MAINE YANKEE
FINAL STATUS SURVEY RELEASE RECORD
FR-0110 PAB ALLEYWAY
SURVEY UNIT 5

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MAINE YANKEE
FINAL STATUS SURVEY RELEASE RECORD
FR-0110 PAB ALLEYWAY
SURVEY UNIT 5

A. SURVEY UNIT DESCRIPTION

Survey Unit 5 is located in Survey Area FR0110, the PAB Alleyway. The survey unit consists of concrete surfaces within the Alleyway excavation. The excavation was made to remove buried pipes running between the PAB and Containment Spray Building. The PAB Alleyway is located within the Restricted Area, bordered on the west by the Personnel Hatch, Main Steam Valve House, Reactor Motor Control Center, and the Emergency Feedwater Pump Room, on the east by the Service Building, and by the PAB on the north. It is located near grid coordinates 407,500 N and 623,800 E using the Maine State Coordinate System (West Zone) NAD 1927.

The PAB Alleyway is shown in relation to other major site structures in map FR 0110-00. All maps referenced in this release record are provided in Attachment 1 unless otherwise noted. The survey unit is approximately 240 m^2.

B. SURVEY UNIT DESIGN INFORMATION

The area was designated a Class 1 land survey unit per the LTP (Table 5-1C, R0100, RCA Yard West). The Alleyway excavation was begun in late 2002 and the removed soil was spread and surveyed for possible reuse. Nearly all of the removed soil was found to be acceptable for reuse. The soil survey effort was suspended when the ground froze, and upon returning to soil surveying in the spring of 2003, it was determined that radioactivity had migrated into the remaining soil from the open, abandoned pipes in the excavation. Consequently, significant soil remediation had to be performed in the excavation pit. There was no remediation of the concrete surfaces performed prior to the Final Status Survey. Since the survey unit was already Class 1, no reassessment of classification was required.

The survey unit design parameters are shown in Table 1. Given an adjusted relative shift of 3, it was determined that 14 direct measurements were required for the Sign Test; however, the number of samples was increased because two additional sample points fell within the area when the locations were laid out. Sixteen direct measurements were actually performed. Measurement locations were determined using a fixed grid with a randomly determined start point and are illustrated on the maps FR 0110-DPC-05 and FR 0110-DPC-05a through FR 0110-DPC-05d. Once the direct measurement readings were completed, removable contamination samples were obtained at each measurement location.

The survey was also designed to include 238 scan grids for flat surfaces, each of approximately 1 m^2 area (see map FR 0110-05). Instrument scan setpoints were conservatively set below the $DCGL_{EMC}$, as shown in Table 2-2 (Attachment 2).

In addition, there were two junctures scanned as shown on map FR 0110-JT-REF. It should be noted that penetrations through the PAB wall were surveyed in survey area FA-0600 Survey Unit 6. Also, embedded pipes in the Main Steam Valve House slab will be removed with the slab.

To accommodate measurement geometry requirements for surfaces of non-uniform smoothness, the SHP-360 probe was used to augment the 43-68 scan survey. First, a 43-68 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. Ninety-degree surface junctures (i.e., wall-floor and wall-wall) were scanned using the 43-68 probe with a reduced efficiency.

Background values were established, for each particular instrument probe application based on ambient background values in the survey unit and previously established material backgrounds. These background values, listed in Table 1, were used to establish net activity for direct measurements, scan alarm setpoints, and to confirm the scan MDCs used were appropriate.

The instruments used in this survey are listed by model and serial number in Attachment 2 (Table 2-1). Scan MDCs are also listed in Attachment 2 (Table 2-2) and are compared to the DCGL, the investigation level, and the $DCGL_{EMC}$. 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. Further, since the investigation level at the alarm setpoint was always less than the design $DCGL_{EMC}$, no EMC sample size adjustment was necessary.

TABLE 1

SURVEY UNIT DESIGN PARAMETERS

Survey Unit	Design Criteria	Basis
Area	240 m^2	
Number of Direct Measurements Required	14	Based on an adjusted LBGR of 15,564 dpm/100cm^2, sigma[1] of 812 dpm/100 cm^2 and a relative shift of 3.0. Type I = Type II = 0.05
Sample Area	17 m^2	240 m^2 / 14 samples[2]
Sample Grid Spacing	4 m	$(17)^{½}$
Scan Grid Area	1 m^2	
Area Factor	2.9	50 m^2/17 m^2 per LTP, Rev. 3[3]
Scan Survey Area	240 m^2	Class 1 – 100%
Background		
43-68 Direct and Scan (flat surfaces)	3,083 dpm/100 cm^2	Ambient and Material
43-68 Scans (junctures)	6,219 dpm/100 cm^2	Ambient and Material
SHP-360 Scans (surface irregularities)	4,386 dpm/100 cm^2	Ambient Only
Scan Investigation Level	DCGL plus background[4]	See Table 2-2 (Attachment 2)
DCGL	18,000 dpm/100 cm^2	LTP, Rev. 3
Design $DCGL_{EMC}$	52,200 dpm/100 cm^2	Area Factor x DCGL

C. SURVEY RESULTS

Sixteen direct measurements were made in Survey Unit 5. All direct measurements were less than the DCGL. The resulting data are presented in Table 2 below.

No verified alarms were received during the surface scans. Therefore, no investigations were required.

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1 Design sigma is based on characterization data, listed in LTP Table 5-1B, Mechanical Penetrations, A1500, (LTP, Rev. 3).

2 This survey unit was initially designed for N=14 samples. The N=14 design led to a survey unit map with 16 locations on the systematic grid. The Area Factor used reflects the design grid size.

3 " LTP, Rev. 3" refers to the LTP submitted in October 2002 (Reference 1) as amended by the MY's addenda of November 2002 (Reference 2). LTP, Rev. 3 was approved by the NRC in February 2003 (Reference 3).

4 As discussed earlier in the Release Record, a limited portion of the survey unit's surfaces were scanned with the SHP-360, which had an investigation level equivalent to approximately 63% of the design $DCGL_{EMC}$.

TABLE 2

DIRECT MEASUREMENTS

Sample Location	Gross Activity dpm/100 cm^2	Net Activity (Table 1 Background Subtracted) dpm/100 cm^2
FR0110-05-C001	3162	79
FR0110-05-C002	3584	501
FR0110-05-C003	2796	-287
FR0110-05-C004	2961	-122
FR0110-05-C005	2735	-348
FR0110-05-C006	3071	-12
FR0110-05-C007	2796	-287
FR0110-05-C008	2698	-385
FR0110-05-C009	3669	586
FR0110-05-C010	3407	324
FR0110-05-C011	3602	519
FR0110-05-C012	2589	-495
FR0110-05-C013	2576	-507
FR0110-05-C014	2143	-940
FR0110-05-C015	2686	-397
FR0110-05-C016	2662	-421
Mean	2946	-137
Median	2796	-287
Standard Deviation.	435	435
Sample Range	2143 to 3669	-940 to 586

D. SURVEY UNIT INVESTIGATIONS PERFORMED AND RESULTS

No investigations were required as there were no verified scan alarms.

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 the DCGL. The maximum direct sample result with background subtracted was equivalent to 586 dpm/100 cm^2.

When adjusted for background, the mean residual contamination level is -137 dpm/100 cm^2. This is equivalent to an annual dose of 0.0 mrem.

There were no verified alarms, and therefore there were no investigations and no Elevated Measurement Comparison test was required.

F. ADDITIONAL DATA EVALUATION

Attachment 4 provides additional data evaluation associated with Survey Unit 5, 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 Sign Test Summary table calculated the total standard deviation by propagating the individual standard deviation values used in the subtracted background survey design (using the square root of the sum of the squares method). Therefore, median, mean, and standard deviation values listed in the Sign Test Summary table are slightly different from those listed in Table 2. These differences, however, are minor and have no impact on the statistical analysis or conclusions.

   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 clearly satisfied for the FSS of this 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 1 survey unit. There is no reason to conclude that the data set represents other than random variations in a Class 1 concrete surface survey unit. It also should be noted that the maximum net activity (586 dpm/100 cm^2 at location C009) is well below the DCGL of 18,000 dpm/100 cm^2.

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 this 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.

As mentioned in Section B, removable contamination samples were obtained at each (direct) measurement location. In that this survey unit involved a (backfilled) foundation area and not a standing building, the removable contamination measurements were not applicable to release decisions for the survey unit. However, the samples were obtained and evaluated, indicating alpha activity less than the MDA values (i.e., < 13.3 dpm/100 cm^2) and the beta activity also less than the MDA values (i.e., < 12.6 dpm/100 cm^2). Thus, in comparison with the mean survey unit net activity (Table 2), the removable contamination sampling effort indicated that the majority of activity is fixed.

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

The survey was designed as a Class 1 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 5 was designed and performed using the criteria of the approved LTP (Revision 3 Addenda). The only subsequent LTP changes (with potential impact to this FSS) were provided in the proposed license amendment related to modifications of the activated concrete remediation plan submitted September 11, 2003 (Reference 4). Changes represented in this later proposed license amendment have been evaluated and have no impact on the design, conduct, or assessment of the final status survey of Survey Unit 5.

I. CONCLUSION

The FSS of this survey unit was designed based on the LTP designation as a Class 1 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 the DCGL of 18,000 dpm/100 cm^2..

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 1 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 a no verified alarms (Section C). Since there were no alarms, the survey unit was determined to satisfy the elevated measurement comparison unity rule per LTP methodology.

In addition, while not part of the release decision criteria, removable contamination sampling confirmed that the majority of remaining activity in this basement survey unit was fixed.

It is concluded that FR0110 Survey Unit 5 meets the release criteria of 10CFR20.1402 and the State of Maine enhanced criteria.

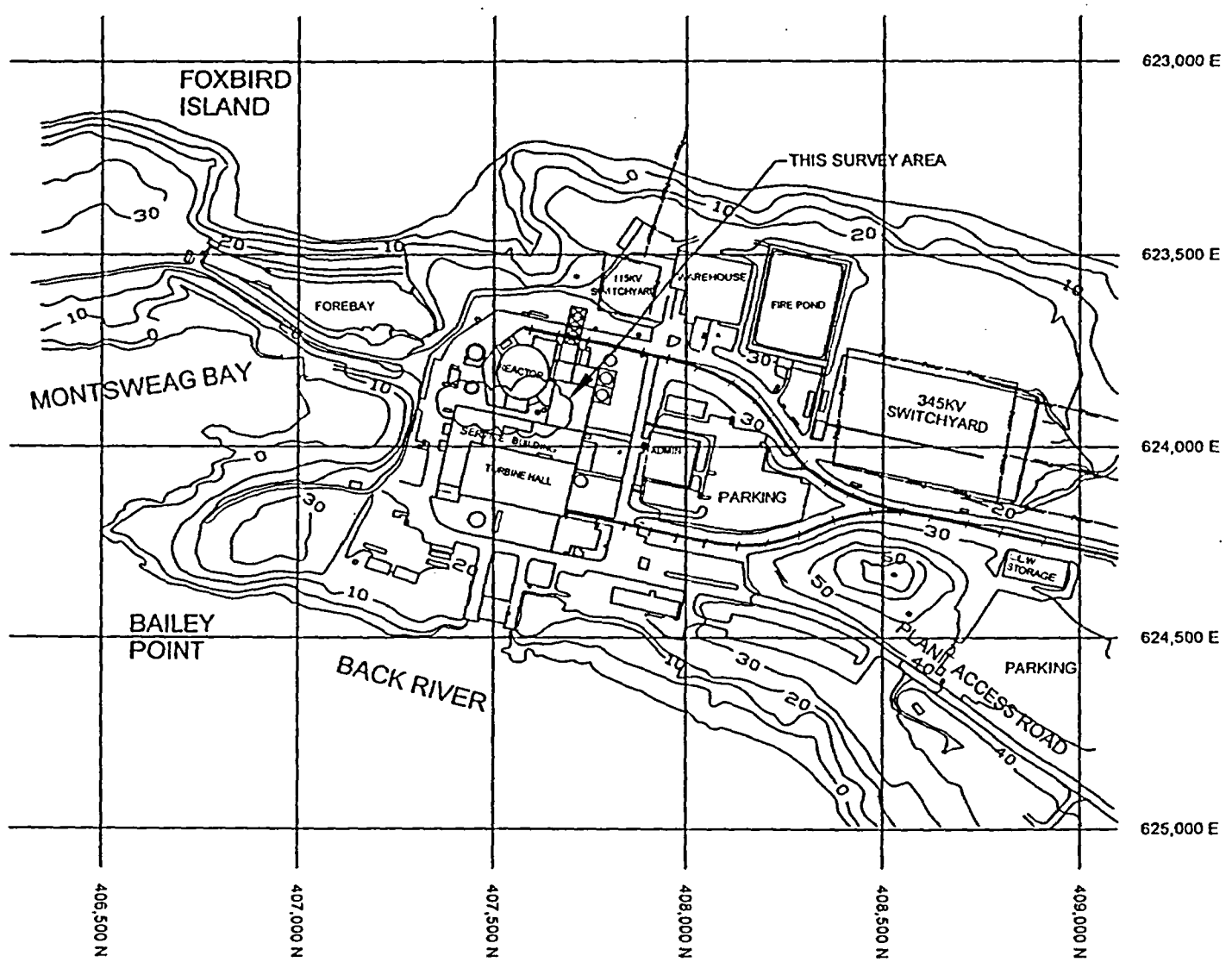
J. REFERENCES

1. Maine Yankee License Termination Plan, Revision 3, October 15, 2002
2. Maine Yankee letter to the NRC, MN-02-061, dated November 26, 2002
3. NRC letter to Maine Yankee, dated February 28, 2003
4. Maine Yankee letter to the NRC, MN-03-049, dated September 11, 2003

Attachment 1

Survey Unit Maps

Maine Yankee Decommissioning Team	*Maine Yankee Decommissioning Project Survey Form*	Map ID #: FR 0110-00
Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey	Survey Area Name: Alleyway Excavation	Date: 6-25-03



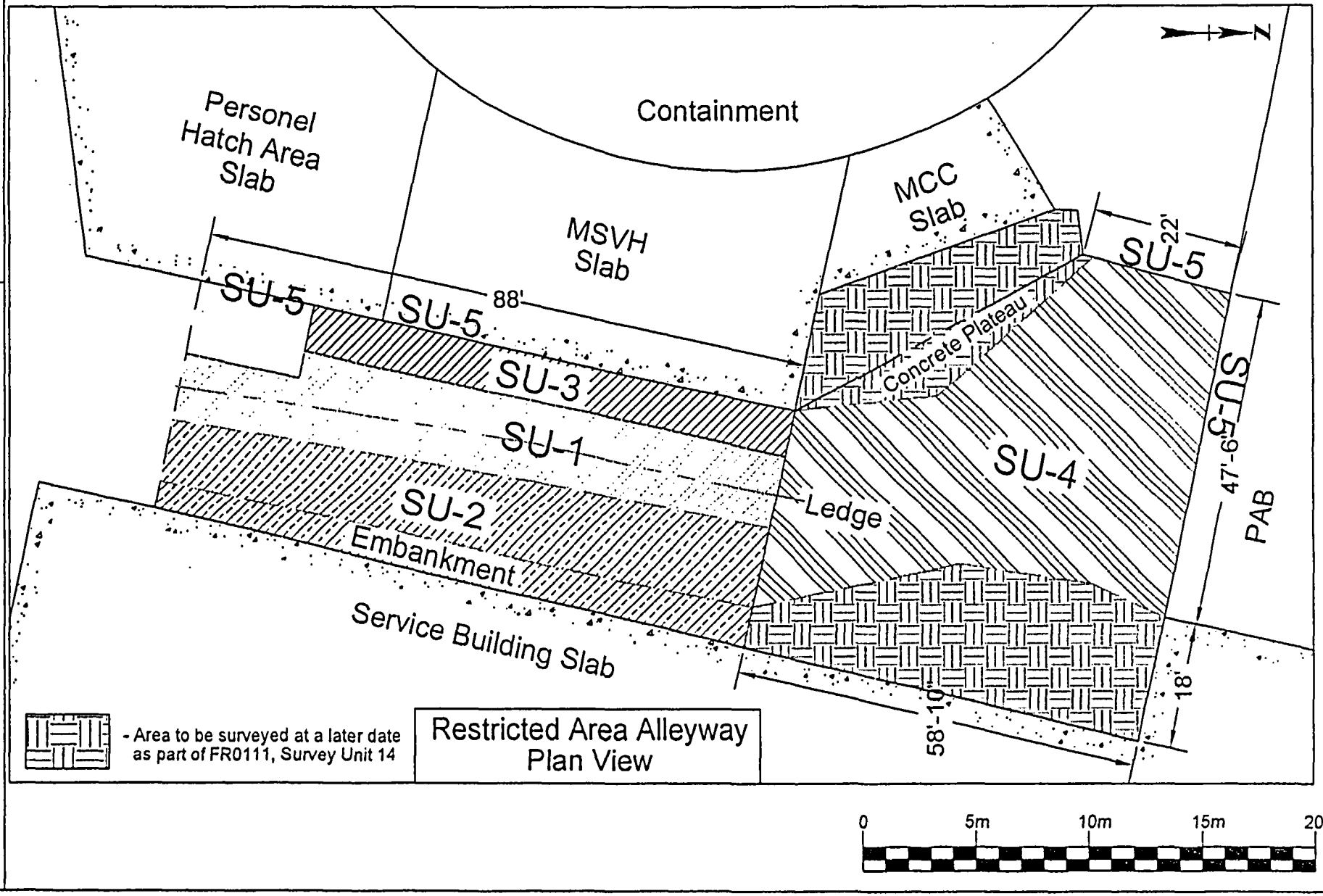
SCALE (ft)

0 400 800 1200

MN

N

Final Status Survey Unit Reference Map
Alleyway Piping Excavation Pit



Maine Yankee Decommissioning Team

Maine Yankee Decommissioning Project Survey Form

Map ID #: FR 0110-REF

Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey

Survey Area Name: Alleyway Excavation

Date: 6-25-03

FR-0110-DPC-05, Direct Point Survey, Concrete
Survey Unit 05
Alleyway Piping Excavation Pit

Maine Yankee Decommissioning Team

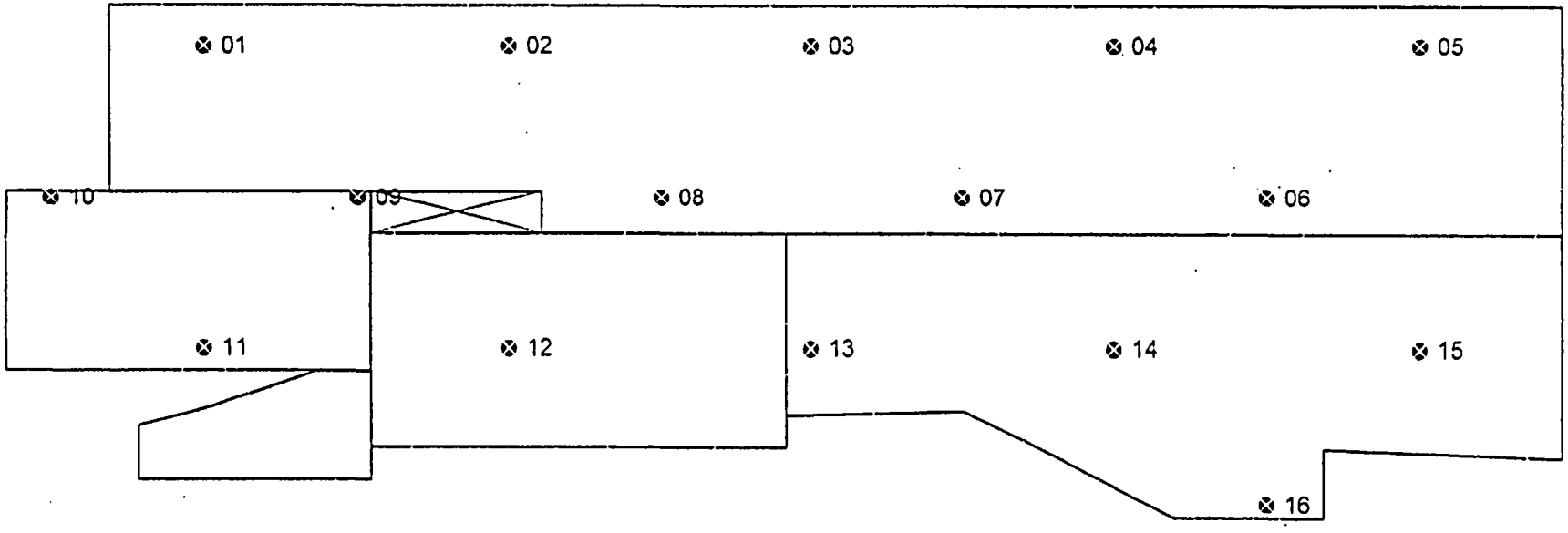
Maine Yankee Decommissioning Project Survey Form

Map ID #: FR 0110-DPC-05 Survey Unit 05

Date: 6-25-03

Survey Area Name: Alleyway Excavation

Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey



L=4, N=14

This survey unit area is approximately 240 square meters.

Maine Yankee Decommissioning Team

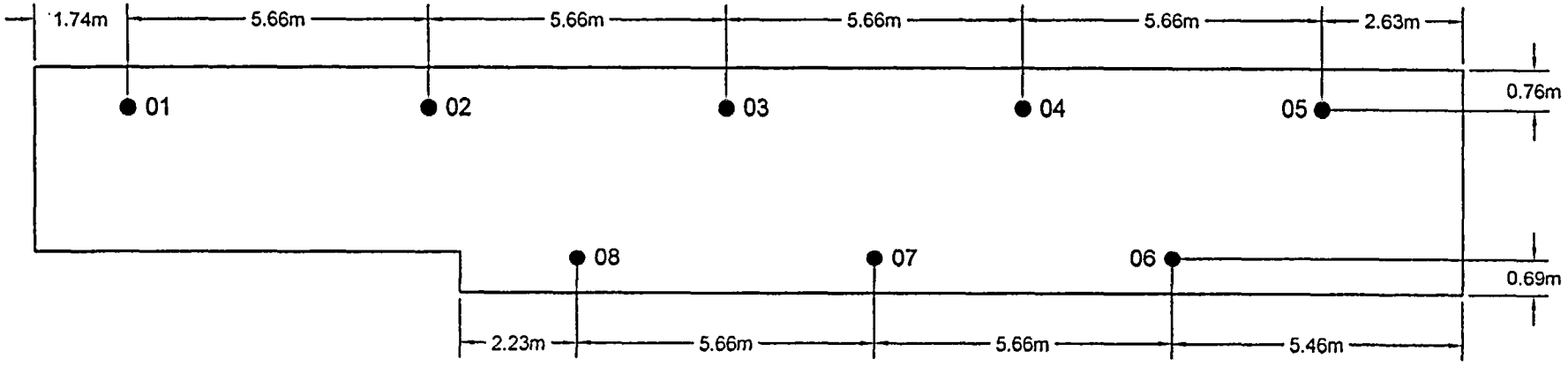
Maine Yankee Decommissioning Project Survey Form

Map ID #:FR 0110-DPC-05a Survey Unit 05

Survey Area Name: Alleyway Excavation | Date: 6-25-03

Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey

FR-0110-DPC-05a, Direct Point Survey, Concrete
Survey Unit 05
Alleyway Piping Excavation Pit



L=4, N=14

MSVH & PH/V Wall

Maine Yankee Decommissioning Team

Maine Yankee Decommissioning Project Survey Form

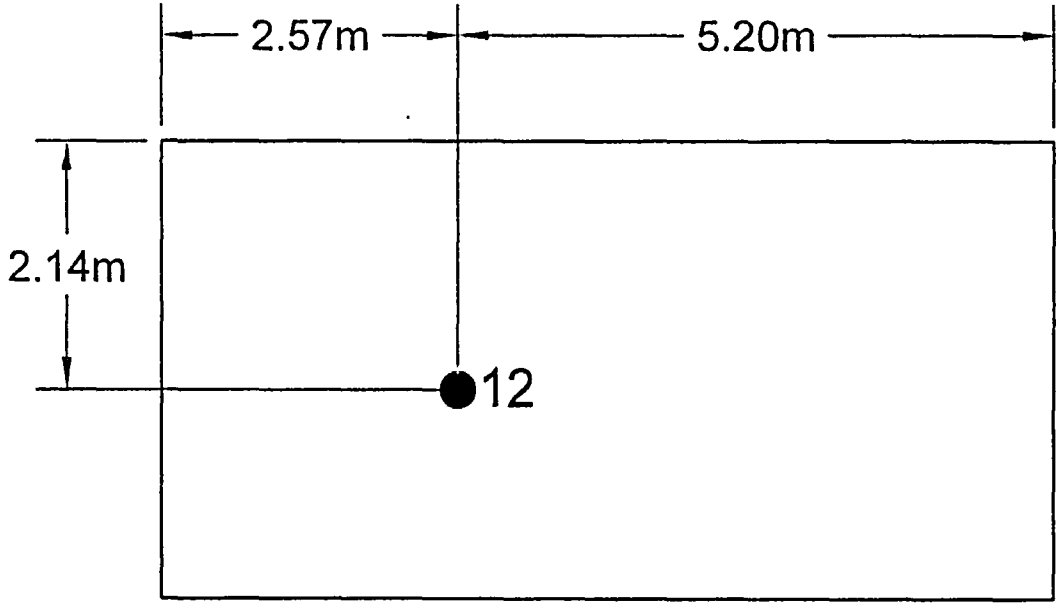
Map ID #:FR 0110-DPC-05b Survey Unit 05

Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey

Survey Area Name: Alleyway Excavation

Date: 6-25-03

FR-0110-DPC-05b, Direct Point Survey, Concrete
Survey Unit 05
Alleyway Piping Excavation Pit



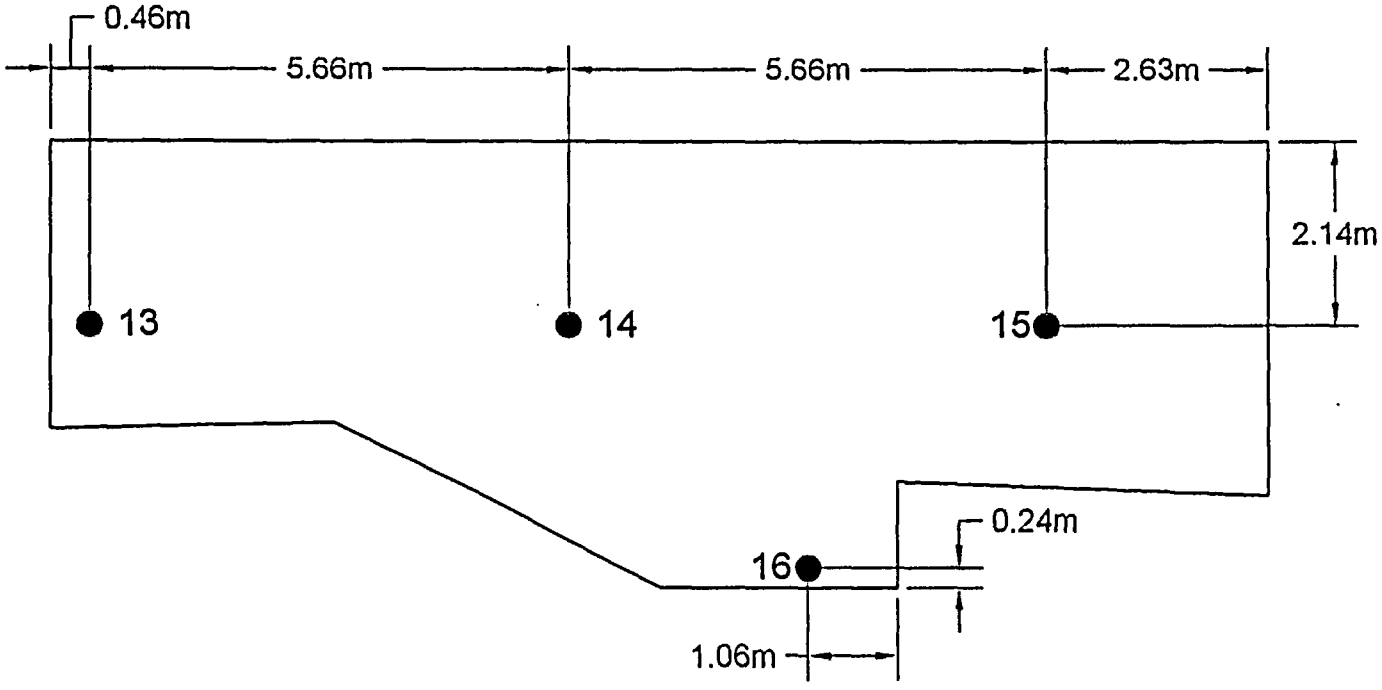
L=4, N=14

Vent Stack Wall

Maine Yankee Decommissioning Team | *Maine Yankee Decommissioning Project Survey Form* | Map ID #:FR 0110-DPC-05c Survey Unit 05 | Date: 6-25-03

Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey | Survey Area Name: Alleyway Excavation

FR-0110-DPC-05c, Direct Point Survey, Concrete
Survey Unit 05
Alleyway Piping Excavation Pit

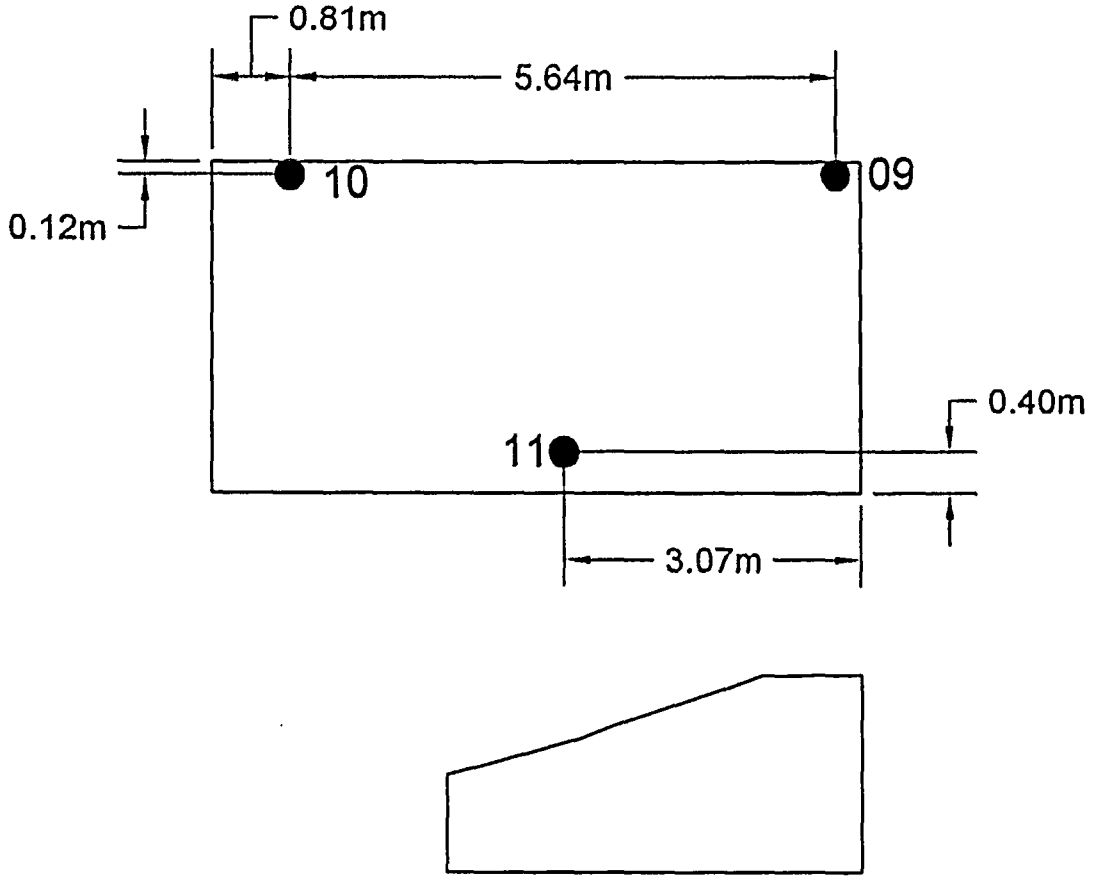


L=4, N=14

PAB Wall

Maine Yankee Decommissioning Team	*Maine Yankee Decommissioning Project Survey Form*	Map ID #:FR 0110-DPC-05d Survey Unit 05
Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey	Survey Area Name: Alleyway Excavation	Date: 6-25-03

FR-0110-DPC-05d, Direct Point Survey, Concrete
Survey Unit 05
Alleyway Piping Excavation Pit



L=4, N=14

Concrete Pad and Wall

FR 0110 -05: Alleyway Piping Excavation Pit
Concrete Survey Scans 001-238

Maine Yankee Decommissioning Team

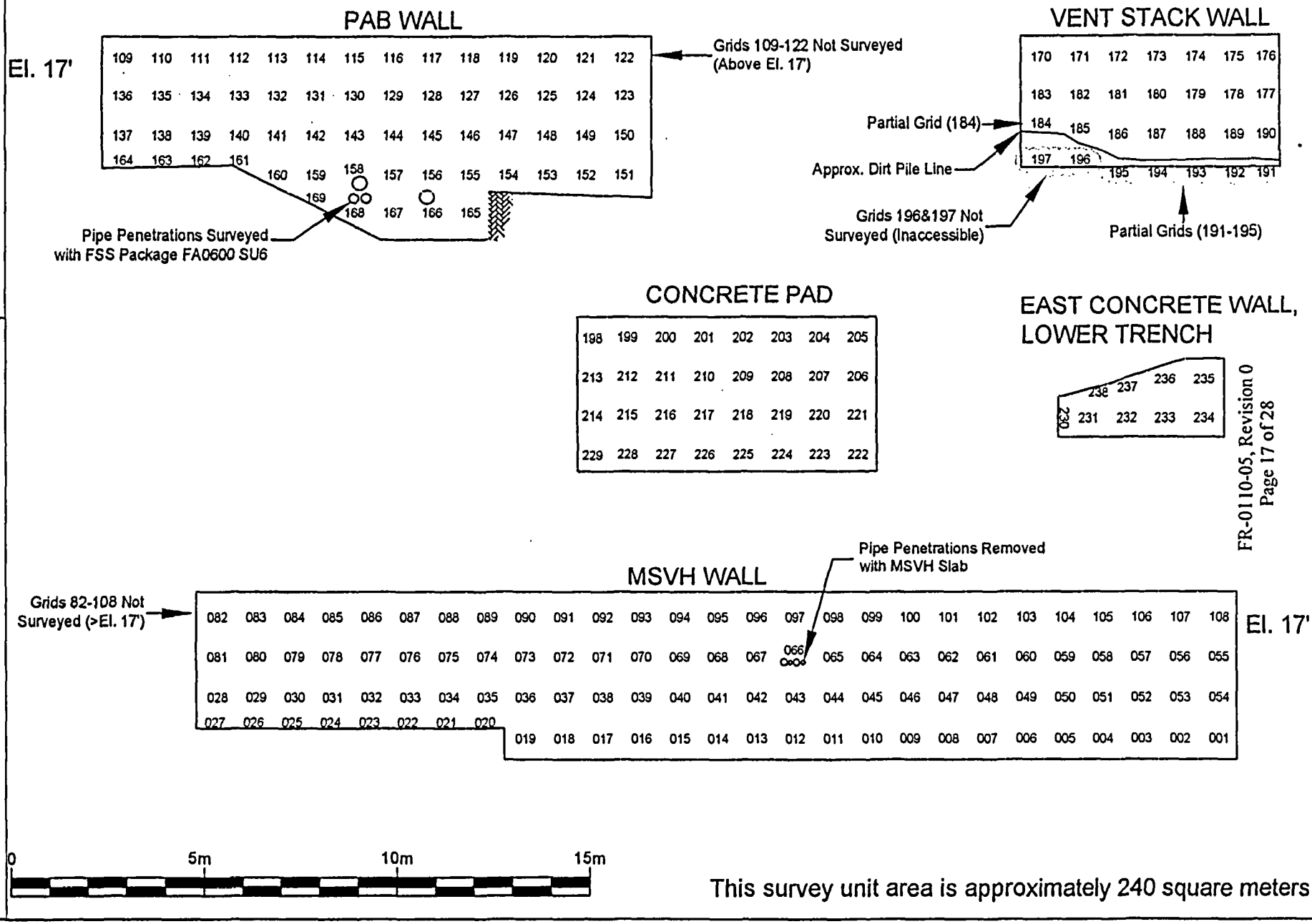
Maine Yankee Decommissioning Project Survey Form

Map ID #: FR 0110-05

Survey Area Name: Alleyway Excavation

Date: 6-25-03

Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey

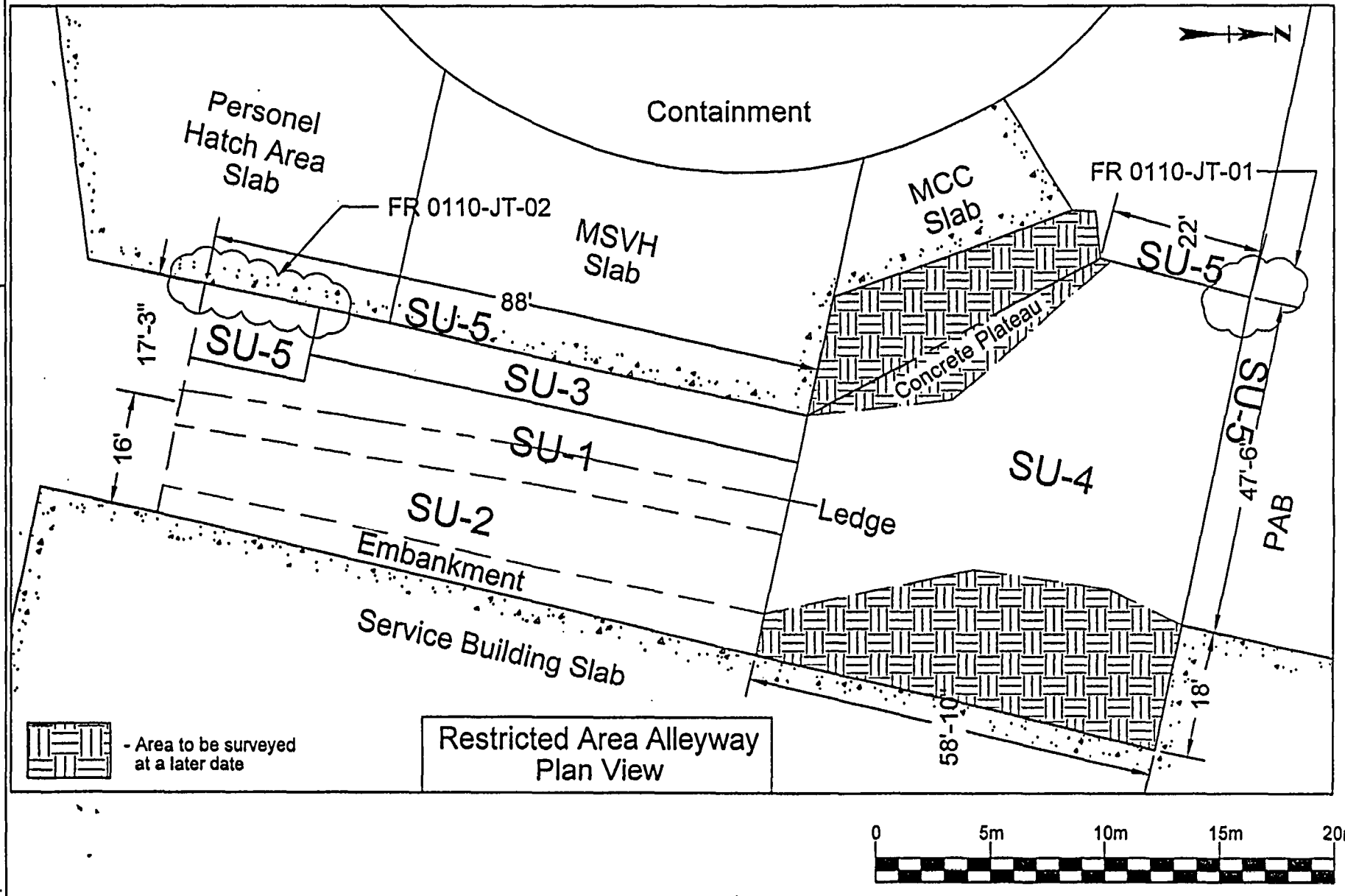


This survey unit area is approximately 240 square meters

Concrete Juncture Reference Map
Alleyway Piping Excavation Pit

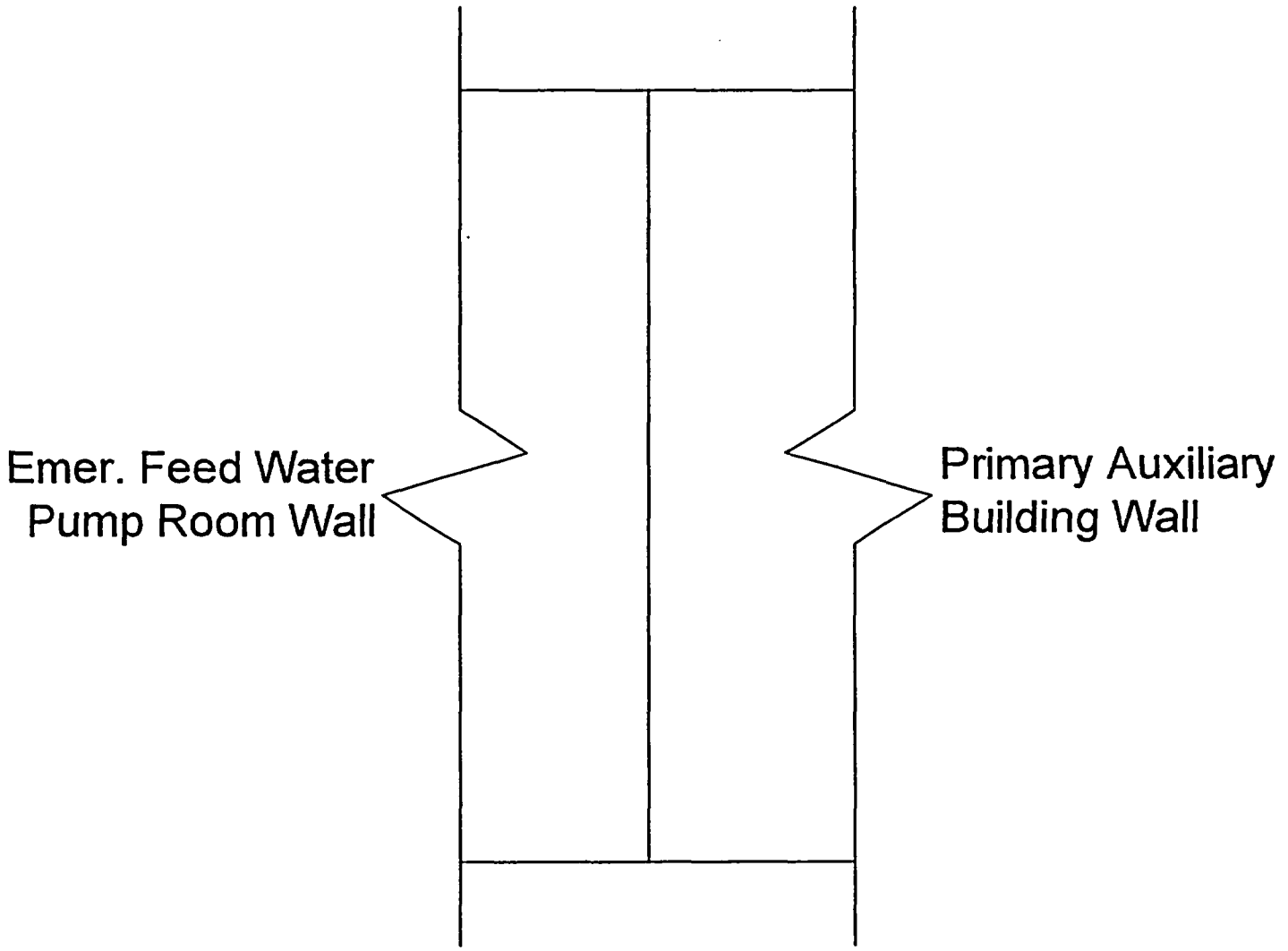
Maine Yankee Decommissioning Team | *Maine Yankee Decommissioning Project Survey Form* | Map ID #: FR 0110-JT-REF

Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey | Survey Area Name: Alleyway Excavation | Date: 6-25-03



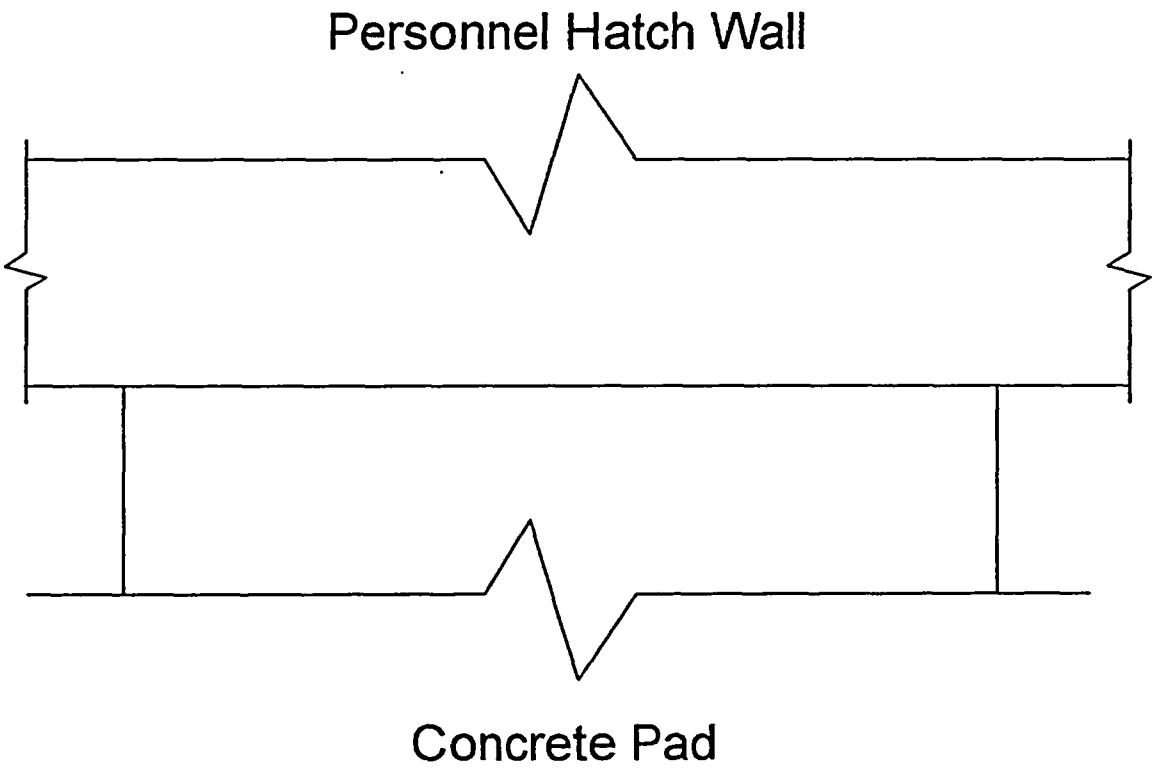
Maine Yankee Decommissioning Team	*Maine Yankee Decommissioning Project Survey Form*	Map ID #: FR 0110-JT-01
Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey	Survey Area Name: Alleyway Excavation	Date: 6-25-03

FR 0110-JT-01, Concrete Juncture
Emergency Feed Water & Primary Auxiliary Building Walls
Alleyway Piping Excavation Pit



Maine Yankee Decommissioning Team	*Maine Yankee Decommissioning Project Survey Form*	Map ID #: FR 0110-JT-02
Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey	Survey Area Name: Alleyway Excavation	Date: 6-25-03

FR 0110-JT-02, Concrete Juncture
Concrete Pad & Personnel Hatch Wall
Alleyway Piping Excavation Pit



Attachment 2

Survey Unit Instrumentation

TABLE 2-1

INSTRUMENT INFORMATION

E-600 S/N	Probe S/N (type)
1622	148937 (43-68)
2491	148938 (43-68)
2489	454 (SHP-360)

TABLE 2-2

INSTRUMENT SCAN MDC, DCGL, INVESTIGATION LEVEL, AND DESIGN $DCGL_{EMC}$

Detector	43-68 Flat	43-68 Junctures	SHP-360 Surface Irregularities
Scan MDC ($dpm/100\ cm^2$)	1,832 LTP Table 5-6	4,330 (Note 1)	10,484 LTP Table 5-6
DCGL ($dpm/100\ cm^2$)	18,000	18,000	18,000
Investigation Level (Alarm setpoint) ($dpm/100\ cm^2$)	21,062 (~ DCGL plus background)	24,098 (~ DCGL plus background)	32,895 (~ 63% Design $DCGL_{EMC}$ (Note 2)
Design $DCGL_{EMC}$ ($dpm/100\ cm^2$) (from Release Record Table 1)	52,200	52,200	52,200

NOTE:
1. Separate scan MDC developed for the 43-68 when applied to juncture geometry by adjusting the LTP Table 5-6 value for the change in efficiency.
2. SHP-360 surveys were performed with an alarm setpoint of 500 cpm. All data was evaluated with the lower investigation levels in this table.

Attachment 3

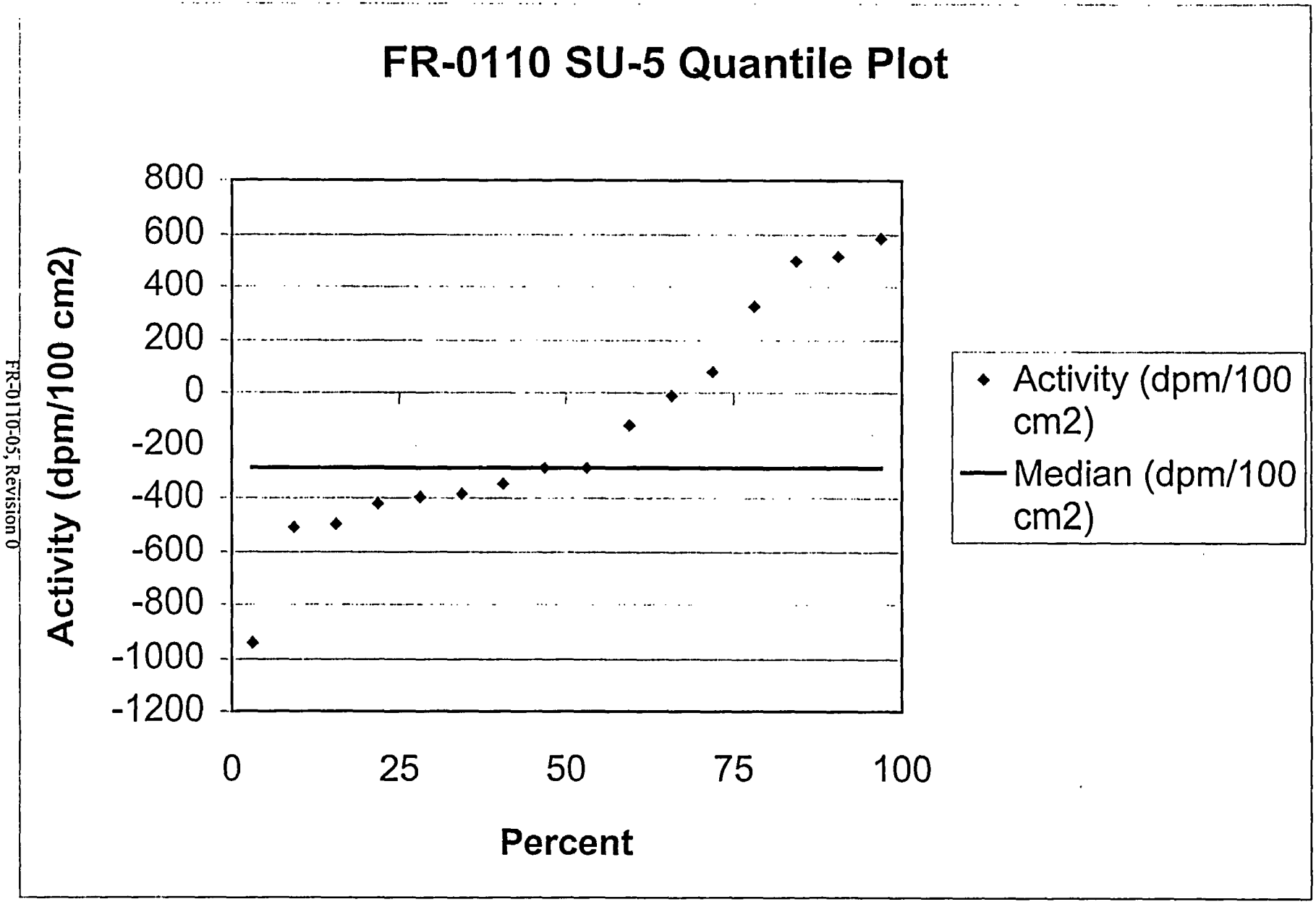
Investigation Table
(None Required)

Attachment 4

Statistical Data

Survey Package FR0110 Unit 5 Surface Sign Test Summary

Evaluation Input Values		Comments
Survey Package:	FR0110	PAB Alleyway
Survey Unit:	05	
Evaluator:	WJC	
$DCGL_w$:	18,000	
$DCGL_{emc}$:	52,200	
LBGR:	9,000	
Sigma:	812	
Type I error:	0.05	
Type II error:	0.05	
Total Instrument Efficiency:	13.0%	
Detector Area (cm^2):	126	
Material Type:	Concrete Unpainted	Choosing 'N/A' sets material background to "0"
Calculated Values		**Comments**
$Z_{1-\alpha}$:	1.645	
$Z_{1-\beta}$:	1.645	
Sign p:	0.99865	
Calculated Relative Shift:	11.0	
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:	16	
Median:	-290	
Mean:	-140	
Net Static Data Standard Deviation:	435	
Total Standard Deviation:	512	Sum of samples and all background
Maximum:	583	
Sign Test Results		**Comments**
Adjusted N Value:	16	
S+ Value:	16	
Critical Value:	11	
Criteria Satisfaction		**Comments**
Sufficient samples collected:	Pass	
Maximum value <$DCGL_w$:	Pass	
Median value <$DCGL_w$:	Pass	
Mean value <$DCGL_w$:	Pass	
Maximum value <$DCGL_{emc}$:	Pass	
Total Standard Deviation <=Sigma:	Pass	
Sign test results:	Pass	
Final Status		**Comments**
The survey unit passes all conditions:	Pass	SU 5 Passes


FR-0110 SU-5 Quantile Plot
Activity (dpm/100 cm2)
800
600
400
200
0
-200
-400
-600
-800
-1000
-1200
0
25
50
75
100
Percent
Activity (dpm/100 cm2)
Median (dpm/100 cm2)

One-Sample T-Test Report

Page/Date/Time	2 11/29/04 3:22:51 PM
Database	C:\Program Files\NCSS97\FR0110SU5.S0
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Plots Section

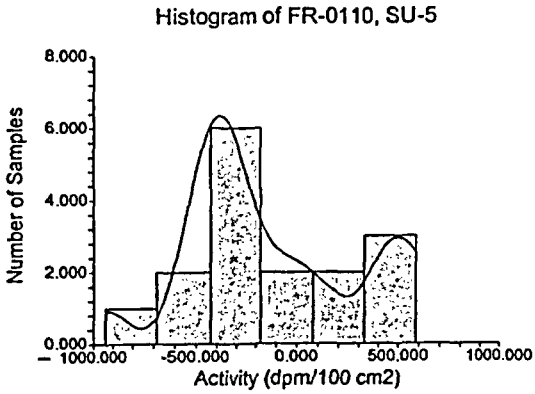

Chart Section