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Office of Environmental Management – Grand Junction

UMTRA Project

Moab UMTRA Project Annual Site Environmental Report for Calendar Year 2008

October 2009

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.

U.S. Department of Energy
200 Grand Avenue
Grand Junction, CO 81501

October 2009

To the Reader:

This report, prepared by the U.S. Department of Energy (DOE) Moab Uranium Mill Tailings Remedial Action (UMTRA) Project, summarizes environmental programs we conducted during calendar year 2008. This report includes activities conducted at either the Moab site located near Moab, Utah, or the Crescent Junction, Utah, disposal site.

Key activities in 2008 included construction of major infrastructure at the Moab and Crescent Junction sites in preparation for beginning the uranium mill tailings haul in the spring of 2009, continuation of our air monitoring program for both sites, realignment of Moab Wash, and continued operation of the surface water initial action and interim action ground water remediation system at the Moab site.

DOE's environmental air monitoring strategy targets concentrations of radon-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.

The primary purpose of ground water remediation at the Moab site is to maintain surface water quality in the Colorado River. Forty-one extraction wells were utilized to prevent discharge to the river of more than 82,200 pounds of ammonia and 370 pounds of uranium.

The project continues to improve its efforts to minimize waste and prevent pollution. Recycling of various products has increased over prior years.

Further information about the Moab UMTRA Project is available on our website at www/gjem.energy.gov/moab.

Comments or questions regarding this document may be directed to the Moab 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.

Sincerely,

Donald R. Metzler
Federal Project Director
Moab UMTRA Project

DOE-EM/GJ1842

Moab UMTRA Project
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for Calendar Year 2008

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Acronyms and Abbreviations

ACM	asbestos-containing material
BMPA	Best Management Practice Area
BO	Biological Opinion
CFR	*Code of Federal Regulations*
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
I-70	Interstate 70
IA	interim action
MEI	maximally exposed individual
mg/L	milligrams per liter
mrem/yr	millirems per year
NEPA	National Environmental Policy Act
NRC	U.S. Nuclear Regulatory Commission
PCB	polychlorinated biphenyl
pCi/L	picocuries per liter
QA	quality assurance
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
RRM	residual radioactive material
SR-279	State Road 279
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*

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 2008. 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 2008.

Primary site activities in 2008 included the start of major infrastructure construction at the Moab and Crescent Junction sites in preparation for beginning the uranium mill tailings haul in the spring of 2009, site management, security, and maintenance, and waste management and pollution prevention. Additional activities conducted at the Moab site included soils remediation, operation of the surface water initial action and interim action (IA) ground water remediation system, and environmental compliance monitoring (air and surface water). Baseline air monitoring and meteorological data collection continued at Crescent Junction during 2008.

Highlights of Site Activities and Summary of Environmental Programs for 2008
Significant accomplishments and activities conducted for the Moab UMTRA Project during 2008 are highlighted below. In addition, summaries of environmental programs are provided. During 2008, 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
- DOE received conditional concurrence from the U.S. Nuclear Regulatory Commission (NRC) on the *Final Remedial Action Plan and Site Design for Stabilization of Moab Title I Uranium Mill Tailings at Crescent Junction, Utah, Disposal Site* (DOE-EM/GJ1547) (*Remedial Action Plan*).
- The U.S. Department of Transportation special permit to transport mill tailings was renewed and modified to clarify hauling four containers per railcar.
- In March, the U.S. Department of the Interior approved the permanent transfer of 500 acres of land to DOE associated with the disposal cell at the Crescent Junction site. In the fall of 2008, DOE applied for a 20-year renewal of DOE jurisdiction over an additional 936 acres of land held in temporary withdrawal for support facilities. That renewal was approved in June 2009.

Moab Site Remediation and Construction Activities
- Realignment of a portion of the Moab Wash along the north side of the tailings pile was completed in the fall to increase the carrying capacity of the wash, enhance erosion control, and reduce potential for contaminated material to enter the wash during high-intensity storm events.

- The contaminated footprint at or near the Moab site was reduced by 3 acres through remediation of contaminated soil, including 9,200 cubic yards during the realignment of the Moab Wash.
- Construction of the Moab site maintenance structure was completed in August, and construction began on the tailings container lidding structure.

Crescent Junction Site Construction Activities

- Installation of a 21½-mile pipeline, including five pump stations, from Green River, Utah, to the Crescent Junction disposal site, for providing dust control was completed.
- A 9-million gallon water storage pond was constructed.
- Excavation of the first portion of the disposal cell was completed in December. More than 1.9 million cubic yards of material was excavated from the cell to create capacity for the initial (approximately) 2.5 million tons of tailings.
- Construction of a maintenance structure and haul roads was completed and two additional support trailers and a restroom trailer were installed.

Waste Management and Pollution Prevention

- Approximately 1,900 pounds of paper, 1,760 pounds of cardboard, 340 pounds of plastic, and 340 pounds of aluminum cans were collected from the Moab Project sites and the Grand Junction, Colorado, office for recycling. Automotive batteries, toner cartridges, and power strips were also recycled.

Environmental Radiological Protection Program Summary

- DOE's environmental air monitoring strategy targets concentrations of radon-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 new air monitoring station (with a continuous air sampler) was added immediately downwind of the tailings pile at the Moab site.
- Two off-site monitoring locations had radon-222 concentrations in air samples that exceeded the DOE guideline for indoor air quality immediately south of the Moab site property boundary on vacant land. Data also indicate that radon concentrations attenuate to near background levels within ½-mile of the Moab site boundary.
- Radioparticulate air emissions and direct gamma radiation data were below the public dose limits applicable to the Moab site at all 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

- The primary purpose of conducting active ground water remediation at the Moab site is to maintain surface water quality in the Colorado River. Forty-one extraction wells were utilized as part of the IA ground water remediation system to limit contamination that reaches the river. More than 24 million gallons of contaminated ground water was extracted, with 82,200 pounds of ammonia and 370 pounds of uranium removed.

- Monitoring was conducted to assess IA system performance and surface water quality, and technical reports were prepared and posted on the project website.
- Only one surface water sample exceeded the ambient water quality criterion for ammonia, the constituent of greatest concern in the river. This single exceedance indicates that discharge of site ground water is having a very local and temporary affect on surface water quality. The highest concentrations of ammonia were observed near the riverbank of the DOE property in shallow, low-velocity portions of the river in October 2008 when the fish were not utilizing shallow water. Contaminant concentrations in the main channel remained within the range of natural background values.

Significant Project Activities After Reporting Period

- Rail load out facilities were constructed at Moab and Crescent Junction sites.
- Additional support and office trailers were installed at both sites.
- Excavation and conditioning of tailings began in February 2009.
- Rail shipments of tailings from Moab and placement of tailing at Crescent Junction began April 20, 2009.

Document Distribution

This document may be viewed in its entirety on the Moab 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 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 and programs conducted for the Moab UMTRA Project during 2008 and to provide a summary of environmental monitoring data results.

This report was prepared in accordance with the requirements of DOE Order (O) 231.1A, "Environment, Safety, and Health Reporting," DOE O 5400.5, "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 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 Moab Project.
- Section 3.0 provides the status of the Moab Project 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 (Figure 1), and lies on the west bank of the Colorado River at the confluence with the Moab Wash. The 439-acre site is bordered on the north and southwest by steep sandstone cliffs. The Colorado River forms the eastern boundary of the site. U.S. Highway 191 (US-191) parallels the northern site boundary, and State Road 279 (SR-279) transects the western and southwestern portions of the property. The Union Pacific Railroad traverses a small section of the site just west 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, tailings pile, roads, and rail line.

The Crescent Junction site is also in Grand County and is located northeast of the junction of Interstate 70 (I-70) and US-191, approximately 30 miles north of the Moab site (Figure 1). The Crescent Junction site is the location for disposal of the Moab site uranium mill tailings.

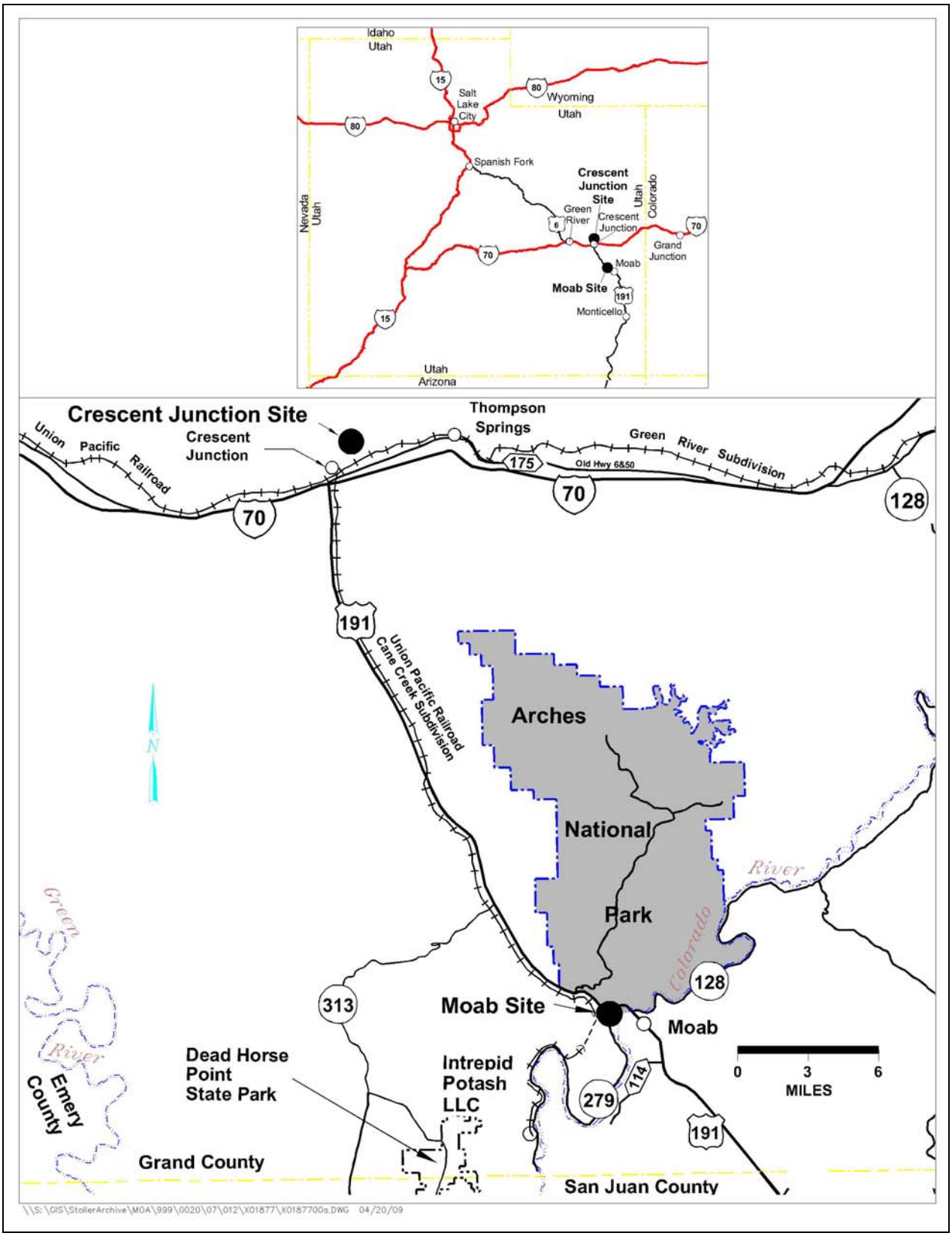

Figure 1. Location of the Moab and Crescent Junction Sites in Grand County, Utah

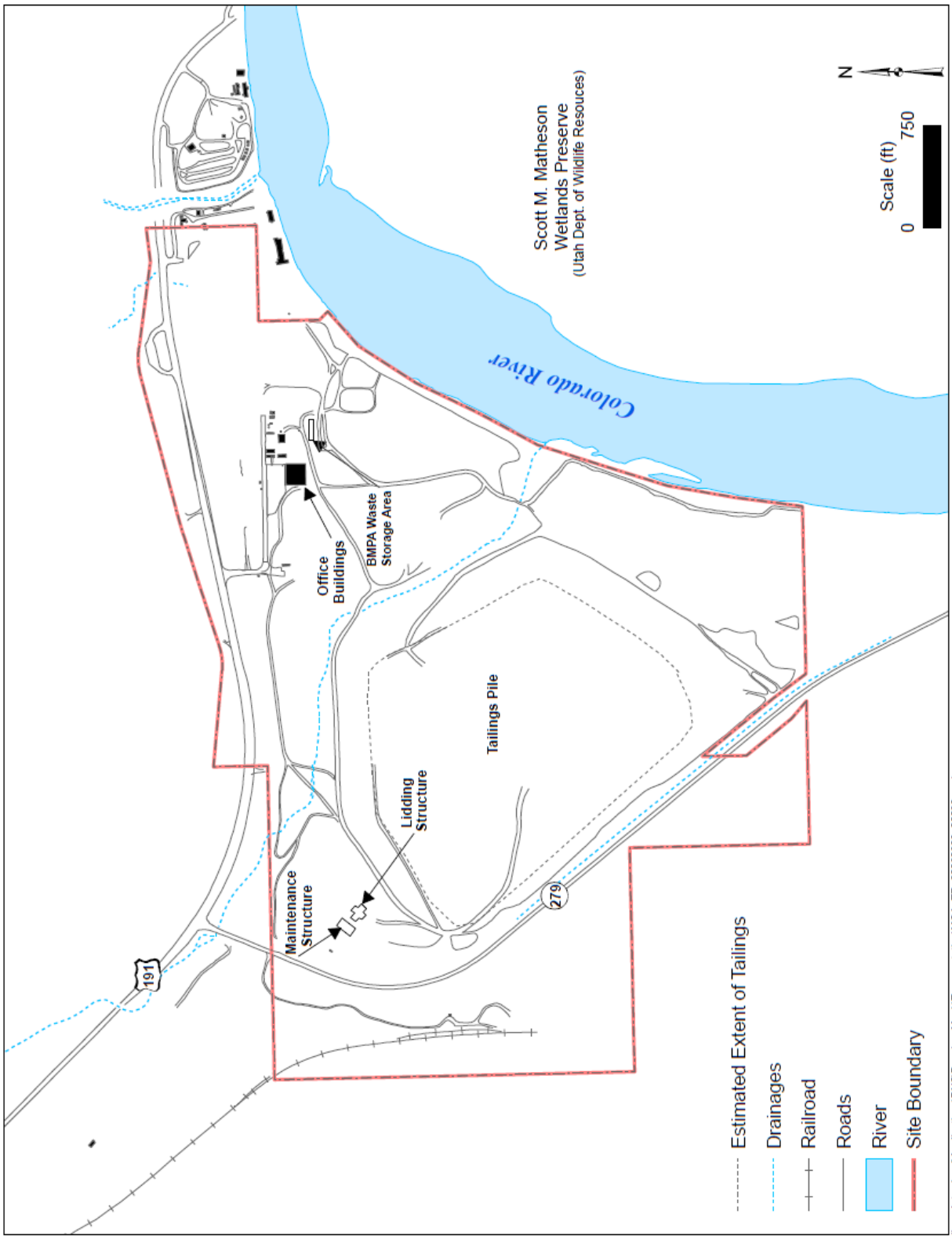

Figure 2. Moab Site Features Map

1.4 Site Histories

The Moab millsite operated under various owners from 1956 through 1984. Uranium mill tailings are residual radioactive material (RRM) that results from the processing of uranium ore. The tailings resulted from the milling operation were slurried to a 130-acre unlined area located at the western portion of the property. The resultant deposition created a pile of material with an estimated total mass of 16 million tons and a volume of 12 million cubic yards. The tailings pile height (4,076 feet above mean sea level) averages 94 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 tailings contain several naturally occurring radioactive elements, including uranium, thorium, radium, polonium, and radon. The tailings at the Moab site contain contaminants in concentrations that could be hazardous to the environment and public health and exceed the 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 Tailings."

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, Colorado, manages cleanup of the Moab site under the Moab UMTRA Project.

To minimize potential adverse effects to human health and the environment from the Moab 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 tailings pile, storm water management, dust suppression, pile dewatering, and site access restrictions. Interim measures have included monitoring surface water and ground 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 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* (DOE/EIS-0355) (EIS) that presents the preferred alternatives of active ground water remediation and off-site disposal of the tailings pile and other contaminated materials at the 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 (ROD) 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 tailings transport by truck.

DOE also prepared the *Remedial Action Plan* that presents the basis for constructing the disposal cell at Crescent Junction. The *Remedial Action Plan* was submitted to 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 in 2005 through a temporary land withdrawal action from the U.S. Department of the Interior. Five hundred acres of this land was permanently transferred to DOE in March 2008, and an application to renew the temporary withdrawal of 938 acres was submitted in the fall of 2008 and approved in June 2009.

2.0 Compliance Summary

2.1 Compliance Status

The Moab and Crescent Junction sites operated during 2008 without any notices of violation and did not have any occurrences that required reporting to outside agencies.

2.1.1 Environmental Restoration and Waste Management

Moab Project compliance with environmental restoration and waste management regulations is 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 2008, two hazardous chemicals were stored in amounts exceeding the threshold planning quantity as established in Section 312 of the Superfund Amendments and Reauthorization Act: calcium chloride at the Moab site and diesel at both the Moab and Crescent Junction sites. 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 Contaminated Area 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 Contaminated Area is considered non-RRM and, therefore, can be regulated by RCRA. No RCRA wastes were generated in 2008.

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. DOE-related NEPA regulations are established in 10 CFR 1021, "National Environmental Policy Act Implementing Procedures."

In January 1996, DOE issued the *Final Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Project* (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 ROD published in 1997 implemented a framework to select the appropriate compliance strategies for ground water remediation at UMTRCA Title I sites. The framework satisfies the requirements of the Floyd D. Spence National 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 2008, the surface water initial action and 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 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 of in the Moab tailings pile. PCB-contaminated materials, such as discarded electrical transformers, are not known to be disposed in the tailings 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 or PCBs that remain within the site's Contaminated Area are considered RRM and are, therefore, subject to UMTRCA regulation, not TSCA regulation. During 2008, no ACM 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," "nonrestricted use," or "general use." EPA may classify a pesticide for 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 nonrestricted use herbicides at the Moab site in 2008 to control noxious weeds.

2.1.2 Radiation Protection

Moab Project compliance with radiation protection regulations 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 uranium mill tailings. Title I of UMTRCA requires DOE to establish a remedial action program and authorizes DOE to stabilize, dispose of, and control uranium mill tailings and other contaminated material at 24 uranium ore-processing sites and associated vicinity properties. Vicinity properties are locations where uranium mill tailings were used as construction material or fill before the hazards associated with this material were known. UMTRCA also directed EPA to promulgate cleanup standards (now codified at 40 CFR 192) and assigned NRC to oversee the cleanup and issue licenses to the completed disposal cells. Remediation of the Moab site will comply 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. 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 the 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 site because RRM is the predominant waste. During 2008, RRM, in the form of contaminated soil and associated materials, and contaminated ground water were remediated at the Moab site and were 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 appropriately managed.

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 specifies that the NRC license for the Moab site be terminated and the title and responsibility for cleanup be transferred to the Secretary of Energy.

2.1.3 Air Quality and Protection

The applicability of the Clean Air Act (42 USC 7401) to Moab Project air quality and protection is discussed below. The environmental air monitoring program for the Moab Project and results of data collected in 2008 are discussed further in Section 4.0. In the state of Utah, federal Clean Air Act requirements are implemented by an equivalent set of state regulations. The Clean Air Act established emission standards for hazardous air pollutants associated with various industrial processes (40 CFR 61, "National Emission Standards for Hazardous Air Pollutants"). The primary air emission addressed by these standards (and associated with the Moab site) is radon gas. Fugitive dust emissions are also associated with both sites.

Radon

During 2008, DOE ambient air monitoring data for public exposure (off-site) indicated there were two locations with radon concentrations that exceeded DOE indoor guidelines immediately south of the DOE property boundary on vacant land. However, data also indicate that radon concentrations attenuate to near background levels within a ½-mile of the Moab site boundary.

Environmental data collected for direct gamma radiation and radioparticulate air emissions during 2008 were below the public dose limits applicable to the Moab site at all off-site monitoring locations.

Fugitive Dust

Most of the surface area at the Moab site consists of exposed soil. Consequently, controlling windblown material is a concern. To comply with the Utah Division of Air Quality regulations for the control of fugitive dust (*Utah Administrative Code* [UAC] Section R307-309-6), DOE prepared the *Moab Project Site Fugitive Dust Control Plan* (GJO-2002-301-TAR). In 2006, a similar plan was prepared for the disposal site, entitled *Crescent Junction Project Site Fugitive Dust Control Plan* (DOE-EM/GJ1235-2006). These plans outline specific areas of the sites that are particularly vulnerable to wind erosion and describe the engineering and procedural controls DOE has implemented at the sites to control fugitive dust emissions. During 2008, DOE implemented the controls outlined in the plans and controlled fugitive dust emissions at the sites to the extent practicable.

2.1.4 Water Quality and Protection

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

Under the Clean Water Act (33 USC 1251), 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) (R317-8-3.9 UAC).

The Moab Project sites have no wastewater point source discharges that are subject to UPDES regulations; however, storm water discharges from the sites are regulated by UPDES requirements. The state of Utah issued the Moab Project a storm water permit in September 2006 (see Table 1 in Section 2.5). As required by the permit, DOE prepared the *Moab UMTRA Project Site Storm Water Pollution Prevention Plan* (DOE-EM/GJ1475-2007) and the *Crescent Junction Project Site Storm Water Pollution Prevention Plan* (DOE-EM/GJ1238-2006) that outline the engineering controls and best management practices DOE has implemented to control and

minimize storm water discharges from the sites. Copies of the plans and the storm water discharge permit are maintained at each respective site. To ensure continued compliance with the plans, DOE conducts at least one storm water inspection per month and documents the inspection results on a site-specific checklist.

Several localized heavy storm events occurred at the Moab site during 2008. 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 in uncontaminated areas to control storm water that was entering the site from US-191. All storm water controls functioned as designed, and no contaminated materials were discharged off-site.

There is no sewer effluent associated with Moab or Crescent Junction site operations. Bottled water is provided for Moab on-site drinking water needs, and city water is trucked to the site for other domestic requirements. In 2006, DOE installed an on-site sewer collection and septic system at Crescent Junction and constructed a domestic waterline to the site.

Protection of Wetlands

DOE regulation 10 CFR 1022, "Compliance with Floodplain and Wetlands Environmental Review Requirements," 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 the U.S. Army Corps of Engineers (USACE) in 2005.

Moab Project activities performed in 2008 with the potential to affect jurisdictional wetlands included construction of a 21½-mile waterline from the Green River to the Crescent Junction site, construction that disturbed upland soils, storm water controls, road improvements, construction of temporary access roads, revegetation activities, and dredging operations to improve the Moab site water intake structure supplying the freshwater pond. 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.

Safe Drinking Water Act

The provisions of the Safe Drinking Water Act (42 USC 300f) are not directly relevant to the Moab or Crescent Junction sites because neither surface water nor ground 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 associated with the IA ground water system 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.

2.1.5 Other Environmental Statutes

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

Endangered Species Act

The Endangered Species Act (16 USC 1531) requires federal agencies to consult with the U.S. Fish and Wildlife Service 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, and

one endangered avian species (southwestern willow flycatcher) that may inhabit tamarisk areas on or near the site. 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 2008. No endangered, threatened, or candidate species have been noted on the Moab site.

The final EIS included a Biological Assessment and a Biological Opinion (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. To protect endangered fish, 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 Moab Site, Utah* (DOE-EM/GJ1079-2006) in 2006 to evaluate Moab site-related impacts on fish. No adverse impacts on fish were observed in 2008.

At the Crescent Junction site, the burrowing owl, a Utah "sensitive" species, was identified as potentially present; however, none was observed in 2008. Construction work conducted during 2008 did not affect a nesting site previously identified in the withdrawal area. There are a large number of prairie dog burrows present, which are associated with burrowing owl habitat. If a nesting burrowing owl is determined to be present, DOE is committed to 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.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (16 USC 703) makes it unlawful to pursue, hunt, take, capture, kill or sell migratory birds. 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).

National Historic Preservation Act

In 2006 and 2007, memoranda of agreement among DOE, the Utah State Historic Preservation Office, the Utah Department of Transportation, and the Bureau of Land Management concerning the protection or mitigation of cultural resources on the Moab and Crescent Junction sites were approved. The remaining millsite features (warehouse building, water pump station, ore load out structure, and scale house), a 1930s vintage log cabin, a section of historic U.S. Highway 160, a stock driveway sign, prehistoric art, and a rock shelter were all eligible for inclusion in the National Register of Historic Places. The log cabin was removed previously. In 2008, the water pump station, ore load out structure, and scale house were removed in accordance with the Moab memorandum of agreement among DOE, the Utah Department of Transportation, and the Utah State Historic Preservation Office, mitigation was performed, and annual reports were submitted.

In 2008, annual cultural resource inventories were performed at the Crescent Junction site for Indian art sites per the memorandum of agreement with the Bureau of Land Management and the Utah State Historical Preservation Office.

Executive Orders 13101 and 13148
Executive Order 13101, "Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition," requires federal agencies to generate less waste, perform recycling activities, use recycled products, and procure environmentally preferable goods and services. Executive Order 13148, "Greening the Government Through Leadership in Environmental Management," requires federal agencies to integrate environmental accountability into day-to-day operations and long-term planning through such means as reducing the use or release of toxic chemicals and ozone-depleting substances, using environmentally beneficial landscaping, and establishing EMSs.

DOE has implemented the requirements of Executive Order 13148 through issuance of DOE O 450.1, "Environmental Protection Program." The objective of this order is to implement sound stewardship practices that are protective of the air, water, land, and other natural and cultural resources. DOE O 450.1 requires that DOE develop and implement an EMS for the Moab Project. The EMS is designed to integrate environmental protection, environmental compliance, pollution prevention, and continual improvement to work planning and execution. The status of the Moab Project EMS implementation is further discussed in Section 3.0.

In addition, during 2008 DOE adhered to the requirements of these executive orders by conducting a pollution prevention program.

2.1.6 Floodplain Management

DOE's implementing regulations in 10 CFR 1022 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 *Floodplain and Wetlands Assessment for Additional Interim Actions at the Moab Project Site* (DOE-EM/GJ805-2005).

Activities conducted in the floodplain during 2008 included interim soils remediation and revegetation. Revegetation activities included planting and seeding of desirable, native species and weed control. Minor erosion control actions were taken in 2008 to prevent sedimentation to the river, and all wetlands were avoided.

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 Project QA organization performed surveillances and management assessments in 2008 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 Project.

2.4 Unplanned Releases

No unplanned releases occurred in 2008.

2.5 Summary of Permits

Table 1 shows the permits and agreements that were active for the Moab Project during 2008.

Table 1. Permits/Agreements Active in 2008 for the Moab Project

Permits/Agreements	Issuing Agency	No. of Permits
Moab UPDES Storm Water Discharge Permit (number UTR100971)	State of Utah, Department of Environmental Quality, Division of Water Quality	1
Crescent Junction UPDES General Permit for Storm Water Discharges Associated with Industrial Activity (number UTR105820)	State of Utah, Department of Environmental Quality	1
EPA Hazardous Waste Generator Identification Number UTP 000001244	EPA	1
Stream Channel Alteration Permits for the Colorado and Green River intake structures and for structures and well fields to support the surface water initial action and IA ground water remediation system	State of Utah, Department of Natural Resources, Division of Water Rights	6
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	2
Highway right-of-way encroachment permits to conduct surveys, perform remediation, and construct pipelines	State of Utah, Department of Transportation	8
Special Permit 14283 to transport mill tailings	U.S. Department of Transportation	2
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 pump inlet, realignment of the Moab Wash, domestic waterline, and waterline construction	USACE	4

3.0 EMS

An EMS is a systematic and structured approach to address the environmental consequences of an organization's activities, products, and services. An EMS establishes a framework for identifying measurable environmental goals, objectives, and targets, which are reviewed and updated annually.

As with most federal agencies, DOE's EMS is based on the standard elements identified in International Organization for Standardization 14001 and integrates these elements into the core functions of the contractor's Integrated Safety Management System Program. In an effort to implement a comprehensive EMS for the Moab Project in accordance with DOE O 450.1, the *Moab UMTRA Project Environmental Management Program Manual* (DOE-EM/GJ1630) was prepared in September 2008 as one element of the EMS. Revisions are currently being made to the manual based on comments received.

3.1 Moab Project Environmental Initiatives

3.1.1 Pollution Prevention

Pollution prevention is part of the waste management strategy for the Moab 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 disposition options have been considered. Pollution prevention is also achieved through environmentally preferred purchasing.

Reuse and Recycling

Approximately 1,900 pounds of office paper, 1,760 pounds of cardboard, 340 pounds of plastic, and 340 pounds of aluminum cans were collected from the Moab Project sites and the Grand Junction office for recycling. Automotive batteries, toner cartridges, and power strips were also recycled. All 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 affect 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.

3.2 Waste Management

During 2008, DOE conducted operations consistent with the *Waste Management Plan for the Moab UMTRA Project* (DOE-EM/GJ1633). Formal training in the requirements of this plan was provided to project staff and subcontractors.

4.0 Environmental Radiological Protection Program and Dose Assessment

Radiological protection for the Moab Project is provided through the environmental air monitoring program, which is described in the *Environmental Air Monitoring Sampling and Analysis Plan for the Moab Project Site and Crescent Junction Disposal Site, Utah* (DOE-EM/GJ1434-2007). This plan documents DOE's strategy for monitoring various airborne contaminants, including monitoring goals and objectives.

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 Moab 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 radon concentration guidelines established by DOE O 5400.5. In late 2005, air monitoring was also initiated at the Crescent Junction site to collect baseline data before disposal operations began.

DOE established the air monitoring network at the Moab site to measure atmospheric radon, 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 the site to the general population center of the city of Moab. Off-site monitoring stations were located such that any emissions or releases of airborne contaminants would be detected before they reached the city of Moab. This strategy enables DOE to quantify any public exposures that may be associated with Moab 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.

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

Maximally exposed individual (MEI) locations (see Moab site MEI identified on Figure 3) 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 Moab site MEI location is the closest inhabited private property near the Moab site property.

4.1 Atmospheric Radon

Radon gas is a daughter product associated with the radioactive decay of uranium mill tailings. The EPA promulgated various radon control standards in 40 CFR 61. DOE and the state of Utah reviewed the applicability of the Subparts Q and T of these standards and determined that they are not applicable to the Moab site nor to the Crescent Junction disposal site because these subparts apply to flux rates for radon released from disposal sites that have an engineered radon barrier and cover. Similarly, design standards and regulations intended to control the release of radon have also been promulgated by the NRC and the state of Utah and are aimed at sites that are currently licensed by the NRC.

In the absence of a federal or state environmental radon standard that is directly applicable to the Moab site, the indoor guideline established in DOE O 5400.5 for atmospheric radon emissions is being used for Moab on-site and off-site locations. The guideline for radon-222 is 3.0 picocuries per liter (pCi/L) above the background concentration. Based on 5 years of data collected from 2003 through 2008, the background concentration in the Moab area has been established as 0.7 pCi/L; therefore, the guideline for radon-222 emissions at the Moab site is 3.7 pCi/L. This guideline is not an enforceable environmental standard, and the value may change as additional data are collected and background values are revised. Because disposal of tailings has not yet

begun at the Crescent Junction site, a background value has not been calculated; however, the 3.0 pCi/L above background guideline will be applicable.

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

Monitoring Station	Location	Parameter: Radioparticulate (RP), Atmospheric Radon (Rn), Environmental Gamma (G).
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 east of Moab millsite	Rn, G
Crescent Junction Locations		
0301-0305	Crescent Junction on-site locations	Rn, G
0308	Crescent Junction on-site location	Rn, G, RP
0306-0307	Crescent Junction off-site locations	Rn, G, RP

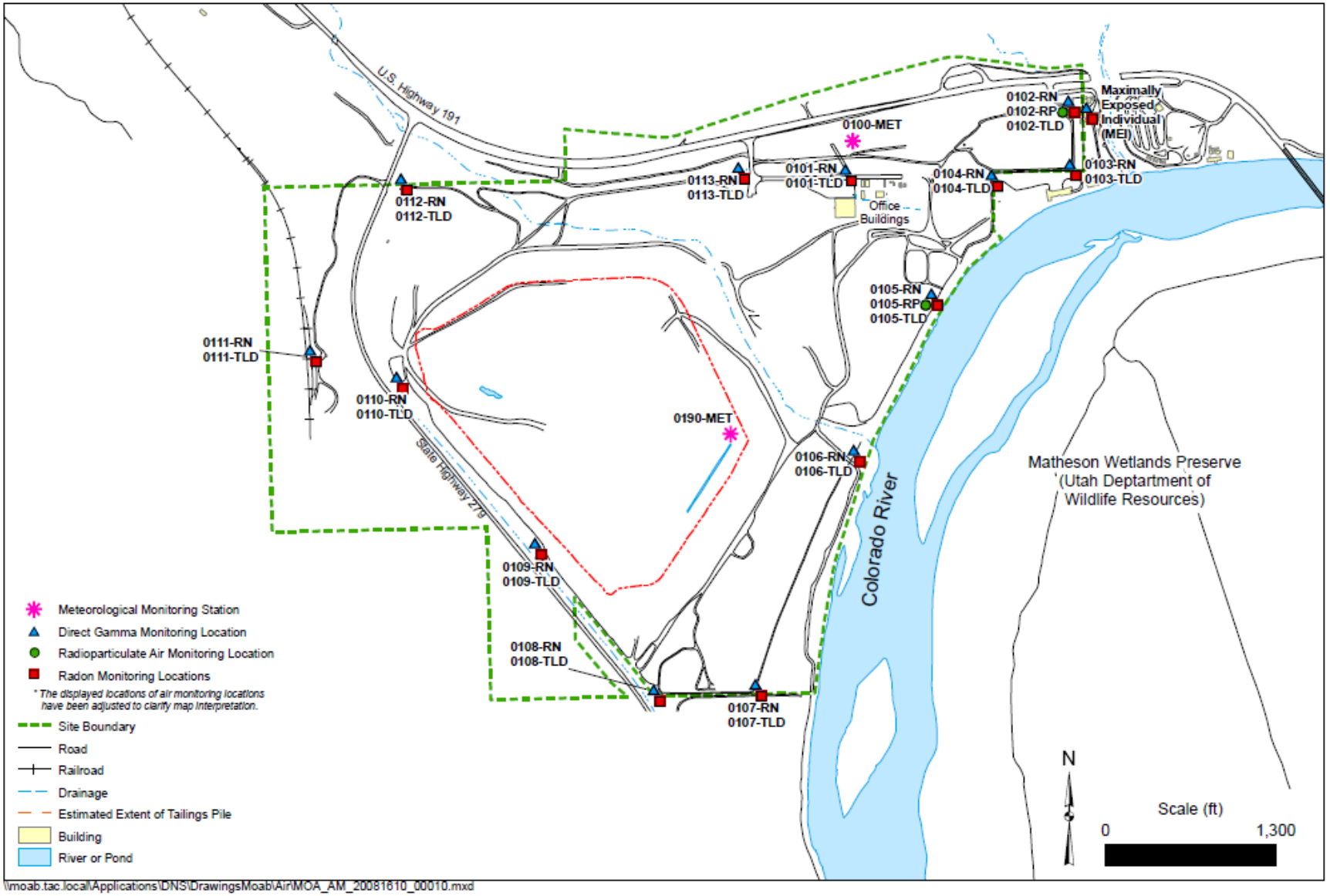

Figure 3. Moab On-Site Environmental Air Monitoring Locations

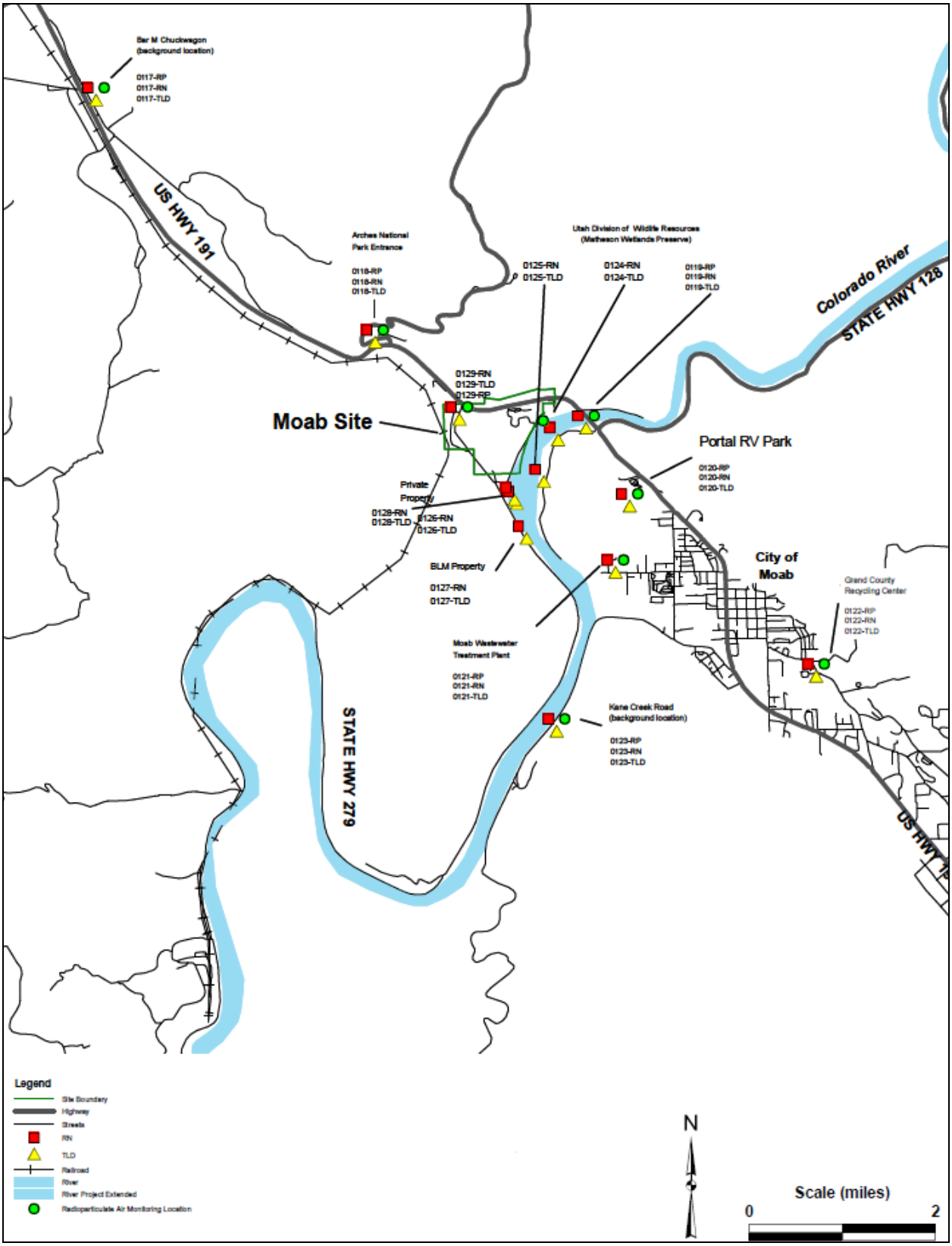

Figure 4. Moab Off-Site Environmental Air Monitoring Locations

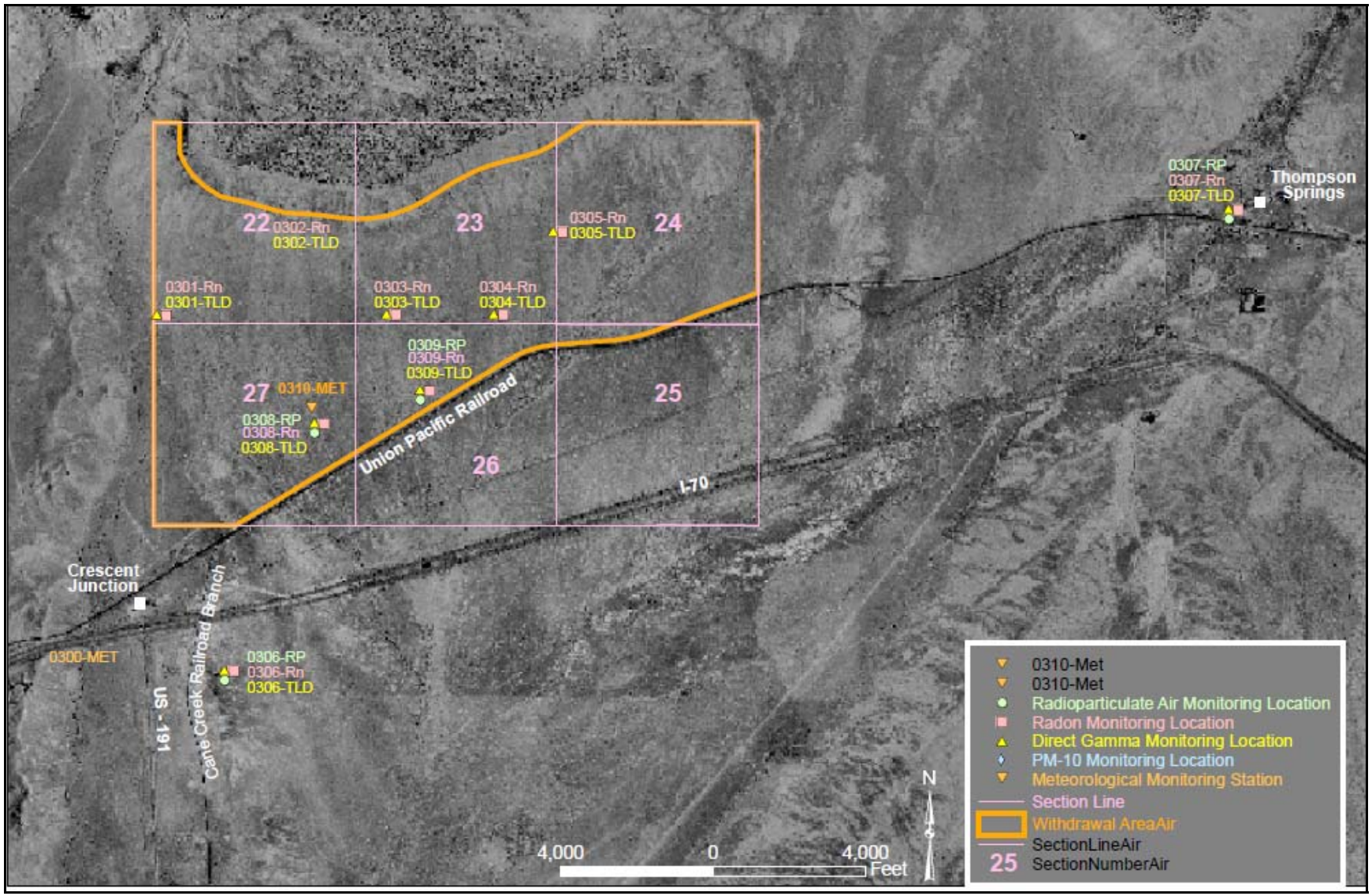

Figure 5. Crescent Junction Site Environmental Air Monitoring Locations

During 2008, atmospheric radon was measured at 35 locations (19 on-site, 15 off-site, and one MEI) using alpha-sensitive detectors (i.e., radon cups). Radon cups were exposed for a period of approximately 3 months (a quarterly exposure). Upon collection, the radon cups were sent to an off-site laboratory for analysis. Analytical results were typically received from the laboratory within 30 days. Radon data results for locations monitored in 2008 are shown in Table 3.

During 2008, the atmospheric radon concentration exceeded the 3.7 pCi/L guideline at five on-site and two off-site locations, which were on vacant land (Table 3). Data also indicate that off-site radon concentrations attenuate to near background levels within ½-mile of the Moab site boundary. Because the tailings pile does not have an engineered radon barrier nor is the existing interim cover designed to control radon flux, it is not surprising that radon concentrations are elevated at various locations at or near the Moab site perimeter.

Based on these data, radon emissions from the mill tailings stored at the Moab site are not affecting the general population of the city of Moab. However, unacceptable exposures to the public may result to individuals if they were to camp or reside for extended periods of time within ½-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 radon gas, DOE will continue, to the extent possible, to enforce the existing institutional controls (e.g., warning signs, fences, other physical barriers).

The 2008 radon monitoring data collected at the MEI location for the Moab site were consistently below the 3.7 pCi/L guideline. One data anomaly was noted at a Crescent Junction off-site location where baseline indoor levels were higher than EPA-recommended levels of naturally occurring radon. Follow-up data confirmed the elevated reading was from a natural source (Mancos Shale). Recommendations for reducing radon levels (ventilation) were suggested.

4.2 Direct Gamma Radiation

The uranium mill tailings stockpiled at the Moab site are 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 site are outlined in DOE O 5400.5, Chapter II, “Requirements for Radiation Protection of the Public and Environment” [1][a]. This order establishes 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. Routine DOE activities shall not cause an effective public dose equivalent (for all exposure modes) greater than 100 millirems per year (mrem/yr) above naturally occurring gamma levels (i.e., background). Contributions from radon are excluded from the dose limit and are addressed independently. DOE has determined that the background gamma radiation for the Moab area is 81 mrem/yr. Therefore, the DOE standard for direct gamma radiation for the Moab on-site and off-site monitoring locations is 181 mrem/yr.

During 2008, direct gamma radiation was measured at 35 locations (19 on-site, 15 off-site, and one MEI) using thermoluminescent dosimeters that are exposed for a period of approximately 3 months (a quarterly exposure). Upon collection, the dosimeters were sent to an off-site laboratory for analysis. Analytical results were typically received from the laboratory within 30 days.

During 2008, direct gamma radiation measurements exceeded the 181 mrem/yr limit at seven on-site locations (see Table 3); however, this is not unexpected due to the large volume of uranium mill tailings stockpiled at the Moab site and their associated gamma activity. No elevated exposure rates were detected at off-site monitoring locations, showing that the gamma radiation is not emanating off-site. In addition, the annual average gamma radiation dose at the Moab MEI location was 75 mrem/yr, substantially below the limit of 181 mrem/yr.

Based on the levels of direct gamma radiation, these emissions are not affecting the general population of the city of Moab. Direct gamma radiation data results for locations monitored in 2008 are shown in Table 3.

Table 3. Summary of Environmental Radon and Gamma Monitoring Data for the Moab and Crescent Junction Sites for 2008

Moab Station Number	1st Quarter 2008		2nd Quarter 2008		3rd Quarter 2008		4th Quarter 2008		2008 Annual Average	
	Radon pCi/L	Gamma mrem*	Radon pCi/L	Gamma mrem*	Radon pCi/L	Gamma mrem*	Radon pCi/L	Gamma mrem*	Radon pCi/L	Gamma mrem/yr
On-Site Locations										
0101	2	35.45	1.4	30.16	1.8	38.75	3	38.8	2	143.2
0102	1.3	23.23	0.9	19.87	1.3	22.8	2.5	27.6	1.5	93.5
0103	2.4	23.64	1.2	19.97	1.2	23.14	2.5	26	1.8	92.7
0104	1.1	26.68	1.6	22.4	2	27.54	3.6	29.8	4.1	106.4
0105	3	46.64	2.1	42.93	2.9	49.5	4.8	54.4	3.2	193.5
0106	5	48.27	4.5	45.3	5.3	51.26	11.9	57.7	6.7	202.5
0107	6.3	35.8	4.1	36.38	5.6	38.64	11.3	46.1	6.8	156.9
0108	3.4	42.22	3	45.14	5.2	49.87	5.9	54.7	4.4	191.9
0109	2.1	56.07	1.6	55.63	2.4	63.21	1.7	66.7	1.9	241.6
0110	1.8	68.1	1.5	57.84	1.9	76.58	2.2	71.5	1.8	274
0111	1.2	59.94	0.8	58.01	0.6	68.26	NDA	NDA	0.9	248.3
0112	NDA	47.87	1.5	20.34	1.7	26.17	2.2	37.7	1.3	132.1
0113	2.6	27.04	1.7	27.65	3.0	32.09	4.1	34.8	2.8	121.6
Off-Site Locations										
0117	0.8	22.51	0.7	22.07	0.6	22.63	1.7	26.7	0.9	93.9
0118	1	21.08	0.5	19.81	0.8	21.25	0.7	23.9	0.7	86.0
0119	1	20.1	0.8	21.53	0.8	21.33	1.3	26.2	1	89.2
0120	0.7	18.64	0.8	19.3	0.6	19.05	1	23.4	0.8	80.4
0121	0.9	20.22	0.7	18.3	0.7	20.73	0.8	22.4	0.6	81.6
0122	0.7	19.28	0.7	16.43	0.3	19.55	0.6	19.9	0.6	75.2
0123	0.4	19.33	<0.3	15.76	0.4	20.63	0.5	19.8	0.4	75.5
0124	1.4	22.03	0.9	21.68	0.9	23.61	1.7	27.9	1.2	95.2
0125	1.4	25.33	1.2	24.15	NDA	27.85	2.9	30.2	1.4	107.7
0126	2.3	23.04	1.3	21.76	2.2	24.44	4.3	28.6	2.5	97.8
0127	1.2	21.05	0.7	22.1	1	22.93	1.6	27.4	1.1	93.5
0128	3.4	22.74	2.1	21.21	2.5	25.57	5.7	28	3.4	97.5
0129	NA	NA	NA	NA	1.6	24.94	2.1	29.5	0.9	108.9
MEI	1.3	18.5	0.7	15.87	1	19.35	2.2	20.8	1.3	74.5

Table 3. Summary of Environmental Radon and Gamma Monitoring Data for the Moab and Crescent Junction Sites for 2008 (continued)

Crescent Junction Station Number	1st Quarter 2008		2nd Quarter 2008		3rd Quarter 2008		4th Quarter 2008		2008 Annual Average	
	Radon pCi/L	Gamma mrem*	Radon pCi/L	Gamma mrem*	Radon pCi/L	Gamma mrem*	Radon pCi/L	Gamma mrem*	Radon pCi/L	Gamma mrem/yr
0301	0.8	21.2	1	20.4	0.8	20.4	0.9	25.5	0.9	87.5
0302	1.3	20.37	1.3	20.9	1.3	19.5	1.3	24.9	1.3	85.7
0303	0.9	21.75	1	22.2	1	21.7	0.9	27.7	0.9	93.3
0304	1.1	23.86	0.9	19.9	1	23.1	1.2	25	1	91.9
0305	1.0	24.66	0.9	22.4	0.7	24.1	0.9	27.7	0.9	98.9
0306	0.6	22.18	0.8	22.2	0.7	21.8	0.8	28.1	0.7	94.3
0307	0.7	23.29	0.9	22.9	1	22.8	0.9	28.7	0.9	97.7
0308	0.6	NDA	1.1	18.3	1	14.8	0.5	21.1	0.8	71.8

NA = not applicable; NDA = no data available
*mrem value is prorated to a 91-day exposure period.

4.3 Airborne Radioparticulates

Collection of radioparticulate data are of particular interest to DOE because this data provide information relative to the dose that the public may be receiving from the inhalation of radioactive particulate matter. In 2008, low-volume air samplers operated continuously at Moab and Crescent Junction at three on-site locations and 10 off-site locations, including a new station (0129) that was installed predominantly downwind from the Moab site in the third quarter of 2008. These samplers consist of a low-volume 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 uranium mill tailings, 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 4.

Table 4. Summary of DCGs for Inhaled Air Radionuclides Monitored at the Moab and Crescent Junction Sites

Radionuclide	DCG (µCi/mL)
Radium-226	1.E-12
Thorium-230	4.E-14
Polonium-210	1.E-12
Total Uranium	2.E-12

µCi/mL = microcuries per milliliter

The annual averages for airborne radioparticulate concentrations did not exceed the DCG values at any Moab or Crescent Junction location during 2008 (see Table 5). These averages 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.

4.4 Fugitive Dust

Most of the surface area at the Moab site consists of exposed soil. Vegetation at the Moab site is relatively sparse and offers little protection or stabilization to the site's soils. Consequently, controlling windblown material is a concern.

State of Utah regulations require that fugitive dust emissions from construction activities shall not exceed 20 percent opacity. When necessary, opacity determinations are documented according to EPA method 9 protocols and provided to project personnel as appropriate.

During 2008, DOE implemented the controls outlined in the fugitive dust control plans (see Section 2.1.3) to the extent practicable. On an annual basis, DOE applies approximately 200,000 gallons of a calcium chloride solution, a dust suppressant, to the Moab mill tailings pile and site roads in an effort to stabilize areas that are susceptible to wind erosion. In addition, DOE restricts travel in off-road areas of the Moab site and the disposal site and limits vehicular speed to minimize the generation of fugitive dust. As areas are remediated or disturbed, DOE seeds with native species and mulches the areas to establish vegetative cover to control windblown dust. Approximately 153 acres were revegetated in 2008, including 150 acres along the water pipeline route from the Green River to the disposal site, 3 acres for the Moab Wash realignment, and minor acreage associated with landscaping of the Moab site entrance road and trees planted as visual screen near site offices.

4.5 Clearance of Property Containing RRM

To support remediation of the Moab site, DOE assessed on-site soils not associated with the pile for radiological contamination in 2005. 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 2008, approximately 9,200 cubic yards of contaminated soil was remediated at the Moab site as part of the Moab Wash realignment and during cleanup of minor areas associated with SR-279, resulting in a reduction of the contaminated footprint by 3 acres. The footprint has been reduced by a total of 108 acres since the start of interim soils remediation. The excavated contaminated soil was transported to the tailings pile for future removal to the Crescent Junction disposal site.

Table 5. Summary of Radioparticulate Air Monitoring Data for the Moab and Crescent Junction Sites for 2008

Moab Station Number	Isotope	1st Quarter 2008 (µCi/mL)	2nd Quarter 2008 (µCi/mL)	3rd Quarter 2008 (µCi/mL)	4th Quarter 2008 (µCi/mL)	Annual Average (µCi/mL)
On-Site Locations						
0102-RP	Uranium[1]	4.8E-17	2.1E-16	1.6E-16	2.2E-16	1.6E-16
	Thorium-230	1.1E-16	1.1E-16	4.0E-17	9.1E-17	8.7E-17
	Radium-226	9.1E-17	1.3E-16	4.7E-17	-6.6E-18	6.4E-17
	Polonium-210	1.0E-14	5.4E-15	5.8E-15	1.9E-14	1.0E-14
0105-RP	Uranium[1]	8.3E-17	4.9E-16	2.8E-16	1.70E-16	2.6E-16
	Thorium-230	2.3E-16	3.6E-16	1.4E-16	7.7E-17	2.0E-16
	Radium-226	8.0E-17	9.4E-17	5.6E-17	-1.0E-16	3.2E-17
	Polonium-210	8.8E-15	7.3E-15	6.8E-15	1.5E-14	9.4E-15
Off-Site Locations						
0117-RP	Uranium[1]	9.7E-17	9.8E-17	9.4E-17	3.9E-17	9.6E-17
	Thorium-230	3.9E-16	5.2E-17	5.1E-17	9.8E-17	1.6E-16
	Radium-226	5.8E-17	8.1E-17	8.5E-17	1.1E-16	7.5E-17
	Polonium-210	8.9E-15	9.5E-16	1.7E-15	7.8E-15	3.8E-15
0118-RP	Uranium[1]	1.2E-16	1.5E-16	1.4E-16	3.6E-17	1.4E-16
	Thorium-230	3.9E-16	7.6E-17	1.1E-16	1.4E-16	1.9E-16
	Radium-226	7.2E-17	1.4E-16	1.3E-16	5.1E-17	1.2E-16
	Polonium-210	8.7E-15	1.6E-15	2.1E-15	1.0E-14	4.1E-15
0119-RP	Uranium[1]	9.6E-17	1.4E-16	9.3E-17	8.4E-17	1.1E-16
	Thorium-230	3.9E-16	8.4E-17	5.8E-17	2.0E-16	1.80E-16
	Radium-226	1.2E-16	1.1E-16	7.3E-17	1.4E-16	9.9E-17
	Polonium-210	7.9E-15	9.1E-16	1.6E-15	8.8E-15	3.5E-15
0120-RP	Uranium[1]	1.1E-16	1.2E-16	1.0E-16	5.7E-17	1.1E-16
	Thorium-230	3.8E-16	9.5E-17	4.9E-17	1.1E-16	1.7E-16
	Radium-226	7.2E-17	7.9E-17	9.4E-17	8.1E-17	8.2E-17
	Polonium-210	7.7E-15	1.1E-15	1.8E-15	9.8E-15	3.5E-15
0121-RP	Uranium[1]	1.1E-16	9.6E-17	8.9E-17	6.0E-17	9.7E-17
	Thorium-230	4.0E-16	3.8E-17	7.1E-17	8.4E-17	1.7E-16
	Radium-226	8.5E-17	1.7E-16	9.2E-17	4.5E-17	1.2E-16
	Polonium-210	7.5E-15	1.0E-15	1.7E-15	6.9E-15	3.4E-15
0122-RP	Uranium[1]	9.6E-17	8.1E-17	9.3E-17	2.7E-17	9.0E-17
	Thorium-230	3.9E-16	5.2E-17	5.2E-17	3.5E-17	1.6E-16
	Radium-226	7.3E-17	8.6E-17	1.2E-16	4.6E-17	9.4E-17
	Polonium-210	7.5E-15	9.3E-16	1.9E-15	8.1E-15	3.4E-15
0123-RP	Uranium[1]	8.8E-17	1.1E-16	8.9E-17	4.7E-17	9.4E-17
	Thorium-230	3.8E-16	7.3E-17	4.8E-17	1.1E-16	1.7E-16
	Radium-226	9.2E-17	1.0E-16	7.4E-17	8.6E-17	8.9E-17
	Polonium-210	7.3E-15	1.3E-15	1.7E-15	7.4E-15	3.4E-15

Table 5. Summary of Radioparticulate Air Monitoring Data for the Moab and Crescent Junction Sites for 2008 (continued)

Moab Station Number	Isotope	1st Quarter 2008 (µCi/mL)	2nd Quarter 2008 (µCi/mL)	3rd Quarter 2008 (µCi/mL)	4th Quarter 2008 (µCi/mL)	Annual Average (µCi/mL)
Off-Site Locations						
0129-RP	Uranium[1]	NA	NA	2.90E-16	2.50E-16	2.7E-16
	Thorium-230	NA	NA	8.5E-17	1.6E-16	1.2E-16
	Radium-226	NA	NA	1.40E-16	0.0E+00	7.0E-17
	Polonium-210	NA	NA	6.3E-15	1.3E-14	9.7E-15
Crescent Junction Station Number	**Isotope**	**1st Quarter 2008 (µCi/mL)**	**2nd Quarter 2008 (µCi/mL)**	**3rd Quarter 2008 (µCi/mL)**	**4th Quarter 2008 (µCi/mL)**	**Annual Average (µCi/mL)**
0306-RP	Uranium[1]	2.90E-17	1.4E-16	1.2E16	1.20E-16	1.00E-16
	Thorium-230	3.7E-17	8.4E-17	6.4E-17	4.5E-17	5.7E-17
	Radium-226	9.8E-17	1.9E-16	2.60E-17	-2.1E-17	8.1E-17
	Polonium-210	1.2E-14	5.1E-15	4.8E-15	1.1E-14	8.1E-15
0307-RP	Uranium[1]	4.1E-17	1.6E-16	1.7E-16	1.2E-16	1.2E-16
	Thorium-230	1.4E-16	8.4E-17	4.10E-17	4.0E-17	7.6E-17
	Radium-226	8.2E-17	1.5E-17	5.90E-17	1.0E-17	6.3E-17
	Polonium-210	9.2E-15	5.3E-15	7.7E-15	9.2E-15	7.9E-15
0308-RP	Uranium[1]	NA	1.8E-16	2.7E-16	3.10E-16	2.5E-16
	Thorium-230	NA	7.4E-17	6.8E-17	1.6E-16	9.9E-17
	Radium-226	NA	4.70E-17	1.1E-16	3.0E-17	6.2E-17
	Polonium-210	NA	2.9E-15	6.2E-15	1.0E-14	6.4E-15

µCi/mL = microcuries per milliliter
[1] total uranium

4.6 Best Management Practice Area

The Best Management Practice Area (BMPA) is a dedicated area within the Contaminated Area at the Moab site that is designed to safely store and isolate waste materials, such as existing structures, 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 east of the former millsite building (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.

4.7 Source Reduction

Source reduction generally means any change in products, services, or actions that reduces, eliminates, or prevents the amount or toxicity or waste being generated. The Moab Project sites primarily achieve source reduction by using work practices that minimize the amount of radioactive waste that is generated. The "as low as reasonably achievable" principle is emphasized to keep materials from becoming radioactively contaminated. Using administrative controls such as establishing radioactive materials areas, limiting the use of materials in the

Contaminated Area (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 Contaminated Area can be protected from becoming radioactively contaminated. Decontamination is performed if warranted, feasible, and cost-effective.

An additional example of source reduction at the project sites during 2008 consisted of using a nonhazardous, environmentally friendly product to wash greasy engine parts and equipment instead of the hazardous chemical solvents that are typically used for such purposes.

5.0 Environmental Nonradiological Program Information

DOE has installed two meteorological monitoring stations at the Moab site and one 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 6 summarizes 2008 meteorological data for temperature, wind speed, and precipitation for the Moab site; these data are similar at Crescent Junction.

Table 6. Meteorological Data Summary for the Moab Site for 2008

Month	Temperature (degrees F)		Wind Speed (mph)		Precipitation* (inches)
	Max. Temp.	Min. Temp.	Average	Peak Gust	
January	54.5	10.4	3.1	46.7	0.47
February	70.6	15	2.0	32.6	1.54
March	75.4	26	3.9	36.2	0.11
April	83.4	34	5.1	45.6	0.25
May	97.4	36.7	4.3	47.0	0.31
June	103.5	49.6	0.1	52.7	0.48
July	106.6	67.7	0.2	58.4	0.12
August	103.4	50.7	4.0	41.4	0.40
September	94.3	40.5	2.0	35.9	0.12
October	82.3	30.7	3.0	44.2	0.27
November	70.4	26.1	2.1	41.2	1.37
December	56.6	11.2	3.0	44.9	0.83
***Total Adjusted with Manual Gauge**					**6.27**

F = Fahrenheit; Max = maximum; Min = minimum; mph = miles per hour; Temp = temperature

6.0 Ground Water Protection Program

Saturated soils beneath the Moab site have been contaminated from the former uranium milling operations. The naturally high salinity of the ground water precludes its beneficial use; however, it should still be protective of aquatic habitat where it discharges to the Colorado River.

In 2008, routine water monitoring was conducted three times during the year, and monthly sampling of up to 41 extraction wells in the IA ground water remediation system was also conducted. A baseline area outside the influence of the IA was also sampled to evaluate natural variability of the ground water and surface water systems as the Colorado River stage changed. IA, baseline, and routine surface water and ground water locations sampled during 2008 are shown in Figures 6 and 7.

Most of the samples were analyzed for the site-related constituents: ammonia, chloride, manganese, sulfate, uranium, and total dissolved solids. A few selected locations were also sampled for selenium and copper. In addition, alkalinity, dissolved oxygen, oxidation reduction potential, pH, specific conductance, temperature, and turbidity were measured in the field at all locations.

6.1 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 2008 focused on understanding the effects of ground water discharge and IA ground water remediation activities on the quality of surface water and was designed to sample locations determined to provide the best potential fish habitat. Favorable habitat is characterized by fairly shallow, low-velocity backwater channels that are closed off from the main channel on the upriver side. The site-related constituent of greatest concern at the site is ammonia because of its toxicity to aquatic life.

Only one surface water sample exceeded the chronic ambient water quality criteria for ammonia as delineated in the EPA "Update of Ambient Water Quality Criteria for Ammonia" (EPA-822-R-99-014). The method to determine these criteria is based on the observed surface water temperature and pH at the time and location of the sample. The exceedance occurred in October 2008, during a time of year when young-of-year fish are not present. The ammonia concentration measured in a surface water sample was 2.2 milligrams per liter (mg/L), compared to the chronic criterion of 1.17 mg/L. This isolated event indicates that discharge of site ground water is having a very local and temporary affect on surface water quality.

6.2 Ground Water

More than 24 million gallons of contaminated ground water was extracted in 2008 from the IA remediation wells, with 82,200 pounds of ammonia and 370 pounds of uranium removed. A total of about 126 million gallons has been extracted from initial implementation of the system through the end of 2008, and included 536,000 pounds of ammonia and 2,310 pounds of uranium. Data results from sampling the IA well field are available on the Moab Project website at www.gjem.energy.gov/moab.

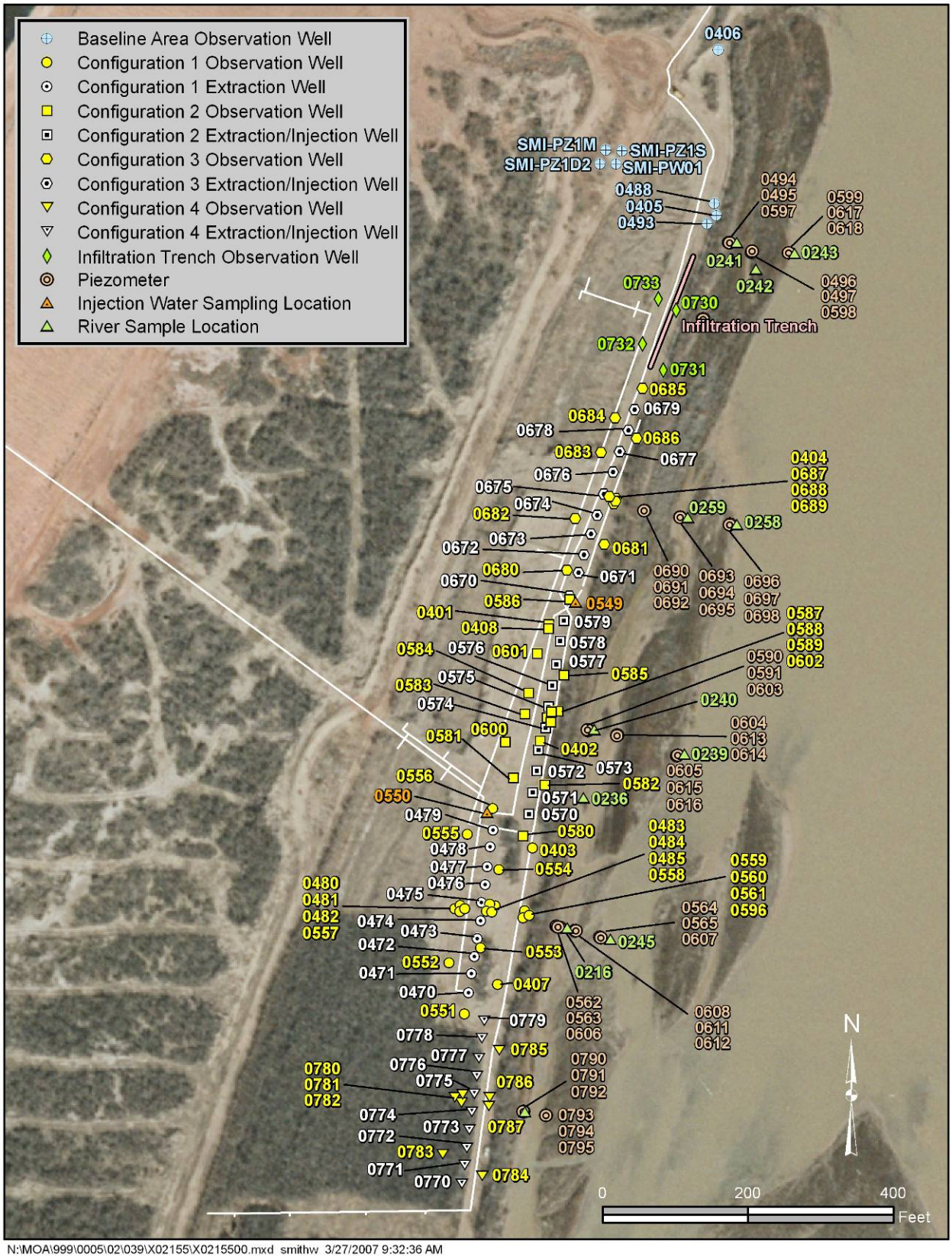

Figure 6. IA and Baseline Surface Water and Ground Water Sampling Locations in 2008

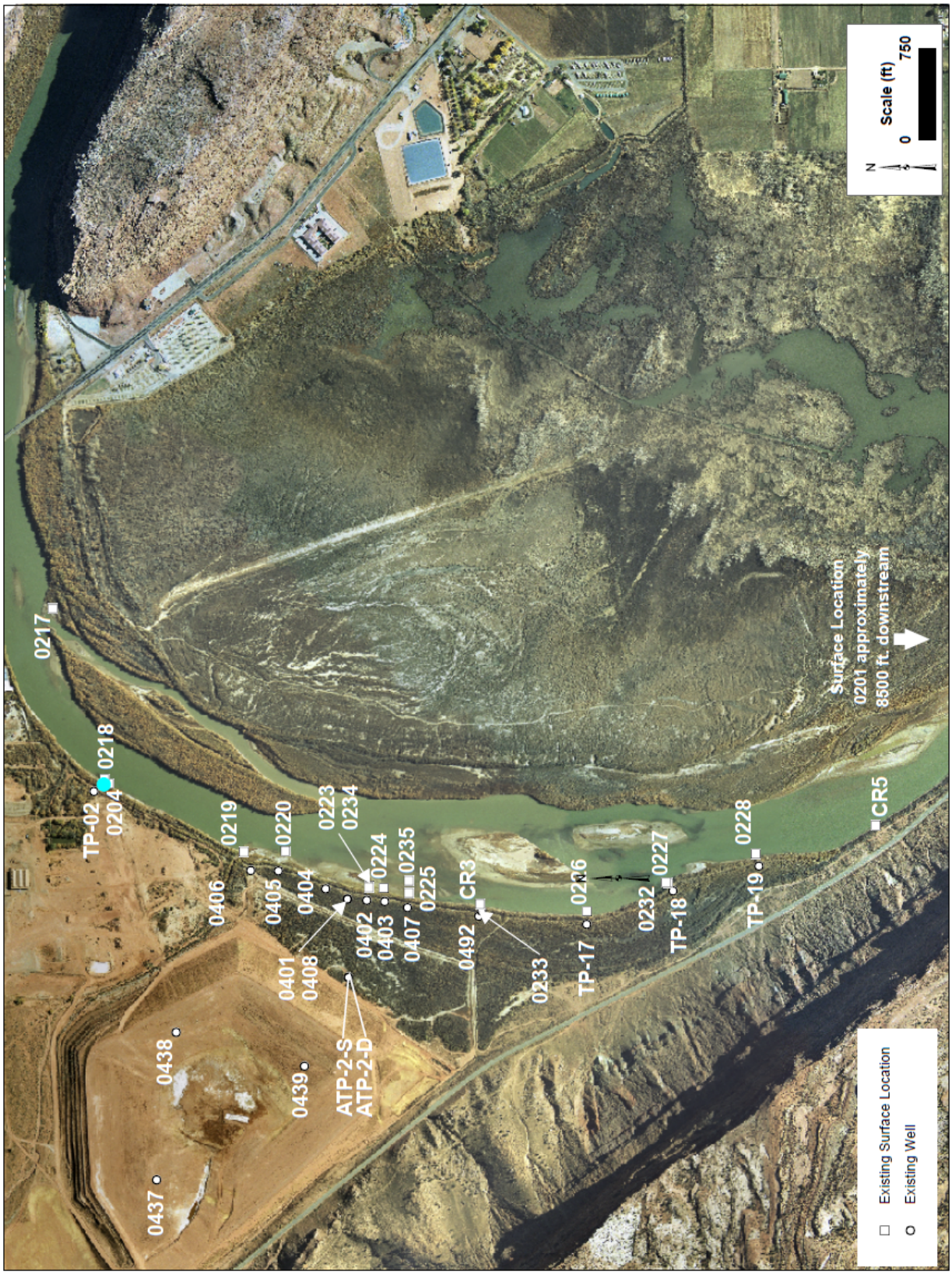

Figure 7. Routine Surface Water and Ground Water Monitoring Locations in 2008

7.0 QA

The Moab 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 DOE O 414.1C, "Quality Assurance," requirements. The QA Program is implemented through contractor-specific QA plans, which ensure that 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

Project records are created both on paper and electronically in a retrievable format. Electronically created records are converted to paper prior to being transferred to a federal record center for long-term storage. Records are protected against deterioration, damage, or loss. Moab Project Records generated in support of environmental monitoring are subject to the requirements of 36 CFR 1220-1234, "Federal Records; General," and are managed accordingly.

8.0 References

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

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40 CFR 61 (*Code of Federal Regulations*). U.S. Environmental Protection Agency, "National Emission Standards for Hazardous Air Pollutants."

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

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

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

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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.

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