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Environmental Assessment of Ground Water Compliance at the Durango, Colorado, UMTRA Project Site

Final

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Grand Junction Office
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Acronyms and Abbreviations

ACL	alternate concentration limit
CDPHE	Colorado Department of Public Health and Environment
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ft	foot
ft^3/s	cubic feet per second
ICs	institutional controls
LTSM	Long-Term Surveillance and Maintenance (Program)
MCL	maximum concentration limit (established in 40 CFR 192)
mg/L	milligrams per liter
PEIS	Programmatic Environmental Impact Statement (for the UMTRA Ground Water Project)
SOWP	Site Observational Work Plan
UMTRA	Uranium Mill Tailings Remedial Action (Project)
UMTRCA	Uranium Mill Tailings Radiation Control Act
USV	United States Vanadium Corporation
VCA	Vanadium Corporation of America

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1.0 Introduction

The U.S. Department of Energy (DOE) is proposing a ground water compliance strategy for the Uranium Mill Tailings Remedial Action (UMTRA) Project site near Durango, Colorado. DOE has prepared this environmental assessment to provide the public with information concerning the potential effects of this proposed strategy.

1.1 Site Description

The Durango UMTRA Project site is located in La Plata County outside the Durango city limits about 0.25 mile from the central business district (Figure 1). The site consists of two separate areas: (1) a mill tailings area, which historically provided the setting for uranium and vanadium milling operations and mill tailings piles, and (2) a raffinate ponds area, which historically contained mill-related waste ponds. The mill tailings area encompasses about 40 acres on a bedrock-supported river terrace between Smelter Mountain to the west, the Animas River to the east and south, and Lightner Creek to the north (Figure 2). The raffinate ponds area occupies about 20 acres on another river terrace 1,500 feet (ft) south of the mill tailings area. It is bordered by the Animas River to the north, U.S. Highway 550 to the east, South Creek to the south, and Smelter Mountain to the west (Figure 2).

Land use in the vicinity of the Durango site is primarily commercial, residential, and open space. Kayakers frequently use the Animas River near the site, and across the river from the site is a city park. The City of Durango owns the mill tailings area property, and the Animas-La Plata Water Conservancy District owns the raffinate ponds area property.

The Durango site is in a semiarid climate characterized by severe winters and moderate summers. Annual mean temperature is 50°F, and monthly averages vary from 19°F in January to 70°F in July. Precipitation is predominantly from heavy rainstorms and winter snowfall and averages 20 inches per year.

1.2 Site History

Before uranium-ore processing, a lead smelter plant operated on the mill tailings area from 1880 to 1930. In 1941, the United States Vanadium Corporation (USV) built a mill in the same area to furnish vanadium to the Metals Reserve Company, a company established by the federal government to purchase strategic materials during World War II. Starting in 1943, USV also reprocessed vanadium tailings to recover uranium for the Manhattan Project. The mill closed in 1946.

In 1949, the mill was reopened by the Vanadium Corporation of America (VCA) and operated until March 1963 under a contract to sell uranium to the U.S. Atomic Energy Commission, a predecessor agency to DOE. VCA retained ownership of the millsite and adjoining property until 1967, when VCA merged with Foote Mineral Company. In 1976 and 1977, the site was purchased by Ranchers Exploration and Development Corporation, which was subsequently acquired by Hecla Mining Company in 1984.

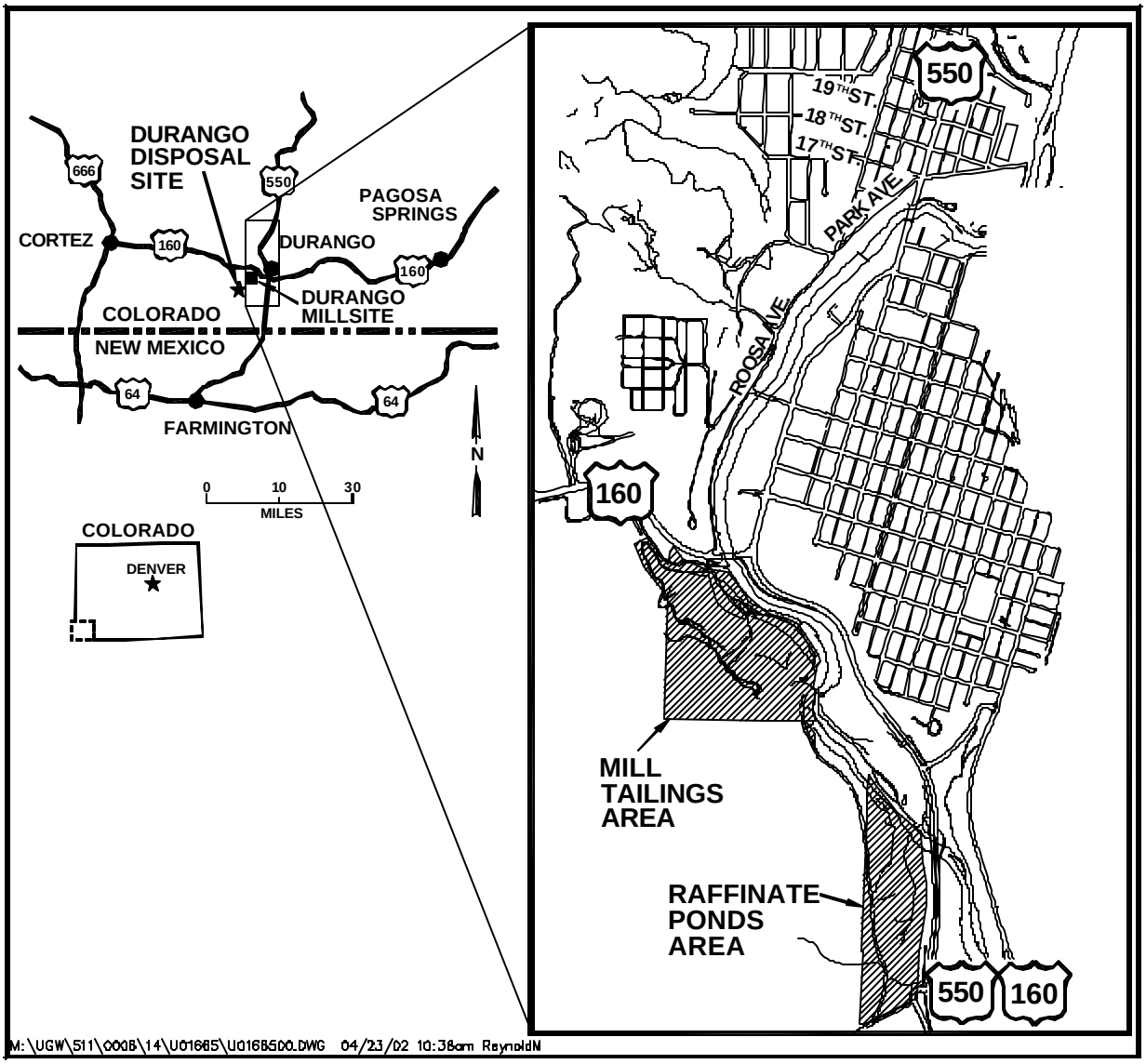

Figure 1. Location of the Durango Site

The uranium-ore milling process involved two separate stages. In the first stage, ores were roasted with sodium chloride, then treated with a sodium carbonate solution to produce an alkaline solution containing both uranium and vanadium. This solution was filtered to separate the solution from the tailings, then treated to remove uranium and vanadium. The alkaline-leach tailings were washed with water and stored for use in reprocessing (Tame and others 1961; Merritt 1971).

The second stage of processing used the alkaline tailings. The tailings were leached with an acid solution containing both hydrochloric and sulfuric acids. The leachate was then separated from the acid-leach tailings and oxidized with potassium permanganate. Uranium and vanadium were removed from this solution by solvent extraction. The spent solution (raffinate) was disposed of after the uranium and vanadium were removed from the aqueous solution (Tame and others 1961).

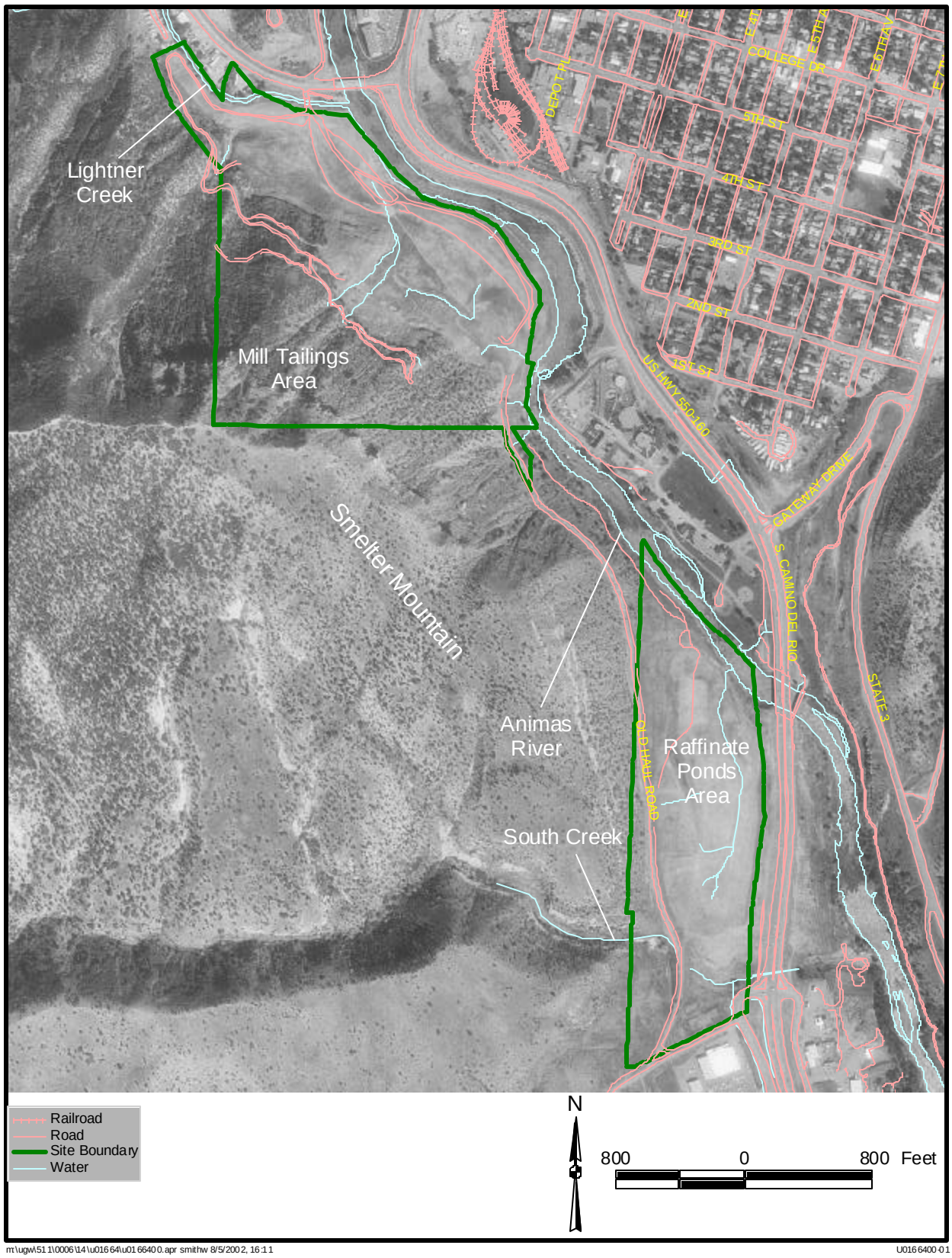

Figure 2. Durango UMTRA Project Site

Before 1959, all aqueous solutions and acid-leach tailings were discharged into the Animas River (Tsivoglou and others 1960). Beginning in 1959, overflow water from the stored alkaline leach tailings and slurried acid-leach tailings was mixed in a settling pond atop the former large tailings pile adjacent to the mill. Overflow from this pond was treated and settled in a second pond atop the former small tailings pile at the mill tailings area. Overflow from this pond and spent alkaline-leach solutions from the first stage of uranium-vanadium recovery were discharged directly into the Animas River (Tsivoglou and others 1960).

Raffinates from the reprocessed tailings contained most of the discarded radioactivity. This waste solution was pumped to a tank above the mill and subsequently discharged into a 3,000-ft-long ditch that carried the waste to the raffinate ponds area. An additional 3,000 ft of ditch carried the raffinate through a series of ponds on the terraced slope of the raffinate ponds area. The raffinate evaporated and percolated into the underlying alluvium, colluvium, and sandstone bedrock.

In 1978, the Uranium Mill Tailings Radiation Control Act (UMTRCA) (42 *U.S. Code* Section 4321 *et seq.*) was enacted to control and mitigate risks to human health and the environment from residual radioactive material that resulted from processing uranium ore. UMTRCA authorized DOE to perform remedial action at 24 inactive uranium-ore processing sites; subsequently, two sites were deleted from the project. The Durango site was one of the 22 sites identified for cleanup. After completing an Environmental Impact Statement (DOE 1985), DOE began surface cleanup of the mill tailings and raffinate ponds areas in November 1986. A total of 2.5 million cubic yards of contaminated material was relocated to the Bodo Canyon disposal cell several miles southwest of the Durango site. Following removal of the contaminated material, approximately 230,000 cubic yards of uncontaminated soil was backfilled, contoured, and seeded. Remedial action was completed in May 1991, and today, a healthy stand of grass covers both areas.

1.3 Overview of Contamination

After the source of ground water contamination (i.e., the mill tailings and raffinate wastes) was removed, U.S. Environmental Protection Agency (EPA) regulations required DOE to evaluate the mill tailings and raffinate ponds areas to determine if contaminant concentrations in ground water beneath these sites complied with UMTRA Project ground water standards listed in Title 40 *Code of Federal Regulations* Part 192 (40 CFR 192) Subpart B. To make this determination, DOE has monitored contaminants in the ground water beneath the two areas on a regular basis since the early 1980s. Results of this monitoring are discussed in detail in the *Site Observational Work Plan for the Durango, Colorado, UMTRA Project Site* (SOWP) (DOE 2002). Also included in the SOWP is an update of the original Baseline Risk Assessment (DOE 1995), which evaluated potential human health and ecological risks associated with contaminants in the ground water. Following is a summary of DOE's monitoring results.

The mill tailings area and the raffinate ponds area are not hydrologically connected and are therefore discussed separately throughout this environmental assessment.

Mill Tailings Area

Ground water beneath the mill tailings area is in an unconfined alluvial aquifer. Contamination of the alluvial aquifer occurred primarily as a result of historical uranium-ore processing activities. Monitoring data indicate that uranium, selenium, cadmium, and molybdenum are present in the ground water at levels that exceed UMTRA Project maximum concentration limits (MCLs). In addition, sulfate and manganese, which have no MCLs, are present in the ground water at levels that exceed the average background concentration and the risk-based concentration[1], respectively.

Table 1 summarizes monitoring data for each of the contaminants and compares the data to ground water quality standards. Section 4.1, "Ground Water," provides additional details on the hydrogeology and ground water quality at the mill tailings area.

Table 1. Ground Water Data Summary and Comparison to Standards and Benchmarks

Contaminant	Minimum Concentration (mg/L)	Maximum Concentration (mg/L)	Mean Concentration (mg/L)	UMTRA MCL (mg/L)	Other Benchmarks (mg/L)
Mill Tailings Area					
Cadmium	< 0.0004	0.037	< 0.0045	0.01	–
Manganese	0.0032	4.31	0.790	–	1.7[a]
Molybdenum	< 0.003	0.116	0.0150	0.1	–
Selenium	< 0.0003	0.123	< 0.0189	0.01	0.05[b]
Sulfate	656	3,510	1,785	–	1,280[c], 250[d]
Uranium	0.00065	1.97	0.413	0.044	–
Raffinate Ponds Area					
Uranium	0.0001	0.309	< 0.0488	0.044	–
Selenium	< 0.0003	19.4	<1.10	0.01	0.05[b]

Note: mg/L = milligrams per liter
[a]Risk-based concentration using a reference dose of 0.047 milligram per kilogram per day (DOE 2002, Section 6)
[b]Safe Drinking Water Act standard
[c]Background concentration
[d]Safe Drinking Water Act secondary standard

In addition to ground water monitoring, DOE has monitored surface water at the site. Samples collected from Lightner Creek and the Animas River between June 1999 and June 2001 verify previous observations (DOE 1995) that past milling operations have had very little effect on surface water quality. Of the 61 surface water samples collected adjacent to and downgradient of the mill tailings area between 1999 and 2001, no constituent concentrations exceeded Colorado Department of Public Health and Environment (CDPHE) surface water quality standards for aquatic life, with the exception of manganese. Manganese was occasionally detected at concentrations above the water quality standard at several locations. However, manganese levels

[1] A risk-based concentration represents a concentration in drinking water that would be protective of human health given certain assumptions. The SOWP (DOE 2002), Section 6.1.2, describes the basis for risk-based concentrations. Also, see EPA (2002) cited in Section 6.0 of this environmental assessment.

also exceeded the standard in the upgradient background surface water locations on the Animas River. None of the measured manganese concentrations from the downgradient surface water locations exceeded the maximum observed concentrations from the upgradient background locations.

Raffinate Ponds Area

Ground water beneath the former raffinate ponds area occurs in two bedrock units of the Mesaverde Group—the Point Lookout Sandstone and the Menefee Formation. Ground water flow is predominantly through joints, open bedding planes, faults, and fractures. The primary fault through which ground water flows is the Bodo Fault, which cuts diagonally across the raffinate ponds area from the southwest corner to the northeast corner. Historical percolation of spent raffinate liquids was the primary cause of ground water contamination. Since completion of surface remediation, uranium and selenium have been the only constituents with concentrations that have consistently exceeded MCLs. With the exception of selenium, concentrations of all contaminants related to uranium-ore processing (arsenic, molybdenum, sulfate, uranium, and vanadium) have decreased since completion of surface remediation and continue to show downward trends in concentration. Table 1 summarizes monitoring data for uranium and selenium and compares the data to ground water quality standards. Section 4.1, "Ground Water," provides additional details on the hydrogeology and ground water quality of the raffinate ponds area.

Results of surface water monitoring in the Animas River adjacent to the raffinate ponds area indicate that, with the exception of manganese, no surface water constituent exceeds or has exceeded CDPHE water quality standards. As at the mill tailings area, when manganese concentrations were elevated in the river adjacent to the raffinate ponds area, they were similarly elevated upstream of the Durango site.

1.4 Summary of Current Risk

Human Health Risk

The 1995 Baseline Risk Assessment (DOE 1995) considered several potential routes of exposure to contaminants at the Durango site and eliminated all but one—ingestion of ground water in a residential setting—as insignificant. The exposure pathways considered insignificant in the original assessment were assumed to be still insignificant in the risk assessment update prepared for the SOWP (DOE 2002). Results of the risk calculations indicate that contaminated ground water should not be used as drinking water until contaminant concentrations decrease to acceptable levels. Institutional Controls[2] (ICs), in the form of deed restrictions, currently in place at both the mill tailings and raffinate ponds areas prevent access to contaminated ground water. Therefore, because no complete exposure pathway exists, the risk is only a potential risk, and ground water at both areas currently poses no actual risk to human health. The ICs are part of the proposed action discussed in Section 3.1.

[2] ICs are restrictions that effectively protect public health and the environment by limiting access to the contaminated ground water. They are implemented through administrative legal actions such as zoning, ordinances, and laws to ensure that the protection is effective and enforceable.

The only other potentially complete exposure pathway to ground water is where it discharges to the Animas River. Because ground water mixes with river water, and contaminant concentrations decrease to levels below all applicable standards, even at low flows (DOE 1995, DOE 2002), ground water entering the river poses a negligible risk to human health.

Ecological Risk

The ecological risk assessment update prepared for the SOWP (DOE 2002) evaluated the potential for ground water contaminants to adversely affect ecosystems at the site and along the Animas River and its tributaries.

Few complete exposure pathways exist between ground water at the Durango site and ecological receptors. Probably the most plausible pathway is root uptake by deep-rooted plants such as cottonwoods. Potential risk to such plants was assessed by comparing ground water concentrations to plant toxicity benchmarks. The comparisons indicated that the potential for risk to plants that may contact ground water in the mill tailings area and the raffinate ponds area is low.

In a hypothetical situation whereby ground water is pumped to a surface pond and used by wildlife as a sole source of drinking water, high potential for risk would exist at both the mill tailings area and the raffinate ponds area for chronic ingestion of contaminants by wildlife and aquatic organisms. However, because ICs are in place at both areas and prevent access to contaminated ground water, the risk from ingestion of ground water is only a potential risk; no actual risk to ecological receptors exists.

Although contaminated ground water at the mill tailings area and the raffinate ponds area discharges to the Animas River, contaminant concentrations rapidly decrease as ground water mixes with river water. Even at low river flows, the concentrations pose a negligible risk to ecological receptors (DOE 1995 and 2002).

1.5 National Environmental Policy Act Process

The National Environmental Policy Act (NEPA) of 1969 requires federal agencies to analyze the environmental impacts of proposed and alternative actions. In 1996, DOE completed the *Final Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Project* (PEIS) (DOE 1996). In that document, DOE analyzed the potential effects of implementing four alternatives for achieving ground water compliance at the UMTRA Project sites. A Record of Decision was issued in April 1997 in which DOE selected the Proposed Action Alternative for conducting the UMTRA Ground Water Project. Under the Proposed Action Alternative, DOE was given the option of implementing active remediation, natural flushing, no further ground water remediation[3], or any combination of these three strategies. The PEIS then recommended that DOE prepare site-specific NEPA documents, such as this

[3] "No further remediation" is not the same as the "no action" alternative discussed in this environmental assessment. The "no further remediation" sites require activities such as site characterization to show that no further remediation is warranted.

environmental assessment, to convey the strategy that was selected for each of the sites. The issues discussed and the environmental impacts analyzed in this environmental assessment are tiered to the PEIS as allowed by NEPA regulations in 10 CFR 1021.210(c).

2.0 Purpose and Need for Action

The purpose of the UMTRA Ground Water Project is to protect human health and the environment at abandoned uranium-ore processing sites by complying with the UMTRA ground water standards in 40 CFR 192. Currently, concentrations of uranium, selenium, cadmium, and molybdenum in ground water at the mill tailings area and concentrations of uranium and selenium in ground water at the raffinate ponds area exceed UMTRA Project ground water standards.

3.0 Proposed Action and No Action Alternatives

The PEIS provides several alternatives for complying with UMTRA Project ground water standards and assesses in general terms the effects associated with each alternative. DOE followed the step-by-step decision process described in the PEIS to select the compliance strategy proposed in this environmental assessment. Section 3.1 describes DOE's decision process, other alternatives DOE considered but eliminated, and, finally, DOE's proposed actions for complying with UMTRA Project Ground water standards at the mill tailings and raffinate ponds areas at the Durango site. Section 3.2 describes DOE's no action alternative, which is required to be evaluated in environmental assessments.

3.1 Proposed Action Alternative

3.1.1 Mill Tailings Area

3.1.1.1 Decision Process for the Proposed Action

DOE's proposed strategy at the mill tailings area is natural flushing in conjunction with ICs and continued ground water and surface water monitoring. Figure 3 shows the steps that were involved in selecting this compliance strategy, and Table 2 explains the decision process in the figure.

Table 2. Explanation of the Compliance Strategy Selection Process for the Mill Tailings Area

Box in Figure 3	Action or Question	Result or Decision
1	Characterize plume and hydrological conditions	See site conceptual model in Section 5 of the SOWP (DOE 2002). Move to Box 2.
2	Is ground water contamination present in excess of UMTRA Project MCLs or background?	Uranium, selenium, cadmium, and molybdenum are present at levels that exceed UMTRA Project MCLs; sulfate and manganese are present at levels that exceed average background concentration and the risk-based concentration, respectively. Move to Box 4.
4	Does contaminated ground water qualify for supplemental standards due to a classification of limited use ground water?	No. Because of wide-spread ambient contamination by selenium on and upgradient of the mill tailings area, ground water could be classified as limited use (40 CFR 192.11[e]). However, selenium concentrations are able to flush naturally to an alternate concentration limit (ACL) of 0.05 mg/L. The supplemental standards strategy would not address the potential risks from the other constituents. Move to Box 6.
6	Does contaminated ground water qualify for ACLs on the basis of acceptable human health and environmental risks and other factors?	Although an ACL for selenium would be protective of human health and the environment, that strategy would not address the potential risks from the other constituents. Move to Box 8.
8	Does contaminated ground water qualify for supplemental standards on the basis of excessive environmental harm from remediation?	No. The area consists of open land that has undergone extensive disturbance during surface remediation. Ground water remediation would not cause excessive environmental harm. Move to Box 10.
10	Will natural flushing result in compliance with MCLs, background levels, or ACLs within 100 years?	Yes. Ground water flow and transport modeling indicate that uranium, molybdenum, and manganese concentrations would decrease to levels below their standards; sulfate concentrations would be within the range of background. Cadmium concentrations exceed the MCL in only one well, and a review of historical data indicates that concentrations are decreasing faster than predicted and are likely to be below the MCL in 100 years. Selenium concentrations are predicted to be below the ACL of 0.05 mg/L, which is the standard in EPA's Safe Drinking Water Act. Move to Box 11.
11	Can ICs be maintained during the flushing period, and is natural flushing protective of human health and the environment?	Yes. An IC in the form of a deed restriction limiting access to alluvial ground water is already in place. An environmental covenant between the State and the City of Durango is in progress. Move to Box 12; implement natural flushing.

3.1.1.2 Alternatives Considered but Eliminated

The two other possible alternatives—active remediation and no further remediation—were eliminated from further consideration at the mill tailings area. Active remediation would not reduce concentrations of selenium, which occurs naturally above the MCL on and upgradient of the mill tailings area. Also, because of ICs currently in place, no complete exposure pathway to contaminated ground water exists. Although ground water discharges to the Animas River, contaminants rapidly mix with river water, and concentrations decrease to levels that are below all applicable standards and benchmarks (DOE 1995). The no further remediation alternative was eliminated because DOE was required to address the ground water constituents with concentrations that exceeded UMTRA standards. Natural flushing was the best alternative for addressing those constituents.

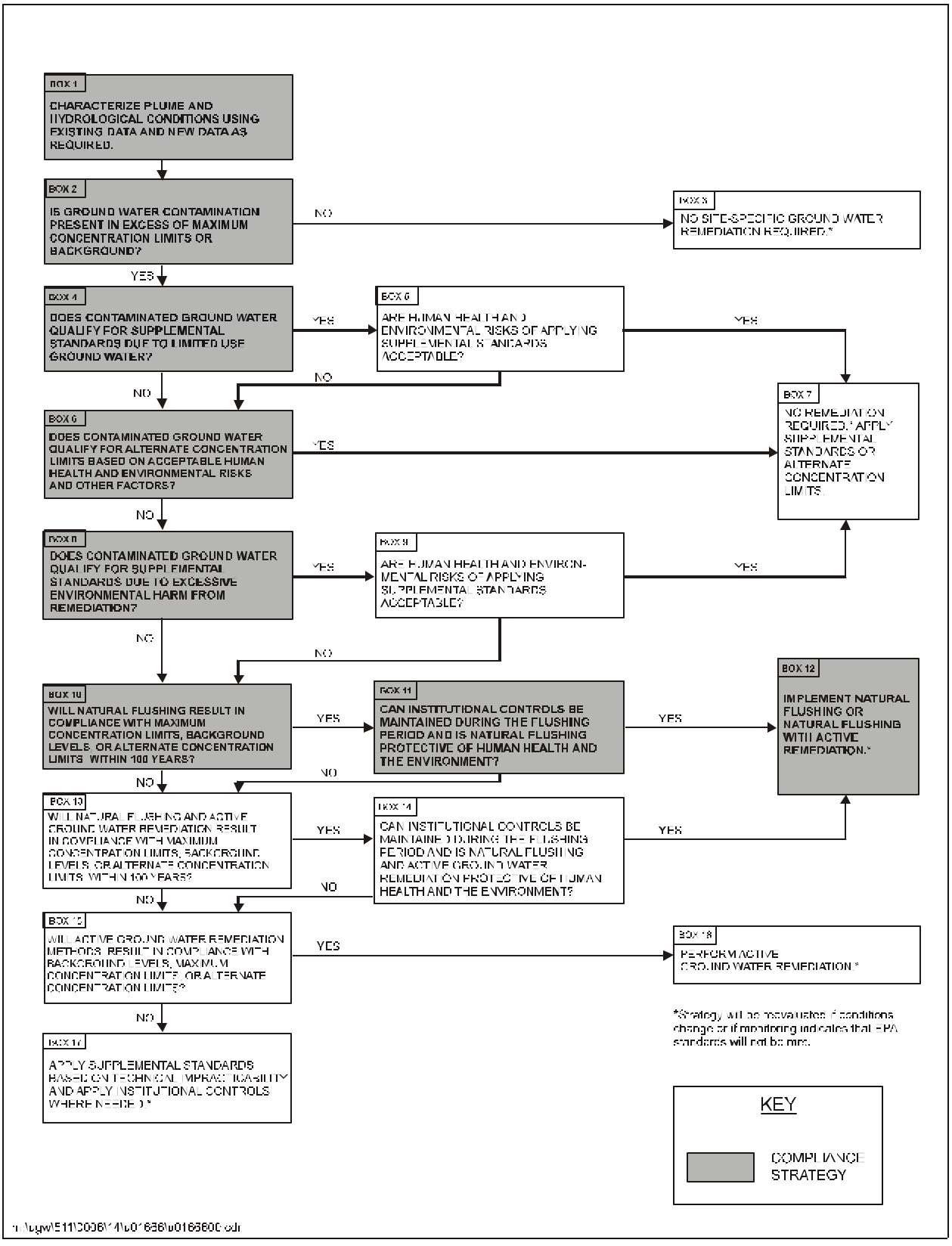

Figure 3. Ground Water Compliance Selection Process for the Mill Tailings Area

3.1.1.3 Explanation of the Proposed Action

The natural-flushing strategy allows natural ground water movement and geochemical processes to decrease contaminant concentrations to background levels, MCLs, or alternate concentration limits (ACLs). This strategy can be applied at a site if compliance with ground water standards can be achieved within 100 years, if effective monitoring and ICs can be maintained, and if the ground water is not currently and is not projected to be a source for a public water system (40 CFR 192).

ACLs, rather than MCLs, may be applied to a hazardous constituent if it does not pose a substantial present or future risk to human health or the environment, as long as the limit is not exceeded. ACLs may be applied if background levels or MCLs cannot be achieved.

The constituents that would be monitored in ground water at the mill tailings area are uranium, molybdenum, manganese, sulfate, selenium, and cadmium. As discussed in Section 1.3, these are the contaminants that exceed either MCLs, background concentrations, or risk-based concentrations.

Ground water flow and transport modeling (DOE 2002, Appendix G)[4] has predicted that site-related concentrations of uranium, molybdenum, manganese, and sulfate in the alluvial ground water will decrease to levels below their respective standards within 100 years:

- Uranium concentrations are predicted to decrease to levels below the MCL of 0.044 milligrams per liter (mg/L) within 80 years.
- Molybdenum concentrations are predicted to decrease to levels below the MCL of 0.1 mg/L within 5 years.
- Manganese concentrations are predicted to decrease to levels below the risk-based concentration of 1.7 mg/L within 50 to 60 years.
- Sulfate concentrations are predicted to decrease to levels below the background concentration of 1,280 mg/L within 80 to 90 years.

Because concentrations of selenium exceed the MCL in background wells (i.e., naturally high levels of selenium are present in ground water upgradient and on the site [DOE 2002]), DOE proposes an ACL of 0.05 mg/L (versus the MCL of 0.01 mg/L), which is the standard in EPA's Safe Drinking Water Act. Modeling indicates that selenium concentrations will decrease below the 0.05 mg/L ACL within 60 years. Cadmium concentrations will not decrease to levels below the MCL according to modeling predictions that used concentrations from the only well (0612) in which the cadmium level is elevated. However, current ground water modeling methods may not account for all mechanisms that may be reducing cadmium concentrations. Also, the concentrations have varied considerably in this well during the last 10 years, and a review of historical data suggests the model could have used a lower initial concentration value. Historical data also indicate a downward trend in concentration that is greater than that predicted by the model. The trend indicates that concentrations will be reduced naturally (through flushing) to

[4] Ground water flow was modeled with MODFLOW (McDonald and Harbaugh 1988), a modular three-dimensional finite-difference ground water flow model published by the U.S. Geological Survey; contaminant transport was modeled with MT3DMS (Zheng and Wang 1999), a modular three-dimensional transport model.

levels below the MCL of 0.01 mg/L within 100 years. Therefore, DOE proposes the natural flushing strategy for cadmium.

In addition to allowing natural flushing to decrease contaminant levels, DOE proposes to implement ground water and surface water monitoring programs. Figure 4 shows the proposed well and surface water monitoring locations at the mill tailings area, and Table 3 summarizes the requirements for monitoring. Point of compliance wells 0612, 0617, 0630, 0631, 0633, 0634, and 0635 would be sampled to monitor the progress of natural flushing in the aquifer. Concentrations of all analytes have exceeded background or a standard in these wells in recent years. Analytical results from sampling well 0612 would allow DOE to track the expected decrease in cadmium concentrations.

Surface water samples would be collected along the Animas River (locations 0652, 0584, 0586, and 0691) to verify that the natural flushing strategy is protective of the environment.

Table 3. Summary of Proposed Monitoring at the Mill Tailings Area

Sampling Location	Monitoring Purpose	Analytes	Location
0617, 0630, 0631, 0633, 0634, 0635	Point of compliance monitoring to monitor plume migration on site.	Manganese Molybdenum Selenium Sulfate Uranium	On site
0612	Verify decrease in cadmium concentrations	Cadmium	Downgradient
0652	Surface water background	Cadmium Molybdenum Selenium Uranium	Off site, upgradient
0584, 0586, 0691	Downgradient surface water concentrations		Off site, downgradient

For the first 5 years (10 years for cadmium in well 0612), monitoring would be conducted annually. After 5 years, the monitoring strategy would be reevaluated and adjusted as appropriate on the basis of analytical results. Monitoring results must show that a constituent is at or below the MCL or ACL for 3 consecutive years before monitoring may be discontinued for that constituent. Monitor wells no longer needed for compliance monitoring would be decommissioned in accordance with UMTRA Project procedures and applicable State of Colorado regulations.

During the natural flushing period, ICs would be maintained to ensure that ground water beneath the mill tailings area is not used. In January 2000, the mill tailings area property was conveyed to the City of Durango by quitclaim deed. The deed contained the following language:

> Grantee [City of Durango] covenants…(ii) not to use ground water from the site for any purpose, and 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 is recorded with the deed and ensures that future landowners are subject to the same restrictions.

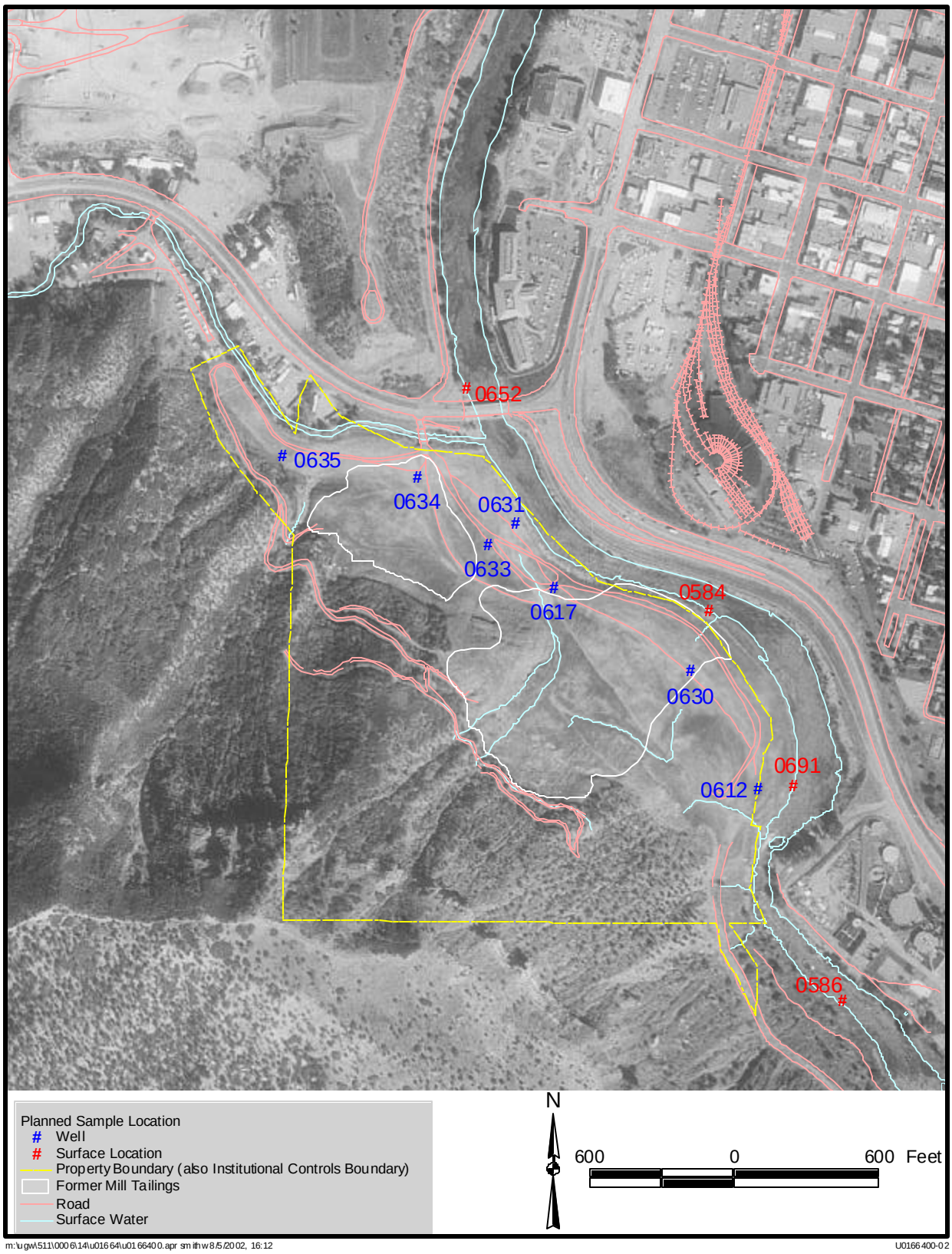

Figure 4. Proposed Sampling Locations at the Mill Tailings Area

As a result of recent legislation (Colorado Senate Bill 01-145; effective July 1, 2001), the State of Colorado, through CDPHE, plans to enter into an environmental covenant with the City of Durango that defines restrictions on ground water use that could present risk to human health and the environment. The environmental covenant on the mill tailings area property will remain in perpetuity and will be binding on future landowners, but the covenant may be modified or terminated according to conditions stated in the covenant. Also, the property owner is obligated to notify CDPHE of any development that has the potential to violate the terms of the covenant. The property owner must also send an annual report to CDPHE certifying compliance, or lack of compliance, with the terms of the covenant. The covenant contains enforcement provisions. DOE believes that these ICs satisfy the EPA requirements (40 CFR 192, Subpart B) for permanence, enforceability, and ability to be maintained and verified.

3.1.2 Raffinate Ponds Area

3.1.2.1 Decision Process for the Proposed Action

At the raffinate ponds area, the proposed strategy is no further remediation in conjunction with (1) application of supplemental standards (on the basis of limited use ground water), (2) implementation of ICs, and (3) as a best management practice, continued monitoring of ground water and surface water. Figure 5 shows the steps that were involved in selecting this compliance strategy, and Table 4 explains the decision process in the figure.

Table 4. Explanation of the Compliance Strategy Selection Process for the Raffinate Ponds Area

Box in Figure 3	Action or Question	Result or Decision
1	Characterize the plume and hydrological conditions.	See site conceptual model in Section 5 of the SOWP (DOE 2002). Move to Box 2.
2	Is ground water contamination present in excess of MCLs or background?	Yes. Selenium concentrations exceed the MCL in many areas of the bedrock aquifer. Move to Box 4.
4	Does contaminated ground water qualify for supplemental standards due to its classification as limited use ground water?	Yes. Ground water beneath the raffinate ponds area can be classified as limited use on the basis of "widespread ambient contamination…that cannot be cleaned up using treatment methods reasonably employed in public water systems…" (40 CFR 192.11 [e] [2]). Also, the ground water is not a current or potential source of drinking water. The presence of selenium is not mill-related and derives from natural geologic sources. Move to Box 5.
5	Are human health and environmental risks of applying supplemental standards acceptable?	Yes. Ground water is not used for any purpose, and no complete exposure pathways exist. An IC is currently in place in the form of language in the property deed that prohibits use of ground water without written permission of DOE and CDPHE. An environmental covenant between the State and Animas-La Plata Water Conservancy District is in progress. Move to Box 7; apply supplemental standards.

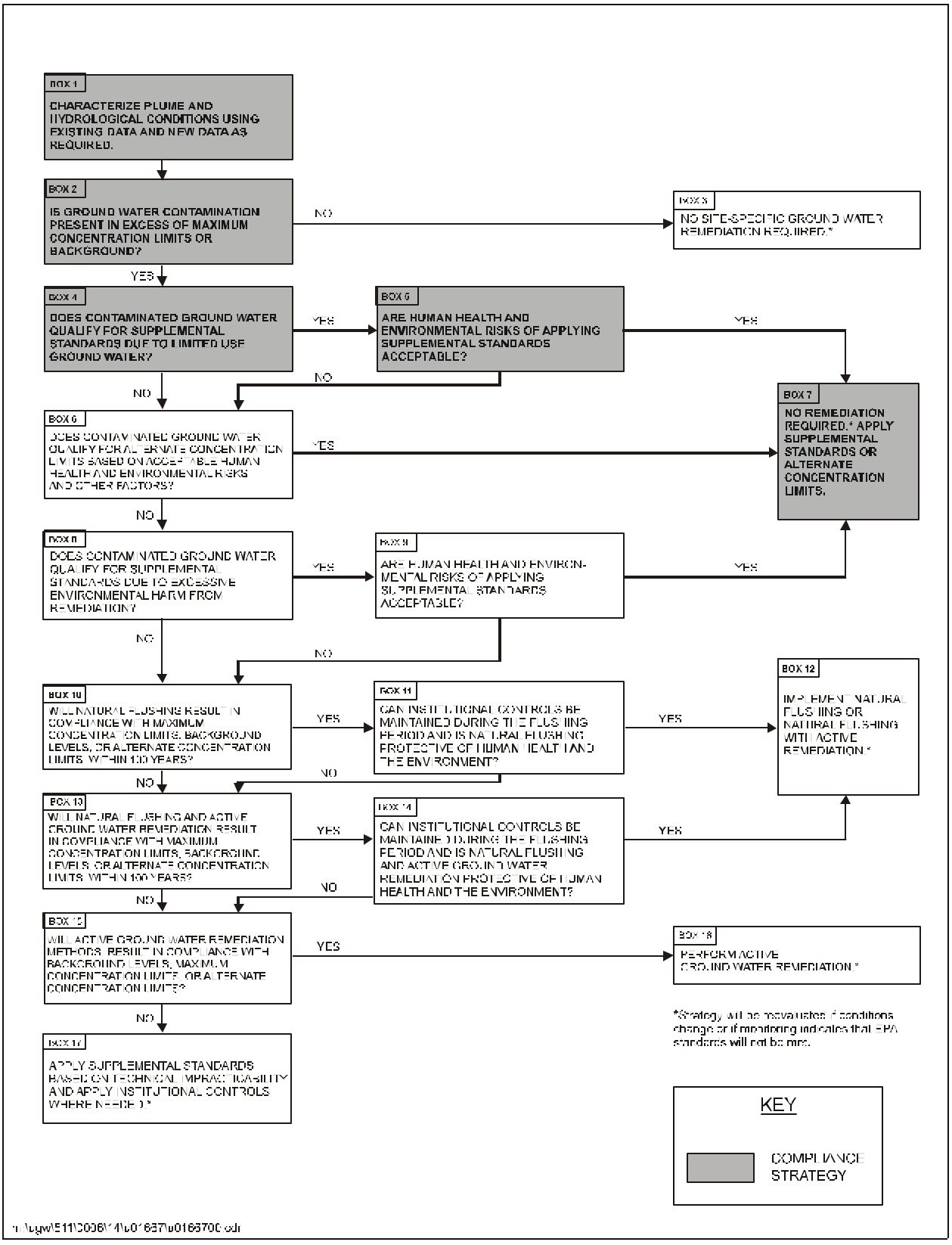

Figure 5. Ground Water Compliance Selection Process for the Raffinate Ponds Area

3.1.2.2 Actions Considered but Eliminated

The two other possible alternatives—active remediation and natural flushing—were eliminated from further consideration at the raffinate ponds area because of the naturally high background levels of selenium in ground water. Neither active remediation nor natural flushing would reduce selenium concentrations to levels below the MCL. As at the mill tailings area, ICs are currently in place, and no complete exposure pathway to contaminated ground water exists.

3.1.2.3 Explanation of the Proposed Action

The no-further-remediation option can be applied at sites where contaminant concentrations are at or below MCLs or background levels or at sites where contaminant concentrations are above MCLs or background levels but qualify for supplemental standards or ACLs. Supplemental standards are ground water quality standards that may be applied instead of MCLs, ACLs, or background concentrations when at least one of the eight criteria in 40 CFR 192.21 is met. One of these criteria is met when ground water is considered to have limited use and is not a current or potential source of drinking water because of "widespread, ambient contamination...that cannot be cleaned up using treatment methods reasonably employed in public water systems."

Bedrock ground water at the raffinate ponds area qualifies for supplemental standards on the basis of its limited use due to widespread, elevated concentrations of selenium. The elevated selenium concentrations are not mill related and are derived from natural geologic sources. Section 5.4 of the SOWP (DOE 2002) provides documentation that selenium levels at the raffinate ponds area occur naturally.

To qualify for supplemental standards under 40 CFR 192, ground water also must not be a current or potential source of drinking water. Ground water beneath the raffinate ponds area meets this criterion because ICs have been implemented to ensure that ground water will not be used. Potable water is readily available from the municipal water system in the vicinity of the site.

Ground water use at the raffinate ponds area is limited by language in the quitclaim deed transferring the property from the State of Colorado to the Colorado Water Conservation Board. The property was later transferred from the Colorado Water Conservation Board to the Animas-La Plata Water Conservancy District, the current owner. The deed has the same restrictive language as that in the quitclaim for the mill tailings area. This language is recorded with the deed and ensures that any future landowners are subject to the same restrictions. As with the mill tailings area property, CDPHE will enter into an environmental covenant to establish restrictions on ground water use that could present risk to human health and the environment.

The raffinate ponds area is the proposed site for the Bureau of Reclamation to construct a pumping plant to support the Animas-La Plata water project (whereby water would be pumped from the Animas River to a water storage reservoir). Following the requirements of the deed restrictions, the Bureau of Reclamation has submitted a land use plan and site monitoring plan for the proposed pumping plant to CDPHE and DOE. Through the land use plan, the Bureau of

Reclamation has agreed to send CDPHE and DOE detailed construction specifications and obtain written approval before awarding the bid for the construction contract. The Bureau of Reclamation has also agreed to send CDPHE and DOE any future revisions to the land use plan for their review and approval.

DOE also proposes to monitor uranium and selenium concentrations in ground water and nearby surface water as a best management practice. Figure 6 shows the proposed well and surface water monitoring locations, and Table 5 summarizes the requirements for monitoring. On-site wells 0879 and 0880 would be sampled to monitor concentrations of selenium and uranium in the upper portions of the bedrock, and well 0598 would be sampled to monitor concentrations in ground water within the Bodo Fault zone. Off-site well 0884 would be sampled to monitor downgradient migration of contaminants. Upgradient well 0607 would be sampled to provide an indication of the quality of ground water coming onto the site.

Surface water samples would be collected at location 0588 (on South Creek upgradient of the site) to assess the quality of water entering the site and at locations 0654 and 0656 along the Animas River to verify that the strategy of no further remediation, supplemental standards, and ICs is protective of the environment.

Table 5. Summary of Proposed Monitoring at the Raffinate Ponds Area

Sampling Location	Monitoring Purpose	Analytes	Location
0879, 0880	Monitor concentrations in ground water in the shallow bedrock	Selenium Uranium	On site
0598	Monitor concentrations in ground water in the deep bedrock and Bodo Fault zone		On site
0884	Monitor off-site downgradient concentrations and migration		Off site, downgradient
0607	Water quality entering the raffinate ponds area		On site, upgradient
0588	Surface water quality entering the site		Off site, upgradient
0654, 0656	Downgradient surface water concentrations		Off site, downgradient

For the first 5 years, monitoring would be conducted annually. After 5 years, the monitoring strategy would be reevaluated and adjusted as appropriate on the basis of analytical results. Monitor wells no longer used for monitoring would be decommissioned in accordance with UMTRA Project procedures and applicable State of Colorado regulations.

3.1.3 Long-Term Stewardship

Once the proposed action has been made final, DOE has the responsibility to ensure that the selected strategy continues to be protective of human health and the environment. The mill tailings area and the raffinate ponds area will become part of the Long-Term Surveillance and Maintenance (LTSM) Program administered by the DOE Grand Junction Office in Grand Junction, Colorado. The LTSM Program will manage these areas according to a long-term surveillance plan to be prepared specifically for the Durango site. DOE will maintain authority and responsibility for long-term monitoring.

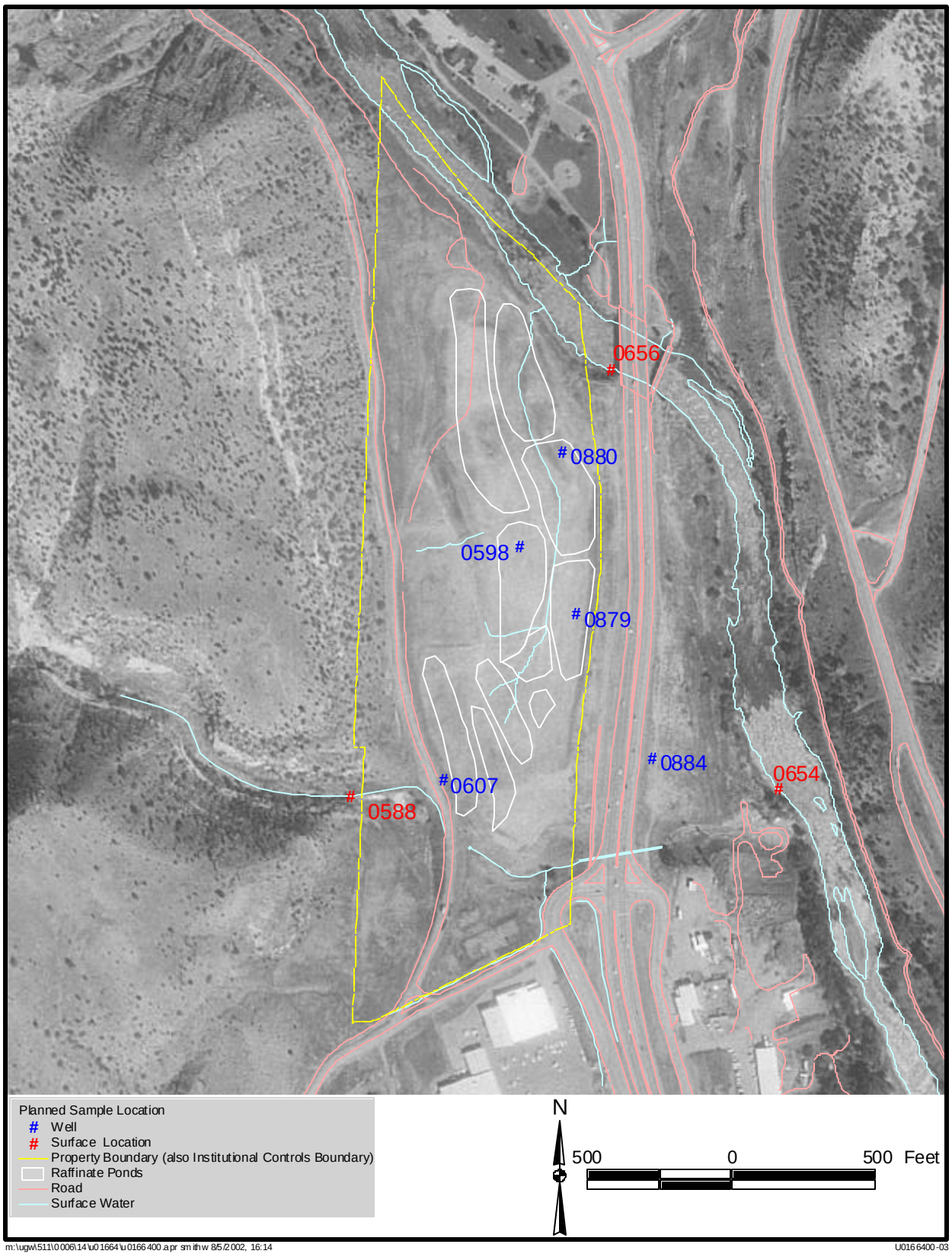

Figure 6. Proposed Monitoring Locations at the Raffinate Ponds Area

DOE created the LTSM Program in 1988 to provide long-term care for low-level radioactive materials disposal sites. LTSM Program personnel inspect each assigned site at least annually and prepare, distribute, and archive an annual site condition report. The purpose of the annual inspection is to confirm the integrity of visible features at the site, identify changes or new conditions that may affect the site's features, and determine the need, if any, for maintenance, follow-up inspections, or additional monitoring. At the Durango site, LTSM inspectors would verify that ground water is not being used for any purpose and would ensure that the environmental covenants are being enforced. Inspectors would look for indications of unauthorized use of ground water such as drilling, building, and excavating.

3.1.3.1 Land Status

In January 2000, the mill tailings area property was conveyed by quitclaim deed to the City of Durango. Potential development plans for the mill tailings area include construction of a park, visitor's center, parking lots, and a museum or other type of public building. There are no plans to develop the site for residential use.

The Animas-La Plata Water Conservancy District owns the raffinate ponds area property. Current plans are to construct a pumping plant on the property as part of the Animas-La Plata water project. A land use plan, currently in preparation, will not allow residential construction, and permanent building of any type at the raffinate ponds area will not be allowed without written approval of CDPHE and DOE.

3.1.3.2 Institutional Controls

The deed restrictions (which serve as a notice to the public) to both the mill tailings and raffinate ponds areas contain language that prohibits access to ground water without written permission of DOE and CDPHE. The LTSM Program would ensure that ICs remain in place throughout the natural flushing period at the mill tailings area and in perpetuity at the raffinate ponds area. In addition, CDPHE would monitor compliance with the site's environmental covenants by reviewing annual reports submitted by the landowners.

3.2 No Action Alternative

By law, DOE is required to evaluate a no action alternative in environmental assessments (10 CFR 1021.321[c]). Evaluation of a no action alternative provides a baseline for comparing the effects of the proposed action. Under the no action alternative for the Durango site, DOE would conduct no further activities at either the mill tailings area or raffinate ponds area and would conduct no monitoring of ground water or surface water quality (DOE 1996, Section 2.2). Although the natural flushing process would continue at both areas, DOE would not document compliance with ground water standards. In addition, DOE would not evaluate future risks that may be associated with cadmium concentrations in well 0612. On-site wells may or may not be decommissioned under this alternative, as this issue is currently unresolved. For the purposes of analysis in this environmental assessment, DOE assumes that all wells would be decommissioned. Public use of or exposure to ground water at the mill tailings and raffinate

ponds areas would continue to be prohibited by the deed restrictions currently in place, but DOE would have no obligation to verify the ICs. CDPHE would verify compliance with the environmental covenants. The only substantive difference between the proposed action and no action alternatives at these areas would be the lack of ground water and surface water quality monitoring under the no action alternative.

4.0 Affected Environment and Environmental Consequences

DOE's NEPA guidance (DOE 1993) directs that only the environmental issues or resources affected by the proposed action and no action alternatives be described in an environmental assessment. The following issues and resources are not affected and are therefore not addressed in this environmental assessment:

Resource or Issue	Rationale
Air quality	No air emissions would result from the proposed action
Cultural and historical resources	The proposed action would not involve any surface-disturbing activities; also, no cultural or historical resources are on or near the site (DOE 1985, DOE 2000).
Soils	No soils would be disturbed during the proposed action.
Transportation	No increase in traffic would occur. The only transportation-related activity would be annual sampling at the monitoring locations.
Vegetation	No surface-disturbing activities would take place under the proposed action. Ground water beneath the mill tailings area presents no risk to wetland plants or deep-rooted plants; ground water beneath the raffinate ponds area presents no risk to wetland plants and very low potential risk to deep-rooted plants.
Visual resources	No surface-disturbing activities would take place to affect visual resources.
Wild and scenic rivers	No proposed or designated wild and scenic rivers are near the site.

The remainder of Section 4 presents discussions of environmentally sensitive issues that are related to the site and other issues that the proposed action may directly or indirectly affect. These issues and resources are ground water, surface water, land and water use, human health, ecological risk, floodplains, wetlands, threatened or endangered species, socioeconomics, and environmental justice.

4.1 Ground Water

4.1.1 Affected Environment

Mill Tailings Area

The uppermost ground water at the mill tailings area is in an unconfined alluvial aquifer, which receives recharge from infiltration of precipitation and runoff and by contact with the Animas River and Lightner Creek. During spring runoff when the river stage is high, water flows into the aquifer. When the river stage is lower, ground water flows from the aquifer into the Animas River. Depth to the water table ranges from about 10 to 60 ft; the base of the aquifer is in contact with Mancos Shale bedrock. Along the base of Smelter Mountain, the bedrock is overlain by up to 70 ft of colluvium, which consists of poorly sorted silty soil from Smelter Mountain. Closer to Lightner Creek and the Animas River, deposits of alluvial sand and gravel up to 15 ft thick overlie the shale bedrock. The saturated zone is generally thin in the mill tailings area, ranging from 0 to about 7 ft in thickness over most of the site. The volume of ground water discharge from the mill tailings area into the Animas River is estimated to be 1,480 ft^3/day; discharge into Lightner Creek is estimated to be 840 ft^3/day (DOE 2002). Because the saturated thickness of the alluvial aquifer was insufficient to conduct conventional pumping tests, aquifer properties were estimated with slug tests[5].

Ground water monitoring results indicate that background concentrations of all constituents except selenium have been and continue to be below UMTRA MCLs. Selenium has been detected at concentrations up to 0.011 mg/L in background well 0857 and up to 0.0148 mg/L in background well 0866.

Following completion of surface remediation in 1991, concentrations of arsenic, cadmium, lead, molybdenum, net alpha, radium-226+228, selenium, and uranium continued to exceed MCLs on-site (directly below the mill tailings area). During the last 10 years of monitoring, arsenic, lead, and radium have decreased to levels below MCLs, and net alpha has been detected only sporadically in a few wells. Manganese and sulfate, which have no MCLs, are present in the ground water at levels that exceed their risk-based concentration and background concentration, respectively.

Historically, monitor well 0612 has shown the highest levels of contamination. This well is completed through slag from an old lead smelter that operated on the site from 1880 to 1930. The slag in this area is 20 to 30 ft thick, and the presence of cadmium, molybdenum, and uranium in the well is believed to be associated with the alluvial material below the slag that remained in place after surface remediation. The completion report for the surface remediation project (DOE 1994, Appendix K) documented that a thin lens of uranium precipitate identified below the slag was thought to be a result of an old spill on the slag pile that was slowly leaching through the slag. The material under the slag was sampled along the riverbank during surface remediation, and the volume-averaged uranium concentration was below the U.S. Nuclear Regulatory Commission guideline for unrestricted disposal. However, because of the difficulties

[5] A slug test is an aquifer test made either by pouring a small instantaneous charge of water into a well or by withdrawing a slug of water from the well.

with excavating and drilling in the slag, the extent of potentially contaminated material was not fully characterized (DOE 2002).
Although some of the selenium concentrations at the mill tailings area may be a result of past ore-processing activities, elevated concentrations can also be attributed to naturally occurring selenium, as evidenced by the concentrations above the MCL in background wells 0857 and 0866.

Raffinate Ponds Area

The uppermost ground water in the raffinate ponds area is primarily in the bedrock units; alluvial ground water occurs only in one small, isolated area. Bedrock of the Point Lookout Sandstone underlies the northwestern two-thirds of the area between the Smelter Mountain Fault and the Bodo Fault, a northeast-southwest trending fault that cuts through the raffinate ponds area. The Menefee Formation underlies the southeastern one-third of the area southeast of the Bodo Fault. Ground water flow in the Point Lookout Sandstone and Menefee Formation is mostly through open bedding planes, joints, and fractures. Except where the Bodo Fault crosses the raffinate ponds area, well yields in the bedrock formations are too low to support conventional pumping tests, and aquifer properties were estimated from slug and packer tests[6]. The slug test results indicate that the Bodo Fault is a potential conduit for ground water flow at the site.

Ground water in the bedrock units is recharged by infiltration of precipitation and runoff and by horizontal inflow from Smelter Mountain. The elevations of both the alluvium/bedrock interface and the ground water are higher than the water level in the Animas River. Therefore, unlike in the mill tailings area, the river does not recharge the aquifer in this area.

Background ground water quality was evaluated using sampling results from wells 0592 and 0903, which are screened in the Menefee Formation, and wells 0599 and 0875, which are screened in the Point Lookout Sandstone. Background concentrations of all constituents except selenium were below the respective standards. Selenium concentrations in well 0599 ranged from 0.062 to 0.087 mg/L.

Since completion of surface remediation, uranium and selenium have been the only constituents with concentrations that have consistently exceeded MCLs. Net alpha has been detected sporadically in only a few wells.

4.1.2 Environmental Consequences

Proposed Action Alternative

Mill Tailings Area

Ground water flow and transport modeling has predicted that natural flushing will reduce site-related concentrations of all constituents except cadmium to levels below the standards shown in Table 1 within 100 years. However, recent monitoring results suggest that cadmium

[6] A packer test is an aquifer test performed in an open borehole; the segment of the borehole to be tested is sealed off from the rest of the borehole by inflating seals, called packers, both above and below the segment.

concentrations are decreasing faster and to a greater extent than predicted by the model. DOE believes the MCL of 0.01 mg/L for cadmium will be met within 100 years. Cadmium concentrations in well 0612 would be monitored annually for the next 10 years, and risk from cadmium would be reevaluated after additional data are collected. Monitoring concentrations of the other constituents would allow DOE to track the progress of natural flushing.

Raffinate Ponds Area

Under the proposed action alternative, the naturally poor quality of the ground water would continue to render it unfit for any use. Ground water in the bedrock formations beneath the raffinate ponds area is not a current or potential source of drinking water. Monitoring would allow DOE to continue to verify that the strategy of no further remediation is protective of the environment.

No Action Alternative

Mill Tailings Area

Under the no action alternative, ground water contaminant concentrations would decrease as milling-related constituents flush through the aquifer. The quitclaim that conveyed the mill tailings area property to the City of Durango in January 2000 contains language that prohibits use of site ground water for any purpose and prohibits construction of wells or any means of exposing ground water to the surface without written approval from DOE and CDPHE. Those restrictions would remain in effect under the no action alternative. The restrictions in the proposed environmental covenant discussed in Section 3.1, "Proposed Action Alternative," would reinforce those in the deed. The only substantive differences under the no action alternative would be that DOE would not monitor ground water to track the progress of natural flushing, would not collect additional data to evaluate risk from cadmium in well 0612, and would not verify that ICs are being maintained.

Raffinate Ponds Area

The Animas-La Plata Water Conservancy District owns the raffinate ponds area property. Current plans are to construct a pumping plant on the property as part of the Animas-La Plata water project. The deed restrictions discussed in Section 3.1, "Proposed Action Alternative," would remain in place under the no action alternative, as would the restrictions in the proposed environmental covenant. Therefore, as with the mill tailings area, the only substantive difference under the no action alternative would be that DOE would not monitor for contaminants and would not verify that ICs are being maintained.

4.2 Surface Water

4.2.1 Affected Environment

Lightner Creek flows along the northern edge of the mill tailings area. Historically, the average flow is 22.6 cubic feet per second (ft^3/s), and minimum daily flows are 1.0 ft^3/s or less

(DOE 2002). The Animas River forms the eastern boundary of the site. A U.S. Geological Survey gauging station is maintained about 4,500 ft upstream of the confluence of Lightner Creek and the river. The annual mean flow in the river from 1970 to 2000 was 847 ft^3/s, and the record 7-day low flow was 100 ft^3/s in December 1971 (DOE 2000).

The Animas River runs along the eastern edge of the northern half of the raffinate ponds area downstream of the mill tailings area. No tributaries enter the river between the two sites, but the outfall from the Durango municipal wastewater treatment plant is located at the north end of the raffinate ponds area. This plant discharges about 2 million gallons per day (DOE 2000).

South Creek flows along the southern edge of the raffinate ponds area and is dry except during heavy rainfall. South Creek joins the Animas River about 1,000 ft east of the raffinate ponds area.

The small number of potential contaminants identified for surface water at the site, as determined by comparisons to upstream concentrations, verifies previous observations (DOE 1995) that past milling operations have had very little effect on water quality of the Animas River and Lightner Creek. All constituent concentrations in the 61 samples collected between June 1999 and June 2001 were below the CDPHE surface water quality standards, with the exception of manganese. Manganese was occasionally detected at concentrations above the water quality standard at several locations. However, manganese levels also exceeded the standard in the upgradient background surface water locations on the Animas River. None of the measured manganese concentrations from the downgradient surface water locations exceeded the maximum observed concentrations from the upgradient background locations.

The estimated combined inflow to the Animas River from the alluvial aquifer at the mill tailings area and the bedrock aquifer at the raffinate ponds area is about 2,680 ft^3/day, and the annual mean flow in the river is about 847 ft^3/s, or more than 73 million ft^3/day. The volume of ground water discharging into the river at the site is insignificant compared to the volume of river water. Consequently, mill-related constituents reaching the river through ground water discharge mix with river water and decrease to background concentrations, which present no risk to human health or the environment.

4.2.2 Environmental Consequences

Proposed Action Alternative

Under the proposed action alternative, contaminated ground water would continue to discharge to the Animas River, but continued monitoring would verify that the volume of flow in the river naturally decreases the contaminant concentrations. Also, because concentrations of most ground water contaminants are predicted to decrease over time, ground water beneath the mill tailings and raffinate ponds areas should deliver less contaminant mass to the river over time. The proposed action alternative would verify but have no effect on this process.

No Action Alternative

As with the proposed action alternative, the no action alternative is expected to have no effect on the quality of surface water in the site area. The only difference is that DOE would not collect samples from the river and Lightner Creek to verify that ground water contaminants are not affecting surface water quality.

4.3 Land and Water Use

4.3.1 Affected Environment

Potential development plans for the mill tailings area include construction of a park, visitor's center, parking lots, and a museum or other type of public building. There are no plans to develop the site for residential use (DOE 2002).

Plans are under way to construct a pumping plant in the raffinate ponds area of the site as part of the Animas-La Plata water project. Development of additional water resources is a concern because the city's water supply is not sufficient to meet projected future needs. The Animas-La Plata Water Conservancy District, Bureau of Reclamation, and CDPHE are in the process of developing a restricted use plan for the raffinate ponds area. The State of Colorado is presently planning to convey a 50-year renewable easement to the Bureau of Reclamation for the land needed for the pumping plant. Although the land use plan is not yet completed, residential use will not be considered, and permanent building of any type at the raffinate ponds area will not be allowed without prior approval from CDPHE and DOE (DOE 2002).

Durango's primary water source is the Florida River; additional water is taken from the Animas River during high-demand periods (usually during the summer). The pumping station for this Animas River water is about 2 miles upstream of the mill tailings area. Although the City is considering developing additional water resources to supplement the current supply, ground water has not been considered as a water source for the municipal system. Ground water in the area is considered to be of poor quality because of elevated levels of hardness, iron, manganese, and hydrogen sulfide (DOE 2002).

The portions of the Animas River that border both areas of the Durango site are used for recreation during the warmer months. Kayaking and rafting are common in this stretch of the river when a sufficient volume of water is flowing, and trout fishing is popular during times of lower flows.

4.3.2 Environmental Consequences

Proposed Action Alternative

Because use of site ground water is already prohibited by language in the deeds at both the mill tailings and raffinate ponds areas, and land use would be restricted by the proposed environmental covenants at both areas, the proposed action would have no effect on land and water use at the Durango site. DOE would continue to monitor ground water and surface water to

track the progress of natural flushing and verify that the proposed strategy is protective of human health and the environment.

No Action Alternative

The no action alternative would not affect current or future uses of land and water at the Durango site. However, DOE would not monitor contaminant concentrations in ground water and surface water to evaluate the progress of natural flushing.

4.4 Human Health

4.4.1 Affected Environment

During preparation of the SOWP (DOE 2002), DOE completed a quantitative human health risk assessment as part of the update for the 1995 Baseline Risk Assessment (DOE 1995). The calculations show that the only potential risks are associated with exposure to ground water; no unacceptable risks (as calculated by EPA methodology described in DOE 1996, Appendix B) are associated with exposure to surface water.

Mill Tailings Area

Contaminated ground water associated with the mill tailings area does not currently pose a human health risk because the water is not used for drinking. The deed restriction preventing the use of ground water for any purpose without permission of CDPHE and DOE essentially serves as a perpetual institutional control. The only potentially complete pathway for ground water exposure is where it discharges to the Animas River. However, ground water mixes with the river water, and contaminant concentrations decrease to levels that are protective for any likely human exposures to surface water. A kayak course is located in the river adjacent to the site. Use of the Animas River for recreation in the area of ground water discharge currently poses no health risk to humans.

Raffinate Ponds Area

As at the mill tailings area, ground water associated with the raffinate ponds area is not currently used for any purpose and does not pose any health risk to humans. Use of this water is restricted as it is at the mill tailings area by language in the property deed. The only potentially complete pathway for ground water exposure would be at the point it discharges to the Animas River. As with the mill tailings area, ground water contaminant concentrations decrease significantly as the aquifer discharges into the river and are protective of human health for likely uses. A city park is located across the river from the raffinate ponds area and has a boat launch. The river is used for recreational purposes in this area.

4.4.2 Environmental Consequences

Proposed Action Alternative

Mill Tailings Area

Under the proposed action strategy of natural flushing, the deed restriction currently placed on the property would ensure protection of human health. DOE would continue to monitor the constituents listed in Table 3 at the locations shown in Figure 4.

Raffinate Ponds Area

The deed restrictions currently in place for the raffinate ponds area property prohibit unauthorized use of ground water. During DOE's annual ground water and surface water monitoring, the sampling team would verify that no improper use of ground water is occurring.

No Action Alternative

Under the no action alternative, although ground water use at both areas would still be prohibited by the deed restrictions in place, and human health would be protected, DOE would have no obligation to monitor ground water or verify that ICs are maintained. It would not be known whether cleanup goals were achieved or if restrictions on ground water use could be lifted. Surface water monitoring would not be conducted; any changes in surface water quality would be undetected.

4.5 Ecological Risk

4.5.1 Affected Environment

The ground surfaces of the mill tailings and raffinate ponds areas are highly disturbed from past use and subsequent soil remediation. These disturbed areas were reseeded with grasses, including smooth brome, Kentucky bluegrass, western wheatgrass, blue grama, galleta, and saltgrass (DOE 1995). Wildlife that use the site include several species of birds, as well as deer mice, cottontail, deer, and beaver. The cold water of the Animas River adjacent to the Durango site supports trout, which are stocked by the Colorado Division of Wildlife (DOE 1995).

As a result of consultation with the U.S. Fish and Wildlife Service Grand Junction Office, three threatened or endangered species were identified as potentially occurring near the site. These are the razorback sucker, Colorado pikeminnow, and southwestern willow flycatcher. Neither the razorback sucker nor the Colorado pikeminnow are likely to occur in the vicinity; however, suitable habitat for the southwestern willow flycatcher occurs along the Animas River, although not close to the site. In addition to these species, bald eagles are known to winter along the Animas River near Durango but are not known to have nested there in recent history.

EPA conducted an investigation of the Animas River adjacent to the Durango site in October 1997 and published a report of their findings in April 1998 (EPA 1998). For this study, samples

of surface water and sediments were collected at regular intervals from the west side of the Animas River for analysis of metals. Upgradient background samples were also collected. Fish tissue samples were collected for analysis upstream and downstream of the site as well. EPA concluded that site contaminants were not adversely affecting surface water or sediments. None of the downstream fish tissues analyzed had constituents that were statistically elevated above background.

DOE completed a quantitative ecological risk assessment as part of the SOWP (DOE 2002). The calculations show that the only potential risks are associated with exposure to ground water; no unacceptable risks are associated with exposure to surface water.

4.5.2 Environmental Consequences

Proposed Action Alternative

The only activities associated with the proposed action alternative would be ground water and surface water monitoring and well decommissioning. These activities would require minimal disturbance and noise generation and would not adversely affect the environment or ecological receptors. Ground water monitoring would allow DOE to track the progress of natural flushing, and surface water monitoring would verify that water quality in the Animas River is protective of potential ecological receptors. The current deed restrictions for the mill tailings and raffinate ponds areas prohibit ground water use, so ecological receptors could not be directly exposed to ground water at the sites.

No Action Alternative

Under the no action alternative, no monitoring would take place. However, potential effects to ecological receptors would be the same as under the proposed action alternative because restrictions on ground water use would be the same at both areas.

4.6 Floodplains and Wetlands

4.6.1 Affected Environment

Floodplains

As the Animas River reaches Durango, it changes from a slow, meandering stream with a wide floodplain to a relatively straight, swiftly flowing stream with a narrow floodplain. For this reason, less than 10 acres of the mill tailings area and the raffinate ponds area are in the 100-year floodplain of the river.

In the Animas River, flooding is usually caused by frontal rainstorms or snowmelt during the period July through October. In the smaller tributaries such as Lightner Creek, flooding is caused by localized thunderstorms. The historical peak flow of the Animas River, measured in 1925, is 25,000 ft^3/s. The 1980 peak flow of 8,220 ft^3/s is the highest flow in the period from 1958 to the present. Estimated peak flood flows for the Animas River are 23,000 ft^3/s for a 100-year flood,

and 271,000 ft^3/s for a Probable Maximum Flood (U.S. Army Corps of Engineers 1977 [in DOE 1985]). The Probable Maximum Flood estimate is based on the 24-hour probable maximum precipitation event in the Animas Basin. The 100-year flood would raise the baseline of the river by 16 ft and inundate the edges of the mill tailings area and the raffinate ponds area.

In accordance with DOE's floodplain regulations (10 CFR 1022), DOE prepared a Floodplain and Wetlands Assessment (DOE 1984, Appendix J) for the Durango site in 1984 before surface remediation was conducted. That document analyzed the impacts associated with various flood events and from surface remediation. Since completion of remediation activities, the 100-year floodplains have revegetated and stabilized. Currently, several monitor wells are located in floodplain areas. No activities other than ground water and surface water sampling presently occur in the floodplain areas.

Wetlands

EPA conducted a wetlands delineation as part of an Expanded Site Investigation in October 1997. Details of that investigation are included in Appendix H of the SOWP (DOE 2002). The wetlands delineation resulted in the identification of 0.40 mile (2,100 ft) of riparian-emergent and scrub-shrub wetland in a narrow band along the Animas River, starting at the south boundary of the mill tailings area and continuing past the raffinate ponds area to the U.S. Highway 550 bridge. Presently, the only activity that occurs within the wetland area is periodic surface water sampling.

4.6.2 Environmental Consequences

Proposed Action Alternative

Under the proposed action alternative, the only activities that would occur in the floodplain and wetland areas are ground water and surface water sampling. Because sampling activities would not disturb soils or vegetation or affect ground water or surface water quality, the proposed action alternative would have no effect on floodplain or wetland areas.

No Action Alternative

Under the no action alternative, no activities would take place in the floodplain or wetland area; hence, this alternative would have no effect on the floodplains or wetlands.

4.7 Threatened or Endangered Species

4.7.1 Affected Environment

Consultation with the U.S. Fish and Wildlife Service in 2000 determined the potential presence of three threatened or endangered species at the Durango site. These are the southwestern willow flycatcher, the Colorado pikeminnow, and the razorback sucker. The bald eagle is another species on the threatened or endangered species list that has been documented as having winter range near the Durango site.

The updated ecological risk assessment in the SOWP determined that there was minimal potential for risk to ecological receptors at the Durango site. Exposure to contaminants in ground water constitutes the main risk at both the mill tailings and raffinate ponds areas. The EPA investigation in 1997 analyzed tissue from trout taken from the Animas River upstream and downstream of the site and found no apparent effects of site contamination on the fish.

4.7.2 Environmental Consequences

Proposed Action Alternative

The proposed action alternative would pose no risk to threatened or endangered species. There is little or no evidence that these species are present at or near the sites; only potentially suitable habitat has been documented. Because the EPA analysis of fish tissues confirmed that site contamination has had no measurable effect on trout in the Animas River, the contamination is therefore unlikely to affect other fish species. Also, no adverse effects to wildlife are expected as a result of ground water and surface water monitoring, as no physical disturbances are associated with this activity.

No Action Alternative

As with the proposed action alternative, the no action alternative is expected to have no effect on threatened or endangered species. The only difference is that DOE would not collect samples from the river to verify that the strategy of no further remediation is protective of the environment.

4.8 Socioeconomics and Environmental Justice

4.8.1 Affected Environment

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, states that federal programs and actions shall not disproportionately affect minority or low-income populations. The 2000 census in Durango found that 10.3 percent of the population is Hispanic or Latino, 6.5 percent is Native American, and 2.2 percent is other minorities.

4.8.2 Environmental Consequences

Proposed Action

Ground water at the site is not a current or potential source of drinking water, and ICs prevent unauthorized access to the contaminated ground water. Therefore, no adverse effects to any populations would be expected.

No Action Alternative

No disproportionately high or adverse effects to minority or low-income populations would occur under the no action alternative. Deed restrictions prevent access to the contaminated ground water. When in place, the proposed environmental covenants would reinforce restrictions at both the mill tailings and raffinate ponds areas.

4.9 Cumulative Impacts

The Council on Environmental Quality defines "cumulative impact" as the "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions" (40 CFR 1508.7). Other actions proposed for the Durango site include construction of a surface water pumping plant on the raffinate ponds area (by the Bureau of Reclamation) and possible construction of a park, visitors center, parking lot, museum, or other type of public building on the mill tailings area (by the City of Durango). None of these activities would affect ground water quality at either area. In-place ICs as well as the proposed environmental covenants would prohibit activities that potentially entailed use or exposure of ground water. Therefore, no cumulative impacts are anticipated as a result of either the proposed action or no action alternative.

5.0 Persons or Agencies Consulted

Gary L. Gianniny, Ph.D.	Professor of Geology, Ft. Lewis College Durango, Colorado
Terry Ireland	U.S. Fish and Wildlife Service Grand Junction, Colorado
Mr. Robert Ledger	City Manager Durango, Colorado
Lesley McHhirter	U.S. Army Corps of Engineers Durango, Colorado
Wendy Naugle	Colorado Department of Public Health and Environment Denver
Allan Pfister	U.S. Fish and Wildlife Service Grand Junction, Colorado
Otha Rogers	Director, City of Durango Department of Public Works Durango, Colorado
Tom Strain	Bureau of Reclamation Durango Colorado
Wayne Urbonas	County Health Manager, San Juan Basin Health Department Durango, Colorado
James W. Yahnke	Bureau of Reclamation Denver

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