Pfizer

Portage Road Facilities
Decontamination and Decommissioning Plan

Building 172 and North Tank Farm

NRC License No. 21-00182-03

Pfizer Global Manufacturing
7000 Portage Road
Kalamazoo, MI 49001

March 2007

Prepared by:
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March 15, 2007

Mr. George M. McCann
Decommissioning Branch
Nuclear Regulatory Commission, Region III
2443 Warrenville Road STE 210
Lisle, IL 60532-4352

Subject: Submission of the Decontamination and Decommissioning (D&D) Plan for Building 172 including the incinerator and connecting North Tank Farm located at the 7000 Portage Road facility under License No. 21-00182-03, Pharmacia and Upjohn Company LLC.

Dear Mr. McCann:

This letter is a follow-up to my February 13, 2007 letter I sent NRC acknowledging that Pfizer has ceased disposal activities of radioactive materials through its incinerator and intends to decommission Building 172 (B172) which includes the incinerator systems and North Tank Farm (NTF.) The initial intent after decommissioning was to remove the incinerator and raze the NTF and retain B172 for future use although Pfizer has now decided to also raze Building 172.

Accompanying this letter is our proposed D&D Plan, two copies. As stated in my 02/13/2007 letter, a formal approved D&D Plan is not required based on the information gathered during the historical site assessment and scoping surveys. However, we would appreciate any comments in regards to its adequacy to meet the NRC's expectations to properly decontaminate and decommission this facility. Pfizer will start preparing for the D&D process in accordance with the "Plan" in 30 days from the date of this letter unless the NRC contacts me to recommend any changes to the Plan.

Per your request in the letter dated March 9, 2007, the decommissioning activities by Pfizer/SEC are scheduled for the period of May 7 – 18, 2007. I will contact you immediately if there is a change in this schedule and I will confirm this schedule with you at a date closer to the start date.

Pfizer has procured Safety & Ecology Corporation (SEC) to manage the D&D project; perform necessary surveys in accordance with MARRISM guidelines and document the process in a "Final Report." Upon completion of the D&D process Pfizer will submit the D& D Final Report and an amendment request to the NRC for approval in order to release B172/Incinerator for "unrestricted use."

Sincerely, Dee L Clement

Dee L. Clement Radiation Safety Officer - Kalamazoo Site

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APPENDICES

ACRONYM LIST

ALARA	As Low As Reasonably Achievable
CFR	Code of Federal Regulations
D&D	Decontamination and Decommissioning
$DCGL_{EMC}$	Derived Concentration Guideline Level – Elevated Measurement Comparison
$DCGL_W$	Derived Concentration Guideline Level – Wilcoxon Rank Sum
DQO	Data Quality Objective
DSV	Default Screening Value
FDA	Food and Drug Administration
GSF	Gross Square Feet
HSA	Historical Site Assessment
HVAC	Heating , Ventilation, Air Conditioning
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	Minimum Detectable Concentration
MDEQ	Michigan Department of Environmental Quality
NRC	U.S. Nuclear Regulatory Commission
P&U	Pharmacia and Upjohn Co.
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RDRC	FDA Approved Radioactive Drug Research Committee
RSO	Radiation Safety Officer
RSC	Radiation Safety Committee
TEDE	Total Effective Dose Equivalent
TUC	The Upjohn Company

1.0 Introduction

Pfizer is planning to perform decontamination and decommissioning (D&D) of the Incinerator, North Tank Farm, and associated systems located within and nearby to Building 172 of the Pfizer Global Manufacturing (PGM) Portage Road site.

The PGM facilities were obtained by Pfizer in 2003 as part of Pfizer's acquisition of Pharmacia and Upjohn Corporation[1]. The incinerator was constructed in 1980 and has been used until December 2006 to incinerate liquid and solid waste including radioactive materials, solvents, animal carcasses, laboratory trash and similar items.

Radioactive materials disposed of in the incinerator over the past 15 years consisted of small quantities of a variety of radionuclides for biomedical research. These included H-3, C-14, I-125, P-32, P-33, S-35, and Cr-51 as well as other generally short lived radionuclides.

This plan was developed using the guidance provided in NUREG 1757, "Consolidated NMSS Decommissioning Guidance"; and NUREG 1575, "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM). It provides the approach, methods, and techniques for the radiological D&D of impacted areas of the facility. Final status surveys are designed to implement the protocols and guidance provided in MARSSIM to demonstrate compliance with the default screening values specified in NUREG 1757, Appendix B or generated using the default scenarios and parameters of the DandD code v.2.1. These methods ensure technically defensible data is generated to aid in determining whether or not these facilities meet the release criteria for unrestricted use specified in 10 CFR 20 Subpart E.

A facility historical site assessment (HSA) and scoping surveys were performed in January 2007 in order to classify impacted areas, estimate decommissioning costs and develop this Plan. Pfizer will retain a qualified D&D contractor to characterize, remediate, perform final status surveys and produce a final status report for submittal along with a license amendment request to remove the buildings from the license. D&D activities will be performed in accordance with this plan, Pfizer's Radiation Protection Program and Pfizer's USNRC Radioactive Materials License(s).

2.0 Site Description

The Pfizer Global Manufacturing Portage Road site located at 7000 Portage Rd., Portage, MI is an approximately 1728 acre pharmaceutical complex consisting of multiple chemical and compound manufacturing structures including offices and pharmaceutical manufacturing facilities. The site also includes a number of supporting services including site maintenance and construction, and waste collection, processing and disposal. Facilities have been routinely added, upgraded and renovated over the years. An aerial view of the site is presented in Figure 2.1.

[1] Pharmacia & Upjohn Company (f/k/a The Upjohn Company) is a wholly owned subsidiary of Pharmacia & Upjohn, Inc. which in turn is a wholly owned subsidiary of Pharmacia Corporation. With the acquisition of Pharmacia by Pfizer, Pharmacia became a wholly owned subsidiary of Pfizer, Inc.

2.1 Incinerator

The incinerator is located in and is the primary purpose of Building 172. Building 172 is a one story building approximately 24 feet in height that contains the incinerator, operating controls, emissions controls, office areas, and waste receipt, transfer and shipping areas. The building is approximately 8,500 gross square feet in area. There is an equipment mezzanine located above part of the incinerator that forms a small equipment "penthouse". Exterior photographs of Building 172 are presented in Figure 2.2 and 2.3.

The incinerator itself is a custom unit designed and built by C&H Combustion of Troy, MI. The incineration system consists of a rotary kiln, a secondary combustion chamber, and a multi-element air pollution control section. The system was designed to accommodate both solid and liquid hazardous and radioactive wastes. A photograph of the incinerator feed mechanism is presented in Figure 2.4

The primary combustion chamber of the incinerator is a variable speed rotary kiln that is 12 feet long and 5-1/2 feet in diameter (interior dimensions). The kiln rotates at a maximum speed of 1.8 rpm and is positioned at a 3-degree down slope from horizontal from feed to discharge. Figure 2.5 is a photograph of the exterior of the rotary kiln. The design of the kiln includes a flowing counter-current of air between the inner and outer shell which preheats secondary combustion chamber air. This cools the outer shell and reduces the average temperature of the refractory layer, thereby increasing its life, while preheating combustion air. The primary combustion chamber is constructed of a 16 gauge steel outer shell with a 4-inch air lane covered with 9-inch industrial firebrick.

The feed end of the kiln is equipped with a dual-feed burner that air-atomizes liquid wastes and injects supplemental fuel (natural gas) when required. Maximum operating temperature by design is 2700 °F. The normal operating temperature is approximately 1,400 °F. A slight negative pressure is maintained in the kiln during operation.

The secondary combustion chamber is a horizontal cylindrical steel shell, lined with super-duty refractory, high temperature insulating firebrick, and an acid resistant membrane. The secondary combustion chamber is 19 feet long with a diameter of 7.67 feet. The volume of the secondary combustion chamber is 878 cubic feet which permits a minimum residence time of 2 seconds. Like the rotary kiln, the burner for the secondary combustion chamber is an air-atomized, dual fuel unit that can burn natural gas and/or liquid wastes. Temperatures in the combustion chamber are maintained above 1,800 °F through the firing of waste solvents with supplementary natural gas as needed.

The principal types of hazardous waste burned in the incinerator include pathologic wastes, trash, returned pharmaceuticals, organic process residues, waste solvents and laboratory chemicals. Some of these wastes are contaminated with low-levels of radioactive materials.

2.2 North Tank Farm

The North Tank Farm (NTF) consists of three 10,000 gallon carbon steel tanks used to store solid waste organic liquids from the Solvent Recycling and Distribution (SRD) unit prior to incineration in the on-site incinerator. Incinerator operators also operate the NTF. The tank designations and dates of installation are listed below:

Tank No.	Date of Installation
ST-1	1980
ST-2	1982
ST-3	1980

The tanks are of similar construction. Each is a vertical tank with an outside diameter of 11 feet and a straight-side height of 13 feet. The maximum capacity of each of the three tanks is 10,100 gallons, with a total capacity for the tank farm of 30,300 gallons.

Solvents containing radioactive materials have been processed through the NTF, however this practice was discontinued approximately 10 years ago. The NTF Tanks were flushed and cleaned subsequent to this practice being discontinued. Figure 2.6 is a photograph of the NTF.

Figure 2.1 Pfizer Site – Aerial View

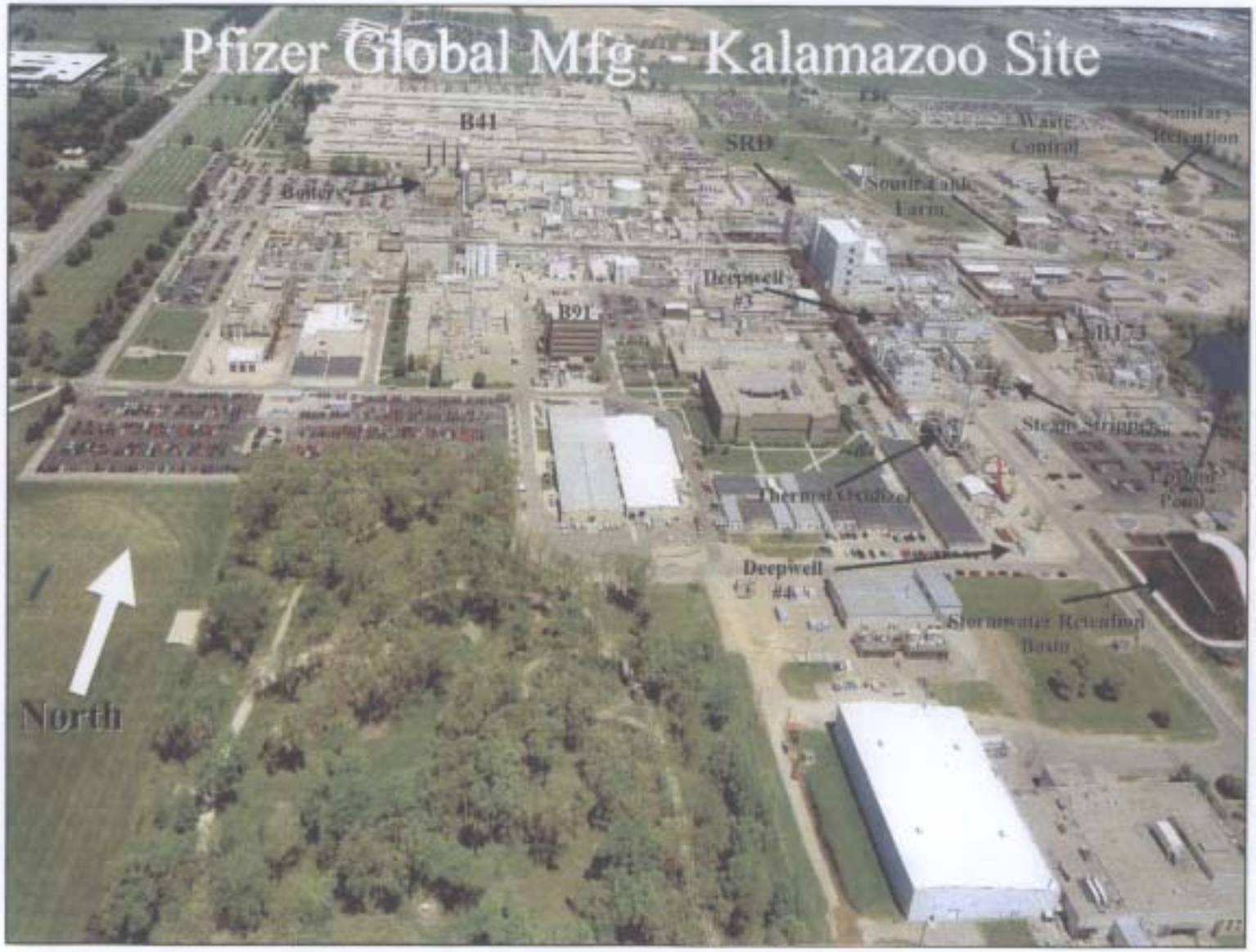


Figure 2.2 Exterior of Building 172 (Incinerator Building)

Figure 2.3 Exterior of Building 172 (Incinerator Building) Office Area

Figure 2.4 Incinerator Loading Ram and Airlock

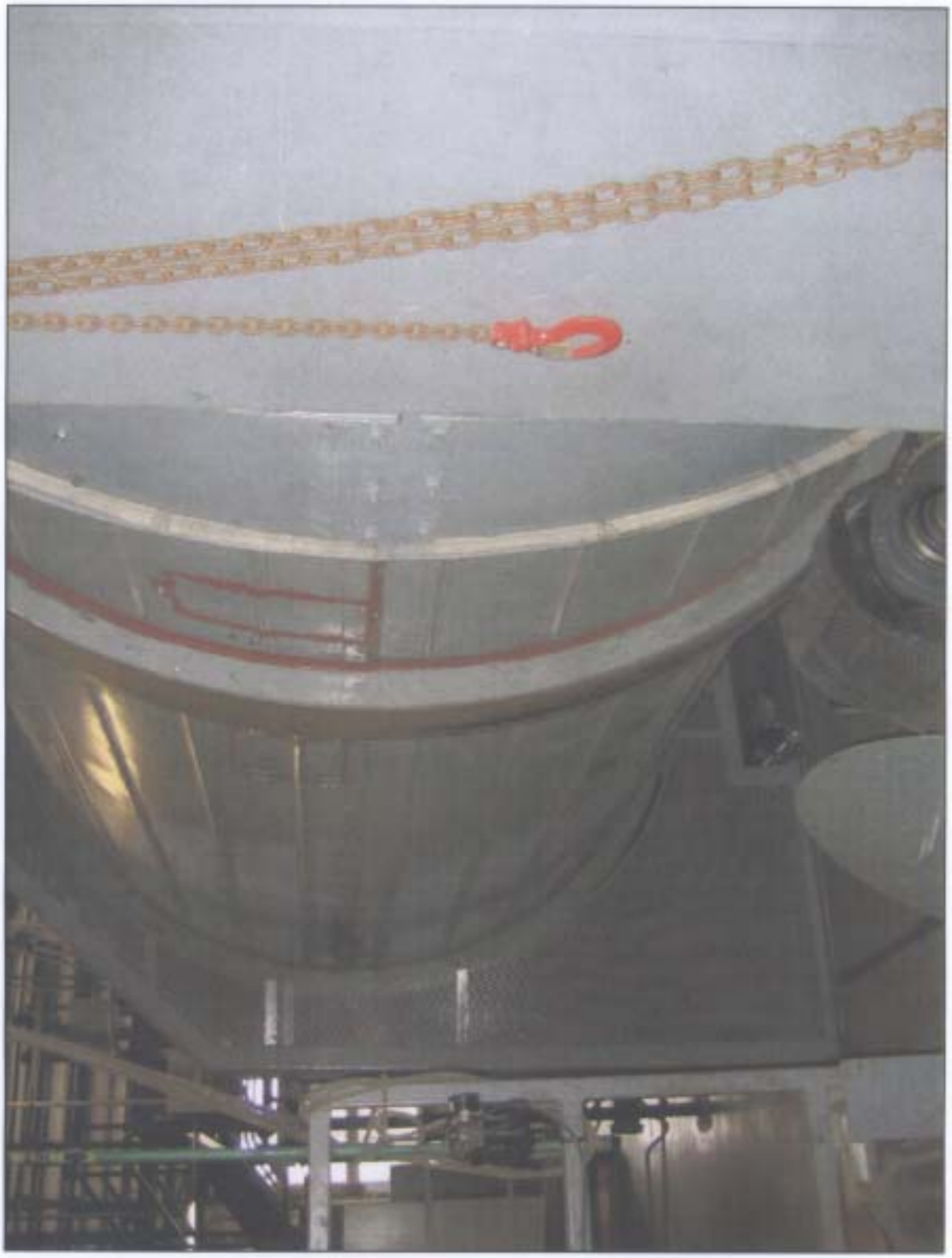


Figure 2.5 Incinerator Rotating Kiln

Figure 2.6 North Tank Farm

3.0 Building 172 and North Tank Farm History

3.1 HSA

The purpose of the historical site assessment (HSA) is to determine status of the site including potential, likely, or known sources of radioactive contamination by gathering data from various sources. This data includes physical characteristics and location of the site as well as information found in site operating records, including radiological surveys.

Originally an HSA was performed from October 13-31, 2003 as part of a larger Pfizer decommissioning effort. Pfizer subsequently decided to defer decommissioning the incinerator at that time. Pfizer has recently made the decision to terminate incinerator operations and to decommission the facility. Consequently HSA and radiological data was updated and additional information was gathered during a site visit conducted from January 10-13, 2007.

The records review included: radioactive materials licenses, license applications, amendment requests, Radiation Safety Committee meeting minutes, radiological surveys, radionuclide receipt and distribution records, incident reports, radiation safety newsletters, decommissioning records, facility renovation records, blueprints, plans and design specifications.

Personnel interviews included radiation safety, operations, and facilities personnel. Scoping surveys were also performed concurrently to aid in the HSA and classification of facility areas as described below.

3.2 Potential Contaminants

Table 3.1 is a list of radionuclides and quantities incinerated since calendar year 2000. This list was compiled from annual radionuclide incineration records maintained by the authorizations for radioactive material use (isotope and quantity) in individual laboratories and review of radionuclide receipt and distribution records. A complete listing dating back to 1991 is contained in Table 3.4.

The majority of these potential contaminants have very short half-lives. Calculations of possible remaining activity were performed based on the dates and quantities of radionuclides incinerated. These calculations were then used to eliminate survey requirements for these short lived isotopes by providing empirical evidence to support that there is no potential to exceed the established DSV after accounting for radioactive decay.

Nuclides were evaluated by 1) decaying each radionuclide delivery to present activity levels, then, 2) summing the remaining activity as if all of it was still present in the incinerator and 3) dividing the summed activity over a one square meter area. The resulting calculated surface activity was then compared to the Default Screening Values (DSV's) contained in NUREG 1757 or generated from a screening analysis using the default parameters contained in the DandD code v.2.1 and v.2.2. Those nuclides whose

possible remaining activities were greater than or equal to the DSV are carried forward as "nuclides of concern" for purposes of performing decommissioning surveys.

Summary reports documenting the input parameters and output values for each DandD code run are provided in Appendix C to this plan.

After considering amounts of radionuclides incinerated and the dates that they were processed, the only radionuclides of concern are H-3 and C-14.

Table 3.1 Radionuclides Disposed via Incineration

Isotope	Half-Life	2006 (mCi)	2005 (mCi)	2004 (mCi)	2003 (mCi)	2002 (mCi)	2001 (mCi)	2000 (mCi)
H-3	12.3 y	3.0E3	7.9E1	4.1E3	3.7E2	3.0E3	3.0E3	3.6E3
C-14	5730 y	5.3E2	3.2E1	2.8E2	6.1E1	6.2E1	1.9E2	4.3E2
P-32	14.3 d	---	---	9.0E-5	1.6E-2	4.0E-2	5.7E-2	2.7E-2
P-33	24.4 d	---	---	1.4E-2	5.6E-2	7.8E-2	1.4E-1	1.3E-1
S-35	87.9 d	1E-3	4.2E-2	1.1E0	3.6E0	6.6E0	8.0E0	1.1E1
I-125	60.2 d	4.0E-5	3.0E-3	1.6E-1	3.4E-1	3.7E-1	2.7E-1	2.4E-1

"---" indicates that no activity for these nuclides was incinerated that year.

Table 3.2 Default Screening Values for Radionuclides Listed in Table 3.1

Isotope	Half-Life	Quantity (mCi)	DSV (dpm/100 cm^2)	DSV Basis
H-3	12.3 y	20	1.2E8	NUREG 1757
C-14	5730 y	5	3.7E6	NUREG 1757
P-32	14.3 d	1	9.5E6	DandD[1]
P-33	24.4 d	1	4.1E7	DandD
S-35	87.9 d	1	1.3E7	NUREG 1757
I-125	60.2 d	3.0	6.6E5	DandD

Note 1: These values were generated using DandD v.2.1; Bldg. Occupancy scenario and default parameters: 0.9 quantile ≤25 mrem/y.

3.3 License History

The original facility Byproduct Material License was applied for in March 22 1956 by The Upjohn Company (TUC). Atomic Energy Commission (AEC) License 21-182-1 was issued for possession of 300 mCi of S-35 on March 30, 1956. The license was

issued for 301 Henrietta Street Kalamazoo, MI. Prior to this license being issued, TUC had operated under individual authorizations for radionuclide procurement issued by the AEC. These were issued by the AEC in response to TUC requests to use individual nuclides and compounds on an *ad hoc* basis.

License renewal issued April 24, 1958. License Number became 21-182-3 (D60). This renewal also added The Upjohn Company at 7171 Portage Road, Kalamazoo, MI as an authorized use location. Amendment 3 was issued September 23, 1959. This added incineration at the Portage Road facility as an authorized waste treatment technology. Amendment 9 dated Jan 27, 1966 renewed license to January 1968 License number changed to 21-182-3 (A-68).

A license amendment request dated May 13, 1983 requested addition of the new incinerator and associated tankage (North Tank Farm). This change was authorized in amendment 21 issued July 31, 1984. The unit has remained in essentially this configuration since that time.

3.4 Previous Decommissioning Activities

Three historical events have been identified with respect to previous decommissioning activities.

A waste heat recovery boiler was removed from the incinerator in the late 1990's. This unit was originally located downstream of the secondary combustion chamber. It was replaced with a transition piece connecting the secondary combustion chamber with the scrubber.

A small spill (less than 10 gallons) occurred in the NTF in March of 1995. The highest levels measured were 2,500 dpm/100cm^2. The spill was cleaned up and the area was re-surveyed and released.

As mentioned previously, the tanks in the NTF have not been used to receive or store radioactive liquids since 1996. The tank interiors were rinsed out subsequent to this process being discontinued.

As part of routine maintenance refractory linings are routinely replaced on an approximately annual basis. Refractory is surveyed to ensure it meets license limits prior to release for offsite disposal.

Table 3.3 Radionuclides Disposed via Incineration

	2006 (µCi)	2005 (µCi)	2004 (µCi)	2003 (µCi)	2002 (µCi)	2001 (µCi)	2000 (µCi)	1999 (µCi)	1998 (µCi)	1997 (µCi)	1996 (µCi)	1995 (µCi)	1994 (µCi)	1993 (µCi)	1992 (µCi)	1991 (µCi)
C-14	5.30E+05	3.20E+04	2.80E+05	6.10E+04	6.20E+04	1.90E+05	4.30E+05	1.00E+06	8.70E+05	4.70E+05	3.10E+05	6.60E+04	3.40E+05	1.16E+05	3.46E+05	3.37E+04
Ca-45									1.70E+00	1.00E+01	7.90E+01		4.70E+02	8.30E+00	8.63E+02	1.30E+03
Ce-141											8.00E-01		3.10E+00	3.81E+01	3.36E+02	7.09E+01
Cl-36														1.00E+00		1.10E+00
Co-57									4.00E-01				3.00E-01	2.00E+00	7.30E+00	1.33E+01
Cr-51								1.00E-01	2.00E-01	8.00E-01	4.20E+00	3.50E+00	1.40E+01	1.91E+03	2.70E+03	2.77E+03
H-3	3.00E+06	7.90E+04	4.10E+06	3.70E+05	3.00E+06	3.00E+06	3.60E+06	1.70E+06	2.00E+06	1.90E+06	8.70E+05	6.60E+05	1.90E+06	1.31E+06	1.61E+06	1.76E+05
I-125	4.00E-02	3.00E+00	1.60E+02	3.40E+02	3.70E+02	2.70E+02	2.40E+02	4.70E+02	6.90E+02	3.80E+02	2.30E+02	1.40E+02	6.20E+02	1.39E+03	9.46E+03	5.31E+03
Nb-95											1.90E+00		1.00E-01	2.90E+00	2.00E-01	4.26E+01
P-32			9.00E-02	1.60E+01	4.00E+01	5.70E+01	2.70E+01	7.10E+01	6.70E+01	1.10E+02	1.70E+03	3.50E+01	8.20E+01	9.73E+02	4.29E+04	4.06E+04
P-33			1.40E+01	5.60E+01	7.80E+01	1.40E+02	1.30E+02	1.90E+02	2.50E+02	9.10E+02	2.50E+03	2.60E+01	6.50E+01	3.69E+02	2.90E+03	
Rb-86												1.00E-01	4.50E+00	1.00E-01	1.24E+02	
Ru-103											3.40E+00	1.00E+00	1.80E+01	3.94E+02	1.76E+01	4.88E+01
S-35	1.00E+00	4.20E+01	1.10E+03	3.60E+03	6.60E+03	8.00E+03	1.10E+04	8.90E+03	5.80E+03	1.30E+04	2.80E+04	1.00E+04	1.10E+05	1.09E+05	1.29E+05	4.80E+04
Se-75															7.29E+02	

4.0 Current Use

At this time Pfizer has ceased all licensed activities in Building 172 and the North Tank Farm. Pfizer intends to remove Building 172 and the North Tank Farm from the license by unrestricted release per 10 CFR30.36. Subsequent to the survey and radiological decontamination, if necessary, the incinerator and Building 172 will under go closure in accordance with the MDEQ RCRA permit closure plan. Subsequent to RCRA closure, Pfizer intends to remove the incinerator and ancillary equipment for either re-sale as surplus equipment or as scrap. After all incinerator equipment is removed from the building the structure will be refitted. It is currently expected that the facility will either be used as a non-radiological waste temporary storage location or will be demolished.

5.0 Radiological Status of Facility

The radiological status of the facility has been determined by a combination of historical survey records, radionuclide incineration records, and ongoing radiological surveillance activities. The facility conducted routine periodic surveys on a semi-annual basis during incinerator operations. Only limited quantities of radioactive materials were contained in the North Tank Farm and disposed of via the incinerator.

Based upon the characterization surveys performed in January 2007, the limited radionuclide use, and ongoing operational radiological surveillance, contamination levels are expected to be below NRC default screening values (DSV's) in Building 172, the incinerator itself, and the NTF.

Table 5.1 presents the results of contamination surveys performed throughout the incinerator and Building 172. Solid and liquid samples were also collected as part of this effort. Table 5.2 presents the results of these solid and liquid samples. As can be seen activity indicated on the total contamination measurements is due to the presence of naturally occurring radioactive material (potassium-40 [K-40]) in the refractory and ash.

5.1.1 North Tank Farm

Samples from the NTF indicate the presence of slight amounts of carbon14 (approximately 700 pCi/g) in the solid (sludge) samples. This appears to be due to chemiluminescent interference resulting from the presence of organic solvents in the sludge. Additional sampling and analysis is being performed to attempt to quantify the degree of solvent interference. The tanks will be cleaned and the potentially contaminated solids will be collected for processing at a licensed off-site mixed waste treatment facility. Rinse water will be sampled to ensure it meets the requirements of 10 CFR20.2003 "Disposal by Release into Sanitary Sewage" and site release criteria and will be released into the sanitary sewage system. Equipment used to flush the tanks will be surveyed for unrestricted release at the completion of the evolution.

Table 5.1 Direct (Total) Activity Measurements

Location	DPM/100 cm^2
Steel Drum (top, marked "radioactive")	106
Second Steel Drum	-635
Absorbent Paper on Pallet with Drums	370
Incinerator Ash (direct)	1852
Incinerator Ash (second, direct)	1958
Incinerator Ash (third, direct)	3069
Incinerator Ash (average, direct)	2293
Secondary Combustion Chamber, Firebrick	7566
Secondary Combustion Chamber, Firebrick (second)	5503
Secondary Combustion Chamber, Firebrick (average)	6534
Secondary Combustion Chamber	21799
Secondary Combustion Chamber (second)	20106
Secondary Combustion Chamber (average)	20952
Inside Kiln East Door (primary combustion)	21058
On Inside of East Door (Kiln)	10370
Ash Dropout Brick	8783
Transition	20370
Scrubber Dropout	7407
North Tank Farm (Inside Top of First Tank)	-423
Second Scan North Tank Farm (Inside Top of First Tank)	476
Average North Tank Farm (Inside Top of First Tank)	26
Other Open North Tank Farm Tank (Inside Top of Second Tank)	-688
Average of Both (First and Second) North Tank Farm Tanks	-212

Table 5.2 Solid and Liquid Sample Radio-analytical Results.

Sample	Location	Matrix	H-3 (pCi/g)	C-14 (pCi/g)	Cs-137 (pCi/g)	Ac-228 (pCi/g)	Bi-214 (pCi/g)	Pb-212 (pCi/g)	Pb-214 (pCi/g)	K-40 (pCi/g)	Tl-208 (pCi/g)	Notes
SECPfizer001	Secondary Manway Firebrick Ash	Solid	-1.87	0.96	0.04	---	0.28	0.41	0.41	21.5	0.143	
SECPfizer001x	Secondary Manway Firebrick Ash	Solid	-1.57	1.12	0.012	---	0.31	0.33	0.29	20.4	0.127	Duplicate
SECPfizer002	Ash Pit Firebrick	Solid	-0.95	1.18	0.0211	1.25	1.04	1.15	1.1	15.9	0.38	
SECPfizer003	Lugger Ash	Solid	-1.14	2.65	-0.04	---	0.7	0.79	0.68	9.3	0.18	
SECPfizer004	Scrubber Dropout	Solid	-1.4	1.66	-0.042	4.1	0.88	0.3	1.02	---	---	
SECPfizer005	Transition Ash	Solid	-1.62	1.04	0.014	0.8	0.69	0.76	0.7	7.3	0.149	
SECPfizer006	Manway Firebrick	Solid	-1.2	0.63	0.034	1.68	1.544	1.51	1.37	3.2	0.59	

Sample	Location	Matrix	H-3 (pCi/l)	C-14 (pCi/l)	Cs-137 (pCi/l)	Ac-228 (pCi/l)	Bi-214 (pCi/l)	Pb-212 (pCi/l)	Pb-214 (pCi/l)	K-40 (pCi/l)	Tl-208 (pCi/l)	Notes
SECPfizer007	NTF Sludge ST-2	Water	383	88	-30	---	---	---	---	---	---	
SECPfizer007x	NTF Sludge ST-2	Water	---	---	-50	---	---	---	---	---	---	Duplicate
SECPfizer008	NTF Slurry ST-3	Water	81	279	-40	---	---	---	---	---	---	
SECPfizer008x	NTF Slurry ST-3	Water	29	316	---	---	---	---	---	---	---	Duplicate

Sample	Location	Matrix	H-3 (pCi/g)	C-14 (pCi/g)	Cs-137 (pCi/g)	Ac-228 (pCi/g)	Bi-214 (pCi/g)	Pb-212 (pCi/g)	Pb-214 (pCi/g)	K-40 (pCi/g)	Tl-208 (pCi/g)	Notes
SECPfizer009	NTF Sludge ST-1	Solid	118	714	---	---	0.39	---	---	12.4	---	

6.0 Release Criteria

A two-step process will be used to decommission the facility. The first step is equipment decommissioning surveys. These will then be followed by a MARSSIM based facility survey.

The incinerator and installed ancillary equipment will be surveyed to confirm the equipment meets site unrestricted release criteria. After flushing, the NTF tanks will be surveyed to ensure that site unrestricted release criteria are met. Piping will be surveyed by opening systems and making measurements at accessible and representative locations.

The incinerator release surveys will consist of taking wipes at a rate of approximately 150 to 200 wipes over the major components (e.g., kiln and secondary combustion chamber) for loose contamination combined with total contamination level measurements made with a thin window (0.8 mg/cm^2) gas flow proportional counter. Dose rate measurements are also made with an ion chamber radiation survey instrument. The removable activity limit for these surveys is 220 dpm/100 cm^2. The total activity limit is 5,000 dpm/100 cm^2 exclusive of natural background radioactivity.

The radiological release criteria of NRC 10CFR20 Subpart E for unrestricted use will be used for decommissioning the building and the NTF. Following incinerator closeout, Building 172 will be surveyed in accordance with the guidance contained in MARSSIM (NURERG-1575 Rev. 1) to demonstrate compliance with the criteria of 10CFR20.1402 Radiological Criteria for Unrestricted Use. The criteria is that residual radioactivity results in a TEDE to an average member of the critical group that does not exceed 25 mrem per year and that the residual radioactivity has been released to levels that are as low as reasonably achievable (ALARA).

7.0 Derived Concentration Guideline Levels

The NRC has published default screening values in NUREG 1757 for commonly used radionuclides. DandD v.2.1 software was used to determine default screening values for isotopes not listed in NUREG 1757. Surface contamination limits were derived using the Building Occupancy scenario together with default parameter values. Screening values were selected such that the 0.9 quantile of projected doses was less than or equal to 25 mrem/y (i.e., when probabilistic dose assessment calculations were performed, there was a 90% probability the calculated dose would be less than 25 mrem/y).

Licensees can use the DandD software to determine site-specific screening levels or use the conservative default parameters of DandD v.2.1 that are acceptable to the NRC for essentially all sites. The isotopes of concern screening values for surfaces under default conditions (generic screening levels) from NUREG 1757 are provided in Table 7.1.

The default screening values are the basis for developing the derived concentration guideline levels (DCGL's) for the project. The DCGL is the radionuclide specific surface area concentration that could result in a dose equal to the release criterion. $DCGL_W$ is the

concentration limit if the residual activity is essentially evenly distributed over a large area. For this project, $DCGL_W$ is equal to the DSV.

Table 7.1 Default Screening Values for Nuclides of Concern

Isotope	Half-life	Radiation Type	Default Screening Value ($dpm/100cm^2$)
H-3	12.3 years	Beta	1.2E8
C-14	5730 years	Beta	3.7E6

In the case of non-uniform contamination, higher levels of activity are permissible over small areas. The $DCGL_{EMC}$ is derived separately for these small areas. The $DCGL_{EMC}$ is the $DCGL_W$ increased by an area factor depending on the size of the elevated area. For the Pfizer Kalamazoo decommissioning project, $DCGL_{EMC}$ will not be used since contamination levels throughout the facility are a small percentage of the DSV.

In the presence of multiple radionuclides, the total of the DCGL's for all radionuclides would exceed the release criterion. Consequently, the unity rule is applied when combinations of radionuclides are present. The unity rule, below, is satisfied when radionuclide mixtures yield a combined fractional concentration limit that is less than or equal to one.

$$\frac{C_1}{DCGL_1} + \frac{C_2}{DCGL_2} + \ldots \frac{C_n}{DCGL_n} \leq 1$$

Where:

C = concentration of nuclide (1,2,..., *n*).
DCGL = guideline value for each radionuclide

Additionally, a reasonable effort shall be made to decontaminate any detectable contamination in support of the ALARA principle. If simple hand wipe/scrub techniques are unsuccessful at removal of the residual contamination, then the RSO may perform a cost vs. risk analysis prior to any aggressive decontamination methods.

8.0 ALARA Analysis

Due to the extremely low doses associated with the release criteria used for this D&D project, a quantitative ALARA analysis is not required. Default screening values are being used to establish DCGL's. Furthermore, Pfizer routinely maintains all radiological areas of the facility to levels less than 1,000 dpm/100 cm^2 total activity and less than 100 $dpm/100cm^2$ removable activity.

NUREG 1727 states in part: "In light of the conservatism in the building surface and surface soil generic screening levels developed by the NRC staff, the staff presumes, absent information to the contrary, that licensees or responsible parties that remediate building surfaces or soil to the generic screening levels do not need to demonstrate that these levels are ALARA. However, licensees or responsible parties should remediate their facility below these levels through practices such as good housekeeping. In

addition, licensees or responsible parties should provide a description in the final status survey report of how these practices were employed to achieve the final activity levels."

Based on scoping surveys, it is anticipated that only limited remedial activities will need to be performed, however, as an additional ALARA measure, locations with residual detectable contamination that is below the release criteria will be at least hand wiped to attempt to further remove contamination.

9.0 Planned Decommissioning Activities

Based upon Pfizer's routine radiological surveillance program, strict implementation of low facility contamination limits, and the results of previous decommissioning activities, it is not expected that significant decontamination will be necessary. NTF tanks will be washed prior to survey. Areas of Building 172 and the NTF pad will then be classified as MARSSIM Class 2 or 3 based upon current radiological characterization. Initial classifications have been performed as detailed in section 17.0 below and Appendix B.

Based on the results of previous characterization surveys and operational radiological surveillance, remediation is not expected to be required. However, if it is required, remediation methods that will be used include simple decontamination (i.e. wet wiping with a mild detergent) and removal of contaminated material by dismantling systems and structures and/or cutting contaminated sections from the material. Cutting may consist of the use reciprocating saws, band saws, high leverage shears, electric snips, tin snips and/or ratcheting cable cutters. HEPA-filtered vacuums may be used to remove loose dry material from surfaces during remediation activities. All remediation activities will be conducted to control the spread of contamination and to maintain personnel exposures ALARA.

9.1 Contaminated Structures

Remediation methods that will be used include simple decontamination (i.e. wet wiping with a mild detergent) and removal of contaminated material. If it is likely that radioactive materials have migrated to inaccessible areas, such as under casework, dismantlement will be required to assess the activity levels in these inaccessible areas.

Contaminated floor surfaces may include asbestos tile. Where required, an approved asbestos abatement contractor trained to the provisions of the Pfizer license will remove the asbestos floor tile (including mastic) and all asbestos/radioactive waste will be disposed as radioactively contaminated asbestos.

9.2 Contaminated Systems and Equipment

Ventilation, vacuum, and drain lines will be removed using saws, snips, etc. to a point where contamination levels are below guideline values. In limited cases, such as short runs of ventilation ducts, decontamination of system internals may be performed. Controls will be put in place to prevent the spread of contamination during cutting and removal operations.

9.3 Schedules

Pfizer intends to complete these decommissioning activities early in the third quarter of 2007.

10.0 Project Management and Organization

Due to the limited scope of remedial actions required and the relative simplicity of the final status survey design, a complex management organization is not required. Decommissioning operations will be conducted under the same Pfizer management structure as current licensed activities. Characterization, remedial actions, final status surveys and final status report will be prepared with the assistance of a D&D consultant. The D&D consultant will operate under the direction of the Radiation Safety Committee and Radiation Safety Officer. A Pfizer Project Manager will be assigned to coordinate Building 172 closeout and survey activities. Additional Pfizer oversight will be provided in the areas of Industrial Safety and Industrial Hygiene. Decommissioning tasks will be performed according to written plans and procedures approved by Pfizer management to ensure they provide adequate worker protection and comply with the facility radioactive materials license.

10.1 Training

Pfizer will provide all contractors with radiation worker training required by the facility radioactive materials license. The D&D consultant will provide training for D&D-specific programs, plans and procedures. Individuals performing D&D tasks will be trained on all project procedures and plans.

10.2 Contractor Support

Pfizer will utilize a D&D consultant to assist in performing characterization, remediation, waste packaging, final status surveys and final status report. The consultant will have experience in successfully performing D&D projects at pharmaceutical research facilities utilizing H-3 and C-14 of similar scope.

11.0 Radiation Safety and Health Program

Radiological work will be performed according to the Pfizer radioactive materials license Radiation Safety Program under the management and supervision of the facility Radiation Safety Officer and Radiation Safety Committee.

12.0 Environmental Monitoring Program

The environmental monitoring program for decommissioning activities will be the current program under Pfizer's NRC license.

13.0 Radioactive Waste Management

All radioactive waste will be packaged in DOT-approved shipping containers for shipment to licensed facilities. Some waste may require sizing for packaging in the appropriate shipping containers. All waste will be stored in approved storage areas at the facility until shipment off-site. Radioactive waste will be subdivided into categories

based on types of material and processing methods. Radioactive subdivisions include metals, DAW/Combustible, asbestos, and mixed wastes. All radioactive waste will be transported via DOT approved carriers and manifested by qualified waste shippers and/or brokers to licensed waste processors and disposal sites as appropriate.

14.0 Quality Assurance Program

The D&D Contractor will be required to submit a project-specific Quality Assurance Project Plan (QAPP) utilizing the guidelines of MARSSIM Section 9. The QAPP will be reviewed and approved by Pfizer management prior to commencing D&D operations. The QAPP will incorporate at a minimum, the following:

- Description of the Quality Assurance and Quality Control goals, Data Quality Objectives (DQO), procedures, and plans to be implemented for all D&D activities.
- Description of the methodology to ensure that all radiological survey data meet the 95% confidence level.
- Description of the sampling and analysis requirements, and on-site waste packaging and storage location, for each waste stream on site.

The QAPP will be developed and organized with emphasis given to maximizing worker safety, minimizing/eliminating off-site releases and minimizing overall project costs.

The quality control program will control all quality documents during the performance of D&D operations. Quality documents include, but are not limited to:

- Training Records
- Survey Records
- Instrument Records
- Work Permits
- Medical Surveillance Records
- Audit Reports
- Shipping Records
- Work Procedures and Plans

15.0 Survey Instrumentation

15.1 Instrument Calibration

Laboratory and portable field instruments will be calibrated at least annually with National Institute of Standards and Technology (NIST) traceable sources, where feasible, and to radiation emission types and energies that will provide detection capabilities similar to the nuclides of concern.

15.2 Functional Checks

Functional checks will be performed at least daily when in use. The background, source check, and field measurement count times for radiation detection instrumentation will be specified by procedure to ensure measurements are statistically valid. Background readings will be taken as part of the daily instrument check and compared with the

acceptance range for instrument and site conditions. If an instrument fails a functional check, all data obtained with the instrument since the last satisfactory check will be invalidated.

15.3 Determination of Counting Times and Minimum Detectable Concentrations

Minimum counting times for background determinations and counting times for measurement of total and removable contamination will be chosen to provide a minimum detectable concentration (MDC) that meets the criteria specified in this Plan. MARSSIM equations relative to building surfaces have been modified to convert to units of dpm/100cm^2. Count times and scanning rates are determined using the following equations:

15.3.1 Static Counting

Static counting Minimum Detectable Concentration at a 95% confidence level is calculated using the following equation, which is an expansion of NUREG 1507, "Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions", Table 3.1 (Strom & Stansbury, 1992):

$$MDC_{static} = \frac{3 + 3.29\sqrt{B_r \cdot t_s \cdot (1 + \frac{t_s}{t_b})}}{t_s \cdot E_{tot} \cdot \frac{A}{100cm^2}}$$

Where:

MDC_{static} = minimum detectable concentration level in dpm/100cm^2
B_r = background count rate in counts per minute
t_b = background count time in minutes
t_s = sample count time in minutes
E_{tot} = total detector efficiency for radionuclide emission of interest (includes combination of instrument efficiency and 0.25 surface efficiency)
A = detector probe area in cm^2

15.3.2 Ratemeter Scanning

Scanning Minimum Detectable Concentration at a 95% confidence level is calculated using the following equation which is a combination of MARSSIM equations 6-8, 6-9, and 6-10:

$$MDC_{scan} = \frac{d'\sqrt{b_i}\left(\frac{60}{i}\right)}{\sqrt{p} \cdot E_{tot} \cdot \frac{A}{100cm^2}}$$

Where:

MDC_{scan} = minimum detectable concentration level in dpm/100 cm^2
d' = desired performance variable (1.38)

b_i = background counts during the residence interval
i = residence interval
p = surveyor efficiency (0.5)
E_{tot} = total detector efficiency for radionuclide emission of interest (includes combination of instrument efficiency and 0.25 surface efficiency)
A = detector probe area in cm^2

15.3.3 Smear Counting

Smear counting Minimum Detectable Concentration at a 95% confidence level is calculated using the following equation, which is NUREG 1507, "Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions", Table 3.1 (Strom & Stansbury, 1992):

$$MDC_{smear} = \frac{3 + 3.29\sqrt{B_r \cdot t_s \cdot (1 + \frac{t_s}{t_b})}}{t_s \cdot E}$$

Where:
MDC_{smear} = minimum detectable concentration level in dpm/smear
B_r = background count rate in counts per minute
t_b = background count time in minutes
t_s = sample count time in minutes
E = instrument efficiency for radionuclide emission of interest

15.4 Instrumentation Specifications

The instrumentation used for facility decommissioning surveys is summarized in the following tables. Table 15.1 lists the standard features of each instrument such as probe size and efficiency. Table 15.2 lists the typical operational parameters such as scan rate, count time, and the associated Minimum Detectable Concentrations (MDC). Alternate or additional instrumentation with similar detection capabilities may be utilized as needed for survey requirements with RSO approval.

Table 15.1 Instrumentation Specifications

Detector Model	Detector Type	Detector Area	Meter Model	Window Thickness	Typical Total Efficiency
Ludlum 43-68	Gas Flow Proportional	126 cm^2	Ludlum 2221	0.8 mg/cm^2	6.5 % (C-14)
Ludlum 43-37 Floor Monitor	Gas Flow Proportional	582 cm^2	Ludlum 2221	0.8 mg/cm^2	7 % (C-14)
Packard TriCarb	Liquid Scintillation	N/A	N/A	N/A	60% (H-3) 80% (C-14)

Table 15.2 Typical Instrument Operating Parameters and Sensitivities

Measurement Type	Detector Model	Meter Model	Scan Rate	Count Time	Background (cpm)	MDC ($dpm/100cm^2$)
Surface Scans	Ludlum 43-68	Ludlum-2350-1	5 in./sec.	N/A	500	6526 (C-14)
Surface Scans	Ludlum 43-37 Floor Monitor	Ludlum 2350-1	20 in./sec.	N/A	1000	2347 (C-14)
Total Surface Activity	Ludlum 43-68	Ludlum 2350-1	N/A	30 sec.	500	1629 (C-14)
Removable Activity	Packard TriCarb	N/A	N/A	120 sec.	25 (H-3) 15 (C-14)	50 (H-3) 15 (C-14)

16.0 Characterization Surveys

The Building 172 closeout surveys will serve as both characterization and, if necessary, remedial action support surveys. Floor regions of Building 172 and the NTF are expected to be MARSSIM class 2 areas for the facility final status surveys based on the data gathered during closeout. Final status survey protocols are described in section 17.3.

The survey protocol for building system surveys will consist of performing removable contamination measurements of internal surfaces of ventilation and drain systems. The percentage of systems surveyed will be consistent with the final status survey protocols contained in this plan.

If the initial characterization survey results indicate that contamination is not present in excess of the release criteria, then data from the survey may be used as part of the final status survey. For areas that are partially contaminated, the characterization survey data may be used as part of the final status survey measurements provided that 1) the data used is only from areas with contamination levels below the release criteria, and 2) decontamination work is controlled such that the survey location could not have become cross-contaminated.

17.0 Design and Performance of Final Status Surveys

Final status surveys are performed to demonstrate that residual radioactivity in each survey unit satisfies the predetermined criteria for release for unrestricted use. The final status survey will be conducted using the Data Quality Objective (DQO) process. Characterization and remedial action survey data will be used as final status survey data to the maximum extent possible in order to minimize overall project costs.

Final status surveys will be conducted by performing required scan surveys, total direct surveys, removable contamination measurements and solid sampling as discussed further in this section. All survey data shall be documented on survey maps and associated data information sheets.

17.1 Background Determination

The use of reference background areas or paired background comparisons is not necessary for the purposes of this plan. Material and ambient background values are not expected to be present at a significant level in comparison to the DCGLs. Surface background will be determined for each survey to calculate the actual survey MDCs and associated count errors.

17.2 Data Quality Objectives (DQO)

The Data Quality Objective Process as described in MARSSIM is used throughout the design and implementation of survey design. The following is a list of the major DQOs for the survey design described in this plan:

- Static measurements will be taken to achieve an MDC_{static} of less than 50% of $DCGL_W$.
- Scanning will be conducted at a rate to achieve an MDC_{scan} of less than the 50% of the $DCGL_W$ in Class 2 areas.
- Scanning will be conducted at a rate to achieve an MDC_{scan} of less than 50% of the $DCGL_W$ in Class 3 areas.
- Individual measurements will be made to a 95% confidence interval.
- Decision error probability rates will initially be set at 0.05 for both α and β. However, Pfizer reserves the right to adjust the value of the β error as deemed necessary.
- The null hypothesis (H_0) and alternate null hypothesis (H_A) are that of NUREG 1505 scenario A:
  H_0 is that the survey unit does not meet the release criteria
  H_A is that the survey unit meets the release criteria
- Characterization and remedial action support surveys will be conducted under the same quality assurance criteria as final status surveys such that the data may be used as final status survey data to the maximum extent possible.

17.3 Area Classifications

Based on the results of the historical site assessment and previous survey results, the floors and lower walls of Building 172 and the North Tank Farm have been classified as an "impacted" area. The flat roof area of Building 172 is also considered an impacted area.

17.3.1 Non-Impacted Area

Non-impacted areas are areas without residual radioactivity from licensed activities and are not surveyed during final status surveys. The following areas are classified as non-impacted:

- Surfaces above a two meter height.
- Building exterior walls
- Surface and subsurface soils of outside grounds

Based on historical operations, little potential exists for residual contamination from spills or tracking on surfaces less than two meters in height. Thorough surveys of building entrances/exits and ventilation exhausts will be conducted during the final status survey and will provide adequate assurance that any residual contamination is contained within the building structure.

17.3.2 Impacted Areas

Impacted areas are those areas that have potential residual radioactivity from licensed activities. Impacted areas are subdivided into Class 1, Class 2 or Class 3 areas. Class 1 areas have the greatest potential for contamination and therefore receive the highest degree of survey effort for the final status survey using a graded approach, followed by Class 2, and then by Class 3. Impacted sub-classifications are defined, for the purposes of this plan, as follows:

17.3.3 Class 1 Area

Areas with the highest potential for contamination, and meet the following criteria: (1) impacted; (2) potential for delivering a dose above the release criterion; (3) potential for small areas of elevated activity; and (4) insufficient evidence to support classification as Class 2 or Class 3.

Based upon operational radiological surveillance records, there are no Class 1 areas.

17.3.4 Class 2 Area

Areas that meet the following criteria: (1) impacted; (2) low potential for delivering a dose above the release criterion; and (3) little or no potential for small areas of elevated activity.

Based upon operational radiological surveillance records, the floors and lower walls (up to 2 m) of Building 172 and the North Tank Farm have been classified as an "impacted" area. and are classified as Class 2 areas.

17.3.5 Class 3 Area

Areas that meet the following criteria: (1) impacted; (2) little or no potential for delivering a dose above the release criterion; and (3) little or no potential for small areas of elevated activity.

Based on operational radiological surveillance records, Building 172 office areas, upper and lower walls of operational areas and the flat portion of the roof are considered MARSSIM Class 3 areas.

17.4 Survey Units

A survey unit is a geographical area of specified size and shape for which a separate decision will be made whether or not that area meets the release criteria. A survey unit is normally a portion of a building or site that is surveyed, evaluated, and released as a single unit. For the purposes of this plan, areas of similar construction and composition will be grouped together as survey units and tested individually against the DCGL's and the null hypothesis to show compliance with the release criteria. Survey units will be homogeneous in construction, contamination potential, and contamination distribution.

The number of discrete sampling locations needed to determine if a uniform level of residual radioactivity exists within a survey unit does not depend on the survey unit size. However, the sampling density should reflect the potential for small elevated areas of residual radioactivity. Survey units will be sized according to the potential for small elevated areas of residual radioactivity. Recommended maximum survey unit sizes for building structures, based on floor area, is Class 1: up to 100 m^2, Class 2: 100 to 1000 m^2 and Class 3: no limit.

Survey unit classifications and designations have been determined from operational radiological surveillance and characterization surveys. Survey unit designations for final status surveys may be modified to facilitate mapping and determination of sample locations. Changes to survey unit designations shall be identified and explained in the final status report. Survey unit classifications may not be downgraded.

Each unit will have an independent survey package that has specific survey instructions. The survey package will contain, at a minimum:

- Survey Unit number (e.g., Building and Room Number, System Number, etc.)
- Percentage of surface requiring scan surveys
- Number of removable contamination measurements
- Instrumentation to be used with static count times and scan rates
- Any additional specific survey instruction
- Maps of the survey unit surfaces

17.5 Surface Scans

Scanning is used to identify locations within the survey unit that exceed the investigation level. These locations are marked and receive additional investigations to determine the concentration, area, and extent of the contamination. For Class 1 areas, scanning surveys are designed to detect small areas of elevated activity that are not detected by the measurements using the systematic pattern. Table 17.1 summarizes the percentage of accessible building structural surfaces to be scanned based on classification.

Table 17.1 Scan Survey Coverage by Classification

Structure	Class 1	Class 2	Class 3
Floors	100%	50%	20%
Other Structures	100%	25%	10%

The percentage of survey area scan surveyed may be increased based on suspected elevated activity. For Class 2 and Class 3 areas, the surfaces to be scan surveyed will be those with the highest potential to contain residual contamination.

Floor areas near building entrances and exits will receive a 100% scan survey regardless of the area classification. These surveys will provide indications of potential migration of residual contamination to the outside grounds.

If elevated activity is detected during the scan surveys, then the location shall be marked and total and removable surface activity measurements and will be taken to quantify the activity. However, total surface activity measurements are in addition to the static measurements required for the statistical test.

17.6 Total Surface Activity Measurements

Direct surveys (static measurements) will be taken on building surfaces and system internals to the extent practical in impacted areas utilizing instrumentation of the best geometry based on the surface at the survey location. Additionally, locations of elevated activity identified and marked during the scan survey will require direct survey measurements.

17.6.1 Determining the Number of Samples

A minimum number of samples are needed to obtain sufficient statistical confidence that the conclusions drawn from the samples are correct. The number of samples will depend on the Relative Shift (the ratio of the concentration to be measured relative to the statistical variability of the contaminant concentration).

The minimum number of samples is obtained from MARSSIM tables or calculated using equations in MARSSIM Section 5.

17.6.2 Determination of the Relative Shift

The number of required samples will depend on the ratio involving the activity level to be measured relative to the variability in the concentration. The ratio to be used is called the Relative Shift, Δ/σ_S and is defined in MARSSIM as:

$$\Delta / \sigma_S = \frac{DCGL - LBGR}{\sigma_S}$$

Where:

DCGL	=	derived concentration guideline level
LBGR	=	concentration at the lower bound of the gray region. The LBGR is the average concentration to which the survey unit should be cleaned in order to have an acceptable probability of passing the test
σ_S	=	an estimate of the standard deviation of the residual radioactivity in the survey unit

17.6.3 Determination of Acceptable Decision Errors

A decision error is the probability of making an error in the decision on a survey unit by failing a unit that should pass (β decision error) or passing a unit that should fail (α decision error). MARSSIM uses the terminology α and β decision errors; this is the same as the more common terminology of Type I and Type II errors, respectively. The decision errors are 0.05 for Type I errors and 0.05 for Type II errors.

17.6.4 Determination of Number of Data Points (Sign Test)

The number of direct measurements for a particular survey unit, employing the Sign Test, is determined from MARSSIM Table 5.5, which is based on the following equation (MARSSIM equation 5-2):

$$N = \frac{\left(Z_{1-\alpha} + Z_{1-\beta}\right)^2}{4\left(SignP - 0.5\right)^2}$$

Where:

N	=	number of samples needed in the survey unit
$Z_{1-\alpha}$	=	percentile represented by the decision error α
$Z_{1-\beta}$	=	percentile represented by the decision error β
SignP	=	estimated probability that a random measurement will be less than the $DCGL_W$ when the survey unit median is actually at the LBGR Note: *SignP* is determined from MARSSIM Table 5.4

MARSSIM recommends increasing the calculated number of measurements by 20% to ensure sufficient power of the statistical tests and to allow for possible data losses. MARSSIM Table 5.5 values include an increase of 20% of the calculated value.

17.6.5 Determination of Sample Locations

Determination of Class 1 survey unit sample locations is accomplished by first determining sample spacing and then systematically plotting the sample locations from a randomly generated start location. The random starting point of the grid provides an unbiased method for obtaining measurement locations to be used in the statistical tests. Class 1 survey units have the highest potential for small areas of elevated activity, so the areas between measurement locations may be adjusted to ensure that these areas can be detected by scanning techniques.

Similar systematic spacing methods are used for Class 2 survey units because there is an increased probability of small areas of elevated activity. The use of a systematic grid allows the decision-maker to draw conclusions about the size of the potential areas of elevated activity based on the area between measurement locations.

Class 3 survey locations are determined from computer selected randomly generated x and y coordinates. Survey protocols for all areas are summarized in Table 17.2.

Table 17.2 Survey Sample Placement Overview

Survey Unit Classification		$DCGL_w$ Comparison	Elevated Measurement Comparison	Measurement Locations
Impacted	Class 1	Yes	N/A	Systematic random
	Class 2	Yes	N/A	Systematic random
	Class 3	Yes	N/A	Random
Non-Impacted		None	None	None

In operational areas, permanent counter tops and other horizontal surfaces, which block floor surfaces will be included as a replacement to the blocked floor surface. Likewise, fixed cabinetry faces and other permanent equipment will replace blocked wall surfaces. Permanent equipment, which does not actually block floor or wall surfaces, will be surveyed individually.

Internal surfaces of permanent furnishings (i.e., drawer or cabinetry interior surfaces) are not included in the systematic measurement location placement. However, these surfaces will be included in the scan surveys and judgmental measurements may be taken.

Additional totals surface activity measurements will be collected at each area of elevated activity identified during the scan surveys.

17.6.5.1 Determining Class 1 Sample Locations

In Class 1 survey units, the sampling locations are established in a unique pattern beginning with the random start location and the determined sample spacing. After determining the number of samples needed in the survey unit, sample spacing is determined from MARSSIM equation 5-8:

$$L = \sqrt{\frac{A}{N}} \text{ for a square grid}$$

Where:

L = sample spacing interval
A = the survey unit area
N = number of samples needed in the survey unit

Maps will be generated of the survey unit's permanent surfaces included in the statistical tests (floors, walls, etc.) and folded out in a 2-dimensional view. A random starting point is determined using computer-generated random numbers coinciding with the x and y coordinates of the total survey unit. A grid is plotted across the survey unit surfaces based on the random start point and the determined sample spacing. A measurement location is plotted at each intersection of the grid plot.

17.6.5.2 Determining Class 2 and Class 3 Sample Locations

Class 1 survey units generally consist of one or two rooms. Class 2 and Class 3 survey units generally consist of many rooms. Representing each room in a "fold-out" view to show all surfaces presents a difficult and time-consuming mapping challenge. The process to identify, map and locate measurement coordinates in survey units with many rooms is complicated due to the noncontiguous nature of the survey unit once walls are "folded-out".

For the reasons above, the MARSSIM sample measurement locations (i.e., random static and wipe measurements) for Class 2 and Class 3 survey units will be determined on

horizontal surfaces only as determined on overhead floor maps. This protocol will increase the sample density on the surfaces with the highest probability for residual contamination. The appropriate percentage of all survey unit surfaces (including vertical surfaces) will be scanned according to the survey unit classification.

As part of characterization, the survey technician will judgmentally select locations with the highest probability of contamination on vertical surfaces for a static measurement and smear such as light switches, door knobs, door pulls and push plates, and other locations. These measurements are in addition to and not included in the statistical analysis of the locations selected by MARSSIM protocols.

Determining Class 2 Sample Locations

In Class 2 survey units, the sampling locations are established in a unique pattern beginning with the random start location and the determined sample spacing. After determining the number of samples needed in the survey unit, sample spacing is determined from MARSSIM equation 5-8:

$$L = \sqrt{\frac{A}{N}} \text{ for a square grid}$$

Where:

L	= sample spacing interval
A	= the survey unit floor area
N	= number of samples needed in the survey unit

Maps will be generated of the survey unit's permanent surfaces included in the statistical tests. Only horizontal surfaces (e.g., floors, countertops, etc.) are included in the statistical tests. A random starting point is determined using computer-generated random numbers coinciding with the x and y coordinates of the total survey unit. A grid is plotted across the survey unit surfaces based on the random start point and the determined sample spacing. A measurement location is plotted at each intersection of the grid plot.

Determining Class 3 Sample Locations

For Class 3 areas, maps will be generated of the survey unit horizontal surfaces. Sample locations are determined using computer generated random x and y coordinates for each sample location. Each location is plotted on the applicable survey map.

17.7 Removable Contamination Measurements

Removable contamination measurements (smears) will be collected on building structural surfaces at each sample location. Additionally, removable contamination measurements will be collected for building system internals. An area of approximately 100cm^2 shall be wiped if possible. If an area of less than 100cm^2 is wiped, a comment shall be added to the survey data sheet estimating the surface area wiped to allow for area correction of the results. Swabs may be used when system or component access points are not large enough to allow for a wipe of a 100cm^2 surface area.

17.8 Surveys of Building Mechanical System Internals

Surveys of various building system components will need to be performed. Survey design for these systems is out of the scope of MARSSIM. For the purposes of identifying potential residual contamination within these systems, a survey protocol has been established and is presented in the following sections.

17.8.1 Ventilation Systems

Surveys of building ventilation will consist of scan surveys, total activity measurements and removable contamination measurements of accessible ventilation exhaust points and at locations of potential collection buildup. The frequency of the survey effort will depend on the classification of the surrounding area. Ventilation system survey requirements are summarized in Table 17.3.

Components will be de-energized prior to access. Lock-out/Tag-out procedures will be initiated prior to any access to mechanical or electrical components.

Table 17.3 Ventilation System Survey Requirements

Component(s)	Classification of Area in Which Components Exist	Survey Requirements		
		Scan Surveys	Static (Total Activity) Measurements	Removable Contamination Measurements
General ventilation and fume hood exhaust ducts	Class 1	100% scan survey of accessible[1] internal surfaces of all existing exhaust ducts	At least one static measurement taken on the internal surfaces of 100% of existing exhaust duct openings	One smear taken at each static measurement location
	Class 2	100% scan survey of accessible[1] internal surfaces of at least 50% of existing exhaust ducts	At least one static measurement taken on the internal surfaces 50% of existing exhaust duct openings	One smear taken at each static measurement location
	Class 3	100% scan survey of accessible[1] internal surfaces of at least 10% of the existing exhaust ducts	At least one static measurement taken on the internal surfaces of 10% of the existing exhaust duct openings	One smear taken at each static measurement location

[1] Within reach of duct or component opening

17.8.2 Drain Systems

Surveys of building drain system internals will consist of surveys of accessible sink drains, sink drain traps, floor drains and collection points such as sumps and outfalls. Removable contamination surveys of sink drains, sink drain traps and floor drains will be collected, since scan surveys and static measurements are not practical due to their small geometry. The frequency of the survey effort will be dependent on the classification of the surrounding area. Drain system initial survey requirements are summarized in Table 17.4.

The mechanical system survey frequencies described above are the minimum survey requirements. Additional surveys may be necessary to adequately access internal contamination levels. If additional survey locations are determined to be necessary, the survey package instructions will provide guidance.

If contamination is detected during the previous survey schemes, then additional surveys or removal of components may be required at various locations. This may require disassembly of components downstream of the affected location. Additional instruction will be provided in the survey package instructions.

Table 17.4 Drain System Survey Requirements

Component(s)	Classification of Area in Which Components Exist	Survey Requirements	
		Scan Surveys and Static (Total Activity) Measurements	Removable Contamination Measurements
Drain system inlets	Class 1	N/A[1]	At least one smear on the internal surfaces of 100% of the existing sink drains, sink drain traps and floor drains[2].
	Class 2	N/A[1]	At least one smear on the internal surfaces of 50% of the existing sink drains, sink drain traps and floor drains[2].
	Class 3	N/A[1]	At least one smear on the internal surfaces of 10% of the existing sink drains, sink drain traps and floor drains[2].
Drain system collection points such as accumulator tanks, sumps and outfalls	All	Scan surveys, total surface activity measurements and removable contamination measurements will be collected in sumps and at drain system outfalls as applicable. Sediment samples will be collected at these locations, if possible.	

[1] Scan surveys and static measurements are not practical for these locations due to the small geometry of the drain system components.

[2] Some disassembly of system components may be necessary to complete these surveys.

17.9 Survey Investigation Levels

Investigation levels are used to flag locations that require special attention and further investigation to ensure areas are properly classified and adequate surveys are performed. These locations are marked and receive additional investigations to determine the concentration, area, and extent of the contamination. The survey investigation levels for each type of measurement is listed by classification in Table 17.5.

Table 17.5 Survey Investigation Levels

Survey Unit Classification	Flag Direct Measurement or Sample Result When:	Flag Scanning Measurement Result When:	Flag Removable Measurement Result When:
Class 1	>5,000 dpm/100cm^2	>10% $DCGL_W$	> 1000 dpm/100cm^2
Class 2	>5,000 dpm/100cm^2	>10% $DCGL_W$	> 1000 dpm/100cm^2
Class 3	>MDC	>MDC	> 200 dpm/100cm^2

17.10 Survey Documentation

A survey package will be developed for each survey unit containing the following:

- Survey Instruction Sheets
- General survey requirements
- Instrument requirements with associated MDCs, count times and scan rates
- Survey Maps
- Overview maps detailing survey locations and placement methodology
- Survey sub-unit maps with additional sample location information, as needed
- Survey Data Sheets
- Signature of Data Collector and Reviewer

17.11 Data Validation

Field data will be reviewed and validated to ensure:

- Completeness of forms and that the type of survey has correctly been assigned to the survey unit.
- The MDC's for measurements meet the established data quality objectives; independent calculations will be performed for a representative sample of data sheets and survey areas.
- Instrument calibrations and daily functional checks have been performed accurately and at the required frequency.

17.12 Sample Chain-of-Custody

The sample chain-of-custody maintains the integrity of the sample; that is, there is an accurate record of sample collection, transport, analysis, and disposal. This ensures that samples are neither lost nor tampered with, and that the sample analyzed in the laboratory is actually and verifiably the sample taken from a specific location in the field. Samples sent off-site for analysis will use an approved Chain of Custody Procedure.

18.0 Data Quality Assessment (DQA) and Interpretation of Survey Results

The statistical guidance contained in Section 8 of MARSSIM will be used to determine if areas are acceptable for unrestricted release, and whether additional surveys or sample measurements are needed.

18.1 Preliminary Data Review

A preliminary data review will be performed for each survey unit to identify any patterns, relationships or potential anomalies. Additionally, measurement data is reviewed and compared with the DCGL's and investigation levels to identify areas of elevated activity and confirm the correct classification of survey units. If an area is misclassified with a less restrictive classification, the area will be upgraded and surveyed accordingly.

The following preliminary data reviews will be performed for each survey unit:

- Calculations of the survey unit mean, maximum, minimum, and standard deviation for each type of reading.
- Comparison of the actual standard deviation to the assumed standard deviation used for calculating the number of measurements. If the actual standard deviation is greater than estimated, the minimum number of samples shall be calculated using the actual standard deviation to ensure a sufficient number of samples have been obtained.
- Comparison of survey data with applicable investigation levels.

18.2 Determining Compliance

For Class 1 areas, if it is determined that all total activity results are less than the applicable DCGL, then no further statistical tests are required. If any of the total activity measurements are greater than the $DCGL_W$, then the survey unit fails and the null hypothesis is not rejected. The survey unit is determined to meet the release criterion provided that the application of any unity rules result in values less than 1.

The Sign test is used to determine the minimum number of sample locations. However, the Sign test is not performed in this survey design because the total activity $DCGL_W$ is used as a maximum. If all measurements are less than the $DCGL_W$, performance of the Sign test is not necessary because the survey unit will pass the Sign test by definition.

For Class 2 and Class 3 areas, data results are initially compared to the investigation levels. These investigation levels are provided to help ensure that survey units have been properly classified. If all data results in Class 2 or 3 areas are less than the investigation levels, then the survey unit is determined to meet the release criterion. If these investigation levels are exceeded, then an investigation is performed to verify the initial assumptions for classification and determine the appropriate resolution (e.g., additional scans or survey unit reclassification).

Class 3 survey units, by definition, are not expected to contain residual activity above a small fraction of the DCGL(s). Therefore, if contamination is detected exceeding the

DCGLs, then reclassification is required. However, reclassification of the entire survey unit may or may not be appropriate. The area containing the residual activity may have been an isolated case and reclassification of the entire survey unit would be inappropriate. More appropriately, the affected portion of the survey unit may be separated and only that portion reclassified. The RSO will evaluate the survey results, assign additional scan surveys, as appropriate, and determine the appropriate course of action.

Removable contamination measurements will be compared directly to the applicable DCGL. No contingency is established for elevated removable contamination. Therefore, if any removable contamination is detected which exceeds the removable contamination DCGL, then the survey unit is determined not to meet the release criterion. However, if all removable contamination measurements are less than the removable contamination DCGL, then compliance shall be determined based on total activity measurements.

Compliance will be determined for each applicable type of total activity measurement performed in each survey unit (i.e., gross beta total activity measurements and gross gamma total activity measurements). Locations with multiple isotopes present will be evaluated by the unity rule.

Table 18.1 – Building Surfaces and Structures Data Compliance Overview

Classification	Survey Result	Conclusion
Class 1	• All measurements < $DCGL_W$, and • Results of applicable unity rules ≤ 1	Survey unit meets release criterion
	• Any measurement > $DCGL_W$, or • Result of unity rule >1	Survey unit does not meet release criterion
Class 2	• All measurements < applicable investigation levels, and • Results of applicable unity rules ≤ 1	Survey unit meets release criterion
	• Average > applicable investigation levels, and • All measurements < $DCGL_W$	Survey unit may meet release criterion. Perform evaluation of elevated activity and determine if additional surveys and/or reclassification are warranted.
	• Any measurement > $DCGL_W$, or • Results of applicable unity rule >1	Survey unit does not meet release criterion
Class 3	• All measurements < applicable investigation levels, and • Results of applicable unity rules ≤ 1	Survey unit meets release criterion
	• Average > applicable investigation levels, and • All measurements <$DCGL_W$	Survey unit may meet release criterion. Perform evaluation of elevated activity and determine if additional surveys and/or reclassification are warranted.
	• Any measurement >$DCGL_W$, or • Result of unity rule >1	Reclassify survey unit or portion of survey unit, if justification for splitting the survey unit is provided. Survey unit does not meet release criterion as it exists

18.3 Mechanical System Survey Data Analysis

If any measurement exceeds the applicable $DCGL_W$, then the survey unit does not meet the release criterion and is considered contaminated. Remediation or removal of the affected system components may be required. If all measurements are less than the applicable $DCGL_W$, then the system meets the release criterion and is considered releasable. Results of mechanical system surveys will be compared directly with the $DCGL_W$. This comparison will consider the applicable DCGL as a maximum value, rather than an average.

If any measurement exceeds the applicable $DCGL_W$, then the survey unit does not meet the release criterion and is considered contaminated. Remediation or removal of the affected system components may be required. If all measurements are less than the applicable $DCGL_W$, then the system meets the release criterion and is considered releasable.

19.0 Final Report

A Final Report summarizing D&D activities performed at the Pfizer facility shall be prepared and submitted to the NRC. The guidance provided in NUREG 1757 will be used to prepare the final report. The following outline is an example of the contents of a Final Status Survey Report.

1.0 INTRODUCTION
- 1.1 Reason for Decommissioning
- 1.2 Management Approach

2.0 DESCRIPTION OF THE SITE
- 2.1 Location
- 2.2 Prior Use
- 2.3 Ownership
- 2.4 Facility
  - 2.4.1 Buildings
  - 2.4.2 Equipment

3.0 HISTORICAL SITE ASSESSMENT (HSA)
- 3.1 Licensing and Operations
- 3.2 Process Performed
- 3.3 Waste Disposal Practices

4.0 DECOMMISSIONING ACTIVITIES
- 4.1 Objectives
- 4.2 Results of Previous Surveys
- 4.3 Decontamination Procedures

5.0 FINAL SURVEY PROCEDURES
- 5.1 Sampling Parameters
- 5.2 Background Levels
- 5.3 Guidelines Established
- 5.4 Equipment and Procedures
  - 5.4.1 Instrumentation Type, Calibration, Sensitivity
  - 5.4.2 Instrument Use Techniques
- 5.5 Survey Procedures
- 5.6 Survey Organization

6.0 SURVEY RESULTS
- 6.1 Data Evaluation Methods
- 6.2 Statistical Evaluation Results
- 6.3 Comparison of Findings with Release Criteria
- 6.4 ALARA Analysis

7.0 SUMMARY

20.0 References

- NRC Regulations 10 CFR 20 Subpart E
- NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM)
- NUREG-1505, "A Nonparametric Statistical Methodology for the Design and Analysis of Final Decommissioning Surveys"
- NUREG 1507, "Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions"
- NUREG 1727, "NMSS Decommissioning Standard Review Plan," September, 2000.
- NUREG 1757, Volume 1 "Consolidated NMSS Decommissioning Guidance," September, 2002
- Pfizer Radioactive Materials License Number 21-00182-03

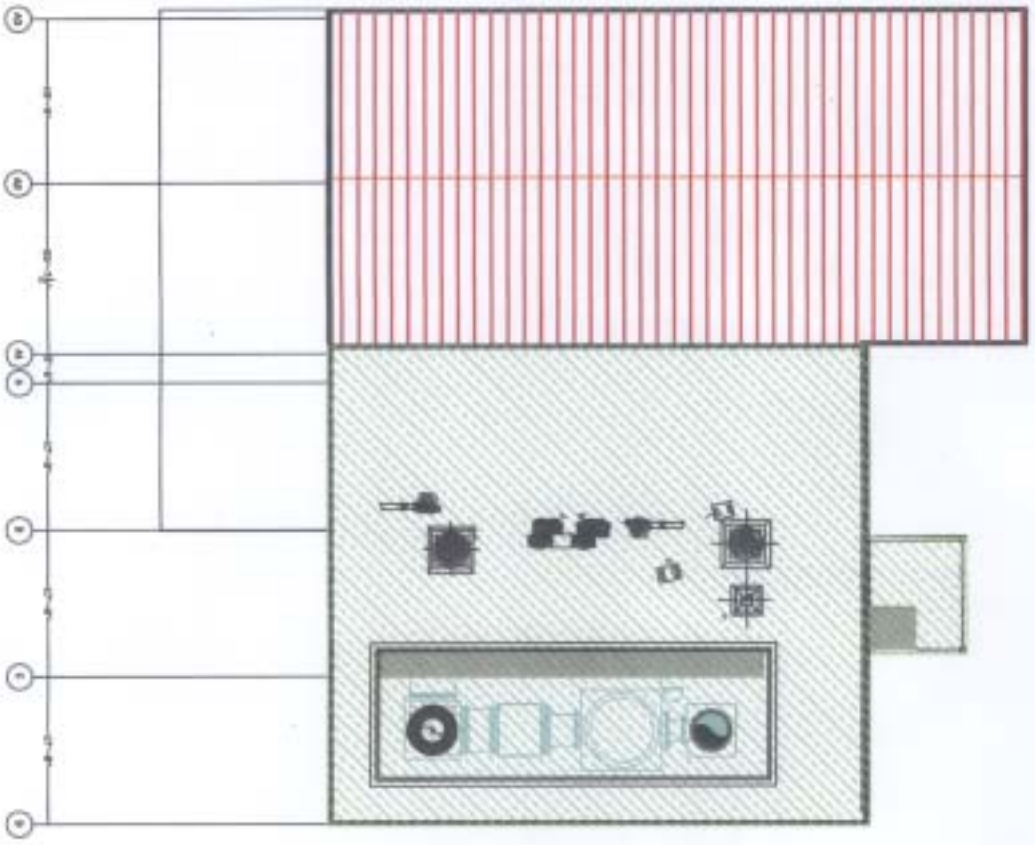
Appendix A

Survey Units

SURVEY UNIT	ROOM	CLASS
172-0001	Bldg 172 Floors	2
172-0002	Bldg 172 Office Area	3
172-0003	Bldg Penthouse	2
172-0004	Bldg 172 Roof	3
172-0005	Bldg 172 Lower Walls	2
172-0006	Drains System	N/A
172-0007	Ventilation System	N/A
NTF-0001	NTF-Pad	2
NTF-0002	Tanks	N/A
NTF-0003	Systems	N/A

Appendix B

Facility Maps



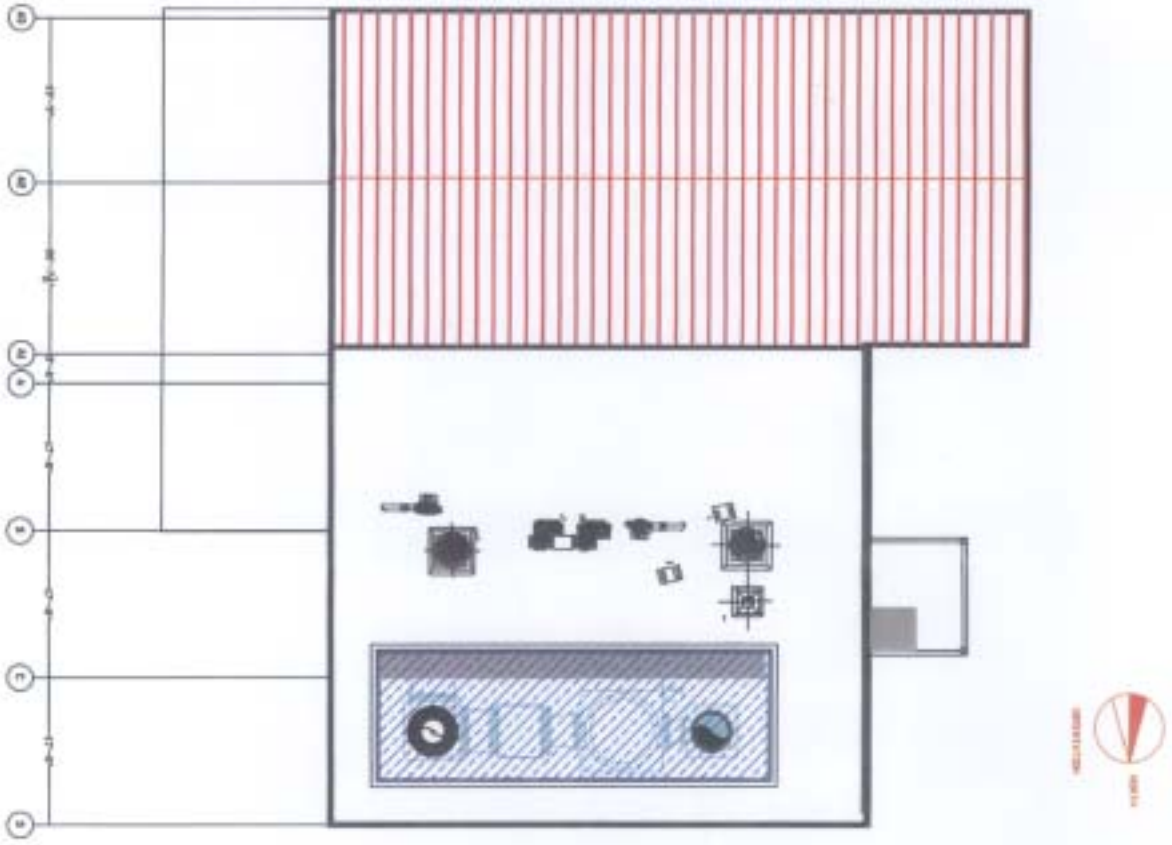
Legend

Class 2

Class 3

PGM Bldg. 172 Survey Units

Building: PGM-172	Survey Unit Number: 172-0004	
Description: Class 3 Roof Survey Unit		Page of
Survey Type:	☐ Baseline Survey	☒ Final Status Survey
Comments:		
		Date:



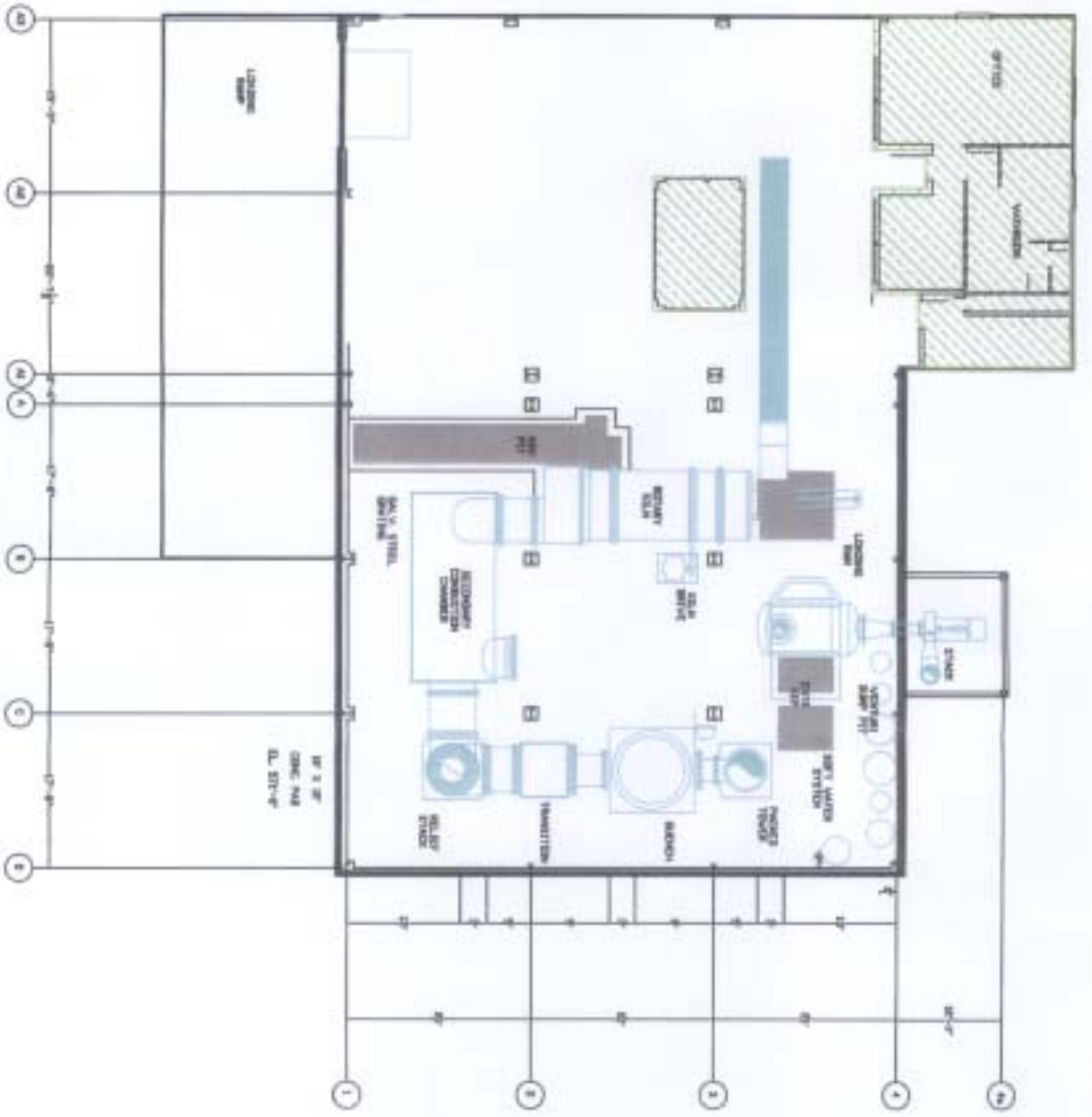
Legend

Class 2

Class 3

PGM Bldg. 172 Survey Units

Building: PGM-172	Survey Unit Number: 172-0003	
Description: Class 2 Penthouse Survey Unit		Page of
Survey Type:	☐ Baseline Survey	☒ Final Status Survey
Comments:		
		Date:



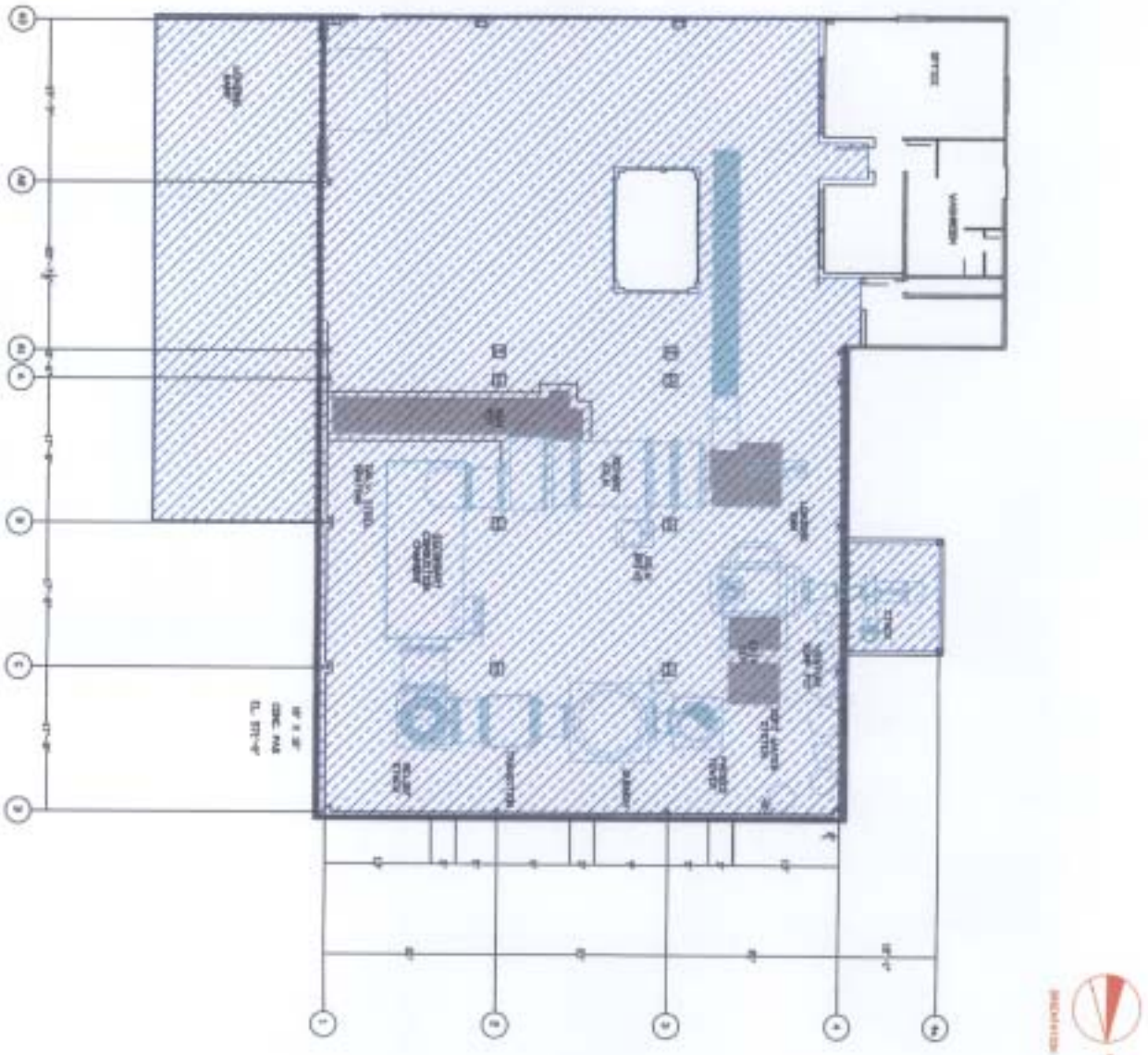
Legend

Class 2

Class 3

PGM Bldg. 172 Survey Units

Building: PGM-172	Survey Unit Number: 172-0002	
Description: Class 3 Floor Survey Unit		Page of
Survey Type:	☐ Baseline Survey	☒ Final Status Survey
Comments:		
		Date:



Legend

Class 2

Class 3

PGM Bldg. 172 Survey Units

Building: PGM-172	Survey Unit Number: 172-0001	
Description: Class 2 Floor Survey Unit		Page of
Survey Type:	☐ Baseline Survey	☒ Final Status Survey
Comments:		
		Date:

Appendix C

DandD Code Summaries

DandD Building Occupancy Scenario

DandD Version: 2.1.0
Run Date/Time: 11/21/2003 4:51:18 AM
Site Name: Pfizer Kalamazoo
Description: Default Screening Values - 25 mrem/y
FileName:\Default Cr51.mcd

Options:

Implicit progeny doses NOT included with explicit parent doses
Nuclide concentrations are distributed among all progeny
Number of simulations: 100
Seed for Random Generation: 8718721
Averages used for behavioral type parameters

External Pathway is ON
Inhalation Pathway is ON
Secondary Ingestion Pathway is ON

Initial Activities:

Nuclide	Area of Contamination (m^2)	Distribution	
51Cr	UNLIMITED	CONSTANT(dpm/100 cm**2)	
Justification for concentration: DSV		Value	5.10E+06

Site Specific Parameters:

General Parameters:

None

Correlation Coefficients:

None

Summary Results:

90.00% **of the** 100 **calculated TEDE values are <** 2.46E+01 **mrem/year . The 95 % Confidence Interval for the** 0.9 **quantile value of TEDE is** 2.46E+01 **to** 2.47E+01 **mrem/year**

DandD Building Occupancy Scenario

DandD Version: 2.1.0
Run Date/Time: 11/21/2003 5:21:13 AM
Site Name: Pfizer Kalamazoo
Description: Default Screening Values - 25 mrem/y
FileName:\Default I125.mcd

Options:

Implicit progeny doses NOT included with explicit parent doses
Nuclide concentrations are distributed among all progeny
Number of simulations: 100
Seed for Random Generation: 8718721
Averages used for behavioral type parameters

External Pathway is ON
Inhalation Pathway is ON
Secondary Ingestion Pathway is ON

Initial Activities:

Nuclide	Area of Contamination (m^2)	Distribution	
125I	UNLIMITED	CONSTANT(dpm/100 cm**2)	
Justification for concentration: DSV		Value	6.60E+05

Site Specific Parameters:

General Parameters:

None

Correlation Coefficients:

None

Summary Results:

90.00% **of the** 100 **calculated TEDE values are <** 2.39E+01 **mrem/year . The 95 % Confidence Interval for the** 0.9 **quantile value of TEDE is** 2.31E+01 **to** 2.50E+01 **mrem/year**

DandD Building Occupancy Scenario

DandD Version: 2.1.0
Run Date/Time: 11/21/2003 4:15:58 AM
Site Name: Pfizer Kalamazoo
Description: Default Screening Values - 25 mrem/y
FileName:\Default P32.mcd

Options:

Implicit progeny doses NOT included with explicit parent doses
Nuclide concentrations are distributed among all progeny
Number of simulations: 100
Seed for Random Generation: 8718721
Averages used for behavioral type parameters

External Pathway is ON
Inhalation Pathway is ON
Secondary Ingestion Pathway is ON

Initial Activities:

Nuclide	Area of Contamination (m^2)	Distribution
32P	UNLIMITED	CONSTANT(dpm/100 cm**2)
Justification for concentration: DSV		Value 9.50E+06

Site Specific Parameters:

General Parameters:

None

Correlation Coefficients:

None

Summary Results:

90.00% **of the** 100 **calculated TEDE values are <** 2.50E+01 **mrem/year . The 95 % Confidence Interval for the** 0.9 **quantile value of TEDE is** 2.31E+01 **to** 2.74E+01 **mrem/year**

DandD Building Occupancy Scenario

DandD Version: 2.1.0
Run Date/Time: 11/21/2003 4:31:29 AM
Site Name: Pfizer Kalamazoo
Description: Default Screening Values - 25 mrem/y
File Name: \Default P33.mcd

Options:

Implicit progeny doses NOT included with explicit parent doses
Nuclide concentrations are distributed among all progeny
Number of simulations: 100
Seed for Random Generation: 8718721
Averages used for behavioral type parameters

External Pathway is ON
Inhalation Pathway is ON
Secondary Ingestion Pathway is ON

Initial Activities:

Nuclide	Area of Contamination (m^2)	Distribution	
33P	UNLIMITED	CONSTANT(dpm/100 cm**2)	
Justification for concentration: DSV		Value	4.10E+07

Site Specific Parameters:

General Parameters:

None

Correlation Coefficients:

None

Summary Results:

90.00% **of the** 100 **calculated TEDE values are <** 2.46E+01 **mrem/year . The 95 % Confidence Interval for the** 0.9 **quantile value of TEDE is** 2.24E+01 **to** 2.73E+01 **mrem/year**

DandD Building Occupancy Scenario

DandD Version: 2.2.0
Run Date/Time: 3/13/2007 3:40:59 PM
Site Name: Pfizer Incinerator
Description: DSV for Pfizer Surf Contam.
FileName:C:\DandD_Docs\Co-57.mcd

Options:

Implicit progeny doses NOT included with explicit parent doses
Nuclide concentrations are distributed among all progeny
Number of simulations: 100
Seed for Random Generation: 8718721
Averages of sampled values used for behavioral and metabolic type parameters
Averages of sampled values not used for derived behavioral or metabolic parameters

External Pathway is ON
Inhalation Pathway is ON
Secondary Ingestion Pathway is ON

Initial Activities:

Nuclide	Area of Contamination (m^2)	Distribution
57Co	UNLIMITED	CONSTANT(dpm/100 cm**2)
Justification for concentration: Pfizer Incinerator DCGL		Value 2.00E+05

Site Specific Parameters:

General Parameters:

None

Correlation Coefficients:

None

Summary Results:

90.00% **of the** 100 **calculated TEDE values are <** 2.37E+01 **mrem/year . The 95 % Confidence Interval for the** 0.9 **quantile value of TEDE is** 2.34E+01 **to** 2.40E+01 **mrem/year**

ORIGIN ID: HAIA (269) 833-7903
KAREN GRIMES
PFIZER INC
333 PORTAGE STREET/DOCK 300

KALAMAZOO, MI 49007
UNITED STATES US

Ship Date: 16MAR07
ActWgt 3.0 LB MAN
System# 245784/CAFE2330
Account S 124981336

TO GEORGE M. MCCANN / STE 210 (630) 829-9856
DECOMMISSIONING BRANCH
NUCLEAR REGULATORY COMM REGION III
2443 WARRENVILLE ROAD
LISLE, IL 605324352

FedEx Express

CLS#930186/21/22

Ref: 185-4K418-2924
INV:
PO: Dept

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19MAR07

TRK# 9271 0538 1041 Form 0201

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60532 -IL-US TR BDFA

ROUTE 16 FZ

PAKSWIDE

World On Time®

Small

Align bottom of Peel and Stick Airbill or Airbill Pouch here.