Fact Sheet Date: March 12, 1998

NEW YORK STATE
- AQUATIC FACT SHEET -

Ambient Water Quality Values for Protection of Aquatic Life

SUBSTANCE: Arsenic, dissolved **CAS REGISTRY NUMBER:** Not Applicable

TYPE:	BASIS:	FRESHWATER AMBIENT WATER QUALITY VALUE (ug/L):
Chronic	Propagation	150
Acute	Survival	340

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

U.S. EPA (1995a,b) has derived acute and chronic aquatic life criteria for dissolved arsenic for the Great Lakes Water Quality Initiative (GLI). The Department has reviewed these criteria and determined that they are based on appropriate data and derived according to the scientific procedures in current and proposed 6 NYCRR Part 702. They are thus determined to be appropriate ambient water quality values for protection of aquatic life for New York State.

The attachment to this fact sheet provides U.S. EPA's derivation of the values. U.S. EPA's Criterion Continuous Concentration (CCC) and Criterion Maximum Concentration (CMC) are equivalent to New York's Aquatic (Chronic) and Aquatic (Acute) values respectively.

U.S. EPA's criteria are expressed as arsenic, III, dissolved. There is, however, no readily available or practical analytical method to quantify the arsenic III. In addition there is no practical way to evaluate the transformations of various species of dissolved arsenic in ambient waters. Because the measurement of arsenic in ambient waters and the

specification of effluent limitations will include other species, it is reasonable to specify the ambient standard to include all species of dissolved arsenic. The potential over conservativeness of this approach should be minimal because the toxicity of arsenic V, the other prevalent species, is similar to arsenic III for both freshwater and saltwater species (U.S. EPA, 1985).

REFERENCES

U.S. EPA (Environmental Protection Agency). 1985. Ambient Water Quality Criteria for Arsenic - 1984. EPA 440/5-84-033. January 1985.

U.S. EPA (Environmental Protection Agency). 1995a. Final Water Quality Guidance for the Great Lakes System. 60 Federal Register: 15366 - 15425. March 23, 1995.

U.S. EPA (Environmental Protection Agency) 1995b. Great Lakes Water Quality Initiative Criteria Documents for the Protection of Aquatic Life in Ambient Water. EPA-820-B-95-004. March 1995.

New York State Department of Environmental Conservation
Division of Water
SJS
January 27, 1997

ATTACHMENT

GREAT LAKES WATER QUALITY INITIATIVE

Tier 1 Aquatic Life Criterion for Arsenic(III)

The new acceptable acute and chronic data for arsenic(III) are given in Tables A1 and A2. These new data were used with those given in Tables 1 and 2 of the criteria document for arsenic (U.S. EPA 1985) to obtain the values given in Table A3.

Criterion Maximum Concentration (CMC)

The Final Acute Value (FAV) was calculated using the four lowest Genus Mean Acute Values given in Table A3, resulting in a FAV of 679.6 ug/L. This value did not need to be lowered to protect a commercially or recreationally important species of the Great Lakes System. The CMC was calculated by dividing the FAV by 2, resulting in a CMC of 339.8 ug/L, as total recoverable arsenic(III).

Criterion Continuous Concentration (CCC)

Insufficient chronic toxicity data were available to calculate a Final Chronic Value (FCV) using the eight-family procedure. Sufficient chronic data were available to calculate a FCV by dividing the FAV by the Final Acute-Chronic Ratio (FACR). The new chronic test gave an ACR of 3.784; the geometric mean of this value and the ACR in U.S. EPA (1985) for the same species was 4.199. This and the two other Species Mean ACRs in U.S. EPA (1985) are given in Table A3; the three ACRs were within a factor of 1.2. The FACR was calculated as the geometric mean of the three ACRs and was 4.594. The FCV = FAV/FACR = (679.6 ug/L)/(4.594) = 147.9 ug/L. This value did not need to be lowered to protect a commercially or recreationally important species of the Great Lakes System. The CCC was 147.9 ug/L, as total recoverable arsenic(III).

The Criterion

The procedures described in the GLI Tier 1 methodology indicate that, except possibly where a locally important species is very sensitive, aquatic organisms should not be affected unacceptably if the four-day average concentration of arsenic(III) does not exceed 147.9 ug/L more than once every three years on the average and if the one-hour average concentration does not exceed 339.8 ug/L more than once every three years on the average.

Table A1. New Acute Values for Arsenic(III)

Species	Method*	Chemical	Test Duration (hrs)	Acute Value (ug/L)	Reference
Fathead minnow, Pimephales promelas	FT,M	Sodium arsenite	96	12,600	Spehar and Fiandt 1986
Cladoceran, Daphnia magna	S,U	Sodium arsenite	48	4,501	Elnabarawy et al. 1986
Cladoceran, Daphnia pulex	S,U	Sodium arsenite	48	2,366	Elnabarawy et al. 1986
Cladoceran, Ceriodaphnia reticulata	S,U	Sodium arsenite	48	1,269	Elnabarawy et al. 1986

* FT = flow-through, M = measured, S = static, U = unmeasured.

Table A2. New Chronic Values for Arsenic(III)

Species	Method*	Acute Value (ug/L)	Chronic Value (ug/L)	Acute-Chronic Ratio	Reference
Fathead minnow, Pimephales promelas	ELS	12,600	3,330	3.784	Spehar and Fiandt 1986

* ELS = early life stage.

Table A3. Ranked Genus Mean Acute Values for Arsenic(III)

Rank*	Genus Mean Acute Value (ug/L)	Species	Species Mean Acute Value (ug/L)	Species Mean Acute-Chronic Ratio
14	97,000	Midge, Tanytarsus dissimilis	97,000	-----
13	41,760	Bluegill, Lepomis macrochirus	41,760	-----
12	26,040	Goldfish, Carassius auratus	26,040	-----
11	24,500	Snail, Aplexa hypnorum	24,500	-----
10	22,040	Stonefly, Pteronarcys californica	22,040	-----
9	20,130	Flagfish, Jordanella floridae	20,130	4.862
8	18,100	Channel catfish Ictalurus punctatus	18,100	-----
7	14,960	Brook trout, Salvelinus fontinalis	14,960	-----
6	14,065	Fathead minnow, Pimephales promelas	14,065	4.199
5	13,340	Rainbow trout, Oncorhynchus mykiss	13,340	-----
4	2,690	Cladoceran, Daphnia magna	4,449	4.748
		Cladoceran, Daphnia pulex	1,626	-----
3	1,511	Cladoceran, Ceriodaphnia reticulata	1,511	-----
2	1,175	Cladoceran, Simocephalus serrulatus	812	-----
		Cladoceran, Simocephalus vetulus	1,700	-----
1	874	Amphipod, Gammarus pseudolimnaeus	874	-----

* Ranked from most resistant to most sensitive based on Genus Mean Acute Value.

FAV = 679.6 ug/L

CMC = FAV/2 = 339.8 ug/L

FACR = 4.594

FCV = FAV/FACR = (679.6 ug/L)/(4.594) = 147.9 ug/L = CCC

References

Elnabarawy, M.T., A.N. Welter, and R.R. Robideau. 1986. Relative Sensitivity of Three Daphnid Species to Selected Organic and Inorganic Chemicals. Environ. Toxicol. Chem. 5:393-398.

Spehar, R.L., and J.T. Fiandt. 1986. Acute and Chronic Effects of Water Quality Criteria-based Metal Mixtures on Three Aquatic Species. Environ. Toxicol. Chem. 5:917-931.

U.S. EPA. 1985. Ambient Water Quality Criteria for Arsenic - 1984. EPA 440/5-84-033. National Technical Information Service, Springfield, VA.