



Western  
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*The discipline of learning. The art of caring.*

### Assessing Spills: Hazards of Radioactive Materials\*

**\*With permission from the Manual of Policies and Procedures for Radiation Protection, for the University of Minnesota, Department of Environmental Health and Safety, Radiation Protection Program, January 2000**

#### Group 1. Low Hazard. Above 1 mCi, treat as a major spill.

$^3\text{H}$ ,  $^7\text{Be}$ ,  $^{14}\text{C}$ ,  $^{18}\text{F}$ ,  $^{59}\text{Ni}$ ,  $^{69}\text{Zn}$ ,  $^{71}\text{Ge}$ ,  $^{238}\text{U}$ , natural thorium, natural uranium and noble gases.

#### Group 2. Medium Hazard. Above 100 uCi treat as a major spill.

$^{24}\text{Na}$ ,  $^{31}\text{Si}$ ,  $^{32}\text{P}$ ,  $^{35}\text{S}$ ,  $^{36}\text{Cl}$ ,  $^{42}\text{K}$ ,  $^{47}\text{Sc}$ ,  $^{48}\text{V}$ ,  $^{51}\text{Cr}$ ,  $^{54}\text{Mn}$ ,  $^{56}\text{Mn}$ ,  $^{55}\text{Fe}$ ,  $^{59}\text{Fe}$ ,  $^{64}\text{Cu}$ ,  $^{65}\text{Zn}$ ,  $^{72}\text{Ga}$ ,  $^{76}\text{As}$ ,  $^{86}\text{Rb}$ ,  $^{89}\text{Rb}$ ,  $^{90}\text{Y}$ ,  $^{91}\text{Y}$ ,  $^{95}\text{Nb}$ ,  $^{99}\text{Mo}$ ,  $^{103}\text{Ru}$ ,  $^{105}\text{Rh}$ ,  $^{103}\text{Pd}$ ,  $^{105}\text{Ag}$ ,  $^{111}\text{Ag}$ ,  $^{109}\text{Cd}$ ,  $^{113}\text{Sn}$ ,  $^{127}\text{Te}$ ,  $^{129\text{m}}\text{Te}$ ,  $^{140}\text{Ba}$ ,  $^{140}\text{La}$ ,  $^{143}\text{Pr}$ ,  $^{147}\text{Pm}$ ,  $^{151}\text{Sm}$ ,  $^{166}\text{Ho}$ ,  $^{170}\text{Tm}$ ,  $^{177}\text{Lu}$ ,  $^{183}\text{Re}$ ,  $^{190}\text{Ir}$ ,  $^{191}\text{Pt}$ ,  $^{193}\text{Pt}$ ,  $^{196}\text{Au}$ ,  $^{198}\text{Au}$ ,  $^{199}\text{Au}$ ,  $^{200}\text{Tl}$ ,  $^{201}\text{Tl}$ ,  $^{202}\text{Tl}$ ,  $^{204}\text{Tl}$ ,  $^{203}\text{Pb}$ ,  $^{220}\text{Rn}$ ,  $^{222}\text{Rn}$ ,  $^{235}\text{U}$

#### Group 3. High Hazard. Above 10 uCi, treat as a major spill.

$^{22}\text{Na}$ ,  $^{45}\text{Ca}$ ,  $^{46}\text{Sc}$ ,  $^{60}\text{Co}$ ,  $^{85}\text{Sr}$ ,  $^{90}\text{Sr}$ ,  $^{106}\text{Ru}$ ,  $^{125}\text{I}$ ,  $^{129}\text{I}$ ,  $^{131}\text{I}$ ,  $^{137}\text{Cs}$ ,  $^{141}\text{Ce}$ ,  $^{154}\text{Eu}$ ,  $^{182}\text{Ta}$ ,  $^{210}\text{Bi}$ ,  $^{211}\text{At}$ ,  $^{224}\text{Ra}$ ,  $^{233}\text{U}$

#### Group 4. Very High Hazard. Above 1 uCi, treat as a major spill.

$^{210}\text{Pb}$ ,  $^{210}\text{Po}$ ,  $^{226}\text{Ra}$ ,  $^{227}\text{Ac}$ ,  $^{228}\text{Th}$ ,  $^{237}\text{Np}$ ,  $^{228}\text{Ra}$ ,  $^{238}\text{Pu}$ ,  $^{239}\text{Pu}$ ,  $^{240}\text{Pu}$ ,  $^{242}\text{Pu}$ ,  $^{241}\text{Am}$ ,  $^{242}\text{Cm}$

\*Emits gamma radiation in significant amounts.