GRANTS RECLAMATION PROJECT

2008 ANNUAL MONITORING REPORT / PERFORMANCE REVIEW FOR HOMESTAKE'S GRANTS PROJECT PURSUANT TO NRC LICENSE SUA-1471 AND DISCHARGE PLAN DP-200

Prepared for:

U.S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, MD 20852-2736

&

New Mexico Environment Department
1190 St. Francis Drive, N4050
Sante Fe, NM 87502

Prepared by:

Homestake Mining Company
P.O. Box 98 – San Mateo Road
Grants, NM 87020

&

Hydro-Engineering, LLC
4685 East Magnolia Street
Casper, Wyoming 82604

March 2009

2008 ANNUAL MONITORING REPORT / PERFORMANCE REVIEW
FOR
HOMESTAKE'S GRANTS PROJECT
PURSUANT TO
NRC LICENSE SUA-1471 AND DISCHARGE PLAN DP-200

FOR:

U.S. NUCLEAR REGULATORY COMMISSION
AND
NEW MEXICO ENVIRONMENT DEPARTMENT

BY:

HOMESTAKE MINING COMPANY OF CALIFORNIA
GRANTS, NEW MEXICO

AND

HYDRO-ENGINEERING, LLC
CASPER, WYOMING

MARCH, 2009

George L. Hoffman

GEORGE L. HOFFMAN, P.E.
5831 N.M. HYDROLOGIST

3/26/09

TABLE OF CONTENTS

GROUND WATER MONITORING FOR HOMESTAKE'S GRANTS PROJECT

Page Number

APPENDICES

NOTE: TABLE OF CONTENTS IS PRESENTED AFTER THE TAB FOR EACH SECTION

SECTION 1

TABLE OF CONTENTS

GROUND WATER MONITORING
FOR HOMESTAKE'S GRANTS PROJECT

FIGURES

1.0 EXECUTIVE SUMMARY AND INTRODUCTION

1.1 EXECUTIVE SUMMARY

Homestake Mining Company of California manages a ground water restoration program as defined by Nuclear Regulatory Commission (NRC) License SUA-1471, and New Mexico Environment Department (NMED), DP-200 permit. The restoration program is a dynamic on-going strategy based on a restoration plan, which began in 1977, and is scheduled to be completed in 2015.

Homestake's long-term goal is to restore the ground water aquifer to levels as close as practicable to the up-gradient background levels. A ground water collection area (see shaded area on Figure 2.1-1, Page 2.1-11) has been established and is bounded by a down-gradient perimeter of injection/infiltration wells and trenches. Alluvial ground water that flows beneath the tailings enters this collection area. All ground water in the alluvial aquifer that is within the collection area is eventually captured by the collection well system. Once ground water quality restoration within the zone is complete and approved by the agencies, the site is to be transferred to the U.S. Department of Energy, which will have the responsibility for long-term site care and maintenance.

The data reported within this document represent the results of the monitoring program during 2008. This is a yearly reporting requirement. A similar report has been submitted to the agencies each year since 1983 (see list in Section 1.2).

The restoration program is designed to remove target contaminants from the ground water by flushing the alluvial aquifer with deep-well supplied fresh water or water produced from the reverse osmosis (R.O.) plant. A series of collection wells is used to collect the contaminated water, which is pumped to the R.O. plant for treatment or, alternatively, reported to the evaporation ponds.

Historically, the contaminants are found in two different aquifer systems. The aquifer system of primary concern is the alluvial system, which averages approximately 100 feet in depth, and extends generally north to south encompassing the San Mateo alluvial aquifer. In addition, a second aquifer system is found within the Chinle formation underlying the San Mateo alluvium. It is comprised of three separate aquifers designated as the Upper, Middle and Lower Chinle aquifers. The Hydro-Engineering 2003b report should be reviewed for details of the geologic setting and aquifer conditions on the site. The Upper and Middle Chinle aquifers subcrop beneath the alluvial system near the project site. Slight to moderately elevated concentrations of constituents of concern have been observed in the Upper, Middle and Lower Chinle aquifers near their subcrops with the overlying alluvial system.

The restoration program, as described above, is made up of injection and collection well systems. R.O. product water, or fresh water pumped from deep wells, is injected in a series of wells or infiltration trenches arranged to form a continuous injection line across the site. The injection line creates a hydraulic barrier that results in containment of the contaminants within the collection area. The contaminated ground water is pumped and collected from a series of wells within the collection area. The collected aquifer water is pumped to the R.O. plant or to two large lined evaporation ponds for passive and forced (spray) evaporation.

In the years from 1977 to the present, the combination of injection wells and the up-gradient collection system has gradually continued the withdrawal of the contaminated ground water plume up-gradient of the current hydraulic barrier which assists in aquifer restoration of ground water concentrations to or below background levels.

An average of 509 gallons per minute (gpm) was pumped into the alluvial fresh-water injection systems in 2008. An additional 86 gpm of fresh water was injected into the Upper and Middle Chinle aquifer systems. An average rate of 194 gpm of R.O. product water was injected into the alluvial aquifer in 2008, in addition to the fresh-water injection program. Production of significant quantities of R.O. product water started in July of 1999 with consistent operation during 2000 through 2008 except during equipment repair periods.

In 2008, the average collection rate for the alluvial aquifer was maintained at 264 gpm. An additional 43 gpm was pumped from the alluvial aquifer and re-injected within the collection area. The Upper Chinle aquifer collection program consisted of pumping wells CE2, CE5, CE6, CE11 and CE12 at an average rate of 148 gpm in 2008. The up-gradient alluvial aquifer collection system was estimated at 40 gpm in 2008, while average rates of 50 and 11 gpm were pumped from the Large Tailings Pile toe drains and in situ tailings pile dewatering, respectively.

The continuing evaluation of the performance of the Grants restoration system, including the 2008 results, shows that sulfate, TDS, chloride, uranium, selenium and molybdenum are still the key constituents of interest at this site. Successful restoration of ground water quality with respect to these key constituents will also accomplish restoration for other constituents. The monitoring program has shown that any low levels of nitrate, radium-226, radium-228, vanadium and thorium-230 are also reduced when the key constituents are restored in a particular area.

Data relating to key constituents currently being restored at the site have been reviewed and statistically evaluated to determine upgradient background water quality. These background water quality levels have been accepted by NRC, EPA and NMED; the NRC has set site standards based on the background water quality and accordingly amended the Radioactive Material license to reflect those standards. It should be noted that these site standards are utilized throughout this report for comparison purposes in discussing restoration progress.

Observed alluvial background concentrations of key constituents at the Grants site were similar to those in previous years. The only areas where sulfate, TDS and chloride concentrations exceed the alluvial site standard are small localized areas east of Valle Verde plus the large area in close proximity to the Large and Small Tailings Piles in the Grants Project area.

Uranium concentrations exceed the alluvial site standard of 0.16 mg/l within the collection area near the tailings. There are also three wells in Felice Acres and one well in Murray Acres subdivision that contain concentrations of uranium exceeding the site standard. Ground water withdrawal for irrigation is being used to further reduce uranium levels that exceed the standard in an area southwest of Felice Acres in Section 3 and in the western half of Section 27 and Section 28. Collection of water from one well in Murray Acres is being used to reduce uranium concentrations in that area.

Selenium concentrations also exceed the relevant site standard in the collection area near the Large Tailings Pile and southeast of the Small Tailings Pile. None of the sampled subdivision wells contained selenium concentrations above the site standard.

Molybdenum concentrations above the site standard of 0.1 mg/l are not present in the sampled subdivision wells. The wells exhibiting elevated molybdenum concentrations are all located near the Large and Small Tailings Piles, to the southeast of the Small Tailings Pile, and in an area in central Section 27. Migration of this constituent has been limited due to natural retardation within the alluvial aquifer.

Nitrate concentrations are compared to the alluvial site standard of 12 mg/l. Areas to the west of the Large Tailings Pile contain higher nitrate concentrations above the site standard, but these levels are likely natural given their location. Nitrate concentrations in the area of the Large and

Small Tailings Piles and to the east are likely caused by tailings seepage. A small area southeast of Valle Verde area exceeds the nitrate alluvial site standard. Water quality with respect to this constituent should easily be remediated through the ongoing restoration program.

All radium values in the alluvial aquifer outside of the tailings perimeter were less than the site standard. This demonstrates that radium is only a constituent of concern under the Large Tailings Pile.

None of the vanadium concentrations measured in 2008 exceeded the alluvial site standard. Concentrations of this constituent have been adequately restored to below the site standard except for levels immediately under the Large Tailings Pile.

Thorium levels observed in 2008 were less than the site standard except levels in the alluvium immediately under the Large Tailings Pile. The mobility of this constituent has been very limited and is found in close proximity to the tailings. However, the analytical results for this constituent vary significantly at the low observed levels that are approaching laboratory detection limits. Slightly higher values should not be given any significance until they are supported by additional monitoring. The monitoring records for thorium indicate that it is a minor constituent of concern at the Grants site.

Fresh-water injection into Upper Chinle well CW13, east of the East Fault, continued in 2008. This injection has maintained higher water levels in the Upper Chinle aquifer east of the East Fault which in turn has allowed continued operation of the nearby Upper Chinle collection wells.

Fresh-water injection continued in 2008 in Upper Chinle well CW5 just north of Broadview Acres and also in Upper Chinle wells CW4R and CW25. This injection has resulted in gradient reversal within the Upper Chinle, thereby forcing ground water from this area back to the north toward the tailings piles. Collection from Upper Chinle well CE2 was initiated in 1999 and continued through 2008. Collection in Upper Chinle wells CE5, CE6, CE11 and CE12 was started in 2006. This collection is used in conjunction with injection wells CW4R, CW5 and CW25 to restore ground water quality in this area. Injection into well CW25 was started in 2000 and continued through 2008.

All sulfate, chloride and TDS concentrations in the Upper Chinle aquifer are below the site standards except for samples from wells CE7 and CE13. Therefore, the Upper Chinle aquifer only requires restoration with respect to TDS, chloride and sulfate in a localized area near the Large Tailings Pile.

Uranium concentrations in twelve Upper Chinle wells exceeded the Upper Chinle site standard in 2008. Restoration of these elevated values should result from CE2, CE5, CE6, CE11 and CE12 well collection and the CW4R, CW5 and CW25 well injection efforts.

Selenium concentrations in the Upper Chinle aquifer exceed the site standard in five wells in the mixing zone. The site standards for selenium for the Upper Chinle mixing zone and the Upper Chinle non-mixing zone are 0.14 and 0.06 mg/l, respectively.

The concentrations of molybdenum exceeded the site standard in four wells near the tailings in the Upper Chinle aquifer and six more to the south of the Collection Ponds during 2008. Restoration for these locations should occur from continued CE2, CE5, CE6, CE11 and CE12 well collection and CW4R, CW5 and CW25 well injection activities.

All nitrate concentrations observed in 2008 for the Upper Chinle mixing zone were less than the nitrate site standard. This indicates that nitrate is not a constituent of concern in this aquifer.

None of the Upper Chinle wells contain a radium-226 plus radium-228 value above 5 pCi/l. Two wells near the Large Tailings Pile exceeded the site standard for vanadium concentrations from the 2008 sampling in the Upper Chinle aquifer. Two of the measured thorium-230 concentrations near the Large Tailings Pile in the Upper Chinle aquifer wells during 2008 were 0.3 and 0.4 pCi/l at CE13 and CE7 respectively. This is consistent with the low observed concentrations in the overlying alluvial aquifer.

The direction and rate of ground water flow in the Middle Chinle aquifer in 2008 is very similar to that of past years. Fresh-water injection into well CW14 started in December of 1997. Fresh-water injection into wells CW30 and CW46 started in 2004. The fresh water is building up a mound of ground water in this area, which will result in a reversal of the flow of Middle Chinle water back toward the alluvial subcrop. Wells 493, 498, CW44 and CW45 are being used for irrigation supply, which will increase the flow in the Middle Chinle aquifer from Broadview and Felice Acres to the south. Additionally, well CW28 was added as a supply well for fresh-water injection in 2002 but has not been used for the last few years.

Water quality in the Middle Chinle aquifer is generally good. All sulfate concentrations are less than the site standards except for exceedance in the mixing zone area at wells CW17 and

WR25. All TDS concentrations in the Middle Chinle aquifer are less than the standards except for two TDS values in Felice Acres and one in the Broadview Acres that are slightly above the non-mixing zone background value and two TDS values in wells west of the West Fault. None of the chloride concentrations exceed the Middle Chinle site standard. Uranium concentrations in the western portion of Felice Acres are above site standards due to the alluvial recharge to the Middle Chinle aquifer just south of Felice Acres. Continued irrigation use of this water by Homestake will reduce these elevated concentrations in western Felice Acres. The uranium background is also exceeded in Broadview Acres in well 456, well CW1 north of the LTP and wells CW17, CW35 and WR25 west of the West Fault. The non-mixing zone selenium site standard is slightly exceeded in well CW28 which is located east of the East Fault and also wells 456 and 493 in Broadview and Felice Acres. Uranium site standards of 0.18 and 0.07 mg/l, respectively, were set for the mixing and non-mixing zones in the Middle Chinle aquifer, while selenium site standards are 0.14 and 0.07 mg/l. Molybdenum concentration in well CW17 is the only Middle Chinle value above the mixing zone standard of 0.10 mg/l.

Nitrate, radium, vanadium and thorium-230 concentrations in the Middle Chinle aquifer are at less than significant levels for each of the constituents except for the nitrate level in well CW17. Hence, uranium and selenium are considered the important constituents relative to restoration needs for the Middle Chinle aquifer system.

Concentrations of major constituents in the Lower Chinle aquifer generally increase in the down-gradient direction due to the slow movement of water in the fractured shale. All sulfate, TDS and chloride concentrations are less than the site standards except in far-down-gradient areas, where natural concentrations exceed the non-mixing zone site standard. These exceedances result because there is only limited background data for the far-down-gradient areas of the Lower Chinle aquifer, and there is a naturally occurring deterioration of Lower Chinle water quality in the down-gradient direction. The uranium site standard in the Lower Chinle aquifer is exceeded in five wells. The three wells where concentrations exceed the mixing zone site standard of 0.18 mg/l are located near the subcrop of the Lower Chinle aquifer with the alluvial aquifer. Concentrations in two non-mixing zone wells exceed the site standard of 0.03 mg/l.

Concentrations of selenium do not exceed the standards in the two zones for the Lower Chinle aquifer. All molybdenum concentrations in the Lower Chinle aquifer are less than the site standard. None of the Lower Chinle nitrate concentrations exist at a significant level. All radium, vanadium and thorium-230 concentrations in the Lower Chinle aquifer in 2008 were at low levels for these constituents.

1.2 INTRODUCTION

This report, as required by the New Mexico Environment Department (NMED) discharge plan DP-200 and the Nuclear Regulatory Commission (NRC) License SUA-1471, presents results of the 2008 annual ground water monitoring program at Homestake's Grants Project. Homestake Mining Company (HMC) conducted uranium milling operations five miles northeast of Milan, New Mexico from 1958 to 1990 (see Figure 1.2-1). Referred to as the Grants Project or Grants site, HMC deposited uranium tailings from the alkaline (high pH) Grants mills into two unlined piles (Large and Small Tailings Piles) that overlie San Mateo alluvium. The San Mateo alluvium is simply referred to as the alluvium or alluvial aquifer in this report. In 1977, due to initial concerns about ground water selenium levels, HMC installed a system of wells and pumps in order to inject fresh water into the alluvium at the property boundary and to withdraw contaminated water from the alluvium near the tailings.

Previous monitoring reports have been published in quarterly, semi-annual and annual reports[1], which were presented to the NMED and the NRC.

Four subdivisions, Broadview Acres, Murray Acres, Felice Acres and Pleasant Valley Estates, are adjacent to the HMC site. These subdivisions are shown on many of the various report figures found in this report.

Monitoring data for ground water west of the project site is included in the 1995 through 2008 reports (see Appendix A for water levels and Appendix B for water quality). This area has been designated the "West Area" and was so labeled on the figures in the annual reports prior to 2003. The 2003 through 2008 annual reports combine the project site and West Area figures on one 11 x 17 inch set of figures.

The annual ALARA audit, required as an NRC license condition, is presented in Appendix C. Additionally, a report of an annual inspection of the tailings piles and pond dikes must be submitted per license condition and is presented in Appendix D. Appendix E provides an annual land-use survey discussion for the immediate Grants site area; this was an added license condition beginning in 2002. The annual radon flux survey report for the Large and Small Tailings Piles is

[1] See Hydro-Engineering 1983b, 1983c, 1984a, 1984b, 1984c, 1985a, 1985b, 1985c, 1985d, 1986a, 1986b, 1986c, 1987a, 1987b, 1988a, 1988b, 1990, 1991, 1992, 1993a, 1994, 1995, 1996, 1997, 1998, 1999, 2000a, 2001a, 2002, 2003a, 2004, 2005, 2006, 2007 and 2008.

presented in Appendix F of this report.

A detailed table of contents is included at the front of each report section including a list of associated section figures and tables.

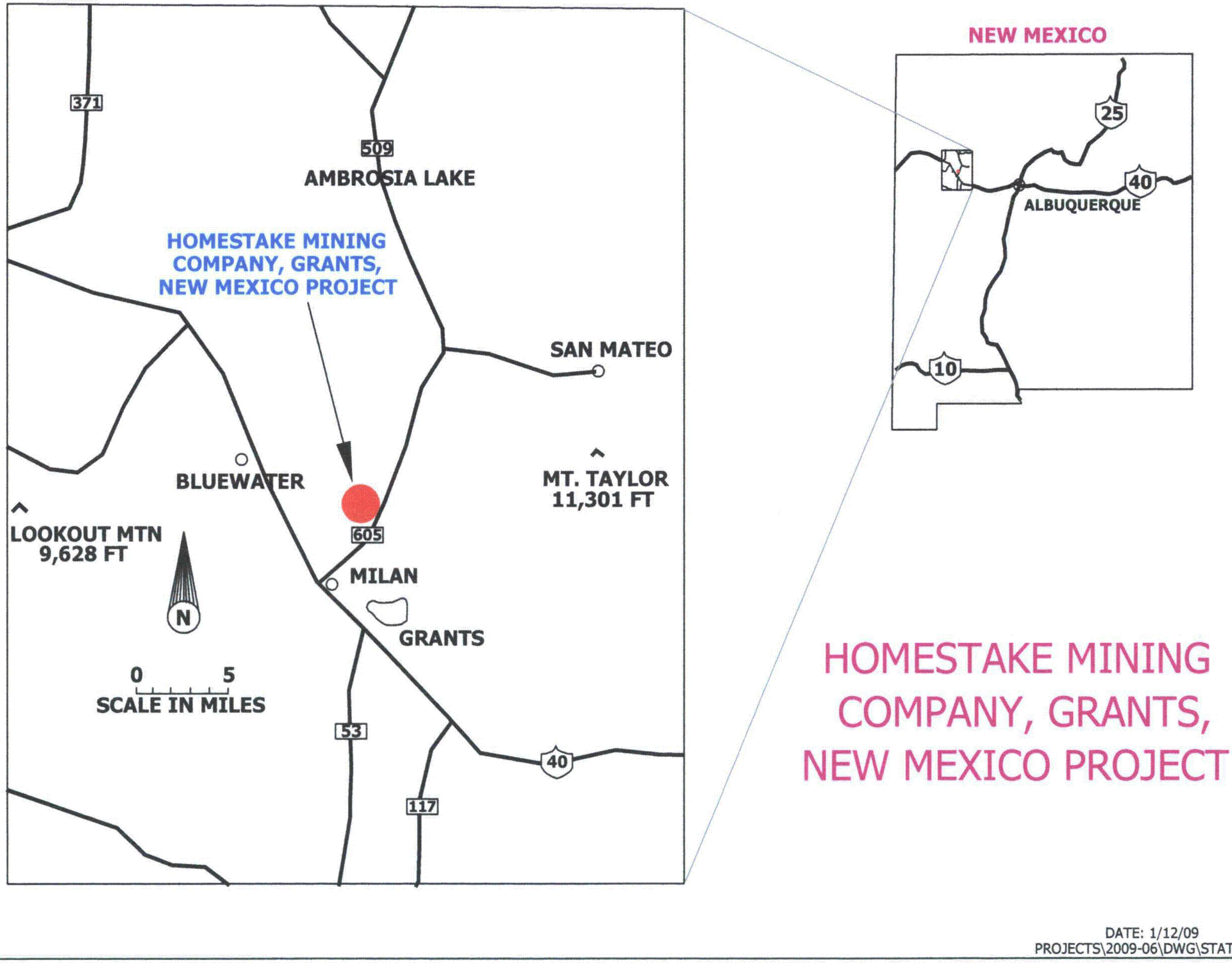


FIGURE 1.2-1. LOCATION OF THE GRANTS PROJECT

SECTION 2

TABLE OF CONTENTS

GROUND WATER MONITORING FOR HOMESTAKE'S GRANTS PROJECT

Page Number

FIGURES

SECTION 2
TABLE OF CONTENTS

GROUND WATER MONITORING
FOR HOMESTAKE'S GRANTS PROJECT
(continued)

Page Number

FIGURES
(continued)

TABLES

2.0 OPERATIONS

2.1 CURRENT OPERATIONS SUMMARY

The annual precipitation of 8.5 inches on site in 2008 is below the normal precipitation for Grants, New Mexico. These below normal conditions in an extended drought have resulted in a continuing natural decline in water levels regionally and at the Grants site.

The Grants Project ground water remediation system consists of collection of contaminated ground water near the tailings piles and down-gradient injection of fresh water and R.O. product water. These collection and injection systems continued to operate in 2008, along with the reverse osmosis (R.O.) plant, which is used to treat and manage the majority of collected ground water. The R.O. plant produces product water that is of much better quality than the natural alluvial water, and it is used as injection water in some areas of the Grants Project restoration program. Figure 2.1-1 on page 2.1-11 shows the location of the present (end of 2008) injection and collection systems along with their starting dates of operation. Water collected from the site is pumped to the R.O. plant or discharged into lined collection ponds or one of two lined evaporation ponds (light blue areas).

The area where ground water flow is controlled by the fresh-water injection and collection systems is called the "Collection Area" and is shown by the yellow cross-hatched pattern on Figure 2.1-1. All of the alluvial ground water within the collection area converges to the collection wells.

2.1.1 R.O. PLANT

The R.O. plant utilizes a lime/caustic pre-treatment and clarification unit. Blowdown (sludge) from the pre-treatment unit discharges to the West Collection Pond with the treated water feeding the two 300 gpm low-pressure R.O. units. The brine from the No. 1 low-pressure unit feeds a 75-gpm high-pressure R.O. unit. The No. 2 R.O. unit is a single stage, low pressure 300 gpm system. The R.O. product water from the two units is discharged to a series of injection wells. The brine from the R.O. plant is discharged to the evaporation ponds. Other miscellaneous flows and blowdown from the R.O. plant are pumped to the West Collection Pond for recycle to the R.O. plant.

The R.O. plant inputs and output of R.O. product water for injection are listed in the following tabulation:

R.O. Plant Performance (GPM) (2000-2008)				
Year	Input		Output	
	Collection Wells	Tailings Collection	R.O. Injection	Brine and Blowdown
2000	274	0	204	70
2001	276	5	222	59
2002	383	5	288	100
2003	338	4	266	76
2004	293	12.2	249	64
2005	250	6.4	198	49
2006	257	2.1	184	48
2007	262	0.0	204	55
2008	264	3.1	194	60

Aquifer restoration results continue to show that the R.O. product water injection is much more effective than the fresh water in reducing the uranium and molybdenum concentrations within the alluvial aquifer.

2.1.2 COLLECTION

The 2008 alluvial aquifer collection rate was very similar to the 2007 rate. In general, the R.O. plant was operated on a single unit 300 gpm basis during 2008; each of the two R.O. units were operated alternatively to allow single unit operation while the other unit was on a backwash cleaning cycle.

Up-gradient alluvial aquifer collection continues north of County Road 63. Wells P2, P3 and P4 were used to collect upgradient alluvial aquifer water (brown triangle symbol on Figure 2.1-1) for transfer to the drainage system farther west. This collection well reduces the quantity of alluvial water flowing into the tailings area. Upper Chinle aquifer collection continued from wells CE2, CE5, CE6, CE11 and CE12 in 2008 (gold X symbols located south of the collection ponds), and this water was used as injection supply water for the Large Tailings Pile (LTP) flushing program described later in Section 2.1.5.

2.1.2.1 ALLUVIAL AQUIFER

Figure 2.1-1 shows the locations of five lines of alluvial aquifer collection wells (red x symbols). The S and D-lines are adjacent to the Large Tailings Pile and the K and C-lines are adjacent to the Small Tailings Pile. No new wells were added to the alluvial collection system in 2008. The L-line south of the Small Tailings Pile continued to operate in 2008 and includes collection wells 521, 522 and 639 which are located on the east side of Highway 605 (see Figure 4.1-1 for location). Alluvial water is pumped from these lines of collection wells to the R.O. plant or, depending on water quality, it is pumped to re-injection wells. Figure 2.1-2 on page 2.1-12 graphically presents collection rates for the last ten years at the Grants Project. The alluvial collection system operated at an average rate of 264 gpm in 2008. Additionally, an average of 43 gpm was extracted from the alluvium for re-injection in 2008.

2.1.2.2 UP-GRADIENT ALLUVIAL WATER

Collection of alluvial water up-gradient of the tailings piles started in January of 1993 and continued through 2008. Wells P2, P3 and P4 were pumped in 2008 (see Figure 2.1-1). This up-gradient water was transferred to the next drainage channel to the west. The transfer of this up-gradient water prevents some of the alluvial water from entering the Grants Project area at the north side of the Large Tailings Pile and helps maintain the gradient reversal. The collection rate for this effort averaged 40 gpm during 2008 (see Figure 2.1-2). Monthly rates were not measured for the up-gradient wells, and therefore only the yearly average is presented for 2001 through 2008 on Figure 2.1-2.

2.1.2.3 UPPER CHINLE AQUIFER

Figure 2.1-2 shows the collection rate for Upper Chinle collection wells CE2, CE5, CE6, CE11 and CE12, which are located on the south side of the collection ponds. Collection from Upper Chinle well CE2 started in 1999 and is expected to continue for several years. Collection from wells

CE5 and CE6 started in August 2006 while pumping from wells CE11 and CE12 was initiated in October of 2006. These wells were used to supply water to the Large Tailings Pile for the tailings flushing program during 2008. The yearly average collection rate from the Upper Chinle was 148 gpm.

2.1.2.4 QUANTITY OF CONSTITUENTS COLLECTED FROM THE ALLUVIAL AQUIFER

Table 2.1-1 (page 2.1-17) presents the quantities of chemical constituents extracted from the ground water system, the tailings piles and the toe drains. The ground water collection system has produced an average pumping rate of 259 gpm for the entire period between 1978 and 2008. The portion of the collection water that has been re-injected into the alluvial aquifer is not included in the values in Table 2.1-1. The quantity of constituents removed in 2008 was computed by multiplying the average concentration of a particular constituent for each source of water (ground water, toe drains and tails collection) by the volume of water pumped for each that year.

2.1.3 INJECTION

The fresh-water and R.O. injection systems, which aid in the reversal of the ground water gradients back toward the collection wells, consist of lines of injection wells, which are oriented generally along the east, south and west perimeter of the two tailings piles and evaporation pond complex (see green and blue circles on Figure 2.1-1).

In 2003, approximately 2100 feet of four-inch corrugated slotted polyethylene pipe was installed at a depth of approximately 6 feet below land surface west of the Large Tailings Pile to serve as a horizontal injection line (see green line on Figure 2.1-1). A filter sock was placed over the pipe thus negating the need for a sandpack. Water is currently being injected into this injection line (S injection line) at three locations. The 2008 injection rate for this horizontal injection line is included in the Broadview and Murray Acres injection rates, and was approximately 126 gpm for the year.

In July 2004, two 250 foot sections of injection line (EBA1 and EBA2) were added south of collection well 522 east of Highway 605 (see Figure 2.1-1 for location). The average injection rate for these two lines is estimated at 20 gpm and is included in the Broadview and Murray Acres injection rate.

A 400-foot extension to the S injection line was added on the north end of this line in 2005. Five EMA injection lines were added southwest of the Large Tailings while three ETA injection lines were added east of the Large Tailings in 2005 (see Figure 2.1-1).

2.1.3.1 BROADVIEW AND MURRAY ACRES

The Broadview Acres injection system started in 1977 with the G line on the north side of this subdivision. Injection into the majority of the G-line wells was discontinued in mid-April of 2000 in order to supply more water to injection wells near the collection area. The J-line, wells X1 through X10, and wells X28 through X31 are also considered part of the Broadview Acres injection system. Fresh water was injected into wells X13 through X27, 1A and 1E in 2007. Alluvial fresh-water injection wells 523 and 524 were added to the Broadview Acres injection system in 2002 (see Figure 4.1-1).

All wells adjacent to the northeast corner and to the north and east of Murray Acres are included in the Murray Acres injection system. This system includes all of the M and WR series injection wells. The M line of the Murray Acres injection system was initially used in 1983. Injection into the M-line west of well WR1R was discontinued at the end of September of 2000, and injection into the WR-line, north of WR10, began at this time. The horizontal injection line, west of the Large Tailings Pile, (S. Inj. Line) was added to this system on August 25, 2003. Fresh-water injection into lines ETA1, ETA2 and ETA3 started in July of 2005 while injection into EMA1 with fresh water started in December, 2005.

Figure 2.1-3 (page 2.1-14) presents fresh-water injection rates for the last nine years. An average of 509 gpm, or a total of 267 million gallons, was injected during 2008.

2.1.3.2 R.O. PRODUCT

The R.O. product water injection system supplies water to the X wells to the south and east of the Small Tailings Pile. Until October, 2005, R.O. product water was discharged into the X line and injected into wells X1 through X10, X28 through X31 and into wells K2, K6, KA through KE, KM, KN, C4, C13, C5, C3R and PM. Fresh-water injection was commenced after that date for these wells. R.O. product was switched to injection lines EMA2 through EMA5 in October 2005. Figure

2.1-3 shows the rates of R.O. product water injection, which averaged 194 gpm in 2008 for a total of 102 million gallons.

2.1.3.3 UPPER CHINLE AQUIFER

Hydro-Engineering 2003b should be reviewed for a detail discussion of the geologic setting for the Chinle aquifers. From 1984 through early 1995, the Upper Chinle injection system consisted of injecting fresh water into Upper Chinle well CW5, located on the north side of Broadview Acres. This effort restored most of the area in the Upper Chinle aquifer between the two faults. Injection into well CW5 was resumed in April of 1997 and continues at present to complete the restoration of this aquifer.

In order to maintain head in the Upper Chinle aquifer east of the East Fault, injection of fresh water into well CW13, an Upper Chinle well, was begun in June, 1996. Injection into Upper Chinle well CW25, located on the western edge of the Upper Chinle outcrop east of Murray Acres, began in 2000. Injection into CW25 will increase the head in the Upper Chinle aquifer and force flow in the Upper Chinle back toward collection well CE2. Injection into Upper Chinle well 944 started in June of 2002, and injection into well CW4R started in 2003. The red squares on Figure 2.1-3 present monthly average injection rates into Upper Chinle wells 944, CW4R, CW5, CW13 and CW25, with an overall 2008 average of 64 gpm.

2.1.3.4 MIDDLE CHINLE AQUIFER

Injection of San Andres fresh water into Middle Chinle well CW14 was started in December of 1997. This injection was initiated to prevent northward movement of alluvial water that recharges the Middle Chinle on the south side of Felice Acres. The injection rate averaged 22 gpm in 2008 (see Figure 2.1-3). This injection has prevented the movement of constituents further to the north and allows up-gradient collection from wells 482, 483, 493, 498, CW44 and CW45.

2.1.3.5 SECTIONS 28 AND 29

A test of fresh-water injection was initiated in late 1999 and continued through January of 2000 by pumping San Andres well 951, which is located in Section 20, (see Figure 2.1-1 for location of supply well 951). This water was subsequently injected into alluvial wells 682, 656, 894, 633 and

655 (see Figure 4.1-1 for location). This fresh-water injection in Sections 28 and 29 was resumed in March of 2002 to impede movement of ground water with modest contaminant concentrations in Section 28 until ongoing irrigation water extraction can reduce these low concentrations. Eight injection lines were added in 2005 in Sections 27 and 28 to replace the injection wells and adjust the location of this injection. Injection into lines NPV1 through NPV5 (5 of the 8 injection lines) was started on July 27, 2005 while injection into NPV6 was started in December 2005. This injection rate averaged 365 gpm for 2008 with a total injected volume of 192 million gallons. Figure 2.1-3 presents the monthly injection rates into wells and injection lines located in Sections 28 and 29.

2.1.3.6 SECTIONS 35 AND 3

Fresh-water injection in the southwestern quarter of Section 35 was initiated in late 2002 utilizing production from Upper Chinle well CW18 and Middle Chinle well CW28. This water was injected into alluvial wells 641, 642, 848 and 868 (see Figure 4.1-1 for location).

Fresh-water injection into alluvial wells 643, 863, 865 and 866, located in the northeast portion of Section 3 was initiated in 2003. Injection into Middle Chinle wells CW30 and CW46 was added to this program in 2004 (see Figure 2.1-1). Seven injection lines in Section 3 and two injection lines in Felice Acres were also added in 2004. Two additional injection lines, FA1 in central Felice Acres and WFA1 west of Felice Acres, were added in 2005. These injection wells and lines were supplied with water by San Andres well 943 in 2008.

Figure 2.1-3 presents the combined monthly injection rates for Sections 34, 35 and 3 fresh-water injection lines and wells (see brown diamond symbols on Figure 2.1-3). This injection effort is associated with the ground water restoration of the Sections 3 and 35 areas. Water collected from wells in Section 3 and 35 is used for the irrigation program. During 2008, the yearly average injection rate in Sections 34, 35 and 3 was 203 gpm.

2.1.4 RE-INJECTION

Alluvial water containing relatively low concentrations of contaminants is collected and is then injected into areas of the alluvial aquifer near the Large Tailings Pile with higher concentrations of contaminants in order to enhance restoration in this area. This aspect of the restoration plan at the Grants sites is referred to as the collection for re-injection program. The lower-concentration water will be as effective (see sulfate, uranium, selenium and molybdenum concentrations in plots for wells T and TA – see report Sec. 4.3) as fresh water during the initial stages of restoration, and therefore, re-injection is a beneficial use of this slightly contaminated ground water. Water collected from the L-line to the south of the Small Tailings Pile and wells 521, 522 and 639 was used for re-injection into the alluvial aquifer and tailings in 2007. The total collection for re-injection rate in 2008 averaged 43 gpm. Re-injection into alluvial wells X11, X12, D2 through D4, DAA, DAB, DL, DW, DY, DF, DG and DX was roughly 20 percent of the rate or 9 gpm. The monthly re-injection rates are depicted on Figure 2.1-2 as collection for re-injection use (COL/RE-INJ). Some of the collection for re-injection water was re-injected into the Large Tailings Pile wells in 2008. Approximately 80 percent of the yearly average is estimated to have been injected into the tailings.

2.1.5 TAILINGS CONDITIONS

Tailings wells were installed in the Large Tailings Pile beginning in 1994, and wells have been periodically added through 2008. Twenty-six additional tailings injection wells were drilled in 2008 and one additional monitoring well. One additional or replacement 5 inch dewatering well was also drilled in 2008. Data collected from these wells has been used to estimate the amount of drainable water in the re-contoured, stabilized tailings. The tailings wells are also a primary component of the tailings dewatering program. With the exception of some testing of dewatering options in 1999, no dewatering of the tailings occurred in 1998 and 1999 due to limited available capacity in the evaporation ponds. The complete dewatering program was restarted in 2000 and operated through mid-April 2002. Dewatering rates were reduced through the remainder of 2002 and 2003 due to limited available storage in the evaporation ponds. The dewatering wells were operated near capacity starting in April of 2004 and throughout 2005 and 2006. Dewatering rates were restricted in 2007 due to limited available storage in the evaporation ponds.

Figure 2.1-4 (page 2.1-14) shows the locations of tailings wells that were available for pumping in 2008. The cumulative volume of tailings water pumped from 1995 through 2008 is presented on Figure 2.1-5. A total volume of 274 million gallons of water had been removed from the tailings via dewatering wells by the end of 2008. Of that total, 6 million gallons were pumped from the tailings in 2008. The yearly average collection rate from the tailings was 11.4 gpm in 2008.

Wells 929, 934, CE2, CE5, CE6, CE11, CE12, CW1 and CW2 have been used to supply water for flushing the Large Tailings Pile in 2008. A total of 140 million gallons were injected into the tailings in 2008 from these wells, which is an average rate of 266 gpm. Additionally, 34 gpm of the alluvial collection for re-injection was injected into the tailings for a total tailings injection rate of 300 gpm. This injection for tailings flushing allows larger extraction rates from the tailings dewatering wells and reduces contaminant concentrations in the tailings.

Table 2.1-1 presents the quantity of constituents collected from the tailings wells since dewatering began in 1995. Tables B.1-1 and B.1-2 of Appendix B present chemical analyses of tailings well water during 2007.

2.1.6 TOE DRAIN CONDITIONS

A series of toe drains have been installed around the Large Tailings Pile to intercept perched ground water seeping from the tailings into the alluvium. The locations of the toe drains and their associated sumps are shown on Figure 2.1-4. Nine sumps are located around the perimeter of the Large Tailings Pile that are utilized for collection of toe seepage. Two of these sumps are tied to the old tailings decant towers (East and West reclaim sumps).

Figure 2.1-5 shows that 295 million gallons of water have been pumped from the toe drains. Approximately 50.3 gpm of water was collected from the toe drains in 2008, which is greater than the 2007 rate. This increase in rate is due to the less dewatering from tailings, which offsets the injection of water in the tailings.

Table 2.1-1 also presents the 2008 quantity of constituents collected from the toe drains (see Tables B.2-1 and B.2-2 of Appendix B for toe drain sump water-quality results for 2008).

2.1.7 LINED EVAPORATION PONDS

The use of lined evaporation collection ponds (East Collection Pond and West Collection Pond) began in October of 1986 when the two ponds were constructed. The No. 1 Large Evaporation Pond, located on the Small Tailings Pile, began receiving water in November of 1990. Usage of the No. 2 Large Evaporation Pond began in March of 1996.

The water from the well collection system and some water from the tailings dewatering wells and toe drains is pumped to the R.O. plant as feed water. The majority of the extracted tailings water is reported directly to the East Collection Pond for subsequent evaporation. Excess water is transferred from the East Collection Pond to the No. 2 Evaporation Pond. When necessary, water is transferred from the No. 2 Evaporation Pond to the No. 1 Evaporation Pond. This transfer is mainly through the turbo mister evaporation spray system. Both ponds use spray systems to enhance evaporation. A total of 64 million gallons (average rate of 121 gpm) of water was delivered to the evaporation pond system in 2008 in addition to the 11 million gallons (average rate of 20 gpm) of precipitation added to the pond. The net evaporation from the evaporation system averaged 169 gpm in 2008, compared to 186 gpm in 2007.

Water quality samples results collected from the No. 1 and No. 2 Large Evaporation Ponds, the East Collection Pond (E COLL POND), and the West Collection Pond (W COLL POND) are presented in Tables B.3-1 and B.3-2 of Appendix B.

2.1.8 IRRIGATION

Four irrigation systems were operated in 2008 (see Figure 2.1-1 for locations). The 150-acre center pivot in the southwest quarter of Section 33 and 120 acres of flood irrigation in the eastern half of Section 34 were used for the eighth full irrigation season; the 100 acre center pivot in Section 28 was operated for the sixth irrigation season. The 24 acre flood irrigation in the eastern portion of Section 33 was operated in 2008. Figure 4.1-1 shows the supply wells for these irrigated areas. In 2008, wells 482, 483, 490, 491, 493, 496, 498, 538, 540, 541, 631, 632, 647, 649, 653, 657, 658, 862, 863, 865, 866, 996, CW29, CW42, CW44, CW45 and CW53 were used for the irrigation supply to the areas in Sections 33 and 34. Water from these supply wells is collected into a common piping system and is used on only one irrigation area at a time. Wells 634, 659, 881, 886, 890, M16, MO, MR and MS were used to supply the Section 28 pivot irrigation. These four areas were successfully irrigated during the entire 2008 growing season with 2 hay cuttings produced from the center pivot irrigation within Section 33 and the flood area in Section 34. Only 1 hay cutting was produced from Section 28 center pivot and no cutting was done on the Section 33 flood area. A total of 1057 Ac-Ft of water was applied to the four irrigation areas in 2008. The average uranium and selenium concentrations applied to the Section 33/34 fields were 0.24 and 0.05 mg/l for uranium and selenium respectively in 2008 while the average values for Section 28 were 0.36 and 0.07 mg/l, respectively.

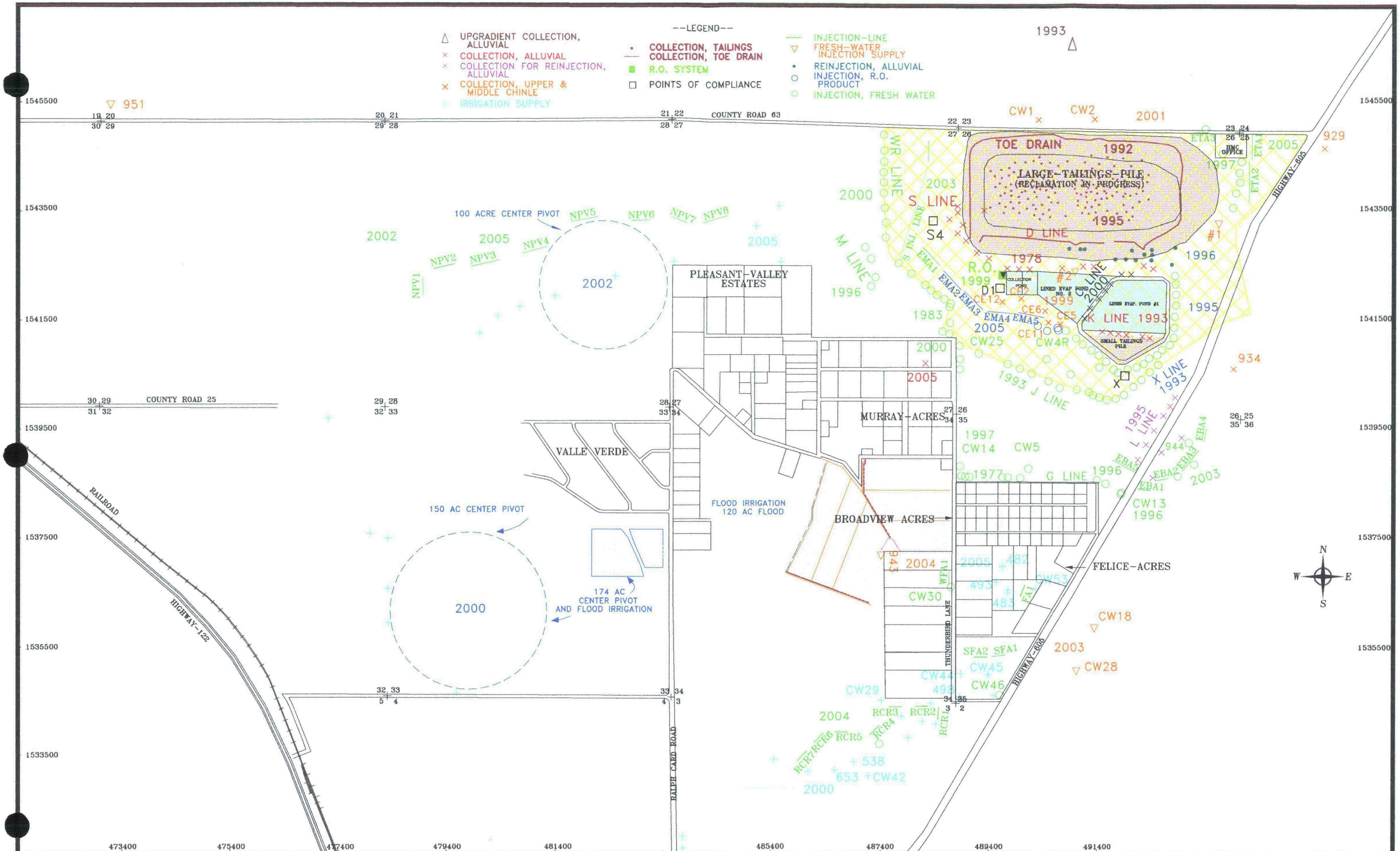


FIGURE 2.1-1. LOCATION OF PRESENT INJECTION AND COLLECTION SYSTEMS WITH START OF OPERATION DATES, 2008

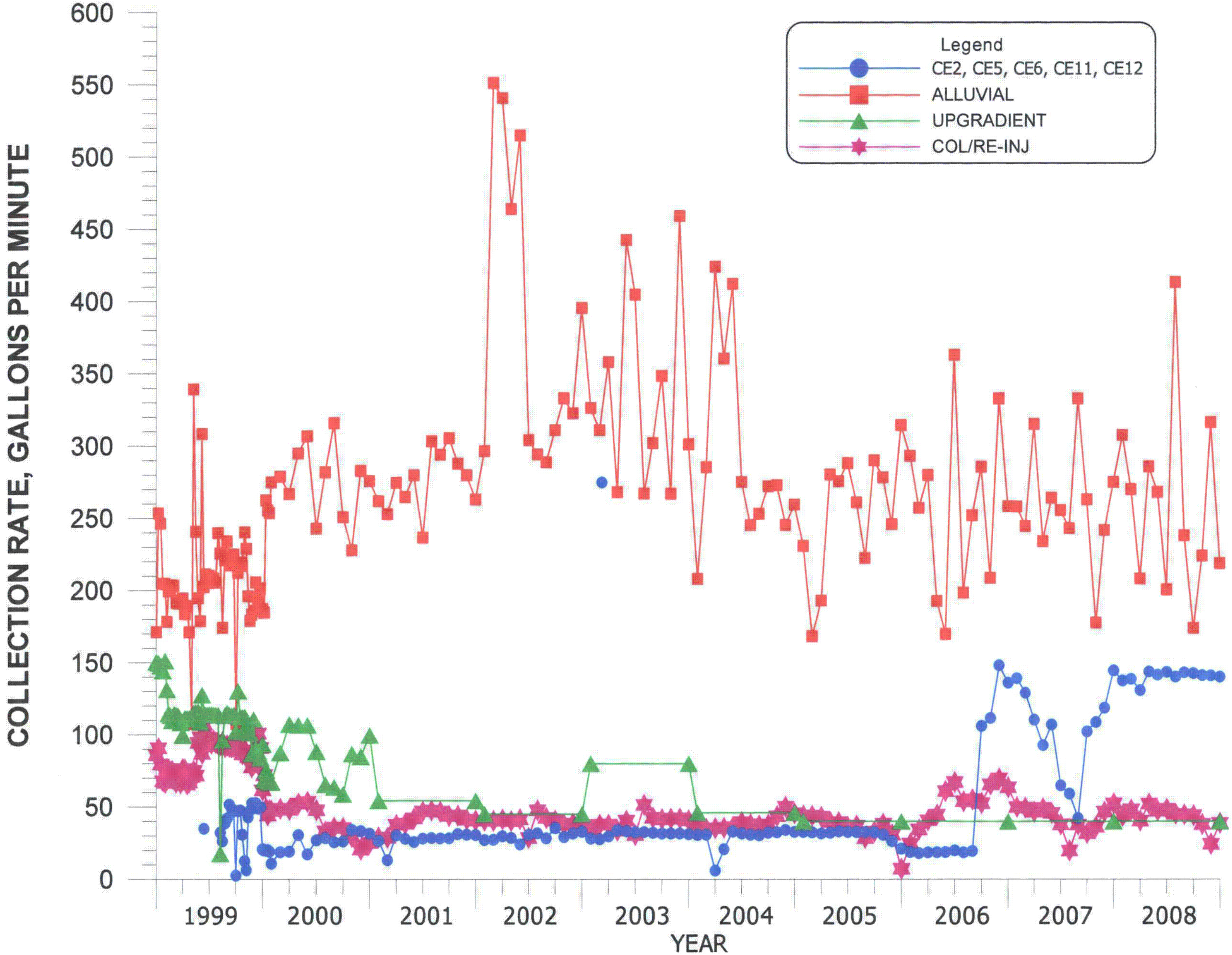


FIGURE 2.1-2. AVERAGE MONTHLY COLLECTION RATES FOR THE ALLUVIAL AND UPPER CHINLE AQUIFERS.

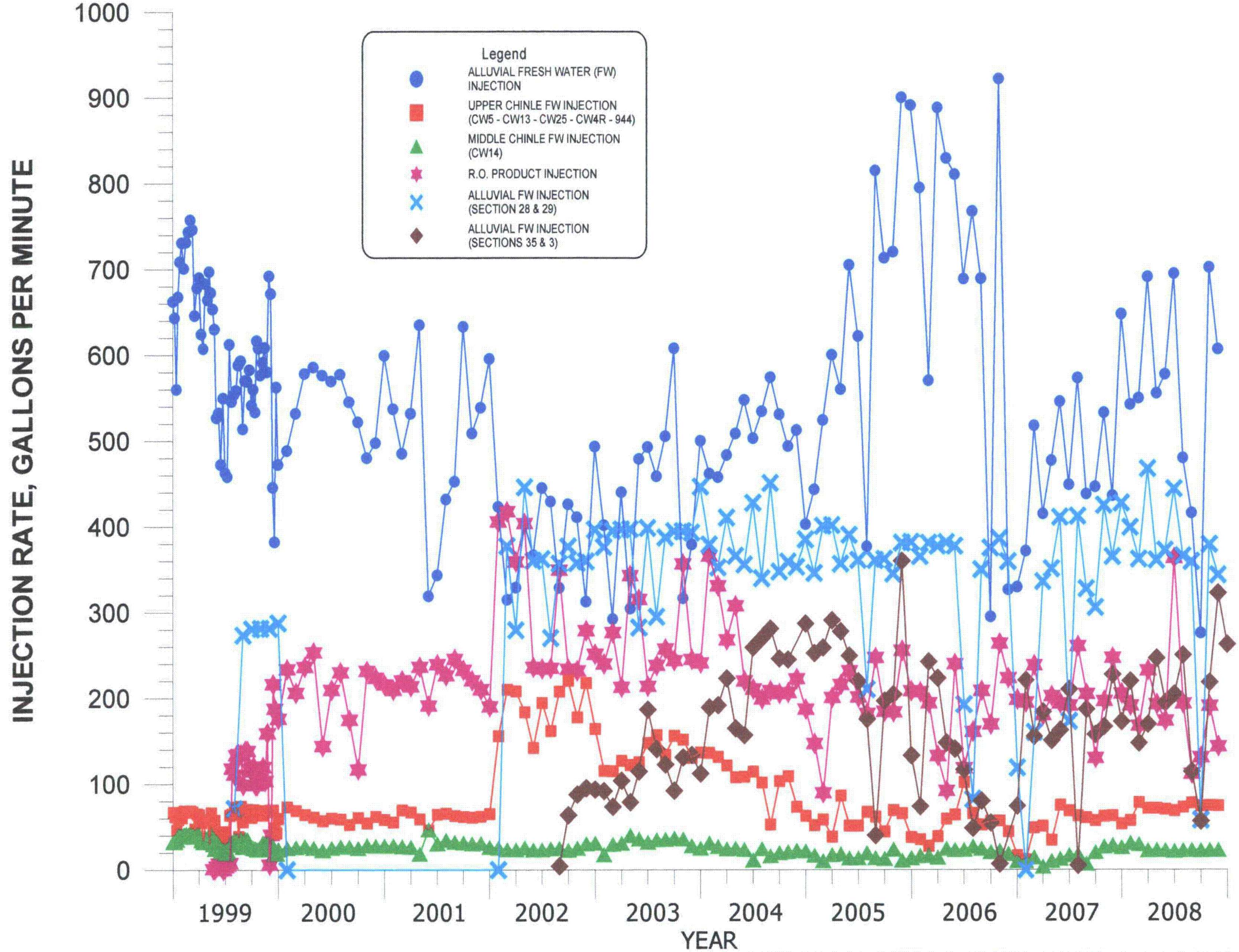


FIGURE 2.1-3. AVERAGE MONTHLY INJECTION RATES FOR THE ALLUVIAL UPPER CHINLE AND MIDDLE CHINLE AQUIFERS.

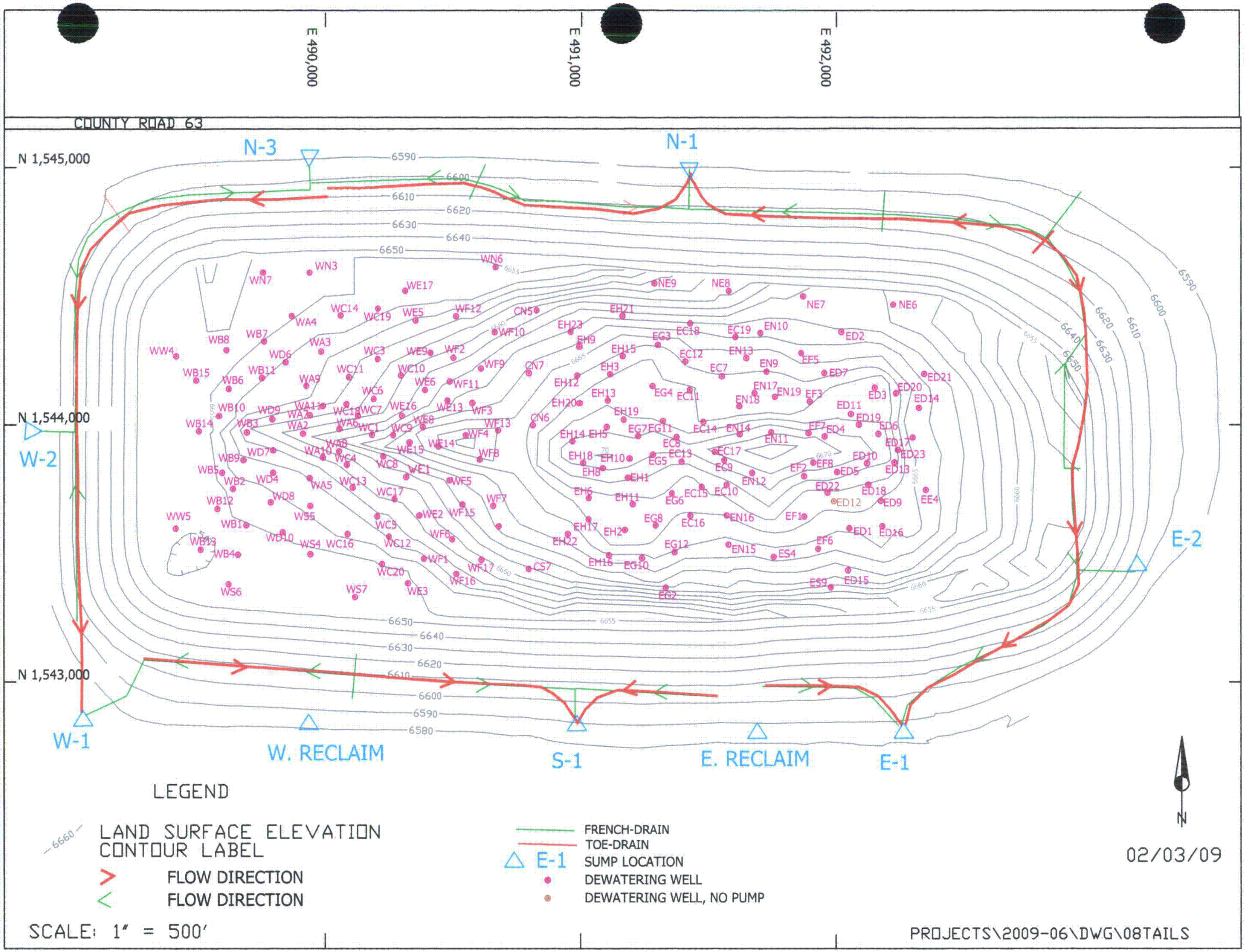


FIGURE 2.1-4. LOCATIONS OF TAILINGS DEWATERING WELLS, TOE DRAINS AND SUMPS

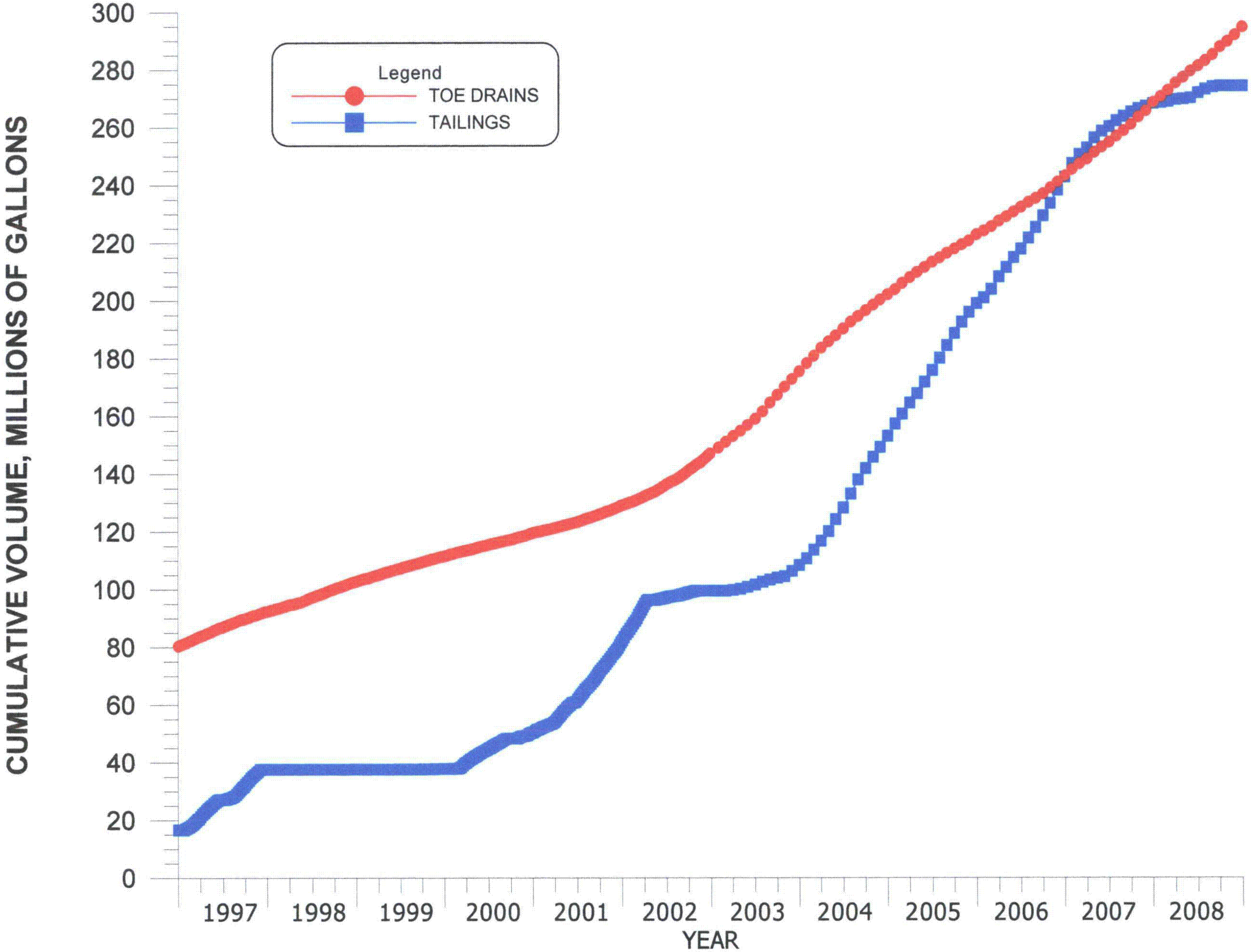


FIGURE 2.1-5. CUMULATIVE VOLUME OF COLLECTION WATER FROM TAILINGS DEWATERING WELLS AND TOE DRAINS.

TABLE 2.1-1. QUANTITIES OF CONSTITUENTS COLLECTED.

YEAR	SOURCE	TOTAL VOLUME PUMPED (GAL)	SULFATE (SO4) CONC. (MG/L)	SULFATE (SO4) AMT. (LB)	URANIUM (U) CONC. (MG/L)	URANIUM (U) AMT. (LB)	MOLYBDENUM (MO) CONC. (MG/L)	MOLYBDENUM (MO) AMT. (LB)	SELENIUM (SE) CONC. (MG/L)	SELENIUM (SE) AMT. (LB)
1978	G.W.	27670033	5200	1200620	35	8081	40	9236	2	462
1979	G.W.	46371629	5200	2012095	35	13543	40	15478	2	774
1980	G.W.	39385860	5200	1708978	35	11503	40	13146	2	657
1981	G.W.	91613183	5200	3975155	35	26756	40	30578	2	1529
1982	G.W.	159848025	5200	6935910	35	46684	40	53353	2	2668
1983	G.W.	167018540	5200	7247043	35	48778	40	55746	2	2787
1984	G.W.	203258522	5200	8819519	35	59362	40	67842	2	3392
1985	G.W.	194074421	5200	8421015	35	56680	40	64777	2	3239
1986	G.W.	199326030	5200	8648886	35	58214	40	66530	2	3326
1987	G.W.	180881740	5200	7848576	35	52827	40	60374	2	3019
1988	G.W.	166460826	5200	7222843	35	48615	40	55560	2	2778
1989	G.W.	175780800	5200	7627243	35	51337	40	58671	2	2934
1990	G.W.	164378919	5200	7132508	35	48007	40	54865	2	2743
1991	G.W.	171497720	5200	7441397	35	50086	40	57242	2	2862
1992	G.W.	128398849	4925	5276234	27.2	29134	35.9	38419	1.60	1718
1992	TOE	8544670	12117	864006	53.2	3793	106.5	7595	1.73	123
1993	G.W.	115795020	5011	4841203	28.1	27130	45.4	43885	1.47	1425
1993	TOE	18357680	12117	1856262	53.2	8150	106.5	16315	1.73	265
1994	G.W.	98294087	4423	3624762	26.0	21146	27.3	22349	1.42	1162
1994	TOE	18337680	12117	1854240	53.2	8141	106.5	16299	1.73	264
1995	G.W.	108306398	3256	2942827	16.1	14553	19.2	17355	1.65	1491
1995	TOE	17711370	11370	1680500	54.6	8069	94.4	13952	2.25	332
1995	TAILS	5905740	8191	403680	36.1	1778	89.7	4420	0.15	7
1996	G.W.	122064160	3899	3967919	20.9	21225	26.8	27259	1.92	1950
1996	TOE	15431810	11537	1484295	46.4	5970	105.0	13509	1.29	166
1996	TAILS	9181390	9434	722129	40.2	3077	108.0	8236	0.18	14
1997	G.W.	94465562	4955	3836678	26.9	20892	33.4	25887	3.17	2456
1997	TOE	12029390	11094	1113808	41.8	419	100.0	10040	0.81	81
1997	TAILS	21292900	10284	1827575	45.8	8139	92.4	16420	0.14	25
1998	G.W.	74459130	5088	3161866	29.6	18385	34.8	21625	1.85	1151
1998	TOE	10321780	9870	850257	42.5	3665	95.2	8203	0.73	63
1999	G.W.	117752408	3363	3305027	16.6	16314	14.8	14545	2.06	2024
1999	TOE	8809890	11560	849976	54.3	3993	106.0	7794	0.46	34
1999	TAILS	120550	9420	9478	40.9	41	111.5	112	0.19	0
2000	G.W.	146609842	3358	4108868	18.8	23004	20.6	25206	1.94	2374
2000	TOE	8032870	9734	652590	58.6	3929	118.0	7911	0.34	23
2000	TAILS	12446810	9710	1008685	37.8	3927	127.0	13193	0.30	31
2001	G.W.	144925056	2770	3350438	19.6	23707	21.4	25884	1.65	1996
2001	TOE	9606280	9935	796529	43.1	3455	95.7	7673	0.78	63
2001	TAILS	31465370	8688	2281555	34.6	9086	89.2	23425	0.19	50
2002	G.W.	201357360	2748	4618092	14.9	25040	16.7	28065	1.23	2067
2002	TOE	17975520	9210	1381718	33.4	5011	88.7	13307	0.76	114
2002	TAILS	17817840	7670	1140588	23.5	3495	40.8	6067	0.12	18
2003	G.W.	177727419	2417	3585168	13.8	20470	15.5	22991	0.73	1083
2003	TOE	28418871	9457	2243048	35.6	8444	78.9	18714	4.35	1032
2003	TAILS	8890076	9800	727126	28.0	2078	92.0	6826	0.30	22
2004	G.W.	154422720	2272	2931913	11.3	14633	16.6	21386	0.79	1017
2004	TOE	26720928	8007	1787722	31.9	7115	67.6	15102	2.78	622
2004	TAILS	44745696	6360	2377848	23.1	8637	60.9	22769	0.20	75
2005	G.W.	130810679	2478	2705346	11.8	12883	15.5	16922	0.59	644
2005	TOE	20704320	8228	1421784	43.5	7517	87.5	15120	2.63	454
2005	TAILS	45685786	4389	1673497	18.7	7130	56.3	21467	0.18	69
2006	G.W.	132406109	1990	2199072	9.6	10609	14.3	15802	0.73	807
2006	TOE	20374782	7432	1263796	38.0	6462	76.2	12958	1.09	185
2006	TAILS	43707760	4278	1560550	17.6	6420	51.9	18932	0.14	51
2007	G.W.	137707200	2420	2781316	10.3	11838	16.7	19193	0.52	598
2007	TOE	25037779	6829	1427024	31.9	6666	67.3	14063	1.20	251
2007	TAILS	24561680	4130	846616	19.9	4079	61.1	12525	0.15	31
2008	G.W.	137145174	2672	3058408	11.5	13163	16.5	18886	0.61	698
2008	TOE	26140850	7847	1711992	31.6	6894	68.5	14945	1.58	345
2008	TAILS	5950324	4671	231968	16.0	795	42.8	2126	0.24	12
SUM G.W.		4,210,213,421		146,536,926		904,597		1,069,058		57,831
SUM TOE		292,556,470		23,239,547		97,692		213,499		4,416
SUM TAILS		271,771,922		14,811,297		58,682		156,518		404
COMBINED SUM		4,774,541,813		184,587,770		1,060,971		1,439,075		62,651

NOTE: Average concentrations for 1978 to 1991 were used in calculating the quantities of constituents removed. Concentrations from the collection wells have gradually decreased from 1978 through 1991.
G.W. = Ground water; TOE = Toe drains on edge of tailings; TAILS = Large tailings collection wells

2.2 FUTURE OPERATION

Ground water quality restoration in 2009 will continue as a combination of fresh-water and R.O. product injection to maintain the overall piezometric gradient reversal between the lines of injection (M Line, WR Line, J Line and X Line) and contaminated water collection near the tailings piles. The reverse osmosis (R.O.) plant can be operated at a rate of up to 600 gpm but is projected to operate at an average rate of approximately 400 gpm in 2009 due to present limitations on pond storage capacity. When the plant is operated at full capacity, approximately 440 gpm of R.O. product is produced for injection into the alluvium and approximately 160 gpm of brine reject is discharged to the evaporation ponds. A larger collection rate and use of the very good quality R.O. product for injection will continue to enhance the progress in restoration.

Water collected from the alluvial and Chinle aquifers, where there are relatively low levels of selenium and uranium, will continue to be collected and used for re-injection in the initial phase of restoration of some areas. This re-injection will occur in the alluvium, where concentrations are greater than those of the injected water, until such time as injection with San Andres fresh water or R.O. product water will better complete the restoration. Use of the low-concentration re-injection water will be limited to areas up-gradient of the J, WR and X injection lines. For the purpose of this document, the reversal zone is called the collection area. To date, re-injection has occurred in wells X5 through X27, 1A, C4, D2 through D4 and DAA, DAB, DL, DW, DY, DF, DG, DQ, DX and K and a few tailings wells.

Collection from Upper Chinle wells CE2, CE5, CE6, CE11 and CE12 will continue to intercept contaminants in this aquifer. Injection into Upper Chinle wells 944, CW4R, CW5, CW13 and CW25 is planned to continue to control the direction of flow in these areas of the Upper Chinle aquifer.

Injection into well CW14 will be continued in order to build the head in this area of the Middle Chinle aquifer. This will prevent alluvial water from flowing into this portion of the Middle Chinle aquifer.

Irrigation with water from Sections 3, 27, 28, 32, 33 and 35 is planned for the entire growing season in 2009. Irrigation of the 24 acres of flood in Section 33 is also planned for 2009. Fresh-water well injection lines in Section 28 will continue to be utilized in 2009 to restore these areas of low level aquifer contamination. Fresh-water injection will be continued in Sections 35 and 3 in 2009 to complement the use of water for irrigation and assist in final aquifer restoration in this area.

SECTION 3

TABLE OF CONTENTS

GROUND WATER MONITORING FOR HOMESTAKE'S GRANTS PROJECT

FIGURES

TABLES

3.0 SITE STANDARDS AND BACKGROUND CONDITIONS

3.1 ALLUVIAL SITE STANDARDS

Ten water-quality site standards (U, Se, Mo, SO4, Cl, TDS, NO3, Ra226 + Ra228, Th230 and V) have been set for the alluvial aquifer at the Homestake site by the United States Nuclear Regulatory Commission (NRC) and the site Radioactive Materials License was amended accordingly. These site standards were established on the basis of defining the full range in alluvial aquifer background concentration values for these constituents. The procedures used to establish background concentrations and subsequent setting of appropriate site standards were reviewed and approved by NRC, EPA and the New Mexico Environmental Department (NMED). Adjustment of the site standards to account for the full range in natural background concentrations was important in assuring that appropriate site standards are set in relation to background concentrations.

The NRC alluvial aquifer site standards are shown in Table 3.1-1 and will be incorporated in the New Mexico Environment Department (NMED) DP-200 Discharge Plan when the permit is renewed. Alluvial site standards for the Grants Project are applicable at three points of compliance; these Point of Compliance (POC) wells are S4, D1, and X (see Figure 2.1-1 for locations).

TABLE 3.1-1. GRANTS PROJECT ALLUVIAL SITE STANDARDS.

Constituents	NRC License Site Standards	New Mexico Site Standards*
Uranium	0.16	0.16
Selenium	0.32	0.32
Molybdenum	0.10	1.0**
Vanadium	0.02	-----
RA-226 + Ra-228	5	30
Thorium-230	0.3	-----
Sulfate	1500	1500
Chloride	250	250
TDS	2734	2734
Nitrate	12	12

NOTE: All concentrations are in mg/l except: Ra-226 + Ra-228 and Th-230, which are in pCi/l.
* = Pending NMED renewal of DP-200 Discharge Plan
** = New Mexico Irrigation Standard

3.2 ALLUVIAL BACKGROUND WATER QUALITY

Background alluvial aquifer water-quality conditions at the Grants site are those found up-gradient or north of the Large Tailings Pile. These conditions in the San Mateo alluvium have been monitored since 1976. Ground water flow in the San Mateo alluvial system is generally from the northeast to the southwest (see Figure 3.2-1). Lobo Creek joins San Mateo Creek in the Felice Acres subdivision area at the Homestake site, although neither creek has a well-defined surface flow channel in this area. Surface-water flow occurs only after extreme precipitation events and then generally only within some reaches of the channels.

Hydrographs of up-gradient wells that have been used to define the background hydrologic conditions of the alluvial aquifer are presented in Section 4 of this report. Wells DD, P, P1, P2, P3, P4, Q, R and ND, located just north of the Large Tailings Pile, have been used for monitoring alluvial background water quality and are called the near up-gradient wells.

Additional alluvial background wells located farther north have also been sampled (wells 914, 920, 921, 922 and 950, see Figure 3.2-1 for locations). Information gathered from these wells has been used to further define the piezometric surface and water-quality conditions in the up-gradient alluvial aquifer, and these wells are referred to as the far up-gradient wells. An additional up-gradient well, DD2, was drilled in 2008.

Figure 3.2-1 presents the latest 2008 water-quality data for the near and far-up-gradient alluvial background wells for six parameters: sulfate, uranium, selenium, chloride, TDS and nitrate. Sulfate concentrations for the wells varied from 411 to 1620 mg/l in 2008. Uranium concentrations also varied over a large range, from 0.009 to 0.23 mg/l. Selenium concentrations also varied over a large range, from <0.005 to 0.61 mg/l.

Chloride concentrations in water sampled in 2008 from the up-gradient wells ranged from a low of 41 mg/l to a high of 120 mg/l. The TDS concentrations varied from 1060 to 2690 mg/l. Nitrate concentrations also vary naturally over a large range in the alluvial aquifer, and ranged from 0.1 to 25.5 mg/l in 2008. Molybdenum concentrations varied from <0.03 to 0.12 mg/l. Concentration versus time plots for up-gradient wells DD, ND, P, P2, Q and R are presented later in Section 4.3 of this report.

The 95th percentile of the historical background alluvial aquifer water-quality data for the Grants site was defined by ERG (1999a and 1999b). These documents, along with a hydrologic support document (Hydro-Engineering 2001c), were submitted to the NRC in 2001 with a request to adjust some of the site standards based on the full range of natural background conditions. The 95th percentile was used to define the upper limit of background. Background data for a ten year period of 1995 through 2004 was used to determine the 95th percentile values. The cumulative database for all of the background wells more adequately defines background concentrations, and this expanded database, based on near-up-gradient wells, was utilized in the two ERG (1999a and 1999b) studies. A tabulation of alluvial standards for the Grants Project area constituents is included in Figure 3.2-1.

The range in concentrations in the alluvial up-gradient wells[1] sampled during 2008 is tabulated in Table 3.2-1 with a list of the site standards. These site standards were established from data from the near up-gradient wells[2]. The following table (Table 3.2-1) summarizes the 2008 data for near up-gradient and far up-gradient wells for constituents of concern where site standards have been set for the Grants site. As shown by the present data, there is a large natural areal variability in the background water quality. Naturally occurring background variation is illustrated by the uranium concentrations, where concentrations in 2008 varied from 0.009 to 0.23 mg/l.

TABLE 3.2-1 2008 BACKGROUND WELL DATA - ALLUVIUM							
	PARAMETERS						
	Se	U	Mo	SO4	Cl	TDS	NO_3
NRC Site Standard	0.32	0.16	0.10	1500	250	2734	12
Pending NMED Standard	0.32	0.16	1.0	1500	250	2734	12
NEAR UP-GRADIENT WELLS							
DD	0.03	0.19	<0.03	1620	69	2690	4.0
DD2	0.01	0.23	<0.03	1310	65	2420	0.2
ND	0.11	0.16	0.12	1130	92	2010	1.2
P	0.14	0.03	<0.03	1000	46	1780	5.7
P2	0.23	0.04	<0.03	1230	62	1900	10.0
P3	0.16	0.02	<0.03	935	49	1670	5.4
P4	0.13	0.02	<0.03	844	41	1480	5.8
Q	0.31	0.05	<0.03	1390	62	2440	14.6
R	0.61	0.02	<0.03	1320	52	2250	22.6
FAR UP-GRADIENT WELLS							
914	<0.005	0.009	<0.03	832	81	1350	0.1
920	0.47	0.20	<0.03	1480	56	2320	12.4
921	0.60	0.22	<0.03	1520	60	2610	25.5
922	<0.005	0.005	0.04	411	70	1060	0.1
950	0.36	0.16	<0.03	904	120	1870	13.8

[1] Wells DD, DD2, ND, P, P2, P3, P4, Q, R, 914, 920, 921, 922 and 950

[2] Wells DD, ND, P, P1, P2, P3, P4, Q and R

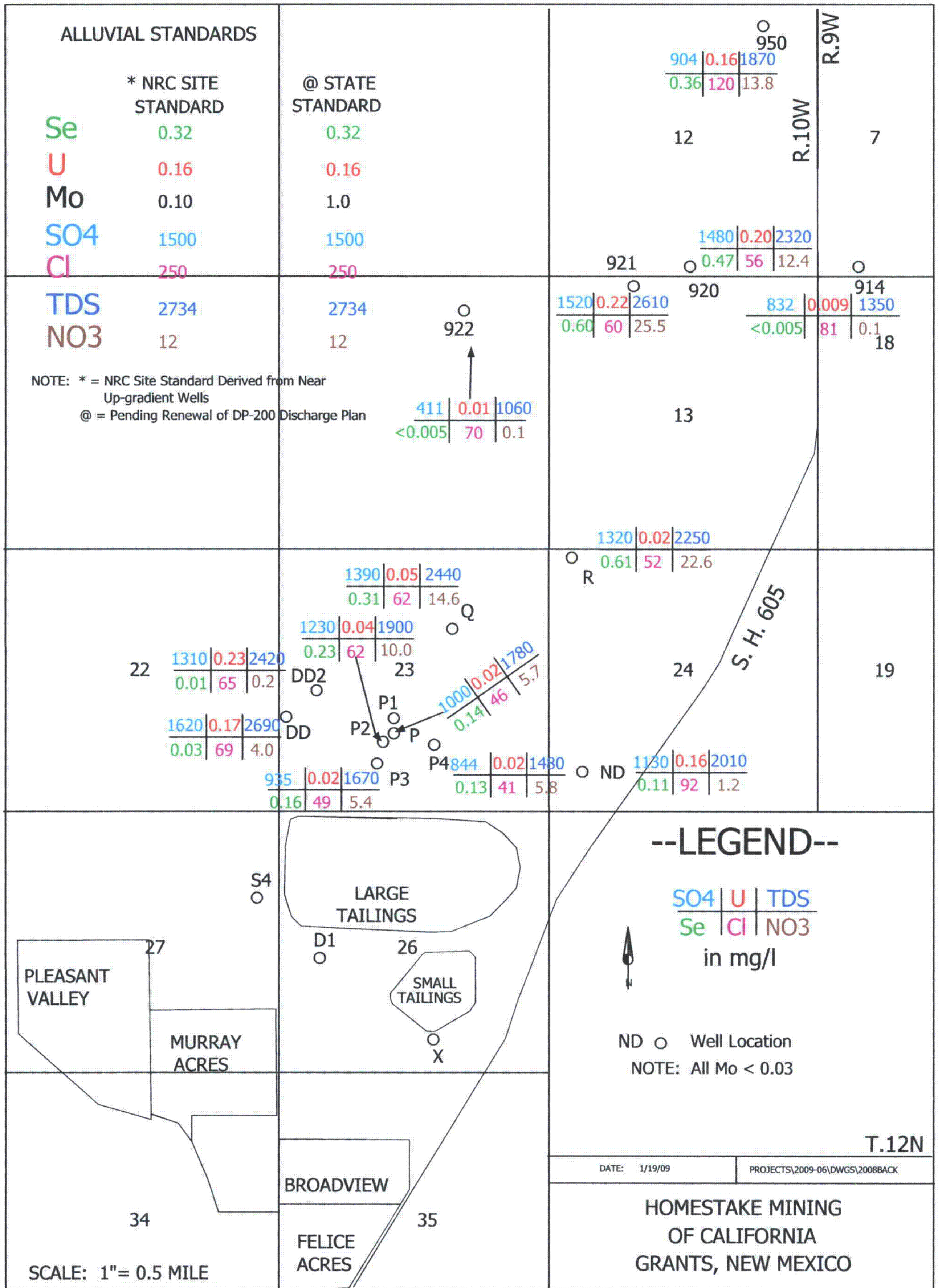


FIGURE 3.2-1. ALLUVIAL BACKGROUND GROUND WATER QUALITY, 2008

3.3 CHINLE SITE STANDARDS

Eight water quality site standards (U, Se, Mo, SO4, Cl, TDS, NO3, and V) have been set for the Chinle aquifers at the Homestake site by the NRC. The site standards were also established based on the full range of background concentration in the Chinle aquifers for these constituents. The procedures accepted and used to establish these site standards can result in a minor amount of observed natural concentrations exceeding the site standards.

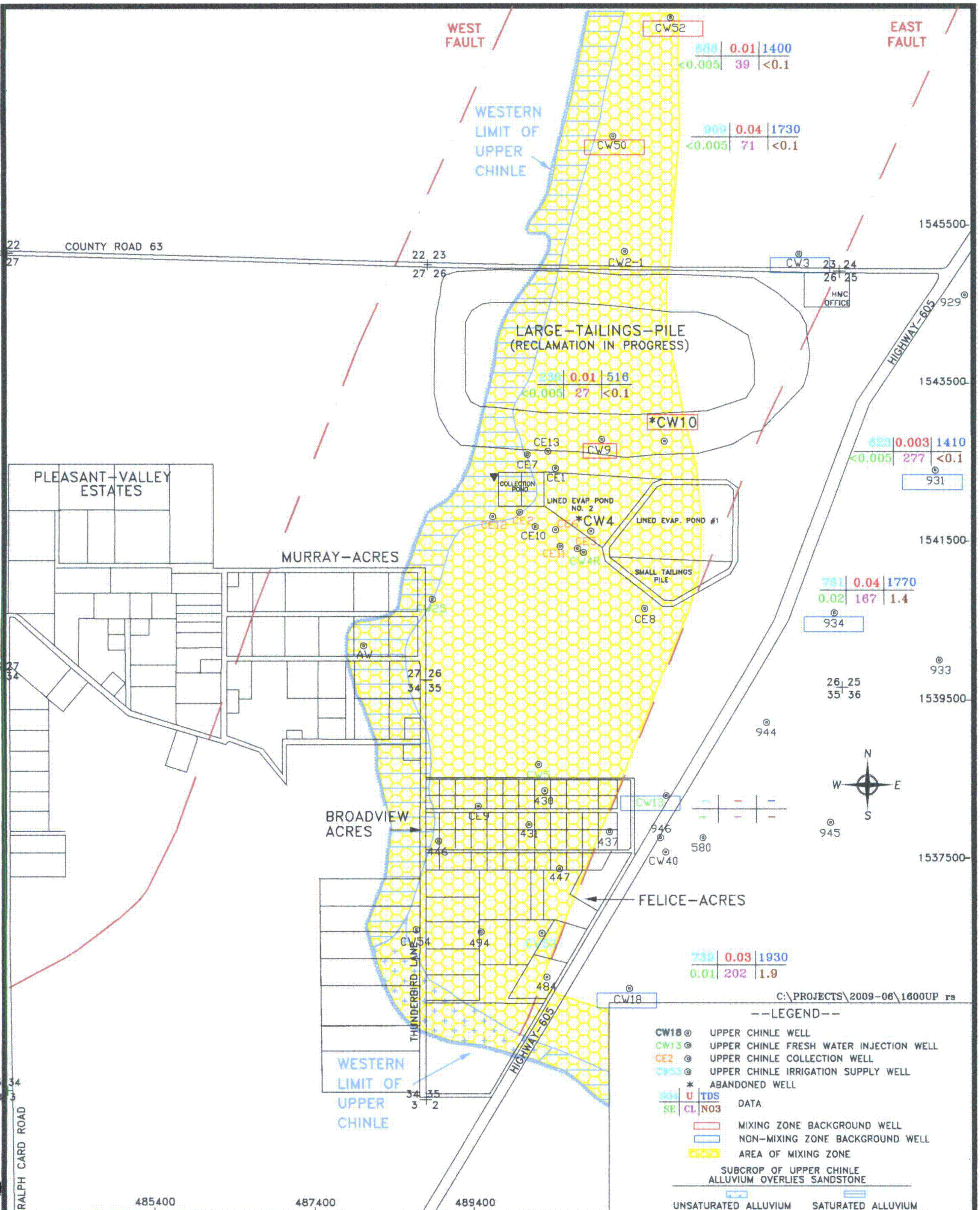
Site standards have been established for the Chinle mixing zone, Upper Chinle non-mixing zone, Middle Chinle non-mixing zone and Lower Chinle non-mixing zone. Separate site standards exist for each of these four Chinle aquifer zones. Figures 3.3-1 through 3.3-3 show the Upper Chinle, Middle Chinle and Lower Chinle aquifers with the portion of the aquifer in the mixing zone and the remainder that is in the non-mixing zone. Figure 3.3-1 presents the location of the Upper Chinle mixing-zone (yellow pattern) and the wells used in the analysis of background values. Wells within the mixing zone that were used in the mixing-zone background calculations have a red box around the well name. Wells used to define the Upper Chinle non-mixing zone are indicated by a light blue rectangular box around their name.

Table 3.3-1 below presents the Chinle site standards for the four Chinle aquifer zones.

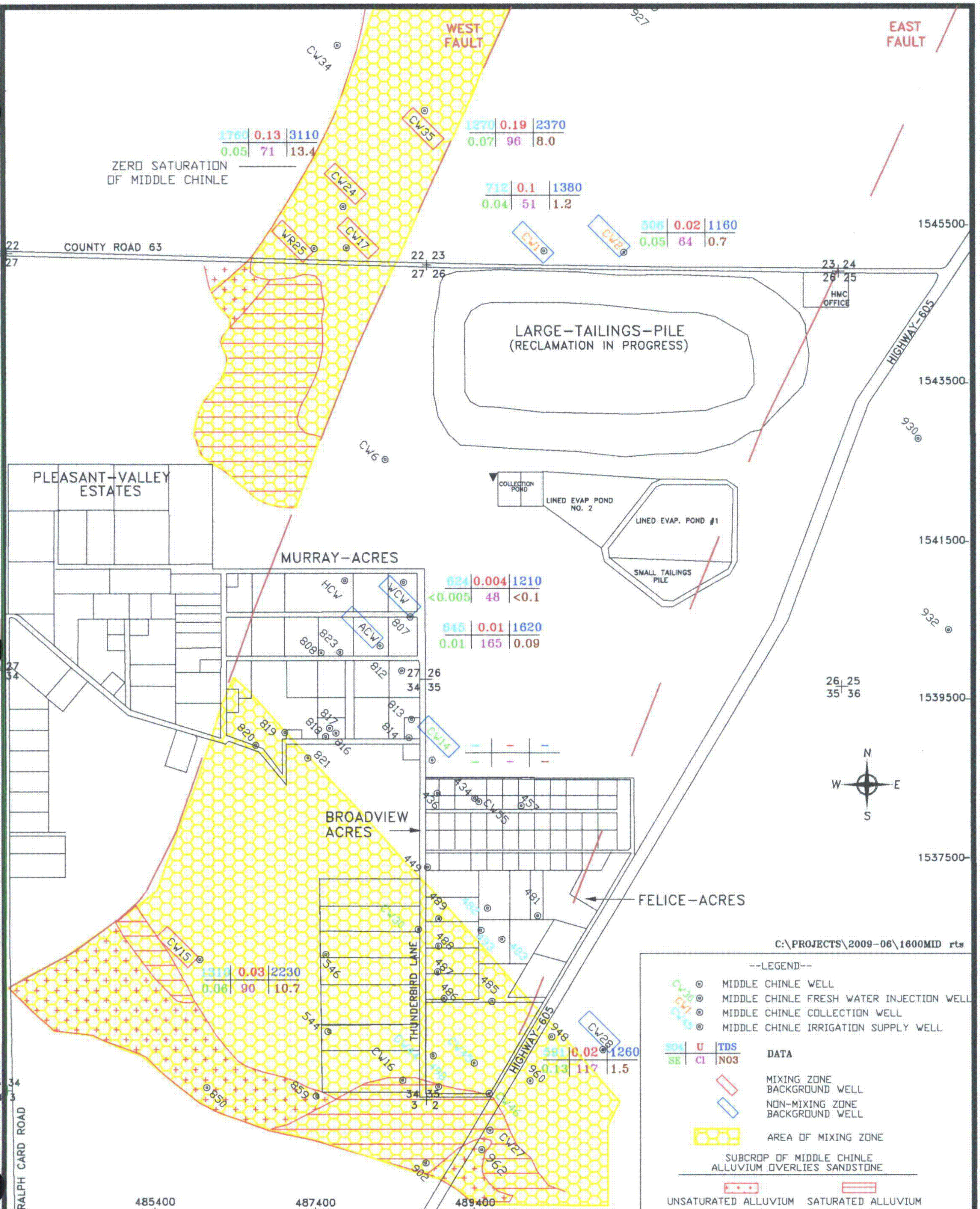
TABLE 3.3-1. GRANTS PROJECT - CHINLE SITE STANDARDS

	CONSTITUENT, concentrations in mg/l except Thorium-230 and Ra226+Ra228 in pCi/l.									
Aquifer Zone	Selenium	Uranium	Molybdenum	TDS	Sulfate	Chloride	Nitrate	Vanadium	Thorium-230	Ra-226 +Ra-228
Chinle Mixing	0.14	0.18	0.10	3140	1750	250	15	0.01	*	*
Upper Chinle Non-Mixing	0.06	0.09	0.10	2010	914	412	*	0.01	*	*
Middle Chinle Non-Mixing	0.07	0.07	0.10	1560	857	250	*	*	*	*
Lower Chinle Non-Mixing	0.32	0.03	0.10	4140	2000	634	*	*	*	*

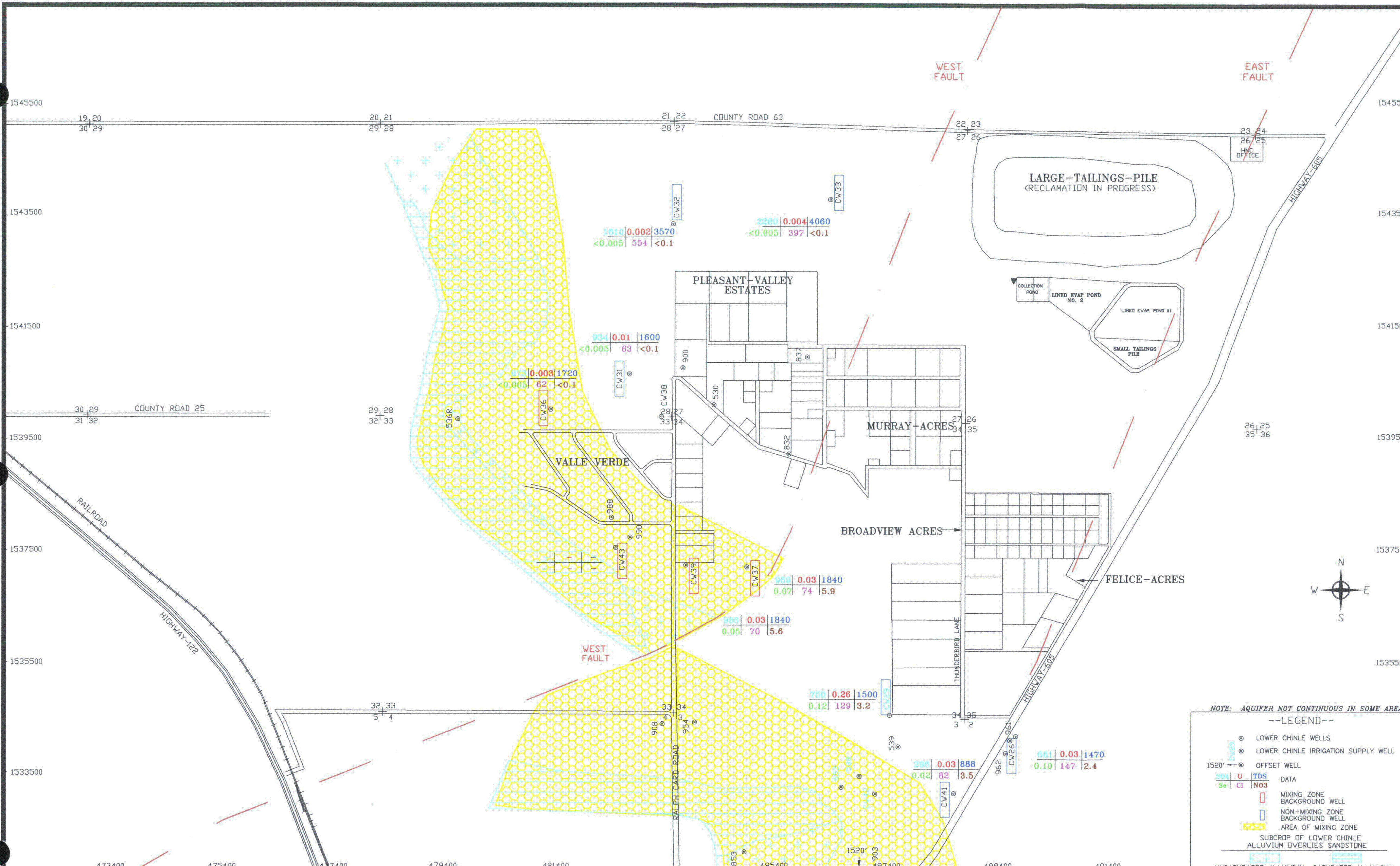
* Background water quality analyses for constituent determined that site standard is not necessary.



HOMESTAKE MILL AND ADJACENT PROPERTIES ~ GRANTS, NM ~ TOWNSHIP-11&12N, RANGE-10W	DATE: 1/27/09
FIGURE 3.3-1. UPPER CHINLE MIXING ZONE AND 2008 GROUND WATER QUALITY	SCALE: 1"=650'
	PAGE: 3.3-2



HOMESTAKE MILL AND ADJACENT PROPERTIES ~ GRANTS, NM ~ TOWNSHIP-11&12N, RANGE-10W	DATE: 3/25/09
FIGURE 3.3-2. MIDDLE CHINLE MIXING ZONE AND 2008 GROUND WATER QUALITY	SCALE: 1"=650'
	PAGE: 3.3-3



SCALE: 1" = 1600'
C:\PROJECTS\2009-06\1600LOW rts
DATE: 3/25/09

FIGURE 3.3-3. LOWER CHINLE MIXING ZONE AND 2008 GROUND WATER QUALITY

3.4 CHINLE BACKGROUND WATER QUALITY

The Chinle aquifer background water quality has been analyzed and presented to the NRC and NMED in Hydro-Engineering 2003b and ERG 2003. The background concentrations for the mixing zones in the Upper, Middle and Lower Chinle aquifers were grouped together to develop a mixing zone background level. The non-mixing zone water chemistry data for each of the three aquifers were analyzed separately. Table 3.4-1 presents the site standards that resulted from the analysis and related discussions with NRC, EPA and NMED concerning agreement on the standards. Figure 3.3-1 also presents the 2008 data collected from these background wells for selected parameters of sulfate, uranium, TDS, selenium, chloride and nitrate. This data is presented in a format similar to that used for the alluvial background data. The data for wells CW3, CW17 and WR25 are not presented on Figures 3.3-1 and 3.3-2 because concentrations are not natural in these wells for 2008. Table 3.4-1 also presents the 2008 data for the Chinle mixing zone background wells and the Upper, Middle and Lower Chinle non-mixing zone wells separated by their category.

The Middle Chinle mixing zone is presented in Figure 3.3-2 with a yellow pattern. Five wells are shown in the Middle Chinle mixing zone, and these wells were included with the Upper Chinle and Lower Chinle mixing-zone wells in establishing the mixing-zone background values. Six wells shown on Figure 3.3-2 were used to establish the Middle Chinle non-mixing zone background levels. This figure also presents the 2008 data collected for these background wells.

Figure 3.3-3 presents the Lower Chinle mixing zone in a yellow pattern. This figure also shows which wells were used to establish the background concentrations in the mixing and non-mixing zones of the Lower Chinle aquifer. The 2008 data for the Lower Chinle wells previously used to define background concentrations are also presented on Figure 3.3-3. The Lower Chinle non-mixing zone background levels are somewhat problematic, because the water quality tends to deteriorate naturally as the ground water moves down-gradient. Therefore, the expected natural water quality deterioration is a function of the distance from the Lower Chinle subcrop beneath the alluvium to a particular point within the aquifer.

TABLE 3.4-1. 2008 BACKGROUND WELL DATA - CHINLE

	CONSTITUENT, concentrations in mg/l							
Aquifer Zone	Selenium	Uranium	Molybdenum	TDS	Sulfate	Chloride	Nitrate	Vanadium
CHINLE SITE STANDARDS								
Chinle Mixing	0.14	0.18	0.10	3140	1750	250	15	0.01
Upper Chinle Non-Mixing	0.06	0.09	0.10	2010	914	412	*	0.01
Middle Chinle Non-Mixing	0.07	0.07	0.10	1560	857	250	*	*
Lower Chinle Non-Mixing	0.32	0.03	0.10	4140	2000	634	*	*
CHINLE MIXING ZONE WELLS								
CW9	<0.005	0.01	<0.03	516	236	27	<0.1	-
CW50	<0.005	0.04	<0.03	1730	909	71	<0.1	<0.01
CW52	<0.005	0.01	<0.03	1400	688	39	<0.1	<0.01
CW15	0.06	0.03	<0.03	2230	1310	90	10.7	-
CW24	0.05	0.13	<0.03	3110	1760	71	13.4	-
CW35	0.07	0.19	<0.03	2390	1270	96	8	-
CW36	<0.005	0.003	<0.03	1720	973	62	<0.1	-
CW37	0.07	0.03	<0.03	1840	989	74	5.9	-
CW39	0.05	0.03	<0.03	1840	988	70	5.6	-
CW43	-	-	-	-	-	-	-	-
UPPER CHINLE NON-MIXING ZONE WELLS								
934	0.02	0.04	<0.03	1770	761	167	1.4	-
CW18	0.01	0.03	<0.03	1930	739	202	1.9	-
MIDDLE CHINLE NON-MIXING ZONE WELLS								
ACW	0.01	0.01	<0.03	1620	645	165	0.09	-
CW1	0.04	0.1	0.04	1380	712	51	1.2	-
CW2	0.05	0.02	<0.03	1160	506	64	0.7	-
CW28	0.13	0.02	<0.03	1260	591	117	1.5	-
WCW	<0.005	0.004	<0.03	1210	624	48	<0.1	-
LOWER CHINLE NON-MIXING ZONE WELLS								
CW26	0.1	0.03	<0.03	1470	661	147	2.4	-
CW29	0.12	0.26	<0.03	1500	750	129	3.2	-
CW31	<0.005	0.01	<0.03	1600	934	63	<0.1	-
CW32	<0.005	0.002	<0.03	3570	1610	544	<0.1	-
CW33	<0.005	0.004	<0.03	4060	2260	597	<0.1	-
CW41	0.02	0.03	<0.03	888	296	82	3.8	-

* Background water quality analyses for constituent determined that site standard is not necessary.

SECTION 4

TABLE OF CONTENTS

GROUND WATER MONITORING FOR HOMESTAKE'S GRANTS PROJECT

Page Number

FIGURES

SECTION 4

TABLE OF CONTENTS

GROUND WATER MONITORING FOR HOMESTAKE'S GRANTS PROJECT

FIGURES (continued)

Page Number

SECTION 4

TABLE OF CONTENTS

GROUND WATER MONITORING FOR HOMESTAKE'S GRANTS PROJECT

FIGURES
(continued)

SECTION 4

TABLE OF CONTENTS

GROUND WATER MONITORING FOR HOMESTAKE'S GRANTS PROJECT

FIGURES (continued)

Page Number

SECTION 4

TABLE OF CONTENTS

GROUND WATER MONITORING FOR HOMESTAKE'S GRANTS PROJECT

FIGURES (continued)

Page Number

SECTION 4

TABLE OF CONTENTS

GROUND WATER MONITORING FOR HOMESTAKE'S GRANTS PROJECT

FIGURES (continued)

Page Number

SECTION 4

TABLE OF CONTENTS

GROUND WATER MONITORING FOR HOMESTAKE'S GRANTS PROJECT

FIGURES (continued)

SECTION 4

TABLE OF CONTENTS

GROUND WATER MONITORING FOR HOMESTAKE'S GRANTS PROJECT

FIGURES (continued)

SECTION 4

TABLE OF CONTENTS

GROUND WATER MONITORING FOR HOMESTAKE'S GRANTS PROJECT

FIGURES (continued)

Page Number

SECTION 4

TABLE OF CONTENTS

GROUND WATER MONITORING FOR HOMESTAKE'S GRANTS PROJECT

FIGURES (continued)

Page Number

SECTION 4

TABLE OF CONTENTS

GROUND WATER MONITORING
FOR HOMESTAKE'S GRANTS PROJECT

FIGURES
(continued)

Page Number

SECTION 4

TABLE OF CONTENTS

GROUND WATER MONITORING FOR HOMESTAKE'S GRANTS PROJECT

FIGURES (continued)

SECTION 4

TABLE OF CONTENTS

GROUND WATER MONITORING FOR HOMESTAKE'S GRANTS PROJECT

TABLES

Page Number

4.0 ALLUVIAL AQUIFER MONITORING

This section presents 2008 monitoring results for the alluvial aquifer. The alluvial aquifer immediately underlies the Grants Project site and is therefore the most important ground water system at the Grants Project site. The section describing well completions is presented first, and is followed by several report sections presenting water-level and water-quality information.

4.1 ALLUVIAL WELL COMPLETIONS

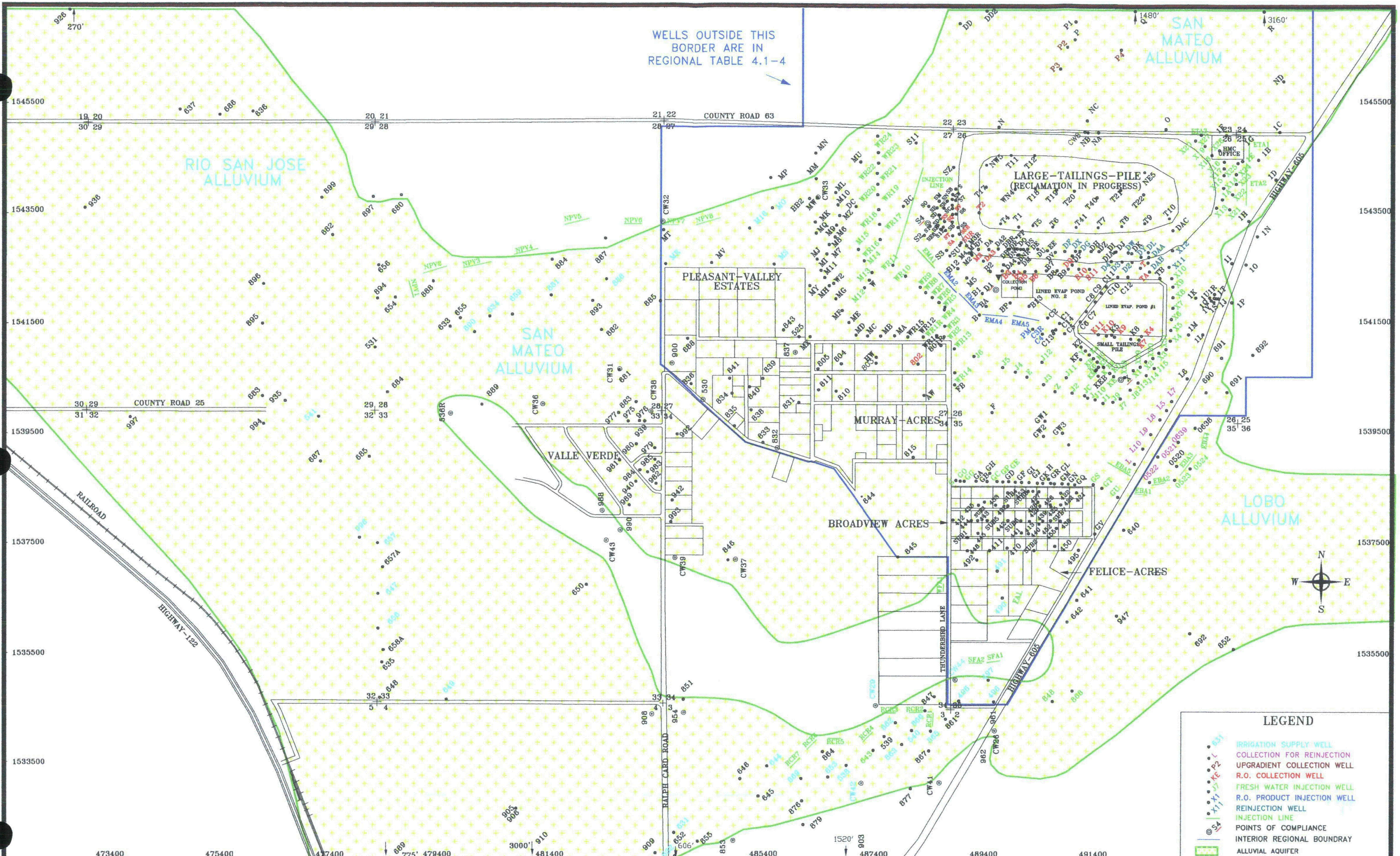
Three new alluvial wells, 1V, DD2 and SE6 were installed in 2008; no additional injection lines were installed during the year. Operational status and other characteristics of the new and previously installed alluvial wells and injection lines are discussed in this section. Figure 4.1-1 shows the locations of the alluvial wells near the Homestake Grants Project with the operational status for each well and injection line for 2008. Black wells were used only for monitoring in 2008. This figure is plotted at a scale of 1" = 1600'.

Alluvial wells 914, 920, 921, 922 and 950 are located outside of the area presented on Figure 4.1-1. These upgradient wells are shown on Figure 3.2-1 in the previous report section.

The currently active injection and collection wells are labeled with different colors on Figure 4.1-1 so that they can be distinguished from monitoring wells. This figure also shows the wells used for irrigation water supply during the 2008 irrigation season. Table 4.1-1 presents basic well data for alluvial wells located on the Grants Project that have been used to define the alluvial ground water hydrology. Many additional alluvial wells outside of the Grants Project have also been used for that purpose. The basic well data table presents the location, well depth, casing diameter, water-level information, depth to the base of the alluvium and casing perforation intervals for each well.

Table 4.1-2 presents the same type of basic well data for alluvial wells in the Broadview and Felice Acres subdivisions. These two subdivisions are located just south of the Homestake property. Figure 4.1-1 shows the locations of the subdivision wells. Table 4.1-3 presents similar basic data for alluvial wells located in Murray Acres and Pleasant Valley Estates subdivisions.

Table 4.1-4 presents data for regional wells located outside of the subdivisions and the immediate Homestake property around the tailings sites (Grants Project). Wells outside the area delineated with a heavy blue boundary line on Figure 4.1-1 are considered to be regional wells; data for these wells are presented in this table. Over 100 alluvial wells are included on the regional table, which brings the total number of alluvial wells used to characterize this site to more than 400. The wells are listed in numerical or alphabetical order based on their well names.



SCALE: 1"=1600'
C:\PROJECTS\2009-06\08-CO-IN-IRR rts
DATE: 03/02/09

FIGURE 4.1-1. ALLUVIAL WELL LOCATIONS

TABLE 4.1-1. WELL DATA FOR THE HOMESTAKE ALLUVIAL WELLS.

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL			MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO BASE OF ALLUVIUM (FT-LSD)	ELEV. TO BASE OF ALLUVIUM (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	SATURATED THICKNESS
					DATE	DEPTH (FT-MP)	ELEV. (FT-MSL)						
0690	1540279	493465	65.0	5.0	12/4/2008	37.25	6544.81	2.5	6582.06	55	6524.6 A	25-65	20.3
0691	1540276	493860	66.0	5.0	12/4/2008	43.67	6545.14	2.9	6588.81	55	6530.9 A	26-66	14.2
0891	1540904	493751	54.0	5.0	5/27/2008	54.36	6526.76	2.1	6581.12	50	6529.0 A	24-54	0.0
0892	1540954	494317	50.0	5.0	12/19/2002	41.96	6545.25	2.0	6587.21	42	6543.2 A	30-50	2.0
1A	1543790	493768	61.0	5.0	11/4/2008	38.40	6547.03	2.9	6585.43	47	6535.5 A	39-51	11.5
1B	1544502	494412	51.8	5.0	10/30/2001	38.70	6545.72	1.5	6584.42	50	6532.9 A	20-50	12.8
1C	1545018	494799	52.9	5.0	9/28/2000	43.26	6544.73	2.5	6587.99	43	6542.5 A	34-54	2.2
1D	1544142	494752	42.9	5.0	12/3/2005	26.42	6559.55	2.2	6585.97	40	6543.8 A	22-42	15.8
1E	1544481	494116	51.4	5.0	11/4/2008	27.96	6556.35	2.1	6584.31	43	6539.2 A	34-54	17.1
1F	1544952	493831	61.8	5.0	11/5/2008	42.03	6545.35	1.8	6587.38	54	6531.6 A	30-60	13.8
1G	1545034	494170	57.5	5.0	11/4/2008	40.46	6546.61	2.3	6587.07	48	6536.8 A	35-55	9.8
1H	1543363	494266	55.4	5.0	11/4/2008	55.08	6531.31	1.8	6586.39	43	6541.6 A	25-55	0.0
1I	1542627	493928	49.8	5.0	2/27/2008	35.51	6562.84	1.3	6598.35	35	6562.1 A	27-47	0.7
1J	1541986	493695	50.3	5.0	8/5/2008	3.80	6581.60	1.8	6585.40	40	6543.6 A	30-50	38.0
1K	1541992	493275	55.6	5.0	12/3/2008	36.06	6548.07	1.0	6584.13	47	6536.1 A	30-55	11.9
1L	1541256	493416	53.4	5.0	11/4/2008	27.46	6551.15	3.1	6578.61	40	6535.5 A	35-55	15.6
1M	1541327	493133	43.1	5.0	11/4/2008	26.94	6548.59	1.3	6575.53	33	6541.2 A	25-54	7.4
1N	1543100	494396	45.6	5.0	5/27/2008	32.45	6558.40	2.4	6590.85	25	6563.5 A	15-44	0.0
1O	1542592	494175	44.0	5.0	5/27/2008	43.76	6551.18	0.8	6594.94	29	6565.1 A	14-34	0.0
1P	1541902	493924	52.8	5.0	12/3/2008	36.21	6549.03	2.6	6585.24	35	6547.6 A	20-40	1.4
1Q	1541993	493619	56.0	5.0	12/2/2008	38.28	6544.83	1.9	6583.11	56	6525.2 A	36-56	19.6
1R	1542071	493623	56.0	5.0	12/2/2008	37.20	6548.79	1.3	6585.99	56	6528.7 A	36-56	20.1
1S	1541920	493614	56.0	5.0	8/5/2008	5.40	6576.59	1.5	6581.99	56	6524.5 A	36-56	52.0
1T	1541990	493656	56.0	5.0	12/2/2008	35.94	6548.97	1.7	6584.91	56	6527.2 A	36-56	21.8
1U	1542001	493542	44.2	4.0	12/2/2008	37.54	6548.68	3.2	6586.22	—	— A	-	—
1V	1541920	493550	61.4	5.0	12/2/2008	36.21	6545.79	1.7	6582.00	—	— A	-	—
* A1	1542365	491539	55.6	4.0	1/12/1994	45.29	6527.86	1.1	6573.15	55	6517.1 A	37-57	10.8
* A2	1542356	491539	46.4	4.0	12/23/1991	47.98	6608.64	1.1	6656.62	—	— A	27-47	—
B	1541684	489311	68.6	4.0	12/29/2008	35.33	6535.57	2.4	6570.90	60	6508.5 A	49-69	27.1
B1	1542071	489370	90.9	5.0	12/3/2008	40.52	6615.92	0.6	6656.44	82	6573.8 A	62-82	42.1
B2	1542475	489515	83.0	5.0	10/17/2006	42.08	6616.22	2.0	6658.30	72	6584.3 A	55-75	31.9
B3	1542480	489731	87.0	5.0	7/14/2008	68.00	6590.98	2.6	6658.98	77	6579.4 A	58-78	11.6
B4	1542471	489942	88.8	5.0	7/14/2008	64.98	6597.33	7.4	6662.31	82	6572.9 A	63-83	24.4
B5	1542474	490141	91.0	5.0	7/14/2008	57.60	6607.42	1.4	6665.02	81	6582.6 A	62-82	24.8
B6	1542478	490341	90.0	5.0	12/5/2000	48.94	6619.59	2.0	6668.53	80	6586.5 A	63-83	33.1
B7	1542488	490540	87.0	5.0	7/14/2008	45.88	6625.72	2.2	6671.60	77	6592.4 A	53-78	33.3

TABLE 4.1-1. WELL DATA FOR THE HOMESTAKE ALLUVIAL WELLS. (cont'd.)

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO BASE OF ALLUVIUM (FT-LSD)	ELEV. TO BASE OF ALLUVIUM (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	SATURATED THICKNESS
B8	1542488	490734	87.0	5.0	6/15/2005	40.30	6628.00	2.3	6668.30	77	6589.0 A	53-78	39.0
B9	1542514	490935	86.0	5.0	6/15/2005	40.03	6628.65	2.2	6668.68	76	6590.5 A	51-78	38.2
B10	1542517	491133	84.8	5.0	7/14/2008	48.91	6527.86	2.3	6576.77	75	6499.5 A	51-78	28.4
B11	1542517	491329	84.9	5.0	7/14/2008	53.00	6612.81	2.2	6665.81	77	6586.6 A	42-80	26.2
B12	1542524	488915	100.0	5.0	12/3/2008	42.28	6530.74	2.2	6573.02	91	6479.8 A	30-100	50.9
B13	1541841	490223	80.0	5.0	12/3/2008	37.19	6532.85	3.1	6570.04	72	6494.9 A	30-80	37.9
BA	1541835	489440	86.0	5.0	12/29/2008	39.95	6531.63	1.7	6571.58	76	6493.9 A	64-78	37.7
BB2	1543791	486213	56.6	4.0	11/15/2002	53.36	6520.44	0.6	6573.80	—	— A	42-62	—
BC	1543655	487910	82.8	4.0	12/3/2008	43.30	6531.31	2.6	6574.61	75	6497.0 A	63-83	34.3
BP	1541882	489841	85.4	4.0	8/21/2007	42.71	6529.59	3.0	6572.30	75	6494.3 A	40-85	35.3
* C	1541762	490854	79.7	4.0	5/16/1994	41.50	6529.34	0.3	6570.84	75	6495.5 A	59-79	33.8
C1	1541533	490780	76.0	5.0	10/27/2008	34.94	6621.79	0.8	6656.73	67	6588.9 A	41-68	32.9
C2	1541630	490566	76.0	5.0	10/27/2008	30.22	6629.78	0.9	6660.00	66	6593.1 A	42-67	36.7
* C3	1541344	490481	75.0	5.0	6/20/1994	36.20	6628.48	0.9	6664.68	65	6598.8 A	45-67	29.7
C3R	1541338	490472	75.0	5.0	3/7/2002	18.00	6551.29	2.0	6569.29	66	6501.3 A	43-68	50.0
C4	1541348	490675	75.0	5.0	10/2/2000	39.66	6626.95	1.3	6666.61	66	6599.3 A	46-66	27.6
C5	1541344	490869	72.0	5.0	10/24/2008	31.32	6639.79	0.8	6671.11	62	6608.3 A	43-63	31.5
C6	1541533	491142	80.8	5.0	6/17/2008	46.90	6623.85	1.6	6670.75	72	6597.2 A	34-74	26.7
C7	1541734	491280	72.4	5.0	6/17/2008	46.40	6623.99	1.5	6670.39	61	6607.9 A	25-65	16.1
C8	1541906	491415	78.1	5.0	6/17/2008	46.00	6625.80	1.6	6671.80	67	6603.2 A	31-71	22.6
C9	1542075	491545	77.0	5.0	6/17/2008	44.91	6626.31	1.5	6671.22	65	6604.7 A	27-67	21.6
C10	1542182	491629	71.6	5.0	6/17/2008	45.34	6626.90	2.7	6672.24	65	6604.5 A	30-70	22.4
C11	1542376	491844	68.2	5.0	6/17/2008	39.22	6627.22	2.4	6666.44	60	6604.0 A	35-65	23.2
C12	1542375	492029	63.5	5.0	6/17/2008	37.34	6543.21	2.6	6580.55	55	6523.0 A	34-64	20.3
C13	1541394	490655	63.0	5.0	11/9/2005	30.00	6540.01	2.0	6570.01	63	6505.0 A	36-70	35.0
C14	1541413	490713	63.0	5.0	11/9/2005	29.95	6539.74	2.0	6569.69	63	6504.7 A	36-70	35.0
* D	1542127	490118	89.7	4.0	7/28/1986	48.04	6524.85	0.8	6572.89	90	6482.1 A	71-91	42.8
D1	1542140	489615	89.4	4.0	7/2/2008	43.11	6615.14	1.0	6658.25	80	6577.3 A	58-90	37.9
D2	1542641	492107	70.0	5.0	11/29/1999	0.50	6654.64	3.0	6655.14	62	6590.2 A	40-70	64.5
D3	1542646	491917	80.0	5.0	11/29/1999	0.50	6658.47	2.5	6658.97	72	6584.5 A	40-80	74.0
D4	1542652	491724	78.0	5.0	11/29/1999	0.50	6660.53	2.5	6661.03	70	6588.5 A	48-78	72.0
DA	1542864	489488	99.1	5.0	12/4/1997	61.40	6524.15	3.0	6585.55	90	6492.6 A	50-100	31.6
DA2	1542881	489656	82.1	5.0	1/13/1995	51.11	6536.18	2.8	6587.29	83	6501.5 A	64-74	34.7
DA3	1542664	489390	81.0	5.0	7/14/2008	54.10	6520.26	2.6	6574.36	72	6499.8 A	30-81	20.5
DA4	1542598	489756	81.0	5.0	6/26/2002	76.50	6497.47	1.7	6573.97	71	6501.3 A	31-81	0.0
DAA	1542733	492411	62.7	5.0	12/5/2000	2.00	6578.60	2.2	6580.60	54	6524.4 A	30-60	54.2

TABLE 4.1-1. WELL DATA FOR THE HOMESTAKE ALLUVIAL WELLS. (cont'd.)

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO BASE OF ALLUVIUM (FT-LSD)	ELEV. TO BASE OF ALLUVIUM (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	SATURATED THICKNESS
DAB	1542633	492399	65.1	5.0	12/5/2000	0.50	6579.38	2.3	6579.88	56	6521.6 A	30-60	57.8
DAC	1543218	492851	67.7	5.0	—	—	—	4.1	6620.36	45	6571.3 A	20-30	—
DB	1542874	489842	73.2	5.0	9/8/1998	66.15	6523.33	0.5	6589.48	—	— A	55-85	—
DBR	1542877	489855	55.6	5.0	1/25/1995	52.19	6536.97	4.8	6589.16	—	— A	-	—
DC	1543646	487060	64.1	4.0	12/3/2008	39.98	6531.33	2.7	6571.31	—	— A	45-65	—
DD	1546989	488943	78.5	4.0	5/21/2008	53.90	6538.69	1.9	6592.59	83	6507.7 A	40-80	31.0
DD2	1547490	489420	94.3	5.0	12/4/2008	51.63	6538.37	2.0	6590.00	—	— A	-	—
DE	1542877	490193	70.2	5.0	10/5/1998	63.70	6527.65	0.8	6591.35	80	6510.6 A	60-90	17.1
DF	1542839	490869	88.5	5.0	5/23/2002	65.06	6525.53	0.6	6590.59	—	— A	65-95	—
DG	1542839	491157	88.9	5.0	5/23/2002	59.80	6531.98	0.4	6591.78	—	— A	65-95	—
DH	1542835	491365	61.7	5.0	12/24/1991	52.65	6538.69	4.8	6591.34	—	— A	65-95	—
DI	1542821	491788	86.1	5.0	12/9/1997	57.87	6531.75	2.3	6589.62	75	6512.3 A	35-85	19.4
DIA	1542821	491793	—	4.0	12/23/1991	50.41	6543.22	1.4	6593.63	—	— A	-	—
DJ	1542821	491793	85.7	5.0	8/24/1988	46.87	6542.69	0.7	6589.56	75	6513.9 A	35-85	28.8
DK	1542799	492094	65.4	5.0	12/23/1991	43.58	6542.33	0.7	6585.91	55	6530.2 A	35-55	12.1
DL	1542813	492398	64.4	5.0	12/5/2000	2.00	6582.87	2.9	6584.87	55	6527.0 A	35-55	55.9
DM	1542628	490035	62.8	5.0	12/14/2000	52.00	6523.08	3.0	6575.08	—	— A	-	—
DN	1542776	490020	66.7	4.0	12/14/2000	51.52	6525.14	3.7	6576.66	—	— A	-	—
DNR	1542779	490031	79.7	4.0	12/5/2000	51.80	6525.26	3.3	6577.06	—	— A	-	—
DO	1542874	490049	75.8	5.0	12/5/2000	65.20	6525.13	1.6	6590.33	75	6513.7 A	65-75	11.4
DP	1542754	491012	79.8	5.0	6/26/2002	53.46	6526.25	3.5	6579.71	—	— A	-	—
DQ	1542592	491006	85.3	5.0	7/11/2002	48.10	6528.33	2.2	6576.43	—	— A	-	—
DR	1542884	489966	87.8	5.0	12/5/2000	66.05	6524.78	2.7	6590.83	85	6503.1 A	65-85	21.6
DS	1542876	490118	87.0	5.0	8/2/1999	65.22	6523.59	0.9	6588.81	77	6510.9 A	62-77	12.7
DT	1542871	489293	72.3	5.0	12/5/2000	59.80	6524.01	2.7	6583.81	99	6482.1 A	59-99	41.9
DU	1542879	490380	84.6	5.0	7/6/1988	51.56	6539.51	2.9	6591.07	81	6507.2 A	61-81	32.3
DV	1542826	490702	80.0	5.0	8/28/2006	54.64	6530.96	2.9	6585.60	77	6505.7 A	60-80	25.3
DW	1542818	492029	73.4	5.0	12/5/2000	2.50	6586.16	3.6	6588.66	59	6526.1 A	45-60	60.1
DX	1542838	491074	90.0	6.0	8/2/1999	61.80	6530.18	1.0	6591.98	80	6511.0 A	60-90	19.2
DY	1542737	492271	65.7	5.0	12/5/2000	1.50	6579.11	2.3	6580.61	56	6522.3 A	15-65	56.8
DZ	1542834	491501	81.8	5.0	12/29/2008	51.15	6539.38	2.2	6590.53	—	— A	-	—
E	1540553	490187	61.7	4.0	12/5/2000	2.00	6566.94	1.7	6568.94	60	6507.2 A	44-64	59.7
EE	1542853	490523	91.2	5.0	1/31/1995	45.26	6542.85	0.6	6588.11	80	6507.5 A	50-90	35.3
F	1539908	489554	63.8	4.0	12/3/2008	32.22	6532.60	1.2	6564.82	62	6501.6 A	45-65	31.0
FB	1540417	488857	62.0	4.0	9/8/2008	36.04	6529.62	2.0	6565.66	58	6505.7 A	43-58	24.0
* FF	1542878	490017	—	4.0	6/21/1983	41.08	6535.46	0.2	6576.54	124	6452.3 A	52-132	83.1

TABLE 4.1-1. WELL DATA FOR THE HOMESTAKE ALLUVIAL WELLS. (cont'd.)

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO BASE OF ALLUVIUM (FT-LSD)	ELEV. TO BASE OF ALLUVIUM (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	SATURATED THICKNESS
G	1538672	488890	78.3	4.0	12/13/2004	4.00	6559.09	2.0	6563.09	75	6486.1 A	50-80	73.0
GA	1538657	489255	—	4.0	12/3/2008	34.92	6527.87	1.8	6562.79	62	6499.0 A	45-65	28.9
GB	1538654	489456	65.2	4.0	4/3/2000	4.00	6558.99	1.9	6562.99	64	6497.1 A	45-65	61.9
GC	1538650	489654	—	4.0	12/11/2003	33.82	6531.35	2.5	6565.17	78	6484.7 A	60-80	46.7
GD	1538646	489855	—	4.0	12/4/1995	0.50	6565.12	1.8	6565.62	72	6491.8 A	55-75	73.3
GE	1538637	489972	117.0	4.0	12/11/2003	34.61	6531.66	2.4	6566.27	65	6498.9 A	50-120	32.8
GF	1538632	490097	119.2	4.0	12/3/2008	35.21	6530.80	1.8	6566.01	67	6497.2 A	50-120	33.6
GG	1538662	489055	58.7	4.0	4/3/2000	4.00	6559.13	1.8	6563.13	57	6504.3 A	48-68	54.8
GH	1538807	489509	69.2	4.0	12/3/2008	34.02	6528.74	1.3	6562.76	67	6494.5 A	55-65	34.3
GI	1538631	490218	119.0	4.0	4/3/2000	4.00	6561.85	1.5	6565.85	67	6497.4 A	50-120	64.5
GJ	1538629	490382	119.2	4.0	4/3/2000	4.00	6562.15	2.0	6566.15	65	6499.2 A	50-120	63.0
GK	1538622	490482	115.7	4.0	12/3/2008	35.60	6531.16	2.4	6566.76	67	6497.4 A	50-120	33.8
GL	1538614	490701	119.3	4.0	4/3/2000	4.00	6563.15	2.1	6567.15	71	6494.1 A	50-120	69.1
GM	1538605	490824	118.2	4.0	4/3/2000	4.00	6563.65	2.1	6567.65	69	6496.6 A	50-120	67.1
GN	1538602	490944	116.5	4.0	10/27/2008	39.16	6528.81	1.8	6567.97	70	6496.2 A	50-120	32.6
GO	1538663	488973	122.3	4.0	4/3/2000	4.00	6559.00	1.6	6563.00	75	6486.4 A	50-120	72.6
GP	1538649	489752	121.4	4.0	12/5/2000	5.00	6559.87	2.1	6564.87	68	6494.8 A	50-120	65.1
GQ	1538599	491067	70.0	4.0	12/3/2008	1.38	6566.78	0.9	6568.16	71	6496.3 A	50-70	70.5
GR	1538619	490619	85.0	4.0	12/23/1991	36.55	6528.66	1.0	6565.21	75	6489.2 A	50-85	39.5
GS	1538597	491408	86.4	5.0	12/5/2000	33.00	6541.31	2.0	6574.31	80	6492.3 A	50-85	49.0
GT	1538534	491565	84.0	5.0	12/5/2000	8.30	6567.87	2.1	6576.17	76	6498.1 A	60-84	69.8
GU	1538367	491854	80.0	5.0	3/7/2002	15.00	6560.65	2.0	6575.65	73	6500.7 A	60-80	60.0
GV	1537701	491428	83.0	5.0	12/3/2008	50.91	6526.47	2.5	6577.38	74	6500.9 A	62-82	25.6
GW1	1539755	490530	73.0	5.0	12/3/2008	32.05	6533.22	1.0	6565.27	65	6499.3 A	48-73	34.0
GW2	1539471	490497	75.0	5.0	12/3/2008	32.26	6533.82	1.0	6566.08	68	6497.1 A	47-75	36.7
GW3	1539532	490835	72.0	5.0	5/4/1993	34.42	6531.86	1.0	6566.28	62	6503.3 A	45-72	28.6
H	1538703	490582	69.3	4.0	12/23/1991	37.93	6528.65	1.8	6566.58	69	6495.8 A	50-70	32.9
I	1539319	490954	70.0	4.0	6/16/2008	34.65	6532.55	1.6	6567.20	68	6497.6 A	52-72	34.9
J	1540174	491302	65.6	4.0	12/5/2000	6.00	6564.19	3.4	6570.19	56	6510.8 A	46-68	53.4
J1	1540082	491585	57.0	6.0	12/5/2000	18.80	6553.05	3.8	6571.85	55	6513.1 A	50-57	40.0
J2	1540271	491013	58.0	6.0	12/5/2000	26.00	6544.19	2.9	6570.19	55	6512.3 A	50-58	31.9
J3	1540414	490499	70.0	6.0	12/5/2000	27.40	6541.74	2.6	6569.14	66	6500.5 A	43-70	41.2
J4	1540643	489974	80.0	6.0	12/5/2000	18.00	6551.52	3.9	6569.52	68	6497.6 A	40-70	53.9
J5	1540728	489747	65.0	6.0	12/5/2000	10.55	6559.24	2.8	6569.79	61	6506.0 A	50-65	53.2
J6	1540919	489221	67.0	6.0	12/5/2000	7.10	6563.00	3.7	6570.10	65	6501.4 A	48-67	61.6
J7	1540168	491892	61.9	5.0	12/5/2000	19.50	6550.88	2.1	6570.38	53	6515.3 A	40-60	35.6

TABLE 4.1-1. WELL DATA FOR THE HOMESTAKE ALLUVIAL WELLS. (cont'd.)

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO BASE OF ALLUVIUM (FT-LSD)	ELEV. TO BASE OF ALLUVIUM (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	SATURATED THICKNESS
J8	1540318	492064	63.2	5.0	12/5/2000	23.30	6547.49	2.4	6570.79	52	6516.4 A	35-61	31.1
J9	1540101	491759	68.0	5.0	12/5/2000	24.60	6546.60	2.0	6571.20	58	6511.2 A	36-68	35.4
J10	1540138	491436	66.0	5.0	12/5/2000	18.00	6552.91	3.5	6570.91	36	6531.4 A	66-	21.5
J11	1540545	490909	66.0	5.0	12/5/2000	12.00	6557.86	2.0	6569.86	55	6512.9 A	36-66	45.0
J12	1540827	490466	70.0	5.0	12/5/2000	18.44	6551.86	3.0	6570.30	60	6507.3 A	40-70	44.6
J13	1540451	492218	55.0	5.0	2/5/2002	4.00	6564.40	1.8	6568.40	46	6520.6 A	15-55	43.8
J14	1540585	492367	55.0	5.0	2/5/2002	12.90	6556.08	1.7	6568.98	44	6523.3 A	15-55	32.8
J15	1540719	492521	55.0	4.0	2/5/2002	3.10	6566.53	2.2	6569.63	46	6521.4 A	15-55	45.1
JC	1540215	491240	60.0	5.0	12/5/2000	22.10	6546.34	1.8	6568.44	50	6516.6 A	35-55	29.7
K	1540730	491590	61.7	4.0	8/12/2002	2.00	6571.51	3.8	6573.51	60	6509.7 A	44-64	61.8
K2	1540736	491587	58.9	4.0	7/19/2005	19.40	6552.81	2.5	6572.21	58	6511.7 A	46-56	41.1
K3	1540744	491571	56.7	2.0	7/19/2005	19.10	6551.57	1.3	6570.67	—	— A	53-58	—
K4	1541211	492371	86.2	5.0	10/22/2008	68.00	6534.02	2.5	6602.02	80	6519.5 A	65-85	14.5
K5	1541269	491935	86.4	5.0	10/22/2008	65.10	6536.63	2.8	6601.73	80	6518.9 A	55-85	17.7
K6	1540689	491459	58.0	5.0	3/6/2002	13.00	6557.07	2.0	6570.07	—	— A	33-58	—
K7	1541232	492237	86.0	5.0	10/22/2008	62.80	6538.73	2.0	6601.53	79	6520.5 A	56-86	18.2
K8	1541250	492081	86.0	5.0	10/22/2008	58.33	6542.16	2.0	6600.49	78	6520.5 A	66-86	21.7
K9	1541287	491787	86.0	5.0	10/22/2008	62.00	6538.34	2.0	6600.34	79	6519.3 A	56-86	19.0
K10	1541305	491638	87.0	5.0	10/22/2008	69.80	6531.01	2.0	6600.81	81	6517.8 A	47-87	13.2
K11	1541325	491490	84.0	5.0	10/22/2008	66.08	6534.53	2.0	6600.61	78	6520.6 A	64-84	13.9
KA	1540959	491331	67.8	5.0	8/12/2002	13.00	6559.19	1.9	6572.19	65	6505.3 A	42-72	53.9
KB	1540893	491406	61.8	5.0	8/12/2002	0.60	6571.05	0.8	6571.65	60	6510.9 A	40-70	60.2
KC	1540826	491477	68.6	5.0	8/12/2002	0.50	6569.81	0.7	6570.31	59	6510.6 A	42-72	59.2
KD	1540627	491701	62.1	5.0	8/12/2002	1.10	6569.12	0.6	6570.22	—	— A	40-70	—
KE	1540566	491776	60.8	5.0	8/12/2002	9.10	6563.18	2.5	6572.28	—	— A	40-70	—
KEB	1540570	491487	59.9	5.0	7/15/2008	24.38	6545.35	1.5	6569.73	50	6518.2 A	40-60	27.1
KF	1540870	491169	63.5	5.0	7/16/2008	28.76	6541.45	2.2	6570.21	50	6518.0 A	30-60	23.4
KM	1540671	491444	52.4	5.0	3/6/2002	12.20	6557.57	2.2	6569.77	—	— A	-	—
KN	1540734	491492	50.1	5.0	10/11/2002	8.36	6561.23	2.3	6569.59	—	— A	-	—
KZ	1541100	491183	58.4	5.0	12/29/2008	31.14	6540.58	1.2	6571.72	—	— A		—
L	1538970	492150	67.0	4.0	10/21/2008	47.70	6527.27	0.8	6574.97	59	6515.2 A	46-66	12.1
L5	1539946	492730	60.2	5.0	10/21/2008	58.00	6518.07	1.3	6576.07	50	6524.8 A	25-55	0.0
L6	1540526	493110	51.1	5.0	10/22/2008	27.50	6547.14	2.1	6574.64	50	6522.5 A	25-55	24.6
L7	1540113	492842	67.8	5.0	10/21/2008	46.68	6529.93	2.3	6576.61	62	6512.3 A	36-66	17.6
L8	1539773	492621	73.9	5.0	10/21/2008	54.00	6522.49	2.1	6576.49	65	6509.4 A	32-72	13.1
L9	1539509	492463	74.9	5.0	10/21/2008	46.30	6530.93	2.2	6577.23	64	6511.0 A	43-73	19.9

TABLE 4.1-1. WELL DATA FOR THE HOMESTAKE ALLUVIAL WELLS. (cont'd.)

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO BASE OF ALLUVIUM (FT-LSD)	ELEV. TO BASE OF ALLUVIUM (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	SATURATED THICKNESS
L10	1539250	492310	74.2	5.0	10/21/2008	45.98	6530.85	2.0	6576.83	63	6511.8 A	53-73	19.0
M1	1542797	489157	103.4	4.0	1/3/1989	79.80	6505.17	1.5	6584.97	120	6463.5 A	66-106	41.7
M2	1542785	489159	40.4	4.0	1/20/1995	34.85	6541.41	1.4	6576.26	—	— A	-	—
M3	1542805	489151	105.3	4.0	7/14/2008	60.23	6515.87	1.0	6576.10	—	— A	79-99	—
M3R	1542926	489078	115.0	5.0	12/15/2004	50.70	6529.56	2.1	6580.26	108	6470.2 A	55-115	59.4
M4	1542804	489134	81.8	5.0	10/31/2000	56.72	6521.54	3.7	6578.26	—	— A	78-82	—
M5	1542360	489080	92.3	5.0	12/3/2008	44.17	6531.17	3.2	6575.34	84	6488.1 A	60-90	43.0
M6	1543097	486674	110.0	5.0	12/3/2008	64.42	6510.62	2.2	6575.04	65	6507.9 A	60-110	2.8
M7	1542790	486523	83.0	5.0	12/3/2008	59.36	6513.49	2.4	6572.85	71	6499.4 A	63-83	14.1
M8	1542960	486567	83.0	5.0	9/5/2000	33.71	6541.52	2.4	6575.23	57	6515.8 A	53-83	25.7
M9	1543310	486699	103.0	5.0	12/3/2008	65.05	6511.76	3.5	6576.81	78	6495.3 A	63-103	16.4
M10	1543677	486723	88.0	5.0	12/3/2008	56.60	6516.76	2.3	6573.36	86	6485.1 A	58-88	31.7
M11	1542358	486486	118.0	5.0	12/8/2003	53.98	6519.24	3.2	6573.22	109	6461.0 A	58-118	58.2
M12	1542174	487209	124.0	5.0	12/5/2000	3.87	6569.64	2.5	6573.51	118	6453.0 A	57-124	116.7
M13	1542450	487336	117.0	5.0	12/5/2000	29.81	6546.35	3.0	6576.16	108	6465.2 A	57-117	81.2
M14	1542661	487216	117.0	5.0	12/5/2000	29.42	6547.75	2.7	6577.17	109	6465.5 A	57-117	82.3
M15	1542872	487094	102.0	5.0	12/5/2000	3.71	6575.37	3.5	6579.08	93	6482.6 A	52-102	92.7
M16	1543252	485112	93.3	5.0	12/8/2008	63.41	6507.18	1.4	6570.59	100	6469.2 A	60-100	38.0
MA	1541290	487767	85.0	4.0	12/3/2008	44.63	6527.59	1.0	6572.22	85	6486.2 A	70-85	41.4
MB	1541296	487512	90.0	4.0	9/5/2000	2.05	6570.01	1.0	6572.06	85	6486.1 A	60-90	84.0
MC	1541304	487264	100.0	4.0	12/3/2008	46.75	6525.31	1.0	6572.06	95	6476.1 A	70-100	49.3
MD	1541311	487050	105.0	4.0	9/5/2000	2.00	6569.46	1.0	6571.46	105	6465.5 A	75-105	104.0
ME	1541537	486934	105.0	4.0	9/5/2000	1.61	6569.31	1.0	6570.92	105	6464.9 A	75-105	104.4
MF	1541757	486808	110.0	4.0	12/3/2008	50.22	6522.06	1.0	6572.28	110	6461.3 A	90-110	60.8
MG	1541972	486694	110.0	4.0	9/5/2000	1.72	6571.36	1.0	6573.08	110	6462.1 A	90-110	109.3
MH	1542208	486569	110.0	4.0	12/3/2008	54.56	6519.36	1.0	6573.92	110	6462.9 A	90-110	56.4
MI	1542486	486413	110.0	4.0	9/5/2000	2.24	6574.03	1.0	6576.27	110	6465.3 A	90-110	108.8
MJ	1542682	486350	60.0	4.0	12/3/2008	54.10	6518.84	1.8	6572.94	60	6511.1 A	40-60	7.7
MK	1543373	486324	57.0	4.5	12/3/2008	59.90	6513.89	1.5	6573.79	92	6480.3 A	-	33.6
ML	1543902	486691	76.0	5.0	12/3/2008	53.18	6519.52	2.3	6572.70	80	6490.4 A	56-76	29.1
MM	1544154	486324	63.0	5.0	9/5/2000	3.46	6573.99	2.4	6577.45	50	6525.1 A	33-63	48.9
MN	1544613	486325	63.0	5.0	12/18/1996	64.15	6513.41	1.9	6577.56	42	6533.7 A	23-63	0.0
MO	1543620	485518	88.0	4.5	12/8/2008	65.30	6507.59	2.0	6572.89	80	6490.9 A	45-85	16.7
MP	1544164	485492	80.0	5.0	12/18/1996	62.66	6511.82	2.1	6574.48	50	6522.4 A	33-63	0.0
MQ	1543173	486326	98.0	5.0	12/3/2008	66.30	6508.00	1.6	6574.30	88	6484.7 A	58-98	23.3
MR	1542609	483574	100.0	5.0	12/8/2008	67.67	6498.59	1.8	6566.26	100	6464.5 A	54-94	34.1

TABLE 4.1-1. WELL DATA FOR THE HOMESTAKE ALLUVIAL WELLS. (cont'd.)

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO BASE OF ALLUVIUM (FT-LSD)	ELEV. TO BASE OF ALLUVIUM (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	SATURATED THICKNESS
MS	1542607	485570	82.0	5.0	12/8/2008	62.95	6507.72	1.5	6570.67	89	6480.2 A	52-82	27.6
MT	1543221	483531	98.0	4.5	11/3/2008	60.90	6506.53	2.3	6567.43	87	6478.1 A	34-94	28.4
MU	1544461	487143	80.0	5.0	12/3/2008	37.52	6536.67	1.5	6574.19	72	6500.7 A	50-80	36.0
MV	1542618	484418	105.0	4.5	12/8/2008	67.55	6502.23	1.3	6569.78	95	6473.5 A	75-105	28.7
MW	1543802	486346	85.0	5.0	12/3/2008	68.21	6506.70	1.9	6574.91	83	6490.0 A	35-85	16.7
MX	1541287	486244	103.0	5.0	3/5/2008	53.05	6515.56	1.7	6568.61	94	6472.9 A	63-103	42.7
MY	1542200	486213	112.0	5.0	11/3/2008	59.34	6514.22	3.0	6573.56	102	6468.6 A	72-112	45.7
MZ	1543485	486757	92.0	5.0	12/3/2008	67.36	6509.28	3.0	6576.64	84	6489.6 A	60-92	19.6
N	1545101	489665	92.0	4.0	11/3/2008	44.48	6539.49	0.9	6583.97	80	6503.1 A	54-94	36.4
NA	1545000	491488	91.4	5.0	10/28/2008	49.67	6541.31	1.1	6590.98	80	6509.9 A	50-90	31.4
NB	1545000	491296	96.4	5.0	10/28/2008	48.31	6544.99	3.5	6593.30	80	6509.8 A	50-90	35.2
NC	1545220	491282	95.0	4.0	12/3/2008	45.42	6540.41	0.8	6585.83	85	6500.0 A	65-95	40.4
ND	1545927	494872	70.0	4.0	5/19/2008	46.38	6546.51	1.1	6592.89	65	6526.8 A	50-70	19.7
NE5	1544279	492332	156.8	5.0	4/3/2007	57.00	6610.00	3.2	6667.00	150	— T	50-110	—
										150	6513.8 A	135-155	96.2
NW5	1544408	489433	149.8	5.0	5/29/2007	42.72	6614.86	2.7	6657.58	155	— T	39-79	—
										155	6499.9 A	119-159	115.0
O	1545060	492725	69.9	4.0	10/28/2008	43.61	6544.22	1.3	6587.83	77	6509.5 A	40-70	34.7
P	1546691	491058	109.1	4.0	10/8/2008	44.71	6542.55	1.7	6587.26	107	6478.6 A	82-112	64.0
P1	1547017	491060	105.0	6.0	11/28/2000	55.75	6536.72	0.8	6592.47	105	6486.7 A	60-105	50.1
P2	1546555	490912	105.0	6.0	2/5/2008	58.31	6531.48	0.9	6589.79	105	6483.9 A	60-105	47.6
P3	1546159	490785	95.0	5.0	10/22/2008	60.28	6529.67	2.2	6589.95	85	6502.8 A	55-95	26.9
P4	1546504	491899	92.0	5.0	10/22/2008	56.14	6533.38	3.6	6589.52	84	6501.9 A	52-92	31.5
PM	1541426	490292	81.9	4.0	1/12/2004	12.33	6555.09	1.8	6567.42	—	— A	-	—
Q	1548693	492153	98.3	4.0	5/19/2008	47.31	6546.51	2.3	6593.82	100	6491.5 A	72-102	55.0
R	1550372	494514	85.0	4.0	5/19/2008	42.00	6562.03	0.3	6604.03	95	6508.7 A	60-90	53.3
S	1543871	488816	72.2	4.0	12/3/2008	46.85	6534.32	2.0	6581.17	75	6504.2 A	52-72	30.2
S1	1543288	488401	85.0	2.0	12/29/2008	43.20	6531.99	5.3	6575.19	85	6484.9 A	60-85	47.1
S2	1543127	488299	100.0	3.0	12/29/2008	42.14	6531.58	2.0	6573.72	100	6471.7 A	90-100	59.9
S3	1542857	488714	122.6	5.0	12/3/2008	44.44	6530.34	6.2	6574.78	116	6452.6 A	80-120	77.8
S4	1543344	488359	112.4	5.0	12/3/2008	43.27	6532.02	2.3	6575.29	108	6465.0 A	50-110	67.0
S5	1543269	488923	115.0	5.0	12/29/2008	49.15	6525.54	1.0	6574.69	105	6468.7 A	54-106	56.8
S5R	1543150	488938	115.0	5.0	7/2/2007	53.00	6527.49	1.9	6580.49	109	6469.6 A	55-115	57.9
S6	1543515	488874	113.2	5.0	1/3/2000	55.85	6524.22	1.3	6580.07	105	6473.8 A	55-105	50.5
S7	1543763	488874	97.0	5.0	1/4/1999	57.38	6522.51	1.0	6579.89	82	6496.9 A	40-84	25.6
S8	1543968	488879	43.8	5.0	8/22/1995	43.28	6537.06	1.0	6580.34	40	6539.3 A	12-42	0.0

TABLE 4.1-1. WELL DATA FOR THE HOMESTAKE ALLUVIAL WELLS. (cont'd.)

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO BASE OF ALLUVIUM (FT-LSD)	ELEV. TO BASE OF ALLUVIUM (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	SATURATED THICKNESS
S11	1544793	488150	76.2	5.0	12/3/2008	31.66	6546.73	1.9	6578.39	70	6506.5 A	48-78	40.2
S12	1543297	488628	93.0	5.0	12/3/2008	47.95	6530.90	2.1	6578.85	80	6496.7 A	53-93	34.1
SA	1543122	488811	123.7	5.0	12/4/2008	59.43	6520.88	1.0	6580.31	115	6464.3 A	100-130	56.6
SB	1543371	488811	125.0	5.0	12/4/2008	49.34	6531.75	0.9	6581.09	115	6465.2 A	100-130	66.6
SC	1543617	488815	105.4	5.0	12/5/2000	57.11	6521.69	1.2	6578.80	103	6474.6 A	55-105	47.1
SD	1543490	488564	90.1	5.0	12/4/2008	41.50	6536.81	0.6	6578.31	107	6470.7 A	50-110	66.1
SD4	1543497	488556	95.0	5.0	12/4/2008	46.98	6531.79	1.1	6578.77	95	6482.7 A	45-95	49.1
SE	1543301	488550	111.8	5.0	12/3/2008	30.48	6547.51	0.5	6577.99	88	6489.5 A	50-90	58.0
SE4	1543308	488560	105.3	2.0	12/4/2008	46.91	6531.09	—	6578.00	—	— A	-	—
SE6	1543140	488650	92.0	5.0	12/3/2008	48.11	6530.89	2.3	6579.00	—	— A	-	—
SM	1543748	488566	86.0	5.0	12/3/2008	44.77	6533.97	0.7	6578.74	—	— A	-	—
SN	1543752	488716	67.5	4.0	12/3/2008	46.41	6532.85	1.1	6579.26	—	— A	-	—
SO	1543652	488381	92.3	5.0	12/29/2008	46.14	6532.65	0.6	6578.79	—	— A	-	—
SP	1543630	488531	94.4	4.0	12/29/2008	45.98	6532.68	2.0	6578.66	—	— A	-	—
SQ	1543507	488814	95.0	5.0	7/14/2008	59.67	6519.53	0.9	6579.20	95	6483.3 A	55-95	36.2
SR	1543611	488669	95.0	5.0	9/21/2007	47.54	6531.65	0.8	6579.19	95	6483.4 A	50-90	48.3
SS	1543374	488666	101.0	5.0	12/3/2008	50.00	6528.38	1.2	6578.38	90	6487.2 A	51-101	41.2
ST	1543215	488688	97.0	5.0	12/3/2008	49.71	6529.60	2.2	6579.31	96	6481.1 A	55-97	48.5
* SU	1542946	488953	110.0	5.0	9/5/1995	35.60	6542.50	0.7	6578.10	110	6467.4 A	50-110	75.1
SUR	1542991	488968	115.0	5.0	7/14/2008	58.28	6522.44	2.6	6580.72	106	6472.1 A	35-115	50.3
SV	1543676	488813	78.2	6.0	7/14/2008	50.27	6528.98	1.7	6579.25	100	6477.6 A	55-105	51.4
SW	1543783	488812	81.9	6.0	5/19/2008	50.31	6530.98	2.9	6581.29	75	6503.4 A	35-80	27.6
SX	1544510	489025	45.0	5.0	—	—	—	1.0	6581.49	40	6540.5 A	20-40	—
SZ	1544367	488833	62.6	5.0	12/3/2008	38.31	6543.16	2.2	6581.47	60	6519.3 A	40-70	23.9
T	1542536	492260	70.2	4.0	10/24/2008	34.88	6544.35	2.4	6579.23	68	6508.8 A	61-71	35.5
T1	1543285	490027	—	5.0	12/6/2002	102.40	6561.51	1.0	6663.91	161	6501.9 A	121-171	59.6
T2	1543538	489303	186.0	5.0	9/10/2008	124.84	6539.98	1.6	6664.82	180	6483.2 A	100-186	56.8
T4	1543340	489699	205.0	5.0	9/10/2008	89.10	6568.64	2.9	6657.74	175	6479.8 A	145-205	88.8
T5	1543307	490289	182.0	5.0	9/10/2008	121.24	6536.09	3.1	6657.33	151	6503.2 A	122-182	32.9
T6	1543282	490655	160.0	5.0	1/16/2008	122.10	6536.67	2.9	6658.77	156	6499.9 A	130-160	36.8
T7	1543272	491484	160.0	5.0	1/16/2008	120.20	6539.47	2.0	6659.67	142	6515.7 A	130-160	23.8
T8	1543296	491914	162.0	5.0	9/10/2008	120.74	6540.87	2.6	6661.61	158	6501.0 A	132-162	39.9
T9	1543347	492337	141.0	5.0	9/10/2008	120.14	6543.81	3.3	6663.95	138	6522.7 A	121-141	21.2
T10	1543434	492791	148.0	5.0	9/10/2008	105.64	6554.32	2.3	6659.96	142	6515.7 A	108-148	38.7
T11	1544585	489887	193.0	5.0	9/12/2008	118.38	6538.43	2.7	6656.81	160	6494.1 A	113-193	44.3
T12	1544583	490317	200.0	5.0	9/16/2008	82.68	6574.55	2.5	6657.23	170	6484.7 A	120-200	89.8

TABLE 4.1-1. WELL DATA FOR THE HOMESTAKE ALLUVIAL WELLS. (cont'd.)

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO BASE OF ALLUVIUM (FT-LSD)	ELEV. TO BASE OF ALLUVIUM (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	SATURATED THICKNESS
T17	1544008	489430	183.0	5.0	2/13/2008	122.08	6534.83	2.6	6656.91	170	6484.3 A	143-183	50.5
T18	1543977	490333	195.0	5.0	4/3/2006	130.22	6534.94	2.9	6665.16	162	6500.3 A	115-195	34.7
T19	1543958	490722	167.0	5.0	9/16/2008	125.90	6541.86	2.5	6667.76	162	6503.3 A	137-167	38.6
T20	1543935	491048	170.0	5.0	9/16/2008	129.76	6540.93	1.5	6670.69	162	6507.2 A	140-170	33.7
T21	1543951	491882	170.0	5.0	1/16/2008	109.00	6561.00	1.3	6670.00	163	6505.7 A	140-170	55.3
T22	1543876	492311	165.0	5.0	9/16/2008	109.00	6558.19	2.1	6667.19	160	6505.1 A	120-165	53.1
T40	1543819	491466	170.0	5.0	9/16/2008	129.20	6541.07	2.3	6670.27	165	6503.0 A	140-170	38.1
T41	1543278	491079	160.0	5.0	9/10/2008	120.08	6539.88	3.2	6659.96	155	6501.8 A	130-160	38.1
TA	1542471	492426	62.4	5.0	9/10/2008	35.13	6545.17	2.4	6580.30	55	6522.9 A	35-65	22.3
TB	1542351	492616	64.4	5.0	9/10/2008	37.92	6545.65	1.9	6583.57	55	6526.7 A	35-65	19.0
W	1542302	487297	99.3	4.0	12/3/2008	47.24	6524.90	0.3	6572.14	117	6454.8 A	58-118	70.1
W2	1542251	486654	79.1	4.0	3/2/1998	56.21	6515.29	0.9	6571.50	—	— A	-	—
WN4	1543958	489961	142.4	5.0	5/23/2007	68.40	6594.38	3.0	6662.78	165	— T	40-100	—
										165	6494.8 A	50-190	99.6
WR1	1541280	488529	—	5.0	6/27/1989	46.54	6521.86	0.8	6568.40	—	— A	-	—
WR1R	1541302	488536	85.0	5.0	12/5/2000	28.62	6539.85	0.0	6568.47	85	6483.5 A	-	56.4
WR2	1541290	488678	94.1	5.0	12/5/2000	2.52	6566.07	0.9	6568.59	85	6482.7 A	65-95	83.4
WR3	1541490	488671	82.3	5.0	12/5/2000	32.96	6536.58	2.7	6569.54	83	6483.8 A	63-93	52.7
WR4	1541788	488678	62.0	5.0	12/5/2000	1.92	6570.89	0.0	6572.81	—	— A	-	—
WR5	1541813	488683	72.4	5.0	12/5/2000	38.69	6532.54	0.6	6571.23	80	6490.6 A	60-80	41.9
WR6	1541902	488566	96.8	5.0	12/5/2000	3.04	6569.99	1.3	6573.03	84	6487.7 A	55-85	82.3
WR7	1541997	488456	97.3	5.0	12/5/2000	38.91	6534.82	2.0	6573.73	84	6487.8 A	55-85	47.0
WR8	1542095	488328	110.2	5.0	11/10/2008	26.40	6546.20	0.4	6572.60	100	6472.2 A	50-100	74.0
WR9	1542185	488217	111.3	5.0	12/5/2000	46.82	6526.23	0.8	6573.05	100	6472.3 A	50-100	54.0
WR10	1542389	487961	120.6	5.0	1/29/2003	14.84	6558.35	0.7	6573.19	110	6462.5 A	60-110	95.9
WR11	1542586	487728	120.5	5.0	1/29/2003	14.88	6559.61	0.3	6574.49	110	6464.2 A	60-110	95.4
WR12	1541280	488277	96.7	4.0	11/12/2007	30.85	6537.34	1.1	6568.19	85	6482.1 A	55-85	55.2
WR13	1541068	488861	70.0	5.0	12/5/2000	18.98	6550.19	3.2	6569.17	60	6506.0 A	50-60	44.2
WR14	1540638	488863	70.0	5.0	5/28/2003	15.50	6551.41	2.3	6566.91	61	6503.6 A	50-60	47.8
WR15	1541280	488016	70.0	4.0	5/28/2003	10.90	6560.29	0.0	6571.19	75	6496.2 A	60-75	64.1
WR16	1543051	487495	122.3	5.0	1/29/2003	6.54	6566.24	1.9	6572.78	100	6470.9 A	40-120	95.4
WR17	1543328	487485	124.4	5.0	1/29/2003	2.45	6570.64	2.2	6573.09	75	6495.9 A	40-120	74.7
WR18	1543597	487465	73.6	5.0	1/29/2003	2.97	6569.94	2.2	6572.91	70	6500.7 A	20-70	69.2
WR19	1543873	487458	87.8	5.0	1/29/2003	3.31	6571.62	2.2	6574.93	74	6498.7 A	25-85	72.9
WR20	1544059	487449	102.3	5.0	1/29/2003	3.98	6570.49	2.1	6574.47	80	6492.4 A	42-102	78.1
WR21	1544241	487449	88.9	5.0	1/29/2003	6.28	6569.77	2.1	6576.05	77	6497.0 A	28-88	72.8

TABLE 4.1-1. WELL DATA FOR THE HOMESTAKE ALLUVIAL WELLS. (cont'd.)

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO BASE OF ALLUVIUM (FT-LSD)	ELEV. TO BASE OF ALLUVIUM (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	SATURATED THICKNESS
WR22	1544434	487462	91.5	5.0	1/29/2003	3.44	6574.45	2.4	6577.89	86	6489.5 A	30-90	85.0
WR23	1544632	487445	94.3	5.0	1/29/2003	1.72	6574.75	2.2	6576.47	77	6497.3 A	32-92	77.5
WR24	1544938	487438	89.2	5.0	1/29/2003	2.04	6586.63	3.0	6588.67	82	6503.7 A	50-90	83.0
X	1540512	491892	50.7	4.0	12/29/2008	25.00	6546.61	1.7	6571.61	—	— A	-	—
X1	1540671	492129	54.0	5.0	8/12/2002	7.50	6650.68	3.9	6658.18	47	6607.3 A	37-47	43.4
X2	1540836	492363	53.0	6.0	8/12/2002	2.50	6569.43	1.9	6571.93	45	6525.0 A	40-45	44.4
X3	1540992	492599	52.0	5.0	8/12/2002	2.50	6570.78	2.0	6573.28	42	6529.3 A	32-42	41.5
X4	1541210	492814	54.0	5.0	8/12/2002	13.10	6563.84	3.2	6576.94	45	6528.7 A	37-45	35.1
X5	1541408	492821	44.0	6.0	8/12/2002	7.80	6569.81	3.6	6577.61	35	6539.0 A	24-36	30.8
X6	1541609	492828	46.0	6.0	8/12/2002	8.00	6570.72	3.5	6578.72	35	6540.2 A	22-37	30.5
X7	1541808	492851	56.0	6.0	12/5/2000	8.60	6571.83	3.4	6580.43	45	6532.0 A	32-46	39.8
X8	1542007	492852	61.0	5.0	12/5/2000	13.00	6568.76	3.4	6581.76	51	6527.4 A	32-52	41.4
X9	1542194	492852	61.0	5.0	12/5/2000	27.00	6555.92	3.6	6582.92	51	6528.3 A	24-52	27.6
X10	1542352	492835	61.0	5.0	8/12/2002	4.00	6578.43	3.6	6582.43	53	6525.8 A	30-55	52.6
X11	1542553	492782	57.0	5.0	12/5/2000	0.50	6581.50	3.0	6582.00	53	6526.0 A	17-57	55.5
X12	1542861	492852	57.0	5.0	12/5/2000	0.50	6582.83	3.0	6583.33	53	6527.3 A	17-57	55.5
X13	1543640	493665	56.0	5.0	4/9/2002	40.76	6546.18	2.5	6586.94	51	6533.4 A	16-56	12.7
X14	1544002	493777	56.0	5.0	4/9/2002	39.80	6546.40	2.1	6586.20	49	6535.1 A	16-56	11.3
X15	1544222	493800	57.0	5.0	4/9/2002	40.54	6542.37	2.3	6582.91	51	6529.6 A	17-57	12.8
X16	1544473	493795	47.0	5.0	4/9/2002	40.64	6544.15	2.3	6584.79	47	6535.5 A	22-47	8.7
X17	1544356	493793	55.0	5.0	4/9/2002	41.06	6544.78	3.3	6585.84	48	6534.6 A	35-55	10.2
X18	1544593	493569	57.0	5.0	9/10/2008	39.06	6547.02	2.9	6586.08	49	6534.2 A	37-57	12.8
X19	1544753	493437	63.0	5.0	11/17/2006	32.46	6552.74	4.2	6585.20	56	6525.1 A	33-63	27.7
X20	1544855	493256	71.0	5.0	11/17/2006	40.15	6545.58	5.0	6585.73	64	6516.8 A	31-71	28.8
X21	1543606	493894	55.0	5.0	12/5/2000	38.99	6547.34	2.7	6586.33	51	6532.6 A	35-55	14.7
X22	1543874	493946	56.0	5.0	12/5/2000	39.21	6546.49	2.6	6585.70	50	6533.1 A	36-56	13.4
X23	1544064	494012	56.0	5.0	12/5/2000	38.96	6546.98	2.8	6585.94	47	6536.1 A	36-56	10.8
X24	1544244	494011	56.0	5.0	12/5/2000	39.94	6545.78	2.6	6585.72	46	6537.1 A	36-56	8.7
X25	1544445	494042	53.0	5.0	12/5/2000	39.41	6546.22	2.8	6585.63	46	6536.9 A	33-53	9.3
X26	1544693	493702	53.0	5.0	12/5/2000	35.34	6552.30	2.8	6587.64	43	6541.8 A	33-53	10.5
X27	1544953	493374	71.0	5.0	11/17/2006	39.75	6545.55	6.0	6585.30	64	6515.4 A	31-71	30.2
X28	1540545	491971	56.0	5.0	8/12/2002	8.30	6561.66	2.0	6569.96	48	6520.0 A	16-56	41.7
X29	1540735	492256	51.0	5.0	8/12/2002	4.00	6566.03	2.0	6570.03	43	6525.0 A	11-51	41.0
X30	1540897	492493	51.0	5.0	8/12/2002	3.00	6569.53	2.0	6572.53	43	6527.5 A	11-51	42.0
X31	1541052	492731	51.0	5.0	8/12/2002	8.00	6566.13	2.0	6574.13	44	6528.1 A	11-51	38.0
Y	1541025	491256	60.8	4.0	10/15/2002	15.20	6557.68	2.4	6572.88	57	6513.5 A	54-59	44.2

TABLE 4.1-1. WELL DATA FOR THE HOMESTAKE ALLUVIAL WELLS. (cont'd.)

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO BASE OF ALLUVIUM (FT-LSD)	ELEV. TO BASE OF ALLUVIUM (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	SATURATED THICKNESS
Z	1540290	490701	73.9	4.0	12/5/2000	5.00	6564.22	0.6	6569.22	68	6500.6 A	60-70	63.6

Note: A = Alluvial Aquifer
MP = Measuring Point
LSD = Land Surface Datum
IN = Inches
FT = Feet
MSL = Mean Sea Level

TABLE 4.1-2. WELL DATA FOR THE ALLUVIAL AQUIFER BROADVIEW AND FELICE ACRES WELLS.

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO BASE OF ALLUVIUM (FT-LSD)	ELEV. TO BASE OF ALLUVIUM (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	SATURATED THICKNESS
					Broadview								
0410	1537459	489882	105.0	6.0	5/25/2005	40.47	6519.19	0.0	6559.66	75	6484.7 A	90-105	34.5
0411	1537400	489510	70.0	6.0	8/7/1996	35.10	6524.90	0.0	6560.00	70	6490.0 A	65-70	34.9
0412	1537940	488830	—	6.0	—	—	—	0.0	6561.00	—	— A	-	—
0413	1537900	490100	—	—	4/27/1994	35.25	6530.75	0.0	6566.00	—	— A	-	—
0421	1538450	491100	88.0	5.0	1/30/1996	37.58	6534.42	0.9	6572.00	92	6479.1 A	72-102	55.3
0422	1538440	490810	80.0	4.0	4/6/1994	32.82	6537.18	0.0	6570.00	75	6495.0 A	60-80	42.2
0423	1538223	490926	—	—	—	—	—	0.0	6570.00	—	— A	-	—
0425	1538430	490630	90.0	6.0	4/7/1994	32.42	6534.58	0.0	6567.00	71	6496.0 A	50-90	38.6
0426	1538230	490620	100.0	—	11/10/1981	30.65	6534.35	0.0	6565.00	80	6485.0 A	80-100	49.4
0427	1538450	490410	121.0	6.0	4/12/1994	35.00	6535.00	0.0	6570.00	81	6489.0 A	62-120	46.0
0428	1538367	490435	110.0	4.0	—	—	—	0.0	6570.00	66	6504.0 A	83-104	—
0429	1538210	490430	100.0	6.0	9/1/1995	37.21	6532.79	0.0	6570.00	74	6496.0 A	58-75	36.8
0430	1538469	490300	145.0	—	—	—	—	0.0	6568.00	72	6496.0 A	-	—
										72	6433.0 U	-	—
0431	1538045	490090	130.0	6.0	4/12/1994	35.00	6533.00	0.0	6568.00	60	6508.0 A	125-130	25.0
										60	6450.0 U	125-130	83.0
0432	1538210	489840	—	—	—	—	—	0.0	6565.00	—	— A	-	—
0433	1538220	489620	90.0	4.0	5/2/1997	36.05	6527.95	1.5	6564.00	75	6487.5 A	58-84	40.5
0435	1538220	489300	85.0	6.0	3/25/2003	34.48	6526.52	1.3	6561.00	85	6474.7 A	-	51.8
0438	1537854	490840	120.0	4.0	—	—	—	0.0	6571.00	105	6466.0 A	70-100	—
0439	1537940	490490	97.0	4.0	8/7/1996	39.80	6527.20	0.0	6567.00	75	6492.0 A	77-97	35.2
0440	1537700	490230	—	—	—	—	—	0.0	6566.00	—	— A	-	—
0441	1537720	490090	116.0	6.0	1/30/1995	35.19	6530.81	0.0	6566.00	78	6488.0 A	106-116	42.8
0442	1537940	489840	100.0	4.0	8/7/1996	37.15	6527.85	0.0	6565.00	80	6485.0 A	70-100	42.8
0443	1537940	489280	—	4.0	—	—	—	0.0	6561.00	75	6486.0 A	60-80	—
0444	1537940	489180	80.0	4.0	5/18/1994	28.84	6532.16	0.0	6561.00	—	— A	-	—
0445	1537720	489300	108.0	6.0	—	—	—	0.0	6561.00	79	6482.0 A	75-105	—
0446	1537830	488960	110.0	6.0	9/8/1983	41.28	6518.72	0.0	6560.00	60	6500.0 A	60-95	18.7
										60	6500.0 U	60-95	18.7
0447	1537490	490480	142.0	6.0	4/11/1985	41.18	6526.82	0.0	6568.00	80	6488.0 A	120-142	38.8
										80	6430.0 U	120-142	96.8
0448	1537400	489100	—	—	—	—	—	0.0	6561.00	—	— A	-	—
0450	1537448	490763	—	6.0	1/25/1995	42.29	6528.71	0.0	6571.00	85	6486.0 A	70-105	42.7
* 0451	1537700	490600	—	—	—	—	—	0.0	0.00	—	— A	-	—
0452	1537880	490420	100.0	4.0	8/7/1996	41.20	6525.80	0.8	6567.00	85	6481.2 A	40-100	44.6

TABLE 4.1-2. WELL DATA FOR THE ALLUVIAL AQUIFER BROADVIEW AND FELICE ACRES WELLS. (cont'd.)

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO BASE OF ALLUVIUM (FT-LSD)	ELEV. TO BASE OF ALLUVIUM (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	SATURATED THICKNESS
0453	1538375	490300	110.0	4.0	7/1/2002	34.93	6533.07	0.9	6568.00	80	6487.1 A	60-110	46.0
* 0454	1537920	489025	—	4.0	—	—	—	0.0	0.00	—	— A	-	—
0455	1537804	490737	—	—	—	—	—	—	—	—	— A	-	—
0456	1538240	490060	—	—	—	—	—	—	—	—	— A	-	—
SUB1	1537620	489100	—	4.0	10/9/2008	42.38	6518.62	0.0	6561.00	—	— A	-	—
SUB2	1537392	490370	—	4.0	5/4/2004	40.10	6527.47	0.0	6567.57	—	— A	-	—
SUB3	1538280	489420	84.0	6.0	10/9/2008	34.90	6522.17	0.0	6557.07	72	6485.1 A	56-72	37.1
SUB4	1538440	489840	100.0	4.0	9/21/1978	49.11	6515.89	0.0	6565.00	78	6487.0 A	60-85	28.9
SUB5	1537940	489470	86.0	4.0	—	—	—	0.0	6562.31	66	6496.3 A	55-80	—
SUB6	1537940	490090	82.0	4.0	—	—	—	0.0	6566.00	80	6486.0 A	52-82	—
SUB7	1537940	490630	98.0	4.0	—	—	—	0.0	6568.00	85	6483.0 A	78-98	—
SUB8	1538450	490210	150.0	5.0	—	—	—	0.0	6568.00	72	6496.0 A	60-90	—
SUB9	—	—	—	—	—	—	—	0.0	0.00	—	— A	-	—
						Felice Acres							
0481	1538350	490180	320.0	4.0	—	—	—	0.0	6568.00	110	6458.0 A	270-310	—
										110	6298.0 M	270-310	—
0482	1536981	489579	260.0	5.0	12/5/2008	38.00	6524.66	0.0	6562.66	80	6482.7 A	220-260	42.0
										80	6352.7 M	220-260	172.0
0483	1536586	489753	280.0	5.0	10/1/2008	50.70	6511.96	0.0	6562.66	40	6522.7 A	-	0.0
										40	6497.7 U	-	14.3
										40	6326.7 M	270-300	185.3
0490	1536553	489752	63.0	4.0	10/1/2008	51.10	6511.32	0.0	6562.42	75	6487.4 A	20-80	23.9
0491	1537031	489658	63.0	4.0	12/5/2008	40.10	6522.52	0.0	6562.62	40	6522.6 A	30-63	0.0
0492	1537220	489280	60.0	4.0	4/12/2006	35.46	6525.22	1.2	6560.68	55	6504.5 A	40-60	20.7
0495	1537400	497100	—	—	—	—	—	0.0	6571.00	—	— A	-	—
0496	1534650	489603	93.0	5.0	12/3/2008	59.83	6502.69	1.6	6562.52	86	6474.9 A	53-93	27.8
0497	1535039	489503	94.0	5.0	12/3/2008	59.14	6503.48	2.0	6562.62	89	6471.6 A	64-94	31.9
0498	1534661	488953	150.0	6.0	12/3/2008	62.62	6497.97	2.0	6560.59	80	6478.6 M	130-150	19.4
										80	6478.6 A	70-110	19.4
CW44	1535048	488891	208.0	6.0	12/5/2008	73.90	6486.84	2.5	6560.74	94	6464.2 A	-	22.6
										94	6428.2 M	69-208	58.6

Note: A = Alluvial Aquifer
MP = Measuring Point
LSD = Land Surface Datum
IN = Inches
FT = Feet
MSL = Mean Sea Level

TABLE 4.1-3. WELL DATA FOR THE ALLUVIAL AQUIFER MURRAY ACRES AND PLEASANT VALLEY WELLS.

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO BASE OF ALLUVIUM (FT-LSD)	ELEV. TO BASE OF ALLUVIUM (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	SATURATED THICKNESS
					Murray								
* 0801	1541020	488600	100.0	4.0	7/15/2004	39.20	6528.53	0.0	6567.73	85	6482.7 A	80-100	45.8
0801R	1541096	488431	90.0	5.0	11/4/2004	41.01	6528.04	3.0	6569.05	82	6484.1 A	60-90	44.0
0802	1540765	488277	98.0	6.0	12/29/2008	86.10	6476.62	2.0	6562.72	81	6479.7 A	75-81	0.0
0803	1540800	487430	—	6.0	9/19/1983	84.86	6476.14	0.0	6561.00	85	— C	85-180	—
										85	6476.0 A	85-180	0.1
0804	1540790	486790	137.0	6.0	4/28/2008	47.00	6515.00	0.0	6562.00	85	6477.0 A	125-136	38.0
0805	1540818	486241	140.0	5.0	10/6/1994	59.34	6507.66	0.0	6567.00	110	6457.0 A	100-140	50.7
0810	1540244	486563	105.0	6.0	—	—	—	0.0	6562.00	81	6481.0 A	75-101	—
0811	1540320	486373	140.0	4.0	—	—	—	0.0	6563.00	110	6453.0 A	100-140	—
0815	1539090	488100	255.0	4.0	5/22/1991	29.14	6526.12	0.0	6555.26	—	— A	-	—
0844	1538376	487002	75.0	4.0	8/13/2008	35.28	6520.85	1.2	6556.13	70	6484.9 A	35-75	35.9
0845	1537280	487833	65.0	4.0	12/1/2008	36.54	6520.51	1.7	6557.05	55	6500.4 A	45-65	20.2
AW	1540235	488015	156.0	6.0	12/4/2008	36.20	6527.23	0.1	6563.43	63	6500.3 A	-	26.9
										63	6463.3 U	66-155	63.9
HW	1540920	487435	115.0	6.0	11/9/1994	40.00	6517.00	0.0	6557.00	95	6462.0 A	60-94	55.0
					Pleasant Valley								
0525	1541283	486020	—	4.5	7/12/2002	55.36	6514.64	—	6570.00	—	— A	-	—
0688	1541257	483955	105.0	5.0	12/3/2008	62.40	6500.22	2.9	6562.62	95	6464.7 A	65-105	35.5
0831	1540090	486030	—	—	9/6/1983	54.95	6506.05	0.0	6561.00	—	— A	-	—
0833	1539335	485445	110.0	6.0	12/10/1996	46.61	6511.39	0.0	6558.00	103	6455.0 A	60-90	56.4
0834	1540259	484847	100.0	4.0	—	—	—	0.0	6560.00	80	6480.0 A	60-80	—
0835	1539610	484795	98.0	5.0	5/2/2000	49.74	6509.26	0.0	6559.00	94	6465.0 A	73-94	44.3
0836	1540250	484010	90.0	4.0	—	—	—	0.0	6558.00	80	6478.0 A	65-80	—
0838	1540600	485640	100.0	—	7/22/1995	49.03	6513.97	0.0	6563.00	—	— A	-	—
0839	1540782	485371	100.0	5.0	12/19/1994	50.00	6510.00	0.0	6560.00	94	6466.0 A	80-96	44.0
0840	1540440	485360	98.0	6.0	9/8/1983	47.32	6513.68	0.0	6561.00	94	6467.0 A	73-94	46.7
0841	1540835	485020	100.0	—	7/22/1995	54.66	6506.34	0.0	6561.00	—	— A	-	—
0843	1541411	485738	120.0	4.0	6/27/1989	52.40	6517.60	0.0	6570.00	112	6458.0 A	100-110	59.6

Note: A = Alluvial Aquifer
MP = Measuring Point
LSD = Land Surface Datum
IN = Inches
FT = Feet
MSL = Mean Sea Level

TABLE 4.1-4. WELL DATA FOR THE ALLUVIAL AQUIFER REGIONAL WELLS.

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL			MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO BASE OF ALLUVIUM (FT-LSD)	ELEV. TO BASE OF ALLUVIUM (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	SATURATED THICKNESS
					DATE	DEPTH (FT-MP)	ELEV. (FT-MSL)						
0520	1538934	492935	75.0	5.0	12/4/2008	52.21	6533.81	0.3	6586.02	68	6517.7 A	35-75	16.1
0521	1539104	492588	75.0	5.0	10/24/2008	49.26	6535.18	2.5	6584.44	65	6516.9 A	35-75	18.2
0522	1538640	492437	77.0	5.0	10/24/2008	51.19	6529.34	2.8	6580.53	68	6509.7 A	37-77	19.6
0523	1538680	492896	74.0	5.0	9/10/2002	2.00	6584.79	3.0	6586.79	62	6521.8 A	34-74	63.0
0524	1538889	493173	78.0	5.0	1/28/2003	3.47	6586.88	3.0	6590.35	70	6517.4 A	33-78	69.5
0531	1541086	478262	—	—	10/30/1996	79.24	6474.55	2.0	6553.79	—	— A	-	—
0532	1518700	482400	214.0	—	—	—	—	0.0	6515.00	—	— A	-	—
* 0533	—	—	195.0	—	—	—	—	0.0	6520.00	—	— A	-	—
0538	1533486	486899	170.0	6.0	12/4/2008	82.21	6466.73	2.0	6548.94	95	6451.9 A	50-90	14.8
										95	6413.9 L	130-170	52.8
0539	1534014	487596	210.0	6.0	12/4/2008	86.77	6468.55	2.0	6555.32	100	6453.3 A	80-100	15.2
										100	6453.3 A	50-70	15.2
										100	6378.3 L	170-210	90.2
0540	1534125	488091	90.0	6.0	12/4/2008	66.51	6489.40	2.7	6555.91	80	6473.2 A	30-90	16.2
0541	1539831	477236	120.0	5.0	12/4/2008	93.60	6462.02	2.0	6555.62	—	— A	78-118	—
0546	1536330	487560	160.0	5.0	—	—	—	—	6559.00	80	— A	-	—
										80	— M	130-160	—
0631	1532234	483756	118.0	6.0	12/4/2008	94.70	6446.40	2.2	6541.10	109	6429.9 A	58-118	16.5
0632	1531850	483767	110.0	6.0	12/4/2008	94.16	6447.14	1.4	6541.30	102	6437.9 A	70-110	9.2
0633	1541467	479642	83.0	8.0	12/8/2008	71.23	6486.33	0.0	6557.56	95	6462.6 A	11-83	23.8
0634	1541652	480362	103.0	4.5	12/8/2008	71.13	6488.94	2.8	6560.07	95	6462.3 A	80-100	26.7
0635	1535363	478401	63.0	12.0	—	—	—	—	6546.25	—	— A	4-63	—
0636	1545374	476038	123.0	4.5	11/17/2008	105.44	6468.00	2.3	6573.44	119	6452.1 A	103-123	15.9
0637	1545409	474710	124.0	4.5	11/17/2008	11.43	6563.77	2.5	6575.20	118	6454.7 A	104-124	109.1
0638	1539628	493265	75.0	5.0	12/4/2008	47.21	6538.35	0.0	6585.56	65	6520.6 A	35-75	17.8
0639	1539370	492961	80.0	5.0	10/24/2008	53.74	6534.14	2.5	6587.88	71	6514.4 A	35-80	19.8
0640	1537790	491961	84.0	5.0	12/4/2008	53.39	6526.58	2.2	6579.97	77	6500.8 A	64-84	25.8
0641	1536494	491110	95.0	5.0	2/28/2007	51.75	6521.61	2.5	6573.36	87	6483.9 A	65-95	37.8
0642	1536104	490932	95.0	5.0	2/28/2007	52.61	6519.27	2.4	6571.88	89	6480.5 A	65-95	38.8
0643	1533760	487386	108.0	5.0	10/16/2002	75.89	6475.44	1.5	6551.33	93	6456.8 A	58-108	18.6
0644	1533481	485450	110.0	5.0	12/4/2008	85.95	6457.95	2.0	6543.90	102	6439.9 A	55-110	18.1
0645	1532924	485282	80.0	5.0	12/11/2006	80.00	6463.79	2.5	6543.79	70	6471.3 A	60-80	0.0
0646	1533246	484953	100.0	5.0	12/1/2008	89.68	6453.67	1.5	6543.35	91	6450.9 A	60-100	2.8
0647	1536623	478308	140.0	4.5	12/4/2008	106.65	6445.26	1.4	6551.91	132	6418.5 A	80-140	26.7
0648	1534730	478343	120.0	4.5	12/4/2008	115.70	6432.09	2.0	6547.79	120	6425.8 A	80-120	6.3
0649	1534730	479798	124.0	4.5	12/4/2008	102.82	6440.47	0.3	6543.29	115	6428.0 A	84-124	12.5

TABLE 4.1-4. WELL DATA FOR THE ALLUVIAL AQUIFER REGIONAL WELLS. (cont'd.)

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO BASE OF ALLUVIUM (FT-LSD)	ELEV. TO BASE OF ALLUVIUM (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	SATURATED THICKNESS
0650	1536779	482135	109.0	4.5	12/4/2008	83.90	6463.21	2.2	6547.11	103	6441.9 A	89-109	21.3
0652	1531170	483779	88.0	5.0	12/4/2008	86.16	6451.99	1.5	6538.15	79	6457.7 A	60-88	0.0
0653	1533283	486570	206.0	6.0	12/4/2008	80.02	6464.95	1.6	6544.97	97	6446.4 A	69-206	18.6
										97	6408.4 L	-	56.6
0654	1541994	478636	120.0	4.5	12/8/2008	73.26	6477.24	1.4	6550.50	106	6443.1 A	60-120	34.1
0655	1541620	479830	96.0	8.0	6/2/2008	74.55	6483.63	—	6558.18	88	— A	21-84	—
0656	1542578	478333	88.0	8.0	10/23/2007	75.10	6478.97	—	6554.07	88	— A	6-88	—
0657	1537497	478392	128.0	6.0	12/4/2008	104.88	6446.93	2.2	6551.81	120	6429.6 A	87-128	17.3
0657A	1537083	478412	35.0	12.0	4/13/1999	37.00	6512.00	—	6549.00	—	— A	17-35	—
0658	1535922	478436	130.0	6.0	12/4/2008	108.50	6441.68	0.4	6550.18	129	6420.8 A	89-130	20.9
0659	1541689	480772	101.0	4.5	12/8/2008	71.11	6489.06	2.0	6560.17	97	6461.2 A	61-101	27.9
0680	1543850	478746	80.0	4.5	10/25/1996	77.39	6481.48	2.0	6558.87	75	6481.9 A	50-80	0.0
0681	1540676	482734	117.0	6.0	9/24/1998	64.18	6496.34	2.1	6560.52	111	6447.4 A	67-117	48.9
0682	1543125	477489	94.0	4.0	6/2/2008	83.64	6470.33	2.8	6553.97	102	6449.2 A	54-94	21.2
0683	1540198	476217	120.0	6.0	11/19/2008	93.76	6462.28	2.0	6556.04	140	6414.0 A	80-120	48.2
0684	1540273	478499	143.0	6.0	11/24/2008	89.14	6464.14	2.0	6553.28	118	6433.3 A	83-143	30.9
0685	1539098	478170	100.0	4.5	12/4/2008	100.17	6456.40	1.7	6556.57	116	6438.9 A	60-100	17.5
0686	1545319	475438	115.0	4.5	11/17/2008	113.82	6464.98	1.8	6578.80	136	6441.0 A	75-115	24.0
0687	1539011	477276	102.0	6.0	12/4/2008	99.05	6456.91	2.2	6555.96	120	6433.8 A	62-102	23.1
0689	1530024	478478	80.0	4.5	11/24/2008	83.65	6458.37	2.6	6542.02	75	6464.4 A	60-80	0.0
0692	1535892	493175	90.0	5.0	11/21/2008	67.14	6517.68	2.5	6584.82	80	6502.3 A	58-90	15.4
0846	1537219	484730	75.0	4.0	12/3/2008	45.58	6503.34	0.8	6548.92	65	6483.1 A	40-65	20.2
0847	1534736	488508	92.0	5.0	11/22/1996	53.88	6504.39	2.6	6558.27	80	6475.7 A	52-92	28.7
0848	1534634	490660	92.0	5.0	2/28/2007	60.78	6511.71	2.7	6572.49	91	6478.8 A	52-92	32.9
0851	1534692	483909	91.0	5.0	12/1/2008	89.13	6457.31	3.3	6546.44	80	6463.1 A	41-91	0.0
0852	1535610	493989	74.0	5.0	11/22/1996	73.26	6516.88	2.5	6590.14	70	6517.7 A	54-74	0.0
0855	1532111	484184	105.0	5.0	9/12/2007	94.00	6447.11	2.1	6541.11	97	6442.0 A	70-105	5.1
0861	1534332	488702	100.0	5.0	11/21/2008	73.31	6486.54	2.3	6559.85	65	6492.6 A	50-100	0.0
0862	1534265	487800	110.0	5.0	12/4/2008	64.81	6491.37	3.3	6556.18	97	6455.9 A	63-103	35.5
0863	1533867	487912	110.0	5.0	9/12/2007	96.08	6460.48	2.5	6556.56	94	6460.1 A	63-103	0.4
0864	1533735	486464	95.0	5.0	11/20/2008	79.06	6467.66	1.9	6546.72	78	6466.9 A	44-84	0.8
0865	1534123	488429	97.0	5.0	10/1/2008	79.00	6477.78	2.2	6556.78	88	6466.6 A	37-97	11.2
0866	1534494	488340	120.0	5.0	5/20/2008	70.10	6488.02	1.8	6558.12	80	6476.3 A	33-113	11.7
0867	1533762	488409	88.0	5.0	12/4/2008	70.40	6485.50	2.0	6555.90	86	6467.9 A	48-88	17.6
0868	1534848	491033	103.0	5.0	2/28/2007	62.10	6512.64	2.2	6574.74	94	6478.5 A	53-103	34.1
0869	1533251	486073	94.0	5.0	12/4/2008	84.63	6459.86	1.7	6544.49	99	6443.8 A	44-94	16.1

TABLE 4.1-4. WELL DATA FOR THE ALLUVIAL AQUIFER REGIONAL WELLS. (cont'd.)

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO BASE OF ALLUVIUM (FT-LSD)	ELEV. TO BASE OF ALLUVIUM (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	SATURATED THICKNESS
* 0870	1532680	484906	93.0	5.0	1/11/1996	68.56	6475.60	1.9	6544.16	95	6447.3 A	69-89	28.3
0871	1533603	485400	100.0	5.0	1/11/1996	66.86	6477.85	2.4	6544.71	93	6449.3 A	60-100	28.5
* 0872	1533092	485407	100.0	5.0	1/11/1996	65.80	6477.51	1.8	6543.31	96	6445.5 A	55-100	32.0
* 0873	1533286	484505	100.0	5.0	1/11/1996	67.55	6475.46	1.9	6543.01	96	6445.1 A	60-100	30.3
* 0874	1533968	484925	105.0	5.0	1/11/1996	68.68	6476.66	2.2	6545.34	110	6433.1 A	55-105	43.5
* 0875	1532785	483634	125.0	5.0	1/11/1996	69.85	6472.99	1.7	6542.84	116	6425.1 A	65-125	47.9
0876	1532853	486088	95.0	5.0	12/4/2008	86.20	6458.06	1.9	6544.26	85	6457.4 A	58-88	0.7
0877	1533068	488067	70.0	5.0	8/18/1998	63.58	6489.50	1.9	6553.08	65	6486.2 A	58-68	3.3
0879	1532401	486104	70.0	5.0	12/4/2008	69.17	6475.38	2.2	6544.55	62	6480.4 A	48-68	0.0
0881	1542034	481478	96.0	4.5	12/8/2008	73.85	6491.19	2.0	6565.04	103	6460.0 A	76-96	31.2
0882	1541404	482396	110.0	4.5	11/18/2008	68.21	6492.95	2.0	6561.16	98	6461.2 A	70-110	31.7
0883	1540097	483039	100.0	5.0	11/18/2008	62.61	6494.52	1.9	6557.13	96	6459.3 A	60-90	35.2
0884	1542677	481498	90.0	5.0	11/19/2008	74.76	6491.34	1.0	6566.10	85	6480.2 A	58-88	11.2
0885	1541919	483474	100.0	5.0	12/8/2008	67.79	6496.85	1.5	6564.64	95	6468.1 A	70-100	28.7
0886	1542327	482487	90.0	5.0	12/8/2008	70.31	6494.24	1.5	6564.55	87	6476.1 A	60-90	18.2
0887	1543063	482469	67.0	5.0	4/1/2008	54.54	6513.19	1.5	6567.73	60	6506.2 A	42-67	7.0
0888	1542285	479335	105.0	5.0	12/8/2008	76.00	6481.33	1.1	6557.33	90	6466.2 A	75-105	15.1
0889	1540047	480222	65.0	5.0	10/24/1996	63.31	6486.32	1.5	6549.63	60	6488.2 A	35-65	0.0
0890	1541365	480088	101.0	5.0	12/8/2008	73.90	6484.53	1.7	6558.43	93	6463.7 A	81-101	20.8
0893	1541934	482244	98.0	4.5	12/8/2008	70.10	6493.87	2.1	6563.97	93	6468.9 A	78-98	25.0
0894	1541976	478317	78.0	4.5	11/16/2005	77.40	6476.89	3.0	6554.29	97	6454.3 A	58-78	22.6
0895	1541521	476222	104.0	5.0	11/19/2008	87.11	6466.73	2.4	6553.84	116	6435.4 A	61-101	31.3
0896	1542246	476237	113.0	5.0	11/19/2008	88.09	6467.52	2.0	6555.61	117	6436.6 A	73-113	30.9
0897	1543819	478237	93.0	4.0	9/27/1998	83.28	6478.97	2.0	6562.25	70	6490.3 A	63-93	0.0
0899	1543801	477288	110.0	4.0	6/2/2008	100.30	6470.54	2.0	6570.84	120	6448.8 A	70-110	21.7
0905	1532700	480850	120.0	5.0	11/13/2006	0.00	6545.00	0.0	6545.00	120	6425.0 A	100-120	120.0
0906	1532900	480450	—	—	8/29/1995	74.65	6462.75	0.0	6537.40	—	— A	-	—
0909	1531900	483400	140.0	4.0	11/20/2007	92.60	6446.30	0.0	6538.90	112	6426.9 A	80-135	19.4
0910	1528800	481150	138.0	5.0	—	—	—	0.0	6535.00	132	6403.0 A	120-134	—
0912	1471000	478250	—	—	—	—	—	0.0	6530.00	—	— A	-	—
0913	1555800	500950	—	8.0	1/24/1996	38.40	6604.60	0.3	6643.00	—	— A	-	—
0914	1555500	500850	93.0	6.0	5/6/2008	42.30	6599.70	1.4	6642.00	—	— A	-	—
0915	1552650	499650	100.0	4.0	6/19/2006	30.00	6595.00	0.0	6625.00	70	6555.0 A	55-85	40.0
0916	1552350	499600	160.0	4.0	4/26/1994	40.00	6585.00	0.0	6625.00	—	— A	45-70	—
0917	1542200	514600	—	—	—	—	—	0.0	6800.00	—	— A	-	—
0920	1555800	496900	—	7.0	5/11/1994	33.40	6594.20	0.7	6627.60	—	— A	-	—

TABLE 4.1-4. WELL DATA FOR THE ALLUVIAL AQUIFER REGIONAL WELLS. (cont'd.)

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO BASE OF ALLUVIUM (FT-LSD)	ELEV. TO BASE OF ALLUVIUM (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	SATURATED THICKNESS
0921	1555400	495800	73.0	5.0	5/6/2008	38.83	6585.17	1.9	6624.00	—	— A	-	—
0922	1555200	492500	96.0	6.0	5/6/2008	50.90	6570.80	1.7	6621.70	—	— A	-	—
0924	1547500	438900	135.0	4.0	—	—	—	0.0	6592.90	112	6480.9 A	94-114	—
0925	1548600	480800	150.0	4.0	—	—	—	0.0	6601.40	140	6461.4 A	126-141	—
0926	1547500	472700	134.0	4.0	—	—	—	0.0	6596.90	132	6464.9 A	123-132	—
0935	1540115	476629	300.0	16.0	11/24/2008	95.31	6462.81	2.6	6558.12	125	6430.5 A	95-132	32.3
0936	1543621	472978	160.0	5.0	—	—	—	0.0	6573.38	160	6413.4 A	100-160	—
0939	1539766	483191	97.0	8.0	7/25/1996	59.31	6497.69	2.3	6557.00	—	— A	-	—
0940	1538651	483040	70.0	—	7/24/1996	57.30	6495.70	8.8	6553.00	—	— A	-	—
0942	1538300	483710	102.0	6.0	—	—	—	0.0	6550.20	95	6455.2 A	85-95	—
0947	1536206	491841	100.0	4.0	7/27/1994	54.63	6520.55	0.0	6575.18	95	6480.2 A	70-100	40.4
0950	1560400	498300	81.0	5.0	7/12/2000	25.70	6631.30	0.5	6657.00	—	— A	-	—
0952	1534550	477800	140.0	—	—	—	—	0.0	6550.00	—	— A	-	—
0975	1539780	482880	—	—	—	—	—	0.0	6556.00	—	— A	-	—
0976	1539750	483100	115.0	—	—	—	—	0.0	0.00	—	— A	-	—
0977	1539400	482730	—	—	12/9/1995	61.47	6495.53	1.0	6557.00	—	— A	-	—
0979	1539180	483340	105.0	5.0	7/10/2002	57.56	6593.44	0.0	6651.00	100	6551.0 A	90-100	42.4
0980	1539260	483080	—	—	11/8/1995	57.70	6497.30	0.0	6555.00	—	— A	-	—
0981	1538970	482820	—	—	—	—	—	0.0	6554.00	—	— A	-	—
0982	1538570	483400	110.0	5.0	—	—	—	0.0	6651.00	105	6546.0 A	90-105	—
0983	1538820	483250	—	—	—	—	—	0.0	6552.00	—	— A	-	—
0984	1538990	483100	103.0	5.0	—	—	—	0.0	6651.00	98	6553.0 A	88-98	—
0985	1539000	483260	115.0	5.0	7/18/1996	58.75	6592.25	0.0	6651.00	102	6549.0 A	90-110	43.3
0989	1538185	482813	—	—	11/2/1995	58.10	6494.90	1.0	6553.00	—	— A	-	—
0992	1539460	483800	100.0	5.0	—	—	—	0.0	6652.00	95	6557.0 A	85-95	—
0993	1537860	483680	102.0	5.0	—	—	—	0.0	6650.00	98	6552.0 A	85-98	—
0994	1539700	476240	144.0	6.0	11/14/2008	96.20	6458.80	0.0	6555.00	—	— A	95-110	—
0996	1537621	477989	138.0	5.0	12/4/2008	105.00	6447.52	1.7	6552.52	136	6414.8 A	126-136	32.7
0997	1539821	473807	—	—	3/12/1996	76.90	6491.40	0.0	6568.30	—	— A	-	—
0999	1524230	480187	185.0	—	—	—	—	0.0	6527.00	—	— A	-	—
1012	—	—	—	6.0	—	—	—	0.0	0.00	—	— A	-	—
1013	—	—	—	4.0	—	—	—	0.0	0.00	—	— A	-	—
1014	—	—	—	9.0	—	—	—	0.0	0.00	—	— A	-	—
1015	—	—	—	6.0	—	—	—	0.0	0.00	—	— A	-	—
1018	—	—	—	5.0	—	—	—	0.0	0.00	—	— A	-	—
1020	—	—	—	5.0	1/18/1996	15.17	-15.17	0.0	0.00	—	— A	-	—

TABLE 4.1-4. WELL DATA FOR THE ALLUVIAL AQUIFER REGIONAL WELLS. (cont'd.)

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO BASE OF ALLUVIUM (FT-LSD)	ELEV. TO BASE OF ALLUVIUM (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	SATURATED THICKNESS
1021	—	—	—	—	1/18/1996	18.00	-18.00	0.0	0.00	—	—	A -	—

Note: A = Alluvial Aquifer
MP = Measuring Point
LSD = Land Surface Datum
IN = Inches
FT = Feet
MSL = Mean Sea Level

4.2 ALLUVIAL WATER LEVELS

4.2.1 WATER-LEVEL ELEVATION - ALLUVIAL

This section presents information necessary to evaluate the direction of ground water flow in the alluvial aquifer. Water-level elevations are used to quantify the gradient of the alluvial water table, which in turn can be used to interpret the direction of ground water flow.

Figure 4.2-1 presents the Fall of 2008 alluvial aquifer water-level elevation contours for the Grants Project area near Homestake's tailings. The alluvial aquifer limits were defined based on the 2002 water-level elevation map and base of the alluvium map. There were no recent adjustments in the alluvial aquifer limits, because water-level changes between 2002 and 2008 have been minor. Locations of the alluvial wells, with their respective well names listed adjacent to the well symbol, are plotted on Figure 4.1-1 in the previous section. The 2008 ground water flow patterns in the alluvial aquifer are very similar to those observed in the Fall of 2007. The ridge in the piezometric surface west of the Large Tailings Pile is attributable to continued injection of water into the injection line in 2008 (see Figure 4.1-1 for location of the injection line). The hydraulic ridge on the southeast side of the Small Tailings Pile was similar in 2008 to that which was observed in 2007. The water-level elevations and flow directions indicate the extent of the area of the alluvial aquifer from which ground water is drawn by the collection system. The area of collection is between the fresh-water injection area and the collection wells, where ground water is flowing back to the collection wells. The area underlying the Large Tailings Pile is also within the collection area, because alluvial ground water in this area flows to the collection wells.

The water-level elevations in Section 3 were overall fairly steady in 2008 with the fresh water injection and irrigation supply water pumping in this section (see Figure 4.2-1). Water-level changes continued an overall decline in Section 33 (see the western half of Figure 4.2-1), because seven irrigation supply wells are located in this area, and because natural recharge was below normal in 2008. The water levels in Section 28 overall increased in 2008 due to the fresh water injection in central Section 28.

Several wells were drilled in the area of the zero saturation boundaries to better define the limits of the alluvial aquifer. However, there are occurrences of limited saturation in the Chinle shale below the alluvium, indicating that there may be zones of perched water in the upper part of the Chinle shale. These wells have been used to help define where the zero saturation boundary of the alluvium occurs and the water levels in these wells may not be representative of the alluvial aquifer.

Flow in the San Mateo alluvium is naturally diverted either west through the western portion of Section 28 or south/southwest through Section 35 around the area where the base of the alluvium is elevated. There is no alluvial saturation where the elevation of the base of the alluvium is above the water table. Further downgradient, the San Mateo alluvial water then mixes with the Rio San Jose alluvial water flowing from the northwest. The combined flow continues to flow in a southerly direction. The gradient of the alluvial water surface in the Rio San Jose alluvium has been increased somewhat due to irrigation water withdrawal, but it is still relatively flat due to its large transmitting ability. San Mateo alluvial ground water that flows through the northern portion of Section 3 (see Figure 4.2-1) joins the Rio San Jose ground water system in the eastern portion of Section 4.

Water-level data for the alluvial wells are presented in Appendix A as Table A.1-1 (HMC alluvial wells), Table A.1-2 (Murray Acres, Broadview Acres, Felice Acres, and Pleasant Valley Estates alluvial wells) and Table A.1-3 (regional alluvial wells).

4.2.2 WATER-LEVEL CHANGE - ALLUVIAL

Figure 4.2-2 presents well locations and indicates the grouping of wells for presentation on water-level elevation versus time plots. The figure number of the water-level elevation plots for each group of wells is shown by the well groupings in the black boxes depicted on Figure 4.2-2. The colors used for the well name and well symbol on Figure 4.2-2 correspond with those used on the water-level elevation plots. Time plots (Figures 4.2-3 through 4.2-18) present the last ten years of data to illustrate the recent trends.

Water levels in the alluvial aquifer have been fairly stable during the last year. Figure 4.2-3 presents water-level elevation data for up-gradient wells DD, ND, NC, P, Q and R. A very slight increasing trend was observed in up-gradient wells during 2008.

Water-level elevation data are presented for two sets of wells monitored for the purpose of detection of a reversal of water-surface gradient near the S line of the collection system. These wells (SP and SO) are located just northeast of the majority of the S line of collection wells. Figure 4.2-4 graphically illustrates that the alluvial hydraulic gradient is very flat in the area of wells SN, SO and SP. Water-level rises were observed in these three wells in 2003 and 2004 due to injection of fresh water into the injection line with an overall increase in 2008. These water levels rose during the second quarter of 2007 and declined the second half of the year. The water levels actually indicate a very flat gradient between wells SP and SO for 2008. The injection of water into the injection line has caused slightly more rise in well SP than SO. The head is larger near the injection line than near wells SP and SO.

Wells S2 and S5 are the two reversal wells down-gradient of the S line of collection wells (see Figures 4.1-1 and 4.2-2 for their location). Recent data from these two wells indicate a very good reversal of the ground water flow direction due to the collection wells near well S5 and the rise in water levels caused by the injection line (see Figure 4.2-5). The injection line water caused a larger water level rise in well S1 than in well S2. This data shows that a strong reversal has been maintained between wells S2 and S5.

Figure 4.2-6 presents water-level elevation data for a group of wells located west of the S line of collection wells. Water-level elevations in each of these wells were maintained higher in 2008 due to the injection into the injection line. Water levels overall were steady in well S4 in 2008. Water levels also were fairly steady in well BC in 2008.

The alluvial water levels north of Murray Acres were overall steady in 2008 in wells MO, MQ, MS, MY and W except during the pumping period for irrigation supply (see Figure 4.2-7).

Wells B and BA are monitored in order to define the reversal in the ground water gradient between the M and J injection lines and the D collection line. Figure 4.2-8 presents water-level elevation data for wells B and BA and indicates a continued ground water reversal. Water levels in this area sharply rose after the addition of the R.O. product injection into the new EMA injection lines until the second quarter of 2006 when the water levels overall declined until mid-2008 when the level steadily rose for the remainder of the year.

Figure 4.2-9 presents water-level elevation plots for alluvial wells B13, C2, D1, M5 and S3, which are located near the lined collection ponds and to the northwest of these ponds. This plot shows that the water levels generally decreased or were steady in each of these wells in 2008. A small increase was observed in well S3.

Water-level elevations in the alluvial aquifer near the Small Tailings collection system are presented on Figure 4.2-10 for reversal wells DZ and KZ. Well DZ is near the D collection line and well KZ is close to the K injection line and, therefore, is naturally down-gradient of well DZ. This plot shows that, during 2008, a reversal of the ground water gradient was maintained between the line of injection and line of collection. This pair of reversal wells is adequate to define the ground water gradient between this major zone of injection and the collection system.

Figure 4.2-11 presents water-level elevation data for wells B11, C12, L6 and TA. This data reflects the changes in water levels near the north and east sides of the Small Tailings Pile. The water level in well B11 declined in 2008 after four years of higher levels. Injection of R.O. product and fresh water has caused the higher water-level elevations observed in well L6 but steady levels occurred in 2008. The water level in well TA was also steady in 2008.

Figure 4.2-12 shows the water-level elevation plots for wells I, KEB, KF and X. Water levels slightly declined or were steady in these wells in 2008.

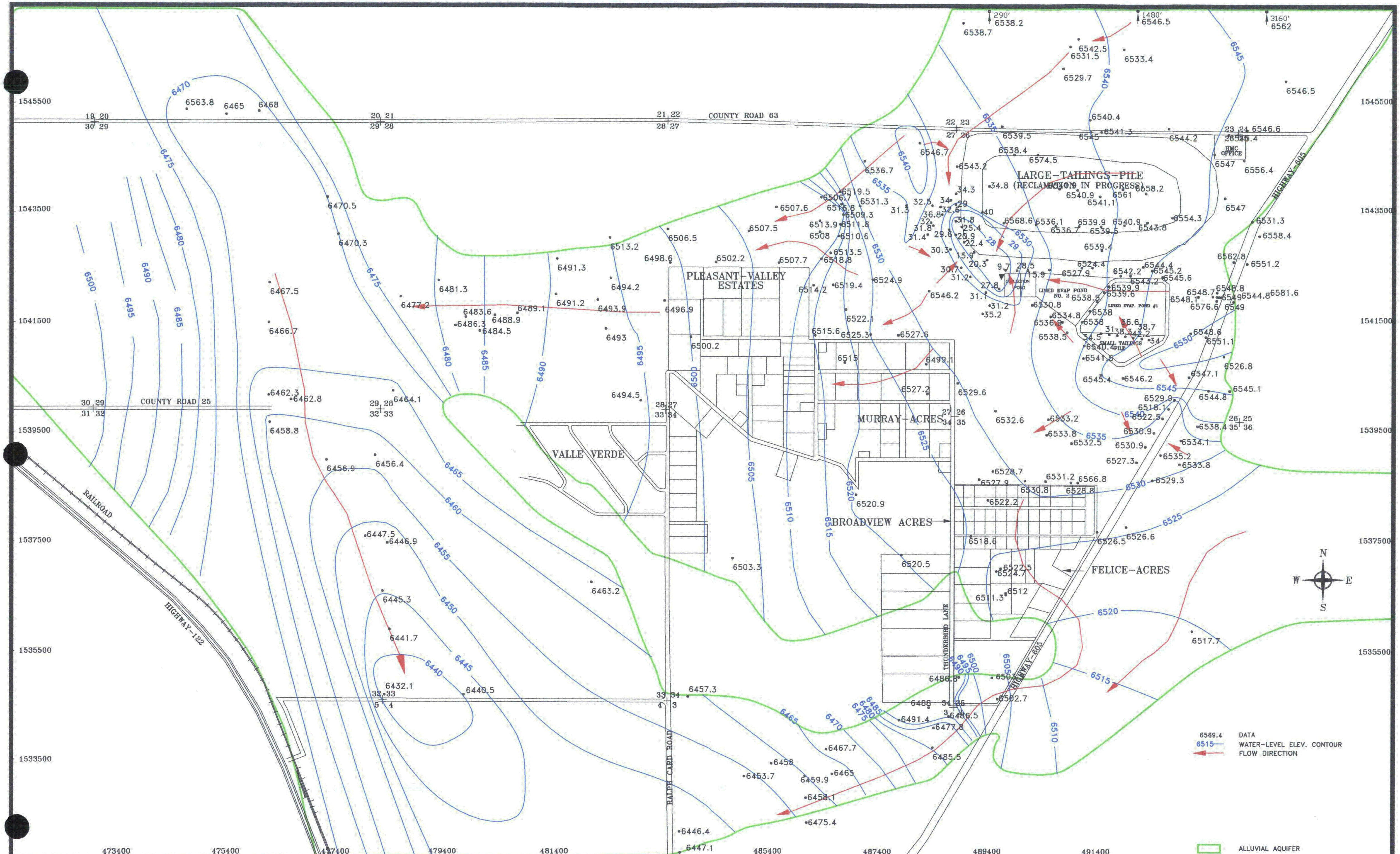
Water-level elevations in the alluvial aquifer south of the Broadview Acres injection system varied in 2008 (see water levels for wells 490, 497, GH and SUB1 on Figure 4.2-13). Water levels overall declined in the wells in 2008 except for fairly steady water level in well GH.

Water levels in the Murray Acres area were fairly steady in alluvial wells 688, 844, 846, FB and MX during 2008 except for a continued gradual decrease in the water level in well 845 (see Figure 4.2-14).

Figure 4.2-15 presents water-level hydrographs for six wells in Section 3. Water levels were overall steady in 2008 in these wells after the irrigation season.

Water-level hydrographs for six wells in the Section 28 area are presented on Figure 4.2-16. Wells 881 and 890 were used as irrigation supply wells. Late season water levels in 2008 were slightly above those at a similar time in recent years due to the fresh water injection in this area. Figure 4.2-17 presents the water- level time plots for the group of wells west and southwest of the Section 28 irrigation supply wells. Some decline in water levels in wells 685, 686, 895 and 935 was observed in 2008 with fairly steady levels in wells 654 and 899 which have been affected by the Section 28 injection.

Figure 4.2-18 presents the water-level plots for the Section 33 wells shown on Figure 4.2-2. Wells 647, 649, 657 and 996 are irrigation supply wells, and therefore, their water levels are influenced by the periodic withdrawal of water from these wells. The observed water levels during December of 2008 were slightly lower than those observed in previous years at this time. The combination of withdrawal for irrigation and the ongoing drought conditions is the likely cause of the overall decline in water levels with time.

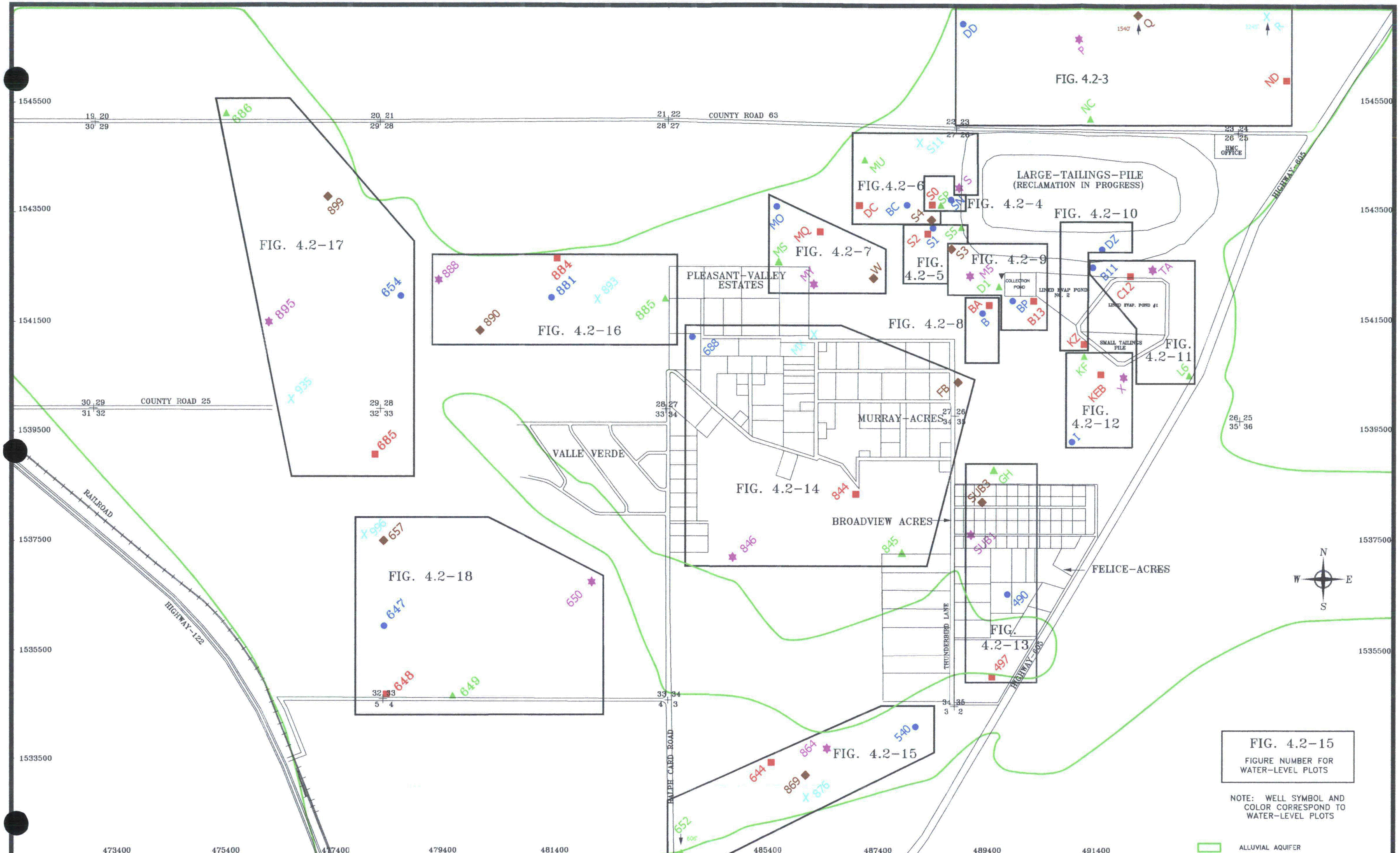


SCALE: 1"=1600'

C:\PROJECTS\

DATE:

FIGURE 4.2-1. WATER-LEVEL ELEVATIONS OF THE ALLUVIAL AQUIFER, FALL 2008, FT-MSL



SCALE: 1" = 1600'
C:\PROJECTS\2009-06\1600QAL
DATE: 3/23/09

FIGURE 4.2-2. LOCATION OF ALLUVIAL WELLS WITH WATER-LEVEL PLOTS, 2008

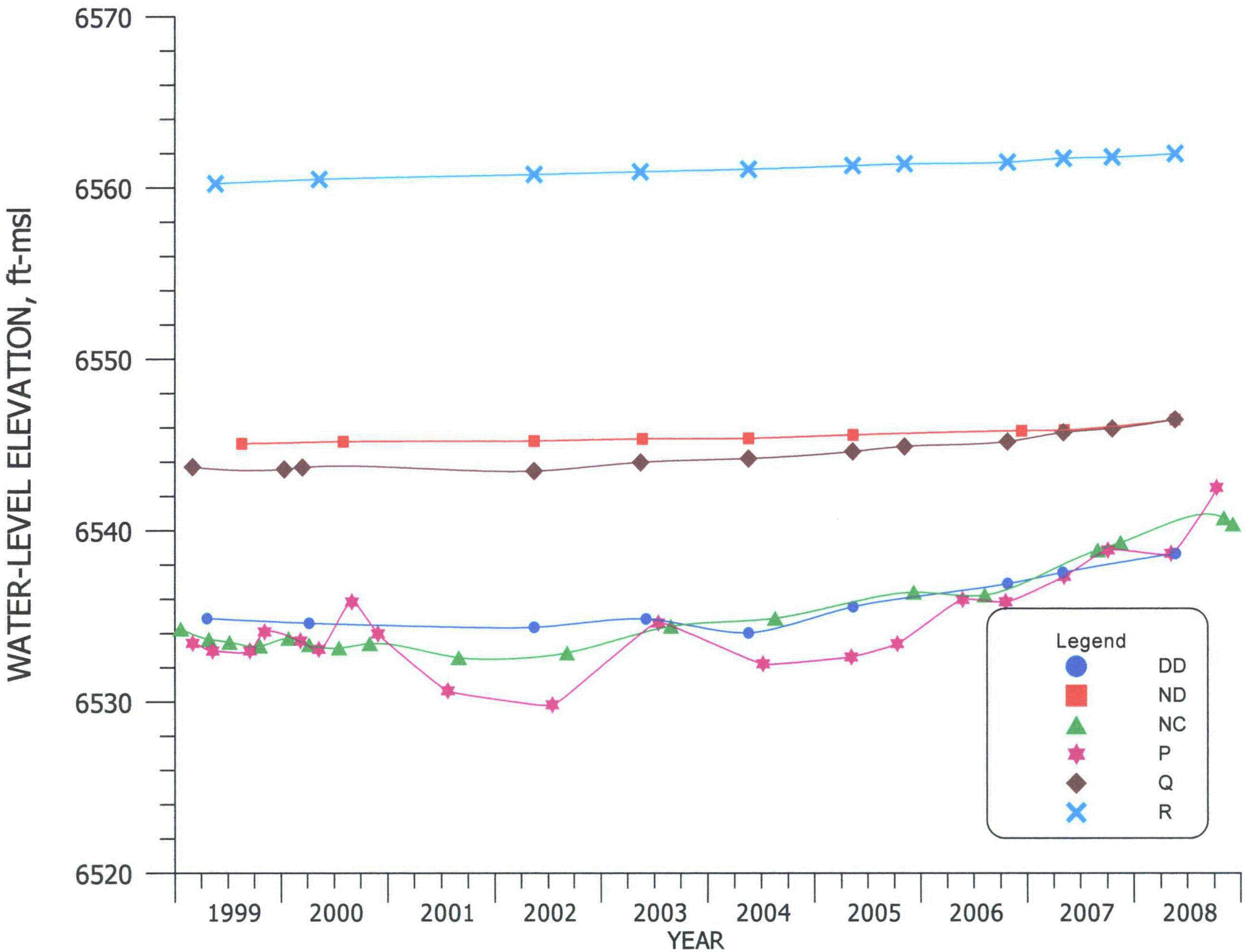


FIGURE 4.2-3. WATER-LEVEL ELEVATION FOR WELLS DD, ND, NC, P, Q AND R.

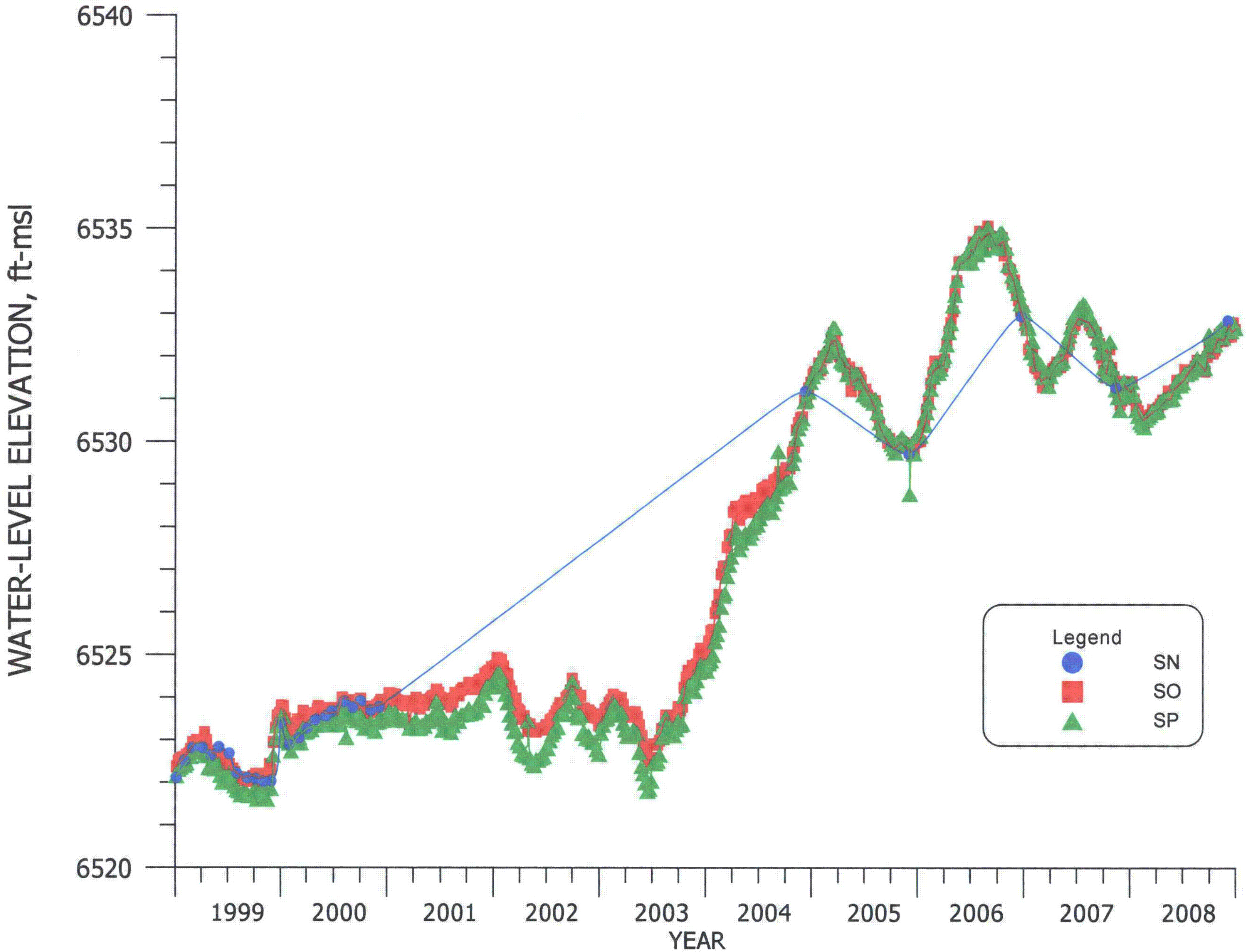


FIGURE 4.2-4. WATER-LEVEL ELEVATION FOR WELLS SN, SO AND SP.

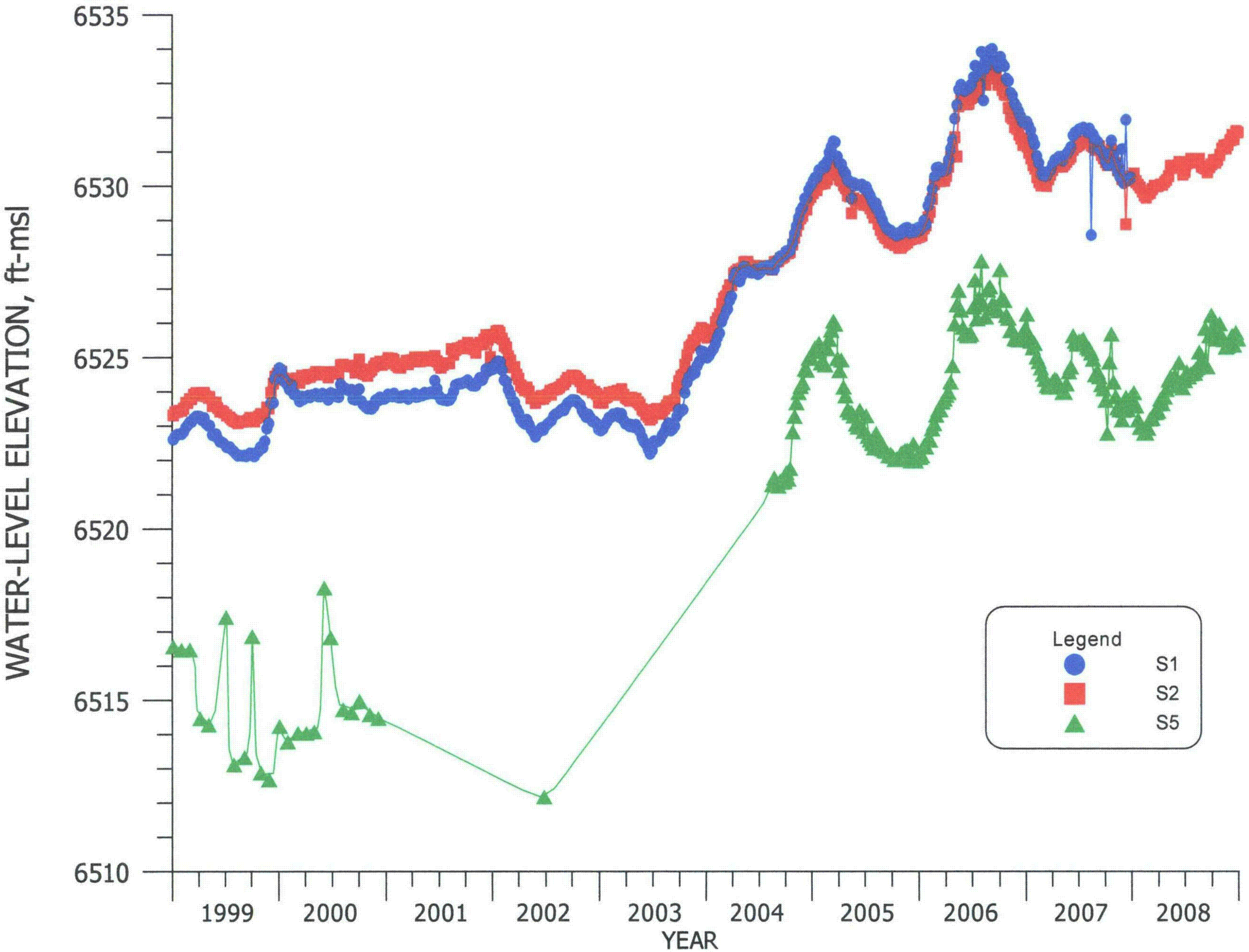


FIGURE 4.2-5. WATER-LEVEL ELEVATION FOR WELLS S1, S2 AND S5.

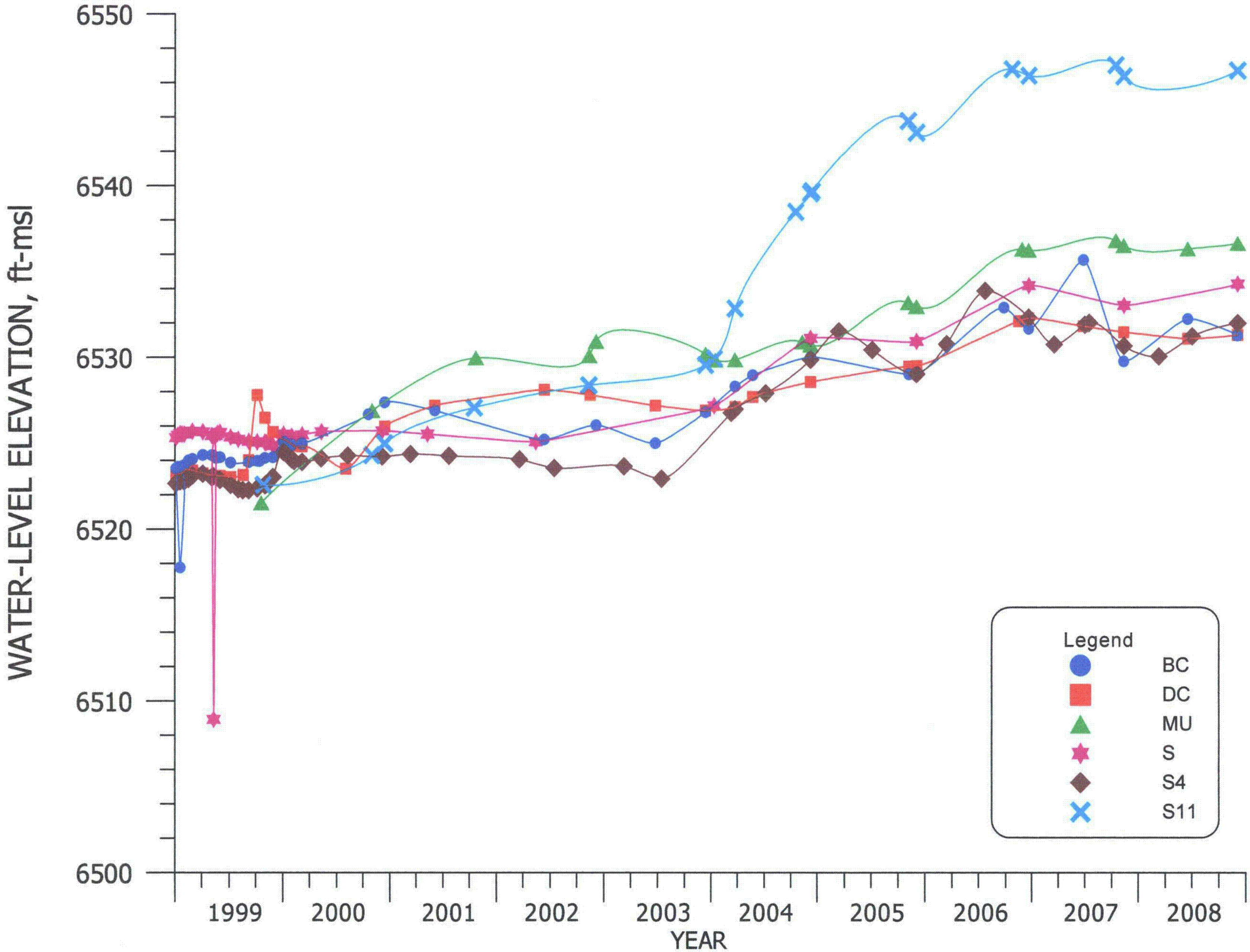


FIGURE 4.2-6. WATER-LEVEL ELEVATION FOR WELLS BC, DC, MU, S, S4 AND S11.

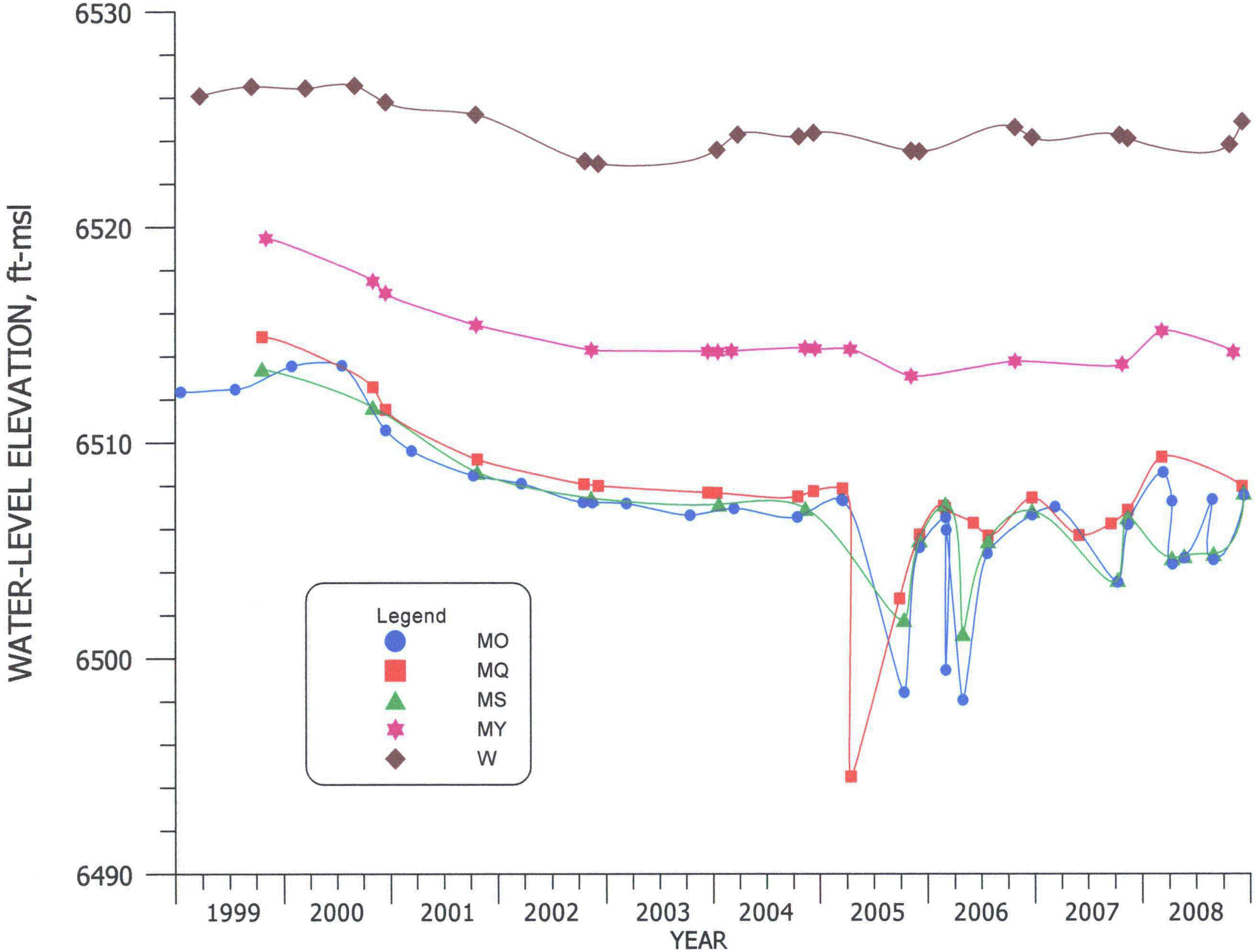


FIGURE 4.2-7. WATER-LEVEL ELEVATION FOR WELLS MO, MQ, MS, MY AND W.

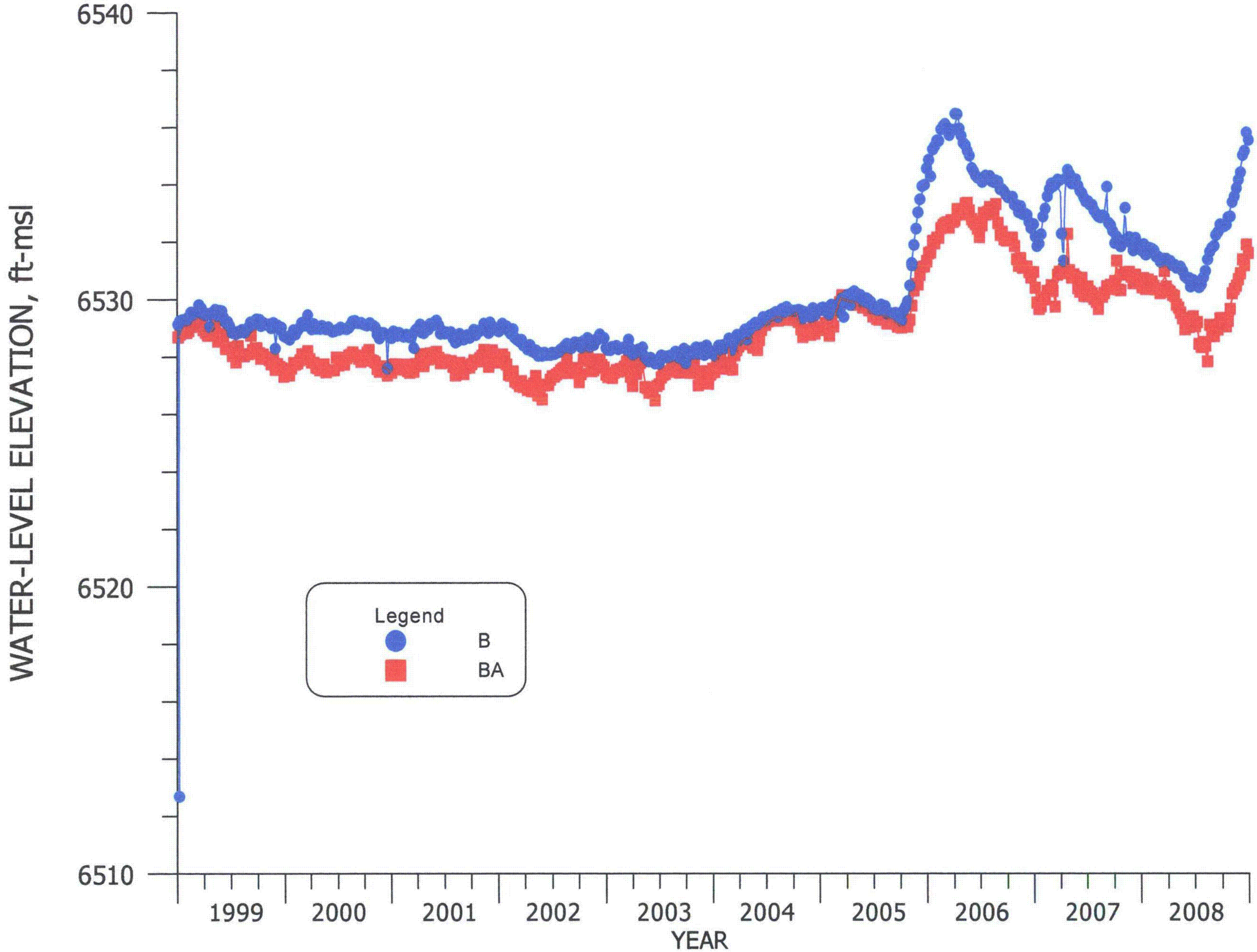


FIGURE 4.2-8. WATER-LEVEL ELEVATION FOR WELLS B AND BA.

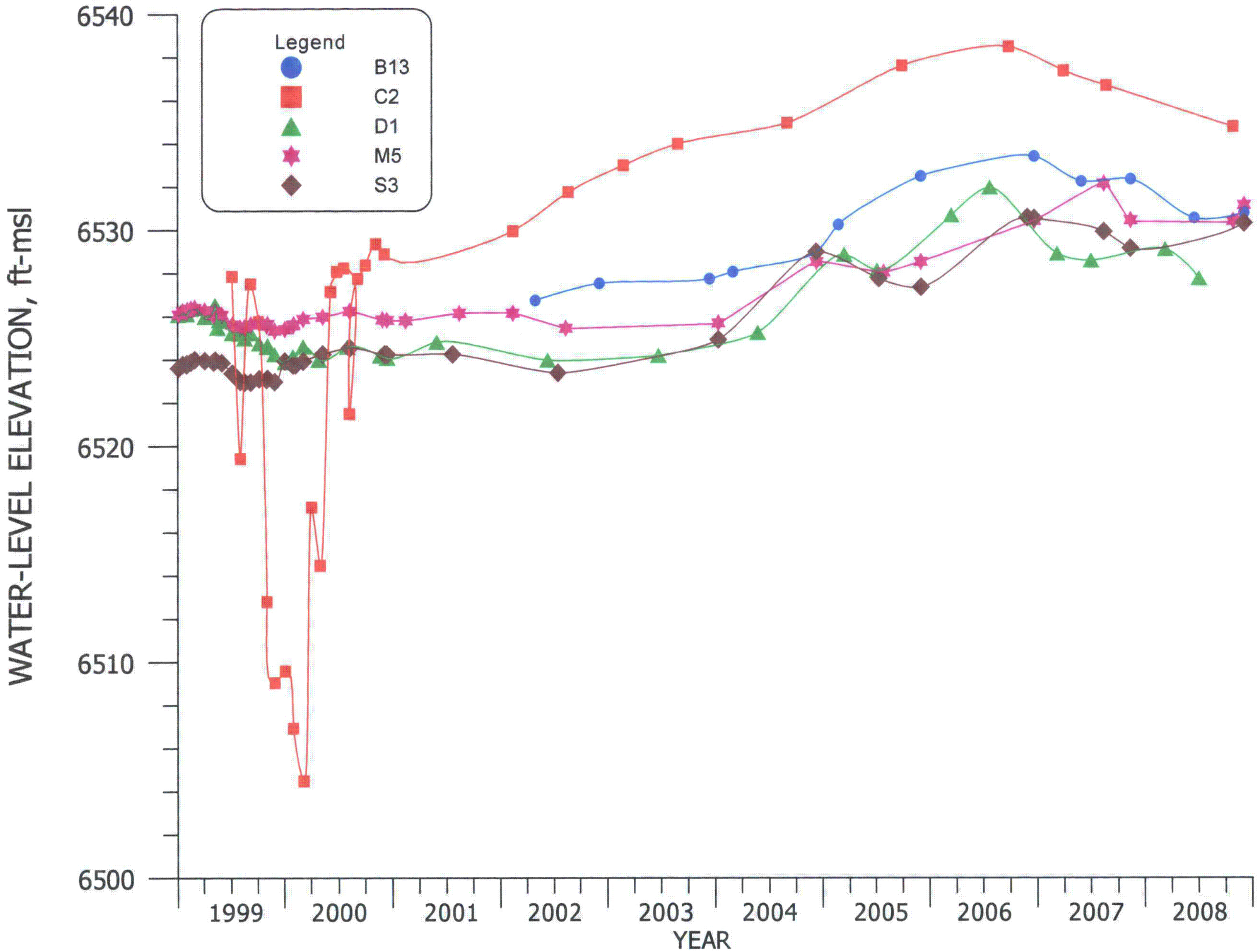


FIGURE 4.2-9. WATER-LEVEL ELEVATION FOR WELLS B13, C2, D1, M5 AND S3.

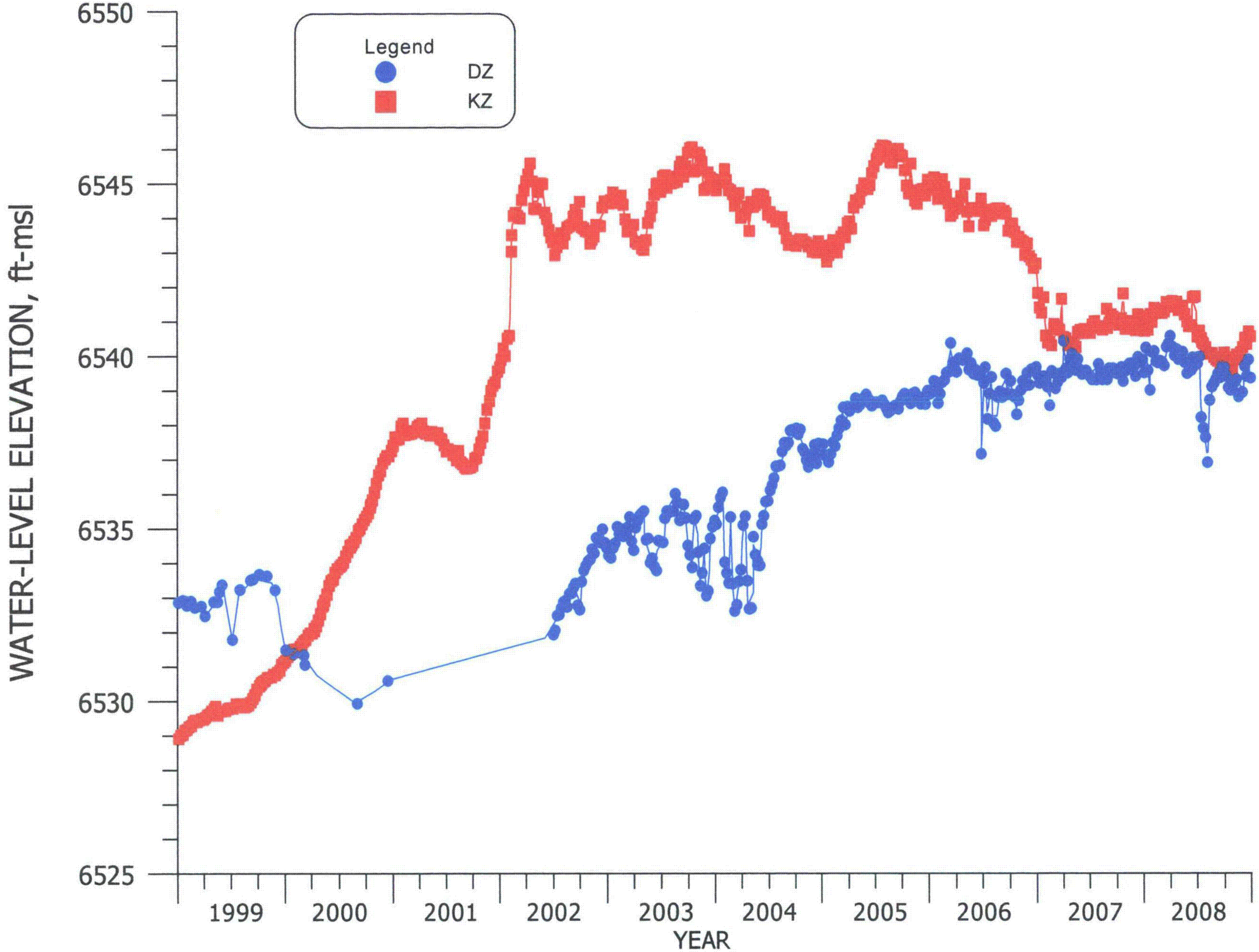


FIGURE 4.2-10. WATER-LEVEL ELEVATION FOR WELLS DZ AND KZ.

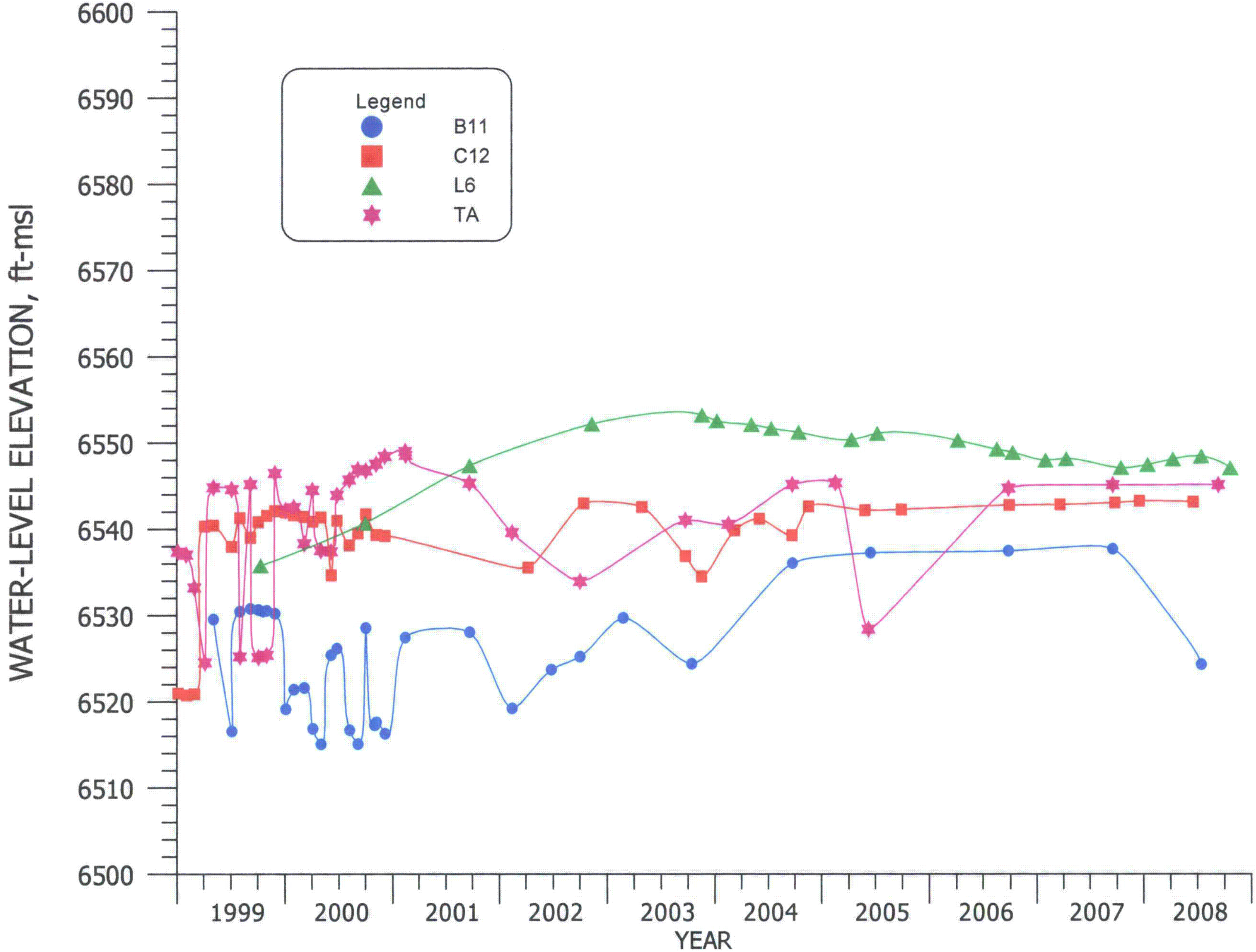


FIGURE 4.2-11. WATER-LEVEL ELEVATION FOR WELLS B11, C12, L6 AND TA.

FIGURE 4.2-12. WATER-LEVEL ELEVATION FOR WELLS I, KEB, KF AND X.

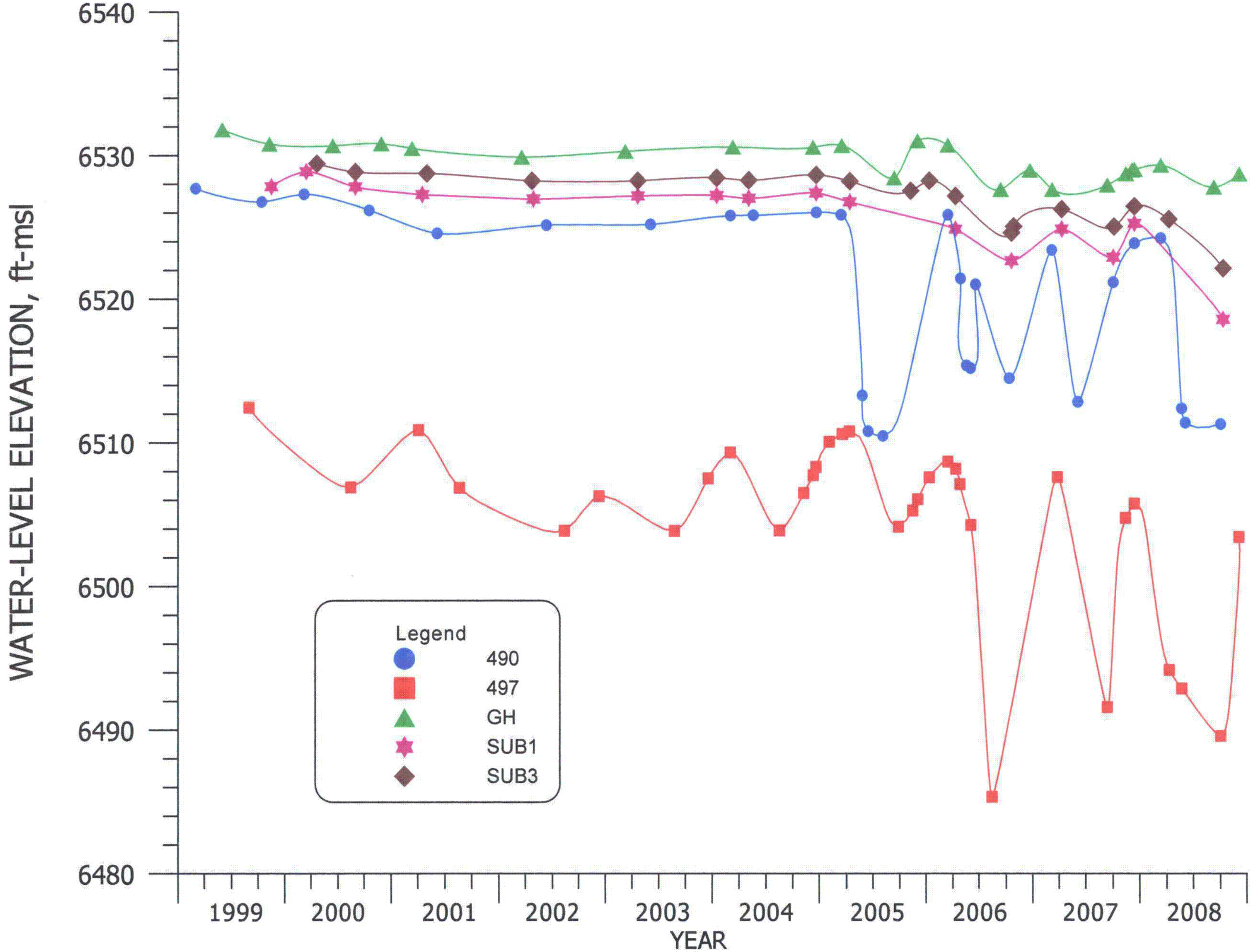


FIGURE 4.2-13. WATER-LEVEL ELEVATION FOR WELLS 490, 497, GH, SUB1 AND SUB3.

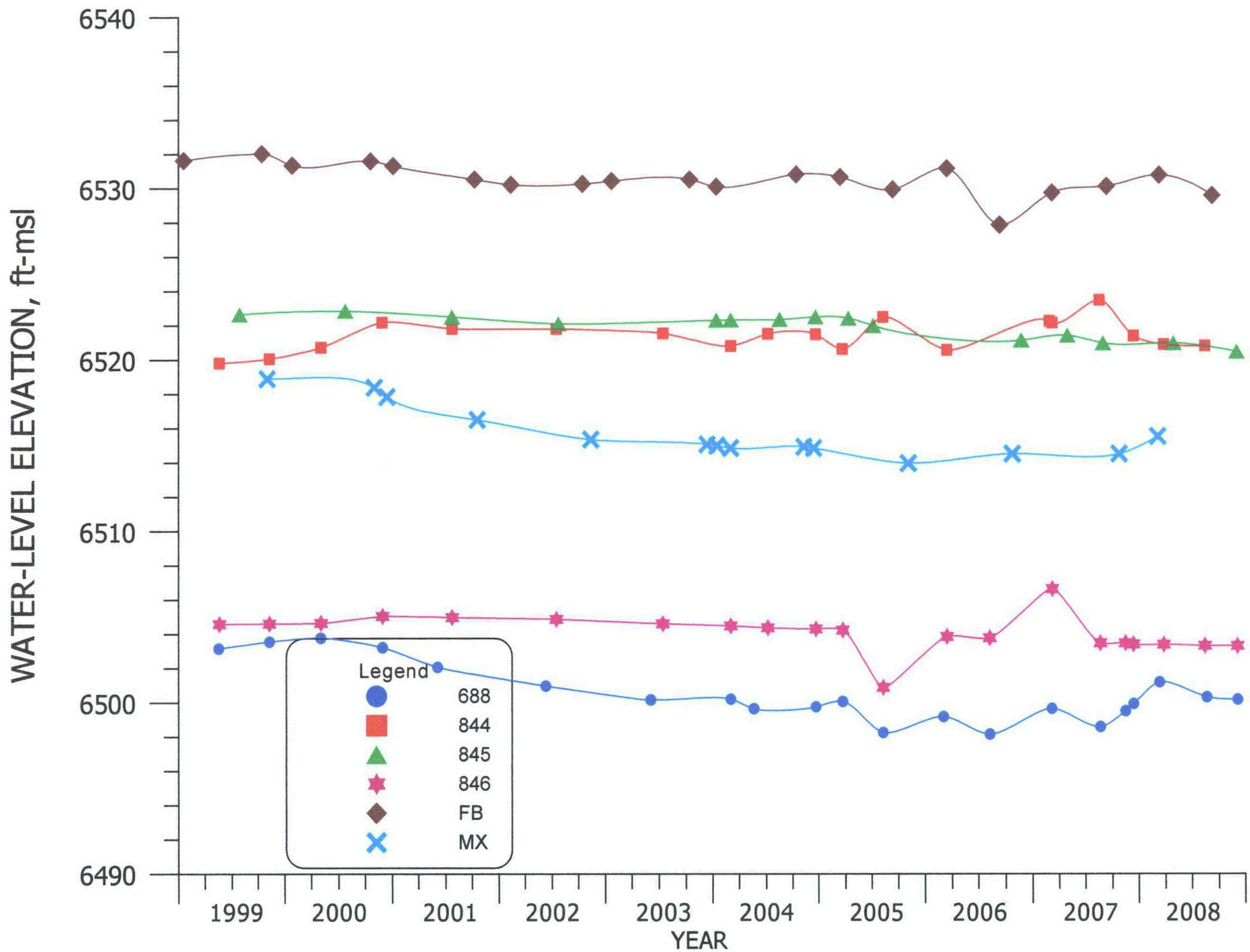


FIGURE 4.2-14. WATER-LEVEL ELEVATION FOR WELLS 688, 844, 845, 846, FB AND MX.

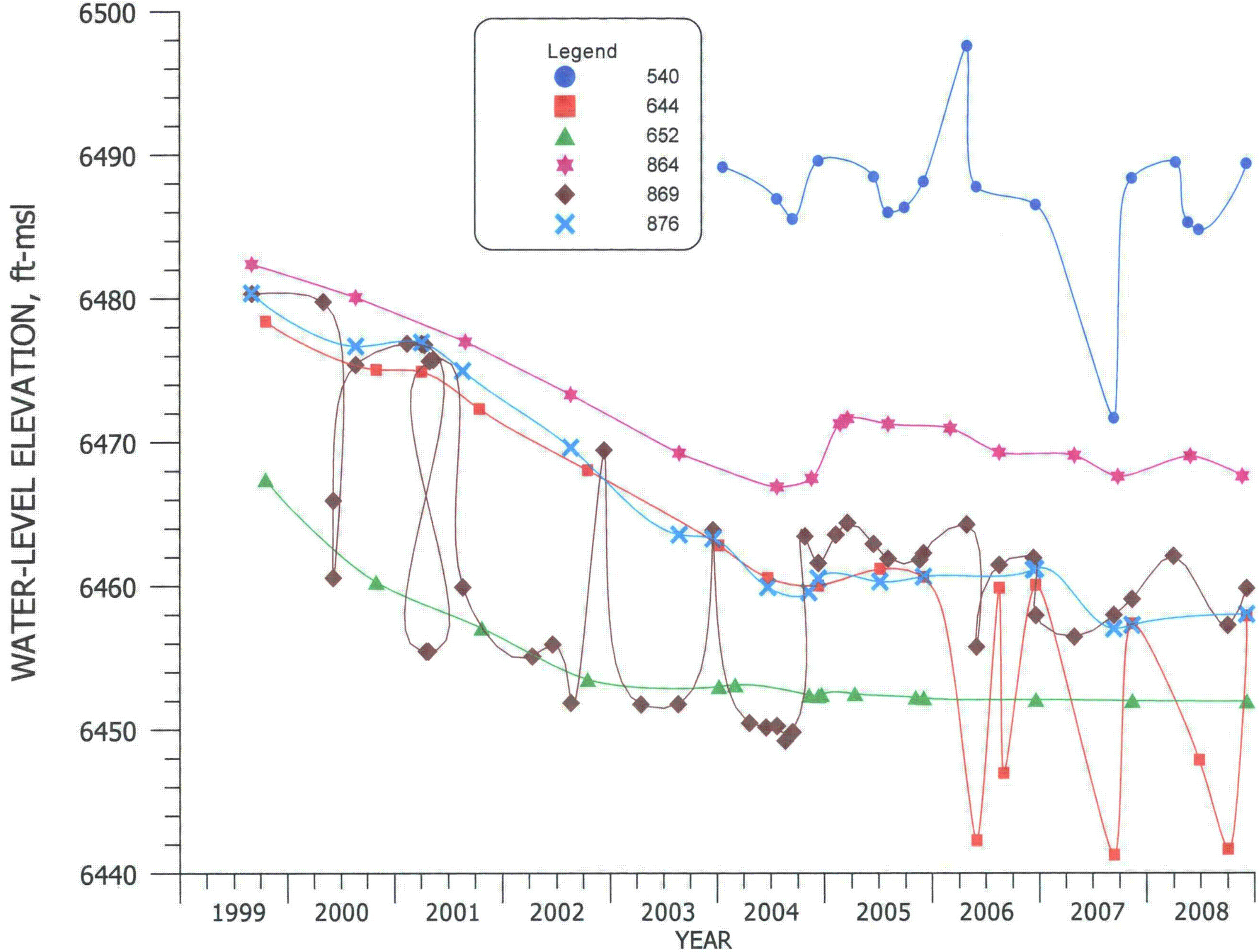


FIGURE 4.2-15. WATER-LEVEL ELEVATION FOR WELLS 540, 644, 652, 864, 869 AND 876.

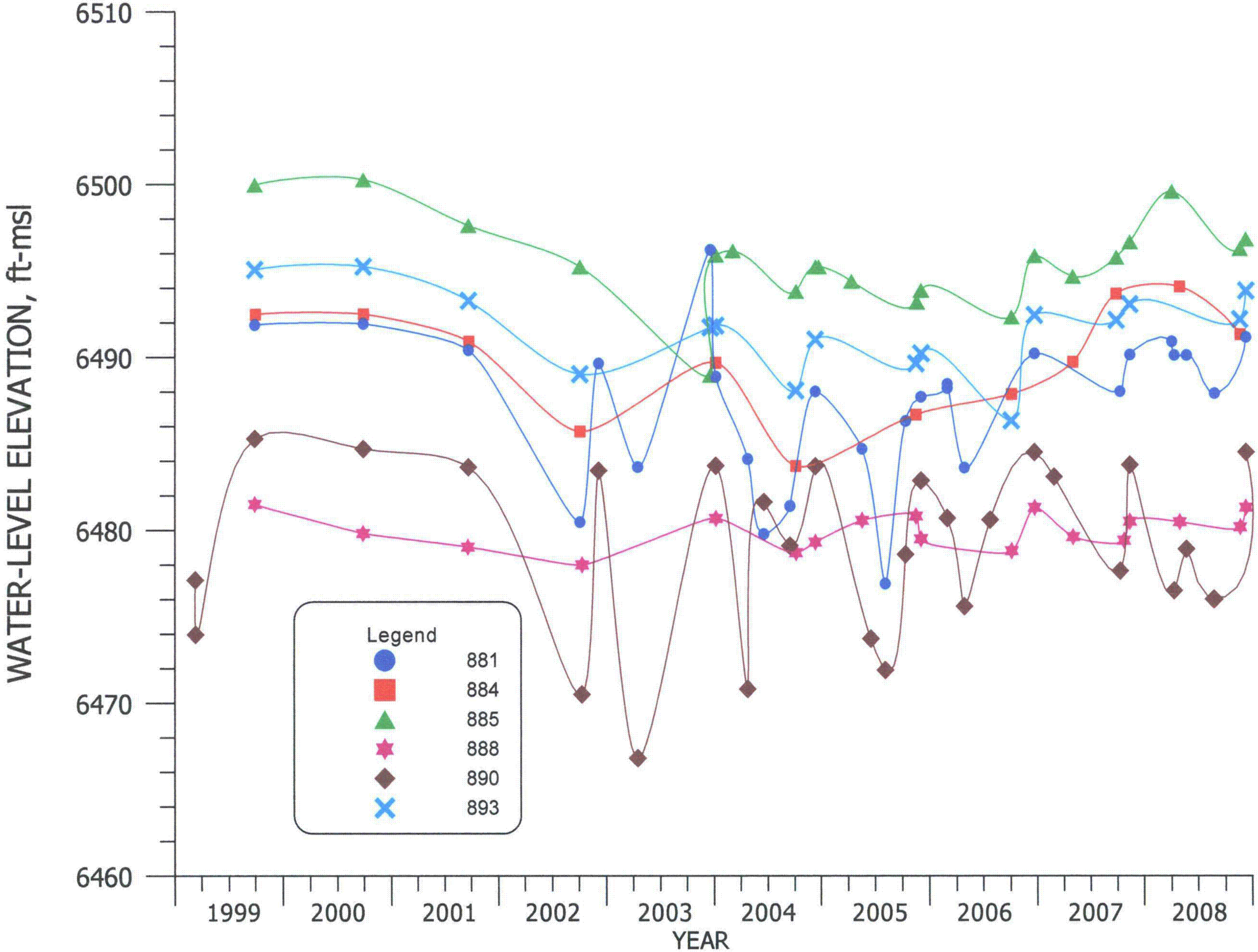


FIGURE 4.2-16. WATER-LEVEL ELEVATION FOR WELLS 881, 884, 885, 888, 890 AND 893.

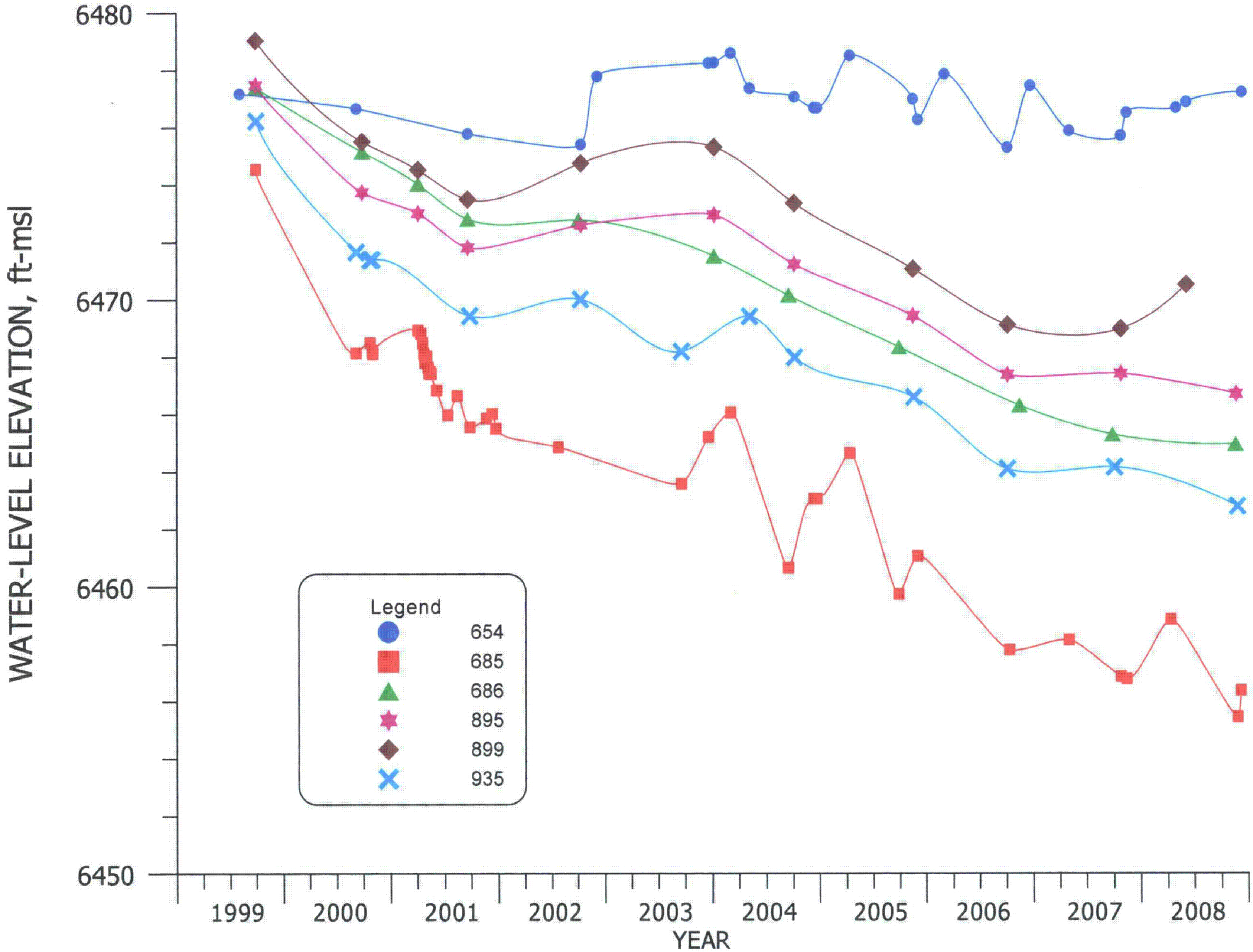


FIGURE 4.2-17. WATER-LEVEL ELEVATION FOR WELLS 654, 685, 686, 895, 899 AND 935.

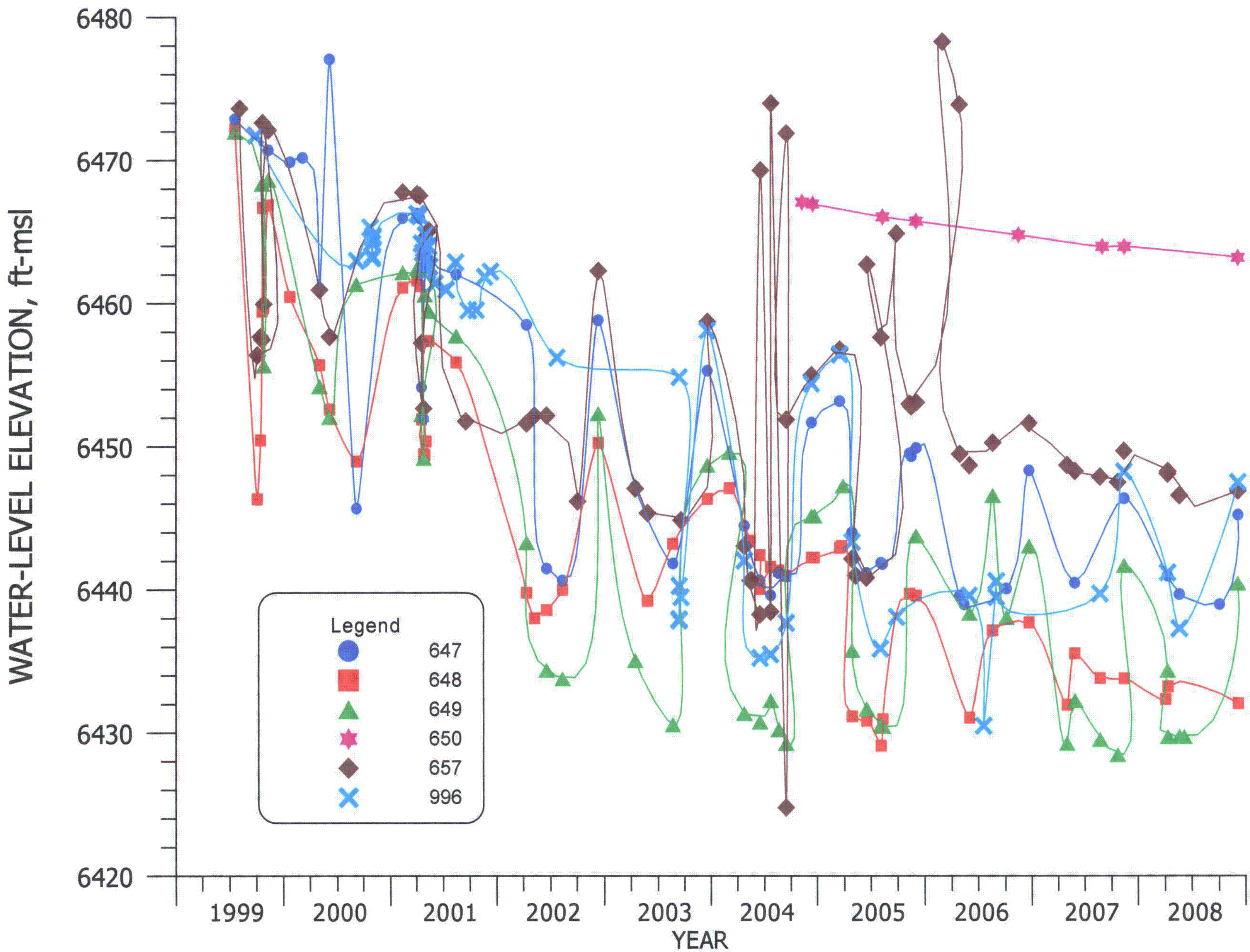


FIGURE 4.2-18. WATER-LEVEL ELEVATION FOR WELLS 647, 648, 649, 650, 657 AND 996.

4.3 ALLUVIAL WATER QUALITY

This section presents the 2008 water-quality data for the alluvial aquifer. The major constituents that are typically measured at this site are sulfate, chloride and TDS. Sulfate concentrations are used as the primary indicator of contaminant remediation. Selenium, uranium and molybdenum are the metals of concern at this site. Nitrate, radium, chromium, vanadium and thorium are also discussed in the monitoring report, but these constituents are of only minor concern at the Grants site. Tables B.4-1 through B.4-6 in Appendix B present the 2008 alluvial water-quality data for each well. The most recent monitoring values were used for the concentration contour figures presented in this section.

Colored patterns are used on the figures to delineate where concentration limits exceed the NRC site standards for each of the constituents. The standard is presented in the legend of the respective figure for each parameter. A greater than sign was added in front of the numeric value to note that the pattern shows where the standard is exceeded.

4.3.1 SULFATE - ALLUVIAL

Sulfate has been used as the primary indicator constituent for this site, because concentrations are large in the tailings solution. Concentrations of sulfate in the alluvial aquifer for 2008 are presented on Figure 4.3-1. Background concentrations observed in 2008 ranged from 411 to 1620 mg/l. An updated statistical evaluation of the background sulfate concentration with data for a ten year period (1995 – 2004) showed that concentrations as great as 1500 mg/l could occur naturally at this site and is, therefore, the site standard. Areas where sulfate concentrations exceed 1500 mg/l are shown with a green pattern on Figure 4.3-1. One well in west-central portion of Section 34 slightly exceeds the site standard. As shown, sulfate concentrations in two small areas underlying the Large Tailings Pile still locally exceed 10,000 mg/l. A significant reduction in sulfate concentration was achieved along the restoration zone in Section 28 in 2008. The observed sulfate concentrations in the four adjacent subdivisions were less than 1000 mg/l in 2008, except for values of 1290 and 1270 mg/l measured in a water samples collected from wells SUB1 and SUB3. Sulfate concentrations were fairly stable in Section 3 in 2008. Sulfate concentrations exceeded 1000 mg/l in the southwest portion of Murray Acres, southern Pleasant Valley Estates, eastern Valle Verde and to the southeast of

Valle Verde. Sulfate concentrations also exceeded 1000 mg/l adjacent to the zero saturation boundary in the northern portion of Section 27 and extending into the eastern portion of Section 28 (see Figure 4.3-1). Down-gradient of the Grants Project site, the sulfate concentrations are all within the natural range of background except for the well previously mentioned and, therefore, no water-quality restoration with respect to sulfate is necessary beyond the immediate Grants Project area except for this well.

Plots of constituent concentrations versus time have been prepared for the alluvial aquifer for sulfate, TDS, chloride, uranium, selenium, molybdenum and nitrate. The groupings of wells used for these plots are shown on Figure 4.3-2. The figure numbers for each of the well groupings that correspond with the sulfate concentration versus time plots are indicated. The color and symbol used for each well are the same as those used in the time plots for each constituent. Figure numbers for the time plots of other constituents are not shown on this map; however, it is useful for the other time-concentration plots because the color, symbol and well groupings are consistent.

Figure 4.3-3 presents sulfate concentrations plotted versus time for up-gradient wells DD, ND, P, P2, Q and R. A gradually increasing trend had occurred in the up-gradient well ND prior to 2007, while the 2008 value shows a steady concentration. Overall steady sulfate concentrations have been observed in wells P, P2, Q and R in 2008. A very gradual increasing trend was observed in well DD during 2008. The historical values for these wells show similar periods of short term increasing and decreasing trends in the alluvial aquifer. The changes in sulfate concentration in these wells are well within the range previously observed for sulfate in the up-gradient wells. Some of these increases could be due to the influx of ground water with higher sulfate concentrations into this area up-gradient of Homestake's background wells.

Sulfate concentrations immediately west of the Large Tailings Pile in alluvial wells S4 and SO were fairly steady in 2008 (see Figure 4.3-4). The sulfate concentrations for well S2 increased in 2005 through 2007 but decreased in 2008. Concentrations to the north of the Large Tailings Pile at well NC were steady in 2008. An increase in sulfate in well SM was observed in 2008.

Figure 4.3-5 presents sulfate concentrations plotted versus time for alluvial wells BC, DC, MO, MU and W situated further west of the Large Tailings Pile. Sulfate concentrations were fairly stable in alluvial wells MO, MU and W in 2008, while concentrations in wells BC and DC were also steady. Samples from BC and DC are thought to have been switched in 2007.

Figure 4.3-6 presents sulfate concentration versus time plots for alluvial wells B, D1, M3 and M5. Overall, sulfate concentration in wells D1 and M3 gradually increased in 2008. A decrease in well M5 and steady level in well B were observed.

Figure 4.3-7 presents time plots of sulfate concentrations for wells B5, B11, SA, T and TB. The sulfate concentrations in collection well B11, SA and TB were fairly steady during 2008. Sulfate concentrations in wells B5 and T were very gradually increasing in 2008.

Figure 4.3-8 presents plots of sulfate concentration versus time for alluvial wells on the west side of the Small Tailings Pile. Sulfate concentrations were relatively stable in each of these wells in 2008 except for an increase in well C2.

Figure 4.3-9 presents sulfate concentrations versus time for alluvial wells on the south side of the Small Tailings Pile. Sulfate concentrations in these wells were all small in 2008 with small variation. The small changes in sulfate concentrations are due to the switching to fresh water injection in this area in place of the R.O. product injection. R.O. product water injection had reduced sulfate concentrations in these wells to very low levels over the previous years.

Figure 4.3-10 shows the sulfate concentrations for the Small Tailings Pile collection wells K4, K7, K9 and K10. Small decreases were observed in these wells during 2008.

Time plots of sulfate concentrations in collection wells located southeast of the Small Tailings Pile are presented on Figure 4.3-11. This figure shows a reasonably steady sulfate concentration in 2008 in wells L6, L7, L8, L9 and L10, while levels increased in well L.

Figure 4.3-12 presents sulfate concentration time plots for Broadview Acres alluvial wells GH, SUB1, SUB2 and SUB3. An increase was observed in well SUB1 in 2008 while a small decline was observed in wells SUB2 and SUB3. A very gradual increase in sulfate concentration was observed in well GH in 2008.

Figure 4.3-13 presents sulfate concentrations versus time for Felice Acres alluvial wells 490, 491, 496 and 497. The sulfate concentrations in 496 and 497 wells were fairly steady in 2008. The sulfate concentrations in well 491 increased in early 2008 but returned its overall declining trend in late 2008. A small increase was observed in well 490.

Figure 4.3-14 contains time plots of sulfate concentrations for Murray Acres and Pleasant Valley Estates alluvial wells 688, 802, 844, 846 and FB. This plot shows that sulfate concentrations in water taken from alluvial well 846 were slightly higher in 2008. Concentrations were fairly steady in alluvial wells 688, 802 and FB during 2008 while an increase was observed in well 844.

Figure 4.3-15 presents the sulfate concentration time plots for six wells in Section 3 (see Figure 4.3-2 for the location of these wells). Sulfate concentrations in each of these Section 3 alluvial wells have been fairly steady over the last several years.

The sulfate concentrations in water from six wells near the Section 28 center pivot irrigation system are presented on Figure 4.3-16. The decline that occurred in monitoring wells 884 and 888 leveled in 2008 due to the influence of fresh water injection in Section 28. A sulfate decline continued in well 886 in 2008 and may have started in well 881 as a result of fresh water injection.

Figure 4.3-17 presents sulfate concentrations with time for six wells located to the west of the Section 28 irrigation area. The sulfate concentrations in these wells remained fairly stable during 2008.

The time variations of sulfate concentrations in water sampled from four irrigation supply wells in Section 33 and one well in the southwest corner of Section 33 are plotted on Figure 4.3-18. Sulfate concentrations in each of these wells were fairly steady in 2008.

4.3.2 TOTAL DISSOLVED SOLIDS - ALLUVIAL

Total dissolved solids (TDS) concentration contours for the alluvial aquifer during 2008 are presented on Figure 4.3-19. The alluvial background TDS concentrations measured up-gradient of the Large Tailings Pile in 2008 varied from 1060 to 2690 mg/l. Based on an updated statistical analysis, TDS concentration must exceed 2734 mg/l before it is considered elevated beyond the naturally occurring range. A light green pattern is shown on Figure 4.3-19 to indicate where the TDS concentrations exceed 2734 mg/l. None of the observed concentrations in the west half of this figure exceed this level. The TDS concentrations near the tailings exceed 2734 mg/l for a distance of approximately 600 feet to the west of the Large Tailings Pile. Some TDS concentrations underlying the Large Tailings area exceed 20,000 mg/l. A zone of 2000 mg/l or greater TDS concentration extends to the west of the Large Tailings Pile into the eastern portion of Section 28 (see Figure 4.3-19). An additional area of TDS concentrations greater than 2000 mg/l exists in the southern portion of Pleasant Valley Estates, the western portion of Murray Acres, the eastern portion of Valle Verde and to the south and southwest of this area. The only other area of TDS concentrations above 2000 mg/l are small areas in western Broadview Acres and two small areas in Section 3. Only the areas closely proximal to the two tailings piles and small areas west of the Large Tailings and small areas east of Valle Verde require ground water quality restoration with respect to TDS.

TDS-time concentration plots were developed for the same grouping of wells as those prepared for sulfate (see Figure 4.3-2 for groupings of wells with TDS plots). Figure 4.3-20 presents the TDS concentrations versus time for the up-gradient wells. TDS concentrations had gradually increased in well ND over the last few years but decreased in 2007 and 2008. TDS concentrations in the remainder of the upgradient wells remained fairly steady in 2008 except for a very gradual increase in wells Q and R which has been an overall trend for several years and a decline in well P2.

Figure 4.3-21 presents TDS concentrations plotted versus time for wells NC, S2, S3, S4 and SM. This plot shows an increase in concentration in 2008 for well SM. Steady concentrations in TDS are noted in wells NC and S4 while a decrease in concentrations was observed in wells S2 and SO.

TDS concentrations were relatively stable in water collected from wells MO and W during 2008 (see Figure 4.3-22). Decreasing concentrations have been observed in 2008 in well MU. The variations in wells BC and DC in 2007 and 2008 indicate the 2007 samples for these two wells were switched.

TDS concentrations in water sampled from wells B, D1, M3 and M5 are presented in Figure 4.3-23. TDS concentrations were relatively unchanged in 2008 in wells B and M3. The increase in well D1 and decrease in well M5 are likely due to the influence of R.O. product injection lines.

Figure 4.3-24 presents TDS concentrations for wells B5, B11, SA, T and TB. Fairly steady concentrations were observed in wells B5, SA and TB in 2008, while an increase was observed in well T, and a decrease was observed in well B11.

Figure 4.3-25 presents time concentration plots for the wells on the west side of the Small Tailings Pile. The concentrations in these wells were fairly steady in 2008 except for an increase in TDS in well C2.

TDS concentrations versus time for four wells just south of the Small Tailings Pile are presented in Figure 4.3-26. This figure shows continued low and slightly variable concentrations in these wells in 2008.

Figure 4.3-27 presents plots of TDS concentrations for four wells on the south side of the No. 1 Evaporation Pond on top of the Small Tailings Pile. Samples from these alluvial wells have shown a decrease in TDS concentrations in 2008. The recent variations in TDS concentrations are likely due to the switch from R.O. product injection to freshwater injection.

TDS concentrations in water taken from the L line of wells are presented in Figure 4.3-28. TDS concentrations are gradually decreasing or steady with time in each of the wells except for a small increase in wells L and L10.

Figure 4.3-29 presents the TDS concentrations versus time for the Broadview Acres wells. This plot shows a gradual decline in TDS concentrations in 2008 in well SUB2 and an increase in value from well SUB1. The TDS were fairly steady in the other two wells.

The TDS concentrations in the Felice Acres alluvial wells 490, 496 and 497 were fairly steady in 2008 (see Figure 4.3-30). The TDS concentrations in 491 increased in early 2008 and then declined to below its 2007 level. The increase in early 2008 is questionable because TDS concentrations in other wells in this area are not that high.

TDS concentrations for the Murray Acres and Pleasant Valley Estates alluvial wells are presented in Figure 4.3-31. A gradual decreasing trend in concentrations was observed in well 844 and 846 in early 2008 while the level increased late in the year. The TDS concentrations in the other four wells have remained relatively unchanged in 2008.

Figure 4.3-32 presents time plots of TDS concentrations for six wells located in Section 3. Overall, TDS concentrations have been relatively steady over the last few years in these wells, except the 2007 value for well 646 which may be an analytical outlier.

The TDS concentrations for the Section 28 irrigation supply and monitoring wells were also stable in 2008 (see Figure 4.3-33) except for a decline in wells 881 and 886 due to the fresh water injection. The observed decline in wells 881 and 886 is likely due to the effects of freshwater injection proximal to these wells. The total change in the TDS due to the freshwater injection appears to have occurred in wells 884 and 888 in 2007.

TDS concentrations in alluvial wells in Section 29 and adjacent areas are presented on Figure 4.3-34. TDS concentrations in these wells in 2008 were fairly steady.

Figure 4.3-35 presents TDS concentrations in the Section 33 alluvial wells. This plot shows fairly steady concentrations in the Section 33 wells in 2008.

4.3.3 CHLORIDE - ALLUVIAL

Chloride concentration is another important indicator of tailings seepage because of the conservative nature of this constituent and the fact that up-gradient concentrations are low. Chloride concentrations measured during 2008 in the alluvial aquifer near the tailings are presented on Figure 4.3-36. Up-gradient chloride concentrations in the alluvial aquifer varied from 49 to 120 mg/l in 2008. The fresh-water injection systems have used water with chloride concentrations of approximately 200 mg/l, whereas the R.O. product chloride concentration is less than 10 mg/l. The alluvial aquifer around and underlying the Large and Small Tailings Piles contains chloride concentrations in excess of the State drinking water standard of 250 mg/l (site standard). Measurement of chloride concentration in alluvial ground water is useful in defining areas where the R.O. product water has migrated in the alluvial aquifer. A light green pattern on Figure 4.3-36 is used to illustrate where concentrations exceed 250 mg/l. The limited areal extent of the green pattern on this figure shows that the need for ground water-quality restoration with respect to chloride is limited to the immediate area of the tailings. Chloride concentrations in the alluvial water in the western half of Figure 4.3-36 have never exceeded 250 mg/l and, therefore, chloride concentrations are not typically measured in all of the wells in the west area. However, chloride concentrations were measured in samples collected from most of these wells in 2008.

Figure 4.3-37 presents chloride concentrations versus time for the six up-gradient wells. Analysis of the data on this figure shows a decrease in chloride concentrations in 2007 and 2008 in wells Q and R after an increase in 2006. Fairly steady chloride concentrations were observed in these wells in 2008.

Figure 4.3-38 presents time plots of chloride concentration for wells NC, S2, S4, SM and SO. Fairly steady chloride levels were measured in these wells in 2008 except for an increase in well SM.

Chloride concentrations in wells BC and DC were steady in 2008 compared to their 2006 values (see Figure 4.3-39). The 2007 samples for wells BC and DC are thought to be switched. Fairly steady chloride levels were observed in the three other wells.

Plots of chloride concentration for wells B, D1, M3 and M5 are presented on Figure 4.3-40. The chloride concentration in well D1 is similar to the fresh water injection concentration. An overall decline in concentrations in well B was caused by the R.O. product injection in this area, but then became steady in 2008. The chloride concentration in collection wells M3 and M5 were fairly steady in 2008.

Chloride concentrations in wells B5, B11, SA, T and TB are presented on Figure 4.3-41. Chloride concentration in well B11 decreased in 2008. An increase in concentration in collection well B5 was observed. A gradual increase was observed in collection well T while chloride concentration in samples from wells SA and TB were fairly steady in 2008.

Chloride concentrations in alluvial wells on the west side of the Small Tailings Pile are presented on Figure 4.3-42. This figure shows stable chloride concentrations in these wells.

All of the chloride concentrations on the south side of the Small Tailings Pile remained very low in 2008 but have been variable due to the switch to fresh water injection. This reflects the changes from the removal of R.O. product water injection in this area (see Figure 4.3-43). The chloride concentrations in water from the K wells (see Figure 4.3-44) have been steady and low in 2008.

The chloride concentrations in water collected from the L line wells are presented in Figure 4.3-45. The chloride concentrations have generally been fairly steady in these wells in 2008 but are higher on the south end of the L wells at well L. With respect to chloride concentration, the quality of water has been restored in the vicinity of the L wells.

Figure 4.3-46 presents time plots of chloride concentrations in the Broadview Acres wells with the concentrations very similar to the fresh water chloride concentration.

Figure 4.3-47 presents the chloride concentration-time plots for the four Felice Acres wells. The 2008 chloride concentrations are fairly similar to previous chloride concentrations except for the increase and decline in irrigation supply well 491. The large increase in early 2008 in well 491 is supported by other parameters from this sample. The late 2008 value and the 2007 values indicate an overall decline in concentration.

Chloride concentration plots for the Murray Acres and Pleasant Valley Estates wells are presented on Figure 4.3-48. Chloride concentrations are very similar to the fresh water injection concentration with a small increase in concentration for well FB.

The plots of chloride concentration versus time in Section 3 wells are presented on Figure 4.3-49. Chloride concentrations were similar in 2008 in these wells to their historic values except for the increase in monitoring well 864.

Figure 4.3-50 presents plots of the variation of chloride concentrations with time in Section 28 wells. Decline in chloride concentrations were observed in wells 884 and 888 in 2008. These declines are likely due to the lower chloride concentration from fresh water injection in the area.

Chloride concentrations in the Section 29 monitoring wells are presented on Figure 4.3-51. Chloride concentrations in samples from these wells are similar to the concentration of the nearby fresh water injection with a lower chloride concentration. The water in injection supply well 951 typically has a chloride concentration of approximately 80 mg/l.

Figure 4.3-52 presents time plots of chloride concentrations in the Section 33 wells. The 2008 chloride concentrations for these wells are fairly similar to those measured prior to 2008.

4.3.4 URANIUM - ALLUVIAL

Uranium is considered an important ground water constituent at this site due to the significant levels in the tailings seepage. Uranium data and contours for 2008 are presented on Figure 4.3-53. Background uranium concentrations during 2008 varied from 0.009 to 0.23 mg/l, and the alluvial site standard is 0.16 mg/l. The light green pattern on Figure 4.3-53 shows where uranium concentrations exceed 0.16 mg/l, the statistical upper range of background from previous statistical analysis of the 1995-2004 data.

Uranium concentrations exceed background in the area of the Large and Small Tailings Piles, and to the west extending into Section 28. Uranium concentrations in Sections 28 and 29 also reflect a contribution from the Rio San Jose alluvial system in Section 20, but these levels have decreased to less than 0.16 mg/l. The zones of moderately elevated concentrations join together and the combined area extends down-gradient approximately one mile into Section 33.

Uranium concentrations greater than 0.16 mg/l are also present near the L collection wells south of the Small Tailings Pile. Uranium concentrations in the L wells were overall slightly reduced in 2008.

An additional area where uranium concentrations in the alluvium are greater than 0.16 mg/l exists in Felice Acres and to the southwest into Section 3 (see Figure 4.3-53). The area of elevated concentrations extends for approximately one-half mile to the southwest of the southwest corner of Felice Acres. Uranium concentrations in this area were generally reduced in 2008. The uranium concentrations in another small area in the northeast portion of Murray Acres at well 802 exceed 0.16 mg/l. Concentrations in this area reduced in 2008. Additional restoration is needed in each of these areas with respect to uranium concentrations.

Uranium concentration plots were prepared in order to illustrate changes that result from the corrective action program and other factors. Figure 4.3-2 shows the grouping and location of the alluvial wells used for the uranium-time plots. The figure numbers shown on Figure 4.3-2 correspond to the sulfate time plots. The same grouping of wells was used for the uranium plots, and their symbols and colors are the same as those used on other time plots.

Figure 4.3-54 presents uranium concentrations plotted versus time for up-gradient wells DD, ND, P, P2, Q and R. The uranium concentrations in these wells have been fairly steady during the last few years except for the increase in well ND in 2008. Additional monitoring is needed to confirm this value. The site standard of 0.16 mg/l is shown in the legend on Figure 4.3-53.

A decrease in uranium concentrations was observed in 2008 for wells S2, S4 and SO (see Figure 4.3-55). Uranium concentrations remained low in well NC; a slight increase was observed in SM.

Figure 4.3-56 presents the uranium concentration time plots for alluvial wells west of the Large Tailings Pile. Uranium concentrations are low with a large increase in well BC in 2005 and 2006 and a decrease in 2008. Well BC is completed in a low permeability area of the alluvial aquifer and responded slowly to restoration. The 2007 samples from wells BC and DC are thought to have been switched. Steady concentrations were observed in wells DC, MO, MU and W in 2008.

Figure 4.3-57 presents time plots of uranium concentrations for alluvial wells B, D1, M3 and M5. Fairly steady uranium concentrations were observed in wells B, M3 and M5 in 2008. Uranium concentrations in well D1 increased in early 2008 and then decreased.

Plots of uranium concentration versus time are presented on Figure 4.3-58 for alluvial wells B5, B11, SA, T and TB. Small concentrations were observed in water from wells T and TB during 2008. Uranium concentration in collection well SA returned to levels similar to values prior to the higher value observed in 2007. A very gradual decline was observed in water from wells B5 and B11.

Figure 4.3-59 presents plots of uranium concentration versus time for collection wells on the west side of the Small Tailings Pile. Uranium concentrations in wells were fairly steady in 2008 in these wells except for a small increase in well C2.

Figure 4.3-60 presents uranium concentrations for wells on the south side of the Small Tailings Pile. Uranium concentrations are low in each of these wells, due to the injection of R.O. product and fresh water into this area.

Uranium concentrations in wells K4, K7, K9 and K10 were reasonably steady in 2008 (see Figure 4.3-61).

Uranium concentrations in water from alluvial wells L, L6, L7, L8, L9 and L10 are presented on Figure 4.3-62. Uranium concentrations were fairly steady in 2008 in all of these wells except for a small increase in well L.

Figure 4.3-63 presents uranium concentrations versus time for four Broadview Acres alluvial wells: GH, SUB1, SUB2 and SUB3. Uranium concentrations in each of these wells were steady in 2008.

Figure 4.3-64 presents the uranium concentration time plots for Felice Acres wells 490, 491, 496 and 497. An overall decrease in concentration was observed in wells 491 and 497 in 2008 with fairly steady levels in wells 490 and 496.

Figure 4.3-65 presents uranium concentrations for wells in the Murray Acres and Pleasant Valley Estates subdivision areas. Uranium concentrations gradually declined in well

802 in 2008 and are expected to continue to gradually decrease with time. Uranium concentrations in the remainder of the wells in this area are low.

The uranium concentrations for six wells in Section 3 southwest of Felice Acres are plotted on Figure 4.3-66. The uranium concentrations in the western well 631 have been low throughout the period of record. Uranium concentrations overall were very gradually declining for the last few years in well 862. The concentration at the leading edge of the uranium plume, as demonstrated by the values measured in well 644 declined in 2008. The steady concentration in irrigation well 869 shows that additional restoration is needed in central Section 3. The uranium concentration in monitoring well 864 declined in 2008 indicating that fresh water injection is starting to decrease these concentrations.

Uranium concentrations from four Section 28 wells and one western Section 27 well are plotted on Figure 4.3-67. A declining trend had been observed in concentrations in wells 884 and 888 but the 2008 values were fairly steady. A decline was also observed in wells 881 and 886 which is thought to be due to the fresh water injection. Concentrations from irrigation supply wells 890 and monitoring well 885 were steady in 2008.

Uranium concentration time plots for wells in the eastern area of Section 29 are presented on Figure 4.3-68. The uranium concentrations to the north of Section 29 (well 686) were steady in 2008. Well 686 is located in the Rio San Jose alluvial system up-gradient of its confluence with the San Mateo alluvial system. Fairly steady concentration was noted in alluvial well 935 in the southern portion of Section 29. The uranium concentration in well 531 increased in 2008. The uranium concentration in well 895 decreased.

Uranium concentrations in wells located in Section 33 are relatively small and are plotted on Figure 4.3-69. Concentrations have remained low with steady values in wells 647, 648, 649 and 658 during 2008. The concentrations in well 657 are slightly higher than the other Section 33 wells.

4.3.5 SELENIUM - ALLUVIAL

Selenium is an important constituent at the Grants Project site because, like uranium, it is present in significant concentrations in the tailings water. Figure 4.3-70 presents a map of the spatial distribution of selenium concentrations throughout the site. The upper limit of background based on statistical analysis and the site standard is 0.32 mg/l. Selenium concentrations upgradient of the site varied from less than 0.005 and 0.61 mg/l in 2008. Concentrations that exceed 0.32 mg/l are considered indicative of seepage impacts, while smaller concentrations are within the range of natural variation. A green pattern is superimposed on the concentration contour figure to show where concentrations exceed 0.32 mg/l. A 0.1 mg/l selenium concentration contour extends less than 0.1 miles into Section 28. Selenium concentrations in excess of 0.1 mg/l were measured southwest of Felice Acres in areas of Section 3 to its western border. All selenium concentrations in the alluvial aquifer in all of the nearby subdivisions are less than 0.1 mg/l.

Selenium concentrations exceeding 0.32 mg/l were measured in wells around the Large and Small Tailings Piles and extend approximately 800 feet to the west of the Large Tailings Pile and also extend to the south of the Small Tailings Pile in the area near the eastern edge of the L collection wells. The selenium value just east of Pleasant Valley at well MY slightly exceeds 0.1 mg/l. This shows that only the area near the tailings pile and the area near some of the L collection wells needs additional restoration in order to reduce selenium concentration.

Figure 4.3-2 presents the location and grouping of wells for selenium concentration plots. The symbols and colors used on Figure 4.3-2 are the same as those used on each constituent time plot.

Figure 4.3-71 presents plots of selenium concentration versus time for up-gradient wells DD, ND, P, P2, Q and R. There has been an increasing selenium concentration trend in up-gradient well R which is the farthest near-up-gradient well from the tailings. The data in 2007 and 2008 indicate that this trend has ceased which is expected because the maximum selenium value measured in the far upgradient wells is similar to the selenium in well R. A smaller increasing trend has also been observed in the data for wells Q and ND. The 2008 concentrations in wells P, P2 and DD were steady.

Figure 4.3-72 shows low selenium concentrations in wells NC and S4 during 2008. Steady but a higher selenium concentration was observed in well SM in 2008. A decline in selenium concentration was observed in wells S2 and SO.

Figure 4.3-73 presents selenium concentrations for wells BC, DC, MO, MU and W. Selenium concentrations have remained low in all of these wells except for an overall decrease in wells BC and DC; as previously mentioned 2007 data for these two wells are believed to have been switched.

Selenium concentrations in water from alluvial wells located southwest of the Large Tailings Pile are plotted on Figure 4.3-74. This figure shows a small selenium concentration in wells B and M5 in 2008 and a slight gradual increase in well D1. A steady concentration was observed for data from well M3 after an increase in 2007.

Figure 4.3-75 presents plots of selenium concentrations for wells B5, B11, SA, T and TB. A gradual increasing trend in selenium was noted for well T in 2008. Fairly steady selenium concentrations in wells B5, B11, SA and TB were observed during 2008.

The selenium concentrations for collection wells located on the west side of the Small Tailings Pile are plotted on Figure 4.3-76. Selenium concentrations in samples collected from wells C1 and C5 were small in 2008. A small increase in concentration was observed in well C2 in 2008.

Figure 4.3-77 presents selenium concentrations for wells KEB, KF, KZ and X, which are located on the south side of the Small Tailings Pile. Only small concentrations were measured in water taken from these wells and this is attributed to restoration by injection of R.O. product and fresh water in this area.

Selenium concentrations in wells K9 and K10 slightly increased in 2008 (see Figure 4.3-78). Concentrations in 2008 in collection wells K4 and K7 decreased.

Figure 4.3-79 presents selenium concentration for wells L, L6, L7, L8, L9 and L10. Fairly steady selenium concentrations with time were observed in these wells during 2008.

Figures 4.3-80 and 4.3-81 present selenium concentration plots for the Broadview Acres and Felice Acres alluvial wells. These plots show that the selenium concentrations have been reduced and maintained at low levels for the last several years in these two subdivisions except for a higher value in early 2008 in well 491. A small decrease was observed in well 496 in 2008.

Selenium concentrations are presented for wells in the Murray Acres and Pleasant Valley Estates areas on Figure 4.3-82. This plot shows continuing low selenium concentrations in monitoring wells in this area of the alluvial aquifer.

Selenium concentrations for six wells in Section 3 are plotted on Figure 4.3-83. Well 631 is located in the western portion of Section 3. Selenium concentrations in this well, and wells 646 and 869, decreased slightly in 2008. Concentrations in wells 644 and 862 were steady in 2008. An increasing trend has been observed in well 864 which is thought to be due to fresh water forcing higher concentrations to move toward the irrigation supply wells.

The selenium concentrations in alluvial water in Section 28 have been fairly steady with time. Figure 4.3-84 presents the selenium concentrations from the Section 28 alluvial wells. A significant decline was observed in concentration in well 884 in 2006 due to the fresh water injection in this area and this decline ceased in 2008 at a very low value. Small decreases were observed in irrigation supply well 881 and 886 likely due to injection water reaching these wells.

Figure 4.3-85 displays selenium concentrations in wells in Section 29 and in wells 686 and 541, which are located to the north and south of Section 29, respectively. Fairly steady and small selenium concentrations were observed in 2008 in these wells.

Selenium concentrations from wells in Section 33 are presented on Figure 4.3-86. The data demonstrated small and steady selenium concentrations in 2008 in these wells.

4.3.6 MOLYBDENUM - ALLUVIAL

This section discusses the molybdenum concentrations in the alluvial aquifer at the Grants Project during 2008. Figure 4.3-87 is a spatial presentation of the concentration data and contours. Molybdenum concentrations in alluvial water in the west area of this figure have typically been less than 0.03 mg/l and, therefore, samples from the western wells are not routinely analyzed for molybdenum. Numerous samples were taken from these wells in 2008 to update the molybdenum database. The movement of molybdenum in the alluvial aquifer is dramatically attenuated in comparison to that of selenium and uranium. Molybdenum concentrations exceed 100 mg/l near the Large Tailings Pile and a 10 mg/l contour extends around most of the Large Tailings Pile and the western portion of the Small Tailings Pile.

The light green pattern on Figure 4.3-87 shows the area where molybdenum concentrations exceed 0.10 mg/l, the site standard. A molybdenum concentration of 0.10 mg/l is considered the threshold of significance for this constituent at this site. Significant molybdenum concentrations extend approximately 1000 feet west of the Large Tailings Pile and also to the southeast of the Small Tailings Pile to the L collection wells. Concentrations in three wells in the central portion of Section 27 exceed the molybdenum site standard of 0.10 mg/l. Concentrations in none of the alluvial wells in the subdivisions exceed 0.10 mg/l of molybdenum.

Figure 4.3-88 presents molybdenum concentration for the up-gradient wells DD, ND, P, P2, Q and R. Concentrations have remained low in these six wells except for an increased value in well ND in 2008. Additional analysis is needed from this well prior to giving this value significance.

A decreasing trend in molybdenum concentration was observed in well S4 in 2008, while the molybdenum concentrations in wells S2 and SO were fairly steady (see Figure 4.3-89). Molybdenum concentrations in well NC were small and steady in 2008. An increase was observed in well SM in 2008.

Figure 4.3-90 presents time plots of molybdenum concentration for wells BC, DC, MO, MU and W. Molybdenum concentrations in each of these wells were small in 2008 except for higher values in well BC. Concentrations in this well are gradually declining, assuming the 2007 samples from wells BC and DC were switched.

Figure 4.3-91 displays molybdenum concentrations for wells B, D1, M3 and M5. Molybdenum concentrations in well M3 increased in 2008 after declining in 2007. Stable concentrations with time were observed in well B. A small increase was observed in well M5 while the 2008 value from well D1 decreased after increasing in early 2008.

Figure 4.3-92 presents molybdenum concentrations for wells B5, B11, SA, T and TB. A decrease in the molybdenum concentrations in wells B11 and T was observed in 2008. The molybdenum concentrations in wells B5 and TB were fairly steady in 2008 while the values in well SA were less than the 2007 value.

Molybdenum concentrations in wells on the west side of the Small Tailings Pile are presented on Figure 4.3-93. Molybdenum concentrations declined in the water in wells C1 and C5 in 2008.

Figure 4.3-94 presents molybdenum concentrations for wells on the south side of the Small Tailings Pile. Small molybdenum concentrations continued to be observed in wells KEB, KF, KZ and X during the last year.

Figure 4.3-95 shows decreasing molybdenum concentrations in wells K4, K7, K9 and K10 in 2008.

Figure 4.3-96 presents molybdenum concentrations in wells L, L6, L7, L8, L9 and L10, which are located further to the southeast of the Small Tailings Pile. Molybdenum concentrations were generally very gradually declining or steady in these wells during 2008. A very small increase was observed in well L.

Molybdenum concentrations in alluvial wells located in Broadview Acres and Felice Acres are plotted on Figures 4.3-97 and 4.3-98, respectively. The molybdenum concentrations in Broadview wells GH, SUB1, SUB2 and SUB3 have been low for the last several years. Molybdenum concentrations in wells 490, 491, 496 and 497 in Felice Acres were reasonably steady for 2008.

Figure 4.3-99 presents the molybdenum concentrations for wells in the Murray Acres and the Pleasant Valley Estates areas. This plot shows that molybdenum concentrations have remained low in these alluvial wells.

Molybdenum concentration plots for the irrigation area wells have been updated. Figures 4.3-100 through 4.3-103 present the molybdenum concentration time plots for the Section 3, Section 28, Section 29 and Section 33 wells, respectively. All of the molybdenum concentrations have remained low in wells located in these areas in 2008. Molybdenum concentrations have migrated into Section 27 and could possibly have migrated into eastern Section 28 in a small area.

4.3.7 NITRATE - ALLUVIAL

The presence of relatively large nitrate concentrations up-gradient of the Grants site has resulted in a site standard of 12 mg/l (see Table 3.1-1). A statistical analysis of the up-gradient data 1995 through 2004 produced the nitrate concentration of 12 mg/l based on the 95th percentile of background. Figure 4.3-104 presents nitrate concentrations measured in 2008 in the alluvial aquifer. The nitrate concentrations north and up-gradient of the tailings ultimately impact the nitrate concentrations down-gradient of the Large Tailings Pile in the northern portion of Sections 27 and 28. It is difficult to determine whether seepage from the tailings has any significant impact on the nitrate concentrations in this area, because the naturally higher concentrations up-gradient of the Large Tailings Pile makes modestly elevated nitrate concentrations indistinguishable from background. The nitrate concentrations in the northern portion of Section 27 did exceed 12 mg/l in 2008. Some of these larger nitrate concentrations could be caused by the higher historical nitrates upgradient of the site.

Nitrate concentrations exceed 12 mg/l in an area on the south and northeast sides of the Large Tailings Pile which are all likely due to seepage from the tailings. Small areas of nitrates above 12 mg/l also exist east of the Small Tailings and south of Pleasant Valley. Nitrate concentrations in all of the alluvial subdivision wells are below 12 mg/l. Areas where water-quality restoration is required with respect to nitrate are shown by the green patterns on Figure 4.3-104. Restoration of nitrate should occur prior to the restoration of some other key parameters in these areas.

Plots of nitrate concentration over time were prepared for the alluvial wells that are listed on Figure 4.3-2. Figure 4.3-105 presents the nitrate concentrations for the background wells. Concentrations in these wells have been relatively stable except for a gradual increasing trend over the last several years in well R and well Q for the last four years. The present nitrate concentrations in wells Q and R exceed the site standard which shows that nitrate concentrations above the site are entering the near-up-gradient area. Well Q nitrate concentrations exceeded the site standard in 2008. The recent increases in well Q fit the travel time between wells R and Q.

The nitrate concentrations in wells NC, S2, S4, SM and SO, immediately west of the Large Tailings Pile, are plotted on Figure 4.3-106. This figure shows small and steady concentrations in 2008 for wells NC, S4 and SM and small and gradually declining concentrations in wells S2 and SO.

Figure 4.3-107 presents the nitrate concentrations for wells BC, DC, MO, MU and W. Nitrate concentrations were marginally higher in 2008 in well MU and gradually decreasing in well MO in 2008. Nitrate concentrations were lower in wells BC, DC and W.

Nitrate concentrations in the group of wells southwest of the Large Tailings Pile are presented as time plots on Figure 4.3-108. All of the concentrations in these wells are small with a small increase observed in wells D1 and M3.

Figure 4.3-109 presents nitrate concentrations in wells B5, B11, SA, T and TB. Nitrate concentrations were fairly steady in these wells in 2008 except for an increase in collection well B5 and a gradual decline in well B11.

Nitrate concentrations in wells on the west side of the Small Tailings Pile are plotted on Figure 4.3-110. Fairly steady and small nitrate concentrations were observed in these wells in 2008.

Figure 4.3-111 shows nitrate concentrations for wells on the south side of the Small Tailings Pile. All of the nitrate concentrations in these wells are low and steady.

The nitrate concentrations in the K and L series wells are presented on Figures 4.3-112 and 4.3-113, respectively. Concentrations in recent samples have been very small in all of these wells.

Nitrate concentrations in the Broadview Acres wells are presented on Figure 4.3-114. Small and relatively steady nitrate concentrations were measured in water from these wells with time.

Nitrate concentrations for the Felice Acres wells are presented on Figure 4.3-115, with reasonably steady concentrations over time except the higher value in early 2008 in well 491.

Nitrate concentrations in Murray Acres and Pleasant Valley Estates wells are presented on Figure 4.3-116. Nitrate concentrations in well 846 are higher than the other four wells shown on this figure and show an increase in concentration in 2008. A small increase was observed in well 844.

Nitrate concentrations in Section 3 wells are presented on Figure 4.3-117. The nitrate concentrations in these wells were low in 2008 with a gradual increase in well 864.

Nitrate concentrations for the Section 28 wells are presented on Figure 4.3-118. A small increase was observed in well 884 while a gradual decreasing trend with time was observed for wells 881 and 886 in 2008. The nitrate concentrations in wells 885, 888 and 890 were reasonably steady.

Figure 4.3-119 presents nitrate concentrations in wells 531, 654, 685, 686, 895 and 935. The nitrate concentrations have been decreasing or steady over the last few years in each of these wells. The large increase in well 686 in 2007 is thought to be an error and the 2006 and 2008 data indicate it is an outlier.

Nitrate concentrations in the Section 33 wells are presented on Figure 4.3-120, and, in these wells, nitrate concentrations were steady in 2008.

4.3.8 RADIUM-226 AND RADIUM-228 - ALLUVIAL

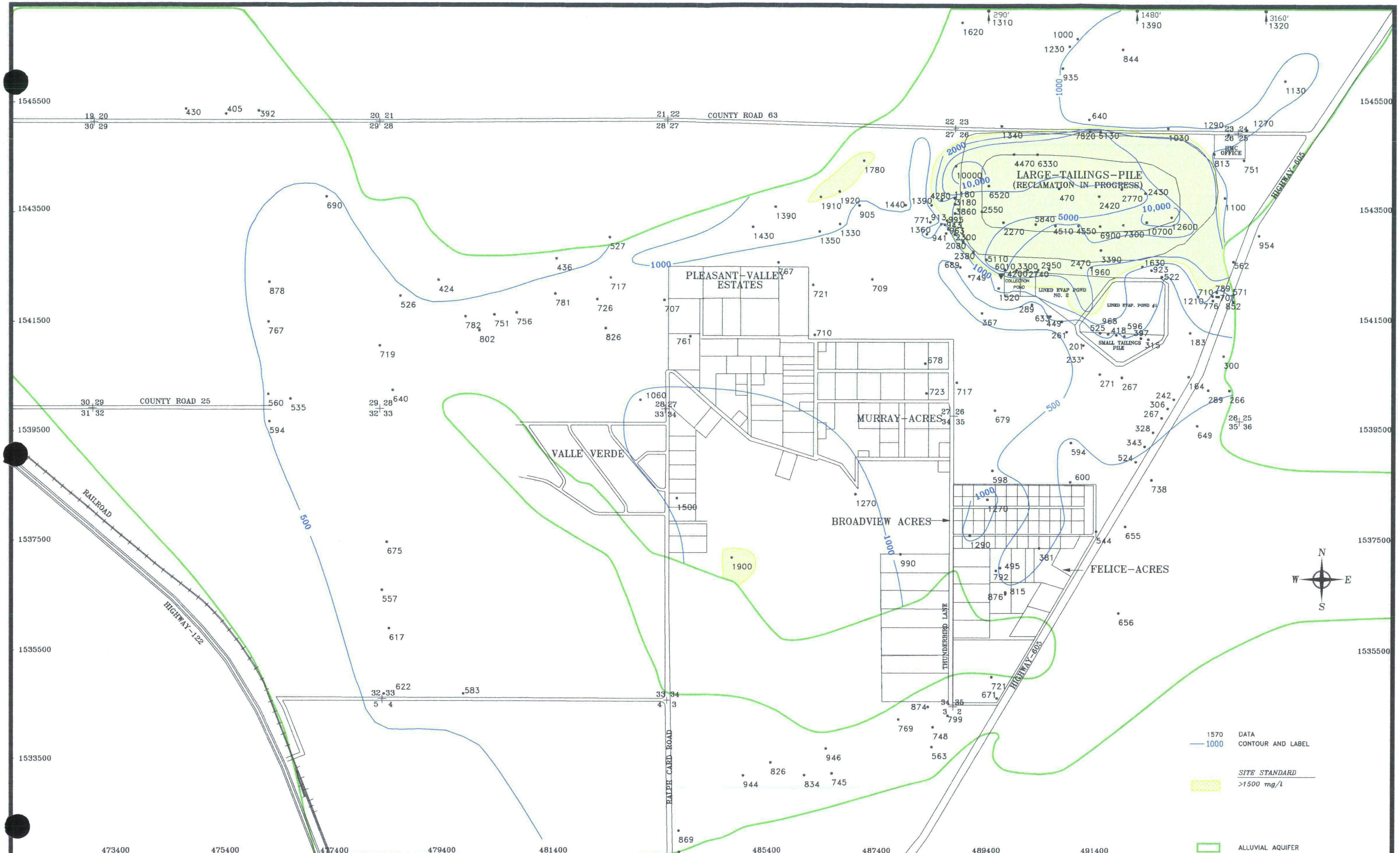
Figure 4.3-121 presents radium concentrations for the alluvial ground water in the Grants Project area. Radium concentrations are very small in the alluvial aquifer except directly underneath the Large Tailings Pile. The monitoring program for radium has been scaled back, because radium is not present in significant concentrations in the alluvial aquifer. The radium-226 concentrations are printed horizontally in black, while the radium-228 values are shown at a 45^{o} angle and in magenta. The State standard for radium-226 plus radium-228 is 30 pCi/l, while the NRC site standard is 5 pCi/l. Measured activities of radium-226 in alluvial wells beneath the Large Tailings Pile exceed 50 pCi/l in some areas and therefore exceeded the site standard in 2008. No significant radium-228 values were measured in 2008, similar to the 2007 results. No radium concentrations outside of the Large Tailings Pile area are in exceedance of the standard. Past data has shown that radium is not mobile in the alluvial aquifer at this site. The laboratory started in 2008 reporting negative and zero values for the radionuclides instead of a less than value. These very low results should be considered non-detect values.

4.3.9 VANADIUM - ALLUVIAL

Vanadium concentrations measured in 2008 are shown on Figure 4.3-122. None of the vanadium concentrations in the POC wells exceeded the site standard of 0.02 mg/l. POC well X was the only POC well that routinely contained a vanadium concentration above the site standard prior to restoration of that area. Therefore, none of the POC wells are expected to contain vanadium concentrations above the site standard of 0.02 mg/l in the future. Injection of R.O. product water has effectively restored ground water quality in the area near well X. Vanadium concentrations in 2004, in eight alluvial wells located within the footprint of the Large Tailings Pile, were above the site standard for vanadium. The ongoing corrective action program will restore vanadium concentrations in this area. All of the 2008 measurements were less than the detection limit.

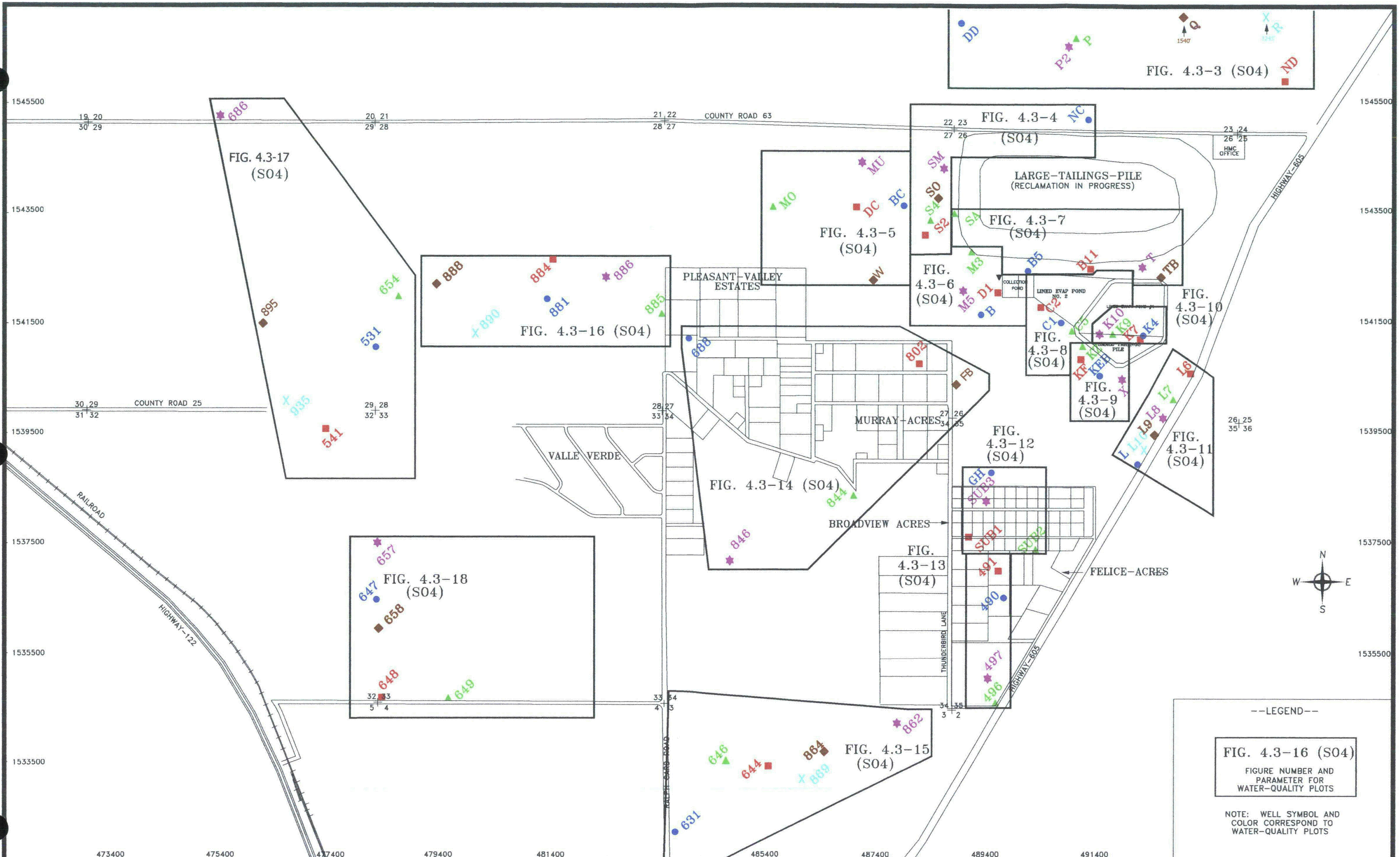
4.3.10 THORIUM-230 - ALLUVIAL

Figure 4.3-123 presents the 2008 thorium-230 concentrations in the alluvial aquifer. Thorium-230 concentrations are low at this site. The very low site standard of 0.3 pCi/l was established to reflect the low background concentrations. The thorium-230 activity was significant in some of the alluvial wells underneath the Large Tailings Pile in 2004. Thorium-230 has not been mobile in the alluvial aquifer except in the immediate vicinity of the tailings. The site standard for thorium-230 was exceeded in 2004 in ten wells in the alluvial aquifer underneath the Large Tailings Pile. This area is within the collection area, and additional restoration will result from the ongoing collection/injection programs. Thorium-230 levels in wells 490, 648, 649, 659, 688, 802, 846, SUB2 and SUB3, the three POC wells and upgradient wells were measured in 2008. The only exceedance in these measurements is a value of 0.5 pCi/l in well 846, east of Valle Verde. The values in 2007 from this well were less than detection. Therefore, no significance should be given to the slightly higher value until it is confirmed.



SCALE: 1"=1600'
C:\PROJECTS\
DATE:

FIGURE 4.3-1. SULFATE CONCENTRATIONS OF THE ALLUVIAL AQUIFER, 2008, mg/l



SCALE: 1" = 1600'
C:\PROJECTS\2009-06\1600QAL rts
DATE: 3/26/09

FIGURE 4.3-2. LOCATION OF ALLUVIAL WELLS WITH WATER-QUALITY PLOTS, 2008

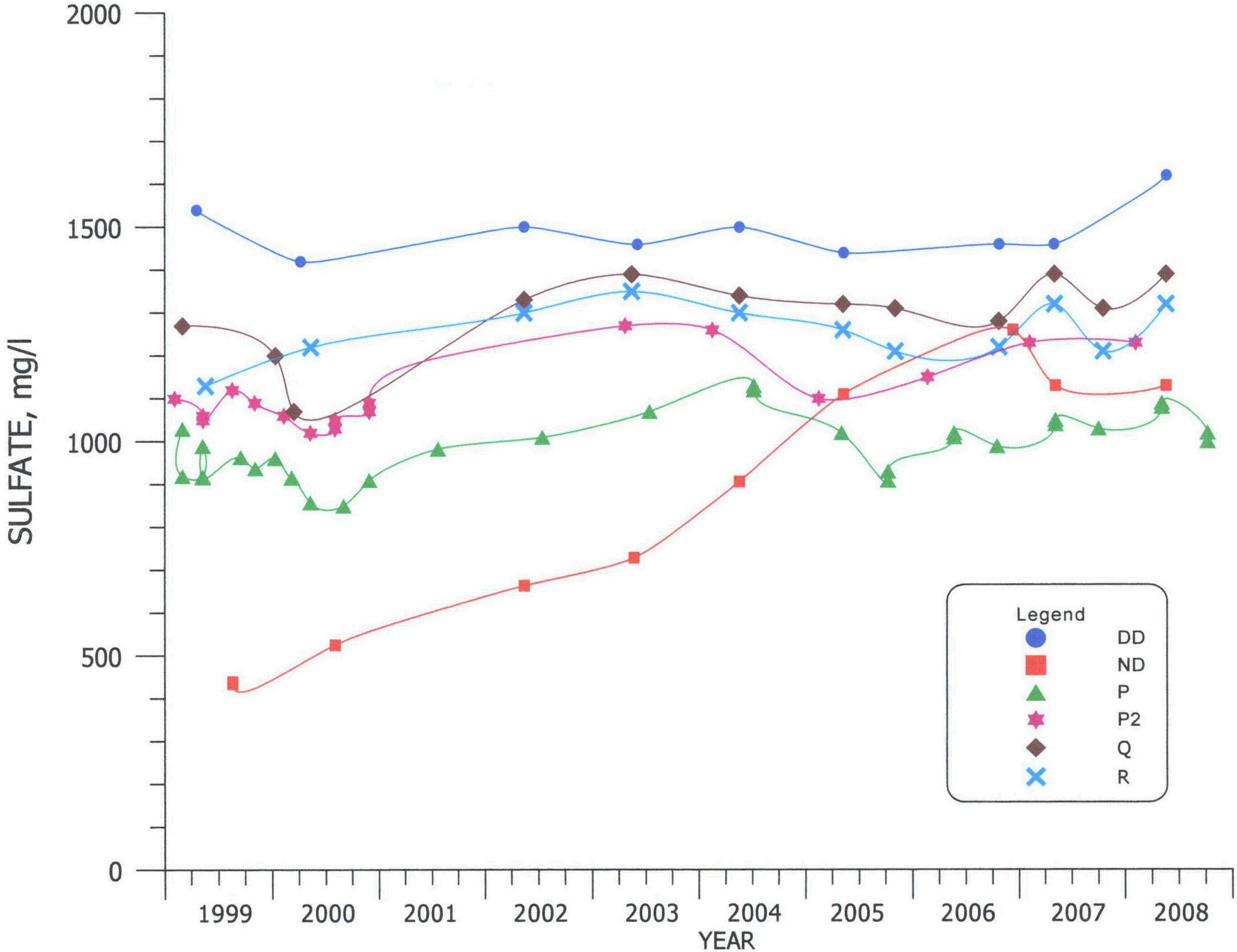


FIGURE 4.3-3. SULFATE CONCENTRATIONS FOR WELLS DD, ND, P, P2, Q AND R.

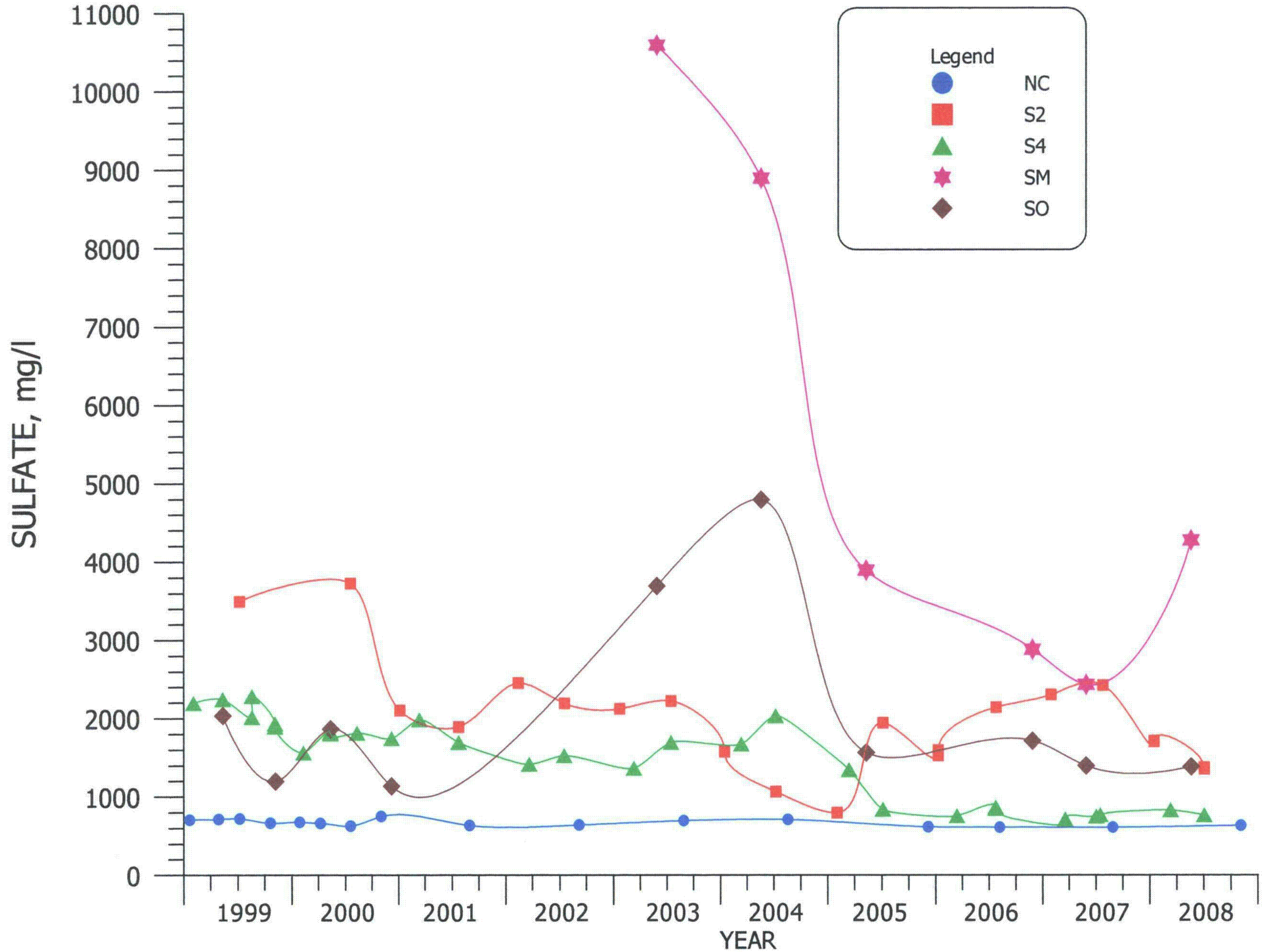


FIGURE 4.3-4. SULFATE CONCENTRATIONS FOR WELLS NC, S2, S4, SM AND SO.

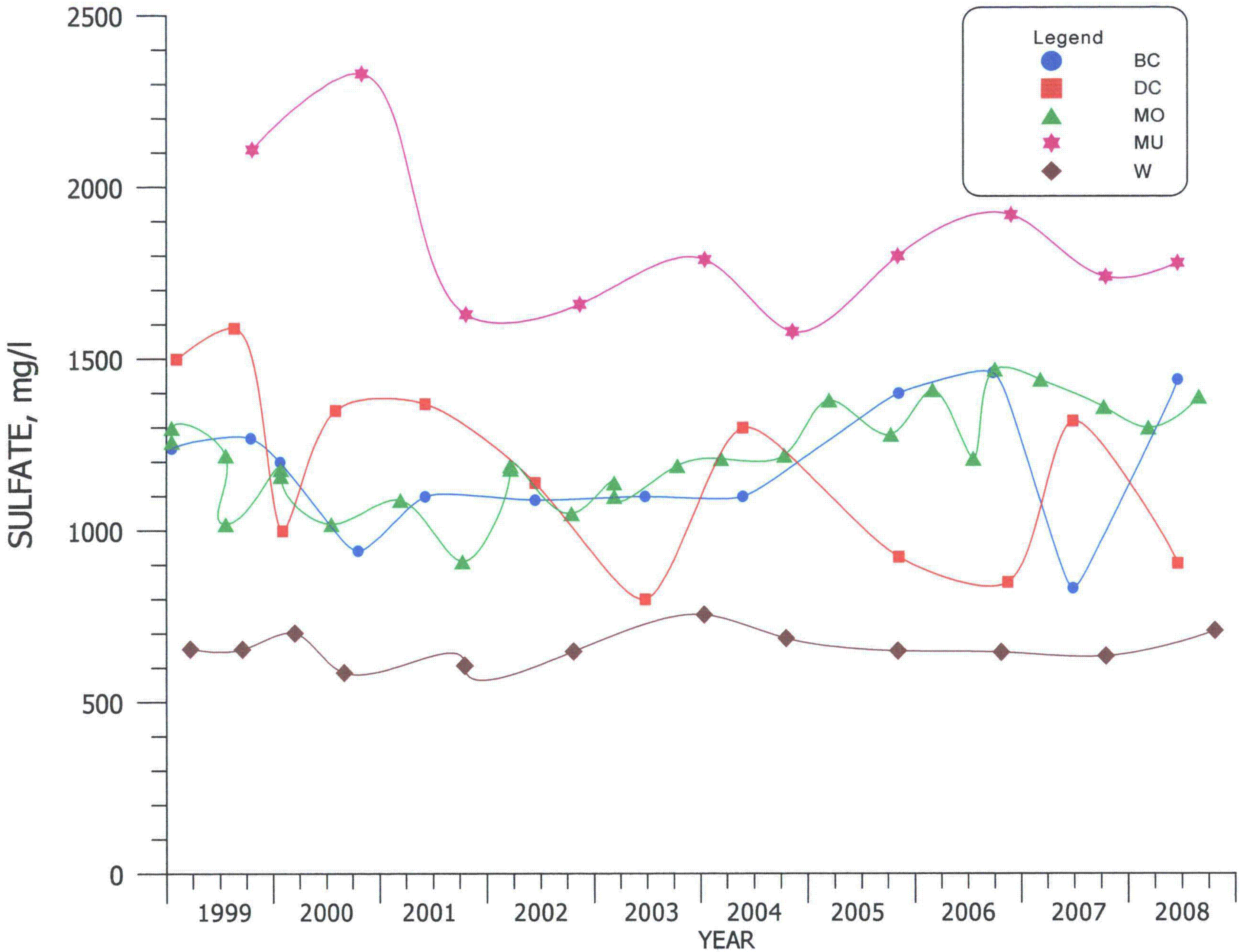


FIGURE 4.3-5. SULFATE CONCENTRATIONS FOR WELLS BC, DC, MO, MU AND W.

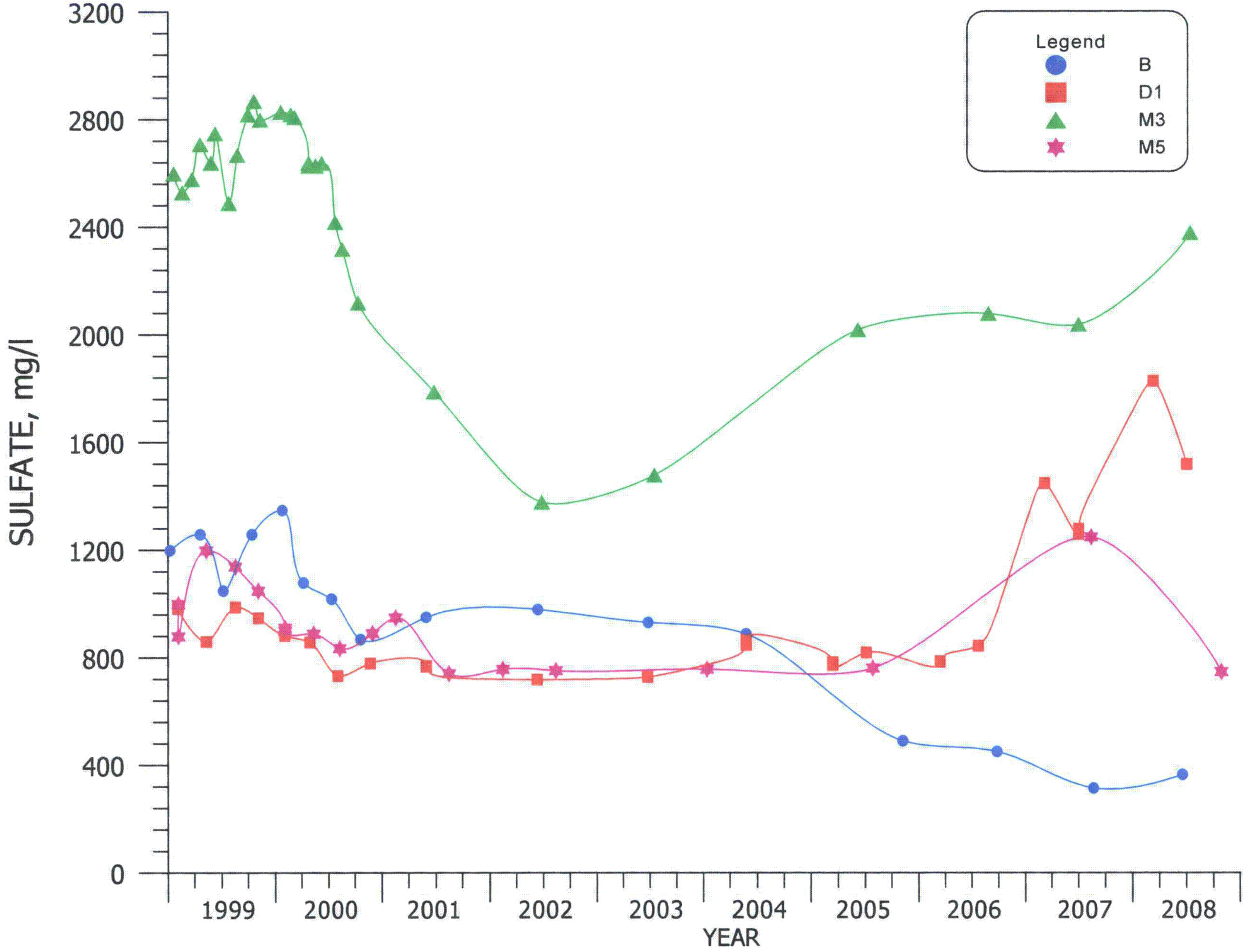


FIGURE 4.3-6. SULFATE CONCENTRATIONS FOR WELLS B, D1, M3 AND M5.

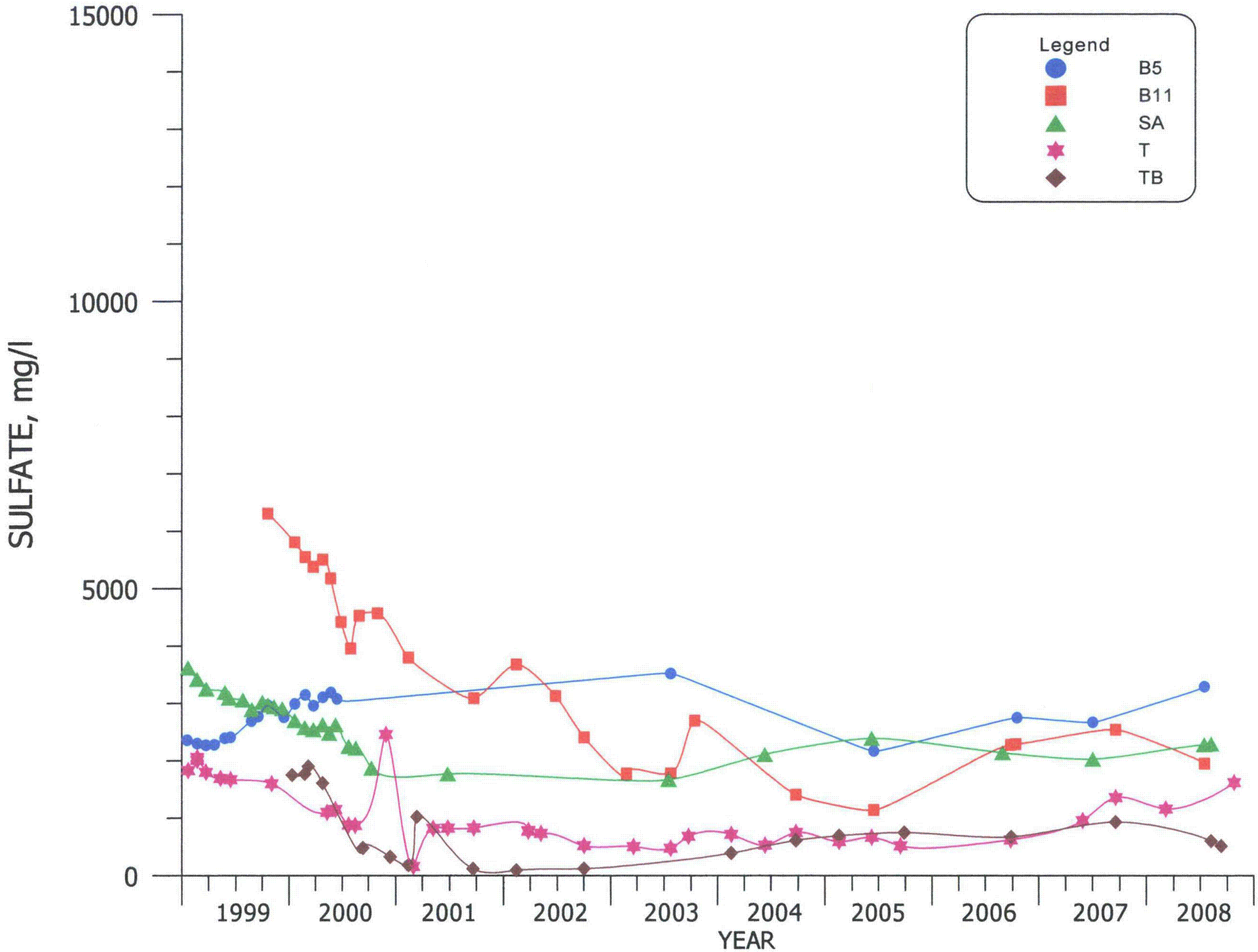


FIGURE 4.3-7. SULFATE CONCENTRATIONS FOR WELLS B5, B11, SA, T AND TB.

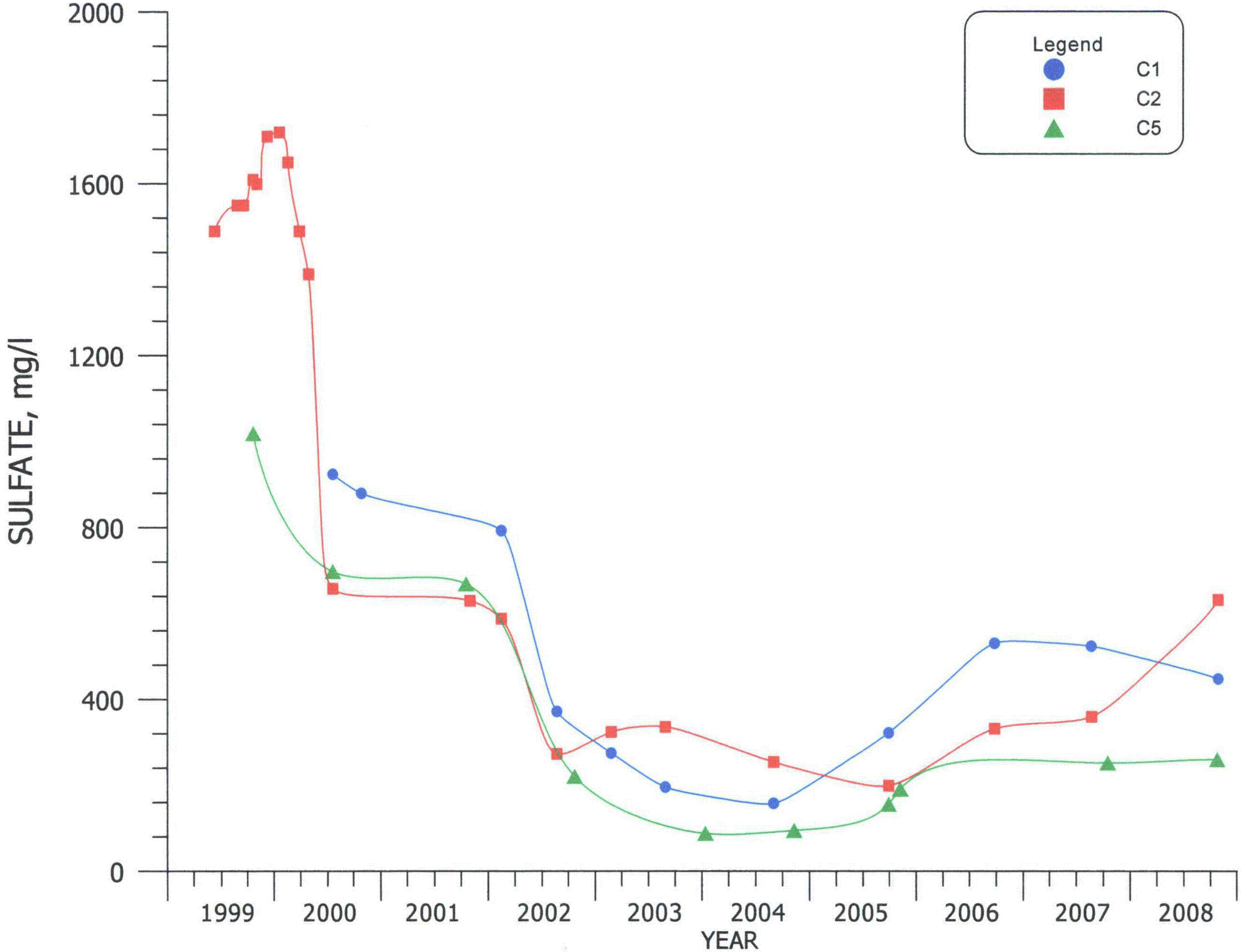


FIGURE 4.3-8. SULFATE CONCENTRATIONS FOR WELLS C1, C2 AND C5.

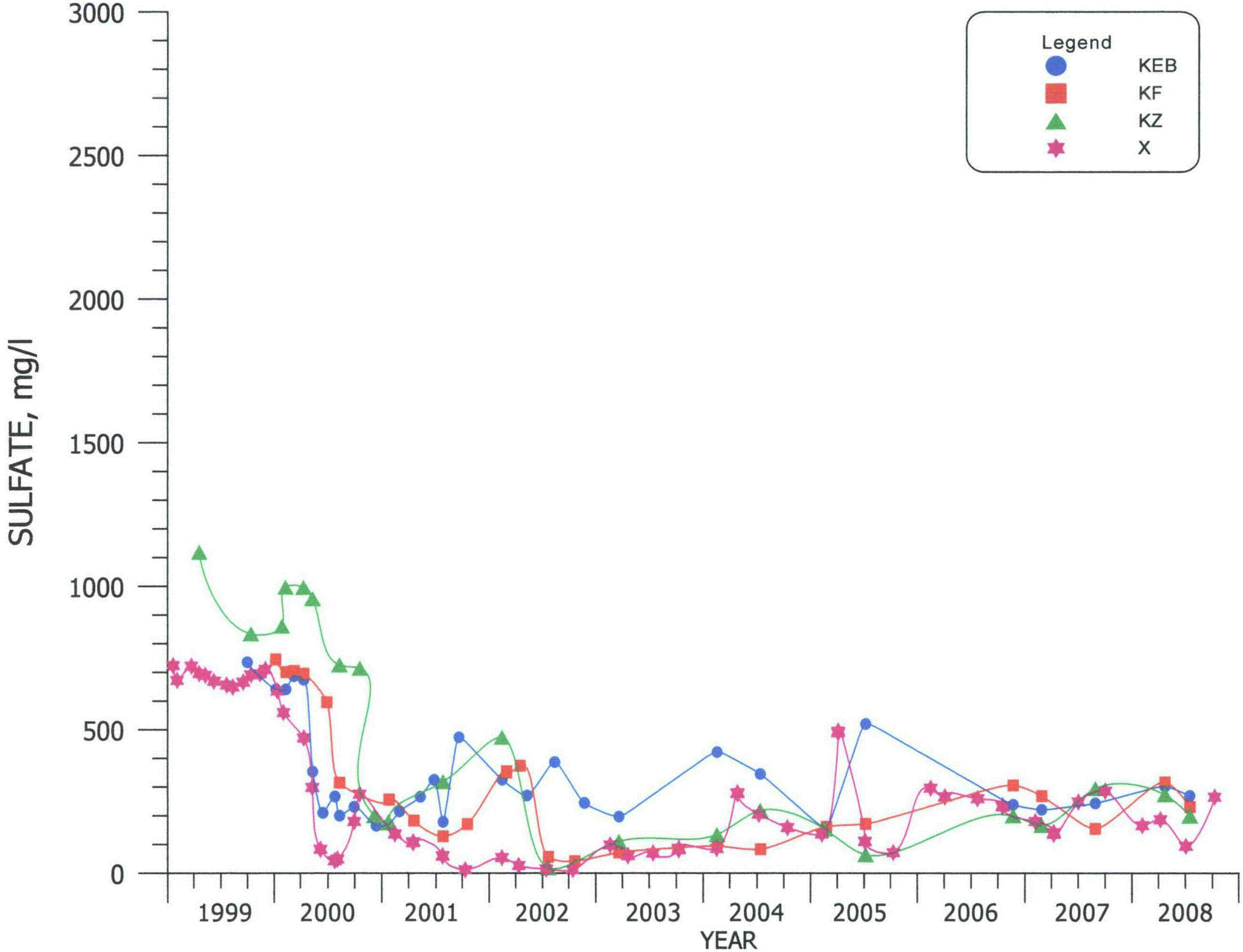


FIGURE 4.3-9. SULFATE CONCENTRATIONS FOR WELLS KEB, KF, KZ AND X.

4.3-31

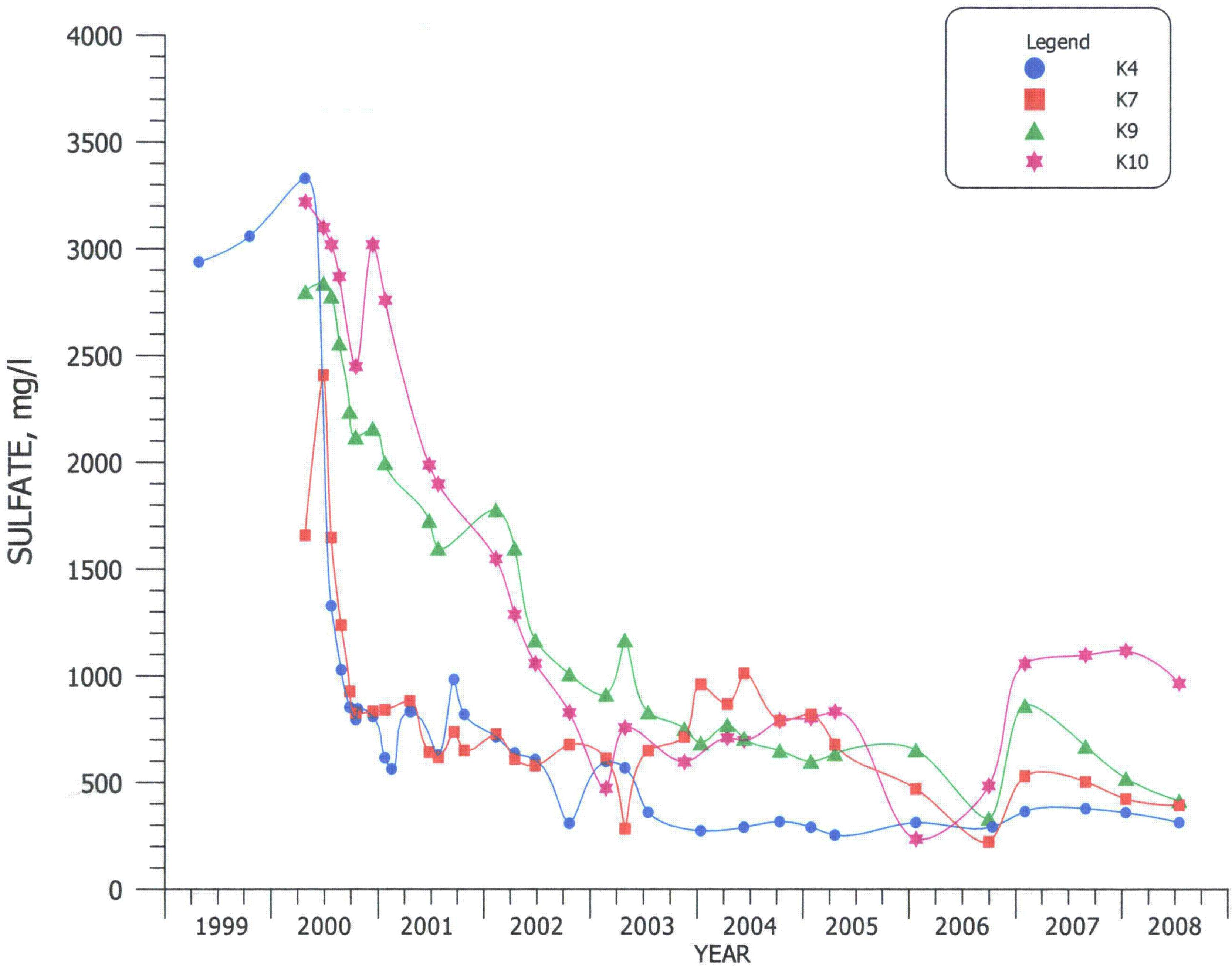


FIGURE 4.3-10. SULFATE CONCENTRATIONS FOR WELLS K4, K7, K9 AND K10.

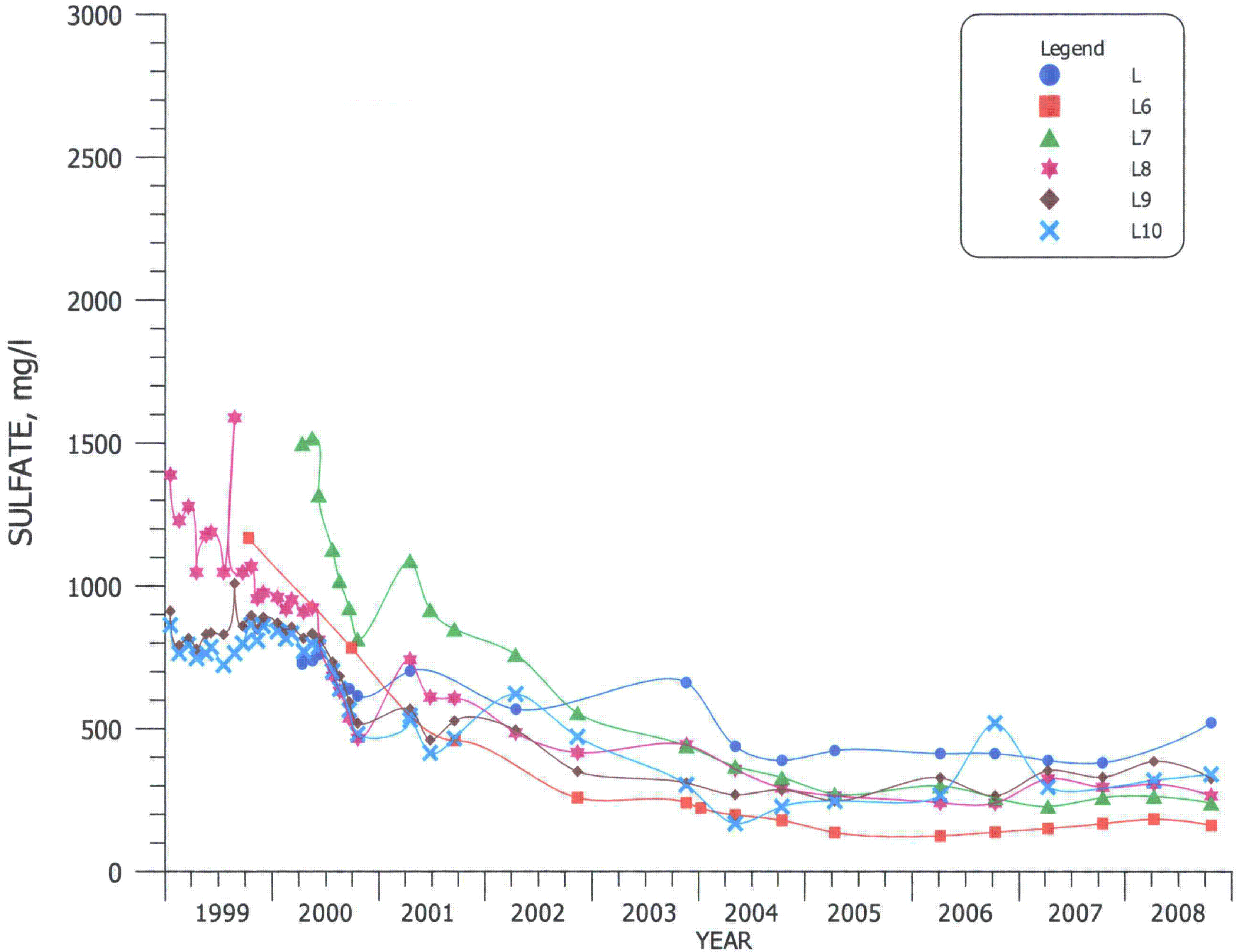


FIGURE 4.3-11. SULFATE CONCENTRATIONS FOR WELLS L, L6, L7, L8, L9 AND L10.

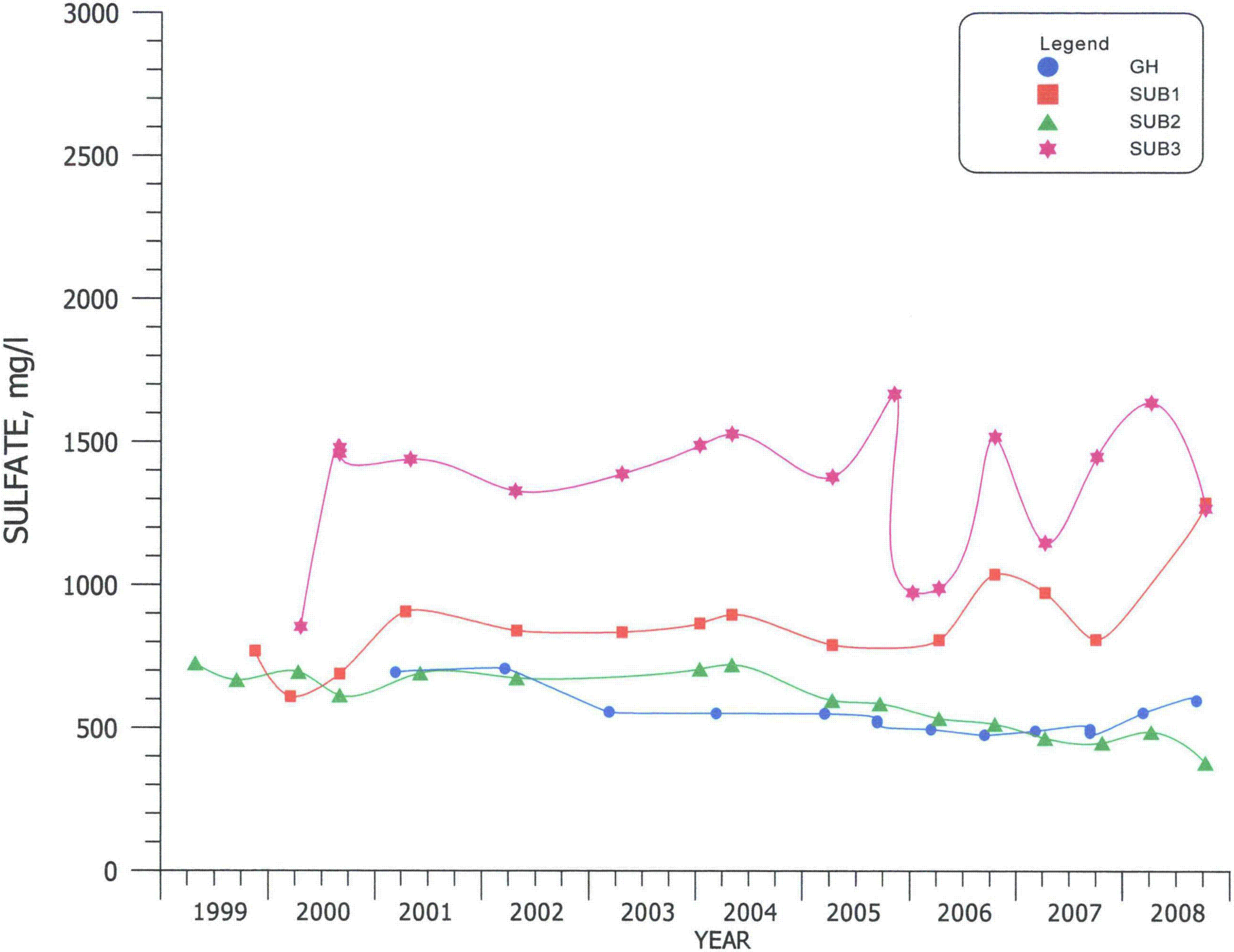


FIGURE 4.3-12. SULFATE CONCENTRATIONS FOR WELLS GH, SUB1, SUB2 AND SUB3.

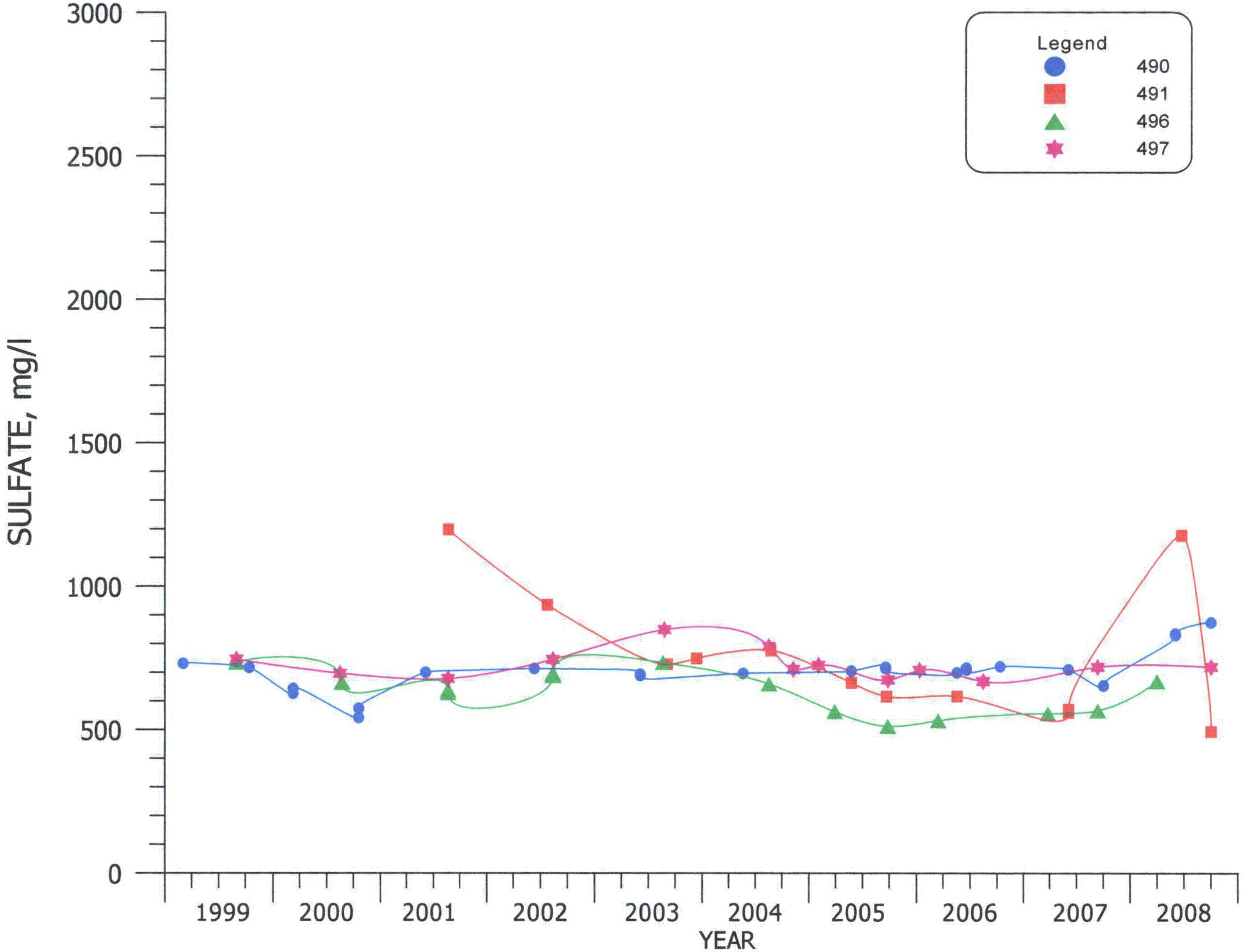


FIGURE 4.3-13. SULFATE CONCENTRATIONS FOR WELLS 490, 491, 496 AND 497.

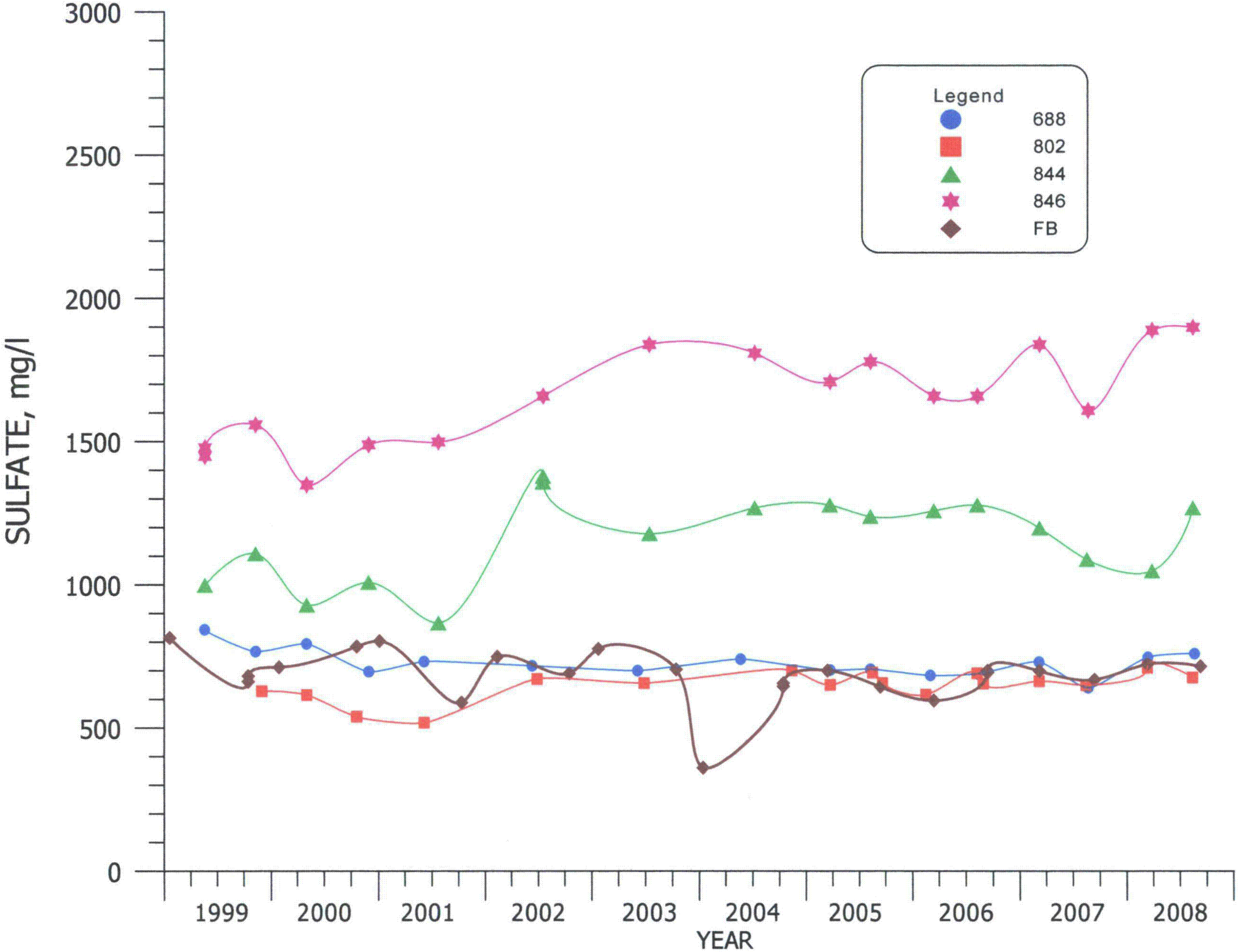


FIGURE 4.3-14. SULFATE CONCENTRATIONS FOR WELLS 688, 802, 844, 846 AND FB.