



June 29, 2007
GDP 07-0024

Mr. Michael F. Weber
Director, Office of Nuclear Material Safety and Safeguards
Attention: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

**Paducah Gaseous Diffusion Plant (PGDP)
Portsmouth Gaseous Diffusion Plant (PORTS)
American Centrifuge Lead Cascade Facility
Docket Nos. 70-7001, 70-7002 and 70-7003
Certificate Nos. GDP-1 and GDP-2 and License No. SNM-7003
Submittal of the National Emission Standards For Hazardous Air Pollutants (NESHAP)
Radionuclide Emission Reports for Calendar Year 2006**

Dear Mr. Weber:

On January 16, 2001, representatives from USEC and the NRC Staff met at NRC headquarters to discuss the Environmental Compliance Status Report (ECSR) contained in Volume 3 of the PGDP and PORTS Certification Applications. As a result of this January meeting, USEC committed (Reference 1) to continue to provide copies of the annual NESHAP Radionuclide Emission Reports for PGDP and PORTS. Enclosures 1 and 2 provide the above noted reports for PGDP and PORTS, respectively. In addition, the License Application for the American Centrifuge Lead Cascade Facility contains a commitment to incorporate Lead Cascade emissions into the existing environmental reports (Reference 2). These reports are provided for information only.

Should you have any questions or require additional information, please contact Mark Smith at (301) 564-3244. There are no new commitments contained in this submittal.

Sincerely,

Steven A. Toelle
Director, Regulatory Affairs

Mr. Michael F. Weber
June 29, 2007
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- Reference:
1. Letter from Steven A. Toelle (USEC) to Mr. Michael F. Weber (NRC), Paducah Gaseous Diffusion Plant (PGDP), Portsmouth Gaseous Diffusion Plant (PORTS), Docket Nos. 70-7001 and 70-7002, "Environmental Compliance Status Report (ECSR) Related Information", GDP 01-0018, dated March 26, 2001.
 2. License Application for the American Centrifuge Lead Cascade Facility, Section 9.3

- Enclosures:
1. PGDP NESHAP Radionuclide Emission Report for Calendar Year 2006
 2. Piketon Facilities NESHAP Radionuclide Emission Report for Calendar Year 2006

cc: J. Downs, NRC HQ
D. Hartland, NRC Region II
J. Henson, NRC Region II
~~G. Janosko, NRC HQ~~
✓ M. Raddatz, NRC HQ
B. Smith, NRC HQ
M. Thomas, NRC PGDP

Enclosure 1
GDP 07-0024
21 Pages Total

**PGDP NESHAP Radionuclide Emission Report
for Calendar Year 2006**



May 7, 2007

Ms. Beverly Banister, Director
Air, Pesticides, and Toxic Management Division
United States Environmental Protection Agency, Region 4
61 Forsyth Street, SW
Atlanta, Georgia 30303-8960
CERTIFIED MAIL – 70051820000359942218

Mr. John S. Lyons, Director
Division for Air Quality
Kentucky Department for Environmental Protection
803 Schenkel Lane
Frankfort, Kentucky 40601-1403
CERTIFIED MAIL – 70051820000359942225

Ms. Elizabeth Cotsworth, Director
Office of Radiation and Indoor Air
MS6601J, Ariel Rios Building
United States Environmental Protection Agency Headquarters
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460
CERTIFIED MAIL – 70051820000359942249

Dear Ms. Banister, Ms. Cotsworth., and Mr. Lyons:

**National Emission Standards for Hazardous Air Pollutants (NESHAP) Annual Report for
United States Enrichment Corporation (USEC) Operations at the Paducah Gaseous Diffusion Plant (PGDP)**

Attached is the USEC annual NESHAP report required by 40 CFR 61, Subpart H, adopted by reference in 401 KAR 57:002. The PGDP site is owned by the Department of Energy (DOE). USEC leases and is responsible for the uranium enrichment operations, while DOE is responsible for the non-leased operations. Since Subpart H applies to total emissions from the PGDP facility, the USEC report also includes summary emission information from DOE operations. Previous annual reports included detailed information for DOE sources. Starting with this report, USEC will only provide detailed information for USEC emissions. Calendar year 2006 radiological emissions from the facility, including USEC and DOE operations, resulted in a public effective dose equivalent of 0.012 millirem. This dose is well below the 10 millirem standard. The required certification is the last page of the report.

If you have any questions, please contact Dennis Reiter at (270) 441-6685.

Sincerely,

Vernon J. Shanks, Manager
Regulatory Affairs

VJS:DLR:mjw

Attachment

cc: Henry Armstrong – KDEP/PADUCAH
Steve Penrod/Mark Keef – USEC/PGDP

cc/att: Mike Boren/Dennis Reiter – USEC/PGDP
Erskin Hickman – USEC/PGDP
Regulatory Compliance – RC

United States Enrichment Corporation
Paducah Gaseous Diffusion Plant
P.O. Box 1410, Paducah, KY 42002

United States Enrichment Corporation
Paducah Gaseous Diffusion Plant

Annual 40 CFR 61 Subpart H Report

Calendar Year 2006

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EXECUTIVE SUMMARY

The Environmental Protection Agency (EPA) regulates air emissions of radionuclides, other than radon, from the United States Department of Energy (DOE) facilities under 40 CFR 61, Subpart H. Since DOE owns the Paducah Gaseous Diffusion Plant (PGDP), all regulated airborne radionuclide emissions are subject to the regulation, whether they originate from the United States Enrichment Corporation (USEC) operations or DOE operations. The public effective dose equivalent (EDE) standard is 10 millirem (mrem) per year from the PGDP facility. 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. This EDE is well below the annual limit of 10 mrem per year.

Previous annual reports contained detailed source information for both DOE and USEC. Beginning with this calendar year 2006 report, each source will submit a separate report for activities under their control. EPA Region IV and the Kentucky Division for Air Quality approved individual report submission. Total EDE from the facility will continue to be reported.

SECTION I: FACILITY INFORMATION

INTRODUCTION

The Department of Energy (DOE) Paducah Site contains 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. This report analyzes emissions from USEC activities at the Paducah Site.

SITE DESCRIPTION

PGDP is an active uranium enrichment facility consisting of a gaseous diffusion cascade and extensive support facilities. The cascade, including product and tails withdrawal, is housed in 6 process buildings covering a total of approximately 80 acres. The plant is located on a reservation consisting of approximately 3,423 acres in western McCracken County, approximately 10 miles west of Paducah, Kentucky, and approximately 3 miles south of the Ohio River. Roughly 748 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 approximately 6,800 acres managed by 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 the wildlife management area. The water treatment plant used by PGDP was originally a KOW facility.

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 mostly ^{238}U with approximately 0.71 percent ^{235}U and 0.0055 percent ^{234}U . Uranium mills process the ores to produce concentrated uranium oxide (U_3O_8), which is then commercially converted to uranium hexafluoride (UF_6) for enrichment at a gaseous diffusion plant.

The Paducah Plant enriches the uranium isotope, ^{235}U , by utilizing a gaseous diffusion separation process. The separation is based on the faster rate at which ^{235}U diffuses through a barrier compared with the heavier ^{238}U isotope. From 1953 to 1975, reactor tails were processed in addition to the UF_6 feed material. The reactor tails contained technetium-99 (^{99}Tc), a fission by-product, and transuranics, most notably neptunium-237 (^{237}Np) and plutonium-239 (^{239}Pu). When the reactor tails were fed into the PGDP cascade system these radionuclides were introduced. ^{99}Tc is a man-made beta emitting radionuclide having a half-life estimated at between 212,000 and 250,000 years.

Extensive support facilities are required to maintain the gaseous diffusion process. Major support facilities include a steam plant, electrical switchyards, cooling tower complexes, a chemical cleaning and decontamination building, a water treatment plant, a cooling water blowdown treatment facility, maintenance facilities, and laboratory facilities. Several inactive facilities are also located on the plant site.

The West Kentucky Wildlife Management Area and lightly populated farmlands are in the immediate vicinity of PGDP. Population within the 50-mile radius is approximately 520,000 persons. Of these, approximately 44,000 live within 10 miles of the plant and approximately 104,000 live within 20 miles of the plant. Population data was generated using the U.S. Census Bureau's LandView 6 software. 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 approximately 10 miles east of the plant; Cape Girardeau, Missouri, located approximately 40 miles to the west; and Metropolis, Illinois, located approximately 6 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 approximately 49 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 PGDP, the uranium enrichment enterprise is now the responsibility of USEC.

USEC SOURCE DESCRIPTIONS

The 40 CFR 61.92 standard states emissions to the ambient air shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent (EDE) of 10 millirem per year (mrem/yr). The continuous emission monitoring requirements are listed in 40 CFR 61.93. Continuous radionuclide emission measurements "shall be made at all release points which have a potential to discharge radionuclides into the air in quantities that could cause an effective dose equivalent in excess of 1% of the standard" (0.1 mrem/yr). To determine if a release point is subject to the continuous emission monitoring requirements, the potential to emit is made assuming "all pollution controls equipment did not exist, but the facility operations were otherwise normal." USEC has determined the only release point requiring continuous monitoring is the C-310 stack. For the purposes of this report, any radionuclide release point requiring continuous emission monitoring is a *major* source. A *minor* source is a source or group of sources that does not exceed the annual EDE 0.1 mrem/yr continuous monitoring requirement. The C-310 stack is the only major source.

There are a number of minor, unmonitored radionuclide air sources at PGDP. Since these sources are not equipped with effluent samplers or monitoring equipment, emissions are estimated using EPA-approved methods. Minor sources were identified during a 1991-1992 plantwide vent stack survey. The source listing is maintained through internal review processes. For the purpose of estimating releases and submitting the annual report, minor sources may be grouped according to similar characteristics (e.g., general location, type of activity, or type of control, etc.). The number of minor sources may change from year to year due to cessation or start-up of operations. Source characteristics and groupings are presented in Section II.

Group A - C-400 Group

C-400 Decontamination Spray Booth

This facility is used to decontaminate equipment. It consists of a large booth equipped with an ultra high-pressure sprayer, which sprays a water solution on the contaminated machinery. The radionuclide emissions result from entrainment of radionuclides in the spray solution during the decontamination process. The booth is equipped with a mist eliminator as an emission control device. The mist eliminator is not listed as a pollution control device in 40 CFR 61, Appendix D, and no credit is taken for it. Emissions were estimated in accordance with Appendix D. The concentration of radionuclides in the spray booth water, multiplied by the total volume of water, was considered as the "curies used."

C-400 No. 5 Dissolver/Rotary Vacuum Filter

This facility is used to dissolve and precipitate the uranium in the solutions from the C-400 cylinder wash and decontamination spray booth. It is also used to treat uranium salvaged from laboratory activities. The solution is chemically treated to precipitate the uranium forming a slurry solution. The solution is then passed through a rotary vacuum filter, which collects the precipitate (filter cake) for future disposal, leaving the filtrate. After sampling, the filtrate is discharged via permitted Kentucky Pollutant Discharge Elimination System (KPDES) outfalls. The radionuclide emissions come from the vent on the pump pulling the slurry solution through the rotary vacuum filter. Emissions from this vent are minimal because the pump and its vent are downstream of the rotary vacuum filter, which trap the uranium as filter cake. Emissions were estimated in accordance with 40 CFR 61, Appendix D. The concentration of radionuclides in the filtrate multiplied by the filtrate volume was considered as the "curies used."

C-400 Laundry

The C-400 Laundry washes and dries protective clothing used to prevent skin contamination on personnel working in radiological areas. The driers are equipped with lint filters. Emissions from the laundry are estimated using data from Health Physics surveys of the lint filters. The alpha radiation is assumed to be 10 percent due to ^{237}Np and 90 percent due to uranium. The beta emissions are assumed to be due to ^{99}Tc . The emission factor for cloth filters in 40 CFR 61, Appendix D, is used to estimate the emissions.

Group B—C-400 Cylinder Drying Station

This facility is used to dry UF_6 cylinders after the "heel" has been removed in the C-400 cylinder washstand. Dry plant air is passed through the cylinder to evaporate any moisture from the washing and hydrostatic testing processes. Emissions were estimated in accordance with 40 CFR 61, Appendix D. The concentrations of radionuclides in water used to wash the cylinders prior to drying, multiplied by the total volume of water used in the washing, were considered as the "curies used."

Group C—C-720

This group has been permanently shut down.

Group D—C-709/C-710 Laboratory Hoods

The C-709/710 Laboratories are the main facilities for sample analysis and research at PGDP. There were a total of 52 laboratory hoods and canopies in the C-709/710 Buildings that were used for radiological activities during the year. The radionuclides involved in analyses consist primarily of uranium, with a slight potential for emissions of ^{99}Tc , ^{237}Np , ^{239}Pu , and the daughters of uranium (^{230}Th and ^{234}Th).

Four methods, depending on the type of operation occurring in the hood or radiological area in which the hood was located, were used to estimate emissions.

1. Estimation of the maximum quantity of uranium that could be lost based on laboratory methods. (If an ASTM analytical method specifies a maximum of 1.6 percent loss of mass during analysis, all samples analyzed using the method were assumed to lose, as an emissions from the hood, 1.6 percent of the uranium in the sample.)
2. Use of 40 CFR 61, Appendix D, emission factors.
3. Use of chemical trap efficiencies and uranium throughput information.
4. Knowledge of the analytical or sample preparation process.

All methods used the total inventory of uranium processed in the hood or radiological area as the basis for the emission estimate.

Group E—C-310 Stack

The primary source of potential radionuclide air emissions is the vent stack that serves the "top end" of the cascade process and the cylinder burping facility. This 200-foot stack, known as the C-310 stack, is located at the southwest corner of the C-310 Product Withdrawal Building. Low molecular weight gas compounds and contaminants, which have traveled up the cascade, are vented to the atmosphere via the C-310 stack. Small quantities of ^{234}U , ^{235}U , ^{238}U , ^{99}Tc , ^{237}Np , ^{239}Pu , and ^{230}Th are also emitted. The cascade effluent is routed through alumina traps prior to being emitted via the C-310 stack. The alumina traps were upgraded in 1990 to provide greater criticality safety. The improved system consists of an on-line bank of 13 traps and a standby bank of 13 traps.

The cylinder burp facility, located on the east side of C-310, is used to vent low molecular weight gases from product cylinders. This facility is a potential source of uranium, ^{99}Tc , and minute quantities of transuranics. The effluent from the burp facility is routed through a bank of sodium fluoride (NaF) traps prior to being emitted from the C-310 stack. There are 2 banks of chemical traps associated with this system. Each bank has 5 primary and 2 secondary traps. Uranium is recovered from the NaF traps and returned to the enrichment cascade.

Emissions from the C-310 stack were based on results from the continuous potassium hydroxide bubbler stack sampling system, which was approved by EPA in 1992. The continuous sampling system consists of a series of three caustic (KOH solution) scrubbers, a sample flow totalizer, and a vent stack flow totalizer. The first bubbler in the C-310 purge and vent sample train is changed daily. Samples are

sent to the laboratory for analysis, and monthly and quarterly composite samples are prepared from the daily samples. The gross beta analysis is used as an indicator of ⁹⁹Tc. If the gross beta analysis is higher than normal, an analysis for ⁹⁹Tc is performed.

As part of the Quality Assurance/Quality Control (QA/QC) requirements for the C-310 stack sampler, a range for the sample flow has been established. During 2006, there were 4 instances where the sample flow was outside of the established range. These instances did not compromise the integrity of the sample. From operational records, there were no indications of excess emissions during these periods. Emissions immediately prior to and after the dates in question indicated they were within normal ranges.

Group F—Seal Exhaust/Wet Air Group

Seal Exhaust Systems

Seals on the UF₆ compressors are supplied with an intricate array of air pressures to reduce any UF₆ release that may occur in the event of a seal failure. The seal exhaust flow is removed by large, oil-filled vacuum pumps and is routed from the seals through alumina traps, the pump, and to a common exhaust vent. There is one seal exhaust vent per cascade building, one on the C-310 Product Withdrawal Building and one on the C-315 Tails Withdrawal Building. Under normal operations, only trace amounts of UF₆ are present in the seal exhaust system. Occasionally, a seal or seal control system malfunction will allow greater quantities of UF₆ to enter the exhaust system. If UF₆ is allowed to enter the pump by virtue of trap breakthrough, it reacts with the pump oil creating a thick sludge, which overloads the pump in a short time. Due to the reaction between UF₆ and pump oil, the oil serves as an excellent uranium emission control device. However, no credit is taken for the oil as a pollution abatement system because the oil is an integral part of the pumping system and is not included for emission control. The locations of the six seal exhaust systems are listed below:

C-310 Product Withdrawal Building	C-333 Process Building
C-315 Tails Withdrawal Building	C-335 Process Building
C-331 Process Building	C-337 Process Building

An evaluation of the potential to emit radionuclides from the seal exhaust and wet air exhaust systems, and the conclusion that the alumina traps, which protect the pump oil, are not pollution control devices under 40 CFR 61, Subpart H, was forwarded to EPA on January 28, 1994.

Periodic confirmatory measurements are made on each type of seal exhaust and wet air system to verify low emissions. Emissions from these systems were originally estimated based on results of a modified 40 CFR 60 Method 5 stack sampling performed in 1992. The systems were resampled in 1997 and 2002. The seal exhaust/wet air system for the C-335 Process Building was sampled in 2004 as part of the CFC-114/UF₆ separator modifications. The most recent stack sampling results were used for emission estimates.

Wet Air Exhaust Systems

When maintenance is required on cascade piping and equipment, the process gas (UF_6) is evacuated to other sections of the cascade or surge drums. The piping and equipment are swept in a series of purges with dry plant air. After maintenance, the system is closed and the ambient (wet) air is pumped from the system by the wet air pumps. During the dry air purges and wet air evacuations, the air is routed through alumina traps for uranium trapping to protect the wet air pump oil and then to an exhaust vent. In process buildings C-310, C-335, and C-337, the exhaust vent is shared with the seal exhaust system for those buildings. As discussed under seal exhaust systems, emissions from the wet air exhaust systems are estimated based on the most recent Method 5 stack sampling results. The locations of the five wet air exhaust systems are listed below:

- C-310 Product Withdrawal Building (same as seal exhaust)
- C-331 Process Building
- C-333 Process Building
- C-335 Process Building (same as seal exhaust)
- C-337 Process Building (same as seal exhaust)

Chlorofluorocarbon-114 (CFC-114) UF_6 Separation System

The CFC-114/ UF_6 Separation System is located in C-335 and is used to freeze out UF_6 from process gas that has been significantly contaminated with R-114 coolant. Such mixtures usually result from equipment failure, but may also result from abnormal cascade operation. Surge drums are used to store these mixtures until they can be separated. The primary purpose of the CFC-114/ UF_6 separation system is to remove the coolant and return the UF_6 to the cascade.

The separation system operates by freezing out the UF_6 from the process gas. To freeze out the UF_6 , the UF_6 /R-114 mixture is transferred from the surge drum through a refrigerated set of favorable geometry cold traps. The gas stream then passes through NaF traps and alumina traps to absorb any residual UF_6 . Typically, the gas stream flows through the alumina traps, although these traps can be bypassed. The trap discharge is connected to the seal exhaust/wet air (SX/WA) pump system and to atmosphere through the existing common discharge header. The UF_6 is sublimed back to cascade after the processing of the coolant-laden gas has been completed.

Modifications to the CFC-114/ UF_6 Separation System to improve nuclear criticality safety characteristics were performed and initial baseline emissions testing completed in 2004. The modification reduced potential radionuclide emissions.

Cylinder Valve Connection Activities

Activities involving connection and disconnection to UF₆ cylinders include cold pressure checks; sampling of feed, product, and tails cylinders; and product withdrawal, tails withdrawal, cylinder feeding, and cylinder burping. The cylinder valves are connected to the associated process via a "pigtail." Cylinder pigtails consist of a single length of copper tubing and threaded couplings. Pigtail disconnection procedures require a series of purges to ensure that no UF₆ remains in the pigtail prior to disconnection. Although adherence to these procedures minimizes UF₆ emissions, occasionally a small amount of UF₆ is observed during disconnection of the pigtails. As an additional measure to control radionuclide emissions, personnel performing the pigtail disconnects employ the use of a glove box containment device and/or portable high efficiency particulate air (HEPA) vacuums (vacs). The HEPA vacs are placed to capture any UF₆, which is emitted from the pigtail disconnect activities

Cylinder disconnection activities were serviced by HEPA filter-equipped vac systems. The locations of the pigtail systems are listed below:

- C-310 Burp Station (located outside portable HEPA vacs used).
- C-310 Product Withdrawal Building.
- C-315 Tails Withdrawal Building.
- C-333-A Feed Facility (UF₆ Vaporizer).
- C-337-A Feed Facility (UF₆ Vaporizer).

Emissions from these systems were estimated by determining the total number of pigtail disconnections in each facility. An estimated quantity of UF₆ in each pigtail multiplied by the number of disconnections was used to estimate the total quantity of UF₆ that could have been released.

Pigtails are evacuated and purged numerous times to reduce the quantity of UF₆ in the pigtail to very low levels. The method described above assumes each pigtail has been evacuated or purged in accordance with operating procedures. Estimated quantities of UF₆ released during pigtail disconnections are added to the releases estimated from normal operations.

Building Ventilation

Radiological areas at PGDP are established under specific criteria defined in USEC Health Physics procedures to comply with the regulatory requirements. A radiological area is any area where: (1) an individual can receive a dose equivalent greater than 5 mrem in 1 hour, or (2) airborne radioactivity concentrations are greater than 10 percent of a derived air concentration (DAC); which is defined as the airborne concentrations of radionuclides in the workplace which would cause a maximum internal radiation dose of 5,000 mrem/year (regulatory exposure limit) to workers breathing the air over a normal year, or (3) surface contamination is present in excess of specified guidelines. Of the criteria for establishing radiological areas, the limits for airborne radioactivity relate directly to the potential exposure of the public from air emissions and are evaluated for radionuclide NESHAP considerations under the Building Ventilation Source category.

There are a number of radiological areas at PGDP with potential airborne radioactivity concentrations that could exceed threshold values. These areas are monitored by Health Physics using low-volume air samplers. The samplers use a low-volume pump (20 to 40 liters per minute) to draw building air through a filter. The samplers run 24 hours per day and the filters are changed on 2-, 3-, 4-, or 5-day basis, depending on filter loading and weekend/holiday schedules. After sample collection, the filters are counted for radioactivity concentrations.

For radionuclide NESHAP considerations, building ventilation sources from C-315, C-331, C-333, C-333A, C-335, C-337, C-337A, and C-720 are grouped with the Seal Exhaust/Wet Air Group. Building ventilation sources from C-310, C-360, C-400, and C-709/C-710 are grouped with the respective building emissions. Alpha and beta results from Health Physics air sampling are evaluated based on the most restrictive DAC applicable to PGDP, listed in 10 CFR 20. For alpha emissions, ^{237}Np is used. For beta emissions, ^{99}Tc is used. Only air sampling results exceeding 10 percent of the designated DAC are used in radionuclide NESHAP source emission calculations.

Group G—C-409 Dissolver/Rotary Vacuum Filter

This facility is used to dissolve and precipitate the high assay uranium in solutions from the C-710 Laboratory and various sources. The solution is chemically treated to precipitate the uranium forming a slurry solution. The solution is then passed through a rotary vacuum filter, which collects the precipitate (filter cake) for future disposal, leaving the filtrate. After sampling, the filtrate is then discharged via permitted KPDES outfalls. The radionuclide emissions come from the vent on the pump that pulls the slurry solution through the rotary vacuum filter. Emissions from this vent are minimal because the pump and its vent are downstream of the rotary vacuum filter, which trap the uranium as filter cake. Emissions are estimated in accordance with 40 CFR 61, Appendix D. The concentrations of radionuclides in the filtrate, multiplied by the filtrate volume, are considered as the "curies used."

Group H—C-360

The primary sources of radionuclide air emissions are cylinder valve connection activities and building ventilation. Emissions from the cylinder valve connections were estimated by determining the total number of pigtail disconnections. An estimated quantity of UF_6 in each pigtail multiplied by the number of disconnections was used to estimate the total quantity of UF_6 released.

CONSTRUCTION AND MODIFICATION ACTIVITIES

During the calendar year, there were no USEC construction or modification activities which were waived under 40 CFR 61.96.

USEC FUGITIVE AND DIFFUSE SOURCES

DOE has identified many areas, such as inactive facilities, building roofs, scrap metal storage yards, landfills, equipment decontamination, and various contamination areas, as potential fugitive and diffuse sources. Site emissions of fugitive or diffuse sources of radionuclides are monitored by DOE in accordance with *The Paducah Gaseous Diffusion Plant Department of Energy National Emission Standards for Hazardous Air Pollutants (NESHAP) Management Plan* (BJC/PAD-141, dated February 2000). 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 the year. Ambient air monitoring results are present in Table 1. All results were non-detectable and below 40 CFR 61, Appendix E, Table 2, limit values. Ambient air monitoring locations are shown in Figure 1.

Table 1. Kentucky Radiation Health and Toxics Branch Ambient Air Monitoring Results CY 2006^{1,2}

		Ambient Air Station									
Quarter	Nuclide	AMSW017	AMW015	AMNW001	AMNE	AME002	AME012	AMBKG2	AMBOLD	AMKOW	AMMWNE
		Ci/m ³	Ci/m ³	Ci/m ³	Ci/m ³	Ci/m ³	Ci/m ³	Ci/m ³	Ci/m ³	Ci/m ³	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

¹ All results were considered non-detect.

² 40 CFR 61, Appendix E, Table 2 Limit Values (Ci/m³): ²⁴¹Am 1.9E-15, ²³⁷Np 1.2E-15, ⁹⁹Tc 1.4E-13, and ²³⁸U/²³⁴Th 8.3E-15.

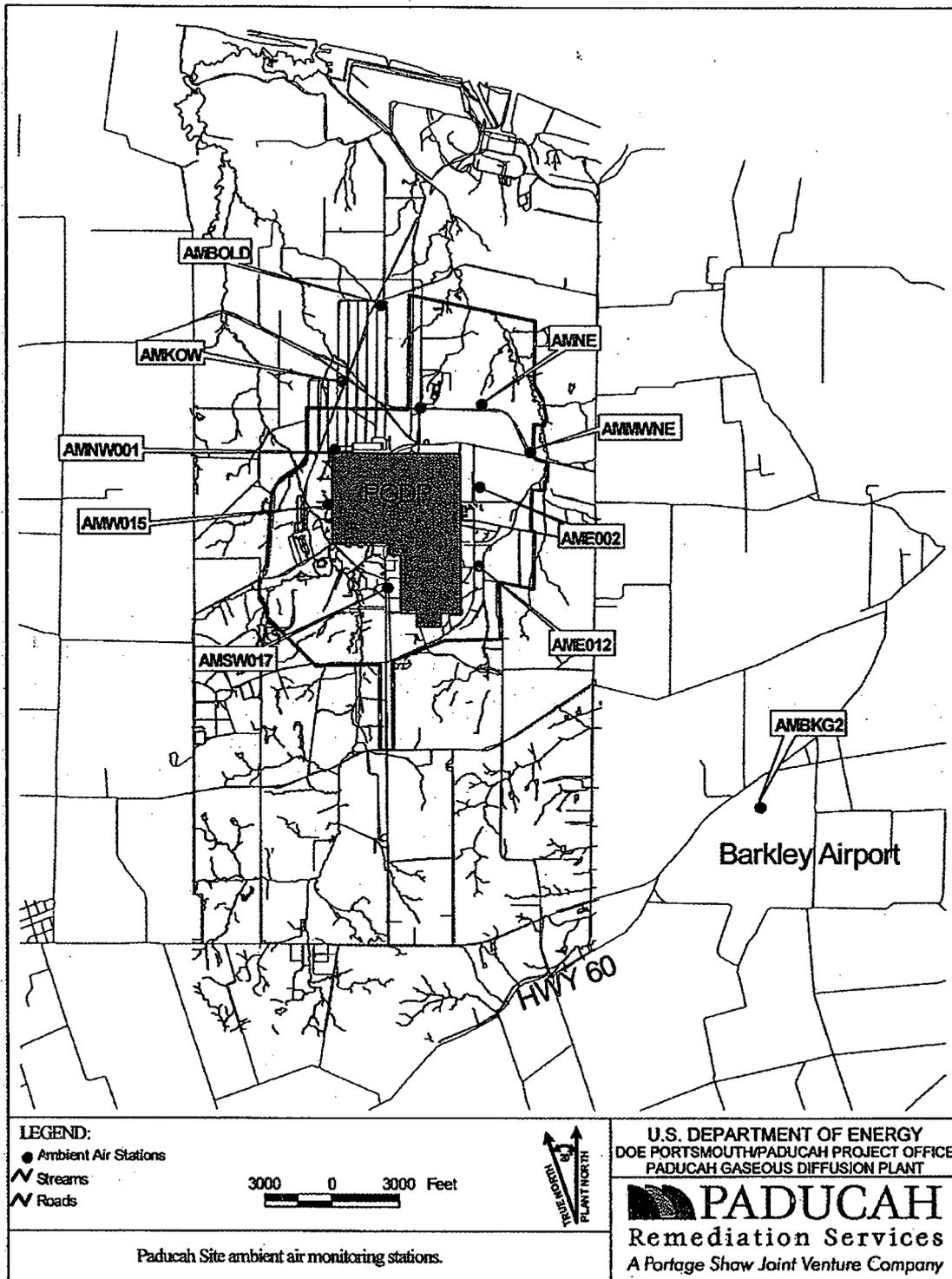


Figure 1. Location of Paducah Site ambient air monitors.

SECTION II: SOURCE CHARACTERISTICS AND AIR EMISSIONS DATA

This section provides tabular summaries of emission points, source parameters, receptor information, and radionuclide emissions.

Table 2 - Major Point Source

Group	Major Point Source	Type Control	Efficiency %	Distance (m) and Direction to Nearest Receptor
E	C-310 Stack	NaF Traps	>99.9	1740 ESE
		Alumina Traps	~98.6	

Table 3 - Minor Point And Area Sources

Group	Minor Point/Area Sources	Type Control	Efficiency %	Distance (m) and Direction to Nearest Receptor
B	C-400 Cylinder Drying Station	None	0	1900 ESE
G	C-409 Dissolver	None	0	2060 ESE
H	C-360	None	0	1180 SE

Table 4 - Minor Grouped Sources

Group	Minor Grouped Sources	Type Control	Efficiency %	Distance (m) and Direction to Nearest Receptor
A	C-400 Group	None	0	1920 ESE
D	C-709/C-710 Laboratory Hoods	None	0	1960 ESE
F	Seal Exhaust/Wet Air Group • Seal Exhausts; Wet Air Exhausts; CFC-114/UF ₆ Separation System	Alumina Traps	~98.6	1490 ESE
	• Cylinder Valve Connection Activities	HEPA Vacuums ¹	99.0 (Appendix D)	1490 ESE
	• Building Ventilation	None	0	1490 ESE

NOTE: The building ventilation and cylinder valve connection activities not serviced by a stack are grouped with the SX/WA Group or respective building.

¹Credit for the use of HEPA vacuums for pigtail operations is not taken for the purposes of estimating emissions.

Table 5 – Source Parameters

Group	Source Name	Type	Height (m)	Diameter (m)	Gas Exit Velocity (m/s)	Gas Exit Temperature (°C)	Distance (m) and Direction to Maximally Exposed Individual	
							Source	Plant
A	C-400 Group	Point	11.3	N/A	0	Ambient	2040 N	2040 N
B	C-400 Cylinder Drying Station	Point	2.4	0.5	0	Ambient	2120 N	2120 N
D	C-709/C-710 Laboratory Hoods	Point	7.1	N/A	0	Ambient	2370 N	2370 N
E	C-310 Stack	Point	61.0	0.3	0	21.7	2430 N	2430 N
F	Seal Exhaust/Wet Air Group	Point	21.0	N/A	0	Ambient	2350 N	2350 N
G	C-409 Dissolver	Point	2.3	0.08	0	Ambient	2134 N	2134 N
H	C-360	Point	16.0	N/A	0	Ambient	1180 SE	2370 NNW

Table 6 – Receptor Information

Group	Source Name	Distances (m) to Selected Receptors		
		Nearest Individual/Farm	Nearest Business	Nearest School
A	C-400 Group	1920	2819	4225
B	C-400 Cylinder Drying Station	1900	2819	4100
D	C-709/C-710 Laboratory Hoods	1960	2705	3900
E	C-310 Stack	1740	2705	3840
F	Seal Exhaust/Wet Air Group	1490	2438	3840
G	C-409 Dissolver	2057	2900	4040
H	C-360	1180	2000	3840

Note: Modeling was performed assuming a theoretical stack located at the approximate center of each grouped source.

Table 7 - Radionuclide Emissions (Ci)

			Emission Source							
			Group A	Group B	Group D	Group E	Group F	Group G	Group H	Total
Nuclide	Solubility	AMAD*	C-400 Grouped Sources	C-400 Cylinder Drying Station	C-709/ C-710 Lab Hoods	C-310 Stack	Seal Exhaust/ Wet Air Group	C-409 Dissolver	C-360	
²³⁴ U	D	1.0	1.39E-04	1.27E-05	5.91E-04	2.04E-03	1.05E-02	1.03E-07	1.31E-04	1.34E-02
²³⁵ U	D	1.0	4.84E-06	4.42E-07	2.05E-05	7.09E-05	3.64E-04	3.59E-09	4.56E-06	4.65E-04
²³⁸ U	D	1.0	2.86E-05	9.94E-06	5.49E-05	2.12E-04	3.65E-03	1.88E-08	1.36E-05	3.97E-03
⁹⁹ Tc	W	1.0	9.40E-03	1.56E-08	0.00E+00	3.65E-04	3.96E-05	1.07E-07	0.00E+00	9.80E-03
²³⁰ Th	W	1.0	3.95E-07	8.73E-09	0.00E+00	3.48E-06	0.00E+00	1.25E-09	0.00E+00	3.88E-06
²³⁷ Np	W	1.0	1.76E-05	3.01E-07	1.31E-07	2.93E-05	1.22E-05	2.59E-09	1.66E-05	7.61E-05
²³⁹ Pu	W	1.0	4.65E-08	5.99E-09	0.00E+00	1.47E-06	0.00E+00	8.55E-10	0.00E+00	1.52E-06
Total Ci/year			9.59E-03	2.34E-05	6.67E-04	2.72E-03	1.46E-02	2.37E-07	1.66E-04	2.77E-02

*AMAD – Activity Median Aerodynamic Diameter

SECTION III: DOSE ASSESSMENT

This section describes how the PGDP Site EDE was determined through computer modeling including input parameters, dose contributions by emission source, and dose contributions from USEC and DOE operations.

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 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.

SUMMARY OF INPUT PARAMETERS

Except for the radionuclide parameters given in Section II, and those given below, all 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 ¹ :	<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

DISCUSSION OF RESULTS

Due to the conservative nature of the estimates, it is likely that the actual radiological dose from site operations was significantly lower than the calculated dose. Using the conservative estimates, however, PGDP was in compliance with requirements of 40 CFR 61 because the total dose from all airborne radionuclides is less than the standard of 10 mrem per year.

¹Rural default values.

COMPLIANCE ASSESSMENT

Effective dose equivalent (mrem) to the maximally exposed member of the public is provided in Table 8. The effective dose equivalent to the maximally exposed individual from plant emissions is 1.2E-02 mrem. The maximally exposed member of the public is identified by the shortest distance in 16 different compass directions from each source. Each individual source may or may not share a public receptor with another source depending on the geographic location of the source compared to the closest public receptor. Using these public receptors, the CAP-88 computer dose modeling program determines maximum dose from each individual source and from all sources combined. Each source will produce a maximum dose, but it may not be the maximum for the plant because a different public receptor receives a greater combined dose total from the plant.

Table 8 – PGDP Effective Dose Equivalent (mrem/yr)

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
Northeast Plume Treatment Facility		5.5E-07	4.1E-07
C-746-P Scrap Metal Project		3.0E-06	3.0E-06
C-301 DMSA OS-12		9.8E-05	4.4E-05
C-402		1.6E-05	1.6E-05
C-410		1.4E-08	1.4E-08
Total From DOE Sources		N/A	7.84E-05
PGDP Site Total From All Sources		N/A	1.2E-02

The maximally exposed individual is located 2,350 meters north of the SX/WA Group Source.

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

SECTION IV: ADDITIONAL INFORMATION

UNPLANNED RELEASES – USEC

There was no unplanned release in USEC facilities occurring outside of a building not included in Health Physics air sampling program during the year.

USEC CERTIFICATION

This certification pertains to the following USEC emission sources:

Group A	C-400
Group B	C-400 Cylinder Drying Station
Group D	C-709/C-710 Laboratory Hoods
Group E	C-310 Stack
Group F	Seal Exhaust/Wet Air Group
Group G	C-409 Dissolver
Group H	C-360
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 U.S. C.1001.)


United States Enrichment Corporation

5-4-07
Date

Enclosure 2
GDP 07-0024
36 Pages Total

**Piketon Facilities NESHAP Radionuclide Emission Report
for Calendar Year 2006**



June 8, 2007

Ms. Elizabeth Cotsworth, Director
Office of Radiation and Indoor Air
United States Environmental Protection Agency
Mail Drop 6601J
1200 Pennsylvania Avenue, NW
Washington, DC 20460

CERTIFIED MAIL
7006 2150 0002 5263 3828

Mr. Stephen Rothblatt, Director
Air and Radiation Division
United States Environmental Protection Agency, Region 5
77 West Jackson Blvd., AR-18J
Chicago, Illinois 60604-3507

CERTIFIED MAIL
7006 2150 0002 5263 3811

Dear Sir or Madam:

United States Enrichment Corporation's Portsmouth Gaseous Diffusion Plant's National Emission Standards For Hazardous Air Pollutants (NESHAP) Radionuclide Emissions Report For Calendar Year 2006

Enclosed is a certified copy of the annual NESHAP report required under Title 40 Code of Federal Regulations Subpart 61.94 for airborne emissions of radionuclides from the Portsmouth Gaseous Diffusion Plant during calendar year 2006. The PORTS site has operations conducted by two separate entities; the Department of Energy performs Environmental Restoration Activities and Waste Handling Activities while the United States Enrichment Corporation uses leased site facilities to remove technetium from off-specification uranium hexafluoride and maintains the site's gaseous diffusion and support equipment under contract with the DOE. This report addresses the emissions from USEC operations and also includes the total dose value associated with DOE operations conducted at PORTS. The combined dose to the most exposed individual resulting from both USEC and DOE operations was 0.016 millirem (mrem) for 2006, which is below the standard of 10 mrem per year.

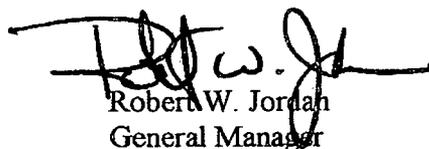
United States Enrichment Corporation
Portsmouth Gaseous Diffusion Plant, P.O. Box 628, Piketon, OH 45661
Telephone 740-897-2331 Fax 740-897-2909 <http://www.usec.com>

Ms. Elizabeth Cotsworth, Director
Mr. Stephen Rothblatt, Director
June 8, 2007
Page 2

This report includes both the PORTS Gaseous Diffusion Plant and the American Centrifuge Lead Cascade, located at PORTS. The senior corporate official for each facility has certified this report as it relates to his facility only.

If you have any questions or require additional information, please contact Pamela J. Potter at (740) 897-4051.

Sincerely,



Robert W. Jordan
General Manager

RWJ:GAGoslow:smj

Enclosure

cc/enc: Jim Anzelmo
Robert Blythe
Larry Clark DOE-ORO
Kathy Easter
Greg Fout
Greg Goslow
Mike Hopkins, OEPA-CO/DAPC
Pam Lauderback
Pete Miner
William E Murphie, DOE-LEX
Mike Murphy, USEPA-Region 5
Pam Potter
Daniel Rogers
Terry Sensue
Angie Strickland
Steve Toelle, USEC-HQ
Russ Vranicar, DOE-PORTS
Bruce Weinberg, OEPA-SEDO/DAPC
Records Management/ESHR - RC
File - POEF-360-07-057

**United States Enrichment Corporation (USEC)
Air Emissions Annual Report
Under Subpart H, 40 CFR 61.94
Calendar Year 2006**

Site Name: Portsmouth Gaseous Diffusion Plant

Operator: United States Enrichment Corporation

Address: Post Office Box 628, Mail Stop 9030
3930 U.S. Route 23 South
Piketon, Ohio 45661

Contact: Pamela J Potter

Phone: (740) 897-4051

Owner: U.S. Department of Energy

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Attachment 1 PORTS 2006 Potential and Actual Radiological Emissions Point Sources
Attachment 2 Certification

SECTION 1.0 FACILITY INFORMATION

The Portsmouth Gaseous Diffusion Plant (PORTS) is owned by the Department of Energy (DOE). PORTS was operated by DOE until July 1, 1993. In 1992, Congress passed legislation amending the Atomic Energy Act of 1954 (the Act) to create the United States Enrichment Corporation (USEC), a government-owned corporation, to operate the uranium enrichment enterprise in the United States. The corporation began operation on July 1, 1993. In accordance with the Act, USEC leased the production facilities at PORTS and its sister plant at Paducah, Kentucky from DOE. DOE retained operational control of most waste storage and handling facilities as well as all sites undergoing environmental restoration. In keeping with the Act, on July 28, 1998, the U.S. Department of the Treasury sold the uranium enrichment enterprise through an Initial Public Offering to create USEC, Inc. The original corporation, USEC, became a wholly owned subsidiary of USEC, Inc and continues to operate/maintain the two uranium enrichment plants.

In May 2001, USEC ceased uranium enrichment operations at PORTS. USEC continues to operate transfer facilities and certain support facilities at PORTS for the purpose of removing technetium from off-specification uranium hexafluoride (UF_6) feed material. USEC also continues to remove uranium deposits from the enrichment cascade under contract to DOE. In addition, a separate division of USEC, Inc is installing and operating the Lead Cascade of the American Centrifuge Plant in existing buildings at PORTS. USEC, Inc has recently received an NRC License for a follow-on commercial American Centrifuge Plant in the same location.

The management of the new centrifuge facility is separate from the management of the older enrichment facility. For this reason, the senior corporate officials for both facilities are certifying this report for their own respective activities.

1.1 Site Description

The PORTS site is located in sparsely populated, rural Pike County, Ohio, on a 16.2-km² (6.3-mile²) site about 1.6 km (1 mile) east of the Scioto River Valley at an elevation of approximately 36.6 m (120 ft) above the Scioto River floodplain. The terrain surrounding the plant, except for the Scioto River floodplain, consists of marginal farmland and densely forested hills. The Scioto River floodplain is farmed extensively, particularly with grain crops such as corn and soybeans.

Pike County has a generally moderate climate. Winters in Pike County are moderately cold, and summers are moderately warm and humid. The precipitation is usually well distributed with fall being the driest season. Prevailing winds at the site are out of the southwest to south. Average wind speeds are about 5 mph (8 km/h) although winds of up to 75 mph (121 km/h) have been recorded at the plantsite. Usually, high winds are associated with thunderstorms that occur in spring and summer. Southern Ohio lies within the Midwestern tornado belt, although no tornados have struck the plantsite to date.

Pike County has approximately 27,695 residents (2000 census data). Scattered rural development is typical; however, the county contains numerous small villages such as Piketon, Wakefield, and

Jasper, which lie within a few kilometers of the plant. The county's largest community, Waverly, is about 19 km (12 miles) north of the plantsite and has a population of approximately 4,433 residents. Additional population centers within 80 km (50 miles) of the plant are Portsmouth (population 20,909), Chillicothe (population 21,796), and Jackson (population 6,184). The total population of the area lying within an 80-km (50-mile) radius of the plant is approximately 669,000.

USEC is responsible for the principal site process and support operations. Until May 2001, the principal site process was the separation of uranium isotopes through gaseous diffusion. From then until June 2002, the principal site process was quality control sampling, packaging and shipping of uranium enriched elsewhere. A normal part of the packaging process was the removal of residual technetium-99 (^{99}Tc) with chemical adsorbents. In June 2002, the transfer and sampling operations were consolidated at the Paducah Gaseous Diffusion Plant and the PORTS facilities were dedicated to removing ^{99}Tc from UF_6 feedstock prior to enrichment. In addition, USEC continues to remove UF_6 deposits from some of the enrichment equipment in situ under contract to the DOE.

Support operations include the withdrawal of UF_6 from the deposit removal process, treatment of water for both potable and cooling purposes, steam generation for autoclave operation and heating purposes, decontamination of equipment removed from the process, recovery of uranium from various waste materials, treatment of industrial wastes generated onsite, and laboratory analysis of samples. DOE is responsible for operations such as the X-326 "L-Cage" and its glove box, the X-345 High Assay Sampling Area (HASA), and site remediation activities. Because of the separation of responsibilities, DOE and USEC are submitting separate annual NESHAP reports and are certifying only those activities for which they have direct responsibility. The following section is a description of USEC's emissions sources.

1.2 Source Description

1.2.1 Radionuclides Used at the Facility

As discussed above, the principal site process was the separation of uranium isotopes as UF_6 by the gaseous diffusion process until May 2001. Some of the equipment continues to be operated for deposit removal activities under contract with the DOE. From May 2001 until June 2002, UF_6 enriched in the ^{235}U isotope was received from the Paducah Gaseous Diffusion Plant located in Paducah, Kentucky for quality control sampling, transfer into customer-owned containers and shipment to customers. Since June 2002, unenriched UF_6 from both the Paducah and PORTS stockpiles has been sampled, processed to remove ^{99}Tc contamination, and re-packaged. Some of the UF_6 stockpiles owned by both USEC, Inc and DOE contain trace quantities of other radionuclides introduced from DOE's practice during the years 1953 to 1975 of intermittently feeding reprocessed reactor fuel from government reactors in addition to unused UF_6 . In particular, concentrations of ^{99}Tc in this material exceed the current ASTM standard for nuclear fuel. PORTS is using chemical adsorbents to remove the ^{99}Tc from liquid UF_6 . PORTS has also detected occasional traces of various thorium isotopes, mostly commonly ^{230}Th , in some of the older UF_6 .

In October 2006, USEC, Inc introduced UF₆ to the American Centrifuge Lead Cascade. This is a pilot plant and demonstration facility for a new centrifuge-based enrichment plant to be built on the site of, and re-using the infrastructure of, DOE's cancelled Gas Centrifuge Enrichment Plant (GCEP). The Lead Cascade will operate for up to five years on total recycle to generate process operating and economic data and is limited by its NRC License to a total of 250 kg of UF₆ in the entire system. Both the Lead Cascade and the follow-on commercial plant will use feedstock that complies with the ASTM standard for UF₆ feedstock, so no detectable levels of other radionuclides in their emissions are anticipated.

PORTS also uses a variety of sealed sources for calibration of equipment; however, none of this results in material releases and therefore is not used in the determination of the effective dose equivalent (EDE). Column 1 of Table 2.3 lists the radionuclides used in the determination of the EDE.

1.2.2 Monitored and Unmonitored Sources

Table 1.0 PORTS Monitored Emission Points

Location	Vent Identification Number
X-326 Top Purge Vent	X-326-P-2799
X-326 Side Purge Vent	X-326-P-2798
X-326 Emergency Jet Vent	X-326-P-616
X-326 Seal Exhaust Vent 6	X-326-A-540
X-326 Seal Exhaust Vent 5	X-326-A-528
X-326 Seal Exhaust Vent 4	X-326-A-512
X-330 Seal Exhaust Vent 3	X-330-A-279
X-330 Seal Exhaust Vent 2	X-330-A-262
X-333 Seal Exhaust Vent 1	X-333-A-851
X-330 Cold Recovery/Building Wet Air Evacuation Vent	X-330-A-272
X-333 Cold Recovery Vent	X-333-P-852
X-333 Building Wet Air Evacuation Vent	X-333-P-856
X-343 Cold Trap Vent	X-343-P-468
X-344 Gulper Vent	X-344-P-929
X-344 Cold Trap Vent	X-344-P-469
X-3001 North Purge Vacuum/Evacuation Vacuum Vent	X-3001-A-3111

PORTS has reviewed the radiological emission sources on the plantsite and determined that sixteen had the greatest potential for emissions and equipped them with continuous emissions samplers (see Table 1.0 above). All sixteen monitored sources are sampled continuously when operating by flow-proportional, isokinetic samplers to provide emissions data. Six of these sources (the purge cascades, the cold recovery systems, and the building wet air evacuation systems) are also monitored in real-time by ionization chamber instruments for operational control. Three of these sources (the X-343 and X-344 cold trap vents and the X-3001 PV/EV vent) are monitored in real-time by gamma detectors mounted on the continuous emission samplers for the same purpose. Laboratory analysis of the emissions samples is more sensitive, more accurate, and more reliable than either the ionization chambers or the gamma detectors but cannot provide real-time data required for process control.

1.2.2.1 Monitored Sources

Top and Side Purge Cascades

The two purge cascades continuously separate light gases from process gas (UF_6) using gaseous diffusion. The separated process gas is returned to the operating cascade cells from the purge cascade. The light gases are split at the head of the purge cascades with enough "lights" being recycled to maintain normal operating flows and the balance being vented through chemical adsorbent traps to the atmosphere. The Side Purge Cascade and Top Purge Cascade typically operate in series at the very top of the main cascade. For operational control, each of the two purge cascades is monitored separately with real-time instruments called "space recorders".

Operation of the purge cascade(s) is required for continued operation of the main process cascade. Consequently, the two purge cascades are exhausted by three interconnected air jet eductors. The third eductor (the E-Jet) is an operating spare for either or both regular eductors. The eductors are interconnected to a set of four exhaust pipes. The pipes extend up a 50-meter freestanding tower to remove the emissions from the X-326 Process Building's wind wake. For compliance purposes, each of the three eductors is fitted with separate continuous samplers.

The Top Purge Cascade continues to operate to support the in-situ deposit removal activities mentioned above. The Side Purge Cascade is in standby with its associated eductor valved off. The E-Jet has continued to operate as needed, but has been needed only occasionally since May 2002 and not at all in 2006. Both purge cascades and all three eductors remain available for use if needed.

Seal Exhaust Stations

The seal exhaust (SE) stations maintain a vacuum within cascade compressor shaft seals to prevent inleakage of wet air to the cascade. This vacuum is isolated from the compressor side of the seal by a buffer zone. Gases evacuated from the seals are pulled through chemical adsorbent traps by a bank of manifolded vacuum pumps and exhausted to the atmosphere through mist eliminators (for pump oil) and a roof vent. There is one seal exhaust station in each of the cascade's six "process areas", each being located adjacent to the area control room (ACR).

Two of the seal exhaust stations (Areas 1 and 2) have been shut down. The rest of the seal exhaust stations continue to operate to support the in-situ deposit removal activities. All of the seal exhaust stations are available for use if needed.

Cold Recovery Systems

The cold recovery systems are intermittently operated maintenance support systems used to prepare cascade equipment (e.g., cells) for internal maintenance. Process gas in cascade cells scheduled for maintenance is first evacuated to adjacent cascade cells to the extent practical. The cell is then isolated and alternately purged with dry nitrogen and evacuated to the Cold Recovery System. The evacuated gases pass through chilled vessels called "cold traps" to solidify any residual process gas. The non-condensable nitrogen carrier is passed through chemical adsorbents for polishing and then is vented by to the atmosphere. Periodically, individual cold traps are valved off from the vent, and the trapped UF_6 is returned to the cascade by vaporization. There are two cold recovery systems operated at PORTS with one each in the X-330 and X-333 Process Buildings. In X-330, the cold recovery system shares a common vent and vent sampler with the building wet air evacuation system.

Only the X-330 Cold Recovery System continues to operate to support the in-situ deposit removal activities. Both of the Cold Recovery Systems are available for use if needed.

Building Wet Air Evacuation Systems

The building wet air evacuation systems are intermittently operated maintenance support systems used to prepare off-line cascade cells for return to service. The cell is alternately purged with dry nitrogen and evacuated to remove air and moisture from the cell. The evacuated gases are passed through chemical adsorbents to catch residual radionuclides (if any) and vented to the atmosphere. There are two building wet air evacuation systems, one associated with each of the cold recovery systems described above. In X-330, the cold recovery and building wet air evacuation systems share a common vent and sampler.

Only the X-330 Building Wet Air Evacuation System continues to operate to support the in-situ deposit removal activities. This system shares a common vent with the X-330 Cold Recovery System. Both of the Building Wet Air Evacuation Systems are available for use if needed.

X-343 and X-344 Cold Trap Areas

Under PORTS' historic configuration, autoclaves in the X-343 facility vaporized UF_6 in 14-ton cylinders to provide feed material for the enrichment cascade. Autoclaves in the X-344 facility liquefied enriched UF_6 in 14-ton or 10-ton cylinders for quality control sampling and transfer to 2.5-ton cylinders for shipment to customers. Residual gases evacuated from the autoclave process piping were returned to the cascade.

When enrichment operations ceased in 2001, the X-343 and X-344 facilities became the sampling and packaging facilities for UF₆ enriched at the Paducah GDP. This process also included draining the liquid UF₆ through chemical adsorbents to remove residual ⁹⁹Tc. In June 2002, all enriched material handling was consolidated at the Paducah GDP and the X-343 and X-344 facilities were dedicated to removing ⁹⁹Tc from out-of-specification UF₆ feedstock before it is enriched at the Paducah GDP. This operation continued through 2006.

A second routine part of the sampling and packaging operation was the replacement and testing of damaged or otherwise out-of-specification valves on the UF₆ cylinders. As the ⁹⁹Tc removal project has progressed, the number of valves needing replacement has increased and the X-343 was also used to replace and test cylinder valves since July 2004.

To deal with the residual gases without an operating enrichment cascade, cold trap systems similar to those in the cascade cold recovery areas were refurbished and upgraded in both facilities. (The cold trap systems were part of the original design of both facilities, but were taken out of service after the piping evacuation systems were redirected back to the cascade.) As part of the upgrades, both systems received new continuous vent samplers based on the continuous vent samplers used on other vents at PORTS. The new samplers are equipped with radiation monitors to track the accumulation of radioactive material in the sampler traps in real-time. This replaces the 1950's-style "space recorders" used for operational control of older monitored vents at PORTS.

X-344A Manifold Evacuation/Gulper

The X-344A UF₆ Sampling Building contains an automated sampling and transfer system for sampling the product and for filling customer cylinders with low assay UF₆. The term "assay" refers to the concentration of ²³⁵U in weight percent. To avoid cross contamination between samples and to prevent emissions to the air, the sampling and transfer manifold was formerly evacuated back to the diffusion cascade through a line to the X-342 Feed Vaporization and Fluorine Generation Building and, since May 2001, to the X-344 Cold Trap System. In the event of a trace release occurring in spite of the purge and evacuation procedure, a "gulper" is mounted behind the manifold-to-cylinder connections. The gulper is simply a continuous vacuum nozzle, similar in principal to a lab hood, which draws any small releases from the room air into a filtration system. The filtration system has two filter banks, each consisting of a roughing filter followed by high efficiency particulate air (HEPA) filters and a centrifugal blower.

X-3001 North Purge Vacuum/Evacuation Vacuum

The X-3001 Process Building is one of two process buildings constructed for DOE's Gas Centrifuge Enrichment Plant in the 1980's. USEC is installing the American Centrifuge Lead Cascade, a demonstration and pilot plant for a new gas centrifuge-based uranium enrichment plant, in the north end of X-3001. The Purge Vacuum/Evacuation Vacuum (PV/EV) Vent is the only radiological vent associated with the Lead Cascade. The high-speed centrifuges in the Lead Cascade operate within a vacuum to eliminate gas friction and heating effects. The PV/EV systems exhaust light gases (e.g., air) from within the centrifuge's outer casing. The EV System

is a high flow system used to evacuate new centrifuges prior to start-up. The PV system is a low flow system used to continuously evacuate operating centrifuge casings. Each of the four PV/EV vents serves half of a process building and the X-3001 North PV/EV vent is the only one in service. Gases evacuated by the PV/EV Systems are pulled through chemical adsorbent traps by manifolded vacuum pumps and exhausted to the atmosphere through a monitored roof vent similar to the seal exhaust systems in the GDP.

1.2.2.2 Unmonitored and Potential Sources

PORTS has several unmonitored minor and potential emission sources associated with USEC process support activities. Based on process knowledge and historical ambient monitoring data, none of these sources are believed to contribute significantly (i.e. in excess of 1% of the USEPA standard) to plant radionuclide emissions under normal operations.

The minor sources, as the term is used at PORTS, may have some trace radionuclides in their routine emissions but only in negligible amounts under normal operating conditions. The potential sources are primarily room ventilation exhausts and/or pressure relief vents from areas that have a potential for an internal radionuclide release.

Since 1995, PORTS has included emissions estimates from unmonitored sources in the calculation of the EDE. As required by NESHAP regulations, these estimates were updated based on 2000 and 2005 operational levels. The estimates are based on the methodology in Appendix D of 40 CFR 61.

X-705 Decontamination Facility

Equipment that is removed from the PORTS cascade is covered at the point of removal and transported to the X-705 Decontamination Facility. Small parts may be cleaned in hand tables, while large parts may be sent through an automated tunnel. The hand tables consist of shallow acid baths where metal parts can be decontaminated by passive soaking. The hand tables have fume hoods over them to protect workers from acid fumes. Pressure relief vents are standard on such equipment. The tunnel is an enclosed series of "booths" that can decontaminate large parts by spraying with decontamination solutions as a small dolly carries the parts through the tunnel. The tunnel is ventilated to prevent a buildup of acid fumes. In all cases, radionuclides (uranium and technetium) are dissolved in the liquid phase and collected for recovery of the uranium. None of the radionuclides are volatilized through normal operation of these facilities and only trace radionuclides carried by entrained droplets would be expected.

Most of the X-705 Decontamination Facility has seen limited or no use since the end of enrichment operations, but is still available for use. Consequently, USEC continues to include the estimated emissions in its source term.

X-705 Calciners

Solutions are processed in the Uranium Recovery Area to yield a concentrated uranyl nitrate solution, which is converted into uranium oxide powder in one of two calciners located in X-705. A calciner consists of an inclined heated tube with the uranyl nitrate solution entering at the top and air entering at the bottom. The uranium is first dried and then oxidized as it passes down the tube. The uranium oxide powder is collected directly into a five-inch diameter storage can at the lower end of the calciner tube. The gaseous stream leaves the upper end of the calciner and is exhausted through a scrubber for NO_x control. Uranium is recovered from the spent scrubber solution through a microfiltration process and the effluent is discharged to a National Pollutant Discharge Elimination System permitted outfall. Turbulence and flow rates through the calciners are controlled to minimize blowback of the uranium oxide. Any blowback that does occur is entrapped by the entering uranium solution.

The calciners have seen minimal use since the end of enrichment operations, but do operate occasionally. Consequently, USEC continues to include the estimated emissions in its source term.

X-705 Glove Boxes

The five-inch can that collects the uranium oxide powder from each calciner is housed in a glove box to prevent the loss of the material. In addition, there is a separate glove box which is used for sampling the material in the can. The glove boxes have air locks for the entry and removal of work materials and are maintained under negative pressure during use. This negative pressure is produced by an exhaust fan drawing through a HEPA filter.

Like the calciners, the gloveboxes have seen minimal use since the end of enrichment operations, but do operate occasionally. Consequently, USEC continues to include the estimated emissions in its source term.

X-705 Storage Tank Vents

Uranium-bearing solutions awaiting treatment are stored in five-inch diameter tanks inside the X-705 facility. All of these tanks are manifolded to a common pressure relief vent that has some potential to release radionuclides if the tanks are overfilled or overheated. Normal emissions should be zero since the stored liquids are quiescent, the dissolved radionuclides are non-volatile, and the vents are not open except during filling.

The storage tanks are in routine use, albeit with a very low thruput compared to historical levels. Consequently, emissions estimates from the storage tanks in the X-705 Decontamination Facility are included in the EDE calculations.

Laboratory Fume Hoods

Laboratory analysis of process and other samples is performed in the PORTS on-site laboratory in accordance with standard laboratory practices. There are no emissions controls on the lab hoods used in these procedures. The hoods should not exhibit any measurable radionuclide emissions

during normal operation. Small amounts of technetium are partially volatilized by the analytical method approved by the Environmental Protection Agency under the Safe Drinking Water Act. There is also a possibility of a UF_6 sample container bursting during processing. This is an extremely rare occurrence, however, and cannot be regarded as normal operation as specified in the NESHAP regulations. Most laboratory fume hoods are located in the X-710 Laboratory. There are two fume hoods in the X-760 Chemical Engineering Building which operates as an adjunct to the X-710 Laboratory. These hoods were formerly used to prepare environmental samples such as soil, water, air, and vegetation samples for analysis in the X-710 Laboratory. The level of radionuclides in these samples is extremely low as evidenced by the analytical results. The X-705 Decontamination Facility also has a small laboratory which contains three fume hoods which were used to prepare samples and analyze materials being processed in the building. This laboratory has been out of service for several years.

The X-710 Laboratory is in routine use. Consequently, emission estimates were included in the source term for the dose modeling using CAP88. The emissions from the X-710 were modeled as a single source.

XT-847 Glove Box

The XT-847 Glove Box is a large stainless steel glove box which is used to batch small quantities of radioactively contaminated waste for more efficient and less costly storage, shipment, and disposal. The primary waste stream involved is spent alumina and other adsorbents used in control traps on process vents. When the adsorbent is removed from use, it is placed in a safe geometry container (5", 8" or 12" diameter, depending on assay). The material is then analyzed, and if the uranium content meets nuclear criticality safety limits, it is batched into larger containers including, but not limited to, 55 gallon drums. Other radiological materials may also be handled in the glove box. The XT-847 Glovebox exhausts through a HEPA filter and is in routine use.

Room Air Exhausts

Several uranium handling areas within the plant buildings have some potential for releasing minute (≤ 1 gram) amounts of UF_6 into the room air. Releases of this size are characterized as small releases (visually resembling a puff of cigarette smoke). However, it should not be implied that any size release is acceptable or overlooked by PORTS. Studies conducted in the early 1980s demonstrated that a release of one gram of UF_6 produces a much larger smoke cloud than what is normally observed during the operations discussed here. Ventilation exhausts from, and worker protection within these areas, are controlled according to the probability of releases occurring. Standard policy in the event of a release is to evacuate the area and remotely close down the local ventilation for confinement and subsequent decontamination.

Material feed and withdrawal areas occasionally have small releases when disconnecting UF_6 containers from process piping. These areas include the X-342A Feed and Fluorine Generation Facility, the X-343 Feed Facility, the X-344A UF_6 Sampling Building, the X-330 Tails Withdrawal Area, the X-333 Low Assay Withdrawal Area, and the X-326 Extended Range Product and X-326 Product Withdrawal Areas. These areas have dedicated ventilation exhausts

for worker protection but no emission controls or continuous vent monitors (except at the X-344A UF₆ Sampling Building). The plant's Health Physics (HP) personnel sample the air inside these areas for worker protection. The HP data indicates the average radionuclide concentrations inside the room are equivalent to natural background and, based on this, emissions from the room can be presumed to be environmentally insignificant.

The highest probability of internal releases besides the X-344A Sampling/Transfer Area, which was discussed in the previous section, is in the X-705 Decontamination Facility South Annex. The South Annex was designed as a contained area with a separate HEPA filtered ventilation system where contaminated equipment could be opened and disassembled safely. Normal emissions to the outside air should be negligible, which is consistent with past ambient monitoring performed by the HP personnel. Current operations in the South Annex include changing of UF₆ cylinder valves and the processing of spent technetium filters from the X-344. The filter media (a granular solid) is transferred from the filter itself to small NCS-approved containers by a HEPA filtered vacuum. The X-705 South Annex is in routine service.

The "cell floors" of the process buildings are subject to a lesser potential for unplanned releases when cascade components are being serviced or removed. Special worker protection ventilation systems for the cell floors are not considered necessary for several reasons, including the huge volume of air passing through the general ventilation systems (approximately 4,000 process motors are air-cooled by the general ventilation system) and the lower potential for a release. The cell floor air is sampled by Health Physics personnel. The same results found in the material withdrawal areas are seen on the cell floor. Routine emissions levels from process building ventilation should be equal to natural background levels.

Maintenance Sources

There are several small maintenance sources (e.g., a grit blasting glovebox) in the X-700 Cleaning Building and the X-720 Stores and Maintenance Building that sometimes worked on radioactively contaminated equipment or material in the past. None of these sources still operate on radioactively contaminated materials and are not expected to do so at any time in the future. Since the sources themselves are still present, this report lists them as potential radioactive sources with emission rates of zero.

SECTION 2.0 AIR EMISSIONS DATA

Table 2.0 and Table 2.1 summarize the control device information for each source and give the distance and direction from each source to the nearest resident, school, office or business, and vegetable, meat, and milk-producing farms.

2.1 Radionuclide Emissions from Point Sources

The CAP88 model allows up to six sources to be modeled at one time, but assumes that all sources are located at the origin of the same circular grid. PORTS modeled its emissions as three

co-located stacks sited at the actual location of the predominant source, the X-326 Tall Stack, up to 1995. From 1995 through 1997, USEC modeled its emissions from PORTS as nine nominal sources at nine different locations to ensure that the impact of estimated emissions from grouped sources close to the downwind site boundary was not underestimated. This required nine different model runs that had to be combined manually, however.

In 1998, after consultation with USEPA-Region 5, the nine nominal sources were re-grouped into three locations, or source groups. At that time, the source terms from the lesser sources in each group were typically an order of magnitude lower than the source term from the predominant source in that same group. In 2000, a tenth source (the XT-847 Glove Box Exhaust) was added to the list. In 2001, two more sources were added (the Cold Trap Vents in X-343 and X-344). The source groups were also reorganized based on the changing emission levels. In 2006, a thirteenth nominal source was added, the American Centrifuge Lead Cascade in the X-3001 Process Building. This is modeled as a fourth source group because it is physically distant from all three of the existing source groups and will be joined by additional sources as the commercial American Centrifuge Plant is constructed.

Group 1 includes the X-326 Stack, all other X-326 vents, all X-710 Laboratory vents and the XT-847 Glove Box Exhaust; these sources were modeled from the location of the X-326 Stack. Group 2 includes only the two X-344 vents; modeled from the location of X-344 Cold Trap Vent. Group 3 includes the X-330, X-333, X-343, X-700, X-705, and X-720 building vents; modeled from the middle of the X-705 Building. Three of the six buildings in Group 3; X-333, X-700 and X-720; had no active radioactive emission sources during 2006. Group 4 includes only the single Lead Cascade Vent in X-3001.

Table 2.2 summarizes the grouping of the modeled sources. The individual source terms of the thirteen modeled sources are provided in Table 2.3 of this report. The physical characteristics of the modeled sources are provided in Table 3.0.

2.2 Radionuclide Emissions from Fugitive and Diffuse Sources

There were no significant emissions of radionuclides from diffuse or fugitive sources at PORTS due to USEC operations.

Table 2.0 Point Sources

Point Source ^a	Control Device	Control Efficiency	Distance in <u>Meters</u> to the Nearest:					
			Resident	School	Office or Business	Farm		
						Milk	Meat	Veg.
X-326 Top Purge, Side Purge & E-jet (Cascades) (3 monitors) ^b	Chemical Adsorbents	0-95% ^c	1370 SE	5000 NNW	1520 SSE	4290 N	1370 E	8660 ENE
X-330 Cold Recovery/Wet Air Evacuation Vent	Cold Traps Chemical Adsorbents	90-95% ^d 0-95% ^c	1690 ESE	3930 NNW	1370 W	3200 N	1520 ESE, W	8380 ENE
X-333 Cold Recovery Vent	Cold Traps Chemical Adsorbents	90-95% ^d 0-95% ^c	1330 ESE	3840 NNW	1860 WSW	2960 N	1230 SE	7890 ENE
X-333 Wet Air Evacuation Vent	Chemical Adsorbents	0-95% ^c	1330 ESE	3840 NNW	1860 WSW	2960 N	1230 SE	7890 ENE
X-326 Seal Exhaust Area 6	Chemical Adsorbents	0-95% ^c	1430 E	4880 NNW	1620 SSE	4180 N	1340 E	8630 ENE
X-326 Seal Exhaust Area 5	Chemical Adsorbents	0-95% ^c	1460 E	4630 NNW	1540 WNW	3940 N	1340 E	5830 ENE
X-326 Seal Exhaust Area 4	Chemical Adsorbents	0-95% ^c	1500 ESE	4420 NNW	1460 WNW	3720 N	1340 E	8470 ENE

See notes on page 16.

Table 2.0 Point Sources, continued

Point Source ^a	Control Device	Control Efficiency	Distance in <u>Meters</u> to the Nearest:					
			Resident	School	Office or Business	Farm		
						Milk	Meat	Veg.
X-330 Seal Exhaust Area 3	Chemical Adsorbents	0-95% ^c	1620 E	4080 NNW	1400 W	3360 N	1430 E	8400 ENE
X-330 Seal Exhaust Area 2	Chemical Adsorbents	0-95% ^c	1725 ESE	3690 NNW	1430 WSW	3020 N	1580 SE, W	8320 ENE
X-333 Seal Exhaust Area 1	Chemical Adsorbents	0-95% ^c	1330 ESE	3840 NNW	1860 WSW	2960 N	1230 SE	7890 ENE
X-343 Cold Trap Vent	Cold Traps Chemical Adsorbents	90-95% ^d 0-95% ^c	1070 ESE	3980 NW	2130 WSW	2980 N	1040 SSE	7620 ENE
X-344A Manifold Evacuation/ Gulper	HEPA Filters	99.97%	1830 ESE	3410 NNW	1460 WSW	2680 N	1830 SSE	8320 ENE
X-344 Cold Trap Vent	Cold Traps Chemical Adsorbents	90-95% ^d 0-95% ^c	1870 ESE	3380 NNW	1440 WSW	2660 N	1860 SSE	8340 ENE
XT-847 Glove Box	HEPA Filters	99.97%	640 SSW	5840 N	980 SE	5150 N	1300 S	9150 ENE

See notes on page 16.

Table 2.0 Point Sources, continued

Point Source ^a	Control Device	Control Efficiency	Distance in <u>Meters</u> to the Nearest:					
			Resident	School	Office or Business	Farm		
						Milk	Meat	Veg.
X-3001 North PV/EV Vent	Chemical Adsorbents	0-95% ^c	1100 W	5110 N	1320 WSW	4450 N	1550 SSE	9270 ENE

See notes on page 16.

Table 2.1 Grouped Sources

Point Source ^a	Control Device	Control Efficiency	Distance in <u>Meters</u> to the Nearest:					
			Resident	School	Office or Business	Farm		
						Milk	Meat	Veg.
X-705 Calciners (3)	Wet Scrubber	75%*	1330 ESE	4020 NNW	1800 W	3200 N	1050 ESE	7960 ENE
X-710 Laboratory Fume Hoods (39)	None	N/A	1260 E	4690 NNW	1660 WNW	3930 N	1130 E	8350 ENE
X-705 Decontamination Facility	One area HEPA Others none	99.97% N/A	1330 ESE	4020 NNW	1800 W	3200 N	1050 ESE	7960 ENE
X-705 Storage Tank Vents	None	N/A	1330 ESE	4020 NNW	1800 W	3200 N	1050 ESE	7960 ENE
X-700 Cleaning Building	HEPA Filters	99.97%	1220 ESE	3910 NNW	1910 W	3200 N	930 E	7840 ENE
X-720 Maintenance Facility	None	N/A	1220 E	4250 NNW	1800 W	3430 N	1010 E	7880 ENE
Room Air Exhausts	None	N/A	850 ESE	3410 NNW	1370 W	2680 N	760 SE	7560 ENE

See notes on page 16.

Notes to Tables in Section 2.0	
a	All sources in Table 2.0 have continuous vent monitors except the XT-847 Glove Box.
b	The Top and Side Purge Cascade vent streams pass separately through activated alumina traps. A third line, the Emergency Jet, connects to both lines through block valves. All three lines have continuous samplers. The three vent lines connect to four exhaust pipes that extend above the 50-meter tower. The Top Purge jet is vented directly through one pipe. The Side Purge Jet and Emergency Jet lines are interconnected to the other three pipes.
c	Chemical adsorbents (such as activated alumina and sodium fluoride) are approximately 95 percent effective at concentrations above 1 ppm. Below this concentration, chemical adsorbents have reduced efficiency or no effect. Normal concentrations entering the Purge Cascade Chemical Traps are near or below 1 ppm. The sample traps (which follow the control traps) use activated alumina hydrated to 14 percent moisture content, which is much more effective due to an instantaneous reaction of gaseous UF_6 and ^{99}Tc with the water to form particulate matter.
d	Based on process knowledge, cold traps are estimated to be approximately 90 to 95 percent effective in trapping gaseous UF_6 .
e	Scrubber efficiency is estimated to be approximately 75 percent but has not been rigorously measured. Normal emissions from the source are estimated to be negligible compared to monitored sources (<0.001 curies of uranium).

Table 2.2 Grouping of USEC Vents for Modeling

Source	Consists of	Modeled with Source
1	X-326 Top Purge Vent, Side Purge Vent and Emergency Jet Vent	1
2	X-326 SE 6 Vent, SE 5 Vent, SE 4 Vent and ventilation exhaust	1
3	X-330 Building Cell Evacuation/Cold Recovery Vent, SE 3 Vent, SE 2 Vent and ventilation exhaust	7
4	X-333 Cold Recovery Vent, Building Wet Air Evacuation Vent, SE 1 Vent and ventilation exhaust (inactive)	7
5	X-344 Gulper Vent	5
6	All X-700 vents (inactive)	7
7	All X-705 vents	7
8	All X-710 vents	1
9	All X-720 vents (inactive)	7
10	XT-847 Glove Box Vent	1
11	X-343 Cold Trap Vent	7
12	X-344 Cold Trap Vent.	5
13	X-3001 North PV/EV Vent	13

Table 2.3 Releases (in Curies) During CY 2006

NUCLIDE	USEC Sources													Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	
²³⁴ U	6.04E-06	5.46E-05	2.27E-04	0	4.12E-06	0	1.31E-04	3.86E-05	0	1.85E-05	6.06E-05	1.76E-04	7.58E-07	7.16E-04
²³⁵ U	1.40E-06	4.19E-06	8.53E-06	0	9.00E-07	0	4.72E-06	3.61E-06	0	5.37E-08	3.73E-06	8.06E-06	2.64E-07	3.52E-05
²³⁸ U	2.16E-06	5.74E-06	2.76E-05	0	1.90E-06	0	4.07E-05	4.18E-04	0	1.85E-05	4.92E-05	1.73E-04	5.07E-07	7.37E-04
⁹⁹ Tc	1.23E-03	3.34E-03	1.57E-02	0	7.19E-04	0	1.59E-04	4.88E-05	0	3.71E-04	1.11E-03	1.11E-03	2.22E-04	2.38E-02
²²⁸ Th	0	0	0	0	0	0	3.39E-10	3.74E-08	0	0	0	0	0	3.77E-08
²³⁰ Th	0	0	0	0	2.81E-06	0	3.40E-10	3.75E-08	0	0	7.47E-07	7.85E-07	0	4.38E-06
²³¹ Th	1.40E-06	4.19E-06	8.53E-06	0	9.00E-07	0	4.72E-06	3.61E-06	0	5.37E-08	3.73E-06	8.06E-06	2.64E-07	3.52E-05
²³² Th	0	0	0	0	6.18E-08	0	2.07E-11	2.29E-09	0	0	0	1.85E-08	0	8.26E-08
²³⁴ Th	2.16E-06	5.74E-06	2.76E-05	0	1.90E-06	0	4.07E-05	4.18E-04	0	1.85E-05	4.92E-05	1.73E-04	5.07E-07	7.37E-04
^{234m} Pa	2.16E-06	5.74E-06	2.76E-05	0	1.90E-06	0	4.07E-05	4.18E-04	0	1.85E-05	4.92E-05	1.73E-04	5.07E-07	7.37E-04

Notes:

1. Sources 4, 6 and 9 (X-333, X-700 & X-720) were inactive for radionuclide operations in 2006.

SECTION 3.0 DOSE ASSESSMENT

3.1 Description of Dose Model

The radiation dose calculations were performed using the CAP88 package of computer codes. This package contains USEPA's AIRDOS-EPA computer code. This program implements a steady-state, Gaussian plume, atmospheric dispersion model to calculate environmental concentrations of released radionuclides. It also includes Regulatory Guide 1.109 food chain models to calculate human exposure, both internal and external, to radionuclides deposited in the environment. The human exposure values are then used by USEPA's DARTAB computer code to calculate radiation dose to man from the radionuclides released during the year. The dose calculations use dose conversion factors in the RADRISK data file, which is provided by USEPA with the CAP88 package.

3.2 Summary of Input Parameters

Except for the radionuclide parameters given in Section 2.0 and those provided below, all important input parameter values used are the default values provided with the CAP88 computer codes and data bases.

Solubility Class: All uranium isotopes:	D
Technetium-99	D
All thorium isotopes	W
All other uranium daughters	W
AMAD:	1 μ m
Meteorological data:	2006 data from onsite tower supplemented with offsite data

As already reported to Region V, on October 25 instrument technicians were replacing the in-place sensors with re-calibrated sensors when the hoist mechanism that suspends the instrument platforms on the onsite tower failed. All three platforms fell to earth, destroying the sensors. The tower was repaired and returned to service with new calibrated sensors on December 20. In the interim, data was provided by an Ohio State University meteorological station in Jackson.

Rainfall rate:	100.0 cm/year
Average air temperature:	12.1 °C
Average mixing layer height:	600 meters

Fraction of foodstuffs from:	<u>Local Area</u>	<u>Within 50 mi</u>	<u>Beyond 50 mi*</u>
Vegetables and produce	0.700	0.300	0.000
Meat	0.442	0.558	0.000
Milk	0.399	0.601	0.000

*The dose estimate for foodstuffs is very conservative when 0.0 is used as an input parameter in the category of foodstuffs consumed that were produced at a distance of 50 miles or more from the PORTS site. Realistically, it can be assumed that very little of the foodstuffs consumed by residents within a 50-mile radius of PORTS are produced within 50 miles of the PORTS site. The majority of the foodstuffs consumed are purchased at supermarkets that receive foodstuffs from all over the world.

3.3 Source Characteristics

Table 3.0 Source Characteristics

Source	Type	Release Height (m)	Inner Diameter (m)	Gas Exit Velocity (m/s)	Gas Exit Temperature (°C)	Distance to Nearest Individual (m)	Direction to Nearest Individual
1	Point	50	0.25	18.0	35.0	1370	SE
2	Point	20	0.97	24.0	35.0	1430	E
3	Point	20	0.20	61.0	35.0	1620	E
4	Point	20	0.62	29.0	35.0	1330	ESE
5	Point	20	0.36	0.3	23.8	1830	ESE
6	Point	16	0.30	14.0	23.8	1220	ESE
7	Point	14	1.50	12.3	26.7	1330	ESE
8	Point	9	1.00	10.2	26.7	1260	E
9	Point	18	1.19	9.0	23.8	1220	E
10	Point	11	0.406	5.5	35.0	640	SSW
11	Point	33	0.076	9.3	23.8	1070	ESE
12	Point	15	0.35	0.4	23.8	1870	ESE
13	Point	30	0.10	5.8	26.7	1102	SSW

The source numbers in Table 3.0 correspond to the source numbers in Tables 2.2 and 2.3. As a matter of policy, USEC assumes a neutral buoyancy and zero plume rise for all its airborne effluents.

3.4 Compliance Assessment

In 1996, USEPA authorized USEC and DOE to submit separate reports for their areas of responsibility. However, each entity was directed to include the other's dose assessment values in its report in order to show the plant's total effect on the public.

The most exposed member of the public received an EDE of 0.0045 mrem/yr (4.5×10^{-5} mSv/yr) from **USEC operations** and an additional 0.012 mrem/yr (1.2×10^{-4} mSv/yr) from **DOE operations** for a total of 0.016 mrem/yr (1.6×10^{-4} mSv/yr) from **total plant operations**. This individual was located 3170 meters north of USEC's predominant emission sources (Source Group 3) and 3200 meters north of DOE's predominant emission source (the X-623 Groundwater Treatment Facility).

The most exposed member of the public due solely to **USEC operations** was the most exposed individual due **total plant operations** described in the previous paragraph. The most exposed member of the public due to **DOE operations** received an EDE of 0.012 mrem/yr (1.2×10^{-4} mSv/yr) from **DOE operations** and an additional 0.0031 mrem/yr (3.1×10^{-5} mSv/yr) from **USEC operations** for a total of 0.015 mrem/yr (1.5×10^{-4} mSv/yr) from **total plant operations**. This individual was located 3200 meters north of DOE's predominant emission source and 3240 meters north-northeast of USEC's predominant emission source.

SECTION 4.0 ADDITIONAL INFORMATION

4.1 Collective EDE (Person-Rem/Yr)

Table 4.0 gives the Collective EDEs (i.e., Population Doses) in person-rem/yr due to USEC operations over the past ten years. The Collective EDEs are given for the 50-mile radius population and the village of Piketon. The individual EDEs for the most exposed individual (MEI) due to USEC operations are also given for comparison.

Table 4.0 Annual Doses Due to PORTS (USEC) Airborne Emissions, 1997-2006¹

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	EPA Std
50-mile Collective EDE ^{2,4}	1.5	6.4	1.0	0.15	0.18	0.095	0.18	0.14	0.013	0.014	NA
Piketon Collective EDE ^{3,4}	0.06	1.5	0.15	0.029	0.039	0.010	0.018	0.018	0.0021	0.0037	NA
MEI EDE ⁵ (mrem/yr)	0.12	1.69	0.28	0.039	0.052	0.026	0.033	0.025	0.0029	0.0045	10

Notes to Table 4.0:

1. All dose figures in this table are for USEC operations only.
2. Collective EDE in person-rem/yr for 50-mile radius. This is a summation of the dose to each individual living within a 50-mile radius.
3. Collective EDE in person-rem/yr for the Village of Piketon. This is a summation of the dose to each individual living within the village.
4. Population distributions for calendar year 2001 onward were updated from 2000 census data.
5. The most exposed individual (USEC operations only) in 2006 was located 3170 meters north of the X-705 Decontamination Facility.

4.2 New/Modified Sources

In February 2003, USEC, Inc. submitted a license application to the NRC to build and operate an American Centrifuge Lead Cascade at PORTS. NRC issued the license in March 2004 and UF₆ was introduced into the system in October, 2006. The Lead Cascade is installed in the existing X-3001 Process Building and will use the existing building vent.

The Lead Cascade is a demonstration facility licensed for up to 240 individual centrifuges and up to 250 Kg of UF₆. The purpose of the Lead Cascade is to generate operability and economic data for a follow-on commercial centrifuge facility. The Lead Cascade will operate on full recycle with no UF₆ being withdrawn except samples for laboratory analysis. The Lead Cascade has only one process vent, which is equipped with a continuous vent monitor similar to the ones currently used on the X-343 and X-344 vents.

4.3 Unplanned Releases

No major unplanned releases to the atmosphere occurred during calendar year 2006.

Minor releases occurred within workspaces during attaching and detaching of lines to cylinders or when other off-normal conditions developed. These were controlled by the use of HEPA filtered gulpers.

SECTION 5.0 SUPPLEMENTAL INFORMATION

5.1 Radon Emissions

PORTS does not have and does not expect to have any ^{220}Rn emissions due to ^{232}U or ^{232}Th sources. PORTS does not manage any ^{232}U and consequently does not have any emissions of ^{220}Rn due to ^{232}U decay. Although PORTS does not specifically manage ^{232}Th , some amount is present due to ^{236}U decay and feedstock contamination. ^{236}U is itself a trace component of the uranium managed at PORTS, and its thorium daughter is extremely long-lived (half-life greater than 14 billion years). These figures indicate that no measurable concentrations of ^{220}Rn due to ^{232}Th decay will exist onsite within any foreseeable future.

The uranium processed at PORTS has previously been chemically purified at the mill to remove all naturally occurring elements including ^{226}Ra , which is the precursor of ^{222}Rn . It has been calculated that 10,000 years would be required before detectable levels of ^{222}Rn would occur due to the natural decay process.

5.2 Compliance with NESHAP Subpart H Requirements

During 2006, USEC had continuous emissions monitors (samplers) on sixteen point sources of the 38 point/grouped sources that represent what are historically the major emission sources at PORTS. Most of the continuously monitored point sources are not actually subject to the continuous monitoring requirement. USEC believes that all sixteen monitors comply with the requirements of 40 CFR 61.93(b) (i.e., they are equivalent to the EPA reference methods). USEPA-Region 5 conducted a detailed inspection of the vent sampling program during its NESHAP inspections during the weeks of March 15, 1993, and July 22, 1996. Although not explicitly stated in the final inspection reports, USEPA-Region 5 has accepted the stack sampling methodology. Further USEPA inspections of this program were conducted in 1994, 1995, 1998, 2000, and 2006.

The final 1993 NESHAP inspection report did not address the frequency or the methodology for periodic confirmatory measurements. USEPA has accepted engineering estimates, and USEC has made emissions estimates for all unmonitored radionuclide sources using the methods found in 40 CFR 61, Appendices D and E. Stack tests for radionuclides were made on six sources in 1989, and repeat testing was conducted on one source in 1993 as part of the process for renewal of the source's state air permit. The emissions estimates for all of the unmonitored sources were updated in 2000 and updated again in 2005.

A NESHAP Compliance Plan was submitted by DOE in 1990 to document how PORTS planned to demonstrate compliance with the newly promulgated radionuclide NESHAP regulations in 40 CFR 61, Subpart H. The plan was revised and resubmitted in 1991 and 1992. USEC originally included continuous ambient air monitoring in its compliance plan to provide supporting evidence that no significant radionuclide emissions had been overlooked in the source monitoring program. However, USEPA-Region 5 never approved the use of ambient air monitoring to demonstrate USEC's compliance with the radiological NESHAP regulations on a continuing basis. The actions

described in the plan were completed. On March 16, 1999, USEPA-Region 5 verbally agreed during a telephone conversation (POEF-520-99-038) that the compliance plan could now be considered a historical document.

PORTS has conducted an extensive stack and vent survey. Stacks with a potential to emit radionuclides have been identified and evaluated. See Attachment 1 for a listing of the radionuclide stacks/vents at PORTS.

5.3 Future Facilities

In August 2004, USEC, Inc. submitted a license application to the NRC for the follow-on commercial plant. The commercial plant will initially be installed in the existing GCEP buildings with some new construction (two new support buildings, an expansion of an existing building and several cylinder storage pads). The NRC issued a Construction and Operating License for this plant on April 13, 2007. USEC is presently finalizing a formal request for EPA Approval to Construct the commercial plant under 40 CFR 61.

Attachment 1

PORTS 2006 Potential and Actual Radiological Emissions Point Sources

(To USEC Air Emissions Annual Report [Under Subpart H, 40 CFR 61.94] Calendar Year 2006).

STACK NUMBER	DESCRIPTION
X-326-A-512	Seal Exhaust Vent Area 4
X-326-A-540	Seal Exhaust Vent Area 6
X-326-A-528	Seal Exhaust Vent Area 5
X-326-B-284	ERP Withdrawal Room Vent
X-326-P-2798	S-Jet Exhaust - Purge Cascade
X-326-P-2799	T-Jet Exhaust - Purge Cascade
X-326-P-616	E-Jet Exhaust - Purge Cascade
X-330-A-079	Tails Withdrawal Room Exhaust
X-330-A-262	Seal Exhaust Vent Area 2
X-330-A-272	X-330 Cold Recovery/Building Wet Air Evacuation Vent
X-330-A-279	Seal Exhaust Vent Area 3
X-330-P-3020	X-330 Building Wet Air Evacuation System (Inactive)
X-333-A-832	Low Assay Withdrawal (LAW) Seal Exhaust Vent
X-333-A-851	Seal Exhaust Vent Area 1
X-333-A-852	X-333 Cold Recovery Vent
X-333-P-856	X-333 Building Wet Air Evacuation Vent
X-333-B-862	LAW Station Room Exhaust
X-342A-A-974	Autoclave Exhaust
X-343-B-1015	Exhaust Fan AJ 108
X-343-P-1011	Autoclave Air Ejector
X-343-P-468	Cold Trap Vent
X-343-P-964	Air Jet
X-343-P-997	Autoclave Housing Relief Vent
X-343-P-998	Autoclave Housing Relief Vent
X-343-P-999	Autoclave Housing Relief Vent
X-344-B-956	Room Air Over Maintenance Shops

STACK NUMBER	DESCRIPTION
X-344-P-929	Gulper Exhaust
X-344-P-469	Cold Trap Vent
X-344A-A-937	Air Ejector
X-700-A-1032	Large Parts Shot Blaster
X-700-A-1037	X-700 Rad Calibration Lab Fume Hood
X-700-A-1043	Converter Repair Station
X-700-A-1053	Small Parts Glass Blaster
X-705-A-1348	Fume Hood
X-705-A-1426	X-705 Gulper System
X-705-A-2813	Small Cylinder Cleaning Unit
X-705-B-1369	Recovery Room Vent
X-705-B-1372	Uranium Solution Storage Vent
X-705-B-1379	Dissolver Storage Columns
X-705-B-1384	Compressor Dismantling Area
X-705-B-2810	Small Cylinder Pit Hood Exhaust
X-705-B-2811	Blue Room
X-705-B-2826	Complexing Hand Table Hood
X-705-B-3091	South Annex Exhaust
X-705-P-1353	X-705 "B" Loop Storage Slabs
X-705-P-1354	X-705 "A" Loop Storage Slabs
X-705-P-1361	T-Water Storage Columns
X-705-P-1364	Bi Uranyl Nitrate Storage Column
X-705-P-1366	Heavy Metals Storage Columns
X-705-P-1375	Caustic Precipitation Handtable Exhaust
X-705-P-1377	Air Jet Recovery
X-705-P-1382	Alumina Filter Tables
X-705-P-1404	Tunnel Vent Fan
X-705-P-1406	Nitric Acid Booth

STACK NUMBER	DESCRIPTION
X-705-P-1422	X-705 Calciner Glove Box
X-705-P-1424	Uranium Sampling & Blending Glove Box
X-705-P-1950	X-705 North Spray Tank
X-705-P-1951	High Assay Parts Cleaning Tables
X-705-P-1952	Group I Hand Table
X-705-P-1953	Small Parts Pit Cleaning Area
X-705-P-1954	Handtable
X-705-P-1960	Ion Exchange Vent
X-710-B-1655	EF 101 Room 111 Lab Hood
X-710-B-1656	EF 122 Room 120 Lab Hood
X-710-B-1657	EF 102 Room 111 Lab Hood
X-710-B-1658	EF 103 Room 111 Lab Hood
X-710-B-1659	EF 123 Room 120 Lab Hood
X-710-B-1661	EF 104 Room 111 Lab Hood
X-710-B-1666	EF 124 Room 120 Lab Hood
X-710-B-1667	EF 106 Room 111 Lab Hood
X-710-B-1668	EF 107 Room 111 Lab Hood
X-710-B-1669	EF 125 Room 120 Lab Hood
X-710-B-1671	EF 108 Room 111 Lab Hood
X-710-B-1673	EF 112 Room 111 Lab Hood
X-710-B-1674	EF 109 Room 111 Lab Hood
X-710-B-1675	EF 126 Room 120 Lab Hood
X-710-B-1676	EF 110 Room 111 Lab Hood
X-710-B-1677	EF 111 Room 111 Lab Vent
X-710-B-1679	EF 127 Room 120 Lab Hood
X-710-B-1681	EF 113 Room 111 Lab Hood
X-710-B-1682	EF 128 Room 120 Lab Hood
X-710-B-1685	EF 114 Room 111 Lab Hood

STACK NUMBER	DESCRIPTION
X-710-B-1686	EF 115 Room 111 Lab Hood
X-710-B-1687	EF 129 Room 120 Lab Hood
X-710-B-1688	EF 116 Room 111 Lab Hood
X-710-B-1692	EF 6 Room 112 Room Vent
X-710-B-1693	EF 117B Room 111 Lab Hood
X-710-B-1694	EF 130 Room 120 Lab Hood
X-710-B-1696	EF 234 Room 240 Lab Hood
X-710-B-1697	EF 117A Room 111 Lab Hood
X-710-B-1698	EF 118 Room 111 Lab Hood
X-710-B-1701	EF 274 Room 240 Lab Hood
X-710-B-1703	EF 167 Room 114 Lab Hood
X-710-B-1706	EF 235 Room 240 Lab Hood
X-710-B-1707	EF 166 Room 114 Lab Hood
X-710-B-1710	EF 275 Room 241 Lab Hood
X-710-B-1711	EF 119 Room 114 Lab Hood
X-710-B-1719	EF 120 Room 115 Lab Hood
X-710-B-1724	EF 238 Room 243 Lab Hood
X-710-B-1732	EF 128 Room 115 Lab Hood
X-710-B-1733	EF 133 Room 128 Lab Hood
X-710-B-1744	EF 223 Room 229 Lab Hood
X-710-B-1747	EF 225 Room 229 Lab Hood
X-710-B-1749	EF 228 Room 229 Lab Hood
X-710-B-1750	EF 229 Room 229 Lab Hood
X-710-B-1751	EF 227 Room 229 Lab Hood
X-710-B-1753	EF 230 Room 229 Lab Hood
X-710-B-1757	EF 239 Room 243 Lab Hood
X-710-B-1758	EF 240 Room 243 Lab Hood
X-710-B-1759	EF 241 Room 243 Lab Hood

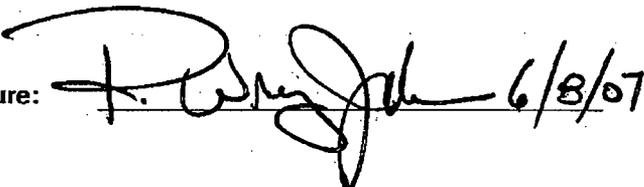
STACK NUMBER	DESCRIPTION
X-710-B-1761	EF 270 Room 238 Lab Hood
X-710-B-1779	EF 265 Room 285 Lab Hood
X-710-B-1789	EF 256 Room 263 Lab Hood
X-710-B-1803	EF 162 Room 157 Lab Hood
X-710-B-1805	EF 161 Room 142 Lab Hood
X-710-B-1808	EF 159 Room 156 Lab Hood
X-710-B-1810	EF 158 Room 156 Lab Hood
X-710-B-1811	EF 157 Room 156 Lab Hood
X-710-B-1814	EF 156 Room 156 Lab Hood
X-710-B-1821	EF 143 Room 138 Lab Hood
X-710-B-1822	EF 142 Room 138 Lab Hood
X-710-B-1823	EF 199 Room 138 Lab Hood (AA Unit, has HEPA filter)
X-710-B-1825	EF 141 Room 138 Lab Hood
X-710-B-1830	EF 140 Room 135 Lab Hood
X-710-B-1832	EF 139 Room 135 Lab Hood
X-710-B-1836	EF 138 Room 135 Lab Hood
X-710-B-1838	EF 137 Room 135 Lab Hood
X-710-B-1841	EF 136 Room 135 Lab Hood
X-710-B-1847	EF 134 Room 135 Lab Hood
X-710-B-1849	EF 135 Room 135 Lab Hood
X-720-A-1874	Grit Blasting Room
X-720-A-1545	Motor Shop Steam Cleaning Booth
X-720-A-1904	X-720 Burn Off Oven
X-720-B-1515	Sample Bottle Exhaust
X-3001-A-3111	X-3001 North Purge Vacuum/Evacuation Vacuum Vent
XT-847-B-3102	XT-847 Glove Box

Attachment 2

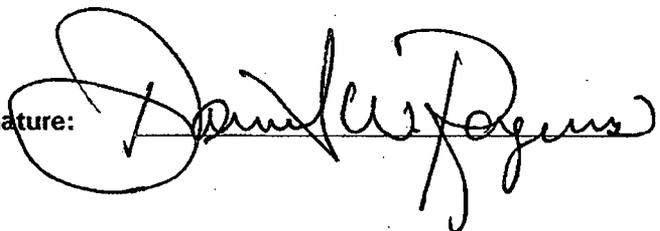
Certification

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 a complete representation of the emissions under United States Enrichment Corporation's control. 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: R. Wray Jordan
General Manager
Portsmouth Gaseous Diffusion Plant

Signature:  6/8/07 Date:

Name: Daniel Rogers
Director, Lead Cascade Construction and Operation

Signature:  Date: 6/7/07