

Appendix 4J

Soil gas acceptance criteria for the protection of indoor air quality

1.1 Overview

Modelling of the migration of volatiles from contaminated soil or groundwater based on contaminant concentrations in soil and/or groundwater and soil properties, incorporates a significant level of uncertainty. While most volatilisation models can account for diffusive and/or advective transport together with source depletion and possibly adsorption/desorption processes, a range of other processes, most notably biodegradation, may mitigate the transport of contaminants.

Direct measurement of indoor air concentrations would circumvent these uncertainties however such measurements are subject to confounding from other sources. Measurement of contaminant concentrations at a depth of, say, 1 metre, allows the estimate of volatilisation to be refined by accounting for some of the processes occurring between the source and point of measurement, particularly biodegradation. This approach is most useful where the source of vapours is located at depth of, say, > 4 metres.

This approach also has the following advantages:

- Only the top 1 metre of soil needs to be homogeneous (although adjustments in calculations can account for multiple soil types).
- There is no need to model phase partitioning.
- One set of criteria can be used for both soil and groundwater contamination source (provided that the source is below 1 metre).
- Model is not limited by the presence of separate phase hydrocarbons.

A limitation of this approach is that it is unable to account for source depletion or the time dependency of the volatilisation, as information regarding the source is not considered in the calculations. Notwithstanding this, the measurement of contaminant concentrations in soil gas at a depth of 1 metre allows estimates of the risk associated with the volatilisation of contaminants to be refined.

Note that this approach is subject to being able to obtain reliable measurements of the contaminant concentrations in soil gas (e.g. minimising infiltration and short circuiting during soil gas sampling).

1.2 Volatilisation model

The Johnson-Ettinger (1991) equation for emissions from soil through a concrete slab into a building has been rearranged and presented in terms of a Volatilisation Factor (refer equation J1). This equation is notable in that it relates soil gas concentrations to indoor air concentrations. The original Johnson and Ettinger model has to be combined with an equilibrium partitioning relationship if indoor air concentrations are to be determined from measured soil concentrations. The Volatilisation Factor relating indoor air concentrations to soil gas concentrations is as follows:

$$VF_{soil-air} \left| \frac{mg / m^3_{air}}{mg / m^3_{soil-gas}} \right| = \frac{\left[\frac{D_s^{eff} / L_s}{ER \cdot L_B} \right]}{1 + \left[\frac{D_s^{eff} / L_s}{ER \cdot L_B} \right] + \left[\frac{D_s^{eff} / L_s}{(D_{crack}^{eff} / L_{crack}) \eta} \right]} \times 10^3 \frac{cm^3 kg}{m^3 g} \quad (J1)$$

where:

- VF = Volatilisation Factor (Attenuation Factor) for soil air to indoor air
- D_s^{eff} = Effective diffusivity (cm²/s)
- L_s = Depth to soil measurement (100 cm)
- ER = Air Exchange Rate (s⁻¹)
- L_B = Ratio of Air Volume to Infiltration Area (cm)
- D_{crack} = Effective Diffusivity in Cracks in Foundation (cm²/s)
- L_{crack} = Thickness of Foundation (cm)
- h = Areal fraction of cracks in foundation

Diffusion coefficients and other parameters are defined in Appendix 4D. Note that the equation J1 represents a simple diffusion controlled, non-depleting source form of the Johnson and Ettinger model.

1.3 Volatilisation factors

The estimated Volatilisation Factors (or Attenuation Factors) for soil-air to indoor air are presented in Table 4J2 and Table 4J4 for residential and commercial respectively. Table J1 present the maximum allowable indoor air concentrations. (See Appendix 4H).

To calculate the maximum allowable contaminant concentrations in soil-air gas at 1 m depth, the following relationship is used:

$$C_{soil-air} = \frac{C_{air}}{VF_{sa}} \quad (J2)$$

where:

- C_{soil-air} = Maximum Soil-Air Concentration at 1 m (mg/m³)
- C_{air} = Maximum allowable indoor air concentration (mg/m³)
- VF_{sa} = Volatilisation Factor (or Attenuation Factor) for soil-air to indoor air (calculated in eq. J1)

Table 4J3 and 4J5 present the maximum allowable contaminant concentrations in soil-air gas at a depth of 1 metre, for residential and commercial land use respectively.

TABLE 4J1 Health-Based Target Indoor Air Concentrations

Contaminant	Indoor Air Concentration ($\mu\text{g}/\text{m}^3$)
RESIDENTIAL / AGRICULTURAL LAND USE	
TPHs	
C ₇ -C ₉	24,000
C ₁₀ -C ₁₄	1,500
C ₁₅ -C ₃₆	7,300
MAHs	
Benzene	3.9
Toluene	540
Ethylbenzene	140
Xylene	440
PAHs	
Naphthalene	19
Non-carc. (Pyrene)	150
Benzo(a)pyrene	0.016
COMMERCIAL / INDUSTRIAL LAND USE	
TPHs	
C ₇ -C ₉	53,000
C ₁₀ -C ₁₄	3,200
C ₁₅ -C ₃₆	16,000
MAHs	
Benzene	13
Toluene	1,200
Ethylbenzene	310
Xylene	960
PAHs	
Naphthalene	43
Non-carc. (Pyrene)	320
Benzo(a)pyrene	0.051

Table 4J2 Attenuation Factor for Soil-Air at 1 metre to Indoor Air Concentration Residential

Chemical	Soil at 1 m					
	Sand	Silty Sand	Silty Clay	Clay	Pumice	Peats
C ₇ -C ₉	1.99E-02	1.69E-02	1.68E-03	4.89E-05	1.67E-02	1.88E-02
C ₁₀ -C ₁₄	1.39E-02	1.18E-02	1.18E-03	3.39E-05	1.17E-02	1.32E-02
C ₁₅ -C ₃₆	1.09E-02	9.28E-03	9.26E-04	2.67E-05	9.19E-03	1.04E-02
Benzene	3.09E-02	2.62E-02	3.56E-03	1.55E-03	2.59E-02	2.92E-02
Toluene	2.82E-02	2.39E-02	3.07E-03	1.14E-03	2.37E-02	2.67E-02
Ethylbenzene	2.52E-02	2.14E-02	2.64E-03	8.55E-04	2.12E-02	2.38E-02
Xylene	2.39E-02	2.03E-02	2.58E-03	9.29E-04	2.01E-02	2.26E-02
Naphthalene	2.39E-02	2.03E-02	5.25E-03	4.84E-03	2.01E-02	2.26E-02
Pyrene	1.68E-02	1.65E-02	1.72E-02	1.73E-02	1.68E-02	1.65E-02
Penzo(a)pyrene	2.39E-02	2.47E-02	2.50E-02	2.50E-02	2.49E-02	2.45E-02

Table 4J3 Target Soil-Air Concentration at 1 metre - Residential

Chemical	Soil-Air Target Concentrations at 1 m (mg/m ³)					
	Sand	Silty Sand	Silty Clay	Clay	Pumice	Peats
C ₇ -C ₉	1.21E+03	1.42E+03	1.43E+04	4.91E+05	1.44E+03	1.27E+03
C ₁₀ -C ₁₄	1.08E+02	1.27E+02	1.27E+03	4.43E+04	1.28E+02	1.14E+02
C ₁₅ -C ₃₆	6.67E+02	7.86E+02	7.89E+03	2.73E+05	7.94E+02	7.05E+02
benzene	1.26E-01	1.49E-01	1.10E+00	2.52E+00	1.50E-01	1.34E-01
toluene	1.91E+01	2.26E+01	1.76E+02	4.73E+02	2.28E+01	2.02E+01
Ethylbenzene	5.55E+00	6.55E+00	5.30E+01	1.64E+02	6.61E+00	5.87E+00
Xylene	1.84E+01	2.17E+01	1.71E+02	4.73E+02	2.19E+01	1.95E+01
Naphthalene	7.95E-01	9.36E-01	3.62E+00	3.92E+00	9.44E-01	8.41E-01
Pyrene	8.95E+00	9.11E+00	8.72E+00	8.67E+00	8.94E+00	9.11E+00
Penzo(a)pyrene	6.69E-04	6.46E-04	6.39E-04	6.39E-04	6.43E-04	6.52E-04

Table 4J4 Attenuation Factor for Soil-Air at 1 metre to Indoor Air Concentration - Commercial / Industrial

Chemical	Soil at 1 m					
	Sand	Silty Sand	Silty Clay	Clay	Pumice	Peats
C ₇ -C ₉	1.33E-02	1.13E-02	1.12E-03	3.26E-05	1.11E-02	1.26E-02
C ₁₀ -C ₁₄	9.29E-03	7.88E-03	7.85E-04	2.26E-05	7.80E-03	8.79E-03
C ₁₅ -C ₃₆	7.30E-03	6.19E-03	6.17E-04	1.78E-05	6.13E-03	6.90E-03
Benzene	2.06E-02	1.74E-02	2.37E-03	1.03E-03	1.73E-02	1.95E-02
Toluene	1.88E-02	1.59E-02	2.05E-03	7.61E-04	1.58E-02	1.78E-02
Ethylbenzene	1.68E-02	1.43E-02	1.76E-03	5.70E-04	1.41E-02	1.59E-02
Xylene	1.59E-02	1.35E-02	1.72E-03	6.20E-04	1.34E-02	1.51E-02
Naphthalene	1.59E-02	1.35E-02	3.50E-03	3.23E-03	1.34E-02	1.51E-02
Pyrene	1.12E-02	1.10E-02	1.15E-02	1.15E-02	1.12E-02	1.10E-02
Penzo(a)pyrene	1.59E-02	1.65E-02	1.67E-02	1.67E-02	1.66E-02	1.64E-02

Table 4J5 Target Soil-Air Concentration at 1 metre - Commercial / Industrial

Chemical	Soil-Air Target Concentrations at 1 m (mg/m ³)					
	Sand	Silty Sand	Silty Clay	Clay	Pumice	Peats
C ₇ -C ₉	3.99E+03	4.71E+03	4.72E+04	1.63E+06	4.76E+03	4.22E+03
C ₁₀ -C ₁₄	3.44E+02	4.06E+02	4.07E+03	1.42E+05	4.10E+02	3.64E+02
C ₁₅ -C ₃₆	2.19E+03	2.59E+03	2.59E+04	8.98E+05	2.61E+03	2.32E+03
Benzene	6.32E-01	7.45E-01	5.48E+00	1.26E+01	7.52E-01	6.68E-01
Toluene	6.38E+01	7.53E+01	5.86E+02	1.58E+03	7.60E+01	6.75E+01
Ethylbenzene	1.84E+01	2.17E+01	1.76E+02	5.44E+02	2.20E+01	1.95E+01
Xylene	6.03E+01	7.11E+01	5.58E+02	1.55E+03	7.18E+01	6.37E+01
Naphthalene	2.70E+00	3.18E+00	1.23E+01	1.33E+01	3.21E+00	2.85E+00
Pyrene	2.86E+01	2.92E+01	2.79E+01	2.78E+01	2.86E+01	2.92E+01
Benzo(a)pyrene	3.20E-03	3.09E-03	3.06E-03	3.05E-03	3.07E-03	3.12E-03

Table 46a Volatilisation (soil-air) of sub-surface soil contamination at 1 metre to enclosed spaces SAND Soil Type

Chemical	Dair cm ² /s	Dwat cm ² /s	H 20°C L-H ₂ O/L-air	Koc	Deff cm ² /s	ks cm ³ H ₂ O/g- soil	Defcrack cm ² /s
C ₇ -C ₉	0.06	7.10E-06	1.2E+02	10000	4.7E-03	30	4.68E-03
C ₁₀ -C ₁₄	0.042	4.80E-06	1.6E+02	1258925	3.3E-03	3776.775	3.28E-03
C ₁₅ -C ₃₆	0.033	3.80E-06	1.4E+02	501187233	2.6E-03	1503561.699	2.58E-03
Bbenzene	0.093	1.1E-05	2.2E-01	83	7.3E-03	0.249	7.26E-03
Ttoluene	0.085	9.40E-06	2.6E-01	302	6.6E-03	0.906	6.63E-03
Eethylbenzene	0.076	8.50E-06	3.2E-01	1096	5.9E-03	3.288	5.93E-03
Xxylene	0.072	8.50E-06	2.9E-01	240	5.6E-03	0.72	5.62E-03
Nnaphthalene	0.072	9.40E-06	4.9E-02	1288	5.6E-03	3.864	5.62E-03
Ppyrene	0.048	7.24E-06	2.2E-04	38019	3.9E-03	114.057	3.94E-03
Bbenzo(a)pyrene	0.05	5.80E-06	2.0E-05	389045	5.6E-03	1167.135	5.63E-03

	T1	T2	Residential VFsa - indoor	Commercial VFsa - indoor
C ₇ -C ₉	4.18E-04	20	1.99E-02	1.33E-02
C ₁₀ -C ₁₄	2.93E-04	20	1.39E-02	9.29E-03
C ₁₅ -C ₃₆	2.30E-04	20	1.09E-02	7.30E-03
benzene	6.48E-04	20	3.09E-02	2.06E-02
toluene	5.92E-04	20	2.82E-02	1.88E-02
ethylbenzene	5.30E-04	20	2.52E-02	1.68E-02
xylene	5.02E-04	20	2.39E-02	1.59E-02
naphthalene	5.02E-04	20	2.39E-02	1.59E-02
pyrene	3.52E-04	20	1.68E-02	1.12E-02
benzo(a)pyrene	5.02E-04	20	2.39E-02	1.59E-02

Table 4J6b Volatilisation (soil-air) of sub-surface soil contamination at 1metre to enclosed spaces SILT Soil Type

Chemical	Dair cm ² /s	Dwat cm ² /s	H 20°C L-H ₂ O/L-air	Koc	Deff cm ² /s	ks cm ³ H ₂ O/g- soil	Defcrack cm ² /s
C ₇ -C ₉	0.06	7.10E-06	1.2E+02	10000	9.8E-04	30	4.68E-03
C ₁₀ -C ₁₄	0.042	4.80E-06	1.6E+02	1258925	6.9E-04	3776.775	3.28E-03
C ₁₅ -C ₃₆	0.033	3.80E-06	1.4E+02	501187233	5.4E-04	1503561.699	2.58E-03
Benzene	0.093	1.1E-05	2.2E-01	83	1.5E-03	0.249	7.26E-03
Toluene	0.085	9.40E-06	2.6E-01	302	1.4E-03	0.906	6.63E-03
Ethylbenzene	0.076	8.50E-06	3.2E-01	1096	1.2E-03	3.288	5.93E-03
Xylene	0.072	8.50E-06	2.9E-01	240	1.2E-03	0.72	5.62E-03
Naphthalene	0.072	9.40E-06	4.9E-02	1288	1.2E-03	3.864	5.62E-03
Pyrene	0.048	7.24E-06	2.2E-04	38019	2.9E-03	114.057	3.94E-03
Benzo(a)pyrene	0.05	5.80E-06	2.0E-05	389045	1.9E-02	1167.135	5.63E-03

	T1	T2	Residential VFsa - indoor	Commercial VFsa - indoor
C ₇ -C ₉	8.76E-05	4	1.69E-02	1.13E-02
C ₁₀ -C ₁₄	6.13E-05	4	1.18E-02	7.88E-03
C ₁₅ -C ₃₆	4.82E-05	4	9.28E-03	6.19E-03
Benzene	1.36E-04	4	2.62E-02	1.74E-02
Toluene	1.24E-04	4	2.39E-02	1.59E-02
Ethylbenzene	1.11E-04	4	2.14E-02	1.43E-02
Xylene	1.05E-04	4	2.03E-02	1.35E-02
Naphthalene	1.06E-04	4	2.03E-02	1.35E-02
Pyrene	2.55E-04	15	1.65E-02	1.10E-02
Benzo(a)pyrene	1.71E-03	68	2.47E-02	1.65E-02

Table 4J6c Volatilisation (soil-air) of sub-surface soil contamination at 1 metre to enclosed spaces SILTY CLAY Soil Type

Chemical	Dair cm ² /s	Dwat cm ² /s	H @ 20°C L-H ₂ O/L-air	Koc	Deff cm ² /s	ks cm ³ H ₂ O/g- soil	Defcrack cm ² /s
C ₇ -C ₉	0.06	7.10E-06	1.2E+02	10000	2.1E-05	30	4.68E-03
C ₁₀ -C ₁₄	0.042	4.80E-06	1.6E+02	1258925	1.4E-05	3776.775	3.28E-03
C ₁₅ -C ₃₆	0.033	3.80E-06	1.4E+02	501187233	1.1E-05	1503561.699	2.58E-03
Benzene	0.093	1.1E-05	2.2E-01	83	4.5E-05	0.249	7.26E-03
Toluene	0.085	9.40E-06	2.6E-01	302	3.8E-05	0.906	6.63E-03
Ethylbenzene	0.076	8.50E-06	3.2E-01	1096	3.3E-05	3.288	5.93E-03
Xylene	0.072	8.50E-06	2.9E-01	240	3.2E-05	0.72	5.62E-03
Naphthalene	0.072	9.40E-06	4.9E-02	1288	7.4E-05	3.864	5.62E-03
Pyrene	0.048	7.24E-06	2.2E-04	38019	8.6E-03	114.057	3.94E-03
Benzo(a)pyrene	0.05	5.80E-06	2.0E-05	389045	7.5E-02	1167.135	5.63E-03

	T1	T2	Residential VFsa - indoor	Commercial VFsa - indoor
C ₇ -C ₉	1.83E-06	0	1.68E-03	1.12E-03
C ₁₀ -C ₁₄	1.28E-06	0	1.18E-03	7.85E-04
C ₁₅ -C ₃₆	1.01E-06	0	9.26E-04	6.17E-04
Benzene	4.00E-06	0	3.56E-03	2.37E-03
Toluene	3.43E-06	0	3.07E-03	2.05E-03
Ethylbenzene	2.93E-06	0	2.64E-03	1.76E-03
Xylene	2.87E-06	0	2.58E-03	1.72E-03
Naphthalene	6.65E-06	0	5.25E-03	3.50E-03
Pyrene	7.65E-04	43	1.72E-02	1.15E-02
Benzo(a)pyrene	6.73E-03	268	2.50E-02	1.67E-02

Table 4J6d Volatilisation (soil-air) of sub-surface soil contamination at 1 metre to enclosed spaces CLAY Soil Type

Chemical	Dair cm ² /s	Dwat cm ² /s	H @ 20°C L-H ₂ O/L-air	Koc	Deff cm ² /s	ks cm ³ H ₂ O/g- soil	Defcrack cm ² /s
C ₇ -C ₉	0.06	7.10E-06	1.2E+02	10000	5.5E-07	30	4.68E-03
C ₁₀ -C ₁₄	0.042	4.80E-06	1.6E+02	1258925	3.8E-07	3776.775	3.28E-03
C ₁₅ -C ₃₆	0.033	3.80E-06	1.4E+02	501187233	3.0E-07	1503561.699	2.58E-03
Benzene	0.093	1.1E-05	2.2E-01	83	1.8E-05	0.249	7.26E-03
Toluene	0.085	9.40E-06	2.6E-01	302	1.3E-05	0.906	6.63E-03
Ethylbenzene	0.076	8.50E-06	3.2E-01	1096	9.9E-06	3.288	5.93E-03
Xylene	0.072	8.50E-06	2.9E-01	240	1.1E-05	0.72	5.62E-03
Naphthalene	0.072	9.40E-06	4.9E-02	1288	6.7E-05	3.864	5.62E-03
Pyrene	0.048	7.24E-06	2.2E-04	38019	1.1E-02	114.057	3.94E-03
Benzo(a)pyrene	0.05	5.80E-06	2.0E-05	389045	1.0E-01	1167.135	5.63E-03

	T1	T2	Residential VFsa - indoor	Commercial VFsa - indoor
C ₇ -C ₉	4.90E-08	0	4.89E-05	3.26E-05
C ₁₀ -C ₁₄	3.39E-08	0	3.39E-05	2.26E-05
C ₁₅ -C ₃₆	2.68E-08	0	2.67E-05	1.78E-05
benzene	1.62E-06	0	1.55E-03	1.03E-03
toluene	1.19E-06	0	1.14E-03	7.61E-04
ethylbenzene	8.83E-07	0	8.55E-04	5.70E-04
xylene	9.65E-07	0	9.29E-04	6.20E-04
naphthalene	6.00E-06	0	4.84E-03	3.23E-03
pyrene	1.02E-03	58	1.73E-02	1.15E-02
benzo(a)pyrene	8.99E-03	358	2.50E-02	1.67E-02

Table 4J6e Volatilisation (soil-air) of sub-surface soil contamination at 1 metre to enclosed spaces PUMICE Soil Type

Chemical	Dair cm ² /s	Dwat cm ² /s	H @ 20°C L-H ₂ O/L-air	Koc	Deff cm ² /s	ks cm ³ H ₂ O/g- soil	Defcrack cm ² /s
C ₇ -C ₉	0.06	7.10E-06	1.2E+02	10000	9.3E-04	50	4.68E-03
C ₁₀ -C ₁₄	0.042	4.80E-06	1.6E+02	1258925	6.5E-04	6294.625	3.28E-03
C ₁₅ -C ₃₆	0.033	3.80E-06	1.4E+02	501187233	5.1E-04	2505936.165	2.58E-03
Benzene	0.093	1.1E-05	2.2E-01	83	1.5E-03	0.415	7.26E-03
Toluene	0.085	9.40E-06	2.6E-01	302	1.3E-03	1.51	6.63E-03
Ethylbenzene	0.076	8.50E-06	3.2E-01	1096	1.2E-03	5.48	5.93E-03
Xylene	0.072	8.50E-06	2.9E-01	240	1.1E-03	1.2	5.62E-03
Naphthalene	0.072	9.40E-06	4.9E-02	1288	1.1E-03	6.44	5.62E-03
Pyrene	0.048	7.24E-06	2.2E-04	38019	4.0E-03	190.095	3.94E-03
Benzo(a)pyrene	0.05	5.80E-06	2.0E-05	389045	3.0E-02	1945.225	5.63E-03

	T1	T2	Residential VFsa - indoor	Commercial VFsa - indoor
C ₇ -C ₉	8.33E-05	4	1.67E-02	1.11E-02
C ₁₀ -C ₁₄	5.83E-05	4	1.17E-02	7.80E-03
C ₁₅ -C ₃₆	4.58E-05	4	9.19E-03	6.13E-03
Benzene	1.30E-04	4	2.59E-02	1.73E-02
Toluene	1.18E-04	4	2.37E-02	1.58E-02
Ethylbenzene	1.06E-04	4	2.12E-02	1.41E-02
Xylene	1.00E-04	4	2.01E-02	1.34E-02
Naphthalene	1.02E-04	4	2.01E-02	1.34E-02
Pyrene	3.61E-04	21	1.68E-02	1.12E-02
Benzo(a)pyrene	2.66E-03	106	2.49E-02	1.66E-02

Table 4J6f Volatilisation (soil-air) of sub-surface soil contamination at 1 metre to enclosed spaces PEATS AND HIGHLY ORGANIC Soil Type

Chemical	Dair cm ² /s	Dwat cm ² /s	H @ 20°C L-H ₂ O/L-air	Koc	Deff cm ² /s	ks cm ³ H ₂ O/g- soil	Defcrack cm ² /s
C ₇ -C ₉	0.06	7.10E-06	1.2E+02	10000	2.1E-03	1200	4.68E-03
C ₁₀ -C ₁₄	0.042	4.80E-06	1.6E+02	1258925	1.5E-03	151071	3.28E-03
C ₁₅ -C ₃₆	0.033	3.80E-06	1.4E+02	501187233	1.2E-03	60142467.96	2.58E-03
Benzene	0.093	1.1E-05	2.2E-01	83	3.3E-03	9.96	7.26E-03
Toluene	0.085	9.40E-06	2.6E-01	302	3.0E-03	36.24	6.63E-03
Ethylbenzene	0.076	8.50E-06	3.2E-01	1096	2.7E-03	131.52	5.93E-03
Xylene	0.072	8.50E-06	2.9E-01	240	2.6E-03	28.8	5.62E-03
Naphthalene	0.072	9.40E-06	4.9E-02	1288	2.6E-03	154.56	5.62E-03
Pyrene	0.048	7.24E-06	2.2E-04	38019	2.9E-03	4562.28	3.94E-03
Benzo(a)pyrene	0.05	5.80E-06	2.0E-05	389045	1.2E-02	46685.4	5.63E-03

	T1	T2	Residential VFsa - indoor	Commercial VFsa - indoor
C ₇ -C ₉	1.90E-04	9	1.88E-02	1.26E-02
C ₁₀ -C ₁₄	1.33E-04	9	1.32E-02	8.79E-03
C ₁₅ -C ₃₆	1.04E-04	9	1.04E-02	6.90E-03
Benzene	2.94E-04	9	2.92E-02	1.95E-02
Toluene	2.69E-04	9	2.67E-02	1.78E-02
Ethylbenzene	2.40E-04	9	2.38E-02	1.59E-02
Xylene	2.28E-04	9	2.26E-02	1.51E-02
Naphthalene	2.28E-04	9	2.26E-02	1.51E-02
Pyrene	2.56E-04	15	1.65E-02	1.10E-02
Benzo(a)pyrene	1.07E-03	43	2.45E-02	1.64E-02