.				
150	93Q0758	1.7	7.3	<.05	1.0	<.15	<100.	2.0	<2.0	<30.	14	<100.0	<2.0	<2.0
156	79Q3751	3.2	5.6	0.40	0.1		<118.	4.4		151				
156	93Q0767	2.7	10.6	<.05	0.7	<.15	<100.	4.0	<2.0	37	185	<100.0	<2.0	<2.0
162	79Q3740	8.0	2.7	0.90	4.4		<118.	40.3		683				
172	94Q0857	2.8	14.6	0.06	0.7	<.15	<30.	9.3	<2.0	<30.	251	<100.0	<2.0	<2.0
177	76Q0278	3.6	61.2	0.26	2.3									
178	79Q3749	25.7	0.6	0.50	3.4		<118.	13.0		590				
178	93Q0760	24.3	4.0	0.51	4.2	<.15	<100.	9.8	<2.0	365	156	222.0	<2.0	<2.0
180	76Q1035	25.3	0.3	0.04	0.8									
180	83Q0400	25.0	4.3	0.03	0.9		<30.			140			<2.0	<2.0
180	93Q0762	26.4	5.9	<.05	1.0	<.15	<100.	1.6	<2.0	125	44	263.0	<2.0	<2.0
185	95Q0347	10.0	40.0	1.90	0.4	<.05	<30.	2.0	<2.0	<80.0	132	100	<2.0	5.3
187	76Q0137	3.3	0.6	0.07	0.6									
187	93Q0719	3.9	8.5	<.04	0.6	<.02	<100.	59.5	<2.0	<30.	108	<50.0	<2.0	<2.0
189	83Q1221	1.9	6.8	0.40	0.5									
198	79Q3762	3.7	18.0	0.40	0.3		<118.	4.1		90				
198	93Q0754	4.2	13.6	0.40	0.4	<.15	<100.	3.4	<2.0	<30.	161	<100.0	<2.0	<2.0
209	93Q0768	5.1	9.7	0.16	2.3	<.15	<100.	5.9	<2.0	137	734	<100.0	<2.0	<2.0
211	76Q0138	6.3	12.2	0.32	0.9									
211	83Q0399	4.9	12.1	0.08	0.9		<30.			60			<2.0	<2.0
211	93Q0720	4.9	10.7	0.05	1.0	<.02	<100.	3.3	<2.0	56	516	57.0	<2.0	<2.0
213	79Q3765	1.4	23.8	0.38	0.4		<118.	9.0		<90.				
213	93Q0769	2.2	19.9	<.05	0.7	0.15	<100.	9.8	<2.0	<30.	329	<100.0	<2.0	<2.0
218	79Q3763	5.0	7.9	1.10	2.0		<118.	8.2		232				
218	93Q0759	5.7	9.3	<.05	2.1	<.15	<100.	18.8	<2.0	120	1673	<100.0	<2.0	<2.0
221	85Q1178	2.4	11.1	0.49	0.2	<.1	<30.			<20.		100	<2.0	<2.0
229	76Q0135	4.8	23.2	0.68	0.3									
229	83Q0398	3.8	27.6	0.95	0.4		<30.			<20.			2.0	<2.0
237	85Q0045	2.6	13.9	0.39	0.2	0.10	<30.			50		<100.0	4.0	<2.0
238	85Q0044	6.4	20.7	0.08	0.5	<.1	340.0			70		100	2.0	2.0
276	93Q0519	16.4	3.8	<.04	7.2	0.14	<30.	5.2	<2.0	660	117	154.0	<2.0	<2.0
277	93Q0763	13.8	<2.5	0.06	2.9	0.30	<100.	32.0	<2.0	300	378	137.0	<2.0	<2.0
287	94Q0855	4.4	36.1	<.05	2.3	<.15	<30.	<1.	<2.0	100	6	<100.0	<2.0	<2.0
290	94Q0982	2.6	27.7	<.1	1.0	<.025	<30.	1.2	<2.0	<30.	14	46.0	<2.0	<2.0
292	93Q0721	6.0	9.0	<.04	3.6	<.02	<100.	15.3	<2.0	288	538	66.0	<2.0	<2.0
295	W4-4-87*	3.2	24.3					<5.0					<5.0	
297	W1-7-86-2*	2.3	5.7					<5.0					<5.0	
300	W6-4-87*	3.2	17.7					<5.0					<5.0	
301	W8-4-87*	3.7	0.5					<5.0					<5.0	

Map No.	Lab No.	Cobalt (μg/l)	Copper (μg/l)	Lithium (μg/l)	Molyb-denum (μg/l)	Nickel (μg/l)	Lead (μg/l)	Phosphate mg/l	Selenium (μg/l)	Silver (μg/l)	Stron-tium (μg/l)	Tit-anium (μg/l)	Vana-dium (μg/l)	Zinc (μg/l)	Zir-conium μg/l	SDC (mg/l)
1	85Q0049		<2.0	<2.0	<20.	<10.		<0.1		<2.0	160	5.0	<1.0	3.0	<4.	372
4	93Q0718	<2.0	<2.0	8.0	<20.	<2.0	<2.0	0.5	1	<1.0	39	<10.	<5.0	10.0	<50.	417
6	79Q3755			<8.0												392
6	93Q0723	<2.0	<2.0	9.0	<20.	<2.0	<2.0	0.45	<1.0	<1.0	46	<10.	<5.0	<2.0	<50.	388
11	79Q3752			<8.0												298
11	94Q0856	<2.0	<2.0	<6.0	<10.	<2.0	<2.0	<0.2	1.60	<1.0	152	<10.	<5.0	<2.0	<20.	311
17	76Q0139			<10.												295
17	93Q0717	<2.0	<2.	<6.0	<20.	<2.0	<2.0	<0.1	<1.0	<1.0	167	<10.	<5.0	12.1	<50.	317
35	93Q0766	<2.0	<2.	45.0	<20.	<2.0	<2.0	<0.1	5.70	<1.0	9	<10.	<5.0	<2.0	<50.	347
39	79Q3747			35.0											<5.0	342
39	93Q0755	<2.0	<2.	43.0	<20.	<2.0	<2.0	<0.1	<2.0	<1.0	8	<10.	<5.0	<2.0	<50.	348
41	79Q3745			39.0												338
41	93Q0761	<2.0	<2.	38.0	<20.	<2.0	<2.0	<0.1	6.4	<1.0	<6.	<10.	<5.0	<2.0	<50.	334
42	79Q3764			18.0												330
42	93Q0764	<2.0	<2.	22.0	<20.	<2.0	<2.0	<0.1	<1.0	<1.0	<6.	<10.	<5.0	<10.	<50.	317
43	75Q1307															221
43	84Q0803		2.0	13.0	<20.	210.0		<0.1		<2.0	46	1.0	<1.0	<3.	<4.	248
45	83Q1015		<2.0	6.0	<20.	<10.	<40.			<2.0	64	<1.0	<1.0	31.0	8.0	175
52	79Q3760			37.0												499
52	94Q0854	<2.0	<2.0	42.0	<10.	<2.0	<2.0	<0.2	2.2	<1.0	56	<10.	<5.0	18.0	<20.	503
54	85Q0046		2.0	<2.	20.0	<10.		<0.1		<2.0	120	<1.0	<1.0	4.0	<4.	254
59	79Q0873			40.0				0.117								368
59	93Q0541	<2.0	<2.0	54.0	<20.	<2.0	<2.0	<0.1	<1.0	<1.0	107	<10.	<5.0	4.5	<50.	388
60	79Q3753			24.0												406
60	93Q0550	<2.0	<2.0	34.0	<20.	<2.0	2.4	<0.1	<1.0	<1.0	80	<10.	<5.0	3.3	<50.	393
62	79Q3741			65.0												491
62	93Q0546	<2.0	<2.0	70.0	<20.	<2.0	<2.0	<0.1	<1.0	<1.0	141	<5.0	<5.0	1.6	<50.	472
67	79Q3766			8.0												383
67	94Q0853	<2.0	1.9	17.0	<10.	<2.0	<2.0	0.57	1.5	<1.0	30	<10.	<5.0	33.0	<20.	389
69	76Q0748															549
72	79Q3757			50.0												514
72	93Q0542	<2.0	<2.0	55.0	<20.	<2.0	<2.0	<0.1	<1.0	<1.0	35	<5.0	<5.0	8.0	<50.	518
74	79Q0872			80.0				0.046								481
74	93Q0545	<2.0	1.9	70.0	<20.	<2.0	<2.0	<0.1	<1.0	<1.0	62	<5.0	<5.0	4.6	<50.	475
75	79Q0871			100.0				0.22								561
75	79Q3744			80.0												578
75	93Q0544	<2.0	<2.0	93.0	<20.	<2.0	<2.0	<0.1	<1.0	<1.0	110	<5.0	<5.0	4.0	<50.	548
76	79Q3754			74.0												551
79	93Q0515	<2.0	<2.0	84.0	<20.	<2.0	<2.0	<0.1	1	<1.0	44	<10.	<5.0	11.0	<50.	602
83	79Q3756			80.0												599
83	93Q0517	<2.0	<2.0	83.0	<20.	<2.0	<2.0	<0.1	1	<1.0	46	<5.0	<5.0	<2.0	<50.	561
84	82Q0355		<2.0	78.0	<20.	<10.	<40.			<2.0	100	<1.0	<1.0	<4.	<3.	579
84	93Q0540	<2.0	<2.0	90.0	<20.	<2.0	<2.0	<0.1	1.1	<1.0	113	<5.0	<5.0	9.0	<50.	593
85	75Q1491															589
85	80Q2722		14.0	83.0	<20.	10.0	<40.			4.0	100	<5.0	4.0	12.0	6.0	
85	80Q2723		11.0	87.0	30.0	30.0	110.0			12.0	100	7.0	8.0	<4.	14.0	594

Map No.	Lab No.	Cobalt (µg/l)	Copper (µg/l)	Lithium (µg/l)	Molyb-denum (µg/l)	Nickel (µg/l)	Lead (µg/l)	Phosphate mg/l	Selenium (µg/l)	Silver (µg/l)	Stron-tium (µg/l)	Tit-anium (µg/l)	Vana-dium (µg/l)	Zinc (µg/l)	Zir-conium µg/l	SDC (mg/l)
94	79Q3739			<8.												402
94	93Q0543	<2.0	<2.0	16.0	<20.	<2.0	<2.0	<0.2	<1.0	<1.0	14	<5.	<5.0	<2.0	<50.	355
101	79Q3742			61.0												540
101	93Q0548	<2.0	<2.0	59.0	<20.	<2.0	<2.0	<0.1	<1.0	<1.0	44	<10.	<5.0	<2.0	<50.	498
104	79Q3758			<8.												419
104	93Q0765	<2.0	<2.0	<6.	<20.	<2.0	<2.0	<0.2	<1.0	<1.0	85	<10.	<5.0	<2.0	<50.	407
105	94Q0851	<2.0	<2.0	<6.	<10.	<2.0	<2.0	1.0	2.1	<1.0	41	<10.	<5.0	<2.0	21.0	457
115	79Q3743			12.0												370
115	93Q0757	<2.0	<2.0	16.0	<20.	<2.0	<2.0	<0.1	<1.0	<1.0	165	<10.	<5.0	16.1	<50.	386
125	79Q3750			<8.												258
125	93Q0756	<2.0	<2.0	8.0	<20.	<2.0	<2.0	<0.1	<1.0	<1.0	108	<10.	<5.0	8.1	<50.	283
134	79Q3746			28.0												373
134	93Q0715	<2.0	<2.0	31.0	<20.	<2.0	<2.0	<0.1	<1.0	<1.0	246	<10.	<5.0	8.1	<50.	381
150	79Q3748			<8.												172
150	93Q0758	<2.0	<2.0	16.0	<20.	<2.0	<2.0	<0.1	<1.0	<1.0	57	<10.	<5.0	5.3	<50.	178
156	79Q3751			<8.												303
156	93Q0767	<2.0	<2.0	<6.	<20.	<2.0	<2.0	<0.1	<1.0	<1.0	134	<10.	<5.0	7.2	<50.	309
162	79Q3740			21.0												388
172	94Q0857	<2.0	<2.0	<6.	<20.	<2.0	<2.0	<0.2	1.1	<1.0	152	<10.	<5.0	10.0	<20.	283
177	76Q0278															272
178	79Q3749			<8.												484
178	93Q0760	<2.0	<2.0	12.0	<20.	<2.0	<2.0	<0.1	0.9	<1.0	148	<10.	<5.0	4.9	<50.	495
180	76Q1035			30.0												417
180	83Q0400		<2.0	24.0	<20.	<10.	<40.			<2.	130	<1.0	<1.0	11.0	<4.	430
180	93Q0762	<2.0	<2.0	27.0	<20.	<2.0	<2.0	<0.1	1	<1.0	125	<10.	<5.0	56.2	<50.	435
185	95Q0347	<2.0	11.2	12.0	<10.0	2.6	<2.0	<0.2	1	<1.0	294	<10.0	<5.0	104.9	<20	590
187	76Q0137			<10.0												166
187	93Q0719	4.80	<2.0	10.0	<20.	3.8	<2.0	0.2	<1.0	<1.0	109	<10.	<5.0	223.0	<50.	215
189	83Q1221															324
198	79Q3762			<8.0												368
198	93Q0754	<2.0	2.5	6.0	<20.	<2.0	<2.0	<0.1	<1.0	<1.0	183	<10.	<5.0	50.0	<50.	367
209	93Q0768	<2.0	<2.0	<6.0	<20.	<2.0	<2.0	<0.1	<1.0	<1.0	130	<10.	<5.0	<2.0	<50.	352
211	76Q0138			<10.												360
211	83Q0399		<2.0	<2.0	<20.	<10.	<40.			<2.0	160	23.0	<1.0	64.0	<4.	353
211	93Q0720	<2.0	<2.0	<6.0	<20.	<2.0	<2.0	<0.1	<1.0	<1.0	160	<10.	<5.0	13.3	<50.	363
213	79Q3765			<8.0												252
213	93Q0769	<2.0	<2.0	<6.0	<20.	<2.0	<2.0	<0.1	<1.0	<1.0	124	<10.	<5.0	8.0	<50.	270
218	79Q3763			9.0												364
218	93Q0759	<2.0	<2.0	12.0	<20.	<2.0	<2.0	<0.1	<1.0	<1.0	183	<10.	<5.0	5.7	<50.	379
221	85Q1178		<2.0	<2.0	<20.	<10.		<0.1		2.0	150	2.0	<1.0	<3.	<4.	274
229	76Q0135			<10.												301
229	83Q0398		<2.0	<2.0	<20.	<10.	<40.			<2.0	75	1.0	10.0	<3.	12.0	311
237	85Q0045		5.0	3.0	<20.	20.0		<0.1		<2.0	170	4.0	<1.0	<3.	<4.	301
238	85Q0044		6.0	53.0	20.0	10.0		<0.1		<2.0	450	24.0	<1.0	6.0	<4.	312
276	93Q0519	<2.0	2.1	62.0	<20.	<2.0	<2.0	<0.1	<1.0	<1.0	98	<5.	<5.0	20.0	<50.	441
277	93Q0763	<2.0	<2.0	<6.0	<20.	<2.0	<2.0	0.3	<1.0	<1.0	100	<10.	<5.0	54.0	<50.	410
287	94Q0855	<2.0	<2.0	15.0	<20.	<2.0	<2.0	<0.2	<1.0	<1.0	91	<10.	<5.0	31.0	<20.	251
290	94Q0982	<2.0	<2.0	36.0	<10.	<2.0	<2.0	<0.2	<1.0	<1.0	71	<10.	<5.0	331.0	<20.	221
292	93Q0721	<2.0	<2.0	<6.0	<20.	<2.0	<2.0	<0.1	<1.0	<1.0	96	<10.	<5.0	12.4	<50.	356
295	W4-4-87*		<20.0				<20.0							<20.0		275
297	W1-7-86-2*		<20.0				<20.0							<20.0		269
300	W6-4-87*		<20.0				<20.0							<20.0		276
301	W8-4-87*		<20.0				<20.0							<20.0		291

Map No.	Lab No.	Lab pH	Field pH	Lab SC	Field SC	Temp ºc
1	85Q0049	8.06	7.90	427	430	10.0
4	93Q0718	8.44	8.33	525	481	14.5
6	79Q3755	8.01	8.35	481	454	12.9
6	93Q0723	8.20	8.32	488	461	14.0
11	79Q3752	7.77	8.02	320	310	12.3
11	94Q0856	7.37	7.98	340	371	12.5
17	76Q0139	7.96		330	330	21.5
17	93Q0717	7.91	8.16	350	325	13.9
35	93Q0766	9.26	9.28	406	361	44.7
39	79Q3747	9.11	9.57	393	395	15.8
39	93Q0755	9.06	9.55	417	380	15.9
41	79Q3745	9.38	9.22	383	586	44.8
41	93Q0761	9.44	9.48	405	363	34.8
42	79Q3764	9.46	9.49	384	363	29.8
42	93Q0764	9.46	9.67	404	361	29.0
43	75Q1307	6.74		246	280	18.5
43	84Q0803	7.99	8.10	254	490	21.0
45	83Q1015	6.76	7.50	179	180	8.0
52	79Q3760	8.16	8.37	549	533	17.3
52	94Q0854	8.09	8.02	546	599	16.4
54	85Q0046	7.91	7.90	290	285	10.0
59	79Q0873	9.45	7.72	442	440	22.8
59	93Q0541	8.07	7.98	453	429	22.4
60	79Q3753	7.90	8.33	447	397	23.6
60	93Q0550	8.05	7.97	457	433	23.0
62	79Q3741	8.48	8.79	537	495	20.3
62	93Q0546	8.45	8.45	554	516	23.9
67	79Q3766	7.74	8.54	438	429	11.8
67	94Q0853	8.27	8.31	438	479	15.6
69	76Q0748	8.18		617	600	24.0
72	79Q3757	8.05	8.42	599	582	16.1
72	93Q0542	8.36	8.12	608	581	17.4
74	79Q0872	9.16	8.29	471	465	25.8
74	93Q0545	8.38	8.51	563	526	24.5
75	79Q0871	8.63	8.10	634	586	34.4
75	79Q3744	7.89	8.53	657	633	28.8
75	93Q0544	8.57	8.46	643	638	29.4
76	79Q3754	8.40	8.33	636	642	32.5
79	93Q0515	8.50	8.11	745		29.9
83	79Q3756	8.28	8.41	668	636	30.6
83	93Q0517	8.49	8.45	662		28.8
84	82Q0355	8.53	8.28	651	645	51.0
84	93Q0540	8.69	8.45	687	676	47.9
85	75Q1491	8.30		663	630	49.0
85	80Q2722	8.69	8.36			52.0
85	80Q2723	8.65	8.44	695		52.0

Map No.	Lab No.	Lab pH	Field pH	Lab SC	Field SC	Temp °c
94	79Q3739	9.05	9.46	408	400	11.6
94	93Q0543	8.54		423		18.5
101	79Q3742	8.06	8.44	593	561	19.0
101	93Q0548	8.38	8.36	582	566	18.7
104	79Q3758	7.69	8.05	459	436	12.3
104	93Q0765	8.00	8.15	487	430	14.2
105	94Q0851	8.08	8.31	522	582	10.8
115	79Q3743	7.81	8.02	413	406	13.7
115	93Q0757	7.78	7.95	435	405	17.0
125	79Q3750	7.89	8.07	290	281	16.6
125	93Q0756	8.01	8.04	317	284	18.5
134	79Q3746	7.89	8.24	406	390	10.0
134	93Q0715	8.12	7.76	427	396	18.0
150	79Q3748	8.40	8.95	184	174	10.6
150	93Q0758	8.30	8.80	199	380	12.8
156	79Q3751	7.82	8.19	328	327	7.9
156	93Q0767	8.06	8.19	339	314	14.8
162	79Q3740	8.10	8.48	428	414	13.8
172	94Q0857	7.40	7.97	311	349	13.8
177	76Q0278	7.08		341	330	15.0
178	79Q3749	7.49	7.68	528	521	10.8
178	93Q0760	8.01	7.72	552	519	12.4
180	76Q1035	7.51	7.60	472	570	19.5
180	83Q0400	7.94	7.09	478	520	14.0
180	93Q0762	7.25	7.44	502	467	15.3
185	95Q0347	7.50	6.71	627	723	9.0
187	76Q0137	6.78		190	275	10.0
187	93Q0719	6.70	6.74	192	214	14.4
189	83Q1221	7.72	8.00	337	350	9.0
198	79Q3762	7.81	7.98	389	384	9.4
198	93Q0754	7.68	7.87	395	353	14.4
209	93Q0768	8.01	7.96	408	382	15.3
211	76Q0138	7.93		397	400	16.5
211	83Q0399	7.82	7.64	394	410	14.0
211	93Q0720	8.03	7.97	411	380	14.4
213	79Q3765	7.52	8.26	286	256	10.2
213	93Q0769	8.26	8.27	304	275	16.2
218	79Q3763	7.66	8.14	412	395	13.6
218	93Q0759	7.66	7.88	425	377	16.0
221	85Q1178	7.24	7.35	314	318	13.0
229	76Q0135	7.91		332	320	11.5
229	83Q0398	8.03	7.54	337	355	14.0
237	85Q0045	8.13	8.20	331	335	13.0
238	85Q0044	7.61	7.80	384	380	11.0
276	93Q0519	8.44	8.36	530		26.0
277	93Q0763	8.16	7.99	462	430	13.7
287	94Q0855	7.80	8.10	281	311	14.0
290	94Q0982	7.03	7.20	221	280	15.8
292	93Q0721	8.20	8.07	417	376	17.0
295	W4-4-87*	7.50	7.50			7.2
297	W1-7-86-2*	8.00	7.90		318	14.5
300	W6-4-87*	8.60	8.10			10.6
301	W8-4-87*	8.10	7.20			18.9

< : Below Instrument Detection Limit
TDS : Total Dissolved Solids
SC : Specific Conductance
* : Analytical data from Briar (1987)
SDC: Sum of dissolved constituents

Analyses for well 88 are for samples collected from the following depth intervals:

80Q2812 254-255 Feet
80Q2813 264-265 Feet
80Q2827 261-324 Feet
80Q2826 261-362 Feet
80Q2825 261-423 Feet
81Q0010 264-1002 Feet
93Q0518 264-1002 Feet