

U.S. Department of Energy
Radionuclide Air Emissions Annual Report Calendar Year 2010

(In accordance with Subpart H of Title 40 *Code of Federal Regulations* Part 61)

**Site Name: Mound Site (Formerly Miamisburg Closure Project),
Miamisburg, Ohio**

Field Office Information:

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Section I. Facility Information

Site Description

The U.S. Department of Energy (DOE) Office of Legacy Management Mound, Ohio, Site (formerly known as the Miamisburg Closure Project [MCP]), currently occupies 0.51 square kilometers (126.7 acres) of land in Miamisburg, Ohio, approximately 16 kilometers (km) (10 miles) southwest of Dayton, Ohio. The site area was 306 acres in the 1980s, and since then more than half of the site property has been transferred to the Mound Miamisburg Community Improvement Corporation now the Mound Development Corporation. Some areas near the Mound site are highly industrialized, while other areas are predominantly farmland, dotted with light industry and small communities. The site is located within 80 km (50 miles) of several large population centers, including Cincinnati, Dayton, and Springfield, Ohio.

The climate in the area is considered moderate. Average annual precipitation is approximately 83 centimeters (33 inches) and is evenly distributed throughout the year. Winds are predominantly from the south and southwest. The annual average wind speed measured at the Mound site is approximately 5.0 meters per second (11.2 miles per hour).

The predominant geographical feature in the Mound site region is the Great Miami River, which flows from northeast to southwest through the city of Miamisburg.

The Mound site began operations for the production of nuclear weapons components in 1949 under the direction of the U.S. Atomic Energy Commission, later to become the DOE.

The Mound site was an integrated research, development, and production facility that supported DOE weapons and nonweapons programs, especially in the areas of chemical explosives and nuclear technology. Other major operations included manufacture of stable (nonradioactive) isotopes for medical, industrial, and general research; development and manufacture of small chemical heat sources for the national defense program; recovery and purification of tritium from scrap materials at the Mound site, and from other DOE sites; development and fabrication of radioisotopic heat sources fueled with plutonium-238 to provide power sources for satellites and spacecraft; and surveillance of explosive and radioactive weapons components received from other DOE sites.

DOE discontinued the defense mission at the Mound site in 1993 and began environmental cleanup. Except for Potential Release Site (PRS) 7 and PRS 441, all physical environmental restoration activities performed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) at the Mound site were completed by July 31, 2006. PRS 7 (a sewer line) and PRS 441 (a rail load-out area used for hauling waste) were completed during the first Operable Unit 1 (OU-1) excavation task in 2009.

The second OU-1 excavation was the only activity occurring during calendar year (CY) 2010.

- The OU-1 site was previously compliant with the requirements defined by the CERCLA OU-1 Record of Decision. The actions taken under this task order were at the discretion of DOE and were additional remedial actions funded by the American Reinvestment and Recovery Act (ARRA) of 2009. The purpose of the project was to safely and completely

remove debris, radioactive materials, and other contamination from the OU-1 Project Area in order to allow for removal of the proposed “no-dig” restriction in support of the accelerated closure and ultimate transfer of the entire Mound site.

- The OU-1 footprint was expanded to include the rail yard, the haul road, and the filled-in retention pond and was comprised of about 23 acres of land of cleaned up area. This area was designated Parcel 9 (see Figure 1). Excavation of contaminated soil was completed in April 2010. Waste shipments were completed in July 2010. All of the wastes shipped from April through July were below cleanup objectives (COs). The soil was shipped as waste because the soil contained solid debris that could not be individually separated and characterized. Air monitoring continued at all locations throughout CY 2010.
- The PRS 7 excavation was completed and approved by the U.S. Environmental Protection Agency (EPA) and Ohio EPA in 2008.
- Cleanup of PRS 441, the soil-staging and rail yard area, was completed and approved by EPA and Ohio EPA on December 1, 2009. This work completed the site environmental remediation to CERCLA cleanup levels. The excavation work between December 1, 2009, and April 2010 was directed by Congress and was performed in cooperation with the CERCLA project.

Parcels 3, 4, D, H and Phases I A, I B, and I C have been transferred to private ownership (i.e., the Mound Development Corporation [MDC]) for industrial reuse. Parcels 6, 7, and 8, equaling another 100.24 acres, are in process of being transferred to private ownership. The transfer process to private ownership is expected to be completed during 2011. When that occurs, 278.59 acres or about 91 percent of the land will no longer be federal property. Improvements and limited construction activities are occurring on the private land at this time and construction activities are expected to increase to a high level in late spring or early summer of 2011. Air monitoring since April 2010 has been of fugitive emissions from soil below COs or from private construction projects. The only federal activities taking place at the former DOE facility located at the Mound site are long-term stewardship, groundwater monitoring, and operation of a groundwater pump-and-treat system to contain movement of volatile organic compounds (VOCs) contamination of groundwater.

The radionuclides of primary concern from past Mound site operations were tritium and plutonium-238.

Source Description

Radionuclide emissions from Mound site to the atmosphere occurred through diffuse (non-point-source) emissions. The diffuse emissions consisted primarily of dust particles. The locations of the site perimeter ambient air samplers are shown on Figure 2. Samplers located outside the Mound site footprint are shown on Figure 3.

Plutonium-238, plutonium-239/240, thorium-227, thorium-228, thorium-230, thorium-232, and tritium could have been released to the air by resuspension as a result of site remediation projects that occurred until July 2010 on and off of the Mound site. Uranium has never been a source of dose at Mound. The Mound site has a network of nine environmental samplers that measure the airborne concentrations of plutonium-238, plutonium-239/240, thorium-228, thorium-230, thorium-232, and tritium. According to an agreement with EPA, DOE added a tenth sampler (215) when the OU-1 work started in January 2007. Those data are included in this report.

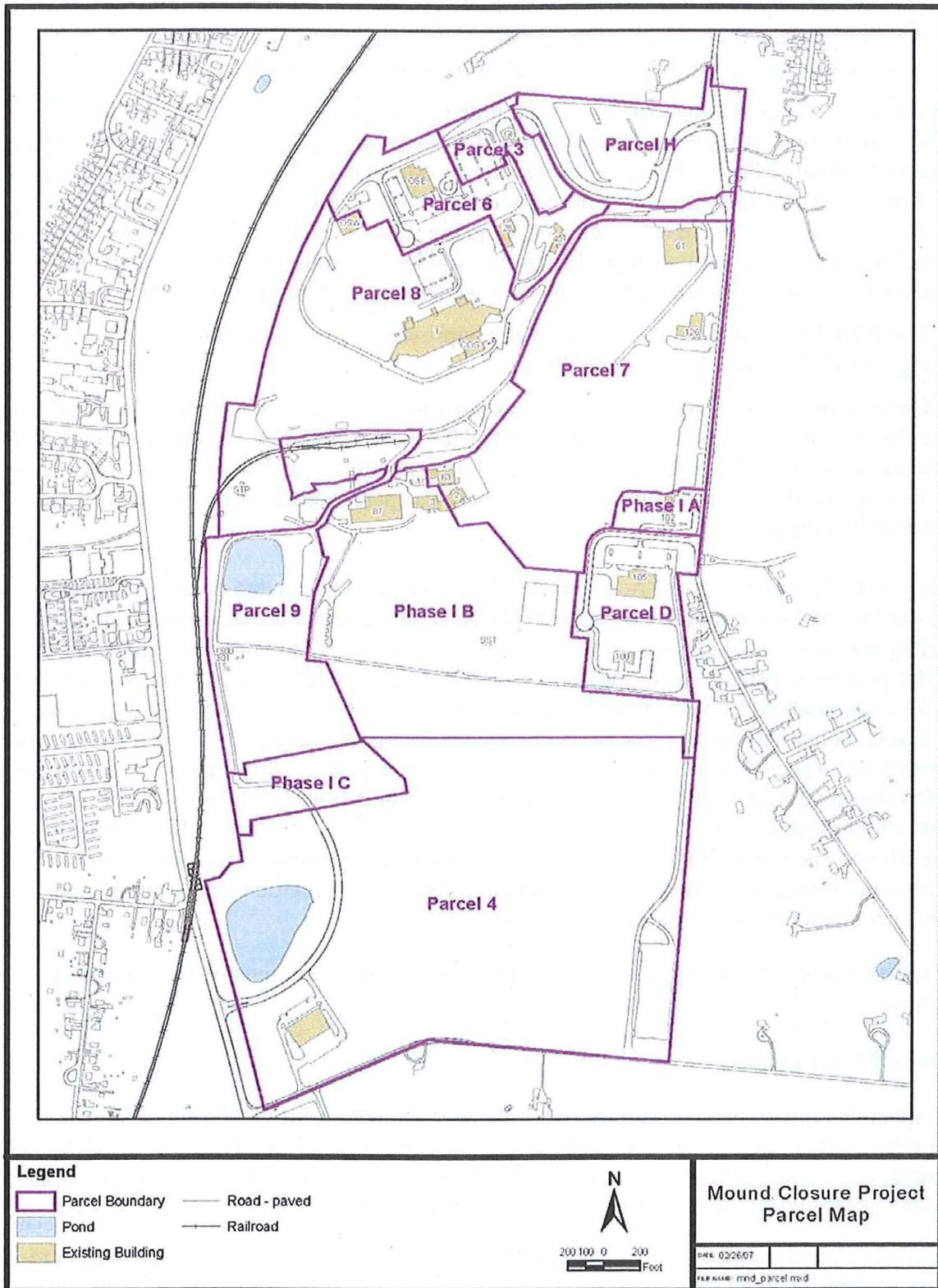


Figure 1. Mound Site Parcel Map

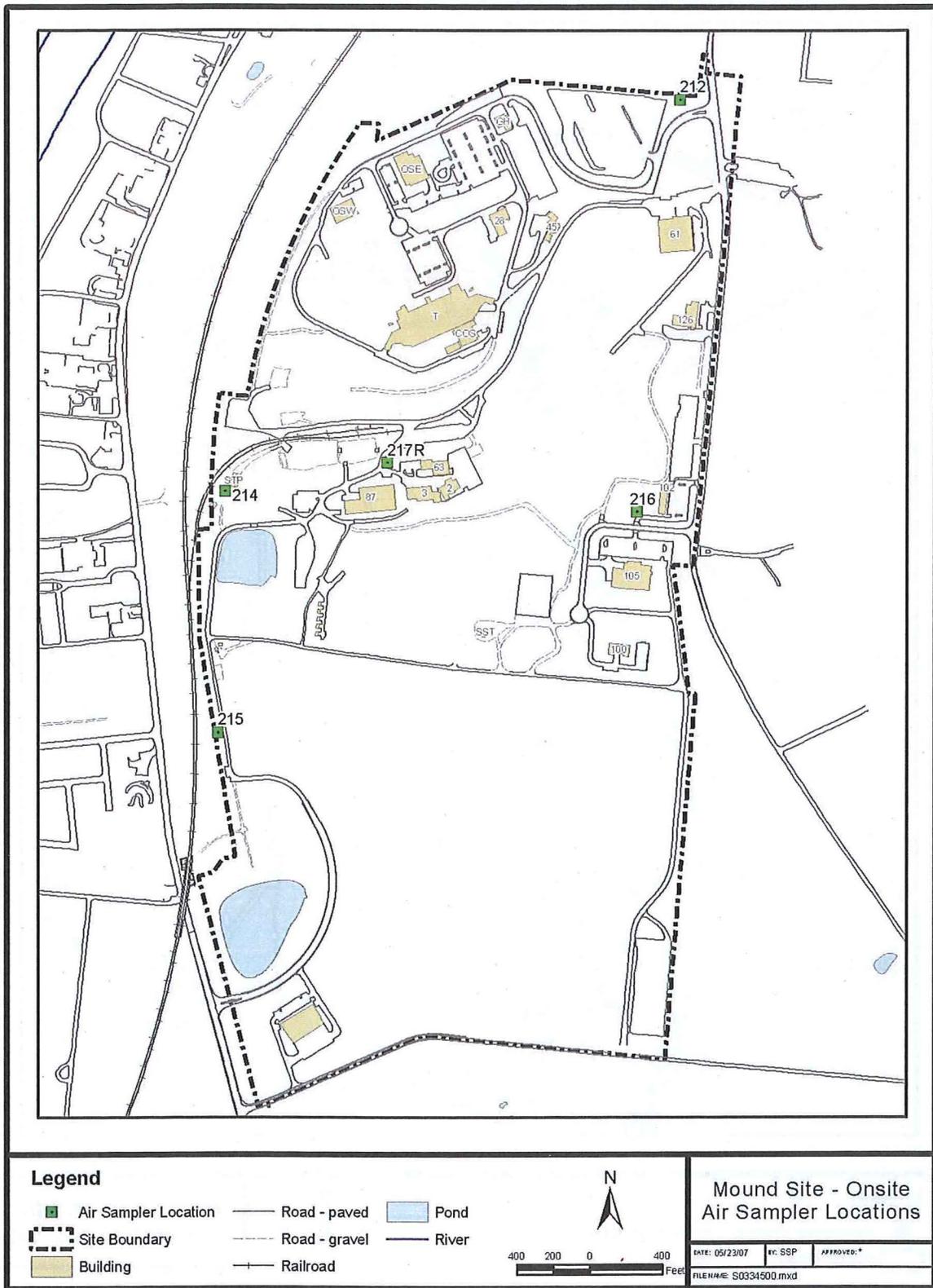


Figure 2. Mound Site On-Site Air Sampler Locations

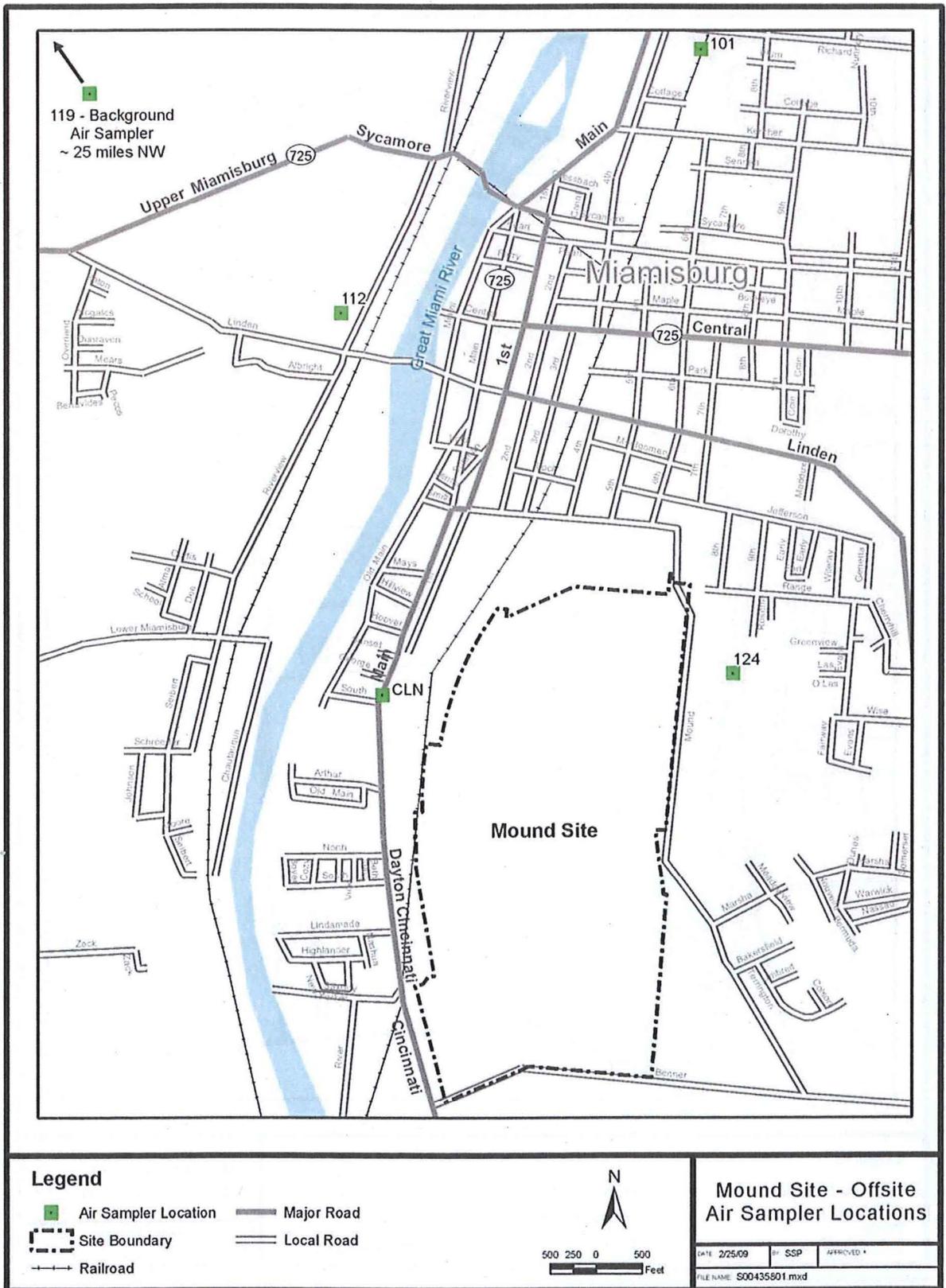


Figure 3. Mound Site Off-Site Air Sampler Locations

Section II. Air Emissions Data

Point Sources

The site has had no point sources of radioactive materials since 2006.

Grouped Sources

The site has had no grouped sources of radioactive materials since 2006.

Non-Point Sources

The Mound site had low-level diffuse emissions of radionuclides due to resuspension. This source contribution was due in part to environmental restoration activities on the plant site.

The Congressionally funded excavation of the landfill in OU-1 started in January 2007. These construction activities ended on July 6, 2009. On July 21, 2009, field activities resumed to continue the safe removal of radioactive materials and other contamination with concentrations above site cleanup goals from the landfill area on the MCP site. The landfill area became known as OU-1 or Parcel 9. The purpose of this action was to reduce contaminant concentrations to levels that will allow for removal of the proposed “no-dig” restriction in support of the accelerated closure and ultimate transfer of the entire Mound site. All removal at the MCP was completed by April 2010. All shipment of excavated soil was completed by July 2010. All of the soil shipped between April and July 2010 was clean, but it was mixed with debris and so was removed from the site. These construction activities were the only source that had the potential to cause diffuse emissions during CY 2010.

Air sampler 215 was activated in December 2006 to ensure operational readiness when the OU-1 excavation commenced. This sampler has been operated continuously since January 1, 2007. Sampler 215 remained in operation until all the DOE construction activities were completed. Additional remedial actions funded by ARRA were taken at the discretion of DOE that will allow for removal of the proposed “no-dig” restriction in support of the accelerated closure and ultimate transfer of the entire Mound site. All construction activities associated with the work in CY 2010 were completed in April 2010, and all waste was shipped by July 2010. The waste shipped from April through July was below the COs for soil at Mound. The soil was shipped as low-level waste in accordance with agreements in the work plan for the excavation at OU-1.

The concentrations of radionuclides above their respective background levels were measured at each off-site and on-site monitoring location for 2010. The theoretical ground-level source terms that could cause these off-site concentrations were determined. These source terms were averaged to determine 2010 fugitive emissions (Table 1).

Table 1. 2010 Fugitive Emission Rates Compared to 2009 Emission Rates

Non-Point-Source Radionuclide	2010 Annual Quantity (Ci)	2010 Annual Quantity (Bq)	2009 Annual Quantity (Ci)	2009 Annual Quantity (Bq)
Pu-238	1.38×10^{-15}	5.08×10^{-5}	1.15×10^{-15}	4.24×10^{-5}
Pu-239/240	(a)	(a)	(a)	(a)
Th-227	(a)	(a)	(a)	(a)
Th-228	2.77×10^{-14}	1.03×10^{-3}	2.66×10^{-14}	9.85×10^{-4}
Th-230	4.32×10^{-14}	1.60×10^{-3}	3.01×10^{-14}	1.11×10^{-3}
Th-232	2.86×10^{-14}	1.06×10^{-3}	2.07×10^{-14}	7.64×10^{-4}
Tritium	(a)	(a)	(a)	(a)

(a) = Not a significant contributor to dose above background

Bq = becquerel

Ci = curie

Pu = plutonium

Th = thorium

Section III. Dose Assessments

Description of the Dose Model

Gaussian plume modeling equations were not used to determine the dose at the air sampling stations because the calculated committed effective dose equivalent (CEDE) was so low for each perimeter sampling location. The CEDE calculated dose is shown in Table 2.

Table 2. 2010 Perimeter Sampler Data

Sampler	Pu-238 (mrem)	Th-228 (mrem)	Th-230 (mrem)	Th-232 (mrem)	2010 Total (mrem)
212	4.39×10^{-4}	1.56×10^{-2}	3.13×10^{-2}	7.50×10^{-2}	1.22×10^{-1}
214	3.07×10^{-3}	2.04×10^{-2}	3.74×10^{-2}	1.30×10^{-1}	1.91×10^{-1}
215	4.81×10^{-3}	3.36×10^{-2}	5.16×10^{-2}	1.60×10^{-1}	2.50×10^{-1}
216	3.82×10^{-4}	1.76×10^{-2}	2.85×10^{-2}	9.32×10^{-2}	1.40×10^{-1}
217	5.01×10^{-3}	2.90×10^{-2}	4.42×10^{-2}	1.35×10^{-1}	2.13×10^{-1}

mrem = millirem

Pu = plutonium

Th = thorium

Compliance Assessment Based on Measured Concentrations for 2010

The MCP (now the Mound site) requested approval from EPA in July 2004 to use environmental measurements of radionuclide air concentrations as a means of demonstrating compliance with Title 40 *Code of Federal Regulations* Part 61 (40 CFR 61) Subpart H. The request was made because a significant decrease in stack emissions occurred in 2004, and all stacks were demolished by summer 2005. EPA approval was received in December 2004.

The Mound site estimated the dose based on data from routine environmental monitoring. Table 3 shows the estimated CEDEs from air emissions from Mound site operations. The dose limit for DOE facilities to be protective of human health is 10 mrem/year (40 CFR Part 61 Subpart H).

Table 3. 2010 Maximum Committed Effective Dose Equivalents to a Hypothetical Individual

Radionuclide	CEDE (mrem)	CEDE (mSv)
Tritium	(a)	(a)
Pu-238	4.81×10^{-3}	4.81×10^{-4}
Pu-239/240	(a)	(a)
Th-227	(a)	(a)
Th-228	3.36×10^{-2}	3.36×10^{-4}
Th-230	5.16×10^{-2}	5.16×10^{-4}
Th-232	1.60×10^{-1}	1.60×10^{-3}
Total	2.51×10^{-1}	2.51×10^{-3}

(a) = Not a significant dose contributor at this location

mrem = millirem

mSv = millisievert

Pu = plutonium

Th = thorium

Based on data collected from each air monitoring station, a CEDE was calculated. The location of the station with the largest CEDE was chosen as the location of the hypothetical individual. This method of determining the maximum CEDE provides a level of conservatism. The maximum CEDE to a hypothetical individual from the Mound site operations during 2010 (due to air emissions) based on monitoring data was 2.51×10^{-1} millirem (mrem) (2.51×10^{-3} millisievert).

Section IV. Additional Information

Summary of Input Parameters

As stated earlier in this report, the Mound site did not use the Gaussian plume model this year because the calculated doses were so low, and no point sources exist at the facility.

Construction and Modification Activities

Dose assessments were performed prior to the beginning of the OU-1 excavation using actual doses calculated from data obtained by on-site monitors. The dose for all of CY 2006 was below 1 mrem. The dose for all of CY 2007 was 3.62×10^{-1} mrem, which was also below 1 mrem. Environmental remediation of OU-1 was performed in 2007 and was completed in early 2008. Additional remediation of PRS 7 and PRS 441 was performed in 2008 and was completed in CY 2009. The final removal of the remaining sanitary landfill in OU-1 was accomplished in CY 2010 with congressionally approved ARRA funding.

Discussion of Projects Approved by EPA

A contract for additional remediation at OU-1 and PRS 441 (Parcel 9) was awarded in mid-October 2006. Physical work started on January 27, 2007. The removal-action work at OU-1 was completed on February 14, 2008. Backfilling of OU-1 started on January 28, 2008,

and was completed in 2008. The removal and backfill of the abandoned outfall line, PRS 7, was accomplished in CY 2008. PRS 441 is the rail storage and waste shipment facility. During CY 2008, PRS 441 received waste from PRS 7 and OU-1. Shipment of all the staged waste was completed in CY 2008, and remediation of PRS 441 was started. All physical work associated with these contracts was completed on July 6, 2009. On July 21, 2009, construction started at OU-1 in preparation for additional removal actions taken at the discretion of DOE utilizing a portion of the ARRA funding. All excavation activities associated with the final removal of the remaining vestiges of the OU-1 landfill were completed in April 2010. The last waste removed from OU-1 that was above site COs was in March 2010 and this waste was shipped by the end of March 2010. The waste shipments from April through July 2010 consisted of soil below the COs. Ordinarily this soil could have remained on site, but the approved OU-1 work plan specified removed soil must be shipped as low-level waste because it might contain solid uncharacterized debris. In addition to the on-site and off-site permanent air monitors, the remediation contractor placed up to four workplace monitors during construction activities. The locations of the downwind monitors were determined by a cloth wind direction indicator and/or smoke tests. The locations of the monitors were adjusted as conditions changed. All workplace sample results for CY 2010, including those for OU-1 construction activities, shipment of wastes, and cleanup of the rail load area waste-loading operations, were less than 2 percent of the derived air concentration.

The location of the station with the largest CEDE was on-site sampler 215, which was selected as the location of the hypothetical individual receiving the maximum off-site 2010 dose of 2.51×10^{-1} mrem (0.3 mrem). The monitoring location was chosen to represent the off-site dose because the site is now open to the public.

Starting April 2010 none of the particulate emissions will be from DOE work, and all future activities will be by the land developers the Mound Development Corporation

Discussion of Future Monitoring and Termination Agreements Approved by USEPA

No excavation or other physical work has been performed by DOE other than monitoring well maintenance since June 2010.

The DOE has agreed with the USEPA that in 2011 it will submit three reports. These will be the 2010 annual report, one for the period July 2009 through June 2010 and another for the period July 2010 to June 2011. This will provide information during the excavation and post excavation activities, respectively.

Section V. Supplemental Information

Unplanned Releases of Radionuclides

No unplanned radionuclide releases occurred in 2010. An unplanned release is one that is not part of a normal, monitored release and that exceeds 50 percent of the EPA's reportable quantity as specified in 40 CFR 302.

Status of Compliance with Subparts Q and T of 40 CFR 61

Subparts Q and T of 40 CFR 61 do not apply to the Mound site. The provisions of subpart Q apply to the design and operation of all storage and disposal facilities for radium-containing material (i.e., byproduct material as defined under section 11.e(2) of the Atomic Energy Act of 1954 [as amended]). The provisions of subpart T apply to owners and operators of all sites that are used for the disposal of uranium mill tailings and that manage residual radioactive material during and following the processing of uranium ores.

Radon-220 Emissions

The Mound site does not have sources of radon-220 emissions.

Non-Disposal/Non-Storage Sources of Radon-222 Emissions

The Mound site does not have sources of radon-222 emissions.

Assessment of Facility Compliance with National Emissions Standards for Hazardous Air Pollutants Effluent Monitoring Requirements

The Mound site does not have point sources of radionuclide emissions.

Audits

There were independent laboratory quality assurance audits in 2010.

Section VI. Certification

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein, and, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. (See 18 U.S.C. 1001).

Name: Art Kleinrath
Title Mound Site Manager
U.S. Department of Energy Office of Legacy Management

Signature *Art Kleinrath*

Date *May 10 2011*