



**Rancho Seco**  
**Final Status Survey Summary Report**  
**October 20, 2016**  
**IOSB Storage Cell A-3**  
**Survey Unit F8300183**

Prepared By:  Date: 12.16.16

**FSS Engineer**

Reviewed By:  Date: 12-16-16

**Lead FSS Engineer**

Approved By:  Date: 12/30/16

**Manager, Rancho Seco Assets**

## FINAL STATUS SURVEY F8300183

### Survey Unit:

F8300183, Interim Onsite Storage Building (IOSB) Storage Cell A-3

### Survey Unit Description:

Operating History: Designed primarily to store packaged radioactive waste containers safely, protected from the elements, and maintain radiological dose as low as reasonably achievable (ALARA), each storage cell possibly stored media of many types, including filters, resins, contaminated chemicals, DAW, activated reactor components, contaminated plant components and other contaminated items.

Site Characterization: Static measurements were made of the interior surfaces of the storage cell, to confirm the absence or presence of plant-derived radionuclides. Static measurements showed a mean gross beta activity level of 2,020 dpm/100 cm<sup>2</sup> and a maximum value of 2,382 dpm/100 cm<sup>2</sup>. Based on the levels of gross activity reported, the area was determined to be a Class 3 area.

### Survey Unit Design Information:

The Survey Unit Design Parameters are presented in **Table 1** below. The survey unit and measurement locations are depicted on the maps in **Attachment 1**. Static measurement locations were randomly determined and approximately 27% of the area scanned. The instrumentation used for the survey along with the MDC values are listed in **Table 2-1 Attachment 2**.

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**Table 1, Survey Unit Design Parameters**

| Evaluation Input Values                               |             | Comments                                       |
|---|-------------|--|
| Survey Package:                                       | <b>F830</b> | Storage Cell A-3                               |
| Survey Unit:  | <b>18</b>   |  |
| Class   | <b>03</b>   |  |
| SU Area (m <sup>2</sup> )                             | <b>28</b>   |  |
| Evaluator:  | JR          |  |
| DCGL <sub>w</sub> :                                   | 43,000      | Gross Activity DCGL                            |
| Area Factor   | N/A         | Class 3  |
| Design DCGL <sub>emc</sub> (dpm/100cm <sup>2</sup> ): | N/A         | Class 3  |
| DCGL <sub>emc</sub> :                                 | N/A         | Class 3  |
| LBGR:   | 21,500      | Default = 50% DCGL                             |
| Sigma:  | 175         | Scoping Survey Data                            |
| Type I error:   | 0.05        |  |
| Type II error:  | 0.05        |  |
| Predominant Nuclide                                   | Cs-137      |  |
| Sample Area (m <sup>2</sup> )                         | N/A         |  |
| Total Instrument Efficiency:                          | 0.129       |  |
| Total Area Scanned (m <sup>2</sup> ):                 | 7.51        |  |
| Scan Coverage (%)                                     | 27%         | Class 3  |
| Material Type:  | N/A         | Choosing 'N/A' sets material background to "0" |
| Calculated Values                                     |             | Comments                                       |
| Z <sub>1-α</sub> :                                    | 1.645       |  |
| Z <sub>1-β</sub> :                                    | 1.645       |  |
| Sign p:   | 0.99865     |  |
| Calculated Relative Shift:                            | 122.8       |  |
| Relative Shift Used:                                  | 3.0         | Uses 3.0 if Relative Shift >3                  |
| N-Value:  | 11          |  |
| N-Value+20%:  | 14          |  |

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## Survey Results:

A total of 15 direct measurements were made in F8300183. The results of the static measurements are shown in **Table 2**. All of the static measurements were less than the DCGL. None of the scan measurements indicated areas of elevated activity. Swipe data did not indicate elevated activity levels above the MDA.

**Table 2, Static Measurement Results**

| Number | Sample #       | Beta (cpm) | Beta (dpm) |
|--------|----------------|------------|------------|
| 1      | F8300183X00001 | 270        | 2,045      |
| 2      | F8300183X00002 | 267        | 2,023      |
| 3      | F8300183X00003 | 283        | 2,144      |
| 4      | F8300183X00004 | 274        | 2,076      |
| 5      | F8300183X00005 | 286        | 2,167      |
| 6      | F8300183X00006 | 250        | 1,894      |
| 7      | F8300183X00007 | 264        | 2,000      |
| 8      | F8300183X00008 | 246        | 1,864      |
| 9      | F8300183X00009 | 265        | 2,008      |
| 10     | F8300183X00010 | 272        | 2,061      |
| 11     | F8300183X00011 | 269        | 2,038      |
| 12     | F8300183X00012 | 273        | 2,068      |
| 13     | F8300183X00013 | 263        | 1,992      |
| 14     | F8300183X00014 | 254        | 1,924      |
| 15     | F8300183X00015 | 248        | 1,879      |

**Table 3** contains the statistical summary of the static measurement data for the Storage Cell A-3.

**Table 3, Beta Summary Statistics**

| <i>Beta Static A-3</i> |       |
|------------------------|-------|
| Mean                   | 2,012 |
| Median                 | 2,023 |
| Standard Deviation     | 91    |
| Minimum                | 1,864 |
| Maximum                | 2,167 |
| Count                  | 15    |

## FINAL STATUS SURVEY F8300183

### Survey Unit Data Assessment:

The survey design required 14 static measurements for the Sign Test. A total of 15 static measurements were collected. The critical value and the results of the Sign Test are presented in **Table 4**. The sample mean and median values were less than the DCGL.

**Table 4, Data Assessment Results**

| Static Data Values                     |       | Comments |
|--|-------|----------|
| Number of Samples:                     | 15    |          |
| Median:                                | 2,023 |          |
| Mean:                                  | 2,012 |          |
| Static Data Standard Deviation:        | 91    |          |
| Maximum:                               | 2,167 |          |
| Sign Test Results                      |       | Comments |
| Adjusted N Value:                      | 14    |          |
| S+ Value:                              | 15    |          |
| 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> :   | N/A   |          |
| Sign test results:                     | Pass  |          |
| Final Status                           |       | Comments |
| The survey unit passes all conditions: | Pass  |          |

### Survey Unit Investigations and Results:

No investigations were required for either direct or scan measurements and no investigation results are reported.

### ALARA Statement:

As stated in Chapter 4 of the LTP, as long as the residual activity within the survey unit is less than the DCGL, the ALARA criterion has been met.

### Changes in Initial Survey Unit Assumptions:

The survey unit was designed as a Class 3 survey and the sample results are consistent with that classification. The variability of the survey results was less than the characterization data used for survey design which would result in a larger relative shift value. Since both values are in excess of 3 the difference in the variability does not affect the power of the survey. No potential areas of elevated activity were detected.

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### **Conclusion:**

The FSS of this survey unit was properly designed as a Class 3 survey based on the results of the scoping survey. The required number of direct measurements was made and the scan coverage met the requirement of Table 5-6 of the LTP. All of the static measurements were less than the DCGL. No investigations were required.

The static 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.

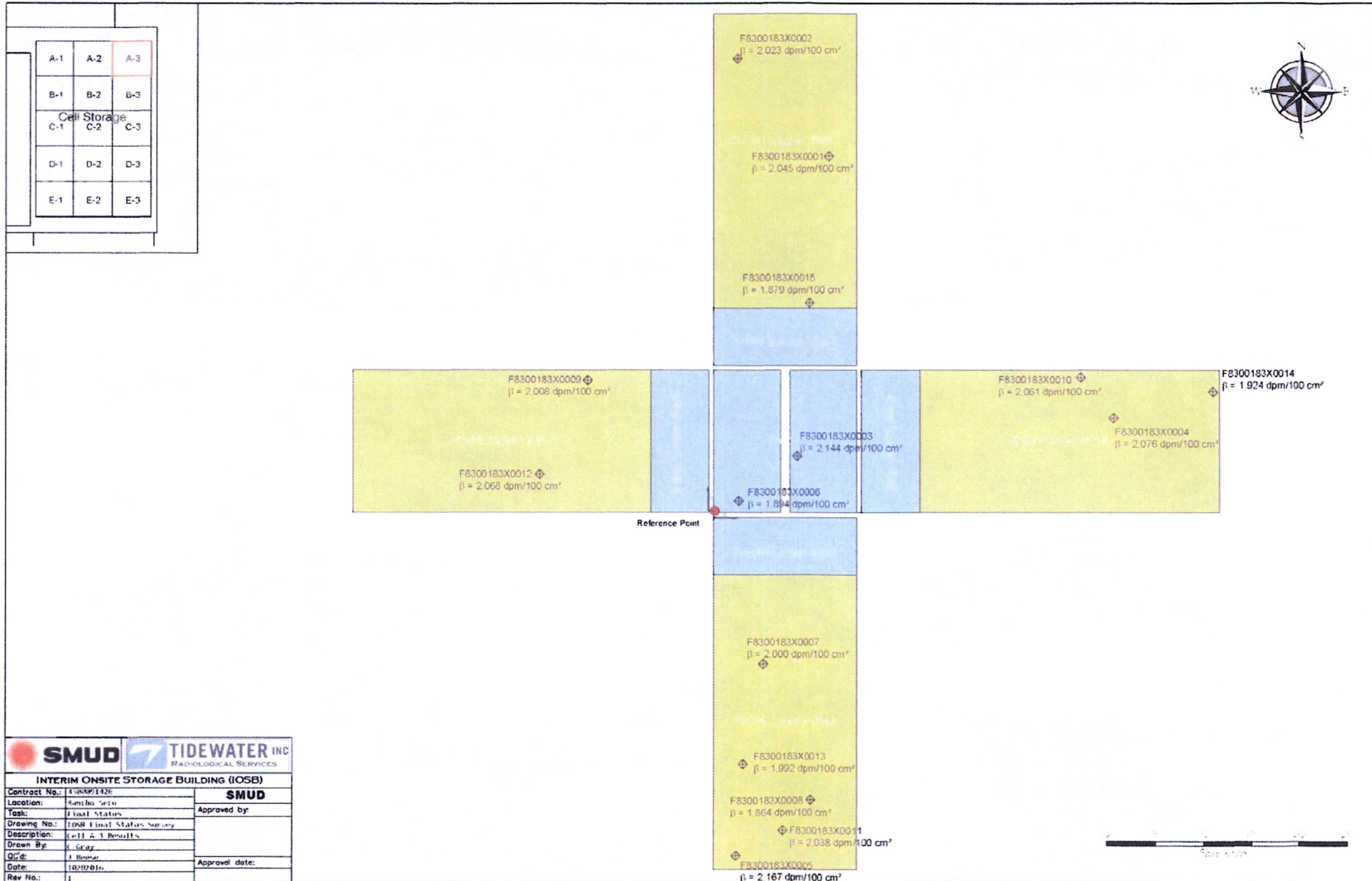
It is concluded that survey unit F8300183 meets the release criteria of 10CFR20.1402.

**Attachment 1**

**Maps**

**December 20, 2016**

**Survey Unit F8300183**



|   |                |
|---|----------------|
|   |                |
| <b>INTERIM ONSITE STORAGE BUILDING (IOSB)</b> |                |
| Contract No.: 4-00091426                      | <b>SMUD</b>    |
| Location: Radio Site                          | Approved by:   |
| Task: Final Status                            |                |
| Drawing No.: IOSB Final Status Survey         |                |
| Description: Cell A, B Results                |                |
| Drawn By: C. Gray                             |                |
| QC'd: J. Brown                                | Approval date: |
| Date: 10/29/06                                |                |
| Rev No.: 1                                    |                |



**Attachment 2**

**Instrumentation**

**December 20, 2016**

**Survey Unit F8300183**

**Table 2-1. Survey Unit Instrumentation**

| Measurement Type        | Instrument Type                           | Minimum Detectable Activity <sup>a</sup> | Detector Efficiencies | Calibration Due Date <sup>b</sup> |
|-------------------------|---|--|-----------------------|-----------------------------------|
| Beta Static Measurement | Ludlum Model 2350-1                       | Beta – 550 dpm/100 cm <sup>2</sup>       | 13.2%                 | 317897/331972<br>2/10/17          |
|                         | Ludlum Model 44-116 B Detector            |  |                       |                                   |
| Swipe Measurements      | Ludlum Model 2929<br>Ludlum Model 44-10-1 | Beta – 76 dpm/100 cm <sup>2</sup>        | 42.8%                 | 166716/170380<br>11/3/16          |

<sup>a</sup> Minimum detectable activities for the count rate instrumentation were calculated in accordance with NUREG-1507, "Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions" (U.S. NRC, 1997).

<sup>b</sup> Detectors are required to be calibrated once every 12 months. Calibration due date indicates the date by which the detector must be calibrated again.

cm<sup>2</sup> = square centimeters

cpm = counts per minute

dpm = disintegrations per minute

## Static Measurement MDA

### Variables

Beta Survey Type  
PR331972 Detector Number  
224 Background count rate (cpm)  
1 Count Time (min)  
0.132 Efficiency  
100 Area of Detector (cm<sup>2</sup>)

### Constants

60 sec/min  
2.54 cm/in

### Assumptions

Background count time and sample count time are equivalent

### Calculate Static MDA

Static MDA =  $3 + 4.65(B_r * t)^{0.5} / t * E * A_{/100}$  (NUREG 1507)

Where:  $B_r$  Background Countrate  
 $t$  Count Time (min)  
 $E$  Efficiency  
 $A$  Area of detector (cm<sup>2</sup>)

Static MDA 550 dpm/100 cm<sup>2</sup>

**Attachment 3**

**Investigation**

**October 20, 2016**

**Survey Unit F8300183**

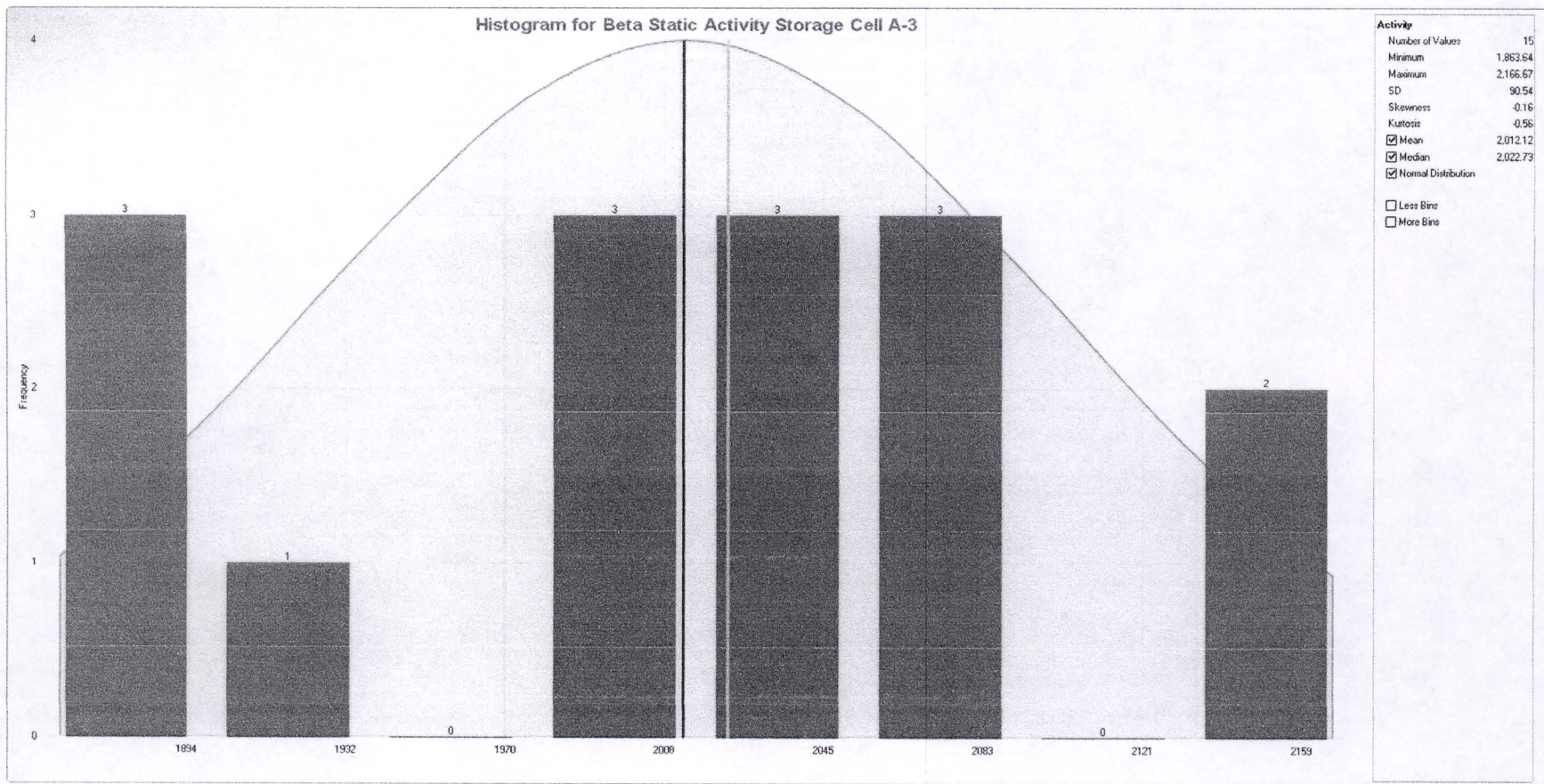
**(none required)**

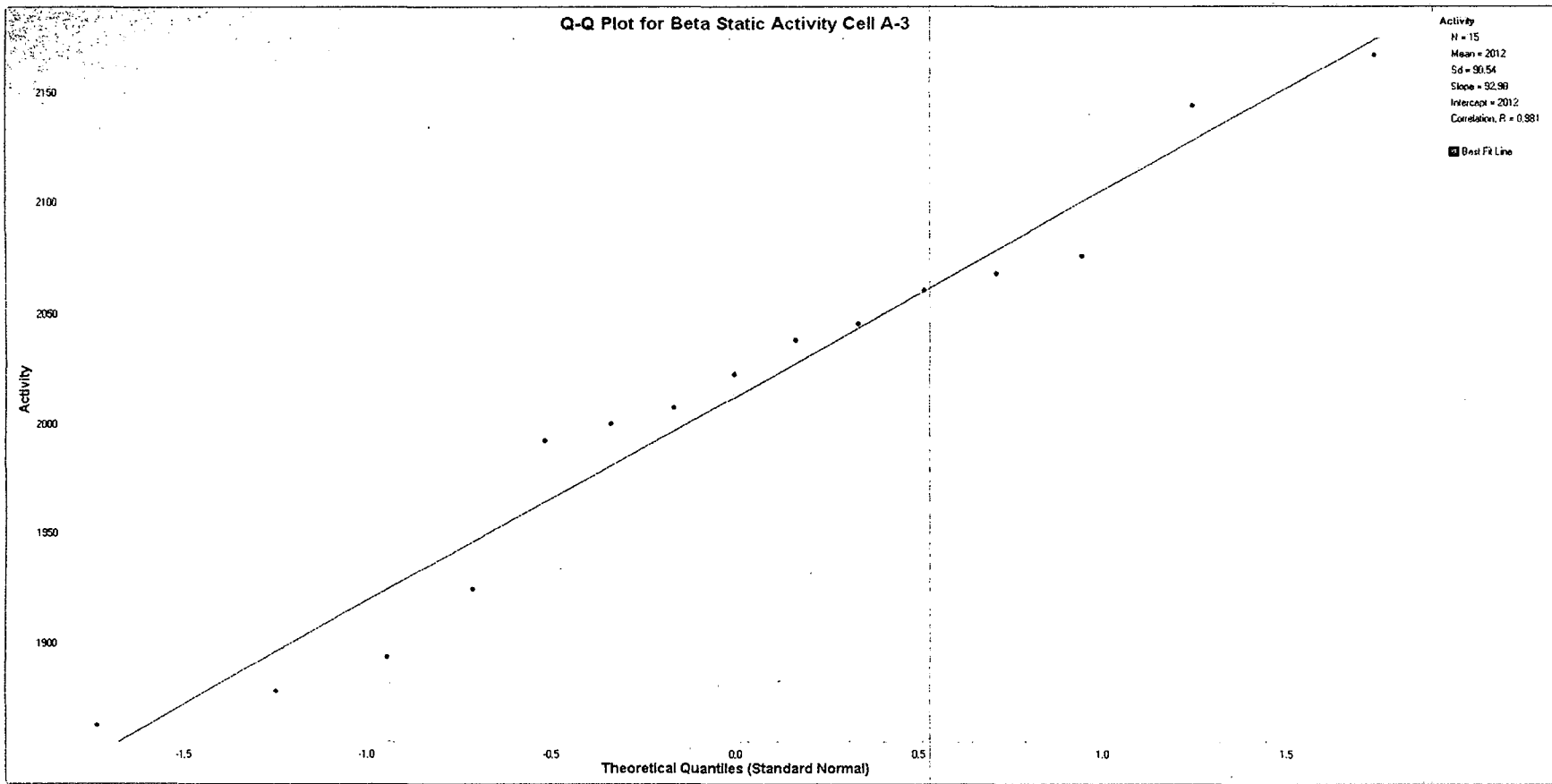
**Attachment 4**

**Data Assessment**

**December 20, 2016**

**Survey Unit F8300183**





| IOSB Final Status Survey  |      |     |     |     |       |     |  |             |             |                    |                      |     |              |
|---|------|-----|-----|-----|-------|-----|--|-------------|-------------|--------------------|----------------------|-----|--------------|
|   | LC1  | LC2 | LC3 | LC4 | LC6   | LC5 |  | $\beta$ CPM | $\beta$ dpm | Date/Time of Count | Sample Comments      |     |              |
| 1   | F830 | 018 | 3   | X   | 00001 | SM  | Cell A-3                               | 42          | -10         | 10/06/16           | 10:43                |     |              |
| 2   | F830 | 018 | 3   | X   | 00002 | SM  | Cell A-3                               | 41          | -12         | 10/06/16           | 10:44                |     |              |
| 3   | F830 | 018 | 3   | X   | 00003 | SM  | Cell A-3                               | 40          | -15         | 10/06/16           | 10:45                |     |              |
| 4   | F830 | 018 | 3   | X   | 00004 | SM  | Cell A-3                               | 41          | -12         | 10/06/16           | 10:47                |     |              |
| 5   | F830 | 018 | 3   | X   | 00005 | SM  | Cell A-3                               | 45          | -3          | 10/06/16           | 10:48                |     |              |
| 6   | F830 | 018 | 3   | X   | 00006 | SM  | Cell A-3                               | 63          | 38          | 10/06/16           | 10:49                |     |              |
| 7   | F830 | 018 | 3   | X   | 00007 | SM  | Cell A-3                               | 57          | 25          | 10/06/16           | 10:50                |     |              |
| 8   | F830 | 018 | 3   | X   | 00008 | SM  | Cell A-3                               | 50          | 9           | 10/06/16           | 10:52                |     |              |
| 9   | F830 | 018 | 3   | X   | 00009 | SM  | Cell A-3                               | 51          | 11          | 10/06/16           | 10:53                |     |              |
| 10  | F830 | 018 | 3   | X   | 00010 | SM  | Cell A-3                               | 39          | -17         | 10/06/16           | 10:54                |     |              |
| 11  | F830 | 018 | 3   | X   | 00011 | SM  | Cell A-3                               | 44          | -5          | 10/06/16           | 10:55                |     |              |
| 12  | F830 | 018 | 3   | X   | 00012 | SM  | Cell A-3                               | 51          | 11          | 10/06/16           | 10:56                |     |              |
| 13  | F830 | 018 | 3   | X   | 00013 | SM  | Cell A-3                               | 42          | -10         | 10/06/16           | 10:58                |     |              |
| 14  | F830 | 018 | 3   | X   | 00014 | SM  | Cell A-3                               | 48          | 4           | 10/06/16           | 10:59                |     |              |
| 15  | F830 | 018 | 3   | X   | 00015 | SM  | Cell A-3                               | 48          | 4           | 10/06/16           | 11:00                |     |              |
| Comments By signature below, the required source check and background checks were satisfactorily performed prior to use of the instrument identified below. |      |     |     |     |       |     |  |             |             |                    |                      |     |              |
|   |      |     |     |     |       |     | <b>Ludlum 2929 Benchtop Instrument</b> |             |             |                    |                      |     |              |
|   |      |     |     |     |       |     | 2929 S/N: 182597                       |             | efficiency  | bkg<br>rate        | bkg<br>count<br>time | MDA |              |
|   |      |     |     |     |       |     | 43-10-1 S/N: 188736                    |             | $\alpha$    | 0.364              | cpm                  | min | dpm per area |
| Tech A Sign/ Date <i>T. Holmes</i> 10/4/16  |      |     |     |     |       |     | Cal Due Date: 5/13/2017                |             | $\beta$     | 0.434              | 46.3                 | 1   | 75.9         |
| Tech B Sign/ Date <i>N/A</i>  |      |     |     |     |       |     |  |             |             |                    |                      |     |              |