# Site-Specific
## Outdoor Worker Equation Inputs for Soil

| Variable | Value |
|---|---|
| Slab size for ACF (area correction factor) $m^2$ | 10000 |
| Cover layer thickness for GSF (gamma shielding factor) cm | 0 |
| TR (target cancer risk) unitless | 0.0001 |
| $t_{ow}$ (time - outdoor worker) yr | 25 |
| $EF_{ow}$ (exposure frequency - outdoor worker) day/yr | 70 |
| $ED_{ow}$ (exposure duration - outdoor worker) yr | 25 |
| $IRS_{ow}$ (soil intake rate - outdoor worker) mg/day | 100 |
| $IRA_{ow}$ (inhalation rate - outdoor worker) $m^3$/day | 23.04 |
| $ET_{ow}$ (exposure time - outdoor worker) hr/day | 16 |
| City (Climate Zone) | Harrisburg, PA |
| $A_s$ (acres) | 3 |
| $Q/C_{wp}$ ($g/m^2$-s per $kg/m^3$) | 68.916564307420 |
| PEF (particulate emission factor) $m^3$/kg | 4995082217.1786 |
| A (PEF Dispersion Constant) | 16.2302 |
| B (PEF Dispersion Constant) | 18.7762 |
| C (PEF Dispersion Constant) | 216.108 |
| V (fraction of vegetative cover) unitless | 0.9 |
| $U_m$ (mean annual wind speed) m/s | 4.69 |
| $U_t$ (equivalent threshold value) | 11.32 |
| F(x) (function dependant on $U_m/U_t$) unitless | 0.194 |

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# Site-Specific
## Outdoor Worker PRGs for Soil

| Isotope | ICRP Lung Absorption Type | Inhalation Slope Factor (risk/pCi) | External Exposure Slope Factor (risk/yr per pCi/g) | Adult Soil Ingestion Slope Factor (risk/pCi) | Particulate Emission Factor ($m^3$/kg) | Lambda (1/yr) | Halflife (yr) | 10000 $m^2$ Soil Volume Area Correction Factor | 0 cm Soil Volume Gamma Shielding Factor | Ingestion PRG (pCi/g) | Inhalation PRG (pCi/g) | External Exposure PRG (pCi/g) | Total PRG (pCi/g) | Total PRG (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bi-212+D | S | 8.44E-11 | 4.96E-07 | 4.44E-13 | 5.00E+09 | 6.02E+03 | 1.15E-04 | 9.16E-01 | 1.00E+00 | 1.94E+11 | 3.31E+13 | 1.04E+07 | 1.04E+07 | 7.08E-07 |
| Pa-234 | S | 1.20E-12 | 6.62E-06 | 9.66E-13 | 5.00E+09 | 9.06E+02 | 7.65E-04 | 9.22E-01 | 1.00E+00 | 1.34E+10 | 3.51E+14 | 1.16E+05 | 1.16E+05 | 5.82E-08 |
| Pb-212 | S | 6.40E-10 | 4.96E-07 | 1.31E-11 | 5.00E+09 | 5.71E+02 | 1.21E-03 | 8.48E-01 | 1.00E+00 | 6.21E+08 | 4.14E+11 | 1.06E+06 | 1.06E+06 | 7.63E-07 |
| Ra-224+D | S | 1.13E-08 | 4.19E-08 | 8.47E-11 | 5.00E+09 | 6.91E+01 | 1.00E-02 | 8.09E-01 | 1.00E+00 | 1.17E+07 | 2.84E+09 | 1.59E+06 | 1.40E+06 | 8.81E-06 |
| Ra-226+D | S | 2.82E-08 | 8.37E-06 | 2.95E-10 | 5.00E+09 | 4.33E-04 | 1.60E+03 | 9.23E-01 | 1.00E+00 | 1.95E+03 | 6.62E+05 | 4.07E+00 | 4.06E+00 | 4.11E-06 |
| Ra-228+D | S | 4.37E-08 | 4.04E-06 | 6.70E-10 | 5.00E+09 | 1.21E-01 | 5.75E+00 | 9.26E-01 | 1.00E+00 | 2.70E+03 | 1.35E+06 | 2.65E+01 | 2.63E+01 | 9.64E-08 |
| Th-228 | S | 1.32E-07 | 5.64E-09 | 6.40E-11 | 5.00E+09 | 3.63E-01 | 1.91E+00 | 1.00E+00 | 1.00E+00 | 8.09E+04 | 1.27E+06 | 5.03E+04 | 3.03E+04 | 3.69E-05 |
| Th-230 | F | 3.41E-08 | 8.45E-10 | 7.73E-11 | 5.00E+09 | 9.19E-06 | 7.54E+04 | 1.00E+00 | 1.00E+00 | 7.39E+03 | 5.45E+05 | 3.70E+04 | 6.09E+03 | 2.96E-01 |
| Th-232 | S | 4.33E-08 | 3.58E-10 | 8.47E-11 | 5.00E+09 | 4.93E-11 | 1.41E+10 | 1.00E+00 | 1.00E+00 | 6.74E+03 | 4.29E+05 | 8.73E+04 | 6.17E+03 | 5.63E+04 |
| Th-234+D | S | 3.08E-11 | 1.08E-07 | 9.51E-12 | 5.00E+09 | 1.05E+01 | 6.60E-02 | 9.83E-01 | 1.00E+00 | 1.58E+07 | 1.58E+11 | 7.71E+04 | 7.67E+04 | 3.32E-06 |
| Tl-208 | - | 0.00E+00 | 1.75E-05 | 0.00E+00 | 5.00E+09 | 1.19E+05 | 5.81E-06 | 9.74E-01 | 1.00E+00 | - | - | 5.47E+06 | 5.47E+06 | 1.85E-08 |
| U-234 | S | 2.78E-08 | 2.53E-10 | 5.11E-11 | 5.00E+09 | 2.82E-06 | 2.46E+05 | 1.00E+00 | 1.00E+00 | 1.12E+04 | 6.68E+05 | 1.23E+05 | 1.01E+04 | 1.63E+00 |
| U-235+D | S | 2.50E-08 | 5.76E-07 | 5.00E-11 | 5.00E+09 | 9.84E-10 | 7.04E+08 | 8.87E-01 | 1.00E+00 | 1.14E+04 | 7.43E+05 | 6.12E+01 | 6.09E+01 | 2.82E+01 |
| U-238 | S | 2.36E-08 | 1.24E-10 | 4.66E-11 | 5.00E+09 | 1.55E-10 | 4.47E+09 | 1.00E+00 | 1.00E+00 | 1.23E+04 | 7.86E+05 | 2.53E+05 | 1.15E+04 | 3.43E+04 |

# Site-Specific
## Outdoor Worker Risk for Soil

| Isotope | ICRP Lung Absorption Type | ICRP Lung Absorption Type | Inhalation Slope Factor (risk/pCi) | External Exposure Slope Factor (risk/yr per pCi/g) | Adult Soil Ingestion Slope Factor (risk/pCi) | Concentration (pCi/g) | Particulate Emission Factor ($m^3$/kg) | Lambda (1/yr) | Halflife (yr) |
|---|---|---|---|---|---|---|---|---|---|
| Bi-212+D | S | S | 8.44E-11 | 4.96E-07 | 4.44E-13 | 7.24E+01 | 5.00E+09 | 6.02E+03 | 1.15E-04 |
| Pa-234 | S | S | 1.20E-12 | 6.62E-06 | 9.66E-13 | 1.30E+01 | 5.00E+09 | 9.06E+02 | 7.65E-04 |
| Pb-212 | S | S | 6.40E-10 | 4.96E-07 | 1.31E-11 | 6.69E+01 | 5.00E+09 | 5.71E+02 | 1.21E-03 |
| Ra-224+D | S | S | 1.13E-08 | 4.19E-08 | 8.47E-11 | 3.49E+01 | 5.00E+09 | 6.91E+01 | 1.00E-02 |
| Ra-226+D | S | S | 2.82E-08 | 8.37E-06 | 2.95E-10 | 5.41E+01 | 5.00E+09 | 4.33E-04 | 1.60E+03 |
| Ra-228+D | S | S | 4.37E-08 | 4.04E-06 | 6.70E-10 | 6.53E+01 | 5.00E+09 | 1.21E-01 | 5.75E+00 |
| Th-228 | S | S | 1.32E-07 | 5.64E-09 | 6.40E-11 | 3.49E+01 | 5.00E+09 | 3.63E-01 | 1.91E+00 |
| Th-230 | F | F | 3.41E-08 | 8.45E-10 | 7.73E-11 | 1.66E+01 | 5.00E+09 | 9.19E-06 | 7.54E+04 |
| Th-232 | S | S | 4.33E-08 | 3.58E-10 | 8.47E-11 | 3.16E+01 | 5.00E+09 | 4.93E-11 | 1.41E+10 |
| Th-234+D | S | S | 3.08E-11 | 1.08E-07 | 9.51E-12 | 1.30E+01 | 5.00E+09 | 1.05E+01 | 6.60E-02 |
| Tl-208 | - | - | 0.00E+00 | 1.75E-05 | 0.00E+00 | 2.32E+01 | 5.00E+09 | 1.19E+05 | 5.81E-06 |
| U-234 | S | S | 2.78E-08 | 2.53E-10 | 5.11E-11 | 1.26E+01 | 5.00E+09 | 2.82E-06 | 2.46E+05 |
| U-235+D | S | S | 2.50E-08 | 5.76E-07 | 5.00E-11 | 7.40E-01 | 5.00E+09 | 9.84E-10 | 7.04E+08 |
| U-238 | S | S | 2.36E-08 | 1.24E-10 | 4.66E-11 | 1.30E+01 | 5.00E+09 | 1.55E-10 | 4.47E+09 |
| **Total Risk* | | | - | - | - | - | - | - | - |

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# Site-Specific

## Outdoor Worker Risk for Soil

| 10000 m ² Soil Volume Area Correction Factor | Ingestion Risk | Inhalation Risk | External Exposure Risk | Total Risk |
|---|---|---|---|---|
| 9.16E-01 | 3.74E-14 | 2.19E-16 | 6.99E-10 | 6.99E-10 |
| 9.22E-01 | 9.70E-14 | 3.70E-18 | 1.12E-08 | 1.12E-08 |
| 8.48E-01 | 1.08E-11 | 1.62E-14 | 6.31E-09 | 6.32E-09 |
| 8.09E-01 | 3.00E-10 | 1.23E-12 | 2.19E-09 | 2.49E-09 |
| 9.23E-01 | 2.78E-06 | 8.17E-09 | 1.33E-03 | 1.33E-03 |
| 9.26E-01 | 2.42E-06 | 4.84E-09 | 2.46E-04 | 2.49E-04 |
| 1.00E+00 | 4.31E-08 | 2.74E-09 | 6.94E-08 | 1.15E-07 |
| 1.00E+00 | 2.25E-07 | 3.04E-09 | 4.48E-08 | 2.73E-07 |
| 1.00E+00 | 4.69E-07 | 7.36E-09 | 3.62E-08 | 5.12E-07 |
| 9.83E-01 | 8.24E-11 | 8.21E-15 | 1.69E-08 | 1.69E-08 |
| 9.74E-01 | - | - | 4.24E-10 | 4.24E-10 |
| 1.00E+00 | 1.13E-07 | 1.89E-09 | 1.02E-08 | 1.25E-07 |
| 8.87E-01 | 6.47E-09 | 9.96E-11 | 1.21E-06 | 1.21E-06 |
| 1.00E+00 | 1.06E-07 | 1.65E-09 | 5.14E-09 | 1.13E-07 |
| - | *6.15E-06* | *2.98E-08* | *1.58E-03* | *1.58E-03* |

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