Designated Original

Honeywell

Honeywell Chemicals
2768 North US 45 Road
Metropolis, IL 62960

40-3392

July 27, 2005

Mr. Michael G. Raddatz, Sr. Project Manager (UPS: 301-415-6334)
U.S. Nuclear Regulatory Commission
Uranium Processing Section Div. of Fuel Cycle Safety & Safeguards
Fuel Cycle Facilities Branch, Mail Stop T-8A33
Office of Nuclear Material Safety and Safeguards
Two White Flint North, 11545 Rockville Pike
Rockville, MD 20852-2738

Dear Mr. Raddatz:

I am responding to your letter dated June 27, 2005, which requested additional information supporting our request for renewal of the Honeywell Metropolis Works Source Materials License (License No. SUB-526). We have reviewed your questions and provided responses in Enclosure 1 to this letter. Also, enclosed is a CD containing the same information in electronic format.

I hope that you find these responses complete and that they provide a basis for furthering your review of our license renewal application. Should you have any questions on this material, please contact Mr. Darren Mays at 618-524-6396.

Sincerely,

David B. Edwards
Plant Manager

cc: D. Mays
J. Riley

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Enclosure 1 – Responses to USNRC Administrative Review Questions

Item 1: Accident Types, Classifications, Detection, and Mitigation

Your letter requested additional information regarding accident types, classifications, detection, and mitigation, citing the requirements of 10 CFR 40.31 and apparent deficiencies in our submitted safety analysis report (entitled the "Safety Demonstration Report").

Item 1 Response:

The cited sections of 10 CFR 40.31 (apparently 10 CFR 40.31(j)(3)(ii) – (v)) establish requirements for the content of the facility Emergency Plan, which was submitted with our License Renewal Application. Section 2 of the Metropolis Works Emergency Response Plan (ERP) discusses postulated accidents and accident prevention and detection. Specifically, Section 2 of our ERP discusses chemical releases (regardless of cause), seismic events, and weather-related events. Regardless of the events that may initiate an emergency condition, previous analyses have indicated that the only likely event that may result in significant offsite radiological consequences is a release of uranium hexafluoride (UF6). Section 2.1.1 of the ERP provides analyses of the hypothetical results of a major UF6 release. Sections 2.2 and 2.3 of the ERP discuss emergency prevention and detection, respectively. Section 3 of the Emergency Response Plan provides criteria for classifying each type of event, depending on its severity and likely impact, as a Plant Emergency, Alert, or Site Area Emergency.

While we believe that this content is accurate and meets the applicable requirements of 10 CFR 40.31(j)(3), recent meetings with NRC representatives have provided a more complete understanding of NRC concerns and initiatives related to facility accident analyses, including information that was not available during preparation of our license renewal application. We understand that the NRC desires a more comprehensive and quantitative analysis of the facility's likely accident scenarios to identify the bounding accidents and their likely consequences as needed to support the proposed licensing action. To that end, we have undertaken a detailed analysis of the likely accident scenarios, including analyses of event probability and potential impact. Using the outcome of this analysis, we intend to develop a revised Section 7 of our Safety Demonstration Report which, consistent with Regulatory Guide 3.55, summarizes the types of accidents and their potential impacts on occupational safety and the environment and makes appropriate references to the Environmental Report and Radiological Contingency Plan (the Metropolis Works ERP). We expect to complete this activity by September 30, 2005.

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Item 2: Fire Protection System

Your letter requested that we provide additional information on the facility's fire protection system consistent with Regulatory Guide 3.55.

Item 2 Response:

The facility and its original fire protection system were designed and constructed to industrial standards in effect during the 1950s. Much of the original fire protection system design information is no longer available. However, the system has been significantly upgraded and modified during the intervening years. Honeywell headquarters personnel provide guidance and professional expertise on proper selection and design of fire protection system components and equipment. All new installations are designed and constructed to the current applicable NFPA standards.

Honeywell's industrial risk insurance carriers provide expertise and recommendations during their periodic assessments of the fire protection program. The most recent assessment was conducted during 2005. The consultant who conducted the assessment holds a B.S. degree in Chemical Engineering and is a member of both the National Fire Protection Association and the Society of Fire Protection Engineers. The periodic risk assessments audit the systems and programs to current NFPA Standards. Although there is no requirement to modify the installed systems and equipment to meet current NFPA Standards, the consultant identifies any deficiencies in the current installation and maintenance that present a danger to life safety. The consultant provides recommendations for resolving these deficiencies. Recommendations from the periodic fire hazards assessments are tracked to completion by the corporate commitment tracking system.

Section 5.3.2 of our License Renewal Application provides an overview of the facility's fire protection systems. Section 2.7 of our Safety Demonstration Report provides a detailed description of the facility's fire protection system, including its water supply, pumping and distribution system, sprinklers, deluge systems, and system inspections. Section 2.7.2 makes specific reference to NFPA Standards 10 and 24. Drawing MTW-5138, provided in the consolidated Emergency Response Plan, provides additional information on the fire protection system. Section 2.7 of the Safety Demonstration Report also discusses the facility's Emergency Response Team and the facility's working agreement with the Massac County Fire Department. This information is augmented by information provided in the ERP.

With regard to administrative features of the fire protection program, please note the following:

Section 5 of the Metropolis Works Safety Procedures Manual contains procedures addressing facility fire prevention and control. The procedures address a range of subjects, including fire preplanning, control of combustibles and fire hazards, fire alarms, flammable liquids and gases, fire extinguishers, fire protection systems and maintenance, and fire system impairment.

The fire-fighting capabilities of the onsite Emergency Response Team are limited to fighting incipient fires only. As indicated in Section 2.7.3 of the Safety Demonstration

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Report, the facility maintains a letter of assistance with the Massac County Fire Department, which is located approximately 3.5 miles (driving distance) from the facility. Honeywell provides any specialized equipment and services, such as acid-resistant protective equipment and radiological monitoring, that may be required for a fire department response to the facility.

Item 3: Effluent Data

Your letter noted that much of the environmental data provided in our Environmental Report was for the years 2000 through 2003 and requested updated environmental monitoring data through calendar year 2004.

Item 3 Response:

We have prepared and enclosed a revised Section 2 of the Environmental Report (Enclosure 2) and Section 5 of the Safety Demonstration Report (Enclosure 3). Those tables that previously provided environmental monitoring data for the years 2000 through 2003 now provide data for the years 2001 through 2004. Therefore, the reports continue to provide at least four consecutive years of data. We have made corresponding changes to the text of these sections to reflect the use of updated data and have also corrected several administrative errors as indicated by the change bars in the revised text.

Item 4: Passive and Active Engineering Controls

Your letter indicates that our application fails to take credit for recently-installed passive and active engineering controls, personnel training, new systems controlling management of change, or procedural compliance.

Item 4 Response:

Section 6 of our Safety Demonstration Report provides a comprehensive overview of the engineering controls associated with each stage of the uranium conversion process. We intend to incorporate this information into our augmented accident analysis as discussed in the response to Item 1.

Section 2.5 of our License Renewal Application provides an overview of our training program as it relates to facility safety, including general safety training for all personnel and detailed training for Chemical Operators. Section 3.6 of the Safety Demonstration Report and Section 7.2 of the Emergency Response Plan expand upon this information.

Section 1.8 of our Safety Demonstration Report provides a detailed overview of our processes for controlling changes to procedures, facilities, and equipment. This is augmented by information provided in Section 3.3, which specifically addresses processes for controlling development and approval of technical procedures.

Section 2.6.2.4 of the License Renewal Application provides a discussion of the measures instituted to ensure procedural adherence. These measures include

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development of procedures that establish clear requirements regarding management expectations for procedural adherence. These procedural requirements have been reinforced through specific training and ongoing management attention. In addition, procedures that govern the procedure development and review process establish strict requirements governing operating procedure validation and verification, thus ensuring the procedures can be followed as written. Section 2.7 of the License Renewal Application discusses the inspection program that provides assurance of procedural adherence.

2.0 ALTERNATIVES

2.1 Detailed Description of the Alternatives

A detailed description of the No-Action Alternative and the Proposed Action are presented in the following sections.

2.1.1 No-Action Alternative

The alternative of no license renewal for the MTW Specialty Materials plant at the Metropolis, Illinois, site implies cessation of conversion and manufacturing of UF_6 and commencement of decontamination and decommissioning of the facility. The Metropolis facility is the only plant that manufactures UF_6 operating in the

United States. Assuming the requirements of the nuclear industry for reactor fuel, including commercial, military, medical, and research, remain unchanged, selection of this alternative implies transfer of conversion activities to a new site located within the United States or transfer to an existing site located outside of the United States. The operational environmental impacts at the new site would be expected to be similar to those described in Section 4 for the license renewal alternative. In addition, there would be the environmental impacts of new plant construction as well as the loss of uranium conversion capability in the United States for the time it would take to design, construct, and license a new facility.

2.1.2 Proposed Action

Implementation of the license renewal alternative involves continued operation of the facility at production levels consistent with recent practice with a gradual increase in production to the target of 15,000 metric tons per year. Several modifications to the facility are currently planned:

- All surface impoundments are planned for closure by the year 2020.
- An expansion of the existing EPF will be completed and operational by the end of 2005.
- The installation of a cooling tower is planned for 2006 to cool replacement rectifiers in the fluorine production facility.

The manufacturing process and waste management practices are described in this section. The system description presented in this section is adapted from material presented in the Application for Renewal of Source Material License.

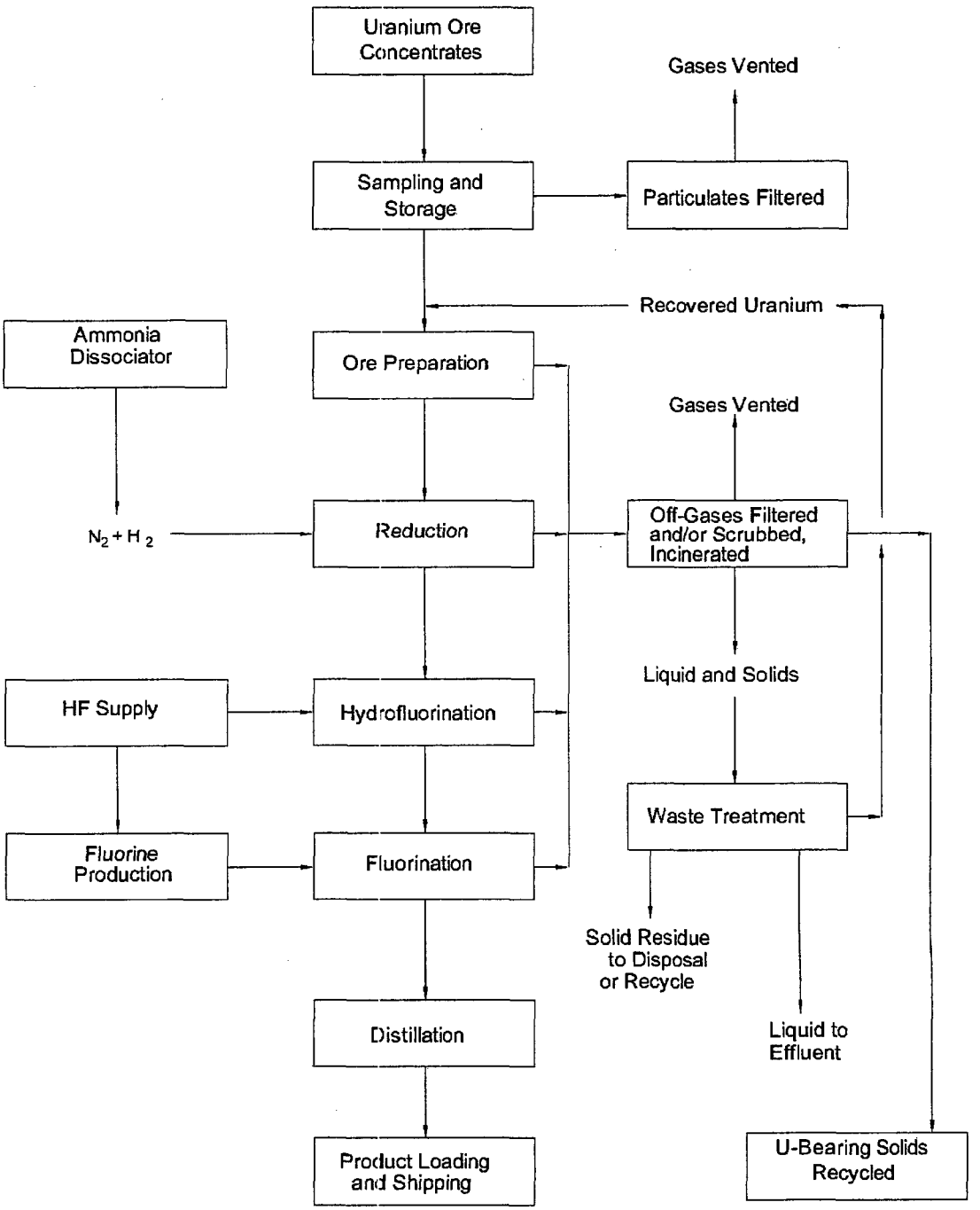
2.1.2.1 Description of the Current Operation

The Metropolis facility is a chemical processing plant that produces several halogenated industrial chemicals as described in Section 1.1. The proposed license renewal is for a portion of the facility that produces uranium hexafluoride (UF_6) from uranium ore concentrates. The current design capacity of the plant is 12,700 metric tons of UF_6 per year (14,000 tons per year). The feed ore contains approximately 75 percent uranium by weight, generally in the form of triuranium octoxide (U_3O_8). The product UF_6 is nearly pure, containing less than 300 parts per million by weight of residual compounds.

The primary processing steps for licensed material are feed ore sampling and preparation, U_3O_8 reduction, uranium oxide (UO_2) hydrofluorination, uranium tetrafluoride (UF_4) fluorination, and UF_6 distillation (product purification). These process steps are conducted in a sequential manner with recycle used only for recovery of uranium from secondary process streams. A diagram showing the conversion process is presented in Figure 2.1-1. The chemical conversion and product purification steps take place in the feed

materials building. Industrial chemicals required for the operations include sulfuric acid (H_2SO_4), ammonia (NH_3), hydrogen fluoride (HF), potassium hydroxide (KOH), sodium hydroxide (NaOH), refrigerants, glycol, hydrogen (H_2), and fluorine (F_2). The balance of this section presents a more detailed description of conversion operations. Waste management operations are described in Section 2.1.2.2.

Figure 2.1-1 Flow Schematic Of The Uranium Oxide To UF_6 Conversion Process At The Metropolis Facility.



Feed Storage, Sampling, and Preparation

Uranium oxide ore concentrates are shipped to the plant via truck in 208-liter (55-gallon) drums and stored onsite on impervious pads. Approximately 650 feed ore shipments are received each year and

approximately 30,000 metric tons (33,000 tons) of ore are stored onsite. Each drum is transported to the sampling plant where the lid is removed and a representative sample is collected to determine the general composition of the ore and to characterize impurities. The lid is replaced and the drum is weighed and moved to a storage area until needed as process feed.

Feed containing high levels of sodium or potassium is leached with sulfuric acid. Uranium feed is removed from the rinse solution by filtration and transferred to the feed preparation system. The filtered rinse solution is pumped to settling ponds 3 and 4 and some particulates are released to the atmosphere.

Feeds with acceptable purity levels are calcined, crushed, and classified to produce solid particles which are processed in fluidized bed reactors. Ventilation air from the feed preparation building is filtered before release to the atmosphere; solid waste filter bags are produced in this operation, and a contaminated liquid stream produced in drum washing is routed to settling ponds 3 and 4.

Reduction

The initial step in the conversion process is reduction of U_3O_8 to UO_2, which is accomplished by contacting feed U_3O_8 with hydrogen (H_2) gas in a fluidized bed reactor at 565°C (1050°F). The H_2 is produced by cracking NH_3 over a catalyst at a temperature of 900°C (1650°F). The reactor offgas is cooled, filtered, and incinerated to oxidize residual H_2 and sulfur compounds before release to the atmosphere. The reduction reactor is fitted with relief valves, alarmed H_2 analyzers, a rupture disk, and pressure sensors to prevent and mitigate the effects of potential explosive conditions. The uranium solids filtered from the reactor offgas are recycled to the ore preparation system. No liquid effluent stream is produced by the reduction process.

Hydrofluorination

Solid UO_2 is converted to solid UF_4 by contacting the UO_2 with gaseous HF in two fluidized bed reactors arranged in series. The hot (455°C [851 °F]) reactor offgas is filtered and scrubbed with water, then with KOH solution before release to the atmosphere. The spent scrubber liquid is processed through the environmental protection facility (EPF) for neutralization and recovery of fluorine as calcium fluoride (CaF_2). The UF_4 solids filtered from the offgas are combined with the UF_4 product stream for transfer to fluorination reactors.

Fluorination

The final chemical reaction in the conversion process is fluorination of UF_4 to UF_6 using F_2 gas. The gaseous F_2 is produced

by decomposition of HF in electrolytic cells located in a building adjoining the feed materials building. The fluorination reaction is accomplished at a temperature of 480°C (900°F) in a fluidized bed containing CaF_2 bed material. The bed material gradually becomes too fine and is continuously removed along with residual Uranium deposits from the process while fresh bed material is continuously added. Contaminated bed material may either be processed onsite or shipped offsite for uranium recovery. The reactor effluent gas stream containing the UF_6 product is passed through two series filters and three series cold traps. The UF_6 is condensed in the cold traps and transferred to the distillation area. Gases exiting the cold traps are scrubbed with KOH solution in series-arranged spray and packed towers. Potassium fluoride mud is removed from the scrubber solution, washed, and recycled to the uranium recovery system. The spent scrubber solution is transferred to the EPF for neutralization, recovery of KOH, and recovery of fluorine as CaF_2. Filtered and scrubbed offgases are released to the atmosphere.

Distillation and Product Packaging

Impurities are removed from the liquefied crude UF_6 in two series-arranged distillation columns. Crude UF_6 is fed to the first column and impurities with high vapor pressure are removed as the overheads from this column. The bottoms from the first column are fed to the second column where impurities with low vapor pressure are removed as the bottoms and the purified UF_6 product is collected in the overheads. Each column is fitted with temperature and pressure indicators, a relief valve, and rupture disk to prevent accidental release of UF_6. The columns are vented to the purification system feed and surge tanks. The purified product UF_6 vapor is condensed and transferred as liquid to cylinders placed on load cells. Flow totalizers are used to measure the amount of UF_6 transferred to the cylinder and the UF_6 entering the cylinder is continuously sampled. On occasion, filled cylinders are heated in a steam chest for vaporization or sampling. Following filling, cylinders are moved to cooling and storage areas.

Uranium Recovery

Fluorinator filter fines and beds material, solids from settling ponds 3 and 4, and process liquids may be processed for uranium recovery. The uranium recovery system is a series of mixing, settling, and separation tanks in which uranium is precipitated as a sodium uranyl carbonate salt through contact with sodium carbonate and sodium hydroxide. The settled or filtered uranium solids are dried and recycled to the feed pretreatment system. The spent liquid is transferred to the EPF for neutralization and fluoride recovery.

Industrial Chemical Storage

The primary industrial chemicals used in the conversion process, sulfuric acid (H_2SO_4), NH_3, KOH, NaOH, and HF, are stored onsite. The bounding and frequently actual quantities of these chemicals are presented in Table 2.1-1. Sulfuric acid, KOH, and NaOH are stored as liquids in horizontal tanks and transferred to the process as needed by centrifugal pumps. Ammonia (NH_3) is stored as a liquid under pressure and transferred to the process by increasing this vapor pressure using pressurized steam. The NH_3 storage tank is fitted with a relief valve that vents to the atmosphere at a point 6 meters (20 feet) above grade. Anhydrous HF is stored in three horizontal tanks and is transferred to the process under inert gas pressure. Each tank is fitted with a relief valve and rupture disk and is vented to a dump tank of similar design. The dump tank is vented through a scrubber with noncondensible gases released to the atmosphere and absorbed HF transferred to the plant wastewater treatment plant.

Table 2.1-1 Bounding Quantities Of Industrial Chemical Used In The Conversion Process At The Metropolis Facility

Chemical	Maximum Storage Quantity (lbs)
NH_3	117,618
HF	161,158
KOH	419,722
NaOH	8,903
H_2SO_4	55,816

2.1.2.2 Waste Confinement and Effluent Controls

Gaseous, liquid, and solid wastes are produced at the Metropolis facility. A description of each of these waste streams is presented in the following text.

Gaseous Waste Management

Gaseous effluents from the UF_6 production facilities contain both radioactive and nonradioactive constituents. Uranium processing areas that produce dusts, mists, or fumes containing uranium or other toxic materials are provided with dust collectors or scrubbers to reduce employee or environmental exposure to as low as is reasonably achievable (ALARA). All plant emissions that may contain significant amounts of radioactive material are monitored continuously as described in Section 2.2.1. Gaseous effluent streams containing nonradioactive pollutants are discharged in accordance with operating permits issued from the Illinois Environmental Protection Agency (IEPA).

The Metropolis facility has 52 individual stacks and exhaust fans used for release of radioactive material and 25 stacks for release of nonradioactive material. These emission sources are primarily from the 32-meter (105-foot) feed materials building and are at various elevations. The locations of the feed materials building and other facilities onsite are shown on Figure 1.1-1. The contaminant and type of pollution control device (including its rated efficiency) for each process stack are presented in Table 2.1-2. The discharge direction, height, flow and estimated annual release of radioactivity for each stack is presented in Table 2.1-3. Uranium is the primary radiological constituent released through the stacks. Fluoride (as HF) and particulates are the primary nonradiological constituents released through stacks on the feed materials building.

Thirteen process and 33 ventilation exhaust stacks are located on the feed materials building. The ventilation system used in the UF_6 process area consists of a series of Dravo fresh-air intake units and a series of window and roof exhaust fans for cleaning workroom air. The total airflow through the process building is sufficient to ensure a complete air change out approximately once every five minutes. A separate air-conditioning system is used to supply fresh air to the main control room. The control room is kept under a slight positive pressure.

The four process stacks onsite are associated with the uranium recovery system and the ore sampling building. The ventilation exhaust (Stack 15-57) from the CaF_2 facility is also monitored for uranium, but uranium emissions have typically been below the detection limit.

Total nonradiological emissions from the plant are summarized in Table 2.1-4.

Table 2.1-2 Significant Air Emission Units And Emission Control Equipment At The Metropolis Facility

Emission Unit	Description	Date Constructed	Emission Control Equipment
Unit 01	UF_6 Manufacturing Process Emission Unit 1	Pre 1973	Dust collectors and scrubbers
Unit 02	Fluorine Plant: 5 kA, 6kA, 15kA Cells (includes additional 15 kA cells and melt reactor	Pre 1972	Hydrogen gas scrubbers, Fluorine scrubbers, Maintenance booth scrubber, Melt scrubber
Unit 03	Process Emission Unit 03 SbF_5 Manufacturing Process		Liquid fluorine purge gas scrubber; KOH scrubber
Unit 04	Sulfur Hexafluoride Packaging	1980	Shot blaster dust collector; Paint booth filter/exhaust
Unit 05	Iodine Pentafluoride Unit	1972	KOH spray tower (P-190), Packed tower scrubber (T-16), Process fume scrubber (T-14)
Unit 06	Ponds mud calciner with dryer (max heat input 3 mmBtu/hr	1972	Secondary baghouse (F182) and baghouse system (F181)
Unit 07	Calcium fluoride cage - Mill flash dryer (max heat input 4.0 mmBtu/hr	1981	Dust collector
Unit 08	Lime silo (Acid neutralization base regeneration)	1974	Dust collector
Unit 09	Sandblasting recovery	1983	Dust collector and blower
Unit 10	Waste gas incinerator manufacturer	1976	None
Unit 11	Former trash incinerator unit removed from service	1972	None
Unit 12	Natural gas fired boilers 1,2, and 3; (Distillate oil backup) maximum heat input capacity 18 mmBtu/hr	1972	None
Unit 13	Tank farm	1972	Scrubber
Unit 14	Fugitive emissions from exhaust fans		None

Source: Illinois EPA, 2003

Table 2.1-3 Discharge Direction, Stack Height, Flow And Annual Uranium Emissions For The Years 2000 - 2004

Stack No.	Description	Discharge Direction	Height m	Flow m^3/min	Uranium emissions (ci/yr)				
					2000	2001	2002	2003	2004
1-1	Wet oxide dust collector	V	30	143	1.55E-03	2.43E-03	7.71E-04	2.84E-04	6.73E-05
1-2	Dry oxide dust collector	H	32	75	2.77E-03	6.59E-03	3.52E-03	9.27E-05	4.49E-05
1-3	Drum cleaner dust collector	V	12	122	1.76E-04	2.51E-04	1.51E-04	1.86E-04	2.79E-04
1-4	Oxide vacuum cleaner	H	30	12	2.54E-05	1.04E-04	2.69E-04	2.22E-04	1.55E-04
1-7	UF_4 vacuum cleaner	H	4	21	1.31E-04	1.81E-04	1.41E-03	2.33E-04	2.50E-04
1-10	"B" UF, dust collector	V	30	12	1.46E-03	1.89E-04	9.10E-05	2.94E-03	3.27E-03
1-11	Dust collector for secondary DC	V	12	167	7.57E-05	5.83E-06	6.45E-07	8.45E-09	0.00E+00
1-12	Ash vacuum cleaner	H	26	73	8.41E-03	1.19E-02	9.01E-03	2.94E-03	5.37E-03
1-12	Ash dust collector	H	26	73	3.24E-03	1.42E-03	1.36E-03	2.26E-04	1.40E-04
1-13	"A" fluorination coke box	V	32	5	1.03E-02	1.37E-02	3.13E-02	2.25E-02	1.09E-02
1-14	"B" fluorination coke box	V	32	5	2.44E-02	1.14E-02	4.29E-02	4.11E-02	1.36E-02
1-46	"A" UF_4 dust collector	V	30	30	6.65E-05	5.50E-03	7.80E-04	7.07E-04	6.77E-05
1-48	H_2S incinerator stack	V	47	184	1.62E-04	2.05E-03	1.22E-04	6.37E-05	8.16E-05
1-49	Distillation multifloor exhaust				1.14E-03	1.10E-03	1.17E-03	1.15E003	1.50E-03

Table 2.1-3 Discharge Direction, Stack Height, Flow And Annual Uranium Emissions For The Years 2000 - 2004 (continued)

Stack No.	Description	Discharge Direction	Height m	Flow m^3/min	Uranium emissions (ci/yr)				
					2000	2001	2002	2003	2004
1-54	Drum invertor dust collector	V	6	436	1.72E-03	2.94E-03	9.83E-03	4.52E-03	3.74E-04
3-2	U-recovery dust collector	V	12	13	1.34E-05	1.98E-05	7.92E-06	1.50E-08	2.44E-08
4-2	Pond mud calciner	V	9	93	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
17-1	Sampling plant dust collector	V	7	214	1.32E-04	5.31E-05	3.93E-05	3.83E-05	4.03E-05
17-2	Sampling plant vacuum cleaner	H	4	14	9.58E-04	1.07E-03	1.03E-03	3.87E-04	3.59E-04
	Total process emissions								
1-15	"A" reductor blower	H	23	28	5.69E-04	4.19E-04	2.73E-04	2.71E-04	1.43E-04
1-16	"B" reductor blower	H	23	28	1.57E-03	4.62E-04	4.55E-04	2.66E-04	1.70E-03
1-17	"A" top hydrofluorinator blower	H	14	188	4.16E-03	5.17E-03	5.09E-03	3.84E-03	2.61E-03
1-18	"A" bottom hydrofluorinator blower	H	4	188	2.93E-07	1.74E-06	2.31E-05	4.42E-06	1.29E-05
1-19	"B" top hydrofluorinator blower	H	12	28	4.70E-04	3.56E-04	1.66E-04	1.94E-04	2.95E-04
1-20	"B" bottom hydrofluorinator blower	H	14	28	2.61E-04	3.48E-04	4.52E-04	1.45E-04	2.51E-04
1-21	"A" fluorinator blower	H	9	120	5.85E-04	2.46E-04	5.91E-04	3.08E-04	2.21E-04
1-22	"B" fluorinator blower	H	9	120	3.22E-04	3.59E-04	0.00E+00	0.00E+00	4.05E-04

Table 2.1-3 Discharge Direction, Stack Height, Flow And Annual Uranium Emissions For The Years 2000 - 2004 (continued)

Stack No.	Description	Discharge Direction	Height m	Flow m^3/min	Uranium emissions (ci/yr)				
					2000	2001	2002	2003	2004
1-26	Ore prep multifloor exhaust	V	18	400	2.95E-06	3.89E-05	2.51E-04	9.26E-04	0.00E+00
1-27	Exhaust fan 1st floor south	H	5	651	3.36E-04	4.64E-04	2.20E-04	1.74E-04	1.62E-04
1-28	Exhaust fan 1st floor west	H	5	651	3.51E-03	1.84E-03	4.56E-03	2.23E-03	2.90E-03
1-29	Exhaust fan 2nd floor south	H	9	651	5.06E-03	4.31E-03	4.08E-03	5.16E-04	1.32E-03
1-30	Exhaust fan 3rd floor south	H	14	651	4.77E-03	4.13E-03	4.80E-03	2.18E-03	3.26E-03
1-31	Exhaust fan 3rd floor west	H	14	651	3.85E 03	4.06E 03	3.75E-03	5.57E-04	1.43E-03
1-32	Exhaust fan 3rd floor south	H	14	651	2.81E-03	9.05E-04	3.63E-03	1.34E-03	2.55E-03
1-33	Exhaust fan 3rd floor north	H	14	651	3.65E-03	8.10E-04	3.40E-05	0.00E+00	1.34E-05
1-34	Exhaust fan 4th floor south	H	18	651	4.48E-03	4.98E-03	5.94E-03	8.05E-04	9.83E-04
1-35	Exhaust fan 4th floor west	H	18	651	3.95E-03	5.16E-03	5.45E-03	1.55E-03	2.29E-03
1-36	Exhaust fan 4th floor south	H	18	651	4.40E-03	4.83E-03	5.05E-03	2.36E-03	3.68E-03
1-37	Exhaust fan 5th floor south	H	23	651	1.80E-03	1.01E-03	2.89E-03	1.92E-03	1.51E-03
1-38	Exhaust fan 5th floor west	H	23	651	3.54E-03	3.82E-03	2.79E-03	1.70E-03	1.99E-03
1-39	Exhaust fan 5th floor south	H	23	651	3.34E-03	3.76E-03	1.86E-03	1.97E-03	2.05E-03
1-41	Exhaust fan overhead no. 2	V	27	708	4.07E-03	4.47E-03	2.82E-03	3.18E-04	4.25E-05

Table 2.1-3 Discharge Direction, Stack Height, Flow And Annual Uranium Emissions For The Years 2000 – 2004 (continued)

Stack No.	Description	Discharge Direction	Height m	Flow m^3/min	Uranium emissions (ci/yr)				
					2000	2001	2002	2003	2004
1-42	Exhaust fan overhead no. 3	V	27	708	1.11E-03	3.95E-03	3.03E-03	3.16E-03	2.03E-03
1-43	Exhaust fan overhead no. 4	V	27	708	4.97E-03	5.50E-03	3.60E-03	2.36E-03	2.24E-03
1-45	NH_3 vent	V	18	356	3.14E-03	2.38E-03	3.04E-03	2.16E-03	1.79E-03
1-47	"C" fluorinator blower	H	9	120	1.82E-04	5.06E-04	9.65E-05	4.57E-04	1.40E-03
1-50	"A" reductor off-gas	H	20	21	3.35E-05	3.22E-05	2.41E-05	2.61E-05	3.91E-05
1-51	"B" reductor off-gas	H	20	34	5.61E-05	5.22E-05	3.61E-05	4.05E-05	1.47E-04
1-55	Exhaust fan 3rd floor north	H	14	242	5.99E-04	7.58E-04	8.41E-04	1.99E-04	5.31E-04
1-56	Exhaust fan distillation 1st floor north	H	7	747	8.15E-04	5.54E-04	8.27E-04	5.30E-04	6.00E-04
1-57	Sampling plant vacuum cleaner				7.04E-06	4.79E-06	2.41E-06	2.17E-06	1.42E-06
1-58	Exhaust fan 3rd floor east				3.38E-04	6.82E-04	4.34E-06	0.00E+00	0.00E+00
	Total ventilation emissions								

Table 2.1-4 Nonradiological Air Emissions From The Metropolis Plant - 2000 to 2004

Air Emissions (tons)	CO	HF	Lead	NH3	Non-VOM	NOx	PM	PM10	SO2	VOM
2000	6.7239	4.0885	0	n/a	0	18.743	4.7624	2.7096	169.0806	8.6983
2001	6.6083	4.251	0	n/a	8.8458*	18.4335	5.0898	3.0743	175.3188	1.0659
2002	7.4679	4.2848	0.000078	0.49495	7.5505*	19.6651	5.6822	n/a	172.9204	1.4984
2003	10.9905	4.1904	0.000065	1.0105	Not required**	13.0062	4.2847	3.3683	175.2911	1.1614
2004	10.0359	6.0096	0.00006	0.9305	Not required**	11.9475	5.7149	2.541	87.1096	0.6791

* Non-VOM reporting increase due to re-interpretation of VOM/Non-VOM relationship
** Non-VOM no longer required after Title V permit issuance
*** Includes emissions from non-licensed activities

Liquid Waste Management

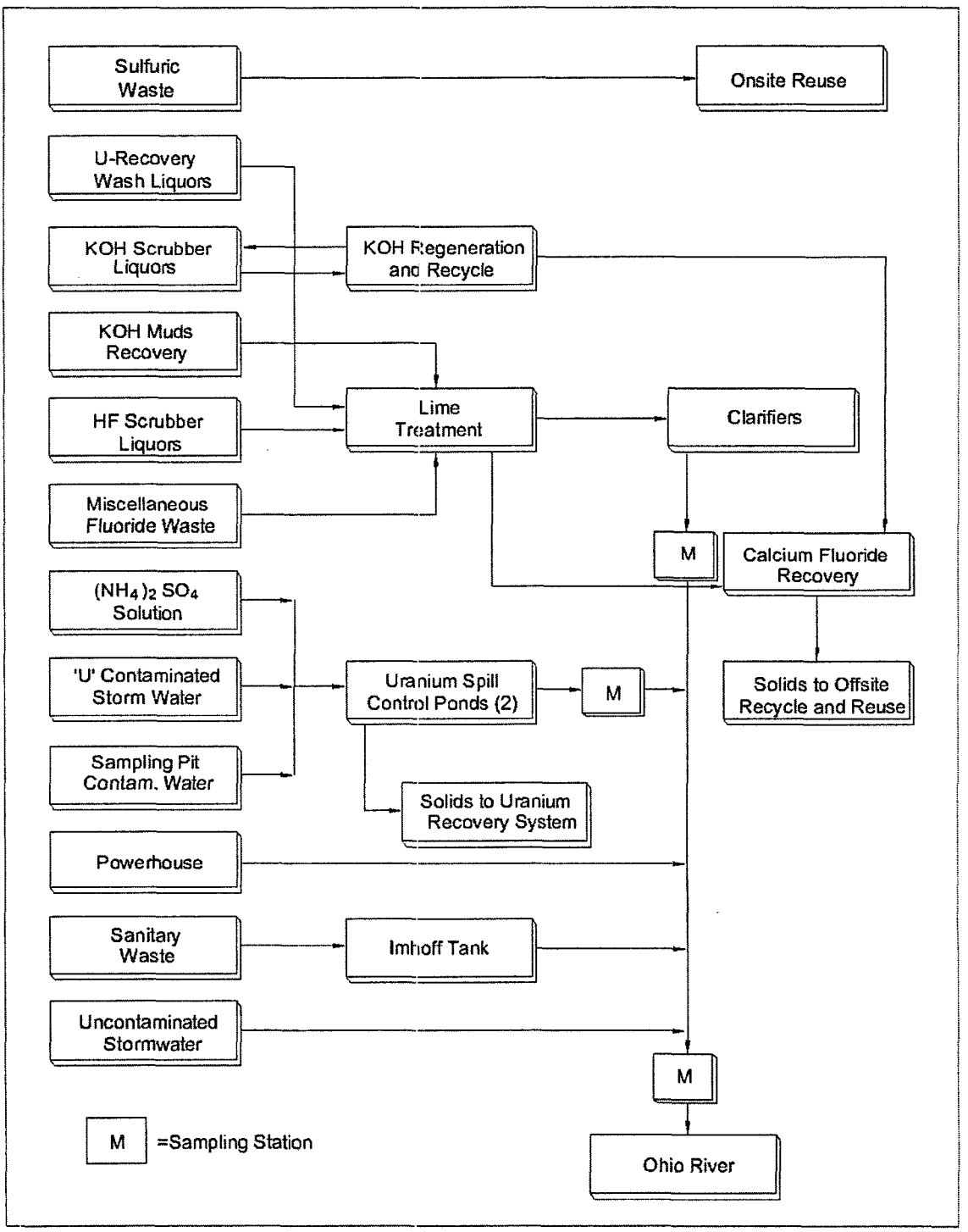
Liquid waste streams generated at the Metropolis facility are categorized as low-level radioactive and nonradioactive waste streams. Each of the waste streams is recycled or treated separately. Most UF_6 process related liquid effluents from the plant are discharged from Outfall 002 to the Ohio River through a natural drainage. Some liquid wastes may be containerized and sent to an appropriate disposal facility. A flow diagram showing liquid waste streams and their disposition is given in Figure 2.1-2.

Low-Level Radioactive Liquid Waste Streams and Treatment

Low-level radioactive liquid wastes produced at the Metropolis facility consist of wash water from the ore sampling building, ammonium sulfate process solutions from the pre-treatment facility, HF scrubber liquors from the hydrofluorinators, KOH scrubbing solutions from air pollution abatement equipment, sodium hydroxide leach liquors from uranium recovery and UF_6 cylinder washing, and uranium contaminated storm water from the feed material building area. The KOH scrubbing solutions are regenerated and recycled onsite and solids removed from the scrubber solutions are processed for calcium fluoride recovery.

Washwaters from the ore sampling building and ammonium sulfate solutions from the pretreatment facility area are routed to uranium settling ponds 3 and 4 where the pH is maintained slightly basic to minimize dissolved uranium loss. Effluent flow from ponds 3 and 4 averages about 94 liters (25 gallons) per minute and is mixed with other plant effluents before discharge at Outfall 002. Sludge from ponds 3 and 4 is periodically removed to maintain at least 0.6 meters (2 feet) of freeboard. It is pumped to the ponds mud calciner to be dried and packaged into drums. The dried solids are processed through the uranium recovery system.

Figure 2.1-2 Flow Diagram For Wastewater Disposition



Wastewaters with significant quantities of fluoride (i.e., HF scrubbing liquors and uranium recovery leach liquors) are routed to the EPF for lime treatment and recovery of the fluoride as CaF2 in settling ponds. The effluent from the EPF is in the normal operating range of 11-12 pH and is sent to the settling ponds. Prior to release to Outfall 002, the pH is adjusted with sulfuric acid to a range of 6-9. This stream is combined with other plant effluents before discharge at Outfall 002. Calcium fluoride that precipitates in the EPF settling basins is recovered for recycle by commercial industry to use as a substitute for natural fluorspar.

MTW is currently modifying the Environmental Protection Facility (EPF), planned for completion by the end of 2005. This facility will improve the capacity of the existing EPF. The primary function of the EPF is treatment of wastewater. The modified EPF will contain an additional high capacity clarifier and new sand filters. These facilities will replace the surface impoundments for the treatment and settling of wastewater. The surface impoundments will be taken out of service and closed as stipulated in the current RCRA permit (#B6-65-CA-11). MTW expects to complete installation and initiate operation of these systems during 2005.

Mixed Liquid Waste Streams and Treatment

There are no mixed waste streams generated as part of the UF_6 manufacturing process. Liquid mixed waste currently in onsite storage was generated from activities that support UF_6 production, including maintenance and laboratory activities. Typical mixed wastes include items such as radiologically contaminated xylene paint thinner, used lubricating oils, and waste naphtha from maintenance or cleaning activities; and waste acetone, tributylphosphate, TEHP, and CFC-113 from various laboratory activities.

The volume of liquid mixed waste generated at the plant is quite variable. In 2004, 1,610 gallons of liquid mixed waste were shipped to a licensed disposal facility. Currently, 1,539 gallons is stored on site. All of the mixed waste is stored on a Resource Conservation and Recovery Act (RCRA)-permitted storage pad pending the availability of offsite facilities to either treat or dispose of these wastes.

Nonradiological Aqueous Waste Streams and Treatment

Nonradiological aqueous waste streams include sanitary wastewater, non-contact cooling water, treated effluents from the EPF and storm water runoff. An Imhoff tank is used for primary treatment of sanitary waste water before discharge to Outfall 002. Hazardous liquid wastes are drummed, analyzed, and disposed of using outside contractors.

Liquid Waste Release Rates

Liquid effluents from the restricted area are discharged through Outfall 002 to the Ohio River via natural drainage in accordance with a National Pollutant Discharge Elimination System (NPDES) permit (No. IL 0004421). In 2004, the average effluent discharge rate was 3.42 million gallons per day. All effluent at Outfall 002 is continuously sampled and monitored. There are no NPDES monitoring requirements for Outfalls 004 and 005 under the IEPA permit.

Solid Waste Management

Solid wastes generated at the Metropolis facility include low-level radioactive, nonradioactive and hazardous wastes. A combination of recycling, compaction, and offsite disposal are used in management of these wastes. See section 3.12 for details on the treatment and disposal of these wastes.

2.1.2.3 Monitoring Programs

Monitoring programs at the Metropolis facility are comprised of effluent monitoring of air and water, environmental monitoring of various media (air, surface water, soil, vegetation and direct gamma radiation) and occupational monitoring for workers. The occupational monitoring program provides a basis for evaluation of public health and safety impacts, for establishing compliance with environmental regulations, and for development of mitigation measures if necessary. Monitoring activities are described in more detail in the following subsections.

Effluent Monitoring Program

The Metropolis facility produces gaseous and liquid effluent streams. Each of these effluent streams is monitored at or just before the point of release. Results from the gaseous and liquid radiological effluent monitoring program are reviewed weekly. Undesirable trends are reported to plant management via ALARA meetings, quarterly health physics audits, or immediately depending on the severity of the condition. Results from the monitoring program are also reported in the semi-annual effluent reports submitted to NRC. The following paragraphs describe the monitoring programs for gaseous and liquid releases.

Gaseous Release Monitoring

Gaseous effluents released from the Metropolis facility contain both radiological and nonradiological constituents as described in Section 2.1.2.2. Stack monitoring is the primary method used to measure gaseous effluents containing uranium. These release points are sampled continuously at isokinetic flow conditions using particulate filters to capture the uranium. Stack samples from

sources with higher loading potential (based on process evaluations and 35 years of historical data) are collected twice per 24 hours and counted for alpha radioactivity. If the uranium loading potential is smaller, the samples are collected and counted once each 24 hours.

The dust collectors typically have primary and secondary (backup) units arranged in series. Secondary dust collector exits have an investigation limit of 5,000 disintegrations per minute (dpm) except the ash dust collector that has an investigation limit of 10,000 dpm because it is exposed to 2-3 percent uranium. Primary dust collector exits have an investigation limit of 15,000 dpm. When the investigation limit is exceeded on three successive samples, an informal investigation is conducted and actions taken to decrease emissions. If the action does not remedy the situation, additional actions are taken including shutdown of the unit. The results of the effluent monitoring analyses are submitted to the NRC in semi-annual monitoring reports. Results for the gaseous effluent radiological monitoring from 2000 to 2004 are summarized in Table 2.1-3.

An investigation level for gaseous uranium emissions is used based on the average of four (4) continuous air samples collected at the restricted area fence line. The samples are collected and analyzed for trends on a weekly basis. The investigation level is based on a quarterly uranium concentration that would produce an annualized dose of 10 mrem. In addition, uranium in the air is monitored at sampling location NR-7, adjacent to the home of the nearest resident, north-northeast of the plant (see Figure 2.1-3).

Compliance with 40 CFR 190 dose limits for members of the public is determined as follows: If the average concentration of total alpha radioactivity (the sum of natural uranium, radium-226, and thorium-230) measured from samples collected from existing Station No. NR-7 (adjacent to the home of the nearest resident north-northeast of the plant) exceeds 3.0×10^{-14} µCi/ml over any calendar quarter, MTW, within 30 days, shall prepare and submit to the NRC a written report that identifies the cause for exceeding the limit and the corrective actions to be taken by the licensee to reduce radioactivity release rates. If the parameters important to a dose assessment change, a report shall be submitted within 30 days that describes the changes in parameters and includes an estimate of the resultant change in dose commitment.

If projections indicate that the calculated dose to any member of the public in any consecutive 12-month period will exceed the limits specified in 40 CFR 190.10, MTW shall take immediate steps to reduce emissions so as to comply with 40 CFR 190.10 or, as provided in 40 CFR 190.11, MTW may petition the NRC for a variance from the requirements of 40 CFR 190.10. If a petition for a variance is anticipated, MTW shall submit the request at least 90 days prior to exceeding the limits specified in 40 CFR 190.10.

Continuous air sampling is conducted at all the stations. The air samples are composited at each station and analyzed at least monthly for uranium and at least quarterly for radium-226 and thorium-230. All radiological analyses specified above are performed with analytical sensitivity of at least 10^{-16} µCi/ml.

Samples taken at Station No. NR-7 are composited at least quarterly and analyzed for uranium solubility. The solubility analysis follows the methodology and procedures established by Pacific Northwest National Laboratories (PNNL), or an equivalent method acceptable to NRC.

The air sampler at Station No. NR-7 is operated continuously except for those periods required for disassembly or repair. A one (1) micron particle size is assumed for purposes of dose calculation.

The actual material solubilities and air concentrations, determined as required in this license condition, are used to calculate the dose to the public for purposes of demonstrating compliance with 40 CFR 190. The computer code "COMPLY" is utilized to estimate the dose produced from stack emissions.

The results of the gaseous uranium emissions data from NR-7 are summarized on Table 2.1-5. Review of the tabulated values indicates that there have been two exceedances of the 3.0 x 10^{-14} micro Ci/cc action level in the 2001-2004 timeframe. These exceedances occurred in the second quarter of 2001 and the fourth quarter of 2003.

Figure 2.1-3 Environmental Air Sampling Stations

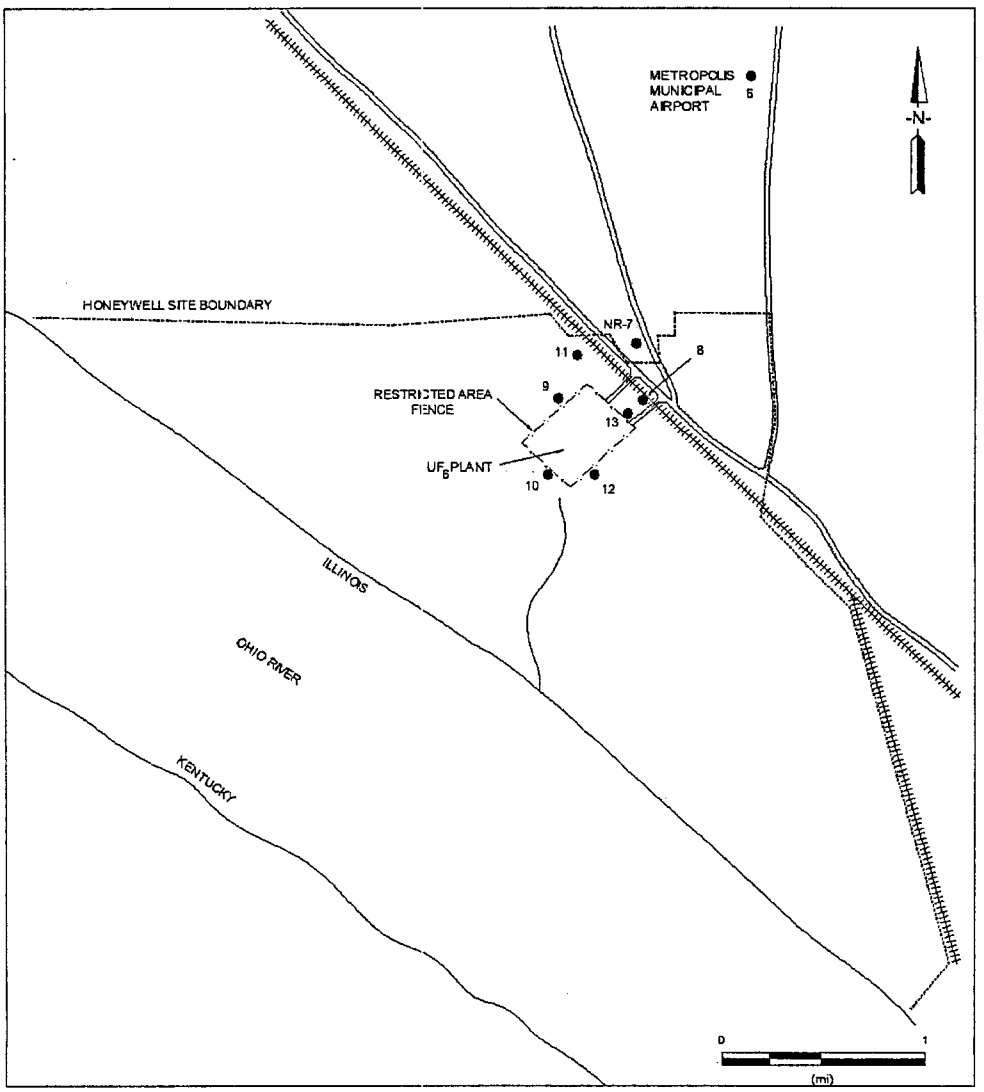


Table 2.1-5 Summary Of Gaseous Emissions Data Collected From Location NR-7

YEAR	CONCENTRATION			PARTICLE SIZE	SOLUBILITY FRACTION		
	U(NAT) µCi/cc	Ra226 µCi/cc	Th230 µCi/cc	AMAD	"D"	"W"	"Y"
1st Qtr. 2001	1.24E-14	2.80E-16	6.65E-16	1	0.530	0.470	
2nd Qtr. 2001	3.72E-14	1.49E-16	5.61E-16	1	0.591	0.407	
3rd Qtr. 2001	1.33E-14	1.81E-17	1.27E-16	1	0.515	0.488	
4th Qtr. 2001	1.13E-14	4.00E-17	2.00E-17	1	0.644	0.356	
1st Qtr. 2002	8.82E-15	1.62E-17	5.36E-16	1	0.731		0.269
2nd Qtr. 2002	6.26E-15	1.63E-17	1.63E-17	1	0.956	0.044	
3rd Qtr. 2002	5.46E-15	2.59E-16	7.93E-16	1	0.287	0.713	
4th Qtr. 2002	7.68E-15	1.66E-17	1.66E-17	1	0.646	0.354	
1st Qtr. 2003	9.34E-15	1.62E-17	1.20E-15	1	0.619	0.381	
2nd Qtr. 2003	1.05E-14	3.34E-17	4.34E-16	1	0.588	0.412	
3rd Qtr. 2003	5.48E-15	1.63E-17	9.05E-15	1	0.704	0.296	
4th Qtr. 2003	8.22E-14	1.07E-16	6.29E-15	1	0.879	0.121	
1st Qtr. 2004	1.60E-15	6.75E-17	5.51E-16	1	0.628		0.372
2nd Qtr. 2004	7.15E-15	1.34E-16	1.33E-16	1	0.678		0.323
3rd Qtr. 2004	5.09E-15	1.22E-17	3.11E-17	1	0.767		0.232
4th Qtr. 2004	7.68E-15	1.22E-25	1.73E-25	1	0.708		0.292

AMAD - Activity Median Aerodynamic Diameter

Liquid Release Monitoring

All treated process and sanitary liquid wastes from the restricted area of the Metropolis facility are discharged through Outfall 002, an NPDES controlled release point. The outfall discharges to an unlined, natural drainage ditch that flows into the Ohio River. This ditch also carries runoff from the restricted area during periods of heavy precipitation.

The Outfall 002 effluent is continuously sampled to produce a daily composite that is analyzed for uranium. The investigation level for uranium in the liquid effluent is established at 1.0 ppm uranium as a monthly average.

The effluent from Outfall 002 is also analyzed for numerous nonradiological constituents as summarized in Table 2.1-6. These constituents include pH, temperature, total fluorides, totals suspended solids, and biological oxygen demand.

Table 2.1-6 Summary Of Monitoring Results For NPDES Outfall 002- 2000 to 2004

		2000		2001		2002		2003		2004	
		Max.	**Avg.**	**Max.**	**Avg.**	**Max.**	**Avg.**	**Max.**	**Avg.**	**Max.**	**Avg.**
Parameter	Units										
Flow Rate	MGD	4.68	3.38	4.73	3.40	5.03	3.54	4.86	3.27	4.75	3.42
Uranium	Mg/L	2.29	0.25	1.19	0.19	0.89	0.10	0.55	0.10	0.52	0.08
PH	SU	8.0	7.1	8.9	7.4	7.6	7.4	7.9	7.4	7.8	7.4
Temperature	°C	25.4	20.3	22.8	19.8	21.9	19.3	22.3	19.3	22.2	19.7
Tot. Fluorides	Mg/L	10.52	3.53	8.90	2.92	7.14	3.25	18.52	3.16	8.92	1.92
TSS	Mg/L	8.40	1.25	31.40	2.11	5.20	1.30	7.40	1.84	6.40	1.18
BOD	Mg/L	29.44	9.55	18.75	4.23	16.42	5.05	7.08	2.54	6.66	1.28

Environmental Monitoring Program

MTW conducts an environmental monitoring program that samples sediment, soil, vegetation, surface water, and air and measures direct gamma radiation at locations on or near the facility as summarized in Table 2.1-7. The frequency of sampling and the constituents sampled as part of this program are also summarized in Table 2.1-7. The location of onsite sampling points are shown in Figure 1.1-1 and offsite sampling locations are shown on figures that support the discussions that follow. Results from the radiological environmental monitoring program are reviewed by the Health Physicist. Plant management is made aware of undesirable trends and results that may show non-compliance with applicable standards. Elements of the environmental monitoring program are described in the following paragraphs.

Table 2.1-7 Summary Of Effluent And Environmental Monitoring Programs[a]

Sample Medium	Number of Stations	Analytical Frequency	Sample Type	Type of Analysis[b]
Onsite				
Air	6	Quarterly	Continuous	Uranium, Ra-226, Th-230, Fluoride
Soil	6	Semiannually	Grab	Uranium, fluoride
Vegetation	6	Semiannually	Grab	Uranium, fluoride
Ambient Radiation	4	Quarterly	Continuous	Gamma
Surface water	1	Monthly Monthly	Continuous Continuous	Uranium, gross alpha, gross beta Suspended solids, dissolved solids, pH, fluorides, other chemicals (see Table 2.12)
Sediment	2	Semiannually	Grab	Uranium, fluoride
Offsite				
Air	2	Weekly	Continuous	Uranium,Ra-226, Th-230, fluoride
Soil	7	Semiannually	Grab	Uranium, fluoride
Vegetation	7	Semiannually	Grab	Uranium, fluoride
Ambient radiation	2	Quarterly	Continuous	Gamma
Surface water	7	Semiannually	Grab	Uranium, fluoride
Sediment	7	Semiannually	Grab	Uranium, fluoride

[a] Refer to Figures 2.1-3 and 2.1-4 for sampling locations
[b] Does not include NPDES monitoring or RCRA monitoring requirements

The plant ALARA committee meets quarterly to evaluate data and identify any undesirable trends in environmental exposures. Investigation and action plans are developed, as necessary.

Air Monitoring

The environmental air monitoring program uses continuous low volume air samples at four points along the restricted area fence line (Stations No. 9, 10, 12 and 13), at two points located near the site boundary in the prevailing wind direction (Stations No. 8 and 11), and at two offsite points, one location at the nearest downwind residence (station number NR-7 on Figure 2.1-3) and one location approximately one mile downwind of the feed materials building (Station No. 6). The sampling locations are shown on Figure 2.1-3 and Figure 2.1-4. Cumulative samples are collected weekly and analyzed for uranium and fluoride. A quarterly composite of the 13 weekly samples is analyzed for airborne concentrations of Ra-226 and Th-230. A high volume continuous air sampler is located at the nearest residence (NR-7).

Tables 2.1-8 and 2.1-9 summarize the results of the environmental air monitoring for 2001 - 2004 for uranium, radium and thorium. The maximum annual average uranium concentration in air occurred in 2001 at sampling Station No. 13 and was 3.94×10^{-14} µCi/ml. The maximum concentration of radium - 226 of 1.22×10^{-16} µCi/ml occurred in 2001 at station NR-7 and the maximum concentration of Thorium-230 of 4.24×10^{-15} µCi/ml occurred in 2003 at station NR-7. Comparison of the air monitoring results from 2001 to 2004 with those reported in the previous license renewal (for the period 1989 to 1993) indicate that uranium concentrations in air have increased while radium and thorium concentrations in air have remained about the same.

Table 2.1-8 Environmental Air Monitoring For Uranium At Onsite Locations, At The Metropolis Municipal Airport, And At The Nearest Residence

SAMPLE STATION NUMBER								
YEAR ANNUAL AVERAGE	**6**	**8**	**9**	**10**	**11**	**12**	**13**	**NR-7**
2001	2.23 E-15	2.06 E-14	1.83 E-14	2.50 E-14	2.30 E-14	1.33 E-14	3.94 E-14	1.86 E-14
2002	1.40 E-15	1.12 E-14	9.13 E-15	1.99 E-14	1.01 E-14	8.59 E-15	2.05 E-15	7.06 E-15
2003	5.73 E-15	1.41 E-14	6.51 E-15	9.77 E-15	1.65 E-14	1.40 E-14	3.05 E-14	2.68 E-14
2004	9.12E-16	1.15E-14	6.99E-15	9.58E-15	6.71E-15	4.48E-15	1.76E-14	5.38E-15

Sample Locations:			
• No. 6	5300 Ft. NNE (Metropolis Airport)	• No. 11	1250 Ft. N of UF_6 Bldg.
• No. 8	1035 Ft. NE of UF_6 Bldg.	• No 12	655 Ft. SSE of UF_6 Bldg.
• No. 9	775 Ft. NNW of UF_6 Bldg.	• No 13	755 Ft. NE of UF_6 Bldg.
• No. 10	950 Ft. SW of UF_6 Bldg.	• NR-7	1850 Ft. N of UF_6 Bldg.

Table 2.1-9 Environmental Air Monitoring For Ra-226 And Th-230 At Onsite Locations, At The Metropolis Municipal Airport, And At The Nearest Residence

SAMPLE STATION NUMBER																
YEAR	6		8		9		10		11		12		13		NR-7	
	Ra226	Th230	Ra226	Th230	Ra226	Th230	Ra226	Th230	Ra226	Th230	Ra226	Th230	Ra226	Th230	Ra226	Th230
2001	1.72E-17	6.69E-18	9.54E-18	8.58E-17	7.64E-18	2.29E-17	8.59E-18	5.44E-17	1.05E-17	3.15E-17	1.34E-17	1.35E-17	7.65E-18	5.74E-17	1.22E-16	3.43E-16
2002	3.82E-18	1.72E-17	3.82E-18	1.43E-17	3.82E-18	2.29E-17	1.25E-17	8.72E-17	3.81E-18	2.38E-17	7.73E-18	1.63E-17	3.81E-18	3.60E-17	7.70E-17	3.40E-16
2003	6.19E-17	5.95-17	8.87E-18	2.98E-16	5.57E-18	2.35E-16	8.60E-18	1.52E-16	7.68E-17	2.94E-16	8.80E-18	2.79E-16	4.68E-18	2.93E-16	4.32E-17	4.24E-15
2004	8.88E-18	2.53E-17	1.08E-17	6.97E-18	5.74E-18	8.39E-18	7.44E-18	6.69E-18	4.78E-18	5.84E-17	3.82E-18	1.97E-17	3.82E-18	5.42E-17	5.45E-17	1.78E-16

Sample Locations:			
• No. 6	5300 Ft. NNE (Metropolis Airport)	• No. 11	1250 Ft. N of UF_6 Bldg.
• No. 8	1035 Ft. NE of UF_6 Bldg.	• No. 12	655 Ft. SSE of UF_6 Bldg.
• No. 9	775 Ft. NNW of UF_6 Bldg.	• No. 13	755 Ft. NE of UF_6 Bldg.
• No. 10	950 Ft. SW of UF_6 Bldg.	• NR-7	1850 Ft. N of UF_6 Bldg.

The results of the environmental monitoring for fluoride for 2001-2004 are summarized in Table 2.1-10. During this period the highest annual average fluoride concentration occurred on the restricted fence line at sampling Station 10 and ranged from 0.228 $\mu g/m^3$ in 2003 to 0.838 $\mu g/m^3$ in 2002.

Table 2.1-10 Environmental Air Monitoring For Fluoride (ug/m3) At Onsite Locations And At The Metropolis Municipal Airport.

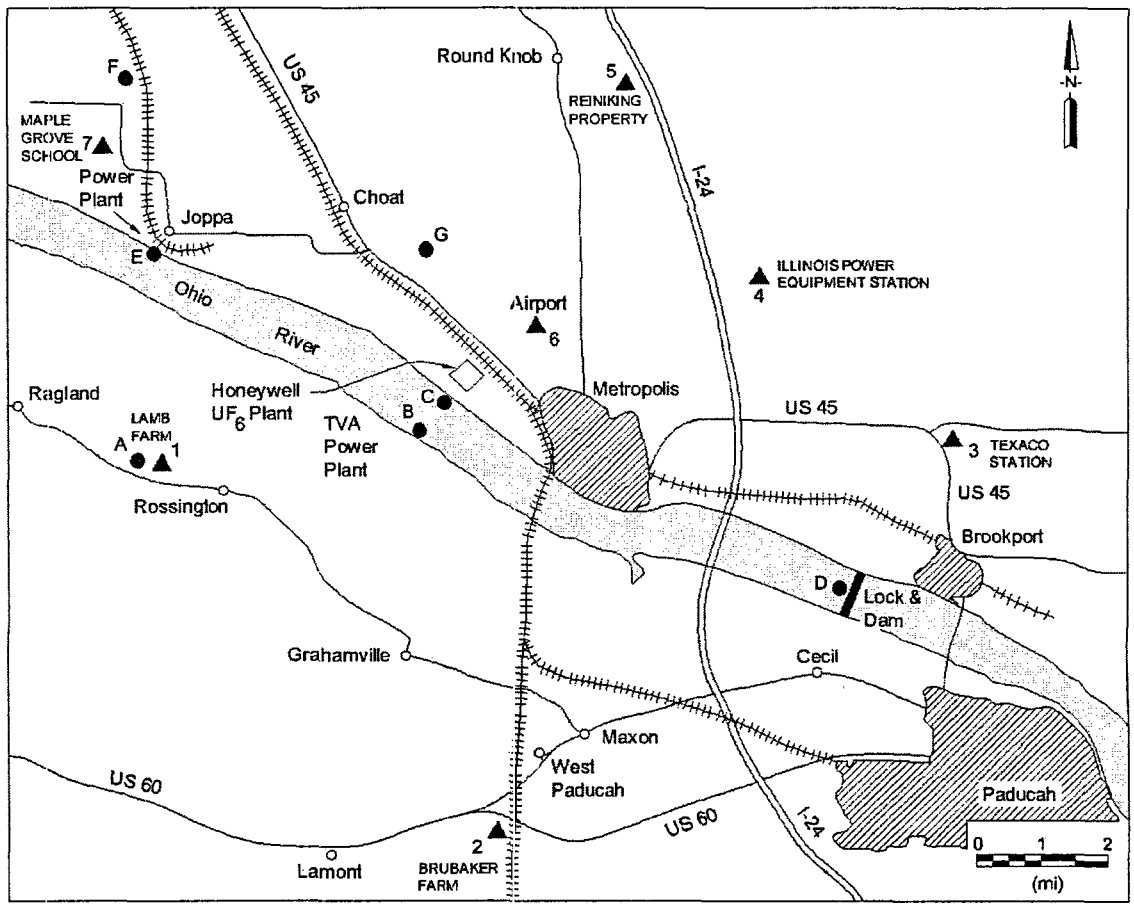
	SAMPLE STATION NUMBER						
YEAR ANNUAL AVERAGE	**6**	**8**	**9**	**10**	**11**	**12**	**13**
2001	0.021	0.110	0.591	0.661	0.299	0.134	0.172
2002	0.022	0.125	0.651	0.838	0.341	0.109	0.197
2003	0.005	0.090	0.131	0.228	0.084	0.068	0.187
2004	0.018	0.067	0.187	0.301	0.112	0.061	0.093

Sample Locations:			
• No. 6	5300 Ft. NNE (Metropolis Airport)	• No. 11	1250 Ft. N of UF_6 Bldg.
• No. 8	1035 Ft. NE of UF_6 Bldg.	• No. 12	655 Ft. SSE of UF_6 Bldg.
• No. 9	775 Ft. NNW of UF_6 Bldg.	• No. 13	755 Ft. NE of UF_6 Bldg.
• No. 10	950 Ft. SW of UF_6 Bldg.		

Surface Water and Sediment Monitoring

The surface water and sediment samples are analyzed for uranium and fluoride. Seven surface water and sediment samples are collected semi-annually at locations shown on Figure 2.1-4. Four locations are on the Ohio River: one sample is taken upstream and one downstream of the plant outflow, one at the point of outflow into the river, and a fourth from a location on the opposite side of the river (Figure 2.1-4). Three inland locations at lakes and ponds (shown on Figure 2.1-4) are also sampled.

Figure 2.1-4 Environmental Monitoring Sample Locations For Surface Water, Sediment, Soil, And Vegetation.



● Surface Water and Sediment (Mud) Samples ▲ Soil and Vegitation Samples

A	Lamb Farm	1	Lamb Farm
B	TVA	2	Brubaker Farm
C	Plant Site Outflow	3	Texaco Station
D	Bookport Dam	4	Illinois Power Equipment Station
E	Joppa Power Plant	5	Reiniking Property
F	Lindsay Lake	6	Metropolis Airport
G	Oak Glenn Lake	7	Maple Grove School

Surface Water

Table 2.1-11 summarizes the average annual concentrations of uranium and fluoride at the plant outflow and in offsite surface water samples for 2001-2004. The uranium concentration in surface water at the point of release into the river shows a decreasing trend from 2001 to 2004. Comparing the 2001 to 2004 overall average to the 4 year period of 1990 to 1993 shows a 76 percent decrease in the 4-year average. The annual average surface water concentrations of uranium upstream and downstream of the Metropolis facility are generally close except for the year 2001, which shows substantially greater concentration of uranium downstream than upstream.

Annual fluoride concentrations in surface water near the plant outflow have varied yearly and do not parallel the decreasing trend seen in the uranium concentrations. Both uranium and fluoride concentrations in surface water are low and meet applicable standards.

Table 2.1-11 Annual Average Concentrations Of Uranium And Fluoride (ppm) In Sediment And Surface Water Samples, 2001 to 2004

YEAR		SAMPLE STATION NUMBER													
		(A) Lamb Farm*		(B) TVA (1)		(C) Plant Site Outflow (2)		(D) Brookport Dam (3)		(E) Joppa Power Plant (4)		(F) Lindsay Lake		(G) Oak Glenn Lake	
		U	F	U	F	U	F	U	F	U	F	U	F	U	F
2001	SEDIMENTS	4.03	6.25	3.38	12.91	5.4	21.31	2.78	13.20	1.27	16.99	1.84	6.11	8.85	5.82
	WATER	0.060	0.62	0.011	0.55	0.031	0.770	0.004	0.60	0.057	0.565	0.005	0.535	0.005	0.505
2002	Sediments	1.60	15.55	0.80	20.87	4.53	54.87	0.54	21.36	0.51	19.89	0.78	9.73	1.04	13.01
	Water	0.006	0.93	0.001	0.90	0.040	1.57	0.001	0.950	0.003	0.950	0.004	1.02	0.001	0.830

Table 2.1-11 Annual Average Concentrations Of Uranium And Fluoride (ppm) In Sediment And Surface Water Samples, 2001 to 2004 (continued)

YEAR		SAMPLE STATION NUMBER													
		(A) Lamb Farm*		(B) TVA (1)		(C) Plant Site Outflow (2)		(D) Brookport Dam (3)		(E) Joppa Power Plant (4)		(F) Lindsay Lake		(G) Oak Glenn Lake	
		U	F	U	F	U	F	U	F	U	F	U	F	U	F
2003	Sediments	0.72	4.49	0.24	6.57	0.65	15.24	0.18	7.44	0.25	8.15	0.61	4.05	1.35	3.72
	Water	0.001	1.9	0.001	1.4	0.012	2.18	0.001	1.25	0.002	1.16	0.001	1.13	0.0005	1.08
2004	Sediments	0.64	2.15	0.22	6.14	1.10	14.61	0.39	5.14	0.27	3.42	0.51	2.09	0.33	2.63
	Water	0.003	1.25	.0009	0.95	0.008	1.39	0.001	0.91	0.0003	0.92	0.0002	0.88	0.003	0.87

***Lamb farm pond filled in Fall 1989. Sample collected in another pond ~ ¼ mile from Lamb farm.**

Sample Locations:	
• No. (1)	Ohio River opposite plant outflow
• No. (2)	Ohio River at plant flow
• No. (3)	Ohio River, 7 miles upstream, at Lock and Dam No. 52
• No. (4)	Ohio River, 5 miles downstream at Joppa, Illinois

Sediment

From 2001 to 2004, the sediment samples show generally uniform uranium concentrations upstream and downstream of the plant except near the plant outflow (sampling station C on Figure 2.1-4) as summarized in Table 2.1-11. Uranium concentrations in sediment samples have increased compared to those reported for 1989-1993. The fluoride concentrations measured in sediment at all locations in the Ohio River for the years 2001 to 2004 are quite variable, as they were for the previous time period, 1989 to 1993. There are no established standards for uranium or fluoride in stream sediments.

Sediments collected from the liquid effluent drainage ditch at 213 and 427 meters (700 and 1,400 feet) downstream of Outfall 002 are sampled for uranium and fluoride as shown in Table 2.1-12. The uranium and fluoride concentrations fluctuate with the sampling event. This fluctuation may result from sampling in slightly different locations for each sampling event, as well as from the very dynamic nature of environment; i.e., the flow rates in the effluent ditch are such that sediment is continuously transported along the ditch. Results of this sampling indicate that the effluent drainage ditch is slightly impacted by current operations and this contamination is being transported to the Ohio River. However, the projected dose from this contamination is a small fraction of NRC and EPA regulatory limits.

Table 2.1-12 Annual Average Concentration Of Uranium And Fluoride (ppm) In Sediment Samples From Effluent Ditch At The Plant Outfall 002

YEAR ANNUAL AVERAGE										
LOCA-TION	2001		2002		2003		2004		4 YEAR AVERAGE	
	U	F	U	F	U	F	U	F	U	F
700 Ft.	19.17	235.06	8.09	72.34	4.26	24.95	51.72	1364.99	20.81	424.4
1400 Ft.	112.8	9229.6	173.4	11899.8	200.42	9083.05	302.72	10212.4	197.34	10106.2

Soil and Vegetation Monitoring

Thirteen soil and vegetation samples are collected semi-annually. Six sample stations are located onsite at the same location of the low volume air samplers (Figures 2.1-3). Seven stations are located in a 13-kilometer (8-mile) radius covering portions of Illinois and Kentucky (Figure 2.1-4). Soil and vegetation samples analyzed for uranium and fluoride onsite for 2001-2004 are summarized in Tables 2.1-13 and 2.1-14.

Table 2.1-13 Annual Average Concentration Of Uranium And Fluoride (ppm) In Onsite And Offsite Environmental Soil Samples 2001 - 2004

	YEAR ANNUAL AVERAGE									
LOCATION	2001		2002		2003		2004		4 Year Average	
	U	F	U	F	U	F	U	F	U	F
(A) Lamb Farm*	1.52	6.1	2.36	27.92	1.38	4.41	0.60	4.0	1.47	10.61
(B) Brubaker Farm	2.61	4.55	3.08	13.40	0.66	3.74	0.44	2.79	1.70	6.12
(C) Texaco Station	2.42	4.76	2.24	11.28	0.65	3.44	0.50	2.34	1.45	5.46
(D) IL Power Equip Station	1.77	4.90	4.53	25.43	1.17	3.83	0.47	2.83	1.99	9.25
(E) Reiniking Property	1.43	5.21	1.19	10.82	0.90	3.42	0.40	2.19	0.98	5.41
(F) Metropolis Airport	1.33	4.78	3.61	10.26	0.90	3.03	0.49	2.08	1.58	5.04
(G) Maple Grove School	1.23	4.77	0.80	10.38	0.49	2.91	0.36	2.38	0.72	5.11
#8 NE Feed Mat'l. Bldg.	16.78	11.44	14.45	11.74	11.22	3.65	7.95	2.79	12.60	7.41
#9 W Feed Mat'l. Bldg.	12.1	7.76	14.45	12.30	5.05	4.42	2.75	3.04	8.59	6.88
#10 S Feed Mat'l. Bldg.	10.11	11.32	40.64	14.41	3.23	3.95	6.47	3.21	15.11	8.22
#11 N Feed Mat'l. Bldg.	30.01	7.1	12.06	13.33	12.56	3.94	2.36	2.62	14.25	6.75
#12 E Feed Mat'l. Bldg.	13.20	15.89	12.38	10.72	3.75	3.84	3.92	1.97	8.31	8.11
#13 NE Feed Mat'l. Bldg.	86.46	15.58	18.86	17.32	33.29	7.15	25.95	4.53	41.14	11.15
(A) - (G) Offsite Avg.	1.76	5.01	2.54	15.64	0.88	3.54	0.47	2.66	1.41	6.71
(8) - (13) On Site Avg.	28.11	11.52	18.81	13.30	11.52	4.49	8.23	3.03	16.67	8.08

Soil

With the exception of Sampling Location #12 (E Feed Material Building) and Sampling Location #13 (NE Feed Material Building) the sampling results from 2001 to 2004 (Table 2.1-13) show a gradual decrease in uranium concentration in onsite soils at the restricted fence line and near the property boundary. The average onsite uranium concentration was 16.67 ppm. Higher concentrations at Sampling Locations #12 and #13 are expected since they are located in the prevailing wind direction and windborne constituents would be deposited on the soil.

With the exception of all sampling locations in 2002, the fluoride concentration in soil showed a gradual decrease over the 4-year reporting period both onsite and offsite locations. An increase in fluoride concentration was observed at all sampling locations during 2002 but had returned to a decreasing trend during the 2003 sampling period.

Vegetation

The onsite and offsite uranium concentrations in vegetation fluctuated over the 4-year reporting period, but overall the data indicated a general downward trend. The average onsite uranium concentration in vegetation was 4.25 ppm for 2001 to 2004 (Table 2.1-14). The 4-year average for onsite uranium concentration is higher than the offsite concentration that averaged 2.71 ppm for the same time period.

Analysis results for many of the onsite sampling locations indicated an increasing trend during 2001 and 2002. However, data obtained from the 2003 sampling period indicated that fluoride concentration levels had decreased to levels slightly higher than results obtained in 2000. Analysis results for samples collected from offsite locations exhibited a relatively flat trend, indicating that fluoride accumulations at offsite locations were minimal.

For fluoride concentrations in vegetation, the 4-year average for onsite samples was 70.09 ppm and the average for offsite samples was 28.29 ppm.

Average fluoride concentrations in onsite vegetation were compared with State of Kentucky standards (Kentucky DEP, 1988) since the State of Illinois does not have an applicable standard. The Kentucky standard allows a 40.0 ppm average fluoride concentration during a 6-month growing season; or 60 ppm as a 2-month average; or 80 ppm as a 1-month average. The onsite fluoride concentration at the Metropolis facility could exceed these standards; however, none

of the vegetation is used for forage and no cattle grazing is allowed on the property.

Table 2.1-14 Annual Average Concentration Of Uranium And Fluoride (ppm) In Onsite And Offsite Vegetation Samples 2001 - 2004

LOCATION	YEAR ANNUAL AVERAGE									
	2001		2002		2003		2004		4 Year Average	
	U	F	U	F	U	F	U	F	U	F
(A) Lamb Farm*	10.60	22.87	1.66	35.84	1.24	26.69	3.45	24.68	4.24	27.52
(B) Brubaker Farm	14.69	22.33	1.61	31.26	0.63	23.67	2.43	29.9	4.84	26.79
(C) Texaco Station	1.63	22.65	2.11	35.26	1.86	21.96	2.02	30.68	1.91	27.64
(D) IL Power Equip Station	5.91	22.46	2.06	28.36	0.75	19.92	6.08	34.37	3.70	26.28
(E) Reiniking Property	7.98	40.79	1.06	33.5	0.83	22	0.64	35.81	2.63	33.03
(F) Metropolis Airport	0.80	20.67	1.09	42.88	0.58	20.60	1.19	36.37	0.92	30.13
(G) Maple Grove School	0.58	22.34	0.73	28.79	1.01	21.39	0.53	33.97	0.71	26.62
#8 NE Feed Mat'l. Bldg.	4.76	60.02	3.26	157.79	2.09	29.23	2.23	42.34	3.09	72.35
#9 W Feed Mat'l. Bldg.	2.97	54.49	5.47	53.22	0.90	27.79	1.85	48.82	2.80	46.08
#10 S Feed Mat'l. Bldg.	8.83	152.82	14.56	92.39	1.17	41.18	0.44	109.48	6.25	98.97
#11 N Feed Mat'l. Bldg.	11.02	48.70	1.94	111.5	1.33	29.71	1.36	46.05	3.91	58.99
#12 E Feed Mat'l. Bldg.	5.78	32.72	4.91	45.24	3.58	28.10	6.11	42.06	5.10	37.03
#13 NE Feed Mat'l. Bldg.	7.23	106.14	2.52	234.2	3.47	45.06	4.13	43.02	4.34	107.11
(A) - (G) Offsite Avg.	6.03	24.87	1.47	33.70	0.99	22.32	2.33	32.25	2.71	28.29
(8) - (13) On Site Avg.	6.77	75.82	5.44	115.72	2.09	33.51	2.69	55.29	4.25	70.09

External Gamma Monitoring

Direct radiation is continuously monitored using environmental thermoluminescense dosimeters (TLDs) at nine locations. The environmental TLDs are located on the restricted fence line on each side of the plant (total of four), at the nearest boundary line, at the Metropolis Municipal Airport (1.6 kilometers northeast of the plant), and two at the nearest residence (NR-7 South and NR-7A North). A ninth TLD is a control measurement. The environmental TLDs are analyzed and replaced every quarter.

The control, onsite, and offsite environmental TLD monitoring results from 2001 to 2004 are summarized in Table 2.1-15. The maximum annual average of the direct gamma radiation consistently occurs at the east or south restricted area fences. This is attributed to the large ore concentrate storage area immediately adjacent to the sampling stations. The shortest distance from the east restricted area fence to the site boundary is approximately 1 kilometer (0.6 miles). Thus the direct dose to any potential offsite individual would be significantly less than the regulatory limits. Background annual average radiation doses at the airport have varied from 91 to 102 mrem. Radiation doses measured at the nearest residence were similar to background and ranged from 86 to 103 mrem, including natural background, during 2001 to 2004.

Table 2.1-15 Annual Dose From Environmental Gamma Dose Measurements (mrem)[1]

Location	Year			
	2001	2002	2003	2004
Control	84	101	86	92
North Fence	158	182	174	193
East Fence	603	375	294	340
South Fence	335	530	568	587
West Fence	107	120	113	125
North Boundary	114	131	126	139
Airport	91	97	93	102
NR-7 A NORTH	86	97	93	101
NR-7 SOUTH	87	94	88	103

[1] Data are raw data – natural background dose levels have not been subtracted.

2.1.2.4 Other Monitoring Programs

Groundwater Monitoring

There are numerous groundwater monitoring wells on the plant site. Locations of the monitoring wells within the restricted fenced area are shown on Figure 1.1-1. There are ten (10) observation wells related to compliance monitoring located within the 59-acre restricted fenced area, nine of which are sampled quarterly for pH, fluoride, specific conductance, gross alpha activity and gross beta activity.

Analytical results for groundwater samples collected from these wells were reviewed for 2000 to 2004. Gross beta concentrations in groundwater varied from 0.5 pCi/L to a maximum of 45.48 pCi/L from 2000 to 2004. In previous studies it was shown that plotting of the concentration data over the reporting period indicated that the groundwater concentrations are very cyclic over time, reflecting the variability in naturally-occurring radioactivity as well as the influence of changing water levels in the Ohio River (USNRC, 1995). Gross alpha activities varied from -1.66 to 17.6 pCi/L over the reporting period with a cyclic trend as described above for the gross beta activity. Fluoride concentrations in groundwater varied from 0.11 to 0.63 mg/L over the same time period and also showed a cyclic trend over time. All of these concentrations are either at or very close to background and do not indicate any increasing trend above background. Review of this data indicates that plant operations have not affected groundwater quality under ponds A through E. Weston (1986) concluded that there was no potential for migration of hazardous constituents from ponds A through E to groundwater (Weston, 1986). Pond A is no longer in service.

Aside from routine monitoring for process analytes, a Resource Conservation and Recovery Act (RCRA) Facility Investigation was initiated in 2001 to address elevated volatile organic compounds and arsenic levels. The investigation is ongoing.

2.1.3 Mitigating Measures

Releases of radiological or nonradiological constituents to the air, water, and soil creates an environmental impact. MTW has special processes to minimize the environmental impact associated with plant operations. Settling ponds are used to remove contaminants from the effluent streams to reduce the volume of these constituents released to the Ohio River. Fluorides are chemically bound as residual solids in the EPF. The solids, which include both fluorides and uranium, are settled out prior to release of the effluent through Outfall 002 to the Ohio River. As stated before, the surface impoundments will be replaced by the upgraded EPF by the end of 2005. All surface impoundments will be closed by the year 2020.

In addition, to the engineering control measures such as scrubbers, air filters, and waste treatment systems, MTW has set action levels for the effluent monitoring program. Exceeding an

action level triggers an investigation into the cause of the exceedance and may trigger corrective actions that could include shutdown. Approaches used in reduction of contaminant sources include equipment repair, cleaning, modification, replacement, and addition of effluent control equipment. Approaches used in contaminant removal include excavation of soil and disposal in permitted offsite facilities.

To reduce gaseous emissions that could contain significant quantities or uranium or hazardous chemicals, dust collectors and scrubbers are typically operated in series. Each emission source is operated in accordance with an operating permit issued by the IEPA. Operational and administrative controls are used to shutdown and repair the emission source to prevent violation of the air permit or excessive concentrations of radioactive materials at the restricted fence line.

2.1.4 Decontamination and Decommissioning

Prior to termination of License SUB-526, MTW will decontaminate the facilities to provide for protection of the environment and public health and safety in accordance with the requirements of Subpart E of 10 CFR 20.

Following completion of decontamination activities, a comprehensive radiological survey will be completed and a report documenting cleanup to the target levels will be produced. The complete decontamination activities and final survey will be reviewed and verified by the NRC before termination of the license.

2.1.5 Reasonable Alternatives

No other reasonable alternatives were identified.

2.2 Alternatives Considered But Eliminated

There were no reasonable alternatives identified that were considered but eliminated.

2.3 Cumulative Impacts

Cumulative effects are defined as the impacts on the environment resulting from the incremental impact of an action under consideration when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7)

Activities considered for cumulative analysis include those in the vicinity of the Metropolis plant site. Actions occurring near the Metropolis plant site that, because of their diverse nature, could contribute to existing or future impacts on the site include continued operation of the Tennessee Valley Authority's (TVA's) Shawnee power plant; the Joppa, Illinois, power plant; and the Paducah Uranium Enrichment plant in Paducah, Kentucky. The following is a qualitative assessment of the potential cumulative impacts of continued operation of the Metropolis facility:

- The cumulative collective radiological exposure to the off-site population would be well below the maximum dose limit of 100 mrem per year to the off-site maximally exposed individual (MEI) and below the limit of 25 mrem/yr specified in 40 CFR 190 for uranium fuel cycle facilities. Annual individual doses to involved workers would be monitored to maintain exposure below the regulatory limit of 5 rem per year.

- Continued operation of the facility would likely continue the trend of increased uranium deposition in soils and sediments both on-site and off-site in the immediate vicinity of the plant.

- The Metropolis site is located in an attainment region for air pollutants. However, background annual average PM2.5 concentration in the vicinity of the Paducah site is near the regulatory standard (USDOE, 2004). Cumulative impacts would not affect attainment status.

- Data from the 2000 annual groundwater monitoring showed that four pollutants exceeded primary drinking water regulation levels in groundwater at the Paducah site (USDOE, 2004). Good engineering and construction practices should ensure that indirect cumulative impacts on groundwater associated with activities at the Paducah site would be minimal.

- Cumulative ecological impacts on habitats and biotic communities, including wetlands, would be negligible. Construction of new facilities at the Paducah site might remove a type of tree preferred by the Indiana bat; however, this federal- and state-listed endangered species is not known to utilize these areas.

- No cumulative land use impacts are anticipated.

- It is unlikely that any noteworthy cumulative impacts on cultural resources would occur, and any such impacts would be adequately mitigated before activities for the chosen action would start.

- Given the absence of high and adverse cumulative impacts for any impact area considered in this ER, and the similar conclusion reached by DOE for construction and operation of a new facility at the Paducah site in Kentucky (USDOE, 2004), no environmental justice cumulative impacts are anticipated for the Metropolis site.

- Cumulative socioeconomic impacts are anticipated to be generally positive, often temporary, and relatively small.

2.4 Comparison Of The Predicted Environmental Impacts

There have been no impacts attributed to the continued operation of the UF_6 facilities at the Metropolis plant identified that differ from the historical operational impacts. When the planned modifications to the UF_6 conversion facilities are completed, i.e., the completion of the upgraded EPF, closure of the remaining surface impoundments, and construction of the cooling towers for fluorine production, the adverse impacts would be expected to decrease.

Under the no-action alternative, releases of materials associated with UF_6 production, primarily uranium would be expected to decrease over time to background levels. Production of other fluorinated chemicals would continue, thus overall impacts from operations at the Metropolis plant would be expected to remain at current levels.

The alternative of no license renewal for the Honeywell Specialty Materials plant at the Metropolis, Illinois, site implies cessation of conversion and manufacturing of UF_6 and commencement of decontamination and decommissioning of the UF_6 production facilities. The Metropolis facility is the only plant that manufactures UF_6 operating in the United States. Assuming the requirements of the nuclear industry for reactor fuel, including commercial, military, medical, and research, remain unchanged, selection of this alternative implies transfer of conversion activities to a new site located within the United States or transfer to an existing site located outside of the United States. The operational environmental impacts of construction of a new facility would be expected to be similar other large industrial construction projects. Operation of a new facility would be expected to be similar to those described in Section 4

for the license renewal alternative. In addition, there would be the environmental impacts of new plant construction as well as the loss of uranium conversion capability in the United States for the time it would take to design, construct, and license a new facility.