APPENDIX B

Hilsenhoff's Family Level Pollution Tolerance Values for Aquatic Arthropods[1]

Order	Family	Tolerance Value
Plecoptera	Capniidae	1
	Chloroperlidae	1
	Leuctridae	0
	Nemouridae	2
	Perlidae	1
	Perlodidae	2
	Pteronarcyidae	0
	Taeniopterygidae	2
Ephemeroptera	Baetidae	4
	Baetiscidae	3
	Caenidae	7
	Ephemerellidae	1
	Ephemeridae	4
	Heptageniidae	4
	Leptophlebiidae	2
	Metretopodidae	2
	Oligoneuriidae	2
	Polymitarcyidae	2
	Potomanthidae	4
	Siphlonuridae	7
	Tricorythidae	4
Odonata	Aeshnidae	3
	Calopterygidae	5
	Coenagrionidae	9
	Cordulegastridae	3
	Corduliidae	5
	Gomphidae	1
	Lestidae	9
	Libellulidae	9
	Macromiidae	3
Trichoptera	Brachycentridae	1
	Glossosomatidae	0
	Helicopsychidae	3
	Hydropsychidae	4
	Hydroptilidae	4
	Lepidostomatidae	1
	Leptoceridae	4

[1]From Hilsenhoff, 1988. Rapid field assessment of organic pollution with a family-level biotic index. J.N. Am. Benthol. Soc. 7(1):65-68.

Order	Family	Tolerance Value
Trichoptera (cont.)	Limnephilidae	4
	Molannidae	6
	Odontoceridae	0
	Philopotamidae	3
	Phryganeidae	4
	Polycentropodidae	6
	Psychomyiidae	2
	Rhyacophilidae	0
	Sericostomatidae	3
Megaloptera	Corydalidae	0
	Sialidae	4
Lepidoptera	Pyralidae	5
Coleoptera	Dryopidae	5
	Elmidae	4
	Psephenidae	4
Diptera	Athericidae	2
	Blephariceridae	0
	Ceratopogonidae	6
	Blood-red Chironomidae (Chironomini)	8
	Other (including pink) Chironomidae	6
	Dolochopodidae	4
	Empididae	6
	Ephydridae	6
	Psychodidae	10
	Simuliidae	6
	Muscidae	6
	Syrphidae	10
	Tabanidae	6
	Tipulidae	3
Amphipoda	Gammaridae	4
	Talitridae	8
Isopoda	Asellidae	8

APPENDIX C

EXAMPLES OF MACROINVERTEBRATE BENCH SHEETS

MACROINVERTEBRATE DATA SHEET

Type of Sampler_____ Sample No._____
Collection Depth_____ Date_____
Substrate Type_____ Location_____
Remarks_____

Station #_____
Identification by_____ Collector_____
Enter Family and/or Genus and Species Name on Blank Line.

Organisms	No.	A.	I.
Diptera			
Chironomidae			
Other			
Trichoptera			
Plecoptera			
Ephemeroptera			
Odonata			
Hemiptera			

	No.	A.	I.
Coleoptera			
Neuroptera and Megaloptera			
Crustacea			
Oligochaeta			
Hirudinea			
Bivalvia			
Gastropoda			
Bryozoa			
Coelenterata			
Other			

A = Adult, I = Immature
Total No. Organisms_____ Total No. Taxa_____

MARINE MACROINVERTEBRATES

Name of water body_____ Sample No._____
Collected by_____ Station No._____
Sorted by_____ Date collected_____
Identified by_____

Group*	Number of Orders	Number of Families	Number of Genera	Number of Species	Total Individuals
Porifera					
Hydrozoa					
Scyphozoa					
Anthozoa					
Ctenophora					
Turbellaria					
Rhynchocoela					
Echiura					
Priapulida					
Sipuncula					
Pogonophera					
Polychaeta					
Oligochaeta					
Hirudinea					
Monoplacophora					
Polyplacophora					
Aplacophora					
Bivalvia					
Gastropoda					
Scaphopoda					
Cephalopoda					
Merostomata					
Pycnogonida					
Ostracoda					
Cirripedia					
Leptostraca					
Stomatopoda					
Cumacea					
Tanaidacea					
Isopoda					
Amphipoda					
Decapoda					
Phoronida					
Bryozoa					
Entoprocta					
Brachiopoda					
Cinoidea					
Stelleroidea					
Echinoidea					
Holothuroidea					
Enteropneusta					
Pterobranchia					
Chaetognatha					
Urochordata					
Cephalochorsata					

*Use separate sheet for taxa names when identified beyond group.

APPENDIX D

EXAMPLE OF MACROINVERTEBRATE SUMMARY SHEET

MACROINVERTEBRATE LABORATORY - Summary of Data

Water Body_____ Sampler_____

Bottom Type_____

Location_____ Depth to Sampler_____

Organisms:									
Diptera									
Chironomidae									
Other									
Trichoptera									
Plecoptera									
Ephemeroptera									
Odonata									
Anisoptera									
Zygoptera									
Neuroptera									
Hemiptera									
Coleoptera									
Lepidoptera									
Crustacea									
Amphipoda									
Isopoda									
Annelida									
Oligochaeta									
Hirudinea									
Turbellaria									
Mollusca									
Pelecypoda									
Gastropoda									
Bryozoa									
Coelenterata									
T. Individuals									
T. Species									

X = organisms present, not counted F - fragmented E - exuvia

Species Present:

SUMMARY OF MACROINVERTEBRATE DATA

STATION (LOCATION):

ORGANISM: Date										
Total Individuals										
Total Taxa										

APPENDIX E

LIST OF EQUIPMENT AND SUPPLIES

Listed below are equipment and supplies needed for the collection and analysis of macroinvertebrate samples. The data quality objectives and sampling and analysis methods should determine the type of equipment and supplies needed. The source numbers refer to the companies that are listed at the end of the table. Mention of these sources or products does not constitute endorsement by the U.S. Environmental Protection Agency.

Item	Unit	Source
Boat, flat bottom, 14-16 ft snatch-block meter wheel and trailer, 18 hp outboard motor. life jackets, other accessories	1	(7,15)
Boat crane kit and winch	1	(3,15)
Boat, inflatable with oar set	1	(1,15)
Cable fastening tools		(4,15)
Cable clamps, 1/8 "	25	
Nicro-press clamps, 1/8 "	100	
Nicro-press tool, 1/8 "	1	
Wire cutter, Felco	1	
Wire thimbles, 1/8 "	25	
Cable, 1/8 ", galvanized steel	1000 ft	(3,15)
Large capacity metal wash tub	1	
Sample wash bucket (sieve)	1	(8,14)
Core sampler, hand held	1	(3,8,14)
Box corer	1	(14)
K-B corer	1	(8)
Wide-barrel gravity corer	1	(14)
Phleger corer	1	(8,14)
Ballchek single or multiple corer	1	(8,14)
Ewing portable piston corer	1	(14)
Hardboard multiplate sampler	10	(3,8)
Ceramic multiplate sampler	10	(14)
Trawl net	1	(8)
Dredge	1	(3,8,14)
Rectangular box sediment sampler	1	(14)
Drift net, stream	6	(8,14)
Triple-net drift sampler	2	(14)
Stream bottom sampler, Surber type	2	(3,8,14)
Portable invertebrate box sampler	2	(13)
Stream-bed fauna sampler, Hess type	2	(14)
Hess stream bottom sampler	2	(8)
Grab sampler, Ponar	1	(3,8,14)

Wildco box corer	1	(8)
Grab sampler, Ekman	1	(3,8,14)
Grab sampler, Petersen	1	(3,8,14)
Grab sampler, Smith-McIntyre	1	(14)
Grab sampler, Van Veen	1	(14)
Grab sampler, Orange Peel	1	(14)
Grab sediment sampler, Shipek	1	(8)
Basket, bar B-Q, tumbler (#740-0035)	12	(9,11)
Sieves, US standard No. 30	2	(5)
Flow meter, mechanical	1	(3)
Mounting media, CMCP-9/9AF with stain	4 oz	No longer available
Mounting medium, CMCP-9	4 oz	(6)
Mounting medium, CMCP-10	4 oz	(6)
Fuchsin basic, C.I. dye	25 g	(6)
Mounting medium, Aquamount	4 oz	(12)
Refrigerated circulator	1	(5)
Water pump, epoxy-coated	2	(1)
Holding tank, constant temp	1	(10)
Balance, top-loading	1	(5)
Counter, 12-unit, 2X6	1	(3)
Counter, hand tally	2	(3)
Waders, with suspenders	1 pr	(1,15)
Boots, hip	1 pr	(1,15)
Raincoat	1	(3,15)
Magni-focuser, 2X	1	(5)
Microscope, field	1	(3)
Magnifier, illuminated + base	1	(3)
Magnifier, pocket, 5X, 10X, and 15X	1	(3)
Microscope, compound, with phase and bright-field, trinocular, 10X and 15X eyepieces, 4X, 10X, 20X, 45X and 100X objectives	1	(5)
Microscope, stereoscopic, with stand	1	(2)
Microscope slide dispenser	1	(1)
Microscope slides and cover slips, 12 and 15 mm circles	10 gross	(1)
Photographic system, photostar	1	(5)
Camera, photomicrographic, with 50 mm lens	1	(1,15)
Stirrer, magnetic	1	(5)
Aquarium, 10 gal., with cover, air pump and filter	1	(1,15)
Aquatic dip net, Model 412D	2	(3)
Jars, screw cap, specimen	5 dz	(1)
Bottles, Wide mouth, 32 oz	1 case	(1)
Specimen jars, wide mouth, 4 oz	48	(1)
Specimen jars, wide mouth, 6 oz	48	(1)
Vials, specimen, 1 oz	10 gross	(1)
Petri dish, ruled grid	4	(1)
Petri dish, compartmented	1 case	(1)
Watch glasses	10	(1)

Vacuum oven	1	(5)
Sounding lead and calibrated line	1	(3)
Forceps, watchman's, stainless	1 pr	(1)
Forceps, microdissection	2 pr	(1)
Dissecting set, basic	1	(1)
Water test kit, limnology	1	(1)
Thermometer, digital	1	(1)
Wash bottle, wide mouth, 500 mL	4	(1)
Wash bottle, polyethylene, 4 oz	2	(1)
Dropper bottle, polystop, 30 mL	2	(2)
Desiccator, polypropylene	1	(1)
Clip board with cover	2	(3,15)
Calculator, scientific	1	(3,15)
Marker, permanent, black	2	(3,15)
Pen set, slim pack, Koh-i-noor	1	(3,15)
Heavy paper tags with string	1000	(1,15)
Ice chest, insulated, 48 qt	2	(3,15)
Blue ice, soft pack	10	(3,15)
Plastic bags	100	(3,15)
Formalin, 10 percent	4 L	(2)
Ethyl alcohol	20 L	(2)
Trays, polypropylene, sorting	6	(5)

Sources of equipment and supplies:

1. Carolina Biological Supply Co.
   2700 York Rd.
   Burlington, NC 27215

2. Fisher Scientific
   50 Fadem Rd.
   Springfield, NJ 07081

3. Forestry Suppliers, Inc.
   205 West Rankin Street
   Jackson, MS 39284-8397

4. Industrial Rope Supply
   5250 River Rd.
   Cincinnati, OH 45233

5. Curtin Matheson Scientific, Inc.
   9999 Veterans Memorial Drive
   Houston, TX 77038-2499

6. Polyscience
   400 Valley Rd.
   Warrington, PA 18976

7. MonArk Boat Company
   Monticello, AK 71655

8. Wildlife Supply Company
   301 Case Street
   Saginaw, MI 48602

9. Tenaco
   2007 NE 27th Ave.
   Gainesville, FL 32609

10. Frigid Units, Inc.
    3214 Sylvania Ave.
    Toledo, OH 43613

11. W.C. Bradly Enterprises, Inc.
    P.O. Box 1240
    Columbus, GA 31993

12. Gallard-Schlesinger Chemical Mfg. Corp.
    584 Mineola Avenue
    Carle Place, NY 11514

13. Ellis-Rutter Associates
    P.O. Box 401
    Punta Gorda, FL 33950

14. Kahl Scientific Instrument Corp.
    P.O. Box 1166
    El Cajon, CA 92022-1166

15. Locally