USTUR 810: Laboratory Surveys for Removable Contamination

Purpose	Determination of removable contamination	**Method Number**	USTUR 810
Original Date	5/20/97	**Author**	USTUR Radiochemistry Staff
Revision Number	1	**Approved By**	Jim Elliston
Effective Date	5/20/97	**Approval Date**	1/31/01

1. Principle of Method

1.1. Swipes of areas which are used for radioactive work are counted by liquid scintillation counting to determine removable contamination.

1.2 For those laboratories where no radioactive work has been performed, no wipes will be done and the survey form noted to reflect this.

2. Apparatus

2.1. Packard Tri-Carb 1900 CA Liquid Scintillation Analyzer.

2.2 4.25 cm filter paper (Whatman No. 1).

2.3 Liquid scintillation vials: 7 mL polyethylene vial, Kimble solvent saver vial 58502.

3. Reagents

3.1. OPTI-FLUOR liquid scintillation cocktail (Packard).

4. Procedure

4.1. All laboratories where work involving radioactive materials was performed shall be surveyed for removable contamination each week.

4.2 Determine the laboratories to be surveyed and obtain the appropriate lab survey forms which have been prepared for each laboratory.

4.3 Obtain a sufficient number of liquid scintillation vials for the number of swipes plus one blank.

4.4 Consecutively number the vials on their caps beginning with the blank (the blank is always number 1).

4.5 Swipe 100 cm^2 of each surface to be surveyed (e.g. hood, bench top, floor), roll the filter paper and place it in the liquid scintillation vial. Mark the surveyed surface on the appropriate lab survey form.

4.6 Add 5 mL of Opti-fluor cocktail to each vial.

4.7 Place each vial into the liquid scintillation counter sample holders (inside glass vials).

4.8 Count the blank for 10 minutes and samples for 1 minute each using the following Regions of Interest :

Table 1: Liquid Scintillation Counter Setup

	Region A (Beta Region)	**Region B (Alpha Region)**	**Region C (Total)**
Channel Numbers	2-50	51-500	0-2000

4.9 Compare the blank count rate with the limits in Table 2 for each region to make sure it is in control (within ±3 standard deviation of mean). If these do not fall within the region, use a new glass vial and recount the blank. If the blank still exceeds the QC chart specification limits, then the materials shall be considered suspect and appropriate action taken.

Table 2: Maximum Blank Values

	Region A	Region B	Region C
Average (cpm)	15.3	5.8	25.3
1 sigma (cpm)	1.5	0.82	2.0
Upper limit (cpm)	20	8.3	32

4.10 Check the net count rate for each sample against the criteria listed in Table 3.

Table 3: Maximum Net Count Rate in Sample

	Region A	Region B	Region C
Maximum allowable Net count rate (cpm)	18	13	23

-Assuming a 10 minute count for blank, 1 minute count for samples, 100% efficiency for alpha particles, 60% for beta.

4.11 Mark any sample which exceeds this count rate. Remove all samples which were acceptable (leave the blank) and dispose of them in the appropriate radioactive waste stream. Change the glass vials and recount the samples which exceeded the maximum allowable count (remember to include the blank with the recount). Leave the samples in their original configuration.

4.12 For samples recounted which are below the maximum allowable, then these will be considered acceptable. Dispose of the vial.

4.13 For samples which are still above the maximum allowable count rate:

a. If the count rate has fallen significantly from the first count, the chemiluminescence is probable and the sample shall be recounted again.

b. If the count rate has remained the same then it will be assumed that the area is contaminated and appropriate action shall be taken based on the magnitude of the contamination (direct measurements, decontamination, bioassay, etc). Consult with senior laboratory personnel.

5. Equations

$$L_d \equiv \text{Decision Level} = \frac{3.29\sqrt{\frac{c_b t_s}{t_b}\left(1+\frac{t_s}{t_b}\right)}+3}{B_s E t_s}$$

$$L_c \equiv \text{Critical Level} = \frac{L_d - \frac{3}{B_s E t_s}}{2}$$

6. References

6.1 ANSI N13.30

6.2 L.A. Currie, "Limits for Qualitative Detection and Quantitative Determination," *Anal. Chem.* 40, 586-593 (1968).

6.3 L.A. Currie, "Lower Limit of Detection: Definition and Elaboration of a Proposed Position for Radiological Effluent and Environmental Measurements," U.S. Nuclear Regulatory Commission report NUREG/CR-4007 (September 1984).

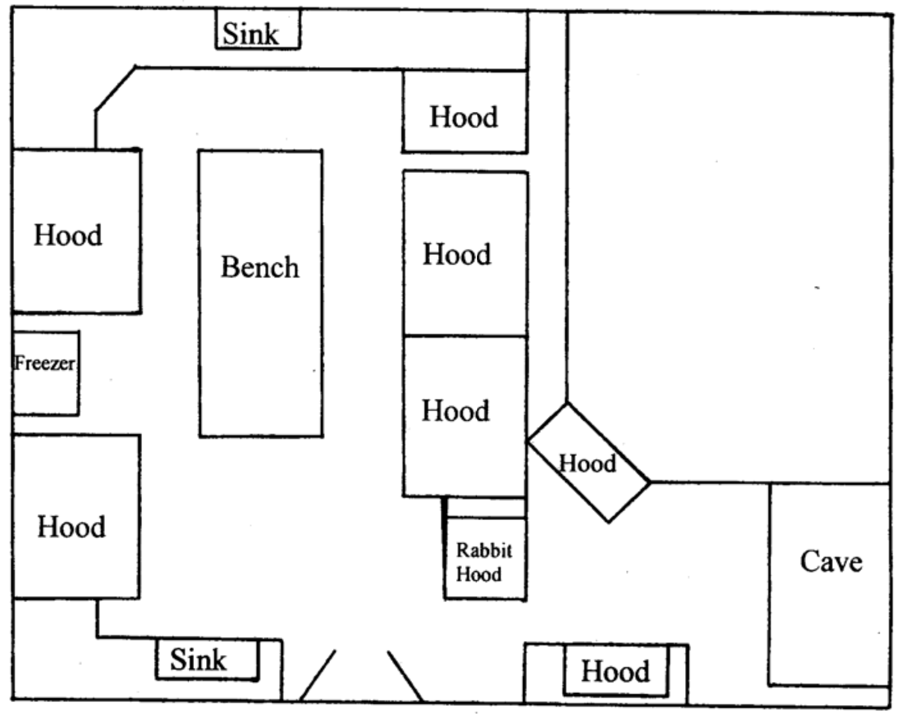
Radiation Safety Office

Laboratory Survey Form

Building: NRC	Room 101	Date
Auth. User: Jim Elliston	Lab Class	Time

Wipe Test Results

	Location	Net Counts 2-2000 keV
Wipe #1	Background	



Surveyed By: ____________________ Date: __________
Reviewed By: ____________________ Date: __________

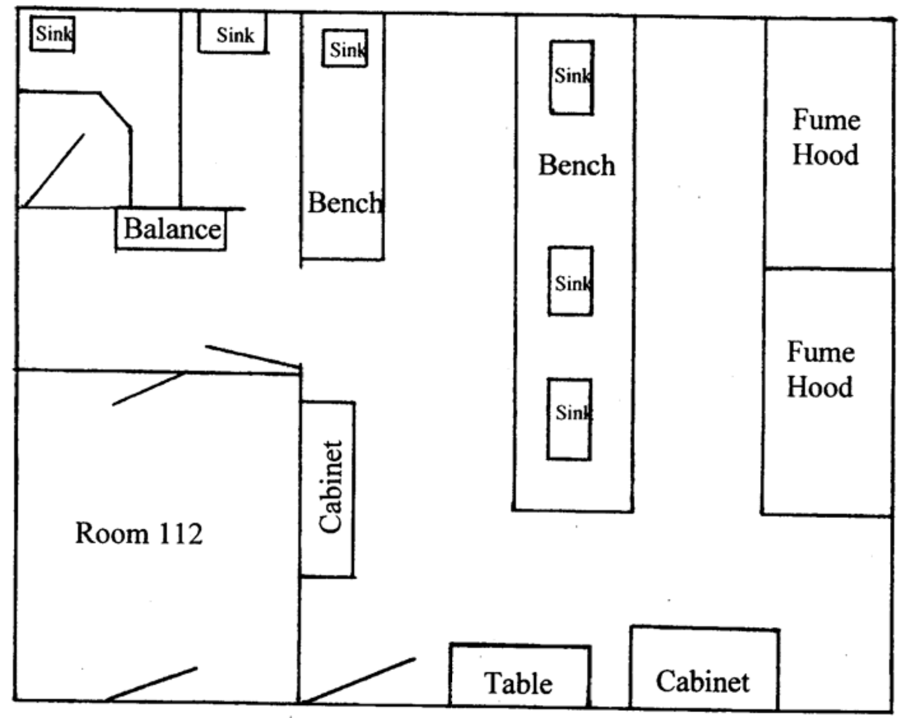
Radiation Safety Office

Laboratory Survey Form

Building: NRC	Room 110 & 112A	Date
Auth. User: Jim Elliston	Lab Class	Time

Wipe Test Results

	Location	Net Counts 2-2000 keV
Wipe #1	Background	



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Reviewed By: ____________________ Date: __________

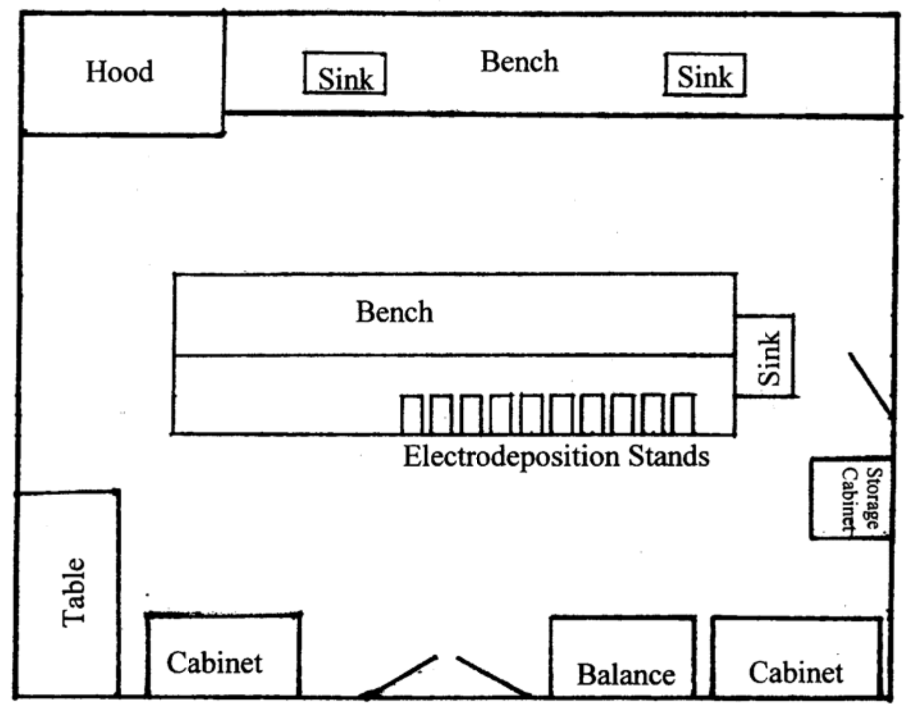
Radiation Safety Office

Laboratory Survey Form

Building: NRC	Room 114	Date
Auth. User: Jim Elliston	Lab Class	Time

Wipe Test Results

	Location	Net Counts 2-2000 keV
Wipe #1	Background	



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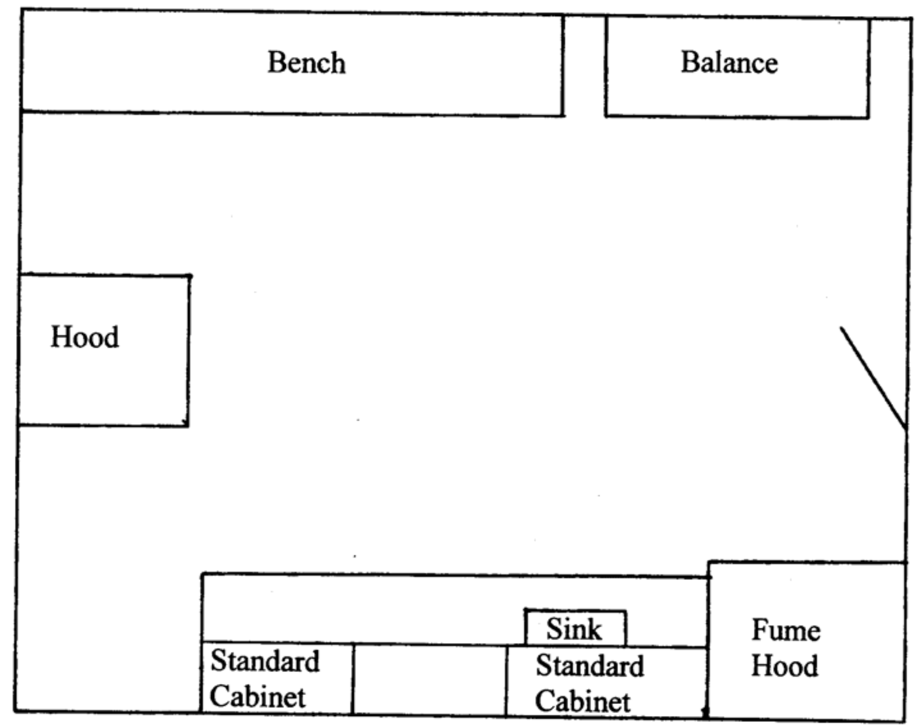
Radiation Safety Office

Laboratory Survey Form

Building: NRC	Room 119	Date
Auth. User: Jim Elliston	Lab Class	Time

Wipe Test Results

	Location	Net Counts 2-2000 keV
Wipe #1	Background	



Surveyed By: ______________________ Date: __________
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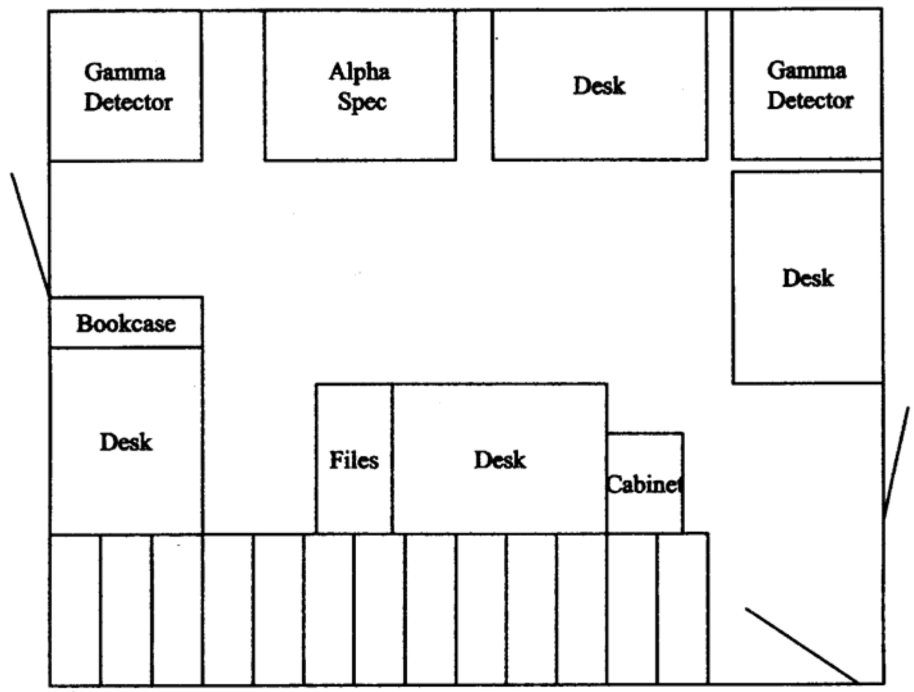
Radiation Safety Office

Laboratory Survey Form

Building: NRC	Room 120	Date
Auth. User: Jim Elliston	Lab Class	Time

Wipe Test Results

	Location	Net Counts 2-2000 keV
Wipe #1	Background	



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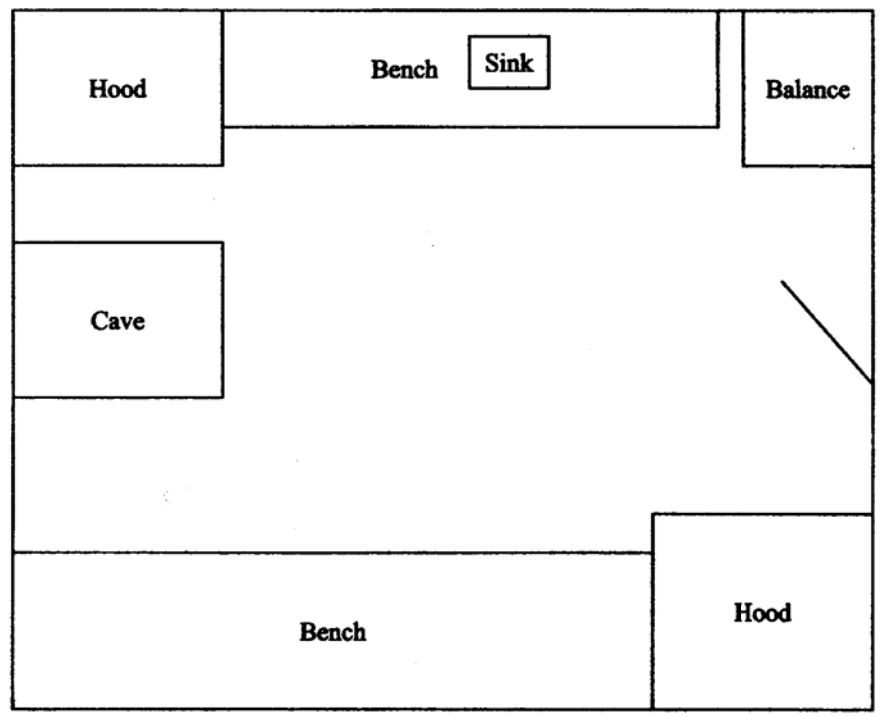
Radiation Safety Office

Laboratory Survey Form

Building: NRC	Room 121	Date
Auth. User: Jim Elliston	Lab Class	Time

Wipe Test Results

	Location	Net Counts 2-2000 keV
Wipe #1	Background	



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Reviewed By: ____________________ Date: __________

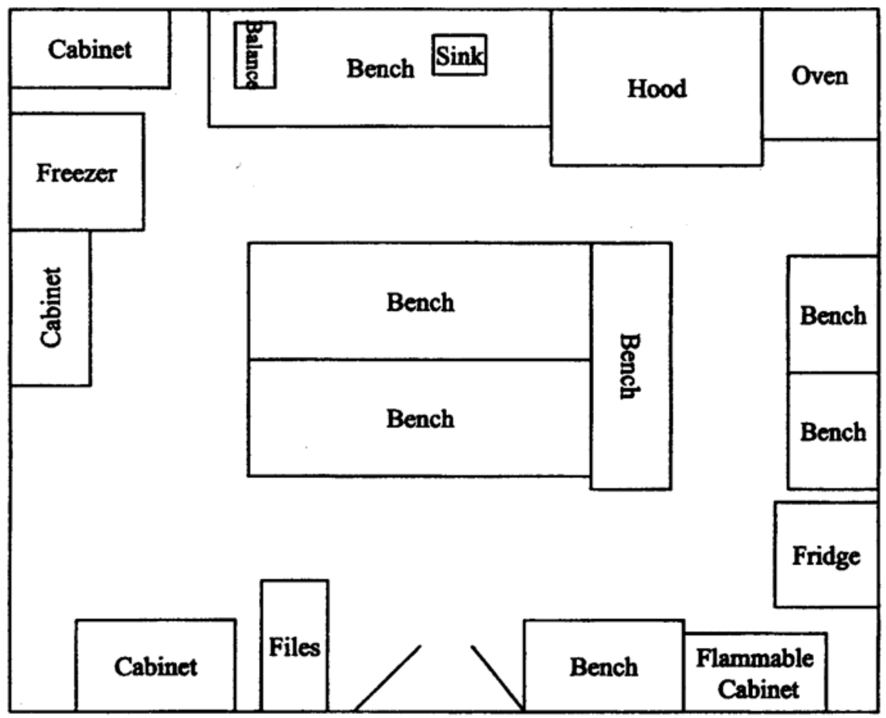
Radiation Safety Office

Laboratory Survey Form

Building: NRC	Room 214	Date
Auth. User: Jim Elliston	Lab Class	Time

Wipe Test Results

	Location	Net Counts 2-2000 keV
Wipe #1	Background	



Surveyed By: ____________________ Date: __________
Reviewed By: ____________________ Date: __________

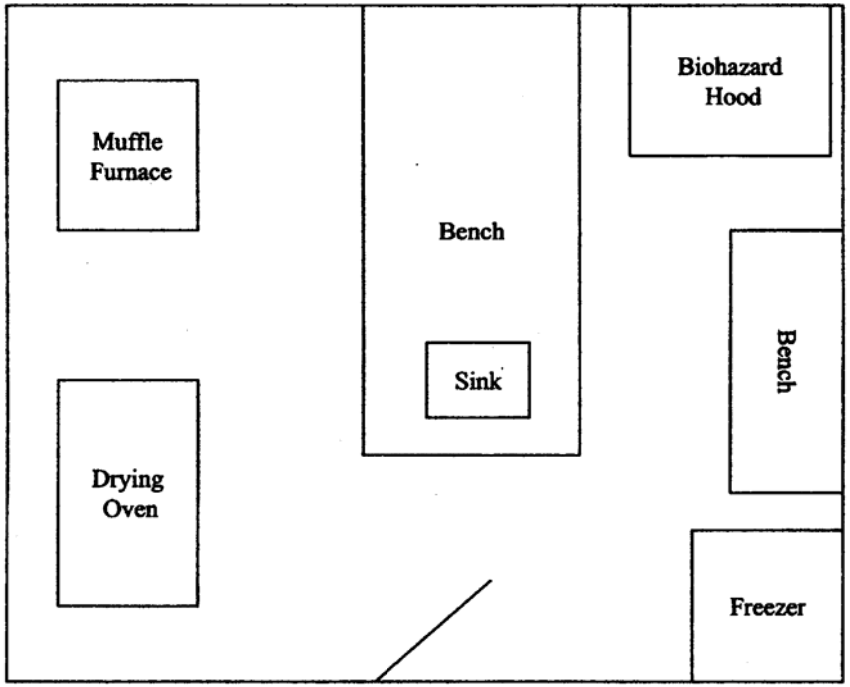
Radiation Safety Office

Laboratory Survey Form

Building: NRC	Room 215	Date
Auth. User: Jim Elliston	Lab Class	Time

Wipe Test Results

	Location	Net Counts 2-2000 keV
Wipe #1	Background	



Surveyed By: _____ Date: _____

Reviewed By: _____ Date: _____

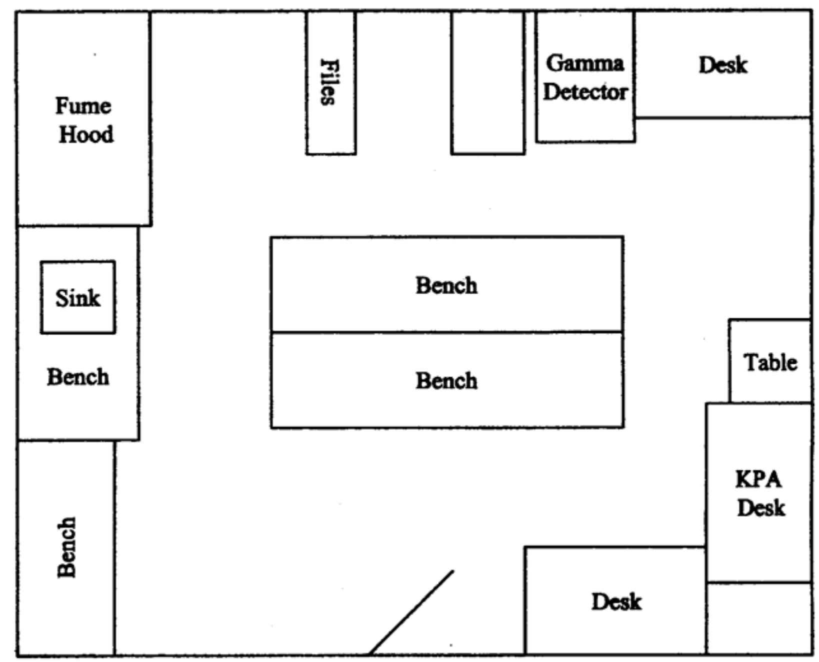
Radiation Safety Office

Laboratory Survey Form

Building: NRC	Room 221	Date
Auth. User: Jim Elliston	Lab Class	Time

Wipe Test Results

	Location	Net Counts 2-2000 keV
Wipe #1	Background	



Surveyed By: ____________________ Date: __________
Reviewed By: ____________________ Date: __________