US EPA RECORDS CENTER REGION 5
490509

Prepared for:
**AK Steel Corporation**
**West Chester, Ohio**

# Baseline Human Health Risk Assessment for the Former Armco Hamilton Plant Site, 401 Augspurger Road, New Miami, Ohio

Revised

Volume III of IV
Appendix F through K

ENSR Corporation
November 2008
Document No.: 00076-077-0005

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# Appendix F
# Indoor Air Modeling from Groundwater

TABLE F-1
JE MODEL INPUTS
AK STEEL FORMER ARMCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

| | MW-1S | | MW-8S | | MW-9M | | MW-9S | | MW-20S | |
|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Site-Specific | Adjusted (i) | Site-Specific | Adjusted (i) | Site-Specific | Adjusted (i) | Site-Specific | Adjusted (i) | Site-Specific | Adjusted (i) |
| Depth to Groundwater (cm) (m) | 835.93 | | 718.35 | | 786.25 | | 744.85 | | 677.54 | |
| Stratum A Type | Fill (Silty Clay Loam) | | Fill (Silty Clay Loam) | | Fill (Silty Clay Loam) | | Fill (Silty Clay Loam) | | Fill (Silty Clay Loam) | |
| Stratum A Thickness (cm) | 365.76 | | 487.68 | | 914.4 | 786.25 (a) | 914.4 | 744.85 (a) | 304.8 | |
| Stratum B Type | Silty Clay | | Loamy Sand | | Silty Clay | NA (b) | Silty Clay | NA (b) | Loamy Sand | |
| Stratum B Thickness (cm) | 335.28 | | 243.84 | 230.67 (a) | 914.4 | NA (b) | 121.92 | NA (b) | 396.24 | 372.74 (a) |
| Stratum C Type | Loamy Sand | | Silty Clay | NA (b) | | | | | Silty Clay | NA (b) |
| Stratum C Thickness (cm) | 304.8 | 134.89 (a) | 182.88 | NA (b) | | | | | 30.48 | NA (b) |
| Stratum D Type | | | | | | | | | | |
| Stratum D Thickness (cm) | | | | | | | | | | |

See notes at end of table.

TABLE F-1
JE MODEL INPUTS
AK STEEL FORMER ARMCO HAMI
NEW MIAMI, BUTLER COUNTY, OH
BASELINE HUMAN HEALTH RISK A

| | MW-21S | | MW-27M | | MW-27S | | MW-28S | | MW-29S | |
|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Site-Specific | Adjusted (l) | Site-Specific | Adjusted (l) | Site-Specific | Adjusted (l) | Site-Specific | Adjusted (l) | Site-Specific | Adjusted (l) |
| Depth to Groundwater (cm) (m) | 658.96 | | 773.18 | | 407.73 | | 602.5 | | 545.5 | |
| Stratum A Type | Fill | | | | FILL | | | | | |
| | (Silty Clay Loam) | | Silty CLAY | | Silty Clay Loam | | CLAY | | SILT | Sand (d) |
| Stratum A Thickness (cm) | 670.56 | 658.96 (b) | 731.52 | | 60.96 | 200 (c) | 45.72 | 200 (c) | 121.92 | 545.5 (d) |
| Stratum B Type | Silty Clay | NA (b) | SAND & GRAVEL | | Silty Clay | | SILT | | SAND & Gravel | NA (d) |
| Stratum B Thickness (cm) | 60.96 | NA (b) | 215.36 | 41.66 (a) | 365.76 | 207.73 (a) | 320.04 | 166.76 (d) | 518.16 | NA (d) |
| Stratum C Type | | | | | | | GRAVEL | | | |
| Stratum C Thickness (cm) | | | | | | | 182.88 | 236.74 (e) | | |
| Stratum D Type | | | | | | | | | | |
| Stratum D Thickness (cm) | | | | | | | | | | |

See notes at end of table.

TABLE F-1
JE MODEL INPUTS
AK STEEL FORMER ARMCO HAMI
NEW MIAMI, BUTLER COUNTY, OH
BASELINE HUMAN HEALTH RISK A

| | MW-31S | | MW-28S | | MW-30S | |
|---|---|---|---|---|---|---|
| Parameter | Site-Specific | Adjusted (l) | Site-Specific | Adjusted (l) | Site-Specific | Adjusted (l) |
| Depth to Groundwater (cm) (m) | 597.01 | | 514.71 | | 535.44 | |
| Stratum A Type | | | Fill | | | |
| | CLAY | Sand (f)(h) | Sand & Gravel | Sand | Silty CLAY | |
| Stratum A Thickness (cm) | 30.48 | 200 (c) | 91.44 | 514.71 (l) | 60.96 | 200 (c)(k) |
| Stratum B Type | GRAVEL | Loamy sand (h) | SAND w/Gravel | NA (i) | Sandy SILT | NA (j) |
| Stratum B Thickness (cm) | 54.86 | 397.01 (a) | 579.12 | NA (i) | 121.92 | NA (j) |
| Stratum C Type | Silty SAND | NA | Silty CLAY | NA (b) | CLAY | |
| Stratum C Thickness (cm) | 487.68 | NA | 91.44 | NA (b) | 304.8 | 287.88 (d) |
| Stratum D Type | | | | | Sand & Gravel | Sand |
| Stratum D Thickness (cm) | | | | | 182.88 | 47.76 (a) |

See notes at end of table.

TABLE F-1
JE MODEL INPUTS
AK STEEL FORMER ARMCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

Notes:
JE - Johnson and Ettinger.
NA - Not applicable.
(a) Soil strata extends through water table. Input changed to distance to top of water table, as recommended by model.
(b) Input is not necessary, soil strata is below the water table.
(c) Adjusted to meet the JE model requirement of the top soil layer (stratum A) extending to the the bottom of the basement (i.e., minimum of 200 cm).
(d) Thickness of soil layer adjusted based on extension of stratum A to minimum required thickness of 200 cm.
(e) Input was changed to assume the soil stratum extends to the top of the water table.
(f) The J&E model requires that the top soil layer (stratum A) extend to the the bottom of the basement (i.e., minimum of 200 cm). Site-specific information didn't meet these conditions so the modeling scenario was adjusted.
(g) The top soil layer, silt, is not as permeable as the next layer, sand, therefore, extending the top layer may not be appropriately conservative. Therefore, a very conservatie assumption was made by assuming a sandy soil type throughout the whole soil column.
(h) Extending the top soil layer of clay would not be appropriately conservative, therefore, it was conservatively assumed that the second soil layer (i.e., stratum B), sand, extended from the ground surface to 200 cm. The second soil layer was assumed to be loamy sand, the more permeable (i.e., conservative) of the model input options for silty sand (the other option is sandy loam).
(i) Stratum A and B are both sand and gravel. Therefore, only one soil stratum of sand was assumed down to the water table.
(j) The JE model allows for only 3 soil strata to be modeled. Therefore, the top 2 soil strata (Strata A and B) were combined into one stratum. The estimated indoor air concentration is the same whether using a soil type of silty clay, silt loam or loam, (the latter two recommended in the JE User's Guide Table 11 for inputs for a sandy silt soil type).
(k) This is a conservative assumption because it assumes the clay layer (the less permeable soil type) is thinner than site-specific conditions show).
(l) Inputs in this column were adjusted from site-specific conditions as noted to meet model restrictions.
(m) Average of depth to groundwater measurements collected between December 2005 and July 2008.

## AOC 13

- MW-8S
- MW-9M
- MW-9S
- MW-20S
- MW-21S
- MW-27M
- MW-27S
- MW-28S
- MW-29S
- MW-31S

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-8S

**GW-ADV**
**Version 3.1; 02/04**

**Reset to Defaults**

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

**OR**

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical | |
|---|---|---|---|
| 91576 | 7.50E+02 | 2-Methylnaphthalene | (Surrogate for 1-Methylnaphthalene) |

MORE ↓

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 718.35 | 487.68 | 230.67 | 0 | B | LS | SICL | | |

MORE ↓

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SICL | 1.37 | 0.482 | 0.198 | LS | 1.62 | 0.39 | 0.076 | | | | |

MORE ↓

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE ↓

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

INTERMEDIATE CALCULATIONS SHEET

MW-8S

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_{te}$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 518.35 | 0.284 | 0.314 | ERROR | 0.276 | 1.71E-09 | 0.638 | 1.43E-09 | 18.75 | 0.39 | 0.087 | 0.303 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.60E+06 | 2.22E-04 | 200 | 16,227 | 1.35E-04 | 5.80E-03 | 1.76E-04 | 3.42E-03 | 7.25E-03 | 0.00E+00 | 2.66E-04 | 2.62E-03 | 518.35 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp(Pe$^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 4.35E+03 | 0.10 | 8.33E+01 | 3.42E-03 | 4.00E+02 | 1.97E+264 | 3.45E-04 | 1.50E+00 | NA | 7.0E-02 |

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-8S

**GW-ADV**
**Version 3.1; 02/04**

**Reset to Defaults**

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

**OR**

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 91576 | 7.60E+02 | 2-Methylnaphthalene |

MORE ↓

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 718.35 | 487.68 | 230.67 | 0 | B | LS | SICL | | |

MORE ↓

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SICL | 1.37 | 0.482 | 0.198 | LS | 1.62 | 0.39 | 0.076 | | | | |

MORE ↓

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE ↓

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

INTERMEDIATE CALCULATIONS SHEET

**MW-8S**

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_{te}$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 518.35 | 0.284 | 0.314 | ERROR | 0.276 | 1.71E-09 | 0.838 | 1.43E-09 | 18.75 | 0.39 | 0.087 | 0.303 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.80E+06 | 2.22E-04 | 200 | 16,227 | 1.35E-04 | 5.80E-03 | 1.76E-04 | 3.42E-03 | 7.25E-03 | 0.00E+00 | 2.66E-04 | 2.82E-03 | 518.35 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp(Pe$^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 4.41E+03 | 0.10 | 8.33E+01 | 3.42E-03 | 4.00E+02 | 1.97E+264 | 3.45E-04 | 1.52E+00 | NA | 7.0E-02 |

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-8S

GW-ADV
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 71432 | 2.80E+03 | Benzene |

MORE

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 718.35 | 487.68 | 230.67 | 0 | B | LS | SICL | | |

MORE

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SICL | 1.37 | 0.482 | 0.198 | LS | 1.62 | 0.39 | 0.076 | | | | |

MORE

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

INTERMEDIATE CALCULATIONS SHEET

MW-8S

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_{te}$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 518.35 | 0.284 | 0.314 | ERROR | 0.276 | 1.71E-09 | 0.838 | 1.43E-09 | 18.75 | 0.39 | 0.087 | 0.303 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.80E+06 | 2.22E-04 | 200 | 8,111 | 2.83E-03 | 1.22E-01 | 1.76E-04 | 5.73E-03 | 1.22E-02 | 0.00E+00 | 1.83E-04 | 3.05E-03 | 518.35 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp(Pe$^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 3.40E+05 | 0.10 | 8.33E+01 | 5.73E-03 | 4.00E+02 | 8.66E+157 | 3.69E-04 | 1.26E+02 | 7.8E-06 | 3.0E-02 |

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-8S

**GW-ADV**
**Version 3.1; 02/04**

**Reset to Defaults**

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

**OR**

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 98828 | 2.20E+01 | Cumene (Isopropylbenzene) |

MORE ↓

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 718.35 | 487.68 | 230.67 | 0 | B | LS | SICL | | |

MORE ↓

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SICL | 1.37 | 0.482 | 0.198 | LS | 1.62 | 0.39 | 0.076 | | | | |

MORE ↓

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE ↓

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

INTERMEDIATE CALCULATIONS SHEET

MW-8S

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_{te}$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 518.35 | 0.284 | 0.314 | ERROR | 0.276 | 1.71E-09 | 0.838 | 1.43E-09 | 18.75 | 0.39 | 0.087 | 0.303 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.64E+04 | 1.00E+06 | 2.22E-04 | 200 | 12,829 | 5.16E-03 | 2.21E-01 | 1.76E-04 | 4.23E-03 | 9.03E-03 | 0.00E+00 | 1.32E-04 | 2.22E-03 | 518.35 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp(Pe$^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 4.86E+03 | 0.10 | 8.33E+01 | 4.23E-03 | 4.00E+02 | 7.08E+213 | 2.77E-04 | 1.35E+00 | NA | 4.0E-01 |

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-8S

**GW-ADV**
**Version 3.1; 02/04**

**Reset to Defaults**

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

**OR**

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 91203 | 1.30E+04 | Naphthalene |

MORE ↓

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 718.35 | 487.68 | 230.67 | 0 | B | LS | SICL | | |

MORE ↓

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SICL | 1.37 | 0.482 | 0.198 | LS | 1.62 | 0.39 | 0.076 | | | | |

MORE ↓

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE ↓

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

INTERMEDIATE CALCULATIONS SHEET

MW-8S

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_{te}$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 518.35 | 0.284 | 0.314 | ERROR | 0.276 | 1.71E-09 | 0.838 | 1.43E-09 | 18.75 | 0.39 | 0.087 | 0.303 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.80E+06 | 2.22E-04 | 200 | 12,901 | 1.66E-04 | 7.12E-03 | 1.76E-04 | 3.86E-03 | 8.20E-03 | 0.00E+00 | 2.45E-04 | 2.93E-03 | 518.35 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 9.26E+04 | 0.10 | 8.33E+01 | 3.86E-03 | 4.00E+02 | 2.37E+234 | 3.57E-04 | 3.30E+01 | NA | 3.0E-03 |

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-8S

**GW-ADV**
**Version 3.1; 02/04**

**Reset to Defaults**

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

**OR**

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 108883 | 8.90E+02 | Toluene |

MORE

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 718.35 | 487.68 | 230.67 | 0 | B | LS | SICL | | |

MORE

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SICL | 1.37 | 0.482 | 0.198 | LS | 1.62 | 0.39 | 0.076 | | | | |

MORE

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

INTERMEDIATE CALCULATIONS SHEET

MW-8S

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_w$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 518.35 | 0.284 | 0.314 | ERROR | 0.276 | 1.71E-09 | 0.838 | 1.43E-09 | 18.75 | 0.39 | 0.087 | 0.303 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.60E+06 | 2.22E-04 | 200 | 9,143 | 3.11E-03 | 1.34E-01 | 1.76E-04 | 5.66E-03 | 1.21E-02 | 0.00E+00 | 1.79E-04 | 2.99E-03 | 518.35 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp(Pe$^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 1,19E+05 | 0.10 | 8.33E+01 | 5.66E-03 | 4.00E+02 | 5.77E+159 | 3.64E-04 | 4.32E+01 | NA | 4.0E-01 |

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-9M

GW-ADV
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 71432 | 6.70E+00 | Benzene |

MORE

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 786.25 | 786.25 | 0 | 0 | A | SICL | SICL | | |

MORE

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SICL | 1.37 | 0.482 | 0.198 | | | | | | | | |

MORE

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

INTERMEDIATE CALCULATIONS SHEET

[redacted]

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_w$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 566.25 | 0.264 | ERROR | ERROR | 0.276 | 1.71E-09 | 0.638 | 1.43E-09 | 133.93 | 0.462 | 0.063 | 0.399 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.64E+04 | 1.00E+06 | 2.22E-04 | 200 | 8,111 | 2.83E-03 | 1.22E-01 | 1.76E-04 | 5.73E-03 | 0.00E+00 | 0.00E+00 | 1.11E-04 | 4.56E-04 | 566.25 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp(Pe$^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 8.14E+02 | 0.10 | 6.33E+01 | 5.73E-03 | 4.00E+02 | 6.66E+157 | 5.42E-06 | 4.41E-02 | 7.8E-06 | 3.0E-02 |

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-9S

**GW-ADV**
**Version 3.1; 02/04**

**Reset to Defaults**

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

**OR**

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 71432 | 1.10E+04 | Benzene |

MORE ↓

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 299 | 744.85 | 744.85 | 0 | 0 | A | SICL | SICL | | |

MORE ↓

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SICL | 1.37 | 0.482 | 0.198 | | | | | | | | |

MORE ↓

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE ↓

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

MW-9S

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_w$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 445.85 | 0.264 | ERROR | ERROR | 0.276 | 1.71E-09 | 0.638 | 1.43E-09 | 133.93 | 0.462 | 0.063 | 0.399 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 2.26E+06 | 1.82E-04 | 299 | 8,111 | 2.83E-03 | 1.22E-01 | 1.76E-04 | 5.73E-03 | 0.00E+00 | 0.00E+00 | 1.11E-04 | 3.53E-04 | 445.85 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp(Pe$^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 299 | 1.34E+06 | 0.10 | 8.33E+01 | 5.73E-03 | 4.00E+02 | 8.66E+157 | 6.71E-05 | 8.97E+01 | 7.8E-06 | 3.0E-02 |

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-9S

GW-ADV
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 98828 | 9.40E+01 | Cumene (Isopropylbenzene) |

MORE

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 744.85 | 744.85 | 0 | 0 | A | SICL | SICL | | |

MORE

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SICL | 1.37 | 0.482 | 0.198 | | | | | | | | |

MORE

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ (g/cm-s$^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

INTERMEDIATE CALCULATIONS SHEET

MW-9S

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_w$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 544.85 | 0.284 | ERROR | ERROR | 0.276 | 1.71E-09 | 0.836 | 1.43E-09 | 133.93 | 0.482 | 0.083 | 0.399 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.64E+04 | 1.80E+06 | 2.22E-04 | 200 | 12,629 | 5.15E-03 | 2.21E-01 | 1.76E-04 | 4.23E-03 | 0.00E+00 | 0.00E+00 | 7.64E-05 | 2.95E-04 | 544.85 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp(Pef) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 2.07E+04 | 0.10 | 8.33E+01 | 4.23E-03 | 4.00E+02 | 7.08E+213 | 3.78E-05 | 7.85E-01 | NA | 4.0E-01 |

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-9S

**GW-ADV**
**Version 3.1; 02/04**

**Reset to Defaults**

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

**OR**

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 91203 | 2.80E+03 | Naphthalene |

MORE ↓

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 744.85 | 744.85 | 0 | 0 | A | SICL | SICL | | |

MORE ↓

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SICL | 1.37 | 0.482 | 0.198 | | | | | | | | |

MORE ↓

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE ↓

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

INTERMEDIATE CALCULATIONS SHEET

MW-9S

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_{te}$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 544.85 | 0.284 | ERROR | ERROR | 0.276 | 1.71E-09 | 0.838 | 1.43E-09 | 133.93 | 0.482 | 0.083 | 0.399 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.80E+06 | 2.22E-04 | 200 | 12,901 | 1.66E-04 | 7.12E-03 | 1.76E-04 | 3.86E-03 | 0.00E+00 | 0.00E+00 | 2.76E-04 | 9.22E-04 | 544.85 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 1.99E+04 | 0.10 | 8.33E+01 | 3.86E-03 | 4.00E+02 | 2.37E+234 | 1.16E-04 | 2.31E+00 | NA | 3.0E-03 |

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-9S

GW-ADV
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 108883 | 2.10E+04 | Toluene |

MORE ↓

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 744.85 | 744.85 | 0 | 0 | A | SICL | SICL | | |

MORE ↓

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SICL | 1.37 | 0.482 | 0.198 | | | | | | | | |

MORE ↓

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE ↓

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

INTERMEDIATE CALCULATIONS SHEET

**MW-9S**

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_{te}$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 544.85 | 0.284 | ERROR | ERROR | 0.276 | 1.71E-09 | 0.838 | 1.43E-09 | 133.93 | 0.482 | 0.083 | 0.399 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.80E+06 | 2.22E-04 | 200 | 9,143 | 3.11E-03 | 1.34E-01 | 1.76E-04 | 5.66E-03 | 0.00E+00 | 0.00E+00 | 1.07E-04 | 4.10E-04 | 544.85 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp($Pe^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 2.80E+06 | 0.10 | 8.33E+01 | 5.66E-03 | 4.00E+02 | 5.77E+159 | 5.24E-05 | 1.47E+02 | NA | 4.0E-01 |

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-9S

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES X

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 106423 | 7.70E+03 | p-Xylene (Surrogate for Total Xylenes) |

MORE

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 744.85 | 744.85 | 0 | 0 | A | SICL | SICL | | |

MORE

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, | ENTER Stratum A soil total porosity, | ENTER Stratum A soil water-filled porosity, | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, | ENTER Stratum B soil total porosity, | ENTER Stratum B soil water-filled porosity, | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, | ENTER Stratum C soil total porosity, | ENTER Stratum C soil water-filled porosity, |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |

INTERMEDIATE CALCULATIONS SHEET

**MW-9S**

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_{te}$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 544.85 | 0.284 | ERROR | ERROR | 0.276 | 1.71E-09 | 0.838 | 1.43E-09 | 133.93 | 0.482 | 0.083 | 0.399 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.80E+06 | 2.22E-04 | 200 | 10,236 | 3.28E-03 | 1.41E-01 | 1.76E-04 | 5.01E-03 | 0.00E+00 | 0.00E+00 | 9.48E-05 | 3.65E-04 | 544.85 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp($Pe^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 1.08E+06 | 0.10 | 8.33E+01 | 5.01E-03 | 4.00E+02 | 5.52E+180 | 4.67E-05 | 5.06E+01 | NA | 1.0E-01 |

**END**

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-20S

**GW-ADV Version 3.1; 02/04**

**Reset to Defaults**

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

**OR**

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 71432 | 9.70E+00 | Benzene |

MORE ↓

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 677.54 | 304.8 | 372.74 | 0 | B | LS | SICL | | |

MORE ↓

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SICL | 1.37 | 0.482 | 0.198 | LS | 1.62 | 0.39 | 0.076 | | | | |

MORE ↓

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE ↓

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

INTERMEDIATE CALCULATIONS SHEET

MW-205

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_w$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 477.54 | 0.284 | 0.314 | ERROR | 0.276 | 1.71E-09 | 0.838 | 1.43E-09 | 18.75 | 0.39 | 0.087 | 0.303 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.60E+06 | 2.23E-04 | 200 | 8,111 | 2.83E-03 | 1.22E-01 | 1.76E-04 | 5.73E-03 | 1.22E-02 | 0.00E+00 | 1.83E-04 | 3.19E-03 | 477.54 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp(Pe$^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 1.18E+03 | 0.10 | 8.33E+01 | 5.73E-03 | 4.00E+02 | 8.66E+157 | 4.13E-04 | 4.87E-01 | 7.8E-06 | 3.0E-02 |

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-21S

**GW-ADV**
**Version 3.1; 02/04**

**Reset to Defaults**

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

**OR**

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 71432 | 1.50E+02 | Benzene |

MORE

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 658.96 | 658.96 | 0 | 0 | A | SICL | SICL | | |

MORE

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SICL | 1.37 | 0.482 | 0.198 | | | | | | | | |

MORE

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

INTERMEDIATE CALCULATIONS SHEET

**MW-21S**

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_{te}$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 458.96 | 0.284 | ERROR | ERROR | 0.276 | 1.71E-09 | 0.838 | 1.43E-09 | 133.93 | 0.482 | 0.083 | 0.399 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.80E+06 | 2.22E-04 | 200 | 8,111 | 2.83E-03 | 1.22E-01 | 1.76E-04 | 5.73E-03 | 0.00E+00 | 0.00E+00 | 1.11E-04 | 3.63E-04 | 458.96 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp($Pe^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 1.82E+04 | 0.10 | 8.33E+01 | 5.73E-03 | 4.00E+02 | 8.66E+157 | 5.51E-05 | 1.00E+00 | 7.8E-06 | 3.0E-02 |

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-21S

GW-ADV
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 98828 | 9.00E+00 | Cumene (Isopropylbenzene) |

MORE

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 658.96 | 658.96 | 0 | 0 | A | SICL | SICL | | |

MORE

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SICL | 1.37 | 0.482 | 0.198 | | | | | | | | |

MORE

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

INTERMEDIATE CALCULATIONS SHEET

MW-21S

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_{te}$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 458.96 | 0.284 | ERROR | ERROR | 0.276 | 1.71E-09 | 0.838 | 1.43E-09 | 133.93 | 0.482 | 0.083 | 0.399 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.80E+06 | 2.22E-04 | 200 | 12,629 | 5.15E-03 | 2.21E-01 | 1.76E-04 | 4.23E-03 | 0.00E+00 | 0.00E+00 | 7.64E-05 | 2.51E-04 | 458.96 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 1.99E+03 | 0.10 | 8.33E+01 | 4.23E-03 | 4.00E+02 | 7.06E+213 | 3.83E-05 | 7.60E-02 | NA | 4.0E-01 |

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-21S

GW-ADV
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 91203 | 2.10E+02 | Naphthalene |

MORE ↓

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 658.96 | 658.96 | 0 | 0 | A | SICL | SICL | | |

MORE ↓

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SICL | 1.37 | 0.482 | 0.198 | | | | | | | | |

MORE ↓

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE ↓

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

INTERMEDIATE CALCULATIONS SHEET

MW-21S

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_w$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 458.96 | 0.284 | ERROR | ERROR | 0.276 | 1.71E-09 | 0.836 | 1.43E-09 | 133.83 | 0.462 | 0.063 | 0.399 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.64E+04 | 1.60E+08 | 2.22E-04 | 200 | 12,901 | 1.66E-04 | 7.12E-03 | 1.76E-04 | 3.86E-03 | 0.00E+00 | 0.00E+00 | 2.76E-04 | 8.07E-04 | 458.96 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp(Pe$^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 1.50E+03 | 0.10 | 8.33E+01 | 3.86E-03 | 4.00E+02 | 2.37E+234 | 1.20E-04 | 1.79E-01 | NA | 3.0E-03 |

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-27M

GW-ADV
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 91576 | 3.42E+02 | 2-Methylnaphthalene |

MORE ↓

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 773.18 | 731.52 | 41.66 | 0 | B | S | SIC | | |

MORE ↓

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SIC | 1.38 | 0.481 | 0.216 | S | 1.66 | 0.375 | 0.054 | | | | |

MORE ↓

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE ↓

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

INTERMEDIATE CALCULATIONS SHEET

**MW-27M**

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_{te}$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 573.18 | 0.265 | 0.321 | ERROR | 0.284 | 1.49E-09 | 0.844 | 1.25E-09 | 17.05 | 0.375 | 0.122 | 0.253 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.80E+06 | 2.22E-04 | 200 | 16,227 | 1.35E-04 | 5.80E-03 | 1.76E-04 | 2.74E-03 | 8.44E-03 | 0.00E+00 | 4.32E-04 | 2.43E-03 | 573.18 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp($Pe^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 1.99E+03 | 0.10 | 8.33E+01 | 2.74E-03 | 4.00E+02 | #NUM! | 2.75E-04 | 5.46E-01 | NA | 7.0E-02 |

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-27M

GW-ADV
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 71432 | 1.23E+01 | Benzene |

MORE

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 773.18 | 731.52 | 41.66 | 0 | B | S | SIC | | |

MORE

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SIC | 1.38 | 0.481 | 0.216 | S | 1.66 | 0.375 | 0.054 | | | | |

MORE

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

INTERMEDIATE CALCULATIONS SHEET

**MW-27M**

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_{te}$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 573.18 | 0.265 | 0.321 | ERROR | 0.284 | 1.49E-09 | 0.844 | 1.25E-09 | 17.05 | 0.375 | 0.122 | 0.253 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.80E+06 | 2.22E-04 | 200 | 8,111 | 2.83E-03 | 1.22E-01 | 1.76E-04 | 4.57E-03 | 1.42E-02 | 0.00E+00 | 5.69E-04 | 3.87E-03 | 573.18 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp($Pe^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 1.49E+03 | 0.10 | 8.33E+01 | 4.57E-03 | 4.00E+02 | 1.08E+198 | 4.18E-04 | 6.22E-01 | 7.8E-06 | 3.0E-02 |

END

MW-27M

**GW-ADV Version 3.1; 02/04**

**Reset to Defaults**

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

**OR**

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 91203 | 9.84E+02 | Naphthalene |

MORE ↓

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 773.18 | 731.52 | 41.66 | 0 | B | S | SIC | | |

MORE ↓

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SIC | 1.38 | 0.481 | 0.216 | S | 1.66 | 0.375 | 0.054 | | | | |

MORE ↓

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE ↓

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

INTERMEDIATE CALCULATIONS SHEET

**MW-27M**

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_{te}$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 573.18 | 0.265 | 0.321 | ERROR | 0.284 | 1.49E-09 | 0.844 | 1.25E-09 | 17.05 | 0.375 | 0.122 | 0.253 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.80E+06 | 2.22E-04 | 200 | 12,901 | 1.66E-04 | 7.12E-03 | 1.76E-04 | 3.09E-03 | 9.54E-03 | 0.00E+00 | 4.55E-04 | 2.70E-03 | 573.18 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp($Pe^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 7.00E+03 | 0.10 | 8.33E+01 | 3.09E-03 | 4.00E+02 | 7.31E+292 | 3.03E-04 | 2.12E+00 | NA | 3.0E-03 |

**END**

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-27S

**GW-ADV**
**Version 3.1; 02/04**

**Reset to Defaults**

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

**OR**

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical | |
|---|---|---|---|
| 91576 | 9.38E+02 | 2-Methylnaphthalene | (Surrogate for 1-Methylnaphthalene) |

MORE ↓

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 407.73 | 200 | 207.73 | 0 | B | SIC | SICL | | |

MORE ↓

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SICL | 1.37 | 0.482 | 0.198 | SIC | 1.38 | 0.481 | 0.216 | | | | |

MORE ↓

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE ↓

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

INTERMEDIATE CALCULATIONS SHEET

MW-27S

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_{te}$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 207.73 | 0.284 | 0.265 | ERROR | 0.276 | 1.71E-09 | 0.838 | 1.43E-09 | 192.31 | 0.481 | 0.057 | 0.424 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.80E+06 | 2.22E-04 | 200 | 16,227 | 1.35E-04 | 5.80E-03 | 1.76E-04 | 3.42E-03 | 2.74E-03 | 0.00E+00 | 3.47E-04 | 3.71E-04 | 207.73 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp($Pe^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF ($\mu g/m^3$)$^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 6.44E+03 | 0.10 | 8.33E+01 | 3.42E-03 | 4.00E+02 | 1.97E+264 | 1.22E-04 | 6.83E-01 | NA | 7.0E-02 |

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-27S

GW-ADV
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 91576 | 1.93E+03 | 2-Methylnaphthalene |

MORE ↓

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 407.73 | 200 | 207.73 | 0 | B | SIC | SICL | | |

MORE ↓

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SICL | 1.37 | 0.482 | 0.198 | SIC | 1.38 | 0.481 | 0.216 | | | | |

MORE ↓

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE ↓

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

INTERMEDIATE CALCULATIONS SHEET

MW-27S

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_{te}$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 207.73 | 0.284 | 0.265 | ERROR | 0.276 | 1.71E-09 | 0.838 | 1.43E-09 | 192.31 | 0.481 | 0.057 | 0.424 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.60E+06 | 2.22E-04 | 200 | 16,227 | 1.35E-04 | 5.80E-03 | 1.76E-04 | 3.42E-03 | 2.74E-03 | 0.00E+00 | 3.47E-04 | 3.71E-04 | 207.73 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 1.12E+04 | 0.10 | 8.33E+01 | 3.42E-03 | 4.00E+02 | 1.97E+264 | 1.22E-04 | 1.36E+00 | NA | 7.0E-02 |

END

MW-27S

**GW-ADV**
**Version 3.1; 02/04**

**Reset to Defaults**

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

**OR**

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 71432 | 6.10E+02 | Benzene |

MORE ↓

| ENTER Average soil/ groundwater temperature, $T_s$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 407.73 | 200 | 207.73 | 0 | B | SIC | SICL | | |

MORE ↓

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SICL | 1.37 | 0.482 | 0.198 | SIC | 1.38 | 0.481 | 0.216 | | | | |

MORE ↓

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE ↓

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

INTERMEDIATE CALCULATIONS SHEET

MW-27S

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_w$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 207.73 | 0.284 | 0.285 | ERROR | 0.278 | 1.71E-09 | 0.836 | 1.43E-09 | 192.31 | 0.481 | 0.057 | 0.424 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.80E+06 | 2.22E-04 | 200 | 8,111 | 2.83E-03 | 1.22E-01 | 1.76E-04 | 5.73E-03 | 4.57E-03 | 0.00E+00 | 4.79E-05 | 5.17E-05 | 207.73 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp(Pe$^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 7.41E+04 | 0.10 | 8.33E+01 | 5.73E-03 | 4.00E+02 | 8.68E+157 | 1.75E-05 | 1.30E+00 | 7.8E-06 | 3.0E-02 |

EMD

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-27S

**GW-ADV Version 3.1; 02/04**

**Reset to Defaults**

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

**OR**

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 91203 | 1.26E+04 | Naphthalene |

MORE

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 407.73 | 200 | 207.73 | 0 | B | SIC | SICL | | |

MORE

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SICL | 1.37 | 0.482 | 0.198 | SIC | 1.38 | 0.481 | 0.216 | | | | |

MORE

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

INTERMEDIATE CALCULATIONS SHEET

**MW-27S**

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_{te}$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 207.73 | 0.284 | 0.265 | ERROR | 0.276 | 1.71E-09 | 0.838 | 1.43E-09 | 192.31 | 0.481 | 0.057 | 0.424 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.80E+06 | 2.22E-04 | 200 | 12,901 | 1.66E-04 | 7.12E-03 | 1.76E-04 | 3.86E-03 | 3.09E-03 | 0.00E+00 | 2.79E-04 | 3.00E-04 | 207.73 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp($Pe^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 8.97E+04 | 0.10 | 8.33E+01 | 3.86E-03 | 4.00E+02 | 2.37E+234 | 9.91E-05 | 8.89E+00 | NA | 3.0E-03 |

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-27S

**GW-ADV**
**Version 3.1; 02/04**

**Reset to Defaults**

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

**OR**

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 108883 | 3.36E+02 | Toluene |

MORE ↓

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 407.73 | 200 | 207.73 | 0 | B | SIC | SICL | | |

MORE ↓

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SICL | 1.37 | 0.482 | 0.198 | SIC | 1.38 | 0.481 | 0.216 | | | | |

MORE ↓

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE ↓

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

MW-27S

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_e$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 207.73 | 0.284 | 0.285 | ERROR | 0.276 | 1.71E-09 | 0.838 | 1.43E-09 | 192.31 | 0.481 | 0.057 | 0.424 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.80E+06 | 2.22E-04 | 200 | 9,143 | 3.11E-03 | 1.34E-01 | 1.76E-04 | 5.68E-03 | 4.52E-03 | 0.00E+00 | 4.36E-05 | 4.70E-05 | 207.73 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp(Pe$^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 4.48E+04 | 0.10 | 8.33E+01 | 5.68E-03 | 4.00E+02 | 5.77E+159 | 1.60E-05 | 7.16E-01 | NA | 4.0E-01 |

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-28S

**GW-ADV**
**Version 3.1; 02/04**

**Reset to Defaults**

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

**OR**

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 71432 | 4.69E+02 | Benzene |

MORE ↓

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 602.5 | 200 | 165.76 | 236.74 | C | S | C | | |

MORE ↓

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| C | 1.43 | 0.459 | 0.215 | SI | 1.35 | 0.489 | 0.167 | S | 1.66 | 0.375 | 0.054 |

MORE ↓

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE ↓

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

INTERMEDIATE CALCULATIONS SHEET

MW-28S

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_t$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 402.5 | 0.244 | 0.322 | 0.321 | 0.324 | 2.26E-09 | 0.821 | 1.86E-09 | 17.05 | 0.375 | 0.122 | 0.253 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.60E+06 | 2.22E-04 | 200 | 8,111 | 2.83E-03 | 1.22E-01 | 1.76E-04 | 3.81E-03 | 8.45E-03 | 1.42E-02 | 5.69E-04 | 6.19E-03 | 402.5 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp(Pe$^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 5.70E+04 | 0.10 | 8.33E+01 | 3.81E-03 | 4.00E+02 | 2.32E+237 | 8.19E-04 | 4.66E+01 | 7.8E-06 | 3.0E-02 |

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-28S

**GW-ADV**
**Version 3.1; 02/04**

**Reset to Defaults**

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

**OR**

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 98828 | 3.15E+01 | Cumene (Isopropylbenzene) |

MORE ↓

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 602.5 | 200 | 165.76 | 236.74 | C | S | C | | |

MORE ↓

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| C | 1.43 | 0.459 | 0.215 | SI | 1.35 | 0.489 | 0.167 | S | 1.66 | 0.375 | 0.054 |

MORE ↓

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ (g/cm-s$^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE ↓

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

INTERMEDIATE CALCULATIONS SHEET

**MW-28S**

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_{te}$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 402.5 | 0.244 | 0.322 | 0.321 | 0.324 | 2.26E-09 | 0.821 | 1.86E-09 | 17.05 | 0.375 | 0.122 | 0.253 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.80E+06 | 2.22E-04 | 200 | 12,629 | 5.15E-03 | 2.21E-01 | 1.76E-04 | 2.81E-03 | 6.24E-03 | 1.05E-02 | 4.19E-04 | 4.56E-03 | 402.5 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp($Pe^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 6.95E+03 | 0.10 | 8.33E+01 | 2.81E-03 | 4.00E+02 | #NUM! | 6.45E-04 | 4.49E+00 | NA | 4.0E-01 |

**END**

MW-28S

**GW-ADV**
**Version 3.1; 02/04**

**Reset to Defaults**

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

**OR**

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 91203 | 1.04E+03 | Naphthalene |

MORE

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 602.5 | 200 | 165.76 | 236.74 | C | S | C | | |

MORE

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| C | 1.43 | 0.459 | 0.215 | SI | 1.35 | 0.489 | 0.167 | S | 1.66 | 0.375 | 0.054 |

MORE

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ (g/cm-s$^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

INTERMEDIATE CALCULATIONS SHEET

**MW-28S**

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_{te}$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 402.5 | 0.244 | 0.322 | 0.321 | 0.324 | 2.26E-09 | 0.821 | 1.86E-09 | 17.05 | 0.375 | 0.122 | 0.253 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.80E+06 | 2.22E-04 | 200 | 12,901 | 1.66E-04 | 7.12E-03 | 1.76E-04 | 2.58E-03 | 5.68E-03 | 9.54E-03 | 4.55E-04 | 4.49E-03 | 402.5 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp(Pe$^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 7.41E+03 | 0.10 | 8.33E+01 | 2.58E-03 | 4.00E+02 | #NUM! | 6.36E-04 | 4.71E+00 | NA | 3.0E-03 |

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-29S

GW-ADV
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 98828 | 2.61E+00 | Cumene (Isopropylbenzene) |

MORE

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 545.5 | 545.5 | 0 | 0 | A | S | S | | |

MORE

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S | 1.66 | 0.375 | 0.054 | | | | | | | | |

MORE

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

INTERMEDIATE CALCULATIONS SHEET

**MW-29S**

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_{te}$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 345.5 | 0.321 | ERROR | ERROR | 0.003 | 9.94E-08 | 0.998 | 9.93E-08 | 17.05 | 0.375 | 0.122 | 0.253 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.80E+06 | 2.22E-04 | 200 | 12,629 | 5.15E-03 | 2.21E-01 | 1.76E-04 | 1.05E-02 | 0.00E+00 | 0.00E+00 | 4.19E-04 | 4.80E-03 | 345.5 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp(Pe$^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 5.76E+02 | 0.10 | 8.33E+01 | 1.05E-02 | 4.00E+02 | 1.27E+86 | 7.57E-04 | 4.36E-01 | NA | 4.0E-01 |

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-31S

**GW-ADV**
**Version 3.1; 02/04**

**Reset to Defaults**

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

**OR**

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 127184 | 1.97E+01 | Tetrachloroethylene |

MORE

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 597.01 | 200 | 397.01 | 0 | B | LS | S | | |

MORE

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S | 1.66 | 0.375 | 0.054 | LS | 1.62 | 0.39 | 0.076 | | | | |

MORE

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

INTERMEDIATE CALCULATIONS SHEET

MW-31S

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_{te}$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 397.01 | 0.321 | 0.314 | ERROR | 0.003 | 9.94E-08 | 0.998 | 9.93E-08 | 18.75 | 0.39 | 0.087 | 0.303 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.80E+06 | 2.22E-04 | 200 | 9,542 | 8.35E-03 | 3.58E-01 | 1.76E-04 | 1.16E-02 | 1.00E-02 | 0.00E+00 | 1.44E-04 | 2.37E-03 | 397.01 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp(Pe$^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 7.05E+03 | 0.10 | 8.33E+01 | 1.16E-02 | 4.00E+02 | 5.42E+77 | 3.74E-04 | 2.64E+00 | 5.9E-06 | 6.0E-01 |

END

## Southern Parcel

- MW-1S
- MW-26S
- MW-30S

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-1S

**GW-ADV**
**Version 3.1; 02/04**

**Reset to Defaults**

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

**OR**

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 91203 | 1.20E+02 | Naphthalene |

MORE ↓

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 835.93 | 365.76 | 335.28 | 134.89 | C | LS | SICL | | |

MORE ↓

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SICL | 1.37 | 0.482 | 0.198 | SIC | 1.38 | 0.481 | 0.216 | LS | 1.62 | 0.39 | 0.076 |

MORE ↓

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ (g/cm-s$^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE ↓

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

INTERMEDIATE CALCULATIONS SHEET

**MW-1S**

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_{te}$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 635.93 | 0.284 | 0.265 | 0.314 | 0.276 | 1.71E-09 | 0.838 | 1.43E-09 | 18.75 | 0.39 | 0.087 | 0.303 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.80E+06 | 2.22E-04 | 200 | 12,901 | 1.66E-04 | 7.12E-03 | 1.76E-04 | 3.86E-03 | 3.09E-03 | 8.20E-03 | 2.45E-04 | 2.63E-03 | 635.93 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp(Pe$^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 8.55E+02 | 0.10 | 8.33E+01 | 3.86E-03 | 4.00E+02 | 2.37E+234 | 2.69E-04 | 2.30E-01 | NA | 3.0E-03 |

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-26S

**GW-ADV**
**Version 3.1; 02/04**

**Reset to Defaults**

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

**OR**

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 98828 | 2.87E+00 | Cumene (Isopropylbenzene) |

MORE ↓

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 514.71 | 514.71 | 0 | 0 | A | S | S | | |

MORE ↓

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S | 1.66 | 0.375 | 0.054 | | | | | | | | |

MORE ↓

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE ↓

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

INTERMEDIATE CALCULATIONS SHEET

**MW-26S**

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_{te}$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 314.71 | 0.321 | ERROR | ERROR | 0.003 | 9.94E-08 | 0.998 | 9.93E-08 | 17.05 | 0.375 | 0.122 | 0.253 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.80E+06 | 2.22E-04 | 200 | 12,629 | 5.15E-03 | 2.21E-01 | 1.76E-04 | 1.05E-02 | 0.00E+00 | 0.00E+00 | 4.19E-04 | 4.56E-03 | 314.71 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp($Pe^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 6.33E+02 | 0.10 | 8.33E+01 | 1.05E-02 | 4.00E+02 | 1.27E+86 | 7.81E-04 | 4.95E-01 | NA | 4.0E-01 |

END

AK STEEL FORMER ARCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

DATA ENTRY SHEET

MW-30S

GW-ADV
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 98828 | 4.39E+00 | Cumene (Isopropylbenzene) |

MORE ↓

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 11.1 | 200 | 535.44 | 200 | 287.68 | 47.76 | C | S | SIC | | |

MORE ↓

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SIC | 1.38 | 0.481 | 0.216 | C | 1.43 | 0.459 | 0.215 | S | 1.66 | 0.375 | 0.054 |

MORE ↓

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 1000 | 1000 | 366 | 0.1 | 0.25 | 5 |

MORE ↓

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|

Model used to calculate air concentration - exposure data not used.

Used to calculate risk-based groundwater concentration.

END

INTERMEDIATE CALCULATIONS SHEET

**MW-30S**

| Exposure duration, $\tau$ (sec) | Source-building separation, $L_T$ (cm) | Stratum A soil air-filled porosity, $\theta_a^A$ ($cm^3/cm^3$) | Stratum B soil air-filled porosity, $\theta_a^B$ ($cm^3/cm^3$) | Stratum C soil air-filled porosity, $\theta_a^C$ ($cm^3/cm^3$) | Stratum A effective total fluid saturation, $S_{te}$ ($cm^3/cm^3$) | Stratum A soil intrinsic permeability, $k_i$ ($cm^2$) | Stratum A soil relative air permeability, $k_{rg}$ ($cm^2$) | Stratum A soil effective vapor permeability, $k_v$ ($cm^2$) | Thickness of capillary zone, $L_{cz}$ (cm) | Total porosity in capillary zone, $n_{cz}$ ($cm^3/cm^3$) | Air-filled porosity in capillary zone, $\theta_{a,cz}$ ($cm^3/cm^3$) | Water-filled porosity in capillary zone, $\theta_{w,cz}$ ($cm^3/cm^3$) | Floor-wall seam perimeter, $X_{crack}$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00E+00 | 335.44 | 0.265 | 0.244 | 0.321 | 0.284 | 1.49E-09 | 0.844 | 1.25E-09 | 17.05 | 0.375 | 0.122 | 0.253 | 4,000 |

| Bldg. ventilation rate, $Q_{building}$ ($cm^3/s$) | Area of enclosed space below grade, $A_B$ ($cm^2$) | Crack-to-total area ratio, $\eta$ (unitless) | Crack depth below grade, $Z_{crack}$ (cm) | Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol) | Henry's law constant at ave. groundwater temperature, $H_{TS}$ (atm-$m^3$/mol) | Henry's law constant at ave. groundwater temperature, $H'_{TS}$ (unitless) | Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s) | Stratum A effective diffusion coefficient, $D^{eff}_A$ ($cm^2/s$) | Stratum B effective diffusion coefficient, $D^{eff}_B$ ($cm^2/s$) | Stratum C effective diffusion coefficient, $D^{eff}_C$ ($cm^2/s$) | Capillary zone effective diffusion coefficient, $D^{eff}_{cz}$ ($cm^2/s$) | Total overall effective diffusion coefficient, $D^{eff}_T$ ($cm^2/s$) | Diffusion path length, $L_d$ (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.54E+04 | 1.80E+06 | 2.22E-04 | 200 | 12,629 | 5.15E-03 | 2.21E-01 | 1.76E-04 | 3.37E-03 | 2.81E-03 | 1.05E-02 | 4.19E-04 | 2.30E-03 | 335.44 |

| Convection path length, $L_p$ (cm) | Source vapor conc., $C_{source}$ ($\mu g/m^3$) | Crack radius, $r_{crack}$ (cm) | Average vapor flow rate into bldg., $Q_{soil}$ ($cm^3/s$) | Crack effective diffusion coefficient, $D^{crack}$ ($cm^2/s$) | Area of crack, $A_{crack}$ ($cm^2$) | Exponent of equivalent foundation Peclet number, exp(Pe$^f$) (unitless) | Infinite source indoor attenuation coefficient, $\alpha$ (unitless) | Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$) | Unit risk factor, URF $(\mu g/m^3)^{-1}$ | Reference conc., RfC ($mg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 9.69E+02 | 0.10 | 8.33E+01 | 3.37E-03 | 4.00E+02 | 1.46E+268 | 4.23E-04 | 4.10E-01 | NA | 4.0E-01 |

END

# Appendix G

# Toxic Endpoint Tables

TABLE G-1
TOXIC ENDPOINTS - ADVERSE EFFECTS FOR POTENTIAL
NONCARCINOGENIC EFFECTS (CHRONIC)
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH Risk Assessment

| Chemical | Changes in Body Weight | | Develop. Effects | | Blood Effects | | Liver Effects | | Kidney Effects | | Neuro. Effects | | GI Effects | | Vascular Effects | | Dec. Longevity | | Renal Effects | | Immune Effects | | Hair and Nail Effects | | Skin Effects | | Eye Effects | | Adrenal Effects | | Respiratory Effects | | Sk Adverse Effects | | Clinical Effects | | Thyroid Effects | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh |
| 1,1-Biphenyl | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2,3,7-8 TCDD TEQ | | | X | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2,4-Dimethylphenol | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X |
| 2-Methylnaphthalene | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | X | | | | | | | |
| Acenaphthene | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthylene | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aluminum | | | X | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Anthracene | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | | | | |
| Antimony | | | | | X | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | | | | X | | | | | | | | X | | | X | X | | | | | | | | | X | | | | | | | | | | | | | |
| Barium | | | | X | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo(a)anthracene | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo(b)pyrene | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo(k)fluoranthene | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo(g,h,i)perylene | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo(a)pyrene | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cadmium | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | X | | | | | | |
| Carbazole | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chromium (total) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | | | | |
| Chrysene | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Copper | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cyanide | | X | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | X | | | | | X |
| Dibenzo,h,o(h)anthracene | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dibenzofuran | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ethylbenzene | | | | X | | | X | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fluoranthene | | | | | X | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fluorene | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Indeno(1,2,3-cd)pyrene | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Iron | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | |
| Isopropylbenzene | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | X | | | | | | | | |
| Lead | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Manganese | | | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mercury | | | | | | | | | | | | X | | | | | | | | | X | | | | | | | | | | | | | | | | | |
| Naphthalene | X | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | |
| o-Cresol (2-Methylphenol) | X | X | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| p-Cresol (4-Methylphenol) | X | X | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pentachlorophenol | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | | | | |
| Phenol | | | X | | | | | | | X | | X | | X | | X | | | | | | | | | | | | | | | | | | | | | | |
| Pyrene | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Selenium | | | | | | | | | | | | | | | | | | | | | | | X | | X | | | | | | | | | | X | | | |
| Silver | | | | | X | | X | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Thallium | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Toluene | | | | | | | | | X | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total PCBs | | | | | | | | | | | | | | | | | | | | | X | X | X | X | | | X | X | | | | | | | | | | |
| Total Xylenes | X | | | | | | | | | | | X | | | | | X | | | | | | | | | | | | | | | | | | | | | |
| Trichloroethene | | | | | | | | | X | | | X | | | | | | | | | | | | | | | | X | | | | | | | | | | |
| Vanadium | | | | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | |
| Zinc | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1-Methylphenanthrene | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | X | | | | | | | |
| 1,2,4-Trichlorobenzene | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | |
| Bis(2-Ethylhexyl)phthalate | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tetrachloroethene | X | | | | | | X | X | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vinyl Chloride | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Notes:
Dev. - Developmental.
Develop. - Developmental.
GI - Gastrointestinal.
Ing - Ingestion.
Inh - Inhalation.
Neuro. - Neurological.
X - Toxic endpoint identified for this exposure route and constituent.

TABLE 9-2
TOXIC ENDPOINTS - ADVERSE EFFECTS FOR POTENTIAL
NONCARCINOGENIC EFFECTS (SUBCHRONIC)
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

| Chemical | Changes in Body Weight | | Develop. Effects | | Blood Effects | | Liver Effects | | Kidney Effects | | Neuro. Effects | | GI Effects | | Vascular Effects | | Dec. Longevity | | Nasal Effects | | Immune Effects | | Hair and Nail Effects | | Skin Effects | | Eye Effects | | Adrenal Effects | | Respiratory Effects | | No Adverse Effects | | Clinical Effects | | Thyroid Effects | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh | Ing | Inh |
| 1,1-Biphenyl | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2,3,7-8 TCDD TEQ | | | X | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2,4-Dimethylphenol | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | | |
| 2-Methylnaphthalene | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | X | | | | | | | |
| Acenaphthene | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthylene | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aluminum | | | X | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | | | | |
| Arsenic | | | | | X | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | | | | X | | | | | | | | X | | | X | X | | | | | | | | | X | | | | | | | | | | | | | |
| Barium | | | | X | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo(a)anthracene | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo(a)pyrene | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo(b)fluoranthene | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo(g,h,i)perylene | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo(k)fluoranthene | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cadmium | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | X | | | | | | |
| Carbazole | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chromium (total) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | | | | |
| Chrysene | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Copper | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cyanide | | X | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | X | | | | | X |
| Dibenzo,h,anthracene | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dibenzofuran | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ethylbenzene | | | | X | | | X | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fluoranthene | | | | | X | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fluorene | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Indeno(1,2,3-cd)pyrene | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Iron | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | |
| Isopropylbenzene | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | X | | | | | | | | |
| Lead | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Manganese | | | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mercury | | | | | | | | | | | | X | | | | | | | | | X | | | | | | | | | | | | | | | | | |
| Naphthalene | X | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | |
| o-Cresol (2-Methylphenol) | X | X | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| p-Cresol (4-Methylphenol) | X | X | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phenanthrene | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | | | | |
| Phenol | | | X | | | | | | | X | | X | | X | | X | | | | | | | | | | | | | | | | | | | | | | |
| Pyrene | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Selenium | | | | | | | | | | | | | | | | | | | | | | | X | | X | | | | | | | | | | X | | | |
| Silver | | | | | X | | X | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Thallium | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Toluene | | | | | | | | | X | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total PCBs | | | | | | | | | | | | | | | | | | | | | X | X | X | X | | | X | X | | | | | | | | | | |
| Total Xylenes | X | | | | | | | | | | | X | | | | | X | | | | | | | | | | | | | | | | | | | | | |
| Trichloroethene | | | | | | | | | X | | | X | | | | | | | | | | | | | | | | X | | | | | | | | | | |
| Vanadium | | | | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | |
| Zinc | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1-Methylnaphthalene | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | X | | | | | | | |
| 1,2,4-Trichlorobenzene | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | |
| Bis(2-Ethylhexyl)phthalate | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Trichloroethene | X | | | | | | X | X | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vinyl Chloride | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Notes:
Dev. - Developmental.
Develop. - Developmental.
GI - Gastrointestinal.
Ing - Ingestion.
Inh - Inhalation.
Neuro. - Neurological.
X - Toxic endpoint identified for this exposure route and constituent.

TABLE G-3
TOXIC ENDPOINTS FOR POTENTIAL NONCARCINOGENIC EFFECTS
- CURRENT/FUTURE TRESPASSER TEEN - RME - AOC 1
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

| Chemical | Dec. Body Changes In | | | Develop. Effects | | | Blood Effects | | | Liver Effects | | | Kidney Effects | | | Neuro. Effects | | | GI Effects | | | Vascular Effects | | | Nasal Effects | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total |
| 1,1-Biphenyl | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2,3,7-8 TCDD TEQ | | | | 1.35E-03 | | 1.35E-03 | | | | | | | | | | 1.35E-03 | | 1.35E-03 | | | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2-Methylnaphthalene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthylene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aluminum | | | | 9.98E-03 | | 9.98E-03 | | | | | | | | | | | 5.22E-04 | 5.22E-04 | | | | | | | | | |
| Anthracene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | | | | | 4.60E-05 | 4.60E-05 | | | | | | | | | | | 4.60E-05 | 4.60E-05 | | | | 2.21E-02 | 4.60E-05 | 2.22E-02 | | | |
| Barium | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | | | | | | | | 3.93E-02 | 3.93E-02 | | | | | | | | | | | | | | | | | | |
| Benzo(a)anthracene | | | | | | | | | | | | | 1.12E-03 | 8.07E-10 | 1.12E-03 | | | | | | | | | | | | |
| Benzo(a)pyrene | | | | | | | | | | | | | 9.78E-04 | 8.80E-10 | 9.78E-04 | | | | | | | | | | | | |
| Benzo(b)fluoranthene | | | | | | | | | | | | | 8.29E-04 | 8.75E-10 | 8.29E-04 | | | | | | | | | | | | |
| Benzo(g,h,i)perylene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo(k)fluoranthene | | | | | | | | | | | | | 7.86E-04 | | 7.86E-04 | | | | | | | | | | | | |
| Cadmium | | | | | | | | | | | | | 1.44E-03 | 2.87E-05 | 1.47E-03 | | | | | | | | | | | | |
| Carbazole | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chromium (total) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chrysene | | | | | | | | | | | | | 5.88E-04 | | 5.88E-04 | | | | | | | | | | | | |
| Copper | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cyanide | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dibenz(a,h)anthracene | | | | | | | | | | | | | 2.32E-04 | 2.42E-10 | 2.32E-04 | | | | | | | | | | | | |
| Dibromochloromethane | 6.54E-05 | | 6.54E-05 | | | | | | | | | | | | | | | | | | | | | | | | |
| Ethylbenzene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fluoranthene | | | | | | | 1.21E-03 | | 1.21E-03 | 1.21E-03 | | 1.21E-03 | 1.21E-03 | | 1.21E-03 | | | | | | | | | | | | |
| Fluorene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Indeno(1,2,3-cd)pyrene | | | | | | | | | | | | | 5.10E-04 | 5.87E-10 | 5.10E-04 | | | | | | | | | | | | |
| Iron | | | | | | | | | | | | | | | | | | | 6.59E-02 | | 6.59E-02 | | | | | | |
| Isopropylbenzene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lead | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Manganese | | | | | | | | | | | | | | | | 7.98E-02 | 8.36E-03 | 8.48E-02 | | | | | | | | | |
| Mercury | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Naphthalene | 3.78E-04 | | | | | | | | | | | | | | | | | | | | | | | | | 4.88E-01 | 4.88E-01 |
| o-Cresol (2-Methylphenol) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| p-Cresol (4-Methylphenol) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phenanthrene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phenol | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pyrene | | | | | | | | | | | | | 1.43E-03 | | 1.43E-03 | | | | | | | | | | | | |
| Selenium | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Styrene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Thallium | | | | | | | 4.92E-03 | | 4.92E-03 | | | | | | | | | | | | | | | | | | |
| Toluene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total PCBs | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total Xylenes | | | | | | | | | | | | | | | | | 1.24E-02 | 1.24E-02 | | | | | | | | | |
| Trichloroethene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vanadium | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Zinc | | | | | | | 1.44E-03 | | 1.44E-03 | | | | | | | | | | | | | | | | | | |
| Total | 4.48E-04 | | 6.54E-05 | 1.08E-02 | 4.60E-05 | 1.10E-02 | 7.57E-03 | 3.93E-02 | 4.31E-02 | 1.21E-03 | | 1.21E-03 | 9.12E-03 | 2.08E-05 | 9.15E-03 | 7.98E-02 | 2.24E-02 | 9.91E-02 | 6.59E-02 | | 6.59E-02 | 2.21E-02 | 4.60E-05 | 2.22E-02 | | 4.88E-01 | 4.88E-01 |

Notes:
COPC - Compound of Potential Concern.
Dec. - Decreased.
Develop. - Developmental.
DR - Dose-Response.
GI - Gastrointestinal.
HQ - Hazard Quotient.
Ing - Ingestion.
Inh - Inhalation.
Neuro. - Neurological.
PCBs - Polychlorinated Biphenyls.
Bold values indicate an exceedance of the target hazard index of 1, or values that significantly contribute to an exceedance.
(a) Individual COPC with an HQ greater than 1 is already defined as a COC.

TABLE G-3
TOXIC ENDPOINTS FOR POTENTIAL NONCARCINOGENIC EFFECTS
- CURRENT/FUTURE TRESPASSER TEEN - RME - AOC 1
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

| | Immune Effects | | | Hair and Nail Effects | | | Skin Effects | | | Eye Effects | | | Respiratory Effects | | | No Adverse Effects | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total |
| 1,1-Biphenyl | | | | | | | | | | | | | | | | | | |
| 2,3,7-8 TCDD TEQ | | | | | | | | | | | | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | | | | | | | | | | | | |
| 2-Methylnaphthalene | | | | | | | | | | | | | 5.08E-04 | | | | | |
| Acenaphthene | | | | | | | | | | | | | | | | | | |
| Acenaphthylene | | | | | | | | | | | | | | | | | | |
| Aluminum | | | | | | | | | | | | | | | | | | |
| Anthracene | | | | | | | | | | | | | | | | | | |
| Antimony | | | | | | | | | | | | | | | | | | |
| Arsenic | | | | | | | 2.21E-02 | | 2.21E-02 | | | | | | | | | |
| Barium | | | | | | | | | | | | | | | | | | |
| Benzene | | | | | | | | | | | | | | | | | | |
| Benzo(a)anthracene | | | | | | | | | | | | | | | | | | |
| Benzo(a)pyrene | | | | | | | | | | | | | | | | | | |
| Benzo(b)fluoranthene | | | | | | | | | | | | | | | | | | |
| Benzo(g,h,i)perylene | | | | | | | | | | | | | | | | | | |
| Benzo(k)fluoranthene | | | | | | | | | | | | | | | | | | |
| Cadmium | | | | | | | | | | | | | | 2.67E-05 | 2.67E-05 | | | |
| Carbazole | | | | | | | | | | | | | | | | | | |
| Chromium (total) | | | | | | | | | | | | | | | | 1.25E-05 | | 1.24E-05 |
| Chrysene | | | | | | | | | | | | | | | | | | |
| Copper | | | | | | | | | | | | | | | | | | |
| Cyanide | | | | | | | | | | | | | | | | | | |
| Dibenz(a,h)anthracene | | | | | | | | | | | | | | | | | | |
| Dibenzofuran | | | | | | | | | | | | | | | | | | |
| Ethylbenzene | | | | | | | | | | | | | | | | | | |
| Fluoranthene | | | | | | | | | | | | | | | | | | |
| Fluorene | | | | | | | | | | | | | | | | | | |
| Indeno(1,2,3-cd)pyrene | | | | | | | | | | | | | | | | | | |
| Iron | | | | | | | | | | | | | | | | | | |
| Isopropylbenzene | | | | | | | | | | | | | | | | | | |
| Lead | | | | | | | | | | | | | | | | | | |
| Manganese | | | | | | | | | | | | | | | | | | |
| Mercury | 7.13E-05 | | | | | | | | | | | | | | | | | |
| Naphthalene | | | | | | | | | | | | | | | | | | |
| o-Cresol (2-Methylphenol) | | | | | | | | | | | | | | | | | | |
| p-Cresol (4-Methylphenol) | | | | | | | | | | | | | | | | | | |
| Phenanthrene | | | | | | | | | | | | | | | | | | |
| Phenol | | | | | | | | | | | | | | | | | | |
| Pyrene | | | | | | | | | | | | | | | | | | |
| Selenium | | | | | | | | | | | | | | | | | | |
| Styrene | | | | | | | | | | | | | | | | | | |
| Thallium | | | | | | | | | | | | | | | | | | |
| Toluene | | | | | | | | | | | | | | | | | | |
| Total PCBs | 1.53E+00 | 1.35E-04 | 1.53E+00 | 1.53E+00 | 1.35E-04 | 1.53E+00 | | | | 1.53E+00 | 1.35E-04 | 1.53E+00 | | | | | | |
| Total Xylenes | | | | | | | | | | | | | | | | | | |
| Trichloroethene | | | | | | | | | | | | | | | | | | |
| Vanadium | | | | 5.23E-03 | | 5.23E-03 | | | | | | | | | | | | |
| Zinc | | | | | | | | | | | | | | | | | | |
| Total | 1.53E+00 | 1.35E-04 | 1.53E+00 | 1.54E+00 | 1.35E-04 | 1.54E+00 | 2.21E-02 | | 2.21E-02 | 1.53E+00 | 1.35E-04 | 1.53E+00 | 5.08E-04 | 2.67E-05 | 2.67E-05 | 1.25E-05 | | 1.25E-05 |

Notes
COPC - Compound of Potential Concern.
Dec. - Decreased.
Develop. - Developmental.
D/R - Dose-Response.
GI - Gastrointestinal.
HQ - Hazard Quotient.
Ing - Ingestion.
Inh - Inhalation.
Neuro. - Neurological.
PCBs - Polychlorinated Biphenyls.
Bold values indicate an exceedance of the target hazard index of 1, or value significantly contributes to an exceedance.
(a) Individual COPC with an HQ greater than 1 is already defined as a COC

TABLE G-4
TOXIC ENDPOINTS FOR POTENTIAL NONCARCINOGENIC EFFECTS
- CURRENT/FUTURE TRESPASSER TEEN - RME - AOC 13
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

| Chemical | Dec. Body Changes in | | | Develop. Effects | | | Blood Effects | | | Liver Effects | | | Kidney Effects | | | Neuro. Effects | | | GI Effects | | | Vascular Effects | | | Renal Effects | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total |
| 1,1-Biphenyl | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2,3,7-8 TCDD TEQ | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2,4-Dinitrophenol | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2-Methylnaphthalene | | | | | | | | | | | | | | | | | | | | | | | | | | 3.93E-08 | 3.93E-08 |
| Acenaphthene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthylene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aluminum | | | | 7.88E-03 | | 7.88E-03 | | | | | | | | | | | 3.87E-04 | 3.87E-04 | | | | | | | | | |
| Anthracene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | | | | | 3.64E-05 | 3.64E-05 | | | | | | | | | | | 3.64E-05 | 3.64E-05 | | | | 1.91E-02 | 3.64E-05 | 1.91E-02 | | | |
| Barium | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | | | | | | | | 4.44E-02 | 4.44E-02 | | | | | | | | | | | | | | | | | | |
| Benzo(a)anthracene | | | | | | | | | | | | | 1.45E-03 | 3.12E-08 | 1.45E-03 | | | | | | | | | | | | |
| Benzo(a)pyrene | | | | | | | | | | | | | 1.28E-03 | 2.82E-08 | 1.28E-03 | | | | | | | | | | | | |
| Benzo(b)fluoranthene | | | | | | | | | | | | | 1.08E-03 | 2.46E-08 | 1.08E-03 | | | | | | | | | | | | |
| Benzo(k)fluoranthene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo(g,h,i)perylene | | | | | | | | | | | | | 1.08E-03 | 2.84E-08 | 1.08E-03 | | | | | | | | | | | | |
| Beryllium | | | | | | | | | | | | | 2.94E-04 | 5.47E-08 | 3.02E-04 | | | | | | | | | | | | |
| Cadmium | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chromium (total) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chrysene | | | | | | | | | | | | | 5.88E-04 | | 5.88E-04 | | | | | | | | | | | | |
| Copper | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cyanide | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dibenz(a,h)anthracene | | | | | | | | | | | | | 3.88E-04 | 5.43E-08 | 3.88E-04 | | | | | | | | | | | | |
| Dibenzofuran | 6.54E-08 | | 6.54E-08 | | | | | | | | | | | | | | | | | | | | | | | | |
| Ethylbenzene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fluoranthene | | | | | | | 1.21E-03 | | 1.21E-03 | 1.21E-03 | | 1.21E-03 | 1.21E-03 | | 1.21E-03 | | | | | | | | | | | | |
| Fluorene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Indeno(1,2,3-cd)pyrene | | | | | | | | | | | | | 7.00E-04 | 1.79E-08 | 7.00E-04 | | | | | | | | | | | | |
| Iron | | | | | | | | | | | | | | | | | | | 3.50E-02 | | 3.50E-02 | | | | | | |
| Isopropylbenzene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lead | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Manganese | | | | | | | | | | | | | | | | 4.84E-02 | 4.89E-03 | 5.40E-02 | | | | | | | | | |
| Mercury | | | | | | | | | | | | | | | | | 7.18E-07 | 7.18E-07 | | | | | | | | | |
| Naphthalene | 4.28E-04 | | 4.28E-04 | | | | | | | | | | | | | | | | | | | | | | | 3.94E+00 (a) | 3.94E+00 |
| o-Cresol (2-Methylphenol) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| p-Cresol (4-Methylphenol) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phenanthrene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phenol | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pyrene | | | | | | | | | | | | | 1.43E-03 | | 1.43E-03 | | | | | | | | | | | | |
| Selenium | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Styrene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Thallium | | | | | | | 4.92E-03 | | 4.92E-03 | | | | | | | | | | | | | | | | | | |
| Toluene | | | | | | | | | | | | | | | | | 2.23E-04 | 2.23E-04 | | | | | | | | | |
| Total PCBs | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total Xylenes | | | | | | | | | | | | | | | | | 1.43E-02 | 1.43E-02 | | | | | | | | | |
| Trichloroethene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vanadium | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Zinc | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total: | 4.81E-04 | | 4.91E-04 | 7.88E-03 | 3.64E-05 | 7.92E-03 | 6.13E-03 | 4.44E-02 | 5.06E-02 | 1.21E-03 | | 1.21E-03 | 9.41E-03 | 5.66E-08 | 9.41E-03 | 4.94E-02 | 1.94E-02 | 6.92E-02 | 3.50E-02 | | 3.50E-02 | 1.91E-02 | 3.64E-05 | 1.91E-02 | | 3.94E+00 | 3.94E+00 |

Notes:
COPC - Compound of Potential Concern.
Dec. - Decreased.
Develop. - Developmental.
D/R - Dose-Response.
GI - Gastrointestinal.
HQ - Hazard Quotient.
Ing - Ingestion.
Inh - Inhalation.
Neuro. - Neurological.
PCBs - Polychlorinated Biphenyls.
Bold values indicate an exceedance of the target hazard index of 1, or values that significantly contribute to an exceedance.
(a) Individual COPC with an HQ greater than 1 is already defined as a COC.

TABLE G-4
TOXIC ENDPOINTS FOR POTENTIAL NONCARCINOGENIC EFFECTS
- CURRENT/FUTURE TRESPASSER TEEN - RME - AOC 13
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

| Chemical | Immune Effects | | | Hair and Nail Effects | | | Skin Effects | | | Eye Effects | | | Respiratory Effects | | | No Adverse Effects | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total |
| 1,1-Biphenyl | | | | | | | | | | | | | | | | | | |
| 2,3,7-8 TCDD TEQ | | | | | | | | | | | | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | | | | | | | | | | | | |
| 3-Methylnaphthalene | | | | | | | | | | | | | 5.92E-04 | | 5.92E-04 | | | |
| Acenaphthene | | | | | | | | | | | | | | | | | | |
| Acenaphthylene | | | | | | | | | | | | | | | | | | |
| Aluminum | | | | | | | | | | | | | | | | | | |
| Anthracene | | | | | | | | | | | | | | | | | | |
| Antimony | | | | | | | | | | | | | | | | | | |
| Arsenic | | | | | | | 1.91E-02 | | 1.91E-02 | | | | | | | | | |
| Barium | | | | | | | | | | | | | | | | | | |
| Benzene | | | | | | | | | | | | | | | | | | |
| Benzo(a)anthracene | | | | | | | | | | | | | | | | | | |
| Benzo(a)pyrene | | | | | | | | | | | | | | | | | | |
| Benzo(b)fluoranthene | | | | | | | | | | | | | | | | | | |
| Benzo(g,h,i)perylene | | | | | | | | | | | | | | | | | | |
| Benzo(k)fluoranthene | | | | | | | | | | | | | | | | | | |
| Cadmium | | | | | | | | | | | | | | 5.47E-06 | 5.47E-06 | | | |
| Carbazole | | | | | | | | | | | | | | | | | | |
| Chromium (total) | | | | | | | | | | | | | | | | 4.88E-06 | | 4.87E-06 |
| Chrysene | | | | | | | | | | | | | | | | | | |
| Copper | | | | | | | | | | | | | | | | | | |
| Cyanide | | | | | | | | | | | | | | | | | | |
| Dibenz(a,h)anthracene | | | | | | | | | | | | | | | | | | |
| Dibenzofuran | | | | | | | | | | | | | | | | | | |
| Ethylbenzene | | | | | | | | | | | | | | | | | | |
| Fluoranthene | | | | | | | | | | | | | | | | | | |
| Fluorene | | | | | | | | | | | | | | | | | | |
| Indeno(1,2,3-cd)pyrene | | | | | | | | | | | | | | | | | | |
| Iron | | | | | | | | | | | | | | | | | | |
| Isophoronene | | | | | | | | | | | | | | | | | | |
| Lead | | | | | | | | | | | | | | | | | | |
| Manganese | | | | | | | | | | | | | | | | | | |
| Mercury | 1.91E-03 | | 1.91E-03 | | | | | | | | | | | | | | | |
| Naphthalene | | | | | | | | | | | | | | | | | | |
| o-Cresol (2-Methylphenol) | | | | | | | | | | | | | | | | | | |
| p-Cresol (4-Methylphenol) | | | | | | | | | | | | | | | | | | |
| Phenanthrene | | | | | | | | | | | | | | | | | | |
| Phenol | | | | | | | | | | | | | | | | | | |
| Pyrene | | | | | | | | | | | | | | | | | | |
| Selenium | | | | | | | | | | | | | | | | | | |
| Styrene | | | | | | | | | | | | | | | | | | |
| Thallium | | | | | | | | | | | | | | | | | | |
| Toluene | | | | | | | | | | | | | | | | | | |
| Total PCBs | 1.40E-01 | 1.04E-05 | 1.40E-01 | 1.40E-01 | 1.04E-05 | 1.40E-01 | | | | 1.40E-01 | 1.04E-05 | 1.40E-01 | | | | | | |
| Total Xylenes | | | | | | | | | | | | | | | | | | |
| Trichloroethene | | | | | | | | | | | | | | | | | | |
| Vanadium | | | | 4.63E-03 | | 4.63E-03 | | | | | | | | | | | | |
| Zinc | | | | | | | | | | | | | | | | | | |
| Total | 1.42E-01 | 1.04E-05 | 1.42E-01 | 1.44E-01 | 1.04E-05 | 1.44E-01 | 1.91E-02 | | 1.91E-02 | 1.40E-01 | 1.04E-05 | 1.40E-01 | 5.92E-04 | 5.47E-06 | 5.97E-04 | 4.88E-06 | | 4.88E-06 |

Notes:
COPC - Compound of Potential Concern.
Dec. - Decreased.
Develop. - Developmental.
DR - Dose-Response.
GI - Gastrointestinal.
HQ - Hazard Quotient.
Ing - Ingestion.
Inh - Inhalation.
Neuro. - Neurological.
PCBs - Polychlorinated Biphenyls.
Bold values indicate an exceedance of the target hazard index of 1, or value significantly contribute to an exceedance.
(a) Individual COPC with an HQ greater than 1 is already defined as a COC

TABLE G-5
TOXIC ENDPOINTS FOR POTENTIAL
NONCARCINOGENIC EFFECTS - FUTURE
CONSTRUCTION WORKER - RME - AOC 1
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

| Chemical | Changes in Body Weight | | | Develop. Effects | | | Blood Effects | | | Liver Effects | | | Kidney Effects | | | Neuro. Effects | | | GI Effects | | | Vascular Effects | | | Dec. Longevity | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total |
| 1,1-Biphenyl | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2,3,7-8 TCDD TEQ | | | | 4.90E-03 | | 4.90E-03 | | | | | | | | | | 4.90E-03 | | 4.90E-03 | | | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2-Methylnaphthalene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthylene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aluminum | | | | 2.60E-02 | | 2.60E-02 | | | | | | | | | | | 6.61E-02 | 6.61E-02 | | | | | | | | | |
| Anthracene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | | | | | 7.94E-03 | 7.94E-03 | | | | | | | | | | | 7.94E-03 | 7.94E-03 | | | | 6.80E-02 | 7.94E-03 | 7.59E-02 | | | |
| Barium | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | | | | | | | 1.53E-03 | 1.58E-01 | 1.60E-01 | | | | | | | | | | | | | | | | | | |
| Benzo(a)anthracene | | | | | | | | | | | | | 5.30E-04 | 1.39E-08 | 5.32E-04 | | | | | | | | | | | | |
| Benzo(a)pyrene | | | | | | | | | | | | | 4.55E-04 | 1.19E-08 | 4.56E-04 | | | | | | | | | | | | |
| Benzo(b)fluoranthene | | | | | | | | | | | | | 3.55E-04 | 9.31E-07 | 3.56E-04 | | | | | | | | | | | | |
| Benzo(g,h,i)perylene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo(k)fluoranthene | | | | | | | | | | | | | 4.30E-04 | 1.13E-06 | 4.31E-04 | | | | | | | | | | | | |
| Cadmium | | | | | | | | | | | | | 3.54E-02 | 6.72E-03 | 4.21E-02 | | | | | | | | | | | | |
| Carbazole | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chromium (total) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chrysene | | | | | | | | | | | | | 5.05E-04 | 1.32E-08 | 5.07E-04 | | | | | | | | | | | | |
| Copper | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cyanide | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dibenz(a,h)anthracene | | | | | | | | | | | | | 8.44E-05 | 2.47E-07 | 8.46E-05 | | | | | | | | | | | | |
| Dibenzofuran | 1.88E-02 | 5.88E-05 | 1.70E-02 | | | | | | | | | | | | | | | | | | | | | | | | |
| Ethylbenzene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fluoranthene | | | | | | | 1.04E-03 | 2.71E-08 | 1.04E-03 | 1.04E-03 | 2.71E-08 | 1.04E-03 | 1.04E-03 | 2.71E-08 | 1.04E-03 | | | | | | | | | | | | |
| Fluorene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Indeno(1,2,3-cd)pyrene | | | | | | | | | | | | | 2.58E-04 | 6.58E-07 | 2.58E-04 | | | | | | | | | | | | |
| Iron | | | | | | | | | | | | | | | | | | | 2.56E-01 | | 2.56E-01 | | | | | | |
| Isopropylbenzene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lead | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Manganese | | | | | | | | | | | | | | | | 3.37E-02 | 3.71E-01 | 4.05E-01 | | | | | | | | | |
| Mercury | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Naphthalene | 4.14E-03 | | 4.14E-03 | | | | | | | | | | | | | | | | | | | | | | | | |
| o-Cresol (2-Methylphenol) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| p-Cresol (4-Methylphenol) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phenanthrene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phenol | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pyrene | | | | | | | | | | | | | 9.36E-04 | 2.50E-08 | 9.36E-04 | | | | | | | | | | | | |
| Selenium | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Styrene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Thallium | | | | | | | 3.28E-03 | | 3.28E-03 | | | | | | | | | | | | | | | | | | |
| Toluene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total PCBs | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total Xylenes | 2.39E-04 | | 2.39E-04 | | | | | | | | | | | | | | 5.58E-02 | 5.58E-02 | | | | | | | 2.59E-04 | | 2.59E-04 |
| Trichloroethene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vanadium | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Zinc | | | | | | | 2.18E-02 | | 2.18E-02 | | | | | | | | | | | | | | | | | | |
| Total | 2.13E-02 | 5.88E-05 | 2.14E-02 | 3.06E-02 | 7.94E-03 | 3.86E-02 | 2.61E-02 | 1.58E-01 | 1.88E-01 | 1.04E-03 | 2.71E-08 | 1.04E-03 | 4.00E-02 | 6.74E-03 | 4.67E-02 | 3.96E-02 | 6.01E-01 | 6.40E-01 | 2.56E-01 | | 2.56E-01 | 6.80E-02 | 7.94E-03 | 7.59E-02 | 2.59E-04 | | 2.59E-04 |

Notes:
COPC - Compound of Potential Concern.
Dec. - Decreased.
Develop. - Developmental.
D/R - Dose-Response.
HQ - Hazard Quotient.
GI - Gastrointestinal.
Ing - Ingestion.
Inh - Inhalation.
Neuro. - Neurological.
PCBs - Polychlorinated Biphenyls.
Bold values indicate an exceedance of the target hazard index of 1, or values that significantly contribute to an exceedance.
(a) Individual COPC with an HQ greater than 1 is already defined as a COC.

TABLE G-8
TOXIC ENDPOINTS FOR POTENTIAL
NONCARCINOGENIC EFFECTS - FUTURE
CONSTRUCTION WORKER - RME - AOC 1
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

| | Nasal Effects | | | Immune Effects | | | Hair and Nail Effects | | | Skin Effects | | | Eye Effects | | | Respiratory Effects | | | No Adverse Effects | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total |
| 1,1-Biphenyl | | | | | | | | | | | | | | | | | | | | | |
| 2,3,7-8 TCDD TEQ | | | | | | | | | | | | | | | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | | | | | | | | | | | | | | | |
| 2-Methylnaphthalene | | 1.01E-04 | 1.01E-04 | | | | | | | | | | | | | 2.47E-02 | | 2.47E-02 | | | |
| Acenaphthene | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthylene | | | | | | | | | | | | | | | | | | | | | |
| Aluminum | | | | | | | | | | | | | | | | | | | | | |
| Anthracene | | | | | | | | | | | | | | | | | | | | | |
| Antimony | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | | | | | | | | | | 9.90E-03 | | 9.90E-03 | | | | | | | | | |
| Barium | | | | | | | | | | | | | | | | | | | | | |
| Benzene | | | | | | | | | | | | | | | | | | | | | |
| Benzo(a)anthracene | | | | | | | | | | | | | | | | | | | | | |
| Benzo(a)pyrene | | | | | | | | | | | | | | | | | | | | | |
| Benzo(b)fluoranthene | | | | | | | | | | | | | | | | | | | | | |
| Benzo(g,h,i)perylene | | | | | | | | | | | | | | | | | | | | | |
| Benzo(k)fluoranthene | | | | | | | | | | | | | | | | | | | | | |
| Cadmium | | | | | | | | | | | | | | | | | 6.72E-03 | 6.72E-03 | | | |
| Carbazole | | | | | | | | | | | | | | | | | | | | | |
| Chromium (total) | | | | | | | | | | | | | | | | | | | 5.21E-05 | | 5.21E-05 |
| Chrysene | | | | | | | | | | | | | | | | | | | | | |
| Copper | | | | | | | | | | | | | | | | | | | | | |
| Cyanide | | | | | | | | | | | | | | | | | | | | | |
| Dibenz(a,h)anthracene | | | | | | | | | | | | | | | | | | | | | |
| Dibenzofuran | | | | | | | | | | | | | | | | | | | | | |
| Ethylbenzene | | | | | | | | | | | | | | | | | | | | | |
| Fluoranthene | | | | | | | | | | | | | | | | | | | | | |
| Fluorene | | | | | | | | | | | | | | | | | | | | | |
| Indeno(1,2,3-cd)pyrene | | | | | | | | | | | | | | | | | | | | | |
| Iron | | | | | | | | | | | | | | | | | | | | | |
| Isopropylbenzene | | | | | | | | | | | | | | | | | | | | | |
| Lead | | | | | | | | | | | | | | | | | | | | | |
| Manganese | | | | | | | | | | | | | | | | | | | | | |
| Mercury | | | | | | | | | | | | | | | | | | | | | |
| Naphthalene | | 2.39E+00 (a) | 2.39E+00 | | | | | | | | | | | | | | | | | | |
| o-Cresol (2-Methylphenol) | | | | | | | | | | | | | | | | | | | | | |
| p-Cresol (4-Methylphenol) | | | | | | | | | | | | | | | | | | | | | |
| Phenanthrene | | | | | | | | | | | | | | | | | | | | | |
| Phenol | | | | | | | | | | | | | | | | | | | | | |
| Pyrene | | | | | | | | | | | | | | | | | | | | | |
| Selenium | | | | | | | | | | | | | | | | | | | | | |
| Styrene | | | | | | | | | | | | | | | | | | | | | |
| Thallium | | | | | | | | | | | | | | | | | | | | | |
| Toluene | | | | | | | | | | | | | | | | | | | | | |
| Total PCBs | | | | 2.04E+00 (a) | 5.24E-03 | 2.06E+00 | 2.04E+00 (a) | 5.24E-03 | 2.06E+00 | | | | 2.04E+00 (a) | 5.24E-03 | 2.05E+00 | | | | | | |
| Total Xylenes | | | | | | | | | | | | | | | | | | | | | |
| Trichloroethene | | | | | | | | | | | | | | | | | | | | | |
| Vanadium | | | | | | | 6.60E-03 | | 6.60E-03 | | | | | | | | | | | | |
| Zinc | | | | | | | | | | | | | | | | | | | | | |
| Total | | 2.39E+00 | 2.39E+00 | 2.04E+00 | 5.24E-03 | 2.06E+00 | 2.06E+00 | 5.24E-03 | 2.06E+00 | 9.90E-03 | | 9.90E-03 | 2.04E+00 | 5.24E-03 | 2.05E+00 | 2.47E-02 | 6.72E-03 | 3.14E-02 | 5.21E-05 | | 5.21E-05 |

Notes:
COPC - Compound of Potential Concern.
Dec. - Decreased.
Develop. - Developmental.
D/R - Dose-Response.
HQ - Hazard Quotient.
GI - Gastrointestinal.
Ing - Ingestion.
Inh - Inhalation.
Neuro. - Neurological.
PCBs - Polychlorinated Biphenyls.
Bold values indicate an exceedance of the target hazard index of 1, or values that significantly contribute to an exceedance.
(a) Individual COPC with an HQ greater than 1 is already defined as a COC.

TABLE G-9
TOXIC ENDPOINTS FOR POTENTIAL
NONCARCINOGENIC EFFECTS - FUTURE
CONSTRUCTION WORKER - RME - BLOCK A
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

| | Changes in Body Weight | | | Develop. Effects | | | Blood Effects | | | Liver Effects | | | Kidney Effects | | | Neuro. Effects | | | GI Effects | | | Vascular Effects | | | Dec. Longevity | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total |
| 1,1-Biphenyl | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2,3,7-8-TCDD TEQ | | | | 2.60E-03 | | 2.60E-03 | | | | | | | | | | 2.60E-03 | | 2.60E-03 | | | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2-Methylnaphthalene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthylene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aluminum | | | | 5.88E-02 | | 5.88E-02 | | | | | | | | | | | 1.49E-01 | 1.49E-01 | | | | | | | | | |
| Anthracene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | | | | | 2.97E-03 | 2.97E-03 | | | | | | | | | | | 2.97E-03 | 2.97E-03 | | | | 2.54E-02 | 2.97E-03 | 2.84E-02 | | | |
| Barium | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | | | | | | | 1.04E-03 | 9.84E-02 | 9.14E-02 | | | | | | | | | | | | | | | | | | |
| Benzo(a)anthracene | | | | | | | | | | | | | 7.38E-05 | 1.83E-08 | 7.40E-05 | | | | | | | | | | | | |
| Benzo(a)pyrene | | | | | | | | | | | | | 3.24E-05 | 8.48E-08 | 3.25E-05 | | | | | | | | | | | | |
| Benzo(b)fluoranthene | | | | | | | | | | | | | 3.34E-05 | 8.75E-08 | 3.35E-05 | | | | | | | | | | | | |
| Benzo(g,h,i)perylene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo(k)fluoranthene | | | | | | | | | | | | | 2.45E-05 | 6.41E-08 | 2.45E-05 | | | | | | | | | | | | |
| Cadmium | | | | | | | | | | | | | 1.02E-02 | 1.93E-03 | 1.21E-02 | | | | | | | | | | | | |
| Carbazole | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chromium (total) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chrysene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Copper | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cyanide | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dibenz(a,h)anthracene | | | | | | | | | | | | | 4.04E-06 | 1.06E-09 | 4.05E-06 | | | | | | | | | | | | |
| Dibenzofuran | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ethylbenzene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fluoranthene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fluorene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Indeno(1,2,3-cd)pyrene | | | | | | | | | | | | | 1.16E-05 | 3.06E-09 | 1.16E-05 | | | | | | | | | | | | |
| Iron | | | | | | | | | | | | | | | | | | | 1.13E-01 | | 1.13E-01 | | | | | | |
| Isopropylbenzene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lead | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Manganese | | | | | | | | | | | | | | | | 5.67E-02 | 6.47E-01 | 7.04E-01 | | | | | | | | | |
| Mercury | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Naphthalene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| o-Cresol (2-Methylphenol) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| p-Cresol (4-Methylphenol) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phenanthrene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phenol | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pyrene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Selenium | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Styrene | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Thallium | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Toluene | | | | | | | | | | | | | 1.18E-04 | | 1.18E-04 | | 6.57E-03 | 6.57E-03 | | | | | | | | | |
| Total PCBs | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total Xylenes | 1.10E-03 | | 1.10E-03 | | | | | | | | | | | | | | 2.36E-01 | 2.36E-01 | | | | | | | 1.10E-03 | | 1.10E-03 |
| Trichloroethene | | | | | | | | | | | | | 2.25E-07 | | 2.25E-07 | | 1.04E-04 | 1.04E-04 | | | | | | | | | |
| Vanadium | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Zinc | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | 1.10E-03 | | 1.10E-03 | 8.46E-02 | 2.97E-03 | 8.76E-02 | 1.04E-03 | 9.84E-02 | 9.14E-02 | | | | 1.04E-02 | 1.93E-03 | 1.23E-02 | 5.46E-02 | 1.04E+00 | 1.10E+00 | 1.13E-01 | | 1.13E-01 | 2.54E-02 | 2.97E-03 | 2.84E-02 | 1.10E-03 | | 1.10E-03 |

Notes:
COPC - Compound of Potential Concern.
Dec. - Decreased.
Develop. - Developmental.
D/R - Dose-Response.
HQ - Hazard Quotient.
GI - Gastrointestinal.
Ing - Ingestion.
Inh - Inhalation.
Neuro. - Neurological.
PCBs - Polychlorinated Biphenyls.
Bold values indicate an exceedance of the target hazard index of 1, or values that significantly contribute to an exceedance.
(a) Individual COPC with an HQ greater than 1 is already defined as a COC.

TABLE G-6
TOXIC ENDPOINTS FOR POTENTIAL
NONCARCINOGENIC EFFECTS - FUTURE
CONSTRUCTION WORKER - RME - BLOCK A
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

| | Immune Effects | | | Hair and Nail Effects | | | Skin Effects | | | Eye Effects | | | Respiratory Effects | | | No Adverse Effects | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total | Ing | Inh | Total |
| 1,1-Biphenyl | | | | | | | | | | | | | | | | | | |
| 2,3,7-8 TCDD TEQ | | | | | | | | | | | | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | | | | | | | | | | | | |
| 2-Methylnaphthalene | | | | | | | | | | | | | | | | | | |
| Acenaphthene | | | | | | | | | | | | | | | | | | |
| Acenaphthylene | | | | | | | | | | | | | | | | | | |
| Aluminum | | | | | | | | | | | | | | | | | | |
| Anthracene | | | | | | | | | | | | | | | | | | |
| Antimony | | | | | | | | | | | | | | | | | | |
| Arsenic | | | | | | | 2.54E-02 | | 2.54E-02 | | | | | | | | | |
| Barium | | | | | | | | | | | | | | | | | | |
| Benzene | | | | | | | | | | | | | | | | | | |
| Benzo(a)anthracene | | | | | | | | | | | | | | | | | | |
| Benzo(a)pyrene | | | | | | | | | | | | | | | | | | |
| Benzo(b)fluoranthene | | | | | | | | | | | | | | | | | | |
| Benzo(g,h,i)perylene | | | | | | | | | | | | | | | | | | |
| Benzo(k)fluoranthene | | | | | | | | | | | | | | | | | | |
| Cadmium | | | | | | | | | | | | | | 1.93E-03 | 1.93E-03 | | | |
| Carbazole | | | | | | | | | | | | | | | | | | |
| Chromium (total) | | | | | | | | | | | | | | | | 5.02E-05 | | 5.02E-05 |
| Chrysene | | | | | | | | | | | | | | | | | | |
| Copper | | | | | | | | | | | | | | | | | | |
| Cyanide | | | | | | | | | | | | | | | | | | |
| Dibenz(a,h)anthracene | | | | | | | | | | | | | | | | | | |
| Dibenzofuran | | | | | | | | | | | | | | | | | | |
| Ethylbenzene | | | | | | | | | | | | | | | | | | |
| Fluoranthene | | | | | | | | | | | | | | | | | | |
| Fluorene | | | | | | | | | | | | | | | | | | |
| Indeno(1,2,3-cd)pyrene | | | | | | | | | | | | | | | | | | |
| Iron | | | | | | | | | | | | | | | | | | |
| Isopropylbenzene | | | | | | | | | | | | | | | | | | |
| Lead | | | | | | | | | | | | | | | | | | |
| Manganese | | | | | | | | | | | | | | | | | | |
| Mercury | | | | | | | | | | | | | | | | | | |
| Naphthalene | | | | | | | | | | | | | | | | | | |
| o-Cresol (2-Methylphenol) | | | | | | | | | | | | | | | | | | |
| p-Cresol (4-Methylphenol) | | | | | | | | | | | | | | | | | | |
| Phenanthrene | | | | | | | | | | | | | | | | | | |
| Phenol | | | | | | | | | | | | | | | | | | |
| Pyrene | | | | | | | | | | | | | | | | | | |
| Selenium | | | | | | | | | | | | | | | | | | |
| Styrene | | | | | | | | | | | | | | | | | | |
| Thallium | | | | | | | | | | | | | | | | | | |
| Toluene | | | | | | | | | | | | | | | | | | |
| Total PCBs | 6.67E-03 | 1.71E-05 | 6.68E-03 | 6.67E-03 | 1.71E-05 | 6.68E-03 | | | | 6.67E-03 | 1.71E-05 | 6.68E-03 | | | | | | |
| Total Xylenes | | | | | | | | | | | | | | | | | | |
| Trichloroethene | | | | | | | | | | | 1.04E-04 | 1.04E-04 | | | | | | |
| Vanadium | | | | 7.37E-03 | | 7.37E-03 | | | | | | | | | | | | |
| Zinc | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| Total | 6.67E-03 | 1.71E-05 | 6.68E-03 | 1.40E-02 | 1.71E-05 | 1.41E-02 | 2.54E-02 | | 2.54E-02 | 6.67E-03 | 1.21E-04 | 6.78E-03 | | 1.93E-03 | 1.93E-03 | 5.02E-05 | | 5.02E-05 |

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