Rancho Seco

Final Status Survey Summary Report

January 6, 2017

IOSB DAW Staging Bay Class 2

Survey Unit F8300042

Prepared By: _____ Date: 1.6.17

FSS Engineer

Reviewed By: _____ Date: 1.6.17

Lead FSS Engineer

Approved By: _____ Date: 1/10/17

Manager, Rancho Seco Assets

Survey Unit:

F8300042, Interim Onsite Storage Building (IOSB) DAW Staging Bay Class 2

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: Based upon the scanning results of the DAW Staging Bay 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.

Survey Unit Design Information:

In accordance with MARSSIM Section 4.6, special considerations may be necessary for survey units with structure surface areas less than 10 m^2 or land areas less than 100 m^2. In this case, the number of data points obtained from the statistical tests is unnecessarily large and not appropriate for smaller survey unit areas. The data generated from these smaller survey units should be obtained based on judgment, rather than on systematic or random design, and compared individually to the DCGLs. This survey unit meets this criterion as the size is less than ten square meters (2.22 m^2).

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 100% of the area scanned. The instrumentation used for the survey along with the MDC values are listed in **Table 2-1 Attachment 2**.

Table 1, Survey Unit Design Parameters

Evaluation Input Values		Comments
Survey Package:	**F830**	DAW Staging Bay Class 2
Survey Unit:	**004**	
Class	**2**	
SU Area (m^2)	**2**	
Evaluator:	JR	
$DCGL_W$:	43,000	Gross Activity DCGL
Area Factor	5	DTBD-05-003 for 4 m^2
Design DCGLemc ($dpm/100cm^2$):	215,860	
$DCGL_{emc}$:	215,860	
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):	2.22	
Scan Coverage (%)	100%	Class 2
Material Type:	N/A	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:	35.9	
Relative Shift Used:	3.0	Uses 3.0 if Relative Shift >3
N-Value:	10	Values selected based upon Judgement
N-Value+20%:	10	Values selected based upon Judgement

Survey Results:

A total of 10 direct measurements were made in F8300042. 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	F8300042C00001	300	2,326
2	F8300042C00002	300	2,326
3	F8300042C00003	280	2,171
4	F8300042C00004	304	2,357
5	F8300042C00005	269	2,085
6	F8300042C00006	281	2,178
7	F8300042C00007	261	2,023
8	F8300042C00008	296	2,295
9	F8300042C00009	287	2,225
10	F8300042C00010	294	2,279

Table 3 contains the statistical summary of the static measurement data for the DAW Staging Bay Class 2.

Table 3, Beta Summary Statistics

Beta Static DAW Staging Bay Class 2	
Mean	2,226
Median	2,252
Standard Deviation	111
Minimum	2,023
Maximum	2,357
Count	10

Survey Unit Data Assessment:

The survey design required 10 static measurements based upon the size of the survey unit (2.22 m^2). Following the guidance in MARSSIM Section 4.6, these values are compared directly to the $DCGL_W$. The comparison and the results 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:	10	
Median:	2,252	
Mean:	2,226	
Static Data Standard Deviation:	111	
Maximum:	2,357	
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	
Sign test results:	N/A	
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 2 survey and the sample results are consistent with that classification. The variability of the survey results was greater than the characterization data used for survey design. However, no individual measurement exceeded the DCGL. No potential areas of elevated activity were detected.

Conclusion:

The FSS of this survey unit was properly designed as a Class 2 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.

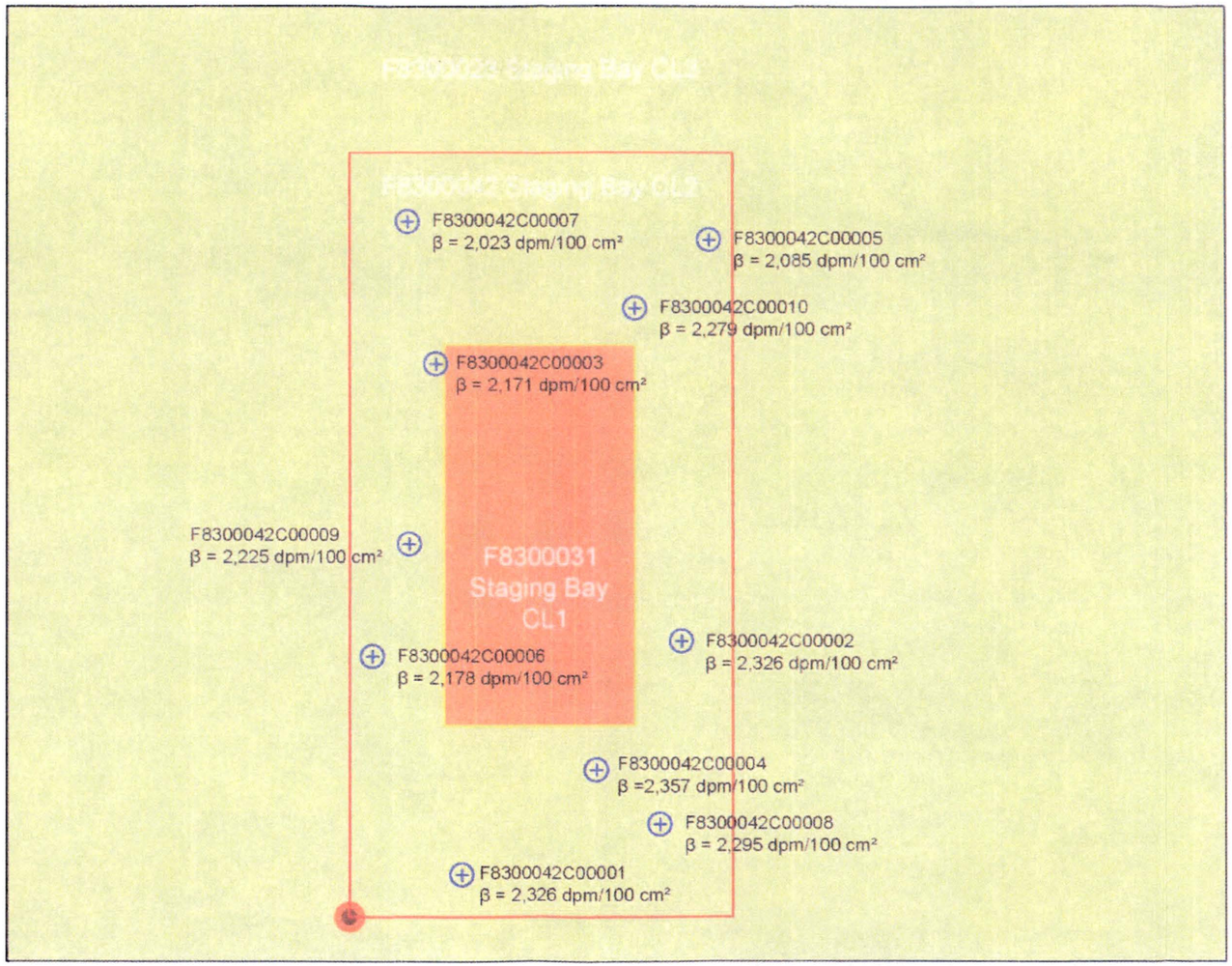
It is concluded that survey unit F8300042 meets the release criteria of 10CFR20.1402.

Attachment 1

Maps

January 6, 2017

Survey Unit F8300042



SMUD | TIDEWATER INC
ENGINEERS / SCIENTISTS / PROGRAM MANAGERS

STAGING BAY CLASS 2

Contract No.:	4500091426	SMUD
Location:	Rancho Seco	Approved by:
Task:	Scoping Survey	
Drawing No.:	1058 Scoping Survey	
Description:	Staging bay	
Drawn By:	C Gray	
QC'd:	J Reese	Approval date:
Date:	01062017	
Rev No.:		

Attachment 2

Instrumentation

January 6, 2017

Survey Unit F8300042

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 Ludlum Model 44-116 B Detector	Beta – 424 dpm/100 cm^2	12.9%	317899/331973 2/10/17
Swipe Measurements	Ludlum Model 2929 Ludlum Model 44-10-1	Beta – 78 dpm/100 cm^2	43.4%	182597/188736 5/13/17

[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.

cm^2 = square centimeters
cpm = counts per minute
dpm = disintegrations per minute

Static Measurement MDA

Beta	Survey Type
PR331973	Detector Number
143	Background count rate (cpm)
1	Count Time (min)
0.129	Efficiency
100	Area of Detector (cm^2)

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^2)

Static MDA	454	dpm/100 cm^2

Attachment 3

Investigation

January 6, 2017

Survey Unit F8300042

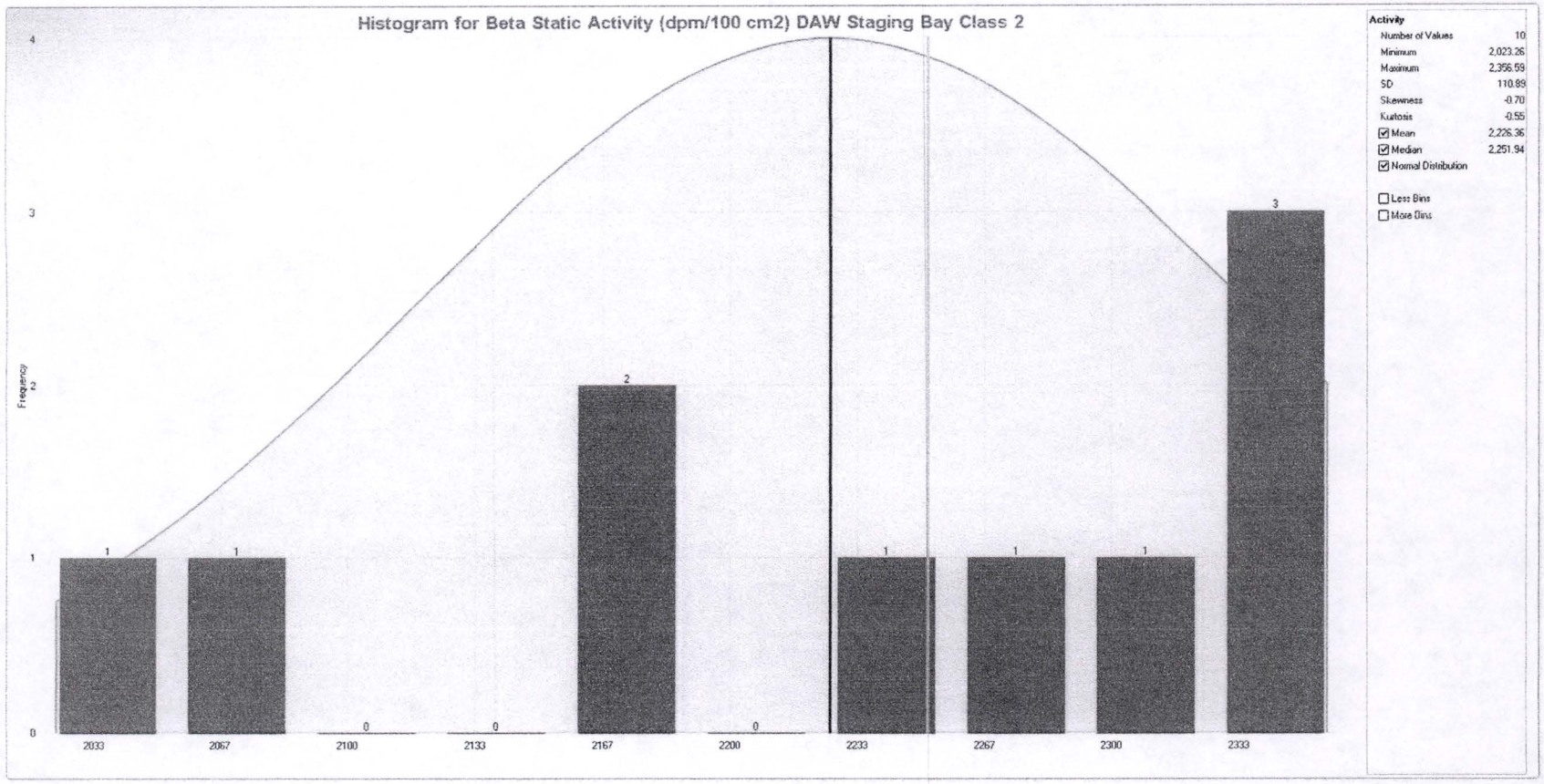
(none required)

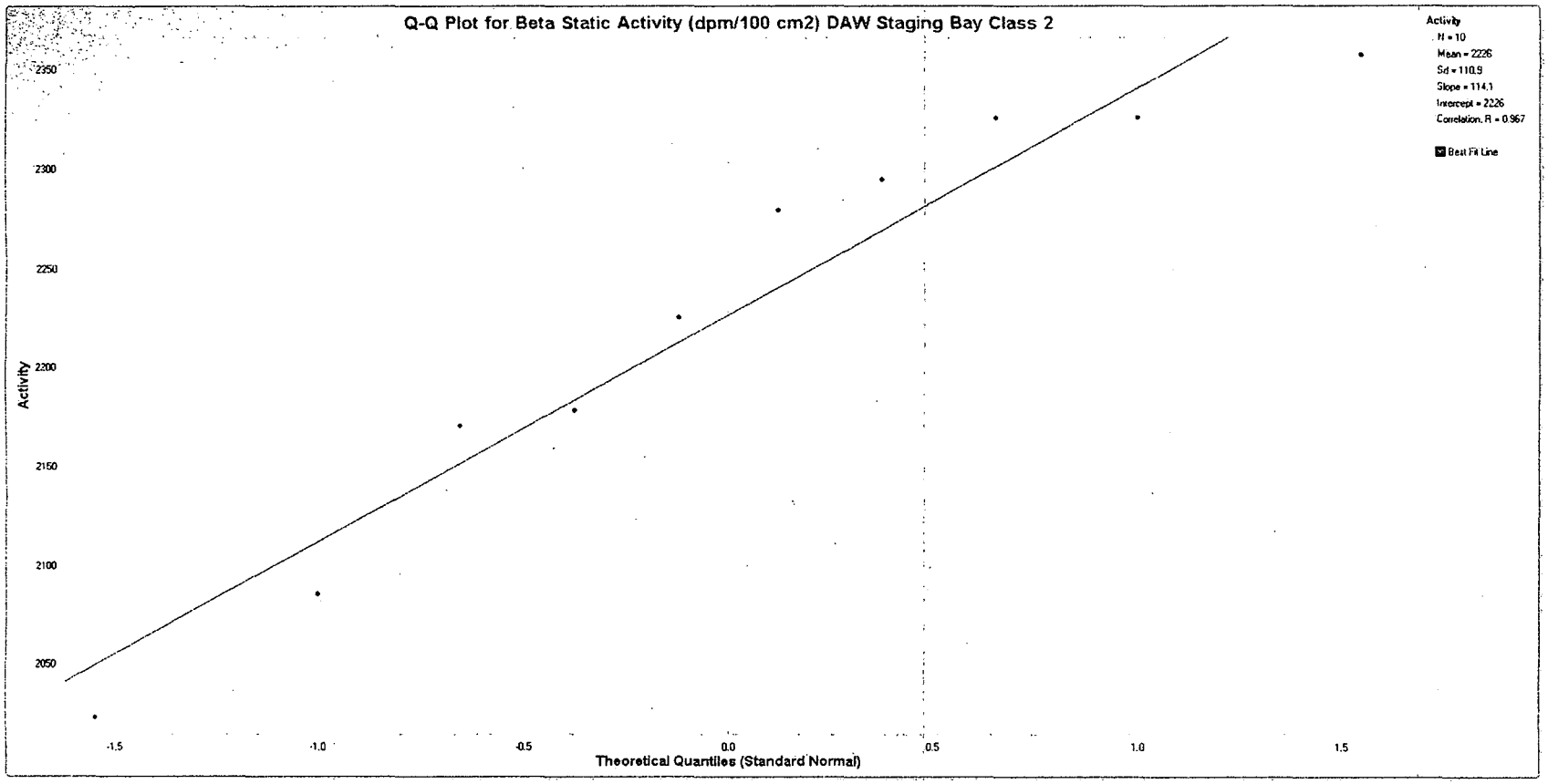
Attachment 4

Data Assessment

January 6, 2017

Survey Unit F8300042


Histogram for Beta Static Activity (dpm/100 cm2) DAW Staging Bay Class 2
Activity
Number of Values 10
Minimum 2,023.26
Maximum 2,356.59
SD 110.89
Skewness -0.70
Kurtosis -0.55
Mean 2,226.36
Median 2,251.94
Normal Distribution
Less Bins
More Bins
Frequency
4
3
1
0
1
1
0
0
2
0
1
1
1
3
2033
2067
2100
2133
2167
2200
2233
2267
2300
2333


Q-Q Plot for Beta Static Activity (dpm/100 cm2) DAW Staging Bay Class 2
Activity
N = 10
Mean = 2226
Sd = 110.9
Slope = 114.1
Intercept = 2226
Correlation, R = 0.967
Best Fit Line
Activity
2350
2300
2250
2200
2150
2100
2050
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)

IOSB Final Status Survey

	LC1	LC2	LC3	LC4	LC6	LC5		β CPM	β dpm	Date/Time of Count		Sample Comments
1	*F830*	*004*	*2*	*C*	*00001*	*SM*	Stage Bay Flr Buffr	49	1	11/29/16	1056	
2	F830	004	2	C	*00002*	SM	Stage Bay Flr Buffr	40	-20	11/29/16	1057	
3	F830	004	2	C	*00003*	SM	Stage Bay Flr Buffr	45	-8	11/29/16	1058	
4	F830	004	2	C	*00004*	SM	Stage Bay Flr Buffr	45	-8	11/29/16	1100	
5	F830	004	2	C	*00005*	SM	Stage Bay Flr Buffr	42	-15	11/29/16	1101	
6	F830	004	2	C	*00006*	SM	Stage Bay Flr Buffr	43	-13	11/29/16	1102	
7	F830	004	2	C	*00007*	SM	Stage Bay Flr Buffr	45	-8	11/29/16	1104	
8	F830	004	2	C	*00008*	SM	Stage Bay Flr Buffr	43	-13	11/29/16	1105	
9	F830	004	2	C	*00009*	SM	Stage Bay Flr Buffr	51	6	11/29/16	1106	
10	F830	004	2	C	*00010*	SM	Stage Bay Flr Buffr	34	-33	11/29/16	1108	
11	F830	004	2	C	*00011*	SM	Stage Bay Flr Buffr					
12	F830	004	2	C	*00012*	SM	Stage Bay Flr Buffr					
13	F830	004	2	C	*00013*	SM	Stage Bay Flr Buffr					
14	F830	004	2	C	*00014*	SM	Stage Bay Flr Buffr					
15	F830	004	2	C	*00015*	SM	Stage Bay Flr Buffr					

Comments By signature below, the required source check and background checks were satisfactorily performed prior to use of the instrument identified below.

Tech A Sign/ Date Joe Nava/12-2-16

Tech B Sign/ Date N/A

Ludlum 2929 Benchtop Instrument

2929 S/N: 182597

43-10-1 S/N: 188736

Cal Due Date: 5/13/2017

	efficiency	bkg rate	bkg count time	MDA
α	0.364	cpm	min	#DIV/0! dpm per area
β	0.434	48.5 cpm	1 min	77.6 dpm per area