NEUTRON PRODUCTS Inc

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April 13, 2007 K-4

RECEIVED
REGION 1
2007 APR 16 PM 12: 26

Mr. Steven Courtemanche
Mail Control # 138394
U. S. Nuclear Regulatory Commission
Region I
Licensing Section
475 Allendale Road
King of Prussia, Pennsylvania 19406-1415

04009007

Re: SUB-1551, Request for Priority Handling

Dear Mr. Courtemanche:

We have completed the relocation of all licensed material on the above referenced license from 416 North Fairfax Blvd., Ranson, West Virginia 25438 to 300 North Preston Street, Ranson, West Virginia 25438. A double verification, accounting procedure was used and documented for the transfer of all licensed material.

After the completion of relocating all unregulated materials and equipment, we cleaned and subsequently performed the enclosed final status survey at the 416 North Fairfax Blvd. site which included:

- a gamma survey using a Bicron microrem survey meter,
- a scan of accessible floor and wall areas with a large gas proportional beta detector and,
- randomized sampling based on MARSSIM principles, also with the gas proportional beta detector

We are requesting that the Commission upon review of the information submitted, amend SUB-1551 to remove the 416 North Fairfax Blvd., Ranson, West Virginia 25438 site as a storage facility for Neutron Products, Inc. and release that site for unrestricted occupancy by others.

140400

NMSS/RGN1 MATERIALS-002

NEUTRON PRODUCTS inc

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We are asking for priority handling of this request because the landlord at the 416 North Fairfax Blvd. site has a new tenant for that location and would like to lease the space to them as soon as possible. Any questions or requests for additional information can be addressed to me, or to Jeffrey Williams RSO at our Dickerson, Maryland facility. He can be reached at 301 349-5001 or at neutronprod@erols.com. I can be reached at 304 725-7041 or through the Dickerson switchboard.

Thank you for your attention in this matter.

Sincerely,

NEUTRON PRODUCTS, INC.

Jerry L. Fogle
RSO, SUB-1551

cc: Jeffrey Williams

FINAL STATUS SURVEY

Neutron Products, Inc.
Facility at
416 North Fairfax Boulevard
Building No. 8
Ranson, West Virginia 25438

SUB-1551

April 17, 2007

Conducted by:
J. Fogle
L. Forrest
J. Williams

FINAL STATUS SURVEY

Neutron Products, Inc.
416 North Fairfax Boulevard
Ranson, West Virginia
SUB-1551

Background

Neutron Products, Inc. headquartered at Dickerson, Maryland is, in part, engaged in the business of servicing, repairing, removing, fueling, and remanufacturing cobalt-60 teletherapy units for worldwide markets. Teletherapy unit remanufacturing and warehousing of spare parts had been housed since June 1992 at the referenced address in Ranson, West Virginia, a leased facility. Integral to these operations is the storage of articles made in whole or in part of depleted uranium (DU). DU has excellent gamma radiation shielding properties because of its high density and atomic number, and is thus used extensively in teletherapy machines, both as a primary shielding material and for parts such as trimmer bars, and beam definers. DU used in teletherapy is in metallic form and is either encapsulated in other metals or otherwise sealed. The receipt, storage, and transfer of teletherapy articles containing DU is authorized under Nuclear Regulatory Commission License SUB-1551, first issued in 1992 and subsequently renewed and amended in 2002. Pursuant to condition 14 the chemical, physical, or metallurgical treatment or processing of DU is not authorized and has not been performed at the Ranson site.

In 2006, the building which Neutron occupies was sold to a new owner, who had originally agreed to continue our rental arrangement, only requiring that we relinquish about 3000 ft^2 of our existing leased space to a new (unlicensed) occupant. A request for a license amendment and a final status survey of the affected area in support of the request was submitted April 10, 2006. The amendment was granted on April 17, 2006.

Subsequently, Neutron and the owner failed to negotiate a satisfactory lease agreement which necessitated a relocation to a facility located nearby at 300 N. Preston St. in Ranson. A request for a licence amendment authorizing the new address for storage of depleted uranium was submitted on September 8, 2006. Amendment #5 was issued on October 6, 2006.

Historical Site Assessment

Structure

Figure 1 shows a plan view of the N. Fairfax Blvd. building. The facility consists of four warehouse areas, designated A through D, and a office/workshop area. Warehouse A was previously decommissioned in 2006. An adjoining, but separate, structure lies north of warehouse A and shares a common wall. This area along with warehouse A are now occupied by the current owner.

Warehouse B is about 2,540 ft^2 (236 m^2) with a 16 ft ceiling and contains a small restroom in the northwest corner. Warehouse C is about 3000 ft^2 (279 m^2) including a small parts room in the southeast corner. Warehouse D is also about 3000 ft^2, and like warehouse B has a 14 ft ceiling. The workshop/office area is about 2220 ft^2 (206 m^2) and is divided into several rooms including the workshop, two offices, a rest room, and a storeroom.

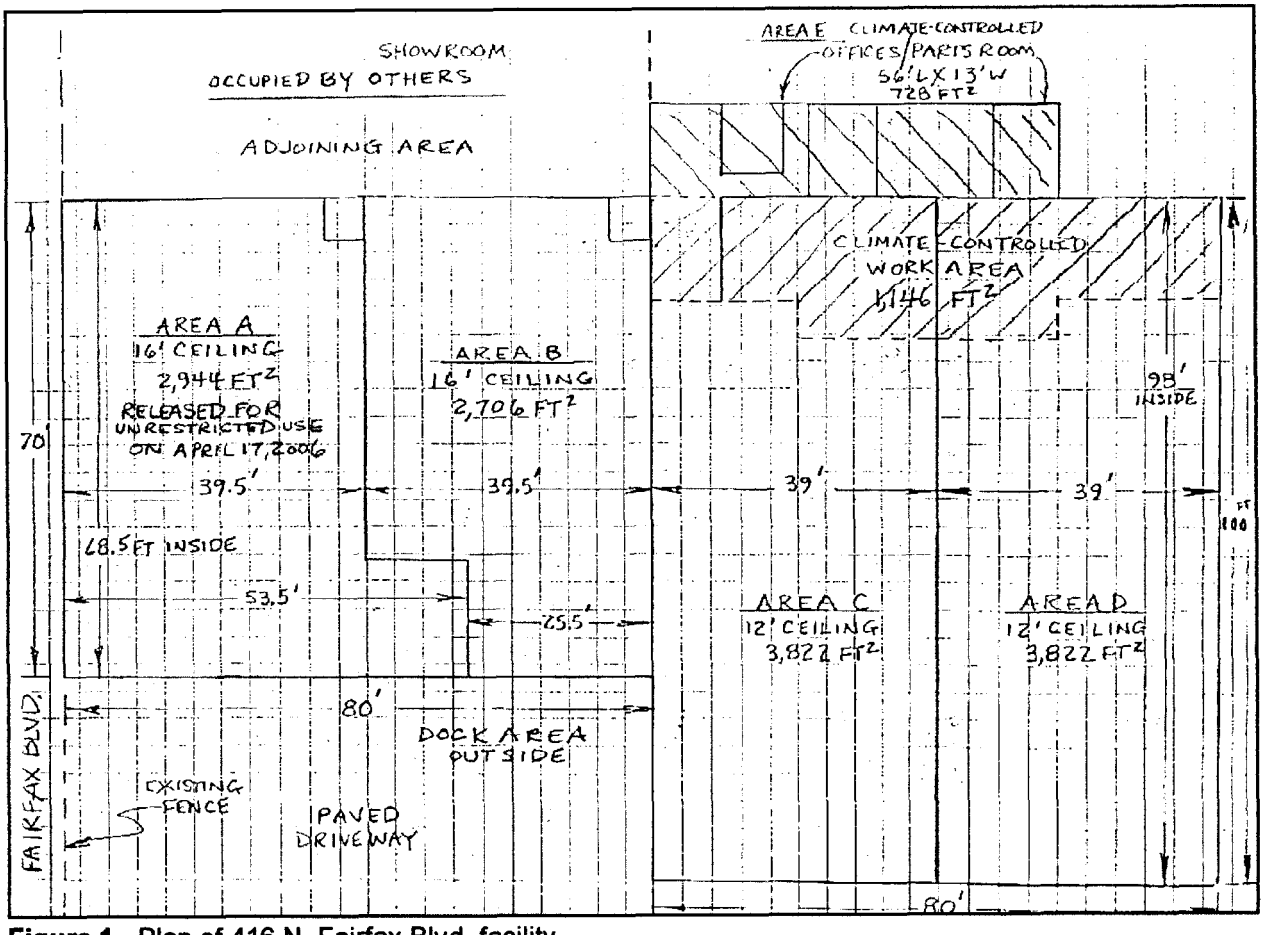

Figure 1 - Plan of 416 N. Fairfax Blvd. facility

The facility is constructed of concrete block external walls, with poured concrete floors and steel truss roofs. Original internal walls are either concrete block or plywood partitions. The workshop is separated from the warehouse areas by a drywall partition installed by Neutron in 1996. The site is surrounded by a chain-link fence and for the most part is paved.

Previous Licensed Use

The Ranson facility housed Neutron's teletherapy operations which included teletherapy unit remanufacturing, parts warehousing and supply, and the service department's offices. Teletherapy field service along with source replacement and removal are authorized under State of Maryland Radioactive Materials License MD-31-025-03. Cobalt-60 sources were not manufactured, stored, used, or installed at the facility.

Teletherapy units frequently make use of depleted uranium. DU has the highest linear absorption coefficient for gamma photons of any readily available material. For this reason it is used as a superior shielding material, despite its radioactivity. DU is used to augment lead as shielding in

teletherapy heads; for collimator trimmer bars and primary beam definers, and as shielding in source wheels and drawers.

SUB-1551 licenses Neutron to receive and store up to 20,000 kg of DU at Ranson, and to transfer DU to authorized licensees. As noted, DU was never processed, treated, or removed from its encapsulation or sealant. No accidental releases are known to have occurred. Therefore, it was concluded to a high degree of probability that the facility remained uncontaminated.

Prior Radiological Assessments

SUB-1551 requires that random wipe tests for removable contamination be conducted on a semi-annual schedule. In fourteen years of operation, no contamination has been detected.

In order to return warehouse A to unrestricted use, a final status survey of that area was conducted in March of 2006. The survey included a gamma dose mapping, *in situ* gas proportional beta sampling of floors and walls in accordance with MARSSIM guidelines for Class 3 areas, and gas proportional beta scanning of 100% of floor space and all walls to an 8 foot elevation.

The beta sampling procedure allowed a MDC of 12 dpm/100 cm^2 at the 95% confidence level, which was about 5% of the $DCGL_w$ used for the survey. The beta scanning procedure allowed a MDCR of 17.1 cps and a Scan MDC of 10 cps. Under these conditions any activity exceeding 67% of the $DCGL_w$ of 220 dpm/100 cm^2 would have been detected with a high degree of confidence. Sampling and scans detected no activity which was distinguishable from the naturally occurring background.

The results of the final status survey substantiated the classification of warehouse A as Class 3, that is, an impacted area not expected to contain any residual activity, or at most residual activity not exceeding a small fraction of the $DCGL_w$.

Disposition of Licensed Materials

All licensed materials were shipped to and received at the new address between January 18 and March 7, 2007. Internal procedures mandated the maintenance of separate shipping and receiving logs. Logs required the initials of two employees verifying the shipment or receipt of any item or package containing DU. At least one of employees verifying receipt of any item had to differ from those verifying shipment. Shipment logs and manifests were cross-checked against current inventory records by Mr. Fogle to assure that all licensed DU was shipped and received. An independent audit of the records conducted by Mr. Williams corroborated that all inventoried DU was delivered to the new address.

An inspection of the N. Fairfax Blvd. facility by Mr. Williams conducted on March 26, 2007 confirmed that the facility was essentially empty and all DU had been removed. Figures 2 through 7 show the various areas of the facility on that date.

Decontamination Measures

Although the possibility of any DU or cobalt-60 contamination was considered highly improbable based on operating history and prior radiological assessments, a thorough cleaning of the facility was considered prudent. The floors were swept clean and washed with an industrial floor washer.

A drum containing wash water from the floor scrubber was surveyed with the Bicron micro rem gamma survey meter and was background on contact. Additionally, the wash water was sampled and counted with a Ludlum 2200 scaler. No activity was detected. No additional decontamination measures were employed or deemed necessary.

Instrumentation and Methods

Direct gamma radiation measurements were conducted using the Bicron micro rem™ radiation survey meter. As its name implies, this instrument is sensitive to dose rates in the µrem/hr range. The meter was last calibrated on December 29, 2006 by AM Calibration Services of Gaithersburg, Maryland.

Uranium-238, the principal component of DU, is in equilibrium with its first two progeny, thorium-234 (half-life, 24.1 days) and protactinium-234m (half-life, 1.17 minutes). Both are beta emitters. U_{238} was measured indirectly by detecting the betas from its daughters. *In situ* sampling and scanning were conducted using a large Helgeson Scientific Services gas proportional detector (HSS 1220) with an Eberline E-600 operating on the beta plateau (HV=1850 V). The detector has a working surface area of 19½" x 12" (1470 cm^2). With the E-600 set to ratemeter or peakhold mode this instrument was used for scanning. Using the E-600 in integrate mode it was used for sampling. Figure 7 shows the equipment.

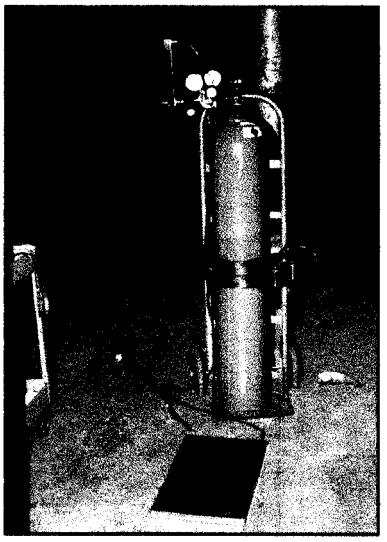

Figure 7 - Gas proportional β counter

Calibration on March 26, 2007 with a 3 nCi (based on U_{238}) DU source gave an efficiency of 0.291 ncpm/dpm. The MDCR for a 10 minute background count and a 5 minute sample count was 55 ncpm at the 95% confidence level. This corresponds to an MDC of 12.9 dpm/100 cm^2.

Prior to the final status survey, a chi-square test was conducted on the instrument with twenty 1-minute counts using a thorium gas mantle as a source. The resulting value for χ^2 was 15.6 which lies within the satisfactory range, p = 0.744. See Appendix 1 for complete chi-square data.

For *in situ* sampling the E-600 was operated in the integrate mode and the count was timed with a NIST traceable stopwatch.[1] The procedure used for sampling is given in Appendix 2.

For floor and wall scanning the E-600 was operated as a ratemeter or in the peak hold[2] mode with the display set in units of cps. The detector was moved in the direction of its longer dimension at an approximate rate of 0.5 ft/s which allows for an observation interval of about 3 seconds. A 3 second time constant was used to average the rate to avoid spurious high spikes. Under these conditions, assuming a surveyor efficiency of 0.5, an instrument efficiency of 0.3, and a surface efficiency of 0.54, the MDCR for 0.95 true positive proportion and a 0.60 false positive proportion is 17.1 cps and the Scan MDC is 10 cps. An investigation limit of 35 gcps (13 ncps) which corresponds to 147 dpm/100 cm^2 was chosen. The procedure used for floor and wall scans is given in Appendix 3.

Survey Planning and Design

As with the previous final status survey for warehouse A and based on the site assessment, the entire remaining area was characterized in accordance with the *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM) as Class 3, which allows for unlimited survey unit areas. However, the various materials of construction (concrete floor, concrete block walls, plywood walls, and drywall) required separate treatment.

Both the concrete floor and block walls were known from the previous survey to contain beta emitters in the background. The Wilcoxon Rank Sum test is thus the appropriate statistical test as recommended in MARSSIM. For the warehouse A final status survey, the adjoining, but separated, structure to the north, assumed to be unimpacted, was used as a reference area for concrete floors and walls. To all appearances, this structure was constructed at the same time as the survey area and of identical materials. Unfortunately, the new owner has made extensive modifications to this area in the past year including tiling the floors and paneling the walls, and it is no longer appropriate as a reference. Accordingly, we elected to use the reference data collected in 2006, adjusted for background changes, for our current statistical tests as the next most valid alternative. A picture of the reference area, as it existed in March 2006, is given as figure 8.

The plywood walls have negligible radioactivity, therefore the Sign Test was selected for evaluation of the data, and no reference area is required. Gypsum drywall, on the other hand, is known to contain beta emitters, so ordinarily the Rank Sum test would be the statistical method

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1 The E-600 has a scalar mode, however, it would not allow for count times longer than 10 seconds.

2 In the peak hold mode the E-600 displays the highest count rate detected over a given scan interval thereby decreasing the chance of missing a count rate above the investigation limit through surveyor inattention, The scan area is divided into discrete smaller portions to limit the surface area which must be re-scanned in the event the peak count rate exceeds the investigation limit.

of choice. However, in this case, no appropriate reference area was readily available, as no similar drywall was installed in an unimpacted area of the site. A scoping survey conducted on March 26, 2007 in the workshop showed that *in situ* dry wall samples had indeed somewhat greater count rates than background. However, the mean net count rate for five points was a small fraction, 0.108, of that expected to result from U_{238} if present at the $DCGL_w$. Therefore, as a preliminary measure, we elected to evaluate the dry wall using the sign test. Only in the event that the null hypothesis, i.e., contamination exceeding the $DCGL_w$, was accepted, would the survey be redesigned and an appropriate reference area be sought.

Figure 8 - Reference area taken in 2006 during warehouse A final status survey

As with the previous survey for warehouse A, wall sampling and scanning was provisionally limited to the area below an 8 foot height. The rationale for this decision was that the highest shelf height at which DU was stored was about 8 feet, and the absence of any airborne activity made contamination above 8 ft extremely improbable. Should sampling or scanning detect significant contamination below eight feet, the areas would be reclassified as Class 1 and the survey extended to the upper half of the walls. Findings of significant contamination elsewhere in the area would have been probable cause to reverse that decision.

For the present survey, the facility was divided into eight survey units. The concrete floors in each of the warehouses and the workshop/office area were treated as separate survey units. The concrete walls were divided into two survey units. The block walls in warehouses B and C formed one unit and those in warehouse D and office formed the other. All plywood and drywall, regardless of location, were each treated as separate units. Table 1 summarizes the survey units.

A $DCGL_w$ for U_{238} of 220 dpm/100 cm^2 was selected from published D&D screening values. This corresponds to an instrument output of 1152 ncpm. An LGBR of one-half the $DCGL_w$ was applied.

TABLE 1 - SURVEY UNITS

Survey Unit	β in background	Area (m^2)	Test Applied	Notes
Warehouse B, floor	Yes	236	WRS	
Warehouse C, floor	Yes	279	WRS	
Warehouse D, floor	Yes	279	WRS	
Workshop/office, floor	Yes	206	WRS	
B/C, concrete block walls	Yes	193	WRS	Lower 8 ft
D/office, concrete block walls 2	Yes	194	WRS	Lower 8 ft
Plywood wall	No	159	Sign	Lower 8 ft
Drywall	Yes	98	Sign	Lower 8 ft

Based on scoping data acquired in 2006 and in accordance with MARSSIM, the number of samples required for the Wilcoxon Rank Sum test for both the concrete floor and the concrete block wall was 9 each in the survey and reference units. The minimum number of data points required for the Sign Test on the plywood and drywall was 14. As recommended for Class 3 areas, all sample and reference locations were randomized as opposed to a random starting point grid used for Class 1 and 2 areas. The Microsoft Excel RAND() function was used to generate random numbers between 0 and 1 which were multiplied by x- and y-axis dimensions. Points which were obstructed or essential duplicates were discarded and replaced.

Gas proportional beta scans were conducted for 100% of the floor surface and the wall surfaces below eight feet. As noted, an investigational limit of 35 cps was established corresponding to 67% of the $DCGL_w$. Gamma dose surveys were conducted at a 3-foot height over the entire facility.

Results

Gamma Surveys

Gamma dose surveys were conducted on March 8 - 16, 2007. Measured dose rates ranged from 5 to 8 µrem/hr which is consistent with background measurements. Figures 9 through 12 show the gamma dose rate maps for the facility.

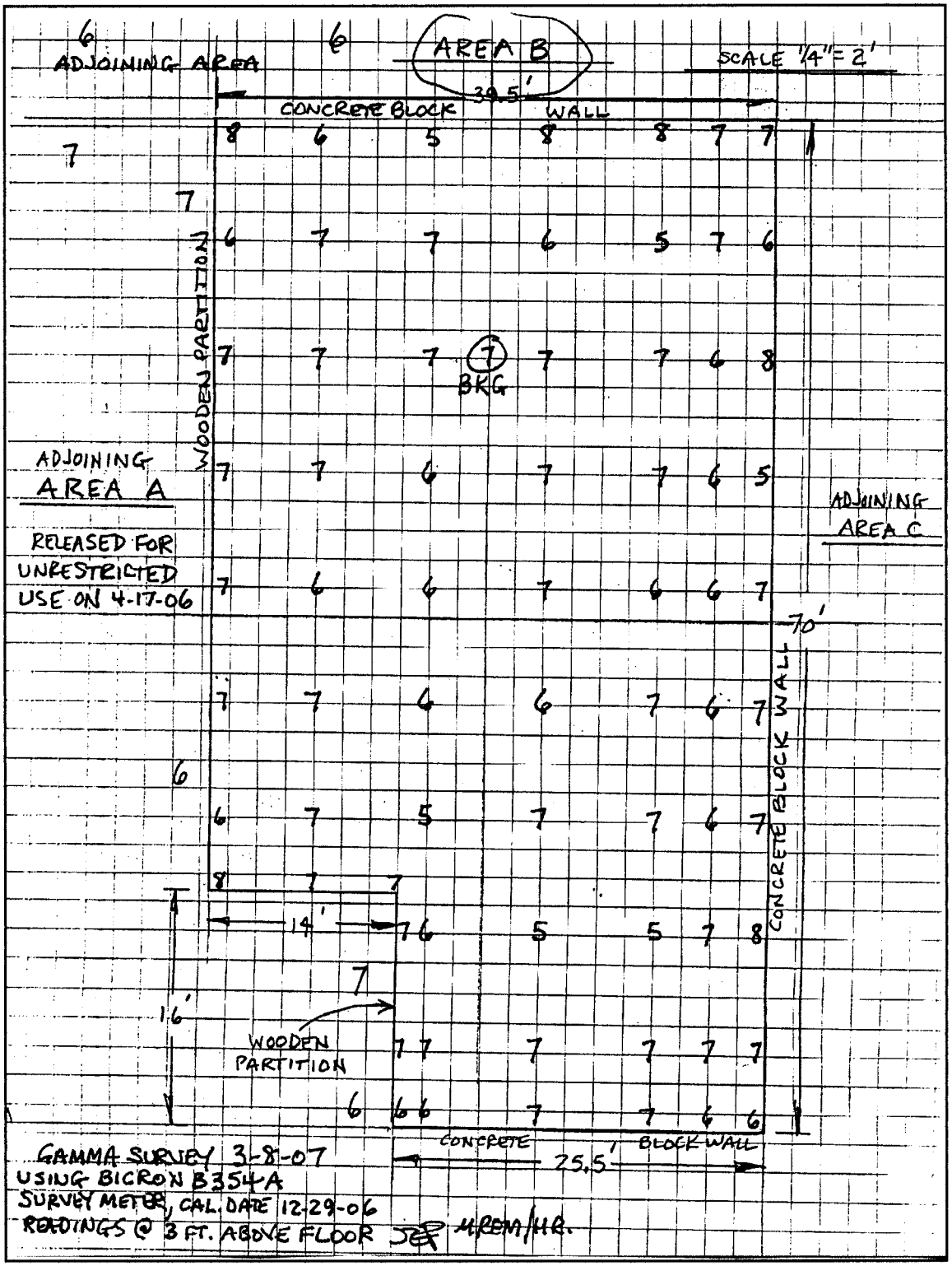

Figure 9 - Gamma dose rate map for warehouse B. Units are in μrem/hr.

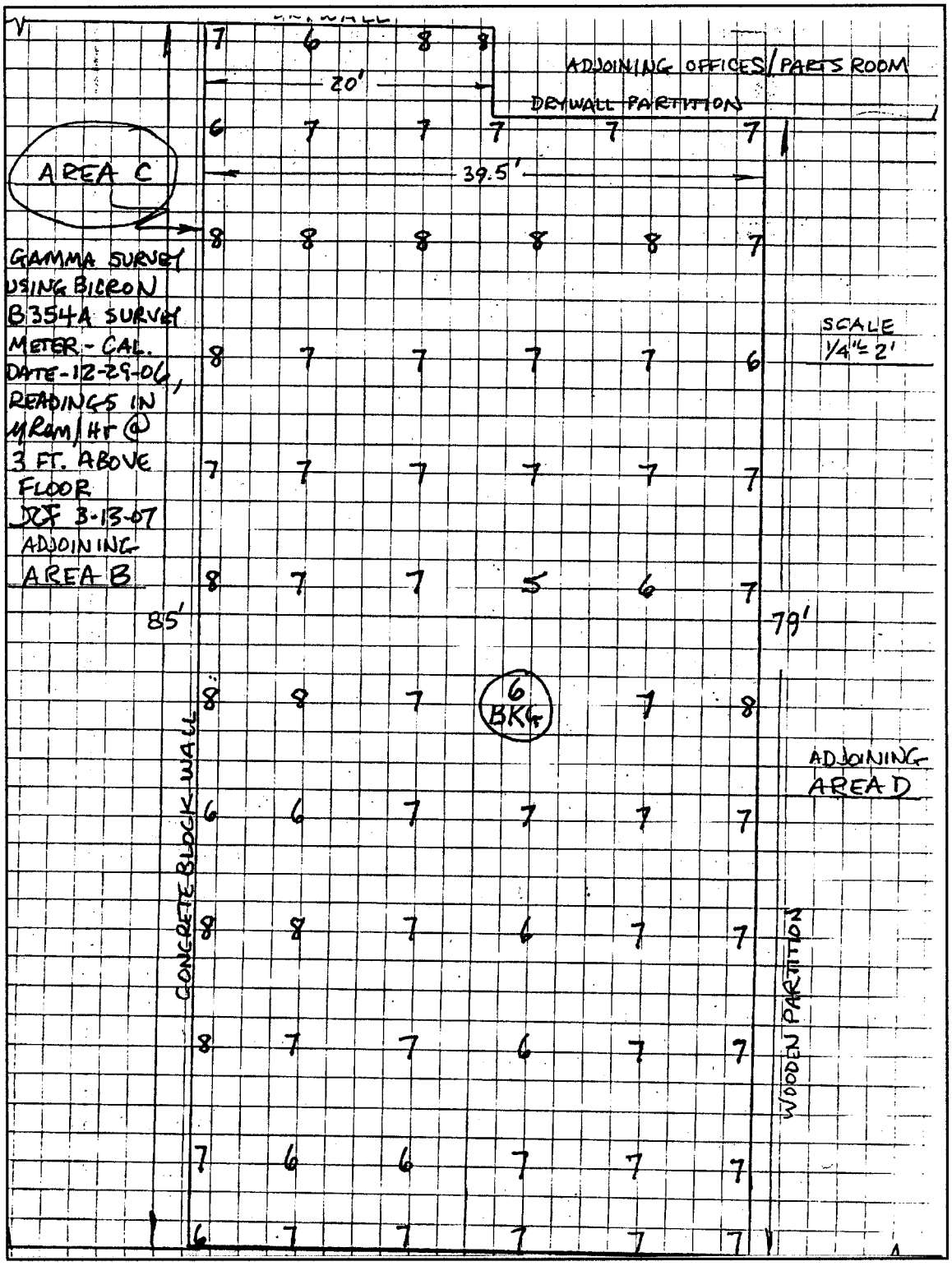

Figure 10 - Gamma dose rate map for warehouse C. Units are in µrem/hr.

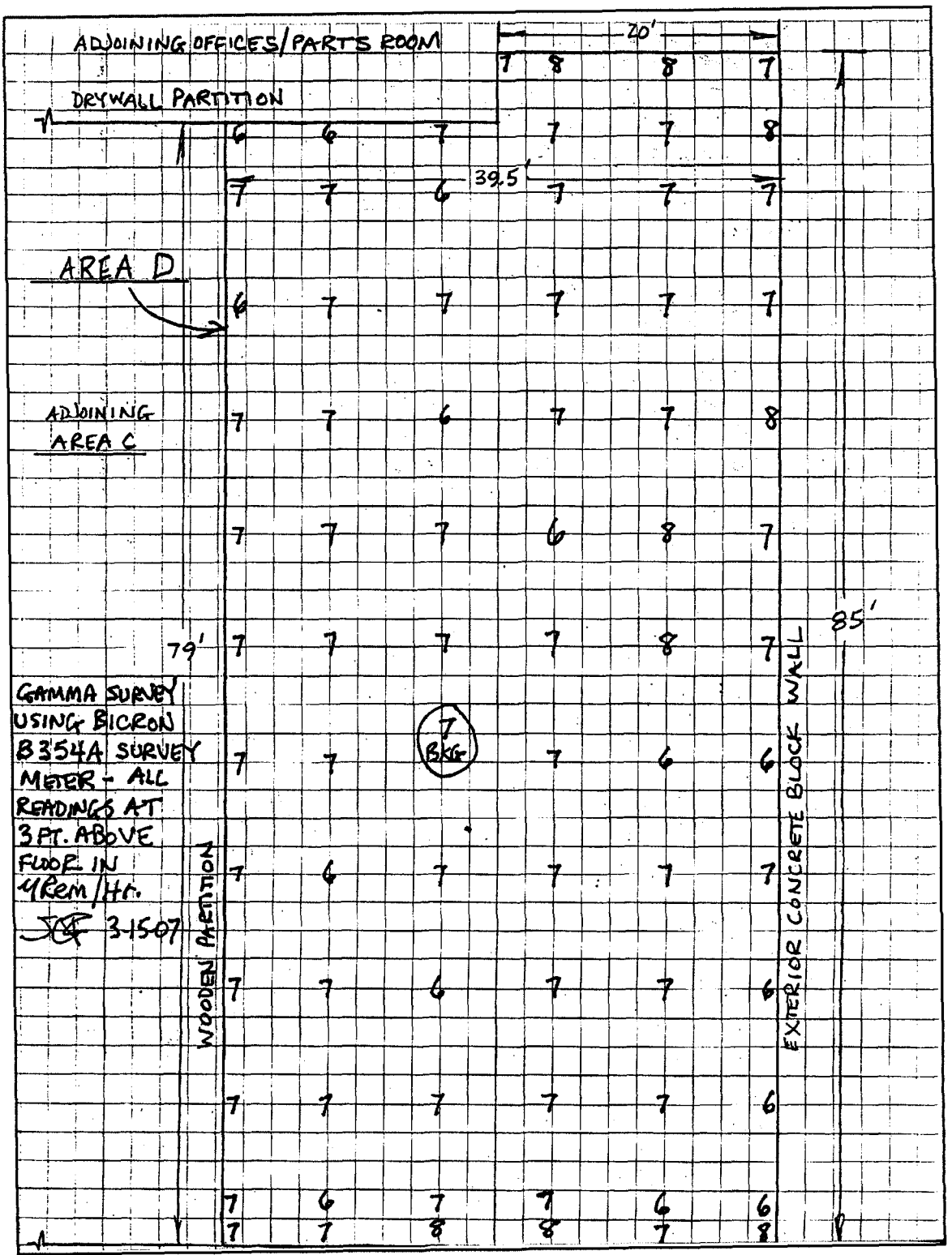

Figure 11 - Gamma dose rate map for warehouse D. Units are in µrem/hr.

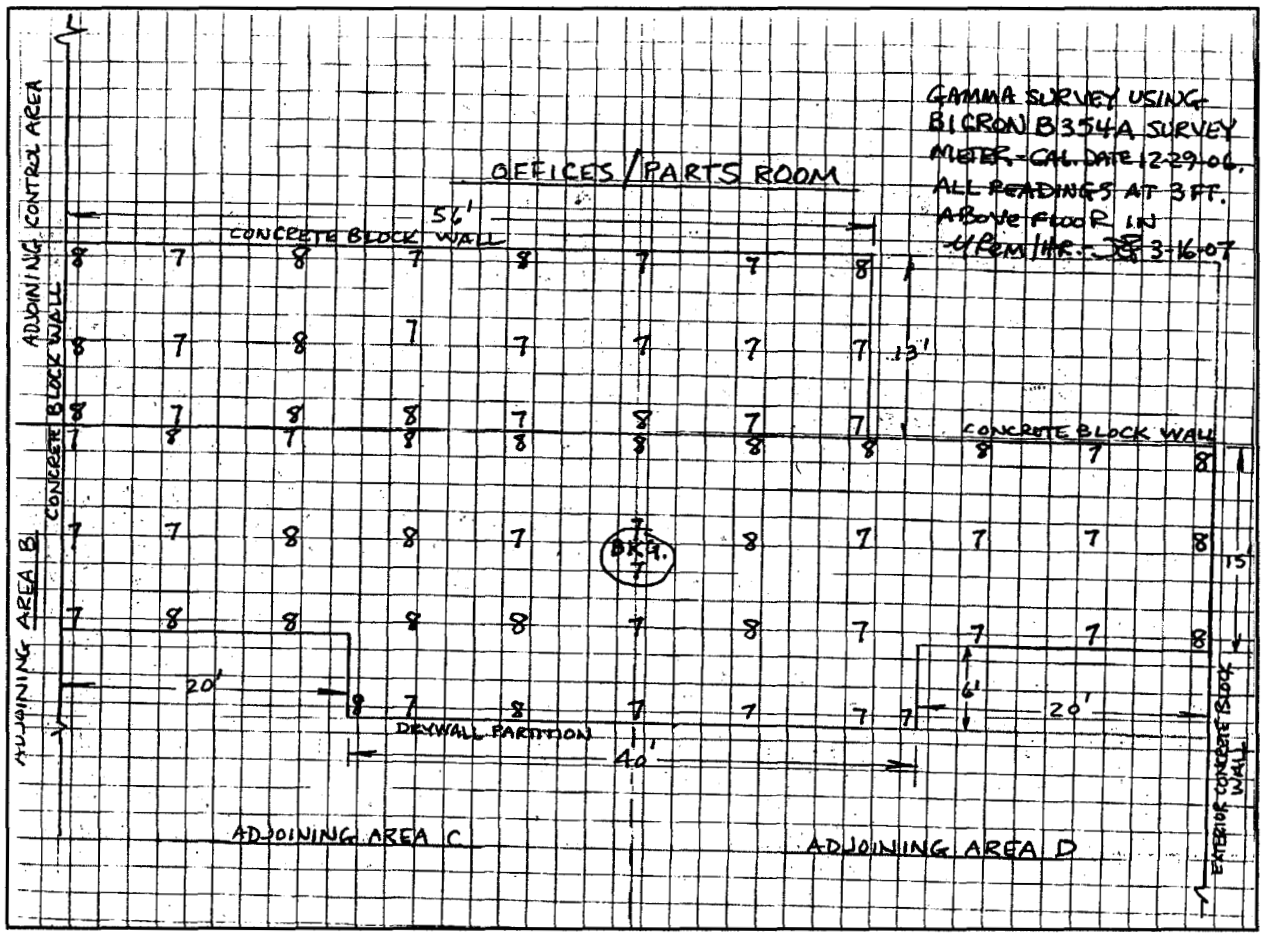

Figure 12 - Gamma dose rate map for work/shop/office area. Units are in µrem/hr.

Gas Proportional Sampling

In situ gas proportional sampling was conducted in accordance with the survey plan on March 30 through April 5, 2007. As noted, reference area data was collected for the warehouse area A final status survey in March of 2006. Gross count rates used in the Wilcoxon Rank Sum tests have been adjusted to reflect a shift in background. Data and calculations for the Wilcoxon Rank Sum and Sign tests are given in Tables 2 through 9.

For each of the concrete floors, the reference area rank sums were 126, i.e., no sample area point exceeded any reference area point by the $DCGL_w$. For nine reference and nine sample points, and α=0.001, the critical value for the WSR test is 118. Thus, the null hypothesis is rejected and the alternative hypothesis, that the median concentrations in the survey areas exceed the reference area by less than the $DCGL_w$, is accepted. The WSR test for the concrete walls gave results similar to that for the floors, the reference area rank sums were 126, and the null hypothesis was rejected

TABLE 2 - *IN SITU* SAMPLING - WAREHOUSE B CONCRETE FLOOR

Point	Area	Gross Counts	Time (min)	gcpm	Adjusted Data	Ranks	Reference Area Ranks
1	R			942	1753	10	10
2	R			1070	1881	14	14
3	R			1042	1853	12	12
4	R			1180	1991	18	18
5	R			1046	1857	13	13
6	R			1114	1925	17	17
7	R			1074	1885	15	15
8	R			972	1783	11	11
9	R			1088	1899	16	16
1	S	5690	5	1138	1138	5	0
2	S	5390	5	1078	1078	2	0
3	S	5710	5	1142	1142	6	0
4	S	5750	5	1150	1150	8	0
5	S	6380	5	1276	1276	9	0
6	S	5240	5	1048	1048	1	0
7	S	5730	5	1146	1146	7	0
8	S	5660	5	1132	1132	4	0
9	S	5650	5	1130	1130	3	0
Sum						171	126

TABLE 3 - *IN SITU* SAMPLING - WAREHOUSE C CONCRETE FLOOR

Point	Area	Gross Counts	Time (min)	gcpm	Adjusted Data	Ranks	Reference Area Ranks
1	R			942	1753	10	10
2	R			1070	1881	14	14
3	R			1042	1853	12	12
4	R			1180	1991	18	18
5	R			1046	1857	13	13
6	R			1114	1925	17	17
7	R			1074	1885	15	15
8	R			972	1783	11	11
9	R			1088	1899	16	16
1	S	5240	5	1048	1048	3	0
2	S	5410	5	1082	1082	6	0
3	S	5400	5	1180	1180	5	0
4	S	5560	5	1112	1112	7	0
5	S	5360	5	1072	1072	4	0
6	S	5720	5	1144	1144	8	0
7	S	5120	5	1024	1024	2	0
8	S	5750	5	1150	1150	9	0
9	S	4880	5	976	976	1	0
Sum						171	126

TABLE 4 - *IN SITU* SAMPLING - WAREHOUSE D CONCRETE FLOOR

Point	Area	Gross Counts	Time (min)	gcpm	Adjusted Data	Ranks	Reference Area Ranks
1	R			942	1753	10	10
2	R			1070	1881	14	14
3	R			1042	1853	12	12
4	R			1180	1991	18	18
5	R			1046	1857	13	13
6	R			1114	1925	17	17
7	R			1074	1885	15	15
8	R			972	1783	11	11
9	R			1088	1899	16	16
1	S	5590	5	1118	1118	8	0
2	S	5960	5	1192	1192	9	0
3	S	4820	5	964	964	1	0
4	S	5200	5	1040	1040	2	0
5	S	5270	5	1054	1054	3	0
6	S	5330	5	1066	1066	6	0
7	S	5290	5	1058	1058	4	0
8	S	5310	5	1062	1062	5	0
9	S	5450	5	1090	1090	7	0
Sum						171	126

TABLE 5 *IN SITU* SAMPLING - WORKSHOP/OFFICE CONCRETE FLOOR

Point	Area	Gross Counts	Time (min)	gcpm	Adjusted Data	Ranks	Reference Area Ranks
1	R			1122	1889	10	10
2	R			1250	2017	14	14
3	R			1222	1989	12	12
4	R			1360	2127	18	18
5	R			1226	1993	13	13
6	R			1294	2061	17	17
7	R			1254	2021	15	15
8	R			1152	1919	11	11
9	R			1268	2035	16	16
1	S	6480	5	1296	1296	2	0
2	S	6630	5	1326	1326	5	0
3	S	6520	5	1304	1304	3	0
4	S	6170	5	1234	1234	1	0
5	S	6550	5	1310	1310	4	0
6	S	7010	5	1402	1402	9	0
7	S	6810	5	1362	1362	8	0
8	S	6710	5	1342	1342	7	0
9	S	6700	5	1340	1340	6	0
Sum						171	126

TABLE 4 - *IN SITU* SAMPLING - WAREHOUSES B & C CONCRETE WALLS

Point	Area	Gross Counts	Time (min)	gcpm	Adjusted Data	Ranks	Reference Area Ranks
1	R			1700	2322	16	16
2	R			1686	2308	15	15
3	R			1728	2350	17	17
5	R			1614	2236	11	11
5	R			1730	2352	18	18
6	R			1604	2226	10	10
7	R			1634	2256	13	13
8	R			1626	2248	12	12
9	R			1662	2284	14	14
1	S	7810	5	1562	1562	7	0
2	S	8430	5	1686	1686	9	0
3	S	7960	5	1592	1592	8	0
4	S	7600	5	1520	1520	6	0
5	S	6330	5	1266	1266	1	0
6	S	6620	5	1324	1324	3	0
7	S	7110	5	1422	1422	4	0
8	S	7280	5	1456	1456	5	0
9	S	6340	5	1268	1268	2	0
Sum						171	126

TABLE 5 - *IN SITU* SAMPLING - WAREHOUSES D & OFFICE CONCRETE WALLS

POINT	AREA	GROSS COUNTS	TIME (MIN)	GCPM	ADJUSTED DATA	RANKS	REFERENCE AREA RANKS
1	R			1700	2322	16	16
2	R			1686	2308	15	15
3	R			1728	2350	17	17
5	R			1614	2236	11	11
5	R			1730	2352	18	18
6	R			1604	2226	10	10
7	R			1634	2256	13	13
8	R			1626	2248	12	12
9	R			1662	2284	14	14
1	S	6550	5	1310	1562	1	0
2	S	7370	5	1474	1686	3	0
3	S	7500	5	1500	1592	5	0
4	S	7200	5	1440	1520	2	0
5	S	8080	5	1616	1266	8	0
6	S	7440	5	1488	1324	4	0
7	S	8160	5	1632	1422	9	0
8	S	7930	5	1586	1456	7	0
9	S	7530	5	1506	1268	6	0
SUM						171	126

Final Status Survey
Neutron Products, Inc.,
416 N. Fairfax Blvd., Ranson, WV
SUB-1551

TABLE 6 - *IN SITU* SAMPLING - PLYWOOD WALL

Point	gross counts	time (min)	gcpm	ncpm	$DCGL_w$-ncpm	Sign
1	5630	5	1126	-134	1099	1
2	6020	5	1204	-56	1021	1
3	6240	5	1248	-12	977	1
4	6360	5	1272	12	953	1
5	6360	5	1272	12	953	1
6	5760	5	1152	-108	1073	1
7	6450	5	1290	30	935	1
8	6550	5	1310	50	915	1
9	5940	5	1188	-72	1037	1
10	5690	5	1138	-122	1087	1
11	5650	5	1130	-130	1095	1
12	6280	5	1256	-4	969	1
13	5930	5	1186	-74	1039	1
14	7000	5	1400	140	825	1
15	5870	5	1174	-86	1051	1
16	6340	5	1286	26	939	1
17	6420	5	1284	24	941	1
18	5690	5	1138	-122	1087	1
S+						18

TABLE 7 - *IN SITU* SAMPLING - DRYWALL

Point	gross counts	time (min)	gcpm	ncpm	$DCGL_w$-ncpm	Sign
1	6080	5	1216	-44	1009	1
2	6810	5	1362	102	863	1
3	7370	5	1474	214	751	1
4	6220	5	1244	-16	981	1
5	6870	5	1374	114	851	1
6	7200	5	1440	180	785	1
7	7200	5	1440	180	785	1
8	6640	5	1328	68	897	1
9	6910	5	1382	122	843	1
10	7150	5	1430	170	795	1
11	7270	5	1454	194	771	1
12	5750	5	1150	-110	1075	1
13	6930	5	1386	126	839	1
14	6350	5	1270	10	955	1
15	7090	5	1418	158	807	1
16	7010	5	1402	142	823	1
17	7200	5	1440	180	785	1
S+						17

For eighteen data points sampled on the plywood wall, the number of positive signs, S+, was 18, i.e. no point exceeded the $DCGL_w$. For N=18 and α=.05, the critical value is 12, therefore the null hypothesis is rejected.

For the seventeen data points sampled for the drywall, the number of positive signs, S+, was 17, i.e. no point exceeded the $DCGL_w$. For N=17 and α=.05, the critical value is also 12, and the null hypothesis is rejected. Unlike for the plywood, the drywall samples tend to have positive net beta counts, which are most likely due to beta emitting isotopes present in the background. As noted, in choosing the sign test over the rank sum test because of the lack of a suitable reference area, we decided to ignore this bias. The average net count rate for the 17 samples was 105 ncpm which, if it were solely attributable to residual U_{238}, would give an average surface concentration of only 24.0 dpm/100 cm^2 or 10.9% of the $DCGL_w$ of 220 dpm/100 cm^2.

Gas Proportional Scanning

Gas proportional scans of the floor and walls were conducted in accordance with the survey plan between March 30 and April 4. The peak hold method (see Appendix 3) was used. No areas of elevated activity were detected except for small wall areas in the concrete block constructed of alternate materials, either a visibly different kind of block or brick. The higher count rates were uniform within these small regions and are attributed to higher concentrations of beta and/or gamma emitters in these materials.

Conclusion

The results of the gas proportional sampling and scans, along with gamma mapping, support the characterization of the survey area as Class 3. Furthermore, the data shows that U_{238} is not present at levels exceeding 220 dpm/100 cm^2 above background. Therefore, we conclude that doses to members of the public occupying the released portion of the Ranson facility will not exceed the 25 mrem per year limit from residual activity established by the Final Decommissioning Rule.

Appendix 1
Chi-Square Test

Eberline E-600
Channel 1
HSS 1220 Gas Proportional Detector
High voltage at 1850V
1 minute counts with Coleman gas mantle (thorium)

	x	$(x - \bar{x})^2$
1	16310	16512
2	16490	2652
3	16610	29412
4	16400	1482
5	16500	3782
6	16230	43472
7	16330	11772
8	16560	14762
9	16410	812
10	16580	20022
11	16490	2652
12	16330	11772
13	16390	2352
14	16390	2352
15	16270	28392
16	16530	8372
17	16580	20022
18	16310	16512
19	16560	14762
20	16500	3782
	$\bar{x}$ = 16439	χ^2 = 15.5

For N = 20 and χ^2 = 15.5, p = 0.744

Appendix 2

Procedure for *In Situ* Sampling with Gas Proportional Beta Detector

1. Purpose

This document provides a procedure for collecting *in situ* beta counting data to be used for the Wilcoxon Rank Sum Test or Sign Test to evaluate surface concentrations of residual depleted uranium (DU) against the Derived Concentration Guideline Level.

2. Scope

This procedure is applicable to the final status survey for the Ranson, West Virginia facility portion to be released.

3. Basis

3.1 The principal isotope present in DU is uranium-238 (half-life, 4.468×10^9 y). U_{238} alpha decays to thorium-234(half-life, 24.1 d) which beta decays to protactinium-234m (half-life, 1.17 m) which beta decays to U_{234} (half-life, 2.454×10^5 y). U_{238} exists in equilibrium with its first two daughters and can be indirectly detected and measured from their beta emissions.

4. Equipment and Materials

4.1 Eberline E-600 portable radiation survey meter
4.2 Helgeson Scientific Services HSS-1220 gas proportional detector
4.3 Eberline smart to conventional coaxial cable, C to BNC adapter, and HSS detector cable
4.4 P-10 cylinder with low pressure regulator and low flow rotometer
4.5 Stopwatch, NIST traceable
4.6 3 nCi DU calibration source, North American Scientific, Inc., Model No. CAL2501, S/N 68007
4.7 Coleman Gas Mantle (thorium source)

5. Equipment Setup

5.1 E-600 to be set at Dickerson with the E-600 Interface Program
Channel - 1
High Voltage - 1850 V

Display - β, cps
Mode - Integrate
Gross/Net - gross

5.2 P-10
Regulator pressure - 2 psig
Rotometer - 50 ml/m

6. Calibration

6.1 With the detector removed from any source of beta radiation take a 10-minute background count in accordance with Step 7.3.

6.2 Place the 3 nCi DU source, active side up, under the detector and take a 10-minute count.

6.3 Determine the efficiency in ncpm/dpm and the MDC for a 5-minute sample count and 10-minute background count in dpm/100 cm^2.

6.4 Take twenty 1-minute counts of the thorium gas mantle and determine the value for chi-square, verify that it is in the satisfactory range, 12 - 27

7. Procedure

7.1 Turn on P-10 flow to detector and allow to purge for 45 minutes.

7.2 Conduct battery check on E-600 (selector switch to check) and verify adequate P-10 pressure (about 100 psi per 6 hours of operation).

7.3 To count:

7.3.1 Set selector switch to integrate

7.3.2 Zero stopwatch

7.3.3 Simultaneously start timer and press the * button on the E600 to zero the display and start the count.

7.3.4 When the stopwatch reaches the desired count time press the Log button on the E600 and record the integrated count. Note: Pressing the Log button will freeze the display for about 10 seconds.

7.4 With the detector face down on the metal cart and away from any beta radiation source take a 10-minute background count and record result.

7.5 Place the 3 nCi DU source, active side up, under the detector and take a 10-minute count.

7.6 Repeat steps 7.1, 7.2, 7.4, and 7.5 at the beginning of each day of sampling.

7.7 Count each random sampling and reference point identified in the survey plan by placing the detector face against the floor or wall at the desired location, counting for 5 minutes, and record results.

Appendix 3

Procedure for Scanning with Gas Proportional Beta Detector

1. Purpose

This document provides a procedure for scanning building surfaces to detect localized areas of elevated residual depleted uranium (DU).

2. Scope

This procedure is applicable to the final status survey for the Ranson, West Virginia facility, portion to be released.

3. Basis

3.1 The principal isotope present in DU is uranium-238 (half-life, 4.468×10^9 y). U_{238} alpha decays to thorium-234(half-life, 24.1 d) which beta decays to protactinium-234m (half-life, 1.17 m) which beta decays to U_{234} (half-life, 2.454×10^5 y). U_{238} exists in equilibrium with its first two daughters and can be indirectly detected and measured from their beta emissions.

3.2 With the instrument operated according to this procedure the detection interval is 3 seconds. Theoretically this should allow detection of 8 ncpm with a 95% probability.

3.3 Using the mean of the reference area floor counts converted to cps, the background is 23.1 cps. A $DCGL_w$ of 220 dpm/100 cm^2 corresponds to 19.2 ncps. Using 67% of the $DCGL_w$ as an action limit gives 12.9 ncps or 36.0 gcps. The probability of detecting a true positive is greater than 95%.

4. Equipment and Materials

4.1 Eberline E-600 portable radiation survey meter
4.2 Helgeson Scientific Services HSS-1220 gas proportional detector
4.3 Eberline smart to conventional coaxial cable, C to BNC adapter, and HSS detector cable
4.4 P-10 cylinder with low pressure regulator and low flow rotometer
4.5 3 nCi DU calibration source, North American Scientific, Inc., Model No. CAL2501, S/N 68007

5. Equipment Setup

5.1 E-600 to be set at Dickerson with the E-600 Interface Program
Channel - 1

High Voltage - 1850 V
Display - β, cps
Mode - Ratemeter or Peak hold
Gross/Net - gross
Response - medium set to 3 second time constant

5.2 P-10
Regulator pressure - 2 psig
Rotometer - 50 ml/m

6. Calibration

6.1 The investigation level given here is based on a calibration conducted on March 26, 2007 in accordance with the *Procedure for In Situ Sampling with Gas Proportional Beta Detector*, Sec. 6. and is valid for scans conducted within 1 month of the calibration. For scans conducted after April 26, 2007, the instrument should be recalibrated and the efficiency, MDCR, and scan MDC recalculated.

7. Procedure

7.1 Preliminary - To be conducted at the beginning of each day of scanning.

7.1.1 Turn on P-10 flow to detector and allow to purge for 45 minutes.

7.1.2 Conduct battery check on E-600 and verify adequate P-10 pressure (about 100 psi per 6 hours of operation).

7.1.3 Put the E-600 in integrate mode and with detector on the cart take a 10 minute background count. Result should be between 8860 and 13300 counts.

7.1.4 Place the 3 nCi DU source active side up under the detector and take a 10-minute count. Results should be between 23900 and 43200 counts.

7.1.5 Mount detector for floor or wall scan.

7.1.6 Set E-600 response to "Med" and verify audio is on.

7.1.7 With the E-600 in rate meter mode, move the detector at ½ ft/s over the 3 nCi DU source and verify it can be detected. Count rate should spike >40 cps and an audible increase in the click rate should be discerned.

7.2 Alternative #1

7.2.1 Set E-600 to rate meter mode, the response to "Med" and verify audio is on.

7.2.2 Scan the detector across the floor or wall area at ½ ft/s along its longer axis.

7.2.3 Observe the count rate and listen for any increase in the audible response.

7.2.4 If the count rate exceeds the action limit (35 cps) place the detector over the suspect area and:

A: Set response to "Slow" and observe count rate for at least 15 seconds, or

B: Set E-600 to integrate mode an count for at least 15 seconds, convert gross counts to gcps

7.2.5 If the results for 7.2.4A or B exceed 42 gcps, record the count rate and mark the spot with spray paint, or equivalent, for further analysis.

7.3 Alternative #2 (Allows for somewhat less diligence in the surveyor's observation of the count rate but may result in having to resurvey an area.)

7.3.1 Set E-600 to peakhold mode, the response to "Med" and verify audio is on.

7.3.2 Scan the detector across the floor or wall area at ½ ft/s along its longer axis while listening for any increase in the audible response.

7.3.3 Confine a scan segment to a relatively small areas, e.g. <100 sq. ft. Upon completion of a segment observe the maximum count rate.

7.3.4 If maximum count rate exceeds 35 cps, or a significant increase in the audible response is discerned, resurvey affected area using Alternative #1.

8. Records

Create and maintain the following records

8.1 Name of surveyor(s) and date(s) of scan

8.2 Results of Preliminary steps 2, 3, 4, and 8 for each day of scanning

8.3 Results and location (marked on floor plan or wall elevation) of any area exceeding 42 gcps

8.4 The area(s) surveyed on floor plan or wall elevation

8.5. If using Alternative #1, map count rate on floor plan or wall elevation approximately every 10 linear ft in each axis, or

If using Alternative #2, show approximate location of each scan segment on floor plan or wall elevation, and indicate where maximum count rate is <36 gcps.

This is to acknowledge the receipt of your letter/application dated

4/13/2007, and to inform you that the initial processing which includes an administrative review has been performed.

☑ AMEND. SUB-1551 There were no administrative omissions. Your application was assigned to a technical reviewer. Please note that the technical review may identify additional omissions or require additional information.

☐ Please provide to this office within 30 days of your receipt of this card

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A copy of your action has been forwarded to our License Fee & Accounts Receivable Branch, who will contact you separately if there is a fee issue involved.

Your action has been assigned **Mail Control Number** 140400.
When calling to inquire about this action, please refer to this control number.
You may call us on (610) 337-5398, or 337-5260.

NRC FORM 532 (RI)
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Sincerely,
Licensing Assistance Team Leader