



U.S. Department of Energy

Grand Junction Office
2597 B³/₄ Road
Grand Junction, CO 81503

SEP 28 2000

Thomas H. Essig, Chief
Uranium Recovery and Low-Level Waste Branch
U.S. Nuclear Regulatory Commission
Mail Stop T7J8
Washington, DC 20555-0001

Subject: Transmittal of the *Ground Water Compliance Action Plan* for the Gunnison, Colorado, UMTRA Project Site

Dear Mr. Essig:

Enclosed are two copies of the *Ground Water Compliance Action Plan* (GCAP) for the Gunnison, Colorado, UMTRA Project Site (September 2000). This GCAP serves as a stand-alone modification to the *Remedial Action Plan and Site Design for Stabilization of the Inactive Uranium Mill Tailings Sites at Gunnison, Colorado* (DOE 1992), and is the U.S. Nuclear Regulatory Commission concurrence document for compliance with Subpart B of 40 CFR 192 for the Gunnison, site. The GCAP is being transmitted to the State of Colorado, concurrent with this transmittal.

The DOE has determined that natural flushing of the alluvial aquifer in conjunction with institutional controls and continued monitoring is the appropriate compliance strategy for remediation of all contaminants at the Gunnison site. The DOE is currently in the process of completing the required National Environmental Policy Act requirements. An Environmental Assessment is under development at this time.

The GCAP will be added to the NRC and DOE-GJO document review log, and we will discuss a completion date during our next teleconference. The supporting technical data resides in the *Final Site Observational Work Plan (SOWP) for the Uranium Mill Tailings Remedial Action Project Gunnison Site* (September 2000). The SOWP is being transmitted to your office under separate cover.

If you have any questions, please call me at (970) 248-7612.

Sincerely,

A handwritten signature in black ink, appearing to read "Donald R. Metzler", is written over the word "Sincerely,".

Donald R. Metzler, P.Hg.
Technical/Project Manager

Enclosures

NMSS08
WM-61

cc w/o enclosure:

C. Abrams, NRC

D. Gillen, NRC

M. Layton, NRC

W. Von Till, NRC

W. Naugle, CDPHE/Denver

R. Heydenburg, MACTEC-ERS

S. Marutzky, MACTEC-ERS

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Ground Water Compliance Action Plan for the Gunnison, Colorado, UMTRA Project Site

September 2000

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



**Ground Water Compliance Action Plan
for the Gunnison, Colorado,
UMTRA Project Site**

September 2000

**Prepared by
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Grand Junction, Colorado**

**Project Number UGW-511-0010-10-000
Document Number U0111300**

Work Performed Under DOE Contract Number DE-AC13-96GJ87335

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1.0 Introduction

This *Ground Water Compliance Action Plan* (GCAP) presents the proposed compliance strategy for ground water cleanup at the Gunnison, Colorado uranium processing site (Figure 1). It is based on U.S. Department of Energy (DOE) evaluation of information included in the Site Observational Work Plan (SOWP) (DOE 2000a). The GCAP will serve as a stand-alone modification to the *Remedial Action Plan and Site Design for Stabilization of the Inactive Uranium Mill Tailings Site at Gunnison, Colorado* (RAP) (DOE 1992) to address ground water restoration and compliance with the U.S. Environmental Protection Agency (EPA) ground water protection standards for the Uranium Mill Tailings Remedial Action (UMTRA) Project Title I sites. The GCAP will be the U.S. Nuclear Regulatory Commission (NRC) concurrence document for compliance with Subpart B of 40 CFR 192 for the Gunnison processing site.

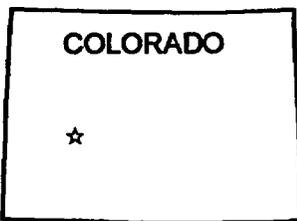
The proposed compliance strategy for the Gunnison site is based on the compliance strategy selection framework following the steps presented in the *Final Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Project* (PEIS) (DOE 1996) (Figure 2). National Environmental Policy Act issues and environmental concerns are addressed in the Environmental Assessment (DOE 2000b), and this information will be made available to public officials and citizens in the area for their review and comment.

2.0 Ground Water Compliance

To achieve compliance with Subpart B of 40 CFR 192, the DOE proposed action is natural flushing in conjunction with institutional controls (ICs) and continued monitoring. Ground water flow and transport modeling has predicted that site-related concentrations of uranium in ground water in the uppermost aquifer beneath and downgradient from the site will decrease to below the maximum concentration limit (MCL) within 100 years (Section 5.2.4 and Appendix H, DOE 2000a). ICs will be maintained and verified during the flushing period. This compliance strategy will be protective of human health and the environment. This proposed action has been determined by applying the compliance strategy selection framework from the PEIS, consisting of several evaluative steps that are discussed below.

2.1 Assessment of Environmental Data

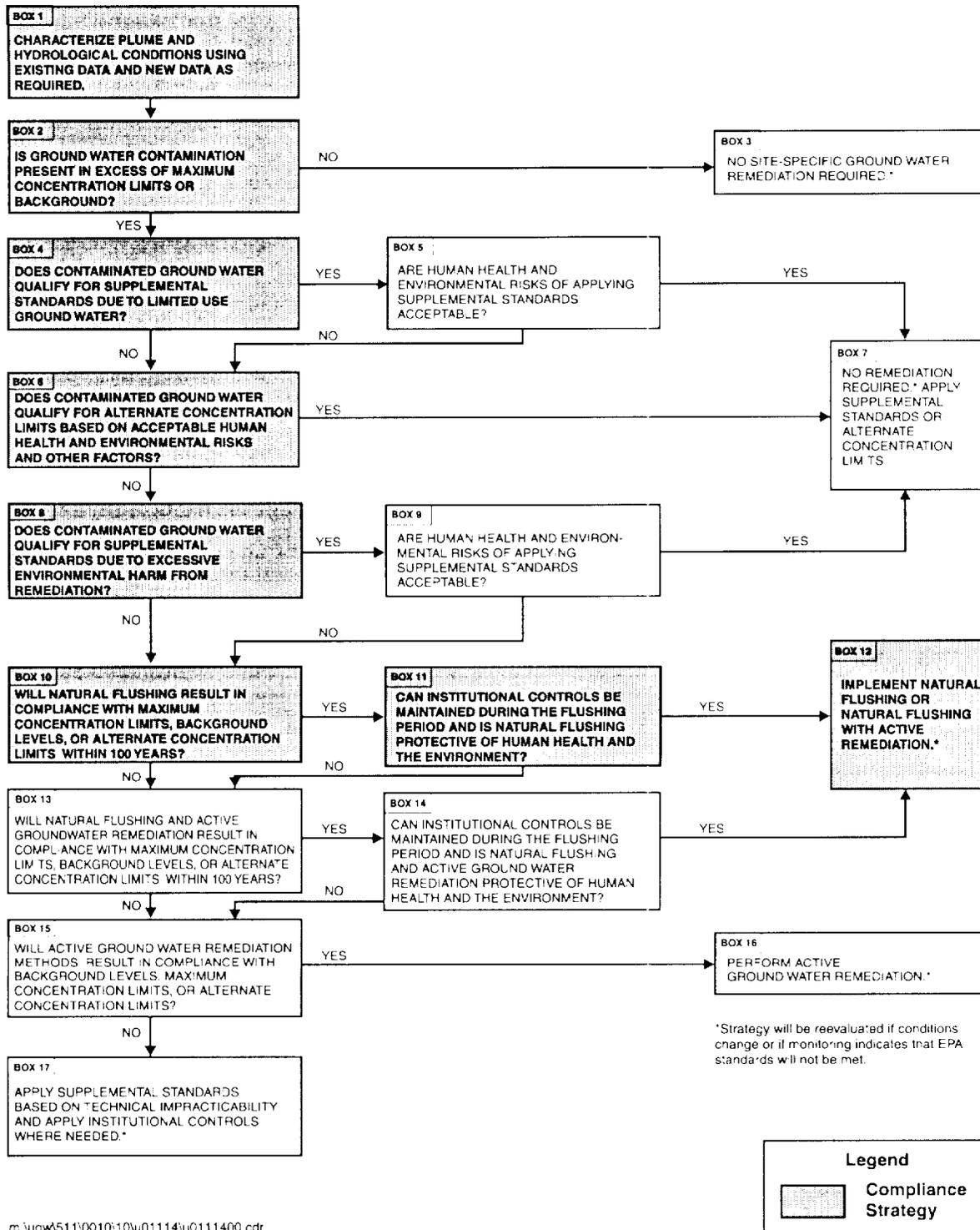
The first step in the decision process was an assessment of both historical and new environmental data collected to characterize hydrogeological conditions and the extent of ground water contamination related to uranium processing activities at the site. Ground water occurs under unconfined conditions 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. The thickness of the alluvium ranges from 70 to 130 ft. Ground water in the alluvial aquifer generally flows to the southwest with an average gradient of 0.005. 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 in the alluvial aquifer system is recharged by 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 and by the gravel pit dewatering operations south of the site.



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Aerial Photograph of Gunnison Area October 1999			
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Figure 1. Aerial Photograph of the Gunnison Area, October 1999



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Figure 2. Compliance Strategy

2.2 Ground Water Contaminants

Ground water in the alluvial aquifer beneath and downgradient from the Gunnison site was contaminated by uranium processing activities. Residual radioactive material 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 because concentrations exceed 1.0 milligram per liter (mg/L) beneath the site and exceed the uranium MCL of 0.044 mg/L to approximately 1,000 ft downgradient from the site boundary beneath the adjacent gravel mining operation (Figure 3). 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 downward as it progresses laterally. Manganese is also a COPC in ground water with concentrations up to 19 mg/L beneath the site (Figure 4). There is no MCL for manganese, but an acceptable human health risk-based level is 1.7 mg/L. Manganese does not appear to be widespread in the aquifer and concentrations beneath the site are decreasing.

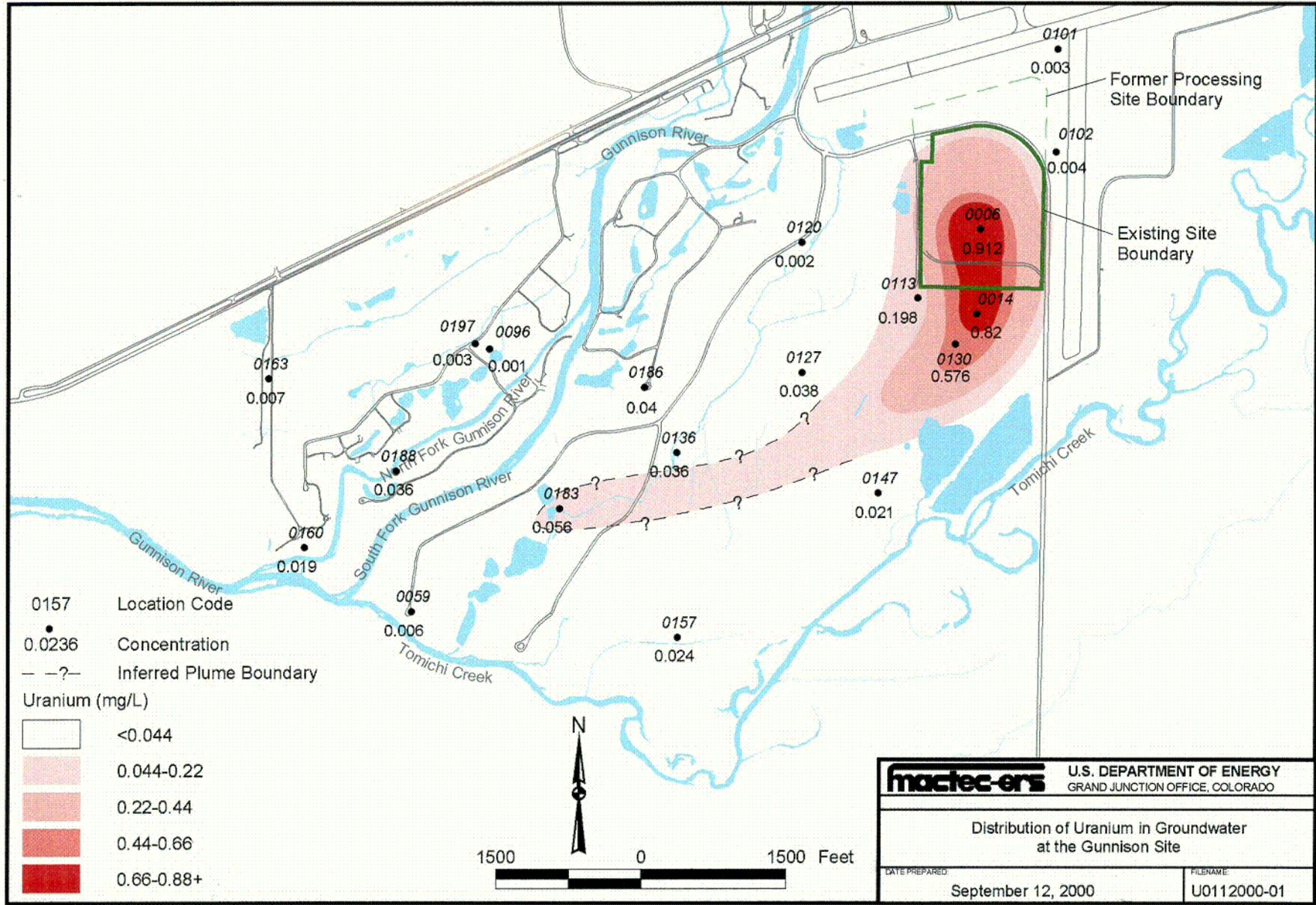
2.3 Applicability of Natural Flushing

Ground water flow and contaminant transport modeling indicates that uranium will naturally flush to concentrations below the MCL in the aquifer system beneath and downgradient from the site within 100 years. Results of the modeling are presented in Section 5.2.4 and Appendix H of the SOWP (DOE 2000a). Only uranium was modeled as it appears to be most representative and widespread of site-related contamination in ground water.

Transient flow and transport modeling was used to address the seasonal nature of several parameters, including the high and low flow periods of the Gunnison River and Tomichi Creek, and the dewatering activities of the adjacent Valco, Inc. gravel mining operation. Results of the transient simulations indicate that the maximum concentration of uranium in ground water will decrease to below 0.044 mg/L in 100 years. Steady state stochastic flow and transport modeling was used to quantify the uncertainty in flow and transport parameters. Results of the stochastic simulations predict that the maximum concentration of uranium in ground water will decrease to 0.032 mg/L after 100 years with a low probability (28 percent) that the standard will be exceeded over a small area of the alluvial aquifer south of the site. Simulated uranium concentrations in ground water versus time are plotted at monitor well locations 006, 012, and 113 showing the median and 5th and 95th percentiles (Figures 5 through 8). These statistics are calculated from 100 stochastic realizations. The location south of the millsite where the stochastic model predicted the probability of elevated uranium concentrations at 100 years is also shown. The uranium MCL of 0.044 mg/L is shown on the graphs just below the 0.05 gridline for reference. These plots will provide monitoring targets for out-years during the natural flushing process.

2.4 Institutional Controls

ICs are restrictions that effectively protect public health and the environment by limiting access to a contaminated medium—alluvial ground water at the Gunnison site. ICs typically depend on an administrative legal action, such as zoning, ordinances, and laws to ensure that protection is



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Figure 3. Distribution of Uranium in Ground Water at the Gunnison Site (1999)

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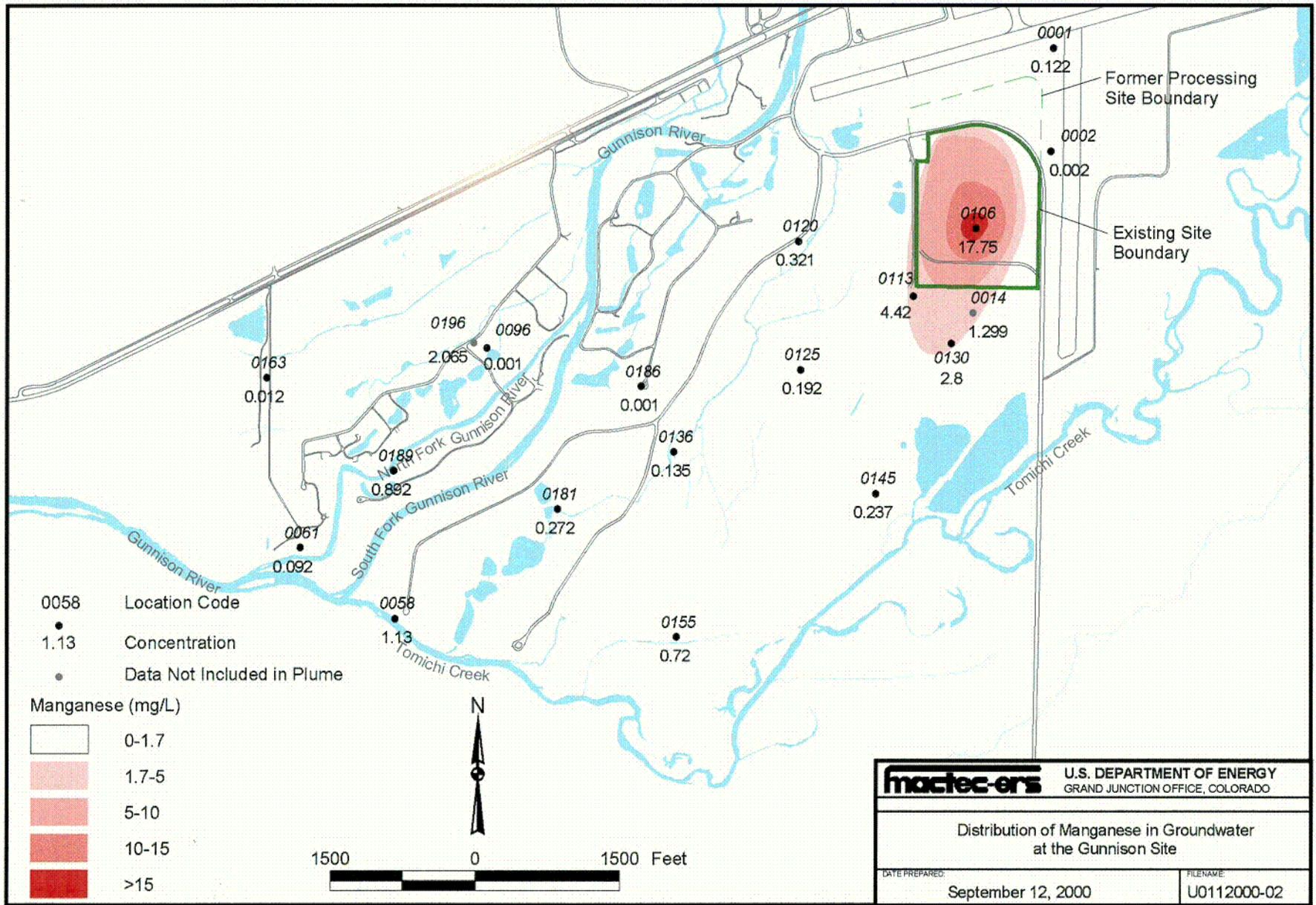


Figure 4. Distribution of Manganese in Ground Water at the Gunnison Site (1999)

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Uranium Concentration vs Time - 0006

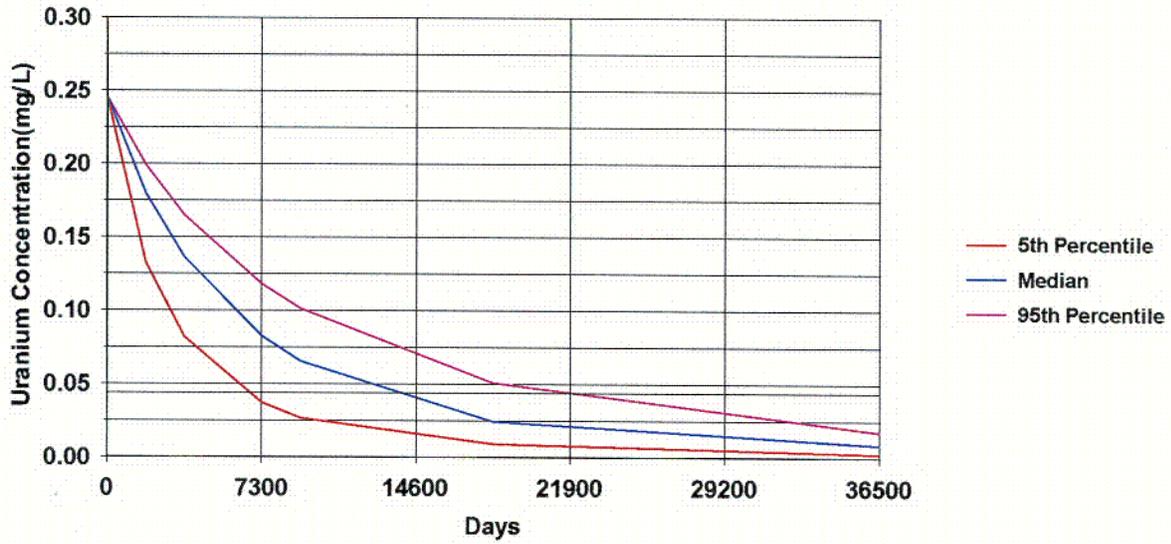


Figure 5. Uranium Concentration Versus Time for Monitor Well 006

Uranium Concentration vs Time - 0012

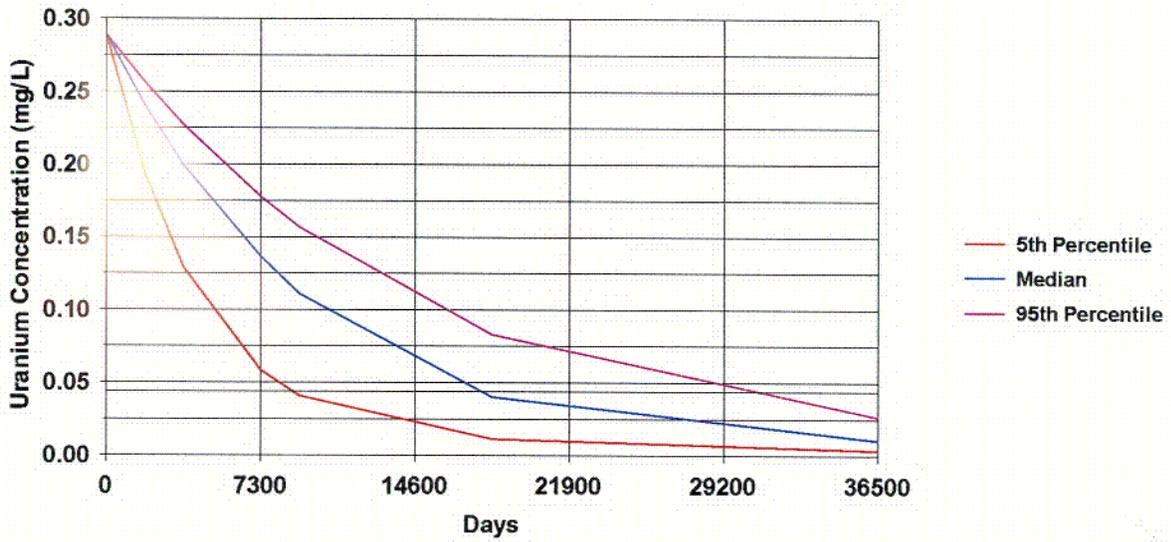


Figure 6. Uranium Concentration Versus Time for Monitor Well 012

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Uranium Concentration vs Time - 0113

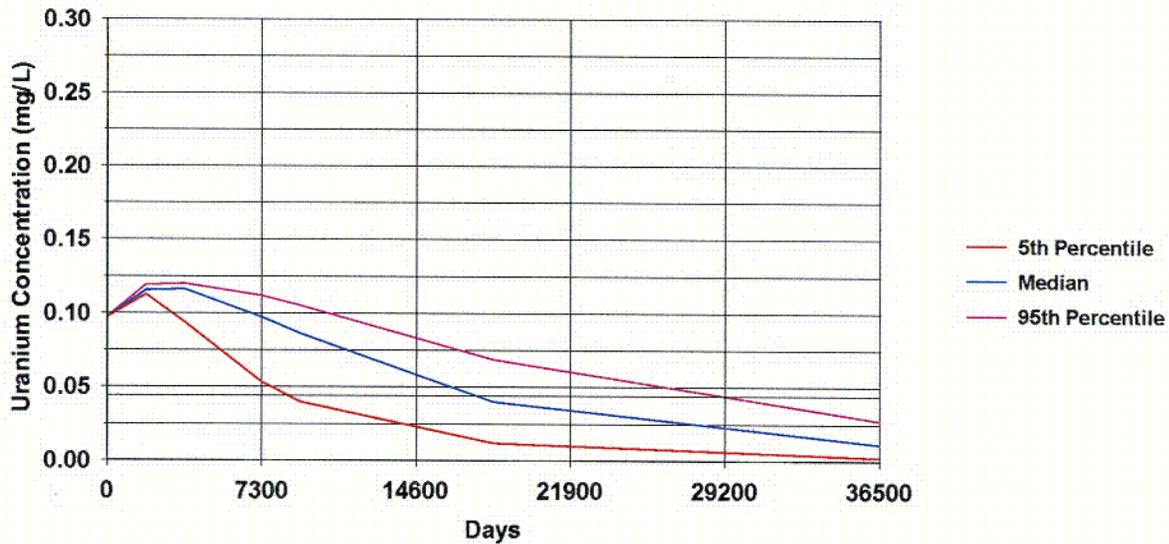


Figure 7. Uranium Concentration Versus Time for Monitor Well 113

Uranium Concentration vs Time - Hotspot

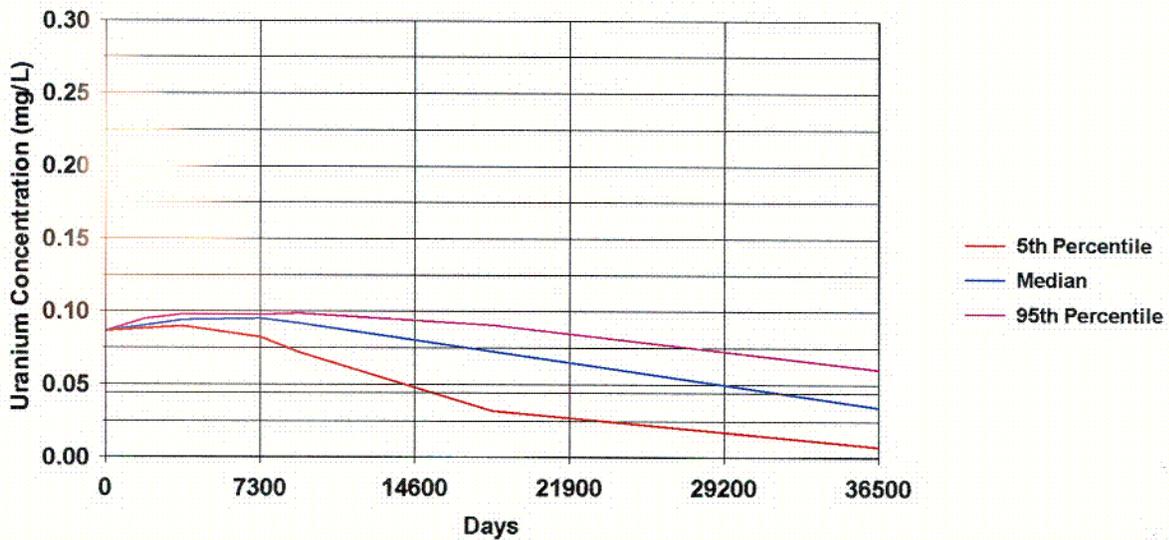


Figure 8. Uranium Concentration Versus Time for Location South of Site

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effective and enforceable. For the UMTRA Ground Water Project, ICs reduce exposure to contaminated ground water or reduce health risks by (1) preventing intrusion into contaminated ground water or (2) restricting access to or use of contaminated ground water for unacceptable purposes. The EPA standards require that ICs (1) have a high degree of permanence, (2) protect human health and the environment, (3) satisfy beneficial uses of ground water, (4) are enforceable by administrative or judicial branches of government entities, and (5) can be effectively maintained and verified. The EPA standards permit the use of ICs at sites where natural flushing will return the ground water to regulatory levels within 100 years.

2.4.1 On-site ICs

ICs are in place at the former millsite through deed restrictions that became effective when the State of Colorado transferred ownership to Gunnison County in December 1999. The restrictions prohibit use of contaminated ground water and control excavation of contaminated soil. The deed contains the following language:

“Grantee (Gunnison county) covenants ... (ii) not to use ground water from the site for any purpose, and not to construct wells or any means of exposing ground water to the surface unless prior written approval for such use is given by the Grantor (Colorado Department of Public Health and Environment) and the U.S. Department of Energy.”

This language follows with the deed and ensures that any future landowner is subject to the same restrictions. This language fulfills the requirements for degree of permanence and enforceability by government entities. The site is within the service area of the Dos Rios water system, so future users have a source of domestic water available.

2.4.2 Off-site ICs

Results of ground water sampling downgradient from the former processing site from July through October 1990 indicated that 22 domestic wells contained concentrations of uranium and manganese in excess of background levels. Most of these wells were located in the Dos Rios subdivision and screened in the shallow alluvial aquifer. Since the elevated levels were related to uranium processing activities at the site, DOE began supplying bottled water to those residences in August 1990. DOE also investigated funding a permanent water supply system for this area. Construction of the water supply system occurred from 1992 to 1994, and approximately 5 miles of pipeline, mostly within the Dos Rios subdivision, was constructed at a cost in excess of \$6 million. DOE supplied 90 percent of the funding and the State of Colorado supplied the remainder. By July 1994, most residents had hooked up to the alternate water supply system, and the facility was turned over to the Gunnison County Public Works Department. Water is taken from the west side of the Gunnison River just south of U.S. Highway 50 into the 350 gpm water treatment plant, and then stored in a 250,000 gallon water storage tank located just north of U.S. Highway 50. The water distribution system extends from U.S. Highway 50 on the north, toward Tomichi Creek on the south, from Gold Basin Road on the east, to Que Quay Lane on the west (DOE 2000a). According to the Director of the Gunnison County Public Works Department, the water system has the capacity for expansion to cover any anticipated growth in demand in the vicinity.

Recent investigations with the State Engineer's Office (well permits), the Gunnison County Planning Department, and contact with local businesses have provided no evidence of anyone

using ground water from the alluvial aquifer for domestic purposes. All businesses and residences within a suggested IC boundary are connected with the Dos Rios water system (Figure 9) (DOE 2000a). DOE is working with Gunnison County to develop an IC program to ensure implementation of an administrative mechanism that can be enforced, verified, and maintained. The mechanism under consideration is a Gunnison County ordinance within an ICs boundary that will prohibit using untreated ground water for drinking water purposes.

2.5 Human Health and Environmental Risk

There are no unacceptable risks to human health and the environment associated with current and projected conditions in the vicinity of the Gunnison site as long as ICs can be maintained (see Section 6.0 of the SOWP, DOE 2000a). Current use of ground water at the Valco, Inc. operation presents no unacceptable risk. Consequently, the proposed compliance strategy of natural flushing in conjunction with institutional controls and continued monitoring will be protective of human health and the environment.

3.0 Implementation

Implementation of the proposed compliance strategy includes ICs and continued monitoring of ground water and surface water.

3.1 Institutional Controls

Gunnison County owns the water distribution system that provides drinking water to the entire area potentially affected by site-related contaminants. DOE is working with Gunnison County to formalize a requirement that all current and future residents in the area connect to the system. This requirement will become an enforceable administrative IC by means of a county ordinance. Any future water resource needs in the area will be regulated by Gunnison County.

The need for and duration of ICs depends on the compliance strategy selected for a site, the level of risk to humans and the environment, and existing site conditions. Movement of contaminated ground water may require restrictions over an extended period of time. As risks decrease over time, so should the need for ICs. Therefore, to ensure protection of human health and the environment, and to satisfy requirements for beneficial uses of the water, it is important that the effectiveness of ICs be verified and modified as necessary.

3.2 Monitoring

Monitoring of ground water and surface water will be implemented during the period of natural flushing to verify modeling results, ascertain that concentrations of uranium and manganese in ground water are decreasing, and ensure protection of human health and the environment (Figure 10 and Table 1). Ground water in the shallow zone of the alluvial aquifer will be sampled on-site in monitor wells 006 and 012 which have the highest concentration of uranium ("hot spot"). Ground water in the intermediate zone at these two locations will also be monitored in offset monitor wells 106 and 112 to verify that uranium concentration remains below background levels at this depth in the aquifer. Ground water in the shallow and intermediate zones in monitor wells 013 and 113, just off the southwest corner of the site, will be sampled.

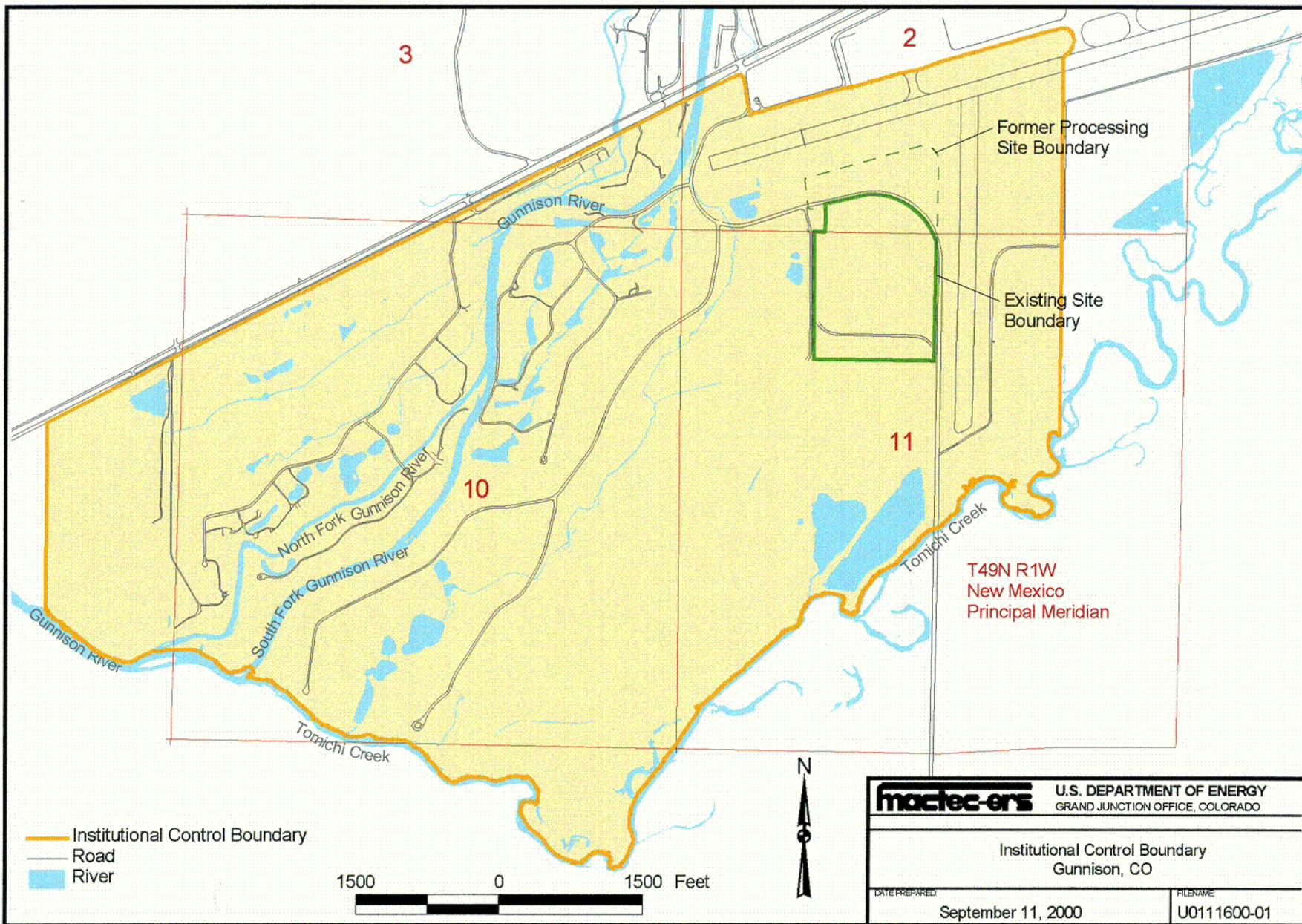


Figure 9. Institutional Control Boundary, Gunnison, Colorado

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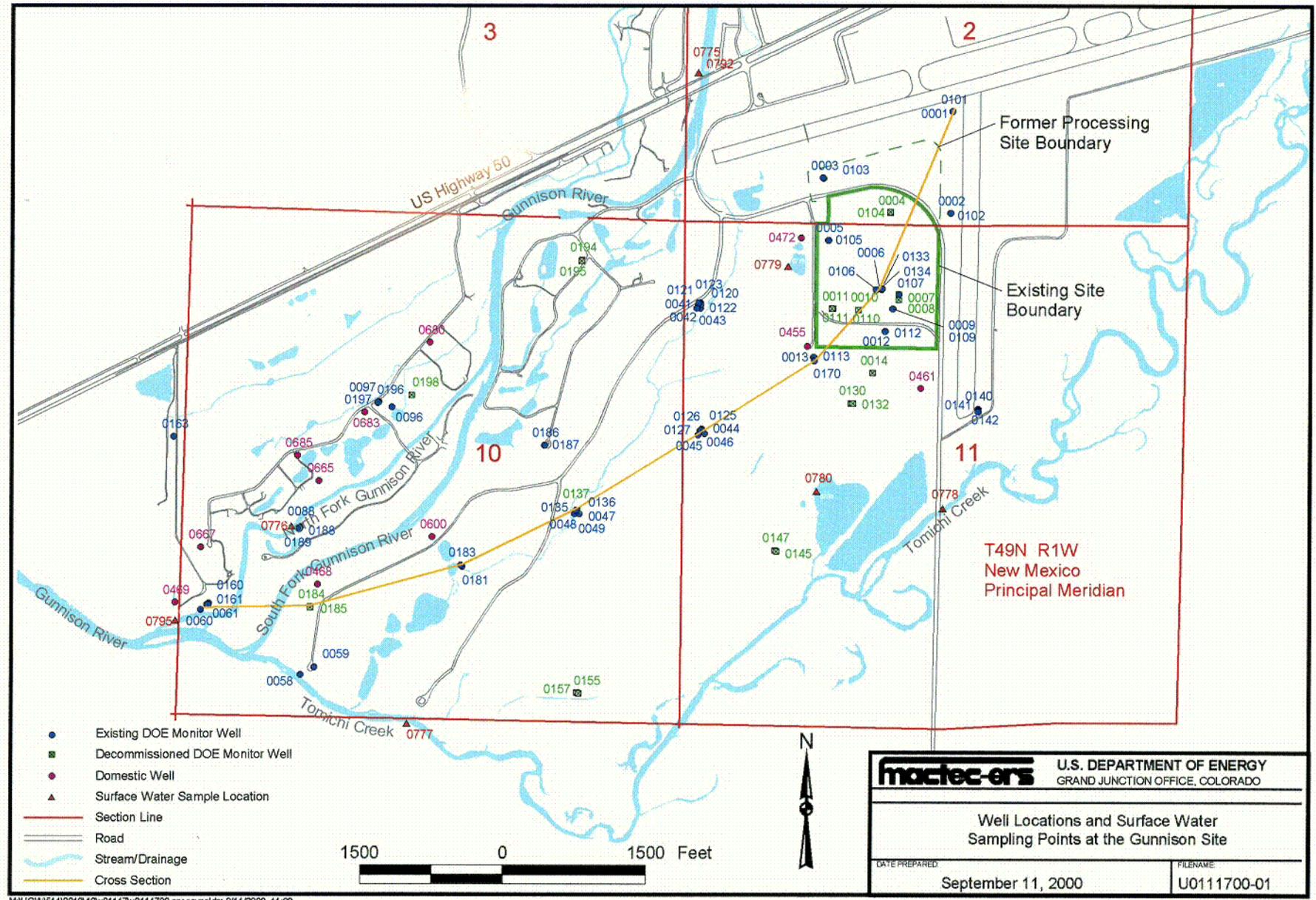


Figure 10. Well Locations and Surface Water Sampling Points at the Gunnison Site

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Concentration of uranium in both wells is decreasing with higher concentration in well 113 indicating that contamination is migrating deeper into the aquifer as it goes downgradient. Monitor wells 126 and 127 are 1,500 ft downgradient from the site and are just beyond the area where uranium concentration is above the MCL. Concentration of uranium is higher in the deeper zone of the aquifer, and is decreasing with time in both intervals. Concentration of uranium is above the MCL in monitor well 183 and is still increasing, indicating migration of the plume through this area. Concentration of uranium in monitor wells 160 and 161 is below the MCL, but is still increasing, again indicating migration of the contaminant plume through this area. Monitoring ground water at these locations will provide adequate information to assess the effectiveness of natural flushing, and to ensure that concentrations of uranium do not significantly increase downgradient to the point of potentially impacting human health and the environment. Concentrations of manganese in these areas are generally decreasing with time. Surface water locations have been selected to verify that uranium concentrations remain very low in the Gunnison River and Tomichi Creek and to track concentrations in the gravel pit on the Valco, Inc. property south of the site.

Table 1. Ground Water and Surface Water Monitoring, Gunnison, Colorado, Site

Monitor Well	Aquifer Zone	Screened Interval	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-183	Deep	93-98	Beneath golf course	Above MCL
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-777			Tomichi Creek	Background
GUN-780			Valco, Inc. gravel pit	Above MCL
GUN-792			Gunnison River	Background
GUN-795			Gunnison River	Background

COPCs to be analyzed in ground water include uranium and manganese. The MCL for uranium is 0.044 mg/L, and an acceptable human health risk-based level for manganese is 1.7 mg/L. General water quality indicators including alkalinity, conductivity, pH, total dissolved solids, sulfate, and temperature will also be determined during sampling. Statistical methods for evaluation of ground water and surface water monitoring data will be used as appropriate to assess variations in concentrations of COPCs over time. Results of monitoring will be compiled periodically and reports will be available to regulatory agencies.

Monitoring will take place on an annual basis for the first 10 years (through 2010) and every 5 years thereafter until completion of natural flushing. At the end of 10 years, an evaluation will be made in consultation with NRC and the State of Colorado to determine the need and timing

for future monitoring at the site. If it is determined that the natural flushing strategy is not progressing as predicted, reevaluation of the compliance strategy will be conducted.

Monitor wells not required as part of the monitoring network will be abandoned according to applicable State of Colorado regulations and UMTRA Project procedures. Abandonment will be done by the LTSM Program.

3.3 Confirmation Report

Upon regulatory concurrence with the Gunnison GCAP the verification monitoring period will commence. This phase should continue through 2005. At that time, actual ground water monitoring results will be compared with modeling predictions and the credibility of the natural flushing compliance strategy will be assessed. If actual ground water conditions in the vicinity of the site are reasonably comparable with the modeling predictions, the Confirmation Report will be prepared. At this point (2006), the site will be turned over to the LTSM Group for long-term management activities.

3.4 Certification Report

On completion of natural flushing, a certification report will be prepared for state, NRC, and local government concurrence. This report will be the final close-out document. Monitoring and institutional controls will be discontinued at this time.

4.0 References

- U.S. Department of Energy (DOE), 1992. *Remedial Action Plan and Site Design for Stabilization of the Inactive Uranium Mill Tailings Site at Gunnison, Colorado*, UMTRA-DOE/AL-050508.0000.
- _____, 1996. *Final Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Project*, Vol. I, DOE/EIS-0198.
- _____, 2000a. *Final Site Observational Work Plan for the Gunnison, Colorado, UMTRA Project Site*, GWGUN 1.1, Document Number U0102400.
- _____, 2000b. *Environmental Assessment of Ground Water Compliance at the Gunnison, Colorado UMTRA Project Site*, Document Number U011900.