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Author Booher Corporate Author DOE

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Department of Energy
Oak Ridge Operations
Paducah Site Office
P.O. Box 1410
Paducah, KY 42001

COPY

June 11, 1993

Mr. Winston A. Smith, Director
Air, Pesticides, and Toxic Management Division
U.S. Environmental Protection Agency
Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365

NATIONAL EMISSION STANDARD FOR HAZARDOUS AIR POLLUTANTS (NESHAP) - 1992 FINAL REPORT

Dear Mr. Smith:

Enclosed is the 1992 NESHAP report which addresses airborne radionuclide emissions from the Paducah Gaseous Diffusion Plant (PGDP). The report is required by 40 Code of Federal Regulation (CFR) 61, Subpart H. The format of this year's report differs slightly from the 1991 report because of guidance from Department of Energy (DOE) Headquarters and the number of grouped sources which are included in the off-site dose estimations.

In the 1991 report, and in Appendix A of the Federal Facility Compliance Agreement (FFCA) between PGDP and the Environmental Protection Agency (EPA), PGDP included building ventilation as a grouped source. In 1991, this grouped source was the major contributor to dose. This anomalous result was due to the fact that the ventilation radionuclide emissions were based on results from the PGDP Health Physics building air samplers which were multiplied by the maximum flow rate of the buildings to determine the total emissions.

On review of the PGDP NESHAP Compliance Plan, which was submitted to the EPA in January 1992, it has been decided to use the radiological emission estimate method outlined in Section 3.1 of that document to estimate radiological emissions from the building ventilation systems.

I certify the 1992 NESHAP report and compliance assessment were prepared under my direction of supervision with a system designed to ensure qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete.

If you have any questions or require additional information, please call W. David Tidwell at (502) 441-6807.

Sincerely,

W. David Tidwell for

Donald C. Booher, Site Manager
Paducah Site Office

MARTIN MARIETTA ENERGY SYSTEMS, INC.

POST OFFICE BOX 1410
PADUCAH, KENTUCKY 42001

June 8, 1993

Mr. Donald C. Booher, Site Manager
Paducah Operations Office
Department of Energy
Post Office Box 1410
Paducah, Kentucky 42002-1410

Dear Mr. Booher:

National Emission Standard for Hazardous Air Pollutants--1992 Final Report

Enclosed is the 1992 National Emission Standard for Hazardous Air Pollutants report which addresses airborne radionuclide emissions from the Paducah Gaseous Diffusion Plant. The report is required by 40 CFR 61, Subpart H. The format of this year's report differs slightly from the 1991 report based on guidance from Department of Energy/Headquarters and the number of grouped sources which are included in the off-site dose estimations. In the 1991 report, and in Appendix A of the Federal Facility Compliance Agreement between the Paducah Gaseous Diffusion Plant and the Environmental Protection Agency, the Paducah Gaseous Diffusion Plant included building ventilation as a grouped source. In 1991 this grouped source was the major contributor to dose. This anomalous result was due to the fact that the ventilation radionuclide emissions were based on results from the Paducah Gaseous Diffusion Plant's Health Physics building air samplers which were multiplied by the maximum ventilation flow rate of the buildings to determine the total emissions.

Upon review of the Paducah Gaseous Diffusion Plant's National Emission Standard for Hazardous Air Pollutants Compliance Plan, which was submitted to the Environmental Protection Agency in January 1992, it has been decided to use the radiological emission estimate method outlined in Section 3.1 of that document to estimate radiological emissions from the building ventilation grouped source. This estimation method is explained fully in the attached draft report and more accurately reflects the emissions and dose resulting from building ventilation systems.

According to the guidance from Department of Energy/Headquarters, the final report should be provided to the Office of Environmental Guidance (EH-232) by June 20, 1993. The report will then be forwarded to the Environmental Protection Agency.

I certify that this 1992 National Emission Standard for Hazardous Air Pollutants report and compliance assessment were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete.

If you have any questions or require further information, please contact D. W. Jones at Extension 6684.

Sincerely,

Steve Polston, Plant Manager
Paducah Gaseous Diffusion Plant

SP:DWJ:fmm

Enclosure

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AW File - RC

U. S. Department of Energy
Air Emissions Annual Report
(under Subpart H, 40 CFR 61.94)
Calendar Year 1992

Site Name: Paducah Gaseous Diffusion Plant

Operations Office Information

Office: Paducah Site Office

Address: P. O. Box 1410

Paducah, Kentucky 42002-1410

Contact: W. David Tidwell Phone: 502-441-6807

Site Information

Operating Contractor: Martin Marietta Energy Systems, Inc.

Address: P. O. Box 1410

Paducah, Kentucky 42002-1410

Contact: Douglas W. Jones Phone: 502-441-6684

SECTION I. FACILITY INFORMATION

SITE DESCRIPTION

The Department of Energy, Paducah Gaseous Diffusion Plant is an active uranium enrichment facility consisting of a diffusion cascade and extensive support facilities. The cascade, including product and tails withdrawal, is housed in six process buildings covering a total of approximately 80 acres. The plant is located on a reservation consisting of approximately 1350 acres in western McCracken County about 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. The raw water treatment plant, residential landfill, and inert landfill are the only operating areas outside of the security area. An uninhabited buffer zone of at least 400 yards surrounds the entire fenced area. Beyond the Department of Energy-owned buffer zone is an extensive wildlife management area consisting of 2100 acres either deeded or leased to the Commonwealth of Kentucky. During World War II, the Kentucky Ordnance Works, a trinitrotoluene production facility, was operated in an area southwest of the plant on what is now the wildlife management area. The water treatment plant used by the plant was originally a Kentucky Ordnance Works facility.

Construction of the Paducah Gaseous Diffusion Plant 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 ^{235}U has been increased from its natural assay. Natural uranium is mostly ^{238}U with about 0.72 percent ^{235}U and 0.0051 percent ^{234}U. Uranium mills process the ores to produce concentrated uranium oxide (U_3O_8) which is then commercially converted to gaseous uranium hexafluoride (UF_6) for enrichment at a gaseous diffusion plant. The Paducah Plant serves as a first step in the uranium enrichment process in which the ^{235}U is increased to approximately 2 percent. Product from the Paducah Gaseous Diffusion Plant must be further enriched prior to its use as a nuclear fuel; thus the plant provides an enriched feed stream to the Portsmouth Gaseous Diffusion Plant in Portsmouth, Ohio, and provided a similar feed stream to the Oak Ridge Gaseous Diffusion Plant in Oak Ridge, Tennessee, prior to its shutdown. The Paducah Gaseous Diffusion Plant is in the process of upgrading its operations to be capable of 5 percent ^{235}U enrichment. The proposed date for this capability is 1994 or early 1995. Hazardous, nonhazardous, and radioactive wastes are generated and disposed as a result of plant operations.

The Paducah Plant enriches the uranium isotope, ^{235}U, via 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 are the fuel from nuclear reactors that have had its ^{235}U content depleted, have been reprocessed to remove most of the fission products, and which must have its ^{235}U content replenished before it can be recycled. The

reactor fuel rods were processed at other Department of Energy facilities (where most of the fission products were removed) and the enriched uranium and fission products were fed into the Paducah Gaseous Diffusion Plant cascade system. Use of the reactor tails resulted in the introduction of technetium-99 (^{99}Tc), a contaminant in the feed material, 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. It 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 sets of cooling towers, a chemical cleaning and decontamination building, a water treatment plant, a cooling water blowdown treatment facility, maintenance facilities, laboratory facilities, and two active landfills. 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 the Paducah Gaseous Diffusion Plant. The population within the 50 mile radius is about 535,000 persons. Of these, about 36,500 live within 10 miles of the plant and about 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 a 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, averages 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.

SOURCE DESCRIPTION

The following are the potential airborne radionuclide sources at the Paducah Gaseous Diffusion Plant. Although not all of them were used in 1992, they are included in this report due to their potential for future restart.

C-310 Stack

The primary source of potential radionuclide air emissions is the vent stack which 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 such as fluorides and chlorides,

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 ^{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 stand-by bank of 13 traps. Each traps 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 three sets of traps; a primary set, a secondary set, and a standby set. Each trap contains approximately 300 pounds of NaF. Emissions from the C-310 stack were estimated based on results of the continuous potassium hydroxide bubbler stack sampling system which was approved by the Environmental Protection Agency in 1992.

Seal Exhausts

Seals on the UF_6 compressors are supplied with an intricate array of air pressures to reduce any UF_6 release which may occur in the unlikely event of a seal failure. The seal air flow is supplied 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, no UF_6 is present in the seal exhaust system. Occasionally, a seal or seal control system malfunction will allow UF_6 to enter the exhaust system. If the UF_6 is allowed to enter the pump, it reacts with the pump oil creating a thick, gummy sludge which overloads the pump in a short time. The alumina traps, therefore, serve a twofold purpose; first to protect the pump and pump oil, and second to prevent UF_6 emissions to the atmosphere. Due to the reaction between UF_6 and pump oil, the oil also serves as an excellent uranium emission control device. No credit is taken for the oil as a pollution abatement system; however, 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 seal exhausts at Paducah Gaseous Diffusion Plant:

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

Emissions from the seal exhaust grouped source were estimated based on results of Method 5 Stack Sampling performed in 1992. The seal exhausts are scheduled to be resampled in 1997.

Wet Air Exhaust

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. The time of each sweep varies, but generally lasts approximately 30 minutes. After maintenance, the system is closed and the ambient (wet) air is pumped from the system by the wet air pumps. The ambient air withdrawal time varies, but generally lasts approximately four hours. In both the dry air purges and the wet air withdrawal, the air is routed through alumina traps for uranium trapping, 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 which services the seal exhaust system for those buildings. The list below indicates locations of wet air exhausts at the Paducah Gaseous Diffusion Plant:

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)

Emissions from the wet air exhausts were estimated based on results of Method 5 Stack Sampling performed in 1992. The wet air exhausts are scheduled to be resampled in 1997.

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; product withdrawal, tails withdrawal, 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 doubling 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 "puff" 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 portable high efficiency particulate filters. These portable control devices, known as high efficiency particulate air vacuums, are placed so that any minute "whiff" or "puff" of UF_6 which is emitted from the pigtail disconnect process is captured by the high efficiency particulate air vacuum. Furthermore, some of the pigtail connect/disconnect areas are serviced by large high efficiency particulate air filters-equipped exhaust hood systems which exhaust any "puffs" not contained by the high efficiency particulate air vacuums from the area to a vent stack. Stack sampling, Health Physics data, and Appendix D emission factors were used to estimate emissions from cylinder valve connection activities. The list below indicates locations of the pigtail exhaust systems.

C-310 Burp Station (located outside--no exhaust system, portable high efficiency particulate air vacuums used)
C-310 Product Withdrawal Building (high efficiency particulate air filters failed test--exhaust system not used in 1992, portable high efficiency particulate air vacuums used)
C-315 Tails Withdrawal Building (controlled by high efficiency particulate air filters-equipped exhaust system)
C-333-A Feed Facility (UF_6 Vaporizer--facility did not operate in 1992)(No exhaust hood)
C-337-A Feed Facility (UF_6 Vaporizer)(No exhaust hood)
C-360 Toll Transfer and Sampling Facility (controlled by high efficiency particulate air filters-equipped exhaust system)

Laboratory Hoods

The C-710 laboratory is the main facility for sample analysis and research at the Paducah Gaseous Diffusion Plant and is operated by the Technical Services Division. There are a total of 111 laboratory hoods and canopies in the C-710 building. All of the hoods and canopies were not used in 1992. Thirty of the hoods were used for exhaust of analyses and research involving radionuclides. This number does not include hoods which contain closed systems with no potential for radionuclide emissions under normal conditions. The radionuclide involved in analyses consists primarily of uranium, with a slight potential for emissions of ^{99}Tc, ^{237}Np, ^{239}Pu, and the daughters of uranium, thorium-230, thorium-234, and protactinium-234. In some cases the hood exhausts combine with other hood exhausts, creating a discrepancy between the number of hoods and actual emission points. There are three high efficiency particulate air filters in the C-710 laboratory. Two of the high efficiency particulate air filters serve as controls only in accidental release situations, and the third is used when samples are being taken or transferred. There are also eight laboratory hoods in the C-409 stabilization facility. Analysis and research in these hoods did not involve radionuclides in 1992. Three laboratory hoods in the C-410 feed plant are permanently shut down. Although only 30 of the C-710 hoods dealt with exhaust of activities involving radionuclides in 1992, it can be assumed that many of the hoods plantwide have historically dealt with radionuclide exhaust at some time. Appendix D factors were used to estimate emissions from laboratory hoods. The list below indicates the laboratory exhaust systems at the Paducah Gaseous Diffusion Plant:

Building	Hoods/Canopies	Radionuclide Analyses in 1992
C-710 Laboratory	111	30
C-409	8	0
C-410	3	0

Freon (R-114) UF_6 Separator

The R-114/UF_6 separator is located in C-335 and can be used to separate relatively large amounts of R-114 coolant which has entered the cascade system and mixed with UF_6.

The separator was installed in 1978. Pilot tests were conducted in 1979. The unit has been used twice since installation, and has not been used since 1985. When in use, the separator air effluent is passed through a cold trap at O°F which condenses approximately 98.5 percent of the gaseous UF_6. The residual UF_6 in the effluent is trapped by two NaF traps containing 900 pounds of NaF each. The outlet of the NaF traps is monitored by a flow through ionization chamber. The effluent passes from the NaF traps through a header to the C-335 wet air/seal exhaust system. The alumina traps and the motor oil of this system provide additional emission control. This facility did not operate in 1992. Since this facility is used only when large amounts of R-114 leak into the cascade and it is equipped with a two-stage control process, restart of this facility is not expected to increase the emissions from the wet air/seal exhaust system. Under normal operations, this facility is not used.

C-400 Decontamination Spray Booth

This facility is used to decontaminate equipment. It consists of a large booth equipped with a high pressure sprayer which sprays a water/sodium carbonate 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. The spray booth was not used in 1992. (Test water was run through the spray booth effluent storage tanks for pressurization tests. This water was treated at the dissolver/rotary vacuum filter below.)

C-400 No. 5 Dissolver/Rotary Vacuum Filter

This facility is used to dissolve and precipitate the uranium in the sodium carbonate solution from the C-400 cylinder wash and the C-400 decontamination spray booth. The solution is chemically treated to precipitate the uranium, which 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 normal outfalls. The possibility for radionuclide emissions arises from the vent on the pump which 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, which should trap the uranium as filter cake. Appendix D factors were used to estimate emissions from this facility.

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 wash stand. Dry "plant air" is passed through the cylinder to evaporate any moisture from the washing process. This facility was not used in 1992.

C-746-A Low-Level Waste Compactor

This facility is used to compact bagged, low-level radiological waste. The facility consists of a telescoping compacting arm which very slowly compacts bags of low-level contaminated material into a storage drum. It is equipped with a high efficiency particulate air filters filter. This facility was not used in 1992.

RADIOLOGICAL AREAS

Radiological areas are established under specific criteria listed in various worker protection procedures and standards. There are a number of minor radiological areas at the Paducah Gaseous Diffusion Plant for which radionuclide emission estimates have been developed from Health Physics air sampling data. The data were generated from air samplers located in the radiological areas. The samplers consist of a low volume pump (20 liters per minute) drawing the ambient building air through a Whatman No. 40 cellulose filter. The samplers run 24 hours per day and the filters are changed on 3-, 4-, or 5-day basis, depending upon weekend and holiday schedules. A minimum of three days of sample air is collected on each filter. After sample collection, the filters are counted for gross alpha concentrations.

For the 1991 National Emission Standard for Hazardous Air Pollutants Report, the Paducah Gaseous Diffusion Plant estimated radionuclide emissions from building ventilation by multiplying the airborne concentrations indicated by the Health Physics building monitors by the design maximum ventilation rate for each building. The effective dose equivalent was then determined by air dispersion modeling. This very conservative method of radionuclide emission estimation resulted in the building ventilation grouped source being the major contributor to off-site dose. The Paducah Gaseous Diffusion Plant believes that this method of radionuclide emission estimation does not accurately represent the emissions due to building ventilation. Therefore, for the 1992 report, the Paducah Gaseous Diffusion Plant estimated the building ventilation grouped source according to the method stated in Section 3.1 of the revised Paducah Gaseous Diffusion Plant's National Emission Standard for Hazardous Air Pollutants Compliance Plan submitted to the Environmental Protection Agency in January 1992.

According to the Paducah Gaseous Diffusion Plant's compliance plan, radiological areas are established under specific criteria, one of which is airborne radioactivity concentrations greater than 10 percent of a derived air concentration listed in Department of Energy 5480.11. Derived air concentrations are defined as the airborne concentrations of radionuclides in the workplace which would cause a maximum internal radiation dose of 5000 millirem/year (50 millisieverts/year) to workers breathing the air over a normal year. It follows that one of the criteria for establishing radiological areas occurs when the airborne radionuclide concentrations have the potential for internal exposures to workers of $\geq$ 500 millirem/year (5 millisieverts/year) (10 percent of the 5000 millirem/year

(50 millisieverts/year) derived air concentration level). The dilution factor due to dispersion at the Paducah Gaseous Diffusion Plant for 1992 is approximately 7.9E-7. Therefore, the air discharged at the Paducah Gaseous Diffusion Plant with concentrations at 10 percent of the derived air concentration would not have the potential to cause a dose exceeding 0.0004 millirem/year (0.000004 millisieverts/year) to the public. Therefore, according to the compliance plan, since a nonradiological area could not have airborne concentrations in excess of 10 percent of a derived air concentration, "it will not be necessary to evaluate nonradiological areas in detail to verify low emissions."

According to the results of the Health Physics monitoring data, the average alpha concentration for all the buildings which were monitored was $\leq$ 2 percent of the most stringent derived air concentration (Np-237). Therefore, the building ventilation emissions, even from radiological areas, is less than 10 percent of the most stringent derived air concentration and will not cause an off-site dose in excess of 7.9E-5 millirems/year (7.9E-7 millisieverts/year [2 percent of the most stringent derived air concentration]). The Paducah Gaseous Diffusion Plant believes that this method of building ventilation emissions and resulting dose more accurately reflects the actual dose resulting from general emissions from buildings.

The following is a list of the Paducah Gaseous Diffusion Plant radiological areas from which emissions were evaluated using Health Physics data:

C-310	Product Withdrawal Building
C-315	Tails Withdrawal Building
C-331	Uranium Enrichment Process Building
C-333	Uranium Enrichment Process Building
C-335	Uranium Enrichment Process Building
C-337	Uranium Enrichment Process Building
C-360	Toll Transfer/Sampling Building
C-400	Decontamination Building
C-409	Stabilization Building - The stabilization process is shut down. This building now houses some laboratory hoods (discussed under the laboratory hood section) and decontamination equipment to be used after the proposed increase to five percent enrichment assay.
C-720	Maintenance Building--This building is the primary maintenance building at the Paducah Gaseous Diffusion Plant. Maintenance on contaminated and uncontaminated machinery is performed here. Transferrable contamination has been removed prior to maintenance; however, there is a potential for airborne radionuclide emissions from fixed contamination during maintenance procedures. Portable Negative Air Machines which are equipped with high efficiency particulate air filters are utilized whenever there is a potential for airborne radionuclide emissions.

Buildings C-340, C-410, C-420, and C-746Q are also categorized as radiological areas. However, the ventilation systems in buildings C-340, C-410 and C-420 are shut down and building C-746-Q has no ventilation system. Any emissions from these buildings would be fugitive or diffuse in nature. Fugitive and diffuse emissions are discussed later in this report.

In addition to the general emissions from radiological areas, the Paducah Gaseous Diffusion Plant also has a number of minor sources which do not have direct exhausts into the ambient air. These minor sources are located in radiological areas and contribute to the emissions from the radiological areas as calculated by the Health Physics samplers. A list of these minor sources with no direct exhaust to the ambient air, and which are located in radiological areas, is as follows: (This list also contains sources which did not operate in 1992.)

C-310 Burp Station, C-333-A and C-337-A Feed Cylinder Connection Activity Emissions

These pigtail systems, unlike those in the C-360 Toll Transfer Building, the C-310 Product Withdrawal Building, and the C-315 Tails Withdrawal Building, have no specific ventilation system. Furthermore, the C-337-A and C-333-A feed cylinder vaporizers are not located in completely enclosed buildings. The C-310 burp station is outside with no enclosure. As stated previously, high efficiency particulate air vacuums are used to control any potential radionuclide emissions during the disconnection of the pigtails. The C-333-A vaporizer was not used in 1992. The C-337-A vaporizer building is enclosed on three sides only. Since the C-337-A vaporizer and the C-310 burp station are not located in an enclosed structure, building ventilation data could not be used to estimate emissions. The emissions from the C-337-A vaporizer and the C-310 burp station cylinder connection activities were estimated in the following manner. There were 8 "whiffs and puffs" of UF_6 which occurred away from permanent exhaust systems; 6 at the C-310 burp station and 2 at the C-337 vaporizer. For each whiff and puff, it was assumed that the entire contents of the pigtail was emitted. Appendix D factors for particulate emissions and the portable high efficiency particulate air vacuums were then applied. This is a very conservative method due to the fact that each whiff and puff is much less than the content of a pigtail. (It is estimated that each whiff and puff is a gram or less, and it is estimated that there are 21.4 pounds of uranium in a pigtail.)

C-400 Compressor Pit

This area was used for maintenance on UF_6 compressors and has not been used since 1989.

C-400 Cylinder Wash

This facility is used to remove the solid UF_6 "heel" from cylinders. The cylinder heel is dissolved in a sodium carbonate solution and the solution is transferred to the C-400 No. 5 dissolver for uranium recovery. The only potential for radionuclide emissions is when the

cylinder valve is opened for introduction of the sodium carbonate solution. Any potential emissions will be included in the estimates from the C-400 Health Physics air samplers.

Nonpoint Sources

Guidance from the Environmental Protection Agency which stated that the provisions of 40 CFR 61, Subpart H applied to fugitive and diffuse sources, was contained in correspondence dated March 24, 1992. The correspondence stated that sources of diffuse and fugitive emissions include evaporation ponds, breathing of buildings, cooling tower drift equipment, and resuspension of contaminated soil. In the October 16, 1992, reply to the Environmental Protection Agency's September 21, 1992, correspondence containing questions pertaining to the Paducah Gaseous Diffusion Plant's 1991 National Emission Standard for Hazardous Air Pollutants report, the Paducah Gaseous Diffusion Plant stated the following:

1. The Paducah Gaseous Diffusion Plant has no evaporation ponds.

2. Emissions from building ventilation are included as a grouped minor source in the 1991 (and 1992) annual National Emission Standard for Hazardous Air Pollutants report. (In the 1992 report, the health physics data indicated no impact to off-site dose due to forced ventilation or the breathing of buildings.)

3. The Paducah Gaseous Diffusion Plant's recirculating cooling water system is separated from the diffusion cascade by a chlorofluorocarbon-114 (CFC-114) cooling system. The cooling tower drift contains no radionuclides due to the fact that the cascade operates below atmospheric pressure and substantially below the operating pressure of the adjacent CFC-114 system, which is approximately 90 pounds per square inch (gauge). Therefore, any leakage in the system will result in an in-leakage of CFC-114 into the process gas stream, rather than process gas into the CFC-114.

4. Resuspension of contaminated soil can occur from vehicular traffic during remediation activities and contaminated scrap storage. Vehicular traffic in contaminated scrap areas is very minimal, and usually results from the hauling and deposit or movement of large pieces of scrap metal. During 1991 the only remediation activities which could have resulted in the resuspension of soil were drilling activities associated with the establishment of sampling wells and removal of two leaking underground fuel storage tanks. The Paducah Gaseous Diffusion Plant has no methods or guidance for estimation of emission from such activities and requests a determination from Environmental Protection Agency as to whether these activities actually constitute a fugitive or diffuse source (during 1992, the only remediation activities which could have resulted in resuspension of contaminated soil were well drilling activities).

   The March 24 correspondence stated that sources of diffuse emissions included the above. It can be inferred that these sources do not comprise the total list of potential

fugitive or diffuse sources. Until such a list is determined by the Environmental Protection Agency, the Paducah Gaseous Diffusion Plant cannot determine whether such sources exist at the Paducah Gaseous Diffusion Plant.

In a reply dated January 8, 1993, the Environmental Protection Agency stated acceptance of the first three comments above. However, the Paducah Gaseous Diffusion Plant's request for source determination and guidance for handling of resuspended contaminated soils was forwarded to the Environmental Protection Agency headquarters for review and comment. The Environmental Protection Agency has not provided a position on this issue to date.

Due to the lack of guidance from the Environmental Protection Agency and Department of Energy, and to the lack of the capability of the Paducah Gaseous Diffusion Plant's ambient air monitoring network to provide an accurate off-site dose estimation, the Paducah Gaseous Diffusion Plant cannot, at this time, provide an estimation of off-site dose due to fugitive and diffuse sources with the exception of building breathing. It should be noted that of the potential diffuse and fugitive sources listed by the Environmental Protection Agency, resuspension of contaminated soils is the only potential source not accounted for at the Paducah Gaseous Diffusion Plant. Activities which result in resuspension of contaminated soils are rare, and it is not expected that such activities would result in emissions which would be distinguishable from background at off-site locations.

SECTION II - AIR EMISSIONS DATA

MAJOR POINT SOURCE

Major Point Source	Type Control	Efficiency	Distance to Nearest Receptor
C-310 Purge Stack	NaF Traps	>99.9%	1755 M ESE
	Alumina Traps	≈98.6%	

GROUPED SOURCES

Grouped Sources	Type Control	Efficiency %	Distance to Nearest Receptor
Wet air/seal exhausts (6)	Alumina Traps	≈ 98.6	1524 M ESE
Cylinder valve connection activities (5)	High Efficiency Particulate Air Filters and Vacuums	99.95	N/A[1]
Cylinder valve connection activities not included above, i.e., not serviced by a stack (2):* C-310 Burp (6 instances) C-337-A (2 instances)	High Efficiency Particulate Air Vacuums	99.0 (Appendix D)	1524 M ESE
C-400 sources (3)*	None	0	1901 M E ESE
C-710 laboratory hoods (30)*	None	0	1944 M NNE
Building ventilation (10)*[2]	None	0	1524 M ESE

[1] Stack sampling data results indicated that emissions were not distinguishable from zero, based on a statistical one-tailed test of significant difference from zero. Therefore, dose modeling was not performed and no receptor was determined.

[2]Air concentrations were less than 10 percent of the derived air concentration.

*Emission estimates determined by means other than continuous or periodic sampling.

PADUCAH GASEOUS DIFFUSION PLANT RADIONUCLIDE EMISSIONS

Radionuclide emissions (Ci)[3] during 1992								
			Paducah					
Emission source			C-310	C-710	Seal/wet	C-400	Cylinder	Total
				Lab	air exhaust		connection	
Nuclide	Solubility	AMAD						
^{99}TC[4]	D	1.0	2.02E-04			3.95E-06		2.06E-04
^{230}Th[4]	W	1.0	3.17E-06			2.66E-07		3.44E-06
^{234}U	D	1.0	2.99E-05	2.66E-04	1.94E-05	1.27E-03	7.62E-07	1.59E-03
^{235}U	D	1.0	1.17E-06	1.04E-05	7.62E-07	4.99E-05	2.99E-08	6.23E-05
^{236}U	D	1.0		8.85E-08				8.85E-08
^{238}U	D	1.0	8.93E-06	7.23E-05	5.81E-06	3.80E-04	2.28E-07	4.67E-04
^{237}Np[4]	W	1.0	1.56E-06			3.81E-07		1.94E-06
^{239}Pu[4]	W	1.0			2.26E-06	1.03E-07		2.36E-06
^{241}Am[4]	W	1.0				3.36E-10		3.36E-10
Total Ci/year			2.47E-04[5]	3.49E-04	2.82E-05	1.70E-03	1.02E-06	2.33E-03
Check totals								2.33E-03

[3] 1 Curie=3.7×10^{10} Becquerels.

[4] The Paducah Gaseous Diffusion Plant is only required to sample for uranium from the C-310 stack since none of the other potential radionuclide emissions comprise 10 percent of the resulting potential dose (See correspondence from W. L. Smith to D. C. Booher dated January 10, 1992). Emission data from all sources pertaining to the other radionuclides, if available, is included in the actual dose calculations, and is presented in this report for informational purposes only. Also, the uranium emissions from the C-310 stack were enriched to a 1.9 percent ^{235}U assay or less for 1992. As a conservative measure, dose assessment was based on enrichment to 2.0 percent assay.

[5] For release of 27.22 grams of 2 percent enriched uranium based on an isotopic distribution as follows: ^{238}U, 3.293E-7 Ci/g; ^{235}U 4.324 E-8 Ci/g; ^{234}U 1.102 E-6 Ci/g.

SECTION III - DOSE ASSESSMENT

DESCRIPTION OF DOSE MODEL

The radiation dose calculations were performed using the Clean Air Act Assessment Package-88 of computer codes. This package contains the Environmental Protection Agency's most recent version of the AIRDOS-Environmental Protection Agency 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 the Environmental Protection Agency'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 the Environmental Protection Agency with the Clean Air Act 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 data bases.

Joint frequency distribution: 1992 data from 60 meters station on Paducah meteorological tower
Rainfall rate: 104 centimeters/year
Average air temperature: 20°C
Average mixing layer height: 930 meters

Fraction of foodstuffs from:	Local area	50-mile radius	Beyond 50 mile
Vegetables and produce:	0.700	0.300	0.000
Meat:	0.442	0.558	0.000
Milk:	0.399	0.601	0.000

SOURCE CHARACTERISTICS

Source Name	Type	Height (m)	Diameter (m)	Gas exit velocity (m/s)	Gas exit temperature (oC)	Distance (m) and direction to maximally exposed individual	
						Source	Plant
C-310	Point	61.0	0.3	0	Ambient	2438 N	2438 N
C-400	Point[6]	11.3	None	0	Ambient	2097 N	2097 N
C-710	Point[6]	7.1	None	0	Ambient	2401 N	2401 N
Seal/wet air exhausts	Point[6]	21.0	None	0	Ambient	2895 N	2286 NNW
Cylinder connection	Point[6]	1.0	None	0	Ambient	1524 ESE	2286 NNW
Building ventilation	Not modelled*						

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

Source Name	Nearest individual	Distances (m) to selected receptors				
		Nearest Business	Nearest School	Nearest Farms		
				Dairy	Beef	Vegetable
C-310	1755	2705	3962	>5000	2896	1700
C-400	1901	2819	4267	>5000	3124	1943
C-710	1944	2705	3962	>5000	2896	1700
Seal/wet air exhausts	1524	2438	3962	>5000	3124	1524
Cylinder valve connection	1524	2705	3962	>5000	2896	1700
Building ventilation*	1524	2705	3962	>5000	2896	1700

*See source description section for dose estimation method.

COMPLIANCE ASSESSMENT

Effective dose equivalent (millirem)[7] to maximally exposed individual for:

Emission Source	For Source	For Plant
C-310	0.000094	0.000094
C-400	0.0035	0.0035
C-710	0.00071	0.00071
Seal/wet air exhausts	0.00022	0.00017
Cylinder valve connection	0.0000020	0.0000013
Total		0.0045

Maximum effective dose equivalent=0.0045 millirem (2401 meters north of C-400, the maximum contributor to dose for this receptor).

[7]1 millirem=0.01 millisieverts.

CERTIFICATION

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

Donald C. Booher, DOE Site Manager, Paducah Site Office

6-24-92

Date

The following are various data spreadsheets provided by the Oak Ridge National Laboratory Modeling Group:

Dose at each receptor from 1992 releases at Paducah Gaseous Diffusion Plant

Effective dose equivalents (mrem/year)

Receptor	Dist. (m) & dir.	Building C-310	Dist. (m) & dir.	Building C-400	Dist. (m) & dir.	Building C-710	Dist. (m) & dir.	Seal/wet air exhaust	Cylinder connection	TOTAL
A	2438 N	9.4E-05	2097 N	3.5E-03	2401 N	7.1E-04	2286 NNW	1.7E-04	1.3E-06	4.15E-03
B	3084 NNE	8.3E-05	2743 NNE	2.5E-03	3084 NNE	4.9E-04	2895 N	2.2E-04	1.4E-06	3.1E-03
C							4949 NNE	1.2E-04	6.2E-07	1.2E-04
D	4651 NE	3.7E-05	4419 NE	9.8E-04	4760 NE	1.9E-04	4340 NE	8.8E-05	4.9E-07	1.3E-03
E			3316 ENE	9.9E-04						9.9E-04
F	3278 ENE	3.8E-05			3389 ENE	2.1E-04	1944 ENE	1.4E-04	1.2E-06	1.1E-04
G			2286 E	1.7E-03	2438 E	3.9E-04	1944 E	1.3E-04	1.4E-06	2.2E-03
G-1										0.0E+00
H	2401 E	3.3E-05								3.3E-05
I	1755 ESE	5.4E-05	1901 ESE	2.0E-03	1944 ESE	5.0E-04	1524 ESE	2.1E-04	2.0E-06	2.8E-03
J	2590 SE	4.8E-05	2859 SE	1.4E-03			2438 SE	1.3E-04	1.0E-06	1.6E-03
K					2859 SE	3.3E-04				3.3E-04
K-1										0.0E+00
L	2627 SSE	5.4E-05	2974 SSE	1.3E-03	2779 SSE	3.2E-04	2627 SSE	1.4E-04	9.0E-07	1.8E-03
M							3048 S	6.1E-05	3.8E-07	6.1E-05
N	2932 S	5.5E-05								5.5E-05
O			3279 S	6.1E-04	2895 S	1.5E-04				7.6E-04
P	2859 SSW	4.6E-05	3432 SSW	3.9E-04	2859 SSW	9.6E-05	3084 SSW	3.8E-05	2.5E-07	5.7E-04
Q	2974 SW	3.4E-05	3316 SW	2.7E-04	2932 SW	6.2E-05	3316 SW	1.7E-05	1.6E-07	3.8E-04
R	3889 WSW	3.2E-05								3.2E-05
S			3730 WSW	3.7E-04	3505 WSW	8.1E-05	3389 WSW	3.5E-05	2.3E-07	4.8E-04
T	5181 W	2.8E-05			5053 W	7.6E-05	5486 W	2.3E-05	1.9E-07	1.3E-04
U			4913 W	3.7E-04						3.7E-04
U-1										0.0E+00
V	4876 WNW	2.7E-05	4687 WNW	2.8E-04	4724 WNW	5.9E-05	5108 WNW	1.7E-05	1.6E-07	3.8E-04
W	2670 NW	4.7E-05	2401 NW	9.8E-04	2474 NW	2.1E-04	2822 NW	7.7E-05	4.9E-07	1.3E-03
W-1										0.0E+00
X					3621 NNW	2.6E-04				2.6E-04
Y	3316 NNW	4.7E-05	2932 NNW	1.5E-03						1.5E-03
Z							2743 NNW	1.4E-04	9.9E-07	1.4E-04

ission source			C-310	Lab.*	air exhaust		connection	vents**	
pe			Point	Point	Point	Point	Point		
lease height, m			61	7.1	21	11.3	1		
meter, m			0.3						
it gas velocity, m/s									
it gas temperature, deg. C			Ambient	Ambient	Ambient	Ambient	Ambient	Ambient	
urce:	Max. EDE (mrem)		9.4E-05	7.1E-04	2.2E-04	3.5E-03	2.0E-06	7.9E-06	
	Distance (m)		2438	2401	2895	2097	1524		
	Direction		N	N	N	N	ESE		
	Pop. (person-rem)		8.9E-04	2.3E-03	1.7E-03	1.2E-02	5.3E-06		
ant:	Max. EDE (mrem)		9.4E-05	7.1E-04	1.7E-04	3.5E-03	1.3E-06	7.9E-06	4.5E-03
	Source % of plant		2.10	15.84	3.79	78.07	0.03	0.18	100.00
	Distance (m)		2438	2401	2286	2097	2286		
	Direction		N	N	NNW	N	NNW		
	Pop. (person-rem)		8.9E-04	2.3E-03	1.7E-03	1.2E-02	5.3E-06		1.7E-02
	Source % of plant		5.39	13.63	10.06	70.89	0.03		100.00

Uranium of three different enrichments (0.711, 2, and 5%) were emitted from this source.
The dose for building ventilation emissions was provided by D. W. Jones in E-mail dated April 15, 1993.

dionuclide emissions (Ci) during 1992

ission source			PADUCAH C-310	C-710 Lab.*	Seal/wet air exhaust	C-400	Cylinder connection	Building vents**	Total
clide	Solubility	AMAD							
-99	D	1.0	2.02E-06			3.95E-06			2.06E-04
-230	W	1.0	3.17E-06			2.66E-07			3.44E-06
234	D	1.0	2.99E-05	2.66E-04	1.94E-05	1.27E-03	7.62E-07		1.59E-03
235	D	1.0	1.17E-06	1.04E-05	7.62E-07	4.99E-05	2.99E-08		6.23E-05
236	D	1.0		8.85E-08					8.85E-08
238	D	1.0	8.93E-06	7.23E-05	5.81E-06	3.80E-04	2.28E-07		4.67E-04
-237	W	1.0	1.56E-06			3.81E-07			1.94E-06
-239	W	1.0			2.26E-06	1.03E-07			2.36E-06
-241	W	1.0				3.36E-10			3.36E-10
ughters									2.33E-03
tal Ci/year			2.47E-04	3.49E-06	2.82E-05	1.70E-03	1.02E-06		2.33E-03
eck totals									

rcent contribution of each nuclide to the individual EDE from each source at its selected receptor

ission source			PADUCAH C-310	C-710 Lab.*	Seal/wet air exhaust	C-400	Cylinder connection	Building vents**	
clide	Solubility	AMAD							
-99	W	1.0	7.46E+00			2.22E-02			
-230	W	1.0	4.42E+01			9.48E-01			
234	D	1.0	8.43E+00	7.59E+01	7.37E+00	7.15E+01	7.44E+01		
235	D	1.0	5.09E-01	4.20E+00	4.26E-01	4.01E+00	4.12E+00		
236	D	1.0		2.39E-02					
238	D	1.0	2.27E+00	1.86E+01	1.99E+00	1.93E+01	2.00E+01		
-237	W	1.0	3.69E+01			2.23E+00			
-239	W	1.0			9.01E+01	6.44E-01			
-241	W	1.0				2.16E-03			
aughters			2.07E-01	1.34E+00	1.60E-01	1.41E+00	1.42E+00		
tal source %			100	100	100	100	100		

Contribution (mrem) of each nuclide to the maximum individual EDE for the source

Emission source			PADUCAH C-310	C-710 Lab.*	Seal/wet air exhaust	C-400	Cylinder connection	Building vents**	Total
Nuclide	Solubility	AMAD							
Tc-99	W	1.0	7.0E-06			7.8E-07			
Th-230	W	1.0	4.2E-05			3.3E-05			
U-234	D	1.0	7.9E-06	5.4E-04	1.6E-05	2.5E-03	1.5E-06		
U-235	D	1.0	4.8E-07	3.0E-05	9.4E-07	1.4E-04	8.2E-08		
U-236	D	1.0		1.7E-07					
U-238	D	1.0	2.1E-06	1.3E-04	4.4E-06	6.8E-04	4.0E-07		
Np-237	W	1.0	3.5E-05			7.8E-05			
Pu-239	W	1.0			2.0E-04	2.3E-05			
Am-241	W	1.0				7.6E-08			
Daughters			1.9E-07	9.5E-06	3.5E-07	4.9E-05	2.8E-08		
Source EDE (mrem)			9.4E-05	7.1E-04	2.2E-04	3.5E-03	2.0E-06		

Contribution (mrem) of each nuclide to the maximum individual EDE for the plant

Emission source			PADUCAH C-310	C-710 Lab.*	Seal/wet air exhaust	C-400	Cylinder connection	Building vents**	Total
Nuclide	Solubility	AMAD							
Tc-99	W	1.0	7.0E-06			7.8E-07			7.8E-06
Th-230	W	1.0	4.2E-05			3.3E-05			7.5E-05
U-234	D	1.0	7.9E-06	5.4E-04	1.3E-05	2.5E-03	9.7E-07		3.1E-03
U-235	D	1.0	4.8E-07	3.0E-05	7.2E-07	1.4E-04	5.4E-08		1.7E-04
U-236	D	1.0		1.7E-07					1.7E-07
U-238	D	1.0	2.1E-06	1.3E-04	3.4E-06	6.8E-04	2.6E-07		8.1E-04
Np-237	W	1.0	3.5E-05			7.8E-05			1.1E-04
Pu-239	W	1.0			1.5E-04	2.3E-05			1.8E-04
Am-241	W	1.0				7.6E-08			7.6E-08
Daughters			1.9E-07	9.5E-06	2.7E-07	4.9E-05	1.8E-08		5.9E-05
Source EDE (mrem)			9.4E-05	7.1E-04	1.7E-04	3.5E-03	1.3E-06		4.5E-03
Check totals									4.5E-03

Contribution (mrem/Ci released) of each nuclide to its source maximum EDE

Emission source			PADUCAH C-310	C-710 Lab.*	Seal/wet air exhaust	C-400	Cylinder connection	Building vents**	Total
Nuclide	Solubility	AMAD							
Tc-99	W	1.0	3.5E-02	#DIV/0!	#DIV/0!	2.0E-01	#DIV/0!	#DIV/0!	
Th-230	W	1.0	1.3E+01	#DIV/0!	#DIV/0!	1.2E+02	#DIV/0!	#DIV/0!	
U-234	D	1.0	2.7E-01	2.0E+00	8.4E-01	2.0E+00	2.0E+00	#DIV/0!	
U-235	D	1.0	4.1E-01	2.9E+00	1.2E+00	2.8E+00	2.8E+00	#DIV/0!	
U-236	D	1.0	#DIV/0!	1.9E+00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
U-238	D	1.0	2.4E-01	1.8E+00	7.5E-01	1.8E+00	1.8E+00	#DIV/0!	
Np-237	W	1.0	2.2E+01	#DIV/0!	#DIV/0!	2.0E+02	#DIV/0!	#DIV/0!	
Pu-239	W	1.0	#DIV/0!	#DIV/0!	8.8E+01	2.2E+02	#DIV/0!	#DIV/0!	
Am-241	W	1.0	#DIV/0!	#DIV/0!	#DIV/0!	2.3E+02	#DIV/0!	#DIV/0!	
Daughters			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

SECTION IV - ADDITIONAL INFORMATION

There were no construction projects or modifications at the Paducah Gaseous Diffusion Plant in 1992.

For a discussion of diffuse and fugitive sources, see Section I "Nonpoint Source."

UNPLANNED RELEASES

Whiffs and puffs of UF_6 are classified in the Department of Energy Occurrence Reporting System as unplanned releases. These insignificant emissions occur primarily during cylinder valve cold pressure checks and pigtail disconnections. The whiffs and puffs are usually described as resembling cigar smoke.

Occasionally, an indication that UF_6 has leaked from the miles of cascade piping is discovered by personnel. The indication is usually described as a small yellowish area located on or around cascade machinery, indicating that a puff of UF_6 leaked. UF_6 detector heads are in place in the buildings housing the cascade. The heads are so sensitive as to provide many false alarms. However, there were no instances where investigation of a UF_6 detector alarm indicated that the alarm was due to any leak of UF_6; e.g., when UF_6 detector heads alarmed, and at no time did investigative personnel discover a continuous leak or an indication (yellowish area) near the detector head which would have caused the alarm.

Under normal operations, the seal and wet air exhaust systems do not emit radionuclides. Furthermore, the systems are equipped with alumina traps as a control device for radionuclide emissions. The alumina traps are monitored weekly, and the alumina is changed when radiological contamination reaches specified levels. Occasionally, under abnormal operations such as misvalving cascade piping, UF_6 is routed to the alumina traps. When the traps become saturated, the UF_6 "breaks through" the alumina and travels to the pump oil. The oil and UF_6 react to form a gummy sludge and, unless the situation is corrected expeditiously, the pump shuts down. Prior to pump shutdown or correction of the situation, it is possible for UF_6 to travel through the oil and be emitted from the exhaust system. These emissions are not quantified. There were no documented emissions to the ambient air as a result of seal and/or wet air exhaust alumina trap breakthroughs in 1992.

SECTION V - SUPPLEMENTAL INFORMATION REQUESTED BY DEPARTMENT OF ENERGY

Collective effective dose equivalent (person-rem/year)-50 mile radius:

Emission Source	CEDE, person/rem
C-310 purge stack	0.00089
C-400	0.012
C-710	0.0023
Wet air/seal exhausts	0.0017
Cylinder valve connection	0.0000053
Building ventilation	Not calculated
Total	0.017

COMPLIANCE WITH SUBPARTS Q AND T OF 40 CFR 61

Not applicable

RADON 220, RADON 222 EMISSIONS

Although radon 222 is uranium decay product, the long half-lives of the elements in the decay chain preceding radon 222 preclude its presence or emission in any significant amounts from the Paducah Gaseous Diffusion Plant operations. There are no known sources of thorium 232 and uranium 232 at the Paducah Gaseous Diffusion Plant; therefore, there are no known emissions of radon 220.

STATUS OF COMPLIANCE WITH NATIONAL EMISSION STANDARD FOR HAZARDOUS AIR POLLUTANTS MONITORING REQUIREMENTS OF SUBPART H

The status of compliance with the new National Emission Standard for Hazardous Air Pollutants monitoring requirements is thoroughly described in the revised National Emission Standard for Hazardous Air Pollutants Compliance Plan which was submitted to the Environmental Protection Agency in January 1991. The Paducah Gaseous Diffusion Plant has only one stack subject to the continuous monitoring requirements of Subpart H, the C-310 stack. Particulate stack sampling was performed on the C-310 purge cascade stack in February 1992. Results of the sampling project were forwarded to the Environmental Protection Agency

by March 31, 1992. Documentation from the Environmental Protection Agency (W. A. Smith to D. C. Booher, April 20, 1992) stated that the Paducah Gaseous Diffusion Plant 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 National Emission Standard for Hazardous Air Pollutants Compliance Plan for the Paducah Gaseous Diffusion Plant which was submitted to the Environmental Protection Agency 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, the Paducah Gaseous Diffusion Plant and the Environmental Protection Agency entered into a Federal Facility Compliance Agreement to bring the Paducah Gaseous Diffusion Plant into compliance with the sampling provisions established in 40 CFR 61, Subpart H. Appendix A of the Federal Facility Compliance Agreement contained 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 the Environmental Protection Agency inspected the Paducah Gaseous Diffusion Plant for National Emission Standard for Hazardous Air Pollutants compliance. Correspondence from the Environmental Protection Agency summarizing the inspection stated that there were no new National Emission Standard for Hazardous Air Pollutants violations identified during the inspection. The Paducah Gaseous Diffusion Plant fulfilled all the commitments in Appendix A of the Federal Facility Compliance Agreement in June 1992, submitted the results of the updated, in-depth vent stack survey in December 1992, and officially requested a Certification of Completion of the Federal Facility Compliance Agreement on March 11, 1993. The Environmental Protection Agency issued the Certification of Completion on March 26, 1993. Certification of Completion of the Federal Facility Compliance Agreement indicates that the Paducah Gaseous Diffusion Plant is in compliance with the provisions of 40 CFR 61, Subpart H.

STATUS OF QUALITY ASSURANCE PLAN

The Paducah Gaseous Diffusion Plant's National Emission Standard for Hazardous Air Pollutants Quality Assurance plan was forwarded to the Environmental Protection Agency in June 1992.