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U.S. Department Of Energy Emissions At The Paducah Gaseous Diffusion Plant (PRS/PROG/0021)
 Author Tracey Brindley Corporate Author R. Boyd
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Department of Energy

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JUN 26 2007

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Dear Sirs:


**SUBMISSION OF THE NATIONAL EMISSIONS STANDARDS FOR
HAZARDOUS AIR POLLUTANTS ANNUAL REPORT FOR 2006 U.S.
DEPARTMENT OF ENERGY EMISSIONS AT THE PADUCAH GASEOUS
DIFFUSION PLANT (PRS-PROG-0021)**

Enclosed is the certified U. S. Department of Energy (DOE) Paducah Site Calendar Year 2006 Annual National Emission Standards for Hazardous Air Pollutants (NESHAP) Report, required by 40 CFR 61, Subpart H.

During 2006, the Paducah Site had operations conducted by two separate entities. DOE, in conjunction with its remediation contractor, performed environmental restoration and waste management activities, while the United States Enrichment Corporation (USEC) leased and operated the gaseous diffusion enrichment facilities at the site. The enclosed certified report addresses the emissions from the DOE operations only; however, for informational purposes, it also includes the total dose value associated with both DOE and USEC operations. The total dose value was derived by adding the DOE calculated dose to the USEC calculated dose. DOE is not certifying the data submitted by USEC. USEC will be submitting a separate NESHAP report addressing the radionuclide emissions from USEC operations. The combined dose to the most exposed individual resulting from both DOE and USEC operations was conservatively calculated at 0.012 millirem (mrem) for CY 2006, which is below the regulatory standard of 10 mrem per year.

If you have technical questions, please contact Mitch Hicks at (270) 441-6820.

Sincerely,


Reinhard Knerr
Paducah Site Lead
Portsmouth/Paducah Site Office

Enclosures:

1. CY 2006 Annual National Emission Standards for Hazardous Air Pollutants Report
2. Certification

cc w/enclosures:

L. Generette, EPA Region 4/Atlanta

G. Vazquez, EH-412/FORS

A. Wallo, EH-412/FORS

June 21, 2007

ENM-L-0352

Mr. Reinhard Knerr, Paducah Site Lead
Portsmouth/Paducah Project Office
U.S. Department of Energy
P.O. Box 1410
Paducah, Kentucky 42002-1410

Dear Mr. Knerr:

DE-AC-30-06EW05001 – DELIVERABLES NO. 35 AND NO. 144 – NATIONAL EMISSIONS STANDARDS FOR HAZARDOUS AIR POLLUTANTS ANNUAL REPORT FOR 2006 U.S. DEPARTMENT OF ENERGY EMISSIONS AT THE PADUCAH GASEOUS DIFFUSION PLANT (PRS/PROG/0021)

Due Date to the Regulators: June 30, 2007

Under cover of this letter, Paducah Remediation Services, LLC, is submitting the calendar year (CY) 2006 Annual National Emission Standards for Hazardous Air Pollutants (NESHAP) Report. This report summarizes U.S. Department of Energy (DOE) airborne radionuclide emissions from the Paducah Site for CY 2006. This report is required in accordance with 40 *CFR* § 61, Subpart H. The report has been revised to reflect DOE technical and legal review comments.

During 2006, the Paducah Site had operations conducted by two separate entities. DOE, in conjunction with its remediation contractor, performed environmental restoration and waste management activities, while the United States Enrichment Corporation (USEC) leased and operated the gaseous diffusion enrichment facilities at the site. The enclosed certified report addresses the emissions from the DOE operations only; however, for informational purposes, it also includes the total dose value associated with both DOE and USEC operations. The total dose value was derived by adding the DOE calculated dose to the USEC calculated dose. DOE is not certifying the data submitted by USEC. USEC will be submitting a separate NESHAP report addressing the radionuclide emissions from USEC operations. The combined dose to the most exposed individual resulting from both DOE and USEC operations conservatively was calculated at 0.012 millirem (mrem) for CY 2006, which is below the regulatory standard of 10 mrem per year.

In accordance with the Memorandum of Understanding between DOE and the U.S. Environmental Protection Agency for emission standards for radionuclides dated April 5, 1995, draft letters and a certification page are enclosed for DOE submission of the report.

If you require additional information, please contact Tracey Brindley at (270) 441-5167.

Sincerely,

A handwritten signature in black ink that reads "Russell Boyd". The signature is written in a cursive style with a long horizontal line extending to the right.

Russell Boyd, P.E., Site Manager
Paducah Remediation Services, LLC

RB:SK:dd

Enclosures:

1. Draft DOE Submittal Letter
2. Certification Page (4)
3. Draft Annual Report

cc w/enclosures:

File-DCC/DMC-RC

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In accordance with the requirements of Contract DE-AC30-06EW05001 and as acknowledged by the above signature, I hereby certify that the information provided in this transmittal has been prepared in accordance with all applicable requirements and the information is, to the best of my knowledge and belief, true, accurate, and complete.

CERTIFICATION


Document Identification: NATIONAL EMISSIONS STANDARDS FOR HAZARDOUS AIR POLLUTANTS ANNUAL REPORT FOR 2006 U.S. DEPARTMENT OF ENERGY EMISSIONS AT THE PADUCAH GASEOUS DIFFUSION PLANT (PRS/PROG/0021)

This certification pertains to the following DOE emission sources:

C-410 D&D Activities
C-746-P Scrap Metal Project
Northwest Plume Treatment Facility
Northeast Plume Treatment Facility
C-402 Demolition
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
Operator




Russell Boyd, P.E., Site Manager
Paducah Remediation Services, LLC
Operator, Paducah Gaseous Diffusion Plant




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)
Owner



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



Date Signed

**National Emissions Standards for Hazardous Air Pollutants
Annual Report for 2006 U.S. Department of Energy
Emissions at the Paducah Gaseous Diffusion Plant**

This document is approved for public release per review by:

Paducah Classification and Control Office
Swift and Staley Team

Date

**National Emissions Standards for Hazardous Air Pollutants
Annual Report for 2006 U.S. Department of Energy
Emissions at the Paducah Gaseous Diffusion Plant**

Date Issued – June 2007

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

| | |
|--|------|
| CONTENTS..... | iii |
| FIGURE | iv |
| TABLES | iv |
| ACRONYMS | v |
| EXECUTIVE SUMMARY..... | ES-1 |
| 1. FACILITY DESCRIPTION | 1 |
| 2. INTRODUCTION | 1 |
| 3. SITE DESCRIPTION | 1 |
| 4. DOE SOURCE HANDLING AND PROCESSING DESCRIPTION | 2 |
| 4.1 NORTHWEST PLUME INTERIM REMEDIAL ACTION PROJECT | 3 |
| 4.2 NORTHEAST PLUME CONTAINMENT SYSTEM..... | 3 |
| 4.3 SCRAP METAL PROJECTS..... | 3 |
| 4.4 C-301 DOE MATERIAL STORAGE AREA OUTSIDE-12 METAL REDUCTION PROJECT | 3 |
| 4.5 C-410 DECONTAMINATION AND DECOMMISSIONING ACTIVITIES..... | 3 |
| 4.6 C-402 DEMOLITION | 4 |
| 4.7 FUGITIVE AND DIFFUSE SOURCES | 4 |
| 4.8 MISCELLANEOUS SOURCES..... | 4 |
| 5. CONSTRUCTION AND MODIFICATION ACTIVITIES | 4 |
| 6. DOE SOURCE CHARACTERISTICS AND AIR EMISSIONS DATA..... | 6 |
| 7. DOSE ASSESSMENT..... | 7 |
| 7.1 DESCRIPTION OF DOSE MODEL | 7 |
| 7.2 SUMMARY OF INPUT PARAMETERS | 7 |
| 7.3 COMPLIANCE ASSESSMENT..... | 8 |
| 8. UNPLANNED RELEASES | 8 |
| 9. AMBIENT AIR MONITORING..... | 9 |
| 10. STATUS OF 40 <i>CFR</i> § 61 SUBPART H COMPLIANCE | 9 |

FIGURE

| | |
|--|---|
| 1. Location of Paducah Site Ambient Air Monitors | 5 |
|--|---|

TABLES

| | |
|--|----|
| 1. Emission Point Effluent Controls and Efficiencies..... | 6 |
| 2. Distances to Selected Receptors | 6 |
| 3. Characteristics of Stacks, Vents or Other Emission Points that Emit Radionuclides | 6 |
| 4. Radionuclide Materials and Emissions Data..... | 7 |
| 5. Dose Analysis | 8 |
| 6. Kentucky Radiation Health and Toxics Branch Ambient Air Monitoring Results..... | 10 |

ACRONYMS

| | |
|------------|--|
| <i>CFR</i> | <i>Code of Federal Regulations</i> |
| CY | Calendar Year |
| DOE | U.S. Department of Energy |
| EDE | effective dose equivalent |
| EPA | Environmental Protection Agency |
| HEPA | high-efficiency particulate air filter |
| KOW | Kentucky Ordnance Works |
| NESHAP | National Emission Standards for Hazardous Air Pollutants |
| PGDP | Paducah Gaseous Diffusion Plant |
| USEC | United States Enrichment Corporation |

EXECUTIVE SUMMARY

The Environmental Protection Agency (EPA) regulates air emissions of radionuclides, other than radon, from the U. S. Department of Energy (DOE) facilities under 40 *CFR* § 61, Subpart H. 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 effective dose equivalent (EDE) to the public. DOE certifies the information relating to its operation only. USEC submits a separate NESHAP report relating to emissions from its activities. The EDE to the public is calculated using a computer modeling program (CAP-88) specified in 40 *CFR* § 61.93. Inputs to the computer program 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 EDE to the maximally exposed member of the public in 2006 at 0.012 mrem, including USEC and DOE contributions. DOE emissions contribution to this total was 0.000078 mrem. This EDE 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
Russell Boyd, P.E.
(270) 441-5167

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, non-leased 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.

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 6 large process buildings. The plant is located on a reservation consisting of 1,350 acres in western McCracken County 10 miles west of Paducah, Kentucky, and 3 miles south of the Ohio River. 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. Beyond the DOE-owned buffer zone is an extensive wildlife management area consisting of 2,080 acres either deeded or leased to the Commonwealth of Kentucky. During World War II, the Kentucky Ordnance Works (KOW), 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 military defense reactors. 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 commercially converted to uranium hexafluoride (UF_6) for enrichment at a gaseous diffusion plant.

The radioactive materials used at the Paducah Plant 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 was also 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. ^{99}Tc is a man-made radioactive substance (radionuclide) having a half-life estimated at between 212,000 and 250,000 years. ^{99}Tc decays by emitting beta radiation.

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 520,000 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.

Paducah is located in the humid continental zone. Summers are generally 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 PGDP is described in the following sections.

4.1 NORTHWEST PLUME INTERIM REMEDIAL ACTION PROJECT

On September 1, 1995, DOE began operation of a groundwater treatment plant designed for the removal of trichloroethene and ⁹⁹Tc. The facility 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 ⁹⁹Tc from the groundwater. The air stripper is located upstream of the ion exchange unit.

Emissions of ⁹⁹Tc were estimated using the analysis of the influent groundwater and the effluent water leaving the air stripper. Comparison of the ⁹⁹Tc concentration in the influent and effluent of the air stripper and the quantity of the water passing through the stripper were used to estimate the total quantity of ⁹⁹Tc emitted from the facility. The exhaust from the air stripper is passed through a carbon adsorption unit prior to exhaust. Extensive sampling has shown that ⁹⁹Tc is not retained in the carbon; therefore, no reduction in ⁹⁹Tc emissions due to the use of the adsorption unit were assumed.

4.2 NORTHEAST PLUME CONTAINMENT SYSTEM

DOE began normal operation of a groundwater treatment system on February 28, 1997, as an interim remedial action. The system extracts contaminated groundwater and pumps it to the C-637 Cooling Towers operated by USEC. Initially, the contaminated groundwater did not contain radionuclides; however, ⁹⁹Tc has been continuously detected in the groundwater and consequently emitted to the air since 2005. Emissions of ⁹⁹Tc were estimated using 40 *CFR* § 61 Subpart H Appendix D emission factors and the analysis of both the influent groundwater and the basin water in the cooling tower.

4.3 SCRAP METAL PROJECTS

The Scrap Metal Projects removed scrap metal from the northwest portion of the Paducah Site as well as the C-746-D yard in the eastern portion of the site. During 2006, fugitive airborne radionuclide emissions may have resulted from dust created by removal, size reduction, and loading the scrap into transportation containers. The amount of radionuclides released was estimated based on emission factors from the U. S. Environmental Protection Agency (EPA), *Compilation of Air Pollutant Emission Factors*, 5th Edition.(1995)

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

DOE Material Storage Area Outside-12 (OS-12) size-reduced, contaminated metal components to facilitate disposal. During 2006, 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 (EPA 1995).

4.5 C-410 DECONTAMINATION AND DECOMMISSIONING ACTIVITIES

DOE completed preparation of fluorine cells for off-site shipment. This preparation required removal of the paint on the exterior of the cells due to concerns about possible contaminants in the paint. The paint was removed by a sponge blasting process. A small amount of radionuclide contamination was present in the paint removed. The blasting occurred within the facility; however, room ventilation was exhausted

through a HEPA filter. The amount of radionuclides released was estimated based on paint sampling data and 40 *CFR* § 61 Subpart H Appendix D emission factors.

4.6 C-402 DEMOLITION

C-402 was demolished during 2006. Fugitive airborne radionuclide emissions may have resulted from dust created by demolition and removal of the debris. The amount of radionuclides released was estimated based on emission factors from the (EPA 1995).

4.7 FUGITIVE AND DIFFUSE SOURCES

Diffuse/fugitive sources include any source that is spatially distributed, 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. DOE also identified transport and disposal of contaminated materials in C-746-U Landfill and decontamination of machinery and equipment used in remediation activities (e.g. well drilling) as additional sources. Based on prior health physics data and historical ambient air monitoring, it is unlikely that any of these potential sources are significant.

4.8 MISCELLANEOUS SOURCES

In accordance with PGDP DOE National Emissions 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. Ambient air monitoring locations are shown in Figure 1. The Radiation/Environmental Monitoring Section of the Radiation Health and Toxic Agents Branch of the Department for Public Health of the Kentucky Cabinet for Health Services operates the ambient air monitors. Based on observations for CY 2006, plant-derived radionuclides were not detected. The results of the ambient air monitoring are in Section 10 of this report. DOE understands that USEC will be submitting a separate NESHAP report addressing emissions of radionuclides from USEC operations.

5. CONSTRUCTION AND MODIFICATION ACTIVITIES

During the CY, C-402 was demolished. No other construction or modification activities were waived under 40 *CFR* § 61.96.

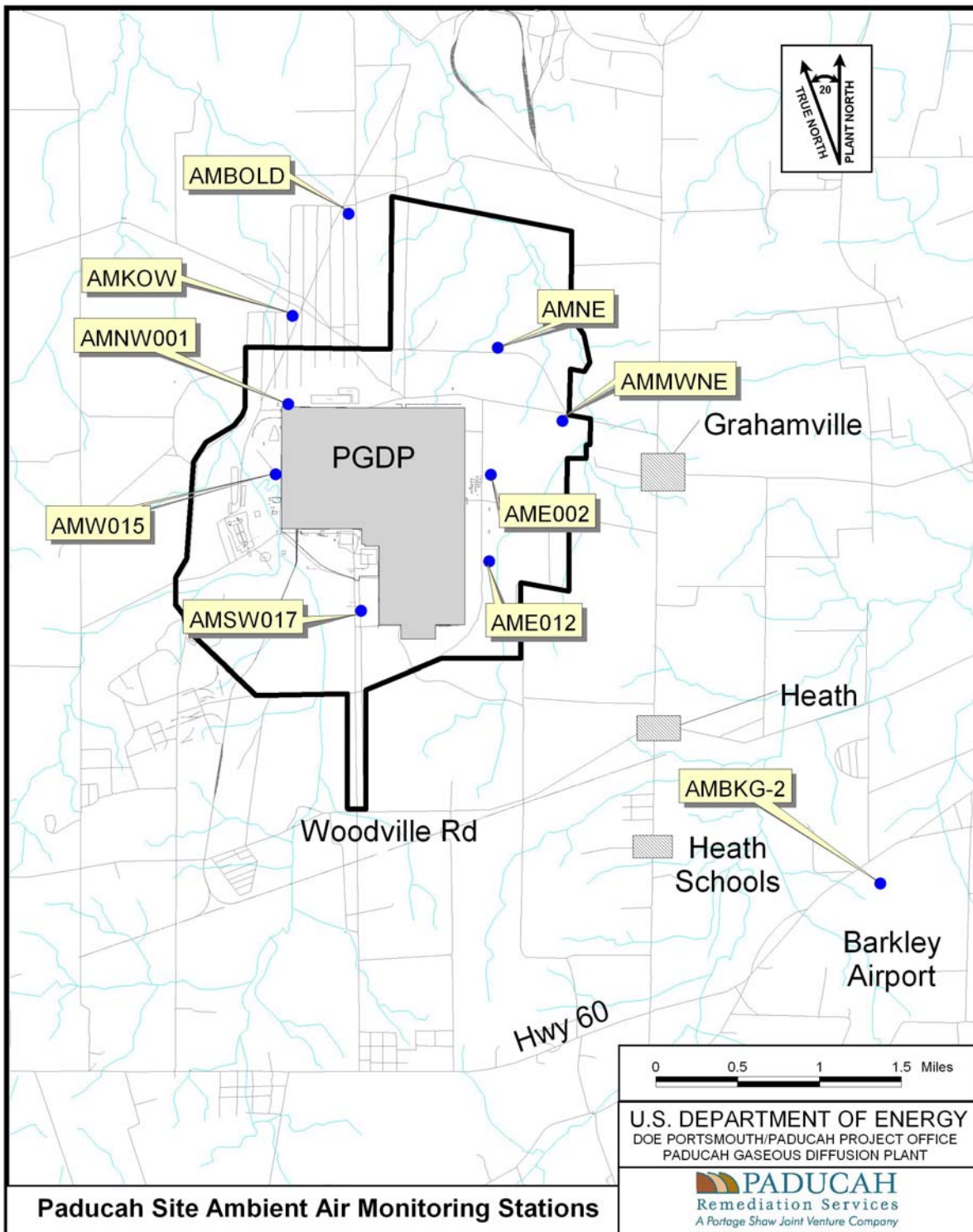


FIGURE No. c5ac9000sk640.apr
DATE 04-19-07

Figure 1. Location of Paducah Site Ambient Air Monitors

6. DOE SOURCE CHARACTERISTICS AND AIR EMISSIONS DATA

The following tables 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% | Distance (m) and Direction to Nearest Receptor |
|------------------------------------|--------------|-------------|--|
| Northwest Plume Treatment Facility | None | 0 | 1080 NNE |
| C-746 P Scrap Metal Project | None | 0 | 1205 NNE |
| C-410 Emissions | HEPA | 99.7 | 1820 ESE |
| NE Plume Treatment Facility | None | 0 | 1360 SE |
| C-402 | None | 0 | 1957 ESE |
| C-301 OS-12 | None | 0 | 1568 SE |

Table 2. Distances to Selected Receptors

| Source Name | Distances (m) to Selected Receptors | | |
|------------------------------------|-------------------------------------|------------------|----------------|
| | Nearest Individual/Farm | Nearest Business | Nearest School |
| Northwest Plume Treatment Facility | 1080 | 2550 | 5150 |
| C-746 P Scrap Metal Project | 1234 | 3033 | 5490 |
| C-410 Emissions | 1820 | 2814 | 4360 |
| NE Plume Treatment Facility | 1268 | 2073 | 4207 |
| C-402 | 3110 | 3660 | 4270 |
| C-301 OS-12 | 3475 | 2490 | 4565 |

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 (MEI) |
|------------------------------------|-------|------------|--------------|-------------------------|---------------------|--|
| Northwest Plume Treatment Facility | Point | 7.0 | 0.3556 | 9.45 | 37.8 | 1080 NNE |
| C-746 P Scrap Metal Project | Point | 1 | NA | 0 | Ambient | 1205 NNE |
| C-410 Emissions | Point | 4.6 | NA | 0 | Ambient | 2220 N |
| NE Plume Treatment Facility | Point | 10.22 | 8.18 | 4.84 | Ambient | 1360 SE |
| C-402 | Point | 1 | NA | 0 | Ambient | 2109 N |
| C-301 OS-12 | Point | 1 | NA | 0 | Ambient | 1554 NNE |

Table 4. Radionuclide Materials and Emissions Data (Curies)

| Nuclide | NW Plume Treatment Facility | Scrap Metal Project | C-410 Emissions | NE Plume Treatment Facility | C-402 | C-301 OS-12 | Total |
|-------------------|------------------------------------|----------------------------|------------------------|------------------------------------|--------------|--------------------|--------------|
| ²³⁴ U | 0 | 5.34E-07 | 5.8E-09 | 0 | 1.7E-07 | 7.1E-06 | 7.8E-06 |
| ²³⁵ U | 0 | 2.09E-08 | 1.1E-10 | 0 | 1.5E-08 | 2.8E-07 | 3.1E-07 |
| ²³⁸ U | 0 | 1.6E-07 | 5.70E-09 | 0 | 1.9E-07 | 2.1E-6 | 2.5E-06 |
| ⁹⁹ Tc | 8.2E-05 | 9.4E-06 | 1.3E-08 | 8.3E-06 | 1.5E-04 | 5.0E-5 | 3.0E-04 |
| ²³⁰ Th | 0 | 0 | 0 | 0 | 1.1E-07 | 0 | 1.1E-07 |
| ²³⁷ Np | 0 | 0 | 3.1E-11 | 0 | 8.9E-10 | 6.9E-07 | 6.9E-07 |
| ²³⁹ Pu | 0 | 0 | 3.4E-11 | 0 | 1.2E-08 | 6.01E-07 | 6.1E-07 |
| ²⁴¹ Am | 0 | 0 | 3.9E-11 | 0 | 0 | 0 | 3.90E-11 |
| Total | 8.2E-05 | 1.0E-05 | 2.5E-08 | 8.3E-06 | 1.5E-04 | 6.1E-05 | 3.1E-04 |

7. DOSE ASSESSMENT

7.1 DESCRIPTION OF DOSE MODEL

The radiation dose calculations were performed using the CAP-88 package of computer codes. 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 food chain models to calculate human exposures, both internal and external, to the environmental concentrations. The human exposure values then are 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

Except for the radionuclide parameters given in the previous tables and those given below, all other important input parameter values used are the default values provided with the CAP-88 computer codes and data bases.

| | |
|-------------------------------|---|
| Joint frequency distribution: | Five-year STAR distribution from 60-meter station on PGDP meteorological tower for the years 1988 through 1992. |
| Rainfall rate: | 116.3 centimeters/year |
| Average air temperature: | 14.7° C |
| Average mixing layer height: | 930 meters |

Fraction of foodstuffs from (rural default values):

| | <u>Local Area</u> | <u>50-Mile Radius</u> | <u>Beyond 50 Miles</u> |
|-------------------------|-------------------|-----------------------|------------------------|
| 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 COMPLIANCE ASSESSMENT

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 | | Maximum for Source | Maximum for Plant |
|------------------------------------|-------------------------------|---------------------------|--------------------------|
| A | C-400 Group | 1.9E-03 | 1.9E-03 |
| B | C-400 Cylinder Drying Station | 3.3E-05 | 3.3E-05 |
| D | C-709/C-710 Laboratory Hoods | 3.6E-04 | 3.6E-04 |
| E | C-310 Stack | 1.4E-03 | 1.4E-03 |
| F | Seal Exhaust/Wet Air Group | 7.2E-03 | 7.2E-03 |
| G | C-409 Dissolver | 3.4E-07 | 3.4E-07 |
| H | C-360 | 1.4E-03 | 6.3E-04 |
| Total From USEC Sources | | N/A | 1.15E-02 |
| DOE Emission Sources | | Maximum for Source | Maximum for Plant |
| Northwest Plume Treatment Facility | | 1.5E-05 | 1.5E-05 |
| C-746 P Scrap Metal Project | | 3.0E-06 | 3.0E-06 |
| C-410 Emissions | | 1.4E-08 | 1.4E-08 |
| Northeast Plume Treatment Facility | | 5.5E-07 | 4.1E-07 |
| C-402 | | 1.6E-05 | 1.6E-05 |
| C-301 OS-12 | | 9.8E-05 | 4.4E-05 |
| Total From DOE Sources | | N/A | 7.84E-05 |
| Total From All Sources | | N/A | 1.2E-02 |

The maximally exposed individual from all plant emissions is located 1,080 meters north northeast of the plant.

Based on 2000 census data obtained from the LandView 6 software, the total collective effective dose equivalent to the 50-mile population (approximately 520,000 persons) was 0.06 person-rem.

8. UNPLANNED RELEASES

There was one unplanned release within C-410 during D&D activities. A small UF₆ release occurred when an instrument line was broken while pulling an air hose in the building. Any release outside the building was not detected by the ambient air monitoring network.

9. AMBIENT AIR MONITORING

The *Paducah Gaseous Diffusion Plant Department of Energy National Emission Standards for Hazardous Air Pollutants (NESHAP) Management Plan*, February 2000, outlines the DOE Paducah Site use of ambient air monitors to demonstrate that total emissions (from point, diffuse, and fugitive sources) result in doses significantly less than the 10-mrem/year standard.

In accordance with the plan, the Radiation/Environmental Monitoring Section of the Radiation Health and Toxic Agents Branch of the Department for Public Health of the Kentucky Cabinet for Health Services conducted ambient air monitoring around the Paducah Site during CY 2006. The Radiation Health and Toxic Agents Branch reports that weekly air filters were screened 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 and Toxic Agents Branch's protocol, plutonium and uranium isotopic analyses were not performed on the quarterly composites since ^{241}Am and ^{234}Th were not detected. Since ^{241}Am and ^{234}Th were not present, the quarterly composites were analyzed for ^{99}Tc . ^{99}Tc also was not detected in the quarterly composites. Lead-210 (^{210}Pb) and potassium-40 (^{40}K) were detected on filters, which accounts for the presence of the gross alpha and beta activities.

Ambient air monitoring conducted by the Kentucky Radiation Health and Toxics Branch did not detect plant derived radionuclides above background levels. The actual results, even though less than the measurement error, of each air monitor are listed in Table 6 of this report.

10. STATUS OF 40 CFR § 61 SUBPART H COMPLIANCE

DOE has remained in compliance with 40 *CFR* § 61, Subpart H since 1993. Kentucky Division of 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 CY 2005; therefore, the facility is in compliance with 40 *CFR* § 61 Appendix E, Table 2 values.

Based on the results included in this report, during 2006, the facility was in compliance with 40 *CFR* § 61, Subpart H for all airborne radionuclide emissions.

Table 6. Kentucky Radiation Health and Toxics Branch Ambient Air Monitoring Results¹²

Ambient Air Station

| Quarter | Nuclide | AMSW017 Ci/m ³ | AMW015 Ci/m ³ | AMNW001 Ci/m ³ | AMNE Ci/m ³ | AME002 Ci/m ³ | AME012 Ci/m ³ | AMBKG2 Ci/m ³ | AMBOLD Ci/m ³ | AMKOW Ci/m ³ | AMMWNE Ci/m ³ |
|---------|-------------------------------------|------------------------------|-----------------------------|------------------------------|---------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|----------------------------|-----------------------------|
| 1 | ²⁴¹ Am | 1.14E-17 | 1.46E-18 | 4.53E-18 | 9.53E-18 | 1.55E-17 | 9.45E-18 | 9.26E-18 | -1.28E-22 | 1.65E-22 | 6.00E-18 |
| | ²³⁷ Np | 2.11E-16 | -1.22E-16 | -1.46E-16 | -1.15E-16 | 9.23E-19 | -3.34E-16 | -1.87E-16 | 4.47E-16 | -1.09E-16 | -1.86E-16 |
| | ⁹⁹ Tc | 7.62E-16 | 7.35E-16 | 4.97E-16 | 4.32E-16 | 4.16E-16 | 3.08E-16 | 7.84E-16 | 6.18E-16 | 2.62E-16 | 2.79E-16 |
| | ²³⁸ U/ ²³⁴ Th | 1.35E-16 | 1.31E-16 | 1.88E-16 | 1.29E-16 | -4.30E-16 | 1.41E-16 | 1.36E-16 | 1.49E-16 | 1.57E-16 | 1.52E-16 |
| 2 | ²⁴¹ Am | 3.44E-16 | -1.61E-16 | -1.78E-16 | -2.43E-16 | 3.90E-17 | -4.51E-17 | -2.05E-16 | 3.04E-17 | 2.77E-16 | 2.42E-16 |
| | ²³⁷ Np | 7.23E-17 | 2.46E-16 | -9.03E-18 | 1.07E-16 | -2.82E-16 | 1.21E-16 | 1.30E-16 | -1.91E-16 | -4.31E-16 | 3.84E-16 |
| | ⁹⁹ Tc | 7.58E-16 | 3.43E-16 | 5.93E-16 | 7.90E-16 | 5.31E-16 | 3.13E-16 | 2.82E-16 | 5.07E-16 | 6.22E-16 | 5.66E-16 |
| | ²³⁸ U/ ²³⁴ Th | 1.70E-16 | 1.81E-16 | 2.57E-16 | 2.04E-16 | 1.78E-16 | 1.82E-16 | 1.55E-16 | 1.79E-16 | 1.85E-16 | 1.70E-16 |
| 3 | ²⁴¹ Am | 1.48E-16 | -1.58E-18 | 2.56E-16 | 1.40E-16 | -2.04E-16 | 1.61E-16 | -3.06E-17 | 2.33E-16 | 1.79E-16 | -2.35E-16 |
| | ²³⁷ Np | -1.99E-17 | 1.12E-16 | -1.39E-16 | 1.93E-16 | -2.42E-17 | -3.82E-17 | -2.18E-16 | -4.02E-16 | 2.25E-16 | 1.12E-16 |
| | ⁹⁹ Tc | 4.61E-16 | 4.69E-16 | 3.58E-17 | 3.59E-17 | -2.27E-16 | -2.25E-16 | 2.70E-16 | 3.50E-16 | 9.59E-17 | 2.11E-16 |
| | ²³⁸ U/ ²³⁴ Th | 1.85E-16 | 2.04E-16 | 2.59E-16 | 1.92E-16 | 2.20E-16 | 1.72E-16 | 1.80E-16 | 3.07E-16 | 2.00E-16 | 1.92E-16 |
| 4 | ²⁴¹ Am | -6.31E-16 | -1.47E-16 | -1.34E-16 | -5.77E-16 | -1.16E-15 | -2.01E-16 | -2.00E-16 | -4.05E-16 | -1.97E-16 | -1.23E-15 |
| | ²³⁷ Np | -1.40E-16 | 2.64E-16 | -2.63E-16 | -8.28E-18 | 3.49E-16 | -1.19E-16 | 4.40E-16 | 7.07E-17 | 2.61E-16 | -4.55E-16 |
| | ⁹⁹ Tc | 9.20E-16 | 1.94E-16 | 6.73E-16 | 5.39E-16 | 3.98E-16 | 4.28E-16 | 7.12E-16 | 5.94E-16 | 9.39E-16 | 5.23E-16 |
| | ²³⁸ U/ ²³⁴ Th | 1.22E-16 | 1.82E-16 | 2.11E-16 | 1.97E-16 | 1.51E-16 | 1.51E-16 | 1.63E-16 | 1.93E-16 | 1.91E-16 | 1.53E-16 |

10

¹ All results were considered nondetect.

² 40 CFR § 61, Table 2, Limiting Values (Ci/m³): ²⁴¹Am 1.9E-15, ²³⁷Np 1.2E-15, ⁹⁹Tc 1.4E-13, and ²³⁸U 8.3E-15.

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