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Verification Monitoring Report for the Gunnison, Colorado, UMTRA Project Site

August 2003

Prepared by the
U.S. Department of Energy
Grand Junction Office



UMTRA Ground Water Project

**Verification Monitoring Report for the
Gunnison, Colorado, UMTRA Project Site**

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Grand Junction Office
Grand Junction, Colorado

Work Performed Under DOE Contract No. DE-AC13-02GJ79491

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Appendix C—Surface Water Quality Data by Parameter

Acronyms and Abbreviations

CDPHE	Colorado Department of Public Health and Environment
COPC	constituent of potential concern
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ft	foot (feet)
GCAP	Ground Water Compliance Action Plan
ICs	institutional controls
MCL	maximum concentration limit
mg/L	milligram per liter
NRC	U.S. Nuclear Regulatory Commission
RBC	risk-based concentration
RRM	residual radioactive material
SOWP	Site Observational Work Plan
UMTRA	Uranium Mill Tailings Remedial Action (Project)

1.0 Introduction

1.1 Purpose of Report

The purpose of this Verification Monitoring Report is to evaluate ground water and surface water monitoring data collected at the Gunnison, Colorado, Uranium Mill Tailings Remedial Action (UMTRA) Project processing site since 2000 and to assess the status of the compliance strategy for ground water cleanup (Figure 1). Detailed information for the Gunnison site and water quality data through 1999 are found in the Final Site Observational Work Plan (SOWP) (DOE 2001a).

1.2 Compliance Strategy

The proposed compliance strategy for the Gunnison site is natural flushing in conjunction with continued ground water and surface water monitoring, and institutional controls (ICs) that would restrict access to contaminated ground water (DOE 2001b and 2002). Also, DOE and the State of Colorado constructed an alternate domestic water supply system in 1994 to service all existing ground water users in the area and some consideration for future users (Figure 2). This compliance strategy will be protective of human health and the environment.

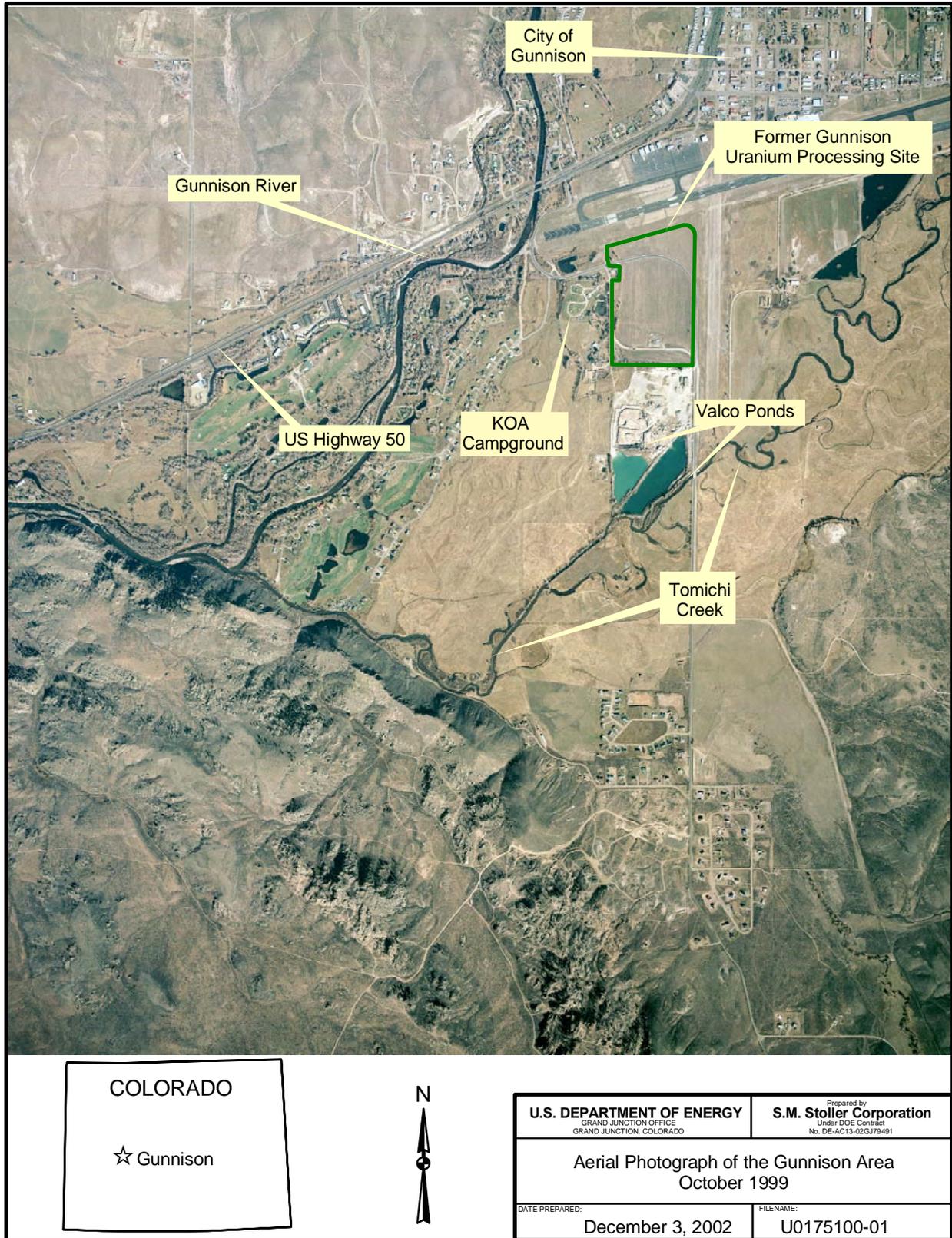
1.3 Site Status

The SOWP (DOE 2001a) is complete and has been conditionally accepted by the U.S. Nuclear Regulatory Commission (NRC) and the Colorado Department of Public Health and Environment (CDPHE). The conditions are to install additional monitor wells in the network downgradient from the site and implement ICs in the affected area (NRC 2002) (Figure 2). The additional monitor wells are scheduled to be installed during fiscal year 2004. Discussions with Gunnison County officials and CDPHE regarding ICs are in progress. The Ground Water Compliance Action Plan (GCAP) will be revised when the above conditions are met and will be submitted to NRC for concurrence (DOE 2001b). The final Environmental Assessment (DOE 2002) and Finding of No Significant Impact have been completed and distributed. The annual verification monitoring proposed in the GCAP is currently being implemented and results for 2000 through 2003 are presented in this report.

2.0 Site Conditions

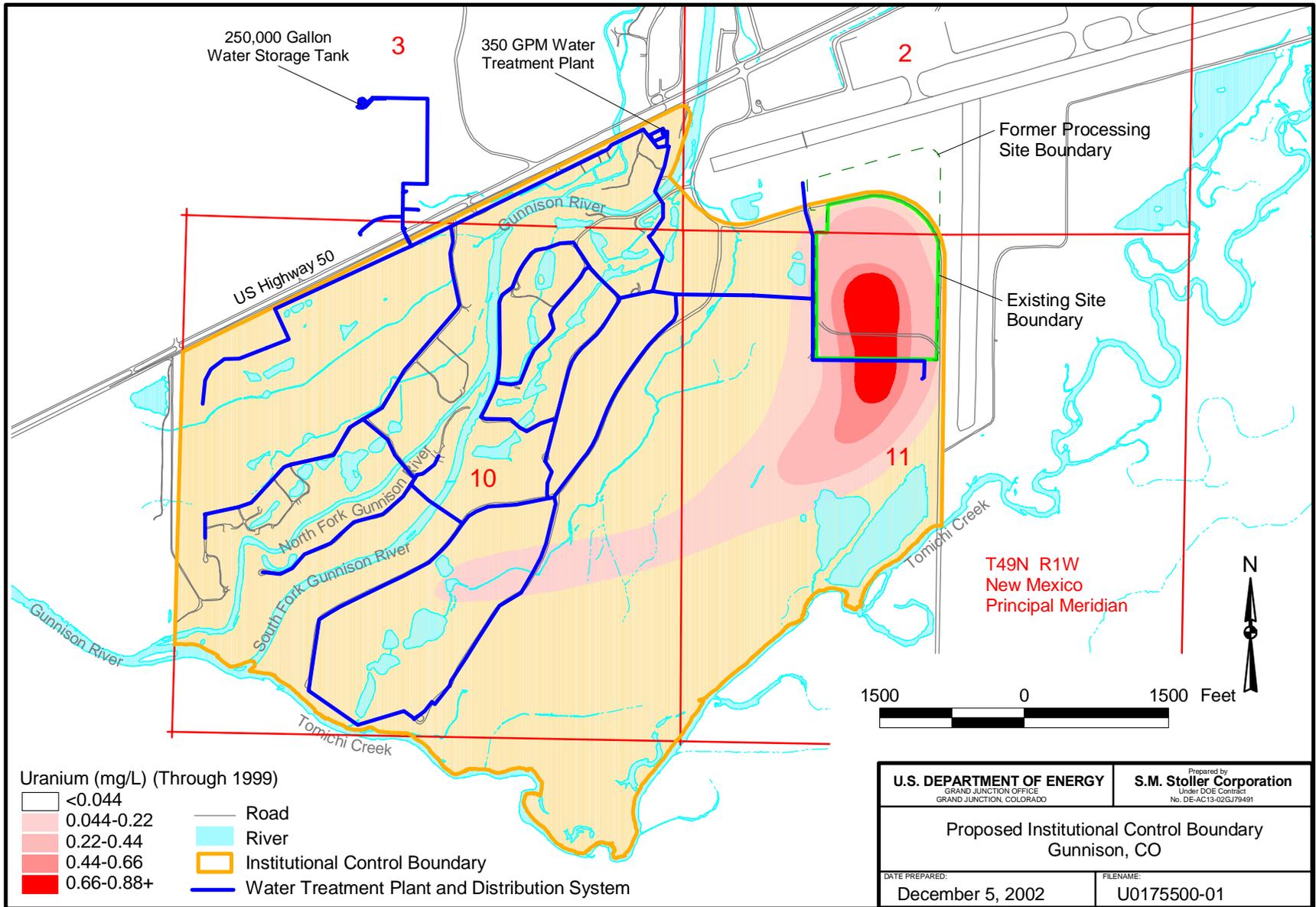
2.1 Hydrogeology

The Gunnison processing site is 0.5 mile southwest of the City of Gunnison, between the Gunnison River and Tomichi Creek, in Gunnison County, Colorado (Figure 1). Ground water occurs under unconfined conditions in the alluvial aquifer (uppermost aquifer) with an average depth to the water table of 5 feet (ft). The alluvium is composed of poorly sorted sediments ranging from clay-sized material through gravel, with cobbles and occasional boulders, and ranges in thickness from 70 to 130 ft. Ground water in the alluvial aquifer generally flows to the southwest with an average gradient of 0.005 ft/ft. Hydraulic conductivity ranges from 100 to 170 ft/day. The average linear ground water velocity ranges from 1.9 to 3.2 ft/day. Ground water



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Figure 1. Aerial Photograph of the Gunnison Area



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Figure 2. Proposed Institutional Control Boundary at the Gunnison Site

in the alluvial aquifer system is recharged by ground water underflow, adjacent streams, precipitation, flood irrigation of the pasture downgradient from the site, and irrigation of the golf course and residential areas southwest of the site. Ground water is discharged naturally to adjacent streams, by evapotranspiration, and by the Valco, Inc. gravel pit dewatering operations south of the site.

2.2 Ground Water Quality

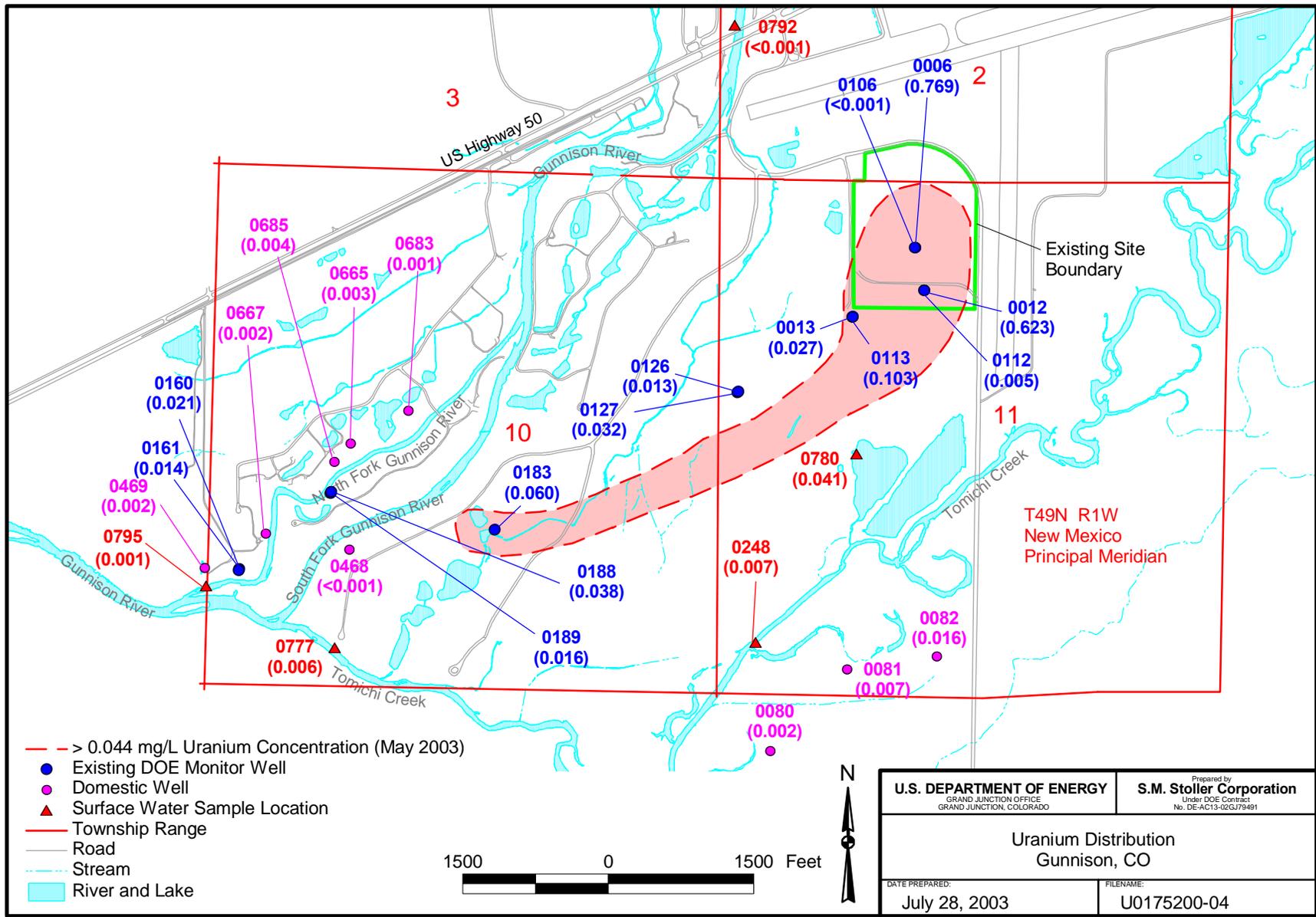
Ground water in the alluvial aquifer beneath and downgradient from the Gunnison site was contaminated by uranium processing activities. Uranium mill tailings and other residual radioactive material (RRM) were removed from the millsite from 1992 through 1995 and stabilized in a disposal cell 6 miles east of Gunnison. RRM beneath the site was cleaned up to just below the water table with some contaminated material left in place. Clean fill was placed above these areas to prevent radiation from emanating to the surface.

Uranium is the primary constituent of potential concern (COPC) in ground water, with concentrations up to 0.769 milligrams per liter (mg/L) beneath the site, and exceeding the uranium maximum concentration limit (MCL) of 0.044 mg/L several thousand feet downgradient from the site boundary (Figure 3 and Appendix A). Concentrations of uranium in ground water below the MCL, but above background, extend approximately 7,000 ft downgradient from the site boundary and have migrated beneath the Gunnison River just beyond the confluence with Tomichi Creek. The zone of contamination attenuates and migrates deeper into the aquifer as it progresses laterally in a southwesterly direction.

Manganese is also a COPC in ground water, with concentrations up to 11.4 mg/L beneath the site (Figure 4 and Appendix A). There is no MCL for manganese, but an acceptable human health risk-based concentration (RBC) is 1.7 mg/L (DOE 2001a). Manganese does not appear to be widespread in the aquifer and concentrations beneath the site are decreasing. Concentrations of manganese are above the RBC beneath and immediately downgradient from site. Concentrations are below the RBC in all other downgradient monitor wells. The presence of manganese in ground water in the area does not represent a risk to human health and the environment.

2.3 Land and Water Use

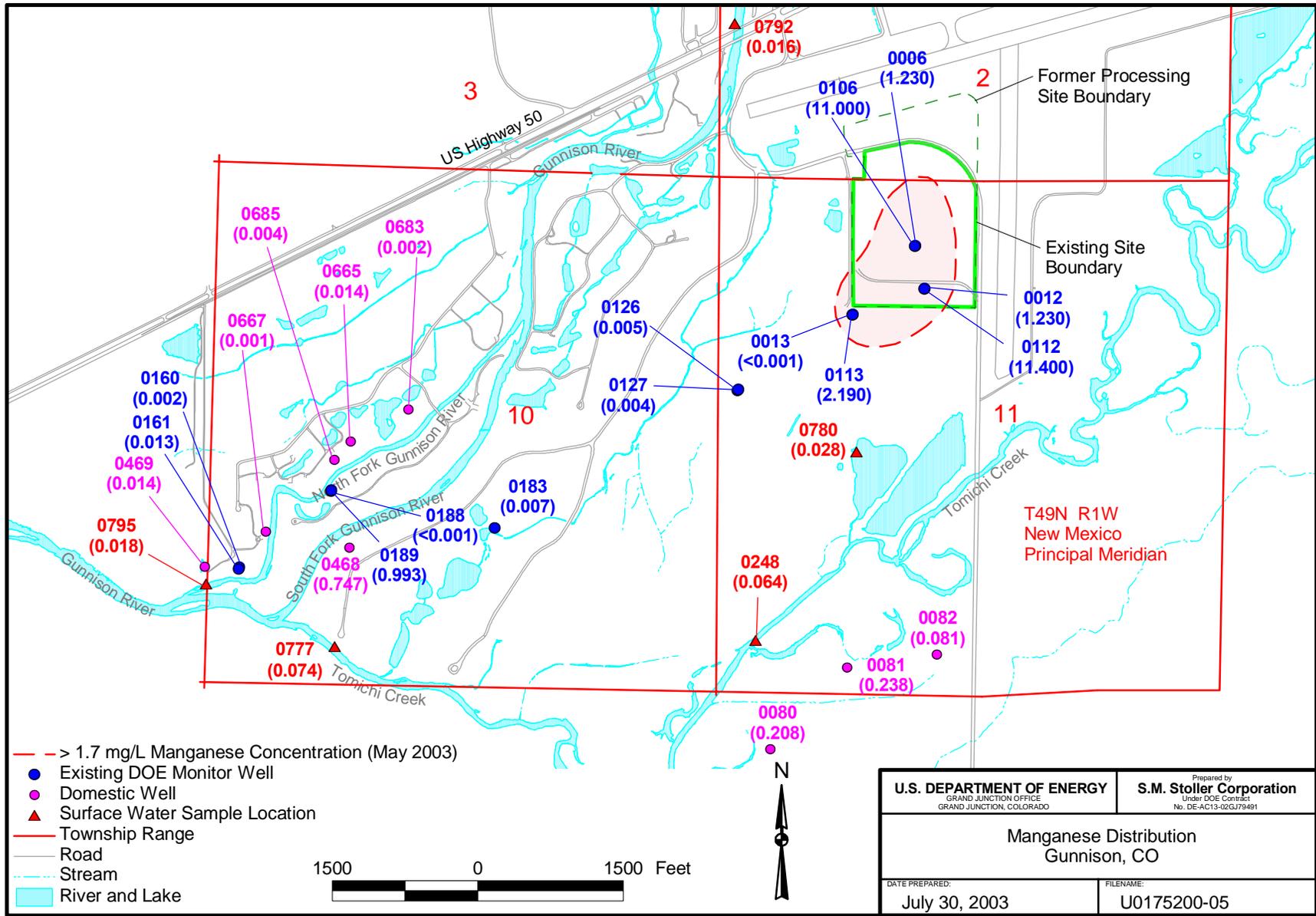
The former uranium-ore processing site is owned by Gunnison County. Adjacent properties are owned by Gunnison County; Valco, Inc.; and other private parties. Valco, Inc. is involved in commercial aggregate mining operations just south of the Gunnison site. Some of the adjacent area will possibly be subject to residential development in the near future. A domestic water supply system was constructed in 1994 to provide drinking water to potentially impacted users in the area (Figure 2).



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Figure 3. Distribution of Uranium at the Gunnison Site

U.S. DEPARTMENT OF ENERGY <small>GRAND JUNCTION OFFICE GRAND JUNCTION, COLORADO</small>	<small>Prepared by</small> S.M. Stoller Corporation <small>Under DOE Contract No. DE-AC13-02GJ79481</small>
Uranium Distribution Gunnison, CO	
<small>DATE PREPARED:</small> July 28, 2003	<small>FILENAME:</small> U0175200-04



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U.S. DEPARTMENT OF ENERGY <small>GRAND JUNCTION OFFICE GRAND JUNCTION, COLORADO</small>	<small>Prepared by</small> S.M. Stoller Corporation <small>Under DOE Contract No. DE-AC13-02GJ79481</small>
Manganese Distribution Gunnison, CO	
<small>DATE PREPARED:</small> July 30, 2003	<small>FILENAME:</small> U0175200-05

Figure 4. Distribution of Manganese at the Gunnison Site

3.0 Monitoring Program

3.1 Monitoring Network

The proposed monitoring network at the Gunnison processing site consists of 15 monitor wells (two of the wells are to be installed during fiscal year 2004), six surface water locations, and six domestic wells in the area (Figure 5 and Table 1). Uranium and manganese are the COPCs that will be analyzed during this period. Verification monitoring is to be performed annually for the first 5 years after NRC concurrence with the GCAP (revision in progress) to ascertain that natural flushing is progressing as predicted by ground water flow and transport modeling (DOE 2001b). Annual ground water and surface water monitoring as proposed in the GCAP was implemented in May 2000.

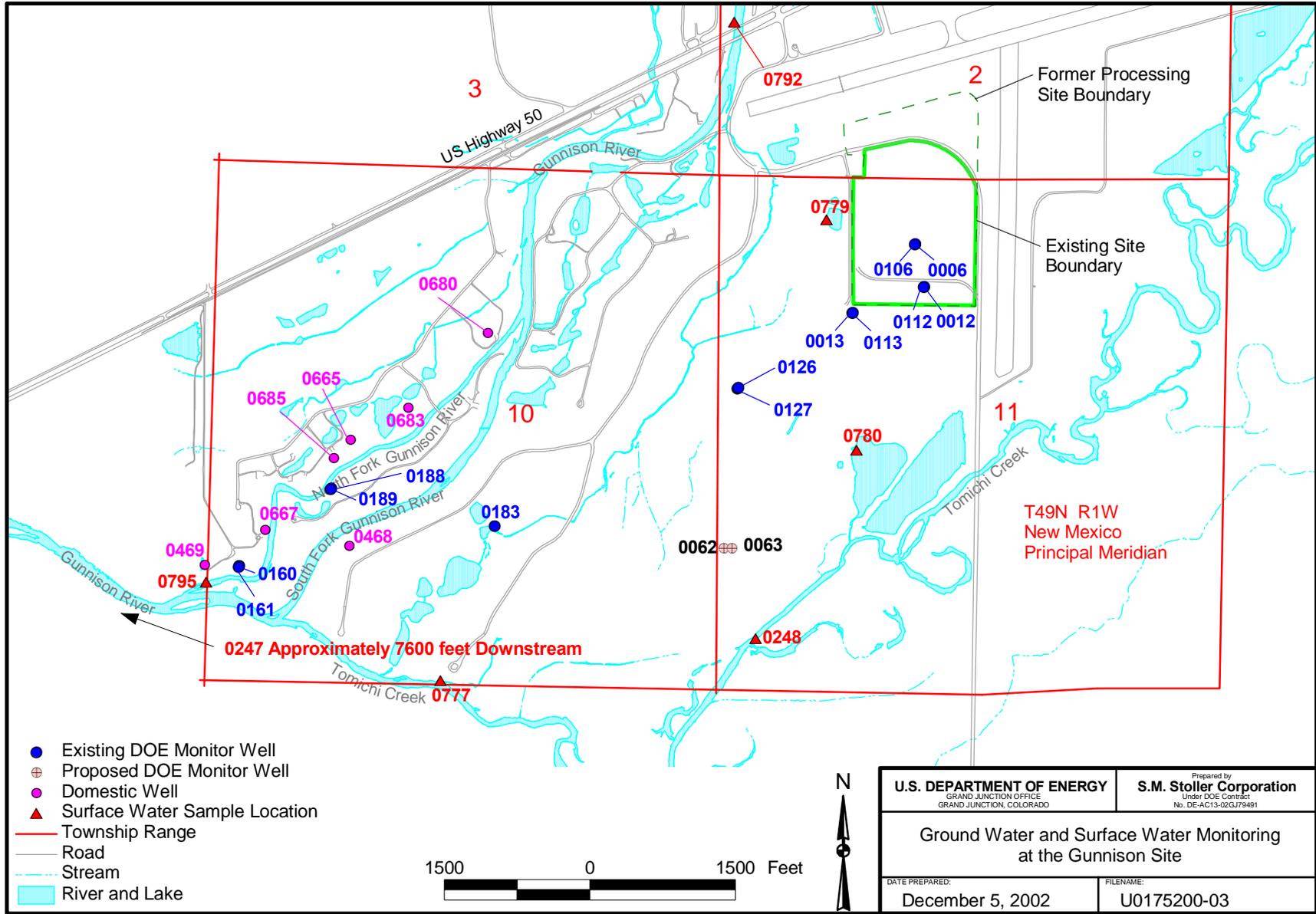
3.2 Results of Monitoring Program

Ground water and surface water analytical results through October 1999 are discussed in the SOWP (DOE 2001a). Only concentrations of uranium and manganese in ground water and surface water are discussed in this report since they are the COPCs. Concentration versus time plots for uranium and manganese in DOE monitor wells, domestic wells, and surface water, from 1997 (post-remedial action) through 2003, are shown in Figures 6 through 11, respectively. The alluvial aquifer has been divided into three zones: (1) shallow zone from 10 to 15 ft, (2) intermediate zone from 35 to 60 ft, and (3) deep zone from 90 to 100 ft (Table 1). Analytical data for uranium and manganese in ground water in DOE monitor wells and domestic wells, and surface water, from 2000 through 2003 are provided in Appendices A through C, respectively.

DOE Monitor Wells

Concentrations of uranium in ground water in the shallow zone beneath the site (0006 and 0012) are still above the MCL of 0.044 mg/L. Even though concentrations have increased slightly since 2002, the overall trend still indicates that natural flushing in the alluvial aquifer is progressing as predicted (Figure 6). Concentrations of uranium in ground water in the intermediate zone beneath the site (0106 and 0112) remain at or below background levels. Uranium concentrations in ground water just off the southwest corner of the site are deeper in the alluvium, with levels below the MCL in the shallow zone (0013) and above the MCL in the intermediate zone (0113). Concentrations are below the MCL and decreasing in monitor wells 0126 (intermediate zone) and 0127 (deep zone), with concentrations slightly more elevated in the deep zone. Concentrations are above the MCL in well 0183 in the deep zone and are decreasing slightly. Concentrations are less than the MCL, but also decreasing in monitor well 0188 (intermediate zone), and are relatively constant in well 0189 (deep zone). Concentrations are less than the MCL and slowly rising in wells 0160 (intermediate zone) and 0161 (deep zone) across the Gunnison River. This pattern of concentration intensity and distribution shows that uranium in ground water is migrating deeper in the alluvial sequence while progressing downgradient from the site, as predicted.

Concentrations of manganese beneath the site are above the RBC of 1.7 mg/L in the intermediate zone, with concentrations below the RBC in the shallow zone. All exceedences of the RBC are beneath or immediately adjacent to the south end of the site. Concentrations are generally decreasing over time.



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Figure 5. Ground Water and Surface Water Monitoring Locations at the Gunnison Site

Table 1. Ground Water and Surface Water Monitoring at the Gunnison Site

Monitor Well	Aquifer Zone	Screened Interval (ft)	Location	Rationale (Uranium)
Ground Water				
GUN-006	Shallow	10–15	On site	Hot spot
GUN-106	Intermediate	34–39	On site	Background
GUN-012	Shallow	10–15	On site	Hot spot
GUN-112	Intermediate	40–45	On site	Background
GUN-013	Shallow	11–16	Just off site	Above MCL
GUN-113	Intermediate	41–46	Just off site	Above MCL
GUN-126	Intermediate	54–59	Downgradient	Below MCL
GUN-127	Deep	94–99	Downgradient	Below MCL
GUN-062 ^a	Intermediate	50–55	Downgradient	South edge of plume
GUN-063 ^a	Deep	95–100	Downgradient	South edge of plume
GUN-183	Deep	93–98	Beneath golf course	Above MCL
GUN-188	Intermediate	53–58	West of Gunnison River	Above background
GUN-189	Deep	93–98	West of Gunnison River	Above background
GUN-160	Intermediate	51–56	West of Gunnison River	Above background
GUN-161	Deep	93–98	West of Gunnison River	Above background
Surface Water				
GUN-247			Gunnison River	Downstream
GUN-248			Tomichi Creek	Near Valco gravel pit
GUN-777			Tomichi Creek	Downstream
GUN-780			Valco gravel pit	Above MCL
GUN-792			Gunnison River	Upstream
GUN-795			Gunnison River	Downstream
Domestic Wells				
GUN-468	Shallow	Unknown	East of Gunnison River	Buffer zone
GUN-469	Shallow	Unknown	West of Gunnison River	Buffer zone
GUN-665	Shallow	Unknown	West of Gunnison River	Buffer zone
GUN-667	Shallow	Unknown	West of Gunnison River	Buffer zone
GUN-680 ^b	Shallow	Unknown	West of Gunnison River	Buffer zone
GUN-683	Shallow	Unknown	West of Gunnison River	Buffer zone
GUN-685	Shallow	Unknown	West of Gunnison River	Buffer zone

^aMonitor wells to be installed in Fiscal Year 2004.

^bWell no longer used -- sampling will be discontinued.

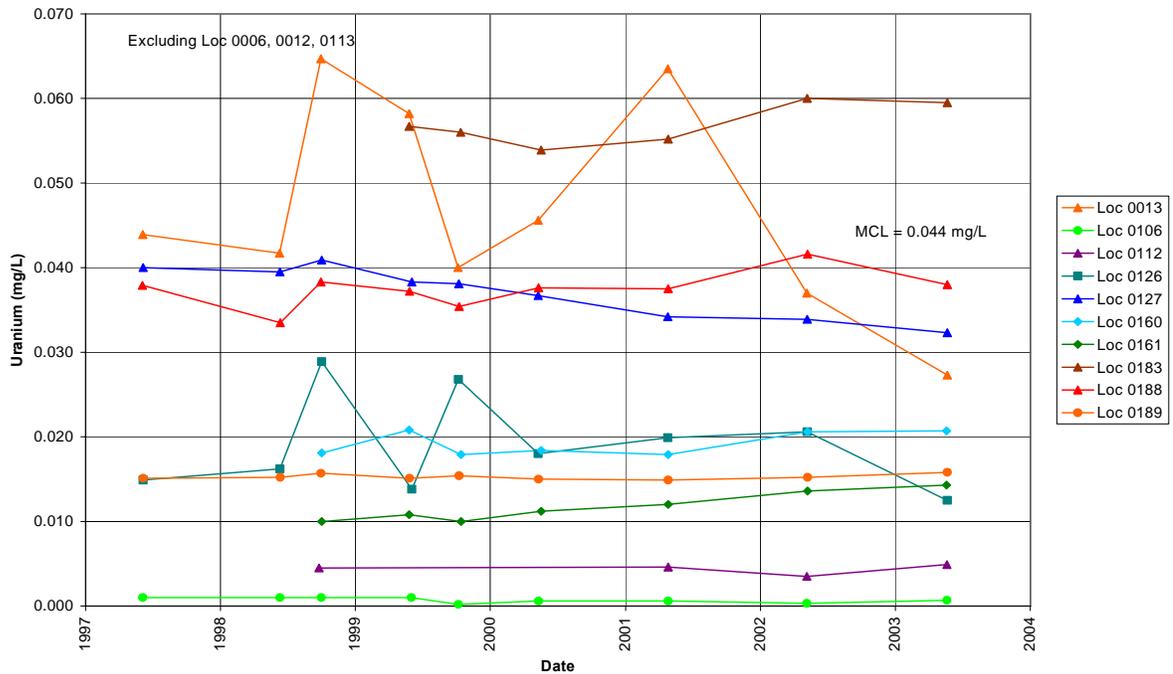
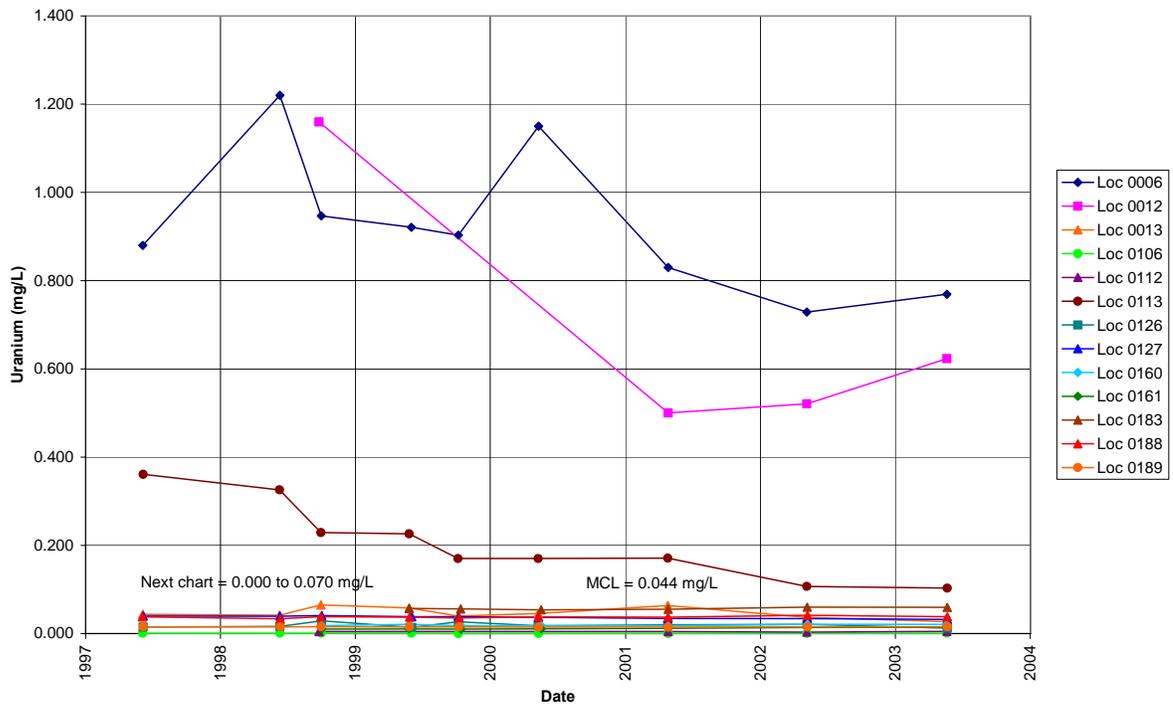


Figure 6. Uranium Concentrations in Ground Water in DOE Monitor Wells at the Gunnison Site

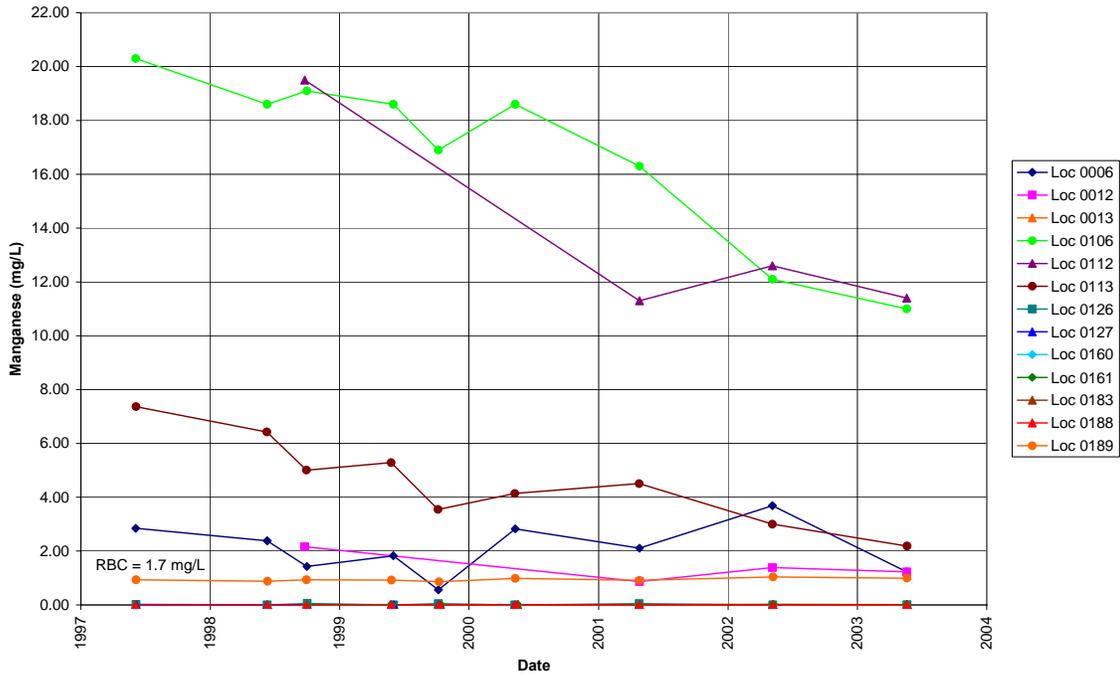


Figure 7. Manganese Concentrations in Ground Water for DOE Monitor Wells at the Gunnison Site

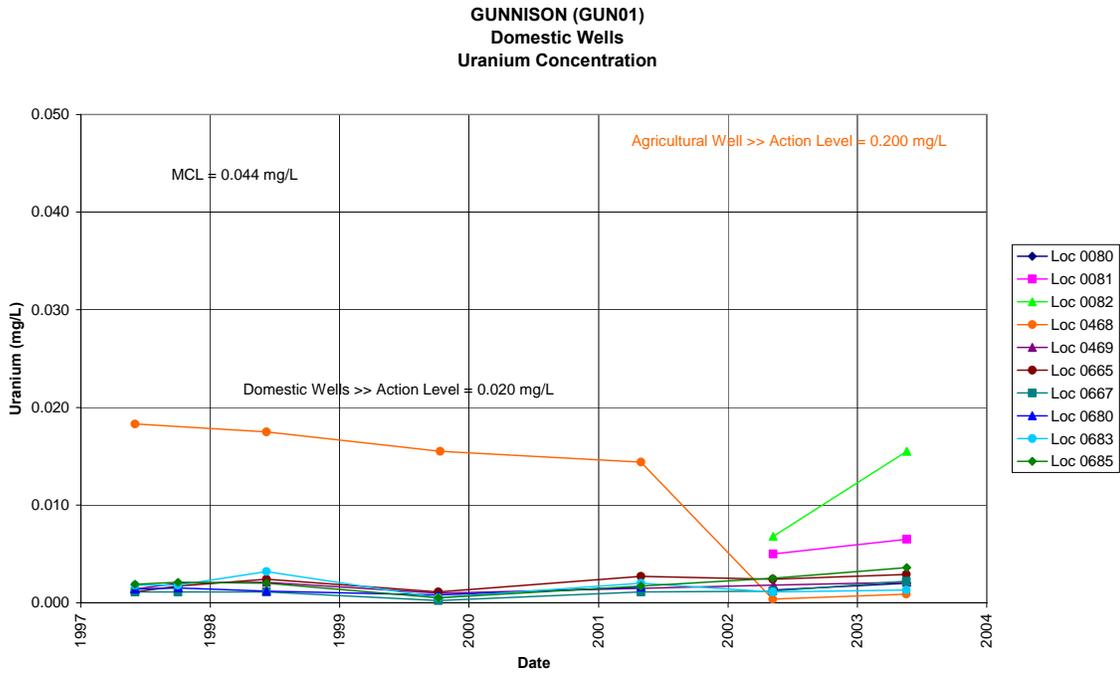


Figure 8. Uranium Concentrations in Ground Water in Domestic Wells at the Gunnison Site

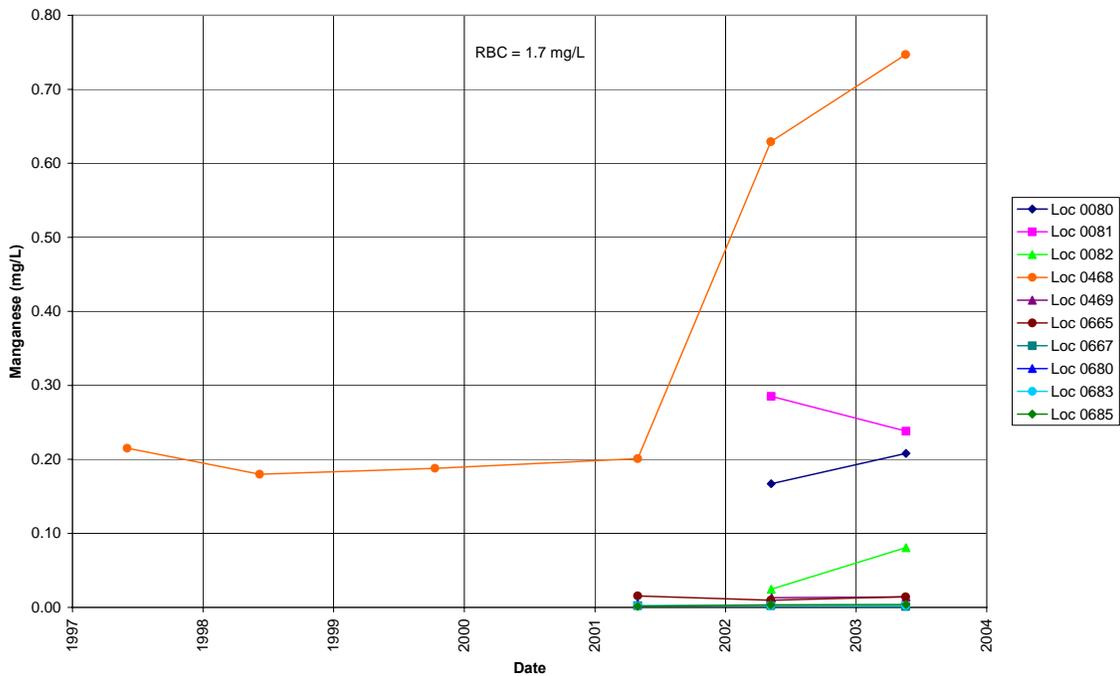


Figure 9. Manganese Concentrations in Ground Water in Domestic Wells at the Gunnison Site

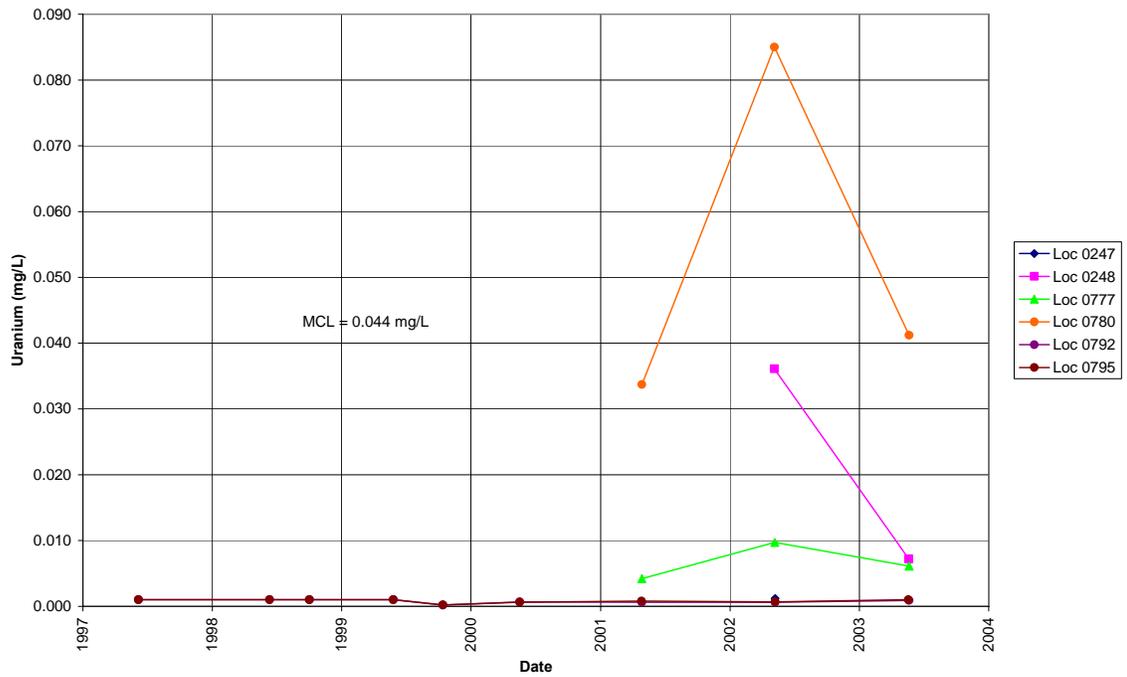


Figure 10. Uranium Concentrations in Surface Water at the Gunnison Site

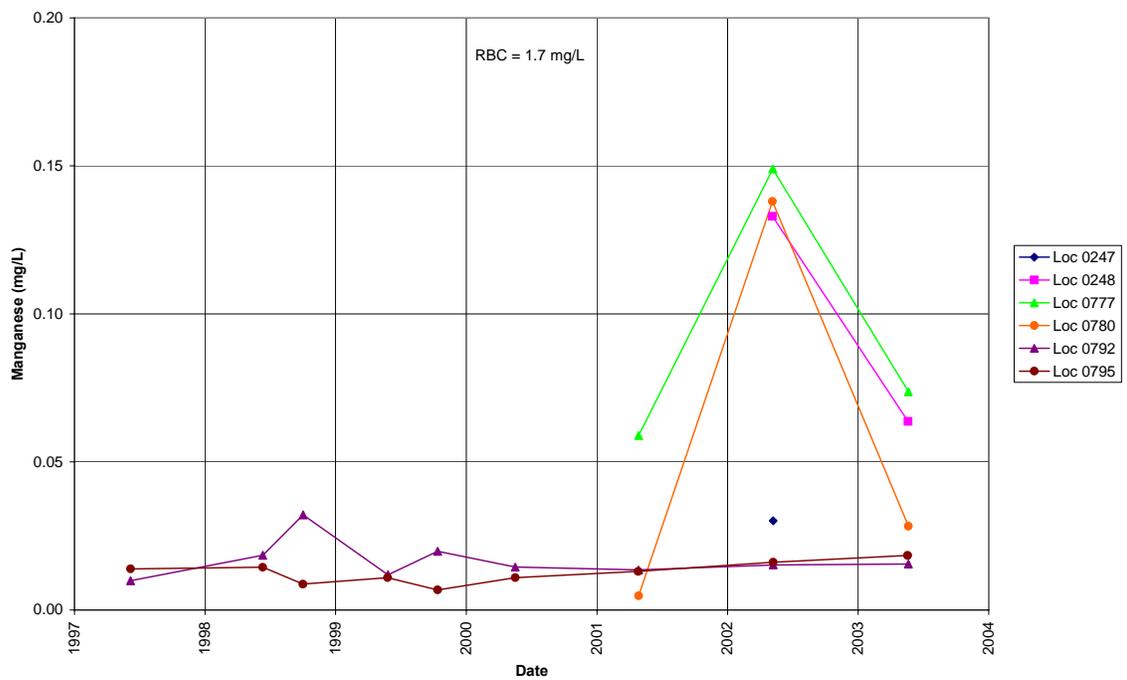


Figure 11. Manganese Concentrations in Surface Water at the Gunnison Site

Domestic Wells

Concentrations of uranium in ground water in the domestic buffer zone wells downgradient from the site are well below the MCL of 0.044 mg/L and below the action level set by CDPHE of 0.020 mg/L. Concentrations of uranium in the agricultural well (0468) are well below the CDPHE action level of 0.200 mg/L. Ground water was sampled during 2002 and 2003 in three new domestic wells (0080, 0081, and 0082) installed just southeast of Tomichi Creek in the proposed Tomichi Creek Preserve subdivision. The wells were approximately 44 ft deep and the open interval in the casing was unknown. Concentrations of uranium in ground water in the three wells during 2003 ranged from 0.002 to 0.0155 mg/L, with the maximum below the CDPHE action level of 0.020 mg/L for domestic wells. Since the uranium concentration in ground water in one of the wells (0082) was slightly above the upper range of background (0.0085 mg/L) (DOE 1996) during 2003, it will be sampled again in 2004. If concentrations continue to be elevated above background, ground water flow paths in the vicinity of Tomichi Creek will be further investigated.

Concentrations of manganese in ground water are well below the RBC of 1.7 mg/L.

Surface Water

Concentrations of uranium in surface water in the Gunnison River during 2003 were at or below 0.001 mg/L, indicating no site-related contamination in the river. Concentrations of uranium in surface water in the Valco, Inc. pond increased during 2002, but decreased during 2003 to below the MCL. Variable concentrations of uranium in surface water in the pit are expected since it is recharged by contaminated ground water. Concentrations vary because of the area and depth of pumping, the rate of discharge, and seasonal interactions between ground water and surface water. Concentrations of uranium in Tomichi Creek approximately 1,500 ft downstream from the Valco, Inc. pond discharge point (0248) were above background during 2002, but below background levels during 2003. This variation is probably a result of elevated concentrations discharging from the pond and a lower volume of water and flow rate in Tomichi Creek during 2002. Concentrations farther down Tomichi Creek, before the confluence with the Gunnison River, are below background levels.

Concentrations of manganese in surface water are well below the RBC of 1.7 mg/L.

4.0 Conclusions

Concentrations of uranium and manganese in ground water beneath the Gunnison site are still above the relevant MCLs and RBCs, but are generally decreasing with time as predicted, indicating that natural flushing is occurring in the alluvial aquifer (Figures 6 and 7). Concentrations of uranium in ground water downgradient from the site and deeper in the alluvial aquifer in some areas are increasing, as expected, as the plume migrates downgradient.

Concentrations of COPCs in ground water in the domestic wells are below the MCL and CDPHE action levels for uranium, and below the RBC for manganese (Figures 8 and 9).

Concentrations of uranium in surface water of the Gunnison River are at or below 0.001 mg/L, indicating no site-related contamination of the river (Figure 10). Concentrations of uranium in surface water in the Valco, Inc. pond are variable, which is expected since the pit is recharged by contaminated ground water. Based on a risk assessment in the SOWP, there is no unacceptable risk to human health at these levels (DOE 2001a). Concentrations are slightly elevated above background in parts of Tomichi Creek because of the discharge of contaminated water from the Valco, Inc. pond. Concentrations of manganese in surface water are less than 0.2 mg/L (Figure 11).

Comparison of uranium concentrations in ground water just off the southwest corner of the site in the intermediate zone in the alluvial aquifer predicted by ground water flow and transport modeling, versus actual concentrations determined by analysis of ground water samples from monitor well 0113, are shown in Figure 12.

Verification monitoring of COPCs in ground water in the alluvial aquifer and surface water in the vicinity of the Gunnison site will continue on an annual basis to assess the progress of natural flushing (Figure 5 and Table 1). An update to this report will be compiled after ground water and surface water monitoring in May 2004.

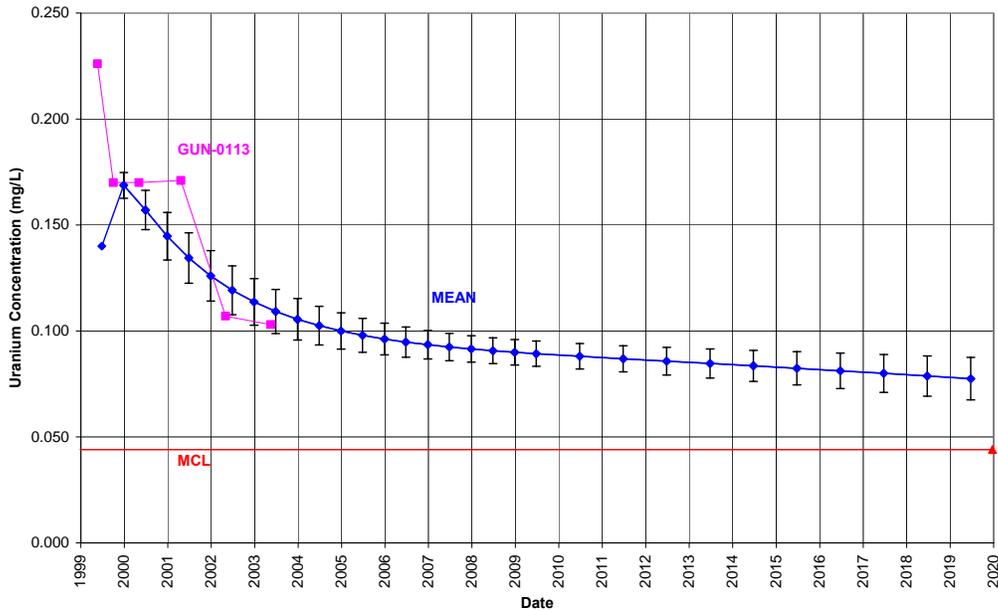


Figure 12. Uranium Concentration—Monitor Well 0113

5.0 References

U.S. Department of Energy (DOE), 1996. *Baseline Risk Assessment of Ground Water Contamination at the Uranium Mill Tailings Site Near Gunnison, Colorado*, DOE/AL/62350-57, Rev.2, June.

———, 2001a. *Final Site Observational Work Plan for the Gunnison, Colorado, UMTRA Project Site*, GJO-2001-214-TAR, March.

———, 2001b. *Ground Water Compliance Action Plan for the Gunnison, Colorado, UMTRA Project Site*, GJO-2001-233-TAR, July, revision in progress.

———, 2002. *Environmental Assessment of Ground Water Compliance at the Gunnison, Colorado, UMTRA Project Site*, DOE/EA-1399, Final, July.

U.S. Nuclear Regulatory Commission (NRC), 2002. “Review of the Final Site Observational Work Plan for the Uranium Mill Tailings Remedial Action Project Site at Gunnison, Colorado,” letter from NRC to DOE dated January 29, 2002.

Appendix A

Ground Water Quality Data by Parameter for DOE Monitor Wells

GROUND WATER QUALITY DATA BY PARAMETER WITH DEPTH (USEE200) FOR SITE GUN01, GUNNISON
 REPORT DATE: 7/24/2003 8:32 am

PARAMETER	UNITS	LOCATION ID	LOCATION TYPE	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Manganese	mg/L	0006	WL	05/10/2000	0001	10.00 - 15.00	2.830	#	-	-
	mg/L	0006	WL	04/26/2001	0001	10.00 - 15.00	2.110	L #	0.0001	-
	mg/L	0006	WL	05/06/2002	0001	10.00 - 15.00	3.690	F #	0.0001	-
	mg/L	0006	WL	05/20/2003	0001	10.00 - 15.00	1.230	F #	0.0002	-
	mg/L	0012	WL	04/26/2001	0001	10.00 - 15.00	0.869	#	0.0001	-
	mg/L	0012	WL	05/06/2002	0001	10.00 - 15.00	1.390	F #	0.0001	-
	mg/L	0012	WL	05/20/2003	0001	10.00 - 15.00	1.230	F #	0.0002	-
	mg/L	0013	WL	05/09/2000	0001	11.00 - 16.00	0.0004	U #	0.0004	-
	mg/L	0013	WL	04/25/2001	0001	11.00 - 16.00	0.00025	B U #	0.0001	-
	mg/L	0013	WL	05/06/2002	0001	11.00 - 16.00	0.00066	B F #	0.0001	-
	mg/L	0013	WL	05/21/2003	0001	11.00 - 16.00	0.00045	B F #	0.0002	-
	mg/L	0106	WL	05/10/2000	0001	34.00 - 39.00	18.600	#	-	-
	mg/L	0106	WL	04/26/2001	0001	34.00 - 39.00	16.300	#	0.0001	-
	mg/L	0106	WL	05/06/2002	0001	34.00 - 39.00	12.100	F #	0.0001	-
	mg/L	0106	WL	05/20/2003	0001	34.00 - 39.00	11.000	F #	0.0002	-
	mg/L	0112	WL	04/26/2001	0001	40.00 - 45.00	11.300	#	0.0001	-
	mg/L	0112	WL	05/06/2002	0001	40.00 - 45.00	12.600	F #	0.0001	-
	mg/L	0112	WL	05/20/2003	0001	40.00 - 45.00	11.400	F #	0.0002	-
	mg/L	0113	WL	05/09/2000	0001	41.00 - 46.00	4.140	#	-	-
	mg/L	0113	WL	04/25/2001	0001	41.00 - 46.00	4.510	#	0.0001	-
	mg/L	0113	WL	05/06/2002	0001	41.00 - 46.00	3.000	F #	0.0001	-
	mg/L	0113	WL	05/21/2003	0001	41.00 - 46.00	2.190	F #	0.0002	-
	mg/L	0126	WL	05/09/2000	0001	54.00 - 59.00	0.0004	U #	0.0004	-
	mg/L	0126	WL	04/25/2001	0001	54.00 - 59.00	0.048	#	0.0001	-
	mg/L	0126	WL	05/07/2002	0001	54.00 - 59.00	0.0027	B F #	0.0001	-
	mg/L	0126	WL	05/21/2003	0001	54.00 - 59.00	0.00490	B F #	0.0002	-

GROUND WATER QUALITY DATA BY PARAMETER WITH DEPTH (USEE200) FOR SITE GUN01, GUNNISON
 REPORT DATE: 7/24/2003 8:32 am

PARAMETER	UNITS	LOCATION ID	LOCATION TYPE	SAMPLE:		DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS:			DETECTION LIMIT	UN-CERTAINTY	
				DATE	ID			LAB	DATA	QA			
Manganese	mg/L	0127	WL	05/09/2000	0001	94.00 - 99.00	0.0011	B		#	-	-	
	mg/L	0127	WL	04/25/2001	0001	94.00 - 99.00	0.00013	B		#	0.0001	-	
	mg/L	0127	WL	05/07/2002	0001	94.00 - 99.00	0.00062	B	UF	#	0.0001	-	
	mg/L	0127	WL	05/21/2003	0001	94.00 - 99.00	0.00380	B	F	#	0.0002	-	
	mg/L	0160	WL	05/17/2000	0001	51.00 - 56.00	0.007	B		#	-	-	
	mg/L	0160	WL	04/26/2001	0001	51.00 - 56.00	0.0065	B		#	0.0001	-	
	mg/L	0160	WL	05/08/2002	0001	51.00 - 56.00	0.003	B	F	#	0.0001	-	
	mg/L	0160	WL	05/19/2003	0001	51.00 - 56.00	0.00220	B	F	#	0.0002	-	
	mg/L	0161	WL	05/17/2000	0001	93.00 - 98.00	0.0069	B		#	-	-	
	mg/L	0161	WL	04/26/2001	0001	93.00 - 98.00	0.0076	B		#	0.0001	-	
	mg/L	0161	WL	05/08/2002	0001	93.00 - 98.00	0.0201		F	#	0.0001	-	
	mg/L	0161	WL	05/19/2003	0001	93.00 - 98.00	0.0127		F	#	0.0002	-	
	mg/L	0183	WL	05/17/2000	0001	93.00 - 98.00	0.0091	B		#	-	-	
	mg/L	0183	WL	04/26/2001	0001	93.00 - 98.00	0.0032	B		#	0.0001	-	
	mg/L	0183	WL	04/26/2001	0002	93.00 - 98.00	0.004	B		#	0.0001	-	
	mg/L	0183	WL	05/07/2002	0001	93.00 - 98.00	0.0013	B	F	#	0.0001	-	
	mg/L	0183	WL	05/21/2003	0001	93.00 - 98.00	0.00730	B	F	#	0.0002	-	
	mg/L	0188	WL	05/10/2000	0001	53.00 - 58.00	0.0012	B	U	#	-	-	
	mg/L	0188	WL	04/26/2001	0001	53.00 - 58.00	0.0011	B		#	0.0001	-	
	mg/L	0188	WL	05/08/2002	0001	53.00 - 58.00	0.00033	B	UF	#	0.0001	-	
	mg/L	0188	WL	05/21/2003	0001	53.00 - 58.00	0.00025	B	F	#	0.0002	-	
	mg/L	0189	WL	05/10/2000	0001	93.00 - 98.00	0.989		L	#	-	-	
	mg/L	0189	WL	04/26/2001	0001	93.00 - 98.00	0.913			#	0.0001	-	
	mg/L	0189	WL	05/08/2002	0001	93.00 - 98.00	1.040		F	#	0.0001	-	
	mg/L	0189	WL	05/21/2003	0001	93.00 - 98.00	0.993		F	#	0.0002	-	
	Uranium	mg/L	0006	WL	05/10/2000	0001	10.00 - 15.00	1.150			#	-	-

GROUND WATER QUALITY DATA BY PARAMETER WITH DEPTH (USEE200) FOR SITE GUN01, GUNNISON
 REPORT DATE: 7/24/2003 8:32 am

PARAMETER	UNITS	LOCATION ID	LOCATION TYPE	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Uranium	mg/L	0006	WL	04/26/2001	0001	10.00 - 15.00	0.830	L #	0.0001	-
	mg/L	0006	WL	05/06/2002	0001	10.00 - 15.00	0.729	F #	0.0001	-
	mg/L	0006	WL	05/20/2003	0001	10.00 - 15.00	0.769	F #	0.0001	-
	mg/L	0012	WL	04/26/2001	0001	10.00 - 15.00	0.500	#	0.0001	-
	mg/L	0012	WL	05/06/2002	0001	10.00 - 15.00	0.521	F #	0.0001	-
	mg/L	0012	WL	05/20/2003	0001	10.00 - 15.00	0.623	F #	0.0001	-
	mg/L	0013	WL	05/09/2000	0001	11.00 - 16.00	0.0456	#	-	-
	mg/L	0013	WL	04/25/2001	0001	11.00 - 16.00	0.0635	#	0.0001	-
	mg/L	0013	WL	05/06/2002	0001	11.00 - 16.00	0.037	F #	0.0001	-
	mg/L	0013	WL	05/21/2003	0001	11.00 - 16.00	0.0273	F #	0.0001	-
	mg/L	0106	WL	05/10/2000	0001	34.00 - 39.00	0.0006	B #	-	-
	mg/L	0106	WL	04/26/2001	0001	34.00 - 39.00	0.00059	B #	0.0001	-
	mg/L	0106	WL	05/06/2002	0001	34.00 - 39.00	0.00032	B F #	0.0001	-
	mg/L	0106	WL	05/20/2003	0001	34.00 - 39.00	0.00068	B F #	0.0001	-
	mg/L	0112	WL	04/26/2001	0001	40.00 - 45.00	0.0046	#	0.0001	-
	mg/L	0112	WL	05/06/2002	0001	40.00 - 45.00	0.0035	F #	0.0001	-
	mg/L	0112	WL	05/20/2003	0001	40.00 - 45.00	0.00490	F #	0.0001	-
	mg/L	0113	WL	05/09/2000	0001	41.00 - 46.00	0.170	#	-	-
	mg/L	0113	WL	04/25/2001	0001	41.00 - 46.00	0.171	#	0.0001	-
	mg/L	0113	WL	05/06/2002	0001	41.00 - 46.00	0.107	F #	0.0001	-
	mg/L	0113	WL	05/21/2003	0001	41.00 - 46.00	0.103	F #	0.0001	-
	mg/L	0126	WL	05/09/2000	0001	54.00 - 59.00	0.018	#	-	-
	mg/L	0126	WL	04/25/2001	0001	54.00 - 59.00	0.0199	#	0.0001	-
	mg/L	0126	WL	05/07/2002	0001	54.00 - 59.00	0.0206	F #	0.0001	-
	mg/L	0126	WL	05/21/2003	0001	54.00 - 59.00	0.0125	F #	0.0001	-
	mg/L	0127	WL	05/09/2000	0001	94.00 - 99.00	0.0367	#	-	-

GROUND WATER QUALITY DATA BY PARAMETER WITH DEPTH (USEE200) FOR SITE GUN01, GUNNISON
 REPORT DATE: 7/24/2003 8:32 am

PARAMETER	UNITS	LOCATION ID	LOCATION TYPE	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Uranium	mg/L	0127	WL	04/25/2001	0001	94.00 - 99.00	0.0342	#	0.0001	-
	mg/L	0127	WL	05/07/2002	0001	94.00 - 99.00	0.0339	F #	0.0001	-
	mg/L	0127	WL	05/21/2003	0001	94.00 - 99.00	0.0323	F #	0.0001	-
	mg/L	0160	WL	05/17/2000	0001	51.00 - 56.00	0.0184	#	-	-
	mg/L	0160	WL	04/26/2001	0001	51.00 - 56.00	0.0179	#	0.0001	-
	mg/L	0160	WL	05/08/2002	0001	51.00 - 56.00	0.0206	F #	0.0001	-
	mg/L	0160	WL	05/19/2003	0001	51.00 - 56.00	0.0207	F #	0.0001	-
	mg/L	0161	WL	05/17/2000	0001	93.00 - 98.00	0.0112	#	-	-
	mg/L	0161	WL	04/26/2001	0001	93.00 - 98.00	0.012	#	0.0001	-
	mg/L	0161	WL	05/08/2002	0001	93.00 - 98.00	0.0136	F #	0.0001	-
	mg/L	0161	WL	05/19/2003	0001	93.00 - 98.00	0.0143	F #	0.0001	-
	mg/L	0183	WL	05/17/2000	0001	93.00 - 98.00	0.0539	#	-	-
	mg/L	0183	WL	04/26/2001	0001	93.00 - 98.00	0.0552	#	0.0001	-
	mg/L	0183	WL	04/26/2001	0002	93.00 - 98.00	0.055	#	0.0001	-
	mg/L	0183	WL	05/07/2002	0001	93.00 - 98.00	0.060	F #	0.0001	-
	mg/L	0183	WL	05/21/2003	0001	93.00 - 98.00	0.0595	F #	0.0001	-
	mg/L	0188	WL	05/10/2000	0001	53.00 - 58.00	0.0376	#	-	-
	mg/L	0188	WL	04/26/2001	0001	53.00 - 58.00	0.0375	#	0.0001	-
	mg/L	0188	WL	05/08/2002	0001	53.00 - 58.00	0.0416	F #	0.0001	-
	mg/L	0188	WL	05/21/2003	0001	53.00 - 58.00	0.0380	F #	0.0001	-
	mg/L	0189	WL	05/10/2000	0001	93.00 - 98.00	0.015	L #	-	-
	mg/L	0189	WL	04/26/2001	0001	93.00 - 98.00	0.0149	#	0.0001	-
	mg/L	0189	WL	05/08/2002	0001	93.00 - 98.00	0.0152	F #	0.0001	-
	mg/L	0189	WL	05/21/2003	0001	93.00 - 98.00	0.0158	F #	0.0001	-

GROUND WATER QUALITY DATA BY PARAMETER WITH DEPTH (USEE200) FOR SITE GUN01, GUNNISON
 REPORT DATE: 7/24/2003 8:32 am

PARAMETER	UNITS	LOCATION ID	LOCATION TYPE	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
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RECORDS: SELECTED FROM USEE200 WHERE site_code='GUN01' AND location_code in('0006','0012','0013','0106','0112','0113','0126','0127','0160','0161','0183','0188','0189') AND (data_validation_qualifiers IS NULL OR data_validation_qualifiers NOT LIKE '%R%' AND data_validation_qualifiers NOT LIKE '%X%') AND cas in('07439-96-5','07440-61-1') AND DATE_SAMPLED between #1/1/2000# and #1/1/2004#

SAMPLE ID CODES: 000X = Filtered sample (0.45 µm). N00X = Unfiltered sample. X = replicate number.

LOCATION TYPES: WL WELL

LAB QUALIFIERS:

- * Replicate analysis not within control limits.
- + Correlation coefficient for MSA < 0.995.
- > Result above upper detection limit.
- A TIC is a suspected aldol-condensation product.
- B Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank.
- C Pesticide result confirmed by GC-MS.
- D Analyte determined in diluted sample.
- E Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
- H Holding time expired, value suspect.
- I Increased detection limit due to required dilution.
- J Estimated
- M GFAA duplicate injection precision not met.
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound (TIC).
- P > 25% difference in detected pesticide or Arochlor concentrations between 2 columns.
- S Result determined by method of standard addition (MSA).
- U Analytical result below detection limit.
- W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- X Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Y Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Z Laboratory defined (USEPA CLP organic) qualifier, see case narrative.

DATA QUALIFIERS:

- | | | |
|--|--|--------------------|
| F Low flow sampling method used. | G Possible grout contamination, pH > 9. | J Estimated value. |
| L Less than 3 bore volumes purged prior to sampling. | Q Qualitative result due to sampling technique | R Unusable result. |
| U Parameter analyzed for but was not detected. | X Location is undefined. | |

QA QUALIFIER: # = validated according to Quality Assurance guidelines.

Appendix B

Ground Water Quality Data by Parameter for Domestic Wells

GROUND WATER QUALITY DATA BY PARAMETER WITH DEPTH (USEE200) FOR SITE GUN01, GUNNISON
 REPORT DATE: 7/24/2003 8:37 am

PARAMETER	UNITS	LOCATION ID	LOCATION TYPE	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Manganese	mg/L	0080	WL	05/08/2002	0001		0.167	#	0.0001	-
	mg/L	0080	WL	05/20/2003	N001		0.208	F #	0.00022	-
	mg/L	0081	WL	05/08/2002	0001		0.285	F #	0.0001	-
	mg/L	0081	WL	05/20/2003	N001		0.238	F #	0.00022	-
	mg/L	0082	WL	05/08/2002	0001		0.0245	F #	0.0001	-
	mg/L	0082	WL	05/20/2003	N001		0.0807	F #	0.00022	-
	mg/L	0468	WL	04/30/2001	N001		0.201	#	0.00011	-
	mg/L	0468	WL	05/07/2002	N001		0.629	F #	0.00011	-
	mg/L	0468	WL	05/19/2003	N001		0.747	F #	0.00022	-
	mg/L	0469	WL	05/09/2002	N001		0.013	#	0.00011	-
	mg/L	0469	WL	05/20/2003	N001		0.0140	#	0.00022	-
	mg/L	0665	WL	04/30/2001	N001		0.0156	#	0.00011	-
	mg/L	0665	WL	05/07/2002	N001		0.0096	B #	0.00011	-
	mg/L	0665	WL	05/07/2002	N002		0.0096	B #	0.00011	-
	mg/L	0665	WL	05/19/2003	N001		0.0142	#	0.00022	-
	mg/L	0667	WL	04/30/2001	N001		0.0023	B #	0.00011	-
	mg/L	0667	WL	05/07/2002	N001		0.0023	B #	0.00011	-
	mg/L	0667	WL	05/19/2003	N001		0.00099	B U #	0.00022	-
	mg/L	0667	WL	05/19/2003	N002		0.00110	B U #	0.00022	-
	mg/L	0680	WL	04/30/2001	N001		0.0028	B #	0.00011	-
	mg/L	0680	WL	04/30/2001	N002		0.0051	B #	0.00011	-
	mg/L	0683	WL	04/30/2001	N001		0.0021	B #	0.00011	-
	mg/L	0683	WL	05/07/2002	N001		0.0023	B #	0.00011	-
	mg/L	0683	WL	05/19/2003	N001		0.00210	B U #	0.00022	-
	mg/L	0685	WL	04/30/2001	N001		0.0015	B #	0.00011	-
	mg/L	0685	WL	05/07/2002	N001		0.0034	B #	0.00011	-

GROUND WATER QUALITY DATA BY PARAMETER WITH DEPTH (USEE200) FOR SITE GUN01, GUNNISON
 REPORT DATE: 7/24/2003 8:37 am

PARAMETER	UNITS	LOCATION ID	LOCATION TYPE	SAMPLE DATE	SAMPLE ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Manganese	mg/L	0685	WL	05/20/2003	N001		0.00400	B U #	0.00022	-
Uranium	mg/L	0080	WL	05/08/2002	0001		0.0013	#	0.0001	-
	mg/L	0080	WL	05/20/2003	N001		0.00200	F #	0.00011	-
	mg/L	0081	WL	05/08/2002	0001		0.005	F #	0.0001	-
	mg/L	0081	WL	05/20/2003	N001		0.00650	F #	0.00011	-
	mg/L	0082	WL	05/08/2002	0001		0.0068	F #	0.0001	-
	mg/L	0082	WL	05/20/2003	N001		0.0155	F #	0.00011	-
	mg/L	0468	WL	04/30/2001	N001		0.0144	#	0.00011	-
	mg/L	0468	WL	05/07/2002	N001		0.00037	B F #	0.00011	-
	mg/L	0468	WL	05/19/2003	N001		0.00089	B F #	0.00011	-
	mg/L	0469	WL	05/09/2002	N001		0.0018	#	0.00011	-
	mg/L	0469	WL	05/20/2003	N001		0.00210	#	0.00011	-
	mg/L	0665	WL	04/30/2001	N001		0.0027	#	0.00011	-
	mg/L	0665	WL	05/07/2002	N001		0.0024	#	0.00011	-
	mg/L	0665	WL	05/07/2002	N002		0.0023	#	0.00011	-
	mg/L	0665	WL	05/19/2003	N001		0.00290	#	0.00011	-
	mg/L	0667	WL	04/30/2001	N001		0.0011	#	0.00011	-
	mg/L	0667	WL	05/07/2002	N001		0.0012	#	0.00011	-
	mg/L	0667	WL	05/19/2003	N001		0.00220	#	0.00011	-
	mg/L	0667	WL	05/19/2003	N002		0.00210	#	0.00011	-
	mg/L	0680	WL	04/30/2001	N001		0.0015	#	0.00011	-
	mg/L	0680	WL	04/30/2001	N002		0.0016	#	0.00011	-
	mg/L	0683	WL	04/30/2001	N001		0.002	#	0.00011	-
	mg/L	0683	WL	05/07/2002	N001		0.0011	#	0.00011	-
	mg/L	0683	WL	05/19/2003	N001		0.00130	#	0.00011	-
	mg/L	0685	WL	04/30/2001	N001		0.0017	#	0.00011	-

GROUND WATER QUALITY DATA BY PARAMETER WITH DEPTH (USEE200) FOR SITE GUN01, GUNNISON
 REPORT DATE: 7/24/2003 8:37 am

PARAMETER	UNITS	LOCATION ID	LOCATION TYPE	SAMPLE: DATE	SAMPLE: ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Uranium	mg/L	0685	WL	05/07/2002	N001		0.0025	#	0.00011	-
	mg/L	0685	WL	05/20/2003	N001		0.00360	#	0.00011	-

RECORDS: SELECTED FROM USEE200 WHERE site_code='GUN01' AND location_code in('0080','0081','0082','0468','0469','0665','0667','0680','0683','0685') AND (data_validation_qualifiers IS NULL OR data_validation_qualifiers NOT LIKE '%R%' AND data_validation_qualifiers NOT LIKE '%X%') AND cas in('07439-96-5','07440-61-1') AND DATE_SAMPLED between #1/1/2000# and #1/1/2004#

SAMPLE ID CODES: 000X = Filtered sample (0.45 µm). N00X = Unfiltered sample. X = replicate number.

LOCATION TYPES: WL WELL

LAB QUALIFIERS:

- * Replicate analysis not within control limits.
- + Correlation coefficient for MSA < 0.995.
- > Result above upper detection limit.
- A TIC is a suspected aldol-condensation product.
- B Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank.
- C Pesticide result confirmed by GC-MS.
- D Analyte determined in diluted sample.
- E Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
- H Holding time expired, value suspect.
- I Increased detection limit due to required dilution.
- J Estimated
- M GFAA duplicate injection precision not met.
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound (TIC).
- P > 25% difference in detected pesticide or Arochlor concentrations between 2 columns.
- S Result determined by method of standard addition (MSA).
- U Analytical result below detection limit.
- W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- X Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Y Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Z Laboratory defined (USEPA CLP organic) qualifier, see case narrative.

DATA QUALIFIERS:

- F Low flow sampling method used.
- L Less than 3 bore volumes purged prior to sampling.
- U Parameter analyzed for but was not detected.
- G Possible grout contamination, pH > 9.
- Q Qualitative result due to sampling technique
- X Location is undefined.
- J Estimated value.
- R Unusable result.

QA QUALIFIER: # = validated according to Quality Assurance guidelines.

Appendix C

Surface Water Quality Data by Parameter

SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE GUN01, GUNNISON
 REPORT DATE: 7/24/2003 8:41 am

PARAMETER	UNITS	LOCATION		SAMPLE:		RESULT	QUALIFIERS:		DETECTION LIMIT	UN- CERTAINTY
		ID	DATE	ID	DATE		LAB	DATA QA		
Manganese	mg/L	0247	05/08/2002	0001		0.0301	#		0.0001	-
	mg/L	0248	05/06/2002	0001		0.133	#		0.0001	-
	mg/L	0248	05/20/2003	0001		0.0637	#		0.0002	-
	mg/L	0777	04/27/2001	0001		0.0589	#		0.0001	-
	mg/L	0777	05/07/2002	0001		0.146	#		0.0001	-
	mg/L	0777	05/07/2002	0002		0.149	#		0.0001	-
	mg/L	0777	05/21/2003	0001		0.0737	#		0.0002	-
	mg/L	0780	04/27/2001	0001		0.0039 B	#		0.0001	-
	mg/L	0780	04/27/2001	0002		0.0048 B	#		0.0001	-
	mg/L	0780	05/06/2002	0001		0.135	#		0.0001	-
	mg/L	0780	05/06/2002	0002		0.138	#		0.0001	-
	mg/L	0780	05/21/2003	0001		0.0275	#		0.0002	-
	mg/L	0780	05/21/2003	0002		0.0283	#		0.0002	-
	mg/L	0792	05/17/2000	0001		0.014	#		-	-
	mg/L	0792	05/17/2000	0002		0.0145	#		-	-
	mg/L	0792	04/27/2001	0001		0.0135	#		0.0001	-
	mg/L	0792	05/08/2002	0001		0.0152	#		0.0001	-
	mg/L	0792	05/21/2003	0001		0.0155	#		0.0002	-
	mg/L	0795	05/17/2000	0001		0.0109	#		-	-
	mg/L	0795	04/26/2001	0001		0.013	#		0.0001	-
mg/L	0795	05/08/2002	0001		0.0161	#		0.0001	-	
mg/L	0795	05/19/2003	0001		0.0184	#		0.0002	-	
Uranium	mg/L	0247	05/08/2002	0001		0.0012	#		0.0001	-
	mg/L	0248	05/06/2002	0001		0.0361	#		0.0001	-
	mg/L	0248	05/20/2003	0001		0.0072	#		0.0001	-
	mg/L	0777	04/27/2001	0001		0.0042	#		0.0001	-
	mg/L	0777	05/07/2002	0001		0.0097	#		0.0001	-
	mg/L	0777	05/07/2002	0002		0.0096	#		0.0001	-
	mg/L	0777	05/21/2003	0001		0.0061	#		0.0001	-
	mg/L	0780	04/27/2001	0001		0.0336	#		0.0001	-
	mg/L	0780	04/27/2001	0002		0.0337	#		0.0001	-
	mg/L	0780	05/06/2002	0001		0.0842	#		0.0001	-
	mg/L	0780	05/06/2002	0002		0.085	#		0.0001	-
	mg/L	0780	05/21/2003	0001		0.0412	#		0.0001	-
	mg/L	0780	05/21/2003	0002		0.0408	#		0.0001	-
	mg/L	0792	05/17/2000	0001		0.0006 B	#		-	-
	mg/L	0792	05/17/2000	0002		0.0006 B	#		-	-
	mg/L	0792	04/27/2001	0001		0.0006 B	#		0.0001	-

SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE GUN01, GUNNISON
 REPORT DATE: 7/24/2003 8:41 am

PARAMETER	UNITS	LOCATION	SAMPLE:		RESULT	QUALIFIERS:	DETECTION	UN-
		ID	DATE	ID		LAB DATA QA		
Uranium	mg/L	0792	05/08/2002	0001	0.0006	B #	0.0001	-
	mg/L	0792	05/21/2003	0001	0.0009	B #	0.0001	-
	mg/L	0795	05/17/2000	0001	0.0006	B #	-	-
	mg/L	0795	04/26/2001	0001	0.0007	B #	0.0001	-
	mg/L	0795	05/08/2002	0001	0.0006	B #	0.0001	-
	mg/L	0795	05/19/2003	0001	0.001	B #	0.0001	-

RECORDS: SELECTED FROM USEE800 WHERE site_code='GUN01' AND location_code in('0247','0248','0777','0780','0792','0795') AND (data_validation_qualifiers IS NULL OR data_validation_qualifiers NOT LIKE '%R%' AND data_validation_qualifiers NOT LIKE '%X%') AND cas in('07439-96-5','07440-61-1') AND DATE_SAMPLED between #1/1/2000# and #1/1/2004#

SAMPLE ID CODES: 000X = Filtered sample (0.45 µm). N00X = Unfiltered sample. X = replicate number.

LAB QUALIFIERS:

- * Replicate analysis not within control limits.
- + Correlation coefficient for MSA < 0.995.
- > Result above upper detection limit.
- A TIC is a suspected aldol-condensation product.
- B Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank.
- C Pesticide result confirmed by GC-MS.
- D Analyte determined in diluted sample.
- E Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
- H Holding time expired, value suspect.
- I Increased detection limit due to required dilution.
- J Estimated
- M GFAA duplicate injection precision not met.
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound (TIC).
- P > 25% difference in detected pesticide or Arochlor concentrations between 2 columns.
- S Result determined by method of standard addition (MSA).
- U Analytical result below detection limit.
- W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- X Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Y Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Z Laboratory defined (USEPA CLP organic) qualifier, see case narrative.

DATA QUALIFIERS:

- F Low flow sampling method used.
- J Estimated value.
- Q Qualitative result due to sampling technique
- U Parameter analyzed for but was not detected.
- G Possible grout contamination, pH > 9.
- L Less than 3 bore volumes purged prior to sampling.
- R Unusable result.
- X Location is undefined.

QA QUALIFIER: # = validated according to Quality Assurance guidelines.