THE SWIFT STALEY TEAM

# Paducah Gaseous Diffusion Plant
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**Department of Energy**

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JUN 2 9 2010

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Mr. Reid Rosnick
U.S. EPA Headquarters
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MS6608J, 1200 Pennsylvania Avenue, Northwest
Washington, DC 20460

Dear Sirs:

**SUBMISSION OF THE NATIONAL EMISSIONS STANDARDS FOR HAZARDOUS AIR POLLUTANTS ANNUAL REPORT FOR 2009 U.S. DEPARTMENT OF ENERGY EMISSIONS AT THE PADUCAH GASEOUS DIFFUSION PLANT, PADUCAH, KENTUCKY (PRS-REG-0010)**

Please find enclosed the calendar year 2009 Annual National Emission Standards for Hazardous Air Pollutants Report, required by 40 *CFR* § 61, Subpart H. This report summarizes airborne radionuclide emissions from the Paducah Site, including both U.S. Department of Energy and United States Enrichment Corporation emissions for calendar year 2009.

If you have any questions or require additional information, please contact Don Dihel at (270) 441-6824.

Sincerely,

Reinhard Knerr
Paducah Site Lead
Portsmouth/Paducah Project Office

Enclosures:
1. Certification page
2. NESHAP Annual Report for 2009

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# CERTIFICATION

**Document Identification:** ***National Emissions Standards for Hazardous Air Pollutants Annual Report For 2009 U.S. Department Of Energy Emissions at the Paducah Gaseous Diffusion Plant*** **(PRS-REG-0010)**

This PRS and DOE certification pertains to the following DOE emission sources:

C-752-A Waste Activities
Northwest Plume Treatment Facility
Northeast Plume Treatment Facility
C-301, DOE Material Storage Area Outside 12
Fugitive and Diffuse Sources

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 *USC* 1001.)

Paducah Remediation Services, LLC

for Dennis Ferrigno, PM, Site Manager
Paducah Remediation Services, LLC

6/29/2010
Date Signed

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 *USC* 1001.)

U.S. Department of Energy (DOE)

Reinhard Knerr
Paducah Site Lead
Portsmouth/Paducah Project Office
U.S. Department of Energy

6/29/10
Date Signed

PRS-REG-0010

# National Emissions Standards for Hazardous Air Pollutants Annual Report for 2009 U.S. Department of Energy Emissions at the Paducah Gaseous Diffusion Plant

This document is approved for public release per review by:

D. T. Anderson — Paducah Classification and Control Office

6-28-10 — Date

PRS-REG-0010

# National Emissions Standards for Hazardous Air Pollutants Annual Report for 2009 U.S. Department of Energy Emissions at the Paducah Gaseous Diffusion Plant

Date Issued—June 2010

Prepared for the
U.S. DEPARTMENT OF ENERGY
Office of Environmental Management

Prepared by
PADUCAH REMEDIATION SERVICES, LLC
managing the
Environmental Management activities at the
Paducah Gaseous Diffusion Plant
under contract DE-AC30-06EW05001

# CONTENTS

## FIGURE



## TABLES

# ACRONYMS

| | |
|---|---|
| CAP-88 | Computer modeling program |
| *CFR* | *Code of Federal Regulations* |
| DOE | U.S. Department of Energy |
| EPA | U.S. Environmental Protection Agency |
| HEPA | high-efficiency particulate air |
| NESHAP | National Emission Standards for Hazardous Air Pollutants |
| PGDP | Paducah Gaseous Diffusion Plant |
| USEC | United States Enrichment Corporation |

# EXECUTIVE SUMMARY

The Kentucky Division for Air Quality regulates air emissions of radionuclides, other than radon, from the U.S. Department of Energy (DOE) facilities under 401 *Kentucky Administrative Regulations* (*KAR*) 57:002. The U.S. Environmental Protection Agency (EPA) also regulates air emissions of radionuclides from DOE facilities under 40 *Code of Federal Regulations (CFR)* § 61, Subpart H. Submission of this report fulfills the annual reporting requirements of 40 *CFR* § 61.94.

DOE owns the Paducah Gaseous Diffusion Plant (PGDP), which has radionuclide air emissions from DOE operations as well as from United States Enrichment Corporation (USEC) operations. Because all regulated airborne radionuclide emissions are subject to the regulation, both DOE and USEC operations were included in the estimate of the Paducah Site resultant dose to the public. DOE certifies the information relating to its operation only. USEC submits a separate National Emission Standards for Hazardous Air Pollutants (NESHAP) report relating to emissions from its activities. The dose to the public is calculated using a computer modeling program (CAP-88) specified in 40 *CFR* § 61.93. Inputs to the computer program for both DOE and USEC sources are obtained through continuous monitoring, periodic confirmatory measurements, engineering estimates, emission factors, and other EPA-approved methods. Subpart H requires an annual compliance report covering site emissions from the previous year. This report meets the annual reporting requirements and establishes the total annual effective dose equivalent to the maximally exposed member of the public in 2009 at 0.012 mrem, including USEC and DOE contributions. DOE emissions contribution to this total was 0.00015 mrem. This is well below the annual limit of 10 mrem per year.

# 1. FACILITY DESCRIPTION

*Site Name*: Paducah Gaseous Diffusion Plant

*Location*: Paducah, Kentucky

*Owner:* U.S. Department of Energy
Portsmouth/Paducah Project Office
P. O. Box 1410
Paducah, Kentucky 42002-1410
Reinhard Knerr
(270) 441-6825

*Operator:* Paducah Remediation Services, LLC
761 Veterans Avenue
Kevil, Kentucky 42053
Mike Spry, President
(270) 441-5100

# 2. INTRODUCTION

The U.S. Department of Energy (DOE) Paducah Site includes the Paducah Gaseous Diffusion Plant (PGDP), which is leased to the United States Enrichment Corporation (USEC). DOE manages the remaining, nonleased facilities at the Paducah Site. The DOE-managed facilities consist of various waste management facilities, inactive buildings, depleted uranium storage facilities, and environmental restoration facilities. Paducah Remediation Services, LLC, and Uranium Disposition Services, LLC, are the operators of the DOE managed facilities.

Emissions from both USEC and DOE activities were analyzed together. DOE certifies only the information related to its emissions. The results from the single combined analysis are presented in separate DOE and USEC reports. The reports have been separated to ease review and approval by the separate organizations.

# 3. SITE DESCRIPTION

PGDP is an active uranium enrichment facility consisting of a diffusion cascade and extensive support facilities. The cascade, including product and tails withdrawal, is housed in six large process buildings. The plant is located on a reservation consisting of approximately 3,500 acres in western McCracken County, 10 miles west of Paducah, Kentucky, and 3.5 miles south of the Ohio River. The facility is on approximately 1,350 acres with controlled access. Roughly 650 acres of the reservation are enclosed within a fenced security area. An uninhabited buffer zone of at least 400 yards surrounds the entire fenced area. During World War II, the Kentucky Ordnance Works, a trinitrotoluene production facility, was operated in an area southwest of the plant on what is now a wildlife management area.

Construction of the PGDP facility began in 1951 and the plant was fully operational by 1955, supplying enriched uranium for commercial reactors and defense uses. Enriched uranium is defined as uranium in which the concentration of the fissionable uranium-235 ($^{235}U$) isotope has been increased from its natural assay. Natural uranium is primarily uranium-238 ($^{238}U$), with about 0.71 percent $^{235}U$ and 0.0055 percent uranium-234 ($^{234}U$). Uranium mills process the ores to produce concentrated uranium oxide ($U_3O_8$), which then is converted commercially to uranium hexafluoride ($UF_6$) for enrichment at a gaseous diffusion plant.

The radioactive materials used at the PGDP are associated with enrichment of the uranium isotope, $^{235}U$, by utilizing a gaseous diffusion process [40 *CFR* § 61.94 (a) (2)]. During enriching operations from 1953 to 1975, feed material (called "reactor tails") from government reactors also was used intermittently in addition to the $UF_6$ typically used. Reactor tails were the spent fuel from nuclear reactors that is depleted in $^{235}U$ content and has been reprocessed to remove most of the fission products. The reactor fuel rods were processed at other DOE facilities (where most of the fission products were removed) and the enriched uranium and the remaining fission products were fed into the PGDP cascade system. Use of the reactor tails resulted in the introduction of technetium-99 ($^{99}Tc$), a fission by-product, and transuranics, most notably neptunium-237 ($^{237}Np$) and plutonium-239 ($^{239}Pu$), into the cascade.

The West Kentucky Wildlife Management Area and lightly populated farmlands are in the immediate environs of PGDP. The population within the 50-mile radius is approximately 530,000 persons. Of these, 44,000 live within 10 miles of the plant and 104,000 live within 20 miles of the plant. Population data were determined from the LandView 6 Census 2000 population estimator computer program. The unincorporated communities of Grahamville and Heath are 1.24 and 1.86 miles east of the plant, respectively. Portions of 28 counties, 11 of which are in Kentucky, 4 in Missouri, 10 in Illinois, and 3 in Tennessee, are included within the 50-mile radius of the plant. Larger cities in the region include Paducah, Kentucky, located 10 air miles east of the plant; Cape Girardeau, Missouri, located 40 air miles to the west; and Metropolis, Illinois, located 6 air miles to the northeast. The nearest neighbor residences in each direction are observed and entered into the dose modeling software.

Paducah is located in the humid continental zone. Summers generally are dry; precipitation occurs mainly in the spring and fall. Winters are characterized by moderately cold days; the average temperature during the coldest month, January, is about 35 °F. Summers are warm and humid; the average temperature in July is 79 °F. Yearly precipitation averages about 44 inches. The prevailing wind direction is south to southwest.

In July 1993, USEC was formed as a government corporation and became a private corporation in July 1998. Although DOE still owns all the facilities at PGDP, the uranium enrichment enterprise is now the responsibility of USEC.

## 4. DOE SOURCE HANDLING AND PROCESSING DESCRIPTION

The description of the handling and processing that the radioactive materials undergo with DOE operations at the Paducah Site is described in the following sections. The radioactive materials handled were containerized waste, depleted uranium hexafluoride managed in cylinders, and radioactive contamination on equipment, facilities, and released to the environment.

## 4.1 NORTHWEST PLUME INTERIM REMEDIAL ACTION PROJECT

On September 1, 1995, DOE began operation of a treatment plant designed to remove of trichloroethene and $^{99}$Tc from contaminated groundwater plume from the PGDP. The facility, C-612, is located at the northwest corner of the PGDP site security area. The facility consists of an air stripper to remove volatile organics and an ion exchange unit to remove of $^{99}$Tc from the groundwater. An air stripper is located upstream of an ion exchange unit.

Historic sampling has shown very little $^{99}$Tc is stripped from the water. Emissions of $^{99}$Tc were estimated using 40 *CFR* § 61, Subpart H, Appendix D, emission factors and the analysis of the groundwater. The exhaust from the air stripper is passed through a carbon adsorption unit prior to exhaust. Extensive sampling has shown that $^{99}$Tc is not retained in the carbon; therefore, no reduction in $^{99}$Tc emissions due to the use of the adsorption unit were assumed. The estimated emissions are analyzed in Section 6.

## 4.2 NORTHEAST PLUME CONTAINMENT SYSTEM

DOE began normal operation of a second treatment system on February 28, 1997 to treat another contaminated groundwater plume, as an interim remedial action. The system, C-614, extracts contaminated groundwater and pumps it to the C-637 Cooling Towers operated by USEC. Initially, the contaminated groundwater did not contain radionuclides; however, $^{99}$Tc has been detected continuously in the groundwater and consequently emitted to the air since 2005. Emissions of $^{99}$Tc were estimated using 40 *CFR* § 61, Subpart H, Appendix D, emission factors and the analysis of the groundwater. The estimated emissions are analyzed in Section 6.

## 4.3 C-752-A WASTE MANAGEMENT ACTIVITIES

Waste containing fine particulate radioactive material was repackaged. The particulate waste was repackaged in an enclosure within C-752-A. The ventilation for the enclosure passes through high-efficiency particulate air (HEPA) filters and then is exhausted through two stacks. The airborne concentration of radionuclides was estimated using emission factors in Appendix D of 40 *CFR* § 61.

## 4.4 C-301 DOE MATERIAL STORAGE AREA OUTSIDE-12 METAL REDUCTION PROJECT

Contaminated metal components were size reduced in DOE Material Storage Area Outside-12 to facilitate disposal. During 2009, fugitive airborne radionuclide emissions may have resulted from dust created by size reduction and loading the metal into transportation containers. The amount of radionuclides released was estimated based on emission factors from the *Compilation of Air Emission Factors*, AP-42, U.S. Environmental Protection Agency (EPA), Fifth Edition, January 1995, updated annually.

## 4.5 FUGITIVE AND DIFFUSE SOURCES

Diffuse/fugitive sources include any source that is distributed spatially, diffuse in nature, or not emitted with forced air from a stack, vent, or other confined conduit. Diffuse/fugitive sources also include emissions from sources where forced air is not used to transport the radionuclides to the atmosphere. In this case, radionuclides are transported entirely by diffusion and/or thermally driven air currents. Typical

examples of diffuse/fugitive sources include emissions from building breathing; resuspension of contaminated soils, debris, or other materials; unventilated tanks; ponds, lakes, and streams; wastewater treatment systems; outdoor storage and processing areas; and leaks in piping, valves, or other process equipment. DOE has identified many potential fugitive and diffuse sources such as inactive facilities, building roofs, scrap metal storage yards, landfills, and various contamination areas. The use of ambient air monitors to evaluate emissions from fugitive and diffuse sources is described in Section 9.

### 4.6 MISCELLANEOUS SOURCES

DOE identified transport and disposal of contaminated materials in the C-746-U Landfill and decontamination of machinery and equipment used in remediation activities (e.g., well drilling) as miscellaneous sources. The use of ambient air monitors to evaluate emissions from these sources is described in Section 9. DOE understands that USEC will be submitting a separate NESHAP report addressing more detailed analysis of USEC emissions from USEC operations.

## 5. CONSTRUCTION AND MODIFICATION ACTIVITIES

No DOE construction or modification activities were waived under 40 *CFR* § 61.96.

## 6. DOE SOURCE CHARACTERISTICS AND AIR EMISSIONS DATA

The Tables 1 through 4 contain specific emission information for each DOE emission point. Table 1 lists the emission points and efficiency of control devices as required by 40 *CFR* § 61.94 (a) (4) & (5). Table 2 lists the distances from each emission point to receptors of concern as listed in 40 *CFR* § 61.94 (a) (6). Table 3 contains emission point information required to estimate the resulting potential exposure as required by 40 *CFR* § 61.94 (a) (7). Table 4 contains a list of site radioactive materials and their emission rates as required by 40 *CFR* § 61.94 (a) (2).

**Table 1. Emission Point Effluent Controls and Efficiencies**

| Minor Point and Area Sources | Type Control | Efficiency % |
|---|---|---|
| Northwest Plume Treatment Facility | None | 0 |
| C-752-A Waste Management Activities | HEPA | 99 |
| Northeast Plume Treatment Facility | None | 0 |
| C-301 OS-12 | None | 0 |

**Table 2. Distances to Selected Receptors**

| Source Name | Distances (m) to Selected Receptors | | |
|---|---|---|---|
| | Nearest Individual/Farm | Nearest Business | Nearest School |
| Northwest Plume Treatment Facility | 1,080 | 2,550 | 5,150 |
| C-752-A Waste Management Activities | 1,700 | 3,202 | 4,270 |
| Northeast Plume Treatment Facility | 1,360 | 2,073 | 4,207 |
| C-301 OS-12 | 1,554 | 2,490 | 4,565 |

**Table 3. Characteristics of Stacks, Vents, or Other Emission Points that Emit Radionuclides**

| Source Name | Type | Height (m) | Diameter (m) | Gas Exit Velocity (m/s) | Gas Exit Temp. (°C) | Distance (m) & Direction to Maximally Exposed Individual for Each Source (MEI) |
|---|---|---|---|---|---|---|
| Northwest Plume Treatment Facility | Point | 7.0 | 0.35 | 9.45 | 37.8 | 1,080 NNE |
| C-752-A Waste Management | Point | 5.5 | 0.3 | 6.47 | Ambient | 1,700 N |
| Northeast Plume Treatment Facility | Point | 10.22 | 8.18 | 4.84 | Ambient | 1,360 SE |
| C-301 OS-12 | Point | 1 | NA | 0 | Ambient | 1,554 SE |

**Table 4. Radionuclide Materials and Emissions Data (Curies)**

| Nuclide | NW Plume Treatment Facility | C-752-A Waste Management Activities | NE Plume Treatment Facility | C-301 OS-12 | Total |
|---|---|---|---|---|---|
| $^{234}U$ | 0 | 1.76E-05 | 0 | 1.68E-08 | 1.76E-05 |
| $^{235}U$ | 0 | 9.13E-07 | 0 | 6.59E-10 | 9.14E-07 |
| $^{238}U$ | 0 | 1.47E-05 | 0 | 5.02E-09 | 1.47E-05 |
| $^{99}Tc$ | 8.20E-05 | 1.29E-06 | 4.44E-06 | 1.19E-07 | 8/79E-05 |
| $^{230}Th$ | 0 | 2.76E-07 | 0 | 0 | 2.76E-07 |
| $^{232}Th$ | | 1.54E-09 | 0 | 0 | 1.54E-09 |
| $^{237}Np$ | 0 | 9.21E-07 | 0 | 1.64E-09 | 9.23E-07 |
| $^{238}Pu$ | | 6.39E-09 | 0 | 0 | 6.39E-09 |
| $^{239}Pu$ | 0 | 6.64E-08 | 0 | 1.43E-09 | 6.78E-08 |
| $^{241}Am$ | 0 | 2.00E-08 | 0 | 0 | 2.00E-08 |
| $^{137}Cs$ | | 5.58E-09 | 0 | 0 | 5.58E-09 |
| **TotalCuries/ year** | 8.20E-05 | 3.58E-05 | 4.44E-06 | 1.44E-07 | 1.22E-04 |

# 7. DOSE ASSESSMENT

## 7.1 DESCRIPTION OF DOSE MODEL

The radiation dose calculations were performed using the CAP-88 package of computer codes which were converted from the mainframe CAP-88 version. This package contains EPA's version of the AIRDOS-EPA computer code, which implements a steady-state, Gaussian plume, atmospheric dispersion model to calculate environmental concentrations of released radionuclides and then uses Regulatory Guide 1.109 foodchain models to calculate human exposures, both internal and external, to the environmental concentrations. The human exposure values are then used by the EPA's version of the DARTAB computer code to calculate radiation doses to man from radionuclides released during the year. The dose calculations use dose conversion factors contained in the RADRISK data file, which is provided by the EPA with the CAP-88 package. Selection of the dose conversion factors follows guidance given by the EPA in its Federal Guidance Report No. 11.

## 7.2 SUMMARY OF INPUT PARAMETERS

Default input parameters are used except for those provided in Section 6 and immediately below. Meteorological input information is from the Paducah National Weather Service (NWS) except for the on-site joint frequency distribution information. The average mixing layer height was derived from area upper air data from 2007 and supplied by Oak Ridge National Laboratory.

| | |
|---|---|
| Joint frequency distribution: | Five-year STAR distribution from 60-meter station on PGDP meteorological tower for the years 1988 through 1992. |
| Rainfall rate: | 125 centimeters/year |
| Average air temperature: | 14.2 °C |
| Average mixing layer height: | 659 meters |

Fraction of foodstuffs from (rural default values):

| | Local Area | 50-Mile Radius | Beyond 50 Miles |
|---|---|---|---|
| Vegetables and produce: | 0.700 | 0.300 | 0.000 |
| Meat: | 0.442 | 0.558 | 0.000 |
| Milk: | 0.399 | 0.601 | 0.000 |

## 7.3 DOSE ESTIMATE

Effective dose equivalent (mrem) to maximally exposed individual for each individual source and the plant is provided in Table 5. The dose estimate is based on both the DOE and USEC sources combined (data provided by USEC).

**Table 5. Dose Analysis**

| USEC Emission Sources[1] | Dose to the Maximum Exposed Individual for each Source (mrem) | Dose to the Maximum Exposed Individual for the Plant (mrem) |
|---|---|---|
| C-400 Group | 2.4E-03 | 2.4E-03 |
| C-400 Cylinder Drying Station | 1.8E-05 | 1.8E-05 |
| C-709/C-710 Laboratory Hoods | 3.1E-04 | 3.1E-04 |
| C-310 Stack | 7.0E-03 | 6.8E-03 |
| Seal Exhaust/Wet Air Group | 1.3E-03 | 1.3E-03 |
| C-409 Dissolver | 2.2E-07 | 2.2E-07 |
| C-360 | 2.2E-03 | 9.7E-04 |
| **Total From USEC Sources** | **N/A** | **1.2E-02** |
| | | |
| **DOE Emission Sources** | | |
| Northwest Plume Treatment Facility | 1.5E-05 | 1.5E-05 |
| C-752-A Waste Activities | 1.3E-04 | 1.3E-04 |
| Northeast Plume Treatment Facility | 3.0E-07 | 2.3E-07 |
| C-301 OS-12 | 2.3E-07 | 1.1E-07 |
| **Total From DOE Sources** | **N/A** | **1.5E-04** |
| | | |
| **Total From All Sources** | **N/A** | **1.2E-02** |

The maximally exposed individual from all plant emissions is located 2,040 meters north of the C-310 Stack (a USEC source).

Based on 2000 census data obtained from the LandView 6 software, the total collective effective dose equivalent to the 50-mile population (approximately 530,000 persons) was 0.08 person-rem.

## 8. UNPLANNED RELEASES

There were no DOE unplanned releases in 2009. An unplanned release from the USEC C-310 Stack on June 27, 2009, was detected by Kentucky Radiation Health Branch ambient air monitor AME002 the week of June 24 - 30, 2009. The isotopes released are included in the 2009 emissions for the stack, which are well below the annual limit.

## 9. AMBIENT AIR MONITORING

In accordance with the *Paducah Gaseous Diffusion Plant Department of Energy National Emission Standards for Hazardous Air Pollutants (NESHAP) Management Plan*, BJC/PAD-141, February 2000, DOE utilized ambient air monitoring data to verify insignificant levels of radionuclides in off-site ambient air. Ambient air stations collect radionuclide samples at sites surrounding the plant. The ambient air monitors capture airborne radionuclides emitted from all sources including fugitive and diffuse sources. The Radiation/Environmental Monitoring Section of the Radiation Health Branch of the Department for Public Health of the Kentucky Cabinet for Health and Family Services operates the ambient air monitors.

[1] Certified by USEC in its annual report.

The Radiation Health Branch reports that air filters were screened weekly for gross alpha and beta activity and then composited on a quarterly basis. The quarterly composites were analyzed by gamma spectroscopy using a thin window 40 percent high purity germanium detector, which allows for detection of low energy gamma emitters. Americium-241 ($^{241}$Am) and thorium-234 ($^{234}$Th) were not detected by gamma spectroscopy for the quarterly composites.

In accordance with the Radiation Health Branch's protocol, plutonium and uranium isotopic analyses were performed on the quarterly composites. The quarterly composites were analyzed for $^{99}$Tc. Technetium-99 was not detected in the quarterly composites.

Other than the unplanned release from the C-310 Stack, the ambient air monitoring conducted by the Kentucky Radiation Health Branch did not detect plant-derived radionuclides above background levels. The actual results, though less than the measurement error, of each air monitor are listed in Table 6 of this report.

Locations of the ambient air monitoring stations are shown in Figure 1.

## 10. STATUS OF 40 *CFR* § 61 SUBPART H COMPLIANCE

DOE has remained in compliance with 40 *CFR* § 61, Subpart H, since 1993. Kentucky Division for Air Quality received a delegation of authority to administer the NESHAP program in July 1999. A NESHAP Management Plan has been developed by DOE that addresses fugitive and diffuse emissions. EPA Region 4 concurred with the DOE NESHAP Management Plan on September 19, 2000. In accordance with the management plan, ambient air monitoring was utilized to verify compliance of the Paducah Site with 40 *CFR* § 61, Subpart H, for all emissions. Ambient air monitoring conducted by the Kentucky Radiation Health and Toxics Branch did not detect plant derived radionuclides above background levels during calendar year 2009; therefore, the facility is in compliance with 40 *CFR* § 61 Appendix E, Table 2 values, and the management plan.

Based on the results included in this report, during 2009, the Paducah Site was in compliance with 40 *CFR* § 61, Subpart H, for all airborne radionuclide emissions.

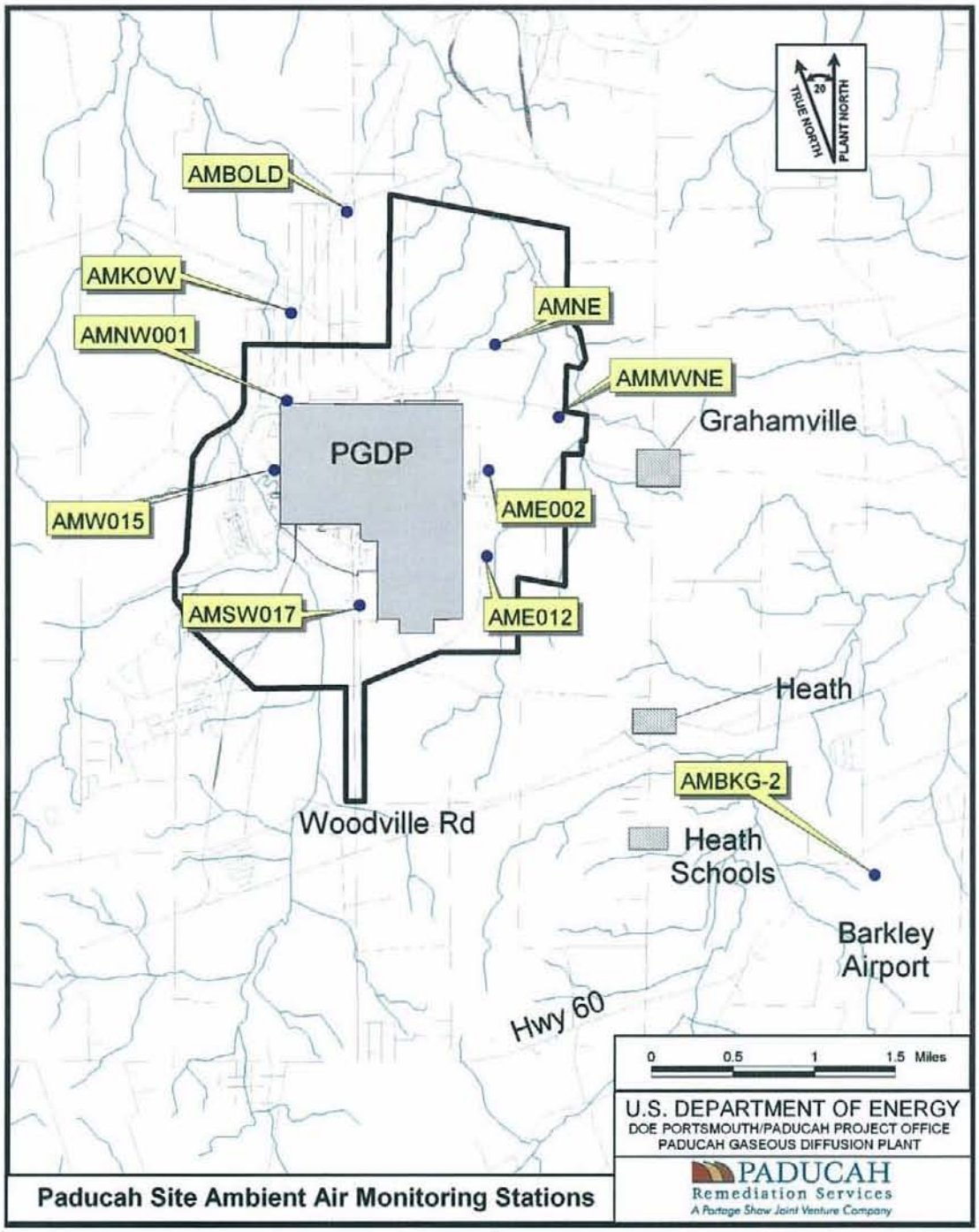


**Figure 1. Location of Paducah Site Ambient Air Monitors**

**Table 6. Kentucky Radiation Health and Toxics Branch Ambient Air Monitoring Results[2,3]**
**Ambient Air Station**

| | | AMSW017 | AMW015 | AMNW001 | AMNE | AME002[4] | AME012 | AMBKG2 | AMBOLD | AMKOW | AMMWNE | TRPBLK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Qtr | Nuclide | Ci/m3 | Ci/m3 | Ci/m3 | Ci/m3 | Ci/m3 | Ci/m3 | Ci/m3 | Ci/m3 | Ci/m3 | Ci/m3 | Ci/m3 |
| 1 | Am-241 | -3.41E-17 | 3.16E-16 | 6.98E-17 | 3.43E-17 | -6.53E-16 | 1.26E-16 | -1.84E-16 | -7.22E-18 | -2.65E-16 | -9.12E-16 | 1.51E-16 |
| | Np-237 | -1.02E-16 | 6.58E-16 | -2.05E-16 | -1.91E-16 | 1.40E-16 | -1.49E-16 | 1.84E-16 | -2.02E-16 | -4.05E-16 | -2.54E-16 | -2.00E-16 |
| | Tc-99 | -3.13E-16 | -4.71E-16 | -3.29E-16 | -4.20E-16 | -1.47E-16 | -1.45E-16 | -3.55E-16 | -6.30E-16 | -7.59E-16 | 1.13E-17 | -4.31E-16 |
| | U-238/Th-234 | 1.64E-16 | 1.09E-16 | 1.14E-16 | 2.57E-16 | 2.06E-16 | 2.13E-16 | 9.02E-17 | 1.83E-16 | 1.59E-16 | 1.51E-16 | 1.09E-15 |
| | | | | | | | | | | | | |
| 2 | Am-241 | -5.42E-17 | 3.76E-16 | 8.48E-18 | -1.89E-16 | 3.15E-16 | 6.43E-19 | 2.63E-16 | -2.57E-16 | -8.97E-17 | -9.09E-17 | -1.73E-16 |
| | Np-237 | 4.89E-17 | 2.71E-16 | -5.36E-17 | -1.69E-16 | -1.78E-16 | -1.91E-16 | 9.40E-17 | -3.56E-16 | 2.95E-16 | 7.15E-17 | -1.05E-16 |
| | Tc-99 | 3.69E-16 | 3.50E-16 | 1.75E-16 | -2.69E-16 | 5.94E-18 | -4.26E-17 | -5.65E-18 | -1.09E-16 | -8.16E-17 | 1.18E-16 | -2.49E-16 |
| | U-238/Th-234 | 1.23E-16 | 1.13E-16 | 8.40E-17 | 6.06E-17 | 1.28E-16 | 4.87E-17 | 7.81E-17 | 1.83E-16 | 1.13E-16 | 3.51E-16 | 2.81E-17 |
| | | | | | | | | | | | | |
| 3 | Am-241 | 3.08E-16 | 1.20E-16 | -1.48E-17 | 1.76E-18 | -3.67E-17 | -4.56E-17 | 1.84E-16 | 1.54E-16 | 1.05E-16 | 5.17E-16 | 7.37E-17 |
| | Np-237 | 2.34E-17 | 8.40E-16 | 2.06E-16 | 6.47E-17 | 1.70E-16 | -2.25E-16 | 2.15E-16 | 1.50E-16 | -3.80E-18 | 1.93E-17 | -4.84E-17 |
| | Tc-99 | 1.64E-16 | 3.80E-16 | 3.09E-16 | 1.84E-16 | 2.58E-16 | 5.45E-17 | 2.33E-16 | 2.12E-16 | 3.80E-16 | 2.82E-16 | 7.60E-17 |
| | U-238/Th-234 | 1.59E-16 | 2.48E-16 | 2.63E-16 | 2.16E-16 | 2.04E-16 | 1.84E-16 | 1.41E-16 | 4.92E-16 | 3.11E-16 | 1.39E-16 | 2.16E-17 |
| | | | | | | | | | | | | |
| 4 | Am-241 | -1.19E-16 | -2.14E-17 | -2.31E-17 | 2.01E-16 | 6.85E-17 | -8.70E-17 | 2.25E-17 | 2.54E-17 | 3.79E-16 | -3.93E-17 | -9.50E-17 |
| | Np-237 | 1.93E-16 | -6.88E-17 | -2.07E-16 | 2.36E-16 | 7.01E-17 | 8.64E-17 | -9.55E-17 | 1.08E-16 | -2.05E-17 | 6.52E-18 | -2.54E-17 |
| | Tc-99 | 4.55E-16 | -3.92E-16 | -7.37E-17 | 2.78E-17 | -1.22E-16 | 6.12E-16 | 4.56E-16 | 1.98E-16 | 3.91E-16 | -1.26E-16 | 8.56E-17 |
| | U-238/Th-234 | 3.36E-17 | -8.15E-18 | 6.22E-17 | 1.34E-16 | 9.07E-17 | 4.14E-17 | 1.52E-18 | 7.19E-17 | 8.67E-17 | 7.18E-17 | -3.00E-17 |

[2] All results are below the applicable limiting values of 40 *CFR* § 61, Table 2 (see footnote 3).
[3] 40 *CFR* § 61, Table 2, Limiting Values (Ci/m3): $^{241}$Am - 1.9E-15, $^{237}$Np - 1.2E-15, $^{99}$Tc - 1.4E-13, $^{234}$Th - 2.2E-12 and $^{238}$U 8.3E-15.
[4] AME002 data for the last week in June were not included in the analysis due to an unplanned USEC release. See the Unplanned Release Section for more information.