DOE–EM/GJ2010

Office of Environmental Management – Grand Junction

UMTRA Project

Moab UMTRA Project Annual Site Environmental Report for Calendar Year 2010

September 2011

U.S. Department of Energy

Office of Environmental Management

Prepared by the Remedial Action Contractor Under DOE Contract No. DE-AT30-07CC00014
for the U.S. Department of Energy Office of Environmental Management, Grand Junction, Colorado.

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Revision 0

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Revision History

Revision No.	Date	Reason/Basis for Revision
0	September 2011	Initial issue.

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Executive Summary

This Annual Site Environmental Report presents information pertaining to environmental activities conducted for the U.S. Department of Energy (DOE) under the Moab Uranium Mill Tailings Remedial Action (UMTRA) Project during 2010. This report includes activities conducted at either the Moab site located near Moab, Utah, or the Crescent Junction, Utah, site, located approximately 30 miles north of the Moab site.

The purpose of the Annual Site Environmental Report is to summarize major site programs, environmental performance measures, and the status of implementing an Environmental Management System (EMS). The Annual Site Environmental Report is a key component of DOE efforts to keep the public informed of environmental conditions at DOE sites. Consequently, this report contains monitoring data and compliance information for 2010.

Primary site activities in 2010 included the shipment of residual radioactive material (RRM) from the Moab site and disposal at the Crescent Junction site. Other activities included site management, security, maintenance, waste management, pollution prevention, and environmental compliance monitoring (air and surface water). In addition, non-pile soils remediation, surface water diversion, and operation of the interim action (IA) ground water remediation system occurred at the Moab site.

Highlights of Site Activities and Summary of Environmental Programs for 2010
Significant accomplishments and activities conducted for the Moab UMTRA Project during 2010 are highlighted below. In addition, summaries of environmental programs are provided. During 2010, the Moab and Crescent Junction sites received no notices of violation and did not have any environmental occurrences that required reporting to outside agencies.

Major Project Accomplishments

- Shipping and disposal of more than 2.3 million tons of RRM (total to date through December 2010 of 2.94 million tons).
- Completed Support Area upgrades on February 1, 2010. These upgrades include replacing asphalt, increasing lighting to support night shift operations, and placing reinforced concrete supports under the survey racks to handle the increased container transfer operations and weight associated with the larger containers.
- The Remedial Action Contractor worked with the Federal Railroad Administration and the Union Pacific Railroad Company to receive a modification to the U.S. Department of Transportation special permit that reduces the project's shipping paperwork from an individual paper for each container per shipment to a single paper per shipment. This modification cut an hour off the shipping turnaround time by streamlining the input process.
- Construction of the underpass of State Road 279 (SR-279) was completed late in 2009, and use of the underpass began in early January 2010.
- Funding awarded under the American Recovery and Reinvestment Act allowed the project to continue shipping RRM with the night work shift and weekly shipments of 10 trains. Over the past year, the project increased the number of shipped containers per train from 136 to the maximum trainload of 144 containers.

Moab Site Remediation and Construction Activities

- The completion of the rail spur extension allowed an additional two rail cars, or eight shipping containers, to be added to each train beginning in June 2010.
- A significant effort was completed in December 2010 to remediate approximately 17 acres of the DOE property south of the RRM pile.
- Tamarisk was removed along approximately 3,500 feet of the banks of the Colorado River.
- A new truck scale was installed, and two retainer walls were constructed between the track and the hillside to help reduce the impact of existing and future rock slides to stabilize rock slides on Moab rail bench.
- Seventeen acres of remediated off-pile area were revegetated. An additional 4 acres were seeded and mulched on the lower haul road, SR-279 right-of-way, and the Support Area road in late 2010. All areas were revegetated with native plant species. Erosion-control efforts included the installation of straw and rock wattles and riprap in the drainages.

Crescent Junction Site Construction Activities

- Construction of the second phase of the disposal cell was started in January.
- Approximately 8 acres associated with the disposal cell wedge were seeded and mulched. The wedge is created from the excess material excavated from the disposal cell.
- A semi-permanent dumping facility was installed at the Crescent Junction disposal cell, including a dump ramp, shelters to protect workers from extreme cold temperatures, safety gates where personnel and trucks interact at the disposal location, and the ability to work in multiple locations based on wind direction.
- The spur at Crescent Junction was extended to accommodate the two additional railcars.

Waste Management and Pollution Prevention

- Approximately 2,500 pounds (lb) of paper, 2,600 lb of plastic, and 1,150 lb of aluminum cans were collected from the Moab UMTRA Project sites and the Grand Junction, Colorado, office for recycling. Automotive and cordless hand-tool batteries, toner cartridges, and power strips were also recycled.
- Approximately 12,000 gallons of used oil was shipped from both Moab and Crescent Junction sites for recycling.

Environmental Radiological Protection Program Summary

- DOE's environmental air monitoring strategy targets concentrations of radon (Rn)-222, airborne particulates, exposure levels to direct gamma radiation, and fugitive dust emissions. The environmental air monitoring network consists of on-site, off-site, and background sampling locations.
- One Moab on-site monitoring location had Rn-222 concentrations that exceeded the DOE guideline for indoor air quality immediately south of the RRM pile at the Moab site on vacant land. Data indicate that Rn concentrations attenuate to near background levels within a ¼-mile of the Moab site boundary, avoiding public exposure.
- Four Moab on-site monitoring locations had a direct gamma radiation reading above the DOE established public dose limit; however, because the land is vacant and the limit is based on a resident occupying the land full-time, the reading did not result in a public exposure.
- Radioparticulate air emissions data were below the public dose limits applicable to the Moab and Crescent Junction sites at all on-site and off-site monitoring locations.
- DOE diligently controlled visible emissions of fugitive dust through implementation of dust-suppression techniques and various engineering and procedural controls.

- Quarterly environmental air monitoring reports were prepared that summarize and trend the data collected and compare it to exposure limits and guidelines. These reports are posted on the DOE Moab UMTRA Project website at www.gjem.energy.gov/moab.

Ground Water Protection Program Summary

Ground water activities were performed at the Moab site to protect water quality in the Colorado River. More than 10 million gallons of ground water was extracted in 2010 through the IA remediation wells, with more than 37,000 lb of ammonia and almost 250 lb of uranium removed, thus preventing these contaminants from discharging to the Colorado River. A total of 162 million gallons of ground water has been extracted, with 664,000 lb of ammonia and 3,000 lb of uranium removed since the IA system was initiated in 2003. The contaminated ground water was eliminated through evaporation or distributed via water truck for dust control on the RRM pile. Other ground water activities included the following:

- Ground water and surface water sampling was conducted to evaluate IA remedial action performance and surface water quality.
- Seventeen ground water extraction wells were operated.
- Five ground water injection wells were operated.
- Site-wide ground water sampling occurred in October.
- On-site ground water sampling occurred in February, March, April, June, August, and September.

Document Distribution

This document may be viewed in its entirety on the DOE Moab UMTRA Project website at www/gjem.energy.gov/moab. Hard copies may be obtained by contacting Mr. Donald Metzler, Moab Federal Project Director, at (970) 257-2115, or at the address below.

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Comments or questions regarding this document also may be directed to the Moab UMTRA Project toll-free telephone number at (800) 637-4575. Members of the public who wish to comment on this document or have questions are encouraged to contact DOE at the above phone number or by email at moabcomments@gjem.doe.gov.

1.0 Introduction

1.1 Purpose

The purpose of the Annual Site Environmental Report is to provide information regarding DOE environmental activities conducted for the Moab UMTRA Project during 2010 and to provide a summary of environmental monitoring data results.

This report was prepared in accordance with the requirements of DOE Order (O) 231.1B, "Environment, Safety, and Health Reporting," DOE O 458.1, "Radiation Protection of the Public and the Environment," and supplemental guidance from DOE Headquarters.

1.2 Scope

This report includes activities conducted at either site included in the Moab UMTRA Project: the Moab site located near Moab, Utah, or the Crescent Junction, Utah, site, located approximately 30 miles north of the Moab site.

This report is structured as follows:

- Section 2.0 describes the compliance status with applicable federal and state environmental regulations and contains a table of the permits held by the project.
- Section 3.0 provides the status of the EMS.
- Section 4.0 describes the environmental radiological protection program and dose assessment.
- Section 5.0 describes the environmental nonradiological programs.
- Section 6.0 describes the ground water protection program.
- Section 7.0 discusses the quality assurance (QA) measures implemented for the project.
- Section 8.0 provides a list of references used in the preparation of this document.

1.3 Site Descriptions

The Moab site is a former uranium ore-processing facility located about 3 miles northwest of the city of Moab in Grand County, Utah (Figure 1), and lies on the west bank of the Colorado River at the confluence with the Moab Wash. The nearly 500-acre site is bordered on the north and southwest by sandstone cliffs. The Colorado River forms the eastern boundary of the site.

U.S. Highway 191 (US-191) parallels the northern site boundary, and SR-279 transects the western and southwestern portions of the property. The Union Pacific Railroad traverses a small section of the site west and uphill of SR-279, then enters a tunnel and emerges several miles to the southwest. Arches National Park has a common property boundary with the Moab site on the north side of US-191, and the park entrance is located less than 1 mile northwest of the site. Figure 2 shows Moab site features, including the site boundary, structures, RRM pile, roads, and rail line.

The Crescent Junction site is located northeast of the junction of Interstate 70 (I-70) and US-191, approximately 30 miles north of the Moab site, and is the location for disposal of the Moab site RRM.

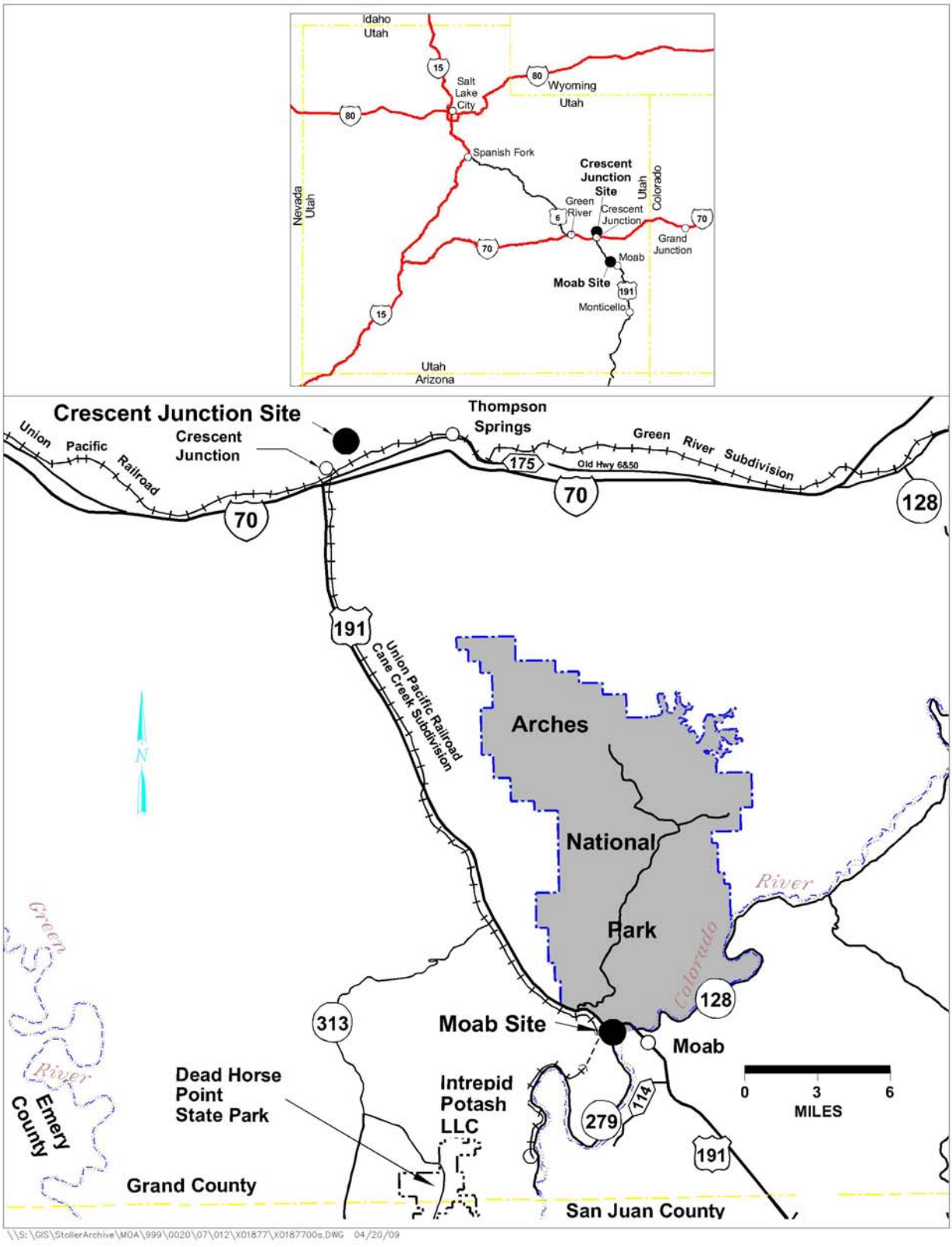

Figure 1. Location of the Moab and Crescent Junction Sites

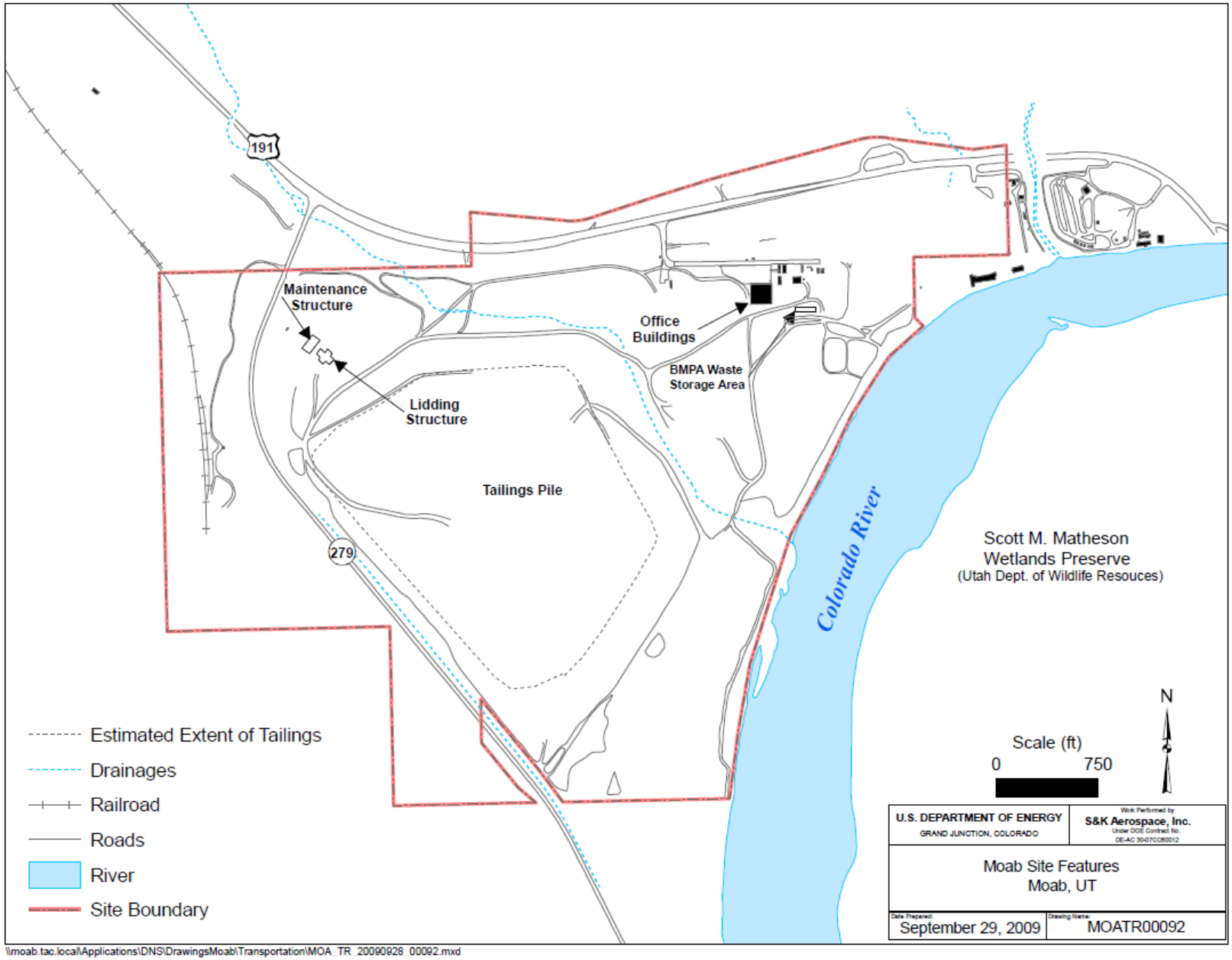

Figure 2. Moab Site Features Map

1.4 Site History

The Moab millsite operated under various owners from 1956 through 1984. Uranium mill tailings are RRM that results from the processing of uranium ore. RRM was slurried to a 130-acre unlined area located at the western portion of the property. The resulting deposition created a pile of material with an estimated total mass of 16 million tons and a volume of 12 million cubic yards. The RRM pile height (4,076 feet above mean sea level) averages 80 feet above the Colorado River and is located in the 100-year floodplain. Although the milling process recovered about 95 percent of the uranium, these RRM contain several naturally occurring radioactive elements, including uranium, thorium, radium, and polonium. The RRM at the Moab site contain contaminants in concentrations that could be hazardous to the environment and public health and could exceed the U.S. Environmental Protection Agency (EPA) standards in Title 40 Code of Federal Regulations Part 192 (40 CFR 192), "Health and Environmental Protection Standards for Uranium and Thorium Mill RRM."

In October 2000, the Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001 (Public Law 106-398) transferred ownership and responsibility for reclamation of the Moab site to DOE. The DOE Office of Environmental Management, located in Grand Junction, manages cleanup of the Moab site under the Moab UMTRA Project.

To minimize potential adverse effects to human health and the environment from Moab site RRM in the short term, former site operators, custodians, and DOE instituted environmental and administrative controls and interim measures at the Moab site. Controls have included placement of an interim cover on the RRM pile, storm water management, dust suppression, pile dewatering, and site access restrictions. Other measures include monitoring ground water and surface water and managing legacy chemicals. In addition, DOE designed and implemented an IA ground water remediation system to intercept contaminants, mostly ammonia and uranium, before they discharge to the Colorado River. The IA system has been expanded and modified since its initial implementation in the summer of 2003.

In July 2005, DOE published *Remediation of the Moab Uranium Mill Tailings, Grand and San Juan Counties, Utah, Final Environmental Impact Statement* (EIS) (DOE/EIS-0355) that presents the preferred alternatives of active ground water remediation and off-site disposal of the RRM pile and other contaminated materials at the (then) proposed Crescent Junction disposal site using predominantly rail transportation. The preferred alternatives included cleanup and reclamation of the former millsite property and certain off-site properties known as vicinity properties. DOE issued the *Record of Decision for the Remediation of the Moab Uranium Mill Tailings, Grand and San Juan Counties, Utah* (ROD) (6450-01-P), in September 2005 that detailed the selection of the preferred alternatives and the basis for that decision. In February 2008, the ROD was amended to allow more truck transport.

DOE also prepared the *Moab UMTRA Project Final Remedial Action Plan and Site Design for Stabilization of Moab Title I Uranium Mill Tailings at the Crescent Junction, Utah, Disposal Site* (DOE-EM/GJ1547) that presents the basis for constructing the disposal cell at Crescent Junction. The Final Remedial Action Plan was submitted to the U.S. Nuclear Regulatory Commission (NRC), and DOE received conditional concurrence in July 2008.

Jurisdiction of 2,300 acres of land at the Crescent Junction site was transferred to DOE through a temporary land withdrawal action from the U.S. Department of the Interior. Five hundred of the 2,300 acres were permanently transferred to DOE in March 2008, and an application to renew the temporary withdrawal of 938 acres was approved in June 2009.

After significant infrastructure construction in 2008 and 2009, DOE began relocating the RRM pile at Moab to the Crescent Junction disposal cell in April 2009. As of the end of December 2010, more than 2.3 million tons of RRM had been relocated.

2.0 Compliance Summary

2.1 Compliance Status

The Moab and Crescent Junction sites operated during 2010 without any notices of violation. In accordance with the U.S. Fish and Wildlife (USFWS) *Final Biological Opinion for Proposed Reclamation of the Atlas Mill Tailings Site in Moab, Utah* (BO), the *Moab UMTRA Project Biota Monitoring Plan* (DOE-EM/GJ1079) was prepared. Visual surveys and surface water sampling were conducted in the potential endangered fish habitat along the Colorado River. Based on the results of these surveys and samples, no biological sampling was required in 2010.

2.1.1 Environmental Restoration and Waste Management

Moab UMTRA Project environmental restoration and waste management are discussed below.

Superfund Amendments and Reauthorization Act/Executive Order 12856

Title III of the Superfund Amendments and Reauthorization Act (Title 42 United States Code Section 9601 [42 USC 9601]), which is the Emergency Planning and Community Right-to-Know Act of 1986 (42 USC 11000), and Executive Order 12856, "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements," established requirements for industry and the government to provide the public with information about the hazardous and toxic chemicals in their communities and to do emergency planning and notifications to protect the public in the event of a release of extremely hazardous substances.

DOE reviews the chemical inventories and activities at the Moab and Crescent Junction sites annually to determine if any relevant reporting is required. During 2010, five hazardous chemicals were stored at the Moab and Crescent Junction sites in amounts exceeding the threshold planning quantity as established in Section 312 of the Superfund Amendments and Reauthorization Act: calcium chloride, diesel, used oil, propane, and glycerin. Tier Two Emergency and Hazardous Chemical Inventory reports were submitted as required to the Utah Emergency Response Commission, the Moab Emergency Planning Committee, and the Moab Fire Department.

Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) (42 USC 6901), established in 1976 and subsequently amended several times, is the nation's primary law governing the proper management of nonhazardous and hazardous solid waste from the point of generation to final disposal. All waste generated within the Moab site's Contamination Area (CA) is considered RRM, the cleanup and management of which is regulated by the Uranium Mill Tailings

Radiation Control Act (UMTRCA) (42 USC 7901), not RCRA. However, waste generated outside the CA is considered non-RRM and, therefore, can be regulated by RCRA. No RCRA wastes were generated in 2010.

National Environmental Policy Act

Remedial actions performed pursuant to UMTRCA are considered to be major federal actions that are subject to the requirements of the National Environmental Policy Act (NEPA) (42 USC 4321). Council on Environmental Quality regulations to implement NEPA are codified in 40 CFR 1500, "Purpose, Policy, and Mandate." These regulations require each federal agency to develop its own implementing procedures (40 CFR 1507.3, "Council on Environmental Quality, Agency Procedures"). DOE-related NEPA regulations are established in 10 CFR 1021, "National Environmental Policy Act Implementing Procedures."

In October 1996, DOE issued the *Final Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Projec*t (DOE/EIS-0198) to analyze the potential impacts of implementing alternatives for ground water compliance at the designated processing sites. The applicable standards are determined on a site-specific basis. The Record of Decision published in 1997 implemented a framework to select the appropriate compliance strategies for ground water remediation at Title I sites. The framework satisfies the requirements of the Floyd D. Spence Act in the selection of a ground water compliance strategy for the Moab site. In 2005, DOE issued the final EIS and ROD for the Moab site, as described in Section 1.4.

In 2010, surface water diversion and the IA ground water remediation system were conducted in accordance with DOE and Council on Environmental Quality NEPA regulations.

Toxic Substances Control Act

The Toxic Substances Control Act (TSCA) (15 USC 2601) was enacted in 1976 to regulate the manufacturing and distribution of certain chemical substances. TSCA provides EPA with authority to require testing of any chemical substances entering the environment and to regulate their production, sale, and management as a waste, where necessary. TSCA specifically addresses the use and management of asbestos and polychlorinated biphenyls (PCBs). Historical records indicate various types of asbestos-containing material (ACM), including pipes, insulation, siding, roofing, and floor tiles from the former millsite structures, were disposed in the Moab RRM pile. PCB-contaminated materials, such as discarded electrical transformers, may be disposed in the RRM pile. It is suspected that ACM is present in the remaining on-site millsite building and utilities, and PCB wastes may be present in fluorescent light ballasts in this building. Any ACM, mercury, or PCBs that remain within the site's CA are considered RRM and are, therefore, subject to UMTRCA regulation, not TSCA regulation. During 2010, no ACM, mercury, or PCBs required management at the Moab site.

Federal Insecticide, Fungicide, and Rodenticide Act

The Federal Insecticide, Fungicide, and Rodenticide Act (7 USC 136) governs the use, storage, registration, and disposal of pesticides. This act categorizes pesticides as either "restricted use" or "general use." EPA may classify a pesticide as restricted use if: (1) it is determined that substantial adverse effects to the applicator or environment may occur without additional regulatory restrictions; or (2) unreasonable harm to humans or the environment may occur, even if the pesticide is used as directed by the label instructions. Restricted-use pesticides must be used or applied only by a certified private or commercial applicator or under the direct

supervision of a certified applicator. A certified applicator was utilized to apply general use herbicides at the Moab site in 2010 to control noxious weeds.

2.1.2 Radiation Protection

Moab UMTRA Project radiation protection is discussed below.

UMTRCA

In 1978, Congress passed UMTRCA in response to public concern regarding potential health hazards of long-term exposure to radiation from RRM. Title I of UMTRCA requires DOE to establish a remedial action program and authorizes DOE to stabilize, dispose of, and control RRM and other contaminated material at 24 uranium ore-processing sites and associated vicinity properties. Vicinity properties are locations where RRM was used as construction material or fill before the hazards associated with this material were known. UMTRCA also directed the EPA to promulgate cleanup standards (now codified at 40 CFR 192) and assigned the NRC to oversee the cleanup and issue licenses to the completed disposal cells. Remediation of the Moab site and disposal at the Crescent Junction site are conducted in compliance with these standards.

RRM, specifically defined at 40 CFR 192.01(a), is waste that DOE determines to be radioactive and related to the milling process. Although the milling process recovered about 95 percent of the uranium, the RRM contains several naturally occurring radioactive elements, including uranium, thorium, radium, polonium, and Rn. RRM at the Moab site contains contaminants in concentrations that could be hazardous to the environment and public health and that exceed the EPA standards.

RRM generally refers to uranium mill tailings, but may also consist of contaminated soil, debris, equipment, and other wastes. Other contaminated materials requiring cleanup at the Moab site include debris from dismantling of the mill buildings and associated structures, remnants of ponds used during ore-processing activities, disposal trenches, other locations used during mill operations, and buried septic tanks that are assumed to be contaminated. Contaminated ground water beneath the Moab site is also considered RRM. For the purposes of this document, “contaminant” or “contamination” refers to RRM unless otherwise specified.

UMTRCA and, by association, the Floyd D. Spence Act and its implementing regulations, are the primary regulatory drivers for the Moab and Crescent Junction sites because RRM is the predominant waste. During 2010, RRM, in the form of contaminated soil and associated materials, and contaminated ground water were remediated and managed in accordance with regulatory requirements.

RRM may also be combined with hazardous or toxic components related to the milling process. DOE manages RRM that is combined with hazardous or toxic components in a manner that is protective of human health and the environment as a best management practice. For example, certain legacy chemicals and industrial products that were stored at the Moab site were considered RRM and were managed in a safe manner that protected site workers and the environment.

Floyd D. Spence Act
The Moab site was originally subject to Title II of UMTRCA because it was an active uranium-processing site when the legislation was passed and it was regulated under an NRC license.

The Floyd D. Spence Act amended UMTRCA to include the Moab site as a designated processing site for remediation under Title I. This legislation specified that the NRC license for the radioactive materials at the Moab site be terminated and the title and responsibility for cleanup be transferred to the Secretary of Energy. The Act further designated that the Moab site undergo remediation in accordance with Title I of UMTRCA.

2.1.3 Air Quality and Protection

The applicability of 42 USC 7401, "Clean Air Act," to Moab UMTRA Project air quality and protection is discussed below. The environmental air monitoring program for the Moab UMTRA Project and results of data collected in 2010 are discussed further in Section 4.0.

National Emission Standards for Hazardous Air Pollutants
Regulatory requirements associated with the Clean Air Act establish emission standards for hazardous air pollutants associated with various industrial processes codified at 40 CFR 61, "National Emission Standards for Hazardous Air Pollutants" (NESHAP). The Moab UMTRA Project is not required to report under the NESHAP program as there are no NESHAP-regulated air emissions associated with the Moab and Crescent Junction sites.

2.1.4 Water Quality and Protection

Moab UMTRA Project efforts regarding water quality and protection are discussed below.

Clean Water Act/National Pollutant Discharge Elimination System
Under 33 USC 1251, "Clean Water Act," the National Pollutant Discharge Elimination System was designed to regulate and control pollutants from industrial wastewater and storm water discharges, both of which can have negative effects on the quality of surface waters of the United States. The federal discharge requirements are implemented by an equivalent state system known as the Utah Pollutant Discharge Elimination System (UPDES). As required by the Clean Water Act, the project obtained UPDES Storm Water General Permits for Construction Activities at the Moab and Crescent Junction sites. No discharges were noted under the UPDES during 2010.

Storm water discharges from the sites are regulated by UPDES requirements. The state of Utah issued the Moab UMTRA Project two storm water permits (see Table 1) in 2006 and 2007. As required by the permits, DOE prepared and implemented the *Moab UMTRA Project Moab Site Storm Water Pollution Prevention Plan* (DOE-EM/GJRAC1475) and the *Moab UMTRA Project Crescent Junction Site Storm Water Pollution Prevention Plan* (DOE-EM/GJRAC1238) that outline the engineering controls and best management practices that DOE has implemented to control and minimize storm water discharges from the sites. Copies of the plan and the storm water discharge permit are maintained at each respective site. To ensure continued compliance with the plans, DOE conducts at least two storm water inspections per month and documents the inspection results on a site-specific checklist.

Several localized, severe storm events occurred at the Moab and Crescent Junction sites during 2010. In late July and early August, two significant storm events were recorded at Crescent Junction that required additional inspections and maintenance. Eroded areas were filled with

clean material, damaged areas were regraded using heavy equipment, and native vegetation was reseeded. Erosion logs and blanket material were also used to repair and control storm water. All storm water controls functioned as designed, and no contaminated materials were discharged off site.

There is no sewer effluent discharge points associated with Moab or Crescent Junction site operations. DOE installed on-site sewer collection and leach-field systems at Moab and Crescent Junction and constructed a domestic waterline to the Crescent Junction site. Bottled water is provided for Moab and Crescent Junction on-site drinking water needs. City water is trucked to the Moab site for other domestic requirements.

Safe Drinking Water Act

The provisions of 42 USC 300f, "Safe Drinking Water Act," are not directly relevant to the Moab or Crescent Junction sites because neither ground water nor surface water at or near the sites is used as a public drinking water supply. DOE did not engage in any activities that affected drinking water supply sources. Remediation wells are designated as a temporary withdrawal point; therefore, a Temporary Change Application was submitted and received from the State of Utah Department of Natural Resources, Division of Water Rights (see Table 1).

Table 1. Permits/Agreements Active in 2010 for the Moab UMTRA Project

Permits/Agreements	Issuing Agency	No. of Permits
Moab UPDES Storm Water Discharge Permit (permit number UTR107469)	State of Utah, Department of Environmental Quality, Division of Water Quality	1
Crescent Junction UPDES Storm Water Discharge Permit (permit number UTR108269)	State of Utah, Department of Environmental Quality, Division of Water Quality	1
Streambank Alteration Permits for the Colorado and Green River intake structures and for structures and well fields to support the surface water and IA ground water remediation system	State of Utah, Department of Natural Resources, Division of Water Rights	5
Water rights applications to change points of diversion to support ground water actions and a non-use application to extract water from the Colorado River	State of Utah, Department of Natural Resources, Division of Water Rights	3
Highway right-of-way encroachment permits to conduct surveys, perform remediation, and construct pipelines	State of Utah, Department of Transportation	8
Special Permit SP-14283 for DOE to transport RRM and party status for the Remedial Action Contract	U.S. Department of Transportation	1
UPDES General Permit for Storm Water Discharges Associated with Industrial Activity: UTR105820	State of Utah, Department of Environmental Quality	1
Hazardous Materials Certificate of Registration	U.S. Department of Transportation	1
Fugitive Dust Control Authorization Letters: Moab DAQC-626-2002 Crescent Junction DAQC-1110-2006	State of Utah, Department of Environmental Quality	2
404 Nationwide General Permit for Green River pump station, water pipelines, the Moab Wash, and off-pile remediation area	USACE	4

2.1.5 Other Environmental Statutes

The applicability of various environmental statutes to the Moab UMTRA Project is discussed below.

Endangered Species Act

The "Endangered Species Act" (16 USC 1531) requires federal agencies to consult with the USFWS prior to any ground-disturbing activities that may impact protected species (threatened or endangered) or their habitat. There are four endangered fish species (Colorado pikeminnow, razorback sucker, humpback chub, and bonytail chub) present in the Colorado River, with the pikeminnow and razorback sucker found near the Moab site. There is one endangered avian species (southwestern willow flycatcher) that may inhabit tamarisk areas on or near the site.

The final EIS included a Biological Assessment and a BO that evaluated potential impacts of the proposed actions to protected species that may be present. DOE continues to meet the required habitat protective measures stated in the BO. DOE requested a water-depletion allowance of 235 acre-feet per year for use of the Colorado River water to meet project needs.

As required by the BO, DOE developed the Biota Monitoring Plan in 2006 to evaluate Moab site-related impacts on fish. No adverse impacts were noted in 2010 to endangered fish as a result of biota monitoring.

National Historic Preservation Act

Memoranda of Agreement are in place among DOE, the State Historic Preservation Office, the Utah Department of Transportation, and the Bureau of Land Management for protection of cultural and historic resources at the project sites. In 2010, an annual cultural resource inventory was performed at the Crescent Junction site for native American art sites per the applicable memoranda of agreement. Annual reports for Moab and Crescent Junction sites were submitted as required by Memoranda of Agreement.

Migratory Bird Treaty Act

To ensure compliance with 16 USC 703, "Migratory Bird Treaty Act," the presence of migratory birds in the Moab area was evaluated in the Biological Assessment. The BO concurred that the potential migratory bird species that may inhabit the Moab site area included the bald eagle (threatened), the southwestern willow flycatcher (endangered), and the yellow-billed cuckoo (candidate species). Surveys were conducted to locate the southwestern willow flycatcher prior to vegetation removal; however, none were found to be present at the Moab site in 2010. No endangered, threatened, or candidate species have been noted on the Moab site.

At the Crescent Junction site, the burrowing owl, a Utah sensitive species, was identified as potentially present; however, none was observed in 2010. A large number of prairie dog burrows is present; these burrows are associated with burrowing owl habitat. If a nesting burrowing owl is determined to be present, DOE is committed to protect a ¼-mile buffer area around the nest and to avoid activities in this area until August. Hawks are known to hunt in the Crescent Junction site area; however, no nests are known to be present. Additionally, a botanical survey was completed at the Crescent Junction site, and no protected plant species were present.

2.1.6 DOE Order 436.1 and Executive Orders 13423 and 13514

DOE O 436.1, "Departmental Sustainability," enforces environmental compliance and reinforces the need to respond to and meet the national sustainability goals through implementation of an integrated EMS that considers environmental aspects affected by all agency activities. The status of the Moab UMTRA Project EMS implementation is further discussed in Section 3.0.

Specific national goals related to improving energy, water, and fuel efficiency and using environmentally preferable products and services are stated in Executive Order 13423, "Strengthening Federal Environmental, Energy, and Transportation Management," and DOE 436.1. In October 2009, the former Secretary of Energy indicated that DOE would exceed the goals established in Executive Order 13423 by applying Leadership in Energy and Environmental Design criteria established by the United States Green Buildings Council. The Moab UMTRA Project is still awaiting direction from DOE Headquarters prior to establishing greenhouse gas reduction targets and sustainability goals to reach those targets in compliance with Executive Order 13514, "Federal Leadership in Environmental, Energy, and Economic Performance." These goals, scheduled for implementation in 2011, will be reported in the appropriate Annual Site Environmental Report.

In 2010, the project utilized an alternative source of raw water for nondomestic (construction) uses at the Crescent Junction site, thus reducing domestic water usage to 1.4 million gallons from the previous 3-million-gallon usage.

Floodplain Management

DOE's implementing regulations in 10 CFR 1022, "Compliance with Floodplain and Wetlands Environmental Review Requirements," identify the requirements of Executive Order 11988, "Floodplain Management," for actions that may affect floodplains. Portions of the Moab site fall within the 100-year and 500-year floodplains as described in the *Moab UMTRA Project Floodplain and Wetlands Assessment for Additional Interim Actions at the Moab Project Site* (DOE-EM/GJ805).

Activities conducted in the floodplain during 2010 included soil remediation and revegetation. Revegetation activities included planting and seeding of desirable, native species, irrigation to promote vegetation, and weed control. Minor erosion control actions were taken in 2010 to prevent transportation of sediment to the river.

A joint U.S. Army Corps of Engineers (USACE) and Utah state 404 Permit was obtained to remediate contaminated soil in the floodplain along the lower portion of the Moab Wash and along the Colorado River from the pump inlet to the Moab Wash in early 2011.

Protection of Wetlands

DOE regulation 10 CFR 1022 implements the requirements of Executive Order 11990, "Protection of Wetlands," for actions that may affect wetlands. Jurisdictional wetlands were delineated at the Moab site in 2004 and verified by USACE in 2005. Moab UMTRA Project activities performed in 2007 with the potential to affect jurisdictional wetlands included construction that disturbed upland soils, storm water controls, revegetation, and erosion control activities. All of these activities were authorized under the USACE 404 permitting program or by the state of Utah's Streambank Alteration permit program through a cooperative agreement with USACE. Required monitoring continued in 2010.

2.2 Other Major Environmental Issues and Actions

DOE uses external and internal audits, surveillances, and management assessments to evaluate environmental compliance and to implement corrective actions. The Moab UMTRA Project QA organization performed surveillances and management assessments in 2010 to verify system descriptions and compliance with internal procedures. Mitigation and compliance requirements in the BO and ROD are tracked for compliance.

2.3 Continuous Release Reporting

Not applicable to the Moab UMTRA Project.

2.4 Unplanned Releases

No unplanned releases occurred in 2010.

2.5 Summary of Permits

Table 1 shows the permits and agreements that were active for the Moab UMTRA Project during 2010.

3.0 EMS

As with most federal agencies, DOE's EMS is based on the standard elements identified in International Organization for Standardization 14001, "Environmental Management System Standard." The EMS integrates these elements into the core functions of the contractors' Integrated Safety Management System Program, which follows the "Plan-Do-Check-Act" cycle to ensure continuous improvement. The Moab UMTRA Project's EMS is a structured process for reducing the environmental consequences of project activities to maximize beneficial use of finite resources and minimize wastes. In an effort to implement a comprehensive EMS for the Moab UMTRA Project in accordance with DOE O 436.1, the *Moab UMTRA Project Environmental Management Program Manual* (DOE-EM/GJ1630) was prepared in September 2008 as one element of the EMS. Revisions are being made to the manual to incorporate comments received in April 2010 following a third-party audit.

3.1 Environmental Initiatives

3.1.1 Pollution Prevention

Pollution prevention is part of the waste management strategy for the Moab UMTRA Project. Operations are evaluated to identify technically and economically feasible opportunities for source reduction, recycling, decontamination, or treatment. Disposal is the final solution after other options have been considered. Pollution prevention is also achieved through environmentally preferred purchasing.

Reuse and Recycling

In 2010, approximately 2,500 lb of paper, 2,600 lb of plastic, 1,150 lb of aluminum cans, and 12,000 of used oil were collected from the Moab UMTRA Project sites and the Grand Junction

office for recycling. Automotive and rechargeable batteries, toner cartridges, and power strips were also recycled. All of these recycled materials were nonradioactive.

Environmentally Preferable Purchasing
The preferred procurement process favors the acquisition of environmentally preferable products and services. This may entail purchasing materials with recycled content or materials or services that have a less adverse or even beneficial effect on the environment. One of the site contractors routinely adds language to contracts that specifies a preference for the use of recycled or otherwise recovered materials and removes language that prohibits the use of recycled materials. In addition, the project participates in the Blue Sky Renewable Energy Program by buying 10 percent renewable energy. As a result, the Remedial Action Contractor and the Moab UMTRA Project have received Blue Sky Champion Partner and EPA Green Power Partner designations.

Energy Efficiency
The project's newly constructed facilities were designed to be energy efficient and comply with DOE O 436.1 and the Secretary of Energy's new energy initiatives for real property. The Moab and Crescent Junction sites receive power from overhead lines through the Rocky Mountain Power distribution system. Rocky Mountain Power performed an energy assessment in July, and no major recommendations were made.

3.2 Waste Management

During 2010, DOE conducted operations consistent with the *Moab UMTRA Project Waste Management Plan* (DOE-EM/GJ1633). Formal training in the requirements of this plan was provided to site project staff and subcontractors.

4.0 Environmental Radiological Protection Program and Dose Assessment

4.1 Radiological Discharges and Doses

4.1.1 Employee Monitoring Program
An employee monitoring program is conducted to ensure safe working conditions are maintained and to limit exposures to "as low as reasonably achievable" (ALARA). On-site radiation readings are higher than off-site locations; therefore, the CA workers represent the highest potentially exposed individuals. External radiation monitoring of employees who enter the CA is performed using a thermoluminescent dosimeter that is analyzed quarterly. Personal electronic dosimeters are also used to give real-time monitoring of the workers in the CA.

The project's ALARA goal for individual exposures is 816 millirems per year (mrem/yr), which is very conservative when compared to the DOE exposure limit of 2,000 mrem/yr and the NRC limit of 5,000 mrem/yr. The 2010 monitoring results were well below the ALARA goal, with the highest individual radiological worker dose being approximately 271 mrem/yr, versus 167 mrem/yr in 2009 prior to excavation of the RRM. These results indicate that with proper personal protective equipment and by limiting exposure, employees can safely work within and around the CA.

4.2 Clearance of Property Containing RRM and Protection of Biota

To support remediation of the Moab site, DOE assessed Moab site soils not associated with the pile for radiological contamination. Interim soils remediation is part of DOE's cleanup strategy and one of the ongoing measures to address contamination resulting from historical uranium-ore processing at the site to reduce potential health and environmental risks.

In 2010, approximately 158,168 cubic yards of contaminated soil was removed to remediate approximately 17 acres of the DOE property south of the RRM pile, resulting in a reduction of the contaminated footprint by about 17 acres.

The excavated soil was placed on the RRM pile for shipment to the Crescent Junction site for disposal. The footprint has been reduced by a total of approximately 131 acres since the start of interim soil remediation. As areas are remediated, DOE replants native plant species.

Calculated dose rate is 0.01 mrem, which is less than the guideline for terrestrial plants or biota; therefore, the Moab UMTRA Project has no biota monitoring program for radiological effects. Biota monitoring for non-radiological effects is discussed in Section 6.0.

4.3 Unplanned Radiological Releases

There were no unplanned radiological releases in 2010.

4.4 Environmental Radiological Monitoring

Radiological protection is provided through the environmental air monitoring program, which is described in the *Moab UMTRA Project Environmental Air Monitoring Sampling and Analysis Plan* (DOE-EM/GJRAC1434). This plan documents DOE's strategy for monitoring various airborne contaminants, including monitoring goals and objectives and evaluation of public radiological exposure. This section provides descriptions of the environmental air monitoring program elements. Environmental air monitoring data are compiled and published in DOE's quarterly environmental air monitoring reports. These reports compare monitoring data to exposure limits and guidelines and are posted on the DOE Moab UMTRA Project website at www.gjem.energy.gov/moab.

In addition to the environmental air monitoring program, DOE has a comprehensive Integrated Safety Management System Program and Radiological Control Program to minimize workplace hazards and to ensure protection of employees and the public. These programs are described in applicable project documents.

During 2002, DOE initiated environmental air monitoring at the Moab site to assess the potential for radiation dose to members of the public that could result from site operations and to demonstrate compliance with applicable Rn concentration guidelines established by DOE O 458.1. In late 2005, air monitoring was also initiated at the Crescent Junction site to collect baseline data before disposal operations began in April 2009. DOE established the air monitoring network for the Moab UMTRA Project to measure Rn, airborne radioparticulate matter, and direct gamma radiation at various on-site, off-site, and background locations. The monitoring network was established after considering prevailing wind directions and the

proximity of each site to the general population. Off-site monitoring stations were located such that emissions or releases of airborne contaminants would be detected before they reached the public. This strategy enables DOE to quantify any public exposures that may be associated with Moab UMTRA Project activities. Table 2 summarizes the types of data collected at the various monitoring locations for Moab and Crescent Junction. Monitoring locations for Moab are shown in Figures 3 and 4 and for Crescent Junction in Figure 5.

Table 2. Summary of Environmental Air Monitoring Locations at the Moab and Crescent Junction Sites

Monitoring Station	Location	Parameter
Moab On-Site Locations		
0101	Office area	Rn, G
0102	Perimeter	Rn, G, RP
0103	Perimeter	Rn, G
0104	Perimeter	Rn, G
0105	Perimeter	Rn, G, RP
0106	Perimeter	Rn, G
0107	Perimeter	Rn, G
0108	Perimeter	Rn, G
0109	Perimeter	Rn, G
0110	Perimeter	Rn, G
0111	Perimeter	Rn, G
0112	Perimeter	Rn, G
0113	Perimeter	Rn, G
Moab Off-Site Locations		
0117	Bar-M Chuckwagon (background location, ~5½ miles north of millsite)	Rn, G, RP
0118	Arches National Park Entrance	Rn, G, RP
0119	Utah Division of Wildlife Resources (Matheson Wetlands Preserve)	Rn, G, RP
0120	Portal RV Park	Rn, G, RP
0121	Moab Wastewater Treatment Plant	Rn, G, RP
0122	Grand County Recycle Center	Rn, G, RP
0123	Kane Creek Road (background location, ~2¾ miles south of millsite)	Rn, G, RP
0124	Utah Division of Wildlife Resources (Matheson Wetlands Preserve)	Rn, G
0125	Utah Division of Wildlife Resources (Matheson Wetlands Preserve)	Rn, G
0126	Private property (~¼-mile south of millsite)	Rn, G
0127	Private property (~¾-mile south of millsite)	Rn, G
0128	Private property ($^{1}/_{10}$-mile south of millsite)	Rn, G
0129	Bureau of Land Management property (~200 yards northwest of millsite)	Rn, G, RP
MEI	Residence (~50 feet east of Moab millsite)	Rn, G

Table 2. Summary of Environmental Air Monitoring Locations at the Moab and Crescent Junction Sites (continued)

Monitoring Station	Location	Parameter
Crescent Junction Locations		
0301, 0305	Crescent Junction off-site locations	Rn, G
0302, 0303, 0304	Crescent Junction on-site locations	Rn, G
MEI (0306)	Residence (~½-mile south of disposal cell) (0306)	Rn, G, RP
0307	Crescent Junction off-site location	Rn, G, RP
0308	Crescent Junction on-site location	Rn, G, RP
0309	Crescent Junction on-site location	Rn, G, RP

G = gamma; MEI = maximally exposed individual; RP = radioparticulate.

Background monitoring locations have been established that are sufficiently removed from the Moab and Crescent Junction sites such that the air quality is not influenced by airborne contaminants associated with operations. Background monitoring locations provide baseline ambient air quality conditions against which site monitoring data may be compared.

Maximally exposed individual (MEI) locations (see Figure 3 for Moab site and Figure 5 for Crescent Junction) have special significance with respect to environmental monitoring because they represent the members of the public potentially receiving the largest dose from all sources of radionuclide emissions combined and are considered to be the worst-case exposure scenario for a continuously occupied residential property. The MEI locations are the closest inhabited private property to each site.

A summary of the MEI public radiation dose is shown in Table 3. The public and MEI receive only a background dose based on project monitoring results.

Table 3. Moab UMTRA Project Public Radiation Dose Reporting for 2010

Pathway	Maximum Dose to MEI in mrem (mSv)	% of DOE 100 mrem/yr Limit	Estimated Population Dose in person-rem	Population Within 80 km (~50 miles)	Estimated Bkgd Radiation Population Dose in person-rem
Air	12 (0.12)	12	less than 0.005	~10,000	less than 0.005
Water	N/A	N/A	N/A	N/A	N/A
Other Pathways	N/A	N/A	N/A	N/A	N/A
All Pathways	12 (0.12)	12	less than 0.005	N/A	less than 0.005

Bkgd = background; km = kilometers; mSv = milliseiverts; N/A = not applicable; rem = roentgen equivalent man; Sv = seiverts

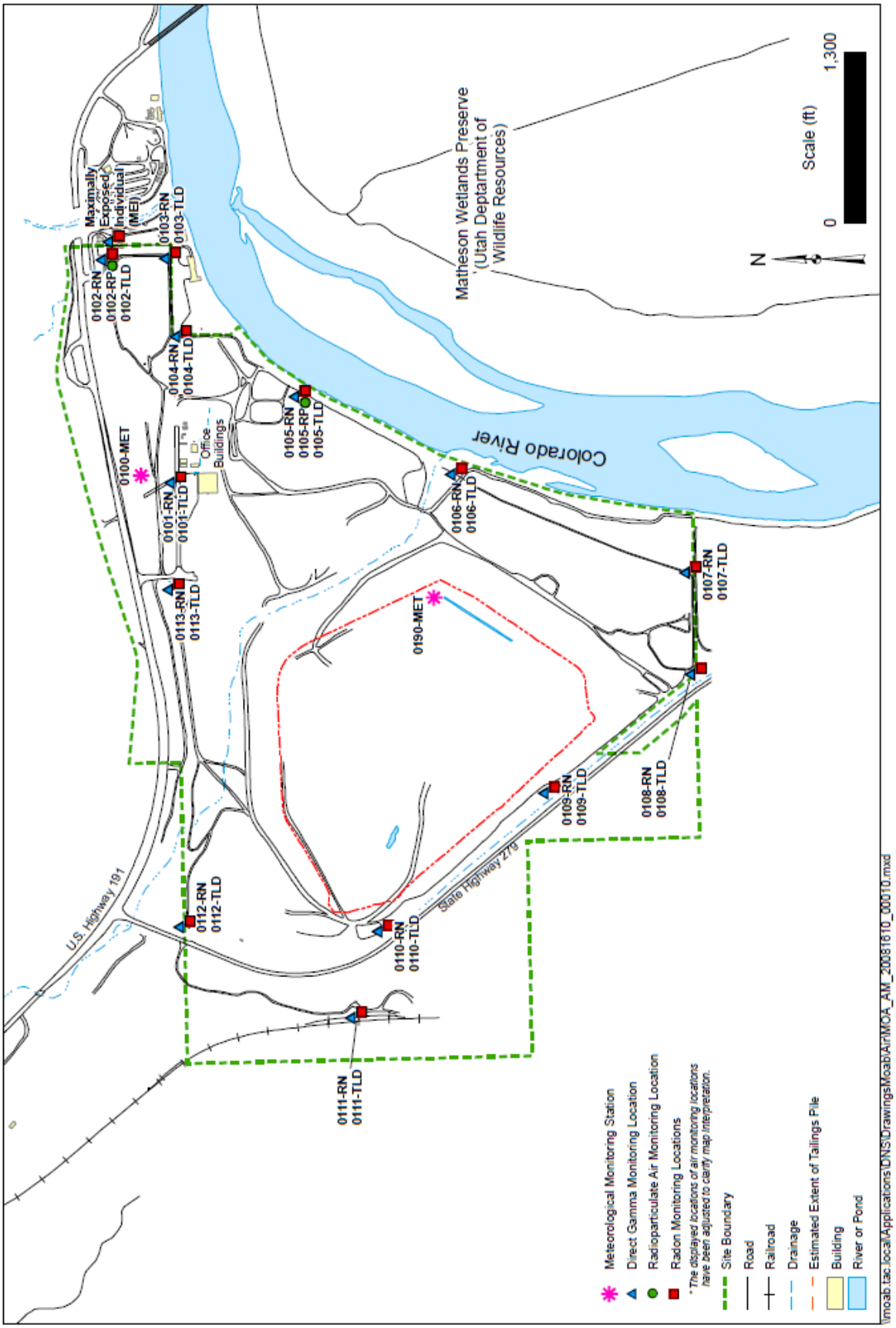

Figure 3. Moab On-Site and MEI Environmental Air Monitoring Locations

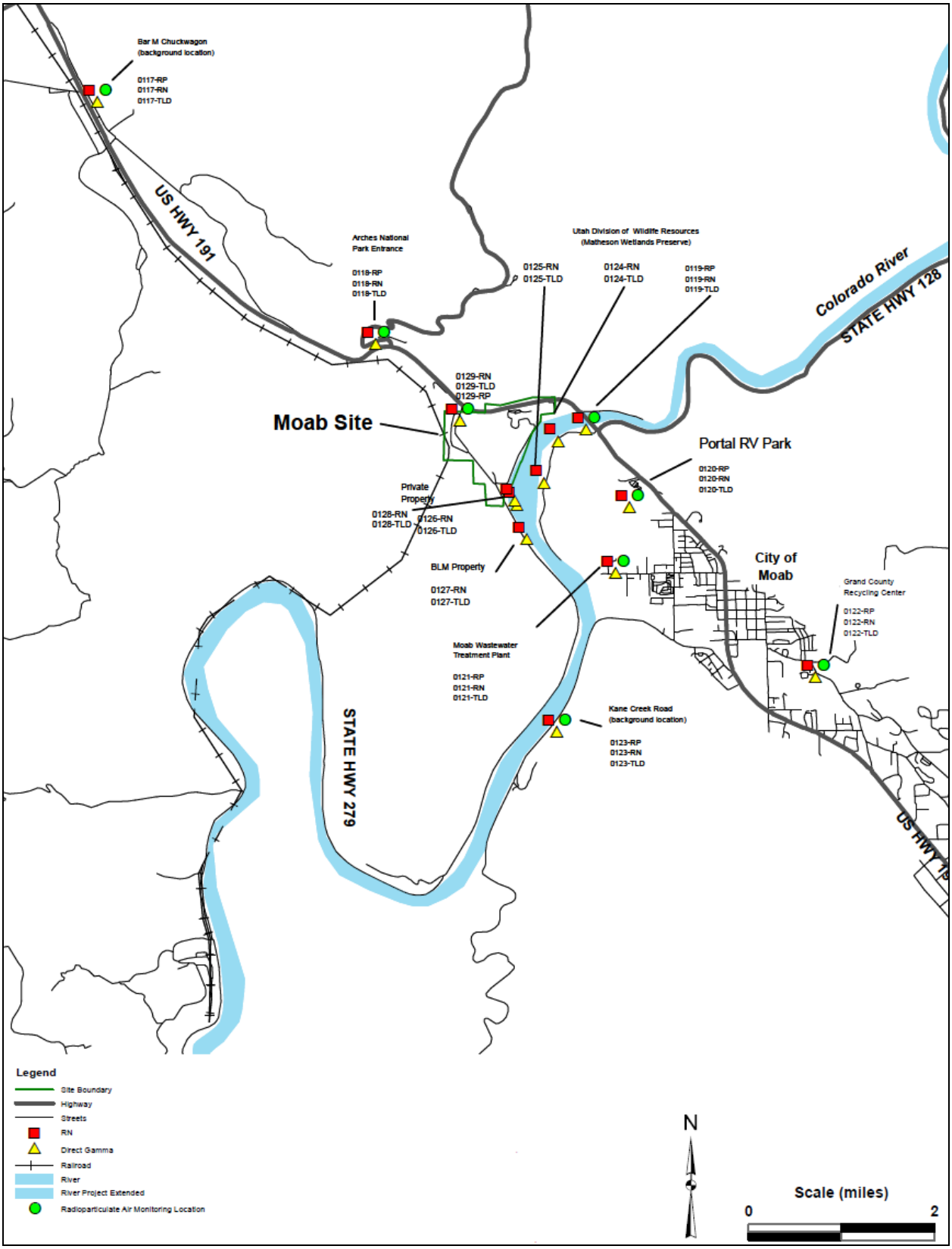

Figure 4. Moab Off-Site Environmental Air Monitoring Locations

Figure 5. Crescent Junction Site Environmental Air Monitoring Locations

4.4.1 Rn

During 2010, DOE continued its environmental air monitoring program at the Moab and Crescent Junction sites to measure Rn emissions at various locations on the millsite property boundary, around the Moab community, and at and around the Crescent Junction site. DOE O 458.1 provides guidelines for all DOE facilities, operations, and activities and offers a conservative goal for guidance with respect to controlling Rn emissions at the Moab UMTRA Project sites, while remediation of the RRM pile and placement in the disposal cell is ongoing. This DOE order established an indoor guideline for Rn-222 concentrations, and this guideline is used at DOE's property boundary and at off-site locations. The guideline or goal is 3.0 picocuries per liter (pCi/L) above background concentrations. Based on 5 years of data from 2003 through 2008, the background concentration of Rn-222 in the Moab area was established at 0.7 pCi/L; therefore, the guideline for Rn-222 emissions at the Moab site is 3.7 pCi/L. Based on 3 years of data from 2006 to 2009, the background concentration of Rn-222 in the Crescent Junction area was established at 0.9 pCi/L; therefore, the guideline for Rn-222 emissions at the Crescent Junction site is 3.9 pCi/L.

During 2010, Rn was measured at 36 locations (17 on site, 17 off site, and two MEIs) using alpha-sensitive detectors (i.e., Rn cups). Rn cups were exposed for a period of approximately 3 months (a quarterly exposure). Upon collection, the Rn cups were sent to an off-site laboratory for analysis. Analytical results were typically received from the laboratory within 30 days. Rn monitoring data results for all on-site, off-site, and MEI locations are shown in Table 4.

During 2010, the Rn concentration exceeded the guideline at one Moab on-site location (station number 106) on vacant land (Table 4). Data indicate off-site Rn concentrations attenuate to near background levels within ¼-mile beyond the Moab site boundary. Because the RRM pile does not have an engineered Rn barrier nor is the existing interim cover designed to control Rn flux, it is not surprising that Rn concentrations can become elevated at locations at or near the Moab site perimeter. There were no Rn exceedances at the Crescent Junction site. The 2010 Rn monitoring data collected at the MEI locations were consistently below the 3.7 pCi/L and 3.9 pCi/L guidelines for Moab and Crescent Junction, respectively.

Based on these data, Rn emissions from the RRM stored at the Moab site are not affecting the general population. However, unacceptable exposures to the public may result to individuals if they were to camp or reside for extended periods of time within ¼-mile of the DOE southern property boundary between SR-279 and the Colorado River. To prevent unauthorized access near the southern property boundary and to minimize the potential for excessive public exposures to Rn gas, DOE will continue, to the extent possible, to enforce the existing institutional controls (e.g., warning signs, fences, other physical barriers).

4.4.2 Direct Gamma Radiation

The RRM stockpiled at the Moab site is a source of direct gamma radiation. As uranium decays, several of the decay products emit gamma radiation. Gamma radiation has sufficient energy to penetrate body tissues; therefore, protection against elevated exposure levels is of utmost importance to DOE. DOE public dose limits applicable to the Moab UMTRA Project are outlined in DOE O 458.1, Chapter II, "Requirements for Radiation Protection of the Public and Environment" [1][a]. DOE also complies with the State of Utah radiation protection requirements codified at Utah Administrative Code (UAC) R313-15-301, "Standards for

Protection Against Radiation, Dose Limits for Individual Members of the Public." These regulations establish standards and requirements for DOE operations (and DOE contractors) with respect to protection of members of the public and environment against undue risk from radiation.

DOE O 458.1 establishes a dose limit of 100.0 mrem/yr above naturally occurring gamma levels or background. DOE has determined that the background direct gamma radiation dose is approximately 81.0 mrem/yr in the Moab area and 92.5 mrem/yr in the Crescent Junction area. These values were derived by averaging monitoring data collected at background monitoring locations in each area. Therefore, the DOE dose limit for direct gamma radiation at the site boundary (and at any off-site location) is approximately 181.0 mrem/yr at Moab and 192.5 mrem/yr at Crescent Junction.

During 2010, direct gamma radiation was measured at 36 locations (17 on site, 17 off site, and two MEI) using thermoluminescent dosimeters that are exposed for a period of approximately 3 months (a quarterly exposure). Upon collection, the dosimeters are sent to an off-site laboratory for analysis. Analytical results are typically received from the laboratory within 30 days. Direct gamma radiation data results for all on-site, off-site, and MEI locations are shown in Table 4.

Table 4. Summary of Rn and Gamma Monitoring Data for the Moab and Crescent Junction Sites for 2010

Station Number	1st Quarter 2010		2nd Quarter 2010		3rd Quarter 2010		4th Quarter 2010		2010 Annual Results	
	Rn (pCi/L)	Gamma (mrem/91 d*)	Rn (pCi/L)	Gamma (mrem/91 d*)	Rn (pCi/L)	Gamma (mrem/91 d*)	Rn (pCi/L)	Gamma (mrem/91 d*)	Avg Rn (pCi/L)	Gamma (mrem/yr*)
On-Site Locations										
0101	1.4	32.2	1.1	31.1	2.4	35.3	3.1	39.3	2.0	137.88
0102	1.0	21.7	0.6	21.8	0.9	23.4	1.6	28.1	1.0	94.96
0103	0.8	21.9	0.7	20.5	0.9	23.0	1.8	27.0	1.1	92.4
0104	1.2	24.6	1	23.3	1.4	26.9	2.1	31.0	1.4	105.83
0105	1.9	41.1	1.2	43.3	2.0	46.6	2.8	47.6	2.0	178.58
0106	2.3	41.4	2	43.7	2.8	48.1	4.5	56.7	2.9	189.95
0107	1.9	25.3	1.6	27	2.2	28.2	3.1	35.0	2.2	115.54
0108	1.4	32.7	1.6	36.2	2.3	40.1	3.6	46.8	2.2	155.75
0109	1.2	89.9	1.4	105.4	3.1	120.1	2.1	132.6	2.0	447.99
0110	1.1	78	1.6	82.3	2.8	96.8	2.0	87.4	1.9	344.48
0111	0.6	32.6	1.2	30.4	1.0	38.0	0.9	35.7	0.9	136.76
0112	1.2	40.9	1.4	42.2	2.9	50.1	3.1	49.8	2.2	182.97
0113	1.4	28.4	1.5	29.1	2.8	30.6	3.1	35.9	2.2	124.04
0303	0.9	23.0	1	24.4	0.6	26.5	0.5	27.4	0.8	101.4
0304	1.1	24.7	0.9	22.5	0.5	28.7	0.7	25.7	0.8	101.6
0308	0.7	17.3	0.4	20	2.0	20.3	1.3	25.2	1.1	82.8
0309	1.0	23.3	0.7	24.4	0.8	24.3	0.7	25.9	0.8	97.9

Table 4. Summary of Rn and Gamma Monitoring Data for the Moab and Crescent Junction Sites for 2010 (continued)

Station Number	1st Quarter 2010		2nd Quarter 2010		3rd Quarter 2010		4th Quarter 2010		2010 Annual Results	
	Rn (pCi/L)	Gamma (mrem/91 d*)	Rn (pCi/L)	Gamma (mrem/91 d*)	Rn (pCi/L)	Gamma (mrem/91 d*)	Rn (pCi/L)	Gamma (mrem/91 d*)	Avg Rn (pCi/L)	Gamma (mrem/yr*)
Off-Site Locations										
0117	0.9	20.5	0.5	20.3	<0.3	22.7	0.4	24.2	0.5	87.76
0118	0.4	20.1	0.4	20.2	0.5	20.6	1.0	24.9	0.6	85.81
0119	0.7	18.7	0.5	21.2	0.5	19.3	0.7	26.1	0.6	85.24
0120	0.8	18	0.4	18.1	<0.3	18.7	0.3	24.9	0.5	79.72
0121	0.9	20.3	0.5	19.6	0.4	20.3	0.6	24.4	0.6	84.51
0122	0.5	19	0.6	17.9	<0.3	19.4	0.8	20.9	0.6	77.28
0123	0.6	18.7	<0.3	17.5	0.4	20.2	<0.3	21.3	0.4	77.67
0124	0.8	21.7	0.7	23.7	0.8	23.2	1.2	29.5	0.9	98.12
0125	1.1	25	0.8	25.6	1.1	27.6	1.5	33.3	1.1	111.52
0126	1.1	21.7	0.7	22.4	1.2	24.5	2.1	28.7	1.3	97.3
0127	0.8	21.1	0.5	23.2	0.5	23.5	1.0	27.9	0.7	95.78
0128	1.5	22	1.1	22.5	1.3	25.7	2.6	27.6	1.6	97.73
0129	1.2	21.7	1.2	24.4	1.8	24.9	NDA	30.0	1.1	101
MEI (Moab)	0.7	18.6	0.5	17.4	1.0	19.3	1.9	22.2	1.0	77.5
0301	0.8	21.8	0.7	23.3	0.5	24.1	0.6	24.1	0.7	93.3
0302	0.6	20.9	0.7	23.2	NDA	25.2	<0.3	26.5	0.4	95.8
0305	1.0	25.3	0.8	24.9	0.5	28.9	0.8	27.7	0.8	106.9
MEI (CJ)	0.8	25.9	0.5	24.7	0.4	27.7	0.5	26.9	0.6	105.2
0307	0.9	24.7	0.3	25.2	<0.3	29.2	0.7	28.1	0.5	107.2

Avg = average; CJ = Crescent Junction; NDA = no data available.
*mrem value is prorated to a 91-day exposure period.

During 2010, direct gamma radiation measurements exceeded the DOE annual guideline at four on-site locations (see Table 4); this is not unexpected due to the large volume of RRM stockpiled at the Moab site and their associated gamma activity. There were no exceedances at the Crescent Junction site. The total gamma radiation dose at the MEI locations was 77.5 mrem/yr and 105.2 mrem/yr for the Moab and Crescent Junction sites, respectively; both doses were substantially below the limit for each site.

Based on the levels of direct gamma radiation, these emissions are not affecting the general population in or near Moab or Crescent Junction.

4.4.3 Airborne Radioparticulates

Collection of radioparticulate data are of particular interest to DOE because these data provide information relative to the dose that the public may be receiving from the inhalation of radioactive particulate matter. In 2010, air samplers operated continuously at four on-site locations and 10 off-site locations at Moab and Crescent Junction. These samplers consist of a low-volume air sampling pump that draws air (at a prescribed rate of 60 liters per minute) through a glass fiber filter. As air passes through the filter, particulate matter suspended in the air is captured on the surface of the filter. Air filters were collected weekly and submitted as a composite sample on a quarterly basis. The filters were then analyzed for specific radionuclides that are common constituents of RRM, including radium-226, thorium-230, polonium-210, and total uranium.

The annual average derived concentration guide (DCG) values were compared to the DCGs published by DOE for inhaled air for various radioisotopes. A DCG represents the concentration from a specified radionuclide that would cause a member of the public residing at the point of collection to receive a dose of 100 mrem/yr. Exposures above this limit are considered unacceptable. The DCG values for the radionuclides included in the DOE monitoring program are shown in Table 5.

Table 5. Summary of DCGs for Inhaled Air Radionuclides Monitored at the Moab and Crescent Junction Sites for 2010

Radionuclide	DCG (µCi/mL)
Radium-226	1.0E-12
Thorium-230	4.0E-14
Polonium-210	1.0E-12
Total Uranium	2.0E-12

µCi/mL = microcuries per milliliter

The annual averages for airborne radioparticulate concentrations did not exceed the DCG values for any of the on-site or off-site locations for either Moab or Crescent Junction during 2010 (see Table 6). These data demonstrate that emissions of airborne radioparticulate matter were consistently two to four orders of magnitude below their respective DCG values, and, therefore, do not exceed levels or concentrations that would result in an unacceptable public exposure. DOE O 458.1 also requires that the radiological dose resulting from airborne emissions is less than 10 mrem/yr, and all sampling results were lower than the airborne limit (see Table 6).

4.4.4 Fugitive Dust

Most of the surface area at the Moab and Crescent Junction sites consists of exposed, unprotected soils and sand. Vegetation at the Moab site is relatively sparse and offers little protection or stabilization to the site's sandy soils. Consequently, controlling windblown sand, soil, and dust is a recognized concern. In Utah, federal Clean Air Act requirements are implemented by an equivalent set of state regulations. To comply with UAC Section R307-309-6, "Fugitive Dust Control," in 2002 DOE prepared the *Moab UMTRA Project Moab Project Site Fugitive Dust Control Plan* (GJO-2002-301-TAR). In 2006, a similar plan was prepared for the disposal site: the *Moab UMTRA Project Crescent Junction Site Fugitive Dust Control Plan* (DOE-EM/GJ1235).

During 2010, DOE diligently monitored fugitive dust emissions and implemented the controls outlined in the fugitive dust control plans to the greatest extent practicable. On an annual basis, DOE applies approximately 60,000 gallons of water and dust suppressant to the RRM at Moab and Crescent Junction and unpaved haul and access roads in an effort to stabilize areas that are susceptible to wind erosion. In addition, DOE restricts travel in off-road areas of the sites and limits vehicular speed to minimize the generation of fugitive dust. As areas are remediated or disturbed, DOE seeds and mulches the areas to establish vegetative cover to control windblown dust. Approximately 29 acres were revegetated in 2010, including 4 acres on the lower haul road, SR-279 right-of-way, the Support Area access road, 17 acres of off-pile remediation area at the Moab site and 8 acres on the Crescent Junction disposal cell wedge.

Table 6. Summary of Radioparticulate Air Monitoring Data for the Moab and Crescent Junction Sites for 2010

Moab Station Number	Isotope	1st Quarter 2010 (µCi/mL)	2nd Quarter 2010 (µCi/mL)	3rd Quarter 2010 (µCi/mL)	4th Quarter 2010 (µCi/mL)	Annual Average (µCi/mL)	Annual 2010 Dose (mrem/yr)
On-Site Locations							
0102-RP	Uranium	1.3E-16	2.0E-16	2.1E-16	1.6E-16	1.8E-16	1.79
	Thorium-230	7.0E-17	2.1E-16	5.8E-16	3.7E-16	3.1E-16	
	Radium-226	8.4E-17	5.5E-17	2.4E-16	1.7E-16	1.4E-16	
	Polonium-210	2.0E-14	4.4E-15	8.1E-15	7.3E-15	1.0E-14	
0105-RP	Uranium	2.7E-16	4.7E-16	4.7E-16	3.5E-16	3.9E-16	3.16
	Thorium-230	2.2E-16	6.1E-16	1.3E-15	1.2E-15	8.3E-16	
	Radium-226	2.4E-16	8.8E-17	9.0E-16	5.7E-16	4.5E-16	
	Polonium-210	1.8E-14	4.6E-15	8.5E-15	9.4E-15	1.0E-14	
Off-Site Locations							
0117-RP	Uranium	1.0E-16	1.6E-16	1.4E-16	1.3E-16	1.3E-16	1.12
	Thorium-230	6.2E-17	9.6E-17	8.9E-17	8.7E-17	8.4E-17	
	Radium-226	7.4E-17	4.5E-17	1.1E-16	1.3E-16	9.0E-17	
	Polonium-210	1.8E-14	3.9E-15	7.5E-15	6.3E-15	8.9E-15	
0118-RP	Uranium	1.3E-16	2.4E-16	2.6E-16	1.5E-16	2.0E-16	2.41
	Thorium-230	1.4E-16	6.6E-16	1.0E-15	3.3E-16	5.3E-16	
	Radium-226	5.7E-17	1.4E-16	8.8E-16	3.0E-16	3.4E-16	
	Polonium-210	2.0E-14	5.5E-15	8.4E-15	7.3E-15	1.0E-14	
0119-RP	Uranium	1.4E-16	1.9E-16	1.6E-16	1.4E-16	1.6E-16	1.32
	Thorium-230	6.8E-17	1.7E-16	2.5E-16	1.6E-16	1.6E-16	
	Radium-226	9.7E-17	2.6E-17	1.6E-16	2.0E-16	1.2E-16	
	Polonium-210	1.6E-14	4.3E-15	7.3E-15	8.2E-15	9.0E-15	
0120-RP	Uranium	1.4E-16	2.0E-16	1.6E-16	1.5E-16	1.6E-16	1.40
	Thorium-230	8.4E-17	1.7E-16	1.6E-16	2.0E-16	1.5E-16	
	Radium-226	4.4E-17	5.1E-17	1.4E-16	1.6E-16	9.9E-17	
	Polonium-210	2.1E-14	4.3E-15	7.7E-15	7.0E-15	1.0E-14	
0121-RP	Uranium	1.4E-16	1.9E-16	1.7E-16	1.4E-16	1.6E-16	1.40
	Thorium-230	1.2E-16	1.3E-16	2.2E-16	2.1E-16	1.7E-16	
	Radium-226	2.4E-16	2.5E-17	2.4E-16	1.7E-16	1.7E-16	
	Polonium-210	2.0E-14	3.8E-15	7.1E-15	7.2E-15	9.5E-15	
0122-RP	Uranium	1.5E-16	2.1E-16	1.5E-16	1.3E-16	1.6E-16	1.23
	Thorium-230	1.6E-16	8.9E-17	1.2E-16	1.4E-16	1.3E-16	
	Radium-226	1.1E-16	8.5E-17	2.1E-16	1.6E-16	1.4E-16	
	Polonium-210	1.8E-14	4.3E-15	6.6E-15	6.6E-15	8.9E-15	
0123-RP	Uranium	1.1E-16	2.0E-16	1.3E-16	1.2E-16	1.4E-16	1.35
	Thorium-230	7.6E-17	1.1E-16	1.7E-16	2.0E-16	1.4E-16	
	Radium-226	8.4E-17	5.4E-17	5.4E-17	1.0E-16	7.3E-17	
	Polonium-210	2.1E-14	3.8E-15	7.3E-15	7.6E-15	9.9E-15	

Table 6. Summary of Radioparticulate Air Monitoring Data for the Moab and Crescent Junction Sites for 2010 (continued)

Moab Station Number	Isotope	1st Quarter 2010 (µCi/mL)	2nd Quarter 2010 (µCi/mL)	3rd Quarter 2010 (µCi/mL)	4th Quarter 2010 (µCi/mL)	Annual Average (µCi/mL)	Annual 2010 Dose (mrem/yr)
Off-Site Locations *(continued)*							
0129-RP	Uranium	3.1E-16	6.4E-16	8.4E-16	3.8E-16	5.4E-16	6.77
	Thorium-230	5.0E-16	2.0E-15	4.6E-15	1.6E-15	2.2E-15	
	Radium-226	3.6E-16	6.5E-18	2.2E-15	7.7E-16	8.3E-16	
	Polonium-210	2.1E-14	6.9E-15	1.2E-14	9.0E-15	1.2E-14	
Crescent Junction Station Number	**Isotope**	**1st Quarter 2010 (µCi/mL)**	**2nd Quarter 2010 (µCi/mL)**	**3rd Quarter 2010 (µCi/mL)**	**4th Quarter 2010 (µCi/mL)**	**Annual Average (µCi/mL)**	**Annual 2010 Dose (mrem/yr)**
On-Site Locations							
0308-RP	Uranium	4.0E-16	8.7E-16	9.4E-16	3.7E-16	6.5E-16	7.31
	Thorium-230	4.1E-16	3.8E-15	4.3E-15	1.3E-15	2.5E-15	
	Radium-226	4.9E-16	1.0E-15	2.1E-15	6.4E-16	1.1E-15	
	Polonium-210	1.4E-14	8.2E-15	1.1E-14	8.3E-15	1.0E-14	
0309-RP	Uranium	2.1E-16	2.7E-16	2.1E-16	1.9E-16	2.2E-16	1.96
	Thorium-230	1.5E-16	6.0E-16	5.0E-16	4.8E-16	4.3E-16	
	Radium-226	8.4E-17	2.0E-16	2.0E-16	2.1E-16	1.7E-16	
	Polonium-210	1.5E-14	4.6E-15	7.2E-15	7.1E-15	8.5E-15	
Off-Site Locations							
MEI (0306-RP)	Uranium	1.0E-16	1.3E-16	1.1E-16	1.1E-16	1.1E-16	1.12
	Thorium-230	2.8E-17	1.3E-16	1.1E-16	1.4E-16	1.0E-16	
	Radium-226	5.3E-17	4.3E-17	1.6E-16	6.5E-17	8.0E-17	
	Polonium-210	1.6E-14	4.4E-15	6.9E-15	6.7E-15	8.5E-15	
0307-RP	Uranium	1.4E-16	1.5E-16	1.9E-16	1.1E-16	1.5E-16	1.02
	Thorium-230	4.9E-17	9.4E-17	1.0E-16	8.8E-17	8.3E-17	
	Radium-226	1.2E-16	2.9E-17	1.2E-16	4.1E-18	6.8E-17	
	Polonium-210	1.5E-14	4.3E-15	6.7E-15	6.1E-15	8.0E-15	

4.5 Best Management Practice Area

The Best Management Practice Area (BMPA) is a dedicated area within the CA at the Moab site that is designed to safely store and isolate waste materials, chemicals, equipment, or soil that require further characterization or for which a disposal strategy has not yet been selected. The area is located about 300 feet southeast of the office buildings (see Figure 2). It measures approximately 14 feet by 8 feet, is surrounded by a 2-foot-high earthen berm, and is lined with 30-millimeter plastic sheeting. Once adequate characterization data are obtained and a disposal strategy is selected, wastes are removed from the BMPA.

4.6 Source Reduction

Source reduction generally means any change in products, services, or actions that reduce, eliminate, or prevent the amount or toxicity of waste being generated. The Moab UMTRA

Project sites primarily achieve source reduction by using work practices that minimize the amount of radioactive waste that is generated. The ALARA principle is emphasized to keep materials from becoming radioactively contaminated. An example of source reduction at the project sites during 2010 was the use of a non-hazardous, environmentally friendly product to wash greasy engine parts and equipment instead of the hazardous chemical solvents that are typically used for such purposes.

Using administrative controls such as establishing radioactive materials areas, limiting the use of materials in the CA (especially hazardous materials such as chemicals), and segregating radioactive waste from nonradioactive waste reduces the volume of radioactive waste generated. Certain materials that must be taken into the CA can be protected from becoming radioactively contaminated. Decontamination is performed if warranted, feasible, and cost-effective.

5.0 Environmental Nonradiological Program Information

5.1 Meteorological Monitoring

DOE has installed two meteorological monitoring stations at the Moab site and two at or near the Crescent Junction site (see Figures 3 and 5, respectively). Meteorological monitoring is an important element in the design of environmental monitoring networks. Not only do these data enable DOE to monitor site-specific climatic conditions and events, but they also provide a valuable resource for assessing impacts resulting from any unplanned release of airborne contamination.

Meteorological parameters monitored at the Moab and Crescent Junction sites include air temperature, relative humidity, solar radiation, wind speed, wind direction, and precipitation. Table 7 summarizes 2010 meteorological data for temperature, wind speed, and precipitation for the Moab site; these data are similar to the Crescent Junction site.

Table 7. Meteorological Data Summary for the Moab Site for 2010

Month	Temperature (degrees F)		Wind Speed (mph)		Precipitation* (inches)
	Max Temp.	Min Temp.	Avg.	Peak Gust	
January	51	2.7	1.6	24.6	0.99
February	53.3	20	2.6	22.3	1.35
March	77.7	29.3	3.3	46.9	1.35
April	82.6	33.2	5.2	47.9	0.30
May	93.4	38.3	5.7	50.7	0.29
June	104.8	53.1	4.4	36.8	0.43
July	107	55.9	4.5	46.2	0.34
August	101.9	59.8	4.1	42.4	1.8
September	99.8	47.5	3.1	34.6	0.57
October	91.8	29.4	3	52.8	0.70
November	75.9	13.4	3.4	41.6	0.42
December	60	4.1	2.8	33.2	1.16
***Total Adjusted with Manual Gauge**					**9.7**

Avg = average; F = Fahrenheit; max = maximum; min = minimum; mph = miles per hour; temp = temperature

6.0 Ground Water Protection Program

The ground water beneath the Moab site has been contaminated from former uranium-milling operations. Ground water at and in the vicinity of the site is not usable due to the naturally high salinity. Ammonia and uranium are the primary contaminants of concern. To protect the Colorado River, ground water is extracted through an IA system installed at the Moab site, and, when endangered species suitable habitat areas form, freshwater is introduced to the backwater channel to reduce ammonia concentrations. In addition, freshwater is injected in wells directly upgradient of the habitat areas. Locations of select monitoring and extraction/injection wells at the Moab site are shown in Figure 6. Site-wide ground water sampling locations are shown in Figure 7. Monitoring results show that the contaminant plumes of ammonia and uranium did not expand in 2010.

6.1 Ground Water

Seventeen ground water extraction wells were used to minimize contaminant discharge to the Colorado River in 2010. Water sampling was conducted in areas in the well field prior to and during active freshwater injection and ground water extraction operations. Site-wide ground water sampling, which includes both on- and off-site sample locations, was conducted in October 2010. The ground water samples were analyzed for the site-related analytes: ammonia, uranium, and total dissolved solids. In addition, dissolved oxygen, oxidation reduction potential, pH, specific conductance, temperature, and turbidity were measured in the field at all locations. Data results from the sampling events are available on the Moab UMTRA Project website at www.gjem.energy.gov/moab.

More than 10 million gallons of ground water was extracted in 2010 from the IA system, with more than 37,000 lb of ammonia and almost 250 lb of uranium removed. A total of approximately 162 million gallons has been extracted since initial implementation of the system through the end of 2010, including 664,000 lb of ammonia and 3,000 lb of uranium.

Three of the Configuration 5 wells, which were designed to extract ground water close to the base of the RRM pile, were installed in late December 2009. The well-drilling activities carried over into January 2010, when the four remaining Configuration 5 wells were installed.

6.2 Surface Water

The principle surface water feature in the vicinity of the Moab site is the Colorado River, which forms the eastern boundary of the site. Surface water sampling in 2010 focused on understanding the effects of ground water discharge and ground water remediation activities on the quality of surface water in areas of potential suitable fish habitat. Suitable habitat is characterized by fairly shallow, low-velocity backwater channels that are closed off from the main channel on the upriver side.

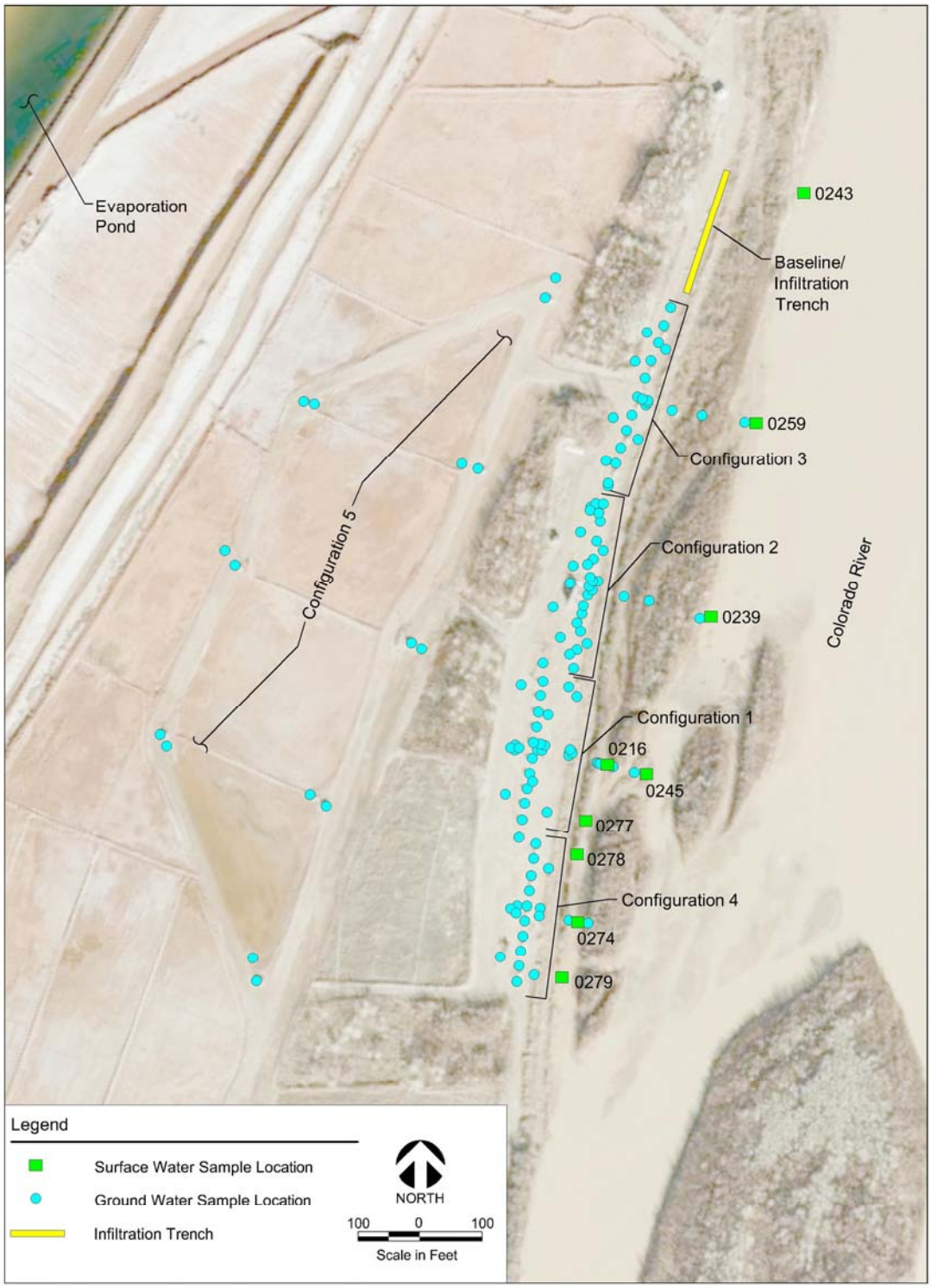

Figure 6. Locations of Select Monitoring and Extraction/Injection Wells at the Moab Site

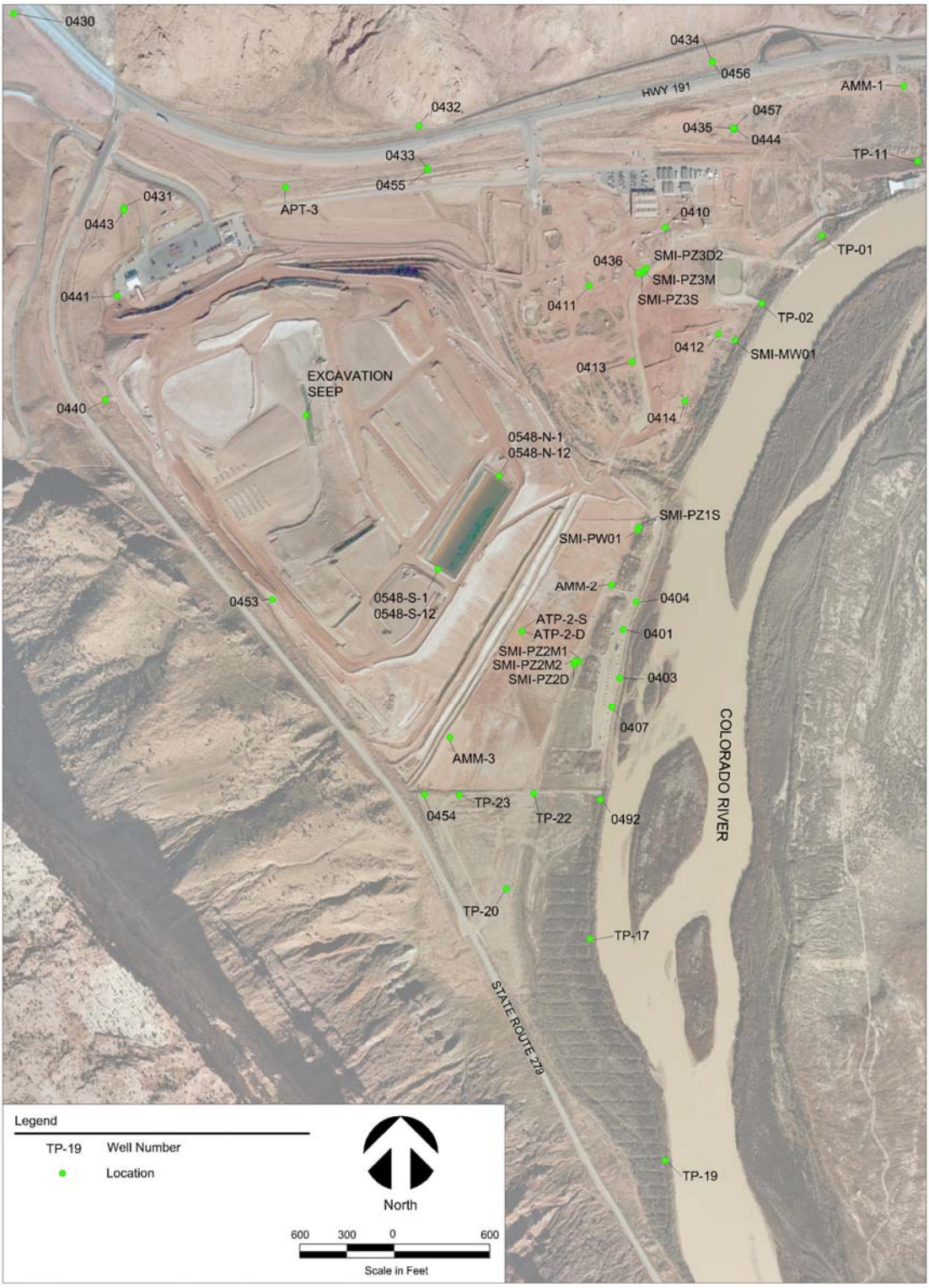

Figure 7. 2010 Site-Wide Surface Water Sampling Locations

The site-related constituent of greatest concern at the site is ammonia because of its toxicity to aquatic life. Discharge of ammonia to the backwater channel of the Colorado River is of primary concern during low river flow. Table 8 presents data for surface water locations and dates when ammonia exceeded the acute and/or chronic ambient water quality criteria as delineated in the EPA "Update of Ambient Water Quality Criteria for Ammonia" (EPA-822-R-99-014). The sampling was biased toward areas where the ammonia concentration was expected to be the highest. The highest concentrations of contaminants were observed near the riverbank of the DOE property in shallow, low-velocity portions of the river during base-flow conditions (October through December) when the fish were not utilizing shallow water. The ammonia concentration downriver of the site was at background levels.

Biota Monitoring

In addition to water quality monitoring, biota monitoring of the riverbank was conducted during the summer months of 2010 to observe the effect, if any, of site-related contamination on fish in habitat areas. Biota monitoring is conducted from July through September when the young-of-year pikeminnow may potentially inhabit the backwater channel. Beginning on July 20, 2010, diverted river water was introduced into the backwater channel adjacent to Configuration 4 (Figure 7). At that time, the river flow had decreased to 3,000 cubic feet per second (cfs), and the channel was approaching habitat conditions. The diversion was temporarily suspended on July 23 and restarted on July 28. The diversion system was shut down once again on August 5 due to a rise in the river flow (more than 6,000 cfs). By August 31, the river flow had decreased to 3,500 cfs and the diversion system was restarted and ran until October 1, 2010.

Table 8. Surface Water Locations with Ammonia Concentrations Exceeding Ambient Water Quality Criteria During 2010

Location	Date	Ammonia Total as N (mg/L)	State/Federal AWQC – Acute Total as N (mg/L)	State/Federal AWQC – Chronic Total as N (mg/L)
0216	1/26/10	80	29.5	5.39
0239	3/2/10	7.2	6.95	1.52
0243	3/1/10	1.2	3.88	1.29
0259	3/1/10	4.6	3.88	1.29
0274	1/27/10	2.8	3.83	1.79
0274	2/25/10	540	36.1	4.72
0274	3/2/10	690	36.1	4.72
0274	10/1/10	4.4	17.0	3.61
0277	3/2/10	200	14.4	3.58
0278	3/2/10	240	26.2	5.80
0278	10/1/10	12	14.4	3.25
0279	3/2/10	71	14.4	2.86
0279	10/1/10	18	17.0	3.61

AWQC = ambient water quality criteria; mg/L = milligrams per liter

7.0 QA

The Moab UMTRA Project has a QA Program that provides a structured approach for the application of QA principles to work performed on the project by DOE contractors and which is based on: the American Society of Mechanical Engineers (ASME) Nuclear Quality Assurance (NQA)-1 2004 and addenda through 2007, "Quality Assurance Requirements for Nuclear Facility Applications," 10 CFR 830 Subpart A, "Quality Assurance Requirements,"

DOE O 414.1D, "Quality Assurance," and DOE O 226.1B, "Implementation of Department of Energy Oversight Policy," requirements. The QA Program is implemented with contractor-specific QA plans, which ensure environmental data collected are valid and traceable.

7.1 Laboratory Analysis

The DOE contractors ensure the receipt of analytical data that meet environmental monitoring program requirements by subcontracting analytical services to qualified laboratories.
The subcontract laboratories are qualified under the Environmental Management Consolidated Audit Program, Utah Certification, and participate in proficiency testing programs.
The contractors evaluate the quality of the data received from the laboratories through a formal data validation process.

7.2 Records Management

All records will be managed in accordance with the *Moab UMTRA Project Records Management Manual* (DOE-EM/GJ1545) and the *Moab UMTRA Project Records Management Program Plan* (DOE-EM/GJ1462), which follow the requirements of 36 CFR 1220-1234, "Federal Records; General."

8.0 References

10 CFR 830 Subpart A (Code of Federal Regulations), "Quality Assurance Requirements."

10 CFR 1021 (Code of Federal Regulations), "National Environmental Policy Act Implementing Procedures."

10 CFR 1022 (Code of Federal Regulations), "Compliance with Floodplain and Wetlands Environmental Review Requirements."

36 CFR 1220-1234 (Code of Federal Regulations), "Federal Records; General."

40 CFR 61 (Code of Federal Regulations), "National Emission Standards for Hazardous Air Pollutants."

40 CFR 192 (Code of Federal Regulations), "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings."

40 CFR 1500 (Code of Federal Regulations), "Purpose, Policy, and Mandate."

40 CFR 1507.3 (Code of Federal Regulations), "Council on Environmental Quality Agency Procedures."

7 USC 136 (United States Code), Federal Insecticide, Fungicide, and Rodenticide Act.

15 USC 2601 (United States Code), Toxic Substances Control Act.

16 USC 703 (United States Code), Migratory Bird Treaty Act.

16 USC 1531 (United States Code), Endangered Species Act.

33 USC 1251 (United States Code), Clean Water Act.

42 USC 300f (United States Code), Safe Drinking Water Act.

42 USC 4321 (United States Code), National Environmental Policy Act.

42 USC 6901 (United States Code), Resource Conservation and Recovery Act.

42 USC 7401 (United States Code), Clean Air Act.

42 USC 7901 (United States Code), Uranium Mill Tailings Radiation Control Act.

42 USC 9601 (United States Code), Superfund Amendments and Reauthorization Act.

42 USC 11000 (United States Code), Emergency Planning and Community Right-to-Know Act.

ASME (American Society of Mechanical Engineers) Nuclear Quality Assurance (NQA)-1 2004 and Addenda through 2007, "Quality Assurance Requirements for Nuclear Facility Applications."

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DOE (U.S. Department of Energy), *Moab UMTRA Project Moab Project Site Fugitive Dust Control Plan* (GJO-2002-301-TAR), March 2002.

DOE (U.S. Department of Energy), *Moab UMTRA Project Records Management Manual* (DOE-EM/GJ1545), July 2011.

DOE (U.S. Department of Energy), *Moab UMTRA Project Records Management Program Plan* (DOE-EM/GJ1462), July 2011.

DOE (U.S. Department of Energy), *Moab UMTRA Project Remediation of the Moab Uranium Mill Tailings, Grand and San Juan Counties, Utah, Final Environmental Impact Statement* (DOE/EIS-0355), July 2005.

DOE (U.S. Department of Energy), *Moab UMTRA Project Moab Site Storm Water Pollution Prevention Plan* (DOE-EM/GJRAC1475), May 2010.

DOE (U.S. Department of Energy), *Moab UMTRA Project Waste Management Plan* (DOE-EM/GJ1633), July 2008.

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DOE (U.S. Department of Energy) Order 226.1B, "Implementation of Department of Energy Oversight Policy"

DOE (U.S. Department of Energy) Order 231.1B, "Environment, Safety, and Health Reporting."

DOE (U.S. Department of Energy) Order 414.1D, "Quality Assurance"

DOE (U.S. Department of Energy) Order 436.1, "Departmental Sustainability"

DOE (U.S. Department of Energy) Order 458.1, "Radiation Protection of the Public and the Environment."

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Executive Order 11990, "Protection of Wetlands."

Executive Order 11988, "Floodplain Management."

Executive Order 12856, "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements."

Executive Order 13423, "Strengthening Federal Environmental, Energy, and Transportation Management."

Executive Order 13514, "Federal Leadership in Environmental, Energy, and Economic Performance."

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International Organization for Standardization 14001, "Environmental Management System Standard."

UAC R307-309-6 (Utah Administrative Code), "Fugitive Dust Control."

UAC R313-15-301 (Utah Administrative Code), "Standards for Protection Against Radiation, Dose Limits for Individual Members of the Public."

USFWS (U.S. Fish and Wildlife Service), "Final Biological Opinion for Proposed Reclamation of the Atlas Mill Tailings Site in Moab, Utah," July 1998.

Appendix A.
Acronyms and Abbreviations

Appendix A. Acronyms and Abbreviations

ACM	asbestos-containing material
ALARA	as low as reasonably achievable
ASME	American Society of Mechanical Engineers
Avg	average
AWQC	ambient water quality criteria
Bkgd	background
BMPA	Best Management Practice Area
BO	Biological Opinion
CA	Contamination Area
CFR	Code of Federal Regulations
cfs	cubic feet per second
DCG	derived concentration guide
DOE	U.S. Department of Energy
DOE O	DOE Order
EIS	Environmental Impact Statement
EMS	Environmental Management System
EPA	U.S. Environmental Protection Agency
F	Fahrenheit
G	gamma
I-70	Interstate 70
IA	interim action
km	kilometers
lb	pounds
max	maximum
MEI	maximally exposed individual
µCi/ml	microcuries per milliliter
mg/L	milligrams per liter
min	minimum
mph	miles per hour
mrem/yr	millirems per year
mSv	milliseiverts
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NQA	National Quality Assurance
NRC	U.S. Nuclear Regulatory Commission
PCB	polychlorinated biphenyl
pCi/L	picocuries per liter
QA	quality assurance
RCRA	Resource Conservation and Recovery Act
rem	roentgen equivalent man
ROD	Record of Decision
RP	radioparticulate
RRM	residual radioactive material
Rn	radon
SR-279	State Road 279

Appendix A. Acronyms and Abbreviations (continued)

temp	temperature
TSCA	Toxic Substances Control Act
UAC	Utah Administrative Code
UMTRA	Uranium Mill Tailings Remedial Action
UMTRCA	Uranium Mill Tailings Radiation Control Act
UPDES	Utah Pollutant Discharge Elimination System
US-191	U.S. Highway 191
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFWS	U.S. Fish and Wildlife Service