
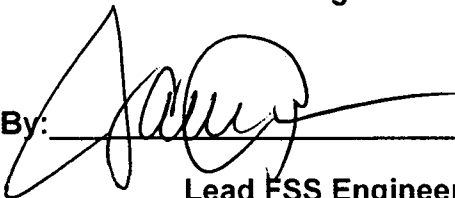


Rancho Seco
Final Status Survey Summary Report
December 28, 2016
IOSB DAW Staging Bay
Survey Unit F8300023

Prepared By:  Date: 1.4.17
FSS Engineer

Reviewed By:  Date: 1.4.17
Lead FSS Engineer

Approved By:  Date: 1/24/2017
Manager, Rancho Seco Assets

FINAL STATUS SURVEY F8300023

Survey Unit:

F8300023, Interim Onsite Storage Building (IOSB) DAW Staging Bay

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), the IOSB contained and 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 DAW Staging Bay to confirm the absence or presence of plant-derived radionuclides. Static measurements showed a mean gross beta activity level of 2,637 dpm/100 cm² and a maximum value of 4,505 dpm/100 cm². The statistics of the DAW Staging bay results combines all lower walls, upper walls, floor, and ceiling data. Based upon the scanning results two elevated areas were identified on the floor. One of these areas exceeded the DCGL_w but not the DCGL_{EMC}. This area required remediation. The other area did not exceed the DCGL_w. The DAW Staging bay was divided into a small Class 1 Survey Unit, buffered by a Class 2 Survey Unit. The remainder of the Bay was designated as a Class 3 Survey Unit and is the subject of this report.

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 3% 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:	F830	DAW Staging Bay
Survey Unit:	002	
Class	3	
SU Area (m ²)	248	
Evaluator:	JR	
DCGL _w :	43,000	Gross Activity DCGL
Area Factor	N/A	Class 3
Design DCGL _{emc} (dpm/100cm ²):	N/A	Class 3
DCGL _{emc} :	N/A	Class 3
LBGR:	21,500	Default = 50% DCGL
Sigma:	598	Scoping Survey Data
Type I error:	0.05	
Type II error:	0.05	
Predominant Nuclide	Cs-137	
Sample Area (m ²)	N/A	
Total Instrument Efficiency:	0.132	From 10/26/16 Survey
Total Area Scanned (m ²):	5.55	
Scan Coverage (%)	3%	Class 3
Material Type:	N/A	Choosing 'N/A' sets material background to "0"
Calculated Values		Comments
Z _{1-α} :	1.645	
Z _{1-β} :	1.645	
Sign p:	0.99865	
Calculated Relative Shift:	35.9	
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 F8300023. 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	F8300023C00001	215	1,629
2	F8300023C00002	274	2,076
3	F8300023C00003	263	1,992
4	F8300023C00004	229	1,735
5	F8300023C00005	294	2,279
6	F8300023C00006	261	1,977
7	F8300023C00007	264	2,000
8	F8300023C00008	234	1,773
9	F8300023C00009	382	2,961
10	F8300023C00010	243	1,884
11	F8300023C00011	276	2,091
12	F8300023C00012	310	2,348
13	F8300023C00013	275	2,083
14	F8300023C00014	284	2,152
15	F8300023C00015	233	1,765

Table 3 contains the statistical summary of the static measurement data for the DAW Staging Bay.

Table 3, Beta Summary Statistics

<i>Beta Static DAW Staging Bay</i>	
Mean	2,050
Median	2,000
Standard Deviation	323
Minimum	1,629
Maximum	2,961
Count	15

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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:	2,000	
Mean:	2,050	
Static Data Standard Deviation:	323	
Maximum:	2,961	
Sign Test Results		Comments
Adjusted N Value:	14	
S+ Value:	15	
Critical Value:	.10	
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} :	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. 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.

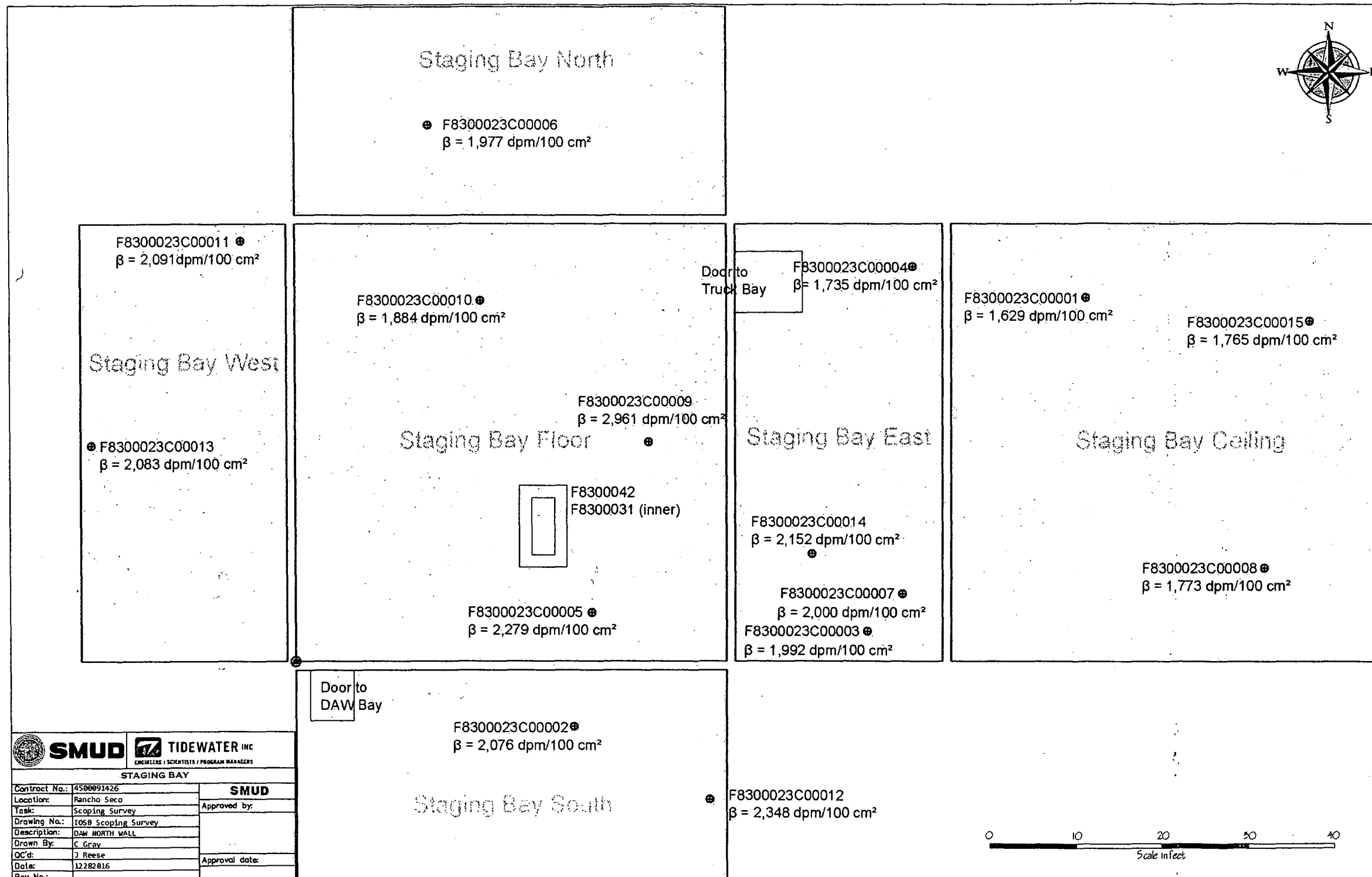
It is concluded that survey unit F8300023 meets the release criteria of 10CFR20.1402.

Attachment 1

Maps

December 28, 2016

Survey Unit F8300023



Attachment 2

Instrumentation

December 28, 2016

Survey Unit F8300023

Table 2-1. Survey Unit Instrumentation

Measurement Type	Instrument Type	Minimum Detectable Activity ^a	Detector Efficiencies	Calibration Due Date ^b
Beta Static Measurement	Ludlum Model 2350-1	Beta – 492 dpm/100 cm ²	12.9%	317899/331973 2/10/17
	Ludlum Model 44-116 B Detector			
Beta Static Measurement	Ludlum Model 2350-1	Beta – 559 dpm/100 cm ²	13.2%	317897/331972 2/10/17
	Ludlum Model 44-116 B Detector			
Swipe Measurements	Ludlum Model 2929	Beta – 73 dpm/100 cm ²	43.4%	182597/188736 5/13/17
	Ludlum Model 44-10-1	Beta – 75 dpm/100 cm ²		

^a 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).

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

cm² = square centimeters

cpm = counts per minute

dpm = disintegrations per minute

Static Measurement MDA

Variables

Beta Survey Type
PR331973 Detector Number
169 Background count rate (cpm)
1 Count Time (min)
0.129 Efficiency
100 Area of Detector (cm²)

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 (cm²)

Static MDA 492 dpm/100 cm²

Static Measurement MDA

Variables

Beta Survey Type
PR331972 Detector Number
232 Background count rate (cpm)
1 Count Time (min)
0.132 Efficiency
100 Area of Detector (cm²)

Constants

60 sec/min
2.54 cm/in

Assumptions

Background count time and sample count time are equivalent

Calculate Static MDA

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

Where: B_r Background Countrate
 t Count Time (min)
 E Efficiency
 A Area of detector (cm²)

Static MDA 559 dpm/100 cm²

Attachment 3
Investigation
December 28, 2016
Survey Unit F8300023

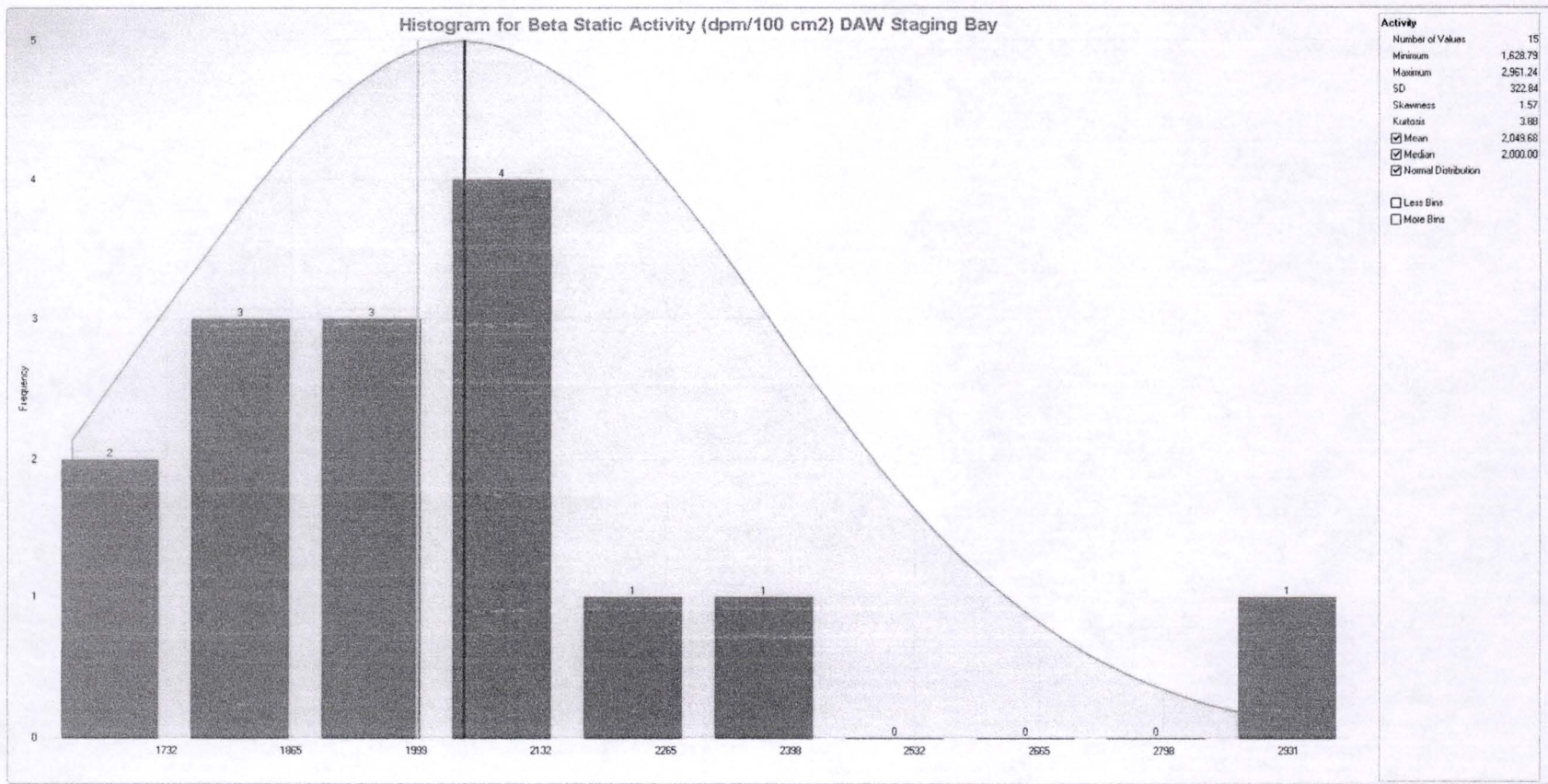
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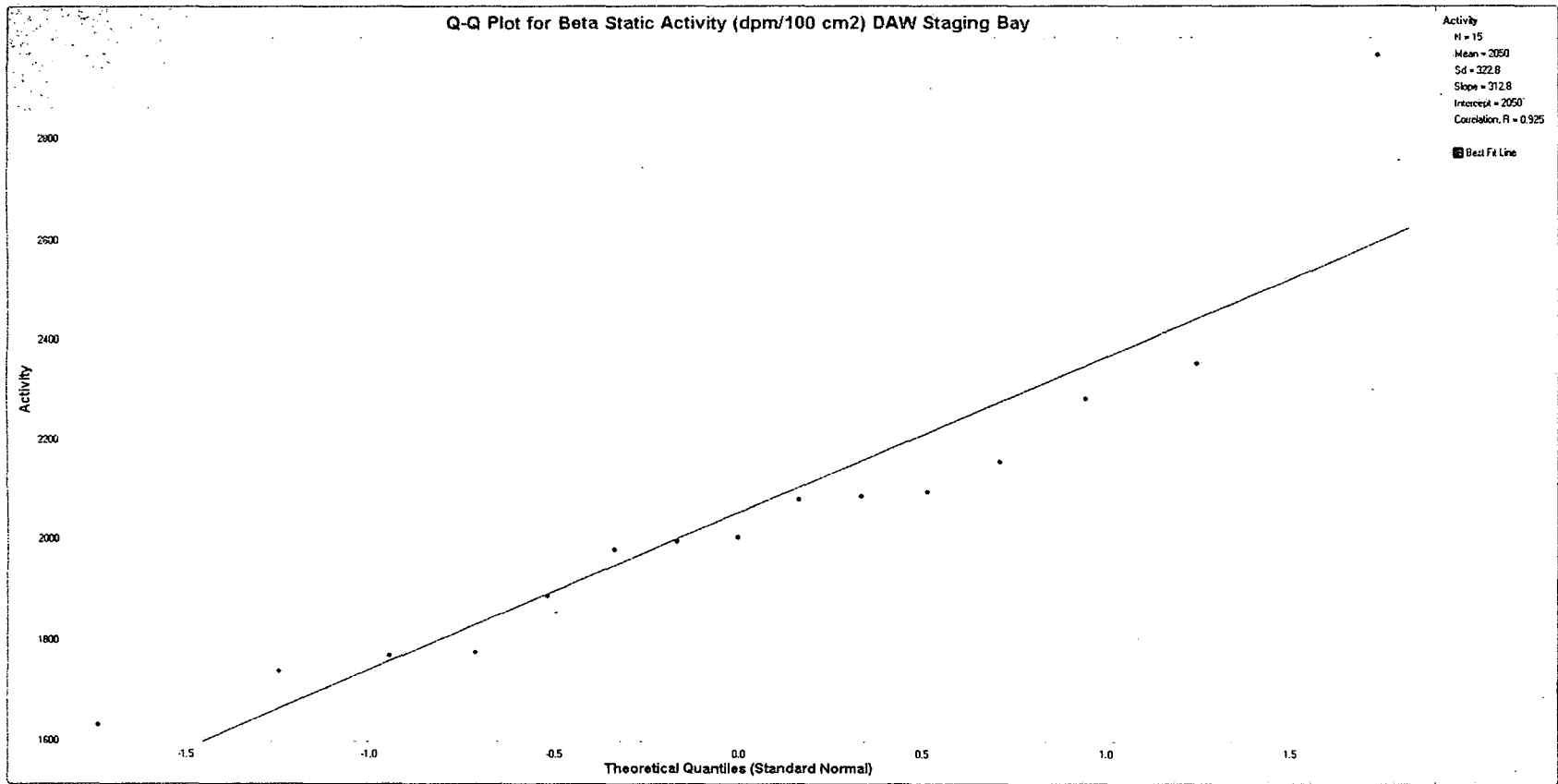
Attachment 4

Data Assessment

December 28, 2016

Survey Unit F8300023





Smear_Data_Calculation_Sheet_101316

IOSB Final Status Survey												
	LC1	LC2	LC3	LC4	LC6	LC5		β CPM	β dpm	Date/Time of Count		Sample Comments
1	F830	002	3	C	00001	SM	Stage Bay	50	17	10/26/16	1300	
2	F830	002	3	C	00002	SM	Stage Bay	44	3	10/26/16	1301	
3	F830	002	3	C	00003	SM	Stage Bay	38	-11	10/26/16	1302	
4	F830	002	3	C	00004	SM	Stage Bay	51	19	10/26/16	1304	
5	F830	002	3	C	00005	SM	Stage Bay	34	-20	12/12/16	0947	
6	F830	002	3	C	00006	SM	Stage Bay	45	5	10/26/16	1305	
7	F830	002	3	C	00007	SM	Stage Bay	52	21	10/26/16	1306	
8	F830	002	3	C	00008	SM	Stage Bay	53	24	10/26/16	1307	
9	F830	002	3	C	00009	SM	Stage Bay	46	8	12/12/16	0948	
10	F830	002	3	C	00010	SM	Stage Bay	40	-6	12/12/16	0950	
11	F830	002	3	C	00011	SM	Stage Bay	50	17	10/26/16	1309	
12	F830	002	3	C	00012	SM	Stage Bay	37	-13	10/26/16	1310	
13	F830	002	3	C	00013	SM	Stage Bay	41	-4	10/26/16	1311	
14	F830	002	3	C	00014	SM	Stage Bay	54	26	10/26/16	1312	
15	F830	002	3	C	00015	SM	Stage Bay	40	-6	10/26/16	1314	
Comments: By signature below, the required source check and background checks were satisfactorily performed prior to use of the instrument identified below.												
							Ludlum 2929 Benchtop Instrument					
							2929 S/N: 182597	efficiency	bkg rate	bkg count time	MDA	
							43-10-1 S/N: 188736	β 10/26/16	0.434	44.5 cpm	1 min	74.5 dpm per area
Tech A Sign/ Date: <i>[Signature]</i> 12-12-16							Cal Due Date: 5/13/2017	β 12/12/16	0.434	42.7 cpm	1 min	73.0 dpm per area
Tech B Sign/ Date: <i>[Signature]</i> 12/12/16												