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 Building SC-1". The documents are for clean closure activities for the Building SC-1 (Building 6596-M) at Sandia National Laboratories, New Mexico (SNL/NM; Environmental Protection Agency (EPA) Identification Number NM5890110518). This submittal is in response to the approval, with changes, of the 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 specifications in the “RCRA Closure Plan for Building SC-1, Technical Area V,” (RCRA Closure Plan; SNL/NM, 1997). All actions were performed to achieve the performance standards found in 20 NMAC 4.1, Subpart VI, 40 CFR 265.111 (a) and (b). Building SC-1 was used to manage small amounts of mixed waste at various times between 1991 and 1993. Clean closure of Building SC-1 was verified through wipe sampling of the floor and walls of the building and subsequent sample analysis to verify the absence of hazardous and radioactive constituents of concern above concentrations requiring further action. The clean closure of Building SC-1 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,

Michael J. Zamorski
Area Manager

Enclosure

cc w/enclosure:
S. Kruse, NMED
B. Botsford, MS 1044, SNL/NM
S. Ward, MS 1044, SNL/NM
D. Moore, MS 1044, SNL/NM
B. Hamilton, MS 1044, SNL/NM
RCRA CLOSURE REPORT FOR
BUILDING SC-1

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 Building SC-1, Technical Area V, 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 Building SC-1, Technical Area V," (RCRA Closure Plan; SNL/NM, 1997). 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 Building SC-1 was verified through wipe sampling of the floor and walls of the building and subsequent sample analysis to verify the absence of hazardous and radioactive constituents of concern above concentrations and activities requiring further action (e.g., decontamination). Analytical results indicate that neither sodium hydroxide, cadmium, tritium, nor uranium-235 were detected in the building above levels that, according to the RCRA Closure Plan (SNL/NM, 1997), require further action. A measurement of the potential of hydrogen (pH), as an indicator of sodium hydroxide contamination, did not indicate any caustic residues in the building. Radiological analysis of wipe samples did not detect uranium nor tritium at any acceptable level of certainty. Wipe sample results for cadmium were compared statistically to analysis results for wipe samples collected at building surface locations representative of background and did not show elevated levels in the building. Consequently, the closure of Building SC-1 can be demonstrated to meet all applicable regulatory requirements and associated U. S. Environmental Protection Agency guidance for clean closure.
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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, 1997) dated March 1997; (2) review of the Sampling and Analysis Plan (SNL/NM, 1996); (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 Building SC-1 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, P.E.
New Mexico Registered Professional Engineer No. 12183
Expires December 31, 1997

Date: 9/18/97
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 Building SC-1,
Sandia National Laboratories/New Mexico

Name: M. Lynn Jones  Date: 7/24/98
Vice President
Laboratories Services Division, 7000 Sandia Corporation
Albuquerque, New Mexico
Co-Operator

Name: George J. Lasikan  Date: 7/28/98
Michael J. Zamorski
Area Manager
Kirtland Area Office
U.S. Department of Energy
Albuquerque, New Mexico
Owner and Co-Operator
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<th>Title</th>
<th>Page</th>
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List of Abbreviations/Acronyms

cm²  square centimeter(s)
EORC  Environmental Operations Records Center
EPA  (U.S.) Environmental Protection Agency
MDA  minimum detectable activity
µg  microgram
mg  milligram
ND  Not detected at or above the reporting limit or MDA
NMAC  New Mexico Administrative Code
pCi  picocurie
RCRA  Resource Conservation and Recovery Act
RCT  Radiation Control Technician(s)
SAP  sampling and analysis plan
SMO  (SNL/NM) Sample Management Office
SNL/NM  Sandia National Laboratories/New Mexico
TA-V  Technical Area V
U-235  uranium isotope 235
1.0 Introduction

This report describes the closure activities carried out at Building SC-1, Sandia National Laboratories/New Mexico (SNL/NM), in accordance with the Resource Conservation and Recovery Act "RCRA Closure Plan for Building SC-1, Technical Area V" (RCRA Closure Plan; SNL/NM, 1997) approved by the New Mexico Environment Department on April 4, 1997. Building SC-1 (Figures 1 and 2) was used to manage small amounts of mixed waste at various times between 1991 and 1993. Building SC-1 has also been designated Building 6596-M. 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 Building SC-1 was performed in accordance with the RCRA Closure Plan (SNL/NM, 1997). In conformance with Section 4.4, "Phase IV: Closure Certification and Final Closure Report," of the RCRA Closure Plan (SNL/NM, 1997) this report describes closure activities, lists and justifies any variances to 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, 1997) 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 the variances described in this report, and a certification of accuracy of the report by the owner and co-operators of the unit.
Figure 1
Location of Technical Area V at Sandia National Laboratories/New Mexico
Figure 2
Location of Building SC-1, Technical Area V, Sandia National Laboratories/New Mexico
1.2 Report Organization
Chapter 1.0 presents an introduction to the report, the purpose of the report, the report organization, and closure performance standards and activities. Chapter 2.0 describes closure activities, both administrative and in the field, associated with the closure, and a statement of QC during field activities. Chapter 3.0 presents the analytical results of wipe sampling at Building SC-1 and at associated background locations. Chapter 4.0 details the variances to the RCRA Closure Plan. 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.

1.3 Closure Performance Standards
Closure of Building SC-1 achieved the following performance standards (20 NMAC 4.1, Subpart VI, 40 CFR 265.111 [a] and [b]):

- Protect human health and 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.

2.0 Closure Activities
Closure activities for Building SC-1 substantially followed the guidelines established in the RCRA Closure Plan (SNL/NM, 1997) and the procedures detailed in the “Sampling and Analysis Plan for Room 112 in Building 6580, Building SC-1, and Building 6592-B,” (SAP; SNL/NM, 1996). The following closure activities were completed for achievement of the NMAC closure performance standards:

- Establish and apply data quality objectives
- Verify that all containers of mixed waste were removed from Building SC-1 and transferred to the SNL/NM interim status mixed waste storage facility
- Conduct a radioactivity survey in the building
- Conduct a hazardous waste survey in the building
• If hazardous waste contamination is detected then conduct and verify decontamination

• Certify closure by an independent, registered professional engineer

2.1 Radiological Hazards Survey
Periodic radiological surveys of Building SC-1 were conducted by qualified SNL/NM Technical Area V (TA-V) Radiation Control Technicians (RCT) following removal of mixed waste from the building. Radiological contamination was not detected in the building (personal communication, Tom Laiche, SNL/NM, June 1996). The radiological surveys are on file with the TA-V Radiation Protection Department. Radiological surveys fulfill requirements found in Section 4.2 of the RCRA Closure Plan.

2.2 Hazardous Waste Survey
A hazardous waste survey for constituents of concern was conducted by establishing sampling grids on the floor and walls and collecting field investigative wipe samples at designated node locations in Building SC-1 on June 11, 1996. Sampling activities followed procedures detailed in the SAP (SNL/NM, 1996). More than the SAP specified minimum of 30 investigative samples were collected and provide sufficient areal coverage and data for statistical analyses. Figure 3 illustrates the wipe sampling locations in Building SC-1.

Background wipe samples were collected in nearby buildings of similar construction that were never used to manage hazardous, radioactive, or mixed waste. Background wipe samples were collected for comparison in Buildings 6592-C and 6590. Building 6592-C is of construction identical to Building SC-1 and provided adequate locations for background wipe samples from the floor. However, items stored in Building 6592-C prevented access to the walls. The upper interior walls in the instrument shack at Building 6590 are constructed of the same materials as the interior walls of Building SC-1 and provided wall surfaces from which background wipe samples were collected. A minimum of 10 samples were collected from each surface at the background sampling locations. All samples were shipped to an off-site, contractor laboratory on the following day and analyzed for the constituents outlined in the SAP (SNL/NM, 1996).

2.3 Quality Control
Quality control for sampling at Building SC-1 was implemented to ensure that the measurement data collected met the informational objectives for the investigation. Quality control was implemented by strict adherence to the sampling procedures described in the SAP (SNL/NM,
Figure 3
Site Sketch and Sample Locations for Building SC-1

Legend
- wipe sample location
- Sample locations FL005, FL011, and FL014 moved to avoid low clearance shelving
- Biased sample at stained area on floor,

SCALE
0 2 4 FT
1996); documentation of sampling activities and sample custody; use of controlled and standard equipment and materials; and, collection, analysis, and evaluation of field and laboratory quality control samples.

Field quality control consisted of collecting and analyzing field blank and overwipe samples. Field blanks were collected to document possible contributions from the sampling media itself to the analytical results. Field blanks were collected for field pH measurements and for submission to the contract laboratory for analysis of the remaining constituents of concern.

Prior to measuring the field pH of building surfaces, and at the completion of pH testing in each unit, deionized water blank samples were measured. The water blank was generated by wetting unused pH paper with the same deionized water used in the field pH measurements and reading the resulting pH value.

Field blank samples for contract laboratory analysis were collected during sampling activities by placing unused wipe sample media, (i.e., filter papers) in sample containers and submitting them for the same suite of analyses as the field investigative wipe samples.

Overwipe sampling was performed to check the representativeness and efficiency of the sampling technique. Investigative/overwipe sample pairs were collected at one floor and one wall location in Building SC-1. Following collection of an investigative wipe sample at a designated location, an overwipe sample was collected in an identical manner over the same area of wall or floor. Both samples were submitted individually for the same analyses. Field quality control sample results and their interpretations are discussed with the investigatory sample analysis results in Chapter 3.0.

### 3.0 Analytical Results

Analytical results for the wipe samples collected in Building SC-1 are summarized in Table 1. Results for laboratory analyses of the constituents of concern included cadmium, reported by the contract laboratory in units of mass per wipe. Tritium and the uranium-235 (U-235) isotope were reported in units of radioactivity per wipe. These results were subsequently converted to mass (cadmium) or radioactivity per 100 square centimeters (cm²) of surface which were the footprint areas used for the sample wipes. Additionally, pH of the sampled floor and wall surfaces were measured as an indicator of caustic (sodium hydroxide) contamination and are also reported in Table 1.

---

AL/07-98/WP/SNL:R4095.WPD  7  774470.04.00.00.00 07/17/98 2:46PM
### Table 1

**Summary of Analytical Results for Investigative Samples from Building SC-1, Sandia National Laboratories/New Mexico**

<table>
<thead>
<tr>
<th>Project Designator with Sketch Location</th>
<th>Analytical Results&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cadmium, µg/100 cm²</td>
</tr>
<tr>
<td><strong>Reporting Limit or MDA</strong></td>
<td>0.02</td>
</tr>
<tr>
<td>T5-SC1-FL001-SA-WP 034182</td>
<td>ND</td>
</tr>
<tr>
<td>T5-SC1-FL002-SA-WP 034183</td>
<td>ND</td>
</tr>
<tr>
<td>T5-SC1-FL003-SA-WP 034184</td>
<td>0.02</td>
</tr>
<tr>
<td>T5-SC1-FL004-SA-WP 034185</td>
<td>0.03</td>
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<td>T5-SC1-FL005-SA-WP 034186</td>
<td>1.11</td>
</tr>
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<td>T5-SC1-FL006-SA-WP 034187</td>
<td>0.03</td>
</tr>
<tr>
<td>T5-SC1-FL007-SA-WP 034188</td>
<td>0.02</td>
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<tr>
<td>T5-SC1-FL008-SA-WP 034189</td>
<td>0.04</td>
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<td>T5-SC1-FL009-SA-WP 034190</td>
<td>0.04</td>
</tr>
<tr>
<td>T5-SC1-FL010-SA-WP 034191</td>
<td>0.17</td>
</tr>
<tr>
<td>T5-SC1-FL011-SA-WP 034192</td>
<td>ND</td>
</tr>
<tr>
<td>T5-SC1-FL012-SA-WP 034193</td>
<td>0.14</td>
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<td>T5-SC1-FL013-SA-WP 034194</td>
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<tr>
<td>T5-SC1-FL014-SA-WP 034195</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Refer to footnotes at end of table.
### Table 1 (Continued)

**Summary of Analytical Results for Investigative Samples from Building SC-1, Sandia National Laboratories/New Mexico**

<table>
<thead>
<tr>
<th>Project Designator with Sketch Location Sample Number</th>
<th>Analytical Results*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cadmium, µg/100 cm²</td>
</tr>
<tr>
<td>Reporting Limit or MDA</td>
<td>0.02</td>
</tr>
<tr>
<td>T5-SC1-FL001-OW-WP 034217 Overwipe at FL014</td>
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<tr>
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<td></td>
</tr>
<tr>
<td>T5-SC1-FL015-SA-WP 034196</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>T5-SC1-FL016-SA-WP 030146 Biased sample</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>T5-SC1-WL001-SA-WP 034197</td>
<td>ND</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>T5-SC1-WL002-SA-WP 034198</td>
<td>ND</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>T5-SC1-WL001-OW-WP 034218 Overwipe at WL002</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>T5-SC1-WL003-SA-WP 034199</td>
<td>ND</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>T5-SC1-WL004-SA-WP 034200</td>
<td>ND</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>T5-SC1-WL005-SA-WP 034201</td>
<td>ND</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>T5-SC1-WL006-SA-WP 034202</td>
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</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>T5-SC1-WL007-SA-WP 034203</td>
<td>ND</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>T5-SC1-WL008-SA-WP 034204</td>
<td>ND</td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>T5-SC1-WL009-SA-WP 034205</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Refer to footnotes at end of table.
Table 1 (Continued)

Summary of Analytical Results for Investigative Samples from Building SC-1, Sandia National Laboratories/New Mexico

<table>
<thead>
<tr>
<th>Project Designator with Sketch Location</th>
<th>Analytical Resultsa</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cadmium, ( \mu g/100 , \text{cm}^2 )</td>
</tr>
<tr>
<td>Reporting Limit or MDA</td>
<td>0.02</td>
</tr>
<tr>
<td>T5-SC1-WL010-SA-WP 034206</td>
<td>0.05</td>
</tr>
<tr>
<td>T5-SC1-WL011-SA-WP 034207</td>
<td>ND</td>
</tr>
<tr>
<td>T5-SC1-WL012-SA-WP 034208</td>
<td>ND</td>
</tr>
<tr>
<td>T5-SC1-WL013-SA-WP 034209</td>
<td>0.04</td>
</tr>
<tr>
<td>T5-SC1-WL014-SA-WP 034210</td>
<td>0.02</td>
</tr>
<tr>
<td>T5-SC1-WL015-SA-WP 034211</td>
<td>0.06</td>
</tr>
<tr>
<td>T5-SC1-WL016-SA-WP 034212</td>
<td>0.02</td>
</tr>
<tr>
<td>T5-SC1-WL017-SA-WP 034213</td>
<td>ND</td>
</tr>
<tr>
<td>T5-SC1-WL018-SA-WP 034214</td>
<td>ND</td>
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<tr>
<td>T5-SC1-WL019-SA-WP 034215</td>
<td>0.04</td>
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<tr>
<td>T5-SC1-WL020-SA-WP 034216</td>
<td>0.05</td>
</tr>
<tr>
<td>T5-SC1-FB001-FB-WP 034219 Field Blank</td>
<td>ND</td>
</tr>
<tr>
<td>T5-SC1-FB002-FB-WP 034220 Field Blank</td>
<td>ND</td>
</tr>
</tbody>
</table>

aFilter was wiped over 100-cm\(^2\) area; therefore reported results are milligrams per 100 cm\(^2\) and pCi/100 cm\(^2\).
Milligrams (mg) converted to micrograms (\( \mu g \)) as directed in SAP (Section 4.1.6); Isotopic results include 2-sigma error.

bPH value determined by visual observation of color change on pH paper, which reads to nearest 1 only. Color change falling between two values is expressed as a range (e.g., 4-5).

MDA = Minimum Detectable Activity (radionuclides).
ND = Not detected at or above the Reporting Limit or MDA.
Laboratory analyses detected 14 occurrences of cadmium ranging from 0.02 to 1.11 micrograms per 100 square centimeters (µg/100 cm²), and one occurrence of tritium at 2.81 picocuries (pCi) per wipe (100 cm²) in samples from Building SC-1 (Table 1). U-235 was not detected in any sample from Building SC-1. One constituent of concern in this room, sodium hydroxide, could have created a high-pH contamination residue. Surface pH values ranged from 4.5 to 7.0 pH units, and were less than the indicated value for sodium hydroxide.

Field quality control sample results are as follows:

- The pH values obtained for field blank samples were between 5.0 and 7.0 pH units, indicating that the water used to perform the tests would not produce false positive values.

- Analytical results for field blank samples show concentrations of barium at 0.09 µg/100 cm². Barium may be contained in the filter papers but this concentration is approximately two orders of magnitude less than the barium concentrations measured in the environmental and background samples. No other constituents of concern were reported in the field blank samples submitted to the laboratory.

- The results for each investigative/overwipe sample pair were essentially equivalent. Based on analytical results and visual observations (windblown silt on all surfaces in Building SC-1), it is likely that the site conditions contributed to these results.

Table 2 summarizes wipe sample analysis results from the flooring sample background locations in Building 6592-C and the wall surface background locations in Building 6590. Background location wipe samples were analyzed for the eight RCRA toxic characteristic list metals. Only the cadmium results are directly comparable to data collected from Building SC-1 samples. Results in Table 2 have also been converted to mass per 100 square centimeters of surface area. A statistical analysis of Building SC-1 sample results compared to background sample results for cadmium, and interpretation of the radiological analyses results, are presented in Chapter 5.0 of this report.

4.0 Variances

The following variances to the requirements of the RCRA Closure Plan (SNL/NM, 1997) and the SAP (SNL/NM, 1996) were noted during execution of the plan:
# Table 2

## Summary of Analytical Results for Background Samples from Buildings 6592-C and 6590, Sandia National Laboratories/New Mexico

<table>
<thead>
<tr>
<th>Project Designator with Sketch Location</th>
<th>Reporting Limit, µg/100 cm²</th>
<th>Arsenic</th>
<th>Barium</th>
<th>Cadmium</th>
<th>Chromium</th>
<th>Lead</th>
<th>Mercury</th>
<th>Selenium</th>
<th>Silver</th>
</tr>
</thead>
<tbody>
<tr>
<td>T5-6592C-FL001-BK-WP 034162</td>
<td>ND</td>
<td>0.5</td>
<td>NR</td>
<td>0.02</td>
<td>0.2</td>
<td>0.2</td>
<td>0.02</td>
<td>0.5</td>
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<tr>
<td>T5-6592C-FL002-BK-WP 034163</td>
<td>ND</td>
<td>ND</td>
<td>5.07</td>
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Refer to footnotes at end of table.
### Table 2 (Continued)
Summary of Analytical Results for Background Samples from Buildings 6592-C and 6590, Sandia National Laboratories/New Mexico

<table>
<thead>
<tr>
<th>Project Designator with Sketch Location</th>
<th>Arsenic</th>
<th>Barium</th>
<th>Cadmium</th>
<th>Chromium</th>
<th>Lead</th>
<th>Mercury</th>
<th>Selenium</th>
<th>Silver</th>
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<tr>
<td>Reporting Limit, ( \mu g/100 \text{ cm}^2 )</td>
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<td>0.7</td>
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</tbody>
</table>

Refer to footnotes at end of table.
Table 2 (Continued)
Summary of Analytical Results for Background Samples from Buildings 6592-C and 6590, Sandia National Laboratories/New Mexico

<table>
<thead>
<tr>
<th>Project Designator with Sketch Location</th>
<th>Reporting Limit, µg/100 cm²</th>
<th>Analytical Resultsa, µg/100 cm²</th>
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<tr>
<td></td>
<td>Arsenic</td>
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<td>T5-6590-WL010-BK-WP 034181</td>
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</table>

*aResults reported in milligram per wipe (mg/wipe). Wipe sample covered 100-cm² area; therefore reported results are mg/100 cm². Milligrams converted to micrograms (µg), per SAP instructions (Section 4.1.6). NR = Not reported; all barium detections were above reporting limit.
• Section 5.0 of the RCRA Closure Plan (SNL/NM, 1997) discusses sampling strategy and sampling locations for the hazardous waste investigation at Building SC-1 and indicates that a stratified random wipe sampling method will be used and that wipe samples will be composited. In the field, a systematic sampling strategy was used and wipe samples were not composited. The sampling strategy employed in Building SC-1 followed closely the procedure detailed in the SAP (SNL/NM, 1996) and EPA guidance referenced in that document. By using the systematic sampling approach and not compositing samples more complete sample coverage of the building surfaces was obtained and the likelihood of detecting “hot-spots” of possible contamination by the constituents of concern was increased. This variance had a positive effect on efforts to detect any residual contamination in Building SC-1.

• One other variance to the RCRA Closure Plan and the SAP occurred during sampling at Building SC-1. SNL/NM Health Physics Department was storing supplies on metal shelving along most of the walls. Only two inches of clearance existed between the shelves and the floor. It was not possible to reach beneath the shelves, and rather than delay field operations while relocating the shelving and contents, it was determined to adjust the locations of affected sampling nodes. Three sample locations required an adjustment of less than two feet, to points just beyond the edge of the shelves, where samples could be collected. This variance affected only three out of more than 30 sample locations. The distances adjusted were less than half the distance to the next adjacent sample locations and so the systematic sample spacing was preserved to a satisfactory degree. The relocation of the three sample locations did not adversely impact the investigation.

5.0 Results of Closure Activities

Closure activities completed in fulfillment of applicable regulations and closure performance criteria (Section 1.3 of this report) are detailed in this report. The following closure activities have been accomplished:

• Data quality objectives were established in the RCRA Closure Plan and implemented throughout the field investigation and reporting process

• Mixed waste containers were removed from Building SC-1 and transferred to an interim status storage facility. Documentation of the removal and transfers are on file at the SNL/NM Environmental Operations Records Center (EORC).

• Radiological surveys completed by the Technical Area V Radiation Control Technicians found no radiological contamination in Building SC-1. Radiation survey documentation are on file with the SNL/NM Radiation Protection Department at Technical Area V.
• A hazardous waste survey was completed through sampling and analysis for constituents of concern. Investigation results relative to attainment of the closure performance standards are discussed in Section 5.1 of this report.

• Building decontamination was not required because the results for the radiological and hazardous waste surveys indicated that clean closure performance standards were met.

• Closure certification by an independent, registered professional engineer is documented in the preface to this report.

5.1 Survey Results

Constituents of concern which were systematically wipe sampled for in Building SC-1 included sodium hydroxide (indicated by pH measurements) and cadmium. The radiological parameters of tritium and uranium-235 were also sampled for during the field investigation.

Wipe samples taken in Building SC-1 were analyzed for U-235, and tritium. The results from the analyses did not detect any U-235 in Building SC-1. Tritium wipe sample analysis showed one positive result at 2.81 pCi/100 cm$^2$ with a 2-standard deviation total error of plus or minus 1.70 pCi/100 cm$^2$. The minimum detectable activity was 2.76 pCi/100 cm$^2$. There is 95 percent certainty that the true activity is within the 2-standard deviation range which nearly equally falls below and above the minimum detectable activity. Consequently, it is highly uncertain that the value reported is actually a positive result and is rather most likely analytical noise, or a false positive value, near the limit of detection. These analysis results and the Technical Area V Radiation Control Technician's results indicate that U-235 and tritium contamination are absent from Building SC-1 and clean closure has been attained relative to these constituents of concern.

None of the field pH measurements showed elevated pH values indicative of sodium hydroxide contamination. There is no evidence of residue from temporary storage of sodium hydroxide in the building. Clean closure has been obtained with respect to this constituent of concern.

Wipe samples collected in Building SC-1 were analyzed for cadmium. Wipe samples were also collected at background locations for statistical comparisons to determine whether or not clean closure performance standards for hazardous waste constituents had been met. Twenty background samples were used for comparison with data collected in Building SC-1. Background data consists of ten floor samples from Building 6592-C and ten wall samples from
Building 6590. Following is a discussion of the statistical techniques used to compare the background samples with the data from Building SC-1 (referred to as site data).

### 5.1.1 Statistical Analysis Methodology

The method recommended in the SAP for determining if a measured value represents contamination is a comparison with a tolerance interval constructed from the background data. The construction of a tolerance interval, however, requires that the background data be normally or lognormally distributed (EPA, 1989). A tolerance interval should not be calculated if the data are nonparametric and do not follow a normal or lognormal distribution. Thus, data for arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver, from the background buildings, were tested to determine if these data are normal or lognormal.

The background data for arsenic, mercury, selenium, and silver did not yield any results with measured concentrations above the analytical method detection limits. The other parameters (barium, cadmium, chromium, and lead) had fewer non-detects. Non-detect values were handled by setting them equal to one-half of the detection limit as recommended by the EPA (EPA, 1992a). Then normality testing and other statistical tests were performed.

The background data were tested for normality using the Shapiro-Wilk Test (EPA, 1992a). This test returns a test statistic (W) which tends to be large when the data is normally distributed. The test statistic was used to calculate a probability level (p-level) value between zero and one, indicating the goodness of fit to a normal distribution (StatSoft, 1996). A p-level of 0.05 or greater indicates an acceptable fit to a normal model at the 95th-percent confidence level (StatSoft, 1996). The Shapiro-Wilk test results indicated that none of the background data for barium, cadmium, chromium, or lead were normally distributed (p-level < 0.05 in all cases). The logtransform was performed for each set of data by taking the natural logarithm. The logtransformed data was then tested using the Shapiro-Wilk test. Results indicate that barium and lead are lognormal (p-levels = 0.43 and 0.97 respectively) while cadmium and chromium are not (p-levels = 0.06 and 0.01). Since the p-level for cadmium is not much greater than 0.05, the test suggests a poor fit to the lognormal model. Because some of the background data do not fit a normal or lognormal distributional model, tolerance limits for the background data set were not calculated. Instead, the background data were compared to the site data using nonparametric statistical techniques. These techniques do not require that the background data or the site data follow any particular distribution.
A nonparametric statistical procedure recommended by the EPA (EPA, 1992b) for the comparison of background data with environmental site data is the Mann-Whitney U test (also known as the Wilcoxon Rank Sum test). The Mann-Whitney U test is used to compare two samples, or groups, of data and tests the null hypothesis that the samples were drawn from populations with distributions having the same medians. The Mann-Whitney U test returns a p-level value between zero and one when comparing the distributions. A p-level of 0.05 or greater indicates that the two distributions are statistically equivalent at the 95-th-percent confidence level (StatSoft, 1996). Alternatively, if the test returns a p-level value that is less than 0.05, then there is reasonable doubt to reject the null hypothesis at the 95-th-percent confidence level and it is concluded that the background and site distributions are different. Significantly elevated site distributions relative to the background distribution is evidence for contamination.

In addition to the Mann-Whitney U test, a robust graphical method called a box-and-whisker plot was used to visually compare data groups. Box and whisker plots were made only when the data sets were statistically different as indicated by the Mann-Whitney U test. This plot is recommended by the EPA (EPA, 1992a) and provides a summary view of a data set, including the overall location, degree of symmetry, and positions of outliers. Box and whisker plots placed side by side are used to compare the background and site distributions to visually determine the differences and similarities between the subpopulations.

5.1.2 **Statistical Analysis Results**
Results of the Mann-Whitney U test for the comparison of the background distribution of cadmium with the site data from Building SC-1 indicated that the distributions were different at the 95th-percent confidence level (p-level = 0.0). However, a box-and-whisker plot of the background data and the site data indicates that most of the data from Building SC-1 have lower concentrations than the background data (Figure 4). If Building SC-1 was contaminated with cadmium concentration values that are greater than background would be expected. These results suggest that this building is not contaminated with respect to cadmium and clean closure has been attained with respect to this constituent of concern.

6.0 **Location of Closure Documentation**
Documentation of the radiation surveys completed by the Technical Area V Radiation Control Technicians are on file with the SNL/NM Radiation Protection Department in Technical Area V.
Figure 4
Box and Wisker Plots of Cadmium Data from Samples Collected at Building SC-1 and Background Locations
Completed records generated during the removal and transfer of mixed waste from Building SC-1 and during the hazardous waste field investigation and data analysis either have been or will be submitted to the SNL/NM 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 closure. Completed records include, but are not limited to, waste tracking forms, original field logs, laboratory, quality control documentation, sample chain-of-custody records, and calculation briefs.

The contract analytical laboratory retains and can make available for inspection all raw analytical records generated in conjunction with this closure. These records include instrument tuning and calibration records, batch quality control sample data, control charts, sample tracking and control documentation, raw analytical sample data, and analytical results. These records will 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 term original laboratory records will be transmitted for storage at the EORC.

7.0 References

EPA, see U.S. Environmental Protection Agency.

Laiche, T., Sandia National Laboratories/New Mexico, June 1996, Personal Communication.


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


FIELD DOCUMENTATION

SNL/NM TA-V RCRA Closure
Field Investigation
Buildings SC-1, 6590, 6591, 6592-B, 6593-B

June 1996
CALCULATION OF UPPER TOLERANCE LIMIT

SNL/NM TA-V RCRA Closure
Field Investigation
Buildings SC-1, 6590, 6591, 6592-B, 6593-B

June 1996
CORE LABORATORY ANALYTICAL REPORTS

SNL/NM TA-V RCRA Closure
Field Investigation
Buildings SC-1, 6590, 6591, 6592-B, 6593-B

June 1996
TOXIC CHARACTERISTIC
CONVERSION CALCULATIONS

SNL/NM TA-V RCRA Closure
Field Investigation
Buildings SC-1, 6590, 6591, 6592-B, 6593-B

June 1996