Appendix O. Individual Effect Analysis

As discussed in the effects assessment section of the chapter, OPP conducted an analysis of U.S.G.S. data used to support the Mayer and Ellerseick data set. The analysis included 48-hr acute toxicity data for freshwater aquatic invertebrates including *Simocephalus serrulatus*, *Daphnia pulex*, *Gammarus fasciatus* and *Pteronarcys californica* (**Table O1**). Across the four species, the 48-hr probit dose response slope ranged from 5.74 to 6.90; the mean slope and standard error of the mean were 6.34 and 0.21, respectively. Since a probit dose-response slope is not available for the most the most sensitive species, *i.e*., *Ceriodaphnia dubia*, the mean slope of 6.34 will be used in the analysis of potential individual effects discussed below.

Table O1. Acute 48-hr and 96-hr LC$_{50}$ values for freshwater aquatic invertebrates based on USGS data used in support of Mayer and Ellerseick.

Species	48-hr LC$_{50}$ (95% CI)	Slope	96-hr LC$_{50}$	Slope
Simocephalus serrulatus	1.34 (1.00 – 1.71)	6.9	no data	--
S. serrulatus	1.67 (1.31 – 2.16)	6.71	no data	--
Daphnia pulex	0.79 (0.58 – 1.02)	6.20	no data	--
Gammarus fasciatus	4.71 (3.69 – 6.11)	6.13	1.99 (1.48 – 2.63)	4.67
Pteronarcys califonica	59.4 (42.5 – 83.3)	5.74	20.5	22.7

Likelihood of individual acute effects to freshwater vertebrates based on maximum RQ value of 0.66 (2 aerial applications to lettuce) is 1 in 5 (**Figure O1**). At the acute risk to endangered species LOC of 0.05, the likelihood of individual effects 1 in 1.

Figure O1. Estimation of likelihood on individual mortality based on risk quotients for freshwater vertebrates (RQ=5.51). Estimated dose-response slope is 4.5.

Likelihood of individual acute mortality in freshwater invertebrates based on and RQ value of 2363 (**Figure O2**).

IEC V1.1 - Individual Effect Chance Model Version 1.1
Predictor of chance of individual effect using probit dose-response curve slope and median lethal estimate

Enter LC_{50} or LD_{50}	0.21
Enter desired threshold	2363
Enter slope of dose-response	6.34
z score result	21.38776	z is the standard normal deviate
Probability associated with z	1.00E+00	Uses Excel NORMDIST function to estimate P with lower reporting limit of 1.0 E-16
Chance of individual effect, ~1 in . .	1.00E+00	Calculated as 1/P

This is based on the formula $logLC_k = logLC_{50}+(z/b)$
where: z is the standard normal deviate and b equals slope
Works for dose-response models based on a probit assumption (i.e. log normal distribution of individual sensitivity)
Note: Excel cannot calculate probabilities for extremes in z scores beyond -8.2
   Probability is defaulted to 10^{-16}, which is the limit of Excel reporting.

Reset Model

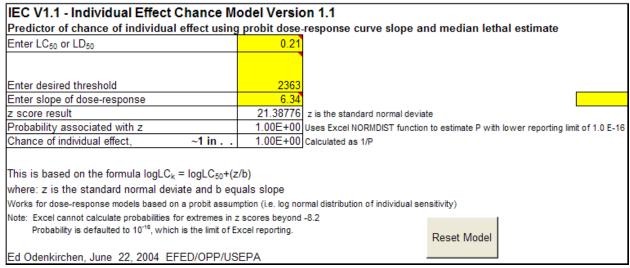Ed Odenkirchen, June 22, 2004 EFED/OPP/USEPA

Figure O2. Estimation of likelihood of individual mortality based on risk quotients for freshwater invertebrates (RQ=2363). Estimated dose-response slope is 6.34.

Likelihood of individual acute mortality in estuarine/marine invertebrates based on and RQ value of 2.99 (**Figure O3**).

IEC V1.1 - Individual Effect Chance Model Version 1.1
Predictor of chance of individual effect using probit dose-response curve slope and median lethal estimate

Enter LC_{50} or LD_{50}	0.21
Enter desired threshold	2.99
Enter slope of dose-response	6.01
z score result	2.85878384	z is the standard normal deviate
Probability associated with z	9.98E-01	Uses Excel NORMDIST function to estimate P with lower reporting limit of 1.0 E-16
Chance of individual effect, ~1 in . .	1.00E+00	Calculated as 1/P

This is based on the formula $logLC_k = logLC_{50}+(z/b)$
where: z is the standard normal deviate and b equals slope
Works for dose-response models based on a probit assumption (i.e. log normal distribution of individual sensitivity)
Note: Excel cannot calculate probabilities for extremes in z scores beyond -8.2
   Probability is defaulted to 10^{-16}, which is the limit of Excel reporting.

Reset Model

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Figure O3. Estimation of likelihood of individual mortality based on risk quotients for esturarine/marine invertebrates (RQ=2.99). Estimated dose-response slope is 6.01.