
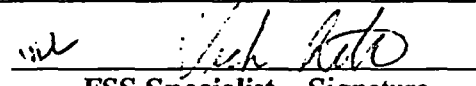

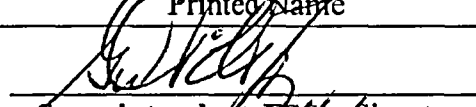
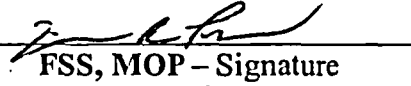


**MAINE YANKEE  
FINAL STATUS SURVEY RELEASE RECORD  
FB-1700 STAFF BUILDING BASEMENT  
SURVEY UNIT 1**

<div>Prepared By: <u></u></div> <div style="text-align: center;">FSS Engineer – Signature <u>C.A. Olsen</u> Printed Name</div>	Date: <u>21, DEC, 04</u>
<div>Reviewed By: <u></u></div> <div style="text-align: center;">FSS Specialist – Signature <u>Vicki Linton</u> Printed Name</div>	Date: <u>12-22-04</u>
<div>Reviewed By: <u></u></div> <div style="text-align: center;">Independent Review – Signature <u>W. C. Gopko</u> Printed Name</div>	Date: <u>12/21/04</u>
<div>Approved By: <u></u></div> <div style="text-align: center;">Superintendent, FSS – Signature <u>George Pillsbury</u> Printed Name</div>	Date: <u>12/22/04</u>
<div>Approved By: <u></u></div> <div style="text-align: center;">FSS, MOP – Signature <u>James R. Parker</u> Printed Name</div>	Date: <u>12/22/04</u>

**MAINE YANKEE  
FINAL STATUS SURVEY RELEASE RECORD  
FB-1700 STAFF BUILDING BASEMENT  
SURVEY UNIT 1**

**A. SURVEY UNIT DESCRIPTION**

Survey unit 1 is located in Survey Area FB1700 in the Staff Building basement. The survey area is located in the basement of the former Staff Building at coordinates 407,885N & 624,078E using the Maine State Coordinate System (West Zone) NAD 1927. The Staff Building is shown in relation to other major site structures in map FB1700 SITE. All maps referenced in this release record are provided in Attachment 1 unless otherwise noted.

Survey Unit 1 of FB1700 consists of the concrete floor and three concrete walls of the basement which will remain following demolition of the Staff Building. Earlier in the decommissioning program, floor carpeting was removed from the building and the floors were painted. Vinyl tiles in the hallways and ceramic tiles in the restrooms were removed during building interior demolition.

The survey unit is approximately 1670 m<sup>2</sup>. Remaining wall and floor surfaces of the Staff Building are concrete, including up to approximately 2.75m of wall surfaces on three sides of the basement floor.

**B. SURVEY UNIT DESIGN INFORMATION**

The Historical Site Assessment classified the survey unit as Class 3 per the LTP Revision 3. The survey unit is shown on the maps in Attachment 1. The basement was completely outside the Restricted Area during plant operations and decommissioning.

During plant operation, the Staff Building was used as office space. During decommissioning activities, several storage areas within the Staff Building housed sealed radioactive sources used for instrumentation, gamma spectroscopy and the Whole Body Counter. The current source inventory confirmed that nonexempt sources were stored within the building. The Chemistry Count Room, which was located in the Staff Building during decommissioning, analyzed and stored gamma cross check samples (liquid form) not listed on the radioactive source inventory. The samples were prepared in the decon sink in the RP access trailer and transferred to the Count Room after sealing.

During the latter part of the decommissioning, the Whole Body Counter was moved from the 3<sup>rd</sup> floor of the Staff Building to the basement. Personnel believed to have received any internal deposition of radionuclides were required by procedure to obtain whole body counts. Showers associated with Whole Body Counting were performed in the Locker Rooms, which are in this survey unit, during the same time frame. (Personnel using these showers had already passed the portal monitors. They may have had extremely low level external contamination, usually naturally occurring radioactive materials, which had to be washed off in order to get a valid Whole Body Count.)

The survey unit design parameters are shown in Table 1. Given a relative shift of 3.0, it was determined that 14 direct measurements were required. Each sample measurement location was determined using a Random Direct Point Location Determination method. These locations are presented on Direct Point Reference Map FB1700 DP REF.

A 1% to 10% scan coverage is required for Class 3 areas. To meet this requirement 211 scan grids of approximately  $1\text{ m}^2$  were incorporated into the design. The total scan area was approximately  $211\text{ m}^2$  or 13% of the survey unit were surveyed. Scan grids and their location are shown on Maps FB1700-1a through 1e. In addition three biased scans in the shower and utility drains were included as shown on Map FB1700-1k and were each much less than  $1\text{ m}^2$  in area.

To accommodate measurement geometry requirements for surfaces of non-uniform smoothness, the SHP-360 probe was used to augment the 43-68 or 43-37 scan surveys. First, a 43-68 or 43-37 scan was performed on all surfaces, including those that were unlikely to meet geometry requirements for that model of probe. Then a repeat scan, using the SHP-360, was performed on areas with surface irregularities that required a smaller probe size.

The instruments used in this survey are listed by model and serial number in Attachment 2 in Table 2-1. Scan MDCs are also listed in Table 2-2 of Attachment 2, and are compared to the DCGL and the investigation level. As shown in this table, the scan MDC is less than the scan investigation level in all cases, thus providing high confidence (95% or higher) that an elevated area would be detected in the scanning process. Actual background measurements were consistent with design backgrounds used to determine the instrument scan MDC values listed in LTP Table 5-6.

Background values were established for the scan measurements based on local values in the survey unit and previously established material background. These background values listed in Table 1 were used to establish alarm setpoints, to confirm that the scan MDCs used were appropriate and to establish net activity for direct measurements. Instrument scan setpoints were set at the DCGL plus background.

**TABLE 1**  
**SURVEY UNIT DESIGN PARAMETERS**

Survey Unit	Design Criteria	Basis
Area	1670 m <sup>2</sup>	Survey Maps
Number of Direct Measurements	14	Based on an adjusted LBGR of 16,878 dpm/100 cm <sup>2</sup> . Sigma <sup>1</sup> = 374 dpm/100 cm <sup>2</sup> . Relative shift = 3. Type I = Type II = 0.05.
Sample Area	N/A	Class 3
Sample Grid Spacing	N/A	Class 3
Scan Grid Area	1 m <sup>2</sup>	
Area Factor	N/A	Class 3 Area
Scan Survey Area	211 m <sup>2</sup> (13%)	Class 3 Area: 1% - 10%.
<b>Background</b>		
43-68 Direct and Scan (flat concrete surfaces) dpm/100 cm <sup>2</sup>	3681	Ambient and Material
43-37 Scan (all flat surfaces) dpm/100 cm <sup>2</sup>	2473	Ambient only
SHP-360 Scan (Surface Irregularities) dpm/100 cm <sup>2</sup>	10088	Ambient and Material
SHP-360 Scan (Drains) dpm/100 cm <sup>2</sup>	2770	Ambient only
Scan Investigation Level	DCGL plus background	See Table 2-2 (Attachment 2)
DCGL dpm/100 cm <sup>2</sup>	18,000	References 2 and 3
Design DCGL <sub>EMC</sub>	N/A	Class 3 Area

### C. SURVEY RESULTS

Fourteen direct measurements were made in Survey Unit 1. All direct measurements were less than 50% of the DCGL. The resulting data are presented in Table 2 below.

No 43-68 or 43-37 scan alarms were encountered while surveying flat surfaces. Four verified alarms were received during the scans of irregular surfaces using the SHP-360. No alarms occurred while surveying the drains with the SHP-360. The investigation of verified alarms is discussed below.

<sup>1</sup> Design sigma is based on LTP Table 5-1B, Staff Building, B1700, (LTP, Rev. 3).

**TABLE 2**  
**DIRECT MEASUREMENTS**

Sample Location	Gross Activity dpm/100 cm <sup>2</sup>	Net Activity (Table 1 Background Subtracted) dpm/100 cm <sup>2</sup>
FB1700-1-C001	4090	409
FB1700-1-C002	3626	-55
FB1700-1-C003	4127	446
FB1700-1-C004	4206	525
FB1700-1-C005	4182	501
FB1700-1-C006	4225	544
FB1700-1-C007	4237	556
FB1700-1-C008	4493	812
FB1700-1-C009	4475	794
FB1700-1-C010	3926	245
FB1700-1-C011	4615	934
FB1700-1-C012	4219	538
FB1700-1-C013	3718	37
FB1700-1-C014	3950	269
<b>Mean</b>	<b>4149</b>	<b>468</b>
<b>Median</b>	<b>4194</b>	<b>513</b>
<b>Standard Deviation</b>	<b>280</b>	<b>280</b>
<b>Range</b>	<b>3626 to 4615</b>	<b>-55 to 934</b>

#### D. SURVEY UNIT INVESTIGATIONS PERFORMED AND RESULTS

The SHP-360 surface scan identified four locations of potentially elevated activity at Grids C179, C184, C188 and C198. An investigation was conducted via survey investigation package XB1700-01. The investigation consisted of a scan of each of the four grids followed by a direct scaler measurement at the highest location scanned. One of the investigation scans exceeded the alarm setpoint, at Grid C179, whereas all of the direct measurements were significantly less than 50% of the DCGL. A follow-up volumetric sample was obtained at Grid 179. The absence of plant related activity was verified by the isotopic analysis. Investigation results are summarized in the Investigation Table in Attachment 3.

#### E. SURVEY UNIT DATA ASSESSMENT

An analysis of the direct sample measurement results including the mean, median, standard deviation and sample result range are provided in Table 2. Without subtracting background, all direct measurement results were below 50% of the DCGL. The maximum direct sample result with background subtracted was equivalent to 934 dpm/100cm<sup>2</sup>. When adjusted for background, the mean residual contamination level is 468 dpm/100cm<sup>2</sup>, equivalent to an annual dose of 0.008 mrem<sup>2</sup>.

<sup>2</sup> This annual dose equivalent is based on LTP Table 6-11 which shows the contaminated concrete dose contribution for surfaces contaminated at the DCGL to be 0.301 mrem/y.

## **F. ADDITIONAL DATA EVALUATION**

Attachment 4 provides additional data evaluation associated with Survey Unit 1, including relevant statistical information. Based on survey unit direct measurement data, this attachment provides the Sign Test Summary, Quantile Plot, Histogram and Retrospective Power Curve.

1. The Sign Test Summary provides an overall summary of design input (Table 1) and resulting calculated values used to determine the required number N of direct measurements (per LTP Section 5.4.2). The Sign Test Summary is a separate statistical analysis that also calculates the mean, median and standard deviation of the direct measurements.

The critical value and the result of the Sign Test are provided in the Sign Test Summary table, as well as a listing of the key release criteria. As is shown in the table, all of the key release criteria were satisfied for the FSS of the survey unit.

2. The Quantile Plot was generated from direct measurement data listed in Table 2 and indicates general symmetry about the median. The data set and plot are consistent with expectations for a Class 3 survey unit. It also should be noted that the maximum net activity of 934 dpm/100 cm<sup>2</sup> was well below 50% of the DCGL which is 9,000 dpm/100 cm<sup>2</sup>.
3. A Histogram Plot was also developed based on the direct measurement values. This plot shows that the direct data were essentially a normal distribution.
4. A Retrospective Power Curve was constructed based on FSS results. The curve shows that the survey unit having a mean residual activity at a small fraction of the DCGL has a high probability (power) of meeting the release criteria. Thus it can be concluded that the direct measurement data support rejection of the null hypothesis, providing high confidence that the survey unit satisfied the release criteria and that the data quality objectives were met.

During the performance of the 43-68 direct measurement surveys, it was noted that two locations contained glue residue from the floor tiles. Volumetric samples were obtained at these locations (C003 and C009) to validate the 43-68 data. The results of the gamma spectroscopy showed no plant-derived activity in the volumetric samples.

## **G. CHANGES IN INITIAL SURVEY UNIT ASSUMPTIONS ON EXTENT OF RESIDUAL ACTIVITY**

The survey was designed as a Class 3 area; the FSS results were consistent with that classification. The direct measurement sample standard deviation was less than the design sigma. Thus, a sufficient number of sample measurements were taken.

## **H. LTP CHANGES SUBSEQUENT TO SURVEY UNIT FSS**

The FSS of Survey Unit 1 was designed and performed during September through November 2004 using the criteria of the approved LTP Revision 3 with Addenda. There have been no subsequent LTP changes with potential to impact this FSS.

## **I. CONCLUSION**

The FSS of this survey unit was designed based on the LTP designation as a Class 3 area. The survey design parameters are presented in Table 1. The required number of direct measurements was determined for the Sign Test in accordance with the LTP. As presented in Table 2, all beta direct measurements were less than 50% of the DCGL or 9,000 dpm/100 cm<sup>2</sup>.

A Sign Test Summary analysis demonstrated that the Sign Test criteria were satisfied. The direct measurement sigma was determined to be less than that used for design, thus indicating that a sufficient number of samples was taken.

The Retrospective Power Curve shown in Attachment 4 confirmed that sufficient samples were taken to support rejection of the null hypothesis providing high confidence that the survey unit satisfied the release criteria and the data quality objectives were met. Attachment 4 also revealed that direct measurement data represented essentially a normal distribution, with variance consistent with expectations for a Class 3 survey unit.

The scan survey design for this survey unit was developed in accordance with the LTP with significant aspects of the design discussed in Section B and Table 1. Scanning resulted in four verified alarms for evaluation. The investigation showed that all direct measurements were significantly less than 50% of the DCGL and the one follow-up isotopic analysis confirmed no plant-derived radioactivity.

It is concluded that FB1700 Survey Unit 1 meets the release criteria of 10CFR20.1402 and the State of Maine enhanced criteria.

## **J. REFERENCES**

1. Maine Yankee License Termination Plan, Revision 3, Maine Yankee letter to the NRC, MN-02-048, October 15, 2002
2. Maine Yankee License Termination Plan, Revision 3 Addenda, Maine Yankee letter to the NRC, MN-02-061, November 26, 2002
3. NRC letter to Maine Yankee, February 28, 2003
4. Maine Yankee letter to the NRC, MN-03-049, September 11, 2003 (LTP Supplement to LTP Revision 3)
5. Issuance of License Amendment No. 170, NRC letter to Maine Yankee, dated February 18, 2004

**Attachment 1**

**Survey Unit Maps**

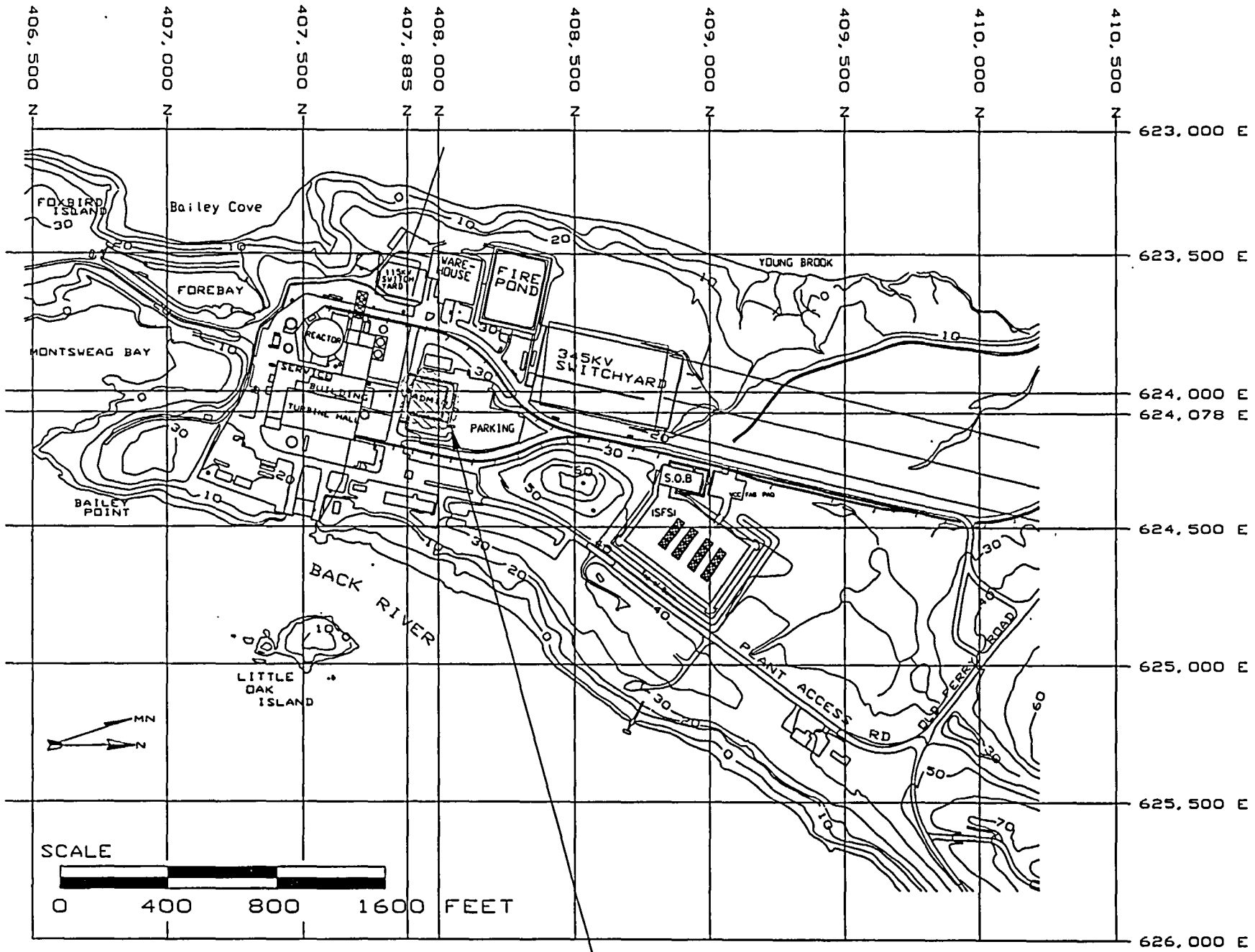


Map ID #: FB 1700 SITE  
Revised: 9-6-04

# Maine Yankee Decommissioning Project Survey Form

Maine Yankee  
Decommissioning Team

Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey Survey Area Name: Staff Building



SURVEY AREA, FB 1700

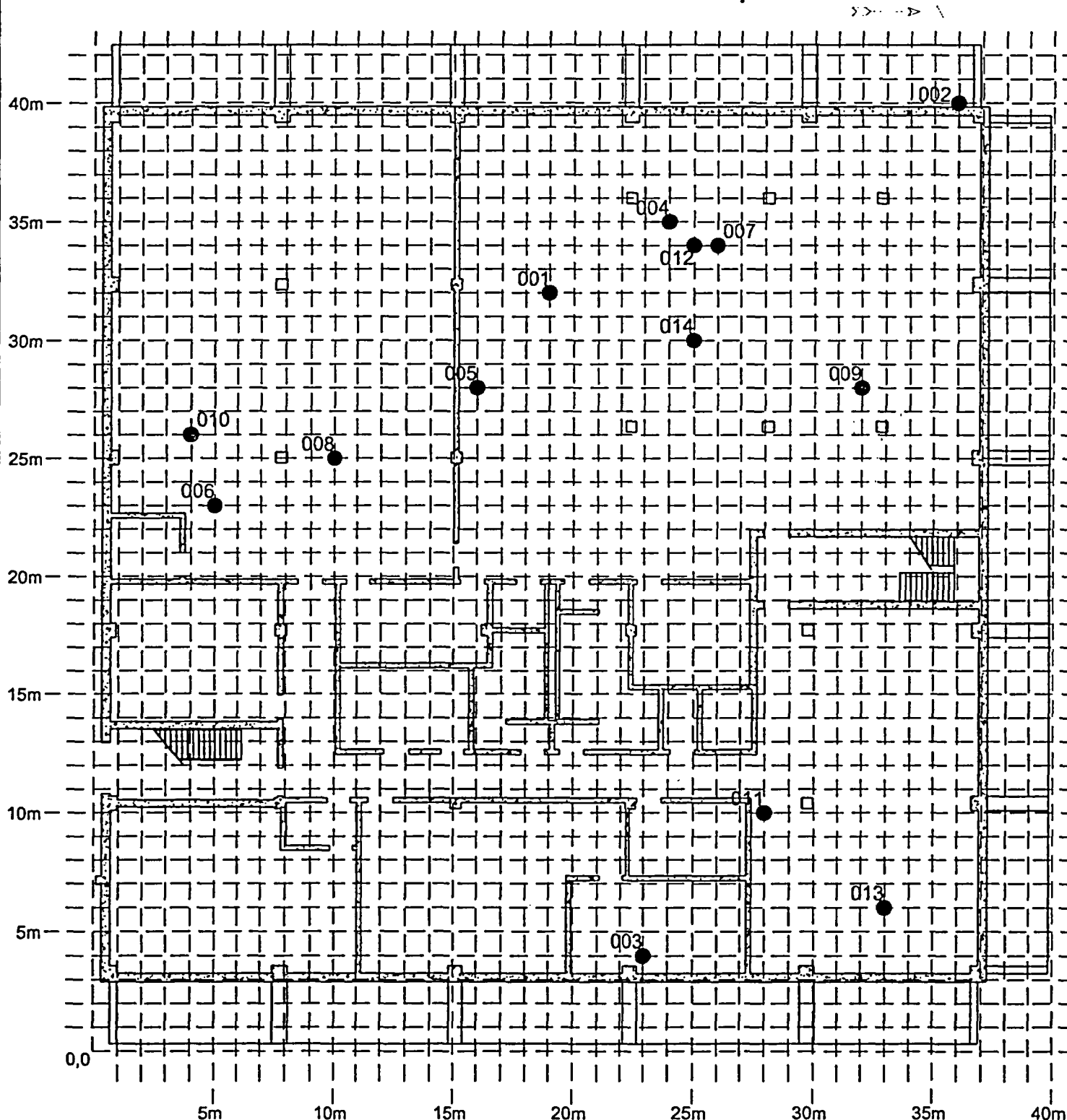
South East Corner of Staff Building at Coordinate -407,885N  
-624,078E

Note: Grid based on Maine State Coordinate System  
(West Zone) NAD 1927

Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey

Survey Area Name: Staff Building

Final Status Survey  
FB1700: Staff Building First Floor (El. 22')  
Direct Point Reference Map



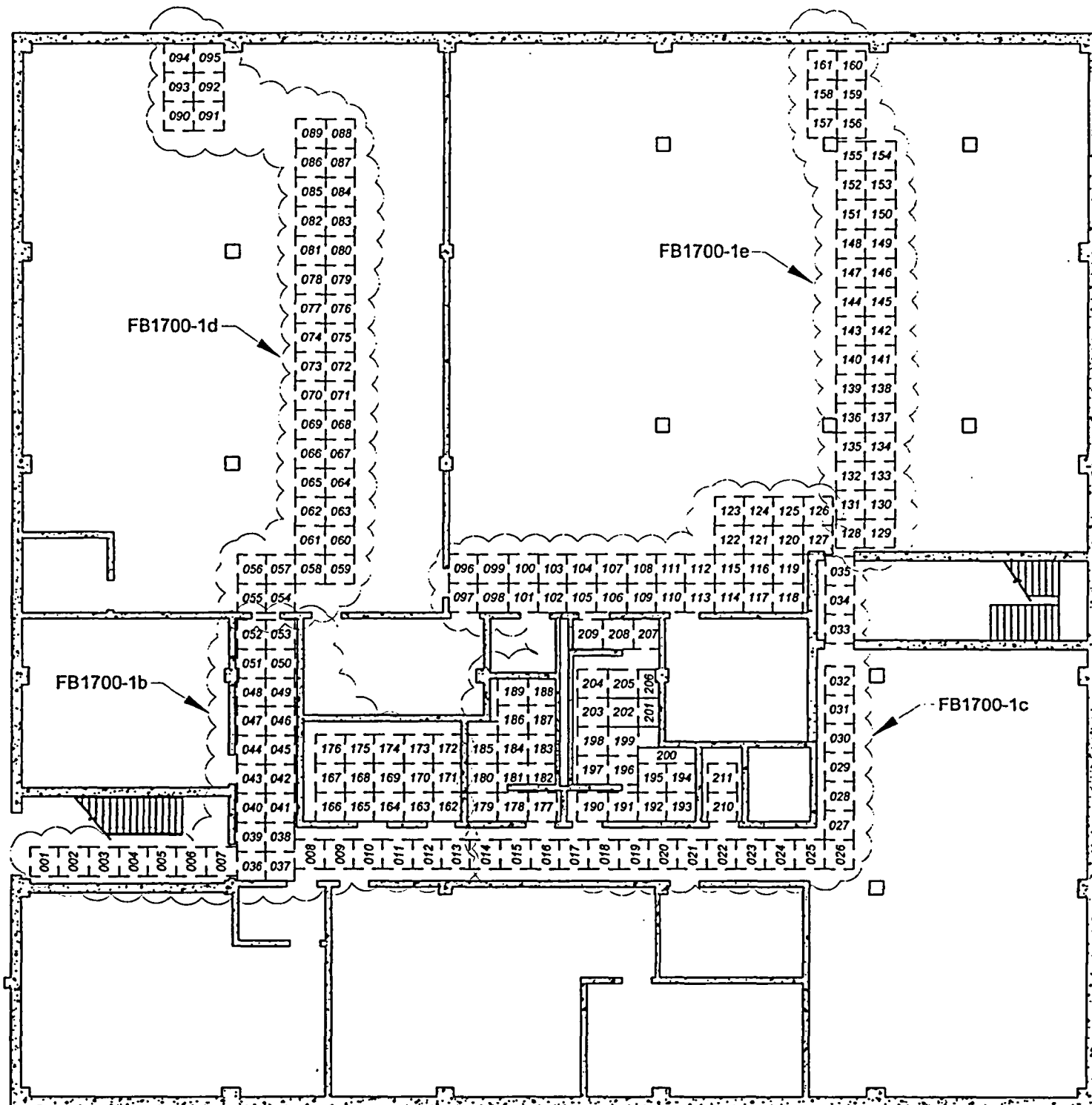
Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey

Survey Area Name: Staff Building

# Final Status Survey

## FB1700: Staff Building First Floor (El. 22')

### Survey Scans Overview

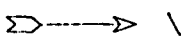
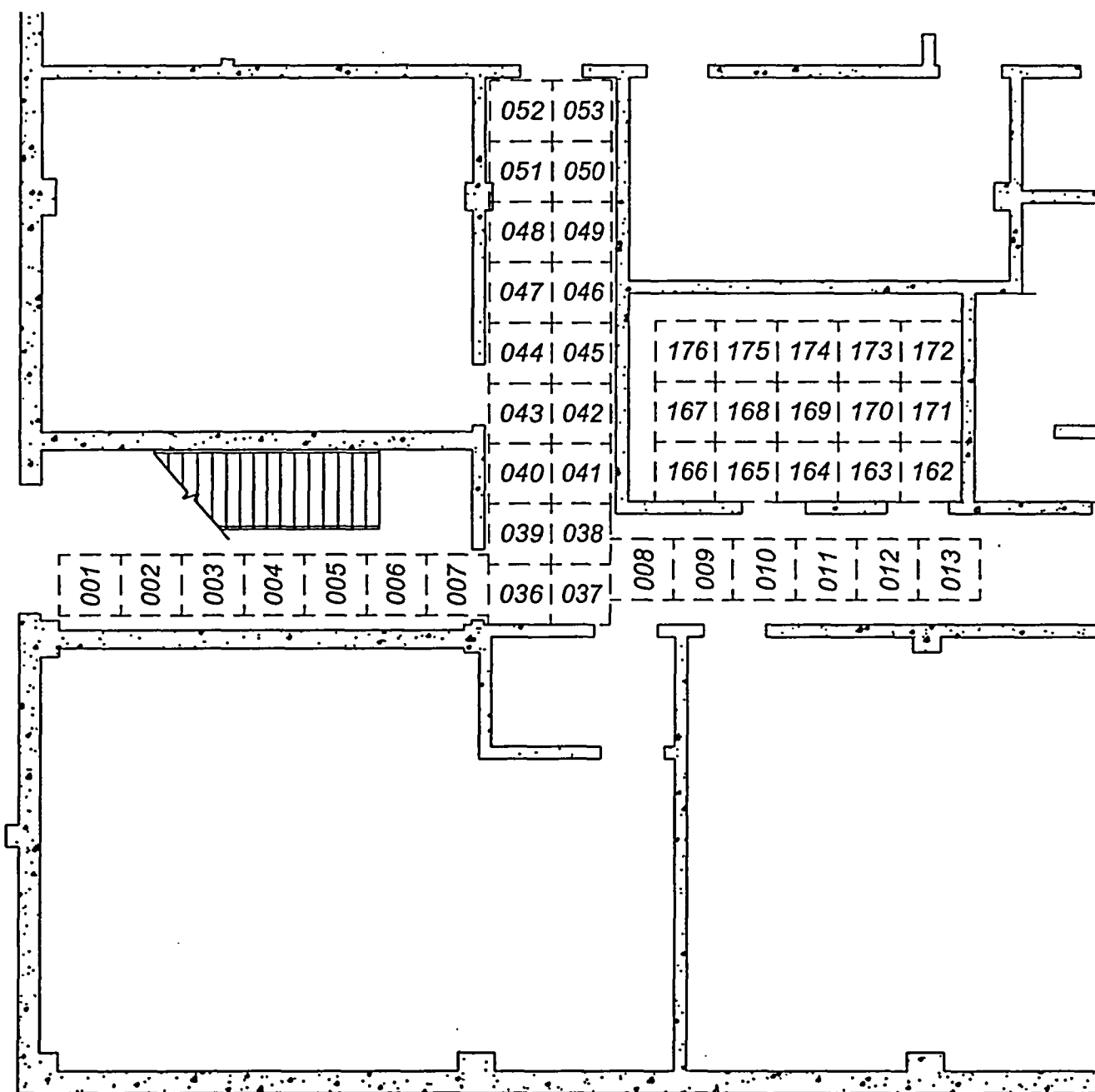


Survey Type: <input type="checkbox"/> Characterization <input type="checkbox"/> Turnover <input checked="" type="checkbox"/> Final Status Survey	Survey Area Name: Staff Building
--	----------------------------------

## Final Status Survey

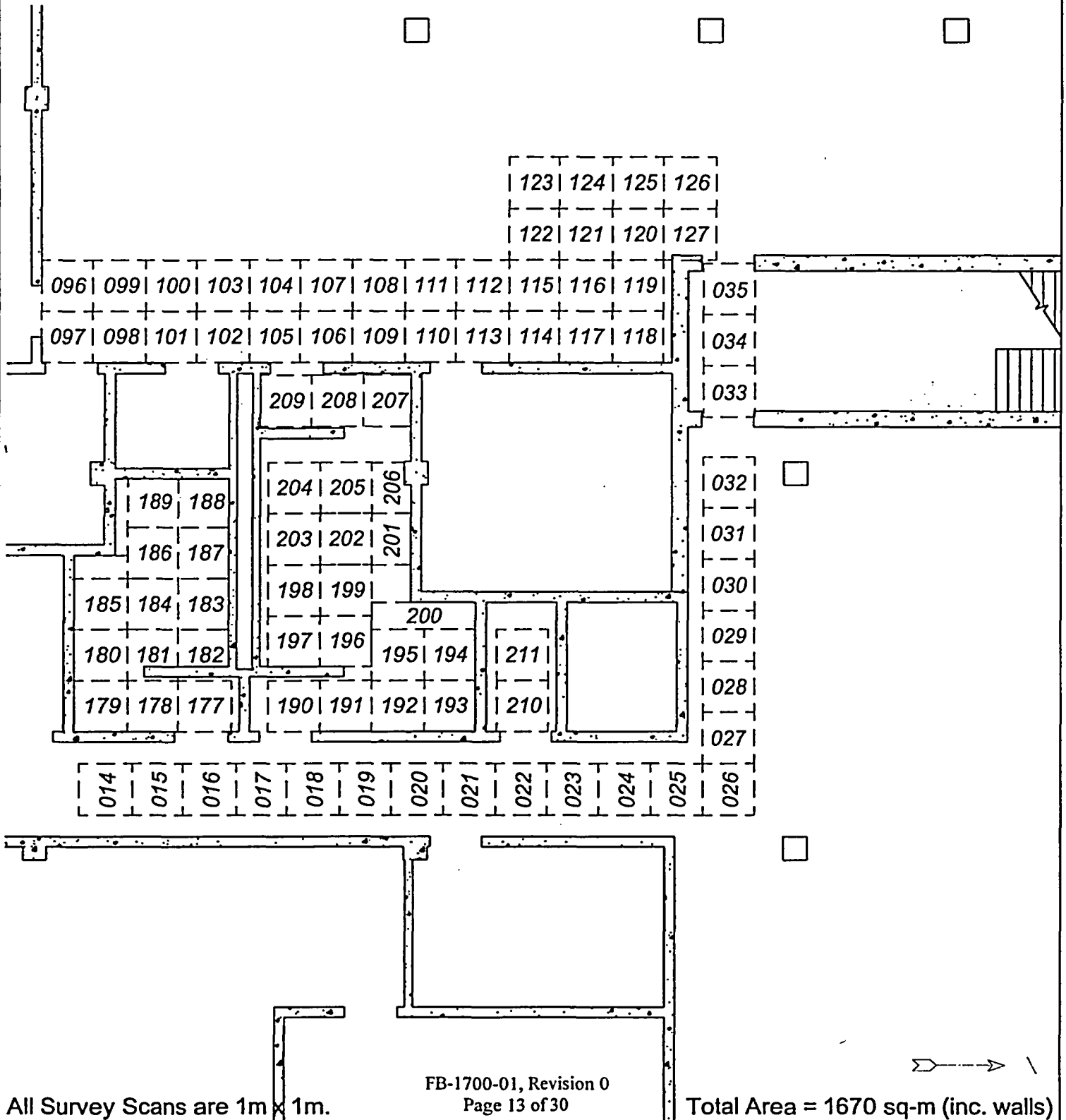
### FB1700: Staff Building First Floor (El. 22')

### Survey Scans 001-013 , 036-053 , 162-176



Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey Survey Area Name: Staff Building

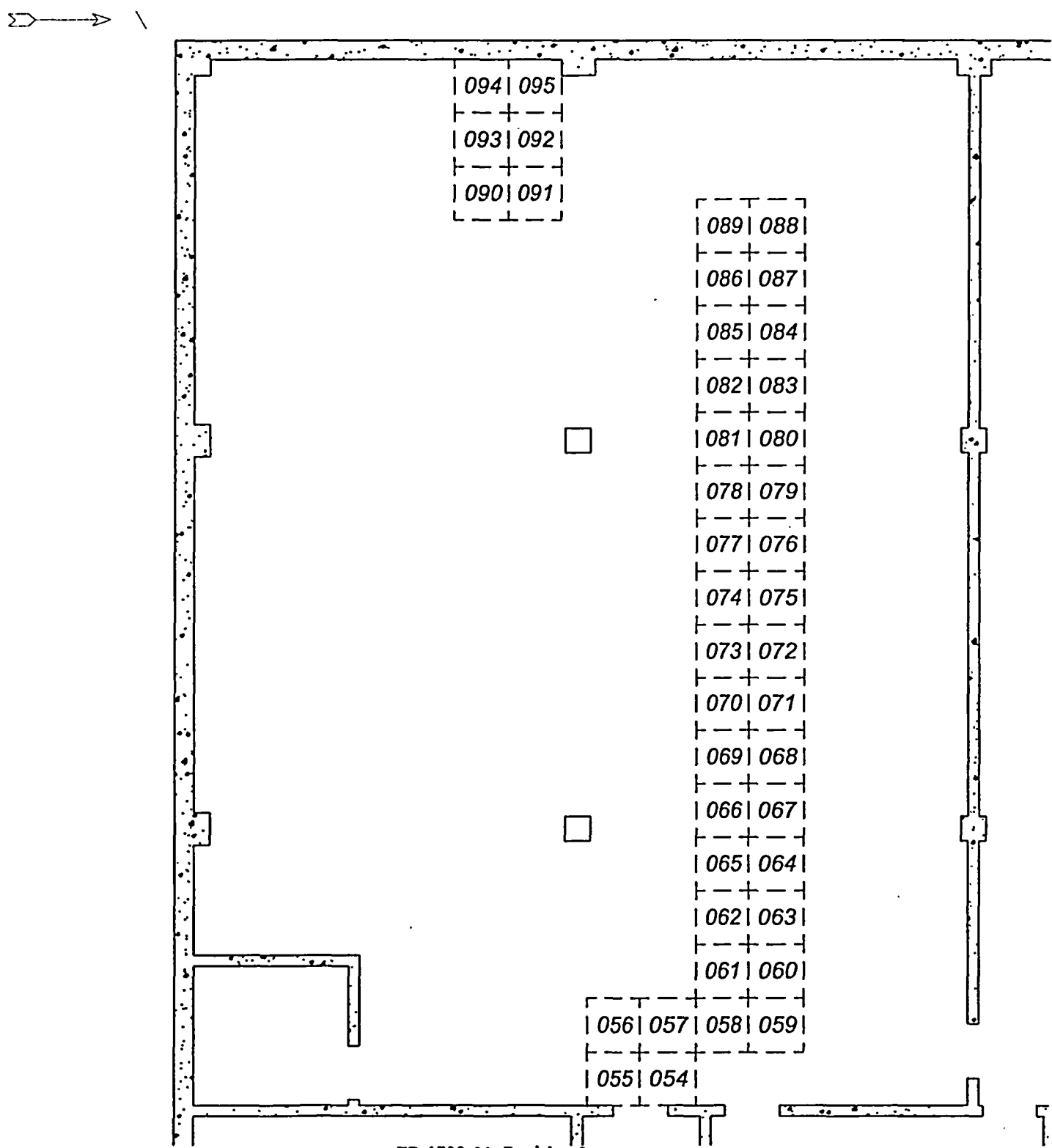
Final Status Survey  
FB1700: Staff Building First Floor (El. 22')  
Survey Scans 014-035 , 096-127 , 177-211



## Final Status Survey

### FB1700: Staff Building First Floor (El. 22')

### Survey Scans 054-095

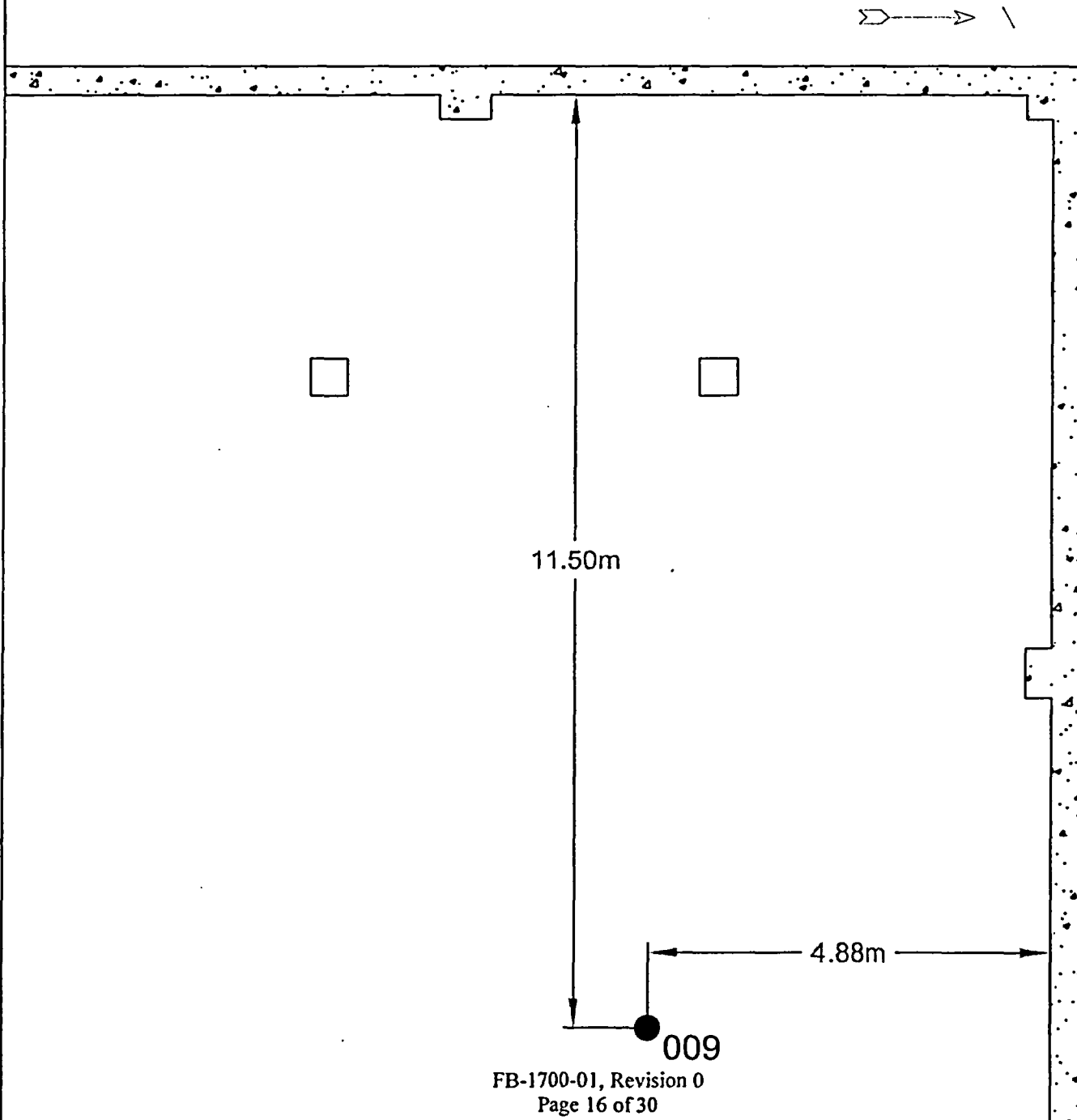




Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey

Survey Area Name: Staff Building

Final Status Survey  
FB1700: Staff Building First Floor (El. 22')  
Direct Point 009



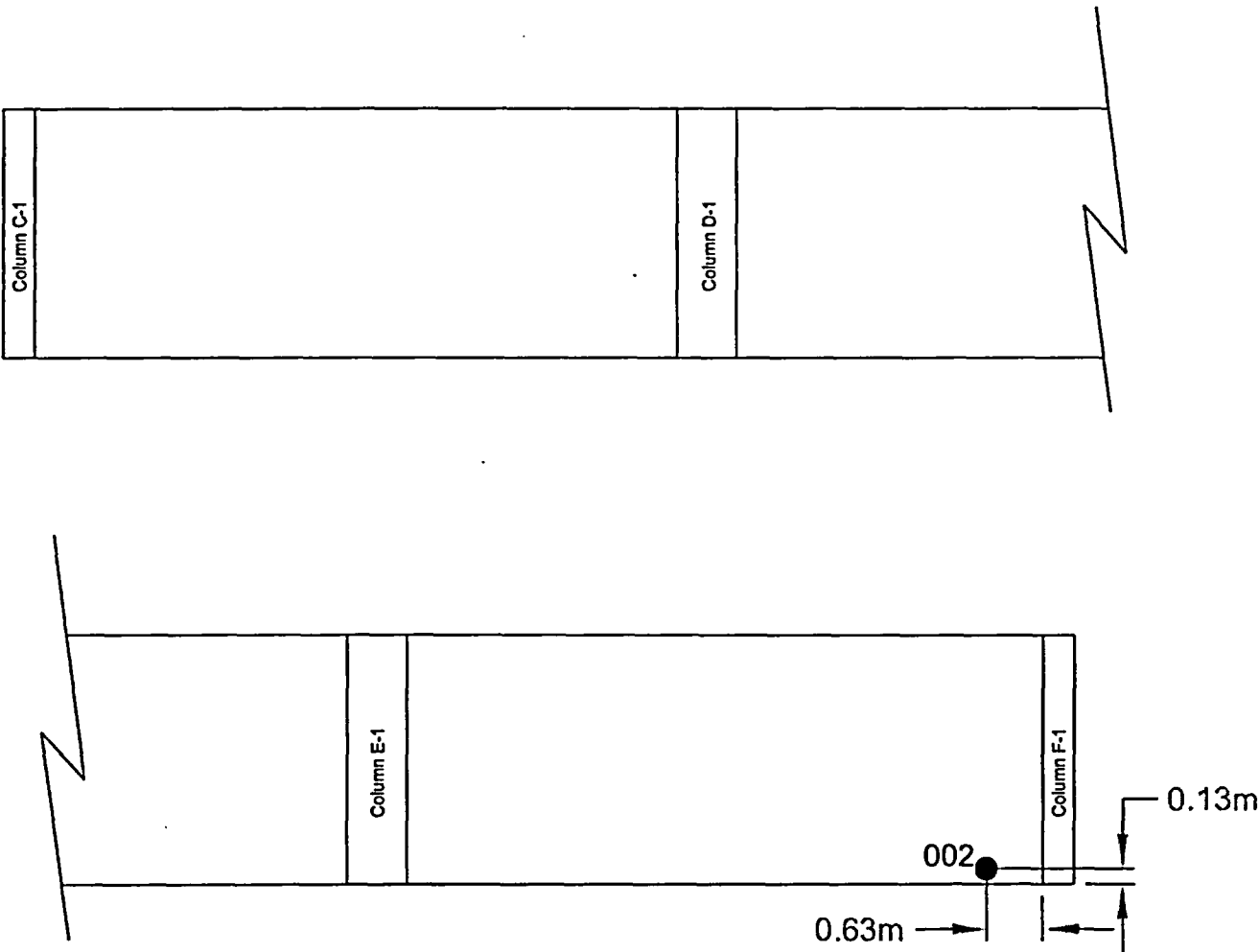


Survey Type:    ☐ Characterization    ☐ Turnover    ☒ Final Status Survey    Survey Area Name: Staff Building

## Final Status Survey

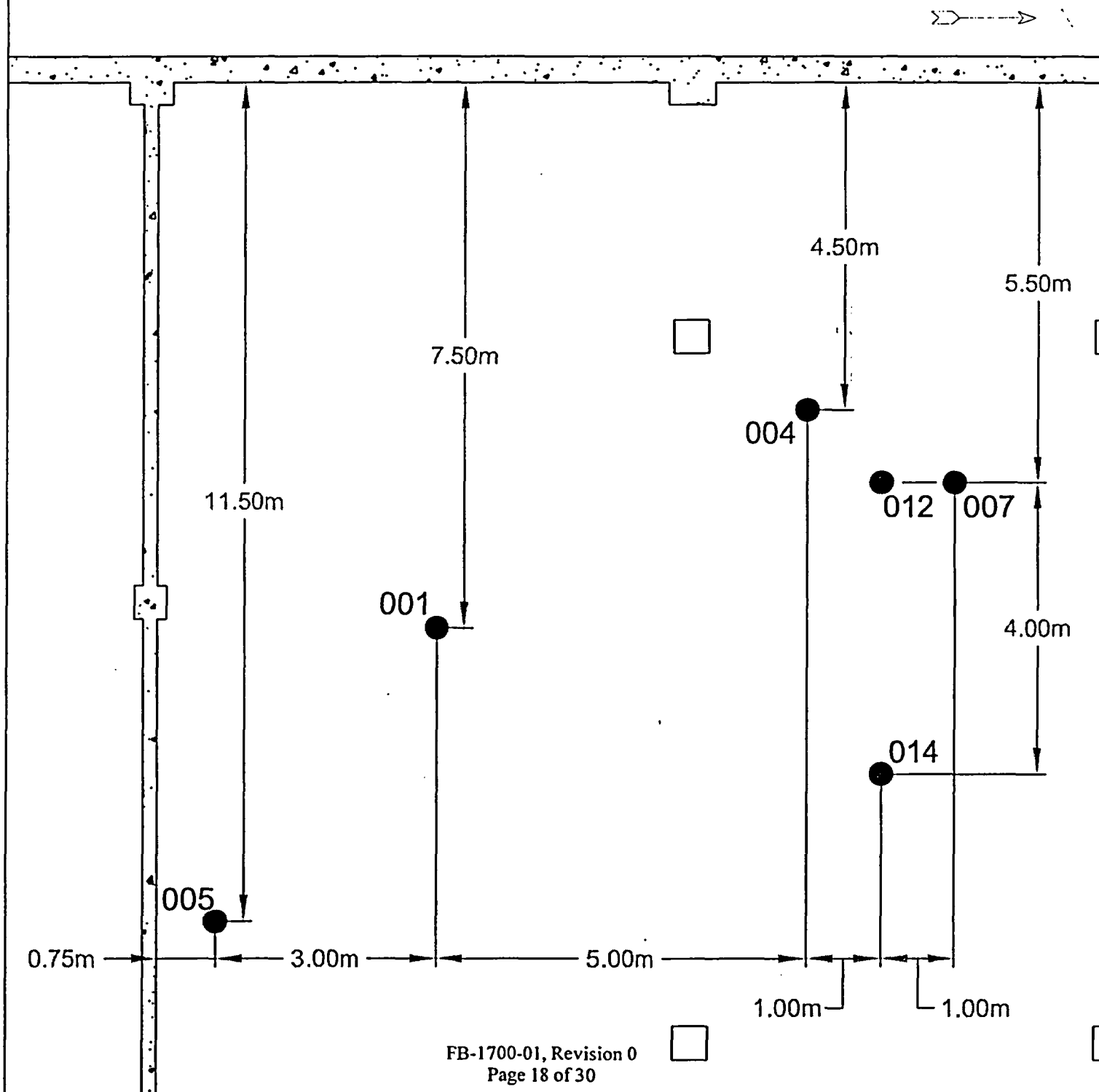
### FB1700: Staff Building First Floor (El. 22')

### West Wall from Q C to Q F, Direct Point 002



Survey Type:	<input type="checkbox"/> Characterization	<input type="checkbox"/> Turnover	<input checked="" type="checkbox"/> Final Status Survey	Survey Area Name: Staff Building
--------------	---	-----------------------------------	---	----------------------------------

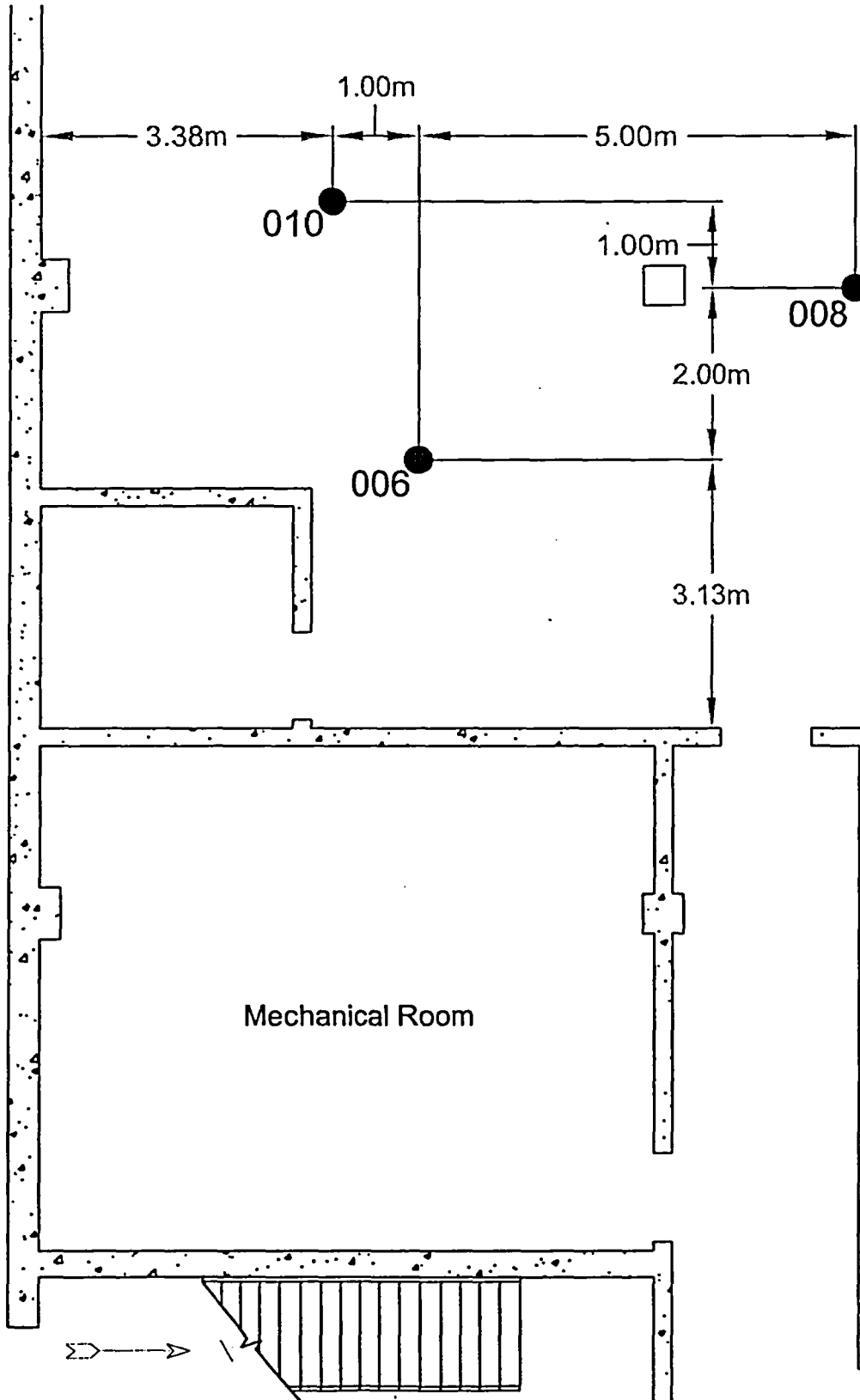
FB1700: Staff Building First Floor (El. 22')  
Direct Points 001, 004, 005, 007, 012, 014



Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey

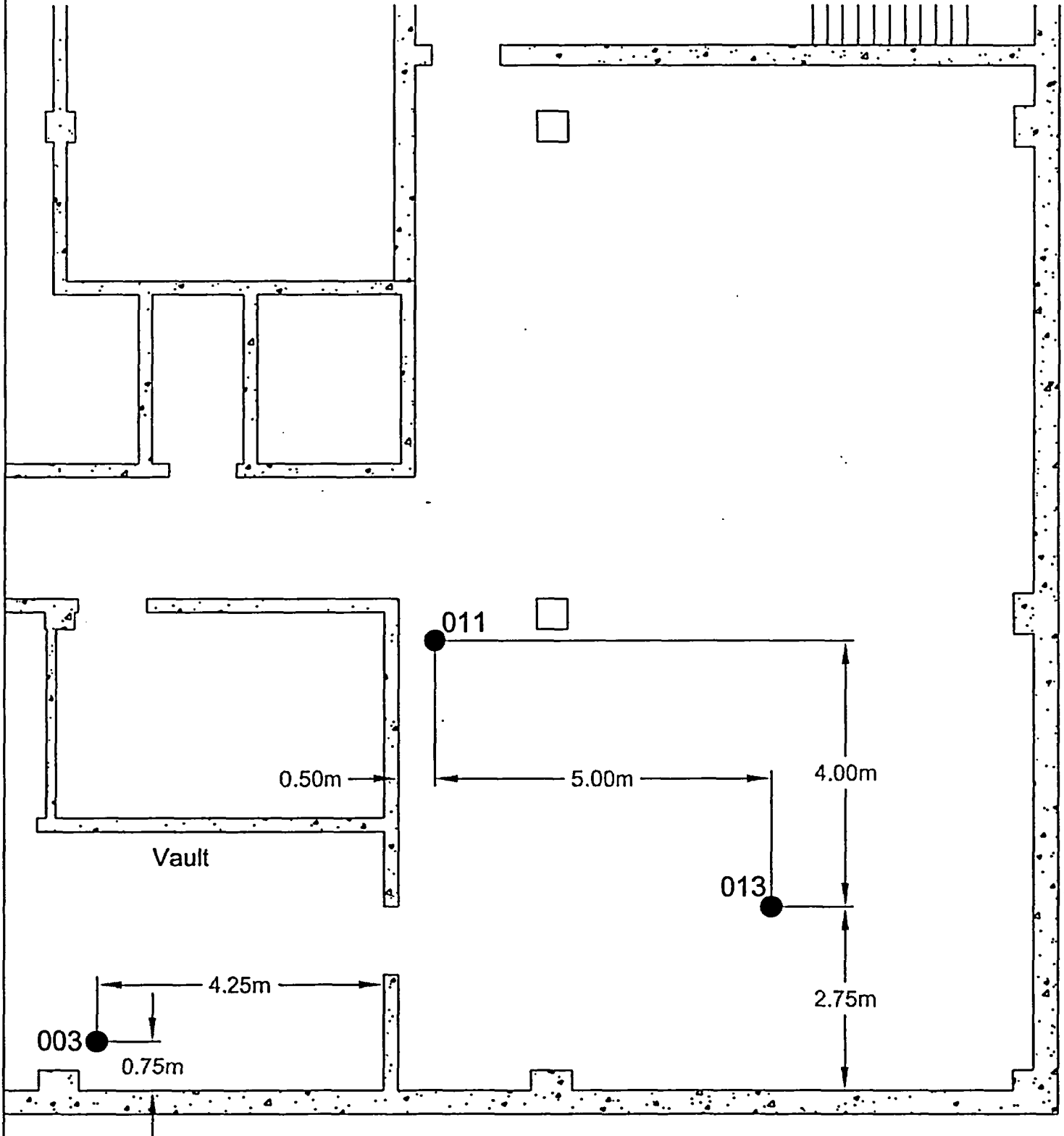
Survey Area Name: Staff Building

Final Status Survey  
FB1700: Staff Building First Floor (El. 22')  
Direct Points 006, 008, 010



Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey Survey Area Name: Staff Building

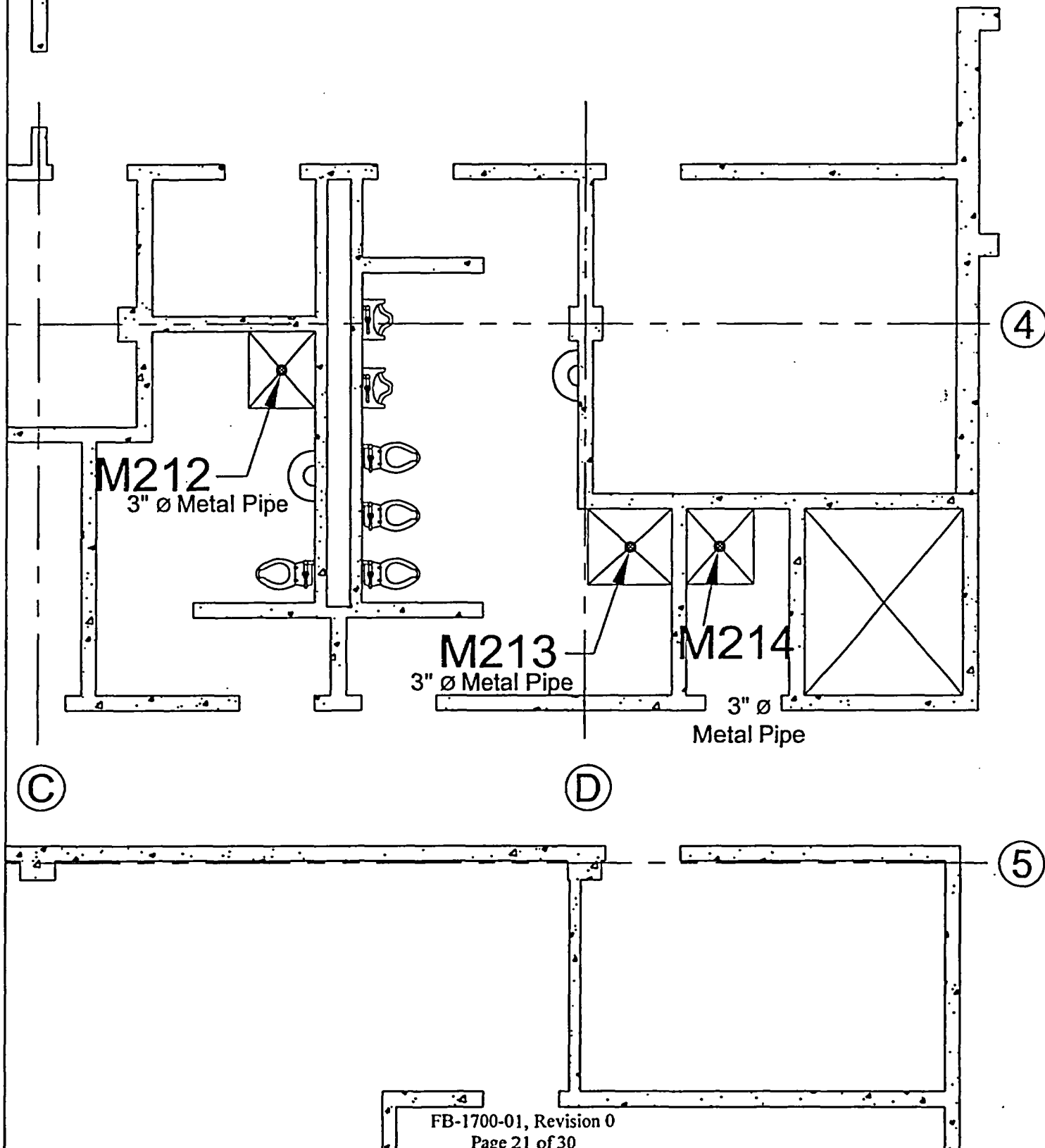
Final Status Survey  
FB1700: Staff Building First Floor (El. 22')  
Direct Points 003, 011, 013



Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey

Survey Area Name: Staff Building

Final Status Survey  
FB1700: Staff Building First Floor (El. 22')  
Survey Scans M212 - M214



---

**Attachment 2**

**Survey Unit Instrumentation**

**TABLE 2-1**  
**INSTRUMENT INFORMATION**

E-600 S/N	Probe S/N (type)
1928	190285 (43-37)
1625	148937 (43-68)
2617	467 (SHP-360)
1645	148939 (43-68)
1625	149069 (43-68)
1648	190327 (43-37)
2619	190329 (43-37)
2489	460 (SHP-360)
1641	190750 (43-37)
2488	462 (SHP-360)
2489	462 (SHP-360)

**HPGe Detectors**  
**(for Laboratory Analysis of Volumetric Samples)**

Detector Number	MDC (pCi/g)
DET2	0.08 to 0.11
DET3	0.11 to 0.12

**TABLE 2-2**  
**INSTRUMENT SCAN MDC, DCGL, AND INVESTIGATION LEVEL**

Detector	43-68 (Concrete)	43-37 (Concrete)	SHP-360 (Irregular Surfaces)	SHP-360 (Metal Penetrations)
<b>Scan MDC</b> (dpm/100 cm <sup>2</sup> )	1,832 (Note 1)	3,663 (Note 1)	10,484 (Note 1)	4,140 (Note 2)
<b>DCGL</b> (dpm/100 cm <sup>2</sup> )	18,000	18,000	18,000	18,000
<b>Scan Investigation Level</b> (Alarm Setpoint) (dpm/100 cm <sup>2</sup> )	21,680 (~ DCGL plus background)	20,470 (~ DCGL plus background) (Note 3)	27,960 (~ DCGL plus background)	20,770 (~ DCGL plus background)

- NOTES**
1. LTP Table 5-6
  2. The SHP-360 scan MDC from LTP Table 5-6 was adjusted to account for a change in efficiency due to geometry and material.
  3. The 43-37 investigation level was determined for 100 cm<sup>2</sup> of detection surface area.

**Attachment 3**

**Investigation Table**



**TABLE 3-1****INVESTIGATION TABLE**

SCAN ALARM			SCAN INVESTIGATION			
Scan Grid No. (Instrument Used)	Alarm Setpoint (cpm)	Alarm Value (cpm)	Gross Scaler (cpm)	Net <sup>3</sup> Scaler (cpm)	Net Scaler (dpm/100 cm <sup>2</sup> )	Percent of DCGL of 18,000 dpm/100 cm <sup>2</sup>
C179 (SHP-360)	255	342	104	12	1,315	7.3%
C184 (SHP-360)	255	322	92	0	0	0
C188 (SHP-360)	255	301	89	-3	-329	0
C198 (SHP-360)	255	291	101	9	987	5.5%

<sup>3</sup> The Table 1 background (= 92 cpm) was subtracted from the gross scaler reading.

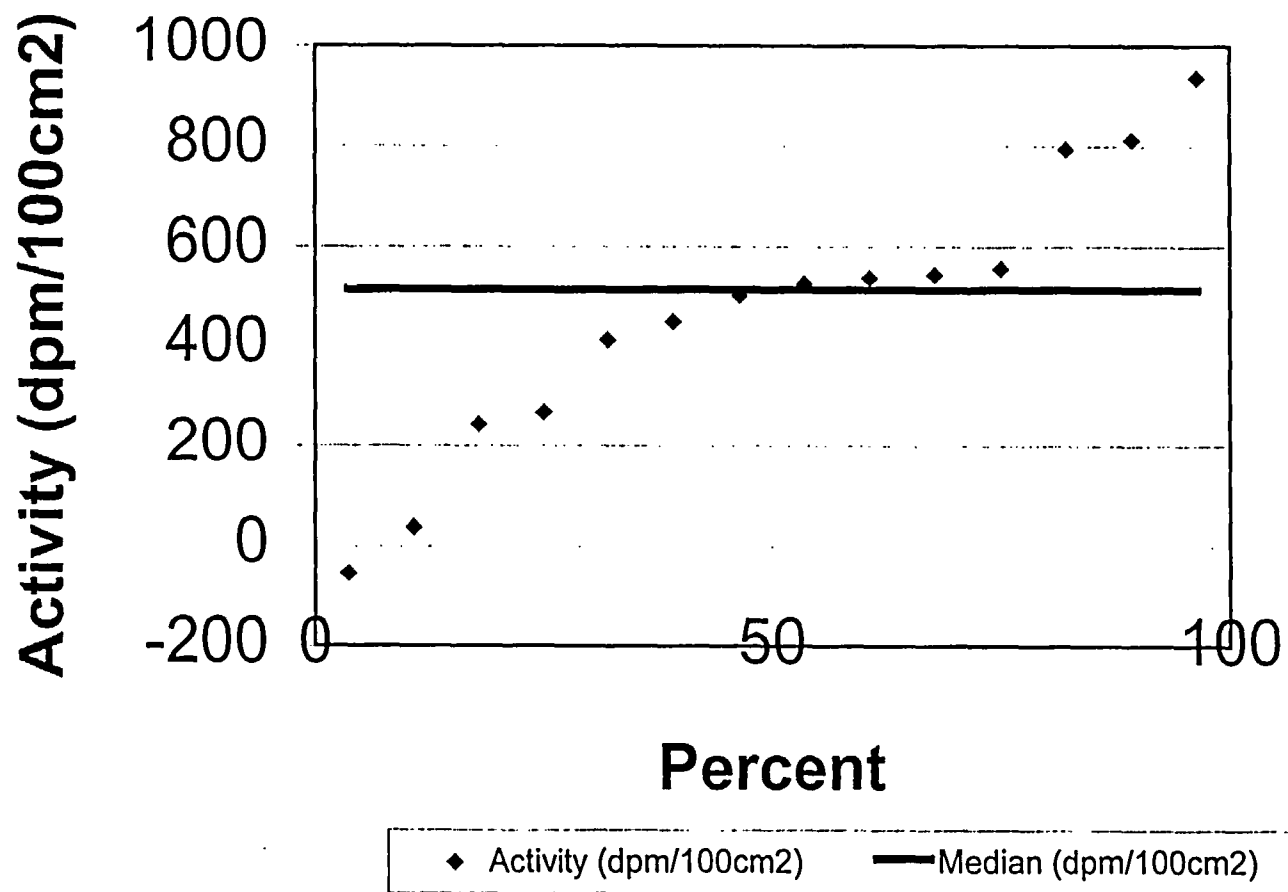
**Attachment 4**

**Statistical Data**

## SIGN TEST SUMMARY

Evaluation Input Values		Comments
Survey Package:	FB1700	
Survey Unit:	01	
Evaluator:	AO	
DCGL <sub>w</sub> :	18,000	dpm/100cm <sup>2</sup>
DCGL <sub>emc</sub> :	n/a	
LBGR:	16878	dpm/100cm <sup>2</sup>
Sigma:	374	dpm/100cm <sup>2</sup>
Type I error:	0.05	
Type II error:	0.05	
Total Instrument Efficiency:	13.0%	
Detector Area (cm <sup>2</sup> ):	126	
Material Type:	Concrete Painted	
Calculated Values		Comments
Z <sub>1-</sub> :	1.645	
Z <sub>1-</sub> :	1.645	
Sign p:	0.99865	
Calculated Relative Shift:	3.0	
Relative Shift Used:	3.0	Uses 3.0 if Relative Shift >3
N-Value:	11	
N-Value+20%:	14	
Static Data Values		Comments
Number of Samples:	14	
Median:	514	dpm/100cm <sup>2</sup>
Mean:	469	dpm/100cm <sup>2</sup>
Net Static Data Standard Deviation:	280	dpm/100cm <sup>2</sup>
Total Standard Deviation:	351	SRSS of samples and all background
Maximum:	935	dpm/100cm <sup>2</sup>
Sign Test Results		Comments
Adjusted N Value:	14	
S+ Value:	14	
Critical Value:	10	
Criteria Satisfaction		Comments
Sufficient samples collected:	Pass	
Maximum value <DCGL <sub>w</sub> :	Pass	
Median value <DCGL <sub>w</sub> :	Pass	
Mean value <DCGL <sub>w</sub> :	Pass	
Maximum value <DCGL <sub>emc</sub> :	Pass	
Total Standard Deviation <=Sigma:	Pass	
Sign test results:	Pass	
Final Status		Comments
The survey unit passes all conditions:	Pass	

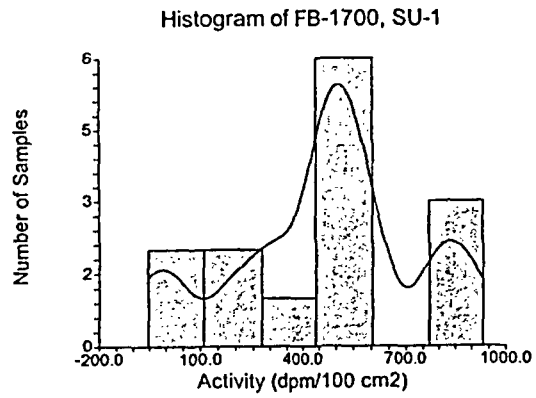
## FB1700 SU-1 Quantile Plot



## One-Sample T-Test Report

Page/Date/Time 2 12/9/04 1:05:20 PM  
Database  
Variable C2

### Plots Section



# One-Sample T-Test Power Analysis

Page/Date/Time 2 12/9/04 1:06:32 PM

## Chart Section

