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CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Dr. Robert S. (Stu) Dinwiddie, Manager
RCRA Permits Management Program
Hazardous and Radioactive Materials Bureau
New Mexico Environment Department
2044 Galisteo St., Bldg A
Santa Fe, NM 87505-2100

Subject: Certification and Closure Report for Completion of Closure Activities for the Igloo 6007 and Magazine 6011 at Sandia National Laboratories, New Mexico (SNL/NM)

Dear Dr. Dinwiddie:

The purpose of this letter is the submittal of the enclosed Independent Professional Engineering Certification and final Resource Conservation and Recovery Act (RCRA), "RCRA Closure Report For Igloo 6007 and Magazine 6011". The documents are for clean closure activities for the Igloo 6007 and Magazine 6011 at SNL/NM (SNL/NM; Environmental Protection Agency (EPA) Identification Number NM5890110518). This document is being submitted as required by the SNL/NM RCRA final Closure Plan, approved by the New Mexico Environment Department, under the authority of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, (20 NMAC 4.1) Subpart VI, 40 Code of Federal Regulations (CFR) 265.112 (d)(4).

Closure activities were carried out pursuant to specification in the "RCRA Closure Plan for Igloo 6007 and Magazine 6011" (RCRA Closure Plan; SNL/NM, 1995a). All actions were performed to achieve the performance standards found in 20 NMAC 4.1, Subpart VI, 40 CFR 265.111 (a) and (b). Clean closure of Igloo 6007 and Magazine 6011 was verified through wipe sampling and analysis of the floors and walls of the units to verify the absence of hazardous constituents of concern above concentrations requiring further action. The clean closure of Igloo 6007 and Magazine 6011 can be demonstrated to meet applicable regulatory requirements and associated EPA guidance for clean closure.

The enclosed Independent Professional Engineering Certification was prepared and signed by the International Technology Corporation (IT), in accordance with

generally accepted professional engineering principles and practices pursuant to the requirements of 20 NMAC 4.1, Subpart VI, 40 CFR 265.115.

The final Closure Report describes closure activities, lists and explains any variances from the RCRA Closure Plan, and identifies the location and custodian of all closure documents. The Closure Report also contains the Certification of Accuracy signed by the Co-Operator at SNL/NM and the Owner and Co-Operator at the Department of Energy.

If you have any questions regarding the Certification or the final Closure Report, please contact Mr. Ted Pietrok of my staff at (505) 845-5649.

Sincerely,

George K. Jaakkar

for Michael J. Zamorski
Area Manager

Enclosure

cc w/enclosure:
S. Kruse, NMED
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D. Moore, MS 1044, SNL/NM
B. Hamilton, MS 1044, SNL/NM

RCRA CLOSURE REPORT
FOR IGLOO 6007 AND MAGAZINE 6011

SANDIA NATIONAL LABORATORIES/NEW MEXICO

Prepared for:

Sandia National Laboratories
Compliance and Metrics
Department 7511
Albuquerque, New Mexico

Prepared by:

IT Corporation
5301 Central Avenue NE, Suite 700
Albuquerque, New Mexico 87108

June 1997

Executive Summary

This closure report documents closure activities for Igloo 6007 and Magazine 6011, Sandia National Laboratories/New Mexico (SNL/NM). Closure activities were carried out pursuant to specifications in the Resource Conservation and Recovery Act "RCRA Closure Plan for Igloo 6007 and Magazine 6011" (RCRA Closure Plan; SNL/NM, 1995a). All actions were performed to achieve the performance standards found in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, (20 NMAC 4.1) Subpart VI, 40 CFR 265.111(a) and (b).

Clean closure of Igloo 6007 and Magazine 6011 was verified through wipe sampling and analysis of the floors and walls of the units to verify the absence of hazardous constituents of concern above concentrations requiring further action (e.g., decontamination). Analytical results indicate that pentaerythritol tetranitrate, barium, cadmium, and chromium were not detected above levels which require further activities, according to the RCRA Closure Plan (SNL/NM, 1995a). The RCRA Closure Plan requires that concentrations of constituents of concern greater than 10 times the detection limits or 10 times the concentration of the analyte in the associated blank (whichever is greater) be considered further. Lead concentrations exceeded 10 times the detection limits for at least some of the samples in both units. However, on further consideration, because lead concentrations were well below regulatory levels requiring further investigation or clean up, no additional actions were necessary. Therefore, the closure of Igloo 6007 and Magazine 6011 can be demonstrated to meet all applicable regulatory requirements and associated U.S. Environmental Protection Agency guidance for clean closure, as well as all the requirements of the approved RCRA Closure Plan.

Table of Contents

Executive Summary i
Independent Professional Engineering Certification iii
Certification of Accuracy iv
List of Tables v
List of Figures v
List of Abbreviations/Acronyms vi
1.0 Introduction 1
1.1 Purpose 1
1.2 Report Organization 4
2.0 Field Activities 4
2.1 Sample Collection 4
2.1.1 Igloo 6007 4
2.1.2 Magazine 6011 6
2.2 Quality Control 6
3.0 Analytical Results 8
3.1 Radiological Hazard Survey 8
3.2 Hazardous Waste Survey 8
4.0 Variances 11
5.0 Results of Closure Activities 13
6.0 Location of Closure Documentation 15
7.0 References 15

Regional Office

INTERNATIONAL TECHNOLOGY CORPORATION

5301 Central Avenue, N.E.—Suite 700
Albuquerque, New Mexico 87108-1513
505-262-8800
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Independent Professional Engineering Certification

This certification was prepared in accordance with generally accepted professional engineering principles and practice pursuant to the requirements of 20 NMAC 4.1, Subpart VI, 40 CFR 265.115, for an independent professional engineering certification. These services have been performed with the care and skill ordinarily exercised by members of the profession practicing under similar conditions at the same time and in the same or in a similar locality. We make no other warranty either expressed or implied. The finding and certification are based on (1) review of the RCRA Closure Plan (SNL/NM, 1995a) dated March 1997; (2) review of the Sampling and Analysis Plan (SNL/NM, 1995b); (3) observations of sampling activities; and (4) review of the analytical results from the verification samples.

With the signature and seal below, I certify that, except for the variances presented in Section 4.0, the closure of Igloo 6007 and Magazine 6011 was conducted in accordance with the RCRA Closure Plan and the Sampling and Analysis Plan, the information presented in this report is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Respectfully,

IT Corporation

JEFFREY K. TUCKER
NEW MEXICO
12183
REGISTERED PROFESSIONAL ENGINEER

Jeffrey K. Tucker, P.E.
New Mexico Registered Professional Engineer No. 12183
Expires December 31, 1997

Date: 9/18/97

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Certification of Accuracy

I certify under penalty of law that this document was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Document Title:

RCRA Closure Report for Igloo 6007 and Magazine 6011,
Sandia National Laboratories/New Mexico

Name: M L Jones Date: 7/24/98

M. Lynn Jones
Vice President
Laboratories Services Division, 7000
Sandia Corporation
Albuquerque, New Mexico
Co-Operator

Name: George K. Lasker for Date: 7/28/98

Michael J. Zamorski
Area Manager
Kirtland Area Office
U.S. Department of Energy
Albuquerque, New Mexico
Owner and Co-Operator

List of Tables

Table	Title	Page
1	Analytical Results of Wipe Samples at Igloo 6007 and Magazine 6011	9

List of Figures

Figure	Title	Page
1	Sandia National Laboratories/New Mexico Technical Areas and the 6000 Igloo Area in Relation to Kirtland Air Force Base	2
2	Igloo 6007 and Magazine 6011 within the 6000 Igloo Area, Sandia National Laboratories/New Mexico	3
3	Site Sketch, Grid Layout, and Sample Locations for Igloo 6007	5
4	Site Sketch, Grid Layout, and Sample Locations for Magazine 6011	7

List of Abbreviations/Acronyms

°C	degrees Celsius
DOE	U.S. Department of Energy
EORC	Environmental Operations Records Center
EPA	U.S. Environmental Protection Agency
ft	foot
ft^2	square foot
HUD	U.S. Housing and Urban Development Agency
in	inch
KAFB	Kirtland Air Force Base
kg	kilogram(s)
µg	microgram(s)
NBS	National Bureau of Standards
NG	neutron generator
NMAC	New Mexico Administrative Code
PETN	pentaerythritol tetranitrate
ppm	parts per million
QC	quality control
RCRA	Resource Conservation and Recovery Act
SAP	Sampling and Analysis Plan
SNL/NM	Sandia National Laboratories/New Mexico

1.0 Introduction

This report describes the closure activities carried out at Igloo 6007 and Magazine 6011, Sandia National Laboratories/New Mexico (SNL/NM), in accordance with the Resource Conservation and Recovery Act "RCRA Closure Plan for Igloo 6007 and Magazine 6011" (RCRA Closure Plan; SNL/NM, 1995a) approved by the New Mexico Environment Department on April 3, 1997. Igloo 6007 and Magazine 6011 are secure storage structures operated by Sandia National Laboratories/New Mexico (SNL/NM) for the U.S. Department of Energy (DOE). The buildings are located on Kirtland Air Force Base (KAFB), Albuquerque, New Mexico (Figures 1 and 2). Closure was performed to achieve the performance standards in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart VI, 40 CFR 265.111(a) and (b).

1.1 Purpose

The purpose of this report is to demonstrate that clean closure of Igloo 6007 and Magazine 6011 was performed in accordance with the RCRA Closure Plan (SNL/NM, 1995a). In conformance with Section 10.0, "Final Closure Report," of the RCRA Closure Plan (SNL/NM, 1995a) this report describes closure activities, lists and explains any variances from the RCRA Closure Plan, and identifies the location and custodian of all closure documentation.

SNL/NM maintains documentation supporting the independent registered professional engineer's certification in accordance with 20 NMAC 4.1, Subpart VI, 40 CFR 265.115. The supporting documentation includes:

- Laboratory analyses/results summaries
- Original data package(s)
- Quality assurance/quality control (QC) documentation for contract laboratory analyses.

This information is available upon request as required by the RCRA Closure Plan. In accordance with 20 NMAC 4.1, Subpart VI, 40 CFR 265.115, and the RCRA Closure Plan (SNL/NM, 1995a), this report also contains an engineering certification from an independent registered professional engineer that the closure was conducted in accordance with the RCRA Closure Plan, with the exception of variances noted in this report, and a certification of accuracy of the report by the owner and co-operators of the units.

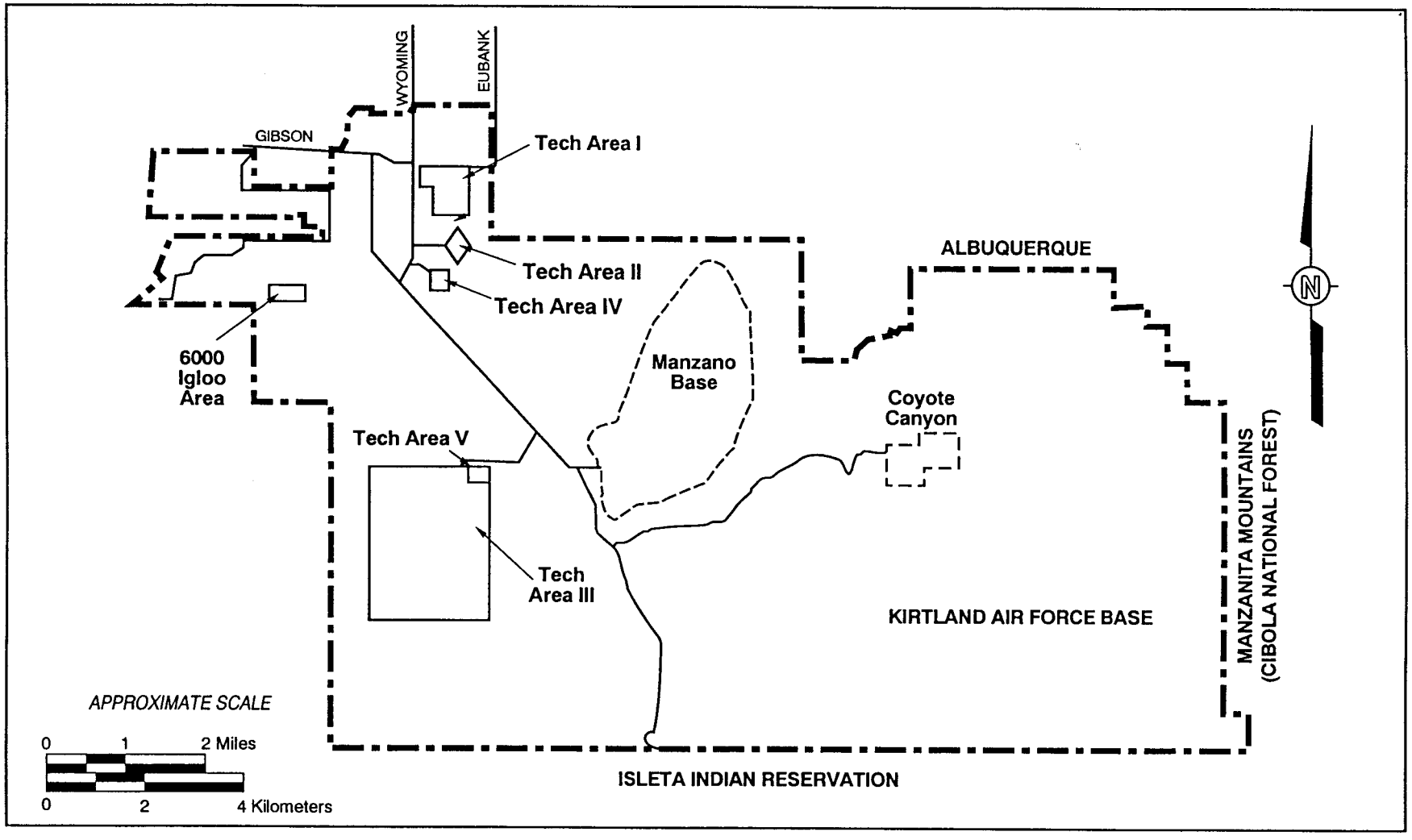

Figure 1
Sandia National Laboratories/New Mexico
Technical Areas and the 6000 Igloo in Relation to Kirtland Air Force Base

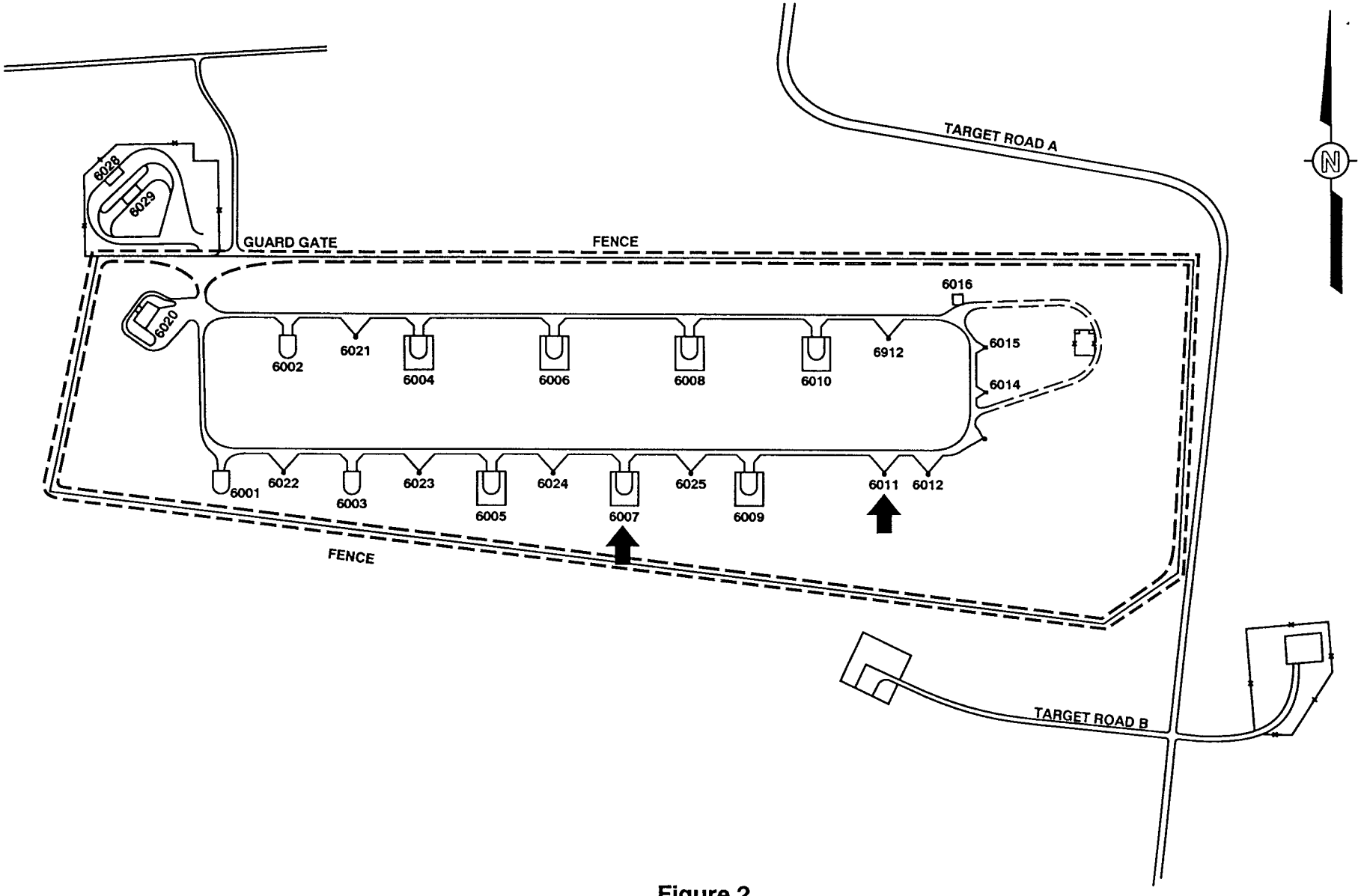

Figure 2

Igloo 6007 and Magazine 6011 within the 6000 Igloo Area, Sandia National Laboratories/New Mexico

1.2 Report Organization

Chapter 1.0 presents an introduction to the report, the purpose of the report, and the report organization. Chapter 2.0 describes the field activities associated with the closure, and a statement of QC during field activities. Chapter 3.0 presents the analytical results of wipe sampling at the two units. Chapter 4.0 details the variances from the RCRA Closure Plan (SNL/NM, 1995a). Chapter 5.0 presents the results of the closure activities. Chapter 6.0 details the location of closure documentation. Chapter 7.0 contains the references for this report.

2.0 Field Activities

Closure of Igloo 6007 and Magazine 6011 achieved the following performance standards (20 NMAC 4.1, Subpart VI, 40 CFR 265.111[a] and [b]):

- Protect human health and the environment
- Prevent the post-closure escape of mixed waste, mixed waste constituents, contaminated run-off, or mixed waste decomposition products to the ground or surface waters, or atmosphere
- Eliminate the need for future maintenance.

Field activities included making detailed descriptions and diagrams of the units and collecting wipe samples of the unit walls and floors. Field activities were conducted on May 4, 1995, in accordance with the requirements of the "Sampling and Analysis Plan for RCRA Closure of Igloo 6007 and Magazine 6011 Mixed Waste Storage Units" (SAP) (SNL/NM, 1995b), except as noted in Section 4.0 of this report.

2.1 Sample Collection

2.1.1 Igloo 6007

A sampling grid was set up at Igloo 6007 by placing six 10-foot (ft) by 10-ft grids down the center, and then six 10-ft by 8-ft, 4-inch (in) grids along each side. Each long exterior wall was gridded with two 20-ft by 5-ft grids and one 20-ft, 9-in by 5-ft grid. The short wall in the back was gridded by one 20-ft by 5-ft grid and one 4-ft by 5-ft grid. The front short wall with the door was gridded by one 20-ft by 5-ft grid and one 6-ft by 5-ft grid (the extra 2 ft were a result of the door frame). Random numbers were generated using a 10^6 random digit table (NBS, 1963), and floor sample locations were selected as shown in Figure 3. Wall sampling locations

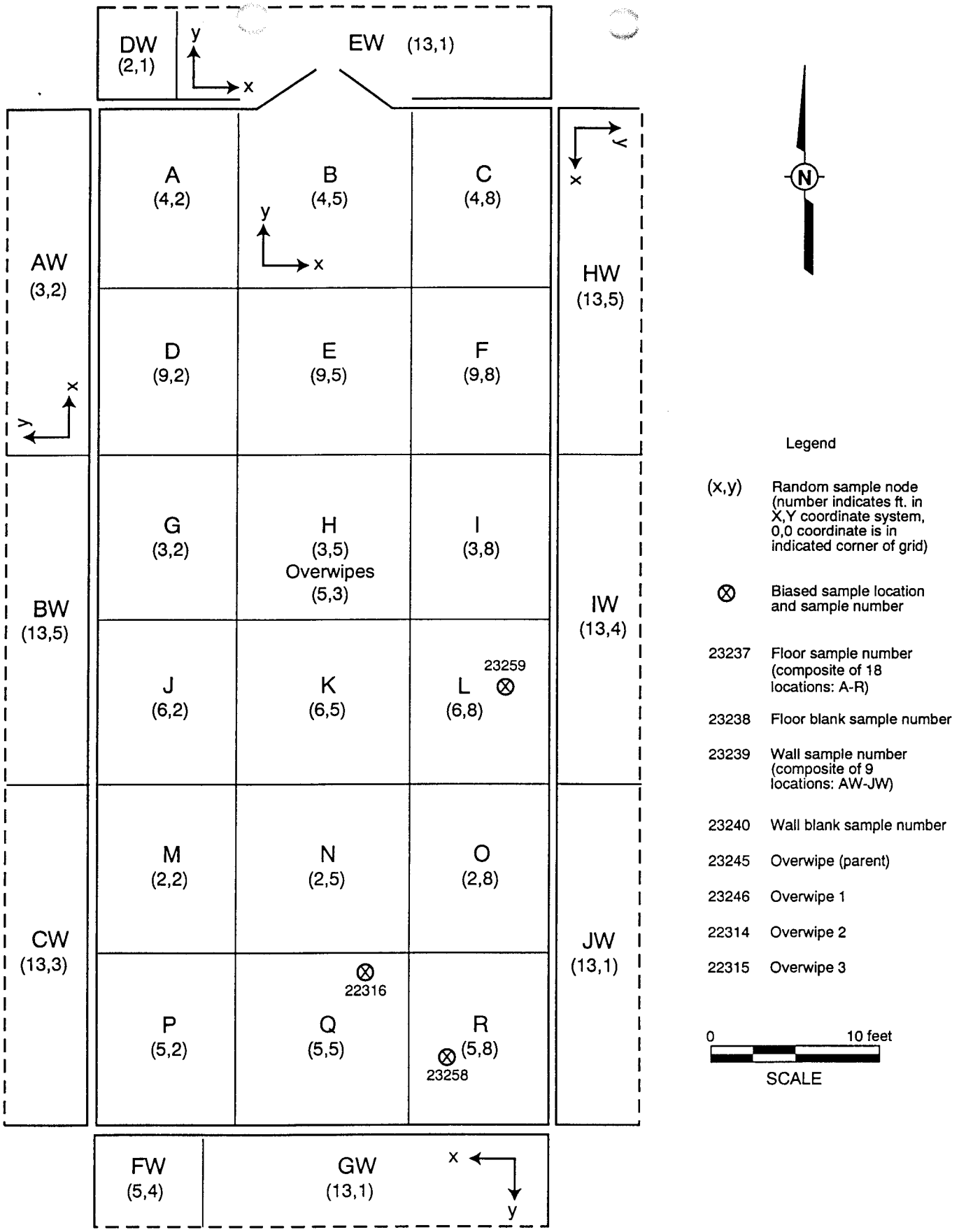

Figure 3
Site Sketch, Grid Layout, and Sample Locations for Igloo 6007

were selected using the same random digit table (NBS, 1963). For the 20-ft by 5-ft grids, the x-coordinate was held constant, as dictated in the SAP (SNL/NM, 1995b), and the y-coordinate was varied. For the 4-ft by 5-ft and 6-ft by 5-ft grids, both x- and y-coordinates were randomly selected. Biased floor and wall samples were selected on the basis of visible staining.

A total of 11 environmental and QC samples were collected at Igloo 6007. The environmental samples consisted of one composite floor sample (18 locations), one composite wall sample (9 locations), one random floor wipe (1 location) with three overwipe samples from the same location, and three biased floor samples collected at stained areas. In addition to the environmental samples, one field blank each was collected for the Igloo 6007 floor (18 wipes) and walls (9 wipes). Each discrete wipe represents one square foot (ft^2) of area.

2.1.2 Magazine 6011

The floor at Magazine 6011 was 10 ft by 10 ft, so only one grid was selected. Walls are 10 ft long; therefore, two 20-ft by 5-ft wall grids were established. Sampling location coordinates were generated using a random digit table (NBS, 1963), and sample locations were selected as indicated in Figure 4. There were no visible stains on the floor, so biased floor samples were not collected. One visible stain on the wall was sampled at a location as indicated in Figure 4.

A total of five environmental and QC samples were collected at Magazine 6011. The environmental samples consisted of one floor sample, one wall sample, and one biased wall sample collected at a stained area. In addition to the environmental samples, one field blank each was collected for the 6011 floor and walls. All samples at Magazine 6011 consisted of one wipe per sample. Each discrete wipe represents one ft^2 of area.

2.2 Quality Control

QC for sampling at Igloo 6007 and Magazine 6011 was implemented to ensure that the measurement data collected met the information objectives for the investigation. QC was implemented by strict adherence to the sampling procedures described in the SAP (SNL/NM, 1995b); documentation of sampling activities and sample custody; use of controlled and standard equipment and materials; and collection, analysis, and evaluation of field and laboratory QC samples.

Field QC samples consisted of field blank samples, the only field QC samples considered appropriate to this sampling task, as specified in the SAP (SNL/NM, 1995b). Field blank

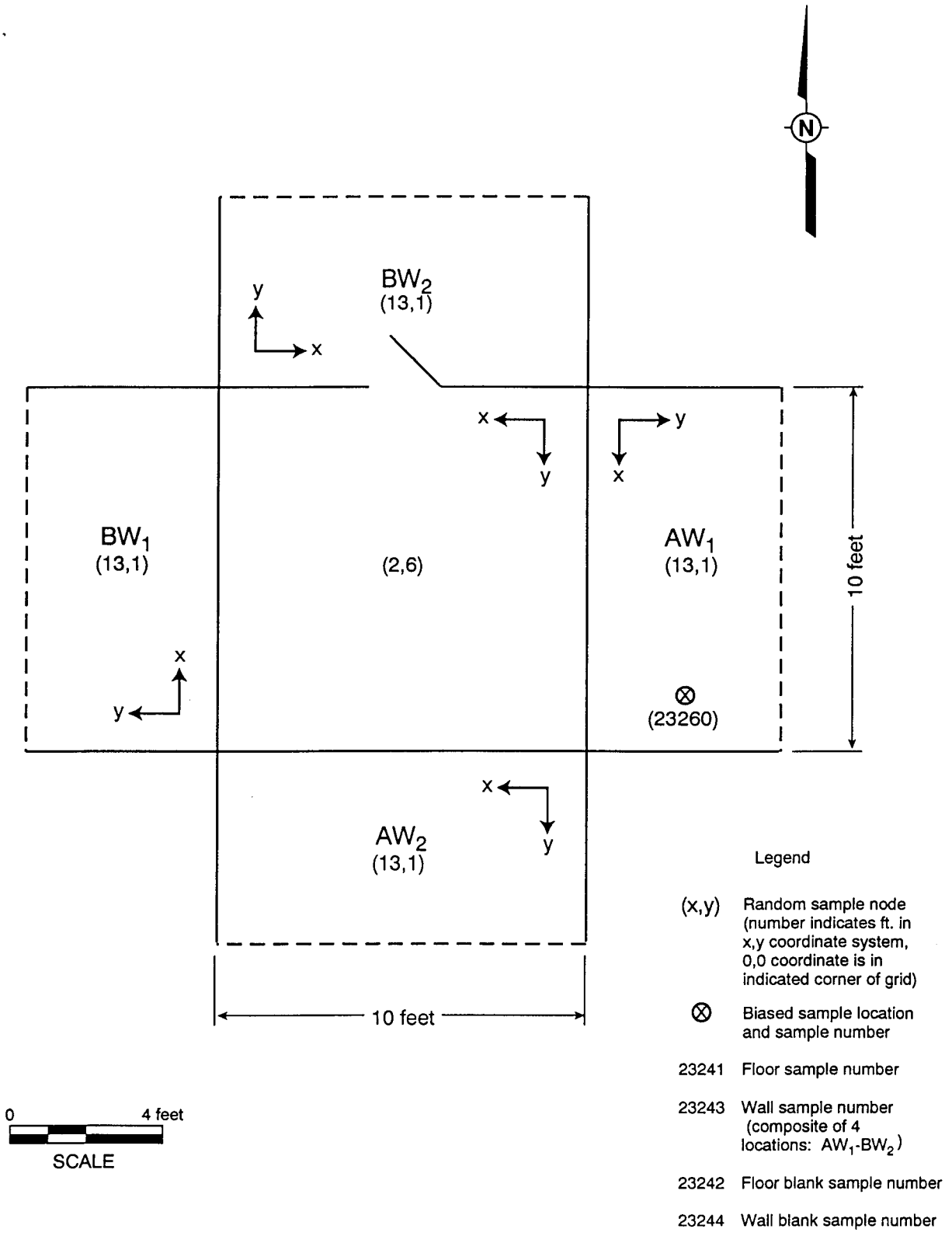

Figure 4
Site Sketch, Grid Layout, and Sample Locations for Magazine 6011

samples, consisting of the same number of filter wipes as the investigatory samples, were handled by the sampling personnel but not applied to the building surfaces.

3.0 Analytical Results

3.1 Radiological Hazard Survey

A systematic wipe sample survey for removable radioactive contamination was conducted on July 8, 1994. The wipes were analyzed at the SNL/NM Department 7715 Central Counting Facility for tritium, gross alpha radioactivity, and gross beta radioactivity by liquid scintillation counting. Removable radioactive contamination was not detected on any of the wipe samples above the minimum detectable activities. Additional real-time gamma radiation surveys of the buildings' floors and walls using a hand-held ion-chamber meter from a distance of 1 ft from the surface showed no exposure of personnel to gamma radiation above normal background values.

3.2 Hazardous Waste Survey

Analytical results for the wipe samples collected at Igloo 6007 and Magazine 6011 are summarized in Table 1. Sample analyses were performed by Lockheed Analytical Services, Las Vegas, Nevada, in accordance with the methods specified in the SAP (SNL/NM, 1995b). Analytical results were reported by the laboratory in terms of mass of analyte per mass of wipe (i.e., micrograms [μg] analyte/kilogram [kg] wipe). Because the samples were single wipes or composites of multiple wipes collected as one wipe per ft^2 of area, results are converted to mass of analyte per unit area (i.e., μg analyte/ft^2 area wiped) based on the actual number of wipes used in each composite sample. Therefore, Table 1 shows sample results as reported by the laboratory and as calculated on a per-ft^2 basis. The analytical results are summarized in the following text.

Pentaerythritol tetranitrate (PETN) was not detected in any samples from either unit at a method detection limit of 1.0 μg/kg.

Barium was detected in the Igloo 6007 floor composite sample at 1,700 μg/kg (94 μg/ft^2), the wall composite sample at 42 μg/kg (4.7 μg/ft^2), and the three biased floor samples at concentrations of 34 μg/ft^2, 45 μg/ft^2, and 42 μg/ft^2. Barium was not detected in any samples from Magazine 6011.

Cadmium was detected in the Igloo 6007 floor composite sample at 4.1 μg/kg (0.23 μg/ft^2), the wall composite sample at 0.55 μg/kg (0.06 μg/ft^2), and two of the three biased floor samples at

Table 1

Analytical Results of Wipe Samples at Igloo 6007 and Magazine 6011

Result values in micrograms/kilogram (µg/kg)
Per ft^2 values in micrograms/square foot (µg/ft^2)

Sample #	Location	Comments	PETN[a]		Ba[b]		Cd[b]		Cr[b]		Pb[b]	
			Result	per ft^2	Result	per ft^2	Result	per ft^2	Result	per ft^2	Result	per ft^2
23237-01 23237-02	Igloo 6007 floor	Composite of 18 locations	u (1.0)	u (1.0)	1,700	94	4.1	0.23	19	1.05	110	6.1
23238-01 23238-02	Igloo 6007 floor	Field blank (18)	u (1.0)	u (1.0)	u (20)	u (20)	u (0.5)	u (0.5)	u (1.0)	u (1.0)	0.31	0.02
23239-01 23239-02	Igloo 6007 walls	Composite of 9 locations	u (1.0)	u (1.0)	42	4.7	0.55	0.06	3.3	0.37	88	9.8
23240-01 23240-02	Igloo 6007 walls	Field blank (9)	u (1.0)	u (1.0)	u (20)	u (20)	u (0.5)	u (0.5)	u (1.0)	u (1.0)	u (0.3)	u (0.3)
23245-01 23245-02	Igloo 6007 overwipe (parent)		u (1.0)	u (1.0)	u (20)	u (20)	u (0.5)	u (0.5)	u (1.0)	u (1.0)	2.1	2.1
23246-01 23246-02	Igloo 6007 overwipe 1		u (1.0)	u (1.0)	u (20)	u (20)	u (0.5)	u (0.5)	u (1.0)	u (1.0)	2.1	2.1
22314-01 22314-02	Igloo 6007 overwipe 2		u (1.0)	u (1.0)	u (20)	u (20)	u (0.5)	u (0.5)	u (1.0)	u (1.0)	2.6	2.6
22315-01 22315-02	Igloo 6007 overwipe 3		u (1.0)	u (1.0)	u (20)	u (20)	u (0.5)	u (0.5)	u (1.0)	u (1.0)	2.4	2.4
22316-01 22316-02	Igloo 6007 floor (biased)	Stained area	u (1.0)	u (1.0)	34	34	u (0.5)	u (0.5)	1.0	1.0	5.3	5.3

Refer to footnotes at end of table.

Table 1 *(Continued)*

Analytical Results of Wipe Samples at Igloo 6007 and Magazine 6011

Result values in micrograms/kilogram (µg/kg)
Per ft^2 values in micrograms/square foot (µg/ft^2)

Sample #	Location	Comments	PETN[a]		Ba[b]		Cd[b]		Cr[b]		Pb[b]	
			Result	per ft^2	Result	per ft^2	Result	per ft^2	Result	per ft^2	Result	per ft^2
23258-01 23258-02	Igloo 6007 floor (biased)	Stained area	u (1.0)	u (1.0)	45	45	0.50	0.50	1.8	1.8	21	21
23259-01 23259-02	Igloo 6007 floor (biased)	Stained area	u (1.0)	u (1.0)	42	42	1.6	1.6	2.0	2.0	11	11
23241-01 23241-02	Magazine 6011 floor		u (1.0)	u (1.0)	u (20)	u (20)	u (0.5)	u (0.5)	u (1.0)	u (1.0)	1.4	1.4
23242-01 23242-02	Magazine 6011 floor	Field blank	u (1.0)	u (1.0)	u (20)	u (20)	u (0.5)	u (0.5)	u (1.0)	u (1.0)	u (0.3)	u (0.3)
23243-01 23243-02	Magazine 6011 walls		u (1.0)	u (1.0)	u (20)	u (20)	u (0.5)	u (0.5)	1.7	1.7	9.3	9.3
23244-01 23244-02	Magazine 6011 walls	Field blank	u (1.0)	u (1.0)	u (20)	u (20)	u (0.5)	u (0.5)	u (1.0)	u (1.0)	u (0.3)	u (0.3)
23260-01 23260-02	Magazine 6011 wall (biased)	Stained area	u (1.0)	u (1.0)	u (20)	u (20)	u (0.5)	u (0.5)	1.0	1.0	2.9	2.9
Blank wipes		Not handled by field staff	u (1.0)	u (1.0)	u (20)	u (20)	u (0.5)	u (0.5)	u (1.0)	u (1.0)	u (0.3)	u (0.3)

[a]U.S. Environmental Protection Agency Method 8330 (EPA, 1986).
[b]U.S. Environmental Protection Agency Method 3050/6010 (EPA, 1986).

Ba = Barium
Cd = Cadmium
Cr = Chromium
Pb = Lead
PETN = Pentaerythritol tetranitrate
u = Not detected at the indicated detection limit (in µg/kg).

concentrations of 0.50 μg/ft^2 and 1.6 μg/ft^2. Cadmium was not detected in any samples from Magazine 6011.

Chromium was detected in the Igloo 6007 floor composite sample at 19 μg/kg (1.05 μg/ft^2), the wall composite sample at 3.3 μg/kg (0.37 μg/ft^2), and the three biased floor samples at concentrations of 1.0 μg/ft^2, 1.8 μg/ft^2, and 2.0 μg/ft^2. Chromium was detected in the Magazine 6011 biased wall sample at 1.7 μg/ft^2, and in the biased wall sample at concentrations of 1.0 μg/ft^2.

Lead was detected in the Igloo 6007 floor composite sample at 110 μg/kg (6.1 μg/ft^2), the wall composite sample at 88 μg/kg (9.8 μg/ft^2), and the three biased floor samples at concentrations of 5.3 μg/ft^2, 21 μg/ft^2, and 11 μg/ft^2. In addition, lead was detected in the random wipe (overwipe parent) at concentrations of 2.1 μg/ft^2, and in the three overwipe samples at the same location as the random wipe at concentrations of 2.1 μg/ft^2, 2.6 μg/ft^2, and 2.4 μg/ft^2. Lead was detected in the Magazine 6011 floor sample at 1.4 μg/ft^2, and in the wall sample at 9.3 μg/ft^2. Lead was also detected in the Magazine 6011 biased wall sample at concentrations of 2.9 μg/ft^2.

Field blank analytical results show that PETN, barium, cadmium, and chromium were not detected in any field blank sample. Lead was detected in the Igloo 6007 floor wipe field blank at a concentration of 0.31 μg/kg (0.02 μg/ft^2). None of the constituents of concern were detected in the blank wipe sample not handled by the field staff.

4.0 Variances

The following variances from the requirements of the RCRA Closure Plan (SNL/NM, 1995a) and the SAP (SNL/NM, 1995b) were noted during the execution of the plan:

- The SAP (SNL/NM, 1995b) indicated that up to 16 wipe samples of the floor for Igloo 6007 would be collected, based on an idealized method of locating grids and sampling points, acknowledging that actual site conditions would differ somewhat from the idealized condition. Sampling grids at Igloo 6007 were modified slightly from the SAP (SNL/NM, 1995b), in order to cover the floor and wall areas with as many 100 ft^2 grids as possible (see also Section 2.1). Actual floor and wall dimensions were slightly different than were anticipated in the development of the SAP. This resulted in the collection of 18 wipe samples, thereby providing additional coverage of the floor area. Therefore, this variance resulted in a positive impact to support clean closure.

- The sampling method specified in the SAP (SNL/NM, 1995b) indicates that wipe samples should be collected by wiping the required area in two directions in order to sample an adequate amount of material. It was noted by the field staff when sampling at Igloo 6007 that there was a significant amount of dust on the floor surface. In order to reduce the amount of dust present, each surface was swept with a fine bristle broom and then sampled. During sampling, it appeared that the wipe media became loaded after the first directional pass. Therefore, samples were collected by wiping in one direction only. In addition, at Igloo 6007, forklift tire tracks were noted on the floor. Wipes were visibly blackened due to the rubber material present on the floor surface. Because the wipes were becoming visibly loaded with material after one directional pass, it was determined by the field staff that adequate sample for laboratory analysis was obtained. Therefore, since an adequate sample was obtained in each case, there should be no impact from this variance.

- The SAP (SNL/NM, 1995b) required that one QC overwipe from a selected area be collected. Due to the significant amount of loading of material on the wipes as noted above, three overwipe samples were collected. The purpose of the overwipe samples was to determine if any contamination present was removable, and to what degree. All constituents of concern were below detection limits on all overwipes except for lead. For lead, the results of the overwipe samples are virtually identical to the original sample at the same location. This suggests that either the lead concentrations detected in the wipe samples may represent the background concentration of lead in the concrete, or the low levels of lead detected were not completely removed from the surface by wiping. As the original overwipe sample was collected per the requirements in the SAP, and the second and third overwipe samples provided additional information to support clean closure, this variance resulted in a positive impact to the project.

- The SAP (SNL/NM, 1995b) provided only for random sampling, as it was assumed that there was no evidence of contamination at the facilities. However, once field activities were initiated, it was discovered that there were three slightly stained areas on the Igloo 6007 floor, and one slightly stained area on a Magazine 6011 wall. Although a release of the mixed waste (i.e., neutron generators [NG]) managed in these units is highly unlikely, because NGs are solid and exhibited only characteristics of reactivity and/or metal toxicity, four biased samples were collected at locations indicated on Figures 3 and 4 for Igloo 6007 and Magazine 6011, respectively. As the biased samples provided additional information to support clean closure of the units, this variance resulted in a positive impact to the project.

- According to the RCRA Closure Plan (SNL/NM, 1995a), concentrations above detection limits for the sampling conducted under the plan must be compared with the blank results, and be greater than 10 times the blank or 10 times the detection limit for the analyte (whichever is greater) to indicate further action is required. Analytical results from the wipe sampling for lead indicate that concentrations are

greater than 10 times the detection limit for some or all non-blank samples from both units. However, the lead concentrations are not considered to be of concern as (1) the results of the overwipe samples collected at Igloo 6007 are virtually identical to the original sample at the same location, suggesting that the lead concentrations detected probably represent the background concentration of lead in the concrete; (2) all lead concentrations on a total and per ft^2 basis fall well below the U.S. Department of Housing and Urban Development (HUD) standard for lead dust levels on floors of 200 $\mu g/ft^2$ (HUD, 1990); and (3) all lead concentrations on a total basis fall well below the U.S. Environmental Protection Agency (EPA) recommended screening level of 400 parts per million (ppm) (EPA, 1994). Therefore, the impact of this variance is negligible.

- The SAP (SNL/NM, 1995b) required that samples be cooled to 4° Celsius (°C) for shipment to the laboratory. Samples were shipped to the laboratory with an inadequate supply of ice to maintain the 4°C temperature requirement. Samples arrived at the analytical laboratory at approximately 15°C. However, the analytical results for filter wipe samples for metals and PETN would not be adversely effected by the elevated temperature, as they are not prone to volatility or degradation at those temperatures. Therefore, the impact of this variance on the analytical results is negligible.

- The sample jar for sample 23237-02 (Igloo 6007 floor composite) broke during shipment to the analytical laboratory, resulting in possible contamination of the wipes sample. However, analytical results for this sample indicate concentrations of constituents of concern on a total and per ft^2 basis are below levels for recommending additional study in the SAP (SNL/NM, 1995b), EPA (1994), and HUD (1990) regulatory levels. Therefore, the impact of this variance on clean closure is negligible.

5.0 Results of Closure Activities

This report presents information on closure assessment activities with regard to the applicable regulations, field activities, and analytical results. This section presents interpretations of the results relative to the performance standards listed in Section 2.0 of this Closure Report.

The following closure activities have been accomplished:

- A previous waste characterization investigation of the NG assemblies stored in Igloo 6007 and Magazine 6011 included toxic characteristic leaching procedure and metal analysis (EPA Methods 1311 and 6010; EPA, 1986) of the metal encapsulation unit, less the timer/driver devices. All constituents were either not detected or were below the release limits with the exception of lead. One of two samples from each half of an NG assembly was slightly greater than the regulatory

limit; however, averaged together, the lead concentrations in the samples representing the entire NG assembly was less than the regulatory limit of 5.0 mg/L.

- The NG assemblies were removed from Igloo 6007 and Magazine 6011 in June, 1994 (SNL/NM, 1995b).

- A systematic wipe sample survey for PETN and metals (barium, cadmium, chromium, and lead) was conducted on May 4, 1995. The wipes were analyzed at Lockheed Analytical Services, Las Vegas, Nevada, and the results are presented in this report (Section 3.0). According to the RCRA Closure Plan (SNL/NM, 1995a), concentrations above detection limits for the sampling conducted under the SAP must be compared with the blank results, and be greater than 10 times the blank or 10 times the detection limit for the analyte (whichever is greater) to indicate further action is required. The results presented in Section 3.0 indicate that analyte concentrations in both units, on a per ft^2 basis, are below 10 times the detection limit for all analytes except for lead. Lead concentrations are not considered to be of concern as (1) all lead concentrations are well below the HUD lead standard (HUD, 1990), and (2) all lead concentrations fall well below the EPA recommended screening guideline (EPA, 1994) (see also Section 4.0 for discussion).

This report documents clean closure for Igloo 6007 and Magazine 6011, as the following objectives previously outlined in Section 2.0 have been met:

- All analytes of concern are below the guidelines recommended in the RCRA Closure Plan (SNL/NM, 1995a) and the SAP (SNL/NM, 1995b), except for lead. Lead concentrations are significantly below the HUD guideline of 200 $\mu g/ft^2$ for lead dust levels on floors (HUD, 1990), and EPA recommended screening levels of 400 ppm lead in soil (EPA, 1994). Lead concentrations above the EPA screening guideline require additional study, while levels below the guideline are considered to be of no impact to human health. Therefore, the closure is protective of human health and the environment.

- Igloo 6007 and Magazine 6011 are enclosed buildings lacking drains or openings other than the doorways, and concentrations of constituents of concern are either non-detectable or below regulatory limits and guidelines. Constituents of concern have little or no volatility. As there is no known pathway for constituents of concern to enter the surrounding soils, surface water, groundwater, or atmosphere, the closure satisfies the requirements to prevent post-closure escape of mixed waste, mixed waste constituents, contaminated run-off, or mixed waste decomposition products to the ground or surface waters, or atmosphere.

- Because clean closure has been achieved and the closure is protective of human health and the environment, no additional monitoring or remediation is required at these locations within the scope of the RCRA Closure Plan (SNL/NM, 1995a).

6.0 Location of Closure Documentation

Completed records generated during sampling and analysis will be submitted to the SNL/NM Environmental Operations Records Center (EORC), Department 7512. The EORC will maintain these records in accordance with "Sandia National Laboratories/New Mexico, Records Center Customer Manual" (SNL/NM, 1994). The SNL/NM Project Leader responsible for this task will submit all documentation to the EORC upon completion of the project. Completed records include original field logs, laboratory certificates of analysis, QC documentation, and chain-of-custody records.

The contract analytical laboratory shall retain and make available for inspection upon request all raw analytical records generated in conjunction with this closure. These records shall include instrument tuning and calibration records, batch quality control sample data, control charts and calculations, sample tracking and control documentation, raw analytical sample data, and analytical results. These records shall be retained for a duration of time specified in the analytical contract Statement of Work until requested by SNL/NM. Upon request from SNL/NM at the end of the contract, original laboratory records will be transmitted for storage at the EORC.

7.0 References

EPA, see U.S. Environmental Protection Agency.

HUD, see U.S. Department of Housing and Urban Development.

NBS, see National Bureau of Standards.

National Bureau of Standards (NBS), 1963, "National Bureau of Standards, Experimental Statistics, Table A-36: 10^6 Random Digit Table," *Handbook 91*, National Bureau of Standards, Washington, D.C.

SNL/NM, see Sandia National Laboratories/New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), 1995a, "RCRA Closure Plan for Igloo 6007 and Magazine 6011," *OP471211*, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), 1995b, "Sampling and Analysis Plan for RCRA Closure of Igloo 6007 and Magazine 6011 Mixed Waste Storage Units," *Appendix A* to *OP471211*, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), 1994, "Records Center Customer Manual," Environmental Operations Center, Department 7500, Sandia National Laboratories, Albuquerque, New Mexico.

U.S. Environmental Protection Agency (EPA), 1994, "Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities," *OSWER Directive 9355.4-12,* U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D. C.

U.S. Environmental Protection Agency (EPA), 1986, "Test Methods for Evaluating Solid Waste: Physical/Chemical Methods," *SW-846,* 3rd ed., U.S. Environmental Protection Agency, Washington, D.C.

U.S. Department of Housing and Urban Development (HUD), 1990, "Lead-Based Paint Interim Guidelines for Hazard Identification and Abatement, Public and Indian Housing," Office of Public and Indian Housing, U.S. Department of Housing and Urban Development, as published in Federal Register, Volume 55, No. 75, April 18, 1990, Washington, D.C.