MAY 2 8 1985

Safety Evaluation Report

By The

Division of Fuel Cycle and Material Safety

Related to the

NRC Source Material License Renewal

for

Allied Corporation

UF_6 Conversion Plant

Metropolis, Illinois

Docket Number 40-3392

License Number SUB-526

TABLE OF CONTENTS

		Page
I.	INTRODUCTION	1
	A. General	1
	B. Location Description	1
	C. License History	1
II.	AUTHORIZED ACTIVITIES	1
	A. General Summary	1
	B. Process Description	4
III.	POSSESSION LIMITS	4
IV.	FACILITIES	6
V.	PERFORMANCE HISTORY	8
	A. Regulatory Compliance	8
	B. External Exposures	8
	C. Internal Exposures	11
	D. Effluent Control	13
VI.	LICENSE APPLICATION	18
	A. Review History	18
	B. Current Application	18
VII.	ORGANIZATION AND ADMINISTRATION	19
	A. Organization	19
	1. Supervision and Responsibility	19
	2. Minimum Qualifications	21
	B. Administrative Practices	22
	1. ALARA	22
	2. Safety Review Committees	23
	3. Procedures	23
	4. Radiation Work Permits	23
	5. Records	24
	C. Inspections and Audits	24
	D. Personnel Training	25
VIII.	RADIATION PROTECTION	25
	A. External Exposure Control	25
	B. Internal Exposure Control	26

TABLE OF CONTENTS (Continued)

		Page
1.	Ventilation	26
2.	Air Sampling	26
3.	Bioassay	26
4.	Respiratory Protection	27
C.	Contamination Control	27
1.	Access Control	27
2.	Surface Contamination Control	28
3.	Personnel Protective Equipment	29
D.	Effluent Control	29
1.	Gaseous Effluent	29
2.	Liquid Effluent	32
3.	Solid Wastes	32
IX.	SEVERE ACCIDENT CONSEQUENCES	32
A.	Introduction	32
B.	Background	33
C.	Potential Accident Types	33
D.	Potential Accident Consequences	35
E.	Conclusion	36
X.	ENVIRONMENTAL PROTECTION	37
XI.	FIRE SAFETY	39
XII.	DECOMMISSIONING PLAN	39
XIII.	RADIOLOGICAL CONTINGENCY PLAN	39
XIV.	EXEMPTIONS AND SPECIAL AUTHORIZATIONS	40
XV.	CONCLUSIONS AND RECOMMENDATIONS	40

LIST OF FIGURES

Figure		
1	Geographical Location of Allied Corporation Metropolis Works	2
2	UF_6 Conversion Flow Chart	5
3	Plot Plan of the Metropolis Works UF_6 Conversion Plant	7
4	Average MPC Air Concentrations 1979 - 1983 (Feed Materials Building)	12
5	Average MPC Air Concentrations 1979 - 1983 (Drum Dumping Area)	12
6	Organizational Chart	20

TABLE OF CONTENTS (Continued)

LIST OF TABLES

Table		Page
1	Amendments to SUB-526	3
2	Summary of Inspection Results 1978-1984	9
3	Personnel Monitoring Report	10
4	Urinary Uranium Data	14
5	Whole Body Counting Data	14
6	Stack height, air flow, and annual uranium emissions for the years 1979-1982 from UF_6 process equipment dust control devices	15
7	Stack height, air flow, and annual uranium emissions for the years 1979-1982 from ventilation systems associated with UF_6 conversion facilities	16
8	Annual average release of radioactivity in liquids released from Outfall 002 at Allied Chemical Company UF_6 Conversion Plant	17
9	Gaseous Cleanup System	30

I. INTRODUCTION

A. General

The primary functions of the Allied Corporation Metropolis Works at Metropolis, Illinois, under Materials License SUB-526, is to convert uranium ore concentrates to uranium hexafluoride (UF_6) by the dry hydrofluor process. The product UF_6 is used as the feed material for uranium enrichment plants. The Metropolis Works was originally licensed from 1958 through June 1964, supplying UF_6 to the Paducah Gaseous Diffusion Plant for the US AEC. Operations were resumed in February 1968 under license No. SUB-526, to supply the commercial nuclear power industry. The current possession limits include 75 million pounds of natural uranium, 100 millicuries Cesium-137 (sealed sources), .01 microcurie, Americium-241 (plated source) and .01 microcurie Thorium - 232 (plated source).

B. Location Description

The Allied Corporation Metropolis Works is located on an 862.3 acre tract of land in Massoc County at the southern tip of Illinois along the north bank of the Ohio River. The site perimeter is formed by U.S. Highway 45 to the north, the Ohio River to the south, an industrial coal blending plant to the west, and privately owned developed land to the east. Figure 1 shows the geographical location of the plant site. Operations are conducted in several facilities within a restricted area covering 54 acres in the north central portion of the site.

C. License History

The facility was initially issued Source Material License No. C-4493 on December 17, 1958, which authorized Allied to receive possession of and title to source material for the production of uranium hexafluoride. This license was renewed in December 1959, in December 1960, and again in January 1962, at which time the license number was changed to SUB-526. License No. SUB-526 was renewed in February 1965, and again in February 1968 and in August 1977. The current license was scheduled to expire August 31, 1982; however, by application dated July 1, 1982, Allied requested that their license be renewed. Accordingly, the license has remained in effect under the timely renewal provisions of 10 CFR 40.43. During the time since the last renewal, a total of eight amendments have been issued. A summary of these amendments is given in Table 1.

II. AUTHORIZED ACTIVITIES

A. General Summary

The activities being assessed by this safety evaluation are the possession and use of natural uranium for the production of uranium hexafluoride from uranium ore concentrates. Ancillary activities incident to UF_6 production such as impurity removal, uranium recovery from scrap material, and washing and testing of UF_6 product cylinders are also performed.

Figure 1. Geographical Location of Allied Corporation Metropolis Works

Table 1. Amendments to SUB-526

1. Cancelled Source Material License SUB-945 and incorporated authorization to receive, weigh, and sample uranium ore concentrates as Condition 18 of SUB-526. (11-21-77)

2. Amendment authorizing modifications of environmental sampling program by installing continuous air monitors. (6-16-78)

3. Amendment changing Condition 17 to include decommissioning and financial plans. (1-31-80)

4. Order to modify license for compliance with 40 CFR Part 190. (3-24-80)

5. Amendment to incorporate the Radiological Contingency Plan as Condition 19. (3-24-82)

6. Amendment to increase the maximum possession limit for natural uranium, Condition 8(a), to 75 million pounds. (11-18-82)

7. Amendment to delete manufacturer's names and model numbers for respiratory protective equipment from the license. (8-31-83)

8. Amendment to change Item 1 of license to read: Allied Corporation, Allied Chemical Company. (5-11-84)

B. Process Description

The process steps used by Allied in the production of UF_6 from uranium ore concentrates are illustrated in Figure 2 and include:

1. Sampling of ore concentrates by falling stream method and storage of concentrates in 55 gallon drums.

2. Pre-treatment of ore concentrates by a four-stage counter-current decantation treatment with ammonium sulfate solution to remove contaminants.

3. Calcination, blending, drying, crushing, and sizing of ore concentrates.

4. Reduction to uranium dioxide (UO_2) in fluid-bed reactors utilizing hydrogen as the fluidizing gas.

5. Hydrofluorination of UO_2 to uranium tetrafluoride (UF_4) using a counter-current flow of anhydrous HF in fluid-bed reactors.

6. Fluorination of UF_4 to UF_6 in a fluid-bed reactor using elemental fluorine as the fluidizing gas.

7. Condensation of UF_6 product material in cold traps and removal to still feed tanks by intermittent heating.

8. Distillation of product using low and high boiler distillation columns to remove impurities.

9. Packaging and sampling of product.

10. Uranium recovery from reactor bed materials, dusts and solutions from ventilation filters and scrubbers, and scrap materials using sodium carbonate leaching, with recycle of recovered materials to the process line.

III. POSSESSION LIMITS

The licensee has requested the following possession limits for the renewed license:

6.	Material	7.	Form	8.	Quantity
A.	Natural Uranium	A.	"Yellowcake", U_3O_8, UO_2, UF_4, UF_6	A.	68 million kg (150 million lb)
B.	Cs-137	B.	Sealed Sources	B.	300 millicuries

These possession limits exceed those of the current license by a factor of 2 for the natural uranium, but eliminate the limits for americium and thorium plated sources. The increased possession limit will provide the licensee with increased flexibility in material handling, and Allied has indicated that no increases in actual production are anticipated.

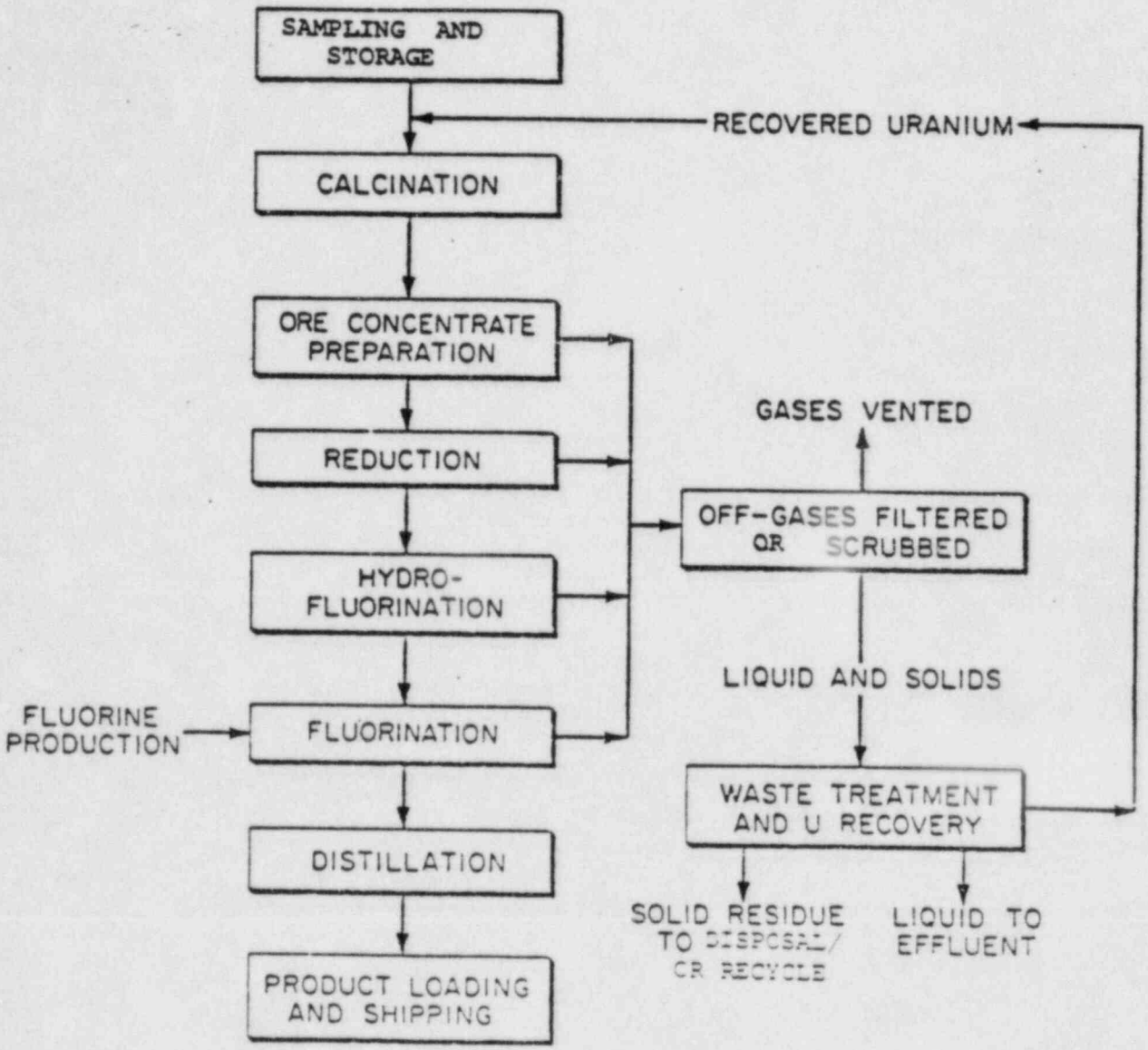

Figure 2. UF_6 Conversion Flow Chart

IV. FACILITIES

The relative location of the facilities handling source material within the restricted plant area are shown in Figure 3. The areas and buildings in which source material is stored and handled are listed below.

A. Feed Materials Building

This building houses essentially all of the equipment necessary for the conversion of ore concentrates to UF_6.

B. Sampling and Storage Facility

These areas receive incoming shipments of ore concentrates, and provide for sampling by the falling stream method, redrumming, and storage prior to conversion.

C. Pre-treatment Facility

Ore concentrates and other materials recycled from the process are treated to remove contaminants (principally sodium) in this facility.

D. Ore Calcining Facility

This facility is used to oxidize feed materials to U_3O_8 in preparation for conversion.

E. Storage Pads

Outdoor storage pads are provided for storage of ore concentrate drums and product cylinders. Hot product cylinders are also cooled in these areas.

F. Cylinder Wash Facility

The activities in this area include UF_6 cylinder washing to remove contamination and pressure testing to assure cylinder integrity.

G. Waste Dryer

This area is used to dewater residues from the uranium recovery process prior to packaging for offsite recycle or disposal.

Additional plant facilities which are involved directly in the UF_6 manufacturing process but do not involve the handling of any significant quantities of source material include a fluorine manufacturing building, a fluoride waste treatment facility with five large settling ponds, a calcium fluoride recovery plant to recycle synthetic CaF_2, a power plant, incinerator, two small fluoride spill control ponds, and two small settling ponds to collect uranium spills.

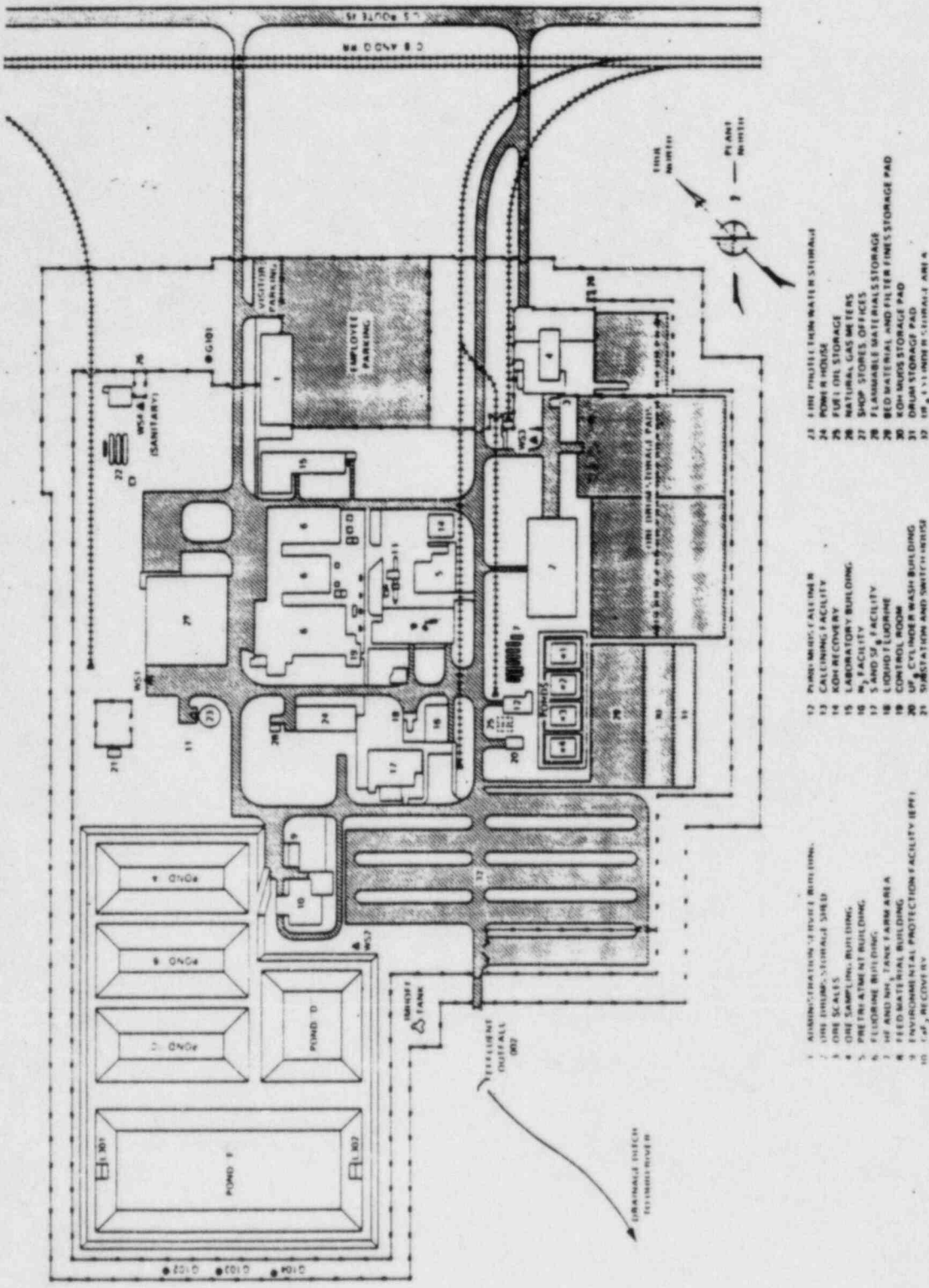

Figure 3. Plot Plan of the Metropolis Works UF_6 Conversion Plant

V. PERFORMANCE HISTORY

A. Regulatory Compliance

Allied's compliance history during the time since the current license was issued on August 15, 1977, was reviewed based upon inspections made by Region III personnel. The results of these inspections are summarized in Table 2. During the past 7 years, there have been 17 site visits and a total of 10 violations or infractions were identified.

The majority of the items identified by the inspections are not considered to be major violations as defined by the NRC in accordance with the General Policy and Procedure for NRC Enforcement Actions, 10 CFR Part 2, Appendix C, as revised, 49 FR 8583 (March 8, 1984). However, there were at least two situations in which individuals were exposed in excess of the limits for soluble uranium, resulting in Severity Level III Violations. These occurred in 1981 and again in 1984 and were caused by a failure of the individuals respiratory protection equipment. There was also a case of exposure in 1980 where an individual inhaled uranium at levels close to the limits established in 10 CFR Part 20.

In response to the first overexposure, Allied instituted increased surveillance and administrative controls. These were not totally successful, as evidenced by the second incident. Entry into process vessels and ventilation baghouses is considered by the licensee to be one of the operations most likely to result in exposure to radioactive materials. However, no direct supervision or health physics support was available during these incidents. A staff recommendation in this area is given in Section VII, as part of the discussion on licensee supervision and responsibility.

A review of the items identified in the inspections also indicates a potential problem in the area of surveys. A failure to conduct adequate surveys was noted in 1978, 1980, and 1984. The staff therefore recommends that a condition be added to the license which would require plant management to focus more closely upon surveys and survey results. This condition will be addressed as part of the ALARA discussions, Section VII.B.1.

Allied has been generally responsive to correcting items of non-compliance. This is evidenced by the improved conditions in the drum dumping area of the plant and by the lack of violations or infractions since 1979 not specifically connected with an overexposure situation.

B. External Exposures

At Allied, greater than 90 percent of the employees receive an annual whole body dose of less than 500 millirem, which is 10 percent of the levels permitted in 10 CFR 20.101. There were no cases of overexposure due to external irradiation reported since the last renewal of the license.

During the time period from 1979 to 1983, employee exposures showed a steady trend towards lower exposures, shown by the data in Table 3. Particularly important in this trend is the decrease in the number of employees receiving greater than 500 millirem during the year. The

Table 2. Summary of Inspection Results 1978-1984

Inspection Dates	Inspection Results
02/27/78 - 03/03/78	Infraction: Failure to calibrate beta-gamma survey instruments. Deviation: Failure to conduct monthly surveys in Na removal building.
02/26/79 - 03/02/79	Infraction: Shipped more than Type A quantity of material without license; no QA program. Infraction: Air samplers operating below 40 SCFH airflow limit. Infraction: No continuous alpha air monitor in facility control room.
10/31/79 - 11/02/79	No items of noncompliance.
06/17/80 - 06/19/80	No items of noncompliance.
05/14/80 - 05/15/80 08/06/80 - 08/07/80	Infraction: Failure to perform adequate surveys, determine occupancy, and material solubility. Infraction: Employee exposure. (rescinded 01/28/82) Infraction: Insufficient engineering controls.
10/29/80 - 10/31/80	No items of noncompliance.
08/03/81 - 08/07/81 12/15/81 - 12/16/81	Violation: Severity Level III Employee exposed to 68 MPC-hours soluble U.
05/18/82 - 05/21/82	No items of noncompliance
10/26/82 - 10/29/82	No items of noncompliance
04/19/83 - 04/20/82	No items of noncompliance
01/31/84 - 02/02/84	No items of noncompliance
11/28/84 - 12/05/84 12/17/84 - 12/18/84	Violation: Severity Level III a. Employee exposed to 90 MPC-hours soluble U. b. Failure to perform adequate surveys. c. Inadequate instructions to employees. d. Failure to use appropriate engineering controls.
03/26/85 - 03/27/85 04/08/85 - 04/12/85	No items of noncompliance.

Table 3. Personnel Monitoring Report

1979-1981

Annual Whole Body Dose Ranges* (REMS)	1979	1980	1981	1982	1983
No measurable exposure	122	132	175	172	149
Measurable exposure less than 0.100	131	152	158	175	183
0.100 - 0.250	68	127	108	119	110
0.250 - 0.500	113	71	69	45	56
0.500 - 0.750	29	32	10	6	2
0.750 - 1.000	11	5	1	1	0
1.000 - 2.000	10	0	0	0	0
TOTALS	484	519	521	518	500

*Individual values exactly to the values separating exposure ranges shall be reported in the higher range.

number of employees in this category was reduced from 50 in 1979 to 2 in 1983. During the same time period, the number of employees receiving less than 100 millirem increased from 252 to 332. The total number of employees exposed each year has remained relatively constant, indicating that the reductions in exposure of individuals has been accomplished through an overall reduction of exposure at the plant rather than as an artifact of increased employment or job rotation.

C. Internal Exposures

A majority of the uranium compounds handled at the Allied plant are somewhat soluble and may be classified as D or W, indicating that clearance times from the lung following inhalation will be on the order of days to weeks. The product material, UF_6, is very soluble and is cleared from the human body with a half-time on the order of less than one day.

According to 10 CFR 20.103, primary reliance for determining acceptable levels of airborne radioactivity is placed upon the measurement of material concentrations in air. The monthly average air concentration for the Feed Materials Building from 1979 to 1983, expressed as a percentage of the maximum permissible concentration given in Appendix B of 10 CFR Part 20, is shown in Figure 4. The average monthly air concentration for the drum dumping area, which traditionally was an area of very high airborne radioactivity, is shown in Figure 5.

The data shown in Figure 4 indicate that during the period of the current license, the average air concentrations have shown a slight downward trend. For the Feed Materials Building, there are several high spikes which reflect a UF_6 release during that particular month. If the monthly average were computed without the UF_6 release, then the average would be similar to the other months.

Since early 1980, when an employee in the drum dumping area received an intake of radioactive material at levels close to the limits, Allied has instituted a program for reducing the air concentrations in this area. The results of these efforts are illustrated in Figure 5. From 1980 to 1983, the average air concentration was reduced from approximately 100 percent of MPC to approximately 30 percent of MPC. Although not plotted in the Figure, these trends continued in 1984 as further efforts, such as in the installation of a new water spray drum cleaning system, were implemented.

Allied's bioassay program uses urine analysis and in vivo measurements to determine the actual exposures of employees. The data for urinary uranium for 1979 to 1983 is given in Table 4. This information indicates that the number of measurements showing less than 5 micrograms of uranium per liter (ug U/L) has increased despite the fact that the total number of samples has decreased. Also important, the number of samples which exceeded the Allied action level of 30 ugU/L has decreased since the last renewal. Followup on these samples indicated that there were no cases in which the chemical toxicity limit was exceeded.

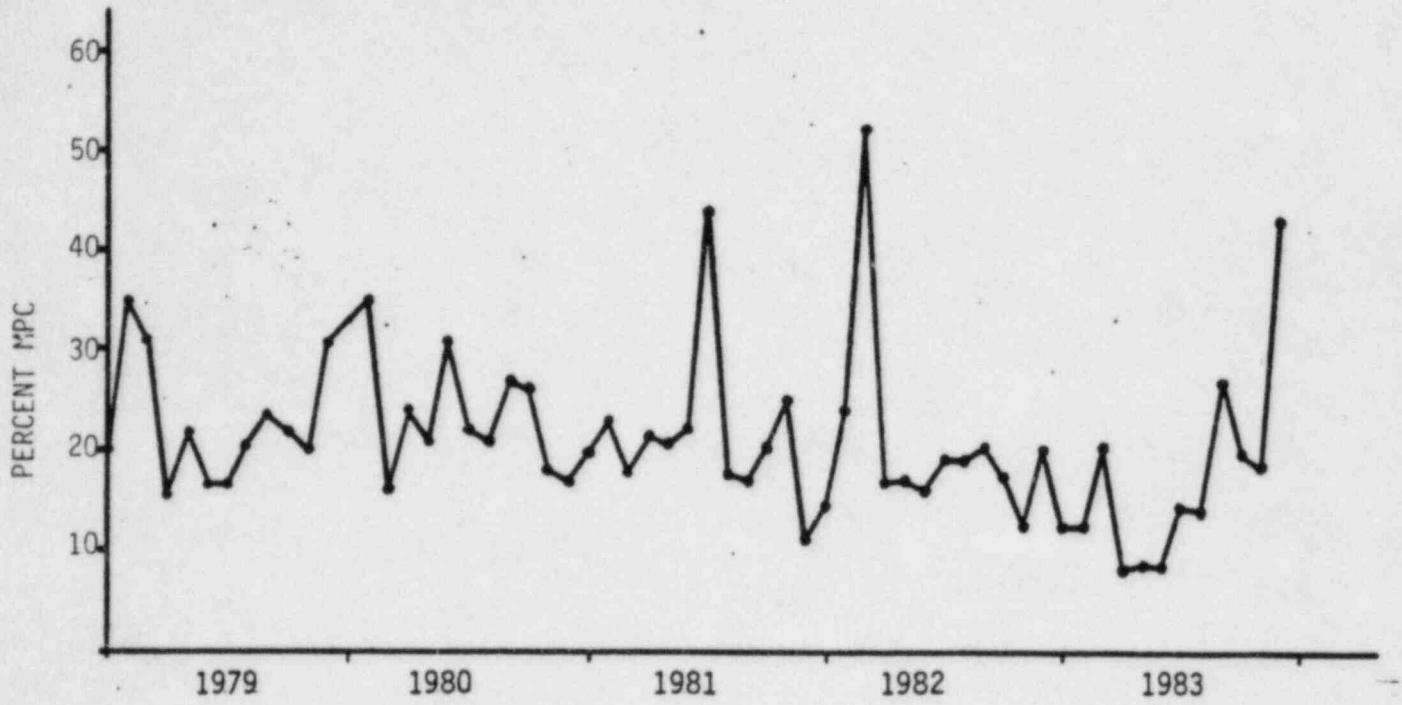

Figure 4. Average MPC Air Concentrations 1979 - 1983
(Feed Materials Building)

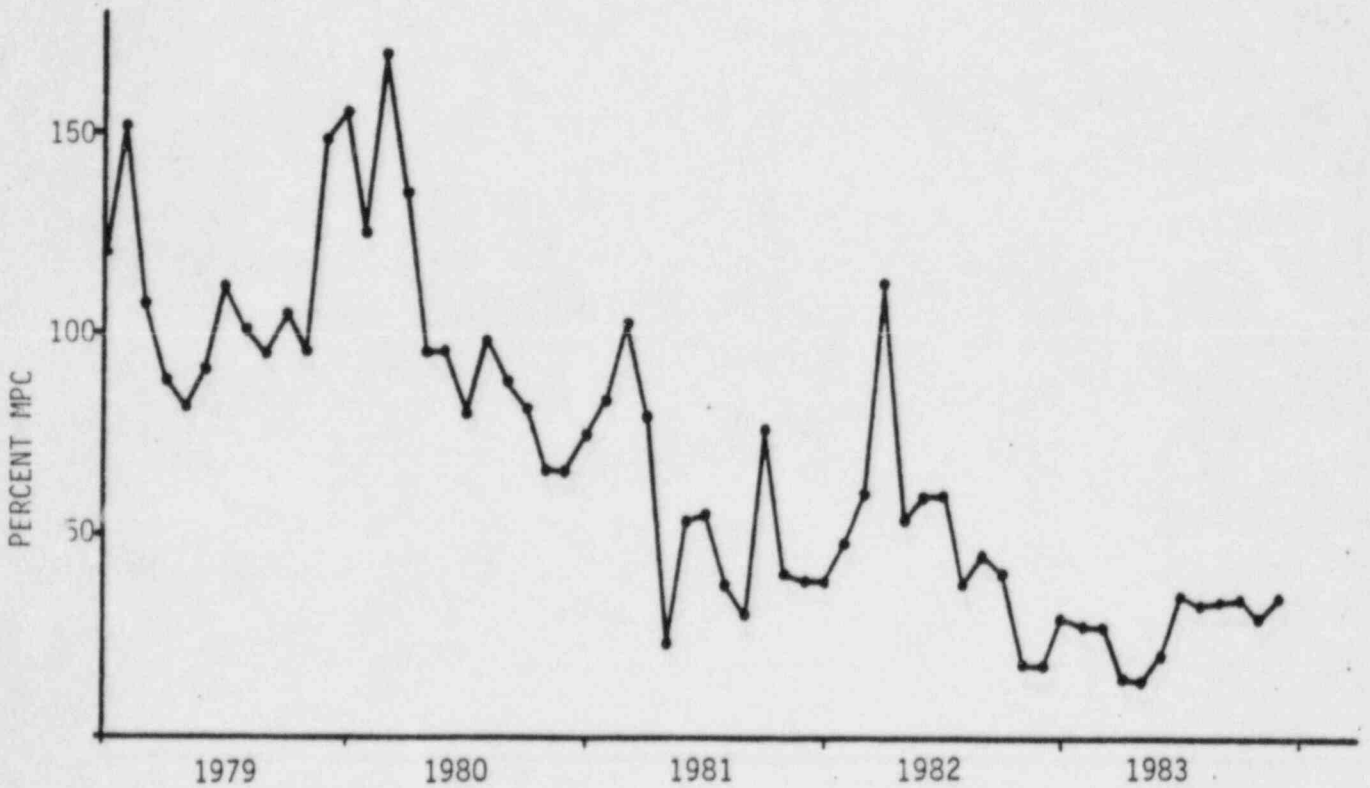

Figure 5. Average MPC Air Concentrations 1979 - 1983
(Drum Dumping Area)

The in vivo whole body counting data for the time period 1979 to 1983 is shown in Table 5. These counts assess the quantity of U^{235} in the lung and the minimum detection level (MDL) for the system is 63 micrograms (ugU^{235}). During these 5 years, the total number of measurements increased and the percentage of those measurements showing a lung burden less than the MDL also increased. The number of measurements indicating a lung burden between the MDL and 100 ugU^{235} increased in 1980 and 1981 and has since returned to approximately the same value. Measurements of a lung burden greater than 100 ugU^{235} have remained steady. In all cases, upon decontamination of the skin and a recount of the individual, the measurements of a lung burden greater than 100 ugU^{235} were reduced to less than 100 ugU^{235}.

During the time since the last renewal, two cases of employee exposure in excess of the levels specified by 10 CFR Part 20 have been observed. Each of these incidents resulted from a failure in the respiratory protection program during entry into ventilation baghouses to replace filters. In the first case, an employee was exposed to approximately 68 MPC-hours of soluble uranium. This incident was attributed by Allied to the employee either removing and then reusing the respirator or making an adjustment to the fit of the respirator which resulted in a loss of seal to the face. In the second incident, an employee was exposed to approximately 90 MPC-hours of soluble uranium due to a cross-threaded connection on the air supply line coupled with a faulty air pressure regulator which provided insufficient air pressure and flow.

D. Effluent Control

Gaseous emissions from process equipment and ventilation units are exhausted through 51 individual stacks and exhaust fans. The discharge characteristics and uranium emissions for 1979 through 1982 are given in Table 6 for exhausts from process equipment dust control devices and Table 7 for ventilation systems. The data in Tables 6 and 7 indicate that the total annual uranium emissions from the plant have been fairly uniform with the highest level being 412.7 kg or about 0.14 Ci in 1979. Approximately one-half of the emissions are from the process equipment with the remainder from ventilation systems.

Liquid wastes from the plant are discharged through the main effluent line into a natural drainage ditch, which empties into the Ohio River. The average annual releases of radioactivity in liquids for the time period 1979 through 1982 are given in Table 8. These data indicate that the releases have decreased or remained steady during the period of the current license. The radioactivity in the plant liquid effluent represents only a small percentage (less than 5%) of the established limits for release of radioactivity to unrestricted areas given in 10 CFR Part 20.

Releases of radioactive material from the plant have been analyzed by the staff as part of the environmental assessment conducted pursuant to Council on Environmental Quality Regulations (40 CFR Parts 1500-1508) and NRC Regulations (10 CFR Part 51) which implement requirements of the National Environmental Policy Act of 1969. The staff's conclusions and recommendations are contained in NUREG-1071, "Environmental Impact

Table 4. Urinary Uranium Data

Concentration	Number of Samples 1979	1980	1981	1982	1983
< 5 ug U/L	5267	5827	6398	6624	6295
5 - 15 ug U/L	2115	1466	1246	1116	941
15-30 ug U/L	496	176	48	54	61
> 30 ug U/L	123	38	28	36	13
TOTAL SAMPLES	8001	7507	7720	7830	7310

Table 5. Whole Body Counting Data

Counts	1979	1980	1981	1982	1983
< MDL(1)	243	302	330	377	383
MDL to 100 ugU^{235}	30	64	50	38	24
100 ugU^{235} to 200 ugU^{235}(2)	10	18	18	16	12
> 200 ugU^{235}(2)	1	0	0	0	1
TOTAL COUNTS	284	384	398	431	420

(1)MDL = 63 ugU^{235}
(2)Recounts were < 100 ugU^{235}

Table 6. Stack height, air flow, and annual uranium emissions for the years 1979-1982 from UF_6 process equipment dust control devices.

Stack No.	Description	Discharge direction[a]	Height		Flow		Uranium emission (kg)			
			m	ft	m^3/min	ACFM	1979	1980	1981	1982
1-1	Wet oxide dust collector	V	30	98	143	5,040	29.7	54.4	15.9	12.4
1-2	Dry oxide dust collector	H	32	105	75	2,650	3.8	5.5	15.8	3.5
1-3	Drum cleaner dust collector	V	12	40	122	4,320	2.3	2.1	3.3	8.9
1-4	Oxide vacuum cleaner	H	30	98	12	428	3.0	2.0	1.0	1.7
1-7	UF_4 vacuum cleaner	H	4	12	31	1,078	9.8	5.8	5.5	3.0
1-10	"B" UF_4 dust collector	V	30	98	82	2,889	54.7	50.0	14.8	4.2
1-11	Dry oxide dust collector	V	12	40	167	5,880	4.9	2.6	2.9	0.4
1-12	Ash vacuum cleaner and dust collector	H	26	86	73	2,561	10.4	21.1	9.4	14.5
1-13	"A" fluorination coke box	V	32	105	5	193	51.4	25.8	45.7	58.3
1-14	"B" fluorination coke box	V	32	105	5	193	41.0	30.2	22.7	19.8
1-46	"A" UF_4 dust collector	V	30	98	38	1,338	2.7	3.4	0.2	8.4
1-48	H_2S incinerator stack	V	47	155	184	6,500	0.4	0.4	0.5	1.0
1-54	Drum invertor dust collector	V	6	19	436	15,394	[b]	[b]	0.1	0.4
3-2	U-recovery dust collector	V	12	40	13	462	<0.1	<0.1	<0.1	<0.1
4-2	Pond mud calciner	V	9	29	93	3,296	1.1	0.5	0.4	0.6
17-1	Sampling plant dust collector	V	7	23	214	7,565	0.2	0.5	0.1	1.1
17-2	Sampling plant vacuum cleaner	H	4	13	14	490	[b]	[b]	0.2	0.6
	Total process emissions						215.5	204.4	138.6	138.9

[a]H = horizontal, V = vertical.

[b]Not installed.

Source: Allied Chemical Company, "Allied Chemical Application for Renewal of Source Material License SUB-526, Docket 40-3392, UF_6 Conversion Plant," Metropolis, Ill., July 1982.

Allied Chemical Company, "Responses to NRC Site Visit Information Requests," May 27, 1983.

Table 7. Stack height, air flow, and annual uranium emissions for the years 1979-1982 from ventilation systems associated with UF_6 conversion facilities.

Stack No.	Description	Discharge direction[a]	Height		Flow		Uranium emission (kg)			
			m	ft	m^3/min	ACFM	1979	1980	1981	1982
1-15	"A" reductor blower	H	23	75	28	987	1.1	0.5	0.8	1.0
1-16	"B" reductor blower	H	23	75	28	987	41.3	23.1	5.8	4.7
1-17	"A" top hydrofluorinator blower	H	14	45	188	6,630	1.5	1.4	64.2	7.3
1-18	"A" bottom hydrofluorinator blower	H	4	12	188	6,630	0.9	0.3	0.1	0.2
1-19	"B" top hydrofluorinator blower	H	12	38	28	987	14.0	31.0	24.5	6.4
1-20	"B" bottom hydrofluorinator blower	H	14	45	28	987	0.5	0.5	0.5	0.2
1-21	"A" fluorinator blower	H	9	30	120	4,239	0.9	0.6	2.9	14.2
1-22	"B" fluorinator blower	H	9	30	120	4,239	1.7	1.9	1.7	1.4
1-26	Ore prep multifloor exhaust	V	18	60	400	14,145	2.8	1.8	0.0	3.0
1-27	Exhaust fan 1st floor south	H	5	15	651	23,000	5.9	5.3	9.6	6.0
1-28	Exhaust fan 1st floor west	H	5	15	651	23,000	5.1	5.7	7.7	5.2
1-29	Exhaust fan 2nd floor south	H	9	30	651	23,000	0.0	1.1	5.1	3.6
1-30	Exhaust fan 3rd floor south	H	14	45	651	23,000	10.4	9.8	4.9	5.8
1-31	Exhaust fan 3rd floor west	H	14	45	651	23,000	9.8	10.9	7.7	5.3
1-32	Exhaust fan 3rd floor south	H	14	45	651	23,000	3.2	4.9	2.5	5.7
1-33	Exhaust fan 3rd floor north	H	14	45	651	23,000	8.6	12.2	8.1	6.7
1-34	Exhaust fan 4th floor south	H	18	60	651	23,000	6.9	5.8	9.1	5.2
1-35	Exhaust fan 4th floor west	H	18	60	651	23,000	9.6	11.2	11.5	7.5
1-36	Exhaust fan 4th floor south	H	18	60	651	23,000	6.0	10.1	4.1	2.7
1-37	Exhaust fan 5th floor south	H	23	75	651	23,000	8.6	8.4	11.5	7.5
1-38	Exhaust fan 5th floor west	H	23	75	651	23,000	9.1	7.2	10.4	2.7
1-39	Exhaust fan 5th floor south	H	23	75	651	23,000	8.4	10.2	7.9	3.3
1-40	Exhaust fan overhead no. 1	V	27	90	708	25,000	<0.1	b	b	b
1-41	Exhaust fan overhead no. 2	V	27	90	708	25,000	9.9	10.3	b	0.4
1-42	Exhaust fan overhead no. 3	V	27	90	708	25,000	4.3	4.6	9.0	1.4
1-43	Exhaust fan overhead no. 4	V	27	90	708	25,000	9.5	15.3	3.7	0
1-45	NH_3 dissociator vent	V	18	60	356	12,580	3.6	6.3	5.0	5.0
1-47	"C" fluorinator blower	H	9	30	120	4,239	1.5	0.7	0.4	0.2
1-49	Distillation multifloor exhaust	V	6	19	787	27,775	0.3	0.2	<0.1	2.3
1-50	"A" reductor off-gas	H	20	67	21	733	10.1	0.3	0.7	0.5
1-51	"B" reductor off-gas	H	20	67	34	1,215	1.6	0.5	3.4	0.7
1-55	Exhaust fan 3rd floor north	H	14	45	242	8,535	c	1.5	0.2	0.3
1-56	Exhaust fan distillation 1st floor north	H	7	22	747	26,390	c	c	3.4	1.2
15-57	Exhaust fan maintenance area 1st floor south	H	3	11	149	5,268	c	c	c	<0.1
	Total ventilation emissions						197.1	203.7	226.5	117.8

[a]H = horizontal, V = vertical.

[b]Removed from service.

[c]Not installed.

Source: Allied Chemical Company, "Allied Chemical Application for Renewal of Source Material License SUB-526, Docket 40-3392 UF_6 Conversion Plant," Metropolis, Ill., July 1982.

Allied Chemical Company, "Responses to NRC Site Visit Information Requests," May 27, 1983.

Table 8. Annual average release of radioactivity in liquids released from Outfall 002 at Allied Chemical Company UF_6 Conversion Plant.

Description	1979	1980	1981	1982
Gross alpha, pCi/L[a]	300	240	200	130
Gross beta, pCi/L	320	170	270	200
Total uranium				
ppm	0.74	0.46	0.46	0.34
pCi/L	500	310	310	230
^{226}Ra, pCi/L				
Soluble	0.72	0.71	0.7	1.3
Insoluble	0.31	0.22	0.1	1.9
^{230}Th, pCi/L				
Soluble	4.2	1.7	1.4	1.9
Insoluble	8.7	12	4	5.9

[a]One pCi/L = 10^{-9} μCi/mL.

Source: Allied Chemical Company, "Allied Chemical Application for Renewal of Source Material License SUB-526, Docket 40-3392, UF_6 Conversion Plant," Metropolis, Ill., July 1982..

Allied Chemical Company, "Responses to NRC Site Visit Information Requests," May 27, 1983.

Appraisal for the Renewal of Source Material License No. SUB-526," published in May 1984.

VI. LICENSE APPLICATION

A. Review History

The safety review of the Allied Corporation renewal application included an evaluation of the application transmitted by letter dated July 1, 1982, its revision dated September 30, 1983, and a subsequent revision dated December 9, 1983. Allied submitted replacement pages dated March 7, and August 1, 1984 for the license conditions section by letter dated March 12, and August 1, 1984, respectively. The revisions were submitted in response to NRC questions and comments and to conform with the draft Regulatory Guide on "Standard Format and Content for the Health and Safety Section of License Renewal Applications for Uranium Hexafluoride Product Plants" (Task CE-227-4).

The safety review also included a review of Allied's compliance history during the period of the current license and an examination of the licensee's organization, administration, and radiation protection safety programs. As part of this review, several site visits were made with Region III inspectors. In addition to the routine inspection tour and discussions concerning the application, the movement of filled UF_6 cylinders in the liquid state was observed and examined. The license was discussed between representatives of Allied and NMSS in NRC offices on August 30, 1983 and May 9, 1985. NMSS also participated in the Enforcement Conference held by Region III in January 1985 to discuss the 1984 overexposure.

As a result of the overexposure incident on September 4, 1984, and subsequent discussions between Region III personnel and headquarters staff, an additional review of Allied's administration, training program, and respiratory protection program was conducted.

B. Current Application

The renewal of License SUB-526 is based upon the application dated July 1, 1982, which forms the demonstration section and the license conditions section dated December 9, 1983, with replacement pages dated March 7, and August 1, 1984. The appropriate and adequate portions of the license conditions section will be incorporated as conditions of the renewed license.

9. Authorized Use: For use in accordance with the statements, representations, and conditions contained in Chapters C-1 through C-7 of the license renewal application dated December 9, 1983, and supplements dated March 7, and August 1, 1984.

10. Authorized Place of Use: The licensee's existing facilities at Metropolis, Illinois.

Within the license conditions section of the application, the licensee uses the term "are" when indicating services or measurements which will

be taken. Although this provides an adequate description of the commitments which are being made, it does not express this commitment in a form which would be binding upon the licensee. The staff therefore recommends that the following condition be added to the license.

11. In the conditions section of the license renewal application, the term "are" shall be interpreted as "shall be" in all instances where this term is used to denote services or actions by the licensee.

VII. ORGANIZATION AND ADMINISTRATION

A. Organization

1. Supervision and Responsibility

The Metropolis Works is owned and operated by the Chemical Sector, Allied Corporation. Operations at the plant are administered by a plant staff which is organized as shown in Figure 6. This organizational structure provides for separate lines of authority and reporting for the production and safety functions.

The Plant Manager reports to the General Manager for UF_6 and other levels of management in Morristown, New Jersey and is responsible for the safe, efficient, and reliable operation of the facility. He holds the final approval authority for the selection of personnel in safety-related positions and safety review committees. Under the Plant Manager, the Operations Manager is responsible for coordination of technical and operations activities to minimize health and environmental impacts while meeting production requirements.

The Manager of Process Technology is responsible for all technical aspects of plant operations including environmental compliance, analytical testing, process improvements, and health physics. He is also responsible for the technical liaison with the Production and Maintenance Departments to assure safe, reliable operation of the plant.

The Health Physics Supervisor is responsible for the development and implementation of the radiation safety program, including management liaison and supervision of health physics personnel. The specific responsibilities of the Health Physics Supervisor include compliance with license and regulation requirements, development of radiological health programs, employee training, emergency preparedness, environmental monitoring, and transportation. He is authorized to suspend operations if a situation exists which jeopardizes radiological health and safety. The Health Physics Supervisor administers the health physics staff which includes an assistant health physicist and a staff of five technicians. The health physics staff is responsible for airborne radioactivity monitoring, surveys, and technical assistance to the health physicist and the production supervision of the plant.

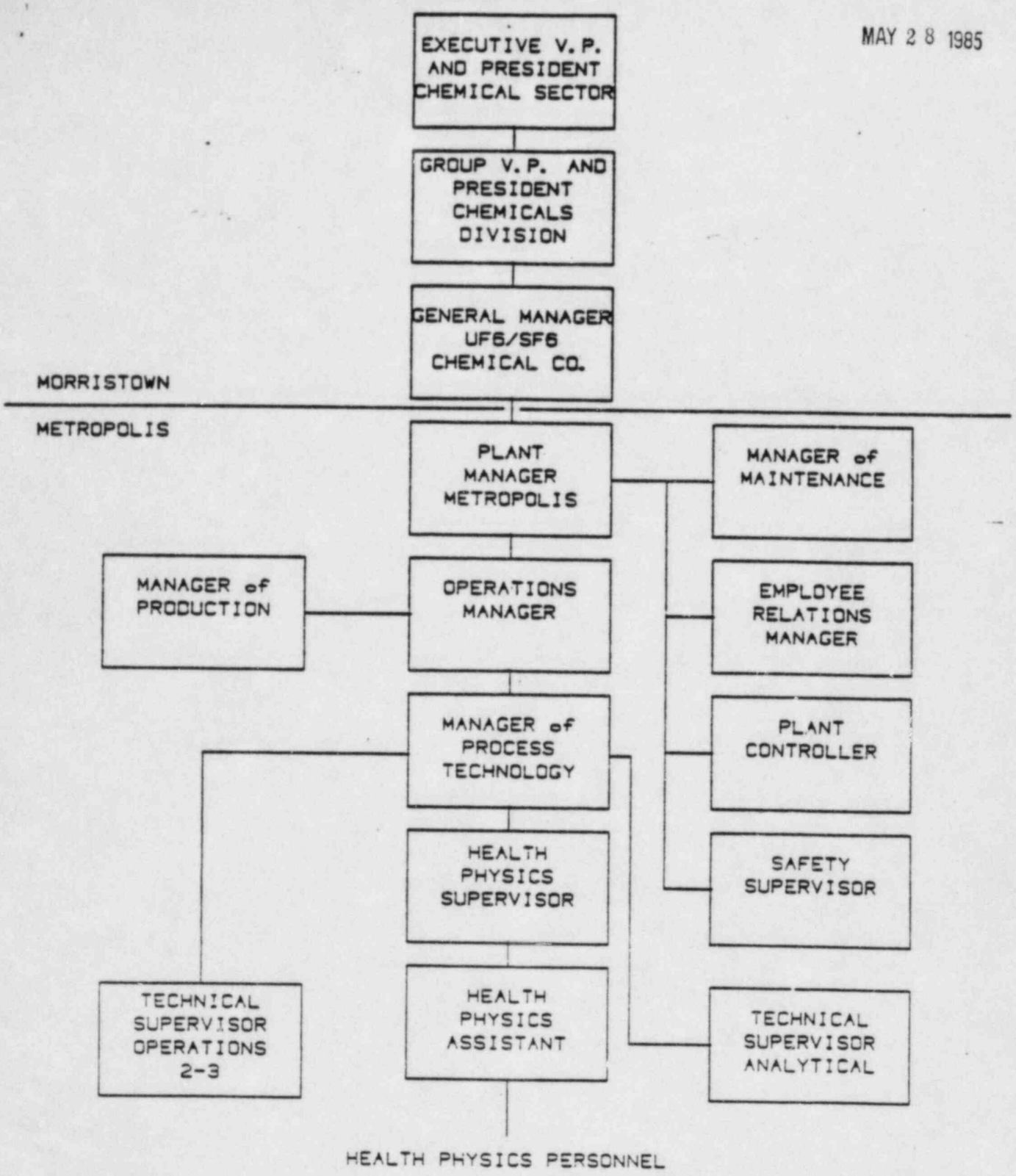

Figure 6. Organizational Chart

Operations are conducted at the Allied plant on a 24 hour per day basis. However, the health physics staff is present at the plant only during the first shift of each day. During the back shifts, the Health Physicist is on call should questions or an emergency arise. The lack of health physics staff during the majority of each day provides a situation in which technical assistance is not immediately available to plant personnel. The staff therefore recommends that the following condition be incorporated into the license to assure that personnel with a knowledge of health physics will be present at the plant at all times when operations are being conducted so that technical assistance and radiological monitoring capability are immediately available. A time period of 4 months for implementation of this condition is recommended to allow the licensee to recuit or train additional qualified staff.

12. Personnel with appropriate health physics training shall be present at the plant at all times when operations involving source material are being conducted. The licensee shall attain compliance with this condition on or before September 30, 1985.

In addition to a health physics presence at the facility, there is a need for direct health physics participation in activities which involve an increased potential for exposure of employees to radioactive materials. The lack of appropriate health physics participation in the entries into ventilation baghouses was one of the contributing factors in the overexposure incidents. The staff therefore recommends that the following condition be incorporated into the license to require that health physics personnel be present whenever entry is made into containment structures where the potential exists for airborne concentrations of radioactive material in excess of the limits specified by 10 CFR Part 20. If several entries are made into the same structure as a result of changes in personnel or equipment, then this condition would require that health physics personnel be present each time an entry is made. A time period of 4 months for implementation is recommended to allow the licensee to recruit and hire additional qualified staff.

13. Health physics personnel shall be present whenever entry is made into containment structures, including ventilation baghouses, where the potential exists for exposure to airborne radioactivity concentrations greater than those specified in 10 CFR Part 20, Appendix B, Table 1. The licensee shall attain compliance with this condition on or before September 30, 1985.

2. Minimum Qualifications

The safety-related positions shown in Figure 5 are filled by individuals who meet stated minimum qualifications of academic training and experience as follows:

Operations Manager

Requires a bachelor's degree in physical science or related discipline and 10 or more years of diversified experience in chemical manufacturing, including supervisory or management experience in the nuclear fuel cycle industry. Requires extensive knowledge of nuclear fuel cycle technology and regulations. Must possess sound judgement and ability to work effectively with management and government officials.

Manager of Process Technology

Requires a bachelor's degree in physical science, engineering or biological science and a minimum of 5 years' experience which includes direct supervision of professional personnel and a working knowledge of radiation protection requirements.

Health Physics Supervisor

Position requirements must include a bachelor's degree in physical or biological science and a minimum of three years health physics or related experience sufficient to maintain an effective radiation safety program.

Assistant Health Physicist

The minimum requirements for this position include a bachelor's degree in physical or biological science and at least 1 year of health physics or related experience.

B. Administrative Practices

1. ALARA

A commitment to maintaining exposures as low as reasonably achievable (ALARA) is demonstrated by Allied through quarterly reviews of the facilities exposures and radiological releases and by the implementation of administrative and engineering controls to reduce exposures. An example of the efforts undertaken to reduce exposures is the controls placed upon the drum dumper area where airborne concentrations have been reduced substantially during the period of the current license.

The ALARA Committee meets quarterly to review the radiological safety program performance and to formulate plans to reduce radiation exposure. Membership in the Committee consists of the Plant Manager, Operations Manager, the Department Managers, the Health Physicist, and the President and Vice-President of the local union. Trend analysis of personnel exposure and effluent release are utilized in decisions to initiate plans for improvements. Records of the meeting transactions are written and retained.

The license application does not contain a commitment by Allied to perform a formal analysis of radiological exposures, airborne contamination measurements, and contamination surveys on a periodic basis

to assist the ALARA Committee in its decisions. The staff therefore recommends that the following license condition be added to the license to assure that all areas related to radiation safety are formally examined and the results reported to management.

14. The licensee shall prepare, on a semi-annual basis, a report summarizing and evaluating all of the radiological measurements made at the facility, including airborne radioactivity, surface contamination, internal and external exposures, effluents, and environmental monitoring. This report shall be provided to the ALARA Committee, the Plant Manager, and other levels of supervision as necessary for appropriate action.

2. Safety Review Committees

Safety review committees at Allied are termed Safety Councils and are composed of all levels of management, including the Plant Manager. There are three "councils" which meet monthly and have the following functions: "A" to review and establish plant health and safety policy, "B" for training and motivation in health and safety practices, and "C" for instruction and review of plant safety and radiological safety procedures.

3. Procedures

The licensee has committed to conducting all plant operations in accordance with approved, written operating procedures. These procedures are contained in operating manuals, such as the Production Operation Manual, Maintenance Procedure Manuals, Supervisory Safety Manual, Chemical Safety Data Sheet Manual, Spill Control Manual, or Health Physics Policy and Procedure Manual, or in written Job Safety Analyses.

Procedures and procedural changes are initiated by first line supervisors, process engineers, or the radiation safety supervisor, and are subject to review and approval by the Technical Supervisor, General Manager, the Health Physicist, and a Departmental Manager prior to implementation.

4. Radiation Work Permits

The primary purpose of Radiation Work Permits (RWP) is to cover operations which are not covered by formal approved procedures. At Allied, unplanned or non-routine work is controlled by a work permit system to ensure that the employees performing the work are properly instructed and to provide management with an opportunity to review the adequacy of the special precautions. The permit must be signed by either the Production, Maintenance, or Technical Manager; the Health Physicist, the Safety Supervisor, and the Foreman before the work is performed. Upon completion, the permit cards are returned for documentation of procedure effectiveness.

One of the uses for Radiation Work Permits is to authorize entry into process vessels and ventilation equipment. Employees who are

to perform this work may be unfamiliar with the procedures necessary to perform the work and the necessary safety precautions. To fulfill the objectives of the Radiation Work Permit, a provision should be made for specific instruction of the employee on the job to be performed. The staff therefore recommends that the following condition be incorporated into the license to ensure that employees are properly instructed prior to performing work with which they are not familiar.

15. Prior to performing work for which a Radiation Work Permit is required, the employee shall be provided with specific instructions regarding the task, the necessary safety precautions, and any safety equipment required. Receipt and understanding of this information shall be documented on the permit and shall include the employee's signature.

5. Records

Personnel and environmental exposure records are maintained in the Health Physics Department. The licensee has committed to the retention of records which demonstrate compliance with NRC regulations until the NRC authorizes their deposition.

C. Inspections and Audits

Inspections and audits are performed by the health physics group to determine that operations are being conducted in accordance with regulations and license conditions. The inspection program consists of checks of operations by health physics personnel during the course of their normal activities. Audits are more formalized reviews which are conducted on a periodic basis.

In addition to the audits conducted by the health physics group at the plant, an annual audit of the plant radiation protection program is conducted by a health physicist from the company headquarters environmental staff. Other audits are also conducted to assure compliance with company, federal, and state standards for occupational health, safety, and pollution control.

Allied has committed to a quarterly audit by the Health Physicist of health physics procedure implementation. However, it is not clear that this audit will be conducted in accordance with a formal written plan which ensures that all aspects of the operation are examined. Further, there is no requirement that the resulting written report will be given to the Plant Manager, and that it will list both the deficiencies observed and the corrective actions taken. The staff therefore recommends that the following condition be incorporated into the license to require a formal quarterly audit. During the course of each year, all areas which involve source materials shall be examined.

16. Notwithstanding the statements made in C-2.7 of the license renewal application, the Health Physicist shall conduct quarterly a formal audit of plant operations which involve source materials

in accordance with a preconceived written plan to determine compliance with regulations, license conditions, and licensee procedures. All areas involving source materials shall be audited at least annually. The findings of the audit, including deficiencies and the corrective actions taken, shall be documented in a formal report to the Plant Manager. The licensee shall attain compliance with this condition on or before July 31, 1985.

D. Personnel Training

All new employees receive safety indoctrination which is appropriate to the area and type of work the employee is to perform. Indoctrination and subsequent training is given by the Health Physics Supervisor or his assistant. The program consists of lectures, a tour of the plant, issuance of safety equipment (radiation detection badges, safety goggles, etc.), and fitting of respiratory equipment.

During the first week, employees are instructed daily by their supervisors in safety and radiation protection procedures. Effectiveness of training is evaluated through observation of job performance by the employees foreman.

Reinstruction is on a monthly schedule at safety meetings which cover a broad spectrum of radiation safety. Subjects covered include: radiological emergency planning, ALARA, air activity measurement of contamination, surface contamination monitoring and control, decontamination procedures, waste disposal, external exposure control, radiation dose and dose limits, uranium deposition and toxicity, respiratory protection, and employees rights and responsibilities. The employees receive an annual quiz to ascertain which subjects should receive additional emphasis.

Records of the initial training, issuance of equipment, and fitting of respirators are signed and retained.

VIII. RADIATION PROTECTION

A. External Exposure Control

As required by 10 CFR Part 20, external exposure of personnel is monitored by issuance of TLD badges to plant employees. The badges are exchanged on a monthly basis for hourly workers and on a quarterly basis for salaried employees.

Listed below are some of the controls utilized by Allied to reduce external exposure:

a. Processing areas having radiation fields in excess of 5 mrem per hour are clearly marked out to a point where the maximum level would be no more than 2.5 mrem per hour.

b. Investigative surveys are conducted by Health Physicists when process or procedural changes are planned and when a radioactive material vessel is to be inspected or repaired.

c. Work in an area known to be the source of higher levels of exposure is administratively limited.

B. Internal Exposure Control

1. Ventilation

All areas which are used to process source materials and which produce airborne contamination are provided with dust collectors, scrubbers, or other types of ventilation equipment. Laboratory type hoods shall have a minimum average face velocity of 100 linear feet per minute for radioactive material use. Normal operation of the ventilating system is monitored by radioactive materials sampling at all exit points, by observation of differential pressure drops and temperature for dust collectors, and visual observation.

Working areas in the facility are ventilated through a system of Dravo fresh-air intakes and a series of window and roof exhaust fans. This system has the capability of providing a complete air change approximately once every 5 minutes. The main control room and the process laboratory have separate air conditioning systems and are maintained at a slight positive pressure with respect to the rest of the facility to avoid infiltration of contaminated air.

2. Air Sampling

Airborne radioactivity levels are measured by 73 breathing zone samplers: 56 in the UF_6 operating area, 1 in the UF_6 plant laboratory, 4 in the Sodium Removal Facility, 3 in the drum dumping area, and 9 in the Sampling Plant. Samples are located approximately 5 feet above floor level and are sampled at a flow rate of 40 SCFH. Filters are changed and counted daily for alpha activity with the results reported in microcuries per cubic centimeter. Sample filters are changed and counted immediately after correction of any process upsets. After correction of process upsets, filters are changed and counted at 2-hour intervals until airborne radioactivity is reduced to less than 40 percent of MPC.

Air sampling results greater than 40 percent MPC results in administrative action to require respiratory protection and an investigation conducted to correct the problem. An investigation is also required if any single air sample is greater than 1 MPC.

The representatives of the fixed air sampling system is determined at least annually through the use of individual lapel samplers worn by employees.

3. Bioassay

The bioassay program consists of urinary uranium analysis to determine exposures to soluble uranium compounds and in vivo whole body counting to determine lung deposition of insoluble compounds.

Urinary bioassay samples are routinely collected twice monthly following a 24 to 96 hour absence from the facility. Uranium concentrations are determined by the fluorimetric method with a minimum sensitivity

of approximately 2 ug U/L. Confirmation of all results in excess of 30 ug U/L is required and a confirmed measurement in excess of 30 ug U/L results in employee restriction.

Non-routine urinary bioassay samples are collected when process upsets, such as a release of UF_6, have occurred or when an exposure is suspected for some other reason. A limit of 2.5 mg of soluble uranium intake is used by Allied based upon the potential for uranium heavy metal toxicity to the kidney.

Whole-body counting is performed at least annually for all potentially exposed employees. Additional measurements are made as necessary to investigate potential overexposures. Measurement is based upon the quantity of uranium-235 in the lung with a minimum sensitivity of 63 micrograms. This minimum sensitivity corresponds to about 32 percent of the maximum permissible lung burden for natural uranium. An action level for confirmation and investigation has been set by Allied at 50 percent of the MPLB (100 ug U^{235}).

4. Respiratory Protection

A respiratory protection program is conducted in accordance with 10 CFR 20.103. Respiratory protection is required by the licensee whenever airborne radioactivity exceeds 40 percent of MPC.

Each potentially exposed employee is given an annual quantitative respirator fit test, instructed in proper fitting, and prior to use, in-field tests for respirator functioning. The protection factors assigned are in accordance with 10 CFR Part 20, Appendix A. Actual exposures are determined through diagnostic bioassay.

C. Contamination Control

1. Access Control

Access to the plant operating area is restricted by two separate fences topped with barbed wire. Gates are secured by guards. Employees and visitors must pass the guard station before gaining access to the restricted area.

Change rooms are provided for employees and visitors and protective clothing is provided. Employees are encouraged to shower before changing into their personal clothing.

During the course of operations, some employees at the facility will not be exposed to or work with radioactive materials. These employees would include those working in fluorine generation and areas of the plant which produce fluoride compounds. Other employees, however, are involved in handling radioactive materials. The licensee has not committed to a personnel monitoring system at exit points which would allow for employees potentially exposed to radioactive materials to self-monitor for contamination prior to leaving the contamination control area. A failure to monitor for contamination of these employees prior to leaving the area could result in contamination of

unrestricted areas, as well as exposure of the employees involved. The staff, therefore, recommends that the following condition be added to the license to require functional survey equipment at all employee access points for the purpose of personnel contamination surveys. As a matter of policy, the licensee should not allow individuals which are contaminated to exit the area without specific approval by the Health Physicist. This policy does not, however, preclude the licensee from exempting employees which do not work with radioactive materials from a requirement to monitor for contamination.

17. The licensee shall maintain operational survey instruments for personnel contamination surveys at all access points to contamination controlled areas. These instruments shall be of a suitable type and sensitivity to detect the presence of contamination on the skin or clothing in excess of 200 dpm/100 cm^2. If contamination in excess of background levels is detected, decontamination of the employee shall be effected to reduce levels to background. The licensee shall not permit any individual to exit the contamination controlled area with contamination above background levels without the specific approval of the Health Physicist. The licensee shall attain compliance with this condition on or before September 30, 1985.

2. Surface Contamination Control

Plant operating areas are surveyed monthly for surface contamination using smear surveys to determine the extent of removable radioactive materials. Immediate decontamination is required if removable alpha exceeds 5000 DPM/100 cm^2. Other areas such as the plant lunchroom, offices, control room, locker room, and exit area are surveyed weekly, and results of 200 DPM/100 cm^2 removable alpha requires immediate cleanup. In non-uranium processing areas where other fluoride products are processed at the facility, surveillance is on a quarterly basis to confirm that uranium contamination is confined to the UF_6 processing areas.

The action levels and actions equal those described in Regulatory Guide 8.24, "Health Physics During Enriched Uranium-235 Processing and Fuel Fabrication," and are conservative when compared with the prescribed levels in Regulatory Guide 8.30, "Health Physics Surveys in Uranium Mills."

Cleanup is an ongoing operation utilizing fulltime employees to clean floors, equipment, and process lines in uranium processing areas. In addition, janitors routinely clean all control rooms, the lunchroom (4x per day), and office spaces.

The license renewal application does not contain any commitments regarding the leak testing of the sealed sources (Cs-137) which are contained in the possession limits. The staff therefore recommends that the following condition be added to the license to specify the frequency for leak testing and actions to be taken if source is found to be leaking.

18. Sealed sources shall be subject to the leak testing and actions specified in the attached Annex A, "License Condition for Leak Testing Sealed Byproduct Material Sources," dated November 1979.

3. Personnel Protective Equipment

All personnel engaged in operations where possible contamination may be encountered are provided with coveralls and safety shoes. Personnel are assigned two lockers each, a "hot" locker and a "cold" locker. When an employee reports for work, he is required to change into coveralls, safety shoes, hardhat, and safety glasses which are worn while on the job. At the end of the shift, the used coveralls are deposited in special containers for delivery to the plant laundry where they are washed and dried and returned to the employee. In addition to the protective clothing for employees, each individual entering the UF_6 building is required to have a respirator on his person.

When an employee needs to work under conditions where the possibility of contamination is greater than normal, he is required to wear two pairs of coveralls, shoe covers, respiratory protection, and gloves. In these cases, upon completion of the job, the outer clothing is removed and left at the job site after which the employee proceeds to a shower provided for decontamination in the UF_6 building and changes into clean coveralls. He then proceeds to the regular shower and locker room to change in the normal manner at the end of his shift. The contaminated clothing removed in the UF_6 building is washed and stored separately from the routine protective clothing to minimize the spread of contamination to other areas.

D. Effluent Control

1. Gaseous Effluent

Gaseous emissions from Allied which could contain significant quantities of uranium are discharged following treatment which is specific to the type of emission, such as mists, dusts or fumes. Table 9 lists a description and rated efficiency of the systems used. The discharge is through 51 stacks or exhaust fans which are continuously sampled. Depending on loss potential, sampling membranes are collected on a 12 or 24 hour frequency and are analysed for each 24 hour period. The licensee has established an administrative limit for each stack which is shutdown if the limit is exceeded. Confirmation of adequate functioning of the gaseous cleanup system is through monitoring of air concentrations at the fence line and at the nearest residence. Average results of air monitoring at the nearest residence for 1980, '81 and '82 are respectively, 70, 53, and 36% of the concentration limit. The allowable concentration limit ($3 \times 10\text{-}14$ µCi/ml for total alpha activity in air measured at Stations No. 8 and No. 11) provides compliance with the Environmental Protection Agency (EPA) uranium fuel cycle standards specified in 40 CFR Part 190.

Table 9. Gaseous Cleanup System
(Rated efficiency in parenthesis)

Description	Stack No.	Contaminate Removed	Primary Control	Secondary Control	Tertiary Control
Wet Oxide Dust Collector	1-1	Particulates	Baghouse (99.9)	Baghouse (99.9)	
Dry Oxide Dust Collector	1-2	Particulates	Baghouse (99.9)	Baghouse (99.9)	
Drum Cleaner Dust Collector	1-3	Particulates	Baghouse (99.9)	Baghouse (99.9)	
Oxide Vacuum Cleaner	1-4	Particulates	Cyclone (95.0)	Baghouse (95.0)	Baghouse (99.0)
UF_4 Vacuum Cleaner	1-7	Particulates	Cyclone (80.0)	Baghouse (99.9)	Baghouse (99.9)
"B" UF_4 Dust Collector	1-10	Particulates	Baghouse (99.9)	Baghouse (99.9)	
Dry Oxide Dust Collector	1-11	Particulates	Baghouse (99.9)	Baghouse (99.9)	
Ash Vacuum Collector	1-12	Particulates	Cyclone (80.0)	Baghouse (99.9)	
Ash Dust Collector	1-12	Particulates	Baghouse (99.9)	Baghouse (99.9)	
"A" Fluorinator Filters	1-13	Particulates	Metal Filters	Metal Filters	
"A" Fluorinator Scrubbers	1-13	F_2, HF, & UF_6	Spray Tower (80.0)	Packed Tower (99.0)	Coke Box (99.0)
"B" Fluorinator Filters	1-14	System Identical to 1-13			
"B" Fluorinator Scrubbers	1-14	System Identical to 1-13			
"C" Fluorinator Filters	1-14	System Identical to 1-13 (May use either "A" or "B" fluorinator scrubber system)			
"A" Top Hydrofluorinator Filter	1-23	Particulates	Carbon Filters (>99.9)	Carbon Filters (>99.9)	
"B" Top Hydrofluorinator	1-23	HF	H_2O Venturi Jets (88.0)	KOH Venturi Jets (85.0)	KOH Packed Tower (99.0)

Table 9. Gaseous Cleanup System (continued)
(Rated efficiency in parenthesis)

Description	Stack No.	Contaminate Removed	Primary Control	Secondary Control	Tertiary Control
"B" Top Hydrofluorinator Filter	1-24	System Identical to 1-23			
"B" Top Hydrofluorinator Scrubber	1-14	System Identical to 1-23			
"A" UF_4 Dust Collector	1-46	Particulates	Baghouse (99.0)	Baghouse (99.9)	
H_2S Incinerator Stack	1-48	H_2S, and S	Sulfur Condenser	Incinerator (99.0)	
Drum Inverter Dust Collector	1-54	Particulates	Baghouse (99.9)	Baghouse (99.9)	
Uranium Recovery Dust Collector	3-2	Particulates	Baghouse (99.9)		
Pond Mud Calciner	4-2	Particulates, HF, SO_2	Baghouse (99.9)	Spray Tower (95.0)	
Sampling Plant Dust Collector	17-1	Particulates	Baghouse (99.9)	Baghouse (99.9)	
Sampling Plant Vacuum Cleaner	17-2	Particulates	Baghouse (99.9)	Baghouse (99.9)	

2. Liquid Effluent

Liquid effluents are routed through an environmental protection facility (EPF) before discharge into the Ohio River. Effluentis sampled continuously and a composite sample is analyzed daily for uranium.

Allied's action level is 5% MPC; however, the reported annual concentration has not exceeded 2% MPC (10 CFR 20 Appendix B, Table II).

Lined settling ponds are used to precipitate solids such as calcium fluoride and uranium. When the ponds are cleaned periodically, the liners are checked for leaks or degradation. Precipitated calcium fluoride is shipped to an Allied Corporation hydrofluoric acid production plant and uranium bearing sludge is routed through the uranium recovery unit for recovery of contained uranium.

3. Solid Wastes

Solid waste routinely generated by operations is compacted in drums and shipped to a licensed waste disposal site.

Solid radioactive wastes, which contain about 2000 PPM natural uranium as well as other long lived isotopes, are packaged, stored in a specially designated area, and are then shipped to a licensed offsite facility for disposal or recovery of uranium.

Contaminated equipment is either decontaminated or compacted and shipped to a licensed site for disposal. The staff recommends that the following condition be added to the license to specify the criteria for decontaminating equipment prior to release from a contaminated area.

19. Release of equipment or packages from the plant site or to uncontrolled areas onsite shall be in accordance with the attached Annex B, "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 July 1982.

IX. SEVERE ACCIDENT CONSEQUENCES

A. Introduction

As part of its safety review for UF_6 production at Allied's Metropolis Works, the NRC staff has considered the potentials for severe accidents and their consequences. At Allied, natural uranium is handled in various chemical forms including yellowcake and UF_6. Of these compounds, accidents involving UF_6 are of primary concern because of the dispersability of this compound, the spontaneous reactions which it will undergo in air, and the toxicity of the compound which includes both chemical and radiological toxicities.

Accordingly, to assess the maximum impact of an accident on plant employees, a large release of UF_6 is considered. Historically, there have been at

least two such accidents, one in 1977 at a French facility and one in 1978 at the Gaseous Diffusion Plant in Portsmouth, Ohio. These two accidents involved a cylinder valve failure while sampling and the rupture of a filled cylinder, respectively. The staff has reviewed the operations conducted by Allied and identified the types of operations that could have the potential for a massive release of UF_6.

B. Background

UF_6 cylinders are filled, weighed, and sampled in a room which is separated from the processing area in the Feed Materials Building. The elongated room measures approximately 75 x 50 x 32 feet and is equipped with four adjacent cylinder stations. During operations, two of the cylinder stations are used for filling and two are used for steam heating and sampling. The room also contains a weigh buggy and scales and the sampling manifold.

UF_6 cylinders are moved a total of four times during the filling and sampling cycle. Following filling, the cylinder is lifted vertically 8 to 10 feet and moved horizontally approximately 50 feet to the weigh buggy for a preliminary determination of weight. The cylinder is then lifted 8 to 10 feet and moved approximately 30 feet to a sampling position where the cylinder is heated 6 hours in a steam chest and a sample of UF_6 is taken. Following sampling, the cylinder is moved to the weigh buggy for a final determination of weight using an 8 to 10 foot vertical lift. The final movement consists of a vertical lift of 6 feet and transfer to a mobile storage buggy. The storage buggy, with the UF_6 cylinder, is transported 150 to 200 feet to an outside cooling area.

Cylinder movements within the building are by crane which is secured via a strongback to the reinforcing bands built into the cylinder. Crane operations are controlled by the operator on a platform above the area. An assistant operator direct maneuvers from the main level. The only other person routinely in the area is the laboratory technician who obtains samples after a cylinder has been heated. Both the crane operator and the assistant currently working in this area are experienced in the method of operation and technology involved. Plant history in this area has been excellent, with no accidents attributed to cylinder movement.

C. Potential Accident Types

1. Valve and Pigtail Failure While Sampling

During heating and sampling, the areas of vulnerability are the valves and sampling lines. Valve failure may be attributed to seal leakage, body failure, or stem packing failure, and pigtail failure may be attributed to material fatigue or operator error. Allied's quality assurance program is designed to prevent these failures. The valves and pigtails are thoroughly inspected and new gaskets are installed and leak tested prior to filling the cylinder. Placement and removal of the steam cover is by crane, and activities in the area are limited to prevent dislodging of the pigtail. The cylinder bank is fronted by a 3-foot wide platform with steps at either end. This arrangement eliminates the presence of equipment such as a forklift which could dislodge the sampling line or puncture the cylinder.

In addition to preventive measures, Allied implements mitigating measures such as:

a. The cylinder is placed with the valve in the 9 o'clock position for heating and sampling. This reduces the quantity of liquid which could be spilled in the event of a damaged pigtail or valve.

b. A CO_2 tank is located immediately outside the filling room door. CO_2 will reduce the temperature of the liquid flowing from the 1-inch valve, forming a solid to block the flow of liquid which would reduce the magnitude of a release.

c. Wooden pegs are available to be placed in position to block the valve opening.

On the basis of the above discussion, the staff concludes that a massive release of UF_6 due to valve or pigtail failure while sampling is unlikely.

2. Cylinder Rupture

Release of UF_6 may result from hydrostatic rupture (from within the cylinder), a dropped cylinder, or an impact between a cylinder and an object. The potential for each to occur is discussed below.

a. Hydrostatic Rupture

At Allied, potential for release of UF_6 due to hydrostatic rupture is diminished by a comprehensive QA program. The program includes visual inspection of the cylinder, scheduled cleaning and hydrostatic testing, and evacuation of the cylinder prior to filling. These controls assure that no contaminants which could cause hydrostatic rupture are present in the cylinder.

Another cause of hydrostatic rupture is overfilling. To prevent overfilling, weight limitations are measured by load cells at each cylinder station by monitoring the product distillation rate during filling and by weighing each cylinder after filling to confirm that the plant administrative level of 88-90% of liquid capacity at 230°F has not been exceeded.

A problem associated with a weight of determination of cylinder filling is the potential presence of HF. HF is considerably lighter than UF_6, and could result in a full cylinder before the weight indicated completed filling. Upon heating, a cylinder containing HF could undergo hydrostatic rupture.

While heating the cylinder for sampling, an open system of steam heating is used to eliminate the possibility of heating the cylinder above 210°F. The QA program as it applies

to the presence of contaminants and the overfilling or overheating of cylinders should effectively minimize the potential for hydrostatic rupture in the filling room.

b. Dropping a Cylinder or Impact Between a Cylinder and an Object

The crane used to move cylinders is designed especially for the operation. It is inspected and serviced weekly in a preventive maintenance program, and cylinder movements are conducted slowly to prevent surging which could result in dropping or impacting the cylinder. Allied's procedures, such as the weekly inspection, the measured movement rate, and the presence of two operators to monitor each movement of the cylinder, contribute to significantly decrease the likelihood of an impact or dropping accident.

A 1976 report (DOE ORD-757) that considered the rupture of cylinders filled with liquid UF_6 states that a liquid filled Model 48Y (14 ton) cylinder could survive a drop on a flat surface without cracking from a maximum height of 4 feet, and Type 0M (5/16" wall) from a maximum height of 2 feet. In a 1968 report (KY-549), 14 ton cylinders filled with solid material did not fail from drops on flat surfaces from heights of up to 30 feet; however, failure did occur from heights of 40 inches when cylinders were dropped on a 6 x 8 inch piston. A cause for concern is the number of times the cylinder is moved in one filling process and that the movements are at heights of about 10 feet over other cylinders and equipment.

Based on this report, the staff is concerned that in the event of a drop or impact of a cylinder while it is being moved, the results could be severe. The staff notes that in the 1978 UF_6 accident, the cylinder was reported to rupture after a drop of 8 to 10 inches and impacting the corner of a wooden cradle.

D. Potential Accident Consequences

The postulated accident is the rupture of a filled cylinder after heating in the steam chest for sampling. The cylinder is assumed to rupture and release its entire contents upon impaction of the bottom of the cylinder with a protruding object. Prior to release, the UF_6 content of the cylinder is assumed to be 12,500 kg at 200°F and 55 psia.

The volume of the room is approximately 3400 m^3 with normal pressure, 50 percent humidity, and a temperature of 68°F. Release of the contents of the cylinder into this atmosphere will result in an initial vapor mass fraction of about .55. Therefore, about 55 percent (7000 kg) of the UF_6 released will be in the vapor phase, while 45 percent remains in the liquid phase. Of the 7000 kg of UF_6 vaporized, about 4 percent will hydrolyse with the available moisture in the air to form HF and particulate UO_2F_2. This reaction will rapidly produce a projected HF concentration of 28 g/m^3

and elevate the room temperature to approximately 160°F. The concentration of UF_6 in the room will be approximately 2000 g/m^3.

The "Generic Report on Health Effects for the U.S. Gaseous Diffusion Plants," K/D 5050, Section VIII, Part 1, June 1984, provides a basis upon which to judge the consequences for employees within the room at the time of this postulated accident. For soluble uranium, the 50% lethality level for a 1 minute exposure is 35 g/m^3. The atmosphere of the room contains over 50 times this concentration. Thus, an individual exposed to such an atmosphere could receive a dose sufficient for 50% lethality in a little more than 1 sec, or in approximately one breath. For HF, the lethality level is 53 g/m^3. Thus lethality due to exposure to HF would occur for exposures of greater than 2 minutes.

It is evident from the preceding discussion that individual survival in the event of a massive release of UF_6 in the cylinder filling area is dependent upon immediate respiratory protection and very rapid evacuation from the area. In addition to the inhalation hazards of these chemicals, an atmosphere containing HF, UO_2F_2, and UF_6 would be highly corrosive and reactant to moisture and hydrocarbons. Thus, even with respiratory protection, damage to the skin, eyes, etc., would occur rapidly.

At the present time, the licensee's mitigation measures are to strictly limit the number of personnel in the filling area and to provide the crane operator with self-contained breathing apparatus and an operator's escape route.

E. Conclusion

The staff finds that the licensee's proposed mitigation efforts are appropriate in the event of minor releases, such as would be associated with a failure of a valve or a pigtail. However, the proposed mitigation efforts are not sufficient for more severe accidents and do not address the cause of the problem.

The licensee, by letter dated July 9, 1984, states that they are "actively investigating operating options which will reduce the physical moves presently required in handling each full cylinder." The staff finds that these efforts should continue and that further efforts to mitigate the effects of a massive release should be considered, evaluated, and implemented. Such efforts should encompass actions for accidents within the facility and also accidents which occur outdoors. As noted in the Environmental Impact Appraisal, the potential consequences of a massive UF_6 release outside are also clearly unacceptable. The staff therefore recommends that the following condition be added to the license:

20. Within 6 months of the issuance of this license, the licensee shall prepare and submit to the Uranium Fuel Licensing Branch the following reports. These reports shall contain sufficient detail and analysis to allow an independent review and shall contain licensee commitments for the actions described.

    a. A report detailing operational modifications and actions to be taken to reduce the potential for a massive UF_6 release.

b. A report detailing measures and actions to mitigate the effects of a UF_6 release. This report shall deal with the potential release of material within the facility and outside of the facility.

X. Environmental Protection

Allied has an environmental monitoring program which involves 57 onsite and offsite locations around the facility. Sampling includes air particulates, soil, vegetation, ambient radiation, surface water, and groundwater, although each medium is not sampled at every location. In addition, the environmental monitoring program includes air, water and soil monitoring of non-radiological effluents (e.g., fluorine). The adequacy of this program was evaluated and established as part of the "Environmental Impact Appraisal for Renewal of Source Material License No. SUB-526," published in May 1984. The appraisal included an evaluation of the impact of the gaseous liquid and solid waste effluent. Based on recommendations in the appraisal, the staff recommends that the following conditions be added to the license:

21. On a semiannual basis, Allied shall take samples and perform uranium and fluoride analyses of bottom sediment from the liquid effluent drainage ditch from, at a minimum, locations approximately 700 and 1400 feet downstream of Outfall 002.

22. Notwithstanding the four steps for determining compliance with 40 CFR 190 (Section C-4.2, Page C-22), the licensee shall assure compliance with 40 CFR 190 as follows:

a. If the average air 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, the licensee shall, within 30 days, prepare and submit to the Commission a written report which identifies the cause for exceeding the limit and the corrective actions to be taken by the licensee to reduce radioactivity release rates.[1] If the parameters important to a dose assessment change, a report shall be submitted within 30 days which describe the changes in parameters and includes an estimate of the resultant change in dose commitment.[1]

b. In the event that the calculated dose to any member of the public in any consecutive 12-month period is about to exceed the limits specified in 40 CFR 190.10, the licensee shall take immediate steps to reduce emissio[illegible]n as to comply with 40 CFR 190.10. As provided in 40 [illegible]190.11, the

[1]The report or petition should be submitted to the Director, Office of Nuclear Material Safety and Safeguards, with a copy to the Director of the Regional Office of Inspection and Enforcement.

licensee may petition the Nuclear Regulatory Commission for a variance from the requirements of 40 CFR 190.10.[1] If a petition for a variance is anticipated, the licensee shall submit the request at least 90 days prior to exceeding the limits specified in 40 CFR 190.10.

c. The licensee shall continue the existing environmental air monitoring program (committed to in Section C-4.2, first paragraph, pages C-21 and C-22, including commitment to monitor fluoride). Continuous air sampling shall be conducted at all the stations and the air samples shall be 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 shall be performed with an analytical sensitivity of at least 10^{-16} µCi/ml.

d. Samples taken at Station No. NR-7 shall be composited at least quarterly and analyzed for uranium solubility. The solubility analysis shall follow the methodology and procedures established by Battelle Pacific Northwest Laboratories (BNWL)[2,3] or an equivalent method acceptable to NRC. If a laboratory other than BNWL is used for the analysis, the licensee shall provide NRC with a split sample so that the NRC can perform a verification analysis.

e. The licensee shall determine the particle size distribution of radioactivity in air at Station No. NR-7 using a multiple stage cascade impactor capable of fractionating particles in the respirable and non-respirable size ranges. The impactor shall be operated continuously except for those periods required for disassembly for particle size distribution analysis. The particle size distribution analysis shall be performed at least once per month as a minimum and more often if necessary to assure effective particle retention and fractionation.

f. The actual particle size distribution, material solubilities, and air concentrations, determined as required in Condition 22 c, d, and e above, shall be used to calculate the dose to the public for purposes of Condition 22 b.

23. Allied shall investigate why the uranium content of recent (1979-1982) soil and vegetation samples from both onsite and offsite locations is significantly higher than the content

---

[1]The report or petition should be submitted to the Director, Office of Nuclear Material Safety and Safeguards, with a copy to the Director of the Regional Office of Inspection and Enforcement.

[2]Solubility Classification of Airborne Products from Uranium Ores and Tailings Piles - D. R. Kalkwarf, BNWL, November 1978, USDOE Contract No. EY-76-C-04-1830.

[3]Second Quarterly Report on Solubility Classification of Airborne Products from LWR-Fuel Plants - D. R. Kalkwarf, BNWL, October 15, 1979.

determined during the 1968-1973 period. The findings of this investigation, including a proposal of what (if any) action by Allied is necessary to stop this increasing trend, shall be reported to the NRC's Uranium Fuel Licensing Branch within 1 year of the date of this license.

XI. FIRE SAFETY

Allied has stated the facility has been constructed and operated consistent with the requirements of applicable health and fire safety codes and will continue to do so. Insurance for the Allied facility is with American Nuclear Insurers. A copy of an inspection report by the Schirmer Engineering Corporation, Fire Protection Engineers, indicating satisfactory conditions is included in an addendum to this safety evaluation report.

XII. DECOMMISSIONING PLAN

Allied has incorporated the decommissioning plan dated August 14, 1978 and approved (as Amendment No. 3) on January 31, 1980, as Section C-6 of the license renewal application.

As noted in Condition 17 of the present license, approval for burial of radioactive contaminated material onsite is not granted by the NRC. Previous authorization under 10 CFR 20.304 to bury small quantities of radionuclides without prior approval was removed from the regulations in January 1981 (45 FR 71761). However, at the time of decommissioning, Allied may apply for specific approval of onsite burial if such burial is permitted by the regulations. Accordingly, the staff recommends that the following condition be added to the license.

24. Notwithstanding the statements made in Section C-6 of the license renewal application and the referenced general decommissioning plan dated August 14, 1978, no licensed material shall be buried onsite without specific approval by the Commission.

Assurance has been provided by the licensee that decommissioning costs will be financed by the Allied Corporation or its successor when they request termination of their Materials License.

XIII. RADIOLOGICAL CONTINGENCY PLAN

By letter dated July 23, 1981, and its revisions transmitted by letter dated January 5, 1982, Allied submitted a Radiological Contingency Plan which was approved by the NRC Amendment No. 5 to the existing license. The revised plan is adequate to demonstrate the licensee has accomplished the purposes of onsite radiological contingency planning: (1) the plant is properly configured to limit releases of radioactive materials and radiation exposures in the event of an accident, (2) a capability exists for measuring and assessing the significance of accidental releases of radioactive materials, (3) appropriate emergency equipment and procedures are provided onsite to protect workers against radiation hazards that might be encountered following an accident, (4) notifications are promptly made offsite to Federal, State and local government agencies, and (5) necessary recovery actions are taken in a timely fashion to return the plant to a safe condition following an accident.

The licensee is committed to implementing the above stated plan in Section C-7 of the renewal application.

XIV. EXEMPTIONS AND SPECIAL AUTHORIZATIONS

In Section C-1.8 of the renewal application, the licensee has requested an exemption from the requirements of 10 CFR 20.203(e)(1) and 20.203(f)(1). In place of the labeling of individual areas and containers, the licensee proposes that all plant entrances be posted with signs bearing the radiation symbol and the words:

RADIATION
RADIATION AREA
RADIOACTIVE MATERIALS

Any area or container in this plant
may contain radioactive materials

The staff recommends that this exemption to the regulations be granted, and therefore recommends that the following condition be added to the license.

25. The licensee shall be exempted from the requirements of 10 CFR 20.203(e)(1) and 20.203(f)(1) as provided in Section C-1.8 of the license renewal application.

XV. CONCLUSIONS AND RECOMMENDATIONS

Upon completion of the safety review of the licensee's application and compliance history, the staff has concluded that the activities authorized by the issuance of the renewal license to Allied, subject to the additional conditions developed by the FCUF staff, will not constitute an undue risk to the health and safety of the public. Further, the staff has determined that the application fulfills the requirements of 10 CFR 40.32.

The staff has discussed the renewal and proposed license conditions with George France, Region III. He feels the license, as written, addresses all of Region III's concerns and has no objection to the issuance of the renewal.

The staff therefore recommends that the Allied Chemical Company license be renewed in accordance with statements, representations, and conditions in Allied's application dated July 7, 1982, the revision dated September 30, 1983, and supplements dated December 9, 1983, and March 7, and August 1, 1984, subject to the following additional conditions:

6. Material	7. Form	8. Quantity
A. Natural Uranium	A. "Yellowcake", U_3O_8, UO_2, UF_4, UF_6	A. 68 million kg (150 million lb)
B. Cs-137	B. Sealed Sources	B. 300 millicuries

9. Authorized Use: For use in accordance with the statements, representations, and conditions contained in Chapters C-1 through C-7 of the license renewal application dated December 9, 1983, and supplements dated March 7, and August 1, 1984.

10. Authorized Place of Use: The licensee's existing facilities at Metropolis, Illinois.

11. In the conditions section of the license renewal application, the term "are" shall be interpreted as "shall be" in all instances where this term is used to denote services or actions by the licensee.

12. Personnel with appropriate health physics training shall be present at the plant at all times when operations involving source material are being conducted. The licensee shall attain compliance with this condition on or before September 30, 1985.

13. Health physics personnel shall be present whenever entry is made into containment structures, including ventilation baghouses, where the potential exists for exposure to airborne radioactivity concentrations greater than those specified in 10 CFR Part 20, Appendix B, Table 1. The licensee shall attain compliance with this condition on or before September 30, 1985.

14. The licensee shall prepare, on a semi-annual basis, a report summarizing and evaluating all of the radiological measurements made at the facility, including airborne radioactivity, surface contamination, internal and external exposures, effluents, and environmental monitoring. This report shall be provided to the ALARA Committee, the Plant Manager, and other levels of supervision as necessary for appropriate action.

15. Prior to performing work for which a Radiation Work Permit is required, the employee shall be provided with specific instructions regarding the task, the necessary safety precautions, and any safety equipment required. Receipt and understanding of this information shall be documented on the permit and shall include the employee's signature.

16. Notwithstanding the statements made in C-2.7 of the license renewal application, the Health Physicist shall conduct quarterly a formal audit of plant operations which involve source materials in accordance with a preconceived written plan to determine compliance with regulations, license conditions, and licensee procedures. All areas involving source materials shall be audited at least annually. The findings of the audit, including deficiencies and the corrective actions taken, shall be documented in a formal report to the Plant Manager. The licensee shall attain compliance with this condition on or before July 31, 1985.

17. The licensee shall maintain operational survey instruments for personnel contamination surveys at all access points to contamination controlled areas. These instruments shall be of a suitable type and sensitivity to detect the presence of contamination on the skin or clothing in excess of 200 dpm/100 cm^2. If contamination in excess of background levels is detected, decontamination of the employee shall be effected to reduce levels to background. The licensee shall not permit any individual to exit the contamination controlled area with contamination above background levels without the specific approval of the Health Physicist. The licensee shall attain compliance with this condition on or before September 30, 1985.

18. Sealed sources shall be subject to the leak testing and actions specified in the attached Annex A, "License Condition for Leak Testing Sealed Byproduct Material Sources," dated November 1979.

19. Release of equipment or packages from the plant site or to uncontrolled areas onsite shall be in accordance with the attached Annex B, "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 July 1982.

20. Within 6 months of the issuance of this license, the licensee shall prepare and submit to the Uranium Fuel Licensing Branch the following reports. These reports shall contain sufficient detail and analysis to allow an independent review and shall contain licensee commitments for the actions described.

    a. A report detailing operational modifications and actions to be taken to reduce the potential for a massive UF_6 release.

    b. A report detailing measures and actions to mitigate the effects of a UF_6 release. This report shall deal with the potential release of material within the facility and outside of the facility.

21. On a semiannual basis, Allied shall take samples and perform uranium and fluoride analyses of bottom sediment from the liquid effluent drainage ditch from, at a minimum, locations approximately 700 and 1400 feet downstream of Outfall 002.

22. Notwithstanding the four steps for determining compliance with 40 CFR 190 (Section C-4.2, Page C-22), the licensee shall assure compliance with 40 CFR 190 as follows:

    a. If the average air 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, the licensee shall, within 30 days, prepare and submit to the Commission a written report which identifies the cause for exceeding the limit and the corrective actions to be taken by the licensee to reduce radioactivity release rates.[1] If the parameters important to a dose assessment change, a report shall be submitted within 30 days which describe the changes in parameters and includes an estimate of the resultant change in dose commitment.[1]

    b. In the event that the calculated dose to any member of the public in any consecutive 12-month period is about to exceed the limits specified in 40 CFR 190.10, the licensee shall take immediate steps to reduce emissions so as to comply with 40 CFR 190.10. As provided in 40 CFR 190.11, the licensee may petition the Nuclear Regulatory Commission for a variance from the requirements of 40 CFR 190.10.[1]

---

[1]The report or petition should be submitted to the Director, Office of Nuclear Material Safety and Safeguards, with a copy to the Director of the Regional Office of Inspection and Enforcement.

If a petition for a variance is anticipated, the licensee shall submit the request at least 90 days prior to exceeding the limits specified in 40 CFR 190.10.

c. The licensee shall continue the existing environmental air monitoring program (committed to in Section C-4.2, first paragraph, pages C-21 and C-22, including commitment to monitor fluoride). Continuous air sampling shall be conducted at all the stations and the air samples shall be 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 shall be performed with an analytical sensitivity of at least 10^{-16} µCi/ml.

d. Samples taken at Station No. NR-7 shall be composited at least quarterly and analyzed for uranium solubility. The solubility analysis shall follow the methodology and procedures established by Battelle Pacific Northwest Laboratories (BNWL)[2,3] or an equivalent method acceptable to NRC. If a laboratory other than BNWL is used for the analysis, the licensee shall provide NRC with a split sample so that the NRC can perform a verification analysis.

e. The licensee shall determine the particle size distribution of radioactivity in air at Station No. NR-7 using a multiple stage cascade impactor capable of fractionating particles in the respirable and nonrespirable size ranges. The impactor shall be operated continuously except for those periods required for disassembly for particle size distribution analysis. The particle size distribution analysis shall be performed at least once per month as a minimum and more often if necessary to assure effective particle retention and fractionation.

f. The actual particle size distribution, material solubilities, and air concentrations, determined as required in Condition 22 c, d, and e above, shall be used to calculate the dose to the public for purposes of Condition 22 b.

23. Allied shall investigate why the uranium content of recent (1979-1982) soil and vegetation samples from both onsite and offsite locations is significantly higher than the content determined during the 1968-1973 period. The findings of this investigation, including a proposal of what (if any) action by Allied is necessary to stop this increasing trend, shall be reported to the NRC's Uranium Fuel Licensing Branch within 1 year of the date of this license.

24. Notwithstanding the statements made in Section C-6 of the license renewal application and the referenced general decommissioning plan dated August 14, 1978, no licensed material shall be buried onsite without specific approval by the Commission.

---

[2]Solubility Classification of Airborne Products from Uranium Ores and Tailings Piles - D. R. Kalkwarf, BNWL, November 1978, USDOE Contract No. EY-76-C-04-1830.

[3]Second Quarterly Report on Solubility Classification of Airborne Products from LWR-Fuel Plants - D. R. Kalkwarf, BNWL, October 15, 1979.

MAY 28 1985

25. The licensee shall be exempted from the requirements of 10 CFR 20.203(e)(1) and 20. 203(f)(1) as provided in Section C-1.8 of the license renewal application.

DONALD A. COOL

Donald A. Cool, Ph.D.
Project Manager

Original Signed By:
W. T. Crow

Approved by:
W. T. Crow, Section Leader

OFC:	FCUP	:FCUP	:FCUF	:FCUF	:	:	:
NAME:	DACool	:SDWyngarden:	VTharpe:	WTCrow	:	:	:
DATE:	5/23/85	:5/23/85	:5/27/85:	5/28/85	:	:	:

OFFICIAL RECORD COPY

MAY 28 1985

SCHIRMER ENGINEERING CORPORATION
707 LAKE COOK ROAD
DEERFIELD, ILLINOIS 60015-4997
(312) 272-8340

FIRE PROTECTION ENGINEERS
SAFETY ENGINEERS
CODE CONSULTANTS

ALLIED CORPORATION
CHEMICAL SECTOR
Chemicals (PMC Group)
Mr. A. Cipolla, Plant Manager
U.S. Hwy. #45, N.
P. O. Box 430
Metropolis, IL 62960

SEC LOC. NO.: 2476
CUSTOMER I.D.: 0807
REINSPECTION NO.: 14

CLASS OF RISK: Partially Sprinklered Nuclear Products Plant

ENGINEER: R. R. Wojcik

INSPECTION DATE: November 17, 1983

CHANGES

There have been no material changes in occupancy, construction, hazards, protection or exposure since the previous inspection.

GENERAL REMARKS

Fire Prevention

PROTECTION EQUIPMENT: Automatic sprinkler equipment in service.

Churn test made on automatic electric fire pump with manual dual diesel drive. Started at 85 psi. Stopped at 125 psi.

Running times set for seven minutes on electric pump.

Two inch drains at sprinkler risers reduced pressure from 125 psi to 85 psi.

Local sprinkler alarms tested with satisfactory results.

Fire extinguishers are inspected monthly.

Fire extinguishers last hydrostatically tested on various dates per NFPA standards.

HEATING SYSTEM: The gas fired heating equipment and all safety controls are serviced and tested by plant personnel on a regular schedule.

ELECTRIC CIRCUITS: Electric circuits are properly fused. No overheating was noted.

Diesel emergency generator tested satisfactorily.

HOUSEKEEPING: Housekeeping and general maintenance found good. Trash and floor sweepings are properly disposed of.

LOSS PREVENTION: Fire Brigade is organized.

Monthly recorded drills are held.

Records are adequate.

WATCH SERVICE: Watch service remains as previously reported.

Coverage is adequate. Records found satisfactory.

SPECIAL REMARKS

Fire Brigade is organized to fight structural fires. It meets requirements of OSHA sub-part L.

There have been no fires since the last inspection.

The deluge system protecting "G" rectifiers was satisfactorily tested and restored to service.

All deluge systems protecting the rectifiers were tested during summer of 1983 with satisfactory results.

The monitor nozzle protection for the propane tanks was tested with satisfactory results during inspection.

The automatic electric and manual diesel drives on the dual drive fire pump were both flow tested with satisfactory results.

Inspection was made with Mr. Ron DeBernardi, Safety Inspector and discussed with him and Mr. B. Ogle, Safety Supervisor.

RECOMMENDATIONS COMPLETED

There were no recommendations on previous report.

RECOMMENDATIONS

None.

*** **

Marsh & McLennan

Marsh & McLennan, Incorporated
1221 Avenue of the Americas
New York, New York 10020
Telephone 212 997-2000

MAY 2 8 1985

November 30, 1983

Mr. Ronald Yates
Allied Corporation
P. O. Box 430
Metropolis, Illinois 62960

Allied Corporation
ANI Policy NS-77
Certificate of Insurance - South Carolina

Dear Mr. Yates:

Pursuant to our telephone conversation this morning, enclosed is the original certificate of insurance issued in the interest of South Carolina Department of Health and Environmental Control for Allied Corp's policy NS-77. The certificate appears to be in good order and is effective January 1, 1984.

Please contact us if you have any questions.

Sincerely,

Ayshe Djemal

Ayshe Djemal
Nuclear Consultants

;ad
Enc.

cc: J. Rubenstein - w/enc.

BURT C. PROOM, CPCU
President

MAY 28 1985

LIABILITY UNDERWRITING DEPARTMENT
John L. Quattrocchi, Vice President

CERTIFICATE OF NUCLEAR ENERGY LIABILITY INSURANCE (SUPPLIER'S AND TRANSPORTER'S FORM)

This is to certify that there is in force as of the effective date of this Certificate a Nuclear Energy Liability Insurance Policy (Supplier's and Transporter's Form) issued by the members of American Nuclear Insurers to the insured named below with respect to his operations hereinafter described. If such policy is canceled or terminated prior to the end of December 31 of the calendar year in which this Certificate becomes effective, 20 days' advance written notice thereof will be mailed to the party designated below for whom this Certificate is issued and this Certificate shall thereupon terminate. Otherwise this Certificate shall terminate as of said December 31st.*

Name and Address of Insured:
Allied Corporation
P. O. Box 1219 R
Morristown, New Jersey 07960

Policy No. NS- 77 Effective Date of Policy November 24, 1959

Limit of Liability $ 10,000,000.00, subject to all of the terms of the policy having reference thereto.

Description of Operations:

The furnishing of services, materials, parts or equipment in connection with nuclear facilities or in connection with other installations utilizing source material or special nuclear material.

Name and Address of Party for whom this Certificate is issued:
South Carolina Department of Health and Environmental Control
Bureau of Finance
2600 Bull Street
Columbia, South Carolina 29201

Attn: H. G. Shealy, Chief
Bureau of Radiological Health

Effective Date of this Certificate: January 1, 1984

AMERICAN NUCLEAR INSURERS

BY J. L. Quattrocchi
JOHN L. QUATTROCCHI, VICE PRESIDENT -LIABILITY UNDERWRITING

DATE November 21, 1983
FARMINGTON, CT

* A Certificate will not be issued for the subsequent calendar year unless requested.