

Long-Term Management Plan for the Riverton, Wyoming, Processing Site

September 2009



U.S. DEPARTMENT OF
ENERGY

Legacy
Management

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Formerly DOE-LM/1430-2007

Long-Term Management Plan for the Riverton, Wyoming, Processing Site

September 2009

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- Attachment A—*Draft Ground Water Compliance Action Plan*
- Attachment B—NRC Letter of Concurrence
- Attachment C—State of Wyoming Institutional Control Letters

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Abbreviations

| | |
|--------|--|
| CFR | <i>Code of Federal Regulations</i> |
| DOE | U.S. Department of Energy |
| EPA | U.S. Environmental Protection Agency |
| ft | feet |
| GCAP | <i>Draft Ground Water Compliance Action Plan</i> |
| IC | institutional control |
| LTMP | long-term management plan |
| MCL | maximum concentration limit |
| NAUO | Northern Arapaho Utility Organization |
| NRC | U.S. Nuclear Regulatory Commission |
| RRM | residual radioactive material |
| SAP | Sampling and Analysis Plan |
| UMTRCA | Uranium Mill Tailings Radiation Control Act |
| WREQC | Wind River Environmental Quality Commission |

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1.0 Introduction

1.1 Purpose

The purpose of this long-term management plan (LTMP) is to specify U.S. Department of Energy (DOE) activities that will ensure compliance with the *Draft Ground Water Compliance Action Plan* (GCAP) (Attachment A) and continued protection of human health and the environment at the former uranium-processing site near Riverton, Wyoming (Riverton site) (Figure 1). Long-term monitoring is necessary to address the groundwater contamination at the Riverton site and meet the requirements of Title 40 *Code of Federal Regulations* Part 192 (40 CFR 192).

1.2 Regulatory Requirements

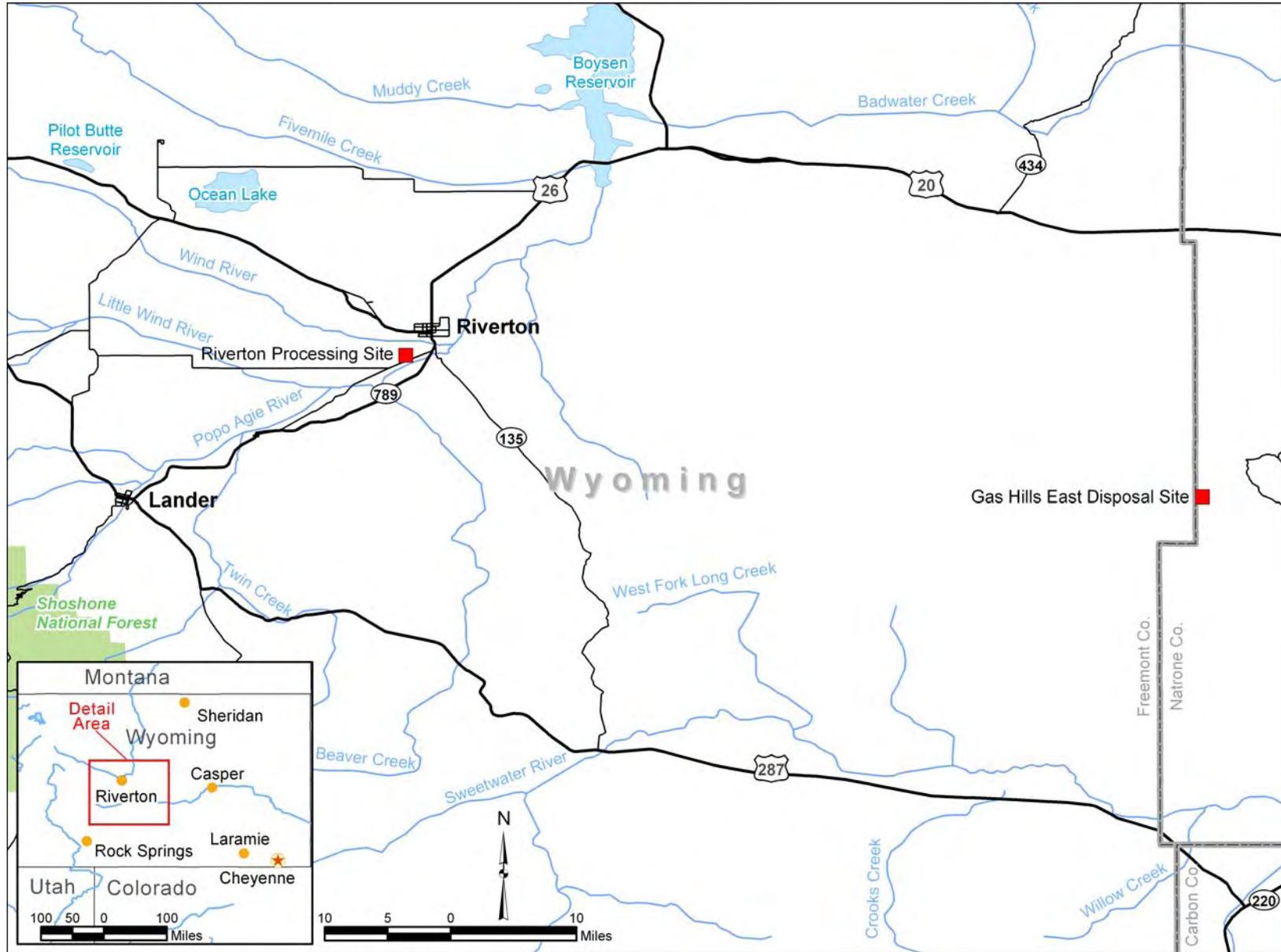
Most of the contaminated materials and residual radioactive material (RRM) were removed to an off-site, privately owned disposal cell (Gas Hills East) during surface remedial action at the Riverton site in 1988 and 1989. Several isolated areas of RRM were left on site in accordance with supplemental standards (DOE 1991). When DOE relocated the RRM, the former processing site was cleaned up to meet U.S. Environmental Protection Agency (EPA) standards. The U.S. Nuclear Regulatory Commission (NRC) certified the completion of surface remediation of the site on January 10, 1995. Because most of the RRM had been removed, NRC was not required to license the former processing site; therefore, a long-term surveillance plan, which is required as part of the licensing agreement for disposal sites, is not applicable (Statements of Consideration for 10 CFR Part 40, 40-SC-16 [April 30, 1992]).

The Riverton GCAP is the concurrence document for compliance with Subpart B of 40 CFR 192 for the Riverton site and provides an overview of the natural flushing compliance strategy (DOE 1998a). In their September 3, 1998, letter (Attachment B), NRC had no technical objection to the compliance strategy specified in the draft GCAP.

This LTMP is a stand-alone document to guide long-term activities at the Riverton site during groundwater remediation. It provides additional detail required to implement, assess, and verify the natural flushing strategy stipulated in the GCAP. It also includes the monitoring of institutional controls (ICs), the inspection and maintenance of monitor wells at the site, and the continuation of access agreements for sampling and maintenance of the monitor wells.

1.3 DOE Role

The DOE Office of Legacy Management manages the Riverton site. Consequently, DOE is responsible for preparing, revising, and implementing this LTMP. Long-term management includes overseeing monitoring and maintenance activities, reporting, and maintaining site records.



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Figure 1. Location Map

2.0 Site Summary

2.1 Site Description

The Riverton site is in Fremont County, 2 miles southwest of the city of Riverton (Figure 1), and is within the boundaries of the Wind River Indian Reservation (Northern Arapaho and Eastern Shoshone tribes). The site is on alluvial deposits between the Wind River, 1 mile north, and the Little Wind River, about 4,000 feet (ft) southeast. Three aquifers, which include (in descending stratigraphic order) an unconfined surficial alluvial aquifer (surficial aquifer), a semiconfined sandstone aquifer (semiconfined aquifer), and a confined sandstone aquifer (confined aquifer), underlie the site. Only the uppermost aquifer is within the purview of 40 CFR 192. The surficial aquifer and semiconfined aquifer constitute the uppermost aquifer, which is the aquifer where compliance with groundwater standards is assessed and enforced by NRC.

A privately owned sulfuric acid plant currently operates in the northwest corner of the former processing site. Effluent from the plant is discharged through an unlined ditch and eventually flows into the Little Wind River.

2.2 Site Ownership and Access

The former millsite is privately owned. Access to the site is granted through a perpetual easement and covenant filed with the owner.

DOE has numerous monitor wells around the former processing site on private, State, and Tribal lands. Access to these monitor wells will be maintained through access agreements with the individual owner or with the appropriate Tribal or State entity. Wells are accessible most of the year.

2.3 Groundwater Conditions

The surficial aquifer consists of 15 to 20 ft of alluvial sand and gravel with depth to groundwater typically ranging from 3 to 6 ft below ground surface. Horizontal flow in the aquifer is generally to the southeast. Molybdenum and uranium are constituents traceable to the former uranium-processing activities at the Riverton site and have contaminated the surficial aquifer. Concentrations of these constituents measured in samples from the surficial aquifer have been above their respective EPA maximum concentration limits (MCLs) (40 CFR 192), but concentrations have been declining (DOE 2009).

The semiconfined aquifer comprises sandstone that ranges in thickness from 15 to 30 ft and is continuous throughout the Riverton site. A 5- to 10-ft thick shale unit separates the surficial and semiconfined aquifers; however, the shale unit does not appear to completely separate the two units because it is discontinuous near the site (DOE 1998b). Concentrations of molybdenum and uranium in the semiconfined aquifer remain below their respective MCLs, indicating an insignificant impact from former milling activities (DOE 2009).

The confined aquifer comprises sandstone greater than 200 ft thick near the Riverton site. A shale aquitard 10 to 25 ft thick separates the semiconfined and confined aquifers. Sample results from domestic wells completed in the confined aquifer continue to indicate no impact related to former milling activities. Recent concentrations of molybdenum and uranium in samples

collected from domestic wells completed in the confined aquifer were two to three orders of magnitude below their respective MCLs (DOE 2009).

2.4 Groundwater Compliance Strategy

The groundwater compliance strategy in the GCAP is natural flushing in conjunction with ICs and compliance monitoring. Groundwater modeling predicts that natural flushing of the surficial aquifer will be completed within the 100-year timeframe specified in 40 CFR 192, Subpart B, as enforced by NRC.

2.5 Institutional Controls

Viable ICs are required to protect human health and the environment during the natural flushing period. ICs at the Riverton site are multilayered to provide additional protectiveness and limit exposure. These ICs consist of ordinances, easements, warnings, notices, and physical measures implemented and administered by a combination of Tribal and governmental agencies. Specifically:

- An alternate water supply system, funded by DOE and operated by Northern Arapaho Utility Organization (NAUO), supplies potable water to residents within the IC boundary to minimize groundwater use.
- Warning signs installed around the oxbow lake explain that the contaminated water is not safe for human consumption, and instruct passersby not to drink from, fish in, or swim in the lake.
- A Tribal ordinance controls well installation, prohibits surface impoundments, authorizes access to inspect and sample new wells, and notifies drilling contractors (who have Tribal permits) of the groundwater contamination within the IC boundary. Restrictions on well installation include a minimum depth of 150 ft below ground surface (approximately 50 ft below the top of the confined aquifer) and installation of surface casing through the contaminated upper aquifer.
- DOE notified area drilling contractors of existing groundwater contamination.
- Persons on privately owned land who apply for a gravel pit permit within the IC boundary will receive a State of Wyoming Department of Environmental Quality notification of existing groundwater contamination (Attachment C).
- Persons on Tribal land who apply for a surface impoundment within and adjacent to the IC boundary will receive a Bureau of Indian Affairs-provided notification of existing groundwater contamination.
- The State of Wyoming State Engineer's Office will inform DOE when permit applications are received for wells or surface impoundments within or adjacent to the IC boundary, provide DOE with a copy of the application for comment, and incorporate comments on the permit, if approved (Attachment C).

- Fee land property owners within the IC boundary will receive a fact sheet detailing existing groundwater contamination and ICs every 5 years until natural flushing is complete. The fact sheet will notify new property owners of current conditions and restrictions.
- A perpetual covenant title restriction on the former millsite property in accordance with Uranium Mill Tailings Radiation Control Act (UMTRCA) requirements.

Following is an IC that is in progress but not finalized.

- All residents on Tribal land within and adjacent to the IC boundary will receive a Bureau of Indian Affairs-provided notification of existing groundwater contamination.

3.0 Long-Term Management Program

3.1 Monitoring

3.1.1 Groundwater Monitoring

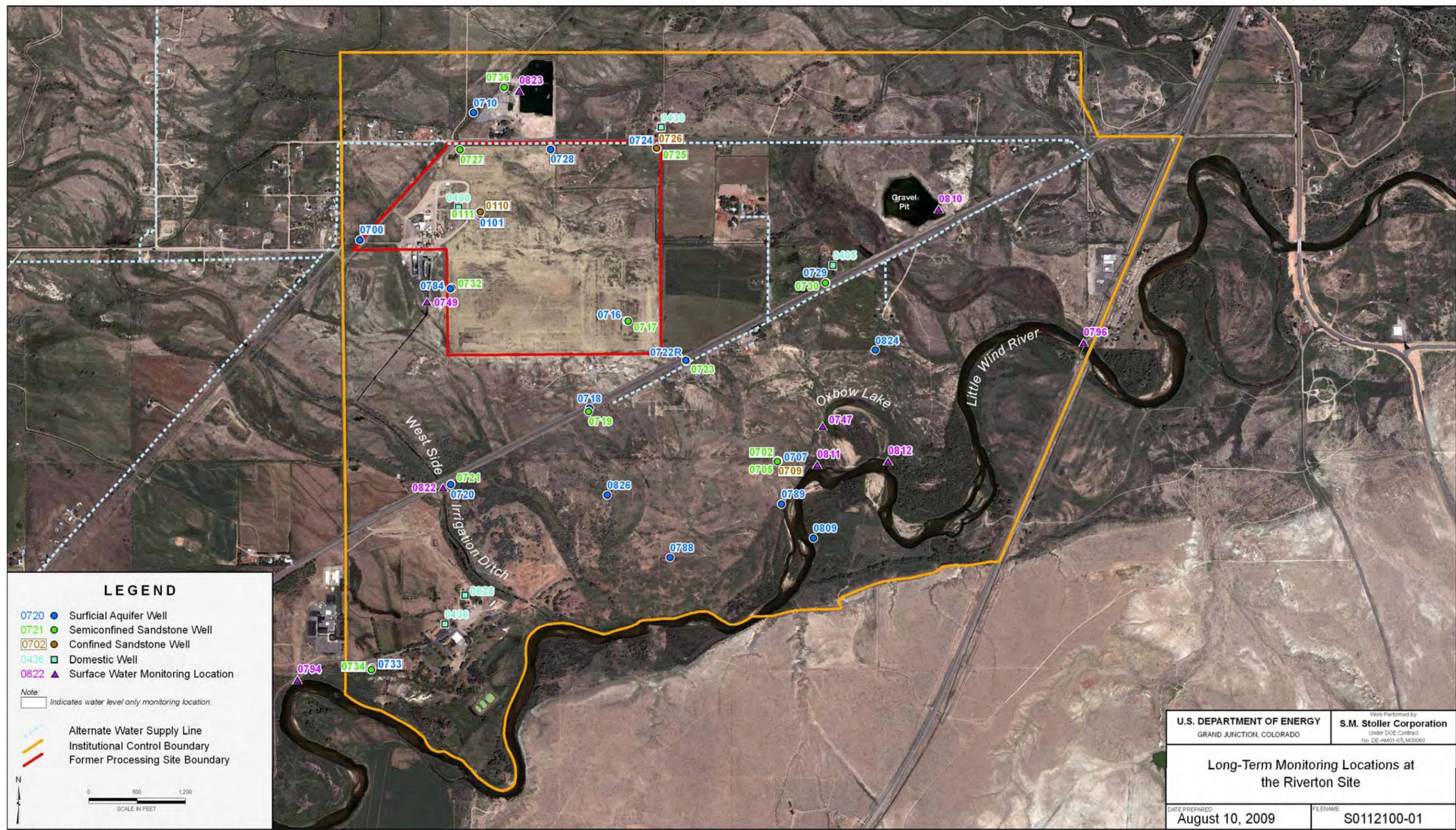
3.1.1.1 Water Quality

Groundwater quality will be monitored to evaluate contaminant plume movement, compare the progress of the natural flushing compliance strategy to model predictions, and verify the performance and completion of natural flushing. All samples from monitor wells in the long-term monitoring network will be analyzed for molybdenum and uranium, the indicator parameters that the GCAP identifies for the Riverton site (Attachment A). Uranium and molybdenum were selected as indicator constituents for compliance monitoring because they are the most widely distributed contaminants, form significant aqueous plumes in the uppermost aquifer near the site, exceed established groundwater standards, and are a result of former milling activities. In addition, samples will be analyzed for manganese and sulfate, which are indicators of former milling activities when detected in elevated concentrations. Field measurements of pH, specific conductance, temperature, and turbidity will be conducted at each well. The long-term groundwater monitoring network is summarized in Table 1 and shown in Figure 2.

Groundwater will be sampled semiannually in June (high-flow) and November (low-flow) to assess variations in contaminant concentrations due to seasonal fluctuations. The June event will be considered the high-flow event because water levels and river flows are typically highest. The November event will be considered the low-flow event because water levels and river flows are typically low and summer-time evaporative losses from surface water have occurred. All monitor wells will be purged and sampled using low-flow methods specified in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites (SAP) (LMS/PLN/S04351)*. The SAP specifies quality assurance measures and required documentation associated with groundwater sampling. It also outlines procedures for filtering, preserving, identifying, and handling samples; conducting field measurements and calibrations; and decontaminating equipment.

Table 1. Summary of the Long-Term Groundwater Monitoring Network

| Location ID | Description | Water Quality | Water Level | Rationale |
|--|----------------------|---------------|-------------|---|
| DOE Monitor Wells—Uppermost Aquifer | | | | |
| 0101 | Surficial aquifer | | √ | Monitor groundwater flow direction |
| 0700 | Surficial aquifer | | √ | Monitor groundwater flow direction |
| 0707 | Surficial aquifer | √ | √ | Monitor centroid of plume |
| 0710 | Surficial aquifer | √ | √ | Background location |
| 0716 | Surficial aquifer | √ | √ | Monitor upgradient portion of plume |
| 0718 | Surficial aquifer | √ | √ | Monitor lateral plume movement |
| 0720 | Surficial aquifer | √ | √ | Monitor lateral plume movement |
| 0722R | Surficial aquifer | √ | √ | Monitor centroid of plume |
| 0724 | Surficial aquifer | | √ | Monitor groundwater flow direction |
| 0728 | Surficial aquifer | | √ | Monitor groundwater flow direction |
| 0729 | Surficial aquifer | √ | √ | Monitor lateral plume movement |
| 0733 | Surficial aquifer | | √ | Monitor groundwater flow direction |
| 0784 | Surficial aquifer | √ | √ | Monitor lateral plume movement |
| 0788 | Surficial aquifer | √ | √ | Monitor lateral plume movement |
| 0789 | Surficial aquifer | √ | √ | Monitor centroid of plume |
| 0809 | Surficial aquifer | √ | √ | Monitor potential plume migration south of river |
| 0824 | Surficial aquifer | √ | √ | Monitor lateral plume movement |
| 0826 | Surficial aquifer | √ | √ | Monitor lateral plume movement |
| 0111 | Semiconfined aquifer | | √ | Assess vertical gradient |
| 0702 | Semiconfined aquifer | | √ | Monitor groundwater flow direction |
| 0705 | Semiconfined aquifer | √ | √ | Monitor semiconfined aquifer |
| 0717 | Semiconfined aquifer | √ | √ | Monitor semiconfined aquifer |
| 0719 | Semiconfined aquifer | √ | √ | Monitor semiconfined aquifer |
| 0721 | Semiconfined aquifer | √ | √ | Monitor semiconfined aquifer |
| 0723 | Semiconfined aquifer | √ | √ | Monitor semiconfined aquifer |
| 0725 | Semiconfined aquifer | | √ | Assess vertical gradient |
| 0727 | Semiconfined aquifer | | √ | Monitor groundwater flow direction |
| 0730 | Semiconfined aquifer | √ | √ | Monitor semiconfined aquifer |
| 0732 | Semiconfined aquifer | | √ | Assess vertical gradient |
| 0734 | Semiconfined aquifer | | √ | Assess vertical gradient |
| 0736 | Semiconfined aquifer | | √ | Monitor groundwater flow direction |
| DOE Monitor Wells—Confined Aquifer | | | | |
| 0110 | Confined aquifer | | √ | Assess vertical gradient |
| 0709 | Confined aquifer | | √ | Assess vertical gradient |
| 0726 | Confined aquifer | | √ | Assess vertical gradient |
| Domestic Wells—Confined Aquifer | | | | |
| 0405 | Private residence | √ | | Verify low concentrations of indicator parameters |
| 0430 | Private residence | √ | | Verify low concentrations of indicator parameters |
| 0436 | St Stephens Mission | √ | | Verify low concentrations of indicator parameters |
| 0460 | Sulfuric Acid Plant | √ | | Verify low concentrations of indicator parameters |
| 0828 | St Stephens Mission | √ | | Verify low concentrations of indicator parameters |



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Figure 2. Long-Term Monitoring Locations

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3.1.1.2 Water Levels

Water levels will be measured to monitor horizontal groundwater flow direction in the surficial aquifer and to monitor vertical gradients between aquifers. Surficial aquifer wells were selected to provide an extensive areal network that will allow groundwater elevation contour maps to be constructed with minimal interpolation between data points. To determine vertical gradients, wells completed in the semiconfined aquifer and confined aquifer were included in the water level network where they were clustered with surficial aquifer wells. Water levels will be measured at all wells in the monitoring network during each water-sampling event, using an electric sounder, according to procedures specified in the SAP. The long-term water level monitoring network is summarized in Table 1 and shown in Figure 2.

3.1.2 Surface Water Monitoring

Surface water will be sampled semiannually in June (high-flow) and November (low-flow) to assess variations in contaminant concentrations due to seasonal fluctuations. The June event will be considered the high-flow event because water levels and river flows are typically highest. The November event will be considered the low-flow event because water levels and river flows are typically low and summer-time evaporative losses from surface water have occurred. Surface water features near the site include gravel pit ponds, ditches, an oxbow lake, the Little Wind River, and wetlands. Because these surface water features likely receive discharge of shallow groundwater from the surficial aquifer, they will be included in the long-term monitoring program and will be sampled on the same schedule as groundwater (see Section 3.1.1). Samples from all surface water locations will be analyzed for molybdenum, uranium, manganese, and sulfate; pH, specific conductance, temperature, and turbidity also will be measured at each surface water location. The surface water monitoring network is summarized in Table 2 and shown in Figure 2.

Table 2. Summary of the Long-Term Surface Water Monitoring Network

| Location ID | Description | Rationale |
|--------------------|----------------------------|---|
| 0747 | Oxbow lake | Impacted by discharge from the groundwater plumes; verify decreasing concentrations of indicator parameters over time |
| 0749 | Sulfuric acid plant ditch | Monitor effluent from sulfuric acid plant |
| 0794 | Little Wind River | Upstream of IC boundary; use for comparison to locations adjacent to and downstream of plume discharge |
| 0796 | Little Wind River | Downstream of predicted plume discharge to the river; verify no impact to river water quality |
| 0810 | Pond—former gravel pit | Within IC boundary and crossgradient of groundwater plumes; verify background concentrations of indicator parameters |
| 0811 | Little Wind River | Within area of predicted plume discharge to the river; verify no impact to river water quality |
| 0812 | Little Wind River | Within area of predicted plume discharge to the river; verify no impact to river water quality |
| 0822 | West side irrigation ditch | Within IC boundary and crossgradient of groundwater plumes; verify background concentrations of indicator parameters |
| 0823 | Pond—former gravel pit | Within IC boundary and upgradient of groundwater plumes; verify background concentrations of indicator parameters |

All surface water locations will be sampled according to procedures specified in the SAP. The SAP specifies quality assurance measures and required documentation associated with surface

water sampling. It also outlines procedures for filtering, preserving, identifying, and handling samples; conducting field measurements and calibrations; and decontaminating equipment.

Natural flushing will be considered complete, and the surface water monitoring program will be discontinued, when concentrations of molybdenum and uranium are below their respective groundwater MCLs in the oxbow lake.

3.1.3 IC Monitoring

The natural flushing compliance strategy depends on ICs to manage exposure during the flushing period. To verify that ICs are in place and working, an IC monitoring program will be conducted. A cooperative agreement with Tribal entities will be maintained as required by Title I of UMTRCA. The cooperative agreement will assure Tribal involvement in site management activities and IC monitoring. The IC monitoring will have two components: sampling, and land and water use verification.

3.1.3.1 Sampling

Domestic Wells

Domestic wells within the IC boundary that are completed in the confined aquifer and are used as a potable water source will be included in DOE's routine sampling events to verify they have not been impacted by former milling activities. All domestic well samples will be collected without filtering. Domestic wells identified for long-term sampling are 0405, 0430, 0436, 0460, and 0828 (Table 1 and Figure 2).

Alternate Water Supply System

NAUO is responsible for ensuring the quality, safety, and quantity of the water supply is adequate and is required to maintain compliance with EPA standards that regulate community water systems. Response to major concerns or compromises of the water supply system integrity will be discussed with NAUO or the Joint Business Council-appointed Tribal representative to further ensure exposure to former mill-related contaminants are managed.

3.1.3.2 Land and Water Use Verification

Land and water use within the IC boundary will be periodically inspected to verify and document that no additional land or water uses expose or involve shallow groundwater. Inspections will occur in conjunction with semiannual water sampling, and results will be documented in the trip report and published in the Verification Monitoring Report. Unauthorized land uses may include new wells, gravel pits, and recreational ponds. If unauthorized land use is observed, it will be documented in the trip report, and a letter will be sent to the appropriate regulatory agency (State of Wyoming or Wind River Environmental Quality Commission [WREQC]) to initiate corrective action. Additional support for land and water use verification will be provided by WREQC.

Gravel ponds, the oxbow lake, and wetlands will be sampled as outlined in DOE's long-term monitoring program (see Section 3.1.2). To date, site-related contamination has affected only the oxbow lake; therefore, the oxbow lake will be inspected routinely to verify that water from the

lake is not being used as a potable water source and that warning signs placed around the lake are intact. If future monitoring indicates site-related impacts to water quality in the gravel pit ponds, irrigation ditches, or wetlands, then these areas will be included in the inspection process.

3.2 Maintenance, Access, and Reports

All monitor wells remaining at the Riverton site are part of the long-term monitoring program, so they must be inspected and maintained. Monitor wells will be inspected during each sampling event. The condition and integrity of the monitor wells will be documented, and maintenance will be performed as necessary. Access agreements will be maintained for monitor wells outside the boundary of the former millsite, and a perpetual easement will be in place to access monitor wells within the boundary of the former millsite. All monitor wells sampled in the long-term network will be redeveloped annually.

A verification monitoring report will be produced each year. This report will include the status of the monitor wells and ICs, water quality data, water-level data, a summary of site conditions, and the progress of the natural flushing compliance strategy. This report will be distributed to the Joint Business Council of the Arapaho and Shoshone tribes, WREQC, NRC, the State of Wyoming Division of Environmental Quality, the local information repository, and the site file.

A letter report to each homeowner where a domestic well was sampled will be sent after each sampling. The letter will provide the sampling results and compare them to applicable standards.

3.3 Quality Assurance and Health and Safety

Quality assurance measures for implementing the long-term monitoring program include using trained and qualified personnel and following established procedures. Water-quality data will be collected in accordance with procedures specified in the SAP. The SAP specifies procedures for data validation and requirements for sample collection, quality control samples, analytical methods and reporting limits, and field instrument calibration.

Health and safety considerations and controls for sampling and maintenance are addressed in the job safety analysis appended to the SAP.

3.4 Review and Revision

As new data are evaluated and as conditions change, modifications to the long-term monitoring program may be required. The long-term monitoring program will be reviewed periodically, and modifications to the long-term monitoring program will be proposed to NRC and Tribal stakeholders as site conditions change or new information becomes available.

4.0 References

40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations*, July 1, 2008.

Statements of Consideration for 10 CFR Part 40, 40-SC-16 (April 30, 1992).

DOE (U.S. Department of Energy), 1991. *Riverton Wyoming Final Completion Report*, Albuquerque Operations Office, Albuquerque, New Mexico, December.

DOE (U.S. Department of Energy), 1998a. *Draft Ground Water Compliance Action Plan (GCAP)*, U.S. Department of Energy, Grand Junction Office, Grand Junction, Colorado, February.

DOE (U.S. Department of Energy), 1998b. *Final Site Observational Work Plan for the UMTRA Project Site at Riverton Wyoming*, U0013801, Grand Junction Office, Grand Junction, Colorado, February.

DOE (U.S. Department of Energy), 1998c. *Environmental Assessment of Groundwater Compliance at the Riverton, Wyoming, Uranium Mill Tailings Site*, DOE/EA-1261, Grand Junction Office, Grand Junction, Colorado, September.

DOE (U.S. Department of Energy), 2009. *Verification Monitoring Report for the Riverton, Wyoming, Processing Site, Update for 2008*, LMS/RVT/S05094, U.S. Department of Energy, Office of Legacy Management, Grand Junction, Colorado, May.

Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites, LMS/PLN/S04351, continually updated, prepared by S.M. Stoller Corporation for the U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado.

Attachment A

Draft Ground Water Compliance Action Plan

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U.S. Department of Energy

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

FEB 25 1998



Joseph J. Holonich, Chief
Uranium Recovery Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards-Mail Stop T7J9
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Final Site Observational Work Plan and Draft Ground Water Compliance Action Plan
for the Riverton, Wyoming, Title I UMTRA Site

Dear Mr. Holonich:

Please find enclosed two copies of the *Final Site Observational Work Plan* (SOWP) for the UMTRA Project Site at Riverton, Wyoming (February 1998), and the *Draft Ground Water Compliance Action Plan* (GCAP) for the UMTRA Project Site at Riverton, Wyoming (February 1998) for your review and approval.

The proposed draft GCAP is submitted as a modification to the Remedial Action Plan (RAP) and Site Design for Stabilization of the Inactive Uranium Mill Tailings Site at Riverton, Wyoming. The GCAP will serve as replacement of the current text identified in the RAP, Section 4.3.4 Hydrogeology, *Aquifer Restoration* (DOE 1987).

Concurrent with this transmittal, copies of the final SOWP and draft GCAP have been transmitted to the Arapaho and Shoshone Tribes and the Wyoming Department of Environment Quality for their review.

The final Programmatic Environmental Impact Statement (PEIS) for the UMTRA Ground Water Project was approved for distribution on September 19, 1996. Distribution of the final PEIS began in October of 1996. The Record of Decision was approved and published in April 1997. DOE is in the process of developing an Environmental Assessment (EA) of ground water compliance activities at the Uranium Mill Tailings Site in Riverton, Wyoming. A public scoping meeting was held at the St. Stephen's Mission School, near the Riverton Site, on January 27, 1998. The proposed action discussed at the scoping meeting suggested "natural flushing with monitoring and institutional controls" to comply with the U.S. Environmental Protection Agency Standards 40 CFR 192, Subpart B. The Riverton EA is expected to be completed in the next few months.

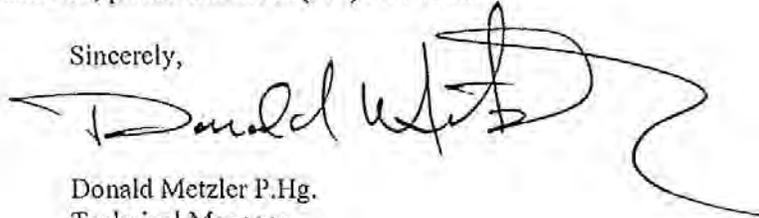
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The mill tailings at the Riverton Site were relocated to the Gas Hills for disposition at a Title II-engineered disposal cell. The Residual Radioactive Material is managed under the Title II General License. Therefore, the "typical" second part of the two-step General License process (10 CFR 40.27) for the Riverton Site is not applicable to DOE. But, because future monitoring and a performance assessment is required with the selection of the natural flushing strategy, verification monitoring will be conducted to gain further confidence in the predicted flushing performance. At the end of verification monitoring (approximately five years) and prior to transferring the site to the Long-Term Surveillance and Maintenance Project (LTSM) for out-year compliance monitoring, the DOE will develop and submit a Confirmation Report. This report will document the ground water and surface water monitoring data collected after NRC's concurrence with the GCAP and will compare actual data results to the predicted concentration plots included in Section 4.3.7 of the final SOWP. DOE's UMTRA Ground Water Project Management Action Process schedule for out-year activities at Riverton shows the site would be transferred to the LTSM Project in the year 2002. Long-term compliance monitoring will be conducted under LTSM according to the proposed locations, frequencies, analyte list, and duration identified in Section 5.3 of the final SOWP. If predicted flushing results do not reasonably coincide with actual compliance monitoring data, DOE will involve the NRC, tribes, and state for a reevaluation. A corrective action could be implemented if determined necessary.

Please provide your review comments within 35 days of the date stamped on this transmittal. If you have questions or need further clarification, please call me at (970) 248-7612.

Sincerely,



Donald Metzler P.Hg.
Technical Manager

Enclosures:

Final SOWP
Draft GCAP

cc w/o enclosure:

J. Erickson, Wyoming DEQ
M. Layton, NRC
R. Edge, DOE-GJO
R. Plienness, DOE-GJO
File GWRIV1.4^{UPM} (P. Taylor)

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Draft Ground Water Compliance Action Plan (GCAP)

February 24, 1998

40 CFR 192 (Subpart B) *Ground Water Compliance Modification to the Remedial Action Plan (RAP) and Site Design for Stabilization of the Inactive Uranium Mill Tailings Site at Riverton, Wyoming* (DOE 1987)

4.3 DESIGN DETAILS (from 1987 RAP)

4.3.4 Hydrogeology

Aquifer Restoration

To achieve compliance with Subpart B of 40 CFR 192, (*Aquifer Restoration*) at the Riverton, Wyoming, UMTRA Site, the DOE proposes implementation of the natural flushing strategy, in conjunction with institutional controls and compliance monitoring. This determination utilizes a consistent and objective strategy selection framework developed in the Final Programmatic Environmental Impact Statement (PEIS) for the Uranium Mill Tailings Remedial Action (UMTRA) Ground Water Project (October 1996).

In summary, the natural flushing strategy is based on observed ground water field data coupled with computer modeling predictions that natural ground water movement and geochemical attenuation processes will reduce the detected contamination to Maximum Concentration Limits (MCLs) or background levels within 100 years. The uppermost aquifer is not currently and is not projected to be a drinking water source in the vicinity of the site.

In applying the decision framework developed in the Final PEIS as the strategy selection process in the Final Site Observational Work Plan (SOWP) for the UMTRA Project Site at Riverton, Wyoming (February 1998), the DOE has determined that the ground water in the uppermost aquifer was contaminated by uranium processing activities at the Riverton Site. The uppermost aquifer qualifies for natural flushing based on: (1) water quality results from approximately 15 years of data collection at the site, (2) probabilistic flow and solute transport modeling depicting contaminant concentrations to the year 2072, (3) viability of an enforceable institutional control that will prevent inappropriate uses of the contaminated ground water during the flushing period, and (4) compliance monitoring that will verify the contaminant concentrations decrease as predicted.

The framework as applied to the Riverton Site consists of five evaluative steps that are discussed below.

The first step of the decision framework was an assessment of both older and more recently collected environmental data. The uppermost aquifer consists of the surficial unconfined quaternary alluvium and the semiconfined sandstones within the upper geologic rock units of the Eocene-aged Wind River Formation. Ground water contaminants are a result of uranium processing activities that occurred from 1958 until mid-1963. Section 4.0 of the Final SOWP provides a conceptual site model that includes the hydrogeologic setting, nature, and extent of ground water contamination and contaminant fate and transport. Evaluation of existing site data coupled with the Riverton Site conceptual model and predictive flow and solute transport modeling indicate that sufficient hydrological and ground water contamination characterization data exists to make an appropriate compliance strategy selection. In technical correspondence from NRC to DOE, dated April 29, 1996, NRC recommended that "DOE consider designing the proposed aquifer tests to measure the full range of properties an aquifer test is capable of measuring." This recommendation was aggressively addressed (Section 3.1.3 of the Final SOWP). NRC also recommended that "DOE provide data points on all maps presented in future reports." This recommendation has also been addressed in the Final SOWP.

The second step compares the list of ground water contaminants with MCLs or background ground water quality. Ground water contaminants from the uranium milling operation have seeped into the subsurface and migrated into the uppermost aquifer, forming a plume that continues to attenuate and discharge to the Little Wind River. The contaminant list includes arsenic, lead-210, molybdenum, nickel, polonium-210, thorium-230, uranium, and vanadium. Additional constituents that are indicators of process-related contaminated ground water, when detected in elevated concentrations include sulfate and manganese (BLRA 1995). Of these constituents only uranium, molybdenum, and sulfate are sufficiently distributed to form volumetric aqueous plumes. Because interpretation of data collection has indicated that sulfate continues to emanate from a different and continued source, other than past uranium mill processing and tailings seepage, sulfate has not been selected as an indicator constituent for predicting natural flushing. Only uranium and molybdenum were selected as indicator constituents for compliance monitoring.

The third step determines whether the contaminated ground water qualifies for natural flushing based on the criterion identified in the EPA ground water standards 40 CFR 192.12 (60 FR 2854-2872). As shown in Figures 4-17, 4-18, 4-19, and 4-20 of the Final SOWP, the numerical probabilistic computer model predicted that concentrations of uranium and molybdenum in the surficial aquifer are reduced to concentrations below MCLs within 100 years from 1997. The probability that the concentrations are less than MCLs in 75 years for each constituent is on the order of 90 percent. By 100 years, all simulations show uranium and molybdenum concentrations at background levels.

The fourth step determines whether institutional controls can be maintained during the flushing period and if natural flushing is protective of human health and environmental. A viable and enforceable institutional control is in place through a Memorandum of Agreement among the Indian Health Service and the Northern Arapaho Tribe, and the Northern Arapaho Utility Organization (Public Law 86-121, Project No. BI 97-837). The institutional control was executed by these government entities because the contaminated ground water resides beneath tribal lands. There is no current risk to human health because there are no known exposure pathways for ground water from the uppermost aquifer to reach a domestic user (i.e., private wells). Further, an alternate water supply is in construction that will provide potable water to existing and future residents and create a moratorium on domestic wells in the affected area (Section 4.3.4, Final SOWP 1998). Environmental risk has been evaluated, and the known ecological pathways are considered acceptable (BLRA 1995). Contaminated ground water discharge to the Little Wind River is diluted nearly instantaneously, and statistical analysis on upstream, adjacent, and downstream water sampling show no appreciable difference. One area the DOE will monitor closely is a cutoff meander (Oxbow Lake) on the north side of the Little Wind River. This cutoff was formed naturally a few years ago and is characterized as contaminated ground water mixing with surface water. During periods of high water stage this area becomes flooded with river water. The water then gradually subsides during the remainder of the year. From an ecological risk, this exposure pathway does not create unacceptable risks; however, it will be monitored as part of compliance.

The fifth and final step in the framework is the selection of an appropriate compliance strategy to meet the EPA ground water standards. The selection is to allow natural flushing to meet the EPA ground water standards within a performance period of 100 years, starting in 1998, and is coupled with institutional controls and compliance monitoring. The uppermost aquifer is not currently and is not projected to be a drinking water source in the vicinity of the site (40 CFR 192.12, Subpart B).

40 CFR 192, Subpart C, *Implementation*, requires compliance monitoring to verify anticipated plume movement and the associated reduction in plume concentrations. The monitoring compliance plan will be used to verify that the elevated concentrations for the indicator constituents are being naturally reduced in general accordance to the out-year predictions. After five years of verification monitoring, the Riverton UMTRA Site will be transferred to the DOE Long-Term Surveillance and Maintenance Program for continued compliance monitoring. In the unlikely event that compliance monitoring indicates that observed concentrations are not decreasing in general accordance with the out-year predictions, the process of applying the decision framework developed in the Final PEIS would be implemented as formal corrective action to select an alternative strategy.

Details supporting regulatory framework requirements; summary of site conditions and risk consequences; ground water compliance strategy selection; and compliance monitoring can be found in the Baseline Risk Assessment of Ground Water Contamination at the Uranium Mill Tailings Site Near Riverton, Wyoming (September, 1995), and the Final Site Observational Work Plan for the UMTRA Project Site at Riverton, Wyoming (February 1998).

An Environmental Assessment of Ground Water Compliance Activities at the Uranium Mill Tailings Site, Riverton, Wyoming, is in progress. This National Environmental Policy Act document will tier from the PEIS and has included public involvement.

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Attachment B

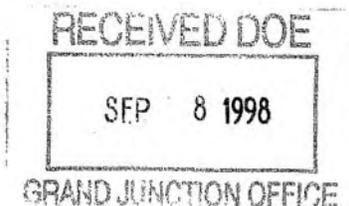
NRC Letter of Concurrence

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

September 3, 1998



Mr. Ray Plienness
U.S. Department of Energy
Grand Junction Office
2597 B 3/4 Road
Grand Junction, CO 81503

SUBJECT: REVIEW OF THE FINAL SITE OBSERVATIONAL WORK PLAN AND DRAFT
GROUND WATER COMPLIANCE ACTION PLAN FOR THE RIVERTON,
WYOMING, TITLE I UMTRA SITE

Dear Mr. Plienness:

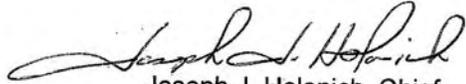
The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the U.S. Department of Energy's (DOE's) Site Observational Work Plan (SOWP), which included the Draft Ground Water Compliance Action Plan, submitted by cover letter dated February 25, 1998, for the Uranium Mill Tailings Remedial Action (UMTRA) Project site at Riverton, Wyoming. The review focused on the proposed ground-water remediation strategy for compliance with 40 CFR Part 192, and the technical information presented in support of this strategy. This review does not imply a concurrence in the ground-water cleanup activities at the Riverton site, but is provided as a "fatal flaw" review of the proposed compliance strategy based on collected data and analyses presented in the final SOWP.

The final SOWP summarizes the results from a probabilistic ground water flow and transport model that is used to reduce the uncertainties associated with the proposed ground-water compliance strategy. The model results show that the uncertainty associated with the proposed ground water compliance strategy is acceptable. Therefore, the next step in the UMTRA process, the preparation of site specific ground-water National Environmental Policy Act (NEPA) document, can begin.

The ground-water compliance strategy recommended for the Riverton site is natural attenuation with institutional controls to limit exposure to the contaminated ground water during the recovery period, and verification monitoring to ensure the model predictions are accurate. Hydrogeologic and geochemical data collected from the Riverton site and the results of the ground-water modeling indicates that the natural ground-water movement and geochemical processes will decrease contaminant concentrations to background levels or maximum concentration limits (MCLs) within 100 years. During that period of time, effective monitoring, institutional controls, and an alternative water supply will be maintained to prevent the use of ground water in the affected aquifer for domestic consumption, stock watering, or crop irrigation.

The NRC staff has no technical objection to utilizing this compliance strategy at the Riverton site. If you have any questions concerning this letter, please contact the NRC Project Manager, Jim Park, at (301) 415-6699.

Sincerely,



Joseph J. Holonich, Chief
Uranium Recovery Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

cc: D. Metzler

Attachment C

State of Wyoming Institutional Control Letters

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Department of Environmental Quality

To protect, conserve and enhance the quality of Wyoming's environment for the benefit of current and future generations.



Dave Freudenthal, Governor

John Corra, Director

September 4, 2009

Jalena Dayvault
U.S. Dept. of Energy
2597 B 3/4 Road
Grand Junction, CO 81503

RE: Notification of Groundwater Contamination at the Riverton UMTRA site

Dear Ms. Dayvault:

By letter dated December 21, 2006, Tracy Plessinger, the former DOE Riverton Site Manager, requested that our office provide a DOE Fact Sheet describing groundwater contamination near the former Susquehanna-Western uranium mill to anyone proposing to mine gravel within the boundaries of the Institutional Control area surrounding the site.

This letter will acknowledge our continuing willingness to assist DOE by providing the Fact Sheet to anyone who requests a gravel permit within the IC boundary.

Please feel free to contact me if you should have any questions regarding this correspondence.

Sincerely,

John Erickson
Assistant District II Supervisor
Land Quality Division

xc: Cheyenne DEQ/LQD
Mark Moxley - Lander DEQ/LQD > Riverton UMTRA file
Chron

Lander Field Office • 510 Meadowview Drive • Lander, WY 82520 • <http://deq.state.wy.us>

ABANDONED MINES
(307) 332-5085
FAX 332-7726

AIR QUALITY
(307) 332-8755
FAX 332-7726

LAND QUALITY
(307) 332-3047
FAX 332-7726

SOLID & HAZARDOUS WASTE
(307) 332-6924
FAX 332-7726

WATER QUALITY
(307) 332-3144
FAX 332-7726





State Engineer's Office

Herschler Building, 4-E Cheyenne, Wyoming 82002
(307) 777-7354 FAX (307) 777-5451
seoleg@seo.wyo.gov

J. Snow

DAVE FREUDENTHAL
GOVERNOR

PATRICK T. TYRRELL
STATE ENGINEER

May 4, 2005



Mr. Ray Plieness, Acting Director
U.S. Department of Energy
Office of Land and Site Management
2597 B 3/4 Rd.
Grand Junction, CO 81503

Re: Notification Area: Former Susquehanna-Western Site, Riverton, Wyoming

Dear Mr. Plieness:

The State Engineer's Office (SEO) will accommodate the U.S. Department of Energy's, Office of Land and Site Management (DOE) request to coordinate between the SEO and DOE concerning ground water appropriations and surface impoundments in the vicinity of the former Susquehanna-Western uranium mill site south of Riverton, Wyoming.

The SEO will use reasonable efforts to assist the DOE in DOE's long-term responsibilities at the Riverton site.

The SEO is in receipt of the DOE's site map on which a Notification Area is delineated. Using this map, the SEO will attempt to identify any permit applications for diversion of groundwater or surface impoundments within the Notification Area. The SEO will attempt to notify DOE that an application has been received, provide the DOE with a copy of the application, and solicit the DOE's comments on that application.

If DOE provides timely comments, SEO will apply Wyoming law to determine whether or not the permit application should be approved, and if approved, condition the permit appropriately. SEO does not undertake to apply federal law or to make a determination about the suitability or quality of water produced or stored within the Notification Area to be used for any purpose.

I understand the DOE will provide the SEO with a Fact Sheet describing the environmental conditions at the Susquehanna site and why the shallow aquifer should not be used. The SEO will use reasonable efforts to attach the Fact Sheet to any permit approved within the Notification Area. The SEO does not control individual appropriators' decisions about whether or not to use the water. DOE may make any separate notification to permit applicants that it wishes to make.

Surface Water
(307) 777-6475

Ground Water
(307) 777-6163

Board of Control
(307) 777-6178

The SEO does not have the ability to waive sovereign immunity under the laws of the State of Wyoming, and does not intend to do so. This letter expresses the entirety of our understanding. In writing this letter, the SEO does not intend to confer benefit upon any person or entity nor does the SEO intend to create a special relationship with any water user or permit holder or applicant within the Notification Area or otherwise.

If you have any questions, please call Lisa Lindemann (Administrator, Ground Water Division, 307-777-5063), or John Barnes (Administrator, Surface Water Division, 307-777-6168).

Sincerely,



Patrick T. Tyrrell
State Engineer

Copy: Tracy Plessinger, U.S. Department of Energy
Hugh McFadden, Assistant Attorney General, Water and Natural Resources
Lisa Lindemann, Administrator, Ground Water Division
John Barnes, Administrator, Surface Water Division

