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Office of Environmental Management – Grand Junction

MOAB UTAH
UMTRA Project

Annual Site Environmental Report for Calendar Year 2006

April 2007

U.S. Department of Energy

Office of Environmental Management

Work Performed Under DOE Contract No. DE–AC01–02GJ79491
for the U.S. Department of Energy Office of Environmental Management.

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Acronyms

ACM	asbestos-containing-material
ALARA	as low as reasonably achievable
AWQC	ambient water quality criteria
BA	Biological Assessment
BLM	Bureau of Land Management
BMPA	best management practice area
BO	Biological Opinion
CEQ	Council on Environmental Quality
CFR	*Code of Federal Regulations*
CY	calendar year
DCG	derived concentration guide
DOE	U.S. Department of Energy
EIS	Environmental Impact Statement
EM	DOE's Office of Environmental Management
EMS	Environmental Management System
ESA	Endangered Species Act
EPA	U.S. Environmental Protection Agency
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
ISMS	Integrated Safety Management System
MEI	maximally exposed individual
mrem/yr	millirem per year
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
PCB	polychlorinated biphenyl
pCi/L	picocuries per liter
PEIS	programmatic environmental impact statement
QA	quality assurance
QAPP	Quality Assurance Program Plan
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
RRM	residual radioactive materials
SARA	Superfund Amendments and Reauthorization Act
SWP^3	Storm Water Pollution Prevention Plan
TAC	Technical Assistance Contractor
TLD	thermoluminscent dosimeter
TSCA	Toxic Substances Control Act
U.A.C.	Utah Administrative Code
UMTRA	Uranium Mill Tailings Remedial Action
UMTRCA	Uranium Mill Tailings Radiation Control Act
UPDES	Utah Pollutant Discharge Elimination System
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USF&WS	U.S. Fish and Wildlife Service

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Executive Summary

This Annual Site Environmental Report presents information pertaining to environmental activities conducted under the Moab Uranium Mill Tailings Remedial Action (UMTRA) Project during calendar year (CY) 2006. This report includes activities at both the Moab Site located in Moab, Utah, and the Crescent Junction Site, located northeast of the junction of Interstate 70 (I-70) and State Highway 191 (US-191) approximately 30 miles north of the Moab Site. The Moab Site is owned by the U.S. Department of Energy (DOE). Jurisdiction of the Crescent Junction Site has been transferred to DOE through a Bureau of Land Management (BLM) land withdrawal. DOE's Office of Environmental Management (EM), located in Grand Junction, Colorado, operates both sites. S.M. Stoller Corporation, the Technical Assistance Contractor (TAC) for DOE-EM, prepared this Annual Site Environmental Report in accordance with the requirements of DOE Order 231.1A, *Environment, Safety, and Health Reporting,* DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, and supplemental guidance from DOE Headquarters.

According to DOE orders, all DOE facilities that conduct significant environmental protection programs shall prepare an annual site report, the purpose of which is to present summary environmental data so as to characterize site environmental management performance, confirm compliance with environmental standards and requirements, and highlight significant programs and efforts. 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 the most accurate and complete monitoring data available and up-to-date compliance information for CY 2006.

DOE took possession of the Moab Site in October 2001, and as the new custodian of this property, one of DOE's first actions was to secure the property boundary and any onsite facilities that presented an imminent risk or hazard to the public, site workers, or the environment. Primary site activities in 2006 included site management, security, and maintenance actions; continued site assessment, characterization, and remediation; waste management and pollution prevention; continued operation of the Initial and Interim Action ground water remediation projects; and environmental compliance monitoring (air and surface water). All activities performed at the Moab Site during 2006 were conducted in compliance with applicable federal, state, and local regulations and requirements, and with applicable DOE orders.

During CY 2006, the Moab Site received no notices of violation and did not have any occurrences that required reporting to outside agencies. Baseline air monitoring and meteorological data collection were conducted at Crescent Junction during CY 2006.

Site Activities and Highlights for Calendar Year 2006

Significant highlights, accomplishments, and activities conducted by DOE on the Moab UMTRA Project during 2006 are as follows.

Site Management, Security, and Maintenance

- Physical security of the site perimeter was maintained (e.g., upgraded and repaired existing perimeter fencing, posted current applicable warning signs, implemented institutional controls as appropriate).

- Upon DOE's receipt of the property in October 2001, the entire site was in an overall state of disrepair. DOE has continued its general "housekeeping" efforts to improve the site's safety and environmental conditions, and to clean up and repair facilities and structures that had been neglected.
- Site conditions and facilities were stabilized (implemented fugitive dust controls and stormwater runoff controls, established radiological barriers, locked former mill buildings, and improved onsite roads, ponds, etc.).
- Repairs of localized storm event erosional damage were made.
- A site access control facility consisting of a decontamination trailer, office trailers, and several sea-land equipment storage units were maintained. Indoor restroom facility and associated leach field was installed.
- General ongoing maintenance of roads, utilities, fences, water-diversion structures, pipelines, and pumps were maintained.

Site Remediation and Construction Activities

- Removal of contaminated soil from the site and adjacent vicinity properties was continued. Approximately 138,600 cubic yards of soil were remediated. The surface soil contamination was mainly from a wind-blown source.
- The contaminated footprint at or near the Moab Site was reduced by 53 acres through remediation of contaminated soil.
- Remediation of contaminated soils associated with the area under and around the site's raw water ponds was performed, along with construction of a new pond for onsite water storage.

Waste Management and Pollution Prevention

- Approximately 250 gallons of non-radioactive waste oil was consumed in a waste oil burner at the Moab Site.
- The Best Management Practice Area (BMPA) was maintained. The BMPA is a lined and bermed impoundment designed to safely store and isolate potential waste materials until permanent disposition can be completed.
- DOE participates in a program offered by the Utah Power electric utility to purchase electricity generated by a renewable source (wind power) for the site's electrical needs.
- Approximately 350 pounds of paper and 100 pounds of aluminum were recycled.

Environmental Compliance

- Site dust controls were maintained in accordance with the *Moab Site Fugitive Dust Control Plan* (DOE 2002b).
- Site stormwater controls were maintained, and inspections were conducted twice per month in accordance with the *Moab Site Storm Water Pollution Prevention Plan* (DOE 2002c).
- *Temporary Change Applications* (3) were prepared and submitted to the Utah Division of Water Rights for the temporary change in use of existing water rights to support the Initial

and Interim Action ground water remediation projects and perform remediation of the adjacent Policaro property.

Environmental Air Monitoring

- Both onsite and offsite environmental air monitoring activities were conducted in accordance with the *Moab Project Environmental Air Monitoring Sampling and Analysis Plan* (DOE 2003a) at the Moab Site. Baseline air monitoring was also conducted at the Crescent Junction Site in 2006. Parameters monitored at both sites include radon-222, direct gamma radiation, and radioparticulate matter (polonium-210, radium-226, thorium-230, and total uranium). For the Moab Site, the air monitoring network is designed to collect data from the Moab Site, the surrounding community, and background locations. At the Crescent Junction Site, the air monitoring network is designed to collect initial baseline data at and near the site before construction activities commence.
- Meteorological monitoring data continues to be collected from a monitoring station that was installed at the Moab Site in 2002; a second monitoring station was installed on the tailings pile in 2006. Baseline meteorological monitoring continues at a monitoring station installed near the Crescent Junction Site in 2005.
- Quarterly environmental air monitoring reports were prepared that summarize and trend the air monitoring data collected from the Moab Site and the surrounding community. Quarterly reporting of the Crescent Junction air monitoring data was initiated in 2006. These reports compare monitoring data to exposure limits and guidelines, and are posted on the DOE Moab Project website at: http://gj.em.doe.gov/Moab.
- Interior radon monitoring was conducted at the Maximally Exposed Individual (MEI) locations. These data are collected from the nearest continuously occupied residences, one located closest to the Moab Site, and one located closest to the Crescent Junction Site. The MEI locations represent the worst-case exposure scenario to a member of the general public.

Ground Water and Surface Water Monitoring

- Extensive ground water and surface water monitoring and field investigations were conducted throughout 2006.
- Ten additional remediation wells were installed, four Interim Action ground water well field configurations were operated during 2006, and monthly performance data was collected.
- Technical reports associated with assessment of Interim Action performance and characterization of ground water and surface water conditions and contaminants (e.g., calculation sets and data validation packages) were prepared.
- Surface water samples were collected from potential endangered fish habitat to evaluate effects from discharge of contaminated ground water.
- Biota monitoring was initiated in 2006 to visually monitor potential site-related impacts in fish habitat areas. No adverse effects were observed.

Compliance Summary for Calendar Year 2006

Ground Water/Surface Water

The principal surface water feature in the vicinity of the Moab Site is the Colorado River, which flows adjacent to the east boundary of the site. Ground water discharge from the Moab Site has caused localized degradation of surface water quality in the Colorado River. The constituent of greatest concern in the Colorado River is ammonia; other contaminants have been detected (e.g., uranium and sulfate).

The primary purpose for conducting active ground water remediation is to improve surface water quality. Throughout 2006, the DOE conducted extensive ground water and surface water monitoring, including operation of four Interim Action ground water remediation systems and collection of related monitoring data to assess systems performance. Only two surface water samples collected in 2006 exceeded ambient water quality criteria for ammonia, indicating that discharge of site ground water is having only a very local and temporary effect on surface water quality. Sampling was biased toward areas where highest ammonia concentrations discharge to the Colorado River. The highest concentrations of all contaminants were in shallow, low velocity portions of the river; contaminant concentrations in the main channel were low.

Environmental Air Monitoring

DOE's environmental air monitoring strategy for the Moab UMTRA Project is designed to monitor public and environmental exposures to airborne contaminants that are directly attributable to the uranium mill tailings and other contaminated materials stockpiled at the Moab Site. Specifically, DOE's air monitoring strategy targets concentrations of radon-222 gas, airborne radioparticulates, exposure levels to direct gamma radiation, and fugitive dust emissions. The Moab and Crescent Junction Sites' environmental air monitoring networks consists of onsite, offsite, and background sampling locations.

During 2006, DOE monitoring data at the Moab Site continued to indicate that both radon concentrations and direct gamma radiation levels exceeded applicable DOE guidelines at several locations along the DOE property boundary. However, data also indicate that both radon concentrations and direct gamma radiation levels (attributable to the mill tailings) attenuate to near background levels within one half mile of the Moab Site boundary. Monitoring data from the MEI location (both interior and exterior measurements), which represent the worst-case public exposure scenario, indicate that both radon and direct gamma radiation levels are below DOE exposure guidelines. Similarly, radon and gamma levels at all offsite monitoring locations within the Moab community were below public exposure guidelines specified by DOE order.

Radioparticulate monitoring data at the Moab Site show that concentrations of airborne contaminants are several orders of magnitude below DOE public exposure limits. These data demonstrate that there were no public exposures to airborne radioparticulates that exceeded regulatory limits.

Evaluation of the baseline monitoring data at the Crescent Junction Site began in 2006. This will be used for comparison with data that will be collected during tailings transport and disposal.

DOE's goal for onsite fugitive dust emissions is to maintain all emissions below the state standard for opacity (i.e., fugitive dust emissions cannot exceed 20-percent opacity). DOE aggressively controls visible emissions of fugitive dust through implementation of dust-suppression techniques and various engineering and procedural controls.

Public Radiological Dose/Exposure Summary

Radiological exposures to the public resulting from uranium mill tailings stored at the Moab Site consist primarily of two components: direct gamma radiation and airborne emissions of radioparticulates. Radiation associated with radon exposures (and its decay products) is addressed independently.

The direct gamma radiation exposure limit for DOE activities and operations at the Moab Site is calculated to be 181 millirem per year (mrem/yr). Although direct gamma radiation exposures were elevated at several locations along the DOE property boundary, all offsite locations were observed to be near background levels.

DOE must also monitor airborne radioactive materials released to the atmosphere. The DOE airborne emissions limit is 10 mrem/yr. DOE conducted continuous air particulate sampling at various onsite and offsite monitoring locations during 2006. DOE's radioparticulate monitoring targeted specific radionuclides that are common constituents of uranium mill tailings. Radioparticulate monitoring data collected at all sampling locations at the Moab Site during 2006 were below the 10 mrem/yr emissions limit.

In summary, environmental data collected for direct gamma radiation and radioparticulate air emissions during 2006 were below the public dose limits applicable to the Moab Site at all offsite monitoring locations.

Waste Management/Pollution Prevention

During 2006, DOE continued to manage radioactively contaminated legacy wastes to better protect the public, site workers, and the environment. These materials included industrial products and used oil. Certain legacy materials were identified for reuse, while others were disposed of onsite. Legacy used oil was safely stored within the site's BMPA. Both non-radioactive legacy used oil and non-radioactive used oil generated during 2006 was burned during colder months in onsite oil-burning space heaters.

Materials such as paper products, aluminum cans, and automotive batteries were collected and recycled within the Moab community, and a nonhazardous solvent was used to clean grease from equipment.

Electricity generated by a pollution-free source (wind power) was purchased from the site's electric utility to support renewable energy. In addition, bio-based lubricants and greases were used.

Distribution of This Document

This document may be viewed in its entirety at the DOE Moab UMTRA Project website at http://gj.em.doe.gov/moab. Hard copies may be obtained by contacting Mr. Don Metzler, DOE Moab Federal Project Director, at (970) 248-7612 or at the address below.

U.S. Department of Energy
2597 B ¾ Road
Grand Junction, CO
81503

Comments or questions regarding this document also may be directed to the Moab Project toll-free at 1-800-637-4575. Members of the public who wish to comment on this document or have questions are encouraged to contact DOE at the above phone numbers or by email at moabcomments@gjo.doe.gov.

1.0 Introduction

1.1 Background

The Moab Uranium Mill Tailings Remedial Action (UMTRA) Project includes two sites: (1) the Moab Site, which is owned by the U.S. Department of Energy (DOE); and (2) the Crescent Junction Disposal Site, which was transferred from the Bureau of Land Management (BLM) to DOE. The Crescent Junction Disposal Site is located northeast of the junction of Interstate 70 (I-70) and U.S. Highway 191 (US-191) approximately 30 miles north of the Moab Site and is the location selected for the disposal cell for the uranium mill tailings.

The Moab Site lies approximately 30 miles south of I-70 on US-191 in Grand County, Utah (Figure 1–1). The 439-acre Moab Site is located about 3 miles northwest of the city of Moab (Figure 1–2) and lies on the west bank of the Colorado River at the confluence with Moab Wash. The site is bordered on the north and southwest by steep sandstone cliffs. The Colorado River forms the eastern boundary of the site. US-191 parallels the northern site boundary, and State Road 279 (SR-279) transects the west and southwest portion 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. Canyonlands National Park is located about 12 miles to the southwest.

The Moab Site is a former uranium-ore processing facility that operated under various owners from 1956 through 1984. Uranium tailings from the milling operation were slurried to a 130-acre pile located at the west portion of the property. Uranium mill tailings are radioactive residue wastes that result from the processing of uranium ore. Although the milling process recovered about 95 percent of the uranium, these residues, or 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 which 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 Tailings."

The mill tailings pile is located in an unlined impoundment at the Moab Site and occupies approximately 130 acres of the western portion of the site. The tailings pile height averages 94 feet above the Colorado River terrace (4,076 feet above mean sea level) and is located in the 100-year floodplain of the Colorado River about 750 feet from the river. The pile consists of an outer compact embankment of coarse tailings, an inner impoundment of both coarse and fine tailings, and an interim cover of uncontaminated soil. DOE estimates the total contaminated material at the Moab Site has a total mass of approximately 16 million tons and a volume of approximately 12 million cubic yards. Debris from dismantling the mill buildings and associated structures was placed in an area at the southern toe of the pile and was covered with contaminated soils and fill. Evidence indicates that historical building materials may contain asbestos. Surveys indicate that soils outside the pile also contain radioactive contaminants at concentrations above EPA standards. Besides tailings, contaminated soils, and debris, other contaminated materials requiring cleanup include ponds used during ore-processing activities, disposal trenches, other locations used for waste management during mill operation, and buried septic tanks that are assumed to be contaminated. Figure 1–3 provides a map of the basic Moab Site features (e.g., site boundary, buildings, tailings pile, roads, etc.).

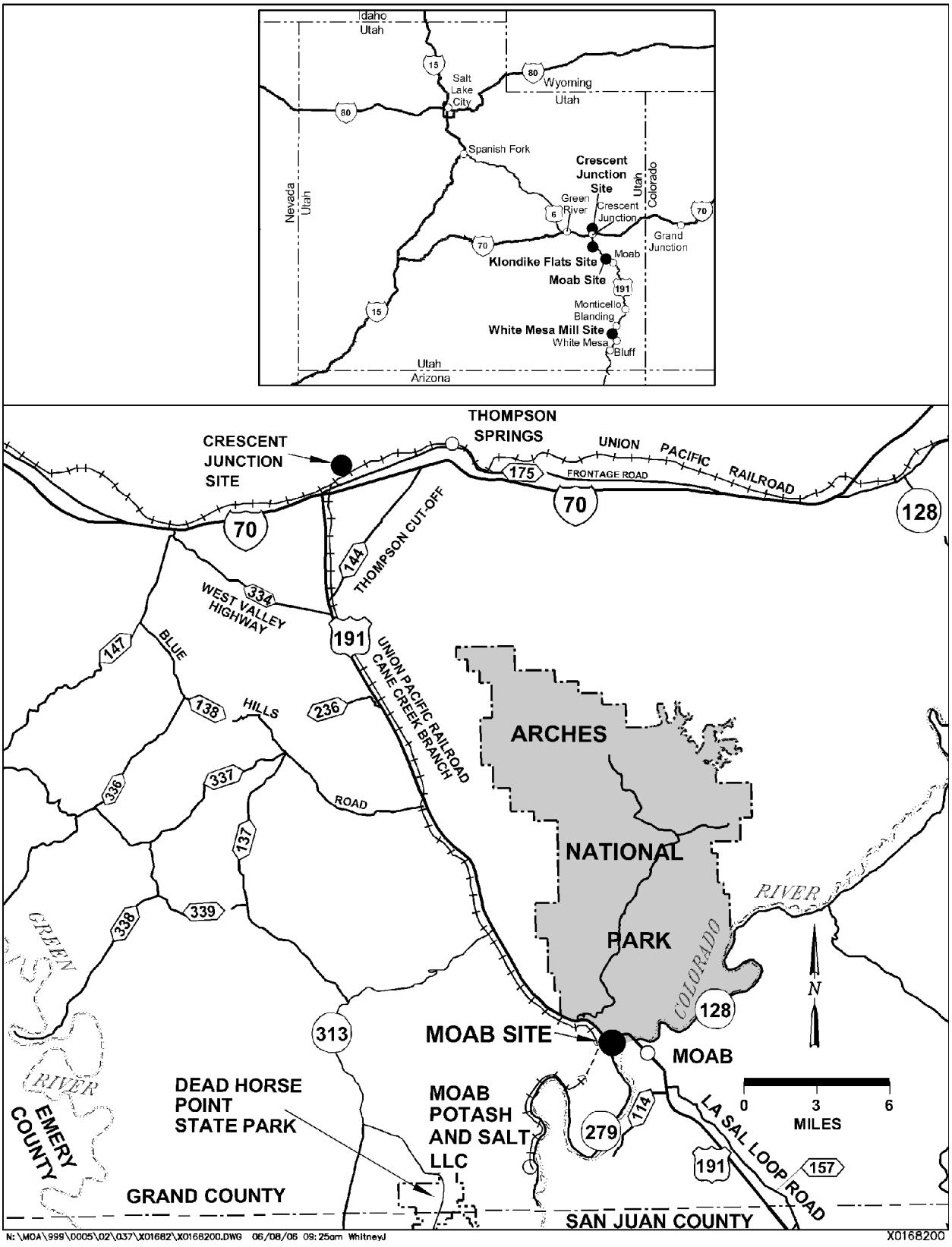

Figure 1–1. Location of the Moab and Crescent Junction Sites in Grand County, Utah

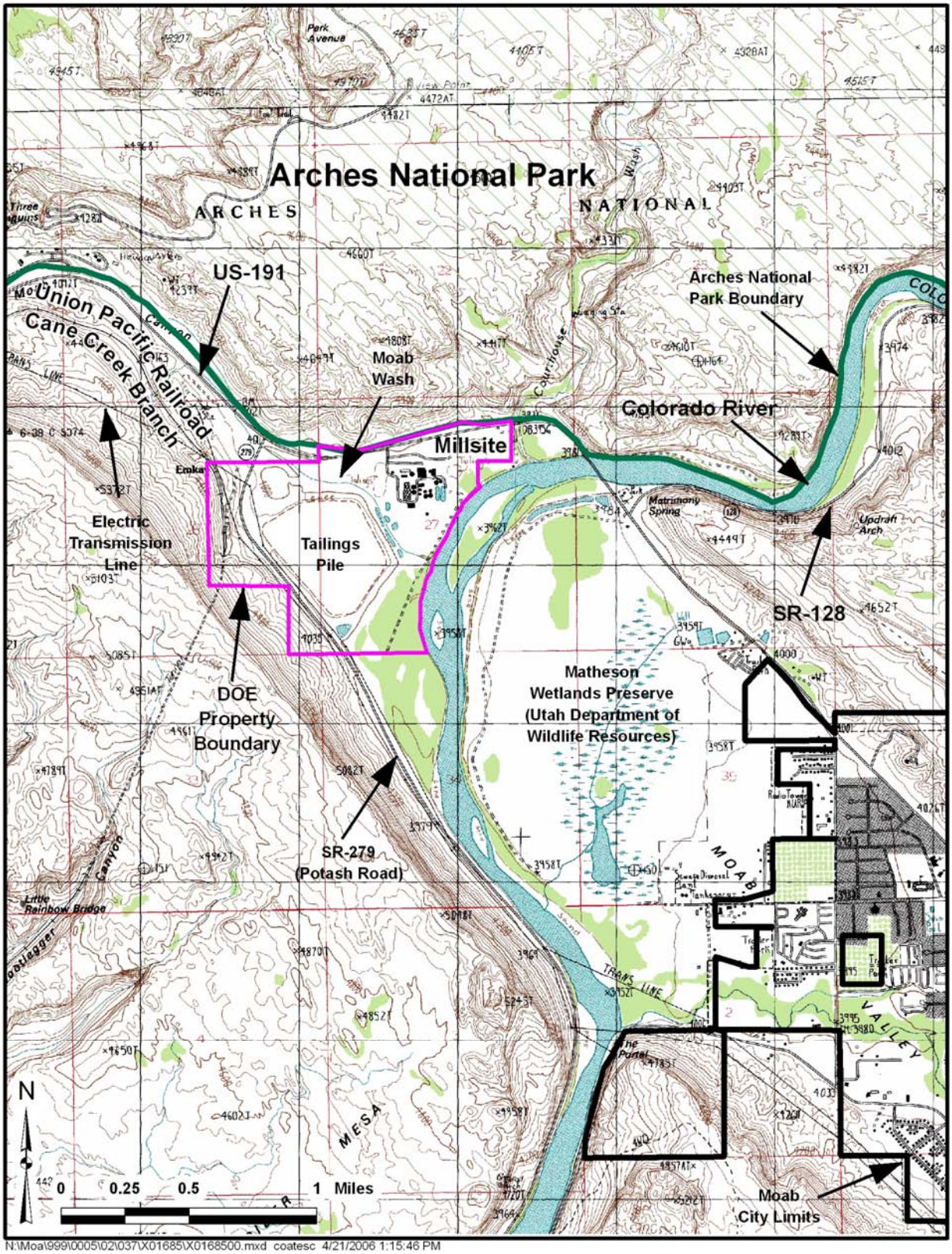

Figure 1–2. Location of the Moab Site in Relation to the City of Moab, Utah

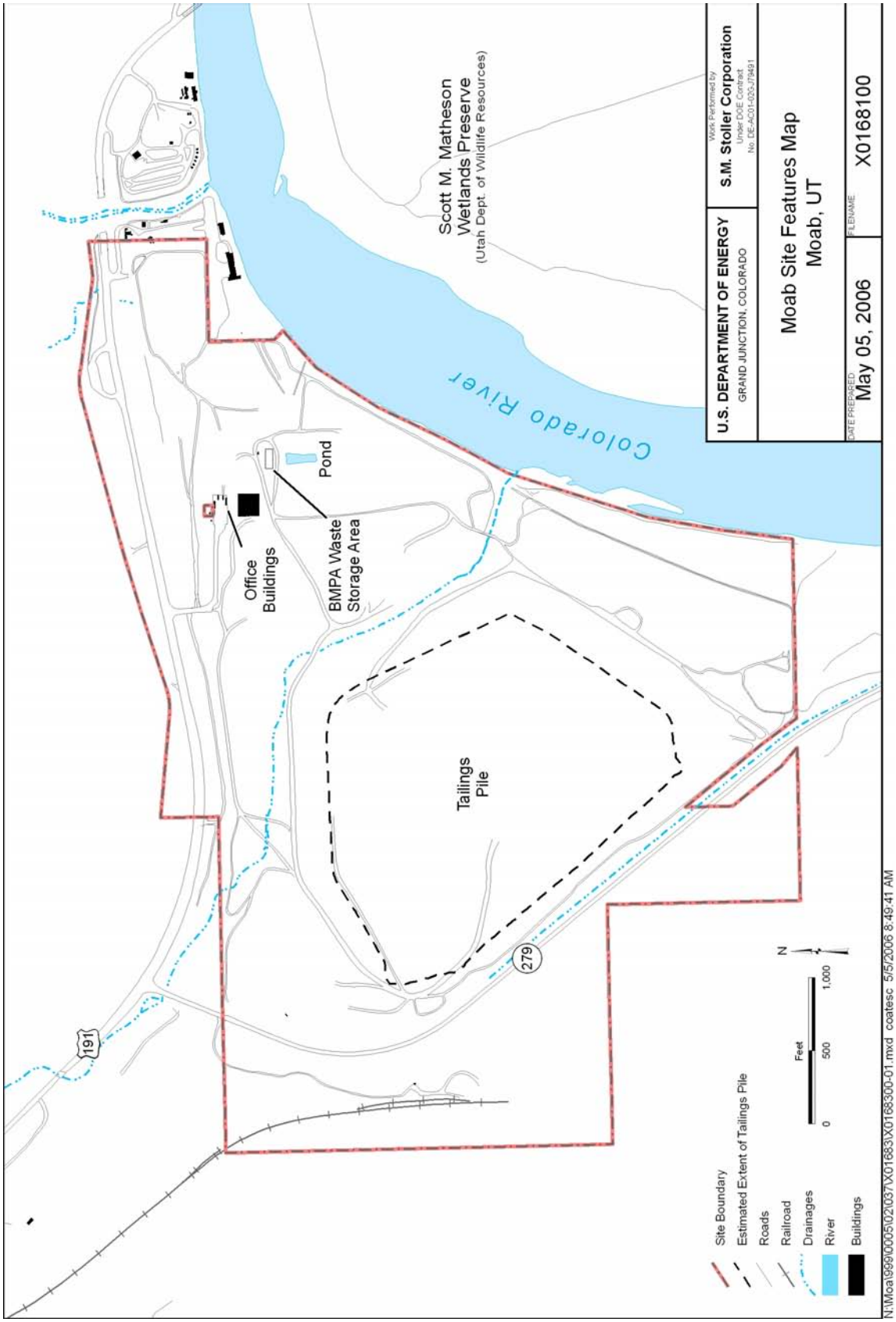

Figure 1–3. Moab Site Features Map

Contaminants are currently seeping from the tailings pile at low rates. Contaminants from the mill tailings are leaching downward into alluvial ground water, which discharges into the Colorado River. Consequently, the surface water quality in some low-velocity areas of the Colorado River adjacent to the site has been negatively affected as a result of site-related contamination. The primary constituents of concern in ground water and surface water are ammonia and, to a lesser extent, uranium. The primary concern for airborne contaminants from the tailings pile is radon-222 gas (a daughter product associated with the radioactive decay of uranium mill tailings) and fugitive dust emissions.

1.2 Site History

The Moab Site is a former uranium-ore processing facility that was owned and operated by the Uranium Reduction Company and later by the Atlas Minerals Corporation (Atlas) under a license issued by the U.S. Nuclear Regulatory Commission (NRC). The processing facility, which was used for processing uranium ore to extract uranium for nuclear power plants, no longer operates and has been dismantled except for one building that is currently used by DOE as a repair/maintenance shop and warehouse.

By 1984, all milling operations at the Moab Site had ceased. Decommissioning of the mill began in 1988, and an interim cover was placed on the tailings pile between 1989 and 1995. In 1996, Atlas submitted a revised Reclamation Plan and an application to NRC to amend its existing NRC License (No. SUA-917) and to allow for reclamation of the site. Under the license amendment, Atlas was required to reclaim the tailings impoundment in accordance with the October 1996 submittal to NRC titled *Final Reclamation Plan, Atlas Corporation Uranium Mill and Tailings Disposal Area* (Atlas 1996).

In 1999, NRC completed the *Final Environmental Impact Statement Related to Reclamation of the Uranium Mill Tailings at the Atlas Site, Moab, Utah* (EIS) (NRC 1999), which focused on stabilizing the tailings pile in place. The final EIS received numerous comments both in favor of and opposed to the proposed action. However, the EIS did not address ground water compliance or remediation of vicinity properties. As part of the EIS process, the U.S. Fish and Wildlife Service (USF&WS) completed a Biological Opinion (BO) that was included in the final version of the EIS. The USF&WS concluded in the final BO that continued leaching of existing concentrations of ammonia and other constituents into the Colorado River would jeopardize the existence of two endangered fish—the razorback sucker and Colorado pikeminnow—found near the project.

In October 2000, the Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001 (Public Law No. 106-398) gave DOE responsibility for remediation of the Moab Site. This legislation also mandated that the Moab Site be remediated in accordance with Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I "subject to the availability of appropriations for this purpose."

To minimize potential adverse effects to human health and the environment in the short term, former site operators, custodians, and DOE have instituted environmental controls and interim actions at the Moab Site. Controls have included stormwater management, dust suppression, pile-dewatering activities, and placement of an interim cover on the tailings to prevent movement of contaminated windblown materials from the pile. Interim actions have included restricting site access, monitoring ground water and surface water, and managing legacy chemicals to minimize

the potential for releases to the environment. In addition, DOE designed a ground water extraction system (implemented in the summer of 2003) to intercept ground water contaminants discharging to the Colorado River, thereby reducing ammonia and uranium concentrations in ground water discharging to the river. The ground water remediation system has been expanded each year since its initial implementation.

A draft EIS was prepared and issued in November 2004 for public comment as required by the National Environmental Policy Act (NEPA), 42 *United States* Code (U.S.C.) §§ 4321 *et seq.*, to assess the potential environmental impacts of remediating the Moab Site. In July 2005, DOE completed the final EIS for the Moab Site. On the basis of the analysis documented in the EIS, the comments received during the public comment period on the draft EIS, and other factors, DOE determined that its preferred alternatives were the offsite disposal of the mill tailings pile, combined with active ground water remediation at the Moab Site. The preferred offsite disposal location was identified as the Crescent Junction Site, and the preferred method of transportation was identified as rail. In September 2005, DOE prepared and issued a Record of Decision (ROD) announcing its resolution to implement the preferred alternatives identified in the EIS.

1.3 Current Status of the Moab Site

During CY 2006, DOE prepared the *Draft Remedial Action Plan and Site Design for Stabilization of Moab Title I Uranium Mill Tailings at the Crescent Junction, Utah, Disposal Site* (RAP; DOE 2006f) for the construction of a disposal cell at the Crescent Junction Site. A series of meetings were held by DOE for the NRC to brief the regulators on key elements of the RAP. The draft RAP was submitted to the NRC in September 2006, initiating NRC's 1-year review process.

The purpose of the *Annual Site Environmental Report* is to provide DOE, state officials, and interested members of the public with current information regarding DOE activities of the Moab UMTRA Project. This report will summarize environmental activities conducted during CY 2006, environmental monitoring data collected during 2006, and noteworthy milestones and accomplishments. This report is structured as follows:

- Section 2.0 defines the laws and regulations that govern operations at the site and includes information about the site's compliance status.
- Section 3.0 describes the site's environmental management system.
- Section 4.0 describes the environmental programs operating at the site.
- Section 5.0 summarizes the data collected by the various environmental monitoring programs.
- Section 6.0 provides an overview of the surface water monitoring program and data.
- Section 7.0 discusses the quality assurance (QA) measures implemented at the site.
- Section 8.0 provides a list of references used in the preparation of this document.

2.0 Compliance Summary

This section describes the compliance status of the Moab Site with applicable federal environmental regulations, describes current issues and actions, and contains a summary of the permits held by the Moab Site.

2.1 Compliance Status

The Moab and Crescent Junction Sites operated during CY 2006 without receiving any notices of violation and did not have any occurrences that required reporting to outside agencies.

2.1.1 Floyd D. Spence Act

The primary regulatory driver for the remediation of the Moab Site is the Floyd D. Spence National Defense Authorization Act for fiscal year 2001 (Public Law 106-398), which amended UMTRCA. This Act specifies that the license for the radioactive materials at the Moab Site issued by the NRC be terminated, and the title and responsibility for cleanup be transferred to the Secretary of Energy. The Act further designates that the Moab Site undergo remediation in accordance with Title I of UMTRCA.

2.1.2 Uranium Mill Tailings Radiation Control Act

In 1978, Congress passed UMTRCA, 42 U.S.C. §§ 7901 *et seq*., 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 the Department to stabilize, dispose of, and control uranium mill tailings and other contaminated material at 24 uranium-ore processing sites and approximately 5,200 associated vicinity properties (properties where uranium mill tailings were used as construction material or landfill 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.

Uranium mill tailings fit within the larger description for residual radioactive materials (RRM). For purposes of this document, "contaminant" or "contamination" refers to RRM, unless specified otherwise. RRM is defined by UMTRCA and its implementing regulations in 40 CFR 192 as (1) waste that DOE determines to be radioactive in the form of tailings resulting from the processing of ores for the extraction of uranium and other valuable constituents of the ores; and (2) other wastes that DOE determines to be radioactive at a processing site which relate to such processing, including any residual stock of unprocessed ores or low-grade materials. RRM includes soils, tailings, facility components, buildings or building materials, equipment, legacy chemicals, and other wastes. Contaminated ground water is ground water in the uppermost aquifer that is contaminated with RRM.

UMTRCA (and by association, the Floyd D. Spence Act [see Section 2.1.1]) and its implementing regulations are the primary regulatory drivers at the Moab Site because RRM is the predominant waste generated. During 2006, RRM was managed at the Moab Site in

accordance with regulatory requirements. RRM in the form of uranium mill tailings and contaminated soils and associated materials were remediated as described in Section 2.1.17.

2.1.3 National Environmental Policy Act

Remedial actions performed pursuant to UMTRCA are considered to be major federal actions that are subject to the requirements of NEPA (42 U.S.C. 4321, *et seq*.). Regulations of the Council on Environmental Quality (CEQ) to implement NEPA are codified in 40 CFR 1500; these regulations require each federal agency to develop its own implementing procedures (40 CFR 1507.3). DOE-related NEPA regulations are established in 10 CFR 1021, *National Environmental Policy Act Implementing Procedures*. DOE prepared site-specific NEPA documentation (either an Environmental Assessment or an EIS) to address surface remediation (i.e., cleanup of tailings, residual processing materials, soil, and buildings) at each UMTRCA Title I site.

In October 1996, DOE issued the *Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Project* (PEIS) (DOE 1996). The purpose of the PEIS was to analyze the potential impacts of implementing four programmatic alternatives for ground water compliance at the designated processing sites. The preferred alternative for the UMTRA Ground Water Project was published in an ROD in 1997. The ROD provides three basic options for achieving compliance with ground water standards: no remediation, natural flushing, or active remediation. The standards that may be met include background, maximum concentration limits (as stipulated in 40 CFR 192, Subpart A), alternate concentration limits, or supplemental standards. The applicable standards are determined on a site-specific basis. The ROD also implemented a framework to select the appropriate compliance strategies for ground water remediation at Title I sites. The framework considers risks to human health and environment, costs, and stakeholder input and therefore 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 for the Moab Site. The EIS identified DOE's preferred alternatives for the Moab Site based on comments received during the public comment period on the draft EIS, the analysis documented in the EIS, and other factors. The EIS also identified DOE's preferred alternatives as offsite disposal of the uranium mill tailings pile, combined with active ground water remediation at the Moab Site. The preferred offsite disposal location was identified as the Crescent Junction Site, and the preferred method of transportation was rail. An ROD for the Moab Site was issued in September 2005 announcing DOE's decision to implement the preferred alternatives identified in the EIS.

Offsite disposal of mill tailings was selected as the preferred alternative primarily because of the uncertainties related to long-term performance of a capped pile at the Moab Site. The Crescent Junction Site was identified as the preferred offsite disposal location over other potential sites because it has the longest isolation period (time it would take for contaminants to reach the ground water); the lowest land-use conflict potential; access to existing rail lines; the shortest haul distance from the rail line into the disposal cell (reducing the size of the radiological control area); and flat terrain, making operations easier and safer. DOE identified rail as the preferred mode of transportation because compared to truck transportation, rail has a lower accident rate, lower potential impacts to wildlife, and lower fuel consumption.

In 2006, DOE continued operation of initial and Interim Actions, which focused on the reduction of site-related ground water contamination (e.g., ammonia) that is currently discharging to the Colorado River. Initial and Interim Actions in 2006 were conducted in accordance with DOE and CEQ NEPA regulations.

2.1.4 Clean Air Act/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. The primary air emissions associated with the Moab Site in its current condition are fugitive dust emissions and radon, a daughter product associated with the radioactive decay of uranium mill tailings.

Fugitive Dust

Most of the surface area at the Moab Site consists of exposed, unprotected soils and sand. With the exception of a narrow strip of land adjacent to the bank of the Colorado River where tamarisk and willows are abundant, vegetation at the Moab Site is relatively sparse and offers little protection or stabilization to the site's sandy soils. Consequently, controlling windblown sand, soils, and dust is a recognized concern.

In the State of Utah, Clean Air Act requirements are implemented by an equivalent set of state regulations. To comply with the State of Utah, Division of Air Quality regulations for the control of fugitive dust (Utah Administrative Code [U.A.C.] Section R307-309-6), DOE prepared the *Moab Project Site Fugitive Dust Control Plan* (DOE 2002b). In 2006 a similar plan was prepared for the disposal site entitled *Crescent Junction Project Site Fugitive Dust Control Plan* (DOE 2006g). These plans outline specific areas of the sites that are particularly vulnerable to wind erosion, and describes the engineering and procedural controls DOE has implemented at the sites to control fugitive dust emissions.

As required by state regulations, DOE provided a copy of the *Crescent Junction Project Site Fugitive Dust Control Plan* (DOE 2006g) to the State of Utah Division of Air Quality. The State of Utah, Division of Air Quality concurred that the DOE plan fulfilled the regulatory requirements for preparing a dust control plan and implementing controls at the Crescent Junction Site as required by Section R307-309-6 of the U.A.C. During 2006, DOE diligently implemented the controls outlined in the plans and controlled fugitive dust emissions at the sites to the greatest extent practicable. On an annual basis, DOE applies approximately 200,000 gallons of calcium chloride, a dust suppressant, to the Moab mill tailings pile and site roads in an effort to stabilize those areas of the millsite that are susceptible to wind erosion. In addition to the application of dust suppressants, DOE restricts travel in off-road areas of the mill and disposal sites, and limits vehicular speed to minimize the generation of fugitive dust. As areas are remediated, DOE seeds and mulches the areas to establish vegetative cover to control windblown dust. Over 60 acres were revegetated in 2006.

Radon

During 2006, DOE continued its environmental air monitoring program at the Moab Site and completed the first full year of baseline monitoring at Crescent Junction to monitor radon emissions and radiological exposures at various locations along the millsite property boundary, throughout the Moab community, and at the Crescent Junction site. Background monitoring locations have also been established to provide a baseline against which site exposure data may be compared. In addition to radon, DOE also collects radioparticulate and direct gamma radiation data as part of its environmental air monitoring program.

EPA has promulgated various radon control standards through its National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations in 40 CFR 61. DOE and the State of Utah have reviewed the applicability of the Subparts Q and T of NESHAP regulations and have determined that these subparts are not applicable to the Moab Project Sites (Moab and Crescent Junction) in its current unremediated condition. 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 NRC and the State of Utah, and are aimed at sites that are currently licensed by NRC. In its current unremediated condition, the Moab Site does not meet the definition of a facility that is subject to these regulations. These regulations will likely apply to the Crescent Junction Site in the future.

DOE Order 5400.5, *Radiation Protection of the Public and Environment,* provides guidelines for all DOE facilities, operations, and activities and offers the best guidance with respect to controlling radon emissions at the Moab Site, given its current status. This DOE order established a guideline for radon-222 concentrations at DOE's property boundary of 3.0 picocuries per liter (pCi/L) above background concentrations. Environmental air monitoring data collected by DOE at the Moab Site during CY 2006 indicated that radon concentrations were elevated above this guideline at several onsite locations along the millsite property boundary. Offsite monitoring data indicated that although radon levels were elevated at the DOE property boundary, these concentrations attenuated rapidly within a relatively short distance from the millsite boundary. One data anomaly was noted at a remote (approximately 5 miles) offsite location (beyond any possible Moab site influence) where one sample was above background levels. Follow-up data will be used to confirm or reject the high reading. Otherwise, radon concentrations were observed to be reduced essentially to background levels within a distance of one half mile of the millsite boundary. During 2006, DOE also conducted radon monitoring at the residential property located closest to the millsite property. This location is known as the MEI and is of particular interest to DOE because it represents a worst-case exposure scenario, where the individuals residing at this location would be exposed to the highest concentrations of radon gas. DOE's monitoring data indicate that radon concentrations at this location during 2006 were consistently below the radon guideline in DOE Order 5400.5.

Radioparticulates/Direct Gamma Radiation

In addition to controlling fugitive dust and monitoring radon levels at the Moab Project Sites, DOE also conducts environmental air monitoring for airborne radioparticulates (thorium-230, radium-226, polonium-210, and total uranium) and direct gamma radiation. Data collected during 2006 indicate that concentrations of airborne radioparticulates were several orders of

magnitude below the inhaled air-derived concentration guides (DCGs) outlined in DOE Order 5400.5. DOE concludes from these data that there were no public exposures to airborne radioparticulates that exceeded regulatory limits in 2006.

As with the radon data for CY 2006, the direct gamma radiation monitoring data also indicate that direct gamma radiation levels are elevated at several onsite locations along the DOE property boundary; however, exposure rates near the MEI and at all offsite monitoring locations throughout the Moab community were below the acceptable exposure limits specified by DOE order and by State of Utah radiation protection requirements (U.A.C Section R313-15-301, *Standards for Protection Against Radiation, Dose Limits for Individual Members of the Public*). Section 5.0 of this document provides more detail regarding DOE's environmental air monitoring activities at the Moab Project Sites during 2006.

2.1.5 Clean Water Act/National Pollutant Discharge Elimination System

Under the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) program was designed to regulate and control pollutants from industrial wastewater and stormwater discharges, both of which can have negative effects on the quality of surface waters of the United States. In Utah, the federal NPDES discharge requirements are implemented by an equivalent state system known as the Utah Pollutant Discharge Elimination System (UPDES).

The Moab Project Sites have no wastewater point source discharges that are subject to UPDES regulations; however, stormwater discharges from the site are regulated by UPDES requirements. In compliance with UPDES stormwater discharge regulations in Section R317-8-3.9 of the U.A.C., DOE submitted a Notice of Intent to the State of Utah, Department of Environmental Quality, Division of Water Quality in September 2006. In response to this Notice of Intent, the State of Utah issued a *General Permit for Storm Water Discharges Associated with Industrial Activity* (permit number UTR105820) in September 2006. As required by the stormwater discharge permit, DOE also prepared and implemented the *Moab Project Site Storm Water Pollution Prevention Plan* (SWP^3) (DOE 2002c and 2006h). These SWP^3 outline the engineering controls and best management practices that DOE has implemented at the Moab Sites to control and minimize storm water discharges from the site. Copies of the SWP^3 and the stormwater discharge permit are maintained at the site. To ensure that the stormwater controls and best management practices are performing as designed, DOE conducts two stormwater inspections per month and documents the inspection results on a site-specific checklist. The stormwater discharge permit issued to the Moab Site provides coverage under the UPDES stormwater discharge regulations until May 27, 2007.

Several localized heavy storm events occurred at the Moab Site during 2006. Erosional features were repaired by filling the eroded areas with clean fill material, regrading damaged areas with heavy equipment, and reseeding with native vegetation. Erosion logs and blanket material were also used in clean areas to control stormwater that was entering the site from US-191 and collecting in a depression onsite created during remediation. All stormwater controls functioned as designed, and no contaminated materials were discharged offsite.

There is no sewer effluent associated with site operations. New restrooms were constructed in 2006 utilize a leach field. Bottled water is provided for onsite drinking water needs and city water is trucked to the site for other domestic requirements.

2.1.6 Clean Water Act/Executive Order 11990, *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 the U.S. Army Corps of Engineers (USACE) in 2005.

Activities accomplished in 2006 with the potential to affect jurisdictional wetlands include upland soils remediation, stormwater controls, road improvements, temporary access roads, vegetation removal (chiefly tamarisk), revegetation activities, installation of monitoring and extraction wells (Configuration 4), and dredging operations to maintain the water-intake structure supplying the onsite holding pond used for site activities such as dust control and equipment washing. All of these activities were permitted under the State of Utah's Streambank Alteration permits through a cooperative agreement with USACE.

2.1.7 Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA), 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.

As noted in Sections 2.1.1 and 2.1.2, the primary regulatory driver at the Moab Site is the Floyd D. Spence National Defense Authorization Act for FY 2001, and through it, UMTRCA. This is because the primary waste generated at the Moab Site is RRM in the form of uranium mill tailings and associated materials, the cleanup and management of which is regulated by UMTRCA, not RCRA. All waste generated within the boundary of the site contaminated area is considered RRM. Waste generated outside the contaminated area is considered non-RRM and, therefore, can be regulated by RCRA. No RCRA wastes were generated in 2006.

2.1.8 Executive Order 13101: *Greening the Government through Waste Prevention, Recycling, and Federal Acquisition*, and Executive Order 13148: *Greening the Government through Leadership in Environmental Management*

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 environmental management systems.

DOE has implemented the requirements of Executive Order 13148 through issuance of DOE Order 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. Order 450.1 requires that DOE develop and implement an Environmental Management System (EMS). In 2005, the Moab Site became integrated into the EMS that is partially managed by DOE-EM in Grand Junction, Colorado. The EMS is designed to integrate environmental protection, environmental compliance, pollution prevention, and continual

improvement into work planning and execution. The document establishes a framework for identifying measurable environmental goals, objectives, and targets, which are reviewed and updated annually. The EMS is further discussed in Section 3.0.

In addition, during 2006, DOE adhered to the requirements of these executive orders by: burning used oil generated from equipment maintenance in onsite oil-burning space heaters; recycling office paper, aluminum cans, and automotive batteries; purchasing electricity generated by a pollution-free source (wind power); purchasing bio-based lubricants and grease; and purchasing a non-hazardous solvent to clean grease from equipment.

2.1.9 Toxic Substances Control Act

The Toxic Substances Control Act (TSCA) 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, both new and old, entering the environment and to regulate their production, sale, and management as a waste, where necessary. TSCA specifically addresses the use and management of polychlorinated biphenyls (PCBs) and asbestos.

Historical records indicate various types of asbestos-containing materials (ACM) have been disposed of in the onsite tailings pile. These ACM wastes, such as transit pipes, insulation, siding, roofing, and floor tiles, were generated from the demolition of millsite structures when Atlas terminated milling operations. It is unknown whether PCB-contaminated materials, such as discarded electrical transformers, were also disposed of in the tailings pile. It is suspected that ACM is present in remaining onsite historical buildings and utilities, and PCB wastes may be present in fluorescent light ballasts in the warehouse/shop building. All of these materials were associated with past milling operations conducted at the Moab Site. Any ACM and PCB-contaminated materials that remain within the site's contaminated area are considered RRM and are therefore subject to UMTRCA regulation, not TSCA regulation.

During 2006, no PCBs or ACM required management at the Moab Site.

2.1.10 Superfund Amendments and Reauthorization Act, Title III: Executive Order 12856 *Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements*

Title III of the Superfund Amendments and Reauthorization Act (SARA), which is the *Emergency Planning and Community Right-to-Know Act of 1986*, 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 Moab Site chemical inventory and activities annually to determine if any SARA Title III reporting is required.

During 2006, one hazardous chemical, calcium chloride, was stored at the Moab Site in an amount exceeding its threshold planning quantity, as established in Section 312 of SARA. Therefore, as required by Section 312, a *Tier Two Emergency and Hazardous Chemical Inventory* report was submitted in 2006 for the 2005 reporting period for the calcium chloride to the state emergency response commission, the local emergency planning committee, and the

local fire department. No other SARA Title III reporting requirements applied to the Moab Site during 2006.

2.1.11 Endangered Species Act and Migratory Bird Treaty Act

Endangered Species Act

The Endangered Species Act (ESA) requires federal agencies to consult with the USF&WS 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.

As part of the EIS process, formal and informal consultation has taken place with USF&WS. The final EIS, released in July 2005, included a Biological Assessment (BA) and Biological Opinion (BO) that evaluated proposed actions related to either removing or stabilizing the uranium mill tailings onsite and the potential impacts to protected species that may be present. Various mitigative or protective measures were included as part of the BO, including monitoring backwater habitats for potential impacts to fish, using 0.25-inch screens on all pumps, and developing a biota monitoring plan, among others. DOE continues to meet the required mitigation stated in the BO.

In addition to specific habitat protective measures, the BO required DOE to make a one-time payment of $3,917.45 (based on a current depletion charge of $16.67 per acre-foot) to the National Fish and Wildlife Foundation to offset the impact related to use of Colorado River water. DOE requested a water-depletion allowance of 235 acre-feet per year for use of the Colorado River water to meet project needs.

A biota monitoring plan to evaluate site-related impacts on fish was completed in January 2006 as required by the BO. The biota monitoring plan was implemented during the summer of 2006. No adverse impacts on fish were observed.

Other Surveys Conducted

As a part of characterization and cleanup of windblown materials both on the Moab Site and on adjacent properties with windblown materials, surveys were conducted to locate the southwestern willow flycatcher prior to vegetation removal. None were found to be present. Additionally, a botanical survey was completed at the Crescent Junction Site, and no protected plant species were found to be present.

Migratory Birds Treaty Act

The presence of migratory birds in the Moab area was evaluated in the BA. The BO concurred that the potential consultation 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). They have been known to frequent nearby areas. None were found to be present at the Moab Site.

At the Crescent Junction Site, the burrowing owl, a Utah "sensitive" species, was identified as potentially present. During a survey conducted by the Utah Division of Natural Resources in July 2005, one confirmed burrowing owl nest was located within the withdrawal area. Construction work conducted during the 2006 season did not affect the nesting site. There are a large number of prairie dog burrows present, which are associated with the burrowing owl habitat needs. The nesting burrowing owl identified in 2005 was not observed in 2006. If a nesting burrowing owl is determined to be present, DOE is committed to a 0.25-mile buffer area around the nest and to avoid activities in these areas until August. Hawks are known to hunt in the Crescent Junction Site area; however no nests are known to be present.

2.1.12 Executive Order 11988: *Floodplain Management*

DOE's implementing regulations in 10 CFR 1022 identifies 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 (DOE 2005a).

Interim actions implemented in the floodplain during 2006 included soils remediation, removal of tamarisk in the well field area and in areas of soils remediation, installation of additional ground water wells (Configuration 4), and revegetation. Revegetation activities included planting and seeding of desirable, native species, and weed control. Prior to commencement of work, a Floodplain and Wetlands Assessment was prepared for the additional interim actions at the Moab Site, and a Statement of Findings was printed in the Federal Register.

Minor erosion-control actions were taken in 2006 to prevent sedimentation to the river, and all wetlands were avoided.

2.1.13 Safe Drinking Water Act

The provisions of the Safe Drinking Water Act (40 CFR 141) are not directly relevant to the Moab or Crescent Junction Sites because neither ground water nor surface water at or near the site is used as a public drinking water supply. DOE did not engage in any activities that affected drinking water supply sources; therefore, the requirements of this statute are not applicable to the activities occurring at the Moab Site during CY 2006.

2.1.14 National Historic Preservation Act

In 2006, a Memorandum of Agreement (MOA) between DOE, the State Historic Preservation Office (SHPO), and the Utah Department of Transportation concerning the mitigation of cultural resources on the Moab Site was approved. The remaining millsite features (warehouse building, water pump station, ore loadout structure, and scale house), a 1930s-vintage log cabin, a section of historic U.S. Highway 160, a stock driveway sign, and a prehistoric rock shelter are all located on DOE property and are eligible for inclusion in the National Register of Historic Places. Because these sites could potentially be affected by remediation activities, the MOA describes how each site will be protected or mitigated. In accordance with the MOA, mitigation was performed, the log cabin was removed, and the pump station was upgraded.

In 2006 additional cultural resource inventories were performed at the Crescent Junction Site for the remaining withdrawal area, potable water line, and electric power line. A draft MOA was submitted to SHPO and the BLM.

2.1.15 Utah Water Rights Law

Section R655, *Natural Resources, Water Rights*, of the U.A.C. provides regulations relative to the diversion and use of water resources within the state of Utah. All water rights associated with the former Atlas millsite were transferred to DOE in 2002. Currently, DOE uses water from the Colorado River for onsite dust suppression. Water is pumped from the millsite intake structure to an onsite holding pond, where another pump is used to fill water trucks. In conjunction with the application of dust suppressants, river water is used to control dust on site roads and for construction activities for compaction.

In addition to dust suppression activities, DOE will conduct various ground water remedial actions in the future that will require the use of water rights. During 2006, DOE continued operation of the Interim Action ground water remediation project. This effort consisted of installing an additional gallery of extraction/infiltration wells between the tailings pile and the Colorado River. The well gallery intercepts and collects contaminated ground water before it reaches the river and pumps the contaminated water to a lined evaporation pond that was constructed on top of the mill tailings pile. Because this ground water remediation strategy consumes water through evaporation, a *Temporary Change Application* was submitted and received from the State of Utah, Department of Natural Resources, Division of Water Rights. During 2006, the Interim Action ground water remediation system pumped and treated (through evaporation) approximately 33.8 million gallons of contaminated ground water. Through the end of 2006, a total of approximately 72.4 million gallons of contaminated ground water have been extracted and evaporated.

Also during 2006, DOE implemented the Initial Action ground water remediation project. The Initial Action is designed to be a non-consumptive water use activity wherein clean river water is used to dilute "hot spots" of ammonia where they are most likely to be seeping into the Colorado River. This action is expected to provide immediate relief to critical fish habitat in the backwater areas of the Colorado River immediately adjacent to the Moab Site. In May 2006, DOE submitted a *Temporary Change Application* to appropriate water to the State of Utah, Department of Natural Resources, Division of Water Rights. Approval for three (including construction water for the Policaro project) *Temporary Change Applications* was received from the State of Utah, Department of Natural Resources, Division of Water Rights in 2006. *Temporary Change Applications* are approved only in 1-year increments, and must be renewed annually for the Interim Action and Initial Action remediation systems.

2.1.16 Federal Insecticide, Fungicide, and Rodenticide Act

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) governs the use, storage, registration, and disposal of pesticides. FIFRA categorizes pesticides as either "restricted use" or "general use". EPA may classify a pesticide as restricted use (1) if it is determined that substantial adverse effects to the applicator or environment may occur without additional regulatory restrictions or (2) if unreasonable harm to humans or the environment may occur, even if the pesticide is used as directed by the label instructions. FIFRA regulations require that restricted-use pesticides 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 2006 to control noxious weeds.

2.1.17 Surface Remediation of Moab Site

To support remediation of the Moab Site, DOE has assessed Moab Site soils for radiological contamination. This assessment provided a general sense of where the highest concentrations of radiological contaminants in soil exist. 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.

During 2006, the Moab UMTRA Project performed significant remediation projects on adjacent U.S.191 and Policaro properties as well as the pump inlet and pond areas. The contaminated soil was surface contamination probably originating from a windblown source. Excavated contaminated soil was transported to the tailings pile for future removal to the permanent disposal site. As soils are remediated, DOE is replanting native plant communities in those areas. The contaminated footprint at the Moab Site was reduced by an additional 53 acres in 2006 for a total of 78 acres since the start of soil remediation. Areas included in the DOE site acreage numbers include RRM cleanup plus areas where supplemental standards have been applied. In addition to the acreage on the DOE site, approximately 24 acres of RRM were remediated on an adjacent private (Policaro) property.

2.2 Current Issues and Actions

DOE uses external and internal environmental audits and management compliance assessments to evaluate environmental compliance and to implement corrective actions. The QA organization performed surveillances and management assessments to verify system descriptions and compliance with internal procedures.

Mitigation and compliance requirements in the EIS and ROD are tracked monthly for compliance. Proposed initiation of Moab Site remediation and construction at the Crescent Junction Site required acquisition of new permits, (i.e. Grand County Conditional Use Permit and Stormwater Discharge, and Fugitive Dust Permits for Crescent Junction). Following issuance of the USF&WS BO and USACE 404 Permit in 2006, monitoring and compliance with conditions of approval are required.

2.2.1 Summary of Moab Site Permits

Table 2−1 shows the permits and agreements that were active at the Moab Site during 2006.

Table 2–1. Permits/Agreements Active in 2006 at the Moab Site

Permits/Agreements	Issuing Agency	No. of Permits
UPDES Storm Water Discharge Permit (permit number UTR100971)	State of Utah, Department of Environmental Quality, Division of Water Quality	1
Ground Water Monitor Well Authorizations	State of Utah, Department of Natural Resources, Division of Water Rights	50[a]

Table 2–1. Permits/Agreements Active in 2006 at the Moab Site (continued)

Permits/Agreements	Issuing Agency	No. of Permits
Access agreements providing ingress/egress to wells and air monitoring equipment for data collection purposes	Bureau of Land Management, Private Landowners	16
EPA Hazardous Waste Generator Identification Number (UTP 000001244)[b]	EPA	1
Stream Channel Alteration Permits for the Colorado River intake structure and for structures and well fields to support the initial and interim ground water actions	State of Utah, Department of Natural Resources, Division of Water Rights	3
Scientific Research and Collecting Permit Number ARCH-2005-SCI-001 to collect background air samples at the Arches National Park	National Park Service	1
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
Ingress and egress to railroad property to construct and maintain access road, potable water line, and electric power line	Union Pacific Railroad	4
Highway right-of-way encroachment permits to conduct surveys and perform remediation	State of Utah, Department of Transportation	2
Withdrawals of 11,985 and 2,300 acres, respectively, of Federal land to consider building a uranium mill tailings disposal cell	Bureau of Land Management	2
Right-of-way to conduct radiological survey and remediation at the BLM vicinity properties 023 and 024	Bureau of Land Management	1
Vicinity property access agreements for radiological survey and remediation	NPS, McClatchy and Policaro	3
DOT Special Permit to transport mill tailings	U.S. Department of Transportation	1
UPDES Stormwater Discharge Permit for Crescent Junction: UTR105820	State of Utah, Department of Environmental Quality	1
Fugitive Dust Control Plans: Moab DAQC-626-2002 Crescent Junction DAQC-1110-2006	State of Utah, Department of Environmental Quality	2
404 Nationwide General Permit for Pump Inlet, and remediation and realignment of Moab Wash	U.S. Army Corps of Engineers	1

[a]This is the number of monitor wells that were authorized and installed by DOE in 2005. Since taking over the site, DOE has installed 107 authorized wells. This number does not reflect the total number of monitor wells that DOE uses to support its ground water monitoring program at the Moab Site.
[b]Acquired previously for offsite disposal of non-RRM hazardous legacy chemicals.

3.0 Environmental Management System

Implementation of an EMS was mandated for all federal agency facilities by Executive Order 13148. The EMS establishes a framework for identifying measurable environmental goals, objectives, and targets, which are reviewed and updated annually. The EMS for the Moab site is described in detail in (DOE 2006a) and summarized below.

3.1 General Requirements

An EMS is a systematic and structured approach to address the environmental consequences of an organization's activities, products, and services. DOE Order 450.1 defines an EMS as "a continuous cycle of planning, implementing, evaluating, and improving processes and actions undertaken to achieve environmental missions and goals." Most federal facilities have adopted the ISO 14001 EMS standard as the framework upon which their EMS programs are built. Similarly, DOE's EMS is based on the standard elements identified in ISO 14001 and integrates these elements into the core functions of the contractor's Integrated Safety Management System (ISMS) Program.

3.2 Environmental Policy Statement

DOE is committed to achieving the highest standards of environmental quality in performing its work, and to providing a safe and healthful workplace for employees and contractors. Daily operations and activities must be performed in compliance with applicable federal and state laws, regulations, permits, and other applicable DOE Orders and requirements.

This philosophy is reinforced through an Environmental Policy Statement, and promotes a workplace culture that is founded upon the values of safety, compliance, integrity, and quality. The Environmental Policy Statement prepared for this EMS is found at the front of this document, immediately behind the front cover. The values espoused by the Environmental Policy Statement are implemented through the programs described in this EMS, and by integrating these practices into the principles of the ISMS.

The Environmental Policy Statement is communicated to all employees through the EMS general awareness training, various EMS-related publications (e.g., this document, brochures, posters), and is available via links on the local intranet. This policy is communicated to the public through the DOE−LM website at http://www.lm.doe.gov/. Copies of the policy are also posted in all of the locations that conduct activities for the DOE Offices previously described.

The Environmental Policy Statement is a declaration of senior management's commitment to protection of the environment, and serves as the foundation for this EMS. All employees are expected to be familiar with and understand this policy. This policy is aligned with DOE's core mission and includes a commitment to continual environmental improvement, pollution prevention, and regulatory compliance.

3.3 Self-Declaration Process

DOE has chosen to use the Self-Declaration procedure outlined in DOE Guidance 450.1-1 to document that this EMS complies with DOE Order 450.1. Self-declaration is a mechanism whereby a site publicly asserts that it conforms to the Order. Self-declaration provides for effective and objective assessment of the integrated ISMS/EMS in a manner that not only ensures a system that meets the requirements of DOE Order 450.1, but that is also designed for ongoing evaluation and continual improvement.

In August 2005, an independent internal audit of the EMS was conducted by a third-party QA organization[1] using the Self-Declaration procedure provided in DOE Guidance 450.1-1, Attachment 2. This procedure was developed pursuant to the *Agency Self-Declaration Protocols for Appropriate Federal Facilities* (September 10, 2003), which was developed by the Executive Order 13148 Interagency Working Group. As a result of this audit, DOE-LM was able to self-declare on October 13, 2005, that its EMS complies with the requirements of DOE Order 450.1.

3.4 Environmental Aspects, Objectives, and Targets

In accordance with DOE Guidance 450.1-2, DOE and its contractors evaluate their activities, products, and services to identify the significant environmental aspects of work activities that have the potential to negatively impact the environment, the public, or to result in a noncompliance with regulatory requirements. This EMS is designed to control and reduce, where possible, the impacts associated with the identified aspects.

Environmental aspects will be identified annually, and determination of aspects will be initiated during the Task Order development process, as specific work tasks are negotiated between DOE and its contractor(s). Determining the significant environmental aspects during the task order process ensures that resources will be dedicated to addressing those aspects that have a potential impact upon the environment or health and safety. Additionally, the EMS provides a framework whereby environmental performance is continually evaluated and the activities having impacts may be periodically adjusted to bring its performance into alignment with stated goals and mission objectives.

Objectives and targets are based on the environmental policy, legal and other requirements, and consideration of significant environmental aspects, stated goals and mission, and the views of affected stakeholders. Although DOE and the contractor(s) are operating jointly under this EMS, the objectives and targets that are appropriate to their respective significant environmental aspects are determined independently; that is to say, DOE and the contractor are each responsible for determining the objectives and targets that apply to its own respective work activities. This separation is necessitated by the fact that the nature of the work performed by DOE and the work performed by the contractor is inherently and significantly different. Therefore, it follows that the environmental objectives and targets likewise may be different; however, the *process* or *system* for identifying these objectives and targets is the same for either entity.

[1] Chris J. Reimer, Registrar Accreditation board, Environmental Management Systems Lead Auditor.

At a minimum, objectives and targets shall be reviewed annually (i.e., when Task Orders are developed and negotiated) and updated as appropriate. As with the identification of significant environmental aspects, DOE and the contractor rely on the Task Order process as the primary planning tool for the identification of objectives and targets. Once significant environmental aspects have been determined, the EMS Core Team and project staff will develop objectives and targets for each significant aspect for approval by senior management. The EMS objectives describe the goals for environmental performance and, if possible, should be measurable. The EMS targets are specific and measurable immediate steps that can be implemented to obtain the objectives. Once the objectives are established, they are broken down into more specific, subordinate targets.

Table 3–1 identifies significant aspects, objectives, and targets for the DOE/Stoller Legacy Management Team (including the Moab project) for FY 2006.

3.5 Training, Awareness, and Competence

Environmental training is provided to ensure that all employees possess the knowledge and skills that are necessary to:

- Perform their jobs in a safe, effective, and environmentally responsible manner;
- Comply with Federal, State, and Local environmental laws, regulations and permits, and company requirements and policies;
- Increase their awareness of environmental protection practices and pollution prevention/waste minimization opportunities; and
- Take appropriate actions in the event of an emergency.

Two types of training are required under this EMS: General EMS Awareness and Competence training.

Line management/hiring supervisors may only hire people sufficiently qualified and skilled to perform the duties to which they are being hired. Line management is responsible for ensuring that all employees are competent, skilled, and appropriately trained to safely and efficiently perform their respective duties and job assignments. Basic qualifications and competence requirements are defined in the job descriptions developed for each position.

3.6 Communication

Effective integrated environmental management demands effective communications to coordinate staff internally and to maintain open, clear lines of communication with external stakeholders. With respect to DOE's mission and goals, DOE and the contractor are committed to communicating environmental information to its employees and the public, as well as receiving input from employees and external stakeholders. DOE is also committed to fully disclosing environmental issues to applicable regulatory agencies and working with these agencies to remedy any deficient or non-compliant conditions that may arise.

Table 3–1. Environmental Management System (EMS) Significant Aspects, Objectives, and Targets for the DOE/Stoller Legacy Management Team – FY 2006

Significant Aspects	Activities/Products/Services	Impacts (Environment/Worker Health and Safety)	Objectives	Targets
Paper Consumption	• Preparation of reports / documents • General office work • Use of printers, faxes, copiers, business machines • Cleaning / maintaining office space • Sampling activities	• Depletion of natural resources • Office clutter • Impacts local landfill space • Non-hazardous waste generation	• Reduce paper consumption	• Reduce paper use at the DOE-LM Grand Junction site by 5% (per capita) • Establish paper use baseline at other DOE-LM sites (those with business/office activities)
Staff Travel (Ground and Air)	• Travel to and from office (essential work activities) • Travel to and from remote sites (essential work activities)	• Fuel consumption / depletion of natural resources • Air emissions / waste generation • Employee accident / injury and property damage	• Eliminate non-essential vehicle and air travel and optimize use of GSA vehicles	• Reduce travel by 5% through the use of televideo and teleconferencing technology
Energy Consumption (Electricity, Natural Gas, etc.)	• General office work • Use of printers, PCs, copiers, business machines, etc. • Office lighting • Heating / cooling work spaces • Use of appliances, testing equipment, chargers • Outside security lighting • Operation of GW treatment systems • Operation of environmental monitoring equip. (wells, air samplers, pumps, etc.)	• Depletion of natural resources • Air emissions / waste generation at power plants	• Reduce energy consumption and increase use of renewable energy sources	• Buy electricity generated by renewable sources for two DOE-LM sites • Provide energy conservation awareness training to employees • Perform energy audits at two DOE-LM sites
Toxic Chemical Use at Disposal Sites	• Manage vegetation	• Accumulation of toxic chemicals in the environment (soil and water) • Worker exposure • Wildlife exposure	• Reduce use of toxic chemicals	• Identify alternative, more environmentally friendly methods for vegetation management at two DOE-LM sites

3.7 EMS Documentation

Maintaining proper documentation of DOE's EMS program provides a source of information to interested external parties in how the EMS program was designed and implemented. This information is essential for enabling external parties such as registrars, regulators, potential customers, and stakeholders to understand the processes and operational controls whereby DOE manages their work activities, and mitigates environmental impacts.

3.8 Document Control

Contractor Records Management/Document Control is responsible for ensuring that controlled documents receive an annual review. Notice is provided to the Environmental Services Manager for the annual review and update of the EMS. The Environmental Services Manager is responsible for incorporating any changes resulting from the annual Management Review and for reviewing the EMS annually and updating the document as needed.

3.9 Operational Control

Operational controls are established for those activities that affect significant environmental aspects. Operational controls consist of policies and procedures, trained personnel, physical or administrative controls, process monitoring and specific acceptance criteria stated in procedures. Operational controls exist in contractor manuals, desk instructions, and plans that are generated, produced, and controlled according to established contractor protocols. Specific operational controls are applied through planning, procurement, subcontracting, design, construction and facility operation. Language is included in all statements of work to inform subcontractors of the Environment, Safety, and Health Policy and to convey environmental requirements to all subcontractors. Safety, environmental, and quality reviews of plans and procedures ensure all needed controls are included.

3.10 Emergency Preparedness and Response

The *Emergency Preparedness and Response Plan* (STO 8) provides for (a) identifying and categorizing potential accidents and emergencies; (b) responding to accidents and emergencies, including the prevention or mitigation of adverse environmental impacts; (c) testing the adequacy of emergency response procedures, personnel training, and equipment through periodic drill and exercises; (d) evaluating emergency drills, exercises, and actual accidents or emergencies for lessons learned; and (e) reviewing and, when necessary, revising emergency preparedness and response plans and procedures to incorporate applicable lessons learned from conducted drills and exercises or from actual accidents and emergency events. Required qualifications and training for emergency response personnel are identified, implemented and maintained.

In support of the *Emergency Preparedness and Response Plan* (STO 8), individual projects and programs may have either project safety plans (for construction activities) or Health and Safety Plans (for hazardous waste operations) to provide site specific direction related to emergency response actions.

Emergency response resources and actions are based on the degree of risk posed by the unique operations for the particular site or project for which the plan was developed. It should be noted that the current scope of work addressed by this EMS is low hazard, non-nuclear, and the Emergency Preparedness and Response Program uses a graded approach based on this hazard potential.

4.0 Environmental Program Information

Environmental programs for the Moab UMTRA Project include environmental air/radiological monitoring, surface water and ground water monitoring, waste management, and pollution prevention. This section provides descriptions of all program elements of the Moab UMTRA Project. This section also presents brief discussions of data associated with soil and sediment characterization, waste management, and pollution prevention.

In addition to the environmental programs, the DOE has a comprehensive Integrated Safety Management System and Radiological Control Program to minimize workplace hazards and to ensure protection of employees and the public. These programs are described in the *Moab Project Site Health and Safety Plan* (DOE 2005d), the *Site Radiological Control Manual* (STO 3), and the *Integrated Safety Management System Description with Embedded Worker Safety and Health Program* (STO 10).

4.1 Environmental Air Monitoring

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 Order 5400.5, *Radiation Protection of the Public and Environment*. In late 2005, air monitoring was also initiated at the Crescent Junction Site to collect initial baseline data before construction begins. Preliminary baseline monitoring data from the Crescent Junction Site are included in this report.

DOE established the air monitoring network at the Moab site to measure atmospheric radon, airborne radioparticulate matter, and direct gamma radiation at various onsite, offsite, 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. Offsite monitoring locations 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 the Moab Site.

Two background monitoring locations were established–one at the Bar-M Chuckwagon, located approximately 5.5 miles north of the Moab Site on US-191, and another approximately 2.75 miles downriver from the Moab Site along Kane Creek Road. Both background locations are similar to the Moab Site in terms of geological and physiographical features; however, they are sufficiently removed from the Moab Site that the air quality is not influenced by airborne contaminants associated with the millsite. Background monitoring locations provide ambient air quality conditions and are necessary because they provide a baseline against which site monitoring data may be compared. During 2006 the monitoring network consisted of 25 monitoring locations. Table 4–1 summarizes the types of data collected at the various monitoring locations.

Table 4–1. Summary of Environmental Air Monitoring Locations at the Moab Site

Monitoring Station	Location	Parameter: Radioparticulate (RP), Atmospheric Radon (Rn), Environmental Gamma (G).
Onsite Locations		
0101	Millsite, Perimeter	Rn, G
0102	Millsite, Perimeter	Rn, G, RP
0103	Millsite, Perimeter	Rn, G
0104	Millsite, Perimeter	Rn, G
0105	Millsite, Perimeter	Rn, G, RP
0106	Millsite, Perimeter	Rn, G
0107	Millsite, Perimeter	Rn, G
0108	Millsite, Perimeter	Rn, G
0109	Millsite, Perimeter	Rn, G
0110	Millsite, Perimeter	Rn, G
0111	Millsite, Perimeter	Rn, G
0112	Millsite, Perimeter	Rn, G
0113	Millsite, Perimeter	Rn, G
Offsite Locations		
0117	Bar-M Chuckwagon (background location, ~5½ miles north of former 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 former 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 former millsite)	Rn, G
0127	Private property (~¾ mile south of former millsite)	Rn, G
Maximally Exposed Individual Location		
MEI	Tex's River Tours caretaker residence, immediately east of site	Rn, G

Summary:

Total onsite monitoring locations:	13
Total offsite monitoring locations:	11
Total MEI locations:	1
Total radon monitoring locations:	25
Total gamma monitoring locations:	25
Total radioparticulate monitoring locations:	9 (two onsite and seven offsite)

Meteorological data are collected at the Moab Site and near the Crescent Junction Site. The meteorological monitoring parameters include wind speed and direction, evaporative transpiration potential, solar radiation, relative humidity, temperature, and precipitation.

Sections 4.1.1 through 4.1.5 discuss DOE's sampling plan for each of the parameters monitored.

4.1.1 Atmospheric Radon

During 2006, atmospheric radon was measured at 25 locations (13 onsite, 11 offsite, and 1 MEI) using Landauer Radtrak® alpha-sensitive detectors (i.e., radon cups). Each radon cup was housed in a PVC canister that was placed at approximately 1-meter above the ground surface. Radon cups were exposed for a period of approximately 3 months (i.e., quarterly exposures). Upon quarterly collection, the radon cups are sent to an offsite laboratory for analysis. Analytical results where typically received from the laboratory within 30 days. These data were compiled along with other environmental air monitoring data, 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: http://gj.em.doe.gov/Moab.

DOE has determined that the "background" radon concentration in the Moab region is approximately 0.6 pCi/L. This value was derived from averaging monitoring data collected at the two background monitoring locations. Onsite, offsite (including background), and MEI radon monitoring locations are shown in Figure 4–1 and Figure 4–2

In the absence of a Federal or state environmental radon standard that is directly applicable to the Moab Site in its current condition, the DOE guideline for atmospheric radon emissions at the site boundary (and at any offsite location) is approximately 3.6 pCi/L. This site-specific goal combines the applicable radon guideline of 3.0 pCi/L (from DOE Order 5400.5) and the average background radon value measured for the Moab region (0.6 pCi/L). It should be noted that this value is a guideline, or goal, for radon emissions; it is not an enforceable environmental standard. This value may change as additional data are collected and background values are revised.

The caretaker's residence for Tex's River Tours has been identified as the MEI (Figure 4–1). This location has special significance with respect to environmental monitoring because it represents the member of the public receiving the largest dose from all sources of radionuclide emissions combined and is considered to be the worst-case exposure scenario for a continuously occupied residential property. The MEI location adjoins DOE's property boundary on the east side of the Moab project site.

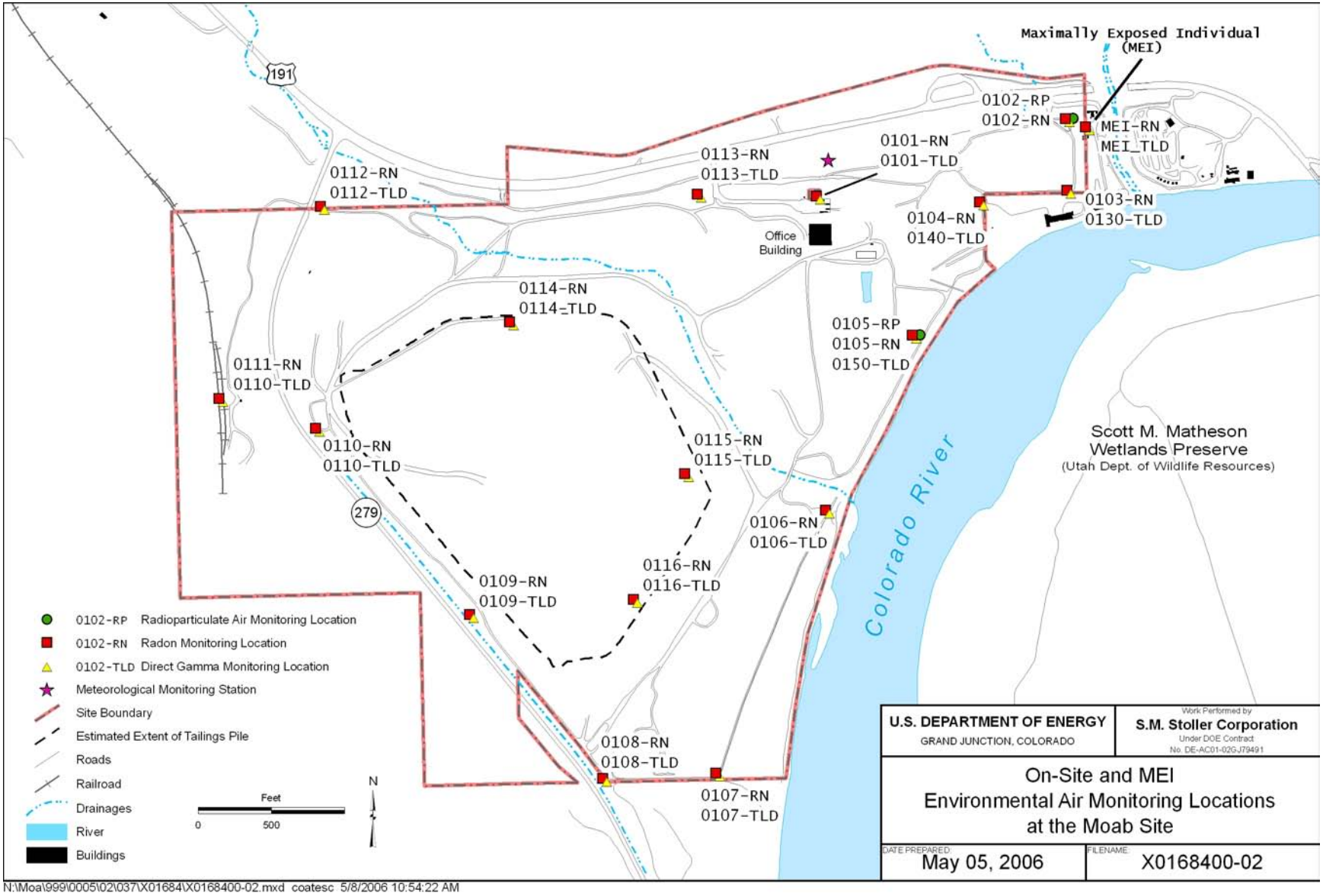

Figure 4–1. Onsite Air and Direct Gamma Monitoring Locations

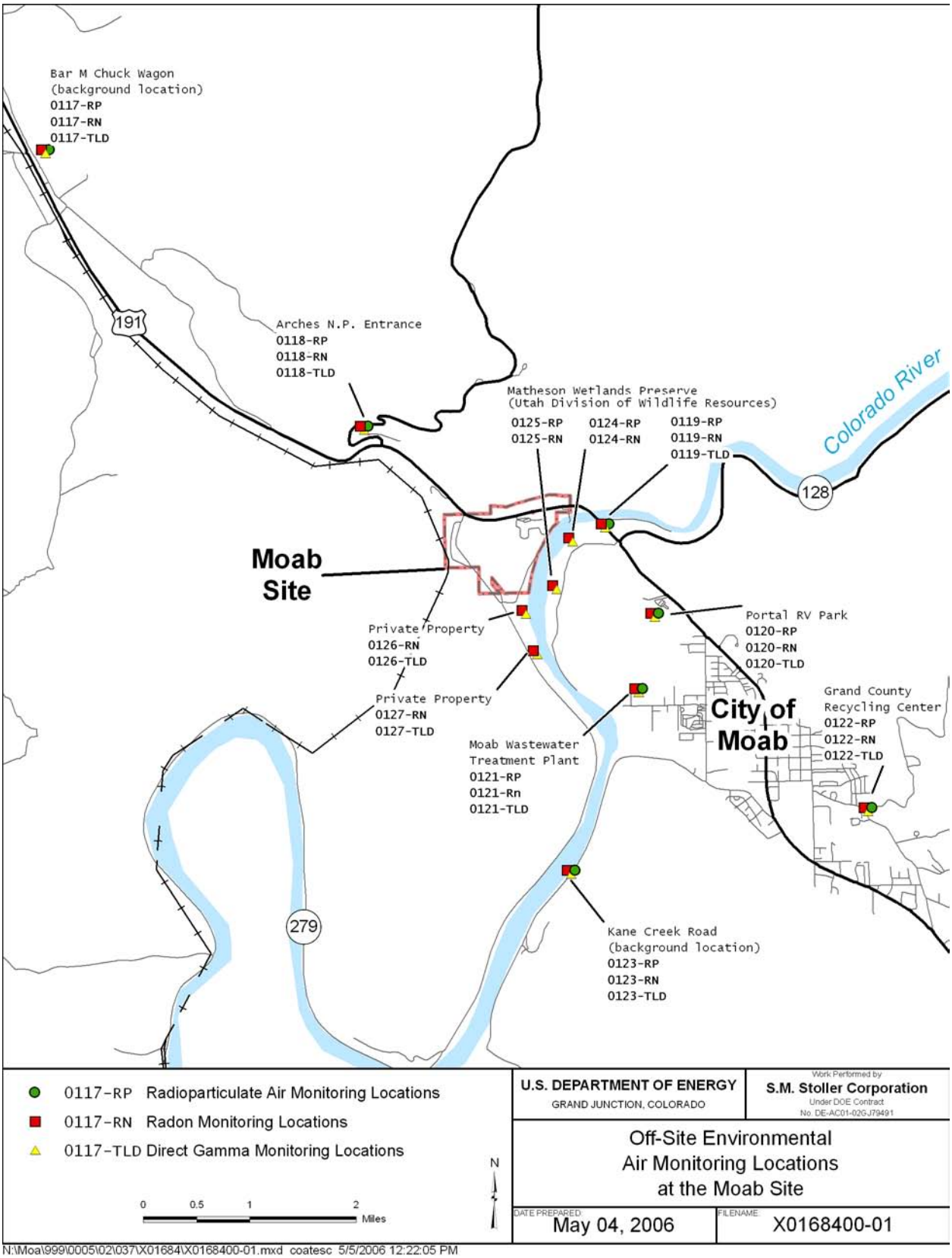

Figure 4–2. Offsite Air and Direct Gamma Monitoring Locations

4.1.2 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 Order 5400.5, *Radiation Protection of the Public and the Environment*. 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. The public dose limit (for all exposure modes) as a consequence of all routine DOE activities shall not cause, in a year, an effective dose equivalent greater than 100 mrem (DOE Order 5400.5, Chapter II[1][a]). Contributions from radon are excluded from the dose limit and are addressed independently.

Direct gamma radiation monitoring is conducted to assess the potential gamma radiation dose to persons on and near the Moab Site. During 2006, direct gamma radiation was measured at 25 locations (13 onsite, 11 offsite, and 1 MEI) using a single calcium sulfate dysprosium thermoluminscent dosimeter (TLD). TLDs are attached to fence line or metal t-post at approximately 1-meter above the ground surface. The TLDs are exposed for a period of approximately 3 months (i.e., quarterly exposures). Upon quarterly collection, the TLDs are sent to an offsite laboratory for analysis. Analytical results are typically received from the laboratory within 30 days. These data are compiled along with other environmental air monitoring data and published in DOE's Quarterly Environmental Air Monitoring reports. These reports compare monitoring data to exposure limits and guidelines, and are posted on DOE's Moab Project website at: http://gj.em.doe.gov/Moab.

DOE has determined that the background gamma radiation is approximately 81 mrem/yr at the Moab region. This value was derived by averaging monitoring data collected at the two background monitoring locations. The DOE site standard for direct gamma radiation at the site boundary (and at any offsite location) is approximately 181 mrem/yr. Onsite, offsite (including background), and MEI radon monitoring locations are shown in Figure 4–1 and Figure 4–2.

4.1.3 Airborne Radioparticulates

In 2006, DOE's air sampling network also included nine low-volume air samplers that operated continuously at two onsite locations and seven offsite (including two background) monitoring locations (see Figure 4–1 and Figure 4–2). 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 (every three months) basis. The filters were then analyzed for specific radioisotopes characteristically associated with uranium mill tailings. These radioisotopes include radium-226 (Ra-226), thorium-230 (Th-230), polonium-210 (Po-210), and total uranium (U-nat).

Radioparticulate data were compiled along with other environmental air monitoring data, and published in DOE's Quarterly Environmental Air Monitoring reports. The analytical data (the annual average values) were compared to DOE's DCGs (for inhaled air) as published in Chapter III of DOE Order 5400.5, *Radiation Protection of the Public and the Environment*. 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.

4.1.4 Fugitive Dust

In compliance with Section R307-205, *Emissions Standards: Fugitive Emissions and Fugitive Dust* of the U.A.C., DOE monitors fugitive dust emissions that result from all construction activities at the Moab Site. 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 the construction project manager.

As required by the State of Utah regulations for the control of fugitive dust (Sections R307-309-6, *Fugitive Dust Control Plan*, of the U.A.C.), DOE prepared the *Moab Project Site Fugitive Dust Control Plan* (DOE 2002b). This plan outlines specific areas of the Moab Site that are particularly vulnerable to wind erosion and describes the engineering controls that DOE has implemented at the Moab Site to control fugitive dust emissions. This plan was provided to the State of Utah Division of Air Quality on April 2, 2002.

The additional *Fugitive Dust Control Plan* was submitted and approved in August 2006 for the Crescent Junction Disposal Site.

4.1.5 Meteorological Monitoring

DOE has installed two meteorological monitoring stations at the Moab Site including an additional one on the tailings pile in mid-2006 and a meteorological monitoring station installed near the Crescent Junction Site. 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, evaporative transpiration potential, wind speed, wind direction, standard deviation of wind speed, and total rainfall.

4.2 Surface and Ground Water Monitoring

The 2006 water monitoring program for the Moab Site was extensive. Routine water monitoring was conducted 3 times during the year along with monthly sampling of the four Interim Action systems that were operated during the year. A baseline area outside the influence of the Interim Actions was also sampled to evaluate natural variability of the ground water and surface water systems based on changes in Colorado River stage. Several calculation sets were completed that analyzed the data collected (DOE 2006b, c).

4.2.1 Surface Water

The principle surface water feature in the vicinity of the Moab Site is the Colorado River, which flows adjacent to the east boundary of the site. Another significant surface water feature, across the river from the site, is the Scott M. Matheson Wetlands Preserve (Matheson Wetlands

Preserve). This is the only sizeable wetlands area on the Colorado River in the state of Utah. A study of the water quality of the Matheson Wetlands Preserve was conducted by DOE in 2006 (DOE 2006d). The study indicated that contamination from the site was not affecting water quality of the wetland area.

Surface water sampling in 2006 focused on understanding the effects of ground water discharge and ground water remediation activities on the quality of surface water in areas of potential fish habitat. Most samples were analyzed for the site-related analytes uranium, ammonia, chloride, sulfate, and total dissolved solids. In addition, alkalinity, dissolved oxygen, oxidation-reduction potential, pH, specific conductance, temperature, and turbidity were measured in the field at most locations. Surface and ground water locations sampled during 2006 are shown in Figure 4–3 and Figure 4–4.

4.2.2 Ground Water

Ground water sampling and analysis conducted during 2006 was extensive, but focused on purposes other than environmental compliance with ground water or drinking water standards (see discussion below). Routine sampling events took place 3 times in 2006. Interim Action sampling occurred as frequently as monthly. Most samples were analyzed for the site-related analytes uranium, ammonia, chloride, sulfate, and total dissolved solids. In addition, alkalinity, dissolved oxygen, oxidation-reduction potential, pH, specific conductance, temperature, and turbidity were measured in the field at most locations. Interim Action and routine surface and ground water locations sampled during 2006 are shown in Figure 4–3 and Figure 4–4, respectively.

Ground water sampling and analysis was not actually performed for the purposes of assessing compliance with ground water standards or other numerical criteria for ground water. Because ground water at the site is saline and qualifies for supplemental standards under 40 CFR 192 ground water regulations, ground water is only required to be protective where it discharges to the surface (i.e., the Colorado River); therefore, ground water data are not presented here. Data are available at: http://gj.em.doe.gov/Moab. However, surface water data were collected to evaluate the effect of ground water discharge on surface water quality, particularly in sensitive habitat areas. One purpose for operating the Interim Action well field was to determine if active ground water remediation could effectively improve surface water quality. Selected surface water data are presented in Section 5 and Appendix A for purposes of evaluating surface water quality against applicable standards.

4.3 Sediment and Soil Characterization

In 2002, DOE initiated a radiological assessment of the surface soils at the Moab Site in accordance with the *Moab Project, Moab Millsite Radiological Assessment Plan* (DOE 2002a). These radiological assessment activities included land surveys, gamma scans, borehole logging, and exposure-rate surveys. A grid system was developed for the entire Moab Site to ensure a systematic and thorough assessment of the entire mill property. The purpose of the radiological surface assessment was to confirm known areas/quantities of contamination and to estimate total volumes of site contaminated soils that are yet to be remediated.

In CY 2006, approximately 137,500 cubic yards of contaminated soils were remediated at the Moab Site, resulting in a reduction of the contaminated footprint by 53 acres.

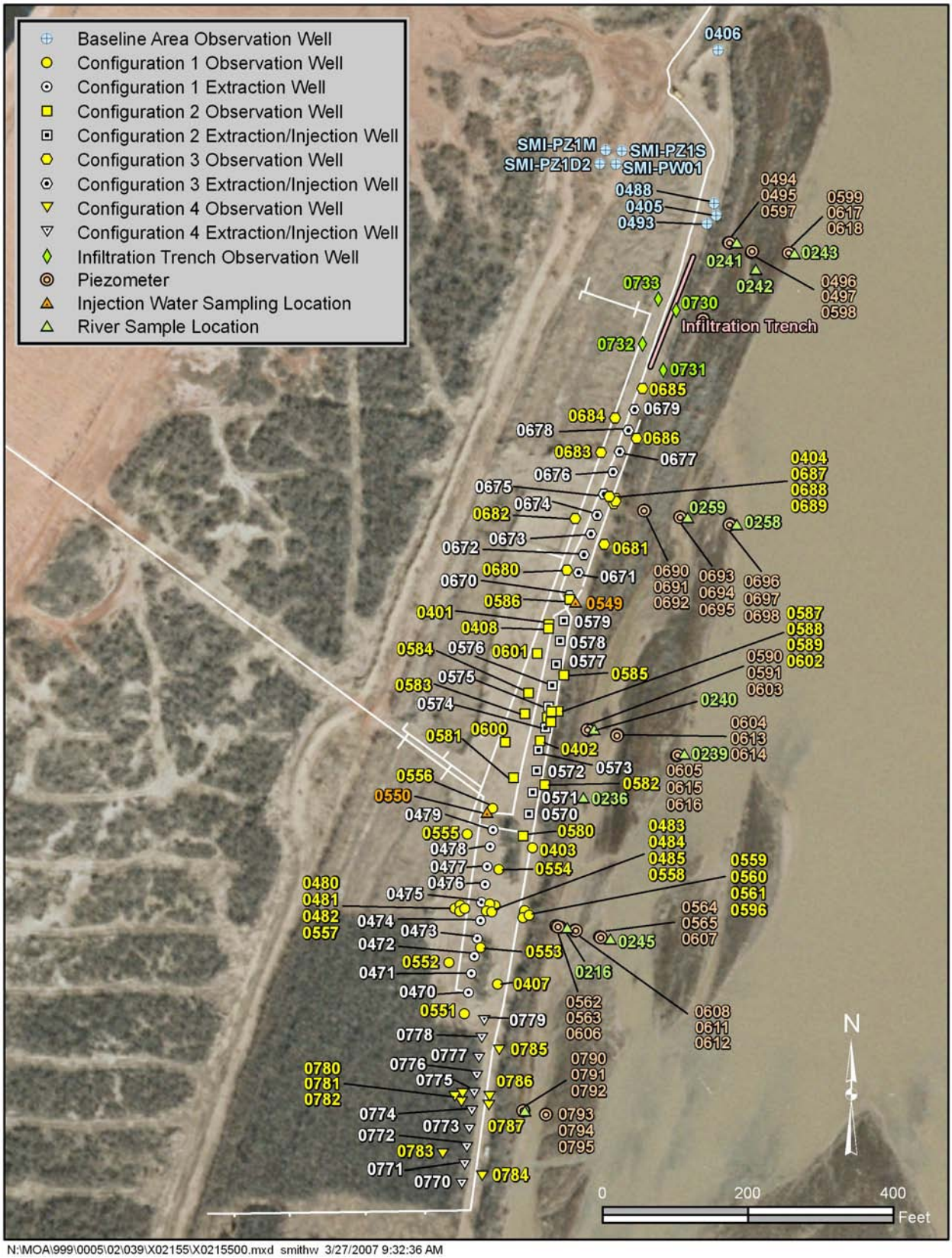

Figure 4–3. Interim Action Surface Water and Ground Water Sampling Locations in 2006

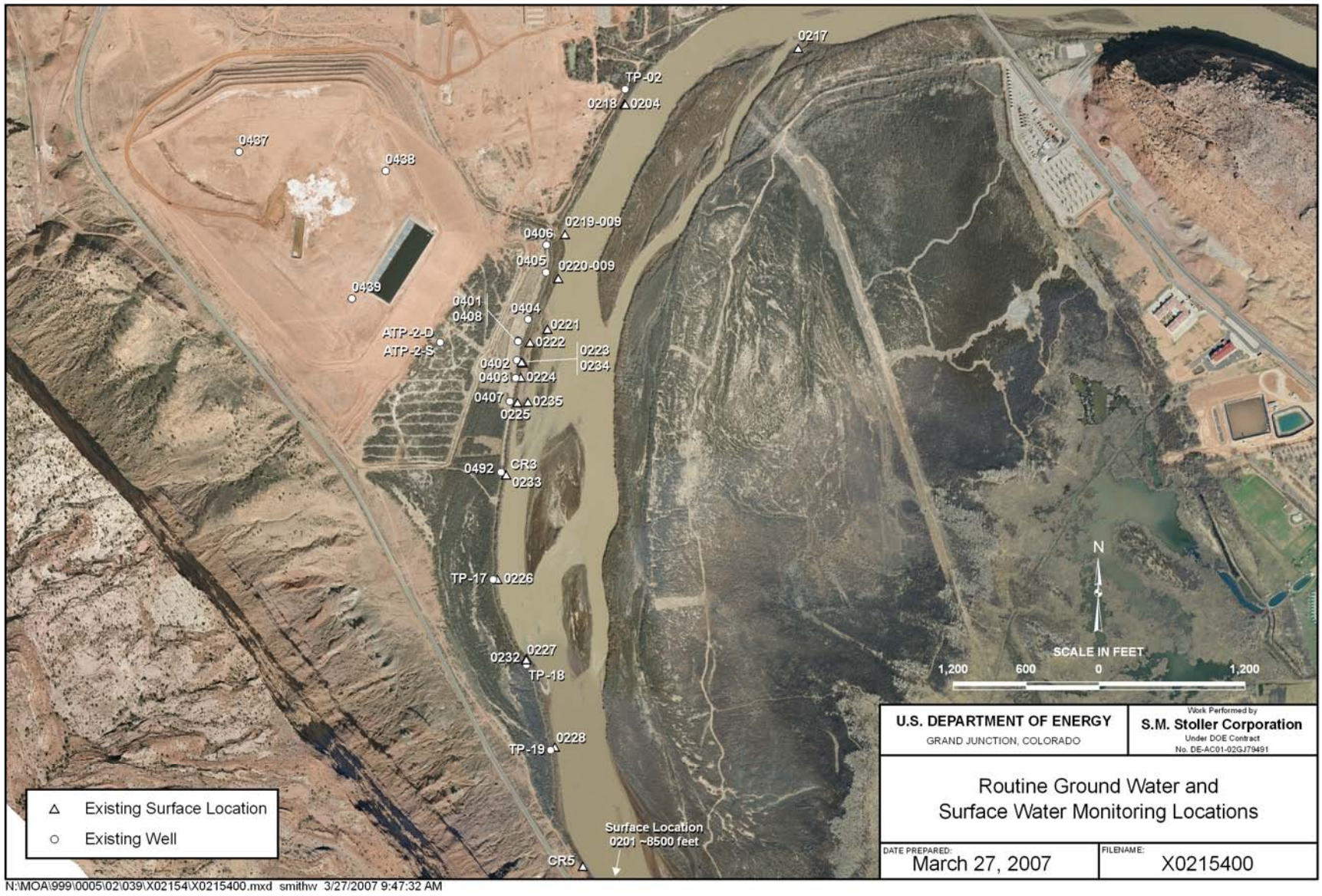

Figure 4–4. Routine Ground Water and Surface Water Monitoring Locations in 2006.

4.4 Waste Management

During 2006, DOE conducted operations consistent with the *Waste Management Guidance for the Moab Project Site* and the *Waste Management Plan for the Moab Project Site* (DOE 2005g). Formal training in the requirements of the *Waste Management Plan for the Moab Project Site* was also provided to onsite staff and subcontractors.

4.4.1 Residual Radioactive Materials

RRM, defined at 40 CFR 192.01(a), is waste that DOE determines as radioactive and related to the milling process. RRM generally refers to uranium mill tailings but may also consist of contaminated soil and debris. Contaminated ground water beneath the Moab Site is also considered RRM. Requirements for the control and cleanup of RRM are provided in 40 CFR 192 Subparts A through C. RRM in the form of uranium mill tailings, contaminated soil and associated materials, and contaminated ground water were remediated at the Moab Site during 2006.

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 in 2006 were considered RRM and were managed in a safe manner that protected site workers and the environment. When necessary, DOE ensured that all such materials were adequately labeled, segregated for compatible storage, and secured by secondary containment.

Legacy Chemicals and Industrial Products

At the end of 2004, approximately 40 containers of legacy chemicals and industrial products remained from pre-DOE site historical operations. All were considered RRM and were segregated in safe storage within the contaminated area. These included unknown materials, certain known materials, and used oil. During 2005, disposition of all legacy chemicals at the Moab Site was completed. Approximately 10 containers of legacy materials were identified for onsite use, and 20 containers were disposed of onsite in a manner that was protective of workers and the environment.

Approximately eight 55-gallon containers of legacy used oil and a small amount of oil-contaminated soil were stored in the BMPA during 2006. The non-radioactive legacy used oil was burned onsite as needed during colder months using oil-burning shop heaters.

Polychlorinated Biphenyls and Asbestos

No PCBs or asbestos-contaminated wastes were managed at the Moab Site in 2006. As a best management practice, DOE will continue to manage any PCBs or asbestos found at the site in a manner that is protective of human health and the environment.

4.4.2 Low-Level Waste Management

Low-level radioactive waste does not exist at the Moab Site. All radioactive waste at the site is classified as RRM and is regulated by UMTRCA and 40 CFR 192. The management of RRM is discussed in Sections 2.1.2 and 4.4.1.

4.4.3 Best Management Practice Area

The BMPA is a dedicated storage area constructed within the contaminated area approximately 300 feet east of the warehouse/shop building. It measures approximately 75 feet by 16 feet, is surrounded by a 2-feet -high earthen berm, and is lined with 30-mil plastic sheeting. The BMPA is intended as a temporary storage area for wastes that require further characterization or for which a disposal strategy has not yet been selected. Once adequate characterization data are obtained and a disposal strategy is selected, wastes are removed from the BMPA.

Wastes stored in the BMPA may come from existing structures, equipment, soil, or uranium mill tailings found onsite. Wastes are stored in the BMPA in a manner that is protective of human health and the environment. Other BMPA storage areas may be constructed at the Moab Site to store additional wastes generated during remediation activities.

4.5 Pollution Prevention

Pollution prevention is part of the waste management strategy for the Moab Site. 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 affirmative procurement and energy conservation.

4.5.1 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 Site primarily achieves source reduction by using work practices that minimize the amount of radioactive waste that is generated. The ALARA (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 surveying wastes to segregate 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 Moab Site during 2006 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.

4.5.2 Reuse and Recycling

Approximately 350 pounds of office paper and 100 pounds of aluminum were generated at the Moab Site during 2006. These materials were recycled at a local recycling center. In addition, automotive batteries were recycled at a local auto parts store. All these recycled materials were nonradioactive.

During 2006, DOE generated approximately 75 gallons of used oil from the maintenance of onsite vehicles and equipment. Approximately 250 gallons of nonradioactive used oil, consisting of used oil generated during 2006 and legacy used oil remaining from pre-DOE site historical operations, were burned during colder months in onsite oil-burning space heaters.

4.5.3 Affirmative Procurement

The affirmative procurement process favors the acquisition of environmentally friendly 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. The Contracts and Financial Services group 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.

4.5.4 Energy Conservation

During 2006, DOE supported the use of renewable energy by purchasing a portion of the Moab Site's electrical power through the Utah Power/PacifiCorp Blue Sky Program. This program enabled DOE to purchase electricity generated by wind turbines that operate within the western United States power grid. DOE also supported renewable energy using bio-based lubricants and grease during 2006.

The majority of site electrical power is used for pumping dust control water from the Colorado River and pumping contaminated ground water for remediation purposes. Reduction of electricity usage should be noted as a result of the 2006 purchase of more energy efficient pumps.

End of current text

5.0 Air Monitoring Summary

This section presents a summary of the monitoring data collected as a result of DOE's environmental air monitoring (including atmospheric radon, direct gamma radiation, airborne radioparticulates, and meteorological conditions), and surface water sampling programs conducted at the Moab Site during 2006.

5.1 Environmental Air Monitoring

DOE continued its environmental air monitoring activities at the Moab Site during 2006 as described in the *Moab Project Environmental Air Monitoring Sampling and Analysis Plan* (DOE 2003a). This sampling and analysis plan was prepared to identify monitoring goals and objectives, and to document DOE's strategy for monitoring various airborne contaminants. This section presents a summary of the environmental air monitoring data that DOE collected at the Moab Site and throughout the Moab community during 2006.

DOE initiated environmental air monitoring activities at Crescent Junction in fall 2005 to collect initial baseline data at and near the site before construction activities commence. Evaluation of the Crescent Junction monitoring data began in 2006.

5.1.1 Atmospheric Radon

DOE derived a site-specific guideline for atmospheric radon concentration for the Moab Site of 3.6 pCi/L (see Section 4.1.1). During 2006, the annual average atmospheric radon concentration exceeded the site-specific standard at three of the onsite locations (Table 5–1); however, the annual average radon guideline was not exceeded at any of the offsite locations.

The elevated radon concentrations observed along the site boundary are consistent with the elevated radon levels that Atlas Corporation measured for many years. During the time it operated the mill, Atlas made several documented requests seeking a variance or an exemption from the radon limits that were specified by NRC in their operating permit. Although a temporary soil cover was placed over the tailings pile, it did little to attenuate radon emissions stemming from the radioactive decay of the buried uranium mill tailings. It should be noted, however, the tailings pile does not have an engineered radon barrier, nor is the existing cover designed to control radon flux. Consequently, it is not surprising that radon concentrations continue to be elevated at various locations within the Moab Site property and along the site perimeter.

Although radon levels are elevated along the site boundary, an important finding resulting from DOE's monitoring is that radon concentrations decrease rapidly within one-half mile of the millsite. Radon monitoring locations directly across the Colorado River within the boundaries of the Matheson Wetlands Preserve (i.e., monitoring locations MPS-0119, MPS-0124, and MPS-0125) and at the MEI location (adjacent to millsite's eastern property line) demonstrate that radon concentrations are below the applicable guideline. Also, none of the other offsite monitoring locations show any indication that the average annual atmospheric radon levels are elevated significantly above background concentrations.

Table 5–1. Summary of Environmental Radon and Gamma Monitoring Data for the Moab Site for Calendar Year 2006

Station Number	1st Quarter 2006 (01/04/06–04/04/06)		2nd Quarter 2006 (04/04/06–06/28/06)		3rd Quarter 2006 (06/28/06−10/11/06)		4th Quarter 2006 (10/11/06−01/03/07)		2006 Annual Average	
	Radon pCi/L	Gamma mrem/91 d[3]	Radon pCi/L	Gamma mrem/91 d[3]	Radon pCi/L	Gamma mrem/91 d[3]	Radon pCi/L	Gamma mrem/91 d[3]	Radon pCi/L	Gamma mrem/yr
On-Site Locations										
0101	2.5	54.8	1.9	46.76	1.3	50.22	2.5	38.96	2.1	190.74
0102	1.9	23.7	1.2	19.21	0.9	22.01	1.8	22.99	1.5	87.91
0103	1.9	25.1	1.1	19.56	0.5	23.93	1.5	21.46	1.3	90.05
0104	2.4	26.2	1.2	19.97	0.7	25.04	1.6	22.59	1.5	93.80
0105	4.1	46.9	2.1	39.71	1.2	45.73	3	40.41	2.6	172.75
0106	9.2	39.7	5.9	33.58	3	38.69	6.4	34.04	6.1	146.01
0107	7.9	52.9	4.8	47.28	2.1	45.45	4.7	45.61	4.9	194.79
0108	4.8	112.5	4.9	118.45	3.6	119.93	4.5	96.43	4.5	447.31
0109	1.7	51.3	2.5	47.75	1.8	49.48	1.6	46.03	1.9	194.56
0110	2.4	80.7	3.1	74.53	1.8	76.36	2.2	66.34	2.4	297.93
0111	0.9	63.8	1	51.29	0.6	62.64	0.7	55.47	0.8	233.20
0112	1.7	38.6	1.8	31.11	1.3	NDA	1.7	36.2	1.6	141.21
0113	2.7	Lost	2.7	64.83	1.9	57.69	Lost	Lost	2.4	245.04
Off-Site Locations										
0117[1]	0.6	22	0.5	19.36	0.5	19.70	Unusable	23.83	0.5†	87.53
0118	0.8	20.2	0.6	18.97	0.6	20.61	0.9	21.07	0.7	80.85
0119	1	21.4	0.8	21.18	0.8	23.53	1.4	27.03	1.0	93.14
0120	0.6	17.8	0.7	17.28	0.5	19.82	0.7	21.7	0.6	76.60
0121	0.8	20.1	0.7	18.62	0.6	22.9	0.9	20.7	0.8	82.32
0122	0.6	18.5	0.5	18.07	<0.3	18.96	<0.4	17.45	0.4	72.98
0123[1]	0.4	18.1	<0.4	14.82	<0.3	19.38	0.5	15.21	0.4	67.51
0124	1.6	20.5	1.3	20.04	0.8	21.23	1.1	22.61	1.2	84.38
0125	2.2	23.7	1.7	21.25	0.8	25.43	1.9	23.44	1.7	93.82
0126	2.7	22	1.8	19.48	1.0	22.8	2.5	23.55	2.1	87.83
0127	0.9	19.7	0.9	20.85	0.4	21.74	0.9	22.6	0.8	84.89
MEI[2]	2	17.4	<0.4	12.97	0.6	19.25	1.4	14.29	1.1	63.71

[1]Designated background monitoring locations. Background locations are located at sufficient distances away from the millsite to be free from any affects or influences from potential site contaminants.
[2]The maximally exposed individual (MEI) is the continually occupied residential property that is closest to the DOE property boundary.
[3]mrem value is prorated to a 91-day exposure period.
†Average is based on first 3 quarters of data
NA = Not Applicable.
NDA = No Data Available.

Based on these data, it can be demonstrated that 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 along the southern property line (between SR-279 and the Colorado River and within one half mile of the DOE property boundary). As a result of this potential for public exposure, DOE (after having received permission from the property owner) remediated the property and fenced off and posted this area as being off limits to the public. To determine radon concentrations in this area that is frequented by the public, DOE initiated radon monitoring on this adjacent property and BLM property to the south in 2003 at varying distances from the site boundary. Monitoring locations MPS-0126 and MPS-0127 indicate that the annual

average radon concentrations observed in this area are below the DOE guideline; however, radon concentrations become elevated during the winter and early spring months. Therefore, to prevent unauthorized trespass within this area, and to minimize the potential for excessive public exposures to radon gas, DOE will continue (to the extent that is possible) to implement and enforce the institutional controls (e.g., warning signs, fences, and other physical barriers) that already exist.

The elevated radon emissions within and along the Moab Site boundary are expected to decrease once the contaminated materials have been removed. Radon monitoring data collected at both onsite and offsite locations are shown in Table 5–1.

5.1.2 Direct Gamma Radiation

The DOE standard for direct gamma radiation at the site boundary (and at any offsite location) is 181 mrem/yr (see Section 4.1.2). As can be seen from Table 5–1, during 2006 direct gamma radiation measurements exceeded this limit at seven of the onsite locations; however, the limit was not exceeded at any of the offsite locations.

Due to the large volume of uranium mill tailings stockpiled at the Moab Site and their reported gamma activity, it is expected that gamma radiation measurements will be elevated at and near the site boundary. However, as with DOE's findings with respect to radon emissions, the offsite monitoring locations show that gamma exposure rates are consistent with background values observed for the Moab region. Therefore, the gamma emanation or "shine" associated with the tailings at the Moab Site is not detected at any of the offsite monitoring locations.

Based on DOE's environmental monitoring data, it can be demonstrated that the levels of direct gamma radiation associated with the mill tailings stored at the Moab Site are not affecting the general population of the city of Moab. Unacceptable exposures may result to individuals who camp or reside for extended periods of time along the southern property line (between SR-279 and the Colorado River and within one-half mile of the DOE property boundary).

The elevated levels of direct gamma radiation observed within and along the Moab Site property boundary are expected to decrease once the contaminated materials have been removed. Direct gamma radiation monitoring data collected at both onsite and offsite locations are shown in Table 5–1.

5.1.3 Air Particulates

Airborne radioparticulate matter is also sampled at specific locations near the Moab Site and throughout the surrounding community (see Section 4.1.3). Radioparticulate data are of particular interest to DOE because it provides information relative to the dose that the public may be receiving from the inhalation of radioactive particulate matter. The radionuclides that are common constituents of uranium mill tailings and are of interest to DOE are Ra-226, Th-230, Po-210, and U-nat.

DOE has published DCG values for inhaled air for various radioisotopes. A DCG value represents the concentration from a specific 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 DOE monitoring program at the Moab Site are shown in Table 5–2.

Table 5–2. Summary of Derived Concentration Guides for Inhaled Air Radionuclides Monitored at the Moab Site

Radionuclide	Derived Concentration Guides (µCi/mL)[a]
Ra-226	1.E-12
Th-230	4.E-14
Po-210	1.E-12
U-nat	2.E-12

[a]µCi/mL = microcuries per milliliter

Radioparticulate data collected at the Moab Site during 2006 are summarized in Table 5–3. As can be seen from Table 5–3, the annual averages for airborne radioparticulate concentrations do not exceed the DCG values for any of the onsite or offsite locations. These data demonstrate that emissions of airborne radioparticulate matter do not exceed levels or concentrations that would result in an unacceptable public exposure. To the contrary, the monitoring data show that actual airborne concentrations were consistently from two to four orders of magnitude below their respective DCG values. Radioparticulate monitoring data collected at both onsite and offsite locations are shown in Table 5–3.

5.1.4 Public Radiological Dose/Exposure Summary

Radiological exposures to the public resulting from uranium mill tailings stored at the Moab Site consist of two components: direct gamma radiation and airborne emissions of radioparticulates. As provided in DOE Order 5400.5, *Radiation Protection of the Public and the Environment* (Chapter II: Requirements for Radiation Protection of the Public and Environment), radiation associated with radon exposures (and its decay products) is to be addressed independently and is not considered in the DOE public dose limit (see discussion in Section 5.1.1).

Direct Gamma Radiation

The public dose limit for all exposure modes (100 mrem/yr above background) described in DOE Order 5400.5 applies to "… dose from exposures to radiation sources from routine activities including remedial actions and naturally occurring radionuclides released by DOE processes and operations."

As discussed in Section 5.1.2, elevated gamma exposure rates were measured at several locations along the Moab Site boundary; however, the annual average direct gamma radiation measurements for all offsite locations were below the DOE public dose limit that has been calculated for the Moab Site of 181 mrem/yr. Direct gamma radiation measurements were also collected at the MEI location (MPS-MEI) during 2006. The monitoring data collected at MPS-MEI indicate that the annual average gamma radiation dose at this location was 66 mrem/yr, well below the calculated site limit of 181 mrem/yr.

Table 5–3. Summary of Radioparticulate Air Monitoring Data for the Moab Site for Calendar Year 2006

Station Number	Isotope	1st Quarter 2006 (µCi/mL)[5]	2nd Quarter 2006 (µCi/mL)	3rd Quarter 2006 (µCi/mL)	4th Quarter 2006 (µCi/mL)	Annual Average (µCi/mL)
On-Site Locations						
0102-RP	Uranium[1]	8.1E-17	1.2E-16	5.0E-17	6.80E-17	8.0E-17
	Thorium-230[2]	9.6E-17	2.5E-16	7.8E-17	8.00E-17	1.3E-16
	Radium-226[3]	1.5E-16	2.2E-16	1.3E-16	2.70E-16	1.9E-16
	Polonium-210[4]	8.1E-15	3.1E-15	4.2E-15	6.20E-15	5.4E-15
0105-RP	Uranium[1]	2.2E-16	2.5E-16	2.0E-16	2.20E-16	2.2E-16
	Thorium-230[2]	1.7E-16	3.3E-16	1.2E-16	2.60E-16	2.2E-16
	Radium-226[3]	2.0E-16	1.8E-16	9.6E-17	3.30E-16	2.0E-16
	Polonium-210[4]	7.8E-15	3.0E-15	6.4E-15	7.30E-15	6.1E-15
Off-Site Locations						
0117-RP	Uranium[1]	1.4E-17	2.7E-17	8.0E-18	2.5E-17	1.9E-17
	Thorium-230[2]	9.1E-17	1.2E-16	5.0E-17	6.5E-17	8.2E-17
	Radium-226[3]	1.8E-16	2.2E-16	8.4E-17	2.9E-16	1.9E-16
	Polonium-210[4]	4.2E-15	2.8E-15	3.9E-15	6.2E-15	4.3E-15
0118-RP	Uranium[1]	5.9E-17	4.9E-17	2.4E-17	3.2E-17	4.1E-17
	Thorium-230[2]	1.2E-16	7.5E-17	3.2E-17	8.5E-17	7.8E-17
	Radium-226[3]	2.7E-16	1.7E-16	1.0E-16	2.2E-16	1.9E-16
	Polonium-210[4]	7.0E-15	3.5E-15	4.8E-15	6.3E-15	5.4E-15
0119-RP	Uranium[1]	4.3E-17	3.5E-17	1.5E-17	1.9E-17	2.8E-17
	Thorium-230[2]	2.9E-16	4.1E-17	1.2E-16	1.0E-16	1.4E-16
	Radium-226[3]	1.6E-16	1.9E-16	1.1E-16	3.0E-16	1.9E-16
	Polonium-210[4]	6.5E-15	2.9E-15	4.2E-15	5.1E-15	4.7E-15
0120-RP	Uranium[1]	2.6E-17	4.8E-17	2.0E-17	2.3E-17	2.9E-17
	Thorium-230[2]	3.5E-17	1.1E-16	9.8E-17	1.1E-16	8.8E-17
	Radium-226[3]	1.8E-16	1.8E-16	9.0E-17	2.7E-16	1.8E-16
	Polonium-210[4]	4.2E-15	2.1E-15	4.0E-15	5.3E-15	3.9E-15
0121-RP	Uranium[1]	2.4E-17	3.6E-17	2.2E-17	1.9E-17	2.5E-17
	Thorium-230[2]	7.3E-17	8.8E-17	1.8E-16	6.1E-17	1.0E-16
	Radium-226[3]	2.0E-16	1.8E-16	1.1E-16	3.1E-16	2.0E-16
	Polonium-210[4]	4.6E-15	2.6E-15	4.4E-15	5.8E-15	4.4E-15
0122-RP	Uranium[1]	2.7E-17	3.2E-17	1.2E-17	2.0E-17	2.3E-17
	Thorium-230[2]	3.1E-16	1.1E-16	1.3E-16	6.7E-17	1.5E-16
	Radium-226[3]	2.1E-16	1.7E-16	9.3E-17	3.2E-16	2.0E-16
	Polonium-210[4]	6.2E-15	2.9E-15	4.7E-15	5.1E-15	4.7E-15
0123-RP	Uranium[1]	2.1E-17	5.6E-17	1.9E-17	1.8E-17	2.9E-17
	Thorium-230[2]	8.7E-17	7.7E-17	1.9E-16	5.7E-17	1.0E-16
	Radium-226[3]	1.9E-16	1.8E-16	9.4E-17	3.3E-16	2.0E-16
	Polonium-210[4]	5.5E-15	3.1E-15	6.2E-15	5.7E-15	5.1E-15

[1]DOE DCG for Total Uranium = 2.E-12
[2]DOE DCG for Thorium-230 = 4.E-14
[3]DOE DCG for Radium-226 = 1.E-12
[4]DOE DCG for Polonium-210 = 1.E-12
[5]µCi/mL = microcuries per milliliter
Note: DOE DCG is equivalent to a dose of 100mrem/yr

Airborne Emissions

DOE Order 5400.5, *Radiation Protection of the Public and the Environment* (Chapter II: Requirements for Radiation Protection of the Public and Environment), also provides that "… the exposure of members of the public to radioactive materials released to the atmosphere as

a consequence of routine DOE activities shall not cause members of the public to receive in a year, an effective dose equivalent greater than 10 mrem."

To demonstrate compliance with this airborne emissions standard, DOE conducts radioparticulate air monitoring at key onsite and offsite locations as discussed in Section 5.1.3. The DOE airborne emissions limit is 10 mrem/yr. As shown in Table 5–3, the annual average concentrations of radionuclides measured at both on- and offsite locations were several orders of magnitude below their respective DCG values. A DCG value is that concentration from a specific radionuclide that would cause a member of the public, residing at the point of collection, to receive a dose of 100 mrem/yr. Therefore, air emissions for any single location cannot exceed one-tenth of the DCG value for any given radionuclide.

Radioparticulate data from monitoring location MPS-0102 are representative of the airborne concentrations received by the MEI. The monitoring data collected at MPS-0102 during CY 2006 indicate that the exposure for each radionuclide was less than one percent of its respective DCG value, well below the 10 mrem/yr emissions limit in DOE Order 5400.5.

In summary, environmental monitoring data collected for direct gamma radiation and radioparticulate air emissions during CY 2006 were well below the public dose limits applicable to the Moab Site.

Meteorology

A meteorological monitoring station was installed at the Moab site in July 2002. The monitoring station is located approximately 300 feet north of the support offices (Figure 4–1). Meteorological parameters monitored at the Moab Site include average air temperature, relative humidity, average solar radiation, evapotranspiration potential, average wind speed, average wind direction, standard deviation of wind speed, and total rainfall. Table 5–4 summarizes 2006 meteorological data for temperature, wind speed, and precipitation.

Table 5–4. Meteorological Data Summary for the Moab Site for Calendar Year 2006

Month	Temperature		Wind Speed		Precipitation (inches)
	Max. Temp.	Min. Temp.	Avg.	Peak Gust	
January	60.9	15.5	3.1	33.9	0.41
February	70.5	15.1.	3.3	45.0	0.38
March	72.4	26.8	4.9	37.8	0.41
April	87.5	33.5	5.6	63.2	0.00 (?)
May	96.4	40.4	4.7	50.0	0.25
June	105.0	49.0	0.1	44.2	0.03 (?)
July	105.4	64.4	0.1	34.2	?*/ 1.90**
August	98.4	53.9	3.5	52.4	?* /0.65**
September	96.2	39.2	3.3	43.9	0.23/1.40**
October	86.3	32.4	2.4	45.3	1.14/3.70**
November	77.1	18.8	2.5	35.1	0.24
December	51.1	12.9	2.0	30.4	0.23
				Total Adjusted with Manual	**9.60**

*Instrument malfunction
**Manual V-Gauge Reading

6.0 Water Monitoring Program

6.1 Hydrogeology

A basin-fill aquifer (alluvial aquifer) directly underlies the Moab Site. This aquifer is divided into three hydrochemical facies (based on total dissolved solids data). A relatively thin zone at the top of the aquifer includes an upper fresh to moderately saline facies and an intermediate facies of very saline water. A thick briny facies dominates the aquifer. All three facies existed beneath the site prior to milling activities. The deeper brine water results mostly from dissolution of the underlying salt beds of the Paradox Formation present beneath most of the site. Navajo Sandstone, Kayenta Formation, and Wingate Sandstone of the Glen Canyon Group comprise the principal bedrock aquifer in the region and locally are present upgradient at the site's northern boundary. While the high salinity nature of the ground water precludes beneficial use of the aquifer, it must still be protective of surface water quality where it discharges to the Colorado River. Data collected from the river adjacent to the Moab Site have indicated that site-related contaminants elevated in the ground water have had a locally detrimental effect on surface water quality.

In general, water of the Colorado River near the Moab Site is characterized as very turbid and of considerable hardness, high suspended solids loading, fairly high salinity for a freshwater river (due to a large extent to high sulfate levels), and often wide fluctuations in the concentrations of all of these constituents. Historically, water quality standards for several constituents have been exceeded upstream of the site.

6.2 Surface Water Analytical Results

The alluvial aquifer beneath the Moab Site has been contaminated from former uranium milling operations. Ground water standards for a number of constituents, particularly molybdenum, nitrate, and uranium, have been routinely exceeded in the past in ground water at the site. Fluids in the tailings pile are elevated in constituents such as ammonia, nitrate, sulfate, and uranium, as evidenced by analysis of pore fluids during 2003. Results presented in the *Site Observational Work Plan for the Moab, Utah Site* (DOE 2003b) indicate that fluids from the pile continue to contaminate ground water beneath the site, which, in turn, can affect surface water quality. The standard analytical suite of constituents for surface water adjacent to the site includes ammonia, chloride, sulfate, total dissolved solids, and uranium. Maximum concentrations for these constituents observed in the Colorado River in 2006 are included in Table 6–1.

The site-related constituent of greatest concern at the site is ammonia because of its toxicity to aquatic life. Historic and recent sampling results indicate that ammonia is elevated in some areas immediately adjacent to the site. Areas that can serve as habitat for endangered fish are of particular concern. Surface water sampling conducted in 2006 was designed specifically to address areas that are potential fish habitat. During routine sampling events, efforts were made to sample locations judged to provide the best habitat at the time of sampling. Favorable habitat is characterized by fairly shallow, low velocity waters. Other samples were collected within the river channel ("compliance sampling") to assess the effect of ground water discharge on the overall quality of surface water.

Table 6–1. Comparison of State of Utah Water Quality Standards[a] with 2006 Maximum Concentrations in Colorado River[b]

Constituent	State Standard[a,b]	2006 Maximum[c] in River
Ammonia Total as N[d]	2-4 mg/L	76
Chloride	na[e]	770
Sulfate	na	2,800
Total dissolved solids	1,200 mg/L	6,000
Uranium	na	0.84

[a]mg/L = milligrams per liter
[b]State of Utah Water Quality Standards for the Colorado River and its tributaries (U.A.C. Section R317-2-13). Not all state standards are listed in this table.
[c]The values are in units shown under the State Standard column.
[d]Ammonia Total as N "standard" is the Federal Ambient Water Quality Acute criterion. Criterion varies with sample pH and temperature; 2-4 mg/L is a typical range for conditions adjacent to the Moab Site.
[e]Not available

Table 6–2 presents data for locations where the ammonia exceeded 2 times the detection limit during 2006 (background in 2006 was at or below the detection limit of 0.1 mg/L). The data provided in Table 6–2 show that only two samples exceeded the ambient water quality criteria (AWQC; EPA 1999) for ammonia and that both of these occurred in January—a time of year when young-of-year fish are not present. Complete results for ammonia in surface water are presented in Appendix A. Compared with calendar year 2005, ammonia concentrations dropped significantly. This is likely due to the operation of the Interim Action ground water remediation systems.

Table 6–2. Surface Locations with Ammonia Concentrations Exceeding 2 Times Background During 2006

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	3/21/2006	0.37	2.1	0.6
0216	12/6/2006	0.42	5.2	1.6
0236	1/24/2006	76	na	na
0239	1/24/2006	0.79	na	na
0239	3/22/2006	0.53	9.4	2.6
0239	11/8/2006	0.515	3.7	1.2
0240	1/24/2006	69	na	na
0240	7/27/2006	0.37	6.8	0.8
0240	10/17/2006	0.27	6.7	2.0
0243	2/15/2006	0.28	3.7	1.1
0243	3/22/2006	0.29	6.1	1.8
0243	11/7/2006	0.223	3.5	1.1
0243	12/12/2006	0.85	4.9	1.5
0245	3/21/2006	0.37	2.1	0.6
0247	5/30/2006	3.7	28.9	5.3
0259	3/22/2006	0.91	3.5	1.1
0273	6/22/2006	0.25	5.5	0.9
0274	12/5/2006	0.43	6.8	2.0

na = Temperature and pH not available

In addition to water quality monitoring, visual monitoring of the riverbank was conducted during the summer months of 2006 to observe the effect, if any, of site-related contamination on fish in habitat areas. No stressed or dead fish were observed throughout the monitoring period.

7.0 Quality Assurance

A QA Program providing a structured approach for the application of QA principles to work performed on the Moab UMTRA Project by DOE's TAC is implemented through the *Quality Assurance Manual* (STO 1). The QA Program is based on DOE Order 414.1C, *Quality Assurance*, requirements and refers to documents that implement the QA Program. The *Moab Project Quality Assurance Program Plan* (QAPP) (DOE 2005c) specifies project-specific implementation of the QA program. Implementation of the QAPP ensures that environmental data are valid and traceable and that they fulfill the requirements of the QA program. All work for the Moab UMTRA Project is conducted under the QAPP.

7.1 Sampling

Strategies and objectives for effluent monitoring and environmental sampling at the Moab Site are described in the following planning documents:

- *Site Observational Work Plan for the Moab, Utah, Site* (DOE 2003b)
- *Sampling and Analysis Plan for USDOE OLM Sites* (DOE 2006e)
- *Moab Project Environmental Air Monitoring and Sampling and Analysis Plan* (DOE 2003a)

Procedures prepared by the organization responsible for the work address field quality control, sampling methods, sampling equipment decontamination, sample identification, chain-of-custody, sample protection, equipment calibration, and independent data verification.

7.2 Laboratory Analysis

The TAC ensures high-quality 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 participation in proficiency testing programs. Laboratories that implement a documented QA plan, employ technically competent staff, maintain suitable facilities and equipment, and follow written procedures are selected. The TAC continually evaluates the quality of the data received from the laboratories through a formal data validation process.

The Sample Coordinator ensures that the laboratory has all the pertinent information, the samples are shipped, the proper analyses requested, and that the report and electronic data are received as requested. Laboratory analytical results of environmental samples are received electronically into an Oracle database. These data are maintained, protected, and archived by Environmental Support Services. Data validation is performed by the sampling organization or by the sample coordinator.

7.3 Data and Records Management

Records are created both on paper and electronically in a retrievable format. They are protected against deterioration, damage, and loss. Records generated in support of environmental monitoring are subject to the requirements of 36 CFR 1220−1234. The *Records Management Manual* (STO 9) and the Moab working file index implement applicable records regulations.

End of current text

8.0 References

10 CFR 1021. U.S. Department of Energy, "National Environmental Policy Act Implementing Procedures," *Code of Federal Regulations,* January 1, 2004.

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

36 CFR 1220−1234. National Archives and Records Administration, "Federal Records; General," *Code of Federal Regulations,* July 1, 2002.

40 CFR 61. U.S. Environmental Protection Agency, "National Emission Standards for Hazardous Air Pollutants," *Code of Federal Regulations,* July 1, 2004.

40 CFR 141. U.S. Environmental Protection Agency, "National Primary Drinking Water Regulations," *Code of Federal Regulations.*

40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations,* July 1, 2004.

40 CFR 1500. Council on Environmental Quality, "Purpose, Policy, and Mandate," *Code of Federal Regulations,* July 1, 2004.

40 CFR 1507.3. Council on Environmental Quality, "Agency Procedures," 43 *Federal Register* 56002, November 29, 1978.

42 U.S.C. 4321, *et seq*., National Environmental Policy Act.

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Atlas, 1996. *Final Reclamation Plan, Atlas Corporation Uranium Mill and Tailings Disposal Area,* Atlas Minerals Corporation.

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End of current text

Appendix A

2006 Ammonia Sampling Results for Surface Water

SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE MOA01, Moab Site
REPORT DATE: 3/26/2007 2:09 pm

PARAMETER	UNITS	LOCATION ID	SAMPLE: DATE	ID	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	0201	05/02/2006	0001	0.1	U		#	0.1	-
	mg/L	0201	07/11/2006	0001	0.17			#	0.1	-
	mg/L	0201	11/13/2006	0001	0.1	U		#	0.1	-
	mg/L	0204-007	05/03/2006	0001	0.1	U		#	0.1	-
	mg/L	0204-009	11/15/2006	0001	0.1	U		#	0.1	-
	mg/L	0216	03/21/2006	0001	0.37			#	0.1	-
	mg/L	0216	04/19/2006	0001	0.1	U		#	0.1	-
	mg/L	0216	05/10/2006	0001	0.1	U		#	0.1	-
	mg/L	0216	05/10/2006	0002	0.1	U		#	0.1	-
	mg/L	0216	06/13/2006	0001	0.1	U		#	0.1	-
	mg/L	0216	07/27/2006	0001	0.15			#	0.1	-
	mg/L	0216	09/14/2006	0001	0.1	U		#	0.1	-
	mg/L	0216	09/14/2006	0002	0.1	U		#	0.1	-
	mg/L	0216	10/24/2006	0001	0.1	U		#	0.1	-
	mg/L	0216	11/09/2006	0001	0.1	U		#	0.1	-
	mg/L	0216	12/06/2006	0001	0.42			#	0.1	-
	mg/L	0217	11/15/2006	0001	0.1	U		#	0.1	-
	mg/L	0218-008	07/13/2006	0001	0.1	U		#	0.1	-
	mg/L	0219-007	05/04/2006	0001	0.1	U		#	0.1	-
	mg/L	0219-008	07/12/2006	0001	0.1	U		#	0.1	-
	mg/L	0219-009	11/15/2006	0001	0.1	U		#	0.1	-
	mg/L	0220-007	05/04/2006	0001	0.1	U		#	0.1	-
	mg/L	0220-008	07/12/2006	0001	0.1	U		#	0.1	-
	mg/L	0220-009	11/14/2006	0001	0.12			#	0.1	-
	mg/L	0221-007	05/04/2006	0001	0.1	U		#	0.1	-
	mg/L	0221-008	07/12/2006	0001	0.1	U		#	0.1	-
	mg/L	0221-008	07/12/2006	0002	0.1	U		#	0.1	-
	mg/L	0221-009	11/14/2006	0001	0.1			#	0.1	-
	mg/L	0222-007	05/04/2006	0001	0.1	U		#	0.1	-

PARAMETER	UNITS	LOCATION ID	SAMPLE: DATE	ID	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	0222-008	07/12/2006	0001	0.1	U		#	0.1	-
	mg/L	0223-007	05/04/2006	0001	0.1	U		#	0.1	-
	mg/L	0223-008	07/12/2006	0001	0.15			#	0.1	-
	mg/L	0224-007	05/04/2006	0001	0.1	U		#	0.1	-
	mg/L	0224-008	07/13/2006	0001	0.1	U		#	0.1	-
	mg/L	0225-007	05/02/2006	0001	0.1	U		#	0.1	-
	mg/L	0225-008	07/13/2006	0001	0.11			#	0.1	-
	mg/L	0225-009	11/14/2006	0001	0.1	U		#	0.1	-
	mg/L	0226-007	05/02/2006	0001	0.1	U		#	0.1	-
	mg/L	0226-007	05/02/2006	0002	0.1	U		#	0.1	-
	mg/L	0226-008	07/12/2006	0001	0.11			#	0.1	-
	mg/L	0226-009	11/14/2006	0001	0.1	U		#	0.1	-
	mg/L	0227-007	05/02/2006	0001	0.1	U		#	0.1	-
	mg/L	0227-008	07/12/2006	0001	0.1	U		#	0.1	-
	mg/L	0227-009	11/14/2006	0001	0.1	U		#	0.1	-
	mg/L	0228-007	05/02/2006	0001	0.1	U		#	0.1	-
	mg/L	0228-008	07/11/2006	0001	0.1	U		#	0.1	-
	mg/L	0228-009	11/14/2006	0001	0.1	U		#	0.1	-
	mg/L	0228-009	11/14/2006	0002	0.1	U		#	0.1	-
	mg/L	0232-009	11/14/2006	0001	0.1	U		#	0.1	-
	mg/L	0233-009	11/15/2006	0001	0.1	U		#	0.1	-
	mg/L	0235-009	11/14/2006	0001	0.1	U		#	0.1	-
	mg/L	0236	01/24/2006	0001	76			#	10	-
	mg/L	0236	05/10/2006	0001	0.1	U		#	0.1	-
	mg/L	0236	06/13/2006	0001	0.1	U		#	0.1	-

SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE MOA01, Moab Site
REPORT DATE: 3/26/2007 2:09 pm

PARAMETER	UNITS	LOCATION ID	SAMPLE: DATE	ID	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	0236	09/13/2006	0001	0.1	U		#	0.1	-
	mg/L	0236	09/13/2006	0002	0.1	U		#	0.1	-
	mg/L	0236	10/24/2006	0001	0.1	U		#	0.1	-
	mg/L	0236	11/08/2006	0001	0.0055	U	J	#	0.0055	-
	mg/L	0236	11/14/2006	0001	0.1	U		#	0.1	-
	mg/L	0239	01/24/2006	0001	0.78			#	0.1	-
	mg/L	0239	01/24/2006	0002	0.79			#	0.1	-
	mg/L	0239	03/22/2006	0001	0.53			#	0.1	-
	mg/L	0239	07/27/2006	0001	0.1	U		#	0.1	-
	mg/L	0239	09/13/2006	0001	0.1	U		#	0.1	-
	mg/L	0239	11/08/2006	0001	0.515		J	#	0.0055	-
	mg/L	0239	12/07/2006	0001	0.11			#	0.1	-
	mg/L	0240	01/24/2006	0001	69			#	10	-
	mg/L	0240	05/10/2006	0001	0.1	U		#	0.1	-
	mg/L	0240	05/10/2006	0002	0.1	U		#	0.1	-
	mg/L	0240	06/13/2006	0001	0.1	U		#	0.1	-
	mg/L	0240	07/27/2006	0001	0.37			#	0.1	-
	mg/L	0240	09/12/2006	0001	0.1	U		#	0.1	-
	mg/L	0240	10/17/2006	0001	0.27			#	0.1	-
	mg/L	0241	06/13/2006	0001	0.1	U		#	0.1	-
	mg/L	0242	04/17/2006	0001	0.1	U		#	0.1	-
	mg/L	0242	05/10/2006	0001	0.1	U		#	0.1	-
	mg/L	0242	10/17/2006	0001	0.1	U		#	0.1	-
	mg/L	0243	02/15/2006	0001	0.28			#	0.1	-
	mg/L	0243	03/22/2006	0001	0.29			#	0.1	-
	mg/L	0243	07/27/2006	0001	0.1	U		#	0.1	-
	mg/L	0243	09/13/2006	0001	0.1	U		#	0.1	-
	mg/L	0243	10/23/2006	0001	0.14			#	0.1	-
	mg/L	0243	11/07/2006	0001	0.223		J	#	0.0055	-
	mg/L	0243	12/12/2006	0001	0.85			#	0.1	-
	mg/L	0245	03/21/2006	0001	0.37			#	0.1	-
	mg/L	0245	07/27/2006	0001	0.1	U		#	0.1	-
	mg/L	0245	09/14/2006	0001	0.1	U		#	0.1	-
	mg/L	0245	09/14/2006	0002	0.1	U		#	0.1	-
	mg/L	0245	11/10/2006	0001	0.1	U		#	0.1	-
	mg/L	0245	12/06/2006	0001	0.1	U		#	0.1	-
	mg/L	0247	05/30/2006	0001	3.7	N		#	0.1	-
	mg/L	0247	06/01/2006	0001	0.1	U		#	0.1	-
	mg/L	0247	06/05/2006	0001	0.1	U		#	0.1	-

PARAMETER	UNITS	LOCATION ID	SAMPLE: DATE	ID	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	0247	06/12/2006	0001	0.1	U		#	0.1	-
	mg/L	0247	06/15/2006	0001	0.1	U		#	0.1	-
	mg/L	0250	05/30/2006	0001	0.1	U		#	0.1	-
	mg/L	0250	06/01/2006	0001	0.1	U		#	0.1	-
	mg/L	0250	06/05/2006	0001	0.1	U		#	0.1	-
	mg/L	0250	06/12/2006	0001	0.13		J	#	0.1	-
	mg/L	0250	06/15/2006	0001	0.1	U		#	0.1	-
	mg/L	0253	05/30/2006	0001	0.15			#	0.1	-
	mg/L	0253	06/01/2006	0001	0.1	U		#	0.1	-
	mg/L	0253	06/05/2006	0001	0.1	U		#	0.1	-
	mg/L	0253	06/12/2006	0001	0.1	U		#	0.1	-
	mg/L	0253	06/15/2006	0001	0.1	U		#	0.1	-
	mg/L	0258	04/17/2006	0001	0.13			#	0.1	-
	mg/L	0258	05/10/2006	0001	0.1	U		#	0.1	-
	mg/L	0258	09/12/2006	0001	0.1	U		#	0.1	-
	mg/L	0258	10/17/2006	0001	0.1	U		#	0.1	-
	mg/L	0259	03/22/2006	0001	0.9			#	0.1	-
	mg/L	0259	03/22/2006	0002	0.91			#	0.1	-
	mg/L	0259	07/27/2006	0001	0.1	U		#	0.1	-
	mg/L	0259	07/27/2006	0002	0.1	U		#	0.1	-
	mg/L	0259	09/12/2006	0001	0.1	U		#	0.1	-
	mg/L	0259	11/07/2006	0001	0.125		J	#	0.0055	-
	mg/L	0259	12/12/2006	0001	0.13			#	0.1	-
	mg/L	0271	05/17/2006	0001	0.1	U		#	0.1	-
	mg/L	0271	06/22/2006	0001	0.1	U		#	0.1	-
	mg/L	0272	05/17/2006	0001	0.1	U		#	0.1	-
	mg/L	0273	05/17/2006	0001	0.15			#	0.1	-
	mg/L	0273	06/22/2006	0001	0.25			#	0.1	-
	mg/L	0274	10/24/2006	0001	0.1	U		#	0.1	-
	mg/L	0274	11/10/2006	0001	0.13			#	0.1	-
	mg/L	0274	12/05/2006	0001	0.43			#	0.1	-
	mg/L	CR1	05/02/2006	0001	0.1	U		#	0.1	-
	mg/L	CR1	07/11/2006	0001	0.1	U		#	0.1	-
	mg/L	CR1	11/15/2006	0001	0.1	U		#	0.1	-
	mg/L	CR3-007	05/02/2006	0001	0.1	U		#	0.1	-
	mg/L	CR3-008	07/12/2006	0001	0.1	U		#	0.1	-
	mg/L	CR3-009	11/15/2006	0001	0.1	U		#	0.1	-
	mg/L	CR5	05/02/2006	0001	0.1	U		#	0.1	-
	mg/L	CR5	07/11/2006	0001	0.1	U		#	0.1	-

SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE MOA01, Moab Site
REPORT DATE: 3/26/2007 2:09 pm

PARAMETER	UNITS	LOCATION ID	SAMPLE: DATE	ID	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	CR5	11/14/2006	0001	0.1	U		#	0.1	-

RECORDS: SELECTED FROM USEE800 WHERE site_code='MOA01' AND quality_assurance = TRUE AND (data_validation_qualifiers IS NULL OR data_validation_qualifiers NOT LIKE '%N%' AND data_validation_qualifiers NOT LIKE '%R%' AND data_validation_qualifiers NOT LIKE '%X%') AND cas in('NH3+NH4-N') AND DATE_SAMPLED between #1/1/2006# and #12/31/2006#

SAMPLE ID CODES: 000X = Filtered sample (0.45 µm). N00X = Unfiltered sample. X = replicate number.

LAB QUALIFIERS:

- * Replicate analysis not within control limits.
- + Correlation coefficient for MSA < 0.995.
- > Result above upper detection limit.
- A TIC is a suspected aldol-condensation product.
- B Inorganic: Result is between the IDL and CRDL. Organic & Radiochemistry: Analyte also found in method blank.
- C Pesticide result confirmed by GC-MS.
- D Analyte determined in diluted sample.
- E Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
- H Holding time expired, value suspect.
- I Increased detection limit due to required dilution.
- J Estimated
- M GFAA duplicate injection precision not met.
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compund (TIC).
- P > 25% difference in detected pesticide or Arochlor concentrations between 2 columns.
- S Result determined by method of standard addition (MSA).
- U Analytical result below detection limit.
- W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- X Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Y Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Z Laboratory defined (USEPA CLP organic) qualifier, see case narrative.

DATA QUALIFIERS:

- F Low flow sampling method used.
- J Estimated value.
- N Presumptive evidence that analyte is present. The analyte is "tentatively identified".
- R Unusable result.
- X Location is undefined.
- G Possible grout contamination, pH > 9.
- L Less than 3 bore volumes purged prior to sampling.
- Q Qualitative result due to sampling technique
- U Parameter analyzed for but was not detected.

QA QUALIFIER: # = validated according to Quality Assurance guidelines.