

**SUMMARY REPORT ON INFORMATION RELEVANT  
TO THE RADIOLOGICAL SURVEY OF THE  
BLAIRSVILLE SPECIALTY METAL PLANT**

**JULY 31, 2000**

**WESTINGHOUSE ELECTRIC CORPORATION  
BLAIRSVILLE, PA**

**REPORT #006**

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TO THE RADIOLOGICAL SURVEY OF THE  
BLAIRSVILLE SPECIALTY METAL PLANT

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1.0 BACKGROUND INFORMATION

1.1 Purpose

The Westinghouse Blairsville Site utilized nuclear materials during the period of the mid to late 1950's to the early part of the 1960's. Work was performed both under licenses with the atomic Energy Commission and for the Bettis Atomic Power Laboratory. Although all work ceased during the 1960's, subsequent radiological surveys and investigations, starting in 1993, established that some residual radioactivity, primarily in underground piping and subsurface soil contamination, existed on the site. During the period of 1993 through the present, additional remediation work and radiological surveys have been conducted to establish that the site can be released for unrestricted use. This series of reports documents the results of the final status radiological surveys subsequent to the various remediation efforts.

1.2 Scope

This report provides an overall summary of the project and final survey. Other reports have been prepared which provide specific information in detail. References are made throughout this report in order to provide a "roadmap" to all relevant information. Where appropriate, sufficient information is included in this report to provide a document which presents a complete overview of the final status of the site. The individual reports provide the detailed documentation necessary to justify the information contained herein.

1.3 Site History

During the period from approximately 1955 to 1961, fuel manufacturing operations were conducted at the Westinghouse Specialty Metals Plant Site facility using enriched uranium in both metal and oxide forms. This involved both highly enriched Uranium for the Navy fuel program (under work for the Bettis Atomic Power Laboratory) and low enriched Uranium for atomic power plants (under License SNM-37 from the U.S. Atomic Energy Commission). AEC license SUC-509 authorized Westinghouse to perform research and development for fuel elements using depleted Uranium at the Blairsville facility. This license was terminated on December 31, 1964. As part of a United States Nuclear Regulatory Commission (USNRC) program to ensure that AEC and USNRC licenses that have been terminated meet the USNRC's current criteria for release for unrestricted use, the Blairsville site was determined to require additional review. See Cummings-Riter Reports for additional site history and background information (References 1, 2, 3, and 4).

#### 1.4 Compilation of Reports

This report is one of a number of reports that have been compiled to document all information necessary to demonstrate that the site buildings meet the radiological criteria for release for unrestricted use. Table 1 provides an index of the reports in the order of the report number.

### 2.0 SITE INFORMATION

#### 2.1 Site Description

Westinghouse has submitted detailed reports which provide a description of the site (References 1, 2, 3, and 4). These reports include such details as topographic maps, plot plans, and hydrogeologic maps. This information is not repeated here.

#### 2.2 Site Conditions at Time of Radiological Survey

The current use of the site is to manufacture Zirconium alloy tubing for the nuclear power industry. No work involving Uranium materials has been conducted since the mid 1960's. Although the AEC licenses were terminated in the 1960's, the available license documentation does not provide sufficient information to define the radiological status of the site at the time of license termination. In addition, fuel fabrication work that was conducted for the Naval Nuclear program was terminated in 1960 but no records have been found that document the radiological status of the building following termination of that work.

As the result of reviews conducted by the Oak Ridge National Laboratory of terminated license files, the Blairsville site was identified as one for which inadequate documentation existed to define the radiological status of the site. In February 1994 Westinghouse voluntarily committed to the NRC to conduct a detailed radiological survey of the site and to conduct remediation as necessary in order to assure the site meets the applicable criteria for unrestricted use.

#### 2.3 Identity of Potential Contaminates

The historical information regarding the use of radioactive material on the sited involved the fabrication of Uranium at various enrichment levels. Small amounts of Thorium may also have been used.

This information has been confirmed by radiological measurements and sampling conducted on the site. Samples have identifies Uranium contamination at all enrichments from depleted to natural to low enriched and up to high enriched. In addition, deposits of waste casting sand were, used in foundry operations at the site, identified which contain naturally occurring concentrations of Uranium and Thorium including their decay products.

In some samples of soil external to the buildings, low concentrations of Thorium, Cs-137 and Co-60 have been detected. These materials appear to be associated with a waste incinerator that operated on the site and received waste from other sites for incineration. In all cases it has been the Uranium concentrations that have dominated the remediation efforts.

## 2.4 Radiological Survey Acceptance Criteria

Table 2 provides the Radiological Acceptance Criteria which was established for this project. These criteria are consistent with the SDMP Action Plan criteria specified in 10CFR20.1401(b)(3).

## 3.0 LICENSE TERMINATION SURVEY OVERVIEW

### 3.1 Survey Objectives

The purpose of the unrestricted release survey was to demonstrate that the radiological conditions of the Blairsville Specialty Metals Plant Site satisfy the NRC guidelines and that the site meets the applicable criteria for unrestricted use. The specific objectives of the survey were to show that:

- A. Surface Activity of Buildings and Structures
  - o Average surface activity levels (total of fixed and removable activity) are at or below guideline values established as acceptable by NRC.
  - o Reasonable efforts have been made to identify, evaluate and remove, if necessary, areas of residual activity exceeding the guideline value. Elevated areas may be acceptable, provided the activity levels are less than three times the guideline values, when averaged over a surface region of 100 cm<sup>2</sup>, and provided the average level within a 1 m<sup>2</sup> area containing the elevated area is within the guideline value.
  - o Reasonable efforts have been made to clean up removable activity and removable activity in any 100 cm<sup>2</sup> area does not exceed 20% of the average surface activity values.
- B. Volume Activity of Soil and Building Materials
  - o Average radionuclide concentrations are at or below guideline values, established as acceptable by the NRC. For land areas, averaging is based on a 100 m<sup>2</sup> (10 m x 10 m) grid area.
  - o Reasonable efforts have been made to identify, evaluate and remove, if necessary, areas of residual activity exceeding the guideline values. Areas of residual activity exceeding the guideline value, known as elevated areas, may be acceptable, provided they do not exceed the guideline value by greater than a factor of  $(100/A)^{1/2}$ , where A is the area of residual activity in m<sup>2</sup>, and provided the activity level at any location does not exceed three times the guideline value.

### C. Exposure Rate

- o Exposure rates do not exceed 5 micro R/h above background at 1 m above the surface. Exposure rates may be averaged over a 100 m<sup>2</sup> grid area. Maximum exposure rates over any discrete area may not exceed 10 micro R/h above background.

The objective of the survey was to demonstrate at a 95% minimum level of confidence, that the above conditions have been met. For the purpose of this demonstration, each survey unit has been independently evaluated.

### 3.2 Instrumentation

Table 3 lists the instruments that were used to make the radiological survey measurements included in Report #003. The calibration information for these specific instruments is included in Report #001. Note that Report #001 includes calibration records for all the instruments used over the period from 1993 through 1999 and therefore includes instruments not given in Table 3. Appendix J provides information concerning the Technical Description of the instruments used.

Table 3 includes typical efficiency (and correction factors) for the instruments. Each Radiological Survey Data Sheet provided in Report #003 includes the specific efficiency values (or correction factors) appropriate for that instrument based on the calibration data appropriate for that time period.

The Radiological Survey Data Sheets also include the Minimum Detectable Activity (MDA) appropriate for the measurement based on the instrument efficiency and background. The method used to determine the MDA is given in Appendix B.

### 3.3 Survey Procedures

Survey planning and procedures were developed using the "Manual for Conducting Radiological Surveys in Support of License Termination," NUREG/CR-5849 as a basis.

#### 3.3.1 Area Classification

For purposes of establishing the sampling and measurement frequency, the site buildings were divided into a classification system as described in Table 4.

Based on the historical review of operations conducted in each building, each area of a building was assigned an appropriate classification. Report #003 provides floor plans for each building, while the appropriate classification for each section is easily found in Appendix A.

### 3.3.2 System for Identification of Survey Point Locations

In order to assure that it would be possible to return to the location of every radiological survey point, a system was established which provided and documented the necessary information. In summary, every survey point was documented in the following form:

AAA-BBB-CCC-DDD-Description-XX-YY

Where:

AAA = Survey Section Identifier which specifically locates the area by building and floor.

BBB = Survey Unit Identifier. Each section was divided into smaller survey units. These units were selected on the basis of being essentially uniform with respect for the potential for contamination. Each survey unit consisted of areas which were all of the same classification.

CCC = Survey Subunit Identifier. In most cases a survey unit included multiple rooms. Subunit identification was used to uniquely identify the area down to the specific area.

DDD = Survey Type, normally Upper or Lower

Description = Specific surfaces were identified such as:

- Floor
- Ceiling
- West Wall
- East Wall
- North Wall
- South Wall
- Light Fixture
- Beam Surface
- Etc.

XX = This value is the distance in the X direction from the established point of origin for the surface. Values are in meters.

YY = This value is the distance in the Y direction from the established point of origin for the surface. Values are in meters.

The point of origin for every surface has been established as the following:

- 1) For floors and ceilings, the point of origin is the northwest corner of the surface. See Report #003 for the established direction of north with respect to the building layout.
- 2) For vertical surfaces, the point of origin is the lower left-hand corner of the surface.

In each case the X and Y dimensions are given the same signs as the standard Cartesian coordinate system. Therefore, normally the value of X will be positive and the value of Y will be negative for floors and ceilings and positive for walls. In some cases where the surface is irregular in shape, the signs for X and Y for some points may be different from the normal. As appropriate, drawings were included with the survey data. This information is included on the Radiological Survey Data Sheets provided in Report #003.

### 3.3.3 Survey Protocol

Tables 5 and 6 provide the survey protocol and survey descriptions utilized for these surveys. A more detailed description is provided in Appendix F.

### 3.4 Determination of Site Background Radiation Levels

Measurements and samples were taken to determine background levels of radiation both interior and exterior to the buildings. Report #005 provides detailed information regarding these determinations including:

- 1) Procedure for taking measurements and samples.
- 2) Locations for each measurement and sample.
- 3) Results obtained.
- 4) Analysis of data.

This information is useful for comparison against the radiological surveys for the buildings but was not used in the statistical evaluation of the survey data to determining if a survey unit met the acceptance criteria.

### 3.5 Data Interpretation and Statistical Analysis

Data conversions and evaluations were performed following the guidance in Reference 5. The selection of the instruments used to make the measurements was based on achieving a Minimum Detectable activity (MDA) that is lower than the applicable criteria. Appendix B provides the method used to determine the MDA for the various instruments. Appendix C provides the methods use to compare the measured results against the criteria and to determine if a sufficient number of samples had been taken to achieve the desired 95% degree of confidence. Appendix G presents an example of sample calculations. Appendix H provides a description of the statistical analysis procedure to determine if the survey unit meets the acceptance criteria at the 95% confidence level and to determine if an adequate number of measurements were made.

#### 4.0 SUMMARY OF SURVEY RESULTS

Report #007 provides complete information on the results of the radiological surveys of the interior building surfaces, including a table of compiled statistics to demonstrate compliance with the acceptance criteria. In addition, Report #002 provides data on the floor scans conducted within the buildings. Report #004 provides the results for the radiological surveys of the roofs.

All of the above noted reports incorporate the survey data after conversion to the proper units for comparison with the acceptance criteria. The original survey data sheets containing the actual measured results are incorporated into Report #003. As an aid to the reader, Appendix G provides an example which traces a typical measurement through all of the reports and includes calculation to show how the measurement data was converted for comparison against the criteria. Appendix H provides a description of the statistical procedure used.

Appendices D and E provide the data trends for the Lower and Upper surveys respectively. These graphical data trends consolidate all of the survey data for the four major survey sections that were designated on the site. Only the following measurement types are included:

- 1) Alpha measurements at a fixed point.
- 2) Beta measurements at a fixed point.
- 3) Maximum Beta scan measurement around the fixed point.
- 4) Average Beta scan measurement around the fixed point.

When comparing these graphs it is important to note the scales used as the graphs are not plotted using consistent scales for the axes.

#### 5.0 CONCLUSIONS

The information presented in this and the accompanying reports demonstrates that the current condition of the Buildings on the Blairsville site meet all of the radiological acceptance criteria at the desired degree of confidence and are therefore acceptable for unrestricted use. This conclusion is based on the large number of radiological survey measurements made as part of this project. The reports listed in Table 1 provide comprehensive documentation for future reference.

# **APPENDICES**

**APPENDIX A**  
**SURVEY CROSS-REFERENCE LOG**

**REPORT #006**

## Survey Cross Reference

Section	Unit	Sub-Unit	Survey Serial Number	Survey Date	Number of Survey Points	Type	Classification
1	1	1	01-051	12/2/94	Deleted due to location error	Lower	3
1	1	1	01-158	1/31/95	4	Lower	4
1	1	1	01-272	3/15/95	9	Lower	5
1	1	1	FS01-020	2/14/95	N/A	Floor Scan	N/A
1	1	1	FS01-030	4/4/95	N/A	Floor Scan	N/A
1	1	2	01-052	12/5/94	Deleted due to location error	Lower	3
1	1	2	01-157	1/31/95	3	Lower	4
1	1	2	01-316	3/22/95	5	Upper	4
1	1	2	FS01-030	4/4/95	N/A	Floor Scan	N/A
1	1	3	01-156	1/31/95	1	Lower	4
1	1	3	01-317	3/22/95	1	Upper	4
1	1	3	FS01-020	2/14/95	N/A	Floor Scan	N/A
1	1	3	FS01-030	4/4/95	N/A	Floor Scan	N/A
1	1	4	01-155	1/31/95	2	Lower	4
1	1	4	FS01-020	2/14/95	N/A	Floor Scan	N/A
1	1	4	FS01-030	4/4/95	N/A	Floor Scan	N/A
1	1	5	01-318	3/22/95	1	Upper	4
1	1	5	01-413	8/11/95	1	Lower	4
1	1	5	FS01-030	4/4/95	N/A	Floor Scan	N/A
1	1	5	FS01-049	8/11/95	N/A	Floor Scan	N/A
1	1	6	01-137	1/18/95	20	Lower	4
1	1	6	01-323	3/22/95	18	Upper	4
1	1	6	FS01-020	2/14/95	N/A	Floor Scan	N/A
1	1	6	FS01-030	4/4/95	N/A	Floor Scan	N/A
1	1	7	01-136	1/18/95	2	Lower	4
1	1	7	FS01-020	2/14/95	N/A	Floor Scan	N/A
1	1	7	FS01-050	8/11/95	N/A	Floor Scan	N/A
1	1	8	01-408	8/11/95	1	Lower	4
1	1	8	FS01-020	2/14/95	N/A	Floor Scan	N/A
1	1	8	FS01-030	4/4/95	N/A	Floor Scan	N/A
1	1	9	01-161	1/31/95	2	Lower	4
1	1	9	01-319	3/22/95	1	Upper	4
1	1	9	FS01-020	2/14/95	N/A	Floor Scan	N/A
1	1	9	FS01-030	4/4/95	N/A	Floor Scan	N/A
1	1	10	01-160	1/31/95	2	Lower	4
1	1	10	01-320	3/22/95	2	Upper	4
1	1	10	FS01-020	2/14/95	N/A	Floor Scan	N/A
1	1	10	FS01-030	4/4/95	N/A	Floor Scan	N/A
1	1	11	01-321	3/22/95	2	Upper	4
1	1	11	01-414	8/11/95	2	Lower	4
1	1	11	FS01-048	8/11/95	N/A	Floor Scan	N/A
1	1	11	FS01-050	8/11/95	N/A	Floor Scan	N/A
1	1	12	01-159	1/31/95	2	Lower	4
1	1	12	01-322	3/22/95	1	Upper	4
1	1	12	FS01-020	2/14/95	N/A	Floor Scan	N/A
1	1	12	FS01-030	4/4/95	N/A	Floor Scan	N/A
1	2	1	01-049	12/2/94	3	Lower	3
1	2	1	01-315	3/21/95	4	Upper	4
1	2	1	FS01-018	2/13/95	N/A	Floor Scan	N/A
1	2	1	FS01-030	4/4/95	N/A	Floor Scan	N/A
1	2	2	01-050	12/2/94	Deleted due to location error	Lower	3
1	2	2	01-412	8/11/95	2	Lower	4
1	2	2	FS01-048	8/11/95	N/A	Floor Scan	N/A
1	2	3	01-410	8/11/95	2	Lower	4
1	2	3	FS01-030	4/4/95	N/A	Floor Scan	N/A
1	2	3	FS01-048	8/11/95	N/A	Floor Scan	N/A
1	2	4	01-150	1/31/95	30	Lower	4
1	2	4	01-314	3/21/95	28	Upper	4
1	2	4	FS01-018	2/13/95	N/A	Floor Scan	N/A
1	2	4	FS01-030	4/4/95	N/A	Floor Scan	N/A
1	2	5	01-151	1/31/95	2	Lower	4

## Survey Cross Reference

Section	Unit	Sub-Unit	Survey Serial Number	Survey Date	Number of Survey Points	Type	Classification
1	2	5	FS01-018	2/13/95	N/A	Floor Scan	N/A
1	2	5	FS01-030	4/4/95	N/A	Floor Scan	N/A
1	2	6	01-152	1/31/95	2	Lower	4
1	2	6	FS01-018	2/13/95	N/A	Floor Scan	N/A
1	2	6	FS01-030	4/4/95	N/A	Floor Scan	N/A
1	2	7	01-154	1/31/95	2	Lower	4
1	2	7	FS01-018	2/13/95	N/A	Floor Scan	N/A
1	2	7	FS01-030	4/4/95	N/A	Floor Scan	N/A
1	2	8	01-411	8/11/95	2	Lower	4
1	2	8	FS01-019	2/13/95	N/A	Floor Scan	N/A
1	2	8	FS01-050	8/11/95	N/A	Floor Scan	N/A
1	2	9	01-415	8/11/95	2	Lower	4
1	2	9	FS01-019	2/13/95	N/A	Floor Scan	N/A
1	2	9	FS01-048	8/11/95	N/A	Floor Scan	N/A
1	2	10	01-153	1/31/95	2	Lower	4
1	2	10	FS01-019	2/13/95	N/A	Floor Scan	N/A
1	2	10	FS01-050	8/11/95	N/A	Floor Scan	N/A
1	3	1	01-048	12/1/94	10	Lower	3
1	3	1	01-306	3/20/95	6	Upper	4
1	3	1	FS01-015	2/8/95	N/A	Floor Scan	N/A
1	3	1	FS01-029	4/3/95	N/A	Floor Scan	N/A
1	3	2	01-047	12/1/94	4	Lower	3
1	3	2	01-307	3/20/95	2	Upper	4
1	3	2	FS01-015	2/8/95	N/A	Floor Scan	N/A
1	3	2	FS01-029	4/3/95	N/A	Floor Scan	N/A
1	3	3	01-046	12/1/94	11	Lower	3
1	3	3	01-308	3/20/95	9	Upper	4
1	3	3	FS01-015	2/8/95	N/A	Floor Scan	N/A
1	3	3	FS01-029	4/3/95	N/A	Floor Scan	N/A
1	3	4	01-045	12/1/94	Deleted due to location error	Lower	3
1	3	4	01-162	2/2/95	5	Lower	4
1	3	4	01-312	3/21/95	6	Upper	4
1	3	4	FS01-018	2/13/95	N/A	Floor Scan	N/A
1	3	4	FS01-029	4/3/95	N/A	Floor Scan	N/A
1	3	5	01-044	12/1/94	4	Lower	3
1	3	5	FS01-018	2/13/95	N/A	Floor Scan	N/A
1	3	5	FS01-029	4/3/95	N/A	Floor Scan	N/A
1	3	6	01-043	12/1/94	Deleted due to location error	Lower	3
1	3	6	01-163	2/2/95	3	Lower	4
1	3	6	01-310	3/21/95	4	Upper	4
1	3	6	FS01-018	2/13/95	N/A	Floor Scan	N/A
1	3	6	FS01-029	4/3/95	N/A	Floor Scan	N/A
1	3	7	01-164	2/2/95	2	Lower	4
1	3	7	FS01-018	2/13/95	N/A	Floor Scan	N/A
1	3	7	FS01-029	4/3/95	N/A	Floor Scan	N/A
1	3	8	01-165	2/2/95	2	Lower	4
1	3	8	FS01-018	2/13/95	N/A	Floor Scan	N/A
1	3	8	FS01-029	4/3/95	N/A	Floor Scan	N/A
1	3	9	01-166	2/2/95	1	Lower	4
1	3	9	01-309	3/21/95	1	Upper	4
1	3	9	FS01-018	2/13/95	N/A	Floor Scan	N/A
1	3	9	FS01-029	4/3/95	N/A	Floor Scan	N/A
1	3	10	01-167	2/2/95	2	Lower	4
1	3	10	01-311	3/21/95	2	Upper	4
1	3	10	FS01-018	2/13/95	N/A	Floor Scan	N/A
1	3	10	FS01-029	4/3/95	N/A	Floor Scan	N/A
1	3	11	01-168	2/2/95	2	Lower	4
1	3	11	01-313	3/21/95	1	Upper	4
1	3	11	FS01-018	2/13/95	N/A	Floor Scan	N/A
1	3	11	FS01-029	4/3/95	N/A	Floor Scan	N/A
1	3	12	01-169	2/2/95	2	Lower	4

## Survey Cross Reference

Section	Unit	Sub-Unit	Survey Serial Number	Survey Date	Number of Survey Points	Type	Classification
1	3	12	FS01-018	2/13/95	N/A	Floor Scan	N/A
1	3	12	FS01-029	4/3/95	N/A	Floor Scan	N/A
1	4	1	01-036	11/30/94	6	Lower	3
1	4	1	01-273	3/15/95	9	Lower	4
1	4	1	FS01-015	2/8/95	N/A	Floor Scan	N/A
1	4	1	FS01-029	4/3/95	N/A	Floor Scan	N/A
1	4	1	FS01-032	4/19/95	N/A	Floor Scan	N/A
1	4	2	01-037	11/30/94	9	Lower	3
1	4	2	01-305	3/20/95	8	Upper	4
1	4	2	FS01-015	2/8/95	N/A	Floor Scan	N/A
1	4	2	FS01-029	4/3/95	N/A	Floor Scan	N/A
1	4	3	01-038	11/30/94	8	Lower	3
1	4	3	01-301	3/20/95	2	Upper	4
1	4	3	FS01-015	2/8/95	N/A	Floor Scan	N/A
1	4	3	FS01-029	4/3/95	N/A	Floor Scan	N/A
1	4	4	01-039	11/30/94	13	Lower	3
1	4	4	01-302	3/20/95	5	Upper	4
1	4	4	FS01-015	2/8/95	N/A	Floor Scan	N/A
1	4	4	FS01-029	4/3/95	N/A	Floor Scan	N/A
1	4	5	01-040	11/30/94	3	Lower	3
1	4	5	01-303	3/20/95	4	Upper	4
1	4	5	FS01-015	2/8/95	N/A	Floor Scan	N/A
1	4	5	FS01-029	4/3/95	N/A	Floor Scan	N/A
1	4	6	01-041	11/30/94	8	Lower	3
1	4	6	01-304	3/20/95	11	Upper	4
1	4	6	FS01-015	2/8/95	N/A	Floor Scan	N/A
1	4	6	FS01-029	4/3/95	N/A	Floor Scan	N/A
1	4	7	01-409	8/11/95	1	Lower	4
1	4	7	FS01-015	2/8/95	N/A	Floor Scan	N/A
1	4	7	FS01-029	4/3/95	N/A	Floor Scan	N/A
1	5	1	01-259	3/1/95	25	Lower	4
1	5	1	01-271	3/8/95	34	Lower	5
1	5	1	01-366	5/8/95	37	Upper	5
1	5	1	01-367	5/9/95	34	Upper	5
1	5	1	01-401	7/8/95	30	Lower	5
1	5	1	01-406	7/12/95	9	TRENCH	5
1	5	1	01-434	9/6/95	3	Upper	4
1	5	1	01-437	9/11/95	40	Upper	5
1	5	1	01-482	3/5/96	15	Upper	5
1	5	1	FS01-038	5/2/95	N/A	Floor Scan	N/A
1	5	1	FS01-052	8/24/95	N/A	Floor Scan	N/A
1	5	2	01-115	1/5/95	18	Lower	5
1	5	2	01-260	3/1/95	15	Lower	4
1	5	2	01-269	3/7/95	87	Lower	5
1	5	2	01-371	5/18/95	40	Upper	4
1	5	2	01-372	5/22/95	52	Upper	4
1	5	2	01-438	9/12/95	21	Upper	5
1	5	2	FS01-005	11/22/94	N/A	Floor Scan	N/A
1	5	2	FS01-038	5/2/95	N/A	Floor Scan	N/A
1	5	3	01-261	3/2/95	7	Lower	4
1	5	3	01-266	3/6/95	5	Lower	4
1	5	3	01-373	5/23/95	16	Upper	4
1	5	3	01-485	3/6/96	6	Upper	5
1	5	3	FS01-005	11/22/94	N/A	Floor Scan	N/A
1	5	3	FS01-038	5/2/95	N/A	Floor Scan	N/A
1	5	4	01-258	3/1/95	7	Lower	4
1	5	4	01-267	3/6/95	10	Lower	4
1	5	4	01-374	5/23/95	15	Upper	4
1	5	4	FS01-004	11/21/94	N/A	Floor Scan	N/A
1	5	4	FS01-038	5/2/95	N/A	Floor Scan	N/A
1	5	5	01-063	12/14/94	8	Lower	4

## Survey Cross Reference

Section	Unit	Sub-Unit	Survey Serial Number	Survey Date	Number of Survey Points	Type	Classification
1	5	5	01-262	3/2/95	5	Lower	4
1	5	5	01-380	5/25/95	16	Upper	5
1	5	5	01-431	8/31/95	16	Upper	5
1	5	5	FS01-007	12/14/94	N/A	Floor Scan	N/A
1	5	5	FS01-038	5/2/95	N/A	Floor Scan	N/A
1	6	1	01-093	12/26/94	9	Lower	3
1	6	1	01-094	12/30/94	43	Lower	5
1	6	1	01-095	12/30/94	44	Lower	5
1	6	1	01-145	1/24/95	126	Lower	5
1	6	1	01-146	1/25/95	110	Lower	5
1	6	1	01-147	1/26/95	104	Lower	5
1	6	1	01-199	2/7/95	18	Lower	4
1	6	1	01-350	4/6/95	32	Upper	4
1	6	1	01-404	7/11/95	6	Lower	5
1	6	1	01-405	7/12/95	10	TRENCH	5
1	6	1	FS01-026	3/8/95	N/A	Floor Scan	N/A
1	6	1	FS01-040	5/4/95	N/A	Floor Scan	N/A
1	7	1	01-140	1/23/95	41	Lower	4
1	7	1	01-198	2/7/95	14	Lower	4
1	7	1	01-351	4/6/95	30	Upper	4
1	7	1	01-496	11/23/96	75	Sub Floor Lower	5
1	7	1	01-497	11/23/96	63	Sub Floor Lower	5
1	7	1	01-498	11/26/96	10	Sub Floor Lower	5
1	7	1	01-500	11/26/96	4	Sub Floor Lower	5
1	7	1	FS01-014	2/7/95	N/A	Floor Scan	N/A
1	7	1	FS01-026	3/8/95	N/A	Floor Scan	N/A
1	8	1	01-139	1/19/95	40	Lower	4
1	8	1	01-197	2/7/95	15	Lower	4
1	8	1	01-352	4/10/95	30	Upper	4
1	8	1	01-495	11/22/96	58	Sub Floor Lower	5
1	8	1	01-499	11/26/96	10	Sub Floor Lower	5
1	8	1	01-501	12/3/96	4	Sub Floor Lower	5
1	8	1	FS01-014	2/7/95	N/A	Floor Scan	N/A
1	8	1	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	9	1	01-138	1/18/95	40	Lower	4
1	9	1	01-195	2/7/95	16	Lower	4
1	9	1	01-353	4/11/95	30	Upper	4
1	9	1	FS01-014	2/7/95	N/A	Floor Scan	N/A
1	9	1	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	10	1	01-132	1/18/95	40	Lower	4
1	10	1	01-196	2/7/95	16	Lower	4
1	10	1	01-354	4/11/95	30	Upper	4
1	10	1	FS01-013	2/6/95	N/A	Floor Scan	N/A
1	10	1	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	11	1	01-065	12/19/94	1	Lower	3
1	11	1	01-276	3/16/95	1	Lower	4
1	11	1	FS01-016	2/8/95	N/A	Floor Scan	N/A
1	11	1	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	11	2	01-066	12/19/94	2	Lower	3
1	11	2	01-200	2/8/95	2	Lower	4
1	11	2	01-277	3/16/95	2	Lower	4
1	11	2	FS01-016	2/8/95	N/A	Floor Scan	N/A
1	11	2	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	11	3	01-067	12/19/94	2	Lower	3
1	11	3	01-201	2/8/95	3	Lower	4
1	11	3	01-278	3/16/95	2	Lower	4
1	11	3	FS01-016	2/8/95	N/A	Floor Scan	N/A
1	11	3	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	11	4	01-076	12/19/94	2	Lower	3
1	11	4	01-202	2/8/95	3	Lower	4
1	11	4	01-279	3/16/95	2	Lower	4

## Survey Cross Reference

Section	Unit	Sub-Unit	Survey Serial Number	Survey Date	Number of Survey Points	Type	Classification
1	11	4	01-280	3/16/95	2	Lower	4
1	11	4	FS01-016	2/8/95	N/A	Floor Scan	N/A
1	11	4	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	11	5	01-069	12/19/94	2	Lower	3
1	11	5	FS01-016	2/8/95	N/A	Floor Scan	N/A
1	11	5	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	11	6	01-068	12/19/94	2	Lower	3
1	11	6	01-281	3/16/95	2	Lower	4
1	11	6	FS01-016	2/8/95	N/A	Floor Scan	N/A
1	11	6	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	11	7	01-064	12/19/94	2	Lower	3
1	11	7	01-203	2/8/95	2	Lower	4
1	11	7	01-282	3/16/95	2	Lower	4
1	11	7	FS01-016	2/8/95	N/A	Floor Scan	N/A
1	11	7	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	11	8	01-077	12/19/94	2	Lower	3
1	11	8	01-204	2/8/95	1	Lower	4
1	11	8	01-283	3/16/95	2	Lower	4
1	11	8	FS01-016	2/8/95	N/A	Floor Scan	N/A
1	11	8	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	11	9	01-078	12/19/94	6	Lower	3
1	11	9	01-284	3/16/95	6	Lower	4
1	11	9	FS01-016	2/8/95	N/A	Floor Scan	N/A
1	11	9	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	11	10	01-070	12/19/94	2	Lower	3
1	11	10	01-285	3/16/95	2	Lower	4
1	11	10	FS01-016	2/8/95	N/A	Floor Scan	N/A
1	11	10	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	11	11	01-071	12/19/94	1	Lower	3
1	11	11	01-286	3/16/95	1	Lower	4
1	11	11	FS01-016	2/8/95	N/A	Floor Scan	N/A
1	11	11	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	11	12	01-079	12/19/94	2	Lower	3
1	11	12	01-287	3/16/95	2	Lower	4
1	11	12	FS01-016	2/8/95	N/A	Floor Scan	N/A
1	11	12	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	11	13	01-080	12/19/94	2	Lower	3
1	11	13	01-288	3/16/95	2	Lower	4
1	11	13	FS01-016	2/8/95	N/A	Floor Scan	N/A
1	11	13	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	11	14	01-081	12/19/94	1	Lower	3
1	11	14	01-289	3/16/95	1	Lower	4
1	11	14	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	11	14	FS01-048	8/11/95	N/A	Floor Scan	N/A
1	11	15	01-082	12/19/94	1	Lower	3
1	11	15	01-290	3/16/95	1	Lower	4
1	11	15	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	11	15	FS01-051	8/12/95	N/A	Floor Scan	N/A
1	11	16	01-072	12/19/94	1	Lower	3
1	11	16	01-291	3/16/95	1	Lower	4
1	11	16	FS01-016	2/8/95	N/A	Floor Scan	N/A
1	11	16	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	11	17	01-073	12/19/94	2	Lower	3
1	11	17	01-292	3/16/95	2	Lower	4
1	11	17	FS01-048	8/11/95	N/A	Floor Scan	N/A
1	11	17	FS01-050	8/11/95	N/A	Floor Scan	N/A
1	11	18	01-075	12/19/94	1	Lower	3
1	11	18	01-205	2/8/95	1	Lower	4
1	11	18	01-293	3/16/95	1	Lower	4
1	11	18	FS01-016	2/8/95	N/A	Floor Scan	N/A
1	11	18	FS01-025	3/7/95	N/A	Floor Scan	N/A

## Survey Cross Reference

Section	Unit	Sub-Unit	Survey Serial Number	Survey Date	Number of Survey Points	Type	Classification
1	11	19	01-074	12/19/94	1	Lower	3
1	11	19	01-206	2/8/95	1	Lower	4
1	11	19	01-294	3/16/95	1	Lower	4
1	11	19	FS01-016	2/8/95	N/A	Floor Scan	N/A
1	11	19	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	11	20	01-083	12/19/94	1	Lower	3
1	11	20	01-295	3/16/95	1	Lower	4
1	11	20	FS01-048	8/11/95	N/A	Floor Scan	N/A
1	11	21	01-084	12/19/94	3	Lower	3
1	11	21	01-296	3/16/95	3	Lower	4
1	11	21	FS01-016	2/8/95	N/A	Floor Scan	N/A
1	11	21	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	11	23	01-085	12/19/94	1	Lower	3
1	11	23	01-297	3/16/95	1	Lower	4
1	11	23	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	11	23	FS01-051	8/12/95	N/A	Floor Scan	N/A
1	11	24	01-086	12/19/94	2	Lower	3
1	11	24	01-207	2/8/95	1	Lower	4
1	11	24	01-298	3/16/95	2	Lower	4
1	11	24	FS01-016	2/8/95	N/A	Floor Scan	N/A
1	11	24	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	11	25	01-087	12/19/94	2	Lower	3
1	11	25	01-208	2/8/95	2	Lower	4
1	11	25	01-299	3/16/95	2	Lower	4
1	11	25	FS01-016	2/8/95	N/A	Floor Scan	N/A
1	11	25	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	11	26	01-088	12/19/94	1	Lower	3
1	11	26	01-209	2/8/95	1	Lower	4
1	11	26	01-300	3/16/95	1	Lower	4
1	11	26	FS01-016	2/8/95	N/A	Floor Scan	N/A
1	11	26	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	12	1	01-131	1/17/95	41	Lower	4
1	12	1	01-194	2/6/95	19	Lower	4
1	12	1	01-355	4/12/95	30	Upper	4
1	12	1	FS01-013	2/6/95	N/A	Floor Scan	N/A
1	12	1	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	13	1	01-130	1/16/95	40	Lower	4
1	13	1	01-193	2/6/95	26	Lower	4
1	13	1	01-357	4/13/95	30	Upper	4
1	13	1	FS01-013	2/6/95	N/A	Floor Scan	N/A
1	13	1	FS01-025	3/7/95	N/A	Floor Scan	N/A
1	14	1	01-129	1/16/95	40	Lower	4
1	14	1	01-192	2/6/95	14	Lower	4
1	14	1	01-356	4/13/95	30	Upper	4
1	14	1	FS01-013	2/6/95	N/A	Floor Scan	N/A
1	14	1	FS01-024	3/1/95	N/A	Floor Scan	N/A
1	15	1	01-128	1/12/95	40	Lower	4
1	15	1	01-191	2/6/95	15	Lower	4
1	15	1	01-358	4/17/95	30	Upper	4
1	15	1	FS01-013	2/6/95	N/A	Floor Scan	N/A
1	15	1	FS01-024	3/1/95	N/A	Floor Scan	N/A
1	16	1	01-002	10/25/94	20	Lower	3
1	16	1	01-003	10/26/94	28	Lower	3
1	16	1	01-127	1/12/95	17	Lower	3
1	16	1	01-347	4/3/95	32	Upper	4
1	16	1	FS01-002	11/7/94	N/A	Floor Scan	N/A
1	16	1	FS01-024	3/1/95	N/A	Floor Scan	N/A
1	17	1	01-001	10/24/94	48	Lower	3
1	17	1	01-126	1/12/95	14	Lower	3
1	17	1	01-345	3/30/95	20	Upper	4
1	17	1	01-346	4/3/95	10	Upper	4

## Survey Cross Reference

Section	Unit	Sub-Unit	Survey Serial Number	Survey Date	Number of Survey Points	Type	Classification
1	17	1	FS01-001	11/3/94	N/A	Floor Scan	N/A
1	17	1	FS01-024	3/1/95	N/A	Floor Scan	N/A
1	18	1	01-122	1/11/95	8	Lower	3
1	18	1	01-445	10/19/95	4	Upper	4
1	18	1	FS01-011	1/25/95	N/A	Floor Scan	N/A
1	18	1	FS01-039	5/3/95	N/A	Floor Scan	N/A
1	18	2	01-124	1/11/95	1	Lower	3
1	18	2	FS01-039	5/3/95	N/A	Floor Scan	N/A
1	18	2	FS01-049	8/11/95	N/A	Floor Scan	N/A
1	18	3	01-123	1/11/95	3	Lower	3
1	18	3	01-446	10/19/95	3	Upper	4
1	18	3	FS01-011	1/25/95	N/A	Floor Scan	N/A
1	18	3	FS01-039	5/3/95	N/A	Floor Scan	N/A
1	18	4	01-120	1/11/95	8	Lower	3
1	18	4	01-141	1/24/95	5	Lower	4
1	18	4	01-444	10/19/95	6	Upper	4
1	18	4	01-448	10/23/95	7	Upper	4
1	18	4	FS01-011	1/25/95	N/A	Floor Scan	N/A
1	18	4	FS01-039	5/3/95	N/A	Floor Scan	N/A
1	18	5	01-121	1/11/95	3	Lower	3
1	18	5	01-142	1/24/95	4	Lower	4
1	18	5	01-443	10/19/95	4	Upper	4
1	18	5	FS01-011	1/25/95	N/A	Floor Scan	N/A
1	18	5	FS01-039	5/3/95	N/A	Floor Scan	N/A
1	18	6	01-117	1/10/95	8	Lower	3
1	18	6	01-143	1/24/95	4	Lower	4
1	18	6	01-449	10/23/95	6	Upper	4
1	18	6	FS01-011	1/25/95	N/A	Floor Scan	N/A
1	18	6	FS01-039	5/3/95	N/A	Floor Scan	N/A
1	18	7	01-116	1/10/95	3	Lower	3
1	18	7	01-144	1/24/95	2	Lower	4
1	18	7	FS01-011	1/25/95	N/A	Floor Scan	N/A
1	18	7	FS01-039	5/3/95	N/A	Floor Scan	N/A
1	18	8	01-274	3/16/95	25	Lower	4
1	18	8	01-447	10/23/95	11	Upper	4
1	18	8	FS01-039	5/3/95	N/A	Floor Scan	N/A
1	18	9	01-275	3/16/95	16	Lower	4
1	18	9	FS01-039	5/3/95	N/A	Floor Scan	N/A
1	18	9	FS01-048	8/11/95	N/A	Floor Scan	N/A
1	18	10	01-416	8/11/95	2	Lower	4
1	18	10	FS01-048	8/11/95	N/A	Floor Scan	N/A
1	19	1	01-090	12/22/94	32	Lower	3
1	19	1	01-253	2/28/95	20	Lower	4
1	19	1	01-376	5/24/95	31	Upper	4
1	19	1	FS01-022	2/17/95	N/A	Floor Scan	N/A
1	19	1	FS01-037	5/1/95	N/A	Floor Scan	N/A
1	19	2	01-092	12/22/94	2	Lower	3
1	19	2	01-254	2/28/95	7	Lower	4
1	19	2	01-377	5/24/95	4	Upper	4
1	19	2	FS01-022	2/17/95	N/A	Floor Scan	N/A
1	19	2	FS01-037	5/1/95	N/A	Floor Scan	N/A
1	19	3	01-089	12/20/94	10	Lower	3
1	19	3	01-255	2/28/95	3	Lower	4
1	19	3	01-379	5/25/95	3	Upper	4
1	19	3	FS01-008	12/20/94	N/A	Floor Scan	N/A
1	19	3	FS01-022	2/17/95	N/A	Floor Scan	N/A
1	19	3	FS01-051	8/12/95	N/A	Floor Scan	N/A
1	19	4	01-091	12/22/94	3	Lower	3
1	19	4	01-252	2/28/95	4	Lower	4
1	19	4	01-378	5/25/95	3	Upper	4
1	19	4	FS01-022	2/17/95	N/A	Floor Scan	N/A

## Survey Cross Reference

Section	Unit	Sub-Unit	Survey Serial Number	Survey Date	Number of Survey Points	Type	Classification
1	19	4	FS01-037	5/1/95	N/A	Floor Scan	N/A
1	20	1	01-263	3/2/95	11	Lower	4
1	20	1	01-268	3/6/95	13	Lower	4
1	20	1	01-369	5/15/95	48	Upper	5
1	20	1	01-430	8/30/95	42	Upper	5
1	20	1	FS01-004	11/21/94	N/A	Floor Scan	N/A
1	20	1	FS01-026	3/8/95	N/A	Floor Scan	N/A
1	20	1	FS01-038	5/2/95	N/A	Floor Scan	N/A
1	20	2	01-265	3/6/95	8	Lower	4
1	20	2	01-382	5/25/95	2	Upper	5
1	20	2	FS01-005	11/22/94	N/A	Floor Scan	N/A
1	20	2	FS01-026	3/8/95	N/A	Floor Scan	N/A
1	20	2	FS01-038	5/2/95	N/A	Floor Scan	N/A
1	20	3	01-096	12/30/94	36	Lower	5
1	20	3	01-148	1/30/95	35	Lower	5
1	20	3	01-149	1/30/95	46	Upper	5
1	20	3	01-370	5/17/95	30	Upper	5
1	20	3	01-439	9/14/95	25	Upper	5
1	20	3	FS01-026	3/8/95	N/A	Floor Scan	N/A
1	20	3	FS01-038	5/2/95	N/A	Floor Scan	N/A
1	20	4	01-133	1/1/95	62	Lower	5
1	20	4	01-264	3/2/95	17	Lower	4
1	20	4	01-270	3/8/95	58	Lower	5
1	20	4	01-362	4/26/95	33	Upper	5
1	20	4	01-363	4/27/95	28	Upper	5
1	20	4	01-364	5/1/95	41	Upper	5
1	20	4	01-365	5/3/95	70	Upper	5
1	20	4	01-402	7/8/95	30	Lower	5
1	20	4	01-433	9/6/95	66	Upper	5
1	20	4	01-436	9/7/95	36	Upper	5
1	20	4	FS01-009	1/1/95	N/A	Floor Scan	N/A
1	20	4	FS01-038	5/2/95	N/A	Floor Scan	N/A
1	21	1	01-018	11/3/94	31	Lower	3
1	21	1	01-229	2/16/95	15	Lower	4
1	21	1	01-383	5/30/95	29	Upper	4
1	21	1	FS01-011	1/25/95	N/A	Floor Scan	N/A
1	22	1	01-017	11/3/94	32	Lower	3
1	22	1	01-228	2/16/95	16	Lower	4
1	22	1	FS01-012	1/26/95	N/A	Floor Scan	N/A
1	22	1	FS01-033	4/24/95	N/A	Floor Scan	N/A
1	23	1	01-016	11/2/94	31	Lower	3
1	23	1	01-227	2/16/95	25	Lower	4
1	23	1	01-400	7/7/95	30	Upper	4
1	23	1	FS01-012	1/26/95	N/A	Floor Scan	N/A
1	23	1	FS01-034	4/25/95	N/A	Floor Scan	N/A
1	24.1	1	01-014	11/1/94	31	Lower	3
1	24.1	1	01-226	2/15/95	18	Lower	4
1	24.1	1	01-395	7/3/95	20	Upper	4
1	24.1	1	FS01-012	1/26/95	N/A	Floor Scan	N/A
1	24.1	1	FS01-034	4/25/95	N/A	Floor Scan	N/A
1	24.1	2	01-135	1/3/95	7	Lower	3
1	24.1	2	01-225	2/15/95	13	Lower	4
1	24.1	2	FS01-012	1/26/95	N/A	Floor Scan	N/A
1	24.1	2	FS01-034	4/25/95	N/A	Floor Scan	N/A
1	24.1	3	01-134	1/3/95	1	Lower	3
1	24.1	3	01-237	2/21/95	5	Lower	4
1	24.1	3	FS01-034	4/25/95	N/A	Floor Scan	N/A
1	24.1	3	FS01-051	8/12/95	N/A	Floor Scan	N/A
1	24.1	4	01-097	1/3/95	2	Lower	3
1	24.1	4	01-238	2/21/95	5	Lower	4
1	24.1	4	01-417	8/12/95	6	Upper	4

## Survey Cross Reference

Section	Unit	Sub-Unit	Survey Serial Number	Survey Date	Number of Survey Points	Type	Classification
1	24.1	4	FS01-034	4/25/95	N/A	Floor Scan	N/A
1	24.1	4	FS01-051	8/12/95	N/A	Floor Scan	N/A
1	24.1	5	01-098	1/3/95	3	Lower	3
1	24.1	5	01-239	2/21/95	5	Lower	4
1	24.1	5	01-418	8/12/95	4	Upper	4
1	24.1	5	FS01-034	4/25/95	N/A	Floor Scan	N/A
1	24.1	5	FS01-051	8/12/95	N/A	Floor Scan	N/A
1	24.1	6	01-099	1/3/95	4	Lower	3
1	24.1	6	01-236	2/21/95	8	Lower	4
1	24.1	6	FS01-012	1/26/95	N/A	Floor Scan	N/A
1	24.1	6	FS01-034	4/25/95	N/A	Floor Scan	N/A
1	24.2	1	01-013	11/1/94	31	Lower	3
1	24.2	1	01-221	2/15/95	15	Lower	4
1	24.2	1	FS01-012	1/26/95	N/A	Floor Scan	N/A
1	24.2	1	FS01-034	4/25/95	N/A	Floor Scan	N/A
1	25	1	01-019	11/7/94	31	Lower	3
1	25	1	01-235	2/21/95	6	Lower	4
1	25	1	01-398	7/4/95	30	Upper	4
1	25	1	FS01-011	1/25/95	N/A	Floor Scan	N/A
1	25	1	FS01-036	4/27/95	N/A	Floor Scan	N/A
1	25	2	01-114	1/5/95	11	Lower	3
1	25	2	FS01-011	1/25/95	N/A	Floor Scan	N/A
1	25	2	FS01-036	4/27/95	N/A	Floor Scan	N/A
1	25	3	01-112	1/5/95	9	Lower	3
1	25	3	FS01-011	1/25/95	N/A	Floor Scan	N/A
1	25	3	FS01-036	4/27/95	N/A	Floor Scan	N/A
1	26	1	01-020	11/7/94	31	Lower	3
1	26	1	01-234	2/20/95	14	Lower	4
1	26	1	FS01-011	1/25/95	N/A	Floor Scan	N/A
1	26	1	FS01-036	4/27/95	N/A	Floor Scan	N/A
1	27	1	01-015	11/2/94	32	Lower	3
1	27	1	01-230	2/20/95	17	Lower	4
1	27	1	01-397	7/4/95	30	Upper	4
1	27	1	FS01-010	1/6/95	N/A	Floor Scan	N/A
1	27	1	FS01-035	4/26/95	N/A	Floor Scan	N/A
1	28	1	01-104	1/4/95	6	Lower	3
1	28	1	01-242	2/21/95	3	Lower	4
1	28	1	FS01-011	1/25/95	N/A	Floor Scan	N/A
1	28	1	FS01-035	4/26/95	N/A	Floor Scan	N/A
1	28	2	01-102	1/4/95	7	Lower	3
1	28	2	01-241	2/21/95	4	Lower	4
1	28	2	FS01-011	1/25/95	N/A	Floor Scan	N/A
1	28	2	FS01-035	4/26/95	N/A	Floor Scan	N/A
1	28	3	01-103	1/4/95	4	Lower	3
1	28	3	FS01-011	1/25/95	N/A	Floor Scan	N/A
1	28	3	FS01-035	4/26/95	N/A	Floor Scan	N/A
1	28	4	01-100	1/3/95	10	Lower	3
1	28	4	01-232	2/20/95	20	Lower	4
1	28	4	01-240	2/21/95	5	Lower	4
1	28	4	FS01-011	1/25/95	N/A	Floor Scan	N/A
1	28	4	FS01-035	4/26/95	N/A	Floor Scan	N/A
1	28	5	01-101	1/3/95	3	Lower	3
1	28	5	01-233	2/20/95	2	Lower	4
1	28	5	FS01-011	1/25/95	N/A	Floor Scan	N/A
1	28	5	FS01-035	4/26/95	N/A	Floor Scan	N/A
1	29	1	01-012	10/31/94	31	Lower	3
1	29	1	01-231	2/20/95	15	Lower	4
1	29	1	01-399	7/7/95	30	Upper	4
1	29	1	FS01-010	1/6/95	N/A	Floor Scan	N/A
1	29	1	FS01-035	4/26/95	N/A	Floor Scan	N/A
1	30	1	01-010	10/31/94	16	Lower	3

## Survey Cross Reference

Section	Unit	Sub-Unit	Survey Serial Number	Survey Date	Number of Survey Points	Type	Classification
1	30	1	FS01-035	4/26/95	N/A	Floor Scan	N/A
1	30	1	FS01-051	8/12/95	N/A	Floor Scan	N/A
1	30	2	01-011	10/31/94	16	Lower	3
1	30	2	01-220	2/14/95	16	Lower	4
1	30	2	FS01-010	1/6/95	N/A	Floor Scan	N/A
1	30	2	FS01-034	4/25/95	N/A	Floor Scan	N/A
1	31	1	01-009	10/28/94	14	Lower	3
1	31	1	01-223	2/15/95	9	Lower	4
1	31	1	01-396	7/3/95	10	Upper	4
1	31	1	FS01-006	12/8/94	N/A	Floor Scan	N/A
1	31	1	FS01-035	4/26/95	N/A	Floor Scan	N/A
1	31	2	01-008	10/28/94	16	Lower	3
1	31	2	01-224	2/15/95	6	Lower	4
1	31	2	01-394	7/3/95	20	Upper	4
1	31	2	FS01-003	11/7/94	N/A	Floor Scan	N/A
1	31	2	FS01-034	4/25/95	N/A	Floor Scan	N/A
1	32	1	01-007	10/27/94	14	Lower	3
1	32	1	01-211	2/8/95	5	Lower	4
1	32	1	FS01-006	12/8/94	N/A	Floor Scan	N/A
1	32	1	FS01-035	4/26/95	N/A	Floor Scan	N/A
1	32	2	01-006	10/27/94	15	Lower	3
1	32	2	01-213	2/9/95	10	Lower	4
1	32	2	01-385	5/31/95	24	Upper	4
1	32	2	FS01-003	11/7/94	N/A	Floor Scan	N/A
1	32	2	FS01-035	4/26/95	N/A	Floor Scan	N/A
1	33	1	01-004	10/26/94	36	Lower	3
1	33	1	01-210	2/8/95	14	Lower	4
1	33	1	FS01-006	12/8/94	N/A	Floor Scan	N/A
1	33	1	FS01-035	4/26/95	N/A	Floor Scan	N/A
1	33	2	01-005	10/27/94	15	Lower	3
1	33	2	01-212	2/9/95	9	Lower	4
1	33	2	01-384	5/30/95	18	Upper	4
1	33	2	FS01-003	11/7/94	N/A	Floor Scan	N/A
1	33	2	FS01-035	4/26/95	N/A	Floor Scan	N/A
1	34	1	01-027	11/10/94	17	Lower	3
1	34	1	01-249	2/27/95	11	Lower	4
1	34	1	01-368	5/11/95	40	Upper	4
1	34	1	FS01-022	2/17/95	N/A	Floor Scan	N/A
1	34	1	FS01-037	5/1/95	N/A	Floor Scan	N/A
1	34	2	01-028	11/10/94	6	Lower	3
1	34	2	01-250	2/27/95	3	Lower	4
1	34	2	FS01-022	2/17/95	N/A	Floor Scan	N/A
1	34	2	FS01-037	5/1/95	N/A	Floor Scan	N/A
1	34	3	01-029	11/10/94	15	Lower	3
1	34	3	01-251	2/27/95	5	Lower	4
1	34	3	FS01-022	2/17/95	N/A	Floor Scan	N/A
1	34	3	FS01-037	5/1/95	N/A	Floor Scan	N/A
1	35.1	1	01-247	2/27/95	20	Lower	4
1	35.1	1	FS01-021	2/15/95	N/A	Floor Scan	N/A
1	35.1	1	FS01-037	5/1/95	N/A	Floor Scan	N/A
1	35.2	1	01-025	11/10/94	22	Lower	3
1	35.2	1	01-042	11/29/94	12	Lower	3
1	35.2	1	01-248	2/27/95	19	Lower	4
1	35.2	1	FS01-021	2/15/95	N/A	Floor Scan	N/A
1	35.2	1	FS01-037	5/1/95	N/A	Floor Scan	N/A
1	36	1	01-024	11/10/94	33	Lower	3
1	36	1	01-246	2/23/95	15	Lower	4
1	36	1	FS01-020	2/14/95	N/A	Floor Scan	N/A
1	36	1	FS01-036	4/27/95	N/A	Floor Scan	N/A
1	37	1	01-023	11/9/94	32	Lower	3
1	37	1	01-245	2/23/95	17	Lower	4

## Survey Cross Reference

Section	Unit	Sub-Unit	Survey Serial Number	Survey Date	Number of Survey Points	Type	Classification
1	37	1	FS01-021	2/15/95	N/A	Floor Scan	N/A
1	37	1	FS01-037	5/1/95	N/A	Floor Scan	N/A
1	38	1	01-022	11/9/94	33	Lower	3
1	38	1	01-244	2/23/95	20	Lower	4
1	38	1	FS01-021	2/15/95	N/A	Floor Scan	N/A
1	38	1	FS01-037	5/1/95	N/A	Floor Scan	N/A
1	38	1	FS01-037	5/1/95	N/A	Floor Scan	N/A
1	39	1	01-021	11/8/94	35	Lower	3
1	39	1	01-243	2/21/95	24	Lower	4
1	39	1	01-386	6/1/95	56	Upper	5
1	39	1	01-450	11/13/95	29	Lower	5
1	39	1	01-451	11/14/95	6	Lower	5
1	39	1	01-452	11/14/95	12	Lower	5
1	39	1	01-453	12/1/95	61	Misc	5
1	39	1	01-454	12/4/95	14	Misc	5
1	39	1	01-455	12/5/95	2	Misc	5
1	39	1	01-456	12/6/95	29	Misc	5
1	39	1	01-457	12/7/95	28	Misc	5
1	39	1	01-458	12/7/95	11	Misc	5
1	39	1	01-459	12/7/95	8	Misc	5
1	39	1	01-473	2/1/96	49	Lower	5
1	39	1	01-474	2/20/96	6	Misc	5
1	39	1	01-476	2/21/96	15	Misc.	5
1	39	1	01-483	3/5/96	17	Misc	5
1	39	1	01-486	4/2/96	20	Lower	5
1	40.1	1	01-032	11/14/94	40	Lower	3
1	40.1	1	01-216	2/14/95	34	Lower	4
1	40.1	1	01-348	4/4/95	15	Upper	4
1	40.1	1	01-462	12/27/95	16	Lower	5
1	40.1	1	01-466	1/3/96	20	Lower	5
1	40.1	1	01-467	1/3/96	34	Lower	5
1	40.1	1	01-468	1/4/96	56	Lower	5
1	40.1	1	01-469	1/9/96	113	Lower	5
1	40.1	1	FS01-019	2/13/95	N/A	Floor Scan	N/A
1	40.1	1	FS01-041	5/11/95	N/A	Floor Scan	N/A
1	40.1	1	FS01-057	12/26/95	N/A	Floor Scan	N/A
1	40.1	2	01-106	1/5/95	7	Lower	3
1	40.1	2	01-217	2/14/95	3	Lower	4
1	40.1	2	01-471	1/10/96	58	Lower	5
1	40.1	2	01-472	1/11/96	16	Lower	5
1	40.1	2	FS01-019	2/13/95	N/A	Floor Scan	N/A
1	40.1	2	FS01-041	5/11/95	N/A	Floor Scan	N/A
1	40.1	3	01-111	1/5/95	6	Lower	3
1	40.1	3	01-222	2/15/95	3	Lower	4
1	40.1	3	01-470	1/10/96	42	Lower	5
1	40.1	3	FS01-021	2/15/95	N/A	Floor Scan	N/A
1	40.1	3	FS01-041	5/11/95	N/A	Floor Scan	N/A
1	40.1	4	01-107	1/5/95	3	Lower	3
1	40.1	4	01-219	2/14/95	2	Lower	4
1	40.1	4	FS01-017	2/9/95	N/A	Floor Scan	N/A
1	40.1	4	FS01-041	5/11/95	N/A	Floor Scan	N/A
1	40.1	5	01-432	8/31/95	31	Lower	4
1	40.1	5	01-435	9/6/95	9	Upper	4
1	40.1	5	FS01-055	9/6/95	N/A	Floor Scan	N/A
1	40.1	6	01-113	1/5/95	4	Lower	3
1	40.1	6	01-218	2/14/95	7	Lower	4
1	40.1	6	FS01-017	2/9/95	N/A	Floor Scan	N/A
1	40.1	6	FS01-041	5/11/95	N/A	Floor Scan	N/A
1	40.1	8	01-387	6/1/95	5	Lower	4
1	40.1	9	01-388	6/1/95	5	Lower	4
1	40.2	1	01-030	11/14/94	20	Lower	3

## Survey Cross Reference

Section	Unit	Sub-Unit	Survey Serial Number	Survey Date	Number of Survey Points	Type	Classification
1	40.2	1	01-215	2/13/95	20	Lower	4
1	40.2	1	01-349	4/4/95	15	Upper	4
1	40.2	1	01-464	12/28/95	82	Lower	5
1	40.2	1	01-465	1/2/96	88	Lower	5
1	40.2	1	FS01-019	2/13/95	N/A	Floor Scan	N/A
1	40.2	1	FS01-041	5/11/95	N/A	Floor Scan	N/A
1	40.2	1	FS01-057	12/26/95	N/A	Floor Scan	N/A
1	40.2	2	01-031	11/14/94	9	Lower	3
1	40.2	2	FS01-017	2/9/95	N/A	Floor Scan	N/A
1	40.2	2	FS01-041	5/11/95	N/A	Floor Scan	N/A
1	40.2	3	01-108	1/5/95	8	Lower	3
1	40.2	3	FS01-017	2/9/95	N/A	Floor Scan	N/A
1	40.2	3	FS01-041	5/11/95	N/A	Floor Scan	N/A
1	40.2	4	01-109	1/5/95	3	Lower	3
1	40.2	4	FS01-017	2/9/95	N/A	Floor Scan	N/A
1	40.2	4	FS01-041	5/11/95	N/A	Floor Scan	N/A
1	40.2	5	01-110	1/5/95	3	Lower	3
1	40.2	5	01-463	12/27/95	35	Lower	5
1	40.2	5	FS01-017	2/9/95	N/A	Floor Scan	N/A
1	40.2	5	FS01-041	5/11/95	N/A	Floor Scan	N/A
1	40.2	6	01-105	1/4/95	8	Lower	3
1	40.2	6	FS01-019	2/13/95	N/A	Floor Scan	N/A
1	40.2	6	FS01-041	5/11/95	N/A	Floor Scan	N/A
1	40.2	7	01-390	6/5/95	8	Lower	4
1	40.2	8	01-389	6/1/95	12	Lower	4
1	41	1	01-034	11/29/94	45	Lower	3
1	41	1	01-257	3/1/95	16	Lower	4
1	41	1	FS01-017	2/9/95	N/A	Floor Scan	N/A
1	41	1	FS01-039	5/3/95	N/A	Floor Scan	N/A
1	41	1	FS01-044	6/15/95	N/A	Floor Scan	N/A
1	41	2	01-033	11/29/94	13	Lower	3
1	41	2	01-460	12/24/95	4	Lower	4
1	41	2	01-461	12/26/95	6	Lower	4
1	41	2	FS01-017	2/9/95	N/A	Floor Scan	N/A
1	41	2	FS01-039	5/3/95	N/A	Floor Scan	N/A
1	41	2	FS01-053	8/25/95	N/A	Floor Scan	N/A
1	41	2	FS01-056	12/24/95	N/A	Floor Scan	N/A
1	41	4	01-359	4/18/95	30	Upper	4
1	43	1	01-026	11/10/94	30	Lower	3
1	43	1	01-214	2/9/95	14	Lower	4
1	43	1	01-256	2/28/95	20	Lower	4
1	43	1	FS01-017	2/9/95	N/A	Floor Scan	N/A
1	43	1	FS01-038	5/2/95	N/A	Floor Scan	N/A
1	44	1	01-061	12/7/94	40	Lower	3
1	44	1	01-339	3/28/95	26	Upper	4
1	44	1	FS01-023	2/20/95	N/A	Floor Scan	N/A
1	44	1	FS01-040	5/4/95	N/A	Floor Scan	N/A
1	44	2	01-062	12/7/94	2	Lower	3
1	44	2	FS01-023	2/20/95	N/A	Floor Scan	N/A
1	44	2	FS01-040	5/4/95	N/A	Floor Scan	N/A
1	44	3	01-180	2/2/95	1	Lower	4
1	44	3	01-336	3/27/95	4	Upper	4
1	44	3	FS01-022	2/17/95	N/A	Floor Scan	N/A
1	44	3	FS01-040	5/4/95	N/A	Floor Scan	N/A
1	44	4	01-181	2/2/95	2	Lower	4
1	44	4	01-337	3/27/95	3	Upper	4
1	44	4	FS01-022	2/17/95	N/A	Floor Scan	N/A
1	44	4	FS01-040	5/4/95	N/A	Floor Scan	N/A
1	44	5	01-182	2/2/95	2	Lower	4
1	44	5	01-340	3/28/95	3	Upper	4
1	44	5	FS01-022	2/17/95	N/A	Floor Scan	N/A

## Survey Cross Reference

Section	Unit	Sub-Unit	Survey Serial Number	Survey Date	Number of Survey Points	Type	Classification
1	44	5	FS01-042	5/16/95	N/A	Floor Scan	N/A
1	44	6	01-183	2/2/95	2	Lower	4
1	44	6	01-341	3/28/95	2	Upper	4
1	44	6	FS01-022	2/17/95	N/A	Floor Scan	N/A
1	44	6	FS01-042	5/16/95	N/A	Floor Scan	N/A
1	44	7	01-184	2/2/95	1	Lower	4
1	44	7	FS01-022	2/17/95	N/A	Floor Scan	N/A
1	44	7	FS01-042	5/16/95	N/A	Floor Scan	N/A
1	44	8	01-185	2/2/95	2	Lower	4
1	44	8	FS01-023	2/20/95	N/A	Floor Scan	N/A
1	44	8	FS01-040	5/4/95	N/A	Floor Scan	N/A
1	44	8	FS01-054	8/29/95	N/A	Floor Scan	N/A
1	44	9	01-186	2/2/95	2	Lower	4
1	44	9	FS01-023	2/20/95	N/A	Floor Scan	N/A
1	44	9	FS01-054	8/29/95	N/A	Floor Scan	N/A
1	45	1	01-035	11/29/94	32	Lower	3
1	45	1	01-059	12/6/94	15	Lower	3
1	45	1	01-338	3/27/95	9	Upper	4
1	45	1	FS01-023	2/20/95	N/A	Floor Scan	N/A
1	45	1	FS01-040	5/4/95	N/A	Floor Scan	N/A
1	45	1	FS01-054	8/29/95	N/A	Floor Scan	N/A
1	45	2	01-058	12/6/94	Deleted due to location error	Lower	3
1	45	2	01-188	2/6/95	7	Lower	4
1	45	2	FS01-023	2/20/95	N/A	Floor Scan	N/A
1	45	2	FS01-039	5/3/95	N/A	Floor Scan	N/A
1	45	2	FS01-042	5/16/95	N/A	Floor Scan	N/A
1	45	2	FS01-054	8/29/95	N/A	Floor Scan	N/A
1	45	3	01-060	12/6/94	9	Lower	3
1	45	3	01-334	3/27/95	18	Upper	4
1	45	3	FS01-023	2/20/95	N/A	Floor Scan	N/A
1	45	3	FS01-039	5/3/95	N/A	Floor Scan	N/A
1	45	3	FS01-042	5/16/95	N/A	Floor Scan	N/A
1	45	3	FS01-054	8/29/95	N/A	Floor Scan	N/A
1	45	4	01-057	12/6/94	8	Lower	3
1	45	4	01-335	3/27/95	11	Upper	4
1	45	4	FS01-023	2/20/95	N/A	Floor Scan	N/A
1	45	4	FS01-043	5/25/95	N/A	Floor Scan	N/A
1	45	4	FS01-043	5/25/95	N/A	Floor Scan	N/A
1	45	4	FS01-054	8/29/95	N/A	Floor Scan	N/A
1	45	6	01-423	8/24/95	1	Lower	4
1	45	7	01-425	8/24/95	1	Lower	4
1	45	7	FS01-054	8/29/95	N/A	Floor Scan	N/A
1	45	8	01-424	8/24/95	1	Lower	4
1	45	8	FS01-040	5/4/95	N/A	Floor Scan	N/A
1	45	8	FS01-054	8/29/95	N/A	Floor Scan	N/A
1	45	9	01-189	2/6/95	2	Lower	4
1	45	9	FS01-023	2/20/95	N/A	Floor Scan	N/A
1	45	9	FS01-039	5/3/95	N/A	Floor Scan	N/A
1	45	9	FS01-042	5/16/95	N/A	Floor Scan	N/A
1	45	9	FS01-054	8/29/95	N/A	Floor Scan	N/A
1	45	10	01-187	2/2/95	1	Lower	4
1	45	10	FS01-031	4/5/95	N/A	Floor Scan	N/A
1	45	10	FS01-054	8/29/95	N/A	Floor Scan	N/A
1	46	1	01-056	12/6/94	35	Lower	3
1	46	1	01-330	3/23/95	22	Upper	4
1	46	1	FS01-021	2/15/95	N/A	Floor Scan	N/A
1	46	1	FS01-031	4/5/95	N/A	Floor Scan	N/A
1	46	2	01-055	12/6/94	3	Lower	3
1	46	2	FS01-021	2/15/95	N/A	Floor Scan	N/A
1	46	2	FS01-031	4/5/95	N/A	Floor Scan	N/A
1	46	3	01-190	2/6/95	2	Lower	4

## Survey Cross Reference

Section	Unit	Sub-Unit	Survey Serial Number	Survey Date	Number of Survey Points	Type	Classification
1	46	3	FS01-021	2/15/95	N/A	Floor Scan	N/A
1	46	3	FS01-054	8/29/95	N/A	Floor Scan	N/A
1	46	4	01-170	2/2/95	2	Lower	4
1	46	4	FS01-021	2/15/95	N/A	Floor Scan	N/A
1	46	4	FS01-031	4/5/95	N/A	Floor Scan	N/A
1	46	5	01-179	2/2/95	2	Lower	4
1	46	5	FS01-021	2/15/95	N/A	Floor Scan	N/A
1	46	5	FS01-031	4/5/95	N/A	Floor Scan	N/A
1	46	6	01-171	2/2/95	2	Lower	4
1	46	6	01-331	3/23/95	4	Upper	4
1	46	6	FS01-021	2/15/95	N/A	Floor Scan	N/A
1	46	6	FS01-031	4/5/95	N/A	Floor Scan	N/A
1	46	7	01-172	2/2/95	2	Lower	4
1	46	7	01-332	3/23/95	2	Upper	4
1	46	7	FS01-021	2/15/95	N/A	Floor Scan	N/A
1	46	7	FS01-031	4/5/95	N/A	Floor Scan	N/A
1	46	8	01-173	2/2/95	2	Lower	4
1	46	8	01-333	3/23/95	2	Upper	4
1	46	8	FS01-021	2/15/95	N/A	Floor Scan	N/A
1	46	8	FS01-031	4/5/95	N/A	Floor Scan	N/A
1	47	1	01-053	12/5/94	2	Lower	3
1	47	1	FS01-021	2/15/95	N/A	Floor Scan	N/A
1	47	1	FS01-054	8/29/95	N/A	Floor Scan	N/A
1	47	2	01-054	12/5/94	36	Lower	3
1	47	2	01-324	3/23/95	11	Upper	4
1	47	2	01-326	3/23/95	10	Upper	4
1	47	2	FS01-021	2/15/95	N/A	Floor Scan	N/A
1	47	2	FS01-031	4/5/95	N/A	Floor Scan	N/A
1	47	3	01-174	2/2/95	4	Lower	4
1	47	3	01-327	3/23/95	4	Upper	4
1	47	3	FS01-021	2/15/95	N/A	Floor Scan	N/A
1	47	3	FS01-031	4/5/95	N/A	Floor Scan	N/A
1	47	4	01-175	2/2/95	2	Lower	4
1	47	4	01-328	3/23/95	2	Upper	4
1	47	4	FS01-021	2/15/95	N/A	Floor Scan	N/A
1	47	4	FS01-031	4/5/95	N/A	Floor Scan	N/A
1	47	5	01-176	2/2/95	2	Lower	5
1	47	5	01-329	3/23/95	3	Upper	4
1	47	5	FS01-021	2/15/95	N/A	Floor Scan	N/A
1	47	5	FS01-031	4/5/95	N/A	Floor Scan	N/A
1	47	6	01-325	3/23/95	5	Upper	4
1	47	6	01-426	8/24/95	5	Lower	4
1	47	6	FS01-021	2/15/95	N/A	Floor Scan	N/A
1	47	6	FS01-031	4/5/95	N/A	Floor Scan	N/A
1	47	7	01-177	2/2/95	2	Lower	4
1	47	7	FS01-021	2/15/95	N/A	Floor Scan	N/A
1	47	7	FS01-031	4/5/95	N/A	Floor Scan	N/A
1	47	8	01-178	2/2/95	2	Lower	4
1	47	8	FS01-021	2/15/95	N/A	Floor Scan	N/A
1	47	8	FS01-031	4/5/95	N/A	Floor Scan	N/A
1	48	1	01-403	7/11/95	30	Lower	5
1	48	1	01-407	7/12/95	18	Lower	4
1	48	1	01-441	9/20/95	20	Lower	4
1	48	1	01-442	9/25/95	30	Upper	4
1	48	1	FS01-047	7/11/95	N/A	Floor Scan	N/A
1	49	3	01-118	1/10/95	55	Lower	3
1	49	3	01-119	1/10/95	18	Lower	4
1	49	3	01-125	1/11/95	28	Lower	3
1	49	3	01-342	3/28/95	8	Upper	4
1	49	3	FS01-028	3/28/95	N/A	Floor Scan	N/A
1	49	4	01-343	3/29/95	14	Lower	4

## Survey Cross Reference

Section	Unit	Sub-Unit	Survey Serial Number	Survey Date	Number of Survey Points	Type	Classification
1	49	4	FS01-028	3/28/95	N/A	Floor Scan	N/A
1	49	5	01-344	3/29/95	17	Lower	4
1	49	5	FS01-027	3/29/95	N/A	Floor Scan	N/A
1	49	9	01-391	6/21/95	82	Lower	5
1	49	9	01-392	6/22/95	80	Lower	5
1	49	9	01-393	6/26/95	42	Lower	5
1	49	9	01-440	9/18/95	22	Upper	4
1	49	9	FS01-044	6/15/95	N/A	Floor Scan	N/A
1	49	9	FS01-045	6/21/95	N/A	Floor Scan	N/A
1	49	9	FS01-046	6/26/95	N/A	Floor Scan	N/A
1	50	1	01-360	4/25/95	45	Lower	4
1	50	1	01-361	4/26/95	15	Upper	4
1	51	1	01-419	8/13/95	34	ROOF	1
1	52	1	01-420	8/17/95	48	ROOF	1
1	53	1	01-421	8/18/95	40	ROOF	1
1	54	1	01-422	8/19/95	34	ROOF	1
1	55	1	01-427	8/29/95	34	ROOF	1
1	56	1	01-429	8/30/95	15	ROOF	1
1	56	2	01-428	8/29/95	16	ROOF	1
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2	1	1	02-007	7/28/95	40	Lower	1
2	2	1	02-004	7/23/95	40	Lower	1
2	3	1	02-005	7/27/95	40	Lower	1
2	4	1	02-003	7/22/95	40	Lower	1
2	5	1	02-006	7/28/95	40	Lower	1
2	6	1	02-002	7/21/95	40	Lower	1
2	7	1	02-023	7/30/95	40	Lower	1
2	8	1	02-001	7/20/95	41	Lower	1
2	9	1	02-024	8/3/95	40	Lower	1
2	10	1	02-008	7/28/95	1	Lower	1
2	10	2	02-009	7/28/95	1	Lower	1
2	10	3	02-010	7/28/95	1	Lower	1
2	10	4	02-011	7/28/95	1	Lower	1
2	10	5	02-012	7/28/95	1	Lower	1
2	10	6	02-013	7/28/95	1	Lower	1
2	10	7	02-025	8/10/95	7	Lower	1
2	10	8	02-014	7/28/95	2	Lower	1
2	10	9	02-015	7/28/95	1	Lower	1
2	10	10	02-026	8/10/95	2	Lower	1
2	10	11	02-016	7/28/95	1	Lower	1
2	10	12	02-027	8/10/95	1	Lower	1
2	10	13	02-028	8/10/95	5	Lower	1
2	10	15	02-017	7/28/95	2	Lower	1
2	10	16	02-018	7/28/95	1	Lower	1
2	10	17	02-019	7/28/95	1	Lower	1
2	10	18	02-020	7/28/95	3	Lower	1
2	10	19	02-021	7/28/95	1	Lower	1
2	10	20	02-022	7/28/95	3	Lower	1
2	10	21	02-029	8/10/95	9	Lower	1
2	10	22	02-030	8/10/95	3	Lower	1
2	10	23	02-031	8/10/95	3	Lower	1
2	10	24	02-032	8/10/95	2	Lower	1
2	10	25	02-033	8/10/95	1	Lower	1
2	10	26	02-034	8/10/95	2	Lower	1
2	10	27	02-035	8/10/95	2	Lower	1
2	10	28	02-036	8/10/95	1	Lower	1
2	10	29	02-037	8/10/95	7	Lower	1
2	10	30	02-038	8/10/95	3	Lower	1
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3	1	1	03-003	4/24/95	20	Upper	4
3	1	1	03-006	6/26/95	20	Lower	4

## Survey Cross Reference

Section	Unit	Sub-Unit	Survey Serial Number	Survey Date	Number of Survey Points	Type	Classification
3	1	1	03-007	6/27/95	15	Lower	4
3	1	1	FS03-003	4/24/95	N/A	Floor Scan	N/A
3	1	1	FS03-004	7/20/95	N/A	Floor Scan	N/A
3	2	1	03-002	4/20/95	29	Upper	4
3	2	1	03-005	6/20/95	40	Lower	4
3	2	1	FS03-001	4/20/95	N/A	Floor Scan	N/A
3	2	1	FS03-004	7/20/95	N/A	Floor Scan	N/A
3	3	1	03-001	4/19/95	30	Upper	4
3	3	1	03-004	6/19/95	40	Lower	4
3	3	1	FS03-002	4/19/95	N/A	Floor Scan	N/A
3	3	1	FS03-004	7/20/95	N/A	Floor Scan	N/A
3	4	1	03-008	6/28/95	4	Lower	4
3	4	1	FS03-005	7/21/95	N/A	Floor Scan	N/A
3	4	1	FS03-006	7/21/95	N/A	Floor Scan	N/A
3	4	2	03-009	6/28/95	4	Lower	4
3	4	2	FS03-005	7/21/95	N/A	Floor Scan	N/A
3	4	2	FS03-006	7/21/95	N/A	Floor Scan	N/A
3	4	3	03-010	6/28/95	2	Lower	4
3	4	3	FS03-005	7/21/95	N/A	Floor Scan	N/A
3	4	3	FS03-006	7/21/95	N/A	Floor Scan	N/A
3	4	4	03-011	6/28/95	2	Lower	4
3	4	4	FS03-005	7/21/95	N/A	Floor Scan	N/A
3	4	4	FS03-006	7/21/95	N/A	Floor Scan	N/A
3	4	5	03-012	6/28/95	6	Lower	4
3	4	5	FS03-005	7/21/95	N/A	Floor Scan	N/A
3	4	5	FS03-006	7/21/95	N/A	Floor Scan	N/A
3	4	6	03-013	6/28/95	1	Lower	4
3	4	6	FS03-005	7/21/95	N/A	Floor Scan	N/A
3	4	6	FS03-006	7/21/95	N/A	Floor Scan	N/A
3	4	7	03-028	6/29/95	1	Lower	4
3	4	7	FS03-005	7/21/95	N/A	Floor Scan	N/A
3	4	7	FS03-006	7/21/95	N/A	Floor Scan	N/A
3	4	8	03-014	6/28/95	1	Lower	4
3	4	8	FS03-005	7/21/95	N/A	Floor Scan	N/A
3	4	8	FS03-006	7/21/95	N/A	Floor Scan	N/A
3	4	9	03-015	6/28/95	2	Lower	4
3	4	9	FS03-005	7/21/95	N/A	Floor Scan	N/A
3	4	9	FS03-006	7/21/95	N/A	Floor Scan	N/A
3	4	10	03-016	6/28/95	6	Lower	4
3	4	10	FS03-005	7/21/95	N/A	Floor Scan	N/A
3	4	10	FS03-006	7/21/95	N/A	Floor Scan	N/A
3	4	11	03-017	6/28/95	6	Lower	4
3	4	11	FS03-005	7/21/95	N/A	Floor Scan	N/A
3	4	11	FS03-006	7/21/95	N/A	Floor Scan	N/A
3	4	12	03-018	6/28/95	4	Lower	4
3	4	12	FS03-005	7/21/95	N/A	Floor Scan	N/A
3	4	12	FS03-006	7/21/95	N/A	Floor Scan	N/A
3	4	13	03-019	6/28/95	17	Lower	4
3	4	13	FS03-005	7/21/95	N/A	Floor Scan	N/A
3	4	13	FS03-006	7/21/95	N/A	Floor Scan	N/A
3	4	14	03-020	6/28/95	3	Lower	4
3	4	14	FS03-005	7/21/95	N/A	Floor Scan	N/A
3	4	14	FS03-006	7/21/95	N/A	Floor Scan	N/A
3	4	15	03-021	6/28/95	1	Lower	4
3	4	15	FS03-005	7/21/95	N/A	Floor Scan	N/A
3	4	15	FS03-006	7/21/95	N/A	Floor Scan	N/A
3	4	16	03-022	6/28/95	1	Lower	4
3	4	16	FS03-005	7/21/95	N/A	Floor Scan	N/A
3	4	16	FS03-006	7/21/95	N/A	Floor Scan	N/A
3	4	17	03-023	6/28/95	1	Lower	4
3	4	17	FS03-005	7/21/95	N/A	Floor Scan	N/A

## Survey Cross Reference

Section	Unit	Sub-Unit	Survey Serial Number	Survey Date	Number of Survey Points	Type	Classification
3	4	17	FS03-006	7/21/95	N/A	Floor Scan	N/A
3	4	18	03-024	6/28/95	1	Lower	4
3	4	18	FS03-005	7/21/95	N/A	Floor Scan	N/A
3	4	18	FS03-006	7/21/95	N/A	Floor Scan	N/A
3	4	19	03-025	6/28/95	1	Lower	4
3	4	19	FS03-005	7/21/95	N/A	Floor Scan	N/A
3	4	19	FS03-006	7/21/95	N/A	Floor Scan	N/A
3	4	20	03-026	6/28/95	1	Lower	4
3	4	20	FS03-005	7/21/95	N/A	Floor Scan	N/A
3	4	20	FS03-006	7/21/95	N/A	Floor Scan	N/A
3	4	21	03-027	6/28/95	1	Lower	4
3	4	21	FS03-005	7/21/95	N/A	Floor Scan	N/A
3	4	21	FS03-006	7/21/95	N/A	Floor Scan	N/A
4	1	1	04-001	6/6/95	31	Lower	4
4	1	1	04-020	4/18/96	30	Upper	4
4	1	2	04-003	6/6/95	2	Lower	4
4	1	3	04-004	6/6/95	2	Lower	4
4	1	4	04-017	6/8/95	20	Lower	4
4	1	4	04-018	6/12/95	10	Lower	4
4	1	5	04-006	6/6/95	4	Lower	4
4	1	6	04-007	6/6/95	2	Lower	4
4	1	7	04-008	6/6/95	2	Lower	4
4	1	8	04-005	6/6/95	10	Lower	4
4	1	9	04-009	6/6/95	1	Lower	4
4	1	10	04-010	6/6/95	3	Lower	4
4	1	11	04-014	6/7/95	2	Lower	4
4	1	12	04-011	6/6/95	2	Lower	4
4	1	13	04-012	6/6/95	2	Lower	4
4	1	14	04-013	6/6/95	2	Lower	4
4	1	15	04-015	6/7/95	8	Lower	4
4	1	16	04-016	6/7/95	6	Lower	4
4	1	17	04-002	6/6/95	10	Lower	4
4	18	1	04-019	8/30/95	31	Roof	1

**APPENDIX B**

**CALCULATION OF MINIMUM DETECTABLE ACTIVITY**

**(EXCERPT FROM NUREG/CR-5849)**

**REPORT #006**

## 5.2 Instrument Detection Sensitivity

The **detection sensitivity** of a measurement system refers to the statistically determined quantity of radioactive material or radiation that can be measured or detected at a preselected confidence level. This sensitivity is a factor of both the instrumentation and the technique or procedure being used. Typically, detection sensitivity has been defined (EPA 1980) as that level above which there is less than a 5% probability that radioactivity will be reported present when it is really absent (Type I error) or reported absent when it really is present (Type II error). This definition has been adopted for the purposes of this Manual.

Two terms used when referring to detection sensitivity are the lower limit of detection and the minimum detectable activity (EPA 1980, CURRIE 1968). The **lower limit of detection** is an *a priori* estimated detection capability, related to the characteristics of the instrumentation. **Minimum detectable activity (MDA)** is an *a priori* estimate of the minimum activity level which is practically measurable with a specific instrument, and sampling and/or measurement technique. Of the two concepts, the MDA is used in this Manual for radiological survey applications. The basic relationship for estimating the MDA is:

$$\text{MDA} = K(2.71 + 4.65 s_b) \quad (5-1)$$

where

K = a proportionality constant relating the detector response (in counts) to an activity concentration.

$s_b$  = the standard deviation of the background count.

Several practical radiological survey applications of this relationship are presented here.

## Surface Activity Measurement

For an integrated measurement over a preset time, the MDA for surface activity can be approximated by:

$$MDA = \frac{2.71 + 4.65 \sqrt{B_R \cdot t}}{t \cdot E \cdot \frac{A}{100}} \quad (5-2)$$

where

MDA	=	activity level in disintegrations/minute/100 cm <sup>2</sup>
B <sub>R</sub>	=	background rate in counts/minute
t	=	counting time in minutes
E	=	detector efficiency in counts/disintegration
A	=	active probe area in cm <sup>2</sup>

### Sample Calculation:

B <sub>R</sub>	=	40 counts/minute
t	=	1 minute
E	=	0.20 counts/disintegration
A	=	15 cm <sup>2</sup>

$$MDA = \frac{2.71 + 4.65\sqrt{40 \cdot 1}}{1 \cdot 0.20 \cdot \frac{15}{100}}$$

$$= 1100^* \text{ disintegrations/minute/100 cm}^2$$

\* Rounded to two significant figures.

The MDA of a ratemeter instrument for surface activity measurements can be approximated by taking twice the time constant of the meter as the counting time and using the relationship (KNOLL 1979):

(5-3)

$$MDA = \frac{4.65\sqrt{B_R / 2t_c}}{E \cdot \frac{A}{100}}$$

where

- MDA = activity level in disintegrations/minute/100 cm<sup>2</sup>  
 B<sub>R</sub> = background rate in counts/minute  
 t<sub>c</sub> = meter time constant in minutes  
 E = detector efficiency in counts/disintegration  
 A = active probe area in cm<sup>2</sup>

Sample Calculation: (for t<sub>c</sub> = 4 seconds)

$$MDA = \frac{4.65\sqrt{40/2 \cdot 0.0667}}{0.20 \cdot \frac{15}{100}}$$

$$= 2700^* \text{ disintegrations/minute/100 cm}^2$$

\* Rounded to two significant figures.

### Scanning

The ability to identify a small region or area of slightly elevated radiation during surface scanning (refer to Section 6.4.2) is dependent upon the surveyor's skill in recognizing an increase in the audible output of the instrument. Experience has shown that a 25% to 50% increase may be easily identifiable at ambient background levels of several thousand counts per minute, whereas, at ambient levels of a few counts per minute, a two to three fold increase in the audible signal is required before a change is readily recognizable. The detection sensitivity of scanning is dependent upon a number of other factors, such as detector speed, size of elevated activity region, level of activity, detector/surface distance; therefore, the ability to detect an elevated region of activity using a particular survey scanning technique should be determined empirically. A rough estimate of the MDA can be calculated by substituting the audibly discernable increase in count rate for the numerator in equation 5-3.

Sample Calculation:

$$B_R = 40 \text{ counts/minute}$$

$$E = 0.20 \text{ counts/disintegration}$$

$$A = 15 \text{ cm}^2$$

Three times the background rate ( $B_R$ ) is audibly discernable as an increase in instrument response by the surveyor using the particular technique selected for the procedure.

$$MDA = \frac{3 \cdot B_R}{0.20 \cdot \frac{15}{100}}$$

$$= 4000 \text{ disintegrations/minute/100 cm}^2$$

Laboratory Analyses

Additional factors may be introduced into the calculation for estimating detection sensitivities for laboratory analyses. Examples of such factors are chemical recovery, sample size, and emission abundances for specific radiations of interest in the analytical process. An example of a calculation for a typical lab procedure for soil analysis would be:

$$MDA = \frac{2.71 + 4.65 \sqrt{B_R \cdot t}}{t \cdot E \cdot S \cdot Y \cdot 2.22} \quad (5-4)$$

where

- MDA = activity in pCi/g
- $B_R$  = background rate in counts/minute
- t = counting time in minutes
- E = detector efficiency in counts/disintegration
- S = samples size in grams
- Y = other factors such as percent chemical recovery and number of emissions of radiation being measured per disintegration of the radionuclide
- 2.22 = conversion from disintegrations/minute to pCi.

### Sample Calculation:

$B_R$	=	2 counts/minute
$t$	=	30 minutes
$E$	=	0.02 counts/disintegration
$S$	=	750 grams
$Y$	=	0.25 (emissions per disintegration)

$$MDA = \frac{2.71 + 4.65\sqrt{2 \cdot 30}}{30 \cdot 0.02 \cdot 750 \cdot 0.25 \cdot 2.22}$$

$$= 1.55 \text{ pCi/g}$$

### General Considerations

In application, the system should be capable of measuring levels below 75%, and preferably at or below 10%, of an established guideline value. It should be noted that many of the radiological instruments and monitoring techniques typically used for applied health physics activities in an operating facility may not provide the detection sensitivities necessary to demonstrate compliance with the guideline levels for license termination. As described above, parameters which will determine the detection sensitivity of a system are background level, detection efficiency, measurement (or counting) time, and sample size or area.

The detection sensitivity for a given application can be improved, (i.e. lowered) by (1) selecting an instrument with a higher efficiency or a lower background; (2) increasing the counting time; (3) increasing chemical recovery; and (4) increasing the size of the sample or the effective probe area. Increasing efficiency, recovery, and sample or area size has the effect of lowering the MDA in direct proportion to the amount of change. For example, selecting a detector with twice the active probe area will decrease the MDA by a factor of 2 (assuming all other parameters remain unchanged). Changes in background rate or counting time effect the MDA proportional to the square root of the change. If, for example, the background rate is increased by a factor of two and all other parameters remain unchanged, the MDA will be increased by a factor of  $\sqrt{2}$  or 1.414; doubling the counting time has the net effect of lowering the MDA by a factor of 1.414. Tables 5-4 through 5-6 provide information on the approximate detection sensitivities for some of the commonly used field survey instruments using nominal background levels and detection efficiencies as well as standard

survey procedures. Information on detection sensitivities for laboratory procedures is provided in Section 7.0.

### 5.3 Instrument Selection and Use

Radiological conditions that should be determined for license termination purposes include total surface activities, removable surface activities, exposure rates, radionuclide concentrations in soil, and/or induced activity levels. To determine these conditions, field measurements and laboratory analyses may be necessary. For certain radionuclides or radionuclide mixtures both alpha and beta radiations may have to be measured. In addition to assessing the average radiological conditions, small areas with elevated levels of residual contamination should be identified and their extents and activities determined. With so many variable applications, it is highly unlikely that any single instrument (detector and readout combination) will be capable of adequately measuring all of the radiological parameters required to demonstrate that criteria for unrestricted release have been satisfied. It is usually necessary therefore to select multiple instruments to perform the variety of measurements required.

Selection of instruments will require an evaluation of a number of situations or conditions. Instruments must be stable and reliable under the environmental and physical conditions where they will be used, and their physical characteristics (size and weight) should be compatible with the intended application. The instrument must be able to detect the type of radiation of interest, and must, in relation to the survey or analytical technique, be capable of measuring levels which are less than the guideline values. There are numerous commercial firms, offering a wide variety of detectors, readout devices, and detector/readout systems, appropriate for measurements described in this Manual. These vendors can provide thorough information regarding capabilities, operating characteristics, limitations, etc. for specific equipment.

This Section provides assistance on selection of instrumentation for surveys associated with license termination. A flow chart (Figure 5-1) and checklist to assist the Manual user in the instrument selection process are included at the end of this Section.

This section describes the primary applications of instrumentation to field radiological measurements for license termination surveys. The reader should refer to Section 7.0 for information on laboratory applications.

**APPENDIX C**

**COMPARISON WITH GUIDELINE VALUES AND**

**IDENTIFYING ADDITIONAL**

**MEASUREMENT/SAMPLING NEEDS**

**(EXCERPT FORM NUREG/CR-5849)**

**REPORT #006**

## 8.5 Comparison With Guideline Values

### 8.5.1 Removable Activity

Data for removable activity levels are compared directly to the guideline values. The limit for removable activity is 20% of the guideline value for total surface activity. If that level is exceeded, remediation and resurvey is necessary.

### 8.5.2 Elevated Areas of Activity

Levels of residual activity, i.e. elevated areas, which exceed the guideline value are initially compared directly with the guideline.

- Buildings or Structures

The limit for activity on a building or structure surface is three times the guideline value, when averaged over an area of 100 cm<sup>2</sup>. Residual activity exceeding this limit should be remediated and follow-up surveys performed. Areas of elevated activity between one and three times the guideline value are then tested to assure that the average surface activity level within a contiguous 1 m<sup>2</sup> area containing the elevated area is less than the guideline value.

To evaluate whether this averaging condition is satisfied, additional measurements are performed, and the activity level and areal extent of the elevated area are determined. The average (weighted average) in the 1 m<sup>2</sup> area is then calculated, taking into consideration the relative fraction of the 1 m<sup>2</sup> occupied by the elevated area(s), using the relationship:

$$\bar{x}_w = \frac{1}{n_s} \sum_{i=1}^{n_s} x_i \left[ 1 - \sum_{k=1}^{n_k} A_k \right] + \sum_{k=1}^{n_k} y_k A_k \quad (8-10)$$

where

- $\bar{x}_w$  = weighted mean including elevated area(s)
- $x_i$  = systematic and random measurements at point i
- $n_s$  = number of systematic and random measurements
- $y_k$  = elevated area activity in area k
- $A_k$  = fraction of 1 m<sup>2</sup> occupied by elevated area k
- $n_k$  = number of elevated areas.

### Sample Calculation

The survey has identified an area of surface activity, having an average level of 7000 dpm/100 cm<sup>2</sup> and occupying an area of 800 cm<sup>2</sup>. Five measurements in the contiguous 1 m<sup>2</sup>, outside the elevated area, are each less than the guideline value of 5000 dpm/100 cm<sup>2</sup> and average 2300 dpm/100 cm<sup>2</sup>. The weighted mean for the 1 m<sup>2</sup> area containing the elevated area is:

$$\begin{aligned} \bar{x}_w &= 2300 \left[ 1 - \frac{800}{10000} \right] + 7000 \left[ \frac{800}{10000} \right] \\ &= 2116 \quad + \quad 560 \\ &= 2676 \text{ dpm/100 cm}^2 \end{aligned}$$

- **soil**

The limit for soil activity at any location is three times the average guideline value. Residual activity exceeding this level should be remediated and follow-up survey performed. Areas of elevated activity between one and three times the guideline value are then tested to assure that the average concentration is less than  $(100/A)^{1/2}$  times the guideline value, where A is the area of the elevated activity in m<sup>2</sup>. Levels exceeding this limit should be remediated. If this condition is satisfied, the average activity in the 100 m<sup>2</sup> contiguous area containing the region

of elevated is then determined to assure that it is within the guideline value. Equation 8-10 is also used for this calculation, substituting 100 m<sup>2</sup> for the 1 m<sup>2</sup>, used when calculating average surface activity.

### Sample Calculation

Five systematic soil samples from a 100 m<sup>2</sup> grid block have the following concentrations of a specific radionuclide for which the guideline level is 10 pCi/g:

1.5 pCi/g  
2.7 pCi/g  
5.0 pCi/g  
1.6 pCi/g  
3.5 pCi/g

In addition, this area also contains a 20 m<sup>2</sup> elevated area with an average concentration of 15.5 pCi/g. Using the relationship of  $(100/A)^{1/2}$  the 20 m<sup>2</sup> area would be permitted to have an average concentration of  $(100/20)^{1/2}$  or 2.236 times the guideline value, i.e. 22.36 pCi/g. The activity level of 15.5 pCi/g in this elevated area satisfied this limit. The weighted average for the contiguous 100 m<sup>2</sup>, containing the elevated area is:

$$\begin{aligned}\bar{x}_w &= 2.9 \left[ 1 - \frac{20}{100} \right] + 15.5 \left[ \frac{20}{100} \right] \\ &= 2.32 \quad + \quad 3.10 \\ &= 5.42 \text{ pCi/g}\end{aligned}$$

### 8.5.3 Exposure Rates

Exposure rate levels are compared directly with the guideline value. The maximum exposure rate may not exceed two times the guideline value, above background. If the level is above that value, the area should be remediated and resurveyed.

#### 8.5.4 Calculating Average Levels

General surface activity, soil activity, and exposure rate guideline values are average values, above background, established for areas of survey unit surfaces (surface activity), 100 m<sup>2</sup> (soil activity and open land exposure rates), and 10 m<sup>2</sup> (indoor exposure rates). To enable comparison of the survey data with those guidelines, the mean ( $\bar{x}$ ) of measurements in each of the survey units is calculated using all measurements ( $n_s$ ) within that area:

$$\bar{x} = \frac{1}{n_s} \sum_{i=1}^{n_s} x_i \quad (8-11)$$

#### 8.5.5 Comparisons

Average levels, calculated following the procedures in Section 8.5.4, are compared with the guideline values and conditions. If the averages exceed the applicable guideline values and/or conditions, further remediation is required and follow-up measurements are performed to verify the effectiveness of the actions. After the averages satisfy the guideline values and conditions, the results are further evaluated to determine whether the data for each survey unit (i.e. group of contiguous grids or regions with the same classification of contamination potential), provides a 95% confidence level that the true mean activity level meets the guidelines.

The test is performed by calculating the average (equation 8-11) and standard deviation of the data for a particular radiological parameter in each survey unit using all measurement locations; the standard deviation is calculated by:

$$s_x = \sqrt{\frac{\sum_{i=1}^n (\bar{x} - x_i)^2}{n-1}} \quad (8-12)$$

If there are areas of elevated activity in the survey unit, the weighted mean  $\bar{x}_w$  (equation 8-10) for each 1 m<sup>2</sup> of building surface or 100 m<sup>2</sup> of land, containing an elevated area, is used as one of the  $x_i$ 's in equations 8-11 and 8-12.

The Environmental Protection Agency (EPA 1989) has recommended the following equation for testing data, relative to a guideline value, at a desired level of confidence.

$$\mu_{\alpha} = \bar{x} + t_{1-\alpha, df} \frac{s_x}{\sqrt{n}} \quad (8-13)$$

where

$t_{1-\alpha, df}$  is the 95% confidence level obtained from Appendix B, Table B-1; df (degrees of freedom) is n-1.  $\alpha$  is the false positive probability, i.e. the probability that  $\mu_{\alpha}$  is less than the guideline value if the true mean activity level is equal to the guideline value.

$\bar{x}$  is the calculated mean from equation 8-11.

$s_x$  is the standard deviation from equation 8-12.

n is the number of individual data points used to determine  $\bar{x}$  and  $s_x$ .

The value of  $\mu_{\alpha}$  is compared to the guideline value; if  $\mu_{\alpha}$  is less than the guideline, the area being tested meets the guideline at a 95% confidence level. This means that the probability is less than 5% that  $\mu_{\alpha}$  will pass the test, when the true mean activity level exceeds the guideline value.

#### Sample Calculation 1

Surface activity levels (dpm/100 cm<sup>2</sup>) at 35 systematic locations in an affected area are:

4100	2190	<460	4000
3250	1430	1380	<480
2120	4370	1840	2060
2600	2390	2160	1970
4750	3710	4020	2350
2000	1220	2030	
3140	1250	1700	
1790	4390	1510	
2000	<460	2420	
3630	4130	3430	

Instrument background has already been subtracted for this surface activity measurement.

The mean and standard deviation are:

$$\bar{x} = 2478 \text{ dpm/100 cm}^2 \text{ (from equation 8-11)*}$$

$$s_x = 1196 \text{ dpm/100 cm}^2 \text{ (from equation 8-12)}$$

$$t_{1-\alpha, df} = 1.692 \text{ for 34 degrees of freedom (Table B-1)}$$

$$\mu_\alpha = 2478 + 1.692 \frac{1196}{\sqrt{35}} = 2820 \text{ dpm/100 cm}^2$$

\*Only minimum detectable activity (MDA) values were available for some measurement locations in this example; the MDA values were therefore used as actual activity levels for the purpose of performing this calculation.

The site-specific guideline value for the site is 5000 dpm/100 cm<sup>2</sup>. Because  $\mu_\alpha$  is less than 5000 dpm/100 cm<sup>2</sup>, the data for this survey unit satisfy the guideline at the 95% confidence level.

### Sample Calculation 2

Concentrations of net (background subtracted) activity at 20 random soil sampling locations are:

1.2	pCi/g	1.5	pCi/g
2.3	pCi/g	2.7	pCi/g
4.4	pCi/g	5.0	pCi/g
2.3	pCi/g	1.6	pCi/g
3.4	pCi/g	3.5	pCi/g
1.6	pCi/g	3.1	pCi/g
0.9	pCi/g	1.7	pCi/g
1.6	pCi/g	1.1	pCi/g
3.3	pCi/g	1.4	pCi/g
2.4	pCi/g	2.2	pCi/g

The guideline value for the site is 4 pCi/g, above background.

Although two of the samples contain activity levels above the guideline value, they satisfy the condition of the maximum concentration being less than three times the guideline value. For the purpose of this example it is assumed that the elevated areas have been tested (Section 8.5.2) and satisfy the conditions for accepting elevated areas.

The mean and standard deviation for this group of data are:

$$\bar{x} = 2.36 \text{ pCi/g (from equation 8-11)}$$

$$s_x = 1.12 \text{ pCi/g (from equation 8-12)}$$

$$t_{1-\alpha, df} = 1.729 \text{ for 19 degrees of freedom (Table B-1)}$$

$$\mu_\alpha = 2.36 + 1.729 \frac{1.12}{\sqrt{20}} = 2.79 \text{ pCi/g}$$

Comparison of  $\mu_\alpha$  (2.79 pCi/g) with the guideline value (4 pCi/g) indicates that the guideline has been satisfied at the desired level of confidence.

Areas for which  $\mu_\alpha$  is  $\leq$  the guideline values by this testing procedure are considered acceptable and no further survey actions are required. If the mean value exceeds the guideline value, the area is not acceptable and further cleanup is required. If the mean value is less than the guideline value, but the test of confidence is inconclusive, i.e.  $\bar{x} < \text{guideline value} < \mu_\alpha$ , either (1) further cleanup with follow-up measurements/sampling or (2) additional measurements/sampling may be conducted.

The technique described above provides a conservative approach, because it gives equal weight to systematic and random measurements and to the weighted means of areas of elevated activity, which may be associated with much smaller surface areas than are the systematic and random measurements. An alternate approach to provide a less based estimate of the mean activity level is as follows.

Calculate the sample mean,  $\bar{y}_k$ , and sample variance,  $s_{yk}^2$ , for elevated level, k, of area,  $A_k$ .

$$\bar{y}_k = \frac{1}{n_k} \sum_{j=1}^{n_k} y_{kj} \quad (8-14)$$

$$s_{yk}^2 = \frac{1}{n_k - 1} \sum_{j=1}^{n_k} (\bar{y}_k - y_{kj})^2 \quad (8-15)$$

The weighted average  $\bar{x}_w$  is then calculated by:

$$\bar{x}_w = \bar{x}(1-A) + \sum_{k=1}^{n_H} A_k \bar{y}_k \quad (8-16)$$

and the estimated variance of  $\bar{x}_w$  is:

$$s_w^2 = \frac{(1-A)^2 s_x^2}{n_s} + \sum_{k=1}^{n_H} \frac{A_k^2 s_{yk}^2}{n_k} \quad (8-17)$$

The value,  $\mu_\alpha$ , for testing the weighted average is calculated by:

$$\mu_\alpha = \frac{\bar{x}_w}{x_w} + t_{1-\alpha, df} \cdot s_w \quad (8-18)$$

The value of  $t_{1-\alpha, df}$  is obtained from Appendix B, Table B-1; the degrees of freedom are determined by:

$$df = \frac{S_w^4}{D} \quad (8-19)$$

and

$$D = \frac{(1-A)^4 s_x^4}{n_s^2(n_s-1)} + \sum_{k=1}^{n_H} \frac{A_k^4 s_{yk}^4}{n_k^2(n_k-1)} \quad (8-20)$$

## 8.6 Identifying Additional Measurement/Sampling Needs

If  $\mu_\alpha$  calculated in the previous section is greater than  $C_G$  (NRC guideline value), there are two possibilities. If  $\bar{x} \geq C_G$ , a cleanup is required. However, if  $\bar{x} < C_G$ , a larger sample might be able to demonstrate compliance. The sample mean ( $\bar{x}$ ) and standard deviation(s) for a given sample size were calculated in the previous Section using equations 8-11 and 8-12. Using these parameters, the total number of data points ( $n_1$ ) which would be required to demonstrate that the activity level satisfies the guideline value at the desired level of confidence, is determined by:

$$n_1 = \left[ \frac{s_x}{C_G - \bar{x}} \right]^2 [Z_{1-\alpha} + Z_{1-\beta}]^2 \quad (8-21)$$

where

$n_1$	=	number of data points required
$C_G$	=	guideline value
$\bar{x}$	=	mean
$s_x$	=	sample standard deviation
$Z_{1-\alpha}, Z_{1-\beta}$	=	standard normal variables: $\alpha$ is the false positive probability, i.e. that $\mu_\alpha < C_G$ , if the true mean activity is equal to $C_G$ , and $\beta$ is the false negative probability, i.e. that $\mu_\alpha > C_G$ , if the true mean activity is equal to $C_G$ .

Table B-2 (Appendix B) has been provided for ease of estimating the total number of data-points required to demonstrate meeting guidelines at a false positive level of 5% and a false negative level of 10%. Subtracting the number of data points already collected ( $n$ ) from this total calculated number ( $n_1$ ), determines the number of additional measurements or samples which will be required to demonstrate the desired confidence of the data. If this calculation indicates that additional data are needed from a survey unit to demonstrate meeting the guideline, it is recommended that they be collected uniformly over the area, using the same sampling methodology as that used for the first samples. To demonstrate compliance,  $\mu_\alpha$  is based on all data points; thus additional data are combined with the original data and the acceptance testing repeated. The process of determining additional samples to try to meet the guideline can only be done one time. If the additional samples do not bring  $\mu_\alpha$  below the guideline, additional remediation will be required.

### Sample Calculation:

Ten measurements have a mean of 7.0 pCi/g with a standard deviation of 2.8 pCi/g. The guideline value is 8.0 pCi/g.

$$\mu_{\alpha} = 7.0 + 1.833 \frac{2.8}{\sqrt{10}} = 8.6 \text{ pCi/g}$$

Although the mean is less than the guideline value, the test for significance is not satisfied at the 95% confidence level. The total number of measurements ( $n_1$ ) required to achieve acceptance is determined from Table B-2, for the value of

$$\frac{C_G - \bar{x}}{s_x} = \frac{8.0 - 7.0}{2.8} = 0.36$$

$n_1 = 68$  measurements

An additional 58 (68-10) measurements are required to demonstrate acceptance.

### Determining Numbers of Background Data Points

As discussed in Section 2.3.1, the average background level determined from an initial 6-10 measurements or samples is adequate for use in evaluating radiological conditions, relative to a specific guideline value, when that average background is insignificant relative to the guideline. For the purposes of this Manual, the background has been considered insignificant if it is <10% of the guideline, although the licensee may use such background levels in determining net residual activity, following the methodology described below. When the background level is significant relative to the guideline value, i.e. >10% of the guideline, however, it is necessary that the average background determined is representative of the true background level to assure correct decisions in the final assessing site conditions. The objective for background determination is that the average level should accurately represent the true background average to within  $\pm 20\%$  at the 95% confidence level. Selection of this criteria for defining an acceptable accuracy for background determinations is arbitrary, based on the natural variations (of background levels) occurring in the environment and the need to keep the effort and cost devoted to background determination reasonable.

The total number of background measurements needed to satisfy the objective is calculated by:

$$n_B = \left[ \frac{t_{95.5\%,df} \cdot s_x}{0.2 \cdot \bar{x}_B} \right]^2 \quad (8-22)$$

where

$n_B$	=	number of background measurements required
$\bar{x}_B$	=	mean of initial background measurements
$s_x$	=	standard deviation of initial background measurements
$t_{95.5\%, df}$	=	t statistic for 95.5% confidence at $df=n-1$ degrees of freedom, where n is the number of initial background data points

Table B-1 (Appendix B) contains a list of values for the  $t_{95.5}$  statistic at various degrees of freedom. Subtracting the number of data points already collected (n) from this total calculated number ( $n_B$ ), determines the number of additional measurements or samples which will be required to demonstrate the desired confidence of the data. If this calculation indicates that additional background data are needed, it is recommended that they be collected uniformly over the area, using the same sampling methodology as that used for the initial samples. The average background is then recalculated using all data points.

Sample Calculation:

Seven soil samples, collected for determining the background level of U-238, contained the following concentrations:

1.3	pCi/g
0.6	pCi/g
0.9	pCi/g
1.6	pCi/g
1.8	pCi/g
1.5	pCi/g
2.0	pCi/g

The mean (equation 8-11) and standard deviation (equation 8-12) for these data are calculated to be 1.39 pCi/g and 0.50 pCi/g, respectively; the t statistic (Table B-1, column 2) is 2.447 for 6 degrees of freedom. The total number of determinations required to establish the average background to within  $\pm 20\%$  of the true average at the 95% confidence level is calculated by:

$$n_1 = \left[ \frac{2.447 \cdot 0.50}{0.2 \cdot 1.39} \right]^2 = 19.4$$

This calculation indicates a need for a total of 20 data points, or 13 additional (20-7) data points to satisfy the statistical objective for this case.

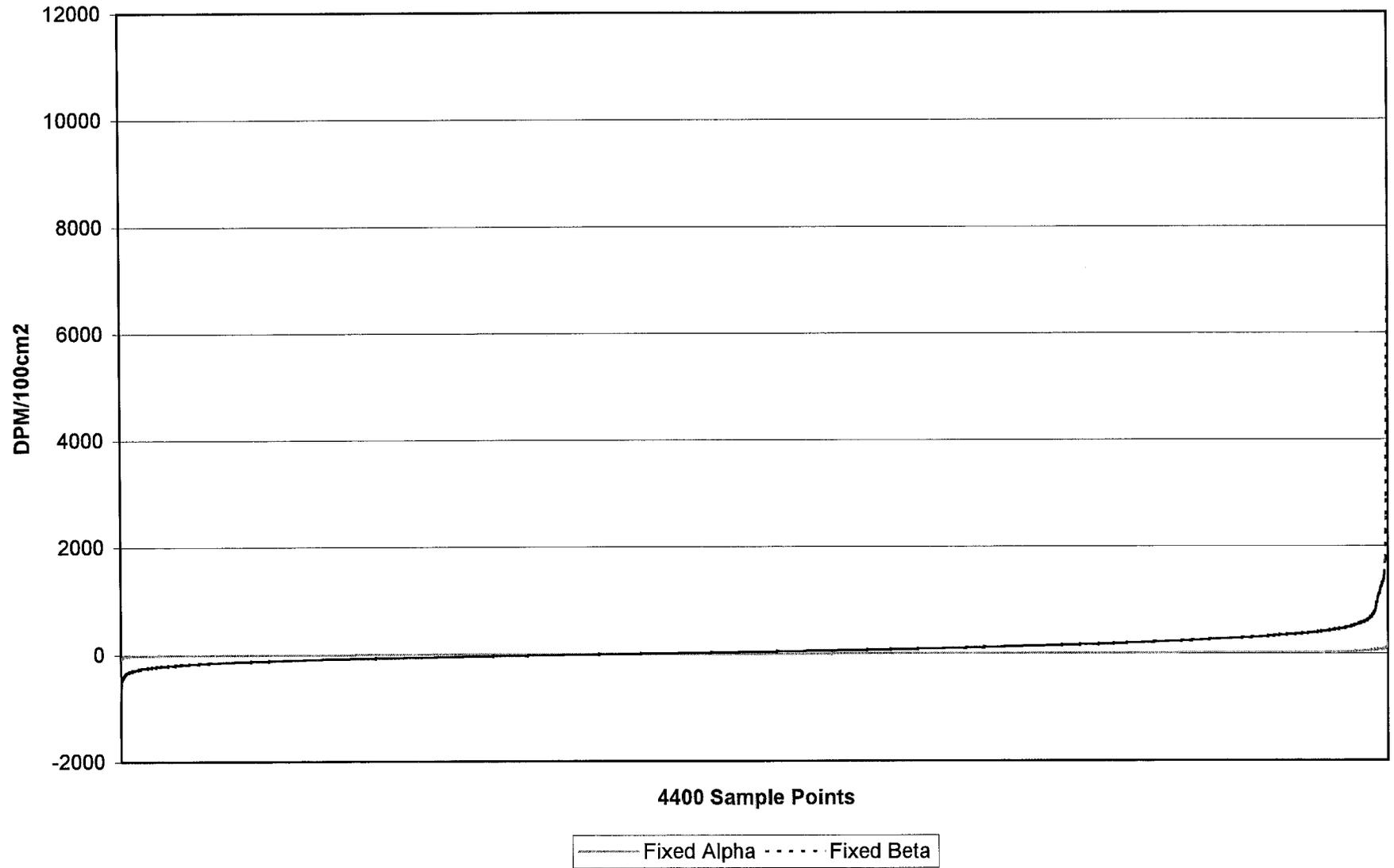
**APPENDIX D**  
**LOWER SURVEY UNITS ALL DATA,**  
**DATA TRENDS**

**REPORT #006**

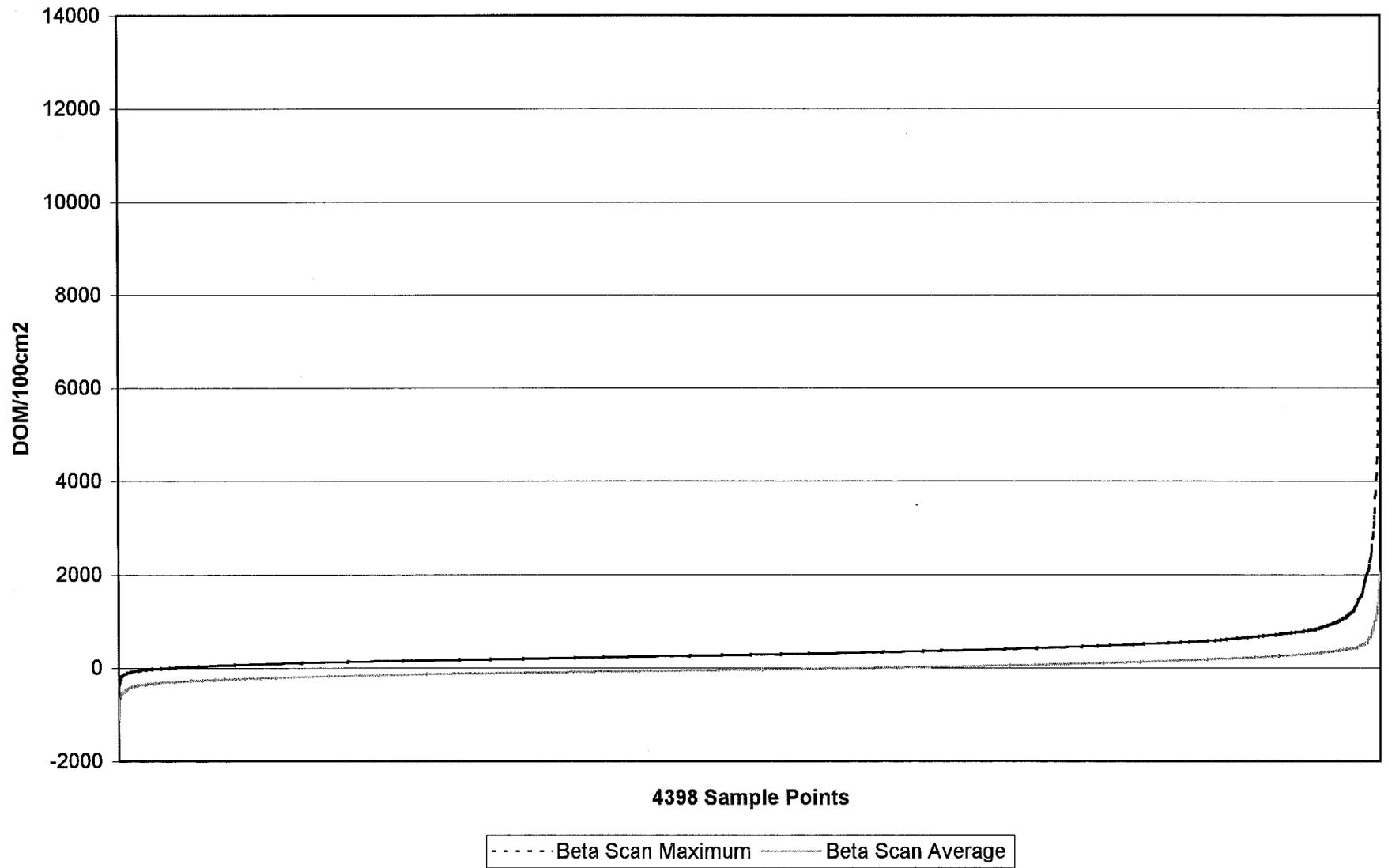
**SURVEY UNIT 1-ALL  
LOWER DATA TRENDS**

**REPORT #007**

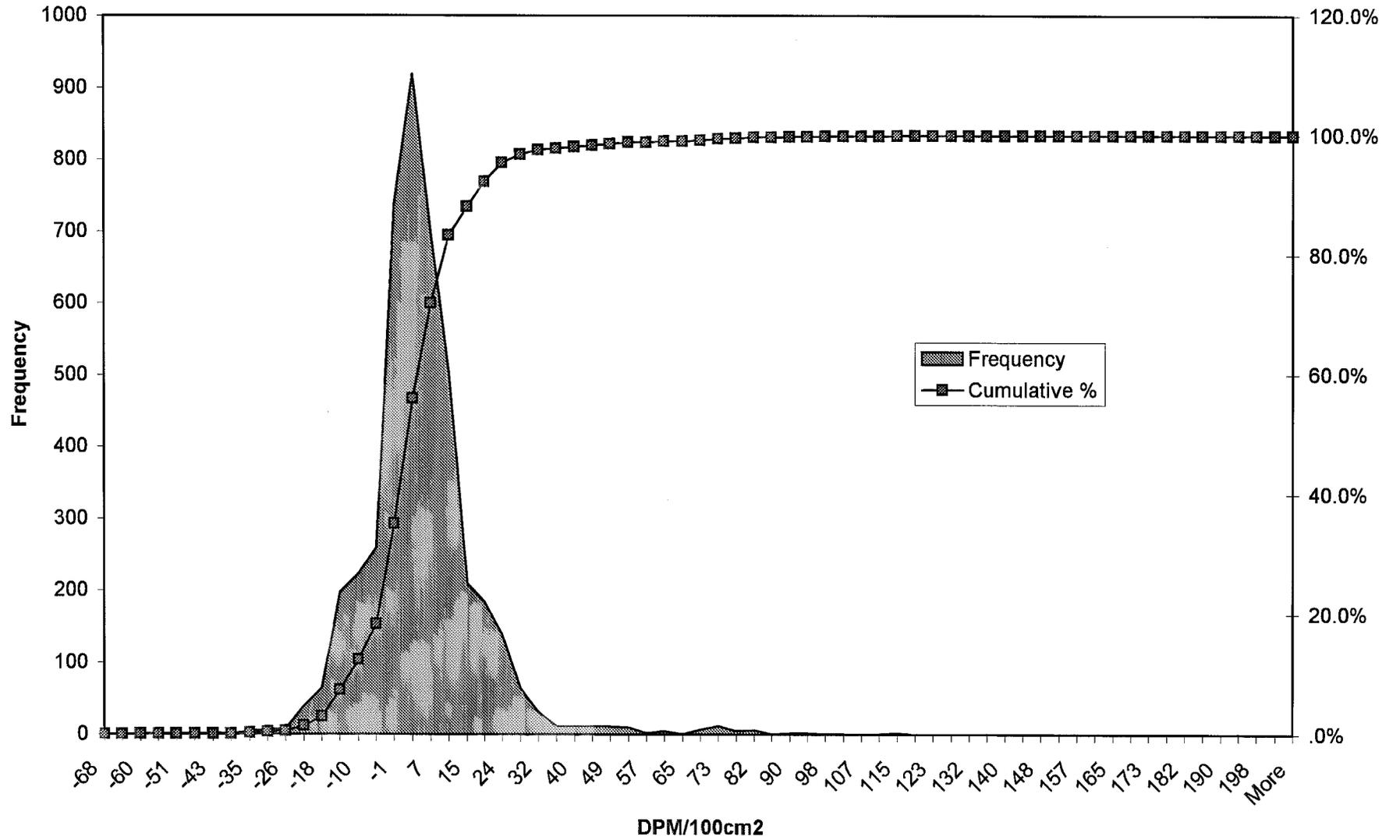
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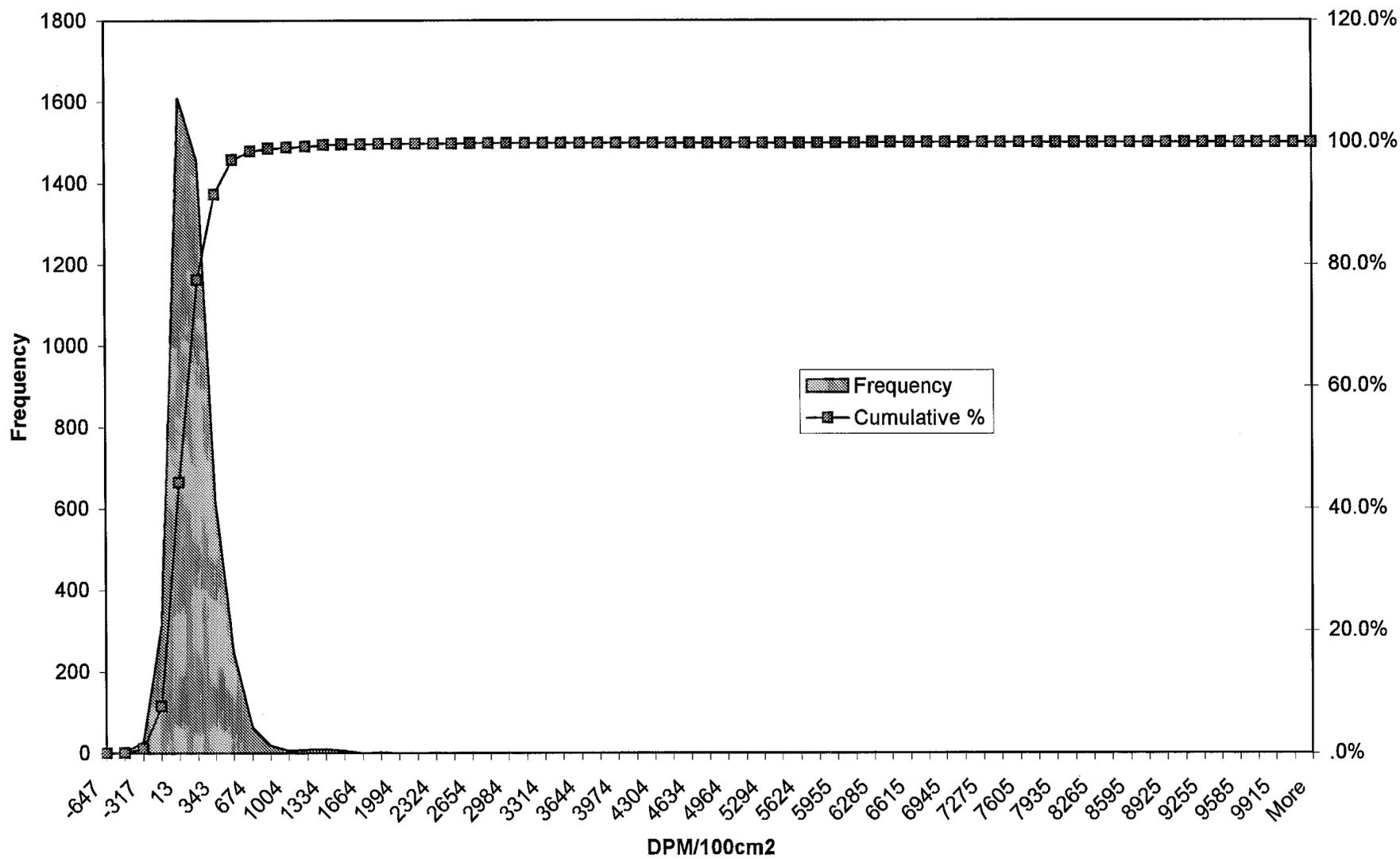
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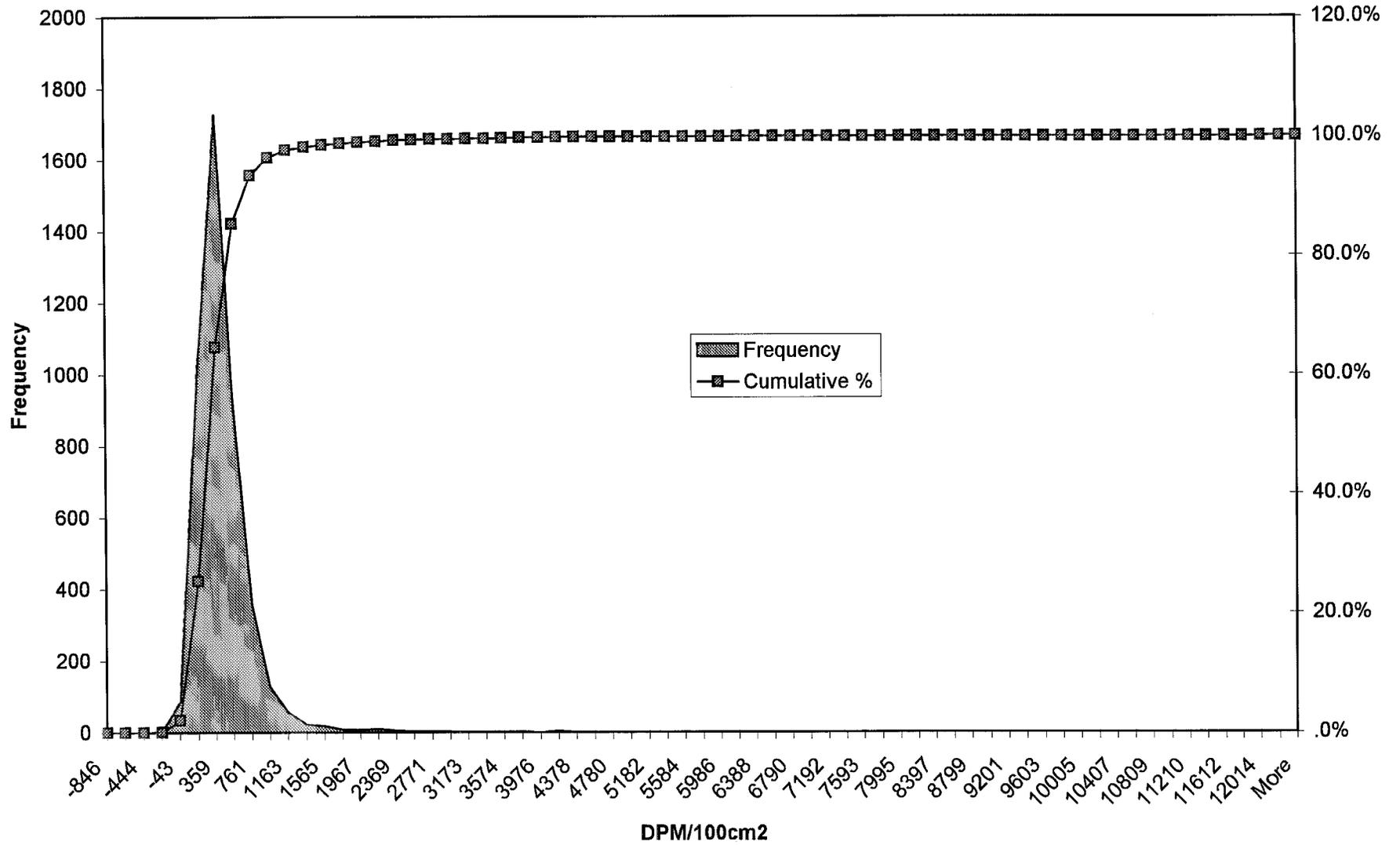
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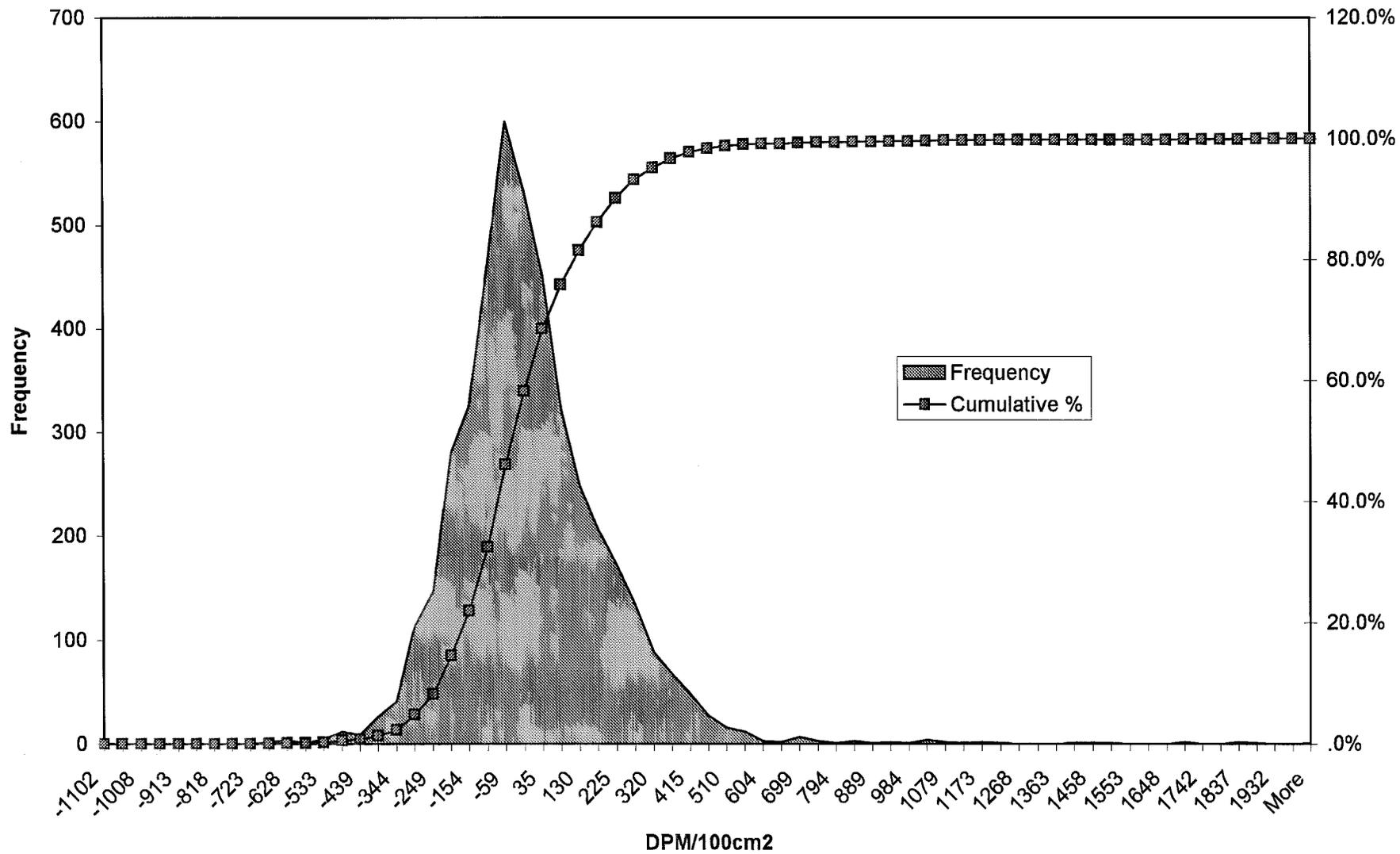
Lower Unit 1-ALL Fixed Beta Histogram



Lower Unit 1-ALL Beta Scan Maximum Histogram



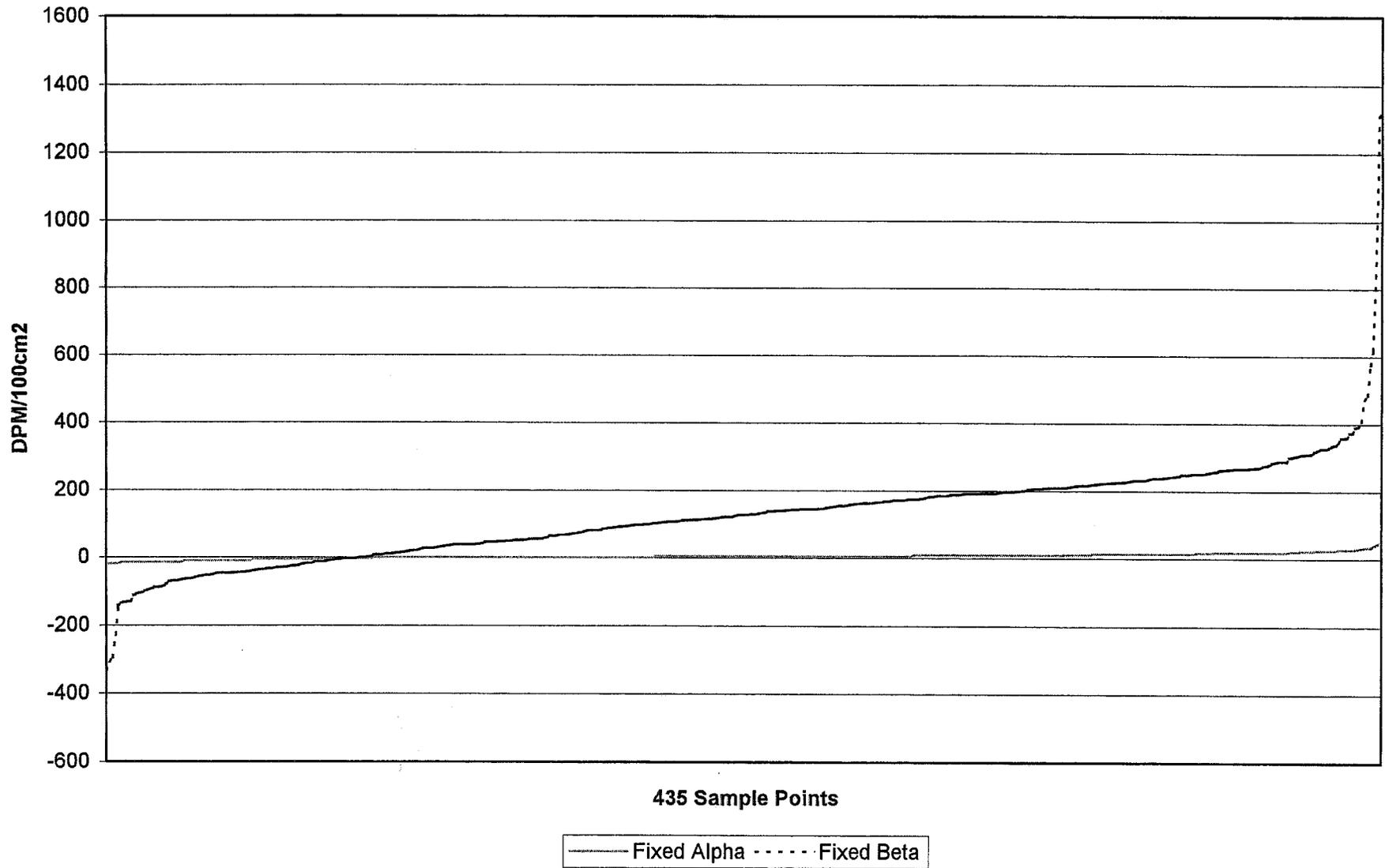
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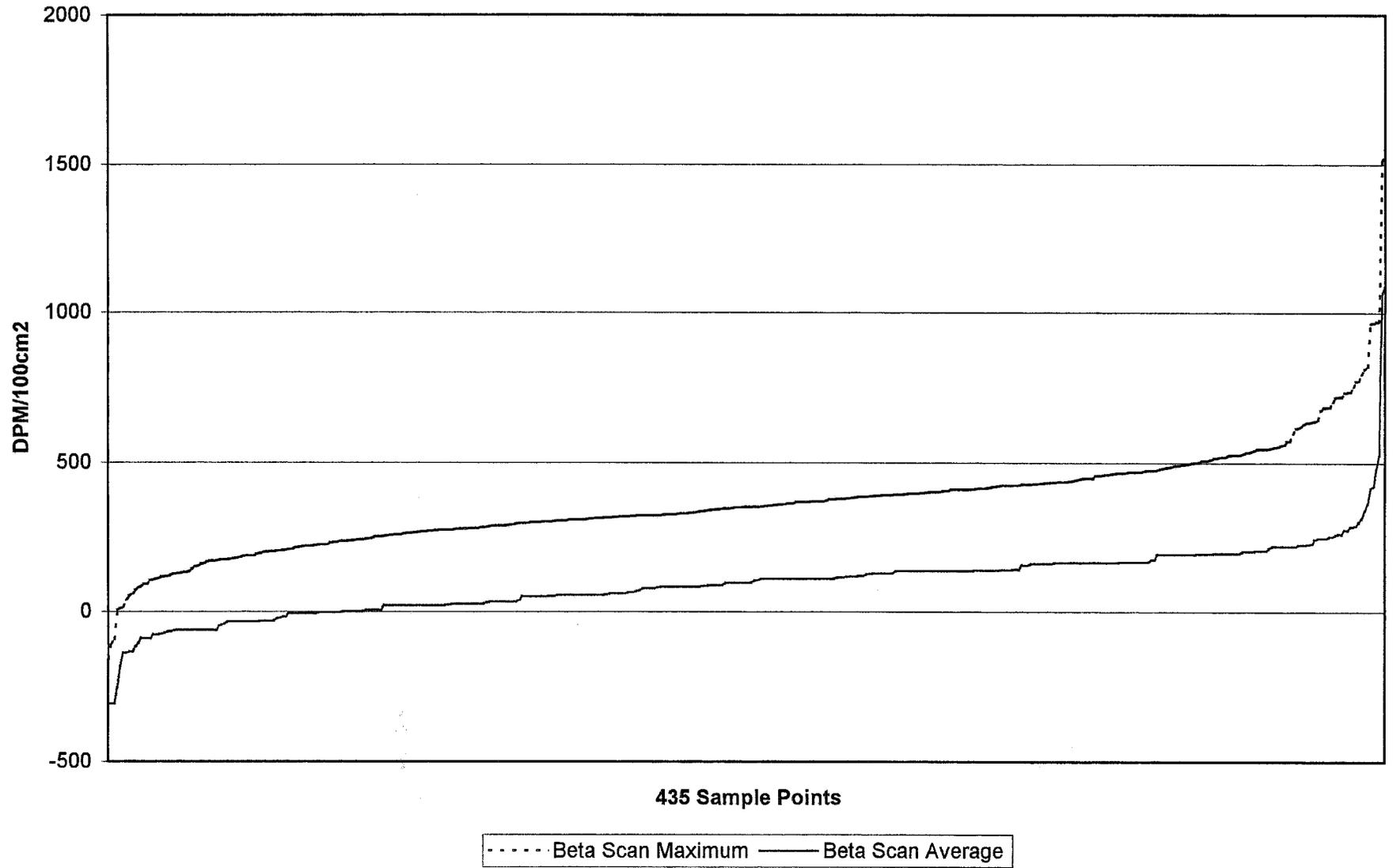
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LOWER DATA TRENDS**

**REPORT #007**

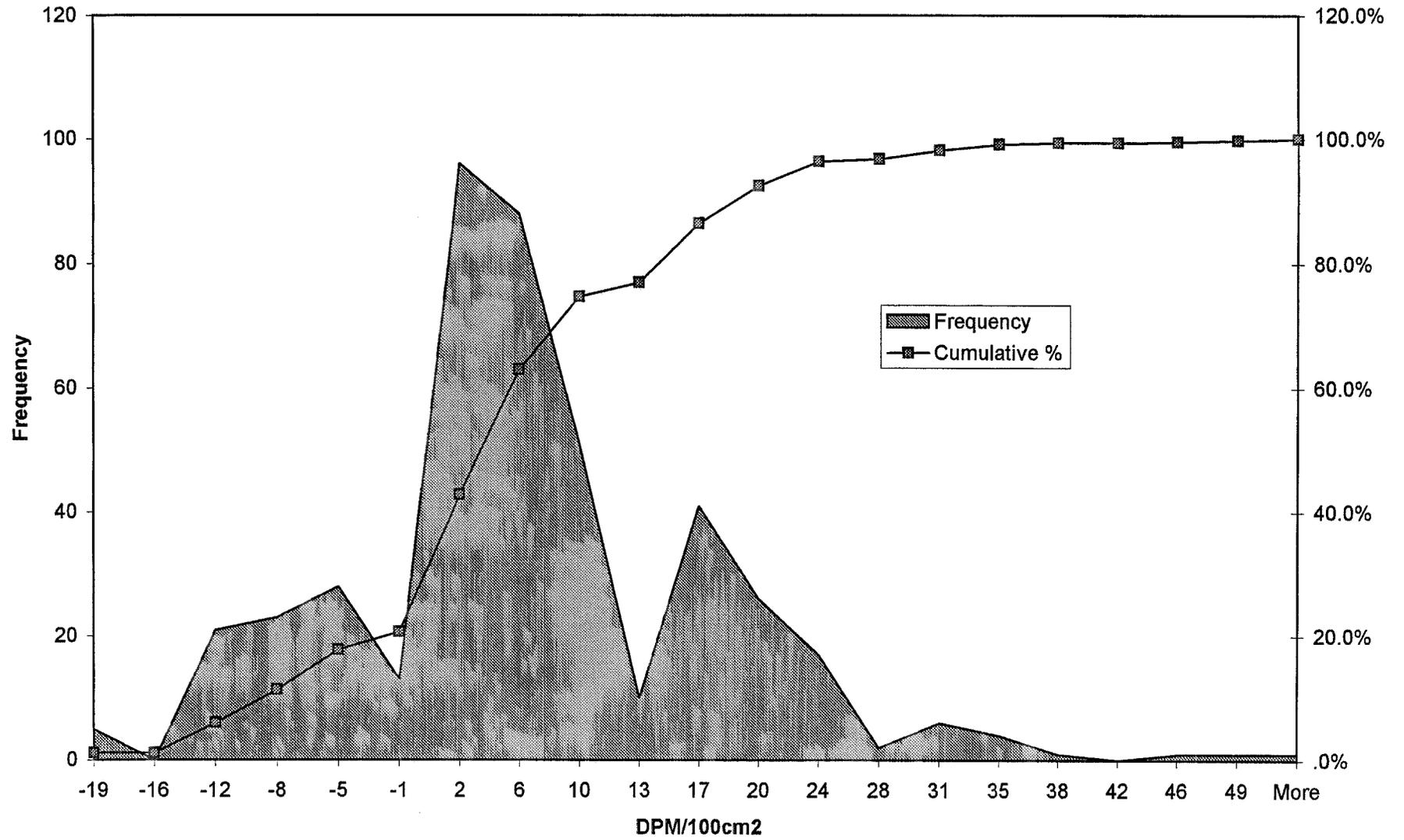
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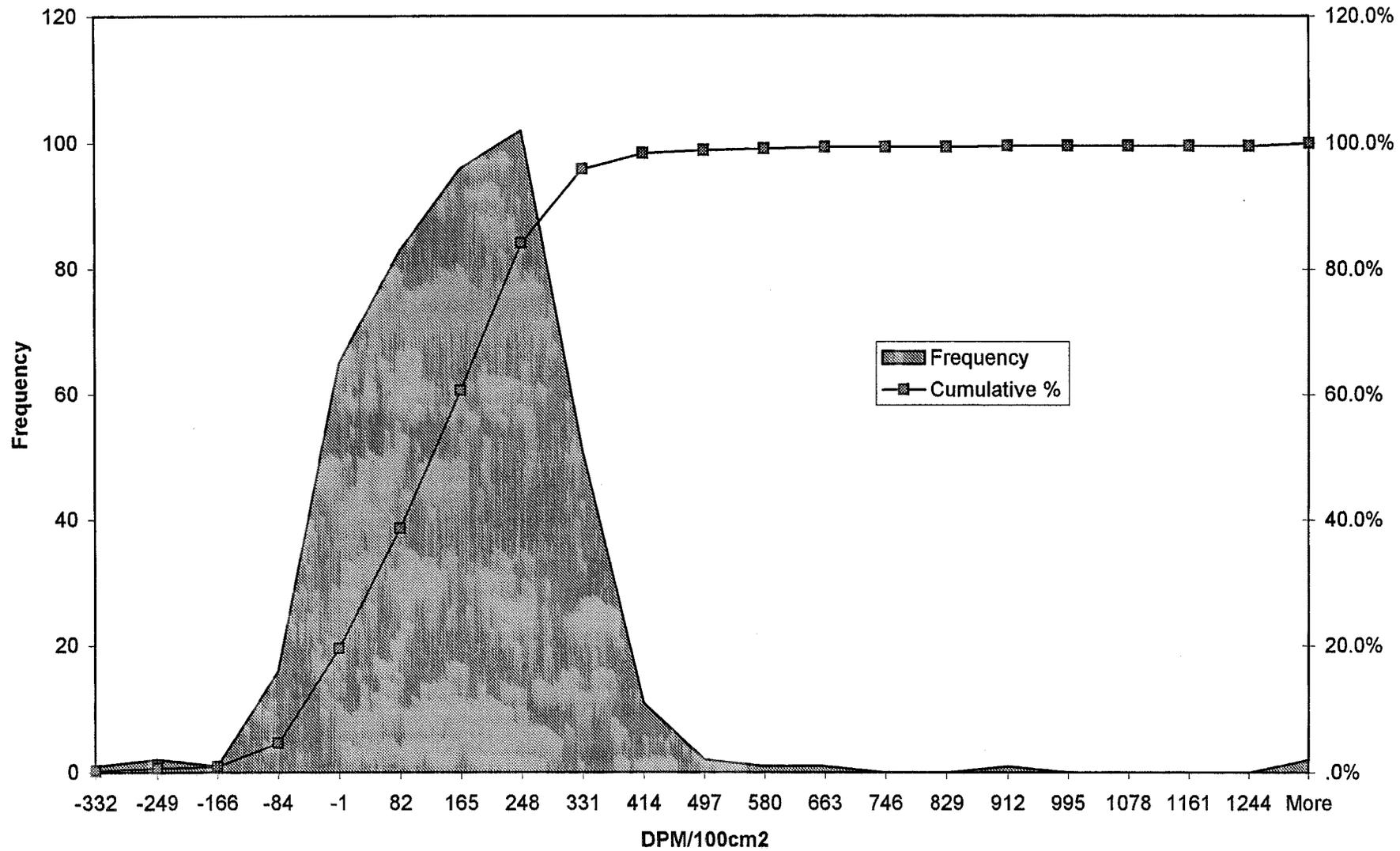
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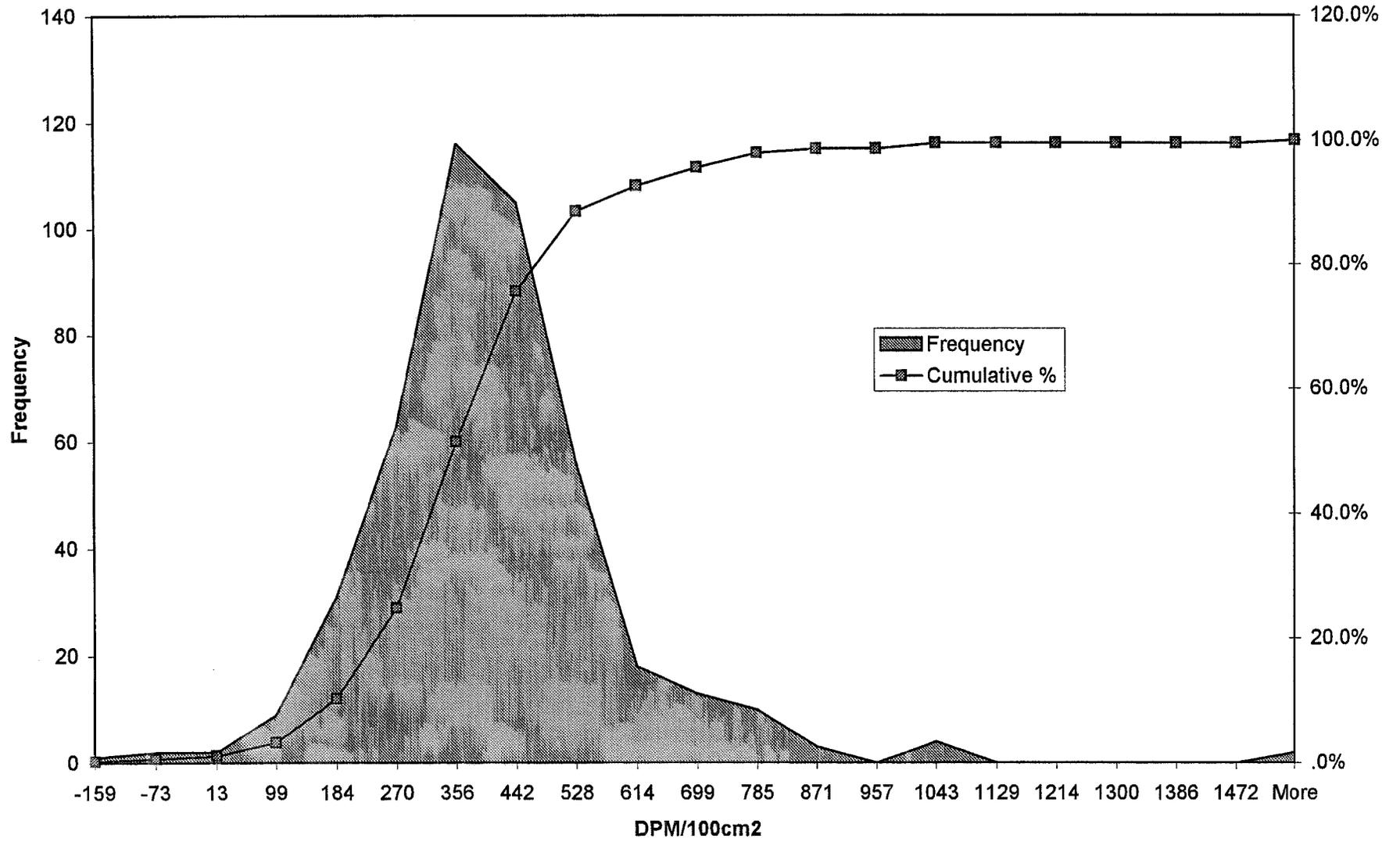
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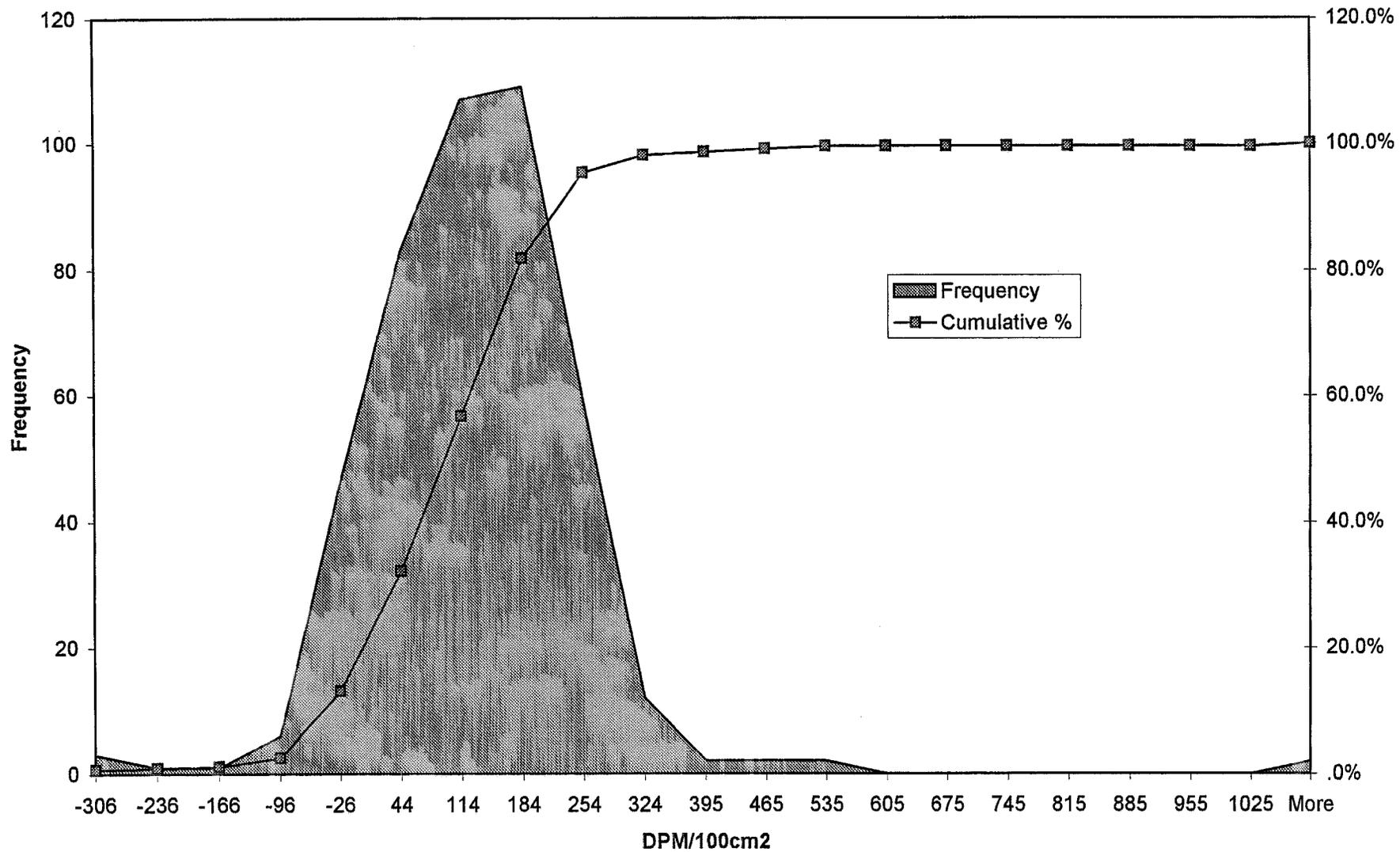
Lower Unit 2-All Fixed Beta Histogram



Lower Unit 2-All Beta Scan Maximum Histogram



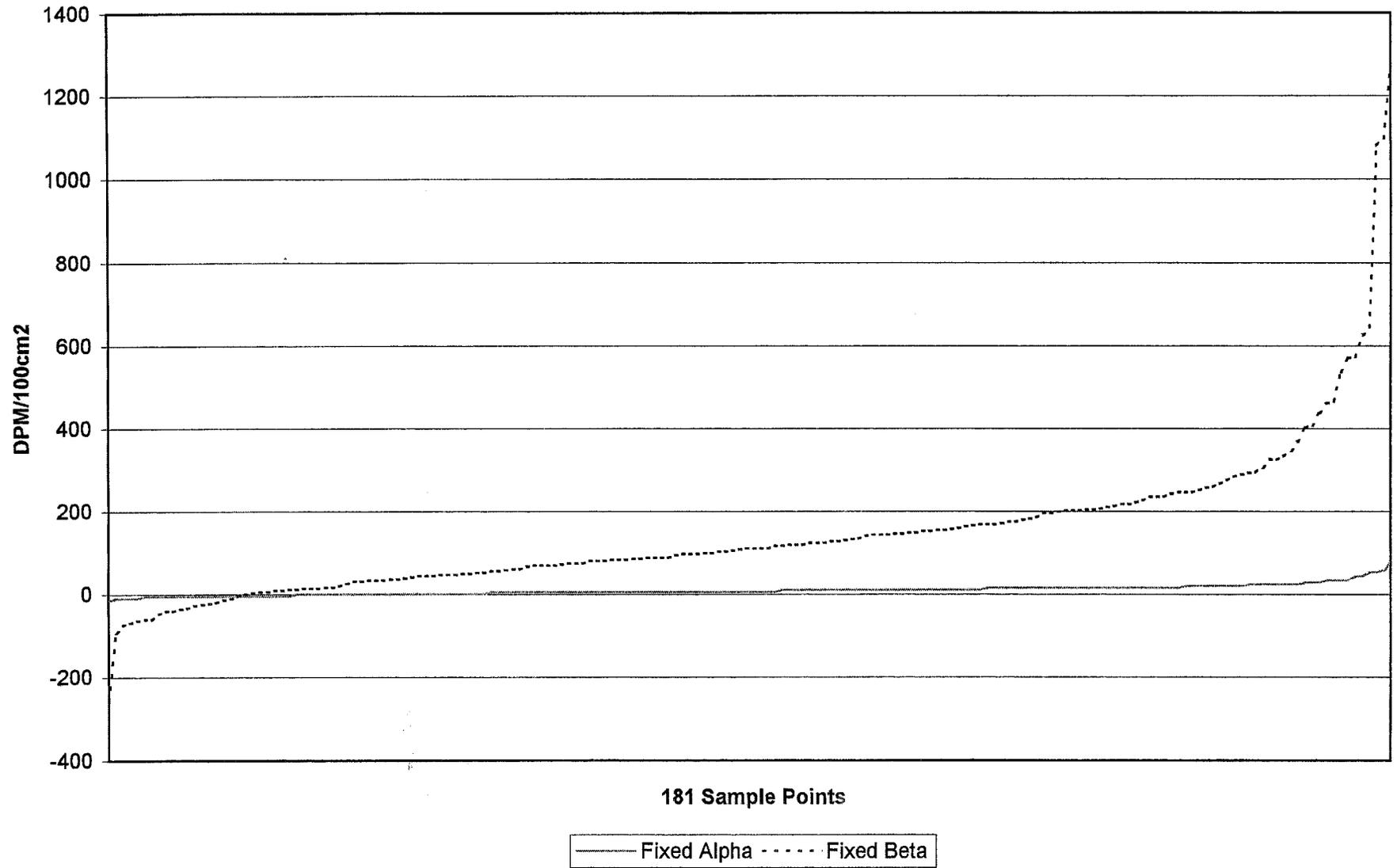
Lower Unit 2-All Beta Scan Average Histogram



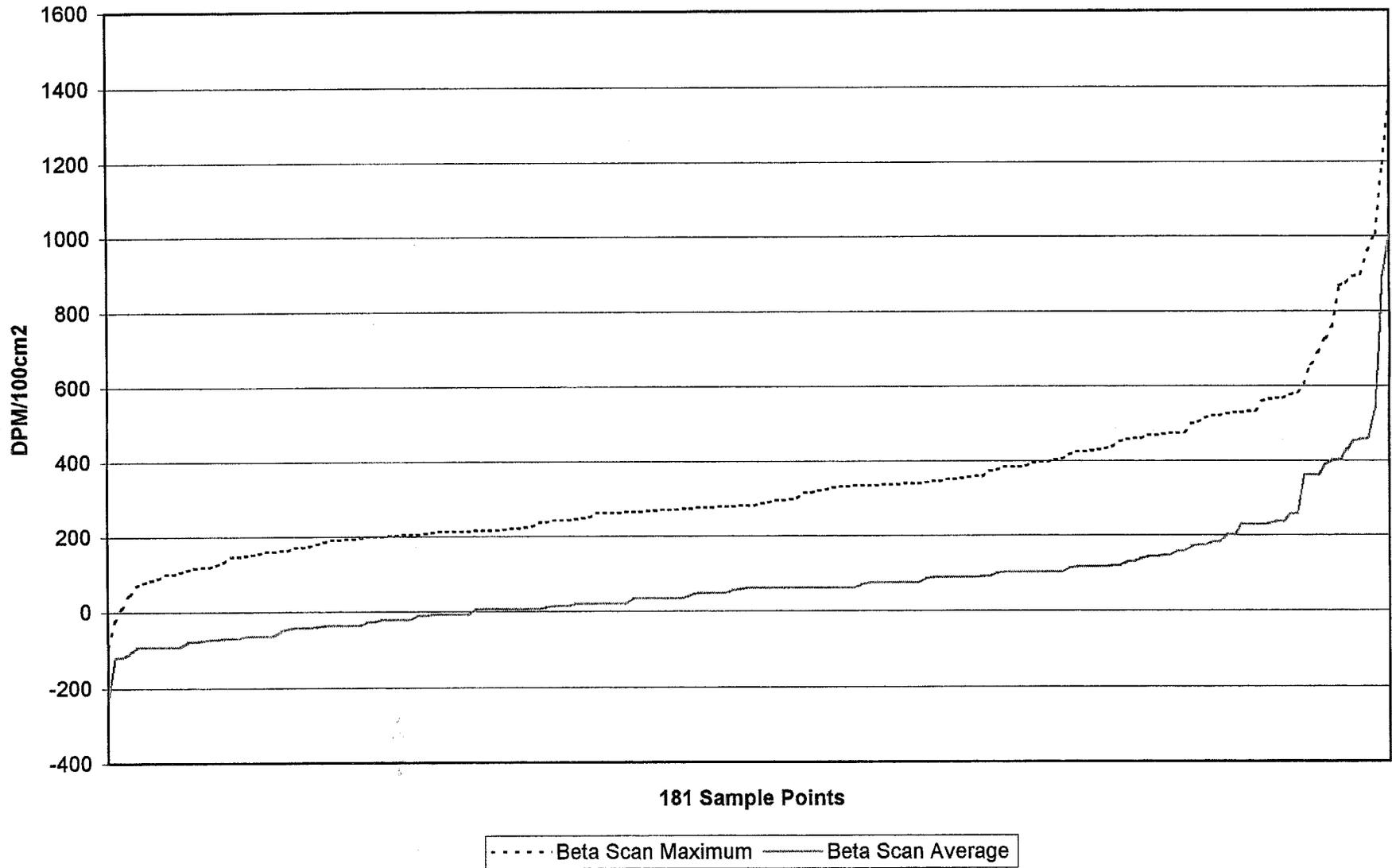
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LOWER DATA TRENDS**

**REPORT #007**

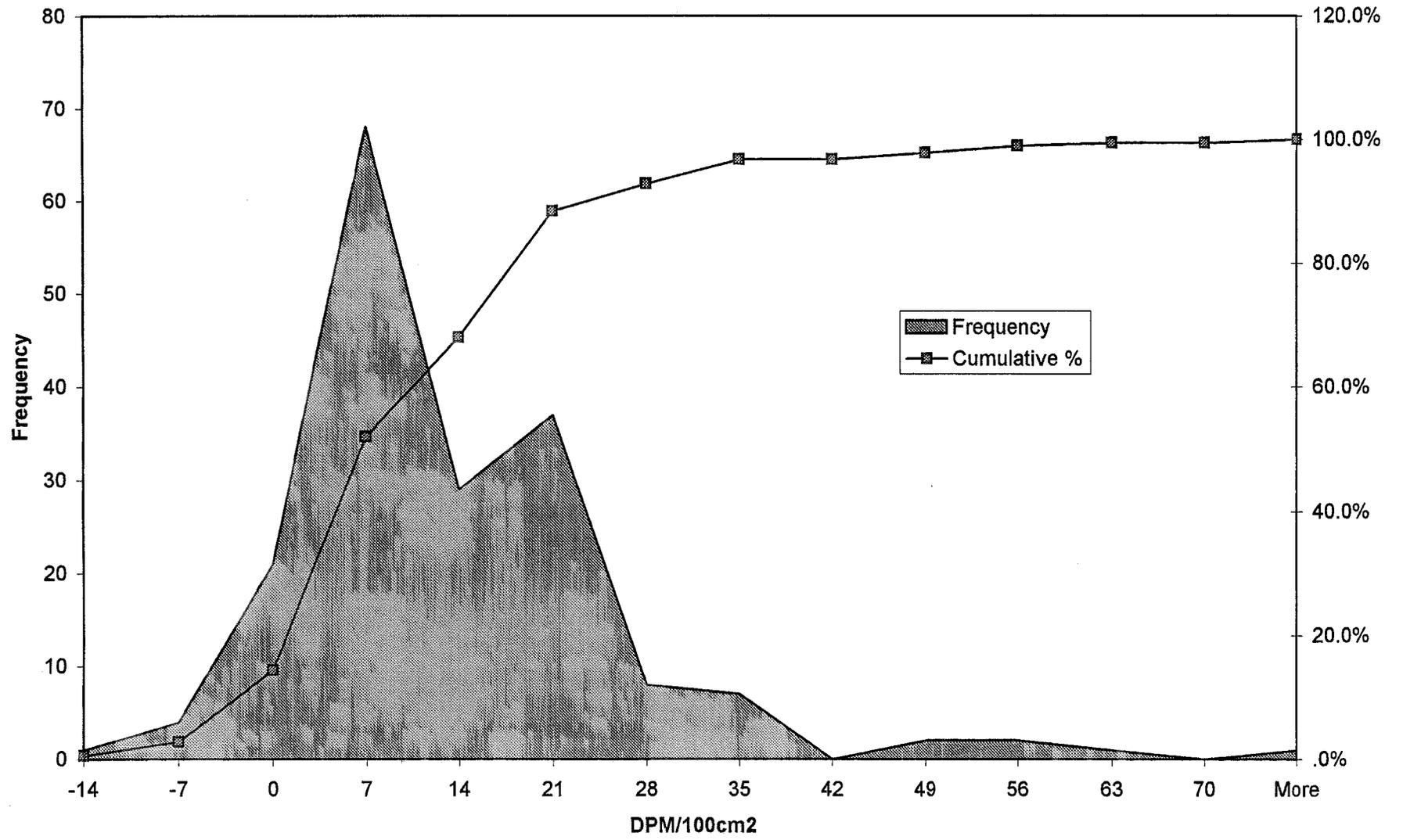
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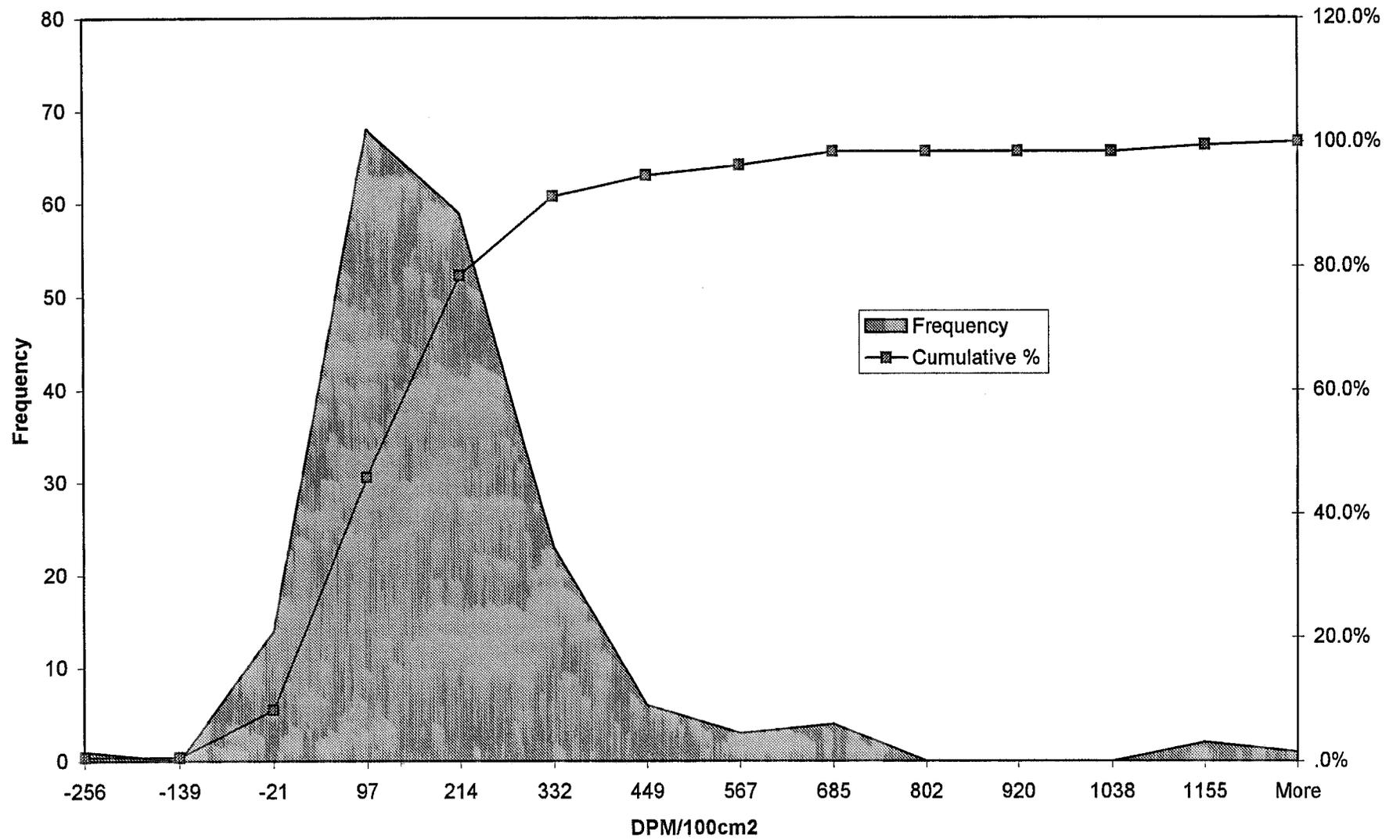
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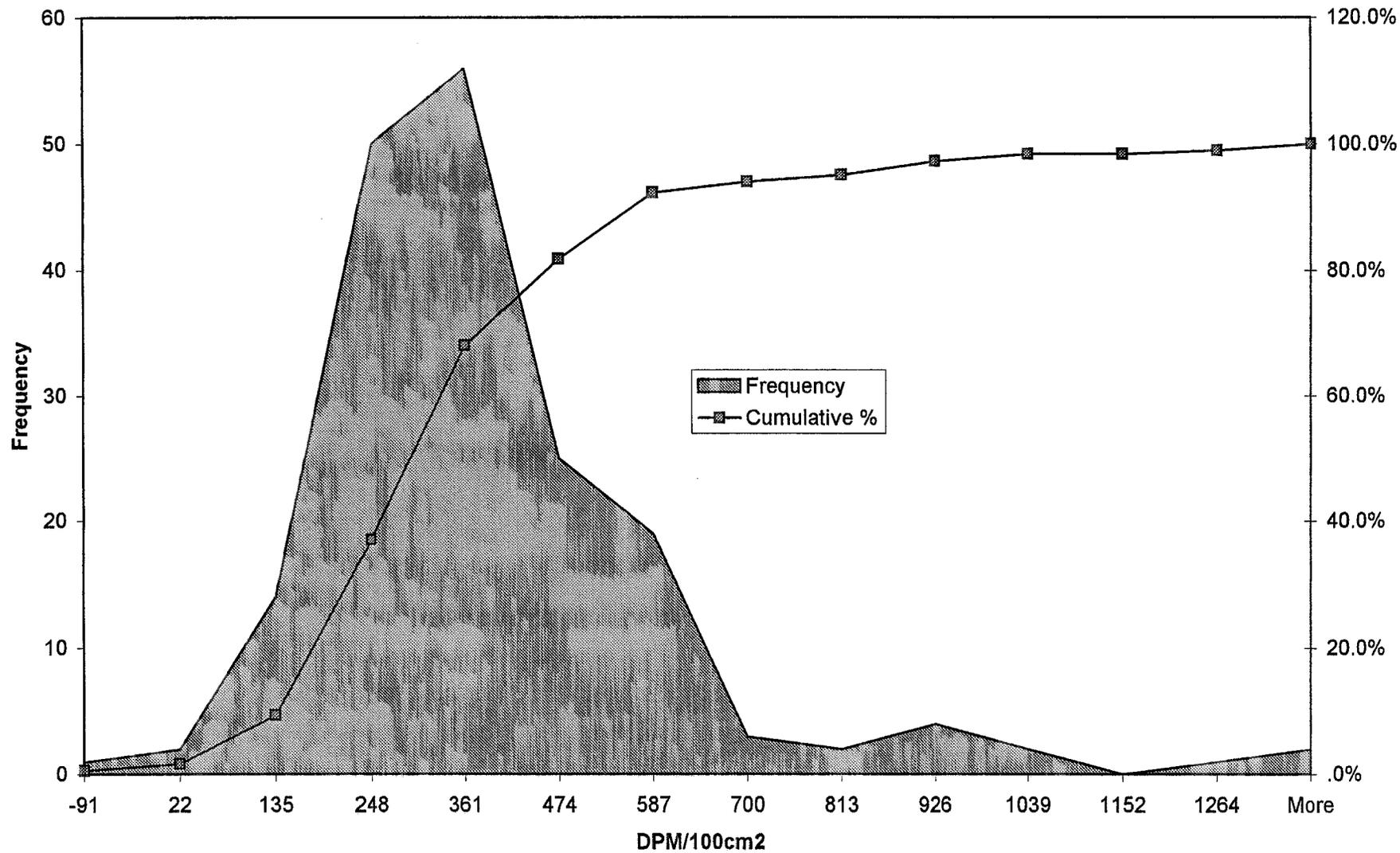
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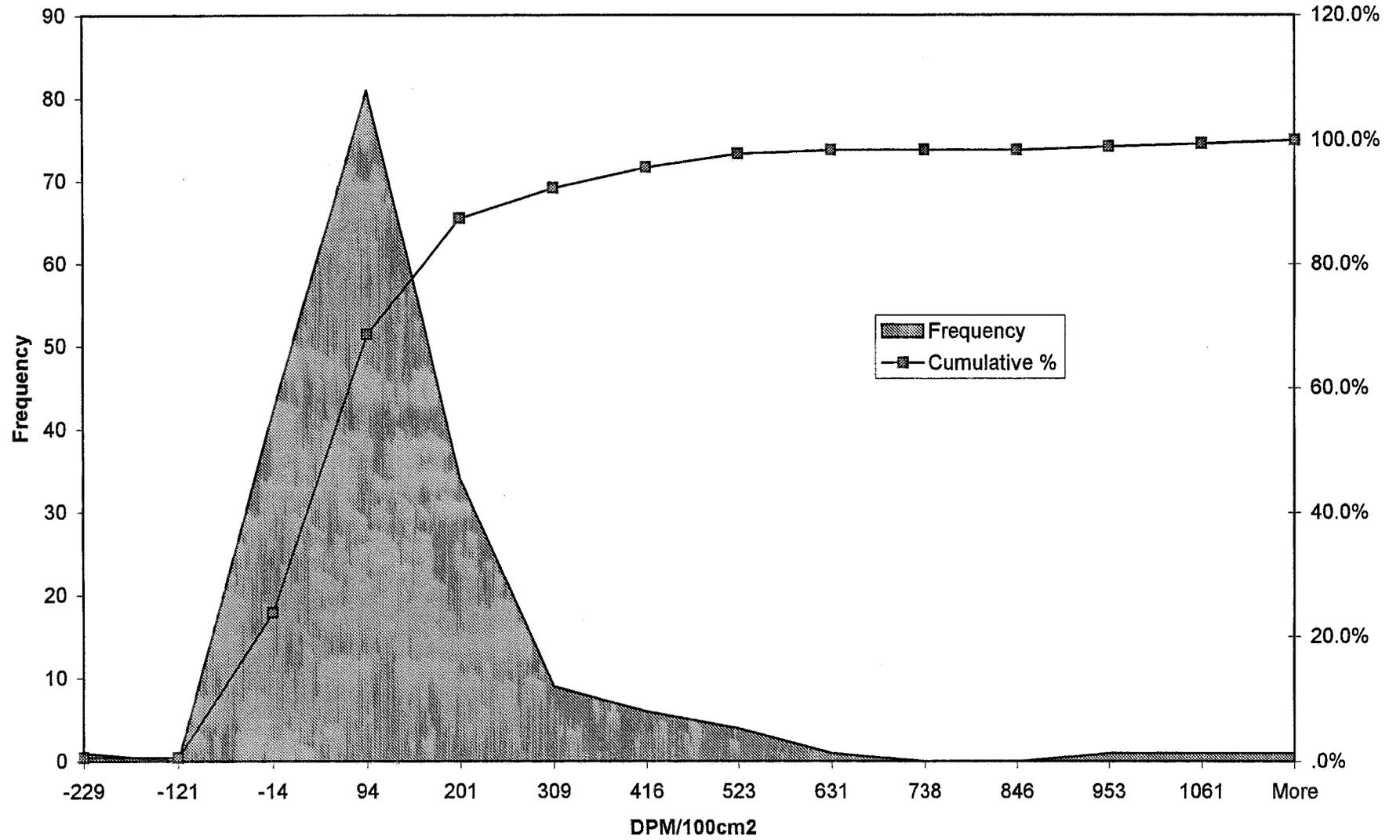
Lower Unit 3-All Fixed Beta Histogram



Lower Unit 3-All Beta Scan Maximum Histogram



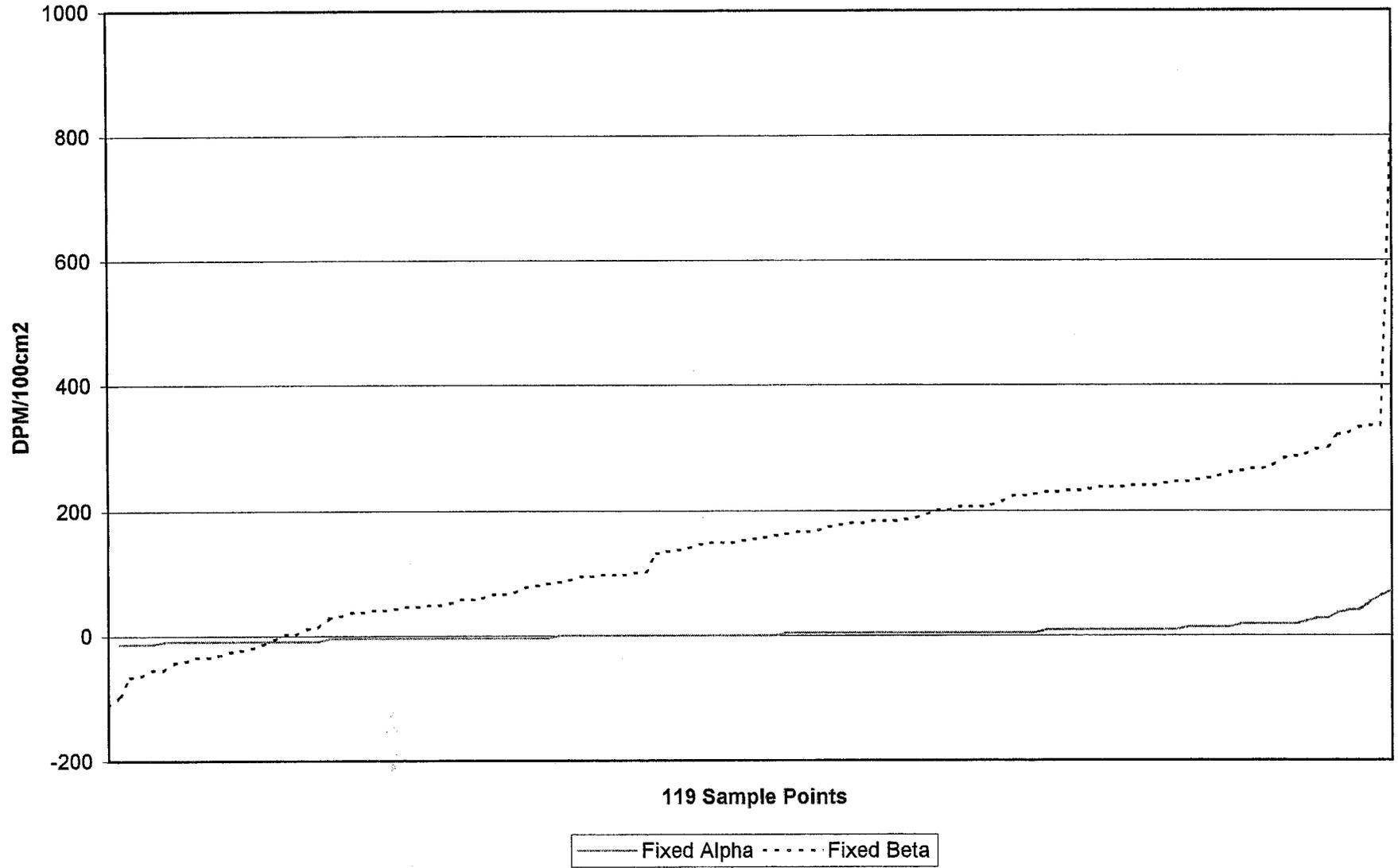
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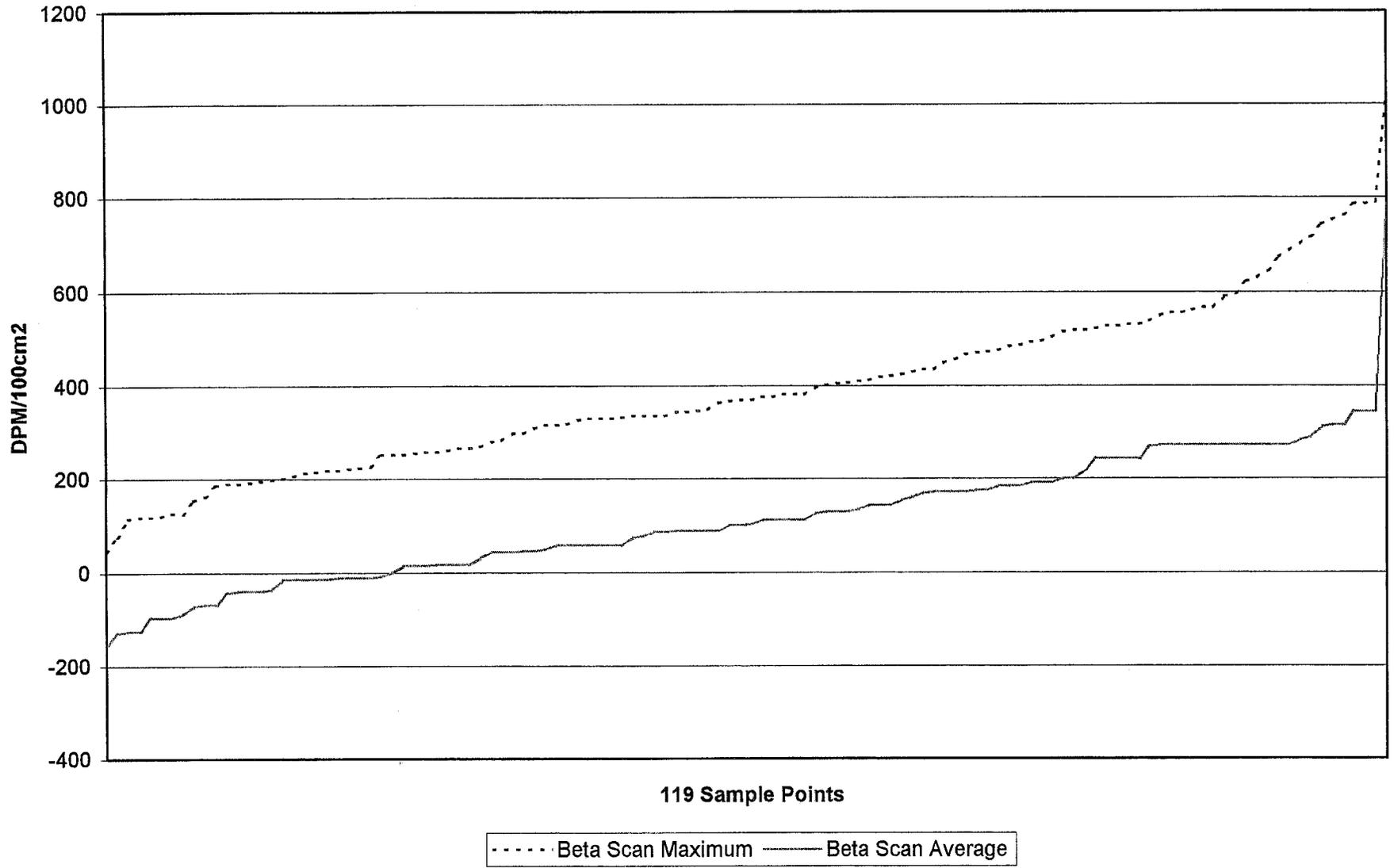
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**LOWER DATA TRENDS**

**REPORT #007**

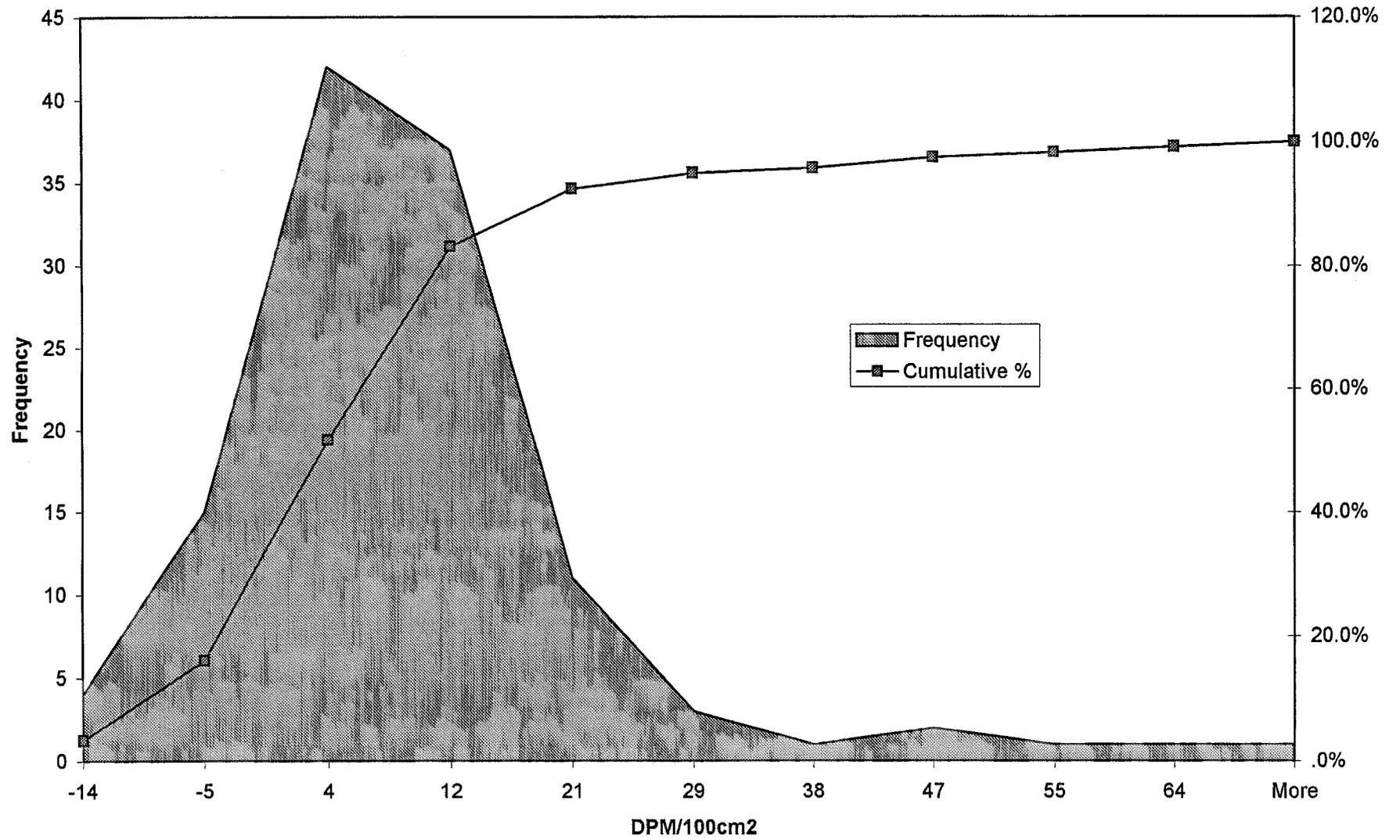
### Lower Unit 4-1 Data Trends



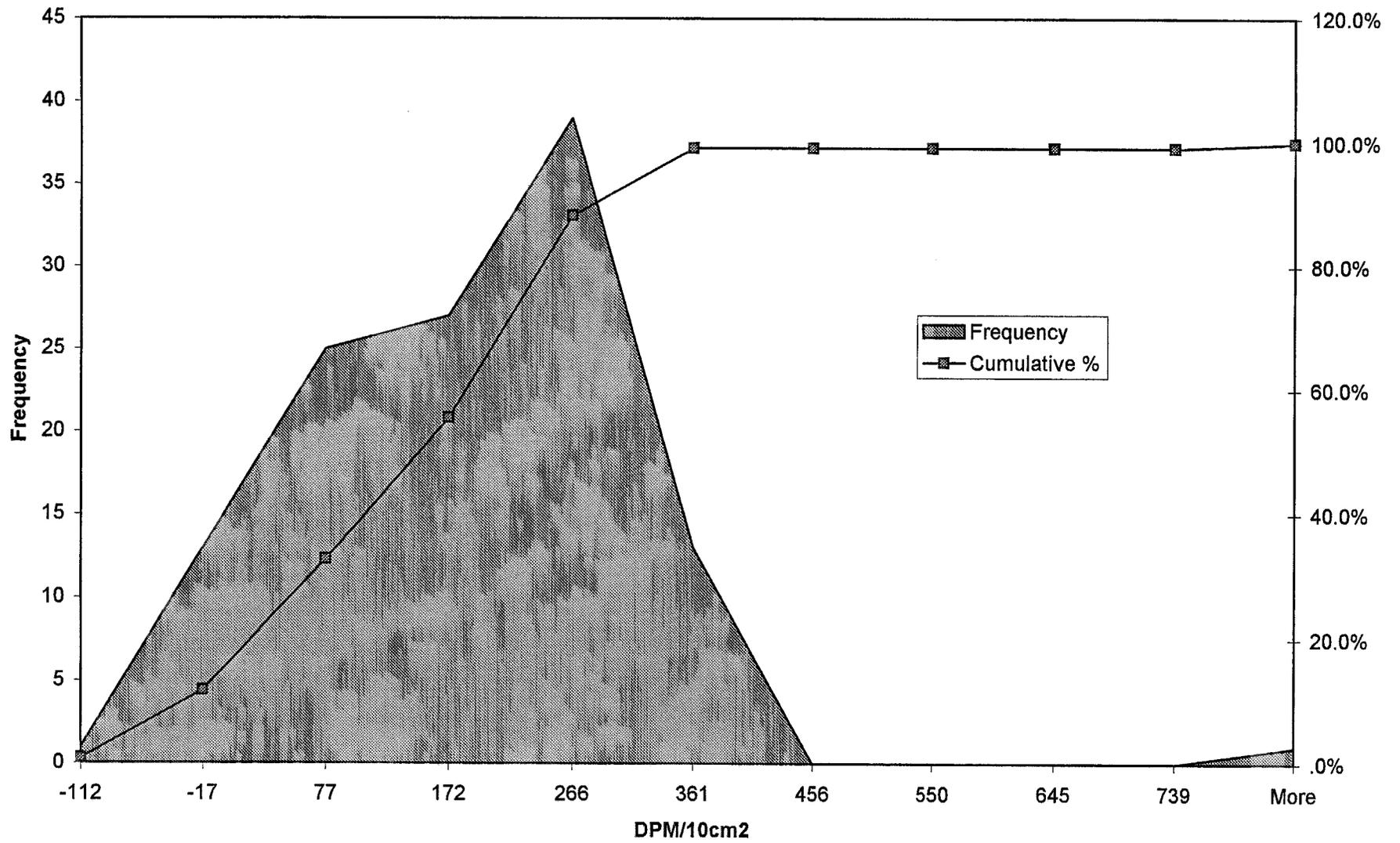
### Lower Unit 4-1 Data Trends



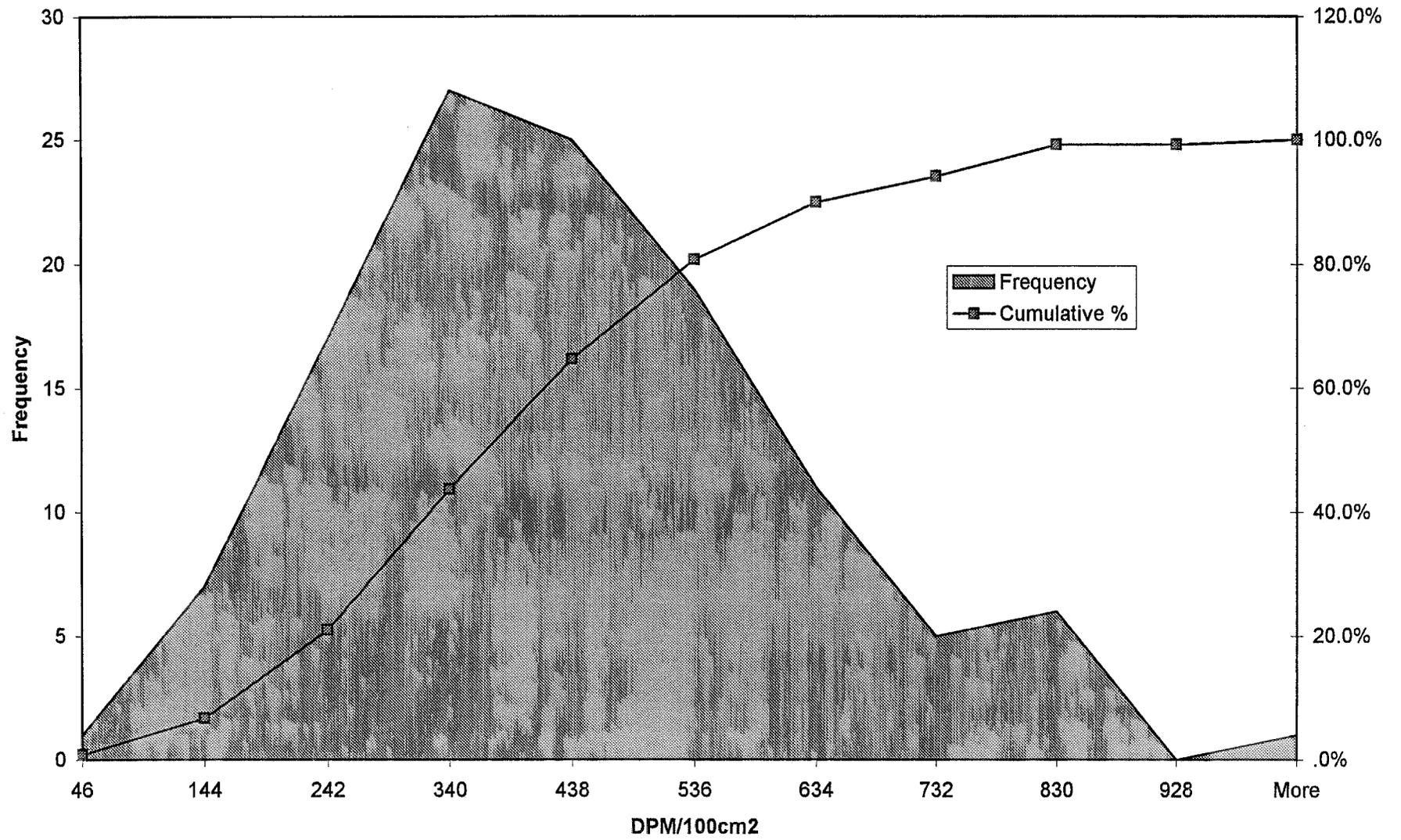
Lower Unit 4-1 Fixed Alpha Histogram



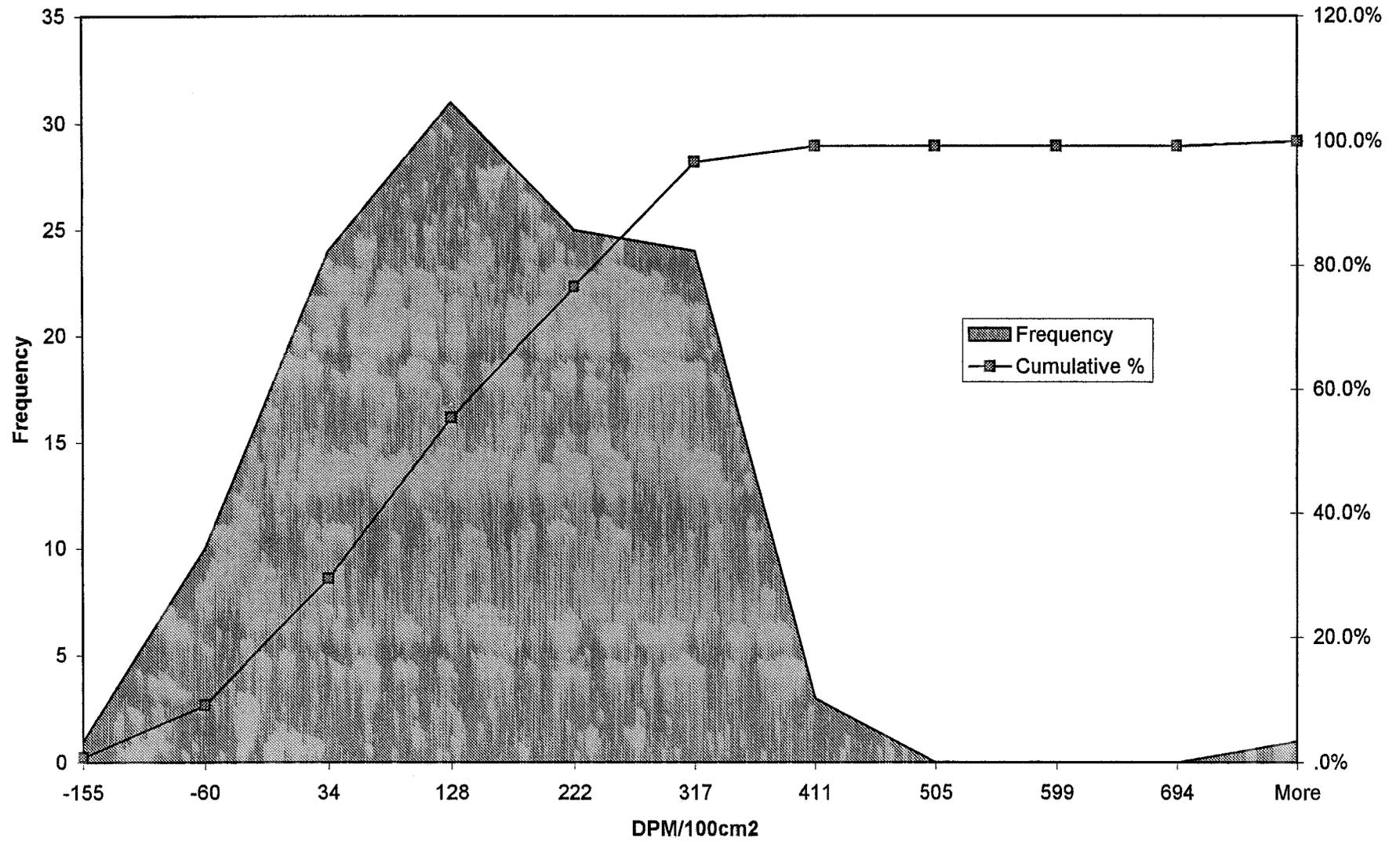
Lower Unit 4-1 Fixed Beta Histogram



Lower Unit 4-1 Beta Scan Maximum Histogram



Lower Unit 4-1 Beta Scan Average Histogram



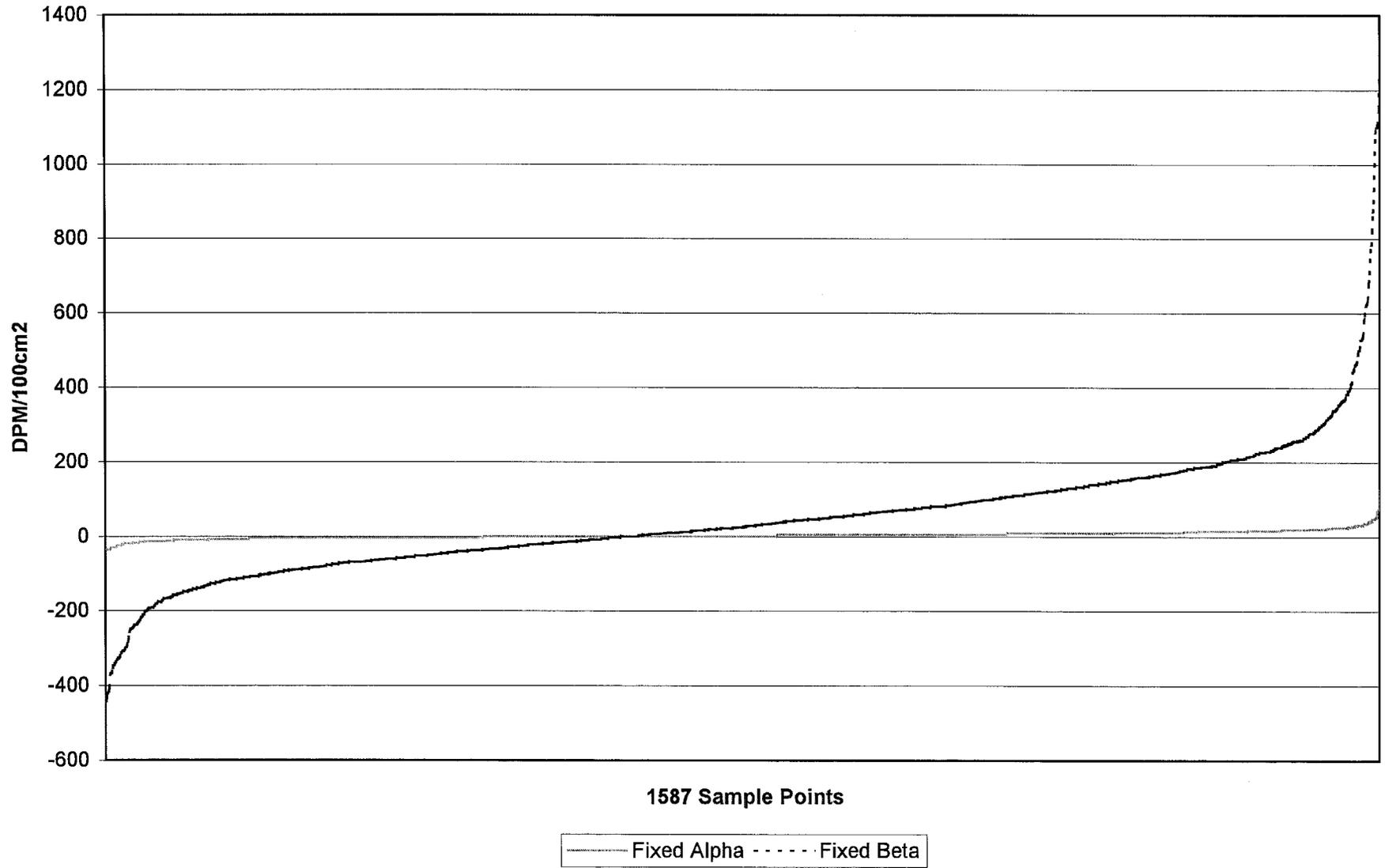
**APPENDIX E**  
**UPPER SURVEY UNITS ALL DATA,**  
**DATA TRENDS**

**REPORT #006**

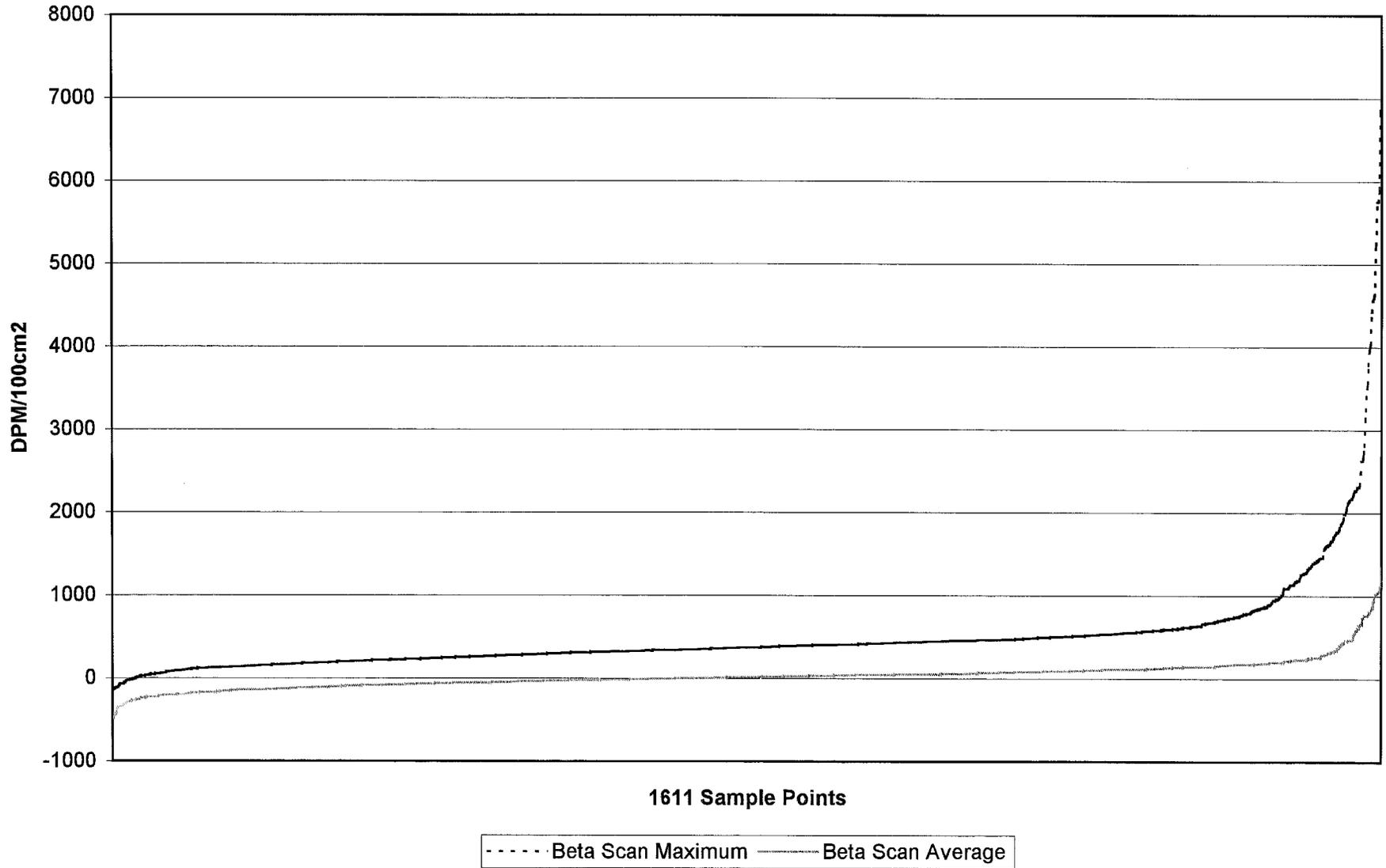
**SURVEY UNIT 1-ALL  
UPPER DATA TRENDS**

**REPORT #007**

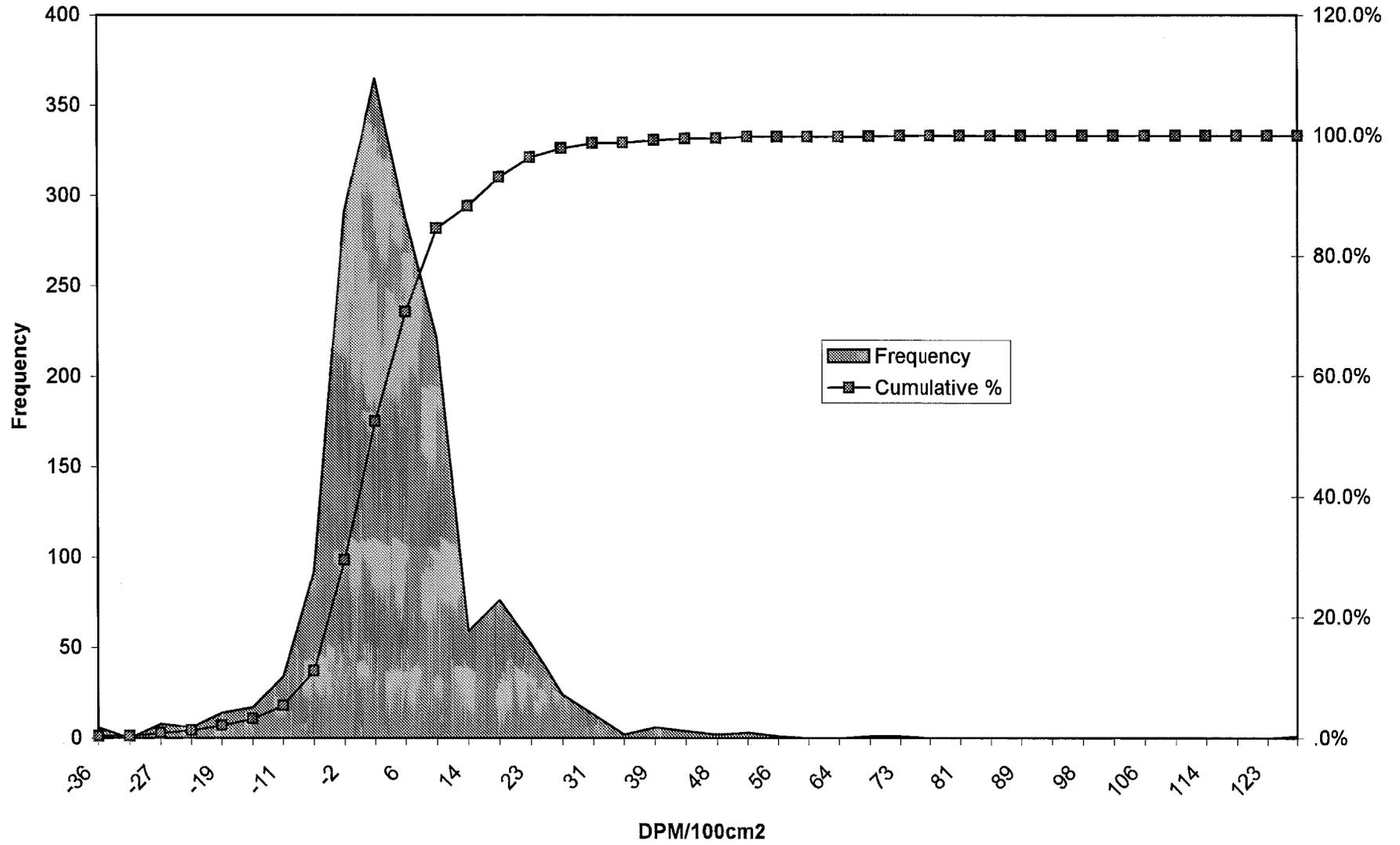
### Upper Unit 1-ALL Data Trends



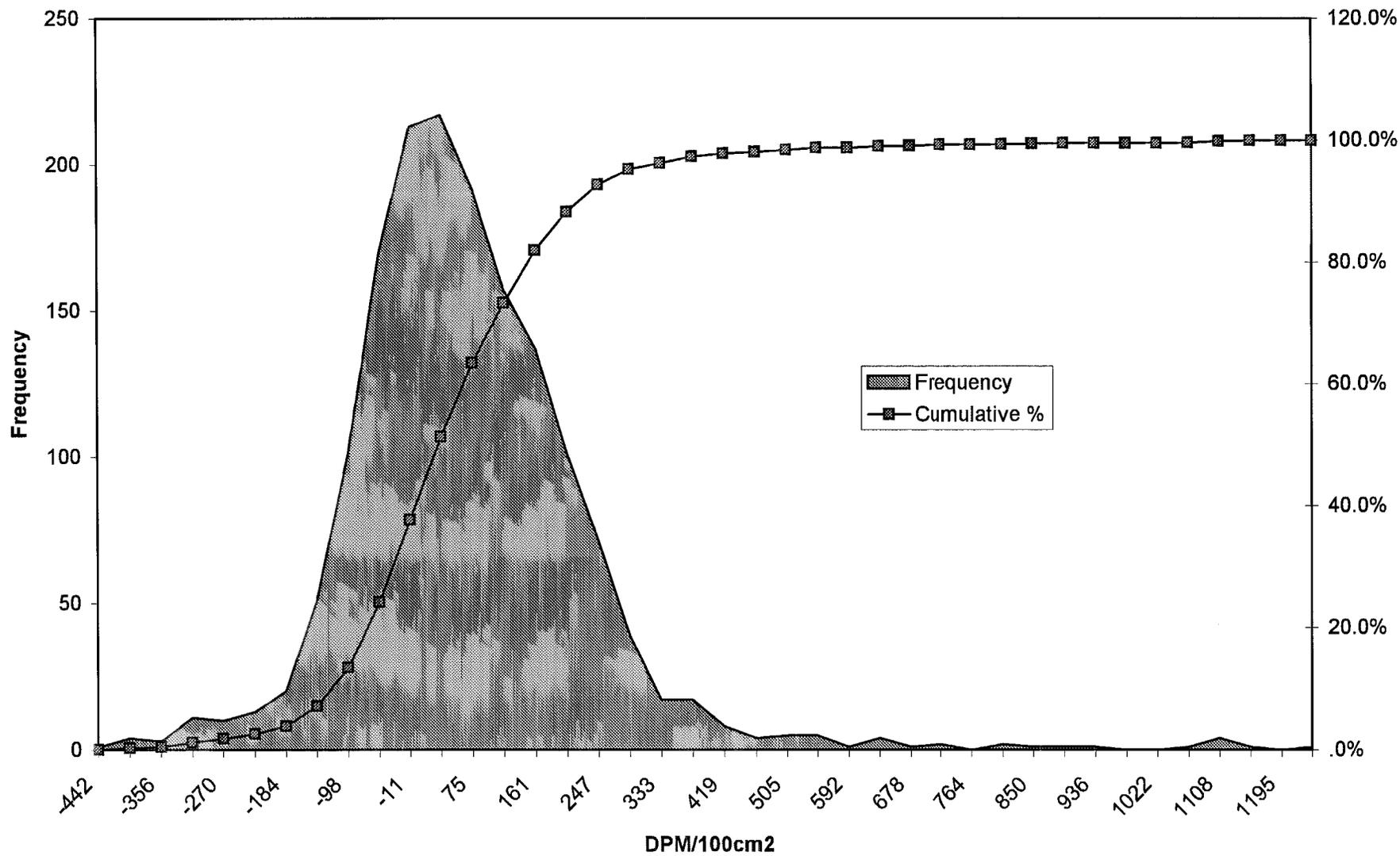
### Upper Unit 1-ALL Data Trends



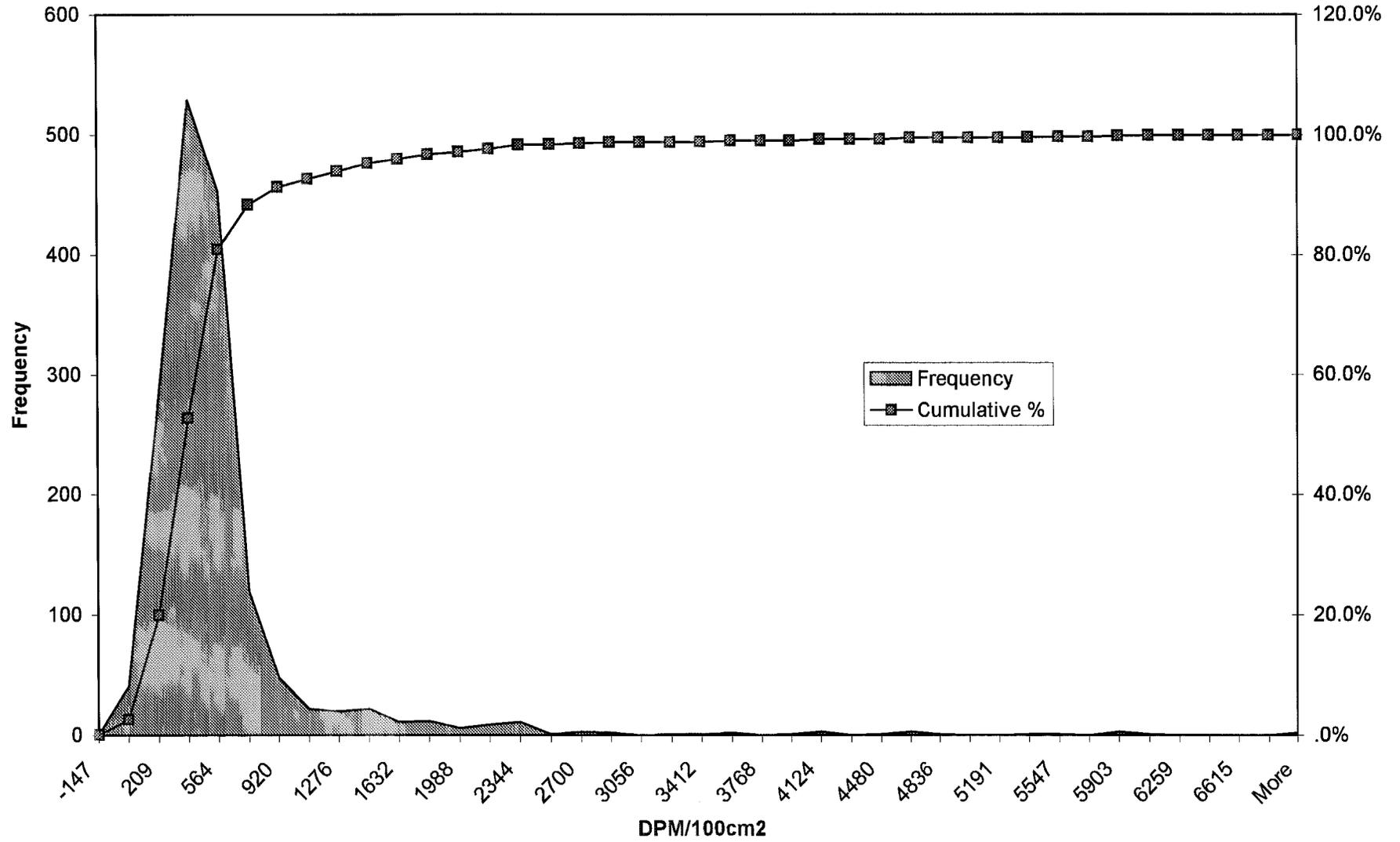
Upper Unit 1-ALL Fixed Alpha Histogram



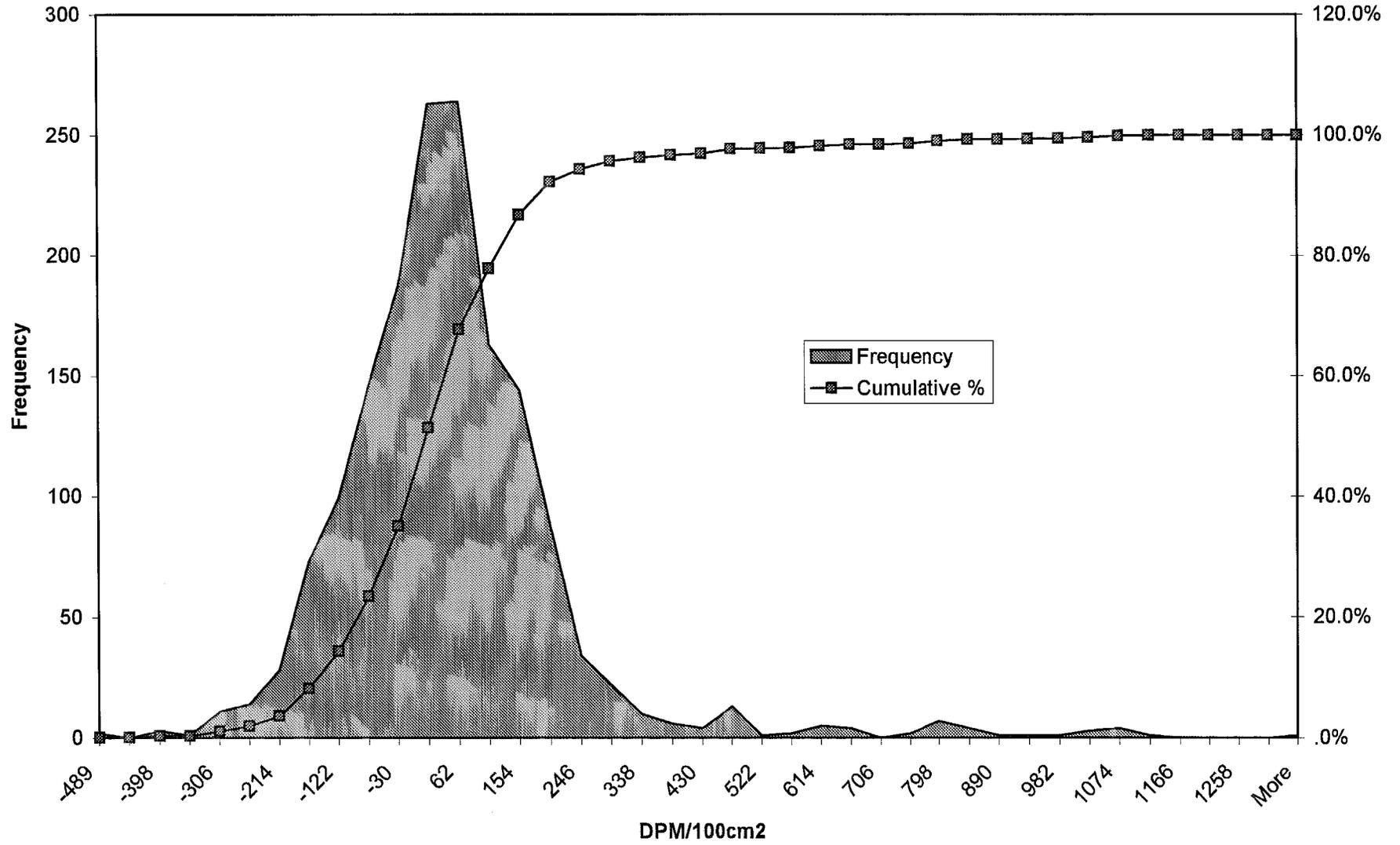
Upper Unit 1-ALL Fixed Beta Histogram



Upper Unit 1-ALL Beta Scan Maximum Histogram



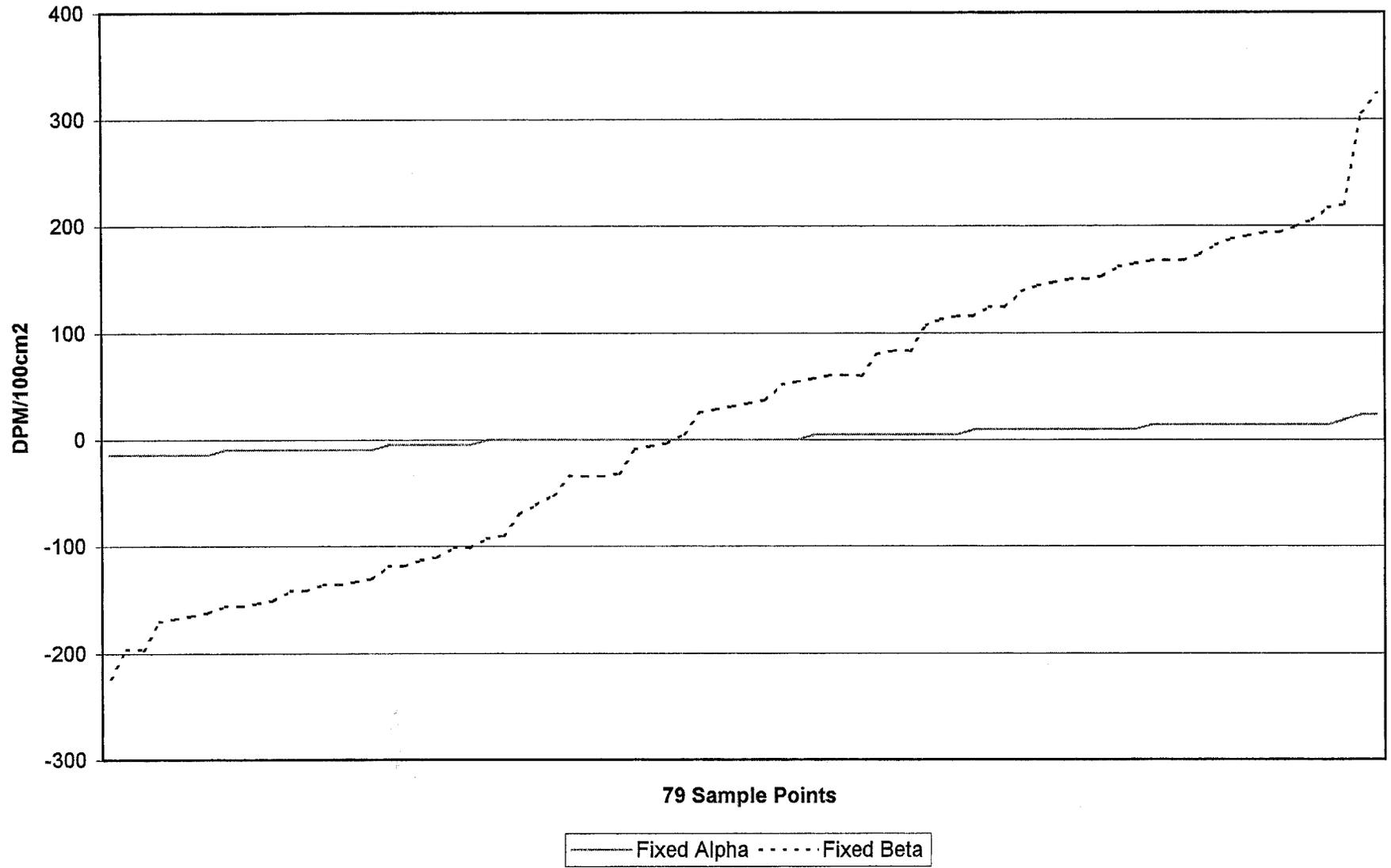
Upper Unit 1-All Beta Scan Average Histogram



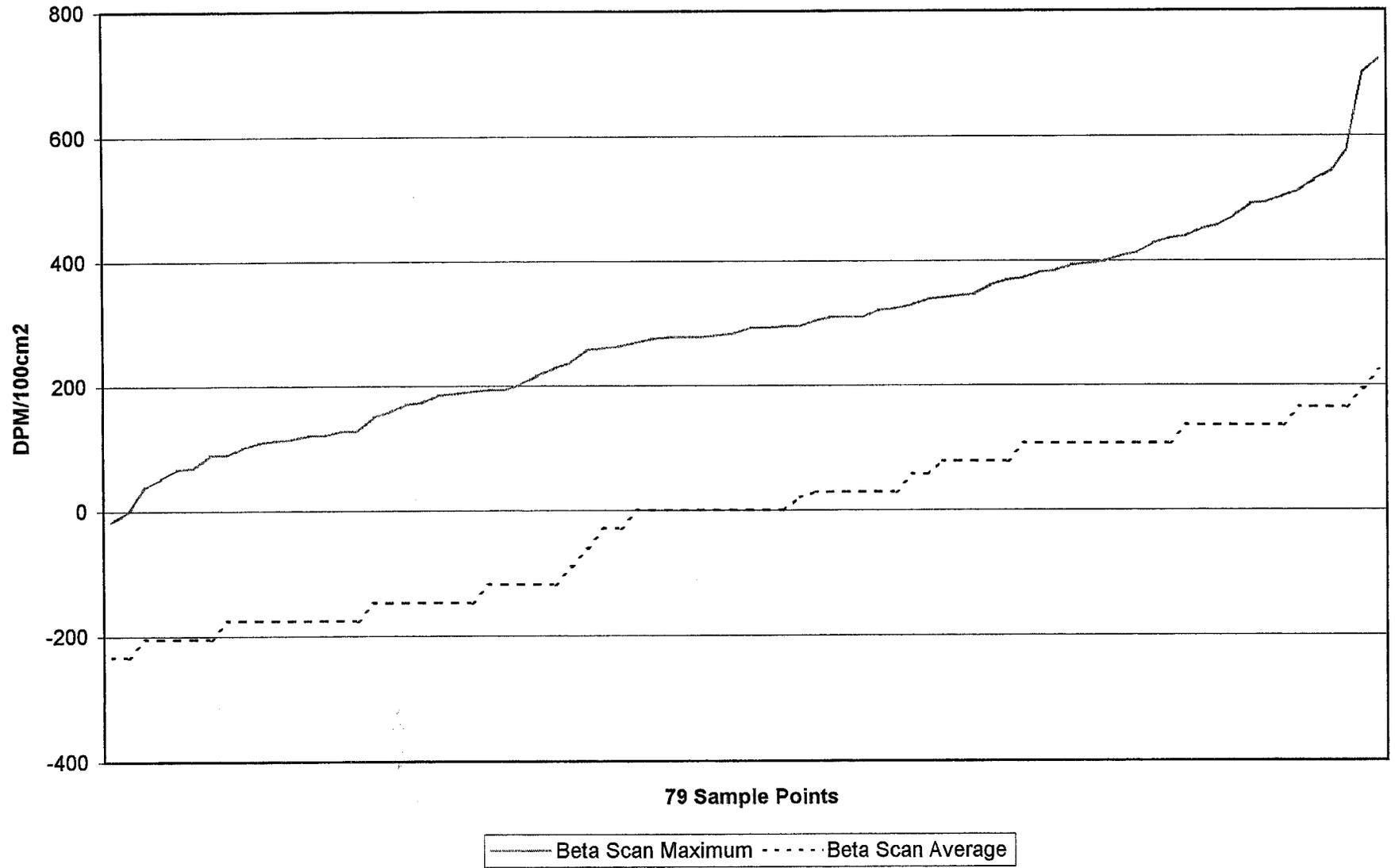
**SURVEY UNIT 3-ALL  
UPPER DATA TRENDS**

**REPORT #007**

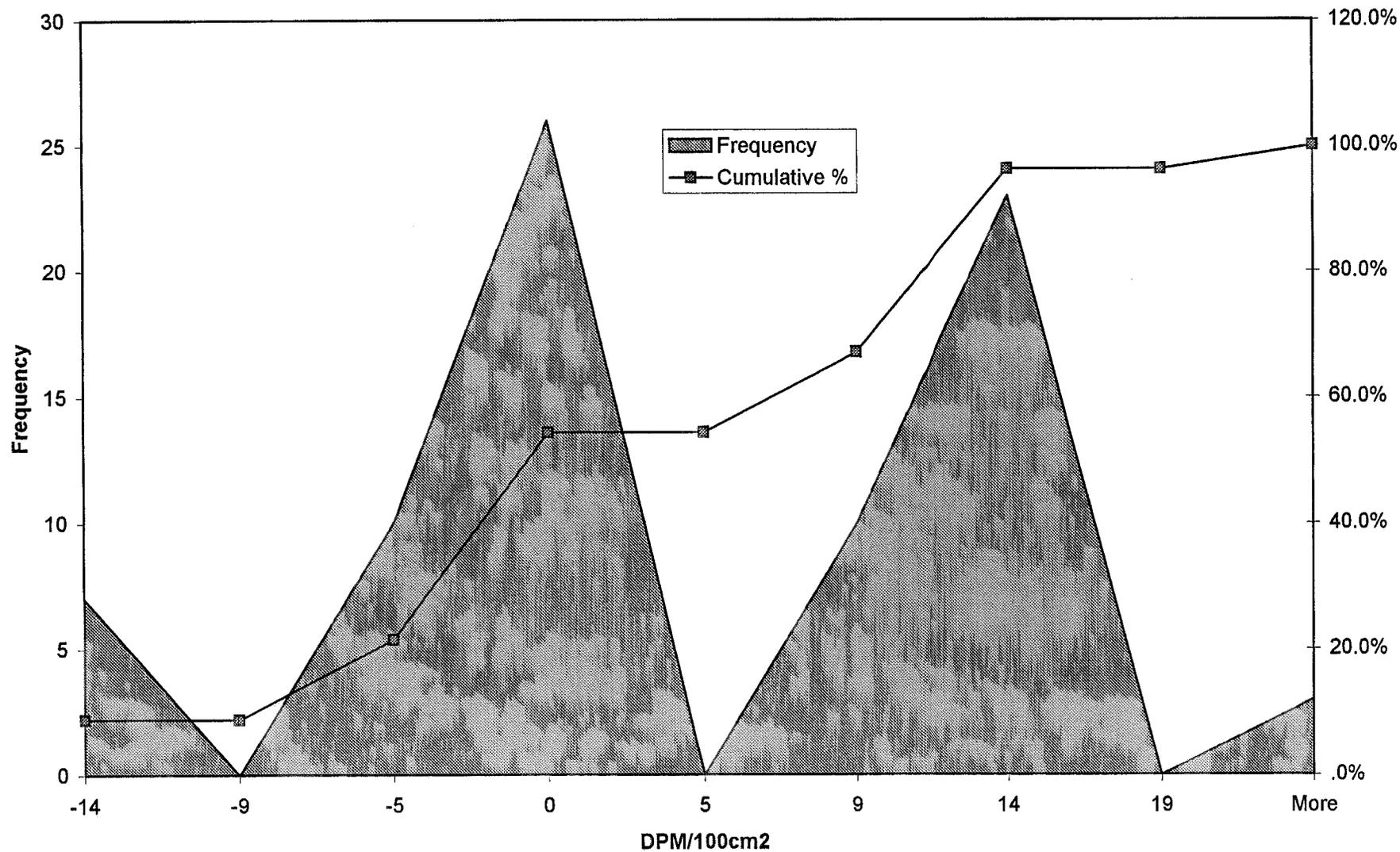
### Upper Unit 3-All Data Trends



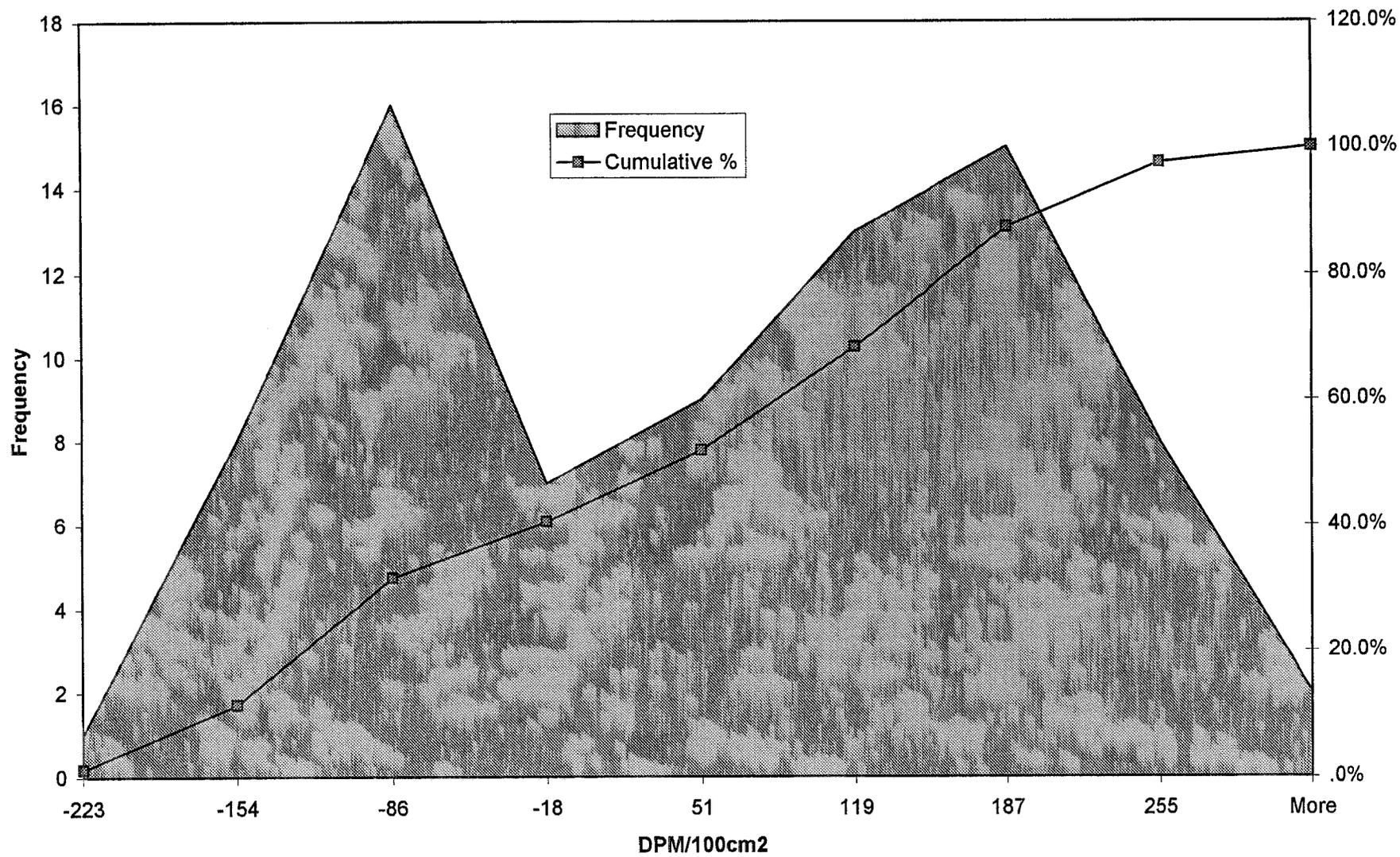
### Upper Unit 3-All Data Trends



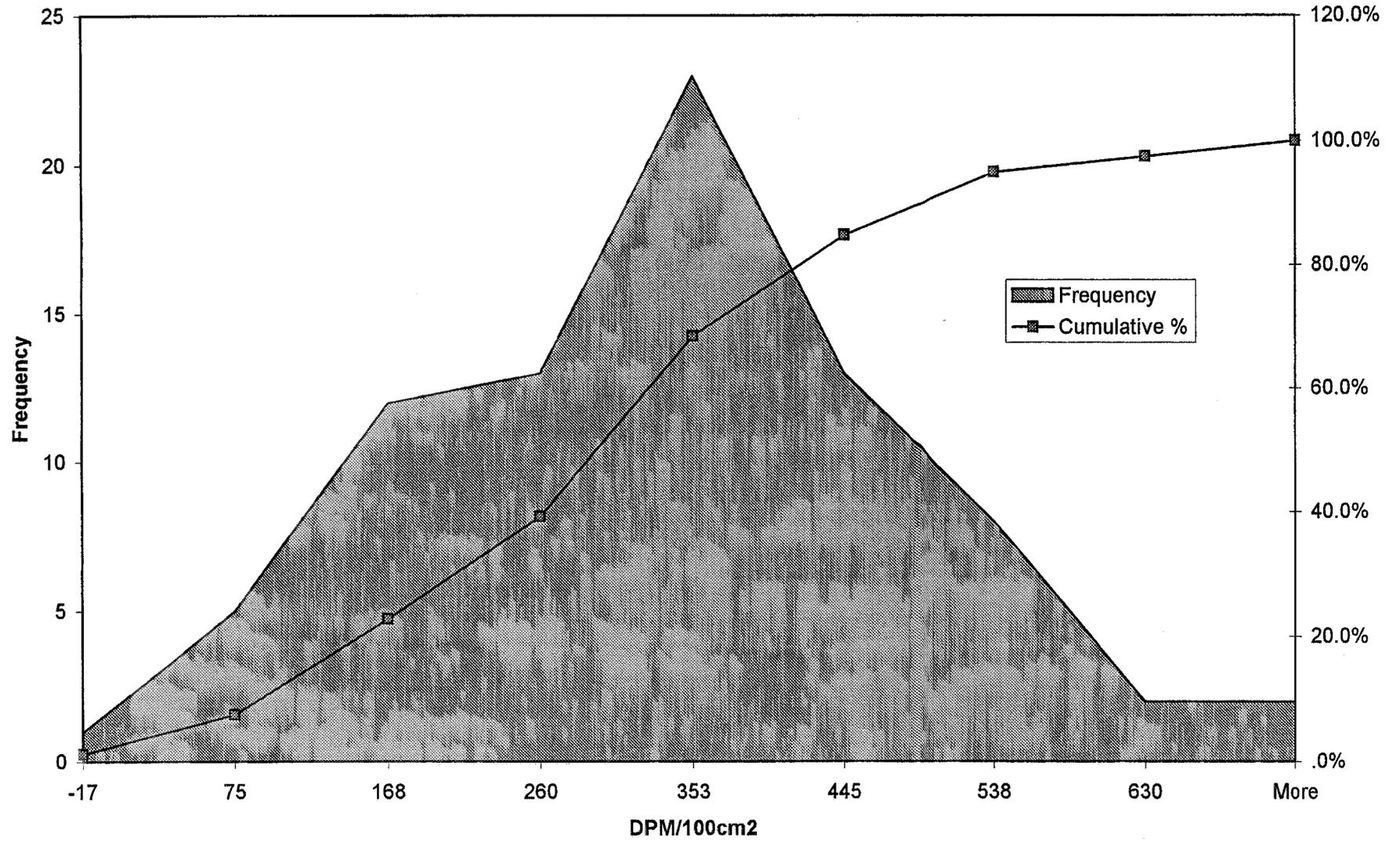
Upper Unit 3-All Fixed Alpha Histogram



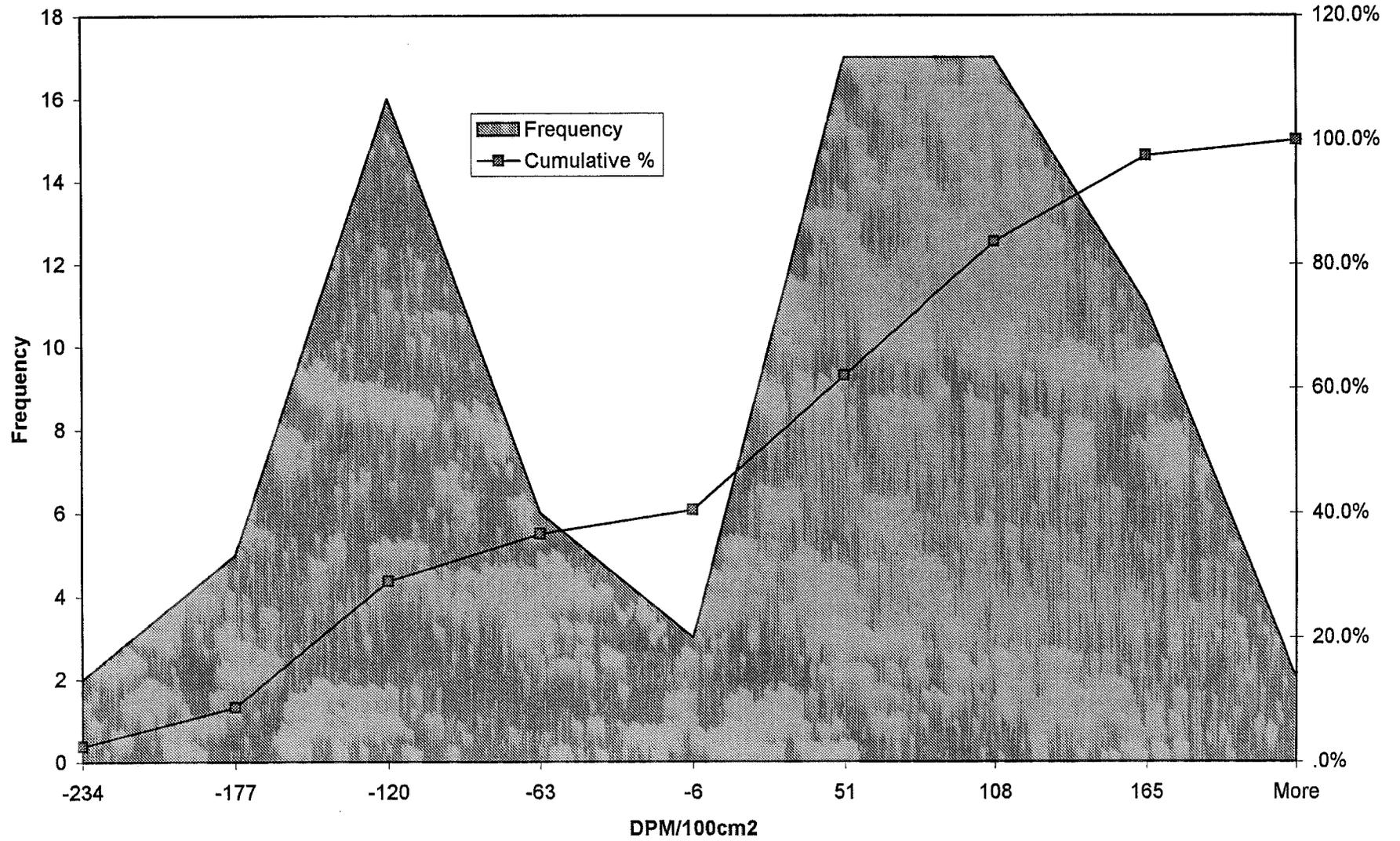
Upper Unit 3-All Fixed Beta Histogram



Upper Unit 3-All Beta Scan Maximum Histogram



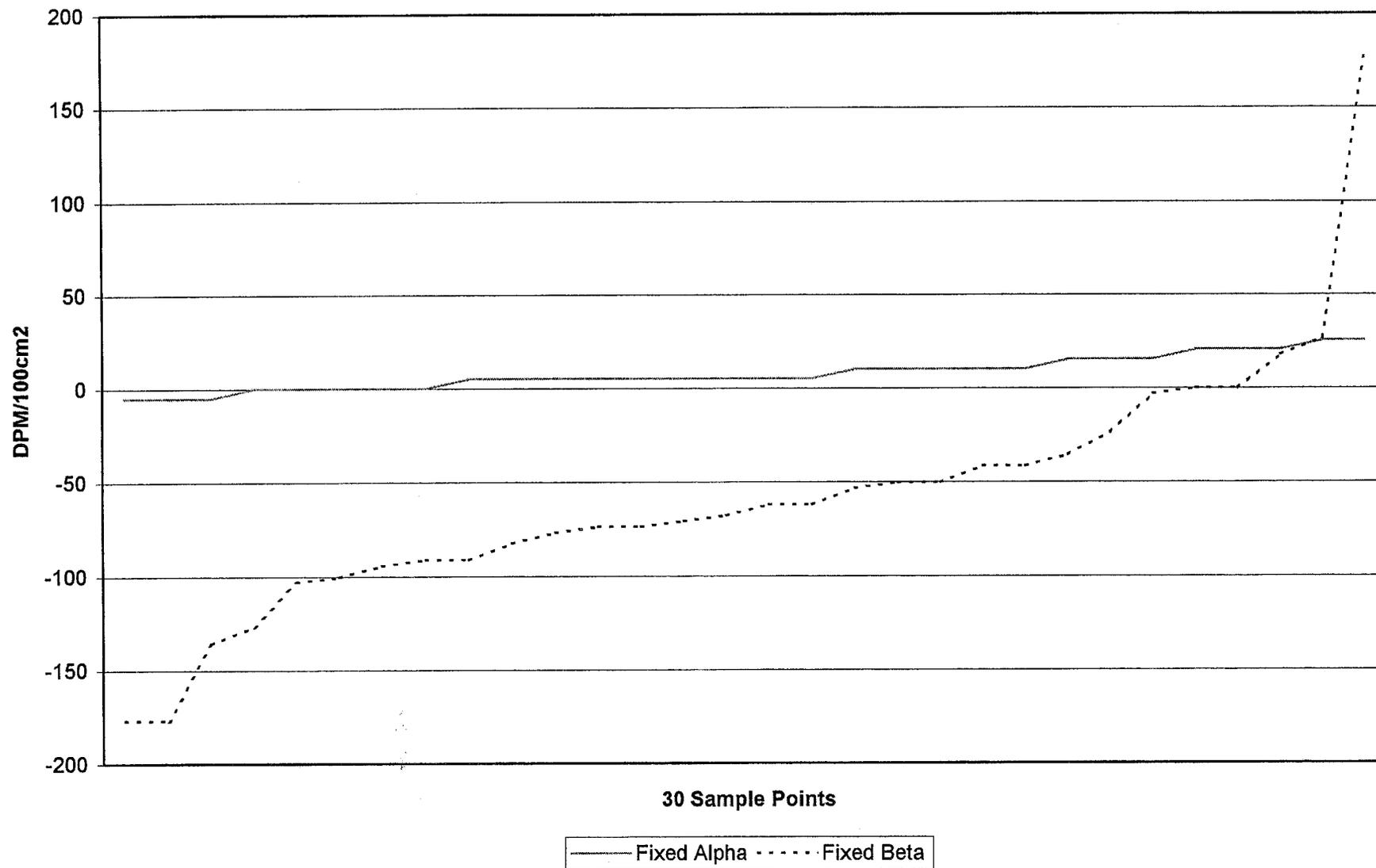
Upper Unit 3-All Beta Scan Average Histogram



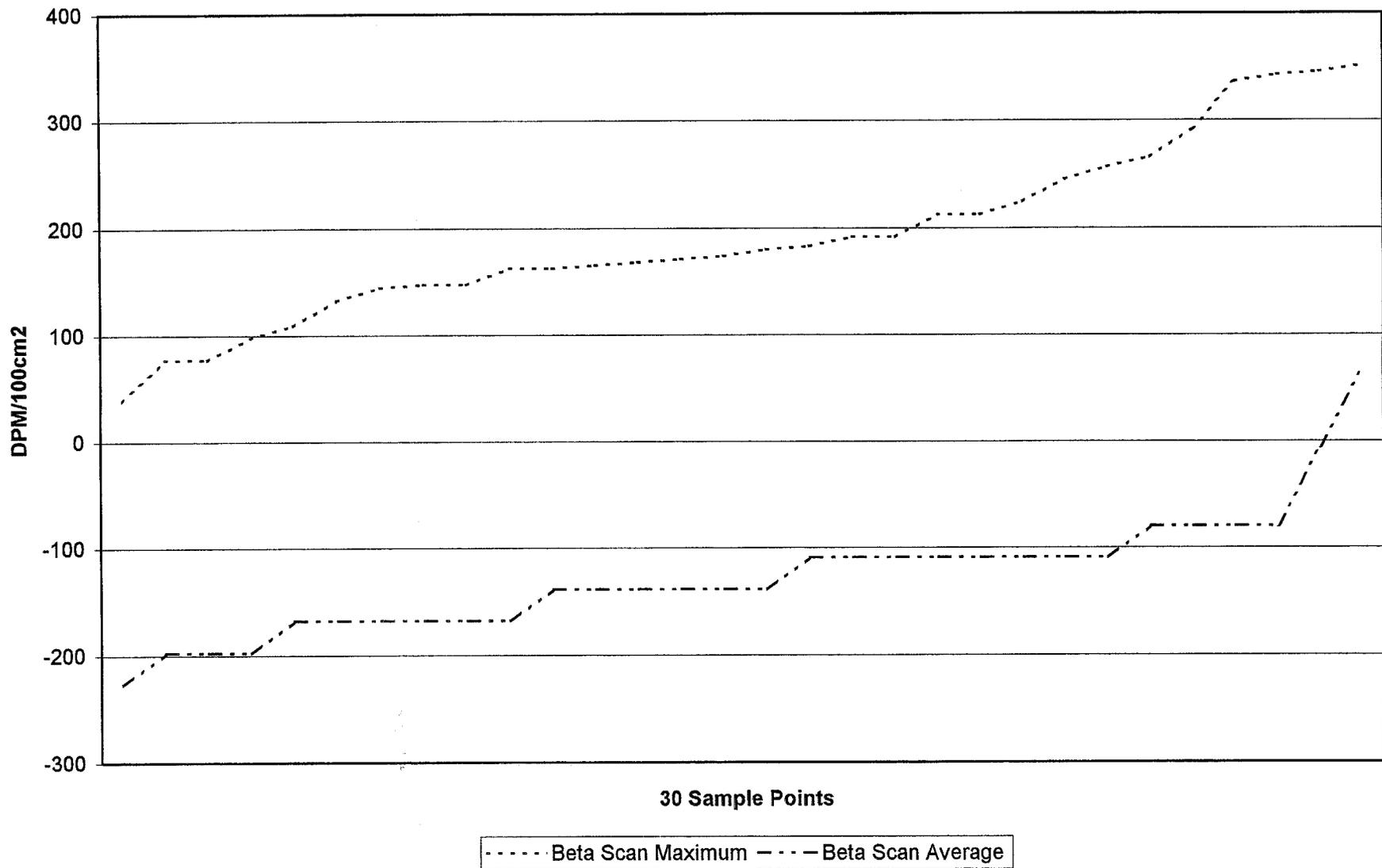
**SURVEY UNIT 4-ALL  
UPPER DATA TRENDS**

**REPORT #007**

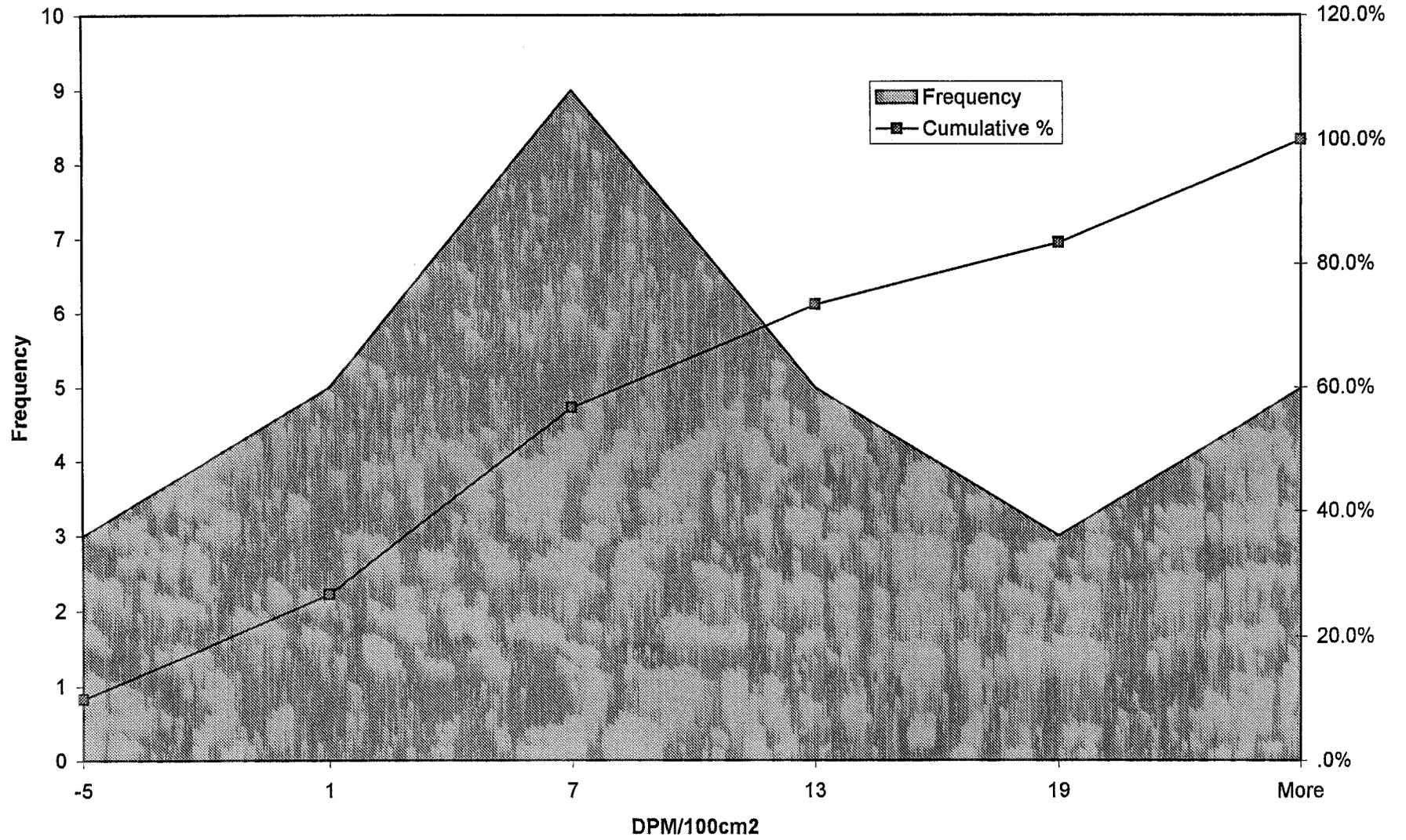
### Upper Unit 4-1 Data Trends



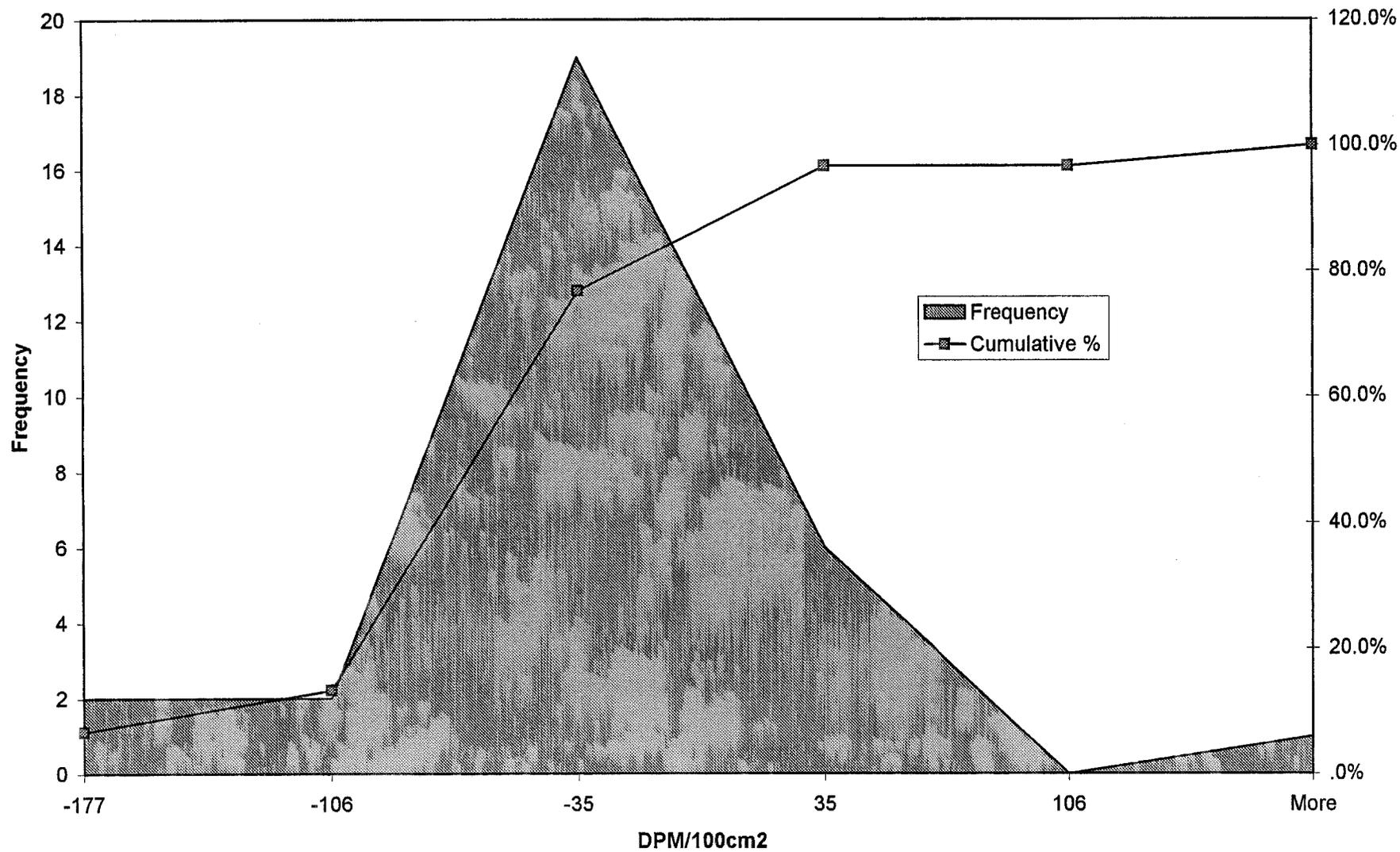
### Upper Unit 4-1 Data Trends



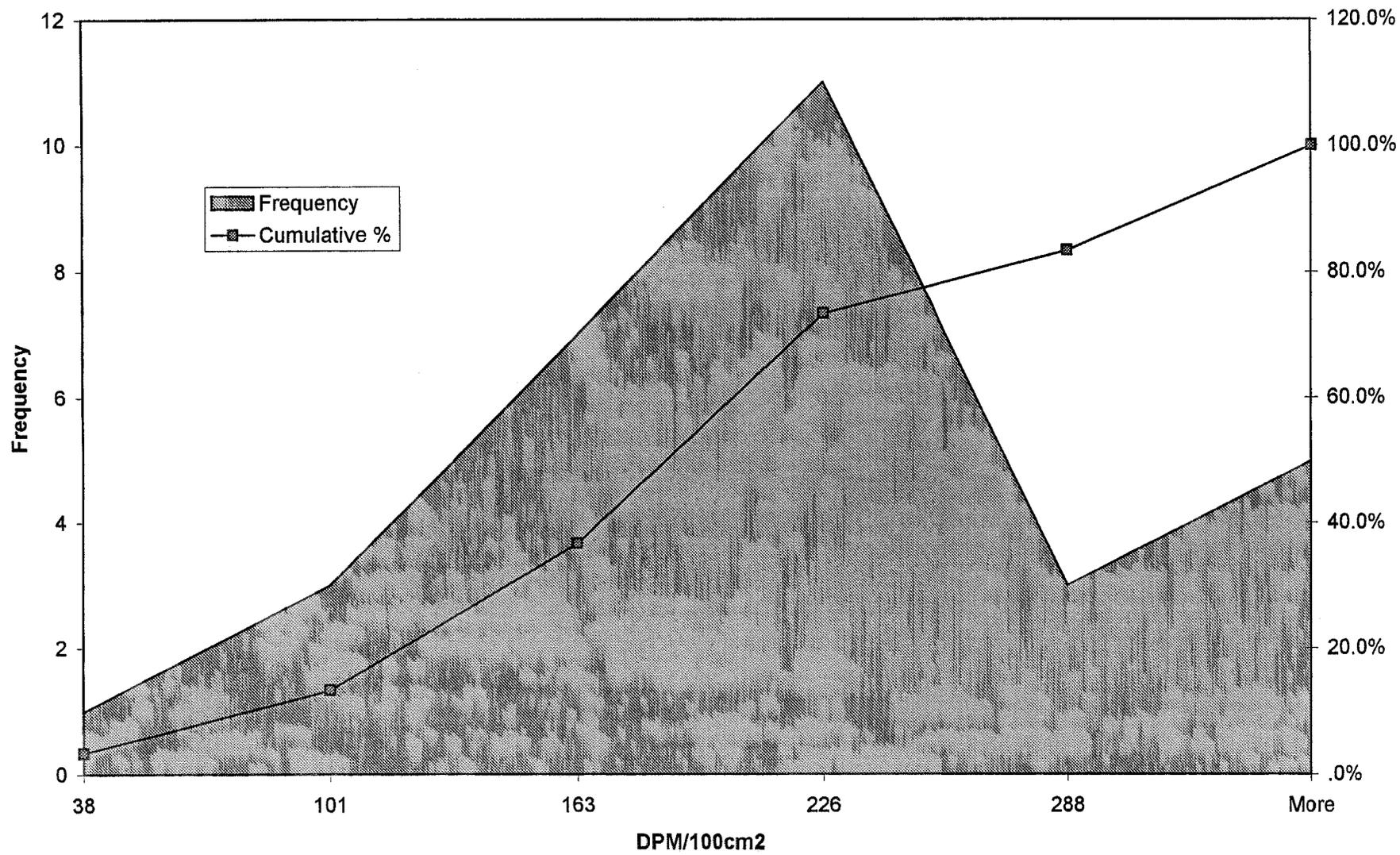
Upper Unit 4-1 Fixed Alpha Histogram



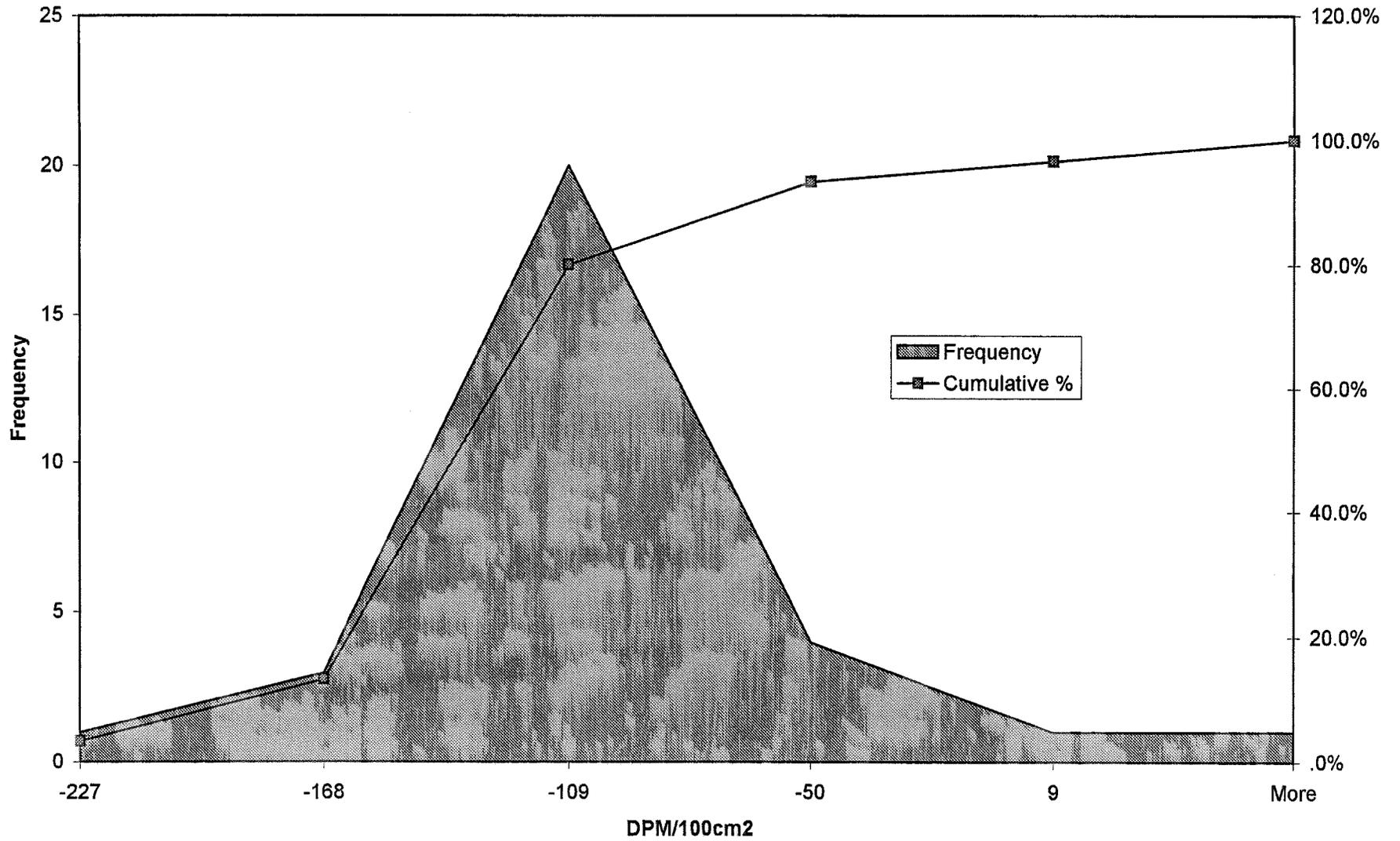
Upper Unit 4-1 Fixed Beta Histogram



Upper 4-1 Beta Scan Maximum Histogram



Upper Unit 4-1 Beta Scan Average Histogram



**APPENDIX F**  
**DETERMINING AREA CLASSIFICATIONS**  
**(PROCEDURE40-01-93)**

**REPORT #006**

## Determining Area Classifications

### Purpose:

To establish a uniform method to identify survey areas for documentation and repeatability.

### Policy and Scope:

To be applied to any area surveyed for the purpose of site decommissioning or characterization.

### Definitions:

Classification: All areas that have been identified as possessing the same potential for contamination.

Section: The most general locator. Usually a building or floor.

Unit: Maximum survey area size, depending on classification.

Sub-unit: The smallest unique part of a unit.

Alpha-numeric: The numbers representing (section) - (unit) - (subunit) i.e.: 15-9-8.

Minimum Survey Points: The minimum number of identifiable survey points within an area required by Nureg 5849.

Working Surfaces: Any area or part of an area that has a potential for elevated activity including floors, walls, overheads, ventilation, and miscellaneous surfaces.

### Responsibilities:

None.

### Reference:

Nureg CR 5849, ORAU/C57 June 1992 section 4.2 'Designing the Survey' ; 4.2.1 'Classifying an area by contamination potential'; 4.2.2. 'Establishing a reference grid system'; 4.2.3. 'Selecting measuring/sampling locations'.  
Environmental Clean-Up Procedures and Guidelines.

## General Procedure

### I. Classification 1. (Green)

#### A. Maximum unit size.

1. Usually one floor or any part thereof.

#### B. Survey Data Requirements

1. A minimum of 30 identifiable points
  - a. Alpha 1 minute count.
  - b. Beta 1 minute count.
  - c. Beta scan.
    - 1) 1 m<sup>2</sup> Around survey point.
  - d. 1 smear per survey point.
    - 1) 100 cm<sup>2</sup>.

- 2) Count for alpha.
- 3) Count for beta.
- e. Contact beta-gamma in mR/hr (floor only).
- f. Gamma at 1 meter in uR/hr (floor only).

- C. Additional surveys.
  - 1. Required as needed based upon results of initial 30 point survey.
  - 2. As requested by supervision.

**II. Classification 2. (Yellow)**

- A. Maximum unit size.
  - 1. 700 m<sup>2</sup>
- B. Survey Data Requirements.
  - 1. Refer to Part I, B, 1, a,b,c,d,e,f above.
    - a. A floor scan for beta of 10% of floor area is required.
- C. Additional surveys.
  - 1. Refer to Part I, C, 1,2 above.

**III. Classification 3. (Blue)**

- A. Maximum unit size.
  - 1. 500 m<sup>2</sup>
- B. Survey Data Requirements
  - 1. Refer to Part I,B, 1, a,b,c,d,e,f above.
  - 2. A floor scan of 30% is required.
  - 3. 30 upper surfaces' survey points.
    - a. Refer to Part I, B,1,a,b,c,d above.

Note: Gamma and beta-gamma measurements are not required for wall and upper surfaces survey points.
- C. Additional surveys.
  - 1. Refer Part I, C, 1, 2 above
  - 2. Ventilation surveys
    - a. Refer to Part I, B, 1, a,b, c, d above

**IV. Classification 4. (Red)**

- A. Maximum unit size.
  - 1. 300 m<sup>2</sup>
- B. Survey data requirements.
  - 1. Refer top Part I, B, 1, a,b,c,d,e,f above.
  - 2. A floor scan of 50% is required.
  - 3. Refer to Part III, B, 3, a above.
- C. Additional surveys.
  - 1. Refer to Part I, C , 1, 2 above.
  - 2. Ventilation surveys.
    - a. Refer to Part I. B, 1, a,b,c,d above.

**V. Classification 5.**

A. Maximum unit size.

1. 100 m<sup>2</sup>

B. Survey Data Requirements.

1. As per supervision.

Note: A class 5 area is an area that has indications of elevated readings or has had to be remediated and surveyed again at greater density.

2. The only part of the area that requires additional survey points is the affected area and the remediated areas. This area would consist of the working surfaces.

**VI. Survey Location Identification.**

A. Section.

1. A building(s) or floor(s).

B. Unit.

1. The largest part of a section.

C. Sub-unit.

1. The smallest unique area of a unit having the same potential for contamination.

**APPENDIX G**  
**SAMPLE CALCULATIONS**  
**AND SURVEY POINT EXAMPLE**

## SAMPLE CALCULATIONS

### AND EXAMPLE OF HOW SURVEY POINT LOCATION IS IDENTIFIED

#### Discussion

This appendix presents a sample of the calculations used to convert recorded survey data into units appropriate for direct comparison against the radiological acceptance criteria. Also included is an example of how a specific sample survey point was identified making it possible to relocate the specific survey point at a later time to verify all measurements. To make the example realistic a survey point on the floor of Building Number 1 was selected. Included in this appendix is a copy of the appropriate pages from Reports #002, #003, #006 and #007 making it unnecessary to refer back to the original reports. These copied pages have been highlighted and annotated to identify specific information of interest. The selected survey point was at grid point (6, - 4) within location code 1-40A-1, first floor of Building 1.

The pages copied from Report #002 are:

- a) Floor Scan Log – The Scan Log lists all the floor scans chronologically, including their location codes and scan type(s) performed.
- b) Beta Detectors Building 1 - This table presents the floor scan survey data with appropriate focus on hot spots found in the preliminary scans. When hot spots were found, there were remediated and then surveyed for radiological closeout.

The pages copied from Report #003 are:

- a) Building Diagrams- This is the floor plan for the first floor of Building 1, Survey Section 40A. Location code 1-40A-1 has been outlined on this figure. (The description of the entire location code system is provided in Report #006). In summary, the location code means:

1 = Survey Section designation  
40A = Unit designation within the Section  
1 = Sub-unit designation within the Unit

The grid designation of (6, - 4) is the distance in meters from the "point-of-origin" for the specific surface. This point-of-origin has been marked on the diagram, and represents a specific point on the floor surface at the northwest corner of that section of floor. Thus, this selected point is 6 meters east (down) and -4 meters south (left) of the "point-of-origin".

- b) Original Survey Data - In all of the reports, the survey data sheets provide all raw survey data. This survey data sheet information is incorporated into report Appendices. Each Appendix has relevant survey data sheets for analysis. In this specific example, Appendix F of Report #002 has the survey data sheets for Unit 40A. Only the 3 original pages

referring to the chosen survey point are included here. On the first page, the specific line of data for the chosen survey point is outlined. Other pertinent information is also outlined, as the location code, the survey classification and the identity of the instruments used. On the second page, the line of printout data for the swipe test results for the identified survey point has been outlined. Note that on the printout for the automatic alpha/beta counter, no specific reference to the survey point is noted. When the swipe samples were loaded into the counting system they were placed in the same order as the location on survey data sheets. Hence, line 16 on the survey data sheet corresponds to line 16 of the automatic counting system printout. Finally, a survey specific diagram is occasionally included designating the specific survey area covered.

The pages copied from Report #006 are:

- a) Survey Cross-Reference Sheets- These sheets are sorted by the specific Section, Unit, and Sub-Unit. This includes all the survey serial number for both Floor Scans and Radiological Closeout surveys for use in finding all respective surveys for a specific area. Take note that when referring to Unit 40A and Unit 40.1 is synonymous.

The pages copied from Report #007 are:

- a) Lower Scan Log – The Scan Log lists all the lower scans chronologically, including their location codes and other pertinent data. This includes all the survey serial numbers, number of survey points, and classifications.
- b) Unit 1-40A - This table presents the survey data with the results converted, as required, to the units necessary for comparison against the radiological acceptance criteria. Example calculations are provided in this appendix for the specific line of data outlined on the table.

Following the unit data table is the statistical analysis for the respective section. This section analysis contains adequate information to determine whether the area passes radiological acceptance criteria. Follow the creation and tracking of the “Beta DPM” in the attached sheets and in the calculations to follow.

- c) Lower Area Compiled Statistics – This table compiles all of the statistical analyses from all of the lower units. Data compiled such as this makes it easy to determine whether the building passes or fails radiological acceptance criteria. “Beta DPM” is shown as to follow the tracking of specific data.

## Sample Calculations

This discussion presents sample calculations used to convert survey data results into the units appropriate for comparison against the radiological acceptance criteria. The calculations are based on the actual data for the selected survey point location identified in the previous discussion: All references to Original Data in the discussion below mean Original Data of Report #003 Appendix F.

### a) Gamma Dose Rate At One Meter above the Surface

Value from Unit 1-40A = 6 microrem/hour  
Value from Original Data = 6 microrem/hour

The Eberline Model PRM-7 (S/N 234) was used for this measurement as indicated at the top of the first page copied from the original data. The instrument reads directly in the appropriate units. No calculations are necessary.

### b) Beta/Gamma Dose Rate On Contact

Value from Unit 1-40A = 0.007 microrem/hour  
Value from Original Data = 0.007 microrem/hour

The Eberline Model ESP-2 (S/N 1522) was used for this measurement as indicated at the top of the first page copied from the original data. The instrument reads directly in the appropriate units. No calculations are necessary. (The instrument calibration records included under Code Number 22, Appendix C of Report #001 identify the instrument probe as an Eberline Model HP-270).

### c) Beta Scan Of Area around the Survey Point

Values from Unit 1-40A = 486.73 DPM/100 cm<sup>2</sup> (Max.)  
244.84 DPM/100 cm<sup>2</sup> (Avg.)  
Values from Original Data = 442 CPM (Max.)  
360 CPM (Avg.)

The Eberline ESP-2 (S/N 1601) was used for these measurements. The equation used for data conversion is:

$$\frac{\text{dpm}}{100 \text{ cm}^2} = \left( \frac{\text{c/m} - \text{B/m}}{E} \right) \left( \frac{100}{A} \right)$$

Where:

c/m = Recorded countrate from the ratemeter.

B/m = Recorded background countrate from the ratemeter (i.e. 277 CPM for Beta).

E = Detector efficiency of instrument in counts per disintegration (i.e. 33.9% for Beta)  
A = Active surface area of the detector in cm<sup>2</sup> (i.e. 100 cm<sup>2</sup> for the Eberline ESP-2. See Code Number 13, Appendix C of Report #001).

The actual calculations are:

For Max:

$$\frac{\text{dpm}}{100 \text{ cm}^2} = \left( \frac{442 - 277}{.339} \right) \left( \frac{100}{100} \right) = 486.73$$

For Avg.:

$$\frac{\text{dpm}}{100 \text{ cm}^2} = \left( \frac{360 - 277}{.339} \right) \left( \frac{100}{100} \right) = 244.84$$

d) Total Alpha Activity at Survey Point:

Value from Unit 1-40A = 23.04 dpm/100cm<sup>2</sup>  
Value from Original Data = 5 counts

This measurement was made by integrating the counts from the Eberline ESP-2 (S/N 1588) for a period of one minute with the instrument held stationary at the survey point location.

The equation used for the data conversion is:

$$\frac{\text{dpm}}{100 \text{ cm}^2} = \left( \frac{c/t - B/m}{E} \right) \left( \frac{100}{A} \right)$$

Where:

c = total integrated counts recorded by the instrument  
t = time period (minutes) over which the count was recorded, (i.e. one minute)

The other terms are as previously defined with B/m = 0, E = 21.4% and A = 100 cm<sup>2</sup>.

The actual calculation is:

$$\frac{\text{dpm}}{100 \text{ cm}^2} = \left( \frac{5/1 - 0}{0.214} \right) \left( \frac{100}{100} \right) = 23.04$$

e) Total Beta Activity at Survey Point:

Value from Unit 1-40A = 418.88 dpm/100cm<sup>2</sup>

Value from Original Data = 419 counts

This measurement was also made by integrating the counts from the Eberline ESP-2 for a period of one minute with the instrument held stationary at the survey point location. The equation used is identical to that described above for Total Alpha Activity with the following values for the Beta measurement:

t = 1 minute  
B/m = 277 cpm  
E = 33.9%  
A = 100 cm<sup>2</sup>

The actual calculation is:

$$\frac{\text{dpm}}{100 \text{ cm}^2} = \left( \frac{419/1 - 277}{.339} \right) \left( \frac{100}{100} \right) = 418.88$$

f) Removable Alpha Activity at Survey Point:

Value from Unit 1-40A = -0.66 dpm/100cm<sup>2</sup>  
Value from Original Data = -0.66 dpm/100 cm<sup>2</sup>

The automatic counting system performs all calculations necessary to compute the results in the desired units. The complete data output given on the counting system report (second page copied from Original Data) includes all the necessary information. The equation used for the data conversion is:

$$\frac{\text{dpm}}{100 \text{ cm}^2} = \left( \frac{c/t - B/m}{E} \right) \left( \frac{100}{A} \right)$$

Where everything has the same meaning as before except that:

A = area in cm<sup>2</sup> that was wiped by the smear paper (ie 100 cm<sup>2</sup>)

The other appropriate values are:

t = 2.0  
E = 34.34%  
B/m = 0.2267  
A = 100cm<sup>2</sup>

The output sheet does not give the value of c directly, rather it gives the net value which is equivalent to:

$$(c/t - B/m) = -0.227 \text{ CPM (net)}$$

The actual calculation is:

$$\frac{\text{dpm}}{100 \text{ cm}^2} = \left(\frac{-0.227}{0.3434}\right)\left(\frac{100}{100}\right) = -0.66$$

g) Removable Beta Activity at Survey Point:

$$\begin{aligned} \text{Value from Unit 1-40A} &= 1.82 \text{ dpm}/100 \text{ cm}^2 \\ \text{Value from Original Data} &= 1.82 \text{ dpm}/100 \text{ cm}^2 \end{aligned}$$

All of the same discussion and equations given above for Removable Alpha Activity apply here. The appropriate values are:

$$\begin{aligned} t &= 2.0 \\ E &= 37.14\% \\ B/m &= 1.8233 \\ A &= 100\text{cm}^2 \\ (c/t - B/m) &= 0.68 \text{ CPM (net)} \end{aligned}$$

Thus the actual calculation is:

$$\frac{\text{dpm}}{100 \text{ cm}^2} = \left(\frac{0.68}{0.3714}\right)\left(\frac{100}{100}\right) = 1.82$$

h) Statistical Summary

At the end of the table of converted survey data for Unit 1-40A (from Report #007) is the statistical summary for the survey data. This summary is provided for each type of measurement. As an example, on the copied page the statistical summary for Fixed Beta measurements is outlined. The summary includes:

- 1) The number of sample points.
- 2) The minimum, maximum, and average values.
- 3) The standard deviation for the data.
- 4) The applicable criteria.
- 5) The results for the statistical test in accordance with the data evaluation procedures in NUREG-5849.

In order to simplify the process of comparing the results across the different survey units, a table of compiled statistics is provided in Report #007. Again, as an example, the statistics for the Fixed Beta Measurements for Survey Unit 1-40A are highlighted on the copied page included here.

COMPARISON OF MEASUREMENT UNITS

DESCRIPTION OF RADIOLOGICAL MEASUREMENT	UNITS OF MEASUREMENTS	UNITS AFTER DATA CONVERSION	UNITS OF RADIOLOGICAL ACCEPTANCE CRITERIA
Alpha Surface Activity (Fixed Measurement)	CPM (Counts integrated for 1 min.)	DPM/100 om <sup>2</sup> *	DPM/100 om <sup>2</sup>
Beta Surface Activity (Fixed Measurement)	CPM (Counts integrated for 1 min.)	DPM/100 om <sup>2</sup> *	DPM/100 om <sup>2</sup>
Surface Scan for Alpha Activity	CPM (Count rate)	DPM/100 om <sup>2</sup> *	DPM/100 om <sup>2</sup>
Surface Scan for Beta Activity	CPM (Count rate)	DPM/100 om <sup>2</sup> *	DPM/100 om <sup>2</sup>
Removable Alpha Activity (Swipe Test)	CPM per Swipe	DPM/100 om <sup>2</sup> *	DPM/100 om <sup>2</sup>
Removable Beta Activity (Swipe Test)	CPM per Swipe	DPM/100 om <sup>2</sup> *	DPM/100 om <sup>2</sup>
Beta/Gamma Dose Rate (On Contact with Surface)	mr/hr	mr/hr	mr/hr
Gamma Dose Rate at 1 meter from surface	microR/hr	microR/hr	microR/hr
Gamma Spectroscopy Analysis of Sample	pico Curies of U-235 per gram of media	pico Curies of Uranium per gram of media	pico Curies of Uranium per gram of media (pCi/g)
Alpha Spectroscopy Analysis of Sample	pico Curies of Uranium isotopes per gam of media	pico Curies of Uranium per gram of media	pico Curies of Uranium per gram of media (pCi/g)

NOTES: \* Data was adjusted to subtract background radiation levels.

\*\* A value of 30 was determined to be applicable for the ratio of Uranium-total activity to the Uranium-235 activity. (See Appendix A of Data Summary Report – Radiological Testing, Former Zircaloy Burn Area, Westinghouse Electric Company Specialty Metals Plant, Blairsville, Pennsylvania (June 15, 1999) for justification).

**COPIED FROM REPORT #002**

**SUMMARY OF FLOOR SCAN MEASUREMENTS**

**AND DATA ANALYSIS**

Floor Scan Log

Scan Serial Number	Survey Date	Section	Unit	Sub-Unit	Total Scans	Scan Type(s) Performed
FS01-001	11/3/94	1	17	1	1	Gamma
FS01-002	11/7/94	1	16	1	1	Gamma
FS01-003	11/7/94	1	31, 32, 33	2	3	Gamma
FS01-004	11/21/94	1	20, 5	Misc	3	Beta and Gamma
FS01-005	11/22/94	1	20, 5	Misc	8	Beta and Gamma
FS01-006	12/8/94	1	31, 32, 33	1	3	Beta
FS01-007	12/14/94	1	5	5	1	Beta
FS01-008	12/20/94	1	19	3	1	Beta
FS01-009	1/1/95	1	20	4	1	Beta
FS01-010	1/6/95	1	27, 29, 30	Misc	3	Beta
FS01-011	1/25/95	1	18, 21, 21, 25, 26, 28	Misc	17	Beta
FS01-012	1/26/95	1	22, 23, 24A, 24B	Misc	6	Beta
FS01-013	2/6/95	1	10, 12, 13, 14, 15	1	6	Beta
FS01-014	2/7/95	1	7, 8, 9	1	11	Beta
FS01-015	2/8/95	1	3, 4	Misc	10	Beta
FS01-016	2/8/95	1	11	Misc	20	Beta
FS01-017	2/9/95	1	40A, 40B, 41, 43	Misc	11	Beta
FS01-018	2/13/95	1	2, 3	Misc	14	Beta
FS01-019	2/13/95	1	2, 40A, 40B	Misc	14	Beta
FS01-020	2/14/95	1	1, 36	Misc	10	Beta
FS01-021	2/15/95	1	5A, 35B, 37, 38, 40A, 46, 47	Misc	25	Beta
FS01-022	2/17/95	1	19, 34, 44	Misc	12	Beta
FS01-023	2/20/95	1	44, 45	Misc	10	Beta
FS01-024	3/1/95	1	14, 15, 16, 17	1	5	Gamma
FS01-025	3/7/95	1	8, 9, 11, 12, 13	Misc	28	Gamma
FS01-026	3/8/95	1	6, 7, 20	Misc	7	Gamma
FS01-027	3/29/95	1	49	5	2	Beta and Gamma
FS01-028	3/28/95	1	49	Misc	4	Beta and Gamma
FS01-029	4/3/95	1	3, 4	Misc	20	Gamma
FS01-030	4/4/95	1	1, 2	Misc	16	Gamma
FS01-031	4/5/95	1	45, 46, 47	Misc	20	Gamma
FS01-032	4/19/95	1	4	1	1	Gamma
FS01-033	4/24/95	1	22	1	1	Gamma
FS01-034	4/25/95	1	23, 24A, 24B, 30, 31	Misc	10	Gamma
FS01-035	4/26/95	1	27, 28, 29, 30, 31, 32, 33	Misc	14	Gamma
FS01-036	4/27/95	1	25, 26, 36	Misc	5	Gamma
FS01-037	5/1/95	1	19, 34, 35A, 35B, 37, 38	Misc	11	Gamma
FS01-038	5/2/95	1	5, 20, 43	Misc	13	Gamma
FS01-039	5/3/95	1	18, 41, 45	Misc	15	Gamma
FS01-040	5/4/95	1	6, 44, 45	Misc	27	Beta and Gamma
FS01-041	5/11/95	1	40A, 40B	Misc	17	Gamma
FS01-042	5/16/95	1	44, 45	Misc	6	Gamma
FS01-043	5/25/95	1	45	4	2	Gamma
FS01-044	6/15/95	1	41, 49	Misc	2	Beta and Gamma
FS01-045	6/21/95	1	49	9	1	Beta
FS01-046	6/26/95	1	49	9	1	Gamma
FS01-047	7/11/95	1	48	1	4	Beta
FS01-048	8/11/95	1	1, 2, 11, 18	Misc	13	Beta and Gamma
FS01-049	8/11/95	1	1, 18	Misc	2	Beta
FS01-050	8/11/95	1	1, 2, 11, 18	Misc	5	Beta and Gamma
FS01-051	8/12/95	1	2, 11, 19, 24A, 30	Misc	7	Beta
FS01-052	8/24/95	1	5	1	1	Beta
FS01-053	8/25/95	1	41	2	1	Beta
FS01-054	8/29/95	1	44, 45, 46, 47	Misc	15	Beta and Gamma
FS01-055	9/6/95	1	40A	5	2	Beta and Gamma
FS01-056	12/24/95	1	41	2	1	Beta
FS01-057	12/26/95	1	40A, 40B	1	3	Beta
FS03-001	4/20/95	3	2	1	4	Gamma
FS03-002	4/19/95	3	3	1	5	Gamma
FS03-003	4/24/95	3	1	1	1	Gamma
FS03-004	7/20/95	3	1, 2, 3	1	3	Beta
FS03-005	7/21/95	3	4	Misc	21	Beta
FS03-006	7/21/95	3	4	Misc	21	Gamma

Beta Detectors Building 1

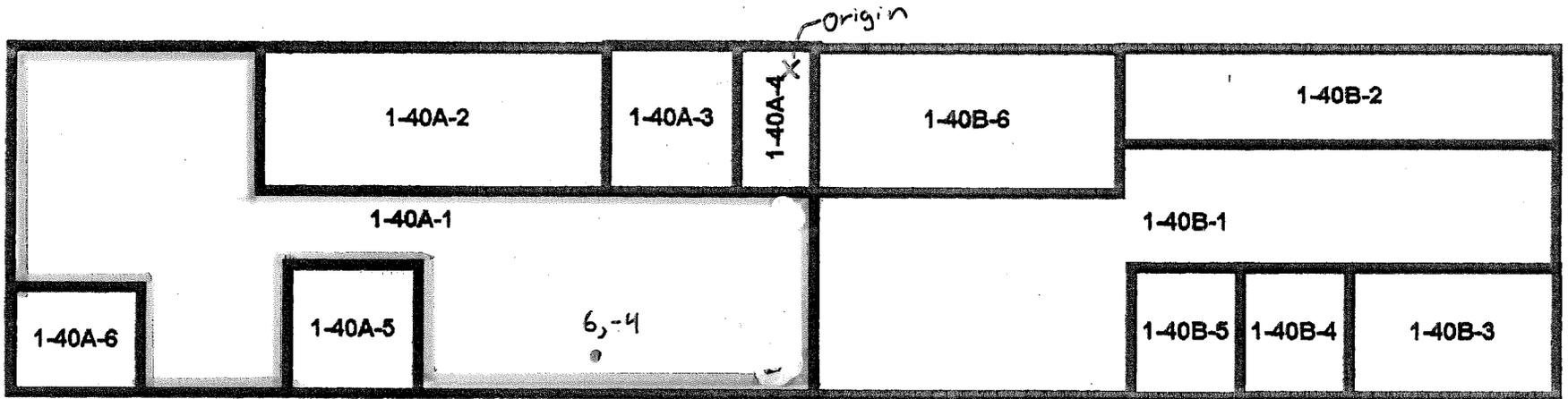
2/13/95	FS01-018	CARPET	80	1-2-4	342	21	26.6	4.34	800	1398	1010	995	
2/13/95	FS01-018	CARPET	50	1-2-5	24	21	26.6	4.34	800	1145	982	995	
2/13/95	FS01-018	CARPET	60	1-2-6	18	21	26.6	4.34	800	1208	920	995	
2/13/95	FS01-018	CARPET	60	1-2-7	10	21	26.6	4.34	800	1109	1005	995	
2/13/95	FS01-018	CARPET	80	1-3-10	14	21	26.6	4.34	800	1124	960	995	
2/13/95	FS01-018	CARPET	60	1-3-11	9	21	26.6	4.34	800	1019	905	995	
2/13/95	FS01-018	CARPET	75	1-3-12	9	21	26.6	4.34	800	1124	895	995	
2/13/95	FS01-018	CARPET	90	1-3-4	44.5	21	26.6	4.34	800	1148	926	995	
2/13/95	FS01-018	MOSAIC TILE	90	1-3-5	11	21	26.6	4.34	800	2294	2073	995	
2/13/95	FS01-018	CARPET	70	1-3-6	32.5	21	26.6	4.34	800	1216	942	995	
2/13/95	FS01-018	CARPET	60	1-3-7	12	21	26.6	4.34	800	1219	924	995	
2/13/95	FS01-018	CARPET	60	1-3-8	9.5	21	26.6	4.34	800	1310	931	995	
2/13/95	FS01-018	CARPET	50	1-3-9	7.5	21	26.6	4.34	800	1046	940	995	
2/13/95	FS01-019	CARPET	50	1-2-10	12	21	26.6	4.34	800	1103	953	975	
2/13/95	FS01-019	CARPET	50	1-2-8	12	21	26.6	4.34	800	1239	911	975	
2/13/95	FS01-019	CARPET	50	1-2-9	12	21	26.6	4.34	800	1071	940	975	
2/13/95	FS01-019	PAINTED CONCRETE	80	1-40A-1	127.5	21	26.6	4.34	800	1874	1493	975	
2/13/95	FS01-019	PAINTED CONCRETE	100	1-40A-1	1	21	26.6	4.34	800	5893	4180	975	3.5, -4.5
2/13/95	FS01-019	PAINTED CONCRETE	100	1-40A-1	1	21	26.6	4.34	800	3062	1550	975	6, -5
2/13/95	FS01-019	PAINTED CONCRETE	100	1-40A-1	1	21	26.6	4.34	800	3501	1580	975	3.5, -4.5
2/13/95	FS01-019	PAINTED CONCRETE	100	1-40A-1	1.5	21	26.6	4.34	800	4579	3000	975	6, -4
2/13/95	FS01-019	PAINTED CONCRETE	100	1-40A-1	1.5	21	26.6	4.34	800	5678	3000	975	3.5, -4
2/13/95	FS01-019	PAINTED CONCRETE	100	1-40A-1	1.5	21	26.6	4.34	800	7145	3000	975	
2/13/95	FS01-019	PAINTED CONCRETE	80	1-40A-2	45	21	26.6	4.34	800	1959	1346	975	
2/13/95	FS01-019	PAINTED CONCRETE	70	1-40B-1	130	21	26.6	4.34	800	2161	1487	975	
2/13/95	FS01-019	PAINTED CONCRETE	100	1-40B-1	4.5	21	26.6	4.34	800	22006	5400	975	5.5, -20 TO 5.5, -2.2 TO WALL '
2/13/95	FS01-019	CARPET	70	1-40B-6	45	21	26.6	4.34	800	1067	1024	975	
2/14/95	FS01-020	TILE ON CONCRETE	70	1-1-1	16	21	27.2	4.34	800	1694	1300	916	
2/14/95	FS01-020	CARPETED CONCRETE	50	1-1-10	19	21	27.2	4.34	800	1129	875	916	
2/14/95	FS01-020	CARPETED CONCRETE	50	1-1-12	16	21	27.2	4.34	800	1079	950	916	
2/14/95	FS01-020	TILE ON CONCRETE	50	1-1-3	9	21	27.2	4.34	800	1173	950	916	
2/14/95	FS01-020	CARPETED CONCRETE	50	1-1-4	16	21	27.2	4.34	800	1101	900	916	
2/14/95	FS01-020	CARPETED CONCRETE	80	1-1-6	180	21	27.2	4.34	800	1321	975	916	
2/14/95	FS01-020	CARPETED CONCRETE	60	1-1-7	11	21	27.2	4.34	800	1099	950	916	
2/14/95	FS01-020	CARPETED CONCRETE	50	1-1-8	11	21	27.2	4.34	800	1053	900	916	
2/14/95	FS01-020	CARPETED CONCRETE	50	1-1-9	12	21	27.2	4.34	800	1107	950	916	
2/14/95	FS01-020	CONCRETE	90	1-36-1	428	21	27.2	4.34	800	1677	1250	916	
2/15/95	FS01-021	CONCRETE	70	1-35A-1	297	21	27.2	4.34	800	2098	1350	984	
2/15/95	FS01-021	CONCRETE	60	1-35B-1	297	21	27.2	4.34	800	1687	1250	984	
2/15/95	FS01-021	PAINTED CONCRETE	60	1-37-1	558	21	27.2	4.34	800	1952	1400	984	
2/15/95	FS01-021	CONCRETE	80	1-38-1	358	21	27.2	4.34	800	1879	1400	984	
2/15/95	FS01-021	BRICK	100	1-38-1	2	21	27.2	4.34	800	8276	4000	984	
2/15/95	FS01-021	BRICK	50	1-38-1	105	21	27.2	4.34	800	3243	2500	984	HOT SPOT @ 1, -7
2/15/95	FS01-021	PAINTED CONCRETE	50	1-40A-3	23	21	27.2	4.34	800	1479	1200	984	
2/15/95	FS01-021	PAINTED CONCRETE	100	1-40A-3	1	21	27.2	4.34	800	4018	1200	984	
2/15/95	FS01-021	PAINTED CONCRETE	100	1-40A-3	1	21	27.2	4.34	800	3584	1200	984	
2/15/95	FS01-021	CARPET SQUARES	70	1-46-1	322	21	27.2	4.34	800	1276	950	984	
2/15/95	FS01-021	CERAMIC TILE	80	1-46-2	10	21	27.2	4.34	800	2792	2450	984	
2/15/95	FS01-021	CERAMIC TILE	80	1-46-3	10	21	27.2	4.34	800	2768	2500	984	
2/15/95	FS01-021	TILED FLOOR	50	1-46-4	33	21	27.2	4.34	800	1456	1150	984	
2/15/95	FS01-021	TILED FLOOR	40	1-46-5	25	21	27.2	4.34	800	1211	1000	984	
2/15/95	FS01-021	CARPET SQUARES	60	1-46-6	18	21	27.2	4.34	800	1373	1000	984	
2/15/95	FS01-021	CARPET SQUARES	60	1-46-7	14	21	27.2	4.34	800	1152	900	984	
2/15/95	FS01-021	CARPET SQUARES	60	1-46-8	14	21	27.2	4.34	800	1179	950	984	

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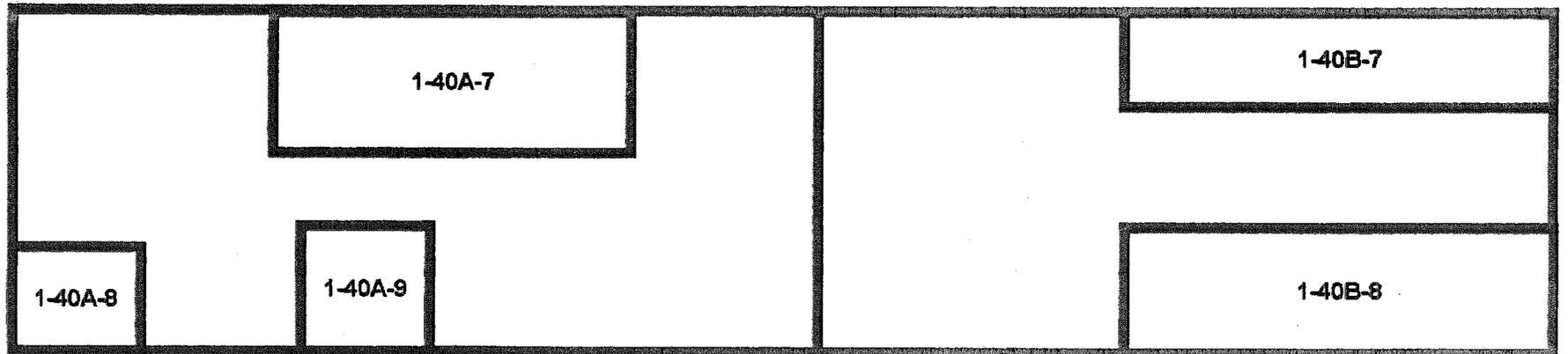
**BASIC INFORMATION AND DATA SHEETS FOR**

**RADIOLOGICAL SURVEYS OF BUILDINGS**

UNIT 1-40A & B  
(Main Floor)



UNIT 1-40A & B  
(Second Floor Surfaces)



# Blairsville Decommissioning Survey Form #003

Survey Serial #:	01-462
Survey Section:	1
Survey Unit:	40A
Survey Sub-unit:	1

Alpha Survey Instruments				
Inst. S/N	Inst. Code	Eff. %	Corr. Fac.	Bkg. CPM
1588	8	21.7	4.61	0

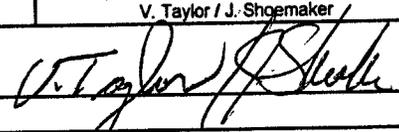
Beta Survey Instruments				
Inst. S/N	Inst. Code	Eff. %	Corr. Fac.	Bkg. CPM
1601	13	33.9	2.95	277

Gamma or Beta/Gamma Instruments			
Inst. S/N	Inst. Code	Bkg.	Detection Type
1522	22	0.015	Beta / Gamma
234	23	6	Gamma

Classification:	5
Survey Type:	Lower
Survey Date:	12/27/95
Count Date:	2/28/96

Alpha Counting Instruments				
Inst. S/N	Inst. Code	Eff. %	Corr. Fac.	Bkg. CPM
13295	2	34.34	2.91	0.23

Beta Counting Instruments				
Inst. S/N	Inst. Code	Eff. %	Corr. Fac.	Bkg. CPM
13295	3	37.14	2.69	1.82

Surveyor:	V. Taylor / J. Shoemaker
Signature:	

Surface Description	Coordinates		Gamma at 1m uR/hr	Gamma Inst. Code	Beta/Gamma Contact mR/hr	Beta/Gamma Code	Contact Gross 1 min. Count Alpha	Alpha Inst. Code	Contact Gross 1 min. Count Beta	Beta Inst. Code	Scan Contact Gross CPM		Removable DPM/100 cm2 Alpha	Alpha Count Code	Removable DPM/100 cm2 Beta	Beta Count Code	Comments
											Max Beta	Avg Beta					
	X	Y															
Floor	3	-1	6	23	0.013	22	0	8	396	13	543	350	-0.66	2	-2.22	3	Painted concrete
Floor	4	-1	6	23	0.01	22	0	8	523	13	563	410	0.80	2	-0.87	3	Painted concrete
Floor	5	-1	6	23	0.013	22	3	8	339	13	403	330	-0.66	2	-4.91	3	Scabbled concrete
Floor	6	-1	6	23	0.013	22	2	8	366	13	433	320	-0.66	2	1.82	3	Scabbled concrete
Floor	3	-2	6	23	0.011	22	2	8	381	13	426	350	-0.66	2	-2.22	3	Scabbled concrete
Floor	4	-2	6	23	0.015	22	3	8	374	13	449	330	0.80	2	0.48	3	Scabbled concrete
Floor	5	-2	6	23	0.011	22	0	8	356	13	461	360	-0.66	2	4.51	3	Scabbled concrete
Floor	6	-2	5	23	0.009	22	4	8	352	13	404	300	0.80	2	-2.22	3	Scabbled concrete
Floor	3	-3	6	23	0.01	22	2	8	388	13	487	350	-0.66	2	0.48	3	Scabbled concrete
Floor	4	-3	6	23	0.01	22	3	8	332	13	457	310	2.25	2	-2.22	3	Scabbled concrete
Floor	5	-3	6	23	0.009	22	5	8	325	13	480	340	-0.66	2	-0.87	3	Scabbled concrete
Floor	6	-3	6	23	0.013	22	3	8	345	13	482	350	-0.66	2	-0.87	3	Scabbled concrete
Floor	3	-4	6	23	0.009	22	4	8	385	13	408	320	0.80	2	-0.87	3	Painted concrete
Floor	4	-4	6	23	0.013	22	3	8	406	13	473	360	-0.66	2	1.82	3	Painted concrete
Floor	5	-4	6	23	0.008	22	3	8	430	13	469	350	0.80	2	1.82	3	Painted concrete
Floor	6	-4	6	23	0.007	22	5	8	419	13	442	360	-0.66	2	1.82	3	Painted concrete

**LB5100-W Low Background Counting System -- Smear Analysis**

Date: 2/29/96  
 Counting Unit id: 1  
 Data file name: C:\LBXL\UNIT1\B01-462.XLD  
 Batch Ended: 2/28/96 8:27  
 Crosstalk Correction: Not Applied

Alpha activity action level (DPM): 20.00  
 Beta activity action level (DPM): 200.00  
 Certainty level for MDA and flags: 95.00%  
 High Voltage Setting: 1440

Application Revision: 3  
 Application Version: Standard

Alpha efficiency log file: th230ab  
 Alpha Efficiency: 34.34%  
 Alpha to Beta Crosstalk: 23.95%  
 Alpha Background (CPM): 0.22666667  
 Alpha Correction Factor: 1.000

Beta efficiency log file: tc99ab  
 Beta Efficiency: 37.14%  
 Beta into Alpha Crosstalk: 0.17%  
 Beta Background (CPM): 1.823333333  
 Beta Correction Factor: 1.000

Batch ID: Blairsville 1-40A-1

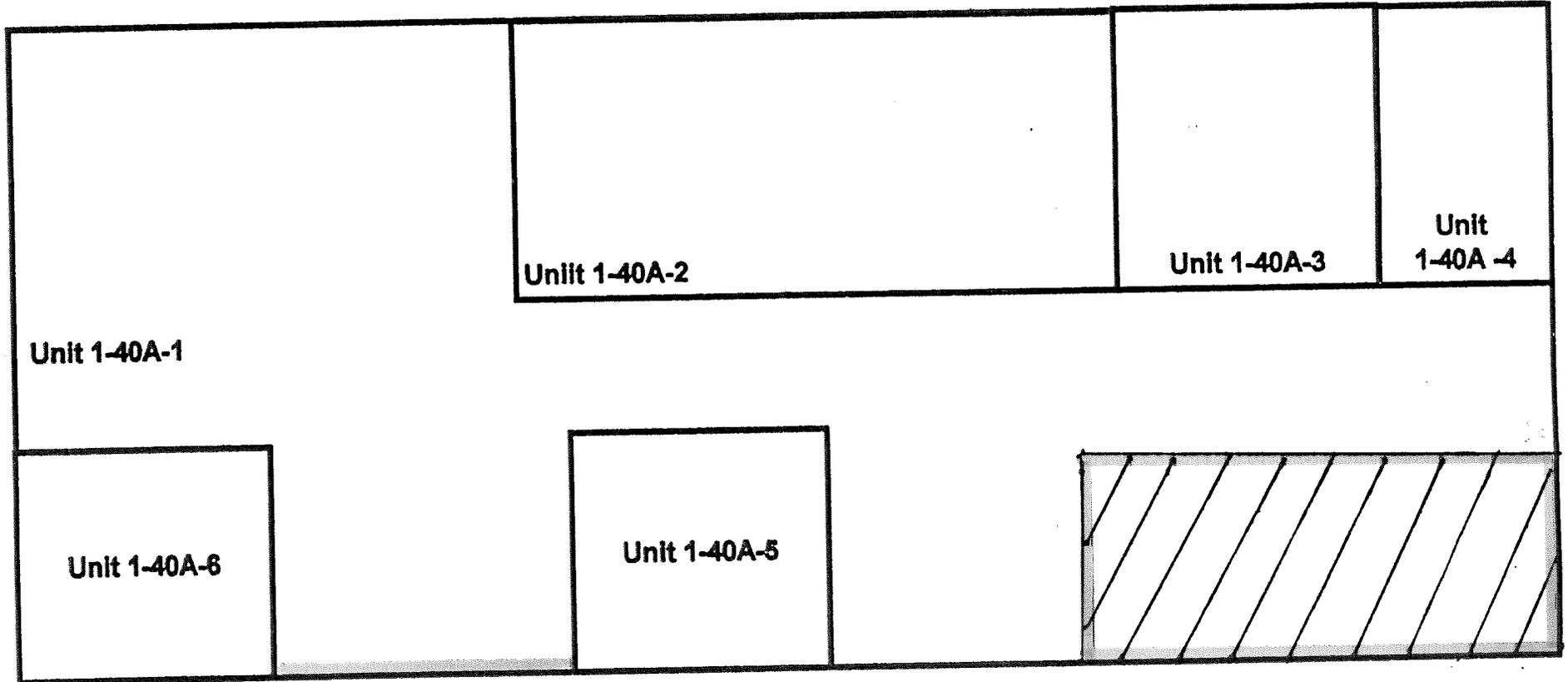
Carrier	Alpha Activity				Beta Activity				Count time (min)	Alpha CPM	Beta CPM	Completion Date - Time
	DPM	$\sigma$	flags	MDA	DPM	$\sigma$	flags	MDA				
28	-0.660	1.46	<MDA	7.18	-2.22	1.92	<MDA	12.13	2.00	-0.227	-0.82	2/28/96 7:54
29	0.796	1.46	<MDA	7.18	-0.87	2.34	<MDA	12.13	2.00	0.273	-0.32	2/28/96 7:56
30	-0.660	1.46	<MDA	7.18	-4.91	1.36	<MDA	12.13	2.00	-0.227	-1.82	2/28/96 7:58
31	-0.660	1.46	<MDA	7.18	1.82	3.02	<MDA	12.13	2.00	-0.227	0.68	2/28/96 8:00
32	-0.660	1.46	<MDA	7.18	-2.22	1.92	<MDA	12.13	2.00	-0.227	-0.82	2/28/96 8:03
33	0.796	1.46	<MDA	7.18	0.48	2.70	<MDA	12.13	2.00	0.273	0.18	2/28/96 8:05
34	-0.660	1.46	<MDA	7.18	4.51	3.57	<AL	12.13	2.00	-0.227	1.68	2/28/96 8:07
35	0.796	1.46	<MDA	7.18	-2.22	1.92	<MDA	12.13	2.00	0.273	-0.82	2/28/96 8:09
36	-0.660	1.46	<MDA	7.18	0.48	2.70	<MDA	12.13	2.00	-0.227	0.18	2/28/96 8:11
37	2.252	2.06	<AL	7.18	-2.22	1.92	<MDA	12.13	2.00	0.773	-0.82	2/28/96 8:14
38	-0.660	1.46	<MDA	7.18	-0.87	2.34	<MDA	12.13	2.00	-0.227	-0.32	2/28/96 8:16
39	-0.660	1.46	<MDA	7.18	-0.87	2.34	<MDA	12.13	2.00	-0.227	-0.32	2/28/96 8:18
40	0.796	1.46	<MDA	7.18	-0.87	2.34	<MDA	12.13	2.00	0.273	-0.32	2/28/96 8:20
41	-0.660	1.46	<MDA	7.18	1.82	3.02	<MDA	12.13	2.00	-0.227	0.68	2/28/96 8:23
42	0.796	1.46	<MDA	7.18	1.82	3.02	<MDA	12.13	2.00	0.273	0.68	2/28/96 8:25
43	-0.660	1.46	<MDA	7.18	1.82	3.02	<MDA	12.13	2.00	-0.227	0.68	2/28/96 8:27

UNIT 1-40A-1

SN# 1-462

12-27-95

# UNIT 1-40A (Main Floor)



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**SUMMARY REPORT ON INFORMATION RELEVANT**

**TO THE RADIOLOGICAL AUDIT OF THE**

**BLAIRSVILLE SPECIALTY METALS PLANT**

## Survey Cross Reference

Section	Unit	Sub-Unit	Survey Serial Number	Survey Date	Number of Survey Points	Type	Classification
1	37	1	FS01-021	2/15/95	N/A	Floor Scan	N/A
1	37	1	FS01-037	5/1/95	N/A	Floor Scan	N/A
1	38	1	01-022	11/9/94	33	Lower	3
1	38	1	01-244	2/23/95	20	Lower	4
1	38	1	FS01-021	2/15/95	N/A	Floor Scan	N/A
1	38	1	FS01-037	5/1/95	N/A	Floor Scan	N/A
1	38	1	FS01-037	5/1/95	N/A	Floor Scan	N/A
1	39	1	01-021	11/8/94	35	Lower	3
1	39	1	01-243	2/21/95	24	Lower	4
1	39	1	01-386	6/1/95	56	Upper	5
1	39	1	01-450	11/13/95	29	Lower	5
1	39	1	01-451	11/14/95	6	Lower	5
1	39	1	01-452	11/14/95	12	Lower	5
1	39	1	01-453	12/1/95	61	Misc	5
1	39	1	01-454	12/4/95	14	Misc	5
1	39	1	01-455	12/5/95	2	Misc	5
1	39	1	01-456	12/6/95	29	Misc	5
1	39	1	01-457	12/7/95	28	Misc	5
1	39	1	01-458	12/7/95	11	Misc	5
1	39	1	01-459	12/7/95	8	Misc	5
1	39	1	01-473	2/1/96	49	Lower	5
1	39	1	01-474	2/20/96	6	Misc	5
1	39	1	01-476	2/21/96	15	Misc.	5
1	39	1	01-483	3/5/96	17	Misc	5
1	39	1	01-486	4/2/96	20	Lower	5
1	40.1	1	01-032	11/14/94	40	Lower	3
1	40.1	1	01-216	2/14/95	34	Lower	4
1	40.1	1	01-348	4/4/95	15	Upper	4
1	40.1	1	01-462	12/27/95	16	Lower	5
1	40.1	1	01-466	1/3/96	20	Lower	5
1	40.1	1	01-467	1/3/96	34	Lower	5
1	40.1	1	01-468	1/4/96	56	Lower	5
1	40.1	1	01-469	1/9/96	113	Lower	5
1	40.1	1	FS01-019	2/13/95	N/A	Floor Scan	N/A
1	40.1	1	FS01-041	5/11/95	N/A	Floor Scan	N/A
1	40.1	1	FS01-057	12/26/95	N/A	Floor Scan	N/A
1	40.1	2	01-106	1/5/95	7	Lower	3
1	40.1	2	01-217	2/14/95	3	Lower	4
1	40.1	2	01-471	1/10/96	58	Lower	5
1	40.1	2	01-472	1/11/96	16	Lower	5
1	40.1	2	FS01-019	2/13/95	N/A	Floor Scan	N/A
1	40.1	2	FS01-041	5/11/95	N/A	Floor Scan	N/A
1	40.1	3	01-111	1/5/95	6	Lower	3
1	40.1	3	01-222	2/15/95	3	Lower	4
1	40.1	3	01-470	1/10/96	42	Lower	5
1	40.1	3	FS01-021	2/15/95	N/A	Floor Scan	N/A
1	40.1	3	FS01-041	5/11/95	N/A	Floor Scan	N/A
1	40.1	4	01-107	1/5/95	3	Lower	3
1	40.1	4	01-219	2/14/95	2	Lower	4
1	40.1	4	FS01-017	2/9/95	N/A	Floor Scan	N/A
1	40.1	4	FS01-041	5/11/95	N/A	Floor Scan	N/A
1	40.1	5	01-432	8/31/95	31	Lower	4
1	40.1	5	01-435	9/6/95	9	Upper	4
1	40.1	5	FS01-055	9/6/95	N/A	Floor Scan	N/A
1	40.1	6	01-113	1/5/95	4	Lower	3
1	40.1	6	01-218	2/14/95	7	Lower	4
1	40.1	6	FS01-017	2/9/95	N/A	Floor Scan	N/A
1	40.1	6	FS01-041	5/11/95	N/A	Floor Scan	N/A
1	40.1	8	01-387	6/1/95	5	Lower	4
1	40.1	9	01-388	6/1/95	5	Lower	4
1	40.2	1	01-030	11/14/94	20	Lower	3

**COPIED FROM REPORT #007**

**DATA EVALUATION AND ANALYSIS FOR**

**RADIOLOGICAL SURVEYS**

**OF INTERIOR BUILDING SURFACES**

Survey Serial Number	Survey Date	Section	Unit	Sub-Unit	Number of Survey Points	Type	Classification	Total Unit Size (sq. ft.)	Total Unit Size (sq. M.)
01-445	10/19/95	1	18	1	4	Upper	4	2313.4	215
01-446	10/19/95	1	18	3	3	Upper	4	2313.4	215
01-447	10/23/95	1	18	8	11	Upper	4	2313.4	215
01-448	10/23/95	1	18	4	7	Upper	4	2313.4	215
01-449	10/23/95	1	18	6	6	Upper	4	2313.4	215
01-450	11/13/95	1	39	1	29	Lower	5	5400	501
01-451	11/14/95	1	39	1	6	Lower	5	5400	501
01-452	11/14/95	1	39	1	12	Lower	5	5400	501
01-453	12/1/95	1	39	1	61	Misc	5	5400	501
01-454	12/4/95	1	39	1	14	Misc	5	5400	501
01-455	12/5/95	1	39	1	2	Misc	5	5400	501
01-456	12/6/95	1	39	1	29	Misc	5	5400	501
01-457	12/7/95	1	39	1	28	Misc	5	5400	501
01-458	12/7/95	1	39	1	11	Misc	5	5400	501
01-459	12/7/95	1	39	1	8	Misc	5	5400	501
01-460	12/24/95	1	41	2	4	Lower	4	4000	371.7
01-461	12/26/95	1	41	2	6	Lower	4	4000	371.7
01-462	12/27/95	1	40.1	1	16	Lower	5	3840	356.9
01-463	12/27/95	1	40.2	5	35	Lower	5	3440	319.7
01-464	12/28/95	1	40.2	1	82	Lower	5	3440	319.7
01-465	1/2/96	1	40.2	1	88	Lower	5	3440	319.7
01-466	1/3/96	1	40.1	1	20	Lower	5	3840	356.9
01-467	1/3/96	1	40.1	1	34	Lower	5	3840	356.9
01-468	1/4/96	1	40.1	1	56	Lower	5	3840	356.9
01-469	1/9/96	1	40.1	1	113	Lower	5	3840	356.9
01-470	1/10/96	1	40.1	3	42	Lower	5	3840	356.9
01-471	1/10/96	1	40.1	2	58	Lower	5	3840	356.9
01-472	1/11/96	1	40.1	2	16	Lower	5	3840	356.9
01-473	2/1/96	1	39	1	49	Lower	5	5400	501
01-474	2/20/96	1	39	1	6	Misc	5	5400	501
01-475		Not	Included	In	Analysis				
01-476	2/21/96	1	39	1	15	Misc.	5	5400	501
01-477		Not	Included	In	Analysis				
01-478		Not	Included	In	Analysis				
01-479		Not	Included	In	Analysis				
01-480		Not	Included	In	Analysis				
01-481		Not	Included	In	Analysis				
01-482	3/5/96	1	5	1	15	Upper	5	2720	252.8
01-483	3/5/96	1	39	1	17	Misc	5	5400	501
01-484		Not	Included	In	Analysis				
01-485	3/6/96	1	5	3	6	Upper	5	2720	252.8
01-486	4/2/96	1	39	1	20	Lower	5	5400	501
01-487		Not	Included	In	Analysis				
01-488		Not	Included	In	Analysis				
01-489		Not	Included	In	Analysis				
01-490		Not	Included	In	Analysis				
01-491		Not	Included	In	Analysis				
01-492		Not	Included	In	Analysis				
01-493		Not	Included	In	Analysis				
01-494		Not	Included	In	Analysis				
01-495	11/22/96	1	8	1	58	Sub Floor Lower	5	4800	446
01-496	11/23/96	1	7	1	75	Sub Floor Lower	5	4800	446
01-497	11/23/96	1	7	1	63	Sub Floor Lower	5	4800	446
01-498	11/26/96	1	7	1	10	Sub Floor Lower	5	4800	446
01-499	11/26/96	1	8	1	10	Sub Floor Lower	5	4800	446
01-500	11/26/96	1	7	1	4	Sub Floor Lower	5	4800	446
01-501	12/3/96	1	8	1	4	Sub Floor Lower	5	4800	446
02-001	7/20/95	2	8	1	41	Lower	1	24000	2230.5
02-002	7/21/95	2	6	1	40	Lower	1	20800	1933.1
02-003	7/22/95	2	4	1	40	Lower	1	24000	2230.5
02-004	7/23/95	2	2	1	40	Lower	1	25600	2379.2
02-005	7/27/95	2	3	1	40	Lower	1	25600	2379.2
02-006	7/28/95	2	5	1	40	Lower	1	24000	2230.5
02-007	7/28/95	2	1	1	40	Lower	1	25600	2379.2
02-008	7/28/95	2	10	1	1	Lower	1	9200	855
02-009	7/28/95	2	10	2	1	Lower	1	9200	855
02-010	7/28/95	2	10	3	1	Lower	1	9200	855
02-011	7/28/95	2	10	4	1	Lower	1	9200	855
02-012	7/28/95	2	10	5	1	Lower	1	9200	855
02-013	7/28/95	2	10	6	1	Lower	1	9200	855
02-014	7/28/95	2	10	8	2	Lower	1	9200	855
02-015	7/28/95	2	10	9	1	Lower	1	9200	855
02-016	7/28/95	2	10	11	1	Lower	1	9200	855

Survey Date	Survey Serial Number	Surface Description	X	Y	Sub-Unit	Gross Gamma	Gamma MDA	Gross Beta/Gamma	Beta/Gamma MDA	Alpha DPM per 100cm2	Alpha MDA	Beta DPM per 100cm2	Beta MDA	Beta Scan DPM per 100cm2 Maximum	Beta Scan DPM per 100cm2 Average	Beta Scan MDA	Removable Alpha DPM per 100cm2	Removable Alpha MDA	Removable Beta DPM per 100cm2	Removable Beta MDA	Comments
2/14/95	01-216	PAINTED BLOCK	9	1.5	1-40A-1	15	15	0.02	0.02	4.67	63	-8.47	286	237.29	-79.10	1300	-0.74	7.64	-2.36	12.71	EAST WALL #1
2/14/95	01-216	PAINTED BLOCK	11	1	1-40A-1	15	15	0.02	0.02	-9.35	63	-8.47	286	209.04	33.90	1300	-0.74	7.64	3.04	12.71	EAST WALL #1
2/14/95	01-216	PAINTED BLOCK	13	1.5	1-40A-1	15	15	0.02	0.02	-14.02	63	98.87	286	341.81	90.40	1300	-0.74	7.64	-2.36	12.71	WEST WALL #2
2/14/95	01-216	PAINTED BLOCK	15	1	1-40A-1	15	15	0.02	0.02	-9.35	63	206.21	236	562.15	259.89	1300	-0.74	7.64	3.04	12.71	WEST WALL #2
2/14/95	01-216	PAINTED BLOCK	18	1.5	1-40A-1	15	15	0.02	0.02	-9.35	63	62.15	286	211.86	33.90	1300	-0.74	7.64	1.69	12.71	EAST WALL #1
2/14/95	01-216	PAINTED BLOCK	20	1.5	1-40A-1	15	15	0.02	0.02	-9.35	63	-48.02	286	296.61	-22.60	1300	-0.74	7.64	3.04	12.71	EAST WALL #1
2/14/95	01-216	PAINTED BLOCK	22	1.5	1-40A-1	15	15	0.02	0.02	9.35	63	50.85	286	279.66	5.65	1300	-0.74	7.64	4.39	12.71	EAST WALL #1
12/27/95	01-462	Floor	3	-1	1-40A-1	6	15	0.013	0.02	0.00	63	351.03	286	784.66	215.34	1300	-0.66	7.18	-2.22	12.13	Painted concrete
12/27/95	01-462	Floor	4	-1	1-40A-1	6	15	0.01	0.02	0.00	63	725.66	286	843.66	392.33	1300	0.80	7.18	-0.87	12.13	Painted concrete
12/27/95	01-462	Floor	5	-1	1-40A-1	6	15	0.013	0.02	13.82	63	182.89	286	371.68	156.34	1300	-0.66	7.18	-4.91	12.13	Scabbled concrete
12/27/95	01-462	Floor	6	-1	1-40A-1	6	15	0.013	0.02	9.22	63	262.54	286	460.18	126.84	1300	-0.66	7.18	1.82	12.13	Scabbled concrete
12/27/95	01-462	Floor	3	-2	1-40A-1	6	15	0.011	0.02	9.22	63	306.78	286	439.53	215.34	1300	-0.66	7.18	-2.22	12.13	Scabbled concrete
12/27/95	01-462	Floor	4	-2	1-40A-1	6	15	0.015	0.02	13.82	63	286.14	286	507.37	156.34	1300	0.80	7.18	0.48	12.13	Scabbled concrete
12/27/95	01-462	Floor	5	-2	1-40A-1	6	15	0.011	0.02	0.00	63	233.04	286	542.77	244.84	1300	-0.66	7.18	4.51	12.13	Scabbled concrete
12/27/95	01-462	Floor	6	-2	1-40A-1	5	15	0.009	0.02	18.43	63	221.24	286	374.63	67.85	1300	0.80	7.18	-2.22	12.13	Scabbled concrete
12/27/95	01-462	Floor	3	-3	1-40A-1	6	15	0.01	0.02	9.22	63	327.43	286	619.47	215.34	1300	-0.66	7.18	0.48	12.13	Scabbled concrete
12/27/95	01-462	Floor	4	-3	1-40A-1	6	15	0.01	0.02	13.82	63	162.24	286	530.97	97.35	1300	2.25	7.18	-2.22	12.13	Scabbled concrete
12/27/95	01-462	Floor	5	-3	1-40A-1	6	15	0.009	0.02	23.04	63	141.59	286	598.82	185.84	1300	-0.66	7.18	-0.87	12.13	Scabbled concrete
12/27/95	01-462	Floor	6	-3	1-40A-1	6	15	0.013	0.02	13.82	63	200.59	286	604.72	215.34	1300	-0.66	7.18	-0.87	12.13	Scabbled concrete
12/27/95	01-462	Floor	3	-4	1-40A-1	6	15	0.009	0.02	18.43	63	318.58	286	386.43	126.84	1300	0.80	7.18	-0.87	12.13	Painted concrete
12/27/95	01-462	Floor	4	-4	1-40A-1	6	15	0.013	0.02	13.82	63	380.53	286	578.17	244.84	1300	-0.66	7.18	1.82	12.13	Painted concrete
12/27/95	01-462	Floor	5	-4	1-40A-1	6	15	0.008	0.02	13.82	63	451.33	286	566.37	215.34	1300	0.80	7.18	1.82	12.13	Painted concrete
12/27/95	01-462	Floor	6	-4	1-40A-1	6	15	0.007	0.02	23.04	63	418.88	286	486.73	244.84	1300	-0.66	7.18	1.82	12.13	Painted concrete
1/3/96	01-466	Painted concrete	1	-1	1-40A-1	6	15	0.01	0.02	4.85	63	302.94	286	694.12	226.47	1300	-0.66	7.18	-0.87	12.13	floor
1/3/96	01-466	Painted concrete	2	-1	1-40A-1	6	15	0.018	0.02	4.85	63	388.24	286	508.82	314.71	1300	-0.66	7.18	-2.22	12.13	floor
1/3/96	01-466	Scabbled concrete	3	-1	1-40A-1	5	15	0.013	0.02	19.42	63	235.29	286	502.94	197.06	1300	-0.66	7.18	-3.56	12.13	floor
1/3/96	01-466	Scabbled concrete	4	-1	1-40A-1	6	15	0.013	0.02	0.00	63	329.41	286	538.24	285.29	1300	0.80	7.18	-3.56	12.13	floor
1/3/96	01-466	Scabbled concrete	5	-1	1-40A-1	6	15	0.014	0.02	-4.85	63	185.29	286	702.94	167.65	1300	0.80	7.18	-3.56	12.13	floor
1/3/96	01-466	Scabbled concrete	6	-1	1-40A-1	5	15	0.013	0.02	-4.85	63	132.35	286	370.59	138.24	1300	2.25	7.18	4.51	12.13	floor
1/3/96	01-466	Painted concrete	1	-2	1-40A-1	6	15	0.015	0.02	-4.85	63	350.00	286	452.94	255.88	1300	0.80	7.18	0.48	12.13	floor
1/3/96	01-466	Painted concrete	2	-2	1-40A-1	6	15	0.013	0.02	-4.85	63	264.71	286	573.53	138.24	1300	-0.66	7.18	-0.87	12.13	floor
1/3/96	01-466	Scabbled concrete	3	-2	1-40A-1	6	15	0.009	0.02	-9.71	63	167.65	286	535.29	197.06	1300	-0.66	7.18	3.17	12.13	floor
1/3/96	01-466	Scabbled concrete	4	-2	1-40A-1	5	15	0.015	0.02	-4.85	63	220.59	286	373.53	226.47	1300	-0.66	7.18	-0.87	12.13	floor
1/3/96	01-466	Scabbled concrete	5	-2	1-40A-1	5	15	0.008	0.02	9.71	63	291.18	286	629.41	255.88	1300	0.80	7.18	-3.56	12.13	floor
1/3/96	01-466	Scabbled concrete	6	-2	1-40A-1	5	15	0.013	0.02	-9.71	63	208.82	286	408.82	167.65	1300	-0.66	7.18	-0.87	12.13	floor
1/3/96	01-466	Painted concrete	1	-3	1-40A-1	6	15	0.012	0.02	0.00	63	202.94	286	285.29	138.24	1300	-0.66	7.18	1.82	12.13	floor
1/3/96	01-466	Painted concrete	2	-3	1-40A-1	6	15	0.009	0.02	-9.71	63	341.18	286	367.65	197.06	1300	0.80	7.18	-0.87	12.13	floor
1/3/96	01-466	Scabbled concrete	3	-3	1-40A-1	6	15	0.014	0.02	4.85	63	267.65	286	673.53	197.06	1300	0.80	7.18	4.51	12.13	floor
1/3/96	01-466	Scabbled concrete	4	-3	1-40A-1	6	15	0.011	0.02	14.56	63	247.06	286	247.06	120.59	1300	0.80	7.18	-0.87	12.13	floor
1/3/96	01-466	Scabbled concrete	5	-3	1-40A-1	6	15	0.017	0.02	-4.85	63	255.88	286	311.76	50.00	1300	-0.66	7.18	-2.22	12.13	floor
1/3/96	01-466	Scabbled concrete	6	-3	1-40A-1	6	15	0.01	0.02	-9.71	63	270.59	286	394.12	108.82	1300	0.80	7.18	0.48	12.13	floor
1/3/96	01-466	Painted concrete	1	-4	1-40A-1	6	15	0.009	0.02	9.71	63	341.18	286	455.88	197.06	1300	0.80	7.18	-3.56	12.13	floor
1/3/96	01-466	Painted concrete	2	-4	1-40A-1	6	15	0.009	0.02	-9.71	63	197.06	286	411.76	108.82	1300	0.80	7.18	0.48	12.13	floor
1/3/96	01-467	Painted Concrete	3	-4	1-40A-1	6	15	0.013	0.02	4.85	63	450.00	286	379.41	258.82	1300	3.71	7.18	-2.22	12.13	floor
1/3/96	01-467	Painted Concrete	4	-4	1-40A-1	6	15	0.016	0.02	-4.85	63	397.06	286	317.65	229.41	1300	-0.66	7.18	0.48	12.13	floor
1/3/96	01-467	Painted Concrete	5	-4	1-40A-1	6	15	0.007	0.02	9.71	63	552.94	286	385.29	200.00	1300	0.80	7.18	7.21	12.13	floor
1/3/96	01-467	Painted Concrete	6	-4	1-40A-1	5	15	0.011	0.02	0.00	63	652.94	286	617.65	200.00	1300	-0.66	7.18	0.48	12.13	floor
1/3/96	01-467	Scabbled concrete	1	-5	1-40A-1	5	15	0.01	0.02	0.00	63	264.71	286	314.71	170.59	1300	0.80	7.18	0.48	12.13	floor
1/3/96	01-467	Scabbled concrete	2	-5	1-40A-1	6	15	0.014	0.02	0.00	63	252.94	286	191.18	111.76	1300	2.25	7.18	4.51	12.13	floor
1/3/96	01-467	Scabbled concrete	3	-5	1-40A-1	6	15	0.009	0.02	9.71	63	402.94	286	423.53	200.00	1300	-0.66	7.18	-3.56	12.13	floor
1/3/96	01-467	Painted concrete	4	-5	1-40A-1	5	15	0.009	0.02	0.00	63	373.53	286	323.53	52.94	1300	-0.66	7.18	-2.22	12.13	floor
1/3/96	01-467	Painted concrete	5	-5	1-40A-1	5	15	0.009	0.02	4.85	63	511.76	286	402.94	317.65	1300	0.80	7.18	-0.87	12.13	floor
1/3/96	01-467	Painted concrete	6	-5	1-40A-1	6	15	0.01	0.02	-4.85	63	408.82	286	652.94	288.24	1300	-0.66	7.18	0.48	12.13	floor
1/3/96	01-467	Painted concrete	1	-6	1-40A-1	6	15	0.014	0.02	14.56	63	464.71	286	544.12	82.35	1300	0.80	7.18	0.48	12.13	floor
1/3/96	01-467	Scabbled concrete	2	-6	1-40A-1	6	15	0.013	0.02	-4.85	63	300.00	286	264.71	52.94	1300	0.80	7.18	3.17	12.13	floor
1/3/96	01-467	Scabbled concrete	3	-6	1-40A-1	6	15	0.012	0.02	4.85	63	302.94	286	405.88	52.94	1300	-0.66	7.18	-0.87	12.13	floor
1/3/96	01-467	Painted concrete	4	-6	1-40A-1	6	15	0.021	0.02	-4.85	63	464.71	286	297.06	82.35	1300	-0.66	7.18	-0.87	12.13	floor
1/3/96	01-467	Scabbled concrete	5	-6	1-40A-1	5	15	0.01	0.02	-4.85	63	482.35	286	438.24	258.82	1300	2.25	7.18	1.82	12.13	floor
1/3/96	01-467	Painted concrete	6	-6	1-40A-1	6	15	0.013	0.02	9.71	63	285.29	286	417.65	288.24	1300	-0.66	7.18	-2.22	12.13	floor
1/3/96	01-467	Painted concrete	1	-7	1-40A-1	6	15	0.01	0.02	0.00	63	405.88	286	332.35	200.00	130					



Lower Aera Compiled Statistics

Sort #	Location Code	Number of Survey Points	Minimum Value	Maximum Value	Average Value	Standard Deviation	Radiological Acceptance Criteria	Units
<b>Beta DPM (fixed measurement at survey point)</b>								
4	1:01	47	-165.33	250.67	37.92	84.99	5000	DPM/100cm2
4	1:02	42	-178.67	263.47	-29.62	80.50	5000	DPM/100cm2
4	1:03	62	-197.60	314.37	17.30	101.92	5000	DPM/100cm2
4	1:04	56	-646.71	354.94	-8.29	141.67	5000	DPM/100cm2
4	1:05	204	-581.92	777.78	138.75	216.52	5000	DPM/100cm2
4	1:06	454	-408.00	1224.00	93.82	731.03	5000	DPM/100cm2
4	1:07	55	-133.96	2940.81	155.53	417.34	5000	DPM/100cm2
4	1:08	55	-124.61	5504.67	135.64	745.17	5000	DPM/100cm2
4	1:09	56	-64.97	236.76	89.68	76.19	5000	DPM/100cm2
4	1:10	56	-209.58	254.24	-34.95	98.58	5000	DPM/100cm2
4	1:11	61	-118.64	194.51	-22.18	63.29	5000	DPM/100cm2
4	1:12	60	-307.45	465.84	74.36	168.57	5000	DPM/100cm2
4	1:13	66	-138.42	307.45	52.02	85.38	5000	DPM/100cm2
4	1:14	54	-431.68	397.52	-69.64	109.44	5000	DPM/100cm2
4	1:15	55	-336.00	279.66	-15.92	110.11	5000	DPM/100cm2
4	1:16	65	-204.97	625.79	82.46	123.00	5000	DPM/100cm2
4	1:17	43	-304.35	34.16	-51.53	88.18	5000	DPM/100cm2
4	1:18	90	-251.55	290.67	43.12	101.93	5000	DPM/100cm2
4	1:19	81	-211.86	669.49	196.91	224.39	5000	DPM/100cm2
4	1:20	270	-301.33	7123.46	228.08	529.16	5000	DPM/100cm2
4	1:21	46	-279.87	160.38	38.27	97.32	5000	DPM/100cm2
4	1:22	48	-180.79	308.18	39.68	96.02	5000	DPM/100cm2
4	1:23	56	-154.09	279.66	3.56	87.33	5000	DPM/100cm2
4	1:24:01	100	-270.44	889.83	71.96	257.54	5000	DPM/100cm2
4	1:24:02	46	-84.75	191.82	40.00	71.60	5000	DPM/100cm2
4	1:25	57	-245.28	144.65	-2.32	76.31	5000	DPM/100cm2
4	1:26	45	-245.28	93.22	-74.73	86.03	5000	DPM/100cm2
4	1:27	49	-245.28	91.19	-32.12	78.97	5000	DPM/100cm2
4	1:28	64	-108.70	231.64	62.61	88.81	5000	DPM/100cm2
4	1:29	46	-101.69	286.16	47.14	75.15	5000	DPM/100cm2
4	1:30	48	-141.51	424.53	118.90	136.54	5000	DPM/100cm2
4	1:31	45	-180.79	267.30	131.63	89.34	5000	DPM/100cm2
4	1:32	44	-141.51	358.49	59.16	109.83	5000	DPM/100cm2
4	1:33	73	-158.19	135.22	-45.71	72.97	5000	DPM/100cm2
4	1:34	57	-342.77	361.64	15.53	149.29	5000	DPM/100cm2
4	1:35:01	52	-233.53	368.26	-34.99	91.05	5000	DPM/100cm2
4	1:35:02	53	-132.77	367.23	60.89	101.83	5000	DPM/100cm2
4	1:36	48	-149.72	169.81	-3.33	68.09	5000	DPM/100cm2
4	1:37	49	-198.11	270.44	-4.23	92.24	5000	DPM/100cm2
4	1:38	53	-319.21	1386.79	189.14	491.07	5000	DPM/100cm2
4	1:39	138	-471.98	1493.71	82.55	235.86	5000	DPM/100cm2
4	1:40:01	463	-314.47	1686.34	142.54	240.30	5000	DPM/100cm2
4	1:40:02	236	-270.19	1085.29	150.81	217.44	5000	DPM/100cm2
4	1:41	80	-319.02	392.33	4.52	142.76	5000	DPM/100cm2
4	1:43	64	-157.41	337.53	69.94	107.79	5000	DPM/100cm2
4	1:44	49	-326.35	134.73	-157.55	115.81	5000	DPM/100cm2
4	1:45	42	-125.75	1353.29	87.98	349.40	5000	DPM/100cm2
4	1:46	46	-169.49	677.97	14.36	146.33	5000	DPM/100cm2
4	1:47	46	-146.71	395.21	-15.35	86.61	5000	DPM/100cm2
4	1:48	48	-256.20	1462.81	210.69	391.05	5000	DPM/100cm2
4	1:49	132	-490.68	601.85	-7.71	197.27	5000	DPM/100cm2
4	1:50	45	-5.78	797.69	390.43	147.43	5000	DPM/100cm2
4	2:01	40	-51.78	375.40	146.93	77.82	5000	DPM/100cm2
4	2:02	40	33.06	484.85	164.26	97.56	5000	DPM/100cm2
4	2:03	40	104.68	316.80	206.61	51.70	5000	DPM/100cm2
4	2:04	40	-143.25	79.89	-37.81	54.59	5000	DPM/100cm2
4	2:05	40	96.42	360.88	217.42	62.47	5000	DPM/100cm2
4	2:06	40	-129.48	214.88	52.69	75.87	5000	DPM/100cm2
4	2:07	40	-135.84	838.15	51.81	144.31	5000	DPM/100cm2
4	2:08	40	-228.65	107.44	-13.43	58.41	5000	DPM/100cm2
4	2:09	40	52.02	335.26	216.62	57.50	5000	DPM/100cm2
4	2:10	75	-332.37	1326.59	199.39	250.40	5000	DPM/100cm2
4	3:01	35	16.53	333.33	163.56	77.68	5000	DPM/100cm2
4	3:02	40	-256.20	325.07	46.56	94.01	5000	DPM/100cm2
4	3:03	40	-74.38	275.48	99.31	72.74	5000	DPM/100cm2
4	3:04	66	-68.87	1272.73	230.40	268.49	5000	DPM/100cm2
4	4:01	119	-111.75	833.81	143.05	127.31	5000	DPM/100cm2

**APPENDIX H**  
**STATISTICAL ANALYSIS PROCEDURE**

**REPORT #006**

## Statistical Analysis Procedure

### Discussion

All the radiological survey data for similar surfaces within a survey unit were pooled to perform a statistical analysis of the data for comparison against the radiological acceptance criteria. The result of this comparison was an evaluation of whether the data supports the conclusion that the acceptance criteria have been met at a specified level of confidence. The statistical approach used is that given in NUREG/CR-5849. The appropriate sections of that report are reproduced and included following this text.

In summary, the following steps were taken for the statistical analysis:

- 1) Calculate the mean for the data.
- 2) Calculate the standard deviation for the data.
- 3) Calculate the "Data Test Parameter" using Equation 8-13 of NUREG/CR-5849 (included). This calculation uses Table B-1 (included).
- 4) Compare the "Data Test Parameter" with the appropriate Acceptance Criteria. If the "Data Test Parameter" is less than the Acceptance Criteria then the limit has been met at the 95% Confidence Level.
- 5) Calculate the "Number of Samples Factor" using the equation given at the top of Table B-2 of NUREG/CR-5849 (included).
- 6) Using Table B-2 determine the number of samples that would be required to demonstrate compliance at the desired level of confidence. If this number is less than the number of sample points that have already been taken, then no further samples were required.
- 7) If the statistical analysis does not demonstrate that the Acceptance Criteria has been met at the desired degree of confidence level, additional steps were taken depending on the specific situation such as:
  - a) Taking additional samples.
  - b) Remediation of the area and resampling.

**TABLE B-1****Factors for Comparison of Survey Data  
with Guidelines and Determining Additional Data Needs**

<b>Degrees of Freedom*</b>	<b>t<sub>95%</sub></b>	<b>t<sub>97.5%</sub></b>
1	6.314	12.706
2	2.920	4.303
3	2.353	3.182
4	2.132	2.776
5	2.015	2.571
6	1.943	2.447
7	1.895	2.365
8	1.860	2.306
9	1.833	2.262
10	1.812	2.228
11	1.796	2.201
12	1.782	2.179
13	1.771	2.160
14	1.761	2.145
15	1.753	2.131
16	1.746	2.120
17	1.740	2.110
18	1.734	2.101
19	1.729	2.093
20	1.725	2.086
21	1.721	2.080
22	1.717	2.074
23	1.714	2.069
24	1.711	2.064

TABLE B-1 (continued)

Factors for Comparison of Survey Data  
with Guidelines and Determining Additional Data Needs

Degrees of Freedom <sup>a</sup>	$t_{95\%}$	97.5%
25	1.708	2.060
26	1.706	2.056
27	1.703	2.052
28	1.701	2.048
29	1.699	2.045
30	1.697	2.042
40	1.684	2.021
60	1.671	2.000
120	1.658	1.980
400	1.649	1.966
infinite	1.645	1.960

<sup>a</sup>Degree of freedom is the number of items of data minus 1; for values of degrees of freedom not in table, interpolate between values listed.

Reference (Gilbert 1987)

TABLE B-2

Factors for Estimating the Number of Sampling Locations for Guideline Comparison

$\frac{C_G - \bar{X}}{s}$	n
0.05	3,422
0.10	856
0.15	380
0.20	214
0.25	137
0.30	95
0.35	70
0.40	53
0.45	42
0.50	34
0.55	28
0.60	24
0.65	20
0.70	17
0.75	15
0.80	13
0.85	12
0.90	11
0.95	9
1.00	9

$C_G$  = Concentration or activity guideline authorized by NRC

$\bar{x}$  = Mean concentration or activity determined for the survey unit.

s = standard deviation of the concentration for the survey unit.

n = number of samples to demonstrate meeting the cleanup guideline, assuming a desired false positive rate of 5% and a false negative rate of 10%, i.e.  $[Z_{.95} Z_{.90}]$ .

Reference (EPA 1989)

**APPENDIX I**  
**GRID LAYOUTS (PROCEDURE 10-04-93)**

**REPORT #006**

## Grid Layout

### Purpose:

To establish the means to identify survey points by gridding.

### Policy and Scope:

None.

### Definitions:

Reference points: to aid in the the repeatability of survey points, a reference point system using a standard Cartesian coordinate system ( x,y) and measurements in meters will be used where 0,0 is the north-western most corner for floors and overheads and the lower left-hand corner for walls. Normally, the value for x will be positive and the value for y will be negative for floors. The value of x and y will be positive for walls.

Stairs and Floors: will be considered walking surfaces.

Minimum Survey Points: are the number required for each classification and are as follows:

Class 1-30 points on floors and walls up to two meters. Maximum size = building floor level.

Class 2-30 points on floors and walls up to two meters. Maximum size = 700 m<sup>2</sup> floor surface.

Class 3-30 points on floors and walls up to two meters, and 30 points in upper and miscellaneous surfaces. Maximum size = 500 m<sup>2</sup> floor surface.

Class 4-30 points on floors and walls up to two meters, and 30 points in upper and miscellaneous surfaces. Maximum size = 300 m<sup>2</sup> floor surface

Class 5- any number of additional points as per supervision in areas found to have elevated counts or areas that require post-remediation surveys. Maximum size = 100 m<sup>2</sup> floor surface

### Responsibilities:

Consideration must be given to the access of survey points to assure the proper number are available for the area classification.

### References:

Nureg CR 5849, ORAU-92/ C57 June 1992

## General Procedure

### I. Floors and Walls up to 2 meters.

- A. Establish a point of reference at the north west corner of the floor for each unit or subunit.
- B. The point of reference is the intersection of the x and y axis on a graph or 0,0.
- C. The points to the right of the y axis on the x axis are expressed in positive numbers.
- D. The points below the x axis on the y axis are expressed in negative numbers conversely the opposites are expressed above the x axis and to the left of the y axis. on the floor the x axis runs east-west and the y axis runs north-south.
- E. Using the meter stick(s), measure along the x axis 1,2,3,4,etc. meters and mark each meter division.
- F. Using the meter stick(s), measure along the y axis 1,2,3,4,etc. meters and mark each meter division.
- G. Using the meter stick(s) find the intersects of both x and y axis and mark the appropriate coordinates on a colored adhesive backed circle and place on the floor at that point.

Example: 4 meters along the x axis and 2 meters along the y axis would be an intersect of 4,-2. a coordinate of 4,-17 would be an intersect of 4 meters along the x axis and 17 meters down the y axis

# Environmental Clean-Up Procedure 10-04-93 Rev 1. 3/28/95

H. The subsequent coordinates become a survey point . each survey point will be measured to the nearest .5 of a meter.

## II. Walls up to 2 meters.

- A. Establish a point of reference at the lower left hand corner of any wall in a unit or subunit.
- B. The point of reference is the intersection of the x and y axis on a graph.
- C. The points above the x axis on the y axis are expressed in positive no.s.
- D. The points to the right of the y axis on the x axis are expressed as positive no.s.
- E. The x axis runs left and right. The y axis runs up and down.
- F. Using the meter stick(s), measure from the point of reference along the x axis 1,2,3,4 etc. meters and mark each meter division.
- G. Using the meter stick(s), measure from the point of reference up (or down) the y axis 1,2,3,4 etc. meters and mark each meter division.
- H. Using the meter stick(s), find the intersection of both the x and y points and mark the appropriate coordinates on the colored adhesive backed circles and place on the wall at this point.

Example: 8 meters along the x axis and 2 meters up the y axis would be an intersect of 8,2. Conversely a coordinate of 10, 4 would be 10 meters along the x axis and 4 meters up the y axis from the point of reference. Each wall will be considered a separate surface , therefore if 2 walls exist on the west side of a unit or subunit, but are separated, they will be identified as 1 and 2 where the wall 1 will be the furthest north and west. In the event that either wall cannot be surveyed they will still be identified the same way.

I. The subsequent coordinates become a survey point.

## III. Upper surfaces.

- A. Walls (above 2 meters).
  1. Proceed as in Part I I, A, B, C, D, E, F, G, H above.
- B. Overhead surveys (ceiling).
  1. Overhead coordinates mirror floor coordinates and should be recorded as such.
- C. Misc. surfaces.
  1. Any horizontal surface above 2 meters.
  2. Mirror floor coordinates whenever possible.
- D. Ventilation.
  1. On wall reference wall coordinates when possible.
  2. In overhead reference floor coordinates .
    - a. If 1 and 2 above are difficult to reference use remarks column when performing survey.
- E. Stairwells.
  1. Are to be numbered and gridded from bottom Stairs shall be considered walking surfaces and, for survey purposes, should be considered as flat.

**APPENDIX J**

**TECHNICAL DESCRIPTION OF**

**INSTRUMENTS/DETECTORS**

**REPORT #006**

SUMMARY REPORT ON INFORMATION RELEVANT  
TO THE RADIOLOGICAL SURVEY OF THE  
BLAIRSVILLE SPECIALTY METAL PLANT

TECHNICAL DESCRIPTION OF INSTRUMENTS/DETECTORS

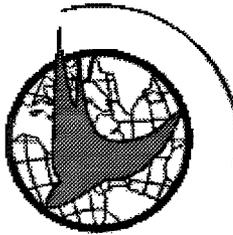
Technical descriptions of each instrument and detector are cross-referenced in Table 3, included in this report. The descriptions for these instruments are provided in the following report:

Westinghouse Electric Corporation, 1993, "License Termination Report, USNRC License No. SNM-951, Technical Description of Instruments Used for Radiological Surveys." Large, PA. Report #037. (April 30, 1993)

This report is on file with the NRC in Docket Number 70-997 and is incorporated herein by reference.

Furthermore, since the license termination completion, more radiological survey instruments have been added to the total inventory. Most new instruments are identical to others found in the "Large" reports and are appropriately referenced.

Instrument Code Number 51 (Bicron Micro REM S/N 142), and the detector used for Code Number 33 (Ludlum 44-2), are not part of the "Large" reports. Information related to these units is included in this Appendix J, acquired from the Internet (respective web addresses can be found on each page).



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## Micro REM



Five linear ranges  
0-20  $\mu$ rem/h to  
0-200 mrem/h or  
90% response time, <15 s  
Energy response 17 keV  
to 1.3 MeV with low  
density window option

This lightweight Micro REM, low level instrument uses a tissue equivalent scintillation detector to make rapid measurements of absorbed dose rate down to background levels. High sensitivity and true dose response sets them apart from other GM- or NaI-based survey meters and makes them ideal for confirming the boundaries of radiation zones wherever radiation fields occur. Low energy and extended detector options are available.

New Micro REM with audio release second quarter 1997.

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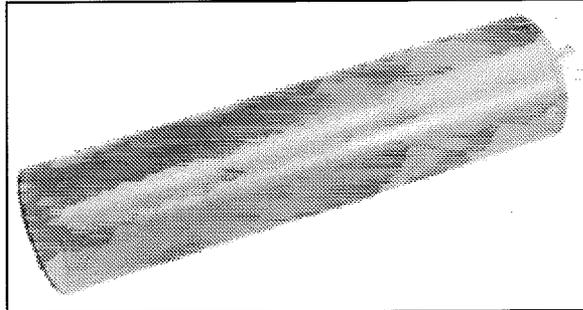


# MODEL 44-2

## 1" x 1" NaI GAMMA SCINTILLATOR

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**PART NUMBER: 47-1532**



**INDICATED USE:** High energy gamma detection

**SCINTILLATOR:** 1" (2.5 cm) diameter X 1" (2.5 cm) thick sodium iodide (NaI)Tl scintillator

**SENSITIVITY:** Typically 175 cpm/microR/hr (*Cs-137*)

**COMPATIBLE INSTRUMENTS:** General purpose survey meters, ratemeters, and scalers

**TUBE:** 1.5" (3.8cm) diameter magnetically shielded photomultiplier

**OPERATING VOLTAGE:** Typically 500 - 1200 volts

**DYNODE STRING RESISTANCE:** 100 megohm

**CONNECTOR:** Series "C" (*others available*)

**CONSTRUCTION:** Aluminum housing with beige polyurethane enamel paint

**TEMPERATURE RANGE:** 5 degrees F(-15 degrees C) to 122 degrees F(50 degrees C)

May be certified to operate from -40 degrees F(-40 degrees C) to 150 degrees F(65 degrees C)

**SIZE:** 2" (5.1 cm) diameter X 7.3" (18.5 cm)L

**WEIGHT:** 1 lb (0.5kg)

---

### **COMMONLY USED INSTRUMENTS**

MODEL 3 - Survey Meter

MODEL 12 - Ratemeter

MODEL 16 - Analyzer

MODEL 2241 - Digital Scaler / Ratemeter

MODEL 2241-2 - Digital Scaler / Ratemeter

MODEL 1000 - Scaler

MODEL 2000 - Scaler

MODEL 2200 - Single Channel Analyzer

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**APPENDIX K**  
**REFERENCES**

**REPORT #006**

SUMMARY REPORT ON INFORMATION RELEVANT  
TO THE RADIOLOGICAL SURVEY OF THE  
BLAIRSVILLE SPECIALTY METAL PLANT

REFERENCES

1. Berger, J. D., Oak Ridge Associated Universities, 1992, "Manual for Conducting Radiological Surveys in Support of License Termination." NUREG/CR-5849, ORAU-92/C57. Prepared for the U.S. Nuclear Regulatory Commission.
2. Cummings/Riter Consultants, Inc., 1994, "Data Summary Report Site Investigation, Specialty Metals Plant, Blairsville, Pennsylvania." Report #93-132.
3. Cummings/Riter Consultants, Inc., 1995a, "Data Summary Report Site Investigation, Specialty Metals Plant, Blairsville, Pennsylvania." Report #93-132.
4. Cummings/Riter Consultants, Inc., 1995b, "Data Summary Report Phase II Investigation, Westinghouse Electric Corporation, Blairsville, Pennsylvania." Report #93132.30/09.
5. Cummings/Riter Consultants, Inc., 1999, "Data Summary Report, Radiological Testing Former Zircaloy Burn Area, Westinghouse Electric Company, Specialty Metals Plant, Blairsville, Pennsylvania." Report #96205.50/02.
6. Westinghouse Electric Corporation, 1993, "License Termination Report, USNRC License No. SNM-951, Technical Description of Instruments Used for Radiological Surveys." Large, PA. Report #037. (April 30, 1993)

## **TABLES**

# TABLE 1

## INDEX OF BLAIRSVILLE UNRESTRICTED RELEASE REPORTS

<u>Report Number</u>	<u>Title</u>	<u>Date</u>
REPORT #001	CALIBRATION RECORDS FOR INSTRUMENTS USED FOR RADIOLOGICAL SURVEYS	6/27/00
REPORT #002	SUMMARY OF FLOOR SCAN MEASUREMENTS AND DATA ANALYSIS	7/11/00
REPORT #003	BASIC INFORMATION AND DATA SHEETS FOR RADIOLOGICAL SURVEYS OF BUILDINGS	7/20/00
REPORT #004	RADIOLOGICAL SURVEY OF BUILDING ROOFS	7/17/00
REPORT #005	DETERMINATION OF SITE BACKGROUND LEVELS FOR RADIOLOGICAL MEASUREMENTS	7/17/00
REPORT #006	SUMMARY REPORT ON INFORMATION RELEVANT TO THE RADIOLOGICAL SURVEY OF THE BLAIRSVILLE SPECIALTY METALS PLANT	7/31/00
REPORT #007	DATA EVALUATION AND ANALYSIS FOR RADIOLOGICAL SURVEYS OF INTERIOR BUILDING SURFACES	7/20/00
REPORT #008	RADIOLOGICAL ANALYSIS OF INTERIOR TRENCH SOIL DATA	7/26/00

**TABLE 2****RADIOLOGICAL SURVEY ACCEPTANCE CRITERIA**

	<b>Levels</b>	<b>Measurement</b>		<b>Limit</b>	<b>Units</b>
I	Acceptable Surface Contamination Levels	Total Surface Contamination	Average Value	5000	DPM/100cm <sup>2</sup>
			Maximum Value	15000	DPM/100cm <sup>2</sup>
		Removable Surface Contamination	1000	DPM/100cm <sup>2</sup>	
II	Acceptable Soil Contamination Levels	All Uranium Isotopes	30	pCi/gram	
		U-235 Isotope	1	pCi/gram (Note 1)	
III	Gamma Dose Rate	Dose Rate measured at 1 meter above the surface	5	Micro Roentgen per hour above natural background	

Note 1: The working limit for U-235 is based on the ratio of Uranium to U-235 being 30.

**TABLE 3**

Instruments Used

									See Report #037 License #SNM-951		
Instrument Code Number	Instrument Manufacturer	Instrument Model	Serial Number	Detector Model/Type	Detection Type	Typical Efficiency	Typical Correction Factor	Area Factor	Instrument Code	Instrument Reference	Detector Reference
2	Tennelec	LB5100	13295	Internal - gas	Alpha Count	33.86	2.95	1	1	A	A
3	Tennelec	LB5100	13295	Internal - gas	Beta Count	37.70	2.65	1	1	A	A
6	Eberline	ESP-2	1510	Gas Proportional	Alpha	24.00	4.17	1	6	F	P
7	Eberline	ESP-2	1517	Gas Proportional	Alpha	20.90	4.78	1	6	F	Q
8	Eberline	ESP-2	1588	Gas Proportional	Alpha	21.40	4.67	1	6	F	Q
11	Eberline	ESP-2	1593	Gas Proportional	Beta	37.70	2.65	1	6	F	P
12	Eberline	ESP-2	1595	Gas Proportional	Beta	38.70	2.58	1	6	F	Q
13	Eberline	ESP-2	1601	Gas Proportional	Beta	33.70	2.97	1	6	F	Q
14	Eberline	E520	4195	GM HP-270	Beta / Gamma	N/A	N/A		11	K	R
15	Eberline	E520	5242	GM Pancake	Beta	23.70	4.22	0.15	11	K	O
16	Eberline	E520	5242	GM HP-270	Beta / Gamma	N/A	N/A		11	K	R
17	Eberline	E520	5245	GM Pancake	Beta	20.30	4.90	0.15	11	K	O
21	Ludlum	2221	91943	Gas Proportional	Beta	31.00	3.23	4.34	5	E	E
22	Eberline	ESP-2	1522	GM HP-270	Beta / Gamma	N/A	N/A		6	F	R
23	Eberline	PRM-7	234	Internal	Gamma	N/A	N/A		10	J	J
33	Ludlum	2221	91943	Ludlum 44-2	Gamma	N/A	N/A		5	E	Note 1
48	Eberline	ESP-2	1578	Gas Proportional	Alpha	22.40	4.46	1	6	F	P
49	Eberline	ESP-2	1641	Gas Proportional	Beta	30.90	3.24	1	6	F	Q
51	Bicron	MicroRem	142	Internal	Gamma	N/A	N/A		Note 1		

Note 1: See Appendix J of this report.

**TABLE 4**

**Building Classification System**

**Group Designation, Description**

---

1. Offices, Administrative Areas and Plant Areas where historical information indicates that no radioactive material had ever been used or stored.
2. Offices, Administrative Areas and Plant Areas where historical information is uncertain, but does not indicate that any radioactive material had been used or stored.
3. Areas where historical information indicates only encapsulated material or sealed sources were used or stored.
4. Areas where historical information indicates that unencapsulated radioactive material may have been used or stored.
5. Areas where the radiological survey data identifies elevated readings indicating that radioactive material had been used or stored.

**TABLE 5**  
**SURVEY PROTOCOL**

Class ID #	Classification Description	Group Description	Maximum Unit Size	Grid Pattern Size	Unit Survey Points by Group	Surveys to be Conducted (see Table 5)	Comments
1	Offices, admin., and plant areas where historical info indicates no RAM had ever been used or stored.	Floors and walls up to 2 meters.	Building floor level.	N/A-Random	30 points initially. Statistical analysis to determine if more are required	ABCDEFH	Random survey points to be biased towards uncovered surfaces where possible.
2	Offices, admin., and plant areas where historical info does not indicate that any RAM had ever been used or stored, but is uncertain.	Floors and walls up to 2 meters.	Building floor level or 700 square meters maximum.	N/A-Random	30 points initially.  10% of floor surfaces.	ABCDEFH  G	
3 A	Areas where historical info indicates only sealed RAM may have been used or stored.	Floors and walls up to 2 meters.	Building floor level or 500 square meters maximum.	N/A-Random	30 points initially.	ABCDEFH	Surface scan may be restricted by obstructions.
B		Miscellaneous upper and horizontal surfaces.			30 points initially.	ABEFH	
4 A	Areas where historical info indicates unsealed RAM may have been used or stored.	Floors and walls up to 2 meters.	300 square meters of floor area maximum.	2 meters by 2 meters	30 points initially at grid intersects. 50% of floor area.	ABCDEFH	
B		Misc. horizontal surfaces and upper surfaces.	Single system.	N/A-Random	30 points initially.	ABEFH	
C		Ventilation system internal surfaces.		N/A-Random	30 points initially.	ABEFH	
5	Areas where the rad. Survey data identifies elevated readings indicating that RAM had been used or stored.	All Surfaces.	100 square meters of floor area.	1 meter by 1 meter	100% scan of all surfaces.  100% of all grid intersects	G  ABCDEF	Additional attention will be required for miscellaneous horizontal surfaces and ventilation systems if they also exceed 25% of the applicable criteria.

**TABLE 6**

**SURVEY DESCRIPTIONS**

Survey ID	Measure for:	Applicable Criteria		Description / Comments
		Average	Maximum	
A	Alpha surface activity.	5000 dpm/100 square centimeters. (Averaged over 1 square meter.)	15000 dpm/100 square centimeters. (Averaged over 100 square centimeters.)	
B	Beta surface activity.	5000 dpm/100 square centimeters. (Averaged over 1 square meter.)	15000 dpm/100 square centimeters. (Averaged over 100 square centimeters.)	
C	Beta / Gamma dose rate at surface.	N/A	N/A	For information only.
D	Gamma dose rate at 1 meter.	5 micro-R /hour above background.	N/A	Can be arranged over 10 square meters indoors. Static reading 1 meter from all surrounding surfaces.
E	Removable alpha activity.	N/A	1000 dpm/100 square centimeters.	Smear sample of 100 square centimeters area.
F	Removable beta activity.	N/A	1000 dpm/100 square centimeters.	Smear sample of 100 square centimeters area.
G	Surface scan for beta activity.	5000 dpm/100 square centimeters.	15000 dpm/100 square centimeters. (Averaged over 100 square centimeters.)	Scan using floor monitor at a maximum rate of 1 detector width / second. Where physical constraints limited use of floor monitor, other detectors including a NaI detector (gamma) were used.
H	Surface scan for beta activity in immediate vicinity of survey point.	5000 dpm/100 square centimeters.	15000 dpm/100 square centimeters. (Averaged over 100 square centimeters.)	Scan 1 square meter using beta survey meter at a maximum rate of 1 detector width / second.