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November 16, 2009

Rachel Browder
Nuclear Materials Licensing Section
U.S. Nuclear Regulatory Commission, Region IV
611 Ryan Plaza Drive, Suite 300
Arlington, TX 76011

Ms. Browder,

Please find attached the Final Status Survey Report (FSSR) for the incinerator located in the Arctic Health Research Building on the UAF campus. This FSSR should complete the requirements of the decommissioning plan approved by the NRC on August 12, 2009. The decommissioning plan is amendment number 52 to NRC License number 50-02430-07, docket number 030-01179.

Sincerely,

Tracey Martinson

Tracey A. Martinson, Ph.D.
Radiation Safety Officer

FINAL STATUS SURVEY REPORT

1) OVERVIEW OF THE RESULTS OF THE FINAL STATUS SURVEY

The University of Alaska Fairbanks has an incinerator that was used to burn materials containing small amounts of ^{3}H and ^{14}C. The incinerator was taken out of service in March 2007, and the last burn of radioactive materials occurred in November 2006.

In accordance with the decommissioning plan, approved by the NRC on August 12, 2009, the incinerator has been removed from the Arctic Health Research Building. It is currently stored at the UAF Central Receiving Warehouse, located at 1855 Marika Road, Fairbanks, Alaska, pending final approval to release it.

Survey results for the interior and exterior of the incinerator chambers were provided as part of the decommissioning plan submitted on July 12, 2009 (Tables 2 and 3). In addition, survey results for the exterior of the stack and the spark arrester were provided (Table 4). Wipe samples taken from these surfaces were all substantially less than the screening levels given in Table 1 of 63 FR 64132 (November 18, 1998). The interior of the stack was the only surface that could not be sampled at the time the decommissioning plan was proposed. This Final Status Survey Report includes wipe sample data from the interior of the incinerator stack.

In accordance with NUREG-1575, Data Quality Objectives (DQOs) were established to demonstrate that radiological contamination of the AHRB incinerator and stack was below the levels specified in Table 1 of 63 FR 64132 (November 18, 1998), thereby meeting the criteria for release for unrestricted use. The procedures outlined in Section 5 of NUREG-1575 (Final Status Surveys) were followed to determine the number of samples required for statistical tests, and the interpretation of survey results was done in accordance with Section 8 of NUREG-1575.

The analysis indicates that the null hypothesis can be rejected (α=0.005). The residual radioactive contamination in the incinerator stack does not exceed the release criteria. Thus, we are requesting that the incinerator be released for unrestricted use.

2) DISCUSSION OF CHANGES FROM THE PROPOSED DECOMMISSIONING PLAN

The only change from the proposed decommissioning plan occurred due to a construction accident. While working on the second floor, the Bobcat operator accidentally hit the incinerator stack, damaging it and knocking a portion of it off center. Due to safety concerns, the stack had to be taken down. The method by which it was taken down was as described in the decommissioning plan, however, that plan had not yet been approved by the NRC. Renovation efforts began in that area of the building in June, 2009, with the contractor attempting to do as much as possible in the area without touching the incinerator or stack.

3) DESCRIPTION OF METHOD BY WHICH THE NUMBER OF SAMPLES WAS DETERMINED FOR EACH SURVEY UNIT

The survey unit was defined as the incinerator stack, including the spark arrester located on the top. From previous survey results (as reported in the decommissioning plan), it was determined that the contaminants (^{14}C and ^{3}H) were present at such a small fraction of the screening levels as to be considered insignificant. Thus, the number of samples needed for the survey unit was determined as per NUREG 1575 Section 5.5.2.3 (contaminant not present in background). In this case, comparison with a reference area is not necessary, and the appropriate statistical test is the one-sample Sign test (NUREG-1575, section 5.5.2.3). Thus the number of samples necessary for each survey unit is determined according to the methodology for the Sign test (see section 4, below).

4) SUMMARY OF THE VALUES USED TO DETERMINE THE NUMBER OF SAMPLES AND A JUSTIFICATION FOR THESE VALUES

To determine the number of samples required to adequately assess the survey unit, the DCGL was set at the screening level specified in Table 1 of 63 FR 64132 (November 18, 1998). These values were 3.7×10^6 dpm/100 cm^2 for ^{14}C and 1.6×10^8 dpm/100 cm^2 for ^{3}H.

The Lower Boundary of the Gray Region (LBGR) represents the acceptable Type II error rate, and was set at 3.7×10^4 dpm/100 cm^2 for ^{14}C and at 1.2×10^6 dpm/100 cm^2 for ^{3}H. These values could be set fairly low because we were most concerned with reducing the probability of a Type I error. We want to minimize the likelihood of falsely rejecting the null hypothesis, which states that the median concentration of contaminant is greater than the screening level. From the selected values for the DCGL and the LBGR, the shift (Δ) can be calculated as DCGL-LBGR. For ^{14}C, Δ was 3.66×10^6 dpm/100 cm^2 and for ^{3}H, Δ was 1.19×10^8 dpm/100 cm^2.

An estimate of the variability in ^{3}H and ^{14}C levels in the survey unit (σ) was determined from the wipe test values taken from the interior of the stack once it was taken down. The stack was taken down in 16 pieces, including the spark arrester (Fig. 1). Three samples were taken at random from each of the 16 pieces, for a total of 48 samples.

The σ values were 15.5 dpm/100 cm^2 and 51.5 dpm/100 cm^2 for ^{14}C and ^{3}H, respectively. The relative shift, Δ/σ, was calculated to be ~237,000 dpm/cm^2 and ~2,300,000 dpm/cm^2 for ^{14}C and ^{3}H, respectively. Given the relative shift values, we can determine the value of Sign p, which is needed to calculate the number of samples needed to conduct the Sign test. Sign p is the "estimated probability that a random measurement taken in the survey unit will be less than the DCGL when the survey unit median is actually at the LBGR" (NUREG-1575, section 5.5.2.3). The larger the shift value, the higher the probability that a random measurement will be less than the DCGL. In this case, the gray region area is quite large, as it was set to be two orders of magnitude less than the DCGL. In both cases, the relative shift was sufficiently large that the value of Sign p was 1.00000. Thus, the probability that a random measurement taken from in the survey unit will be less than the DCGL is 100%.

The next step in the process is to determine the decision error percentiles, $Z_{1-\alpha}$ and $Z_{1-\beta}$. In this case we want to minimize the probability of falsely rejecting the null hypothesis, and thus we want to minimize the value of α. The values of both α and ß were set at 0.005, and the $Z_{1-\alpha}$ and $Z_{1-\beta}$ values were determined to be 2.576 (from Table 5.2 of NUREG-1575).

The number of data points required for the Sign test can be determined by the following equation:

$$N = \frac{(Z_{1-\alpha} + Z_{1-\beta})^2}{4(Sign\ p - 0.5)^2}$$

Using the values describe above, N is calculated as 27. This number is increased by 20% to allow for possible data losses and to ensure sufficient power for the test. Thus, the adjusted number of data points required for the Sign test is 33.

5) SURVEY RESULTS

As described in section 4 (above), at least 33 data points were required for conducting the Sign test. In this case, the survey unit (incinerator stack) was dismantled in 16 sections (including the spark arrester) and 3 wipe samples of 100 cm^2 were taken at random from each section. This resulted in a total of 48 samples. Figure 1a shows ten of the 15 stack sections, while Figure 1b shows a close-up of the interior of one of the sections, along with locations of two wipe samples. The third sample was taken from the upper surface of the interior, and is not visible in the photo. Figure 1c shows the spark arrester. Wipes were taken from the bottom and top rims of the spark arrester, and together, the three wipes covered 100% of the rim surfaces. Blank wipes averaged 32.2 dpm/100 cm^2 for ^{14}C and 94.4 dpm/100 cm^2 for ^{3}H.

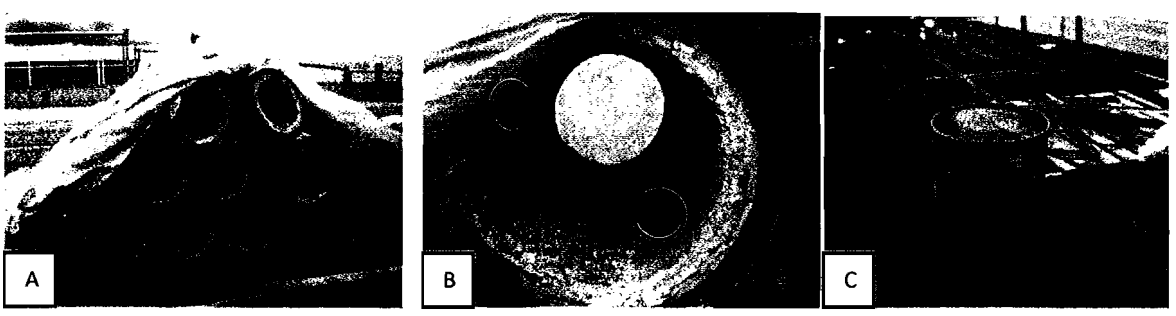

Fig. 1. A) Sections of the incinerator stack after it had been dismantled. B) A close-up view of the interior of one section. The circled areas indicate locations of two of the three 100 cm^2 wipe samples taken at random from this particular section of the stack. All 15 stack sections were sampled in this manner. C) The spark arrester from the top of the stack (sample #16 in table below).

Wipe samples were counted on a Beckman LS 6000 SE liquid scintillation counter (Serial Number: 7065966). Results of the wipe tests are provided in the following table:

Sample	^{3}H dpm/100 cm^2	DCGL-x	^{14}C dpm/100 cm^2	DCGL-x
1.1	143.3	1.20E+8	78.0	3.7E+6
1.2	248.8	1.20E+8	75.9	3.7E+6
1.3	167.1	1.20E+8	64.5	3.7E+6
2.1	91.5	1.20E+8	41.6	3.7E+6
2.2	93.5	1.20E+8	36.3	3.7E+6
2.3	117.2	1.20E+8	55.9	3.7E+6
3.1	89.8	1.20E+8	41.2	3.7E+6
3.2	106	1.20E+8	34.3	3.7E+6
3.3	83.3	1.20E+8	35.9	3.7E+6
4.1	89.6	1.20E+8	52.7	3.7E+6
4.2	78.2	1.20E+8	35.9	3.7E+6
4.3	92.5	1.20E+8	43.7	3.7E+6
5.1	113.1	1.20E+8	64.1	3.7E+6
5.2	97.2	1.20E+8	46.1	3.7E+6
5.3	171.9	1.20E+8	104.9	3.7E+6
6.1	107.4	1.20E+8	65.7	3.7E+6
6.2	87.6	1.20E+8	64.5	3.7E+6
6.3	155.8	1.20E+8	77.1	3.7E+6
7.1	98.4	1.20E+8	46.5	3.7E+6
7.2	131.4	1.20E+8	65.7	3.7E+6
7.3	94.1	1.20E+8	40.8	3.7E+6
8.1	98.2	1.20E+8	41.2	3.7E+6
8.2	112.6	1.20E+8	34.3	3.7E+6
8.3	151.1	1.20E+8	38.8	3.7E+6
9.1	70.4	1.20E+8	43.7	3.7E+6
9.2	191.3	1.20E+8	54.3	3.7E+6
9.3	84.5	1.20E+8	41.2	3.7E+6
10.1	92.9	1.20E+8	49.4	3.7E+6
10.2	94	1.20E+8	43.3	3.7E+6
10.3	105	1.20E+8	49.4	3.7E+6
11.1	123.1	1.20E+8	60.0	3.7E+6
11.2	91.1	1.20E+8	42.4	3.7E+6
11.3	126.4	1.20E+8	75.5	3.7E+6
12.1	72.2	1.20E+8	37.6	3.7E+6
12.2	61	1.20E+8	39.2	3.7E+6
12.3	72.3	1.20E+8	40.4	3.7E+6
13.1	170.8	1.20E+8	35.9	3.7E+6
13.2	261.6	1.20E+8	31.0	3.7E+6
13.3	166.5	1.20E+8	32.2	3.7E+6
14.1	78.4	1.20E+8	33.9	3.7E+6
14.2	81.5	1.20E+8	44.5	3.7E+6
14.3	63.7	1.20E+8	42.9	3.7E+6
15.1	96.1	1.20E+8	47.8	3.7E+6
15.2	85.2	1.20E+8	50.6	3.7E+6
15.3	108.3	1.20E+8	53.5	3.7E+6
16.1	89.8*	1.20E+8	36.3*	3.7E+6
16.2	306.1*	1.20E+8	35.9*	3.7E+6
16.3	76.7*	1.20E+8	29.8*	3.7E+6

*Samples covered 100% of the surface area of the top and bottom rims of the spark arrester, and were not taken using a 100 cm^2 template.

For all samples, the Sign value was positive (DCGL-x >0). Thus, for both ^{3}H and ^{14}C, the S+ value was 48. The critical value, k, for N = 48 and $\alpha = 0.005$ is 33 (Table I.3 in NUREG-1575). Thus, the S+ value of 48 is greater than the k value of 33, and therefore the null hypothesis is rejected. The median concentration of residual radioactivity in the survey unit is less than the DCGL, and is therefore less than the screening criteria for unrestricted release according to Table 1 of 63 FR 64132 (November 18, 1998).

6) DESCRIPTION OF ANY CHANGES IN INITIAL SURVEY UNIT ASSUMPTIONS RELATIVE TO THE EXTENT OF RESIDUAL RADIOACTIVITY

There were no changes in our assumptions regarding the initial survey unit. Based on our knowledge of the history of the incinerator and from preliminary samples taken before the stack was dismantled, we did not expect to find any residual radioactive contamination.

7) A DESCRIPTION OF HOW ALARA PRACTICES WERE EMPLOYED TO ACHIEVE FINAL ACTIVITY LEVELS

No remediation efforts were required as the survey unit did not exhibit any residual radioactivity.

BETWEEN:

License Fee Management Branch, ARM
and
Regional Licensing Sections

(FOR LFMS USE)
INFORMATION FROM LTS

Program Code: 01110
Status Code: 0
Fee Category: EX 3L
Exp. Date: 20100331
Fee Comments: 170.11(A)(4)
Decom Fin Assur Reqd: Y

LICENSE FEE TRANSMITTAL

A. REGION

1. APPLICATION ATTACHED
   Applicant/Licensee: ALASKA, UNIV OF FAIRBANKS, ENVIR
   Received Date: 20091123
   Docket No: 3001179
   Control No.: 472507
   License No.: 50-02430-07
   Action Type: Decommissioning

2. FEE ATTACHED
   Amount: ____
   Check No.: ____

3. COMMENTS

Signed Colleen Murnahan
Date 12-18-09

B. LICENSE FEE MANAGEMENT BRANCH (Check when milestone 03 is entered /__/)

1. Fee Category and Amount: _____

2. Correct Fee Paid. Application may be processed for:
   Amendment _____
   Renewal _____
   License _____

3. OTHER _____

Signed _____
Date _____

Tracey Martinson, RSO
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611 Ryan Plaza Drive, Suite 300
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472507

ACCEPTANCE REVIEW MEMO (ARM)

Licensee:	Univ of Fairbanks, Alaska	**License:** 50-02430-07	
Docket:	030-01179	**Mail Control:** 4724507	
Type of Action:	Decomm.	**Date of Requested Action: 11/16/09**	
Reviewer Assigned:		**ARM reviewer(s): Torres**	

Response	Deficiencies Noted During Acceptance Review
	[ ] Open ended possession limits. Submit inventory. Limit possession. [ ] Submit copies of latest leak test results. [ ] Add IC L.C./Fingerprint LC, add SUNSI markings to license. [ ] Confirm with licensee if they have NARM material. [ ] Change of contact information (RSO), send request to update IC database.

Reviewer's Initials: _____ **Date:**

☐Yes ☐No Request for unrestricted release Group 2 or >. Consult with Bravo Branch.

☐Yes ☐No Termination request < 90 days from date of expiration

☐Yes ☐No Expedite (medical emergency, no RSO, location of use/storage not on license, RAM in possession not on license, other)

☐Yes ☐No TAR needed to complete action.

Branch Chief's and/or HP's Initials: _____ **Date:**

SUNSI Screening according to RIS 2005-31

☐Yes ☑No **Sensitive and Non-Publicly Available** if <u>any</u> item below is checked

General guidance:

_____RAM = or > than Category 3 (Table 1, RIS 2005-31), use Unity Rule
_____Exact location of RAM [suite #, bldg. #, location different from mailing address] (whether = or > than Category 3 or not)
_____Design of structure and/or equipment (site specific)
_____Information on nearby facilities
_____Detailed design drawings and/or performance information
_____Emergency planning and/or fire protection systems

Specific guidance for medical, industrial and academic (above Category 3):

_____RAM quantities and inventory
_____Manufacturer's name and model number of sealed sources & devices
_____Site drawings with exact location of RAM, description of facility
_____RAM security program information (locks, alarms, etc.)
_____Emergency Plan specifics (routes to/from RAM, response to security events)
_____Vulnerability/security assessment/accident-safety analysis/risk assess
_____Mailing lists related to security response

Branch Chief's and/or HP's Initials: RITC **Date:** 12/27/09