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June 29, 2005
GDP 05-0027

Mr. Jack R. Strosnider
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)
Docket Nos. 70-7001 and 70-7002
Certificate Nos. GDP-1 and GDP-2
Submittal of the National Emission Standards For Hazardous Air Pollutants (NESHAP) Radionuclide Emission Reports for Calendar Year 2004

Dear Mr. Strosnider:

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 (See the Reference) 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. These reports are provided for information only.

Should you have any questions or require additional information, please contact me at (301) 564-3250. There are no new commitments contained in this submittal.

Sincerely,

S. A. Toelle

Steven A. Toelle
Director, Nuclear Regulatory Affairs

NMSS01

USEC Inc.
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Reference: 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.

Enclosures: 1. PGDP NESHAP Radionuclide Emission Report for Calendar Year 2004
2. PORTS NESHAP Radionuclide Emission Report for Calendar Year 2004

cc: J. Henson, Chief, Fuel Facility Inspection, NRC Region II
M. Thomas, Acting NRC Senior Resident Inspector, PGDP
D. Martin, NRC Project Manager

Enclosure 1
GDP 05-0027
26 Pages Total

PGDP NESHAP Radionuclide Emission Report for Calendar Year 2004

USEC
A Global Energy Company

June 28, 2005

Ms. Beverly Banister, Director
Air, Pesticides, and Toxic Management Division
United States Environmental Protection Agency, Region 4
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Mr. Behram Shraff
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MS6608J, Ariel Rios Building
United States Environmental Protection Agency Headquarters
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Dear Ms. Banister, Mr. Lyons, and Mr. Shraff:

2004 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 annual NESHAP report (Attachment 1) required by 40 CFR 61, Subpart H, as adopted by the Commonwealth of Kentucky by reference in 401 KAR 57:002. This report summarizes airborne radionuclide emissions from USEC operations during CY 2004. Attached for reference is a copy of the DOE report for CY 2004 (Attachment 2).

The PGDP site is owned by the Department of Energy (DOE). USEC and DOE conduct independent operations at the site. As the regulations apply to the total quantity of radionuclides emitted from the site, the USEC report also includes emissions from DOE operations. Separate certifications are provided for USEC and DOE operations.

If you have any questions, please contact Greg Herndon at (270) 441-6076.

Sincerely,

T. Michael Taimi
Director, Environmental Affairs

TMT:GLH:mjw

Attachments (2)

cc: Mark Keef/Keith Ahern – USEC/PGDP
William Murphie – DOE/PGDP
Steve Penrod – USEC/PGDP

cc/att: Greg Herndon
Vernon Shanks/Dennis Reiter – USEC/PGDP
WM/EC – RC

cc/att (1): Steve Cowne – USEC/PGDP

United States Enrichment Corporation
Paducah Gaseous Diffusion Plant
P.O. Box 1410, Paducah, KY 42001

ATTACHMENT 1

United States Enrichment Corporation
Air Emissions Annual Report
(40 CFR 61, Subpart H)
Calendar Year 2004

SITE INFORMATION

Site Name:

Paducah Gaseous Diffusion Plant

Operating Contractor:

United States Enrichment Corporation

Address:

Post Office Box 1410
Paducah, Kentucky 42002-1410

Contact:

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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 and DOE portions of the Paducah Site.

SITE DESCRIPTION

PGDP is an active uranium enrichment facility consisting of a diffusion cascade and extensive support facilities. The cascade, including product and tails withdrawal, is housed in 6 process buildings covering a total of approximately 80 acres. The plant is located on a reservation consisting of approximately 1,350 acres in western McCracken County approximately 10 miles west of Paducah, Kentucky, and approximately 3 miles south of the Ohio River. Roughly 740 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 2,100 acres either deeded or leased to the Commonwealth of Kentucky. During World War II, the Kentucky Ordnance Works (KOW), a trinitrotoluene production facility, was operated in an area southwest of the plant on what is now 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 about 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 physical 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. During enriching operations from 1953 to 1975, feed material (called "reactor tails") from government reactors was also used intermittently in addition to the UF_6 typically used. Reactor tails were the spent fuel from nuclear reactors that is depleted in ^{235}U content and has been reprocessed to remove most of the fission products. The reactor fuel rods were processed at other DOE facilities (where most of the fission products were removed) and the enriched uranium and the remaining fission products were fed into the PGDP cascade system. Use of the reactor tails resulted in the introduction of technetium-99 (^{99}Tc), a fission by-product, and transuranics, most notably neptunium-237 (^{237}Np) and plutonium-239 (^{239}Pu), into the cascade. ^{99}Tc is a man-made radioactive substance (radionuclide) having a half-life estimated at between 212,000 and 250,000 years. ^{99}Tc decays by emitting beta radiation.

Extensive support facilities are required to maintain the diffusion process. Some of the major support facilities include a steam plant, four major electrical switchyards, four 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 environs of PGDP. The population within the 50-mile radius is approximately 531,000 persons. Of these, approximately 36,500 live within 10 miles of the plant and approximately 104,000 within 20 miles. 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 air miles east of the plant; Cape Girardeau, Missouri, located approximately 40 air miles to the west; and Metropolis, Illinois, located approximately 6 air miles to the northeast.

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

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

USEC SOURCE DESCRIPTIONS

Based on historical emission data, USEC has identified only one release point (C-310 stack) which requires continuous monitoring per the radionuclide NESHAP regulations because of potential to emit radionuclides resulting in an Effective Dose Equivalent (EDE) to off-site personnel exceeding the regulatory threshold of 0.1 mrem/yr (1 percent of the standard). Based on evaluation of current and historical stack monitoring data and process knowledge, all other USEC source emissions are expected to contribute to doses less than the radionuclide NESHAP threshold limit for continuous monitoring.

Section 61.93 of 40 CFR 61 requires continuous emission measurements for sources with a potential (assuming no controls exist, but the facility operations are normal) to emit radionuclides which would result in an EDE of 0.1 mrem to any member of the public. For the purposes of this report, any source with a potential to emit radionuclides that would result in an annual EDE of 0.1 mrem is defined as a *major* source. A *minor* source is a source or group of sources that do not have the potential to emit radionuclides, that would result in an annual EDE of less than 0.1 mrem to the maximally affected resident. A sources potential to emit is calculated by assuming the source is operating normally, but control devices do not exist.

There are a number of minor, unmonitored radionuclide air sources at PGDP. Since these sources are not equipped with effluent samplers or monitors, emissions must be estimated using EPA-approved methods. Minor sources were identified during a 1991–1992 vent stack survey. 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.

Group A/G—C-400/C-409 Group

C-400 Decontamination Spray Booth (Group A)

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 potential of radionuclide emissions arises 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 (Group A)

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 C-710. The solution is chemically treated to precipitate the uranium that forms a slurry. The slurry is then passed through a rotary vacuum filter, which collects the precipitate (filter cake) for future disposal. After sampling, the filtrate is then discharged via permitted Kentucky Pollutant Discharge Elimination System (KPDES) outfalls. The possibility for radionuclide emissions arises from the vent on the pump that pulls the slurry through the rotary vacuum filter. Emissions from this vent should be minimal because the pump and its vent are downstream of the rotary vacuum filter that should trap the uranium as filter cake. Emissions were estimated in accordance with 40 CFR 61, Appendix D. The concentrations of radionuclides in the filtrate multiplied by the filtrate volume were considered as the curies "used."

C-400 Laundry (Group A)

The C-400 Laundry washes and dries coveralls and 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.

C-409 Dissolver/Rotary Vacuum Filter (Group G)

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 that forms a slurry. The slurry is then passed through a rotary vacuum filter, which collects the precipitate (filter cake) for future disposal. After sampling, the filtrate is then discharged via permitted KPDES outfalls. The possibility for radionuclide emissions arises from the vent on the pump that pulls the slurry through the rotary vacuum filter. Emissions from this vent are expected to be minimal because the pump and its vent are downstream of the rotary vacuum filter that should 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 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 hydrostatically test the cylinders prior to drying, multiplied by the total volume of water used in the hydrostatic test, were considered as the curies "used."

Group C—C-720

The motor burnout facility in C-720 is used to remove insulation from process motors in preparation for rebuilding. Administrative controls, such as limiting the level of radioactive contamination on the motors, are used to minimize emissions from this system. Emissions from the motor burnout facility are estimated using the results of radiological surveys of the motors placed in the facility. This facility was not operated in 2004.

Group D—C-709/C-710 Laboratory Hoods

The C-709/710 Laboratories are operated by Production Support and are the main facilities for sample analysis and research at PGDP. There are a total of 77 laboratory hoods and canopies in the C-709/710 buildings that could be used for radiological activities. 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 (e.g., 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 loose, 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 purge vent stack. Small quantities of ^{234}U, ^{235}U, ^{238}U, ^{99}Tc, ^{237}Np, ^{239}Pu, and thorium-230 (^{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. Each trap contains approximately 200 pounds of alumina.

The cylinder burp facility, located on the east side of C-310, is used to vent the low molecular weight gases from product cylinders. This facility is also a potential source of uranium, ^{99}Tc, minute quantities of transuranics, and ^{230}Th. 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. These traps contain approximately 130 pounds of NaF each. Uranium is recovered from the NaF traps back to the enrichment cascade.

Emissions from the C-310 stack were estimated based on daily emission samples from the continuous potassium hydroxide bubbler stack sampling system, which was approved by the Environmental Protection Agency (EPA) in 1992.

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 2004, there were 6 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 that they were within normal ranges.

Group F—Seal Exhaust/Wet Air Group

Seal Exhausts

Seals on the UF_6 compressors are supplied with an intricate array of air pressures to reduce any UF_6 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 UF_6 are present in the seal exhaust system. Occasionally, a seal or seal control system malfunction will allow greater quantities of UF_6 to enter the exhaust system. If UF_6 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 UF_6 and pump oil, the oil also 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 in no way is included for emission control. The list below indicates locations of the six seal exhausts at PGDP:

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

Emissions from the seal exhaust grouped source were originally estimated based on results of Method 5 stack sampling performed in 1992. The seal exhausts were resampled in 1997 and 2002 respectively. The seal exhaust/wet air system for the C-335 Process Building was sampled in 2004 as part of the CFC-114/UF_6 separator modifications. The latest sampling results were used for emission estimates for CY 2004.

A discussion of the potential to emit from the seal exhausts and wet air exhausts, 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.

Wet Air Exhausts

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 subject equipment and piping 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. In 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-333, C-335, and C-337, the exhaust vent is the same one that services the seal exhaust system for those buildings. Emissions from the wet air exhausts are estimated based on the most recent Method 5 stack sampling performed on this system. The list below indicates locations of the five wet air exhausts at PGDP:

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

Chlorofluorocarbon-114 (CFC-114) UF_6 Separator

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 results from equipment failure, but may also result from abnormal cascade operation. The 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 (via pressure differential or process gas pumps) 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 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 the connection and disconnection to UF_6 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 UF_6 remains in the pigtail prior to disconnection. Although adherence to these procedures minimizes UF_6 emissions, occasionally a small amount of UF_6 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 so that UF_6 which is emitted from the pigtail disconnect process is captured by the HEPA vac.

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

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 (UF_6 Vaporizer).
C-337-A	Feed Facility (UF_6 Vaporizer).

Emissions from these systems were estimated by determining the total number of pigtail disconnections in each facility. An estimated quantity of UF_6 in each pigtail (based on the system volume, temperature, and pressure) multiplied by the number of disconnections was used to estimate the total quantity of UF_6 that could have been released.

Pigtails are evacuated and purged numerous times to reduce the quantity of UF_6 in the pigtail to very low levels. The method described above assumes that each pigtail has been evacuated or purged in accordance with operating procedures. Estimated quantities of UF_6 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 and comply with the regulatory guidelines detailed in CFRs. As such, 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 the Health Physics (HP) Group through the use of low-volume air samplers. These sampling systems consist of a low-volume pump (20 to 40 liters per minute) drawing ambient 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. Typically, a minimum of 2 days of sample air is collected on each filter. 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-334, C-335, C-337, and C-337A are grouped with the Seal Exhaust/Wet Air Group. Building ventilation sources from C-310, C-360, C-400, C-709/C-710, and C-720 are grouped with the respective building emissions. Results from HP air sampling is evaluated based on the most restrictive DAC, applicable to PGDP, listed in 10 CFR 20, Appendix B (2E-12uCi/ml for ^{237}Np). Only air sampling results exceeding 10% of the designated DAC are used in radionuclide NESHAP source emission calculations.

Group II—C-360

The primary sources of potential radionulide 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 that could have been released. Emissions from the building ventilitation were estimated by the results from HP air sampling based on the most restrictive DAC, applicable to PGDP, listed in 10 CFR 20, Appendix B (2E-12uCi/ml for ^{237}Np). Only air sampling results exceeding 10% of the designated DAC are used in radionuclide NESHAP source emission calculations.

USEC FUGITIVE AND DIFFUSED SOURCES

Radionuclide NESHAP evaluations have not identified potential fugitive or diffused sources of radionuclides that would result in emissions that would be distinguishable from background at off-site locations. On-going ambient air monitoring at the site validates these evaluations. Therefore, USEC fugitive or diffused source emissions are not currently included in radionuclide NESHAP reporting.

DOE SOURCE DESCRIPTION

Northwest Plume Interim Remedial Action Project

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

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

Scrap Metal Projects

The Scrap Metal Projects removed scrap metal from the northwest portion of the Paducah Site as well as the C-746-D yard in the eastern portion of the site. During 2004, fugitive airborne radionuclide emissions may have resulted from dust created by removal, size reduction, and loading the scrap into transportation containers. The amount of radionuclides released was estimated based on emission factors from the Environmental Protection Agency, Document AP-42.

C-410 Decontamination and Decommissioning Activities

DOE constructed a new source in 2004 in support of C-410 decontamination and decommissioning. Fluorine cells were removed and prepared for off-site shipment. This preparation required removal of the paint on the exterior of the cells due to concerns about possible contaminants in the paint. The paint was removed by a sponge blasting process. A small amount of radionuclide contamination was present in the paint removed. The blasting occurred within the facility however room ventilation was exhausted through a HEPA filter. The amount of radionuclides released was estimated based on paint sampling data and 40 CFR Subpart H Appendix D emission factors.

Fugitive and Diffuse Sources

DOE has identified the areas listed below as potential fugitive and diffuse sources. Based on prior health physics data and historical ambient air monitoring, it is unlikely that any of these potential sources are significant; however, ambient air monitoring is being conducted around the Paducah Site to verify this position. In addition, some of these sources are listed due to posting of direct radiation, not airborne radiation emissions.

List of DOE Fugitive and Diffuse Potential Emission Sources

1. C-745-T Cylinder Storage Yard
2. Area From C-745-U to East Perimeter Fence to Cylinder Yard
3. C-745-K Cylinder Storage Yard
4. Dirt Storage Area Near C-333
5. C-740 Material Yard
6. C-747 and C-748-B Burial Area
7. C-745-A Southeast Contamination Area
8. C-745-A Southwest Contamination Area
9. C-746-H3 Storage Area
10. C-410 Building
11. C-745-C
    C-749 Cylinder Storage Yards
    C-404 Burial Ground
12. C-746-P Scrap Material Storage Area
13. C-746-A and B Warehouses
    C-746-C Scrap Material Storage Yard
14. Burial Area North of C-746-F
15. C-746-P Burial Area
16. C-747-A Burial Area - Burial Grounds
17. Rubble Pile - South of Perimeter Fence
18. Rubble Pile - North of Plant Near Ogden Landing Road
19. Rubble Pile - Southeast Between Perimeter Fence and Dyke Road
20. Rubble Pile - East of Plant Near Outfall K002
21. C-301 Low-Level Waste Storage Area
22. C-340 Building
23. Rubble Pile - East of Plant near Outfall K010
24. KPDES Outfall 011
25. Little Bayou Creek and Dyke Road
26. Little Bayou Creek Confluent with KPDES Outfall 002
27. Little Bayou Creek Crossing and McCaw Road
28. Little Bayou Creek and Ogden Landing Road
29. North-South Diversion Ditch and Ogden Landing Road
30. Contaminated Ditch Flowing to KPDES Outfall 001
31. Contamination Area West of Plant
32. C-615 Sewage Treatment Facility
33. North-South Diversion Ditch Near Perimeter Fence
34. North-South Diversion Ditch Near Ogden Landing Road
35. C-746-U Landfill
*36. C-746-S and C-746-T Landfills
*37. C-746-S and C-746-T Landfill Area

* DOE monitored the C-746-S Landfill vents for radionuclides on October 6, 1999. No radionuclides were detected either in air emissions or smears of the inside surface of the vent pipe surfaces.

Miscellaneous Sources

Another minor potential fugitive or diffuse source of radionuclides results from the decontamination of machinery and equipment used in remediation activities such as well drilling. The equipment is washed with high-powered sprayers to remove any contaminants (radiological or non-radiological). The cleansing solutions and wash products could contain small amounts of radionuclides. No emission controls are used during the decontamination process. The contaminants originate from the soil and groundwater.

In accordance with PGDP DOE NESHAP Management Plan (BJC/PAD-141, dated February 2000), DOE utilized ambient air monitoring data to verify insignificant levels of radionuclides in off-site ambient air. Ambient air stations collect radionuclide samples at sites surrounding the plant. The ambient air monitors capture airborne radionuclides emitted from all sources including fugitive and diffuse. Ambient air monitoring locations are shown in Fig. 1. The Radiation/Environmental Monitoring Section of the Radiation Health and Toxic Agents Branch of the Department for Public Health of the Kentucky Cabinet for Health Services has operated the ambient air monitors during CY 2004. Based on observations for CY 2004, plant derived radionuclides were not detected. The results of the ambient air monitoring are in Table A-1 of this report.

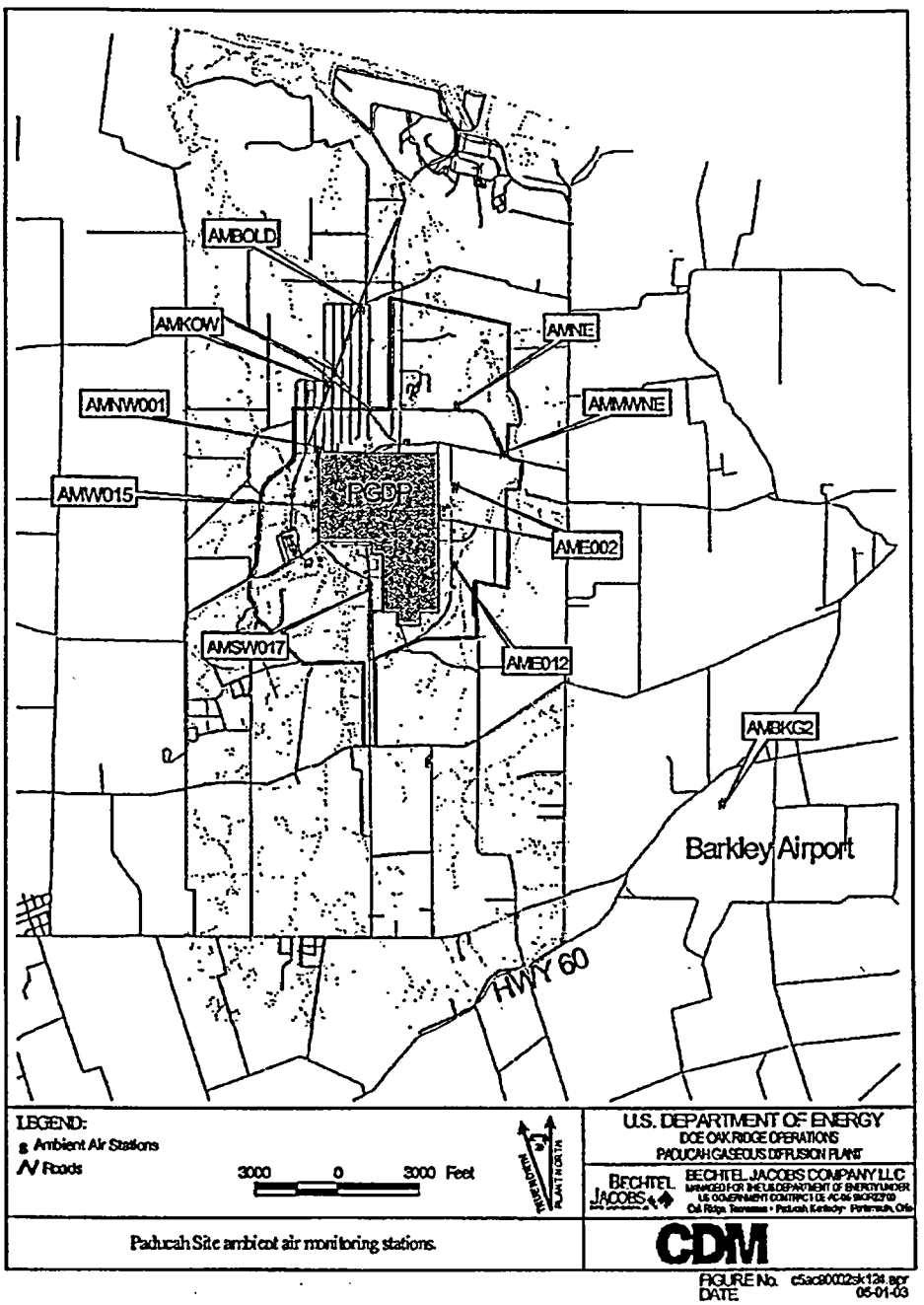

Figure 1. Location of Paducah Site ambient air monitors.

SECTION II SOURCE CHARACTERISTICS AND AIR EMISSIONS DATA

USEC SOURCE CHARACTERISTICS AND RADIONUCLIDE EMISSIONS

MAJOR POINT SOURCE

Group	Major Point Source	Type Control	Efficiency %	Distance (m) and Direction to Nearest Receptor[1]
E	C-310 Stack	NaF Traps[2]	>99.9	1740 ESE
		Alumina Traps[3]	~98.6	

MINOR POINT AND AREA SOURCES

Group	Minor Point and Area Sources	Type Control	Efficiency %	Distance (m) and Direction to Nearest Receptor[1]
B	C-400 Cylinder Drying Station[3]	None	0	1900 ESE
H	C-360[3]	None	0	1180 SE

MINOR GROUPED SOURCES

Group	Minor Grouped Sources	Type Control	Efficiency %	Distance (m) and Direction to Nearest Receptor[1]
A/G	C-400/C-409 Group[3]	None	0	1920 ESE
C	C-720 Motor Burnout Ovens	None	0	1960ESE
D	C-709/C-710 Laboratory Hoods[3]	None	0	1960 ESE
F	Seal Exhaust/Wet Air Group • Seal Exhausts; Wet Air Exhausts; CFC-114/UF_6 Separation System	Alumina Traps[2]	~98.6	1490 ESE
	• Cylinder Valve Connection Activities[3]	HEPA Vacuums[4]	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.

[1]Distances to receptors were resurveyed in 2004 due to residential construction in the vicinity of the plant.

[2]See January 28, 1994 correspondence from D. F. Hutcheson to W. A. Smith discussing "Potential to Emit."

[3] Emissions estimated in accordance with 40 CFR 61, Appendix D.

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

USEC SOURCE CHARACTERISTICS

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/G	C-400/C-409 Group	Point[1]	11.3	N/A	0	Ambient	2040 N	2040 N
B	C-400 Cylinder Drying Station	Point[1]	2.4	0.5	0	Ambient	2120 N	2120 N
C	C-720 Motor Burnout Ovens	Point	15.8	0.5	0	Ambient	NA	NA
D	C-709/C-710 Laboratory Hoods	Point[1]	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[1]	Point[1]	21.0	N/A	0	Ambient	2350 N	2350 N
H	C-360	Point[2]	16.0	N/A	0	Ambient	1180 SE	2370 NNW

Group	Source Name	Distances (m) to Selected Receptors		
		Nearest Individual/Farm	Nearest Business	Nearest School
A/G	C-400/C-409 Group	1920	2819	4225
B	C-400 Cylinder Drying Station	1900	2819	4100
C	C-720 Motor Burnout Ovens	1960	2705	3900
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
H	C-360	1180	2000	3840

[1]Grouped source includes building ventilation and cylinder valve disconnections from systems not served by permanent HEPA filter systems.

[2] Modeling was performed assuming a theoretical stack located at the approximate center of each grouped source.

PGDP USEC RADIONUCLIDE EMISSIONS

Radionuclide Emissions (Ci)[1] During 2004									
			Emission Sources						
			Group A/G	Group B	Group D	Group E	Group F	Group H	
Nuclide	Solubility	AMAD	C-400/ C-409 Group	C-400 Cylinder Drying Station	C-709/ C-710 Laboratory Hoods	C-310 Stack	Seal Exhaust/ Wet Air Group	C-360	Total
^{99}Tc	W	1	7.61E-03	NA[2]	9.05E-06	3.55E-03	2.44E-04	1.12E-04	1.15E-02
^{230}Th	W	1	5.32E-11	NA[2]	NA[2]	6.13E-06	ND[3]	NA[2]	6.13E-06
^{234}U	D	1	5.80E-04	1.17E-07	1.62E-03	5.60E-04	1.27E-02	3.41E-05	1.55E-02
^{235}U	D	1	2.00E-05	2.54E-06	5.61E-05	1.95E-05	4.40E-04	1.18E-06	5.39E-04
^{238}U	D	1	1.29E-04	3.37E-06	1.50E-04	5.20E-05	3.74E-03	3.16E-06	4.08E-03
^{237}Np	W	1	7.34E-05	6.03E-07	3.23E-06	4.78E-05	1.59E-05	4.26E-06	1.45E-04
^{239}Pu	W	1	2.02E-12	NA[2]	NA[2]	1.32E-06	ND[3]	NA[2]	1.32E-06
Total Ci/year			8.41E-03	6.63E-06	1.83E-03	4.24E-03	4.24E-03	1.55E-04	1.55E-04

[1] 1 Curie (Ci) = 3.7×10^{10} Becquerels
[2] NA = Not Analyzed
[3] ND = Not Detected

DOE SOURCE CHARACTERISTICS AND RADIONUCLIDE EMISSIONS DATA

Minor Point and Area Sources	Type Control	Efficiency%	Distance (m) and Direction to Nearest Receptor[1]
Northwest Plume Treatment Facility	None	0	1080 NNE
C-746 P Scrap Metal Project	None	0	1205 NNE
C-746 D Scrap Metal	None	0	1220 ESE
C-410 Emissions	HEPA	99.7	1820 ESE

Emission Source	NW Plume Treatment Facility	C-746 P Scrap Metal Project	C-746 D Scrap Metal Project	C-410 Emissions
^{99}Tc	9.85E-05	2.40E-11	2.38E-06	1.00E-07
^{234}U		3.39E-11	4.36E-04	4.50E-08
^{235}U		1.33E-12	1.71E-05	8.20E-10
^{238}U		1.01E-11	1.30E-04	4.40E-08
^{237}Np			3.29E-08	2.40E-10
^{239}Pu			2.86E-08	2.60E-10
^{241}Am				3.00E-10
Total Ci/year	**9.85E-05**	**6.93E-11**	**5.86E-04**	**1.91E-07**

Source Name	Distances (m) to Selected Receptors		
	Nearest Individual/Farm	Nearest Business	Nearest School
Northwest Plume Treatment Facility	1080	2550	5150
C-746 P Scrap Metal Project	1234	3033	5490
C-746 D Scrap Metal	1220	2105	3873
C-410 Emissions	1820	2814	4360

Source Name	Type	Height (m)	Diameter (m)	Gas Exit Velocity (m/s)	Gas Exit Temperature (°C)	Distance (m) & Direction to Maximally Exposed Individual (MEI) Source MEI
Northwest Plume Treatment Facility	Point	7.0	0.3556	9.45	37.8	1080 NNE
C-746 P Scrap Metal Project	Point	1	NA	0	Ambient	1205 NNE
C-746 D Scrap Metal	Point	1	NA	0	Ambient	1220 SE
C-410 Emissions	Point	4.6	NA	0	Ambient	2220 N

[1]Distances to receptors were resurveyed in CY 2004 due to residential construction in the vicinity of the plant.

SECTION III DOSE ASSESSMENT

DESCRIPTION OF DOSE MODEL

The radiation dose calculations were performed using the Clean Air Act (CAA) Assessment Package-88 of computer codes. This package contains EPA's most recent 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 Regulatory Guide 1.109 food chain models to calculate human exposures, both internal and external, to radionuclides deposited in the environment. The human exposure values are then used by EPA's latest 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 in the latest version of the RADRISK data file, which is provided by EPA with CAA Assessment Package-88.

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 databases.

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

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 (including fugitive and diffuse sources) is less than the standard of 10 mrem per year.

[1]Rural default values.

COMPLIANCE ASSESSMENT

Effective dose equivalent (mrem)[1] to maximally exposed individual for each individual source and the plant:

USEC Emission Sources		Maximum for Source	Maximum for Plant
A/G	C-400/C-409 Group	5.4E-03	5.4E-03
B	C-400 Cylinder Drying Station	4.1E-05	4.1E-05
C	C-720 Motor Burnout Ovens	0	0
D	C-709/C-710 Laboratory Hoods	1.1E-03	1.1E-03
E	C-310 Stack	1.5E-03	1.5E-03
F	Seal Exhaust/Wet Air Group	8.5E-03	8.5E-03
H	C-360	3.8E-04	1.7E-04
Total From USEC Sources		N/A	**1.7E-02**
DOE Emission Sources		**Maximum for Source**	**Maximum for Plant**
Northwest Plume Treatment Facility		1.8E-05	1.8E-05
C-746 P Scrap Metal Project		8.5E-11	8.5E-11
C-746 D Scrap Metal		6.0E-04	2.2E-04
C-410 Emissions		1.1E-07	1.1E-07
Total From DOE Sources		N/A	**2.4E-04**
Total From All Sources		N/A	**1.7E-02**

Maximum effective dose equivalent to the maximum exposed individual for the plant = 1.7E-02 mrem.

Location of maximally exposed individual: 2,350 meters north of greatest contributor to dose which is the SX/WA Group Source.

NOTE: Based on estimated 2000 census data, the total collective effective dose equivalent (CEDE) to the 50-mile population (approximately 531,000 persons) was 0.09 person-rem.

[1] 1 mrem=0.01 millisieverts.

SECTION IV ADDITIONAL INFORMATION

UNPLANNED RELEASES – USEC

There were 2 unplanned releases in USEC facilities occurring outside of a building not included in HP air sampling program during CY 2004. The estimated total quantity of uranium released was less than 45g. These releases were included in the seal/wet air exhaust group.

DIFFUSE/FUGITIVE EMISSIONS – DOE

Diffuse/fugitive sources include any source that is spatially distributed, diffuse in nature, or not emitted with forced air from a stack, vent, or other confined conduit. Diffuse/fugitive sources also include emissions from sources where forced air is not used to transport the radionuclides to the atmosphere. In this case, radionuclides are transported entirely by diffusion and/or thermally driven air currents. Typical examples of diffuse/fugitive sources include emissions from building breathing; resuspension of contaminated soils, debris, or other materials; unventilated tanks; ponds, lakes, and streams; wastewater treatment systems; outdoor storage and processing areas; and leaks in piping, valves, or other process equipment.

EPA has not identified a methodology or requirements for determining airborne radionuclide source terms for many unique fugitive and diffuse emission sources characteristic of DOE facilities, nor does the Paducah Site currently have any available methods to selectively and accurately quantify airborne radionuclide source terms from specific fugitive emission sources. However, consistent with the April 1995 memoranda of understanding between DOE and EPA Headquarters, information on diffuse/fugitive emissions is being provided to EPA as additional information. On February 8, 2000, DOE submitted to Kentucky Division for Air Quality and EPA Region IV the *Paducah Gaseous Diffusion Plant Department of Energy National Emission Standards for Hazardous Air Pollutants (NESHAP) Management Plan*. This plan outlined the DOE Paducah Site plans for using ambient air monitors to demonstrate that total emissions (from point, diffuse, and fugitive sources) result in doses significantly less than the 10-mrem/year (0.1-mSv/year) standard. Section I of the NESHAP Management Plan provides a list of potential fugitive/diffuse sources on the Paducah Site.

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 has conducted ambient air monitoring around the Paducah Site during CY 2004. The Radiation Health and Toxic Agents Branch reports that weekly air filters were screened for gross alpha and beta activity and then composited on a quarterly basis. The quarterly composites were analyzed by gamma spectroscopy using a thin window 40 percent high purity germanium detector, which allows for detection of low energy gamma emitters. Americium-241 (^{241}Am) and ^{234}Th were not detected by gamma spectroscopy for the quarterly composites.

In accordance with the Radiation Health and Toxic Agents Branch's protocol, plutonium and uranium isotopic analyses were not performed on the quarterly composites since ^{241}Am and ^{234}Th were not detected. Since ^{241}Am and ^{234}Th were not present, the quarterly composites were analyzed for ^{99}Tc. ^{99}Tc was also not detected in the quarterly composites. ^{210}Pb and ^{40}K were detected on filters, which accounts for the presence of the gross alpha and beta activities.

Based on observations for CY 2004, plant derived radionuclides were not detected by the Radiation Health and Toxic Agents Branch's air monitoring network.

STATUS OF NESHAP MONITORING REQUIREMENTS, SUBPART H COMPLIANCE

The status of compliance with the new NESHAP monitoring requirements is described in the revised NESHAP Compliance Plan which was submitted to EPA January 1992. PGDP has only one stack subject to the continuous monitoring requirements of Subpart H, the C-310 Stack.[1] Particulate stack sampling was performed on the C-310 Purge Cascade Stack February 1992. Results of the sampling project were forwarded to EPA by March 31, 1992. Documentation from EPA[2] stated that PGDP is exempted from the requirement to install an isokinetic sampling system.

Minor Sources: The periodic confirmatory measurement plan for minor sources is outlined in detail in the Revised NESHAP Compliance Plan for PGDP, which was submitted to EPA on January 15, 1992. The initial plan for confirmatory measurements is to estimate emissions using Appendix D and/or mass balance methods on an annual basis, and to stack sample those sources for which stack sampling is the only feasible estimation method on a five-year basis.

On May 26, 1992, PGDP and EPA entered into a Federal Facility Compliance Agreement (FFCA) to bring PGDP into compliance with the sampling provisions established in accordance with 40 CFR 61, Subpart H. Appendix A of the FFCA contains a schedule establishing compliance commitments. The major effort of the compliance schedule was the site evaluation in which all potential sources of airborne radionuclides were identified and emissions were determined. The radionuclide sources were identified through a preliminary stack vent survey, which was completed in 1991. In November 1992, a more in-depth survey was completed which did not discover any previously unknown airborne radionuclide sources. In September 1992, representatives from EPA inspected PGDP for NESHAP compliance. Correspondence from EPA summarizing the inspection stated there were no NESHAP violations identified during the inspection. PGDP fulfilled all commitments in accordance with Appendix A of the FFCA in June 1992; submitted results of the updated, in-depth vent stack survey in December 1992; and officially requested a Certification of Completion of the FFCA on March 11, 1993. EPA issued the Certification of Completion on March 26, 1993. Certification of Completion of the FFCA indicates that PGDP is in compliance with the provisions in accordance with 40 CFR 61, Subpart H.

[1]See correspondence from D. F. Hutcheson to D. C. Booher, dated January 28, 1994, discussing "Potential to Emit."

[2]See correspondence from W. A. Smith to D. C. Booher, dated April 20, 1992.

DOE has remained in compliance since 1993. KDAQ received a delegation of authority to administer the NESHAP program in July 1999. A NESHAP Management Plan has been developed by DOE, which addresses fugitive and diffuse emissions. EPA Region 4 concurred with the DOE NESHAP Management Plan on September 19, 2000. In accordance with the management plan, ambient air monitoring was utilized to verify compliance of the Paducah Site with 40 CFR 61, Subpart H for all emissions. Ambient air monitoring conducted by the Kentucky Radiation Health and Toxics Branch did not detect plant derived radionuclides above background levels during CY 2004. Therefore, the facility is in compliance with 40 CFR 61 Appendix E, Table 2 values.

The actual results, even though less than the measurement error, of each air monitor are listed in Table A-1 of this report. The ratio of each isotopic concentration to the standard for that isotope in 40 CFR 61, Appendix E, Table 2, was calculated. The sum of all of these ratios should be less than one to meet the standard. The sum of the ratios is listed for each monitoring station for each quarter in Table A-1.

Table A-1. Kentucky Radiation Health and Toxics Branch Ambient Air Monitoring Results[1]

Quarter	Nuclide	AMSW017 Ci/m3	AMW015 Ci/m3	AMNW001 Ci/m3	AMNE Ci/m3	AME002 Ci/m3	AME012 Ci/m3	AMBKG2 Ci/m3	AMBOLD Ci/m3	AMKOW Ci/m3	AMMWNE Ci/m3
1	Am-241	2.088E-17	7.723E-18	7.927E-18	1.275E-17	3.104E-17	1.521E-17	1.186E-17	1.663E-17	1.784E-17	1.095E-17
	Np-237	1.933E-17	4.094E-17	5.958E-17	1.145E-16	2.284E-16	-1.495E-16	-1.826E-16	-2.087E-16	1.761E-16	6.421E-16
	Tc-99	5.248E-16	4.258E-16	-1.217E-16	2.6205E-16	5.5104E-17	1.982E-16	3.586E-16	2.1831E-16	3.1062E-16	3.1506E-16
	U-238	2.09E-16	2.161E-16	2.074E-16	1.702E-16	2.222E-16	1.83E-16	1.931E-16	1.615E-16	2.216E-16	2.098E-16
	Sum of ratios	0.06	0.07	0.08	0.12	0.23	-0.09	-0.12	-0.14	0.19	0.57
2	Am-241	-9.845E-18	0	9.151E-18	1.06E-17	4.987E-18	1.437E-17	2.027E-17	6.661E-18	6.752E-18	7.315E-18
	Np-237	-5.641E-17	-2.134E-17	-7.087E-16	1.415E-16	1E-16	-3.808E-16	6.04E-17	-1.689E-16	4.975E-16	4.555E-17
	Tc-99	-1.2774E-16	-2.117E-16	-3.137E-16	-1.876E-16	1.8035E-16	-2.618E-16	-5.329E-17	-4.364E-16	-4.096E-16	-2.404E-16
	U-238	1.76E-16	1.659E-16	1.809E-16	1.45E-16	1.8E-16	3.01E-16	-4.25E-15[2]	2.037E-16	1.513E-16	1.529E-16
	Sum of ratios	-0.03	0.00	-0.57	0.14	0.11	-0.28	-0.45	-0.12	0.43	0.06
3	Am-241	-4.107E-18	9.702E-18	1.696E-17	4.818E-18	3.127E-18	0	7.967E-18	2.945E-17	0	1.497E-17
	Np-237	1.853E-16	-1.184E-16	-3.054E-16	5.096E-16	-2.048E-16	3.668E-16	2.964E-16	8.433E-16	1.571E-16	1.894E-16
	Tc-99	3.4272E-16	4.0101E-16	5.6235E-16	1.703E-16	4.2447E-16	1.1667E-16	-1.075E-16	1.2821E-15	2.9592E-16	1.4694E-16
	U-238	2.168E-16	2.866E-16	2.766E-16	2.414E-16	2.543E-16	2.126E-16	1.91E-16	5.571E-16	2.693E-16	2.461E-16
	Sum of ratios	0.18	-0.06	-0.21	0.46	-0.14	0.33	0.27	0.79	0.17	0.20
4	Am-241	-4.238E-18	-7.073E-18	8.502E-18	4.939E-18	-5.713E-18[3]	1.823E-17[3]	-4.797E-18[3]	7.405E-18	-8.099E-17[3]	-1.872E-17[3]
	Np-237	-2.537E-16	8.748E-17	-4.843E-16	-4.74E-16	-2.366E-18[3]	9.505E-18[3]	2.861E-16[3]	-2.627E-16	6.776E-16[3]	-9.845E-17[3]
	Tc-99	3.5596E-16	3.2114E-16	3.5716E-16	4.5585E-16	5.8117E-16[3]	2.5258E-16[3]	3.2692E-16[3]	6.2239E-16	5.0536E-16[3]	3.5282E-16[3]
	U-238	2.372E-16	2.904E-16	3.244E-16	2.419E-16	2.834E-16[4]	1.698E-16[4]	1.429E-16[4]	2.052E-16	5.745E-16[4]	2.149E-16[4]
	Sum of ratios	-0.18	0.11	-0.36	-0.36	0.03[3]	0.04[3]	0.26[3]	-0.19	0.59[3]	-0.06[3]

[1] 40 CFR 61, Table 2, Limiting Values (Ci/m3): ^{241}Am 1.9E-15, ^{237}Np 1.2E-15, ^{99}Tc 1.4E-13, and ^{238}U 8.3E-15.

[2] Indicates alpha spectroscopy number was unavailable and gamma spectroscopy number was used instead. Gamma spectroscopy MDC was 6.03E-15 Ci/m^3 which is still below the 40 CFR 61, Table 2, limit.

[3] Indicates there is a "UJ" analysis code associated with this data.

[4] Indicates there is a "J" analysis code associated with this data.

CERTIFICATION

This certification pertains to the following USEC emission sources:

Group A/G	C-400/C-409 Group
Group B	C-400 Cylinder Drying Station
Group C	C-720 Motor Burnout Ovens
Group D	C-709/C-710 Laboratory Hoods
Group E	C-310 Stack
Group F	Seal Exhaust/Wet Air Group
Group H	C-360

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.)

Steven Penrod
United States Enrichment Corporation

6-28-05
Date

CERTIFICATION

This certification pertains to the following DOE emission source:

C-410 D&D Activities
C-746-D Scrap Metal Project
C-746-P Scrap Metal Project
Northwest Plume Treatment Facility
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.)

WE Murphy
Department of Energy

6/27/05
Date

ATTACHMENT 2

Paducah Gaseous Diffusion Plant
United States Department of Energy
Air Emissions Annual Report
(40 CFR 61, Subpart H)
Calendar Year 2004

Site Name: Paducah Gaseous Diffusion Plant

U.S. DEPARTMENT OF ENERGY INFORMATION

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USEC INFORMATION

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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 and DOE portions of the Paducah Site.

SITE DESCRIPTION

PGDP is an active uranium enrichment facility consisting of a diffusion cascade and extensive support facilities. The cascade, including product and tails withdrawal, is housed in 6 process buildings covering a total of approximately 80 acres. The plant is located on a reservation consisting of approximately 1,350 acres in western McCracken County approximately 10 miles west of Paducah, Kentucky, and approximately 3 miles south of the Ohio River. Roughly 740 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 2,100 acres either deeded or leased to the Commonwealth of Kentucky. During World War II, the Kentucky Ordnance Works (KOW), a trinitrotoluene production facility, was operated in an area southwest of the plant on what is now 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 about 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 physical 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. During enriching operations from 1953 to 1975, feed material (called "reactor tails") from government reactors was also used intermittently in addition to the UF_6 typically used. Reactor tails were the spent fuel from nuclear reactors that is depleted in ^{235}U content and has been reprocessed to remove most of the fission products. The reactor fuel rods were processed at other DOE facilities (where most of the fission products were removed) and the enriched uranium and the remaining fission products were fed into the PGDP cascade system. Use of the reactor tails resulted in the introduction of technetium-99 (^{99}Tc), a fission by-product, and transuranics, most notably neptunium-237 (^{237}Np) and plutonium-239 (^{239}Pu), into the cascade. ^{99}Tc is a man-made radioactive substance (radionuclide) having a half-life estimated at between 212,000 and 250,000 years. ^{99}Tc decays by emitting beta radiation.

Extensive support facilities are required to maintain the diffusion process. Some of the major support facilities include a steam plant, four major electrical switchyards, four 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 environs of PGDP. The population within the 50-mile radius is approximately 531,000 persons. Of these, approximately 36,500 live within 10 miles of the plant and approximately 104,000 within 20 miles. 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 air miles east of the plant; Cape Girardeau, Missouri, located approximately 40 air miles to the west; and Metropolis, Illinois, located approximately 6 air miles to the northeast.

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

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

USEC SOURCE DESCRIPTIONS

Based on historical emission data, USEC has identified only one release point (C-310 stack) which requires continuous monitoring per the radionuclide NESHAP regulations because of potential to emit radionuclides resulting in an Effective Dose Equivalent (EDE) to off-site personnel exceeding the regulatory threshold of 0.1 mrem/yr (1 percent of the standard). Based on evaluation of current and historical stack monitoring data and process knowledge, all other USEC source emissions are expected to contribute to doses less than the radionuclide NESHAP threshold limit for continuous monitoring.

Section 61.93 of 40 CFR 61 requires continuous emission measurements for sources with a potential (assuming no controls exist, but the facility operations are normal) to emit radionuclides which would result in an EDE of 0.1 mrem to any member of the public. For the purposes of this report, any source with a potential to emit radionuclides that would result in an annual EDE of 0.1 mrem is defined as a *major* source. A *minor* source is a source or group of sources that do not have the potential to emit radionuclides, that would result in an annual EDE of less than 0.1 mrem to the maximally affected resident. A sources potential to emit is calculated by assuming the source is operating normally, but control devices do not exist.

There are a number of minor, unmonitored radionuclide air sources at PGDP. Since these sources are not equipped with effluent samplers or monitors, emissions must be estimated using EPA-approved methods. Minor sources were identified during a 1991--1992 vent stack survey. 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.

Group A/G—C-400/C-409 Group

C-400 Decontamination Spray Booth (Group A)

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 potential of radionuclide emissions arises 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 (Group A)

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 C-710. The solution is chemically treated to precipitate the uranium that forms a slurry. The slurry is then passed through a rotary vacuum filter, which collects the precipitate (filter cake) for future disposal. After sampling, the filtrate is then discharged via permitted Kentucky Pollutant Discharge Elimination System (KPDES) outfalls. The possibility for radionuclide emissions arises from the vent on the pump that pulls the slurry through the rotary vacuum filter. Emissions from this vent should be minimal because the pump and its vent are downstream of the rotary vacuum filter that should trap the uranium as filter cake. Emissions were estimated in accordance with 40 CFR 61, Appendix D. The concentrations of radionuclides in the filtrate multiplied by the filtrate volume were considered as the curies "used."

C-400 Laundry (Group A)

The C-400 Laundry washes and dries coveralls and 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.

C-409 Dissolver/Rotary Vacuum Filter (Group G)

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 that forms a slurry. The slurry is then passed through a rotary vacuum filter, which collects the precipitate (filter cake) for future disposal. After sampling, the filtrate is then discharged via permitted KPDES outfalls. The possibility for radionuclide emissions arises from the vent on the pump that pulls the slurry through the rotary vacuum filter. Emissions from this vent are expected to be minimal because the pump and its vent are downstream of the rotary vacuum filter that should 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 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 hydrostatically test the cylinders prior to drying, multiplied by the total volume of water used in the hydrostatic test, were considered as the curies "used."

Group C—C-720

The motor burnout facility in C-720 is used to remove insulation from process motors in preparation for rebuilding. Administrative controls, such as limiting the level of radioactive contamination on the motors, are used to minimize emissions from this system. Emissions from the motor burnout facility are estimated using the results of radiological surveys of the motors placed in the facility. This facility was not operated in 2004.

Group D—C-709/C-710 Laboratory Hoods

The C-709/710 Laboratories are operated by Production Support and are the main facilities for sample analysis and research at PGDP. There are a total of 77 laboratory hoods and canopies in the C-709/710 buildings that could be used for radiological activities. 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 (e.g., 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 loose, 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 purge vent stack. Small quantities of ^{234}U, ^{235}U, ^{238}U, ^{99}Tc, ^{237}Np, ^{239}Pu, and thorium-230 (^{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. Each trap contains approximately 200 pounds of alumina.

The cylinder burp facility, located on the east side of C-310, is used to vent the low molecular weight gases from product cylinders. This facility is also a potential source of uranium, ^{99}Tc, minute quantities of transuranics, and ^{230}Th. 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. These traps contain approximately 130 pounds of NaF each. Uranium is recovered from the NaF traps back to the enrichment cascade.

Emissions from the C-310 stack were estimated based on daily emission samples from the continuous potassium hydroxide bubbler stack sampling system, which was approved by the Environmental Protection Agency (EPA) in 1992.

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 2004, there were 6 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 that they were within normal ranges.

Group F—Seal Exhaust/Wet Air Group

Seal Exhausts

Seals on the UF_6 compressors are supplied with an intricate array of air pressures to reduce any UF_6 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 UF_6 are present in the seal exhaust system. Occasionally, a seal or seal control system malfunction will allow greater quantities of UF_6 to enter the exhaust system. If UF_6 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 UF_6 and pump oil, the oil also 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 in no way is included for emission control. The list below indicates locations of the six seal exhausts at PGDP:

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

Emissions from the seal exhaust grouped source were originally estimated based on results of Method 5 stack sampling performed in 1992. The seal exhausts were resampled in 1997 and 2002 respectively. The seal exhaust/wet air system for the C-335 Process Building was sampled in 2004 as part of the CFC-114/UF_6 separator modifications. The latest sampling results were used for emission estimates for CY 2004.

A discussion of the potential to emit from the seal exhausts and wet air exhausts, 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.

Wet Air Exhausts

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 subject equipment and piping 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. In 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-333, C-335, and C-337, the exhaust vent is the same one that services the seal exhaust system for those buildings. Emissions from the wet air exhausts are estimated based on the most recent Method 5 stack sampling performed on this system. The list below indicates locations of the five wet air exhausts at PGDP:

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

Chlorofluorocarbon-114 (CFC-114) UF_6 Separator

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 results from equipment failure, but may also result from abnormal cascade operation. The 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 (via pressure differential or process gas pumps) 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 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 the connection and disconnection to UF_6 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 UF_6 remains in the pigtail prior to disconnection. Although adherence to these procedures minimizes UF_6 emissions, occasionally a small amount of UF_6 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 so that UF_6 which is emitted from the pigtail disconnect process is captured by the HEPA vac.

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

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 (UF_6 Vaporizer).
C-337-A	Feed Facility (UF_6 Vaporizer).

Emissions from these systems were estimated by determining the total number of pigtail disconnections in each facility. An estimated quantity of UF_6 in each pigtail (based on the system volume, temperature, and pressure) multiplied by the number of disconnections was used to estimate the total quantity of UF_6 that could have been released.

Pigtails are evacuated and purged numerous times to reduce the quantity of UF_6 in the pigtail to very low levels. The method described above assumes that each pigtail has been evacuated or purged in accordance with operating procedures. Estimated quantities of UF_6 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 and comply with the regulatory guidelines detailed in CFRs. As such, 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 the Health Physics (HP) Group through the use of low-volume air samplers. These sampling systems consist of a low-volume pump (20 to 40 liters per minute) drawing ambient 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. Typically, a minimum of 2 days of sample air is collected on each filter. 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-334, C-335, C-337, and C-337A are grouped with the Seal Exhaust/Wet Air Group. Building ventilation sources from C-310, C-360, C-400, C-709/C-710, and C-720 are grouped with the respective building emissions. Results from HP air sampling is evaluated based on the most restrictive DAC, applicable to PGDP, listed in 10 CFR 20, Appendix B (2E-12uCi/ml for ^{237}Np). Only air sampling results exceeding 10% of the designated DAC are used in radionuclide NESHAP source emission calculations.

Group II—C-360

The primary sources of potential radionulide 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 that could have been released. Emissions from the building ventilitation were estimated by the results from HP air sampling based on the most restrictive DAC, applicable to PGDP, listed in 10 CFR 20, Appendix B (2E-12uCi/ml for ^{237}Np). Only air sampling results exceeding 10% of the designated DAC are used in radionuclide NESHAP source emission calculations.

USEC FUGITIVE AND DIFFUSED SOURCES

Radionuclide NESHAP evaluations have not identified potential fugitive or diffused sources of radionuclides that would result in emissions that would be distinguishable from background at off-site locations. On-going ambient air monitoring at the site validates these evaluations. Therefore, USEC fugitive or diffused source emissions are not currently included in radionuclide NESHAP reporting.

DOE SOURCE DESCRIPTION

Northwest Plume Interim Remedial Action Project

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

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

Scrap Metal Projects

The Scrap Metal Projects removed scrap metal from the northwest portion of the Paducah Site as well as the C-746-D yard in the eastern portion of the site. During 2004, fugitive airborne radionuclide emissions may have resulted from dust created by removal, size reduction, and loading the scrap into transportation containers. The amount of radionuclides released was estimated based on emission factors from the Environmental Protection Agency, Document AP-42.

C-410 Decontamination and Decommissioning Activities

DOE constructed a new source in 2004 in support of C-410 decontamination and decommissioning. Fluorine cells were removed and prepared for off-site shipment. This preparation required removal of the paint on the exterior of the cells due to concerns about possible contaminants in the paint. The paint was removed by a sponge blasting process. A small amount of radionuclide contamination was present in the paint removed. The blasting occurred within the facility however room ventilation was exhausted through a HEPA filter. The amount of radionuclides released was estimated based on paint sampling data and 40 CFR Subpart H Appendix D emission factors.

Fugitive and Diffuse Sources

DOE has identified the areas listed below as potential fugitive and diffuse sources. Based on prior health physics data and historical ambient air monitoring, it is unlikely that any of these potential sources are significant; however, ambient air monitoring is being conducted around the Paducah Site to verify this position. In addition, some of these sources are listed due to posting of direct radiation, not airborne radiation emissions.

List of DOE Fugitive and Diffuse Potential Emission Sources

1. C-745-T Cylinder Storage Yard
2. Area From C-745-U to East Perimeter Fence to Cylinder Yard
3. C-745-K Cylinder Storage Yard
4. Dirt Storage Area Near C-333
5. C-740 Material Yard
6. C-747 and C-748-B Burial Area
7. C-745-A Southeast Contamination Area
8. C-745-A Southwest Contamination Area
9. C-746-H3 Storage Area
10. C-410 Building
11. C-745-C
    C-749 Cylinder Storage Yards
    C-404 Burial Ground
12. C-746-P Scrap Material Storage Area
13. C-746-A and B Warehouses
    C-746-C Scrap Material Storage Yard
14. Burial Area North of C-746-F
15. C-746-P Burial Area
16. C-747-A Burial Area - Burial Grounds
17. Rubble Pile - South of Perimeter Fence
18. Rubble Pile - North of Plant Near Ogden Landing Road
19. Rubble Pile - Southeast Between Perimeter Fence and Dyke Road
20. Rubble Pile - East of Plant Near Outfall K002
21. C-301 Low-Level Waste Storage Area
22. C-340 Building
23. Rubble Pile - East of Plant near Outfall K010
24. KPDES Outfall 011
25. Little Bayou Creek and Dyke Road
26. Little Bayou Creek Confluent with KPDES Outfall 002
27. Little Bayou Creek Crossing and McCaw Road
28. Little Bayou Creek and Ogden Landing Road
29. North-South Diversion Ditch and Ogden Landing Road
30. Contaminated Ditch Flowing to KPDES Outfall 001
31. Contamination Area West of Plant
32. C-615 Sewage Treatment Facility
33. North-South Diversion Ditch Near Perimeter Fence
34. North-South Diversion Ditch Near Ogden Landing Road
35. C-746-U Landfill
*36. C-746-S and C-746-T Landfills
*37. C-746-S and C-746-T Landfill Area

* DOE monitored the C-746-S Landfill vents for radionuclides on October 6, 1999. No radionuclides were detected either in air emissions or smears of the inside surface of the vent pipe surfaces.

Miscellaneous Sources

Another minor potential fugitive or diffuse source of radionuclides results from the decontamination of machinery and equipment used in remediation activities such as well drilling. The equipment is washed with high-powered sprayers to remove any contaminants (radiological or non-radiological). The cleansing solutions and wash products could contain small amounts of radionuclides. No emission controls are used during the decontamination process. The contaminants originate from the soil and groundwater.

In accordance with PGDP DOE NESHAP Management Plan (BJC/PAD-141, dated February 2000), DOE utilized ambient air monitoring data to verify insignificant levels of radionuclides in off-site ambient air. Ambient air stations collect radionuclide samples at sites surrounding the plant. The ambient air monitors capture airborne radionuclides emitted from all sources including fugitive and diffuse. Ambient air monitoring locations are shown in Fig. 1. The Radiation/Environmental Monitoring Section of the Radiation Health and Toxic Agents Branch of the Department for Public Health of the Kentucky Cabinet for Health Services has operated the ambient air monitors during CY 2004. Based on observations for CY 2004, plant derived radionuclides were not detected. The results of the ambient air monitoring are in Table A-1 of this report.

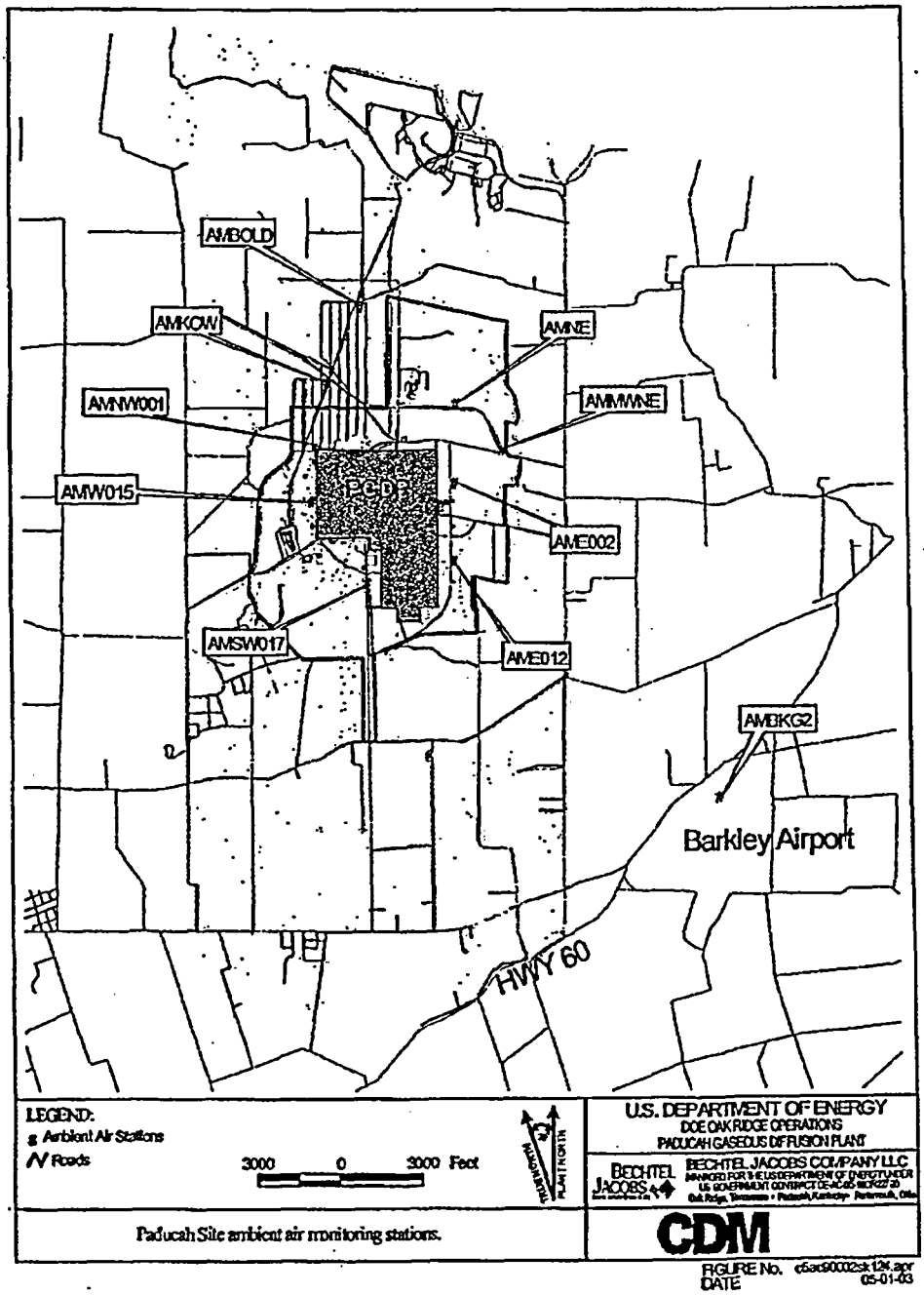

Figure 1. Location of Paducah Site ambient air monitors.

SECTION II SOURCE CHARACTERISTICS AND AIR EMISSIONS DATA

USEC SOURCE CHARACTERISTICS AND RADIONUCLIDE EMISSIONS

MAJOR POINT SOURCE

Group	Major Point Source	Type Control	Efficiency %	Distance (m) and Direction to Nearest Receptor[1]
E	C-310 Stack	NaF Traps[2]	>99.9	1740 ESE
		Alumina Traps[3]	~98.6	

MINOR POINT AND AREA SOURCES

Group	Minor Point and Area Sources	Type Control	Efficiency %	Distance (m) and Direction to Nearest Receptor[1]
B	C-400 Cylinder Drying Station[3]	None	0	1900 ESE
H	C-360[3]	None	0	1180 SE

MINOR GROUPED SOURCES

Group	Minor Grouped Sources	Type Control	Efficiency %	Distance (m) and Direction to Nearest Receptor[1]
A/G	C-400/C-409 Group[3]	None	0	1920 ESE
C	C-720 Motor Burnout Ovens	None	0	1960ESE
D	C-709/C-710 Laboratory Hoods[3]	None	0	1960 ESE
F	Seal Exhaust/Wet Air Group • Seal Exhausts; Wet Air Exhausts; CFC-114/UF_6 Separation System	Alumina Traps[2]	~98.6	1490 ESE
	• Cylinder Valve Connection Activities[3]	HEPA Vacuums[4]	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.

[1]Distances to receptors were resurveyed in 2004 due to residential construction in the vicinity of the plant.

[2]See January 28, 1994 correspondence from D. F. Hutcheson to W. A. Smith discussing "Potential to Emit."

[3] Emissions estimated in accordance with 40 CFR 61, Appendix D.

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

USEC SOURCE CHARACTERISTICS

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/G	C-400/C-409 Group	Point[1]	11.3	N/A	0	Ambient	2040 N	2040 N
B	C-400 Cylinder Drying Station	Point[1]	2.4	0.5	0	Ambient	2120 N	2120 N
C	C-720 Motor Burnout Ovens	Point	15.8	0.5	0	Ambient	NA	NA
D	C-709/C-710 Laboratory Hoods	Point[1]	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[1]	Point[1]	21.0	N/A	0	Ambient	2350 N	2350 N
H	C-360	Point[2]	16.0	N/A	0	Ambient	1180 SE	2370 NNW

Group	Source Name	Distances (m) to Selected Receptors		
		Nearest Individual/Farm	Nearest Business	Nearest School
A/G	C-400/C-409 Group	1920	2819	4225
B	C-400 Cylinder Drying Station	1900	2819	4100
C	C-720 Motor Burnout Ovens	1960	2705	3900
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
H	C-360	1180	2000	3840

[1]Grouped source includes building ventilation and cylinder valve disconnections from systems not served by permanent HEPA filter systems.

[2] Modeling was performed assuming a theoretical stack located at the approximate center of each grouped source.

PGDP USEC RADIONUCLIDE EMISSIONS

Radionuclide Emissions (Ci)[1] During 2004									
			Emission Sources						
			Group A/G	Group B	Group D	Group E	Group F	Group H	
Nuclide	Solubility	AMAD	C-400/ C-409 Group	C-400 Cylinder Drying Station	C-709/ C-710 Laboratory Hoods	C-310 Stack	Seal Exhaust/ Wet Air Group	C-360	Total
^{99}Tc	W	1	7.61E-03	NA[2]	9.05E-06	3.55E-03	2.44E-04	1.12E-04	1.15E-02
^{230}Th	W	1	5.32E-11	NA[2]	NA[2]	6.13E-06	ND[3]	NA[2]	6.13E-06
^{234}U	D	1	5.80E-04	1.17E-07	1.62E-03	5.60E-04	1.27E-02	3.41E-05	1.55E-02
^{235}U	D	1	2.00E-05	2.54E-06	5.61E-05	1.95E-05	4.40E-04	1.18E-06	5.39E-04
^{238}U	D	1	1.29E-04	3.37E-06	1.50E-04	5.20E-05	3.74E-03	3.16E-06	4.08E-03
^{237}Np	W	1	7.34E-05	6.03E-07	3.23E-06	4.78E-05	1.59E-05	4.26E-06	1.45E-04
^{239}Pu	W	1	2.02E-12	NA[2]	NA[2]	1.32E-06	ND[3]	NA[2]	1.32E-06
Total Ci/year			8.41E-03	6.63E-06	1.83E-03	4.24E-03	4.24E-03	1.55E-04	1.55E-04

[1] 1 Curie (Ci) = 3.7×10^{10} Becquerels
[2] NA = Not Analyzed
[3] ND = Not Detected

DOE SOURCE CHARACTERISTICS AND RADIONUCLIDE EMISSIONS DATA

Minor Point and Area Sources	Type Control	Efficiency%	Distance (m) and Direction to Nearest Receptor[1]
Northwest Plume Treatment Facility	None	0	1080 NNE
C-746 P Scrap Metal Project	None	0	1205 NNE
C-746 D Scrap Metal	None	0	1220 ESE
C-410 Emissions	HEPA	99.7	1820 ESE

Emission Source	NW Plume Treatment Facility	C-746 P Scrap Metal Project	C-746 D Scrap Metal Project	C-410 Emissions
^{99}Tc	9.85E-05	2.40E-11	2.38E-06	1.00E-07
^{234}U		3.39E-11	4.36E-04	4.50E-08
^{235}U		1.33E-12	1.71E-05	8.20E-10
^{238}U		1.01E-11	1.30E-04	4.40E-08
^{237}Np			3.29E-08	2.40E-10
^{239}Pu			2.86E-08	2.60E-10
^{241}Am				3.00E-10
Total Ci/year	**9.85E-05**	**6.93E-11**	**5.86E-04**	**1.91E-07**

Source Name	Distances (m) to Selected Receptors		
	Nearest Individual/Farm	Nearest Business	Nearest School
Northwest Plume Treatment Facility	1080	2550	5150
C-746 P Scrap Metal Project	1234	3033	5490
C-746 D Scrap Metal	1220	2105	3873
C-410 Emissions	1820	2814	4360

Source Name	Type	Height (m)	Diameter (m)	Gas Exit Velocity (m/s)	Gas Exit Temperature (°C)	Distance (m) & Direction to Maximally Exposed Individual (MEI) Source MEI
Northwest Plume Treatment Facility	Point	7.0	0.3556	9.45	37.8	1080 NNE
C-746 P Scrap Metal Project	Point	1	NA	0	Ambient	1205 NNE
C-746 D Scrap Metal	Point	1	NA	0	Ambient	1220 SE
C-410 Emissions	Point	4.6	NA	0	Ambient	2220 N

[1]Distances to receptors were resurveyed in CY 2004 due to residential construction in the vicinity of the plant.

SECTION III DOSE ASSESSMENT

DESCRIPTION OF DOSE MODEL

The radiation dose calculations were performed using the Clean Air Act (CAA) Assessment Package-88 of computer codes. This package contains EPA's most recent 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 Regulatory Guide 1.109 food chain models to calculate human exposures, both internal and external, to radionuclides deposited in the environment. The human exposure values are then used by EPA's latest 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 in the latest version of the RADRISK data file, which is provided by EPA with CAA Assessment Package-88.

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 databases.

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

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 (including fugitive and diffuse sources) is less than the standard of 10 mrem per year.

[1]Rural default values.

COMPLIANCE ASSESSMENT

Effective dose equivalent (mrem)[1] to maximally exposed individual for each individual source and the plant:

USEC Emission Sources		Maximum for Source	Maximum for Plant
A/G	C-400/C-409 Group	5.4E-03	5.4E-03
B	C-400 Cylinder Drying Station	4.1E-05	4.1E-05
C	C-720 Motor Burnout Ovens	0	0
D	C-709/C-710 Laboratory Hoods	1.1E-03	1.1E-03
E	C-310 Stack	1.5E-03	1.5E-03
F	Seal Exhaust/Wet Air Group	8.5E-03	8.5E-03
H	C-360	3.8E-04	1.7E-04
Total From USEC Sources		N/A	**1.7E-02**
DOE Emission Sources		**Maximum for Source**	**Maximum for Plant**
Northwest Plume Treatment Facility		1.8E-05	1.8E-05
C-746 P Scrap Metal Project		8.5E-11	8.5E-11
C-746 D Scrap Metal		6.0E-04	2.2E-04
C-410 Emissions		1.1E-07	1.1E-07
Total From DOE Sources		N/A	**2.4E-04**
Total From All Sources		N/A	**1.7E-02**

Maximum effective dose equivalent to the maximum exposed individual for the plant = 1.7E-02 mrem.

Location of maximally exposed individual: 2,350 meters north of greatest contributor to dose which is the SX/WA Group Source.

NOTE: Based on estimated 2000 census data, the total collective effective dose equivalent (CEDE) to the 50-mile population (approximately 531,000 persons) was 0.09 person-rem.

[1] 1 mrem=0.01 millisieverts.

SECTION IV ADDITIONAL INFORMATION

UNPLANNED RELEASES – USEC

There were 2 unplanned releases in USEC facilities occurring outside of a building not included in HP air sampling program during CY 2004. The estimated total quantity of uranium released was less than 45g. These releases were included in the seal/wet air exhaust group.

DIFFUSE/FUGITIVE EMISSIONS – DOE

Diffuse/fugitive sources include any source that is spatially distributed, diffuse in nature, or not emitted with forced air from a stack, vent, or other confined conduit. Diffuse/fugitive sources also include emissions from sources where forced air is not used to transport the radionuclides to the atmosphere. In this case, radionuclides are transported entirely by diffusion and/or thermally driven air currents. Typical examples of diffuse/fugitive sources include emissions from building breathing; resuspension of contaminated soils, debris, or other materials; unventilated tanks; ponds, lakes, and streams; wastewater treatment systems; outdoor storage and processing areas; and leaks in piping, valves, or other process equipment.

EPA has not identified a methodology or requirements for determining airborne radionuclide source terms for many unique fugitive and diffuse emission sources characteristic of DOE facilities, nor does the Paducah Site currently have any available methods to selectively and accurately quantify airborne radionuclide source terms from specific fugitive emission sources. However, consistent with the April 1995 memoranda of understanding between DOE and EPA Headquarters, information on diffuse/fugitive emissions is being provided to EPA as additional information. On February 8, 2000, DOE submitted to Kentucky Division for Air Quality and EPA Region IV the *Paducah Gaseous Diffusion Plant Department of Energy National Emission Standards for Hazardous Air Pollutants (NESHAP) Management Plan*. This plan outlined the DOE Paducah Site plans for using ambient air monitors to demonstrate that total emissions (from point, diffuse, and fugitive sources) result in doses significantly less than the 10-mrem/year (0.1-mSv/year) standard. Section I of the NESHAP Management Plan provides a list of potential fugitive/diffuse sources on the Paducah Site.

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 has conducted ambient air monitoring around the Paducah Site during CY 2004. The Radiation Health and Toxic Agents Branch reports that weekly air filters were screened for gross alpha and beta activity and then composited on a quarterly basis. The quarterly composites were analyzed by gamma spectroscopy using a thin window 40 percent high purity germanium detector, which allows for detection of low energy gamma emitters. Americium-241 (^{241}Am) and ^{234}Th were not detected by gamma spectroscopy for the quarterly composites.

In accordance with the Radiation Health and Toxic Agents Branch's protocol, plutonium and uranium isotopic analyses were not performed on the quarterly composites since ^{241}Am and ^{234}Th were not detected. Since ^{241}Am and ^{234}Th were not present, the quarterly composites were analyzed for ^{99}Tc. ^{99}Tc was also not detected in the quarterly composites. ^{210}Pb and ^{40}K were detected on filters, which accounts for the presence of the gross alpha and beta activities.

Based on observations for CY 2004, plant derived radionuclides were not detected by the Radiation Health and Toxic Agents Branch's air monitoring network.

STATUS OF NESHAP MONITORING REQUIREMENTS, SUBPART H COMPLIANCE

The status of compliance with the new NESHAP monitoring requirements is described in the revised NESHAP Compliance Plan which was submitted to EPA January 1992. PGDP has only one stack subject to the continuous monitoring requirements of Subpart H, the C-310 Stack.[1] Particulate stack sampling was performed on the C-310 Purge Cascade Stack February 1992. Results of the sampling project were forwarded to EPA by March 31, 1992. Documentation from EPA[2] stated that PGDP is exempted from the requirement to install an isokinetic sampling system.

Minor Sources: The periodic confirmatory measurement plan for minor sources is outlined in detail in the Revised NESHAP Compliance Plan for PGDP, which was submitted to EPA on January 15, 1992. The initial plan for confirmatory measurements is to estimate emissions using Appendix D and/or mass balance methods on an annual basis, and to stack sample those sources for which stack sampling is the only feasible estimation method on a five-year basis.

On May 26, 1992, PGDP and EPA entered into a Federal Facility Compliance Agreement (FFCA) to bring PGDP into compliance with the sampling provisions established in accordance with 40 CFR 61, Subpart H. Appendix A of the FFCA contains a schedule establishing compliance commitments. The major effort of the compliance schedule was the site evaluation in which all potential sources of airborne radionuclides were identified and emissions were determined. The radionuclide sources were identified through a preliminary stack vent survey, which was completed in 1991. In November 1992, a more in-depth survey was completed which did not discover any previously unknown airborne radionuclide sources. In September 1992, representatives from EPA inspected PGDP for NESHAP compliance. Correspondence from EPA summarizing the inspection stated there were no NESHAP violations identified during the inspection. PGDP fulfilled all commitments in accordance with Appendix A of the FFCA in June 1992; submitted results of the updated, in-depth vent stack survey in December 1992; and officially requested a Certification of Completion of the FFCA on March 11, 1993. EPA issued the Certification of Completion on March 26, 1993. Certification of Completion of the FFCA indicates that PGDP is in compliance with the provisions in accordance with 40 CFR 61, Subpart H.

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[1]See correspondence from D. F. Hutcheson to D. C. Booher, dated January 28, 1994, discussing "Potential to Emit."

[2]See correspondence from W. A. Smith to D. C. Booher, dated April 20, 1992.

DOE has remained in compliance since 1993. KDAQ received a delegation of authority to administer the NESHAP program in July 1999. A NESHAP Management Plan has been developed by DOE, which addresses fugitive and diffuse emissions. EPA Region 4 concurred with the DOE NESHAP Management Plan on September 19, 2000. In accordance with the management plan, ambient air monitoring was utilized to verify compliance of the Paducah Site with 40 CFR 61, Subpart H for all emissions. Ambient air monitoring conducted by the Kentucky Radiation Health and Toxics Branch did not detect plant derived radionuclides above background levels during CY 2004. Therefore, the facility is in compliance with 40 CFR 61 Appendix E, Table 2 values.

The actual results, even though less than the measurement error, of each air monitor are listed in Table A-1 of this report. The ratio of each isotopic concentration to the standard for that isotope in 40 CFR 61, Appendix E, Table 2, was calculated. The sum of all of these ratios should be less than one to meet the standard. The sum of the ratios is listed for each monitoring station for each quarter in Table A-1.

Table A-1. Kentucky Radiation Health and Toxics Branch Ambient Air Monitoring Results[1]

Quarter	Nuclide	AMSW017 Ci/m3	AMW015 Ci/m3	AMNW001 Ci/m3	AMNE Ci/m3	AME002 Ci/m3	AME012 Ci/m3	AMBKG2 Ci/m3	AMBOLD Ci/m3	AMKOW Ci/m3	AMMWNE Ci/m3
1	Am-241	2.088E-17	7.723E-18	7.927E-18	1.275E-17	3.104E-17	1.521E-17	1.186E-17	1.663E-17	1.784E-17	1.095E-17
	Np-237	1.933E-17	4.094E-17	5.958E-17	1.145E-16	2.284E-16	-1.495E-16	-1.826E-16	-2.087E-16	1.761E-16	6.421E-16
	Tc-99	5.248E-16	4.258E-16	-1.217E-16	2.6205E-16	5.5104E-17	1.982E-16	3.586E-16	2.1831E-16	3.1062E-16	3.1506E-16
	U-238	2.09E-16	2.161E-16	2.074E-16	1.702E-16	2.222E-16	1.83E-16	1.931E-16	1.615E-16	2.216E-16	2.098E-16
	Sum of ratios	0.06	0.07	0.08	0.12	0.23	-0.09	-0.12	-0.14	0.19	0.57
2	Am-241	-9.845E-18	0	9.151E-18	1.06E-17	4.987E-18	1.437E-17	2.027E-17	6.661E-18	6.752E-18	7.315E-18
	Np-237	-5.641E-17	-2.134E-17	-7.087E-16	1.415E-16	1E-16	-3.808E-16	6.04E-17	-1.689E-16	4.975E-16	4.555E-17
	Tc-99	-1.2774E-16	-2.117E-16	-3.137E-16	-1.876E-16	1.8035E-16	-2.618E-16	-5.329E-17	-4.364E-16	-4.096E-16	-2.404E-16
	U-238	1.76E-16	1.659E-16	1.809E-16	1.45E-16	1.8E-16	3.01E-16	-4.25E-15[2]	2.037E-16	1.513E-16	1.529E-16
	Sum of ratios	-0.03	0.00	-0.57	0.14	0.11	-0.28	-0.45	-0.12	0.43	0.06
3	Am-241	-4.107E-18	9.702E-18	1.696E-17	4.818E-18	3.127E-18	0	7.967E-18	2.945E-17	0	1.497E-17
	Np-237	1.853E-16	-1.184E-16	-3.054E-16	5.096E-16	-2.048E-16	3.668E-16	2.964E-16	8.433E-16	1.571E-16	1.894E-16
	Tc-99	3.4272E-16	4.0101E-16	5.6235E-16	1.703E-16	4.2447E-16	1.1667E-16	-1.075E-16	1.2821E-15	2.9592E-16	1.4694E-16
	U-238	2.168E-16	2.866E-16	2.766E-16	2.414E-16	2.543E-16	2.126E-16	1.91E-16	5.571E-16	2.693E-16	2.461E-16
	Sum of ratios	0.18	-0.06	-0.21	0.46	-0.14	0.33	0.27	0.79	0.17	0.20
4	Am-241	-4.238E-18	-7.073E-18	8.502E-18	4.939E-18	-5.713E-18[3]	1.823E-17[3]	-4.797E-18[3]	7.405E-18	-8.099E-17[3]	-1.872E-17[3]
	Np-237	-2.537E-16	8.748E-17	-4.843E-16	-4.74E-16	-2.366E-18[3]	9.505E-18[3]	2.861E-16[3]	-2.627E-16	6.776E-16[3]	-9.845E-17[3]
	Tc-99	3.5596E-16	3.2114E-16	3.5716E-16	4.5585E-16	5.8117E-16[3]	2.5258E-16[3]	3.2692E-16[3]	6.2239E-16	5.0536E-16[3]	3.5282E-16[3]
	U-238	2.372E-16	2.904E-16	3.244E-16	2.419E-16	2.834E-16[4]	1.698E-16[4]	1.429E-16[4]	2.052E-16	5.745E-16[4]	2.149E-16[4]
	Sum of ratios	-0.18	0.11	-0.36	-0.36	0.03[3]	0.04[3]	0.26[3]	-0.19	0.59[3]	-0.06[3]

[1] 40 CFR 61, Table 2, Limiting Values (Ci/m3): ^{241}Am 1.9E-15, ^{237}Np 1.2E-15, ^{99}Tc 1.4E-13, and ^{238}U 8.3E-15.

[2] Indicates alpha spectroscopy number was unavailable and gamma spectroscopy number was used instead. Gamma spectroscopy MDC was 6.03E-15 Ci/m^3 which is still below the 40 CFR 61, Table 2, limit.

[3] Indicates there is a "UJ" analysis code associated with this data.

[4] Indicates there is a "J" analysis code associated with this data.

CERTIFICATION

This certification pertains to the following USEC emission sources:

Group A/G	C-400/C-409 Group
Group B	C-400 Cylinder Drying Station
Group C	C-720 Motor Burnout Ovens
Group D	C-709/C-710 Laboratory Hoods
Group E	C-310 Stack
Group F	Seal Exhaust/Wet Air Group
Group H	C-360

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.)

Steven Penrod
United States Enrichment Corporation

6-28-05
Date.

CERTIFICATION

This certification pertains to the following DOE emission source:

C-410 D&D Activities
C-746-D Scrap Metal Project
C-746-P Scrap Metal Project
Northwest Plume Treatment Facility
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.)

WE Murphy
Department of Energy

6/27/05
Date

Enclosure 2
GDP 05-0027
34 Pages Total

PORTS NESHAP Radionuclide Emission Report for Calendar Year 2004

USEC
A Global Energy Company

June 13, 2005

Ms. Elizabeth Cotsworth, Director
Office of Radiation and Indoor Air
United States Environmental Protection Agency
Mail Drop6601J
1200 Pennsylvania Avenue, NW
Washington, DC 20460

CERTIFIED MAIL
7003 3110 0005 0802 4877

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

CERTIFIED MAIL
7003 3110 0005 0802 4884

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 2004

Enclosed is a certified copy of the annual NESHAP report required under 40 CFR 61.94 for airborne emissions of radionuclides from the Portsmouth Gaseous Diffusion Plant (PORTS) during calendar year 2004. The PORTS site has operations conducted by two separate entities; the Department of Energy (DOE) performs Environmental Restoration Activities and Waste Handling Activities while the United States Enrichment Corporation (USEC) uses leased site facilities to remove technetium from off-specification UF_6. In addition, USEC maintains the site's gaseous diffusion equipment in a standby condition under contract with the DOE. This report addresses the emissions from USEC operations and it 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 0.031 millirem (mrem) for 2004, 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

If you have any questions or require additional information, please contact Greg Fout at (740) 897-3823.

Sincerely,

Sandra L Fout

for Patrick D. Musser
General Manager

PDM:GAGoslow:smj

Enclosure

cc/enc: Robert Blythe
Kathy Easter
Greg Fout
Greg Goslow
Kay Gilmer, OEPA-SEDO/DAPC
Mike Hopkins, OEPA-CO/DAPC
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Mike Murphy, USEPA-Region 5
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Pam Lauderback
Mike Taimi, USEC-HQ
Steve Toelle, USEC-HQ
Gary Workman
Records Management/ESHR - RC
File - POEF-360-05-077

United States Enrichment Corporation (USEC)
Air Emissions Annual Report
(Under Subpart H, 40 CFR 61.94)
Calendar Year 2004

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:	T. Michael Taimi
Phone:	(301) 564-3409
Owner:	U.S. Department of Energy

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SECTION 1.0 FACILITY INFORMATION

1.1 Site Description

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, a government corporation, to operate the uranium enrichment enterprise in the United States. The government corporation began operation on July 1, 1993. In accordance with the Act, the United States Enrichment Corporation 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 (IPO). USEC, Inc. officially became a private corporation on that date. The Portsmouth and Paducah gaseous diffusion plants are operated by a subsidiary of USEC, Inc., the United States Enrichment Corporation (USEC). 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 (Tc) from off-specification uranium hexafluoride (UF_6) feed material. USEC also continues to maintain the enrichment cascade in a standby condition under contract to DOE.

The PORTS site is located in sparsely populated, rural Pike County, Ohio, on a 16.2-km^2 (6.3-$mile^2$) 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 absorbents. 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 is continuing to decontaminate some of the enrichment equipment in situ and is maintaining the gaseous diffusion process equipment in "cold standby" under contract to the DOE.

Support operations include the withdrawal of material from the decontaminated process equipment, treatment of water for both potable and cooling purposes, steam generation for heating purposes, decontamination of equipment either in situ or removed from the process, recovery of uranium from various waste materials, and treatment of industrial wastes generated onsite. 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 until May 2001 and now is the sampling and handling of UF_6. Large quantities of UF_6 are located on the site. 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, filtered and re-packaged for USEC's own use. The UF_6 contains 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 ASTM standard for nuclear fuel. PORTS is using chemical absorbents to remove the ^{99}Tc from liquid UF_6. PORTS has also detected occasional traces of various thorium isotopes in the process equipment.

In May 2001, USEC ceased enrichment operations at the Portsmouth GDP. Since then, the enrichment cascade has been in "Cold Standby". USEC is under contract to DOE to maintain the PORTS enrichment cascade in a condition that will allow it to be re-started within 24 months if needed. In addition, some of the equipment is being operated for in situ decontamination.

PORTS also uses a variety of sealed sources for calibration of equipment; however, none of these are released and therefore are 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

The sources discussed in this section are the significant or potentially significant contributors to airborne radionuclide emissions from USEC operations.

PORTS has reviewed the radiological emission sources on the plantsite and determined that fifteen had the greatest potential for emissions and equipped them with continuous emissions samplers (see Table 1.0). All fifteen 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. Two of these sources (the X-343 and X-344 cold trap vents) 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.

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

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 main cascade from the tail of the purge cascades. The light gases are split at the head of the purge cascades with enough "lights" being recycled to the main cascade 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 operate in series at the very head 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 cascades 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 decontamination 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. 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 "areas", each being located adjacent to an 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 decontamination 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 (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 sealed off and alternately purged with dry nitrogen and evacuated to the Cold Recovery System. The evacuated gases pass through chilled cylinders 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 an air jet eductor 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 decontamination 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 sealed off and alternately purged with dry nitrogen and evacuated to remove all outside 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 by an air jet eductor. 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 decontamination 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 UF_6 enriched at the Paducah GDP. This process also included filtering the liquid UF_6 through chemical absorbents to remove residual ^{99}Tc. In June 2002, all enriched material handling was consolidated at the Paducah GDP and the X-343 and X-344 facilities were dedicated to filtering ^{99}Tc from out-of-specification UF_6 feedstock before it is enriched at the Paducah GDP. This operation continued through 2004.

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 UF_6 cylinders. As the ^{99}Tc removal project has progressed, the number of valves needing replacement has increased and the X-343 was refocused on the replacement and testing of cylinder valves in July 2003.

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 the other monitored vents at PORTS.

In mid-2004, the X-343 and X-344 were re-connected to the cascade to assist in the evacuation of residual material ("heels") from used UF_6 cylinders. Residual gasses from these buildings can now be sent to either the cold traps or back to the cascade.

X-344A Manifold Evacuation/Gulper

The X-344A Toll Transfer Facility contains an automated sampling and transfer system for sampling the product and for filling customer cylinders with low assay UF_6. The term "assay" refers to the concentration of ^{235}U 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.

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, 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 for the 2000 and later calculations.

X-705 Decontamination Facility

Equipment that is removed from the PORTS cascade is sealed at the point of removal and transported to the X-705 Decontamination Facility. Small parts are cleaned in "hand tables" or spray tanks, while

large parts are sent through an automated "tunnel." The hand tables consist of shallow acid baths (either nitric or citric depending on the metal to be cleaned) where metal parts are decontaminated by passive soaking. The hand tables have fume hoods over them to protect workers from acid fumes. The spray tanks are enclosed tanks where equipment can be cleaned remotely. Pressure relief vents are standard on such equipment. The tunnel is an enclosed series of "booths" that decontaminate large parts by spraying with decontamination solutions (acids and water rinses) as a small rail car 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.

The X-705 facility has seen minimal 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

Decontamination solutions are treated to yield a concentrated aqueous solution of uranyl nitrate, which is converted into uranium oxide powder in one of three calciners located in the X-705 Decontamination Facility. 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 are still available for use. 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 are still available for use. 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 a manifold of 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.

Emissions estimates from sources in the X-705 Decontamination Facility are included in the EDE calculations. Emissions from X-705 were modeled as a single source. The emissions from X-705 were estimated using the factors given in the Code of Federal Regulations, Title 40, Part 61, Appendix D, and are extremely conservative.

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 has a small laboratory which contains three fume hoods which can be used to prepare samples and analyze materials being processed in the building.

Emissions from the X-710 Laboratory were estimated using the 40 CFR 61 Appendix D method. These 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.

The X-710 Laboratory has a Radioactive Material License from the State of Ohio and now expects to start accepting this work in 2005.

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 glove box is used primarily to batch 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 assay 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.

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 release (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 Toll Transfer Facility, 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. (Some of these areas ceased operation with the end of enrichment operations but all remain in place and are operable if needed.) These areas have dedicated ventilation exhausts for worker protection but no emission controls or continuous vent monitors (except at the X-344A Toll Transfer Facility). The plant's Health Physics (HP) Department samples the air inside these areas when operating for worker protection. The HP data indicates the average radionuclide concentrations inside the room are typically 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, where contaminated equipment is unsealed and disassembled. The South Annex has a separate HEPA filtered ventilation system and operates as a sealed area. Supplied air respirators are mandated for worker protection within the annex when the facility is in use. Normal emissions to the outside air should be negligible, which is consistent with past ambient monitoring performed by the plant's HP Department. The main operation in the South Annex during 2004 was the processing of spent technetium filters from the X-344. The filter media (a granular solid) is transferred from the filter itself to small NRC-approved containers by a HEPA filtered vacuum. This particular operation is new to PORTS and the additional emissions have been estimated based on the weight of filter media processed in 2003, laboratory analyses of filter media samples, and methods from 40 CFR 61 Appendix D.

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 the HP Department. 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.

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 individual release points 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 sources were re-grouped into three 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). Since then, the source groups have been re-organized, based on changing emission levels. See Table 2.2 for a description of the emission points for each modeled source.

Group 1 now 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.

The individual source terms and stack characteristics for each of the twelve sources are provided in Table 2.3 and Table 3.0 of this report.

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 Meters 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 13.

Table 2.0 Point Sources, continued

Point Source[a]	Control Device	Control Efficiency	Distance in Meters 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 13.

Table 2.1 Grouped Sources

Point Source[a]	Control Device	Control Efficiency	Distance in Meters to the Nearest:					
			Resident	School	Office or Business	Farm		
						Milk	Meat	Veg.
X-705 Calciners (3)	Wet Scrubber	75%[e]	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 13.

	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 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 Extended Range Product emissions, SE 6 Vent, SE 5 Vent and SE 4 Vent	1
3	X-330 Building Cell Evacuation/Cold Recovery Vent, SE 3 Vent and SE 2 Vent	7
4	X-333 Low Assay Withdrawal, Cold Recovery Vent, Building Wet Air Evacuation Vent, and SE 1 Vent	7
5	X-344 Gulper Vent	5
6	All X-700 vents	7
7	All X-705 vents	7
8	All X-710 vents	1
9	All X-720 vents	7
10	XT-847 Glove Box	1
11	X-343 Cold Trap Vent	7
12	X-344 Cold Trap Vent.	5

Table 2.3 Releases (in Curies) During CY 2004

NUCLIDE	USEC Sources												
	1	2	3	4	5	6	7	8	9	10	11	12	Total
^{234}U	5.41E-06	5.79E-05	2.71E-04	0	2.44E-05	0	8.65E-03	8.07E-03	1.07E-06	1.81E-05	6.66E-03	1.24E-04	2.39E-02
^{235}U	7.12E-06	4.38E-06	1.54E-05	0	5.30E-06	0	2.90E-04	2.71E-04	3.59E-08	6.06E-07	3.14E-04	6.85E-06	9.14E-04
^{238}U	1.67E-06	6.21E-06	5.89E-05	0	1.13E-06	0	7.07E-04	6.60E-04	8.74E-08	1.48E-06	6.93E-03	1.12E-04	8.48E-03
^{99}Tc	1.32E-03	3.40E-03	2.34E-03	0	7.02E-04	0	1.94E-03	1.81E-03	0	2.81E-04	1.20E-03	1.27E-03	1.43E-02
^{228}Th	0	0	0	0	3.62E-07	0	5.06E-12	0	0	0	7.00E-08	4.38E-08	4.76E-07
^{230}Th	0	0	0	0	1.24E-06	0	1.92E-11	0	0	0	4.18E-07	3.88E-07	2.04E-06
^{231}Th	7.12E-06	4.38E-06	1.54E-05	0	5.30E-06	0	2.90E-04	2.71E-04	3.59E-08	6.06E-07	3.14E-04	6.85E-06	9.14E-04
^{232}Th	0	0	0	0	0	0	3.02E-13	0	0	0	2.42E-08	0	2.42E-08
^{234}Th	1.67E-06	6.21E-06	5.89E-05	0	1.13E-06	0	7.07E-04	6.60E-04	8.74E-08	1.48E-06	6.93E-03	1.12E-04	8.48E-03
^{234m}Pa	1.67E-06	6.21E-06	5.89E-05	0	1.13E-06	0	7.07E-04	6.60E-04	8.74E-08	1.48E-06	6.93E-03	1.12E-04	8.48E-03

Notes:

1. Sources 6 and 9 (X-700 & X-720) do not routinely process technetium. Equipment going to these buildings is first decontaminated in X-705 to strip all removable contamination. Therefore, emissions of Tc are estimated to be zero.

2. Source 6 is not known to have processed any removable uranium during 2004. Therefore, all uranium and uranium daughter emissions from this building are estimated to be zero.

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 most recent version of the 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 latest version of 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 uranium daughters	W
	All other thorium isotopes	W
AMAD:		1 μm
Meteorological data:		2004 data from onsite tower
Rainfall rate:		120.8 cm/year (CY 2004)
Average air temperature:		12.2 °C (CY 2004)
Average mixing layer height:		693 meters

Fraction of foodstuffs from:	Local Area	Within 50 mi	Beyond 50 mi*
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

3.4 Compliance Assessment

In 1996, USEPA allowed 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 0.025 mrem/yr (2.5×10^{-4} mSv/yr) from **USEC operations** and an additional 0.0057 mrem/yr (5.7×10^{-5} mSv/yr) from **DOE operations** for a total of 0.031 mrem/yr (3.1×10^{-4} mSv/yr) from **total plant operations**. This individual was located 1580 meters east-northeast of USEC's predominant emission sources (Source Group 3) and 640 meters east of DOE's predominant emission source (the X-624 Groundwater Treatment Facility).

The most exposed member of the public due solely to **USEC operations** was the most exposed individual due to **total plant operations** described in the previous paragraph. The most exposed member of the public due to **DOE operations** received an EDE of 0.0063 mrem/yr (6.3×10^{-5} mSv/yr) from **DOE operations** and an additional 0.021 mrem/yr (2.1×10^{-4} mSv/yr) from **USEC operations** for a total of 0.028 mrem/yr (2.8×10^{-4} mSv/yr) from **total plant operations**. This

individual was located 671 meters east of DOE's predominant emission source and 1330 meters east-southeast of USEC's predominant emission sources.

SECTION 4.0 ADDITIONAL INFORMATION

4.1 Collective EDE (Person-Rem/Yr)

The Table 4.0 gives the 50-mile radius EDEs over the past ten years. The EDEs for the most exposed individual are also given for comparison. The 2004 collective EDE for persons living in the village of Piketon (~2070 persons) is 0.018 person-rem/yr.

Table 4.0 Annual Doses Due to PORTS (USEC) Airborne Emissions, 1995-2004[1]

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	EPA Std
EDE[2] (mrem/yr)	0.13	0.14	0.12	1.69	0.28	0.039	0.052	0.026	0.033	0.025	10
Collective EDE[3,4]	1.2	2.2	1.5	6.4	1.0	0.15	0.18	0.095	0.18	0.14	N/A

Notes to Table 4.0:

1. EDE values for 1995 are for total plant operations; since 1996, figures are for USEC operations only.
2. The most exposed individual (USEC operations only) in 2004 was located 1580 meters ENE of the X-705 Decontamination Facility.
3. 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.
4. Population distributions for calendar year 2001 onward were updated from 2000 census data.

4.2 New/Modified Sources

When enrichment operations ceased in 2001, the X-343 and X-344 facilities became the sampling and packaging facilities for UF_6 enriched at the Paducah GDP. This process included filtering the liquid UF_6 through chemical absorbents to remove residual ^{99}Tc.

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 have been out of service since 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 the other monitored vents at PORTS.

During 2002, the sampling and transfer of enriched UF_6 was consolidated at the Paducah GDP and the PORTS facilities dedicated to removing ^{99}Tc from contaminated UF_6 feedstock. Removal of ^{99}Tc contamination was a normal part of the sampling and transfer operation and no physical modifications were required. Technetium releases from the feedstock operation have been negligible (undetectable for the most part) and uranium activity releases have been reduced due to the lower assay being processed (less than one percent U-235 instead of up to five percent).

Since beginning the feedstock operation, however, it has become apparent that thorium and transuranics were also being collected and concentrated in the tech traps. Wipe samples of the process piping indicates that these nuclides are predominately confined to the immediate vicinity of the tech traps, but as a precaution ^{228}Th, ^{230}Th, ^{232}Th, ^{237}Np, ^{238}Pu, ^{239}Pu, ^{240}Pu, and ^{241}Am were added to the weekly analyses for the X-343 and X-344 vent samplers beginning at the end of July 2002. As of the end of 2002, no transuranic isotopes had been detected in vent emissions and those analyses have been returned to their previous frequency. Individual thorium isotopes were detected seven times (out of 150 possible detections) between July and the end of 2002 though.

The annual thorium release is several orders of magnitude less than the uranium release, but these thorium isotopes have a much higher dose response than soluble uranium. Therefore, USEC conducted an analysis of the relative releases and their dose response (based on the stochastic Annual Limiting Intake published in Appendix B to 10 CFR 20). The result indicated that the thorium isotopes would contribute less than four percent of the total public dose even if assumed emissions at the detection limit were included. This is well under the ten percent standard for inclusion under 40 CFR 61.93(b)(4)(i). The issue was discussed with Mr. Mike Murphy of USEPA and it was decided to include quantifiable thorium emissions in the site's annual dose assessment, but to exclude assumed emissions where no thorium was detected.

To reduce the volume of low level radioactive waste generated by the feedstock project, PORTS began consolidating spent technetium absorbent rather than disposing of the filters as sealed units. The spent absorbent is transferred from the filter body into a small container using a HEPA filtered vacuum. This takes place in the X-705 South Annex, which is itself HEPA filtered. The closed containers are later consolidated in 55-gallon drums for disposal. Airborne emissions from this operation were estimated using Appendix D methods and added to the existing emission estimates for X-705. Aside from trace amounts of long-lived thorium isotopes, the additional emissions were not sufficient to change the previous emission estimates.

At the beginning of the feedstock project, X-343 primarily performed UF_6 sampling and replaced damaged UF_6 cylinder valves as needed. As the project proceeded, the number of cylinder valves that required replacement increased to the point that X-343 was refocused on this function starting in July 2003. This operation includes a post-maintenance test that includes pressurizing the cylinder with dry air to test for leakage, then evacuating the cylinder to a specified vacuum. It was expected that radionuclide emissions from X-343 would decrease since the UF_6 is not heated at any point during this operation. In actuality, the increased gas volume of dilute UF_6 from the testing resulted in a net

increase in emissions through July 2003. X-343 operations were halted and administrative controls put in place prior to resuming operations in August. Engineered controls that increased the efficiency of the cold traps replaced the administrative controls in September 2003.

In mid-2004, the X-343 and X-344 were re-connected to the cascade to assist in the evacuation of residual material ("heels") from used UF_6 cylinders. Residual gasses from these buildings can now be sent to either the cold traps or back to the cascade.

Beginning in 2005, DOE has expanded the feedstock contract to include transferring UF_6 from DOE-owned "non-compliant" cylinders. This is an operation that USEC (and its predecessors) have performed on an "as-needed" basis for more than 40 years and will be carried out with existing equipment. Some of DOE's UF_6 stockpile is in cylinders that are not compliant with the current ANSI standard and, therefore, cannot be heated to liquefy the contained UF_6 under present safety standards. Instead, USEC will extract the UF_6 by sublimating the solid material directly into a gas under a vacuum and then condense the gas for storage in ANSI compliant cylinders. Historically, this operation has been carried out at room temperature and only when essential due to the slow sublimation rate of UF_6. To accelerate the sublimation process and maintain an acceptable margin of safety, USEC will modify the controls of two of its existing UF_6 autoclaves to maintain a reduced level of heating that cannot liquefy the UF_6. No new emissions are expected from this operation.

4.3 Unplanned Releases .

No major unplanned releases occurred during calendar year 2004.

Minor releases occurred during attaching and detaching of lines to cylinders or when other anomalous conditions developed. The practice of as low as reasonably achievable (ALARA) is used to shut down the building ventilation system to prevent the release from reaching the atmosphere. Therefore, PORTS feels that the small releases should be considered insignificant.

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 2004, USEC had continuous emissions monitors (samplers) on fifteen point sources of the 37 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 fifteen 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, and 2000.

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.

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 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 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. The Lead Cascade is being installed in the existing X-3001 Process Building and will use the existing building vent. USEC currently plans to have the Lead Cascade in operation in 2005.

The Lead Cascade will be a demonstration facility consisting of up to 240 individual centrifuges. 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 UF_6 being withdrawn except samples for laboratory analysis. The total uranium inventory of the Lead Cascade will be only 250 kg UF6 (less than 0.125 Curies) and the maximum emission rate is predicted to be less than 0.001 Curie per week. Assuming that this emission rate was maintained for an entire year (which would shut down the cascade) the maximum predicted dose to a member of the public would still be only 0.023 mrem/yr. The Lead Cascade will have only one process vent, which will be equipped with a continuous vent monitor similar to the ones currently used on the X-343 and X-344 vents.

In August 2004, USEC, Inc. submitted a license application to the NRC for the follow-on commercial plant. The commercial plant will be installed in the existing GCEP buildings with some new construction (two small support buildings and several cylinder storage pads). This application is currently being reviewed by the NRC. A decision on this application is due by 2007.

Attachment 1
PORTS 2004 Potential and Actual Radiological Emissions Point Sources
(To USEC Air Emissions Annual Report [Under Subpart H, 40 CFR 61.94] Calendar Year 2004).

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
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: **Patrick D. Musser**
General Manager

Signature: Sandra L. Foltz for PDMusser **Date:** 6-13-08