Department of Energy
Office of Legacy Management

SEP 2 6 2005

Ms. Madeline Roanhorse
Director Navajo AML Reclamation
Division of Natural Resources
P.O. Box 1875
Window Rock, AZ 86515

Subject: *Annual Performance Report April 2004 through March 2005 for the Shiprock, New Mexico, Site*

Dear Ms. Roanhorse:

Enclosed are two copies of the *Annual Performance Report April 2004 through March 2005 for the Shiprock, New Mexico, Site* (September 2005). This evaluation is based upon comparison of the site conditions in March 2005 to the baseline site conditions presented in the Shiprock Baseline Performance Report (September 2003).

Findings from the April 2004 through March 2005 evaluation indicate that on the floodplain ground water is flowing toward the wells in response to pumping and although there have been minimal reductions in Contaminant of Concern concentrations, the extraction wells removed some contamination that would have otherwise discharged to the San Juan River. The terrace ground water elevations have generally declined relative to baseline conditions although actual withdrawals of ground water from the terrace are lagging behind model-projected ground water withdrawals.

If you have any question or comments, please call me at 970/248-6073.

Sincerely,

Richard P. Bush

Richard P. Bush
Site Manager

Enclosures (2)

cc w/enclosures:
B. Von Till, NRC
S. Austin, Navajo Nation EPA
R. Whitehorse-Larson, Navajo Nation Fish and Wildlife
R. MacRae, U.S. Fish and Wildlife Service
SHP 30.10.5 (DOE)

cc w/o enclosures:
D. Miller, Stoller

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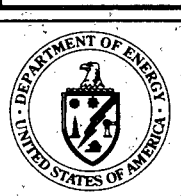
DOE–LM/GJ933–2005

Annual Performance Report April 2004 Through March 2005 for the Shiprock, New Mexico, Site

September 2005



U.S. Department of Energy

Office of Legacy Management

Work Performed Under DOE Contract No. DE–AC01–02GJ79491
for the U.S. Department of Energy Office of Legacy Management.

DOE–LM/GJ933–2005

Annual Performance Report April 2004 through March 2005 for the Shiprock, New Mexico, Site

September 2005

Work Performed by S.M. Stoller Corporation under DOE Contract No. DE–AC01–02GJ79491
for the U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado

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1.0 Introduction

This report evaluates the performance of the ground water remediation system at the disposal and processing site in Shiprock, New Mexico, for the period of April 2004 through March 2005. The Shiprock site, a former uranium mill tailings facility under the Uranium Mill Tailings Remedial Action (UMTRA) Project, is currently managed by the Department of Energy (DOE) Office of Legacy Management (OLM). This evaluation is based upon comparison of the site conditions in September 2004 and March 2005 to the baseline site conditions presented in the Shiprock Baseline Performance Report (DOE 2003a). The baseline conditions were established using data collected primarily from March 2003. A detailed description of the site conditions is presented in the Site Observational Work Plan (SOWP) (DOE 2000), and the compliance strategy is presented in the Ground Water Compliance Action Plan (GCAP) (DOE 2002).

The Shiprock site is divided into two distinct areas, the floodplain and the terrace. An escarpment forms the boundary between the two areas. The terrace is further divided into terrace west and terrace east. Initially the remediation system (Figure 1) consisted of two floodplain ground water extraction wells, four terrace-east ground-water extraction wells, two interceptor drains (one installed in Bob Lee Wash and the other installed in Many Devils Wash), a lined evaporation pond, and a terrace drainage channel diversion structure. The terrace ground water extraction wells and interceptor drains became operational in late February 2003, and the floodplain extraction wells became operational in March 2003. Four additional extraction wells were installed on the terrace east portion of the site in July 2003; they were piped into the remediation system in early August 2003 in an attempt to increase the volume of ground water removed from the terrace. In its refinement of the site conceptual model, DOE (2004a; p. 6-1) recommended installing three new extraction wells in the terrace-east area. Two of these wells were installed in March 2005 (the third could not be emplaced because of failure to obtain access right-of way). Preliminary testing indicates that the combined production rate from the two new terrace wells will be in the neighborhood of 3 to 5 gpm and that they should enable the DOE to more readily extract ground water from the terrace alluvial flow system.

1.1 Remediation System Performance Standards

This performance assessment is based on the analysis of water quality and water level data obtained from site monitoring wells in addition to ground water flow rates associated with the drains and seeps. Specific performance standards as established for the Shiprock floodplain ground water remediation system in the Baseline Performance Report (DOE 2003a) are summarized as follows:

- Ground water flow directions in the vicinity of the extraction wells should be toward the extraction wells.
- Pumping on the floodplain should intercept contaminants of concern (COCs) that would otherwise discharge to the San Juan River.

Specific performance standards as established for the Shiprock terrace ground water remediation system (Section 3.2) in the Baseline Performance Report (DOE 2003a) are summarized as follows:

- Terrace ground water surface elevations should decrease as water is removed from the terrace system.

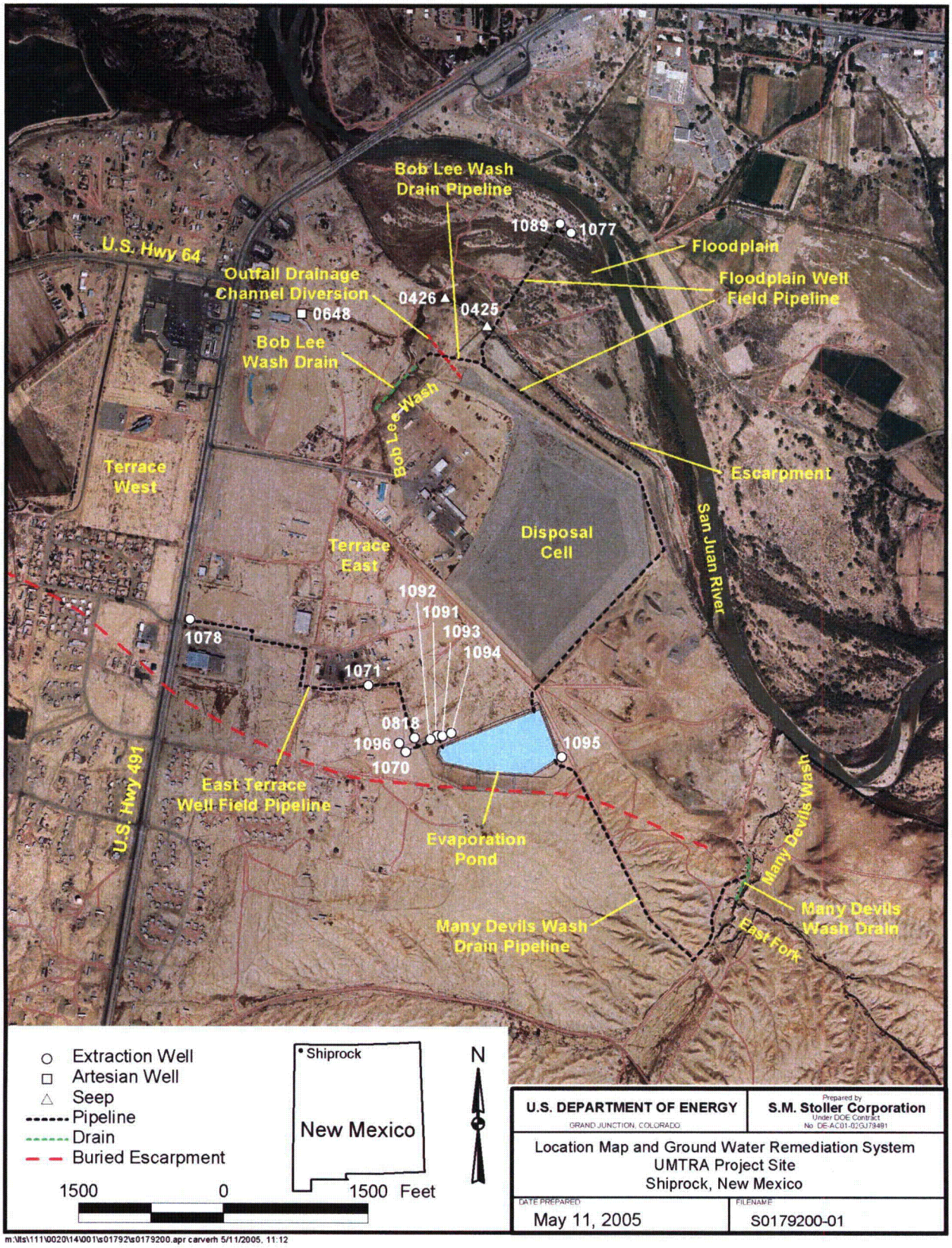

Figure 1. Location Map

- Ground water flow directions in the vicinity of the extraction wells should be toward the extraction wells.
- The volume of water discharging to the interceptor drains located in Bob Lee and Many Devils Washes should decrease over time as ground water levels on the terrace decline.
- The flow rates of seeps located at the escarpment face (locations 0425 and 0426) should decrease over time as ground water levels on the terrace decline.

1.2 Contaminants of Concern and Remediation Goals

Ground water at the site is contaminated as a result of uranium milling activities between 1954 and 1968. The COCs for both the floodplain and terrace are ammonia (total as NH_4), manganese, nitrate+nitrite as N (nitrate), selenium, strontium, sulfate, and uranium. Ground water compliance for the terrace is based on hydrologic control and concentration standards do not apply.

Floodplain compliance standards for uranium and nitrate are their respective UMTRA standards of 0.044 and 44 milligrams per liter (mg/L).

A secondary standard of 250 mg/L for sulfate exists under the Safe Drinking Water Act. However, studies conducted by the Centers for Disease Control in conjunction with the U.S. Environmental Protection Agency (EPA) have shown that no adverse effects from sulfate ingestion occur at concentrations of up to 1,200 mg/L (EPA 1999). The report notes that other studies have shown that concentrations of sulfate exceeding 2,000 mg/L may have little to no adverse effect on humans and animals. Because of the presence of high background sulfate concentrations at the site in the floodplain (up to 1,920 mg/L) and the high sulfate concentration of water entering the floodplain from flowing artesian well 0648 (up to 2,340 mg/L), the proposed cleanup goal for floodplain sulfate is 2,000 mg/L.

Relatively high selenium concentrations in the floodplain make it unlikely that the UMTRA standard of 0.01 mg/L for this constituent can be met while contaminated terrace water is still providing a source. DOE proposed an alternate concentration limit for selenium of 0.05 mg/L (DOE 2003a), which is EPA's maximum contaminant level for drinking water.

The cleanup objective for manganese is the maximum background concentration for the floodplain, which is currently 2.74 mg/L. There are no cleanup standards or background concentrations established for ammonia (total as NH_4) and strontium.

1.3 Hydrogeological Setting

Sections 1.3.1 and 1.3.2 provide a summary of the floodplain and terrace ground water systems, respectively. A more detailed description is provided in the SOWP (DOE 2000).

1.3.1 Floodplain Alluvial Aquifer

The thick Mancos Shale of Cretaceous age forms the bedrock underlying the entire site. A floodplain alluvial aquifer occurs in unconsolidated medium- to coarse-grained sand, gravel, and cobbles that were deposited in former channels of the San Juan River above the Mancos Shale. The floodplain aquifer is hydraulically connected to the San Juan River; the river is a source of

ground water to the floodplain aquifer in some areas, and receives ground water discharge in others. In addition, the floodplain aquifer almost certainly receives some inflow from a ground water system in the terrace area. The floodplain alluvium is up to 20 feet (ft) thick and overlies Mancos Shale, which is typically soft and weathered for the first several feet below the alluvium.

Most ground water contamination in the floodplain lies close to the escarpment east and north of the disposal cell. A plume extends northward from this contaminated area in an arc-shape as it crosses the floodplain and reaches the San Juan River near the two floodplain extraction wells (1089 and 1077, Figure 1). This plume configuration is best characterized by elevated concentrations of sulfate and uranium. Contamination does not occur along the escarpment base in the northwest part of the floodplain because relatively uncontaminated surface water from Bob Lee Wash discharges into the floodplain, recharging local ground water and then flowing to the north and west. Surface water in Bob Lee Wash originates primarily as deep ground water from the Morrison Formation that flows to the land surface via artesian well 0648. Well 0648 flows at approximately 65 gallons per minute (gpm) and drains eastward into lower Bob Lee Wash. Background ground water quality in the floodplain aquifer has been defined by monitor wells installed in the floodplain about 1 mile upriver from the site.

1.3.2 Terrace Ground Water System

The terrace ground water system occurs partly in unconsolidated alluvium in the form of medium- to coarse-grained sand, gravel, and cobbles deposited in the floodplain of the ancestral San Juan River. Terrace alluvial material is Quaternary in age; it varies from 0 to 20 ft thick, and caps the Mancos Shale. Though less well mapped, some terrace ground water also occurs in weathered Mancos Shale underlying the alluvium. The Mancos Shale is exposed in the escarpment overlooking the present floodplain.

The terrace ground water system extends southwestward from the escarpment separating the terrace from the floodplain for up to 1 mile where it is abruptly bounded by a buried escarpment. Terrace alluvial material is exposed at the terrace/floodplain escarpment, but southwestward from there it is covered by an increasing thickness of eolian silt, or loess. At the southwest edge of the terrace aquifer, along the base of the buried escarpment, up to 40 ft of loess overlies the alluvium. The alluvium in this latter area consists of coarse, ancestral San Juan River deposits.

Mancos Shale in the terrace area is weathered (fractured and soft) several feet below its contact with alluvium. Ground water is known to occur in the weathered shale, and may flow through deeper portions of the shale that might be fractured and along bedding surfaces.

2.0 Subsurface Conditions

This section summarizes hydraulic and water quality characteristics of the floodplain and terrace ground water systems in March 2005, approximately 2 years after startup of the treatment system. The response of the floodplain is evaluated in Section 2.1, and the terrace response is evaluated in Section 2.2. Figure 2 shows the locations of all the wells that are discussed in this report.

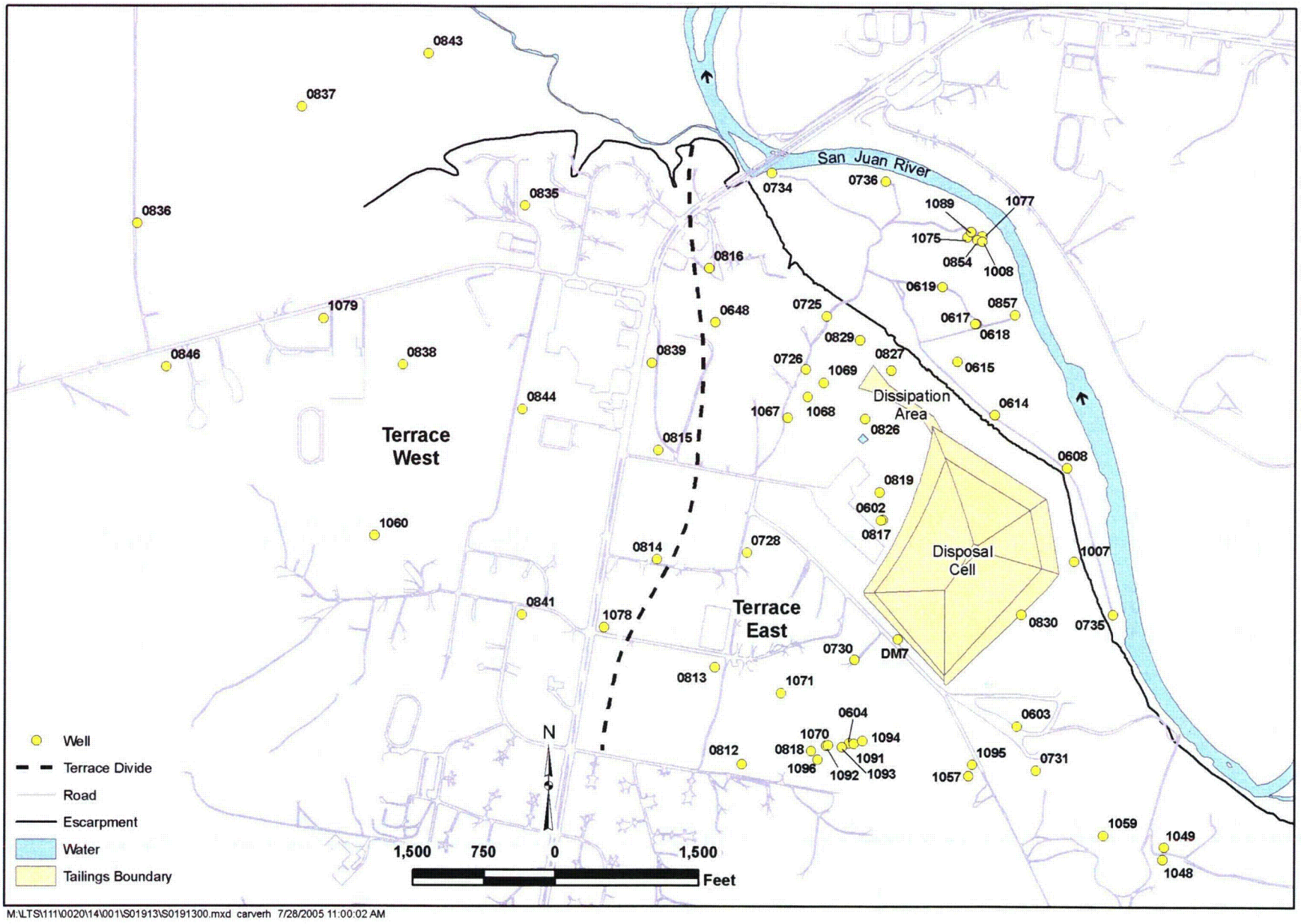

Figure 2. Locations of Wells Discussed in This Report

2.1 Floodplain Subsurface Conditions

Performance standards provided in the Baseline Performance Report (DOE 2003a) and presented in Section 1.1 regarding the floodplain are designed to evaluate the effectiveness of the floodplain treatment system. An analysis of the horizontal hydraulic gradients and contaminant distributions in the floodplain are discussed in Sections 2.1.1 and 2.1.2, respectively.

2.1.1 Horizontal Hydraulic Gradients

The Baseline Performance Report contains a map of horizontal hydraulic gradients in the floodplain as determined from three-point analyses of March 2003 water level data. This figure, which represents conditions prior to the start-up of the floodplain extraction wells, is presented as Figure A–1 in Appendix A of this report. Figure A–2 (Appendix A) presents comparable horizontal gradients developed from a three-point analysis of water level data collected in March 2005. Comparison of the two maps shows that the ground water flow directions have not changed much between March 2003 and March 2005. The river flow on the day the March 2003 water level data were measured was 649 cubic feet per second (cfs), while the flows on February 28 through March 2, 2005, the 3 days which spanned the March 2005 measurements, were 902, 841, and 825 cfs, respectively. In terms of stage, or water-surface elevation, the difference between San Juan River flows measured in 2005 and the March 2003 flows represents approximately 0.2 ft (U.S. Geological Survey data; Gaging Station 09368000).

Appendix B contains graphs of floodplain ground water elevation fluctuations between April 2004 and March 2005 collected using data loggers installed in wells 0617, 0736, 0857, 1008, and 0854. The current period (April 2004 – March 2005) marks the first complete year in which data were obtained from well 0854.

Ground water level fluctuations in the floodplain wells during the April 2004 through March 2005 period, as shown in the ground-water hydrographs of Appendix B, were on the order of 2 ft. Maximum ground water elevations appear to have coincided with maximum flows in the San Juan River and the peak ground-water elevations occurred between mid-April and late-May 2004. Ground water elevations declined throughout the remainder of the growing season and minimum ground water elevations occurred in conjunction with minimum flows in the San Juan River. Ground-water levels recovered throughout the balance of the dormant season. During this latter period, the ground water recovery was aided by a 4,220-cfs spike in the flow of the San Juan River, which occurred on September 21, 2004. This flow spike in the San Juan River probably occurred in response to a frontal storm that produced 0.98 inches of precipitation in Farmington, New Mexico, and 1.06 inch of precipitation in Durango, Colorado, on September 19, 2004 (http://www.wunderground.com/history/airport/KFMN/2004/9/19/DailyHistory.html; http://www.wunderground.com/history/airport/KDRO/2004/9/19/DailyHistory.html)

Unfortunately, ground water level data have not been collected in the floodplain during short-term high runoff events, such as the one that occurred in mid-September 2004. As a consequence, it is difficult to assess how floodplain horizontal hydraulic gradients react to such events. However, since it is known that most of the water entering the floodplain aquifer does so via San Juan River losses along the southernmost tip of the aquifer, it is logical to assume inflow from the river increases during high runoff, and that this produces gradient vectors east of the disposal cell that point in a more northward to northwestward direction than depicted in

Figure A–2. The potential for greater mixing of relatively clean water from the river with contaminated ground water emanating from the Mancos Shale would likely increase under such circumstances, which possibly leads to greater dilution of ground water contaminants in the aquifer.

2.1.2 Contaminant Distributions

Ground water samples were collected from selected floodplain wells in September 2004 and March 2005. Locations of the wells sampled are shown in Figure 3 through Figure 9, which illustrate the spatial distribution of concentrations measured in March 2005 for ammonia (total as N), manganese, nitrate, selenium, strontium, sulfate, and uranium, respectively. Table 1 compares the COC concentrations measured in September 2004 and March 2005 to baseline COC concentrations measured in March 2003. To compare the data sets, it was necessary to convert the concentrations for ammonia and nitrate listed in the Baseline Performance Report (DOE 2003a). Ammonia concentrations were converted from "ammonia total as NH_4" to "ammonia as total nitrogen." The baseline nitrate concentrations were converted from "nitrate as NO_3" to "nitrate plus nitrite as nitrogen." These conversions were made in response to different analyses being requested with a change in laboratories. These same conversions were made in preparing the first annual performance report (DOE 2004b).

The monitoring data presented in Table 1 suggest that the COC concentrations at wells 0608, 0615, and 1008 did not change significantly between April 1 and March 2004; however, some declines in COC concentrations were noted for this period in the remaining monitoring wells. The observed selenium concentration at well 0614, ammonia concentration at well 0618, and manganese concentration at well 0736, were each less than one-half their respective baseline concentrations. The concentrations of ammonia, nitrate + nitrite as N, and selenium at well 0619 had also declined below one-half their respective baseline concentrations. Similarly, each COC declined to below one-half its initial concentration at well 0735.

2.2 Terrace System Subsurface Conditions

Performance standards provided in the Baseline Performance Report (DOE 2003a) are designed to evaluate the effectiveness of the terrace treatment system. Analyses of horizontal hydraulic gradients, water level trends, drain flow rates, and seep flow rates associated with the terrace are discussed in Sections 2.2.1, 2.2.2, 2.2.3, and 2.2.4, respectively. There are no concentration-driven performance standards because compliance is based on hydrologic control. However, as a best management practice, selected contaminant concentrations are being measured at each extraction well, each drain, and each seep. Preliminary estimates of mass removal were compiled during this performance period and are presented in Section 3 of this report.

2.2.1 Horizontal Hydraulic Gradients

The Baseline Performance Report (DOE 2003a) contains a map of horizontal hydraulic gradients in the terrace as determined from three-point analyses of March 2003 water level data. This figure, which represents the baseline condition prior to the start-up of the terrace extraction wells, is also presented as Figure A–4 of Appendix A in this report. Figure A–5 (Appendix A) presents a map of the horizontal gradients developed from three-point analysis of the water level data collected in March 2005. Figure A–6 shows the locations of wells that could potentially be used to calculate the gradients in March 2005.

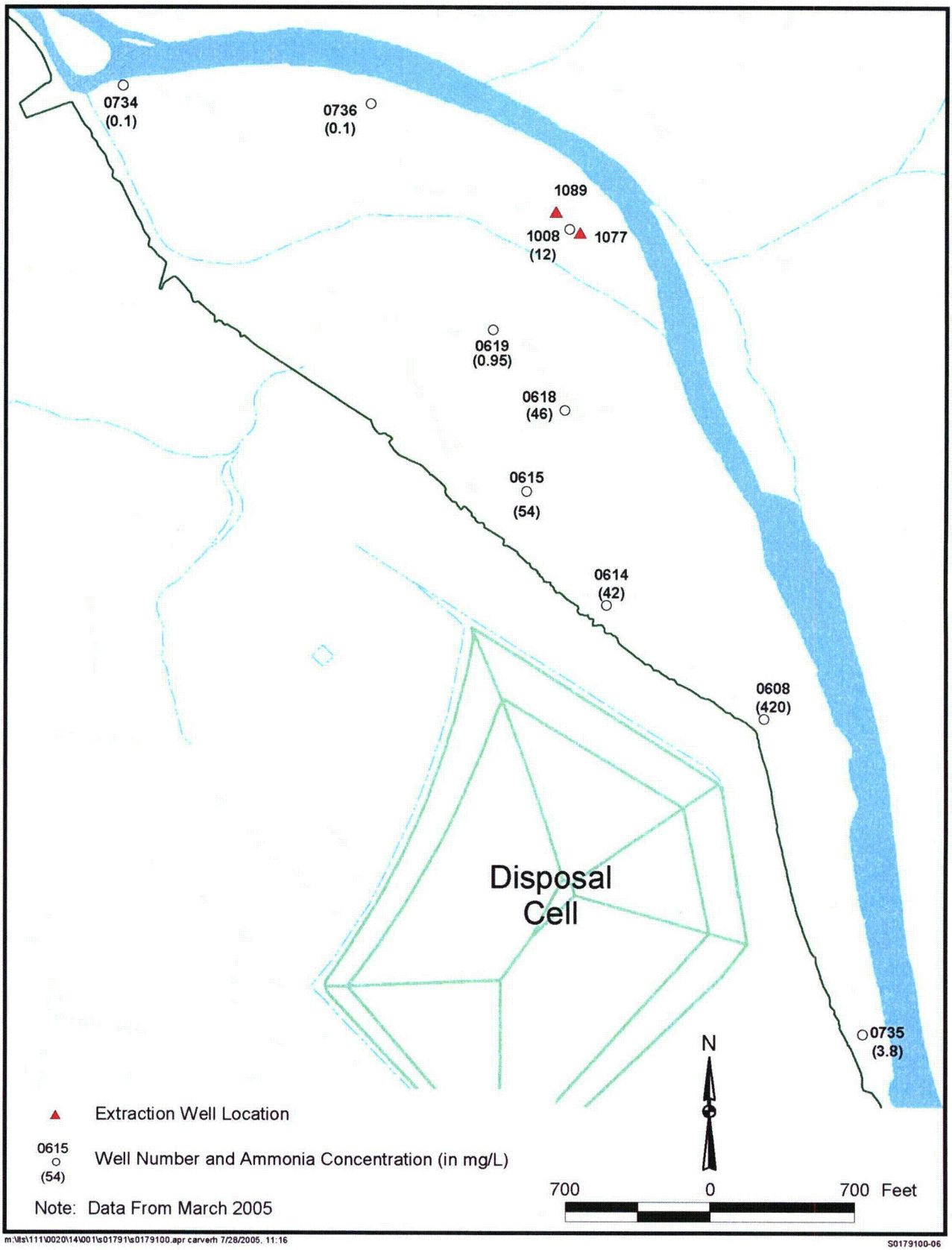

Figure 3. Floodplain Ammonia (total as N) Ground Water Concentrations

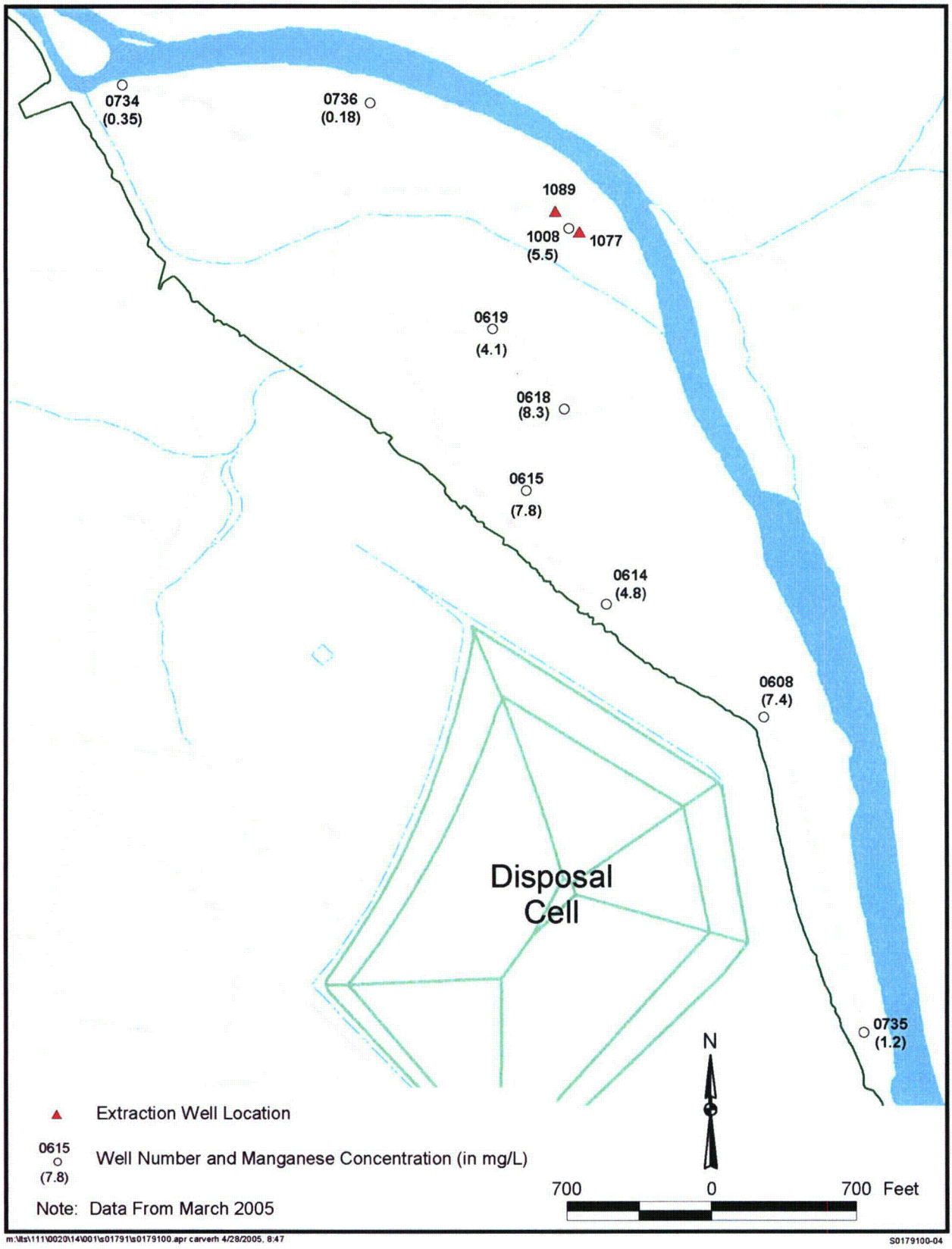

Figure 4. Floodplain Manganese Ground Water Concentrations

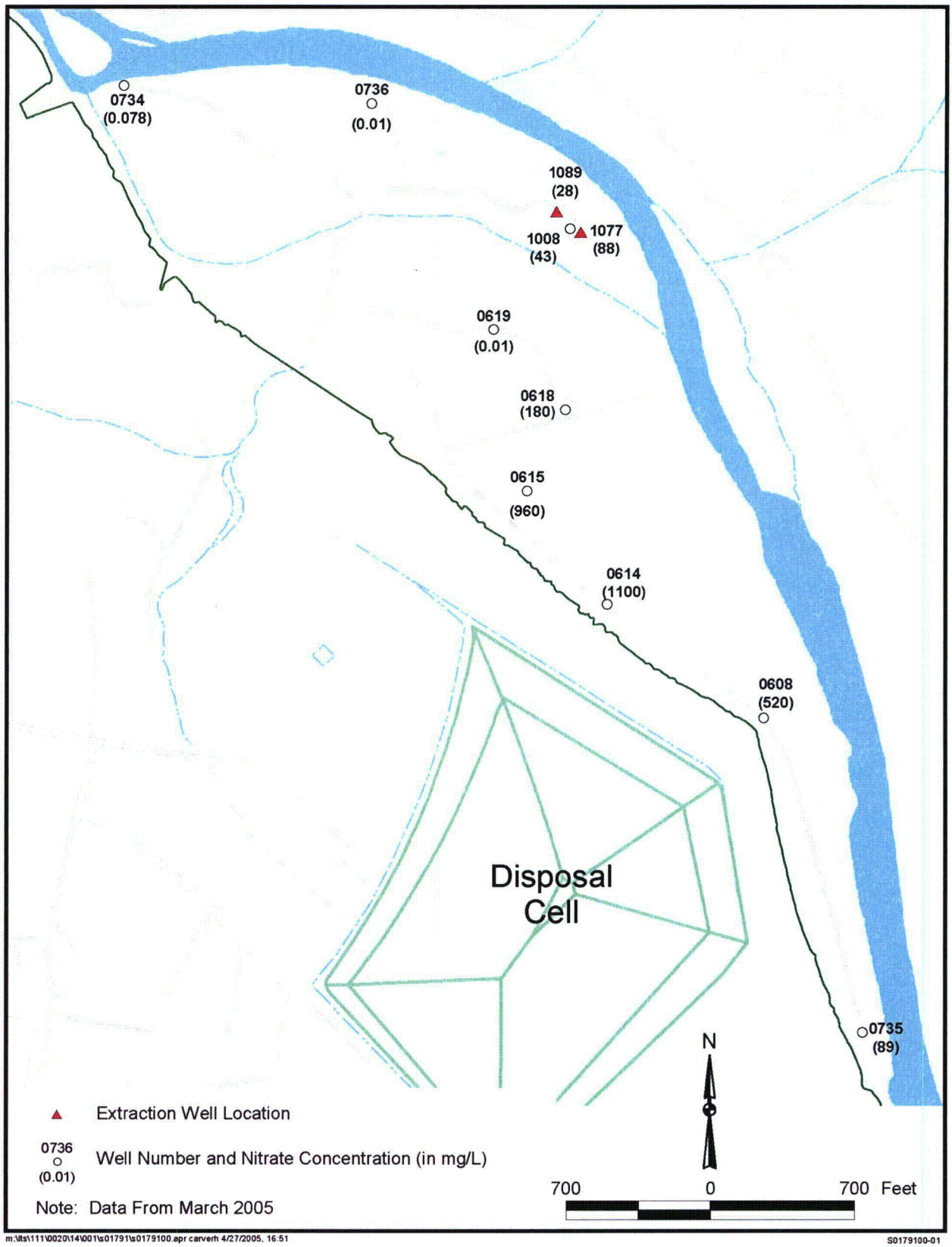

Figure 5. Floodplain Nitrate Ground Water Concentrations

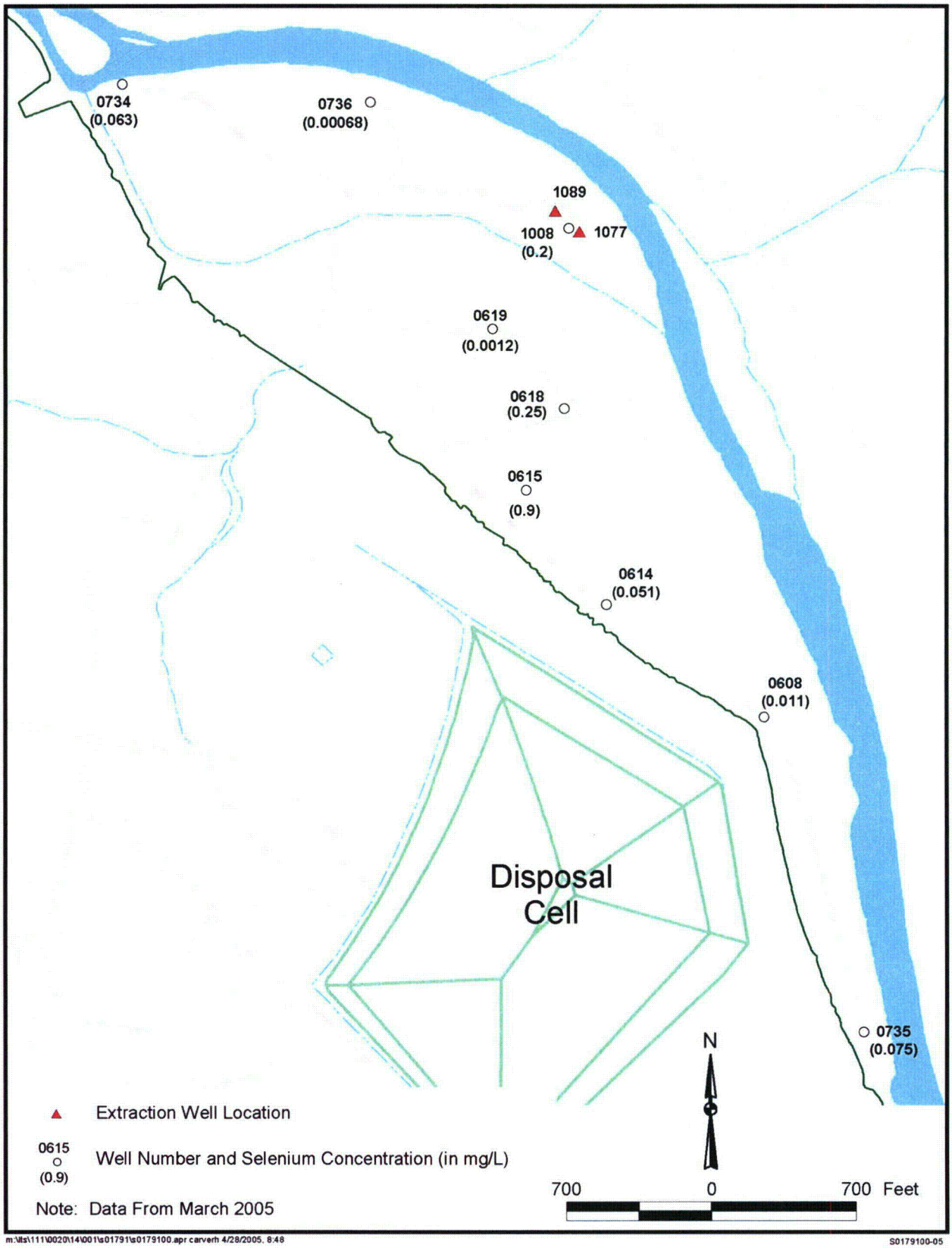

Figure 6. Floodplain Selenium Ground Water Concentrations

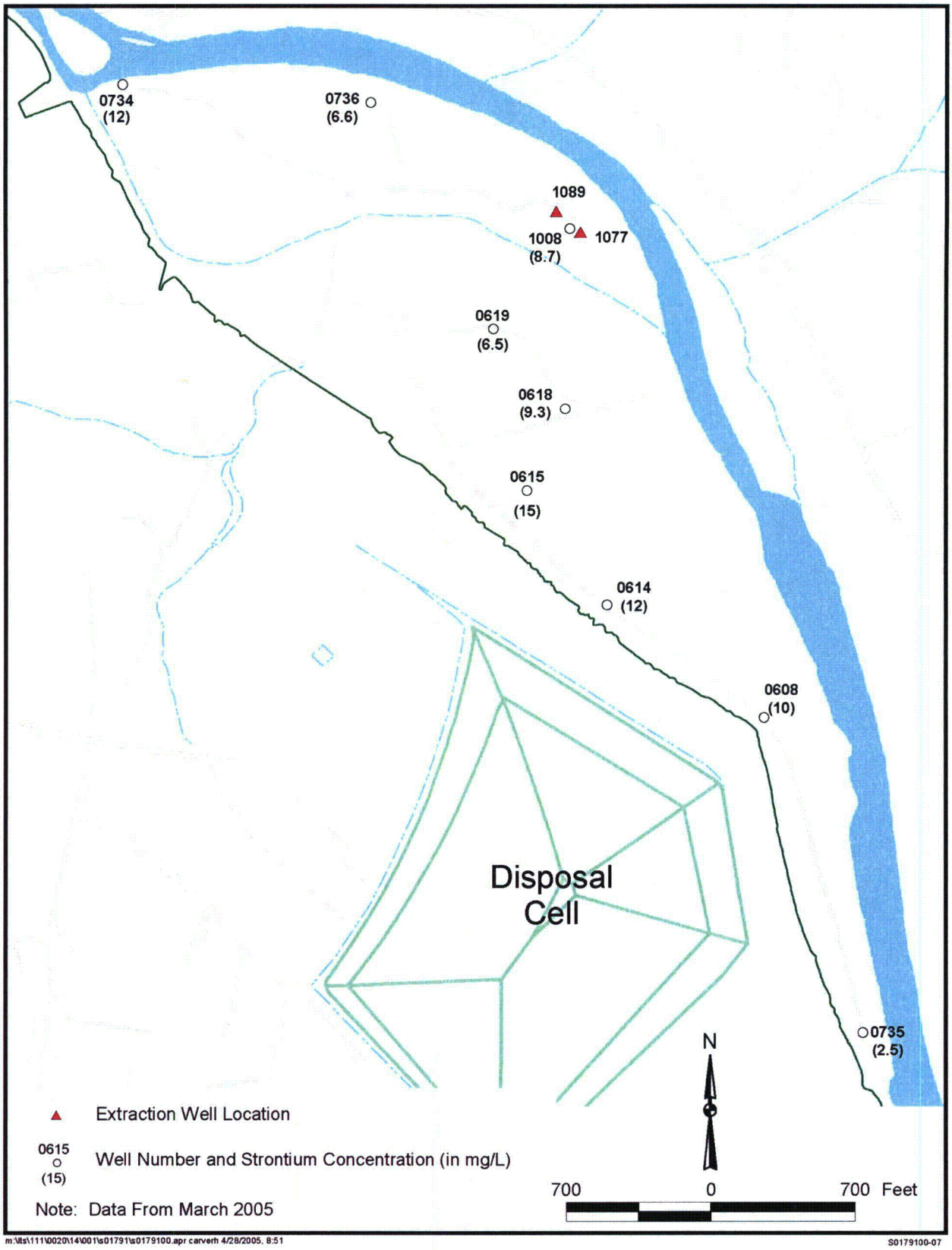

Figure 7. Floodplain Strontium Ground Water Concentrations

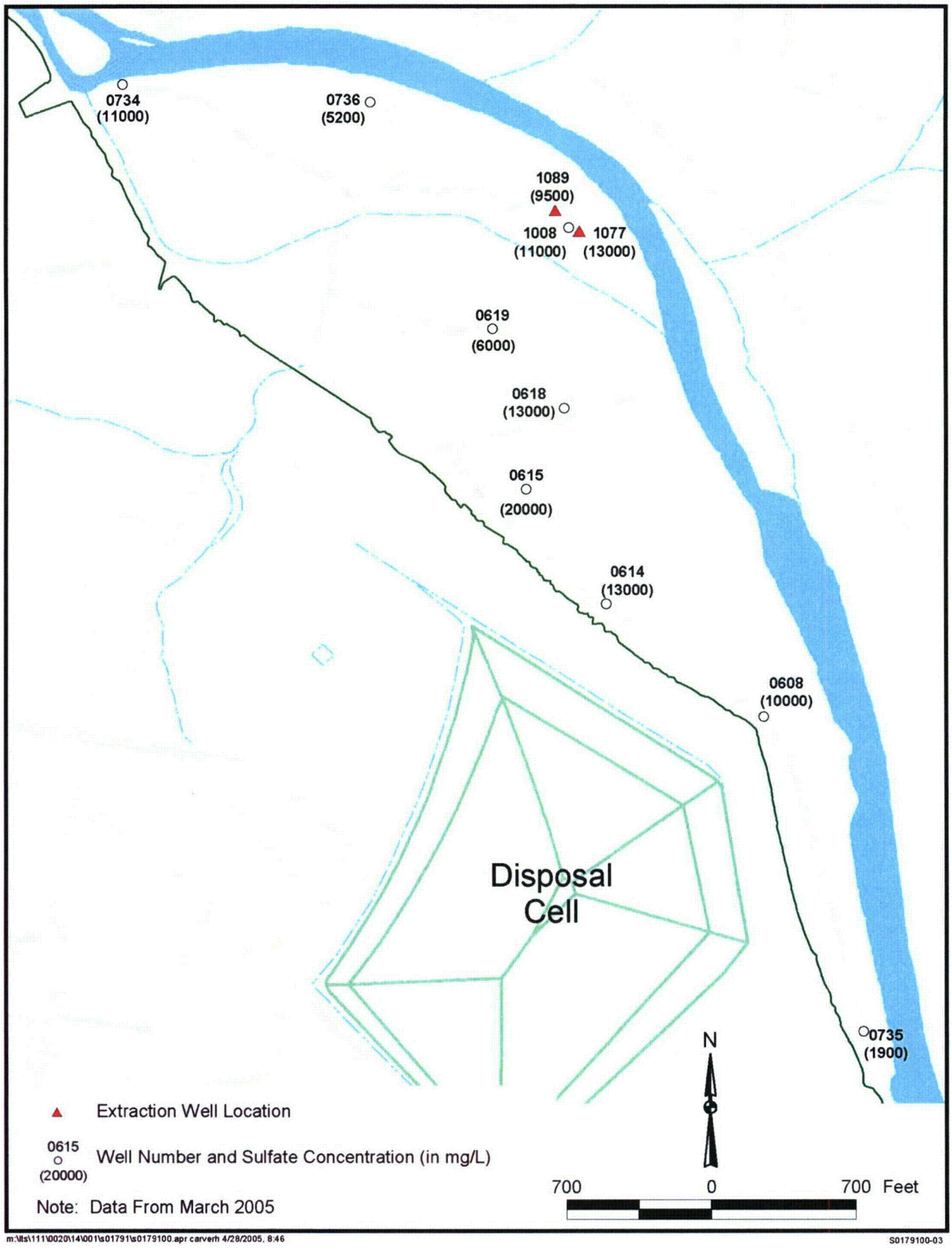

Figure 8. Floodplain Sulfate Ground Water Concentrations

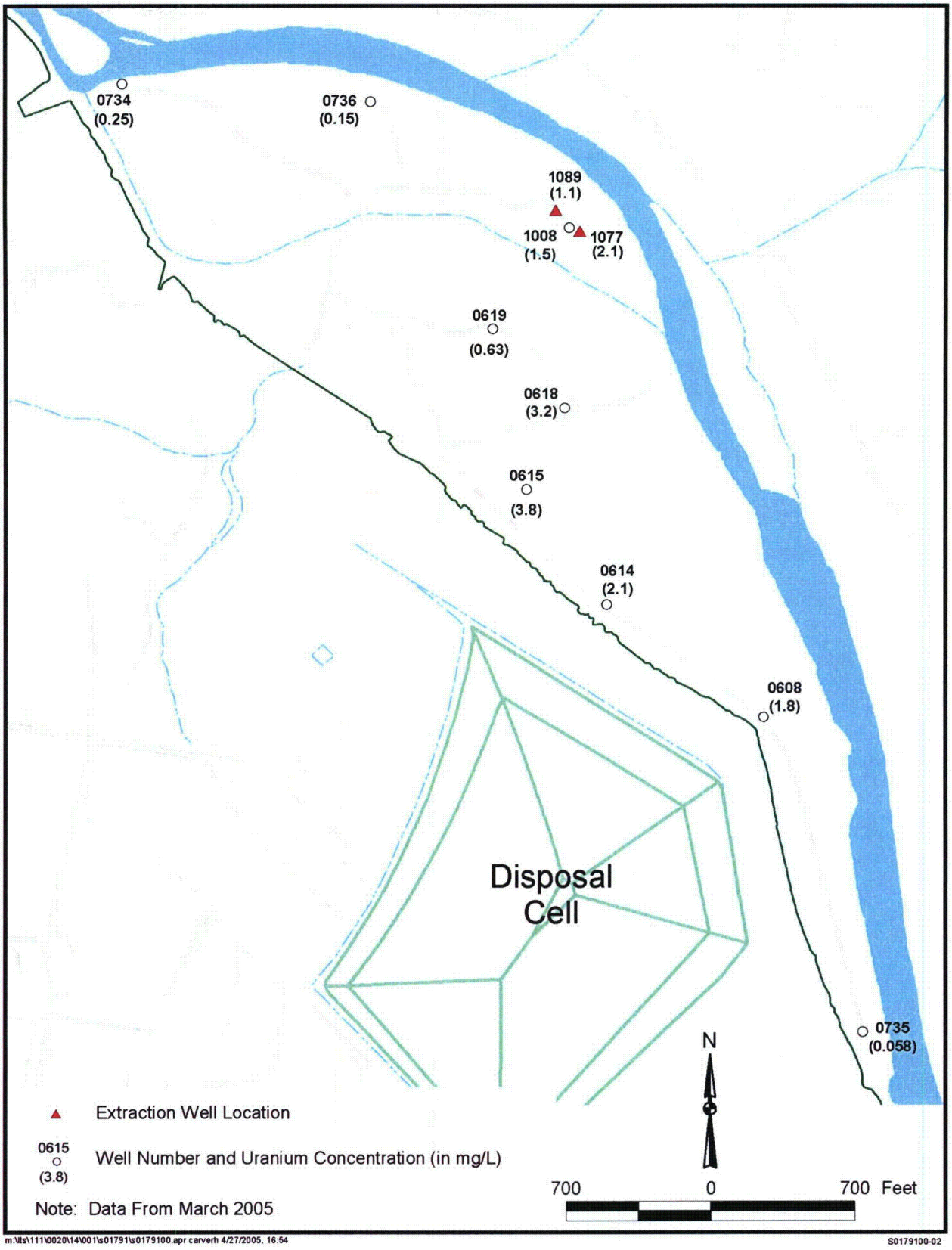

Figure 9. Floodplain Uranium Ground Water Concentrations

Table 1. Comparison of September 2004 and March 2005 COC Concentrations with Baseline Data

Well	Ammonia (Total as N)			Manganese			Nitrate + Nitrite as N			Selenium			Strontium			Sulfate			Uranium		
	Baseline[a] Concentration (mg/L)	September 2004 Concentration (mg/L)	March 2005 Concentration (mg/L))	Baseline Concentration (mg/L)	September 2004 Concentration (mg/L)	March 2005 Concentration (mg/L))	Baseline[b] Concentration (mg/L)	September 2004 Concentration (mg/L)	March 2005 Concentration (mg/L))	Baseline Concentration (mg/L)	September 2004 Concentration (mg/L)	March 2005 Concentration (mg/L))	Baseline Concentration (mg/L)	September 2004 Concentration (mg/L)	March 2005 Concentration (mg/L))	Baseline Concentration (mg/L)	September 2004 Concentration (mg/L)	March 2005 Concentration (mg/L))	Baseline Concentration (mg/L)	September 2004 Concentration (mg/L)	March 2005 Concentration (mg/L))
0608	303	230	420	7.8	4.3	7.4	524	470	520	0.0065	0.0110	0.0110	10.7	12	10	10,500	9,800	10,000	1.78	1.7	1.8
0614	39	40	42	6.01	5.3	4.8	958	870	1100	0.291	**0.0650**	**0.0510**	13.1	12	12	14,400	13,000	13,000	2.43	2.4	2.1
0615	40	NS°	52	5.56	NS°	7.5	940	NS°	960	1.16	NS°	0.7800	14.4	NS°	14	19,900	NS°	20,000	3.78	NS°	3.5
0618	604	**52**	**46**	11.3	8.7	8.2	278	180	180	0.352	0.3300	0.2500	11.2	9.8	9.3	13,300	13,000	13,000	3.12	3.1	3.0
0619	2.3	**0.67**	**0.95**	3.13	2.4	4.1	4.95	**0.01**	**0.01**	0.213	**0.0059**	**0.0012**	7.32	6.2	5.7	6,280	5,400	6,000	0.48	0.45	0.63
0734	0.003	NS°	0.1	0.656	NS°	0.35	1.68	NS°	**0.078**	0.0086	NS°	0.0630	6.63	NS°	12	4,940	NS°	11,000	0.0735	NS°	0.25
0735	12	6.9	**3.8**	3.47	**0.51**	**1.2**	454	**70**	**89**	0.159	**0.0310**	**0.0750**	9.3	**1.3**	**2.5**	6,980	**1,300**	**1,900**	0.24	**0.046**	**0.058**
0736	0.072	NS°	0.1	1.54	NS°	**0.18**	0.019	NS°	0.01	0.0007	NS°	0.0007	6.79	NS°	8.7	3,480	NS°	5,200	0.146	NS°	0.15
1008	22	15	12	6.61	7.0	5.5	39	73	43	0.169	0.1500	0.2000	10.2	10.0	9.5	13,900	13,000	11,000	2.05	2.00	1.5

Notes: a = Baseline ammonia concentrations were converted from "Ammonia Total as NH_4" to "Ammonia as Total N" for comparison purposes
b = Baseline nitrate concentrations were converted from "Nitrate as NO_3" to "Nitrate + Nitrite as N" for comparison purposes
° = NS (Not Sampled)
Boldface values indicate that the concentration is less than one-half the baseline concentration.

The March 2005 data set contains fewer wells than the baseline data set because monitoring at some of the baseline wells was discontinued per recommendations presented in the *Refinement of Conceptual Model and Recommendations for Improving Remediation Efficiency at the Shiprock, New Mexico, Site* (DOE 2004a); therefore, the two data sets are not ideally suited for direct comparison. Nevertheless, a map of the 2005 hydraulic gradient vectors was created using as many wells as possible from both data sets. There are important similarities between the two vector plots. One important similarity is that vectors next to the northern, northeastern, and eastern margins of the disposal cell are oriented north-northeast to east-northeast, or almost perpendicular to the escarpment between the terrace and the floodplain. The vector plots in this region support the perception that terrace fluids discharge to the floodplain aquifer along the interface between the two ground water flow systems. The vectors along the southern, southeastern, and southwestern margins of the disposal cell, together with the remaining vectors in the terrace domain, with one distinctive exception, are oriented mainly west-northwest to north-northwest and north. The north-northeast-trending vector in the triangle described by wells 0835, 0839, and 0841 (Figure A–5) is the one exception; the baseline data also had this vector pointing toward the north-northeast (Figure A–4). At the scale of the vector plot for the current period, the pumping rates on the terrace had a negligible impact on ground water flow directions near the extraction wells.

2.2.2 Water Level Trends

The March 2005 water level data were compared to terrace baseline ground water elevations presented in the *Baseline Performance Report* (DOE 2003a; Table 1). Table 2 in this document summarizes the resulting quantitative changes in ground water levels and Figure 10 presents a qualitative map view of some of the ground water elevation increases and decreases. Ground water elevations appear to be declining slightly across the entire terrace ground water system. Of the 25 measurements of ground water levels taken in March 2005, twenty results showed declines relative to the baseline period and only five results showed increases. These observations cannot be easily explained because most of the State of New Mexico received abundant precipitation during this period. The town of Farmington received a cumulative 3.42 inches of precipitation for the period January 1 through April 10, 2005 versus a normal of 2.48 inches for these months. (http://www.nass.usda.gov/nm/AGUP5516.HTM). The greatest ground water level decrease was 5.7 ft at well 0726, which is completed in the Mancos Shale. This well is located 200 ft west of the Bob Lee Wash drain and approximately 500 ft north of well 1067, which is now dry. Well 0827, which is located near the rock-lined dissipation area (Figure 2), became dry in September 2004, providing further indication of declining water levels in the terrace east region north and west of the NECA pond.

The maximum increase in water level elevation (1.27 ft) occurred in well 1049, which is located on a small eolian-filled terrace just east of the so-called *knickpoint* in Many Devils Wash. As discussed later in Section 3.2.2 and shown in Figure 22, the pumping rate from the ground water interceptor drain in Many Devils Wash began increasing substantially in March 2005, at the time of the ground water elevation increase in well 1049. These simultaneous occurrences may be related to the above-normal precipitation observed in the northwestern portion of New Mexico since January 1, 2005.

Table 2. Comparison of Terrace March 2005 Water Level Data to Baseline Conditions and 2004 Water Level Data

Well	Zone of Completion	Baseline Ground Water Elevation[a] (ft msl)	March 2004 Ground Water Elevation[‡] (ft msl)	Difference in Elevation[b] (ft)	March 2005 Ground Water Elevation (ft msl)	Difference in Elevation[b] (ft)
0603*	Alluvium/Mancos	4,948.22			4,948.29	0.07
0726*	Mancos	4,919.33			4,913.63	-5.7
0728*	Alluvium/Mancos	4,940.25			4,939.88	-0.37
0730	Alluvium/Mancos	4,946.26	4,945.08	-1.18	4,942.80	**-3.46**[†]
0812*	Alluvium/Mancos	4,944.62	4,944.31	-0.31	4,944.12	**-0.5**[†]
0814*	Alluvium/Mancos	4,936.27	4,936.23	-0.04	4,936.13	**-0.14**[†]
0815*	Alluvium/Mancos	4,927.78	4,927.80	0.02	4,927.79	**0.01**[†]
0816*	Alluvium/Mancos	4,913.12			4,912.57	-0.55
0817*	Mancos	4,938.68	4,938.59	-0.09	4,938.59	-0.09
0829*	Mancos	Dry	Dry		Dry	
0830*	Alluvium/Mancos	4,949.59			4,944.30	-5.29
0835*	Alluvium	4,911.10	4,910.89	-0.21	4,912.03	0.93
0836*	Alluvium	4,878.25	4,878.86	0.61	4,878.19	**-0.06**[†]
0838*	Alluvium	4,911.73	4,911.12	-0.61	4,911.32	-0.41
0839*	Alluvium/Mancos	4,917.32	4,916.76	-0.56	4,916.81	-0.51
0841*	Alluvium	4,939.06	4,938.65	-0.41	4,938.87	-0.19
0844*	Alluvium/Mancos	4,918.20			4,916.56	-1.64
0846*	Alluvium/Mancos	4,910.93	4,910.10	-0.83	4,909.81	**-1.12**[†]
1007*	Alluvium/Mancos	4,917.91	4,917.41	-0.5	4,917.31	**-0.6**
1048*	Eolian/Mancos	4,915.35			4,915.91	0.56
1049*	Eolian/Mancos	4,916.26			4,917.53	1.27
1057*	Alluvium	4,948.10	4,948.32	0	4,947.93	**-0.17**[†]
1059*	Mancos	4,947.64	4,947.47	-0.17	4,947.93	0.29
1060*	Alluvium/Mancos	4,932.64	4,932.23	-0.41	4,932.44	-0.2
1067*	Alluvium/Mancos	Dry	Dry		Dry	
1079*	Alluvium	4,909.89	4,909.39	-0.5	4,909.34	**-0.55**[†]
DM7	Mancos	4,925.61			4,924.54	-1.07

[a]Baseline Water Levels Measured In All Wells In March 2003
[b]Water Level – Baseline Water Level.
[‡]March 2004 water-level data were also presented in DOE (2004b).
[†]Boldface signifies that 2005 ground water elevation is lower than 2004 ground water elevation.
*Designates a well included in the long-term monitoring plan.

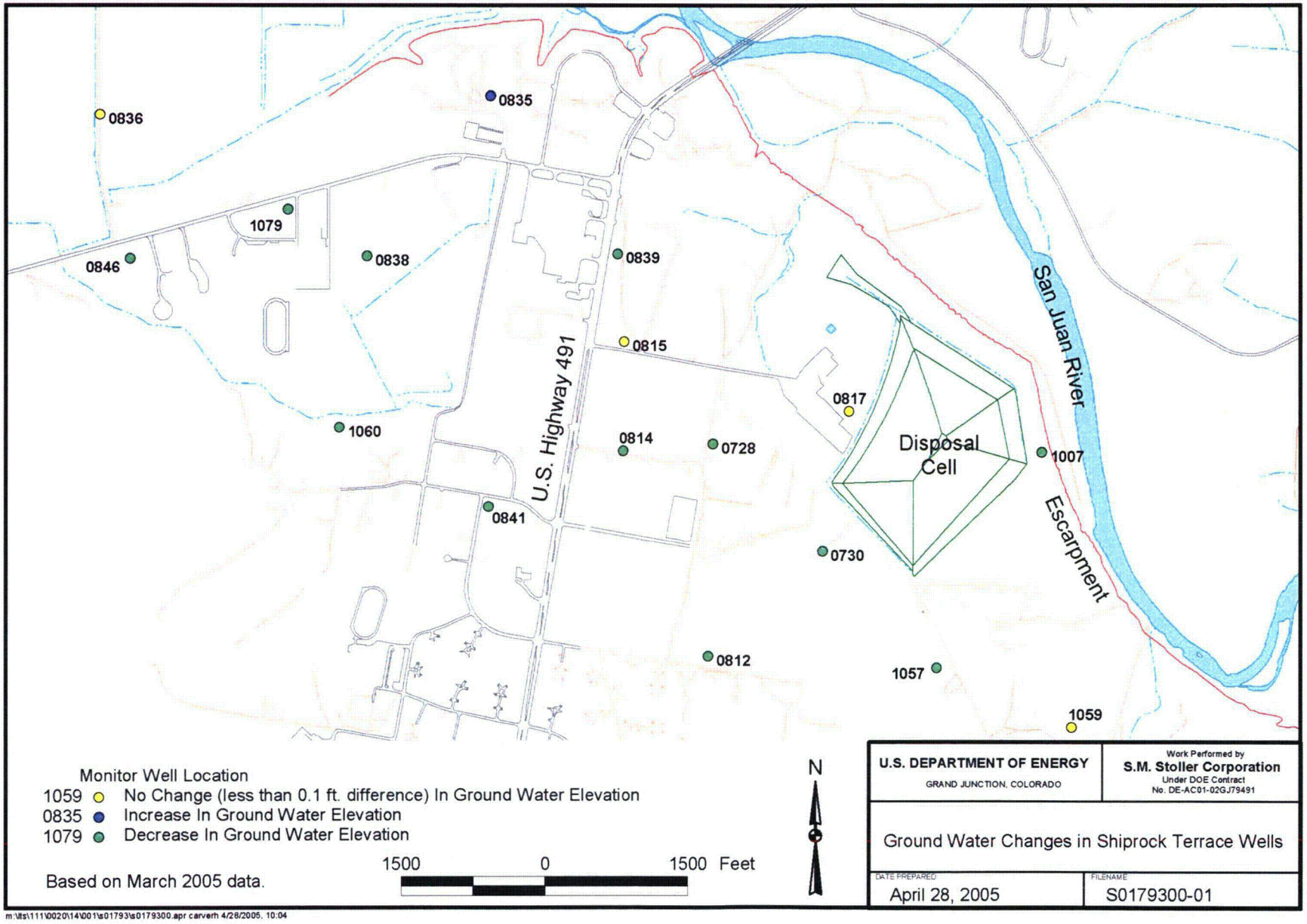

Figure 10. Terrace Ground Water Elevation Changes Between Baseline Conditions and March 2005

Although ground water elevations have generally declined in the terrace east ground water system since remediation began, the decline due to pumping is difficult to isolate partly because it is likely masked by the above-normal precipitation, and presumably ground water recharge, that has occurred since January 1, 2005. As of March 2005, the cumulative volume of water removed from the terrace extraction wells since pumping began was 2.74×10^6 gallons (8.4 acre-ft) and pumping records showed that approximately 1.05×10^6 gallons (3.2 acre-ft) were removed during the period April 2004 through March 2005. The three observation wells nearest the extraction well field are 0730, 0812, and 1057. The water levels in each of these wells in 2005 had declined both relative to baseline conditions and relative to water-level measurements made in 2004 (Table 2). In consideration of the additional precipitation that was potentially available as recharge to the terrace ground water system, especially during the winter and early spring of this reporting period, it can be tentatively concluded that the extraction well field is beginning to have the desired effect on ground water levels in terrace east.

Water levels have also been monitored using pressure transducers that were installed in selected wells on the terrace prior to treatment system startup. Appendix B contains plots of ground water elevation data collected from pressure transducers connected to dataloggers in terrace east wells 0602, 0604, 0731, 0813, 0819, 0826, 0827, and 0830. With the exception of well 0830, water level changes in these wells are not presented in Table 2; consequently, the plots provide additional means to evaluate trends in the terrace-east ground water flow system.

The data logger in well 0604 indicates how the pumping at well 0818 apparently impacted neighboring ground water elevations during 2004. The trend of declining water elevations that began during the previous year (2003) in response to pumping of approximately 1.5 gpm from well 0818 (DOE 2004b) continued into March 2004 and through early July 2004. In mid-July 2004, the extraction rate in well 0818 dropped to approximately 0.7 gpm (Figure 13) which resulted in approximately 0.5 ft of ground water recovery. When the pumping rate in well 0818 began to increase during the week of July 26, 2004, the water level at well 0604 began dropping again. A data gap in the continuous water-level data at well 0604 occurred between mid-September and mid-November 2004. Pumping in well 0818 was interrupted between mid-December 2004 and early January 2005 and resulted in a water-level recovery of more than 1 ft in well 0604. Pumping in well 0818 resumed during the week of January 10, 2005, and was accompanied by a rapid drop in water levels in well 0604. Overall, since January 2003, the water level in well 0604 has dropped by more than 2 ft.

The decline in water levels at the remaining terrace east locations has been less impressive, perhaps as a consequence of higher-than-normal precipitation during the second half of this performance period. Continuous water-level monitoring records for terrace east wells 0731, 0813, 0819, and 0826 show that water levels in these wells remained about the same as those published in the previous performance report (DOE 2004b). It is possible that the overall extraction rate on terrace east needs to increase before the effects of pumping become discernible at the remaining wells.

Appendix B also contains plots of ground water elevation data collected by data loggers in terrace west wells 0837, 0841, 0843, 0846, and 1060. The graphs of wells 0837, 0843, 0846, and 1060 indicate that ground water elevations are influenced by irrigation practices in the terrace west area. Evidence of irrigation is absent in well 0841 because it is approximately 1,200 ft upgradient of the Helium Lateral Canal Figure 2.

2.2.3 Seep Flow Rates

Rates of ground water discharge at seeps 0425 and 0426 were measured in September 2004 and February 2005. The September 2004 flow rate at seep 0425 was 0.21 gpm, which is measurably lower than the rate measured in March 2003 (0.5 gpm). In February 2005 the flow rate at seep 0425 was 1.0 gpm, an increase above the March 2003 rate. This is potentially due to the above-normal precipitation in New Mexico during the winter of 2005.

The flow measured at seep 0426 in September 2004 was 1.0 gpm, which is lower than the rate measured in March 2003 (1.8 gpm). In February 2005 the maximum flow rate measured at seep 0426 was 1.4 gpm.

The semiannual measurements of flow at seeps 0425 and 0426 are subject to considerable temporal variability. The actual variability between semiannual monitoring might be even larger. Misleading conclusions could arise if the semiannual flow measurements are used to ascertain whether seep flows are actually changing. In addition, it should be noted that the ground water flow model reported on in the GCAP (DOE 2002) model failed to accurately simulate the behavior of these two seeps. Indeed, simulated hydraulic heads along the escarpment were lower than the seep elevations. Consequently, a comparison of the simulated versus actual seep flow rates cannot be made without further flow-model calibration.

2.2.4 Drain Flow Rates

As discussed in the Baseline Performance Report (DOE 2003a), the flow rates of the pumps removing water from the drains installed in Bob Lee and Many Devils Washes were expected to decrease as ground water levels in the terrace declined. The flow rate data collected from March through August 2003 indicated that ground water discharge into the collector drain in Bob Lee Wash exceeded the design pumping capacity of the collector drain (7 gpm). At the end of March 2004, approximately 3.5 gpm was being pumped from the drain in Bob Lee Wash. Although the pumping rate has fluctuated during the current performance period, the average pumping rate from the Bob Lee Wash drain between April 2004 and January 2005 continued at approximately 3.5 gpm during the past year. A plot of average weekly pumping rates from Bob Lee Wash (Figure 21) is presented in Section 3.

While the pump at the Many Devils Wash drain removed water at an average rate of about 0.14 gpm between March and August 2003, the average pumping rate between August 2003 and March 2004 was 0.48 gpm. This increase was attributed to modifications made to the drain system in June 2003 (DOE 2004b). During the current performance period, the average weekly pumping rate fluctuated during the year but the yearly average for the period was 0.68 gpm. A plot of average weekly pumping rates from Many Devils Wash is presented in Section 3 (Figure 22).

The pumping rates at both washes do not support the expectation that discharges to the drains are decreasing in response to decreasing terrace ground water levels. It is too early in the performance evaluation process to understand why a decreasing trend in pumping rates has not occurred.

3.0 Remediation System Performance

The following sections provide a brief description of the components of the floodplain and terrace ground water remediation systems, and summarize their performance during the current reporting period.

3.1 Floodplain Remediation System

The objective of the floodplain ground water extraction system is to reduce the chemical mass of COCs in the alluvial ground water near the San Juan River. Pumping is focused at this location to lessen exposure risk to aquatic life. All ground water collected from the floodplain extraction wells is piped south to the terrace where it feeds into the evaporation pond. A more complete description of the floodplain extraction system is presented in the Baseline Performance Report (DOE 2003a).

The floodplain remediation system initially consisted of wells 1075 and 1077. These wells were drilled to approximately 20 ft below ground surface and had saturated alluvial thicknesses of 8 to 10 ft. After nearly 4 months of pumping, neither well was producing more than 3 gpm, far below the goal of 10 to 20 gpm per well. Both wells were re-developed a number of times in an attempt to increase the extraction rates. Ultimately, well 1075 was replaced with well 1089, which was installed just north of 1075 using alternative methods. Specifically, well 1089 was constructed using a slotted culvert placed in a trench excavated to bedrock. After installation of the culvert, the pump was removed from well 1075 and placed inside the new well.

3.1.1 Extraction Well Performance

Figure 11 presents measured pumping rates and the cumulative volume of extracted ground water at well 1089 from between April 2004 and March 2005. Elevated pumping rates during the early spring 2004 are attributed to the higher river stage of the San Juan River at this time. The higher river stage during the spring produces an increased saturated thickness and, consequently, more available drawdown in the pumping well. By the end of March 2005, well 1089 had removed nearly 5.5×10^6 gallons of water from the floodplain ground water system.

During the current performance period, well 1077 produced an average of approximately 0.5 gpm, which is similar to the average pumping rate that was observed during the previous reporting period. Approximately 268,600 gallons of ground water were pumped from this well between April 2004 and March 2005, which brings the total volume of extracted ground water from this well to approximately 573,700 gallons (Figure 12). Appendix C lists measured flow rates and corresponding volumes of ground water removed from floodplain extraction wells 1089 and 1077.

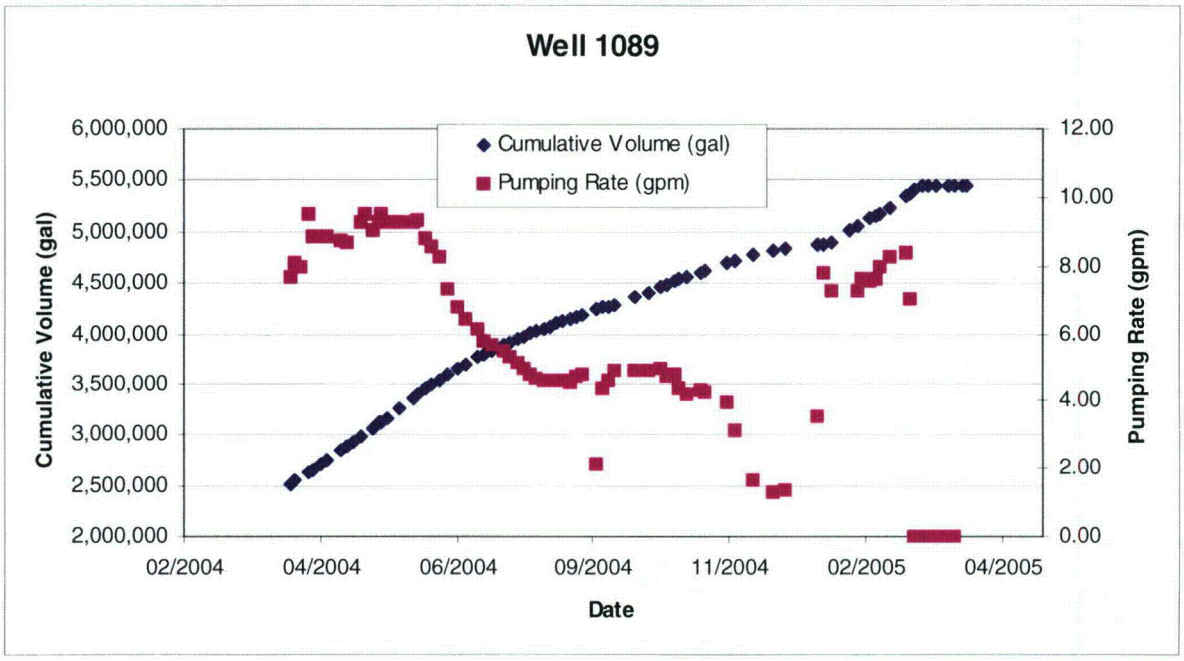

Figure 11. Well 1089 Pumping Rate and Cumulative Ground Water Volume Extracted

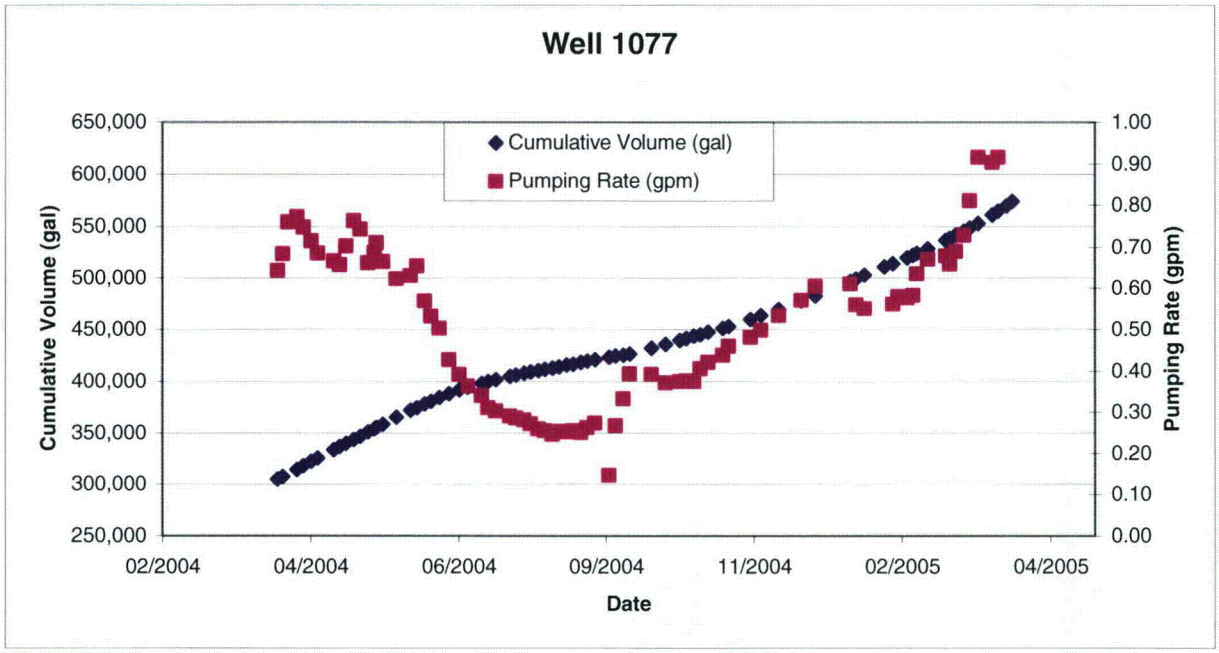

Figure 12. Well 1077 Pumping Rate and Cumulative Ground Water Volume Extracted

3.2 Terrace Remediation System

The terrace remediation system consists of four components: the terrace extraction wells, the terrace drains (Bob Lee and Many Devils Washes), the evaporation pond, and the terrace outfall drainage channel diversion (Figure 1).

Extraction Wells

During the current period, the terrace remediation well field consisted of wells 0818, 1070, 1071, 1078, 1091, 1092, 1093, and 1094. Because of disappointingly low yields in the current well field, two additional extraction wells (1095 and 1096) were drilled in the terrace east system (Figure 2) during March 2005. During three-day pumping tests, wells 1095 and 1096 produced 2.8 gpm and 1.3 gpm, respectively. Both of these wells will be brought on line during the second half of 2005.

Terrace Drain System

The terrace extraction system collects seepage from Bob Lee and Many Devils Washes using subsurface interceptor drains. These drains, which consist of perforated pipe surrounded by drain rock and are lined with impermeable geomembrane and geotextile filter fabric, are offset from the centerline of each wash to minimize infiltration of surface water. All water collected by these drains is pumped through a pipeline to the evaporation pond.

Evaporation Pond

The selected method for treating ground water from the interceptor drains and extraction wells is solar evaporation. The contaminated ground water is pumped to a lined evaporation pond in the south part of the radon cover borrow pit area (Figure 1). Depth of water in this 11-acre pond was approximately 1 ft in March 2005, leaving approximately 7 ft of unfilled pond capacity.

Terrace Drainage Channel Diversion

Storm-water runoff from the disposal cell is designed to drain northwest to a rock-lined energy-dissipation area, eventually reaching upper Bob Lee Wash. The so-called *outfall drainage channel diversion* conveys surface water to the lower part of Bob Lee Wash from the energy dissipation area. The extent to which the energy dissipation area functions as a point source of recharge to the terrace is unclear.

3.2.1 Extraction Well Performance

The pumping rates and corresponding ground water volumes removed from wells 0818, 1070, 1071, 1078, 1091, 1092, 1093, and 1094 from April 2004 through March 2005 are presented in Figure 13 through Figure 20, respectively. Appendix C lists measured pumping rates and corresponding volumes of ground water removed from the terrace ground-water extraction wells during the recent performance period. Table 3 compares each well's current-period and previous-period average pumping rate and total ground water volume removed. The current-period average pumping rates ranged from 0.01 (well 1094) to 1.05 gpm (well 0818), and the total ground water volume removed from each well during this period ranged from 4,818 (well 1094) to 527,905 gallons (well 0818). The cumulative total volume removed during the current period

was approximately 64 percent less than during the previous reporting period. This reduction is partly attributed to a gradual drop in water levels throughout the year as reductions in well efficiency and pumping time may have also had an effect. The two new wells (1095 and 1096) are expected to improve ground water recovery in the terrace east area during the forthcoming performance period.

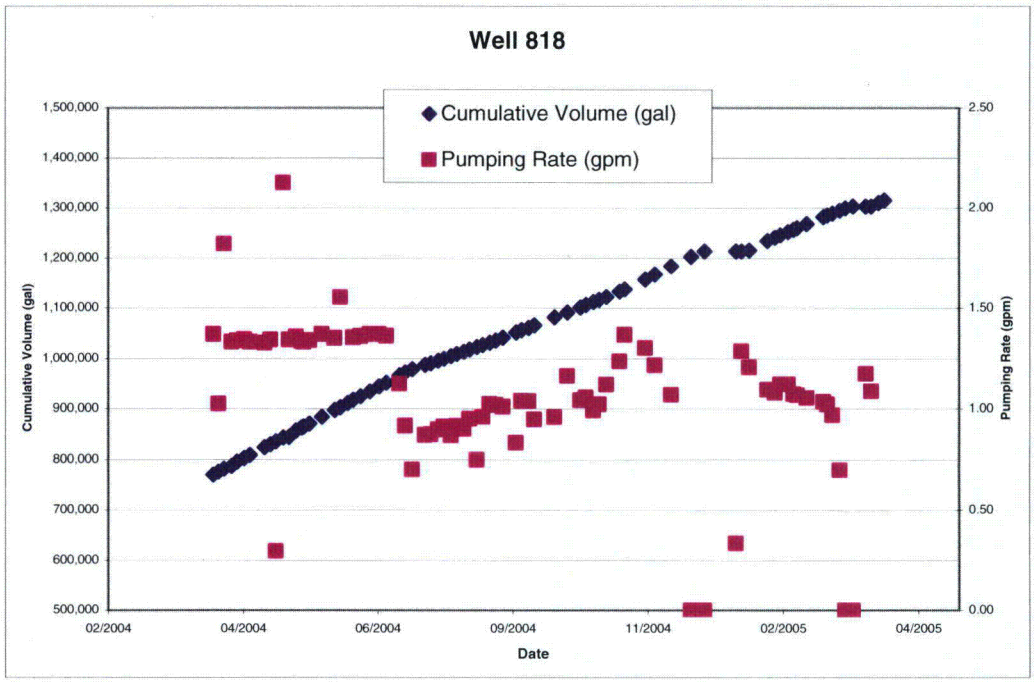

Figure 13. Well 0818 Pumping Rate and Cumulative Ground Water Volume Extracted

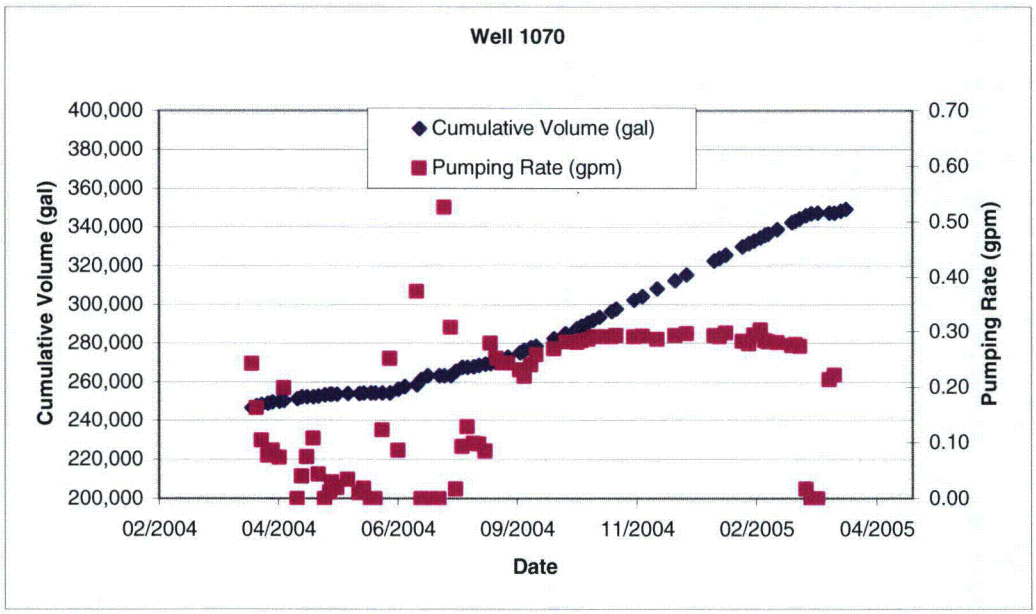

Figure 14. Well 1070 Pumping Rate and Cumulative Ground Water Volume Extracted

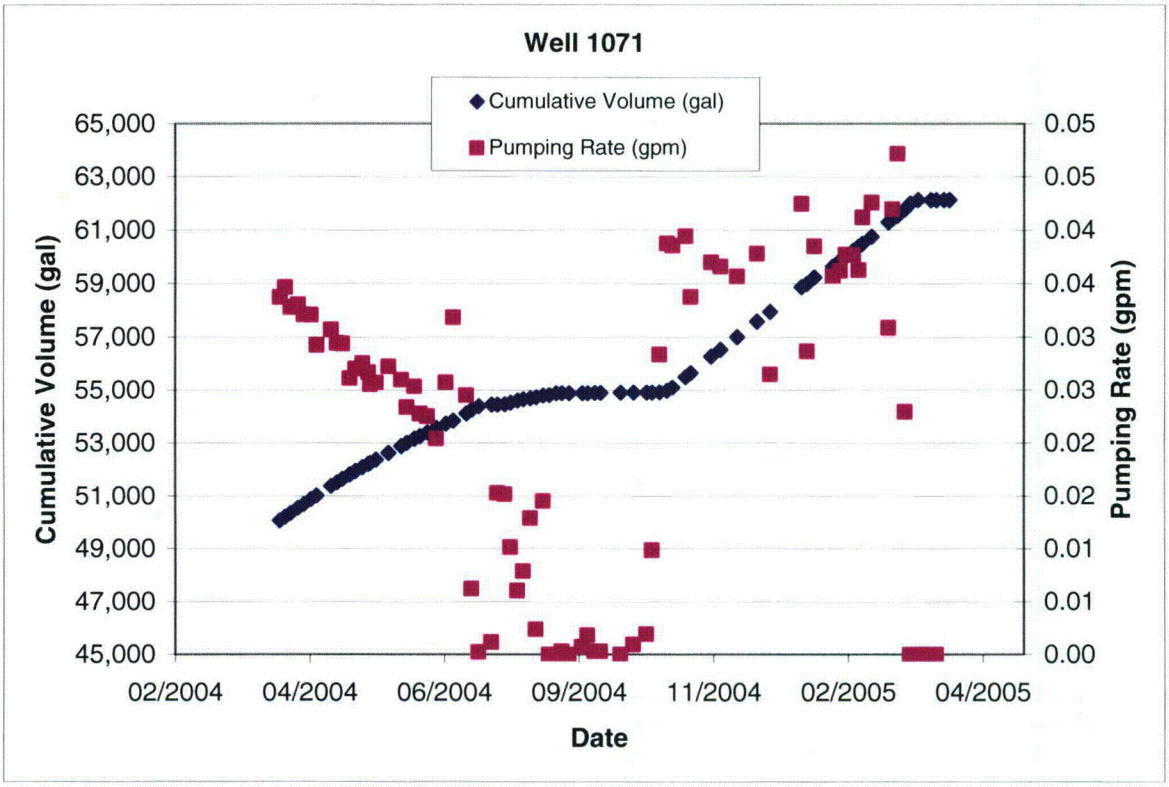

Figure 15. Well 1071 Pumping Rate and Cumulative Ground Water Volume Extracted

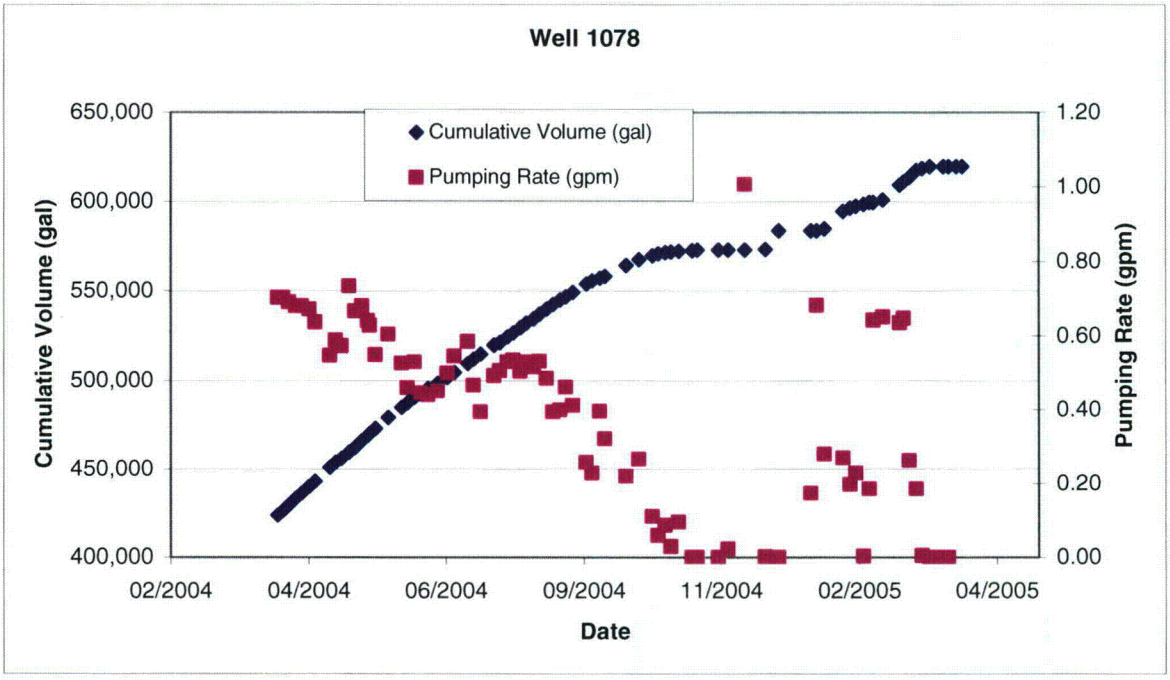

Figure 16. Well 1078 Pumping Rate and Cumulative Ground Water Volume Extracted

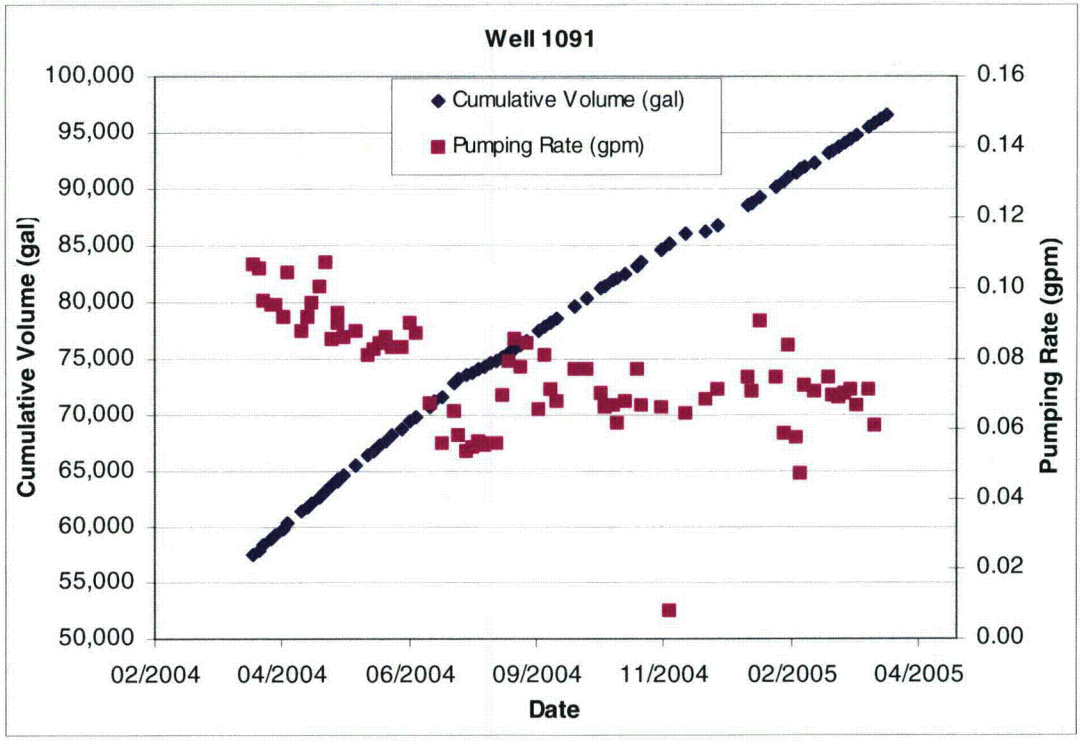

Figure 17. Well 1091 Pumping Rate and Cumulative Ground Water Volume Extracted

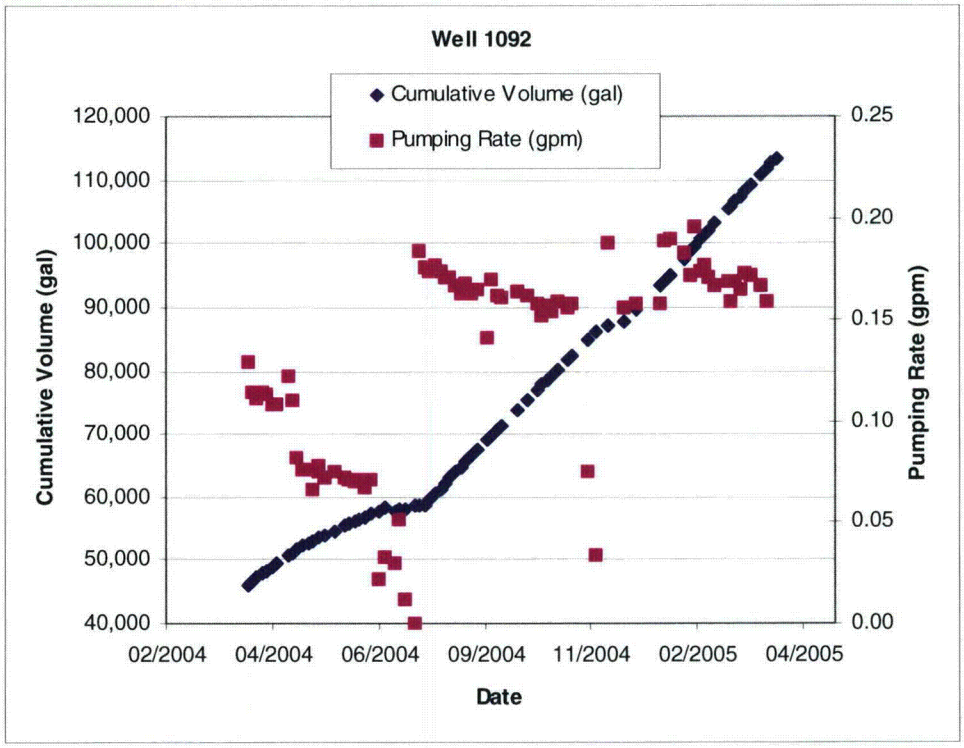

Figure 18. Well 1092 Pumping Rate and Cumulative Ground Water Volume Extracted

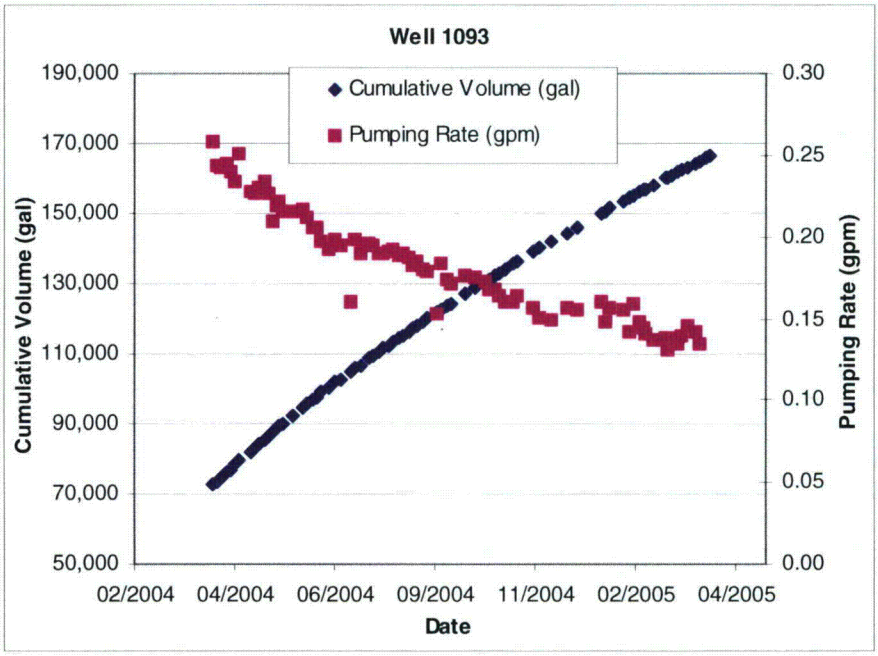

Figure 19. Well 1093 Pumping Rate and Cumulative Ground Water Volume Extracted

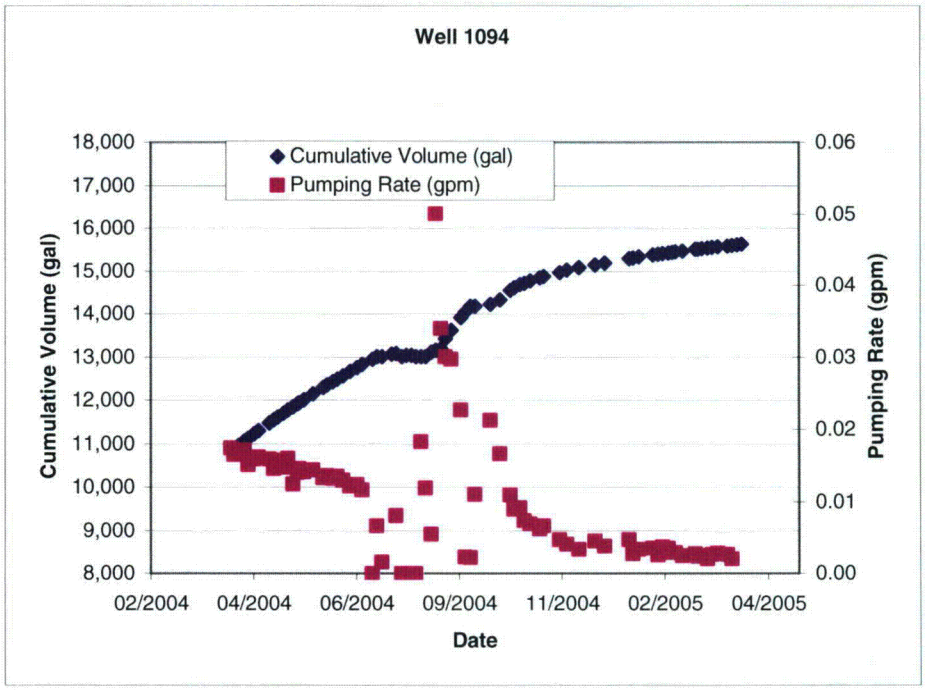

Figure 20. Well 1094 Pumping Rate and Cumulative Ground Water Volume Extracted

Table 3. Terrace Extraction Well Average Pumping Rate and Total Ground Water Volume Removed

Well	Previous Period (September 2003 through March 2004)		Current Period (April 1, 2004 through March 31, 2005)	
	Average Pumping Rate (gpm)	Total Ground Water Volume Removed (gallons)	Average Pumping Rate (gpm)	Total Ground Water Volume Removed (gallons)
0818	1.38	770,697	1.05	527,905
1070	0.29	246,641	0.19	98,885
1071	0.06	50,074	0.02	11,274
1078	0.70	423,626	0.38	183,144
1091	0.16	57,467	0.08	38,024
1092	0.13	46,144	0.13	65,129
1093	0.22	72,591	0.18	91,432
1094	0.03	10,819	0.01	4,818
Total	**2.97**	**1,678,059**	**2.04**	**1,020,611**

3.2.2 Terrace Drain System Performance

Figure 21 presents extraction rates and cumulative flow volumes for the pump installed in the Bob Lee Wash drain. The weekly-average pumping rate spiked to over 10 gpm during mid-to late February, and quickly fell back to more normal rates of about 3 to 4 gpm. The rate increase was presumably due to the above-normal precipitation that occurred during the winter of 2005. During the current performance period, the average pumping rate from Bob Lee Wash was 3.52 gpm, and approximately 1.7 million gallons of water removed by the ground water interceptor drain.

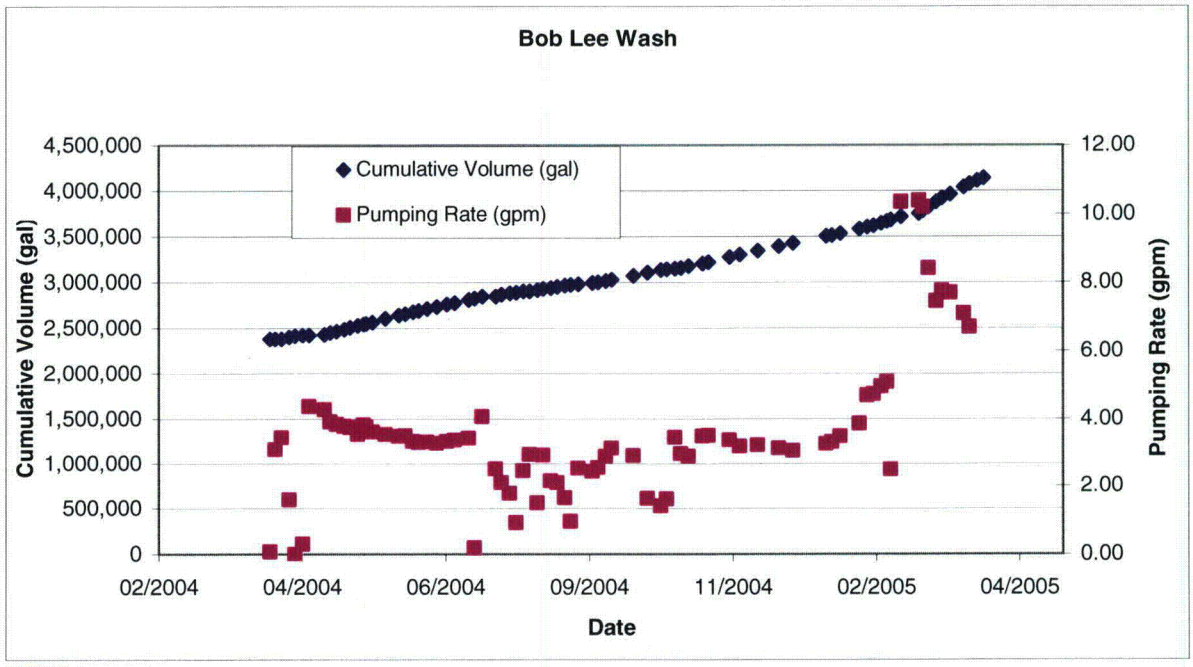

Figure 21. Bob Lee Wash Pumping Rate and Cumulative Ground Water Volume Extracted

The pumping rates and volumes of water removed from the ground water interceptor drain in Many Devils Wash are presented in Figure 22. At the beginning of the current performance period, the flow rate from the drain in Many Devils Wash was approximately 1 gpm. The flow dropped to a minimum of 0.08 gpm in early August, and then increased to approximately 0.5 gpm through the end of October. Two spikes in the flow occurred during the remainder of the period: an increase to 1.29 gpm in late November, and an increase to 1.51 gpm in late March. Flow reductions from Many Devils Wash appeared to be influenced by seasonal evapotranspiration, which is highest in the summer; maximum pumping rates occurred during cooler periods. By the end of March 2005 the total volume removed by this drain had reached 573,268 gallons, representing a mean flow over the performance period of approximately 1.1 gpm. Appendix C lists the measured pumping rates and corresponding volumes of ground water removed from the Bob Lee Wash and Many Devils Wash drains.

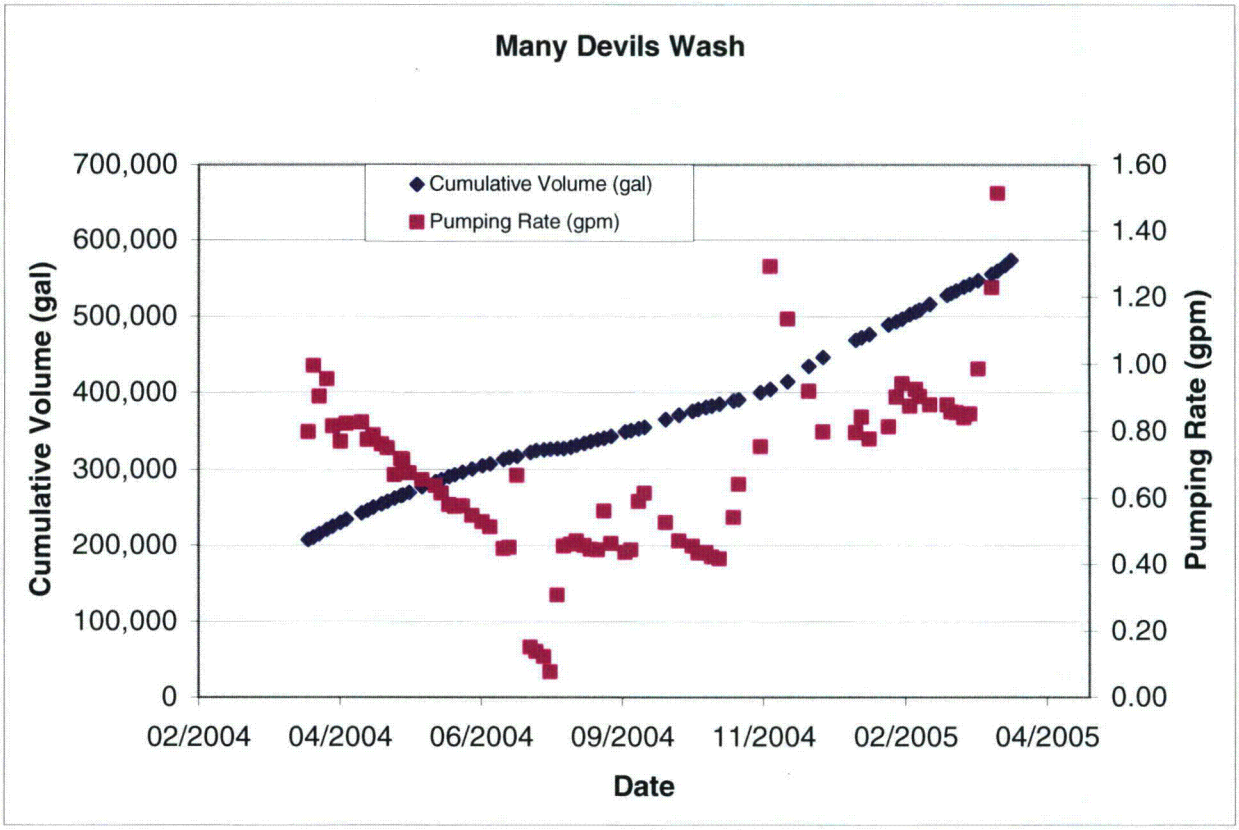

Figure 22. Many Devils Wash Pumping Rate and Cumulative Ground Water Volume Extracted

3.2.3 Evaporation Pond

The evaporation pond had a water depth of approximately 1 ft during winter 2005. Approximately 45 percent of the influent liquids entering the evaporation pond come from the floodplain aquifer, leaving approximately 55 percent of the inflow to come from the terrace ground water system. As of the end of this reporting period, approximately 13,470,000 gallons of water had been pumped to the evaporation pond. The terrace contribution includes the extraction

wells, Bob Lee Wash, and Many Devils Wash. Figure 23 presents the total volume of water transported to the pond, and the relative contributions from the floodplain and terrace systems.

The estimated masses of sulfate, nitrate, and uranium entering the evaporation pond from the alluvial extraction wells and the terrace ground water extraction system (i.e., extraction wells, and the ground water interceptor drains in Bob Lee Wash and Many Devils Wash) are summarized in Figure 24. Because of its high concentration in both the alluvial and terrace ground water systems, sulfate is the dominant COC constituent (in terms of mass) that enters the evaporation pond. During the current performance period the estimated mass of selected COCs pumped to the evaporation pond was 338,486 kilograms (kg) of sulfate, 10,859 kg of nitrate, and 28.0 kg of uranium. This is the first performance report that includes an estimate the mass of COCs entering the evaporation pond from the ground water extraction system. The estimate was computed from the average COC concentrations and the weekly flows at each well.

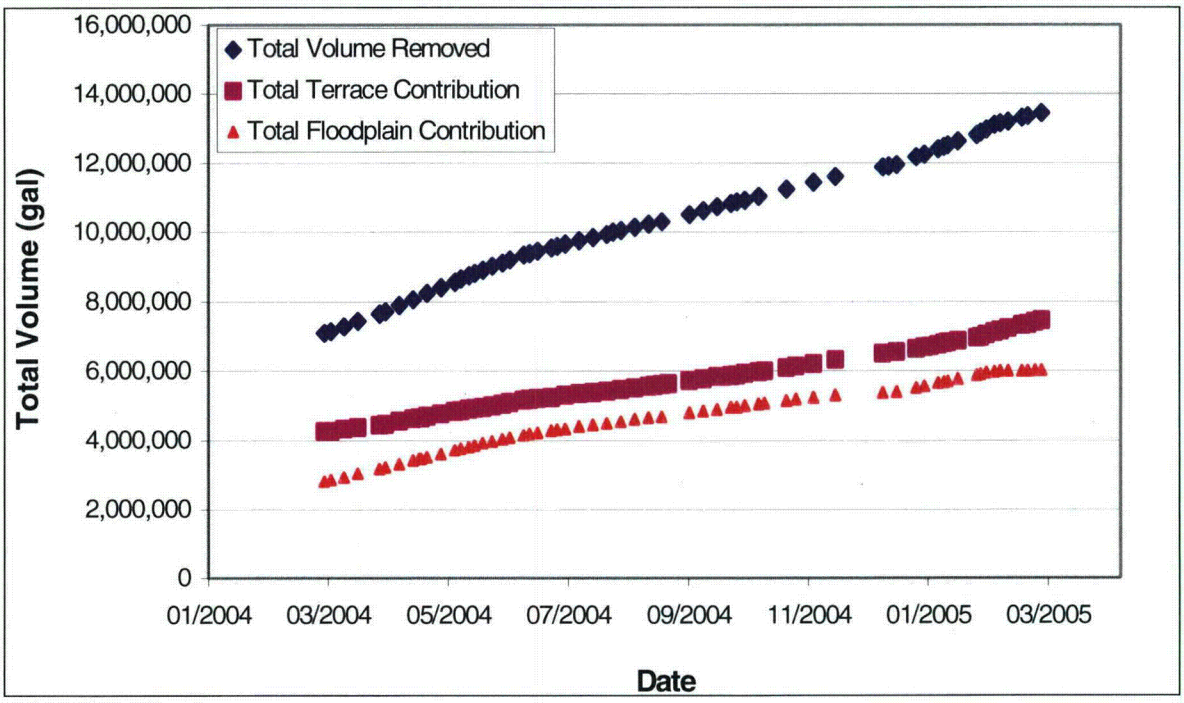

Figure 23. Total Ground Water Volume Transported to the Evaporation Pond

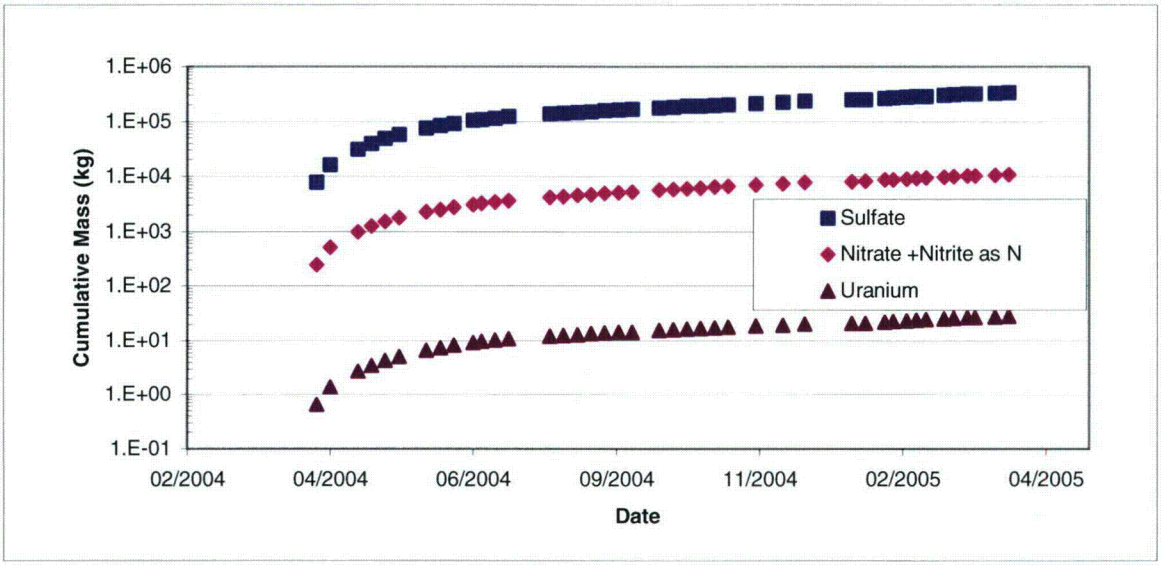

Figure 24. Estimated Total Mass of Selected Constituents Pumped from Terrace and Alluvial Extraction Wells

4.0 Performance Summary

This report contains an assessment of the ground water remediation system at the UMTRA Project site in Shiprock, New Mexico, for the performance period of April 2004 through March 2005. The performance period marks the end of the second year of operation of the ground water remediation system. Findings from the April 2004 through March 2005 evaluation of the floodplain and terrace remediation systems at the site are as follows:

- Relative to baseline conditions, COC concentrations in floodplain well 0735 have dropped to less than one-half the baseline concentration.
- The water level in terrace well 0604, which is next to extraction well 0818 (whose average pumping rate was 1.38 gpm during the current performance period), declined approximately 2 ft since pumping began at this well in 2003. This value is similar to projected drops for this area using a ground water model (DOE 2002). This relative match between observed and predicted drawdown represents somewhat of an isolated occurrence.
- Actual withdrawals of ground water from the terrace system are lagging behind model-projected ground-water withdrawals. During the design of the GCAP (DOE 2002), the total pumping rates for the terrace well field was estimated to range from 4 gpm to 7.5 gpm and was assumed to require 3 to 4 extraction wells. As presented in Table 3 of this report, the average pumping rate for the well field during the current performance period was 2.04 gpm; during the previous period, the pumping rate was almost 3 gpm. Eight extraction wells are currently being used to produce these meager yields.
- During the current performance period the total ground water withdrawal from the terrace east system was 3.08×10^6 gallons. The total volume pumped consisted of 1.7×10^6 gallons from the ground-water interceptor drain in Bob Lee Wash, 0.35×10^6 gallons from the

ground-water interceptor drain in Many Devils Wash, and 1.02×10^6 gallons from the terrace east ground-water extraction wells.

- The estimated dissolved mass of sulfate, nitrate, and uranium removed from the floodplain and terrace east well fields were 338,486 kg, 10,859 kg, and 28.0 kg, respectively.
- Two new wells (1095 and 1096) were installed in the terrace east well field during March 2005 and are projected to come on line during September 2005. Preliminary pumping tests have shown that the production from each of these wells will range from 1.5 to 3 gpm. The addition of these two wells is expected to increase the total production rate to the levels that were assumed in the GCAP design.
- The current-period average pumping rate of 3.52 gpm from the ground-water interceptor drain in Bob Lee Wash exceeded the flow that was projected with the ground-water model used in the GCAP design. The model-forecasted drain flows amounted to approximately 1.55 gpm after 2 years of operation. It is difficult to identify causes of this apparent discrepancy, although temporally and spatially variable recharge rates are potential factors.
- Pumping of ground water from the floodplain alluvial aquifer has lagged behind the pumping rates that were estimated with the ground water flow model. Well 1089 is the best producer of the two floodplain extraction wells, having removed nearly 5.5×10^6 gallons of water since pumping began. The production rate from well 1077 is approximately one-tenth the average pumping rate from well 1089.
- Semiannual measurements of discharge at seeps 0425 and 0426 display considerable, temporal variability and are not recommended indicators of long-term changes in flow rates. It is possible that spatially and temporally variable recharge on the terrace affects the varying seep rates.

5.0 Recommendations

The following recommendations are provided to help improve the performance of the Shiprock remediation system and to improve evaluation of the system:

- Some of the terrace wells used in the baseline analysis (DOE 2003a) were omitted from the March 2005 water-level measurements in accordance with recommendations presented in "Refinement of Conceptual Model" report (DOE 2004a). To improve the assessment of ground-water flow directions estimated from well data, the future ground-water elevation measurements should be made in the same set of wells used in the baseline analysis.
- To improve monitoring of the effectiveness of the interceptor drain in Bob Lee Wash, continuous water-level monitoring with data loggers is recommended in wells 1067, 1068, 1069, 0725, and 0726, all of which are located in and around Bob Lee Wash.
- To improve the analysis of ground water response to precipitation events, full functionality of the recording precipitation gauge at the Navajo Tribal Utility Authority trailer should be maintained.
- As the pumping capability of the remediation system increases, it will become more important to monitor the fluid level in the evaporation pond. The staff gauge in the pond should be monitored and recorded, at a minimum, on a weekly basis.

- The performance of the terrace remedial action is currently tied to the reduction of flow from springs 425 and 426 and perhaps the elimination of flow at these locations. As a consequence, the discharge from these springs should be monitored with totalizing flow meters. Records from the devices should be analyzed and included as part of the annual performance evaluation. Given the temporal variability in hydrologic conditions at the site, long-term trends in annual combined flow rates from the two seeps may be discernible.

6.0 References

Laase, A.D., J.E. Wilson, and D.W. Green, 2002. "Evaluation of Natural Flushing Using Three-Point and Partitioning Theory Analysis," in *Proceedings for the Third International Conference on Remediation of Chlorinated and Recalcitrant Compounds*, May.

U.S. Department of Energy (DOE), 2000. *Final Site Observational Work Plan for the Shiprock, New Mexico, UMTRA Project Site*, Rev. 2, GJO–2001–169–TAR, MAC-GWSHP 1.1, U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado, November.

———, 2002. *Final Ground Water Compliance Action Plan for Remediation at the Shiprock, New Mexico, UMTRA Project Site*, GJO–2001–297–TAR, MAC-GWSHP 1.9, U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado, July.

———, 2003a. *Baseline Performance Report for the Shiprock, New Mexico, UMTRA Project Site*, GJO–2003–431–TAC, U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado, September.

———, 2003b. *Semiannual Performance Report February 2003 through August 2003 for the Shiprock, New Mexico, UMTRA Project Site*, GJO–2003–490–TAC, U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado, September.

———, 2004a. *Refinement of Conceptual Model and Recommendations for Improving Remediation Efficiency at the Shiprock, New Mexico, Site*, GJO–2004–579–TAC, U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado, March.

———, 2004b. *Semiannual Performance Report September 2003 through March 2004 for the Shiprock, New Mexico, UMTRA Project Site*, DOE–LM/GJ725–2004, U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado, September.

U.S. Environmental Protection Agency (EPA), 1999. *Health Effects from Exposure to High Levels of Sulfate in Drinking Water Study*, EPA 815-R-99-001, Office of Water, January.

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Appendix A

Three-Point Analyses of Floodplain and Terrace Ground Water Elevation Data

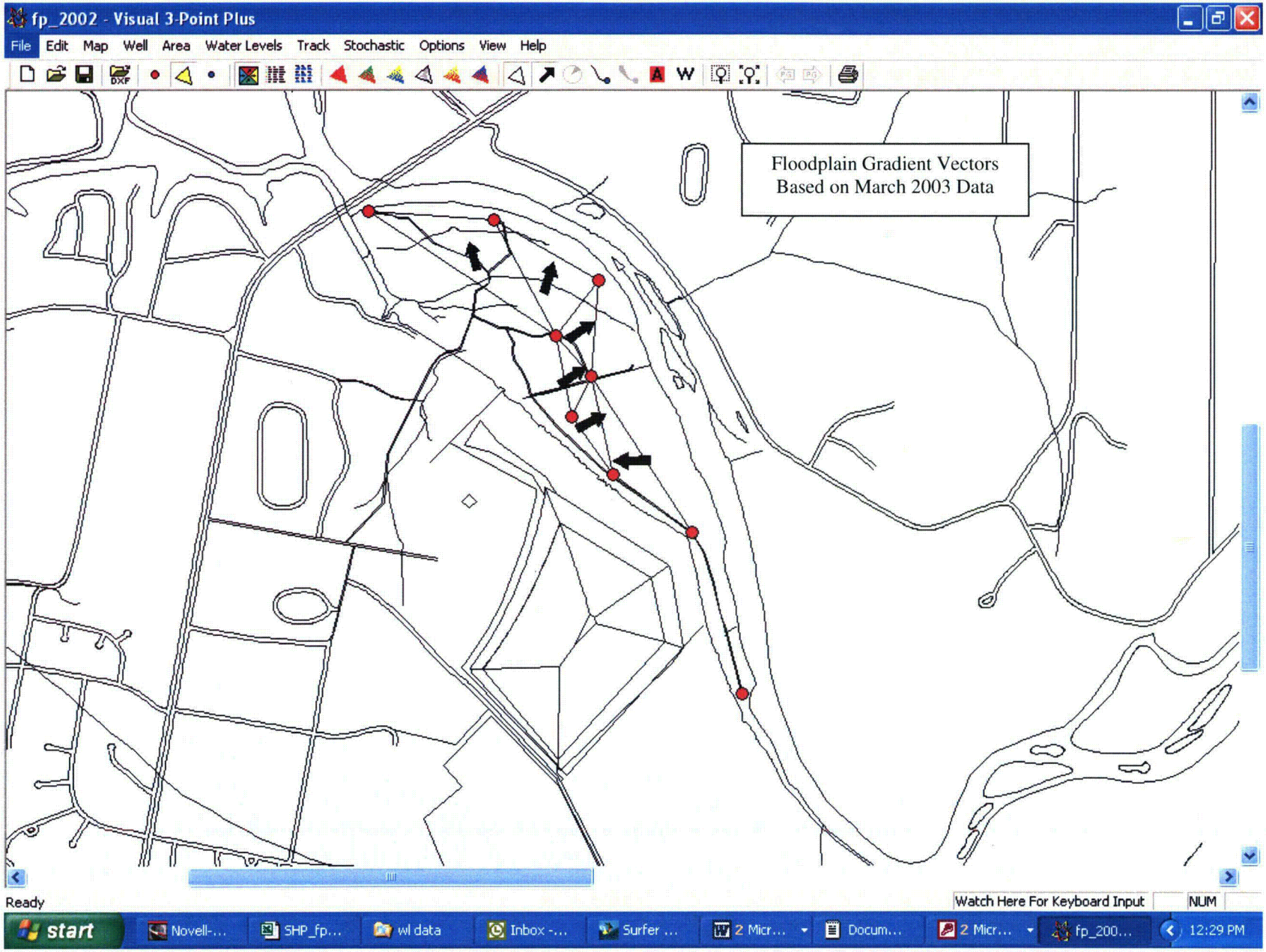
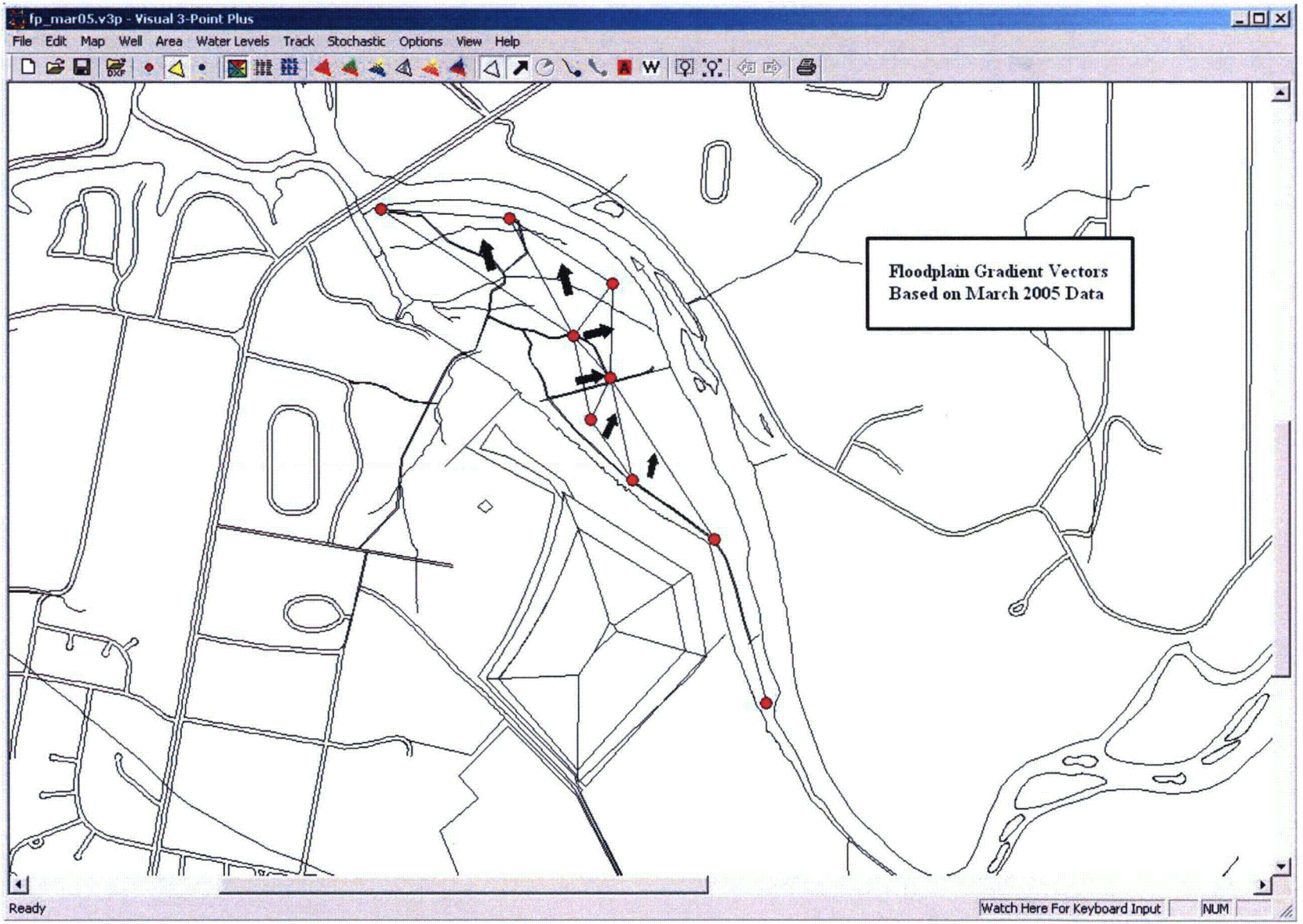

fp_2002 - Visual 3-Point Plus
File Edit Map Well Area Water Levels Track Stochastic Options View Help
Floodplain Gradient Vectors
Based on March 2003 Data
Ready
Watch Here For Keyboard Input
NUM
start
Novell-...
SHP_fp...
wl data
Inbox -...
Surfer ...
2 Micr...
Docum...
2 Micr...
fp_200...
12:29 PM

Figure A–1


fp_mar05.v3p - Visual 3-Point Plus
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Floodplain Gradient Vectors
Based on March 2005 Data
Ready
Watch Here For Keyboard Input
NUM

Figure A–2

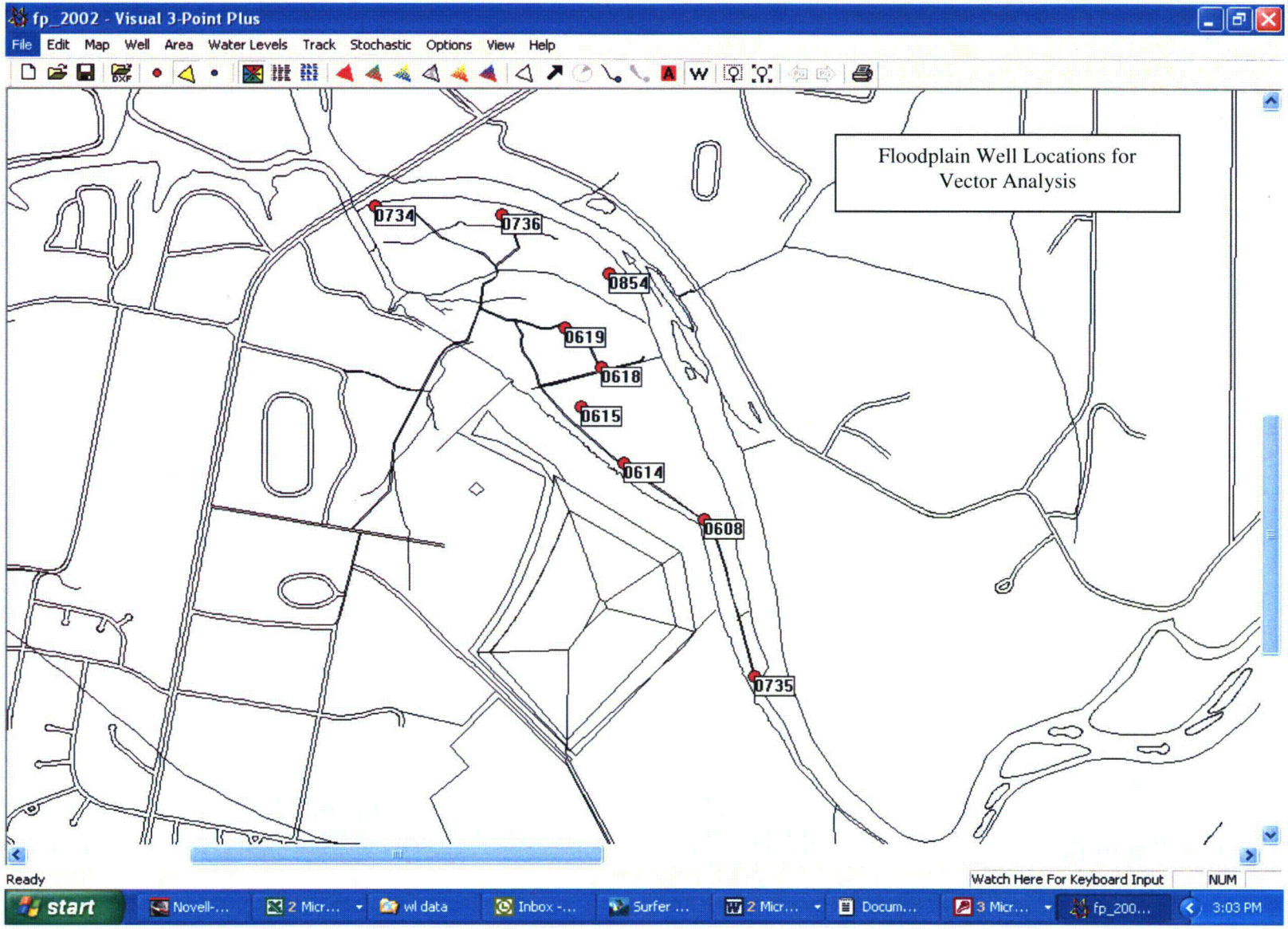

fp_2002 - Visual 3-Point Plus
File Edit Map Well Area Water Levels Track Stochastic Options View Help
Floodplain Well Locations for Vector Analysis
D734
D736
D854
D619
D618
D615
D614
D608
D735
Ready
Watch Here For Keyboard Input
NUM
start
Novell-...
2 Micr...
wl data
Inbox -...
Surfer ...
2 Micr...
Docum...
3 Micr...
fp_200...
3:03 PM

Figure A–3

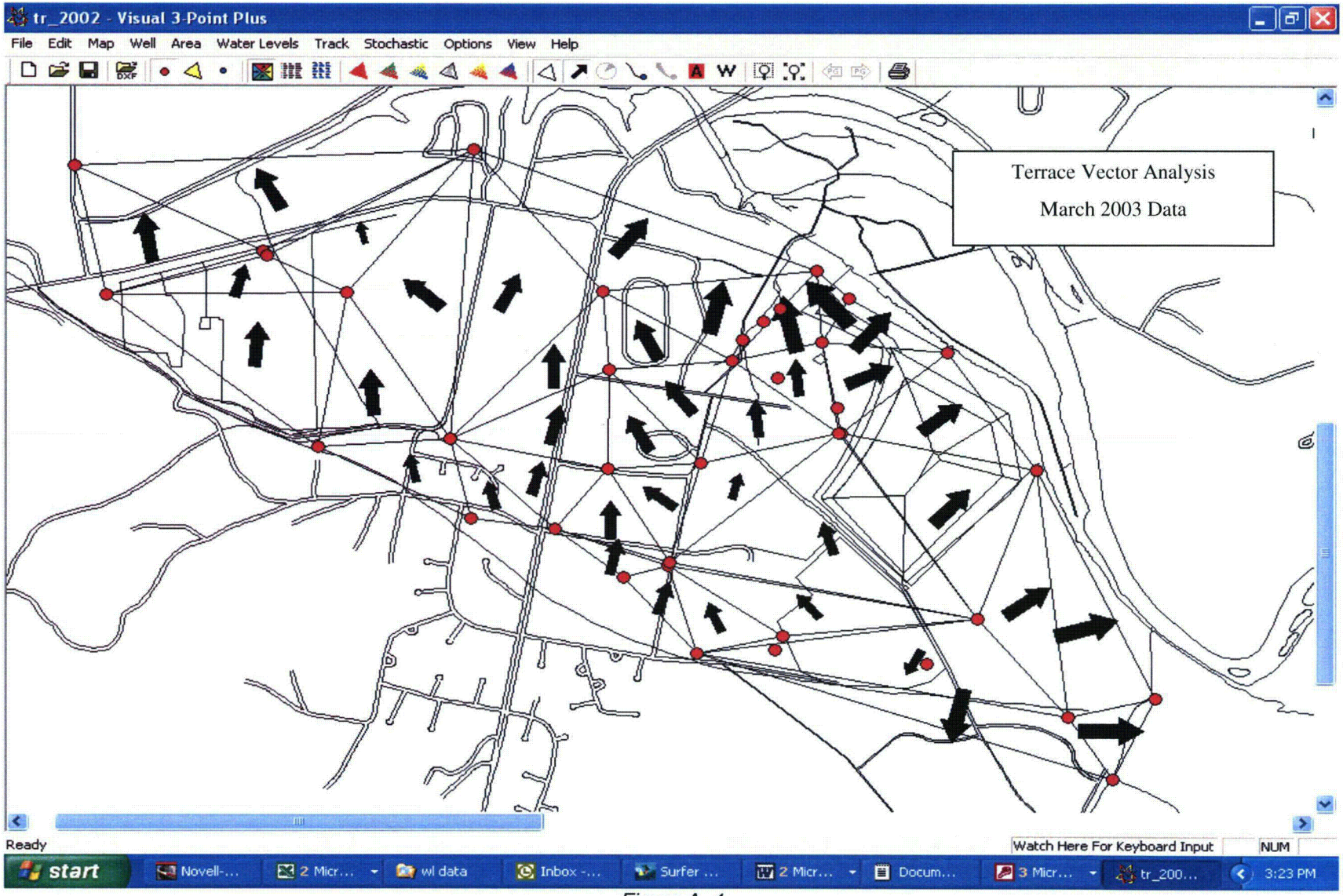
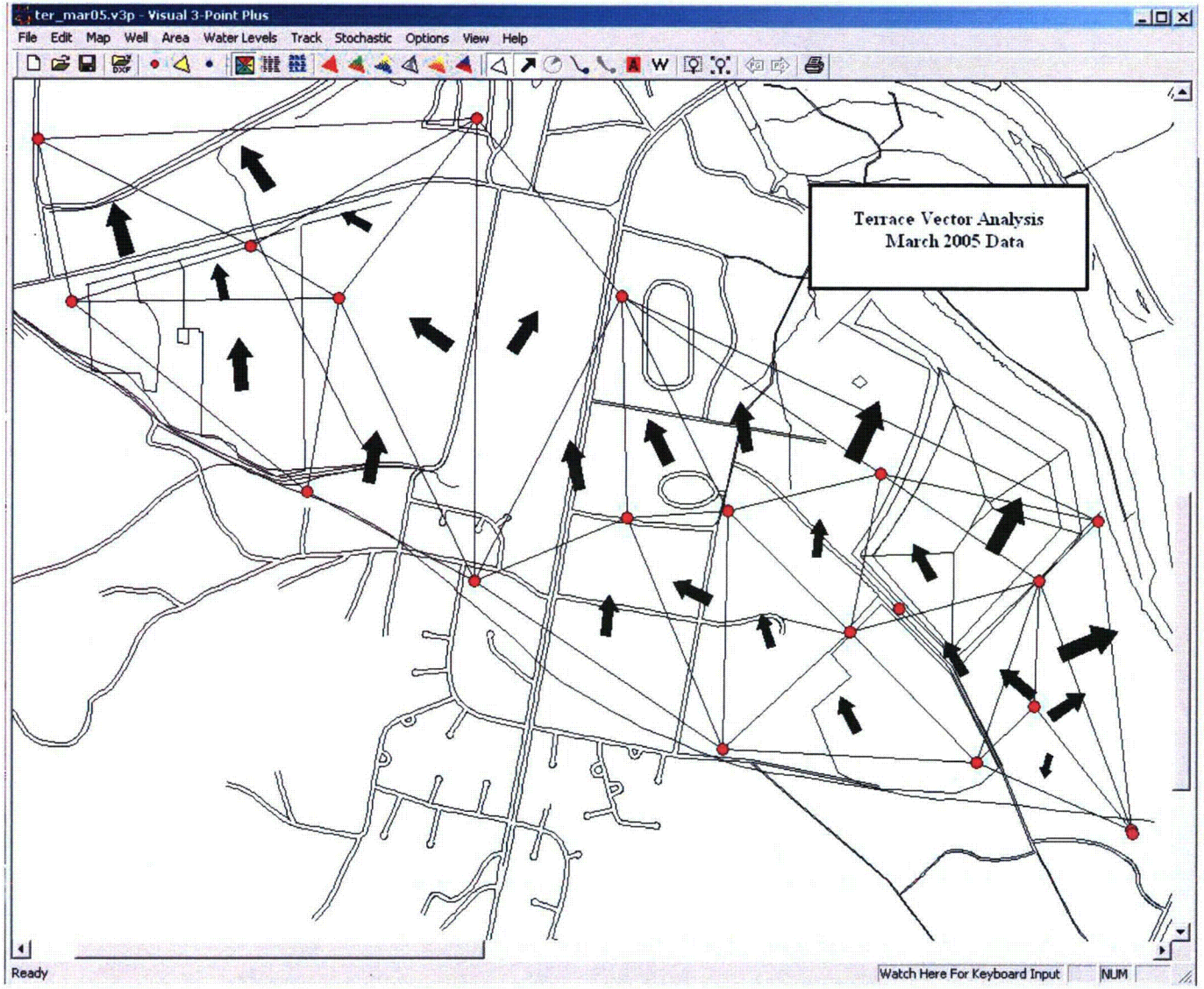

tr_2002 - Visual 3-Point Plus
File Edit Map Well Area Water Levels Track Stochastic Options View Help
Terrace Vector Analysis
March 2003 Data
Ready
Watch Here For Keyboard Input
NUM
start
Novell-...
2 Micr...
wl data
Inbox -...
Surfer ...
2 Micr...
Docum...
3 Micr...
tr_200...
3:23 PM

Figure A–4


ter_mar05.v3p - Visual 3-Point Plus
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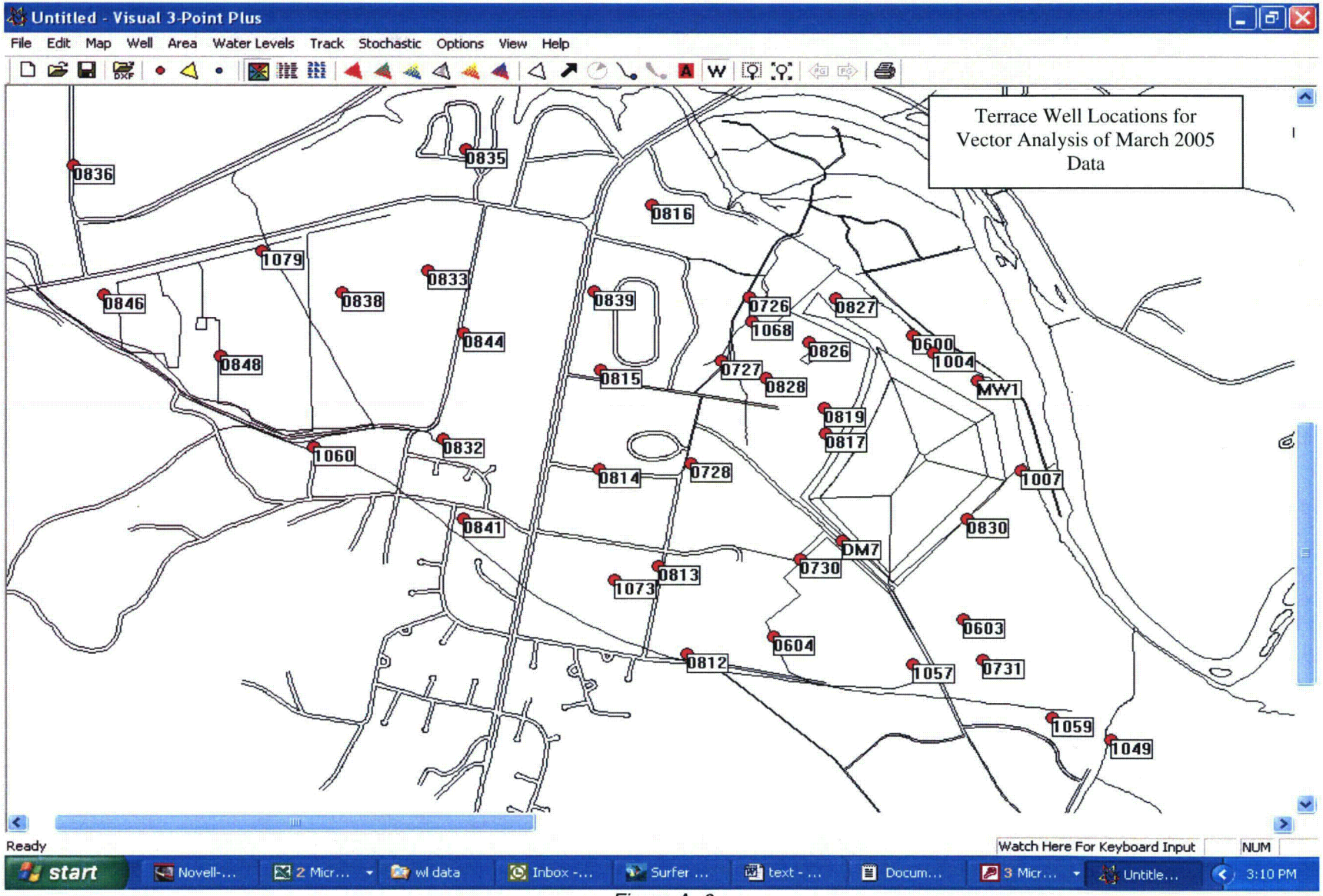
Terrace Vector Analysis
March 2005 Data
Ready
Watch Here For Keyboard Input
NUM

Figure A–5


Untitled - Visual 3-Point Plus
File Edit Map Well Area Water Levels Track Stochastic Options View Help
Terrace Well Locations for Vector Analysis of March 2005 Data
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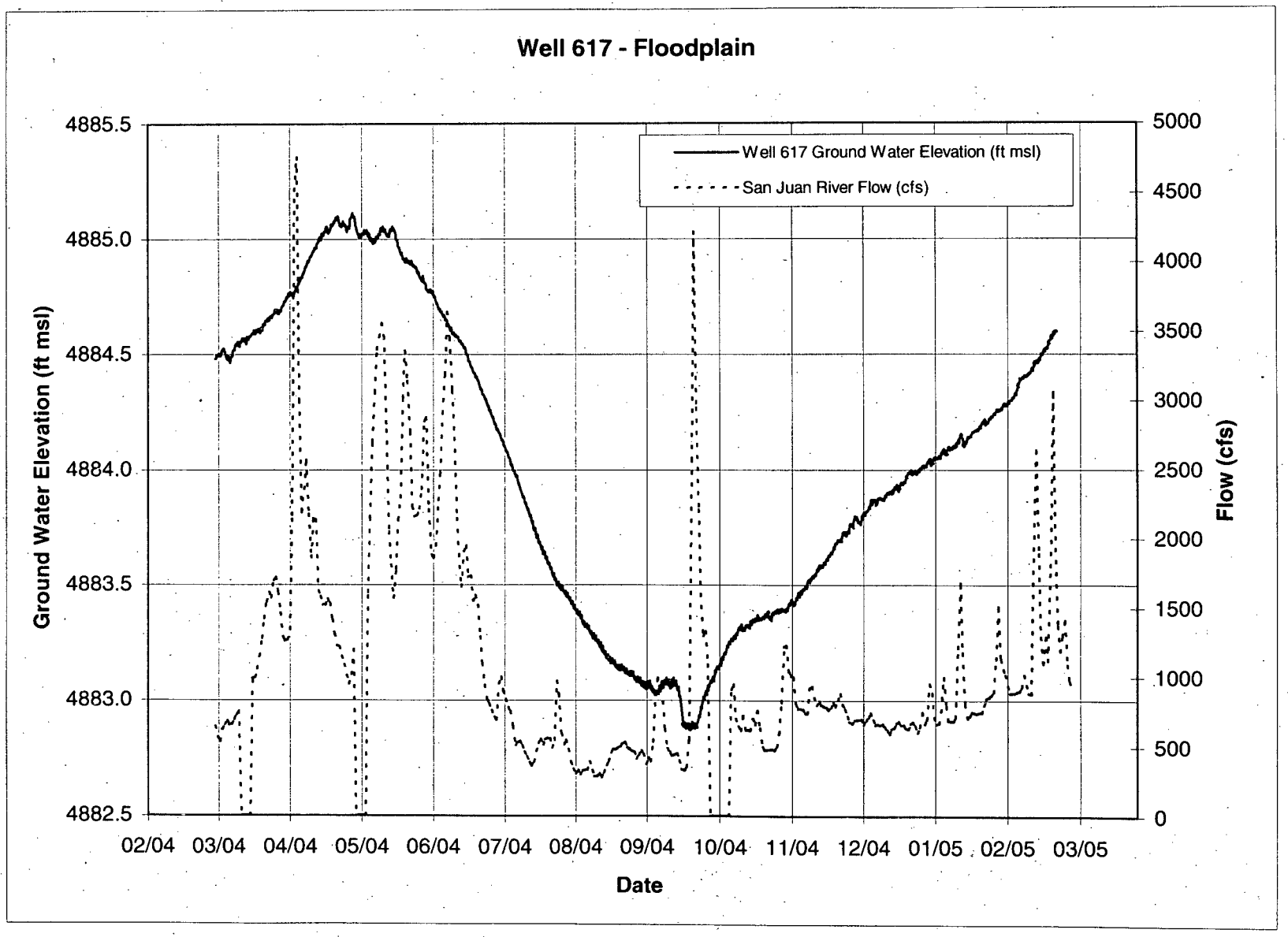
0835
0816
1079
0833
0846
0838
0839
0726
0827
1068
0844
0826
0600
1004
0848
0727
0815
0828
MW1
0819
0817
0832
1060
0814
0728
1007
0841
0830
DM7
0730
0813
1073
0603
0604
0812
1057
0731
1059
1049
Ready
Watch Here For Keyboard Input
NUM
start
Novell-...
2 Micr...
wl data
Inbox -...
Surfer ...
text - ...
Docum...
3 Micr...
Untitle...
3:10 PM

Figure A–6

Appendix B

Shiprock Data-Logger Ground-Water Elevation Data

Floodplain Ground-Water Elevation Data
(April 2004 through March 2005)


Well 617 - Floodplain
Well 617 Ground Water Elevation (ft msl)
San Juan River Flow (cfs)
Ground Water Elevation (ft msl)
Flow (cfs)
Date
4885.5
4885.0
4884.5
4884.0
4883.5
4883.0
4882.5
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
02/04
03/04
04/04
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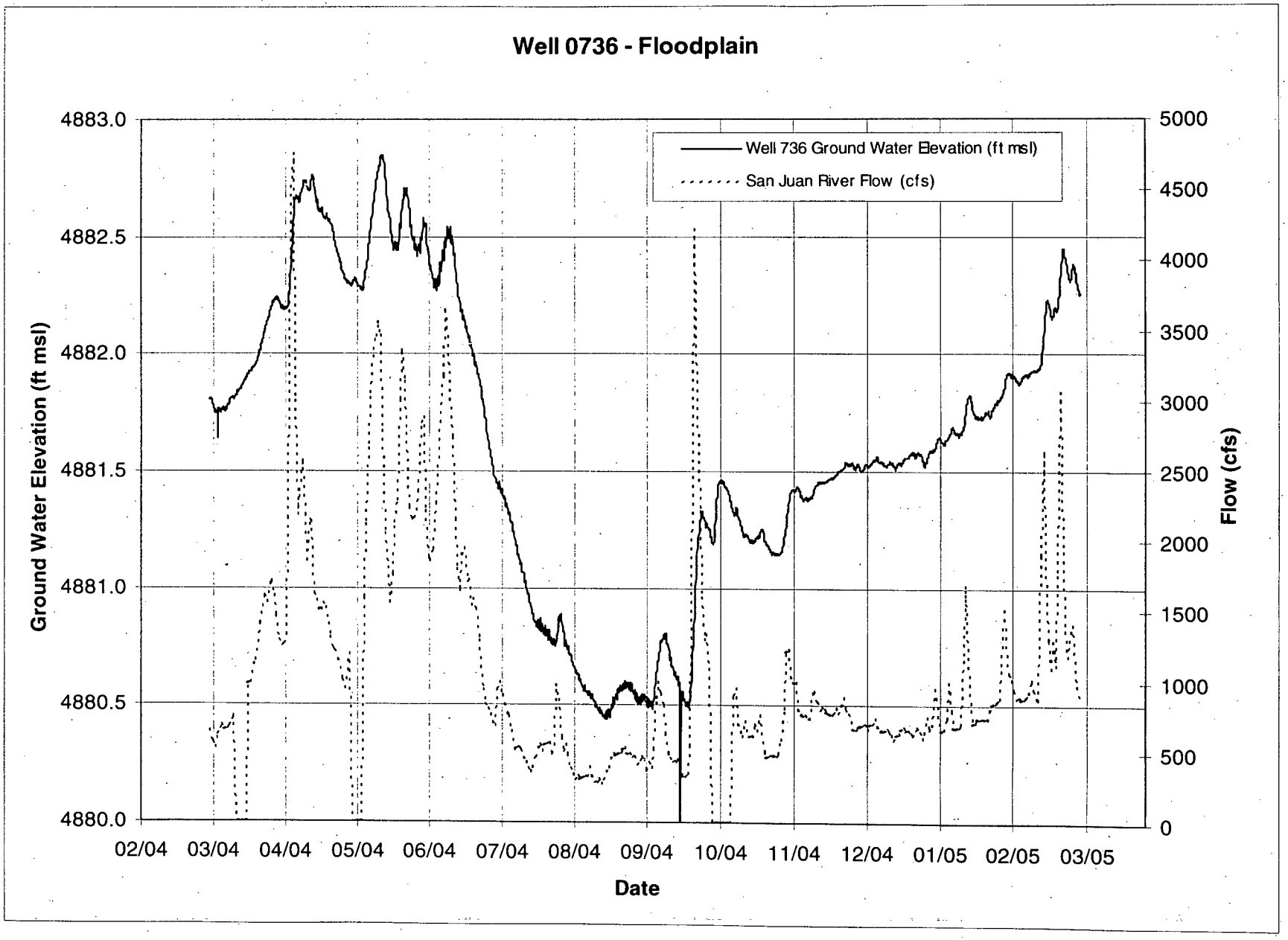
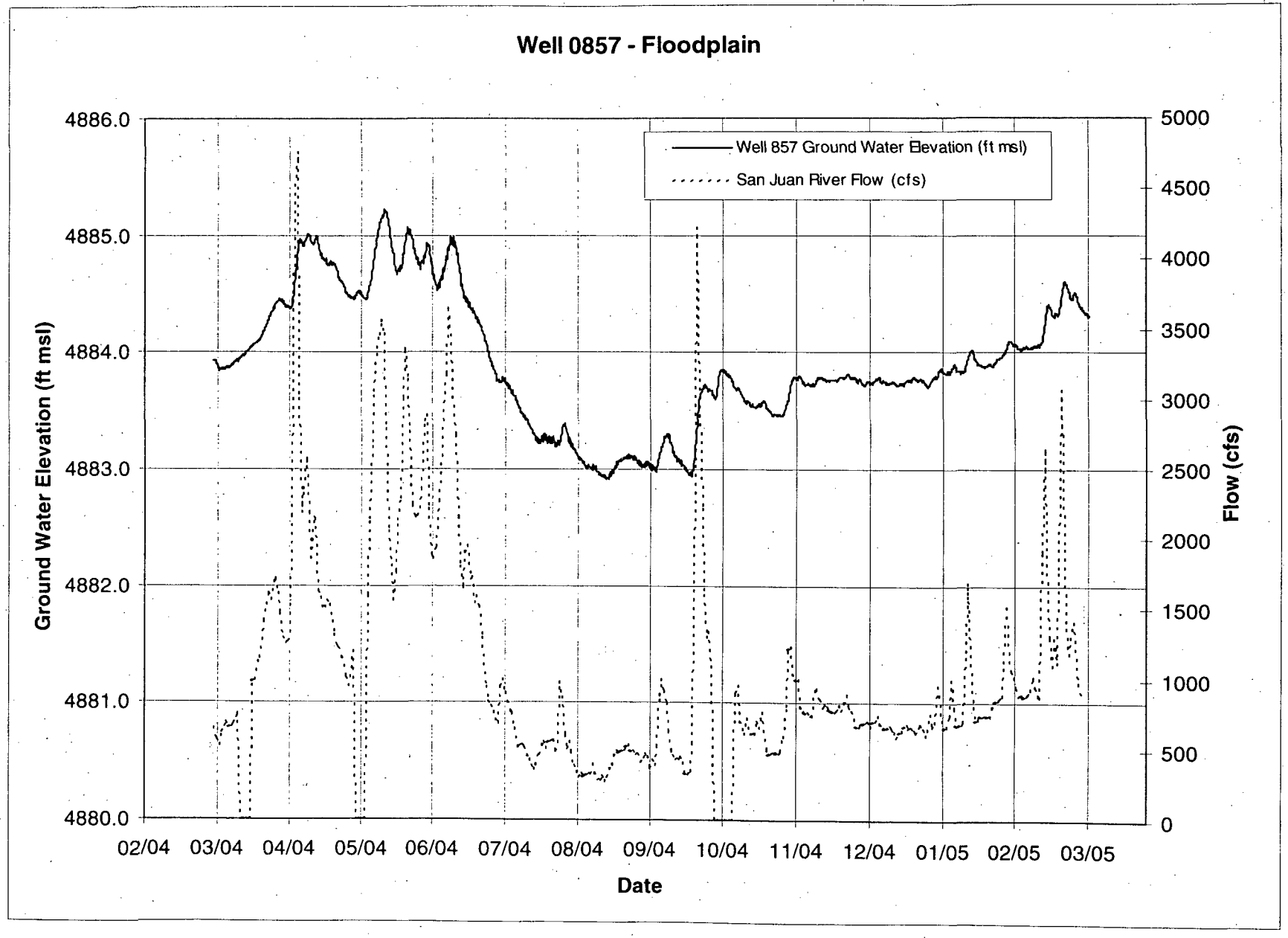
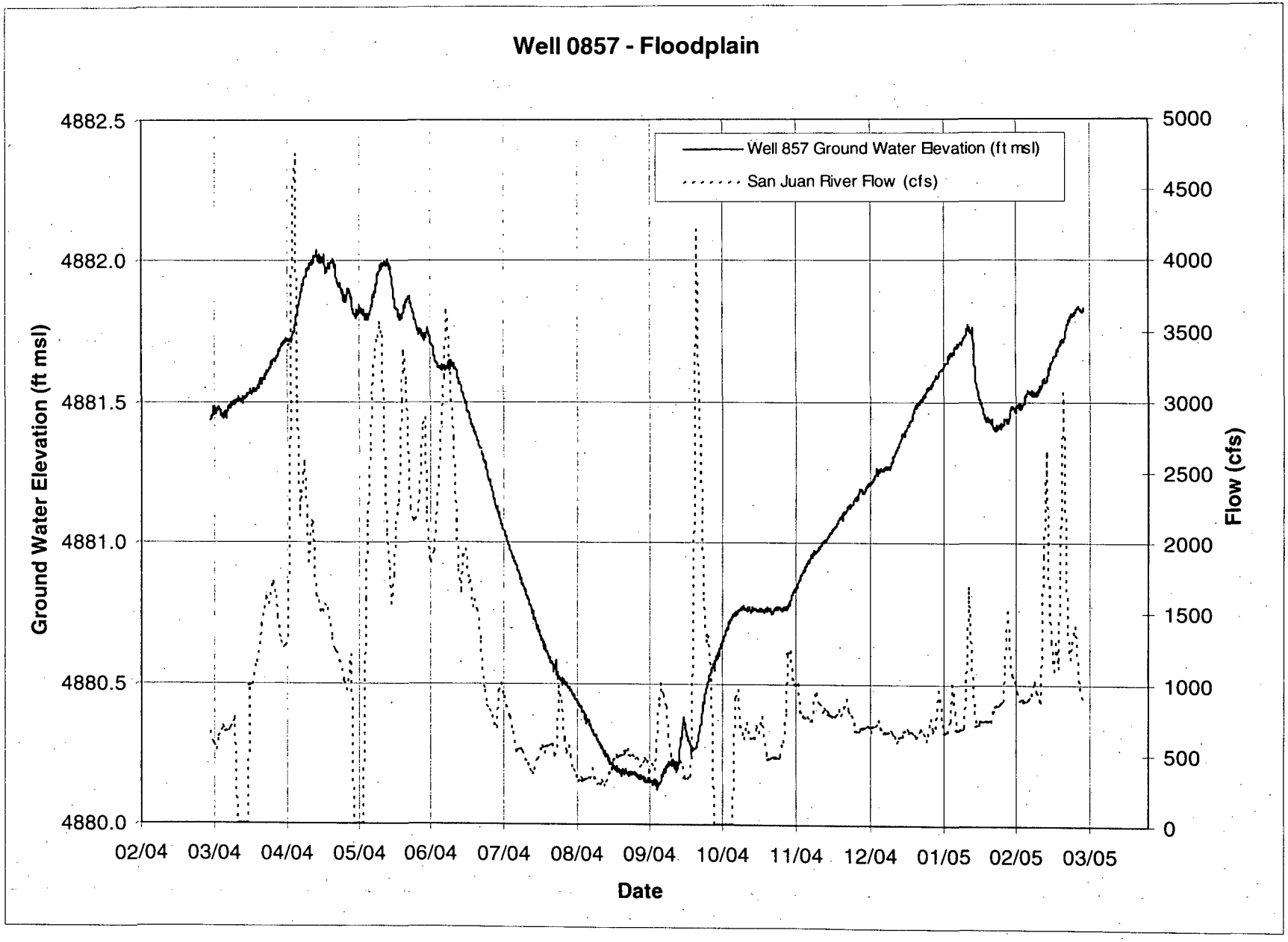
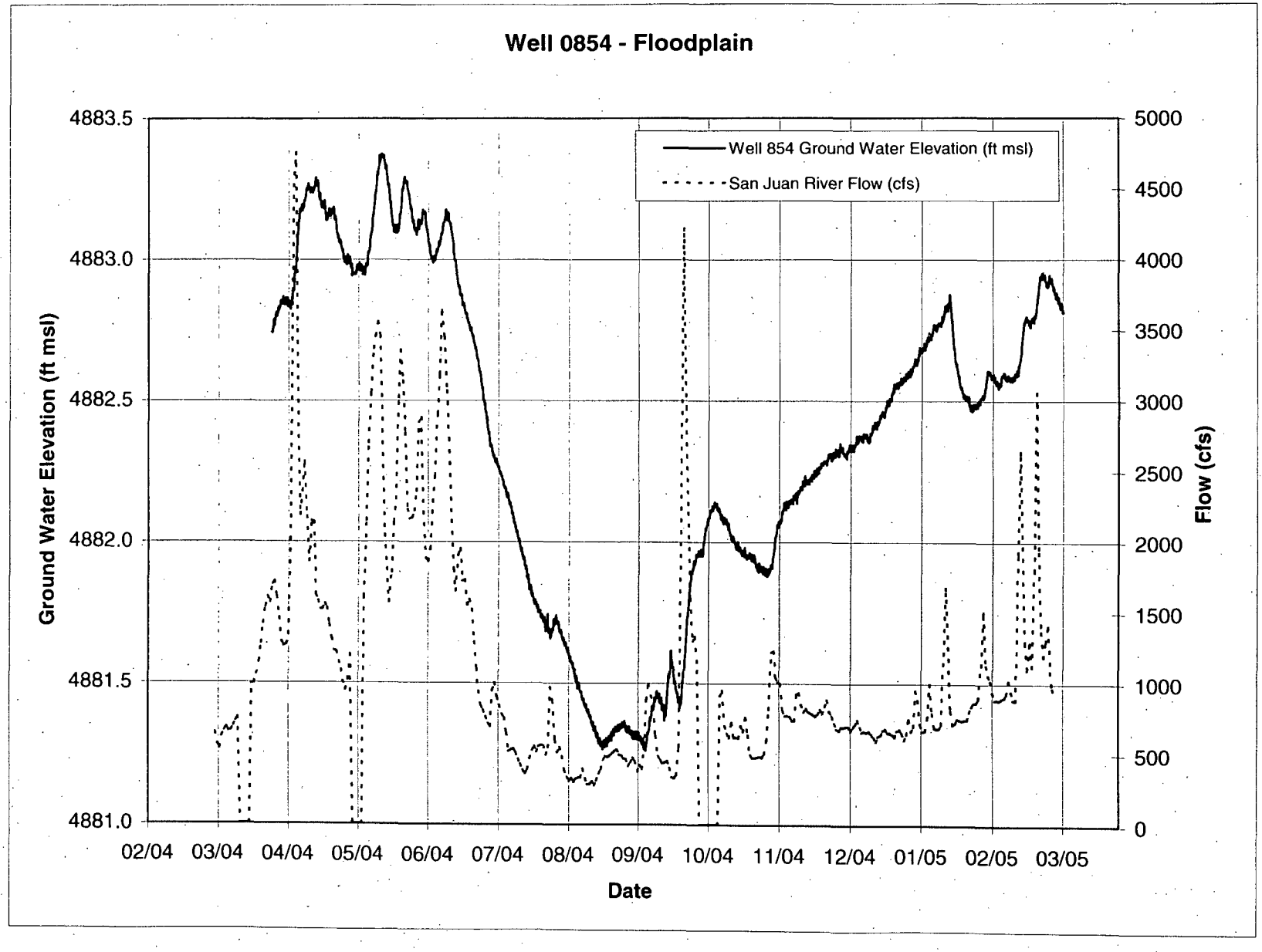
10/04
11/04
12/04
01/05
02/05
03/05


Well 0736 - Floodplain
Well 736 Ground Water Elevation (ft msl)
San Juan River Flow (cfs)
Ground Water Elevation (ft msl)
Flow (cfs)
Date
4883.0
4882.5
4882.0
4881.5
4881.0
4880.5
4880.0
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
02/04
03/04
04/04
05/04
06/04
07/04
08/04
09/04
10/04
11/04
12/04
01/05
02/05
03/05

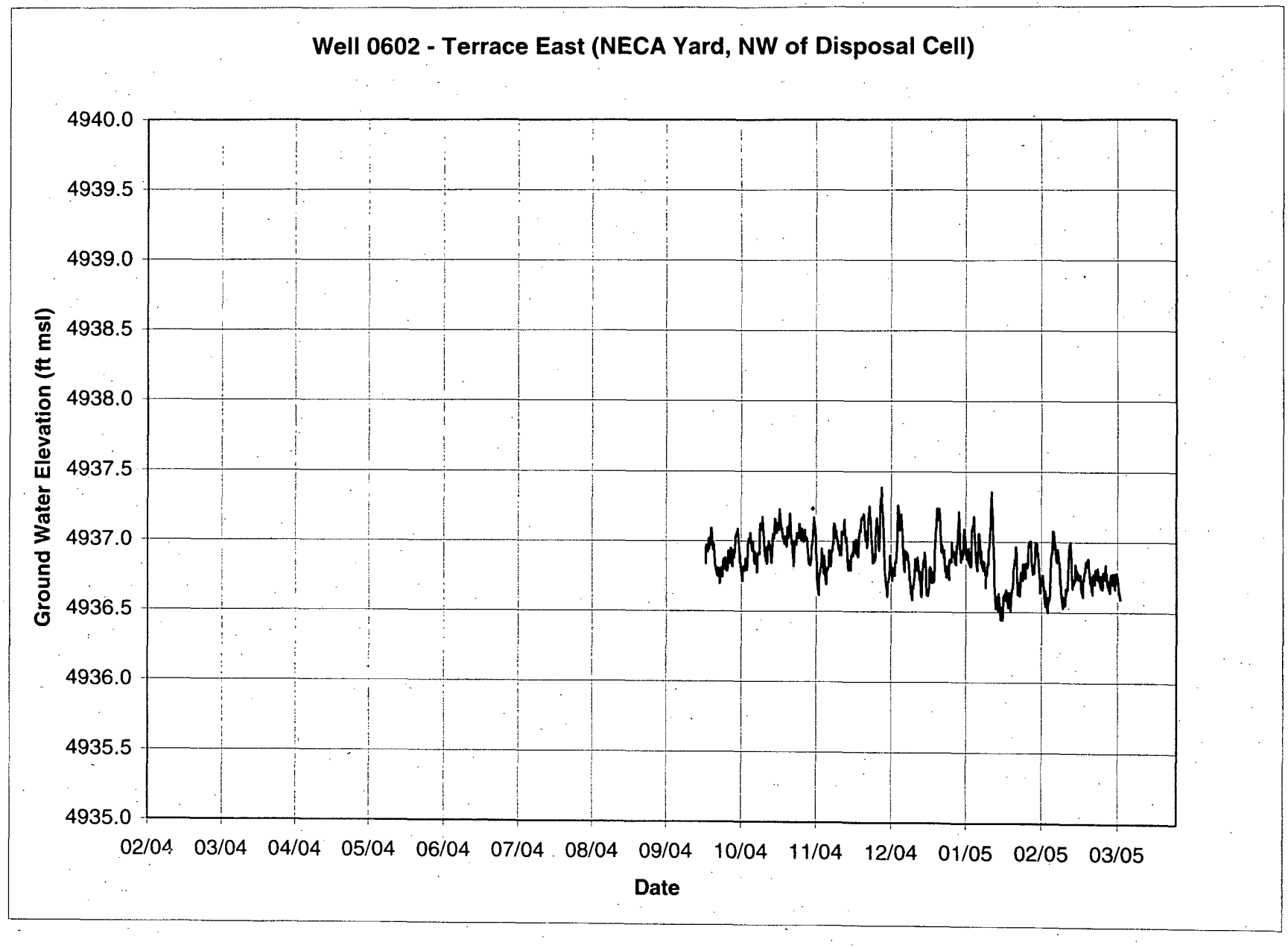

Well 0857 - Floodplain
Well 857 Ground Water Elevation (ft msl)
San Juan River Flow (cfs)
Ground Water Elevation (ft msl)
Flow (cfs)
4886.0
4885.0
4884.0
4883.0
4882.0
4881.0
4880.0
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
02/04
03/04
04/04
05/04
06/04
07/04
08/04
09/04
10/04
11/04
12/04
01/05
02/05
03/05
Date

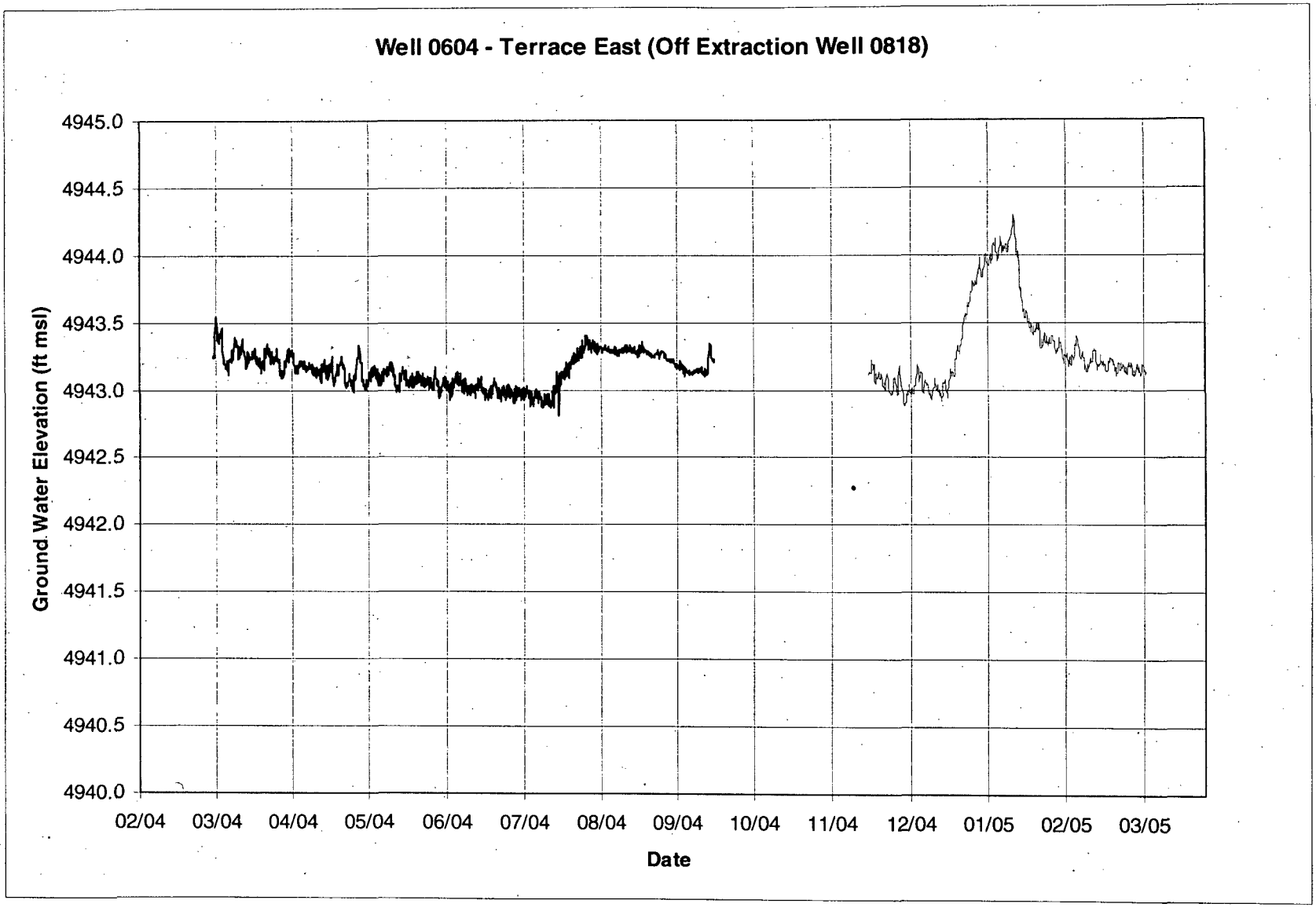

Well 0857 - Floodplain
Well 857 Ground Water Elevation (ft msl)
San Juan River Flow (cfs)
Ground Water Elevation (ft msl)
Flow (cfs)
4882.5
4882.0
4881.5
4881.0
4880.5
4880.0
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
02/04
03/04
04/04
05/04
06/04
07/04
08/04
09/04
10/04
11/04
12/04
01/05
02/05
03/05
Date

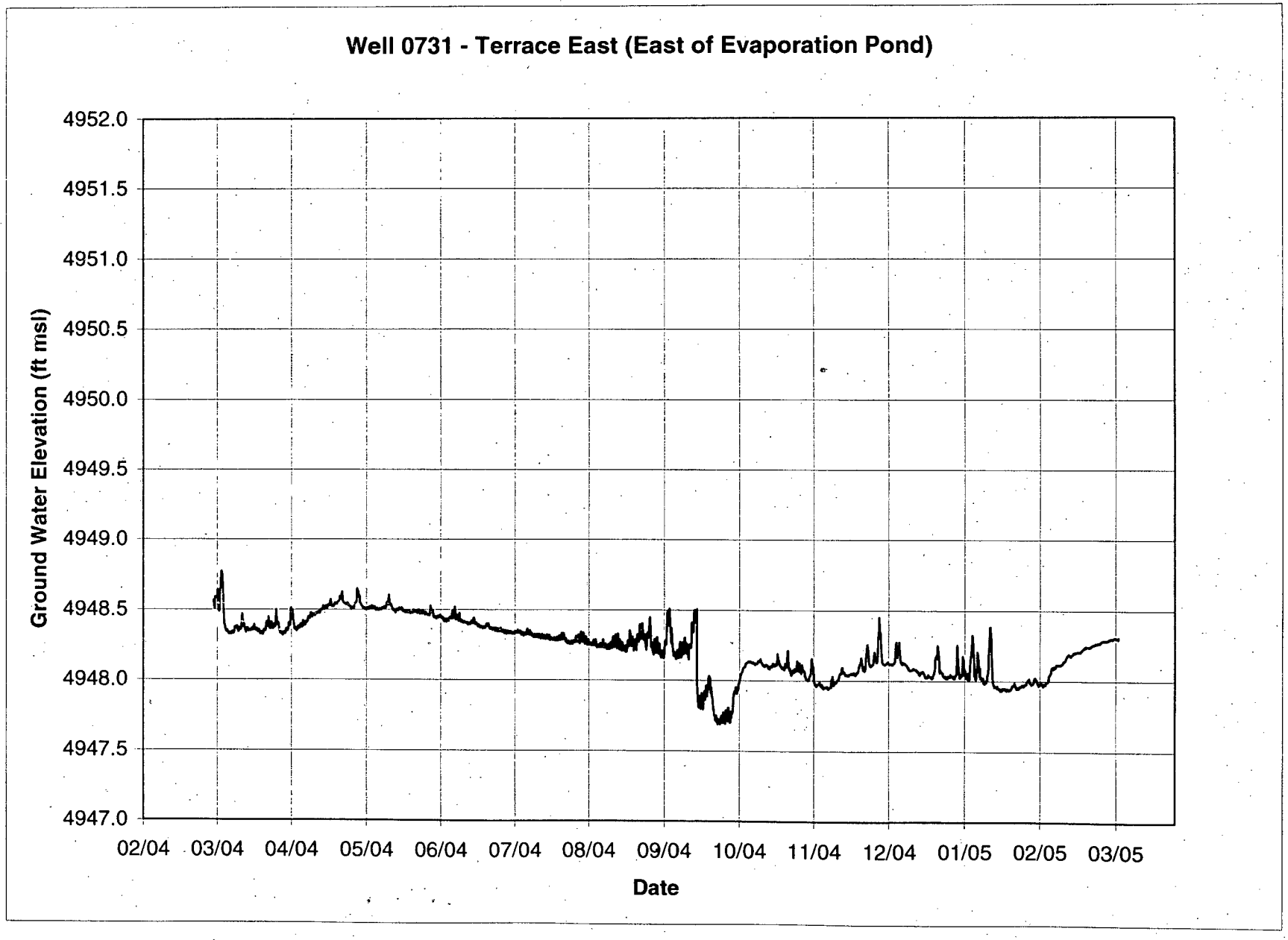

Well 0854 - Floodplain
Well 854 Ground Water Elevation (ft msl)
San Juan River Flow (cfs)
Ground Water Elevation (ft msl)
Flow (cfs)
Date
4883.5
4883.0
4882.5
4882.0
4881.5
4881.0
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
02/04
03/04
04/04
05/04
06/04
07/04
08/04
09/04
10/04
11/04
12/04
01/05
02/05
03/05

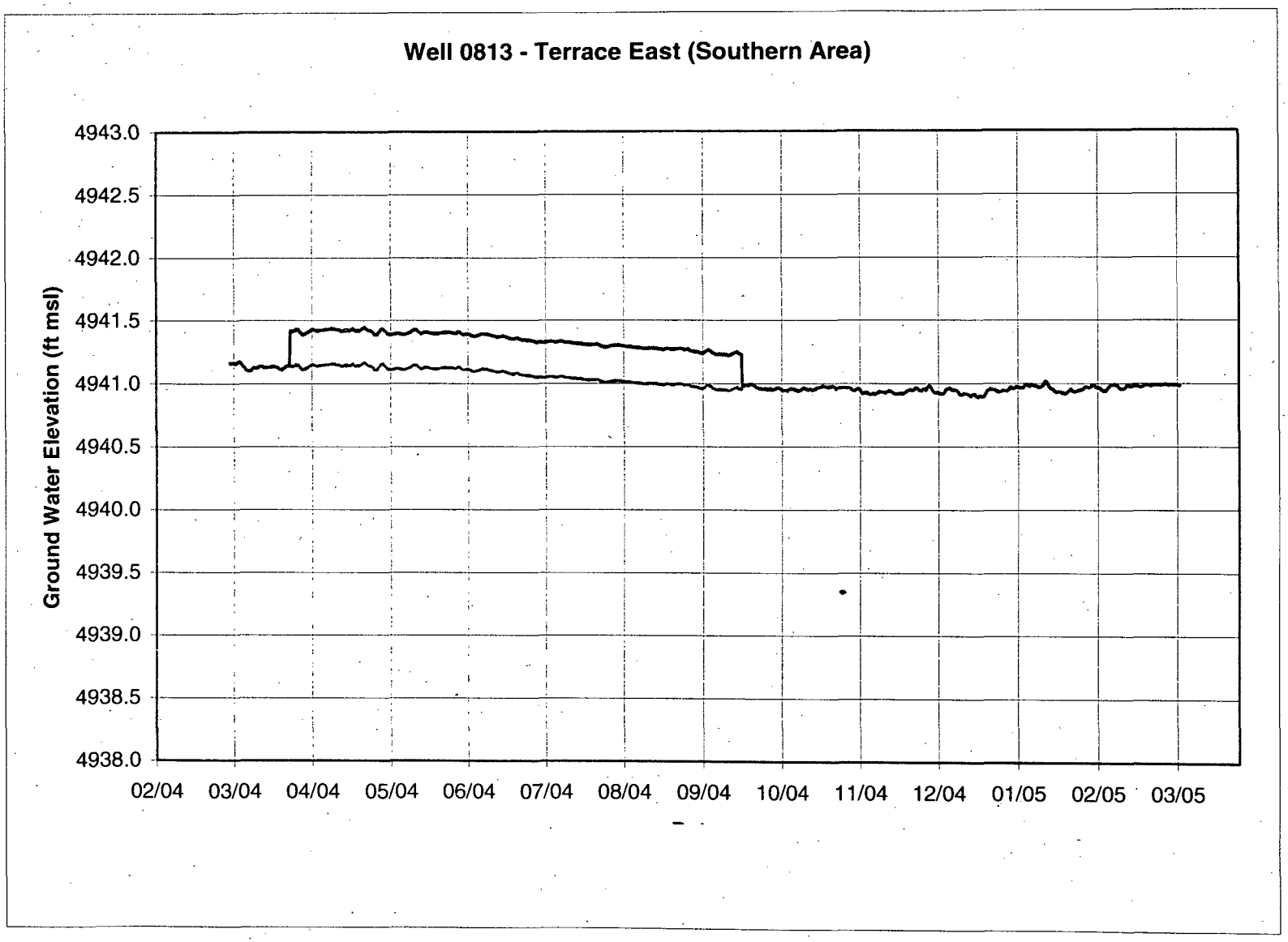
End of current text

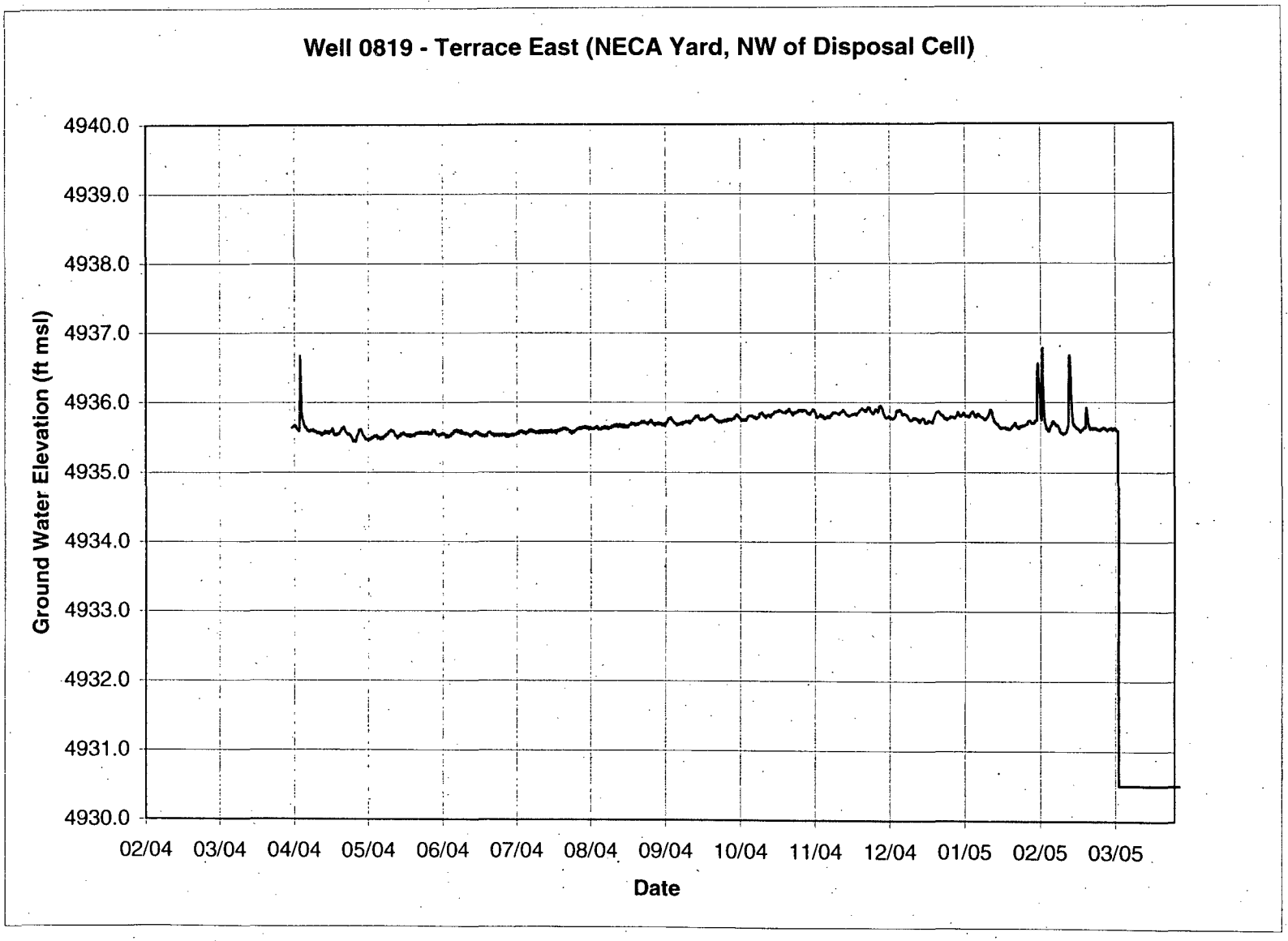
Terrace East Ground-Water Elevation Data
(April 2004 through March 2005)

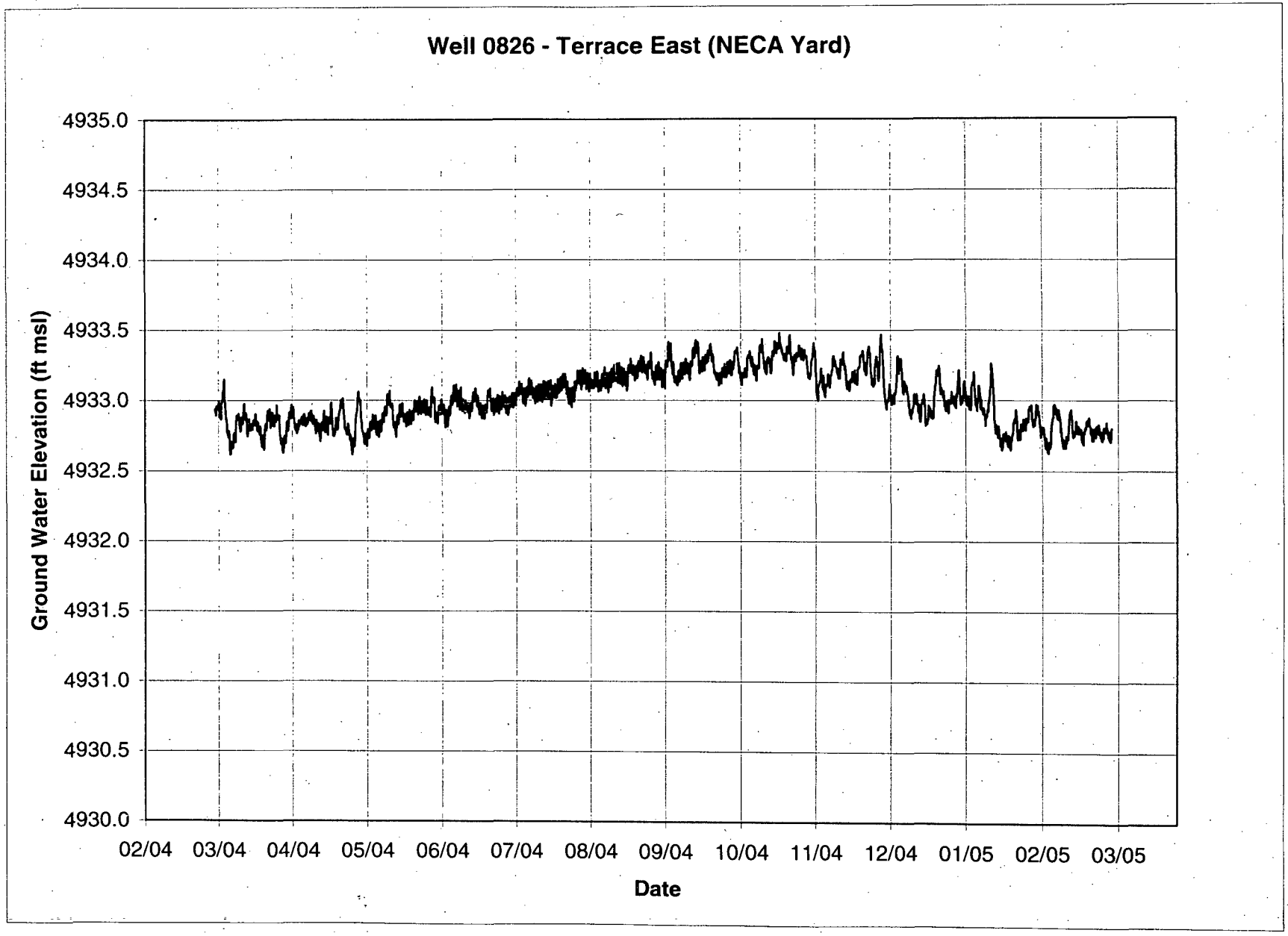

Well 0602 - Terrace East (NECA Yard, NW of Disposal Cell)
Ground Water Elevation (ft msl)
4940.0
4939.5
4939.0
4938.5
4938.0
4937.5
4937.0
4936.5
4936.0
4935.5
4935.0
02/04
03/04
04/04
05/04
06/04
07/04
08/04
09/04
10/04
11/04
12/04
01/05
02/05
03/05
Date

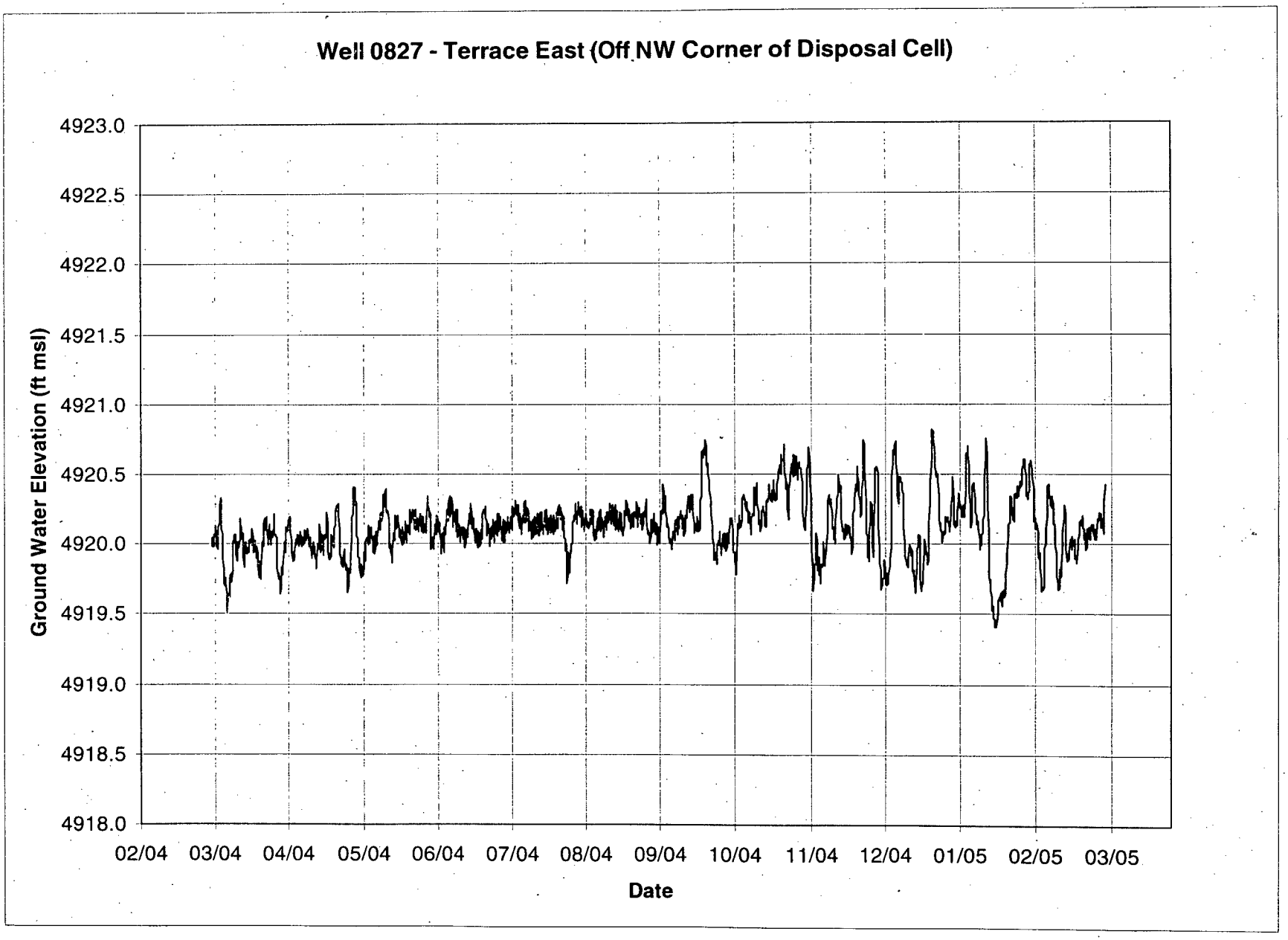

Well 0604 - Terrace East (Off Extraction Well 0818)
Ground Water Elevation (ft msl)
4945.0
4944.5
4944.0
4943.5
4943.0
4942.5
4942.0
4941.5
4941.0
4940.5
4940.0
02/04
03/04
04/04
05/04
06/04
07/04
08/04
09/04
10/04
11/04
12/04
01/05
02/05
03/05
Date


Well 0731 - Terrace East (East of Evaporation Pond)
Ground Water Elevation (ft msl)
4952.0
4951.5
4951.0
4950.5
4950.0
4949.5
4949.0
4948.5
4948.0
4947.5
4947.0
02/04
03/04
04/04
05/04
06/04
07/04
08/04
09/04
10/04
11/04
12/04
01/05
02/05
03/05
Date


Well 0813 - Terrace East (Southern Area)
Ground Water Elevation (ft msl)
4943.0
4942.5
4942.0
4941.5
4941.0
4940.5
4940.0
4939.5
4939.0
4938.5
4938.0
02/04
03/04
04/04
05/04
06/04
07/04
08/04
09/04
10/04
11/04
12/04
01/05
02/05
03/05


Well 0819 - Terrace East (NECA Yard, NW of Disposal Cell)
Ground Water Elevation (ft msl)
4940.0
4939.0
4938.0
4937.0
4936.0
4935.0
4934.0
4933.0
4932.0
4931.0
4930.0
02/04
03/04
04/04
05/04
06/04
07/04
08/04
09/04
10/04
11/04
12/04
01/05
02/05
03/05
Date


Well 0826 - Terrace East (NECA Yard)
Ground Water Elevation (ft msl)
4935.0
4934.5
4934.0
4933.5
4933.0
4932.5
4932.0
4931.5
4931.0
4930.5
4930.0
02/04
03/04
04/04
05/04
06/04
07/04
08/04
09/04
10/04
11/04
12/04
01/05
02/05
03/05
Date


Well 0827 - Terrace East (Off NW Corner of Disposal Cell)
Ground Water Elevation (ft msl)
4923.0
4922.5
4922.0
4921.5
4921.0
4920.5
4920.0
4919.5
4919.0
4918.5
4918.0
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03/04
04/04
05/04
06/04
07/04
08/04
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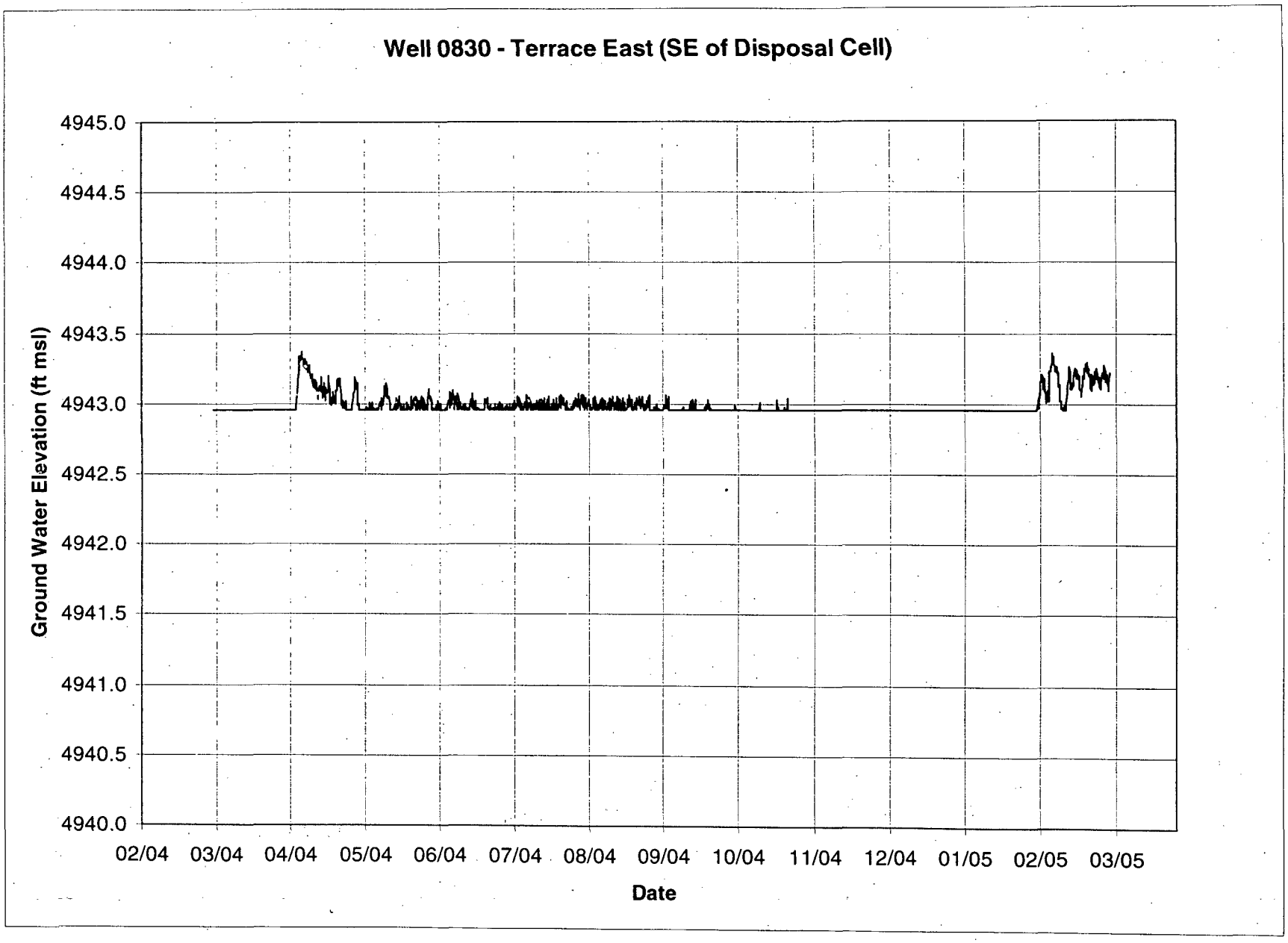
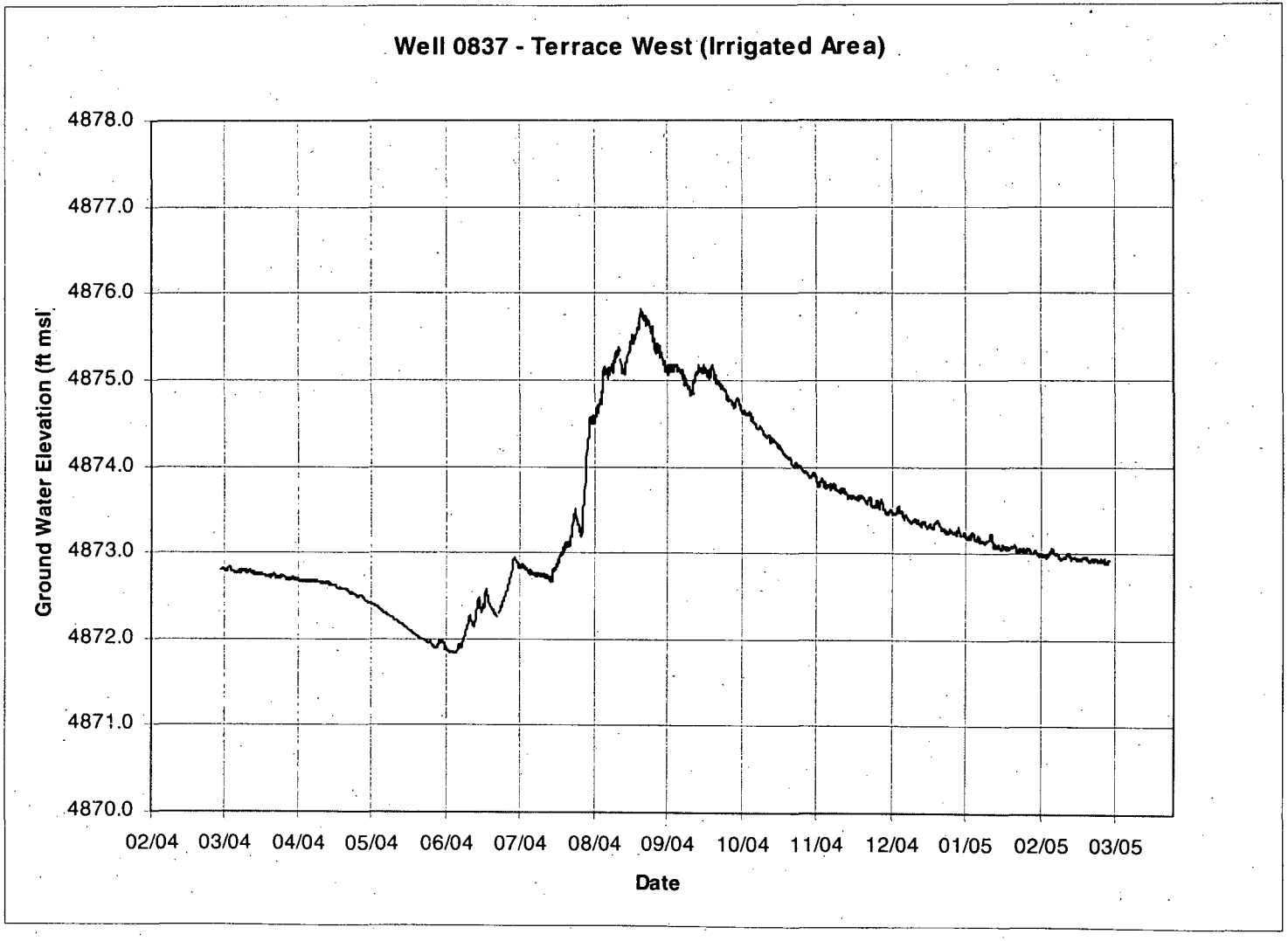
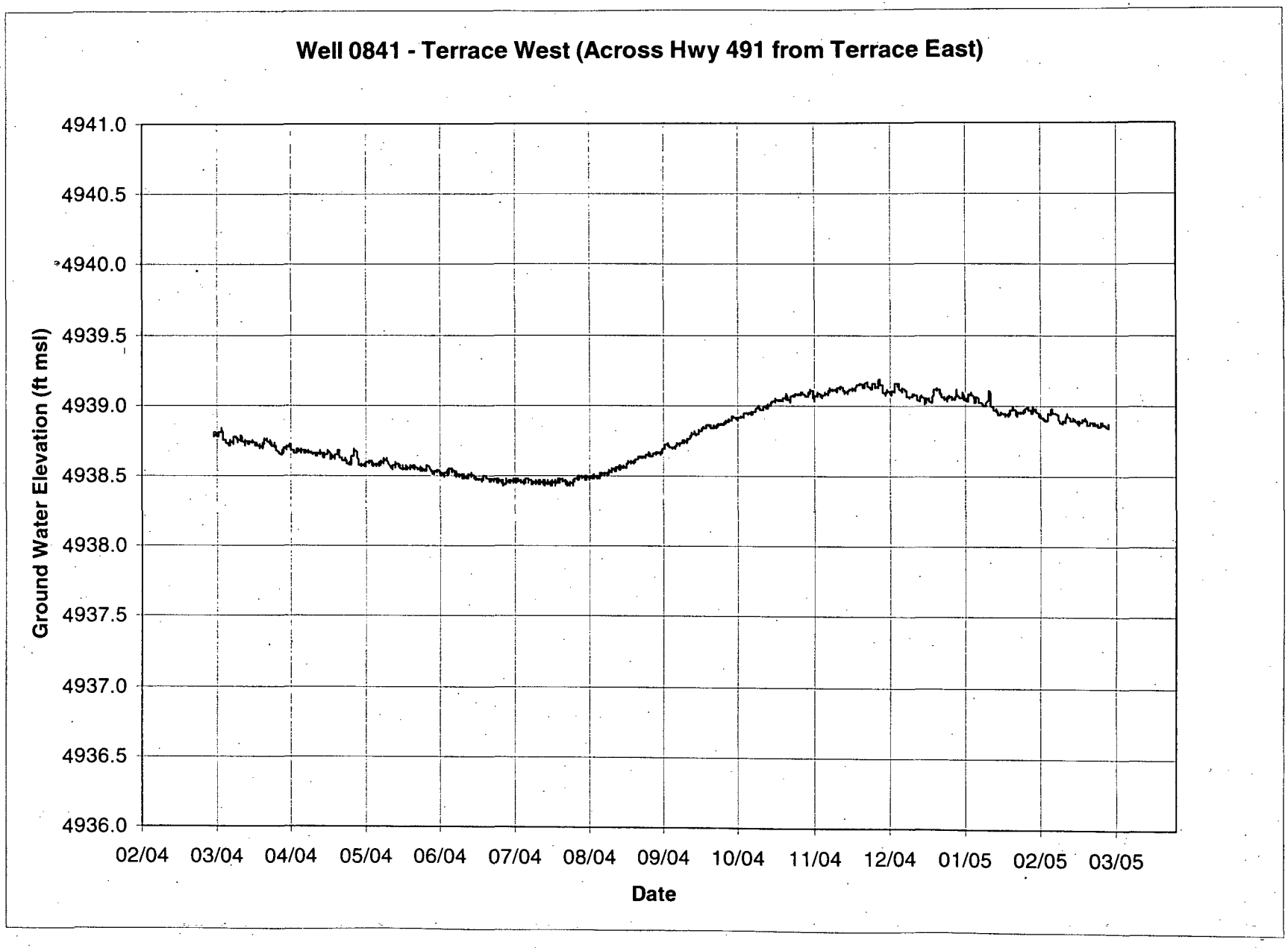
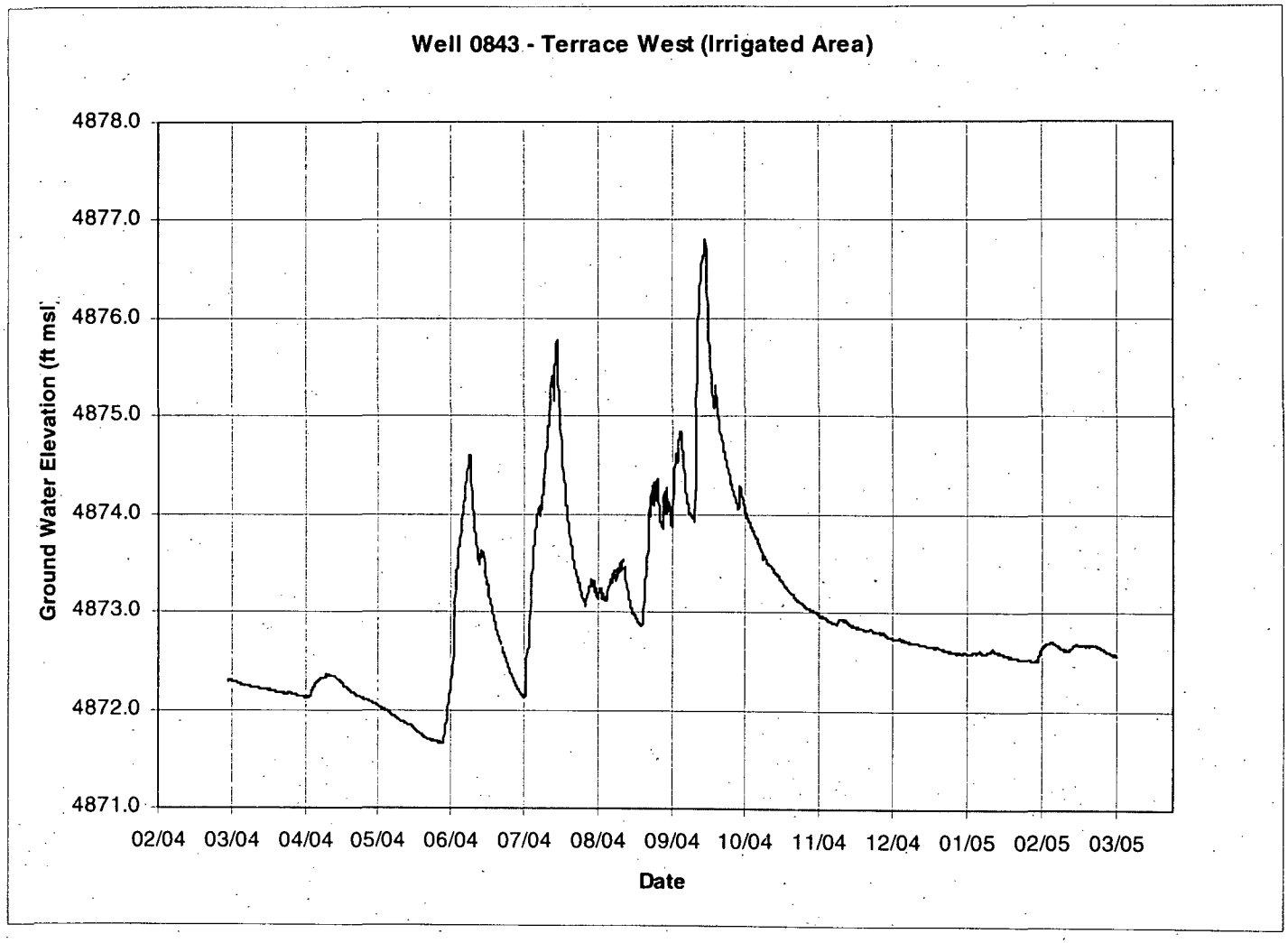
10/04
11/04
12/04
01/05
02/05
03/05
Date

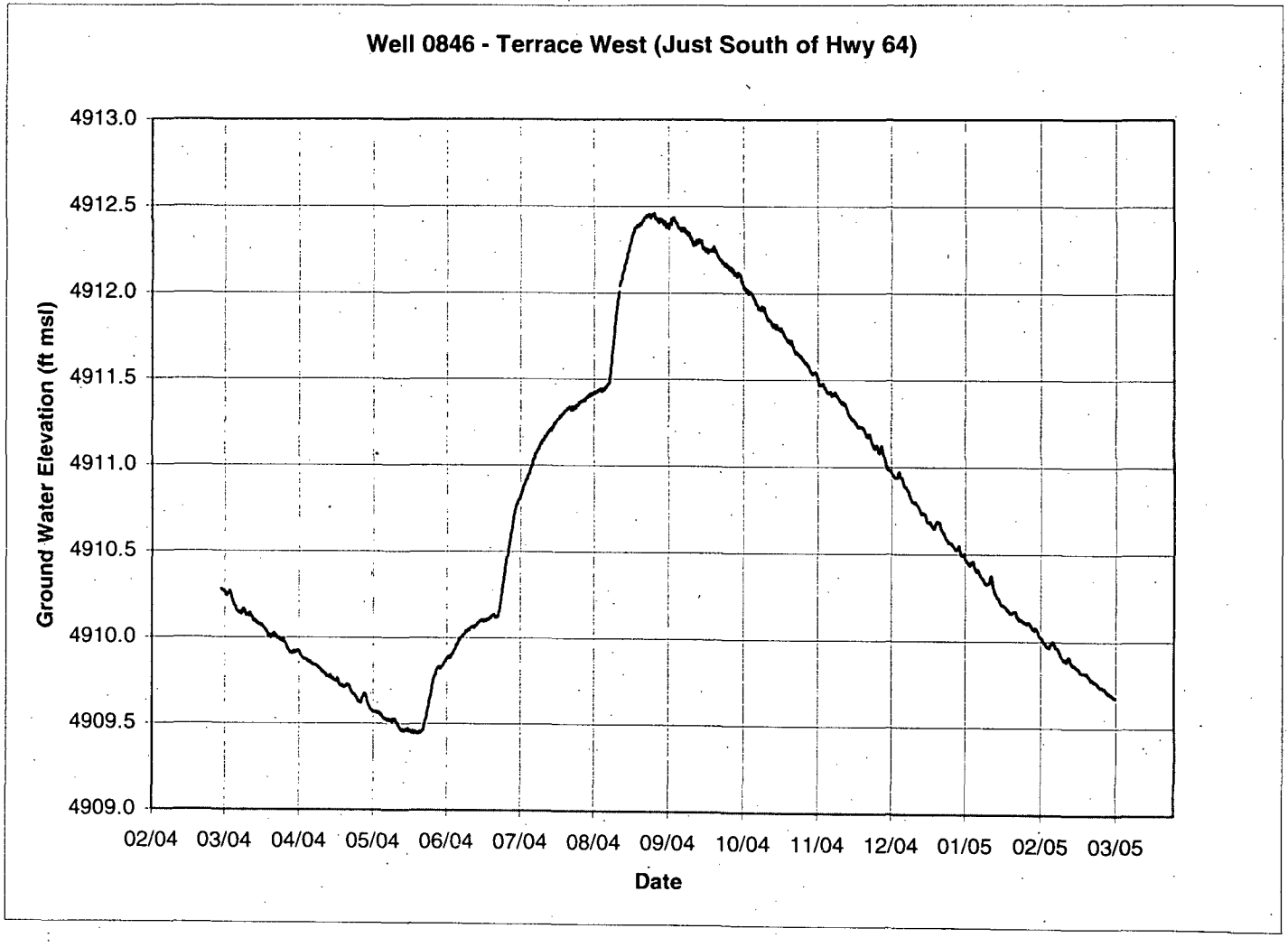

Well 0830 - Terrace East (SE of Disposal Cell)
Ground Water Elevation (ft msl)
4945.0
4944.5
4944.0
4943.5
4943.0
4942.5
4942.0
4941.5
4941.0
4940.5
4940.0
02/04
03/04
04/04
05/04
06/04
07/04
08/04
09/04
10/04
11/04
12/04
01/05
02/05
03/05
Date

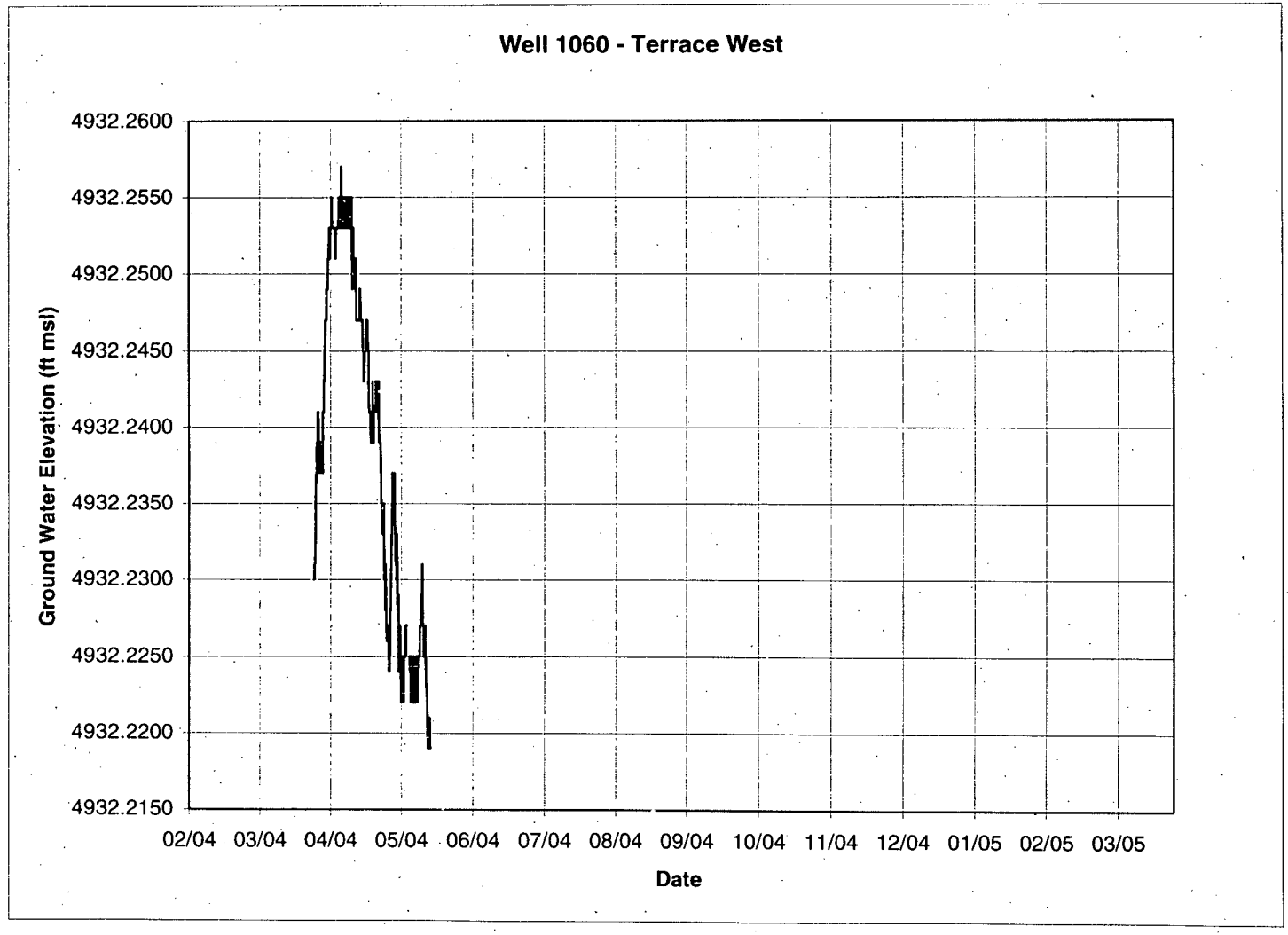
Terrace West Ground-Water Elevation Data
(January 2003 through March 2005)


Well 0837 - Terrace West (Irrigated Area)
Ground Water Elevation (ft msl)
4878.0
4877.0
4876.0
4875.0
4874.0
4873.0
4872.0
4871.0
4870.0
02/04
03/04
04/04
05/04
06/04
07/04
08/04
09/04
10/04
11/04
12/04
01/05
02/05
03/05
Date


Well 0841 - Terrace West (Across Hwy 491 from Terrace East)
Ground Water Elevation (ft msl)
4941.0
4940.5
4940.0
4939.5
4939.0
4938.5
4938.0
4937.5
4937.0
4936.5
4936.0
02/04
03/04
04/04
05/04
06/04
07/04
08/04
09/04
10/04
11/04
12/04
01/05
02/05
03/05
Date


Well 0843 - Terrace West (Irrigated Area)
Ground Water Elevation (ft msl)
4878.0
4877.0
4876.0
4875.0
4874.0
4873.0
4872.0
4871.0
02/04
03/04
04/04
05/04
06/04
07/04
08/04
09/04
10/04
11/04
12/04
01/05
02/05
03/05
Date


Well 0846 - Terrace West (Just South of Hwy 64)
Ground Water Elevation (ft msl)
4913.0
4912.5
4912.0
4911.5
4911.0
4910.5
4910.0
4909.5
4909.0
02/04
03/04
04/04
05/04
06/04
07/04
08/04
09/04
10/04
11/04
12/04
01/05
02/05
03/05
Date


Well 1060 - Terrace West
Ground Water Elevation (ft msl)
4932.2600
4932.2550
4932.2500
4932.2450
4932.2400
4932.2350
4932.2300
4932.2250
4932.2200
4932.2150
02/04
03/04
04/04
05/04
06/04
07/04
08/04
09/04
10/04
11/04
12/04
01/05
02/05
03/05
Date

End of current text

Appendix C

Floodplain and Terrace Ground Water Extraction Well Data (April 2004 through March 2005)

Shiprock Terrace Well Field Pumping Rates

well	date/time	reading cum vol (gal)	added vol prev meter	actual cum vol (gal)	delta vol (gal)	delta t (min)	avg gpm
818	3/30/2004 17:33	301,742	468,955	770,697			
	4/2/2004 10:54	307,118	468,955	776,073	5376	3921	1.37
	4/5/2004 10:57	312,856	468,955	781,811	5738	4323	1.33
	4/9/2004 11:49	318,815	468,955	787,770	5959	5812	1.03
	4/12/2004 11:07	326,608	468,955	795,563	7793	4278	1.82
	4/16/2004 9:27	334,158	468,955	803,113	7550	5660	1.33
	4/19/2004 11:41	340,123	468,955	809,078	5965	4454	1.34
	4/27/2004 9:34	355,454	468,955	824,409	15331	11393	1.35
	4/30/2004 10:38	361,298	468,955	830,253	5844	4384	1.33
	5/3/2004 11:00	367,068	468,955	836,023	5770	4342	1.33
	5/7/2004 11:05	374,821	468,955	843,776	7753	5765	1.34
	5/10/2004 12:09	376,123	468,955	845,078	1302	4384	0.30
	5/14/2004 9:21	388,009	468,955	856,964	11886	5592	2.13
	5/17/2004 10:38	393,924	468,955	862,879	5915	4397	1.35
	5/18/2004 12:40	396,047	468,955	865,002	2123	1562	1.36
	5/21/2004 16:02	402,091	468,955	871,046	6044	4522	1.34
	5/28/2004 10:31	415,085	468,955	884,040	12994	9749	1.33
	6/4/2004 9:02	428,488	468,955	897,443	13403	9991	1.34
	6/7/2004 10:14	434,511	468,955	903,466	6023	4392	1.37
	6/11/2004 10:08	442,289	468,955	911,244	7778	5754	1.35
	6/14/2004 10:40	449,055	468,955	918,010	6766	4352	1.55
	6/18/2004 11:45	455,851	468,955	924,806			
	6/23/2004 9:40	9,028	925,373	934,401	9595	7075	1.36
	6/28/2004 12:45	19,134	925,373	944,507	19701	14460	1.36
	7/2/2004 11:25	26,921	925,373	952,294	7787	5680	1.37
	7/9/2004 14:18	40,989	925,373	966,362	14068	10253	1.37
	7/12/2004 15:34	46,984	925,373	972,357	5995	4396	1.36
	7/16/2004 10:40	53,133	925,373	978,506	6149	5466	1.12
	7/23/2004 11:10	62,415	925,373	987,788	9282	10110	0.92
	7/26/2004 11:09	65,448	925,373	990,821	3033	4319	0.70
	7/30/2004 13:32	70,589	925,373	995,962	5141	5903	0.87
	8/2/2004 15:40	74,479	925,373	999,852	3890	4448	0.87
	8/6/2004 11:47	79,445	925,373	1,004,818	4966	5527	0.90
	8/9/2004 15:17	83,583	925,373	1,008,956	4138	4530	0.91
	8/13/2004 10:05	88,318	925,373	1,013,691	4735	5448	0.87
	8/16/2004 14:05	92,494	925,373	1,017,867	4176	4560	0.92
	8/20/2004 11:15	97,536	925,373	1,022,909	5042	5590	0.90
	8/23/2004 16:09	101,925	925,373	1,027,298	4389	4614	0.95
	8/27/2004 10:55	106,004	925,373	1,031,377	4079	5446	0.75
	8/30/2004 15:56	110,441	925,373	1,035,814	4437	4621	0.96
	9/3/2004 11:42	116,074	925,373	1,041,447	5633	5506	1.02
	9/10/2004 14:57	126,549	925,373	1,051,922	10475	10275	1.02
	9/13/2004 13:27	130,826	925,373	1,056,199	4277	4230	1.01
	9/17/2004 11:30	135,526	925,373	1,060,899	4700	5643	0.83
	9/20/2004 12:07	140,056	925,373	1,065,429	4530	4357	1.04

well	date/time	reading cum vol (gal)	added vol prev meter	actual cum vol (gal)	delta vol (gal)	delta t (min)	avg gpm
818	10/1/2004 11:40	156,462	925,373	1,081,835	16406	15813	1.04
	10/8/2004 10:51	165,966	925,373	1,091,339	9504	10031	0.95
	10/15/2004 11:31	175,664	925,373	1,101,037	9698	10120	0.96
	10/18/2004 11:12	180,668	925,373	1,106,041	5004	4301	1.16
	10/22/2004 11:00	186,664	925,373	1,112,037	5996	5748	1.04
	10/25/2004 11:04	191,235	925,373	1,116,608	4571	4324	1.06
	10/29/2004 11:42	196,985	925,373	1,122,358	5750	5798	0.99
	11/5/2004 15:18	207,507	925,373	1,132,880	10522	10296	1.02
	11/8/2004 10:46	212,042	925,373	1,137,415	4535	4048	1.12
	11/19/2004 11:04	231,643	925,373	1,157,016	19601	15858	1.24
	11/24/2004 14:33	241,778	925,373	1,167,151	10135	7409	1.37
	12/3/2004 12:10	258,471	925,373	1,183,844	16693	12817	1.30
	12/14/2004 8:30	277,487	925,373	1,202,860	19016	15620	1.22
	12/21/2004 12:36	288,540	925,373	1,213,913	11053	10326	1.07
	1/7/2005 14:41	288,541	925,373	1,213,914	1	24605	0.00
	1/10/2005 12:30	288,541	925,373	1,213,914	0	4189	0.00
	1/14/2005 13:30	290,489	925,373	1,215,862	1948	5820	0.33
	1/24/2005 13:05	308,983	925,373	1,234,356	18494	14375	1.29
	1/28/2005 11:03	315,782	925,373	1,241,155	6799	5638	1.21
	1/31/2005 12:48	320,631	925,373	1,246,004	4849	4425	1.10
	2/4/2005 14:02	326,924	925,373	1,252,297	6293	5834	1.08
	2/7/2005 12:46	331,685	925,373	1,257,058	4761	4244	1.12
	2/9/2005 11:57	334,860	925,373	1,260,233	3175	2831	1.12
	2/14/2005 16:00	342,844	925,373	1,268,217	7984	7443	1.07
	2/23/2005 16:19	356,700	925,373	1,282,073	13856	12979	1.07
	2/25/2005 16:25	359,741	925,373	1,285,114	3041	2886	1.05
	2/28/2005 12:01	363,936	925,373	1,289,309	4195	4056	1.03
	3/4/2005 11:37	369,802	925,373	1,295,175	5866	5736	1.02
	3/7/2005 12:05	374,015	925,373	1,299,388	4213	4348	0.97
	3/11/2005 13:26	378,090	925,373	1,303,463	4075	5841	0.70
	3/18/2005 13:35	378,090	925,373	1,303,463	0	10089	0.00
	3/21/2005 12:06	378,090	925,373	1,303,463	0	4231	0.00
	3/25/2005 11:07	384,790	925,373	1,310,163	6700	5701	1.18
	3/28/2005 13:47	389,658	925,373	1,315,031	4868	4480	1.09
	avg						1.07

Shiprock Terrace Well Field Pumping Rates

well	date/time	reading cum vol (gal)	added vol prev meter	actual cum vol (gal)	delta vol (gal)	delta t (min)	avg gpm
1070	3/30/2004 17:33	62,104	184,537	246,641			
	4/2/2004 11:02	63,059	184,537	247,596	955	3929	0.24
	4/5/2004 11:10	63,685	184,537	248,222	626	4328	0.14
	4/9/2004 11:51	64,636	184,537	249,173	951	5801	0.16
	4/12/2004 11:16	65,086	184,537	249,623	450	4285	0.11
	4/16/2004 9:43	65,520	184,537	250,057	434	5667	0.08
	4/19/2004 11:53	65,904	184,537	250,441	384	4450	0.09
	4/27/2004 9:31	66,736	184,537	251,273	832	11378	0.07
	4/30/2004 10:55	67,611	184,537	252,148	875	4404	0.20
	5/3/2004 11:05	67,611	184,537	252,148	0	4330	0.00
	5/7/2004 11:17	67,842	184,537	252,379	231	5772	0.04
	5/10/2004 12:12	68,169	184,537	252,706	327	4375	0.07
	5/14/2004 9:30	68,775	184,537	253,312	606	5598	0.11
	5/17/2004 10:51	68,967	184,537	253,504	192	4401	0.04
	5/18/2004 12:45	68,967	184,537	253,504	0	1554	0.00
	5/21/2004 16:05	69,017	184,537	253,554	50	4520	0.01
	5/28/2004 10:43	69,304	184,537	253,841	287	9758	0.03
	6/4/2004 9:15	69,497	184,537	254,034	193	9992	0.02
	6/7/2004 10:20	69,647	184,537	254,184	150	4385	0.03
	6/11/2004 10:11	69,708	184,537	254,245	61	5751	0.01
	6/14/2004 10:55	69,788	184,537	254,325	80	4364	0.02
	6/18/2004 11:51	69,788	184,537	254,325	0	5816	0.00
	6/23/2004 9:45	69,789	184,537	254,326	1	7074	0.00
	6/28/2004 11:48	71,567	184,537	256,104	1,779	14397	0.12
	7/2/2004 11:27	73,012	184,537	257,549	1,445	5739	0.25
	7/9/2004 14:21	73,901	184,537	258,438	889	10254	0.09
	7/12/2004 15:41	76,671	184,537	261,208	2,770	4400	0.63
	7/16/2004 10:45	2,044	261,208	263,252	2,044	5464	0.37
	7/23/2004 11:10	2,044	261,208	263,252	0	10105	0.00
	7/26/2004 11:09	2,044	261,208	263,252	0	4319	0.00
	7/30/2004 13:34	2,044	261,208	263,252	0	5905	0.00
	8/2/2004 15:48	4,390	261,208	265,598	2,346	4454	0.53
	8/6/2004 11:51	6,091	261,208	267,299	1,701	5523	0.31
	8/9/2004 15:20	6,167	261,208	267,375	76	4529	0.02
	8/13/2004 10:08	6,672	261,208	267,880	505	5448	0.09
	8/16/2004 14:13	7,261	261,208	268,469	589	4565	0.13
	8/20/2004 11:17	550	268,469	269,019	550	5584	0.10
	8/23/2004 16:11	1,000	268,469	269,469	450	4614	0.10
	8/27/2004 10:55	1,465	268,469	269,934	465	5444	0.09
	8/30/2004 15:59	2,757	268,469	271,226	1,292	4624	0.28
	9/3/2004 11:50	4,149	268,469	272,618	1,392	5511	0.25
	9/10/2004 14:59	6,660	268,469	275,129	2,511	10269	0.24
	9/13/2004 13:37	7,696	268,469	276,165	1,036	4238	0.24
	9/17/2004 11:35	9,000	268,469	277,469	1,304	5638	0.23
	9/20/2004 12:11	9,897	268,469	278,366	2,201	9994	0.22
	10/1/2004 11:44	13,843	268,469	282,312	4,843	20169	0.24
	10/8/2004 10:55	16,446	268,469	284,915	2,603	10031	0.26

Shiprock Terrace Well Field Pumping Rates (continued)

well	date/time	reading cum vol (gal)	added vol prev meter	actual cum vol (gal)	delta vol (gal)	delta t (min)	avg gpm
	10/15/2004 11:43	19,174	268,469	287,643	2,728	10128	0.27
	10/18/2004 11:15	20,387	268,469	288,856	1,213	4292	0.28
1070	10/22/2004 11:04	22,004	268,469	290,473	1,617	5749	0.28
	10/25/2004 11:06	1,228	290,473	291,701	1,228	4322	0.28
	10/29/2004 11:46	24,894	268,469	293,363	1,662	5800	0.29
	11/5/2004 15:17	27,889	268,469	296,358	2,995	10291	0.29
	11/8/2004 10:49	29,069	268,469	297,538	1,180	4052	0.29
	11/19/2004 11:07	33,693	268,469	302,162	4,624	15858	0.29
	11/24/2004 14:38	35,873	268,469	304,342	2,180	7411	0.29
	12/3/2004 12:21	39,607	268,469	308,076	3,734	12823	0.29
	12/14/2004 8:50	44,170	268,469	312,639	4,563	15629	0.29
	12/21/2004 12:57	47,129	268,469	315,598	2,959	10327	0.29
	1/7/2005 14:45	54,347	268,469	322,816	7,218	24588	0.29
	1/10/2005 12:35	55,592	268,469	324,061	1,245	4190	0.30
	1/14/2005 13:38	57,299	268,469	325,768	1,707	5823	0.29
	1/24/2005 13:10	61,481	268,469	329,950	4,182	14372	0.29
	1/28/2005 11:10	63,166	268,469	331,635	1,685	5640	0.30
	1/31/2005 12:59	64,421	268,469	332,890	1,255	4429	0.28
	2/4/2005 14:20	66,049	268,469	334,518	1,628	5841	0.28
	2/7/2005 13:00	67,299	268,469	335,768	1,250	4240	0.29
	2/9/2005 12:01	68,157	268,469	336,626	858	2821	0.30
	2/14/2005 16:06	70,276	268,469	338,745	2,119	7445	0.28
	2/23/2005 16:22	73,940	268,469	342,409	3,664	12976	0.28
	2/25/2005 16:27	74,749	268,469	343,218	809	2885	0.28
	2/28/2005 12:11	75,866	268,469	344,335	1,117	4064	0.27
	3/4/2005 11:41	77,458	268,469	345,927	1,592	5730	0.28
	3/7/2005 12:10	78,650	268,469	347,119	1,192	4349	0.27
	3/11/2005 13:31	78,751	268,469	347,220	101	5841	0.02
	3/18/2005 13:50	78,751	268,469	347,220	0	10099	0.00
	3/21/2005 12:08	78,751	268,469	347,220	0	4218	0.00
	3/25/2005 11:10	79,975	268,469	348,444	1,224	5702	0.21
	3/28/2005 13:54	80,971	268,469	349,440	996	4484	0.22
	avg						0.19

Shiprock Terrace Well Field Pumping Rates

well	date/time	reading cum vol (gal)	added vol prev meter	actual cum vol (gal)	delta vol (gal)	delta t (min)	avg gpm
1071	3/30/2004 17:26	12,002	38,072	50,074			
	4/2/2004 10:40	12,134	38,072	50,206	132	3914	0.03
	4/5/2004 10:40	12,278	38,072	50,350	144	4320	0.03
	4/9/2004 11:46	12,480	38,072	50,552	202	5826	0.03
	4/12/2004 10:56	12,620	38,072	50,692	140	4270	0.03
	4/16/2004 9:18	12,807	38,072	50,879	187	5662	0.03
	4/19/2004 11:30	12,950	38,072	51,022	143	4452	0.03
	4/27/2004 9:40	13,316	38,072	51,388	366	11410	0.03
	4/30/2004 10:30	13,444	38,072	51,516	128	4370	0.03
	5/3/2004 10:44	13,577	38,072	51,649	133	4334	0.03
	5/7/2004 10:55	13,747	38,072	51,819	170	5771	0.03
	5/10/2004 12:05	13,876	38,072	51,948	129	4390	0.03
	5/14/2004 9:12	14,022	38,072	52,094	146	5587	0.03
	5/17/2004 10:30	14,141	38,072	52,213	119	4398	0.03
	5/18/2004 12:30	14,184	38,072	52,256	43	1560	0.03
	5/21/2004 15:58	14,305	38,072	52,377	121	4528	0.03
	5/28/2004 10:22	14,554	38,072	52,626	249	9744	0.03
	6/4/2004 8:49	14,811	38,072	52,883	257	9987	0.03
	6/7/2004 10:12	14,931	38,072	53,003	120	4403	0.03
	6/11/2004 11:04	15,082	38,072	53,154	151	5812	0.03
	6/14/2004 10:24	15,182	38,072	53,254	100	4280	0.02
	6/18/2004 11:37	15,330	38,072	53,402	148	5833	0.03
	6/23/2004 9:30	15,491	38,072	53,563	161	7073	0.02
	6/28/2004 12:40	15,656	38,072	53,728	326	14463	0.02
	7/2/2004 11:20	15,772	38,072	53,844	116	5680	0.02
	7/9/2004 14:14	16,036	38,072	54,108	264	10254	0.03
	7/12/2004 15:30	16,176	38,072	54,248	140	4396	0.03
	7/16/2004 10:33	16,310	38,072	54,382	134	5463	0.02
	7/23/2004 11:05	16,373	38,072	54,445	63	10112	0.01
	7/26/2004 11:04	16,374	38,072	54,446	1	4319	0.00
	7/30/2004 13:28	16,381	38,072	54,453	7	5904	0.00
	8/2/2004 15:32	16,449	38,072	54,521	68	4444	0.02
	8/6/2004 11:40	16,533	38,072	54,605	84	5528	0.02
	8/9/2004 15:13	16,579	38,072	54,651	46	4533	0.01
	8/13/2004 10:00	16,612	38,072	54,684	33	5447	0.01
	8/16/2004 13:57	16,648	38,072	54,720	36	4557	0.01
	8/20/2004 11:07	16,720	38,072	54,792	72	5590	0.01
	8/23/2004 16:02	16,731	38,072	54,803	11	4615	0.00
	8/27/2004 10:49	16,810	38,072	54,882	79	5447	0.01
	8/30/2004 15:53	16,810	38,072	54,882	0	4624	0.00
	9/3/2004 11:36	16,810	38,072	54,882	0	5503	0.00
	9/10/2004 14:44	3	54,882	54,885	3	10268	0.00
	9/13/2004 13:18	3	54,882	54,885	0	4234	0.00
	9/17/2004 11:25	7	54,882	54,889	4	5647	0.00
	9/20/2004 12:01	15	54,882	54,897	8	4356	0.00
	10/1/2004 11:33	20	54,882	54,902	5	15812	0.00
	10/8/2004 10:45	23	54,882	54,905	3	10032	0.00

well	date/time	reading cum vol (gal)	added vol prev meter	actual cum vol (gal)	delta vol (gal)	delta t (min)	avg gpm
	10/15/2004 11:23	23	54,882	54,905	0	10118	0.00
	10/18/2004 11:08	27	54,882	54,909	4	4305	0.00
1071	10/22/2004 10:54	38	54,882	54,920	11	5746	0.00
	10/26/2004 13:10	49	54,929	54,978	58	5896	0.01
	10/29/2004 11:38	295	54,803	55,098	120	4228	0.03
	11/5/2004 15:14	694	54,803	55,497	399	10296	0.04
	11/8/2004 10:41	850	54,803	55,653	156	4047	0.04
	11/19/2004 10:58	1,475	54,803	56,278	625	15857	0.04
	11/24/2004 14:27	1,725	54,803	56,528	250	7409	0.03
	12/3/2004 11:57	2,199	54,803	57,002	474	12810	0.04
	12/14/2004 8:00	2,770	54,803	57,573	571	15603	0.04
	12/21/2004 12:26	3,139	54,803	57,942	369	10346	0.04
	1/7/2005 14:37	4,069	54,803	58,872	930	24611	0.04
	1/10/2005 12:25	4,180	54,803	58,983	111	4188	0.03
	1/14/2005 13:21	4,427	54,803	59,230	247	5816	0.04
	1/24/2005 12:56	4,839	54,803	59,642	412	14375	0.03
	1/28/2005 10:55	5,056	54,803	59,859	217	5639	0.04
	1/31/2005 12:39	5,214	54,803	60,017	158	4424	0.04
	2/4/2005 13:46	5,425	54,803	60,228	211	5827	0.04
	2/7/2005 12:30	5,585	54,803	60,388	160	4244	0.04
	2/9/2005 11:50	5,692	54,803	60,495	107	2840	0.04
	2/14/2005 15:54	5,962	54,803	60,765	270	7444	0.04
	2/23/2005 16:15	6,497	54,803	61,300	535	12981	0.04
	2/25/2005 16:22	6,620	54,803	61,423	123	2887	0.04
	2/28/2005 11:50	6,745	54,803	61,548	125	4048	0.03
	3/4/2005 11:34	6,986	54,803	61,789	241	5744	0.04
	3/7/2005 12:00	7,191	54,803	61,994	205	4346	0.05
	3/11/2005 13:20	7,325	54,803	62,128	134	5840	0.02
	3/18/2005 13:27	7,325	54,803	62,128	0	10087	0.00
	3/21/2005 12:03	7,325	54,803	62,128	0	4236	0.00
	3/25/2005 11:04	7,325	54,803	62,128	0	5701	0.00
	3/28/2005 13:41	7,325	54,803	62,128	0	4477	0.00
	avg						0.02

Shiprock Terrace Well Field Pumping Rates'

well	date/time	reading (gpm)reading	added vol prev meter	actual cum vol (gal)	delta vol (gal)	delta t (min)	avg gpm
1078	3/30/2004 17:20	159,626	264,000	423,626			
	4/2/2004 10:24	162,375	264,000	426,375	2,749	3904	0.70
	4/5/2004 10:25	165,318	264,000	429,318	2,943	4321	0.68
	4/9/2004 11:41	169,427	264,000	433,427	4,109	5836	0.70
	4/12/2004 10:50	172,381	264,000	436,381	2,954	4269	0.69
	4/16/2004 9:11	176,234	264,000	440,234	3,853	5661	0.68
	4/19/2004 11:22	179,262	264,000	443,262	3,028	4451	0.68
	4/27/2004 9:45	186,935	264,000	450,935	7,673	11423	0.67
	4/30/2004 10:20	189,711	264,000	453,711	2,776	4355	0.64
	5/3/2004 10:36	192,085	264,000	456,085	2,374	4336	0.55
	5/7/2004 10:45	195,482	264,000	459,482	3,397	5769	0.59
	5/10/2004 12:02	198,010	264,000	462,010	2,528	4397	0.57
	5/14/2004 9:00	202,104	264,000	466,104	4,094	5578	0.73
	5/17/2004 10:18	205,039	264,000	469,039	2,935	4398	0.67
	5/18/2004 12:17	206,102	264,000	470,102	1,063	1559	0.68
	5/21/2004 15:55	209,011	264,000	473,011	2,909	4538	0.64
	5/28/2004 10:10	215,145	264,000	479,145	6,134	9735	0.63
	6/4/2004 8:38	220,644	264,000	484,644	5,499	9988	0.55
	6/7/2004 10:07	223,311	264,000	487,311	2,667	4409	0.60
	6/11/2004 9:58	226,350	264,000	490,350	3,039	5751	0.53
	6/14/2004 10:15	228,343	264,000	492,343	1,993	4337	0.46
	6/18/2004 11:30	231,437	264,000	495,437	3,094	5835	0.53
	6/23/2004 9:18	234,595	264,000	498,595	3,158	7068	0.45
	6/28/2004 12:31	237,813	264,000	501,813	6,376	14461	0.44
	7/2/2004 11:11	240,380	264,000	504,380	2,567	5680	0.45
	7/9/2004 14:08	245,517	264,000	509,517	5,137	10257	0.50
	7/12/2004 15:22	247,917	264,000	511,917	2,400	4394	0.55
	7/16/2004 10:15	251,115	264,000	515,115	3,198	5453	0.59
	7/23/2004 10:56	255,847	264,000	519,847	4,732	10121	0.47
	7/26/2004 10:55	257,554	264,000	521,554	1,707	4319	0.40
	7/30/2004 13:19	2,341	522,126	524,467	2,913	5904	0.49
	8/2/2004 15:26	4,598	522,126	526,724	2,257	4447	0.51
	8/6/2004 11:31	7,530	522,126	529,656	2,932	5525	0.53
	8/9/2004 15:04	9,962	522,126	532,088	2,432	4533	0.54
	8/13/2004 9:51	12,715	522,126	534,841	2,753	5447	0.51
	8/16/2004 13:45	15,136	522,126	537,262	2,421	4554	0.53
	8/20/2004 10:59	18,029	522,126	540,155	2,893	5594	0.52
	8/23/2004 15:54	20,488	522,126	542,614	2,459	4615	0.53
	8/27/2004 10:40	23,135	522,126	545,261	2,647	5446	0.49
	8/30/2004 15:34	24,958	522,126	547,084	1,823	4614	0.40
	9/3/2004 11:27	27,160	522,126	549,286	2,202	5513	0.40
	9/10/2004 14:44	31,902	522,126	554,028	4,742	10277	0.46
	9/13/2004 13:09	33,644	522,126	555,770	1,742	4225	0.41
	9/17/2004 11:14	35,105	522,126	557,231	1,461	5645	0.26
	9/20/2004 11:52	36,108	522,126	558,234	1,003	4358	0.23
	10/1/2004 11:25	42,375	522,126	564,501	6,267	15813	0.40
	10/8/2004 10:35	45,617	522,126	567,743	3,242	10030	0.32

well	date/time	reading (gpm)reading	added vol prev meter	actual cum vol (gal)	delta vol (gal)	delta t (min)	avg gpm
	10/15/2004 11:10	47,853	522,126	569,979	2,236	10115	0.22
	10/18/2004 10:59	49,005	522,126	571,131	1,152	4309	0.27
1078	10/22/2004 10:46	49,639	522,126	571,765	634	5747	0.11
	10/25/2004 10:50	49,893	522,126	572,019	254	4324	0.06
	10/29/2004 11:30	50,393	522,126	572,519	500	5800	0.09
	11/5/2004 15:07	50,687	522,126	572,813	294	10297	0.03
	11/8/2004 10:34	51,070	522,126	573,196	383	4047	0.09
	11/19/2004 10:50	51,071	522,126	573,197	1	15856	0.00
	11/24/2004 14:19	51,072	522,126	573,198	1	7409	0.00
	12/3/2004 11:46	51,072	522,126	573,198	0	12807	0.00
	12/14/2004 7:50	51,421	522,126	573,547	349	15604	0.02
	12/21/2004 11:50	61,805	522,126	583,931	10,384	10320	1.01
	1/7/2005 14:31	61,839	522,126	583,965	34	24641	0.00
	1/10/2005 12:15	61,839	522,126	583,965	0	4184	0.00
	1/14/2005 13:10	62,850	522,126	584,976	1,011	5815	0.17
	1/24/2005 12:47	72,662	522,126	594,788	9,812	14377	0.68
	1/28/2005 10:45	74,250	522,126	596,376	1,588	5638	0.28
	1/31/2005 12:28	75,445	522,126	597,571	1,195	4423	0.27
	2/4/2005 13:33	76,601	522,126	598,727	1,156	5825	0.20
	2/7/2005 12:15	77,577	522,126	599,703	976	4242	0.23
	2/9/2005 11:40	77,586	522,126	599,712	9	2845	0.00
	2/14/2005 15:45	78,972	522,126	601,098	1,386	7445	0.19
	2/23/2005 16:12	87,321	522,126	609,447	8,349	12987	0.64
	2/25/2005 16:14	89,200	522,126	611,326	1,879	2882	0.65
	2/28/2005 11:43	91,774	522,126	613,900	2,574	4049	0.64
	3/4/2005 11:29	95,502	522,126	617,628	3,728	5746	0.65
	3/7/2005 11:55	96,645	522,126	618,771	1,143	4346	0.26
	3/11/2005 13:12	97,732	522,126	619,858	1,087	5837	0.19
	3/18/2005 13:15	97,777	522,126	619,903	45	10083	0.00
	3/21/2005 11:59	97,777	522,126	619,903	0	4244	0.00
	3/25/2005 10:55	97,777	522,126	619,903	0	5696	0.00
	3/28/2005 13:34	97,777	522,126	619,903	0	4479	0.00
	avg						0.40

Shiprock Terrace Well Field Pumping Rates

well	date/time	reading cum vol (gal)	added vol prev meter	actual cum vol (gal)	delta vol (gal)	delta t (min)	avg gpm
1091	3/30/2004 17:51	14,217	43,250	57,467			
	4/2/2004 9:10	14,624	43,250	57,874	407	3799	0.11
	4/5/2004 8:50	15,056	43,250	58,306	432	4300	0.10
	4/9/2004 11:05	15,678	43,250	58,928	622	5895	0.11
	4/12/2004 9:34	16,087	43,250	59,337	409	4229	0.10
	4/16/2004 8:26	16,629	43,250	59,879	542	5692	0.10
	4/19/2004 9:57	17,050	43,250	60,300	421	4411	0.10
	4/27/2004 10:23	18,109	43,250	61,359	1,059	11546	0.09
	4/30/2004 8:40	18,550	43,250	61,800	441	4217	0.10
	5/3/2004 8:44	18,931	43,250	62,181	381	4324	0.09
	5/7/2004 9:40	19,467	43,250	62,717	536	5816	0.09
	5/10/2004 11:27	19,891	43,250	63,141	424	4427	0.10
	5/14/2004 7:35	20,447	43,250	63,697	556	5528	0.10
	5/17/2004 8:38	20,918	43,250	64,168	471	4383	0.11
	5/18/2004 10:32	21,051	43,250	64,301	133	1554	0.09
	5/21/2004 15:19	21,468	43,250	64,718	417	4607	0.09
	5/28/2004 9:05	22,373	43,250	65,623	905	9706	0.09
	6/4/2004 7:35	23,235	43,250	66,485	862	9990	0.09
	6/7/2004 9:27	23,625	43,250	66,875	390	4432	0.09
	6/11/2004 9:40	24,094	43,250	67,344	469	5773	0.08
	6/14/2004 8:41	24,447	43,250	67,697	353	4261	0.08
	6/18/2004 10:17	24,943	43,250	68,193	496	5856	0.08
	6/23/2004 11:25	25,570	43,250	68,820	627	7268	0.09
	6/28/2004 10:35	26,145	43,250	69,395	1,202	14418	0.08
	7/2/2004 10:16	26,623	43,250	69,873	478	5741	0.08
	7/9/2004 13:27	27,552	43,250	70,802	929	10271	0.09
	7/12/2004 14:14	27,934	43,250	71,184	382	4367	0.09
	7/16/2004 9:18	28,302	43,250	71,552	368	5464	0.07
	7/23/2004 9:55	29,664	43,250	72,914	1,362	10117	0.13
	7/26/2004 9:47	29,905	43,250	73,155	241	4312	0.06
	7/30/2004 12:32	30,290	43,250	73,540	385	5925	0.06
	8/2/2004 14:35	30,549	43,250	73,799	259	4443	0.06
	8/6/2004 10:46	30,846	43,250	74,096	297	5531	0.05
	8/9/2004 14:11	31,095	43,250	74,345	249	4525	0.06
	8/13/2004 8:56	31,403	43,250	74,653	308	5445	0.06
	8/16/2004 10:45	31,648	43,250	74,898	245	4429	0.06
	8/20/2004 10:04	31,968	43,250	75,218	320	5719	0.06
	8/23/2004 14:58	32,226	43,250	75,476	258	4614	0.06
	8/27/2004 9:44	32,607	43,250	75,857	381	5446	0.07
	8/30/2004 14:39	32,974	43,250	76,224	367	4615	0.08
	9/3/2004 10:12	33,444	43,250	76,694	470	5493	0.09
	9/10/2004 13:51	34,244	43,250	77,494	800	10299	0.08
	9/13/2004 11:24	34,598	43,250	77,848	354	4173	0.08
	9/17/2004 10:21	34,973	43,250	78,223	375	5697	0.07
	9/20/2004 10:55	35,326	43,250	78,576	353	4354	0.08
	10/1/2004 10:22	36,458	43,250	79,708	1,132	15807	0.07
	10/8/2004 9:27	37,142	43,250	80,392	684	10025	0.07

well	date/time	reading cum vol (gal)	added vol prev meter	actual cum vol (gal)	delta vol (gal)	delta t (min)	avg gpm
	10/15/2004 9:18	37,920	43,250	81,170	778	10071	0.08
	10/18/2004 9:56	38,256	43,250	81,506	336	4358	0.08
1091	10/22/2004 9:36	38,658	43,250	81,908	402	5740	0.07
	10/25/2004 9:48	38,945	43,250	82,195	287	4332	0.07
	10/29/2004 10:32	39,334	43,250	82,584	389	5804	0.07
	11/5/2004 14:11	39,971	43,250	83,221	637	10299	0.06
	11/8/2004 9:35	40,247	43,250	83,497	276	4044	0.07
	11/19/2004 9:49	41,466	43,250	84,716	1,219	15854	0.08
	11/24/2004 11:26	41,954	43,250	85,204	488	7297	0.07
	12/3/2004 9:57	850	85,205	86,055	851	12871	0.07
	12/14/2004 10:22	973	85,205	86,178	123	15865	0.01
	12/21/2004 13:27	1,634	85,205	86,839	661	10265	0.06
	1/7/2005 13:05	3,307	85,205	88,512	1,673	24458	0.07
	1/10/2005 11:35	3,609	85,205	88,814	302	4230	0.07
	1/14/2005 11:20	4,038	85,205	89,243	429	5745	0.07
	1/24/2005 11:20	1,160	89,100	90,260	1,017	14400	0.07
	1/28/2005 9:32	1,674	89,100	90,774	514	5652	0.09
	1/31/2005 11:34	333	90,774	91,107	333	4442	0.07
	2/4/2005 11:41	671	90,774	91,445	338	5767	0.06
	2/7/2005 10:43	357	91,445	91,802	357	4262	0.08
	2/9/2005 10:14	164	91,802	91,966	164	2851	0.06
	2/14/2005 14:37	518	91,802	92,320	354	7463	0.05
	2/23/2005 16:50	658	92,612	93,270	950	13093	0.07
	2/25/2005 15:30	199	93,270	93,469	199	2800	0.07
	2/28/2005 10:33	500	93,270	93,770	301	4023	0.07
	3/4/2005 10:23	900	93,270	94,170	400	5750	0.07
	3/7/2005 10:50	1,200	93,270	94,470	300	4347	0.07
	3/11/2005 11:34	179	94,700	94,879	409	5804	0.07
	3/18/2005 11:36	899	94,700	95,599	720	10082	0.07
	3/21/2005 11:16	1,186	94,700	95,886	287	4300	0.07
	3/25/2005 10:01	1,592	94,700	96,292	406	5685	0.07
	3/28/2005 10:50	1,859	94,700	96,559	267	4369	0.06
	avg						0.08

Shiprock Terrace Well Field Pumping Rates

well	date/time	reading cum vol (gal)	added vol prev meter	actual cum vol (gal)	delta vol (gal)	delta t (min)	avg gpm
1092	3/30/2004 17:53	26,544	19,600	46,144			
	4/2/2004 9:17	27,038	19,600	46,638	494	3804	0.13
	4/5/2004 8:39	27,538	19,600	47,138	500	4282	0.12
	4/9/2004 11:03	28,213	19,600	47,813	675	5904	0.11
	4/12/2004 9:50	28,689	19,600	48,289	476	4247	0.11
	4/16/2004 7:36	29,335	19,600	48,935	646	5626	0.11
	4/19/2004 9:30	29,837	19,600	49,437	502	4434	0.11
	4/27/2004 10:26	31,090	19,600	50,690	1,253	11576	0.11
	4/30/2004 8:45	31,550	19,600	51,150	460	4219	0.11
	5/3/2004 8:57	32,079	19,600	51,679	529	4332	0.12
	5/7/2004 9:35	32,721	19,600	52,321	642	5798	0.11
	5/10/2004 11:25	33,084	19,600	52,684	363	4430	0.08
	5/14/2004 7:20	33,506	19,600	53,106	422	5515	0.08
	5/17/2004 8:30	33,839	19,600	53,439	333	4390	0.08
	5/18/2004 10:37	33,942	19,600	53,542	103	1567	0.07
	5/21/2004 15:17	34,301	19,600	53,901	359	4600	0.08
	5/28/2004 8:30	35,030	19,600	54,630	729	9673	0.08
	6/4/2004 7:01	35,746	19,600	55,346	716	9991	0.07
	6/7/2004 9:27	36,081	19,600	55,681	335	4466	0.08
	6/11/2004 9:37	36,497	19,600	56,097	416	5770	0.07
	6/14/2004 9:10	36,803	19,600	56,403	306	4293	0.07
	6/18/2004 10:21	37,214	19,600	56,814	411	5831	0.07
	6/23/2004 11:30	37,728	19,600	57,328	514	7269	0.07
	6/28/2004 10:37	38,189	19,600	57,789	975	14416	0.07
	7/2/2004 10:17	38,600	19,600	58,200	411	5740	0.07
	7/9/2004 13:26	38,227	19,600	57,827	499	23156	0.02
	7/12/2004 14:30	38,368	19,600	57,968	141	4384	0.03
	7/16/2004 9:20	38,531	19,600	58,131	163	5450	0.03
	7/23/2004 9:58	39,046	19,600	58,646	515	10118	0.05
	7/26/2004 9:50	39,098	19,600	58,698	52	4312	0.01
	7/30/2004 12:28	39,098	19,600	58,698	0	5918	0.00
	8/2/2004 14:47	39,917	19,600	59,517	819	4459	0.18
	8/6/2004 10:48	40,890	19,600	60,490	973	5521	0.18
	8/9/2004 14:13	41,675	19,600	61,275	785	4525	0.17
	8/13/2004 8:58	42,636	19,600	62,236	961	5445	0.18
	8/16/2004 10:40	43,405	19,600	63,005	769	4422	0.17
	8/20/2004 10:06	44,382	19,600	63,982	977	5726	0.17
	8/23/2004 15:00	45,170	19,600	64,770	788	4614	0.17
	8/27/2004 9:46	46,081	19,600	65,681	911	5446	0.17
	8/30/2004 14:41	46,832	19,600	66,432	751	4615	0.16
	9/3/2004 10:30	47,755	19,600	67,355	923	5509	0.17
	9/10/2004 13:53	49,429	19,600	69,029	1,674	10283	0.16
	9/13/2004 11:44	50,122	19,600	69,722	693	4191	0.17
	9/17/2004 10:23	50,923	19,600	70,523	801	5679	0.14
	9/20/2004 10:50	51,661	19,600	71,261	738	4347	0.17
	10/1/2004 10:26	54,223	19,600	73,823	2,562	15816	0.16
	10/8/2004 9:45	55,837	19,600	75,437	1,614	10039	0.16

well	date/time	reading cum vol (gal)	added vol prev meter	actual cum vol (gal)	delta vol (gal)	delta t (min)	avg gpm
1092	10/15/2004 9:57	57,488	19,600	77,088	1,651	10092	0.16
	10/18/2004 9:58	58,189	19,600	77,789	701	4321	0.16
	10/22/2004 9:38	59,095	19,600	78,695	906	5740	0.16
	10/25/2004 9:50	59,754	19,600	79,354	659	4332	0.15
	10/29/2004 10:35	60,665	19,600	80,265	911	5805	0.16
	11/5/2004 14:13	62,252	19,600	81,852	1,587	10298	0.15
	11/8/2004 9:38	62,895	19,600	82,495	643	4045	0.16
	11/19/2004 9:51	65,376	19,600	84,976	2,481	15853	0.16
	11/24/2004 11:04	1,379	84,750	86,129	1,153	7273	0.16
	12/3/2004 10:10	2,344	84,750	87,094	965	12906	0.07
	12/14/2004 10:27	2,877	84,750	87,627	533	15857	0.03
	12/21/2004 13:28	4,806	84,750	89,556	1,929	10261	0.19
	1/7/2005 13:11	8,632	84,750	93,382	3,826	24463	0.16
	1/10/2005 11:30	9,300	84,750	94,050	668	4219	0.16
	1/14/2005 11:50	212	94,750	94,962	912	5780	0.16
	1/24/2005 11:26	2,930	94,750	97,680	2,718	14376	0.19
	1/28/2005 9:54	4,007	94,750	98,757	1,077	5668	0.19
	1/31/2005 11:55	4,817	94,750	99,567	810	4441	0.18
	2/4/2005 12:08	5,809	94,750	100,559	992	5773	0.17
	2/7/2005 11:13	6,642	94,750	101,392	833	4265	0.20
	2/9/2005 10:16	7,133	94,750	101,883	491	2823	0.17
	2/14/2005 14:40	8,456	94,750	103,206	1,323	7464	0.18
	2/23/2005 16:48	10,692	94,750	105,442	2,236	13088	0.17
	2/25/2005 15:32	11,159	94,750	105,909	467	2804	0.17
	2/28/2005 10:40	11,840	94,750	106,590	681	4028	0.17
	3/4/2005 10:21	12,756	94,750	107,506	916	5741	0.16
	3/7/2005 11:08	13,493	94,750	108,243	737	4367	0.17
	3/11/2005 11:52	14,448	94,750	109,198	955	5804	0.16
	3/18/2005 11:41	16,188	94,750	110,938	1,740	10069	0.17
	3/21/2005 11:14	16,926	94,750	111,676	738	4293	0.17
	3/25/2005 10:04	17,877	94,750	112,627	951	5690	0.17
	3/28/2005 11:04	18,573	94,750	113,323	696	4380	0.16
	avg						0.13

Shiprock Terrace Well Field Pumping Rates

well	date/time	reading cum vol (gal)	added vol prev meter	actual cum vol (gal)	delta vol (gal)	delta t (min)	avg gpm
1093	3/30/2004 17:49	51,225	21,366	72,591			
	4/2/2004 9:04	52,204	21,366	73,570	979	3795	0.26
	4/5/2004 9:00	53,290	21,366	74,656	1,086	4316	0.25
	4/9/2004 11:06	54,727	21,366	76,093	1,437	5886	0.24
	4/12/2004 9:38	55,751	21,366	77,117	1,024	4232	0.24
	4/16/2004 7:50	57,132	21,366	78,498	1,381	5652	0.24
	4/19/2004 9:45	58,199	21,366	79,565	1,067	4435	0.24
	4/27/2004 10:18	60,907	21,366	82,273	2,708	11553	0.23
	4/30/2004 8:55	61,971	21,366	83,337	1,064	4237	0.25
	5/3/2004 9:11	62,957	21,366	84,323	986	4336	0.23
	5/7/2004 9:30	64,267	21,366	85,633	1,310	5779	0.23
	5/10/2004 11:29	65,290	21,366	86,656	1,023	4439	0.23
	5/14/2004 7:45	66,587	21,366	87,953	1,297	5536	0.23
	5/17/2004 9:05	67,585	21,366	88,951	998	4400	0.23
	5/18/2004 10:25	67,903	21,366	89,269	318	1520	0.21
	5/21/2004 15:21	68,917	21,366	90,283	1,014	4616	0.22
	5/28/2004 8:41	71,065	21,366	92,431	2,148	9680	0.22
	6/4/2004 7:16	73,224	21,366	94,590	2,159	9995	0.22
	6/7/2004 9:30	74,186	21,366	95,552	962	4454	0.22
	6/11/2004 9:43	75,436	21,366	96,802	1,250	5773	0.22
	6/14/2004 8:52	76,341	21,366	97,707	905	4269	0.21
	6/18/2004 10:14	77,546	21,366	98,912	1,205	5842	0.21
	6/23/2004 11:15	79,038	21,366	100,404	1,492	7261	0.21
	6/28/2004 10:34	80,382	21,366	101,748	2,836	14420	0.20
	7/2/2004 10:15	81,484	21,366	102,850	1,102	5741	0.19
	7/9/2004 13:31	83,520	21,366	104,886	2,036	10276	0.20
	7/12/2004 14:18	84,372	21,366	105,738	852	4367	0.20
	7/16/2004 9:16	85,248	21,366	106,614	876	5458	0.16
	7/23/2004 9:52	87,249	21,366	108,615	2,001	10116	0.20
	7/26/2004 9:46	88,070	21,366	109,436	821	4314	0.19
	7/30/2004 12:25	89,230	21,366	110,596	1,160	5919	0.20
	8/2/2004 14:43	90,096	21,366	111,462	866	4458	0.19
	8/6/2004 10:44	91,146	21,366	112,512	1,050	5521	0.19
	8/9/2004 14:09	92,005	21,366	113,371	859	4525	0.19
	8/13/2004 8:54	93,048	21,366	114,414	1,043	5445	0.19
	8/16/2004 10:35	93,896	21,366	115,262	848	4421	0.19
	8/20/2004 10:03	94,977	21,366	116,343	1,081	5728	0.19
	8/23/2004 14:56	95,854	21,366	117,220	877	4613	0.19
	8/27/2004 9:42	96,876	21,366	118,242	1,022	5446	0.19
	8/30/2004 14:37	97,719	21,366	119,085	843	4615	0.18
	9/3/2004 10:25	98,735	21,366	120,101	1,016	5508	0.18
	9/10/2004 13:49	100,580	21,366	121,946	1,845	10284	0.18
	9/13/2004 11:37	101,330	21,366	122,696	750	4188	0.18
	9/17/2004 10:19	102,203	21,366	123,569	873	5682	0.15
	9/20/2004 10:53	103,005	21,366	124,371	802	4354	0.18
	10/1/2004 10:19	105,760	21,366	127,126	2,755	15806	0.17
	10/8/2004 9:34	107,483	21,366	128,849	1,723	10035	0.17

Shiprock Terrace Well Field Pumping Rates (continued)

well	date/time	reading cum vol (gal)	added vol prev meter	actual cum vol (gal)	delta vol (gal)	delta t (min)	avg gpm
1093	10/15/2004 9:31	109,259	21,366	130,625	1,776	10077	0.18
	10/18/2004 9:54	110,019	21,366	131,385	760	4343	0.17
	10/22/2004 9:35	111,013	21,366	132,379	994	5741	0.17
	10/25/2004 9:45	111,740	21,366	133,106	727	4330	0.17
	10/29/2004 10:29	112,716	21,366	134,082	976	5804	0.17
	11/5/2004 14:09	114,404	21,366	135,770	1,688	10300	0.16
	11/8/2004 9:33	115,051	21,366	136,417	647	4044	0.16
	11/19/2004 9:47	117,595	21,366	138,961	2,544	15854	0.16
	11/24/2004 12:01	118,797	21,366	140,163	1,202	7334	0.16
	12/3/2004 10:22	120,805	21,366	142,171	2,008	12861	0.16
	12/14/2004 10:18	123,190	21,366	144,556	2,385	15836	0.15
	12/21/2004 13:24	124,724	21,366	146,090	1,534	10266	0.15
	1/7/2005 13:20	3,823	146,090	149,913	3,823	24476	0.16
	1/10/2005 11:40	4,477	146,090	150,567	654	4220	0.15
	1/14/2005 11:33	5,398	146,090	151,488	921	5753	0.16
	1/24/2005 11:33	7,527	146,090	153,617	2,129	14400	0.15
	1/28/2005 9:46	8,411	146,090	154,501	884	5653	0.16
	1/31/2005 11:41	9,099	146,090	155,189	688	4435	0.16
	2/4/2005 11:48	9,915	146,090	156,005	816	5767	0.14
	2/7/2005 10:55	10592	146,090	156,682	677	4267	0.16
	2/9/2005 10:12	11014	146,090	157,104	422	2837	0.15
	2/14/2005 14:34	12092	146,090	158,182	1,078	7462	0.14
	2/23/2005 16:52	13,942	146,090	160,032	1,850	13098	0.14
	2/25/2005 15:25	14,325	146,090	160,415	383	2793	0.14
	2/28/2005 10:46	14,885	146,090	160,975	560	4041	0.14
	3/4/2005 10:25	15,634	146,090	161,724	749	5739	0.13
	3/7/2005 10:54	16,236	146,090	162,326	602	4349	0.14
	3/11/2005 11:46	17,018	146,090	163,108	782	5812	0.13
	3/18/2005 11:46	18,427	146,090	164,517	1,409	10080	0.14
	3/21/2005 11:17	19,052	146,090	165,142	625	4291	0.15
	3/25/2005 10:00	19,858	146,090	165,948	806	5683	0.14
	3/28/2005 11:00	20,446	146,090	166,536	588	4380	0.13
	avg						0.18

Shiprock Terrace Well Field Pumping Rates

well	date/time	reading cum vol (gal)	added vol prev meter	actual cum vol (gal)	delta vol (gal)	delta t (min)	avg gpm
1094	3/30/2004 17:47			10,819			
	4/2/2004 8:58			10,885	66	3791	0.02
	4/5/2004 9:20			10,966	81	4342	0.02
	4/9/2004 11:08			11,063	97	5868	0.02
	4/12/2004 9:43			11,133	70	4235	0.02
	4/16/2004 8:10			11,230	97	5667	0.02
	4/19/2004 10:15			11,297	67	4445	0.02
	4/27/2004 10:10			11,480	183	11515	0.02
	4/30/2004 9:08			11,549	69	4258	0.02
	5/3/2004 9:24			11,618	69	4336	0.02
	5/7/2004 9:26			11,702	84	5762	0.01
	5/10/2004 11:31			11,772	70	4445	0.02
	5/14/2004 7:55			11,854	82	5544	0.01
	5/17/2004 8:50			11,924	70	4375	0.02
	5/18/2004 10:17			11,943	19	1527	0.01
	5/21/2004 15:23			12,008	65	4626	0.01
	5/28/2004 8:49			12,149	141	9686	0.01
	6/4/2004 7:22			12,290	141	9993	0.01
	6/7/2004 9:30			12,354	64	4448	0.01
	6/11/2004 9:46			12,431	77	5776	0.01
	6/14/2004 9:00			12,489	58	4274	0.01
	6/18/2004 10:09			12,566	77	5829	0.01
	6/23/2004 11:07			12,664	98	7258	0.01
	6/28/2004 10:33			12,753	187	14424	0.01
	7/2/2004 10:14			12,823	70	5741	0.01
	7/9/2004 13:33			12,950	127	10279	0.01
	7/12/2004 14:24			13,001	51	4371	0.01
	7/16/2004 9:25			13,001	0	5461	0.00
	7/23/2004 9:51	67	13,001	13,068	67	10106	0.01
	7/26/2004 9:44	74	13,001	13,075	7	4313	0.00
	7/30/2004 12:25		13,001	13,001	-74	5921	-0.01
	8/2/2004 14:40	36	13,001	13,037	36	4455	0.01
	8/6/2004 10:41	36	13,001	13,037	0	5521	0.00
	8/9/2004 14:09		13,001	13,001	-36	4528	-0.01
	8/13/2004 8:54		13,001	13,001	0	5445	0.00
	8/16/2004 10:30		13,001	13,001	0	4416	0.00
	8/20/2004 10:02	105	13,001	13,106	105	5732	0.02
	8/23/2004 14:54	160	13,001	13,161	55	4612	0.01
	8/27/2004 9:40	190	13,001	13,191	30	5446	0.01
	8/30/2004 14:36	421	13,001	13,422	231	4616	0.05
	9/3/2004 10:20	608	13,001	13,609	187	5504	0.03
	9/10/2004 13:49	917	13,001	13,918	309	10289	0.03
	9/13/2004 11:31	1041	13,001	14,042	124	4182	0.03
	9/17/2004 10:17	1170	13,001	14,171	129	5686	0.02
	9/20/2004 10:51	1180	13,001	14,181	10	4354	0.00
	10/1/2004 10:18	1215	13,001	14,216	35	15807	0.00
	10/8/2004 9:39	1326	13,001	14,327	111	10041	0.01

well	date/time	reading cum vol (gal)	added vol prev meter	actual cum vol (gal)	delta vol (gal)	delta t (min)	avg gpm
1094	10/15/2004 9:45	1540	13,001	14,541	214	10086	0.02
	10/18/2004 9:54	1612	13,001	14,613	72	4329	0.02
	10/22/2004 9:33	1675	13,001	14,676	63	5739	0.01
	10/25/2004 9:43	1714	13,001	14,715	39	4330	0.01
	10/29/2004 10:26	1767	13,001	14,768	53	5803	0.01
	11/5/2004 14:07	1843	13,001	14,844	76	10301	0.01
	11/8/2004 9:31	1871	13,001	14,872	28	4044	0.01
	11/19/2004 9:46	1969	13,001	14,970	98	15855	0.01
	11/24/2004 12:40	2018	13,001	15,019	49	7374	0.01
	12/3/2004 10:36	2078	13,001	15,079	60	12836	0.00
	12/14/2004 10:15	2142	13,001	15,143	64	15819	0.00
	12/21/2004 13:22	2177	13,001	15,178	35	10267	0.00
	1/7/2005 13:27	2289	13,001	15,290	112	24485	0.00
	1/10/2005 11:40	2305	13,001	15,306	16	4213	0.00
	1/14/2005 11:40	2332	13,001	15,333	27	5760	0.00
	1/24/2005 11:42	2372	13,001	15,373	40	14402	0.00
	1/28/2005 9:38	2391	13,001	15,392	19	5636	0.00
	1/31/2005 11:48	2407	13,001	15,408	16	4450	0.00
	2/4/2005 11:59	2422	13,001	15,423	15	5771	0.00
	2/7/2005 11:04	2438	13,001	15,439	16	4265	0.00
	2/9/2005 10:08	2448	13,001	15,449	10	2824	0.00
	2/14/2005 14:30	2470	13,001	15,471	22	7462	0.00
	2/23/2005 16:54	2509	13,001	15,510	39	13104	0.00
	2/25/2005 15:23	2516	13,001	15,517	7	2789	0.00
	2/28/2005 10:53	2527	13,001	15,528	11	4050	0.00
	3/4/2005 10:28	2541	13,001	15,542	14	5735	0.00
	3/7/2005 10:59	2552	13,001	15,553	11	4351	0.00
	3/11/2005 11:40	2564	13,001	15,565	12	5801	0.00
	3/18/2005 11:55	2591	13,001	15,592	27	10095	0.00
	3/21/2005 11:20	2603	13,001	15,604	12	4285	0.00
	3/25/2005 10:00	2618	13,001	15,619	15	5680	0.00
	3/28/2005 10:55	2627	13,001	15,628	9	4375	0.00
	avg						0.01

Shiprock Wash Drain Pumping Rates

location	date/time	reading cum vol (gal)	added vol prev meter	actual cum vol (gal)	delta vol (gal)	delta t (min)	avg gpm
bob lee	3/30/2004 16:30	717,885	1,668,137	2,386,022			
	4/2/2004 9:38	718,207	1,668,137	2,386,344	322	3908	0.08
	4/5/2004 10:00	718,210	1,668,137	2,386,347	3	4342	0.00
	4/9/2004 11:20	736,294	1,668,137	2,404,431	18,084	5840	3.10
	4/12/2004 10:01	750,948	1,668,137	2,419,085	14,654	4241	3.46
	4/16/2004 8:30	759,989	1,668,137	2,428,126	9,041	5669	1.59
	4/19/2004 10:38	760,018	1,668,137	2,428,155	29	4448	0.01
	4/27/2004 7:10	763,509	1,668,137	2,431,646	3,491	11312	0.31
	4/30/2004 9:30	782,990	1,668,137	2,451,127	19,481	4460	4.37
	5/3/2004 9:49	801,511	1,668,137	2,469,648	18,521	4339	4.27
	5/7/2004 10:00	824,168	1,668,137	2,492,305	22,657	5771	3.93
	5/10/2004 11:42	841,155	1,668,137	2,509,292	16,987	4422	3.84
	5/14/2004 8:20	862,233	1,668,137	2,530,370	21,078	5558	3.79
	5/17/2004 9:30	878,683	1,668,137	2,546,820	16,450	4390	3.75
	5/18/2004 11:03	884,111	1,668,137	2,552,248	5,428	1533	3.54
	5/21/2004 15:33	901,663	1,668,137	2,569,800	17,552	4590	3.82
	5/28/2004 9:20	938,337	1,668,137	2,606,474	36,674	9707	3.78
	6/4/2004 7:48	974,550	1,668,137	2,642,687	36,213	9988	3.63
	6/7/2004 9:43	990,276	1,668,137	2,658,413	15,726	4435	3.55
	6/11/2004 10:06	1,010,485	1,668,137	2,678,622	20,209	5783	3.49
	6/14/2004 9:30	1,025,469	1,668,137	2,693,606	14,984	4284	3.50
	6/18/2004 10:41	1,044,889	1,668,137	2,713,026	19,420	5831	3.33
	6/23/2004 10:03	1,068,479	1,668,137	2,736,616	23,590	7162	3.29
	6/28/2004 11:55	24,432	2,736,616	2,761,048	48,022	14474	3.32
	7/2/2004 10:37	43,078	2,736,616	2,779,694	18,646	5682	3.28
	7/9/2004 13:45	77,438	2,736,616	2,814,054	34,360	10268	3.35
	7/12/2004 14:47	92,187	2,736,616	2,828,803	14,749	4382	3.37
	7/16/2004 9:40	110,854	2,736,616	2,847,470	18,667	5453	3.42
	7/23/2004 10:19	1,868	2,847,470	2,849,338	1,868	10119	0.18
	7/26/2004 10:15	19,429	2,847,470	2,866,899	17,561	4316	4.07
	7/30/2004 12:48	34,288	2,847,470	2,881,758	14,859	5913	2.51
	8/2/2004 14:57	43,671	2,847,470	2,891,141	9,383	4449	2.11
	8/6/2004 11:04	53,466	2,847,470	2,900,936	9,795	5527	1.77
	8/9/2004 14:29	57,647	2,847,470	2,905,117	4,181	4525	0.92
	8/13/2004 9:17	71,000	2,847,470	2,918,470	13,353	5448	2.45
	8/16/2004 11:57	84,146	2,847,470	2,931,616	13,146	4480	2.93
	8/20/2004 10:25	92,695	2,847,470	2,940,165	8,549	5668	1.51
	8/23/2004 15:16	106,225	2,847,470	2,953,695	13,530	4611	2.93
	8/27/2004 10:05	117,975	2,847,470	2,965,445	11,750	5449	2.16
	8/30/2004 15:00	127,697	2,847,470	2,975,167	9,722	4615	2.11
	9/3/2004 10:45	136,830	2,847,470	2,984,300	9,133	5505	1.66
	9/10/2004 14:10	146,613	2,847,470	2,994,083	9,783	10285	0.95
	9/13/2004 12:03	157,265	2,847,470	3,004,735	10,652	4193	2.54
	9/17/2004 10:43	171,092	2,847,470	3,018,562	13,827	5680	2.43
	9/20/2004 11:14	182,213	2,847,470	3,029,683	11,121	4351	2.56
	10/1/2004 10:47	227,979	2,847,470	3,075,449	45,766	15813	2.89
	10/8/2004 9:59	259,340	2,847,470	3,106,810	31,361	10032	3.13

location	date/time	reading cum vol (gal)	added vol prev meter	actual cum vol (gal)	delta vol (gal)	delta t (min)	avg gpm
bob lee	10/15/2004 10:20	288,660	2,847,470	3,136,130	29,320	10101	2.90
	10/18/2004 10:16	295,693	2,847,470	3,143,163	7,033	4316	1.63
	10/22/2004 10:08	303,801	2,847,470	3,151,271	8,108	5752	1.41
	10/25/2004 10:10	310,801	2,847,470	3,158,271	7,000	4322	1.62
	10/29/2004 10:54	330,857	2,847,470	3,178,327	20,056	5804	3.46
	11/5/2004 14:31	361,292	2,847,470	3,208,762	30,435	10297	2.96
	11/8/2004 9:55	372,990	2,847,470	3,220,460	11,698	4044	2.89
	11/19/2004 10:13	428,419	2,847,470	3,275,889	55,429	15858	3.50
	11/24/2004 13:13	454,236	2,847,470	3,301,706	25,817	7380	3.50
	12/3/2004 11:00	497,636	2,847,470	3,345,106	43,400	12827	3.38
	12/14/2004 11:10	548,265	2,847,470	3,395,735	50,629	15850	3.19
	12/21/2004 13:52	581,350	2,847,470	3,428,820	33,085	10242	3.23
	1/7/2005 13:45	658,043	2,847,470	3,505,513	76,693	24473	3.13
	1/10/2005 11:55	670,879	2,847,470	3,518,349	12,836	4210	3.05
	1/14/2005 12:30	689,789	2,847,470	3,537,259	18,910	5795	3.26
	1/24/2005 12:10	737,427	2,847,470	3,584,897	47,638	14380	3.31
	1/28/2005 10:04	757,067	2,847,470	3,604,537	19,640	5634	3.49
	1/31/2005 12:08	774,213	2,847,470	3,621,683	17,146	4444	3.86
	2/4/2005 12:30	801,339	2,847,470	3,648,809	27,126	5782	4.69
	2/7/2005 11:31	821,475	2,847,470	3,668,945	20,136	4261	4.73
	2/9/2005 10:49	835,535	2,847,470	3,683,005	14,060	2838	4.95
	2/14/2005 14:57	873,384	2,847,470	3,720,854	37,849	7448	5.08
	2/23/2005 15:20	905,780	2,847,470	3,753,250	32,396	12983	2.50
	2/25/2005 15:50	935,889	2,847,470	3,783,359	30,109	2910	10.35
	2/28/2005 11:11	977,861	2,847,470	3,825,331	41,972	4041	10.39
	3/4/2005 10:28	1,036,211	2,847,470	3,883,681	58,350	5717	10.21
	3/7/2005 10:59	1,072,806	2,847,470	3,920,276	36,595	4351	8.41
	3/11/2005 12:05	1,116,252	2,847,470	3,963,722	43,446	5826	7.46
	3/18/2005 12:18	1,194,588	2,847,470	4,042,058	78,336	10093	7.76
	3/21/2005 11:30	1,227,473	2,847,470	4,074,943	32,885	4272	7.70
	3/25/2005 10:22	1,267,872	2,847,470	4,115,342	40,399	5692	7.10
	3/28/2005 11:35	1,297,366	2,847,470	4,144,836	29,494	4393	6.71
	avg						3.52

Shiprock Wash Sump Pumping Rates

location	date/time	reading cum vol (gal)	added vol prev meter	actual cum vol (gal)	delta vol (gal)	delta t (min)	avg gpm
many devils	3/30/2004 15:55	126,005	81,669	207,674			
	4/2/2004 8:44	129,112	81,669	210,781	3,107	3889	0.80
	4/5/2004 8:21	133,711	81,669	215,380	4,599	4297	1.07
	4/9/2004 10:54	139,600	81,669	221,269	5,889	5913	1.00
	4/12/2004 9:20	143,415	81,669	225,084	3,815	4226	0.90
	4/16/2004 7:22	148,808	81,669	230,477	5,393	5642	0.96
	4/19/2004 9:12	152,421	81,669	234,090	3,613	4430	0.82
	4/27/2004 7:48	161,211	81,669	242,880	8,790	11436	0.77
	4/30/2004 8:30	164,800	81,669	246,469	3,589	4362	0.82
	5/3/2004 8:20	168,375	81,669	250,044	7,164	8672	0.83
	5/7/2004 9:20	172,881	81,669	254,550	4,506	5820	0.77
	5/10/2004 11:17	176,376	81,669	258,045	3,495	4437	0.79
	5/14/2004 7:00	180,569	81,669	262,238	4,193	5503	0.76
	5/17/2004 8:13	183,868	81,669	265,537	3,299	4393	0.75
	5/18/2004 9:45	184,895	81,669	266,564	1,027	1532	0.67
	5/21/2004 15:09	188,226	81,669	269,895	3,331	4644	0.72
	5/28/2004 8:11	195,135	81,669	276,804	6,909	9662	0.72
	6/4/2004 6:45	201,888	81,669	283,557	6,753	9994	0.68
	6/7/2004 9:13	204,816	81,669	286,485	2,928	4468	0.66
	6/11/2004 9:20	208,496	81,669	290,165	3,680	5767	0.64
	6/14/2004 8:11	211,105	81,669	292,774	2,609	4251	0.61
	6/18/2004 9:52	214,503	81,669	296,172	3,398	5861	0.58
	6/23/2004 9:03	218,608	81,669	300,277	4,105	7151	0.57
	6/28/2004 11:17	222,846	81,669	304,515	8,343	14485	0.58
	7/2/2004 9:55	225,956	81,669	307,625	3,110	5678	0.55
	7/9/2004 13:17	231,384	81,669	313,053	5,428	10282	0.53
	7/12/2004 13:58	233,623	81,669	315,292	2,239	4361	0.51
	7/16/2004 8:55	236,066	81,669	317,735	2,443	5457	0.45
	7/23/2004 9:30	240,644	81,669	322,313	4,578	10115	0.45
	7/26/2004 9:24	243,522	81,669	325,191	2,878	4314	0.67
	7/30/2004 12:10	244,421	81,669	326,090	899	5926	0.15
	8/2/2004 14:20	245,037	81,669	326,706	616	4450	0.14
	8/6/2004 10:25	245,717	81,669	327,386	680	5525	0.12
	8/9/2004 13:50	246,062	81,669	327,731	345	4525	0.08
	8/13/2004 8:36	247,735	81,669	329,404	1,673	5446	0.31
	8/16/2004 11:20	249,777	81,669	331,446	2,042	4484	0.46
	8/20/2004 9:45	252,385	81,669	334,054	2,608	5665	0.46
	8/23/2004 14:40	254,558	81,669	336,227	2,173	4615	0.47
	8/27/2004 9:24	257,048	81,669	338,717	2,490	5444	0.46
	8/30/2004 14:21	259,103	81,669	340,772	2,055	4617	0.45
	9/3/2004 10:00	261,546	81,669	343,215	2,443	5499	0.44
	9/10/2004 13:30	267,322	81,669	348,991	5,776	10290	0.56
	9/13/2004 11:03	269,251	81,669	350,920	1,929	4173	0.46
	9/17/2004 10:01	271,740	81,669	353,409	2,489	5698	0.44
	9/20/2004 10:35	273,671	81,669	355,340	1,931	4354	0.44
	10/1/2004 10:01	282,998	81,669	364,667	9,327	15806	0.59
	10/8/2004 9:10	289,153	81,669	370,822	6,155	10029	0.61

location	date/time	reading cum vol (gal)	added vol prev meter	actual cum vol (gal)	delta vol (gal)	delta t (min)	avg gpm
many devils	10/15/2004 9:00	294,449	81,669	376,118	5,296	10070	0.53
	10/18/2004 9:37	296,503	81,669	378,172	2,054	4357	0.47
	10/22/2004 9:20	299,117	81,669	380,786	2,614	5743	0.46
	10/25/2004 9:26	300,998	81,669	382,667	1,881	4326	0.43
	10/29/2004 10:11	303,532	81,669	385,201	2,534	5805	0.44
	11/5/2004 13:53	307,889	81,669	389,558	4,357	10302	0.42
	11/8/2004 9:15	309,572	81,669	391,241	1,683	4042	0.42
	11/19/2004 9:30	318,155	81,669	399,824	8,583	15855	0.54
	11/24/2004 9:50	322,782	81,669	404,451	4,627	7220	0.64
	12/3/2004 9:40	332,550	81,669	414,219	9,768	12950	0.75
	12/14/2004 10:00	353,037	81,669	434,706	20,487	15860	1.29
	12/21/2004 13:10	364,700	81,669	446,369	11,663	10270	1.14
	1/7/2005 12:41	387,145	81,669	468,814	22,445	24451	0.92
	1/10/2005 11:20	390,527	81,669	472,196	3,382	4239	0.80
	1/14/2005 11:00	395,097	81,669	476,766	4,570	5740	0.80
	1/24/2005 11:00	407,228	81,669	488,897	12,131	14400	0.84
	1/28/2005 9:20	411,628	81,669	493,297	4,400	5660	0.78
	1/31/2005 11:15	415,232	81,669	496,901	3,604	4435	0.81
	2/4/2005 11:18	420,428	81,669	502,097	5,196	5763	0.90
	2/7/2005 10:19	424,439	81,669	506,108	4,011	4261	0.94
	2/9/2005 9:42	426,927	81,669	508,596	2,488	2843	0.88
	2/14/2005 14:12	433,829	81,669	515,498	6,902	7470	0.92
	2/23/2005 16:31	445,660	81,669	527,329	11,831	13099	0.90
	2/25/2005 15:08	2,457	527,329	529,786	2,457	2797	0.88
	2/28/2005 10:12	5,990	527,329	533,319	3,533	4024	0.88
	3/4/2005 10:14	10,927	527,329	538,256	4,937	5762	0.86
	3/7/2005 10:40	14,642	527,329	541,971	3,715	4346	0.85
	3/11/2005 11:22	19,515	527,329	546,844	4,873	5802	0.84
	3/18/2005 11:18	28,094	527,329	555,423	8,579	10076	0.85
	3/21/2005 11:06	32,341	527,329	559,670	4,247	4308	0.99
	3/25/2005 9:40	39,315	527,329	566,644	6,974	5674	1.23
	3/28/2005 10:37	45,939	527,329	573,268	6,624	4377	1.51
	avg						0.68

Shiprock Floodplain Well Field Pumping Rates

well	date/time	reading cum vol (gal)	added vol prev meter	actual cum vol (gal)	delta vol (gal)	delta t (min)	avg gpm
1089	3/30/2004 16:50	1,276,264	1,236,127	2,512,391			
	4/2/2004 10:06	1,306,271	1,236,127	2,542,398	30,007	3916	7.66
	4/5/2004 0:00						
	4/9/2004 11:31	1,388,589	1,236,127	2,624,716	82,318	10165	8.10
	4/12/2004 10:28	1,422,558	1,236,127	2,658,685	33,969	4257	7.98
	4/16/2004 8:51	1,476,398	1,236,127	2,712,525	53,840	5663	9.51
	4/19/2004 11:10	1,515,814	1,236,127	2,751,941	39,416	4459	8.84
	4/27/2004 9:54	1,617,098	1,236,127	2,853,225	101,284	11444	8.85
	4/30/2004 9:57	1,655,342	1,236,127	2,891,469	38,244	4323	8.85
	5/3/2004 10:22	1,693,258	1,236,127	2,929,385	37,916	4345	8.73
	5/7/2004 10:31	1,743,388	1,236,127	2,979,515	50,130	5769	8.69
	5/10/2004 11:00						
	5/14/2004 8:45	1,836,071	1,236,127	3,072,198	92,683	9974	9.29
	5/17/2004 10:04	1,877,976	1,236,127	3,114,103	41,905	4399	9.53
	5/18/2004 11:46	1,891,935	1,236,127	3,128,062	13,959	1542	9.05
	5/21/2004 15:42	1,934,291	1,236,127	3,170,418	42,356	4556	9.30
	5/28/2004 9:47	2,026,625	1,236,127	3,262,752	92,334	9725	9.49
	6/4/2004 8:15	2,119,570	1,236,127	3,355,697	92,945	9988	9.31
	6/7/2004 9:51	2,160,585	1,236,127	3,396,712	41,015	4416	9.29
	6/11/2004 10:21	2,214,313	1,236,127	3,450,440	53,728	5790	9.28
	6/14/2004 10:00	2,254,456	1,236,127	3,490,583	40,143	4299	9.34
	6/18/2004 11:09	2,305,724	1,236,127	3,541,851	51,268	5829	8.80
	6/23/2004 10:30	2,367,112	1,236,127	3,603,239	61,388	7161	8.57
	6/28/2004 12:11	2,425,704	1,236,127	3,661,831	119,980	14462	8.30
	7/2/2004 10:54	2,467,476	1,236,127	3,703,603	41,772	5683	7.35
	7/9/2004 13:58	2,537,449	1,236,127	3,773,576	69,973	10264	6.82
	7/12/2004 15:04	2,565,782	1,236,127	3,801,909	28,333	4386	6.46
	7/16/2004 10:00	2,599,295	1,236,127	3,835,422	33,513	5456	6.14
	7/23/2004 10:35	2,657,826	1,236,127	3,893,953	58,531	10115	5.79
	7/26/2004 9:33	2,682,000	1,236,127	3,918,127	24,174	4258	5.68
	7/30/2004 13:04	24,566	3,926,377	3,950,943	32,816	5971	5.50
	8/2/2004 15:14	48,208	3,926,377	3,974,585	23,642	4450	5.31
	8/6/2004 11:20	76,771	3,926,377	4,003,148	28,563	5526	5.17
	8/9/2004 14:47	99,292	3,926,377	4,025,669	22,521	4527	4.97
	8/13/2004 9:35	125,492	3,926,377	4,051,869	26,200	5448	4.81
	8/16/2004 13:25	146,750	3,926,377	4,073,127	21,258	4550	4.67
	8/20/2004 10:44	172,427	3,926,377	4,098,804	25,677	5599	4.59
	8/23/2004 15:37	193,657	3,926,377	4,120,034	21,230	4613	4.60
	8/27/2004 10:20	218,892	3,926,377	4,145,269	25,235	5443	4.64
	8/30/2004 15:17	240,203	3,926,377	4,166,580	21,311	4617	4.62
	9/3/2004 11:17	265,446	3,926,377	4,191,823	25,243	5520	4.57
	9/10/2004 14:27	313,861	3,926,377	4,240,238	48,415	10270	4.71
	9/13/2004 13:00	334,244	3,926,377	4,260,621	20,383	4233	4.82
	9/17/2004 11:00	346,169	3,926,377	4,272,546	11,925	5640	2.11
	9/20/2004 11:31	365,129	3,926,377	4,291,506	18,960	4351	4.36
	10/1/2004 11:06	437,758	3,926,377	4,364,135	72,629	15815	4.59
	10/8/2004 10:18	487,229	3,926,377	4,413,606	49,471	10032	4.93

well	date/time	reading cum vol (gal)	added vol prev meter	actual cum vol (gal)	delta vol (gal)	delta t (min)	avg gpm
1089	10/15/2004 10:52	536,681	3,926,377	4,463,058	49,452	10114	4.89
	10/18/2004 10:37	557,704	3,926,377	4,484,081	21,023	4305	4.88
	10/22/2004 10:26	586,411	3,926,377	4,512,788	28,707	5749	4.99
	10/25/2004 10:29	606,881	3,926,377	4,533,258	20,470	4323	4.74
	10/29/2004 11:11	634,682	3,926,377	4,561,059	27,801	5802	4.79
	11/5/2004 14:48	679,634	3,926,377	4,606,011	44,952	10297	4.37
	11/8/2004 10:13	696,582	3,926,377	4,622,959	16,948	4045	4.19
	11/19/2004 10:32	764,992	3,926,377	4,691,369	68,410	15859	4.31
	11/24/2004 13:36	796,620	3,926,377	4,722,997	31,628	7384	4.28
	12/3/2004 11:30	847,613	3,926,377	4,773,990	50,993	12834	3.97
	12/14/2004 11:25	897,104	3,926,377	4,823,481	49,491	15835	3.13
	12/21/2004 14:05	914,115	3,926,377	4,840,492	17,011	10240	1.66
	1/7/2005 14:15	946,508	3,926,377	4,872,885	32,393	24490	1.32
	1/10/2005 12:05	952,192	3,926,377	4,878,569	5,684	4190	1.36
	1/14/2005 12:53	972,672	3,926,377	4,899,049	20,480	5808	3.53
	1/24/2005 12:35	1,085,027	3,926,377	5,011,404	112,355	14382	7.81
	1/28/2005 10:25	10,181	5,042,277	5,052,458	41,054	5630	7.29
	1/31/2005 0:00						
	2/4/2005 13:11	84,973	5,042,277	5,127,250	74,792	10246	7.30
	2/7/2005 11:55	117,384	5,042,277	5,159,661	32,411	4244	7.64
	2/9/2005 11:20	138,911	5,042,277	5,181,188	21,527	2845	7.57
	2/14/2005 15:19	195,535	5,042,277	5,237,812	56,624	7439	7.61
	2/23/2005 15:30	299,370	5,042,277	5,341,647	103,835	12971	8.01
	2/25/2005 16:05	323,486	5,042,277	5,365,763	24,116	2915	8.27
	2/28/2005 11:30	357,388	5,042,277	5,399,665	33,902	4045	8.38
	3/4/2005 11:07	397,856	5,042,277	5,440,133	40,468	5737	7.05
	3/7/2005 11:41	397,856	5,042,277	5,440,133	0	4354	0.00
	3/11/2005 12:31	397,856	5,042,277	5,440,133	0	5810	0.00
	3/18/2005 12:49	397,856	5,042,277	5,440,133	0	10098	0.00
	3/21/2005 11:40	397,856	5,042,277	5,440,133	0	4251	0.00
	3/25/2005 10:38	397,856	5,042,277	5,440,133	0	5698	0.00
	3/28/2005 11:21	397,856	5,042,277	5,440,133	0	4363	0.00
	avg						5.83

Shiprock Floodplain Well Field Pumping Rates

well	date/time	reading cum vol (gal)	added vol prev meter	actual cum vol (gal)	delta vol (gal)	delta t (min)	avg gpm
1077	3/30/2004 17:05	110,229	194,902	305,131			
	4/2/2004 9:54	112,732	194,902	307,634	2503	3889	0.64
	4/5/2004 0:00						
	4/9/2004 11:35	119,705	194,902	314,607	6973	10181	0.68
	4/12/2004 10:15	122,926	194,902	317,828	3,221	4240	0.76
	4/16/2004 8:41	127,306	194,902	322,208	4,380	5666	0.77
	4/19/2004 10:50	130,629	194,902	325,531	3,323	4449	0.75
	4/27/2004 9:58	138,828	194,902	333,730	8,199	11468	0.71
	4/30/2004 9:41	141,782	194,902	336,684	2,954	4303	0.69
	5/3/2004 10:10	144,684	194,902	339,586	2,902	4349	0.67
	5/7/2004 10:18	148,483	194,902	343,385	3,799	5768	0.66
	5/10/2004 11:51	151,585	194,902	346,487	3,102	4413	0.70
	5/14/2004 8:33	155,829	194,902	350,731	4,244	5562	0.76
	5/17/2004 9:49	159,098	194,902	354,000	3,269	4396	0.74
	5/18/2004 11:55	160,135	194,902	355,037	1,037	1566	0.66
	5/21/2004 15:47	163,261	194,902	358,163	3,126	4552	0.69
	5/28/2004 9:35	170,156	194,902	365,058	6,895	9708	0.71
	6/4/2004 8:00	176,804	194,902	371,706	6,648	9985	0.67
	6/7/2004 10:00	179,571	194,902	374,473	2,767	4440	0.62
	6/11/2004 10:24	183,228	194,902	378,130	3,657	5784	0.63
	6/14/2004 9:48	186,034	194,902	380,936	2,806	4284	0.65
	6/18/2004 10:56	189,356	194,902	384,258	3,322	5828	0.57
	6/23/2004 10:30	193,173	194,902	388,075	3,817	7174	0.53
	6/28/2004 12:14	196,646	194,902	391,548	7,290	14478	0.50
	7/2/2004 10:57	199,075	194,902	393,977	2,429	5683	0.43
	7/9/2004 14:04	203,093	194,902	397,995	4,018	10267	0.39
	7/12/2004 14:57	204,684	194,902	399,586	1,591	4373	0.36
	7/16/2004 9:55	206,542	194,902	401,444	1,858	5458	0.34
	7/23/2004 10:40	209,699	194,902	404,601	3,157	10125	0.31
	7/26/2004 9:36	210,990	194,902	405,892	1,291	4256	0.30
	7/30/2004 13:07	212,726	194,902	407,628	1,736	5971	0.29
	8/2/2004 15:06	213,995	194,902	408,897	1,269	4439	0.29
	8/6/2004 11:17	215,549	194,902	410,451	1,554	5531	0.28
	8/9/2004 14:44	216,782	194,902	411,684	1,233	4527	0.27
	8/13/2004 9:32	218,201	194,902	413,103	1,419	5448	0.26
	8/16/2004 13:10	219,358	194,902	414,260	1,157	4538	0.25
	8/20/2004 10:40	220,742	194,902	415,644	1,384	5610	0.25
	8/23/2004 15:32	221,910	194,902	416,812	1,168	4612	0.25
	8/27/2004 10:18	223,285	194,902	418,187	1,375	5446	0.25
	8/30/2004 15:10	224,460	194,902	419,362	1,175	4612	0.25
	9/3/2004 11:10	225,845	194,902	420,747	1,385	5520	0.25
	9/10/2004 14:21	228,544	194,902	423,446	2,699	10271	0.26
	9/13/2004 12:51	229,701	194,902	424,603	1,157	4230	0.27
	9/17/2004 10:55	230,534	194,902	425,436	833	5644	0.15
	9/20/2004 11:28	231,697	194,902	426,599	1,163	4353	0.27
	10/1/2004 11:01	236,948	194,902	431,850	5,251	15813	0.33
	10/8/2004 10:07	240,886	194,902	435,788	3,938	10026	0.39

well	date/time	reading cum vol (gal)	added vol prev meter	actual cum vol (gal)	delta vol (gal)	delta t (min)	avg gpm
1077	10/15/2004 10:38	244,841	194,902	439,743	3,955	10111	0.39
	10/18/2004 10:32	246,445	194,902	441,347	1,604	4314	0.37
	10/22/2004 10:22	248,598	194,902	443,500	2,153	5750	0.37
	10/25/2004 10:25	250,222	194,902	445,124	1,624	4323	0.38
	10/29/2004 11:07	252,392	194,902	447,294	2,170	5802	0.37
	11/5/2004 14:44	256,561	194,902	451,463	4,169	10297	0.40
	11/8/2004 10:09	258,267	194,902	453,169	1,706	4045	0.42
	11/19/2004 10:27	265,225	194,902	460,127	6,958	15858	0.44
	11/24/2004 14:05	268,641	194,902	463,543	3,416	7418	0.46
	12/3/2004 11:15	274,797	194,902	469,699	6,156	12790	0.48
	12/14/2004 11:50	282,702	194,902	477,604	7,905	15875	0.50
	12/21/2004 14:02	288,150	194,902	483,052	5,448	10212	0.53
	1/7/2005 14:06	302,141	194,902	497,043	13,991	24484	0.57
	1/10/2005 12:10	304,684	194,902	499,586	2,543	4204	0.60
	1/14/2005 12:41	308,225	194,902	503,127	3,541	5791	0.61
	1/24/2005 12:25	316,285	194,902	511,187	8,060	14384	0.56
	1/28/2005 10:15	319,386	194,902	514,288	3,101	5630	0.55
	1/31/2005 0:00						
	2/4/2005 12:53	325,142	194,902	520,044	5,756	10238	0.56
	2/7/2005 11:45	327,609	194,902	522,511	2,467	4252	0.58
	2/9/2005 11:24	329,260	194,902	524,162	1,651	2859	0.58
	2/14/2005 15:13	333,601	194,902	528,503	4,341	7429	0.58
	2/23/2005 15:35	341,856	194,902	536,758	8,255	12982	0.64
	2/25/2005 16:02	343,811	194,902	538,713	1,955	2907	0.67
	2/28/2005 11:22	346,556	194,902	541,458	2,745	4040	0.68
	3/4/2005 11:10	350,349	194,902	545,251	3,793	5748	0.66
	3/7/2005 11:35	353,348	194,902	548,250	2,999	4345	0.69
	3/11/2005 12:17	357,578	194,902	552,480	4,230	5802	0.73
	3/18/2005 12:37	365,775	194,902	560,677	8,197	10100	0.81
	3/21/2005 11:44	369,683	194,902	564,585	3,908	4267	0.92
	3/25/2005 10:35	374,826	194,902	569,728	5,143	5691	0.90
	3/28/2005 11:13	378,817	194,902	573,719	3,991	4358	0.92
	avg						0.52