

THE TRITIUM GUY

- Presented by:
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- Division of Radioactive Materials
- IL Dept. of Nuclear Safety

Generally Licensed Exit Signs

- Safe and Important: Fires, electrical blackouts
- Inexpensive, very little maintenance
- Ubiquitous (12,000+ IL)/350,000 in NRC jurisdictions
- Mfrd/dist. under sp. lic. and used under general license (gl)

Exit Signs

- Glass Tubes: Gaseous Tritium
 - Pure Beta Emitter, 18.6 KeV
 - T $1/2=12.3$ Yrs/Bio.T $1/2=10$ days
 - Phosphor=ZnS on tube walls
 - Glows due to Beta interactions w/phosphor





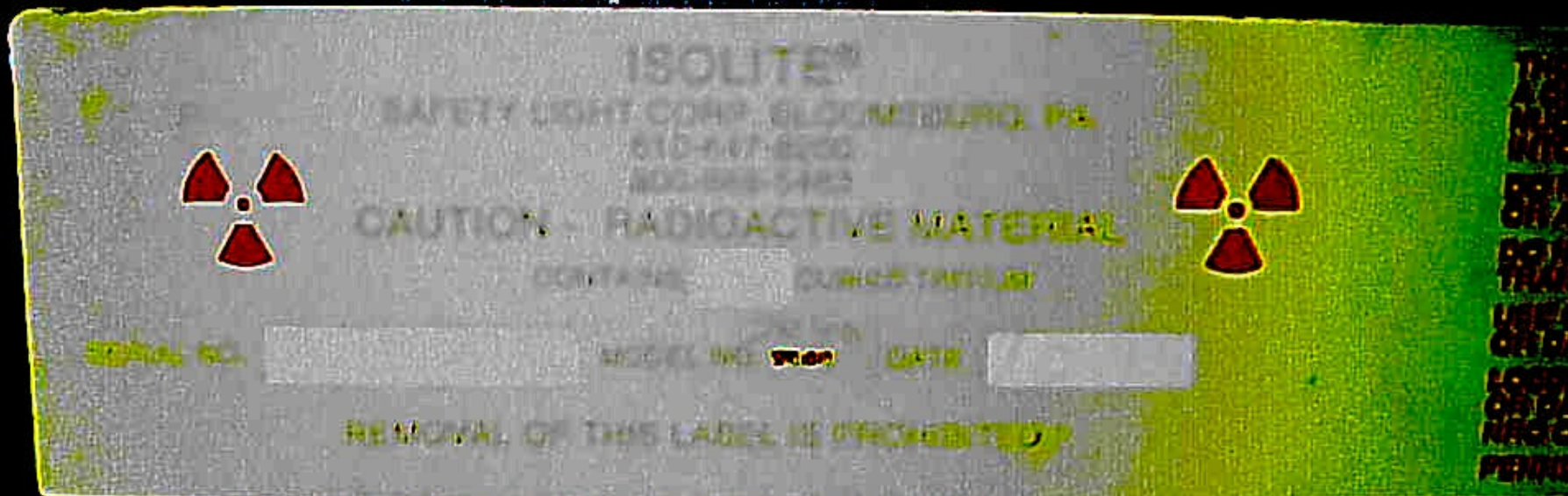
Problems

- Multi-Curie quantities of Hydrogen-3
- GLs not required to license or register
- Not aware of ram
- Not aware that they are regulated
- Not aware of proper disposal
- Inadequate labeling



SELF-LUMINOUS EXIT SIGN (MARKER)
RECOMMENDED MAXIMUM DISTANCE FOR LEGIBILITY: 100 FT.
RECOMMENDED EFFECTIVE LIFE: 10 YEARS
REPLACE BEFORE: 12/2005

THIS DE
WITH LETTER
(0.21 Cd/Sq
THAN 5 FT C
SEE UL MEC



LIGHT-TUBE®
POWERED LIGHTING, INC.
1 WESTCHESTER PLAZA
ELMSFORD, N.Y. 10523
CAUTION ☣
(193) 20 CURIES MAX
LICENSE NO. GL 1424 (S)

Problems (cont.)

- Safe and effective unless you have the inquisitive, intelligent(?!) and most dreaded of all:

**THE TRITIUM
GUY**

NJ Tritium Guys

- 1st-teen found an exit sign
 - swim suit posters, sunflower seeds
 - Fire Dept., GM Tube. No Contamination!
 - NJDEP investigated
 - 23 Agencies, \$100,000 +, TEDE 80 mrem (256)

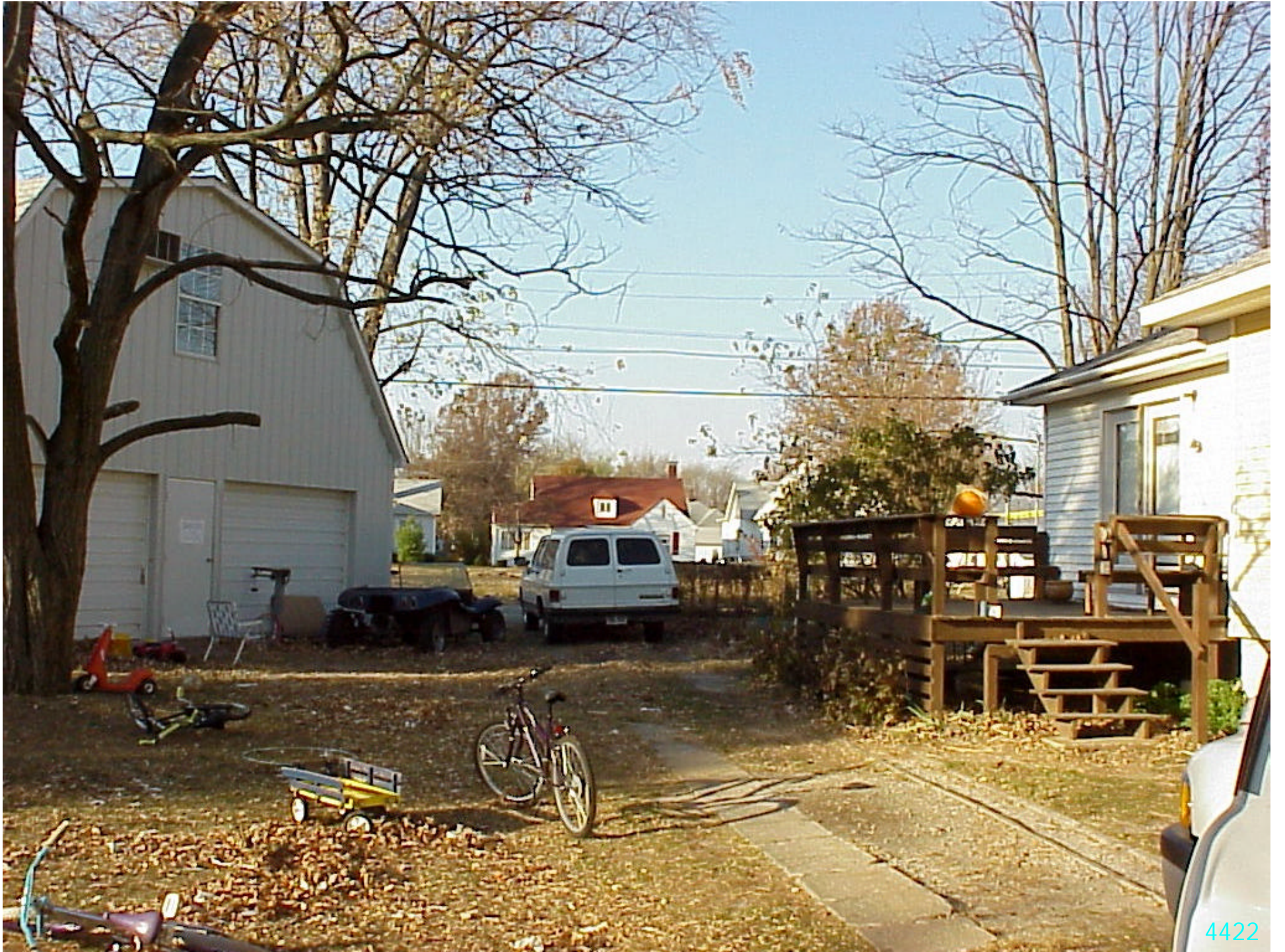
NJ (cont.)

- 2nd- Teen- Child Trtmt Center
 - Tantrum
 - 15 Curies, several tubes broken
 - 930,000 dpm/100cm² in bedroom/16 mrem
 - \$200,000+ 16 mrem

IL Tritium Experience

- Nov 1, 1999--MINWAX in Flora, IL
- Damaged sign (Self-powered Lighting, Elmsford, NY)
- Scavenger-(aka Tritium Guy)
- Home













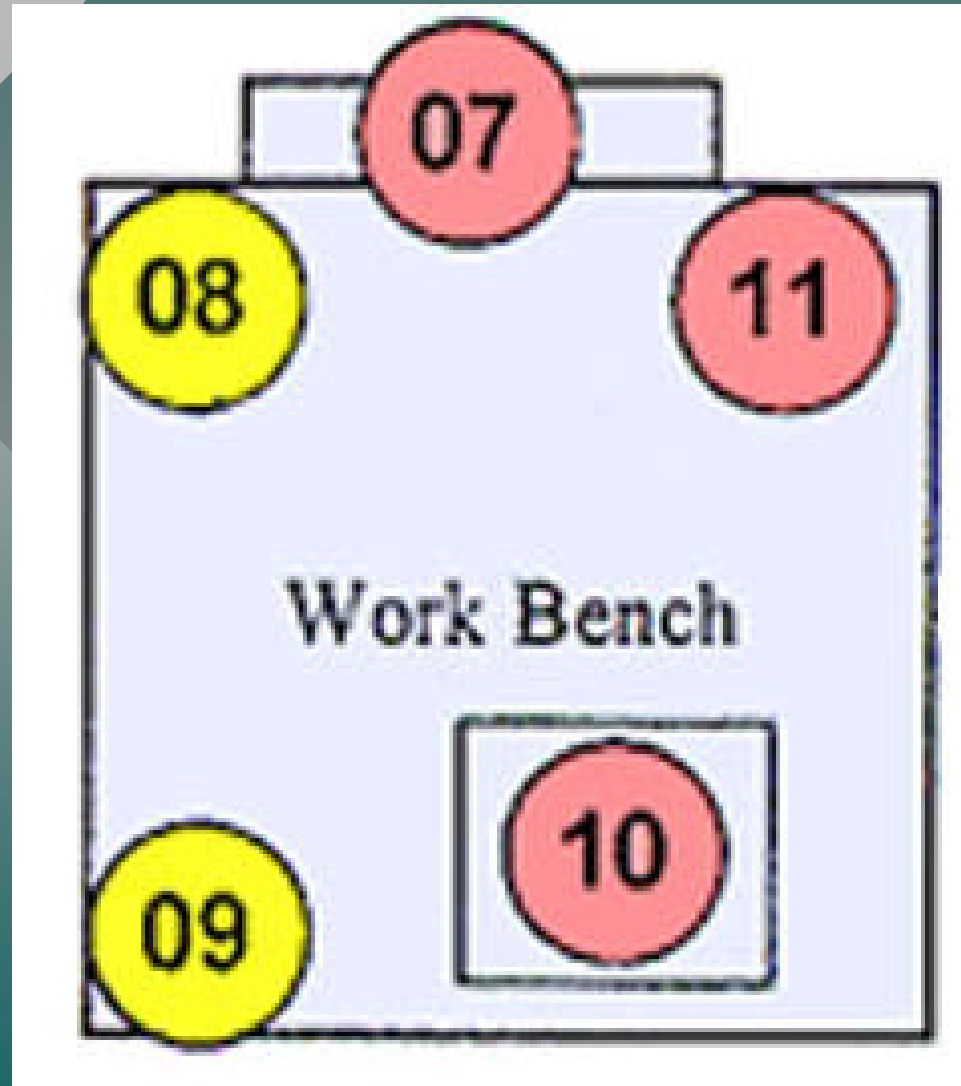
Contamination Assessment

- Wipe samples only effective means of measurement
- IDNS Lab in Springfield. Liquid Scintillation (Phosphor interference)
- Urinalyses
- Portable Proportional Gas Flow Proportional Counter

Contamination Limits

- 340 Appendix A (Similar to NRC RG 1.86)
 - 1,000 pCi/100 cm²
 - 5,000 pCi/100 cm² Max.
 - Fixed--250 microrem/hr @ 1 cm

Before Dec...



Before Decon

11		BENCH, NW CORNER	
Date	Sample #	Activity	
11/3/99	1173	110,314	
11/10/99	1211	57,578	
11/10/99	1212	*6696	
		*clean	
1/6/00	1278	6398	

IDNS Decontamination Decision

- Luxury of contamination confined to a non-residence
- Luxury of time for H-3 concentration reduction over time
- Most of the source was initially removed. Contamination was like a particulate

IDNS Decontamination Decision (cont.)

- Equipment, supplies, manpower to conduct ourselves and save expense
- Opportunity for staff for practical health physics experience

Decon Methods

- Basic HP contamination control
- Rotated duties
- Non-phosphate detergent and water (detector interference)
- Iso-propyl alcohol
- Washed down and air-dried.
Ventilation and heating, collander for small items

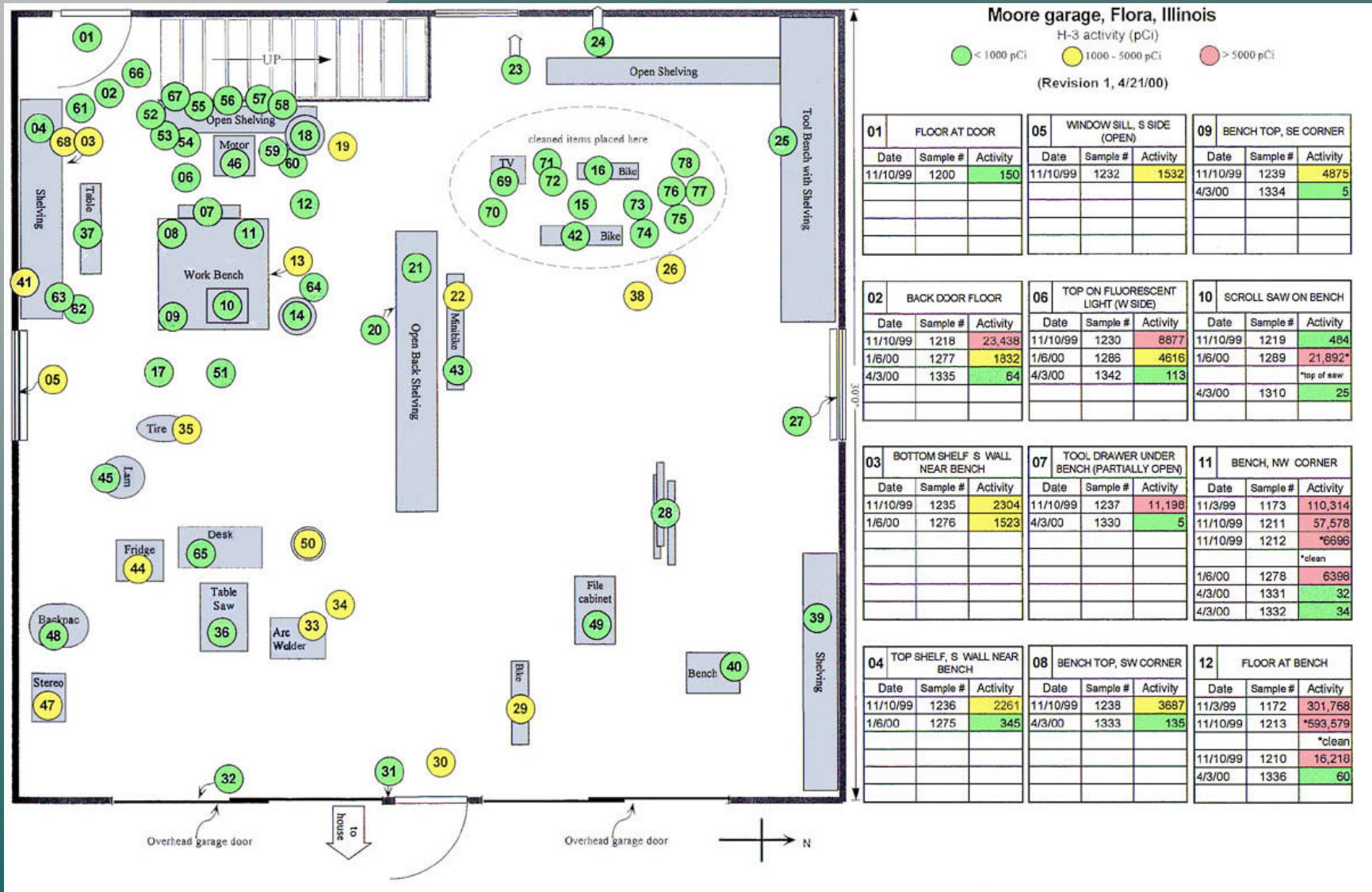




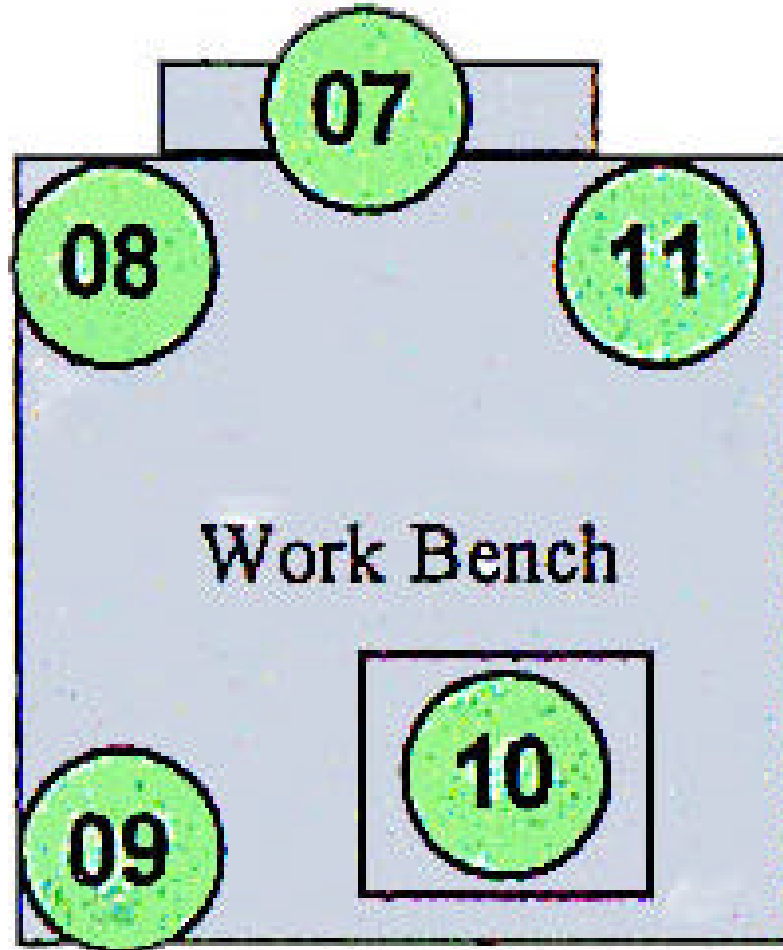




After Decc...



After Decon



After Decon

11		BENCH, NW CORNER	
Date	Sample #	Activity	
11/3/99	1173	110,314	
11/10/99	1211	57,578	
11/10/99	1212	*6696	
		*clean	
1/6/00	1278	6398	
4/3/00	1331	32	
4/3/00	1332	34	

Final Dose Estimates

- Tritium Guy--7.1 mrem (DOE REMedy and ANSI HPS N13.14-1994)

Final Dose Estimates (cont.)

- 250+ (NCRP 65)
 - REMedy-SAIC, integrates ICRP 30 biokinetics models, TEDE based on avg <urine> 24 hr. periods.
 - Tritium Spouse--1.07 mrem/Tritium Daughter--1.06 mrem
 - Highest IDNS --.18 mrem

Final Cost Estimates

- Staff Time including decon, ntgs., travel = \$31,735
- Bioassay analyses = \$11,700
- Wipe Sample analyses = \$16,650
- Disposal of 4 drums of waste = \$4,000
- TOTAL = \$64,085.00

Final Recommendations

- Labeling improvements
- Sales literature improvements (install and forget about for 20 years!). Enhanced communication with contractors, vendors, building owners etc.

Final Recommendations (cont.)

- Discourage proliferation simply to avoid running electrical wire.
- Install protection to avoid damage.

Final Recommendations (cont.)

- Revisit Acceptable Surface Contamination Levels in NRC RG 1.86 and related documents
- Possible technological improvements to solidify or mix phosphor with H-3 to improve detection and decon efforts
- Watch out for “Tritium Guys” in your neighborhood!