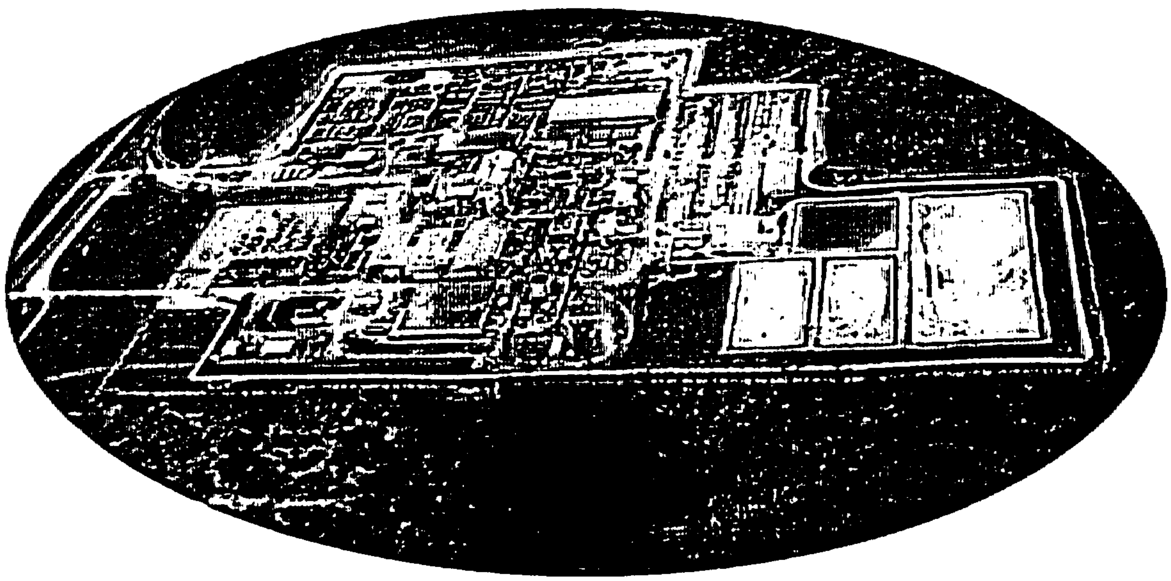
Environmental Report
Renewal of Source Material License SUB-526

Docket 40-3392

for

HONEYWELL SPECIALTY MATERIALS



Metropolis Works (MTW)
Metropolis, Illinois

May 25, 2005

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1.0 INTRODUCTION

Honeywell Specialty Materials, Inc. is requesting the renewal of its Source Material License SUB-526 for the uranium hexafluoride (UF_6) facility at the Metropolis Works (MTW), Metropolis, Illinois for a period of 10 years. The facility is located at 2768 North US 45 Highway, approximately one mile west of the City of Metropolis (Figure 1.0-1). The plant site is located in a predominantly agricultural area of low average population density with widely scattered villages and small cities in Massac County, Illinois, and across the Ohio River from McCracken County, Kentucky (Figure 1.0-2).

MTW has prepared this Environmental Report (ER) as part of the application for license. The ER has been prepared according to the guidelines contained in NUREG 1748, "Environmental Review Guidance for Licensing Actions Associated with NMSS Programs" (USNRC 2003). The purpose of this document is to assess the environmental consequences of the proposed license renewal for this facility.

Initial construction of the facility was completed in 1958 and the first UF_6 produced in 1959 as part of a five-year contract for conversion services with the former Atomic Energy Commission (AEC). In 1961 the UF_6 pilot plant was installed. The AEC conversion contract was completed in 1964 and the conversion process was mothballed. Continued increase in demand for conversion services resulted in rehabilitation of the UF_6 facility in 1967 and commercial conversion started in 1968. In 1968-69 capacity for the facility was expanded to 9,000 metric tons. Capacity was increased again in 1975 to 11,500 metric tons and in 1995 to 12,700 metric tons. Re-engineering in 2001 increased capacity to approximately 14,000 metric tons.

1.1 Purpose and Need for the Proposed Action

MTW performs a necessary service for the commercial nuclear power industry by converting natural uranium ore concentrates into UF_6. The UF_6 product is then shipped to gaseous diffusion plants for the enrichment of the uranium (U-235) isotope. Following enrichment, the uranium is converted into fuel for use in commercial, government, and military nuclear reactors producing electricity, medical isotopes or supporting scientific research. Currently, the MTW is the only UF_6 conversion facility operating within the United States and is a critical part of the United States nuclear fuel cycle. As the only domestic facility, the facility also has significant importance in providing domestic energy supplies for the nation.

The facility at Metropolis, Illinois, is a multi-product chemical manufacturing facility producing sulfur hexafluoride (SF_6), iodine and antimony pentafluorides (IF_5, SbF_5), liquid fluorine (F_2), and uranium hexafluoride (UF_6). The production process of UF_6 is the only operation at the plant licensed by NRC as required under 10 CFR

Part 40. The licensed facility is designed to produce about 14,000 metric tons (15,430 tons) per year of uranium as UF_6 from uranium ore concentrates. The production volume will increase gradually to the target of 15,000 metric tons per year beginning in 2008. The plant feed is uranium ore concentrates about 75 weight percent uranium and the primary product is high purity UF_6. The UF_6 product is shipped to U.S. Enrichment Corporation (USEC) or to foreign customers for enrichment of the uranium-235 (U-235) isotope; following enrichment, the uranium is converted into fuel for use in nuclear reactors.

The MTW operation uses the "fluoride volatility process" in the production of UF_6, where the ore concentrates feed moves through the successive steps of feed preparation, reduction, hydrofluorination, fluorination and distillation. Chemical reactions are carried out in fluidized bed reactors.

Figure 1.0-1 Site Map

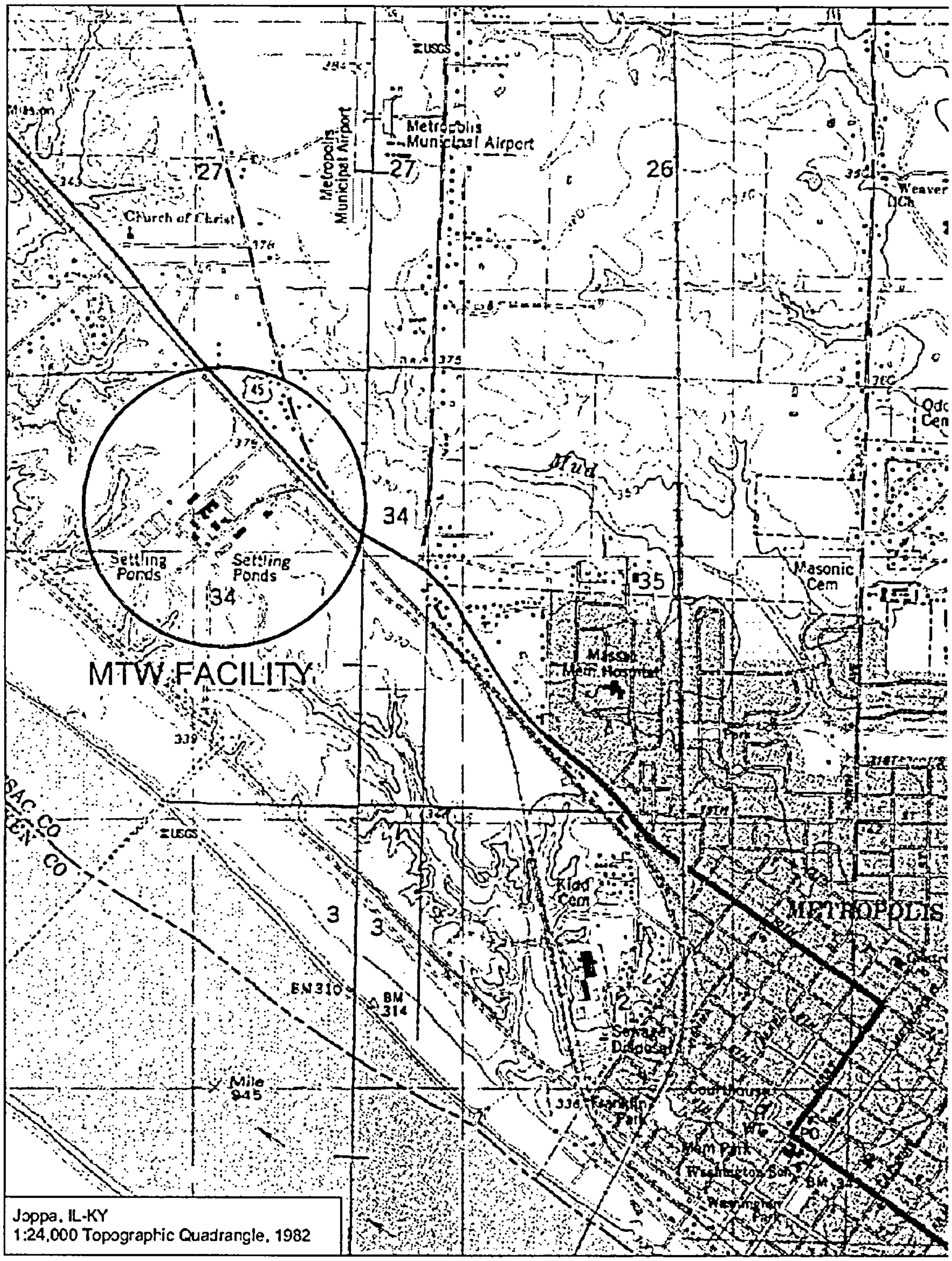
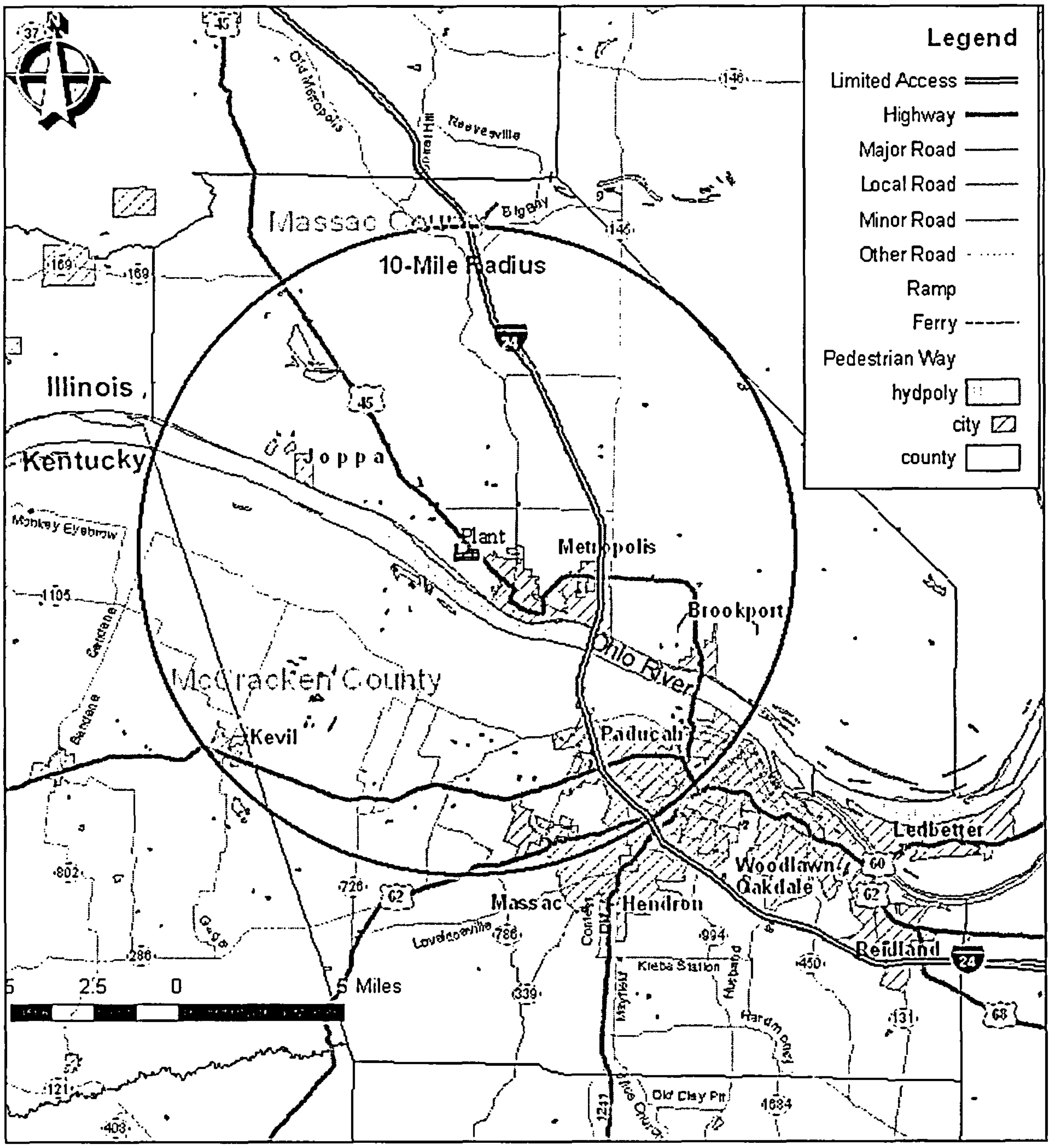


Figure 1.0-2 Location Map



As part of UF_6 production, the MTW site also includes: (1) a storage area for uranium ore concentrates received from uranium mills; (2) a uranium sampling facility; (3) a bulk storage area for process chemicals such as hydrofluoride (HF), ammonia (NH_3), sodium hydroxide (NaOH), potassium hydroxide (KOH), and sulfuric (H_2SO_4) acid; (4) a facility for electrolytic production of F_2 from HF; and

(5) treatment systems and storage ponds for liquid wastes. These facilities and areas are shown on Figure 1.1-1. The feed materials building, where most of the UF_6 conversion activities occur, is located in the center of the industrialized area shown on Figure 1.1-1. The chemical manufacturing facilities are on the west side of the feed materials building, settling ponds occupy the southwest portion of the industrialized area and various types of storage pads occupy the southeast and eastern portion of the industrialized area.

The present application for renewal of the license involves no expansion or major program changes in UF_6 production facilities since the last license renewal in May 1995. However, there have been several upgrades and modifications to the facilities:

- Digital control systems have been implemented for the fluorine plant and feed building.

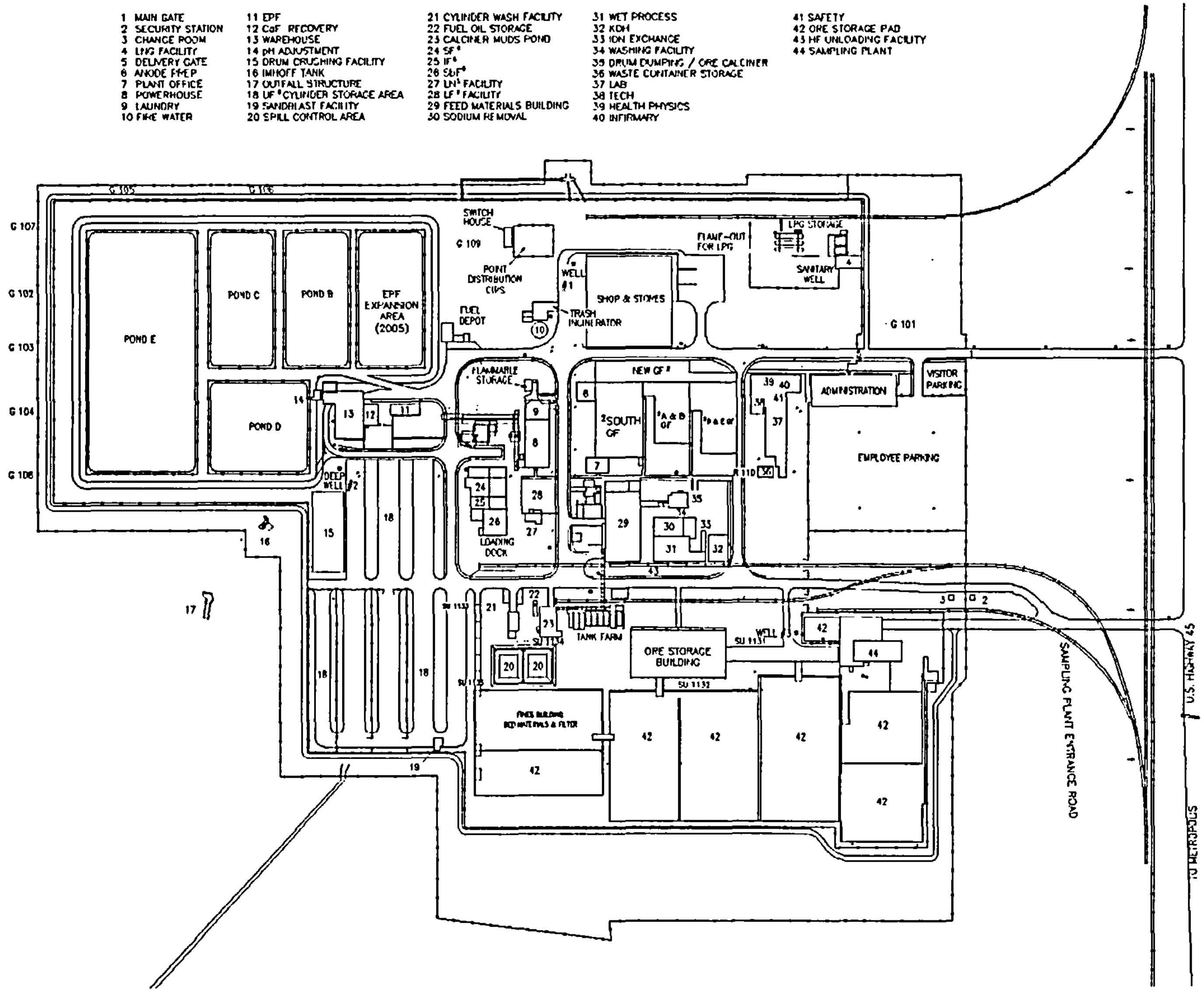
- One surface impoundment, pond A, was closed in 2001 as part of the ongoing program to close all of the surface impoundments, required by Condition II.H.2 of the current RCRA Permit(#B6-65-CA-11). All surface impoundments will be closed by the year 2012.

- An expansion of the existing Environmental Protection Facility (EPF) is being constructed that will expand and improve the capacity of the existing EPF. The newly constructed EPF will contain an additional high capacity clarifier placed in series with the existing clarifier, and new sand filters for the treatment of wastewater as well as two 350,000 gallon off-spec tanks for holding effluent that does not meet NPDES limits. The facility will be completed and operational by the end of 2005

- The solid waste incinerator was dismantled and removed in 2003.

- The outdated oil cooled rectifiers in the fluorine production facility are being replaced with new water cooled units. A new cooling tower is planned for installation in 2006 to cool the full compliment of new rectifiers.

Figure 1.1-1 Facility Layout



1.2 The Proposed Action

The proposed action is the renewal of the Honeywell Specialty Material License SUB-526 for 10 years. With this renewal, the Metropolis facility will continue to convert natural uranium ore concentrates into UF_6, for the nuclear industry, including commercial power reactors and medical, military, and research reactors. The production of UF_6 is one phase in the nuclear fuel cycle resulting in production of fuel elements for nuclear reactors.

1.3 Applicable Regulatory Requirements, Permits, and Required Consultations

The plant NPDES permit (No. IL 0004421) has been renewed by the Illinois Environmental Protection Agency, effective through January 31, 2006. The plant liquid effluent is monitored in accordance with the terms and conditions of the permit.

The plant has also been issued a RCRA permit (LQG #B6-65-CA-11) by the Illinois Environmental Protection Agency for the storage and treatment of hazardous waste generated on-site. This permit is in effect from March 11, 2003 until March 11, 2013. This permit regulates operation of the EPF Ponds and storage of drummed hazardous waste on the waste storage pad. Some of the drummed hazardous waste is "mixed waste" in that it contains both RCRA hazardous waste and low concentrations of uranium. This waste is stored on-site until shipped to a licensed facility for treatment and/or disposal. In an effort to minimize the amount of RCRA wastes, as much material as possible is recycled through the facility. The remaining drummed waste is periodically shipped off-site for appropriate disposal.

The plant has also been issued a Title V Clean Air Act Permit (ID No. 127854AAD) by the Illinois Environmental Protection Agency, which expires on July 14, 2008.

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 gradually 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.

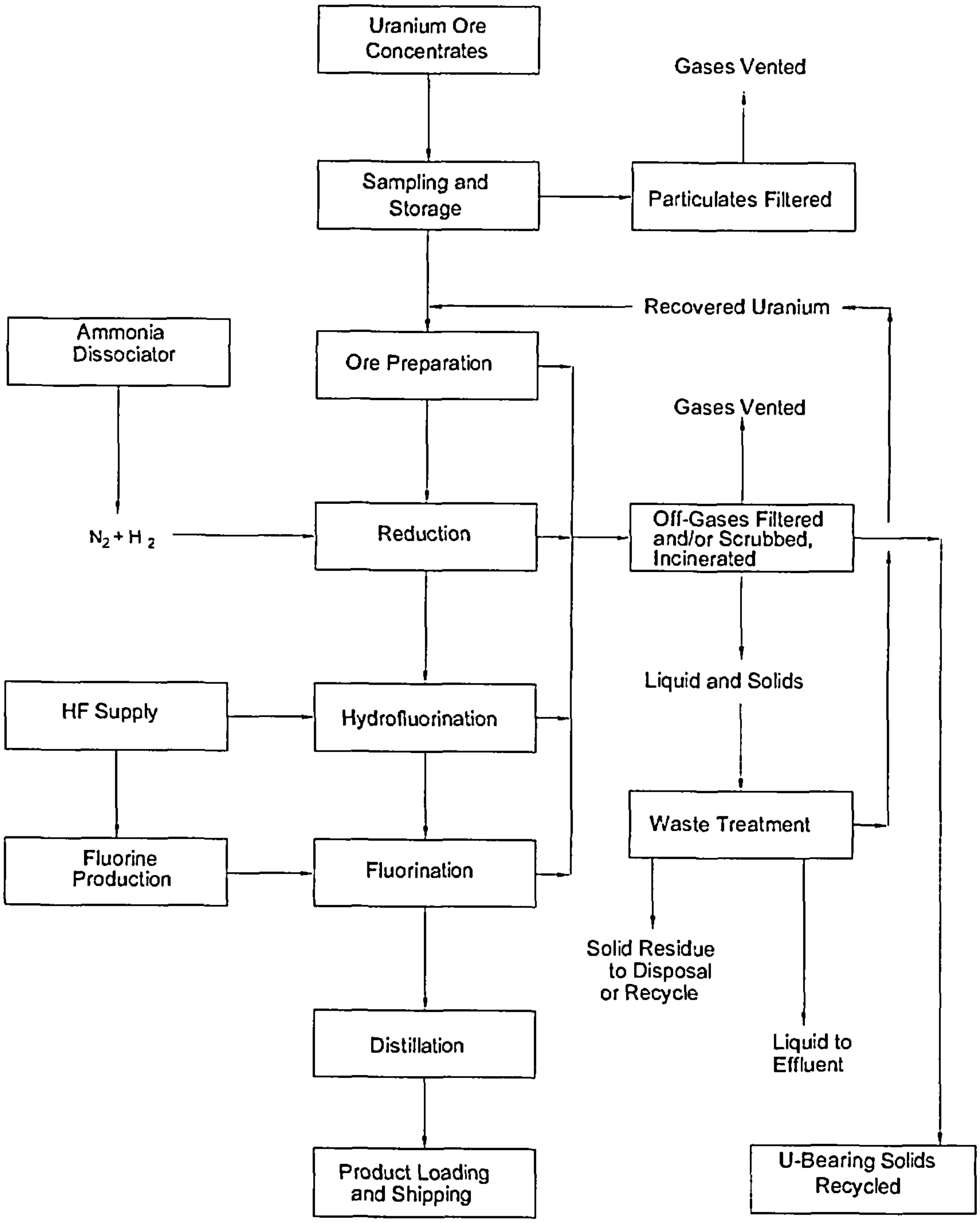
The manufacturing process and waste management practices are described in this section. The system description presented in this section is adapted from material presented in the Application for Renewal of Source Material License.

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 location 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 and a process laboratory. The control room is kept under a slight positive pressure and the laboratory is kept under slight negative 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

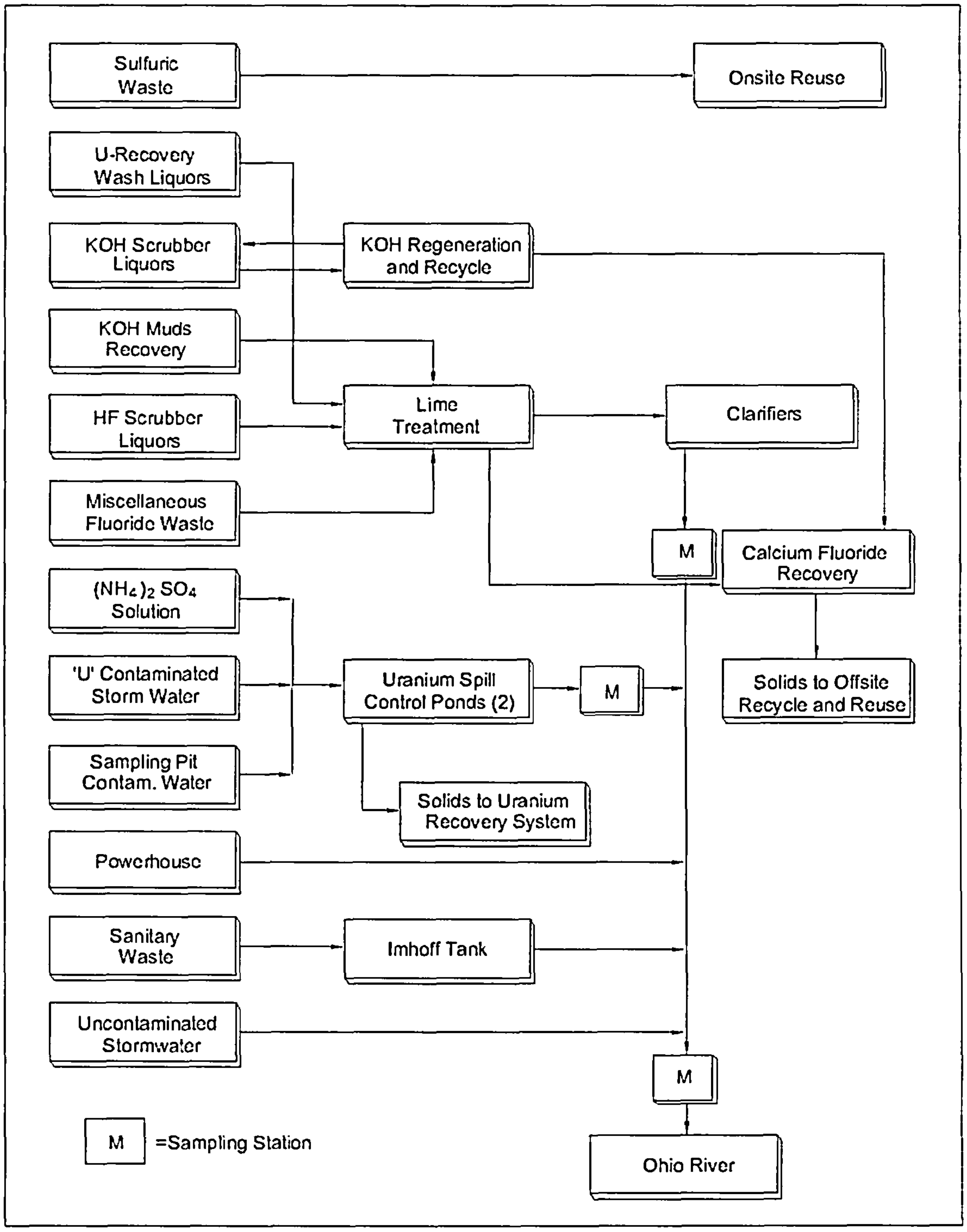
Liquid waste streams generated at the Metropolis facility are categorized as low-level radioactive and nonradioactive waste streams. Each of the waste streams are recycled or treated separately. Most UF_6 process related liquid effluents from the plant are discharged from Outfall 002 to the Ohio River 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 per minute (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 is 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 (mg). 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 residence 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 residence 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 3.0×10^{-14} micro Ci/cc action level, in the 2000-2003 timeframe. These exceedances occurred in the second quarter of 2001 and the fourth quarter of 2003.

Figure 2.1-3 Environmental Air Sampling Stations

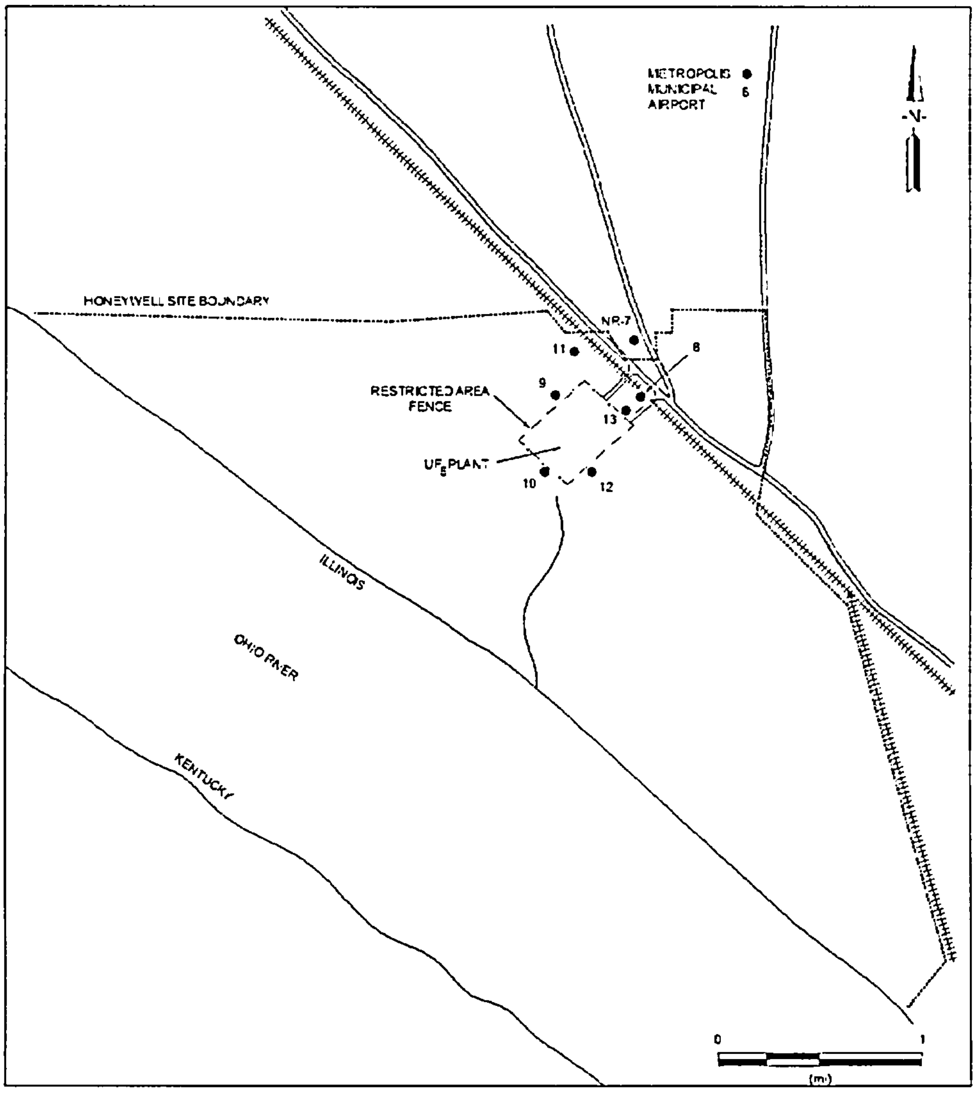


Table 2.1-5 Summary Of Gaseous Emissions Data Collected From Location NR-7

YEAR	CONCENTRATION			PARTICLE SIZE	SOLUBILITY FRACTION		
	U(NAT) µCi/cc	Ra226 µCi/cc	Th230 µCi/cc	AMAD	"D"	"W"	"Y"
1st Qtr. 2000	2.09E-14	2.75E-16	1.62E-17	1	0.716	0.284	
2nd Qtr. 2000	2.84E-14	1.65E-17	3.96E-16	1	0.752	0.248	
3rd Qtr. 2000	1.04E-14	1.62E-17	1.62E-17	1	0.608	0.392	
4th Qtr. 2000	9.50E-15	1.88E-17	1.88E-17	1	0.434	0.569	
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

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, 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 2000 - 2003 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 8.47×10^{-17} µCi/ml occurred in 2000 at station 8 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 2000 to 2003 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 MUNBER								
YEAR ANNUAL AVERAGE	6	8	9	10	11	12	13	NR-7
2000	1.89 E-15	2.29 E-14	1.32 E-14	2.45 E-14	1.93 E-14	1.59 E-14	4.21 E-15	1.73 E-14
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

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
2000	3.83E-18	9.22E-18	8.48E-17	2.08E-17	3.82E-18	4.17E-17	1.24E-17	1.07E-16	6.69E-18	3.12E-17	7.64E-18	7.81E-17	5.74E-18	7.72E-17	8.16E-17	1.12E-16
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

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 2000-2003 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.

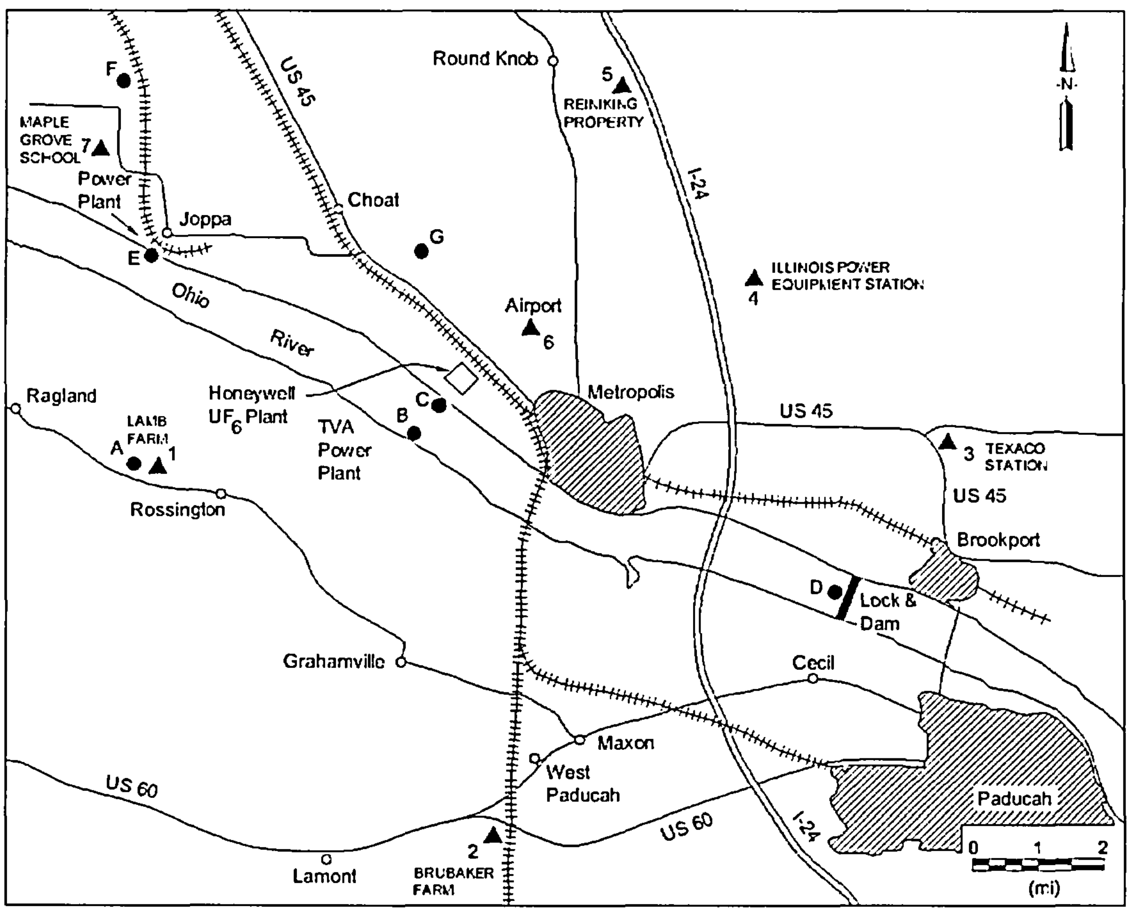
	SAMPLE STATION NUMBER						
YEAR ANNUAL AVERAGE	6	8	9	10	11	12	13
2000	0.014	0.072	0.262	0.526	0.179	0.131	0.119
2001	0.021	0.110	0.591	0.661	0.299	0.134	0.172
2002	0.022	0.125	0.651	0.838	0.341	0.109	0.197
2003	0.005	0.090	0.131	0.228	0.084	0.068	0.187

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 2000-2003. The uranium concentration in surface water at the point of release into the river shows a decreasing trend from 2000 to 2003. Comparing the 2000 to 2003 overall average to the 4 year period of 1990 to 1993 shows a 39 percent decrease in the 4-year average. Comparing the current data to the 4-year period of 1989 to 1992 indicates the 4-year averages are approximately equal. 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, 2000 to 2003

		SAMPLE STATION NUMBER													
YEAR		(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
2000	SEDIMENTS	1.99	5.85	1.07	16.83	4.30	81.34	0.73	21.13	0.88	23.0	1.79	7.65	0.93	15.16
	WATER	0.005	0.89	0.007	0.64	0.145	4.95	0.011	0.66	0.013	0.59	0.016	0.63	0.008	0.71
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

Table 2.1-11 Annual Average Concentrations Of Uranium And Fluoride (ppm) In Sediment And Surface Water Samples, 2000 to 2003 (continued)

		SAMPLE STATION NUMBER													
YEAR		(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
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
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

*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 2000 to 2003, 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 2000 to 2003 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										
LOCATION	2000		2001		2002		2003		4 YEAR AVERAGE	
	U	F	U	F	U	F	U	F	U	F
700 Ft.	3.88	75.78	19.17	235.06	8.09	72.34	4.26	24.95	8.85	102.03
1400 Ft.	192.5	2276.9	112.79	9229.62	173.43	11899.81	200.42	9083.05	169.79	8122.35

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 2000-2004 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 2000 - 2003

	YEAR ANNUAL AVGERAGE									
LOCATION	2000		2001		2002		2003		4 Year Average	
	U	F	U	F	U	F	U	F	U	F
(A) Lamb Farm*	1.94	12.56	1.52	6.1	2.36	27.92	1.38	4.41	1.8	12.75
(B) Brubaker Farm	1.65	8.34	2.61	4.55	3.08	13.40	0.66	3.74	2.0	7.51
(C) Texaco Station	1.82	26.39	2.42	4.76	2.24	11.28	0.65	3.44	1.78	11.47
(D) IL Power Equip Station	1.56	8.67	1.77	4.90	4.53	25.43	1.17	3.83	2.26	10.71
(E) Reiniking Property	1.81	28.43	1.43	5.21	1.19	10.82	0.90	3.42	1.33	11.97
(F) Metropolis Airport	3.42	16.02	1.33	4.78	3.61	10.26	0.90	3.03	2.31	8.52
(G) Maple Grove School	1.06	11.15	1.23	4.77	0.80	10.38	0.49	2.91	0.90	7.30
#8 NE Feed Mat'l. Bldg.	17.79	18.92	16.78	11.44	14.45	11.74	11.22	3.65	15.06	11.44
#9 W Feed Mat'l. Bldg.	15.55	17.46	12.1	7.76	14.45	12.30	5.05	4.42	11.79	10.49
#10 S Feed Mat'l. Bldg.	14.80	39.12	10.11	11.32	40.64	14.41	3.23	3.95	17.20	17.20
#11 N Feed Mat'l. Bldg.	24.83	12.63	30.01	7.1	12.06	13.33	12.56	3.94	19.87	9.25
#12 E Feed Mat'l. Bldg.	4.77	14.01	13.20	15.89	12.38	10.72	3.75	3.84	8.53	11.12
#13 NE Feed Mat'l. Bldg.	74.91	30.69	86.46	15.58	18.86	17.32	33.29	7.15	53.38	17.69
(A) - (G) Offsite Avg.	1.89	15.94	1.76	5.01	2.54	15.64	0.88	3.54	1.77	10.03
(8) - (13) On Site Avg.	25.44	22.14	28.11	11.52	18.81	13.30	11.52	4.49	20.97	12.86

Soil

With the exception of Sampling Location #12 (E Feed Material Building) and Sampling Location #13 (NE Feed Material Building) the sampling results from 2000 to 2003 (Table 2.1-14) 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 20.97 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 5.25 ppm for 2000 to 2003 (Table 2.1-14). The 4-year average for onsite uranium concentration is higher than the offsite concentration that averaged 2.92 ppm for the same time period.

Analysis results for many of the onsite sampling locations indicated an increasing trend concentration 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.

The 4-year average for onsite samples was 68.60 ppm and the average for offsite samples was 24.0 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 2000 - 2003

	YEAR ANNUAL AVERAGE									
LOCATION	2000		2001		2002		2003		4 Year Average	
	U	F	U	F	U	F	U	F	U	F
(A) Lamb Farm*	6.31	23	10.60	22.87	1.66	35.84	1.24	26.69	4.95	27.1
(B) Brubaker Farm	6.75	10.8	14.69	22.33	1.61	31.26	0.63	23.67	5.92	22.02
(C) Texaco Station	3.22	10.45	1.63	22.65	2.11	35.26	1.86	21.96	2.21	22.58
(D) IL Power Equip Station	2.22	8.45	5.91	22.46	2.06	28.36	0.75	19.92	2.74	19.80
(E) Reiniking Property	1.75	24.65	7.98	40.79	1.06	33.5	0.83	22	2.91	30.24
(F) Metropolis Airport	1.25	13.55	0.80	20.67	1.09	42.88	0.58	20.60	0.93	24.43
(G) Maple Grove School	0.93	14.85	0.58	22.34	0.73	28.79	1.01	21.39	0.81	21.84
#8 NE Feed Mat'l. Bldg.	2.13	20.9	4.76	60.02	3.26	157.79	2.09	29.23	3.06	66.99
#9 W Feed Mat'l. Bldg.	2.54	30	2.97	54.49	5.47	53.22	0.90	27.79	2.97	41.38
#10 S Feed Mat'l. Bldg.	6.18	124.3	8.83	152.82	14.56	92.39	1.17	41.18	7.69	102.67
#11 N Feed Mat'l. Bldg.	8.69	34.15	11.02	48.70	1.94	111.5	1.33	29.71	5.75	56.02
#12 E Feed Mat'l. Bldg.	4.59	24.05	5.78	32.72	4.91	45.24	3.58	28.10	4.72	32.53
#13 NE Feed Mat'l. Bldg.	15.95	62.65	7.23	106.14	2.52	234.2	3.47	45.06	7.29	112.01
(A) - (G) Offsite Avg.	3.20	15.11	6.03	24.87	1.47	33.70	0.99	22.32	2.92	24.0
(8) - (13) On Site Avg.	6.68	49.34	6.77	75.82	5.44	115.72	2.09	33.51	5.25	68.60

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 TLD badges are analyzed and replaced every quarter.

The control, onsite, and offsite environmental TLD monitoring results from 2000 to 2003 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 maximum annual average environmental TLD dose is approximately 4 percent of the limit specified in 10 CFR 20.1301(a)(2) for dose in any unrestricted area from external sources. In addition, 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 4 percent of the referenced regulatory limits. Background annual average radiation doses at the airport have varied from 91 to 97 mrem. Radiation doses at the nearest residence were similar to background and ranged from 86 to 97 mrem during 2000 to 2003.

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

Location	Year			
	2000	2001	2002	2003
Control	90	84	101	86
North Fence	166	158	182	174
East Fence	708	603	375	294
South Fence	213	335	530	568
West Fence	114	107	120	113
North Boundary	118	114	131	126
Airport	91	91	97	93
NR-7 A NORTH	92	86	97	93
NR-7 SOUTH	89	87	94	88

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 22-hectare (54-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. Contamination will be reduced to levels that allow for release of the facility for unrestricted use. These levels are specified in "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material," dated April 1993 (USNRC, 1993).

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 DOE 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.

3.0 Description of the Affected Environment

3.1 Land Use

Anderson, et al. (1976) define five major land use categories. They are cropland, grassland pasture and range, forest, special (including urban areas, transportation areas, rural parks, wildlife refuges, and others), and miscellaneous (typically unoccupied and unused areas such as tundra, glaciers, icefields, wetlands, and others). Of these, cropland, pasture, forest, rural residential, urban, transportation, and wetlands occur on or in close proximity to the MTW site. The site itself is classified as industrial, while the remainder of the land owned by the operator is secondary forest and cropland.

Open water is not usually considered a "land use." In this case, however, the proximity of the plant site to the Ohio River means that a significant portion of the "land" in close proximity to the site is actually water. We included the area occupied by the river in the analysis below because the river, while not used by the plant, is also a significant transportation corridor.

Wetlands, refuges, and wildlife conservation areas are discussed in greater detail in Section 3.5.2.

3.1.1 Site Vicinity

Land use within a radius of two miles of the MTW site is summarized in Table 3.1-1.

Table 3.1-1 Major Land Use Categories Within A Two-Mile Radius Of The Site Center

Land Use Category	Approximate Total Acreage	% of Total
MAINLY UNDEVELOPED		
Agricultural Land		
Corn	158.12	1.97
Soybeans	720.34	8.95
Winter Wheat	28.91	0.36
Other Small Grains / Hay	44.26	.55
Winter Wheat / Soybeans	94.96	1.18
Other Agriculture	105.42	1.31
Rural Grassland	1595.68	19.83
Forested Land		
Upland Dry	101.41	1.26
Upland Dry - Mesic	42.48	0.53
Upland Mesic	494.62	6.15
Savannah Upland	49.82	0.62
Coniferous	187.03	2.32
Wetland		
Shallow Marsh / Wet Meadow	57.82	0.72
Seasonally / Temporarily Flooded	4.67	0.06
Floodplain Forest	930.95	11.57
Swamp	8.90	0.11
Shallow Water	93.41	1.16
Surface Water	1756.03	21.83
Barren and Exposed Land	.89	0.01
Sub-total	6475.72	80.49
DEVELOPED		
Urban: High Density	412.10	5.12
Urban: Low / Medium Density	855.11	10.63
Urban: Open Space	302.46	3.76
Sub-total	1569.67	19.51
Total	8045.39	100.0

This analysis is based on interpretation of the U.S. Geological Survey Joppa, IL-KY quadrangle map dated 1982. As illustrated by these data, the site lies in a mainly undeveloped, rural region of extreme southern Illinois.

The MTW site lies in a mainly undeveloped, rural region of extreme southern Illinois. Dominant land use within a two-mile radius of the MTW is pasture, cropland, wetlands and forest that cover more than 80% of the land (Table 3.1-1). Most of the MTW land outside the exclusion zone remains forested. Accordingly, forests are probably over represented in this radius in comparison to Massac County as a whole.

Based upon a subjective comparison with the 1982 USGS topographic map and the aerial photograph from 1998 (see figure 3.9-1): with the exception of a small expansion of the plant, there are no obvious or significant trends or changes in the land use. The flood plain within the MTW site, between the restricted area and the Ohio River, was cultivated in the past. It is no longer farmed and is returning to a more natural vegetation stand. Cropland on the MTW site is restricted to the approximately 100 acres north of Route 45.

According to USNRC (1995), about 70 percent of the land in Massac County was used for agricultural purposes in the mid-1990s, with corn and soybeans as principal cash crops and cattle and hogs as principal livestock (USDOC, n.d.). The nearest pastureland was then located approximately 1.5 miles northeast of the plant and was used to graze beef cattle. The nearest dairy cattle were grazed approximately eight miles east of the plant.

3.1.2 Site

Major facilities in the 54-acre exclusion zone include the administration building, the laboratory, the fluorine production facility, the feed materials building, the waste water ponds and treatment plant, and a UF_6 cylinder storage area (see Figure 1.1-1). These facilities are surrounded by inner- and outer-perimeter security fences, about 50 feet apart. Much of the site, including the six-story feed materials building, the administration building, the maintenance facility are visible from U.S. Highway 45 northeast of the plant structures.

3.1.3 Transportation and Transmission

U.S. Highway 45 and a Burlington Northern railroad right-of-way border the site to the northeast. An electrical transmission line crosses the property about half-way between the Ohio River and the southwestern border of the exclusion zone. The transmission line corridor is maintained in grasses and low-growing shrubs. A buried natural gas pipeline, crossing the property about 18 meters (60 feet) north of the administration building, provides gas to the MTW plant and continues east to serve the City of Metropolis.

3.1.4 Other Nearby Development

Major nearby industrial development includes the Tennessee Valley Authority Shawnee Steam Plant and the U.S. Enrichment Corporation Paducah Gaseous Diffusion Plant (a uranium enrichment facility) both located across the Ohio River from the MSM facility in Kentucky.

An American Electric Power Company coal blending plant is located immediately northwest of the site, and a coal-fired power plant operated by Electrical Energy, Inc. is located about six miles to the northwest according to USNRC (1995).

3.1.5 Archaeologically or Historically Significant Sites

According to USNRC (1995) two sites listed on the National Register of Historic Places are located in the area. The Elijah P. Curtis House is within the City of Metropolis about one mile southeast from the plant. This site is a two story brick home constructed in 1870 by a local Civil War veteran that now houses the Massac County Historical Society.

Fort Massac, for which the county was named, is about four miles upriver in Fort Massac State Park on the banks of the Ohio River. Fort Massac is the oldest state park in Illinois and the fort itself was ordered restored by George Washington when he became President of the United States.

Since the above was published, a third National Register site has been added to the list. It is located east-southeast of Brookport, Illinois (approximately 7.5 miles southeast of the MTW facility). Known as the "Kincaid Mounds", it consists of 19 prehistoric mounds that rise about 30 feet above an otherwise flat riverbottom along Avery Lake. The mounds date from the Mississippian period that flourished around AD 1050-1400.

There are no state-listed historic sites in the immediate area of the MTW facility.

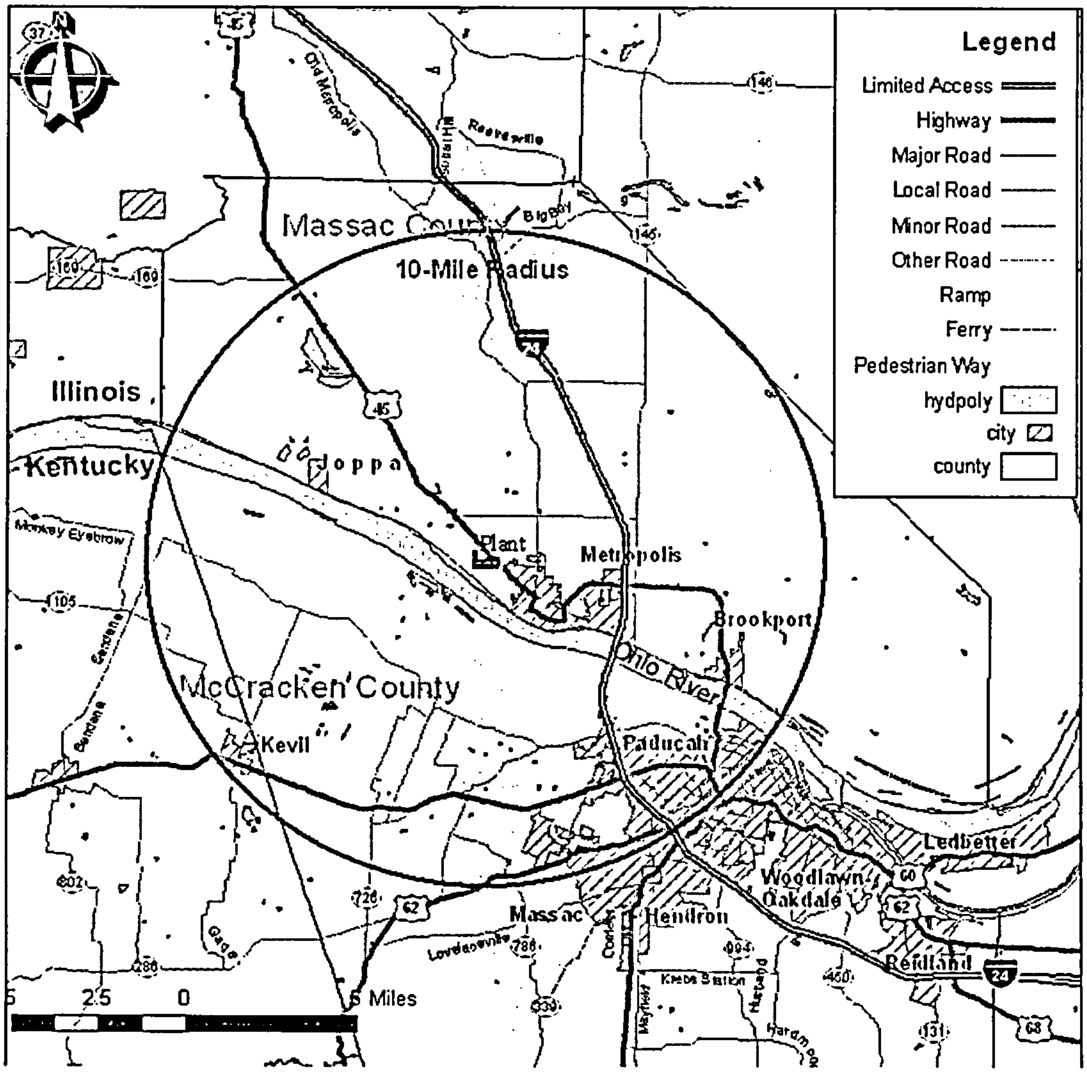
3.1.6 Mineral Use

According to AlliedSignal (1994), the nearest active mineral extraction operation are fluorspar mines near Rosiciare, Illinois, approximately 40 miles northeast of the plant. Sand dredging also occurs in the Ohio River about 7 miles upstream of the plant near Paducah, Kentucky.

3.2 Transportation

The MTW facility is located approximately one mile west of Metropolis. US Highway 45 and Burlington North Railroad border the facility to the north, and Ohio River bounds the MTW facility to the south. Interstate 24 is located approximately 4.5 miles east of the facility and provides access from Paducah, KY across the Ohio River into Metropolis, IL (See Figure 3.2-1).

Figure 3.2-1 Transportation Routes & Cities Within Vicinity Of MTW Facility



3.3 Geology and Soils

3.3.1 Regional Geology

The MTW Site is located near the northern end of the Mississippian Embayment, an extension of the Gulf Coastal Plain (Figure 3.3-1) and a depositional basin filled in with weakly lithified Cretaceous, Tertiary, and Quaternary clastic sediments, which overlap Paleozoic bedrock.

The MTW Site is located within the northern portion of the New Madrid seismic zone (Figure 3.3-1). A large number of earthquakes have occurred in northeastern Arkansas and southeastern Missouri in association with the New Madrid fault zone. The major historic earthquakes felt in this area were from the 1811-1812 New Madrid earthquakes whose epicenter was approximately 97 kilometers (60 miles) southwest of the MTW facility. The strongest of these earthquakes was estimated to have produced a Modified Mercalli Intensity IX earthquake at Metropolis (i.e., a seismic event capable of causing considerable damage to well-built buildings, moving houses off their foundations, breaking some underground pipes, cracking the ground and causing serious damage to reservoirs).

3.3.2 Local Geology and Terrain

The topography of the MTW site is relatively flat. Southern Illinois has gently rolling hills with site terrain between 300 and 380 ft (91 and 116 m) above mean sea level. Within the boundaries of the MTW security fence, the maximum variation in elevation is about 10 ft.(USGS Joppa, IL. 1982 Topo Map)

Locally, the MTW Site and much of the surrounding region overlies approximately a few meters of Quaternary loess. Recent Surface Geology Maps (Nelson et al., 2002) developed by the Illinois State Geological Survey (ISGS) exclude this loess veneer and show the area of the site to overlie the Metropolis Formation, comprised of poorly sorted, deeply weathered and burrowed alluvial sediments. The Metropolis Formation is composed of clay-rich silty sand and sandy silt, mottled in gray, yellow, and orange and containing bleached chert pebbles 20 to 55 feet (6.1 to 17 meters) thick at the site. The Metropolis Formation probably ranges in age from early through middle Pleistocene (Illinoian Stage and older). The Metropolis Formation overlies the Mounds Gravel, comprised of gravel and sand 35 to 65 feet (11 to 20 meters) thick, and interpreted as deposits of large, braided rivers that were in part ancestral to the modern Tennessee River. Groundwater monitoring wells at the site are completed in the Mounds Gravel. Figure 3.3-2 is a cross-section showing the stratigraphy across the MTW Site (Andrews Engineering, 2005).

Figure 3.3-1 Regional Geologic Setting

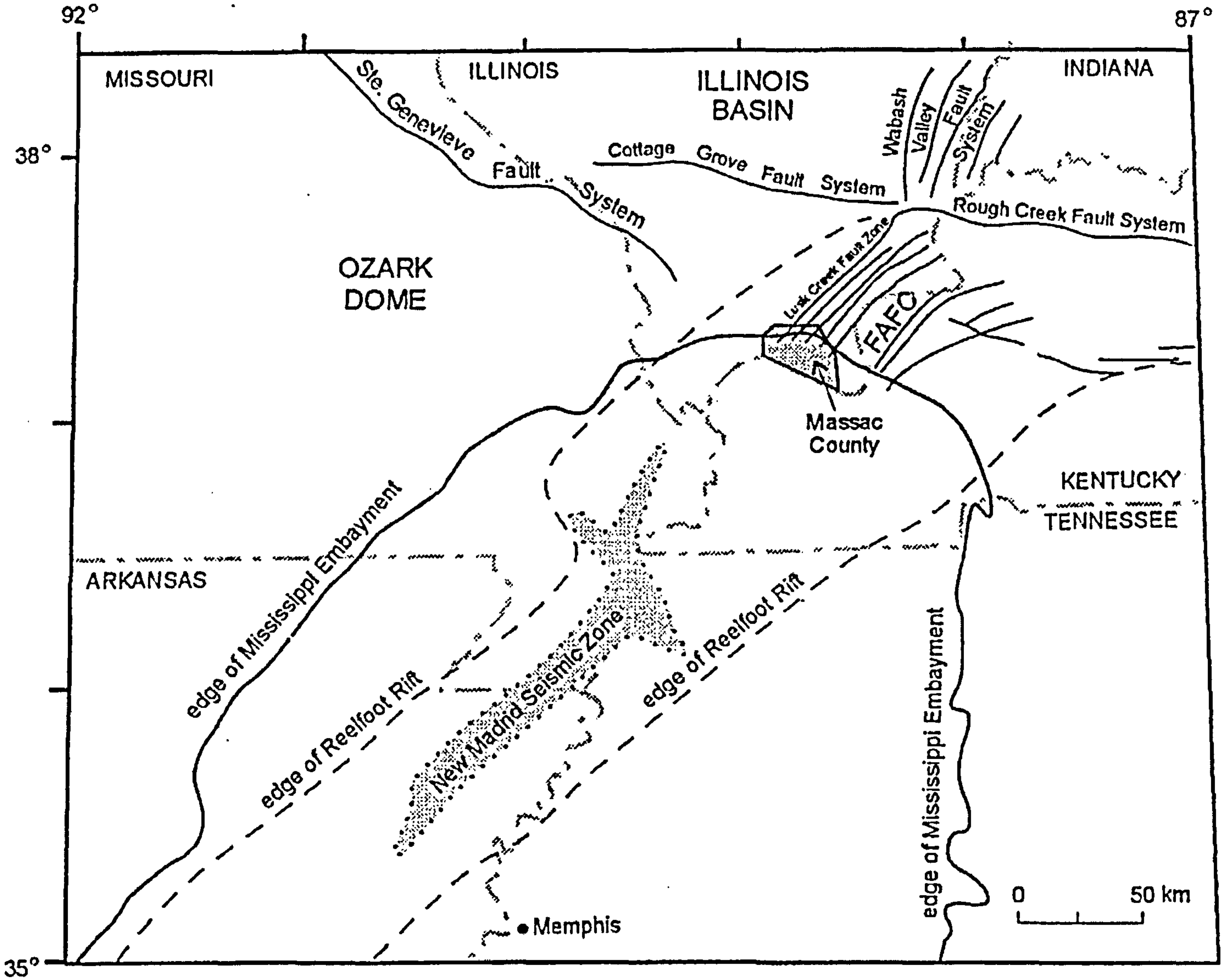
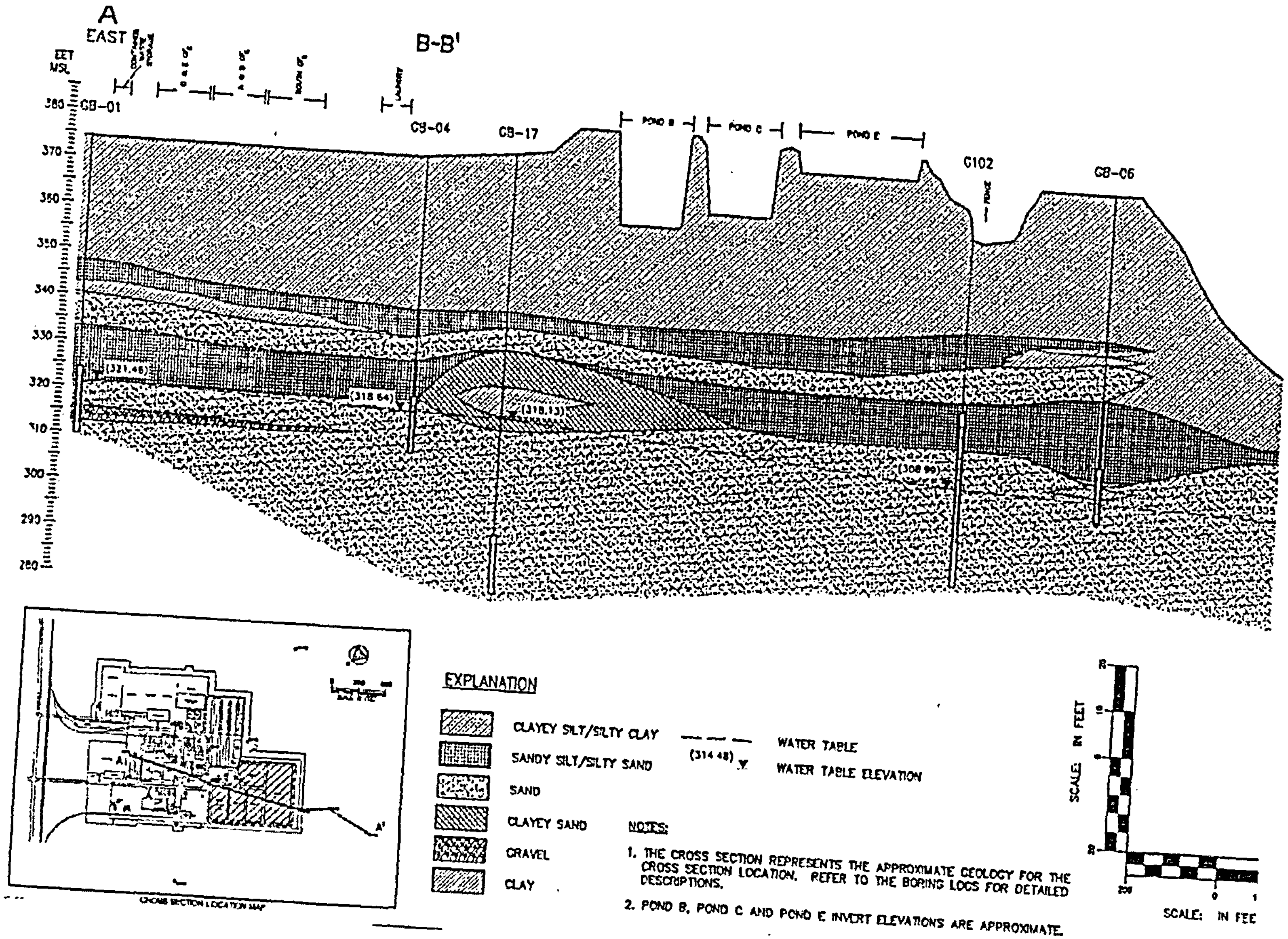


Figure 3.3-2 North-South Cross-Section



Bedrock underlying unconsolidated Mounds Gravel includes the Tertiary Porter's Creek Clay, Cretaceous McNairy Formation and the Mississippian Limestone. The McNairy Formation is comprised of sand, silt and clay is found beneath the Mounds Gravel and likely represents deltaic and shoreline deposits of the Mississippi Embayment. The underlying Mississippian Limestone is a cherty microgranular limestone and minor dolomite (wackestone/packstone) and is the water source for the three on-site water supply wells of good quality water (see Section 3.4.1).

The Fluorspar Area Fault Complex within the New Madrid Seismic Zone extends into Massac County. This fault complex is composed of NE and N-NE trending high-angle faults. East of the MTW Site, faults extend through the town of Metropolis, creating the Massac Creek Graben (Nelson, 2000). Some displacements of approximately 35 to 100 feet affect older sediments more than 75,000 years old. Small offsets of 4 to 7 feet were observed on units younger than 75,000 but more than 15,000 years old. Sediment younger than 15,000 years does not appear disturbed. No faults were mapped on the subject MTW Site (Nelson, 2005).

3.3.3 Soils

3.3.3.1 Regional Soils

Gently rolling hills are the predominant surface feature of the site area. Drainage is directly; or indirectly through secondary watersheds, into the Ohio river. Bottomland and light colored terrace soils are found along the Ohio River, which forms the South boundary of the site. These soils were developed primarily from outwash or alluvium under forest vegetation. Soils in the remainder of the area are light colored silt loams, with moderately slow to slowly permeable subsoils developed primarily under forest vegetation from loess.

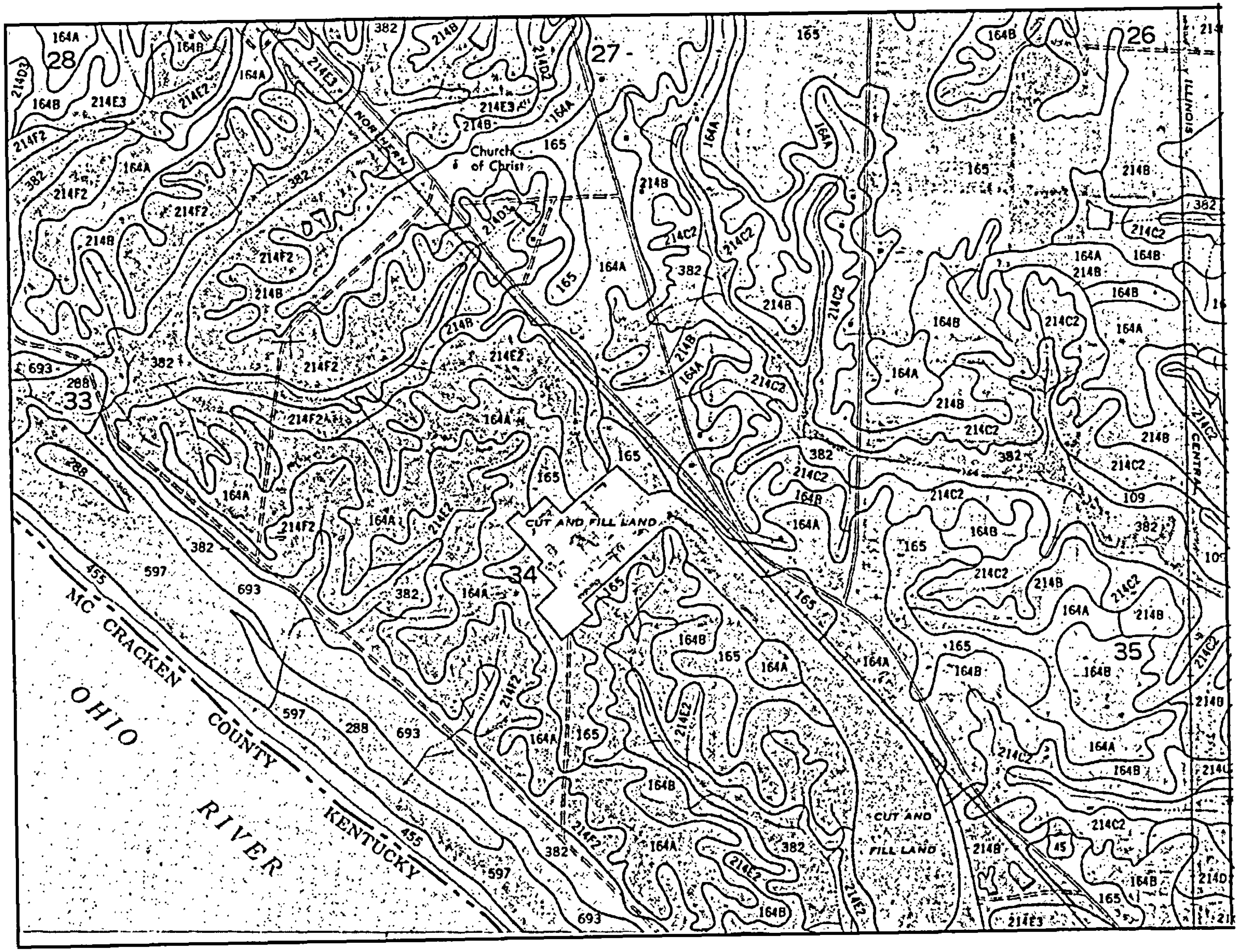
3.3.3.2 Site Soils

Based on review of the Massac County Soil Survey (NRCS, 1975), the soils on and surrounding the MTW Site included Stoy silt loam, 0-2 percent slopes, Stoy silt loam, 2-5 percent slopes, and Weir silt loam, 0-2 percent slopes. The distribution of these dominant soil types is provided in Figure 3.3-3. The Natural Resource Conservation Service (NRCS) Soil Data Mart website (http://soildatamart.nrcs.usda.gov/) indicated these soils represented a total of 3.8 percent of the soil types in Massac County. The Weir silt loam is considered a Hydric Soil and the Stoy silt loam is prime farmland. These silt loam and silty clay loam soils (CL, CL-ML, ML) exhibit a variable water table, a high to medium surface runoff rate, slow permeability and are not prone to flooding, although Weir soils exhibit frequent ponding. The soils offer very limited conditions for dwellings, dwellings with basements, and commercial buildings due to the depth to soil saturation, shrink-swell and ponding issues. Due to low permeability and depth to saturation, these soils are very limited in use for septic tank absorption fields. Site soils also exhibit a high potential for frost action and a high risk of corrosion to uncoated steel and concrete. The soil structure in the area of the plant may exhibit a viscous or visco-elastic response to earthquake loading and may be susceptible to ground wave motion from distant earthquakes; however, severe ground motion tends to be reduced due to the soil structure present.

3.3.4 Mineral Resources

Mineral resources in the area include sand and fluorspar. Sand dredging on the Ohio River occurs about 11 kilometers (7 miles) upstream of the plant and fluorspar mining occurs about 64 kilometers (40 miles) northeast of the plant.

Figure 3.3-3 Regional Geologic Setting - Soil types



3.4 Hydrology

3.4.1 Surface Water

The MTW Site is bound on the south by the Ohio River in the vicinity of River Mile 946 (USGS, 1982). The Ohio River at the plant site is about 910 meters (3,000 feet) wide with a normal pool elevation of 88 meters (290 feet) above mean sea level. The Ohio River drains 203,940 square miles (ORSANCO, 2004) The site is located along the Ohio River at a point approximately 35 miles upstream from its confluence with the Mississippi River.

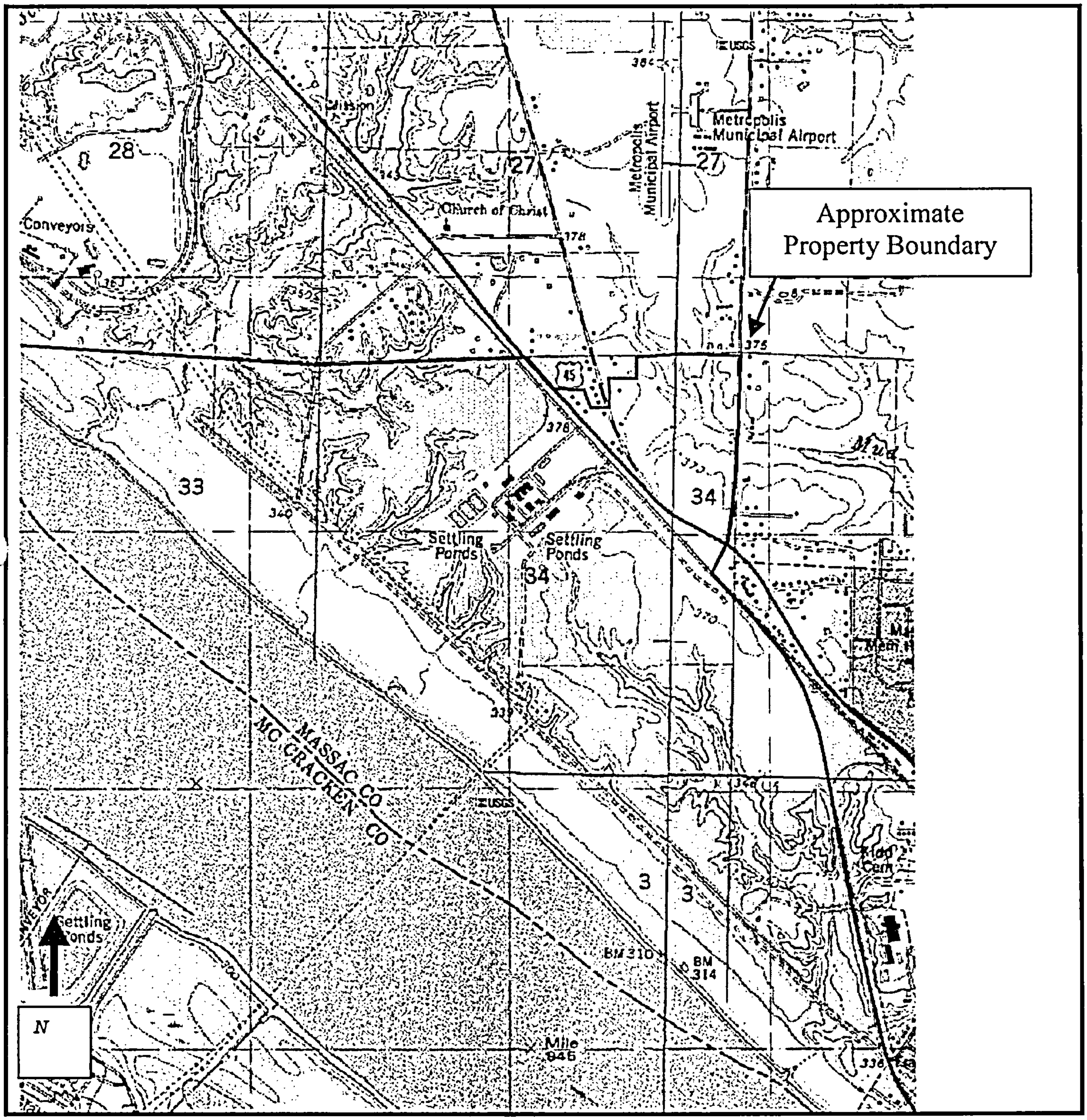
There are four intermittent creeks that drain the MTW Site property to the Ohio River. Surface water features are illustrated on Figure 3.4-1. The intermittent creeks enter the MTW Site on the north side, and there are no other downstream properties between the Honeywell facility and the Ohio River.

The MTW Site currently utilizes two settling ponds. Process wastewater is discharged to Pond E, then overflows to Pond D. Pond A was closed in 2001 as part of an ongoing program to phase out the surface impoundments. The remaining four surface impoundments will be closed by 2020.

Effluent from the settling ponds is mixed with other plant effluents before discharge at Outfall 002. Outfall 002, which is used to discharge the plant's treated sanitary , process waste waters, non-contact cooling water, and storm water, is located on one of the on-site drainages about 610 meters (2,000 feet) from the Ohio River. According to NPDES permit data, Outfall 002 is located at latitude 3710090, longitude -08845290 within USGS hydrologic basin code 05140206 (USEPA, 2005).

There are no downstream receptors for the intermittent drainage channel that receives plant effluent. This water body has no downstream uses for potable water, fishing, recreation, or irrigation prior to discharge to the Ohio River.

Figure 3.4-1 Topographic and Hydrologic Features



3.4.2 Streamflow and Flood Characteristics

Numerous flood control dams regulate the flow of the Ohio River and have reduced the threat of flooding. The nearest flood control structure is Lock and Dam No. 52 at Brookport, Illinois, which is about 11 kilometers (7 miles) upstream from the site.

Ohio River discharge records have been maintained since 1928. The maximum recorded discharge on the Ohio River at Metropolis, Illinois was 50,410 m^3/s (1,780,000 ft^3/s) and occurred on February 1, 1937 (USGS, 2005). Although flooding is an annual event, the plant site has reportedly never been reached by flood waters. While the 1937 flood reached an elevation of 342 feet, the probable elevation of a 100-year flood (1 in 100 chance of occurring in a given year) in the area is approximately 337 feet (USFEMA, 1983). The plant site elevation is 375 feet and is considerably above the most extreme flood level projected for the Ohio River. The distance from the plant site restricted area to the 100-year floodplain is approximately 650 feet.

The plant effluent is insignificant compared to the annual mean discharge rate for the Ohio River, which has ranged from 118,900 ft^3/s to 465,500 ft^3/s (USGS, 2005). The following Table 3.4-1 summarize effluent flow rates from NPDES monitoring data:

Table 3.4-1 NPDES Monitoring Data - Outfall 002 Monthly Average Flow Rate

Month	2000 Average (MGD)	2001 Average (MGD)	2002 Average (MGD)	2003 Average (MGD)	2004 Average (MGD)	2005 Average (MGD)
January	3.4129	3.1705	3.4162	3.4769	3.3042	3.5334
February	3.4045	3.2756	3.4365	3.3755	3.1437	3.5913
March	3.3869	2.9733	3.5631	3.2042	3.1976	3.5376
April	3.3032	2.9701	3.5604	3.2503	3.4059	Not Available
May	3.2556	3.3059	3.4812	3.4247	3.5926	Not Available
June	3.5831	3.5258	3.6057	3.1703	3.7322	Not Available
July	3.6014	3.7873	3.5888	3.5302	3.3649	Not Available
August	3.6602	3.5872	3.5362	3.4835	3.4660	Not Available
September	3.3729	3.5970	3.6090	3.1869	3.3894	Not Available
October	3.1037	3.5711	3.6739	2.5184	3.3713	Not Available
November	3.1661	3.5616	3.4799	3.2349	3.5686	Not Available
December	3.3498	3.4834	3.5498	3.4142	3.4749	Not Available

Source: Honeywell NPDES monitoring data.

3.4.3 Water Use

The MTW Site does not utilize surface water as a source for potable water or for process water. There are no fishing, recreational, irrigation, or other agricultural uses of the on-site intermittent streams.

The Ohio River in the area is used for barge transportation, commercial and sport fishing, musseling, and as a source of water supply. The nearest public drinking water intake is located at Paducah, Kentucky, about eleven miles upstream (USEPA, 2005). There are no upstream or downstream public drinking water intakes on the Illinois side of the river within Massac County. The nearest downstream public drinking water intake is located in Cairo, Illinois, about 51 kilometers (32 miles) away (AlliedSignal, 1994).

Most surface streams outside the site boundary are used for recreation and for watering livestock. Numerous farm ponds and lakes are found throughout the area.

According to information on water use for 2000 (USGS, February 2005) total surface water withdrawals for Massac County, Illinois, and McCracken County, Kentucky (the adjoining county to the south) were broken down as follows in Table 3.4-2:

Table 3.4-2 Surface Water Withdrawal

Usage	Surface Water Withdrawal Quantity (MGD)	
	Massac County, IL	McCracken County, KY
Public supply	0	6.99
Domestic self supply	0	Not reported
Industrial self supply	0	10.75
Irrigation	0	0.04
Livestock	0	Not reported
Mining	0	Not reported
Aquaculture	0	Not reported
Thermoelectric, once through	554.70	0
Thermoelectric, closed loop	0	1181.05
Total withdrawals	554.70	1198.83

3.4.4 Water Quality

The Outfall 002 effluent is continuously sampled to produce a daily composite, which is analyzed for uranium, and the monthly composite is also analyzed for numerous non-radiological constituents. Effluent limits are stipulated in NPDES permit number IL000421.

In general, the effluent has not had any significant adverse trending in required monitoring parameters. The flow rate has increased slightly over the last five years due to lack of water conservation, as well as the installation of water cooled rectifiers for the fluorine plant. However, the facility will install a cooling tower in 2006, which will reduce the flow rate. NPDES monthly monitoring data is summarized on the following Table 3.4-3.

Table 3.4-3 NPDES Monitoring Data - Outfall 002 Five-Day Biochemical Oxygen Demand (BOD)

MONITORING PERIOD END DATE	MAXIMUM QUANTITY (lbs/day)	AVERAGE QUANTITY (lbs/day)	MAXIMUM CONCENTRATION (mg/L)	AVERAGE CONCENTRATION (mg/L)
28-FEB-2005	43.4	33.7	1.4	1.1
31-JAN-2005	250.0	166.2	8.6	5.5
31-DEC-2004	36.3	32.4	1.4	1.2
30-NOV-2004	38.1	25.4	1.2	0.8
31-OCT-2004	90.1	61.7	3.2	2.2
30-SEP-2004	4.0	2.3	0.2	0.1
31-AUG-2004	52.5	27.9	1.8	0.9
31-JUL-2004	31.3	20.4	1.1	0.7
30-JUN-2004	31.4	20.7	1.0	0.7
31-MAY-2004	31.4	18.9	1.1	0.6
30-APR-2004	197.7	105.4	6.7	3.6
31-MAR-2004	47.9	31.4	1.8	1.2
29-FEB-2004	76.6	40.6	2.9	1.5
31-JAN-2004	53.2	48.8	1.9	1.8
31-DEC-2003	75.4	39.3	2.7	1.4
30-NOV-2003	70.4	62.2	2.4	2.0
31-OCT-2003	23.5	16.4	1.2	0.8
30-SEP-2003	42.0	32.4	2.0	1.6
31-AUG-2003	54.8	47.1	1.9	1.7
31-JUL-2003	87.9	52.3	3.1	1.9
30-JUN-2003	77.3	77.3	2.8	2.8
31-MAY-2003	78.8	53.7	2.6	1.8
30-APR-2003	110.4	76.1	3.7	2.6
31-MAR-2003	144.8	107.7	5.9	4.3
28-FEB-2003	161.3	119.2	5.7	4.3
31-JAN-2003	215.6	164.5	7.1	5.5
31-DEC-2002	235.1	137.0	8.0	4.5
30-NOV-2002	144.1	113.8	4.8	3.9
31-OCT-2002	572.5	405.4	16.4	12.2
30-SEP-2002	166.2	157.4	5.8	5.3
31-AUG-2002	155.1	123.1	5.5	4.2
31-JUL-2002	106.0	79.0	3.6	2.6
30-JUN-2002	34.7	18.8	1.1	0.6
31-MAY-2002	100.3	92.9	3.2	3.1
30-APR-2002	264.1	188.4	9.1	6.5
31-MAR-2002	301.0	185.4	8.8	5.6
28-FEB-2002	183.3	121.4	6.0	4.2

Quantity is measured in pounds per day (lbs/day) and concentration is milligrams per liter (mg/L).

Table 3.4-3 NPDES Monitoring Data - Outfall 002 (continued)

pH

MONITORING PERIOD END DATE	MAXIMUM CONCENTRATION (SU)	MINIMUM CONCENTRATION (SU)
28-FEB-2005	7.8	7.2
31-JAN-2005	7.6	7.4
31-DEC-2004	7.7	7.3
30-NOV-2004	7.6	7.2
31-OCT-2004	7.7	7.5
30-SEP-2004	7.7	7.5
31-AUG-2004	7.8	7.3
31-JUL-2004	7.6	7.2
30-JUN-2004	7.5	7.1
31-MAY-2004	7.7	7.3
30-APR-2004	7.6	7.3
31-MAR-2004	7.7	6.9
29-FEB-2004	7.5	7.0
31-JAN-2004	7.4	7.0
31-DEC-2003	7.4	7.2
30-NOV-2003	7.8	7.3
31-OCT-2003	7.7	7.4
30-SEP-2003	8.0	7.2
31-AUG-2003	7.7	7.1
31-JUL-2003	7.9	7.2
30-JUN-2003	7.9	7.0
31-MAY-2003	7.4	7.0
30-APR-2003	7.5	7.3
31-MAR-2003	7.7	7.2
28-FEB-2003	7.5	7.2
31-JAN-2003	7.5	7.4
31-DEC-2002	7.6	7.5
30-NOV-2002	7.6	7.2
31-OCT-2002	7.6	7.3
30-SEP-2002	7.4	7.3
31-AUG-2002	7.4	7.3
31-JUL-2002	7.3	7.2
30-JUN-2002	7.5	7.4
31-MAY-2002	7.6	7.2
30-APR-2002	7.5	7.1
31-MAR-2002	7.4	7.1
28-FEB-2002	7.3	7.2

Table 3.4-3 NPDES Monitoring Data - Outfall 002 Total Suspended Solids (TSS) - Effluent Location (continued)

MONITORING PERIOD END DATE	MAXIMUM QUANTITY (lbs/day)	AVERAGE QUANTITY (lbs/day)	MAXIMUM CONCENTRATION (mg/L)	AVERAGE CONCENTRATION (mg/L)
28-FEB-2005	33.2	26.4	1.1	0.9
31-JAN-2005	112.2	63.3	3.7	2.1
31-DEC-2004	59.4	27.4	2.0	1.0
30-NOV-2004	66.0	42.9	2.1	1.4
31-OCT-2004	33.4	27.3	1.2	1.0
30-SEP-2004	48.6	35.9	1.7	1.3
31-AUG-2004	63.5	44.0	2.3	1.5
31-JUL-2004	153.1	84.3	6.4	3.3
30-JUN-2004	94.3	37.8	3.0	1.2
31-MAY-2004	30.3	18.8	1.0	0.6
30-APR-2004	38.6	22.3	1.3	0.8
31-MAR-2004	33.3	24.7	1.2	0.9
29-FEB-2004	21.7	14.8	0.8	0.6
31-JAN-2004	17.3	13.6	0.6	0.5
31-DEC-2003	81.4	33.6	2.5	1.1
30-NOV-2003	71.6	39.9	2.4	1.4
31-OCT-2003	64.4	27.2	2.9	1.3
30-SEP-2003	113.2	53.2	4.4	2.0
31-AUG-2003	61.9	36.8	2.1	1.3
31-JUL-2003	80.7	41.9	2.9	1.5
30-JUN-2003	224.5	94.1	7.1	3.2
31-MAY-2003	70.8	35.1	2.7	1.3
30-APR-2003	183.4	59.3	6.5	2.1
31-MAR-2003	222.6	85.7	7.4	3.0
28-FEB-2003	71.3	54.8	2.6	2.0
31-JAN-2003	134.1	68.1	3.5	2.1
31-DEC-2002	58.3	52.9	1.9	1.8
30-NOV-2002	40.3	30.9	1.4	1.1
31-OCT-2002	23.6	18.6	0.8	0.6
30-SEP-2002	38.5	22.2	1.4	0.8
31-AUG-2002	157.0	61.9	5.2	2.1
31-JUL-2002	55.5	33.3	1.8	1.1
30-JUN-2002	57.4	27.9	1.8	0.9
31-MAY-2002	43.5	33.8	1.4	1.1
30-APR-2002	151.3	68.1	4.9	2.3
31-MAR-2002	92.2	45.1	2.7	1.4
28-FEB-2002	98.3	39.1	3.0	1.3

Values are effluent gross. Quantity is measured in pounds per day (lbs/day) and concentration is milligrams per liter (mg/L).

Table 3.4-3 NPDES Monitoring Data - Outfall 002 Total Suspended Solids (TSS) - Process Location - (continued)

MONITORING PERIOD END DATE	MAXIMUM CONCENTRATION (mg/L)	AVERAGE CONCENTRATION (mg/L)
28-FEB-2005	2.2	1.8
31-JAN-2005	7.5	4.2
31-DEC-2004	3.8	1.8
30-NOV-2004	4.0	2.7
31-OCT-2004	2.1	1.8
30-SEP-2004	3.6	2.5
31-AUG-2004	4.7	3.1
31-JUL-2004	11.3	6.1
30-JUN-2004	6.1	2.6
31-MAY-2004	2.2	1.4
30-APR-2004	2.9	1.7
31-MAR-2004	2.2	1.8
29-FEB-2004	1.4	1.0
31-JAN-2004	1.2	0.9
31-DEC-2003	5.2	2.2
30-NOV-2003	4.6	2.6
31-OCT-2003	4.9	2.0
30-SEP-2003	6.7	3.5
31-AUG-2003	4.2	2.6
31-JUL-2003	5.7	2.9
30-JUN-2003	12.3	5.7
31-MAY-2003	4.6	2.3
30-APR-2003	11.6	3.8
31-MAR-2003	14.2	5.7
28-FEB-2003	5.1	3.7
31-JAN-2003	7.6	4.2
31-DEC-2002	3.8	3.5
30-NOV-2002	2.9	2.1
31-OCT-2002	1.5	1.1
30-SEP-2002	2.9	1.6
31-AUG-2002	9.0	3.8
31-JUL-2002	3.6	2.2
30-JUN-2002	3.8	1.9
31-MAY-2002	2.7	2.2
30-APR-2002	10.7	4.6
31-MAR-2002	5.4	2.8
28-FEB-2002	6.2	2.5

Quantity is measured in pounds per day (lbs/day) and concentration is milligrams per liter (mg/L).

Table 3.4-3 NPDES Monitoring Data - Outfall 002 Total Fluoride - (continued)

MONITORING PERIOD END DATE	MAXIMUM QUANTITY (lbs/day)	AVERAGE QUANTITY (lbs/day)	MAXIMUM CONCENTRATION (mg/L)	AVERAGE CONCENTRATION (mg/L)
28-FEB-2005	85.6	63.2	2.8	2.1
31-JAN-2005	78.7	68.2	2.6	2.3
31-DEC-2004	72.3	48.9	2.5	1.7
30-NOV-2004	109.6	73.8	3.5	2.4
31-OCT-2004	76.0	69.6	2.7	2.5
30-SEP-2004	48.8	43.5	1.7	1.5
31-AUG-2004	91.7	55.2	3.0	1.9
31-JUL-2004	96.5	67.3	3.4	2.5
30-JUN-2004	280.4	104.0	8.9	3.3
31-MAY-2004	80.9	48.5	2.7	1.6
30-APR-2004	24.0	21.5	0.8	0.8
31-MAR-2004	58.3	35.9	2.1	1.3
29-FEB-2004	61.3	43.7	2.3	1.6
31-JAN-2004	58.8	42.3	2.0	1.5
31-DEC-2003	59.6	49.0	1.8	1.7
30-NOV-2003	72.8	58.9	2.4	2.1
31-OCT-2003	53.0	35.6	2.4	1.7
30-SEP-2003	205.3	80.3	5.4	2.7
31-AUG-2003	116.9	71.6	3.9	2.5
31-JUL-2003	160.2	91.5	5.8	3.2
30-JUN-2003	152.4	82.4	4.8	2.9
31-MAY-2003	119.2	82.9	4.0	2.9
30-APR-2003	129.2	99.4	4.6	3.6
31-MAR-2003	104.1	76.6	3.5	2.8
28-FEB-2003	578.3	222.1	18.5	7.5
31-JAN-2003	158.4	107.9	5.2	3.5
31-DEC-2002	126.2	102.4	4.2	3.4
30-NOV-2002	147.7	75.8	5.2	2.6
31-OCT-2002	80.1	59.5	2.6	2.0
30-SEP-2002	133.5	77.8	4.4	2.7
31-AUG-2002	158.2	113.3	5.2	3.8
31-JUL-2002	192.3	116.2	6.3	3.9
30-JUN-2002	94.0	72.8	3.0	2.4
31-MAY-2002	123.6	93.9	4.0	3.1
30-APR-2002	151.8	105.6	4.9	3.5
31-MAR-2002	212.0	146.9	7.1	4.8
28-FEB-2002	115.4	88.9	4.1	3.1

Values are effluent gross. Quantity is measured in pounds per day (lbs/day) and concentration is milligrams per liter (mg/L).

Table 3.4-3 NPDES Monitoring Data - Outfall 002 Total Uranium (U_3O_8) (continued)

MONITORING PERIOD END DATE	AVERAGE QUANTITY (lbs/day)	MAXIMUM CONCENTRATION (mg/L)	AVERAGE CONCENTRATION (mg/L)	MINIMUM CONCENTRATION (mg/L)
28-FEB-2005	2.39	0.18	0.08	0.03
31-JAN-2005	4.42	0.67	0.14	0.05
31-DEC-2004	3.05	0.27	0.10	0.04
30-NOV-2004	6.50	0.52	0.22	0.03
31-OCT-2004	4.12	0.50	0.15	0.05
30-SEP-2004	2.16	0.13	0.08	0.03
31-AUG-2004	1.04	0.11	0.04	0.01
31-JUL-2004	1.77	0.23	0.06	0.02
30-JUN-2004	3.30	0.43	0.10	0.03
31-MAY-2004	1.77	0.26	0.06	0.01
30-APR-2004	1.22	0.21	0.04	0.01
31-MAR-2004	1.48	0.29	0.05	0.01
29-FEB-2004	1.53	0.21	0.06	0.01
31-JAN-2004	1.59	0.19	0.05	0.02
31-DEC-2003	1.53	0.20	0.05	0.02
30-NOV-2003	2.44	0.30	0.08	0.01
31-OCT-2003	0.73	0.11	0.04	0.01
30-SEP-2003	2.98	0.38	0.10	0.01
31-AUG-2003	10.47	7.47	0.34	0.02
31-JUL-2003	3.04	0.36	0.10	0.03
30-JUN-2003	2.74	0.50	0.10	0.01
31-MAY-2003	4.14	0.53	0.14	0.01
30-APR-2003	2.98	0.41	0.11	0.03
31-MAR-2003	2.56	0.34	0.09	0.03
28-FEB-2003	5.06	0.52	0.17	0.04
31-JAN-2003	2.82	0.39	0.10	0.03
31-DEC-2002	4.65	0.49	0.15	0.03
30-NOV-2002	2.05	0.27	0.07	0.01
31-OCT-2002	3.52	0.56	0.11	0.03
30-SEP-2002	5.58	0.89	0.18	0.02
31-AUG-2002	2.18	0.58	0.07	0.02
31-JUL-2002	3.02	0.72	0.10	0.01
30-JUN-2002	1.61	0.21	0.05	0.01
31-MAY-2002	2.94	0.50	0.10	0.01
30-APR-2002	2.54	0.41	0.08	0.01
31-MAR-2002	3.25	0.63	0.11	0.01
28-FEB-2002	2.44	0.43	0.08	0.02

Values are effluent gross. Quantity is measured in pounds per day (lbs/day) and concentration is milligrams per liter (mg/L).

Excursions related to NPDES permit in the last seven years have included the following as summarized in Table 3.4-4 (Honeywell, 2005): There were no consequences from these excursions.

Table 3.4-4 NPDES Excursions

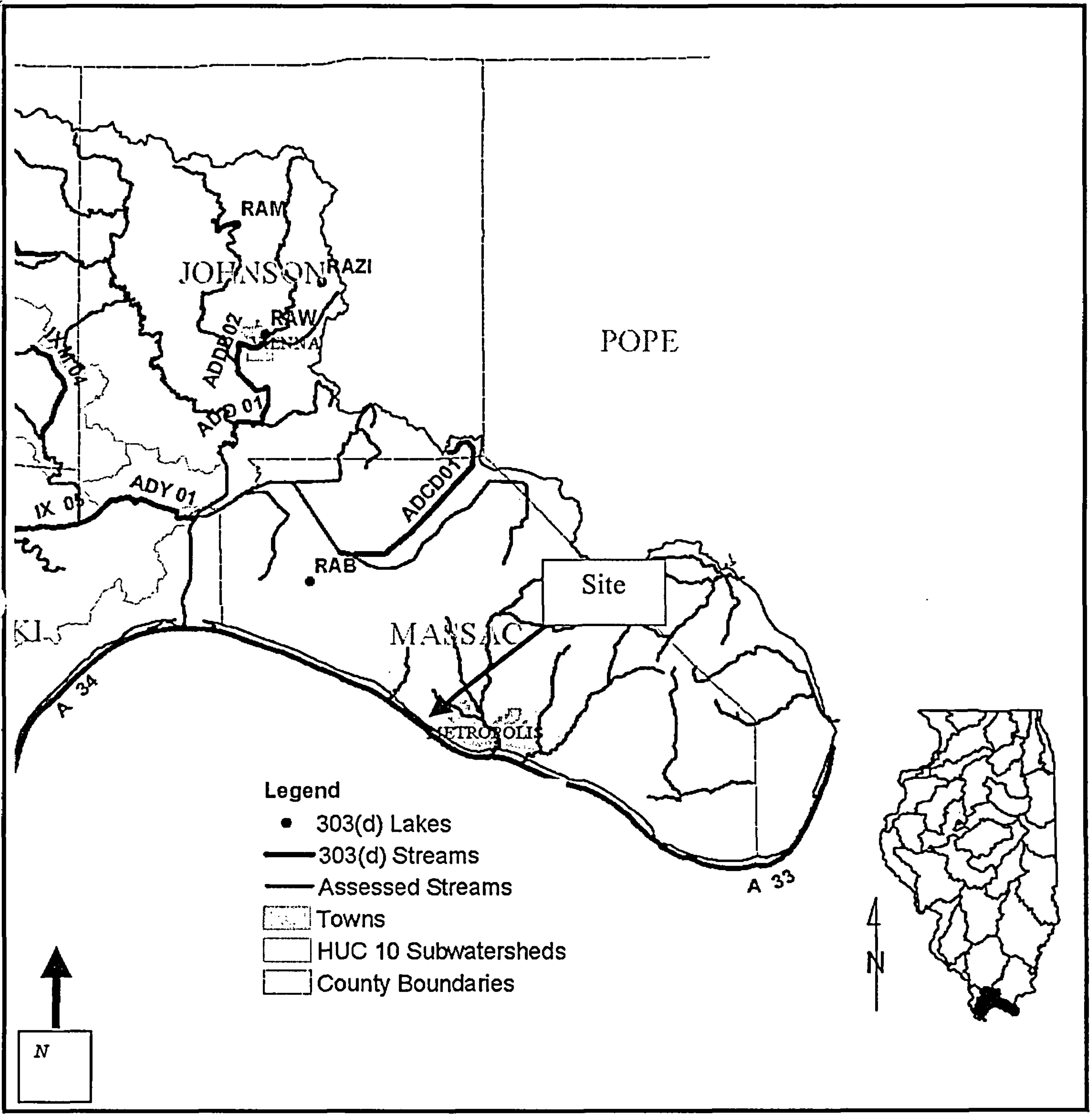
Date	Description
2005	No Excursions YTD
2004	No Excursions
Feb-03	Excursion, EPF, facility fluoride excursion to its NPDES permit
2001	Excursion, SF6, dike overflowed at SF6 resulting in approximately 10 gallons of acid entering into storm drain and caused a pH excursion.
2001	Excursion, Administration/Yard, water line broke near Administration Building resulting in considerable amount of solids running into the storm drain and caused a TSS excursion of NPDES.
2000	Excursion, EPF, secondary containment overflowed and approx. 300 gallons of weak HF liquors went into the storm drain causing an excursion.
2000	Excursion, EPF, probe at EPF weir was not calibrated and caused the introduction of too much acid. The result was a pH excursion.
1998	Excursion, Yard, contractor was high pressure washing components in the yard. The runoff went into the storm drain and resulted in an excursion.
1998	Excursion, FMB, NPDES excursion of TSS & F due to inappropriate discharge of liquors into the sewer system.
1998	Excursion, Yard, NPDES excursion due to unloading scrubber overflowing. This resulted in a pH & F excursion.

The 2004 Section 303 (d) list of impaired water bodies was reviewed (IEPA, 2004) for locations within the vicinity of the site. The impaired water bodies are summarized on the following Table 3.4-5 and Figure 3.4-2.

Table 3.4-5 303(d) Information On The Ohio River In Massac County, IL

Hydrologic Unit Code	Segment ID	Site Name	Designated Uses	Potential Causes	Potential Sources
0714010804	A 34	Ohio River	Aquatic Life Partial Support Fish Consumption Partial Support Primary Contact (Swimming) Not Assessed Public Water Supply Full	Impairment Unknown PCBs Mercury	Source Unknown
0514020318	A 33	Ohio River	Aquatic Life Partial Support Fish Consumption Partial Support Primary Contact (Swimming) Not Assessed	PCBs Mercury	Source Unknown
0514020601	A 33	Ohio River	Aquatic Life Partial Support Fish Consumption Partial Support Primary Contact (Swimming) Not Assessed	PCBs Mercury	Source Unknown
0514020601	A 34	Ohio River	Aquatic Life Partial Support Fish Consumption Partial Support Primary Contact (Swimming) Not Assessed	PCBs Mercury	Source Unknown
0514020603	A 34	Ohio River	Aquatic Life Partial Support Fish Consumption Partial Support Primary Contact (Swimming) Not Assessed Public Water Supply Full	Impairment Unknown PCBs Mercury	Source Unknown
0514020610	A 34	Ohio River	Aquatic Life Partial Support Fish Consumption Partial Support Primary Contact (Swimming) Not Assessed Public Water Supply Full	Impairment Unknown PCBs Mercury	Source Unknown

Figure 3.4-2 303 (d) Impaired Water Bodies



Water quality data for the Ohio River at Lock and Dam #52 (Paducah, Kentucky, upstream of the Honeywell facility) is shown on the following Table 3.4-6 for comparison (USEPA storet, May 2005).

Table 3.4-6 Upstream Water Quality Sampling Data - Paducah, KY

Sample Date	Sample Parameter	Concentration	Units
05/03/04	Phosphorus	0.38	mg/l
05/03/04	Hardness, non-carbonate	170.00	mg/l
05/03/04	Sulfur, sulfate (SO_4) as SO_4	60.00	mg/l
05/03/04	Total Suspended Solids (TSS)	140.00	mg/l
05/03/04	Dissolved oxygen (DO)	7.30	mg/l
05/03/04	Specific conductance	408.00	umho/cm
05/03/04	Temperature, water	15.00	deg C
05/03/04	Total Organic Carbon (TOC)	8.92	mg/l
05/03/04	Chloride	74.00	mg/l
05/03/04	Phenols (mixture)	NA	
05/03/04	Nitrogen, Nitrate (NO_3) as NO_3	1.60	mg/l
05/03/04	Ammonia, unionized	0.04	mg/l
05/03/04	Nitrogen, Kjeldahl	1.04	mg/l
03/08/04	Dissolved oxygen (DO)	22.00	mg/l
03/08/04	Specific conductance	450.00	umho/cm
03/08/04	Temperature, water	10.00	deg C
03/08/04	pH	6.10	None
03/08/04	Total Organic Carbon (TOC)	5.53	mg/l
03/08/04	Chloride	65.00	mg/l
03/08/04	Phenols (mixture)	NA	
03/08/04	Nitrogen, Nitrate (NO_3) as NO_3	1.06	mg/l
03/08/04	Ammonia, unionized	0.11	mg/l
03/08/04	Nitrogen, Kjeldahl	0.37	mg/l
03/08/04	Phosphorus	0.31	mg/l
03/08/04	Hardness, non-carbonate	164.00	mg/l
03/08/04	Sulfur, sulfate (SO_4) as SO_4	64.00	mg/l
03/08/04	Total Suspended Solids (TSS)	168.00	mg/l

Table 3.4-6 Upstream Water Quality Sampling Data - Paducah, KY (continued)

Sample Date	Sample Parameter	Concentration	Units
01/06/04	Total Organic Carbon (TOC)	3.61	mg/l
01/06/04	Chloride	52.00	mg/l
01/06/04	Phenols (mixture)	NA	N/A
01/06/04	Nitrogen, Nitrate (NO_3) as NO_3	2.11	mg/l
01/06/04	Ammonia, unionized	0.06	mg/l
01/06/04	Nitrogen, Kjeldahl	0.76	mg/l
01/06/04	Phosphorus	0.44	mg/l
01/06/04	Hardness, non-carbonate	164.00	mg/l
01/06/04	Sulfur, sulfate (SO_4) as SO_4	44.00	mg/l
01/06/04	Total Suspended Solids (TSS)	89.00	mg/l
01/06/04	Dissolved oxygen (DO)	13.60	mg/l
01/06/04	Specific conductance	387.00	umho/cm
01/06/04	Temperature, water	6.00	deg C
01/06/04	pH	6.30	None

Radiological monitoring of surface water is routinely conducted by Honeywell, and is described in detail in Sections 6.0 and 6.1.

A biennial water quality assessment of the Ohio River was conducted (ORANSCO, 2004). The following Table 3.4-7 describes attainment of designated uses for the 46.5 mile segment of the Ohio River that includes the Honeywell site (segment OVWB34).

Table 3.4-7 Number Of Miles Within The 46.5 Mile Segment Attaining Designated Uses

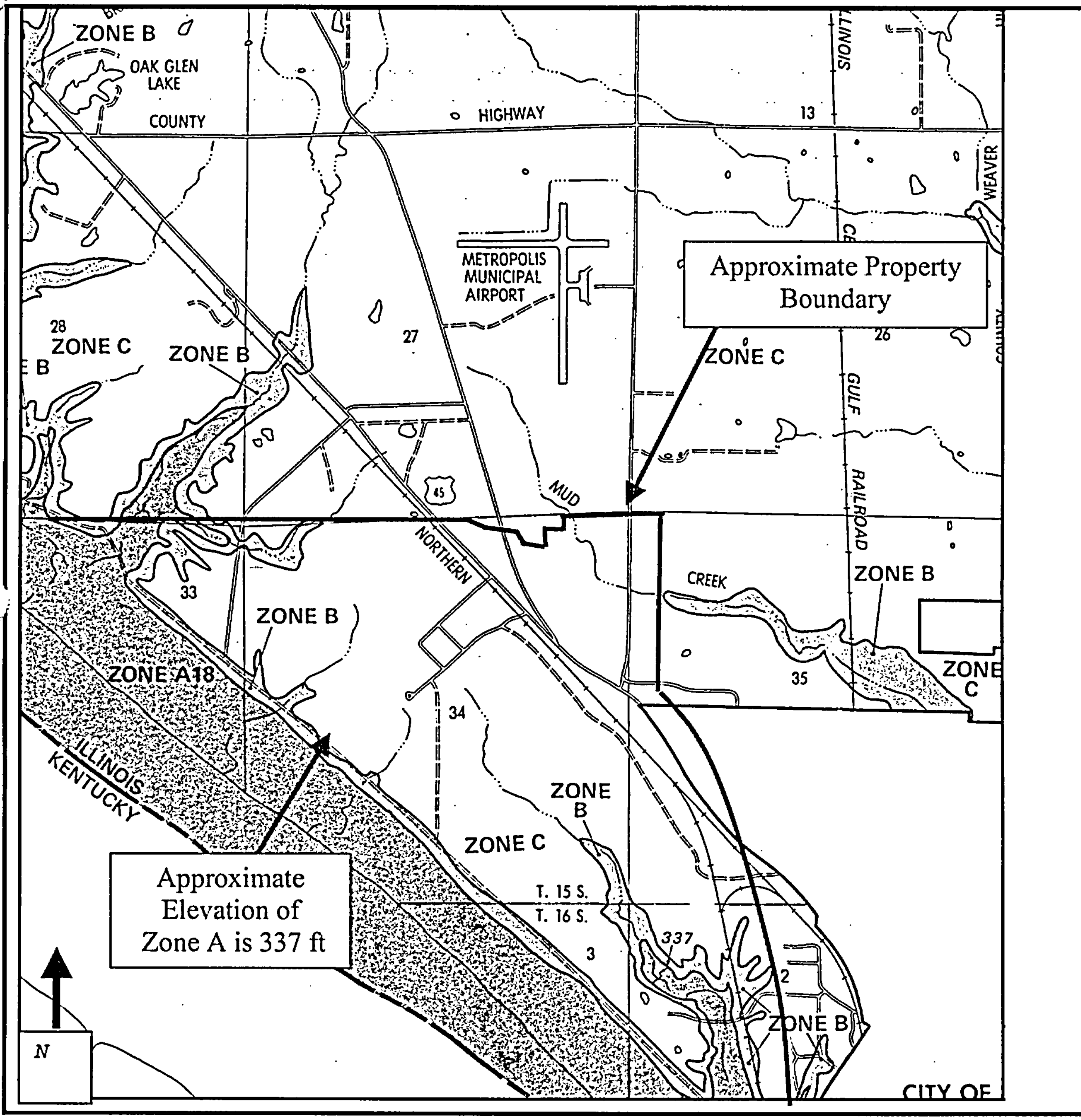
Criteria	Fully Supporting (Good Water Quality)	Not Supporting (Poor Water Quality)	Unassessed	Partially Supporting (Fair Water Quality)	Causes of Impairment
Warm Water Aquatic Life Use	19.2	2.6	24.7	0.0	None Given
Public Water Supply Use	46.5	0.0	0.0	0.0	-
Fish Consumption	0.0	0.0	0.0	46.5	PCBs, Dioxin
Contact Recreation Use	46.5	0.0	0.0	0.0	-

3.4.5 Wetlands and Floodplain Characteristics

The southern portion of the site is located within the flood plain of the Ohio River; however, no plant facilities are located in this area. The floodplain areas mapped on the FEMA floodplain map are illustrated on the following Figure 3.4-3.

The restricted area of the facility contains no wetlands. There are areas on the Honeywell property that have been identified as wetlands, primarily in the floodplain of the Ohio River, south of the plant area. Section 3.5 provides additional discussion concerning wetlands.

Figure 3.4-3 FEMA Floodplain Map



3.4.6 Regional Groundwater

According to information on water use for 2000 (USGS, February 2005) total surface water withdrawals for Massac County, Illinois, and McCracken County, Kentucky (the adjoining county to the south) were broken down as shown in Table 3.4-8.

Table 3.4-8 Total Ground Water Use For 2000- Massac County, IL And McCracken County, KY

Usage	Ground Water Withdrawal Quantity (MGD)	
	Massac County,	McCracken County, KY
Public supply	1.31	0.78
Domestic self supply	1.17	0
Industrial self	3.74	0.45
Irrigation	2.43	0.08
Livestock	0.19	0
Mining	0	0
Aquaculture	0	0
Thermoelectric, closed loop	1.39	0
Total withdrawals	10.23	1.31

No designated sole source aquifers are located in Illinois, and Massac County has no community water supplies that were identified by the IEPA as potentially exceeding the new Arsenic standard. The City of Metropolis utilizes three municipal water supply wells, each completed in Mississippian limestone, to provide for its population (Illinois EPA Metropolis, 2003). The City's water treatment plant is designed to treat and pump up to 4 million gallons per day (MGD).

3.4.7 Local Groundwater

Within the site area, the overlying Loess deposits do not yield enough water for domestic use. When saturated by precipitation, these formations transmit water to the underlying aquifers. The mixed gravel, sand and clay of the Pliocene series (the Mounds Gravel Formation) are the first unconfined aquifer encountered. Domestic wells may be bored to a depth of 120 feet before encountering the Porter's Creek Clay formation. The Porter's Creek Clay is an aquitard, slowing groundwater movement between the Pliocene gravel and the sand in the McNairy formation. The McNairy formation may yield enough water for domestic use but the high iron content and fine-grained matrix make the groundwater quality generally unattractive. The shallowest aquifer adequate for most industrial needs is the Mississippian limestone that occurs at a depth of 300 to 500 feet. The yield of an industrial well penetrating the Mississippian limestone often exceeds one thousand gallons per minute, but usually the water is hard. The lower units of the McNairy Formation and the Mississippian limestone are confined aquifers (Andrews Engineering, 2005).

Public water use for the region is provided by the Massac County Water District and the City of Metropolis. Both of these sources withdraw their water from wells in the Mississippian limestone aquifer.

The MTW Site water supply produces groundwater from the Mississippian limestone. Process wells No's. 1, 2 and 3 are drilled to depths of 455 feet, 520 feet and 500 feet, respectively. The plant sanitary well is 412 feet deep. The total capacity of these four wells is more than sufficient to meet normal operating requirements. Wells 1, 3 and the sanitary well have been in use since 1958. The No. 2 well was drilled in 1971. After placing automatic recorders on the other three wells, a seventy-two hour pumping test was performed on the No. 2 well in October 1971. The drawdown was measured in all four wells during the test. During the pumping test of Well 2, a drawdown of 1.5 feet was observed in the sanitary well and two feet in Well 1 with no apparent drawdown experienced in Well 3. It was concluded that significant hydrologic connection exists between the sanitary well and Wells 1 and 2, but this system has no apparent interconnection with Well 3.

The Illinois Department of Public Health (IDPH) administers the drinking water regulations of the U.S. Environmental Protection Agency. The analyses required and frequency of testing for the sanitary well is determined by the Department of Public Health based on the results obtained from previous analyses and is listed in Table 3.4-9.

Table 3.4-9 Required IDPH Drinking Water Monitoring

Required IDPH Drinking Water Monitoring		
Analysis	**Number of Samples Required**	**Frequency**
Copper & Lead	5	Every 3 Years
Coliform	1	Yearly
Nitrates	1	Yearly
Inorganic (IOC's)	1	Every 9 Years
Volatile (SOC's)	1	Every 6 Years
Pesticides & Herbicides	1	Every 3 Years
Phase V Contaminants	1	Every 3 Years

Results of the IDPH required sampling is provided in Table 3.4-10 below and show the results were below federal MCLs or other regulatory thresholds. A sampling event is scheduled for all parameters for 2005.

3.4.8 Groundwater Monitoring

The facility has three means of monitoring for leaks from the surface impoundments. First, each pond is equipped with a two-part liner system. The first part is a 60-mil synthetic liner and the second is a minimum of 15 feet of in-situ clay. To monitor for leaks or determine if a leak is present in the synthetic liner, each pond has leachate collection system (gravel trench with perforated pipe) that gravity flows to a sump. The sump liquors are monitored for pH and fluorides, if the liquors exceed certain thresholds then it is consider in leak status (for the synthetic liner). Second, most of the ponds are equipped with a lysimeter. A lysimeter is essentially a well that is drilled on an angle down below the 15 feet of clay. These lysimeters are positioned in areas where suspected or known leaks in the synthetic liner may be present. Quarterly, these lysimeters are monitored for pH, fluorides, and potassium. If the values exceed certain thresholds, the liner system is considered to be in leak status. Lastly, the facility has monitoring wells along the perimeter of the facility that are monitored for pH, fluorides, and Gross Alpha & Beta.

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 22-hectare (54-acre) restricted fenced area, nine of which are sampled quarterly for pH, fluoride, specific conductance, gross alpha activity and gross beta activity. One additional well is utilized for groundwater surface elevation measurements only. There are two (2) wells that are common to RCRA Facility Investigation and landfill monitoring wells. The landfill is no longer active and is located beyond the restricted area of the facility. Groundwater monitoring related to the closed landfill is not discussed in detail in this document. Well locations surrounding the restricted area are illustrated on Figure 3.4-4.

3.4.8.1 Sanitary and Process Well Monitoring

Two of the four deep wells, the sanitary well and Process Well #1, are monitored are monitored for inorganic constituents, volatile organic compounds, radionuclides, and general parameters including pH, turbidity, Chlorine, Total Coliform, and Fecal Coliform. Analytical results for the years 2003 and 2004 are attached as Table 3.4-11. In comparison to Groundwater Quality Standards, no significant impact of these parameters is indicated in the deep Mississippian limestone aquifer.

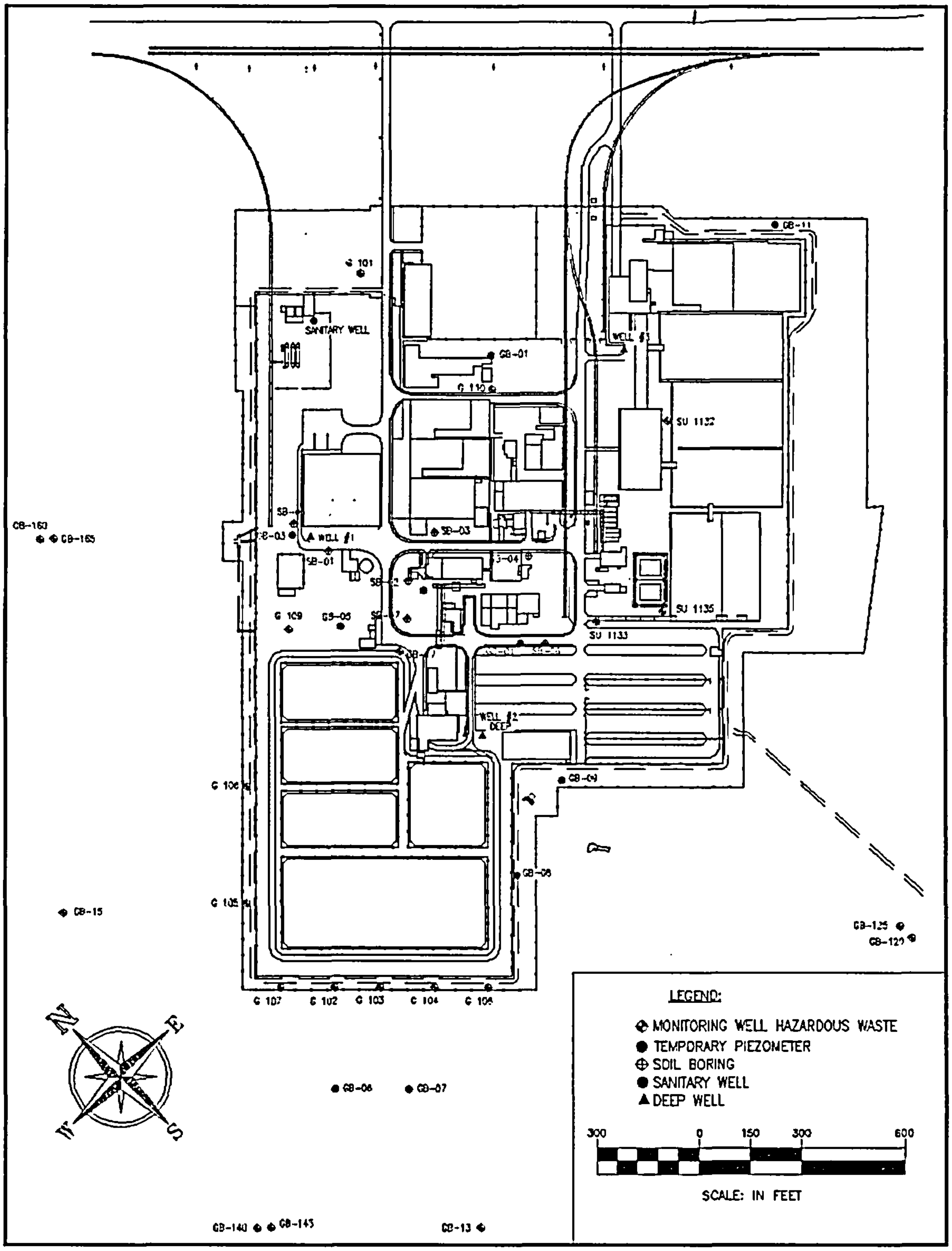
Table 3.4-10 Laboratory Analysis Of Groundwater At Taps

		Sample Locations Around the Facility							
Analyte	MCL	Lab Library 17-May-96	Lab Library 15-Apr-99	Lab Library 11-Apr-02	Na Removal 11-Apr-02	Sampling Plant 11-Apr-02	EPF 11-Apr-02	FMB 11-Apr-02	Due in 2005
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Turbidity				< 1	< 1	< 1	< 1	< 1	X
Inorganics									
Lead	0.015	<0.005	<0.003	< 0.001	0.001	0.002	< 0.001	< 0.001	X
Copper	1.3	0.112	0.0978	0.21	0.04	0.11	0.18	0.05	X
Barium	2	0.045	0.0462	0.039	-	-	-	-	X
Cadmium	0.005	<0.005	<0.005	< 0.001	-	-	-	-	X
Chromium	0.1	<0.010	<0.010	< 0.004	-	-	-	-	X
Fluoride	4	0.38	<0.50	0.42	-	-	-	-	X
Mercury	0.002	<0.0002	<0.0002	< 0.0002	-	-	-	-	X
Selenium	0.05	<0.005	<0.005	0.002	-	-	-	-	X
Pesticides/Herbicides									
Alachlor	0.002	<0.0005	<0.0002	< 0.0002	-	-	-	-	X
Aldicarb	0.003	<0.003	<0.001	< 0.001	-	-	-	-	X
Aldicarb Sulfone	0.002	<0.002	<0.001	< 0.001	-	-	-	-	X
Aldicarb Sulfoxide	0.004	<0.004	<0.001	< 0.001	-	-	-	-	X
Atrazine	0.003	<0.0005	<0.0003	< 0.0003	-	-	-	-	X
Carbofuran	0.04	<0.004	<0.04	< 0.004	-	-	-	-	X
Chlordane	0.002	<0.0001	<0.002	< 0.0002	-	-	-	-	X
Ethylene Dibromide	0.00005	<0.00005	<0.001	< 0.00004	-	-	-	-	X
Heptachlor	0.0004	<0.00005	<0.00004	< 0.00004	-	-	-	-	X
Heptachlor Epoxide	0.0002	<0.00005	<0.00002	< 0.00002	-	-	-	-	X
Lindane	0.0002	<0.00005	<0.00002	< 0.004	-	-	-	-	X
Methoxchlor	0.04	<0.0005	<0.0004	<0.004	-	-	-	-	X
Pentachlorophenol	0.001	<0.001	<0.0001	< 0.0001	-	-	-	-	X
Polychlorinated Byphenyl	0.0005	<0.0005		< 0.0004	-	-	-	-	X
Aroclor - 1016	-	-	<0.00026	<0.00026	-	-	-	-	X
Aroclor - 1221	-	-	<0.00019	<0.00019	-	-	-	-	X
Aroclor - 1232	-	-	<0.00023	<0.00023	-	-	-	-	X
Aroclor - 1242	-	-	<0.00026	<0.00026	-	-	-	-	X
Aroclor - 1248	-	-	<0.00030	<0.00030	-	-	-	-	X
Aroclor - 1254	-	-	<0.00033	<0.00033	-	-	-	-	X
Aroclor - 1260	-	-	<0.00036	<0.00036	-	-	-	-	X
Toxaphene	0.003	<0.001	<0.001	<0.001	-	-	-	-	X
1,2 - Dibromochloropropane	0.0002	<.0001	<0.00002	< 0.00002	-	-	-	-	X
2,4 - D	0.07	<0.002	<0.007	< 0.007	-	-	-	-	X
2,4,5 - TP (Silvex)	0.05	<0.001	<0.005	< 0.005	-	-	-	-	X
Synthetic Organic Chemicals									
Benzene	0.005	<0.001	-	-	-	-	-	-	X
Carbontetrachloride	0.005	<0.001	-	-	-	-	-	-	X
CIS - 1,2 - Dichloroethylene	0.07	<0.001	-	-	-	-	-	-	X
Ethylbenzene	0.7	<0.001	-	-	-	-	-	-	X
Monochlorobenzene	0.1	<0.001	-	-	-	-	-	-	X
0 - Dichlorobenzene	0.6	<0.001	-	-	-	-	-	-	X
Para - Dichlorobenzene	0.075	<0.001	-	-	-	-	-	-	X
Styrene	0.1	<0.001	-	-	-	-	-	-	X
Tetrachloroethylene	0.005	<0.001	-	-	-	-	-	-	X
Toluene	1	<0.001	-	-	-	-	-	-	X
Trans - 1,2 - Dichloroethylene	0.1	<0.001	-	-	-	-	-	-	X
Trichloroethylene	0.005	<0.001	-	-	-	-	-	-	X
Vinyl Chloride	0.002	<0.001	-	-	-	-	-	-	X
Xylene	10	<0.001	-	-	-	-	-	-	X
1,1 - Dichloroethylene	0.007	<0.001	-	-	-	-	-	-	X
1,1,1 -Trichloroethane	0.2	<0.001	-	-	-	-	-	-	X
1,2 - Dichloroethane	0.005	<0.001	-	-	-	-	-	-	X
1,2 - Dichloropropane	0.005	<0.001	-	-	-	-	-	-	X
Phase V Contaminants									
Antimony	0.006	<0.005	-	-	-	-	-	-	X
Beryllium	0.004	<.004	-	-	-	-	-	-	X
Cyanide	0.2	<0.0050	-	-	-	-	-	-	X
Nickel	0.1	<.02	-	-	-	-	-	-	X
Thallium	0.002	<0.002	-	-	-	-	-	-	X
Dichloromethane	0.005	<0.001	-	-	-	-	-	-	X
1,2,4 - Trichlorobenzene	0.07	<0.001	-	-	-	-	-	-	X
1,1,2 - Trichloroethane	0.005	<0.001	-	-	-	-	-	-	X
Dalapon	0.2	<0.02	-	-	-	-	-	-	X
Dinoseb	0.007	<0.0007	-	-	-	-	-	-	X
Diquat	0.02	<0.002	-	-	-	-	-	-	X
Endothall	0.1	<0.01	-	-	-	-	-	-	X
Endrin	0.002	<0.0002	-	-	-	-	-	-	X
Glyphosate	0.7	<0.07	-	-	-	-	-	-	X
Oxamyl (Vydate)	0.2	<0.02	-	-	-	-	-	-	X
Picloram	0.5	<0.05	-	-	-	-	-	-	X
Simazine	0.004	<.0004	-	-	-	-	-	-	X
Benzo(a)pyrene	0.0002	<0.00002	-	-	-	-	-	-	X
Di(2-ethylhexyl)adipate	0.4	<0.04	-	-	-	-	-	-	X
Di(2-ethylhexyl)phthalate	0.006	<0.0006	-	-	-	-	-	-	X
Hexachlorobenzene	0.001	<0.0001	-	-	-	-	-	-	X
Hexachlorocyclopentadiene	0.05	<0.005	-	-	-	-	-	-	X

Table 3.4-11 Analysis Of Compliance Parameters In Deep Water Wells

	MCL (Mg/L)	Sanitary Well 11/17/2003 (mg/l)	Process Well # 1 11/17/2003 (mg/l)	Sanitary Well 5/24/2004 (mg/l)	Process Well # 1 5/24/2004 (mg/l)
Inorganics:					
Antimony	0.006	0.003	0.003	0.0003	0.0003
Arsenic	0.01	0.001	0.001	0.001	0.001
Barium	2.0	0.042	0.046	0.042	0.045
Beryllium	0.004	0.001	0.001	0.001	0.001
Cadmium	0.005	0.001	0.001	0.001	0.001
Chromium	0.1	0.004	0.004	0.004	0.0049
Cyanide	0.2	0.01	0.01	0.01	0.01
Fluoride	4.0	0.311	0.316	0.29	0.29
Mercury	0.002	0.0002	0.0002	0.0002	0.0002
Nitrate	10	0.31	0.13	0.35	0.18
Nitrite	1	0.15	0.15	0.15	0.15
Selenium	0.05	0.001	0.001	0.0016	0.001
Thallium	0.002	0.001	0.001	0.001	0.001
Volatile Organics:					
0 - Dichlorobenzene	0.6	0.0005	0.0005	0.0005	0.0005
1,1 - Dichloroethylene	0.007	0.0005	0.0005	0.0005	0.0005
1,1,1 -Trichloroethane	0.2	0.0005	0.0005	0.0005	0.0005
1,1,2-Trichloroethane				0.0005	0.0005
1,1,2-Trichlorobenzene		0.0005	0.0005	0.0005	0.0005
1,2 - Dichloroethane	0.005	0.0005	0.0005	0.0005	0.0005
1,2 - Dichloropropane	0.005	0.0005	0.0005	0.0005	0.0005
1,2,4-Trichlorobenzene		0.0005	0.0005	0.0005	0.0005
1,4-Dichlorobenzene				0.0005	0.0005
Benzene	0.005	0.0005	0.0005	0.0005	0.0005
Carbon tetrachloride	0.005	0.0005	0.0005	0.0005	0.0005
CIS - 1,2 - Dichloroethylene	0.07	0.0005	0.0005	0.0005	0.0005
Ethylbenzene	0.7	0.0005	0.0005	0.0005	0.0005
Methyl tert-butyl ether		0.0005	0.0005	0.0005	0.0005
Methylene Chloride		0.0005	0.0005	0.0005	0.0005
Monochlorobenzene	0.1	0.0005	0.0005	0.0005	0.0005
Para - Dichlorobenzene	0.075	0.0005	0.0005	NA	NA
Styrene	0.1	0.0005	0.0005	0.0005	0.0005
Tetrachloroethylene	0.005	0.0005	0.0005	0.0005	0.0005
Toluene	1.0	0.0005	0.0005	0.0005	0.0005
Trans - 1,2 - Dichloroethylene	0.1	0.0005	0.0005	0.0005	0.0005
Trichloroethylene	0.005	0.0005	0.0005	0.0005	0.0005
Vinyl Chloride	0.002	0.0005	0.0005	0.0005	0.0005
Xylene	10.0	0.0005	0.0005	0.0005	0.0005
mp-Xylene				0.0005	0.0005
O-Xylene				0.0005	0.0005
General Parameters:					
pH		7.23	7.2	7.59	7.5
Turbidity		1	1	1	1
Chlorine		0.1		0.1	0.1
Total Coliform		ND	ND	ND	P
Fecal Coliform				ND	ND
Radionuclides:					
Rd-226 (pic/L)		0.2	0.3	0.2	0.4
Rd-228 (pic/L)		0.6	4.5	1.7	1.3
Gross Alpha (pic/L)		1.3	0.8	1	0.8

Figure 3.4-4 Well Locations



3.4.8.2 RCRA Groundwater and Compliance Monitoring

The Plant's routine RCRA groundwater compliance monitoring network consists of ten wells - two upgradient, seven downgradient, and the tenth well is used for groundwater surface elevation determination only. The nine monitoring wells were sampled and analyzed quarterly for pH, specific conductance, fluoride, gross alpha and gross beta and historical analytical results are provided in Tables 3.4-12 and 3.4-13. The quarterly results from each well were statistically compared to historical upgradient groundwater quality. Results are routinely reported to Illinois EPA. Based on review of the data from 2000 to the present suggest no significant impact of these parameters to the first water zone in the Mounds Gravel Aquifer.

3.4.8.3 RCRA Groundwater Investigation Monitoring

In April 2001, the Illinois EPA (IEPA) identified the presence of dissolved arsenic, total arsenic, chloroform, trichloroethene, tetrachloroethene, and trichlorofluoromethane in groundwater from on-site monitoring wells exceeding the applicable Groundwater Quality Standards and/or Groundwater Remediation Objectives (Andrews Engineering, 2005). Depth to first water is approximately 55 feet below ground level (See Figure 3.4-4 above). The IEPA issued a violation notice to Honeywell, which prompted the development of a Groundwater Investigation Plan to investigate the source and extent of the groundwater exceedances. The Illinois EPA approved of the Groundwater Investigation Plan in April 2003. The plan was implemented in the Summer of 2003 and the "RCRA Groundwater Investigation Report" was submitted to IEPA in August 2003. The soil and groundwater sampling indicated the RCRA Ponds are not the source of the groundwater exceedances. In February 2004 the IEPA requested further investigation to identify potential sources of contamination and to identify the horizontal and vertical extent of the exceedances. Further investigation was conducted in Summer and Fall of 2004; however, no source or release has reportedly been identified and migration of impacted groundwater to the boundaries of the restricted area has occurred (Andrews Engineering, 2005). A work plan, proposing additional soil sampling and additional perimeter groundwater wells, is to be submitted to IEPA before May 20, 2005.

According to recent maps prepared by ISGS, the affected media is groundwater in the Pliocene Mounds Gravel Formation. The "RCRA Groundwater Investigation Report" dated January 2005 states that groundwater migration is toward the southwest toward the Ohio River at a rate ranging from 0.052 to 2.36 feet per day (Andrews Engineering, 2005).

Table 3.4-12 Historical RCRA Compliance Monitoring Data

Well ID	Date	Alpha Activity, Total (pCi/l)	Alpha Error (pCi/l)	Beta Activity, Total (pCi/l)	Beta Error (pCi/l)
G101					
	1/11/2000	0.68	1.15	1.70	1.58
	4/14/2000	0.58	1.04	2.83	1.53
	7/17/2000	0.31	1.48	6.18	1.98
	10/12/2000	0.21	1.25	3.00	2.13
	1/6/2001	1.25	1.50	1.40	2.85
	3/13/2001	0.18	1.30	2.50	2.83
	4/12/2001	1.38	1.73	1.55	2.03
	6/19/2001	-1.60	1.78	1.15	2.18
	7/24/2001	0.00	1.38	0.88	2.00
	10/9/2001	0.90	1.50	1.98	1.63
	11/1/2001	1.00	1.09		
	2/13/2002	0.50	1.65	2.10	1.33
	4/16/2002	3.88	2.28	3.08	1.53
	5/22/2002	2.28	2.28	2.48	1.95
	7/30/2002	0.91	2.68	2.48	1.88
	9/13/2002	2.18	1.83	2.28	1.48
	10/14/2002	1.35	1.48	2.13	1.45
	1/30/2003	0.66	1.22	2.30	1.28
	3/4/2003	0.53	1.20	3.05	1.30
	4/1/2003	1.08	1.20	2.38	1.15
	7/14/2003	0.57	1.40	1.53	1.28
	10/16/2003	0.48	1.25	2.45	1.33
	11/25/2003	2.05	1.23		
	1/22/2004	1.08	1.20	2.45	1.30
	4/29/2004	1.28	1.73	2.30	1.50
	6/4/2004	2.25	1.73	3.75	2.43
	7/27/2004	2.23	1.93	2.03	1.53
	9/16/2004	1.15	1.70	2.03	1.50
	10/15/2004	0.10	1.55	2.15	1.60
G102					
	1/11/2000	1.65	1.48	2.07	1.50
	4/14/2000	1.18	1.19	2.35	1.63
	7/17/2000	2.23	1.85	2.63	2.25
	1/6/2001	16.90	5.88	16.28	5.15
	3/13/2001	1.53	1.85	1.60	2.43
	4/12/2001	3.58	3.98	0.95	5.48
	7/24/2001	1.03	1.70	2.45	2.23
	2/14/2002	0.90	1.58	1.63	1.35
	4/16/2002	2.33	1.73	2.78	1.48
	7/30/2002	2.93	2.78	3.50	2.05
	10/14/2002	2.83	1.93	1.73	1.73
	1/30/2003	2.30	1.63	2.58	1.28
	4/1/2003	2.35	1.50	2.18	1.18
	7/14/2003	1.43	1.43	2.68	1.35
	10/16/2003	2.33	1.78	4.10	1.45
	1/22/2004	1.63	1.43	2.28	1.23
	4/29/2004	1.80	2.05	1.98	1.65
	7/27/2004	1.95	2.78	1.45	1.65
	10/15/2004	1.25	1.80	1.78	2.03

Table 3.4-12 Historical RCRA Compliance Monitoring Data (continued)

Well ID	Date	Alpha Activity, Total (pCi/l)	Alpha Error (pCi/l)	Beta Activity, Total (pCi/l)	Beta Error (pCi/l)
G103					
	1/11/2000	0.68	1.63	3.20	2.65
	4/14/2000	1.40	1.15	2.63	1.55
	7/17/2000	0.70	2.68	2.25	3.95
	10/12/2000	1.08	1.95	2.35	2.63
	1/6/2001	1.63	1.80	3.45	2.25
	4/12/2001	3.80	4.08	3.05	5.35
	7/24/2001	1.85	3.53	1.85	5.33
	10/9/2001	2.60	3.33	4.38	3.10
	2/14/2002	1.48	2.13	2.58	1.45
	4/16/2002	3.35	2.43	3.00	1.98
	7/30/2002	7.75	5.95	6.53	4.08
	9/13/2002	6.25	5.58	5.48	5.00
	10/14/2002	2.65	2.75	3.33	2.58
	1/30/2003	2.35	2.25	3.33	1.80
	4/1/2003	1.13	1.53	2.15	1.30
	7/14/2003	1.53	1.98	2.73	1.88
	10/16/2003	2.10	3.83	45.48	6.65
	11/25/2003	2.63	1.35		
	1/22/2004	3.48	2.03	3.08	1.63
	4/29/2004	1.68	1.98	2.68	2.15
	7/27/2004	8.18	5.93	4.85	3.00
	9/16/2004	4.55	4.48	3.08	3.68
	10/15/2004	3.43	3.78	2.18	3.15
G-105					
	1/11/2000	0.53	1.04	1.78	1.68
	4/14/2000	1.39	0.94	1.43	1.23
	7/17/2000	1.38	1.98	2.43	2.10
	10/12/2000	1.13	1.55	2.10	2.10
	1/6/2001	1.55	1.35	2.43	1.35
	4/12/2001	6.53	3.00	5.98	2.83
	6/19/2001	0.49	1.95	3.53	2.13
	7/24/2001	1.63	1.53	2.08	1.83
	10/9/2001	4.28	2.08	4.23	1.75
	11/1/2001	2.55	1.38		
	2/13/2002	2.38	2.00	3.15	1.45
	4/16/2002	7.55	2.45	6.15	1.50
	5/22/2002	3.20	2.20	2.90	1.50
	7/30/2002	6.50	2.90	4.90	1.88
	9/13/2002	5.28	2.70	4.75	2.20
	10/14/2002	3.28	2.05	2.73	1.78
	1/30/2003	2.45	1.55	3.10	1.33
	4/1/2003	2.63	1.60	2.65	1.23
	7/14/2003	3.05	1.83	3.20	1.38
	10/16/2003	1.08	1.48	2.60	1.35
	1/22/2004	3.65	1.83	3.58	1.48
	4/29/2004	6.35	2.38	5.28	1.63
	6/4/2004	1.65	1.85	3.93	2.33
	7/27/2004	1.08	1.40	1.75	1.43
	10/15/2004	2.68	2.18	3.03	1.73

Table 3.4-12 Historical RCRA Compliance Monitoring Data (continued)

Well ID	Date	Alpha Activity, Total (pCi/l)	Alpha Error (pCi/l)	Beta Activity, Total (pCi/l)	Beta Error (pCi/l)
G-106					
	1/11/2000	0.75	1.68	2.08	3.48
	4/14/2000	0.97	0.78	2.68	1.40
	7/17/2000	0.66	1.14	2.15	1.70
	10/12/2000	0.63	1.53	3.05	2.08
	1/6/2001	0.25	1.73	1.60	2.05
	4/12/2001	2.85	1.98	3.13	2.03
	7/24/2001	1.45	2.25	4.13	3.30
	10/9/2001	1.60	1.83	1.93	1.75
	2/13/2002	1.03	1.78	2.08	1.43
	4/16/2002	2.78	1.85	3.05	1.53
	7/30/2002	4.45	3.95	4.03	2.58
	9/13/2002	1.76	2.33	2.95	1.85
	10/14/2002	1.60	1.65	2.88	1.63
	1/30/2003	0.93	1.48	2.58	1.28
	4/1/2003	1.20	1.35	2.08	1.20
	7/14/2003	17.60	5.15	17.88	4.23
	10/16/2003	2.30	2.20	4.28	2.25
	1/22/2004	2.03	1.50	3.10	1.33
	4/29/2004	1.68	1.60	2.23	1.28
	7/27/2004	0.37	1.13	0.81	0.84
	10/15/2004	1.13	2.03	1.53	1.85
G-107					
	1/11/2000	0.55	1.55	1.78	2.73
	4/14/2000	1.39	1.02	3.18	2.13
	7/17/2000	0.68	1.40	1.78	1.85
	10/12/2000	0.85	1.55	2.78	2.18
	1/6/2001	1.68	1.45	1.78	1.63
	4/12/2001	2.68	2.38	1.70	2.80
	7/24/2001	-0.43	3.55	0.10	6.30
	10/9/2001	2.65	1.78	3.20	1.53
	2/14/2002	0.38	1.50	1.63	1.35
	4/16/2002	1.18	1.38	1.80	1.25
	7/30/2002	1.60	2.78	2.83	2.25
	10/14/2002	1.35	1.65	2.58	1.58
	1/30/2003	1.15	1.43	4.58	1.45
	3/4/2003	1.38	1.48	3.40	1.33
	4/1/2003	0.58	1.43	1.58	1.23
	7/14/2003	1.48	1.45	2.43	1.28
	10/16/2003	1.90	1.78	2.68	1.40
	1/22/2004	0.95	1.25	2.25	1.20
	4/29/2004	1.05	1.63	2.35	1.63
	7/27/2004	1.03	1.18	0.73	0.81
	10/15/2004	1.00	2.18	1.70	1.90

Table 3.4-12 Historic RCRA Compliance Monitoring Data (continued)

Well ID	Date	Alpha Activity, Total (pCi/l)	Alpha Error (pCi/l)	Beta Activity, Total (pCi/l)	Beta Error (pCi/l)
G-108					
	1/11/2000	0.58	2.43	1.83	3.68
	4/14/2000	1.52	0.92	2.23	1.70
	7/17/2000	0.78	1.75	2.53	2.13
	10/12/2000	1.08	1.83	2.40	2.10
	1/6/2001	0.15	1.38	2.15	1.95
	4/12/2001	1.55	1.93	0.90	2.05
	7/24/2001	2.28	5.25	4.35	7.43
	10/9/2001	1.83	1.75	3.13	1.78
	2/14/2002	0.80	1.75	1.60	1.28
	4/16/2002	1.28	1.40	2.75	1.38
	7/30/2002	4.43	4.80	2.48	3.28
	9/13/2002	2.10	1.90	3.38	1.73
	10/14/2002	1.20	1.85	2.08	1.65
	1/30/2003	1.68	1.78	8.25	2.05
	3/4/2003	0.41	1.30	2.33	1.33
	4/1/2003	0.98	1.38	1.68	1.20
	7/14/2003	0.55	0.75	1.28	0.72
	10/16/2003	1.75	1.90	3.35	1.60
	1/22/2004	1.08	1.28	2.28	1.23
	4/29/2004	1.55	1.55	1.95	1.38
	7/27/2004	1.61	2.63	2.28	2.65
	10/15/2004	1.65	2.95	2.13	2.65
R-104					
	1/11/2000	2.10	1.90	2.43	2.53
	4/14/2000	1.12	1.02	2.03	1.43
	7/17/2000	1.13	2.03	2.70	2.60
	1/6/2001	4.70	2.08	4.83	1.90
	3/13/2001	0.40	2.80		
	4/12/2001	3.13	3.38	1.93	4.55
	7/24/2001	0.71	1.65	1.68	2.30
	10/9/2001	2.15	1.98	3.50	2.03
	2/14/2002	0.50	1.55	1.48	1.35
	4/16/2002	2.30	2.03	2.48	1.68
	7/30/2002	1.88	2.40	2.18	1.85
	10/14/2002	2.38	2.13	1.60	1.95
	1/30/2003	0.73	1.43	2.10	1.35
	4/1/2003	1.73	1.63	2.15	1.28
	7/14/2003	0.90	1.38	2.38	1.25
	10/16/2003	0.88	1.50	32.90	4.10
	11/25/2003	2.93	1.30		
	1/22/2004	1.20	1.38	1.95	1.38
	4/29/2004	0.60	1.40	2.38	1.85
	7/27/2004	1.65	2.53	1.53	1.65
	10/15/2004	1.53	2.33	1.70	2.05

Table 3.4-12 Historical RCRA Compliance Monitoring Data (continued)

Well ID	Date	Alpha Activity, Total (pCi/l)	Alpha Error (pCi/l)	Beta Activity, Total (pCi/l)	Beta Error (pCi/l)
R-110					
	1/11/2000	1.65	2.90	1.18	5.10
	4/14/2000	1.12	0.97	2.15	1.80
	7/17/2000	-0.28	1.78	2.43	2.13
	10/12/2000	0.73	1.68	2.43	2.33
	1/6/2001	0.07	1.23	1.60	1.95
	3/13/2001	0.20	1.95	2.38	3.65
	4/12/2001	1.75	1.95	2.85	2.38
	6/19/2001	-1.66	2.68	1.80	3.10
	7/24/2001	0.85	2.68	0.80	4.08
	10/9/2001	4.23	2.63	3.63	2.05
	11/1/2001	1.55	1.10		
	2/13/2002	1.35	1.75	1.25	1.33
	4/16/2002	4.08	2.28	3.65	1.80
	5/22/2002	4.20	2.58	3.58	1.88
	7/30/2002	2.51	3.55	4.08	2.35
	9/13/2002	1.03	1.95	1.75	1.83
	10/14/2002	1.48	1.85	1.65	1.68
	1/30/2003	0.70	1.58	1.78	1.53
	3/4/2003	0.58	1.23	3.25	1.35
	4/1/2003	0.73	1.43	1.70	1.23
	7/14/2003	1.18	1.57	2.60	1.38
	10/16/2003	-0.13	1.88	2.58	2.58
	11/25/2003	3.55	1.65		
	1/22/2004	1.03	1.48	1.90	1.48
	4/29/2004	2.98	2.48	2.85	1.73
	6/4/2004	1.43	2.08	2.03	2.90
	7/27/2004	0.30	2.33	1.30	2.15
	9/16/2004	1.95	2.03	2.45	2.13
	10/15/2004	0.40	2.23	1.58	1.93

Table 3.4-13 Historical RCRA Compliance Monitoring Data

Well ID	Date	Fluoride, Dissolved mg/L	pH SU	Specific Coductivity umhos/cm
G-101				
	1/11/2000	0.21	6.61	436.86
	3/2/2000		6.62	428.83
	4/14/2000	0.37	7.15	446.03
	6/9/2000		6.76	
	7/17/2000	0.31	6.87	444.18
	8/25/2000			453.25
	10/12/2000	0.32	6.84	445.26
	12/20/2000			447.63
	1/6/2001	0.32	7.21	442.64
	3/13/2001		6.18	654.75
	4/12/2001	0.35	6.48	445.75
	7/24/2001	0.22	6.33	393.75
	9/12/2001			402.25
	10/9/2001	0.30	6.12	435.75
	11/1/2001			394.75
	2/13/2002	0.32	6.62	449.75
	4/16/2002	0.42	6.53	518.50
	7/30/2002	0.50	6.46	448.50
	9/13/2002		6.74	433.00
	10/14/2002	0.41	6.64	407.00
	11/7/2002		6.65	414.50
	1/30/2003	0.41	6.80	437.50
	4/1/2003	0.63	6.65	469.50
	5/8/2003	0.37	6.47	346.75
	7/14/2003	0.43	6.81	443.00
	10/16/2003	0.18	6.77	440.25
	11/25/2003			438.75
	1/22/2004	0.26	6.62	448.25
	4/29/2004	0.25	6.79	451.25
	7/27/2004	0.24	6.75	454.50
	8/25/2004	0.24	6.75	454.50
	9/16/2004			444.25
	10/15/2004	0.23	6.47	430.50
	11/22/2004			429.25
	1/14/2005	0.47	6.33	229.50

Table 3.4-13 Historical RCRA Compliance Monitoring Data (continued)

Well ID	Date	Fluoride, Dissolved mg/L	pH SU	Specific Coductivity umhos/cm
G-102				
	1/11/2000	0.22	6.46	468.16
	4/14/2000	0.34	7.10	482.66
	7/17/2000	0.31	6.83	478.17
	1/6/2001	0.33	7.03	482.98
	4/12/2001	0.34	6.50	585.25
	7/24/2001	0.34	6.38	517.00
	2/14/2002	0.25	6.45	476.50
	4/16/2002	0.36	6.37	505.50
	7/30/2002	0.53	6.55	584.00
	10/14/2002	0.44	6.51	425.25
	1/30/2003	0.41	6.74	550.00
	4/1/2003	0.54	6.59	528.00
	5/8/2003	0.27	6.33	378.75
	7/14/2003	0.38	6.17	568.50
	10/16/2003	0.21	6.66	551.50
	1/22/2004	0.25	6.53	450.75
	4/29/2004	0.24	6.71	484.75
	7/27/2004	0.24	6.48	483.00
	8/25/2004	0.24	6.48	483.00
	10/15/2004	0.24	6.42	488.25
	1/14/2005	0.41	6.59	471.75
G-103				
	1/11/2000	0.19	6.43	601.51
	3/2/2000			547.29
	4/14/2000	0.32	6.95	538.40
	7/17/2000	0.29	6.80	645.77
	8/25/2000			667.73
	10/12/2000	0.30	6.75	595.83
	12/20/2000			578.20
	1/6/2001	0.31	6.80	695.14
	3/13/2001			503.50
	4/12/2001	0.33	6.45	570.25
	7/24/2001	0.36	6.45	848.50
	9/12/2001			963.25
	10/9/2001	0.31	6.29	934.50
	11/1/2001			589.00
	2/14/2002	0.35	6.41	581.00
	4/16/2002	0.39	6.38	577.25
	7/30/2002	0.52	6.62	1,098.50
	9/13/2002		6.73	1,358.25

Table 3.4-13 Historical RCRA Compliance Monitoring Data (continued)

Well ID	Date	Fluoride, Dissolved mg/L	pH SU	Specific Coductivity umhos/cm
G-103				
	10/14/2002	0.36	6.52	887.50
	11/7/2002		6.51	708.25
	1/30/2003	0.39	6.72	774.50
	3/4/2003			819.75
	4/1/2003	0.51	6.56	607.50
	5/8/2003	0.27	6.34	578.50
	7/14/2003	0.39	6.28	984.75
	10/16/2003	0.22	6.80	1,235.50
	11/25/2003			599.75
	1/22/2004	0.25	6.51	570.00
	4/29/2004	0.23	6.70	707.00
	7/27/2004	0.25	6.87	1,232.50
	8/25/2004	0.25	6.87	1,232.50
	9/16/2004			905.50
	10/15/2004	0.23	6.52	943.00
	11/22/2004			601.50
	1/14/2005	0.38	6.53	589.75
G-105				
	1/11/2000	0.15	6.32	423.55
	3/2/2000		6.38	
	4/14/2000	0.23	6.90	438.88
	7/17/2000	0.20	6.62	431.78
	10/12/2000	0.21	6.63	434.19
	1/6/2001	0.20	6.15	437.40
	4/12/2001	0.23	6.32	399.75
	6/19/2001			
	7/24/2001	0.25	6.10	359.00
	10/9/2001	0.21	5.83	448.25
	11/1/2001			
	2/13/2002	0.20	6.61	416.25
	4/16/2002	0.26	6.31	399.50
	5/22/2002			
	7/30/2002	0.32	6.18	406.25
	9/13/2002		6.50	399.75
	10/14/2002	0.30	6.28	385.75
	1/30/2003	0.25	6.44	419.75
	4/1/2003	0.36	6.44	366.25
	7/14/2003	0.23	6.24	359.25
	10/16/2003	0.16	6.59	406.25
	1/22/2004	0.21	6.35	363.75
	4/29/2004	0.20	6.63	348.50
	6/4/2004			
	7/27/2004	0.21	6.57	384.75
	8/25/2004	0.21	6.57	384.75
	10/15/2004	0.21	6.20	402.75
	1/14/2005	0.30	6.33	439.50

Table 3.4-13 Historical RCRA Compliance Monitoring Data (continued)

Well ID	Date	Fluoride, Dissolved mg/L	pH SU	Specific Coductivity umhos/cm
G-106				
	1/11/2000	0.21	6.62	469.57
	4/14/2000	0.34	7.16	485.44
	6/9/2000		6.81	
	7/17/2000	0.33	6.89	489.16
	10/12/2000	0.30	6.93	462.79
	1/6/2001	0.31	7.25	461.35
	3/13/2001		6.66	
	4/12/2001	0.31	6.55	469.00
	7/24/2001	0.33	6.40	413.25
	10/9/2001	0.26	6.20	455.50
	2/13/2002	0.28	6.71	463.00
	4/16/2002	0.31	6.48	514.75
	7/30/2002	0.46	6.49	468.75
	9/13/2002		6.79	451.50
	10/14/2002	0.38	6.66	454.00
	1/30/2003	0.35	6.76	473.75
	4/1/2003	0.40	6.62	491.75
	7/14/2003	0.36	6.65	495.50
	10/16/2003	0.21	6.80	464.50
	1/22/2004	0.28	6.51	467.00
	4/29/2004	0.24	6.78	484.75
	7/27/2004	0.26	6.61	573.25
	8/25/2004	0.26	6.61	573.25
	10/15/2004	0.26	6.45	465.75
	1/14/2005	0.43	6.52	485.00
G-107				
	1/11/2000	0.25	6.41	479.50
	4/14/2000	0.32	7.05	507.22
	7/17/2000	0.29	6.89	492.84
	10/12/2000	0.32	6.82	485.86
	1/6/2001	0.30	7.00	479.48
	4/12/2001	0.31	6.49	493.75
	7/24/2001	0.36	6.38	426.50
	10/9/2001	0.30	6.19	463.75
	2/14/2002	0.25	6.36	496.00
	4/16/2002	0.32	6.40	501.75
	7/30/2002	0.44	6.40	481.25
	10/14/2002	0.44	6.63	447.25
	1/30/2003	0.36	6.63	485.00
	3/4/2003			

Table 3.4-13 Historical RCRA Compliance Monitoring Data (continued)

Well ID	Date	Fluoride, Dissolved mg/L	pH SU	Specific Coductivity umhos/cm
G-107				
	4/1/2003	0.45	6.58	485.00
	7/14/2003	0.36	6.37	479.75
	10/16/2003	0.19	6.71	494.75
	1/22/2004	0.32	6.49	477.25
	4/29/2004	0.26	6.72	487.00
	7/27/2004	0.29	6.63	503.75
	8/25/2004	0.29	6.63	503.75
	10/15/2004	0.29	6.33	494.00
	1/14/2005	0.36	6.53	492.00
G-108				
	1/11/2000	0.16	6.47	579.19
	4/14/2000	0.27	7.02	538.37
	7/17/2000	0.22	6.77	575.66
	10/12/2000	0.23	6.69	564.60
	1/6/2001	0.24	6.24	518.85
	4/12/2001	0.25	6.50	505.50
	7/24/2001	0.35	6.52	533.50
	10/9/2001	0.26	6.09	503.75
	2/14/2002	0.20	6.48	472.75
	4/16/2002	0.31	6.34	497.25
	7/30/2002	0.46	6.48	655.25
	9/13/2002		6.59	543.50
	10/14/2002	0.30	6.35	489.75
	1/30/2003	0.33	6.83	588.00
	3/4/2003			
	4/1/2003	0.43	6.61	493.25
	7/14/2003	0.29	6.14	499.50
	10/16/2003	0.20	6.69	669.25
	1/22/2004	0.29	6.51	459.75
	4/29/2004	0.26	6.64	491.25
	7/27/2004	0.26	6.81	677.75
	8/25/2004	0.26	6.81	677.75
	10/15/2004	0.20	6.41	656.25
	1/14/2005	0.31	6.38	489.25

Table 3.4-13 Historical RCRA Compliance Monitoring Data (continued)

Well ID	Date	Fluoride, Dissolved mg/L	pH SU	Specific Coductivity umhos/cm
R-104				
	1/11/2000	0.26	6.41	591.79
	3/2/2000			566.07
	4/14/2000	0.31	7.00	579.53
	7/17/2000	0.28	6.63	632.46
	8/25/2000			569.96
	10/12/2000			
	1/6/2001	0.31	6.16	493.62
	3/13/2001			
	4/12/2001	0.34	6.45	505.25
	7/24/2001	0.39	6.46	422.00
	10/9/2001	0.27	5.95	548.25
	2/14/2002	0.28	6.41	524.25
	4/16/2002	0.36	6.36	544.00
	7/30/2002	0.48	6.47	510.75
	10/14/2002	0.37	6.33	502.50
	1/30/2003	0.37	6.67	480.50
	4/1/2003	0.43	6.57	519.50
	7/14/2003	0.34	6.15	513.50
	10/16/2003	0.21	6.67	505.75
	11/25/2003			
	1/22/2004	0.25	6.49	478.50
	4/29/2004	0.23	6.69	514.50
	7/27/2004	0.22	6.70	550.50
	8/25/2004	0.22	6.70	550.50
	10/15/2004	0.23	6.35	514.00
	1/14/2005	0.49	6.42	503.00

Table 3.4-13 Historical RCRA Compliance Monitoring Data (continued)

Well ID	Date	Fluoride, Dissolved mg/L	pH SU	Specific Coductivity umhos/cm
R-110				
	1/11/2000	0.11	6.12	719.49
	3/2/2000		5.78	684.66
	4/14/2000	0.18	6.72	692.29
	6/9/2000		6.42	
	7/17/2000	0.17	6.39	650.39
	8/25/2000			647.20
	10/12/2000	0.16	6.23	691.88
	12/20/2000			646.57
	1/6/2001	0.18	7.27	720.14
	3/13/2001		6.61	438.25
	4/12/2001	0.14	6.05	659.00
	6/19/2001			
	7/24/2001	0.21	5.79	603.00
	9/12/2001			629.75
	10/9/2001	0.20	5.51	688.00
	11/1/2001			623.50
	2/13/2002	0.17	6.20	647.50
	4/16/2002	0.22	6.18	663.25
	5/22/2002			
	7/30/2002	0.32	6.02	615.50
	9/13/2002		6.33	632.00
	10/14/2002	0.22	6.25	608.50
	11/7/2002		6.28	623.25
	1/30/2003	0.20	6.42	648.25
	3/4/2003			
	4/1/2003	0.36	6.34	678.75
	5/8/2003	0.18	6.24	493.50
	7/14/2003	0.36	6.52	511.50
	10/16/2003	0.12	6.49	633.25
	11/25/2003			638.75
	1/22/2004	0.27	6.23	630.50
	4/29/2004	0.25	6.34	678.00
	6/4/2004			
	7/27/2004	0.25	6.36	680.00
	8/25/2004	0.25	6.36	680.00
	9/16/2004			622.75
	10/15/2004	0.25	6.04	619.00
	11/22/2004			610.25
	1/14/2005	0.31	6.07	447.75

3.5 Ecological Resources

In characterizing ecological resources for the purposes of this application, it is important to differentiate between resources in the general area of the plant and those that actually occur within the confines of the security fence at the plant site itself.

Developing the existing plant required clearing all natural vegetation from the site to permit construction of buildings, waste ponds, and other plant-related facilities. However, the plant site occupies only about 5% of applicant's property that has otherwise remained mostly undeveloped through the years.

Additionally, review of topographic maps suggests that the plant site was historically devoid of aquatic features of interest, including ephemeral streams. Accordingly, like terrestrial habitats and biota, the plant has had little or no affect on the area's aquatic biotic resources. The following discussions, therefore, focus on characterizing the ecological features of the general area that, unless otherwise noted, are universally absent from the plant area within the security fence.

3.5.1 General Description

Massac County is located in the Coastal Plain Natural Division of extreme southern Illinois (IDNR, n.d.). This division is characterized by swampy, forested bottomlands and low clay and gravel hills. It is the northernmost extension of the Gulf of Mexico Plain Province of North America. Bald cypress-tupelo swamps are a unique feature of the area. Southern mixed bottomland forests occur along floodplains while oak-hickory associations are more common at higher elevations (Kuchler, 1964).

Illinois forests are typically assigned to the Eastern Broadleaf Forest ecoregion defined by Bailey (1994) that extends westward from the Appalachian Mountains to northwest Minnesota on the north and to the northeast corner of Oklahoma to the south. There, tall, broadleaf deciduous trees dominate most of the landscape, interspersed with mixed evergreen/deciduous forests in the northern and southern regions of Illinois.

Natural vegetation in the vicinity of the MTW site is characteristic of oak-hickory and southern mixed hardwood forests (Kuchler, 1964). This area lacks mixed evergreen/hardwood stands found elsewhere in southern Illinois. Tree species associated with these areas include oak (*Quercus* sp.), hickory (*Carya* sp.), persimmon (*Doispyros virginiana)*, sassafras (*Sassafras albidum)*, and black locust (*Robinia pseudoacacia)* according to Voight and Mohlenbeck (1959) as reported in USNRC (1995).

Cottonwood (*Populus deltoides)* and a variety of willows (*Salix* sp.) inhabit floodplains such as those of the Ohio River to the south of the plant site along with box elder (*Acer negundo)* American beech (*Fagus grandifolia)*, sweet gum (*Liquidambar styraciflua)*, and sycamore (*Plantanus occidentalis)* at slightly higher elevations (Voight and Mohlenbeck, 1959). Floodplain forests generally support a relatively sparse understory due to frequent inundation.

According to USNRC (1995), the electrical transmission line corridor crossing the property southwest of the plant site is artificially maintained and supports only grasses (like brome (*Bromus* sp.), broom sedge (*Andropogon virginicus), and* bluegrass (*Poa pretensis))* and low-growing shrubs like sumac (*Rhus* sp.) and blackberry (*Rubus allegheniensis)*.

3.5.2 Important Species

NUREG-1748 (USNRC, 2003) defines "important species." Included are those that are rare (i.e., listed as threatened or endangered at either the state or Federal level or proposed or a candidate for listing). Also included are those that are commercially or recreationally valuable, essential to the maintenance or survival of the above, or that serve as biological indicators.

Important habitats include wildlife sanctuaries and refuges, habitats identified by state or Federal agencies as rare or unique, wetlands and floodplains, and "critical habitats" for listed species.

3.5.2.1 Endangered and Threatened Species

The State of Illinois lists 483 plant and animal species as endangered or threatened (IESPB, 2004). Of these, 356 are classified as endangered and 127 are classified as threatened (Table 3.5-1).

Table 3.5-1 Summary Of Illinois Threatened, Endangered, And Candidate Species

Taxa	State: E	State: T	Fed: E	Fed: T	Fed: C	Massac: E**	Massac: T
Plants	263	76	1	8	0	0	0
Fish	18	13	1	0	0	0	0
Amphibians	3	5	0	0	0	0	0
Reptiles	8	8	0	0	1	0	0
Birds	24	8	2	1	0	1	0
Mammals	5	4	2	0	0	0	0
Invertebrates	35	13	10	0	2	3	0
Total	356	127	16	9	3	4	0

*E = Endangered; T= Threatened; C = Candidate
**E= Federally Endangered Confirmed in Massac County; T = Federally Threatened Confirmed in Massac County

Of the species common to both lists, only four species have actually been collected in Massac County. They are the Pink mucket pearly mussel (*Lampsilis abrupta)*, Fat pocketbook pearly mussle (*Potamilis capax)*, Least tern (*Sterna antillarum)*, and Spectacle case mussel (*Cumberlandia monodonta)* according to USFWS (2005). That authority also notes that the Indiana bat (*Myotis sodalis)* potentially occurs in all counties of the state.

Included in the state list for Massac County are 28 species also listed nationally by the U.S. Fish and Wildlife Service (16 as endangered, 9 as threatened, and 3 as candidates) according to USFWS (2005) (Table 3.5-2).

Table 3.5-2 Federally Listed Threatened, Endangered, And Candidate In Illinois

Taxa	Common Name	Scientific Name	Status*	Possible Occurrence in Massac County
Mammal	Gray bat	*Myotis grisescens*	F-E	Unlikely
	Indiana bat	*Myotis sodalis*	F-E; CHD	Very Unlikely
	Rice rat	*Oryzomys palustris*	S-T	Confirmed
Bird	Bald eagle	*Haliaeetus leucocephalis*	F-T; S-T	Seasonal Migrant
	Least tern	*Sterna antillarum*	F-E; S-E	Seasonal Migrant
	Piping plover	*Charadrius melodus*	F-E; CHD	Seasonal Migrant
	Common moorhen	*Gallinule chloropus*	S-T	Confirmed
	Mississippi kite	*Ictinia mississippiensis*	S-E	Confirmed
	Least bittern	*Ixobrychus exilis*	S-T	Confirmed
	Loggerhead shrike	*Lanius ludovicianus*	S-T	Confirmed
	Osprey	*Pandion haliaetus*	S-E	Confirmed
Reptile	Eastern massasauga	*Sistrurus catenatus*	F-C	Possible
	Eastern ribbon snake	*Thamnophis sauritus*	S-T	Confirmed
Amphibian	River cooter	*Pseudemys concinna*	S-E	Confirmed
Fish	Pallid sturgeon	*Scaphirhynchus albus*	F-E	Very Unlikely
	Redspotted sunfish	*Lepomis miniatus*	S-T	Confirmed
	Taillight shiner	*Notropis maculates*	S-E	Confirmed
	Northern madtom	*Noturus stigmosus*	S-E	Confirmed
Clam	Clubshell	*Pleurobema clava*	F-E	Extirpated
	Fanshell	*Cyprogenia stegaria*	F-E	Extirpated
	Fat pocketbook	*Potamilus capex*	F-E; S-E	Confirmed
	Higgins eye pearlymussel	*Lampsillis higginsii*	F-E	Very Unlikely

Table 3.5-2 Federally Listed Threatened, Endangered, And Candidate In Illinois (continued)

Taxa	Common Name	*Scientific Name*	Status*	Possible Occurrence in Massac County
	Orange-footed pimpleback pearlymussel	*Plethobasus cooperianus*	F-E; S-E	Confirmed
	Pink mucket pearlymussel	*Lampsilis orbiculata*	F-E	Very Unlikely
	Sheepnose	*Plethobasus cyphyus*	F-C; S-E	Confirmed
	Spectaclecase	*Cumberlandia monodonta*	F-C; S-E	Confirmed
	Ebonyshell	*Fusconaia ebena*	S-T	Confirmed
	Black sandshell	*Ligumia recta*	S-T	Confirmed
	Ohio pigtoe	*Pleurobema cordatum*	S-E	Confirmed
	Elephant-ear	*Elliptio crassideus*	S-T	Confirmed
	Rabbitsfoot	*Quadrula cylindrical*	S-E	Confirmed
Snail	Iowa Pleistocene snail	*Discus macclintocki*	F-E	Very Unlikely
Insect	Hine's emerald dragonfly	*Somatochlora hineana*	F-E	Very Unlikely
	Karner blue butterfly	*Lycaeides melissa samuelis*	F-E	Extirpated
	Butterfly	*Ellipsaria lineolata*	S-T	Confirmed
Crustacean	Illinois cave amphipod	*Gammarus acherondytes*	F-E	Very Unlikely
	Bigclaw crawfish	*Orconectes placidus*	S-E	Confirmed
Plant	Decurrent false aster	*Boltonia decurrens*	F-T	Possible
	Eastern prairie fringed orchid	*Platanthera leucophaea*	F-T	Very Unlikely
	Lakeside daisy	*Hymenoxys herbacea*	F-T	Extirpated
	Leafy prairie-clover	*Dalea foliosa*	F-E	Very Unlikely
	Mead's milkweed	*Asclepias meadii*	F-T	Very Unlikely
	Pitcher's thistle	*Cirsium pitcheri*	F-T	Very Unlikely
	Prairie bush-clover	*Lespedeza leptostachya*	F-T	Very Unlikely

Table 3.5-2 Federally Listed Threatened, Endangered, And Candidate In Illinois (continued)

Taxa	Common Name	Scientific Name	Status*	Possible Occurrence in Massac County
	Price's potato-bean	*Apios priceana*	F-T	Extirpated
	Small whorled pogonia	*Isotria medeoloides*	F-T	Very Unlikely
	Large sedge	*Carex gigantean*	S-E	Confirmed
	Sedge	*Carex reniformis*	S-E	Confirmed
	Silverbell tree	*Halesia Carolina*	S-E	Confirmed
	Narrow-leaved sunflower	*Helianthus angustifolius*	S-T	Confirmed
	Bloodleaf	*Iresine rhizomatosa*	S-E	Confirmed
	Two-flowered melic grass	*Melica mutica*	S-E	Confirmed
	Lea's bog lichen	*Phaeophysica leana*	S-T	Confirmed
	Water elm	*Planera aquatica*	S-T	Confirmed
	Tubercled orchid	*Platanthera flava*	S-E	Confirmed
	Willow oak	*Quercus phellos*	S-T	Confirmed
	White basswood	*Tilia heterophylla*	S-E	Confirmed
	Galingale	*Cyperus lancastriensis*	S-E	Confirmed
	Eryngo	*Eryngium prostratum*	S-E	Confirmed
	Boykin's dioclea	*Galactia mohlenbrockii*	S-E	Confirmed
	White melanthera	*Melanthera rivea*	S-E	Confirmed
	American snowbell	*Styrax Americana*	S-T	Confirmed

*E = Endangered: T = Threatened; C = Candidate; CHD = Critical Habitat Designated

Of the 28 federally listed species, 20 are considered extirpated from Illinois or otherwise unlikely to occur in the project area. The three listed birds are all likely to be seasonal migrants in Massac County. Of the five other species possibly occurring within the county, two (Eastern massasauga rattlesnake and Decurrent false aster) are terrestrial, and three are clams historically found in the Ohio River.

3.5.2.2 Other Important Species

Other important species include recreational game animals and sport fish regulated by the Illinois Department of Natural Resources. Note that scientific names are not included in this description since the species named are generically grouped. In the area of the MTW site, regulated species potentially include small game such as rabbits, squirrels, and woodchucks and resident game birds like pheasant and quail (IDNR, 2004).

Examples of important woodland game species are white-tailed deer and wild turkeys. While also protected Federally, state hunting regulations cover migratory game birds like dove, ducks, geese, woodcock, and crows. Finally, furbearers like raccoon, opossum, weasel, mink, and muskrat are probably also hunted and trapped recreationally in the project area.

Protected aquatic life in Illinois includes recreationally important fish such as bass, muskies, northern pike, walleye, and sauger. Statewide sport fishing regulations also cover bullfrogs and turtles, excluding those protected by Federal or state endangered species regulations (IDNR, 2005).

Commercial fishing has been largely abandoned in the Ohio River according to USNRC (1995). Accordingly, there are no known important commercial species in the area nor are there any references to designated biological indicators.

3.5.2.3 Important Habitats

According to USNRC (1995), two natural areas occur within a 5-mile radius of the site. The first is the Mermet Lake Conservation Area containing the Mermet Swamp Nature Preserve. Under the jurisdiction of the Illinois Department of Conservation, it is about 3.5 miles northwest of the site. The second is the West Kentucky Wildlife Management Area located across the Ohio River about two miles southwest of the site adjacent to the Paducah Gaseous Diffusion Plant in Kentucky.

There are no other wildlife sanctuaries, refuges or habitats identified by state or Federal agencies as rare or unique in this area.

3.5.2.4 Floodplains and Wetlands

Wetlands and other waters of the United States are within the jurisdictional control of the U.S. Army Corps of Engineers, which regulates any activity resulting in discharge to and fill of such waters. Wetlands are defined by the U.S. Fish and Wildlife Service in Cowardin, et al., 1979. They are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation adapted for life in saturated soil conditions. Wetlands typically include swamps, marshes, bogs, and similar areas.

The existing plant is situated atop a low bluff above the floodplain of the Ohio River. Inspection of available aerial photographs suggests that the area of the floodplain owned by the plant operator is largely cleared of natural vegetation. This area was farmed in the past. This are is no longer farmed and is being allowed to return to more natural vegetation. In its original condition, this area probably supported a typical bottomland hardwood forest. Bottomland hardwood forests also qualify as palustrine, forested, seasonally flooded wetlands. According to USNRC (1995), this area near the site has been "mapped" as a wetland.

On-site characterization of wetlands is accomplished through a process known as "wetland delineation" according to a process described in Cowardin, et al. (1979), also referred to as the U.S. Fish and Wildlife Service Wetland Delineation Manual. With the exception of the bottomland forest discussed above, there is no evidence that the site or surrounding areas has yet been subjected to rigorous wetland delineation. USNRC (1995), however, notes that no wetlands occur within the plant exclusion zone.

3.5.2.5 Waters of the United States

Waters of the United States are broadly defined as waters that are, were, or could be used in interstate or foreign commerce. They include all waters which are subject to the ebb and flow of the tide, the territorial sea, interstate waters and wetlands, and all other waters (such as intrastate lakes, rivers, streams, and wetlands) if their use, degradation, or destruction could affect interstate or foreign commerce. Also included are tributaries to waters or wetlands identified above, and wetlands adjacent to these waters.

The Ohio River is used in interstate and foreign commerce. Natural drainages on and adjacent to the site are tributary to the Ohio River. Accordingly, they are waters of the United States under the above definition and subject to the regulatory jurisdiction of the U.S. Army Corps of Engineers.

3.5.2.6 Critical Habitat

While critical habitat has been designated for two of the Federally listed species (Indiana bat and Piping plover), none of the habitat is on or near the MTW site or elsewhere in Massac County.

3.5.3 Terrestrial Ecology

USNRC (1995) reports that typical animal species on the site are those of old field and secondary-growth forests in Illinois. Birds and mammals associated with open habitat such as the transmission line corridor and the cultivated fields include bobwhite quail *(Colinus virginianus)*, mourning dove *(Zenaidura macroura)*, horned lark *(Eremophila alpestris)*, groundhog *(Marmota monax)*, deer mouse *(Peromyscus maniculatus)*, and the eastern cottontail rabbit *(Sylvilagus floridanus)*.

Common forest dwellers include the cardinal *(Richmondena cardinalis)*, chickadee (Parus sp.), woodpeckers, eastern gray squirrel *(Sciurus carolinensis)*, white-footed mouse *(Peromyscus leucopus)*, and opossum *(Didelphis marsupialis)*. As also discussed in additional detail above, species of special concern are game animals. Probably the most common on the site is the white-tailed deer *(Odocoileus virginianus)*.

Other common animals associated with the banks of the Ohio River include muskrats *(Ondatra zibethica)*, raccoon *(Procyon lotor)*, and a variety of turtles, water snakes, salamanders, and frogs.

On the slightly irregular plains in adjacent ecological regions to the north, east, and west, most of the land is cultivated for corn and soybeans. On the Coastal Plain Division, less that half the land is cropped while the remainder is commonly used for pasture (USEPA, 2000).

None of the above occur within the fenced area of the MTW facility.

3.5.4 Aquatic Ecology

According to USNRC (1995) benthic communities in the Ohio River are characterized by species adapted to both flowing and restricted circulation conditions. Crustaceans are found in greater abundance in pooled areas behind dams than in the open river. Benthic invertebrate communities are not well developed in the Ohio River, possibly because of the lack of suitable substrates, high turbidity, or of unfavorable chemical environment (USACOE, 1976). Chironomid larvae and turbificids often dominate the community in terms of numbers, and the asiatic clam (*Corbicula manilensis*) occurs in large quantities. Other common organisms include snails and leeches.

Forage fish that feed largely on detritus, plant material, and on bottom-dwelling invertebrates are abundant in the Ohio River. These include the emerald shiner (*Notropis atherinoides)*, the gizzard shad (*Dorosoma cepedianum)*, and common carp (*Cyprinus carpio)*.

USNRC (1995) also states that the Ohio River Basin has changed greatly in the past 100 years due to the construction of locks and dams and the degradation of water quality associated with industrial and municipal discharges and agricultural runoff. Large-scale damming has changed the habitat and hindered the migration of fish. Water quality changes have also produced adverse changes in fish populations.

No natural aquatic habitats occur within the fenced area of the MTW site.

3.6 Meteorology and Climatology

The Meteorology and Climate of the MTW UF_6 conversion plant near Metropolis, Illinois, was summarized in a 1995 Environmental Assessment (EA) (USNRC, 1995). That report used meteorological data from the National Weather Service (NWS) at Paducah, Kentucky, which is on the far bank of the Ohio River just 6.8 miles south of the MTW UF_6 site. It is reasonable to assume that the climate at Paducah adequately describes the weather at the plant. In this report, additional, more recent, data is collected to assure that the general climate remains consistent with that described in the 1995 EA.

3.6.1 Description of the General Climate of the Region

The general description of the climate has not changed since the EA was written. Borrowing from the text of the EA, the climate of the area can be described as characteristic of the humid continental zone, where the primary source of heat and moisture for western Kentucky and southern Illinois is the Gulf of Mexico. Because of prevailing southern winds and the site's proximity to the Ohio River on the border with Kentucky, the climate is more typical of western Kentucky than southern Illinois.

The region has two predominant weather patterns that define the winter and summer circulation regimes. Winter is characterized by evenly distributed precipitation events and moderate diurnal changes in temperature. During the summer, frontal and pressure systems generally pass north of the region, resulting in a more tranquil weather pattern over the area.

Changes in the recent 8-year database (1997-2004) compared to the EA 30-year database (1951-1980) are modest. There is a slight increase in average temperature (+0.3°F) and annual rainfall (+6%); however the extreme events such as maximum and minimum temperatures, maximum rainfall, etc., in the older, longer database tend to envelope the extreme events in the recent database. The conclusion is that there is no design basis impact suggested by weather changes in the past few decades, but the slight warming and wetter trend is consistent with other sources that evaluate global warming trends (IPCC, 2001).

3.6.2 Temperatures

3.6.2.1 Dry Bulb Temperature

General measures of the recent 8 years of temperature data (NCDC, 1997-2004)show consistent values with those submitted in the EA. The average annual temperature from 1997 through 2004 was 58.2°F, little changed from the EA value of 57.9°F. In the recent data, the warmest month continues to be July (79.1°F in the new data, 79.3°F in the EA) and the coolest January (35.4°F in the new data, 34.3°F in the EA). The maximum and minimum temperatures in the new data set at 101°F and -8°F are bounded by the temperature extremes of the EA (106°F in 1952, and -12°F in 1951). In the EA, it was reported that Paducah recorded 55 days with a high temperature above 32.2C (approximately 90°F) in the years 1951 through 1980. The new data recorded the annual number of days with a high temperature that equals or exceeds 90 as 42 days per year. The area had about 11 days per year when the daily high temperature did not exceed freezing in the recent data, and 12 days per year in the EA data.

The conclusion is that the recent 8 years of temperature data (NCDC, 1997-2004) are not significantly different from the temperature data of the EA. This makes it possible to update Table 3.1 of the EA by merging the 30-year data set with the 8-year data set from the NCDC. For mean values, the value reported in the updated Table 3.1 is the EA value multiplied by 30/38 plus the newer value multiplied by 8/38. For extreme values, both data sets are examined to see the limiting value. The result is not significantly different from the EA data. The new table is Table 3.6-1.

Table 3.6-1: Dry Bulb Temperature Data (°F), NWS At Paducah, KY, Combined Periods 1951 - 1980 And 1997 - 2004 (NRCS, 1995 And NCDC, 1997-2004)

	Means			Extremes						Mean # Days				Degree Days	
	Max	Min	Mean	Record high	Year	Day	Record low	Year	Day	Max>=90	Max<=32	Min<=32	Min<=0	Heat	Cool
Jan	43.6	25.2	34.5	79	1952	1	-8	1963	24	0	6	24	1	945	0
Feb	49.3	29.1	38.5	81	1962	13	-12	1951	3	0	3	18	0	742	0
Mar	57.8	36.5	47.2	84	1967	13	2	1960	5	0	1	12	0	562	11
Apr	70.2	47.4	58.9	90	1977	17	26	1954	1	0	0	1	0	214	30
May	78.8	55.8	67.3	96	1974	20	34	1963	1	3	0	0	0	67	141
Jun	86.7	64.0	75.4	105	1952	30	44	1972	1	11	0	0	0	1	316
Jul	90.2	68.2	79.3	106	1952	29	50	1962	27	18	0	0	0	0	442
Aug	88.9	65.8	77.4	103	1980	1	46	2004	14	14	0	0	0	0	386
Sep	83.3	58.4	71.0	105	1954	6	36	1963	30	6	0	0	0	20	199
Oct	72.4	46.5	59.5	95	1953	1	24	1957	28	0	0	2	0	208	39
Nov	58.6	37.1	48.0	84	1955	13	8	1964	30	0	0	11	0	512	1
Dec	47.4	29.0	38.2	75	1970	1	-8	2004	25	0	3	20	0	830	0
Annual	69.0	46.9	57.9	106	1952	29	-12	1951	3	52	13	88	1	4101	1564

Table 3.6-1 also includes heating days and cooling days. Heating days are defined as the sum in each month of (65 - Tavg) for all days with Tavg below 65. This measure has been shown to be directly proportional to heating costs. Similarly, cooling days is the sum of all days' (Tavg-65), and is proportional to air conditioning costs. The mean value for heating obtained with the recent 8 years of data was 3992 as compared to 4130 in the EA, giving a total mean for the 38 years of data of 4101. This value is consistent with 30-yr data available from the Kentucky State Meteorologist reproduced here as Figure 3.6-1.

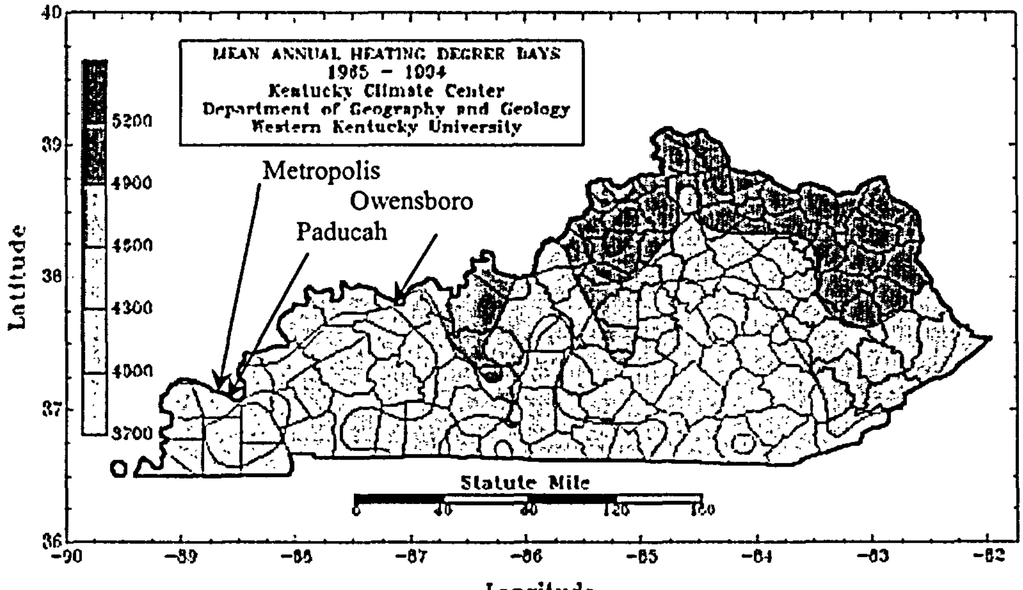


Figure 3.6-1: Mean Annual Heating Days, Kentucky (Conner, 1998)

In addition to the various temperature-related measurements of Table 3.6.1, there is a convenient measurement for evaluating the possibility of ice formation in ponds and on the river based on dry bulb data. This measurement is the Accumulated Freezing Degree Days (AFDD), defined as recommended in US Army Corp of Engineer report ERDC/CRREL TN-04-3 (USACE, 2004). This is an integration of (32 - temperature) over time in units of days, with the value kept to a minimum of zero so that at the start of each period below freezing no credit is given to preceding warm days. The AFDD maximums by cold season are given in Table 3.6-2 (note: this data extends from 1/1/97 to 4/30/2005 to capture 9 winter seasons). Although a longer time period would be better for determining a 100-yr recurrence calculation, it is still possible to use this 9 years of data in a Gumbel distribution, with parameters developed according to the method of moments as suggested by Wilks (Wilks, 1995), to develop the 100-yr return value for AFDD shown in the table.

Table 3.6-2: Accumulated Freezing Degree Days (NCDC, 1997-2004)

1997	1998	1999	2000	2001	2002	2003	2004	2005	100-yr
169	25	142	73	110	38	167	60	95	265

3.6.2.2 Wet Bulb Temperatures and Humidity

For purposes of HVAC design, it is also important to evaluate the wet bulb temperatures, or alternatively the dew point or relative humidity. Wet bulb and dew point data was obtained from the NCDC (NCDC, 1997-2004). These measures are not meaningful unless they are given along with the coincident dry bulb temperature. Table 3.6-3 contains the maximum wet bulb temperature along with its coincident dry bulb temperature from the NCDC database (NCDC, 1997-2004).

A common resource for HVAC engineers is the ASHRAE Fundamentals Handbook (ASHRAE, 2001). This gives data relevant to heating and cooling loads for specific cities. ASHRAE data is also provided in Table 3.6-3. Here Cape Girardeau, MO, is located alongside the Missouri River 50 miles directly east of Metropolis.

Table 3.6-3. **ASHRAE Data (ASHRAE, 2001) Is For Paducah Based On 1982-1993 (Data In Parentheses Is For Cape Girardeau, Missouri, 1982-1993). Paducah 1997-2004 (NCDC, 1997-2004).**

	ASHRAE, Paducah, KY (1982 – 1993)			NCDC, Paducah, KY (1997 – 2004)			
	Dry Bulb (F)	Wet Bulb (F)	Dew Point (F)	Dry Bulb (F)	Wet Bulb (F)	Dew Point (F)	Date
99.6% Dry Bulb	96 (96)	77 (77)					
Dry Bulb Extreme	98 (100)			101 106*	79	70	7/30/99 7/29/52*
99.6% Wet Bulb	90 (92)	80 (80)					
Wet Bulb Extreme				94 91 87	83 83 83	79 80 81	7/26/97 7/7/98 7/27/99
99.6% Dew Point	86 (86)		77 (77)				
Dew Point Extreme				87	83	81	7/27/97
99.6% Dry Bulb Min	7 (6)						
Dry Bulb Min Extreme	-1 (-1)			-12*			2/3/1951

* These values are from the EA database that covers 1951 - 1980 (from Table 3.6-1)

3.6.3 Winds and Atmospheric Stability

The EA contains a windrose (EA Figure 3.3) based on data collected at Paducah in the years 1985 through 1992. Similar data is collected at Paducah for the years 1997 through 2004, an equally long 8-yr period. When this data is collected into a windrose, the result is very similar to that of the EA figure with a small exception. The more recent data tends to show winds primarily from the SSW and SW rather than the S and SSW. This small shift may be due to instrument change, or data manipulation. Figure 3.6-2 was developed from data that was expressed in terms of nearest 10 degrees. This data was converted to the standard 16 points of the compass by weighted distribution. For example, the southward direction was assigned 62.5% of the 170° winds, plus 100% of the 180° winds, plus 62.5% of the 190° winds. The resulting windrose is consistent with the observation that the mode of the wind direction data (most common angle) was 210° measured clockwise from North. The mode for all 8 individual years 1997 through 2004 ranged from 200° to 230°, but was 210° for 5 of those years.

The average windspeed for this period was 5.5 knots, with individual year averages ranging from 5.3 to 5.8 knots. The maximum hourly-average windspeed observed in this period was 30 knots.

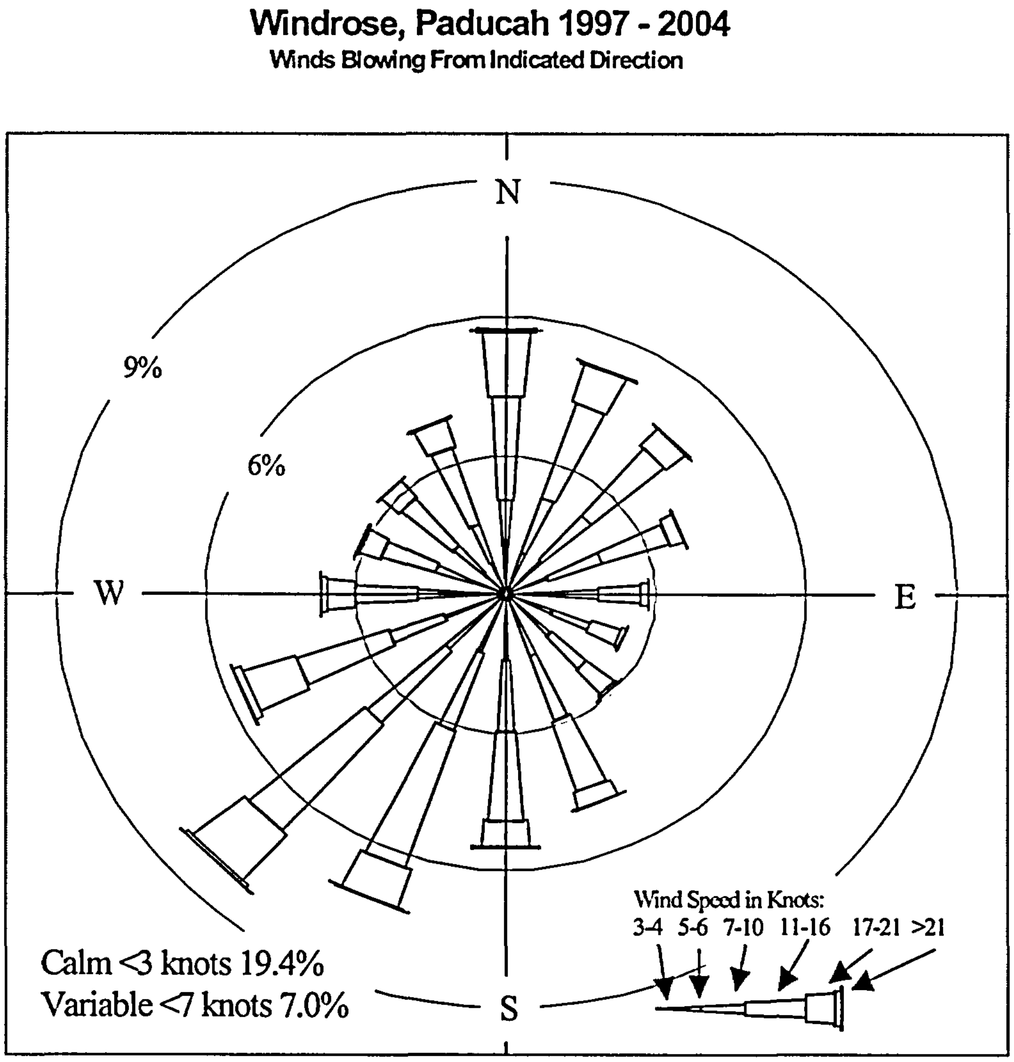


Figure 3.6-2: Paducah NWS Windrose. Percentages Are Percentages Of All Wind Data; Winds With Direction Defined Total 83.6%.

3.6.4 Precipitation

The Metropolis site has a fairly constant level of rain throughout the year. The monthly means of precipitation varied only from 2.44" in August to 5.18″ in June in the 8 years of recent Paducah weather records. The EA variation previously reported in licensing submittals was a range of 2.49″ in October to 4.92″ in March. The more recent data had a 6% wetter average (48.6″ versus 45.8″), but most maximum rain month and individual day totals were bounded by events in the 1951 - 1980 database.

Snowfall is a common winter occurrence at this site, with a record monthly maximum of 22.6 inches in January of 1978. The recent data set has less snow recorded than the 1951 through 1980 period with an annual mean of just 4.3 inches versus 9.9 inches. (Note: the maximum snowfall event of 1997, discussed below in Section 3.6.5, that lists up to 22″, refers to a storm that deposited this amount of snow well to the north of Metropolis.)

Table 3.6-4 summarizes the precipitation data in a format identical to the EA. As in the case of Table 3.6-1, the data is time-averaged such that the earlier and longer data set contributes more than 75% to the mean values. This does not impact the rain values much due to the consistency of the data.

Table 3.6-4: Precipitation Data, NWS At Paducah, KY, Combined Periods 1951 - 1980 And 1997 - 2004 (NRCS, 1995 and NCDC, 1997-2004)

	Rain						Snow			Mean # Days of Precip		
	Mean (in)	Max (in)	Year	Daily Max (in)	Year	Day	Mean (in)	Monthly Max (in)	Year	<0.1"	<0.5"	<1"
Jan	3.58	7.37	1960	3.97	2000	3	3.4	22.60	1978	6	2	1
Feb	3.30	7.35	1962	3.14	1976	18	2.3	16.00	1979	5	2	1
Mar	4.70	17.73	1966	8.00	1964	4	1.7	10.30	1960	7	3	1
Apr	4.54	10.11	1973	3.40	1999	3	0.1	1.50	1951	7	3	2
May	4.66	9.83	1957	3.62	1967	14	0	0		7	3	1
Jun	4.45	10.98	1998	3.96	1998	9	0	0		6	3	1
Jul	3.92	11.18	1958	4.43	2000	29	0	0		6	3	1
Aug	3.12	6.68	1979	3.89	1952	12	0	0		5	3	1
Sep	3.23	11.16	1962	5.90	1962	14	0	0		5	2	1
Oct	2.82	7.37	1998	4.03	1998	6	0	0		4	2	1
Nov	4.07	13.23	1957	3.95	1957	13	0.2	4.00	1958	6	3	1
Dec	3.99	9.24	1978	2.98	1978	8	1.0	7.00	1963	6	3	1
Annual	46.38	17.73	1964	8.00	1964	4	8.7	22.6	1978	71	32	13

3.6.5 Severe Weather Phenomena

3.6.5.1 Temperature Extremes

Although the ASHRAE reference quoted in Table 3.6-3 is an industry standard source for HVAC design, the Paducah data tends to predict greater extremes, and it is more conservative to use that data. A 100-yr temperature extreme can be calculated the 8 years of Paducah data plus a 9th year using the historic extremes from the 1951 - 1980 data base as seen in Table 3.6-5:

Table 3.6-5 Data And Development Of 100-yr Return Temperature (°F) Extremes

	1997	1998	1999	2000	2001	2002	2003	2004	1951/2	100-yr
Tmin	-3	11	7	4	5	10	-3	-8	-12	-24
Tmax	100	96	101	99	99	99	97	96	106	108

To check on the reasonableness of these 100-yr values, the long-term record at Owensboro, KY, was consulted. Owensboro has data from 1932 through 1998 in the United States Historical Climatology Network (USHCN) Owensboro is seen on Figure 3.6-1 to be similarly situated on the river, but 100 miles Northeast in a region of greater heating days. The maximum-recorded temperature in this database at Owensboro is 107°F in 1936 and 1944. Like Paducah, Owensboro reached 106°F in 1952. The minimum recorded at Owensboro was -23°F in 1993, but Owensboro hit -21°F in 1951, the year that Paducah hit -12°F.

3.6.5.2 Wind Speed Extremes

A typical design value for high winds is the 3-second gust at 33 feet elevation, as recommended in SEI/ASCE 7-02 (SEI/ASCE, 2002). This value is identified using the methodology of SEI/ASCE 7-02 to have a 50-year return value of 90 mph for Metropolis, Illinois. This is converted to a 100-yr value by the factor 1.07 obtained from Table C6-3. That is, the 100-yr value for 3-second gust at this site is 96 mph. The maximum gust recorded in 1997 through 2004 at Paducah was 61 knots in 2001.

3.6.5.3 Tornadoes

The Metropolis site is located at the edge of tornado alley, where tornado alley is the portion of the United States that has experienced a touchdown of an F5 tornado. Figure 3.6-3 shows the frequencies of F2 and larger tornados in days per century per grid box, where the area of a grid box is defined as roughly equal to a circle 25 miles in radius, or 2000 square miles. At Metropolis, the contour line of 20 tornados per century per 2000 square miles converts to 1.0 per 10,000 square miles annually. The right side of Figure 3.6-3 shows the frequency of F5 or higher tornados per grid area per millennium. The contour at Metropolis of 20 converts to 0.1 per 10,000 square miles annually. It is noted that the highest frequency period for tornados is spring (April to June).

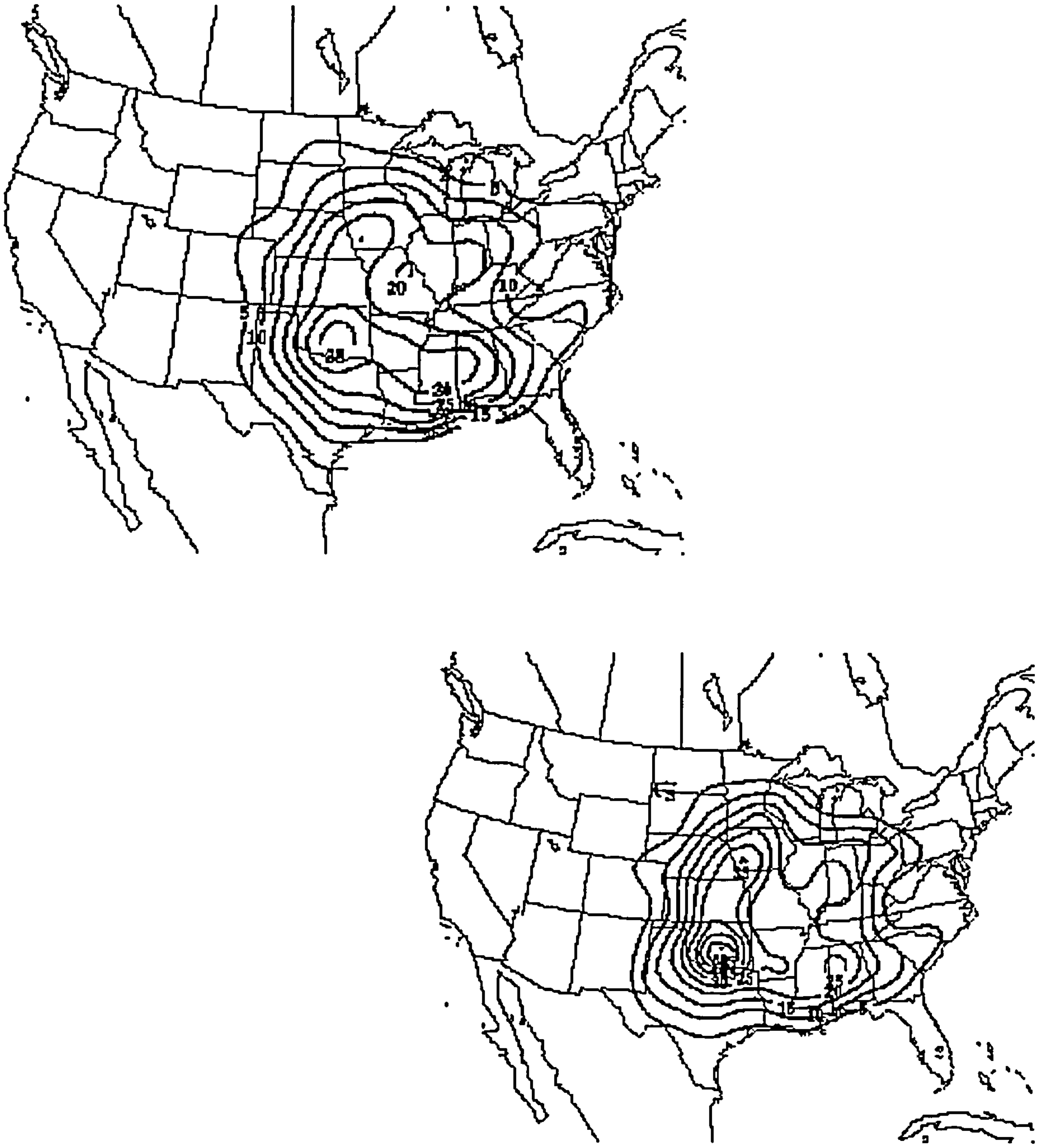


Figure 3.6-3 Tornado Frequency From NOAA Database (Concannon, 2000). Contour values are in increments of 5, with the contour through Metropolis in the figure at left representing 20 F2 tornadoes per grid area per century, and at right representing 20 F4 tornadoes per grid area per millennium. Frequencies are based on data from the years 1921 through 1995.

The NCDC severe weather database was queried for all tornados in seven counties around the Metropolis site from 1950 to the present. The counties selected were Massac, Pope and Pulaski in Illinois (Metropolis is in the center-south of Massac, and the other two counties border it up and down the river), and McCracken, Livingston, Ballard and Grace in Kentucky (McCracken is across the river from Metropolis, Ballard and Livingston border it up and down the river, and Grace is directly south of McCracken in the direction of common winds). These counties total 2,194 square miles. There are 13 days with tornados of F2 or greater listed, converting to a frequency of $13/(54 \text{ years} * 2194 \text{ mi}^2) = 1.08$ tornado-days annually per 10,000 mi^2, consistent with Figure 3.6-3. There was one F4 tornado, converting to a frequency of 0.08 annual per 10,000 mi^2, also consistent with Figure 3.6-3. Individual tornados are listed in Table 3.6-6.

Table 3.6-6: All Tornado-Day Records, F2 or Greater, In the NCDC Severe Weather Database (NCDC)

Date	Time	Intensity	Deaths	Injury	Property Damage ($)	County
4/3/1957	1408	F2	0	0	250K	Pope
6/12/1958	1808	F3	0	3	25K	Pulaski
6/6/1966	1200	F2	0	2	25K	Ballard
6/21/1967	1900	F2	0	0	25K	McCracken
4/24/1970	100	F3	0	5	0K	Pulaski
12/15/1971	340	F2	0	0	25K	Livingston/ McCracken
4/21/1972	1703	F2	0	2	25K	Graves/ Pulaski/ Livingston
4/19/1973	1530	F2	0	0	25K	pope
10/3/1990	2120	F2	0	0	250K	McCracken
1/22/1999	1:15 AM	F2	0	0	800K	Pope
4/28/2002	12:59 AM	F3	0	1	400K	Pope/Livings ton
5/6/2003	9:14 PM	F3	0	0	2.5M	Pope/Ballard
5/6/2003	8:40 PM	F4	1/ 1	20/ 13	10.0M/ 3.5M	Massac/ Pulaski
10/18/2004	6:55 PM	F2	0	0	150K	Pope

The one F4 event day occurred 5/6/2003. The tornado began near Grand Chain in Pulaski County, 20 miles WNW of Metropolis, and traveled 6 miles into Massac County. Its peak velocity was 210 mph.

3.6.5.4 Hurricanes

Metropolis is well inland and not subject to hurricanes. No record of a Hurricane occurring in the seven counties of Massac, Pope and Pulaski, McCracken, Livingston, Ballard or Grace exist in the NCDC severe weather database (NCDC).

3.6.5.5 Thunderstorms and Lightning

Thunderstorms and lightning occur with moderate frequency in this area. Figure 3.6-4 from the National Lightning Safety Institute shows an estimated frequency of 70 thunderstorm days per year. However, these storms tend to be of lower energy and involve less lightning than regions that are better known for storm intensity, such as the Rocky Mountains and Florida.

Table 3.6-7 lists the greatest property-damage storms in the NCDC's severe weather database for the seven counties described in Section 3.6.5.3. It is noted that the storms are all of recent occurrence, which is believed to be due to more thorough reporting and cost assignation. Evaluation of the storms indicates that while damaging storms occur, they are not on a large scale relative to other parts of the United States.

Figure 3.6-4: Storm And Lightning Data (NLSI, 2005)Shows Storm Frequency At 70 Thunderstorm Days/yr, And Lightning Strike Frequency Of 8 Flashes/km2-yr (NLSI, 2005)

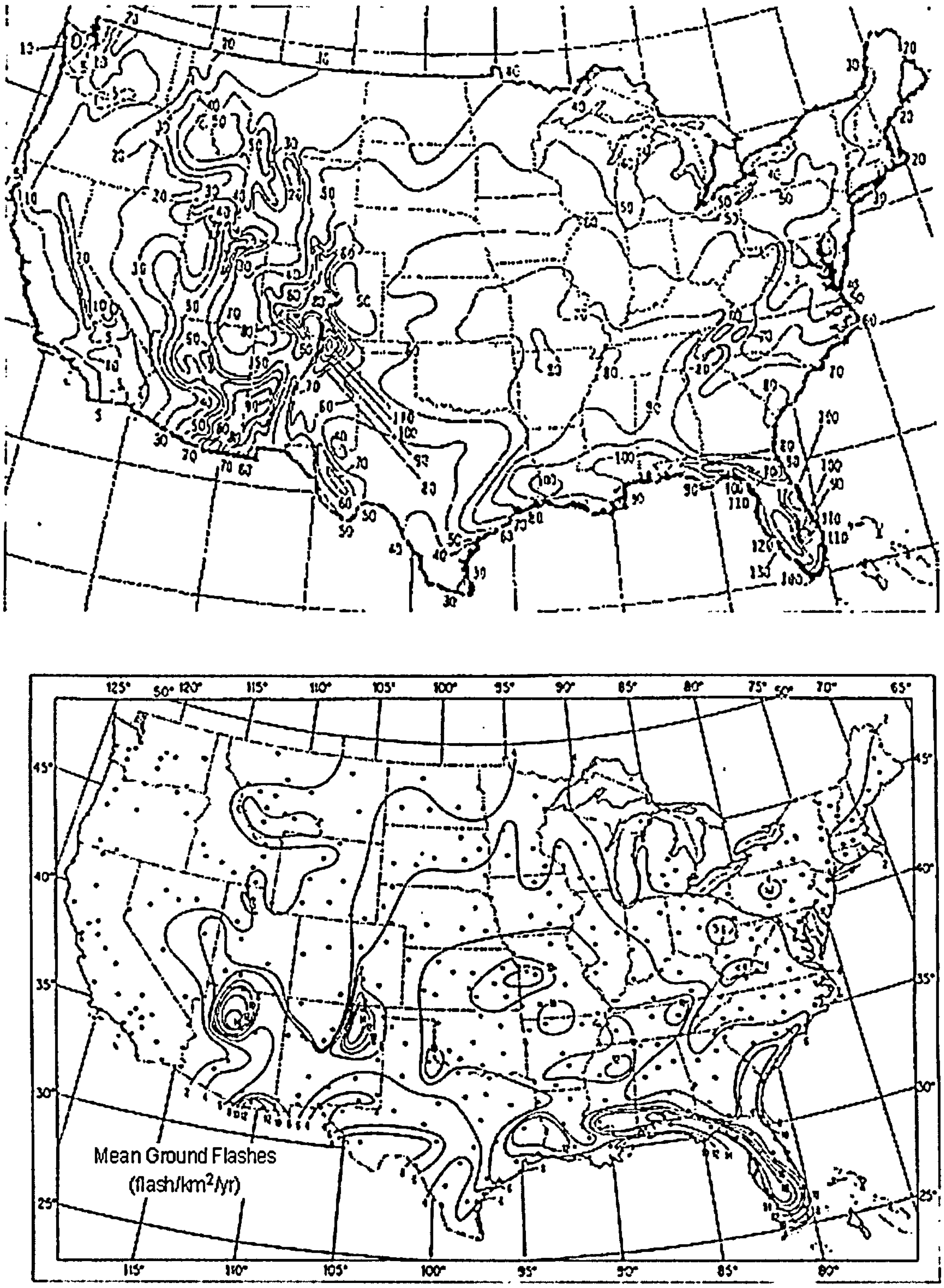


Table 3.6-7 Ten Worst Storms By Property Damage In NCDC Database, 1950 - 2005 (NCDC)

Date	Time	Type	Magnitude	Death	Injury	Property Damage ($)	County	Comments
3/8/1994	16:00	Heavy Snow	Up to 12" snowfall	0	0	500,000	Massac/ Pope/Pulaski	Roof damage, auto accidents
6/8/1995	18:20	Thunder-storm Winds	65 kts	0	5	250,000	Massac	Injuries from a tree falling on a car, blowing tent
4/18/1995	6:10	Thunder-storm Winds	70 kts.	0	2	200,000	McCracken	Injuries from overturned mobile home
1/22/1999	0:55	Tstm Wind	78 kts.	0	3	200,000	Ballard	Injuries from overturned mobile home
1/1/1999	17:00	Ice Storm	Up to ½" ice	0	0	150,000	Massac/ Pope/Pulaski	-
1/17/1999	18:37	Tstm Wind	70 kts.	0	0	150,000	Graves	Barn, mobile home damaged
5/5/1996	13:40	Tstm Wind	Not recorded	0	2	100,000	Massac	Injury from falling tree, blown trampoline
4/28/2002	1:32	Tstm Wind	61 kts.	0	0	100,000	Massac	-
12/22/2004	1:00	Winter Storm	Up to 20", centr Ill	1	1	100,000	Massac/ Pope/Pulaski	Fatality caused by collapsing metal awning
6/8/1995	18:00	Thunder-storm Winds	70 kts.	0	0	100,000	Pulaski	-

3.6.5.6 Probable Maximum Precipitation

Probable Maximum Precipitation (PMP) is defined in Hydrometeorological Report HMR 52 (Hansen, 1982) as the maximum theoretical rainfall that is physically possible over a given area. This value is often used for probable maximum flood risk evaluation. HMR 51 and 53 present similar data for longer time periods that are of use in reviewing site characteristics. In general, a contour map of Eastern US PMP values shows roughly horizontal isohyets of decreasing values as one moves north from the Gulf of Mexico. Although 500 miles from the Gulf, Metropolis is still close enough to potentially receive significant precipitation storms.

The values and sources of PMPs are shown in Table 3.6-8.

Table 3.6-8: Probable Maximum Precipitation Values From HMR 52 (Figures 24, 29, 36, 37 and 38) and HMR 51 (Figures 18, 19, 20 and 21) and HMR 53 (Figure 42), (Hansen, 1982; Shreiner, 1978 and Ho, 1980)

Duration	Area	PMP (in)	Source
5-min	1-mi^2	6.1	HMR 52
15-min	1-mi^2	9.7	HMR 52
30-min	1-mi^2	13.9	HMR 52
1-hr	1-mi^2	18.6	HMR 52
1-hr	10-mi^2	15.25	HMR 52
6-hr	10-mi^2	28.75	HMR 51
12-hr	10-mi^2	34	HMR 51
24-hr	10-mi^2	36.5	HMR 51
48-hr	10-mi^2	40	HMR 51
72-hr	10-mi^2	42	HMR 53

3.6.6 Regional Emission Inventory

The Illinois Environmental Protection Agency (IEPA) maintains a statewide air monitoring network of more than 200 monitors measuring air pollutants and other toxic compounds (IEPA, 2003). The Illinois Annual Air Quality Report for 2003 provided an estimate for stationary point source emissions in Massac County, IL. A summary of these estimated emissions is provided in Table 3.6-9.

Table 3.6-9 Massac County, IL - Stationary Point Source Emissions (Tons/Year)

Carbon Monoxide	Nitrogen Oxides	Particulate Matter	Sulfur Dioxide	Volatile Organic Material
1,882.7	11,728.3	2,162.6	24,121.9	350.5

Source: IEPA, Illinois Annual Air Quality Report 2003.

The Kentucky Division of Air Quality (KDAQ) maintains a network of 101 monitors in 33 counties to monitor air quality in the state with monitoring locations for PM 2.5, PM 10, SO2, NO2, and O3 in McCracken County, KY (KDEPDAQ,2003). The Kentucky Ambient Air Quality Annual Report 2003 provided data relating to the ambient air quality in McCracken County. A summary of the ambient air quality monitoring data is provided in Tables 3.6-10 through 3.6-13.

Table 3.6-10 McCracken County, KY - $PM_{2.5}$ and PM_{10} Monitoring ($\mu g/m^3$)

$PM_{2.5}$					PM_{10}				
Mean	24-hour Average				Mean	24-hour Average			
	1st Max	2nd Max	3rd Max	4th Max		1st Max	2nd Max	3rd Max	4th Max
13.8	43.6	36.3	31.0	29.3	19.0	44.0	38.0	36.0	36.0

Source: KDEPDAQ, Kentucky Ambient Air Quality Annual Report 2003.

Table 3.6-11, McCracken County, KY - SO_2 Monitoring ($\mu g/m^3$)

Annual Mean	24-hour Average		3-hour Average	
	1st Max	2nd Max	1st Max	2nd Max
0.003	0.019	0.014	0.023	0.022

Source: KDEPDAQ, Kentucky Ambient Air Quality Annual Report 2003.

Table 3.6-12 McCracken County, KY - NO_2 Monitoring ($\mu g/m^3$)

Annual Mean	1-hour Average	
	1st Max	2nd Max
0.009	0.059	0.059

Source: KDEPDAQ, Kentucky Ambient Air Quality Annual Report 2003.

Table 3.6-13 McCracken County, KY - O3 Monitoring (μg/m3)

1-hour Average		8-hour Average			
1st Max	2nd Max	1st Max	2nd Max	3rd Max	4th Max
0.019	0.014	0.023		0.022	

Source: KDEPDAQ, Kentucky Ambient Air Quality Annual Report 2003.

3.7 Noise

Noise is generally defined as unwanted or undesirable sound. Scientists measure ambient or background noise in the field at selected sampling locations using Sound Level Meters (or SLMs) adjusted to accurately reflect the way humans typically hear sound. Sound is described in units called decibels (or dB) and sound adjusted to human hearing is referred to as the "A-weighted scale" or dBA.

Especially important in assessing the impact of noise is an understanding of the sound environment at noise-sensitive receptors (NSRs). According to FHWA (1997), NSRs are categorized from A to E depending on the level of human activity normally associated with each (Table 3.7-1).

Table 3.7-1 Federal Highway Administration Noise Abatement Criteria In Hourly A-Weighted dBA

Activity Category	Description of Activities	Hourly A-Weighted dBA
A	Lands or places where preservation of serenity and quiet is essential to continue to serve the intended purpose	57 (Exterior)
B	Picnic, sports, and recreation areas, playgrounds, parks, residences, motels, hotels, schools, churches, libraries, and hospitals	67 (Exterior)
C	Cemeteries, commercial and industrial areas, office buildings, and other developments	72 (Exterior)
D	Undeveloped land including roadside facilities and dispersed recreation	None
E	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, auditoriums	52 (Interior)

For example, Category A NSRs are places or lands where serenity and quiet are of special importance and where the preservation of those qualities is essential if the place or area is to continue to serve its intended purpose. Category C NSRs are commercial and industrial areas, office buildings and other developed lands. Noise abatement criteria (NAC) are more stringent for Category A (hourly A-weighted sound levels of 57dBA or less) than Category C (hourly A-weighted sound levels of 72dBA or less) NSRs.

There are no ambient noise survey data available for the area around the MTW site nor has the operator performed any noise surveys at the boundary of the exclusion area. However, there are also no known NSRs in close proximity to the site with the exception of Category B rural residences typically assigned a NAC of 72dBA. Common outdoor noise levels in the range of 60-70dBA are heavy highway traffic at 300 feet (60dBA) to a gas-powered lawn mower at 100 feet (75dBA).

In addition to the MTW facility, other sources of noise in the vicinity include U.S. Highway 45 and the Burlington-Northern Railroad to the northeast and the Ohio River to the southwest. The nearest NSR (a rural home) is 1,850 feet (or more than one-third mile) north-northeast of the MTW facility.

3.8 Historic and Cultural Resources

No known records of archeological or cultural surveys are available for the previous development at the site. No registered Federal or State archaeological sites were identified within the boundaries of the site. A detailed description of the sites located on State and Federal Registries is provided in Section 3.1 of this report.

Honeywell has initiated consultation with the State Historical Preservation Office (SHPO) regarding continued operation of the MTW facility.

3.9 Visual/Scenic Resources

As described in Section 3.1, the MTW site lies in a rural region of extreme southern Illinois adjacent to the Ohio River. Generally, southern Illinois is an area of swampy, forested bottomlands and low clay and gravel hills. Away from well-traveled roadways, the area affords pastoral viewsheds where rural residences and undeveloped agricultural land and deciduous forests are the dominant visual features.

U.S. Highway 45 and a Burlington Northern railroad right-of-way border MTW to the northeast. Viewed from the air, MTW has the typical appearance of an industrial complex with interconnected industrial-looking buildings, open-air storage of raw material, exhaust stacks with pollution control equipment, parking lots, railroad spurs, and a number of large, waste management ponds. Open space on the property is minimal (see Figure 1.1-1).

The complex of buildings, ponds, and storage areas is surrounded by two nine-foot high chain-link and barbed wire security fences approximately 50 feet apart. Much of the site, including the six-story feed materials building, the administration building, the maintenance facility are visible from U.S. Highway 45 northeast of the plant structures. Even a brief glimpse down the access roads, however, is sufficient to characterize the site as an industrial installation.

While Massac County is mainly rural, the area in the immediate vicinity of the MTW site contains other substantial industrial and urban development on both sides of the Ohio River. Like portions of the MTW plant, smoke stacks at the TVA Shawnee Plant in Kentucky are probably visible to travelers on Highway 45 (Figure 3.9-1).

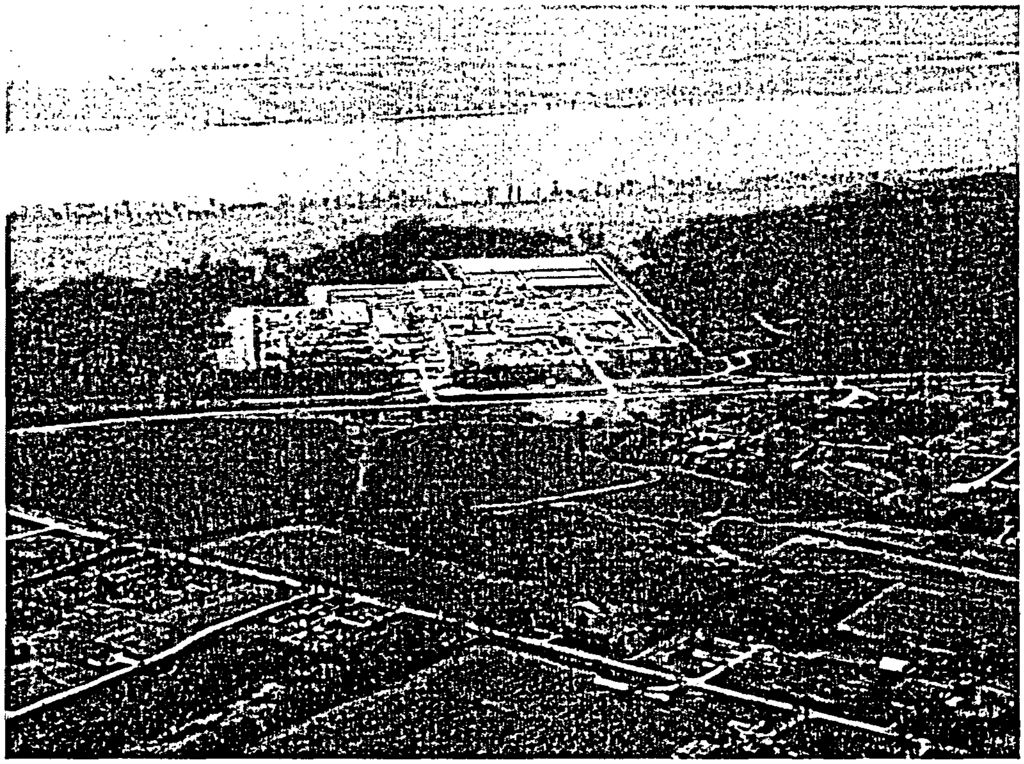


Figure 3.9-1 Aerial View Looking Southwest Across The MTW Facility Toward The TVA Shawnee Steam Electric Plant On The Kentucky Side Of The Ohio River

Also located across the river in Kentucky is a uranium enrichment facility. A coal blending plant immediately northwest of the MTW site along Highway 45 and a coal-fired power plant about six miles to the northwest are also visible to travelers on Highway 45 who enter the City of Metropolis approximately two miles south of the MTW facility.

While rural and predominantly undeveloped, most of Massac County away from the Ohio River offers little of unique or even high scenic value. Similarly, the stretch of the Ohio River along Highway 45 from northwest of the MTW site to Metropolis has little scenic value because of industrialization and urbanization. In contrast, nearby sites like Fort Massac State Park in Metropolis have high value views of the river from numerous picnic areas and pavilions.

The visual character of the area thus varies widely. Highly rural, pastoral views in the interior of the county contrast sharply to the industrialized setting along Highway 45 in the vicinity of MTW. The industrial zone gives way to the Metropolis urban area only two miles down the highway from the site. Throughout, high value scenic views are limited in the county, clearly absent from the immediate area adjacent to MTW, and primarily confined to a small number of historical sites located elsewhere on the banks of the river itself.

3.10 Socioeconomic

The Honeywell Special Materials' Metropolis Works (MTW) plant site is located in a predominantly agricultural area of low average population density with widely scattered villages and small cities in Massac County, Illinois, and across the Ohio River in McCracken County, Kentucky. Population data for Massac and McCracken County, obtained from the 2000 US Census, for various geographic units in the vicinity of the plant are provided below in Table 3.10-1. Population data for several cities and towns in the vicinity of the site is provided in Table 3.10-1 and Figure 3.10-1.

Table 3.10-1: Population Density

Geographic Area	2000 Population	Density (People/Mile^2)
Massac County, IL	15,161	63
McCracken County, KY	65,514	245
50-Mile Radius	516,825	66

US Census 2000 SF1

3.10.1 Economic Analysis

Employment and labor force statistics for 2004 were examined for each of the counties and are included in Table 3.10-2. The Honeywell MTW facility employs 311 people, who live and commute from surrounding communities in Illinois and Kentucky. In total, 65 percent of the plant population resides in Illinois and 35 percent reside in Kentucky. For the most part, plant personnel concentrate in the largest metropolitan communities in the area including Metropolis, Illinois and Paducah, Kentucky. Approximately 48 percent, of the workforce reside in Metropolis, Illinois and 24 percent reside in Paducah, Kentucky. The remainder of the plant population reside in small towns scattered throughout the countryside surrounding the plant with approximately 17 percent of plant personnel residing in 18 different rural communities in Illinois and approximately 11 percent residing in 15 different rural communities in Kentucky (LaGarde, Lew). Plant employment is not a significant fraction of the employment in Massac and McCracken Counties. Approximately 37,662 people were employed in McCracken and Massac Counties in 2004 (Illinois Labor Force Statistics 2004 Workforce Kentucky Labor Force Statistics 2004). Based on current number of employees, MTW facility accounts for 0.82 percent of the estimated 37,622 people employed in the two county area

The MTW plant is not planning or expecting a significant employment expansion within the next licensing period; therefore, local employment trends will be unaffected by the licensing action.

Table 3.10-2: Labor And Employment 2004 Massac County, IL And McCracken County, KY

Location	Labor Force	Employed	Unemployed	Unemployment
Massac County, IL	7,082	6,651	431	6.1%
McCracken County, IL	30,540	28,914	1,626	5.3%

(Illinois Labor Force Statistics 2004) and (Workforce Kentucky, Labor Force Statistics)

Evaluation of income levels indicates median household incomes of $31,498 and $33,865 for Massac and McCracken Counties, respectively. The median household income levels for McCracken County Kentucky are slightly higher than the average median household income for the state of Kentucky. Income levels for Massac County, Illinois were approximately $15,000 less than the income levels for the State of Illinois. However, the difference between median household incomes in Massac County and the immediately adjacent McCracken County, Kentucky is only $2,367(US Census 2000 SF3).

Approximately 13 percent of the households in McCracken and Massac counties have household incomes below $10,000 (US Census 2000 SF3). Median household incomes and income distribution for Massac County, IL and McCracken County, KY, are reported in Table 3.10-3 and 3.10-4 below. Poverty rates within the area were evaluated for census tracts located within a 6.6 km (4 mile radius) of the site. Only two census tracts had higher poverty rates than the Illinois State average (10.7 percent). These Census tracts had poverty rates of 14.6 percent and 17.5 percent and are located within the city of Metropolis, Illinois. These rates are not significantly higher than state averages. Poverty rates for the population in the vicinity of the plant is discussed in detail in Section 3.3.6.2 Environmental Justice.

Table 3.10-3 Median Household Income

	Massac County, IL	Illinois	McCracken County, KY	Kentucky
Median Household Income	$31,498	$46,590	$33,865	$33,672

US Census 2000 SF3

Table 3.10-4 Income Distribution

Income Distribution (Households)	Massac County, Illinois	% of total	McCracken County, Kentucky	% of total
Total Households	6,256	-	27741	-
Less than $10,000	844	13.49	3,868	13.49
$10,000 to $14,999	837	13.38	2,400	13.37
$15,000 to $19,999	408	6.52	2,190	6.52
$20,000 to $24,999	388	6.20	1,971	6.20
$25,000 to $29,999	458	7.32	1,971	7.32
$30,000 to $34,999	548	8.76	1,859	8.75
$35,000 to $39,999	397	6.35	1,635	6.34
$40,000 to $44,999	411	6.57	1,570	6.56
$45,000 to $49,999	201	3.21	1,238	4.46
$50,000 to $59,999	504	8.06	2,104	7.58
$60,000 to $74,999	541	8.65	2,638	9.51
$75,000 to $99,999	496	7.93	2,283	8.23
$100,000 to $124,999	139	2.22	916	3.30
$125,000 to $149,999	39	0.62	350	1.26
$150,000 to $199,999	19	0.30	378	1.36
$200,000 or more	26	0.41	370	1.33

(US Census 2000 SF3)

Employment by industry was examined for Massac County and McCracken County for 2000 and 1990 to examine trends in area employment and labor markets. Table 3.10-5 provides number of employees for industrial categories in Massac and McCracken Counties in 2000 and 1990. It should be noted that employment categories changed slightly from the 1990 Census to the 2000 Census. Therefore, some categories listed in the 1990 census were combined to coincide with 2000 census industry categories. "Information" was added as an industry category in 2000 and has no comparable category in the 1990 Census. Employment has remained stable or grown from 1990 to 2000 and has increased by approximately 19.5 percent in Massac County and by 6.1% in McCracken County. The largest growth in employment for both McCracken and Massac Counties was in the Arts, Entertainment, Recreation, and Accommodation industry, which exhibited employment increases of 2,354 percent in Massac County and 1,120 percent in McCracken County. Both counties experienced employment growth in educational, health and social services and the construction industry, and employment decline in retail trade, agriculture, and manufacturing (US Census 2000 1990 SF3 DP-3).

Table 3.10-5 Employment By Industry

Industry	Massac Co, IL 2000	Massac Co, IL 1990	McCracken Co, KY 2000	McCracken Co, KY 1990
Employed Persons 16 years and older (Civilian Labor Force)	7,149	5,757	29,359	27,571
Agriculture, forestry, fishing and hunting, and mining	260	294	337	556
Construction	428	361	2,167	1,586
**Manufacturing	783	843	3,786	4,287
Wholesale trade	254	178	1,449	1,530
Retail trade	881	1,111	4,286	6,084
**Transportation, warehousing, and utilities	646	886	1,999	1,832
Information	93	*	788	*
Finance, insurance, real estate, and rental and leasing	233	237	1,215	1,091
Professional, scientific, management, administrative, and waste management services	290	278	1,756	1,539
Educational, health and social services	1,424	1031	6,053	5,014
**Arts, entertainment, recreation, accommodation and food services	810	33	2921	243
Other services (except public administration)	333	278	1,540	1539
Public administration	295	367	1,062	913

* No comparable industry category in 1990, **1990 industry categories combined (US Census 2000 1990 SF3 DP-3)

3.10.2 Health and Social Services

NRC Licensing requires Honeywell to maintain agreements and working relationships with specific state and local emergency agencies to ensure proper response in the event of an emergency at the Metropolis Honeywell facility. The following agencies are currently part of a "Mutual Assistance Agreement" with the Honeywell Specialty Materials Metropolis Facility: Metropolis/Massac County Emergency Services and Disaster Agency (ESDA), Massac County/Metropolis City Fire Department, Massac County Sheriff's Department, City of Metropolis Police Department, Massac Memorial Hospital (Metropolis, Illinois), Lourdes Hospital (Paducah, Kentucky), and Western Baptist Hospital (Paducah Kentucky). Agreements with local agencies are reviewed and renewed on an annual basis (Mutual Assistance Agreement 2004)

As part of the "Mutual Assistance Agreement" Honeywell agrees to provide general awareness training, HAZMAT training, and emergency response equipment (if requested) to emergency responders in Massac County and the City of Metropolis. In exchange, local emergency responders in Massac County and the city of Metropolis agree to provide law enforcement, fire and emergency services, and coordination of efforts to protect the health and safety of the public during a plant emergency (Mutual Assistance Agreement 2004).

The Honeywell plant has separate annual agreements with Massac Memorial Hospital, Lourdes Hospital, and Western Baptist Hospital. In these agreements, Honeywell provides training with regard to injured Honeywell employees, and assistance with chemical/radiological decontamination procedures in the event of exposure during the treatment of an injured employee. Massac Memorial Hospital located in Metropolis, Illinois is the nearest medical facility to the MTW facility (Honeywell Mutual Assistance Agreement, 2005). The hospital has 31 beds with 6 in an Intensive Care Unit. This hospital's classification as a "critical access hospital limits the number of beds to 25 (not including beds in the Intensive Care Unit); therefore, the hospital is not expected to increase in capacity (McNeill 2005). Massac Memorial Hospital currently has seven (7) active Physicians, 30 full time nurses and 21 part-time nurses. When necessary, patients are transferred to either Lourdes Hospital (approximately 14 miles from the plant site) or Western Baptist Hospital (approximately 14 miles from the plant site) located in Paducah, Kentucky (McNeill 2005).

3.10.3 Education

Public and private schools in Metropolis currently provide educational resources to approximately 1,461 children in grades 0-8 in eight (8) separate elementary or middle schools. The High School in Metropolis serves rural communities in the immediate vicinity and currently has 590 students (Metropolis, Illinois City Profile 2005). Approximately, 8,342 students are currently enrolled in grades 0-8 in 15 elementary and middle schools in Paducah and the immediately surrounding communities. The Paducah metropolitan area has seven (7) high schools with a current enrollment of 3,148 students. The following Colleges and Universities are located within approximately 50 miles of the Metropolis/Paducah area: Paducah Community College, West Kentucky Technical College, Paducah Technical College, Paducah Beauty School, Murray State University, John A Logan College, and

Southern Illinois University (Paducah, Kentucky City Profile 2005). Information concerning the enrollment and populations of these institutions is included in Table 3.10-6.

Table 3.10-6 Schools In Vicinity Of MTW Facility

School / Name	Enrollment	City/State	Type (Grades)	Public/ Private
Central Elem. School	265	Metropolis, IL	KG-04	Public
Franklin Elem. School	217	Metropolis, IL	KG-08	Public
Jefferson Elem. School	177	Metropolis, IL	KG-08	Public
Maple Grove Elem. School	174	Metropolis, IL	PK-06	Public
Massac Co Pre Kindergarten	127	Metropolis, IL	PK-PK	Public
George R. Clark Elem. School	127	Metropolis, IL	PK-04	Public
Metropolis Middle School	150	Metropolis, IL	05-06	Public
Massac County High School	590	Metropolis, IL	09-12	Public
Murray State University	7,676	Murray, KY	College	Public
John A Logan College	4,255	Carterville, IL	College	Public
Southern Illinois University	19,742	Carbondale, IL	College	Public
Ballard County Elementary School	628	Barlow, KY	KG-05	Public
St. Mary Elem. School	384	Paducah, KY	PK-5	Private
St. John Elem. School	164	Paducah, KY	PK-5	Private
Ballard County Preschool Head Start Center	No Data	Lacenter, KY	PK-KG	Public
Speedwell Montessori	23	Paducah, KY	PK-KG	Private
Hendron Lone Oak Elem. School	614	Hendron, KY	PK-05	Public
Lone Oak Elem. School	594	Paducah, KY	PK-05	Public
Clark Elem. School	544	Paducah, KY	KG-05	Public
Farley Elem. School	526	Paducah, KY	PK-05	Public
McNabb Elem, School	439	Paducah, KY	KG-05	Public
Concord Elem School	427	Paducah, KY	PK-05	Public
Heath Elementary School	487	West Paducah, KY	KG-05	Public
Reidland Elem. School	383	Reidland, KY	KG-05	Public
Ballard County Middle School	324	Barlow, KY	06-08	Public
Paducah Middle School	658	Paducah, KY	06-08	Public
Reidland Middle School	459	Reidland, KY	06-08	Public
St. Mary Middle School	164	Paducah, KY	06-08	Private
Lone Oak Middle School	626	Paducah, KY	06-08	Public
Heath Middle School	487	West Paducah, KY	06-08	Public
Ballard County Memorial High School	411	Barlow, KY	09-12	Public
Community Christian Academy	254	Paducah, KY	KG-12	Private
Open Door Christian Academy	33	Paducah, KY	KG-12	Private
Paducah Tilghman High School	753	Paducah, KY	09-12	Public
Lone Oak High School	749	Paducah, KY	09-12	Public
Reidland High School	560	Reidland, KY	09-12	Public
Paducah Adult/Alt. High School	45	Paducah, KY	09-12	Public
St. Mary High School	193	Paducah, KY	09-12	Private
Heath High School	561	West Paducah, KY	09-12	Public
Paducah, Community College	1,830	Paducah, KY	College	Public
West Kentucky Technical College	935	Paducah, KY	College	Public
Paducah Technical College	139	Paducah, KY	College	Public
Paducah Beauty School	124	Paducah, KY	College	Public

(Metropolis, Illinois City Profile 2005) (Paducah, Kentucky City Profile 2005)

3.10.4 Transportation Resources

The MTW facility is located approximately one mile west of Metropolis. US Highway 45 and Burlington North Railroad border the facility to the north, and Ohio River bounds the MTW facility to the south. Interstate 24 is located approximately 4.5 miles east of the facility and provides access from Paducah, KY across the Ohio River into Metropolis, IL. (See Figure 3.10-1).

3.10.5 Cities

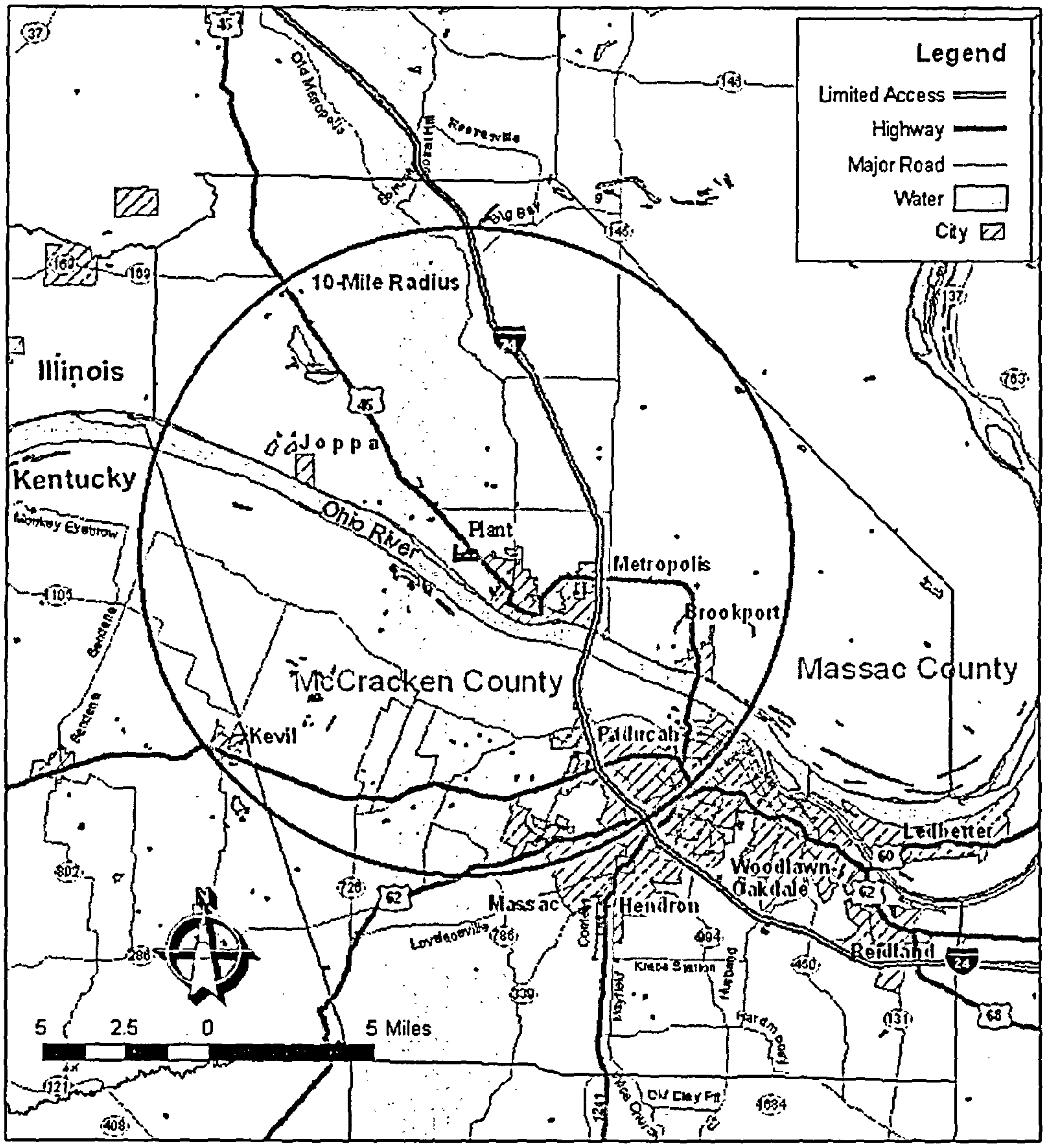
Metropolis, Illinois is the closest community and is located approximately 1 mile east southeast of the MTW facility. Paducah, Kentucky is located approximately 16 Kilometers (10 miles) southeast of the site on the south side of the Ohio River. In addition, several communities are immediately adjacent to Paducah including: Hendron, KY, Ledbetter, KY, Massac, Kentucky, Reidland, Kentucky, and Woodlawn-Oakdale, Kentucky. Table 3.10-7 provides population data for towns/cities located within the vicinity of the MTW facility (US Census 2000 SF1). Evaluation of the population data indicates Paducah and the immediately surrounding communities represent approximately 70% of the permanent population for McCracken County. The remaining 30% of the population is located throughout the county in low density farming communities. A map depicting the location and distance of the above listed cities is included as Figure 3.10-1

Table 3.10-7: Cities In Vicinity Of MTW Facility

City	County/State	Distance & Direction from site (miles)	Direction from MTW Facility	Population
Metropolis	Massac, IL	1.0	ESE	6,482
Joppa	Massac, IL	5.5	WNW	409
Brookport	Massac, IL	7.5	ESE	1,054
Kevil	McCracken, KY	9.2	SW	574
Paducah	McCracken, KY	10	SE	26,307
*Massac	McCracken, KY	10.2	SSE	3,888
*Hendron	McCracken, KY	11	SE	4,239
*Woodlawn-Oakdale	McCracken, KY	13.5	SE	4,937
*Ledbetter	McCracken, KY	16	ESE	1,700
*Reidland	McCracken, KY	17	SE	4,353

*Communities adjacent to Paducah, Kentucky (US Census 2000 SF1)

Figure 3.10-1 Cities Within 10 Mile Radius Of The MTW Facility



3.10.6 Demographics

The most recent decinnial census was used to estimate the population within 80 kilometers (50 miles) of the plant. Census block groups were utilized to estimate the population within a 50 mile radius broken into 160 segments defined by 16 22.5 degree "cardinal" directions from the center of the MTW facility at various radial distances bounded by concentric circles (US Census 2000 SF1). The population within these segments for 0 to 5 miles in 1 mile increments is provided in Table 3.10-8 and Figure 3.10-2. The population from 5 to 50 miles at various radial distances is provided in Table 3.10-9 and Figure 3.10-3. The total permanent population within 80 kilometers (50 miles) of the site is 516,825 (US Census 2000 SF1).

Table 3.10-8 2000 Population and Projected Population 0 to 5 miles from MTW Facility

Sector / Years	0-1	1-2	2-3	3-4	4-5	Total
North						
2000	28	61	80	57	46	272
2010	29	62	82	58	47	278
2015	29	64	83	59	48	284
N-NE						
2000	24	53	47	48	104	276
2010	25	54	48	49	106	282
2015	25	55	49	50	108	288
NE						
2000	33	156	200	73	62	524
2010	34	160	205	75	63	536
2015	34	163	208	76	65	546
E-NE						
2000	37	126	73	117	57	410
2010	38	129	75	120	58	419
2015	39	131	76	122	59	427
East						
2000	143	421	120	153	131	968
2010	146	431	123	157	134	990
2015	149	439	125	159	137	1009
E-SE						
2000	272	1997	728	131	67	3195
2010	278	2043	745	134	69	3268
2015	284	2082	759	137	70	3331
S-E						
2000	3	1136	2095	3	8	3245
2010	3	1168	2154	3	8	3336
2015	3	1190	2195	3	8	3399
S-SE						
2000	1	30	10	39	121	201
2010	1	31	10	40	124	207
2015	1	31	10	40	125	208

Table 3.10-8 2000 Population and Projected Population 0 to 5 miles from MTW Facility (continued)

Sector / Years	0-1	1-2	2-3	3-4	4-5	Total
South						
2000	0	8	39	94	259	400
2010	0	8	40	97	266	411
2015	0	8	40	97	269	415
S-SW						
2000	0	14	27	66	257	364
2010	0	14	28	68	264	374
2015	0	15	28	68	266	377
SW						
2000	0	0	10	7	6	23
2010	0	0	10	7	6	24
2015	0	0	10	7	6	24
N-SW						
2000	0	2	4	5	18	29
2010	0	2	4	5	19	30
2015	0	2	4	5	19	30
West						
2000	1	0	2	5	7	15
2010	1	0	2	5	7	15
2015	1	0	2	5	7	16
W-NW						
2000	2	3	19	29	53	106
2010	2	3	19	30	54	108
2015	2	3	20	30	55	110
NW						
2000	2	3	101	94	80	280
2010	2	3	103	96	82	286
2015	2	3	105	98	83	292
N-NW						0
2000	12	95	135	101	77	420
2010	12	97	138	103	79	430
2015	13	99	141	105	80	438
Total 2000	**10448**					
Total Projected 2010	**10996**					
Total Projected 2020	**11194**					

Table 3.10-9 Population 10 to 50 miles from MTW Facility

Sector / Years	5-10	10-20	20-30	30-40	40-50	Total
North						
2000	168	3670	2069	5073	12027	23007
N-NE						
2000	356	648	844	8014	16900	26762
NE						
2000	298	1369	2873	2111	3603	10254
E-NE						
2000	358	339	2138	6354	4553	13742
East						
2000	482	1008	1794	5062	9759	18105
E-SE						
2000	1608	2571	7965	6242	2737	21123
S-E						
2000	13323	25660	8462	13345	7011	67801
S-SE						
2000	5987	12860	5698	10320	22914	57779
South						
2000	2467	3051	5988	11813	10099	33418
S-SW						
2000	1555	1935	2510	3702	5607	15309
SW						
2000	1727	1450	3006	1112	5521	12816
N-SW						
2000	519	3022	4927	6000	14338	28806
West						
2000	371	1047	4263	2684	15650	24015
W-NW						
2000	608	937	3834	2003	42891	50273
NW						
2000	343	1546	1947	12765	11432	28033
N-NW						
2000	112	2227	3131	15075	54589	75134
					TOTAL	506377
					TOTAL 0-5	10448
					TOTAL 50	516825

Figure 3.10-2 Population 0 to 5 miles from MTW Facility

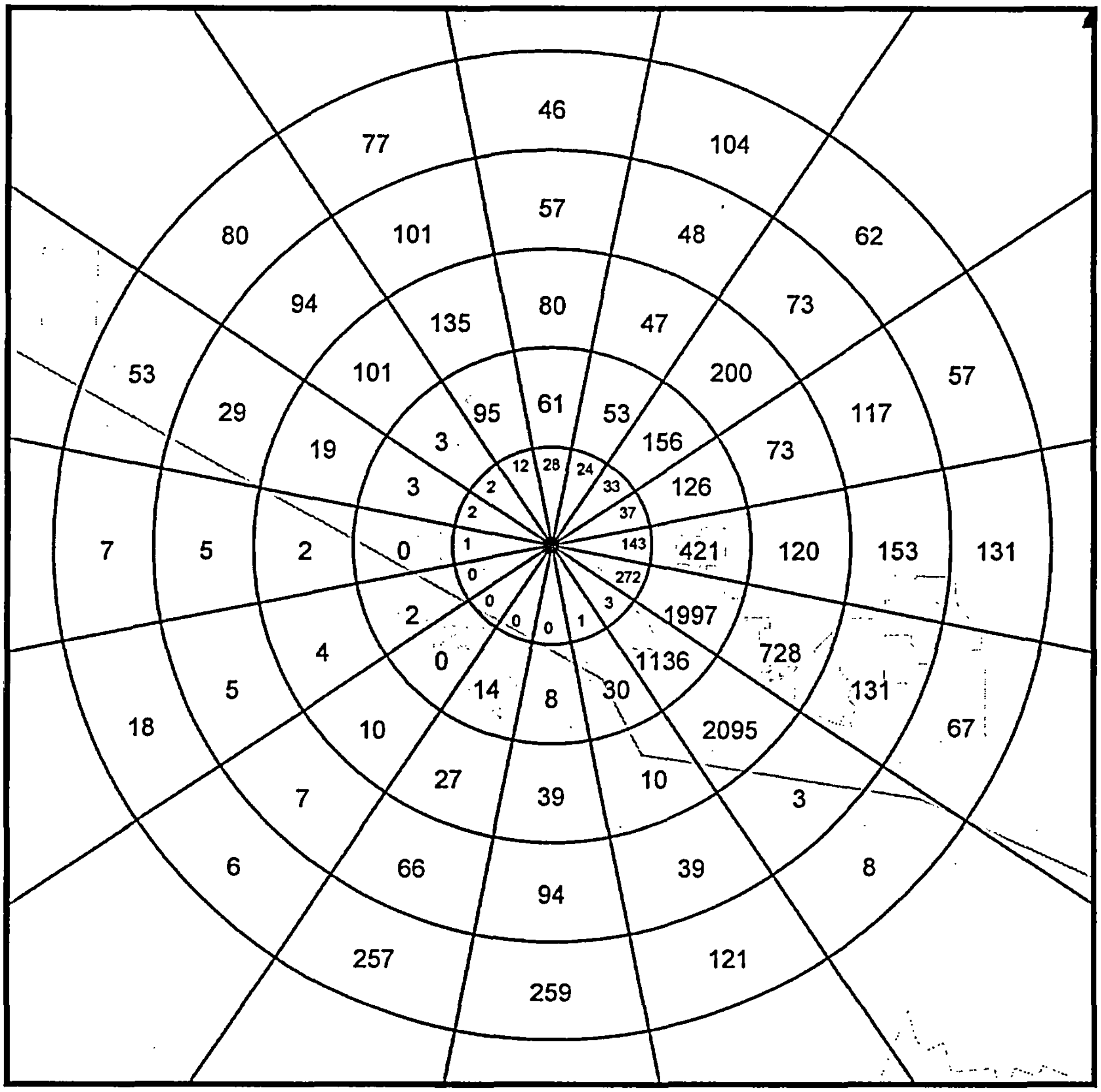
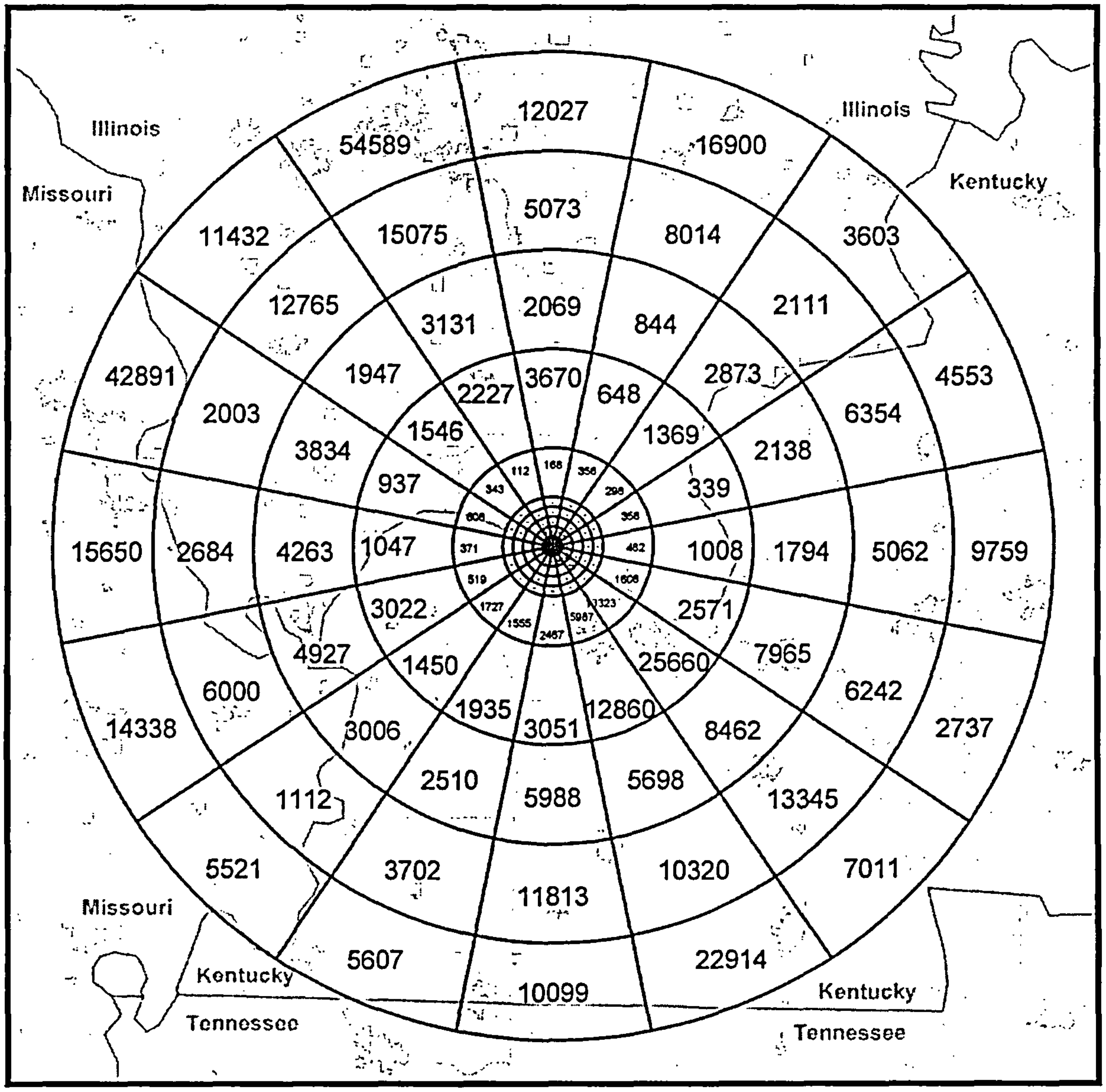


Figure 3.10-3 Population 10 to 50 miles from MTW Facility



3.10.6.1 Population Projections

The 2000 Decinnial Census data was projected to 2010, the end of the MTW licensing period for a radial distance of 5 miles from the center of the plant site. Massac County population was projected to increase 2.3% from 2000 to 2010 (Herring 2002), while McCracken County population was projected to increase 2.8% from 2000 to 2010 (Kentucky State Data Center 2004). These growth rates were applied as appropriate to the individual segments created by the 16 directions and radial boundaries and 1 mile concentric circles from 0 to 5 miles, from the center of the MTW facility. The individual segments were then added together to obtain a total population. The total 2000 population within a 5-mile radius of the MTW facility is 9,658 and the population in 2010 is projected to be 10,188. The 2000 population and 2010 projected population are provided in Table 3.10-8.

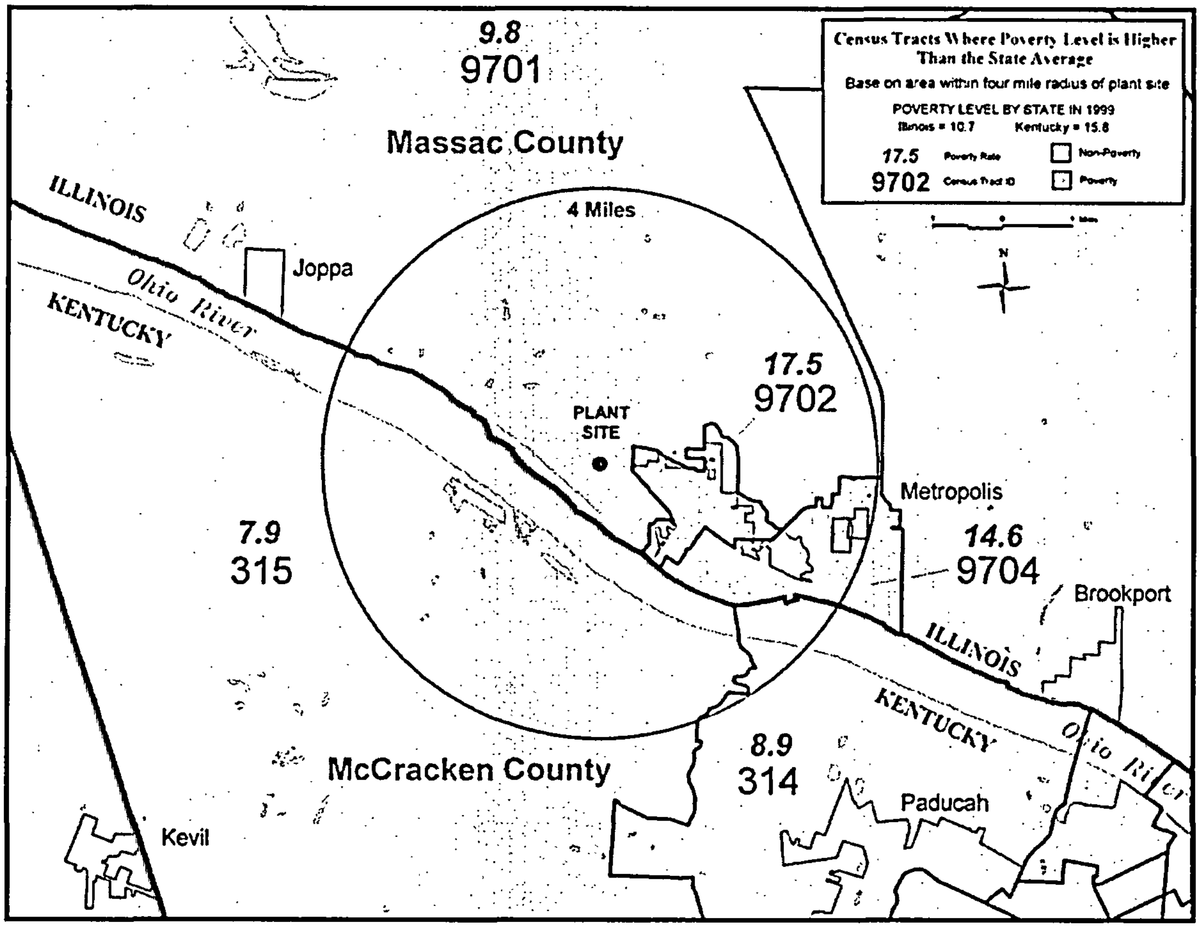
3.10.6.2 Environmental Justice Evaluation

Additional demographic data was collected for census tracts within a 6.6 kilometer (4-mile) radius of the site to determine if either minority individuals or low-income individuals would be disproportionately impacted by the license renewal for the Metropolis facility. For the purpose of this analysis "minority" is defined as one of the following categories listed within the US Census: Black or African-American, American Indian or Alaska Native, Asian, Native Hawaiian or other Pacific Islander, some other race, and Hispanic or Latino (of any race) (US Census 2000). In the 2000 census multiracial categories were added to the census. Therefore, any white person who identifies themselves as a minority is included within that minority group. Percent minority was calculated using the following equation: Total Population - White (alone).

For the purpose of this analysis, low-income populations are defined as "percent individuals below the poverty line" or "poverty rate" (US Dept of Commerce Census 2000 Poverty Brief 2003) Minority and low-income populations in each census tract were then compared to minority and low-income populations within their respective states. On average, the state of Illinois minority population comprises approximately 26.5% of the resident state population. The minority population in Kentucky represents approximately 9.9% of the resident state population. Five (5) census tracts are located within 4-miles of the site. The highest minority population (10% minority) within the search radius is located in the west portion of Metropolis. This census tract is well below the Illinois state average. None of the Census tracts within 4 miles of the MTW facility contain minority population rates greater than their respective state averages (Census 2000 SF1).

Poverty rates for the Census tracts within a 4 mile radius of the MTW facility were compared to their respective state averages. Average poverty rates (in 1999 income) in Illinois and Kentucky are 10.7 percent and 15.8 percent, respectively. Examination of poverty levels within 4 miles of the site indicates two census tracts with a higher poverty rate than the state average. Both census tracts were located within the city of Metropolis, Illinois that exhibited poverty rates of 14.6 percent and 17.5 percent. Figure 3.10-8 shows census tracts with poverty rates higher than the state average. Although the population within Metropolis has a higher poverty rate than the Illinois state average of 10.7 percent, they are not significantly greater (i.e. 20 percent higher) than the state average.

Figure 3.10-6 Poverty Census Tracts



3.11 Public and Occupational Health

3.11.1 Major Sources and Levels of Background Radiation Exposure

External background radiation levels in the vicinity of Metropolis, Illinois, are primarily from natural sources of cosmic and terrestrial origin. The total effective dose equivalent from cosmic rays is about .43 mSv (43 mrem) per year, while terrestrial sources contribute about .46 mSv (46 mrem) per year (Oakley). Radon progeny doses are highly variable, with an average effective dose equivalent of 2.0 mSv (200 mrem) per year (US National Council on Radiation Protection and Measurements).

Additional sources of radiation dose from background consist of radionuclides within the body (e.g., K-40) and cosmogenic radionuclides (e.g., C-14). Radionuclides within the body result in an average effective dose equivalent of about .4 mSv (40mrem) per year, while cosmogenic radionuclides contribute about .01 Sv (1 mrem) per year.

Man-made sources of radiation include radiation arising from medical diagnoses and treatment, incorporation of radioactive material in consumer products, and activities and effluents from industrial facilities using radioactive materials. On a national basis, doses from man-made sources of radiation average approximately .7 mSv (70 mrem) per year (US Nuclear Regulatory Commission. URL).

3.11.2 Sources and Levels of Exposures to Radioactive Materials

In addition to the background radiation exposures discussed in Section 3.11.1, Honeywell employees and members of the public in the immediate plant vicinity may be exposed to low levels of radiation and radioactive materials as a result of plant operations. For plant employees, sources of radiation exposure include external exposure resulting from: 1) working in proximity to natural uranium, its daughter products, and other licensed materials in storage and in the plant process; and 2) internal exposures resulting from inhalation or ingestion of process materials. Members of the public in the immediate plant vicinity may be exposed to radiation and radioactive materials as a result of liquid and airborne plant effluents. The resulting occupational and non-occupational doses are controlled to levels that are within regulatory limits and as low as is reasonably achievable. Tables 3.11-1, 3.11-2, 3.11-3, 3.11-4 provide an overview of the current and historical radiation doses of both Honeywell employees and members of the public in the immediate vicinity as a result of Honeywell's operations.

Some exposures to members of the public are also likely to result from the transportation of process materials, products, and waste materials in the public arena. During normal transportation operations, radioactive material and chemicals would be contained within their transport packages. Health impacts to crew members (i.e., workers) and members of the general public along the routes could occur if they were exposed to low-level external radiation in the vicinity of uranium material shipments. In addition, exposure to vehicle emissions (engine exhaust and fugitive dust) could potentially cause adverse health effects from inhalation. All transportation activities are conducted in accordance with Department of Transportation regulations. In comparison to doses resulting from natural background radiation, the doses resulting from transportation activities are expected to be negligible.

Table 3.11-1 Environmental Gamma Dose Measurements Annual Dose (mrem) 2000

			Annual Dose (mrem)*				
Location	TLD #	Detection	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Average mrem
Control		ENV TLD	96	96	96	72	90
North Fence	9001	ENV TLD	168	172	168	156	166
East Fence	9002	ENV TLD	756	652	684	740	708
South Fence	9003	ENV TLD	236	216	204	196	213
West Fence	9004	ENV TLD	120	112	124	100	114
North Boundary	9005	ENV TLD	124	112	124	112	118
Airport	9006	ENV TLD	108	84	92	80	91
NR-7 A NORTH	9007	ENV TLD	92	92	100	84	92
NR-7 SOUTH	9008	ENV TLD	100	84	92	80	89

*Annual Dose in mrem determined from vendor's mrem/quarter X 4 quarters

Table 3.11-2 Environmental Gamma Dose Measurements Annual Dose (mrem) 2001

Annual Dose (mrem)*							
Location	TLD #	Detection	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Average mrem
Control		ENV TLD	84	84	92	76	84
North Fence	9001	ENV TLD	160	160	164	148	158
East Fence	9002	ENV TLD	684	656	544	528	603
South Fence	9003	ENV TLD	200	260	412	468	335
West Fence	9004	ENV TLD	112	108	108	100	107
North Boundary	9005	ENV TLD	112	116	116	112	114
Airport	9006	ENV TLD	96	88	88	92	91
NR-7 A NORTH	9007	ENV TLD	92	88	84	80	86
NR-7 SOUTH	9008	ENV TLD	96	84	84	84	87

*Annual Dose in mrem determined from vendor's mrem/quarter X 4 quarters

No control exposures have been subtracted, and only element, reader and fade corrections have been made.

Table 3.11-3 Environmental Gamma Dose Measurements Annual Dose (mrem) 2002

Annual Dose (mrem) *							
Location	TLD #	Detection	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Average mrem
Control		ENV TLD	88	136	92	88	101
North Fence	9001	ENV TLD	200	164	180	184	182
East Fence	9002	ENV TLD	496	352	328	324	375
South Fence	9003	ENV TLD	568	496	520	536	530
West Fence	9004	ENV TLD	128	116	120	116	120
North Boundary	9005	ENV TLD	144	124	128	128	131
Airport	9006	ENV TLD	108	92	92	96	97
NR-7 A NORTH	9007	ENV TLD	116	80	96	96	97
NR-7 SOUTH	9008	ENV TLD	108	84	84	100	94
*Annual Dose in mrem determined from vendor's mrem/quarter X 4 quarters							
No control exposures have been subtracted, and only element, reader and fade corrections have been made.							

Table 3.11-4 Environmental Gamma Dose Measurements Annual Dose (mrem) 2003

Annual Dose (mrem) *							
Location	TLD #	Detection	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Average mrem
Control		ENV TLD	84	92	92	76	86
North Fence	9001	ENV TLD	180	168	180	168	174
East Fence	9002	ENV TLD	304	264	312	296	294
South Fence	9003	ENV TLD	584	552	560	576	568
West Fence	9004	ENV TLD	124	112	116	100	113
North Boundary	9005	ENV TLD	128	124	128	124	126
Airport	9006	ENV TLD	100	88	96	88	93
NR-7 A NORTH	9007	ENV TLD	104	96	92	80	93
NR-7 SOUTH	9008	ENV TLD	92	96	88	76	88
*Annual Dose in mrem determined from vendor's mrem/quarter X 4 quarters							
No control exposures have been subtracted, and only element, reader and fade corrections have been made.							

3.11.3 Major Sources and Levels of Chemical Exposure

Honeywell employees and members of the public in the immediate plant vicinity may be exposed to chemicals used in plant processes. For plant employees, sources of chemical include routine exposures due to controlled system drainage, venting, and leakage points and non-routine exposures resulting from unplanned excursions. Members of the public in the immediate plant vicinity may be exposed to chemicals used in the plant as a result of routine controlled effluents and non-routine releases due to unplanned events.

During 2004, Honeywell retained a consultant to perform a survey of selected workplace areas for airborne chemical contaminants[1] (ESIS, Zurich). This study included monitoring for methyl carbitol, hydrogen fluoride, total particulates, nickel, fumes, iron, manganese, copper, and arsenic. Personal and area air sampling performed in various areas throughout the facility indicated personal exposures in all but one area (the calcium fluoride warehouse) to be below OSHA PELs and ACGIH TLVs. In the calcium fluoride warehouse, respiratory protection is required for employees who intermittently enter or work in the area.

A similar study conducted during 2003 indicated that the personal airborne contaminant concentrations for all of the activities monitored were below fifty-percent (50%) the applicable ACGIH TLV with the exception of the insoluble chromium VI compound sample result. The insoluble chromium VI compound sample result was below the laboratory's limit of detection, however the sample volume was not sufficient to demonstrate if the concentration was below fifty-percent (50%) of the TLV. One (1) area was identified where the airborne nickel concentration exceeded the TLV (253% of the TLV-TWA). The personal sample obtained for the operator at the same time was 5.6% of the TLV, verifying that the operator spends little if any time inside the affected area when the operation is in process. The affected area also has Local Exhaust Ventilation that can quickly reduce the airborne nickel concentration once the metal spraying process is stopped. Controls in the work areas monitored include a combination of LEV, general ventilation, process enclosure, and personal protective equipment (PPE). All employees in the plant have been trained and approved to use respiratory protection and participate in a medical surveillance program. Employees wear full body coveralls that are laundered on-site.

Facility Accidents Involving Radiation or Chemical Releases

It is possible that accidents could release radiation or chemicals to the environment, potentially affecting workers and members of the public. Accidents involving transportation of chemicals (tank cars,

[1] Not all of the contaminants assessed are associated with licensed activities.

UF$_6$ cylinders) would have the largest potential effects. The facilities Risk Management Plan Update provides details of highly unlikely worst case scenario for release of hydrogen fluoride, and alternate scenarios for ammonia (anhydrous) IF$_5$ SbF$_5$ Fluorine (liquid) from on-site bulk storage tanks. MTW has developed, in conjunction with the NRC, IEPA, and the local Emergency Response Agencies, the Protective Action and Supporting Notification Plans to minimize the potential of any adverse consequences to the workers and members of the public in the unlikely event that such a release occurs.

3.11.4 Occupational Injury and Fatality Rates

Honeywell conducts its operations in accordance with the applicable requirements of the Occupational Safety and Health Administration, particularly 29 CFR 1910. Figures 3.11-1 and 3.11-2 provide an overview of Honeywells' occupational injury rates. There have been no work-related fatalities on the plant site in the past 10 years.

Figure 3.11-1 OSHA Recordable Incident Rate

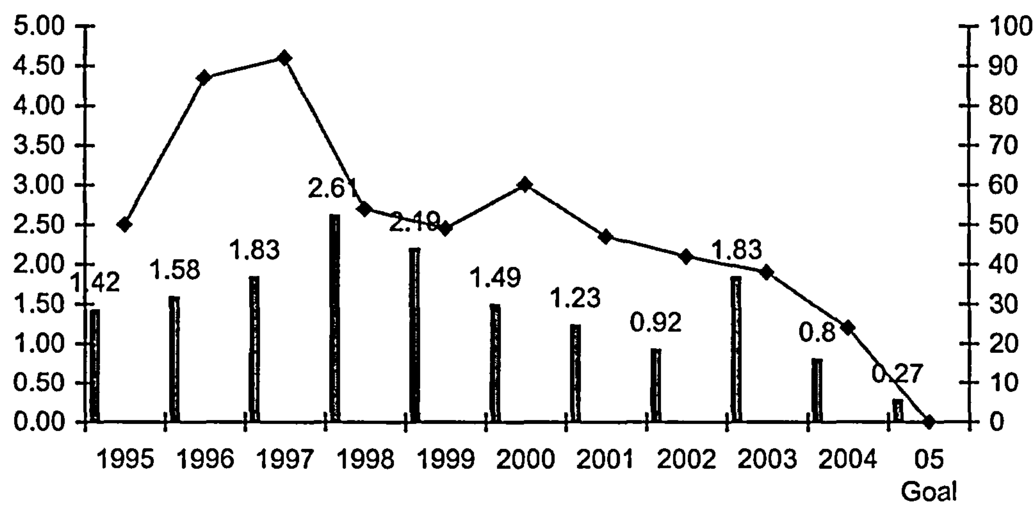
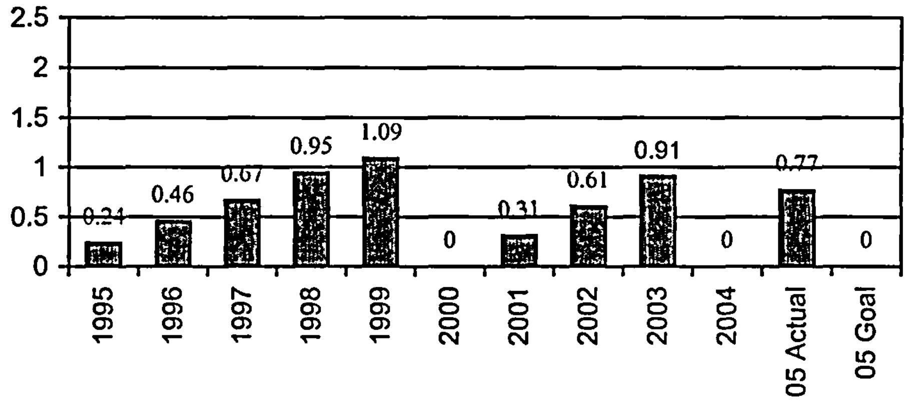


Figure 3.11-2 Lost Work Day Rate - 1995 to 2004



3.11.5 Public and Occupational Health Impacts

3.11.5.1 Nonradiological Impacts

Figure 6.1-1 provides an illustration of the physical plant layout, with directions and distances from the Feed Materials Building to the following features. Figure 6.1-1 illustrates these features:

- US Highway 45 - 1185 feet
- Nearest resident - 1850 feet
- Nearest commercial establishment - 2550 feet
- Nearest lodging - 2750 feet
- Nearest hospital - 5020 feet
- Nearest nursing home - 9180 feet
- Nearest Police Station - 9450 feet
- Nearest school - 9850 feet

For locations of liquid and gaseous releases refer to sections 4.4 and 2.1.

Table 3.11-5 Environmental Air Monitoring Fluoride ($\mu g/m^3$) Annual Average

	SAMPLE STATION NUMBER						
YEAR ANNUAL AVERAGE	6	8	9	10	11	12	13
2000	0.014	0.072	0.262	0.526	0.179	0.131	0.119
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

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.		

Environmental air sample results for fluoride ($\mu g/m^3$) are presented in Table 3.11-5. During the most recent four years of plant operation, the average concentration at the fence line was 0.37 $\mu gF^-/m^3$. The maximum annual concentration near the site boundary was 0.838 $\mu g/m^3$ during 2002 at Station No. 10. The State of Illinois does not have an ambient air quality standard for fluoride; however, the State of Kentucky, which joins the plant property on the south, has an established standard of 0.76 $\mu g\ F^-/m^3$ as a maximum one month average. An examination of the air monitoring data indicates the maximum off-site (Station No. 6) annual concentration was 0.022 $\mu g/m^3$ in 2002, or about 2.9% of the Kentucky standard.

Excursions or permit violations related to NPDES permit in the last seven years are summarized in Table 3.4-4 (Honeywell, 2005). Except for these upset conditions, the non-radiological contaminants measured in the plant effluent do not exceed the facility NPDES permit conditions. From Table 3.4-3, the maximum average monthly fluoride concentration was 7.5 mg/l during March of 2003. This was the same period as an upset in the EPF (See Table 3.4-4).

Using data from Table 3.4-1, the average discharge rate for the plant effluent during the five-year period from 2000-2004 was approximately 3.40 million gallons per day (MGD) or about 5.1 cubic feet per second (CFS). The effluent discharges into a natural watercourse, which also carries run-off during periods of heavy precipitation. The effluent travels about 2,000 feet across Honeywell property before it enters the Ohio River. The quantity of effluent discharged into the river (5.3 CFS) is insignificant compared to the 75-year average flow (1929-2003) of the Ohio River of 277,614 CFS (USGS 2003). Moreover, this discharge would comprise only 0.04% of the river's lowest flow on record (15,000 CFS) and 0.01% of the normal drought condition.

The Illinois State Water Survey has surveyed flow on the Ohio River and provided a 7-day 10-year low flow estimate of 53,730 CFS. The 7-day 10-year low flow estimate is a statistical estimate of the lowest average flow that would be experienced during a consecutive 7-day period with an average recurrence interval of ten years. It is estimated to recur on average only once in 10 years it is usually an indicator of low flow conditions during drought. The value for the Ohio River at the Paducah measurement point is 53,730 CFS (Singh, 1988). Under these conditions, the contaminants discharged would not be expected to be detectable after mixing with the river and should have no significant environmental impact.

Environmental water and mud samples are taken semi-annually from four locations on the Ohio River and at three area lakes and ponds. These samples are analyzed for uranium and fluoride content to determine any potential impact of plant operation. Refer to Figure 2.1-4 for location of water, mud, soil, and vegetation sampling locations.

Table 3.11-6 Environmental Surface Water Samples Uranium & Fluoride (PPM) Annual Average

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
2000	0.005	0.89	0.007	0.64	0.145	4.95	0.011	0.66	0.013	0.59	0.016	0.63	0.008	0.71
2001	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	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
2003	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

*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

Environmental water samples collected from the Ohio River during the most recent four year period of plant operation are shown in Table 3.11-6 and Table 3.11-7. During the most recent four year period, the river concentration of uranium and fluoride upstream of the plant discharge (Brookport Dam) averaged 0.87 PPM fluoride and 0.004 PPM uranium. Downstream concentrations at Joppa, Illinois averaged 0.82 PPM fluoride and 0.019 PPM uranium. Joppa is the nearest downstream municipality that could (but does not) use river water for drinking purposes. The State of Kentucky, which owns the Ohio River, limits fluoride in drinking water (401 KAR 5:031), at the point of withdrawal, to 2 PPM F. On December 7, 2000 (65 FR 76708), EPA published a final Radionuclides Rule in the Federal Register that included a MCL of 30 micrograms per liter (30 μg/L or 0.03 PPM)) for uranium that took effect in December 2003 and is the current EPA drinking water standard for uranium. The four year average at Joppa measurement site is lower than the current standard.

Analysis of mud samples (bottom sediment) for uranium and fluoride indicate there is some deposition of both uranium and fluoride in river sediment at the point of effluent discharge into the river. With the exception of the area around the plant effluent discharge point, results for uranium appear uniform for all sampling stations. Fluoride concentrations in sediment are generally higher downstream compared to upstream. There are no established standards for uranium or fluoride in stream sediments; however, the off-site concentrations fall within the concentration range of many naturally occurring materials, e.g., Florida phosphate rock contains up to 200 PPM U, and some United States soils contain up to 300 PPM F^- to plow depth (6").

Sediment samples are also collected semi-annually from the effluent ditch at points 700 feet and 1400 feet downstream of the plant effluent sampling station. These samples have been analyzed for uranium and fluoride content since 1985. Analytical results from the most recent four year period are shown in Table 3.11-8.

3.11.6 Environmental Soil and Vegetation Samples

Additional environmental soil and vegetation samples are also collected semi-annually. Six sample stations are located on-site at the same location of the low volume air samplers. Seven additional stations are located off-site in the surrounding areas of Illinois and Kentucky covering a radius of about eight miles from the plant. Refer to Figure 2.1-3 and Figure 2.1-4, respectively, for location of on-site and off-site stations. Each sample is analyzed for uranium and fluoride content.

Table 3.11-7 Environmental Mud Samples Uranium & Fluoride (PPM) Annual Average

	SAMPLE STATION NUMBER													
YEAR	(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
2000	1.99	5.85	1.07	16.83	4.30	81.34	0.73	21.13	0.88	23.0	1.79	7.65	0.93	15.16
2001	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
2002	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
2003	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

*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

Table 3.11-8 Environmental Mud Samples Effluent Ditch Uranium & Fluoride (PPM) Annual Average

	YEAR ANNUAL AVERAGE									
LOCATION	2000		2001		2002		2003		4 YEAR AVERAGE	
	U	F	U	F	U	F	U	F	U	F
700 Ft.	3.88	75.78	19.17	235.06	8.09	72.34	4.26	24.95	8.85	102.03
1400 Ft.	192.5	2276.9	112.79	9229.62	173.43	11899.81	200.42	9083.05	169.79	8122.35

Table 3.11-9 Environmental Soil Samples Uranium & Fluoride (PPM) Annual Average

	YEAR ANNUAL AVGERAGE									
LOCATION	2000		2001		2002		2003		4 Year Average	
	U	F	U	F	U	F	U	F	U	F
(A) Lamb Farm*	1.94	12.56	1.52	6.1	2.36	27.92	1.38	4.41	1.8	12.75
(B) Brubaker Farm	1.65	8.34	2.61	4.55	3.08	13.40	0.66	3.74	2.0	7.51
(C) Texaco Station	1.82	26.39	2.42	4.76	2.24	11.28	0.65	3.44	1.78	11.47
(D) IL Power Equip Station	1.56	8.67	1.77	4.90	4.53	25.43	1.17	3.83	2.26	10.71
(E) Reiniking Property	1.81	28.43	1.43	5.21	1.19	10.82	0.90	3.42	1.33	11.97
(F) Metropolis Airport	3.42	16.02	1.33	4.78	3.61	10.26	0.90	3.03	2.31	8.52
(G) Maple Grove School	1.06	11.15	1.23	4.77	0.80	10.38	0.49	2.91	0.90	7.30
#8 NE Feed Mat'l. Bldg.	17.79	18.92	16.78	11.44	14.45	11.74	11.22	3.65	15.06	11.44
#9 W Feed Mat'l. Bldg.	15.55	17.46	12.1	7.76	14.45	12.30	5.05	4.42	11.79	10.49
#10 S Feed Mat'l. Bldg.	14.80	39.12	10.11	11.32	40.64	14.41	3.23	3.95	17.20	17.20
#11 N Feed Mat'l. Bldg.	24.83	12.63	30.01	7.1	12.06	13.33	12.56	3.94	19.87	9.25
#12 E Feed Mat'l. Bldg.	4.77	14.01	13.20	15.89	12.38	10.72	3.75	3.84	8.53	11.12
#13 NE Feed Mat'l. Bldg.	74.91	30.69	86.46	15.58	18.86	17.32	33.29	7.15	53.38	17.69
(A) – (G) Offsite Avg.	1.89	15.94	1.76	5.01	2.54	15.64	0.88	3.54	1.77	10.03
(8) – (13) On Site Avg.	25.44	22.14	28.11	11.52	18.81	13.30	11.52	4.49	20.97	12.86

Table 3.11-10 Environmental Vegetation Samples Uranium & Fluoride (PPM) Annual Average

LOCATION	YEAR ANNUAL AVGERAGE									
	2000		2001		2002		2003		4 Year Average	
	U	F	U	F	U	F	U	F	U	F
(A) Lamb Farm*	6.31	23	10.60	22.87	1.66	35.84	1.24	26.69	4.95	27.1
(B) Brubaker Farm	6.75	10.8	14.69	22.33	1.61	31.26	0.63	23.67	5.92	22.02
(C) Texaco Station	3.22	10.45	1.63	22.65	2.11	35.26	1.86	21.96	2.21	22.58
(D) IL Power Equip Station	2.22	8.45	5.91	22.46	2.06	28.36	0.75	19.92	2.74	19.80
(E) Reiniking Property	1.75	24.65	7.98	40.79	1.06	33.5	0.83	22	2.91	30.24
(F) Metropolis Airport	1.25	13.55	0.80	20.67	1.09	42.88	0.58	20.60	0.93	24.43
(G) Maple Grove School	0.93	14.85	0.58	22.34	0.73	28.79	1.01	21.39	0.81	21.84
#8 NE Feed Mat'l. Bldg.	2.13	20.9	4.76	60.02	3.26	157.79	2.09	29.23	3.06	66.99
#9 W Feed Mat'l. Bldg.	2.54	30	2.97	54.49	5.47	53.22	0.90	27.79	2.97	41.38
#10 S Feed Mat'l. Bldg.	6.18	124.3	8.83	152.82	14.56	92.39	1.17	41.18	7.69	102.67
#11 N Feed Mat'l. Bldg.	8.69	34.15	11.02	48.70	1.94	111.5	1.33	29.71	5.75	56.02
#12 E Feed Mat'l. Bldg.	4.59	24.05	5.78	32.72	4.91	45.24	3.58	28.10	4.72	32.53
#13 NE Feed Mat'l. Bldg.	15.95	62.65	7.23	106.14	2.52	234.2	3.47	45.06	7.29	112.01
(A) – (G) Offsite Avg.	3.20	15.11	6.03	24.87	1.47	33.70	0.99	22.32	2.92	24.00
(8) – (13) On Site Avg.	6.68	49.34	6.77	75.82	5.44	115.72	2.09	33.51	5.25	68.60

Table 3.11-9 shows the results for uranium and fluoride in soil during the years 2000 - 2003. The four-year off-site average concentration of uranium in soil is 1.77 PPM. Most values fall in the range of 0.49 - 4.53 PPM U during the period.

On-site uranium in soil concentrations averaged 20.97 PPM during the four-year period.

Off-site fluoride in soil concentrations averaged 10.03 ppm F and on-site averaged 12.86 PPM during the four-year period. These concentrations are not considered significant because many agricultural soils contain greater concentrations of fluoride due to annual application of super phosphate fertilizer which contains about 1-3% fluoride. About 90% of the applied fluoride in fertilizer may accumulate in the soil. Fluorides in soil often are, or rapidly become, relatively insoluble forms that are not readily available to plants grown on the soil.

Table 3.11-10 provides concentrations of fluoride and uranium in vegetation for the years 2000 - 2003. The off-site concentrations (Stations No. A through No. G) averaged 24.00 PPM "F", and 2.92 PPM "U" during the four year period. The on-site concentrations are significantly higher than off-site; however, these areas are inside the MTW property boundary and under licensee control. The on-site concentration of fluoride in vegetation (68.60 PPM) may be compared to the State of Kentucky limit (401 KAR 53:010) which allows a 40 PPM average during a 6-month growing season, 60 PPM as a 2-month average, or 80 PPM as a 1 month average. Although the plant species collected for fluoride analysis could be considered cattle forage, the plant does not allow cattle grazing on the property.

Section 2 provides a summary of environmental monitoring data for non-radiological contaminants.

3.11.7 Numbers and Locations of Workers

The current plant workforce totals approximately 311; this figure represents a significant increase during the years 2004 and 2005. As efforts to automate plant operations progress, it is expected that this figure may be reduced by approximately 10-20% in the next 5 years. Within the plant restricted area, one may assume that the workforce is most heavily concentrated in the Administration Building and Feed Materials Building (20-50 workers at peak periods), with smaller concentrations (2-10 persons) spread evenly throughout the remainder of the plant's facilities. One may also assume that these individuals are present in these locations approximately 2000 hours per year, with slight variations for overtime, training assignments, and other absences. Total workforce man-hours per year average approximately 650,000 man-hours with year to year variations of approximately 100,000 man-hours.

3.11.8 Mitigative Measures

For plant workers, protection from health effects resulting from exposures is provided primarily by engineering controls - system design and maintenance to ensure integrity and adequate ventilation. These controls are augmented by administrative controls - primarily written procedures, augmented work controls for specified evolutions, and personal protective equipment (e.g., acid suits, respiratory protection).

For members of the public residing in the immediate vicinity of the plant, protection is achieved primarily through system design and operational controls that limit chemical releases within established standards. For unforeseen events that may lead to unplanned releases, these controls are augmented by the measures incorporated in the site's Emergency Response Plan, which establishes requirements for activation of public warning systems and protective action recommendations (e.g., for specified conditions, sheltering in place within 1.3 miles of the Feed Materials Building).

3.11.9 Cumulative Impacts

As a result of the vigorous engineering and administrative controls applied to plant design and operation, the cumulative nonradiological health effects of plant operations are expected to be negligible.

3.12 Solid Waste Management

Solid wastes generated at the Metropolis facility include low-level radioactive, nonradioactive hazardous and mixed wastes. As described in the following text, a combination of recycling, compaction, and offsite disposal are used in management of these wastes.

3.12.1 Facility Effluents

Facility effluents (liquid and air) are discussed in Section 2.0 of the Environmental Report.

3.12.2 Low-Level Radioactive Solid Waste Streams and Treatment

Dry active waste, which consists primarily of contaminated filters, papers, floor sweeping compounds, cleaning rags, and gloves, is generated by the facility. This waste is collected in marked containers, segregated by radioactivity, drummed and either compacted onsite or shipped to a licensed supercompactor before final disposal at a licensed site. The estimated annual volume is

8,000 - 10,000 ft^3 per year with an average uranium content of 6,000 pCi/g. In 2000 and 2001 efforts were made by the facility to remove legacy waste that had been stored at the facility. This waste consisted primarily of contaminated wooden pallets from uranium ore storage. Approximately 200,000 ft^3 of chipped wood and 90,000 ft^3 of scrap metal was disposed-of during the effort. The practice of storing ore drums on wooden pallets has been discontinued in order to reduce the overall generation of contaminated wood.

Based on data from 2000 through 2004, an estimated annual average of 410 metric tons (903,856 pounds) of fluorination reactor ash, also called "Bed Material Filter Fines", was produced. The uranium concentration for fluorination reactor ash was estimated at 13,540 pCi/g. The reactor ash is processed through the onsite uranium recovery system along with other miscellaneous waste streams including recovered dust and scrap materials. Waste materials from the uranium recovery process (principally inorganic fluorides) are packaged for recycling or storage pending disposal at a licensed low-level radioactive waste disposal facility.

About 3,946 metric tons (8,700,000 pounds per year) of synthetic calcium fluoride (CaF_2) containing about 143 pCi/g of uranium are shipped to commercial plants that can use this synthetic CaF_2 in industrial processes.

Contaminated pieces of process equipment and other scrap metal being discarded are decontaminated where feasible. An estimated 5,000 - 10,000 ft^3 of contaminated metal (primarily crushed drums) will be annually generated by continued operation of the Metropolis facility for the foreseeable future. Any gross contamination of the material is removed at the facility. The material is then sent to a licensed facility for sorting, decontamination, and disposal.

3.12.3 Nonradioactive Solid Waste and Treatment

Nonradioactive solid waste generated at the Metropolis facility includes miscellaneous trash, paper, scrap metal, and wood. Non-contaminated scrap metal and wood are sold to scrap dealers or are released for reuse after thorough radiation monitoring is performed to assure that the residual radioactivity level is below the NRC release criteria. The facility generated approximately 60,203 ft^3 of nonradioactive industrial and special waste in 2004. In addition, approximately 247 ft^3 of nonradioactive scrap metal was sent to a local scrap metal recycler. In the past, an incinerator was used to reduce the volume of nonradioactive waste but the incinerator has been recently removed from service. Volume reduction of nonradioactive waste is currently performed by a recently installed compactor. Nonradioactive solid waste not sold or recycled is sent to a landfill or other commercial waste disposal facility.

3.12.4 RCRA Hazardous Waste

The facility has been issued a RCRA permit (#B6-65-CA-11) by the Illinois Environmental Protection Agency for the storage and treatment of hazardous waste generated on-site. This permit is in effect from March 11, 2003 until March 11, 2013. The permit regulates operation of the Environment Protection Facility (EPF) Ponds and storage of drummed hazardous waste on the waste storage pad. 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 CaF_2 in settling ponds D and E. It should be noted that the facility is currently planning an upgrade to the waste treatment system. Current plans are to install an additional clarifier and sand filter, with off-specification tanks, to replace the use of Ponds D and E. The planned upgrade is scheduled to be completed by the end of 2005. The effluent from the EPF is in the normal operating range of 11 to 12 pH. The pH is adjusted with sulfuric acid to meet RCRA land ban requirements prior to releasing to the settling basins. The pH of the effluent from the settling basins is further adjusted with sulfuric acid to a pH range of 6-9. This stream is combined with other plant effluents prior to release to 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.

Some of the drummed hazardous waste is "mixed waste" in that it contains both RCRA hazardous waste and low concentrations of uranium. In 2004, 1,610 gallons of liquid mixed waste were shipped to a licensed disposal facility. Currently, 1,539 gallons of the mixed waste is stored on site. The mixed waste is stored on a RCRA-permitted storage pad shipment to an offsite facility to either treat or dispose of these waste.

4.0 Environmental Impacts

4.1 Land Use Impacts

As discussed in Section 3.1, predominant land uses in Massac County in general are as pasture, cropland, and forestland. Even in the industrialized and urbanized environment of the Highway 45 corridor from the site to Metropolis, these uses account for more than 50% of the land within a two mile radius of the plant.

MTW proposes to re-license its existing facility with minor modifications to on-site systems. Neither re-licensing or system modification would change any current use of the land outside the exclusion zone with the sole exception of converting formerly cultivated bottomlands along the Ohio River back into riparian forest. Thus, the proposal would insignificantly decrease the proportion of cropland in the immediate vicinity of the plant and would insignificantly increase the proportion of bottomland forest or wetland. This would have a positive affect as these fields will eventually recover as wildlife habitat.

With the exception of very limited habitat enhancement, the proposed action has no other beneficial or adverse impact on current land use in the area.

4.2 Transportation Impacts

The NRC has evaluated the potential impacts of transportation radioactive materials in a prior environmental impact Statement (USNRC 1977). This analysis concluded that "the average radiation dose to the population at risk from normal transportation is a small fraction of the limits recommended for members of the public from all sources of radiation other than natural and medical sources and is a small fraction of natural background does" (NRC 1977). This earlier environmental analysis considered the types of activities conducted at the Honeywell Specialty Materials Metropolis facility. There have been no substantive changes in the transportation procedures in the time since this evaluation and none are planned. Thus the conclusion remains valid for the proposed license renewal.

4.3 Geology and Soil Impacts

The facility is located in a region of recognized seismic activity caused by the New Madrid seismic zone, the locus of one of the highest intensity earthquakes in North American history. The USGS seismic hazard website shows a 30 percent probability of exceeding a magnitude of 5 within 50 years and approximately 0.15 percent probability of exceeding a magnitude of 7 within 100 years.

Little evidence exists concerning the behavior of the surficial geological materials or site subsurface strata during recent earthquakes. However, the facility has performed without damage or interruption of operations since its opening. The affect of another seismic event similar to the 1811-1812 earthquakes could potentially result in damage to on-site buildings, containments and piping. No geological features (e.g., structural faults or karstic depressions) were identified on-site that would increase the likelihood of a local seismic event.

Continued operations at the facility is not expected to have any significant impact to geological features such as soil compaction, soil erosion, subsidence, landslides or disruption of natural drainage patterns. The applicant proposes to re-license its existing facility with minor modifications to on-site systems.

Neither re-licensing nor system modification will change the existing geological or soil conditions at or surrounding the facility.

4.4 Water Resources Impacts

4.4.1 Surface Water

4.4.1.1 System

The site for the Honeywell facility is bound on the south by the Ohio River in the vicinity of River Mile 946 (USGS, 1982). The Ohio River drains 203,940 square miles (ORSANCO, 2004) The site is located along the Ohio River at a point approximately 35 miles upstream from its confluence with the Mississippi River.

There are four intermittent creeks that drain the Honeywell property to the Ohio River. The intermittent creeks enter the Honeywell property on the north side, and there are no other downstream properties between the Honeywell facility and the Ohio River. The receiving water for the Honeywell facility is the Ohio River. A detailed discussion of the surface hydrological systems and a discussion of the Ohio River water quality are provided in Section 3.4.

4.4.1.2 Alterations

Continued operation of existing processes will require no additional uses or modifications of natural surface water bodies. Process and potable water for the facility will continue to be provided by groundwater wells, as discussed in Section 3.4.

Settling ponds are currently used to remove particulate contaminants from plant effluent. As discussed in Section 3.6, concentrations of NPDES monitored contaminants in the effluent from the plant have not had adverse trends within the past five years. Effluent limits stipulated in the NPDES permit are intended to minimize impacts to the receiving water.

Honeywell proposes to re-license its facility with only minor modifications. The planned modifications are discussed in Section 2.0. Some of the modifications will include phasing out the use of settling ponds. Settling pond A was closed in 2001, and the remaining four surface impoundments are planned for closure by the year 2020. The flow for the effluent has increased slightly over the last five years due to lack of water conservation, as well as the installation of water cooled rectifiers for the fluorine plant. Previously, the rectifiers were oil cooled rectifiers. The facility plans to replace the remaining rectifiers with water cooled rectifiers. However, with the next rectifier replacement, the facility will install a cooling tower in 2006, which will reduce the effluent flow rate.

4.4.1.3 Impacts

The plant effluent flow rate is insignificant compared to the annual mean discharge rate for the Ohio River, so the temporary increasing trend, and planned reduction, in the flow rate should have no significant impact on the Ohio River.

The following tables provide information on surface water and sediment sampling locations (annual averages from 2000 to 2003) for uranium and fluoride. Sediment samples from the plant effluent ditch have show no overall increasing trends, with the exception of an increase in uranium and fluoride concentrations in 2001 for both plant effluent ditch sample locations.

Comparing sediment samples from the Ohio River at the plant outflow, 7 miles upstream, and 5 miles downstream there was an increase in the average uranium and fluoride concentrations during 2001. The upstream sample location showed no significant increases in uranium over the period, and the fluoride concentration varied. The downstream sample location showed a generally decreasing trend in the uranium concentration, and the fluoride concentration varied. The plant outflow location did not have a significant increasing trend in the uranium concentration, and the fluoride concentration generally decreased. The uranium and fluoride concentrations at the plant outflow were generally higher than the concentrations at the upstream and downstream locations in all years.

Comparing surface water samples from the Ohio River at the plant outflow, 7 miles upstream, and 5 miles downstream, the uranium concentration generally decreased at all three sample locations over the period. The fluoride concentration increased slightly at the upstream sample location, and was variable at the other sample locations. The uranium and fluoride concentrations were generally higher at the plant outflow location than at the upstream and downstream sample locations in all years.

Continued operation of the Honeywell facility would likely have similar impacts to the local hydrological systems.

Table 4.4-1 Environmental Sediment Samples - Effluent Ditch Uranium & Fluoride (ppm) Annual Average

	YEAR ANNUAL AVERAGE									
LOCATION	2000		2001		2002		2003		4 YEAR AVERAGE	
	U	F	U	F	U	F	U	F	U	F
700 Ft.	3.88	75.78	19.17	235.06	8.09	72.34	4.26	24.95	8.85	102.03
1400 Ft.	192.5	2276.9	112.79	9229.62	173.43	11899.81	200.42	9083.05	169.79	8122.35

Table 4.4-2 Environmental Sediment Samples - Uranium & Fluoride (ppm) Annual Average

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
2000	1.99	5.85	1.07	16.83	4.30	81.34	0.73	21.13	0.88	23.0	1.79	7.65	0.93	15.16
2001	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
2002	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
2003	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

*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

Table 4.4-3 Environmental Surface Water Samples - Uranium & Fluoride (ppm) Annual Average

	SAMPLE STATION NUMBER													
YEAR	(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
2000	0.005	0.89	0.007	0.64	0.145	4.95	0.011	0.66	0.013	0.59	0.016	0.63	0.008	0.71
2001	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	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
2003	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

*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

4.4.2 Other Surface Water Users and Compatibility of Water Use

Some nearby water users in the vicinity of the Metropolis facility also utilize the Ohio River. Nearby industrial use of the Ohio River is primarily limited to effluent discharge and / or cooling water make-up. The nearest downstream City, Joppa, IL. located approximately 8 miles to the northwest, does not utilize the Ohio River for drinking water supply.

4.5 Ecological Resource Impacts

Applicant proposes to re-license its existing facility with minor modifications to on-site systems including abandonment of a waste treatment pond. In some cases, waste ponds pose a threat of death or injury to terrestrial animals, especially migratory birds that might land in them. Abandoning exposed ponds in favor of closed-cycle waste treatment is beneficial and decreases the potential adverse impacts associated with uncovered.

Simply re-licensing the plant and making modifications to existing systems within the exclusion zone requires no additional destruction or modification of terrestrial and aquatic habitat. Therefore, it has no potential adverse impact on the species that might inhabit them as residents and migrants.

Further, there are no wildlife sanctuaries, nature preserves, refuges, conservation areas or rare, unique, or critical habitats on or in close proximity to the MTW site. Pending consultation with the U.S. Fish and Wildlife Service and the Illinois Department of Natural Resources, it appears equally unlikely that the proposed action could adversely effect any threatened, endangered or candidate species.

While the property includes a once cultivated floodplain, farming there has ceased and the property is being replanted. This activity increases the overall acreage of bottomland forest in the area and would eventually offset losses of this and other wetland habitats that might occur on other property nearby.

Applicant permits no recreational hunting, fishing, or trapping on its property and has posted signs to that effect. Therefore, the proposed action would neither increase nor decrease harvest pressure on recreationally important fish or wildlife species. It would similarly interfere in no way with commercial fishing on the Ohio River that, in any case, is now apparently an insignificant economic activity.

Because it is used by barge traffic engaged in interstate and foreign commerce, the Ohio River at the MTW site is classified as "waters of the United States" subject to the regulation by the U.S. Army Corps of Engineers. However, because Applicant's proposal requires no work on or in close proximity to the river that could pose any adverse impact, it is not subject to the Corps' review.

4.6 Air Quality Impacts

4.6.1 Permits

The facility is currently operating under a Title V Clean Air Act Permit (ID Number 127854AAD) issued by the Illinois EPA, Division of Air Pollution Control, on July 14, 2003 and expiring July 14, 2008. The permit grants the permittee to operate a facility classified within the Industrial Organic Chemicals Group. The permit contain terms and conditions which address applicability of Title I of the Clean Air Act, including federal PSD and Illinois Administrative Code 35 IAC Part 203 - Major Stationary Sources Construction and Modification. The permit describes various terms and conditions. Per the Title V permit, the facility is subject to NRC regulations for emissions of radionuclides and is not subject to National Emissions Standard for Hazardous Air Pollutants (NESHAP) for radionuclides (40 CFR 61, Subpart I).

4.6.2 Facility Gaseous Effluents

A detailed description of the facility gaseous effluents has been provided in Section 2.0. The information provided in those sections include: the type, quantity, and origin of effluents; tabulated data of effluent concentrations; and date pertaining to release point characteristics such as elevation above grade, inside vent or stack diameter, physical shape, flow rate, effluent temperature, exit velocity, and release frequency.

4.6.3 Gaseous Effluent Control Systems

A detailed description of the facility gaseous effluent control systems has been provided in Section 2.0. Many of the process operations have primary, secondary, and tertiary controls functioning to minimize or eliminate air effluents. Gaseous effluent control systems include: baghouse dust collectors with filter fabric and metal or carbon filters for control of particulate emissions; scrubbing systems using water or potassium hydroxide for control of F_2, HF, UF_4, and UF_6.

4.6.4 Non-Radiological Air Quality Impacts

Normal operation of the Metropolis facility is not expected to have any significant effect on offsite non-radiological air quality. An application for a Title V Clean Air Act Permit was initially filed with the Illinois EPA in March of 1996 and was issued in July 2003. The permit includes emission limitations for: Volatile Organic Material (VOM); Sulfur Dioxide (SO_2); Particulate Matter (PM); Nitrogen Oxides (NOx); and Hazardous Air Pollutants (HAP), excluding VOM and PM. Estimates of release rates for these emissions are below air permit levels. In addition, the permit establishes operating conditions for many of the process units to minimize or eliminate impact to local and regional air quality.

Process operations, production levels, and effluent emissions have not changed substantially since preparation of the Environmental Assessment (EA) for the 1995 License Renewal. The EA concluded that ambient concentrations of SO2, NH3, and HF estimated for the point of maximum exposure using atmospheric dispersion modeling are 16.0, 0.38, and 0.26 μg/m3, respectively. The states of both Illinois and Kentucky have Ambient Air Quality regulations. Table 4.6-1 provides a comparison of the estimated maximum exposure values with the Ambient Air Quality Standards.

Table 4.6-1 Estimated Concentrations Versus Ambient Air Quality Standards

Contaminant	Emission $\mu g/m^3$	Illinois[B]		Kentucky[C]	
		Primary $\mu g/m^3$	Secondary $\mu g/m^3$	Primary $\mu g/m^3$	Secondary $\mu g/m^3$
Sulfur Oxides	16.00	80.0[A]	NR	365.0[A]	NR
Ammonia	0.38	NR	NR	NR	NR
Gaseous Fluorides	0.26	NR	NR	400.0	0.82[A]

NR - No Regulation
A. Annual arithmetic mean concentration.
B. Source: Illinois Title 35 Part 243.122
C. Source: Kentucky Title 401 Part 53:010 Appendix A

While Federal and Illinois State regulations do not specify acceptable levels for NH3, the estimated values are small fractions of the levels recommended by the American Conference of Governmental Industrial Hygienists (ACGIH) for extended workplace exposures.

4.6.5 Radiological Air Quality Impacts

During preparation of the EA for the 1995 License Renewal, the radiological impacts of the continued operation of the Metropolis facility were assessed by calculating the radiation dose to the maximally exposed individual located at the nearest residence and the collective radiation dose to the local population living within 80 kilometers (50 miles) of the plant site. The results and methodology of the dose assessments are summarized in this section, and a detailed description of the methodology was provided in Appendix A of the 1995 EA. Process operations, production levels, and air effluent emissions have not changed substantially since preparation of the EA for the 1995 License Renewal.

Throughout this section, the generic term "radiation dose" is used. This term means the total effective dose equivalent (TEDE), which is the sum of (1) the effective dose equivalent (EDE) from exposure to external radiation for a period of 1 year, and (2) the 50-year committed effective dose equivalent (CEDE) from internal exposure from the intake of radionuclides for a period of 1 year. The generic term radiation dose may be applied to an individual in which case it has units of mrem per year or to populations in which case it is the collective radiation dose with units of person-rem per year.

Doses from Routine Airborne Releases

The Honeywell Metropolis facility releases radioactive material to the atmosphere through 52 monitored release points and report measurements of the activity released to the NRC on a semi-annual basis. The annual release rates for the past 5 years are provided in Section 6.1. The isotopic distribution of the uranium and the solubility class of the uranium presented during the 1995 License Renewal is consistent for the License Renewal. The isotopic distribution by activity was 49 percent U-234, 49 percent U-238, and 2 percent U-235. The solubility classification of the uranium isotopes was a weighted average of data collected from 1990 through 1993. Fifty-eight and one-half percent of the uranium was calculated to be Class D, 10.7 percent of the uranium was calculated to be Class W, and 30 8 percent of the uranium was calculated to be Class Y. Relatively small amounts of thorium- 230 and radium-226 are also released from the Metropolis facility. The Th-230 and Ra-226 emissions were not attributed to a particular emission point or building, so they were allocated to the ore sampling plant because emissions from this building had the largest atmospheric dispersion factor.

Dose to the Maximally Exposed Individual

The radiation doses resulting from atmospheric releases were estimated in the 1995 EA using the XOQDOQ computer code and the GEN1l computer code. The XOQDOQ computer code was used to calculate atmospheric dispersion factors (X/Qs) for locations surrounding the Metropolis facility. The X/Qs were used by the GENII computer code to estimate radiation doses through the inhalation, ground surface, and immersion pathways. The maximally exposed individual was located at the nearest residence, which was 564 meters (1,850 feet) north-northeast of the Metropolis facility. The maximally exposed individual did not have a home garden, therefore the ingestion pathway was not included in the dose assessment. The methodology, data, and assumptions used in the dose assessments were provided in Appendix A of the 1995 EA.

The radiation dose (TEDE) to the maximally exposed individual located at the nearest residence was estimated to be 1.5 mrem per year. This estimated radiation dose is less than the limit of 25 mrem per year established by the U.S. Environmental Protection Agency (EPA) in 40 CFR Part 190. The highest organ dose is to the lungs from insoluble forms of uranium (Class Y). The estimated lung dose of 9.3 mrem per year is less than the 25 mrem per year dose limit established in 40 CFR Part 190; the thyroid doses were also an insignificant fraction of the 75 mrem per year thyroid dose limit established in 40 CFR Part 190. The estimated radiation dose of 1.5 mrem per year is also less than the limit of 100 mrem per year established by the U.S. Nuclear Regulatory Commission in 10 CFR Part 20.

Almost 100 percent of the radiation dose was through the inhalation pathway and from radionuclides released as solubility class Y. Uranium-234 contributed 52 percent of the dose, U-238 contributed 46 percent of the dose, and U-235 contributed 2 percent of the dose.

Dose to the Surrounding Population

The population surrounding the Metropolis facility is about 517,128 people, based on 2000 census data as described in Section 3.10. As with the maximally exposed individual, the collective radiation dose to the population was estimated using the GEN11 and XOQDOQ computer codes. In contrast to the maximally exposed individual dose assessment, the ingestion pathway was included in the population dose assessment. The methodology, data, and assumptions used in the dose assessments were provided in Appendix A of the 1995 EA.

The collective radiation dose to the population surrounding the Metropolis facility is estimated to be 4.1 person-rem per year. Based on an average background radiation dose of 0.360 rem per year for individuals in the U.S., the same population would receive about 170,000 person-rem per year from background radiation; the collective radiation dose associated with atmospheric releases from the Metropolis facility is a small percentage of the collective radiation dose from background radiation for these same people.

4.6.6 Visibility Impacts

The Honeywell Metropolis currently has a Title V Clean Air Act Permit issued by the Illinois EPA. Section 5.2.2 (a) of the permit requires that no emission of fugitive particle matter from any process, including any material storage handling or storage activity, be visible by an observer looking generally overhead at a point beyond the property line of the source unless wind speeds are greater than 25 miles per hour. In addition, Section 5.2.2 (b) of the permit requires that no emission of smoke or other particulate matter be allowed or emitted to the atmosphere from a regulated process in excess of 30 percent opacity. The facility complies with these permit conditions during normal operation of the facility.

No significant process modifications or construction activities which would alter aesthetic or visibility impacts have been completed since the 1995 License Renewal. During the license renewal period, closure of the existing settling ponds will occur. The closure plan will describe measures necessary to control dust and other emissions from pond decommissioning activities.

4.6.7 Mitigative Measures For Air Quality Impacts

Many of the process operations have primary, secondary, and tertiary controls functioning to minimize or eliminate air effluents. In addition, a Title V Clean Air Act Permit issued by the Illinois EPA establishes limitations on emissions, control of effluent sources, and general operating requirements for the facility. No additional mitigative measures needed to reduce air quality impacts are contemplated.

4.6.8 Description of Cumulative Air Quality Impacts

The Metropolis facility performs a comprehensive Environmental Monitoring Program designed to assess impacts to the environment from both short-term and long-term emissions and resulting cumulative impacts. The facility Environmental Monitoring Program is detailed in Section 6.0 of this Environmental Report. A portion of the Environmental Monitoring Program includes Soil, Vegetation, and External Gamma Monitoring which is specifically designed to assess cumulative impacts, especially from air effluent emissions.

Soil

With the exception of Sampling Location #12 (E Feed Material Building) and Sampling Location #13 (NE Feed Material Building) the sampling results from 2000 to 2003 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 20.97 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 5.25 ppm for 2000 to 2003. The 4-year average for onsite uranium concentration is higher than the offsite concentration that averaged 2.92 ppm for the same time period.

Analysis results for many of the onsite sampling locations indicated an increasing trend concentration 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.

The 4-year average for onsite samples was 68.60 ppm and the average for offsite samples was 24.0 ppm.

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 TLD badges are analyzed and replaced every quarter.

The control, onsite, and offsite environmental TLD monitoring results from 2000 to 2003 are summarized in Section 6.0. The maximum annual average of the direct gamma radiation consistently occurs at the east restricted area fence. This is because of a large ore concentrate storage area immediately adjacent to the sampling station. The maximum annual average environmental TLD dose is approximately 4 percent of the limit specified in 10 CFR 20.1301(a)(2) for dose in any unrestricted area from external sources. In addition, 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 4 percent of the referenced regulatory limits. Background annual average radiation doses at the airport have varied from 91 to 97 mrem. Radiation doses at the nearest residence were similar to background and ranged from 86 to 97 mrem during 2000 to 2003.

4.7 Noise Impacts

Title 23 of the Code of Federal Regulations, Part 772 (23 CFR 772) defines adverse noise impact as "impacts which occur when predicted noise levels approach or exceed" the noise abatement criteria at a specific location.

The nearest noise sensitive receptor (NSR) to the MTW site is a rural residence more than one-third mile north-northeast of the plant. It is highly unlikely that the noise abatement criteria at this location, 67dBA, has ever been approached.

The proposed license renewal will result in no increase in noise now produced by the MTW facility. Therefore, it's unlikely that continued operation of the plant would have any adverse impact on environmental noise in the area or on the nearest NSR.

4.8 Historic and Cultural Resources Impacts

No impacts are expected to cultural or historical resources within the plant boundaries because all planned activities within the licensing period would occur in areas already disturbed by previous site development. Archaeological surveys must be undertaken prior to initiation of new construction projects planned for areas that are outside of the current development footprint or that would take place in a previously undeveloped area.

4.9 Visual and Scenic Resource Impacts

The dominant visual features on the MTW site and on lands adjacent to MTW along Highway 45 are industrial and urban in nature. They have no scenic value.

Applicant proposes to re-license its existing facility with minor modifications to on-site systems. Neither re-licensing or system modification would alter the current perception of the facility, either from the air or on the ground, as industrial. Thus, the proposal would significantly alter no existing visual features or adversely affect a scenic view. Therefore, the proposal would have no impact on the area's visual or scenic resources.

4.10 Socioeconomic Impacts

The MTW plant is not planning or expecting a significant employment expansion or new construction outside of the current plant footprint; therefore, local socioeconomic trends would be unaffected by continued operation of the plant. Continued operation ensures the annual renewal of "Mutual Assistance Agreements" between the Honeywell Facility and local emergency responders in Massac County/ city of Metropolis. Emergency response agencies within the immediate vicinity currently benefit from training, emergency drills, and emergency response equipment provided by Honeywell. Coordination, emergency response training/radiological contingency planning is a condition of NRC licensing.

4.11 Environmental Justice Impacts

No areas within the 4 mile radius have minority or low income populations that are disproportionately high (i.e. 20 percent higher than the state averages). Furthermore, the populations of Metropolis and Paducah, the highest density communities in the vicinity of the plant, are located upstream of the MTW facility. No disproportionately high adverse human health or environmental impacts are expected to minority or low-income populations during continued facility operations.

4.12 Public and Occupational Health Impacts

Analysis of the projected public and occupational health impacts includes consideration of a wide range of process materials, effluents, and other hazards and their potential effects. These effects include the potential for causation of disease, disability, untimely death or other effects upon the workforce or local populace.

The radiation dose to the off-site population has been and is expected to be well below the regulatory limits established at 10 CFR 20.1301. The licensee implements a stringent program of effluent monitoring to identify any failures in the effluent clean-up systems and, should any such failure be detected, imposes operational controls to ensure effluents remain within established limits. The licensee also implements an environmental monitoring program to provide verification that the established controls are effectively limiting offsite releases. The licensee also implements a program to maintain public doses at levels that are as low as is reasonably achievable. Therefore, the radiation effects on public health are expected to be negligible.

Individual occupational radiation doses are also maintained well below the limits established in 10 CFR 20 and are subject to the ALARA process. While there is some dispute within the scientific community regarding the health effects of radiation exposure at occupational levels, the regulatory limits have been established at levels that are expected to maintain potential health effects within the bounds of those effects noted in comparable industries. Therefore, any potential health effects are expected to be within the range of those effects for comparable licensed facilities and other industrial concerns.

Continued operation of the facility is likely to result in continued low-level deposition of uranium in soils both on- and off-site. However, uranium has a low specific activity and is relatively benign in a radiological sense. Any potential health effects are bounded by maintenance of the stipulated effluent controls, which limit exposures to individuals within established limits (see above). Therefore, these effects are considered to be negligible.

The health effects resulting from occupational exposures to onsite chemicals, noise, and industrial safety hazards are limited by the licensee's implementation of safety programs that meet the requirements of the U.S. Occupational Safety and Health Administration and more stringent corporate standards. In particular, the licensee implements a Process Safety Management Program consistent with the requirements of 29 CFR 1910.119 which provides a comprehensive assessment of chemical safety hazards and specific processes and programs to mitigate these hazards. This program also implements a process of periodic review and feedback to allow continuous improvement of administrative and engineering controls. The licensee also implements stringent engineering controls to limit the workplace concentrations of hazardous and radioactive constituents and also implements a respiratory protection program consistent with the requirements of 29 CFR 1910 and 10 CFR 20. These measures limit employees' exposures to both hazardous chemicals and radioactive materials. The licensee has conducted detailed air and noise sampling processes to characterize the workplace hazards and provide for establishment of appropriate controls, consistent with applicable regulatory requirements and good industrial practice. Therefore, the health effects related to operation of the facility are expected to be consistent with those resulting from operation of similar chemical processing facilities.

4.13 Waste Management Impacts

Solid wastes generated at the Metropolis facility includes low-level radioactive, nonradioactive hazardous and mixed wastes. A combination of recycling, compaction, and offsite sorting, segregation, screening, and disposal are used in management of these wastes. A detailed description of the sources, types, quantities, and composition of solid, hazardous, and mixed waste has been provided in Section 2.0 and Section 3.12 of this Environmental Report. Also, a detailed description of the waste management systems designed to collect, store, and dispose of all wastes generated by the facility is provided in Section 2.0.

4.13.1 Disposal Plans for Liquid Wastes Generated At The Metropolis Facility

All waste generated by the Metropolis facility is recycled, disposed at an appropriate disposal facility, or stored onsite. Liquid waste streams generated at the Metropolis facility are categorized as low-level radioactive, mixed, and nonradioactive waste streams. Each of the waste streams are recycled or treated separately. Most liquid effluent, including sanitary, non-contact cooling water, treated effluents from the EPF and stormwater, from the restricted area of the plant is discharged from Outfall 002 and drains to the Ohio River in a natural drainage channel.

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 are 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 for uranium recovery.

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 CaF_2 in settling ponds D and E. Settling Pond A was removed from service, decommissioned, and clean closed. In addition, Ponds B and C have been removed from service and will be decommissioned in the near future. It should be noted that the facility is currently planning an upgrade to the waste treatment system. Current plans are to install an additional clarifier and new sand filter, with off-specification tanks, to replace the use of Ponds D and E. The planned upgrade is scheduled to be completed by the end of 2005. The effluent from the EPF is in the normal range of 11 to 12 pH. The pH is adjusted with sulfuric acid to meet RCRA land ban requirements prior to releasing to the settling basins. The pH of the effluent from the settling basins is further adjusted with sulfuric acid to a pH 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.

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 either maintenance or 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, tri (2-ethyl-hexyl) phosphate solvent (TEHP), and CFC-113 from various laboratory activities. Mixed waste is stored onsite until transferred to an appropriate disposal facility. During the past few years the facility has made successful efforts toward reducing the amount of mixed waste stored onsite. All 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.

Non-radiological Aqueous Waste Streams and Treatment

Non-radiological aqueous waste streams include sulfuric acid waste, sanitary wastewater, non-contact cooling water, and storm water runoff from non-process areas. An Imhoff tank is used for primary treatment of sanitary wastewater before discharge to Outfall 002. Storm water runoff from non-process areas and process waters from the power house (used in boilers and for cooling purposes) are discharged without treatment to Outfall 002. Hazardous liquid wastes are drummed, analyzed, and disposed of using outside contractors.

Liquid Waste Release Rates

Most of the facility's liquid effluent (i.e., process wastewater, treated sanitary sewage, non-contact cooling water, and storm water runoff) from the restricted area is discharged from Outfall 002 into the Ohio River via natural drainage in accordance with a National Pollutant Discharge Elimination System (NPDES) permit. The effluent at Outfall 002 is continuously sampled and monitored.

4.13.2 Disposal Plans For Solid Waste Generated at the Metropolis Facility

Solid wastes generated at the Metropolis facility include low-level radioactive, nonradioactive hazardous, and mixed wastes. As described in the following text, a combination of recycling, compaction, and offsite disposal are used in management of these wastes.

Low-Level Radioactive Solid Waste Streams and Treatment

Dry active waste, which consists primarily of contaminated filters, papers, floor sweeping compounds, cleaning rags, and gloves. This waste is collected in marked containers, segregated by radioactivity, drummed and either compacted onsite or shipped to a licensed facility for further processing before final disposal at a licensed site.

Fluorination reactor ash is also produce. The reactor ash is processed through the onsite uranium recovery system along with other miscellaneous waste streams including recovered dust and scrap materials. Fluorination reactor ash may be shipped to an off-site facility for uranium recovery. Waste materials from the uranium recovery process (principally inorganic fluorides) are packaged for recycling or storage pending disposal at a licensed low-level radioactive waste disposal facility.

Synthetic calcium fluoride (CaF_2) is recycled by shipping the material to commercial plants that can use this synthetic CaF_2 in industrial processes. Contaminated pieces of process equipment and other scrap metal being discarded are decontaminated where feasible. Contaminated scrap metal waste may also be compacted for volume reduction before disposal and sent to a licensed low-level waste disposal facility whenever practical.

Nonradioactive Solid Waste and Treatment

Nonradioactive solid waste generated at the Metropolis facility includes miscellaneous trash, paper, scrap metal, and wood. Non-contaminated scrap metal is sold to scrap dealers or are released for reuse after thorough radiation monitoring is performed to assure that the residual radioactivity level is below the NRC release criteria.

4.13.3 Waste Minimization Plans

Personnel at the Metropolis facility continually search for new and innovative ways to minimize or eliminate waste generated from the facility. Recycling materials such as the CaF_2 for use as a replacement for natural fluorspar at other commercial facilities and recovering uranium from waste streams are prime examples. Currently, however, there are no other feasible (economic or technical) plans for waste minimization that are being contemplated.

4.13.4 Waste Management Cumulative Impacts

With the exception of mixed liquid waste, low-level dry active waste, and nonradioactive solid waste, all other waste generated by the facility is processed for recovery of materials or sent to a commercial facility as a byproduct. The only cumulative impacts conceived by the waste management practices of the facility would be compounded disposal of the mixed liquid waste and dry active waste at a low-level radioactive disposal, and disposal of the nonradioactive solid waste by an appropriate disposal facility.

5.0 Mitigation Measures

Releases of radiological or nonradiological constituents to the air, water, and soil creates an environmental impact. MTW has implemented mitigation measures to minimize the environmental impact associated with plant operations. Settling ponds have been used to lower the level contaminants in the effluent streams being released to the Ohio River. Currently, this system is being upgraded to increase the efficiency of removing the contaminants and to remove the surface impoundments from service as required by Condition II.H.2 of the current RCRA Permit (#B6-65-CA-11). One surface impoundment, pond A, was closed in 2001. The remaining four surface impoundments are scheduled for closure by the year 2020.

The surface impoundments are being replaced by a new Environmental Protection Facility (EPF). The newly constructed EPF will contain higher capacity clarifiers and sand filters for the removal of fluorides and uranium from wastewater prior to release to the Ohio River. The upgraded EPF is planned for completion by the end of 2005.

To reduce gaseous emissions that could contain significant quantities or uranium or hazardous chemicals, dust collectors and scrubbers are 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.

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 may include equipment repair, cleaning, modification, replacement, and addition of effluent control equipment. For example, the outdated oil cooled rectifiers in the fluorine production facility are planned for replacement with new water cooled units. A new cooling tower is planned for installation to mitigate the potential effects of the waste heat from the full compliment of new rectifiers on the receiving waters, i.e. the Ohio River.

6.0 Environmental Measurements & Monitoring Program

6.1 Radiological Monitoring

6.1.1 Sampling and Monitoring Locations

The fixed environmental sampling and monitoring locations and liquid effluent release points associated with Honeywell Metropolis Works are illustrated on Figure 2.1-3 and 2.1-4.

There are currently 52 airborne release stacks associated with the facility. Due to their number and distribution, these have not been illustrated on the figure. Characteristics of these stacks are presented in Table 2.1-3.

6.1.2 Principal Radiological Exposure Pathways

6.1.2.1 Pathways to Site Workers

Internal exposure from inhalation of airborne emissions and external exposure from radioactive material entrained in plant systems are the primary exposure pathways for MTW workers because they directly handle radioactive materials and/or may be in close proximity to radiation sources. Internal exposures can occur through exposures through inhalation and incidental ingestion of radioactive particulates. Operations that could result in potential airborne emissions are confined and controlled through the use of administrative and engineering controls.

The use of appropriate personal protective equipment (PPE) further minimizes the potential for worker exposure to airborne emissions. In addition, MTW implements an aggressive ALARA program to identify additional measures to minimize the exposure of workers to radiation.

Inhalation of contaminated particulates and incidental ingestion of deposited particulates are less likely pathways for plant employees not directly working in ore processing areas. However, exposure to radiation would be possible from the radionuclides deposited on ground surfaces and from airborne radionuclides from gaseous and particulate releases from degraded process equipment and normal effluent pathways.

6.1.2.2 Pathways to the General Public

Radiation exposures to members of the off-site general public are primarily from airborne and waterborne pathways. Figure 6.1-1 provides an illustration of the physical plant layout, with directions and distances from the Feed Materials Building to the following features:

- US Highway 45 - 1185 feet
- Nearest resident - 1850 feet
- Nearest commercial establishment - 2550 feet
- Nearest lodging - 2750 feet
- Nearest hospital - 5020 feet
- Nearest nursing home - 9180 feet
- Nearest Police Station - 9450 feet
- Nearest school - 9850 feet

For locations of liquid and gaseous releases refer to sections 4.4 and 2.1. No cattle grazing is allowed on the property.

Section 3 of this report provides additional information regarding water use for the area. Most surface streams outside the site boundary are used for recreation and for watering livestock. Numerous farm ponds and lakes are found throughout the area. Sections 2, 4.4, and 4.6 of this report provides additional details regarding radioactive discharges to water and air.

The airborne pathways include inhalation of radioactive particulates, external radiation from deposited radionuclides, incidental ingestion of deposited radionuclides, and ingestion of contaminated food products (plants, meat, and dairy products). Plants grown in the area where the emission plume passed could become contaminated by deposition of radionuclides on leaves or ground surfaces. Radionuclides deposited on leaves could subsequently translocate to the edible portions of plants; those deposited on ground surfaces could subsequently be absorbed by plant roots. Livestock and livestock products could become contaminated if the livestock ingest contaminated surface soil and plants.

The waterborne pathways included possible ingestion of surface water and groundwater; possible ingestion of contaminated plant foods, fish, meat, and dairy products. Plant foods and fodder could be contaminated from irrigation with contaminated water, and the livestock and their products could become contaminated if the livestock were fed with contaminated water and ate contaminated fodder.

Each of the above-described pathways is recognized and the MTW monitoring program, described in Section 6.1, ensures that levels remain within regulatory limits.

6.1.3 Locations and Characteristics of Radiation Source and Radioactive Effluent

In addition to the background radiation exposures discussed in Section 3.11.1, Honeywell employees and members of the public in the immediate plant vicinity may be exposed to low levels of radiation and radioactive materials as a result of plant operations. For plant employees, sources of radiation exposure include external exposure resulting from: 1) working in proximity to natural uranium, its daughter products, and other licensed materials in storage and in the plant process; and 2) internal exposures resulting from inhalation or ingestion of process materials. Members of the public in the immediate plant vicinity may be exposed to radiation and radioactive materials as a result of liquid and airborne plant effluents. The resulting occupational and non-occupational doses are controlled to levels that are within regulatory limits and as low as is reasonably achievable. Tables 3.11-1, 3.11-2, 3.11-3, 3.11-4 provide an overview of the current and historical radiation doses of both Honeywell employees and members of the public in the immediate vicinity as a result of Honeywell's operations. Water Resource Impacts are discussed in Section 4.4 and Air Quality Impacts are discussed in Section 4.6 of this report. Principal effluent pathways are continuously monitored or sampled to assure effective plant operations. Refer to table 2.1-3 for a summary of those pathway monitoring results.

6.1.4 Detailed Description of the Monitoring Program

6.1.4.1 Nearest Resident Inhalation Dose

Analytical data collected at the nearest residence sampling station (NR-7) during the most recent four years of operation (2000 - 2003) are shown in Table 6.1-1. These site- specific data are used to calculate the nearest resident inhalation dose in conjunction with dose conversion factors provided from the COMPLY computer code. A one (1) micron particle size is assumed and dose conversion factors from Federal Guidance Report No. 11 are used to calculate the Committed Effective Dose Equivalent (CEDE) from one year of intake for the nearest residence. The dose calculated for the nearest resident is provided in Table 6.1-2.

6.1.4.2 Stack Emissions

MTW's stack emissions from the plant during the four year period have been modeled using EPA's COMPLY computer code to predict the inhalation and ingestion dose at the location of the nearest resident.. The highest committed effective dose equivalent calculated using the COMPLY program was 2.2 mrem in 2002. The COMPLY computer program assumes that 100% of the food source is locally grown; however, the nearest residents do not produce vegetables, meat, or milk for personal consumption, therefore, the inhalation dose is the total dose.

6.1.4.3 Direct Radiation Monitoring

Direct radiation is continuously monitored using environmental TLDs. An environmental TLD is located on the restricted area fence on each side of the plant, one badge is located at the nearest property boundary, one is located at the Metropolis Airport approximately one mile NE of the facility and two are located at the nearest residence. These locations are depicted on Figure 6.1-1. The badges are exchanged quarterly for analysis by a vendor laboratory.

The environmental TLD monitoring results are shown in Tables 6.1-3, 6.1-4, 6.1-5 and 6.1-6, and represent results from the years 2000 through 2003. The highest annual averages of direct gamma radiation occurred at the east and south restricted area fences, due to ore concentrate and waste storage areas immediately adjacent to the monitoring locations. The maximum annual average at the east station during 2000 was 708 mrem, approximately 4.0% of that allowed by 10CFR20.1301(a)(2). Radiation levels at the airport averaged 93 mrem/year during the four year period. Duplicate samples taken at the nearest residence at NR-7 North averaged 91.8 mrem/year during the four year period. The four year average data for the airport and the NR-7 stations is summarized in 6.1-7. The dose measured at the nearest residence is not significantly different from that at the airport, and is within the expected range of natural background radiation.

6.1.4.4 Environmental Air Monitoring

The environmental air monitoring program consists of taking continuous air samples (low volume) at four points along the restricted area fence line (Stations No. 9, 10, 12, and 13). Two samplers are located near the site boundary in the prevailing wind direction (Stations No. 8 and 11). One sampler is located off-site approximately one mile downwind of the Feed Materials building (Station No. 6). An additional continuous air sampler is located at the nearest residence (NR-7). Refer to Figure 2.1-3.

The concentrations of uranium found in environmental air samples during the years 2000 - 2003 are shown in Table 6.1-7. The maximum annual average concentration measured at the fence line during the four year period (stations 9, 10, 12, and 13) was 3.94E-14 μCi/cc at Station 13 during 2001.

The quarterly air sample concentrations of Ra226 and Th230 are shown in Table 6.1-8. The maximum annual average concentration at the restricted area fence line was 8.48E-17 μCi/cc for Ra226 during 2000 and 2.98E-16 μCi/cc for Th230 during 2003. These values represent 0.01% and 1.49% of the 10CFR20 release limits, respectively (Code of Federal Regulations Ref Table 2 of 10CFR20, Appendix B).

6.1.4.5 Wastewater Monitoring

Wastewater treatment, deposition, and analytical data are discussed in Sections 2.1, 3.12.4, 4.14.1, and Section 5.0 A flow diagram showing liquid waste streams and their disposition is given in Figure 2.1-2. Compliance with applicable effluent release limits and water quality criteria is determined by sampling the plant effluent discharge and the Ohio River, which is the receiving stream for plant effluents.

The analytical data for wastewater is provided in the following Tables included in this report.

2.1-7	Summary of Effluent and Environmental Monitoring Programs
2.1-9	Environmental Air Monitoring for Ra-226 and Th-230
2.1-11	Annual Average Concentrations of U & F In Sediment And Surface Water Samples - 2000 to 2003
2.1-12	Annual Average Concentration of U & F Outfall 002 - 2000 to 2003
3.4-1	NPDES Monitoring Data - Outfall 002
3.4-2	Surface Water Withdrawal
3.4-3	NPDES Monitoring Data Outfall 002 5-day BOD
3.4-4	NPDES Excursions

Using data from Table 3.4-1, the average discharge rate for the plant effluent during the five-year period from 2000-2004 was approximately 3.40 million gallons per day (MGD) or about 5.1 cubic feet per second (CFS). The effluent discharges into a natural watercourse, which also carries run-off during periods of heavy precipitation. The effluent travels about 2,000 feet across Honeywell property before it enters the Ohio River. The quantity of effluent discharged into the river (5.3 CFS) is insignificant compared to the 75-year average flow (1929-2003) of the Ohio River of 277,614 CFS (USGS 2003). Moreover, this discharge would comprise only 0.04% of the river's lowest flow on record (15,000 CFS) and 0.01% of the normal drought condition. Under these conditions, the contaminants discharged would not be expected to be detectable after mixing with the river and should have no significant environmental impact.

6.1.4.6 Environmental Water and Mud Sampling

Environmental water and mud samples are taken semi-annually from four locations on the Ohio River and at three area lakes and ponds. These samples are analyzed for uranium content to determine any potential impact of plant operation. Refer to Figure 2.1-4 for location of water, mud, soil, and vegetation sampling locations. The four year average at Joppa measurement site is lower than the current standard.

Environmental water samples collected from the Ohio River during the most recent four year period of plant operation are shown in Table 6.1-9. During the most recent four year period, the river concentration of uranium upstream of the plant discharge (Brookport Dam) averaged 0.004 PPM uranium with the highest Annual Average occurring in 2000 at 0.011 PPM uranium. Downstream concentrations at Joppa, Illinois averaged 0.019 PPM uranium with the highest Annual Average during the 2000 to 2003 period occurring in 2001 at 0.057 PPM uranium. Joppa is the nearest downstream municipality that could (but does not) use river water for drinking purposes. On December 7, 2000 (65 FR 76708), EPA published a final Radionuclides Rule in the Federal Register that included a MCL of 30 micrograms per liter (30 μg/L or 0.03 PPM)) for uranium that took effect in December 2003 and is the current EPA drinking water standard for uranium. The four year average at Joppa measurement site is lower than the current standard.

Analysis of mud samples (bottom sediment) for uranium (see Table 6.1-10 indicate there is some deposition of uranium in river sediment at the point of effluent discharge into the river. With the exception of the area around the plant effluent discharge point, results for uranium appear uniform for all sampling stations. There are no established standards for uranium in stream sediments; however, the off-site concentrations fall within the concentration range of many naturally occurring materials, e.g., Florida phosphate rock contains up to 200 PPM U.

Sediment samples are also collected semi-annually from the effluent ditch at points 700 feet and 1400 feet downstream of the plant effluent sampling station. These samples have been analyzed for uranium since 1985. Analytical results from the most recent four year period are shown in Table 6.1-11.

6.1.4.7 Environmental Soil and Vegetation Samples

Additional environmental soil and vegetation samples are also collected semi-annually. Six sample stations are located on-site at the same location of the low volume air samplers. Seven additional stations are located off-site in the surrounding areas of Illinois and Kentucky covering a radius of about eight miles from the plant. Refer to Figure 2.1-3 and 2.1-4 respectively, for location of on-site and off-site stations. Each sample is analyzed for uranium content.

Table 6.1-12 shows the results for uranium in soil during the years 2000 - 2003. The four-year off-site average concentration of uranium in soil is 1.77 PPM. Most values fall in the range of 0.49 - 4.53 PPM U during the period.

Table 6.1-13 provides concentrations of uranium in vegetation for the years 2000 to 2003. The off-site concentrations (Stations No. A through No. G) averaged 2.92 PPM "U" during the four year period. The on-site concentrations are moderately higher than off-site;

however, these areas are inside the MTW property boundary and under licensee control.

Table 6.1-1 Nearest Residence Air Sampling Data

YEAR	CONCENTRATION			PARTICLE SIZE	SOLUBILITY FRACTION		
	U(nat) µCi/cc	Ra226 µCi/cc	Th230 µCi/cc	AMAD	"D"	"W"	"Y"
1st Qtr. 2000	2.09e-14	2.75e-16	1.62e-17	1	0.716	0.284	
2nd Qtr. 2000	2.84e-14	1.65e-17	3.96e-16	1	0.752	0.248	
3rd Qtr. 2000	1.04E-14	1.62E-17	1.62E-17	1	0.608	0.392	
4th Qtr. 2000	9.50E-15	1.88E-17	1.88E-17	1	0.434	0.569	
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

Table 6.1-2 Nearest Residence Dose

YEAR	COMPLY EDE mrem(1)
2000	0.70
2001	0.70
2002	2.20
2003	1.60
(1) Effective Dose Equivalent (Inhalation + Ingestion)	

Table 6.1-3 Environmental Gamma Dose Measurements Annual Dose (mrem)

Yr 2000							
Location	TLD #	Detection	1st	2nd	3rd	4th	Average
			Quarter	Quarter	Quarter	Quarter	mrem
Control		ENV TLD	96	96	96	72	90
North Fence	9001	ENV TLD	168	172	168	156	166
East Fence	9002	ENV TLD	756	652	684	740	708
South Fence	9003	ENV TLD	236	216	204	196	213
West Fence	9004	ENV TLD	120	112	124	100	114
North Boundary	9005	ENV TLD	124	112	124	112	118
Airport	9006	ENV TLD	108	84	92	80	91
NR-7 A North	9007	ENV TLD	92	92	100	84	92
NR-7 South	9008	ENV TLD	100	84	92	80	89

*Annual Dose Rate in mrem determined from vendor's mrem/quarter x 4 quarters
No exposure control have been subtracted, and only element, reader, and fade corrections have been made.

Table 6.1-4 Environmental Gamma Dose Measurements Annual Dose (mrem)

Yr 2001							
Location	TLD #	Detection	1st	2nd	3rd	4th	Average
			Quarter	Quarter	Quarter	Quarter	mrem
Control		ENV TLD	84	84	92	76	84
North Fence	9001	ENV TLD	160	160	164	148	158
East Fence	9002	ENV TLD	684	656	544	528	603
South Fence	9003	ENV TLD	200	260	412	468	335
West Fence	9004	ENV TLD	112	108	108	100	107
North Boundary	9005	ENV TLD	112	116	116	112	114
Airport	9006	ENV TLD	96	88	88	92	91
NR-7 A North	9007	ENV TLD	92	88	84	80	86
NR-7 South	9008	ENV TLD	96	84	84	84	87

*Annual Dose Rate in mrem determined from vendor's mrem/quarter x 4 quarters
No exposure control have been subtracted, and only element, reader, and fade corrections have been made.

Table 6.1-5 Environmental Gamma Dose Measurements Annual Dose (mrem)

Yr 2002							
Location	TLD #	Detection	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Average mrem
Control		ENV TLD	88	136	92	88	101
North Fence	9001	ENV TLD	200	164	180	184	182
East Fence	9002	ENV TLD	496	352	328	324	375
South Fence	9003	ENV TLD	568	496	520	536	530
West Fence	9004	ENV TLD	128	116	120	116	120
North Boundary	9005	ENV TLD	144	124	128	128	131
Airport	9006	ENV TLD	108	92	92	96	97
NR-7 A North	9007	ENV TLD	116	80	96	96	97
NR-7 South	9008	ENV TLD	108	84	84	100	94

*Annual Dose Rate in mrem determined from vendor's mrem/quarter x 4 quarters

No exposure control have been subtracted, and only element, reader, and fade corrections have been made.

Table 6.1-6 Environmental Gamma Dose Measurements Annual Dose (mrem)

Yr 2003							
Location	TLD #	Detection	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Average mrem
Control		ENV TLD	84	92	92	76	86
North Fence	9001	ENV TLD	180	168	180	168	174
East Fence	9002	ENV TLD	304	264	312	296	294
South Fence	9003	ENV TLD	584	552	560	576	568
West Fence	9004	ENV TLD	124	112	116	100	113
North Boundary	9005	ENV TLD	128	124	128	124	126
Airport	9006	ENV TLD	100	88	96	88	93
NR-7 A North	9007	ENV TLD	104	96	92	80	93
NR-7 South	9008	ENV TLD	92	96	88	76	88

*Annual Dose Rate in mrem determined from vendor's mrem/quarter x 4 quarters

No exposure control have been subtracted, and only element, reader, and fade corrections have been made.

Table 6.1-7 Environmental Gamma Dose Measurements - 2000 to 2003 Average Annual Dose (mrem)

Airport and NR-7							
Location	TLD #	Detection	1st	2nd	3rd	4th	Average
			Quarter	Quarter	Quarter	Quarter	mrem
Airport-2000	9006	ENV TLD	108	84	92	80	91
Airport-2001	9006	ENV TLD	96	88	88	92	91
Airport-2002	9006	ENV TLD	108	92	92	96	97
Airport-2003	9006	ENV TLD	100	88	96	88	93
Airport 2000-2003 Average Annual Dose							93
Location	TLD #	Detection	1st	2nd	3rd	4th	Average
			Quarter	Quarter	Quarter	Quarter	mrem
NR-7 A North-2000	9007	ENV TLD	92	92	100	84	92
NR-7 A North-2001	9007	ENV TLD	92	88	84	80	86
NR-7 A North-2002	9007	ENV TLD	116	80	96	96	97
NR-7 A North-2003	9007	ENV TLD	92	92	100	84	92
NR-7 A North 2000-2003 Average Annual Dose							91.8
Control-2000		ENV TLD	96	96	96	72	90
Control-2001		ENV TLD	84	84	92	76	84
Control-2002		ENV TLD	88	136	92	88	101
Control-2003		ENV TLD	84	92	92	76	86
Control 2000-2003 Average Annual Dose							90.3
*Annual Dose Rate in mrem determined from vendor's mrem/quarter x 4 quarters No exposure control have been subtracted, and only element, reader, and fade corrections have been made.							

Table 6.1-8 Environmental Air Monitoring

Ra226 and Th230 (μCi/cc) Annual Average														
SAMPLE STATION NUMBER														
YEAR	6		8		9		10		11		12		13	
	Ra226	Th230	Ra226	Th230	Ra226	Th230	Ra226	Th230	Ra226	Th230	Ra226	Th230	Ra226	Th230
2000	3.83E-18	9.22E-18	8.48E-17	2.08E-17	3.82E-18	4.17E-17	1.24E-17	1.07E-16	6.69E-18	3.12E-17	7.64E-18	7.81E-17	5.74E-18	7.72E-17
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
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
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

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

Table 6.1-9 Environmental Surface Water Samples

Uranium & Fluoride (PPM) Annual Average														
SAMPLE STATION NUMBER														
YEAR	(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
2000	0.005	0.89	0.007	0.64	0.145	4.95	0.011	0.66	0.013	0.59	0.016	0.63	0.008	0.71
2001	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	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
2003	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

*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

Table 6.1-10 Environmental Mud Samples

Uranium & Fluoride (PPM) Annual Average														
SAMPLE STATION NUMBER														
YEAR	(A) Lamb Farm*		(B) TVA (1)		(C) Plant Site Outflow (2)		(D) Brookport Dam (3)		(E) Joppa PowerPlant (4)		(F) Lindsay Lake		(G) Oak Glenn Lake	
	U	F	U	F	U	F	U	F	U	F	U	F	U	F
2000	1.99	5.85	1.07	16.83	4.30	81.34	0.73	21.13	0.88	23.0	1.79	7.65	0.93	15.16
2001	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
2002	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
2003	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

*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

Table 6.1-11 Environmental Mud Samples Effluent Ditch

Uranium & Fluoride (PPM) Annual Average										
LOCATION	2000		2001		2002		2003		4 YEAR AVERAGE	
	U	F	U	F	U	F	U	F	U	F
700 Ft.	3.88	75.78	19.17	235.06	8.09	72.34	4.26	24.95	8.85	102.03
1400 Ft.	192.5	2276.9	112.79	9229.62	173.43	11899.81	200.42	9083.05	169.79	8122.35

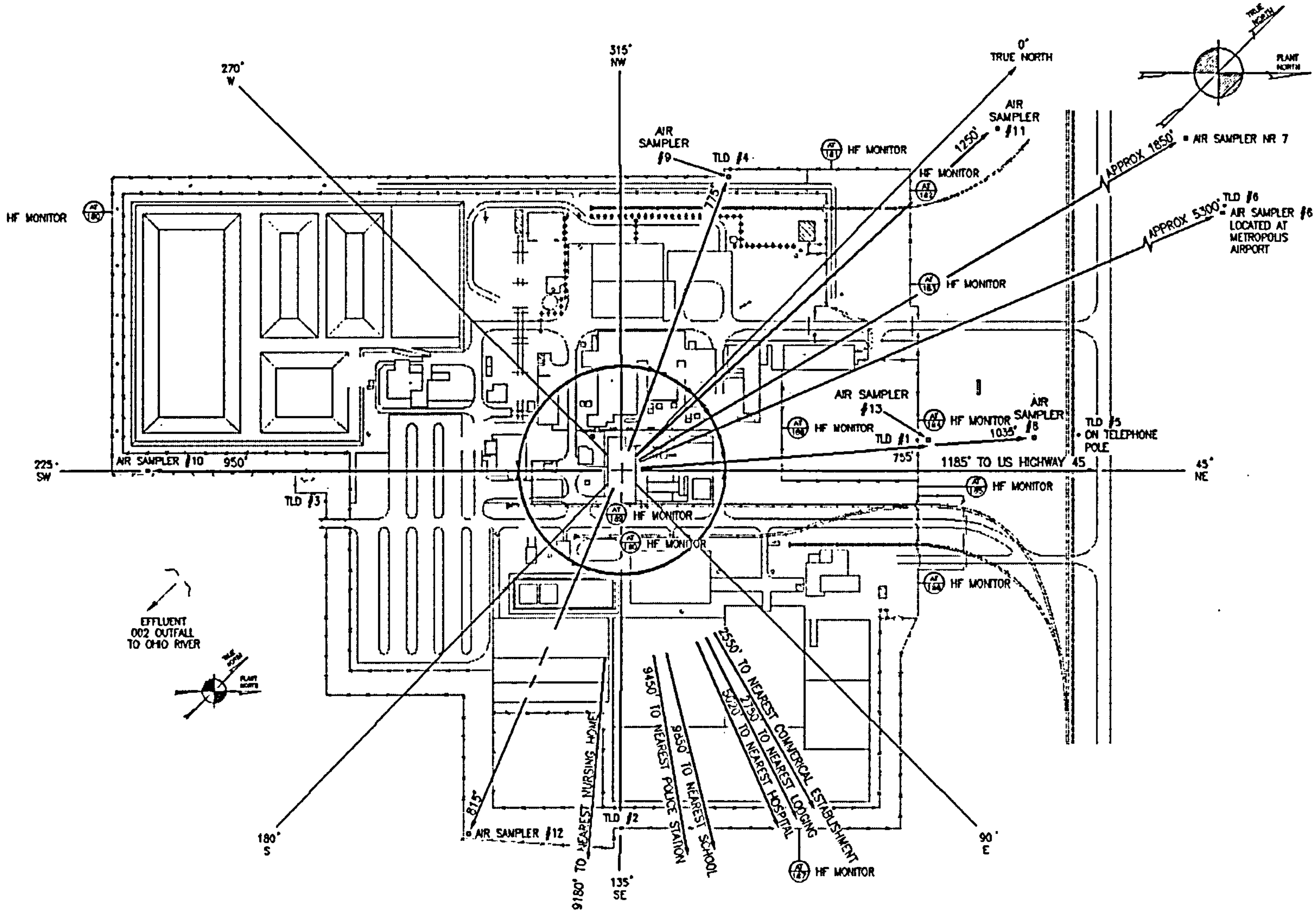
Table 6.1-12 Environmental Soil Samples

Uranium & Fluoride (PPM) Annual Average										
LOCATION	2000		2001		2002		2003		4 Year Average	
	3.	F	U	F	U	F	U	F	U	F
(A) Lamb Farm*	1.94	12.56	1.52	6.1	2.36	27.92	1.38	4.41	1.8	12.75
(B) Brubaker Farm	1.65	8.34	2.61	4.55	3.08	13.40	0.66	3.74	2.0	7.51
(C) Texaco Station	1.82	26.39	2.42	4.76	2.24	11.28	0.65	3.44	1.78	11.47
(D) IL Power Equip Station	1.56	8.67	1.77	4.90	4.53	25.43	1.17	3.83	2.26	10.71
(E) Reiniking Property	1.81	28.43	1.43	5.21	1.19	10.82	0.90	3.42	1.33	11.97
(F) Metropolis Airport	3.42	16.02	1.33	4.78	3.61	10.26	0.90	3.03	2.31	8.52
(G) Maple Grove School	1.06	11.15	1.23	4.77	0.80	10.38	0.49	2.91	0.90	7.30
#8 NE Feed Mat'l. Bldg.	17.79	18.92	16.78	11.44	14.45	11.74	11.22	3.65	15.06	11.44
#9 W Feed Mat'l. Bldg.	15.55	17.46	12.1	7.76	14.45	12.30	5.05	4.42	11.79	10.49
#10 S Feed Mat'l. Bldg.	14.80	39.12	10.11	11.32	40.64	14.41	3.23	3.95	17.20	17.20
#11 N Feed Mat'l. Bldg.	24.83	12.63	30.01	7.1	12.06	13.33	12.56	3.94	19.87	9.25
#12 E Feed Mat'l. Bldg.	4.77	14.01	13.20	15.89	12.38	10.72	3.75	3.84	8.53	11.12
#13 NE Feed Mat'l. Bldg.	74.91	30.69	86.46	15.58	18.86	17.32	33.29	7.15	53.38	17.69
(A) – (G) Offsite Avg.	1.89	15.94	1.76	5.01	2.54	15.64	0.88	3.54	1.77	10.03
(8) – (13) On Site Avg.	25.44	22.14	28.11	11.52	18.81	13.30	11.52	4.49	20.97	12.86

Table 6.1-13 Environmental Vegetation Samples

Uranium & Fluoride (PPM) Annual Average										
LOCATION	2000		2001		2002		2003		4 Year Average	
	U	F	U	F	U	F	U	F	U	F
(A) Lamb Farm*	6.31	23	10.60	22.87	1.66	35.84	1.24	26.69	4.95	27.1
(B) Brubaker Farm	6.75	10.8	14.69	22.33	1.61	31.26	0.63	23.67	5.92	22.02
(C) Texaco Station	3.22	10.45	1.63	22.65	2.11	35.26	1.86	21.96	2.21	22.58
(D) IL Power Equip Station	2.22	8.45	5.91	22.46	2.06	28.36	0.75	19.92	2.74	19.80
(E) Reiniking Property	1.75	24.65	7.98	40.79	1.06	33.5	0.83	22	2.91	30.24
(F) Metropolis Airport	1.25	13.55	0.80	20.67	1.09	42.88	0.58	20.60	0.93	24.43
(G) Maple Grove School	0.93	14.85	0.58	22.34	0.73	28.79	1.01	21.39	0.81	21.84
#8 NE Feed Mat'l. Bldg.	2.13	20.9	4.76	60.02	3.26	157.79	2.09	29.23	3.06	66.99
#9 W Feed Mat'l. Bldg.	2.54	30	2.97	54.49	5.47	53.22	0.90	27.79	2.97	41.38
#10 S Feed Mat'l. Bldg.	6.18	124.3	8.83	152.82	14.56	92.39	1.17	41.18	7.69	102.67
#11 N Feed Mat'l. Bldg.	8.69	34.15	11.02	48.70	1.94	111.5	1.33	29.71	5.75	56.02
#12 E Feed Mat'l. Bldg.	4.59	24.05	5.78	32.72	4.91	45.24	3.58	28.10	4.72	32.53
#13 NE Feed Mat'l. Bldg.	15.95	62.65	7.23	106.14	2.52	234.2	3.47	45.06	7.29	112.01
(A) - (G) Offsite Avg.	3.20	15.11	6.03	24.87	1.47	33.70	0.99	22.32	2.92	24
(8) - (13) On Site Avg.	6.68	49.34	6.77	75.82	5.44	115.72	2.09	33.51	5.25	68.60

Figure 6.1-1 Sampling Station



6.2 Physiochemical Monitoring

Monitoring programs at MTW's facility are comprised of effluent monitoring of air and water and environmental monitoring of air, surface water, soil, and vegetation. The programs are described in Section 2.1.1.3.

6.3 Ecological Monitoring

MTW's environmental monitoring programs at the Metropolis facility are composed of monitoring the effluents emitted from the facilities and the monitoring of various environmental media including air, surface water, soil, vegetation and direct gamma radiation. The monitoring program and a summary of results for the time period of 2000 to 2004 are described in Section 2.1.2.3.

MTW would continue the existing monitoring programs following license renewal. No new programs are planned.

7.0 Cost Benefit Analysis

UF_6 conversion at Honeywell's Metropolis facility has occurred successfully since 1958 with no major accidents or catastrophic impacts to the environment. Although no quantitative cost/benefit analysis has been completed, the following considerations lead to a conclusion that the benefits of renewing the operating license would far outweigh the cost of denying renewal:

- MTW manufactures fluorinated chemicals in addition to UF_6 at the Metropolis facility. Thus, the capital and maintenance costs for the facility are not the sole responsibility of the government.

- The President's energy policy emphasizes the need for construction of new nuclear power plants to meet the future energy needs of the country. This would result in an increased demand for enriched uranium to fuel existing and new reactors.

- MTW's facility is the only facility in the United States producing the feed material for uranium enrichment.

- Procuring UF_6 from foreign sources would not contribute to the President's goal of reducing the country's dependence on imported energy.

- Non-renewal of the license would result in the need to construct a new facility for production of UF_6 elsewhere. The capital costs of constructing a new facility in the United States would be greater than the continued maintenance cost of the existing plant and the capital cost of any future upgrades or improvements.

- The environmental impacts on air, water, soil, and biota associated with continued operation of MTW's plant are negligible. Therefore, impacts associated with the construction of a new facility elsewhere would be greater than those associated with continued operation of the existing plant.

The socioeconomic benefits of MTW's plant to the local area including job opportunities and tax revenue are important. The socioeconomic costs with respect to noise, traffic congestion, public health and safety, use of public works and facilities, and other land use conflicts are minor. Like environmental impacts, the socioeconomic costs associated with new construction elsewhere would be far greater than continuing operation at MTW's facility.

8.0 Summary of Environmental Consequences

8.1 Unavoidable Adverse Environmental Impacts

Unavoidable adverse environmental impacts are those that remain after all practical means to avoid or mitigate the impact have been taken. The action discussed in this ER is re-issuance of a license allowing continued operation of the MTW facility. The action includes no new development or other land disturbing activities outside the boundary of the existing security fence. No land or aquatic features of the natural environment occur within the fence because of previous construction. There are no adverse impacts to mitigate or avoid and, accordingly, no unavoidable impacts on the natural environment.

8.2 Irreversible and Irretrievable Commitment of Resources

There will be no significant irreversible and irretrievable commitment of either environmental or material resources due to license renewal because there will be no significant new construction or physical enlargement of the existing MTW facility. There are plans for improvements such as a cooling tower, which should reduce environmental impacts of the facility.

8.3 Relationship Between Short Term Uses and Long Term Productivity of the Human Environment

Short-term use generally refers to the time between the start of construction of a facility and the end of its useful life as an operating plant. Long-term use generally refers to the period after abandonment and decommissioning.

Operation of an industrial facility at the MTW site began in 1958. Re-issuance of the license in this proceeding is totally consistent with the intended short-term use of the site as a nuclear fuel processor. Re-issuance would further extend the short-term preemption of the site from other uses. However, the overall economic and societal benefits of nuclear fuel conversion are considerable. They are undoubtedly greater than those that could now be derived from other likely uses of the property in forestry or agriculture during this period.

As stated elsewhere, the MTW plant is the only one of its type operating in the United States today. Should the plant be closed and scheduled for decommissioning, another would have to be built to take its place so that production of fuel elements for the commercial nuclear power industry would proceed uninterrupted. Because of its importance to the industry, it is not anticipated that the plant will cease operating at any time in the foreseeable future.

Continuing the current short-term use of the land does not in the long-term preclude other uses once the existing facility realizes its useful life. Therefore, there exists no conflict. Alternate long-term use could be facilitated after future decommissioning by either selectively or totally removing structures and appurtenant facilities now on the site or converting them to meet the need posed by other operations that might choose to locate there.

9.0 List of References

AlliedSignal, Inc. AlliedSignal, Inc. Application for Renewal of Source Materials License SUB-526, Docket 40-3392, UF_6 Conversion Plant, Metropolis, Illinois. April 1990, July 1994, and September 1994.

AlliedSignal. AlliedSignal Responses to NRC Environmental Questions Dated June 23, 1994 in Docket No. 40-3392. AlliedSignal, P.O. Box 430, Metropolis, IL 62960. 1994

Andrews Environmental Engineering. RCRA Groundwater Investigation Timeline/Summary. April 2005.

Anderson, J.R., E.E. Hardy, J.T. Roach and R.E. Witmer. A Land Use and Land Cover Classification System for Use with Remote Sensor Data. Geological Survey Professional Paper 964, U.S. GPO Washington, DC. 1976

ASHRAE (American Society of Heating Refrigeration and Air-Conditioning Engineers) ASHRAE Fundamentals Handbook. 2001.

Bailey, R.G., 1994. "Forest Ecoregions of the Eastern United States." Intermountain Region, USDA Forest Service Ogden, Utah. Reprinted in 1980 by the Forest Service, Washington, DD, as Miscellaneous Publication No. 1391 and revised 1994.

Code of Federal Regulations - 10CFR20, Appendix B - Annual Limits on Intake (ALI's) and Derived Air Concentrations (DAC's) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage.

Concannon, Peggy R. Climatological Risk Of Strong And Violent Tornadoes In The United States. NOAA/ERL/National Severe Storms Laboratory, Second Conference on Environmental Applications, American Meteorological Society, Long Beach, California, 8-12 January 2000. Paper 9.4.

Conner, Glen. Kentucky State Meteorologist. *Kentucky Climate Center Fact Sheet*. available at http://kyclim.wku.edu/factsheets/hdd/. August 1998.

Cowardin, L.M., V. Carter, and E.T. LaRoe. "Classification of Wetlands and Deepwater Habitats of the United States." U.S. Department of the Interior, Fish and Wildlife Service, Washington, DC, 1979.

Dodge, Darrin. "Requested Information." E-mail to Tim Basham. 3 May 2005.

ESIS, Inc. Industrial Hygiene Assessment Report. January 2005

Federal Highway Administration. FHWA (Federal Highway Administration). Procedures for Abatement of Highway Traffic Noise and Construction Noise. Title 23 of the Code of Federal Regulations, Part 772 (23 CFR 772). 1997.

Hansen, E.M., et al National Weather Service (NWS). National Oceanic and Atmospheric Administration (NOAA) Hydrometeorological Report (HMR) No. 52, Application of Probable Maximum Precipitation Estimates—United States East of the 105th Meridian. 1982.

Herring, C. The Growing Diversity Of The Illinois Population, 1990-2020 (pdf) Urbana, IL: Institute of Government and Public Affairs. Online: http://www.igpa.uillinois.edu/publications/critIssues/diversity.pdf.

Ho, Francis P. and Reidel, John T. National Weather Service (NWS). National Oceanic and Atmospheric Administration (NOAA) Hydrometeorological Report (HMR) No. 53, Season Variation of 10-mi^2 PMP Estimates, US East of the 105th Meridian. 1980.

Honeywell. Mutual Assistance Agreement. 1 June 2004

Honeywell. Mutual Assistance Agreement. Letter of Agreement 27 May 2003

Honeywell. NPDES Monitoring Data for 2000-2005. May 2005.

Honeywell Specialty Chemicals. RMP 5-Year Update. 17 June 2004.

Illinois. Department of Natural Resources. 2004-2005 Season Dates and Limits Information. Illinois: Department of Natural Resources, 2004.

Illinois. Department of Natural Resources. 2005 Illinois Fishing Information. Illinois: Department of Natural Resources, 2005.

Illinois. Department of Natural Resources. Illinois Comprehensive Wildlife Conservation Plan, Conservation Maps: Natural Divisions of Illinois. Illinois: Department of Natural Resources, n.d.

Illinois. Endangered Species Protection Board. 2004 Endangered and Threatened Species List. 2004.

Illinois. Environmental Protection Agency. Bureau of Air. Illinois Annual Air Quality Report 2003: Illinois.

Illinois. Environmental Protection Agency. Bureau of Air. Title V - Clean Air Act Permit Program (CAAPP) Permit and Title I Permit, 2003: Permit Number 127854AAD issued to Honeywell International Inc. Illinois. 14 July 2003

Illinois. Environmental Protection Agency. Consumer Confidence Report. Online. April 2005. <http://epadata.epa.state.il.us/water/bowccr/ccrselect.aspx>.

Illinois. Environmental Protection Agency. Information on the Ohio River in Massac County, IL near the town of Metropolis. Section 303(d), IEPA document IEPA/BOW/04-005. Illinois: November 2004.

Illinois. Illinois Historic Preservation Agency. Historic Sites Maps. Online. <http://www.illinoishistory.gov/hs/historicsites.htm>.

IPCC (Intergovernmental Panel on Climate Change) 3rd Assessment, *Climate Change 2001: The Scientific Basis*, UNEP and World Meteorologists Organization Report, summary available at http://www.ipcc.ch/pub/wg1TARtechsum.pdf

Kentucky, Commonwealth of. Department of Employment Services. Workforce Kentucky. Online. 2003 data. 5 May 2005.

Kentucky, Commonwealth of. Department of Employment Services. Workforce Kentucky. Work Force Statistics (Local Area Unemployment Statistics-Unemployment Rates). Online <http://www.workforcekentucky.ky.gov/cgi/dataanalysis/labForceReport.asp?menuchoice=LABFORCE>. 5 May 2005.

Kentucky, Commonwealth of. Department of Environmental Protection. Division for Air Quality. Kentucky Ambient Air Quality Annual Report 2003: Kentucky.

Kentucky. Department for Environmental Protection. Division for Air Quality. 401 KAR 53:010. "Ambient Air Quality Standards. April 14 1988

"Kentucky State Data Center & Kentucky Population Research" Population Projections for Kentucky Counties. Home Page. University of Louisville . 6 May 2005 <http://ksdc.louisville.edu/kpr/pro/hmk2004_summarytable.xls>.

"Kentucky State Data Center & Kentucky Population Research" Population Projections for Kentucky Counties Methodology & Assumptions. Home Page. University of Louisville . 6 May 2005 <http://ksdc.louisville.edu/kpr/pro/hmk2004_methodology.doc>.

Kuchler, A.W. Potential Natural Vegetation of the Conterminous United States. Special Publication No. 36, New York: American Geographical Society. 1964.

LaGarde, Lew. "Updated Date for Metropolis" e-mail with attachments to Tim Basham. 29 April 2005

Mays, Darren. "Emergency Aid Agreements-2004" e-mail to Darrin Dodge, John Corn, Jim Milhoan, John Riley, Lew LaGarde, Michael Ginzel, Robert Davis, Tim Basham. 3 May 2005.

Mays, Darren. "Forward from Terry Williams: Census Information about Metropolis Employees". E-mail to Darrin Dodge, John Corn, Jim Milhoan, John Riley, Lew LaGarde, Michael Ginzel, Robert Davis, Tim Basham. 3 May 2005.

Metropolis. Illinois City Profile 2005. Online. <http://www.city-data.com/city/Metropolis-Illinois,html>.

McNeill, Jane. Massac County Memorial Hospital, Metropolis, IL. Telephone interview. 6 May 2005.

"National Register Information System". Index by State County" Home Page. ParkNet National Park Service. 30 April 2005 www.nr.nps.gov.

National Climatic Data Center (NCDC). Data for Paducah National Weather Station, 1997 - 2004. Both the daily summaries and the hourly reports are utilized.

National Climatic Data Center (NCDC). US Local and Storm Events Data, available online at http://www.ncdc.noaa.gov/oa/climate/severeweather/extremes.html.

Nelson, W. John. Personal interview (ISGS). Site specific discussion related to findings within Joppa Quadrangle, west of Metropolis Quadrangle. 4 May 2005.

Nelson, W. John. Quaternary Faulting in the New Madrid Seismic Zone in Southernmost Illinois USGS Award No: 1434-95-G-2525 Annual Project Summary. 2000.

Nelson, W. John, Leon R. Follmer, and John M. Masters. Surficial Geology Map. Metropolis Quadrangle, Massac County, Illinois. Illinois Geological Quadrangle Map, IGQ Metropolis-SG, 1:24000 (2 sheets) 2002.

"NewCrop." Level III Ecoregions of Illinois. Home page. Purdue University. 3 May 2005 <http://www.hort.purdue.edu/newcrop/cropmap/illinois/maps/Ileco3.html.

NLSI (National Lightning Safety Institute). Reference Information 6.17, 2005, Available at http://www.lightningsafety.com/nlsi_info.html.

Oakley, D.T. Natural Radiation Exposure in the United States. U.S. Environmental Protection Agency, Report No. ORPISID-72-1. 1972.

ORSANCO. (Ohio River Valley Water Sanitation Commission). 2004 Biennial Assessment of Ohio River Water Quality Conditions. June 2004.

Paducah. Kentucky. City Profile 2005. Online. <http://www.city-data.com/city/Paducah-Kentucky.html>.

Schreiner, Louis C. and Reidel, John T. National Weather Service. HMR 51, Probable Maximum Precipitation Estimates, US East of the 105th Meridian. 1978

SEI/ASCE 7-02. "Design Loads for Buildings and Other Structures". 2002

Singh, Krishan P., Ganapathi S. Ramamurthy, and Il Won Seo. 7-day 10-year Low Flows of Streams in the Kankakee, Sangamon, Embarras, Little Wabash, and Southern Regions. Illinois State Water Survey, Champaign, IL. 1988.

United States. Army Corps of Engineers. Draft Environmental Impact Statement for Commercial Sand and Gravel Dredging Operations: Ohio River Mile 438.0 to Mile 981.0. U.S. Army Corps of Engineers, Army Engineering District: Louisville, KY.

United States. Army Corp of Engineers ERDC/CRREL (Engineer Research and Development Center/Cold Regions Research and Engineering Laboratory) TN-04-3, Method to Predict Ice Thickness Based on Meteorological Data. June 2004.

United States. Census Bureau. "Census Summary File 1 (SF 1) 100-Percent Data". FactFinder. Online. Citing the Census. Google. 5 May 2005.

United States. Census Bureau. "DP-3. Labor Force Status and Employment Characteristics: 1990—1990 Summary Tape File 3 (STF 3)-Sample Data". FactFinder. Online. Citing the Census. Google. 5 May 2005.

United States. Census Bureau. "DP-3. Profile of Selected Economic Characteristics: 2000—Census 2000 Summary File 3 (3SF 3)-Sample Data". FactFinder. Online. Citing the Census. Google. 5 May 2005.

United States. Department of Agriculture. Massac County Soil Survey. USDA 1975

United States. Department of Commerce. Economics and Statistics Administration. U.S. Census Bureau. Poverty: 1999, Census 2000 Brief. May 2003.

United States. Department of Commerce. 1987 Census of Agriculture AC87-A-A13, Vol. 1., Geographic Area Series, Part 13, Illinois State and County Data." U.S. Department of Commerce, Bureau of the Census, Washington, DC. n.d.

United States. Department of Energy. Final Environmental Impact Statement For Construction And Operation Of A Depleted Uranium Hexafluoride Conversion Facility At The Paducah, Kentucky, Site. DOE/EIS - 0359. June 2004

United States. Department of Transportation. Federal Highway Administration. Federal-Aid Policy Guide, October 16, 1997, Transmittal 19. Subchapter H-Right-of-Way and Environment. Online. <http://www.fhwa.dot.gov/legsregs/directives/fapg/cfr0772.htm>. 7 May 2005

United States. Environmental Protection Agency. Envirofacts data on water discharge permits. Home Page. EPA 5 May 2005.

United States. Environmental Protection Agency. Safe Drinking Water Information System. Home Page. EPA 4 May 2005.

United States. Environmental Protection Agency. Primary Distinguishing Characteristics of Level III Ecoregions of the Continental United States. National Health and Environmental Effects Research Laboratory. Washington, DC. April 2000.

United States. Environmental Protection Agency. www.epa.gov/storet/dbtop.html. Samples collected by ORSANCO. May 2005.

United States. Federal Emergency Management Agency. Map Number 1704670075B, 5 July 1983.

United States. Fish and Wildlife Service. County Distribution of Federally Listed Species in Illinois. Rock Island, IL, January 2005.

United States. Geological Survey. Calendar Year Streamflow Statistics for Illinois, USGS 03611500 Ohio River at Metropolis, IL. May 2005 http://nwis.waterdata.usgs.gov/il/nwis.

United States. Geological Survey. "Estimated Use of Water in the United States in 2000" USGS Circular 1268 released March 2004. Revised April 2004, May 2004, February 2005.

United States. Geological Survey. Topographic Map - Joppa, Illinois and Kentucky, 7.5 minute quadrangle, 1982.

United States Historical Climatology Network. data available at http://www.ncdc.noaa.gov/oa/climate/research/ushcn/ushcn.html.

United States. National Council on Radiation Protection and Measurements. Exposure of the Population in the United States and Canada from Natural Background Radiation. NRCP Report No. 94, Bethesda, Maryland. 1987.

United States. Nuclear Regulatory Commission. Office of Fuel Cycle Safety and Safeguards. Environmental Assessment for Renewal of Source Material License, SUB-526, Docket 40-3392, AlliedSignal, Inc., Metropolis, Illinois. U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, 11 May 1995.

United States. Nuclear Regulatory Commission. Final Environmental Impact Statement on the Transportation of Radioactive Material by Air and Other Modes NUREG-0710. Vol. 1, U.S. NRC, Washington, DC. 1977

United States. Nuclear Regulatory Commission. Office of Fuel Cycle Safety and Safeguards. Environmental Assessment for Renewal of Source Material License. (SUB-526, Docket 40-3392) AlliedSignal, Inc. Metropolis, Illinois. Washington, DC, 11 May 1995.

United States. Nuclear Regulatory Commission. Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material. April 1993

United States. Nuclear Regulatory Commission. Office of Nuclear Material Safety and Safeguards Nureg-1748: Environmental Review Guidance for Licensing Actions Associated with NMSS Programs, Final Report. Washington, DC, August 2003.

United States. Nuclear Regulatory Commission. http://www.nrc.gov/what-we-do/radiation/sources.html#member

Voight, J.W. and R.H. Mohlenbrock. Plant Communities of Southern Illinois. Carbondale: Southern Illinois University Press, 1959.

Weston. Surface Impoundments Retrofitting Exemption Application for Allied Corporation Metropolis Works, Illinois. November 7 1986

Wilks, Daniel. *Statistical Methods in the Atmospheric Sciences:* Academic Press, 1995

"Workforce Information Center". Massac County, Illinois-2004. Labor Force Information. Online. http://wic.ilworkinfo.com. 5 May 2005.

Zurich Services Corp. "Industrial Hygiene Service Report for Honeywell International, Inc." February 2004

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