Fact Sheet Date: June 1998

NEW YORK STATE
- AQUATIC FACT SHEET -

Ambient Water Quality Value
For Protection of Aquatic Life

SUBSTANCE: Phenanthrene **CAS REGISTRY NUMBER:** 85-01-8

TYPE:	BASIS:	Ambient Water Quality Value, ug/L FRESHWATER	SALTWATER
Chronic	Propagation	5.0	1.5
Acute	Survival	45	14

INTRODUCTION

These values apply to the water column and are derived to protect aquatic life from the effects of waterborne contaminants. Values for the protection of propagation of aquatic life are referred to as Aquatic (Chronic) or A(C) values. Values for the protection of survival of aquatic life are referred to as Aquatic (Acute) or A(A) values.

SUMMARY OF INFORMATION AND DERIVATION OF VALUE

The U.S. EPA AQUIRE (**AQU**uatic toxicity **I**nformation **Re**treival System)(U.S. EPA, 1993) was searched for toxicity data on phenanthrene with EC_{50} or LC_{50} toxicity endpoints. The initial search identified 36 toxicity test records. Species Mean Acute Values (SMAVs) were determined from the acceptable phenanthrene toxicity studies obtained from the AQUIRE database. If both flow-through and static test toxicity data were available for the same species, only flow-through data was used. Static toxicity test data was used only if flow-through data was not available. From that original group, only data with a documentation code of C (Complete methods and results documentation), and 96 hour LC_{50} or 48 hour EC_{50} endpoints were selected. This second screening resulted in a final acute toxicity database for phenanthrene of two studies with two freshwater species and one study with one marine species. Ambient water quality values were then calculated in accordance with 6NYCRR Part 706.1.

DERIVATION OF ACUTE VALUES

As shown in Table 1, data are available for two of the eight families necessary to derive a Tier 1 freshwater value. Consequently, the data from the two families are used to derive a Tier 2 freshwater value. Similarly, Table 2 shows that data are available for one of the eight families necessary to derive a Tier 1 saltwater value, so those data are used to derive a Tier 2 saltwater value.

Table 1. Freshwater toxicity data used to derive the phenanthrene acute value. When only an SMAV is listed, the SMAV was the LC_{50} of the test species indicated. NDA means no data was available.

Data Requirement	Species	SMAV, ug/L	References
Family Salmonidae	Rainbow trout	3200	138
A second Family in the Class Osteichthyes	NDA		
A third family from the phylum Chordata	NDA		
A planktonic crustacean	Daphnia magna	1158.3	11936
A benthic crustacean	NDA		
An insect	NDA		
A family in a phylum other than Arthropoda or Chordata	NDA		
A family in any order of insect or any other phylum not already represented	NDA		

The lowest SMAV was divided by the SAF to determine the secondary acute value (SAV). Because two data requirements were met, a secondary acute factor (SAF) of 13.0 is required. The Tier II guidance value was determined by dividing the SAV by two and rounding to two significant digits.

SAV = 1158.3 / 13.0 = 89.10 ug/L
Freshwater Tier II A(A) value = 89.10 ug/L / 2 = 44.55 ≈ 45 ug/L

Table 2. Saltwater toxicity data used to derive the phenanthrene acute value. When only an SMAV is listed, the SMAV was the LC_{50} of the test species indicated. NDA means no data was available.

Data Requirement	Species	SMAV, ug/L	References
A family from the phylum Chordata	NDA		
A second family from the Phylum Chordata	NDA		
A family in a phylum other than Arthropoda or Chordata	Neanthes arenaceodentata	600	5053
Either the Mysidae or Penaeidae family	NDA		
Three other families not in the family Chordata; may include Mysidae or Penaeidae, which ever was not used above	NDA		
	NDA		
	NDA		
Any other family	NDA		

Because one data requirement was met, a secondary acute factor (SAF) of 21.9 is required.

SAV = 600 ug/L / 21.9 = 27.3973 ≈ 27 ug/L
Saltwater Tier II A(A) value = 27.3973 ug/L / 2 = 13.6986 ≈ 14 ug/L

DERIVATION OF CHRONIC VALUES

The secondary chronic value (SCV) is determined by dividing the SAV by the secondary acute to chronic ratio (SACR). The Tier II A(C) value is equal to the SCV. A species acute to chronic ratio (ACR) is an acute LC_{50} divided by a chronic value for the same species. The chronic value is the geometric mean of the NOEC (No Observed Effects Concentration) and LOEC (Lowest Observed Effects Concentration) values. A minimum of three species ACRs are required to derive a SACR. If three species ACRs are not available, 6NYCRR Part 706.1 requires that a species ACR value of 18 should be substituted for each missing species ACR. The SACR is equal to the cube root of the product of the three species ACRs. Both saltwater and freshwater species data are used to derive a common SACR. No studies could be found in the AQUIRE database that provided adequate acute and chronic data to determine an acute to

chronic ratio as required by 6NYCRR Part 706.1 so the SCV was determined by dividing the SAV by a SACR of 18.

The freshwater SAV = 89.10 ug/L / 18 = 4.95 ug/L
Freshwater Tier II A(C) value = 4.95 ug/L ≈ 5.0 ug/L

The saltwater SCV = 27.3973 ug/L / 18 = 1.5221 ug/L
Saltwater Tier II A(C) value = 1.5221ug/L ≈ 2 ug/L

REFERENCES

U.S. EPA 1993. AQUIRE, AQUatic toxicity Information Retrieval Database, Technical Support Document. U.S. EPA Environmental Research Laboratory, Office of Research and Development, Duluth, Minnesota, September, 1993.

AQUIRE DATA CITATIONS

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Rossi,S.S. and J.M.Neff, 1978. Toxicity of Polynuclear Aromatic Hydrocarbons to the Polychaete Neanthes arenaceodentata. Mar. Pollut. Bull. 9(8):220-223 (903 Used As Reference)

REFERENCE NUMBER: 11936
Bobra,A.M., W.Y.Shiu, and D.MacKay, 1983. A Predictive Correlation for the Acute Toxicity of Hydrocarbons and Chlorinated Hydrocarbons to the Water Flea (Daphnia magna). Chemosphere 12(9-10):1121-1129

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