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Closeout Radiological Survey Report

For Building 779, Annex B

Rocky Mountain Remediation Services, L.L.C.

Millennium Services Inc.

Revision 1

October 1999

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CLOSEOUT RADIOLOGICAL SURVEY REPORT
FOR BUILDING 779, Annex B

REVISION 1

OCTOBER, 99

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10/11/99

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For total surface activity data collected with the NE Electra, an average one-minute local area background was determined and subtracted from total surface activity measurements to obtain net total surface activity results.

Paint/Surface media samples were analyzed by alpha spectroscopy methods. Individual isotopic data results are contained in Attachments A through D. Transuranic isotopes are not present in natural radioactivity, therefore no background concerns exist. Uranium isotopes, though present in nature, are not expected to exist in significant quantities in paint /surface media samples. As in surface activity measurements, total reported activity from paint/surface media sample analyses was evaluated against the applicable uranium or transuranic $DCGL_W$ defined in Section 3.0.

Other than instrument background, which is quantified prior to analysis, background is not a factor during performance of removable contamination surveys. Reported values from the removable contamination surveys were evaluated against the applicable $DCGL_W$ defined in section 3.0.

5.0 Quality Assurance/Quality Control

Quality control for each type of instrument utilized in the Annex B survey is discussed in the sections below. As described in MARSSIM, a data quality assessment (DQA) was also performed and documented (refer to Attachment H).

5.1 Paint/Surface Media Samples

Quality control for media samples was performed per each survey package. Measures of laboratory precision and accuracy were assessed per applicable laboratory procedures. All QA data indicated that sample results were valid (refer to Attachment H, Data Quality Assessment).

5.2 Removable Surface Contamination

The instruments utilized for removable surface contamination analysis (Eberline SAC-4) was calibrated with NIST-traceable sources. A daily background and QC check was also performed. All background and QC checks were within required tolerances as delineated in the Building 779 CRSP RF/RMRS-97-123.UN (also refer to Attachment H, Data Quality Assessment).

5.3 Total Surface Activity Surveys

An additional 5% of total surface activity measurements were obtained for quality control purposes (refer to Attachments A through D). The results from these measurements were compared to the applicable $DCGL_W$ to ensure survey compliance (i.e., all QC measurements were less than $DCGL_W$). All QC measurements were less than $DCGL_W$ (refer to Attachment H, Data Quality Assessment).

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5.4 Scan Surveys

5.4.1 SCM/SIMS Scan Surveys

Quality control surveys for SCM/SIMS scans were performed with a NIST traceable Plutonium-238 source with an activity of 194,400 dpm. The source, RFETS ID# RS3911, Manufacturer's ID ER716, is a 71 mm x 71 mm (approximately 50 cm^2) plated source. The source manufacturer's certificate is in the 779 Closure Project file. Quality control surveys consisted of a minimum of three measurements of the source by the detector in the configuration used in the actual survey. SCM quality control surveys were performed with the source on the floor or wall and the detector assembly moving at the appropriate survey speed (i.e., 2.5 cm/sec). Corner detector quality control surveys consisted of measurements of the source placed on a surface and the data acquisition set for the survey time (i.e., 8 seconds).

A quality control survey was performed at the beginning and end of each detector use each day and periodically during the surveys. The response of the detector over the duration of its use became the basis for the detector's efficiency. Additionally, each survey was evaluated to ensure that it was bracketed by acceptable quality control surveys. At least two of the three measurements must fall within the specified tolerance (within 20% of the mean of all quality control surveys for each specific detector) in order for the data to be considered valid. The above criteria were satisfied. Therefore, the detector results were considered valid.

Source checks were conducted daily prior to start of survey, whenever the detector configuration was changed, and whenever any other electronic adjustments or maintenance was performed. The mean of the valid quality control surveys, determined from all acceptable results over the duration of the survey, was used to establish the efficiency for a specific detector. Attachment E includes the quality control charts for the SCM/SIMS detectors used during the survey.

5.4.2 NE Electra Scan Surveys

Performance checks were performed on the NE Electra prior to field use. The results were required to fall within the established range (± 20% in acordance with the applicable Radiological Safety Procedures) in order for the instrument and the associated data to be considered valid (refer to Attachment H, Data Quality Assessment).

6.0 Investigation Methodology

Follow up investigations were conducted for each measurement result in excess of 75% of the $DCGL_{EMC}$. SCM survey results in excess of 225 dpm/100cm^2 (75% of the $DCGL_{EMC}$) were investigated by performing a survey of the flagged area with a hand held instrument, the NE Electra with a DP6 probe.

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Investigation surveys utilizing the NE Electra were performed by first scanning the surrounding suspect area to determine if any elevated activity areas could be identified. Following the scan, a shielded local area background measurement (one minute count) and an unshielded direct measurement (one minute count) were obtained in the area of highest activity identified during the scan.

Remediation and a follow-up survey were performed at each confirmed location that produced an NE Electra result in excess of 225 dpm/100 cm^2.

Each investigation measurement was documented on an investigation form. In some cases, more than one investigation result was documented for a given grid..

All scan investigation results are presented in Tables 7.5, 7.6, 7.7, and 7.8.

No investigations were required for Total and Removable Surface Activity because no result was in excess of 75% of the $DCGL_W$.

One paint/surface media sample result in survey unit 77904 exceeded the $DCGL_W$. Therefore, eight additional media samples were collected around the initial measurement to assure the square meter average was less than the $DCGL_W$ of 100 dpm per 100 cm^2. The average result was 34.0 dpm per 100 cm^2 (including the original sample result). In addition, no single measurement exceeded the investigation action level of 225 dpm per 100 cm^2. Therefore, the survey unit meets the acceptance criteria for paint/surface media. The investigation data is presented in Attachment D.

7.0 Survey Results

7.1 Paint/Surface Media Samples

Paint/surface media samples were obtained at each grid location where paint/surface media existed in accordance with approved instructions in each survey package, ensuring that the minimum required paint/surface media samples were obtained for each survey unit. Attachments A, B, C and D, present results and a data summary of paint/surface media sample analyses for each survey unit. Alpha spectroscopy was performed to determine the activity of Uranium-233/234, Uranium-235, Uranium-238, Plutonium-239/240, and Americium-241. Values for each isotope(s) are reported separately. All reported values for the four survey units were below the applicable total uranium and total transuranic $DCGL_W$. The number of media samples obtained was verified to be adequate by re-calculating the required number of samples with the actual survey unit sample standard deviation (refer to Attachments A, B, C, and D). Tables 7.1 and 7.2 summarize the results of the paint/surface media samples.

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Table 7.1
Paint/Surface Media Summary Results for Transuranics

Survey Unit	Minimum (dpm/100 cm^2)	Maximum (dpm/100 cm^2)	Mean (dpm/100 cm^2)	Std. Dev. (dpm/100 cm^2)	$DCGL_W$
77901	-1.1	13.8	2.8	3.5	100
77902	-0.1	9.9	1.9	3.0	
77903	0.1	7.8	1.1	1.9	
77904	0.0	34.0	5.1	8.2	

Table 7.2
Paint/Surface Media Summary Results for Uranium

Survey Unit	Minimum (dpm/100 cm^2)	Maximum (dpm/100 cm^2)	Mean (dpm/100 cm^2)	Std. Dev. (dpm/100 cm^2)	$DCGL_W$
77901	3.7	43.3	20.3	12.2	5000
77902	0.2	62.2	21.0	18.0	
77903	3.6	46.3	13.1	11.7	
77904	2.0	89.5	28.4	25.4	

Detailed sampling instructions and paint/surface media samples results are on file in the Building 779 project files.

7.2 Removable Surface Contamination Surveys

Removable contamination measurements were obtained at each accessible grid location in accordance with approved instructions in each survey package. The minimum required removable contamination measurements were obtained for each survey unit. Removable contamination survey results are presented by survey unit in Attachments A, B, C and D. Surveys were performed at each location from which paint/surface media samples were obtained, ensuring that the minimum required number of smears was collected for each survey unit. For those points, measurements were obtained prior to and after the media sample. For those areas from which no paint/media sample was obtained, a single removable contamination measurement was obtained. The results of all smears show that the removable contamination levels met the $DCGL_W$ described in Section 3.0. The number of removable activity measurements obtained was verified to be adequate by re-calculating the required number of measurements with the actual survey unit measurement standard deviation (refer to Attachments A, B, C and D). Table 7.3 summarizes the results of removable surface contamination surveys.

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Table 7.3
Removable Surface Contamination Summary Results

Survey Unit	Minimum (dpm/100 cm^2)	Maximum (dpm/100 cm^2)	Mean (dpm/100 cm^2)	Std. Dev. (dpm/100 cm^2)	$DCGL_W$
77901	-1.8	5.7	-0.5	1.9	20
77902	-0.9	3.0	0.5	1.5	
77903	-0.3	3.0	-0.2	0.4	
77904	-3.0	4.8	0.4	3.0	

Detailed survey instructions and removable surface contamination results are on file in the Building 779 project files.

7.3 Total Surface Activity Surveys

Total surface activity measurements were obtained in accordance with approved instructions in each survey package, at each accessible grid location, ensuring that the minimum required total surface activity measurements were obtained for each survey unit. Total surface activity survey results for each survey unit are presented in Attachments A, B, C and D. Total surface activity surveys were performed at each location where paint/surface media samples were obtained. For those areas where no media sample was obtained, a single total surface activity measurement was obtained. The results of all surveys showed that all total surface activity levels were less than the $DCGL_W$ described in Section 3.0. The number of total surface activity measurements obtained was verified to be adequate by re-calculating the required number of measurements with the actual survey unit measurement standard deviation (refer to Attachments A, B, C and D). Table 7.4 summarizes the total surface contamination survey results.

Table 7.4
Total Surface Contamination Summary Results

Survey Unit	Minimum (dpm/100 cm^2)	Maximum (dpm/100 cm^2)	Mean (dpm/100 cm^2)	Std. Dev. (dpm/100 cm^2)	$DCGL_W$
77901	-9	28	6	10	100
77902	-5	37	5	12	
77903	-11	22	4	9	
77904	-12	41	5	12	

Detailed survey instructions and total surface contamination results are on file in the Building 779 project files.

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7.4 Scan Surveys

Scan surveys were performed at the required density in accordance with approved instructions in each survey package. The survey results are presented in Attachments A, B, C, and D. Survey results are grouped by survey unit. Each survey unit is divided into a number of subunits, which is typically represented by a single surface (e.g. floor, wall < 2 meters, wall > 2 meters, ceiling, etc.). Within each subunit, survey(s) are performed. For SCM scan surveys, a report is automatically generated. For the NE Electra scan surveys, the results are reported as < 225 dpm/100 cm^2 (given that no areas are flagged for investigation). For both scan methods, survey information is documented on survey forms and maps. A consistent numbering system established in the Final Survey Breakdown Structure, Rev 2. is used that identifies the survey unit, subunit, survey number, and type of detector used.

The scan survey overlay maps (refer to Attachments A, B, C, and D) delineate the subunit locations so that all surveys can be traced to the location surveyed. The yellow-shaded areas represent areas requiring 100% scan. The blue-shaded areas represent areas requiring 10% scan. The required scan frequency for each survey unit, per the Closeout Radiological Survey Plan for the 779 Cluster, was verified.

Due to the low expected count rate and the random nature of radioactivity, a low occurrence of individual 100 cm^2 area false positive results are expected. This phenomenon is amplified when using the SCM/SIMS system due to the large amounts of data generated (i.e. a result is recorded for each 25 cm^2 area scanned). The utilization of a recount detector allows for a rapid evaluation of an area that indicates a higher than normal value. If one detector indicates a slightly elevated reading but the event is not confirmed by the second detector, the measurement is likely a false positive. Readings that meet an investigation level with either detector are averaged with the results from the other detector. An average value in excess of 225 dpm/100 cm^2 requires an investigation.

Surveys taken with the SCM operating in the timer mode are presented as a single survey. Survey time for those detectors have been increased to minimize the probability of false positives. Timer mode surveys are performed when the cart mounted, motor driven SCM can not physically access an area due to area size, interference, or accessibility. The timer mode setting was 8 seconds, providing the same surface area measurement as the time measured by both the primary and recount operating at 2.5 cm/sec.

7.4.1 Survey Unit 77901 Scan and Investigation Data Summary

Table 7.5 summarizes the SCM/SIMS and NE Electra scans and follow-up investigations conducted in survey unit 77901:

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Final Scan Survey Number (1)	Scan Survey Date	Max. Result (dpm/100cm^2) (2)	Investigation Survey Number	SCM value >75% of EMC (dpm/100cm^2)	Electra Investigation Result (dpm/100cm^2)	Decon required (y/n)	Final Investigation Value (dpm/100cm^2)
00422700	7/7/99	171	n/a	n/a	n/a	no	n/a
00465400	7/6/99	171	n/a	n/a	n/a	no	n/a
00465500	7/6/99	171	n/a	n/a	n/a	no	n/a
00465600	7/6/99	170	n/a	n/a	n/a	no	n/a
00465800	7/6/99	137	n/a	n/a	n/a	no	n/a
00465900	7/6/99	137	n/a	n/a	n/a	no	n/a
00485300	7/6/99	163	n/a	n/a	n/a	no	n/a

(1) The first six characters represent the survey subunit number. The last two numbers represent the detector type.
(2) NE Electra scan results are reported as < 225 dpm/100 cm^2 when no areas are flagged.
(3) One-square meter averages are verified as less than 75 dpm/100 cm^2 when individual measurements in excess of 100 dpm/100 cm^2 are present.

Detailed scan survey instructions and results are on file in the Building 779 project file.

8.0 Conclusion

All survey/sample data collected from the Annex B interior surfaces of Building 779 were collected in accordance with the Closeout Radiological Survey Plan for the 779 Cluster and approved survey instructions. All data was verified and validated as described in Attachment H) and therefore is considered acceptable to demonstrate compliance with release criteria.

All survey/sample results meet the DCGLs as defined by the Closeout Radiological Survey Plan for the 779 Cluster. Therefore, the Annex B interior surfaces are suitable for unrestricted release.

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ATTACHMENT B
Survey Unit 77901 Data Summary

SURVEY UNIT 77901 DATA

COLOR CODES:

Less Than or Equal to 75% of $DCGL_{W=}$	
>75% and <100% of $DCGL_{W=}$	
Greater Than or Equal to $DCGL_{W=}$	

Best Available Copy

Survey Unit 77901 Data Summary and Approval Sheet

Total Surface Activity Measurements

	15	25
	Number Required	Number Obtained

MIN	-9	dpm/100 cm^2
MAX	28	dpm/100 cm^2
MEAN	6	dpm/100 cm^2
STD DEV	10	dpm/100 cm^2
TRANSURANIC $DCGL_W$	100	dpm/100 cm^2

Removable Activity Measurements

	17	25
	Number Required	Number Obtained

MIN	-1.8	dpm/100 cm^2
MAX	5.7	dpm/100 cm^2
MEAN	-0.5	dpm/100 cm^2
STD DEV	1.9	dpm/100 cm^2
TRANSURANIC $DCGL_W$	20	dpm/100 cm^2

Media Sample Activity

Media Samples	15	23
	Number Required	Number Obtained

Total Uranium Results

MIN	3.7	dpm/100 cm^2
MAX	43.3	dpm/100 cm^2
MEAN	20.3	dpm/100 cm^2
STD DEV	12.2	dpm/100 cm^2
$DCGL_W$	5000	dpm/100 cm^2

Total Transuranic Results

MIN	-1.1	dpm/100 cm^2
MAX	13.8	dpm/100 cm^2
MEAN	2.8	dpm/100 cm^2
STD DEV	3.5	dpm/100 cm^2
$DCGL_W$	100	dpm/100 cm^2

Survey Unit 77901 Building 779 Total Surface Contamination Results

Total Surface Activity Survey						Quality Control Survey				
Meter Model:	NE Electra w/ DP6 Probe			Local Area Bkgd (cpm)		NE Electra w/ DP6 Probe			Local Area Bkgd (cpm)	
Instrument #:	2374	N/A	N/A	2		1375	N/A	N/A	3	
Cal. Due Date:	12/9/99	N/A	N/A			12/8/99	N/A	N/A		
Efficiency (c/d):	0.216	N/A	N/A			0.219	N/A	N/A		
Total Surface Activity Measurements						**Quality Control Measurements**				
Sample Location Number	Serial #	Date	(cpm)	MDA (dpm/100 cm^2)	(dpm/100 cm^2)	Serial #	Date	(cpm)	MDA (dpm/100 cm^2)	(dpm/100 cm^2)
1	2374	06/26/99	2	42	1					
2	2374	06/26/99	2	42	1					
3	2374	06/26/99	4	42	10					
4	2374	06/26/99	3	42	5					
5	2374	06/26/99	1	42	-4					
6	2374	06/26/99	4	42	10					
7	2374	06/26/99	4	42	10					
8	2374	06/26/99	0	42	-9					
9	2374	06/26/99	5	42	14					
10	2374	06/26/99	1	42	-4					
11	2374	06/26/99	2	42	1					
12	2374	06/26/99	3	42	5					
13	2374	06/26/99	3	42	5					
14	2374	06/26/99	6	42	19					
15	2374	06/26/99	2	42	1					
16	2374	06/26/99	3	42	5					
17	2374	06/26/99	1	42	-4					
18	2374	06/26/99	0	42	-9					
19	2374	06/26/99	3	42	5					
20	2374	06/26/99	3	42	5					
21	2374	06/26/99	0	42	-9					
22	2374	06/26/99	4	42	10					
23	2374	06/26/99	8	42	28	1375	08/02/99	8	49	23
24	2374	06/26/99	8	42	28	1375	08/02/99	5	49	9
25	2374	06/26/99	5	42	14					
				MIN	-9					
				MAX	28					
				MEAN	6					
				SD	10					
				Transuranic $DCGL_W$	100					

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Survey Unit 77901 Building 779 Smear Results

Smear Location Number	Smear Results				
	Serial Number	Date Counted	Net (cpm)	(dpm/100 cm^2)	MDA
1	1409	6/29/99	-0.6	**-1.8**	10.0
2	1409	6/29/99	-0.6	**-1.8**	10.0
3	1409	6/29/99	-0.6	**-1.8**	10.0
4	1409	6/29/99	0.4	**1.2**	10.0
5	1409	6/29/99	-0.6	**-1.8**	10.0
6	1409	6/29/99	-0.1	**-0.3**	10.0
7	1409	6/29/99	-0.6	**-1.8**	10.0
8	1409	6/29/99	-0.6	**-1.8**	10.0
9	1409	6/29/99	-0.6	**-1.8**	10.0
10	1409	6/29/99	0.4	**1.2**	10.0
11	1409	6/29/99	0.9	**2.7**	10.0
12	1409	6/29/99	1.9	**5.7**	10.0
13	1409	6/29/99	-0.6	**-1.8**	10.0
14	1409	6/29/99	-0.6	**-1.8**	10.0
15	1409	6/29/99	-0.6	**-1.8**	10.0
16	1409	6/29/99	0.4	**1.2**	10.0
17	1409	6/29/99	-0.6	**-1.8**	10.0
18	1409	6/29/99	-0.1	**-0.3**	10.0
19	1409	6/29/99	-0.1	**-0.3**	10.0
20	1409	6/29/99	-0.6	**-1.8**	10.0
21	1409	6/29/99	-0.6	**-1.8**	10.0
22	1409	6/29/99	0.4	**1.2**	10.0
23	1409	6/29/99	-0.1	**-0.3**	10.0
24	1409	6/29/99	-0.1	**-0.3**	10.0
25	1409	6/29/99	-0.6	**-1.8**	10.0
			MIN	-1.8	
			MAX	**5.7**	
			MEAN	**-0.5**	
			SD	1.9	
			Transuranic $DCGL_W$	**20**	

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Survey Unit 77901 Building 779 Paint/Solid Media Sample Results

LOCATION DESCRIPTION	SAMPLE LOCATION NUMBER	SITE SAMPLE ID	NUCLIDE	pCi/g	MDA (pCi/g)	WEIGHT (g)	SURFACE AREA (in^2)	INDIVIDUAL NUCLIDE ($dpm/100cm^2$)	ESTIMATED MDA ($dpm/100cm^2$)	URANIUM TOTAL ($dpm/100cm^2$) $DCGL_W$=5000	TRANSURANIC TOTAL ($dpm/100cm^2$) $DCGL_W$=100
Room 171, Floor	1	001.002	U-233/234	1.210	0.236	5.43	40	5.7	1.1		
			U-235	0.072	0.169			0.3	0.8		
			U-238	0.916	0.189			4.3	0.9	**10.3**	
			Pu-239/240	0.103	0.093			0.5	0.4		
			Am-241	0.126	0.085			0.6	0.4		**1.1**
Room 171, North Wall	2	002.002	U-233/234	0.570	0.230	14.78	40	7.2	2.9		
			U-235	0.042	0.165			0.5	2.1		
			U-238	0.610	0.075			7.8	1.0	**15.5**	
			Pu-239/240	0.000	0.097			0.0	1.2		
			Am-241	0.097	0.175			1.2	2.2		**1.2**
Room 171, Floor	3	003.002	U-233/234	0.253	0.246	45.93	40	10.0	9.7		
			U-235	0.023	0.148			0.9	5.8		
			U-238	0.179	0.215			7.1	8.5	**18.0**	
			Pu-239/240	0.027	0.073			1.1	2.9		
			Am-241	0.047	0.183			1.8	7.2		**2.9**
Room 171, North Wall	4	004.002	U-233/234	0.360	0.201	26.15	40	8.1	4.5		
			U-235	0.070	0.164			1.6	3.7		
			U-238	0.435	0.138			9.8	3.1	**19.4**	
			Pu-239/240	0.010	0.262			0.2	5.9		
			Am-241	0.016	0.182			0.4	4.1		**0.6**
Room 171, Floor	5	005.002	U-233/234	0.187	0.215	52.51	40	8.4	9.7		
			U-235	0.049	0.137			2.2	6.2		
			U-238	0.357	0.074			16.1	3.4	**26.8**	
			Pu-239/240	0.094	0.085			4.2	3.8		
			Am-241	0.099	0.179			4.5	8.1		**8.7**
Room 171, North Wall	6	006.002	U-233/234	0.574	0.244	32.58	40	16.1	6.8		
			U-235	0.081	0.147			2.3	4.1		
			U-238	0.463	0.147			13.0	4.1	**31.3**	
			Pu-239/240	0.038	0.102			1.1	2.9		
			Am-241	0.000	0.095			0.0	2.7		**1.1**
Room 171, Floor	7	007.002	U-233/234	0.478	0.283	26.29	40	10.8	6.4		
			U-235	0.042	0.164			0.9	3.7		
			U-238	0.332	0.200			7.5	4.5	**19.3**	
			Pu-239/240	0.029	0.190			0.7	4.3		
			Am-241	0.033	0.089			0.7	2.0		**1.4**

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Survey Unit 77901 Building 779 Paint/Solid Media Sample Results

LOCATION DESCRIPTION	SAMPLE LOCATION NUMBER	SITE SAMPLE ID	NUCLIDE	pCi/g	MDA (pCi/g)	WEIGHT (g)	SURFACE AREA (in^2)	INDIVIDUAL NUCLIDE ($dpm/100cm^2$)	ESTIMATED MDA ($dpm/100cm^2$)	URANIUM TOTAL ($dpm/100cm^2$) $DCGL_W$=5000	TRANSURANIC TOTAL ($dpm/100cm^2$) $DCGL_W$=100
Room 171, North Wall	8	008.002	U-233/234	0.194	0.303	32.84	40	5.5	8.6		
			U-235	-0.033	0.303			-0.9	8.6		
			U-238	0.625	0.227			17.7	6.4	**22.2**	
			Pu-239/240	0.021	0.245			0.6	6.9		
			Am-241	0.010	0.246			0.3	6.9		**0.9**
Room 171, Floor	9	009.002	U-233/234	0.377	0.250	44.45	40	14.4	9.6		
			U-235	0.026	0.250			1.0	9.6		
			U-238	0.575	0.087			22.0	3.3	**37.4**	
			Pu-239/240	0.190	0.103			7.3	3.9		
			Am-241	0.172	0.093			6.6	3.6		**13.8**
Room 171, North Wall	10	010.002	U-233/234	0.473	0.336	15.05	40	6.1	4.4		
			U-235	-0.008	0.300			-0.1	3.9		
			U-238	0.471	0.256			6.1	3.3	**12.1**	
			Pu-239/240	0.031	0.200			0.4	2.6		
			Am-241	0.035	0.246			0.5	3.2		**0.9**
Room 171, Mezzanine Ceiling	11	011.002	U-233/234	0.311	0.302	5.73	40	1.5	1.5		
			U-235	0.048	0.187			0.2	0.9		
			U-238	0.395	0.187			1.9	0.9	**3.7**	
			Pu-239/240	0.000	0.096			0.0	0.5		
			Am-241	0.023	0.152			0.1	0.7		**0.1**
Room 171, Mezzanine	12	012.002	U-233/234	0.453	0.259	7.32	40	2.9	1.6		
			U-235	-0.057	0.271			-0.4	1.7		
			U-238	0.215	0.197			1.4	1.2	**3.8**	
			Pu-239/240	-0.010	0.198			-0.1	1.2		
			Am-241	0.026	0.169			0.2	1.1		**0.1**
Room 171, Mezzanine Ceiling	13	013.002	U-233/234	0.387	0.183	16.45	40	5.5	2.6		
			U-235	0.040	0.206			0.6	2.9		
			U-238	0.441	0.206			6.2	2.9	**12.3**	
			Pu-239/240	-0.018	0.224			-0.3	3.2		
			Am-241	0.000	0.086			0.0	1.2		**-0.3**
Room 171, Mezzanine Ceiling	14	014.002	U-233/234	0.411	0.199	57.07	40	20.2	9.8		
			U-235	0.000	0.074			0.0	3.6		
			U-238	0.424	0.162			20.8	8.0	**41.0**	
			Pu-239/240	0.076	0.102			3.7	5.0		
			Am-241	0.069	0.093			3.4	4.6		**7.1**

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Survey Unit 77901 Building 779 Paint/Solid Media Sample Results

LOCATION DESCRIPTION	SAMPLE LOCATION NUMBER	SITE SAMPLE ID	NUCLIDE	pCi/g	MDA (pCi/g)	WEIGHT (g)	SURFACE AREA (in^2)	INDIVIDUAL NUCLIDE ($dpm/100cm^2$)	ESTIMATED MDA ($dpm/100cm^2$)	URANIUM TOTAL ($dpm/100cm^2$) $DCGL_W$=5000	TRANSURANIC TOTAL ($dpm/100cm^2$) $DCGL_W$=100
Room 171, Wall #5	15	015.002	U-233/234	0.271	0.254	79.76	40	18.6	17.4		
			U-235	-0.025	0.186			-1.7	12.8		
			U-238	0.384	0.186			26.3	12.8	**43.3**	
			Pu-239/240	0.099	0.179			6.8	12.3		
			Am-241	-0.008	0.169			-0.6	11.6		**6.2**
Room 171, Wall #5	16	016.002	U-233/234	0.832	0.196	30.12	40	21.6	5.1		
			U-235	0.001	0.214			0.0	5.5		
			U-238	0.309	0.175			8.0	4.5	**29.6**	
			Pu-239/240	-0.028	0.210			-0.7	5.4		
			Am-241	0.121	0.109			3.1	2.8		**2.4**
Room 172, Wall #2	17	017.002	U-233/234	0.493	0.238	28.69	40	12.2	5.9		
			U-235	-0.055	0.287			-1.4	7.1		
			U-238	0.238	0.218			5.9	5.4	**16.7**	
			Pu-239/240	0.025	0.165			0.6	4.1		
			Am-241	0.079	0.107			2.0	2.6		**2.6**
Room 172, Shield Wall	18	018.002	U-233/234	0.469	0.205	12.30	40	5.0	2.2		
			U-235	0.047	0.182			0.5	1.9		
			U-238	0.277	0.083			2.9	0.9	**8.4**	
			Pu-239/240	0.000	0.095			0.0	1.0		
			Am-241	-0.034	0.259			-0.4	2.7		**-0.4**
Room 172, Floor	19	019.002	U-233/234	0.611	0.222	18.85	40	9.9	3.6		
			U-235	0.070	0.203			1.1	3.3		
			U-238	0.595	0.181			9.7	2.9	**20.7**	
			Pu-239/240	0.099	0.178			1.6	2.9		
			Am-241	0.025	0.164			0.4	2.7		**2.0**
Room 172, Shield Wall	20	020.002	U-233/234	1.300	0.098	25.42	40	28.4	2.1		
			U-235	0.072	0.098			1.6	2.1		
			U-238	0.576	0.098			12.6	2.1	**42.6**	
			Pu-239/240	0.144	0.097			3.1	2.1		
			Am-241	0.121	0.161			2.6	3.5		**5.8**
Room 172, Wall #5	21	021.002	U-233/234	0.281	0.226	24.84	40	6.0	4.8		
			U-235	0.010	0.226			0.2	4.8		
			U-238	0.289	0.202			6.2	4.3	**12.4**	
			Pu-239/240	-0.028	0.214			-0.6	4.6		
			Am-241	-0.022	0.200			-0.5	4.3		**-1.1**

Survey Unit 77901 Building 779 Paint/Solid Media Sample Results

LOCATION DESCRIPTION	SAMPLE LOCATION NUMBER	SITE SAMPLE ID	NUCLIDE	pCi/g	MDA (pCi/g)	WEIGHT (g)	SURFACE AREA (in^2)	INDIVIDUAL NUCLIDE ($dpm/100cm^2$)	ESTIMATED MDA ($dpm/100cm^2$)	URANIUM TOTAL ($dpm/100cm^2$) *$DCGL_W$=5000*	TRANSURANIC TOTAL ($dpm/100cm^2$) *$DCGL_W$=100*
Room 171, Floor	22	022.002	U-233/234	0.192	0.287	19.47	40	3.2	4.8		
			U-235	0.018	0.205			0.3	3.4		
			U-238	0.199	0.173			3.3	2.9	**6.9**	
			Pu-239/240	0.229	0.198			3.8	3.3		
			Am-241	0.062	0.084			1.0	1.4		**4.9**
Room 171, Floor	23	023.002	U-233/234	0.944	0.190	8.51	40	6.9	1.4		
			U-235	0.029	0.190			0.2	1.4		
			U-238	0.801	0.103			5.9	0.8	**13.0**	
			Pu-239/240	0.118	0.107			0.9	0.8		
			Am-241	0.295	0.205			2.2	1.5		**3.0**

MIN	**3.7**	**-1.1**
MAX	**43.3**	**13.8**
MEAN	**20.3**	**2.8**
SD	**12.2**	**3.5**
$DCGL_W$ =	**5000**	**100**

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Survey Unit 77901 Building 779 Sample Weight Data Sheet

RIN NUMBER 99A7108			RIN NUMBER 99A7108			SUM (*)
Sample Location Number	Event	Rad Screening Weight, grams	Sample Location Number	Event	Isotopic Analysis Weight, grams	Total Weight, grams
1	001.001	1.0332	1	001.002	4.40	5.43
2	002.001	1.0423	2	002.002	13.74	14.78
3	003.001	1.0031	3	003.002	44.93	45.93
4	004.001	1.0058	4	004.002	25.14	26.15
5	005.001	1.0477	5	005.002	51.47	52.51
6	006.001	1.0059	6	006.002	31.57	32.58
7	007.001	1.0275	7	007.002	25.26	26.29
8	008.001	1.0378	8	008.002	31.80	32.84
9	009.001	1.0483	9	009.002	43.40	44.45
10	010.001	1.0228	10	010.002	14.03	15.05
11	011.001	1.0270	11	011.002	4.70	5.73
12	012.001	1.0092	12	012.002	6.31	7.32
13	013.001	1.0079	13	013.002	15.45	16.45
14	014.001	1.0529	14	014.002	56.01	57.07
15	015.001	1.0318	15	015.002	78.73	79.76
16	016.001	1.0120	16	016.002	29.11	30.12
17	017.001	1.0120	17	017.002	27.68	28.69
18	018.001	1.0131	18	018.002	11.29	12.30
19	019.001	1.0394	19	019.002	17.81	18.85
20	020.001	1.0417	20	020.002	24.38	25.42
21	021.001	1.0166	21	021.002	23.82	24.84
22	022.001	1.0275	22	022.002	18.45	19.47
23	023.001	1.0213	23	023.002	7.49	8.51

(*) The total weight of each sample used for the activity calculations is the sum of the weights of each aliquot removed. for rad screens and the weights of each sample received for isotopic analysis.

Rocky Mountain Remediation Services, L
... protecting the environment

Software Quality Control Checklist
Verification of Calculations

Final Status Surveys
Bldg 779 Cluster

Check List for - Title: Verification of Calculations used in Computerized Spreadsheets & Databases
REQUIREMENTS: *Kaiser-Hill Team Quality Assurance Program,* Rev. 8, 3/99

ASSESSMENT ITEMS

Engineering/Calculations

FINAL REPORT (Title & date: CLOSEOUT RAD SURVEY REPORT for BLDG 779, ANNEX B ~~ADMINISTRATIVE BLDG~~)

Are all equations, that support final status survey decisions, stated in the ~~report?~~ RSP's ..... (Y) / N

SPREADSHEET/DBASE (FILE NAME {e.g., "Workbook", if EXCEL} & date): 779B1 DATA SUMMARY.XLS)
FILE SERVER 4, "FINAL STATUS" SUBDIRECTORY → SURVEY AREA B/779B1

Individual Work Sheets (within the "Workbook" listed above)
Title: "ATTACHMENT ID" (NA -- NO CALCS)
Title: "DATA SUMMARY"
Title: "TSA RESULTS"
Title: "SMEAR DATA"
Title: "PAINT & MEDIA RESULTS"
"SAMPLE WEIGHT DATA"

Are all equations listed in the report, that were used in spreadsheet software, accurately written within the spreadsheets? ..... (Y) / N

In general terms, list the types of algorithms used (e.g., unit conversion of pCi/g to dpm/100cm^2): MDA, CALC. TO DPM CONVERSIONS, DESCRIPTIVE STATISTICS, LOCAL AREA BACKGROUND CORRECTIONS; COMPARISON of HARDCOPY w/ COUNTER FILE

Are inputs, as defined in equations referenced above, clearly defined & labeled by parameter? ..... (Y) / N
Inputs (list of): MDA (incl. REAL COUNT TIMES, BKGRD COUNT TIMES), CPM, COUNT TIMES (REAL, BKGRD) SAMPLE WEIGHTS (RAD SCREEN & ISOTOPIC), EFFICIENCY, CONCENTRATIONS

Are outputs (results of the calculations) as defined in the equations above, clearly defined and labeled by parameter? ..... (Y) / N
Outputs (list of): MDA, TSA, REMOVABLE ACTIVITY, MEDIA SAMPLE ACTIVITY, MIN, MAX, MEANS, STD DEVIATIONS,

COMMENTS

INDEPENDENT REVIEW
By: R S LUKER / [signature] (SL) / 9.28.99
Print Name / Signature / Verification Date

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ATTACHMENT C
Survey Unit 77902 Data Summary

SURVEY UNIT 77902 DATA

COLOR CODES:

Less Than or Equal to 75% of $DCGL_{W=}$

>75% and <100% of $DCGL_{W=}$

Greater Than or Equal to $DCGL_{W=}$

Best Available Copy

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Survey Unit 77902 Data Summary and Approval Sheet

Total Surface Activity Measurements

	Number Required	Number Obtained	
	15	20	
MIN	-5		dpm/100 cm^2
MAX	37		dpm/100 cm^2
MEAN	5		dpm/100 cm^2
STD DEV	12		dpm/100 cm^2
TRANSURANIC $DCGL_W$	100		dpm/100 cm^2

Removable Activity Measurements

	Number Required	Number Obtained	
	17	19	
MIN	-0.9		dpm/100 cm^2
MAX	3.0		dpm/100 cm^2
MEAN	0.6		dpm/100 cm^2
STD DEV	1.6		dpm/100 cm^2
TRANSURANIC $DCGL_W$	20		dpm/100 cm^2

Media Sample Activity

Media Samples	Number Required	Number Obtained
	15	18

Total Uranium Results

MIN	0.2	dpm/100 cm^2
MAX	62.2	dpm/100 cm^2
MEAN	21.0	dpm/100 cm^2
STD DEV	18.0	dpm/100 cm^2
$DCGL_W$	5000	dpm/100 cm^2

Total Transuranic Results

MIN	-0.1	dpm/100 cm^2
MAX	9.9	dpm/100 cm^2
MEAN	1.9	dpm/100 cm^2
STD DEV	3.0	dpm/100 cm^2
$DCGL_W$	100	dpm/100 cm^2

Survey Unit 77902 Building 779 Total Surface Contamination Results

Total Surface Activity Survey				Quality Control Survey			
Meter Model:	NE Electra w/ DP6 Probe	Efficiency (c/d)	0.2165	NE Electra w/ DP6 Probe	Efficiency (c/d)	0.209	
Serial #/Date:	2363/5-5-99	Local Area Bkgd (cpm)	2	1259/5-5-99	Local Area Bkgd (cpm)	2	
Cal. Due Date	7/15/99			8/18/99			

Sample Location Number	Total Surface Activity Measurements (cpm)	MDA (dpm/100 cm^2)	(dpm/100 cm^2)	Quality Control Measurements (cpm)	MDA (dpm/100 cm^2)	(dpm/100 cm^2)
1	3	43	5			
2	2	43	0			
3	2	43	0			
4	1	43	-5			
5	1	43	-5			
6	1	43	-5			
7	1	43	-5			
8	3	43	5	5	44	14
9	3	43	5			
10	3	43	5			
11	2	43	0			
12	5	43	14			
13	2	43	0			
14	1	43	-5			
15	1	43	-5	1	44	-5
16	10	43	37			
17	4	43	9			
18	4	43	9			
19	9	43	32			
20	3	43	5			
21						
22						
23						
24						
25						
26						
		MIN	-5			
		MAX	37			
		MEAN	5			
		SD	12			
	Transuranic $DCGL_W$		100			

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Survey Unit 77902 Building 779 Smear Results

Smear Location Number	Smear Results				
	Serial Number	Date Counted	Net (cpm)	(dpm/100 cm^2)	MDA
1	1407	6/23/99	-0.3	**-0.9**	8.3
2	1407	6/23/99	0.2	**0.6**	8.3
3	1407	6/23/99	1.0	**3.0**	8.3
4	1407	6/23/99	0.2	**0.6**	8.3
5	1407	6/23/99	-0.3	**-0.9**	8.3
6	1407	6/23/99	-0.3	**-0.9**	8.3
7	1407	6/23/99	0.2	**0.6**	8.3
8	1407	6/23/99	1.0	**3.0**	8.3
9	1407	6/23/99	1.0	**3.0**	8.3
10	1407	6/23/99	0.2	**0.6**	8.3
11	1407	6/23/99	-0.3	**-0.9**	8.3
12	1407	6/23/99	-0.3	**-0.9**	8.3
13	1407	6/23/99	0.2	**0.6**	8.3
14	1407	6/23/99	-0.3	**-0.9**	8.3
15	1407	6/23/99	1.0	**3.0**	8.3
16	1407	6/23/99	-0.3	**-0.9**	8.3
17	1407	6/23/99	0.2	**0.6**	8.3
18	1407	6/23/99	0.2	**0.6**	8.3
19	1407	6/23/99	0.2	**0.6**	8.3
			MIN	-0.9	
			MAX	**3.0**	
			MEAN	**0.6**	
			SD	1.6	
			Transuranic $DCGL_W$	**20**	

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Survey Unit 77902 Building 779 Paint/Solid Media Sample Results

LOCATION DESCRIPTION	SAMPLE LOCATION NUMBER	SITE SAMPLE ID	NUCLIDE	pCi/g	MDA (pCi/g)	WEIGHT (g)	SURFACE AREA (in^2)	INDIVIDUAL NUCLIDE ($dpm/100cm^2$)	ESTIMATED MDA ($dpm/100cm^2$)	URANIUM TOTAL ($dpm/100cm^2$) *$DCGL_W$=5000*	TRANSURANIC TOTAL ($dpm/100cm^2$) *$DCGL_W$=100*
Vault #6, Bottom Vaults Inside	1	001.002	U-233/234	0.673	0.018	25.69	40	14.9	0.4		
			U-235	0.041	0.022			0.9	0.5		
			U-238	0.616	0.042			13.6	0.9	**29.4**	
			Pu-239/240	0.163	0.025			3.6	0.6		
			Am-241	0.285	0.078			6.3	1.7		**9.9**
Vault #6, Bottom Vaults Inside	2	002.002	U-233/234	0.696	0.041	30.27	40	18.1	1.1		
			U-235	0.032	0.029			0.8	0.8		
			U-238	0.676	0.041			17.6	1.1	**36.6**	
			Pu-239/240	0.062	0.028			1.6	0.7		
			Am-241	0.069	0.027			1.8	0.7		**3.4**
Vault #6, Bottom Vaults Inside	3	003.002	U-233/234	0.700	0.036	23.79	40	14.3	0.7		
			U-235	0.037	0.025			0.8	0.5		
			U-238	0.608	0.036			12.4	0.7	**27.5**	
			Pu-239/240	0.030	0.040			0.6	0.8		
			Am-241	0.016	0.022			0.3	0.5		**0.9**
Vault #6, Bottom Vaults Inside	4	004.002	U-233/234	0.815	0.020	5.75	40	4.0	0.1		
			U-235	0.014	0.043			0.1	0.2		
			U-238	0.838	0.035			4.1	0.2	**8.2**	
			Pu-239/240	0.027	0.072			0.1	0.4		
			Am-241	0.000	0.064			0.0	0.3		**0.1**
Vault #6, West	5	005.002	U-233/234	0.216	0.036	2.81	40	0.5	0.1		
			U-235	0.011	0.053			0.0	0.1		
			U-238	0.211	0.020			0.5	0.0	**1.1**	
			Pu-239/240	-0.009	0.112			0.0	0.3		
			Am-241	0.000	0.073			0.0	0.2		**0.0**
Vault #5, Bottom Vaults Inside	6	006.002	U-233/234	0.497	0.020	4.29	40	1.8	0.1		
			U-235	0.027	0.025			0.1	0.1		
			U-238	0.516	0.047			1.9	0.2	**3.8**	
			Pu-239/240	0.004	0.117			0.0	0.4		
			Am-241	-0.010	0.117			0.0	0.4		**0.0**
Vault #5, Bottom Vaults Inside	7	007.002	U-233/234	0.535	0.035	4.01	40	1.8	0.1		
			U-235	0.045	0.024			0.2	0.1		
			U-238	0.492	0.020			1.7	0.1	**3.7**	
			Pu-239/240	0.027	0.125			0.1	0.4		
			Am-241	0.000	0.068			0.0	0.2		**0.1**

Survey Unit 77902 Building 779 Paint/Solid Media Sample Results

LOCATION DESCRIPTION	SAMPLE LOCATION NUMBER	SITE SAMPLE ID	NUCLIDE	pCi/g	MDA (pCi/g)	WEIGHT (g)	SURFACE AREA (in^2)	INDIVIDUAL NUCLIDE ($dpm/100cm^2$)	ESTIMATED MDA ($dpm/100cm^2$)	URANIUM TOTAL ($dpm/100cm^2$) $DCGL_W$=5000	TRANSURANIC TOTAL ($dpm/100cm^2$) $DCGL_W$=100
Vault #4, East	8	008.002	U-233/234	0.165	0.171	1.27	40	0.2	0.2		
			U-235	-0.018	0.212			0.0	0.2		
			U-238	0.057	0.171			0.1	0.2	**0.2**	
			Pu-239/240	0.039	0.035			0.0	0.0		
			Am-241	0.054	0.147			0.1	0.2		**0.1**
Vault #4, Top Vaults-Inside	9	009.002	U-233/234	1.520	0.020	10.40	40	13.6	0.2		
			U-235	0.053	0.024			0.5	0.2		
			U-238	1.160	0.019			10.4	0.2	**24.5**	
			Pu-239/240	0.024	0.033			0.2	0.3		
			Am-241	0.000	0.035			0.0	0.3		**0.2**
Vault #4, Top Vaults-Inside	10	010.002	U-233/234	1.200	0.020	7.90	40	8.2	0.1		
			U-235	0.027	0.024			0.2	0.2		
			U-238	1.300	0.020			8.8	0.1	**17.2**	
			Pu-239/240	0.000	0.057			0.0	0.4		
			Am-241	0.018	0.049			0.1	0.3		**0.1**
Vault #4, Top Vaults-Inside	11	011.002	U-233/234	1.230	0.037	6.57	40	6.9	0.2		
			U-235	0.054	0.046			0.3	0.3		
			U-238	1.130	0.021			6.4	0.1	**13.6**	
			Pu-239/240	0.007	0.053			0.0	0.3		
			Am-241	0.066	0.110			0.4	0.6		**0.4**
Vault #4, Top Vaults-Inside	12	012.002	U-233/234	0.702	0.043	7.92	40	4.8	0.3		
			U-235	0.038	0.025			0.3	0.2		
			U-238	0.611	0.036			4.2	0.2	**9.2**	
			Pu-239/240	0.009	0.076			0.1	0.5		
			Am-241	0.079	0.131			0.5	0.9		**0.6**
Vault #3, Top Vaults-Inside	13	013.002	U-233/234	1.300	0.032	10.82	40	12.1	0.3		
			U-235	0.054	0.040			0.5	0.4		
			U-238	0.994	0.038			9.2	0.4	**21.8**	
			Pu-239/240	0.018	0.047			0.2	0.4		
			Am-241	-0.033	0.106			-0.3	1.0		**-0.1**
Vault #3, Top Vaults-Inside	14	014.002	U-233/234	1.220	0.017	22.63	40	23.7	0.3		
			U-235	0.060	0.038			1.2	0.7		
			U-238	1.080	0.031			21.0	0.6	**45.9**	
			Pu-239/240	0.000	0.025			0.0	0.5		
			Am-241	0.026	0.069			0.5	1.3		**0.5**

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Survey Unit 77902 Building 779 Paint/Solid Media Sample Results

LOCATION DESCRIPTION	SAMPLE LOCATION NUMBER	SITE SAMPLE ID	NUCLIDE	pCi/g	MDA (pCi/g)	WEIGHT (g)	SURFACE AREA (in^2)	INDIVIDUAL NUCLIDE ($dpm/100cm^2$)	ESTIMATED MDA ($dpm/100cm^2$)	URANIUM TOTAL ($dpm/100cm^2$) *$DCGL_W$=5000*	TRANSURANIC TOTAL ($dpm/100cm^2$) *$DCGL_W$=100*
Vault #2, East	15	015.002	U-233/234	0.075	0.054	1.83	40	0.1	0.1		
			U-235	0.017	0.079			0.0	0.1		
			U-238	0.180	0.031			0.3	0.0	**0.4**	
			Pu-239/240	0.006	0.175			0.0	0.3		
			Am-241	0.048	0.233			0.1	0.4		**0.1**
Vault #6, Top	17	017.002	U-233/234	1.190	0.017	22.38	40	22.9	0.3		
			U-235	0.055	0.021			1.1	0.4		
			U-238	1.080	0.040			20.8	0.8	**44.8**	
			Pu-239/240	0.155	0.022			3.0	0.4		
			Am-241	0.098	0.122			1.9	2.3		**4.9**
Vault #5, Top	18	018.002	U-233/234	1.300	0.033	12.83	40	14.3	0.4		
			U-235	0.051	0.023			0.6	0.3		
			U-238	1.240	0.018			13.7	0.2	**28.6**	
			Pu-239/240	0.517	0.023			5.7	0.3		
			Am-241	0.102	0.028			1.1	0.3		**6.8**
Vault #2, Top	20	020.002	U-233/234	1.500	0.034	24.21	40	31.2	0.7		
			U-235	0.058	0.042			1.2	0.9		
			U-238	1.430	0.034			29.8	0.7	**62.2**	
			Pu-239/240	0.102	0.025			2.1	0.5		
			Am-241	0.152	0.041			3.2	0.9		**5.3**

MIN	**0.2**	**-0.1**
MAX	**62.2**	**9.9**
MEAN	**21.0**	**1.9**
SD	**18.0**	**3.0**
$DCGL_W$ =	**5000**	**100**

Survey Unit 77902 Building 779 Sample Weight Data Sheet

RIN NUMBER 99A7102			RIN NUMBER 99A7102			SUM (*)
Sample Location Number	Event	Rad Screening Weight, grams	Sample Location Number	Event	Isotopic Analysis Weight, grams	Total Weight, grams
1	001.001	1.0300	1	001.002	24.66	25.69
2	002.001	1.0225	2	002.002	29.25	30.27
3	003.001	1.0250	3	003.002	22.76	23.79
4	004.001	1.0211	4	004.002	4.73	5.75
5	005.001	1.0169	5	005.002	1.79	2.81
6	006.001	1.0078	6	006.002	3.28	4.29
7	007.001	1.0194	7	007.002	2.99	4.01
8	008.001	1.0229	8	008.002	0.25	1.27
9	009.001	1.0198	9	009.002	9.38	10.40
10	010.001	1.0184	10	010.002	6.88	7.90
11	011.001	1.0166	11	011.002	5.55	6.57
12	012.001	1.0269	12	012.002	6.89	7.92
13	013.001	1.0168	13	013.002	9.80	10.82
14	014.001	1.0150	14	014.002	21.61	22.63
15	015.001	1.0254	15	015.002	0.80	1.83
16						
17	017.001	1.0123	17	017.002	21.37	22.38
18	018.001	1.0366	18	018.002	11.79	12.83
19						
20	020.001	1.0054	20	020.002	23.20	24.21

(*) The total weight of each sample used for the activity calculations is the sum of the weights of each aliquot removed. for rad screens and the weights of each sample received for isotopic analysis.

RMRS Rocky Mountain Remediation Services, L
. . . protecting the environment

Software Quality Control Checklist
Verification of Calculations

Final Status Surveys
Bldg 779 Cluster

Check List for - Title: Verification of Calculations used in Computerized Spreadsheets & Databases
REQUIREMENTS: *Kaiser-Hill Team Quality Assurance Program,* Rev. 8, 3/99

ASSESSMENT ITEMS

Engineering/Calculations

FINAL REPORT (Title & date: CLOSEOUT RAD SURVEY REPORT for BLDG 779, ANNEX B)

Are all equations, that support final status survey decisions, stated in the ~~report?~~ RSP's ..... Y / N

SPREADSHEET/DBASE (FILE NAME {e.g., "Workbook", if EXCEL} & date): 77902 DATA SUMMARY. XLS)

Individual Work Sheets (within the "Workbook" listed above)

Title: ATTACHMENT ID
Title: DATA SUMMARY
Title: TSA RESULTS
Title: SMEAR DATA → AVG LOCATIONS 1-16 (ex. 1-19) -- CORRECTED on 9/30/99
Title: PAINT & MEDIA RESULTS
SAMPLE WEIGHT DATA

Are all equations listed in the report, that were used in spreadsheet software, accurately written within the spreadsheets? ..... Y / N

In general terms, list the types of algorithms used (e.g., unit conversion of pCi/g to dpm/100cm^2): MDA, CONC. to DPM CONVERSIONS, DESCRIPTIVE STATS, LOCAL AREA BACKGROUND CORRECTIONS
& cf. SPREAD to HARDCOPY

Are inputs, as defined in equations referenced above, clearly defined & labeled by parameter? ..... Y / N
Inputs (list of): CPM, COUNT TIMES (REAL + BKGRD), SAMPLE WEIGHTS (RAD SCREEN + ISOTOPIC), EFFICIENCY, CONCENTRATIONS

Are outputs (results of the calculations) as defined in the equations above, clearly defined and labeled by parameter? ..... Y / N
Outputs (list of): MDA, TSA, REMOVABLE ACTIVITY, SAMPLE ACTIVITIES, MIN, MAX, MEANS, STD. DEVS.

COMMENTS

INDEPENDENT REVIEW

By: R S LUKER / [signature] (SL) / 9.28.99

Print Name / Signature / Verification Date

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ATTACHMENT D
Survey Unit 77903 Data Summary

SURVEY UNIT 77903 DATA

COLOR CODES:

Less Than or Equal to 75% of $DCGL_{W=}$

>75% and <100% of $DCGL_{W=}$

Greater Than or Equal to $DCGL_{W=}$

Best Available Copy

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Survey Unit 77903 Data Summary and Approval Sheet

Total Surface Activity Measurements

	15	17	
	Number Required	Number Obtained	
MIN	-11		dpm/100 cm^2
MAX	22		dpm/100 cm^2
MEAN	4		dpm/100 cm^2
STD DEV	9		dpm/100 cm^2
TRANSURANIC DCGL$_W$	100		dpm/100 cm^2

Removable Activity Measurements

	17	17	
	Number Required	Number Obtained	
MIN	-0.3		dpm/100 cm^2
MAX	1.2		dpm/100 cm^2
MEAN	-0.2		dpm/100 cm^2
STD DEV	0.4		dpm/100 cm^2
TRANSURANIC DCGL$_W$	20		dpm/100 cm^2

Media Sample Activity

Media Samples	15	17
	Number Required	Number Obtained

Total Uranium Results

MIN	3.6	dpm/100 cm^2
MAX	46.3	dpm/100 cm^2
MEAN	13.1	dpm/100 cm^2
STD DEV	11.7	dpm/100 cm^2
DCGL$_W$	5000	dpm/100 cm^2

Total Transuranic Results

MIN	0.1	dpm/100 cm^2
MAX	7.8	dpm/100 cm^2
MEAN	1.1	dpm/100 cm^2
STD DEV	1.9	dpm/100 cm^2
DCGL$_W$	100	dpm/100 cm^2

Survey Unit 77903 Building 779 Total Surface Contamination Results

Total Surface Activity Survey						Quality Control Survey				
Meter Model:	NE Electra w/ DP6 Probe			**Local Area Bkgd (cpm)**		NE Electra w/ DP6 Probe			**Local Area Bkgd (cpm)**	
Instrument #:	1549	N/A	N/A	2		2380	N/A	N/A	3	
Cal. Due Date:	10/26/99	N/A	N/A			12/3/99	N/A	N/A		
Efficiency (c/d):	0.214	N/A	N/A			0.211	N/A	N/A		
	Total Surface Activity Measurements					**Quality Control Measurements**				
Sample Location Number	**Serial #**	**Date**	**(cpm)**	**MDA (dpm/100 cm^2)**	**(dpm/100 cm^2)**	**Serial #**	**Date**	**(cpm)**	**MDA (dpm/100 cm^2)**	**(dpm/100 cm^2)**
1	1549	06/28/99	4	46	**8**					
2	1549	06/28/99	3	46	**3**					
3	1549	06/28/99	2	46	**-1**					
4	1549	06/28/99	0	46	**-11**					
5	1549	06/28/99	1	46	**-6**					
6	1549	06/28/99	2	46	**-1**					
7	1549	06/28/99	4	46	**8**					
8	1549	06/28/99	4	46	**8**					
9	1549	06/28/99	1	46	**-6**					
10	1549	06/28/99	4	46	**8**					
11	1549	06/28/99	4	46	**8**					
12	1549	06/28/99	1	46	**-6**					
13	1549	06/28/99	3	46	**3**					
14	1549	06/28/99	3	46	**3**					
15	1549	06/28/99	7	46	**22**	2380	06/29/99	2	51	**-5**
16	1549	06/28/99	5	46	**13**					
17	1549	06/28/99	6	46	**17**	2380	06/29/99	4	51	**5**
				MIN	-11					
				MAX	**22**					
				MEAN	**4**					
				SD	9					
				Transuranic $DCGL_W$	**100**					

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Survey Unit 77903 Building 779 Smear Results

Smear Location Number	Smear Results				
	Serial Number	Date Counted	Net (cpm)	Net (dpm/100 cm^2)	MDA (dpm/100 cm2)
1	1407	6/28/99	-0.1	**-0.3**	6.5
2	1407	6/28/99	-0.1	**-0.3**	6.5
3	1407	6/28/99	0.4	**1.2**	6.5
4	1407	6/28/99	-0.1	**-0.3**	6.5
5	1407	6/28/99	-0.1	**-0.3**	6.5
6	1407	6/28/99	-0.1	**-0.3**	6.5
7	1407	6/28/99	-0.1	**-0.3**	6.5
8	1407	6/28/99	-0.1	**-0.3**	6.5
9	1407	6/28/99	-0.1	**-0.3**	6.5
10	1407	6/28/99	-0.1	**-0.3**	6.5
11	1407	6/28/99	-0.1	**-0.3**	6.5
12	1407	6/28/99	-0.1	**-0.3**	6.5
13	1407	6/28/99	-0.1	**-0.3**	6.5
14	1407	6/28/99	-0.1	**-0.3**	6.5
15	1407	6/28/99	-0.1	**-0.3**	6.5
16	1407	6/28/99	-0.1	**-0.3**	6.5
17	1407	6/28/99	-0.1	**-0.3**	6.5
			MIN	-0.3	
			MAX	**1.2**	
			MEAN	**-0.2**	
			SD	0.4	
			Transuranic $DCGL_W$	**20**	

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Survey Unit 77903 Building 779 Paint/Solid Media Sample Results

LOCATION DESCRIPTION	SAMPLE LOCATION NUMBER	SITE SAMPLE ID	NUCLIDE	pCi/g	MDA (pCi/g)	WEIGHT (g)	SURFACE AREA (in^2)	INDIVIDUAL NUCLIDE ($dpm/100cm^2$)	ESTIMATED MDA ($dpm/100cm^2$)	URANIUM TOTAL ($dpm/100cm^2$) $DCGL_W$=5000	TRANSURANIC TOTAL ($dpm/100cm^2$) $DCGL_W$=100
Room 171, South Wall	1	001.002	U-233/234	0.303	0.373	10.39	40	2.7	3.3		
			U-235	0.028	0.181			0.2	1.6		
			U-238	0.499	0.181			4.5	1.6	**7.4**	
			Pu-239/240	0.063	0.245			0.6	2.2		
			Am-241	0.057	0.168			0.5	1.5		**1.1**
Room 171, Ceiling	2	002.002	U-233/234	0.667	0.424	10.50	40	6.0	3.8		
			U-235	-0.010	0.213			-0.1	1.9		
			U-238	0.535	0.254			4.8	2.3	**10.8**	
			Pu-239/240	0.022	0.252			0.2	2.3		
			Am-241	0.039	0.106			0.4	1.0		**0.6**
Room 171, South Wall	3	003.002	U-233/234	0.296	0.271	7.23	40	1.8	1.7		
			U-235	0.021	0.242			0.1	1.5		
			U-238	0.570	0.110			3.5	0.7	**5.5**	
			Pu-239/240	0.033	0.215			0.2	1.3		
			Am-241	0.053	0.265			0.3	1.6		**0.5**
Room 171, Ceiling	4	004.002	U-233/234	0.733	0.202	5.73	40	3.6	1.0		
			U-235	0.010	0.227			0.0	1.1		
			U-238	0.409	0.092			2.0	0.5	**5.7**	
			Pu-239/240	0.031	0.084			0.2	0.4		
			Am-241	-0.009	0.186			0.0	0.9		**0.1**
Room 171, South Wall	5	005.002	U-233/234	0.533	0.351	10.12	40	4.6	3.1		
			U-235	-0.046	0.351			-0.4	3.1		
			U-238	0.471	0.241			4.1	2.1	**8.3**	
			Pu-239/240	-0.035	0.263			-0.3	2.3		
			Am-241	0.083	0.236			0.7	2.1		**0.4**
Room 171, Ceiling	6	006.002	U-233/234	0.594	0.243	6.92	40	3.5	1.4		
			U-235	-0.026	0.243			-0.2	1.4		
			U-238	0.219	0.099			1.3	0.6	**4.7**	
			Pu-239/240	0.017	0.188			0.1	1.1		
			Am-241	0.000	0.135			0.0	0.8		**0.1**
Room 171, South Wall	7	007.002	U-233/234	0.368	0.156	15.35	40	4.9	2.1		
			U-235	0.009	0.208			0.1	2.7		
			U-238	0.368	0.156			4.9	2.1	**9.8**	
			Pu-239/240	-0.020	0.242			-0.3	3.2		
			Am-241	0.093	0.264			1.2	3.5		**1.0**

Survey Unit 77903 Building 779 Paint/Solid Media Sample Results

LOCATION DESCRIPTION	SAMPLE LOCATION NUMBER	SITE SAMPLE ID	NUCLIDE	pCi/g	MDA (pCi/g)	WEIGHT (g)	SURFACE AREA (in^2)	INDIVIDUAL NUCLIDE ($dpm/100cm^2$)	ESTIMATED MDA ($dpm/100cm^2$)	URANIUM TOTAL ($dpm/100cm^2$) $DCGL_W$=5000	TRANSURANIC TOTAL ($dpm/100cm^2$) $DCGL_W$=100
Room 171, Ceiling	8	008.002	U-233/234	0.496	0.194	8.34	40	3.6	1.4		
			U-235	0.000	0.105			0.0	0.8		
			U-238	0.700	0.105			5.0	0.8	**8.6**	
			Pu-239/240	0.081	0.110			0.6	0.8		
			Am-241	0.000	0.111			0.0	0.8		**0.6**
Room 171, South Wall	9	009.002	U-233/234	0.316	0.095	49.82	40	13.5	4.1		
			U-235	-0.017	0.208			-0.7	8.9		
			U-238	0.588	0.175			25.2	7.5	**38.0**	
			Pu-239/240	0.110	0.200			4.7	8.6		
			Am-241	0.073	0.099			3.1	4.2		**7.8**
Room 171, Ceiling	10	010.002	U-233/234	1.410	0.243	7.36	40	8.9	1.5		
			U-235	0.103	0.243			0.7	1.5		
			U-238	1.170	0.243			7.4	1.5	**17.0**	
			Pu-239/240	0.036	0.233			0.2	1.5		
			Am-241	0.111	0.151			0.7	1.0		**0.9**
Room 171, Ceiling	11	011.002	U-233/234	0.847	0.234	5.92	40	4.3	1.2		
			U-235	0.118	0.107			0.6	0.5		
			U-238	0.965	0.234			4.9	1.2	**9.8**	
			Pu-239/240	0.067	0.263			0.3	1.3		
			Am-241	0.000	0.128			0.0	0.7		**0.3**
Room 172, Ceiling	12	012.002	U-233/234	0.637	0.231	4.78	40	2.6	1.0		
			U-235	0.042	0.278			0.2	1.1		
			U-238	0.549	0.212			2.3	0.9	**5.1**	
			Pu-239/240	0.067	0.090			0.3	0.4		
			Am-241	0.038	0.191			0.2	0.8		**0.4**
Room 172, Ceiling	13	013.002	U-233/234	0.174	0.219	7.23	40	1.1	1.4		
			U-235	-0.016	0.195			-0.1	1.2		
			U-238	0.428	0.089			2.7	0.6	**3.6**	
			Pu-239/240	0.059	0.166			0.4	1.0		
			Am-241	0.000	0.094			0.0	0.6		**0.4**
Room 171, Ceiling	14	014.002	U-233/234	1.190	0.247	6.37	40	6.5	1.4		
			U-235	0.010	0.226			0.1	1.2		
			U-238	1.270	0.201			7.0	1.1	**13.5**	
			Pu-239/240	0.067	0.190			0.4	1.0		
			Am-241	0.114	0.206			0.6	1.1		**1.0**

Survey Unit 77903 Building 779 Paint/Solid Media Sample Results

LOCATION DESCRIPTION	SAMPLE LOCATION NUMBER	SITE SAMPLE ID	NUCLIDE	pCi/g	MDA (pCi/g)	WEIGHT (g)	SURFACE AREA (in^2)	INDIVIDUAL NUCLIDE ($dpm/100cm^2$)	ESTIMATED MDA ($dpm/100cm^2$)	URANIUM TOTAL ($dpm/100cm^2$) *$DCGL_W$=5000*	TRANSURANIC TOTAL ($dpm/100cm^2$) *$DCGL_W$=100*
Room 171, Ceiling	15	015.002	U-233/234	1.230	0.084	6.79	40	7.2	0.5		
			U-235	0.124	0.084			0.7	0.5		
			U-238	1.170	0.084			6.8	0.5	**14.7**	
			Pu-239/240	0.027	0.175			0.2	1.0		
			Am-241	0.000	0.116			0.0	0.7		**0.2**
Room 171, South Wall	16	016.002	U-233/234	0.493	0.233	46.31	40	19.6	9.3		
			U-235	0.036	0.187			1.4	7.4		
			U-238	0.632	0.167			25.2	6.7	**46.3**	
			Pu-239/240	0.017	0.194			0.7	7.7		
			Am-241	0.060	0.214			2.4	8.5		**3.1**
Room 171, East Door & Wall	17	017.002	U-233/234	0.695	0.183	14.01	40	8.4	2.2		
			U-235	-0.007	0.137			-0.1	1.7		
			U-238	0.516	0.137			6.2	1.7	**14.5**	
			Pu-239/240	0.027	0.175			0.3	2.1		
			Am-241	0.000	0.098			0.0	1.2		**0.3**

MIN	**3.6**	**0.1**
MAX	**46.3**	**7.8**
MEAN	**13.1**	**1.1**
SD	**11.7**	**1.9**
$DCGL_W$ =	**5000**	**100**

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Survey Unit 77903 Building 779 Sample Weight Data Sheet

RIN NUMBER 99A7109			RIN NUMBER 99A7109			SUM (*)
Sample Location Number	Event	Rad Screening Weight, grams	Sample Location Number	Event	Isotopic Analysis Weight, grams	Total Weight, grams
1	001.001	1.0197	1	001.002	9.37	10.39
2	002.001	1.0178	2	002.002	9.49	10.50
3	003.001	1.0205	3	003.002	6.21	7.23
4	004.001	1.0410	4	004.002	4.69	5.73
5	005.001	1.0249	5	005.002	9.10	10.12
6	006.001	1.0499	6	006.002	5.87	6.92
7	007.001	1.0231	7	007.002	14.33	15.35
8	008.001	1.0113	8	008.002	7.32	8.34
9	009.001	1.0169	9	009.002	48.80	49.82
10	010.001	1.0004	10	010.002	6.36	7.36
11	011.001	1.0132	11	011.002	4.91	5.92
12	012.001	1.0081	12	012.002	3.77	4.78
13	013.001	1.0315	13	013.002	6.19	7.23
14	014.001	1.0076	14	014.002	5.36	6.37
15	015.001	1.0055	15	015.002	5.78	6.79
16	016.001	1.0241	16	016.002	45.29	46.31
17	017.001	1.0182	17	017.002	12.99	14.01

(*) The total weight of each sample used for the activity calculations is the sum of the weights of each aliquot for rad screens and the weights of each sample received for isotopic analysis.

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Rocky Mountain Remediation Services, L
... protecting the environment

Software Quality Control ~~Checklist~~ Verification of Calculations

Final Status Surveys
Bldg 779 Cluster

Check List for - Title: Verification of Calculations used in Computerized Spreadsheets & Databases
REQUIREMENTS: *Kaiser-Hill Team Quality Assurance Program,* Rev. 8, 3/99

ASSESSMENT ITEMS

Engineering/Calculations

FINAL REPORT (Title & date: CLOSEOUT RAD SURVEY REPORT for BLDG 779, ANNEX B)

Are all equations, that support final status survey decisions, stated in the ~~report?~~ RSPs ..... (Y) / N

SPREADSHEET/DBASE (FILE NAME {e.g., "Workbook", if EXCEL} & date): 77903 DATA SUMMARY.XLS)

Individual Work Sheets (within the "Workbook" listed above)

Title: ATTENUATION ID
Title: DATA SUMMARY
Title: TSA RESULTS
Title: SMEAR DATA
Title: PAINT & MEDIA RESULTS
SAMPLE WEIGHT DATA

Are all equations listed in the report, that were used in spreadsheet software, accurately written within the spreadsheets? ..... (Y) / N

In general terms, list the types of algorithms used (e.g., unit conversion of pCi/g to dpm/100cm^2): MDA, CONC. TO DPM CONVERSIONS, DESCRIPTIVE STATS, LOCAL AREA ~~BKGRD~~ CORRECTIONS

cf. HARDCOPY w/ DIGITAL FILE

Are inputs, as defined in equations referenced above, clearly defined & labeled by parameter? ..... (Y) / N
Inputs (list of): CPM, COUNT TIMES (REAL & BKGRD), SAMPLE WEIGHTS (RAD SCREEN & ISOTOPIC) EFFICIENCIES, CONCENTRATIONS

Are outputs (results of the calculations) as defined in the equations above, clearly defined and labeled by parameter? ..... (Y) / N
Outputs (list of): MDA, TSA, REMOV. ACTIVITY, SAMPLE ACTIVITIES, MIN, MAX, MEANS

COMMENTS

INDEPENDENT REVIEW
By: R S LUKER / [signature] (R) / 9.28.99
Print Name / Signature / Verification Date

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ATTACHMENT E
Survey Unit 77904 Data Summary

SURVEY UNIT 77904 DATA

COLOR CODES:

Less Than or Equal to 75% of $DCGL_{W=}$

>75% and <100% of $DCGL_{W=}$

Greater Than or Equal to $DCGL_{W=}$

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Survey Unit 77904 Data Summary and Approval Sheet

Total Surface Activity Measurements

	15	24	
	Number Required	Number Obtained	
MIN	-12		dpm/100 cm^2
MAX	41		dpm/100 cm^2
MEAN	5		dpm/100 cm^2
STD DEV	12		dpm/100 cm^2
TRANSURANIC $DCGL_W$	100		dpm/100 cm^2

Removable Activity Measurements

	17	24	
	Number Required	Number Obtained	
MIN	-3.0		dpm/100 cm^2
MAX	4.8		dpm/100 cm^2
MEAN	0.4		dpm/100 cm^2
STD DEV	2.0		dpm/100 cm^2
TRANSURANIC $DCGL_W$	20		dpm/100 cm^2

Media Sample Activity

Media Samples	15	22
	Number Required	Number Obtained

Total Uranium Results

MIN	2.0	dpm/100 cm^2
MAX	89.5	dpm/100 cm^2
MEAN	28.4	dpm/100 cm^2
STD DEV	25.4	dpm/100 cm^2
$DCGL_W$	5000	dpm/100 cm^2

Total Transuranic Results

MIN	0.0	dpm/100 cm^2
MAX	34.0	dpm/100 cm^2
MEAN	5.1	dpm/100 cm^2
STD DEV	8.2	dpm/100 cm^2
$DCGL_W$	100	dpm/100 cm^2

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Survey Unit 77904 Building 779 Total Surface Contamination Results

Total Surface Activity Survey					Quality Control Survey			
Meter Model:	NE Electra w/ DP6 Probe			Local Area Bkgd (cpm)	NE Electra w/ DP6 Probe			Local Area Bkgd (cpm)
Instrument #:	1259	2374	1273	3	1549	N/A	N/A	3
Cal. Due Date:	8/18/99	12/9/99	12/3/99		10/26/99	N/A	N/A	
Efficiency (c/d):	0.209	0.217	0.209		0.214	N/A	N/A	

Sample Location Number	Total Surface Activity Measurements					Quality Control Measurements				
	Serial #	Date	(cpm)	MDA (dpm/100 cm^2)	(dpm/100 cm^2)	Serial #	Date	(cpm)	MDA (dpm/100 cm^2)	(dpm/100 cm^2)
1	1259	05/12/99	1	54	-12					
2	1259	05/12/99	6	54	12					
3	1259	05/12/99	6	54	12					
4	1259	05/12/99	4	54	3					
5	1259	05/12/99	3	54	-2					
6	1259	05/12/99	8	54	22					
7	1259	05/12/99	7	54	17					
8	1259	05/12/99	6	54	12					
9	1259	05/12/99	7	54	17					
10	1259	05/12/99	1	54	-12					
11	1259	05/12/99	2	54	-7					
12	1259	05/12/99	2	54	-7					
13	1259	05/12/99	3	54	-2					
14	1259	05/12/99	3	54	-2					
15	1259	05/12/99	2	54	-7					
16	1259	05/12/99	5	54	7					
17	1259	05/12/99	6	54	12	1549	06/12/99	3	47	2
18	1259	05/12/99	12	54	41					
19	1259	05/12/99	3	54	-2					
20	2374	06/18/99	3	52	-2	1549	06/12/99	8	47	26
21	2374	06/18/99	5	52	7					
22	2374	06/18/99	3	52	-2					
23	2374	06/18/99	4	52	2					
24	1273	06/23/99	5	54	7					
				MIN	-12					
				MAX	41					
				MEAN	5					
				SD	12					
				Transuranic $DCGL_W$	100					

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Survey Unit 77904 Building 779 Smear Results

Smear Location Number	Smear Results				
	Serial Number	Date Counted	Net (cpm)	Net (dpm/100 cm^2)	MDA
1	1411	5/12/99	1.6	**4.8**	8.9
2	1411	5/12/99	0.1	**0.3**	8.9
3	1411	5/12/99	-0.4	**-1.2**	8.9
4	1411	5/12/99	-0.4	**-1.2**	8.9
5	1411	5/12/99	0.6	**1.8**	8.9
6	1411	5/12/99	0.1	**0.3**	8.9
7	1411	5/12/99	0.6	**1.8**	8.9
8	1411	5/12/99	1.6	**4.8**	8.9
9	1411	5/12/99	0.6	**1.8**	8.9
10	1411	5/12/99	0.6	**1.8**	8.9
11	1411	5/12/99	0.1	**0.3**	8.9
12	1411	5/12/99	-0.4	**-1.2**	8.9
13	1411	5/12/99	-0.4	**-1.2**	8.9
14	1411	5/12/99	0.1	**0.3**	8.9
15	1411	5/12/99	0.1	**0.3**	8.9
16	1411	5/12/99	-0.4	**-1.2**	8.9
17	1411	5/12/99	0.6	**1.8**	8.9
18	1411	5/12/99	-0.4	**-1.2**	8.9
19	1411	5/12/99	0.6	**1.8**	8.9
20	1409	5/23/99	0.5	**1.5**	9.5
21	1409	5/23/99	0.0	**0.0**	9.5
22	1409	5/23/99	-1.5	**-3.0**	9.5
23	1409	5/23/99	-1.5	**-3.0**	9.5
24	1053	5/23/99	0.0	**0.0**	9.5
			MIN	-3.0	
			MAX	**4.8**	
			MEAN	**0.4**	
			SD	2.0	
			Transuranic $DCGL_W$	**20**	

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Survey Unit 77904 Building 779 Paint/Surface Media Sample Results

LOCATION DESCRIPTION	SAMPLE LOCATION NUMBER	SITE SAMPLE ID	NUCLIDE	pCi/g	MDA (pCi/g)	WEIGHT (g)	SURFACE AREA (in^2)	INDIVIDUAL NUCLIDE ($dpm/100cm^2$)	ESTIMATED MDA ($dpm/100cm^2$)	URANIUM TOTAL ($dpm/100cm^2$) *$DCGL_W$=5000*	TRANSURANIC TOTAL ($dpm/100cm^2$) *$DCGL_W$=100*
Room 270 Stairwell, South Wall	1	001.002	U-233/234	1.170	0.094	14.55	40	14.6	1.2		
			U-235	0.136	0.096			1.7	1.2		
			U-238	1.310	0.045			16.4	0.6	**32.7**	
			Pu-239/240	0.018	0.048			0.2	0.6		
			Am-241	0.017	0.045			0.2	0.6		**0.4**
Room 270 Stairwell	2	002.002	U-233/234	0.766	0.044	7.06	40	4.7	0.3		
			U-235	0.032	0.096			0.2	0.6		
			U-238	1.340	0.078			8.1	0.5	**13.0**	
			Pu-239/240	1.950	0.050			11.9	0.3		
			Am-241	0.722	0.047			4.4	0.3		**16.2**
Room 270/272, Ceiling	3	003.002	U-233/234	0.396	0.045	2.53	40	0.9	0.1		
			U-235	0.061	0.055			0.1	0.1		
			U-238	0.479	0.093			1.0	0.2	**2.0**	
			Pu-239/240	0.000	0.094			0.0	0.2		
			Am-241	0.000	0.085			0.0	0.2		**0.0**
Room 270/272, Ceiling	4	004.002	U-233/234	0.432	0.075	5.81	40	2.2	0.4		
			U-235	0.039	0.052			0.2	0.3		
			U-238	0.467	0.042			2.3	0.2	**4.7**	
			Pu-239/240	0.138	0.053			0.7	0.3		
			Am-241	0.063	0.057			0.3	0.3		**1.0**
Room 171 to First Landing Stairwell, West Wall	5	005.002	U-233/234	0.775	0.078	12.30	40	8.2	0.8		
			U-235	0.000	0.054			0.0	0.6		
			U-238	1.050	0.078			11.1	0.8	**19.3**	
			Pu-239/240	0.171	0.058			1.8	0.6		
			Am-241	0.222	0.060			2.3	0.6		**4.2**
Room 270/272, Ceiling	6	006.002	U-233/234	0.467	0.042	2.16	40	0.9	0.1		
			U-235	0.019	0.052			0.0	0.1		
			U-238	0.568	0.074			1.1	0.1	**2.0**	
			Pu-239/240	0.186	0.072			0.3	0.1		
			Am-241	0.000	0.097			0.0	0.2		**0.3**
Room 270/272, South Wall	7	007.002	U-233/234	0.512	0.080	19.29	40	8.5	1.3		
			U-235	0.021	0.056			0.3	0.9		
			U-238	0.527	0.080			8.7	1.3	**17.6**	
			Pu-239/240	-0.007	0.084			-0.1	1.4		
			Am-241	0.039	0.053			0.6	0.9		**0.5**

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Survey Unit 77904 Building 779 Paint/Surface Media Sample Results

LOCATION DESCRIPTION	SAMPLE LOCATION NUMBER	SITE SAMPLE ID	NUCLIDE	pCi/g	MDA (pCi/g)	WEIGHT (g)	SURFACE AREA (in^2)	INDIVIDUAL NUCLIDE ($dpm/100cm^2$)	ESTIMATED MDA ($dpm/100cm^2$)	URANIUM TOTAL ($dpm/100cm^2$) $DCGL_W$=5000	TRANSURANIC TOTAL ($dpm/100cm^2$) $DCGL_W$=100
Room 270/272, Floor	8	008.002	U-233/234	0.644	0.098	51.76	40	28.7	4.4		
			U-235	0.077	0.102			3.4	4.5		
			U-238	0.655	0.047			29.2	2.1	**61.3**	
			Pu-239/240	0.000	0.054			0.0	2.4		
			Am-241	0.057	0.051			2.5	2.3		**2.5**
Room 270/272, Ceiling	9	009.002	U-233/234	0.516	0.045	4.07	40	1.8	0.2		
			U-235	0.082	0.056			0.3	0.2		
			U-238	0.497	0.045			1.7	0.2	**3.8**	
			Pu-239/240	0.034	0.093			0.1	0.3		
			Am-241	0.000	0.100			0.0	0.4		**0.1**
Room 270/272, South Wall	10	010.002	U-233/234	0.779	0.080	24.26	40	16.3	1.7		
			U-235	0.062	0.056			1.3	1.2		
			U-238	0.716	0.045			14.9	0.9	**32.5**	
			Pu-239/240	0.036	0.049			0.8	1.0		
			Am-241	0.000	0.050			0.0	1.0		**0.8**
Room 270/272, Floor	11	011.002	U-233/234	1.180	0.106	38.77	40	39.4	3.5		
			U-235	0.054	0.074			1.8	2.5		
			U-238	0.738	0.105			24.6	3.5	**65.8**	
			Pu-239/240	0.301	0.128			10.0	4.3		
			Am-241	0.232	0.048			7.7	1.6		**17.8**
Room 270/272, Ceiling	12	012.002	U-233/234	0.514	0.052	10.21	40	4.5	0.5		
			U-235	0.000	0.064			0.0	0.6		
			U-238	0.409	0.091			3.6	0.8	**8.1**	
			Pu-239/240	0.000	0.053			0.0	0.5		
			Am-241	0.000	0.063			0.0	0.6		**0.0**
Room 270/272, South Wall	13	013.002	U-233/234	0.386	0.098	9.85	40	3.3	0.8		
			U-235	0.026	0.069			0.2	0.6		
			U-238	0.632	0.099			5.4	0.8	**8.8**	
			Pu-239/240	0.012	0.097			0.1	0.8		
			Am-241	0.021	0.057			0.2	0.5		**0.3**
Room 270/272, Floor	14	014.002	U-233/234	1.420	0.134	24.40	40	29.8	2.8		
			U-235	0.134	0.140			2.8	2.9		
			U-238	0.942	0.064			19.8	1.3	**52.4**	
			Pu-239/240	0.239	0.133			5.0	2.8		
			Am-241	0.059	0.053			1.2	1.1		**6.3**

Survey Unit 77904 Building 779 Paint/Surface Media Sample Results

LOCATION DESCRIPTION	SAMPLE LOCATION NUMBER	SITE SAMPLE ID	NUCLIDE	pCi/g	MDA (pCi/g)	WEIGHT (g)	SURFACE AREA (in^2)	INDIVIDUAL NUCLIDE ($dpm/100cm^2$)	ESTIMATED MDA ($dpm/100cm^2$)	URANIUM TOTAL ($dpm/100cm^2$) *$DCGL_W$=5000*	TRANSURANIC TOTAL ($dpm/100cm^2$) *$DCGL_W$=100*
Room 270/272, North Wall	15	015.002	U-233/234	1.290	0.066	7.40	40	8.2	0.4		
			U-235	0.030	0.082			0.2	0.5		
			U-238	1.480	0.066			9.4	0.4	**17.8**	
			Pu-239/240	-0.016	0.191			-0.1	1.2		
			Am-241	0.022	0.059			0.1	0.4		**0.0**
Room 270/272, Ceiling	16	016.002	U-233/234	0.531	0.099	3.74	40	1.7	0.3		
			U-235	0.026	0.069			0.1	0.2		
			U-238	0.372	0.056			1.2	0.2	**3.0**	
			Pu-239/240	0.065	0.177			0.2	0.6		
			Am-241	0.000	0.070			0.0	0.2		**0.2**
Room 270/272, South Wall	17	017.002	U-233/234	0.486	0.057	12.42	40	5.2	0.6		
			U-235	0.104	0.071			1.1	0.8		
			U-238	0.442	0.057			4.7	0.6	**11.0**	
			Pu-239/240	0.000	0.052			0.0	0.6		
			Am-241	0.036	0.049			0.4	0.5		**0.4**
Room 270/272, Floor	18	018.002	U-233/234	Represents the average of nine sample results							
			U-235								
			U-238							**58.4**	
			Pu-239/240								
			Am-241								**34.0**
Room 270/272, Floor	20	020.002	U-233/234	0.985	0.099	35.44	40	30.0	3.0		
			U-235	0.174	0.161			5.3	4.9		
			U-238	0.680	0.056			20.7	1.7	**56.1**	
			Pu-239/240	0.180	0.081			5.5	2.5		
			Am-241	0.094	0.098			2.9	3.0		**8.4**
Room 270/272, Floor	21	021.002	U-233/234	1.270	0.137	32.03	40	35.0	3.8		
			U-235	0.138	0.143			3.8	3.9		
			U-238	1.840	0.065			50.7	1.8	**89.5**	
			Pu-239/240	0.137	0.091			3.8	2.5		
			Am-241	0.079	0.053			2.2	1.5		**6.0**

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Survey Unit 77904 Building 779 Paint/Surface Media Sample Results

LOCATION DESCRIPTION	SAMPLE LOCATION NUMBER	SITE SAMPLE ID	NUCLIDE	pCi/g	MDA (pCi/g)	WEIGHT (g)	SURFACE AREA (in^2)	INDIVIDUAL NUCLIDE ($dpm/100cm^2$)	ESTIMATED MDA ($dpm/100cm^2$)	URANIUM TOTAL ($dpm/100cm^2$) $DCGL_W$=5000	TRANSURANIC TOTAL ($dpm/100cm^2$) $DCGL_W$=100
Room 270/272, Floor	22	022.002	U-233/234	0.818	0.077	29.61	40	20.8	2.0		
			U-235	0.160	0.054			4.1	1.4		
			U-238	0.716	0.077			18.2	2.0	**43.2**	
			Pu-239/240	0.183	0.045			4.7	1.1		
			Am-241	0.098	0.044			2.5	1.1		**7.2**
Room 270/272, Floor	23	023.002	U-233/234	0.349	0.045	33.64	40	10.1	1.3		
			U-235	0.062	0.056			1.8	1.6		
			U-238	0.357	0.079			10.3	2.3	**22.2**	
			Pu-239/240	0.063	0.045			1.8	1.3		
			Am-241	0.132	0.051			3.8	1.5		**5.6**

MIN	**2.0**	**0.0**
MAX	**89.5**	**34.0**
MEAN	**28.4**	**5.1**
SD	**25.4**	**8.2**
$DCGL_W$ =	**5000**	**100**

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Survey Unit 77904 Building 779 Sample Weight Data Sheet

RIN NUMBER 99A7112			RIN NUMBER 99A7112			SUM (*)
Sample Location Number	Event	Rad Screening Weight, grams	Sample Location Number	Event	Isotopic Analysis Weight, grams	Total Weight, grams
1	001.001	1.0084	1	001.002	13.54	14.55
2	002.001	1.0047	2	002.002	6.06	7.06
3	003.001	1.0029	3	003.002	1.53	2.53
4	004.001	1.0422	4	004.002	4.77	5.81
5	005.001	1.0088	5	005.002	11.29	12.30
6	006.001	1.0102	6	006.002	1.15	2.16
7	007.001	1.0265	7	007.002	18.26	19.29
8	008.001	1.0293	8	008.002	50.73	51.76
9	009.001	1.0017	9	009.002	3.07	4.07
10	010.001	1.0492	10	010.002	23.21	24.26
11	011.001	1.0158	11	011.002	37.75	38.77
12	012.001	1.0067	12	012.002	9.20	10.21
13	013.001	1.0193	13	013.002	8.83	9.85
14	014.001	1.0513	14	014.002	23.35	24.40
15	015.001	1.0251	15	015.002	6.37	7.40
16	016.001	1.0065	16	016.002	2.73	3.74
17	017.001	1.0114	17	017.002	11.41	12.42
18	018.001	1.0482	18	018.002	48.60	49.65
19						
20	020.001	1.0331	20	020.002	34.41	35.44
21	021.001	1.0175	21	021.002	31.01	32.03
22	022.001	1.0324	22	022.002	28.58	29.61
23	023.001	1.0156	23	023.002	32.62	33.64

(*) The total weight of each sample used for the activity calculations is the sum of the weights of each aliquot removed. for rad screens and the weights of each sample received for isotopic analysis.

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RMRS Rocky Mountain Remediation Services, L
. . . protecting the environment

Software Quality Control Checklist
Verification of Calculations

Final Status Surveys
Bldg 779 Cluster

Check List for - Title: Verification of Calculations used in Computerized Spreadsheets & Databases
REQUIREMENTS: *Kaiser-Hill Team Quality Assurance Program,* Rev. 8, 3/99

ASSESSMENT ITEMS

Engineering/Calculations

FINAL REPORT (Title & date: CLOSEOUT RAD SURVEY REPORT for BLDG 779, ANNEX B)

Are all equations, that support final status survey decisions, stated in the ~~report?~~ RSPs ..... (Y) / N

SPREADSHEET/DBASE (FILE NAME {e.g., "Workbook", if EXCEL} & date): 77904 DATA SUMMARY .XLS

Individual Work Sheets (within the "Workbook" listed above)
Title: "ATTACHMENT ID" "LOCATION 18 AVERAGE RESULTS"
Title: "DATA SUMMARY"
Title: "TSA RESULTS"
Title: "SMEAR DATA"
Title: "PAINT & MEDIA RESULTS"
"SAMPLE WEIGHT DATA"

Are all equations listed in the report, that were used in spreadsheet software, accurately written within the spreadsheets? ..... (Y) / N

In general terms, list the types of algorithms used (e.g., unit conversion of pCi/g to dpm/100cm^2): MDA, CONC. -> DPM CONVERSIONS, DESCRIPTIVE STATS, LOCAL AREA BKGRDS, CORRECTIONS,
cf. HARDCOPY w/ DIGITAL FILE

Are inputs, as defined in equations referenced above, clearly defined & labeled by parameter? ..... (Y) / N
Inputs (list of): CPM, COUNT TIMES (REAL & BKGRD), SAMPLE WEIGHTS (RAD SCREEN & ISOTOPIC), EFFICIENCIES, CONCEN

Are outputs (results of the calculations) as defined in the equations above, clearly defined and labeled by parameter? ..... (Y) / N
Outputs (list of): MDA, TSA, REMOV. ACTIVITY, SAMPLE ACTIVITIES, MIN, MAX, MEANS

COMMENTS

INDEPENDENT REVIEW
By: R S LUCER / [signature] (SL) / 9.28.99
Print Name / Signature / Verification Date

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ATTACHMENT F
Verification of Survey Design

52

Survey Area: B	Building: 779
Survey Unit (s): 77901	

Post Survey Paint/Media Sample Summary Statistics Calculation Verification Worksheet

Step 1:

Conduct a preliminary data review: (the mean, standard deviation, and median of the 77901 media sample (paint) data are calculated on the "Survey Unit 77901 Data Summary and Approval Sheet." Because all media sample results are less than $DCGL_W$ (less than 100 dpm/100 cm^2 for transuranics and 5000 dpm/100 cm^2 for uranium), the survey unit meets the media sample release criterion.

Step 2:

Select the statistical tests: The one-sample sign test was selected to assess the data, with $\alpha = 0.05$ and $\beta = 0.05$. The number of sample points calculated (see "Media Surface Activity Measurement Calculation Worksheet") was based on the use of this test.

The performance of the sign test was not necessary due to the fact that each individual net result was less than the $DCGL_W$. Thus, the sign test would result in the rejection of the null hypothesis, and conclude that the median concentration of residual radioactivity in the survey unit is less than the $DCGL_W$.

Step 3:

Verify the assumptions of the test: The assumed data variance, as indicated by the assumed standard deviation (see "Media Surface Activity Measurement Calculation Worksheet") was verified by re-calculating the required number of samples with the ACTUAL survey unit standard deviation.

The actual media (paint) sample standard deviation for transuranics for 77901 is: 3.5
The actual media (paint) sample standard deviation for uranium for 77901 is: 12.2

Thus, the ACTUAL required number of samples is as follows:

$\Delta/\delta = (DCGL_{MEDIA} - LBGR_{MEDIA})/ SD_{MEDIA}$

$\Delta/\delta_{transuranics}$ = 17 = (100 dpm/100cm^2 – 40 dpm/100cm^2)/3.5 dpm/100cm^2
$\Delta\delta_{uranium}$ = 246 = (5000 dpm/100cm^2 – 2000 dpm/100cm^2)/12.2 dpm/100cm^2

Where:

Δ/δ	is the relative shift or the resolution of measurements in units of measurement uncertainty
$DCGL_{MEDIA}$	is the media sample derived concentration guideline value (DOE Order 5400.5 total surface contamination limit equals 100 dpm/100cm^2 for transuranics and 5000 dpm/100cm^2 for uranium per the B779 Cluster Radiological Closeout Survey Plan)
$LBGR_{MEDIA}$	is the lower bound of the gray region – the lower bound of the range of values of the parameter of interest in a survey unit where the consequences of making a decision error is relatively minor (set equal to the value utilized in the original sample size calculations).
SD_{MEDIA}	is the ACTUAL standard deviation of the 77901 samples.

Determine the Sign P value by looking up the relative shift (Δ/δ) in Table 5.4 of MARSSIM (the Sign P value is the estimated probability that a random measurement from the survey unit will be less than the DCGL when the survey unit median is actually at the LBGR). The Sign P value from Table 5.4, equals 0.998650 for a relative shift of 3.0 (The actual value approaches one. The highest published value is utilized for conservatism).

Determine the number of media samples for the applicable survey unit using the following MARSSIM, Section 5.5.2.3 formula that is based on Plutonium and Uranium contaminants not being present in the background:

Step 3: Continued

$N = (1.645 + 1.645)^2 / 4(\text{Sign P} - 0.5)^2$

Survey Area: B	Building: 779
Survey Unit (s): 77901	

Post Survey Paint/Media Sample Summary Statistics Calculation Verification Worksheet

$N = (1.645 + 1.645)^2 / 4(0.998650-0.5)^2 = \underline{10.9}$

Where:

1.645 is the alpha and beta decision error value (95% confidence) per the B779 Cluster Radiological Closeout Survey Plan

Sign P equals 0.998650

Step 4: Increase N by 20% to allow for missing or invalid data points per MARSSIM, Section 5.5.2.3.

N = 10.9 * 1.2 = 13

Conclusion: Utilizing a conservative relative shift value of 3.0, a minimum of 13 Media (paint) samples were required in 77901.

Step 4:

Draw conclusions from the data: All sample results are less than $DCGL_W$. The minimum number of required media samples were collected. Thus, survey unit 77901 complies with the media sample release criteria.

[redacted]

9/29/99
Date

9/30/99
Date

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Survey Area: B	Building: 779
Survey Unit (s): 77902	

Post Survey Paint/Media Sample Summary Statistics Calculation Verification Worksheet

Step 1:

Conduct a preliminary data review: (the mean, standard deviation, and median of the 77902 media sample (paint) data are calculated on the "Survey Unit 77902 Data Summary and Approval Sheet." Because all media sample results are less than $DCGL_W$ (less than 100 dpm/100 cm^2 for transuranics and 5000 dpm/100 cm^2 for uranium), the survey unit meets the media sample release criterion.

Step 2:

Select the statistical tests: The one-sample sign test was selected to assess the data, with $\alpha = 0.05$ and $\beta = 0.05$. The number of sample points calculated (see "Media Surface Activity Measurement Calculation Worksheet") was based on the use of this test.

The performance of the sign test was not necessary due to the fact that each individual net result was less than the $DCGL_W$. Thus, the sign test would result in the rejection of the null hypothesis, and conclude that the median concentration of residual radioactivity in the survey unit is less than the $DCGL_W$.

Step 3:

Verify the assumptions of the test: The assumed data variance, as indicated by the assumed standard deviation (see "Media Surface Activity Measurement Calculation Worksheet") was verified by re-calculating the required number of samples with the ACTUAL survey unit standard deviation.

The actual media (paint) sample standard deviation for transuranics for 77902 is: 3.0
The actual media (paint) sample standard deviation for uranium for 77902 is: 18.0

Thus, the ACTUAL required number of samples is as follows:

$\Delta/\delta = (DCGL_{MEDIA} - LBGR_{MEDIA}) / SD_{MEDIA}$

$\Delta/\delta_{transuranics}$ = 20 = (100 dpm/100cm^2 – 40 dpm/100cm^2)/3.0 dpm/100cm^2
$\Delta\delta_{uranium}$ = 167 = (5000 dpm/100cm^2 – 2000 dpm/100cm^2)/18.0 dpm/100cm^2

Where:

Δ/δ is the relative shift or the resolution of measurements in units of measurement uncertainty

$DCGL_{MEDIA}$ is the media sample derived concentration guideline value (DOE Order 5400.5 total surface contamination limit equals 100 dpm/100cm^2 for transuranics and 5000 dpm/100cm^2 for uranium per the B779 Cluster Radiological Closeout Survey Plan)

$LBGR_{MEDIA}$ is the lower bound of the gray region – the lower bound of the range of values of the parameter of interest in a survey unit where the consequences of making a decision error is relatively minor (set equal to the value utilized in the original sample size calculations).

SD_{MEDIA} is the ACTUAL standard deviation of the 77902 samples.

Determine the Sign P value by looking up the relative shift (Δ/δ) in Table 5.4 of MARSSIM (the Sign P value is the estimated probability that a random measurement from the survey unit will be less than the DCGL when the survey unit median is actually at the LBGR). The Sign P value from Table 5.4, equals 0.998650 for a relative shift of 3.0 (The actual value approaches one. The highest published value is utilized for conservatism).

Determine the number of media samples for the applicable survey unit using the following MARSSIM, Section 5.5.2.3 formula that is based on Plutonium and Uranium contaminants not being present in the background:

Step 3: Continued

$N = (1.645 + 1.645)^2 / 4(\text{Sign P} - 0.5)^2$

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Survey Area: B	Building: 779
Survey Unit (s): 77902	

Post Survey Paint/Media Sample Summary Statistics Calculation Verification Worksheet

$N = (1.645 + 1.645)^2 / 4(0.998650-0.5)^2 = \underline{10.9}$

Where:

1.645 is the alpha and beta decision error value (95% confidence) per the B779 Cluster Radiological Closeout Survey Plan

Sign P equals 0.998650

Step 4: Increase N by 20% to allow for missing or invalid data points per MARSSIM, Section 5.5.2.3.

$N = \underline{10.9} \bullet 1.2 = \underline{13}$

Conclusion: Utilizing a conservative relative shift value of 3.0, a minimum of 13 Media (paint) samples were required in 77902.

Step 4:

Draw conclusions from the data: All sample results are less than $DCGL_W$. The minimum number of required media samples were collected. Thus, survey unit 77902 complies with the media sample release criteria.

[redacted]

[redacted]	9/29/99 Date
[redacted]	9/30/99 Date

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Survey Area: B	Building: 779
Survey Unit (s): 77903	

Post Survey Paint/Media Sample Summary Statistics Calculation Verification Worksheet

Step 1:

Conduct a preliminary data review: (the mean, standard deviation, and median of the 77903 media sample (paint) data are calculated on the "Survey Unit 77903 Data Summary and Approval Sheet." Because all media sample results are less than $DCGL_W$ (less than 100 dpm/100 cm^2 for transuranics and 5000 dpm/100 cm^2 for uranium), the survey unit meets the media sample release criterion.

Step 2:

Select the statistical tests: The one-sample sign test was selected to assess the data, with $\alpha = 0.05$ and $\beta = 0.05$. The number of sample points calculated (see "Media Surface Activity Measurement Calculation Worksheet") was based on the use of this test.

The performance of the sign test was not necessary due to the fact that each individual net result was less than the $DCGL_W$. Thus, the sign test would result in the rejection of the null hypothesis, and conclude that the median concentration of residual radioactivity in the survey unit is less than the $DCGL_W$.

Step 3:

Verify the assumptions of the test: The assumed data variance, as indicated by the assumed standard deviation (see "Media Surface Activity Measurement Calculation Worksheet") was verified by re-calculating the required number of samples with the ACTUAL survey unit standard deviation.

The actual media (paint) sample standard deviation for transuranics for 77903 is: 1.9
The actual media (paint) sample standard deviation for uranium for 77903 is: 11.7

Thus, the ACTUAL required number of samples is as follows:

$\Delta/\delta = (DCGL_{MEDIA} - LBGR_{MEDIA})/ SD_{MEDIA}$

$\Delta/\delta_{transuranics}$ = 32 = (100 dpm/100cm^2 – 40 dpm/100cm^2)/1.9 dpm/100cm^2
$\Delta\delta_{uranium}$ = 256 = (5000 dpm/100cm^2 – 2000 dpm/100cm^2)/11.7 dpm/100cm^2

Where:

Δ/δ	is the relative shift or the resolution of measurements in units of measurement uncertainty
$DCGL_{MEDIA}$	is the media sample derived concentration guideline value (DOE Order 5400.5 total surface contamination limit equals 100 dpm/100cm^2 for transuranics and 5000 dpm/100cm^2 for uranium per the B779 Cluster Radiological Closeout Survey Plan)
$LBGR_{MEDIA}$	is the lower bound of the gray region – the lower bound of the range of values of the parameter of interest in a survey unit where the consequences of making a decision error is relatively minor (set equal to the value utilized in the original sample size calculations).
SD_{MEDIA}	is the ACTUAL standard deviation of the 77903 samples.

Determine the Sign P value by looking up the relative shift (Δ/δ) in Table 5.4 of MARSSIM (the Sign P value is the estimated probability that a random measurement from the survey unit will be less than the DCGL when the survey unit median is actually at the LBGR). The Sign P value from Table 5.4, equals 0.998650 for a relative shift of 3.0 (The actual value approaches one. The highest published value is utilized for conservatism).

Determine the number of media samples for the applicable survey unit using the following MARSSIM, Section 5.5.2.3 formula that is based on Plutonium and Uranium contaminants not being present in the background:

Step 3: Continued

$N = (1.645 + 1.645)^2 / 4(\text{Sign P} - 0.5)^2$

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Survey Area: B	Building: 779
Survey Unit (s): 77903	

Post Survey Paint/Media Sample Summary Statistics Calculation Verification Worksheet

$N = (1.645 + 1.645)^2 / 4(0.998650-0.5)^2 = \underline{10.9}$

Where:

1.645 is the alpha and beta decision error value (95% confidence) per the B779 Cluster Radiological Closeout Survey Plan

Sign P equals 0.998650

Step 4: Increase N by 20% to allow for missing or invalid data points per MARSSIM, Section 5.5.2.3.

N = 10.9 * 1.2 = 13

Conclusion: Utilizing a conservative relative shift value of 3.0, a minimum of 13 Media (paint) samples were required in 77903.

Step 4:

Draw conclusions from the data: All sample results are less than $DCGL_W$. The minimum number of required media samples were collected. Thus, survey unit 77903 complies with the media sample release criteria.

[redacted]	9/29/99 Date
	9/29/99 Date

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Survey Area: B	Building: 779
Survey Unit (s): 77904	

Post Survey Paint/Media Sample Summary Statistics Calculation Verification Worksheet

Step 1:

Conduct a preliminary data review: (the mean, standard deviation, and median of the 77904 media sample (paint) data are calculated on the "Survey Unit 77904 Data Summary and Approval Sheet." Because all media sample results are less than $DCGL_W$ (less than 100 dpm/100 cm^2 for transuranics and 5000 dpm/100 cm^2 for uranium), the survey unit meets the media sample release criterion.

Step 2:

Select the statistical tests: The one-sample sign test was selected to assess the data, with $\alpha = 0.05$ and $\beta = 0.05$. The number of sample points calculated (see "Media Surface Activity Measurement Calculation Worksheet") was based on the use of this test.

The performance of the sign test was not necessary due to the fact that each individual net result was less than the $DCGL_W$. Thus, the sign test would result in the rejection of the null hypothesis, and conclude that the median concentration of residual radioactivity in the survey unit is less than the $DCGL_W$.

Step 3:

Verify the assumptions of the test: The assumed data variance, as indicated by the assumed standard deviation (see "Media Surface Activity Measurement Calculation Worksheet") was verified by re-calculating the required number of samples with the ACTUAL survey unit standard deviation.

The actual media (paint) sample standard deviation for transuranics for 77904 is: 24.9
The actual media (paint) sample standard deviation for uranium for 77904 is: 42.7

Thus, the ACTUAL required number of samples is as follows:

$\Delta/\delta = (DCGL_{MEDIA} - LBGR_{MEDIA})/ SD_{MEDIA}$

$\Delta/\delta_{transuranics}$ = 2.4 = (100 dpm/100cm^2 – 40 dpm/100cm^2)/24.9 dpm/100cm^2
$\Delta\delta_{uranium}$ = 70 = (5000 dpm/100cm^2 – 2000 dpm/100cm^2)/42.7 dpm/100cm^2

Where:

Δ/δ is the relative shift or the resolution of measurements in units of measurement uncertainty

$DCGL_{MEDIA}$ is the media sample derived concentration guideline value (DOE Order 5400.5 total surface contamination limit equals 100 dpm/100cm^2 for transuranics and 5000 dpm/100cm^2 for uranium per the B779 Cluster Radiological Closeout Survey Plan)

$LBGR_{MEDIA}$ is the lower bound of the gray region – the lower bound of the range of values of the parameter of interest in a survey unit where the consequences of making a decision error is relatively minor (set equal to the value utilized in the original sample size calculations).

SD_{MEDIA} is the ACTUAL standard deviation of the 77904 samples.

Determine the Sign P value by looking up the relative shift (Δ/δ) in Table 5.4 of MARSSIM (the Sign P value is the estimated probability that a random measurement from the survey unit will be less than the DCGL when the survey unit median is actually at the LBGR). The Sign P value from Table 5.4, equals 0.977250 for a relative shift of 2.0 (selected due to the fact that a relative shift for 2.4 is not available in table - for conservatism). Note that a separate test for uranium values is not performed because the relative shift is greater than 3.0. Thus, the plutonium data will result in the most number of samples.

Determine the number of media samples for the applicable survey unit using the following MARSSIM, Section 5.5.2.3 formula that is based on Plutonium and Uranium contaminants not being present in the background:

Step 3: Continued

Survey Area: B	Building: 779
Survey Unit (s): 77904	

Post Survey Paint/Media Sample Summary Statistics Calculation Verification Worksheet

$N = (1.645 + 1.645)^2 / 4(\text{Sign P} - 0.5)^2$

$N = (1.645 + 1.645)^2 / 4(0.977250-0.5)^2 = \underline{11.9}$

Where:

1.645 is the alpha and beta decision error value (95% confidence) per the B779 Cluster Radiological Closeout Survey Plan

Sign P equals 0.977250

Step 4: Increase N by 20% to allow for missing or invalid data points per MARSSIM, Section 5.5.2.3.

N = 11.9 * 1.2 = 14.28

Conclusion: Utilizing a conservative relative shift value of 2.0, a minimum of 15 Media (paint) samples were required in 77904.

Step 4:

Draw conclusions from the data: All sample results are less than $DCGL_W$. The minimum number of required media samples were collected. Thus, survey unit 77904 complies with the media sample release criteria.

[redacted]	9/30/99 Date
	9/30/99 Date

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ATTACHMENT H
Data Quality Assessment

DATA QUALITY ASSESSMENT

1.0 INTRODUCTION

Data used in making management decisions for waste management remedial actions must be of adequate quality to support the decisions. Adequate data quality for decision-making is required by applicable RMRS and K-H corporate policies (RMRS, 1998, §6.4 and K-H, 1997, §7.1.4 and 7.2.2), as well as by the customer (DOE, RFFO; Order O 414.1, Quality Assurance, §4.b.(2)(b)). Regulators and the public also expect decisions and data that are technically and legally defensible. Verification and validation of the data ensure that data used in decisions resulting from the FSS are usable and defensible.

Verification and validation (V&V) of this Closeout Radiological Survey Report (CRSR) are the primary components of the DQA. V&V constitutes the cornerstone of the DQA because statistical tests and background determinations relative to decision-making for radiological survey units were not implemented nor required per the approved CRSP for the 779 Cluster. Instead, measurement results were compared, on a one-to-one basis, with free-release criteria given in DOE Order 5400.5. The FSS results could, theoretically, be used to conduct Sign Tests for decisions, but because all individual measurements were less than the $DCGL_W$, the survey units meet release criteria without further data reduction. The DQA presented in this Attachment supports conclusions in the report through implementation of the guidelines taken from the following MARSSIM sections:

- §4.9, Quality Control
- §8.2, Data Quality Assessment
- §9.0, Quality Assurance & Quality Control
- Appendix E, Assessment Phase of the Data Life Cycle
- Appendix N, Data Validation using Data Descriptors

The MARSSIM-recommended criteria for V&V of final status survey data, listed above, are concisely summarized in Table H-2. The MARRSIM criteria are listed across the top of the table whereas the project's proof of implementation is listed along the left-hand side of the page. Note that 1 or more "checks" *per column* exhibit compliance with the MARSSIM criteria, which are listed per column.

2.0 VERIFICATION OF RESULTS

Verification ensures that data produced and used by the project are documented and traceable per quality requirements. Verification consisted of reviewing the project's data relative to three subsets: 1) radiological scans with the SCM/SIMS, 2) static surveys for removable and total contamination, and 3) radiochemical data resulting from samples taken and subsequently analyzed via alpha spectrometry. Verification confirmed that

- Chain-of-Custody was intact from initial sampling though transport and final analysis;
- preservation and hold-times were within tolerance
- format and content of the data are clearly presented relative to goals of the project, i.e., to determine, with at least 95% confidence, that the survey units of interest (Building 779 B Annex) are adequate for radiological free release.

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Verification of the Building 779 B Annex FSS data also confirmed quality records representing implementation of the following quality controls:

- calibrations (radiochemistry & surveys), for accuracy
- laboratory control samples (LCS -- radiochemistry), for accuracy
- blanks (radiochemistry), for accuracy
- duplicate measurements (radiochemistry & surveys), for precision
- chemical yield (radiochemistry), for accuracy
- count times (radiochemistry & surveys), for sensitivity
- sample preparations (radiochemistry), for accuracy, representativeness

SCM data were systematically managed and verified as follows:

- A survey summary sheet was generated for each survey unit.
- The survey summary sheet was developed from the Batch Table functions in the SIMS software. The Batch Table will list whether any flagged values exist in a survey.
- The presence of a flagged value determines whether an investigation was needed for the survey. This status determines the location of the survey information in the electronic database as well as the file cabinet.
- Thus, the presence of electronic and paper files can be correlated to the Batch Table as an ongoing file system accounting method.
- The survey summary sheet, ordered by survey unit, is maintained at the front of the electronic database file structure as well as in the file cabinet.

Areas requiring 100% survey coverage were verified as follows:

- An overview map was developed for each survey unit.
- The overview map served as an index of the subunits, and defined the subunit boundaries.
- Every survey map used to document Electra as well as SCM scan surveys was reviewed against the overview map for coverage.
- Because every survey map was correlated to a survey form, and all survey forms were inventoried via the survey summary sheet, 100% coverage of every subunit was assured.

Areas requiring 10% survey coverage were verified as follows:

- The area covered by the survey was summed for each subunit that required 10% coverage.
- The subunit size was electronically calculated in Turbocad using scaled maps.
- The sum of all subunits in the survey unit that require 10% coverage was summed.
- The area surveyed was divided by the sum of the 10% subunit size to determine the percent surveyed.

Upon completion of the data management activities listed above, an independent peer review was performed on each surveys package.

In summary, the verification confirmed that documentation and quality records are intact for the project, which in turn corroborates implementation of the required technical quality controls and administrative requirements, particularly verification of those documents and records that will ultimately support the CERCLA Administrative Record. All relevant Quality records associated with the Building 779 B Annex D&D final status survey decisions will be submitted to the RMRS Records Center for permanent storage within 30 days of the conclusion of the 779 project.

3.0 VALIDATION OF RESULTS

Validation consists of a technical review of all data that directly support the FSS decisions, so that any limitations of the data relative to project goals are delineated, and the associated data are qualified (caveated) accordingly. Data were validated relative to

1) the DQOs of the project as defined in the CRSP for the 779 Cluster (i.e., did the final data achieve the initial DQOs of the project?), and

2) quality criteria discussed throughout various sections in the MARSSIM (sections noted previously).

MARSSIM criteria for the broad topic of "data quality assessment" used in final status surveys generally falls within the generic categories of quality assurance, quality control, data validation, and data assessment (including verification and validation). Table H-2 provides a "crosswalk" that lists the primary MARSSIM sections and generic data quality criteria (at top) and their corresponding implementation via the CRSP, CRSR, and project files.

All of the significant MARSSIM criteria listed in Table H-2 are summarily discussed within the "PARCC Parameters" section. PARCC parameters are congruent with "data descriptors" in the MARSSIM parlance and address characteristics of the data that must be defined for scientific integrity and defensibility. Recall that at least one "X" in each column of the table constitutes achievement of the MARSSIM quality objective (vs. one "X" in each row). The next section, which addresses the PARCC parameters -- Precision, Accuracy, Representativeness, Comparability, and Completeness, will also include discussion on bias and sensitivity, two more data descriptors emphasized in MARSSIM.

Validation of data to K-H contractual requirements (K-H Statements of Work) is currently performed on a site-wide basis at ~25% frequency by the K-H Analytical Services Division. Satisfactory validation at this frequency indicates that subcontracted labs are operating competently relative to industry-wide standards, and more specifically, that sample custody and analytical procedures are implemented under defined quality controls on a sitewide programmatic basis. Sitewide data validation coupled with annual lab audits provides the inference that all analytical and radiochemical results not *specifically* validated, are represented by the percentage that is validated. Radiochemistry performed for this FSS was verified as meeting K-H contractual requirements -- Module RC01-B.3 for alpha spectrometry (4/24/98 and Module 9, 7/6/98).

PARCC PARAMETERS

PRECISION

Fundamental reproducibility of measurements, at levels near MDA and between different types/brands of instruments, are discussed at length in the "B779 Final Status Survey Meeting Resolution of CDPHE/EPA/IVC Comments, 6/30/99", which is included as Appendix 5 to the *Closeout Radiological Survey Report for Building 729.*

1) Radiological Surveys

Precision of the radiological instrumentation was satisfactory based on tolerance charting of daily source measurements for each individual sensor used on the project, which includes all measurement types (scans and static measures for total contamination, swipes for removable). Adequate precision was established through instrument performance within a ±20% range as defined by measurement results compared to a standard source value. Based on standard protocol (*Radiological Safety Practices*) any measurement exceeding the defined tolerance limits required corrective action (repair or replacement) prior to the instrument's use in final survey.

For the SCM, three (3) measurements were taken for each QC check "episode", i.e., before and after each set of measurements per work shift (Millennium QAP, 3/99). Of the 3 measurements, 2 measurements had to pass specifications. Performance checks performed on the SCM are shown in the respective control charts (Attachment H).

Duplicate measurements were acquired total surface activity measurements at ≥5% frequency per survey unit. All duplicate measurements were within tolerance based on the acceptance criterion that both results be below $DCGL_W$ (note that, even if populations were "significantly" different between real and duplicate results, if both duplicate and real population statistics are less than action levels, the difference between duplicate and real values is, ultimately, insignificant relative to free-release decisions).

2) Radiochemistry

Results from laboratory duplicates indicate adequate reproducibility based on duplicate results within statistical tolerance values (>90% confidence of equivalency between the original sample and the duplicate). Although blind duplicate samples were not acquired for determination of overall project precision, agreement between the multiple samples to within a range less than the $DCGL_W$ indicate that reproducibility is adequate for project decisions (i.e., relative to free-release of materials).

ACCURACY (and Bias)

1) Radiological Surveys

Accuracy of all radiological surveys is satisfactory based on implementation of protocols covering calibrations (at least annual) and periodic checks (at least daily). All instrumentation except the SCM/SIMS is controlled through (RFETS) site-specific procedures (e.g., RSPs), whereas the SCM/SIMS is controlled through the subcontractor's (Millennium Services Inc.) QAP and associated SOPs. Calibration and calibration check results were within the RFETS and industry-standard requirement of 20% of the applicable reference standard values. Full-scale, multi-point calibrations provided accuracies of ± 10% prior to use of hand-held survey instruments in the project, consistent with guidelines put forth in ANSI-N323. All protocols that control instrumentation accuracy are included in the reference section, and may be referenced through the site document control system (site documents) or in the 779 Project File (Millennium QAP).

Distance measurements recorded by the SCM/SIMS are within 3% of actual distances for mapping and location purposes, as documented in the "Incremental Encoder Calibration Verification Data Sheet."

Some bias may be indicated within control charts of the SCM (Attachment G), with runs of data below or above the reference standard value. However, given the overall low values of the data sets relative to the free-release criteria and the low probability of false negatives, the potential biases do not impact the ultimate project decisions of compliance with free-release criteria for the 4 survey units of interest for B Annex. Potential low biases in recount results – where recounts were performed with a hand-held instruments (Electra) following elevated counts (above action- or investigative-levels) by the SCM – have been concluded as insignificant, primarily based on the higher sensitivities of the hand-held instrumentation, where lower values would be expected if contamination was, in fact, absent. Comparability of these instruments, their results, and the role of measurement uncertainties in evaluating bias were have been addressed in related documentation (Appendix 5 of the Building 729 Closeout Report).

2) Radiochemistry

Accuracies of radiochemical results were within tolerance and acceptable based on the associated results of LCS and calibrations at the lab. Preparation blanks also confirmed that no significant cross-contamination occurred in the analysis process. Uncertainties of the radiochemical results are quantified for each sample by both 2-sigma error (probabilistic) and Total error (systematic + probabilistic). Uncertainties associated with the alpha-spec analyses were within standard industry magnitudes and did not adversely impact project decisions.

REPRESENTATIVENESS

Samples and surveys are representative based on the following criteria:

- familiarity with facilities -- multiple walk-downs and collaborations by management and technical staff;
- implementation of industry-standard Chain-of-Custody protocols;
- compliance with sample preservation and hold times;
- documented and (site) approved methods:
- radiochemistry - alpha spectrometry via K-H Module RC01-B.3 (4/24/98)
- radiological surveys - K-H RSP 7.02
- compliance with the CRSP (RMRS, March 1999) -- reviewed & approved by technical and management consensus prior to implementation

COMPLETENESS

The data set for this project is complete, with respect to both samples acquired and associated quality records ("data packages") resulting from the characterization process. Table H-1 summarizes the minimum required number of samples or surveys, the actual quantity of samples or surveys to date, and whether DQO's were achieved.

Table H-1 Data Completeness Summary

Rad Measurement Type	Required # of Samples/ Surveys (1)	Actual # of Samples/ Surveys	Comments
Survey Unit 77901			
Shonka: SCM/SIMS (total)	100% areal coverage[2]	100% areal coverage[2]	DQO achieved
NE Electra (total)	13	25	DQO achieved
Eberline SAC-4 (removable)	13	25	DQO achieved
Radiochemical	13	23	DQO achieved
Survey Unit 77902			

Shonka: SCM/SIMS (total)	100% areal coverage[2]	100% areal coverage[2]	DQO achieved
NE Electra (total)	13	20	DQO achieved
Eberline SAC-4 (removable)	13	19	DQO achieved
Radiochemical	13	18	DQO achieved
Survey Unit 77903			
Shonka: SCM/SIMS (total)	>10% areal coverage[2]	>>10% areal coverage[2]	DQO achieved
NE Electra (total)	13	17	DQO achieved
Eberline SAC-4 (removable)	13	17	DQO achieved
Radiochemical	13	17	DQO achieved
Survey Unit 77904			
Shonka: SCM/SIMS (total)	>10% areal coverage[2]	>>10% areal coverage[2]	DQO achieved
NE Electra (total)	13	24	DQO achieved
Eberline SAC-4 removable)	13	24	DQO achieved
Radiochemical	13	22	DQO achieved

(1) see "Summary Statistics Calculation Verification Worksheets." - Attachment F.
(2) MARSSIM guidelines are 10% to 100% for Class 2 units; Radiological Engineering professional judgement (stated in the CRSP) yielded ~100% coverage for floors and walls to 2m height; 10% of remaining room surface areas.

Consistent with EPA's G-4 DQO process, the sampling design was optimized through back-calculating actual measurement results (acquired during final status survey) and comparing model output with original estimates. Use of actual sample/survey (result) variances in MARSSIM's DQO model provided confirmation that an adequate number of samples/surveys had been acquired. Inputs required for decision-making, as stated in the original (planning) DQOs, were acquired, including coverage of originally-planned 3-dimensional boundaries of the structure. All radiological results are valid without qualification, and form data sets with adequate quantities and quality of data for free-release decisions on the four survey units of interest.

COMPARABILITY

All results presented are comparable with radiological survey and radiochemistry data on a site- and DOE-complex wide basis. This comparability is based on:

- use of standardized engineering units in the reporting of measurement results
- consistent sensitivities of measurements at approximately 50% or less of the $DCGL_W$ (approximately 50% or less of the $DCGL_{EMC}$ for scans)
- use of site-approved procedures (RSPs)
- systematic quality controls
- thorough documentation of the planning, sampling/analysis process, and data reduction into formats designed for making decisions posed from the project's original data quality objectives.

SENSITIVITY

Adequate sensitivities, in units of dpm/100 cm^2 were attained for all surveys and radiochemical methods implemented based on MDAs at 50% of the transuranic $DCGL_W$ ($\leq$ 50% $DCGL_{EMC}$ for scans). The nominal MDAs for each survey and radiochemical method are summarized as follows:

- SCM/SIMS - scan surveys/total contamination: <225 dpm/100cm^2 w/ >90% confidence (relative to false negative) and <275 dpm/100cm^2 w/ >95% confidence (relative to false negatives)

- Surveys (Eberline SAC-4) - removable contamination: 10 dpm/100cm^2
- Surveys (NE Electra) - total contamination: 50 dpm/100cm^2
- Radiochemistry (alpha spec) - total contamination: <10 dpm/100cm^2

In summary, the data presented in this report have been verified and are qualified as valid and complete for comparison with free-release criteria (action levels) as stated in the original DQOs. All media sampled and surveyed, relative to both total and removable alpha activities, yielded results less than action levels for the associated contaminants of concern. Therefore, the Survey Units in question meet the free-release criteria with the confidences stated in this section and throughout the report.

4.0 OTHER QA ELEMENTS

Adequate implementation of the ten quality elements required by DOE Quality Assurance Order (414.1) was corroborated through the verification and validation process described above. The ten DOE quality elements, or criteria, are inherent within the MARSSIM guidance, as DOE was a co-authoring organization to the MARSSIM. Quality elements deserving emphasis include qualifications of project personnel and additional controls in the areas of engineering design and computer software.

All personnel performing quality-affecting activities within the FSS project were qualified to perform their specific tasks. Suitable **training and qualification** documentation for personnel performing the work, from the laborers to technical professionals to management, is documented in several ways. T&Q status for personnel is included in the *Building 779 Cluster Closure Project Health & Safety Plan* (Rev. 6, 18 August 1998) and personnel dossiers controlled by company-specific Human Resource departments.

Software quality control for the SCM/SIMS is chronologically documented and archived within the QA/QC folder (for Millennium Services) of the Project File. Software used to reduce data from radiochemical sampling and hand-held instrumentation was modified to record verifications and any alterations to calculations following V&V of the calculations. Details of the verification process were also improved through use of a checklist, which was completed and filed with each survey package.

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Two (2) **QA (independent) assessments** were performed on the Building 779 D&D Project prior to composition of the B Annex Closeout Radiological Survey Report. Surveillance RMRS-99-0167 focused on records management while Surveillance RMRS-99-0139 addressed data quality of the Building 729 final status survey. Both surveillances incorporated review of data and records relative to quality requirements. No deficiencies were identified for the Building 729 DQA, though several potential improvements were noted based on the independent verification performed by MacTec. The records surveillance noted deficiencies in limited aspects of data traceability, but corrections (to data forms) were in progress at the time of this report. Additionally, control of new data forms designed for the project by Millennium was not fully implemented, but revisions to the Millennium QA Plan should correct the deficiency prior to the next Closeout Survey Report issued for the 779 Cluster.

Table H-2. Building 779, Annex B, Compliance with MARSSIM Data Quality Guidance

Bldg 779 Final Status Survey Report -- Annex B - Survey Units 77901, 77902, 77903, 77904	MARSSIM sec 4.9	QAPP	SOPs	Training & Quals (personnel)	calibrations	QC Samples	sample quantities (adequacy of)	precision	MARSSIM sec 8.2	Reviews - DQOs & Sampling Design	"prelim" data review	graphical data review	statistical tests & assumptions[1]	conclusions	MARSSIM sec 9.0	Reports (to decision makers)	site description	analytical methods & MDA/MDC	backgroud radiation	measurement results	Chain-of-Custody	SOPs	Quality records	results by geographic location	defined level of data review	data quality indicators (PARCCS)	QC measurements	MARSSIM Appdx E (DQA)	review DQOs & survey design	select statistical test	verify assumptions (statistics)	draw conclusions	MARSSIM Appdx N	raw data; original data forms	QA assessments/NCRs/CARs	data reduction/calculations	method validation	historical data
Inventory of Project Files/Report Contents		X	X	X	X	X	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X	X		X			X		X	X	X	X	X
Closeout Radiological Survey Report																X	X						X									X						
Executive Summary												X		X		X				X						X						X						
sec 3.0 DCGLs											X							X											X									
sec 4.0 Background																			X																			
sec 5.0 QA/QC																										X	X											
sec 7.0 Survey Results											X					X								X			X		X					X				
Attachments (Maps, data summaries)																								X														
Attachment, Data Quality Assessment						X	X			X		X		X												X			X			X				X		
Project Files		X		X																															X		X	
SCM/SIMS DATA (by Survey Unit)																X																				X		
SCM Survey Forms						X														X			X															
Investigation Flagging Forms						X														X			X															
Survey Maps						X														X			X	X														
Overlay Maps						X														X			X	X														
SURVEY PACKAGES (by Survey Unit)			X			X	X			X						X					X		X														X	
Summary Package Cover Sheets																				X			X															
(MARSSIM) Measurement Calculation Worksheets						X													X				X														X	
Sampling & Survey Instructions			X																				X															
Total Surface Activity Data Sheets						X													X				X											X				
Removable Contamination Sheets																			X				X															
Smear/Sample Tracking Data Sheets																							X											X				
Instrument Data Sheets																			X				X															
Survey Signature Sheets											X	X											X		X													
Survey Maps												X											X	X														
(MARSSIM) Calc/Verification worksheets						X																	X													X		
Random Start Data Sheets																							X															
Lab Results						X												X		X			X											X				
Chain-of-Custody						X															X		X											X				
Survey Unit Data Summary						X						X								X			X	X												X		
QA/QC																		X					X															
Calibrations & Reference (Source) Standards				X																			X															
Sensitivity (MDC) determinations & DCGLs																							X															
Periodic Performance Checks				X																			X				X							X				
DOCUMENT REVIEWS/COMMENT RESOLUTION										X		X											X		X				X									

[1]grey boxes/areas are not applicable, based on consensus approval of the CRSP, which notes exceptions to MARSSIM statistical applications in decision-making.

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