STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC HEALTH

Jewel Mullen, M.D., M.P.H., M.P.A.
Commissioner

Dannel P. Malloy
Governor
Nancy Wyman
Lt. Governor

Betsy Ullrich, Senior Health Physicist
Commercial, Industrial, R&D and Academic Branch
Division of Nuclear Materials Safety
US NRC Region I Office
Via Fax (610-337-5269)

May 22, 2014

Control # 582357

Re: Request for Modification of Radioactive Materials License (# 06-27895-03)

Dear Dr. Ullrich:

The Connecticut Department of Public Health Laboratory has moved our operations from our 10 Clinton Street (Hartford, CT) facility to our 395 West Street (Rocky Hill, CT) facility. We thus wish to modify our current license by removing the 10 Clinton Street address from Item #10.

To support the decommissioning of 10 Clinton Street, we have completed an Assessment of Radiological Residuals for the impacted area. The document is included with this letter. We look forward to your comments following your review of this documentation. Thank you for your assistance.

Regards,

Stewart Chute, Ph.D.
Toxicologist & RSO
Connecticut Department of Public Health
860-509-7758 or 860-920-6512
Stewart.chute@ct.gov

582357
NMSS/RGN1 MATERIALS-002

Assessment of Radiological Residuals for the Connecticut Department of Public Health Laboratory:

To Support the Decommissioning of 10 Clinton Street, Hartford CT

Compiled by Stewart Chute, Ph.D.
May, 2014

Background:
On November 21, 2013, the Connecticut Department of Public Health Laboratory (CTDPHL) submitted a Historical Site Assessment (HSA) to the US Nuclear Regulatory Commission (NRC). The purpose of this document was to describe the isotopes, their activities, the laboratory operations, and the potentially impacted areas within the licensed area. Also, on October 10, 2013, the CTDPH submitted an initial characterization survey of removable surface contamination for alpha, beta, and gamma activity. Additionally, on January 22, 2014, the Laboratory's Chief Administrator submitted a letter describing the remediation activities that occurred at the 10 Clinton Street facility. Most recently, on February 27, 2014, the Laboratory's Radiation Safety Officer submitted a Radiological Exposure Assessment.

The CTDPHL possesses small, unimportant quantities of source material under the general license requirements of 10 CFR 40.22 (a), and in accordance with CFR 40.13 (c)(1)(vi). The CTDPHL also possesses small, exempt quantities of special nuclear materials as granted within 10 CFR 70.17, and calibration or reference sources under the general license requirements within 10 CFR 70.19 (a)(1).

In January 2009, the CTDPHL was awarded a Cooperative Agreement from the United States Environmental Protection Agency for a "Demonstration of Enhancing Radiological Incident Response and Recovery: Enhancing Capability and Capacity of Environmental Radioanalytical Laboratories Across the Nation" [RFA No:EPA-OAR-NAREL-07-10]. Within this grant, the CTDPHL has been participating in proficiency testing programs to verify that the capability to analyze samples is maintained. Additionally, the CTDPHL has been validating analytical methods against reference materials containing known amounts of contaminants. The purpose of this testing and validation work is to assure that sufficient surge capacity is in place for the testing of environmental samples from sites undergoing radiological evaluation and remediation.

The CTDPHL has also been providing radloanalytic testing services for other government agencies and continues to use exempt quantities of byproduct reference materials for radiological testing of drinking water under the Environmental Protection Agency (EPA) Safe Drinking Water Act. In addition, the CTDPHL conducts analyses for low-levels of alpha-, beta-, or gamma-emitting radionuclides in various media at the request of the Connecticut Department of Energy and Environmental Protection or local health directors.

Inventory of radioactive isotopes in the CTDPHL was submitted earlier (See letter of October 10, 2013). The reported inventory includes isotopes within the consumable (*i.e.,* dispersible) items.

Purpose:
The purpose of this document is to assess the likelihood that any residual contamination could result in an additional exposure greater than 25 mrem per person per year above background.

Approach:
The activity per isotope within the inventory of consumable items was compared to a set of NRC Screening Values. Where the inventory (uCi) was greater than the Screening Value (uCi/100cm^2) it is possible that the density of residual radioactivity could exceed the density cited in the Screening Value. Conversely, if the amount in inventory is less than the Screening Value, then there is little chance that the density of residual from inventory could exceed the Screening Value density. In instances where the inventory amount was greater than its respective Screening Value, an analysis of work patterns and isotope consumption was used to estimate a turnover per unit of work surface area. A turnover density less than the respective Screening Value indicates that the density of residual is unlikely to exceed the Screening Value.

Estimate of Source Term:
An analysis of the work areas was compiled (See Figure 1 & Table 1) and analytical staff were interviewed as to the type, amounts, and frequency of consumable inventory used (See Table 2). Isotopes in consumable inventory were then compared to the respective Screening Value (See Table 3). For isotopes in amounts greater than the Screening Value, the results were compiled into a Table and the turnover densities derived were then compared to the Screening Value (See Table 4). Note that the inventory of consumable U-235 is a component of natural uranium for proficiency testing. Also note that isotopes Cd-109, Co-57, and Co-60 were in one item used as a standard. This item exists as a series of dilutions, and as such, the isotopes are not turned out of inventory.

Estimate of Residual Radioactivity:
The Radiochemistry Laboratory was surveyed by Supervisors, the RSO, or their designee, approximately monthly using wipes and a Geiger Muller counter. Contamination surveys for low-energy alpha/beta emitters are to be conducted using wipes and counted using a Tennelec 5XLB counter . Instruments used for surveys are calibrated annually. Action levels for decontamination are shown in Table 5.

Results of these surveys are referenced against a diagram (as in Figure 1) so that any area that becomes contaminated can be readily identified. Areas tested are to be representative of where contamination might be expected. An example of a survey report is shown in Figure 2. Results for swipe testing are shown near the bottom. Beta activity for swipes was not above background (0.7cpm/100cm^2). In addition to routine surveys of the laboratories, our policy has been to survey other potentially contaminated areas in the circumstances listed:

- After any spill, leak, fire, or other disturbance in a laboratory.
- When work with radioactive materials is terminated.
- Before and after laboratory construction modifications.
- Before maintenance or removal of any equipment that may have come in contact with radioactive material or that contains radioactive material.

Spill History:
On May 11, 2011 a ten ml glass vial containing 500 picocuries of an aqueous gamma standard was dropped on the laboratory floor. The area was decontaminated and the RSO performed confirmatory testing. This RSO knows of no other spill events.

Additional Sources of Radioactivity:
The CTDPHL possesses six sealed electron capture detector sources containing Nickel-63. These detectors are swipe tested every six months. Results of these tests were forwarded on October 10, 2013.

Results and Conclusions:
The radioactivity within the inventory of consumable (i.e., dispersible) items was compiled by isotope and these amounts were compared to NRC screening density values shown in Table 3. Of the twenty-four isotopes in this inventory, the activities of thirteen (in uCi) were below their corresponding screening density (in uCi/100cm^2). Three of the eleven remaining isotopes (Cd-109, Co-57, Co-60) were in a dispersible item used in making a standard and no inventory was consumed through this process. For the eight remaining isotopes of potential concern, an analysis of work patterns (See Table 3) and isotope consumption (See Table 4) was performed. Consumption density per unit work surface area was thereby calculated. These density values represent the maximum possible residual. The density values were then compared to Screening Values. All density values shown in Table 4 are below their corresponding Screening Values. These results indicate it is highly unlikely that residual activity on the working and storage surfaces would be present in amounts in excess of NRC guidelines.

In addition, there is nothing in the spill history suggesting there is additional residue. Furthermore, regular monitoring of working surfaces was performed and no significant activity was discovered.

In conclusion, the dose from residual radioactive material from the surfaces at the 10 Clinton Street facility is, in all likelihood, below the 25 mrem per year threshold cited in 10 CFR 20.1402. Sites which meet this criterion are available for unrestricted use.

FIGURES AND TABLES

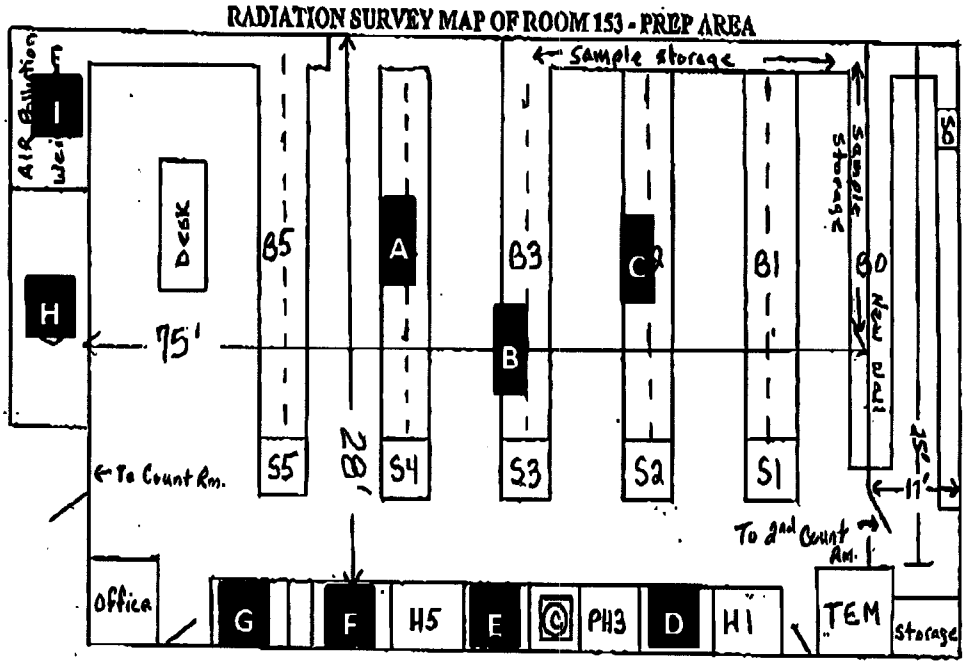


Figure 1: Schematic of the Sample Prep Room, 10 Clinton St. Surfaces shown with black background are areas where radionuclides were used or stored. Workbenches are B1-B5. S1-S5 mark sinks while hoods are on the bottom (south) wall. Storage areas H-I were on the left (west wall).

Table 1 : Description of Work Areas in Sample Prep and Storage. (From Figure 1)

Part A: Work Surfaces Shown in Black Rectangles

Diagram Key	Category	Work Surface Area (m^2)	Benchcoat or tray used?
A	Benchtop	1.08	Yes
B	Benchtop	1.08	Yes
C	Benchtop	1.08	Yes
D	Hood	0.84	No
E	Hood	0.84	No
F	Hood	0.84	Yes
G	Hood	0.84	No

Part B: Storage Areas

Diagram Key	Category	Floor Surface Area (m^2)
H	Store Room	4.5
I	Walk-in Fridge	4.5

Table 2: Parameters for Estimates of Isotope Consumption by Isotope and Analytic Procedure. Isotopes listed are those in amounts above the threshold of concern as demonstrated in Table 3. These parameters were derived in consultation with supervisors and staff in the Radiochemistry Laboratory. Work surface locations are those from Figure 1.

Isotope	Analytic Procedure	Work Surface Area (meters^2)	Location(s) [See Diagram]	Procedures per year	Isotope consumed per procedure (pCi)	Years Operation
Am241	Rapid Actinides	1.92	A,F	2	540	2
Am243	Rapid Actinides	1.92	A,F	2	28	2
Cd109	Gamma Standard for Drinking Water **	0.84	G	1	0	20
Co57	Gamma Standard for Drinking Water **	0.84	G	1	0	20
Co60	Gamma Standard for Drinking Water **	0.84	G	1	0	20
Cs137	Gross Beta in Drinking Water	1.92	B,E	5	50	20
Pu239	Rapid Actinides	1.92	A,F	2	540	2
Pu242	Rapid Actinides	1.92	A,F	2	28	2
Ra226	Ra-226 in Drinking Water	1.92	C,D	20	30	20
Sr90	Rapid Sr-90	1.92	A,F	1	136	2
Sr90	Sr-90 in Drinking Water or Milk	1.92	C,D	7	50	20
U235 *	Rapid Actinides	1.92	A,F	2	1	2

** U-235 as component of natural uranium for proficiency testing using the Rapid Actinides methodology*

*** Isotope is dispersible but the procedure involves only dilution.*

Table 3: CT DPH Inventory of Isotopes in Consumable (*i.e.*, Dispersible) Items with their corresponding NRC Screening Values. U-235 is a component of natural uranium for proficiency testing. Inventory amounts shown in bold are below the Screening Value.

Isotope	Screening Value (uCi/100cm^2)	Inventory of Consumables (uCi)
Cs134	5.70E-03	**8.57E-04**
H3	55.8	**4.03E-02**
Ir192	3.30E-02	**1.60E-10**
Ra228	9.00E-05	**2.56E-07**
Ru106	1.20E-02	**1.56E-04**
Sb125	2.00E-02	**1.09E-03**
Se75	5.00E-02	**1.06E-07**
Te123m	1.20E-01	**2.01E-02**
Th230	1.50E-05	**1.16E-09**
U232	7.70E-06	**9.79E-09**
U234	4.10E-05	**2.58E-09**
U238	4.50E-05	**2.68E-09**
Zn65	2.20E-02	**1.23E-04**
Am241	1.20E-05	1.51E-01
Am243	1.20E-05	5.30E-03
Cd109	5.10E-03	9.91E-01
Co57	9.50E-03	2.84E-02
Co60	3.20E-03	2.66E-01
Cs137	1.30E-02	2.30E-01
Pu239	1.30E-05	7.75E-03
Pu242	1.40E-05	5.10E-03
Ra226	5.00E-05	9.55E-04
Sr90	3.90E-03	6.34E-03
U235	4.40E-05	2.34E-04

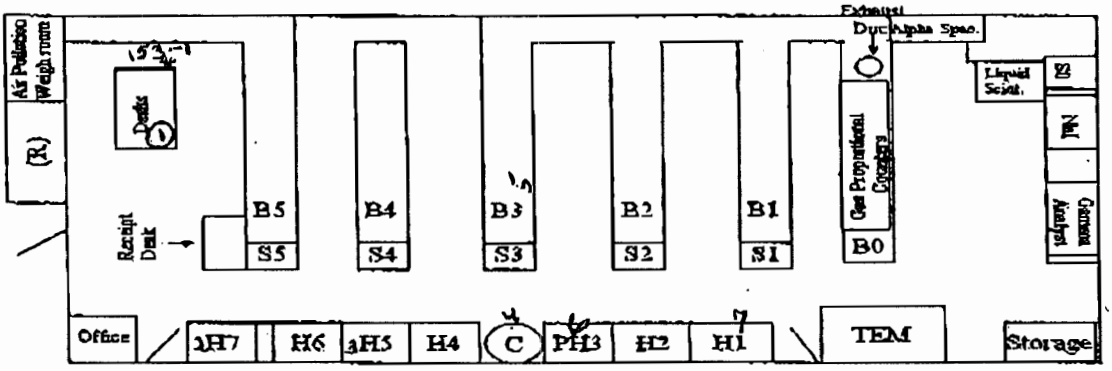
Table 4: Consumption by Isotope and Analytic Procedure. Consumption per 100 cm^2 of work surface is estimated using the parameters listed in Table 3. Consumption is compared to the Screening Value listed in the last column. Screening Values are greater than consumption indicating that the density of residual activity is unlikely to exceed the Screening Value.

Isotope	Analytic Procedure	Consumption (pCi/(100 cm^2))	Consumption (dpm/(100 cm^2))	Screening Value (dpm/(100 cm^2))
Am241	Rapid Actinides	11.25	24.98	27.00
Am243	Rapid Actinides	0.58	1.29	27.00
Cs137	Gross Beta in Drinking Water	26.04	57.81	28000.00
Pu239	Rapid Actinides	11.25	24.98	28.00
Pu242	Rapid Actinides	0.58	1.29	30.00
Ra226	Ra-226 in Drinking Water	62.50	138.75	1120.00
Sr90	Rapid Sr-90	1.42	3.15	8710.00
Sr90	Sr-90 in Drinking Water or Milk	36.46	80.94	8710.00
U235	Rapid Actinides	0.02	0.04	98.00

Table 5: Action Levels for Removable alpha/beta Contamination

Smear Results*	**Action**
< 100 dpm/100 cm^2	No action required by RSO. Left to discretion of Supervisor.
100-349 dpm/100 cm^2	Area or surfaces are to be cleaned as soon as possible by the Supervisor or laboratory personnel. Shoe covers and step-off pads shall be used if contamination is on floor.
350-1,999 dpm/100 cm^2	Contamination is to be cleaned immediately under supervision of Supervisor or manager. Shoe covers and step-off pads are required for entry into area. Only essential personnel will have access.
≥ 2,000 dpm/100 cm^2	Entry of personnel into area is to be prevented until area is cleaned. Cleanup is to begin immediately by Supervisor under supervision of RSO. Shoe covers and step-off pads are required.

RADIATION SURVEY MAP OF ROOM 153 – PREP AREA



Key: (H) = Hood, (PH) = Perchloric Hood, (S) = Sink, (C) = Centrifuge, (B) = Bench, (R) = Refrigeration Unit, (M) = Meter Survey Area, (W) = Wipe Sample Area, (X) = Contamination Area (≤100cm² unless stated otherwise)

Survey Instrument & Probe Information

Meter Make: Ludlum Model: 14C Serial No.: 210164 Calibration Date: 14 Dec 2010

Probe Make: Ludlum Model: 44-9 Serial No.: 220956

Meter Reading Results:

Sample ID	Area Description	CPM	MREM	OK/Corrective Action
153-1	*Desks	<100		OK
-2	H7 near lights	<100		OK
-3	H5 R side under lts	<100		OK
-4	C - Inside left	<100		OK
-5	B3 - R side	<100		OK
-6	PH3 - Hot Plate	<100		OK
153-7	H1 - under	<100		OK
155-1	Hood #5	<100		OK
155-2	#3	<100		OK

Background Location: Hall

Count 1: 100 cpm / mrem
Count 2: 100 cpm / mrem
Count 3: 100 cpm / mrem

Total: 300 cpm / mrem
Average: 100 cpm / mrem

Wipe Sample Results:

Sample ID	Area Description	Nuc.	CPM	DPM	uCi	OK/Corrective Action
153-1	Same as above		0.50			OK
2			0.90			OK
3			2.6			OK
4			0.9			OK
5			0.7			OK
6			0.0			OK
153-7			1.0			OK
155-1			0.7			OK
155-2			0.7			OK

Date of Survey: 10/17/11 Signature: Joseph M Taylor

Note: All areas are less than twice background levels above unless stated otherwise.

CT DPH Laboratory - Room 153 Survey Map - Version 2.0 19 July 2010

Figure 2: Typical monthly survey report showing locations surveyed, background counts, survey instrumentation, and results of gamma screening. Different locations were surveyed each month.